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NATIONAL ASSOCIATION OF MARINE SURVEYORS

• OUTLINE FOR SURVEYOR'S •

• *Yacht and Small Craft Examination* •

*The examination is designed to allow the Candidate the opportunity to demonstrate the broad based knowledge that is necessary of the Yacht and Small Craft surveyor. Successfully passing the exam will allow the Candidate to attain the professional status of **Certified Marine Surveyor**.*

• ELIGIBILITY

To be eligible to take the NATIONAL ASSOCIATION OF MARINE SURVEYORS “*Yacht & Small Craft*” exam you need to meet the requirements for CMS membership. Requirements can be met in two manners:

- A. You must have devoted 50% of your business practice to the profession of Yacht & Small Craft Surveying for a period of at least five years.
- B. You may supplement up to three of those years by attaining experience in the marine industry that is closely related to the profession of Marine Surveying. Experience is credited on a one credit for two years experience basis and is evaluated by the Regional Screening Committee.

Upon applying for CMS membership, your application, resume and sample surveys will be evaluated by the Regional Screening Committee in your area. Successfully passing the screening process will allow you to sit for the CMS exam. Upon acceptance, you will have up to six months to take the exam. Failing to meet this time frame, it will be necessary to re-apply for membership.

• CMS EXAMINATION CONTENT OUTLINE

The exam consists of approximately 135 questions in a narrative and multiple choice format chosen from six primary technical and business practice areas pertaining to the field of the Yacht and Small Craft surveyor.

The areas to be tested will involve :

- Construction materials and repair technology in wood, fiberglass and metal vessels.
- Installations to include electrical, mechanical, plumbing, rigging and hydraulics.
- Standards & Regulations involving ABYC, NFPA and applicable Federal Regulations such as CFR 46.
- Ethics involving surveyor responsibilities, integrity and report writing.
- Corrosion theory, prevention, bonding and metals selection.
- Appraisals including methodology, ethics, principles.

• **TAKING THE CMS EXAM**

The scheduling for taking the CMS exam will involve your Regional Vice President. When you are prepared to take the exam, inform your Regional Vice President at least three weeks in advance. This will allow the RVP time to arrange a date, time and location that is convenient for your schedule and for the person that will monitor you. It is at this time that the exam will be sent to your RVP.

The exam must be completed in the same day it was begun. Therefore it is best to schedule an early start time. The average time to take the exam is approximately six hours. This is a variable with each Candidate and is normally determined by how lengthy the answers are for each question. It is a benefit to the Candidate to include as much information as possible for each answer to help the Certification Committee gain an understanding of the Candidates abilities.

No books, notes or computers are allowed during the examination. Breaks may be taken at will however, the Candidate should remain on the premises where the exam is being taken.

The Candidate should bring a pad of non-spiral bound lined paper for writing their answers on. All answers are to be printed and legible. Answers that are not legible will be marked incorrect. Follow the question format. If the question has both “a” and “b” questions, the answer should be labeled as such.

• **EXAM RESULTS**

Candidates are generally informed of the exam results within approximately two weeks of the Qualification & Certification Committee receiving the exam for correcting. A score of 90 points is necessary to successfully pass the exam of which 70 points must be earned on the exam questions. Educational and /or work related experience points, awarded by your Regional Screening Committee, may account for up to 20 points toward the final exam score. A Candidate that successfully passes the exam will be submitted to the Executive Committee and Board of Directors for a two thirds affirmative vote required for admission. Candidates failing the exam will be eligible to take the exam again after a six month period. Those Candidates that demonstrate good overall knowledge and come within 15 points of passing the exam will be offered an abbreviated test. They will be informed of their areas of difficulty within the original exam and tested in those areas. A Candidate meeting these requirements will be allowed six months to take the abbreviated test.

• **SAMPLE EXAM QUESTIONS**

Construction

1.

When surveying a fiberglass rudder on a 40 foot cruising vessel you find that the outside laminate has separated from the core material....Explain how this impacts the structure, the possible causes of the bond failure and two methods of repair.

2.

According to the US Coast Guard, how often should hull fastenings on a wood vessel be inspected ?

