



## Addressing Emerging Port and Maritime Industry Workforce Gaps

*Findings and Key Takeaways from Two-Day Focus Group with Port of Baltimore Area Employers, Workforce Intermediaries and Educators*



**“Addressing Emerging Port and Maritime Industry Workforce Gaps: Findings and Key Takeaways from Two-Day Focus Group with Port of Baltimore-area Employers and Educators”**

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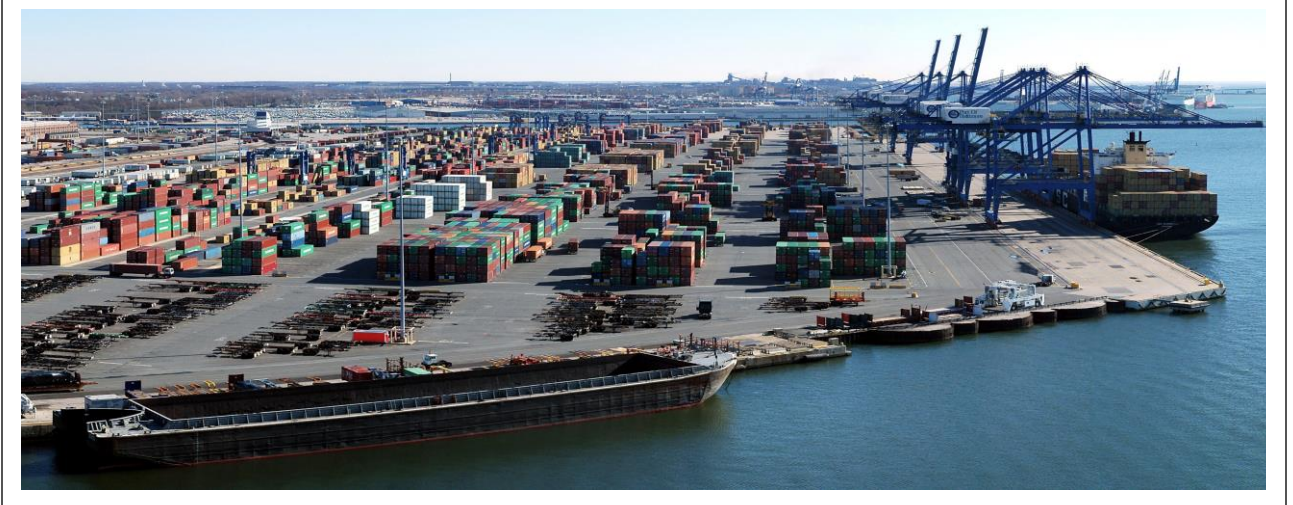
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## Overview

The Port of Baltimore is a critical hub of employment in a city that is within an overnight drive of one-third of the nation's population. The city's accessibility to a wide swath of American consumers makes its network of multimodal transportation a key location for major maritime and transportation, distribution and logistics (TDL) employers.



The Panama Canal expansion is accelerating the port's business volume; it is one of only four ports on the East Coast that has a deep enough channel and berth to accommodate the supersized post-Panamax ships now able to cross the canal. In 2017 it handled a record-setting tonnage of general cargo and container shipments increased by nearly double digits. The port has a total of 17 terminals used by more than 50 globally-recognized ocean carriers including three of the world's largest shipping companies – Evergreen, Maersk and MSC – which now operate at the port.

Continually accelerating demands for port services is increasing employers' needs for educated, skilled and credentialed technicians. The port itself supports nearly 14,000 direct jobs; in total more than a quarter million local jobs are connected to the port. As the nation's top port for container productivity and a growing cruise industry business the port and its connected employers are working collaboratively to develop effective career pathways that enable them to attract, train, retain and promote workers.

The SMART Center has worked closely with the Port of Baltimore and Anne Arundel Community College (AACC) for several years. In partnership with AACC's Transportation, Logistics and Cargo Security (TLCS) program and the Baltimore Port Administration's Education Outreach Committee, the SMART Center has worked with local employers, educators and stakeholders to develop industry-validated career pathway and awareness materials. The SMART Center and AACC have also held four summer Maritime and Transportation Institutes for secondary and post-secondary educators, providing them with the opportunity to tour local employer worksites and engage with workforce leaders, receive classroom tools and resources to raise awareness of maritime careers, and collaborate with other educators on producing materials to share through the Center's National Digital Science Library (NDSL)-linked online repository. The Center's work and deep partnerships with local industry employers and stakeholders formed the basis for the January 24-25, 2017 focus group.

## Focus Group Background

On January 24-25, 2017 the SMART Center joined key partners from the Port of Baltimore and Anne Arundel Community College to convene a two-day meeting of local industry employers, secondary and post-secondary educators, workforce intermediaries and state policymakers for the purpose of:

- (1) discussing current best practices and successful replicable pathways in port-based and local maritime industry workforce development, and
- (2) identifying future local industry workforce needs, competencies and standards to shape the creation of industry-validated career pathways, programs of study, and registered apprenticeship programs for critically-needed occupations.

