

**ASA S12 Committee on Noise**  
**Working Group (WG) 47 – Underwater Noise Measurement of Ships**

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Third Meeting August 7, 2007, 9am -4pm  
Mantech, Inc. Room 730,

**MEETING MINUTES**  
**REVISION 0 – 08/08/2007**  
**Prepared by Michael Bahtiarian**

The meeting started around 9am with brief introductions of all attendees. The meeting agenda and the list of attendees are given on the two pages following the end of these minutes. The chair gave a brief update of the last meeting in Salt Lake City. This meeting was held in June in conjunction with the Acoustical Society of America (ASA) meeting. The meeting minutes are available on the WG47 website ([www.noise-control.com/wg47/](http://www.noise-control.com/wg47/)).

The first discussion was item (3) on the agenda concerning existence of similar standards for underwater noise measurement of ships, specifically in Europe. The chair noted that this seems to be a myth as he has heard this comment a few times, but has not seen any such standards. The committee was asked at the first and second meetings about such standards but none have been found by other committee members.

Dave Venditis reminded the chair about the NATO STANAG document. This has been circulated to committee members and the chair has reviewed it. It is NATO document for performance of underwater noise measurements related to sonar detection and torpedo acquisition so it was determined not to be applicable.

The chair asked the U.S. Navy participants if they agreed with this statement and whether they had any documents applicable. Kurt Yankaskis/Dick Tadeo (NAVSEA) agreed STANAG may not be suitable as example standard for WG47. They stated that Navy obviously has underwater measurement standards, but they would be classified and not available to this open forum. Jim Otis (NSWC-CD) & Bob Myers (Mantech) agreed.

The chair moved onto item (6) of the agenda to discuss with all parties (Yankaskis and Tadeo needed to leave before lunch). As noted in the agenda, chair believes it would be nice (but not necessary) have a small source of funds to cover copying, meeting rooms, net meetings (i.e. WebEX), telecons, website, and travel for experts, etc. He reminded everyone, that all work and travel of committee members must be and must remain voluntary. Chair has noted that he has seen many grant offerings for related, but probably not this effort. This include marine environmental monitoring, etc. Mostly funds were being offered by NOAA and NSF.

No one had any suggestions at the time for further funding. Matt Hawkins (University of Delaware) offered that UNOLS uses one of the net meeting services and if we wanted to

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conduct a net meeting they might consider covering this cost. Matt would check into this for the next meeting.

The chair brought up item (7) on the agenda about the next meeting. The chair wanted to hold a New England meeting for people up in that area. Kurt Yankasis reminded Bahtiarian that government budgets will expire in fall so meetings that require travel fund (airfare) in October time frame will be difficult for Navy reps and contractors. Venditis invited committee to FAU in winter 2008. Everyone generally liked the location and time frame.

John Diebold (LDEO) offered a meeting at LDEO in the NY/NJ area as middle ground between DC and New England. This was considered by most to be good location. John will need to check schedule within next month on his availability. Mae Seto (Defense R&D Canada) offered to host a summer 2008 meeting at her office in Dartmouth/Halifax, Nova Scotia. That location was also acceptable to most participants.

While this was not said in the meeting, as a matter of logistics, the chair will contact each host as time comes, make necessary arrangements and then notify the committee. Also not mention, but it will be reported here that WG47 will not meet at the ASA Conference in New Orleans in Nov 2007. Chair will also consider other ASA conferences as they are scheduled. ASA conference in summer is in Paris and will also not be likely meeting place.

**At this time the future meeting schedule is as follows:**

October – November 2007: Lamont-Doherty Earth Observatory (Palisades, NY)  
January – February 2008: Florida Atlantic University (Ft Lauderdale, FL)  
June – August 2008: Defense R&D Canada (Dartmouth, Nova Scotia)

Before starting full discussion on the measurement Grades, the chair wanted to be clear that his intention was for the committee to develop a single standard which would cover all three measurement grades. The chair stated he prefers this approach to developing one general standard with three parts one for each grade. The consensus from the committee was that they believed this was already discussed and decided to be one standard. Boone Hichborn (NAVSEA) suggested that the committee need to set time table and try to stick to it. Chair reminded everyone that general schedule was to have document in three years: First year internal draft generation, second year internal draft review, third year S12 and “public” review. There was some discussion about review process, who would review, etc. However, all members present agreed that the intention is to write one standard which will cover three different measurement grades.

