REPORT ON IALA WORKSHOP ON ATON SERVICES IN EXTREMELY HOT CLIMATES

Doha - Qatar, 4 to 7 September 2016

9 September 2016

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Report of the IALA Workshop

On

AtoN Services in Extremely Hot Climates

Executive Summary

An IALA workshop on the subject of Aids to Navigation (AtoN) Services in Extremely Hot Climates was hosted by the Qatar Ministry of Transport and Communications, supported by Qatar Ports Company and Sealite in Doha, Qatar from 4 to 7 September 2016.

The workshop was attended by 44 delegates, representing 12 countries, 9 national members, 9 associate members, and 11 industrial members (see ANNEX C).

The workshop was structured with presentations on relevant topics on day 1 and a technical study tour on day 2 followed by working group sessions on day 3. Output work was reviewed and conclusions were agreed on day 4.

The workshop generated six conclusions.

1. There is an increase in average global temperature, sea level and dust, giving rise to growing challenges in AtoN provision in relation to both equipment and personnel.
2. There is a need for IALA guidance to identify appropriate standards for AtoN equipment for regions around the world in relation to issues such as temperature conditions, enclosure ratings, UV conditions, peak intensity specification for LED AtoN, batteries, optic service factor, thermal cap, etc. There is a number of sources of information on worldwide climatic conditions which can be referenced.
3. Consideration of human factors in AtoN work in extremely hot and humid environments is essential to ensure safety of personnel and productivity.
4. Modular replacement is an effective maintenance strategy to minimise working on station in hot climates.
5. Considering that manufacturer equipment tests are conducted at 25^{o}C, there is a need to apply above average technical specifications for AtoN equipment in hot climates.
6. AtoN competent authorities and service providers should work as close as possible with the suppliers and provide them with as much accurate information as possible.

The workshop further developed the draft IALA Guideline on Providing AtoN Services in Extremely Hot and Humid Climates.

The output documents were forwarded to the ENG Committee Autumn 2016 session (ENG5) for further development and completion.

Attendees enjoyed a welcome reception on day 1 hosted by Sealite, a visit to the Islamic Cultural Museum and Souq Waqif traditional market on day 2 and a workshop dinner on day 3.

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IALA WORKSHOP ON AtoN SERVICES IN EXTREMELY HOT CLIMATES

1. INTRODUCTION

A workshop on the subject of Aids to Navigation (AtoN) Services in Extremely Hot Climates was hosted by the Qatar Ministry of Transport and Communications, supported by Qatar Ports Company and Sealite in Doha, Qatar from 4 to 7 September 2016. The workshop was attended by 44 delegates, representing 12 countries, 9 national members, 9 associate members, and 11 industrial members.

A list of participants is at ANNEX C.

2. OVERALL PROGRAMME

The overall programme is shown in the following table.

Sunday 4th September	Monday 5th September	Tuesday 6th September	Wednesday 7th September
Registration Session 1 Opening of the Workshop	Technical session 4 Technical study visit to AtoN stations with Qatar Ports Company to examine working conditions, AtoN condition in service, issues arising from deployment in hot climates and special arrangements to control heat and UV radiation.	Technical session 5 Working Groups on Design and Management/Maintenance to draft an IALA Guideline on AtoN in Hot Climates, focusing on the specific requirements for hot climates	Technical session 8 Working to draft an IALA Guideline on AtoN in Hot Climates, focusing on the specific requirements for hot climates
Break		Break	Break
Technical Session 2 The Challenges of Providing AtoN in Hot Climates		Technical session 6 Working Groups to draft an IALA Guideline on AtoN in Hot Climates, focusing on the specific requirements for hot climates	Session 9 Presentation and discussion of Working Groups output
Lunch		Lunch	Lunch
Technical Session 3 AtoN Management in Hot Climates		Technical session 7 Working to draft an IALA Guideline on AtoN in Hot Climates, focusing on the specific requirements for hot climates	Session 10 Workshop conclusions & Closing of Workshop
Welcome reception	Visit to Islamic Cultural Museum and traditional market	Workshop dinner	

3. CONCLUSIONS

Following a discussion of the conclusions, the workshop agreed to the following six conclusions:

1. There is an increase in average global temperature, sea level and dust, giving rise to growing challenges in AtoN provision in relation to both equipment and personnel.
2. There is a need for IALA guidance to identify appropriate standards for AtoN equipment for regions around the world in relation to issues such as temperature conditions, enclosure ratings, UV conditions, peak intensity specification for LED AtoN, batteries, optic service factor, thermal cap, etc. There are a number of sources of information on worldwide climatic conditions which can be referenced.
3. Consideration of human factors in AtoN work in extremely hot and humid environments is essential to ensure safety of personnel and productivity.
4. Modular replacement is an effective maintenance strategy to minimise working on station in hot climates.
5. Considering that manufacturer equipment tests are conducted at 25o C, there is a need to apply above average technical specifications for AtoN equipment in hot climates.
6. AtoN competent authorities and service providers should work as close as possible with the suppliers and provide them with as much accurate information as possible.