The invitees represented diverse perspectives and segments of this industry. The goal of the meeting was to increase understanding of effective educational pathways for the industry and to identify workforce and education needs for the next generation of port and maritime industry workers.

## Composition

Participants represented a wide diversity of organizations, institutions and firms connected to the port and marine logistics industry. Representatives in attendance came from:

- K-12, community college and technical education institutions
- Domestic and international shipping operations companies
- Industry and trade associations
- Maritime logistics firms
- Warehousing companies
- Freight forwarders
- State and local government officials

Nearly half (46%) of participants coordinate training or develop education programs within or outside of their company, working with educational institutions. In addition to their current roles, focus group participants have deep experience in the maritime industry that supports their ability to identify and forecast workforce needs:

- Nearly half (45%) of all participants have previous experience either specifying job skills and categories for company or coordinating training/developing education programs for a maritime industry company
- Slightly fewer than 20% of all participants have worked as craft manager or line supervisor directly supervising or directing the activities of production workers
- Slightly less than 10% have experience as a skilled maritime technician or tradesman (welder, pipefitter, electrician, carpenter, machinist, assembly line worker)



*Anne Arundel Community College is a key strategic partner of the SMART Center. Through its Transportation, Logistics and Cargo Security (TLCS) certificate program the school collaborates with the Port of Baltimore and numerous port-connected employers to align curriculum, courses and student engagement opportunities including internships with industry needs and desired competencies and credentials.*

## Hiring Needs and the Workforce “Big Picture”

Drawing on their extensive experience and deep background in the industry, the vast majority (80%) of focus group participants believe that “the need for skilled port and maritime technicians will increase greatly” or “increase somewhat.” Participants believed that the projected increased demand is a result of increased volume (of trade coming through the port) and forecasted labor force shrinkage due to retirement.

*All focus group participants cited an aging workforce and technological change in industry as driving forces for the projected increased need for skilled technicians in port-connected maritime industry occupations.*

## Identification of In-Demand Occupations

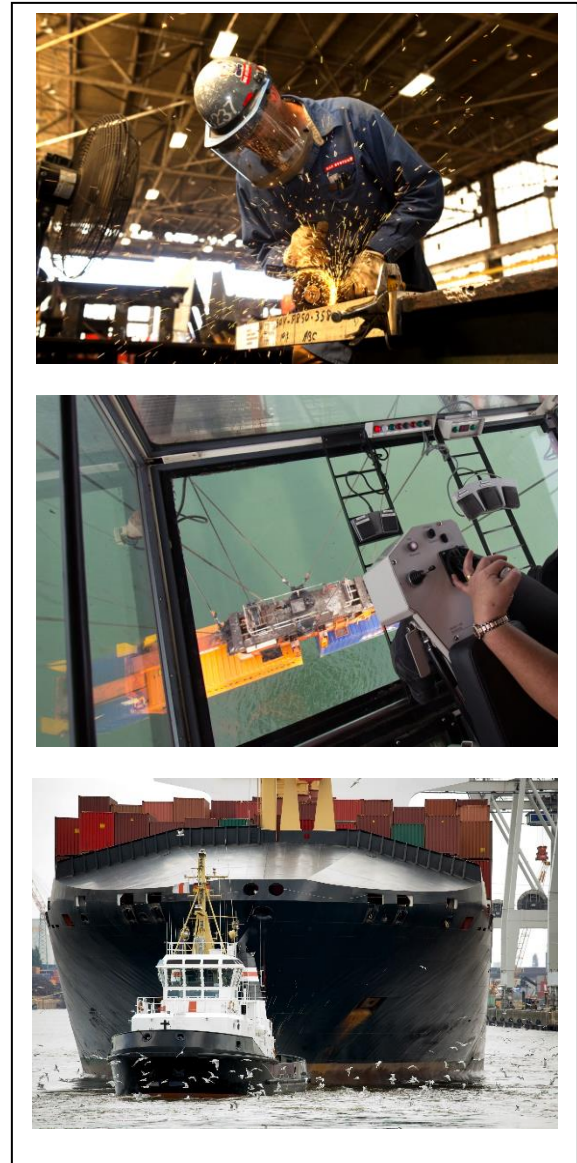
In order to support, develop and scale effective educational pathways as well as outreach and training programs it is necessary to understand the top in-demand occupations for maritime and port-connected employers. Through a series of questions, group discussion and surveying the group provided the following ranking for top in-demand occupations:

