REPORT OF THE COAST GUARD-AWO BRIDGING AND IMPLEMENTATION TEAM WORKING GROUP #5 SUBGROUP ON INLAND TOWING VESSEL INSPECTION AND REPAIR STANDARDS

JULY 20, 2012

BACKGROUND AND PURPOSE

The Subgroup on Inland Towing Vessel Inspection and Repair Standards was established by Coast Guard-AWO Bridging and Implementation Team (BAIT) Working Group #5 in the spring of 2011. Consistent with the goals of the Towing Vessel Bridging Program (TVBP) and the BAIT to facilitate the transition to towing vessel inspection for both industry and the Coast Guard, the subgroup was tasked with:

- Defining good marine practice for inland towing vessel inspection and repair; and,
- Making recommendations to ensure that good marine practice for inland towboat inspection and repair is reflected in applicable Coast Guard guidance following the implementation of the forthcoming towing vessel inspection regulations at 46 CFR Subchapter M.

In the spirit of the TVBP/BAIT, the subgroup sought to anticipate and proactively address areas in which current industry practice for the inspection and repair of inland towing vessels may not be consistent with current Coast Guard guidance applicable to some other classes of inspected vessels, and to evaluate critically both the effectiveness of current industry practice and the appropriateness of current Coast Guard inspection and repair guidance for application to inland towing vessels. The intention of the BAIT working group that chartered the subgroup was that beginning these discussions early – i.e., prior to publication of the final Subchapter M regulations – would allow time to modify existing guidance documents or draft new guidance documents as needed before Subchapter M is implemented. Beginning the process early will also allow time to clarify expectations and educate both industry and Coast Guard personnel on how key issues in inland towboat inspection and repair should be handled once Subchapter M is in place. The working group's assumption was that the issues addressed by the subgroup would involve a finer level of detail than that likely to be addressed in the proposed or final Subchapter M regulations. As such, the subgroup saw no disadvantage to beginning its work prior to publication of the proposed and final Subchapter M regulations.

The need for the subgroup's work was validated by the Congressionally authorized Towing Safety Advisory Committee (TSAC), which observed in its October 2011 report on the Subchapter M notice of proposed rulemaking that:

> While not an issue to be addressed through regulatory text in the final rule, the working group notes that it will be important to develop amplifying guidance on issues such as what constitutes an acceptable repair on an inspected towing vessel. Such guidance should be tailored to fit the vessel characteristics and operational environment of towing vessels, rather than simply mirroring existing guidance for other classes of inspected vessels, such as tank barges or passenger vessels.

MEMBERSHIP AND PROCESS

The subgroup was co-chaired and facilitated by Jennifer Carpenter of The American Waterways Operators and Steven Douglass of the Towing Vessel National Center of Expertise, U.S. Coast Guard. Other members of the subgroup included industry and Coast Guard experts with substantial experience in vessel operations, marine engineering, naval architecture, and vessel inspection. Brian Vahey of AWO provided staff support to the subgroup. Other members of the subgroup included the following:

Donald Blum, McNational, Inc.
Randy Bowling, Crounse Corporation
CAPT Greg Case, U.S. Coast Guard Towing Vessel National Center of Expertise[1]
Kevin Cissna, Crounse Corporation
Marion Clendenin, Marathon Petroleum Company
Lena Coradini, Ingram Barge Company
Steve Crowley, Marquette Transportation Company, Inc.
Ron Culp, AEP River Operations
Taylor DuChaine, Canal Barge Company
Mark Duley, Ingram Barge Company
Steve Furlough, Furlough Marine Management
Jerry Gallion, Kirby Corporation
Alan Hall, Amherst Madison, Inc.
Chetan Kumaria, Marine Solutions, Inc.
Willie Kurnot, Amherst Madison, Inc.
Patrick Lee, U.S. Coast Guard (CG-CVC-1)
Julio Martinez, U.S. Coast Guard – District 5
Roy Murphy, U.S. Coast Guard Towing Vessel National Center of Expertise
Joe Myers, U.S. Coast Guard Training Center Yorktown
Chris Myskowski, Marquette Transportation Company, Inc.
Fred Nyhuis, Marathon Petroleum Company, LP
Mike Quinton, Golding Barge Line, Inc.
David Reed, Crounse Corporation
Kenny Robinson, Crounse Corporation
Mike Rushing, Rushing Marine Services
LCDR Wade Russell, U.S. Coast Guard Towing Vessel National Center of Expertise
David Sehrt, Ingram Barge Company
Ed Shearer, The Shearer Group, Inc.
Tim Sizemore, AEP River Operations
Tim Spencer, Amherst Madison, Inc.
Peter Squicciarini, U.S. Coast Guard - LANTAREA
Mike White, U.S. Coast Guard – District 8

The full subgroup convened for two separate meetings over three days. The first meeting was on May 18, 2011. The second meeting took place on May 23-24, 2012. Between meetings, the

[1] CAPT Case served as a member of the working group until June 2011, when he was succeeded by LCDR Wade Russell as Detachment Chief of the Towing Vessel National Center of Expertise.

subgroup conducted its work primarily by email. Small teams of subgroup members met several times by conference call to discuss the shipyard survey and casualty analysis discussed later in this report.

OPERATIONAL CONDITIONS AND SAFETY CONSIDERATIONS IN THE INLAND TOWING VESSEL ENVIRONMENT

The subgroup began its work by cataloging operational conditions and safety considerations in the inland towing vessel environment to lay the foundation for its subsequent analysis. The group identified the following physical features of inland towing vessels and characteristics of the inland towing vessel operating environment as relevant to defining good marine practice for the inspection and repair of inland towing vessels and evaluating the applicability of current Coast Guard guidance for steel hull repair to inland towboats.

