



**Comparison of Capabilities Between Prince William Sound
Emergency Towing Package
and
IMO/SOLAS Emergency Towing Package for Tankers**

Prepared for:
Prince William Sound Regional Citizens' Advisory Council
Valdez, Alaska

Prepared by:
Little River Marine Consultants
P.O. Box 504
East Boothbay, ME 04544
Date: 9 August 2017
Revised Date: 20 February 2018

Project No: 8020-16-01
Revision 1.0

[The opinions expressed in this PWSRCAC-commissioned report are not necessarily those of PWSRCAC](#)

CONTENTS

GLOSSARY OF TERMS	3
1. Introduction	4
2. Background on Prince William Sound (PWS) Tow Package	4
2.1 State of Alaska Requirements	4
2.2 Implementation: Contingency Plan and Vessel Response Plans	4
2.3 Vessel Escort/Response Plan (VERP) Changes Over Time	5
3. United States Coast Guard (USCG)Standards.....	7
3.1 33 CFR 155.235.....	7
4. International Maritime Organization (IMO) Standards.....	8
4.1 IMO Resolution A.535(13).....	8
4.2 SOLAS.....	9
5. Conclusion.....	11
REFERENCES.....	13

GLOSSARY OF TERMS

- **33 CFR** - Title 33 is the portion of the Code of Federal Regulations that governs Navigation and Navigable Waters within the United States.
- **Alaska Administrative Code** - Is an official publication by the State of Alaska, containing regulations of state agencies filed with the lieutenant governor under the Alaska Administrative Procedure Act, Title 18 pertains to regulations covering environmental conservation.
- **Breaking Strength (BS)** - The Minimum breaking force (minimum breaking load), in kilonewtons, long or short tons is the lowest breaking strain of the rope when tested to destruction.
- **Emergency Towing Arrangements (System)** - The emergency towing system fitted to tankers will typically consist of a wire towing pennant on a stern deck storage drum and a storage box containing the messenger and pick up gear. Frequently, the system is designed with the messenger line led from the storage box, through the fairlead and permanently attached to the wire pennant connection on deck to ensure that the equipment can be easily and quickly deployed in an emergency.
- **Oil Companies International Marine Forum (OCIMF)** - A voluntary association of oil companies with an interest in the shipment and terminalling of crude oil, oil products, petrochemicals and gas.
- **International Maritime Organization (IMO)** - A specialized agency of the United Nations that is responsible for measures to improve the safety and security of international shipping and to prevent marine pollution from ships.
- **International Convention for the Safety of Life at Sea (SOLAS)** - An international maritime treaty which requires Signatory flag states to ensure that ships flagged by them comply with minimum safety standards in construction, equipment and operation. The current version of the SOLAS Convention is the 1974 version, known as SOLAS 1974, which came into force on 25 May 1980. As of March 2016, SOLAS 1974 has 162 contracting States, which flag about 99% of merchant ships around the world in terms of gross tonnage.
- **Prince William Sound Tanker Oil Discharge Prevention and Contingency Plan Part 2. (Feb 2017)** - The Core Plan describes oil spill prevention and response activities, and procedures common to PWS tank vessel operators and their response action contractor, APSC/SERVS. It is comprised of five parts consistent with Alaska Administrative Code (AAC) Title 18, Chapter 75, Section 425 [18 AAC 75.425(d)(2)].
- **Safe Working Load (SWL)** - The manufacturer's recommended maximum weight load for a line, rope, crane or any other lifting device or component of a lifting device.
- **Short Ton** - A unit of weight equal to 2,000 pounds' or 907.19 kg.
- **United States Coast Guard NVIC** - A Navigation and Vessel Inspection Circular (NVIC) provides detailed guidance about the enforcement or compliance with a certain Federal marine safety regulations and Coast Guard marine safety programs.
- **Vessel Escort and Response Plan (VERP)** - The Vessel Escort and Response Plan (VERP) is designed as a port specific guide to further aid and enhance the safety of tanker navigation and the protection of the marine environment within the waters of Prince William Sound.

