DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

U. S. Coast Guard G-MMT-4/13
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NVC 5-82
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NAVIGATION AND VESSEL INSPECTION CIRCULAR NO. 5-82

Subj: Fixed Ballast

1. PURPOSE. The purpose of this Circular is to update existing guidelines for the use of special fixed ballast materials.

2. DIRECTIVES AFFECTED. Navigation and Vessel Inspection Circular 8-67 concerning fixed ballast is hereby canceled.

3. DISCUSSION.

   a. The use of fixed ballast may be necessary in order to provide satisfactory immersion, trim) and stability on certain vessels. Various forms of ballast material have been used successfully in the past including heavy solids such as concrete and iron, liquids such as drilling mud, and most recently an iron ore concentrate called "QCM" Certain design and installation considerations, however, are necessary when employing fixed ballast. Ballast materials must be secured to prevent shifting. Longitudinal strength must be sufficient to accommodate the concentrated weight. Corrosion in ballast compartments must be properly monitored and minimized. Some types of ballast settle as the moisture content is reduced. Other types of ballast require venting and chemical treatment to prevent gas accumulation.

   b. This NVC provides guidelines for the installation of fixed ballast pursuant to the requirements of 46 CFR 93.13-5 and 46 CFR 74.15-5 which require fixed ballast amount and location data to be included with stability information. In addition, the Commandant's approval is required to remove or relocate fixed ballast.

4. ACTION. The guidelines contained in enclosure (1) are for use in conducting plan review and inspection of fixed ballast installations on all certificated vessels.

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End: (1) Guidelines for the Installation and Inspection of Special Fixed Ballast Materials

GUIDELINES FOR THE INSTALLATION AND INSPECTION OF SPECIAL FIXED BALLAST MATERIALS

1. GENERAL FIXED BALLAST

a. Fixed ballast may be installed to increase stability on new or existing vessels. If fixed ballast is to be used aboard vessels requiring stability tests, it should be installed prior to conducting the test. On existing vessels, addition or removal of fixed ballast may require that a new stability test be performed on the vessel. The weight and location of fixed ballast on such vessels should be included in the stability calculations, the stability letter and, if applicable, the stability booklet (See 46 CFR 93.13-5 or 46 CFR 74.15-5).

b. The use of high density materials for fixed ballast installations may cause excessive structural loading on a vessel. Therefore, the following plans and calculations may be required to be submitted for Coast Guard approval:

1. An arrangement plan showing proposed types, locations and quantities of fixed ballast.

2. A capacity plan showing the original capacity of each space in which fixed ballast will be installed.

3. A midship section plan and section modules calculations, indicating maximum allowable bending moments and shear forces.

4. A longitudinal strength study which evaluates the proposed normal loading and ballasted conditions in conjunction with all fixed ballast.

5. A structural evaluation of each fixed ballast compartment for the weight and location of the proposed ballast installation.

c. Special arrangements may be necessary to provide proper ventilation and to facilitate the installation and inspection of the ballast material. The following guidance applies to all fixed ballast installations:

1. Each ballast tank should be fitted with vents to the weather deck. Flame screens should be installed if organic decay is possible.

2. Fixed ballast should not be installed in tanks containing piping systems which require inspection. If fixed ballast must be installed in such tanks, a pipe tunnel or other suitable arrangement should be made to permit inspection of the piping.

3. The ballast material should be properly secured to prevent shifting in severe weather.

4. Inspection openings should be provided in each corner of the ballast space for detection of shifting or settling of the material or seepage of water into the ballast space. Manholes may be provided for this purpose in double bottom tanks. If concrete caps are used to secure the ballast, ullage pipes at least 8 inches in

diameter should be fitted in the concrete to permit inspection of the ballast material.

5. An expansion trunk should be provided which is adequate for the maximum volumetric expansion of liquid ballast.

6. Plans showing ventilation of the fixed ballast space, the securing arrangement of the ballast material, and all closure plate installations for openings cut in the vessel structure may be required to be submitted to the Coast Guard for approval.

d. Fixed ballast is often installed in compartments or tanks which would normally be examined for deterioration during periodic inspections. The following procedures may be followed in lieu of emptying fixed ballast tanks each inspection period:

1. The atmosphere in each tank should be sampled and analyzed by a certified marine chemist who should follow the provisions of NFPA 306 to determine if gas evolution is present.

2. All fixed ballast installations should be accessed through the ullage openings provided. The ballast material should be inspected for shifting, settling, and excessive moisture. Visible change to the ballast material may be cause for removal and additional inspection.

3. If a bacteriostatic agent is required, a sample of ballast fluid from the mid-depth of each tank should be removed for analysis to determine the bacteriostatic agent residual and the presence of any methane gas or gas producing bacteria. If there is evidence that the bacteriostatic agent residual is inadequate to prevent bacteria growth, the fluid should be pumped out and retreated with a bacteriostatic agent.