Annexes to the Report

ANNEX A OPENING OF THE WORKSHOP AND TECHNICAL SESSIONS

4. SESSION 1 - OPENING

Chaired by Simon Millyard, Trinity House Lighthouse Service, UK, and Chairman of the IALA ENG Committee.

All presentations form part of the output of the workshop.

4.1 Address by Francis Zachariae, Secretary-General of the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA)

Francis Zachariae, IALA Secretary-General, welcomed all the participants. He noted the importance of the workshop as a means of developing guidance on the provision of AtoN services in hot climate regions and the suitability of the beautiful city of Doha as a venue. He thanked the hosts for the excellent facilities, the sponsors for their support and appreciated the work of the steering committee, chair persons and participants.

He noted that IALA membership is growing and welcomed Qatar Port Company (MWANI) as a new member of IALA. He recalled the four IALA Committees and their work and observed that they are the powerhouse of IALA. He remarked on the changes planned in IALA Headquarters to accommodate Committee meetings as well as the very important project to transfer IALA from NGO to IGO status which is expected to be ratified at a diplomatic conference in 2018. He noted other IALA operational improvements including a new web site, improvements to the Bulletin and Academy progress.

He also thanked the representative from Malaysia, Mr Arumugam Subramaniam, for the outstanding organisation of the IALA VTS Symposium in Kuala Lumpur in the previous month.

4.2 Address by Hassan Al-Hail, Ministerial Advisor, Qatar Ministry of Transport and Communications

Mr Hassan Al Hail, Advisor to the Minister for Transport and Communications, welcomed all participants to the workshop and articulated his excitement at hosting the event. He thanked IALA for choosing Doha as the venue for the workshop. He expressed confidence that the outcome of the workshop will be of positive benefit to all AtoN stakeholders in hot regions around the world. He thanked all participants for bringing their expertise and experience to the workshop and encouraged all to be proactive in shaping the future of AtoN.

4.3 Administrative and safety information

Administrative and safety information was provided by Seamus Doyle, IALA.

4.4 Workshop aims and objectives

The presentation was made by Simon Millyard, Trinity House Lighthouse Service.

4.4.1 Presentation abstract

Recalling the service provided by IALA through provision of international standards to enable safe and environmentally responsible navigation, Mr Millyard outlined the purpose of this workshop to gather technical knowledge and experience in the field of working in hot climates and to develop an IALA guideline which will provide information to all engaged in the design, manufacture and operation of marine AtoN in hot climates.

4.5 Setting the Scene - The hot climates challenge

The presentation was made by Shaheen H. Mirza Ismaeel, MENAS.

4.5.1 Presentation abstract

The combination of extreme climatic conditions significantly impacts decisions taken in the provision of Aids to Navigation in the regions with very hot climates. These high temperatures and UV levels radically affect AtoN performance, equipment life expectancy, frequency of maintenance cycles, and operational/maintenance costs. Every AtoN component is affected to a greater or lesser extent, i.e. structures, surface colour, light glazing, lenses, flashers regulators, electronics, and batteries. Shore based stations such as beacons and DGPS sites are also affected.

4.5.2 The key points of the presentation were:

1. Gulf climate conditions;
2. Impact of hot climates on AtoN service and maritime community;
3. National & International obligations;
4. Experiment on AtoN equipment and resulting improvement;
5. Modifying / improving AtoN equipment and IALA document.

5. SESSION 2 – THE CHALLENGES OF PROVIDING ATON IN HOT CLIMATES

The session was chaired by Shaheen H. Mirza Ismaeel, MENAS, Bahrain.

5.1 Presentation: UV degradation – experiences in colour retention & degradation on buoys and structures

The presentation was made by John Corio, Sealite, Australia.

5.1.1 Presentation abstract

Mr Corio highlighted the importance of specifying the correct polymer material protection factor for applications in hot environments. Too often floating Aids to Navigation are on site for 12-18 months where the colour has faded to such a degree that it is no longer certain if the buoy pink or red, green or white. He encouraged buyers, consultants and engineers to consider and request the UV protection rating of the product in order for it to give years of trouble free service.

5.1.2 The key points of the presentation were:

1. Do not take for granted the UV protection factor in protective layers.
2. Ask suppliers to provide proof that their product material is suitable for the environment.
3. Ask for reference sites from suppliers.
4. Always use a reputable supplier, going cheap is often a false economy.
5. Ask as many questions as necessary, a reputable supplier will be happy to help as many times as needed.

5.1.3 Discussion

In discussion it was noted that IALA should consider providing surface temperature guidance.

