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NAVIGATION AND VESSEL INSPECTION CIRCULAR NO. 1-81, CHANGE 1 INCLUDED
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Subj: Guidance for Enforcement of the Requirements of the Port and Tanker Safety Act of 1978 (PTSA) Pertaining to SBT, CET, COW, IGS, Steering Gear, and Navigation Equipment for Tank Vessels

1. PURPOSE. The purpose of this NVC and its enclosures is to provide guidance and information pertaining to:

   a. The requirements for Segregated Ballast Tanks (SBT), Dedicated Clean Ballast Tanks (CET), a Crude Oil Washing System (COW), an Inert Gas System (lOS), the Improved Steering Gear Standards, and Navigation Equipment mandated by the PTSA;

   b. The relationship between the newly developed international standards (the Protocol of 1978 Relating to the International Convention for the Safety of Life at Sea, 1974 and the Protocol of 1978 Relating to International Convention for the Prevention of Pollution from Ships, 1973), the PTSA, and the implementing regulations which relate to tank vessel equipment and construction standards for improving safety and reducing oil pollution; and

   c. Policy for submission of plans, scheduling and conducting of boardings, examinations, and inspections, and enforcement of the requirements for both United States and foreign flag tank vessels to ensure compliance with the applicable regulations.

2. BACKGROUND.

   a. The IMCO sponsored Tanker Safety and Pollution Prevention (TSPP) Conference of 1978 adopted two important instruments: the Protocol of 1978 Relating to the International Convention for the Safety of Life at Sea, 1974 (SOLAS Protocol) and the Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from ships, 1973 (MARPOL Protocol). Theme two instruments Contain new requirements for SBT, CBT, COW, 105, improved steering gear standards, and navigation equipment. In addition, Resolutions 1 and 2 to the TSPP. Conference recommended target dates for entry into force of the two protocols and invited all Administrations to put the requirements of the two protocol: into effect by the recommended target dates, without waiting for the entry into force of the protocols e The recommended date for entry into force of the SOLAS Protocol was June 1979; the recommended date for the MARPOL Protocol was June 1981. At the time the recommended target dates were developed, it was anticipate that the two protocol would be ratified by the sufficient number of Administrations so that the protocols would enter into force by the recommended target date:. However, the SOLAS Protocol ham just recently been ratified by the sufficient number of Administrations and will enter into force on 1 May 1981. The MARPOL Protocol ham yet to be ratified by the sufficient number of Administrations

b. Section 5 of the PTSA (46 U.S.C. 391a) mandates, as a minimum, tank vessel standards that are consistent with those adopted at the TSPP Conference. The implementation dates mandated by the PTSA parallel the SOLAS and MARPOL Protocol target date: recommended at the TSPP Conference. Therefore, U.S. tank vessels and theme foreign tank vessels that enter U.S. waters for commercial service are required to meet specific equipment and construction standards that are consistent with theme of the SOLAS and MARPOL protocols on the internationally recommended implementation dates, rather than when the standards come into force internationally U.S. tank vessels are required to meet Coast Guard regulations; foreign tank vessels entering U.S. waters for Commercial service are require to meet Coast Guard regulations which generally recognize equivalent international standards.

c. 33 CFR Part 157 ham been recently amended to implement the regulation of the MARPOL Protocol for SBT, CBT, and COW, am well am the corresponding sections of the PTSA. this part, am well am other parts of U. S. regulations, will be further amended to incorporate fully the additional mandate: of the PTSA. 33 CFR Part 164 contains the requirements for the improved steering gear standards and navigation equipment of the SOLAS Protocol and the PTSA. 46 CFR 32.53 ham been amended to include the new applicability requirements of the SOLAS Protocol and the PTSA Pertaining to IGS.

3. DISCUSSION.

a. The requirements for SBT, CBT, COW, IGS, and improved steering gear standards are applicable on 1 June 1981 to U.S. tank vessels and foreign tank vessels that enter U.S. waters for commercial service. With the exception of the electronic relative motion analyzer (ERMA), the navigation equipment was required on tank vessels by 1 June 1979. ERMA is required on tank vessels by 1 July 1982.

b. This NVC deals primarily with the Coast Guard treatment of foreign flag tank vessels calling at U. S. ports. United States flag tank vessels must meet the requirements of the regulations in 33 CFR 157 and 164, and 46 CFR 32.53, as applicable, and should do so within the framework of existing vessel inspection procedures. For foreign flag tank vessels, existing requirements and their enforcement by Coast Guard foreign tank vessel boarding examinations are not affected by these requirements in Title 33 and 46 CFR for SBT, CBT, COW, IGS, improved steering gear standards and ERMA. These new requirements are in addition to those presently in effect and will become part of subsequent foreign tank vessel boarding examinations.

c. Documentation indicating acceptance of SBT, CBT, COW and/or 103 may come from either the government of the vessel's flag state (or authorized representative) or the Coast Guard, at the owner's option. Acceptance documentation from the government of the vessel's flag state may be in the form of an International Oil Pollution Prevention (IOPP) Certificate or an interim certificate or letter indicating compliance with the applicable requirements. An owner/operator of foreign flag tank vessel is encouraged to obtain installation and inspection approval and accompanying acceptance documentation from the government of the vessel's flag state. A foreign tank vessel obtaining Coast Guard acceptance documentation may experience delays in U.S. ports when undergoing the necessary inspections. Specific documentation indicating approval of the improved steering gear standards or the navigation equipment is not required, however, a tank vessel will be examined to verify compliance with the applicable requirements.

d. U.S. and foreign flag tank vessel owners/operators may, and are encouraged to, initiate the necessary equipment acceptance procedures for SBT, CBT, COW, and IGS prior to 1 June 1981.

e. Title 33 U.S.C. 1228 prohibits a tank vessel from operating in U.S. waters or transferring cargo in a port of the U.S. if the vessel is not in compliance with U.S. laws and regulations. Nevertheless, the Coast Guard recognizes that not all foreign flag tank vessels desiring to enter U.S. ports will have the documentation required by 33 CFR Part 157 by 1 June 1981, due to extenuating circumstances, such as shipyard scheduling problem", equipment delivery delays, etc. The OCMI/COTP should consider these factors in allowing a fully loaded entry into a U.S. port on a foreign flag tank vessel's first visit after 1 June 1981. Upon entry, the vessel will be examined to determine its degree of compliance with the regulations. Appropriate enforcement action, including the assessment of civil penalties, may be initiated. Subsequent entry by a tank vessel in partial compliance with the regulations is subject to the close scrutiny of the OCMI/COTP. A tank vessel which shows inadequate evidence towards compliance villa be denied further entry into the U.S. until satisfactory evidence towards compliance can be shown.

4. ACTION.

a. Enclosure (1) is a matrix which provides guidelines regarding Coast -Guard enforcement procedures to ensure that foreign flag tank vessels entering U.S. waters for commercial service comply with the applicable regulations. A tank vessel that has completed the required installations and modifications and has on board acceptance documents issued by the government of the vessel 's flag state or the Coast Guard will routinely be boarded and examined for verification only. Those vessels in partial compliance will be examined as recommended in enclosure (1) to ensure they continue to move towards full compliance within a reasonable time. Appropriate enforcement action may be taken against tank vessels not in full compliance. Tank vessels making no apparent effort to comply or having deficiencies which would seriously affect safety will normally be refused permission to conduct cargo transfer operations, denied further entry into U. S. waters, and/or subjected to civil penalties of up to $25,000 a day.

b. Owners/operators of U. S. flag tank vessels subject to the requirements of 33 CFR 157 and 164 and/or 46 CFR 32.53 should follow the procedures contained in those regulations to ensure compliance. Modifications and alterations made to a tank vessel to bring it into compliance should be treated similar to any other modification in terms of plan submission and approval, inspection scheduling, and the conduct of the inspection. Owners/operators are encouraged to contact the cognizant OCMI at their earliest opportunity to arrange for the inspection.

c. Owners/operators of foreign flag tank vessels who intend to obtain Coast Guard acceptance documentation should ensure that the plans and operating manuals required by 33 CFR 157 arrive at U. S. Coast Guard Headquarters' Vessel Inspection Division (G-MVI) of the Office of Merchant Marine Safety, at least 45 days prior to the vessel's first arrival in a U.S. port on or after 1 June 1981. The proper mailing address is Commandant (G-MVI-2114), USCG Headquarters, Washington, D.C. 20593, Tele: 202-426-4431. To provide sufficient time for the plans to be forwarded to the cognizant OCMI, the owner, operator or agent should notify G-MVI at least 14 days prior to the vessel's arrival at the vessel's specific port of call. It is recommended that the owner, operator or agent contact

the cognizant OCMI as soon as the port of call is known to facilitate scheduling of the necessary inspections. To provide sufficient time for scheduling of the inspections, at least 72 hours notice should be given to the OCMI.

d. G-MVI will review the submitted plans and manuals and inform the submitted by letter if the plans are accepted. Plans that are not accepted will be returned to the submitted with a letter stating the reasons why they were not accepted. The OCMI will not normally conduct the necessary inspections on a tank vessel that has an incomplete installation or when the accepted plans are not available locally.

e. In addition to undergoing the usual tank vessel boarding examination, a foreign flag tank vessel obtaining Coast Guard acceptance documentation will undergo an inspection, as necessary, to verify that the equipment and/or construction standard is in accordance with the Coast Guard accepted plans. In addition, when COW is installed for compliance with the requirements of 33 CFR 157, the inspection required in 33 CFR 157.140 will also be conducted.

f. A foreign flag tank vessel that has plan review and a survey conducted by a classification society and that desires to obtain Coast Guard acceptance documentation is still required to undergo Coast Guard plan review and inspection. However, the classification society survey report will be utilized by the OCMI in determining the scope of inspection to be conducted.

g. A foreign flag tank vessel with, or in the process of obtaining, acceptance documentation from the government of the vessel's flag state will undergo a boarding examination to ensure compliance with the applicable requirements. As shown in enclosure (1), the extent of the examination will depend upon the vessel's degree of compliance.

h. When a U.S. tank vessel is subject to and complies with the SBT, CBT and COW requirements in 33 CFR 157.l0c, the vessel's Certificate of Inspection will be endorsed with the following appropriate select wording:

This tank vessel is equipped with segregated ballast tanks/ dedicated clean ballast tanks/a crude oil washing system and complies with the requirements of 33 CFR Part 157.l0c to operate as a "Crude Oil Carrier" I "Product Carrier" I "Crude Oil/Product Carrier."

i. A U.S. tank vessel that is not in compliance with the applicable requirements will be treated within the framework of existing inspection procedures consistent with those of enclosure (1).

j. For a foreign flag tank vessel, 46 USC 3711 requires a Certificate of Compliance to be issued to a vessel found to be in compliance with the applicable requirements. A Tank Vessel Examination Letter (Form GG 8405-1), or in the case of a chemical/product tanker a Letter of Compliance, is used as the Certificate of Compliance. When a foreign flag tank vessel is subject to and complies with 33 CFR 157.l0c, the -Certificate of Compliance will be endorsed with the following appropriate select wording:

This tank vessel is equipped with segregated ballast tanks/ dedicated clean ballast tanks/a crude oil washing system and complies with the requirements of 33 CFR Part 157.l0c to operate as a "Crude Oil Carrier" / "Product Carrier" / "Crude Oil/Product Carrier."

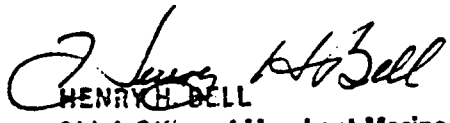
k. A foreign flag tank vessel that is not in compliance with the applicable requirements will have the deficiencies listed on the Tank Vessel Examination Letter along with an agreed upon schedule which should provide the vessel with a reasonable time to comply.

1. The Coast Guard's computerized Marine safety Information System (MSIS) will be used to record, keep track of, and follow-up on tank vessel examinations. Following an examination, appropriate entries will be made in the MSIS.

m. Specific documentation verifying that the personnel conducting COW operations comply with the personnel requirements of 33 CFR 157.152 and 157.154 is not required. However, evidence of completion of a COW training program or a document indicating compliance with these requirements is encouraged and will be utilized to assist the OCMI in determining compliance.

n. Enclosure (2) provides detailed information and guidance regarding implementation of the requirements for SBT, CBT, COW, IGS, and improved steering gear standards.

o. Enclosure (3) contains recommended safety precautions to be taken when conducting the COW inspections under 33 CFR 157.140. Particular emphasis is placed on safety precautions for cargo tank entry.



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End: (1) Table entitled "Guidelines Regarding Coast Guard Enforcement Procedures for Foreign Flag Tank Vessels"
(2) "Updated Regulatory Guide for the Review and Inspection of the New Tank Vessel Standards" dated February 1981.
(3) Guidelines regarding procedures and safety precautions for conducting the crude oil washing visual tank inspection of 33 CFR 157.140.

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Ce: Baltimore (75); San Francisco, Mobile, Guam, Pittsburgh, Providence, Valdez AK, Norfolk (50); Galveston (30); Cleveland, Portland OR, Sturgeon Bay, Fort Arthur (25); San Diego, Savannah, Buffalo, Corpus Christi (20); Tampa, Milwaukee, Louisville, Detroit, Toledo, Nashville, Anchorage (15); Portland ME, Duluth, Charleston, Huntington, Minneapolis-St Paul (Dubuque), San Juan (10); Juneau, Cincinnati, Memphis, Wilmington, Paducan, Albany (5) extra

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List CG-12

GUIDELINES REGARDING COAST GUARD ENFORCEMENT PROCEDURES FOR FOREIGN FLAG TANK VESSELS

Authority Issuing Approval Documents	Surveyor/ Inspector	Installation Complete Inspection/Documentation Complete	Installation Complete Inspection/Documentation Incomplete	Installation Incomplete Inspection/Documentation Incomplete	No Evidence of Apparent Action Towards Compliance
Government of the vessels Flag State or authorized representative	Government of the vessel's Flag State or authorized representative	Routine verification during boarding examination	If only COW arrival ballast inspection of 157.140(b) is incomplete, treat as complete. Otherwise conduct examinations as necessary. Reasonable time should be given to allow flag state to complete inspection and issue documentation. Appropriate enforcement action may be taken. See Note 1.	Conduct examination to determine degree of compliance and ability of vessel to conduct safe operations. List deficiencies, restrict vessels operations, and/or initiate penalty procedures as appropriate. See Note 1. If evidence of intent to comply is provided (scheduled shipyard, ordered machinery, etc.) the vessel may be considered in this category	Refuse entry and/or restrict operations and/or initiate penalty procedures and/ or other action as determined by cognizant OCMI/COTP.
U. S. Coast Guard	U. S. Coast Guard	Routine verification during boarding examination	Coast Guard will conduct inspection and issue documentation upon completion. Vessels not passing/completing inspection are subject to enforcement action. See Note 2.	Coast Guard will not conduct inspection until installation is complete. Otherwise same as above	Same as above
	Classification Society	Not Applicable (Classification Society documentation is not an acceptable approval document, therefore vessel documentation will not be complete)	CG inspectors may utilize surveyor's report to assist in conducting inspection. Degree of reliance on survey report to be determined by cognizant OCMI/COTP. Otherwise same as above.	Same as above	Same as above

NOTES: 1. When conducting examinations, the degree of thoroughness and the handling of deficiencies shall be at OCMI/COTP descretion. Deficiencies may be required to be corrected on the spot or within a specified time, or, if serious, may require shutting down transfer operations restricting vessel movement, initiating penalty procedures, and/or refusing port entry.

2. If only the COW arrival ballast inspection of 157.140(b) is incomplete, the vessel should not be refused subsequent port entries until sufficient time has been given to allow the vessel to complete this inspection.

UPDATED REGULATORY GUIDE FOR THE REVIEW AND INSPECTION OF THE NEW TANK VESSEL STANDARDS

February 1981

This document contains background information and interpretive guidance relating to the new tank vessel regulations issued in the 19 November 1979 and 30 June 1980 Federal Registers. Its purpose is to provide additional information explaining the regulations and assisting with implementation of the regulations. This document does NOT contain the applicable regulations and its contents are NOT to be considered as regulations.

PURPOSE: The purpose of this document is to provide background information and interpretive guidance for the review and inspection of the Dew design and equipment standards which are aimed at reducing oil pollution from and improving the safety or tank vessels of 20,000 DWT and above. This document is expected to make implementation of the regulations uniform and easier for those who must deal with these standards. The new design and equipment standards addressed in this document are segregated ballast tanks, dedicated clean ballast tanks, crude oil washing systems, inert gas systems, and improved steering gear standards. These standards are mandated by Subsection 7 of Section 5 or the Port and Tanker Safety Act of 1978 (Public Law 95-~7~). The federal regulations implementing these standards were issued in the Federal Register on November 19, 1979 and June 30, 1980. The regulations for segregated ballast tanks, dedicated clean ballast tanks, and crude oil washing systems are contained in Part 157 of Title 33 of the Code of Federal Regulations. The regulations for inert gas systems are contained in Part 32 of Title 46 of the Code of Federal Regulations. The regulations for improved steering gear standards are contained in Part 164 of Title 33 of the Code of Federal Regulations. This document does NOT provide the applicable regulations contained in the referenced Titles and Parts of the Code of Federal Regulations. This document only provides comments and interpretations of the applicable regulations where considered necessary at this time. Another source of information relating to these standards is contained in the preambles to the regulations of the November 19, 1979 and June 30, 1980 Federal Registers.

BACKGROUND: During the winter of 1976/1977 several tanker casualties occurred in or near U.S. waters which demonstrated the need for a global effort to improve both the level of safety and degree of pollution prevention from oil tankers. This series of casualties resulted in great public concern within the United States over the risks associated with the marine transportation of oil. Demands for the federal government to take additional steps to improve tanker safety and pollution prevention were evident.

Both the Executive Branch of the federal government and the Congress responded to these demands. An Interagency Oil Pollution Task Force was established to review the problem and make recommendations. As a result, on which 17, 1977, President Carter announced a series of desired federal government actions to deal with the problem of marine oil pollution caused by oil tankers.

These Presidential Initiatives included a diverse but interrelated group of measures designed to reduce the risks associated with the marine transportation of oil. These measures, both international and domestic in nature and scope, were aimed toward achieving a number of objectives. including reform of ship construction and equipment standards for all U. S. oil tankers of 20,000 DWT and above and foreign oil tankers of 20,000 DWT and above that enter U. S. ports.

Specifically, the Secretary of Transportation was directed to develop new rules within 60 days which would include:

- Double bottoms on all new tankers.
- Segregated ballast on all tankers.
- Inert gas systems on all tankers.
- Backup radar and collision avoidance equipment on all tankers.
- Improved emergency steering gear standards for all tankers.
- Where technological improvements and alternative: could be shown to achieve the same degree of safety or protection against pollution, the rules could allow their use.

In response to these Presidential Initiatives the Coast Guard published proposed rules in the May 16, 1977 Issue of the Federal Register (42 CFR 24868) to incorporate the recommended changes to tanker construction and equipment standards. Over 200 written comments were received in response to the proposals, most of which indicated support for the more stringent tanker standards.

At the same time the United States proposed changes to the international standards for tanker construction and equipment and the international system of inspection and certification of tankers. These

proposals, together with various alternatives, were considered at the International Conference on Tanker Safety and Pollution Prevention (TSPP) held under the auspices of the Intergovernmental Maritime Consultative Organization (IMCO) in London, February 6-17, 1978. IMCO is the specialized agency of the United Nations which considers maritime safety and pollution prevention matters. The Coast Guard decided to wait until the TSPP Conference was concluded before taking any further action on the proposals made on May 16, 1977.

The TSPP Conference adopted two important instruments: the Protocol of 1978 Relating to the International Convention for the Safety of Life at Sea, 1974, and the Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships, These two instruments contained new standards for segregated ballast tanks (SET), dedicated clean ballast tanks (CBT), crude oil washing (COW) system:, inert gas systems (108), improved steering gear standards, and dual radar for tank vessels. These standards adopted by the TSPP Conference are at least equivalent and in some cases are more stringent than the Presidential Initiatives.

In the spring of 1978, the Coast Guard began work on developing regulatory amendments which would withdraw the proposed rules for double bottoms, SET, IGS, and improved steering gear standards published in the Federal Register of May 16, 1977 and in their place, substitute the related standards developed at the TSPP Conference. The standards developed at the TSPP Conference for dual radar were the same as those proposed on May 16 and were, therefore, issued as final rules in the July 24, 1978 Federal Register (43 CFR 32112).

On October 17, 1978 the Port and Tanker Safety Act of 1978 (PTSA) became law, amending the Ports and Waterways Safety Act of 1973, and mandated, as a minimum, the tanker construction and equipment standards developed at the TSPP Conference. The PTSA became the new authority for issuing the regulations which implement the TSPP standards.

The Coast Guard issued these new proposed regulations in the Federal Register on February 12, 1979 and, at the same time, withdrew the proposals for double bottom:, SET, IGS, and improved steering gear standards which were published in the May 16, 1977 Federal Register. Interested parties were given 60 days to submit comments concerning this action to the Coast Guard. A number of minor changes were made to the detailed requirements for COW and CET based on the comments received. Interim final rules for SET, CBT, and COW and final rules for 103 and improved steering gear standards were published in the Federal Register on November 19, 1979 (411 CFR 66500). Interim final rules for SET, CET, and COW were issued because of changes made to the assignment of responsibility for various operating requirements. Final rules for these items were issued on June 30, 1980 with only a few minor editorial modifications. A Regulatory Analysis and Environmental Impact Statement was prepared in support of all of these regulations.

Additional rules mandated by the PTSA which will affect tank vessel construction that were not included in the November 19, 1979 or June 30, 1980 Federal Registers, but have been recently implemented or will be implemented in the near future, include:

1. SBT or CBT on tank vessels engaged in the transfer of oil from the Outer Continental Shelf. Proposed regulations were issued on May 1, 1980 (45 FR 29087). Final regulations were issued on December 15, 1980 (45 FR 82248).

2. SBT, CDT, or COW on existing tank vessels between 20,000-40,000 DWT that are 15 years or older by January 1, 1986. A cost/benefit analysis is currently underway.

