Executive Summary

Background
The maritime and transportation industry is facing a potential workforce crisis. By 2020, a majority of workers in all industry sectors will be eligible to retire including:

- ship captains and mates
- marine engineers
- skilled craft ship builders, repair, maintenance and modernization technicians (i.e. welders, electricians, painters)
- riggers
- logistics managers

In addition, increased demand for maritime-based transportation with the completion of the Panama Canal expansion will require new construction such as major port expansions as well as increased workforce demands. To meet the current and future needs for a strong workforce, new workers must be brought into the pipeline now to learn from experienced, soon-to-retire employees. To accomplish this knowledge transition, new workforce entrants must understand the industry, the skills, and competencies required to perform the work and pursue job opportunities.

The maritime and transportation industry needs tools that can be used by industry employers, educators, and workforce development professionals to articulate the skills required to perform the work so that job candidates can be effectively screened and training courses and educational pathways can be developed to most effectively prepare candidates for work. The maritime and transportation industry competency model is a critical tool in this effort.

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According to the U.S. DOL Employment and Training Agency (DOLETA), a competency model is a collection of competencies that define the potential for successful performance in a particular work setting. Competency models are the foundation for important human resource functions—such as recruitment and hiring, training and development and performance management—because they specifically define what is essential to select as well as train and develop a diverse, talented candidate pool.

Why a competency model?
The Maritime and Transportation Industry Competency Building Block model is designed to provide a consistent definition of the competencies required to work in the industry. The model builds from basic fundamentals to more industry and career specific competencies.

For the U.S. Department of Labor, the maritime and transportation industry is a sector of the Transportation, Distribution and Logistics (TDL) Industry. In 2014, for the first time in its history, the USDOL incorporated a separate building block in Tier 5 solely focused on maritime transportation as a result of the SMART Center PI’s work on the competency model task force.

The competency model consists of stacked tiers increasing in specificity and specialization as the pyramid ascends. Each tier is divided into blocks representing content or the skills, knowledge, abilities and other factors that are essential to successful performance in the industry.

The competencies reflected at the base of the model (Tiers 1 – 3) represent those needed for success in life and in the foundation for success in school and work. These foundational skills are a needed prerequisite for workers to be able to learn new industry-specific skills (Tiers 4-7)

How should the model be used?
The Competency Building Block model is intended to help teachers, students, Career One Stops and potential employees understand the skills required to work in the maritime and transportation industry. The model can be used by educators to tailor curriculum to reinforce the competencies. Students can use the model to match job requirements as identified by employers with their skills. Where there are gaps, short-term training programs can be developed to address them or existing programs can be modified.

How are these competencies used in the workplace?
Students often have difficulty understanding how the courses they take in school—such as math, English, and science—relate to the real world and future careers. Using this competency model teachers and guidance counselors can help students make the connection to real-world employment as well as what to consider when evaluating post-secondary education and training options.
Algebra – increases problem solving skills which are needed when troubleshooting problems in a shipyard or port.

Geometry – using diagrams to install new equipment or wiring which requires measuring and understanding dimensions and space.

Physics – understanding the basic concepts of physics such as friction and buoyant force helps in understanding the science behind ship and marine propulsion engine design.

History/Humanities/Social Sciences – understanding the experiences of other cultures helps in teamwork, collaboration and problem solving.

English – being able to speak, write and read English helps the individual follow directions, ensure a safe job site, prepare reports and talk to the boss, coworkers, and customers.

Transportation, Distribution and Logistics (TDL) Industry Competency Model

Tier 1: Personal Effectiveness

1. Interpersonal Skills: Displaying skills to work with others from a range of backgrounds

Maintaining Open Communication
- Maintains open lines of communication with others
- Recognizes and accurately interprets the verbal and nonverbal behavior of others
- Establishes a high degree of trust and credibility with others

Working with Diverse People
- Is flexible and open-minded when dealing with a wide range of people
- Listens to and considers others’ viewpoints
- Works well and develops effective relationships with diverse personalities
- Demonstrates respect for the opinions, perspectives, and individual differences of others
- Values diversity of people and ideas

2. Integrity: Displaying accepted social and work behaviors

Behaving Ethically
- Abides by a strict code of ethics and behavior
- Chooses an ethical course of action and does the right thing, even in the face of opposition
- Differentiates between legal and ethical issues
- Performs work-related duties according to laws, regulations, contract provisions, and policies

Acting Fairly
- Treats others with honesty, fairness, and respect
- Makes decisions that are objective and reflect the just treatment of others
- Is willing to have tough conversations when others need to be corrected

Taking Responsibility
- Takes responsibility for accomplishing work goals within accepted timeframes
- Accepts responsibility for one’s actions and for those of one’s group, team, or department
- Makes an effort to learn from mistakes
- Takes personal responsibility and accountability

3. Professionalism: Maintaining a professional demeanor

Demonstrating Self-Control
- Demonstrates self-control by maintaining composure and keeping emotions in check even in difficult situations
- Deals calmly and effectively with stressful situations
- Demonstrates emotional intelligence

