The American Waterways Operators

FALLS OVERBOARD PREVENTION REPORT

CONTENTS

The American Waterways Operators (AWO) is the tugboat, towboat, and barge industry's advocate, resource, and united voice for safe, sustainable, and efficient transportation on America's waterways, oceans, and coasts. Our industry is the largest segment of the nation's 40,000-vessel domestic maritime fleet, consisting of nearly 5,000 tugboats and towboats, and more than 33,000 barges.

Our industry moves nearly 665 million tons of cargo each year safely and efficiently, over more than 25,000 miles of inland and intracoastal waterways, the Great Lakes, and the Atlantic, Pacific, and Gulf coasts. A vital segment of America's transportation system, our industry moves more than 60 percent of U.S. export grain, energy sources such as coal and petroleum, and other bulk commodities that are the building blocks of the U.S. economy, and provides essential services, including ship docking, tanker escort, and bunkering in ports and harbors around the country.

INTRODUCTION

Under the auspices of the Coast Guard-AWO Safety Partnership, formalized in a Memorandum of Understanding between the United States Coast Guard and The American Waterways Operators, the Coast Guard and AWO have worked together to address the issue of crew fatalities since 1995. In 1996, the Partnership produced a report assessing the causes of deckhand fatalities in the inland towing industry and making recommendations to prevent future fatalities. The Quality Action Team (QAT) on Reducing Fall-Overboard Crew Fatalities was chartered in June 2011 to continue the work of identifying and reducing fatalities and published a report with recommendations to reduce fall-overboard crew fatalities in April 2012.[1] Since that time, the Coast Guard-AWO Safety Partnership's Annual Safety Report has recorded a steady decline in crew fatalities, falling from an average of 9.5 fatalities from 2004 to 2013, to an average of 5.4 crew fatalities from 2014 to 2023, as shown in Figure 1, with the leading cause attributed to falls overboard, as illustrated in Figure 2.

To address this serious issue, AWO's Board of Directors approved the reorganization of AWO's Permanent Subcommittee on Crew Fatalities as the Falls Overboard Subcommittee, or FOB, chartered in May 2022.

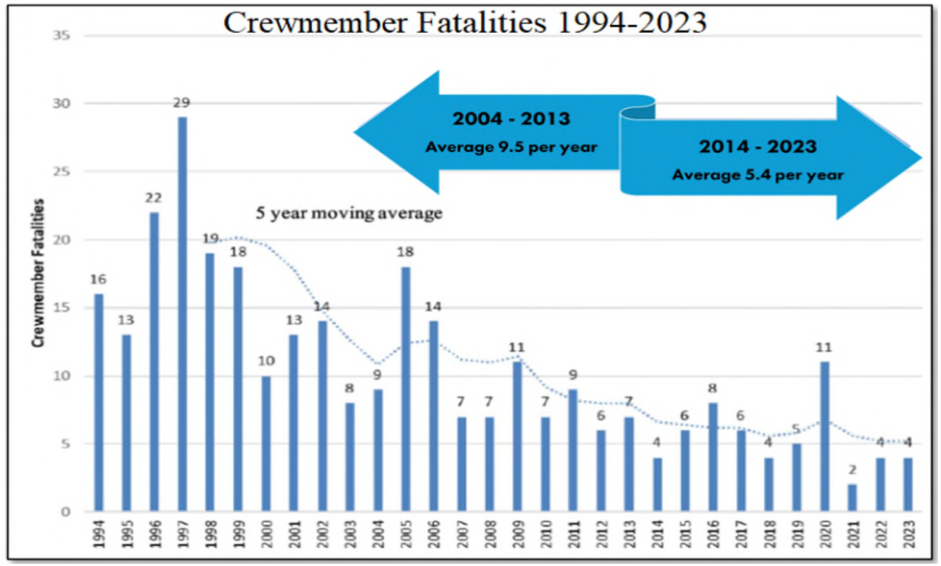

Figure 1

Table 1 – Crewmember Fatalities by Accident Type, 2019-2023 versus Cumulative Totals, 2000-2023

Accident Type	2019	2020	2021	2022	2023	Last 5 Years 2019-2023	Last 5 Years % 2019-2023	Since 2000 2000-2023	Since 2000 % 2000-2023
Contact Injury- Fall into water	1	3	0	0	2	6	23.1%	83	43.8%
Noncontact Injury - Asphyxiation	1	4	0	0	1	6	23.1%	34	18.0%
Contact Injury- Crushed between objects	2	0	1	2	0	5	19.2%	18	10.8%
Other/Unknown	1	3	1	0	1	6	23.1%	13	7.7%
Struck by Moving Object	0	1	0	0	0	1	3.8%	10	5.2%
Fall Onto Surface	0	0	0	0	0	0	0.0%	8	4.1%
Line handling/Caught in Lines	0	0	0	0	0	0	0.0%	8	4.1%
Contact Injury- Other	0	0	0	0	0	0	0.0%	4	2.1%
Contact Injury- Collision with Fixed Object	0	0	0	1	0	1	3.8%	3	2.1%
Burn	0	0	0	0	0	0	0.0%	2	1.0%
Noncontact Injury - Exposure	0	0	0	1	0	1	3.8%	1	1.0%
TOTAL	**5**	**11**	**2**	**4**	**4**	**26**	**100.0%**	**184**	**100.0%**

Figure 2

DEFINE, MEASURE, AND ASSESS DATA

The reconstituted Subcommittee first set out to collect falls overboard incident data from members to examine contributing factors. An initial survey was administered to collect incident data for events that occurred between 2012 and June 2022, compiling details of 79 distinct incidents for analysis.

Following analysis, the Subcommittee administered a second survey that examined an additional 39 incidents and included two additional questions that were aimed at collecting additional data on the efficacy of barriers installed on barges to control the risk of falls from an unguarded edge. The second survey covered the years 2022-2024.

[1] American Waterways Operators. (2012, April). Fall overboard quality action team report. Retrieved 13 February, 2025, from https://www.americanwaterways.com/sites/default/files/falloverboardqatreportapril2012.pdf

A full analysis of the survey data is included in APPENDIX D and specific findings are included in relevant sections of this report.

Key findings from Survey data:

- **Most incidents occurred in 2024** (20) followed by 2023 (12) and 2022 (12). SQ1
- **Falls from barges are most likely**, with 68% of incidents occurring on a barge as compared to other vessels, equipment, or facilities. CHART1 SQ8
- **Falls are more likely at night**, with 66% of reported events occurring between 9:00 p.m. and 7:00 a.m. SQ2
- **Experience is not a good indicator of risk**, with 45% of incidents attributed to mariners with 2 or more years of experience, 19% to those with 1 to 2 years of experience, and 55% attributed to mariners with 1 year or less. SQ4
- **Deckhands were most likely to fall overboard**, making up 52% of incidents, followed by Tankermen, at 28% of incidents. SQ5
- **Slip trips and falls were the greatest contributing factors** leading to a fall overboard, attributed as a primary causal factor in 84% of incidents. SQ10
- **Distraction or Lack of Situational Awareness was the second most-cited factor**, named in 26% of incidents. SQ10
- **Hazard Identification** (14%), **Human Error** (12%), and **Debris or Cargo on Deck** (7%), rounded out the top five causal factors. SQ10

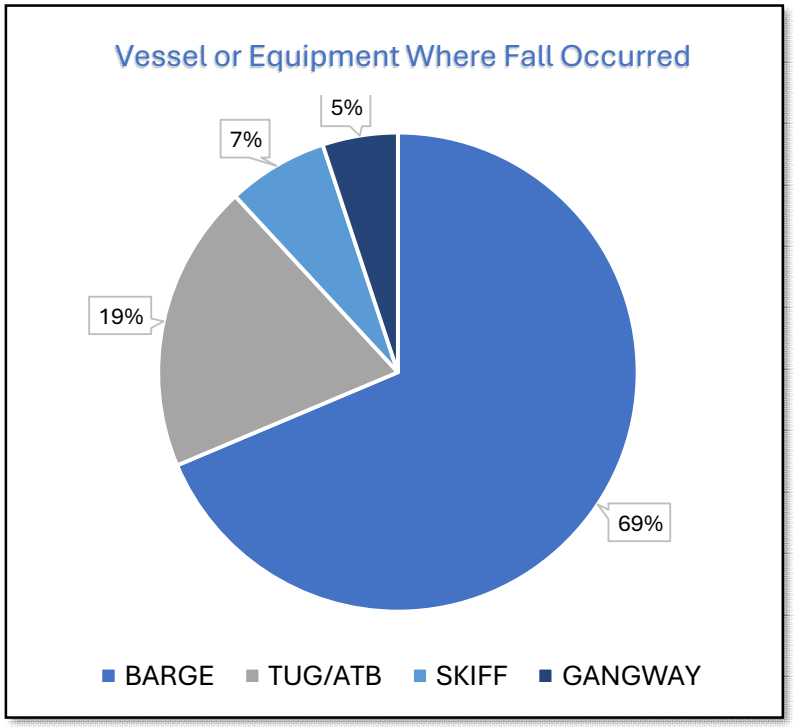

Chart 1

The survey results offered valuable insight into the vessel types and causal factors associated with each incident and shaped the development of this report by highlighting common issues and persistent hazards that should be addressed to reduce the risk of falls overboard.