- |                          |   |
|--------------------------|---|
| 1. Crane Operators       | 8. Pipefitters                          |
| 2. Maintenance Mechanics | 9. Marine Engineers                     |
| 3. Forklift Operators    | 10. Assembly/Utility Operators          |
| 4. Welders               | 11. CAD/Drafting and Design Technicians |
| 5. Logistics Technicians | 12. Marine Carpenters                   |
| 6. Machinists            | 13. CNC Operators                       |
| 7. Electricians          | 14. Marine Architects                   |

Following are job descriptions for the identified in-demand occupations:

1. **Crane Operators** operate mechanical boom and cable or tower and cable equipment to lift and move materials, machines, or products in many directions.
2. **Industrial Maintenance Mechanics and Technicians** ensure operation of machinery and mechanical equipment by completing preventive maintenance requirements on engines, motors, pneumatic tools, conveyor systems, and production machines; following diagrams, sketches, operations manuals, manufacturer's instructions, and engineering specifications; troubleshooting malfunctions.
3. **Forklift Operators** drive powered industrial trucks to load and unload materials and deliveries and move them to and from storage areas, machines and loading docks, into railroad cars or trucks or storage facilities.
4. **Welders** use hand-welding or flame-cutting equipment to weld or join metal components or to fill holes, indentations, or seams of fabricated metal products. At ports and port-related firms welders work on building, maintaining, repairing, and modernizing vessels of all sizes,

5. **Logistics Technicians** working at ports analyze and coordinate the logistical functions of a port or port tenant organization. They are involved in carrying out critical components of a ports' delivery system including acquisition, distribution, internal allocation, delivery, and final disposal of resources.
6. **Machinists** set up and operate a variety of machine tools to produce precision parts and instruments. Includes precision instrument makers who fabricate, modify, or repair mechanical instruments.
7. **Electricians** read blueprints or technical diagrams, install and maintain wiring, control, and lighting systems, and inspect electrical components, such as transformers and circuit breakers.
8. **Pipefitters** lay out, assemble, install, or maintain pipe systems, pipe supports, or related hydraulic or pneumatic equipment for steam, hot water, heating, cooling, lubricating, sprinkling, or industrial production or processing systems.
9. **Marine Engineers** design, develop, and take responsibility for the installation of ship machinery and related equipment including propulsion machines and power supply systems.
10. **Assembly/Utility Operators** assemble components by using templates or reading measurements, examining connections for correct fit; fastening parts and subassemblies, verifying specifications and resolving assembly problems.
11. **CAD (Computer Aided Design)/Drafting Technicians** work with CAD designers to create a detailed visual representation of a project. They use computer design programs to sketch the object from multiple perspectives and include relevant details such as materials, dimensions, and fasteners.
12. **Maritime Carpenters**, also known as shipwrights, build and repair boats according to blueprints and client specifications. A career in ship carpentry offers numerous possibilities, from cruise ship manufacturing to naval ship building to repair of industrial fishing boats. The job involves working with a variety of materials, such as wood, fiberglass, and aluminum. Ship carpenter job responsibilities include construction of ship parts and frames,



structural assembly and repairs, finishing of ship surfaces, and inspections of finished crafts.

13. **CNC Operators** produce machined parts by programming, setting up, and operating a computer numerical control (CNC) machine; maintaining quality and safety standards; keeping records; and maintaining equipment and supplies.
14. **Marine Architects** design and oversee construction and repair of marine craft and floating structures such as ships, barges, tugs, dredges, submarines, torpedoes, floats, and buoys. They work closely with marine engineers.

Focus group participants identified the following additional, but not as highly ranked, in-demand occupations at the Port of Baltimore and port-connected maritime and transportation companies:

Marine/Operations Supervisors	CDL Drivers
Mariners	Crane Mechanics
Longshoremen	Union Foremen
Vehicle Drivers	Installers
Export/Import Agents	Diesel Mechanics
Planners	Port Superintendent

### **Spotlight: Credentials and Certifications**

While focus group participants acknowledged that few entry-level or technician-level industry job applicants hold industry-valued credentials or certifications they are important – and even essential – for employment and/or promotion.

The maritime industry requires basic skills training and licensing for even the most entry-level positions. American mariners are required to hold individual licenses known as the Merchant Mariner Credential (MMC), which is issued by the Coast Guard to certify mariner qualifications for a five-year period. To earn an MMC and the appropriate credentials for each level of work, mariners must complete regular training from course providers also approved by the US Coast Guard. For most port and maritime industry jobs employees are also required to hold a TWIC (Transportation Worker Identification Credential) issued by the TSA (Transportation Security Administration).