The main portion of the meeting was intended to review and complete the grades matrix. The committee undertook this process line by line. A copy of the Grades Matrix (Rev 5) as given at the beginning of the meeting is attached to these minutes. A copy of the Grades Matrix (Rev 6) as revised during the meeting is given on the following page. A

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copy of the final proposed Grades Matrix (Rev 7) after the meeting is on the following page.

Obviously all the changes between Rev 5 and Rev 6 were as decided by the committee members present at the meeting. The changes from Rev 6 to Rev 7 were some small formatting, organization of the information and also the addition of hydrophone depths which was suggested by Dick Wood (UK), but never discussed at the meeting and obviously important issue the committee missed. A summary of the discussion around significant items is given below.

**Expected Use/Application:** Changed item name from “Expected Use” to “Example Use” to make clear these were just guidelines and not hard fast requirements. Replace wording “Annual Checkup” with “Periodic Assessment” to soften from something that sounds like a requirement to one of need.

**Expected User/Type of Ship:** Replaced “Navy Non-Combatants” with “Navy”, replaced “ship” with “vessel”.

**Grade Driving Factor:** No significant changes.

**Measurement Units:** Changed item name to “Measurement Reporting Units”. Changed from Lp (Level Pressure) to SPL (Sound Pressure Level) at request of Venditis. It was also suggested that Ls (Level Source) could be used to. Currently, it is listed as “SPL dB re 1 micro-Pa”.

**Source Level Correction:** Changed item name to “Reference Distance”. Distance remains at 1 meter to be consistent with prior datasets.

**Distance Correction Method:** Changed item name to “Distance Adjustment Method”. All three grades were left with spherical spreading. It should be noted that there was much discussion on the validity of using spherical spreading. It was agreed to leave such method, but that other aspects such as the accuracy, measurement distance and water depth would have to be consistent with using spherical spreading.

**Measurement System Accuracy:** Changed item name to “Measurement Accuracy” which implies this will be accuracy of the measured sound level in total (i.e. not just the accuracy of the measurement system. Values changed to 2, 3, & 4 dB for Grade A, B, & C, respectively. These values were not the result of any calculation, test or verification. At this point, they are the accuracy the committee believes can be achieved when the other items in the Grade Matrix are used. These values should also be used a guideline to WG47 in writing the actual standard.

**Measurement System Repeatability:** Changed item name to “Measurement Repeatability” for same reasons noted in accuracy item above. Values changed to 1, 2, & 3 dB for Grade A, B, & C, respectively. As with accuracy, these are desired values not computed or verified.

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**Frequency Response, Primary:** Some discussion on selected ranges, but they remained as noted in Rev 5.

**Frequency Analysis, Primary:** No changes

**Frequency Resolution, Primary:** No changes

**Frequency Response, Secondary:** Discussed changing to upper limit of 1/3 octave band for each grade, but decided to change frequency limits to same as primary response (i.e. the main difference on the secondary values is not frequency range by analysis type, the next item.

**Frequency Analysis, Secondary:** No changes

**Frequency Resolution, Secondary:** Grade A is 1 Hz with a note stating, “Resolution subject to instrumentation, reporting limitations and costs thereof”. Grades B & C are listed “As Needed”. The idea here is that narrowband analysis is required for Grade A, optional for Grades B & C, and that in Grade A 1 Hz resolution is preferred but this may be subject to change as the actual standard is written if the committee finds that 1 Hz resolution requires too costly equipment or methodology, etc.

**Maximum Hydrophone Sensitivity:** Changed item name to “System Sensitivity”. For all grades changed from “???” to 10 dB below Knudsen Sea State 0. Chair would like to get this translated into a hard number and is hoping someone can run math and convert to mV/Pa or dB re 1V/micro-Pa. This would be good item for our hydrophone vendors to work on.

**Hydrophone Frequency Response:** This was redundant item and deleted from the matrix.

**Number of Hydrophones:** Grade A stayed at three hydrophones, Grade C stayed at one hydrophone. Grade B changed from two to three hydrophones due to fact that if have two hydrophones with differences, you will not be sure which one is wrong. Thus, Grade B was changed to three hydrophones for above reason.

**Minimum Water Depth:** This issue had significant discussion. First, The Grade A water depth of 5x ship length was recommended at the last meeting. Grade A has always been reserved as what the Navy would want. On the other end, Grade C was decided to be 1x ship length which is double from the last rev at 1/2x ship length. Dave Venditis suggested that the ratio of measurement distance to water depth should be  $\leq 3$ . Thus, the Ratio for Grade A = 1/5, Grade B 1/2 and Grade C = 2 (previous) and C = 1 (current values). Further, the 1x was decided as middle ground between shallow water which then makes the Grade C less expensive (due to minimum time to travel to shallow water and other related factors) and need for deeper water to avoid bottom reflections which will

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contaminate a measurement. Grade B was determined to use 2x ship length for minimum depth splitting difference between depths of Grades A & C.