3. Exemption from the SBT, OST, and COW requirements for U. S. tank vessels in specific trades between U. S. ports that discharge ballast and oily water mixtures to a reception facility. Proposed regulations were issued on May 22, 1980 (45 FR 3L;306). Final regulations were issued on January 15, 1981 (46 FR 3510).

EQUIPMENT AND CONSTRUCTION STANDARDS - DESCRIPTION:

Prior to describing the new design standards and their impact on oil pollution, it is necessary to understand the causes of oil pollution and the normal tank vessel operations which result in this pollution. Tank vessels contribute to oil pollution of the marine environment in two ways: accidents and operations.

Accidental oil pollution is caused by collisions, rammings, groundings, and explosions and accounts for about 15 percent or the quantity of oil pollution from tank vessels. Since these incidents usually occur in a dramatic, concentrated manner, accidental oil pollution receives significant public attention. Protectively located segregated ballast tanks, inert gas systems, and improved steering gear standards are aimed at reducing accidental oil pollution and improving tank vessel safety.

Operational oil pollution from tank vessels occurs from ballasting operations, tank cleaning, and sludge removal prior to shipyard entry. It is estimated that 85 percent of all oil outflows from tank vessels results from operational procedures. Segregated ballast tanks, dedicated clean ballast tanks, and crude oil washing systems are aimed at reducing operational oil pollution. The following is a brief discussion on the three causes of operational oil pollution:

1. Ballasting operations. On a normal tank vessel, water is introduced into cargo tanks that previously carried oil to ballast the vessel so that it can efficiently and safely proceed to a loading port. During this ballast voyage the oil water mixture is generally processed by a technique called "load on top." This technique is simply to let the oil separate from the water naturally. The oil rises to the top to the water which significantly reduces the amount of oil mixed in with the water (oil/water emulsions). The "clean" water is then discharged overboard and the oil is retained on board with the next load of cargo "loaded on top." As can be expected, some of the oil/water emulsions are discharged overboard, resulting in operational oil pollution.

2. Tank cleaning. Cargo tanks are cleaned for two primary reasons. The first is to optimize the cargo carrying capacity of the cargo tank. During a normal voyage, sludge settles out of the oil and clings to the tank sides. Over a period of time this builds up to such a thickness that the tank is not carrying its maximum capacity of cargo. The second reason for cleaning cargo tanks is to ensure cargo purity. This is usually more prevalent on product carriers.

   Tank washing with high pressure water jets knocks this residue off the tank sides and the resulting oily water mixture is processed by "load on top" as described above. Normally 25 percent of the vessel's cargo tanks are cleaned in this manner on each voyage. When tank cleaning is conducted to maintain cargo purity, the number of tanks cleaned and the frequency of cleaning will be increased.

3. Sludge removal prior to shipyard entry. Removing sludge prior to shipyard entry is a somewhat different exercise than the tank cleaning conducted to increase vessel cargo carrying efficiency. Sludge which is not removed during the tank washing settles to the bottom of the tank and becomes a thick dense mass of extremely heavy hydrocarbon and sand. Normally, prior to shipyard entry, this sludge must be removed by hand. The sludge is "hand Bucked" and lifted to the deck in barrels or buckets. Much of the sludge is ultimately disposed of at sea.

The following is a description of the standards:

A. SEGREGATED BALLAST TANKS Segregated ballast tanks (SET) are ballast tanks that are permanently allocated to the carriage of ballast water and are completely separated from cargo oil and fuel oil systems. The entire SET system (tanks, piping, pumps, etc.) must be independent of the cargo oil and fuel oil system. When SET is required by 33 CFR Part 157 or chosen by the shipowner or operator as an option for compliance with 33 CFR Part 157, the segregated ballast capacity must be sufficient to fully immerse the vessel's propeller and also enable the tank vessel to meet specific minimum draft and trim requirements in any ballast condition at any stage of a ballast voyage. The intent of these requirements is to provide the tank vessel with enough segregated ballast capacity that the vessel may operate safely on ballast voyages without putting ballast water ~n oil tanks except during unusually severe weather or other specific operational conditions. In this manner, operational oil pollution that results from the ballasting and deballasting of cargo tanks is substantially reduced.

B. PROTECTIVELY LOCATED SEGREGATED BALLAST TANKS - Protectively located segregated ballast tanks (FL/SET) are ballast tanks as described above that are located within the cargo tank length of a tank vessel, outboard of or below the cargo tanks. Protectively located segregated ballast tanks are usually wing tanks (side tanks) or double bottom tanks. Wing tanks reduce accidental oil pollution and the number of explosions that may result from collisions and rankings, while double bottoms provide similar protection from grounding!. when FL/SET is required, they must provide a specific minim amount of protection for the cargo tanks. There are two separate minim standards for FL/SET in 33 CFR Part 157. Tank vessels in Categories El, 32, or B3 of TABLES ONE, TWO, or THREE that are required to have FL/SET Rust meet the FL/SET standards in 33 CFR 157.09(d). The FL/SET standard in 33 CFR 157.09(d) was developed by the Coast Guard in 1975 and is required on certain tank vessels of 70,000 DWT and above. Tank vessels in Categories Al, £2, or £3 of the TABLES that are required to have FL/SET Rust fleet the FL/SET standards in Appendix C of 33 CFR Part 157. The PLISET standard in Appendix C of 33 CFR Part 157 was developed by IMCO at the TSPP Conference and is required on certain crude oil carriers of 20,000 DWT and above, and product carriers of 30,000 DWT and above. This new standard for FL/SET in Appendix C of 33 CFR Part 157 was established after a acre thorough examination of the subject, its effect on tank vessel design, and its anticipated effect on reducing accidental oil pollution.

C. DEDICATED CLEAN BALLAST TANKS - Dedicated clean ballast tanks (CBT) are cargo tanks that are dedicated solely to the carriage of clean ballast and which no longer carry cargo. The associated pumps and piping system for CBT are allowed to be common with the cargo piping system and therefore, require flushing each time prior to the handling of clean ballast. The CBT concept is an operational measure, rather than a design feature like SET, which, if operated correctly, will achieve about the same effect as SET in reducing operational oil pollution that results from ballasting and deballasting. On a product carrier, where tank cleaning operations often take place after each cargo discharge to ensure the purity of the next cargo to be loaded, there is a minimum amount of oil clingage in the cargo system and CBT is, there fore, considered to have the urn. effect as SET on the reduction of operational oil pollution due to ballasting and deballasting. In view of this, CBT is accepted as an equivalent alternative to SET Oil product carriers that are already constructed. On crude oil carriers, CBT is not considered to have the same effect as SET or COW on reducing operational oil pollution, but it is allowed as an interim measure before SET or COW are ultimately required on crude oil carriers that are already constructed. This provides a crude oil carrier with an immediate method of reducing oil pollution at very little cost and gives the shipowner or operator additional time to plan and schedule the installation of SET or COW. CDT as an interim measure for crude oil carriers will also help prevent a temporary shortage of crude carriers by allowing a gradual phase in period for retrofitting tank vessels with SET or COW. If

CDT is chosen by the shipowner or operator as an option for compliance with 33 CFR Part 157, the capacity of these tanks must be sufficient to enable the tank vessel to meet the same minimum draft, trim, and propeller immersion requirements of SET. In addition, preferential treatment must be given to selecting wing tanks for CDT.

D. CRUDE OIL WASHING SYSTEM - Crude oil washing (COW) is a tank cleaning procedure that utilizes crude oil as the washing medium. Crude oil is discharged through fixed tank washing machines positioned so that oil is sprayed on internal tank bulkheads and structures to remove the oil residue that would normally remain after cargo discharge. In this regard, crude oil washing is conducted in the same manner as water washing or "butterworthing" except crude oil is used rather that seawater. The spray action of the crude oil and the subsequent rundown place the oil residue remaining on the tank surfaces back into suspension so that the combination of remaining cargo and residue can be collected and discharged ashore through installed piping. Due to the solvent action of the crude oil, the amount of oil and sludge recovered and pumped ashore is increased significantly over that which is removed by other washing techniques. COW provides an economic benefit because of this increased amount of cargo that is discharged ashore from a tank that is crude oil washed. The potential for operational oil pollution is reduced because less oil and sludge remain in the empty tanks to be mixed with ballast or tank cleaning water which are subsequently discharged. In addition, COW is effective in reducing sludge build-up in cargo tanks, thereby reducing the time needed to prepare for shipyard entry and reducing oil pollution that results from sludge removal prior to shipyard entry. COW also reduces oil pollution that results from normal tank cleaning and periodic sludge removal. SET has virtually no effect on reducing these two causes of operational oil pollution. In view of this, COW is considered to be at least as effective as SET in reducing operational oil pollution and therefore, is allowed as an equivalent alternative to SET on crude oil carriers that are already constructed.

A crude oil washing machine is simply a rotating single or multi-nozzle which is mechanically driven through a gearing arrangement. The mass and pressure of the oil passing through the drive' unit to the nozzle(s) is used to provide the energy to operate the mechanism. The machine my be the deck mounted or submerged type. On a tank vessel equipped with deck mounted k machines, openings are provided in the main deck for insertion of the rotating nozzle section into the cargo tanks Bolted flanged connections are used to permanently hold the machines in the tanks. The drive unit portion of the washing machines remains extended above the main deck. Some deck mounted machines are designed to allow separation of the drive unit from the rotating nozzle section. The advantages of this arrangement are that one drive unit is not required for every washing machine and the drive units may be removed and stowed when not in use.

Crude oil washing machines may be programmable or non-programmable. The operator can manually change the setting of the nozzle sweep angle during the various stages of the tank cleaning operation on programmable machines. The nozzle sweep angle can normally be observed by the physical movement of an indicator as well as listening to the sound of the spray pattern. Non-programmable machines are normally the submerged type washing machines. They are installed with one fixed nozzle sweep angle which cannot be changed. Operation of non-programmable machines can usually be determined by listening to the sound of the nozzle spray pattern, however, other methods may be used (indicators or verification during a ballast voyage). Proper operation of the washing machine is obviously more difficult to establish by sound pattern alone.

Crude oil washing is normally accomplished either by the multi-stage or the single-stage method. The choice of method is governed by the discharge procedure, tank washing sequence, and the type of tank washing machines. The number of cycles a crude oil washing machine revolves is based on tank condition regarding sediment build-up, grade of crude oil, and the speed of revolution of the machine.

1. Multi-stage method. The multi-stage method of crude oil washing involves washing the upper portion of the tank (topwashing) in stages at any convenient time as the oil level drops and then finally washing the tank bottom (bottom washing) as an independent operation with a slightly different procedure. The multi-stage method is most efficiently conducted with programmable deck mounted tank washing machines. There is no objection to oil jets striking the cargo surface while washing the upper section of the tank. In fact, the induced wave action produced by the oil jet hitting the oil surface may even increase the cleaning effect of the crude oil in shadow areas.

   Topwashing is usually accomplished using the maximum number of deck mounted machines which can be effectively operated simultaneously. It is normally started when about one third of the tank volume has been discharged. When this ullage has been reached, the deck mounted machines are operated and allowed to transverse through the top part of the cargo tank. The number of stages is dependent upon the discharge rate of the oil in the cargo tank being washed.

   Bottom washing normally commences when there is about one meter of cargo remaining in the tank. Towards the end, however, the tank bottom must be free of standing oil to achieve best cleaning results in the tank bottom. The number of machines used during the bottom washing phase is, therefore, limited by the available draining capacity of the tank vessel. Submerged machines, in addition to deck mounted machines, may be used when conducting bottom washing.

2. Single stage method. The single state method is similar to the conventional water washing method. Either programmable or non-programmable tank washing machines may be used with this method. The tank is first emptied of the bulk of the cargo, and if preferred, drained. Continuous stripping is not as critical as it is in water washing because the residue, once redispersed in the oil, remain is suspension for removal from the tank. However, towards the end of the washing cycle when cleaning the tank bottom, it is necessary, as in topwashing, to keep the tank bottom free of standing oil to obtain the best cleaning results of the tank bottom. The number of fixed tank washing machines which can be used is once again limited by the available draining capacity of the tank vessel.

Crude oil washing may be accomplished utilizing one of the following methods for supplying the wash oil to the washing machines:

1. Bleed-off method. The wash oil is bled off from the discharge of the main cargo pump(s) by a pipeline leading directly to the tank wash line. Obviously, there must be adequate pressure to the individual washing machines to ensure efficient washing. When shore back pressure, by itself, is not high enough, this may be achieved by reducing the number of machines being used, throttling or fully closing one or more of the cargo pump delivery valves, and/or increasing the shore terminal back pressure. The bleed-off method is the most effective way to crude oil wash the tank with the least amount of time spent in port conducting discharge operations.

2. Dedicated pump method using fresh oil. A cargo pump or a separate pump dedicated to supplying oil to the washing machines will be used by this method. This method is usually used when the back pressure cannot be sufficiently increased by the bleed-off method. This method will result in a reduction in the rate of cargo discharge. The selected pump(s) will take suction from a cargo tank and discharge to the tank washing line to ensure a supply of oil to the washing machines at the required operating pressure.

3. Dedicated pump method using recirculated oil. This is a closed cycle recirculation method via the slop tank which usually utilizes eductors during the later stages of crude oil washing when the pressure in the main line is low. Before commencing it is necessary to fill the slop tank with "water free" crude oil. As the washing is conducted oil is supplied into the slop tank to maintain its level and the source of the crude oil washing fluid.

E. INERT GAS SYSTEM - An inert gas system (IGS) is a system that supplies to the cargo tanks a gas or mixture of gases which are so deficient in oxygen content that combustion cannot take place within the cargo tanks. The inert gas is either treated flue gas from a tank vessel's boiler or treated gas from an inert gas generator. This gas is pumped into the cargo tanks to displace the air in the tank that has an oxygen content sufficient to allow combustion. An inerted atmosphere should be maintained in the cargo tanks at all times, except when the tanks are gas free. The safety of the vessel is considerably increased by maintaining this inert atmosphere in the cargo tanks because the risk of an explosion and/or fire in the tanks is significantly reduced. A more detailed description of the IGS and its components is contained in Chapter 15 of Volume II of the Marine Safety Manual (COMDTINST Ml6000.7). The specific requirements for the design and operation of an IGS are contained in 46 CFR Part 32.

The basic requirements apply to crude carriers and petroleum product carriers. Recent international decisions clarified the situation that chemical tankers, when carrying chemicals, need not be provided with inert gas systems complying with Regulation 60 of SOLAS 1974, as amended.

F. IMPROVED STEERING GEAR STANDARDS - Improved steering gear standards for all (new and existing) tank vessels of 10,000 gross tons and above that carry oil or hazardous materials in bulk include:

1. Two remote steering gear control systems operable separately from the navigating bridge.

2. Main steering gear' control in the steering gear compartment.

3. A mans of communication between the navigating bridge and the steering gear compartment.

4. A rudder angle indicator on the navigating bridge and in the steering gear compartment.

5. An audible and visual alarm that activates on the navigating bridge upon loss of power to the remote steering gear control system.

In addition, all tank vessels of 10,000 gross tons and above that carry oil or hazardous materials in bulk and that are in Categories Al, £2, or A3 of the TABLES must have improved steering gear standards that include:

1. Two or more identical steering gear power units.

2. An alternative power supply to the steering gear power units.

3. A means of automatically starting each steering gear power unit when power is restored after a power failure.

4. An alarm that activates on the navigating bridge upon loss of power to a steering gear power unit.

TANK VESSEL REQUIREMENTS: The regulation: in the November 19, 1979 and June 30, 1980 Federal Registers added standards for SBT, CET, COW, and IGS for domestic tank vessels of 209000 DWT and above, and foreign tank vessels of 20,000 DWT and above that enter U. S. waters In addition, the regulations of November 19 added improved steering gear standards for domestic tank vessels of 10,000 gross tons and above and foreign tank vessels of 10,000 gross tons and above that enter U. S. waters. The applicability of these equipment and construction standards for each tank vessel is dependent upon three parameters:

1. The type of trade in which the tank vessel is engaged (crude oil or product).

2. The size of the tank vessel (deadweight or gross tonnage).

3. The date the tank vessel was contracted for, the date the keel was laid, or the date the tank vessel was delivered.

Using these parameters, the following three tables were developed to show which equipment and construction standards are required on each tank vessel and when these standards must be met:

1. TABLE ONE is for U. S. TANK VESSELS IN DOMESTIC TRADE.

2. TABLE TWO is for U. S. TANK VESSELS IN FOREIGN TRADE.

3. TABLE THREE is for FOREIGN TANK VESSELS ENTERING U. S. WATERS FOR COMMERCIAL SERVICE.

These tables combine the requirements for SBT, CBT, COW, 105, and improved steering gear standards that were included in the November 19 and June 30 Federal Registers with the requirements for SET and IGS that existed in 33 CFR Part 157 and 46 CFR Part 32 prior to the amendments of November 19. There were no requirements for CET or COW prior to the amendments of November 19. There are steering gear requirements for U. S. tank vessels that existed prior to the amendments of November 19, but they are not included in the tables.

Regarding the type of trade in which the tank vessel is engaged, crude oil is defined as any liquid hydrocarbon mixture occurring naturally in the earth, whether or not treated to render it suitable for transportation, and includes crude oil from which certain distillate fractions may have been removed or added. Product is defined as any liquid hydrocarbon mixture, except crude oil, petrochemicals, and liquefied gases. Product includes, among other things, all fuel oils, residual oils, feed stocks, asphalt, and solar black product oils.

There are numerous contract dates, keel laying dates, and delivery dates specified in 33 CFR Part 157 and Part 164 and 46 CFR Part 32 which govern the applicability of the requirements for SET, CBT, COW, 105, and improved steering gear standards for a tank vessel. Each tank vessel can be placed in a certain category based on when- the vessel was contracted for, when the keel was laid, or when the vessel was delivered. Categories are defined in the NOTES of each table to assist in determining the applicability of these equipment and construction standards. Major conversion, as used in the Tables, is defined in 33 CFR 157.03(k). Interpretations regarding this definition are contained in the PLAN REVIEW section of this document.

In each table certain product carriers are required to be equipped with an inert gas system if high capacity tank washing machines are used. A high capacity tank washing machine is a tank washing

machine that has a capacity of 60 cubic meters per hour or more. In addition, any crude oil carrier that is equipped with a COW system, whether it is required by regulations or installed at the owners option for economic reasons, must also have an inert gas system.

The applicability of the improved steering gear standards is dependent upon the gross tonnage of the tank vessel, while the applicability of SBT, CDT, COW, and IGS is dependent upon the deadweight tonnage of the tank vessel. To reduce overcomplication of the tables, the tank vessel requirements for improved steering gear standards are not included in the matrix of each table, but rather, are presented just before the matrix of each table.

The following is an explanation of the symbols used in the tables:

DWT - Deadweight tonnage in metric tons.

IGS - Inert gas system that meets ~6 CFR 32.53.

COW - Crude oil washing system that meets Subpart D of 33 CFR Part 157.

SBT - Segregated ballast tanks that meet 33 CFR Part 157.

CDT - Dedicated clean ballast tanks that meet Subpart E of 33 CFR Part 157.

PL/SBTa - Protectively located segregated ballast tanks that meet Appendix C of 33 CFR Part 157.

PL/SBTb - Protectively located segregated ballast tanks that meet 33 CFR 157.09(d).

ISSa - Improved steering gear standards that include:

1. Two remote steering gear control systems operable separately from the bridge.

2. Main steering gear control in the steering gear compartment.

3. Means of communications ion between the bridge and the steering gear compartment.

4. Rudder angle indicators on the bridge and in the steering gear compartment.

5. An audible and visual alarm that activates on the navigating bridge upon loss of power to the remote steering gear control system.

ISSb - Improved steering gear standards that include:

1. Two or more identical steering gear power units.

2. An alternative power supply to the steering gear power units.

3. A means of automatically starting each steering gear power unit when power is restored after a power failure.

4. An alarm that activates on the navigating bridge upon loss of power to the steering gear power unit.

Vessel Certification

Each U.S. tank vessel's Certificate of Inspection and each foreign tank vessel's Certificate of Compliance will be endorsed by the Coast Guard to reflect the vessel's trade. The endorsement will be one of the following, depending on which trade the operator/owner desires to have the vessel operate:

1. Crude Oil Carrier.

2. Product Carrier.

3. Crude Oil/Product Carrier.

A "Crude Oil Carrier" must meet all the requirements applicable to a vessel carrying crude oil and my only arry crude oil. A "Product Carrier" must meet all the requirements applicable to a vessel carrying product oil and my only carry product oil. A "Crude Oil/Product Carrier" mast meet all the requirements applicable for both trades and my carry either during the same voyage or en separate voyages.

The operator/owner of a tank vessel that meets the requirements of both trades my have the vessel designated for any one of the three types of services. This can be accomplished by having the vessel equipped with SET for both trades or having the vessel equipped with CDT for' the product trade and COW for the crude oil trade. If CDT is selected for product trade and a COW system is selected for crude oil trade, the following applies:

1. If the operator/owner has the vessel designated as a "Crude Oil/Product Carrier", only cargo, crude oil or product, my be carried in the CDT at any time. The vessel my carry crude oil and product oil on the same voyage.

2. If the operator/owner has the vessel designated as a "Product Carrier", only product oil my be carried on the vessel during that voyage, and NO cargo may be carried in the CDT at any time.

3. If the operator/owner has the vessel designated as a "Crude Oil Carrier", only crude oil my be carried on the vessel during that voyage, but cargo my be carried in all the tanks, including those tanks that would be designated as CDT when the vessel is in the product trade.