5.2 Presentation: Summary of extremely hot weather information sources study

The presentation was introduced by Adam Hay, Chair of IALA ENG Committee Working Group 2, on behalf of Alfredo Dominguez, Tideland, USA, who was unable to attend due to a last minute issue.

5.2.1 Presentation abstract

Throughout the requirements compilation stage at the beginning of a development project, one question always comes up: what environmental conditions should we design to? However, little or no attention is paid to the wealth of information, both historical and empirical, that is available regarding the conditions in different sites of the world. While it is known that aids to navigation have to endure some extremely hot conditions, it is rare that a deep dive is taken into the available information and figure out how hot is "extremely hot" or the actual definition of "extremely" humid.

All of the data that is available through various standards, organizations, and empirical data obtained from environmental buoys placed in what are considered extremely hot regions in the world was presented. A set of points and data sources was put forward that can provide both authorities and manufacturers with an initial idea of what the design criteria needs to be when considering an extremely hot climate.

5.2.2 The key points of the presentation were:

1. Definition of the category "extremely hot".
2. Effects of high temperature environments.
3. Available standards.
4. Empirical data collected from a meteorological buoy.

5.3 Presentation: AMSA's application of protective coatings in hot and humid climates

The presentation was made by Greg Hansen, AMSA, Australia.

5.3.1 Presentation abstract

Mr Hansen described major protective coating repaint projects that the Australian Maritime Safety Authority (AMSA) has implemented in the AtoN network, in particular aspects required to manage hot and humid environments. Links to standards, requirements and practical considerations to maximise durability and protection were discussed.

5.3.2 The key points of the presentation were*:*

1. Summary of Australia's AtoN network and climate.
2. Undertaking major protective coatings projects in hot and humid climates.
3. Issues and needs to be considered to maximise coating system durability.

5.3.3 Discussion

In discussion it was noted that "encapsulation" of AtoN structures were of benefit to both the application of paint coatings and personnel comfort and safety.

Considering fading on GRP structures, manufacturers recommend sanding and buffing as a means of restoring surface colour rather than painting.

5.4 Presentation: Power generation and storage

The presentation was made by Tony Taylor, Pharos Marine - Automatic Power, UK.

5.4.1 Presentation abstract

Lead Acid, Nickel Cadmium (NiCd), and Nickel Metal Hydride are the main types of batteries used in the Aids to Navigation industry. Each type of battery reacts differently in hot climates which dramatically affects the overall life cycle of each battery type.

The key to maintaining a long life battery in hot climates is implementing key safety factors when calculating and sizing a solar system. Employing a well designed battery storage and maintenance procedure with the correct facilities will also extend and provide a good battery life cycle

Although the Aids to Navigation industry is predominantly using only three types of batteries there are new innovative battery technologies becoming available to the market for future use.

5.4.2 The key points of the presentation were:

1. Battery types and the effect of high temperatures and life cycle.
2. Battery storage and maintenance in hot climates.
3. Future battery technologies.
4. Battery sizing calculations.

5.4.3 Discussion

In discussion it was noted that NiCd batteries perform much better than lead-acid in high temperatures. However most suppliers are providing gel electrolyte lead acid batteries in self-contained lanterns with life expectancy of about 2 years. In practice life of 5 – 7 years is being achieved with gel electrolyte lead-acid batteries and 2 – 3 years with AGM lead-acid batteries.

Conditioning charging of batteries before putting into service is essential to ensure maximum performance of the battery during its lifetime.

5.5 Design for high temperature operation

The topic was presented by John Brook, VEGA, New Zealand.

5.5.1 Presentation abstract

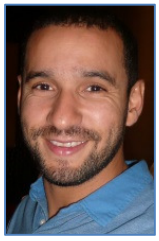
Environmental conditions can have a very strong influence over electronic components, even when the components are well-hidden inside an AtoN. The design of viable and long-lived products should be founded on the quantitative appreciation of both the limitations of technology and of the influence of the environment. Mr Brook explored component characteristics and good design practices for high-temperature environments. The provision of built-in protections was also explored as these are important for AtoN viability and longevity. Development of an accurate and clear declaration of performance and of a realistic estimation of lifetime is vital to enabling AtoN customers' informed choice.

A worthy ambition would be to standardise the interpretation (and statement) of product and lifetime specifications so that a suitable AtoN could be practically selected for a high-temperature application.

5.5.2 The key points of the presentation were:

1. Understanding the thermal sensitivity of LEDs & components.
2. Applying practical thermal design techniques.
3. The effects of ambient temperature and insolation.
4. Calculating performance and estimating lifetime.
5. Designing passive & active protections & explaining contingency behaviours.

5.6 Specification and testing of polyethylene material



The topic was presented by Samir Benouda, Mobilis, France.