1. Introduction

Little River Marine Consultants were retained by Prince William Sound Regional Citizens' Advisory Council (PWSRCAC) under Contract Number 8020-16-01 to conduct a of comparison of capabilities between Prince William Sound Emergency Towing Package, the IMO/SOLAS Emergency Towing Package for Tankers, and other requirements applicable to tankers operating in Prince William Sound.

2. Background on Prince William Sound (PWS) Tow Package

This section provides background on the requirement for the PWS tow package and information on its use by tankers in PWS.

2.1 State of Alaska Requirements

Currently, Alaska regulations require tankers in state waters to have a towing line suitable to connect to tow vessels in the area made up and prepared for "rapid deployment." Tankers calling at the Valdez Marine Terminal are required to use the Prince William Sound towing package, or an equivalent package, per 18 AAC 75.027(f). That towing package is defined at 18 AAC 75.990(96)(A-D) as including:

- (A) 400 feet of 2 ¼ -inch tow reaching wire;*
- (B) 720 feet of six-inch polypropylene floating pickup line;*
- (C) One floating pickup buoy; and*
- (D) A "D" shackle, 2 ¼ inches in diameter, with a 4 1/8-inch jaw opening, and a breaking strain of 55 tons, to connect the floating line to the tow reaching wire.*

This report compares these requirements to those established under the International Maritime Organization.

2.2 Implementation: Contingency Plan and Vessel Response Plans

Three key documents that indicate how tankers in PWS comply with the PWS emergency tow package requirements:

- Prince William Sound Tanker Oil Discharge Prevention and Contingency Plan,
- Vessel Escort/Response Plan (VERP), and
- Individual shipping company Vessel Response Plans.

The **Prince William Sound Tanker Oil Discharge Prevention and Contingency Plan** (Feb 2017) is developed by the Response Planning Group (RPG) and shared among the shippers. This document commits that, as required, "Each tank vessel operating at the VMT uses the PWS Towing Package, defined in 18 AAC 75.990(96), or its equivalent. The PWS Towing Package is made up and prepared for rapid deployment to an escort vessel." (Section 2.1.7) It also states that, "The equipment meets or exceeds IMO and ADEC regulations and USCG standards for such equipment."

In addition to the shared plan, individual shippers have their own Vessel Response Plans. Examining each of the TAPS shippers' current response plans, Alaska Tanker Company (ATC) is the only operator that offers specific detail of the PWS package on board the tankers. It also notes the four new Alaska

Class tankers have Samson Ropes' AmSteel Blue (Dyneema®) line (SWL 495 short tons) as a substitute for the emergency tow wire. Something worth noting is the Dyneema® fiber lines are considerably lighter at 3.62 lbs./ft. as opposed to 2 ¼" wire at 9.36 lbs./ft. and have a specific gravity of 0.98, meaning they float in both fresh and salt water. The significance of this is that the lines are safer for the crew members to handle, easier to pass to the tug, and pose less chance of the system being fouled in the tugs propellers.

The other PWS tanker operators (SeaRiver¹, Polar², Chevron³ and Tesoro⁴) state that they have the PWS package on board along with the IMO package, but do not provide specific details of the systems.

2.3 Vessel Escort/Response Plan (VERP) Changes Over Time

The 2013 VERP states simply that tankers are required to have on-board emergency towing equipment packages in compliance with, and equivalent in strength to all IMO/USCG standards for such equipment as specified in NVIC 8-89 and IMO Resolution MSC 35(63) (adopted 20 May 1994).

¹ According to the SeaRiver Maritime Inc. Emergency Response Plan Core Manual – Sect. 900 Lightering and Salvage Rev. 1/25/16 (Part 906 EMERGENCY / OCEAN TOWING): “S/RM tankers are equipped with bow and stern emergency towing gear assemblies in compliance with federal regulations. The equipment is compatible for use with tugs which may be called upon to assist and can be deployed in 15 minutes or less from a dead ship. The systems are designed to meet IMO Resolution MSC.35 and consist of a readily – deployable synthetic or wire rope towing pendant, messenger line, floating pickup line and buoy, equipment storage locker or reel and reinforced fairleads and strong points. Details of this equipment and guidance for its deployment are included in the Prince William Sound Emergency Towing Plan section of the Prince William Sound Tanker Oil Discharge Prevention and Contingency Plan Part 2.”