4. The operator/owner my change the vessel's designated service from "Crude Oil Carrier" to "Product Carrier" or "Crude Oil/Product Carrier" and vice versa between any voyage under the following conditions:

    a. If the tank vessel has common pump and piping arrangements for ballast and cargo handling of the CDT, the vessel's Certificate must be re-endorsed by the Coast Guard to reflect the change in trade. Prior to giving this re-endorsement and allowing the vessel to carry product oil, the CDT that have carried crude oil mast be crude oil washed, water rinsed, and inspected by the Coast Guard or an authorized representative of the government of the vessel's flag state for cleanliness before using the tanks as CDT.

b. If the tank vessel has separate independent pump and piping arrangements for ballasting and deballasting the CDT, re-endorsement of the vessel's Certificate and an inspection for tank cleanliness prior to changing from the crude oil trade to the product trade are not necessary. In this case, two separate endorsements will be made to the vessel's Certificate, one as a "Crude Oil Carrier" and the other as a "Product Carrier." The vessel's CDT and COW manuals must contain procedures for changing from one trade to the other and these procedures should be followed by the crew. The vessel will be allowed to function as a "Crude Oil/Product Carrier" with one additional advantage. When carrying only crude oil, the vessel will be allowed to carry crude oil in all the tanks, including those tanks that would be designated as CDT when the vessel is in the product trade.

NOTES for TABLE ONE - REQUIREMENTS FOR U.S. TANK VESSELS IN DOMESTIC TRADE

1. The numbers in parentheses under the "Crude Oil Carrier" and "Product Carrier" columns correspond to the numbers in parentheses under the "Date Required" column for each particular Category. To determine when the equipment is required, read the corresponding number in parenthesis under the "Date Required" column.

2. Definition of Categories in TABLE ONE:

Category

Al - A tank vessel that -

1. is contracted for after June 1, 1979; or

2. in the absence of a building contract, has the keel laid or is at a similar stage of construction after January 1, 1980; or

3. is delivered after June 1, 1982; or

4. has undergone a major conversion that is contracted for after June 1, 1979, or has begun the conversion after January 1, 1980, or has completed the conversion after June 1, 1982.

Bl - A tank vessel that is contracted for after January 7, 1976, BUT DOES NOT COME UNDER CATEGORY Al.

Cl - A tank vessel that -

1. is contracted for after December 31, 1974; or

2. in the absence of a building contract, has the keel laid or is at a similar stage of construction after June 30, 1975; or

3. is delivered after December 31, 1977; or

4. has undergone a major conversion that is contracted for after December 31, 1974, or has begun the conversion after June 30, 1975, or has completed the conversion after December 31, 1977; BUT

5. DOES NOT COME UNDER CATEGORIES Al or Bl

Dl - A tank vessel that DOES NOT COME UNDER CATEGORIES Al, Bl, or Cl.

TABLE ONE - REQUIREMENTS FOR U. S. TANK VESSELS IN DOMESTIC TRADE
(see NOTES on preceding page.)

ISSa and ISSb are required on each tank vessel of 10,000 gross tons or above that is in Category A1. They are required upon delivery of the vessel.
ISSa is required on each tank vessel of 10,000 gross tons or above that is in Categories B1, C1, or D1. It is required by 6/1/81.

Category	DWT Range	Crude Oil Carrier	Product Carrier	Date Required
A1	20,000 DWT or above, but less than 30,000 DWT	PL/SBTa COW IGS	IGS	Upon Delivery
	30,000 DWT or above	PL/SBTa COW IGS	PL/SBTa IGS	Upon Delivery
B1	20,000 DWT or above, but less than 40,000 DWT	IGS (1) SBT or (3) COW	IGS (2) SBT or (3) CBT	(1) 6/1/83 (2) 6/1/83, only if high tank washing machines are used (3) 1/1/86 or when the tanker is 15 yrs. old, whichever is later.
	40,000 DWT or above, but less than 70,000 DWT	IGS (1)(2) SBT CBT (3) or COW SBT or (4) COW	IGS (1)(2) SBT or (5) CBT	(1) 6/1/83 (2) On comb. carriers of 50,000 DWT or above with keel laid after 12/31/74, IGS required by 2/26/76 (3) 6/1/81 until 6/1/85 (4) after 6/1/85 (5) 6/1/81
	70,000 DWT or above	IGS (1)(2) PL/SBTb (3)	IGS (1)(2) PL/SBTb (3)	(1) 6/1/81 (2) On tank vessel of 100,000 DWT or above with keel laid after 12/31/74, IGS required by 2/26/76 (3) Upon delivery
C1	20,000 DWT or above, but less than 40,000 DWT	Same as Category B1 for this deadweight range.		
	40,000 DWT or above, but less than 70,000 DWT	Same as Category B1 for this deadweight range.		
	70,000 DWT or above	IGS (1)(2) SBT (3)	IGS (1)(2) SBT (3)	(1) 6/1/81 (2) On tank vessel of 100,000 DWT or above with keel laid after 12/31/74, IGS required by 2/26/76 (3) Upon delivery
D1	20,000 DWT or above, but less than 40,000 DWT	Same as Category B1 for this deadweight range.		
	40,000 DWT or above, but less than 70,000 DWT	Same as Category B1 for this deadweight range.		
	70,000 DWT or above	IGS (1)(2) SBT CBT (3) or COW SBT (4) or COW	IGS (1)(2) SBT or (1) CBT	(1) 6/1/81 (2) On tank vessels of 100,000 DWT or above with keel laid after 12/31/74, IGS required by 2/26/76 (3) 6/1/81 until 6/1/83 (4) after 6/1/83

NOTES for TABLE TWO - REQUIREMENTS FOR U. S. TANK VESSELS IN FOREIGN TRADE

1. The numbers in parentheses under the "Crude Oil Carrier" and' "Product Carrier" columns correspond to the numbers in parentheses under the "Date Required" column for each particular Category. To determine when the equipment is required, read the corresponding number in parenthesis under the "Date Required" column.

2. Definition of Categories in TABLE TWO:

Category

A2 - A tank vessel that -

1. is contracted for after June 1, 1979; or

2. in the absence of a building contract, has the keel laid or is at a similar stage of construction after January 1, 1980; or

3. is delivered after June 1, 1982; or

4. has undergone a major conversion that is contracted for after June 1, 1979, or has begun the conversion after January 1, 1980, or has completed the conversion after June 1, 1982.

B2 - A tank vessel that is contracted for after March 31, 1977, BUT DOES NOT COME UNDER CATEGORY A2.

C2 - A tank vessel that -

1. is contracted for after December 31, 1975; or

2. in the absence of a building contract, has the keel laid or is at a similar stage of construction after June 30, 1976; or

3. is delivered after December 31, 1979; or

4. has undergone a major conversion that is contracted for after December 31, 1975, or has begun the conversion after June 30, 1976, or has completed the conversion after December 31, 1979; BUT

5. DOES NOT COME UNDER CATEGORIES A2 or B2

D2 - A tank vessel that DOES NOT COME UNDER CATEGORIES A2, B2, or C2.

TABLE TWO - REQUIREMENTS FOR U.S. TANK VESSELS IN FOREIGN TRADE
(see NOTES on preceding page.)

ISSa and ISSb are required on each tank vessel of 10,000 gross tons or above that is in Category A2. They are required upon delivery of the vessel.
ISSa is required on each tank vessel of 10,000 gross tons or above that is in Categories B2, C2, or D2. It is required by 6/1/81.

Category	DWT Range	Crude Oil Carrier	Product Carrier	Date Required
A2	20,000 DWT or above, but less than 30,000 DWT	PL/SBTa COW IGS	IGS	Upon Delivery
	30,000 DWT or above	PL/SBTa COW IGS	PL/SBTa IGS	Upon Delivery
B2	20,000 DWT or above, but less than 40,000 DWT	IGS (1) SBT or (3) COW	IGS (2) SBT or (3) CBT	(1) 6/1/83 (2) 6/1/83, only if high tank washing machines are used (3) 1/1/86 or when the tanker is 15 yrs. old, whichever is later.
	40,000 DWT or above, but less than 70,000 DWT	IGS (1)(2) SBT CBT (3) or COW SBT or (4) COW	IGS (1)(2) SBT or (5) CBT	(1) 6/1/83 (2) On comb. carriers of 50,000 DWT or above with keel laid after 12/31/74, IGS required by 2/26/76 (3) 6/1/81 until 6/1/85 (4) after 6/1/85 (5) 6/1/81
	70,000 DWT or above	IGS (1)(2) PL/SBTb (3)	IGS (1)(2) PL/SBTb (3)	(1) 6/1/81 (2) On tank vessel of 100,000 DWT or above with keel laid after 12/31/74, IGS required by 2/26/76 (3) Upon delivery
C2	20,000 DWT or above, but less than 40,000 DWT	Same as Category B2 for this deadweight range.		
	40,000 DWT or above, but less than 70,000 DWT	Same as Category B2 for this deadweight range.		
	70,000 DWT or above	IGS (1)(2) SBT (3)	IGS (1)(2) SBT (3)	(1) 6/1/81 (2) On tank vessel of 100,000 DWT or above with keel laid after 12/31/74, IGS required by 2/26/76 (3) Upon delivery
D2	20,000 DWT or above, but less than 40,000 DWT	Same as Category B2 for this deadweight range.		
	40,000 DWT or above, but less than 70,000 DWT	Same as Category B2 for this deadweight range.		
	70,000 DWT or above	IGS (1)(2) SBT CBT (3) or COW SBT (4) or COW	IGS (1)(2) SBT or (1) CBT	(1) 6/1/81 (2) On tank vessels of 100,000 DWT or above with keel laid after 12/31/74, IGS required by 2/26/76 (3) 6/1/81 until 6/1/83 (4) after 6/1/83

NOTES for TABLE THREE - REQUIREMENTS FOR FOREIGN TANK VESSELS ENTERING U.S. WATER FOR COMMERCIAL SERVICE

1. The numbers in parentheses under the "Crude Oil Carrier" and "Product Carrier" columns correspond to the numbers in parentheses under the "Date Required" column for each particular Category To determine when the equipment is required, read the corresponding number in parenthesis under the "Date Required" column.

2. Definition of Categories in TABLE THREE:

Category

A3 - A tank vessel that -

1. is contracted for after June 1, 1979; or

2. in the absence of a building contract, has the keel laid or is at a similar stage of construction after January 1, 1980; or

3. is delivered after June 1, 1982; or

4. has undergone a major conversion that is contracted for after June 1, 1979, or has begun the conversion after January 1, 1980, or has completed the conversion after June 1, 1982.

B3 - A tank vessel that is contracted for after March 31, 1977, BUT DOES NOT COME UNDER CATEGORY A3.

C3 - A tank vessel that -

1. is contracted for after December 31, 1975; or

2. in the absence of a building contract, has the keel laid or is at a similar stage of construction after June 30, 1976; or

3. is delivered after December 31, 1979; or

4. has undergone a major conversion that is contracted for after December 31, 1975, or has begun the conversion after June 30, 1976, or has completed the conversion after December 31, 1979; BUT

5. DOES NOT COME UNDER CATEGORIES A3 or B3

D3 - A tank vessel that DOES NOT COME UNDER CATEGORIES A3, B3, or C3.

3. Foreign tank vessels must meet the applicable requirements when the vessel enters U.S. waters for commercial service after the date the equipment or construction standard is required.

TABLE THREE - REQUIREMENTS- FOR FOREIGN TANK VESSELS ENTERING U.S. WATERS FOR COMMERCIAL SERVICE (See NOTES on preceding page.)

ISSa and ISSb are required on each tank vessel of 10,000 gross tons or above that is in Category A3. They are required by January 1, 1980.
ISSa is required on each tank vessel of 10,000 gross tons or above that is in Categories B3, C3, or D3. It is required by 6/1/81.

Category	DWT Range	Crude Oil Carrier	Product Carrier	Date Required
A3	20,000 DWT or above, but less than 30,000 DWT	PL/SBTa COW IGS	IGS	1/1/80
	30,000 DWT or above	PL/SBTa COW IGS	PL/SBTa IGS	1/1/80
B3	20,000 DWT or above, but less than 40,000 DWT	IGS (1) SBT or (3) COW	IGS (2) SBT or (3) CBT	(1) 6/1/83 (2) 6/1/83, only if high tank washing machines are used (3) 1/1/86 or when the tanker is 15 yrs. old, whichever is later.
	40,000 DWT or above, but less than 70,000 DWT	IGS (1) SBT CBT (2) or COW SBT or (3) COW	IGS (1) SBT or (4) CBT	(1) 6/1/83 (2) 6/1/81 until 6/1/85 (3) after 6/1/85 (4) 6/1/81
	70,000 DWT or above	IGS (1) PL/SBTb (2)	IGS (1) PL/SBTb (2)	(1) 6/1/81 (2) 4/1/77
C3	20,000 DWT or above, but less than 40,000 DWT	Same as Category B3 for this deadweight range.		
	40,000 DWT or above, but less than 70,000 DWT	Same as Category B3 for this deadweight range.		
	70,000 DWT or above	IGS (1) SBT (2)	IGS (1) SBT (2)	(1) 6/1/81 (2) 4/1/77
D3	20,000 DWT or above, but less than 40,000 DWT	Same as Category B3 for this deadweight range.		
	40,000 DWT or above, but less than 70,000 DWT	Same as Category B3 for this deadweight range.		
	70,000 DWT or above	IGS (1) SBT CBT (2) or COW SBT (3) or COW	IGS (1) SBT or (1) CBT	(1) 6/1/81 (2) 6/1/81 until 6/1/83 (3) after 6/1/83

PLAN REVIEW: Plan review of the equipment and construction standards addressed in this document must be conducted for all U. S. tank vessels to which the requirements are applicable. This plan review for U.S. tank vessels is to be conducted before or during the construction or retrofitting of the tank vessel and is normally done by the Officer in Charge, Marine Inspection, of the zone in which the equipment is installed or the appropriate Coast Guard field technical office.

It is not mandatory for foreign tank vessels to have plan review of these equipment and construction standards conducted by the Coast Guard. If the government of the tank vessel's flag state issues a letter to the vessel certifying that the applicable standards are in accordance with the Coast Guard or relevant IMCO requirements, Coast Guard plan review is not necessary. Review and approval of the applicable standards by the government of the vessel's flag state is strongly recommended and encouraged. However, the owner or operator of a foreign tank vessel my request Coast Guard plan review and approval of this equipment in lieu of obtaining and showing a letter from the government of the vessel's flag state. If Coast Guard review and approval is requested for a foreign tank vessel, plan review is normally conducted by the Merchant Marine Technical Division of Coast Guard Headquarters and must be done prior to the tank vessel entering U. S. waters after the date the equipment and/or construction standards are required.

Coast Guard review of' certain equipment manuals is also required and my be conducted during plan review. Review of equipment Manuals is addressed in detail in the Manual Review Chapter.

The specific requirements which must be met during Coast Guard plan review are contained in the applicable Federal Regulations. The following are comments and interpretations of these regulations, which are intended to assist the submitted in preparing the plans and the reviewer in conducting the plan review. Unless otherwise noted, these comments and interpretations pertain to both U. S. and foreign tank vessels.

All necessary measurements should be converted to metric units before starting any ca: lations to avoid errors.

A. GENERAL - The requirements of 33 CFR Part 157 are derived from the standards contained in the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78). The Marine Environment Protection Committee of IMCO has developed certain amendments and interpretations to the requirements of MARPOL 73/78. The Coast Guard's intention is to implement standards and interpretations that are consistent with those agreed to internationally. The following amendments and interpretations to MARPOL 73,78 have been agreed to by the MEPC at IMCO and should be considered when determining a vessel's compliance with the requirements of 33 CFR Part 157. These amendments and interpretations will be added to the regulations as soon as possible. They are being provided here as guidelines to allow for a consistent implementation policy and to prevent unnecessary and impractical changes to a vessel at a later point in time.

1. 33 CFR 157.03(k) - The following interpretations are provided regarding 'major conversion":

   a. The re-assignment of a load line to a tank vessel which changes the vessel's deadweight capacity should not be considered a major conversion provided there is no alteration to the structure of the vessel.

   b. The conversion of a "Crude Oil Carrier" operating with a COW system to a "Product Carrier" operating with SBT or CBT should not be considered a major conversion.

c. The changing of a tank vessel that is used solely for the storage of oil to a vessel put into service for the transportation of oil should not be considered a major conversion.

d. A conversion which improves the vessel's 3economic life" without prolonging the vessel's service life should not be considered a major conversion. An example of this type of conversion would be the replacement of a well-functioning steam plant with a diesel plant to take advantage of a savings in fuel cost.

e. The conversion of a tank vessel to a combination carrier should be considered a major conversion.

f. The shortening of a tank vessel by removing a transverse section of cargo tasks should be considered a major conversion.

g. The lengthening of a tank vessel by adding a transverse section of tanks for the purpose of adding SBT to the vessel should be considered a major conversion only if the cargo carrying capacity of the vessel is increased.

2. 33 CFR 157.03(cc) -Black product oils should be considered “product”. These include, among other things, residual oils, fuel oils, feed stocks, asphalt, and similar oils. Animal and vegetable oils should not be considered “product”.

3. 33 CFR 157.08(b) - In addition to asphalt, Sections 157.11, 157.13, and 157.15 should also not apply to oils which through their physical properties inhibit effective oil/water separation and monitoring, eg. having a specific gravity of one or more. An example of such an oil is carbon black feedstock.

4. 33 CFR 157.09, 157.10, and 157.10a - A tank vessel that is used for the storage of oil and has its propulsion machinery arrangements immobilized and a tank vessel that is used as a floating facility to receive dirty ballast from other vessels should not be required to comply with the requirements is 33 CFR 157.09, 157.10, and 157.l0a.

5. 33 CFR 157.10- If a tank vessel is contracted for prior to 1 June 1979 and was scheduled to be delivered prior to 1 June 1982, but for some unforeseen reason delivery is delayed until after 1 June 1982, the reasons for the delay should be considered on a case by case basis when determining which vessel requirements are applicable. If the delay occurred through no fault of the shipbuilder or the prospective owner, the requirements of 157.09 or 157.l0a, whichever is applicable, should apply to the vessel rather than those of 157.10.

a. 33 CFR 157.l0c - Vessels that install SBT or CBT to meet the requirements of this paragraph will convert cargo tanks to either SBT or CBT. The amount of tankage that must be converted is that necessary for the vessel to meet the draft, trim and propeller immersion standards of 33 CFR 157.09(b).

To prevent tankers from suffering an excessive loss of cargo carrying capacity, reduced draft and propeller immersion standards have been provided for in 33 CFR 157.l0c(d). Under this paragraph, a tanker that exceeds either the draft or the propeller immersion requirements of 157.09(b) by more than 10% when "using the tankage necessary" to meet the draft requirement may reduce the amount of SBT or CBT provided it meets 80% of both the draft and propeller immersion standards.

The wording in 157.l0c(d) has been some cause for confusion. It does not mean that any arbitrary arrangement of cargo tanks may be chosen in order to qualify the vessel for the 80% requirement. A submission with the intent of qualifying the vessel for the 80% standard must show why all arrangements, other than the ones that qualify the vessel for the reduced standard, were not selected. Insufficient longitudinal strength is expected to be a major reason for particular arrangements not being acceptable. It is not necessary to check all possible combinations of ballast tank arrangement, rather, a few critical arrangements should be verified including the one used to qualify the vessel for the 80% standard.

Another point of confusion concerning the choice of cargo tanks to convert to SBT or CBT is whether or not wing tanks should be preferred over center tanks. Because they provide better protection against side damage wing tanks are preferable. Wing tanks must be used for a CBT installation since 33 CFR 157.220 restricts CBT to wing tanks unless specific approval for other tanks is obtained from the Commandant.

There is no such restriction in the choice of tanks for SBT. The situation could occur where a tanker using only wing tanks for ballast will qualify for the 80% standard but an arrangement using a combination of wing and center tanks will not qualify for the 80% standard. If CBT was being installed there is no question the 80% standard would be allowed, but that is not the case for SBT since SBT is not regulatory restricted to wing tanks. In this instance the owner who installs SBT instead of CBT is penalized because more tankage would have been converted to ballast thus losing more cargo capacity. As a pollution prevention measure SBT is preferable to CBT since the ballast and cargo systems are completely segregated thus decreasing the chances for pollution. SBT is preferable to an owner since it allows a vessel to simultaneously ballast and discharge cargo and thus decrease turnaround time at the discharge port. Therefore, a SBT or CBT arrangement which uses wing tanks to qualify for the 80% standard under 157.l0c(d) and results in only wing tanks being used as the ballast tanks is acceptable even if a combination of wing and center tanks meets the full draft and trim standards of 33 CFR 157.09(b). However, an arbitrary arrangement of wing tanks cannot be chosen. The submission must indicate why all other combinations of wing tanks other than those that qualify the vessel for the 80% standard cannot be used.

6. 33 CFR 157.11(b) - The discharge point that is required to be above the waterline my be:

   a. OD the vessel's side located above the waterline in the deepest ballast condition; or

   b. A discharge manifold located above the weatherdeck. (Although the use of a discharge manifold is not prohibited, it is highly undesirable and strongly recommended that such a discharge point not be used.)

When determining the height of a discharge point that is on the vessel's side, the lower edge of the discharge should not be submerged when the vessel is carrying the maximum quantity of ballast. In this regard$_1$ the following should be considered:

a. On a tank vessel without SBT or CDT, the maximum quantity of ballast should be both normal departure ballast and normal. clean ballast carried simultaneously.

b. On a tank vessel with SBT or CDT, the maximum quantity of ballast should be the ballast carried in the SBT or CDT plus ballast that would be carried in the cargo tanks during severe weather conditions or one of the vessel operations addressed in paragraph 12 below.

A discharge point that is located on the vessel's side above the departure ballast waterline but below the deepest ballast condition my be accepted if such an arrangement was fitted before January 1, 1981.

7. 33 CFR 157.11(b) - In lieu of having a piping system with a discharge point that terminates above the weather deck or on the vessel's side above the waterline, an existing tank vessel my have a piping system with the discharge point below the waterline provided that a part of the flow through this piping is led through permanent piping to a readily accessible location on the upper deck or above where it can be visually observed during the discharge operation. Specific requirements for this part flow arrangement are being developed. For further information contact G-MMT-1, U.S. Coast Guard, Washington D.C. 20593, (202) 426-4431.

   In addition, connection of a piping system which discharges below the waterline to the pumproom sea chest should not be prohibited. This connection should be permitted to allow a tank vessel to discharge dirty ballast or oil contaminated water from cargo tanks at sea by gravity. Slop tanks should not be discharged by gravity.