3.

What effect can over-welding have on a aluminum or steel plated hull ?

Sample Exam Questions, con't

Installations

1. Standing rigging on sailboats typically have toggles installed below the turnbuckles. What are their purpose ?
2. Name three common problems associated with poor maintenance of a traditional bronze packing gland.
3. What is a galvanic isolator and where would you recommend it be installed ?

Standards and Regulations

1. According to ABYC standard # H-24.13.2, the minimum recommended inside diameter for gasoline fuel tank vent lines shall be : A. 1/4" B. 7/16" or C. 3/4"
2. According to ABYC standard # H-33.18.4.2, diesel fuel tanks shall be pressure tested to at least : A. 3 psi, B. 6 psi or C. 9 psi
3. What are the US Coast Guard's requirements for gasoline fuel tank openings?

Ethics and Report Writing

1. Describe an incident where you have declined a survey due to a significant conflict of interest.
2. What is your response to a yacht broker that requests a copy of the report of survey on a vessel that is being sold through his brokerage ?
3. Name two specific details that should be considered necessary to identify the vessel in your report.

Corrosion Theory, Bonding

1. In a galvanic cell the more noble metal is called a _____ and the less noble metal is called a _____.
2. Because of the area ratio effect, the corrosion of a small base metal appendage underwater on a hull of a more noble metal is : A. spread out and less noticeable B. concentrated on the base metal or C. takes place at a very slow rate.
3. Galvanic corrosion will only take place below the waterline. True or False.

Appraisals

1. Define market value and the means by which you would determine it.
2. An appraiser has an obligation to their client to accommodate their needs regarding the numerical result of the appraisal. True or False
3. An appraiser may not disclose the fact of their engagement without their client approving the disclosure. True or False.

The following syllabus has been developed for the apprentice surveyor and as guidance in developing a course of study for the profession of Marine Surveying.

WOOD HULLS

1. Construction Methods :
 - a. Carvel planked
 - b. Strip planked
 - c. Cold molded
 - d. Lapstrake
 - e. Edge glued
 - f. Batten seam
2. The Understanding of Lumber :
 - a. The characteristics of various species of ship lumber
 - b. The methods of sawing lumber and selection of
 - c. Rot resistance of various types of lumber
3. Advantages and Disadvantages of Types of Fastenings
4. Accepted Repair Practices :
 - a. Frame and butt block spacing
 - b. Sister frame application
 - c. Refastening
5. Maintenance and Care of Wood Vessels

METAL HULLS

1. Welding practices
2. Construction methods
3. Material selection
4. Repair Methods
5. Protective coatings
6. Properties of metals
7. Corrosion

FIBERGLASS HULLS

1. General Composites Knowledge :
 - a. Definition of composites
 - b. Advantages and disadvantages
2. Structural Concepts :
 - a. Single skin
 - b. Sandwich construction and theory of
3. Knowledge of Resins Types :
 - a. Polyester
 - b. Epoxy
 - c. Vinyl ester
4. Repair Considerations :
 - a. Overlaps
 - b. Secondary bonds
 - c. Material selection

FIBERGLASS HULLS CON'T.

5. Fiber Materials, Characteristics :
 - a. E glass
 - b. S glass
 - c. Kevlar
 - d. Carbon
6. Core Materials, Characteristics and Uses :
 - a. Polyvinyl chloride (PVC), cross-linked and linear
 - b. Balsa
 - c. Polyurethane
7. Osmotic Blisters :
 - a. Causes/Prevention
8. Composites Manufacturing Processes :
 - a. Open molding processes
 1. Hand lay up
 2. Spray-up
 3. Filament winding
 - b. Closed molding process
 1. Resin transfer
 2. Vacuum infusion
 3. Prepreg processing

ELECTRICAL

1. DC Systems, Basic Knowledge of :
 - a. ABYC, NFPA Standards
 - b. Bonding and Corrosion Control
 - c. Batteries, Type and Selection
 - d. Alternative Charging Systems
2. AC Systems, Basic Knowledge of :
 - a. ABYC, NFPA Standards
 - b. Grounding
 - c. Inverters
 - d. Corrosion Protection