Once hazards were identified, proposed barriers and other preventive measures were scrutinized to ensure they would not only mitigate risk but also avoid unintentionally introducing new hazards. These two critical considerations were central to the Subcommittee's discussion and formulation of this report.

The Subcommittee also emphasized the importance of ensuring all proposed mitigation measures could be practically implemented into existing vessel designs without requiring significant changes and while maintaining full regulatory compliance. Proposals that may require extensive structural modifications, or those likely to disrupt vessel operations, were categorized separately in a section titled NEW BARGE CONSTRUCTION, which describes measures that may be best considered during barge design and construction, rather than applied as modifications to an existing vessel.

The resulting set of hazards and potential mitigations included in this report are based on these considerations, data gathered from the surveys, feedback from licensed mariners, guidance from process safety experts, input from marine construction and barge design professionals, and advice from vessel owners and agents.

REGULATIONS

Following the initial member survey and before discussing potential controls, the Subcommittee investigated existing regulations and guidance for preventing falls overboard. This step provided information about risk mitigation features either required or recommended for worker safety on vessels.

The Coast Guard is the regulatory authority responsible for the promulgation and enforcement of safety and health standards for the inspected vessels operating on the United States' navigable waterways.[2] The agency's authority extends to all vessels and most operations considered by the Subcommittee. The Coast Guard's rules within the U.S. Code of Federal Regulations are applied according to several factors, including:

- Vessel tonnage, length, and other physical characteristics,
- Vessel function, with specifications for operations such as liquid or dry cargo transportation, towing, or passenger services, and
- Vessel areas of operation, including inland waterways, near coastal waters, and oceans.

The diversity of vessel types makes it difficult to consider all factors that may be applicable to a specific vessel, and therefore, it is important to thoroughly research rules that may apply to a vessel or operation before applying any controls described in this report. To perform this analysis, the Subcommittee recommends the use of a risk analysis tool. One such tool is the "Bowtie" risk model, which is discussed further in the IMPLEMENTATION section of this report.

Additional discussion of the regulations that may apply to vessels examined by this report can be found in APPENDIX C.

ANALYSIS

With the breadth of vessel types and rules in mind, the Subcommittee agreed that no single solution may mitigate fall overboard risks on all vessel types. However, the survey data and operational experience of the Subcommittee did identify one common hazard that contributes to falls from all vessel types, which is a lack of effective barriers or other controls used to guard the perimeter edge of the vessel. This is an especially common hazard on unmanned barges operating on inland waterways, hereafter referred to as "inland barges."

Considerations of controls that may address this risk were tempered by the Subcommittee's concern that the installation of physical barriers or restraints on the edge of inland barges could introduce new hazards. This concern is supported by broad exceptions in regulations which specifically allow some vessels operating on "sheltered routes," including inland barges, to refrain from installing fall protection at an unguarded edge.[3] Considering this, the Subcommittee decided to narrow the scope of this report to focus on the specific hazard of an unguarded edge of a barge and the associated risk of a fall overboard.

This is not to suggest that falls overboard do not occur on other vessels, including those with well-guarded edges, and the Subcommittee acknowledges that the risk of a fall overboard event exists on every type of vessel. However, rather than viewing the narrow scope of this report as a limitation, it was perceived as an opportunity that allowed more thorough consideration of each presented control and the positive or problematic results that could accompany application.

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[2] Occupational Safety and Health Administration. (1983, March 4). *Memorandum of understanding between OSHA and U.S. Coast Guard: Authority over inspected vessels*. U.S. Department of Labor. Retrieved 13 February, 2025 from https://www.osha.gov/laws-regs/mou/1983-03-04

[3] U.S. Government Publishing Office. (n.d.). 46 CFR § 32.02-10 - Rails (TB/ALL). U.S. Code of Federal Regulations. Retrieved 13 February 2025 from https://www.ecfr.gov/current/title-46/chapter-I/subchapter-D/part-32/section-32.02-10

The Subcommittee remains committed to its mission to reduce the risk of falls overboard by continuing to investigate controls that mitigate hazards that may contribute to a fall overboard on all vessel types, including those not included in the scope of this report. The unique hazards that exist on other types of vessels, such as skiffs, articulated tug and barge units, pushboats, ship assist vessels, and others, should be addressed in future research and reports.

IMPLEMENTATION

This report examines controls that create a barrier, remove, substitute, or protect workers from the hazard of an unguarded edge on an inland barge in a fleet, in tow, or moored temporarily for transitory operations. Permanently moored barges are not covered by this report, as nearly all are defined as facilities of different types and, therefore, fall under the jurisdiction of the Occupational Safety and Health Administration. OSHA regulations require fall protection for workers at these facilities and in nearly all other working environments within the agency's jurisdiction when workers are more than five feet above a solid surface or any distance above water.

This risk management strategies presented in this report are organized according to their effectiveness using a modified "Hierarchy of Controls", with an added "Design Mitigation" level, developed by the authors of this report to describe engineering controls that mitigate risk but do not create a barrier between the worker and the hazard. This modified Hierarchy is illustrated in Figure 3.

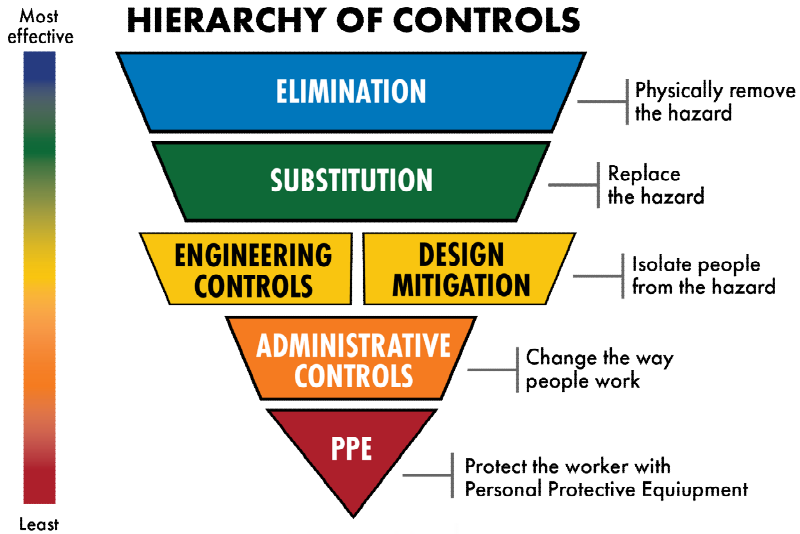


Figure 3

To use the information in this report to develop a plan of action, the Subcommittee recommends users first review the Hazard and Mitigation Tables to identify applicable hazards. After selecting applicable hazards and researching available mitigations included in the report, use a risk model or process-safety tool, such as the Bowtie Model illustrated on the following page, to examine the effectiveness of each barrier for the identified hazard. The risk model should help users analyze the effectiveness of each barrier by considering how well it may perform in the unique operation, environment, or vessels that are being considered by the user. The decision to implement a barrier (or not) should be based on this process of risk analysis and consideration for all variables that impact the efficacy of applied mitigations. The Bowtie Model is suggested in this report to achieve this; however, it may be replaced by a process-safety method that is familiar to the user and effective in its examination of risk mitigation.

The Bowtie Model is illustrated in Figure 4 and the Hazard and Mitigation Tables are organized according to where the risk falls in this report's modified Hierarchy of Controls. Some decisions about the organization of hazards in this report are subjective. As such, user feedback is welcome to inform future risk mitigation investigations and reports.

To submit feedback or questions about the use or content of this report, please contact _____.