8. 33 CFR 157.11(d)(3) and (e)(~) - The intent of requiring this small diameter oil piping line is to allow for the discharge ashore of as such oil residue from the cargo pumps and piping as possible. A small diameter piping line will result in less oil remaining in the lines after oil has been discharged ashore when compared to the large discharge manifold lines. To accomplish this, the small diameter line should extend from the equipment required in 33 CFR 157.11(d)(1) or (e)(2), respectively,(in most cases this equipment will be a small stripping pump) to a point on the main discharge piping outboard of the manifold valves or to a point on the main deck adjacent to the main discharge piping. A small diameter piping line that extends a short distance from the main discharge piping, outboard of the manifold valves to a point on the main deck near the discharge manifold does not meet the intent of these requirements.

Many existing tank vessels have separate small stripping lines meeting the required size criteria, but rather than being connected to the main discharge piping, they are adjacent to or near the main discharge piping. These lines may be considered acceptable as complying with these requirements.

9. 33 CFR 157.11(f)- When calculating the cross sectional areas of the piping line to determine compliance with this regulation, the nominal diameter of the main discharge piping line should be used. In addition, the cross sectional area of the largest main discharge line should be used, not that of all the main discharge lines combined.

For those piping lines that have to be installed, the 10 percent value was chosen so the piping line would be small enough to discharge a sufficient quantity of oil, yet large enough so as not to create piping discharge problems. The 25 percent value was chosen so owners/operators who took the initiative to have such a piping line installed before it was required would not be penalized. In this case G-MMT, Headquarters has accepted piping lines already installed that have a cross sectional area of up to 33 percent of the cross sectional area of the main cargo discharge piping line.

10. 33 CFR 157.15(b) - Less oily water mixtures will be generated from the use of 53T, CBT, and COW and the smooth tank surfaces of combination carriers, therefore, the total capacity of the slop tank should be 3 percent of the total oil carrying capacity of the vessel, except as follows:

    a. 2 percent should be allowed if the vessel has one of the following:

        i. SBT that meets the requirements of 33 CFR 157.

        ii. CDT that meets the requirements of 33 CFR 157.

        iii. A COW system that meets the requirements of 33 CFR 157.

        iv. Tank washing arrangements that use a closed loop system, including the source of the driving fluid for educator arrangements, where applicable. A closed loop system is a tank washing system where once the slop tank(s) are filled with the necessary washing water, no other additional water is added.

    b. 1.5 percent should be allowed if the tank vessel meets one of the standards in paragraph a.i, a.ii, or a.iii above and also has the tank washing arrangements described in paragraph a. iv above. A tank vessel with any combination of the standards in paragraph a.i, a.ii, or a.iii above should not be allowed any additional reduction in slop tank capacity.

    c. 1 percent should be allowed for combination carriers which carry oil cargo in tanks with smooth walls. Tanks with smooth walls should be taken to include main cargo tanks which may be constructed with vertical framing of a small depth. Vertically corrugated bulkheads should be considered smooth walls.

    d. 0.8 percent should be allowed for combination carriers which carry oil cargo in tanks with smooth walls and which have the tank washing arrangements of a.iv above.

11. 33 CFR 157.17- A slop tank may be used as an oil residue tank provided that any piping arrangements connecting the engine room and slop tanks do not allow cargo to enter the machinery spaces. Such piping connections should incorporate adequate means to prevent any backflow of liquid cargo or gases into the machinery spaces.

12. 33 CFR 157.35- A tank vessel with SBT should be allowed to carry I ballast water in cargo tanks:

    a. When local port or canal regulations require specific drafts for safe navigation.

    b. When the vessel is required to pass under a low bridge.

    c. if a combination carrier, when the vessel is required to operate beneath loading and unloading gantries.

B. SEGREGATED BALLAST TANKS- When SBT is required by 33 CFR Part 157 or chosen by the shipowner or operator as an option for compliance with 33 CFR Part 157, the following information and interpretations are provided:

1. The SBT arrangement should be checked to verify that the SBT system is not connected to either the cargo oil or the fuel oil systems. If water-ballast exemption from inclusion in gross register tonnage is claimed, the SBT must meet the requirement: in ~6 CFR 69.03-63(g). The segregated ballast system should be a system which is "completely separated from the cargo oil and fuel oil systems", however, if the owner/operator desires, provisions may be allowed for the discharge of segregated ballast by means of a connection to a cargo pump through a portable spool piece. This spool piece should be mounted in a conspicuous position in the pump room and should only be used during an emergency which affects the safety of the vessel or for the discharge of contaminated segregated ballast in accordance with 33 CFR 157.37. A permanent notice restricting the use of this spool piece should be displayed next to the spool piece.

2. 33 CFR 157.09(b) - The segregated ballast capacity must be sufficient to allow the tank vessel to meet the following draft and trim requirements in any ballast condition during any part of a voyage, including the hypothetical situation of the vessel at lightweight (as defined in 33 CFR 157.03(h)) with only segregated ballast, without ballast in the cargo tanks:

   a. The molded draft amidship (dm) must not be less than dm in the following equation:

$$dm = 2.0 \text{ meters} + .02\ L$$

   Where:

   dm is the mathematical average of the molded drafts at the forward and after perpendiculars in meters; and
   L is the length of the tank vessel as defined in 33 CFR 157.03(a).

   b. The drafts at the forward and after perpendiculars used to meet the requirement in paragraph a above must allow the vessel to meet the following trim condition:

$$da - df \leq .015L$$

   Where:

   da is the draft at the after perpendicular in meters;
   df is the draft at the forward perpendicular in meters; and
   L is the length of the tank vessel as defined in 33 CFR 157.03(a).

   c. The minimum draft at the after perpendicular must obtain full immersion of the propeller.

3. When making these calculations, vessel deformation should not be taken into account. In most instances, the ballast condition that creates the minimum drafts and is used to determine compliance with the above requirements is with the tank vessel in the

hypothetical situation of lightweight condition as defined in 33 CFR 157.03(h) and' ballast in the SBT only. Usually, if a tank vessel meets these draft and trim requirements in this ballast condition, the vessel will meet the requirements for all other ballast conditions. In addition, the location of SBT should allow safe operation of the vessel in actual ballast conditions with fuel, stores, fresh water, etc., on board.

4. Forepeak and afterpeak tank: my be used as SBT provided those tanks are permanently allocated to the carriage of ballast water, are not used at any time for the carriage of feedwater or potable water that will be consumed by the vessel or the crew, and are connected with permanent piping to ballast water pumps.

C. PROTECTIVELY LOCATED SEGREGATED BALLAST TANKS - When PL/SBT is required by 33 CFR Part 157, the tank vessel must meet the SBT requirements of Sect ion B above and the applicable PL/SBT criteria of 33 CFR 157.09(d) or Appendix C of 33 CFR Part 157. The PLISET criteria of 33 CFR ¶57.09(d) are applicable to crude oil carriers and product carriers of 70,000 DWT and above that are in Categories B1, B2, and B3 of the TABLES. The PL/SBT criteria of Appendix C of 33 CFR Part 157 are applicable to crude oil carriers of 20,000 DWT and above and product carriers of 30,000 DWT and above that are in Categories Al, ~, and A3 of the TABLES.

1. PL/SBT criteria of 33 CFR 157.09(d). Segregated ballast tanks, voids, and other spaces that do not carry cargo, within the cargo tank length, must be distributed to allow the tank vessel to meet the following:

a. $$\frac{O_C + O_S}{2} = 0.8O_a$$

Where:

O_c is the hypothetical outflow for side damage (collision or ramming) as calculated in Appendix A of 33 CFR Part 157;
O_s is the hypothetical outflow for bottom damage (grounding) as calculated in Appendix A of 33 CFR Part 157; and
Q_a is the maximum allowable outflow as determined in 33 CFR 157.19.

b. $$\sum PA_C + \sum PA_S \geq J\left[Lt(B + 2D)\right]$$

Where:

PA_c is the side shell area in square meters based on projected molded dimensions for each segregated ballast tank, void, or other space that does not carry cargo, which separates the cargo tank boundaries from the shell plating of the vessel by at least 2 meters and which complies with paragraph 3 below;

PA_S is the bottom shell area in square meters based on projected molded dimensions for each segregated ballast tank$_1$ void, or other space that does not carry cargo, which separates the cargo tank boundaries from the shell plating of the vessel by at least 2 meters and which complies with paragraph 3 below;

Lt is the length in meters between the forward and after extremities of the cargo tanks;

B is the maximum breadth of the vessel in meters measured midship to the molded line or the frame;

D is the molded depth in meters measured vertically from the top of the keel plate to the top of the freeboard deck beam at the side midships. On tank vessels having rounded gunwales, the molded depth is measured from the top of the keel plate to the point or intersection of the molded lines of the deck and side shell plating, the lines being extended as though the gunwale were of angular design (see Figure One); and

J is one of the following values, whichever the owner or operator chooses:

0.45, or

$$0.05 + \left[\frac{O_C + O_S}{4O_a} \right]$$

Where:

O_c, O_s, and O_a are the same as described in paragraph 1.a above.

Additional criteria for segregated ballast tanks, voids, or other spaces that do not carry cargo which should be used in determining a value for PAc or PAS are contained in paragraph 3 below.

2. PL/SDT criteria of Appendix C of 33 CFR Part 157. Segregated ballast tasks, voids, and other spaces that do not carry cargo, within the cargo tank length, must be distributed to allow the tank vessel to meet the following:

a. $$\sum PA_C + \sum PA_S \geq J\left[Lt(B + 2D)\right]$$

Where:

PA_c is the side shell area in square meters based on projected molded dimensions for each segregated ballast tank, void, or other space that does not carry cargo and which complies with paragraph 3 below;

PA_s is the bottom shell area in square meters based on projected molded dimensions for each segregated ballast tank, void, or other space that does not carry cargo and which complies with paragraph 3 below;

Lt is the length in meters between the forward and after extremities of the cargo tanks;

B is the maximum breadth or the vessel in meters measured midship to the molded line of the frame;

D is the molded depth in meters measured vertically from the top of the keel plate to the top of the freeboard deck beam at the side midships. On tank vessels

having rounded gunwales, the molded depth is measured from the top of the keel plate to the point of intersection of the molded lines or the deck and side shell plating, the lines being extended as though the gunwale were of angular design (see Figure One); and

J is determined as follows:

(i) For tank vessels of 20,000 DWT, J = 0.45.

(ii) For tank vessels of 200,000 DWT or more -J = 0.30, or

J = 0.30, or

J = the greater of 0.20, or

$$0.30 - \left[a - \frac{\left(O_C + O_S\right)}{4O_a} \right]$$

Where:

a = 0.25 for tank vessels of 200,000 DWT;

a = 0.110 for tank vessels of 300,000 DWT;

a = 3 0.50 for tank vessels of 420,000 DWT;

For values of DWT between 200,000 and 300,000 DWT, 300,000 and 420,000 DWT, and greater than 420,000, the value of "a" is determined by interpolation or extrapolation; and O_c, O_s, and O_a are the same as described as in paragraph 1.a above,

(iii) For values of DWT between 20,000 and 200,000 DWT, the value of "J" is determined by linear interpolation between 0.115 and 0.30 respectively.

3. Criteria for determining PAc and PAS. For a segregated ballast tank, void or other space that does not carry cargo to be considered as part of the area that can be used in determining a value for PAc or PAS, the following criteria should be met:

a. The minimum width of each wing tank or space, either of which extends for the full depth of the vessel's side or from the main deck to the top of the double bottoms must be 2 meters or more. The width is measured inboard from the vessel's side shell plating at right angles to the vessel's center line. If a wing tank or space has a width anywhere within it that is less than 2 meters, except as allowed in paragraph b below, that wing tank or space is not to be used when calculating PAc. The width of a wing tank may be used when calculating PAS.

b. The minimum width of a wing tank or space should not be measured in the way of the turn of the bilge area or a rounded gunwale area. If the form of a forward or

aft wing tank or space does not clearly define the turn of the bilge area, the turn of the bilge area should be considered complete at a height of D/5 measured upwards from the baseline. The tank or space may be used when calculating PAc only if the width of the tank or space is 2 meters or more at the height of D/5 and above, along the entire length of the tank (See Figure Two).

c. The minimum vertical depth of each double bottom tank or apace must be B/15 or 2 meters, whichever is less. If a double bottom tank or space has a depth less that B/15 or 2 meters,' whichever is smaller, anywhere within the double bottom, except as allowed in paragraph d or e below, that double bottom or space is not to be used when calculating PAs. If a double bottom tank is used for compliance with 33 CFR 157.09(d), it must have a depth of 2 meters or more. The B/15 option does not apply. The depth of a double bottom tank may be used when calculating PAc.

d. The minimum depth of a double bottom tank or space should not be measured in the way of the turn of the bilge area. If the form of a forward or aft double bottom tank or space does not clearly define the turn of the bilge area, the turn of the bilge area should be considered complete at a breadth of D/5 measured inboard from the shell plating at a height of D/5 measured upwards from the baseline. The double bottom tank or space may be used when calculating PAS only if the depth of the tank or space is at least B/15 or 2 meters, whichever is less, between the completion of the turn of the bilge areas measured from both sides of the tank, along the entire length of the tank or space (See Figure Three). If a double bottom tank is used for compliance with 33 CFR 157.09(d), the B/15 option does not apply.

e. If the projected dimensions of a cargo tank fall entirely within a portion of a double bottom tank or space that meets the minimum height requirement of 2 meters or B/15, whichever is less, that part of the double bottom tank or space which is below the cargo tank may be used when calculating PAS. Figure Six provides further clarification of this paragraph.

f. Dimensions for the width of a wing tank or the depth of a double bottom tank should be measured from the inner surfaces of the tank.

g. Figures Four through Twelve are provided as examples for determining PAS and PAc.

h. Suction wells extending into a double bottom tank may be neglected in determining the minimum depth of the tank if such wells are not excessive in area and do not extend into the double bottom tank more that half the height of the double bottom tank.

D. DEDICATED CLEAN BALLAST TANKS - When CDT is chosen by the shipowner or operator as an option for compliance, with 33 CFR Part 157, the CDT system must meet the design and equipment requirements in 33 CFR 157.220 and 222. In addition, the CDT system design should include provisions to allow the master of the vessel to comply with certain operating requirements in 33 CFR 157.225. The following information provides comments and interpretations of the CDT requirements where considered necessary:

1. 46 CFR 31.10-1 and 33 CFR 157.202(b) - The location of the tanks selected for CDT must not result in unacceptable hull stresses during any ballast or loaded condition, or any other intermediate condition during ballasting or loading. For U. S. tank vessels the American Bureau of Shipping (ABS) should be contacted to verify that the selection of CET will not result in unacceptable hull stresses. For foreign tank vessels, the owner or operator of the vessel must submit documentation from. the authority that assigned the load line to the tank vessel stating that the location of CBT is acceptable to that authority.

2. 33 CFR 157.220(a) - For the purpose of determining the capacity of CBT, the following tanks may be included:

   a. Dedicated clean ballast tanks.

   b. Segregated ballast tanks.

   c. Cofferdams and fore and after peak tanks, provided that they are used exclusively for the carriage of ballast water and are connected with permanent piping to ballast water pumps.

   The capacity of the tanks selected to be CDT must be sufficient to allow the tank vessel to meet the following draft and trim requirements in any ballast condition during any part of a voyage, including the hypothetical situation of the vessel at lightweight with only ballast in the tanks specified in paragraphs 2.a, 2.b, and 2.c above, without ballast in the cargo tanks:

   a. The molded draft amidship (dm) must not be less than dm in the following equation:

   $$dm = 2.0 \text{ meters} + .02\ L$$

   Where:

   dm is the mathematical average of the molded drafts at the forward and after perpendiculars in meters; and

   L is the length of the tank vessel as defined in 33 CFR 157.03(a).

   b. The drafts at the forward and after perpendiculars used to meet the requirements in paragraph a above must allow the vessel to meet the following trim condition:

   $$da - df \leq 0.015L$$

   Where:

   da is the draft at the after perpendicular in meters;

   df is the draft at the forward perpendicular in meters; and

   L is the length of the tank vessel as defined in 33 CFR 157.03(a).

c. The minimum draft at the after perpendicular must obtain full immersion of the propeller.

When making these calculations, vessel deformation should not be taken into account. In most instances, the ballast condition that creates the minimum drafts and is used to determine compliance with the above criteria is with the tank vessel in the hypothetical situation of lightweight condition as defined in 33 CFR 157.03(h) and ballast in the CDT only. Usually, if a tank vessel meets these draft and trim requirements in this ballast condition, the vessel will meet the requirements for all other ballast conditions.

3. 33 CFR 157.220(b) - The highest priority for selection of CDT should be based on paragraphs D.1 and D.2 above. The next priority for the selection of CDT should be the selection of wing tanks, unless the shipowner or operator can show that other tanks (center tanks, double bottom:, etc.) would be more practical or of greater benefit, or that wing tanks selected for CDT would not meet the criteria in paragraphs D.1 and/cr D.2 above. The intent of this criteria is to gain the benefits of protectively located dedicated clean ballast tanks (i.e. ballast tasks that are located to reduce accidental oil outflow in the event of a collision, ramming, or grounding). In this regard the trade-off of selecting double bottoms instead of wing tanks is acceptable and in fact, highly recommended because double bottoms will provide a similar degree of protection against accidental oil outflow as would wing tanks.

The trade-off of selecting center tanks instead of wing tanks should be given some consideration. Center tanks selected for CDT will provide some protection against oil outflow in the event of a grounding (most probably forward center tanks) and therefore, should not be totally prohibited. However, wing tanks should be given preferential treatment and considered first. If a selection of wing tanks meets paragraphs D.1 and D.2, but results in an unreasonably complicated piping system (the involvement of numerous valves, cross connections, piping, etc.), one or two center tanks should be allowed to help reduce or eliminate the complexity of the CDT piping system. Conversely, the need for additional piping, valves, fittings, etc. for wing tanks, which otherwise would not be necessary or would be minimized if center tanks were selected, is considered a sufficient reason for the selection of one or two center tanks for CDT. Further, the selection of one or two center tanks for CDT because the overall cargo volume lost would be less than that if wing tasks were chosen, is also considered a sufficient reason for the selection of one or two center tanks for CDT. Loss of tank volume should not be considered, by itself, as an acceptable reason for selecting center tanks for all the CDT.

In summation, if most of the CDT are wing tanks, a center tank or two may be allowed for simplification of the piping system, to reduce tank volume loss, or any other valid reason.

4. 33 CFR 157.222(a) - After selecting CDT based on the criteria in paragraphs D.1, D.2, and D.3 above, the lowest priority in selecting tanks for CDT should be the involvement of the least practicable number of pumps and length of piping. The criteria in paragraphs D.l, D.2, and D.3 should take precedence over this criteria, but if more than one selection of tanks for CDT is available after meeting the criteria of paragraphs D.1, D.2, and D.3, the selection that involves the least number of pumps or amount of piping, or both, should be chosen. This selection will play an important role in minimizing oil pollution from CDT by reducing the number of pumps or amount of piping that needs to be flushed each time ballast to or from CDT is handled.

5. 33 CFR 157.222(b) - The cargo piping system that will also be used for loading or discharging ballast from CDT must be designed so that flushing water from a sea chest or a CDT will flow through this common piping to a slop tank. This is to provide a place for flushing water to collect without risking contamination of CDT with oily water.

6. 33 CFR 157.222(d) - There must be at least two valves separating each CDT from the piping system serving the cargo tanks. This requirement is to prevent the contamination of CDT with oil or oily water through one leaking valve during the discharge or loading of cargo or when flushing the piping system with water to remove cargo residue in the piping lines. The operating requirements for keeping these valves closed are contained in 33 CFR 157.228.

7. 33 CFR 157.222(e) - There must be a sample point located in a vertical section of the CDT discharge piping system to allow the sampling of the ballast being discharged from CDT. An example of a sample point is shown in 46 CFR Figure 162.050-17(e). The sample point required in the piping system does not have to be the same as the example given.

8. 33 CFR 157.225(e) - The CDT piping system should be arranged so that clean ballast from each CDT is capable of being discharged through an oil discharge monitoring and control system as required in 33 CFR 157.43 which is referenced in 33 CFR 157.225(e). This criteria is necessary to ensure that the tank vessel is equipped to allow the master to meet the operating requirement in 33 CFR 157.225(e).

9. 33 CFR 157.225(f) - The CDT piping system should be arranged so that flushing water can be monitored to determine the oil content in the flushing water. This criteria is necessary to ensure that the tank vessel is equipped to allow the master to meet the operating requirements in 33 CFR 157.225(f).

E. CRUDE OIL WASHING SYSTEM - "hen a COW system is required by 33 CFR Part 157 or chosen by the shipowner or operator as an option for compliance with 33 CFR Part 157, the COW system must meet the design and equipment requirements in 33 CFR 157.122, 124, 126, 128, and 130. In addition, the tank vessel must meet the design and equipment requirements in 33 CFR 157.132, 134, 136, and 138. Because of the economic benefits of a COW system, some owners or operators will be installing a COW system on their tank vessel even though it is not required. If a COW system is installed on a tank vessel, but it is not required by 33 CFR Part 157 or not selected as an option for compliance with 33 CFR Part 157, the COW system and the tank vessel do not have to be in compliance with the design, equipment, inspection, personnel, and applicable operating requirements of Subpart D of 33 CFR Part 157. In this case the COW system should be treated as part of the cargo piping system and it should meet all the applicable design, installation, and safety requirements of the cargo piping system. In addition, the tank vessel would be required to be equipped with an IGS that complies with the requirements in 46 CFR 32.53 and which must be operating properly during COW operations.

The following information provides comments and interpretations, where considered necessary, of the COW system requirements in Subpart D of 33 CFR Part 157.