² According to the Polar Response Plan – Revision 47-W November 20, 2015: “All vessels covered under this plan currently have emergency towing systems in compliance with IMO, OCIMF and USCG regulations. Details of each vessel’s mooring arrangements are in plans on file in Polar Tankers offices and on each vessel...Polar vessels are equipped with emergency towing arrangements at both the stern and bow. Ships are also fitted with the ‘Prince William Sound (PWS) Emergency Towing Package.’”

³ According to the Chevron Shipping Company LLC Oil Discharge Prevention and Contingency Plan for Prince William Sound - Alaska Prince William Sound Appendix 17-Oct-11 “All CSC vessels operating in Alaska are equipped with towing packages forward and aft meeting the International Maritime Organization (IMO) Marine Safety Committee resolution MSC.35(63). These towing packages also meet the requirements of Washington State and the Prince William Sound towing package.

⁴ According to the Tesoro Cook Inlet Tesoro Alaska Company Cook Inlet Vessel Oil Discharge Prevention and Contingency Plan, ADEC Plan #: 14-CP-2039” Revision 5 April 2017: “TAPS vessels have Prince William Sound Towing Package (bow) that includes components listed in 18 AAC 75.990 (96). The PWS Towing Package must be rapidly deployable per 18 AAC 75.027(f). The Stern Towing Systems designed to meet IMO Resolution MSC .35 are also installed on each vessel. All vessels shall have tow lines made up and prepared for rapid deployment to a towing vessel, whenever they are in Alaskan waters as required by Alaska Regulation 18 AAC 75.027(f). Tesoro will assure this requirement is met by either including a detailed description of the towline in this plan or through certification on a case by case basis established by Table 2.1-4 of this plan. Vessels are in compliance with Federal and International (SOLAS) standards for emergency towing systems for vessels over 20,000 deadweight tons. All vessels are equipped with emergency towing arrangements on the bow and stern.”

However, although not applicable now, the 1994 VERP spells out in detail each component of the PWS package in detail that has been removed from the more recent VERP.

From the 2004 VERP:

A.4 TOWING PACKAGE

A.4.1 PRINCIPLE OF THE TOWING PACKAGE

Tankers calling at the Terminal will be required to have on-board two emergency towing equipment packages which are to be compatible with/and equivalent in strength to any IMO/USCG standards for such equipment.

Past experience has demonstrated the difficulties in trying to take a large vessel under tow in adverse weather conditions. With these difficulties in mind, the Prince William Sound Towing Package has been so designed.

The towing gear assembly consists of:

- 1) 400 feet of 2- 1/4" tow reaching wire*
- 2) 720 feet of 6" polypropylene floating pick-up line*
- 3) 1 floating pick-up buoy*
- 4) 2- 1/4" diameter "D" shackle to connect the floating line to the tow reaching wire*

Equivalent towing gear may be substituted with concurrence of the Alaska Department of Environmental Conservation and SERVS. This towing gear assembly is dedicated for emergency use and should not be used for any other purpose. It is designed so that lines may be passed between the disabled tanker and the tow vessel by heaving line or by using the floating buoy and floating pick-up line. If the floating buoy and line are used, the buoy drifts downwind with the pick-up line. When the end of the pick-up line is retrievable, the towing tug can move in and grapple the pick-up line. The towing tug can then heave on the floating line which in turn is connected to the tow reaching wire, the bitter end of which is made fast on-board the disabled vessel. The tow reaching wire is then shackled to the towing tug's wire. In this way, a safe distance is maintained between the disabled vessel and the towing tug, and the towing wire can be safely passed without danger to either the vessel or the towing tug.