PROCESS RISK ANALYSIS TOOL EXAMPLE: BOWTIE MODEL

BOWTIE MODEL ILLUSTRATION

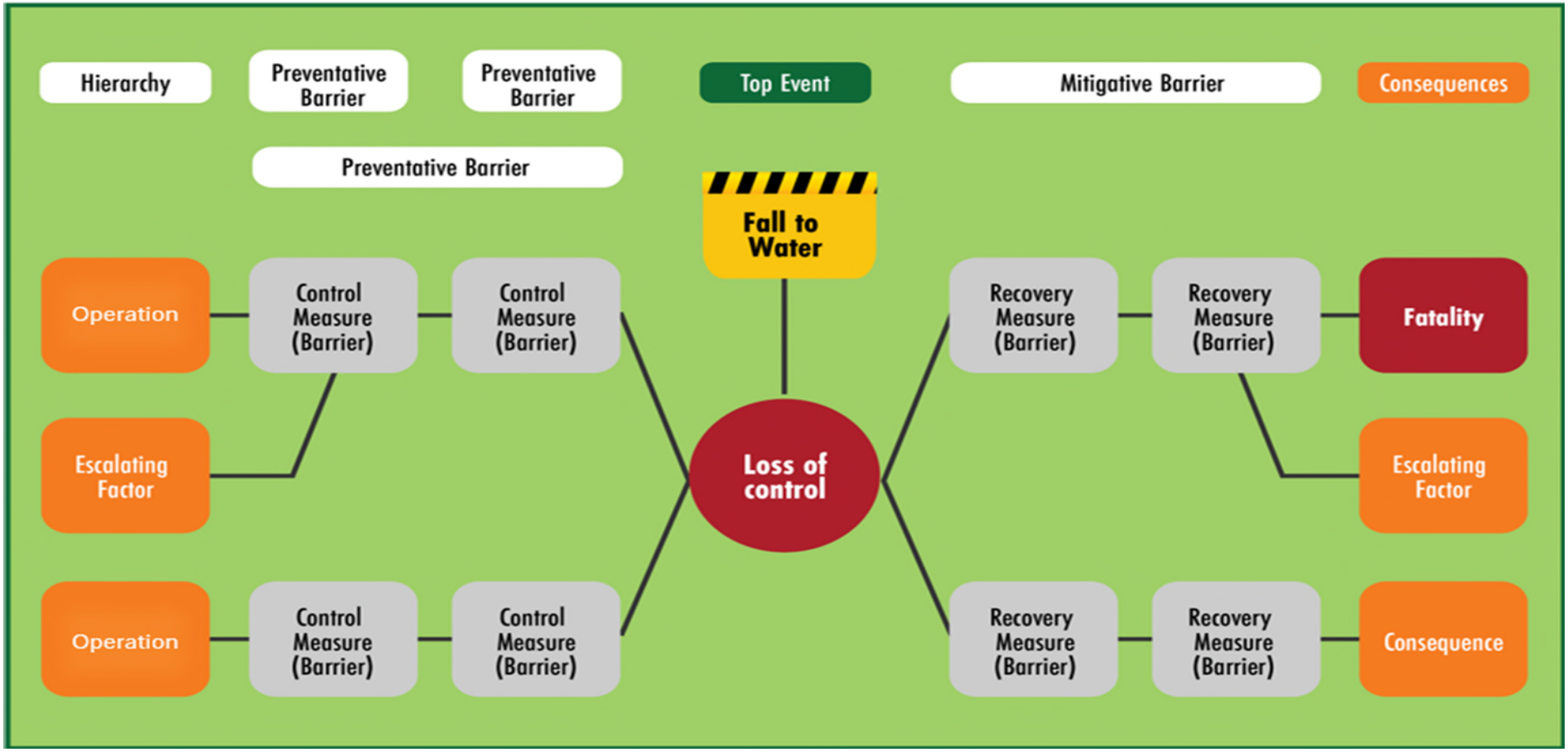


Figure 4

A **bowtie risk model** visually maps how a specific hazard can lead to an unwanted event (the 'knot') by identifying its causes (on the left) and consequences (on the right) along with the controls in place to prevent and mitigate them. In this illustration, the unwanted event is a "Loss of Control," which may lead to the top event, a "Fall to Water".

This report is focused on *preventing* falls overboard from the unguarded edge of an inland barge; therefore, only the left side of the bowtie is applicable for the controls listed in the Hazard Mitigation Tables on the following pages.

The right side of the bowtie will be used to investigate risk mitigations and barriers that prevent further injury or incident during rescue operations that take place after a person has experienced a fall to water.

HAZARD AND MITIGATION TABLES

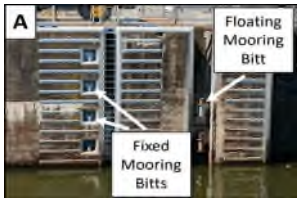
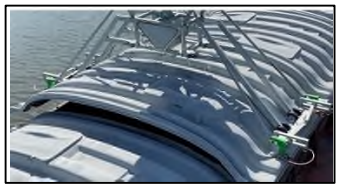
ELIMINATION OR SUBSTITUTION CONTROLS

ELIMINATION OR SUBSTITUTION CONTROLS *The most effective way to control a hazard is to eliminate it or to substitute a different process that removes the opportunity for personnel to be exposed to the risk.*			
	OPERATION	**BARRIER**	**BARRIER EFFECT**
Eliminate or Substitute	**Walking Barges** ***or*** **Fleeting Barges** ***or*** **Building Tow**	 **Walk the Interior Gunnel**	Eliminates access to unguarded edges by substituting decks with an unprotected edge with paths on the interior of a tow where deck crew can walk between barges already fixed together.
		 **Add a Safety Barge**	Eliminates access to unguarded edges of barges where work is being performed by covering the outside edge with a "safety barge" where no work may take place. This protects workers by eliminating access to an unguarded edge within the work area.
		 **Stage Tug Outside Couplings**	Eliminates access to the unguarded edge of barges where work is being performed by covering that edge with the boat. This protects workers by eliminating access to an unguarded edge within the work area.

HAZARD AND MITIGATION TABLES

ELIMINATION OR SUBSTITUTION CONTROLS *(continued)*

The most effective way to control a hazard is to eliminate it or to substitute a different process that removes the opportunity for personnel to be exposed to the risk.

	OPERATION	BARRIER	BARRIER EFFECT
Eliminate or Substitute	**Locking***	 **Use Hands Free Devices**	Substitute crew working on deck near an unguarded edge with Hands Free Mooring (HFM) Systems, which are designed to raise or lower a barge while locking without deck crew intervention. Floating mooring bits and other systems eliminates the need for vessel crew to access the unguarded edge of a barge while locking.
	Tankering *or* Surveying	 **Use Remote Drafting Devices**	Substitute workers leaning over edge to take draft measurements by using a machine to make measurements. This eliminates the need for workers to access the unguarded edge for survey or draft readings.
		Use Davits or Cranes to Handle Transfer Hoses & Lines	Substitute the need for workers to pass hoses and gear across a barge edge by installing a davit arm or crane and basket to pass gear instead.
	Fiberglass Cover Handling	 **Use Remote Cover Handlers**	Substitute crew needing to access the edge of a barge during fiberglass cover operations by using a remote-controlled cover handling system. The pictured system uses a crane and bridle to manipulate fiberglass covers without requiring crew intervention on the barge.[4]

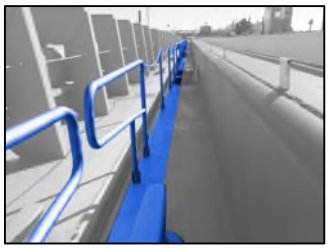
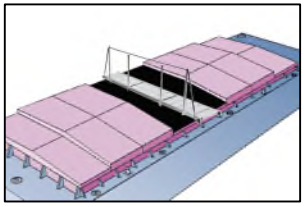
*Hands Free Mooring Devices for locks include floating bits and other systems that provide an alternative to requiring crew to handle lines at the edge of a barge while locking. The image provided in the description of this control, along with other hands-free mooring systems for use in locks, is detailed by the US Army Corps of Engineers.[5]

[4] The Claw Lid Lifter. (n.d.). Home. Retrieved 06 May 2025 from https://www.theclawlidlifter.com/.