Physical Features of Inland Towing Vessels

- Transverse (not longitudinal) framing on most inland towing vessels
- Inland towing vessels are generally short (average 100-120 feet, many 50-60 feet, largest ever 200 feet) and heavily stiffened
- Rugged, durable design (plus fendering) to withstand contact with the river bottom, barges, fleet boats, etc.
- Square bows
- Flat bottoms
- Shallow draft
- Towing vessels don't carry cargo so draft does not change significantly during a trip
- Long-lived vessels with no significant history of hull failure
- Most plating deterioration caused by abrasion
- Don't need much freeboard so no freeing ports, low door sill heights
- Don't need/don't have loadlines
- Not designed for operation in heavy waves
- Engine room ventilation through doors/windows and bulkhead openings
- No required subdivision bulkheads; vessel can sink quickly if the large machinery space is flooded
- Generally, older towing vessels have single-skin fuel tanks; many newer vessels have double skin fuel tanks and engine rooms
- Most vessels are twin-screw or triple-screw

Characteristics of the Inland Towing Vessel Operating Environment

- Close proximity to shore
- Shallow water
- Swift water
- Less exposure to longitudinal stress than oceangoing or cargo-laden vessels
- Except when operating light boat, towing vessel is connected to multiple-barge tow
- Fresh water operation produces less hull deterioration

- Generally protected waters without heavy waves (standard practice is to wait out heavy waves if transiting Mississippi Sound or other areas of open water)
- Significant temperature variations from warm water to ice
- Drift or debris present, especially during high water conditions
- Frequent drydockings to address emergent need for repairs based on operational environment (e.g., fouled propeller)
- Close proximity to other vessels that can provide emergency assistance
- Most inland line-haul towing vessels carry a skiff or utility boat
- Crew comfort/crew endurance often drives need for repairs (e.g., noise, vibration issues)
- Taking boat out of water for drydocking may be highest stress event vessel experiences

EVALUATION OF EFFECTIVENESS

The subgroup used the following criteria to assess the effectiveness of current industry practice for inland towing vessel inspection and repair and to evaluate the soundness of the proposed definitions of good marine practice with respect to the key issues discussed in this report:

- Historical industry experience
- Expert perspective provided by port engineers, shipyard personnel, and naval architects/marine engineers with knowledge and experience in inland towing vessel operation, construction and repair
- Inland towing vessel casualty data from the Coast Guard's Marine Information for Safety and Law Enforcement (MISLE) database

Shipyard Survey

Information on historical industry experience and expert perspective was collected through the distribution of a shipyard questionnaire developed by subgroup members Taylor DuChaine, Canal Barge Company, and Fred Nyhuis, Marathon Petroleum Company, LP. The purpose of the questionnaire was to gather information about current industry practice on issues related to the repair of inland towing vessels. The information provided was used to ensure an accurate characterization of current industry practice in the various sections of this report and to inform the development of recommendations on good marine practice for inland towing vessels. In some instances, the shipyard responses prompted additional questions from Mr. DuChaine and Mr. Nyhuis, who posed clarifying follow-up questions to targeted shipyards as needed. The survey questions, list of participating shipyards, and a summary of responses are contained in Appendices A, B, and C, respectively.

Coast Guard Casualty Data Analysis

In April-May 2012, Mr. Nyhuis, Mr. DuChaine, and Mr. David Sehrt, Ingram Barge Company, conducted an analysis of inland towing vessel hull failure casualty cases based on information extracted from the Coast Guard's MISLE database and Coast Guard investigation reports supplied by Mr. Dave Dickey of the Offices of Investigations and Analysis at Coast Guard headquarters. Mr. Dickey extracted inland towing vessel hull failure incidents that were not the result of other casualty events such as collisions, allisions or groundings from 2002 (the first full

year of MISLE) through 2010. A spreadsheet providing a summary of these incidents is attached as Appendix D.

From these cases, the review team observed the following:

- There were 59 hull failure incidents during this nine-year period. Mr. Dickey did not provide detailed information on 14 of the incidents because they involved atypical circumstances that were not likely to produce useful lessons for inland towing vessels generally (e.g., wooden hull vessels, ice damage, laid up vessels, etc.). The review team thus excluded these 14 cases from its analysis.
- No deaths or injuries resulted from any of the casualty incidents.
- The majority of incidents involved very small vessels in harbor/fleeting service. Only two vessels were line-haul vessels more than 100 feet in length. The vessels involved in more than half (30) of the incidents were 60 feet in length or less.
- There were no major hull buckling failures.
- The majority of the casualty incidents occurred with vessels that were moored and unmanned. (The subgroup observes that while it is not unusual for small harbor or fleet boats to be unmanned and tied up at the dock, inland line-haul towing vessels are generally in continuous operation.)
- There were no incidents in which the vessel sank quickly.

The investigation reports tended to focus more on any oil discharge resulting from the incidents and less on the precipitating hull failure, making it difficult for the review team to make any determination as to the nature of the failure. However, it is noteworthy that there were only two hull failure incidents involving inland line-haul towing vessels over a nine-year period.

Additionally, AWO reviewed its records to determine whether the company listed as the "subject of investigation" in the Coast Guard casualty reports (or as the "operator" of the vessel if no subject company was provided) was operating with a safety management system (SMS) at the time of the incident. Since 2000, AWO members have been required to be in compliance with the Responsible Carrier Program (RCP), a third-party audited SMS, as a condition of membership. It is unlikely that any inland towing company would have been using an SMS other than the RCP.

AWO found that 30 of the 45 incidents for which the Coast Guard provided detailed information involved a subject company that was not an AWO member at the time of the casualty and therefore not likely to have been operating under an SMS. One company had joined AWO just weeks before the casualty occurred and would not have had time to implement the RCP. The remaining 14 companies were AWO members at the time of the event and can be assumed to have been operating under the RCP. Thus, with respect to the casualty cases examined by the subgroup, hull failure incidents involving companies without an SMS outnumber incidents involving companies with an SMS by more than 2 to 1.

Risk Management Considerations

Also relevant to the subgroup's evaluation of good marine practice is the concept of risk management, which requires weighing the following factors:

- The probability of failure;
- The consequences of failure; and,
- The cost-effectiveness or cost-benefit of proposed alternatives.

The subgroup believes that these factors must be considered together in any evaluation of good marine practice for inland towing vessel inspection and repair. Consider the example of an inland towing vessel with a minor fracture in hull plating resulting in a small amount of water entering a void tank. If the probability of failure is low (as demonstrated by Coast Guard casualty data indicating a very low incidence of inland towing vessel hull failures); the consequences of failure are low to moderate (for example, because of the availability of emergency resources or the ability to evacuate to the tow in the event of an emergency), and the opportunity cost of requiring an immediate repair is high (because the vessel would have to drop its tow and would not be able to deliver economically critical cargo in a timely manner), it might be prudent to allow the vessel to complete its voyage, deliver the tow to its destination, and continue to operate until its next scheduled drydocking, subject to ongoing monitoring, evaluation and management to ensure that the situation does not worsen to an unacceptable level.

CURRENT INDUSTRY PRACTICE: DRYDOCKING

The subgroup expects that the forthcoming Subchapter M regulations will specify the frequency, scope and content of Coast Guard-required drydocking examinations of inland towing vessels, a subject addressed in detail by the TSAC in its recommendations to the Coast Guard during the development of the draft Subchapter M proposal. With this expectation in mind, the subgroup thought it useful simply to describe current industry practice for the drydocking of inland towing vessels, rather than make recommendations on this subject. Having an understanding of current industry practice with respect to drydocking may inform the subsequent development of recommendations for good marine practice on particular issues associated with the inspection and repair of inland towing vessels.

