
	ITTC –Recommended Procedures	7.5 – 0.4 01 – 01.3 Page 1 of 5	
	Full Scale Measurements Speed and Power Trials Hull and Propulsor Survey	Effective Date 2002	Revision 01

CONTENTS

1. **PURPOSE**
2. **SCOPE**
3. **RESPONSIBILITIES**
4. **DEFINITIONS**
5. **PROCEDURES**
 - 5.1 **Preparation**
 - 5.2 **Roughness Survey**
 - 5.3 **Reporting of Results and Distribution of Information**
6. **REFERENCES**
7. **RECORDS**
8. **ATTACHMENTS**

Updated by	Approved
Specialist Committee of 23 rd ITTC on Speed and Powering	23 rd ITTC 2002
Date	Date 2002

	ITTC –Recommended Procedures	7.5 – 0.4 01 – 01.3 Page 2 of 5	
	Full Scale Measurements Speed and Power Trials Hull and Propulsor Survey	Effective Date 2002	Revision 01

Hull and Propulsor Survey

1. PURPOSE

The purpose of this procedure is to provide guidance in establishing a baseline of the ship hull and propulsor condition prior to the conduct of a full-scale Speed/Power trial. Hull and propulsor surveys are recommended to allow an evaluation of the trial results for scientific purposes.

2. SCOPE

This procedure applies to the ship hull and propulsor survey performed prior to the conduct of full-scale Speed/Power trials and is considered a part of the ship inspection outlined in Speed/Power Trial Ship Inspection Procedure 7.5-04-01-01.2. No correction of trial results is expected based on the condition of the hull or propulsor. However, the trial report must clearly state the hull and propulsor condition since these conditions effect hydrodynamic performance.

3. RESPONSIBILITIES

- The Trial Director is the duly authorized shipbuilder's representative responsible for the execution of all phases of the Speed/Power trials including the arrangement or conduct of a ship hull and propulsor survey.
- The shipbuilder is responsible for the overall trial coordination between the ship's crew, trial team, and the owner representative. Hull and/or propulsor cleaning, if necessary, is negotiated between the shipbuilder and the shipowner.

- The trial team is responsible for arranging and/or conducting a ship hull and propulsor survey prior to the conduct of the Speed/Power trial.

4. DEFINITIONS


None

5. PROCEDURE

A roughness survey is necessary to document the conditions of the ship hull, appendages, and propulsor(s) prior to the start of the full-scale speed/ power trial. Cleaning may be required if fouling is found to be such that it would bias the trial data.

After the hull and propulsor are cleaned, a roughness survey of the hull and propulsor will be conducted by either the trials team or personnel arranged for by the Trials Director to document the ship pre-trial condition. Ideally, roughness surveys should be conducted immediately prior to the onset of the trials. Further cleaning, followed by another roughness survey, may be recommended if fouling is found to be such that it would bias the trials data, i.e., the average hull roughness level is greater than 250 μm ($\mu = 1 \times 10^{-6} \text{ m}$) (6.35 mils) or the average propulsor roughness level is greater than 150 μm (3.81 mils).

If a hull cleaning is not required, ship's crew or the shipbuilder shall provide a copy of the most recent hull, control surfaces, and propulsor inspection report to the Trial Director. This information is an important part of understanding the trials conditions and will assist with the post-trials model correlation efforts.

	ITTC –Recommended Procedures	7.5 – 0.4 01 – 01.3 Page 3 of 5	
	Full Scale Measurements Speed and Power Trials Hull and Propulsor Survey	Effective Date 2002	Revision 01

There are three stages of a roughness survey; in-house preparation, the survey, and the reporting of results and distribution of information to the various parties involved in the trial. The procedure is as follows:

5.1 Preparation

This procedure assumes the use of a BMT roughness gage. Comparable roughness gages may also be utilized.


1. Develop the roughness survey template to determine where and how many roughness readings will be taken.
 - a. If available, obtain the generic roughness template for the ship to be surveyed.
 - b. Consult the shipbuilder's documentation or the open literature to determine if past roughness surveys have been conducted on this ship or other ships in its class.
 - c. If no previous roughness surveys exist, develop a new template using the ship's drawings to modify the generic template. Incorporate any ship specific hull and propulsor appendages.
 - d. If previous surveys exist, modify the generic template using the previous surveys as a guideline. This will ensure that measurements are made in similar locations for comparison purposes.
2. Obtain the ship's most recent docking report, if available. Evaluate the report to determine if cleaning may be required prior to the conduct of the survey. The Trial Director, ship builder and ship owner's representative will decide if a survey needs to be conducted based upon past trials experience, the known effects of roughness on

speed trial data for similar hulls, and/or comparison between full-scale trials data and ship-model correlation results.