[5] U.S. Army Engineer Research and Development Center. (2023). Systematic evaluation of inland navigation channel dimensions. Retrieved 06 May, 2025 from https://erdc-library.erdc.dren.mil/server/api/core/bitstreams/a34639ce-7eea-494b-81f6-b4bddf8636a3/content

HAZARD AND MITIGATION TABLES

ENGINEERING CONTROLS

ENGINEERING CONTROLS *These controls remove hazardous conditions or place a barrier between the worker and the hazard. They reduce risk by addressing the hazard directly.*			
	OPERATION	**BARRIER**	**BARRIER EFFECT**
Engineering	**Walking Barges** ***or*** **Fleeting Barges** ***or*** **Building Tow**	 **Install Guards on Barge Perimeter**	Railing protects vessel crew from accessing the hazard of an unguarded edge by placing a barrier between worker and edge.*
		 **Install Restraint System**	Permanent or temporary restraint systems anchored and sized at a length that limits access to an unguarded edge prevent a loss of control.**
	Cover Handling	 **Use a scaffold board with Guard Rails for "Roll Tops".**	"Roll Top" covers are less common than fiberglass covers on modern hopper barges. To uncover roll-top barges, crew members can place a catwalk or scaffold board with guard rails across the hopper for safe access to the pad eyes.

*Railing and other barriers are also discussed in the NEW BARGE CONSTRUCTION AND TECHNOLOGY-BASED OPPORTUNITIES section of this report, as many existing barges may not be easily altered to include railing on the outside edge.

**Fall Restraint and Fall Arrest system considerations are discussed in more detail in APPENDIX A.

HAZARD AND MITIGATION TABLES

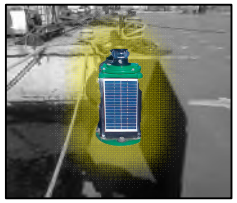
DESIGN MITIGATIONS

DESIGN MITIGATIONS *This category represents an adapted form of Engineering Controls designed to mitigate risks by using physical barriers, restraints, or other devices at the hazard site, reducing worker exposure without fully eliminating or isolating the hazardous condition.*			
	OPERATION	**BARRIER**	**BARRIER EFFECT**
Design Mitigation	**Tow** ***or*** **Fleet Work**	 **Handholds**	Handholds allow crew to grab on to barge if they experience a loss of control near an unguarded edge.
	Facing Up ***or*** **Headlining**	 **Capstan on Vessel to Limit Use of Face Wires**	Capstans allow center-kevel ties from the tug to the barge, preventing crew from using face wires which may be fixed on corners near the unguarded edge of a barge.
	Mooring	 **Use Pike Poles, Tools and and Hooks to Catch Lines**	Use a pike pole, grappling hook, or other tool to catch taglines, shorelines, or other anchors to prevent crew leaning over the edge and/or shifting body weight toward an unguarded edge of a barge.
	Locking	 **Pre-Stage Bumpers & Lines**	Frees up the hands of crew walking the unguarded edge of a barge to put out bumpers and lines by utilizing the boat to deliver bumper gear while making up tow. An example of a specialized bumper designed to remain on deck is illustrated in Figure 5

HAZARD AND MITIGATION TABLES

DESIGN MITIGATIONS *(continued)*

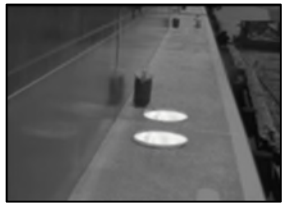
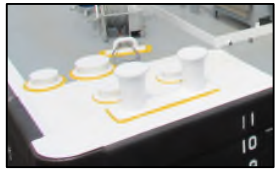
This category represents an adapted form of Engineering Controls designed to mitigate risks by using physical barriers, restraints, or other devices at the hazard site, reducing worker exposure without fully eliminating or isolating the hazardous condition.

	OPERATION	BARRIER	BARRIER EFFECT
DESIGN MITIGATION	**Deck Appliance** ***and*** **Equipment Use**	 **Install Deck Appliances With Leverage Assist**	Deck appliances equipped with leverage assist features significantly reduce the amount of force required to tighten and install rigging near the edge of a barge, thereby mitigating the potential for a loss of control.
		 **Use Lighter Rigging**	Using lighter ratchets, straps and wires reduces the amount of force and energy needed to carry and install barge rigging near the edge of a barge, thereby mitigating the potential for a loss of control near an unguarded edge.
		Install Deck Appliances that Tighten Inboard	Deck appliances that tighten inboard allow crew to apply force inboard and prevent loss of balance near an unguarded edge.
		 **Install Deck Lights**	Illuminating decks allows crew to visually identify hazards, reducing risk of a loss of control.
		Position Deck Appliances and Bits Outside of Walkways	Deck appliances, such as d-rings & kevels, should be installed strategically to minimize overlap with walking and working surfaces to reduce risk of tripping.

HAZARD AND MITIGATION TABLES

DESIGN MITIGATIONS *(continued)*

This category represents an adapted form of Engineering Controls designed to mitigate risks by using physical barriers, restraints, or other devices at the hazard site, reducing worker exposure without fully eliminating or isolating the hazardous condition.

	OPERATION	BARRIER	BARRIER EFFECT
DESIGN MITIGATION	**Surveying** ***and*** **Drafting**	 **Install Sounder in the Center of the Barge**	Depth sensors and sounding devices in the middle of the barge allow safe monitoring of barge depth without requiring crew to be near an unguarded edge to check draft during cargo operations or while traversing shallow waterways.
	Walking Barges	**Use Non-Slip Deck Coating**	Non-slip coatings prevent slips, mitigating the risk of a loss of control near edge.
		 **Install a Visual Edge Alert**	Alert workers when they move too close to the edge using a perimeter cable with flags or ribbons tied to it.
		 **Install Flush Hatch Covers**	Use flush hatch covers instead of raised hatches to reduce the risk of trips when crews are walking the side edge of an unguarded barge.
		 **Highlight Hazards**	Use high-visibility paint to highlight edges and the tips of deck appliances to draw attention to potential tripping hazards to mitigate the risk of trips and loss of control.

HAZARD AND MITIGATION TABLES

DESIGN MITIGATIONS *(continued)* *This category represents an adapted form of Engineering Controls designed to mitigate risks by using physical barriers, restraints, or other devices at the hazard site, reducing worker exposure without fully eliminating or isolating the hazardous condition.*			
	OPERATION	**BARRIER**	**BARRIER EFFECT**
DESIGN MITIGATION	**Using Tools *and* Ladders**	 **Mark Steps on Pigeonholes**	Highlight and mark steps on pigeonhole ladders to provide better visibility and reduce the risk of a misplaced step leading to a slip and fall.
		 **Use Ladder Extensions**	Use ladders that extend 36 inches or more above the deck or provide handholds for crews climbing to higher-level decks to prevent a loss of control when transitioning from ladder to deck.
		 **Use Grab Bars or Line on Top of Pigeonhole Ladders**	Pigeonhole ladders end at deck level. Providing a strap or grab bar at the top deck edge provides crew with a handhold to prevent loss of control at the upper deck level.

The Maritime Safety Wedge is a device that may be stored permanently at key barge locations to enable rapid deployment if someone falls overboard. Its wedge shape fits tight openings, helping prevent crush injuries by maintaining a gap between the barge and a structure. It can also replace rope bumpers, eliminating the need for crew members to carry them from tug to barge in some situations, which reduces the amount of gear transport along unguarded edges, lowering the risk of a loss of control and fall overboard event.

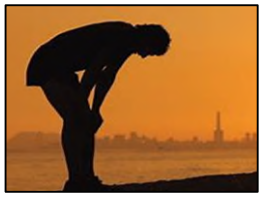
Figure 5

HAZARD AND MITIGATION TABLES

ADMINISTRATIVE CONTROLS

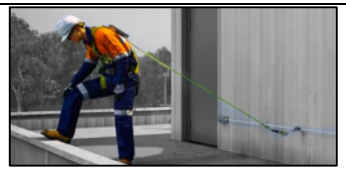
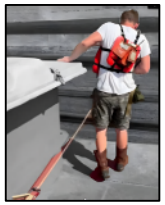
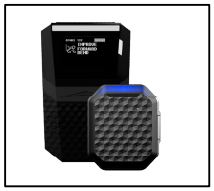
ADMINISTRATIVE CONTROLS *Administrative controls establish work practices that reduce the duration, frequency, or intensity of exposure to hazards.*			
	OPERATION	**BARRIER**	**BARRIER EFFECT**
ADMIN CONTROLS	**Walking Barges** ***or*** **Fleeting Barges** ***or*** **Building Tow**	**Housekeeping**	Require walkways to be clear of obstructions and tripping hazards on deck to reduce the risk of slips, trips, and falls overboard.
		 **Communicating Hazards**	Train crew in detecting, communicating, and marking duck ponds and other fall-overboard hazards in barge tows and fleets to prevent loss of control.
		Removing Cargo or Ice from Deck	Require de-icing or removal of slippery cargo on deck before allowing crew access to prevent slips and loss of control near unguarded edges.
		Ergonomics	Require the use of baskets to lift tools or rigging between barges and vessels with different deck heights, instead of carrying them while climbing ladders.
		 **Walk Center Line of Barge or Barge Covers**	Mitigate access to unguarded edges by requiring crew to walk the in the middle of a barge rather than along the unguarded edge when moving between the bow and stern of a barge.
		Set Up Portable Ladders at Center of Barge	Require portable ladders be setup near the center of the barge and always secure them properly, as far as practical from unguarded edges.

