

NAVIGATION AND VESSEL INSPECTION CIRCULAR NO. 2 - 81 CHANGE 1 INCLUDED  
*Electronic Version for Distribution Via the World Wide Web*

Subj: Coast Guard Inspection Guidance Regarding Integrated Tug Barge Combinations

1. PURPOSE. The purpose of this Circular is to provide the marine industry and Coast Guard personnel with uniform guidance regarding the application of certain statutes and Coast Guard regulations to tug barge combinations.
2. APPLICATION. This guidance is effective on the publication date. Since past application of statutes and regulations was accomplished on an individual case basis, it is not necessary to apply this guidance retroactively. Therefore, this Circular will not be applied to existing tug barge combinations. Owners however, do have the option of altering existing vessels to comply with this guidance if they so desire. This Circular is not applicable to tug barge combinations with routes restricted to lakes, bays and sounds or rivers as defined in Title 46 Code of Federal Regulations Subpart 90.10.
3. DISCUSSION.
  - a. There recently has been an increased interest in the use of tug barge combinations for marine transportation. This interest has prompted the development of a variety of tug barge connection systems incorporating innovative design features. The class of vessels which has evolved employs a variety of arrangements and designs, some of which simply replace or supplement conventional wire rope arrangements. The safety of these arrangements depends on proper design, fabrication and maintenance; aspects which raise considerations long resolved for the wire rope systems they replace.
  - b. The Coast Guard considers an Integrated Tug Barge (ITB) to be any tug barge combination which, through the use of special design features or a specially designed connection system, has increased seakeeping capabilities relative to a tug and barge in the conventional pushing mode. Enclosure (1) contains a more complete ITB definition. Because of their increased seakeeping capability, speed and cargo capacity and because of their dependence for safe operation on the proper functioning of specially designed features, the Coast Guard considers it necessary to publicize the inspection and certification requirements applicable to ITBs.
  - c. The Coast Guard recognizes that there are significant differences among the various vessel combinations covered by the ITB definition. For this reason, ITBs are divided into two groups: Pushing Mode ITBs and Dual Mode ITBs.
    - (1) Pushing Mode ITBs are those ITBs where the tug remains in the combined configuration or has the capability to remain in the combined configuration under the environmental conditions which a ship of comparable size could anticipate on a comparable route. Pushing Mode ITB tugs, in general, are not equipped or capable of separating from the barge and towing on a hawser. Safety regulations and statutory requirements dependent on tonnage measurements are applicable to Pushing Mode ITBs as determined by the aggregate tonnage of the ITB combination.

- (2) Dual Mode ITBs are those ITBs where the tug is similar to a conventional tug and is equipped to tow by hawser. The Dual Mode ITB can operate in either the combined configuration or tow on a hawser. The Dual Mode ITB tug can separate safely from the barge and shift to the hawser towing configuration at designated sea states. For inspection purposes, the tug and barge of a Dual Mode ITB will be considered as separate vessels. The specially designed connection system will be considered as part of the barge for purposes of review and inspection.

d. Enclosure (1) contains further guidance.

4. ACTION. The guidelines contained in enclosure (1) are for use in conducting Coast Guard review of Integrated Tug Barges (ITBs).

  
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**Chief, Office of Merchant Marine Safety**

End: (1) Guidelines for Integrated Tug Barge Combinations.

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## GUIDELINES FOR INTEGRATED TUG BARGE COMBINATIONS

### 1. DEFINITION

An Integrated Tug Barge is any tug barge combination in which a specially designed propulsion unit (tug) is mated to a cargo unit (barge) of a compatible special design or where a propulsion unit (tug) is mated to a cargo unit (barge) with a specially designed connection system such that the combined unit has operating characteristics and seakeeping capabilities which exceed, under all anticipated weather conditions, those of a tug and barge where the tug is secured in the barge notch or on fenders by means such as wire rope, chains, lines or other tackle now commonly used in offshore towing.

This definition applies to vessel construction standards, inspection, certification and manning and may not be applicable with reference to other regulations and statutes.

