

Executive Summary: The Transportation Operations Discipline

*Identifying the Education, Training, Experiential Learning,
Competencies, and Skills for Critical Occupations within the
Transportation Operations Discipline*

Project Overview

The U.S. DOT Federal Highway Administration (FHWA) funded the launch of the Southeast Transportation Workforce Center (SETWC) in concert with four other regional centers that form the National Network for the Transportation Workforce. Each center is dedicated to providing a more strategic and efficient approach to 21st century transportation workforce development through research, education, and industry engagement. At SETWC, we build partnerships and alliances between strategic stakeholders to advance an abiding goal: develop a skilled and career-ready transportation workforce throughout our service area, which includes twelve southeastern states and Puerto Rico.

As part of its work, the NNTW is undertaking a National Transportation Career Pathways Initiative, sponsored by FHWA. The initiative focuses on priority occupations in the following five areas: Engineering, Environment, Operations, Planning, and Safety. SETWC is leading the Operations focus area, and has formed a Discipline Working Group of industry experts to inform the initiative.

Our SETWC Operations Discipline Working Group is dedicated to:

- Using labor market data and industry forecasts to identify the top 10-15 critical transportation occupations with an “operations” focus, covering the next 5-15 years;
- Identifying the skills, competencies, experiences, and credentialing required for workers to be successful in these critical occupations;
- Evaluating the availability, comprehensiveness, and effectiveness of existing educational and training outlets, courses, and materials; and
- Establishing career pathways, demonstration programs, and work-based learning projects as resources for education/training institutions across the nation.

The following sections briefly outline findings related to priority occupations, career pathway and competency models, and key insights related to the training and skillset requirements for the workforce of the future.

Defining Transportation

With a goal of identifying priority occupations, relevant knowledge, skills, and abilities (KSAs), education and training practices, and related gaps, SETWC staff first embarked on a process of defining the term ‘transportation operations.’ Varied definitions exist depending on the industry sector of interest. For example, the USDOT refers to this discipline as Transportation Systems Operation and Management (TSMO) and defines it as incorporating, ‘...a broad set of strategies that aim to optimize the safe, efficient, and reliable use of existing and planned transportation infrastructure for all modes’, and reflects the greatest emphasis on traffic operations (USDOT

Federal Highway Administration 2015). Similar definitions exist with transportation operations being a clearly defined discipline in the freight and logistics realm, where it may extend to manufacturing and distribution operations in the case of supply chain (Council of Supply Chain Management Professionals 2018), and it is defined by the FHWA Office of Operations as encompassing, ‘...the practical work of moving goods from a shipper to a receiver, a subset of activities that constitute logistics management’ (USDOT Federal Highway Administration 2017).

Regardless of the setting, an overarching theme in transportation operations is the necessity of a systems approach and ever-changing impacts of technological advances (Manyika, et al. 2013). In the public sector, the rise of Intelligent Transportation Systems (ITS) began rapidly changing the knowledge, skills, and abilities, required of its workforce (USDOT Federal Highway Administration 2013) (Cronin, et al. 2012). Transformative technologies also dominate all other areas of the transportation industry, and occupy a key focus for companies whether from the standpoint of impact on efficiencies and the way business is conducted or the challenges in attracting and retaining an appropriately skilled workforce (Materials Handling Institute 2017) (Intelligent Transportation Systems Joint Program Office n.d.) (National Academies of Science, Engineering and Medicine 2017). Thus, SETWC approached this work defining transportation operations through three realms: traffic, transit, and freight, and focused on disruptive/transformative technology impacts on the workforce of the future.

Identifying Priority Occupations, Career Pathways, and Competency Models

Our research process for identifying priority occupations, relevant skillsets, and career pathway models was iterative and included the following tasks:

1. Conduct comprehensive literature review on transportation operations workforce and impact of transformational technologies
2. Review Bureau of Labor Statistics (BLS) and O*Net for initial priority occupation and skillset summaries
3. Refinement of priority occupation list via discussions with a national Discipline Working Group (DWG), comprised of leaders in traffic, transit, and freight operations from the public and private sectors and academia
4. Web search for relevant job descriptions and training/education programs
5. Gather input regarding occupational priorities from broad group of external stakeholders via online survey
6. Analyze survey data, conduct final occupation discussion with DWG, and finalize occupation list
7. Review and in-depth analysis of job descriptions for target occupations
8. Vetting of findings via Burning Glass
9. Develop career pathway and competency model
10. Review models with DWG and other external stakeholders for refinement.

Table 1 provides the final list of priority occupations identified through this effort. Appendix A provides mapping of occupations to SOC codes and outlines BLS growth projections. Appendix

B contains KSA analysis from real-time job postings. Appendix C contains career pathway models and Appendix D contains competency models developed through this work.

Table 1. Final List of Priority Occupations within Transportation Operations

TRAFFIC	TRANSIT	FREIGHT
Project and Program Managers		
Computer and Information Systems Managers/ Cyber Security		
Operations Planners		
Traffic Signal Maintenance Technicians	Commercial Drivers	Commercial Drivers
Traffic Incident/Operations Center Managers	Diesel Mechanics	Diesel Mechanics
Civil/Traffic Engineers	Civil/Transportation Engineers	Data Science Analysts/Logisticians
ITS Technicians		Industrial Engineers/ Operations Research Analysts

Insights for the Future Workforce

Transportation operations requires workers who are:

- *Tech-savvy;*
- *Flexible, responsive, and adaptive to an ever-changing set of technological tools and innovations;*
- *Effective communicators, particularly with a wide range of stakeholders;*
- *Knowledgeable of system infrastructure design and connectivity; and*
- *Equipped with skillsets related to data acquisition, management, analysis, modeling, and decision-making.*

There are a variety of entry points into this workforce, from technician-level occupations that require technical training or 2-year degrees, to engineering, data science, and management positions that require 4-year degrees and beyond. But for workers to be fully prepared to handle the challenges of the next 10-15 years, they must possess more interdisciplinary skills that cross over traditional boundaries of academic preparation.

Also, though the specific challenges to attracting and retaining workers in these occupations may differ across realms, they also share some broader issues. For technician-level occupations, perceptions of the industry or its work environment (i.e., driving positions are unfulfilling or diesel mechanic jobs are “dirty”) limit the attraction of new workers. In higher-level positions, its competition between public, private, and other industry sectors that vie for a limited pool of qualified applicants.

However, a general lack of awareness of the transportation industry as a whole, and the transportation operations realm in particular, offers a more significant barrier to preparing an adequately trained and sized workforce. This includes the challenge of attracting more diversity to these positions. It is important to tell the story of transportation operations so that potential candidates understand the value of these workers in our society and to put a “face” on the occupations so that they can “see” themselves in these roles.

Further, beyond the more entry-level positions, there is no common pathway for entering into a transportation operations career. As the complexity and interdisciplinary nature of these jobs continues to increase, this further complicates this career path model and the mechanisms needed to introduce students to these careers within a traditional academic environment. Innovative interdisciplinary partnerships for integrating experiential learning into academic programs and demonstrating to students the opportunities available within transportation operations are key to developing career awareness and relevant competencies for the workforce of the future.

Next Steps

Over the next year, the Operations Discipline Working Group will focus on career pathway solutions that provide demonstrable achievements for both students—in terms of articulating a continuum of learning versus occupational opportunity, and employers—by providing a technically agile and comprehensively skilled talent pool. Solutions must be ready to deploy within technical schools, community colleges, 4-year universities, and professional development programs. All SETWC research, education, and industry engagement efforts are guided by FHWA’s position that the nation’s ability to successfully deliver and manage an efficient, safe, and effective transportation system is dependent on the knowledge, skills, and abilities of the transportation workforce.

Works Cited

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Appendix A: Priority Occupation SOC Mapping and Projections

SOC Mapping for Priority Occupations within Transportation Operations

SETWC Priority Occupation Title	SOC	BLS Occupation Title
Project and Program Managers (Freight)	11-1021	General and Operations Managers
	13-1081	Logisticians
	15-1111	Computer and Information Research Scientist
	15-2041	Statisticians
	15-2031	Operations Research Analyst
	17-2112	Industrial Engineers
Project and Program Managers (Traffic/Transit)	17-2051	Civil Engineers
Computer and Information Systems Managers/ Cyber Security	11-3021	Computer and Information Systems Managers
	15-1122	Information Security Analyst
Operations Planners (Freight)	11-1021	General and Operations Managers
	13-1081	Logisticians
	15-1111	Computer and Information Research Scientists
	15-2041	Statisticians
	15-2031	Operations Research Analysts
	17-2112	Industrial Engineers
Operations Planners (Traffic/Transit)	17-2051	Civil Engineers
	19-3051	Urban and Regional Planner
Traffic Signal Maintenance/ ITS Technicians	53-6041	Traffic Technicians
	17-2071	Electrical Engineers
	17-3023	Electrical and Electronic Engineering Technician
	49-2093	Electrical and Electronics Installers and Repairers, Transportation Equipment

SOC Mapping for Priority Occupations within Transportation Operations (cont.)

SETWC Priority Occupation Title	SOC	BLS Occupation Title
Traffic Incident/ Operations Center Managers	11-9161	Emergency Management Directors
	17-2051	Civil Engineers
	53-6041	Traffic Technicians
Civil/Transportation Engineers (Traffic/Transit)	17-2051	Civil Engineers
Commercial Drivers (Transit/Freight)	53-3032	Heavy and Tractor-Trailer Truck Drivers
	53-3021	Bus Drivers, Transit and Intercity
Diesel Mechanics (Transit/Freight)	49-3031	Bus and Truck Mechanics and Diesel Engine Specialists
Data Science Analysts/ Logisticians	13-1081	Logisticians
	15-1111	Computer and Information Research Scientists
	15-2041	Statisticians
Industrial Engineers/ Operations Research Analysts	15-2031	Operations Research Analysts
	17-2112	Industrial Engineers

BLS Projections for Priority Occupations within Transportation Operations

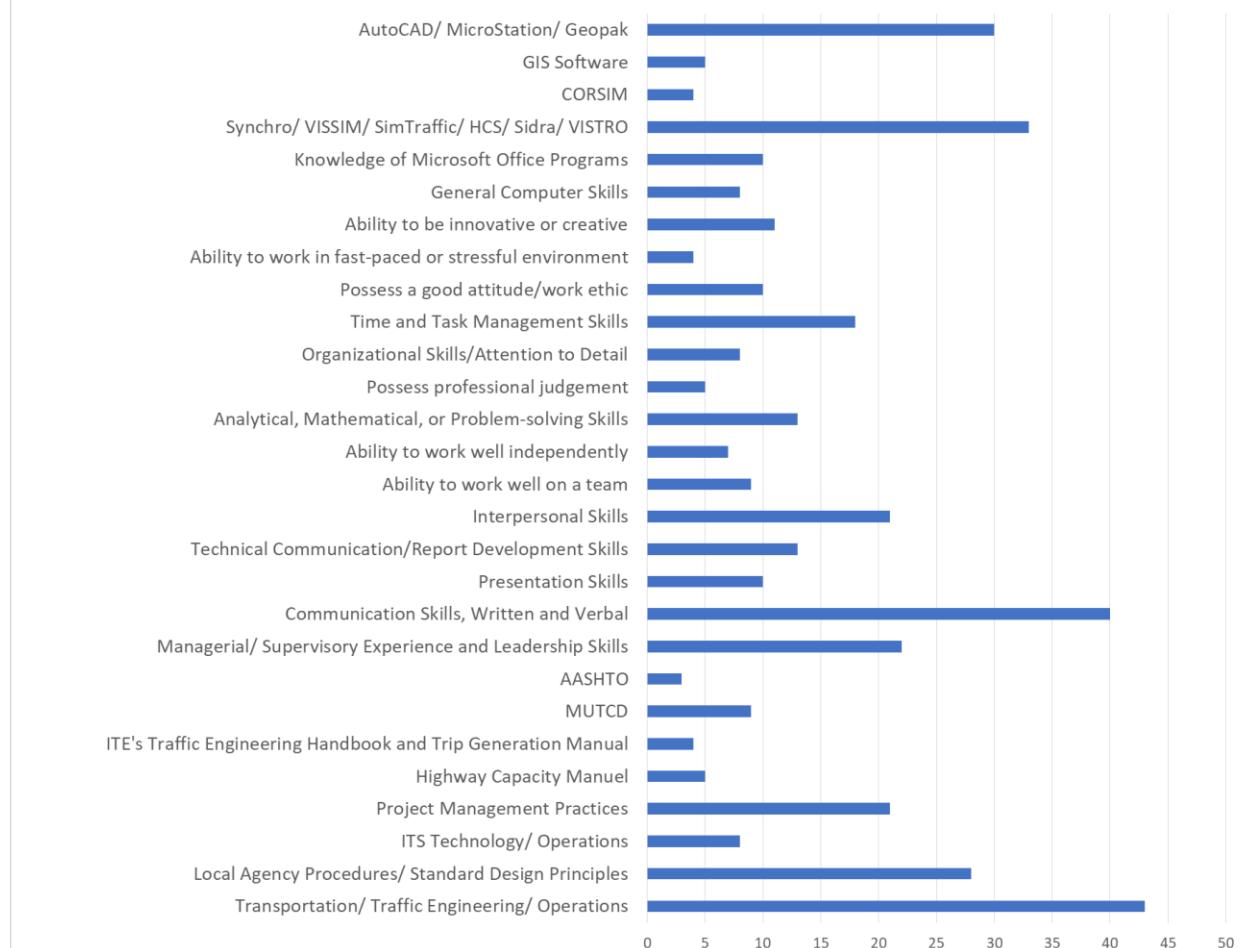
SOC CODE	OCCUPATION TITLE	CURRENT # EMPLOYEES, 2016	PROJECTED # EMPLOYEES, 2026	PERCENT CHANGE
53-6041	Traffic Technicians	6,600	7,200	9.10%
17-2071	Electrical Engineers	188,300	204,500	9.00%
17-3023	Electrical and Electronic Engineering Technician	137,000	139,800	2.00%
17-2051	Civil Engineers	303,500	335,700	10.60%
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	278,800	305,300	9.50%
15-2031	Operations Research Analysts	114,000	145,300	27.40%
17-2112	Industrial Engineers	257,900	283,000	9.70%
53-3032	Heavy and Tractor-Trailer Truck Drivers	1,871,700	1,985,500	6.10%
53-3021	Bus Drivers, Transit and Intercity	179,300	195,100	8.80%
13-1081	Logisticians	148,700	159,000	6.90%
15-1111	Computer and Information Research Scientists	27,900	33,200	19.20%
15-2041	Statisticians	37,200	49,600	33.40%
11-3021	Computer and Information Systems Managers	367,600	411,400	11.90%
15-1122	Information Security Analyst	100,000	128,500	28.40%
11-9161	Emergency Management Directors	10,100	10,900	7.70%
11-1021	General and Operations Managers	2,263,100	2,469,000	9.10%
19-3051	Urban and Regional Planner	36,000	40,600	12.80%
49-2093	Electrical and Electronics Installers and Repairers, Transportation Equipment	13,900	14,300	2.90%
47-2111	Electricians	666,900	727,000	9.00%