5.6.1 Presentation abstract

Mr Benouda described the process of making polyethylene and stress testing of polyethylene buoys. Modular construction provides flexibility in design and facilitates repair in the event of damage.

6. SESSION 3 – AtoN MANAGEMENT IN HOT CLIMATES

This session was chaired by Adam Hay, Nawae Construction, Papua New Guinea and Chair of WG2 of the IALA ENG Committee.

6.1 Presentation: Scheduling work and safety management in hot regions

The topic was presented by Arumugam V.S Subramaniam, Marine Department, Malaysia.

6.1.1 Presentation abstract

Mr Subramaniam explained the weather conditions in Malaysia, which is tropical weather. He outlined the different aids to navigation used in Malaysia, such as buoys, beacons and lighthouses. He described the maintenance progamme for all AtoN. He outlined the Malaysian plan to use steel buoys with lifetime of more than 40 years, damage tolerance and good colour retention. He also touched briefly on the Malaysia Guidelines on the Construction of Steel Navigation Lightbuoys.

6.1.2 The key points of the presentation were:

1. Weather and climate in Malaysia.
2. Types of aids to navigation.
3. Maintenance of AtoN in Malaysia.
4. Guidelines on the Construction of Steel Navigation Lightbuoys.
5. AtoN maintenance programme.

6.2 Presentation: Water ingress issues in high humidity environments

The topic was presented by Adam Hay, Nawae Construction, Papua New Guinea.

6.2.1 Presentation abstract

The effects of high temperatures, humidity and water ingress on electronics can be serious, especially for equipment where operational availability is critical. Marine Aids to Navigation are often installed in very remote and extreme marine environments and are exposed to the elements.

Mr Hay explored the effects of humidity and water ingress on AtoN and the important of choosing appropriately designed, quality equipment for applications in areas of high temperature and humidity.

The key points of the presentation were:

1. Extreme heat combined with high humidity can cause water ingress.
2. Water ingress can damage marine electronics and cause failure.
3. Examples of water ingress and the damage it causes.
4. The importance of choosing AtoN equipment that has been designed and manufacturer properly.
5. Even the best equipment can fail. All equipment should be trialled under similar conditions to monitor performance.

6.2.2 Discussion

In discussion, it was noted that temperature cycling can generate a pumping action which sucks water into AtoN enclosures.

6.3 Presentation: Specific maintenance activities in hot climates

The topic was presented by Laurie Campbell, Australia Maritime Services (AMS), Australia.

6.3.1 Presentation abstract

Mr Campbell provided a combination of technical information on painting systems, and practical non-technical experience and advice, which included the effects of hot climates on different paints, the application and controls required in their application. Paint has become a more technical area that now has complex chemistry in some of the products and high tech equipment for its application. Polyurethane paint has been successfully use on GRP structures. He hoped to provide a practical path to a successful project that will be cost effective, will control corrosion, will give a long life and importantly for Marine Aids to Navigation have a good colour retention.

6.3.2 The key points of the presentation were:

1 Working on marine structures.

2 Painting in hot climates.

3 Effects of hot climates on paints and materials.

6.4 Forum: Human Factors for working in hot climates

The topic was chaired by Adam Hay.

6.4.1 Discussion

There are real dangers of fatigue when working in hot climates that may not be obvious. It is therefore essential that supervisors and contractors prepare and implement strategies and procedures to detect early signs of fatigue in the workplace. On site supervisors should be trained in fatigue recognition and treatment.

In some regions national legislation limits hours of working during summer months.

7. SESSION 4 TECHNICAL STUDY TOUR

Participants visited two AtoN stations with Qatar Ports Company (MWANI) on board MWANI MQ Barge to examine working conditions, AtoN condition in service, issues arising from deployment in hot climates and special arrangements to control heat and UV radiation.

7.1 Buoy P4

Buoy P4 in Doha had been at sea for 8 months. The buoy is 4 years old and is moored with a 6 ton concrete sinker and 38mm stud link chain in 9m of water. The buoy is maintained on a two year cycle with divers checking the mooring. The station is checked visually monthly using a speedboat. There was a small amount of mussel growth on both floatation body and mooring chain. The main problem appeared to be dust from a recent dust storm.

7.2 Buoy P5

Buoy P5 had been at sea for 5 years. The buoy is 8 years old, 1.5m diameter using a 1 ton sinker. It was reported that the water is slightly acidic due to a local flour mill. Maintenance is carried out at 2 year intervals. The buoy surface is badly faded and it was remarked that modern polyethylene materials are much more UV resistant. The lantern surface also shows UV damage or dust abrasion damage.

8. SESSIONS 5 TO 8 - WORKING GROUPS

The workshop broke into two Working Groups (WG) to progress the draft Guideline on AtoN in Hot Climates.