3. Query the ship's crew for known problem areas on the hull and propulsors that should be investigated during the roughness survey.
4. Arrange a time with the ship's point of contact to conduct a roughness survey.
5. Coordinate with divers for conduct of the survey if it is waterborne. Detailed information should be provided to the divers on locations for roughness measurements, photography, and video for use in the preparation of the Diver's Report and Roughness Survey.
6. Send appropriate notification to all necessary parties of any findings and/or requirements needed to complete the survey(s).

5.2 Roughness Survey

1. Upon arrival, the trials team should meet with the ship's point of contact and the divers if the survey is to be waterborne. This meeting should be held prior to conducting the survey in order to discuss overall roughness survey procedures.
2. Record all identifying numbers for the instrumentation used to conduct the survey.
3. Divers should perform a visual underwater survey of the hull and propulsors to evaluate the current conditions of the hull and propulsors if waterborne.
4. Inspect the hull to see if marine growth is found on the hull, and to ensure that draft marks are visible.
 - a. The hull roughness gauge should only be used in locations in accordance with the manufacturer's recommendations to avoid damaging the gauge. A reference that may be used is the Naval Ship's Technical

	ITTC –Recommended Procedures	7.5 – 0.4 01 – 01.3 Page 4 of 5	
	Full Scale Measurements Speed and Power Trials Hull and Propulsor Survey	Effective Date 2002	Revision 01


Manual S9086-CQ-STM-000 Chapter 081 Waterborne Underwater Hull Cleaning of Navy Ships. This guideline suggests that the hull roughness gauge should not be used with a fouling rating (FR) over 20 or a paint deterioration rate (PDR) over 30.

- b. The propeller roughness gauge should not be used if the propulsor is not smooth and clean.
5. Conduct the roughness survey using the appropriate roughness survey template as a guideline.
6. Additional guidelines for conducting the roughness measurements are as follows:
 - a. Perform calibration of hull roughness gauge using BMT calibration templates.
 - b. Measurements should be made in the direction of flow whenever possible.
 - c. Hull, appendages, and control surfaces:
 - A hull roughness gauge should be used.
 - A measurement length of 1 to 2 m is desirable.
 - At least 3 measurements at each location should be made.
 - Measurements should be made at selected locations on the hull, bow, amidships, stern area, keel, and significant appendages (rudders, fin stabilizers, bilge keels, and bulbous bows)
 - Document the size, location, and condition of hull appendages
 - d. Propulsors
 - A propeller roughness gauge should be used if available for increased accuracy

- A measurement length of 0.3 to 0.7 m is desirable.
 - At least 3 measurements at each location should be made.
 - For propulsors, measurements should be made on the pressure and suction sides of the blades
 - Document the condition of the propulsor(s) for obvious problems, dings, nicks, dents, and cavitation erosion.
- e. Document the size, location, and condition of zinc anodes, seawater inlets and outlet
 7. Obtain a copy of the Diver's Report and Roughness Survey from the divers if the cleaning or survey was waterborne.

5.3 Reporting of Results and Distribution of Information

1. Document all pertinent information relating to the survey in a Roughness Survey report.
 - a. Last date of cleaning
 - b. Means of cleaning
 - c. Summary of events
 - d. Summary of results and major findings including:
 - Hull roughness measurements; average, standard deviation, roughness distribution along the hull
 - Propulsor roughness; average, standard deviation, roughness distribution along the blades
 - Appendage roughness; average, standard deviation, roughness distribution along the appendage
 - Physical damage, if any

	ITTC –Recommended Procedures	7.5 – 0.4 01 – 01.3 Page 5 of 5	
	Full Scale Measurements Speed and Power Trials Hull and Propulsor Survey	Effective Date 2002	Revision 01

2. The Roughness Survey report may be incorporated in the final trial report or as a separate stand-alone report.
3. Incorporate findings noted in the Diver's Report and Roughness Survey report into the overall trial preparation documentation, as necessary.
4. Meet with relevant personnel to discuss findings of the hull and propulsor survey.
5. Incorporate findings into overall trial preparation as necessary.

6. REFERENCES

1. Speed/Power Trial Ship Inspection 7.5-04-01-01.2

2. Naval Ship's Technical Manual S9086-CQ-STM-000 Chapter 081 Waterborne Underwater Hull Cleaning of Navy Ships

7. RECORDS

1. Ship's plans
2. Roughness Survey template
3. Roughness Survey report
4. Docking report
5. Diver's Report and Roughness Survey, if applicable

8. ATTACHMENTS

None