MACHINERY

1. The principals of operation of :
 - a. Diesel engines
 - b. Gasoline engines
2. Exhaust Systems
3. Tankage, Materials Selection, Plumbing

SAFETY AND REGULATIONS

1. Demonstrate Knowledge of :
 - a. US Coast Guard Rules and Regulations for Recreational Vessels, CFR 33 & 46
 - b. American Boat and Yacht Council “Standards and Recommended Practices for Small Craft”
 - c. National Fire Protection Standard #302 “Pleasure and Commercial Motor Craft”
 - d. US Coast Guard 72 COLREGS, Navigation Rules, International & Inland
 - e. Offshore Racing Council “Safety Recommendations for Offshore Sailing”

SPARS AND RIGGING

1. Standing Rigging Material and Fittings
2. Cabin Stepped vs. Keel Stepped Masts
3. Critical Inspection Issues for Fittings and Attachments
4. Spar Material Advantages and Disadvantages
 - a. Aluminum
 - b. Wood, solid or hollow box section
 - c. Carbon
 - d. Steel

STABILITY

1. Demonstrate knowledge of the basics of stability :
 - a. Center of Gravity
 - b. Center of Buoyancy
 - c. Principals of Motion

GENERAL

1. The Surveyor’s Role :
 - a. Responsibility to Clients
 - b. Relationship to third parties
2. The Written Report :
 - a. Scope and Objectives
3. Appraisals :
 - a. Methodology
 - b. Limiting Conditions
 - c. Ethics
4. Insurance :
 - a. Surveyor’s Responsibility
 - b. Salvage Contracts
 - c. Understanding of Insurance Policies

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• *Yachts and Small Craft* •

TECHNICAL BIBLIOGRAPHY AND REFERENCE LIST

This list was developed as a tool of reference for the Yacht and Small Craft surveyor and for Candidates considering applying for the Certified Marine Surveyor Exam. **Those publications that are highlighted in red should be considered required reading for the Candidate prior to sitting for the CMS exam.**

Wood Hulls

1. Yacht Designing and Planning, *Howard Chapelle* (19)
2. Boatbuilding, *Howard Chapelle* (19)
3. Boatbuilding Manual, *Robert Steward* (4)
4. Cold Molded and Strip Planked Wood Boat Building, *Ian Nicolson* (19)
5. How to build a Wooden Boat, *David C. "Bud" McIntosh* (3,4,19)
6. The Gougeon Brothers on Boat Construction (3, 4,19)
7. The Common Sense of Yacht Design, *L.Francis Herreshoff* (3, 4)
8. Understanding Wood, *R.Bruce Hoadley* (3, 19)
9. Skiffs and Schooners, *R.D. Culler*
10. Wooden Boat magazine (3)
11. Surveying and Restoring Classic Boats, *JC Winters* (4, 19)
12. Planking & Fastening, *Wooden Boat* (3, 11, 19)
13. Frame, Stem & Keel Repair, *Wooden Boat* (3, 11, 19)
14. USCG NVIC 7-95 "Guidance on Inspection, Repair & Maintenance of Wooden Hulls.(10, 18)
15. Wood Handbook : Wood as a Engineering Material, Agricultural Dept., Forest Service, Forest Products Laboratory (21)

Fiberglass Hulls

1. Composite Basics, *Andrew C. Marshall* (13)
2. Surveying Fiberglass Sailboats, *Henry C. Mustin* (4, 11)
3. The Fiberglass Boat Repair Manual, *Allan H. Vaitses* (4, 11)
4. Osmosis & Glassfiber Yacht Construction, *Tony Stanton-Bevan* (19)
5. Blisters, (Reference Series), *Professional Boatbuilder Magazine* (3)
6. Gelcoat Blisters, Diagnosis, Repair and Prevention, *Gougeon Bros.*

National Association of Marine Surveyors
Technical Bibliography and Reference List
Yachts and Small Craft
2000