Maintaining Professional Demeanor
- Projects a professional image of oneself and the organization
- Dresses appropriately for the occupation and its requirements
- Maintains appropriate personal hygiene
- Takes pride in one’s work and the work of the organization
- Demonstrates a positive attitude towards work

Social Responsibility
- Remains free from substance abuse
- Maintains a healthy lifestyle

Self Development
- Takes charge of personal career development by identifying occupational interests, strengths, options, and opportunities
- Makes insightful career planning decisions based on integration and consideration of others’ feedback, and seeks out additional training to pursue career goals

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Tier 1: Personal Effectiveness (continued)

4. Initiative: Demonstrating a willingness to work

- Shows Commitment
  - Pursues work with energy, drive, and a strong accomplishment orientation
  - Expends extra effort to accomplish tasks even when conditions are difficult or deadlines are tight
  - Persists at a task or problem despite interruptions, obstacles, or setbacks
  - Exerts effort toward task mastery

- Taking Initiative
  - Takes initiative in seeking out new work challenges and increasing the variety and scope of one’s job
  - Establishes personally challenging but realistic work goals
  - Goes beyond the routine demands of the job
  - Seeks opportunities to influence events and originate action

- Working Independently
  - Works effectively and efficiently
  - Is solutions-oriented
  - Is able to perform effectively even with minimal direction, support, or approval and without direct supervision

- Demonstrating Motivation
  - Is intrinsically driven to succeed and excel
  - Strives to exceed standards and expectations
  - Demonstrates confidence in one’s capabilities and an expectation to succeed in future activities

5. Dependability & Reliability: Displaying responsible behaviors at work

- Fulfilling Obligations
  - Behaves maturely, consistently, and predictably
  - Is reliable, responsible, and dependable in fulfilling obligations
  - Diligently follows through on commitments and consistently meets deadlines
  - Demonstrates regular and punctual attendance; rarely is late for meetings or appointments
  - Follows written and verbal directions
  - Complies with organizational rules, policies, and procedures

- Attending to Details
  - Diligently checks work to ensure that all essential details have been considered
  - Notices errors or inconsistencies that others have missed, and takes prompt, thorough action to correct errors

- 6. Adaptability/Flexibility: Being open to change and to considerable variety in the workplace

- Entertaining New Ideas
  - Is open to considering new ways of doing things
  - Actively seeks out and carefully considers the merits of new approaches to work
  - Embraces new approaches when appropriate and discards approaches that are no longer working

- Dealing with Ambiguity
  - Takes proper and effective action when necessary without having to have all the necessary facts in hand
  - Easily changes gears in response to unpredictable or unexpected events, pressures, situations, and job demands
  - Effectively changes plans, goals, actions, or priorities to deal with changing situations

- 8. Lifelong Learning: Understanding the importance of new information for both current and future problem solving and decision making

- Demonstrating an Interest in Learning
  - Demonstrates an interest in personal learning
  - Seeks feedback from multiple sources about how to improve and develop, and modifies behavior based on feedback or self-analysis of past mistakes
  - Treats unexpected circumstances as opportunities to learn

- Participating in Training
  - Identifies when it is necessary to acquire new knowledge and skills
  - Takes steps to develop and maintain knowledge, skills, and expertise necessary to achieve positive results
  - Participates fully in relevant training programs and actively pursues other opportunities to develop knowledge and skills

- Integration and Application
  - Integrates newly learned knowledge and skills with existing knowledge and skills
  - Uses newly learned knowledge and skills to complete specific tasks
  - Applies newly learned knowledge and skills in new or unfamiliar situations

Did You Know?...

Short-term training courses can help employers identify potential workers with the personal effectiveness skills needed for work? The Maritime Trades Training Program (MTTP) is a short-term intensive hands-on and classroom instruction training program that the SMART Center launched with five Virginia community college programs to address workforce gaps in critical maritime skilled trades. More than 360 previously unskilled students were successfully trained and immediately hired for full-time work by one of the industry’s global leaders. The program demonstrated a 6-month graduate retention rate of 93% and reduced the company’s new hire turnover rate by 70%. It received the National Career Pathways Network (NCPN) Partnership Excellence Award for Promoting Practices in 2015.

MTTP students learned in a portable lab that replicates real-life work environments.

Tier 2: Academic Requirements

1. Communication – Visual and Verbal: Listening, speaking and signaling so others can understand; communicate in spoken English well enough to be understood by others.