1. 33 CFR 157.122 - Piping, valves, and fittings.

a. 33 CFR 157.122(a) and (o) - The piping, valves, and fittings of the COW system must be of steel or an equivalent material. This should not be construed to mean that an equivalent material must meet all the metallurgical and/or physical properties of steel. The piping, valves, and fittings of the COW system should, be treated the same as those of the cargo system. The same materials that would be accepted for the cargo system should be accepted for the COW system. The intent is to allow the use of materials other than steel, provided the safety and effectiveness of the COW system are not compromised. On combination carriers portable flexible hose with flanged connections my be used between a COW machine located in a hatch cover and an adjacent location just outside the hatch coaming. Flexible hose should meet the applicable requirements of 33 CFR 154.500.

b. 33 CFR 157.122(b) - Except for the use of portable flexible hose as allowed on combination carriers, the piping of the COW system must be permanently installed. The installation should allow for the removal of the piping during maintenance and repair.

c. 33 CFR 157.122(c) - The COW piping system must be completely separate from all other piping systems, except that cargo piping my be used as part of the COW piping system if that cargo piping complies with 33 CFR 157.122. This does not prohibit the connection of a portable hose to a hydrant valve in the COW piping system for the purpose' of water washing cargo tanks with portable tank washing machines. In this instance, water is usually pumped from the COW piping through the hydrant valve to a portable hose The other end of the portable hose is connected to a portable tank washing machine which is placed in the tank through a deck opening. At no time my the fire main system be connected to the' COW piping system for water washing purposes (33 CFR 157. 55(a)(13)).

d. 33 CFR 157.122(d) - If the maximum allowable working pressure of the COW system is less than the shut-off head of the COW pumps, the COW piping system must have a means to prevent overpressure in the system. 46 CFR Part 56 requires an overpressure relief valve in the system to meet this requirement. A temperature sensing pump cutoff switch should not be allowed as a means to prevent overpressure in the COW piping system, but it my be installed to prevent overheating of a pump.

e. 33 CFR 157.122(g) - A hydrant valve is the same as a hose valve, i.e. one end connected to the COW piping with the other end open to allow the connection of a portable hose. These valves are provided for the connection of portable hoses for water washing cargo tanks through an opening in the deck. They should be closed and blanked off at all other times. To prevent inadvertent connection of the fire main system to the COW system, a screwed cap should not be considered acceptable as blanking off the hydrant valve, unless the thread design is significantly different from that of the fire main connections.

f. 33 CFR 157.122(h) - A sensing instrument, as referred to in this regulation, includes pressure gages, temperature gages, level indicators, flow meters$_1$ and any other instrument used for sensing the fluid in the COW system.

g. 33 CFR 157.122(i) - Steam heaters that are already located within the engineroom of a tank vessel that is in Category El, B2, 33, Cl, C2, C3, Dl, D2, or D3 of TABLES ONE, TWO, or THREE should be allowed provided they are isolated during crude oil washing. The two shut off valves or blank flanges identifiable as being closed that are required in both the inlet and outlet piping of a steam heater must be in the water washing piping to prevent the leakage of oil into the heater, through the steam lines possibly into the engine room. They are not required to be in the steam piping. A spectacle flange is provided as an example of a blank flange that is identifiable as being closed. These blank flanges are not required to be spectacle flanges.

h. 33 CFR 157.122(k) and (1) - Pipe anchors are required to prevent movement of the COW piping that would adversely affect the structure or the effectiveness of the COW system. Pipe anchors should be such that any hydraulic shock can be absorbed without undue movement of the COW piping. For piping which suspends from the deckhead of the tank into the tank with a COW machine at its end, the weight of the COW machine is usually used as the anchor for that piping.

2. 33 CFR 157.124 - Tank washing machines. The Coast Guard will not be reviewing for approval each specific COW machine design and its related equipment submitted by a manufacturer; nor will the Coast Guard verify the performance of each individual COW machine. Rather the Coast Guard will evaluate the COW system as a whole when submitted by the vessel owner for acceptance by the Coast Guard. The design, material, and safety aspects of each COW machine will evaluated at that time. Final acceptance of the COW system will be based on the performance of the entire system and not that of the individual components.

a. 33 CFR 157.12£l(a) - COW machines must be permanently mounted in each cargo tank. Their installation should allow for removal during maintenance or repair.

b. 33 CFR 157.12~(c) - Each COW machine and its supply piping must be supported to withstand vibration and pressure surges. Verification of compliance with this requirement is extremely important. An inadequate design could result in the COW machine and its supply piping falling into the tank, producing damage and a possible explosion in the tank. There have been some reports of supply piping failing due to vibration or cyclic stresses. To prevent this from happening, the effect of the tank vessel's laboratory responses and dynamic motions on the COW machines and their' supply piping should be carefully considered by the designer and the plan reviewer when determining compliance with this requirement. The maximum allowable stress permitted in 46 CFR 56.07-10(c) may be used to aid in establishing an acceptable design. A COW machine design that will not allow the machine to fall into the tank as a result of structural failure of the COW machine or its supply piping should be taken into consideration when establishing the extent of the analysis necessary to determine compliance with this requirement.

c. 33 CFR 157.124(d) - This regulation stipulates the minimum number of portable drive units required on board a tank vessel to prevent the need for constant moving of the portable drive units by the vessel's crew. The minimum number of portable

drive units required on board should be based on the maximum number of COW machines that are used prior to any given ballast voyage. Not all COW machines will be used prior to each ballast voyage.

d. 33 CFR 157.124(e) and (f) - The projected direct impingement pattern (more commonly known as the "shadow diagram") required by 33 CFR 157.100(a)(£;) or 157.102(d) is used to verify compliance with these regulations. If the impingement pattern in a tank cannot be adequately shown on a shadow diagram, the scale model required by 33 CFR 157.104 should be used to verify compliance with these regulations. In all probability the scale model will be very rarely used.

There is no easy method, short of being inside the tank, to verify that all areas of the tank are washed by direct impingement, jet deflection, or splashing. If the required areas, 90% horizontal area and 85% vertical area, are washed by direct impingement, it can be assumed that the remainder of the tank is washed by jet deflection or splashing. Except as allowed in 33 CFR 157.12~(f) which only applies to tank vessels under 33 CFR 157.10a, the percent of area washed by direct impingement IN EACH TANK mist be 90% or more of the total horizontal area of the tank bottom and the upper surfaces of large primary structural members and 85% or more of the total vertical area of the tank sides and awash bulkheads. Each tank that has particularly complicated internal structural members (such as forward wing tanks), as determined by the shipowner or operator, does not have to meet the direct impingement percentage requirement of 33 CFR 157.124(e) in that tank if the percent of area washed by direct impingement IN ALL THE TANKS on the vessel is 90% or more of the total horizontal areas of all the tank bottoms and the upper surfaces of all large primary structural members and 85% or more of the total vertical areas of all the tanks' sides and awash bulkheads. This second method is allowed to preclude requiring an inordinate number of COW machines, which would not be necessary to attain a satisfactory state of cleanliness, in a tank with complicated internal structural members. In summation, the percent of direct impingement should be calculated on a per tank basis for compliance with 33 CFR 157.124(e) and on a per vessel basis for compliance with 33 CFR 157.124(f).

The following guides are listed for reviewing shadow diagrams:

(i) The drawings for each tank should include a view of the tank bottom, the tank sides, and each awash bulkhead.

(ii) The drawing should include all large primary structural members as defined in 33 CFR 157.03(gg) and any other structural member winch contributes significant strength to the vessel or produces an extremely large shadow preventing a large area of the tank from being washed (such as an very large cluster of pipes). Ladders, most pipe work, corrugations in corrugated bulkheads, and those structural members which only provide local strength or stiffness, such as longitudinals, brackets, face plates, and small stiffeners, should be disregarded. Struts in transverse web frames should also be disregarded if there are less than 3 struts in a transverse web frame or the depth of each strut is less than 1/15 the total depth of the tank.

(iii) The undersides of decks and the undersides and vertical surfaces of large primary structural members should not be considered when calculating the percent of area washed by direct impingement.

(iv) Calculations should be provided to show how the percent of areas washed by direct impingement were arrived at.

(v) Exact geometric projections of a curved surface area are not necessary. A reasonable estimate of the surface area should be accepted.

(vi) For the purpose of determining the bottom area of a wing tank, the breadth of the tank should be taken as the horizontal distance from the inside of the longitudinal bulkhead to the inside of the shell plating, midway between the tank's transverse bulkheads, measured as a straight line across the top of the bottom longitudinal frames (See Figure Thirteen).

(vii) A swash bulkhead should be assumed to have no holes in it when determining both the total vertical area of the swash bulkhead and the area of the wash bulkhead washed by direct impingement.

e. 33 CFR 157.124(h) - Multi-nozzle COW machines are usually designed for rapid spinning of two or more nozzles in the vertical plane as the machine slowly revolves in the horizontal plane. The rapid spinning of the nozzles makes the use of an indicator that shows the arc and rotation of the nozzle (as required on single nozzle machines) impractical, therefore, such indicators are not required on multi-nozzle COW machines. However, multi-nozzle COW machine! are required to have a means that indicates the movement of the machine. This movement can be observed and compared to the design movement to determine if the COW machine is operating properly. Any means that accomplishes this intent should be accepted, including a means that incorporates a design feature of the COW machine (internal gearing that causes the machine to rotate before the nozzles can spin).

f. 33 CFR 157.12~(i) - Effective operation of the COW system is dependent upon satisfactory operation of the COW machines. If a COW machine is programmed to operate in a particular fashion, but there is no satisfactory means available to determine if the machine is operating correctly, the effectiveness of the COW system could be compromised unknowingly if the machine malfunctions. To prevent this from happening, programmable COW machines are required to have a satisfactory means on the deck to indicate the programmed movement of the machine. COW machines without indicators are usually bottom mounted non-programmable multi-nozzle COW machines that revolve about an axis as the nozzles spin in one plane as long as driving fluid is pumped to them.

3. 33 CFR 157.126 - Pumps.

a. 33 CFR 157.126(a) - The most common method of supplying crude oil to the COW machines is bleeding off oil from the discharge of a main cargo pump. Other methods include separate dedicated COW pumps using oil from a cargo tank and dedicated COW pumps using recirculated oil usually from a slop tank.

b. 33 CFR 157.126(c) - The more common methods of maintaining design pressure in the COW system when terminal back pressure is less than that required for effective operation of the COW system are throttling the delivery valves, and using a booster or dedicated COW pump.

4. 33 CFR 157.128 - Stripping system.

a. 33 CFR 157.128(a)(1) - Bottom washing of the cargo tanks takes place when the tank is virtually empty. The COW machines in the tank are aimed at the tank bottom and the lower portions of the tank sides to remove sludge build-up and any remaining oil clingage on these surfaces. If the oil is pumped through the machines into the tank at a rate faster than the stripping system can remove the oil, the fluid level will build-up in the tank and the washing may become ineffective on the tank bottom. To prevent this from happening, the stripping system should be designed to remove oil from the tank at a rate of 1.25 times the rate at which the COW machines are spraying oil into the tank during a bottom wash. Proper tank design to accommodate cargo drainage will be instrumental in allowing the stripping system to meet this requirement.

b. 33 CFR 157.128(b) - Hand dipping is a term used to mean the measuring or "sounding" of the level of' fluid in the tank by lowering an indicator into the tank to determine the fluid level. If this method is chosen to determine the level of fluid in the tank, each tank must be designed to allow hand dipping at the after most portion of the tank and at three other locations. The after most portion of the tank is stipulated because that is usually where the stripping suction is located and vessels normally trim by the stern during unloading, resulting in the accumulation of oil at the after most portion of the tank. The other three locations for hand dipping should be placed in locations in the tank that would most likely permit oil to accumulate. Other acceptable means for determining the level of the fluid in the tank are tank level indicators or stripping system performance gages, provided they accurately indicate the level of fluid in the tank.

c. 33 CFR 157.128(c) - Any other acceptable stripping device should allow the stripping system to meet the requirements of 33 CFR 157.128 without compromising the safety and effectiveness of the COW system when compared to a positive displacement pump, a self-priming centrifugal pump, or an eductor.

d. 33 CFR 157.128(d) - A valve would be the most common means of isolating the stripping device from each cargo tank. This means is required to allow the stripping of individual tanks when necessary.

e. 33 CFR 157.128(e)(2) - The monitoring device chosen to indicate operation of the particular pump should be the appropriate device for the stripping pump used. (e.g. A stroke counter should not be used with a centrifugal pump.)

f. 33 CFR 157.128(g) - The equipment required in 33 CFR 157.128(e) and (f) should have indicating devices in the cargo control room. If the indicating devices are placed in a location other than the cargo control room, that location must be manned during COW operations and must allow for immediate operational control of the COW system.

5. 33 CFR 157.130 - Crude oil washing with more than one grade of crude oil. If more than one grade of crude oil is to be carried on the tank vessel, the COW system should be capable of crude oil washing with more than one grade of crude oil. The design or operational limitations of the COW system will not be accepted as a reason for not crude oil washing the required number of tanks because more than one grade of oil is carried on the tank vessel. If the shipowner or operator anticipates carrying more than one grade of oil, the COW system should be capable of crude oil washing the required number of tanks. This can be accomplished by a design or operational feature of the COW system.

6. 33 CFR 157.132 - Cargo tanks: hydrocarbon vapor emissions. The mans to discharge hydrocarbon vapors from a cargo tank being ballasted to a cargo tank discharging crude oil (simultaneous ballasting and discharge of cargo) can most easily be accomplished by proper arrangement of the piping of the inert gas system. The vapor can flow from the tank being ballasted to the tank discharging cargo through the IGS piping if that piping system is properly set up for such an operation. Other means to prevent hydrocarbon vapor emissions during ballasting of cargo tanks include the gas compression technique (containing the vapors in the tank without lifting the P/V valve) and discharge of the vapor to a shoreside vapor recovery system. 33 CFR 157.166 specifies where this means must be used to prevent hydrocarbon vapor emissions. For the most part, this includes every major port within the United States.

7. 33 CFR 157.134 - Cargo tank drainage. Compliance with this requirement should not be a problem for a tank vessel that will be built in the future. The tank's internal construction can be designed to include these drainage features. This requirement should also not create a problem for those tank vessels already built because most all tank vessels are designed to accommodate drainage of cargo. The only sure way to determine if this requirement has been met is if the tank vessel passes the inspection of 33 CFR 157.140(a)(2). Therefore, during plan review, the arrangements for longitudinal and transverse drainage should be reviewed, if possible, and any areas considered to be capable of producing a drainage problem should be brought to the attention of the shipowner or operator.

F. INERT GAS SYSTEM - The amendments to 46 CFR 32.53 made no changes to the technical requirements of an inert gas system. The amendments only modified the applicability portion of 46 CFR 32.53. When an inert gas system is required by 46 CFR Part 32, the IGS must meet the design and equipment requirements in 46 CFR 32.53-10 through 80. Interpretation of these requirements during plan review has not been identified as a problem area as of this date. However, if necessary, guidance regarding specific details of the inert gas system is contained in the Commandants International Technical Series, Volume VII, USCG CITS-80-1-1. This CITS contains a detailed set of guidelines for an inert gas system, as well as an updated version of the inert gas system requirements of Regulation 62 of SOLAS 74.

G. IMPROVED STEERING GEAR STANDARDS - Existing steering gear requirements for U. S. tank vessels are contained in 46 CFR Parts 58, 111, and 113. The new steering gear regulations issued in 33 CFR Part 164 in the Federal Register on November 19 added steering gear standards for U. S. tank vessels and extended their applicability to foreign tank vessels that enter U. S. waters. Several of the new standards are the same or similar to the steering gear standards in 46 CFR Parts 58, 111, and 113. TABLE FOUR shows which of the steering gear standards are new and which are comparable to the existing Coast Guard regulations in ~6 CFR Parts 58, 111, and 113. Tank vessels in compliance with the existing regulations in 46 CFR Parts 58, 1111 and 113

of TABLE IV would also comply with the comparable new steering gear standards in 33 CFR Part 16~. The new steering gear standards for U. S. tank vessels were added to 33 CFR Part i6~ because ~6 CFR Parts 58, 111 and 113 are not applicable to foreign tank vessels. Duplication or these new standards in Part 33 and Part 316 would be too redundant. Interpretation of these new requirements during plan review has not been identified as a problem area as of this date.

For clarification of “major conversion" as defined under 33 CFR 1611.39(b)(3), the installation of SET, CBT, or a COW system on a tank vessel in Categories El, 32, E3, C1, C2, C3, Dl, D2, or D3 of the Tables for compliance with 33 CFR Part 157 should not be considered a major conversion. Therefore, a tank vessel in any of the above mentioned Categories of the Tables that have SET, CET, or a COW system installed for compliance with 33 CFR Part 157 should not be considered a "new tank vessel" under 33 CFR l64.39.

Submittal of plans for Coast Guard review and approval is not required for foreign tank vessels.

TABLE FOUR - COMPARISON OF EXISTING AND NEW STEERING GEAR REGULATIONS

New Regulations	Comparable Existing Regulations in Titles 33 and 46 of the Code of Federal Regulations
1. 33 CFR 164.39(a)	New
2. 33 CFR 164.39(b)(1)	46 CFR 30.10-69
3. 33 CFR 164.39(b)(2) to (8)	New
4. 33 CFR 164.39(c)	46 CFR 58.25-55(a)
5. 33 CFR 164.39(d)(1)	46 CFR 58.25-55(b)(2)
6. 33 CFR 164.39(d)(2)	46 CFR 111.80-70(e)
7. 33 CFR 164.39(d)(3)	New
8. 33 CFR 164.39(e)	New
9. 33 CFR 164.39(f)(1)	New
10. 33 CFR 164.39(f)(2)	46 CFR 111.80-70(e)
11. 33 CFR 164.39(f)(3)	46 CFR 113.30-5
12. 33 CFR 164.39(f)(4)	46 CFR 58.25-5(d), 46 CFR 113.40, and 33 CFR 164.35(f)
13. 33 CFR 164.39(f)(5)	New
14. 33 CFR 164.39(g)(1)	46 CFR 58.25-25
15. 33 CFR 164.39(g)(2)	New
16. 33 CFR 164.39(g)(3)	46 CFR 58.25-10(a)
17. 33 CFR 164.39(h)(1)	46 CFR 58.25-25, except the reference to 33 CFR 164.39(g)(2)
18. 33 CFR 164.39(h)(2)	46 CFR 58.25-10(a)
19. 33 CFR 164.39(i)	New
20. 33 CFR 164.39(j)(1)(i)	New
21. 33 CFR 164.39(j)(1)(ii)	46 CFR 111.80-70(d)(2) and (3)
22. 33 CFR 164.39(j)(2)	New
23. 33 CFR 164.39(k) to (t)	New

MANUAL REVIEW: Effective operation of the CDT, COW, and inert gas systems, as well as the vessel's cargo and ballast system, is extremely dependent upon the tank vessel operator. Because of this high operator dependence, the Coast Guard requires specific manuals on each U.S. tank vessel and each foreign tank vessel that enters U.S. waters for commercial service which are equipped with any of these three new standards. In addition, a cargo and ballast system manual is required on all U.S. tank vessels and foreign tank vessels that enter U.S. waters for commercial service. These manuals are required to provide the vessel's personnel with the necessary and correct information for operating these systems. There are specific requirements that these manuals must meet to be approved or accepted by the Coast Guard, if required. Manuals submitted to the Coast Guard for review and approval should be in English. When preparing or reviewing the manuals, three general guidelines should be used:

1. The manuals should be specifically tailored to the vessel on which they will be used.

2. The manuals should be in a simple, easy to understand format for the crew that will be using them.

3. The manuals will be used by Coast Guard personnel to verify compliance with operating procedures; therefore, they should be prepared for simple verification of the operating procedures by Coast Guard inspectors.

The following information provides additional comments and interpretations of the requirements for these manuals:

A. DEDICATED CLEAN BALLAST TANKS OPERATIONS MANUAL Each U. S. tank vessel that is equipped with CDT for compliance with 33 CFR Part 157 must have on board a Dedicated Clean Ballast Tanks Operation Manual that is approved by the Coast Guard. Review and approval of this CDT Manual should be conducted by the Officer in Charge, Marine Inspection of the zone in which the CDT system is installed or the appropriate Coast Guard field technical office. Each foreign tank vessel that is equipped with CDT for compliance with 33 CFR Part 157 must have on board a Dedicated Clean Ballast Tanks Operations Manual that is approved by the Coast Guard or the government of the vessel's flag state. Review and approval of a Coast Guard approved CDT Manual for a foreign tank vessel should be conducted by the Merchant Marine Technical Division of Coast Guard Headquarters.

Each CDT Manual approved by the Coast Guard must comply with 33 CFR 157.221;. The example or a procedure for CDT operations in 33 CFR 157.224 is provided as a general idea of what CDT operations are like for a particular vessel. Each vessel will be different, therefore, the CDT operational procedure provided in each manual does not have to be the same as the example given in 33 CFR 157.221;.

Each CDT Manual approved by the government of the vessel's flag state must meet the manual standards of Resolution 11; of the MARPOL Protocol.

B. CRUDE OIL WASHING OPERATIONS AND EQUIPMENT MANUAL - Each U. S. tank vessel that is equipped with a COW system for compliance with 33 CFR Part ¶57 must have on board a Crude Oil Washing Operations and Equipment Manual that is approved by the Coast Guard. Review and approval of this COW Manual should be conducted by the Officer in Charge, Marine Inspection of the zone in which the COW system is installed or the appropriate Coast Guard field technical office. Each foreign tank vessel that is equipped with a COW system for compliance with 33 CFR Part 157 must have on board a Crude Oil Washing Operations and Equipment Manual that is approved by the Coast Guard or the government Of the vessel's flag

state. Review and approval of a Coast Guard approved COW Manual for a foreign tank vessel should be conducted by the Merchant Marine Technical Division of Coast Guard Headquarters.

Each COW Manual approved by the Coast Guard must comply with 33 CFR 157.138. Each COW Manual approved by the government of' the vessel's flag state Bust meet the manual standards of Resolution 15 of the MARPOL Protocol.

C. INERT GAS SYSTEM MANUAL - Each U. S. and foreign tank vessel that is equipped with an 105 must have on board an Inert Gas System Instruction Manual. It is not required that this manual be approved by the Coast Guard, as with the CBT and COW Manuals, but the IGS Manual must comply with 46 CFR 32.53-85 to be accepted by the Coast Guard. In accordance with 46 CFR 32.53-85, the 103 Manual must contain instructions for the safe operation (including occupational health) and maintenance of the 105. Compliance with the requirement for the 105 Manual can be verified by the Coast Guard inspector when conducting inspections of the 105.