WG1	AtoN Design for hot climates (objective to draft design section of Guideline on AtoN in Hot Climates, focusing on the specific requirements for hot climates and not replicating existing AtoN Guidelines)	Leader: Malcolm Nicholson
WG2	AtoN Management and maintenance in hot climates (objective to draft management and maintenance section of Guideline on AtoN in Hot Climates, focusing on the specific requirements for hot climates and not replicating existing AtoN Guidelines)	Leader: Adam Hay

9. SESSION 9 – REVIEW OF OUTPUT DOCUMENTATION

Chaired by Simon Millyard, Trinity House Lighthouse Service, UK and Chair of IALA ENG Committee.

The outputs from the workshop will be submitted to the 5th session of the IALA ENG Committee (ENG5) in October 2016 where they will be progressed to completion.

9.1 Report of Working Groups

WG1 and WG2 split into separate rooms to work on the review and development of individual sections of the draft Guideline.

Both WGs identified early that the Guideline should refer to both heat and humidity, rather than exclusively to heat, and subsequent changes were made to the title of the document.

Both WGs also identified that the Guideline should not be attached to a specific temperature range or classification. The WGs felt that the initial guideline should refer generally to extreme heat and humidity and that there was a need and incentive to develop Guidelines to identify and standardise regions with extreme ambient conditions to enable authorities and manufacturers to agree on an AtoN specification.

WG1 focused on development of the consideration for the design and engineering aspects of AtoN in extreme heat and humidity. WG2 focused on the development of sections relating to management, maintenance and the human factor. The context of these issues in relation to extreme heat and humidity was explored and discussed in the individual WGs. Participants discussed the various challenges experienced in their respective regions and the controls and methods used to meet those challenges.

Both WGs developed the description of environmental considerations, to define the conditions around which the guideline was based. There was good participation from all participants.

The draft guideline content produced by both WGs was then discussed and further developed in a plenary session, with an understanding that the goal of the workshop was to create a draft Guideline.

There was agreement on a number of possible improvements, to be progressed by the ENG Committee. These included:

1. That the document would benefit by a re-organisation of sections and headings.
2. That there was a need to procure original versions of any figures and obtain permission to use them.
3. That some additional work was required to explore the application of AIS / VHF in hot and humid climates and possibly request input from the ENAV Committee.
4. That the references section of the document required additional development.
5. That the draft Guideline would be reviewed and tidied up and submitted as an input paper to ENG5.

Action

The ENG Committee is requested to consider if a section on application of AIS / VHF in hot and humid climates is required in the Guideline and possibly request input from the ENAV Committee.

10. SESSIONS 10 – CONCLUSIONS AND CLOSING

The session was chaired by Simon Millyard, Trinity House Lighthouse Service, UK and Chair of IALA ENG Committee.

10.1 Discussion Forum

A panel comprising Simon Millyard, Shaheen Mirza, Adam Hay, Arumugam Subramaniam, Malcolm Nicholson and Mahdi Al Mosawi led a general discussion on a number of topics.

It was considered that there was a need to identify and standardise regions with extreme ambient conditions to enable authorities and manufacturers to agree on an AtoN specification. Manufacturers were encouraged to modify equipment to suit applications in hot regions and to consider the life-cycle of equipment. It was noted that it is important for manufacturers to fully understand user requirements.

Action

The ENG Chairman is requested to consider if a work item on regional specifications for AtoN equipment or regionalised AtoN guidance should be included in the ENG work programme for the work period 2018 – 2022.

Experience with the IALA Certification Scheme has proven that standardisation of user requirements is complex. It was noted that IALA is not a certification body. It was suggested that IALA guidance / generic specifications could be provided through IHO S-100 product specifications or a simplified version of the discontinued IALA Certification Scheme test specifications. An alternative view was expressed that, rather than a product certification approach, administrations should push manufacturers for good performance based contracts. It was agreed that certification of AtoN products would increase capital cost but this could reduce overall cost of ownership through improved lifetime performance.

Action

The ENG Chairman is requested to consider if a work item on generic equipment specifications/ Product Specifications should be included in the ENG work programme for the work period 2018 – 2022.

It was suggested that the draft Guideline on Providing AtoN Services in Extremely Hot and Humid Climates should be circulated to all IALA Members and Industrial Members in hot climate regions to raise awareness of the work on the draft Guideline and to generate additional input to the drafting of the Guideline.

Action

Following review by the ENG Committee at ENG5, the Secretariat is requested to circulate the draft Guideline on Providing AtoN Services in Extremely Hot and Humid Climates to all IALA National and Associate Members in hot climate regions and Industrial Members to raise awareness of the work on the draft Guideline and to generate additional input to the drafting of the Guideline.

It was suggested that the IALA Wiki could provide a mechanism for knowledge sharing on products. The IALA general Questionnaire maintained by the ARM Committee may be another source of information about IALA Members working in hot climates.