- Speaking
  - Expresses information to individuals or groups taking into account the audience and the nature of the information (e.g., technical or controversial)
  - Speaks clearly and confidently in a logical manner
  - Speaks using common English conventions including proper grammar, tone, and pace
  - Effectively uses eye contact and non-verbal expression

- Communication
  - Receives, attends to, interprets, understands, and responds to verbal or signaled messages
  - Recognizes important information in verbal or signaled messages
  - Understands and acts upon instructions to complete assignments

- Listening and Following Directions
  - Identifies when it is necessary to acquire new knowledge and skills
  - Takes steps to develop and maintain knowledge, skills, and expertise necessary to achieve positive results
  - Participates fully in relevant training programs and actively pursues other opportunities to develop knowledge and skills

- Integration and Application
  - Integrates newly learned knowledge and skills with existing knowledge and skills
  - Uses newly learned knowledge and skills to complete specific tasks
  - Applies newly learned knowledge and skills in new or unfamiliar situations

2. Reading: Understanding written sentences, paragraphs, and figures in work-related documents

- Comprehension
  - Understands the purpose of written materials
  - Comprehends meaning and core ideas

- Integration and Application
  - Critically evaluates and analyzes information in written materials
  - Integrates and synthesizes information from multiple written materials
  - Applies what is learned from written material to follow instructions and complete specific tasks
  - Applies what is learned from written material to future situations

3. Locating & Using Information: Functional and critical thinking skills related to information, media and technology

- Locate and Evaluate Information
  - Locates, understands, and interprets written information such as manuals, reports, memos, letters, forms, graphs, charts, tables, calendars, schedules, signs, notices, applications, and directions
  - Locates information efficiently (time and effectively) (sources)
  - Evaluates information critically and competently
  - Reviews information obtained for relevance and completeness

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MTTP students learned in a portable lab that replicates real-life work environments.
Tier 2: Academic Requirements (continued)

Locate and Evaluate Information
- Recognizes important gaps in existing information
- Takes steps to eliminate those gaps

Use and Manage Information
- Uses information accurately and creatively for the issue or problem at hand
- Manages the flow of information from a wide variety of sources
- Organizes/reorganizes information as appropriate to get a better understanding of a problem

4. Writing: Using standard English to compile information and prepare written documents

Organization and Development
- Creates and formats documents such as letters, directions, manuals, reports, and flow charts
- Communicates thoughts, ideas, information, messages, and other written information, which may contain technical terms and concepts, in a logical, organized, and coherent manner
- Develops ideas using supporting information and examples

Mechanics
- Writes in a manner appropriate for business and with language appropriate for the target audience
- Uses appropriate tone and word choice (e.g., writing is professional and courteous)
- Uses standard syntax and sentence structure
- Uses correct spelling, punctuation, and capitalization
- Uses appropriate grammar (e.g., correct tense, subject-verb agreement, no missing words)

5. STEM (Science, Technology, Engineering & Math): Applying basic scientific, technological, engineering, and mathematical principles to complete tasks

STEM
- Understands basic scientific concepts and principles and how to use commonly available technology
- Understands the scientific method (i.e., identifies problems, collects information, forms opinions, and draws conclusions)
- Has knowledge of the practical application of science, technology, and engineering
- Applies the appropriate technical solution to complete tasks
- Solves problems where a variety of mechanical faults could be the cause

- Translates practical problems into useful mathematical expressions and uses appropriate mathematical formulas and techniques
- Adds, subtracts, multiplies, and divides with whole numbers, fractions, decimals, and percentages
- Recognizes and interprets the value of numbers and what they mean to the operation
- Calculates averages, ratios, proportions, and rates
- Takes measurement of weight, time, temperature, distance, length, width, height, etc.
- Correctly converts from one measurement to another
- Solves simple algebraic equations
- Reads, tracks, and calculates gauge measurements
- Uses elementary statistics and laws of probability – mean, median, and mode

6. Critical & Analytical Thinking: Possessing sufficient inductive and deductive reasoning ability to perform job

Reasoning
- Reviews, analyzes, synthesizes, compares and interprets information
- Draws conclusions from relevant and/or missing information
- Applies critical thinking skills to formulate solutions to problems

Mental Agility
- Identifies connections between issues
- Understands, orients to, and learns new assignments
- Demonstrates the ability to multi-task and adjust to changes when working on multiple projects or issues

Employing Unique Analyses
- Employs unique analyses and generates new, innovative ideas in complex areas
- Integrates seemingly unrelated information to develop creative solutions
- Develops innovative methods of obtaining or using resources when insufficient resources are available

7. Information Technology Fundamentals: Using a computer, communication devices, and related applications to input, retrieve and communicate information

General Computer, Software, IT Knowledge and Skills
- Understands common terminology related to the use of technology by people with disabilities and/or sensory and functional limitations, including accessible IT, assistive technology, and universal design
- Understands and uses common computer hardware (e.g., desktops, laptops, tablets, PC components, cabling), software (e.g., operating systems; applications; communication, collaboration, and productivity software) and communication devices (e.g., telephony, wireless devices, network and wireless systems) to perform tasks and communicate effectively
- Understands and uses appropriate computer etiquette
- Understands and uses common communications media, including wired and wireless telephones, audio conferences, videoconferences, and online collaboration tools
- Uses a computer to search for online information and interact with Web sites and Web applications (e.g., enterprise solutions, online stores, blogs, social networks, wikis)
- Understands how to critically evaluate online information and be aware of relevant copyright and data protection issues