In addition to the MMC focus group participants indicated that their organizations value credentials or certifications from:

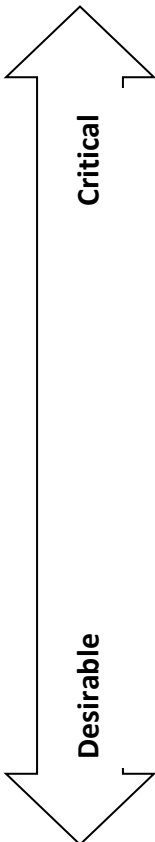
- APICS
- ISM (Institute for Supply Management)
- IATA/FIATA (International Air Transport Association/International Federation of Freight Forwarders)
- MSSC (Manufacturing Skill Standards Coalition)

## Employer-Valued Knowledge, Skills and Abilities

To appropriately educate, train and equip the next generation of port and maritime industry technicians, educators and workplace-based trainers must understand the knowledge, skills and abilities (KSAs) most highly sought-after by employers. The focus group first identified KSAs for the industry at large and then identified separate KSAs for specific port and port-related industry occupations.

### **General Port Employment KSAs**

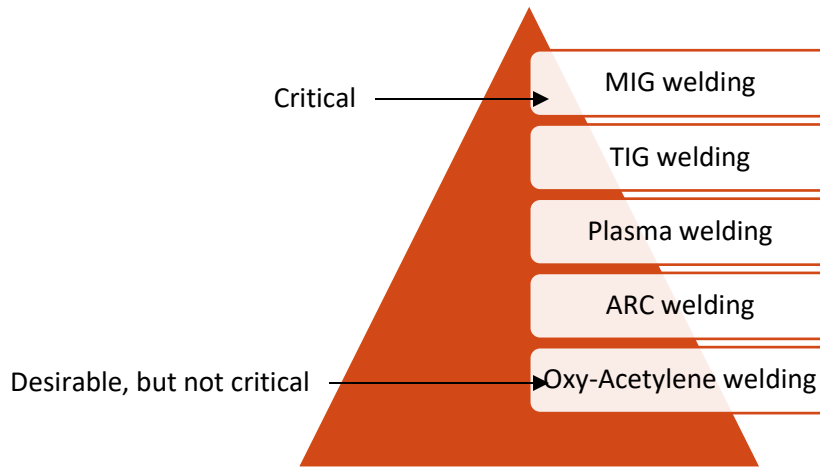
The following skills were ranked in order from 1 (*most critical*) to 12 (*desirable but not critical*) for employment in the port operations and marine logistics industry:

- 
1. Safety: security, regulatory, packaging and customs requirements
  2. Recognizing unsafe material equipment and operations and offering corrective actions
  3. Ability to access data and communicate electronically, including capable use of IT networks, databases and other logistics applications
  4. Familiarity with appropriate industry terminology and acronyms
  5. Operating a computer and keyboard equipment
  6. Understanding and ability to follow prescribed procedures for loading/unloading cargo
  7. Utilizing appropriate transportation modes for loading and unloading processes
  8. Maintaining accurate inventory by using appropriate hardware/software to avoid shipping and billing errors
  9. Classifying freight according to freight standards for bill of lading
  10. Operating bar coding/RFID equipment and applications
  11. Accessing inventory and implementing record control principles to assure timely delivery of materials
  12. Knowledge of warehouse and inventory control fundamentals
  13. Operating GPS/GIS equipment and applications
  14. Identifying necessary markings required for asset identification

### **Welding Skills for Port and Maritime Employer Hiring**

The Port of Baltimore and virtually all of its connected employers require welders for a wide variety of installation, repair and maintenance needs. The average welder working at today's ports and maritime employer worksites are in his or her late 50s and frequently within 5-7 years of retirement. Recognizing the critical need for skilled welders, the group drilled down to rank specific skill sets as most important (MIG and TIG - tied) to least important (Oxy-Acetylene) for those trade occupations at the Port of Baltimore and related local Baltimore maritime companies.





### **Electrical Skills for Port Employment**

Electricians – particularly marine electricians – are always in high demand at ports and for port-connected employers. The group ranked the following skill sets as most important (1) to least important (6) for electrician occupations at port and marine logistics companies.

1. Network Wiring
2. Low Voltage
3. DC Theory
4. 3-Phase AC
5. AC Theory
6. PLCs
7. Installation

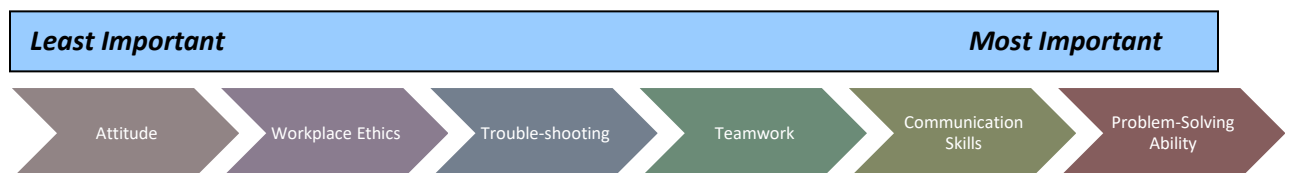
### **Mechanical Skills for Port and Maritime Industry Employment**

Industrial mechanics also work across virtually every port and port-connected maritime industry sector employer environment. The group ranked the following knowledge and skill areas as most important (1) to least important (4) for mechanical occupations at port and marine logistics companies.