The AWO Responsible Carrier Program recommends that inland towing vessels undergo a hull inspection on drydock as needed, but no less frequently than every 36 months. In practice, however, most inland towing vessels are drydocked much more frequently (once a year is not unusual) to address emergent operational conditions. While some companies may elect to send a diver down to visually examine a potential problem and determine whether it is necessary to take the boat out of the water (or whether, for example, unusual vibration is caused by a line or crab trap in the propeller), it is more common simply to drydock the vessel to investigate the cause of a mechanical problem with the wheel or rudder, a crew complaint (vibration, noise, etc.), a performance problem (e.g., burning more fuel than usual), or water in a void tank caused by a crack in the plating above the kort nozzle.

While the boat is on drydock, standard industry practice is not only to repair the problem that prompted the decision to take the boat out of the water in the first place, but to conduct a visual examination of the hull and address any other issues that present themselves. During the visual examination, if propeller damage is noted and appears to be significant enough to require one or more propellers to be removed for repair or replacement, it is standard practice to take lift and run-out readings of the tailshaft to determine if it needs to be replaced or if it is suitable for continued service based on the company's standards for deviation; check rudders and visually inspect the hull for cracks or leaks and other more significant damage; clean the sea chest; etc. Inland shipyards report that the majority of issues on inland towing vessel hulls tend to involve indents/upsets, cracks/fractures, and plate/weld wastage; hull punctures and buckling issues are far less common on inland vessels.

Hull gaugings are typically not conducted at a specified interval but rather as needed based on visual observation or in order to establish a baseline for future comparison when a vessel is newly acquired. Most companies use a drydocking checklist and produce a report of the items examined, findings and repairs. Such inspections are typically conducted by trained company personnel such as port engineers. (Because inland towing vessels are drydocked so frequently due to operational conditions, it is often cost-effective to have qualified personnel on staff to conduct such examinations.) Companies that operate inland tank barges will typically employ the same or similar practices for repairing their towboats as their barges rather than maintain two separate sets of standards or maintenance programs. Companies that do not operate tank barges may have different practices.

KEY ISSUES IN INLAND TOWING VESSEL INSPECTION AND REPAIR

The subgroup identified several key issues related to inland towing vessel inspection and repair for further examination, including:

- Use of doubler plates
- Water in void tanks
- Set-ins
- Internal structural members
- Wastage
- Testing of repairs
- Welding standards/welder qualifications

In each of these areas, the group sought to make recommendations regarding what should be considered good marine practice in the inland towing industry and accepted by the Coast Guard for application to inland towing vessels inspected under the forthcoming Subchapter M.

The subgroup proposes that the approach to good marine practice outlined in this report be applicable to all towing vessels that will receive Certificate of Inspection (COI) endorsements under Subchapter M for service on rivers, lakes, bays and sounds, the limited coastwise route from St. Marks to Carrabelle, FL, and the limited Great Lakes route from Chicago, IL, to Burns Harbor, IN.

Use of Doubler Plates

Doubler plates are commonly used on inland towing vessels as temporary or permanent repairs to small cracks, punctures, and fractures. Although doublers may also be used to reinforce wear points such as knuckles or to reinforce plating where galvanic corrosion occurs, the subgroup's focus in this report is on the use of doublers for purposes of repair. Some typical applications for doublers for towing vessel repairs include:

- Void or ballast tank fractures at framing;
- Washout hole covers in void, ballast and water tanks;
- Over formed channel coolers for machinery as a repair ("channel coolers" refers to the heat exchanger portion of a closed loop system used to cool main engines, generators, aftercoolers or gear boxes);
- Hull plate in the vicinity of kort nozzles after interior framing repairs.

Doubler plates are typically affixed by trained shipyard personnel. Normal procedure for using a doubler to repair a fracture involves first stopping the fracture by drilling the ends and welding over the crack, and then welding the doubler on all sides over the fracture. Some welders will elect to make two passes on all sides of the patch, but there is no standard practice among shipyards for how a weld is to be reinforced. Based on the shipyard survey results, the subgroup estimates that it is 2-3 times more expensive to crop and renew damaged steel than to use a doubler plate.

Current Coast Guard guidance (NVIC 7-68 Section IV (D)(1)-(8)) provides, in pertinent part, that:

- Doublers may be properly used to provide local reinforcement at hatch corners, overboard discharges, seachests, mast or kingpost foundations, etc., and in accordance with approved plans;

- Doublers may be accepted in non-strength areas where their purpose is essentially to restore watertight integrity and local strength (e.g., deck plating well inboard between cargo hatches, platform decks, etc.)

- Doublers should not be permitted where special local strength is required;

- When a doubler is installed over a crack, the ends of the crack should be drilled and the crack should be veed and welded;

- On vessels without double bottoms operating on protected waters, doublers may be accepted for repairs in way of engine or boiler rooms where it would be necessary to remove heavy equipment in order to provide access for plating replacement;

- Doublers should not be permitted in such locations on tank barges where the interface between doubler and the plate beneath can constitute a gas pocket; and,

- A record of each installation, including size and location, should be made in the vessel's inspection file.

- A welded doubler is not, in general, considered suitable as a permanent repair measure for the main hull girder;

Since 1968, NVIC 7-68 has supported the assumption of the Coast Guard and classification societies that doubler plates are only appropriate for temporary repairs. However, a 2005 report of the Ship Structural Committee (SSC), an interagency research and development committee for safer ship structures, stated that there has been little to no performance data and engineering design guidance collected to support this long-standing position.[2] In its report, the SSC counters this thinking and recommends specific best practices for doubler repair work that will allow the original hull structure to regain its original strength so that the repairs can be considered permanent.[3]

The historical experience of the inland towing industry is consistent with the SSC's conclusion that properly installed doubler plates are a suitable means of permanent repair for hull fractures. While doubler plates may fail due to improper welding or instances where the doubler was welded to a plate that was too thin to hold it, when installed properly, shipyards have reported doubler failure rates on inland towing vessels of 5 percent or less.

The guidance in the SSC report was intended to apply to large ocean-going ships, and thus its specific recommendations are not necessarily appropriate for the very different physical characteristics and operating environment of inland towing vessels. With this in mind, the subgroup believes that the use of doubler plates for permanent repairs on inland towing vessels is consistent with good marine practice under the following circumstances:

- Doublers should not be used in way of fuel tanks or any tank carrying hazardous materials or other pollutants (e.g., waste oil tanks, lube oil tanks, and slop tanks). Damaged steel on fuel tanks should be cropped and renewed in accordance with current Coast Guard guidance for the repair of inland tank barges.