Did You Know?...
The SMART Center’s annual Maritime and Transportation Institute provides immersive professional development for STEM educators, community college faculty and administrators, guidance counselors and career coaches. The week-long event enables educators to meet with and learn from industry professionals and current workers and registered apprentices in a wide variety of settings including ports, shipyards, marinas, merchant marine vessels, and much more. Institute participants produce classroom-ready materials that educators and counselors can use to increase students’ awareness of, and academic readiness for, a career in the maritime and transportation industry. (bottom l: Maryland students using a hydraulic fluid kit project designed by an Institute alumni, Florida students from a Global Logistics Academy created by a SMART Institute alumni participating in a plywood regatta)
Tier 2: Academic Requirements

**Common IT Applications Use**
- Uses word processing applications to compose, organize, and edit simple documents and other business communications, and produce accurate outputs to print or share electronically
- Uses standard formulas and functions, format and modify content, and demonstrates competence in creating and formatting spreadsheets, graphs, or charts
- Uses and manages electronic mail to communicate with appropriate etiquette
- Uses Internet applications to search for information
- Uses presentation software to effectively share information and ideas
- Understands and is able to use simple databases
- Uses spreadsheet, database, and presentation software both independently and in an integrated fashion
- Manages file storage: uses functions to store, retrieve, and sort documents
- Understands social media and their appropriate workplace uses
- Double-checks work carefully to identify and correct typographical, grammatical, and other errors

**Cyber Safety**
- Understands the importance of privacy and potential abuses of private information
- Is able to stay safe in an online, networked environment
- Understands the importance of updating and using the most recent security software, Web browser, and operating system to protect against malware, and other online threats
- Recognizes and responds appropriately to suspicious vulnerabilities and threats: Web sites, Web links, emails, posts, online advertisements, phishing, virus infections
- Recognizes secure Web addresses, (e.g., “https://”) or “ssh://”
- Protects and manages personally identifiable information
- Understands and uses privacy and security settings on social networking applications to share only appropriate personal information
- Reviews the privacy policy and understands what data an application can access prior to downloading and installing
- Understands the risk of connecting to an unsecured or unprotected network
- Uses strong passwords, passphrases, and basic encryption
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**Tier 3: Workplace Competencies**

1. **Teamwork: Working cooperatively with others to complete work assignments**
   - Accepts membership in the team
   - Identifies with the goals, norms, values and customers of the team
   - Uses a group approach to identify problems and develop solutions based on group consensus
   - Effectively communicates with all members of the team to achieve goals
   - Develops cooperative and supportive working relationships with others
   - Shows sensitivity to the thoughts and opinions of others
   - Responds appropriately to positive and constructive feedback
   - Encourages others to express their ideas and opinions
   - Learns from other team members
   - Applies interpersonal skills to help team achieve goals
   - Gives full attention to what others are saying, taking time to understand the points being made, asking questions as appropriate and not interrupting at inappropriate times
   - Keeps all parties informed of progress and all relevant changes to project timelines
   - Demonstrates loyalty to the team

2. **Customer Focus: Efficiently and effectively addressing the needs of clients/customers**
   - Receives, interprets, understands and responds to verbal messages and other cues
   - Picks out important information in verbal messages
   - Interprets complex instructions and their relevance to the work assignment
   - Asks questions to clarify unclear directions
   - Acts upon the instruction to complete an assignment

3. **Planning/Organizing: Planning and prioritizing work to manage time effectively and accomplish assigned tasks**
   - Prioritizes various competing tasks and performs them quickly and efficiently according to their urgency
   - Finds new ways of organizing work area or planning work to accomplish work more efficiently
   - Estimates resources needed for project completion; allocates time and resources effectively
   - Anticipates obstacles to project completion and develops contingency plans to address them; takes necessary corrective action when projects go off-track
   - Plans and schedules tasks so that work is completed on time
   - Makes arrangements that fulfill all requirements as efficiently and economically as possible
   - Responds to the schedules of others affected by arrangements; informs others of arrangements, giving them complete, accurate and timely information
   - Keeps track of details to ensure work is performed accurately and completely
   - Takes steps to verify all arrangements; recognizes problems, generates effective alternatives and takes corrective action
   - Effectively coordinates the transition of employees at the beginning and end of each work shift; disseminates crucial information in an organized manner to rapidly bring employees up to speed at the start of their shifts

4. **Problem Solving/Decision-Making: Applying critical-thinking skills to solve problems encountered on the work site**
   - Anticipates or recognizes the existence of a problem
   - Identifies the true nature of the problem by analyzing its component parts
   - Effectively uses both internal and external resources to locate and gather information; examine information obtained for relevance and completeness; recognizes important gaps in existing information and takes steps to eliminate those gaps; recalls previously learned information that is relevant to the problem; organizes information as appropriate to gain a better understanding of the problem
   - Integrates previously learned and externally obtained information to generate a variety of high quality alternative approaches to the problem
   - Skillfully uses logic and analysis to identify the strengths and weaknesses, the costs and benefits and the short and long-term consequences of different approaches
   - Decisively chooses the best solution after contemplating available approaches to the problem; makes difficult decisions even in highly ambiguous or ill-defined situations; quickly chooses an effective solution without assistance when appropriate
   - Commits to a solution in a timely manner and develops a realistic approach for implementing the chosen solution; observes and evaluates the outcomes of implementing the solution to assess the need for alternative approaches and to identify lessons learned
   - Uses scientific rules and methods to solve problems