Action

The ENG Committee is requested to provide input to the ARM Committee to include additional questions in the IALA general Questionnaire regarding operations in hot climates.

It was stated that a life time of two years for polyethylene buoys is unrealistic and a life of at least five years is required. Manufacturers were encouraged to study issues such as colour retention, structural design to meet user needs in hot climates. It was stated that steel buoys have good colour retention and lifetime performance.

It was noted that dust accumulates on lanterns in some regions. This is a particular problem with exposed Fresnel lens lanterns where the dust turns to mud when exposed to moisture and seriously degrades the optic range performance. It was noted that tests should be carried out to evaluate the actual impact of dust on lantern performance.

Action

Shaheen Mirza was requested to conduct tests on exposed Fresnel lens type lantern to evaluate the effect of dust and mud on the lens and provide a report to the ENG Committee.

10.2 Conclusions

Six conclusions were agreed as listed in the main report.

Attendees were invited to advise the workshop if anyone had knowledge of any patents, including pending patents, held either by themselves or by other organisations or individuals, the use of which may be required to practice or implement the content of IALA Documents being developed or worked on in the workshop. No patent issues were advised. It was stated that any information provided to the workshop could not be subject to intellectual property rights claims (IPR) unless the IPR was claimed at time of submission.

10.3 Workshop report

Seamus Doyle noted that the workshop documents and photographs would be available on the workshop file sharing server on the ftphotclimates page of http://www.iala-aism.org/file-sharing/ for one month. The draft workshop report was posted on the file share server and the final report will be posted within one week and will be permanently available on the IALA website. It will be forwarded to ENG5 and the IALA Council.

10.4 Closing of the workshop

Francis Zachariae thanked everyone for attending and working so hard. He thanked HE Jassim bin Saif Al Sultani, Minister for Transport and Communications, for his support and hospitality and welcomed the Qatar Ministry of Transport and Communication as the 84th National Member of IALA. He thanked Hassan Al Hail and the members of the Qatar Ministry of Transport and Communications for their excellent hosting of the event, the steering group, session chairs and working group chairs, the sponsors – Qatar Ports Company and Sealite, IALA Secretariat and the delegates for making the workshop such a success. Presenting Ali Al Hammadi with the first IALA tie with the new IALA logo, he thanked him for his assistance in making the workshop such a success. He thanked Capt. Ashraf Mabrouk and Mr Abdulhahman Al Thybani for an excellent technical visit. Noting their extremely well prepared presentations, he thanked the speakers for their focussed and relevant contribution to the workshop. He thanked Simon Millyard, Shaheen Mirza and Mahdi Al Mosawi for providing an excellent workshop. He noted that the draft Guideline will be finalised over the next two sessions of the ENG Committee.

Certificates were presented to all participants by Francis Zachariae and Ali Al Hammadi.

Mr Zachariae wished everyone a safe journey home and declared the workshop closed.

ANNEX B SOCIAL EVENTS

10.5 Welcome reception

On Sunday 4th September, delegates enjoyed an informal buffet reception hosted by Sealite at the Crowne Plaza Hotel in Doha to welcome delegates to the workshop.

10.6 Visit to Islamic Cultural Museum and traditional market

On Monday 5th September, following lunch hosted by Sealite, delegates visited the Islamic Cultural Museum and traditional Souq Waqif market in Doha. The visit was hosted by the Qatar Ministry of Transport and Communication.

10.7 Workshop dinner

On Tuesday, 6th September, delegates enjoyed a workshop dinner at the Burj Al Hamam restaurant in Doha.

ANNEX C LIST OF DELEGATES

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ANNEX D WORKING GROUP PARTICIPANTS

Working Group 1 AtoN Design for Hot Climates

	Name	Organisation / Country
1	Malcolm Nicholson (Chair)	Sealite / Australia
2	Arumugan V.S. Subramaniam	Marine Department / Malaysia
3	Fernando Romero	Mediterraneo Senales Maritimas / Spain
4	Tony Taylor	Pharos Marine / United Kingdom
5	Issa Hamed Al-Kiyumi	Arabian Maritime and Navigation Aids Services / Oman
6	Sahar Rasti	Marine Services Abu Dhabi Ports / UAE
7	Abdul Aziz al Alhammedi	Abu Dhabi Ports / UAE
8	Jaffer Abdulla	MENAS / Bahrain
9	M. Ansaf Safeed	Sealite / Qatar
10	John Brook	Vega Industries Ltd / New Zealand
11	John Corio	Sealite Pty / United Kingdom
12	Michael Ozannat	Mobilis SA / France