**Minimum Measurement Distance:** This issue was discussed, but it was decided to leave the measurement distance at 1x ship length.

**Distance Ranging Accuracy:** The distance ranging accuracy was changed from absolute values of  $\pm 3$ ,  $\pm 10$  and “ $\pm??$ ” to a relative 5%, 5% & 10% for Grades A, B & C, respectively.

**Deployment Requirements:** No discussion or changes made.

**Weather/Sea Conditions:** Weather requirements were changed from less than or equal to Sea State 1 to less than or equal to Sea State 2 and elimination of precipitation exclusion (i.e. can test in rain if meet background noise requirements).

**Auxiliary Measurements:** For all Grades the easy set of “measurements” of engine speed (rpm), wind speed and direction were added. This should not add any burden to Grade B & C users. For Grade A it was also decided to require Sound Velocity Profiles. There was some discuss about what this tell you, (Typically, where thermoclines are). Some suggested that when you run this test still do nothing, but everyone thought it was important item for the higher Grade A.

**Other Factors:** No changes except to better word requirements.

**Calibration:** Changed Grade C to requiring field calibration.

**Hydrophone Position:** Bob Myers suggested at some point, that bottom mounting hydrophones would be great way to avoid Lloyd-Mirror errors. While this is true, it was noted by someone that bottom mounting is much more complicated setup configuration. It was agreed that all measurements would be with beam aspect of hydrophones in vertical array. In Rev 7 this issue was moved up to the section with other hydrophone issues and renamed, “Hydrophone Geometry/Position”.

**Hydrophone Depth(s):** This was missed as Grades Matrix topic and suggested by Dick Wood in his email comments. During the meeting, Dave Venditis stated that hydrophone heights should be that which give  $15^\circ$ ,  $30^\circ$ ,  $45^\circ$  angle from the centerline of the ship for three hydrophone arrangement (Grades A & B). For Grade C the  $30^\circ$  position should be used (i.e. center hydrophone). This topic will need to be fully described with diagram in the standard.

Lastly, the chair handed out a rough draft of a table of contents with 14 different sections. The list was compiled by looking through half dozen acoustics standards. See last page of the minutes for the original Table of Contents. The table was quickly revised to include following 10 sections below. The sections in bold are required for all ANSI

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standards. The Chair will prepare summary of what should be included in each section and send around to everyone before the next meeting.

- 0 Introduction**
- 1 Scope, Purpose and Applications**
- 2 References**
- 3 Terms and Definitions**
- 4 Instrumentation
- 5 Measurement Requirements & Procedure
- 6 Evaluation
- 7 Basis of Acceptability ???
- 8 Reporting/Example
- 9 Measurement Uncertainty
- 10 Application Guidance/General Notes

The meeting was ended approximately 4pm. All the participants are thanked for taking time to travel to DC and attend the meeting. The chair would also like to thank Mantech and Andrew Perini for use of the conference room and the facility.

*Minutes Prepared By*  
*Michael Bahtiarian*  
*Chair Working Group 47*

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**MEETING ATTENDEES**

<b>WG Member</b>	<b>Name</b>	<b>Company</b>	<b>Email</b>
X	Michael Bahtiarian	Noise Control Engineering	<a href="mailto:mikeb@noise-control.com">mikeb@noise-control.com</a>
	Jim Otis	NDWC	<a href="mailto:jamesotis@navy.mil">jamesotis@navy.mil</a>
X	David Vendittis	Florida Atlantic University	<a href="mailto:dvendittis@aol.com">dvendittis@aol.com</a>
X	Bob Myers	Mantech	<a href="mailto:bmyers@mantech-pc.com">bmyers@mantech-pc.com</a>
	Tim Gates	Mantech	<a href="mailto:tgates@mantech.com">tgates@mantech.com</a>
X	Shane Guan	NOAA	<a href="mailto:shane.guan@noaa.gov">shane.guan@noaa.gov</a>
X	Amy Scholik	NOAA	<a href="mailto:amy.scholik@noaa.gov">amy.scholik@noaa.gov</a>
X	Kurt Yankaskas**	NAVSEA	<a href="mailto:Kurt.d.yankaskas@navy.mil">Kurt.d.yankaskas@navy.mil</a>
X	Mae Seto	Defense R&D Canada	<a href="mailto:Mae.seto@drdc-rddc.gc.ca">Mae.seto@drdc-rddc.gc.ca</a>
X	Boone Hichborn	NAVSEA 05E	<a href="mailto:boone.hichborn@navy.mil">boone.hichborn@navy.mil</a>
X	John Diebold	LDEO	<a href="mailto:johnd@ldeo.columbia.edu">johnd@ldeo.columbia.edu</a>
X	Matt Hawkins	University of Delaware	<a href="mailto:hawkins@udel.edu">hawkins@udel.edu</a>
X	James Roche	NSWC	<a href="mailto:james.g.roche@navy.mil">james.g.roche@navy.mil</a>
X	Dick Tadeo**	NSWC	<a href="mailto:richard.taddeo@navy.mil">richard.taddeo@navy.mil</a>