1. Maintenance
2. Measurement
3. Pneumatics
4. Hydraulics

### **Soft Skills for Port and Maritime Industry Employment**

In addition to technical skills, 100% of respondents said non-technical “soft” skills are vitally important when hiring, retaining and promoting. Participants ranked these soft skills according to the following hierarchy:



Participants noted that employers placed a high value on candidates with demonstrable skills or background in the areas of safety, quality assurance and critical thinking. Employers indicated that when choosing between two otherwise-equal job applicants, soft-skill differences are a definite tipping point in favor of hiring.

### Takeaways for Knowledge, Skills and Abilities (KSAs)

Port-connected maritime industry employers have a clearly-defined set of critical knowledge, skills and abilities desired for their skilled workforce across a wide range of occupations. The most general KSAs focus on safety and communication which are logical given the fast-paced, dangerous environment of maritime work and the potential human and financial consequences of errors. There is a clear opportunity for educators and workforce development organizations providers to incorporate KSAs training in these specific areas into pre-employment training and secondary-level curriculum.

#### Spotlight: Maryland New Directions

Maryland new Directions is a workforce intermediary serving low-income adults. Through its Maritime Transportation Distribution and Logistics Training Program, developed in coordination with the Maryland Port Administration, AACC and other key port and maritime industry employers, MND provides industry-validated workforce training to meet local employers' needs and in the process serving as a community liaison for the Port of Baltimore and the Maritime Transportation Industry.



The Maritime TDL Training Program consists of:

- 60 hours of soft skills training including: job readiness, work ethic and understanding employer expectations
- 30 hours of Industry specific multimedia and field training titled: Introduction to the Port of Baltimore, including 4 modules: Port History, Warehousing & Stevedoring, Logistics & Freight Forwarding and Customer Service
- General Computer Software training & certified forklift training
- Interview Practice & Networking Opportunities with Industry Professionals
- Shadowing, on-the-job (OTJ) training and Internship Opportunities
- Job Placement & Follow-up



*The Maryland new Directions Maritime TDL Training program has placed 84% of its graduates in maritime industry careers with leading employers at the Port of Baltimore.*

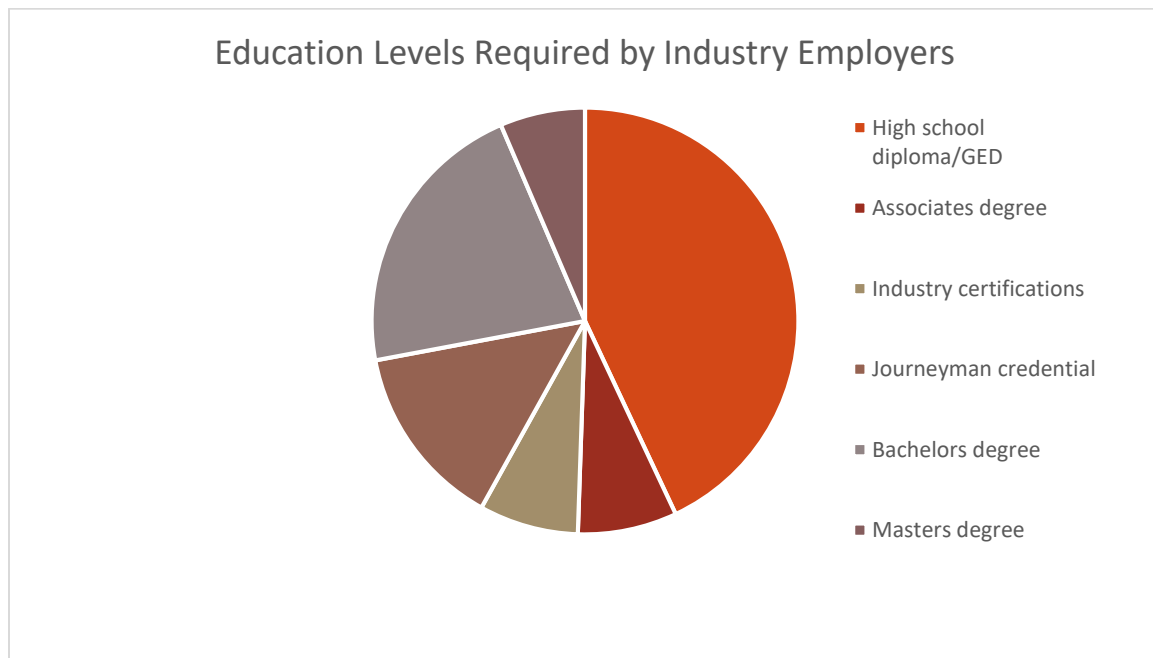
The Maritime TDL Training Program has successfully completed 7 cohorts with a total of **179 graduates**:

- **152 (84%) of them are now employed with an average wage of \$12.89/hr.**
- **158 graduates now have port-required TWIC cards**
- **118 are now certified as forklift operators**

Employers from the industry who have hired these graduates include, but are not limited to: UPS, Auto Expeditors, A1 Escort Service, John W. Ritter Trucking, and Anne Arundel County Water Treatment. Other MND workforce training partners and hiring employers include S. Steinwig Group, Rukert Terminals, Securitas, Premium Logistics North America LLC, Ports America of the Chesapeake, Field Guide Consulting, EcoLogix Group, and Village Learning Place.

### Education and Training

In order to help create a pipeline of skilled, trained technicians for ports and marine logistics industry employers it is necessary to identify the needed level of educational attainment for the majority of skilled workforce. Participants indicated that the most critical education and training needed for the majority of its skilled workforce is a high school diploma or GED and preferably some industry-specific certifications. Employers may desire a 4-year undergraduate degree or the skilled trade equivalent with a national, portable Journeyman credential obtained through completion of a structure registered apprenticeship program, however that level of certification and education is not critical.

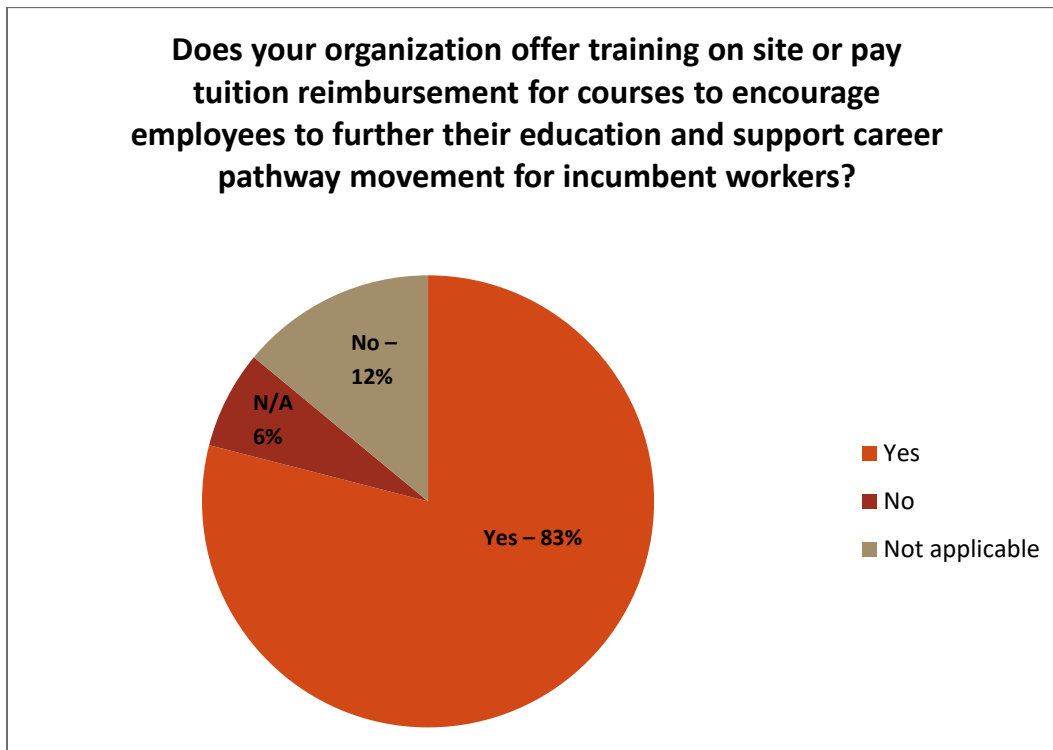


**Which of the following levels of education and/or training are needed by the majority of your skilled workforce?**

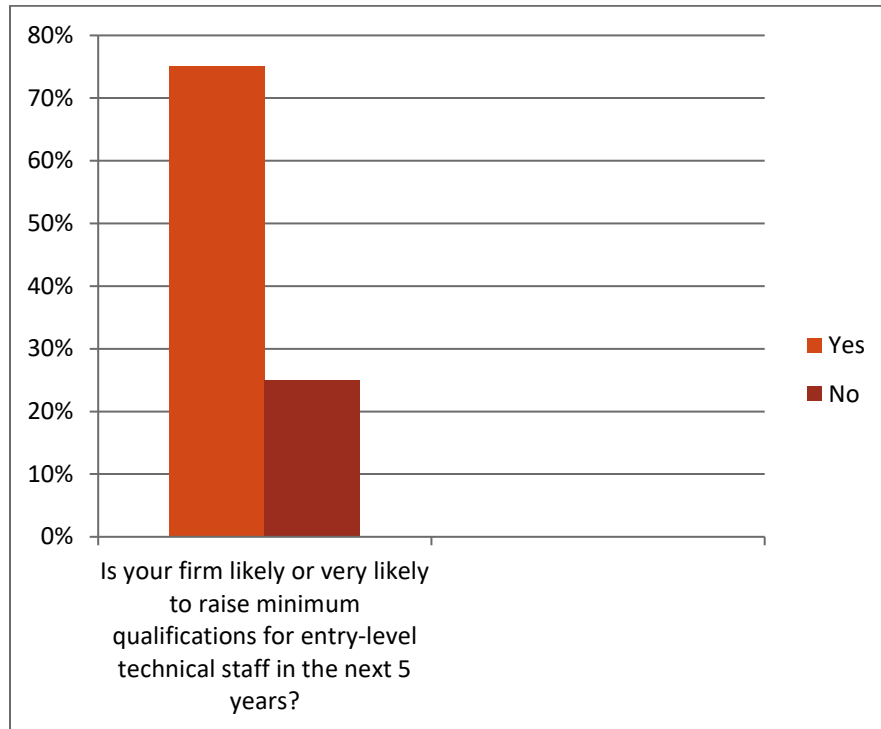
High School diploma or GED	40%
Industry-specific certifications	7%
2-year college or technical school degree (A.A.S./A.A.)	7%
Journeyman credential	13%
4-year college degree (B.S./B.A.)	20%
Graduate degree	6%

Although a majority of respondents indicated that less than 30% of the majority of their current skilled workforce hold a 2-year or 4-year college degree, when you add in the option of a nationally-recognized U.S. Department of Labor Journeyman credential which requires completion of significant college-level related technical instruction annually or industry-specific certifications, nearly half (47%) of their workforce has significant post-secondary education and/or training.

While industry employers may not require higher education or industry training for skilled trade employment, it does strongly encourage workforce development through onsite training and tuition reimbursement for offsite education through local or national providers.



With an impending workforce gap the rapid scaling of effective pathways to prepare the next generation of port and maritime industry employees is critical. Most organizations are likely or very likely to raise minimum qualifications for entry-level technical staff in the next 5 years (75%)



### Takeaways for Education and Training

The key takeaway for overall career awareness among students, veterans and workers transitioning from other industries is that the Port of Baltimore and port-connected maritime industry companies offer good careers paying a livable wage for people with a high school diploma (or equivalent) or having some industry experience and certification. The industry values higher education and hands-on learning as evidenced by apprenticeship credential but does not require it.

