COFFERDAM AND FREEBOARD REQUIREMENTS FOR SHIP REPAIRS

1. PURPOSE

The purpose of this procedure is to establish minimum freeboard requirements as well as minimum design, fabrication, and installation requirements for the use of cofferdams on Military Sealift Command (MSC) Vessels during waterborne repair operations.

2. APPLICABILITY: This procedure is applicable to all government operated ships.

NOTE

This procedure is specific to repair operations and does not apply to Shipboard Automated Maintenance Management (SAMM) preventive maintenance requirements. For SAMM preventive maintenance requirements that result in single valve isolation from the sea, follow SMS procedure 10.4-001-ALL "PREVENTIVE MAINTENANCE" (reference 5.1) and SMS procedure 2.1-004-ALL "LOCKOUT / TAG OUT" (reference 5.2).

3. BACKGROUND & PROCEDURES

3.1. Background: Technical concerns aboard MSC ships regarding the minimum requirements for conducting repairs at or near the maximum calculated draft, including the use of cofferdams, has resulted in the need to provide procedures to safely conduct such repairs.

3.2. Cofferdam / Freeboard Requirements: During repairs, ships must maintain watertight integrity to a level four (4) feet above the maximum calculated draft, including but not limited to the following operations:

3.2.1. Access openings,

3.2.2. Hull plating replacement,

3.2.3. Welding to the hull when pre-heating is required,

3.2.4. Modifications or repairs to damage or deterioration that will degrade watertight integrity or stability, or

3.2.5. Piping and mechanical repairs that are expected to result in less than double-valve protection from the sea.

3.3. Cofferdam Minimum Design, Fabrication, and Installation Requirements: In the absence of a commercial standard for cofferdams, endorsed by MSC N7, Chapter 16 of S0600-AA-PRO "Underwater Ship Husbandry Manual" (reference 5.3) must be utilized as the minimum requirement for cofferdams.

3.3.1. Formal Work Package: A Formal Work Package (FWP), developed by the assigned contractor, is required for each repair involving installation of a cofferdam. The Chief Engineer and Principal Port Engineer must provide input to the contractor as necessary in the development of the FWP. The FWP must include all applicable elements found in SMS checklist 10.7-002-01-ALL "Cofferdam Formal Work Package Requirements" (record 4.1) which incorporates the requirements found in reference 5.3. Additionally, the FWP must include:

3.3.1.1. The "Compliance and Performance Standards for Contractor Cofferdam Work" found in Table 16-9 of reference 5.3.

3.3.2. FWP Acceptance by Master: Prior to repair work being started, the completed FWP must be provided to the Master for review and acceptance. Anytime a repair will be conducted with only one barrier to the sea (single valve protection), SMS form 10.7-002-01-ALL "Authorization for Repairs Involving Single Valve Isolation" (record 4.2) and SMS form 2.1-004-04-ALL "Master's Approval for Single Valve Isolation" (record 4.3).

NOTE

If single valve protection from the sea is involved, the first page of the FWP must be stamped SINGLE VALVE PROTECTION, at the top, in minimum one-half inch letters.

3.3.3. Prior to the start of the FWP, the assigned contractor must submit one legible copy, in approved transferable media, of Ship's Force notification in accordance with Paragraph 16-4.7.1.4 (plugs), or Paragraph 16-5.2.9 (patches), or Paragraph 16-6.6.10 (dry-chambers), or Paragraphs 16-7.6.5 and 16-7.6.8 (stern tube seals) of reference 5.3 to the Port Engineer.

3.3.4. Prior to the removal of the cofferdam, the contractor must submit one legible copy, in approved transferrable media, of Ship's Force notification of the location of the cofferdam and level of protection (single or double valve) to the Port Engineer.

3.3.5. Accomplish cofferdam removal in accordance with reference 5.3, Appendix D, steps 21 through 29.

3.3.6. Verify cofferdam(s) and associated hardware installed in 3.3.1 have been removed.

3.4. Emergent and Short Duration Piping and Valve Repairs by Ship's Force: Emergent and short duration repairs to piping and valves that result in single valve protection from the sea may be accomplished without developing a FWP if the following requirements are met:

3.4.1. Master's Confidence in Planned Repair: The Master must be confident that the planned repair complies with the requirements of this paragraph. If there is any doubt, a FWP is required.

3.4.2. Area Commander's Concurrence: Repairs performed under this paragraph require Area Commander concurrence prior to starting the work.

3.4.3. Piping and Valve Size: Pipe and valve diameters must be less than or equal to 8 inches.

3.4.4. Duration of Work: The planned repair must take four hours or less to accomplish.

3.4.5. Ship's Force Repair: The repair work can be accomplished by ship's force. Note: This may include temporary repairs.