For example, a tug barge combination will be considered an ITB, when the tug:

- cannot operate with barges other than those barges specifically designed for joint operation with the tug; or
- cannot engage in hawser towing (does not meet the towline pull stability criteria or does not have necessary towing equipment installed); or
- requires significant reinforcement of internal structure to accommodate shelves, wedges or other interlocking mechanisms; or
- is restrained in the notch of a barge to the extent that the speed and weather operating capabilities of the combined unit approach those of a single vessel.

### 2. ITB MODE TYPE

In order to accommodate the wide spectrum of designs, ITBs -are classed as either Pushing Mode or Dual Mode.

#### a. Pushing Mode ITB

- (1) A Pushing Mode ITB has the characteristics of a ship of comparable size in that it has a similar seakeeping capability and it remains in the pushing mode throughout a voyage under all anticipated weather conditions. A Pushing Mode ITB tug may be -connected to the barge with either a rigid or an articulated connection system.
- (2) For example, an ITB in which the tug:
  - (a) cannot meet the towline pull stability criteria; or
  - (b) does not have installed or rigged the necessary equipment for towing by hawser; or
  - (c) cannot demonstrate safe separation from the barge under all operating conditions for which the tug and barge are designed to operate as a combined unit;

Will be considered a Pushing Mode ITB and the tug must be able to remain in the pushing mode under those weather conditions in which a ship of equivalent size could operate.

b. Dual Mode ITB

- (1) A Dual Model ITB is similar to a tug and barge where the tug is secured in the barge notch or on fenders by means such as wire rope, chains, lines or other tackle now commonly used in offshore towing in that it is in all respects equipped to tow by hawser. It does differ, however in that it employs a method of connection which may permit greater speed, improved maneuverability and seakeeping, and which may be easier and safer to operate.
- (2) A Dual Mode ITB has all of the following characteristics:
  - (a) The tug has a hull shape which permits safe hawser towing.
  - (b) The tug meets the weather, dynamic and towline pull stability criteria.
  - (c) The tug and barge are equipped and rigged with the necessary gear for hawser towing. This should include a towing engine or bitts, hawser and bridle.
  - (d) The tug has the capability to separate safely in a timely fashion at a predesignated sea state and shift to towing on the hawser. The capability to disconnect must be demonstrated.
  - (e) The barge is subject to inspection under applicable statutes. If the barge is not subject to inspection, the combined tug and barge will be considered a conventional tug barge combination.

3. APPLICATION OF THE REGULATIONS

a. Pushing Mode ITB

Those regulations and statutes applicable to a ship of the same tonnage as the aggregate tonnage of the combined units shall be applied.

b. Dual Mode ITB

The tug and barge of a Dual Mode ITB will be considered for inspection purposes as separate vessels. The specially designed connection system, however, will be considered as part of the barge.

4. GENERAL PROCEDURES FOR REVIEW, CERTIFICATION, AND INSPECTION

- a. The initial step in the Coast Guard review of a tug barge combination is to determine if the unit is an ITB by using the definition of this enclosure. Units falling within the definition should be classed as Pushing or Dual Mode ITBs. A mutual understanding between all concerned parties (designer, owners, OCMI, etc.) as to how the unit will be treated for inspection purposes should be established in the early stages of review.

- b. Pushing units will be reviewed as self-propelled vessels. Certification and inspection procedures will be the same tonnage as the aggregate tonnage of the Pushing Mode ITB.
- c. Dual Mode units will be reviewed as separate vessels. The tug will be inspected only if it requires inspection under applicable statutes. (For example, a motor driven vessel greater than 300 gross tons operating on the high seas.) Similarly, the barge will be inspected only if it requires inspection under applicable statutes. Review of an inspected barge, however, will encompass the specially designed connection system, including those system components on the tug, except, as noted in 4.e. below.
- d. The Certificate of Inspection of the barge will specify those tugs which the Coast Guard has determined to be suitable for operation with the barge as an ITB. This limitation on the Certificate of Inspection, however, does not preclude non-specified tugs from operating with the barge when the specially designed connection system is not in use.
- e. The Certificate of Inspection for the barge will note if connection system components on the specified tug(s) need be inspected during subsequent inspections. This determination will be made prior to initial certification of the inspected barge by the cognizant Officer in Charge, Marine Inspection. The determination will take into account the complexity of the tug mounted components and the likelihood of their malfunction with age. It may occur that component inspection on the tug at the time of a subsequent barge inspection would interfere with the tug's operational commitments. In this case, the Officer in Charge, Marine Inspection will accept written certification from the barge owner that the connection system components on the tug are in good working order.