\*\* Attended part time

Email list:

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Third Meeting August 7, 2007, 9am -4pm  
Mantech, Inc. Room 730,  
1100 New Jersey Ave SE,  
Washington DC 20003  
**(Across from Washington Navy Yard)**

**AGENDA**

**1. INTRODUCTIONS**

As needed, attendees & members to introduce themselves, as in previous meetings.

**2. BACKGROUND**

Chair to highlight work completed to date and summarize the Salt Lake City meeting in June

**3. OTHER STANDARDS**

Still looking for any other relevant standards

**4. DISCUSSION OF MEASUREMENT GRADES**

This is the main reason for the meeting and shall take up the majority of the time. Full review, discussion and completion of the measurement grades. Final version to be distributed to all members after the meeting for final review.

**5. DRAFT STANDARD WRITING**

We will need volunteers to start drafting certain sections of the standard. Chair to come with boilerplate standard and list of generic sections, etc.

**6. WORKING GROUP FUNDING**

All work and travel of committee members is voluntary. However, it would be nice to have a small source of funds to cover copying, meeting rooms, net meetings (i.e. WebEX), telecons, website, and travel for experts, etc.

**7. NEXT WG47 MEETING:**

- October 2007 in DC or Boston???
- January 2008 in Ft Lauderdale???

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***Grades Matrix***

Revision 5 – Dated July 10, 2007

**Cells Shaded- Recently Revised**

<b>GRADE</b>	<b>A</b>	<b>B</b>	<b>C</b>
<b>GRADE NAME</b>	<b>Precision Method</b>	<b>Engineering Method</b>	<b>Survey (in-situ) Method</b>
Expected Use/Application	Contract requirements Conformance (Note 1)	Contract Requirements Conformance (Note 1) Annual Check-Up	Annual Check-Up
Expected User/Type of Ship	Navy Non-Combatant NOAA Quiet R/V's	UNOLS R/V Commercial ships Navy/NOAA	UNOLS R/V's Commercial ships
Grade Driving Factor	Accuracy	Best Accuracy for Cost	Cost (Note 2)
Measurement Units	Lp dB re 1 µPa		
Source Level Correction	1 meter from far-field		
Distance Correction Method	Spherical Spreading	Spherical Spreading	Spherical Spreading
Measurement System Accuracy	± 1½ dB	± 2½ dB	± 4 dB
Measurement System Repeatability	± 1½ dB	± 2½ dB	± 4 dB
Frequency Response, Primary	10 to 50,000 Hz	10 to 25,000 Hz	100 to 10,000 Hz
Frequency Analysis, Primary	1/3 octave band	1/3 octave band	1/3 octave band
Frequency Resolution , Primary	23%	23%	23%
Frequency Response, Secondary	10 to 5,000 Hz	Optional	Optional
Frequency Analysis, Secondary	Narrowband	Narrowband	Narrowband
Frequency Resolution, Secondary	1 Hertz	Any	Any
Maximum Hydrophone Sensitivity	???	???	???
Hydrophone Frequency Response	???	???	???
<b>Number of Hydrophones</b>	<b>Three</b>	<b>Two</b>	<b>One</b>
Minimum Water Depth	5x Ship Length	1x Ship Length	½x Ship Length
Minimum Measurement Distance	1 x ship length ±10%		
Distance Ranging Accuracy	±3 meters	±10 meters	±?? meters
Deployment Requirements	No limitations. May use bottom mounted hydrophones.	Small craft, such as crew boat. No divers shall be required.	Small "launch" such as RHIB. No divers required.
<b>Weather/Sea Conditions</b>	<b>≤ Sea State 1; No Precipitation Allowed (See Note 3)</b>		
Auxiliary Measurements	Sound Velocity Profiles	???	???
Other Factors	Account for cable strum and sea surface affects.	Account for cable strum and sea surface affects.	None
Calibration	Hydrophones field calibrated and Insert Voltage (i.e. full system calibration)	Hydrophones field calibrated	Hydrophones, factory calibration acceptable
Hydrophone Position	Beam Aspect	Beam Aspect	Beam Aspect