HAZARD AND MITIGATION TABLES

ADMINISTRATIVE CONTROLS *(continued)* *Administrative controls establish work practices that reduce the duration, frequency, or intensity of exposure to hazards.*			
	OPERATION	**BARRIER**	**BARRIER EFFECT**
ADMIN CONTROLS	**Headlining *and* Facing Up**	**Using Headline or Hiplines Instead of Face Wires**	Encourage the use of headlines or hiplines when it is safe to use for barge movements to prevent facing up, which has a greater chance of placing crew near an unguarded edge with a heavy face wire or wire rope.
		 **Train Crew in Safe Use of Face Wires and Lines**	Train crew in safe handling procedures for facing up, un-facing, and catching or throwing a line to prevent a loss of control during these operations.
	Human Factors *and* Training	**Educate Crew about Physical and Mental Wellness**	Provide resources and education for crew about the importance of physical and mental wellness and how each contributes or detracts from safe working conditions.
		 **Conduct Training on the Risk of Fatigue and Distractions**	Train the crew on how to recognize performance-affecting issues, including crew endurance or fatigue, distraction, and loss of situational awareness, to reduce the chance of a loss of control when working near an unguarded edge.
		Train Crew on Risks of Mind-Altering Substances	Train crew about the importance of avoiding mind-altering substances, such as drugs, alcohol, caffeine, and certain OTC medications, to prevent loss of control.

HAZARD AND MITIGATION TABLES

PERSONAL PROTECTIVE EQUIPMENT

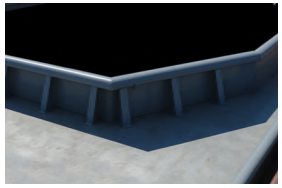
PERSONAL PROTECTIVE EQUIPMENT*			
PPE is equipment worn to minimize exposure to hazards that cannot be controlled using Elimination, Substitution, Engineering, or Administrative Controls.			
	OPERATION	**BARRIER**	**BARRIER EFFECT**
PERSONAL PROTECTIVE EQUIPMENT	**Walking Barges *or* Fleeting Barges *or* Building Tow**	 **Fall Restraint System with Harness & Shock Absorber****	Prevent workers from reaching an unguarded edge by installing anchor points and restraint systems that prevent access to an unguarded edge. Crew must be trained to properly set up and use restraint systems to ensure anchor points are strong enough and lanyards are sized properly to prevent access to the edge. Systems may use barge perimeter keyways or fixed anchor points.
		 **Fall Restraint Belt & Tether****	Prevent workers from moving further than the length of the tether to prevent falls, similar to the restraint system with harness and shock absorbing lanyard. A "Fall Restraint Belt & Tether" device may also be called a "positioning device" or "positioning system."
		 **Haptic or Audible Feedback**	Alert workers when they move too close to the edge of a barge by using an audible alert or haptic feedback (vibrating device) that continues to alert until the worker has moved to a safe distance away from the edge.
	Barge Cleaning *and* Repair	**Horizontal Lifeline and Fall Restraint or Arrest Device****	Utilize horizontal lines that run along the longitudinal center span of a covered barge, tank barge, or deck barge, to allow workers to 'clip in' using a lanyard and harness. This can prevent access to the unguarded edge on either side of the barge.

*Personal Flotation Devices (PFDs) are excluded from this section as they do not prevent a fall from an unguarded edge. APPENDIX B contains a review of PFDs, their buoyancy, and type approval details.

**A Horizontal Lifeline and Personal Fall Restraint or Arrest device must be used with extreme caution during barge operations. Failure to use these systems correctly may result in grave injury or death. More details about considerations for the use of fall arrest and restraint included in APPENDIX A.

HAZARD AND MITIGATION TABLES

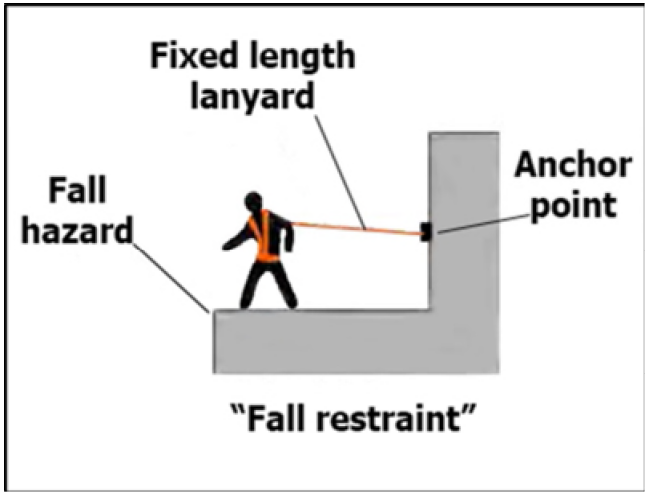
NEW BARGE CONSTRUCTION AND TECHNOLOGY-BASED OPPORTUNITIES

NEW BARGE CONSTRUCTION AND TECHNOLOGY-BASED OPPORTUNITIES *Construction of new barges can include design features that may reduce the risk of falling from an unguarded edge through novel design or use of technology.*			
	OPERATION	**BARRIER**	**BARRIER EFFECT**
NEW CONSTRUCTION	**Hull Design**	 **Raised Trunk & Coaming Wall Design**	Building shorter coaming walls and designing diagonal corners can provide extra working room for deck crew, preventing accidental contact with vertical structures and preventing loss of control near an unguarded edge.
		Increased Walkway Width	Increasing walkway width can provide crew with more room to work and prevent contact with structures that can lead to loss of control.
		Flat Deck Barges	Flat deck barges with closed cargo holds below deck level can allow ample room for deck crews.
		Moving Working Areas Inboard	Moving manifold connection areas, gauging trees, cargo tank access, deck appliances, and other barge equipment inboard allows workers to stay away from unguarded edges.
		Guard Rails or Bulwarks	Installing guard rails or bulwarks on barges is not common for inland barges. If suited for purposes, including these structures in new barge designs will eliminate the hazard of an unguarded edge.
	Technology	**Remote Monitoring**	Designing barges with remote drafting and gauging devices prevents the need for crew to access the edge of a barge for drafting or surveying, mitigating the risk of a fall near an unguarded barge edge.

APPENDIX A: FALL RESTRAINT & ARREST

CONSIDERATIONS FOR SAFE USE OF FALL RESTRAINT SYSTEMS

- Fall Restraint Systems can be used in tow work and fleet work to prevent access to unguarded edges as practical when approved by the operating company's qualified person for use by employees working on deck.
- Fall Restraint Systems' anchor points should be capable of restraining applied force with an added safety factor to be determined by regulation and qualified persons.
- Fall Restraint Systems' anchor points should be installed to prevent damage to the gear or create tripping or other additional hazards.
    - Training and inspection programs should be provided along with Fall Restraint Systems to ensure safe use.
- Fall Restraint Systems should not prevent the use of personal flotation devices or other required PPE.
- Fall Restraint Systems should not create an added risk that is unacceptable to vessel operations.
- Fall Restraint Systems may be impractical for tasks requiring movement between barges, such as tow building.



CONSIDERATIONS FOR SAFE USE OF FALL ARREST SYSTEMS

Fall Arrest Systems consist of a full-body harness connected to an anchor point via a lanyard or self-retracting lifeline and are designed to slow and stop a person after a fall, reducing injury risk from impact with the water or lower decks, but creating the potential for hanging in suspension on the side of a vessel or structure.

Considerations for the safe use of Fall Arrest systems include points for the safe use of Fall Restraint Systems listed above with additional consideration for the distance required to safely slow and stop a person who has fallen.