A. 4.2 DESCRIPTION OF TOWING PACKAGE

A.4.2.1 TOWING WIRE

Length: 400' between Bearing Points of the Thimbles

Diameter: 2-1/4"

Wire Grade: XIPS Preformed Galvanized

Breaking Strength: 463,000 lbs. (231 short tons) S.W.L. 231,500 lbs. (115.8 short tons)

Core: I.W.R.C.

End Fittings: Heavy Duty 2-1/4" Alloy Steel Hawser Thimble

Lubrication: Heavy Duty Asphaltic

Weight: 1' = 10 lbs.

It has not been feasible to compromise the strength and durability of the wire to achieve ease of handling since this would render the towing package ineffective. However, the choice of 6 x 37 class wire rope is recommended since it is among the most flexible available and is easier to handle than other wires of the same size, of different construction. Synthetic lines may be substituted with concurrence of the Alaska Department of Environmental Conservation and SERVS.

A.4.2.2 POLYPROPYLENE FLOATING PICK-UP LINE

Length: 720'

Size: 6" circumference

Breaking Strength: 48,800 lbs. (24 short tons)

S.W.L.: 6,7000 lbs. (3.4 short tons)

Construction: 8 stranded braided A.M.C. polypropylene rope.

Fittings: Thimble hard eye spliced on one end and 30" soft eye spliced on the other.

A.4.2.3 3 FLOATING PICK-UP BUOY

This is a high-quality float designed expressly for the marine environment. The inner core of the float is filled with a non-water absorbing closed-cell foam. The outer skin is a thick layer of filament-reinforced elastomer specifically formulated for wear and abrasion resistance. A heavy wall steel pipe through the axis of the float provides a high pull through load capability.

Length: 30"

Size: 20" diameter

Pull Through Load: 5,000 lbs.

Weight: 40 lbs.

Internal Diameter of Eye: 2-1/4"

Color: International orange for high visibility

A.4.2.4 CONNECTING SHACKLE

Size: 2-1/4" diameter "D" shackle with 4-1/8" jaw openings

Breaking Strain: 110,000 lbs. (55 short tons) SWL 55,000 lbs. (27.5 short tons)

This shackle should be kept shackled to the outboard thimble of the tow reaching wire and should not be used for any other purpose.

3. United States Coast Guard (USCG) Standards

The USGC specifies the Emergency towing capability for oil tankers under 33 CFR 155.235 mirroring the IMO Resolution A.535(13) and IMO resolution MSC.35(63).

3.1. 33 CFR 155.235

Emergency towing capability for oil tankers. An emergency towing arrangement

shall be fitted at both ends on board all oil tankers of not less than 20,000 deadweight tons (dwt), constructed on or after September 30, 1997. For oil tankers constructed before September 30, 1997, such an arrangement shall be fitted at the first scheduled dry-docking, but not later than January 1, 1999. The design and construction of the towing arrangement shall be in accordance with IMO resolution MSC.35(63).

4. International Maritime Organization (IMO) Standards

The IMO establishes standards for towing packages through two documents: Resolution MSC 35(63) (adopted 20 May 1994) and the International Convention for the Safety of Life at Sea (SOLAS), which essentially incorporates the earlier recommendation.

4.1 IMO Resolution MSC 35(63) (20 May 1994)⁵

This resolution was an amendment to the IMO Resolution A.535(13) Recommendation on Emergency Towing Requirements for Tankers (adopted on 17 November 1983) providing additional detail to A.535(13). The document described the Emergency Towing System as follows:

The emergency towing arrangements should be so designed as to facilitate salvage and emergency towing operations on tankers primarily to reduce the risk of pollution. The arrangements should at all times be capable of rapid deployment in the absence of main power on the ship to be towed and easy connection to the towing vessel.

The aft arrangement must be possible to rig in 15 minutes under harbor conditions, while the forward one has a permitted deployment time of 60 minutes. The emergency towing arrangement at the aft end of the vessel must consist of pick-up gear, a towing pennant, chafing gear, a fairlead, a strong point and a roller pedestal. There are strength requirements for most parts. Furthermore, it is a requirement for the aft arrangement that the pick-up gear can be released manually by one man only. At the forward end, the pick-up gear and the towing pennant are made optional, but there is to be a strong point, a fairlead and a chafing chain.