Appendix B: KSA Analysis for Priority Occupations

		Traffic Engineers or Project Managers					
	Job Type	Entry Level Engineer	Traffic Operations Engineer	Traffic Operations Program/ Project Manager	Traffic Engineer/ Program Manager	Advanced Traffic Operations PM/ Engineer	TOTAL COUNT:
Job Title (n=60)		5	19	18	8	11	61
Agency		5	19	18	8	11	
State		5	18	18	8	11	
Job duties		5	18	18	8	7	
Required Education or Training		5	18	15	8	8	
Bachelor's Degree Required		100%	95%	83%	100%	73%	
Major coursework in:		4	18	15	8	8	
Master's Degree Preferred		40%	16%	17%	38%	55%	
Traffic or Transportation Emphasis		40%	42%	0%	25%	27%	
From Accredited Institution		20%	16%	6%	50%	0%	
Required certifications or licenses		3	18	15	8	10	
FE/ EIT Required		60%	37%	6%	0%	0%	
PE Required or Preferred		40%	84%	61%	88%	91%	
PTOE Preferred		0%	32%	11%	50%	18%	
Driver's License Required		40%	26%	28%	13%	18%	
Additional Certifications Required		0%	5%	11%	13%	18%	
Desired Technical Skills		3	12	11	6	6	
Desired Soft Skills		4	17	14	5	9	
Hardware or Software Competencies		4	15	15	8	8	
Transportation/ Traffic Engineering/ Operations		20%	89%	50%	100%	73%	43
Local Agency Procedures/ Standard Design Principles		0%	47%	61%	75%	18%	28
ITS Technology/ Operations		0%	16%	17%	25%	0%	8
Project Management Practices		0%	32%	44%	38%	36%	21
Highway Capacity Manual		20%	16%	6%	0%	0%	5
ITE's Traffic Engineering Handbook and Trip Generation Manual		0%	16%	6%	0%	0%	4
MUTCD		20%	26%	17%	0%	0%	9
AASHTO		20%	5%	6%	0%	0%	3
Managerial/ Supervisory Experience and Leadership Skills		20%	42%	33%	25%	45%	22
Communication Skills, Written and Verbal		80%	63%	61%	63%	73%	40
Presentation Skills		20%	5%	22%	0%	36%	10
Technical Communication/Report Development Skills		20%	26%	11%	13%	36%	13
Interpersonal Skills		60%	21%	33%	50%	36%	21
Ability to work well on a team		60%	16%	11%	13%	0%	9
Ability to work well independently		40%	16%	0%	13%	9%	7
Analytical, Mathematical, or Problem-solving Skills		80%	16%	11%	25%	18%	13
Possess professional judgement		40%	5%	11%	0%	0%	5
Organizational Skills/Attention to Detail		20%	16%	11%	13%	9%	8
Time and Task Management Skills		40%	26%	39%	38%	9%	18
Possess a good attitude/work ethic		40%	16%	17%	13%	9%	10
Ability to work in fast-paced or stressful environment		40%	0%	11%	0%	0%	4
Ability to be innovative or creative		40%	21%	11%	0%	27%	11
General Computer Skills		0%	11%	17%	0%	27%	8
Knowledge of Microsoft Office Programs		40%	5%	22%	25%	9%	10
Synchro/ VISSIM/ SimTraffic/ HCS/ Sidra/ VISTRO		20%	63%	50%	63%	55%	33
CORSIM		0%	11%	0%	13%	9%	4
GIS Software		20%	11%	6%	0%	9%	5
AutoCAD/ MicroStation/ Geopak		60%	37%	50%	100%	27%	30
Experience Requirements		2	18	16	8	9	
Average Years of Experience Required		3 years	5 years	8.8 years	9.5 years	8.5 years	
Supervisory Experience Required		0%	5%	6%	0%	27%	
Experience with Local DOT or Government Agency		0%	16%	28%	50%	27%	
Education can replace experience		0%	11%	6%	0%	0%	
Salary Range		1	6	4	0	1	
Average Salary		\$ 73,767.20	\$ 67,151.42	\$ 81,878.22	\$ -	\$ 115,800.00	
Average Hourly Rate		\$ 35.47	\$ 32.28	\$ 39.36	\$ -	\$ 55.67	

Data represents count unless otherwise indicated.

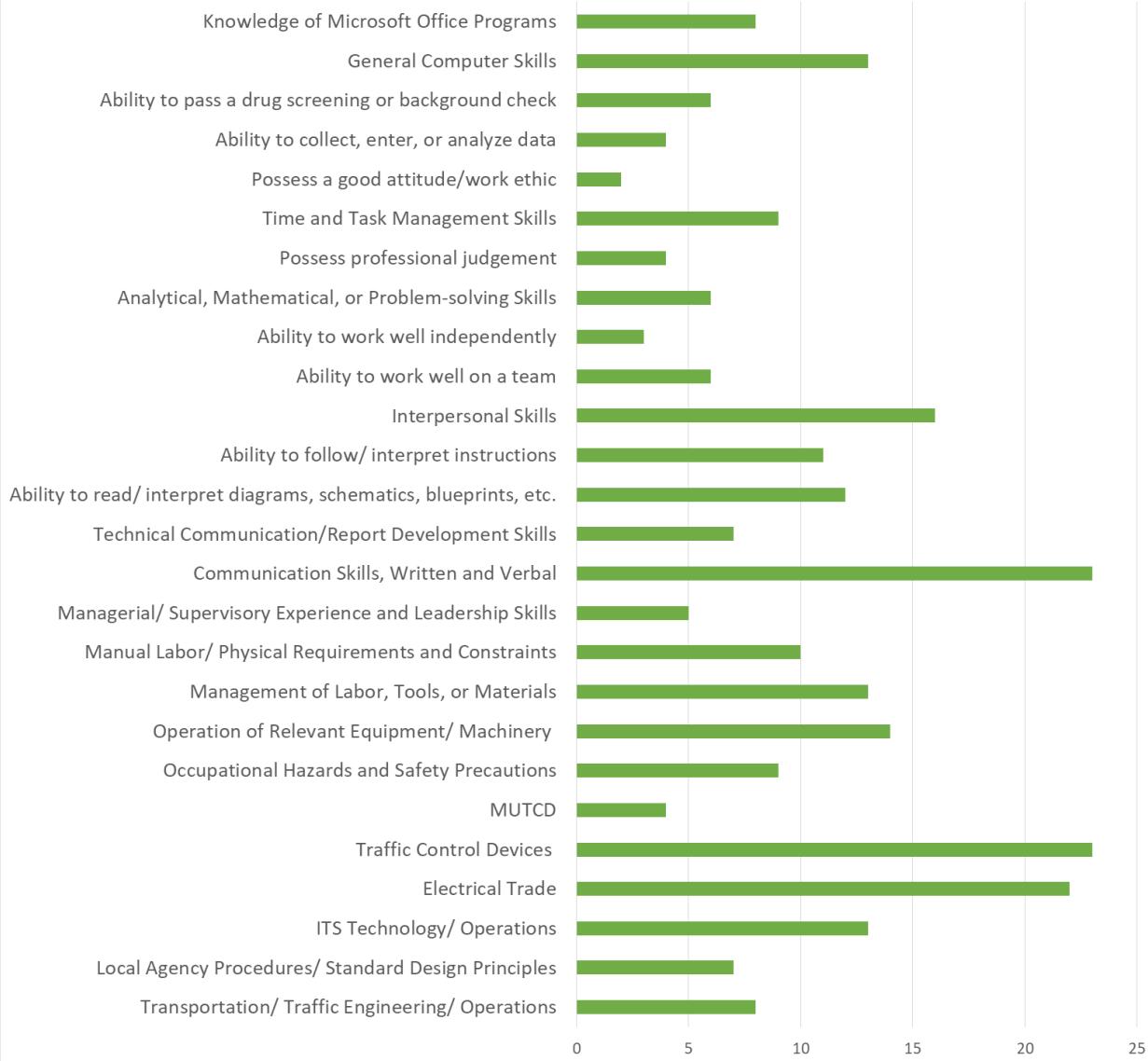
Traffic Engineers or Project Managers: Most Sought-After Competencies



		Traffic Signal/ITS Technicians				
	Job Type	ITS Technician	Traffic Systems/ Signal Technician I	Traffic Systems/ Signal Technician II	Traffic System Supervisor	TOTAL COUNT:
Job Title (n=39)		6	21	7	5	39
Agency		6	21	7	5	
State		6	21	7	5	
Job duties		5	21	7	5	
Required Education or Training		2	18	6	4	
High School Diploma or GED Required		0%	86%	86%	20%	
Some additional training required (technical, vocational, or college level)		0%	33%	29%	0%	
Associate's Degree Required		17%	10%	14%	20%	
Bachelor's Degree Required		17%	0%	0%	60%	
Major coursework in:		33%	19%	29%	20%	
Required certifications or licenses		6	19	7	2	
Driver's License Required		83%	29%	29%	40%	
Commercial Driver's License Required		17%	76%	71%	0%	
CDL Type		1	12	4	0	
Maintain good driving record		67%	19%	14%	0%	
PE Required or Preferred		0%	0%	0%	20%	
IMSA Certifications		50%	62%	57%	0%	
Work Zone/ Traffic Control Certifications		17%	43%	14%	0%	
Safety Impact Certificate		0%	0%	29%	20%	
Electrician Certificate		0%	10%	14%	0%	
Desired Technical Skills		6	16	7	5	
Desired Soft Skills		5	15	7	5	
Hardware or Software Competencies		1	7	2	5	
Knowledge	Transportation/ Traffic Engineering/ Operations	17%	14%	0%	80%	8
	Local Agency Procedures/ Standard Design Principles	17%	19%	0%	40%	7
	ITS Technology/ Operations	67%	19%	14%	80%	13
	Electrical Trade	67%	57%	71%	20%	22
	Traffic Control Devices	67%	62%	57%	40%	23
	MUTCD	17%	5%	14%	20%	4
	Occupational Hazards and Safety Precautions	33%	24%	29%	0%	9
	Operation of Relevant Equipment/ Machinery	50%	38%	43%	0%	14
	Management of Labor, Tools, or Materials	67%	24%	43%	20%	13
Skills and Abilities	Manual Labor/ Physical Requirements and Constraints	33%	24%	43%	0%	10
	Managerial/ Supervisory Experience and Leadership Skills	0%	10%	0%	60%	5
	Communication Skills, Written and Verbal	33%	57%	71%	80%	23
	Technical Communication/Report Development Skills	33%	10%	14%	40%	7
	Ability to read/ interpret diagrams, schematics, blueprints, etc.	50%	33%	14%	20%	12
	Ability to follow/ interpret instructions	0%	38%	43%	0%	11
	Interpersonal Skills	33%	38%	43%	60%	16
	Ability to work well on a team	0%	14%	29%	20%	6
	Ability to work well independently	17%	10%	0%	0%	3
	Analytical, Mathematical, or Problem-solving Skills	50%	10%	14%	0%	6
	Possess professional judgement	0%	10%	29%	0%	4
Tech Comps	Time and Task Management Skills	33%	19%	14%	40%	9
	Possess a good attitude/work ethic	0%	0%	29%	0%	2
	Ability to collect, enter, or analyze data	0%	19%	0%	0%	4
	Ability to pass a drug screening or background check	33%	14%	14%	0%	6
	General Computer Skills	33%	29%	43%	40%	13
	Knowledge of Microsoft Office Programs	0%	14%	14%	80%	8
	Experience Requirements		4	17	6	3
	Average Years of Experience Required	5.8 years	5.8 years	4.9 years	4.5 years	
	Education can replace experience	0%	38%	57%	60%	
	Salary Range		2	5	2	1
	Average Salary	\$ 38,500.00	\$ 38,768.30	\$ 41,279.20	\$ 48,750.00	
	Average Hourly Rate	\$ 18.51	\$ 18.64	\$ 19.85	\$ 23.44	

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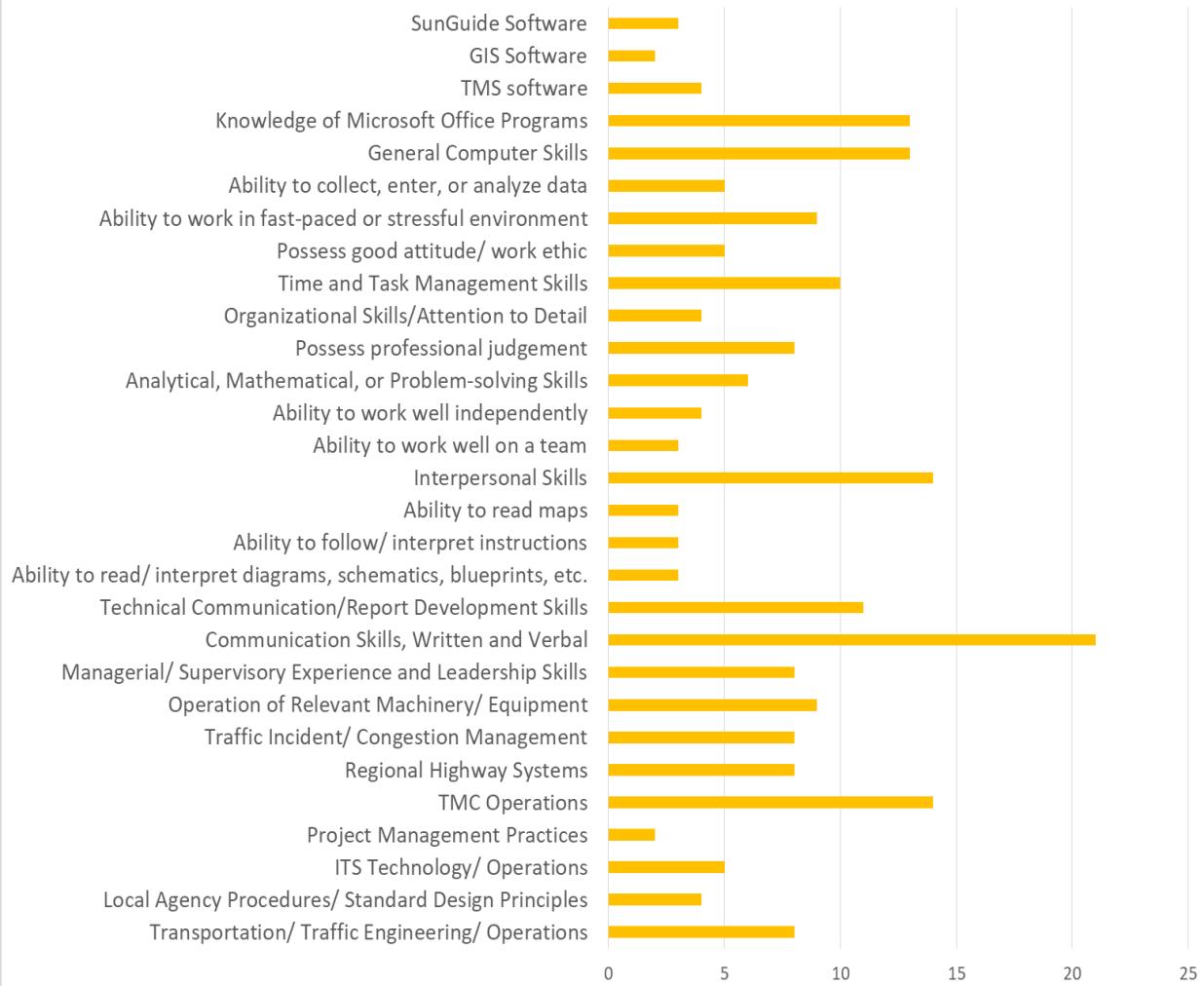
Traffic Signal/ITS Technicians: Most Sought-After Competencies



		Traffic Incident Managers				
	Job Type	TMC Operator or Dispatcher	TMC Manager or Coordinator	TMC Technician or Engineer	TMC Supervisor or Senior Operator	TOTAL COUNT:
Job Title (n=28)		10	6	4	8	28
Agency		10	6	2	7	
State		10	6	4	8	
Job duties		10	6	4	8	
Required Education or Training		7	5	4	8	
High School Diploma or GED Required		60%	33%	50%	75%	
Associate's Degree Preferred		10%	17%	0%	50%	
Bachelor's Degree Required		0%	33%	25%	38%	
Major coursework in:		0	3	0	1	
Required certifications or licenses		1	3	2	3	
Driver's License Required		0%	33%	0%	13%	
Commercial Driver's License Required		0%	0%	50%	25%	
CDL Type		0	0	2	2	
Additional Licenses Required		0%	17%	0%	13%	
On The Job Training Required		10%	0%	50%	13%	
Desired Technical Skills		10	4	4	7	
Desired Soft Skills		9	4	4	6	
Hardware or Software Competencies		8	3	0	6	
Knowledge	Transportation/ Traffic Engineering/ Operations	10%	17%	100%	25%	8
	Local Agency Procedures/ Standard Design Principles	0%	17%	25%	25%	4
	ITS Technology/ Operations	0%	0%	50%	38%	5
	Project Management Practices	0%	17%	0%	13%	2
	TMC Operations	40%	0%	50%	100%	14
	Regional Highway Systems	40%	0%	50%	25%	8
	Traffic Incident/ Congestion Management	10%	33%	50%	38%	8
Skills and Abilities	Operation of Relevant Machinery/ Equipment	30%	17%	50%	38%	9
	Managerial/ Supervisory Experience and Leadership Skills	0%	33%	50%	50%	8
	Communication Skills, Written and Verbal	80%	67%	75%	75%	21
	Technical Communication/Report Development Skills	30%	17%	75%	50%	11
	Ability to read/ interpret diagrams, schematics, blueprints, etc.	10%	17%	0%	13%	3
	Ability to follow/ interpret instructions	20%	0%	0%	13%	3
	Ability to read maps	0%	0%	50%	13%	3
	Interpersonal Skills	50%	17%	50%	75%	14
	Ability to work well on a team	0%	0%	50%	13%	3
	Ability to work well independently	20%	17%	25%	0%	4
Technical Comps.	Analytical, Mathematical, or Problem-solving Skills	20%	33%	50%	0%	6
	Possess professional judgement	20%	17%	100%	13%	8
	Organizational Skills/Attention to Detail	30%	17%	0%	0%	4
	Time and Task Management Skills	40%	50%	25%	25%	10
	Possess good attitude/ work ethic	0%	17%	50%	25%	5
	Ability to work in fast-paced or stressful environment	50%	33%	0%	25%	9
	Ability to collect, enter, or analyze data	40%	0%	0%	13%	5
	General Computer Skills	70%	50%	50%	13%	13
	Knowledge of Microsoft Office Programs	70%	50%	0%	38%	13
	TMS software	0%	17%	0%	38%	4
	GIS Software	0%	17%	0%	13%	2
	SunGuide Software	10%	0%	0%	25%	3
	Experience Requirements	6	4	3	8	
	Average Years of Experience Required	1.1 years	4.5 years	2 years	2.7 years	
	Supervisory Experience Required	0%	0%	25%	25%	
	Education can replace experience	0%	0%	0%	13%	
	Salary Range	1	1	0	0	
	Average Salary	\$ 34,320.00	\$ 47,000.00	\$ -	\$ -	
	Average Hourly Rate	\$ 16.50	\$ 22.60	\$ -	\$ -	