5. **Working with Tools & Technology: Selecting, maintaining and using tools and technology to facilitate work activity**

**Selecting and Using Tools**
- Identifies, selects, and applies appropriate tools or technological solutions to frequently encountered problems
- Carefully considers which tools or technological solutions are appropriate for a given job, and consistently chooses the best tool or technological solution for the problem at hand
- Demonstrates appropriate use of tools and technology to complete work functions
- Uses tool, equipment, and machinery safely and appropriately

**Keeping Current**
- Demonstrates an interest in learning about new and emerging tools and technologies
- Seeks out opportunities to improve knowledge of tools and technologies that may assist in streamlining work and improving productivity
- Adapts quickly to changes in process or technology
- Accepts help from others
- Troubleshooting
- Learns how to maintain and troubleshoot tools and technologies
- Performs routine maintenance on tools, technology, and equipment

**Did You Know?...**
The SMART Center has created a “SMART Maritime and Transportation Industry Career Guide & Resource Handbook” to provide students and workers with the key information they need about the maritime and transportation industry including relevant educational pathways, registered apprenticeship programs, average salaries and career pathways, etc.

**Use the online version of the Resource Handbook and Career Guide at:**
http://www.maritime-technology.org/knowledge-center/
### Tier 3: Workplace Competencies (continued)

#### Keeping Current
- Determines causes of operating errors and decides what to do about it
- Troubleshoots maintenance problems in accordance with established procedures
- Develops alternatives to complete a task if desired tool technology is unavailable

#### 6. Scheduling & Coordinating: Making arrangements that fulfill all requirements as efficiently and economically as possible

#### Arranging and Informing
- Handles all aspects of arrangements thoroughly and completely with little or no supervision
- Ensures that others are informed, giving them complete, accurate, and timely information
- Responds to the schedules of others affected by arrangements
- Takes steps to verify all arrangements
- Recognizes problems, generates effective alternatives, and takes corrective action

#### Coordinating in Distributed Environments
- Coordinates schedules of colleagues, co-workers, and clients in regional locations (i.e., across time zones) to ensure that inconvenience is minimized and productivity is enhanced
- Leverages technology (e.g., internet, teleconference) to facilitate information sharing in distributed work environments
- Takes advantage of team member availability throughout business hours in multiple time zones to enhance productivity

#### Shift Work
- Effectively coordinates the transition of employees at the beginning and end of each work shift
- Disseminates crucial information in an organized manner to rapidly bring employees up to speed at the start of their shifts
- Ensures employees are updated on work completed on past shifts and work that still needs to be completed
- Demonstrates willingness to work various shifts and schedules

#### Tier 3: Workplace Competencies

### Business Ethics
- Demonstrates respect for coworkers, colleagues, and customers
- Acts in the best interest of the company, the community, and the environment
- Complies with applicable laws and rules governing work and reports loss, waste, or theft or company property to appropriate personnel

### Industry Knowledge - Private Sector
- Understands the industry, industry market trends, and the company's position in the market
- Knows who the company's primary competitors are, their products/services, strengths/weaknesses, and, to the extent possible, organizational strategies
- Understands the company's priorities, workforce capabilities, strategic plan, business plan, critical customers, suppliers, and stakeholders
- Understands major competitive challenges faced by the organization

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The “gold standard” for maritime transportation industry workforce development, particularly in the shipbuilding and repair sector, is registered apprenticeship. Registered apprenticeship provides employers with a way of training a highly-skilled, educated set of employees for rapid promotion and career security; it provides workers with a way of earning industry and education credentials while earning a full-time salary and learning an in-demand skilled trade.

### Did You Know?

**Understands major competitive challenges faced by the company**

**Knows who the company’s primary competitors are, their products/services, strengths/weaknesses, and, to the extent possible, organizational strategies**

**Understands the company’s priorities, workforce capabilities, strategic plan, business plan, critical customers, suppliers, and stakeholders**

**Understands major competitive challenges faced by the organization**

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**What is registered apprenticeship?**

- Employer Involvement
- Structured On-the-Job Learning
- Related Training and Instruction
- Rewards for Skill Gains
- National Occupational Credential

**Five Core Components of Registered Apprenticeship**

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**After graduating high school, working in the Navy and a series of other jobs Sarah Canclini was turning 25 and wanted “something productive that could give me a long-term career.” Sarah was accepted into BAE Systems’ registered apprenticeship program in Norfolk, Virginia. During the four-year program she worked under a master craftsman to learn a specific trade—outside machinist. Today she applies what she learned to “do a lot of prefabrication work on U.S. Navy and commercial merchant ships—installing and removing stuff so that ships can be repaired, maintained, and improved.” Sarah is most enthusiastic about her future with BAE. “It’s great to work somewhere that doesn’t hold your lack of direct experience against you—that’s the whole point of the apprenticeship program. I gained great skills, got a free college education and get to do work every day that’s really important.” Learn more at: [http://www.maritime-technology.org/students-apprenticeship/](http://www.maritime-technology.org/students-apprenticeship/)**