7. Design Guide for Marine Applications of Composites, *Eric Green* (14)
8. **Fiberglass Boat Design and Construction, *Robert Scott* (15, 19)**
9. Fiberglass Boats, *Hugo du Plessis* (4, 11)
10. Fiberglass Boat Survey, *Arther Edmunds*
11. Composites Materials Handbook, *SP Systems* (16)
12. High Performance Composites Magazine (bimonthly) (17)
13. **USCG NIVIC 8-87 "Notes on Design, Construction, Inspection & Repair of Fiber Reinforced Plastic Vessels" (10, 18)**

General

1. Desirable and Undesirable Characteristics of Offshore Yachts
by *The Technical Committee of the Cruising Club of America* (4)
2. Seaworthiness, The Forgotten Factor, *C.A. Marchaj* (4, 19)
3. **Metal Corrosion in Boats, *Nigel Warren* (4,19)**
4. Boat Owner's Mechanical and Electrical Manual, *Nigel Calder* (4, 11, 19)
5. Marine Diesel Engines, *Nigel Calder* (4, 11)
6. Small Steel Craft, *Ian Nicolson* (4, 19)
7. Surveying Small Craft, *Ian Nicolson* (4)
8. What Shape is She In?, A Guide to the Surveying of Boats, *Allan H. Vaitses*
9. Boatowner's Illustrated Handbook of Wiring, *Charlie Wing*, (4,5,11,19)
10. Recommendations for Offshore Sailing (including ORC Regulations), *US Sailing Association* (20)
11. Guide for Building and Classing Offshore Racing Yachts, *American Bureau of Shipping*
12. Principals of Yacht Design, *Lars Larsson & Rolf Eliasson* (19)
13. Stability and Trim for the Ship's Officer, *La Dage* (edited by *William George*)....(1, 2)
14. **Standards and Recommended Practices for Small Craft, *ABYC*.....(5)**
15. **Rules and Regulations for Recreational Boats (excerpts from CFR) , *ABYC*....(5)**
16. **NFPA Standard 302 for Pleasure and Commercial Motor Craft, *National Fire Protection Association*.....(6)**
17. Navigation Rules, International and Inland, *US Coast Guard* (COLREGS)
18. Marine Survey Practice Compendium, *R.A. Cady*.....(7)
19. Developments in Marine and Small Craft Liabilities, *Kenneth Fisher*.....(7)
20. Marine Accident Investigation Manual, *Robert Loeser* for *The US Department of Transportation*.....(2, 10)
21. Uniform Standards of Professional Appraisal Practice, *Appraisal Standards Board* ...(12)
22. **Principles of Appraisal Practice and Code of Ethics, *American Society of Appraisers*(12)**
23. The Complete Rigger's Apprentice, *Brian Toss* (4, 11, 19)
24. Understanding Rigs & Rigging, *Richard Henderson* (4, 11, 19)
25. Propeller Handbook, *Dave Gerr* (4, 11, 19)
26. Chapman's Piloting, Seamanship & Small Boat Handling, (2)

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27. The Procedure Handbook of Arc Welding, *Lincoln Electric Co.* (2)
28. The Professional Boatbuilder Magazine, (3)
29. The Complete Guide To Choosing a Cruising Sailboat, Roger Marshall (11,19)
31. **USCG NVIC 7-68 "Notes on Inspecting & Repair of Steel Hulls" (10, 18)**
32. Handbook of Marine Surveying, *Thomas Ask* (4)
33. The Elements of Boat Strength, *Dave Gerr* (4, 11,19)
34. Boat Data Book, *Ian Nicolson* (19)
34. Surveying Marine Damage, *C.B.Thompson* (4) (this book is \$ 120.00 !)
35. Marine Surveying and Consultancy, *John Guy* (4)
36. Boatbuilding with Steel, *Gilbert C. Klingel*

Source List

1. Cornell Maritime Press
P.O. Box 456, Centreville, Maryland 21617
ph. 1-800-638-7641, 410-758-1075, fax. 410-758-6849
2. Marine Education Textbooks
124 North Van Ave.
Houma, Louisiana 70363-5895
ph. 504-879-3866, fax. 504-879-3866
3. Professional Boatbuilder & Wooden Boat Magazine
P.O. Box 78, Naskeag Rd., Brooklin, Me. 04616-0078
ph. 1-800-273-7447, fax. 207-359-8920,
Web site- <http://www.proboat.com>
4. American Nautical Services, Inc.
3311 South Andrews Ave., Suite 11
Fort Lauderdale, FL. 33316
ph: 954.522.3321 email: Sales@amnautical.com
www.amnautical.com