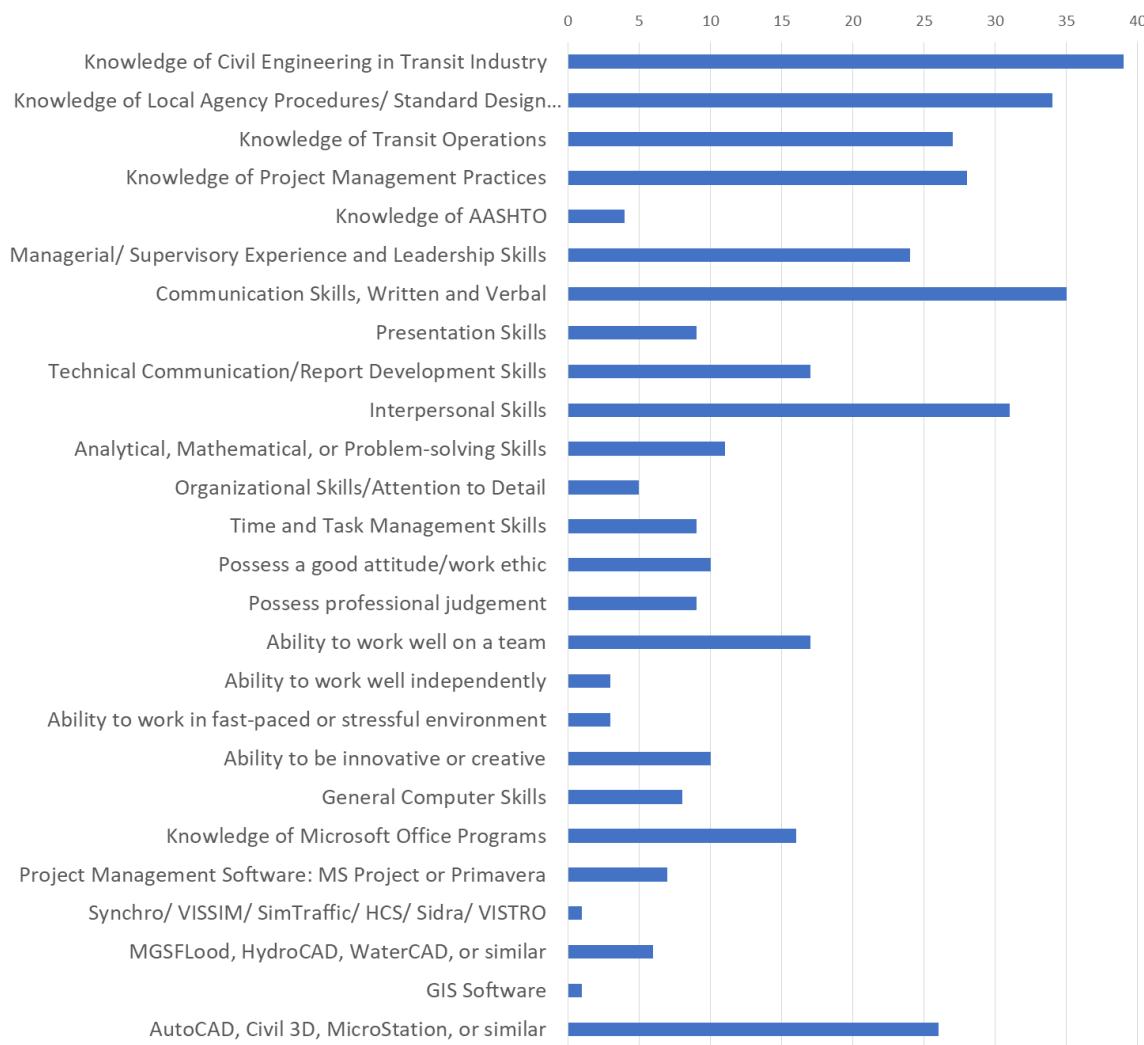
Data represents count unless otherwise indicated.

Traffic Incident Managers: Most Sought-After Competencies



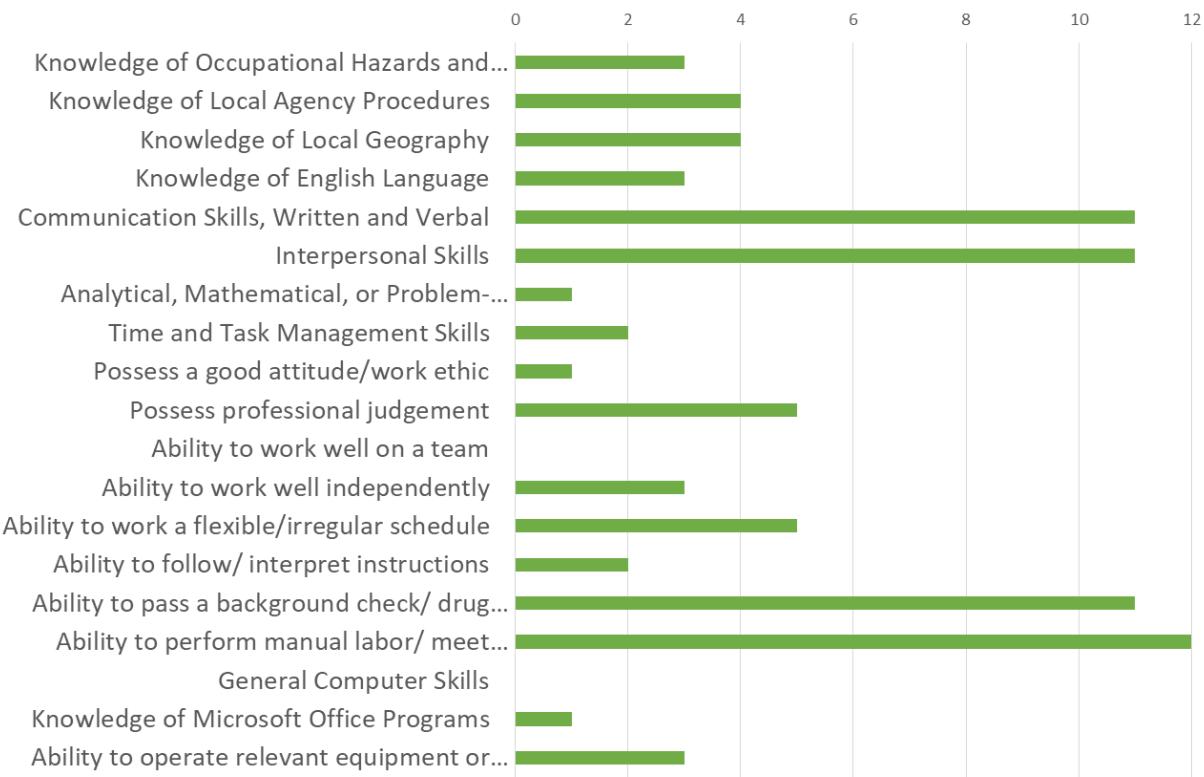
		Civil Transit Engineers + Transit Project Managers					
Job Title		Associate or Entry-Level Civil Engineer	Civil Engineer, Transit	Project Manager, Transit	Senior Civil Engineer, Transit	Senior Project Manager, Transit	TOTAL COUNT:
Job Type		7	17	21	4	10	59
Level		7	17	21	4	10	
Agency		7	17	21	4	10	
State		6	17	21	4	10	
Job duties		6	14	20	4	10	
Required Education or Training		7	17	21	4	10	
Bachelor's Degree Required		100%	100%	100%	100%	100%	
Major coursework in:		100%	88%	100%	100%	100%	
Master's Degree Required		43%	6%	33%	25%	40%	
Transportation Emphasis		29%	6%	10%	0%	10%	
From Accredited Institution		29%	18%	10%	0%	0%	
Required certifications or licenses		5	16	14	4	6	
FE/ EIT Required		57%	12%	0%	0%	0%	
PE Required or Preferred		0%	82%	52%	100%	40%	
PTOE Preferred		0%	0%	5%	0%	0%	
Driver's License Required		43%	24%	5%	0%	0%	
Additional Certifications Required		0%	6%	10%	0%	40%	
Desired Technical Skills		6	15	18	3	8	
Desired Soft Skills		4	13	14	2	10	
Hardware or Software Competencies		6	12	10	3	5	
Knowledge	Knowledge of Civil Engineering in Transit Industry	71%	71%	67%	50%	60%	39
	Knowledge of Local Agency Procedures/ Standard Design Principles	43%	59%	62%	50%	60%	34
	Knowledge of Transit Operations	14%	29%	57%	50%	70%	27
	Knowledge of Project Management Practices	0%	24%	71%	25%	80%	28
	Knowledge of AASHTO	14%	6%	0%	25%	10%	4
Skills and Abilities	Managerial/ Supervisory Experience and Leadership Skills	0%	29%	43%	50%	80%	24
	Communication Skills, Written and Verbal	57%	76%	38%	75%	70%	35
	Presentation Skills	0%	12%	19%	0%	30%	9
	Technical Communication/Report Development Skills	14%	35%	24%	25%	40%	17
	Interpersonal Skills	29%	35%	67%	50%	70%	31
	Analytical, Mathematical, or Problem-solving Skills	0%	18%	5%	25%	60%	11
	Organizational Skills/Attention to Detail	0%	0%	14%	0%	20%	5
	Time and Task Management Skills	14%	6%	14%	0%	40%	9
	Possess a good attitude/work ethic	14%	24%	19%	25%	0%	10
	Possess professional judgement	0%	18%	5%	25%	40%	9
	Ability to work well on a team	14%	24%	29%	50%	40%	17
	Ability to work well independently	0%	6%	0%	25%	10%	3
	Ability to work in fast-paced or stressful environment	14%	6%	5%	0%	0%	3
	Ability to be innovative or creative	29%	12%	14%	0%	30%	10
Technical Competencies	General Computer Skills	0%	18%	19%	0%	10%	8
	Knowledge of Microsoft Office Programs	14%	29%	33%	0%	30%	16
	Project Management Software: MS Project or Primavera	0%	0%	24%	0%	20%	7
	Synchro/ VISSIM/ SimTraffic/ HCS/ Sidra/ VISTRO	14%	0%	0%	0%	0%	1
	MGSFLood, HydroCAD, WaterCAD, or similar	29%	6%	10%	25%	0%	6
	GIS Software	0%	6%	0%	0%	0%	1
	AutoCAD, Civil 3D, MicroStation, or similar	86%	71%	19%	75%	10%	26
	Experience Requirements	5	15	19	4	10	
	Average Years of Experience Required	2.5 years	6 years	11.1 years	8.8 years	12.9 years	
	Education can replace experience	0%	12%	5%	0%	0%	
	Supervisory Experience Required	0%	0%	24%	50%	30%	
	Experience with Local DOT or Government Agency	0%	18%	19%	50%	10%	
	Salary Range	1	2	2	0	1	
	Average Salary	\$ 52,909.00	\$ 87,158.50	\$ 92,079.64	n/a	\$ 113,519.33	
	Average Hourly Rate	\$ 25.44	\$ 41.90	\$ 44.27	n/a	\$ 54.58	
	Additional Info	6	14	20	4	10	
	Data represents count unless otherwise indicated.						

Civil Transit Engineers/Transit Project Managers : Most Sought-After Competencies



		Commercial Drivers			
	Job Title	Bus or Shuttle Operator Driver	Paratransit Operator/Driver	Supervisor, Transit Service Delivery	TOTAL COUNT:
	Job Type	18	4	1	
	Agency	18	4	1	
	State	18	4	1	
	Job duties	11	4	1	
	Required Education or Training	10	2	1	
	Age Requirement	33%	25%	0%	
	High School Diploma or GED Required	56%	50%	100%	
	Required certifications or licenses	17	4	1	
	CDL Required	89%	100%	100%	
	CDL Type	61%	100%	100%	
	CDL Endorsements Required	78%	75%	100%	
	Good driving record required	56%	25%	100%	
	Desired Technical Skills	9	3	1	
	Desired Soft Skills	12	4	1	
Knowledge	Knowledge of Occupational Hazards and Safety Precautions	17%	0%	0%	3
	Knowledge of Local Agency Procedures	17%	25%	0%	4
	Knowledge of Local Geography	17%	25%	0%	4
	Knowledge of English Language	11%	25%	0%	3
Skills and Abilities	Communication Skills, Written and Verbal	39%	75%	100%	11
	Interpersonal Skills	39%	75%	100%	11
	Analytical, Mathematical, or Problem-solving Skills	0%	25%	0%	1
	Time and Task Management Skills	6%	25%	0%	2
	Possess a good attitude/work ethic	6%	0%	0%	1
	Possess professional judgement	17%	50%	0%	5
	Ability to work well on a team	0%	0%	0%	0
	Ability to work well independently	11%	25%	0%	3
	Ability to work a flexible/irregular schedule	22%	0%	100%	5
	Ability to follow/ interpret instructions	11%	0%	0%	2
	Ability to pass a background check/ drug screening	50%	50%	0%	11
Tech Comps	Ability to perform manual labor/ meet physical requirements	50%	50%	100%	12
	General Computer Skills	0%	0%	0%	0
	Knowledge of Microsoft Office Programs	0%	0%	100%	1
	Ability to operate relevant equipment or software	11%	0%	100%	3
	Experience Requirements	12	3	1	
	Average Years of Experience Required	2.7 years	3 years	n/a	
	Education can replace experience	50%	75%	0%	
	Driving Experience Required	39%	75%	0%	
	Salary Range	17	3	1	
	Average Salary	\$ 33,499.39	\$ 28,003.73	\$ 61,824.00	
	Average Hourly Rate	\$ 16.11	\$ 13.46	\$ 29.72	
	<i>Data represents count unless otherwise indicated.</i>				