Sarah Canclini graduated the BAE Systems Ship Repair program with a DOL Journeyman credential, an A.A.S. Maritime Technologies degree from Tidewater Community College (TCC) and was promoted within months to a supervisor position. Way to go Sarah!
Tier 4: Industry-wide Technical Competencies

Industry Fundamentals: Knowledge of the fundamentals of the transportation, distribution and logistics industry, including transportation modes and the industry’s key components

Critical Work Functions
- Understands the nature and scope of transportation, distribution, and logistics
- Describes the various modes of transportation and their inter-connectivity
- Explains the role and impact of the transportation of passengers and freight on the economy
- Understands the public and private organizations, systems, and infrastructure supporting the transportation, distribution, and logistics industry

Technical Content Areas
- Modes of Transportation
  - Air
  - Rail
  - Maritime
  - Highway
  - Pipeline
  - Public Transit and Ground Transportation Systems
  - Intermodal and Multimodal
  - Scenic and Sightseeing Transportation (NAICS 487), the Postal Service (NAICS 491), and Couriers and Messengers (NAICS 492)
- Support Providers
  - Logistics
  - Supply Chain Management
  - Transportation Management
  - Warehousing Management
  - Infrastructure Management
  - Non-Asset Based Third Party Suppliers for activities such as auditing, customer service issue resolution, freight quoting, financial settlement and invoicing, packaging and transportation, and tracking

2. Design & Development: Activities related to the research, design and development of transportation systems capable of moving materials, products, and people to meet customers’ requirements.

Critical Work Functions
- Develops plans including routes and schedules for transporting people and goods to meet customer requirements
- Analyzes performance of transportation operations in order to improve quality and service levels and increase efficiency
- Applies systems analysis to the elements, relationships, and functions in the supply chain
- Determines customer needs and requirements
- Ensures that passengers or cargo arrive at the right location, on time, and in the safest and most efficient and economical manner within regulatory guidelines
- Maintains information on the movement of people and goods according to planned routes and schedules
- Assesses infrastructure conditions and develops plans to maintain and improve transportation infrastructure

Technical Content Areas
- Design and Development
  - Asset Management
  - Geometric Design
  - Intelligent Transportation Systems
  - Pavements
  - Roads and Bridges
  - Traffic Operations and Capacity
  - Traffic Safety
  - Transportation Planning Development
  - User Behavior/Human Factors
- Business Cycle
  - Contracting
  - Documentation
  - Forecasting
  - Procurement
  - Scheduling and Monitoring

3. Operations & Management: Activities related to implementation, management, and control of transportation systems.

Critical Work Functions
- Drives or operates transportation equipment
- Implements transportation plans and schedules
- Adjusts transportation and distribution processes in response to changing conditions
- Demonstrates knowledge of roadway planning, design, and construction, and vehicle dispatching, routing, and tracking

Did You Know?....
According to the Jones Act, all goods being transported between U.S. ports must be carried on American-flagged vessels which were built in the U.S., owned by U.S. citizens/companies, and crewed by U.S. citizens or permanent residents. That means that there will ALWAYS be a demand for well-educated, skilled and experienced mariners to operate these vessels within U.S. waterways—both near-shore (along the coast) and inland or “brown” waterways—the rivers that connect major American inland ports (see right). Community colleges like San Jacinto College (Houston, TX) are training the next generation of vessel operators including tankermen, deckhands, pilots, captains, and more. Learn more at: http://bit.ly/2dkHKG

3. Operations & Management (continued)
- Applies strategies for managing traffic flow at transportation hubs, facilities, and staging areas
- Applies industry standards to ensure quality service
- Maintains logs and other required documents
- Monitors processes to ensure they are appropriate and effective
- Ensures equipment is operating to prescribed standards
- Provides ongoing customer service to both internal and external customers
- Responds to customer problems, complaints, and questions

Technical Content Areas
- Operation
  - Dispatch
  - Intermodal Transfers/Synchronization
  - Impact of Intermodal Operations
  - Operations Systems
  - Signaling
  - Scheduling
  - Tracking
  - Traffic Flow
  - Vehicle Operation
- Customer Relationship Management
  - Internal and External Customers
  - Company Policies and Procedures
  - Confidentiality
  - Marketing
  - Sales
  - Handling Questions, Problems, Complaints
  - Educating the Customer
- Customer Satisfaction and Commitment to Product or Service
- Routes and Schedules
  - Local
  - Long-Distance
  - Special Handling
  - Hazardous Materials
- Quality Assurance
  - Total Quality Management (TQM)
  - Enterprise Lean
  - Six Sigma Methodology

4. Maintenance & Repair: Activities related to the maintenance and repair of transportation facilities, equipment, infrastructure and systems.