4. If installed, the tank material test pieces should be examined to determine the apparent type and rate of corrosion. If there is indication that extensive or accelerated corrosion is taking place (See NVC 7-68) the ballast material should be pumped out and the tank cleaned for internal examination.

e. Plans, calculations and procedures for approval of fixed ballast installations should be submitted in one coordinated package. Coast Guard approval of the package should be obtained prior to installation of the ballast material.

2. <u>FIXED MUD BALLAST</u>

a. Special drilling mud type fluids may be used as fixed ballast, under the following provisions:

1. Bacteriostatic agent. A bacteriostatic agent effective against aerobic as well as anaerobic bacteria should be thoroughly mixed with the fluid in accordance with the manufacturer's specifications.

2. Anticorrosivity. The ph factor of the fluid should be adjusted to a value which minimizes corrosion for the particular metals involved. Corrosion inhibitors may be added to the fluid, but they should not interfere with the action of the

bacteriostatic agent or affect the physical properties of the fluid such as suspension, viscosity, etc.

3. Settling. Fluids should have sufficient viscosity and gell strength to minimize settling of solids.

4. Thermal expansion. Volumetric expansion should not be greater than four tenths of one percent (0.4%) over a temperature range from 28 degrees F to 90 degrees F. The fluid should withstand a low -temperature ambient of 28 degrees F without freezing. Unless adjacent to high temperature spaces, the expected maximum temperature of the ballast should be taken as 90 degrees F.

5. Proposed ballast. A sample of proposed ballast fluid should be prepared by the manufacturer and subjected to at least a thirty day test to insure that all of the above requirements are fulfilled. A report of the test should be made available to the cognizant Officer in Charge, Marine Inspection prior to installation of the fluid.

6. Corrosion test plates. Corrosion test specimens, in the form of two 3 inch by 24 inch plates 1/2 inch thick of the same material as the internal structure of the ballast tanks and welded together to form a plate 6 inches wide, should be attached to the underside of the manhole cover on each expansion trunk for the ballast tanks in such a way that the corrosion test specimens hang down to the mid-depth of the ballast tanks. A permanent record of the date of installation, thickness and weight of each corrosion test specimen should be kept aboard the vessel. Specimen thickness, weight, and date of inspection should be placed in this record after each inspection.

7. Air pockets. When pumping the fluid into the ballast tanks, care should be taken to eliminate all air pockets. Permanently installed ship's pumps or piping should not be used for handling the fluid.

3. <u>IRON ORE CONCENTRATE BALLAST</u>

a. Dry iron ore concentrate ballast (QCM*) may be used as fixed ballast under the following provisions:

1. Density. The overall density of the material after installation should equal the calculated density as submitted. Compaction is usually necessary to achieve the calculated density and to prevent later settling. Before capping, the actual weight of the ballast material should be determined and recorded.

2. Concrete caps. Concrete caps should be used to prevent shifting of ballast material in partially filled spaces. All excess water should be removed before the concrete is poured. A moisture barrier such as plastic sheeting should be installed on top of the ballast before pouring the concrete to prevent additional moisture from being added. Brackets should be installed at the boundaries of the ballasted spaces so that the concrete will flow around them and provide anchoring points to prevent the caps from shifting.

3. Corrosion test plates. Corrosion test specimens, in the form described under FIXED MUD BALLAST should be provided.

b. Iron ore concentrate slurry may be installed in ballast compartments under the following provisions:

1. Slurry contents. A list of ingredients of the slurry should be submitted to the Coast Guard for approval. The list should include a brief description of each ingredient and its weight and volume per slurry unit. Wet and dry weight and pH range for the complete slurry mixture should be calculated.

2. Cutouts. Numerous openings in the ballast tank top may be necessary to assure that the slurry flows between each frame, however, sufficient strength must be maintained in structural tank tops. A plan showing the location and size of each cutout and the welding procedure to replace them should be submitted.

3. Air pockets. Shifting will occur unless all air pockets within the ballast compartment have been filled. After dewatering is completed, the ullage below the tank top should not exceed three inches at any point. An inspection for shifting ballast material should be made following the first several voyages if air pocketing is suspected.

4. Moisture. The percentage volume of moisture entrained in the ballast after installation should not be greater than seven percent over a temperature range from 28 degrees F to 90 degrees F.

5. Corrosion test plates. Corrosion test specimens, in the form described under FIXED MUD BALLAST should be provided.

*NOTE: QCM is a finely crushed specular hematite (Fe_2O_3) which is primarily mined in the Quebec Cartier Mines. Its density is approximately 190 lb/ft^3.