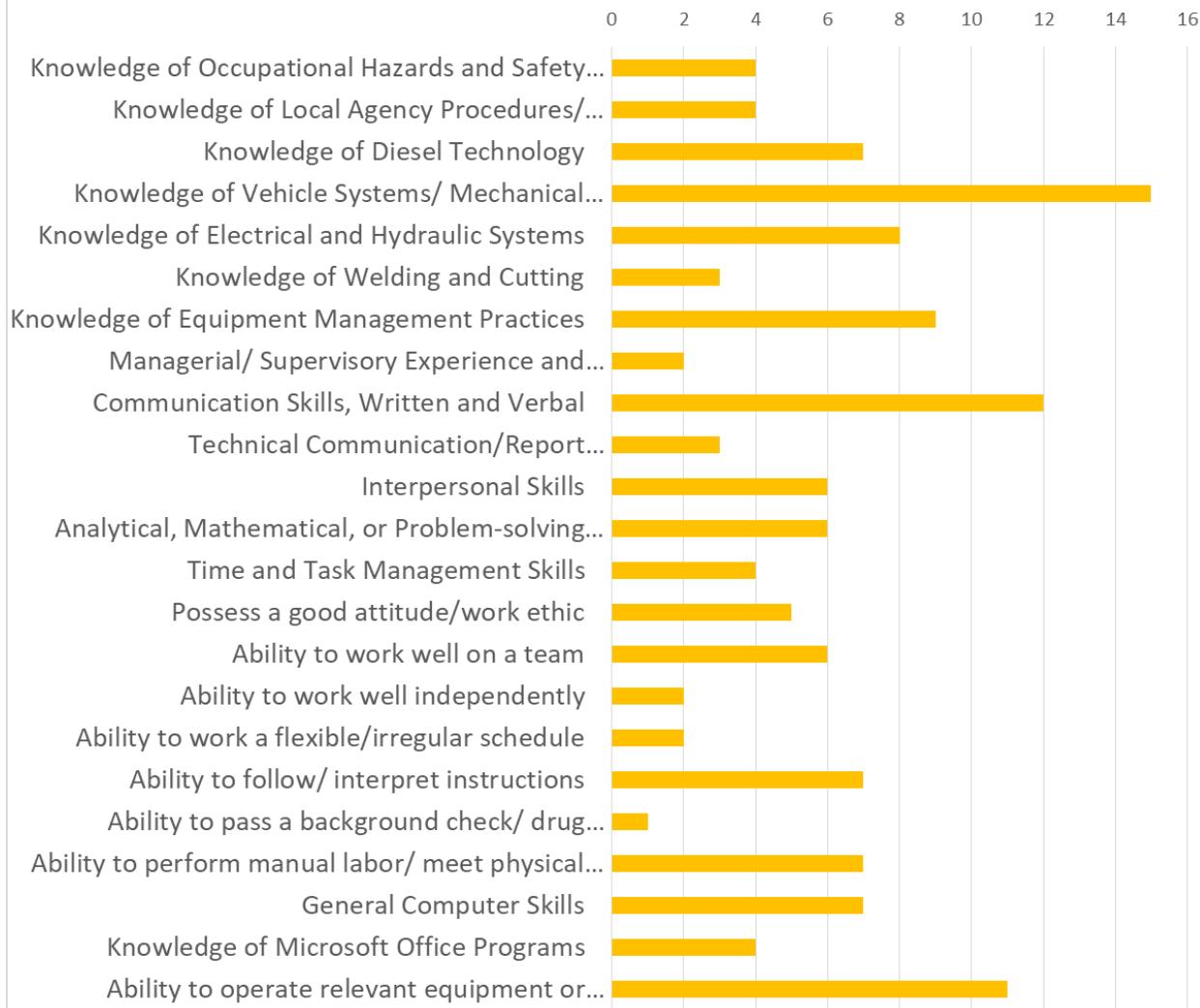
Commercial Drivers: Most Sought-After Competencies



Diesel Mechanics/ Diesel Shop Technicians

	Job Title	Diesel Mechanic	Technician/ Mechanic	Senior Technician/ Mechanic	TOTAL COUNT:
Job Type		17	5	4	26
Agency		17	5	4	
State		17	5	4	
Job duties		15	4	4	
Required Education or Training		12	4	4	
Age Requirement		6%	0%	0%	
High School Diploma or GED Required		65%	40%	100%	
Additional Vocational/ Technical Training Required		29%	60%	100%	
Required certifications or licenses		13	4	3	
Driver's License Required		35%	40%	50%	
CDL Required		53%	20%	75%	
CDL Type		41%	20%	75%	
CDL Endorsements Required		18%	0%	0%	
ASE Certification Required		24%	20%	75%	
Additional Certifications Required		12%	20%	50%	
Desired Technical Skills		7	2	4	
Desired Soft Skills		8	4	2	
Hardware or Software Competencies		5	1	3	
Knowledge	Knowledge of Occupational Hazards and Safety Precautions	12%	20%	25%	4
	Knowledge of Local Agency Procedures/ Standard Design Principles	6%	20%	50%	4
	Knowledge of Diesel Technology	29%	20%	25%	7
	Knowledge of Vehicle Systems/ Mechanical Aptitude	53%	40%	100%	15
	Knowledge of Electrical and Hydraulic Systems	18%	20%	100%	8
	Knowledge of Welding and Cutting	6%	0%	50%	3
Skills and Abilities	Knowledge of Equipment Management Practices	29%	40%	50%	9
	Managerial/ Supervisory Experience and Leadership Skills	6%	0%	25%	2
	Communication Skills, Written and Verbal	41%	80%	25%	12
	Technical Communication/Report Development Skills	6%	20%	25%	3
	Interpersonal Skills	18%	60%	0%	6
	Analytical, Mathematical, or Problem-solving Skills	18%	40%	25%	6
Tech Comps	Time and Task Management Skills	24%	0%	0%	4
	Possess a good attitude/work ethic	12%	60%	0%	5
	Ability to work well on a team	12%	80%	0%	6
	Ability to work well independently	6%	0%	25%	2
	Ability to work a flexible/irregular schedule	6%	20%	0%	2
	Ability to follow/ interpret instructions	24%	40%	25%	7
	Ability to pass a background check/ drug screening	6%	0%	0%	1
	Ability to perform manual labor/ meet physical requirements	18%	40%	50%	7
	General Computer Skills	18%	40%	50%	7
	Knowledge of Microsoft Office Programs	18%	0%	25%	4
	Ability to operate relevant equipment or software	29%	40%	100%	11
	Experience Requirements	17	5	4	
	Average Years of Experience Required	3.5 years	3 years	4.7 years	
	Education can replace experience	18%	40%	75%	
	Salary Range	6	1	1	
	Average Salary	\$ 55,483.30	\$ 74,807.20	\$ 65,520.00	
	Average Hourly Rate	\$ 26.67	\$ 35.97	\$ 31.50	
	Additional Info	13	3	4	
<i>Data represents count unless otherwise indicated.</i>					

Diesel Mechanics/Diesel Shop Technicians: Most Sought-After Competencies



Industrial Engineers + Operations Research/ Modeling Analysts

	Job Title	Logistics Intern	Logistics Coordinator/ Analyst	Logistics/Supply Chain Engineer	Supply Chain Manager or Senior Analyst	TOTAL COUNT:
	Agency	4	7	16	7	34
	State	4	7	16	7	
	Job duties	4	7	16	7	
	Required Education or Training	4	7	16	7	
Knowledge	Bachelor's Degree Required	100%	100%	100%	100%	
	Advanced Degree Required	50%	14%	13%	0%	
	Major Coursework In:	75%	71%	100%	100%	
	Experience can replace education	0%	14%	6%	71%	
	Required certifications or licenses	0	0	3	0	
	Certifications	0%	0%	19%	0%	
	Desired Technical Skills	2	4	15	7	
	Desired Soft Skills	4	6	14	7	
	Hardware or Software Competencies	4	6	14	5	
	Knowledge of Transportation, Warehousing, Supply Chain, and Logistics	25%	71%	100%	71%	25
Skills and Abilities	Knowledge of Local Agency Procedures/ Standard Design Principles	0%	0%	25%	29%	5
	Knowledge of Project Management Practices	50%	29%	31%	71%	12
	Knowledge of Statistical Analysis, Modeling and Optimization	0%	43%	50%	43%	12
	Knowledge of Operations Research/ Industrial Engineering Practices	0%	14%	44%	43%	9
	Knowledge of 6 Sigma and Lean Practices	25%	0%	19%	14%	5
	Knowledge of Material Handling/Manufacturing	0%	57%	38%	29%	12
	Managerial/ Supervisory Experience and Leadership Skills	0%	14%	31%	43%	8
	Communication Skills, Written and Verbal	75%	71%	75%	57%	22
	Technical Communication/Report Development Skills	0%	43%	19%	29%	6
	Presentation Skills	25%	29%	13%	0%	5
Technical Competencies	Interpersonal Skills	50%	43%	63%	29%	16
	Analytical, Mathematical, or Problem-solving Skills	50%	43%	75%	71%	19
	Time or task management skills	75%	29%	50%	43%	14
	Organizational Skills/Attention to Detail	75%	14%	0%	43%	5
	Possess a good attitude/work ethic	25%	43%	6%	57%	6
	Possess professional judgement	25%	43%	31%	29%	10
	Ability to work well on a team	50%	57%	19%	29%	9
	Ability to work well independently	50%	29%	25%	29%	9
	Ability to collect, enter, or analyze data	0%	43%	44%	43%	10
	Ability to work in a fast paced/stressful environment	0%	43%	0%	29%	4
	Ability to work a flexible/irregular schedule	25%	0%	19%	29%	5
	Ability to pass a background check/ drug screening	0%	14%	13%	0%	3
	General computer skills	0%	14%	38%	29%	8
	Knowledge of Microsoft Office Programs	25%	14%	38%	0%	8
	AutoCAD/ MicroStation/ Geopak	100%	71%	81%	57%	23
	Access, SQL, or other database software	0%	14%	13%	29%	4
	SAS/ SAP ERP	0%	57%	50%	43%	12
	Experience Requirements	1	3	14	6	
	Average Years of Experience Required	0	2.3 years	3.9 years	5.7 years	
	Education can replace experience	0%	0%	6%	0%	
	Salary/Hourly Pay	0	0	0	0	
	Additional Info	0	0	0	1	

Industrial Engineers/Ops Research/Modeling Analysts: Most Sought-After Competencies



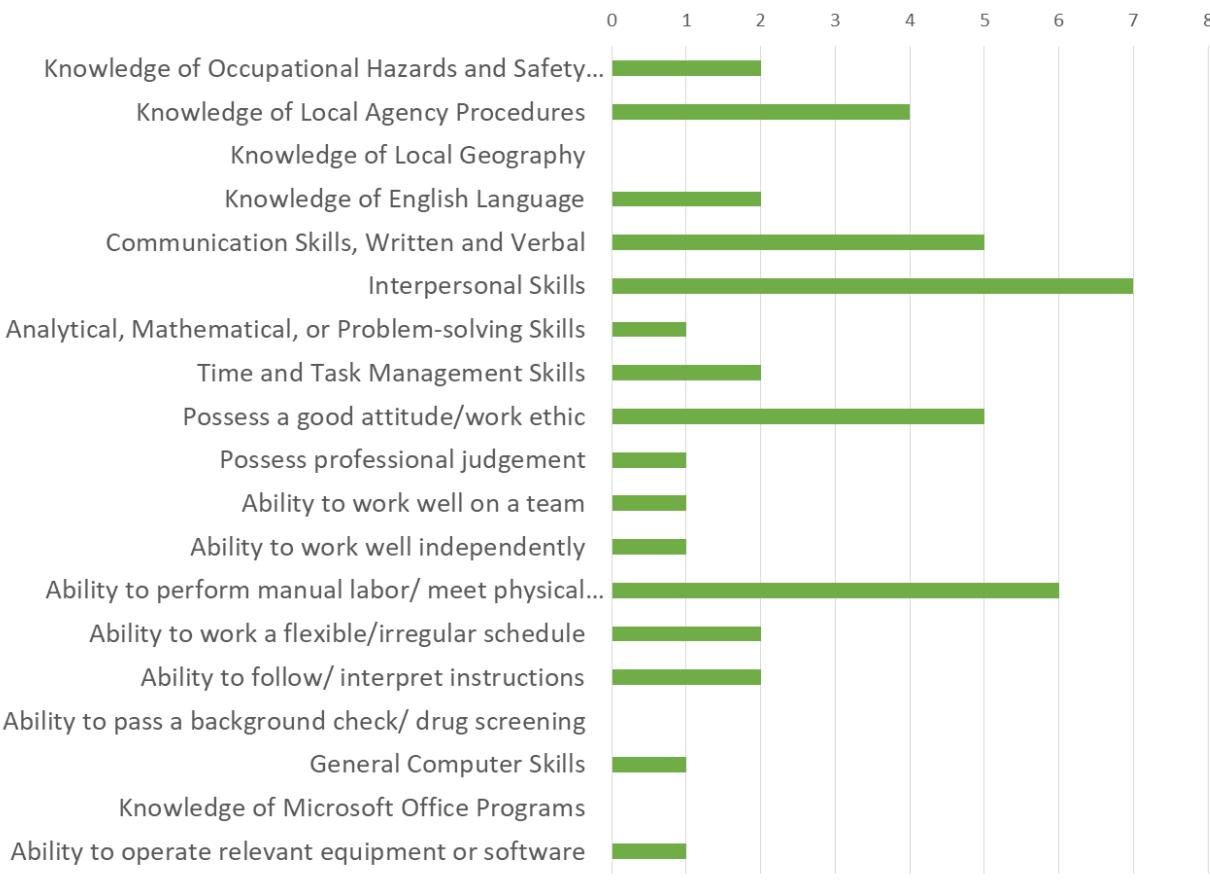
Data Science Analyst / Logisticians + Project and Program Managers						
	Job Title	Entry Level Analyst or Logistician	Analyst or Logistician	Program/ Project Manager or Level III Analyst	Senior Analyst, Logician, or Project Manager	FINAL COUNT:
Job Type	3	35	21	10	69	
Agency	3	35	21	10		
State	3	34	21	10		
Job duties	3	32	18	9		
Required Education or Training	3	30	18	10		
Bachelor's Degree Required	100%	86%	86%	100%		
Advanced Degree Required	33%	3%	0%	0%		
Major Coursework In:	67%	57%	29%	70%		
Experience can replace education	33%	23%	29%	30%		
Required certifications or licenses	0	1	1	0		
Certifications	0%	9%	5%	20%		
Desired Technical Skills	3	27	9	4		
Desired Soft Skills	2	26	16	6		
Hardware or Software Competencies	2	26	9	4		
Knowledge						
Knowledge of Transportation, Warehousing, Supply Chain, and Logistics	100%	60%	67%	50%	43	
Knowledge of Local Agency Procedures/ Standard Design Principles	0%	11%	14%	10%	8	
Knowledge of Project Management Practices	67%	17%	43%	10%	18	
Knowledge of Statistical Analysis, Modeling and Optimization	33%	20%	0%	10%	9	
Knowledge of Computer Science/Software Engineering	0%	11%	5%	10%	6	
Knowledge of Material Handling/Manufacturing	0%	29%	0%	0%	10	
Skills and Abilities						
Managerial/ Supervisory Experience and Leadership Skills	33%	14%	43%	40%	19	
Communication Skills, Written and Verbal	100%	69%	81%	60%	50	
Technical Communication/Report Development Skills	33%	20%	29%	10%	15	
Presentation Skills	67%	17%	29%	10%	15	
Interpersonal Skills	33%	54%	48%	60%	36	
Analytical, Mathematical, or Problem-solving Skills	67%	49%	62%	70%	39	
Time and Task Management Skills	33%	49%	52%	10%	30	
Organizational Skills/Attention to Detail	33%	46%	43%	10%	27	
Possess a good attitude/work ethic	67%	46%	29%	20%	26	
Possess professional judgement	0%	26%	33%	0%	16	
Ability to work well on a team	33%	23%	43%	20%	20	
Ability to work well independently	0%	29%	14%	10%	14	
Ability to collect, enter, or analyze data	33%	43%	5%	20%	19	
Ability to work in a fast paced/stressful environment	0%	23%	24%	0%	13	
Ability to work a flexible/irregular schedule	0%	11%	5%	0%	5	
Ability to follow/ interpret instructions	0%	3%	0%	0%	1	
Ability to pass a background check/ drug screening	0%	6%	0%	0%	2	
Technical Competencies						
General Computer Skills	0%	34%	38%	30%	23	
Knowledge of Microsoft Office Programs	33%	66%	57%	30%	39	
Project Management Software	0%	3%	10%	10%	4	
Access, SQL, or other database software	0%	34%	10%	30%	17	
SAS/ SAP ERP	0%	6%	5%	0%	3	
	Experience Requirements	1	29	18	10	
Average Years of Experience Required	0	3.6 years	5.5 years	7 years		
Type of Experience	0%	11%	81%	40%		
Supervisory Experience Required	0%	0%	33%	10%		
	Salary/Hourly Pay	0	1	2	2	
Average Salary	\$ -	\$ 35,360.00	\$ 67,500.00	\$ 73,250.00		
Average Hourly Rate	\$ -	\$ 17.00	\$ 32.45	\$ 35.22		
	Data represents count unless otherwise indicated.					