D. CARGO AND BALLAST SYSTEM MANUAL 33 CFR 157.23 requires that each U.S. tank vessel and each foreign tank vessel that enters U.S. waters have on board an instruction manual that describes the automatic and manual operation of the vessel's cargo and ballast system. Coast Guard approval of this manual is NOT required, therefore, it is not necessary to submit this manual to the Coast Guard for approval prior to entering U.S. waters. As with the 105 manual, compliance with the requirement for the vessel to have this manual will be verified by the Coast Guard inspector when conducting an examination of the vessel.

The requirement for this manual stems from Regulation 15(3) (c) of MARPOL 73/78 which requires instructions on the operation of the oil discharge monitoring and control system. The footnote to this regulation makes reference to the "Clean Seas Guide for Oil Tankers" which addresses load on top procedures. In view of this reference, the Coast Guard requires this manual to include cargo and ballast operations. It should be recognized that until oil discharge monitoring and control systems are required, this manual does not have to contain procedures for automatic ballasting operations.

INSPECTION: Inspections are necessary to ensure that U. S. tank vessels comply with all the applicable requirements. Examinations are conducted on foreign tank vessels entering U.S. waters for commercial service to determine their compliance with all the applicable requirements. (This distinction between inspection of U.S. vessels and examination of foreign vessels is made because of the specific wording of the PTSA. The PTSA requires U.S. tank vessels to be inspected and foreign tank vessels to be examined.) Initial inspection of the equipment and construction standards addressed in this document must be conducted on all U.S. tank vessels to which the requirements are applicable. Initial inspections of SET, GET, and COW need only be conducted on each foreign tank vessel whose owner or operator requests Coast Guard approval of these standards. In addition, U S. tank vessels and foreign tank vessels whose owner or operator requests Coast Guard approval that are equipped with a COW system for compliance with 33 CFR Part 157 must also undergo three additional initial inspections to verify satisfactory performance of the COW system. Each foreign tank vessel whose owner or operator has not requested Coast Guard approval of the SBT, CBT, or COW standards must have a letter from the government of the vessel's flag state certifying that the vessel is in compliance with the applicable Coast Guard or related IMCO standards. Examination of 105 on a foreign tank vessel should be conducted if the vessel does not have a SOLAS certificate with an up to date equipment list that includes 105. Steering gear standards should be verified on all applicable foreign tank vessels that enter U. S. waters.

The inspections and examinations should be conducted by a Coast Guard inspector. U. S. tank vessels should be inspected at the shipyard or installing facility during the installation of the equipment or construction standard. Foreign tank vessels should be inspected and/or examined before or during the first entry of the vessel into a U. S. port after the date the standards are required. In addition, all U. S. tank

vessels should be periodically inspected and all foreign tank vessels should be periodically examined to ensure that the equipment and construction standards are maintained and the equipment is operated in accordance with accepted plans and procedures.

The following initial inspections of these equipment and construction standards should be conducted to ensure that the vessel complies with the applicable requirements. Comments and interpretations of certain inspections or inspection requirements are provided, where considered necessary, to assist the Coast Guard inspector.

A. SEGREGATED BALLAST TANKS - Inspection of SET should be made to ensure that the SET system is in accordance with the Coast Guard accepted plans for SET on that vessel. This should include verification that the SET system is not permanently connected to the cargo oil and fuel oil systems and that the tanks designated as SET on the accepted plans are SET on the vessel. Connection of the SET piping system to the cargo piping system via a removable spool piece of piping is allowed for the discharge of contaminated segregated ballast to a slop tank or a reception facility. This spool piece is only to be installed when discharging contaminated segregated ballast or for an emergency situation that will affect the safety of the vessel. During all other times the spool piece must be removed from between the piping connections and the end of the two piping systems should be blanked off.

B. PROTECTIVELY! LOCATED SEGREGATED BALLAST TANKS - The s-c inspections conducted to verify SBT should be used to verify PL/SBT.

C. DEDICATED CLEAN BALLAST TANKS - Inspection of CBT should be made to ensure that the CBT system is designed arid equipped in accordance with the applicable requirements of Subpart E of 33 CFR Part 157 and the Coast Guard accepted plans for CBT on that vessel. The important aspects of the CBT inspection are verification that the tanks designated as CBT on the accepted plans are CDT on the vessel and assurance that the ballast water in the tanks designated as CDT is not contaminated with oil. If possible$_1$ operational procedures should be checked during CDT operations to ensure that the CDT system is. operated in accordance with the requirements of 33 CFR 157.225 arid 226 and any other operational procedures set forth in the Dedicated Clean Ballast Tanks Operations Manual.

D. CRUDE OIL WASHING SYSTEM - Inspection of the COW system should be made to ensure that the COW system is designed, equipped, and installed in accordance with the applicable requirements of Subpart D of 33 CFR Part 157 and the Coast Guard accepted plans for the COW system on that vessel. The owner or operator of a foreign tank vessel requiring inspection by the Coast Guard for compliance with Subpart D of 33 CFR Part 157 must submit to the inspector evidence that the COW system has been installed in accordance with the Coast Guard accepted plans. The evidence my consist of documentation from a recognized classification society or the government of the vessel's flag state. A spot check of the installation can be made to verify the major portions of the installation. In addition, the owner or operator of each U. S. or foreign tank vessel being inspected for compliance with Subpart D of 33 CFR Part 157 must submit to the inspector evidence that the COW piping system has passed a hydrostatic test of 1 1/2 times the design working pressure. This evidence may also be documentation from a recognized classification society or the government of the vessel's flag state.

In addition to the design, equipment, and installation verification inspection addressed above, the three inspections of 33 CFR 157.1110 must be passed before a COW system is accepted by the Coast Guard as complying with Subpart D of 33 CFR Part 157 and the letter under 33 CFR 157.1112 is issued to the tank vessel. These inspections are conducted to ensure that the performance of the COW system is acceptable and that continued operation of the COW

system in accordance with the procedures used to pass these inspections will not result in operational oil pollution.

There are three performance inspections that must be conducted. These three inspections need to be conducted only once on a tank vessel to certify the COW system. If the vessel passes these three inspections, it is not required that these inspections be conducted again, unless the operator desires to operate the COW system at a later date with characteristics that do not meet those which were used to pass these inspections. 33 CFR 157.158 addresses this situation.

Tank vessels in Categories Al, A2, or A3 of the Tables will not normally ballast cargo tanks to leave a port because they will be equipped with SBT; therefore, these tank vessels will not have departure ballast tanks to be inspected for compliance with this second inspection. However, on these tank vessels there should be cargo tanks that will be designated for ballasting during rough weather conditions. This inspection should be conducted on these cargo tanks after they have been filled with water only for the purpose of this inspection. The oily water mixture should then be treated as dirty ballast water and should be discharged in accordance with 33 CFR 157.37.

3. 33 CFR 157.140(b) - The third inspection is conducted to verify that effluent discharged from tanks that have been properly crude oil washed and water rinsed does not exceed the acceptable limits for oil content. This inspection is conducted on the tanks that have been crude oil washed, water rinsed, stripped, and then ballasted during a ballast voyage of the vessel (arrival ballast tanks). The volume of water used for water washing should be kept to a minimum. This inspection should be conducted after the first two inspections have been passed but, prior to the next cargo loading. The discharge of ballast water from these tanks must be monitored and the oil content must not exceed 15 ppm for the tank vessel to pass this inspection. The oil content may be monitored through the vessel's fixed oil discharge monitor or a portable monitor. If a monitor is not available or is not working properly, the vessel's operator may take samples of the ballast water during various stages of discharge and have the oil content checked for compliance by means of laboratory tests. If this method is used, four or five samples should be taken from each tank being inspected, with at least one of those samples taken at the start of the discharge and another just before the completion of the discharge.

   The problems associated with this inspection are - Where should the inspection take place, and who should be allowed to certify this inspection? The ideal and recommended location for this inspection is at the loading port after the vessel has completed the ballast voyage following the first two inspections. This should not be a problem for U.S. tank vessels in domestic trade. The OCMI' of the next port at which the tank vessel will be loading cargo can be contacted to conduct this inspection and the results reported back to the initial inspecting office. U.S. tank vessels in foreign trade and foreign tank vessels create more of a problem. These vessels will be loading cargo at a foreign port. For these tank vessels, there are two acceptable methods of verifying the oil content of the effluent being discharged from arrival ballast tanks. The two methods are listed in order of accepted preference, however, this inspection should be conducted using the method most preferred by the OCMI' to certify the COW system.

   a. Inspection in the cargo loading port by a Coast Guard inspector or an exclusive surveyor of a recognized classification society. After completion of the first two inspections, the vessel commences a "normal ballast voyage water rinsing and filling the arrival ballast tanks during this voyages. A Coast Guard inspector or an exclusive surveyor of a recognized classification society at the next port the vessel

will be loading cargo is contacted, if one is available, to conduct the inspection during the discharge of the arrival ballast tanks. Exclusive surveyors should be contacted through the classification society. The results should be reported to the OCMI certifying the COW system. Results from an exclusive surveyor should be forwarded through the classification society to the cognizant OCMI.

b. Inspection at the cargo discharge port. After completion of the first two inspections, the arrival ballast tanks are water rinsed while the vessel is at the terminal or anchored in the discharge port after completion of cargo discharge. The arrival ballast tanks are then filled with ballast water while the vessel is at the terminal or anchored in the discharge port. The vessel remains in the port for a few hours or overnight to allow any oil in the tank to mix with the ballast water. The monitoring inspection is then conducted in the discharge port by the initial inspector. There is the distinct possibility that the discharge from these arrival ballast tanks could create a visible sheen, which would be in violation of the Federal Water Pollution Control Act, if in a United States port. To prevent this from happening, the effluent being monitored from the arrival ballast tanks in a cargo discharge port in the United States should be discharged either:

(i) To a reception facility.

(ii) To another tank vessel.

(iii) To another tank on the same vessel.

(iv) At least 50 miles from the nearest land.

(v) In any other suitable manner acceptable to the OCMI. Portable hoses may be necessary to accomplish some of the above methods.

A tank vessel that passes the initial verification inspection of the COW system and these three performance inspections has a COW system in compliance with Subpart D of 33 CFR Part 157.

In addition to the initial verification inspection and the three performance inspections of the COW system, the inspector should conduct operational inspections during COW operations to ensure that the COW system is operated in accordance with the applicable operating requirements in Subpart D of 33 CFR Part 157 and any other operational procedures set forth in the Crude Oil Washing Operations and Equipment Manual.

E. INERT GAS SYSTEM - Initial inspection of the IGS on U.S. tank vessels should be conducted to ensure that the IGS is equipped and installed in accordance with the applicable requirements of 46 CFR 32.53. A foreign tank vessel that has a SOLAS Certificate issued by the government of the vessel's flag state with an up to date equipment list that includes IGS need not be inspected by the Coast Guard inspector for compliance with 46 CFR 32.53. A foreign tank vessel that has documentation from the government of the vessel's flag state certifying that the IGS is in accordance with Regulation 60 of SOLAS 74, as amended, should be accepted. Maintenance and operational inspections of the IGS, which should be conducted when making a routine inspection/examination of the IGS, are contained in Chapter 15 of Volume II of the Marine Safety Manual (COMDTINST M16000.7).

As allowed under 46 CFR 32.53-3, existing crude oil tankers less than 40,000 DWT that are fitted with low capacity tank washing machines may be granted an exemption from the IGS requirements under certain conditions. This applies to a foreign flag tank vessel even if the vessel has been granted an exemption by the government of the vessel's flag state under Regulation 60(d)(ii) of Chapter 11-2 of the SOLAS Protocol. Flag state exemptions will not be accepted automatically, however, a flag state exemption will be considered for foreign flag tank vessels that apply for an exemption under 46 CFR 32.53-3.

F. IMPROVED STEERING GEAR STANDARDS - Inspection of the improved steering gear standards should be made on U.S. and foreign tank vessels to ensure that the steering gear equipment is in accordance with the applicable design and equipment requirements of 33 CFR Part 164 and 46 CFR Parts 58, 111, and 113.

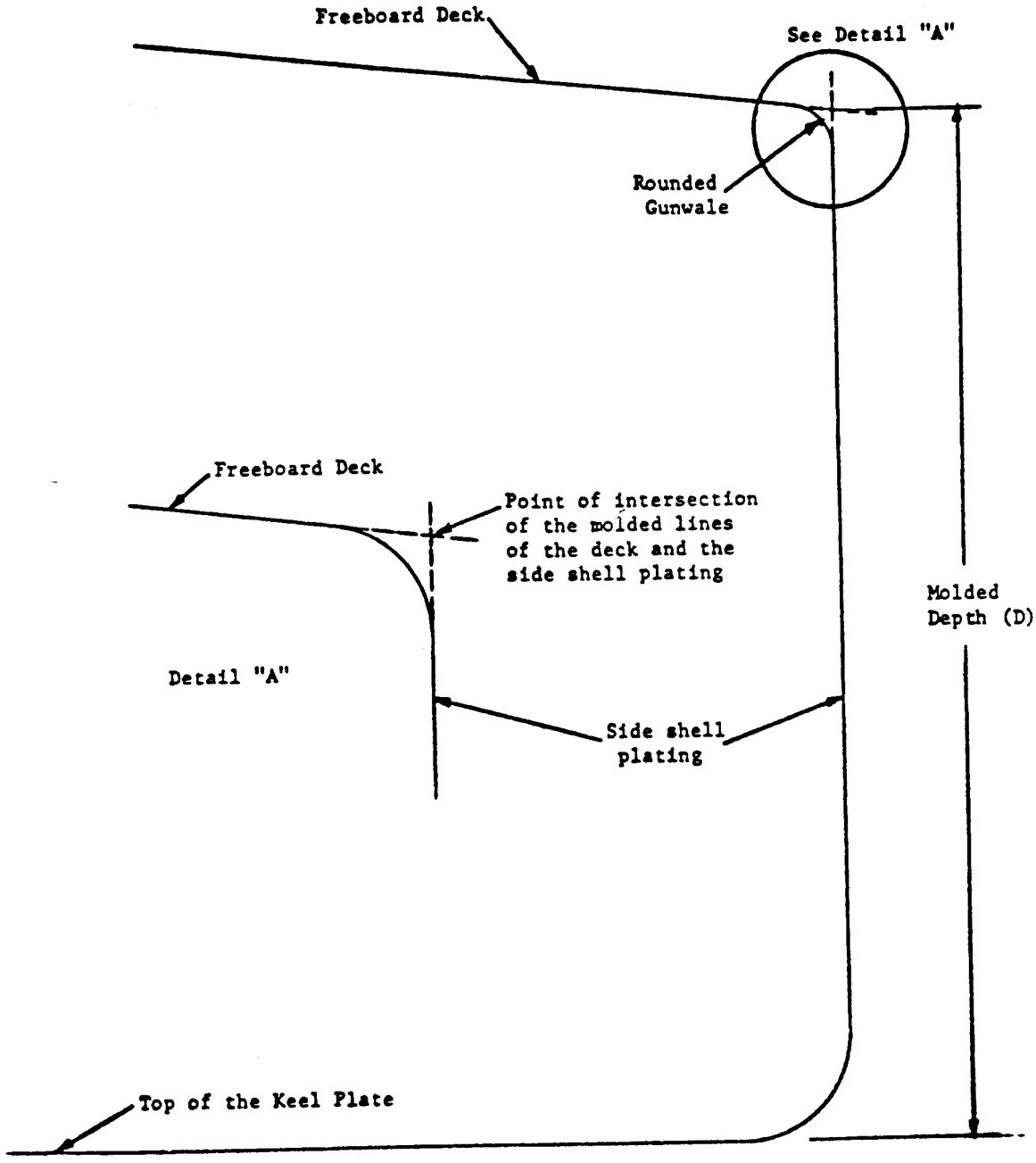


FIGURE ONE - MIDSHIP SECTION SHOWING MOLDED DEPTH ON A TANK VESSEL WITH A ROUNDED GUNWALE

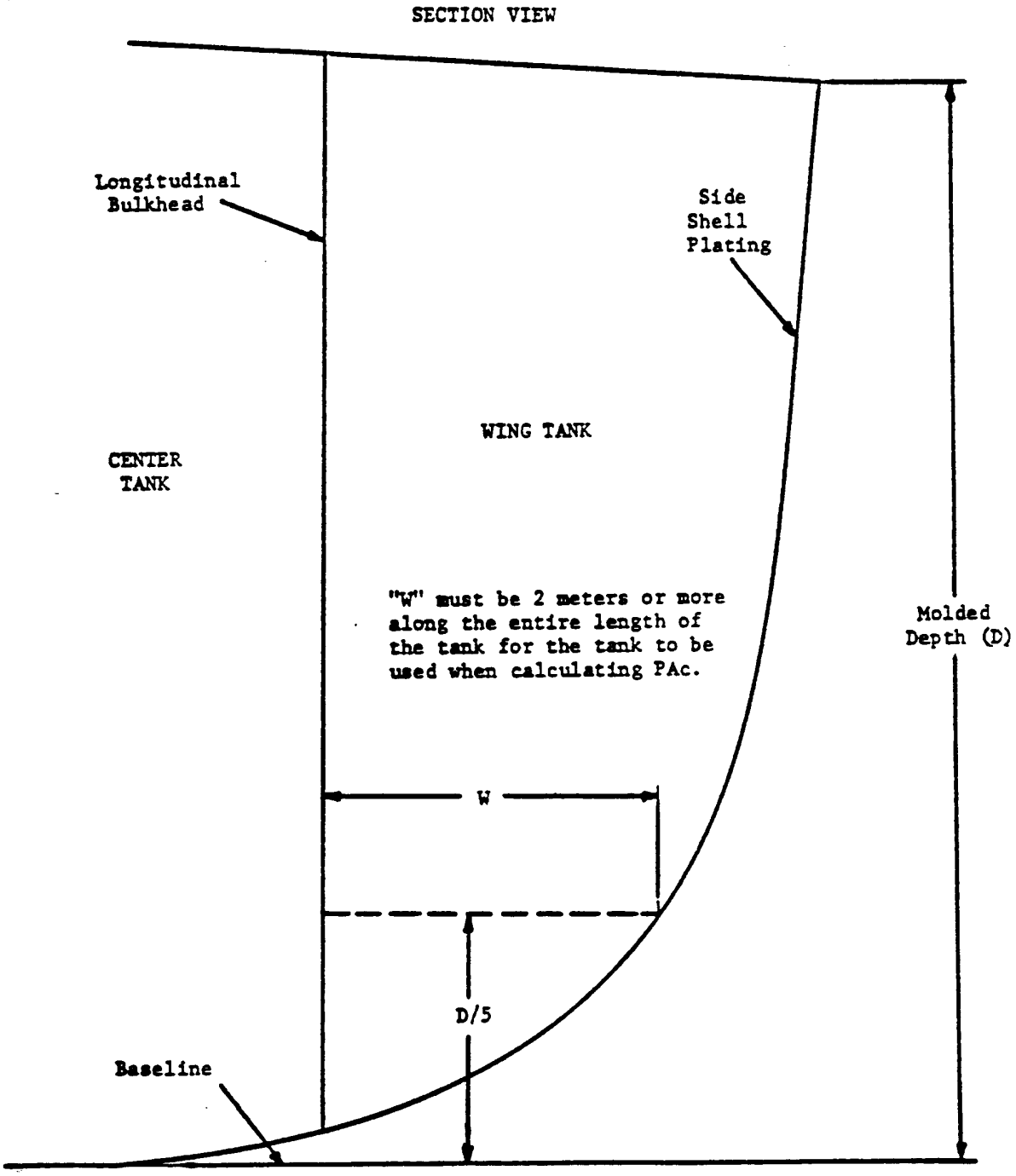


FIGURE TWO - MINIMUM WIDTH OF A WING TANK TO BE USED WHEN CALCULATING PAc IF THE TURN OF THE BILGE AREA IS NOT CLEARLY DEFINED