Recognizing that the industry offers good-paying skilled trade and pre-professional work for students and workers without post-secondary education, there is an opportunity for secondary-level teachers, counselors and administrators to both incorporate relevant industry information into existing programs and curricula as well as intentionally undertake more focused campaigns to increase career awareness about this field.

#### Spotlight: Career and Technical Education

Participants' responses also highlight the need for expanded focus on secondary-level career and technical education (CTE) offerings in critical port and maritime skilled trades including welding, electrical and mechanical work as well as mariner occupations (both onshore support and at-sea positions).

Currently the state of Maryland CTE program enrolls half of all grade 10-12 high school students; more than 40% of all CTE students take dual enrollment courses that articulate to academic credit with the University of Maryland (UMD).



Focus group participants ranked “high school courses or technical programs” third highest – behind only for-profit training organizations and equipment manufacturers – for “supplying trained individuals for maritime employment.” Given the high rate of CTE course enrollment – and strong dual enrollment-based career pathway and industry recognition of its value - the state could benefit port and maritime industry employers by expanding its program offerings to more closely align its areas of study with economic and workforce development needs and provide a larger, more well-educated, trained and credentialed pipeline of technicians. Specifically the state could:

- incorporate maritime-specific competencies into the State of Maryland’s Department of Education “Construction and Development” career cluster,
- expand the “Transportation Technologies” cluster beyond automotive technologies to teach port and maritime-specific skills and curriculum based on the U.S. Maritime Administration MARAD 4-year high school model.

### **Recruiting and Hiring**

While the port and local maritime industry employers have a rapidly growing of positions to fill requiring educated, skilled technicians, they do not have effective marketing plans to fill the workforce gap. An overwhelming majority of focus group respondents (74%) said that their company or organization’s recruiting and hiring efforts are “only somewhat effective” or “not effective.” A much smaller 16% said their efforts in this area are “highly effective” or “effective.”

Recognizing the long-forecasted need for workforce development, the majority (69%) of companies and organizations participating in the two-day focus group meeting are reaching further back to begin connecting with and recruiting students into academic and career pathways in middle school or high school. Only 16% wait to begin recruiting college-age teenagers and 26% solely target adult workers through job fairs.