Data Science Analyst/Logistician/Project & Program Managers: Most Sought-After Competencies



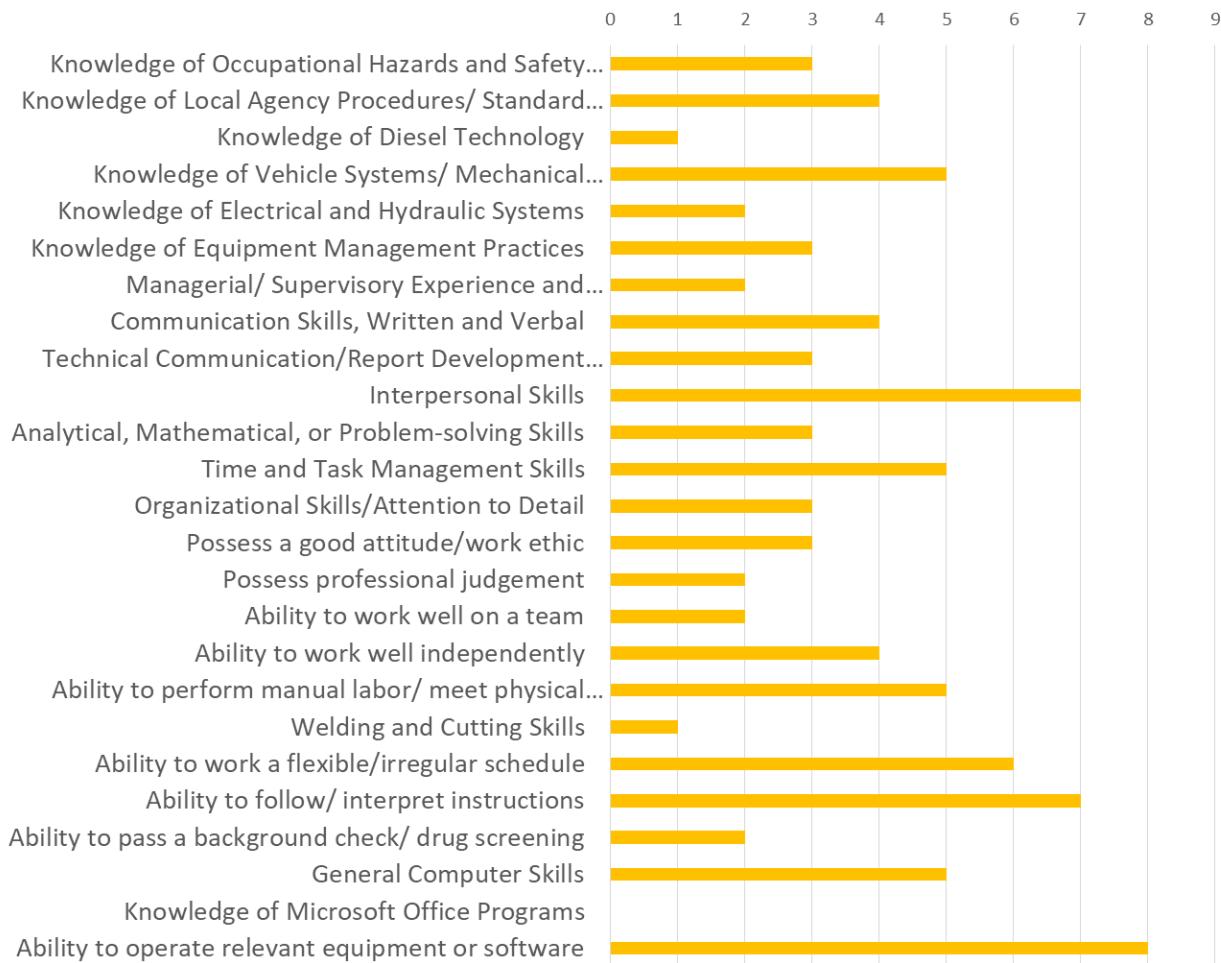
Commercial Drivers in Freight			
	Job Title	37	
	Agency	37	
	State	37	
	Job duties	13	
	Required Education or Training	20	
	Age Requirement	Count: 17 or 45%	Average: 22.2 years
	High School Diploma or GED Required	19%	
	Required certifications or licenses	35	
	CDL Required	95%	
	CDL Type	92%	
	CDL Endorsements Required	24%	
	Good driving record required	27%	
	Desired Technical Skills	4	
	Desired Soft Skills	12	
Knowledge	Knowledge of Occupational Hazards and Safety Precautions	5%	2
	Knowledge of Local Agency Procedures	11%	4
	Knowledge of Local Geography	0%	0
	Knowledge of English Language	5%	2
Skills and Abilities	Communication Skills, Written and Verbal	14%	5
	Interpersonal Skills	19%	7
	Analytical, Mathematical, or Problem-solving Skills	3%	1
	Time and Task Management Skills	5%	2
	Possess a good attitude/work ethic	14%	5
	Possess professional judgement	3%	1
	Ability to work well on a team	3%	1
	Ability to work well independently	3%	1
	Ability to perform manual labor/ meet physical requirements	16%	6
	Ability to work a flexible/irregular schedule	5%	2
	Ability to follow/ interpret instructions	5%	2
	Ability to pass a background check/ drug screening	0%	0
Tech Comps	General Computer Skills	3%	1
	Knowledge of Microsoft Office Programs	0%	0
	Ability to operate relevant equipment or software	3%	1
	Experience Requirements	34	
	Average Years of Experience Required	Count: 32 or 86%	Average: 1.4 years
	Education can replace experience	8%	
	Driving Experience Required	76%	
	Salary Range	25	
	Average Salary	\$ 54,690.28	
	Average Hourly Rate	\$ 26.29	
	Additional Info	0	
	Data represents count unless otherwise indicated.		

Commercial Drivers in Freight: Most Sought-After Competencies



Diesel Mechanics/ Diesel Shop Technicians					
	Job Title	Diesel Mechanic	Technician/ Mechanic	Senior Technician/ Mechanic	TOTAL COUNT:
Job Type		25	4	4	33
Agency		25	4	4	
State		24	4	4	
Job duties		20	2	4	
Required Education or Training		11	2	3	
Age Requirement	Count: 1 or 4% Average: 18	0	0		
High School Diploma or GED Required	44%	50%	75%		
Additional Vocational/ Technical Training Required	20%	0%	75%		
Required certifications or licenses	14	1	3		
Driver's License Required	24%	0%	50%		
CDL Required	40%	25%	50%		
CDL Type	32%	25%	0%		
CDL Endorsements Required	4%	0%	25%		
ASE Certification Required	12%	0%	0%		
Additional Certifications Required	12%	25%	0%		
Desired Technical Skills	7	1	2		
Desired Soft Skills	7	1	2		
Hardware or Software Competencies	3	0	1		
Knowledge	Knowledge of Occupational Hazards and Safety Precautions	12%	0%	0%	3
	Knowledge of Local Agency Procedures/ Standard Design Principles	16%	0%	0%	4
	Knowledge of Diesel Technology	0%	25%	0%	1
	Knowledge of Vehicle Systems/ Mechanical Aptitude	16%	25%	0%	5
	Knowledge of Electrical and Hydraulic Systems	8%	0%	0%	2
	Knowledge of Equipment Management Practices	12%	0%	0%	3
Skills and Abilities	Managerial/ Supervisory Experience and Leadership Skills	4%	25%	0%	2
	Communication Skills, Written and Verbal	16%	0%	0%	4
	Technical Communication/Report Development Skills	12%	0%	0%	3
	Interpersonal Skills	24%	25%	0%	7
	Analytical, Mathematical, or Problem-solving Skills	12%	0%	0%	3
	Time and Task Management Skills	12%	0%	50%	5
	Organizational Skills/Attention to Detail	8%	0%	25%	3
	Possess a good attitude/work ethic	8%	25%	0%	3
	Possess professional judgement	8%	0%	0%	2
	Ability to work well on a team	8%	0%	0%	2
	Ability to work well independently	12%	25%	0%	4
	Ability to perform manual labor/ meet physical requirements	16%	0%	25%	5
	Welding and Cutting Skills	4%	0%	0%	1
	Ability to work a flexible/irregular schedule	16%	0%	50%	6
	Ability to follow/ interpret instructions	28%	0%	0%	7
	Ability to pass a background check/ drug screening	8%	0%	0%	2
Tech Comps	General Computer Skills	12%	0%	50%	5
	Knowledge of Microsoft Office Programs	0%	0%	0%	0
	Ability to operate relevant equipment or software	20%	25%	50%	8
	Experience Requirements	24	4	3	
	Average Years of Experience Required	2.5 years	1.7 years	2 years	
	Education can replace experience	20%	0%	0%	
	Salary Range	5	2	1	
	Average Salary	\$ 60,528.00	\$ 60,600.00	\$ 55,000.00	
	Average Hourly Rate	\$ 29.10	\$ 29.13	\$ 26.44	
	Additional Info	5	0	2	
	Data represents count unless otherwise indicated.				

Diesel Mechanics/Diesel Shop Technicians in Freight: Most Sought-After Competencies



Operations Planners

	Job Title	Operations Planning Intern	Operations Planner/Engineer	Operations Planner III/Planning Manager	TOTAL COUNT:
Focus		7	41	41	
Career Progression		7	41	41	
Agency		7	41	41	89
State		7	41	41	
Job duties		6	40	41	
Required Education or Training		7	39	36	
Bachelor's Degree Required		100%	93%	88%	
From Accredited Institution		29%	15%	12%	
Experience can replace education		14%	12%	12%	
Engineering or other quantitative field		71%	56%	29%	
Planning		43%	51%	37%	
Business		43%	29%	34%	
Related Field		71%	49%	44%	
Advanced Degree Required		0%	29%	39%	
Required certifications or licenses		2	19	7	
Driver's License Required		0	9	2	
AICP Certification		0	3	3	
EIT Certification		2	7	3	
PE License		0	3	3	
Additional Certifications Required		0	1	3	
Desired Technical Skills		6	32	18	
Desired Soft Skills		4	31	25	
Hardware or Software Competencies		6	23	13	
Knowledge	Knowledge Transportation Planning or Engineering	86%	95%	71%	74
	Knowledge of Travel Demand Modeling	14%	10%	12%	10
	Local Agency Procedures/ Standard Design Principles	57%	56%	44%	45
	Knowledge of ITS Technology/ Operations	14%	2%	2%	3
	Knowledge of Project Management practices (budgeting, scheduling, etc.)	29%	24%	41%	29
Skills and Abilities	Managerial/ Supervisory Experience and Leadership Skills	14%	27%	71%	41
	Communication Skills, Written and Verbal	86%	78%	83%	72
	Technical Communication/Report Development Skills	71%	85%	66%	67
	Presentation Skills	14%	32%	34%	28
	Interpersonal Skills	86%	80%	73%	69
	Analytical, Mathematical, or Problem-solving Skills	57%	37%	54%	41
	Time and Task Management Skills	71%	44%	61%	48
	Organizational Skills/Attention to Detail	71%	37%	51%	41
	Possess a good attitude/work ethic	57%	56%	41%	44
	Possess professional judgement	43%	37%	66%	45
	Ability to work well on a team	86%	63%	71%	61
	Ability to work well independently	57%	34%	59%	42
	Ability to collect, enter, or analyze data	14%	41%	22%	27
	Ability to work in fast-paced or stressful environment	0%	22%	27%	20
	Ability to perform manual labor/ meet physical requirements	0%	2%	7%	4
Technical Competencies	General Computer Skills	86%	80%	56%	62
	Knowledge of Microsoft Office Programs	71%	76%	49%	56
	GIS Software	57%	39%	10%	24
	AutoCAD/ MicroStation/ Geopak/VISSIM	14%	17%	10%	12
	Other software:	71%	41%	34%	36
	Experience Requirements	4	32	38	
	Average Years of Experience Required	1.2 years	3.6 years	7.8 years	
	Type of Experience	29%	66%	80%	
	Education can replace experience	0%	10%	5%	
	Supervisory Experience Required	0%	2%	22%	
	Salary/Hourly Pay	1	5	8	
	Average Salary	\$ 17.78	\$ 25.82	\$ 42.53	
	Average Hourly Rate	\$ 36,976.00	\$ 53,713.84	\$ 88,452.19	
	Additional Info	3	15	11	
	Data represents count unless otherwise indicated.				

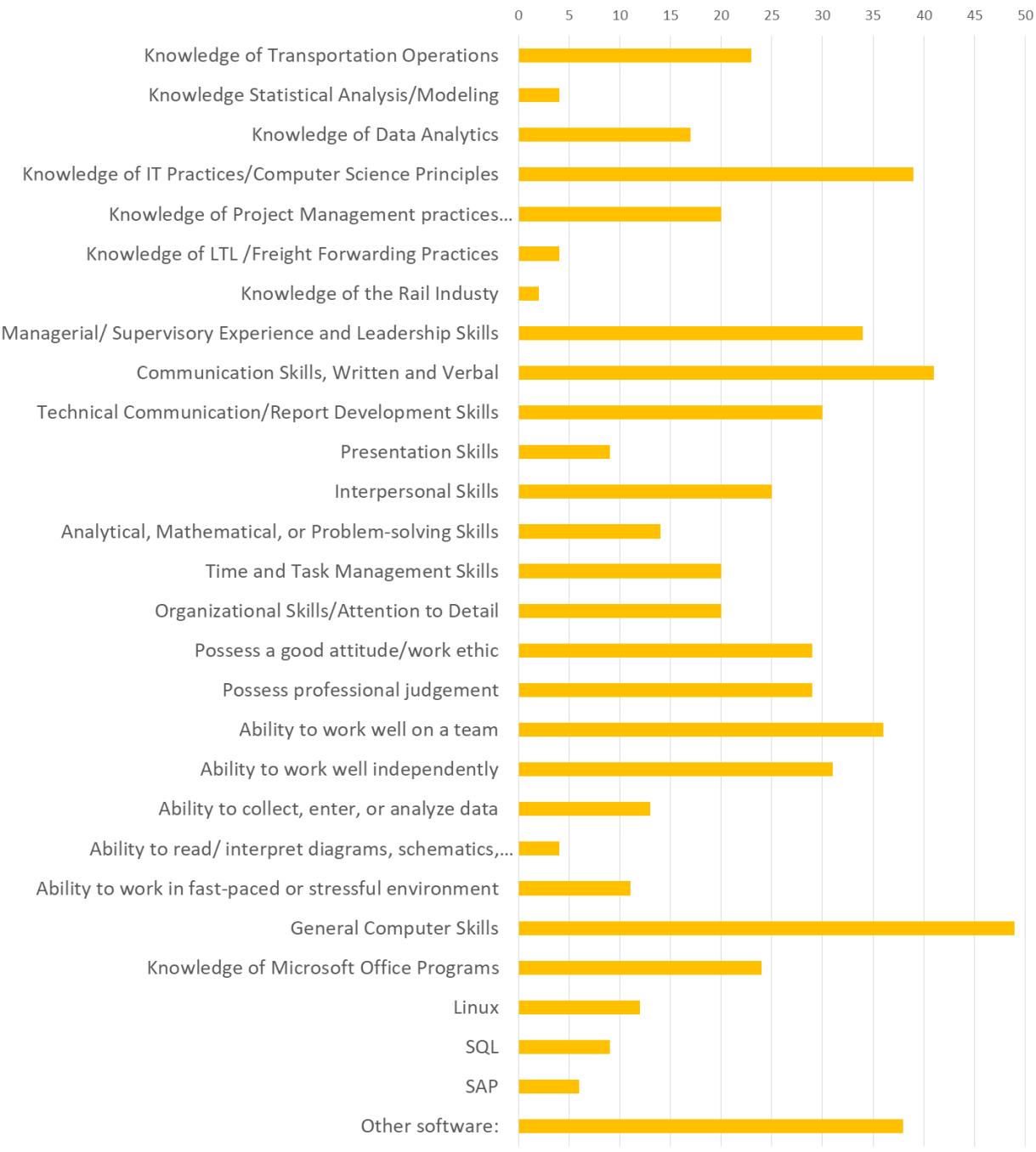
Operations Planners (all realms): Most Sought-After Competencies



Computer and Information Systems Manager					
	Job Title	IT Specialist/ Analyst	Engineer/ Technologist/ Programmer	Senior Level Computer Information Systems Manager	TOTAL COUNT:
Focus		21	16	41	
Career Progression		21	16	41	
Agency	20	16	39		75
State	20	16	39		
Job duties	20	15	39		
Required Education or Training	20	14	37		
Bachelor's Degree Required	95%	88%	90%		
From Accredited Institution	14%	13%	7%		
Experience can replace education	38%	19%	17%		
Major coursework in:	67%	75%	68%		
Advanced Degree Required	5%	0%	20%		
Required certifications or licenses	5	1	6		
Driver's License Required	5%	6%	5%		
Microsoft Certifications	10%	0%	2%		
Comp TIA IT Certifications	5%	0%	2%		
PE License	0%	0%	0%		
Additional Certifications Required	5%	0%	5%		
Desired Technical Skills	18	13	26		
Desired Soft Skills	10	9	24		
Hardware or Software Competencies	8	5	15		
Knowledge of Transportation Operations	29%	31%	29%		23
Knowledge Statistical Analysis/Modeling	10%	13%	0%		4
Knowledge of Data Analytics	38%	38%	7%		17
Knowledge of IT Practices/Computer Science Principles	62%	56%	41%		39
Knowledge of Project Management practices (budgeting, scheduling, etc.)	19%	13%	34%		20
Knowledge of LTL /Freight Forwarding Practices	10%	0%	5%		4
Knowledge of the Rail Industry	0%	13%	0%		2
Skills and Abilities					
Managerial/ Supervisory Experience and Leadership Skills	19%	31%	61%		34
Communication Skills, Written and Verbal	62%	44%	51%		41
Technical Communication/Report Development Skills	38%	50%	34%		30
Presentation Skills	14%	19%	7%		9
Interpersonal Skills	33%	31%	32%		25
Analytical, Mathematical, or Problem-solving Skills	14%	38%	12%		14
Time and Task Management Skills	10%	25%	34%		20
Organizational Skills/Attention to Detail	29%	25%	24%		20
Possess a good attitude/work ethic	38%	25%	41%		29
Possess professional judgement	29%	31%	44%		29
Ability to work well on a team	29%	31%	61%		36
Ability to work well independently	38%	44%	39%		31
Ability to collect, enter, or analyze data	24%	25%	10%		13
Ability to read/ interpret diagrams, schematics, blueprints, etc.	0%	19%	2%		4
Ability to work in fast-paced or stressful environment	10%	19%	15%		11
Technical Competencies					
General Computer Skills	86%	56%	54%		49
Knowledge of Microsoft Office Programs	48%	38%	20%		24
Linux	10%	31%	12%		12
SQL	10%	25%	7%		9
SAP	5%	13%	7%		6
Other software:	43%	44%	54%		38
Experience Requirements	18	11	38		
Average Years of Experience Required	2.8 years	5.5 years	5.6 years		
Education can replace experience	0%	0%	0%		
Supervisory Experience Required	0%	0%	0%		
Salary/Hourly Pay	0	1	3		
Average Salary	\$ -	\$ -	\$ 108,141.75		
Average Hourly Rate	\$ -	\$ -	\$ 51.99		
Additional Info	8	3	5		

Data represents count unless otherwise indicated.