The towing components need to have a working strength of at least 1,000 kN (112.4 short tons) for tankers between 20,000 and 50,000 tonnes deadweight, and of at least 2,000 kN (224.8 short tons) for vessels of greater tonnage. Working strength is defined as one half ultimate strength. The strength should be sufficient for all relevant angles of the towline, including a 90° pull to either side, and a 30° vertical pull downwards.

The towing pennant is required to have a length of at least twice the lightest seagoing ballast freeboard at the fairlead, plus 50 meters. The requirements for the chafing gear allow for different designs, but if a chain is used, it should be fixed to the strong point and reach at least three meters beyond the fairlead.

⁵ [http://www.imo.org/en/KnowledgeCentre/IndexofIMOResolutions/Maritime-Safety-Committee-\(MSC\)/Documents/MSC.35\(63\).pdf](http://www.imo.org/en/KnowledgeCentre/IndexofIMOResolutions/Maritime-Safety-Committee-(MSC)/Documents/MSC.35(63).pdf)

Fairleads should have an opening large enough to pass the largest portion of the chafing gear, towing pennant or towing line. The fairlead should give adequate support for the towing pennant during towing operation which means bending 90° to port and to starboard side and 30° vertical downwards. The bending ratio (towing pennant bearing surface diameter to towing pennant diameter) should be not less than 7 to 1.

The fairlead should be located as close as possible to the deck and, in any case, in such a position that the chafing chain is approximately parallel to the deck when it is under strain between the strongpoint and the fairlead.

Before abandoning vessel, the crew is expected to drop the pick-up gear overboard at the stern of the vessel. Some manufacturers use only one buoy on the pick-up rope, others use two, claiming that it is much easier to get hold of a rope between two buoys, than the buoy itself. The buoys should be fitted with a light to facilitate detection at night. While the forward gear is installed in the vessel's centerline, the aft gear is often installed off center, where space is available. The gear is therefore not meant for long tows, only emergency use. Some owners have preferred to install the gear under deck, where it is better protected.

4.2 SOLAS

Through an amendment,⁶ SOLAS incorporates the recommendation made in Resolution A.535(13) as part of the convention, as follows:

Emergency towing arrangements shall be fitted at both ends on board every tanker of not less than 20,000 tons' deadweight.

For tankers constructed on or after 1 July 2002:

The arrangements shall, at all times, be capable of rapid deployment in the absence of main power on the ship to be towed and easy connection to the towing ship. At least one of the emergency towing arrangements shall be pre-rigged ready for rapid deployment...

...Emergency towing arrangements at both ends shall be of adequate strength taking into account the size and deadweight of the ship, and the expected forces during bad weather conditions. The design and construction and prototype testing of emergency towing arrangements shall be approved by the Administration, based on the Guidelines developed by the Organization.*

** Refer to the Guidelines on emergency towing arrangements for tankers, adopted by the Maritime Safety Committee by resolution MSC.35(63), as amended.*