- Doublers should not be layered or overlapped.

- Doubler plates should be sized to extend a minimum distances beyond the crack or puncture being repaired. The minimum distance should be ascertained using the following formula: ***50 mm or 2 in*** $\leq$ ***Overlap Length, Overlap Width*** $\leq$ ***100 mm or 4 in.*** [4]

- A doubler plate of more than 18"x18" on each side should be affixed with slot or plug welds inside the perimeter welds. The corners of the plate should be radiused as appropriate.

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[2] *Design Guidelines for Doubler Plate Repairs of Ship Structures*, Ship Structure Committee, 2005, p. 4.

[3] Ibid, p. 3.

[4] *Design Guidelines for Doubler Plate Repair of S hip Structures,* Ship Structure Committee, 2005, Abstract, p. 17.

- As a general rule, doubler plate thickness should be greater than the larger of 65% of the original stiffened panel plate thickness, or the thickness required by the doubler thickness factor of 2.6 (i.e., 2.6*(original panel thickness – damaged area thickness).[5]

- It is not necessary to prescribe minimum sizes for doublers on inland towing vessels. Unlike ocean-going ships, inland towing vessels are not subject to significant longitudinal stresses, do not carry cargo, and are drydocked at more frequent intervals.

- Previously affixed doublers, including those in way of fuel tanks, should not be removed simply on the basis that the repair does not conform to the recommendations listed in this section, so long as the integrity of the doubler is intact. In this case, the vessel owner should document the pre-existing repair and monitor it at regular drydock intervals.

- If a vessel's original hull construction included the use of lap seam type welded joints in way of fuel tanks, the vessel should be permitted to continue to operate as such provided a hazardous condition does not exist. However, any new construction using lap seam type welded joints should not be used in way of fuel tanks.

Water in Voids

Consistent with the focus of this report on inland towing vessel inspection and repair, this section is focused on water in void spaces that was not introduced intentionally.[6] The presence of some water in a void space on and inland towing vessel is not unusual and may occur as a result of a breach in the hull due to a collision, allision, or grounding; because of a crack in the hull plating or weld that may be either above or below the water line; from a leak from an adjacent compartment through an interior bulkhead; a leak from an internal source, such as a pipe that passes through the space; or from an open or unsecured hatch. In such circumstances, good marine practice is to consider the following questions in determining whether a hazardous condition exists and what action, in what time frame, needs to be taken:

- How much water is in the void?
- Is the vessel currently taking on water, and how quickly? Is there a risk of progressive flooding?
- Can the water be pumped out? Is there sufficient pump capacity?
- Why is the water in the void?
- How big is the void?
- Is there a noticeable sheen in the void that has flooded?
- What would be the effect on the vessel's stability if the void were to flood completely, or to the river level?
- Where is the vessel operating?
- Is a temporary repair feasible?

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[5] *Design Guidelines for Doubler Plate Repair of Ship Structures,* Ship Structure Committee, 2005, p. 107.

[6] Water is occasionally placed in the void spaces of an inland towing vessel intentionally to maintain proper trim, minimize noise and vibration, adjust the response of the vessel, or provide a source of clean cooling water. In the majority of cases, this is done safely; however, care must be taken not to negatively impact the stability of the vessel.

The vessel owner's SMS should lay out how the answers to these questions will determine the action to be taken. Because of the wide variety of possible circumstances, the subgroup did not believe it appropriate or practical to try to prescribe the specific actions to be taken in the event of water in the void space(s) of an inland towing vessel.

There is no specific Coast Guard guidance for inspectors on how to address water in voids. As a general practice, inspectors are trained to investigate to determine whether the presence of water in the void spaces is adversely impacting the stability of the vessel.

Set-Ins

Set-ins, or indented hull plating, may occur on the headlog, rake sheet, bottom or side shell plating, or on the aft rudder housing of an inland towing vessel, primarily because of impact with a structure such as a dock or lock or another vessel. Set-ins are typically found while the vessel is on drydock.

The subgroup developed the following recommendations on good marine practice for set-ins on inland towing vessels. These recommendations are adapted from the March 1994 *Inland Tank Barge Inspection and Repairs Guidelines* developed by Coast Guard MSD Baton Rouge.

- The severity and need for repair of set-ins depends upon location, orientation (transverse/longitudinal), sharpness, size, and framing. Each set-in must be evaluated on a case-by-case basis.
- A set-in seen on the outside that may need repair should also be looked at from the inside, to evaluate the effect on the structure inside.
- Sharp set-ins should be cropped/renewed/inserted in all cases in the deck or deck knuckle. Sharp set-ins are those that are obviously sharp, where the plate forms an angle of less than 135 degrees (2.5" depth/1' span) in any direction, or where the internal attached framing is abruptly tripped.
- If the set-in is smooth (1" deep/1' span), it may not require repair. The internal members in way of these set-ins should be intact and connected.
- Set-ins in the bow rake have no effect on longitudinal strength.

Internal Structural Members

The subgroup's recommended approach to good marine practice with respect to shaped structural members on inland towing vessels is also adapted from the *Inland Tank Barge Inspection and Repairs Guidelines*:

- Excessive bending, twisting, buckling, crushing, or other distortion of shaped or flanged structural members (e.g., angles, channels, I-beams, and pipe stanchions) should be repaired as necessary.
- Angles that serve as shell plate stiffeners (e.g., bottom or side shell angles) may have smooth bends associated with smooth plate set-ins. Smooth set-ins, within the limits of acceptable plate set-in, may not require renewal if:
    - They stay in their original longitudinal alignment of the member;
    - They are connected to the plate;
    - They do not roll, twist, or buckle;

    - The shaped member's flanges stay in the same orientation to the plate as original, throughout their length.
- Isolated, individual bottom plate and side shell plate stiffeners that are rolled or buckled should be examined on a case-by-case basis to determine whether the adjacent members are intact.

Wastage

Inland towing vessels generally do not experience the same amount of framing damage as barges, although they may experience some wastage. Bottom framing may also be damaged due to grounding. The subgroup believes that current Coast Guard guidance for repairing internal structural members on inland tank barges at 46 CFR 32.59 and the *Inland Tank Barge Inspection and Repairs Guidelines* lay out an appropriate standard for good marine practice for the repair of inland towing vessels: that is, steel should be replaced when wastage exceeds 20% from the "as required" thickness for structural members and 25% for plating. This is also consistent with the guidance in NVIC 7-68.[7]

Testing of Repairs

Repairs on hull plating or watertight bulkheads should be tested using satisfactory, non-destructive testing procedures. The appropriate testing procedure will vary depending on the type and location of the repair.