Computer and Information Systems Manager (all realms): Most Sought-After Competencies



Appendix C: Career Pathway Models for Priority Occupations

Traffic Operations Pathway: Traffic Engineers or Project Managers

	KSAs	ACADEMIC PROGRAM OF STUDY	INDUSTRY CERTIFICATION	JOBS AND WAGES			
ADVANCED LEVEL	<p>Knowledge of Transportation and Traffic Engineering/Operations Knowledge of Project Management Practices Managerial/ Supervisory Experience and Leadership Skills Communication Skills, Written and Verbal Experience with Synchro, VISSIM, SimTraffic, HCS, Sidra, or VISTRO software</p>	<table border="1"> <tr> <td style="text-align: center; padding: 5px;"> Master's degree preferred <i>Major Coursework in Civil Engineering or related field strongly preferred</i> </td> <td style="text-align: center; padding: 5px;"> Supervisory experience required <i>6-10 years experience in management of traffic engineering projects</i> </td> <td style="text-align: center; padding: 5px;"> <input type="checkbox"/> Envision Sustainability Professional (ENV SP) <input type="checkbox"/> AICP </td> </tr> </table>	Master's degree preferred <i>Major Coursework in Civil Engineering or related field strongly preferred</i>	Supervisory experience required <i>6-10 years experience in management of traffic engineering projects</i>	<input type="checkbox"/> Envision Sustainability Professional (ENV SP) <input type="checkbox"/> AICP		<p>Advanced Level</p> <p>Advanced Traffic Operations Project Manager Advanced Traffic Operations Engineer \$55.67 (mean hourly rate from job descriptions)</p>
Master's degree preferred <i>Major Coursework in Civil Engineering or related field strongly preferred</i>	Supervisory experience required <i>6-10 years experience in management of traffic engineering projects</i>	<input type="checkbox"/> Envision Sustainability Professional (ENV SP) <input type="checkbox"/> AICP					
MID LEVEL	<p>Knowledge of Transportation and Traffic Engineering/Operations Knowledge of Agency Procedures/ Standard Design Principles Communication Skills, Written and Verbal Experience with AutoCAD, MicroStation, or Geopak Experience with Synchro, VISSIM, SimTraffic, HCS, Sidra, or VISTRO software</p>	<table border="1"> <tr> <td style="text-align: center; padding: 5px;"> Bachelor's Degree Required or In Progress Master's Degree sometimes preferred <i>Major Coursework in Civil Engineering</i> </td> <td style="text-align: center; padding: 5px;"> 5-9 years experience in transportation or traffic engineering </td> <td style="text-align: center; padding: 5px;"> <input type="checkbox"/> Professional Engineering License <input type="checkbox"/> Professional Traffic Operations Engineer <input type="checkbox"/> IMSA Traffic Signals Level II or III </td> </tr> </table>	Bachelor's Degree Required or In Progress Master's Degree sometimes preferred <i>Major Coursework in Civil Engineering</i>	5-9 years experience in transportation or traffic engineering	<input type="checkbox"/> Professional Engineering License <input type="checkbox"/> Professional Traffic Operations Engineer <input type="checkbox"/> IMSA Traffic Signals Level II or III		<p>Intermediate Level</p> <p>Traffic Operations Engineer \$32.28 (mean hourly rate from job descriptions) <ul style="list-style-type: none"> • Associate Traffic Engineer • Traffic Operations Design Engineer • Traffic Project Engineer Traffic Operations Program/Project Manager \$39.36 (mean hourly rate from job descriptions) <ul style="list-style-type: none"> • Transportation Project Manager Traffic Engineer/Program Manager \$43.14 (BLS mean hourly wage 2016)</p>
Bachelor's Degree Required or In Progress Master's Degree sometimes preferred <i>Major Coursework in Civil Engineering</i>	5-9 years experience in transportation or traffic engineering	<input type="checkbox"/> Professional Engineering License <input type="checkbox"/> Professional Traffic Operations Engineer <input type="checkbox"/> IMSA Traffic Signals Level II or III					
ENTRY LEVEL	<p>Communication Skills, Written and Verbal Analytical, Mathematical, or Problem-solving Skills Interpersonal Skills Ability to work well on a team Experience with AutoCAD, MicroStation, or Geopak</p>	<table border="1"> <tr> <td style="text-align: center; padding: 5px;"> Bachelor's Degree Required or In Progress Master's Degree sometimes preferred <i>Major Coursework in Civil Engineering</i> </td> <td style="text-align: center; padding: 5px;"> 0-3 years experience in traffic engineering </td> <td style="text-align: center; padding: 5px;"> <input type="checkbox"/> Engineer-in-Training (EIT) certification <input type="checkbox"/> Driver's License </td> </tr> </table>	Bachelor's Degree Required or In Progress Master's Degree sometimes preferred <i>Major Coursework in Civil Engineering</i>	0-3 years experience in traffic engineering	<input type="checkbox"/> Engineer-in-Training (EIT) certification <input type="checkbox"/> Driver's License		<p>Entry Level</p> <p>Entry Level Engineer <ul style="list-style-type: none"> • Operations and Maintenance Engineer Intern • Civil Engineering Intern • Assistant Traffic Engineer \$35.47 (mean hourly rate from job descriptions)</p>
Bachelor's Degree Required or In Progress Master's Degree sometimes preferred <i>Major Coursework in Civil Engineering</i>	0-3 years experience in traffic engineering	<input type="checkbox"/> Engineer-in-Training (EIT) certification <input type="checkbox"/> Driver's License					

Traffic Operations Pathway: Traffic Signal/ITS Technicians

	KSAs	ACADEMIC PROGRAM OF STUDY	INDUSTRY CERTIFICATION	JOBs AND WAGES
ADVANCED LEVEL	<p>Knowledge of Transportation and Traffic Engineering/Operations Knowledge of ITS Technology and Operations Knowledge of Local Agency Procedures/ Standard Design Principles Knowledge of Traffic Control Devices Communication Skills, Written and Verbal Interpersonal Skills Managerial or Supervisory Experience and Leadership Skills Knowledge of Microsoft Office Programs</p>	<p>Bachelor's degree required <i>Major coursework in Civil or Electrical Engineering with experience in ITS planning, design, or implementation</i></p> <p>3-9 years experience in ITS supervisory/management position (education may count toward experience)</p>	<input type="checkbox"/> Professional Engineering License <input type="checkbox"/> Safety Impact Certificate	Advanced Level Traffic System Supervisor <ul style="list-style-type: none"> • Traffic Devices Certification • Traffic Systems Supervisor • Traffic Signal/ITS Engineer <p>\$23.44 (mean hourly rate from job descriptions)</p>
MID LEVEL	<p>Knowledge of ITS Technology and Operations Knowledge of the Electrical Trade Knowledge of Traffic Control Devices Management of Labor, Tools, or Materials Ability to read and interpret diagrams, schematics, blueprints, etc. Analytical, Mathematical, or Problem-solving Skills Communication Skills, Written and Verbal General Computer Skills</p>	<p>Some additional training required (technical, vocational, or college level) Associate's degree sometimes required <i>Major coursework in Electronics, Electrical Engineering, Engineering Technology, Computer Technology</i></p>	<input type="checkbox"/> IMSA Traffic Signal Level II <input type="checkbox"/> Networking Certifications <input type="checkbox"/> BICSI Certifications <input type="checkbox"/> Fiber Certifications <input type="checkbox"/> Wireless Certifications <input type="checkbox"/> Comtrain Tower Climbing Certification	Intermediate Level ITS Technician \$18.51 <ul style="list-style-type: none"> • ITS Field Technician • ITS Locator • Traffic Signal/ ITS Technician Traffic Systems/ Signal Technician II <p>\$19.85 (mean hourly rate from job descriptions)</p>
ENTRY LEVEL	<p>Knowledge of Traffic Control Devices Knowledge of the Electrical Trade Operation of relevant equipment/machinery Communication, Written and Verbal Ability to follow/interpret instructions Interpersonal Skills Ability to read and interpret diagrams, schematics, blueprints, etc. General Computer Skills</p>	<p>High School Diploma or GED required Some additional training required (vocational, technical, or college level coursework) <i>Major coursework in Electronics or related field</i></p> <p>1-5 years experience with installation, maintenance, and repair of traffic signals or related system (education may count as experience)</p>	<input type="checkbox"/> Driver's License with a good driving record <input type="checkbox"/> Commercial Driver's License (Class A, B, or C with airbrake endorsements) <input type="checkbox"/> IMSA Traffic Signal Level I, II, or III <input type="checkbox"/> Work Zone Traffic Control <input type="checkbox"/> Electrician Certification	Entry Level Traffic Systems Signal Technician I <ul style="list-style-type: none"> • Traffic Signal Installer <p>\$18.64 (mean hourly rate from job descriptions)</p>

Traffic Operations Pathway: Traffic Incident Managers

	KSAs	ACADEMIC PROGRAM OF STUDY	INDUSTRY CERTIFICATION	JOBs AND WAGES
ADVANCED LEVEL	<p>Knowledge of TMC Operations Communication Skills, Written and Verbal Interpersonal Skills Managerial/ Supervisory Experience and Leadership Skills Time and Task Management Skills Technical Communication/Report Development Skills General Computer Skills Knowledge of Microsoft Office Programs</p>		<input type="checkbox"/> Commercial Driver's License (Class A, B, or C) <input type="checkbox"/> Professional Engineering License <input type="checkbox"/> International Municipal Signal (Level I & II) <input type="checkbox"/> Basic Electronics and Fiber Optics <input type="checkbox"/> Driver's License	Advanced Level TMC Supervisor or Senior Operator <ul style="list-style-type: none"> • TMC Shift Supervisor • Field Operations Supervisor TMC Manager or Coordinator <ul style="list-style-type: none"> • Incident Management Coordinator • Senior TMC Operator \$80,521 Salary (Indeed.com)
MID LEVEL	<p>Knowledge of Transportation and Traffic Engineering/Operations Knowledge of ITS Technology and Operations Possess professional judgement Communication Skills, Written and Verbal Technical Communication/Report Development Skills General Computer Skills</p>		<input type="checkbox"/> Driver's License <input type="checkbox"/> Class A Commercial Driver's License	Intermediate Level TMC Engineer <ul style="list-style-type: none"> • Incident Management Engineer TMC Technician <ul style="list-style-type: none"> \$16.37/hour (Indeed.com) • Emergency Operations Technician • Emergency Response Technician
ENTRY LEVEL	<p>Knowledge of TMC Operations Knowledge of Regional Highway Systems Communication Skills, Written and Verbal Interpersonal Skills Ability to work in fast-paced or stressful environment General Computer Skills Knowledge of Microsoft Office Programs</p>			Entry Level TMC Operator or Dispatcher <ul style="list-style-type: none"> • Dispatch Clerk • Operator • Operator I • Traffic Management Operator • Traffic Management Dispatcher <ul style="list-style-type: none"> \$16.50 (mean hourly rate from job descriptions)

Transit Operations Pathway: Civil Transit Engineers + Transit Project Managers

	KSAs	ACADEMIC PROGRAM OF STUDY	INDUSTRY CERTIFICATION	JOBS AND WAGES
ADVANCED LEVEL	<p>Knowledge of Transit Operations Managerial/ Supervisory Experience and Leadership Skills Communication Skills, Written and Verbal Technical Communication/Report Development Skills Experience with AutoCAD, Civil 3D, MicroStation, or similar</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Master's degree preferred</p> <p><i>Major Coursework in Civil Engineering or related field strongly preferred</i></p> </div> <div style="text-align: center;"> <p>Senior Civil Engineers 6-12 years engineering project experience</p> </div> <div style="text-align: center;"> <p>Senior Project Managers 9-17 years of planning or design project management experience</p> </div> </div>	<ul style="list-style-type: none"> <input type="checkbox"/> Professional Engineering License Required <input type="checkbox"/> PMP Certification <input type="checkbox"/> AICP can sometimes replace PE 	<p>Advanced Level</p> <p>Senior Rail/Transit Engineer \$54.58 (mean hourly rate from job descriptions)</p> <ul style="list-style-type: none"> • Civil Engineer Department Manager - Transportation • Senior Civil Engineer - Transit/Rail <p>Senior Project Manager</p> <ul style="list-style-type: none"> • Senior Project Engineer/Project Manager • Senior Project Manager - Rail & Transit
MID LEVEL	<p>Knowledge of Transit Operations Knowledge of Agency Procedures/ Standard Design Principles Knowledge of Project Management Practices Communication Skills, Written and Verbal Interpersonal Skills Experience with AutoCAD, Civil 3D, MicroStation, or similar Knowledge of Microsoft Office Programs</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Bachelor's Degree Required or In Progress; Master's Degree sometimes preferred</p> <p><i>Major Coursework in Civil or Structural Engineering for CE</i></p> <p><i>Major Coursework in Information Technology, Architecture, Business, Construction Management, Planning, or Civil/Mechanical Engineering for PM</i></p> </div> <div style="text-align: center;"> <p>Civil Engineers 3-10 years experience in transportation, emphasis on design or construction management</p> </div> <div style="text-align: center;"> <p>Project Managers 5-16 years experience in transit project management</p> </div> </div>	<ul style="list-style-type: none"> <input type="checkbox"/> Professional Engineering License 	<p>Intermediate Level</p> <p>Civil Engineer, Transit \$41.90 (mean hourly rate from job descriptions)</p> <ul style="list-style-type: none"> • Civil Engineer II - Transportation • Civil Engineer, Rail & Transit • Transportation Engineer <p>Project Manager, Transit \$44.27 (mean hourly rate from job descriptions)</p> <ul style="list-style-type: none"> • Project Manager-Rail & Transit • Project Manager II • Transportation Project Manager
ENTRY LEVEL	<p>Knowledge of Civil Engineering applied to the Transit Industry Knowledge of Local Area Procedures/Standard Design Principles Communication Skills, Written and Verbal Interpersonal Skills Ability to be innovative or creative Experience with AutoCAD, Civil 3D, MicroStation, or similar</p>	<div style="display: flex; align-items: center;"> <div style="flex-grow: 1;"> <p>Bachelor's Degree Required or In Progress</p> <p>Master's Degree sometimes preferred</p> <p><i>Major Coursework in Civil Engineering (sometimes with Transportation emphasis)</i></p> </div> <div style="margin-left: 20px;"> <p>1-4 years experience in civil or transportation engineering work</p> </div> </div>	<ul style="list-style-type: none"> <input type="checkbox"/> Engineer-in-Training (EIT) certification <input type="checkbox"/> Driver's License 	<p>Entry Level</p> <p>Associate or Entry-Level Civil Engineer \$25.44 (mean hourly rate from job descriptions)</p> <ul style="list-style-type: none"> • Civil Engineering Intern • Assistant Civil Engineer • Associate Transportation Engineer