Working Group 2 Aton Management and Maintenance in Hot Climates

	Name	Organisation / Country
1	Adam Hay	Nawae Construction / Papua New Guinea
2	Greg Hansen	AMSA / Australia
3	Mohamad Darwish	North West Marine / UAE
4	D. Antonio Martinez	Mediterraneo Senales Maritimas / Spain
5	Mahdi Al Mosawi	IALA
6	Marie-Helene Grillet	IALA
7	Laurie Campbell	Australian Maritime Services / Australia
8	Shaheen Mirza	MENAS / Bahrain
9	Tamer Abdelhamid	Ministry of Transport and Communication / Qatar
10	Ahmed Ahmadi	Ministry of Transport and Communication / Qatar
11	Hilal Saad Al Naimi	Ministry of Transport and Communication / Qatar
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16	Yahya Mubarak Al Braki	AMNAS / Oman
17	Abbas Bushehri	MENAS / Bahrain
18	Sahar Rasti	Abu Dhabi Ports Marine Services / UAE

	Name	Organisation / Country
19	Abdul Aziz Abdullah Alhammadi	Abu Dhabi Ports Marine Services / UAE
20	Muhamad Hassen Othman	MWANI Qatar Port Management Company / Qatar
21	Mohd Arma Noramin Rashid	Marine Department / Malaysia

ANNEX E WORKSHOP PROGRAMME

DAY 1 – Sunday, 4 September 2016

Time	Activity	
0800 – 0900	Registration	
0900 - 1000	**Session 1 - Opening of the Workshop**	**Simon Millyard**
0900 - 0915	Welcome from IALA	Francis Zachariae, IALA Secretary-General
0915 - 0930	Welcome from Host	Hassan Al Hail, Qatar Ministry of Transport and Communications
0930 - 0940	Administration & Safety Briefing	Hotel staff / Seamus Doyle
0940 – 0950	Workshop aims & objectives	Simon Millyard, Trinity House
0950 - 1000	Setting the scene – The hot climates challenge	Shaheen Mirza, MENAS
1000 – 1030	**Break**	
1030 - 1230	**Session 2 - The Challenges of providing AtoN in Hot Climates**	**Chair: Shaheen Mirza**
1030 - 1050	UV degradation – experiences in colour retention & degradation on buoys and structures	John Corio, Sealite
1050 - 1110	Summary of extremely hot weather information sources study	Adam Hay introduce on behalf of Alfredo Dominguez, Tideland
1110 - 1140	AMSA's application of protective coatings in hot and humid climates	Greg Hansen, AMSA
1140 - 1200	Power generation and storage	Tony Taylor, Pharos Marine Automatic Power
1200 - 1220	Design for high temperature operation	John Brook, VEGA
1220 - 1230	**Group Photograph**	
1230 - 1400	**Lunch**	
1400 - 1530	**Session 3 – AtoN Management in Hot climates**	**Malcolm Nicholson**
1400 - 1420	Scheduling work and safety management in hot regions	Arumugam V.S Subramaniam, Malaysia
1420 - 1440	Water ingress issues in high humidity environments	Adam Hay, Nawae Construction, PNG
1440 - 1500	Specific maintenance activities in hot climates	Laurie Campbell, AMS
1500 - 1520	Specification and testing of polyethylene material	Samir Benouda
1520 – 1530	Human Factors for working in hot climates – forum	Adam Hay to lead
1530 - 1540	Setting up working groups and close of session	Adam Hay
1900 – 2200	**Informal reception, Crowne Plaza Doha Hotel**	**Sponsored by Sealite**

DAY 2 – Monday, 5 September 2016

Time	Activity	
0900 – 1230	**Session 4 – Technical Study Tour Site** Visit to AtoN stations with Doha Port Company to examine working conditions, AtoN condition in service, issues arising from deployment in hot climates and special arrangements to control heat and UV radiation. The visit will consider recently refurbished buoys and buoys about 2 years since refurbishment as well as local breakwater AtoN. Sponsored by Qatar Ports Company	
1230 – 1400	**Lunch**	**Sponsored by Sealite**
1530 - 1800	**Visit to Islamic Cultural Museum and traditional market**	**Sponsored by Qatar Ministry of Transport and Communication**

DAY3 – Tuesday, 6 September 2016

Time	Activity	
0800 - 1030	**Session 5 – Working Groups (WG)**	**Co-ordinator: Simon Millyard**
0800 – 1030	WG1- AtoN Design for hot climates (objective to draft design section of Guideline on AtoN in Hot Climates, focusing on the specific requirements for hot climates and not replicating existing AtoN Guidelines)	Leader: Malcolm Nicholson
0800 – 1030	WG2- AtoN Management and maintenance in hot climates (objective to draft management and maintenance section of Guideline on AtoN in Hot Climates, focusing on the specific requirements for hot climates and not replicating existing AtoN Guidelines)	Leader: Adam Hay
1030 - 1100	**Break**	
1100 - 1230	**Session 6 - Working Groups (WG) continued**	**Co-ordinator: Simon Millyard**
1230 - 1400	Lunch	
1400 - 1530	**Session 7 – Working Groups (WG) continued**	**Co-ordinator: Simon Millyard**
1530 - 1600	Meeting of WG leaders	WG leaders, Simon Millyard, Mahdi, Shaheen, Seamus Doyle
2000 - 2200	**Workshop dinner, Burj Al Hamam**	**Dress code: Traditional local dress / smart casual**