Welding Standards/Welder Qualifications

There is currently no requirement for welders working on inland towing vessels to be certified to any standard or code; shipyards determine if and how their welders are qualified at their own discretion. For this reason, there is considerable variance in individual shipyard practices. In some instances, shipyards require 100% of their welders to be certified to a standard or code; in other instances, shipyards do not require any of their welders to achieve any official certification. Many shipyards have a mix of certified and non-certified welders.

For those shipyards that require all or some portion of their welders to be certified, the three most popular standards are Coast Guard, American Bureau of Shipping (ABS), and American Welding Society (AWS) standards.

Those shipyards that do not require certification for their welders generally qualify them through testing and maintain performance records for each employee that can be audited by a third party.

With respect to Coast Guard requirements for welder qualifications for inspected vessels generally, 46 CFR 2.75-70, "Welding Procedure and Performance Qualifications," provides that "welding procedures and welder performance utilized in the fabrication of vessels and their various systems and components subject to Coast Guard inspection shall be qualified as required" by the subchapter applicable to that vessel class. Some subchapters, including

[7]Section III of NVIC 7-68, "Notes on Inspection," part D, "Oversize or Undersize Scantlings," lays out procedures for repairing reduced scantlings. This is not an issue for inland towing vessels because they are generally overbuilt.

Subchapter L and Subchapter T, do not require the use of certified welders for vessels subject to those subchapters.

With all of the above in mind, the working group makes the following recommendation with respect to good marine practice for welders working on inland towing vessels:

- Welders involved in the repair of inland towing vessels should display competency in the appropriate welding process, including welding procedure, position, and specific material.
- Welders may be qualified by the Coast Guard, by other agencies of the federal government, by the American Bureau of Shipping, or by the shipyard employing the welder.

CONCLUSION

The Subgroup on Inland Towing Vessel Inspection and Repair Standards was established under BAIT Working Group #5 to make recommendations to ensure that future Coast Guard guidance with respect to what constitutes an acceptable repair or acceptable condition on an inland towing vessel is appropriate for the physical characteristics and operating environment of inland towing vessels. Accordingly, the subgroup recommends that the background information and recommendations reflected in this report be used by the Coast Guard as the basis for publication of a new Navigation and Vessel Inspection Circular (NVIC) on inland towing vessel inspection and repair. Such a NVIC should be developed in time to be published contemporaneously with the final Subchapter M regulations.

In the meantime, the subgroup recommends that the information and recommendations in this report be used as the basis for a Coast Guard headquarters policy letter on inland towing vessel repair. This will enable the document to be used by both industry and the Coast Guard during the Towing Vessel Bridging Program and will assist both parties in preparing for implementation of the Subchapter M regulations.

Shipyard Questionnaire:
Inland Towing Vessel Repair Practices

This survey has been developed by The American Waterways Operators (AWO), the national trade association for the tugboat, towboat and barge industry, to gather information about current industry practice on issues related to the repair of inland towing vessels. The information you provide will be used to inform the efforts of a Coast Guard-AWO working group that is developing recommendations on appropriate standards for inland towing vessel repairs in anticipation of forthcoming Coast Guard regulations on towing vessel inspection. Thank you for taking the time to complete this survey!

1. What type of shipyard are you?
   New construction _____
   Repair _____
   Both _____

2. Do you also do repair work on tank barges?
   Yes ____
   No ____

3. What percent of your welders are certified to some standard or code? _____

4. If certified to a standard or code, which one?
   AWS ____
   ABS ____
   USCG ____
   ASME____
   Other (please specify) _____

5. If you do not "certify "to a specific standard or code, do you "qualify" your welders by testing?
   Yes ____
   No ____

6. If you test your welders, do you have records that could be reviewed by outside inspectors?
   Yes ____
   No _____

7. Briefly describe your approach to recordkeeping on welder qualifications:

8. Would you object to being required to test all welders working on towboats to a specific standard or code?
   Yes _____
   No _____

9. Would you object to establishing a standard welder qualification test designed by your yard with records available for audit?
   Yes ____
   No _____

10. Concerning hull exterior repair, please estimate the percentage of inland towing vessels you see in your yard that have the following situations:
    Indents/upsets _____
    Cracks/fractures _____
    Punctures _____
    Plate/weld wastage _____
    Buckling _____
    Other (please identify) _____

11. Do you commonly use doublers on towboat hull repairs?
    Yes _____
    No _____

12. Do you have a maximum and minimum size for doublers?
    Yes ____
    No ____

13. If yes, what are they?

14. On larger doublers, do you spot or plug weld the doublers inside of the perimeter welds?
    Yes ____
    No ____

15. Please describe your normal procedure for using a doubler to repair a fracture to exterior hull plating, assume the fracture is on flat plate.

16. Are there areas of the hull on an inland towboat on which you would not use a doubler?
    Yes ____
    No ____

17. If yes, please describe.

18. Do you ever use doublers to cover large areas of wasted plate?
    Yes _____
    No _____

19. Have you ever seen a doubler on an inland towboat fail?
    Yes ____
    No _____

19 (a). What was the primary reason for doubler failures seen at your shipyard?

19 (b). What is the failure rate (or frequency) of properly installed doublers seen at your shipyard?

19 (c). What is the rate (or frequency) of doubler failures seen at your shipyard that could have led to the sinking or loss of the vessel?

20. If you could determine why the doubler failed, please describe:

21. If you use doublers, do you use plate thickness that is larger than, smaller than, or the same as the hull plating?
    Larger than hull plating _____
    Smaller than hull plating _____
    Same as hull plating _____

22. Please estimate the cost differential between a doubler and an insert, of the same size, in the same location.

23. Have you ever seen problems resulting from a large number of doublers being used in a relatively small given area?
    Yes ____
    No _____
    If yes, please describe:

24. Do you commonly test hull repairs?
    Yes _____
    No _____

25. If yes, do you use:
    Air/soap _____
    Hose test _____
    Non-destructive testing (NDT) _____

26. At the request of the owner, do you commonly do hull gaugings to determine the overall condition of hull plating on an inland towing vessel?
    Yes _____
    No _____

27. Are you familiar with U.S. Coast Guard Navigation and Vessel Inspection Circular (NVIC) 7-68, Notes on Inspection and Repair of Steel Hulls?
    Yes _____
    No _____

28. Are you familiar with the U.S. Coast Guard publication "Inland Tank Barge Inspection and Repair Guidelines?"
    Yes _____
    No _____