Transit and Freight Operations Pathway: Commercial Drivers

	KSAs	ACADEMIC PROGRAM OF STUDY	INDUSTRY CERTIFICATION	JOBs AND WAGES
ADVANCED LEVEL	<p>Communication Skills, Written and Verbal Interpersonal Skills Ability to work a flexible/irregular schedule Ability to perform manual labor/ meet physical requirements General Computer Skills Knowledge of Microsoft Office Programs Ability to operate relevant equipment or software</p>	<p>High School Diploma or GED Required Bachelor's Degree preferred Major Coursework in business, transportation, safety or other relevant area</p>	<p>Past experience in similar business required, supervision of bus operators preferred.</p>	<p><input type="checkbox"/> Commercial Driver's License (CDL) Required <input type="checkbox"/> Class A or B CDL with Airbrake and Passenger Endorsements <input type="checkbox"/> Good driving record required</p> <p>Advanced Level</p> <p>Transit Operator Supervisor</p> <ul style="list-style-type: none"> Supervisor, Transit Service Delivery <p>\$29.72 (mean hourly rate from job descriptions)</p>
MID LEVEL	<p>Knowledge of Local Agency Procedures Interpersonal Skills Ability to perform manual labor/ meet physical requirements Communication Skills, Written and Verbal Possess a good attitude/work ethic</p>	<p>Must be at least 21-24 years old in many cases</p>	<p>0-2 years driving experience, commercial driving experience preferred</p>	<p><input type="checkbox"/> CDL Required- Class A (or sometimes Class B) with the following endorsements: <input type="checkbox"/> Hazardous Materials <input type="checkbox"/> Tank Vehicle <input type="checkbox"/> Double or Triple Trailer <input type="checkbox"/> Airbrake <input type="checkbox"/> Good driving record required</p> <p>Freight Driver/Operator</p> <ul style="list-style-type: none"> Commercial Driver Equipment Operator Route Delivery Driver Truck Driver Class A <p>\$26.29 (mean hourly rate from job descriptions)</p>
ENTRY LEVEL	<p>Knowledge of Local Agency Procedures Knowledge of Local Geography Communication Skills, Written and Verbal Interpersonal Skills Possess professional judgement Ability to work a flexible/irregular schedule Ability to pass a background check/ drug screening Ability to perform manual labor/ meet physical requirements Ability to work well independently Ability to operate relevant equipment or software</p>	<p>Must be at least 21 in some cases High School Diploma or GED required</p>	<p>1-5 years driving experience, commercial driving experience preferred (training can sometimes count experience)</p>	<p><input type="checkbox"/> CDL Required- Class A, B, C or D with the following endorsements: <input type="checkbox"/> Airbrake <input type="checkbox"/> Passenger <input type="checkbox"/> Good driving record required</p> <p><input type="checkbox"/> Driver's License with a good driving record required</p> <p><input type="checkbox"/> Class A, B, or C CDL with Airbrake and Passenger Endorsements</p> <p>(On the job training toward obtaining a CDL is sometimes available)</p> <p>Paratransit Driver/ Operator</p> <ul style="list-style-type: none"> Paratransit Bus Driver Paratransit Driver Van Driver - Paratransit <p>\$13.46 (mean hourly rate from job descriptions)</p> <p>Bus or Shuttle Driver/Operator</p> <ul style="list-style-type: none"> Airport Shuttle Bus Driver Bus Driver Bus Operator / Motor Coach Driver Chariot Driver – Commuter <p>\$16.11 (mean hourly rate from job descriptions)</p>

Transit and Freight Operations Pathway: Diesel Mechanics/ Diesel Shop Technicians

	KSAs	ACADEMIC PROGRAM OF STUDY	INDUSTRY CERTIFICATION	JOBs AND WAGES
ADVANCED LEVEL	<p>Knowledge of Vehicle Systems/ Mechanical Aptitude Knowledge of Electrical and Hydraulic Systems Knowledge of Local Agency Procedures/ Standard Design Principles Time and Task Management Skills Ability to work a flexible/irregular schedule Ability to operate relevant equipment or software General Computer Skills</p>	<div style="border: 1px solid black; padding: 5px;"> High School Diploma or GED Required </div> <div style="border: 1px solid black; padding: 5px;"> Vocational/ Technical Training Required <ul style="list-style-type: none"> • Trade School Certification or Diploma in Diesel Technology • Associate's degree </div> <div style="border: 1px solid black; padding: 5px;"> 3-7 years experience fleet maintenance or diesel equipment maintenance and repair (education can count toward experience in most cases) </div>	<p>In addition to the certifications listed below:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Automotive or Medium/ Heavy Duty National Institute for Automotive Service Excellence (ASE) Certification <input type="checkbox"/> Annual Inspector Certification <input type="checkbox"/> Brake Inspector Certification <input type="checkbox"/> 608 and 609 HVAC – Refrigeration Certification 	Advanced Level <p>Senior Diesel Technician/ Mechanic</p> <ul style="list-style-type: none"> • Diesel Fleet Mechanic Technician II • Diesel Mechanic III • Senior Diesel Technician/Mechanic • Head Diesel Mechanic <p>\$31.50 in Transit and \$26.44 in Freight (mean hourly rate from job descriptions)</p>
MID LEVEL	<p>Knowledge of Vehicle Systems/ Mechanical Aptitude Knowledge of Equipment Management Communication Skills, Written and Verbal Ability to work well on a team Interpersonal Skills Possess a good attitude/work ethic General Computer Skills Ability to operate relevant equipment or software</p>	<div style="border: 1px solid black; padding: 5px;"> Additional Vocational/ Technical Training Preferred in Diesel/Automotive Mechanics </div> <div style="border: 1px solid black; padding: 5px;"> High School Diploma or GED Required </div> <div style="border: 1px solid black; padding: 5px;"> 1-4 years experience heavy duty diesel or automotive equipment repair and maintenance (education can count toward experience in some cases) </div>	<p>Relevant Industry Certifications for Technicians and Mechanics:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Driver's License <input type="checkbox"/> Class A or B CDL with Passenger and Airbrake Endorsements <input type="checkbox"/> National Institute for Automotive Service Excellence (ASE) Certification <input type="checkbox"/> Journeyman's Card <input type="checkbox"/> Diesel Mechanic Certification 	<p>Diesel Technician</p> <ul style="list-style-type: none"> • Diesel Technician • Heavy Duty Diesel Technician • Fleet Services Technician • Truck & Trailer Diesel Tech. <p>\$35.97 in Transit and \$29.13 in Freight (mean hourly rate from job descriptions)</p>
ENTRY LEVEL	<p>Knowledge of Vehicle Systems/ Mechanical Aptitude Knowledge of Diesel Technology Knowledge of Equipment Management Practices Communication Skills, Written and Verbal Time and Task Management Skills Ability to follow/ interpret instructions Ability to operate relevant equipment or software</p>	<div style="border: 1px solid black; padding: 5px;"> Additional Vocational/ Technical Training Preferred <ul style="list-style-type: none"> • Trade School Certification • Associate's degree </div> <div style="border: 1px solid black; padding: 5px;"> High School Diploma or GED Required </div> <div style="border: 1px solid black; padding: 5px;"> 1-5 years experience in heavy equipment mechanics (education can count toward experience in some cases) </div>	<p>Some additional relevant certifications:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Transportation Workers Identification Card <input type="checkbox"/> HVAC Certification <input type="checkbox"/> Forklift Certification <input type="checkbox"/> Welding Certification <input type="checkbox"/> Valid DOT Medical Card 	<p>Diesel Mechanic</p> <ul style="list-style-type: none"> • Diesel & Heavy Equipment Mechanic • Diesel Mechanic • Diesel Truck Mechanic <p>\$26.67 in Transit and \$29.10 in Freight (mean hourly rate from job descriptions)</p>

Freight Operations Pathway: Industrial Engineers + Operations Research/Modeling Analysts

	KSAs	ACADEMIC PROGRAM OF STUDY	INDUSTRY CERTIFICATION*	JOBS AND WAGES*
ADVANCED LEVEL	<p>Knowledge of Transportation, Warehousing, Supply Chain, and Logistics Knowledge of Project Management Practices Problem solving, mathematical, or critical thinking skills Communication Skills, Written and Verbal Possess a good attitude/work ethic AutoCAD/ MicroStation/ Geopak SAS/ SAP ERP</p>	<p>Bachelor's Degree Required <i>Major Coursework in Transportation, Supply Chain Management, Operations Research, Mathematics, Logistics Management, Industrial Engineering, Business Administration, or other quantitative field</i></p> <p>5-10 years of supply chain leadership/management and engineering experience in logistics/transportation</p>		Advanced Level Supply Chain Manager or Senior Analyst <ul style="list-style-type: none"> • Director of Supply Chain Engineering • Senior Analyst, Operations Analysis • Supply/Demand Planning Program Manager
MID LEVEL	<p>Knowledge of Transportation, Warehousing, Supply Chain, and Logistics Knowledge of Material Handling/ Manufacturing Communication Skills, Written and Verbal Problem solving, mathematical, or critical thinking skills Interpersonal Skills AutoCAD/ MicroStation/ Geopak SAS/ SAP ERP</p>	<p>Bachelor's Degree Required or In Progress; <i>Master's Degree sometimes preferred</i> <i>Major Coursework in Computer Science, Data Analytics, Engineering (Industrial, Electrical, Systems or Mechanical), Logistics Management, Operations Research, Statistics, Supply Chain Management, or Transportation, or other related field</i></p> <p>2-5 years experience transportation and/or production industry</p> <p>1-3 years experience logistics planning or process engineering</p>		Intermediate Level Logistics/Supply Chain Engineer <ul style="list-style-type: none"> • Industrial Engineer • Logistics Engineer I • Manufacturing Engineer • Logistic Engineer/Distribution Analyst Logistics Coordinator/Analyst <ul style="list-style-type: none"> • Logistics Coordinator • Logistics Operation Analyst • Materials Analyst II
ENTRY LEVEL	<p>Knowledge of Project Management Practices Communication Skills, Written and Verbal Time or task management skills Organizational Skills/ Detail Oriented Interpersonal Skills Problem solving, mathematical, or critical thinking skills AutoCAD/ MicroStation/ Geopak</p>	<p>Bachelor's Degree Required or In Progress <i>Master's Degree sometimes preferred</i> <i>Major Coursework in Industrial Engineering, Logistics/Transportation Management, Operations Research/Management, Supply Chain, Finance, or other related business field</i></p>		Entry Level Logistics Intern <ul style="list-style-type: none"> • Intern - Global Logistics • Intern - Industrial Engineering • Logistics Analyst Intern

*Dataset did not include Certification or Salary Information

Freight Operations Pathway: Data Science Analyst / Logisticians + Project and Program Managers

	KSAs	ACADEMIC PROGRAM OF STUDY	INDUSTRY CERTIFICATION	JOBs AND WAGES
ADVANCED LEVEL	<p>Knowledge of Transportation, Warehousing, Supply Chain, and Logistics</p> <p>Analytical, Mathematical, or Problem-solving Skills</p> <p>Communication Skills, Written and Verbal</p> <p>Interpersonal Skills</p> <p>Managerial/ Supervisory Experience and Leadership Skills</p> <p>Knowledge of Microsoft Office Programs</p> <p>General Computer Skills</p> <p>Access, SQL, or other database software</p>	<p>Bachelor's degree required</p> <p><i>Major coursework in Business, Computer Science, Economics, Engineering, Finance, Logistics, Management Info Systems, Mathematics, Operations, Statistics, or Supply Chain Management</i></p>	<p>4-12 years in project management in a global supply chain environment</p>	<p><input type="checkbox"/> PMP (Project Management Professional) Certification</p> <p><input type="checkbox"/> Driver's License</p> <p>Advanced Level</p> <p>Senior Analyst, Logistician, or Project Manager</p> <ul style="list-style-type: none"> • Senior Manager Global Logistics & Fulfillment • Senior Supply Chain Program Manager • Vice President / Director of Supply Chain • Logistics Analyst Senior <p>\$35.22 (mean hourly rate from job descriptions)</p>
MID LEVEL	<p>Knowledge of Transportation, Warehousing, Supply Chain, and Logistics</p> <p>Communication Skills, Written and Verbal</p> <p>Analytical, Mathematical, or Problem-solving Skills</p> <p>Time and Task Management Skills</p> <p>Interpersonal Skills</p> <p>Organizational Skills/ Detail Oriented</p> <p>Knowledge of Microsoft Office Programs</p> <p>General Computer Skills</p>	<p>Bachelor's degree required (or Associate's degree for some Logistics Analyst positions)</p> <p><i>Major coursework in Logistics, Business Analytics, Mathematics, Transportation, Logistics, Supply Chain, Business Administration, Engineering or other technical field</i></p>	<p>3-10 years in years in Operations, Program Management, Project Management, Procurement and/or Logistics Management</p>	<p><input type="checkbox"/> PMP</p> <p><input type="checkbox"/> CPM (Certified Project Manager)</p> <p><input type="checkbox"/> MPM (Master Project Manager)</p> <p><input type="checkbox"/> CPIM (Certified Production and Inventory Management)</p> <p>Intermediate Level</p> <p>Program/Project Manager or Level III</p> <ul style="list-style-type: none"> • Supply Chain Manager • Transportation Analyst III • Logistics Program Administrator • Transportation Operations Manager <p>\$32.45 (mean hourly rate from job descriptions)</p>
ENTRY LEVEL	<p>Knowledge of Transportation, Warehousing, Supply Chain, and Logistics</p> <p>Knowledge of Project Management Practices</p> <p>Communication Skills, Written and Verbal</p> <p>Analytical, Mathematical, or Problem-solving Skills</p> <p>Possess a good attitude/work ethic</p> <p>Interpersonal Skills</p> <p>Presentation Skills</p> <p>Time and Task Management Skills</p> <p>Knowledge of Microsoft Office Programs</p>	<p>Bachelor's degree required (or Associate's degree for some Logistics Analyst positions)</p> <p>Master's degree or MBA sometimes preferred</p> <p><i>Major coursework in Engineering (Industrial, Mechanical, Manufacturing, or Software), Computer Science, Mathematics, Logistics, Supply Chain Management, Operations, Statistics, or Business (Economics, Finance, or Accounting)</i></p>	<p>1-5 years Project Management, Supply Chain Procurement or Inventory Planning in a manufacturing company (background in statistical/ data analysis a plus)</p>	<p><input type="checkbox"/> Certified Professional Logistician (CPL) preferred</p> <p><input type="checkbox"/> PMP Certification a plus</p> <p><input type="checkbox"/> Customs Broker's License</p> <p><input type="checkbox"/> Certified Lean Manager</p> <p><input type="checkbox"/> Forklift Certified</p> <p><input type="checkbox"/> Driver's License</p> <p>Entry Level</p> <p>Analyst or Logistician</p> <ul style="list-style-type: none"> • Logistics Analyst • Logistician • Supply Chain Management Specialist • Data Scientist • Operations Systems Analyst • Application Engineer <p>\$17.00 (mean hourly rate from job descriptions)</p>