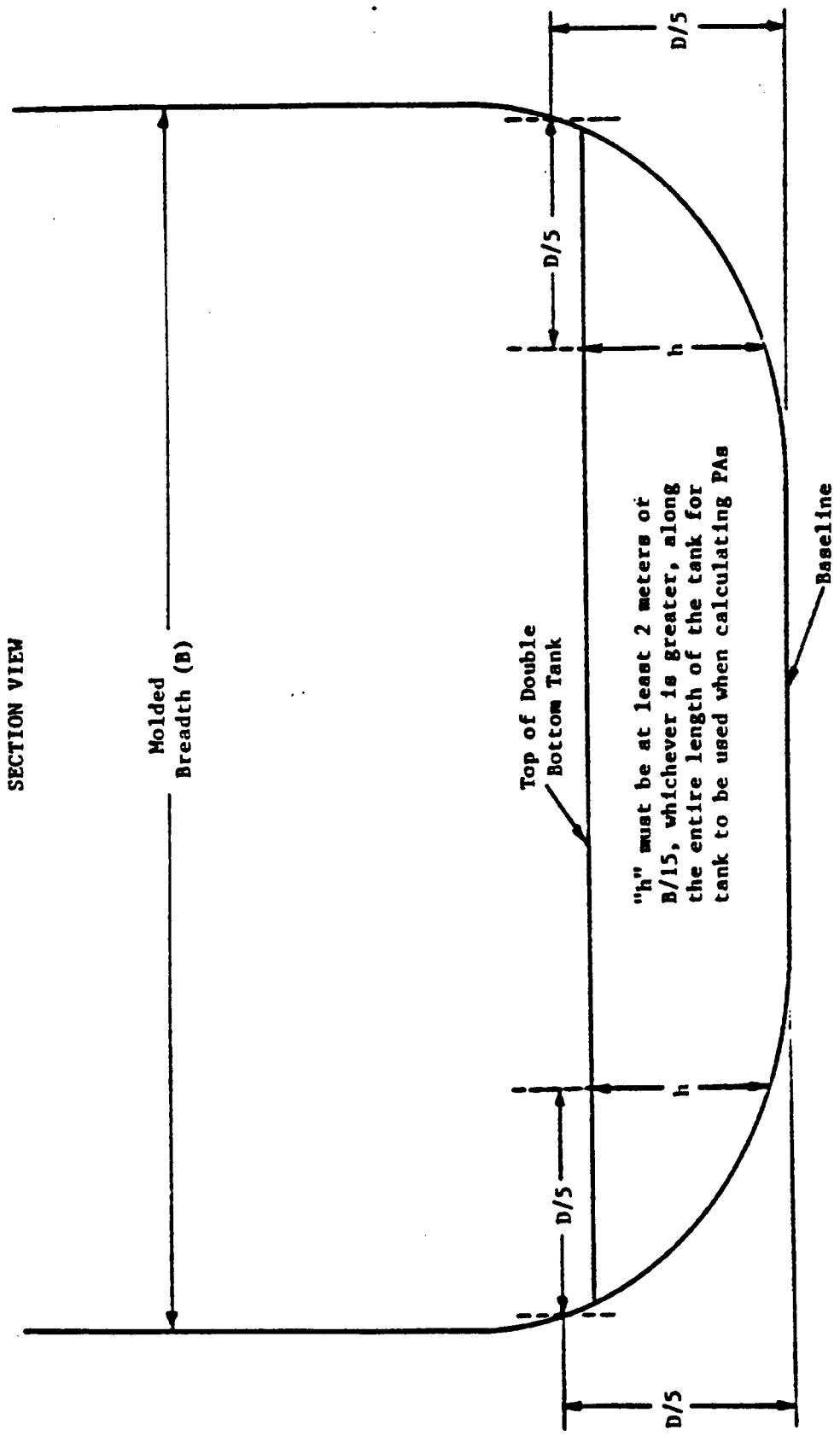
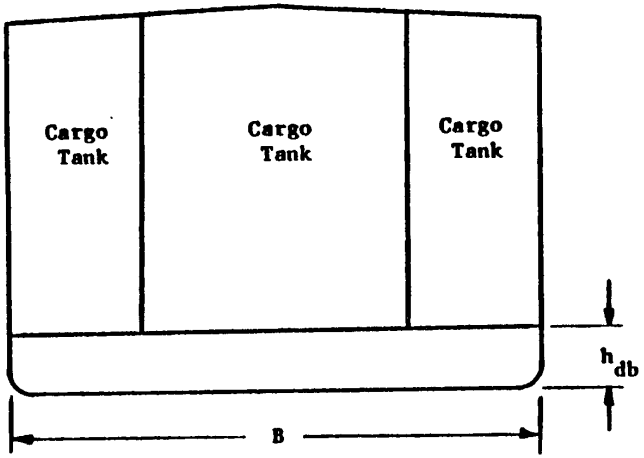


FIGURE THREE - MINIMUM DEPTH OF A DOUBLE BOTTOM TANK TO BE USED WHEN CALCULATING PAs IF THE TURN OF THE BILGE AREA IS NOT CLEARLY DEFINED



If h_{db} is at least 2 meters or B/15, whichever is less, along entire tank length -

PAc = h_{db} x Double Bottom Tank Length

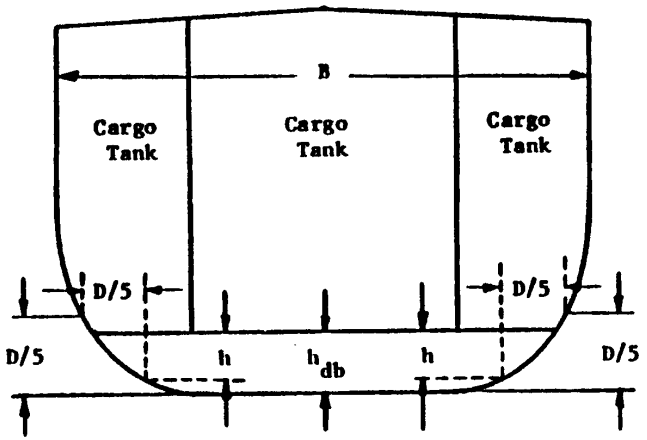
PAs = B x Double Bottom Tank Length

If h_{db} is less than 2 meters or B/15, whichever is less, -

PAc = h_{db} x Double Bottom Tank Length

PAs = 0

FIGURE FOUR - DETERMINATION OF PAc and PAs FOR DOUBLE BOTTOM TANK WITH CLEARLY DEFINED TURN OF THE BILGE AREA



If h is at least 2 meters or B/15, whichever is less, along entire tank length -

PAc = h_{db} x Double Bottom Tank Length

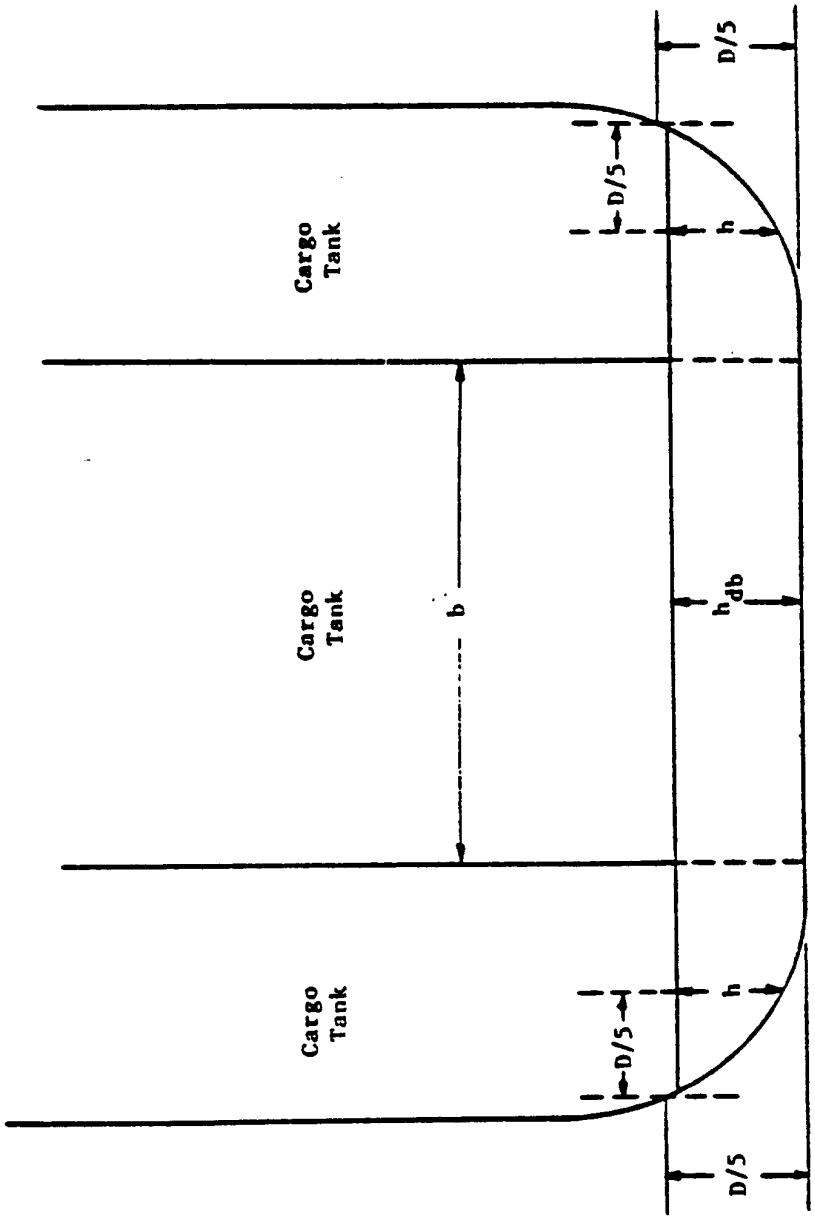
PAs = B x Double Bottom Tank Length

If h is less than 2 meters or B/15, whichever is less, -

PAc = h_{db} x Double Bottom Tank Length

PAs = 0

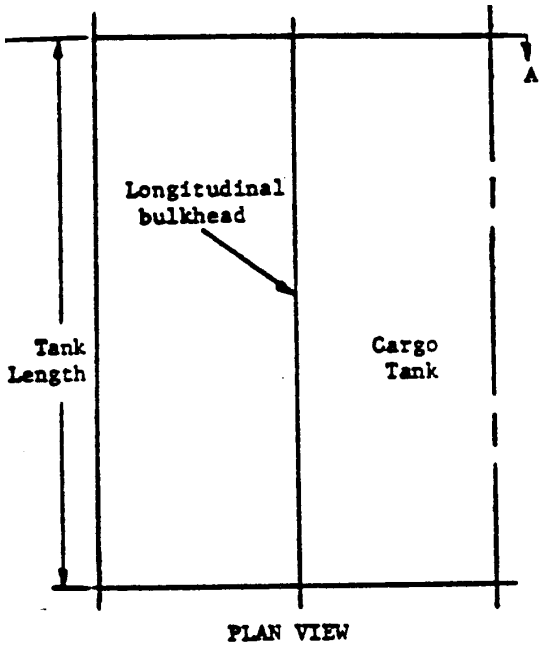
FIGURE FIVE - DETERMINATION OF PAc and PAs FOR DOUBLE BOTTOM TANK WITHOUT CLEARLY DEFINED TURN OF THE BILGE AREA



If h is less than 2 meters or B/15, whichever is less, anywhere along the tank length, BUT h_{db} is at least 2 meters or B/15, whichever is less, along the entire tank length within the width of b - PAc = h_{db} x Double Bottom Tank Length

PAs = b x Double Bottom Tank Length

FIGURE SIX - ADDITIONAL DETERMINATION OF PAc and PAs FOR DOUBLE BOTTOM TANK WITHOUT CLEARLY DEFINED TURN OF THE BILGE AREA



If W is 2 meters or more -

PAc = D x Tank Length

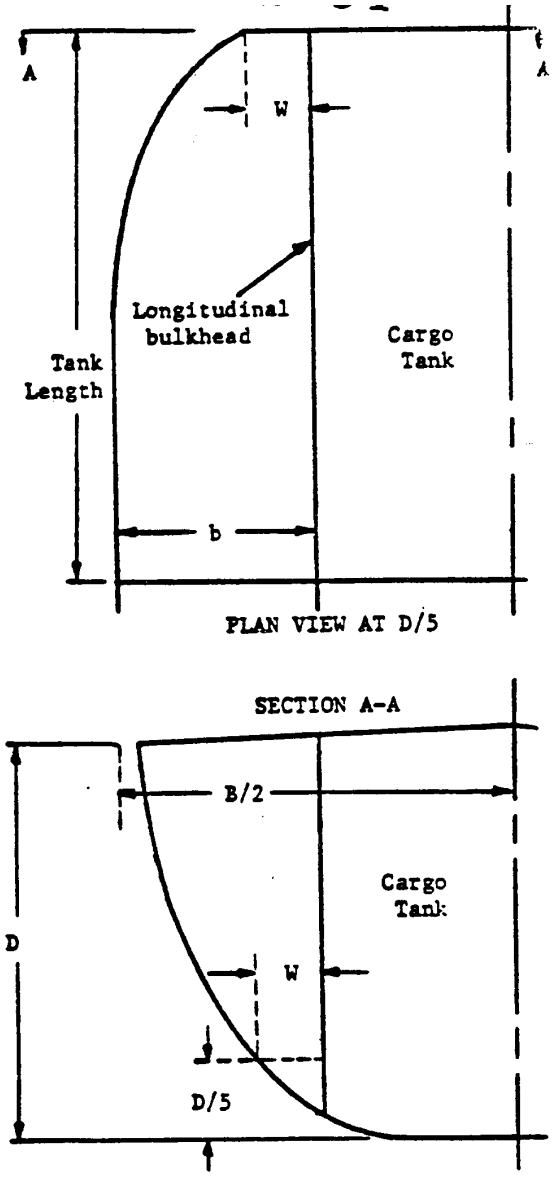
PAs = W x Tank Length

If W is less than 2 meters -

PAc = 0

PAs = W x Tank Length

FIGURE SEVEN - DETERMINATION OF PAc and PAs FOR WING TANK WITH CLEARLY DEFINED TURN OF THE BILGE AREA



If W is 2 meters or more -

PAc = D x Tank Length

PAs = b x Tank Length

If W is less than 2 meters -

PAc = 0

PAs = b x Tank Length

FIGURE EIGHT - DETERMINATION OF PAc and PAs FOR WING TANK WITHOUT CLEARLY DEFINED TURN OF THE BILGE AREA

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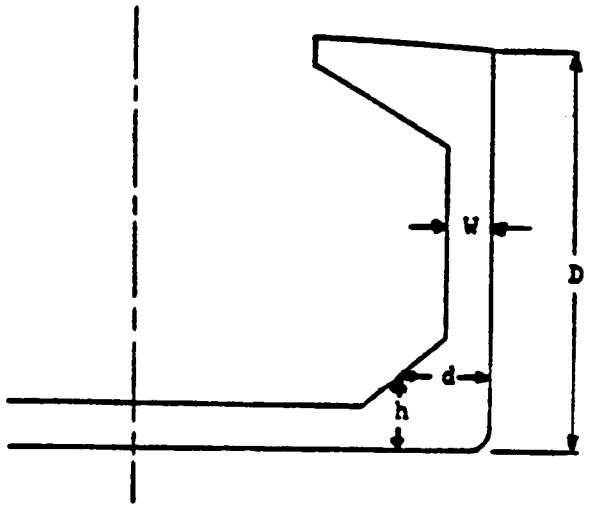


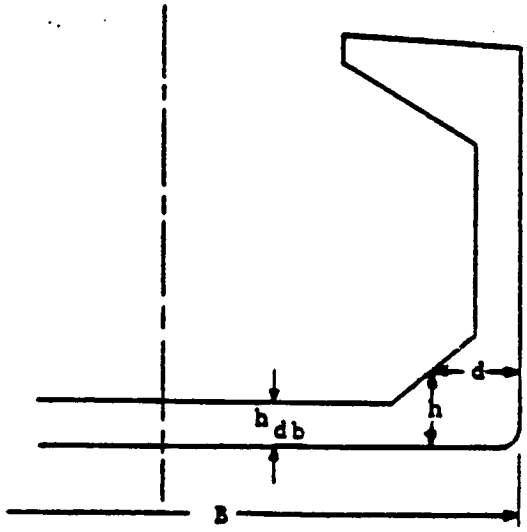
If W is 2 meters or more -

PAc = D x Tank Length

If W is less than 2 meters -

PAc = h x Tank Length

(h is measured from the point where d = 2 meters)



If h_{db} is at least 2 meters or B/15, whichever is less -

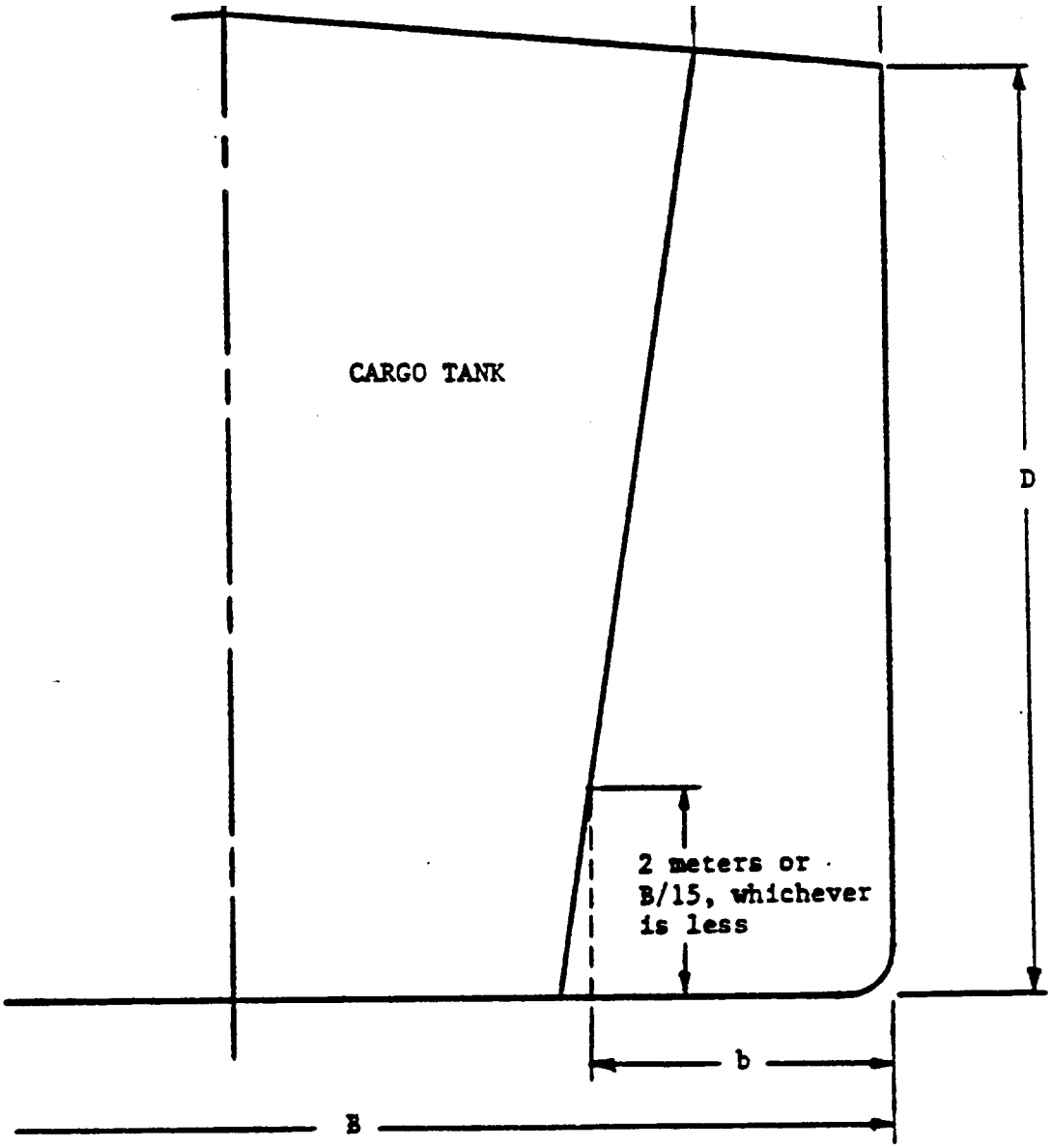
PAs = B x Tank Length

If h_{db} is less than 2 meters or B/15, whichever is less -

PAs = d x Tank Length

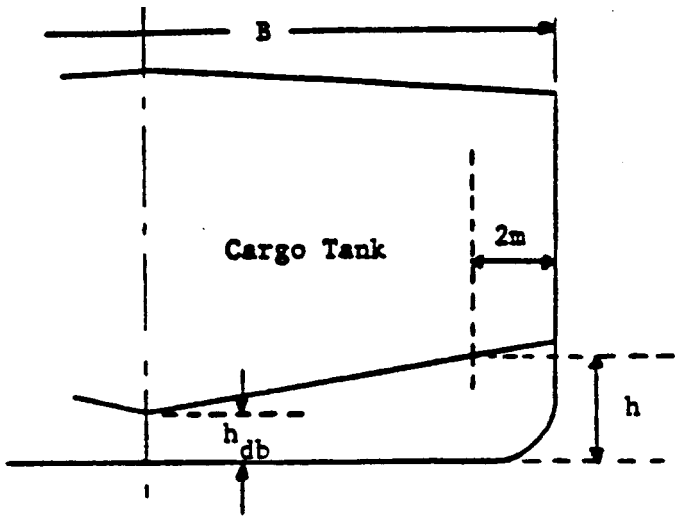
(d is measured from the point where h = 2 meters)

FIGURE NINE - DETERMINATION OF PAc and PAs FOR A COMBINATION CARRIER



If W is 2 meters or more -	If W is less than 2 meters -
PAc = D x Tank Length	PAc = 0
PAs = b x Tank Length	PAs = b x Tank Length