Shipyard name/location:

Name/title of person completing the survey:

May an AWO representative contact you if we have any questions? If so, please provide contact information:

Phone:
Email address:

Participating Shipyards

Big River	Vicksburg	MS
Jantran Marine	Rosedale	MS
Jeffboat	Jeffersonville	IN
Mississippi Marine	Greenville	MS
Bludworth	Corpus Christi	TX
Bollinger	Algiers	LA
Bollinger	Amelia	LA
Bollinger	Calcasieu	LA
Bollinger	Golden Meadow	LA
Bollinger	Larose	LA
Bollinger	Morgan City	LA
Bollinger	Harvey	LA
Bollinger	Lockport	LA
Bollinger	Texas City	TX
Campbell Transportation	Dunlevy	PA
Campbell Transportation	Georgetown	PA
Campbell Transportation	Clairton	PA
Campbell Transportation	Congo	PA
Marathon Marine Repair	Catlettsburg	KY
McGinnis	Southpoint	OH
National Maintenance	Hartford	IL
National Maintenance	Paducah	KY
National Maintenance	Harahan	LA
R&D Associates	Catlettsburg	KY
Upper River Services	St. Paul	MN
A&Z Marine	Port Allen	LA
Ashton Shipyard	Harvey	LA
C&G Boat Works	Mobile	MS
James Marine	Paducah	KY
Pelican	Morgan City	LA
Verret	Plaquemine	LA
Amherst Madison	Henderson	WV
Neals Shipyard	Vienna	WV
Okan Shipyard	Gallipolis	OH
Ohio River Salvage	Belmont	OH
Bellaire Harbor Services	Bellaire	OH

Inland Towing Vessel Repair Practices
Shipyard Survey

- 27 of the 35 individual shipyards represented by this survey are involved in both new construction and repair work; 28 of 35 conduct repair work on tank barges.

- On average, about 60% of welders employed across the shipyards counted in this survey are certified to some standard or code. However, the range varies greatly – from 100% in some cases to 0% in others. Among shipyards that certify any percent of their welders, there is a fairly even distribution among three different standards:
    - American Welding Society (AWS): 35%
    - ABS: 45%
    - Coast Guard: 43%

- The vast majority of shipyards qualify their welders through testing in instances where the welders are not already certified. 20 of the 22 respondents that answered this question test their non-certified welders. Of the 35 participating shipyards, 29 have records that could be reviewed by outside inspectors.

- Each shipyard takes a different approach to keeping records for welder qualifications. In instances where the specific certification standard has associated best recordkeeping practices (such as ABS), those practices are followed. In all instances shipyards keep personnel files that allow them to keep track of certifications (where applicable) and job performance. In instances where shipyards make welders take pre-employment tests, those are kept in the individual's file as well.

- The vast majority of respondents (77%) say they would not object to being required to test all welders working on towboats to a specific standard or code, although one respondent specified that all yards should operate under the same standard. Even more respondents (88%) say they would not object to a standard welder qualification test designed by each yard with records available for audit. However, in one dissenting view, the respondent asked why this would be necessary if a welder shows continual competence through existing means of performance evaluation.

- Concerning hull repair, the majority of issues on inland towing vessels tend to be related to normal wear: indents/upsets; cracks/fractures; and plate/weld wastage. Comparably fewer casualty incidents involve punctures and buckling.

- Roughly 80% of respondents answered that they commonly use doublers on towboat hull repairs, and about 40% of respondents indicated that they have a maximum and minimum size threshold for doublers. As a standard practice, all participating shipyards noted that for larger doublers, they spot or plug weld the doublers inside the perimeter welds.

- Normal procedure for using a doubler to repair a fracture involves first gouging or grinding the fracture, drilling at both ends to stop the crack, and then welding the doubler

on all sides over it. When welding the doubler, some shipyards report the standard practice of making at least two passes on all sides of the patch. 80% of the respondents indicated that there are areas of the hull in which they would not apply a doubler. Most frequently respondents cited the fuel tanks, but noted generally that any void that could or does contain hazardous materials or other such pollutants is not an area in which they would apply a doubler. In addition to fuel tanks these could also include lube tanks, hydraulic oil tanks, and slop tanks.

- Regarding the size of doublers, the most common industry practice based on those surveyed is to use a doubler that is the same thickness as the hull plating. Some respondents indicated that they would use a doubler thicker than the hull plating to provide extra wear protection. Smaller doubler thickness was rare, but occasionally used to cover a difficult crack area. About 70% of respondents indicated that they have used doublers to cover large areas of wasted plate.

- Roughly 80% of respondents reported having seen a doubler on an inland towing vessel fail. Among the most cited reasons for doubler failures were simple wear and tear on the vessel, improper welding, or instances where the doubler was welded to a plate that was too thin to hold it.

    - In follow-up with three targeted shipyards (Bollinger Quick Repair, James Marine, and National Maintenance), respondents clarified that while they had worked on vessels in which doublers had failed, the overall failure rate when doublers have been installed properly is 5% or less.

    - The likelihood that a doubler failure will result in the loss of the vessel is even less frequent, on average around 1%. This is partly due to the fact that doublers are usually installed above the loaded water line, and partly due to the fact a failure below the water line is most likely to result in a minor leak, not significant flooding.

- The overwhelming majority of respondents estimated that inserts costs at least 2-3 times more than doublers. Some respondents went as high as 5-7 times more expensive. Only one respondent estimated that inserts costs less than twice as much as doublers.

- All respondents reported that they tested hull repairs. Air/soap is the one method all shipyards reported using. Roughly 65% of respondents conducted hose tests, and a little more than 40% of respondents conducted non-destructive testing.

- All respondents reported conducting hull gaugings to determine the overall condition of the hull plating on the inland towing vessel when the owner requests it; one respondent noted, however, that owners rarely request the gaugings.

- 80% of respondents were familiar with NVIC 7-68; a little more than that, 82% reported being familiar with “Inland Tank Barge Inspection and Repair Guidelines.”