Critical Work Functions
- Examines or inspects facilities, equipment, infrastructure, and systems to detect malfunctions, damage, or maintenance needed
- Maintains and repairs transportation facilities, equipment, infrastructure, and systems
- Updates maintenance records and logs according to company policies and procedures and government regulations

Technical Content Areas
- Maintenance
  - Equipment Operation and Repair
  - Equipment/Machinery Maintenance Services
  - Maintenance Schedules
  - Maintenance Logs
  - Computer Software and Hardware
- Repair
  - Repair Schedules
  - Vehicle Diagnostic Systems
  - Vehicle Monitoring Systems (VMS)
5. Technology Applications: Maintaining and awareness of technological advances and applying appropriate technology to transportation, distribution and logistics processes.

Critical Work Functions
- Applies new and emerging advanced techniques to provide solutions for transportation, distribution, and logistics problems
- Stays informed of technological advances and the benefits of applying appropriate technology to transportation, distribution, and logistics processes

Technical Content Areas
- Technology
  - Transportation Components and Systems such as vehicular global positioning systems, or vehicle navigation systems
  - Transportation Services Equipment such as integrated maintenance information systems
  - Communications Devices and Accessories such as mobile phones, or two-way radios
  - Computer Equipment and Accessories such as notebook computers, personal digital assistants (PDAs) or organizers, thin-client computers, desktop computers, personal computers, wearable computing devices, bar code reader equipment, radio frequency identification devices, scanners, touchpads, portable data input terminals
  - Data Voice or Multimedia Network Equipment or Platforms and Accessories such as automatic call distributor (ACD), interactive voice recognition equipment, intercom systems, radio frequency data communication equipment, telegraph sounders, instant messaging platform, location based messaging service platforms, paging controllers
  - Robotics
  - Public Safety and Control Systems
  - Fire Protection such as fire suppression systems
  - Consumer Electronics such as global positioning system receivers, radio frequency scanners, radio frequency transmitters or receivers

- Systems and Software
  - Advanced Traveler Information Systems (ATIS)
  - Compliance
  - Customer Relationship Management (CRM)
  - Electronic Data Interchange (EDI)
  - Electronic Logging Systems
  - Enterprise Resource Planning (ERP)
  - Expert Systems
  - Facilities Management
  - Geographic Information Systems (GIS)
  - Global Logistics Systems (GLS)
  - Industrial Control
  - Intelligent Transportation Systems (ITS)
  - Materials Requirements Planning Logistics and Supply Chain
  - Mobile Location-based Services
  - Procurement
  - Project Management
  - Route Navigation
  - Transportation Management Systems (TMS)
  - Safety and Security Systems
  - Video Monitoring Systems

6. Regulations: Compliance with relevant local, state, federal and international laws and regulations that impact the transportation, distribution and logistics industry.

Critical Work Functions
- Understands the roles and functions of government agencies (e.g., Federal Aviation Administration) in regulating and supporting transportation, distribution, and logistics organizations
- Complies with local, state, federal, and international laws and regulations
- Understands transportation systems' political, regulatory, and legal issues
- Identifies governmental policies and procedures for transportation, distribution and logistics facilities

Technical Content Areas
- Standards and Regulations
  - International Organization for Standardization (ISO) Standards
  - Tariff and Trade Regulations
  - Labeling Regulations
  - Environmental Regulations
  - Safety Regulations, Including Occupational Safety and Health Administration (OSHA) Local, State, Federal, and International Laws

7. Safety & Security: Assessing and managing risks associated with safety and security

Critical Work Functions
- Takes measures to protect public health and safety
- Understands and follows relevant safety rules, regulations, and laws
- Follows organizational policies and procedures to maintain a safe work area
- Identifies workplace hazards
- Uses appropriate Personal Protective Equipment (PPE)
- Follows emergency procedures
- Recognizes universal signs and symbols, such as colors, flags, and stakes, to function safely in the workplace
- Completes safety training on pertinent equipment and applies safe operating procedures
- Correctly identifies hazardous materials and substances
- Handles/transport hazardous materials in accordance with government regulations and health standards

- Reports health, safety, security, and environmental problems
- Maintains documentation of compliance with health, safety, security, and environmental management systems
- Understands and follows the safety and security rules and procedures particular to employee’s mode and occupation
- Implements security measures to minimize loss and disruption
- Practices sustainability by using processes that are non-polluting, conserving of energy and natural resources, economically efficient, and safe for workers, communities, and consumers
- Stays up to date on environmentally-friendly trends in the industry
- Follows organizational procedures to reduce emissions, increase energy efficiency, and reduce the organization’s carbon footprint

Did You Know?....
Ports play an integral role in our nation’s intermodal transportation system. Every day thousands of port workers offload and onload vessels of all types and sizes for destinations within the country and worldwide. Ports are small cities of activity 24 hours a day and require workers including gantry crane operators, welders, marine electricians, logistics managers, welders and more. Learn more through the SMART Center’s “Make the SMART Choice” video on YouTube at: https://youtu.be/NjKLnXpwCYc
7. Safety & Security: Assessing and managing risks associated with safety and security (continued)