- Fall Arrest Systems are suitable for preventing injuries when climbing fixed ladders or using horizontal lifelines for tasks like washing or repairing topside areas of a barge or vessel.
- Fall Arrest Systems may be used to safely access the roof of a vessel when barriers do not offer enough protection.
- Fall Arrest Systems may be used for accessing barges at terminals using fixed ladders or when terminals provide overhead anchors, and enough space is provided to safely arrest and retrieve a worker who has fallen without creating a risk of crushing or other potential injuries that result from being caught in suspension.
- Fall Arrest systems can be used in permanent or semi-permanent areas with overhead anchor points.

APPENDIX B: PERSONAL FLOATATION DEVICES

PFD GENERAL NOTES

- Personal Floatation Devices (PFDs), also referred to as lifejackets and buoyancy aids, are categorized as "Commercial PFDs," "Recreational PFDs," or "Throwable PFDs" (e.g., Ring Buoys, Cushions, etc.).

PFD REGULATIONS

- Commercial PFDs are life jackets intended for use on uninspected passenger vessels, uninspected commercial vessels over 40 feet (12 meters), and inspected vessels. Lifejackets may rely on inherently buoyant material, inflatable chambers, or a combination of the two.
- Subchapter M regulations at 46 CFR § 141.340 and 46 CFR § 140.430 require towing vessels to carry at least one appropriately sized and type approved lifejacket for each person on board. These requirements ensure that personnel are equipped with floatation devices suitable for tow work.

PFD TYPE APPROVAL

- The Coast Guard updated type approval regulations for Commercial PFDs in 2021 and is no longer approving PFDs under series 160.002, 160.005, and 160.055. PFDs approved prior to these changes can continue to be used in accordance with their labels as long as they are in good and serviceable condition.[6]
- Updated type approval series specifications can be found on the Coast Guard Office of Design and Engineering Standards website: https://www.dco.uscg.mil/CG-ENG-4/PFD/lv/true/.[7] [8]

WEARING OF WORK VESTS

- Personnel dispatched from the towing vessel or that are working in an area on the exterior of the vessel without rails and guards must wear a (Type I) lifejacket meeting requirements of 46 CFR § 141.340, an immersion suit meeting requirements of 46 CFR § 141.350, or a (Type V) Work Vest approved by the Commandant under 46 CFR § 160.053.
- When worn at night, the work vest must be equipped with a light that meets the requirements of 46 CFR § 141.340(g)(1). Work vests may not be substituted for the life jackets required by 46 CFR Part 141.[9]

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6 U.S. Coast Guard. (n.d.). Life jacket wear rates and testing information. U.S. Department of Homeland Security. Retrieved 13 February 2025, from https://www.dco.uscg.mil/CG-ENG-4/PFD/lv/true/

7 International Maritime Organization. (n.d.). Guidelines for the approval of personal life-saving appliances (MSC.1/Circ.1628/Rev.1). U.S. Coast Guard. Retrieved 13 February 2025, from https://www.dco.uscg.mil/Portals/9/DCO Documents/5p/5ps/Design and Engineering Standards/Life Saving and Fire Safety/Docs/MSC_1-Circ_1628-Rev_1 - Personal LSA.pdf

8 U.S. Coast Guard. (2021, August 1). Adoption of ANSI/CAN/UL 12402-4 standard for personal flotation devices (CG-ENG Policy Letter 02-21). U.S. Department of Homeland Security. Retrieved 13 February, 2025, from https://www.dco.uscg.mil/Portals/9/DCO Documents/5p/5ps/Design and Engineering Standards/docs/20210801_CG-ENG_PL02-21_Adoption of UL12402-4.pdf

9 U.S. Government Publishing Office. (n.d.). 46 CFR § 140.430 - Work vests. U.S. Code of Federal Regulations. Retrieved 13 February, from https://www.ecfr.gov/current/title-46/chapter-I/subchapter-M/part-140/subpart-D/section-140.430

APPENDIX B: PERSONAL FLOATATION DEVICES

CONSIDERATIONS FOR SELECTING PFDS

Towing vessel operators are permitted under Subchapter M to wear either a Type I PFD or Type V PFD. Type I PFDs are typically stored and should be used during emergencies. Type V are generally referred to as "Work Vests" and provide a durable vest approved for work on deck. Type III PFDs are typically inherently buoyant (foam) with pockets and webbing that tend to make them more comfortable than the Type V and Type I vests and may be worn in lieu of Work Vests on a Subchapter M vessel if approved by the OCMI through a "special consideration" request.[10]

To decide on the right PFD for your crew, consider the regulations, the operation and environment, the comfort level, the buoyancy, and the ability to self-right a person who has fallen in the water. A simple table has been included for reference:

FEATURE	Type I	Type III		Type V (Work Vest)		
Floatation Type	FOAM	FOAM	INFLATABLE	FOAM	INFLATABLE	HYBRID
Typical Buoyancy	22 lbs.	15.5 lbs.	22.0 lbs.	15.5 – 22.0 lbs.	22.0 lbs.	Deflated: 7.5 lbs. Inflated: 22.0 - 34.0 lbs.
Performance When Unconscious	Excellent (turns face-up)	Limited (may not turn face-up)	Better (inflatable can turn face-up)	Limited (may not turn face-up)	Better (inflatable can turn face-up)	Better (inflatable can turn face-up)
Comfort & Mobility	Low (very bulky)	High		Moderate to High (varies by design)		
Maintenance Needs	Low	Low	Moderate to High (requires inspection, rearming kits, etc.)	Low	Moderate to High (requires inspection, rearming kits, etc.)	Moderate to High (requires inspection, rearming kits, etc.)
Best Use Case	Abandon ship and/or offshore work.	Getting on or off the towboat; performing tasks onboard towboat, such as pilot, cook, or engineer duties.		Deck Work	Deck work and work on side of barge or vessel	Deck Work and work on side of barge or vessel

OTHER NOTABLE CONSIDERATIONS

Some personal floatation devices approved under 46 CFR §160.064 are marked as "USCG-approved wearable device for uninspected commercial vessels less than 12 m (40 feet) in length not carrying passengers for hire, and for recreational boats." This statement speaks to the vessels for which the device meets carriage requirements.

Proper wearing of PFDs is of utmost importance in ensuring they function as intended. Loose or unused straps will reduce the effectiveness of the PFD or render the PFD entirely ineffective and/or harmful. Further details about life jacket use, care, and selection are available on the CG-ENG website.[11]

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[10] U.S. Coast Guard. (2023, February 7). CVC-WI-10(3), OCMI Guidance on Special Consideration for 46 CFR Subchapter M Vessels. Retrieved 14 April, 2025 from https://www.dco.uscg.mil/Portals/9/DCO Documents/5p/CG-5PC/CG-CVC/CVC_MMS/CVC-WI-010(3) OCMI Special Consideration FINAL SIGNED.pdf?

[11] U.S. Coast Guard. (n.d.). *PFD selection, use, wear & care*. U.S. Department of Homeland Security. Retrieved 05 May 2025 from https://www.dco.uscg.mil/CG-ENG-4/PFDSel/

APPENDIX C: REGULATIONS

GENERAL NOTES – REGULATIONS

- Unmanned barges operating on sheltered routes (inland) are generally exempt from most of these regulations.
- Much of this research is summarized. Regulatory citations must be used to ensure compliance.

ALL VESSELS - REGULATIONS

- 46 CFR 199.70 - Life Jackets and Rails
- 46 CFR 177.900 - Deck rails

INSPECTED TOWING VESSELS – REGULATIONS (OPERATIONS)

- 46 CFR 140.425 - Fall Overboard Prevention

The owner or managing operator of a towing vessel must establish procedures for fall overboard prevention and recovery, covering personal protective equipment, safe working practices, and the use of retrieval equipment.

TANK BARGES - REGULATIONS

- 46 CFR 32.02-10 - TB/ALL

All tank vessels, except unmanned tank barges and other specific exemptions listed in 46 CFR 32.02-10, built after July 1, 1969, must have efficient guard rails or bulwarks on decks and bridges, with specific height and spacing requirements, unless a lesser height is approved by the Commandant.

CARGO HOPPER BARGES - REGULATIONS

- 46 CFR 32.63-10 - Rakes and Coamings

All open hopper type barge hulls shall have a coaming around the hopper space at a minimum height of 36 inches on the stern graduated to 24 inches at half barge and 18 inches on the bow.