3.4.6. Repair Plan: A repair plan that identifies each step of the repair, identifies key personnel and defines key personnel responsibilities must be developed and approved by the Chief Engineer.

3.4.7. Lockout: The system under repair is locked out per SMS procedure 2.1-004-ALL "LOCKOUT / TAG OUT" (reference 5.2).

3.4.8. Master's Approval: SMS Form 2.1-004-04-ALL "Master's Approval for Single Valve Isolation" (record 4.3) is completed prior to commencement of the repair.

3.4.9. Reporting: Required casualty and regulatory body reports are made (see par. 3.5 below).

3.5. Reporting: As applicable, regulatory body and casualty reporting must be complied with per SMS procedures 7.1-001-ALL "INCIDENT REPORTING" (reference 5.4) and 7.1-002-ALL "Casualty Reporting" (reference 5.5).

3.6. Risk Assessment: Prior to any work involving cofferdams, a risk assessment must be completed per SMS procedure 2.1-019-ALL "Operational Risk Management" (reference 5.6) must be utilized.

3.7. Lockout Involving Cofferdams and Single Valve Isolation from the Sea

3.7.1. Repair work involving cofferdams that will result in single valve isolation from the sea requires lockout. Tag out for work that will result in single valve isolation from the sea is not authorized. The requirements of SMS procedure 2.1-004-ALL "Lockout / Tag Out" (reference 5.2) must be complied with.

3.7.2. The Chief Engineer must be the Authorizing Officer when the lockout involves single valve isolation from the sea.

3.7.3. Lockout for work involving single valve isolation must be approved by the Master using SMS form 2.1-004-04-ALL "Master's Approval for Single Valve Isolation" (record 4.3). Use of this form will ensure proper risk assessment and appropriate mitigation and response strategies are considered and in place prior to initiating the work.

3.8. Primary Risks: The primary risks addressed by this procedure are below.

Primary Risk	Risk Level	Mitigating Factors	Risk after Mitigation
Damage to the ship or equipment due to flooding caused by inadequate design or improper use of cofferdams.	High	Maintain minimum freeboard requirement. Utilize accepted standards for design and fabrication of cofferdams.	Low
Damage to the ship or equipment due to flooding resulting from lack of awareness of repair activities involving single barrier isolation from the sea.	High	Master's approval for repairs involving single barrier isolation from the sea. Chief Engineer's authorization for repairs involving single barrier isolation from the sea. Response personnel identified. Roving watch during work.	Low

3.9. Office of Primary Responsibility: The Office of Primary Responsibility for this Procedure is N72. Supporting offices include N75, N76, Program Managers, and Port Officers.

4. RECORDS

4.1. SMS Checklist 10.7-002-01-ALL "Cofferdam Formal Work Package Requirements"

4.2. SMS Form 10.7-002-01-ALL "Authorization for Repairs Involving Single Valve Isolation"

4.3. SMS Form 2.1-004-04-ALL "Master's Approval for Single Valve Isolation"

5. REFERENCES

5.1. SMS Procedure 10.4-001-ALL "PREVENTIVE MAINTENANCE"

5.2. SMS Procedure 2.1-004-ALL "LOCKOUT / TAG OUT"

5.3. S0600-AA-PRO "Underwater Ship Husbandry Manual"

5.4. SMS Procedure 7.1-001-ALL "INCIDENT REPORTING"

5.5. SMS Procedure 7.1-002-ALL "Casualty Reporting"

5.6. SMS Procedure 2.1-019-ALL "Operational Risk Management"

6. DEFINITIONS

6.1. **Cofferdam** – Any plug, patch, or dry-chamber installed externally to the hull of a ship or other vessel type, at or below the waterline in order to secure or dewater an area or system to enable shipboard or diver personnel to conduct repairs to the hull or system.

6.2. **Maximum Calculated Draft (MCD)** – The maximum draft, calculated during the period in which ship's draft is affected due to evolutions which add, remove, or change weight. It represents the worst case cumulative effect at any one time on trim, list, or draft for the proposed weight changes throughout the period that hull penetrations are in a non-standard configuration. MCD must be known and utilized by MSC ASHORE and Ship's Force in scheduling work and testing during waterborne maintenance and/or repair periods.

6.3. **Formal Work Package (FWP)** – A process control procedure that contains at a minimum the requirements as outlined in paragraph 3.3 above preferably in the order listed in SMS checklist 10.7-002-01-ALL "Cofferdam Formal Work Package Requirements."

6.4. **Double Valve Protection** – Maintaining any two of the following boundaries simultaneously:

6.4.1. A ship's sea chest closure valve

6.4.2. An internal sealing blank installed immediately after the internal piping or watertight boundary is opened

6.4.3. An external cofferdam

7. REVISION HISTORY

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