Technical Content Areas
- Rules and Regulations
  - Safety, Health, Environmental, and Operational Regulations
  - HAZMAT Regulations
  - Personal Protective Equipment (PPE)
  - Health, Safety, and Environmental Risks
- Safety
  - Protective Gear
  - Safety Practices
  - Workplace Hazards
  - Emergency Preparedness
  - Investigations and Audits
  - Documentation
- Security
  - Continuity of Operations
  - Cybersecurity
  - Emergency Preparedness
  - Infrastructure and Physical Security
  - Internal Controls
  - Risk Management
  - Vulnerability Assessment
- Environmental
  - Hazardous Materials
  - Green Issues Impacting Transportation, Distribution, and Logistics Industry
    - Greenhouse Gas Emissions
    - Energy Efficiency
    - Carbon Footprint
    - Fuel-saving Technologies
    - Air/Water Quality

Tier 5: Industry-Sector Technical Competencies | Maritime Transportation

1. Maritime Transportation: These activities required to provide for the water transportation of passengers and cargo using watercraft such as ships, barges, and boats. Includes both deep sea and inland waterway.

Critical Work Functions
- Takes measures to protect public health and safety
- Understands and follows relevant safety rules, regulations, and laws
- Follows organizational policies and procedures to maintain a safe work area
- Identifies workplace hazards
- Uses appropriate Personal Protective Equipment (PPE)
- Follows emergency procedures
- Recognizes universal signs and symbols, such as colors, flags, and stakes, to function safely in the workplace
- Completes safety training on pertinent equipment and applies safe operating procedures
- Correctly identifies hazardous materials and substances
- Handles/transport hazardous materials in accordance with government regulations and health standards
- Reports health, safety, security, and environmental problems
- Maintains documentation of compliance with health, safety, security, and environmental management systems
- Understands and follows the safety and security rules and procedures particular to employee’s mode and occupation
- Implements security measures to minimize loss and disruption
- Practices sustainability by using processes that are non-polluting, conserving of energy and natural resources, economically efficient, and safe for workers, communities, and consumers
- Stays up to date on environmentally-friendly trends in the industry
- Follows organizational procedures to reduce emissions, increase energy efficiency, and reduce the organization’s carbon footprint
- Correctly identifies hazardous materials and substances
- Completes safety training on pertinent equipment and applies safe operating procedures
- Monitors the environment for signs of potential pollution
- Uses appropriate Personal Protective Equipment (PPE)
- Follows emergency procedures
- Recognizes universal signs and symbols, such as colors, flags, and stakes, to function safely in the workplace
- Completes safety training on pertinent equipment and applies safe operating procedures
- Correctly identifies hazardous materials and substances
- Handles/transport hazardous materials in accordance with government regulations and health standards
- Reports health, safety, security, and environmental problems
- Maintains documentation of compliance with health, safety, security, and environmental management systems
- Understands and follows the safety and security rules and procedures particular to employee’s mode and occupation
- Implements security measures to minimize loss and disruption
- Practices sustainability by using processes that are non-polluting, conserving of energy and natural resources, economically efficient, and safe for workers, communities, and consumers
- Stays up to date on environmentally-friendly trends in the industry
- Follows organizational procedures to reduce emissions, increase energy efficiency, and reduce the organization’s carbon footprint

Learn more about in-demand industry careers and educational pathways at www.maritime-technology.org.

Tier 6 Industry-Specific/Job Specific Competencies | Maritime Transportation – Transportation, Distribution & Logistics

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<td>Crane &amp; Tower Operators</td>
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Ship Repair, Maintenance and Modernization

- High school diploma or GED
- Basic knowledge of first aid and CPR
- Possession of a valid driver’s license
- SEAL license (state requirement)
- Physical Requirements
  - Able to perform manual work
  - Able to lift up to 45 lbs
  - Able to climb ladders 200+ feet above ground without assistance
  - Able to work outdoors in extreme cold and heat for extended periods of time
  - Able to work in noisy conditions
  - Able to work in enclosed spaces
  - Able to discriminate between fine visual details at eighteen inches or less (inspecting a part, machining a piece, reading a print)
  - Able to recognize colors
  - Able to detect heat or vibration in equipment or machinery parts by feeling
  - Able to use one’s hands and fingers to adjust or manipulate hand controls, tools or objects
  - Able to climb stairs and ladders, operate stiff valves manually, lift weights, control pneumatic or hydraulic wrenches

Vessel Operations

- High school diploma or equivalent
- Valid driver’s license
- Able to lift, push, pull or carry objects greater than 50 lbs
- Able to work in confined spaces
- Able to climb poles 35+ tall or work in a truck-mounted bucket
- Able to work in situations involving physical danger or discomfort
- Willing to work in all types of weather conditions

Port Operations and Marine Logistics

- High school diploma or equivalent
- Valid driver’s license
- Refrigeration license desirable
- Good vision at close range
- Physical steadiness while moving arm or holding arm and hand in one position
- Able to quickly move hand, hand together with arm or two hands to grasp, manipulate or assemble objects
- Able to lift, push, pull or carry objects greater than 50 lbs
- Able to use a jack hammer or other similar equipment
- Able to drive construction equipment such as a back hoe or Kubota
- Able to work in confined spaces

To order the DVD set of “Make the SMART T Choice” Maritime Transportation Industry career videos for your school or classroom please visit the website at: www.maritime-technology.org.