- 46 CFR Part 92.25-5 - Where rails required

All vessels shall have efficient guard rails or bulwarks on decks and bridges. The height of rails or bulwarks shall be at least 39-1/2 inches from the deck except where this height would interfere with the normal operation of the vessel. Rules may be relaxed for vessels on sheltered voyages.

ALL VESSEL RAILING BASICS:

- Perimeter rail height = 39 1/2 inches.
- Other rail height = 36 inches.
- Hand grabs may be substituted.
- Rail equivalents include lifelines, wire rope, chains, and bulwarks which provide strength and support equivalent to fixed rails.
- Rails should withstand 200 pounds of force in any direction and 50 pounds per square foot on the top rail.

These rules may not apply where passengers embark or where cargo is transferred and when guards hinder passage.

TANK BARGE RAILING BASICS:

- Top rail height = 39 1/2 inches
- Bottom rail ≤ 9 inches from deck
- Horizontal rails ≤ 15 inches apart

Except where this would interfere with the normal operation of the vessel.

HOPPER BARGE COAMING BASICS:

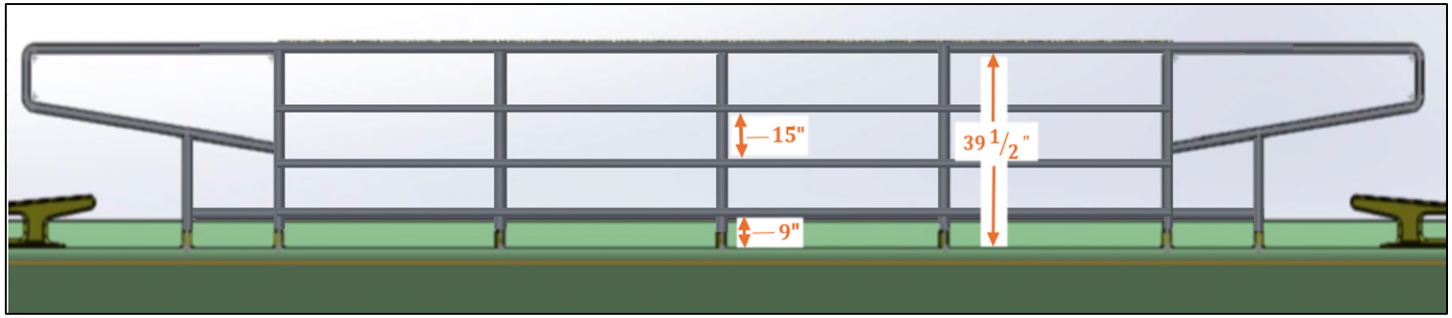
- Coaming height around hopper

Stern	Mid	Bow
36 inches	24 inches	18 inches

APPENDIX C: REGULATIONS

OCEAN AND COASTWISE BARGES - REGULATIONS

- 46 CFR 92.25-90 - Storm rails. Install storm rails on both sides of decks or passageways which are six feet or more in width.



HOPPER BARGE RAIL BASICS*

- Top Rail Height = 39 1/2 in.
- Bottom Rail ≤ 9 in. from deck
- Horizontal Rails ≤ 15 in. apart

*Except where this would interfere with the normal operation of the vessel.

*For barges on "sheltered routes" (inland barges) these requirements may be relaxed.

LOAD LINE VESSELS - REGULATIONS

- 46 CFR 42.15-75 - Coastwise and Intercoastal Barges

Vessels which engage in domestic voyages by sea (coastwise and intercoastal voyages) except Merchant Vessels of less than 150 gross tons (shall) use efficient guard rails or bulwarks on all exposed parts of the freeboard and decks (of at least 39-1/2 inches) unless this height interferes with the normal operation of the vessel.

INSPECTED TOWING VESSELS – REGULATIONS (CONSTRUCTION AND ARRANGEMENT)

- 46 CFR 144.800 - Handrails and Bulwarks

Rails or equivalent must be installed near periphery of crew decks. Equivalent protection includes lifelines, wire rope, chains, and bulwarks that provide strength and support equivalent to fixed rails. Hand grabs can be used where rails are impractical due to space limitations.

UNINSPECTED VESSELS - REGULATIONS

- 46 CFR Part 25

(Generally, do not apply to inspected towing vessels or barges)

PASSENGER VESSELS - REGULATIONS

- 46 CFR 116.900

(Generally, do not apply to inspected towing vessels or barges)

INTERNATIONAL REQUIREMENTS - REGULATIONS

- IMO Rules and Regulations for the Classification of Naval Ships, January 2023: Vol -1- Part 3 - Ch 4 - Sec 9

(Generally, do not apply to inspected towing vessels or barges)

OSHA GUIDES & CITATIONS *(NOT AN EXHAUSTIVE LIST)*

- OSHA Publication 3358 - OSHA Guide to Deck Barge safety
- OSHA Fall Protection Guide OSHA Shipyard Fall Protection Guide
- 29 CFR 1910 Subpart D - Walking-Working Surfaces
- 29 CFR 1910.28 - Fall protection and falling object protection, Unprotected sides and edges.
- 29 CFR 1910.29 - Fall protection systems and falling object protection-criteria and practices.
- 29 CFR 1915.159 - Personal fall arrest systems (PFAS)
- 29 CFR 1915.160 - Positioning device systems
- 29 CFR 1915.152 - General requirements (including training and documentation)
- 29 CFR 1915.71 - Scaffolds or staging
- 29 CFR 1915.77 - Working Surfaces
- 29 CFR 1917.112 - Guarding of Edges
- 29 CFR 1917.117 - Landings
- 29 CFR 1917.118 - Protection against falls

APPENDIX D: SURVEY DATA

Executive Summary

- **Most incidents occurred in 2024** (20) followed by 2023 (12) and 2022 (12). SQ1
- **Falls from barges are most likely**, with 68% of incidents occurring on a barge as compared to other vessels, equipment, or facilities. SQ8
- **Falls are more likely at night**, with 66% occurring during daylight hours, and 33% occurring at night. SQ2
- **Experience is not a good indicator of risk**, with 45% of incidents attributed to mariners with 2 or more years of experience, 19% to those with 1 to 2 years of experience, and 55% attributed to mariners with 1 year or less. SQ4
- **Deckhands were most likely to fall overboard**, making up 52% of incidents, followed by Tankermen, at 28% of incidents. SQ5
- **Slip trips and falls were the greatest contributing factors** leading to a fall overboard, attributed to 84% of recorded events. SQ10

Q1: Incident Year

YEAR	
2024	20
2023	12
2022	12
2021	10
2020	9
2019	9
2018	12
2017	10
2016	9
2015	5
2014	7
2013	2
2012	1
Sum	**118**

Q2: Time of Day When Incident Occurred

TIME	
DAY: 0700-2059	39
NIGHT: 2100-0659	78
Unknown	1
Sum	**118**

Q3: Days Remaining in Hitch

HITCH	
Crew Change Day	1
Within 3 Days of Hitch Start	12
Mid Hitch	71
Within 3 Days of Hitch End	13
Unknown	19
Sum	**116**

- 2 incidents involved shore-based employees (not on a hitch schedule).

Q4: Experience Level of Involved Crewmember:

EXPERIENCE	
2 years or more	53
1 - 2 years	22
6 - 12 months	16
1 - 6 months	22
Less than 1 month	2
Unknown	3
Sum	**118**

Q5: Job Title of Involved Worker

JOB	
Deckhand	61
Tankermen	33
Mate (of deck operations)	15
Captain or Pilot	3
Trainee	2
AB	1
Cook	1
Engineer	1
Facility Associate	1
Sum	**118**

Q6: Personal Protective Equipment in Use at Time of Incident:

PPE	
STANDARD PPE: Personal Floatation Device (PFD), Boots, Uniform, Gloves, Light, Whistle, Head Protection	113
None	2
STANDARD PPE and Personal Fall Arrest or Restraint System	2
STANDARD PPE & Personal Location Beacon (PLB)	1
Sum	**118**

Q7: Safety Features Installed at the Time of Incident:

SAFETY FEATURES	
Non-Skid	39
None	37
Guardrails / Chains / Ropes or Bulwarks	35
Highlighted Edges	7
Fall Arrest or Restraint Gear	5
Grab Bar / Hand Hold	2
Sum	**125**

- Survey respondents were allowed to input multiple answers for this question.