DAY 4 – Wednesday, 7 September 2016

Time	Activity	
0800 - 1000	**Session 8 – Working Groups (WG) continued**	
1000 - 1030	**Break**	
1030 - 1200	**Session 9 – Working Groups Plenary**	
1030 – 1200	Combined review of WG outputs	Leader: Malcolm Nicholson
1200 - 1330	**Lunch**	
1330 - 1515	**Session 10 – Plenary – Conclusions & Closing**	**Chair: Simon Millyard**
1330 – 1400	Panel-led discussion forum re operations in hot climates and technical tour	Panel of speakers
1400 – 1415	Conclusions from Workshop	Seamus Doyle
1415 – 1515	Closing of the workshop & presentation of certificates	Hassan Al Hail, Qatar Ministry of Transport and Communications Francis Zachariae, IALA

ANNEX F WORKSHOP INPUT PAPERS

Including the presentations made during sessions, the following papers were input to the workshop:

Paper number		Title / Author (if required)	Source	WG
HC1-	5.1	ENG4-11.2.10 Draft Guideline on the Challenges of Providing AtoN Services in Hot Climates	ENG4	All
HC1-	5.2	Outline IALA Guideline #### Ed.1 Providing AtoN services in Extremely Hot Climates Rev0 sd	Steering Group	All
HC1-	5.3	EEP20-48 Antifouling paint	EEP20	All
HC1-	5.4	EEP20-WG1-WP3 Antifouling section update for guideline 1015	EEP20	All
	2.3	2.3 Draft Hot climates II Powerpoint	Mariano Marpeggan	All
Presentation	1.1	Welcome address IALA	Francis Zachariae	
Presentation	1.2	Welcome address Qatar Ministry of Transport and Communication	Hassan Al Hail	
Presentation	1.3	Safety briefing and admin briefing	Seamus Doyle	
Presentation	1.4	Workshop aims and objectives	Simon Millyard	
Presentation	1.5	Keynote address - Setting the Scene - the Hot Climate AtoN challenge v1	Shaheen H. Mirza Ismaeel	
Presentation	2.1	UV degradation – experiences in colour retention & degradation on buoys and structures REV B.	John Corio	
Presentation	2.2	Summary of extremely hot weather information sources study	Alfredo Dominguez	
Presentation	2.3	AMSA application of protective coatings	Greg Hansen	
Presentation	2.4	Power storage – batteries	Tony Taylor	
Presentation	2.5	Design For High Temp Operation V2	John Brook	
Presentation	3.1	Scheduling work and safety management in hot regions	Arumugam Subramaniam	
Presentation	3.2	Water ingress issues in high humidity environments	Adam Hay	
Presentation	3.3	Specific maintenance activities in hot climates	Laurie Campbell	

ANNEX G WORKSHOP OUTPUT DOCUMENTS

Number		Title / Author (if required)	Source	Action
HC1-	9.1	Draft Guideline on Providing Aton Services In Extremely Hot And Humid Climates Merge Plenary	WG1 / WG2	To ENG5
HC1-	10.1	Report IALA Workshop on AtoN Services in Extremely Hot Climates	Secretariat	To ENG5 To Council

ANNEX H ACTIONS

1. The ENG Committee is requested to consider if a section on application of AIS / VHF in hot and humid climates is required in the Guideline and possibly request input from the ENAV Committee. 16
2. The ENG Chairman is requested to consider if a work item on regional specifications for AtoN equipment or regionalised AtoN guidance should be included in the ENG work programme for the work period 2018 – 2022. 16
3. The ENG Chairman is requested to consider if a work item on generic equipment specifications/ Product Specifications should be included in the ENG work programme for the work period 2018 – 2022. 16
4. Following review by the ENG Committee at ENG5, the Secretariat is requested to circulate the draft Guideline on Providing AtoN Services in Extremely Hot and Humid Climates to all IALA National and Associate Members in hot climate regions and Industrial Members to raise awareness of the work on the draft Guideline and to generate additional input to the drafting of the Guideline. 16
5. The ENG Committee is requested to provide input to the ARM Committee to include additional questions in the IALA general Questionnaire regarding operations in hot climates. 16
6. Shaheen Mirza was requested to conduct tests on exposed Fresnel lens type lantern to evaluate the effect of dust and mud on the lens and provide a report to the ENG Committee. 17

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