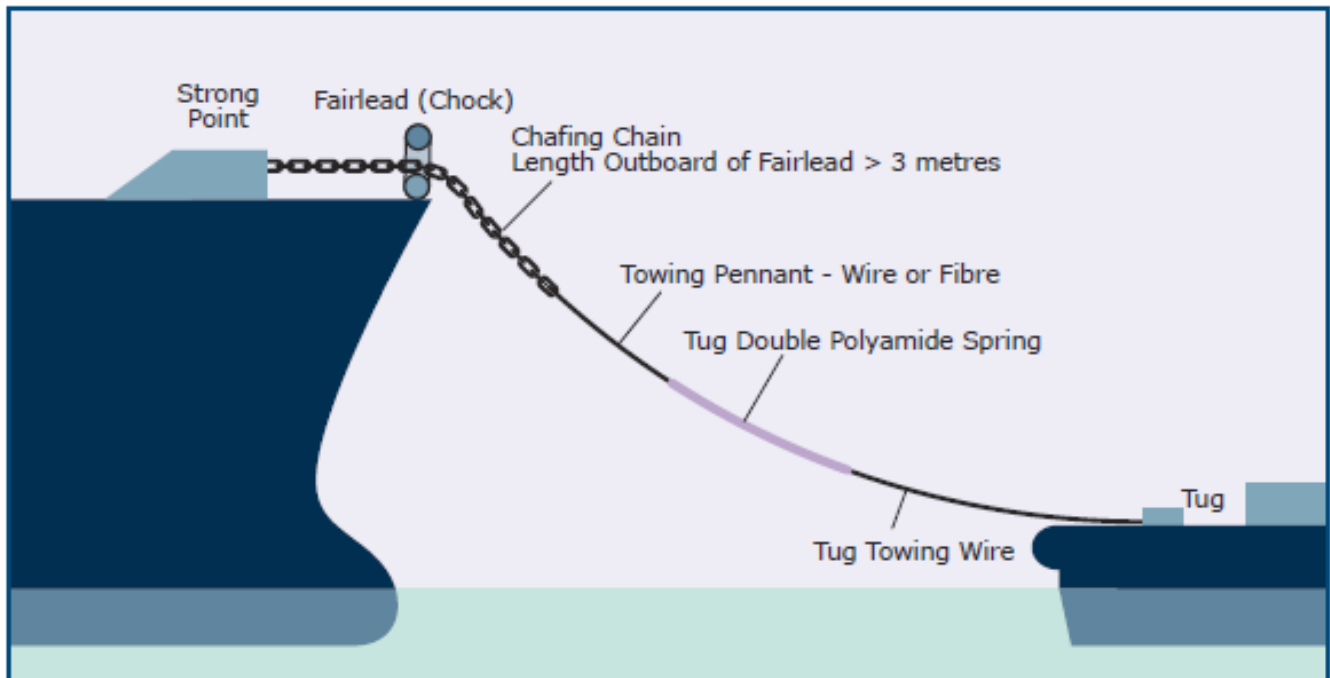
⁶ The Annex Amendments to SOLAS 1974, As Amended, Chapter II-1 Construction – Structure, Subdivision and Stability, Machinery and Electrical Installations, “Regulation 3-4 Emergency towing arrangements and procedures”),