## 5. SPECIFIC DESIGN REQUIREMENTS

The following discussion contains some guidelines for Coast Guard review of Pushing Mode and Dual Mode ITBs.

### a. Analysis of Connection

- (1) For both Pushing and Dual Mode ITBs, the complexity of the connection will govern the method and degree of analysis required for a particular design. Dual Mode ITB designs using simple connection systems will normally not require any greater analysis than that currently given a tug and barge where the tug is secured in the barge notch or on fenders by means such as wire rope, chains, lines or other tackle now commonly used in offshore towing. As the complexity of the connection system increases, the degree of analysis should increase accordingly. Pushing Mode ITB designs will normally require that a design analysis be performed which
  - (a) applies realistic environmental criteria representative of that which can be expected on the intended route,
  - (b) provides sufficient data to determine the motions of and between the tug, barge and their connection; and

- (c) can be utilized to establish the moments and forces which will be imposed on the units and the connection system.

It is the intent of the Coast Guard to verify that such an analysis has been performed using reasonable assumptions and an appropriate engineering approach.

- (2) One approach is the use of an analytical model to provide response amplitude operators which will require verification by actual model basin testing. After the analytical model has been accepted, it may be used to perform motion analysis and determine loading over the full range of expected sea conditions.
- (3) Where a particular connection system has previously undergone analysis, the results of the analysis may be considered for new applications of the design to tugs and barges of different length and displacement. The acceptability of any scaling will depend on the particulars of the design under consideration.
- (4) Consideration will be given to the operational experience gained from designs which were employed prior to the publishing of these guidelines. When it can be shown that a system has a successful operational record, part or all of the detailed design analysis, which would normally be required for a new connection design, may be eliminated. Information such as sizes of tug barge combinations, specific routes, operational history, etc. should be provided to the Coast Guard when requesting that operational experience replace design analysis.

b. Longitudinal Strength

- (1) An ITB connected by a completely rigid system allowing no relative motion between the tug and the barge (Pushing Mode) shall comply with ABS Rules for Building and Classing Steel Vessels for a single vessel of equivalent size. Structural formulas based on length shall use the length of the tug and barge when connected. (Where the Rules allow the use of .97L, .97 of the length of the tug and barge when connected may be used.)
- (2) An ITB connected by a system that allows relative motion between the tug and barge in one or more degrees of freedom, whether Pushing or Dual Mode, shall be designed to the following standards:
  - (a) The longitudinal strength of the barge shall comply with the ABS Rules for Building and Classing Steel Barges for Offshore Service. The forces and moments imparted to the barge by the tug as determined from analytical techniques or model tests shall be included in determining longitudinal strength.
  - (b) For both Pushing and Dual Mode units, the design shall take into account stresses in the vicinity of the points of attachment from forces and moments due to the interaction of the two units and from any loadings imposed by the attachment device itself.

c. Stability

For Pushing Mode units, the tug and barge individually and the combined unit shall meet all current applicable intact and damaged stability requirements. The Pushing Mode tug, however, need not meet the towline pull criteria. For Dual Mode units, the tug and barge must meet stability requirements applicable to the vessels individually.

d. Connection Equipment

- (1) The method and equipment used to effect the connection between the tug and barge must be designed on the basis of the considerations previously discussed in "Analysis of Connection."
  - (a) For Pushing Mode ITBs the connection system shall be capable of maintaining the connection and restricting excessive relative motion between the tug and barge under adverse weather conditions.
  - (b) For Dual Mode ITBs, the system should be capable of readily allowing safe disconnection. (Generally, disconnection within five minutes is considered acceptable.)