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Technical Bibliography and Reference List
Yachts and Small Craft
2000

5. The American Boat and Yacht Council
3069 Solomons Island Road, Edgewater, Md. 21037
ph. 410-956-1050, fax. 410-956-2737
Web Site : <http://abycinc.org/index.cfm>

6. The National Fire Protection Association
1 Batterymarch Park, P.O. Box 9101, Quincy, Ma. 02269-9101
ph. 1-800-344-3555, fax. 1-800-593-6372
Web Site : <http://www.nfpa.org>

7. Fisher Maritime
71 Valley St. #301, South Orange, NJ. 07079
ph. 973-763-4266

8. The American Society of Nondestructive Testing
1711 Arlingate Lane, P.O. Box 28518, Columbus, Oh. 43228-0518
ph. 1-800-222-2768, fax. 614-274-6899
(has publications catalog)

9. The National Association of Corrosion Engineers
P.O. Box 201009, Houston, TX. 77216-1009
ph. 281-228-6223, fax. 281-228-6329
Web site: <http://www.nace.org>
(has publications catalog)

10. The National Technical Information Services
Technology Administration
5285 Port Royal Road
Springfield, Va. 22161
ph. 1-800-553-6847, fax. 703-321-8547,
Web site: <http://www.fedworld.gov/ntis/ntishome.html>
(you can also access the American Society for Testing and Materials at this site)

11. International Marine
P.O. Box 182607, Columbus, OH. 43218-2607
ph. 1-800-262-4729, fax. 614-759-3644
Web Site : <http://www.internationalmarine.com>
(has publications catalog)

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12. American Society of Appraisers
P.O. Box 17265
Washington, D.C. 20041
ph. 703-478-2228, fax 703-742-8471
Web Site : <http://www.appraisers.org>

13. Andrew C. Marshall
Marshall Consulting
720 Appaloosa Drive
Walnut Creek, Ca. 94596
ph. 925-934-1222

14. Eric Green Associates
86 River Drive
Annapolis, Maryland 21403
ph. 410-263-1348
Web site : <http://www.marinecomposites.com>
(portions of this book can be down-loaded from this site)

15. The Society of Naval Architects & Marine Engineers (SNAME)
601 Pavonia Ave.
Jersey City, New Jersey 07306
ph. 1-800-798-4975, fax 201-798-4975
Web Site : <http://www.sname.org>
(has publications catalog)

16. SP Systems Limited
St. Cross Business Park
Newport, Isle of Wight, England, PO30 5WEU
ph. +44 1983 828000, fax +44 1983 828100
Web Site : <http://www.spsystems.com>
(their entire manual can be down-loaded for free, or purchased with CD for \$ 50.00)

17. High Performance Composites
Online Data Inc.
P.O. Box 21648
Eagan, Mn. 55121-0648
ph. 651-686-7824, fax 651-686-4883
Web Site : <http://www.raypubs.com>
(offers free subscriptions via web site application)

**National Association of Marine Surveyors
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2000**

18. NVIC's are available on the World Wide Web at :

<http://www.uscg.mil/hq/g-m/nvic/index.htm>

19. Amazon.com

1600 E. Newlands Dr.

Fernley, Nevada 89408

ph. 800-201-7575, fax 206-266-2950

Web Site : <http://amazon.com>

20. US Sailing

P.O. Box 1260

15 Maritime Drive

Portsmouth, RI 02871-0907

ph. 1-800-877-2451, fax 401-683-0840

Web site : <http://www.ussailing.org/merchandise/offshore.asp>

21. Government Printing Office

Superintendent of Documents

P.O. Box 371954

Pittsburgh, PA 15250-7954

ph. 202-512-1800, fax 202-512-2250

Web site : http://www.access.gpo.gov/su_docs/sale/prf/ordinfo.html