Illustrations of towing arrangement and required gear Per IMO/SOLAS

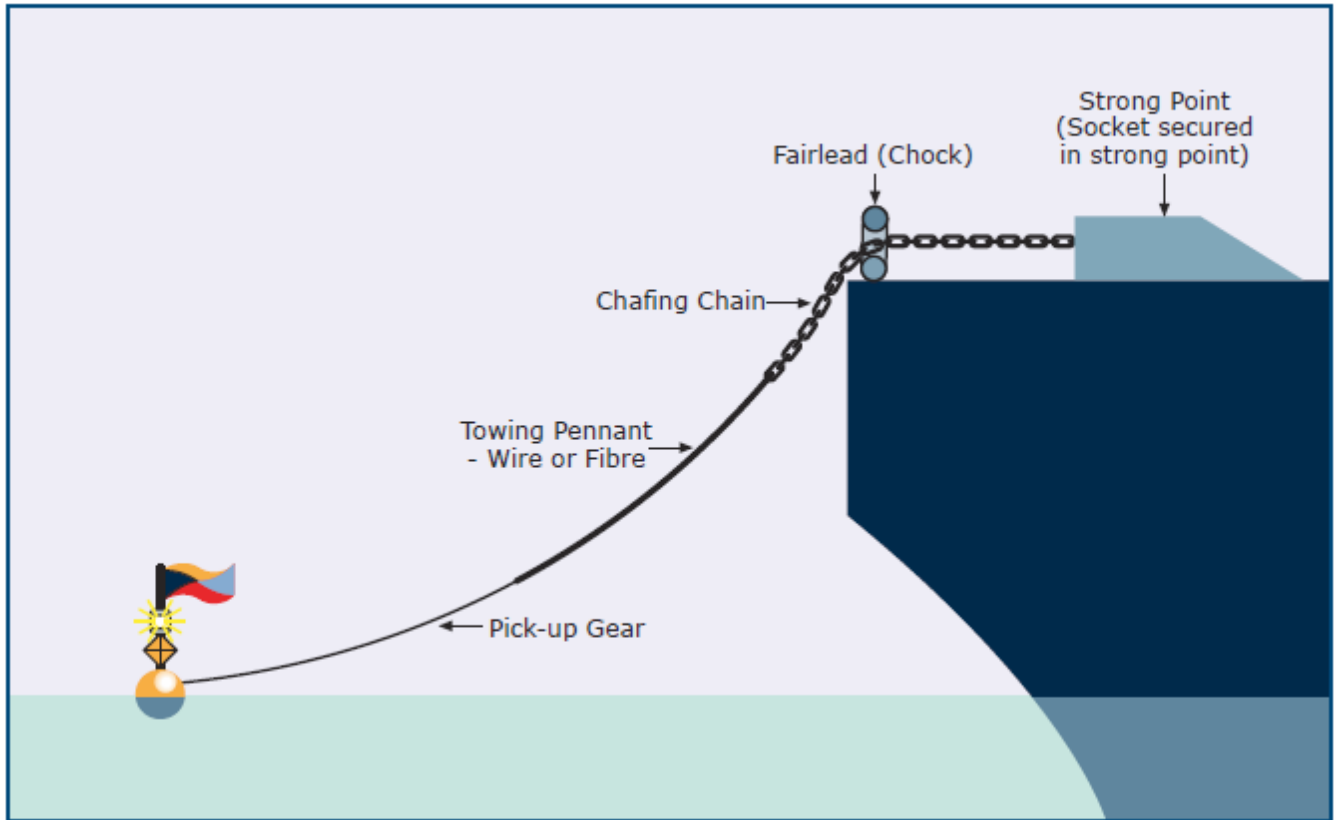
Required gear

Component	Forward	Aft
Towing pennant	Optional	Required
Pick-up gear	Optional	Required
Chafing gear	Required	Dependent on design
Fairlead	Required	Required
Strong point	Required	Required
Roller pedestal lead	Required	Dependent on design

Emergency Towing Arrangements



Typical Arrangement Forward End



Typical Arrangement Aft End

5. Conclusion

The specifications under IMO Resolution A.535(13) Recommendation on Emergency Towing Requirements for Tankers and IMO Resolution MSC.35(63) Guidelines for Emergency Towing Arrangements on Tankers are non-descriptive: the resolutions do not call out specific requirements for the components of the tow package but relates them back to a single safe working load of one-half (1/2) the ultimate strength (BS) of the towing connection or 224.5 short tons and a towline length of twice the lightest sea going ballast freeboard plus 164 feet for the current fleet of TAPS tankers.

Other than specifying the strength and radius requirements for the chocks and fairleads aboard the tanker and a length of chain if used for chaffing gear, the resolution does not specify any particular retrieval gear (float line and buoy) used to deploy and connect the system to the towing tug.

SOLAS, OCIMF, 33 CFR Chapter I, USCG NVIC 8-89 and 33 CFR 155.235 specifications directly mimic or refer to the IMO requirements, with the exception that SOLAS requirements came into effect for tankers constructed on or after 1 July 2002.

Specific package components, strength requirements, and operating area for the emergency towing package are only identified in the State of Alaska Administrative codes 18 AAC 75.027 (f), and 18 AAC

75.990 (96) (A-D). These are highly prescriptive, and include specific line lengths. It also includes retrieval gear.

Interestingly, the Prince William Sound Tanker Oil Discharge Prevention and Contingency Plan – February 2017 Edition, Part 2, Section 2.1.7 Emergency Tow Program [18 AAC 75.027(f)] also states: “Each primary escort vessel to be fitted with towing equipment designed for rapid deployment to the tank vessel. The nominal breaking strength of the towlines must meet or exceed the requirements of the PWS Towing Package, and is at least twice the maximum bollard pull of the escort vessel.”