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**NOTES:**

1. Conformance tests are those that are conducted after contractual requirement tests and would then be performed repeated with frequency greater than a year (3-5 years).
2. Committee believes that most important factor related to cost is the water depth at which measurements can be taken.
3. Higher sea states and/or precipitation should be allowed as long as the user can show they are complying with signal-to-noise requirements. This will have to be details put into writing in the standard itself. For the novice user, they should/could follow the sea state weather limitations, but more advanced user could test in foul weather conditions assuming they meeting S/N requirements.

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***Grades Matrix***

**Revision 6 – Dated August 7, 2007**

<b>GRADE</b>	<b>A</b>	<b>B</b>	<b>C</b>
<b>GRADE NAME</b>	<b>Precision Method</b>	<b>Engineering Method</b>	<b>Survey Method</b>
Example Use/Application (note 1)	Contract requirements Conformance R&D	Contract Requirements Conformance Periodic Assessment R&D	Mission Requirements Periodic Assessment Quick Look R&D
Example User	Navy NOAA Quiet R/V's	UNOLS R/V Commercial Vessels Navy/NOAA	UNOLS R/V's Commercial Vessels
Grade Driving Factor	Accuracy	Accuracy/Cost	Cost (Note 2)
Measurement Reporting Units	SPL - dB re 1 $\mu$ Pa		
Reference Distance	1 meter		
Distance Adjustment Method	Spherical Spreading		
Measurement Accuracy	$\pm 2$ dB	$\pm 3$ dB	$\pm 4$ dB
Measurement Repeatability	$\pm 1$ dB	$\pm 2$ dB	$\pm 3$ dB
Frequency Response, Primary	10 to 50,000 Hz	10 to 25,000 Hz	100 to 10,000 Hz
Frequency Analysis, Primary	1/3 octave band	1/3 octave band	1/3 octave band
Frequency Resolution , Primary	23%	23%	23%
Frequency Response, Secondary	10 to 50,000 Hz	10 to 25,000 Hz	100 to 10,000 Hz
Frequency Analysis, Secondary	Narrowband	Narrowband	Narrowband
Frequency Resolution, Secondary	1 Hz (note 4)	As Needed	As Needed
System Sensitivity	10 dB below Sea State 0 (Knudsen)		
Minimum Number of Hydrophones	Three	Three	One
Minimum Water Depth	5x Ship Length	2x Ship Length	1x Ship Length
Distance Ranging Accuracy	5%	5%	10%
Measurement Distance (CPA)	1x Ship Length		
Deployment Requirements	No limitations. May use bottom mounted hydrophones.	Small craft, such as crew boat. No divers shall be required.	Small "launch" such as RHIB. No divers required.
Weather/Sea Conditions	$\leq$ Sea State 2; (See Note 3)		
Auxiliary Measurements	Engine (shaft) speed, Wind Speed & Direction, Sound Velocity Profiles	Engine (shaft) speed, Wind Speed & Direction	Engine (shaft) speed, Wind Speed & Direction
Other Factors	Mitigation of for cable strum and sea surface affects.	Mitigation for cable strum and sea surface affects.	None
Calibration	Hydrophones field calibrated and Insert Voltage (i.e. full system calibration)	Hydrophones field calibrated	Hydrophones field calibrated
Hydrophone Geometry/Position	Vertical/Beam	Vertical/Beam	Beam

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	Aspect	Aspect	
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**NOTES:**

1. Conformance tests are those that are conducted after contractual requirement tests and would then be performed repeated with frequency greater than a year (3-5 years).
2. Committee believes that most important factor related to cost is the water depth at which measurements can be taken.
3. **Higher sea states and/or precipitation should be allowed as long as the user can show they are complying with signal-to-noise requirements. This will have to be details put into writing in the standard itself. For the novice user, they should/could follow the sea state weather limitations, but more advanced user could test in foul weather conditions assuming they meeting S/N requirements.**
4. Resolution subject to instrumentation, reporting limitations and costs thereof.

