AOC Section 5.4 Scope of Work Outline

Introduction

The Navy will provide documents that will consist of additional research, studies, data, information, investigations, and recommendations. The intent of the documents is to clarify, explain, amplify, and present new information.

Content will be presented in categories populated by Topics listed below. The basis for Topics 1-4 is Regulatory Agency letters from March and July 2020. Topics 5-6 will present changes to process and procedures based on what was learned from Destructive Testing, Regulatory Agency input, and Navy process improvement.

Content will be organized into the following broad categories.

a) Technology
b) Application of Technology
c) Repair Criteria
d) Corrosion Mitigation

Schedule

A schedule for the production of these documents will be developed and presented. The schedule will based on Navy/DLA resources and realistic timeframes.

Topics

1. Interpretation of the Coupon Results
   1.1. Significance of field NDE results vs laboratory results
   1.2. Significance of False Positive vs False Negative
   1.3. Scale of Damage Mechanism
   1.4. Accuracy and precision of NDE
   1.5. Reliability of NDE process

2. Deficiencies in Data Collected
   2.1. Profilometry vs thinnest portion of each coupon
   2.2. Incomplete analysis of thinnest portion of each plate
   2.3. Failure to complete profilometry
   2.4. Significance of profilometry vs field NDE
   2.5. Regulatory Agencies disagreement with Navy conclusion

3. Uncertainty Regarding NDE Accuracy
   3.1. Correlation between field NDE and laboratory measurements
   3.2. Accuracy of NDE – pitting
   3.3. Accuracy of NDE – general corrosion
   3.4. Difference between PAUT and laboratory measurements
   3.5. Disagreement with statements in DTRR
   3.6. Dr. Hihara's statements on profilometry and thinnest point of each coupon

4. Potential for Increased Rates of Corrosion
   - 4.1. Method by which Corrosion Rate is calculated
   - 4.2. Using extreme value vs uniform to establish Minimum Remaining Thickness
   - 4.3. Dr. Hihara's theory concerning metal liner
   - 4.4. Environmental and chemical conditions affecting rates
   - 4.5. Dr. Hihara's theory concerning reinforced concrete
   - 4.6. Potential causes for corrosion
   - 4.7. Rainfall effects on metal liner
   - 4.8. Removal of telltales

5. Recommendations for Moving Forward
   - 5.1. List of known NDE techniques
     - 5.1.1. Applicability to Red Hill
     - 5.1.2. Reported accuracy of equipment
   - 5.2. Factor of Safety
     - 5.2.1. Comparison with other Industries (API, ASME, ASCE, etc.)
   - 5.3. Corrosion Rates
     - 5.3.1. Address extreme value (e.g., timber lodged behind plate) vs uniform rate.
     - 5.3.2. Comparison to API 650 tank steel bottom
     - 5.3.3. Analysis of Inspection Data (modeling, regression, comparative, quantitative)
     - 5.3.4. Laboratory study to attempt to distinguish between recent and historic corrosion
   - 5.4. Changes to LFET
     - 5.4.1. Change software to flag errors
     - 5.4.2. Refinements to Procedures (lift-off, markings, order)
     - 5.4.3. Additional testing of testers using actually corroded plates
     - 5.4.4. Qualification of Testers with corroded plates
     - 5.4.5. Human Factors
   - 5.5. Changes to Step 2 (PAUT or another technology)
   - 5.6. Limiting PAUT to certain uses
   - 5.7. During prove-up, if the threshold cannot be found, flag the spot for an independent review
   - 5.8. Investigate other methods for corrosion mapping
   - 5.9. Change to Straight Beam/Angle Beam UT
   - 5.10. Data Entry and Documentation
     - 5.10.1. Refine process to eliminate entry errors
     - 5.10.2. Eliminate intermediate steps in data handling
     - 5.10.3. Screening for outlier data
   - 5.11. Auditing of Quality Control Program
     - 5.11.1. Spot checks (metal loss) using KTR NDE
     - 5.11.2. Spot checks (metal loss) using 3rd party NDE
     - 5.11.3. Spot checks (metal loss) using destructive means
     - 5.11.4. Spot checks of QC documentation
     - 5.11.5. Negative Performance Incentives (rework, removal of personnel, rejection of work)
     - 5.11.6. Acceptance sampling plan

6. Validation of Initiatives
    6.1. Report on results
    6.2. Implement Changes to Specifications
        6.2.1. Qualification of Inspectors
        6.2.2. Testing procedures
        6.2.3. Reporting procedures
        6.2.4. Audit coupons
    6.3. Changes to Quality Assurance procedures