Q8: Incidents – Organized by Vessel Type

VESSEL TYPE	
BARGE	81
TUG/ATB	23
SKIFF	8
GANGWAY	6
Sum	**118**

Q8.1: Barge Incidents - Location on Vessel

LOCATION OF BARGE INCIDENTS	
BARGE: Unspecified	24
BARGE: Bow - Starboard Corner	12
BARGE: Port - Side	10
BARGE: Starboard - Side	10
BARGE: Stern - Starboard Corner	7
BARGE: Bow - Port Corner	6
BARGE: Stern - Port Corner	6
BARGE: Bow - Center	3
BARGE: Stern - Center	3
Sum	**81**

Q8.2: Other Incidents – Location

LOCATION OF ALL OTHER INCIDENTS	
SKIFF	8
GANGWAY	6
Sum	**14**

Q8.3: Tug (ATB & Push Boat) Incidents - Location on Vessel

LOCATION OF ALL OTHER INCIDENTS	
TUG/ATB: Unspecified	9
TUG/ATB: Side	7
TUG/ATB: Bow	3
TUG/ATB: Stern	3
TUG/ATB: Keyway Area	1
Sum	**23**

Q9: Method of Retrieval After Fall to Water:

METHOD OF RETRIEVAL	
Onboard Crew	46
Self-Rescue	19
Ladder	16
Rope	11
Skiff	8
Ring Buoy	7
Shore Based Crew	4
Unknown	4
Life Ring	2
Retrieved by Another Vessel	1
Sum	**118**

- The most common method of rescue is assistance from other crew members onboard.
- Self-Rescue describes when a crewmember climbs out of the water without assistance.
- Respondents were allowed to select more than one choice for this question which resulted in some selecting a combination of rescue methods.

Q10: Primary & Contributing Causal Factors

CAUSAL FACTORS			
PRIMARY		**CONTRIBUTING**	
Slip/Trip/Fall	**99**	**Distraction, Inattention, or Situational Awareness**	**18**
Distraction, Inattention, or Situational Awareness	**13**	Hazard Awareness / Risk Assessment / Path of Travel	16
Human Error / Inexperience / Failure to Follow Policy	**5**	Crewing issues	6
Struck By	4	**Debris on deck / Spilled material / Cargo**	**5**
Debris on deck / Spilled material / Cargo	**3**	Poor communication	5
Ergonomics / Body positioning / Weight distribution	**3**	**Human Error / Inexperience / Failure to Follow Policy**	**7**
Weather (Wind)	3	Poor boot condition	4
Rigging and Ropes	2	Safety chain issues	3
Bump or Barge Movement	**1**	**Bump or Barge Movement**	**2**
Complacency	1	**Ergonomics / Body positioning / Weight distribution**	**4**
Illness	1	Wet Deck	2
Tools	1	Bulwark handrails not replaced	1
		Damaged coaming and deck	1
		Damaged or defective equipment	1
		Design of mooring structures at dock	1
		Dog handles incorrect	1
		Gangway improperly secured	1
		Narrowed walkway	1
		Unsecured equipment	1
		Weather (Rain)	1
Sum	**136**	**Sum**	**81**
2 respondents did not record a primary factor.		60 respondents did not record a contributing factor.	
Respondents were allowed to input multiple selections for these questions.			

APPENDIX E: ACKNOWLEDGEMENTS

CONTRIBUTORS - ORGANIZATIONS

AWO gratefully acknowledges the individuals and organizations whose support made this project possible. We extend our sincere thanks to the staff, members, and partners who generously contributed their time and expertise in pursuit of enhanced safety for mariners and the tugboat, towboat, and barge industry.

ARCOSA Marine – arcosamarine.com/barges/
Bergan Marine – berganmarinesystems.com/marine-systems/
C-HERO: Shane Smith, President/CEO – www.c-hero.com
USCG-AWO QAT: Reducing Fall-Overboard Fatalities – www.americanwaterways.com/sites/default/files/falloverboardqatreportapril2012
Emerald Marine Products: Robert Linder – www.emeraldmarineproducts.com
ERL Inc. - https://erlinc.com/products/erl-ratchet/
Maritime Safety Wedge – mhproductionsonline.com
Mustang Marine – www.mustang-equipment.com
Occupational Safety and Health Administration – OSHA.gov
Overboard Prevention Training, LLC – www.overboardpreventiontraining.com
Shell Techworks | Shell Global – www.shell.com/what-we-do/technology-and-innovation/innovate-with-shell/shell-techworks | www.shell.com/
The American Club – www.american-club.com
The Claw Cover Lifting Device – www.theclawlidlifter.com
Timco Industries, Inc. - timcomarine.com
United States Coast Guard – www.uscg.mil
U SAFE – Revolutionary Remote-Controlled Life-Saving Device – www.usaferescue.com
Webb Rite Safety: – www.webbritesafety.com/fall-arrest-solutions

This report was made possible through the voluntary contributions of AWO members and partners who shared their time, knowledge, and resources with the Subcommittee. While critical to the development of this report, the participation and acknowledgment of any individual or organization does not constitute an endorsement or approval of specific products or methods included herein.

APPENDIX E: ACKNOWLEDGEMENTS

CONTRIBUTORS - INDIVIDUALS

Name		Organization
Adila	Fathallah	American Waterways Operators
Andy	Norval	Blessey Marine Services, Inc.
Brian	Falk	Kirby Corporation
Bryson	Person	ARCOSA Marine Products, Inc.
Caitlyn	Stewart	American Waterways Operators
Casey	Stubbs	Golding Barge Line, Inc.
Chester	Urban	Shell Trading US Company
Chuck	Hriczak	Holcim (US)
Clint	Bryan	ARCOSA Marine Products, Inc.
Cody	Sanders	Canal Barge Company, Inc.
Craig	Thieler	ERL Inc.
Dan	Palen	Brennan Marine, Inc.
Doug	Corey	Parker Towing Company, Inc.
Elena	Peterson	Tidewater Transportation and Terminals
Eric	Ricker	Enterprise Marine Services LLC
Ernie	Ramos	Crowley Corporation
Forrest	Davis	Bay-Houston Towing Company
Hannah	Lewis	Golding Barge Line, Inc.
Ian	Wolfarth	Chevron Shipping Company
Jacob	Brown	Enterprise Marine Services LLC
James	Werner	Campbell Transportation Company, Inc.
Jamie	Bigbie	Magnolia Marine Transport Company
Jason	Campbell	Great Lakes Dredge & Dock Company
Jeffrey	Johnson	Enterprise Marine Services LLC
Jeffrey	Parker	Kirby Offshore Marine, LLC
Jessica	Gross (Robbins)	Moran Towing Corporation
Jim	Fletcher	Team Services, LLC
Jim	Peschel	Vane Line Bunkering
Joel	Morton	Fairwater

Name		Organization
John	Hazel	Marquette Transportation Company, Inc.
Jon	Ray	Ingram Barge Company
Joshua	Legg	Amherst Madison, Inc.
Kate	Primeaux	Petro-Chem Services, LLC
Kelly	Teichman	T & T Marine Salvage, Inc.
Ken	Albee	Canal Barge Company, Inc.
Kris	Tower	Magnolia Marine Transport Company
Kyle	Durden	Bergan Marine
Lee	Huber	Cinch Design & Communications
Lillie	Wightman	American Waterways Operators
Luis	Carmona	Crounse Corporation
Mark	McManus	LeBeouf Bros. Towing, LLC
Matt	Lagarde	Ingram Barge Company
Matt	Lewis	Campbell Transportation Company, Inc.
Michael	Quinton	Golding Barge Line, Inc.
Michiel	Versteeg	Saltchuk Marine
Mike	Breslin	American Waterways Operators
Mike	Warner	Genesis Marine, LLC
Miles	Harris	Magnolia Marine Transport Company
Neal	Langdon	ARCOSA Marine Products, Inc.
Nijel	Renfro	Wepfer Marine, Inc.
Patrick	Cheramie	American Commercial Barge Line LLC
Ray	Richmond	SCF Marine Inc.
Reis	Prevost	Enterprise Marine Services LLC
Sarah	Freyer	Centerline Logistics Corporation
Sean P.	Smith	American River Transportation Company
Stephen	LeBouef	American River Transportation Company
Tyler	Smith	Marquis Marine, Inc.
William	Collins	Tidewater Transportation and Terminals

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VERSION and CHANGE LOG

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Version	Changes	Publication Date
Version 250728	Changed image for "Remote Drafting" device on Page 10 to show the latest model by Bergan.	July 28, 2025