e. Disconnection and Reconnection

- (1) ITBs of the Pushing Mode type shall not be required to demonstrate disconnection. It is intended that these units remain connected at all times during transit and that the units remain connected during emergencies. The master, however, shall always have the option of separating from the barge in extreme cases.
- (2) For Dual Mode ITBs, the maximum sea state at which the tug can routinely disconnect and the maximum sea state at which the tug can safely reconnect shall be determined by the designer. This information shall be made available to the master or operator of each Dual Mode ITB for his use in exercising responsibility for the ITB's operation.
- (3) For both Pushing Mode and Dual Mode ITBs, the proper procedures to effect disconnection shall be made available to the master or operator.
- (4) Dual Mode ITBs are required to demonstrate the ability of the tug to safely and readily disconnect from the barge without impairing the stability or -structural integrity of either unit. This initial demonstration need not be performed at any specified sea state. Additional design information, however, must be submitted to the Coast Guard to reasonably support the ability of the Dual Mode ITB to routinely disconnect at the sea states designated by the designer. If the design information submitted is not adequate, actual demonstration of the ability of the tug to disconnect in sea states approximating those maximum sea states claimed by the designer will be required. At each subsequent inspection for certification of the barge, the connection system shall be examined. A demonstration of disconnection/reconnection in port may be required by the Officer in Charge, Marine Inspection to ensure the good working order of the equipment.

f. Fire Protection

- (1) For Pushing Mode units, all firefighting and structural fire protection requirements will be applied to the combined tug and barge as a single vessel.
- (2) For Dual Mode units, requirements for firefighting equipment and structural fire protection will be applied to the tug and barge individually.

g. Loading Manual

The master of every Pushing Mode ITB shall be supplied with sufficient information in a form approved by the -loadline assigning and issuing authority, to enable him to arrange for the loading and ballasting of the barge in such a way as to avoid the creation of any unacceptable stresses in the barge's structure, especially during dockside loading and unloading. Similar information shall be supplied to the operator of a Dual Mode ITB barge when it is otherwise required by regulation because of the service and size of the barge.

h. Load Line Assessment

- (1) For Pushing Mode units, both the tug and the barge will be assigned load lines, so that independent operation of either the tug or the barge is not precluded. The tug's load line will be calculated and assigned independently. The required freeboard of the barge will be calculated both independently and by taking into account the intact (and damage, if applicable) stability requirements of the combined unit. The load line which results in the greater freeboard from the above calculations will be assigned to the barge. When operating in the pushing mode, the barge's load line may not be submerged, but consideration will be given to approving loading conditions which submerge the tug's load line. In no case, however, will loading conditions which submerge any portion of the tug's freeboard deck be approved. The barge of a Pushing Mode ITB will not be considered an unmanned barge for the purposes of the freeboard reduction provided for in 46 CFR 42.20-10(h).
- (2) For Dual Mode units, both the tug and the barge will be assigned independently calculated load lines. An unmanned barge of Dual Mode ITB may be considered for the freeboard reduction provided for in 46 CFR 42.20-10(h).

i. Lifesaving Equipment

- (1) For Pushing Mode units, lifesaving equipment requirements will be based on the combined tug and barge. Since the tug of a Pushing Mode ITB must be able to remain in the pushing mode during all anticipated operations, the location of lifesaving equipment will be as for a ship of equivalent size.
- (2) For Dual Mode units, lifesaving equipment type, amount and location will be based on the tug and barge individually.

6. MANNING

The following manning scales are directed to motor-propelled ITBs, and are provided for general informational purposes only. The actual scale assigned a particular Pushing Mode ITB or a tug of a Dual Mode ITB may vary somewhat due to its individual features. Accordingly, potential owners and operators of ITBs are urged to compile and submit to the cognizant Officer in Charge, Marine



Inspection a complete general information and operating scenario at an early date. Such action will permit the establishment of a tentative manning scale, and minimize the possibility of ultimately receiving a scale which the Pushing Mode ITB or tug of a Dual Mode ITB cannot physically accommodate.

a. Pushing Mode

- (1) It is contemplated that virtually all of this class of ITB will equal or exceed 1000 gross tons (combined tug and barge tonnage). The following manning scale presupposes a highly automated engineering plant and making certain call and convenience features available to bridge personnel. Failure to have such special features will cause an upward adjustment of the scale.