Towing Vessel Casualty Incidents

#	Title	Vessel Operator	SMS?	Incident Details	Length	Incident Consequences	Activity_Id	Year	Event2	Event3	Event4	SubSystem	Component
1	M/V STORMY SUNK AT THE DOCK	Anchor Marine	No	holes in pitted plating while unmanned & moored	46'	vsl sank	1608257	2002	Flooding	Sinking		Hull	Hull Plating
2	M/V ASHLEY W - SINKING & POLLUTION	J & A Fleeting	No	failed rudder packing, stern tube packing, wasted plate and shell fractures left unrepaired for a long time while unmanned & moored	48'	flooding monitored with "maintenance" pumping; vsl sank with unknown oil discharge when shore power failed	1657259	2002	Flooding	Sinking		Hull	Weld
3	M/V Allen Carmen - Sinking @ Ohio River Mile 482	Herbert, TL and Sons (owner)	No	split thru-hull fitting near bow due to freezing while unmanned & moored	52'	vsl sank with 950 gal discharge	1738874	2003	Flooding	Sinking		Hull	Hull Plating
4	M/V STARFIRE Hull Breach ARTCO Dock	Wisconsin Barge Lines	No	unknown hole in bottom plate in Eng Rm while moored	156'	partial flooding	1745273	2003	Flooding			Hull	Hull Plating
5	VICKEY S - Sinking	Wellsville Terminal Co.	No	worn bottom plate while unmanned & moored	59'	flooding monitored with "maintenance" pumping; vsl sank when shore power failed	1815993	2003	Flooding	Sinking		Hull	Hull Plating
6	Sinking / TG FLETCH	Lakeshore Marine Construction	No	fatigue fracture in bottom plate near rudder while unmanned & moored	35'	vsl sank	1941459	2003	Sinking			Hull	Bottom Plating
7	UTV SHELLEN R - Hull Damage & Flooding	Buffalo Marine Services	Yes	hull fracture in stern caused by contact with submerged object	43'	partial flooding	1955751	2003	Flooding			Hull	Hull Plating
8	PP/MISSCATHERINE/CBR/ATCHAFALAYARIV/ODS	Central Boat Rentals Inc.	No	recent faulty shipyard repairs	45'	vsl sank with 800 gal discharge	1980222	2003	Flooding	Sinking		Hull	Weld
9	VICTORIA ROSE HUNT SINKING	Hunt Marine LLC	No	flooding for unknown reasons in **coastal** location	60'	vsl sank with 1,000 gal discharge	2005410	2003	Flooding	Sinking		Hull	Hull Plating
10	UTV BACCHUS: Sinking @ the pier	Midstream Stores Rentals and Supplies (owner)	No	cracks in aft bottom plate after grounding & loss of propellor while moored	52'	vsl sank	1986505	2004	Flooding	Sinking		Hull	Hull Plating
11	CAPTAIN STAPP - pollution/flooding	Stapp Towing Company Inc.	No	holes in bottom plate midship near keel	109'	vsl sank with 2 gal discharge	1997623	2004	Flooding			Hull	Hull Plating
12	UTV Ginger Sinking- MM 53 GIWW	Weeks Marine, Inc.	Yes	hole in bow and through wasted interior bulkhead	57'	vsl sank	2030566	2004	Flooding	Sinking		Hull	Hull Plating
13	M/V Samantha Flooding	Blackhawk Fleet	No	flooding through cracks in stern plate	54'	partial flooding with 25 gal discharge	2074280	2004	Flooding			Hull	Hull Plating
14	M/V MITCHELL/Flooding	Allegheny Power System	No	flooding through holes in wasted stern bottom plate	40'	partial flooding	2091465	2004	Flooding			Hull	Hull Plating
15	SHAWNEE (M/V); FLOODING	Warrior & Gulf Navigation Company	No	holes in aft hull plate	80'	partial flooding	2201277	2004	Flooding			Hull	Hull Plating
16	UTV LITTLE TIM sinking	Hot Energy Services	No	1.5" crack in keel	47'	vsl sank with 42 gal discharge	2268500	2005	Sinking			Hull	Hull Plating
17	* ICE DAMAGE * Tug BOBBIE JEAN JOHNSON/						2289993	2005	Flooding	Loss of Stability		Hull	Hull Plating
18	Sinking / M/V Ranger	Industry Terminal and Salvage Co.	No	failed shaft seal and fractures at chine and wrapper plates while unmanned & moored	66'	vsl sank with 100 gal discharge	2300451	2005	Flooding	Sinking		Hull	Hull Plating
19	CAP'N BILL SINKING	Jeffrey Sand Company	No	8" stress crack at tow knee with progressive flooding through disconnected water lines while unmanned & moored	40'	vsl sank with 200 gal discharge	2356791	2005	Flooding	Sinking		Hull	Hull Plating
20	UTV POLARIS SINKING/PORT OF IBERIA CANAL	Viking Marine Transportation	No	holes in wasted bottom plate at location of temporary repair of board and rags	92'	vsl sank with 3,000 gal discharge	2383735	2005	Flooding	Sinking	Abandonm-ent	Hull	Hull Plating
21	* WOOD HULL * IMD; FLORENCE FILBERG; 05-329						2424697	2005	Flooding	Sinking		Hull	Hull Plating
22	HMS PELICAN minor flooding	Houston Marine Services, Inc.	Yes	3' crack in bow normally above waterline	33'	minor flooding	2448861	2005	Flooding			Hull	Hull Plating
23	** LAID UP ** Pollution / MV Ben Franklin 900						2520696	2005	Flooding	Sinking		Hull	Hull Plating
24	** OTHER DAMAGE ** Tug Alton A II/Marine						2568650	2005	Flooding	Sinking		Hull	Side Shell
25	ELLY LANE / SINKING	Canal Barge Company, Inc.	Yes	8" fracture in weld at stern corner	96'	vsl sank with 3,500 gal discharge	2724396	2005	Flooding	Sinking		Hull	Weld
26	** OTHER DAMAGE ** TUG CANDACE FLOODING						2576815	2006	Flooding	Material Failure	Maneuvera	Hull	Bottom Plating
27	** Barge ** Flooding/J A R 3/ GIWW mm 492						2611185	2006	Flooding			Hull	Side Shell
28	M/V JANE L- Flooding	Kirby Inland Marine, LP	Yes	fracture in plating in shaft alley	57'	shingle stopped minor leak	2703779	2006	Flooding			Hull	Hull Plating
29	MS SUE - Flooding	Southwest Shipyard	No	18" corrosion fracture, Eng Rm flooded through disconnected bilge connection	25'	Eng Rm only flooded	2731295	2006	Flooding			Hull	Hull Plating
30	M/V DONNA JEAN leak in stern	American River Transportation Company	Yes	following unrelated marine casualty, CG discovered small stern leak near propellor	56'	minor flooding	2809245	2006	Flooding			Hull	Hull Plating
31	HELEN B / Flooding	Jefferson Barracks Marine Service, Inc. (owner)	Yes	fracture in interior bulkhead while unmanned & moored	66'	potable water tank contents drained into Eng Rm	2819758	2006	Flooding			Hull	Hull Plating