*Most concerning, 60% of respondents felt that the current pool of available workers for port and maritime industry employment is only “somewhat ready” or “not ready” for employment, meaning that they felt incoming candidates may have basic skills but will require additional training. Remediation is an intensive, costly process for firms. Earlier intervention by schools with industry-validated curriculum can prepare students to be “job-ready” day one.*

### **Takeaways for Recruiting and Hiring**

With nearly three-fourths of all participating organizations indicating that they are dissatisfied with their current recruiting and outreach work efforts there is a clear opportunity for educators and workforce intermediaries to both better train and prepare students and re-careering workers to be qualified for those positions and to expand awareness of industry careers.

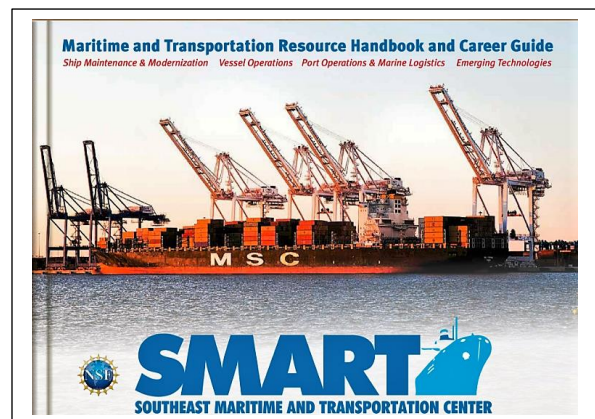
It's worth noting that the vast majority (63%) of focus group participants indicated that their companies or organizations do not directly market port and maritime industry career opportunities and pathways to parents, guardians or student influencers. With the growing concern parents have about their children taking on substantial sums of college debt burden – particularly when compared to a graduate's earning potential – middle skill jobs in growing industries such as maritime transportation, port and port-connected industry sector work represent an overlooked but viable career pathway. However parents, guardians, school counselors and other student influencers often have an outdated, negative association with transportation including maritime and ports. Older paradigms of typical “dirty, blue collar” manual work don't reflect the considerable advancements in an industry that is highly STEM and technical in nature. Today's port and maritime employees regularly use math and multiple forms of technology in their daily work. Demonstrating the new, technical and STEM-based nature of work – as well as the opportunities for competitive salaries in high demand jobs with avenues for advancement – to parents and student influencers is an opportunity for educators, workforce intermediaries and local trade associations to explore. Strong engagement with school systems and creation of tools that schools can employ with parents, counselors and students – such as the use of short video formats (to be shown on closed circuit television channels in schools), social media (with distinctly separate campaigns and social media platforms for students and student influencers), and facility tours for parents and counselors can help to change outdated industry stereotypes.

### **Spotlight: The SMART Center Toolkit**

A general lack of awareness about maritime and transportation industry careers identified by ports and port-connected maritime employers across the southeast prompted the SMART Center's development of a toolkit for educators and employer workforce outreach coordinators and recruiters.

The SMART Center Toolkit includes:

- the SMART Center Maritime Resource and Career Guide Handbook featuring an 80+ page in-depth career guide that provides detailed job descriptions for in-demand occupations, career pathway descriptions, information on maritime academies (federal and state) as well as post-secondary maritime education programs
- visual career pathway tools
- assessment tools
- “Make the SMART Choice” DVDs featuring more than 20, 2-minute industry career videos featuring real-life students, recent graduates and current industry workers
- posters



## Conclusion

The Port of Baltimore and its connected maritime and transportation industry employers, like ports and maritime/TDL companies nationwide, is facing an impending workforce shortage. At the same time the nature of this industry segment has changed dramatically over the past 30-50 years becoming much more STEM-intensive, particularly at the technician level. Baltimore area employers are seeking workers with some level of middle skill (post-secondary but not college) training or relevant work experience and critical “soft” or “employability” skills. Area employers are willing to pay for workers’ tuition or professional development expenses to ensure they have relevant skill training and required/desired credentials and certifications. Because employers are concerned about the overall low level of job awareness and preparedness they are extending their outreach, recruitment and pathway engagement efforts to the middle school and high school level.



Secondary and post-secondary institutions have an opportunity to partner with employers and workforce intermediaries to increase teachers’ awareness of industry occupations, align programs of study and curriculum with industry competencies, embed industry credentials and competencies in programs of study, and develop effective career pathways. Successfully filling the current and emerging talent workforce pipeline shortage will take a multi-pronged approach by a broad spectrum of stakeholders.

## Acknowledgements and Resources

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*For related work and additional resources including downloadable curriculum, classroom projects and activities as well as videos and career pathway tools, visit the SMART Center’s website at*

[www.maritime-technology.org](http://www.maritime-technology.org).