IALA MODEL COURSE

L2.2.4
AIDS TO NAVIGATION - TECHNICIAN TRAINING
LEVEL 2 MODULE 2 ELEMENT 2.4
WIND GENERATORS

Edition 2.0

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International Association of Marine Aids to Navigation and Lighthouse Authorities
Association Internationale de Signalisation Maritime

DOCUMENT HISTORY

Date	Details	Approval
13 December 2013	1st issue	Edition 1
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FOREWORD

The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) recognises that training in all aspects of Aids to Navigation (AtoN) service delivery, from inception through installation and maintenance to replacement or removal at the end of a planned life-cycle, is critical to the consistent provision of that AtoN service.

Taking into account that under the SOLAS Convention, Chapter 5, Regulation 13, paragraph 2; Contracting Governments, mindful of their obligations published by the International Maritime Organization, undertake to consider the international recommendations and guidelines when establishing aids to navigation, including recommendations on training and qualification of AtoN technicians, IALA has adopted Recommendation E-141 on Standards for Training and Certification of AtoN personnel.

IALA Committees working closely with the IALA World-Wide Academy have developed a series of model courses for AtoN personnel having E-141 Level 2 technician functions. This model course on AtoN Service Craft and Buoy Tenders should be read in conjunction with the Training Overview Document IALA WWA.L2.0 which contains standard guidance for the conduct of all Level 2 model courses

This model course is intended to provide national members and other appropriate authorities charged with the provision of AtoN services with specific guidance on the training of AtoN technicians in an introduction to service craft and buoy tenders. Assistance in implementing this and other model courses may be obtained from the IALA World-Wide Academy at the following address:

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PART 1 - COURSE OVERVIEW

1. SCOPE

This course is intended to provide technicians with the theoretical and practical training necessary to install, operate and maintain wind generators.

This course is intended to be supported by further training modules on energy storage systems, maintenance records and protection against damage to aids to navigation stations from lightning. Details of these supporting model courses can be found in the Level 2 Technician training overview document IALA WWA L2.0.

2. OBJECTIVE

Upon successful completion of this course, participants will have acquired sufficient knowledge and skill to install, operate and maintain wind generators within their organizations.

3. COURSE OUTLINE

This mainly practical course is intended to cover the knowledge required for a technician to install, set to work and maintain wind generators used to power aids to navigation. The complete course comprises 1 classroom, 2 practical modules and a practical assessment of competence. Each of these deals with a specific subject covering the use of wind generators.

4. TEACHING MODULES

Table 1 ***Table of Teaching Modules***

Module Title	Time in hours	Overview
An introduction to wind generators	2.0	This module describes the background of, the types and the performance of wind generators
Wind generator installation	3.0	This module describes how to install and set to work a wind generator
Maintenance of wind generators	1.0	This module describes the maintenance procedures for wind generators
Evaluation	1.0	Practical assessment
Total Hours	**7.0**	One-day course

5. SPECIFIC COURSE RELATED TEACHING AIDS

This course will be both classroom and workshop/site based. Classrooms should be equipped with blackboards, whiteboards, and overhead projectors to enable presentation of the subject matter.

A demonstration wind generator should be made available in a suitable workshop or open air environment.

6. ACRONYMS

To assist in the use of this model course, the following acronyms have been used:

AtoN	Aid(s) to Navigation
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities - AISM
L	Level
SOLAS	International Convention for the Safety of Life at Sea, 1974 (as amended)
WWA	World Wide Academy

7. DEFINITIONS

The definition of terms used in this Guideline can be found in the International Dictionary of Marine Aids to Navigation (IALA Dictionary) at http://www.iala-aism.org/wiki/dictionary.

8. REFERENCES

In addition to any specific references required by the Competent Authority, the following material is relevant to this course:

1 IALA NAVGUIDE.

2 IALA Guideline 1067 on Selection of Power Systems for Aids to Navigation and Associated Equipment.

3 IALA Guideline 1067-2 on Power Sources.

4 Handbooks from manufacturers of wind generators.

PART 2 – TEACHING MODULES

1. MODULE 1 – AN INTRODUCTION TO WIND GENERATORS

1.1. SCOPE

This module describes the background to, the types and the performance of wind generators.

1.2. LEARNING OBJECTIVE

To gain a **satisfactory** understanding of the types of wind generators used to power aids to navigation.

1.3. SYLLABUS

1.3.1. LESSON 1 – GENERAL INFORMATION

1 The resource – wind.

2 Wind generators in use world-wide.

3 Operating principles – Betz's law.

1.3.2. LESSON 2 – TYPES OF WIND GENERATORS

1 Horizontal axis wind turbines:

  a High speed wind generators.

  b Low speed wind generators.

2 Vertical axis wind turbines:

  a Savonius wind turbines.

  b Darrieus wind turbines.

3 Ideal windmill efficiency.

1.3.3. LESSON 3 - CAPACITY AND OUTPUT

1 Generator outputs.

2 Annual wind predictions and predicted outputs.

3 Capacity assessment for AtoN autonomy.

4 Energy management

2. MODULE 2 – WIND GENERATOR INSTALLATION

2.1. SCOPE

This module describes how to install and operate a wind generator.

2.2. LEARNING OBJECTIVE

To gain a **satisfactory** understanding of how to install and set to work a wind generator.

2.3. SYLLABUS

2.3.1. LESSON 1 – INSTALLATION OF A WIND GENERATOR

1 Review of components.

2 Health and Safety considerations.

3 Assembly of the wind generator.

4 Fitting the assembly to the tower or stand.

5 Blade fitting and safety precautions.

6 Power supply connection from tower to AtoN site.

2.3.2. LESSON 2 - CONNECTION TO BATTERY PACK

1 Electrical safety precautions.

2 Connection to regulator and battery pack.

3 Testing procedures.

3. MODULE 3 – MAINTENANCE OF WIND GENERATORS

3.1. SCOPE

This module describes the maintenance procedures for wind generators.

3.2. LEARNING OBJECTIVE

To gain a **satisfactory** understanding of how to maintain a wind generator.

3.3. SYLLABUS

3.3.1. LESSON 1 – PRE-MAINTENANCE PROCEDURES

1 Review of manufacturer's planned maintenance procedures.

2 Health and Safety considerations.

3 Review of spare part list and maintenance equipment.

4 Maintenance records and forms.

3.3.2. LESSON 2 - PRACTICAL MAINTENANCE

1 Initial examination and checks.

2 Disconnection of electrical connections.

3 Blade rotation considerations.

4 Axis component maintenance.

5 Turbine maintenance.

6 Testing procedures.

7 Reconnection procedures and tests.

8 Maintenance records.

4. ASSESSMENT

Participants will be assessed on their competency at the end of Module 2 and 3.