1	Master	1	Chief Engineer
1	Chief Mate	1	First Assistant Engineer
1	Second Mate	1	Second/Third Assistant Engineer
1	Third Mate	1	Radio Officer (as required by the FCC)
6-4*	Able Seamen		
0-2*	Ordinary Seamen		

\* Variables

Note: Master/First Class Pilot and 3 First Class Pilots shall be utilized on ITBs navigating exclusively on the Great Lakes in lieu of the above indicated deck officers.

- (2) Owners, operators and designers are advised that Coast Guard policy requires an initial period of fully manned operation of automated engineering plants. The duration of this fully manned operating period shall be determined by the cognizant Officer in Charge, Marine Inspection. Accordingly, the quarters should be designed to accommodate a minimum of 3 additional persons (oilers), in addition to the above scale. Another factor compelling the additional accommodations is the everpresent possibility of significant or continuing malfunction of the automated engineering plant. Should such an eventuality occur, an increase in the manning scale (above the of the automated level) will be prescribed.

b. Dual Mode ITB

- (1) The Dual Mode seagoing ITB manning scale is controlled by the gross tonnage and inspection status of the tug. Accordingly, when applying existing laws a great degree of variation will result. The following examples are considered representative.

1000 Gross Tons and Above

See scale noted in Pushing Mode ITB section

300 and over but less than 1000 Gross Tons

1	Master	1	Chief Engineer
2	Licensed Mates	<u>X</u> *	Licensed Assistant Engineers
4-2*	Able Seamen		

## 2-1\* Ordinary Seamen

## \* Variables

NOTE: The tugs in the above tonnage ranges are subject to Coast Guard inspection, and the commentary concerning special features, accommodation, etc. contained in the Pushing Mode ITB section is generally applicable.

200 and over but less than 300 Gross Tons (uninspected)

1	Master	1	Chief Engineer
<u>X</u> *	Mates	<u>X</u> *	Licensed Assistant Engineers

## \* Variables

NOTE: The requirement for the foregoing officers are derived from a complementary reading of 46 U.S.C. 224a and 46 U.S.C. 673. Unlicensed personnel in the deck and engine departments are controlled by 46 U.S.C. 672 and 673.

Less than 200 Gross Tons (Uninspected)

## 2 Operator of Uninspected Towing Vessels

NOTE: For those units of 100 gross tons and above, the unlicensed personnel are controlled by 46 U.S.C. 672 and 673.

- (2) For Dual Mode Great Lakes ITBs, the tug is not subject to inspection regardless of gross tonnage. The above noted manning scale and comment applicable to Dual Mode seagoing ITBs, of less than 200 gross tons, therefore, applies without tonnage limitations.

- c. Steam propelled ITBs whether Pushing or Dual Mode and whether seagoing or navigating on the Great Lakes are subject to inspection. As this propulsion system is not commonly used for ITB operations, example manning scales are not provided. Potential owners and operators should contact the cognizant Officer in Charge, Marine In section for guidance if steam propulsion is anticipated.

## 7. OTHER COAST GUARD REGULATIONS

The definition in this NVC of an ITB applies to vessel construction standards, inspection, certification and manning and may not necessarily be applicable with reference to other regulations and statutes. For example, characterization of a vessel combination as a Pushing Mode or Dual Mode ITB as outlined in this NVC does not determine the running lights the combination will display. Reference must be made to the Navigation Rules (formerly "Rules of the Road") to determine the criteria for the correct running lights to display. The Inland Navigation Rules Act of 1980 (Inland Rules) and the International Regulations for Preventing Collisions at Sea, 1972 (International Rules) distinguish rigidly connected tug barge combinations from non-rigidly connected combinations. Therefore, a rigidly connected ITB, whether characterized as Pushing Mode or Dual Mode by the guidelines of this NVC, would display the running lights of a ship under the Inland and International Rules. Likewise, a tug barge combination not rigidly connected,

whether characterized as Pushing Mode or Dual Mode by the guidelines of this NVC, would display the running lights for a power driven vessel pushing ahead or towing astern as appropriate.