Towing Vessel Casualty Incidents

	Title			Incident Details	Length	Incident Consequences	Activity_Id	Year	Event2	Event3	Event4	SubSystem	Component
32	Flooding - M/V PRO TOW MM 517.5 UMR	Riverview Boat Store, Inc.	No	pinhole leaks through wasted metal while running in ice	44'	minor flooding	2843230	2006	Flooding			Hull	Bottom Plating
33	UTV CHERYL DOBARD TAKING ON WATER	American Commercial Lines LLC	Yes	4" fracture on stern corner in wasted metal	71'	minor flooding	2853280	2007	Flooding			Hull	Hull Plating
34	** Still Open ** BRUCE D/Sinking						2859864	2007	Flooding	Sinking		Hull	Hull Plating
35	** Other Cause ** M/V JOHN W. CANNON (Sinking)						2955093	2007	Flooding	Sinking		Hull	Hull Plating
36	CHARLES B - Sinking/ IMD/NRC835855/DIESEL/500GAL	River Marine Management, Inc.	Yes	slow leak through stern crack into Eng Rm while unmanned & moored	58'	vsl sank with 500 gal discharge	2958477	2007	Flooding	Sinking		Hull	Hull Plating
37	M/V MISS HANNAH - Sinking/Pollution	Guntersville Marine, Inc.	No	cracks in hull at deck	54'	vsl sank with 600 gal discharge	3022439	2007	Sinking			Hull	Bottom Plating
38	Flooding/pollution/UTV CAPT. BRUCE STAPP/Brazos FG	Stapp Towing Company Inc.	Yes	fracture in stern void	66'	partial flooding with 0.3 gal discharge	3040744	2007	Flooding			Hull	Weld
39	M/V MISS DEBBIE - Sinking	Western Kentucky Energy Corp.	No	3" fractured weld on stern bilge knuckle	36'	vsl sank with 10 gal discharge	3122676	2007	Flooding	Sinking		Hull	Hull Plating
40	UTV JUSTIN JAMES/Sinking/DJC	Smith Marine Services	No	slow leak through small hole in bow while unmanned & moored	42'	vsl sank with 5 gal discharge	3124245	2007	Flooding	Sinking		Hull	Hull Plating
41	ELIZABETH ANN; TOW	Need-a-Diver Marine Services Inc.	No	flooding through extensive plate deterioration	59'	bilge pumps kept boat afloat	3126716	2008	Flooding			Hull	Hull Plating
42	** Other Damage ** Equipment Failure: M/V						3186247	2008	Flooding			Hull	Hull Plating
43	UTV CAPT DONALD CREPPEL/Flooding/mile 227 LMR	Slidell Towing, Inc.	No	crack in stern corner	52'	2 voids only flooded	3261715	2008	Flooding			Hull	Side Shell
44	UTV Rosie Paris-Equipment Failure	U.S. United Ocean Services	No	hole in Eng Rm plating caused by electrolosys	64'	minor flooding	3284532	2008	Flooding			Hull	Hull Plating
45	** Laid Up ** SAMUEL CLEMENS,THRIFTY						3303901	2008	Flooding	Sinking	Allision	Hull	Hull Plating
46	** Laid Up ** UTV RED DRAGON; SINKING						3348999	2008	Flooding	Sinking		Hull	Bottom Plating
47	FLOODING/GROUNDING - TUG SOUTHERN CROSS	Patriot Marine, LLC.	No	hole in **coastal** tug ballast tank caused by deterioration		vsl sank by progressive flooding through normally close but left open WT door	3360443	2008	Flooding	Sinking	Vessel Maneuver-ability	Hull	Hull Plating
48	Tug Humboldt - Flooding	Hawaiian Tug and Barge Corp.	Yes	slow leak through 4" crack while unmanned & moored; **coastal setting**	60'	minor flooding	3411685	2008	Flooding			Hull	Bottom Plating
49	** Ice Damage ** FLOODING - UTV MARIAN HAGESTAD - OHR MM 30						3400033	2009	Flooding			Hull	Hull Plating
50	Flooding - TUG ARIES	Vulcan Construction Materials, LP	No	8" crack in rudder void	61'	vsl sank by progressive flooding through wasted ballast pipe into adjacent tank	3423540	2009	Flooding	Sinking		Hull	Hull Plating
51	LOYD C - Sinking/Pollution	Evansville Marine Services, Inc.	Yes	cracked bow plate left unrepaired for long time	55'	flooding monitored with "maintenance" pumping; vsl sank with 25 gal discharge	3423772	2009	Flooding	Sinking		Hull	Hull Plating
52	UTV CLIFFTY CREEK - SINKING - OHR MM 123	Wellsville Terminal Co.	No	slow leak through hole in wasted plating while unmanned & moored	42'	vsl sank with no discharge	3506693	2009	Flooding	Sinking		Hull	Bottom Plating
53	062HUN09,M/V Ashley W./09-018/NOV, SML	Aquarius Marine, Inc./ CJ Mahan Construction Company	No	failed lap patch plate over failed waster plates above propellor	45'	vsl progressively flooded thru wasted internal Eng Rm bulkhead and sank with 10 gal discharge	3518366	2009	Flooding	Sinking		Hull	Hull Plating
54	** Barge ** NONNIE, UTV; FLOODING						3521038	2009	Flooding	Sinking		Hull	Hull Plating
55	Cumberland Express/flooding/pollution/NOV	Ingram Barge Company	Yes	hole in stern void through worn plate or previous damage	71'	minor flooding; vsl grounded; small discharge	3555332	2009	Flooding	Grounding		Hull	Weld
56	MC- CAPT LARRY BARKS, UTV; CAPSIZE	Captain Larry Barks, LLC (owner)	No	vsl departed shipyard with exposed incomplete hull repairs	71'	flooding through incomplete repairs; vsl sank with 5,045 gal discharge	3626224	2009	Flooding	Loss of Stability		Hull	Hull Plating
57	UTV Twyla Marge/Equipment Failure/Old River	Luhr Bros. Inc.	Yes	crack in stern void tank partially flooded Eng Rm	60'	partial flooding with 2 gal discharge	3648199	2009	Flooding			Hull	Hull Plating
58	** Laid Up ** SEQUOYA/Sinking/Panama City, FL						3841820	2010	Flooding	Sinking		Hull	Hull Plating
59	M/V STEVE RICHOUX; flooding in engine room	Marqutte Transportation Company Gulf Inland, LLC	Yes	interior routine hull maintenance opened small hole in bottom plate	85'	minor flooding	3892572	2010	Flooding			Hull	

Reported as "Steel Hull Failures" (white notebook)