FIGURE TEN - DETERMINATION OF PAc and PAs OF WING TANK WITH INCLINED LONGITUDINAL BULKHEAD



If h_{db} is at least 2 meters or B/15, whichever is less -

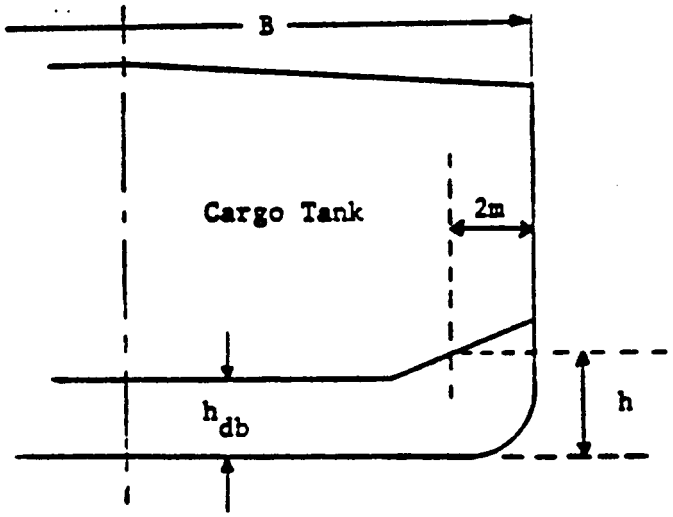
PAc = h x Tank Length

PAs = B x Tank Length

If h_{db} is less than 2 meters or B/15, whichever is less -

PAc = h x Tank Length

PAs = 0



If h_{db} is at least 2 meters or B/15, whichever is less -

PAc = h x Tank Length

PAs = B x Tank Length

If h_{db} is less than 2 meters or B/15, whichever is less -

PAc = h x Tank Length

PAs = 0

FIGURE ELEVEN - DETERMINATION OF PAc and PAs FOR A DOUBLE BOTTOM WITH AN INCLINED TANK TOP

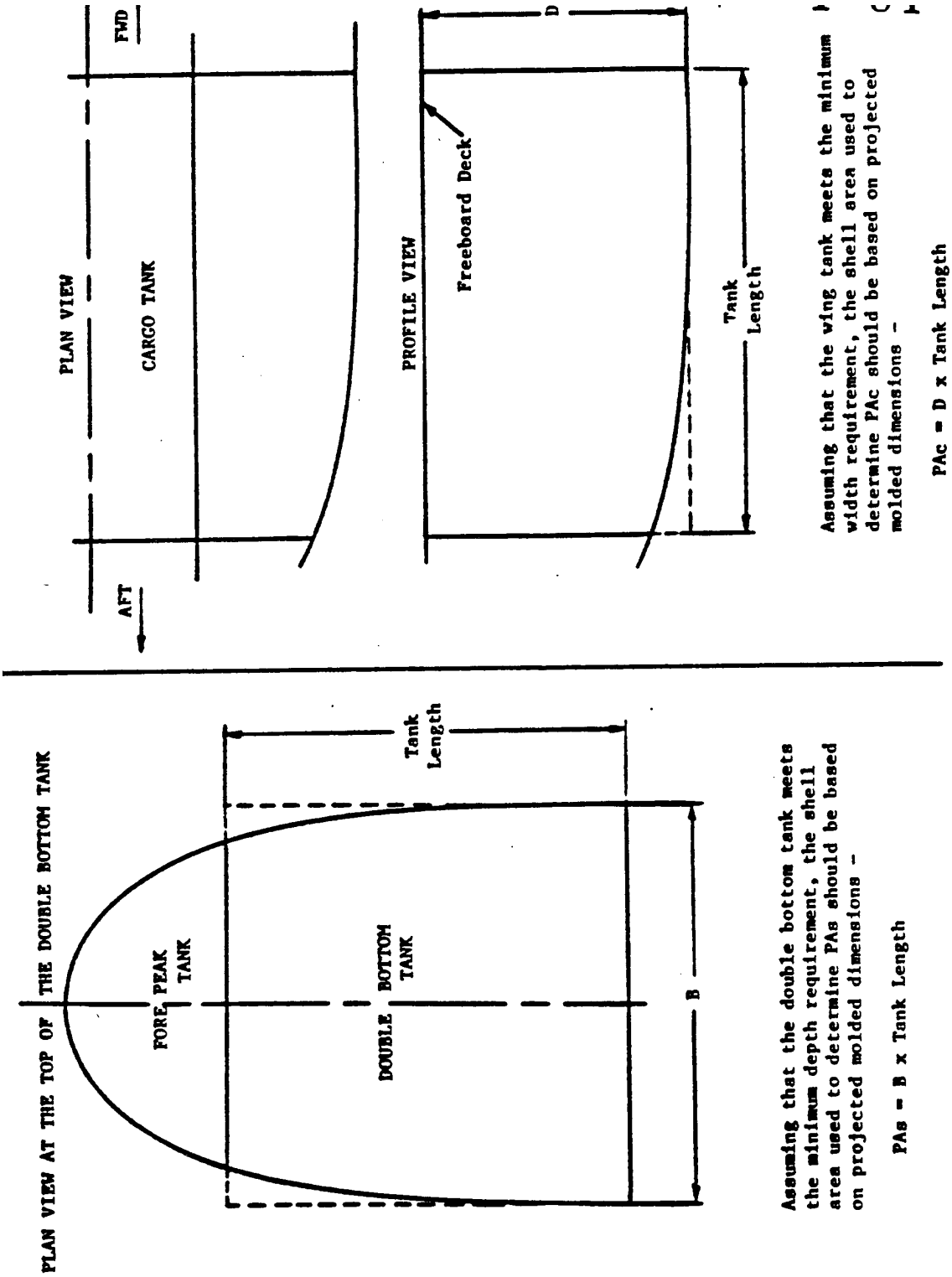
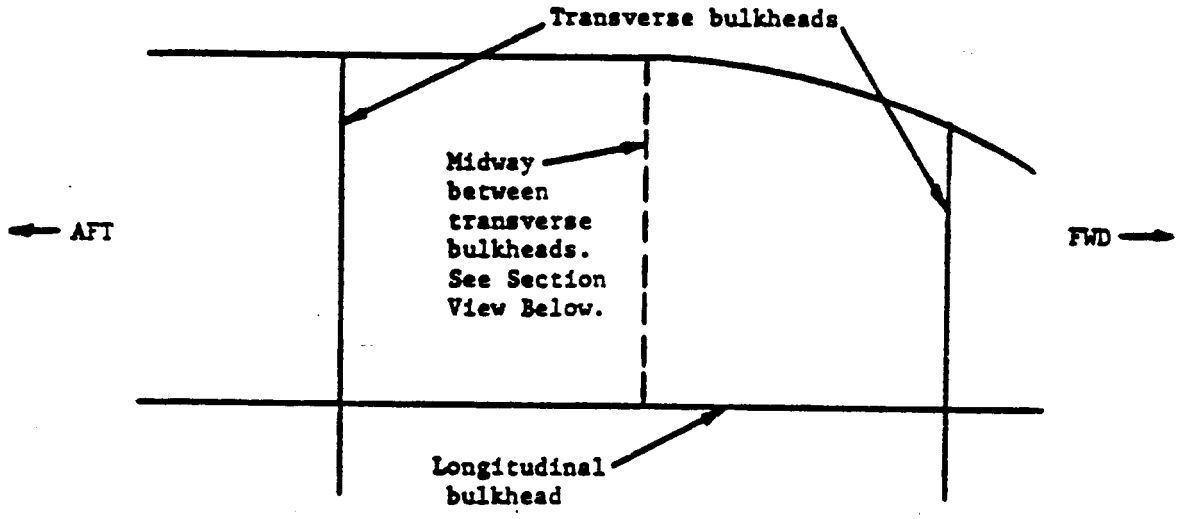


FIGURE TWELVE - DETERMINATION OF SHELL AREA FOR PAc or PAs OF A FORWARD OR AFT LOCATED DOUBLE BOTTOM OR WING TANK WITHIN THE VESSEL'S MOLDED DIMENSIONS

PLAN VIEW OF WING TANK



SECTION VIEW AT MIDLENGTH OF WING TANK

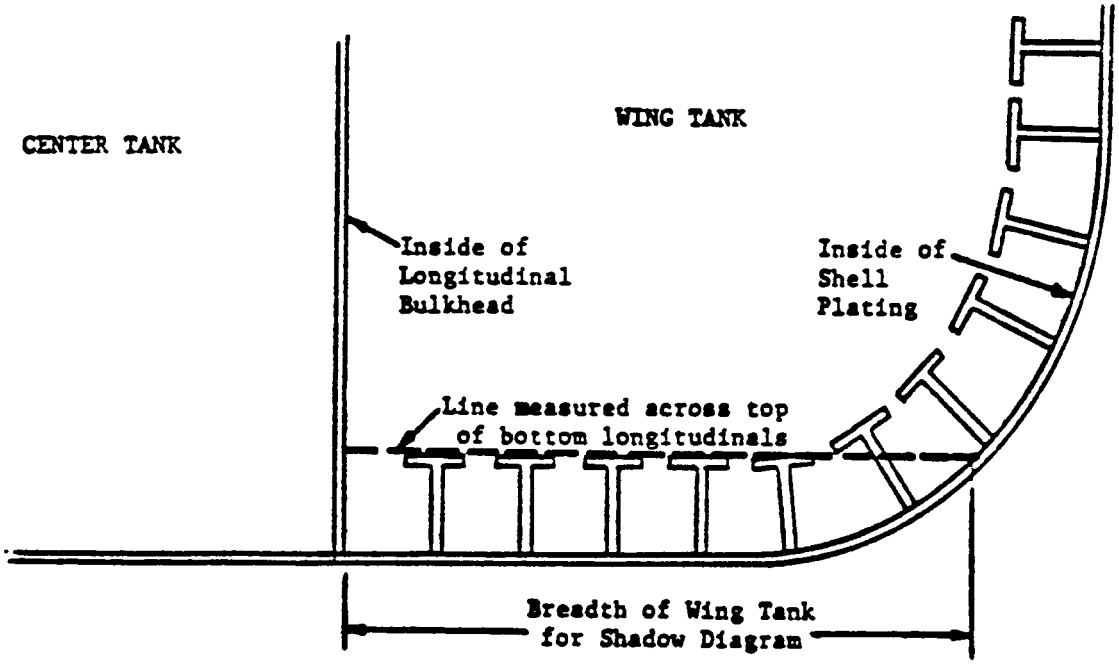


FIGURE THIRTEEN - DETERMINATION OF BOTTOM AREA OF A WING TANK FOR CRUDE OIL WASHING SHADOW DIAGRAM

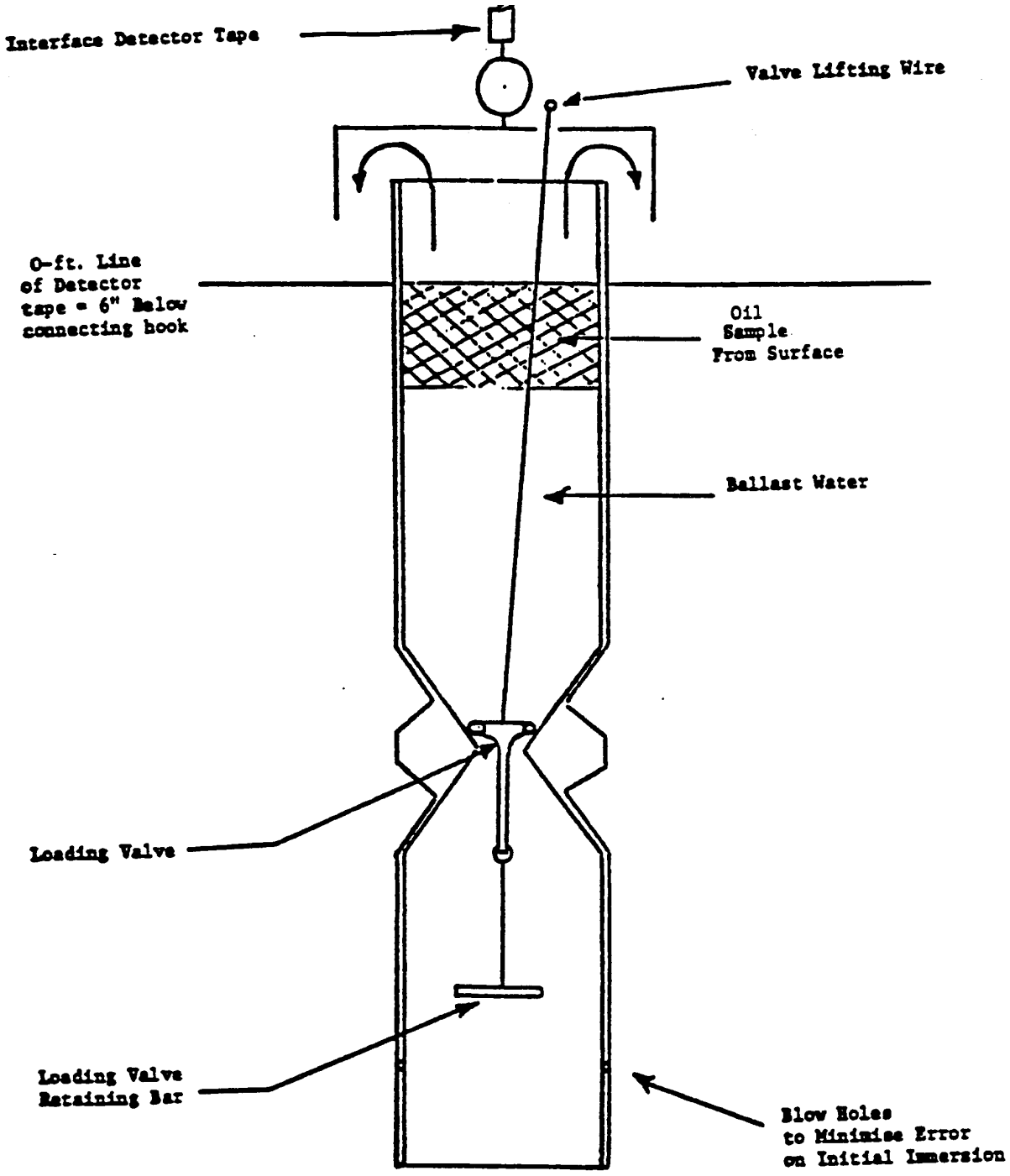


FIGURE FOURTEEN - EXAMPLE OF A DEVICE TO MEASURE OIL LAYER THICKNESS FOR CRUDE OIL WASHING SYSTEM INSPECTION

February 1981

GUIDELINES REGARDING PROCEDURES AND SAFETY PRECAUTIONS FOR CONDUCTING THE CRUDE OIL WASHING VISUAL TANK INSPECTION OF 33 CFR 157.140

1. BACKGROUND

33 CFR 157.140 contains the Coast Guard inspections that are necessary to ensure that the crude oil washing system (COW) is operating properly. To confirm the degree of tank cleanliness and to verify the number and location of tank washing machines, 33 CFR 157.140(a)(1) requires that each tank be inspected to determine if the tank is free of oil clingage or deposits after COW operation:. This will usually require a visual inspection within the cargo tank. There is a general agreement within the tanker comity that this inspection involves safety considerations that go beyond the normal hazards of cargo tank entry. The Marine Safety Manual (CG-495), Chapter 21 - Safety and Health for Personnel, provides basic safety and health information. That chapter and this guide should be read, reviewed, and understood by personnel assigned to conduct COW visual tank inspections. Rigid adherence to safety precautions cannot be over emphasized. It is recognized that varying procedures and conditions exist between different tankers and tanker operations. This guide addresses those common factors which are crucial to safety so that all those involved in these visual tank inspections can evaluate whether all risks have been properly considered and minimized to an acceptable degree.

2. DISCUSSION OF HAZARDS

This section highlights the different hazard aspects associated with the visual tank inspections after COW operations. It is pointed out that even after following the required flushing, stripping, and ventilation procedures, gaspockets may remain in places which are shielded and therefore difficult to reach for ventilation. Sensory perception should not be relied upon when determining if an atmosphere is dangerous to health. The senses are directly influenced by toxic gases or by lack of oxygen, and as such constitute dangerous monitors. In order to make an accurate judgment of the tank atmosphere, use of suitable and reliable measuring equipment by a Certified Marine Chemist should be used. 46 CFR 35.01-1 addresses the use of a Certified Marine Chemist or another person authorized by the OCMI.

a. Toxic Tank Atmosphere

Hydrocarbon gas emitted by crude oil contains many toxic components of different Threshold Limit Values (TLVs). The composition of the gas depends on the origin and type of crude oil. The three most significant toxic components that are usually present in the tanks after purging and venting are carbon monoxide, benzene, and hydrogen sulfide. Therefore, after purging and venting the tank, measurements should be made to ensure that the allowable limits of concentrations of 50 ppm for carbon monoxide, 10 ppm for benzene, and 10 ppm for hydrogen sulfide are not exceeded.

b. Oxygen Deficient Atmosphere

After purging a tank with inert gas, the oxygen content of the tank atmosphere is too low to sustain life. Ventilation of the tank with fresh air is necessary to obtain the proper oxygen content level. A tank may not be entered before the tank atmosphere inside the tank has an oxygen content of at least 19.5%. If, during the inspection, any pockets are encountered which contain less the 19.5% oxygen content, the tank should be evacuated until 19.5% is achieved.

c. Explosive Tank Atmosphere

If purging and ventilation of the tank have been properly carried out, the danger of explosion will be reduced, but measurements to dateline the concentration of flammable vapors (hydrocarbon content) are necessary to ensure that the allowable limit of concentration of 1% of the lower flammable limit is not exceeded. It is emphasized that dangerous gaspockets my still exist inside the tank, especially in areas shielded by internal structures. Although 1% of the lower flammable limit is well below the hydrocarbon concentration which would sustain combustion, purging and venting the tank to the 1% value will help reduce the levels of toxic components.

d. Damage to Ladders, Grating$_1$ and Handgrips

Ladders, gratings, and handgrips in a cargo tank are alternately exposed to oil, ballast water, crude oil washing, air, and other gas mixtures. This may result in dangerous damage by corrosion, therefore, they must be used with extreme caution.

e. Slippery Surfaces, Obstacles, and Lightening/Drain Holes

Crude oil washing leaves most surfaces clean and, frequently, the necessary ventilation results in drying of the structure which will render the chance of slipping on these surfaces small. Even so non-slip safety shoes should be worn.

Good lighting and a careful lookout are necessary because sludge spots and tripping hazards will exist. Lightening or drain holes in structural members which are used for walking On are potential hazards. Caution should be used when walking en or around these structural members. These holes my continue to be difficult to spot even when using high intensity portable lights.

3. VENTILATION

In order to obtain a safe tank atmosphere thorough ventilation of a tank is necessary. The only acceptable method of ventilation is ventilation by mans of power driven portable fans of sufficient number and power to ventilate the entire tank, including the tank bottom. If electric driven fans are used, they must be intrinsically safe. These portable fans are rigged above tank cleaning or similar openings and have proven to be the most effective. Two other methods of ventilation which are not recommended and are only mentioned to make personnel aware of the hazards of using these methods include the following:

a. Ventilation by mans of inert gas blowers through the inert gas piping. The air is introduced through the hatch coamings. When using this method it is necessary that all other tanks are isolated from the inert gas piping main. Local gaspockets my not be reached by this system.

b. Ventilation by mans of turbine driven bottom blowers. With this system the cargo lines are utilized for supplying the air, which is introduced into the tank through the auction piping. Due to the danger of inert gas leakage through the lines, valves to other tanks must be tightly closed. Oil or oily water mixtures trapped in certain sections of lines constitute a danger. After inefficient stripping the forced airstream my cause a mist through the oil heel. As with the use of inert gas blowers there is a danger that gaspockets are not reached.

As stated above, these two methods of ventilation are not recommended, but if it becomes necessary to use one of these methods or a combination of portable fans with one of these methods, the

inert gas and cargo piping to the tank being inspected must be securely closed and blanked, if possible, before entering the tank.

4. PROCEDURES AND SAFETY PRECAUTIONS

The exact methods and procedures associated with preparing, entering and inspecting cargo tanks will vary from ship to ship. This guide provides pertinent information which should be considered in the preliminary discussions where the detailed procedures for each particular tanker are to be developed.

When the owner/operator representative contacts the OCMI to schedule the inspection, all aspects of the inspection, including the detailed procedures for actual conduct of the inspection, should be discussed. All equipment and/or services necessary to prepare for and conduct the inspections are to be provided by the vessel owner/operator. Discussion with the OCMI should also be conducted to determine what equipment and/or services will be necessary.

A follow-up meting should be held on board the tanker prior to starting inspection operations. All parties who will be involved in the inspection should attend so that everyone involved has a clear understanding of what is to happen and how it will be done.

The following is a list of safety precautions that should be followed:

a. The master is responsible for the appropriate safety measures prior to and during tank entry. No tank should be entered without his permission.

b. The master should appoint a responsible officer who will be in charge of the safety and emergency procedures during tank inspections. This officer should remain on deck in charge of the rescue party and ensure that continuous visual and radio contact is maintained with the inspection party.

c. The master should also appoint an officer experienced in the inspection and evacuation of tanks to accompany the inspection party in the tank. While in the tank this officer should continuously monitor the tank atmosphere for safe conditions as detailed in paragraph j below.

d. Tank inspections should be conducted in daylight hours only.

e. Adjacent tanks should not contain cargo.

f. The tank to be entered should be effectively isolated from the inert gas supply line by means of a blank.

g. The inert gas pressure in all tanks should be reduced to atmospheric.

h. Valves which interconnect pipes through the piping system and through which a tank to be entered is connected with other tanks should be closed and secured with locks or; in case of hydraulic valves, should be secured by switching off the power pack.

i. Prior to tank entry, measurements should be taken by a Certified Marine Chemist through as many deck openings as practicable and at several levels inside the tank to ensure that the tank atmosphere meets the minimum standards of paragraph j below. Requirements for a certified Marine Chemist or such person authorized by the OCMI are detailed in 46 CFR 35.01-1.

j. Prior to and throughout tank entry it should be determined that the tank atmosphere ii maintained as follows:

(1) Oxygen content is 19.5% or more.

(2) The concentration of flammable vapors is below 1% of the lower flammable limit.

(3) Carbon Monoxide content is 50 ppm or less.

(4) Benzene content is l0 ppm or less.

(5) Hydrogen sulfide content is 10 ppm or less.

k. Skin contact with the crude oil should be avoided.

1. Ventilation by means of portable fans should be maintained in the tank throughout the inspection.

m. Continuos visual and radio contact between the inspection party and the safety officer should be maintained. Intrinsically safe portable radios should be used to provide this vital communications link.

n. The size of the inspection party should be limited. A good practice is to have no more than four persons inside the tank simultaneously. Each of these persons should be familiar with the evacuation procedure.

o. Whenever possible, the inspection should be conducted without leaving walkways and sloping ladders.

p. The following minimum rescue personnel and equipment should be located Dear the tank hatch in which the inspection party is working:

(1) The safety officer and a 3 man rescue team to assist in cases of accidents.

(2) Stretcher with hoist.

(3) Resuscitation equipment.

(4) Self contained breathing apparatus for rescue team.

(5) Tools, heaving and safety lines, intrinsically safe lighting.

(6) Intrinsically safe portable radio.

This equipment should be moved from hatch to hatch as various tanks are inspected.

q. The following clothing and equipment for the in tank inspection party should be used. Discussions between the OCMI and the vessel's owner/operator representation should be conducted to determine who will provide this clothing and equipment.

(1) Light colored overalls.

(2) Leather safety gloves.

(3) Safety shoes/boots of the non-slip type.

(4) Intrinsically safe high intensity flashlight.

(5) Safety helmet.

(6) Self contained breathing apparatus (SCBA) with a minimum air supply of 30 minutes for one member of the inspection party.

(7) Emergency escape breathing apparatus (EEBA) with a minimum air supply of 5 minutes for all other members of the inspection party.

(8) Portable oxygen meter suitable for continuous sampling and provided with an alarm and portable gas indicator for hydrocarbon sampling (one amber only).

(9) Safety harness with short line and hook in order to secure a person who might become sick while in the tank.