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***Grades Matrix***

**Revision 7 – Dated August 8, 2007**

<b>GRADE</b>	<b>A</b>	<b>B</b>	<b>C</b>
<b>GRADE NAME</b>	<b>Precision Method</b>	<b>Engineering Method</b>	<b>Survey Method</b>
Example Use/Application (note 1)	Contract requirements Conformance R&D	Contract Requirements Conformance Periodic Assessment R&D	Mission Requirements Periodic Assessment Quick Look R&D
Example User	Navy NOAA Quiet R/V's	UNOLS R/V Commercial Vessels Navy/NOAA	UNOLS R/V's Commercial Vessels
Grade Driving Factor	Accuracy	Accuracy/Cost	Cost (Note 2)
Measurement Reporting Units	SPL - dB re 1 $\mu$ Pa		
Reference Distance	1 meter		
Distance Adjustment Method	Spherical Spreading		
Measurement Accuracy	$\pm 2$ dB	$\pm 3$ dB	$\pm 4$ dB
Measurement Repeatability	$\pm 1$ dB	$\pm 2$ dB	$\pm 3$ dB
Frequency Response, Primary	10 to 50,000 Hz	10 to 25,000 Hz	100 to 10,000 Hz
Frequency Analysis, Primary	1/3 octave band	1/3 octave band	1/3 octave band
Frequency Resolution, Primary	23%	23%	23%
Frequency Response, Secondary	10 to 50,000 Hz	10 to 25,000 Hz	100 to 10,000 Hz
Frequency Analysis, Secondary	Narrowband	Narrowband	Narrowband
Frequency Resolution, Secondary	1 Hz (note 4)	As Needed	As Needed
System Sensitivity	10 dB below Sea State 0 (Knudsen)		
Minimum Number of Hydrophones	Three	Three	One
Hydrophone Geometry/Position	Vertical/Beam Aspect	Vertical/Beam Aspect	Beam
Hydrophone Depth(s) (note 5)	15°, 30°, 45° angle	15°, 30°, 45° angle	30° Angle
Minimum Water Depth	5x Ship Length	2x Ship Length	1x Ship Length
Distance Ranging Accuracy	5%	5%	10%
Measurement Distance (CPA)	1x Ship Length		
Deployment Requirements	No limitations. May use bottom mounted hydrophones.	Small craft, such as crew boat. No divers shall be required.	Small "launch" such as RHIB. No divers required.
Weather/Sea Conditions	$\leq$ Sea State 2; (See Note 3)		
Auxiliary Measurements	Engine (shaft) speed, Wind Speed & Direction, Sound Velocity Profiles	Engine (shaft) speed, Wind Speed & Direction	Engine (shaft) speed, Wind Speed & Direction
Other Factors	Mitigation of for cable strum and sea surface affects.	Mitigation for cable strum and sea surface affects.	None
Calibration	Hydrophones field calibrated and Insert Voltage (i.e. full system calibration)	Hydrophones field calibrated	Hydrophones field calibrated

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**NOTES:**

1. Conformance tests are those that are conducted after contractual requirement tests and would then be performed repeated with frequency greater than a year (3-5 years).
2. Committee believes that most important factor related to cost is the water depth at which measurements can be taken.
3. Higher sea states and/or precipitation should be allowed as long as the user can show they are complying with signal-to-noise requirements. This will have to be details put into writing in the standard itself. For the novice user, they should/could follow the sea state weather limitations, but more advanced user could test in foul weather conditions assuming they meeting S/N requirements.
4. Resolution subject to instrumentation, reporting limitations and costs thereof.
5. Hydrophone depths are to be angle down from the centerline of the ship at the distance of one ship length.

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**PROPOSED STANDARD TABLE OF CONTENTS**

*Sections 0 to 3 are same for all standards*

*Sections 4 to 9 are specific to each standard*

*Sections 10 to are section names from other standards that may not really need*

<b>0</b>	<b>Introduction</b>
<b>1</b>	<b>Scope, Purpose and Applications</b>
<b>2</b>	<b>References</b>
<b>3</b>	<b>Terms and Definitions</b>
4	Instrumentation
5	Measurement Requirements & Procedure
6	Determining Background Sound
7	Basis of Acceptability
8	Evaluation
9	Reporting
10	Measurement Uncertainty
11	Certification of Testing
12	Application Guidance
13	Data to be Recorded
14	General Notes