Since the specifications for the 2 ¼” Extra Improved Plow Steel (XIPS) Preformed Galvanized tow wire of the PWS package state that the breaking strength (BS) is 231 tons with a working strength (SWL) of 115.8 short tons, the package does not meet the guidelines of the IMO resolution of a (BS) of 449.6 short tons (SWL) 224.5 short tons.

In conclusion, the PWS emergency tow system does not satisfy the C-Plan, VERP or USCG requirement of “Meets or exceeds IMO and ADEC regulations and USCG standards for such equipment.” Specifically, the PWS Emergency tow package has significantly less strength, (SWL) 115.8 short tons as opposed to the IMO (SWL) of 224.5 short tons, although the PWS emergency tow system guidelines provide significantly more details of the ancillary rigging used to deploy the system. Additionally, the TAPS tanker operators are required under both 18 AAC 75.027 (f) / 18 AAC 75.990 (96) (A-D) and the Prince William Sound Tanker Oil Discharge Prevention and Contingency Plan Part 2. (Feb 2017) to carry the PWS equipment in addition to conducting four towing drills annually.

REFERENCES

Alaska Department of Environmental Conservation Approved Contingency Plans

<http://dec.alaska.gov/Applications/SPAR/PublicMVC/IPP/ApprovedCPlans>

Alaska Emergency Towing System Procedures Manual (January 2014) Version 004

<https://dec.alaska.gov/spar/ppr/ets/documents/ETS%20V4%2001152014.%20non%20press.pdf>

Chevron Shipping Company LLC Oil Discharge Prevention and Contingency Plan for Prince William Sound Renewal Application of ADEC Plan Number 07-CP-4004

<http://dec.alaska.gov/Applications/SPAR/PublicMVC/IPP/ApprovedCPlans>

Code of Federal Regulations 33 CFR 155.235 - Emergency towing capability for oil tankers.

<https://www.gpo.gov/fdsys/pkg/CFR-2002-title33-vol2/pdf/CFR-2002-title33-vol2-sec155-235.pdf>

International Maritime Organization Resolution A.535(13) Recommendation on Emergency Towing Requirements for Tankers (Adopted on 17 November 1983)

<http://www4.shmtu.edu.cn/imrc/wp-content/uploads/2015/03/A.53513.pdf>

International Maritime Organization Resolution MSC.35(63) Adoption of Guidelines for Emergency Towing Arrangements on Tanker (Adopted On 20 May 1994)

[http://www.imo.org/en/KnowledgeCentre/IndexofIMOResolutions/Maritime-Safety-Committee-\(MSC\)/Documents/MSC.35\(63\).pdf](http://www.imo.org/en/KnowledgeCentre/IndexofIMOResolutions/Maritime-Safety-Committee-(MSC)/Documents/MSC.35(63).pdf)

OCIMF Mooring Equipment Guidelines 3rd Edition, Joe Megeed (Sep 24, 2008)

Polar Tankers Vessel Response Plan – Revision 47-W November 20, 2015:

<http://dec.alaska.gov/Applications/SPAR/PublicMVC/IPP/ApprovedCPlans>

SeaRiver Maritime Inc. Emergency Response Plan Core Manual – Sect. 900 Lightering and Salvage Rev. 1/25/16 (Part 906 EMERGENCY / OCEAN TOWING)

<http://dec.alaska.gov/Applications/SPAR/PublicMVC/IPP/ApprovedCPlans>

SOLAS Amendments to The International Convention for the Safety of Life At Sea, 1974, As Amended

<http://www.marine.gov.my/jlm/pic/article/service/notice/NPM/2010/MSN052010.pdf>

Tesoro Alaska Company Cook Inlet Vessel Oil Discharge Prevention and Contingency Plan, ADEC Plan #: 14-CP-2039;

<http://dec.alaska.gov/Applications/SPAR/PublicMVC/IPP/ApprovedCPlans>

USCG NAVIC 8-89 Recommendations Concerning Emergency Towing of Tankers (8 Jan 1996)

<https://www.uscg.mil/hq/cg5/nvic/pdf/1989/n8-89.pdf>

Vessel Escort & Response Plan (April 2013) Prince William Sound Tanker Owners/Operators