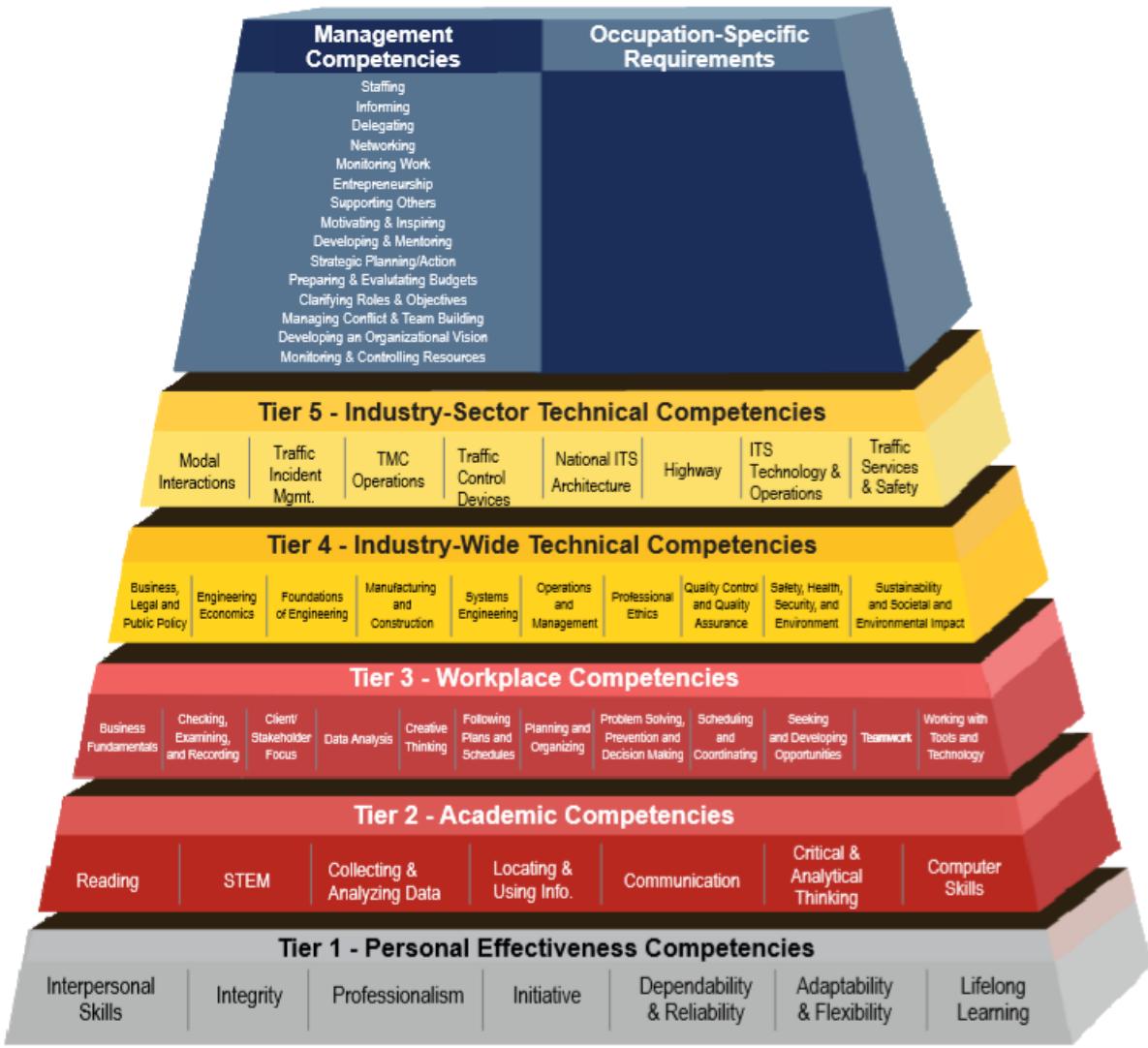
Transportation Operations Pathway: Operations Planners

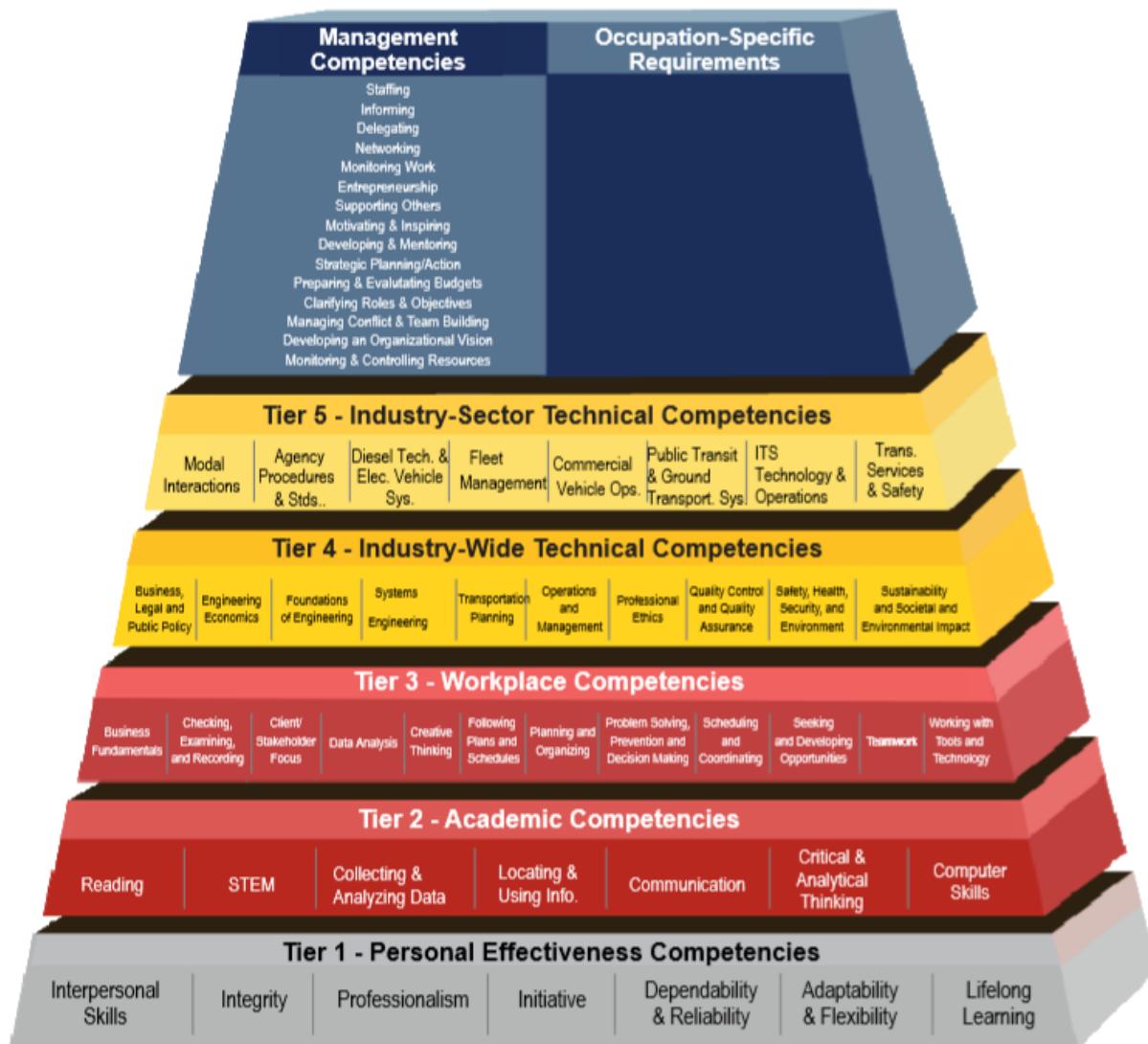
	KSAs	ACADEMIC PROGRAM OF STUDY	INDUSTRY CERTIFICATION	JOBS AND WAGES
ADVANCED LEVEL	<p>Knowledge Transportation Planning or Engineering Communication Skills, Written and Verbal Interpersonal Skills Managerial/ Supervisory Experience and Leadership Skills Ability to work well on a team Technical Communication/Report Development Skills Possess professional judgement</p>	<p>Bachelor's Degree Required <i>Master's Degree, MBA, or PhD preferred</i> <i>Major Coursework in Industrial, Civil, or Transportation Engineers, Urban/regional or Transportation Planning, Business, Public Administration, or Supply Chain/Logistics</i></p>	<p>6-12 years of management experience in a transportation division or manufacturing operations environment</p>	<p><input type="checkbox"/> Driver's License Required <input type="checkbox"/> AICP Certification <input type="checkbox"/> PE License <input type="checkbox"/> PTOE</p> <p>Advanced Level</p> <p>Operations Planner III/ Planning Manager</p> <ul style="list-style-type: none"> Manager, Global Strategic Planning & Analysis Operations Director Regional Operations Director Senior Manager, Logistics Planning Sr. Planning Manager VP of Transportation <p>\$42.53 (mean hourly rate from job descriptions)</p>
MID LEVEL	<p>Knowledge Transportation Planning or Engineering Technical Communication/Report Development Skills Interpersonal Skills Communication Skills, Written and Verbal Ability to work well on a team General Computer Skills Knowledge of Microsoft Office Programs</p>	<p>Bachelor's Degree Required or In Progress Master's Degree or PhD preferred <i>Major Coursework in Civil or Transportation Engineering, Urban/regional or Transportation Planning, Operations, Logistics, Public Administration, Economics, Architecture or other related field</i></p>	<p>2-5 years experience in transportation planning including scheduling, budgeting, zoning analysis, or business analysis</p>	<p><input type="checkbox"/> Driver's License Required <input type="checkbox"/> AICP Certification <input type="checkbox"/> PE License <input type="checkbox"/> IMSA Traffic Signal</p> <p>Intermediate Level</p> <p>Operations Planner/ Engineer</p> <ul style="list-style-type: none"> Transit Planner Transportation/Traffic Engineer Operations Planner Transportation Planner Load Planner Practice Leader, Transportation Planning Transportation Planning Manager <p>\$25.82 (mean hourly rate from job descriptions)</p>
ENTRY LEVEL	<p>Knowledge Transportation Planning or Engineering Communication Skills, Written and Verbal Interpersonal Skills Ability to work well on a team Technical Communication/Report Development Skills Time and Task Management Skills Organizational Skills/Attention to Detail GIS Software</p>	<p>Bachelor's Degree Required or In Progress <i>Major Coursework in Engineering, Public Administration, Supply Chain Management, Transportation Planning, or other related field</i></p>	<p>1-3 years experience in transportation planning or analysis</p> <p><input type="checkbox"/> EIT Certification</p>	<p>Entry Level</p> <p>Operations Planning Intern</p> <ul style="list-style-type: none"> Entry level Transportation Planner Planner I Traffic EIT Transportation EIT <p>\$17.78 (mean hourly rate from job descriptions)</p>

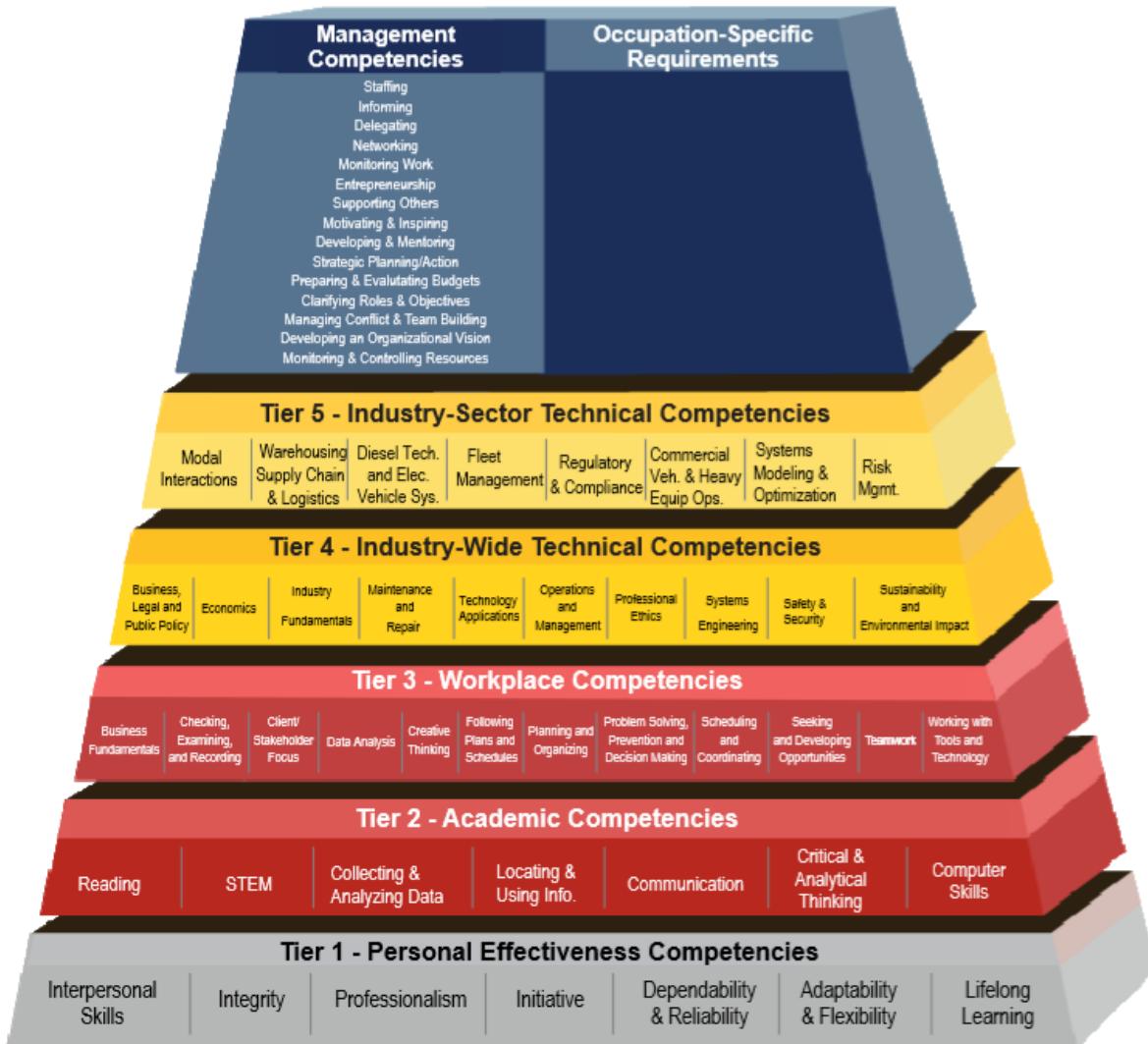
Transportation Operations Pathway: Computer and Information Systems Manager

	KSAs	ACADEMIC PROGRAM OF STUDY	INDUSTRY CERTIFICATION	JOBS AND WAGES
ADVANCED LEVEL	<p>Knowledge of IT Practices/Computer Science Principles Knowledge of Project Management practices (budgeting, scheduling, etc.) Knowledge of Transportation Operations Managerial/ Supervisory Experience and Leadership Skills General Computer Skills</p>	<p>Bachelor's Degree Required Master's degree or MBA sometimes preferred <i>Major Coursework in Civil Engineering or related field strongly preferred</i></p>	<p>4-10 years of experience in computer technical development, program management, and/or system administration with technical management experience</p>	<p><input type="checkbox"/> GIAC Certifications (GCIA, GCIH, GMON, GPPA or GCED) <input type="checkbox"/> EC-Council (CEH, ECSA, CHFI) <input type="checkbox"/> Cisco CCIE</p> <p>Advanced Level</p> <p>Senior Level Computer Information Systems Manager</p> <ul style="list-style-type: none"> • Engineering Manager • IT Leadership Development Program • IT Manager – Transportation • Analyst / Sr. Specialist Mechanical Systems • Lead IT Analyst • Senior Systems Product Manager <p>\$51.99 (mean hourly rate from job descriptions)</p>
MID LEVEL	<p>Knowledge of IT Practices/Computer Science Principles Knowledge of Data Analytics Knowledge of Transportation Operations Technical Communication/Report Development Skills Communication Skills, Written and Verbal Analytical, Mathematical, or Problem-Solving Skills General Computer Skills Knowledge of Microsoft Office Programs</p>	<p>Bachelor's Degree Required <i>Major Coursework in Engineering, Mathematics, Physics, Computer Science, Information Technology, Business Administration</i></p>	<p>2-8 years experience with computers, systems or technical experience with Logistics / Transportation experience preferred</p>	<p><input type="checkbox"/> Professional Engineering License</p> <p>Intermediate Level</p> <p>Engineer/ Technologist/ Programmer</p> <ul style="list-style-type: none"> • Systems Engineer • Information Systems Programmer • Information Technology Security Engineer • ISSO-Security Engineering and Architecture • Information Technology Technician
ENTRY LEVEL	<p>Knowledge of IT Practices/Computer Science Principles Knowledge of Data Analytics Knowledge of Transportation Operations Communication Skills, Written and Verbal Technical Communication/Report Development Skills Possess a good attitude/work ethic General Computer Skills Knowledge of Microsoft Office Programs</p>	<p>Bachelor's Degree Required or In Progress <i>Major Coursework Computer Science, Management Information Systems, Engineering, Supply Chain/Logistics, or Mathematics</i></p>	<p>1-5 experience in IT systems design and development</p>	<p><input type="checkbox"/> Driver's License Required <input type="checkbox"/> Microsoft Certifications <input type="checkbox"/> Comp TIA IT Certifications</p> <p>Entry Level</p> <p>IT Specialist/ Analyst</p> <ul style="list-style-type: none"> • IT Support Specialist • IT Analyst - Supply Chain Systems • Cyber Security Specialist • Paratransit Technical Support Data Analyst (Administrative Officer III)

Appendix D: Competency Models for Transportation Operations







Competency Model in Freight Operations