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Deliverable D06.2
**Guidelines for manual screening of cargo fire hazards
and effective fire patrols**
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Abstract

This Deliverable is an output of the LASH FIRE Project, within its Work Package for Effective Manual Operations. It intends to address the problem of manual screening of cargo and effective fire patrols onboard ro-ro and ro-pax ships, by establishing suggestions for guidelines to be implemented by ship operators, their staff and crew.

For the development of the tasks that lead to this document, the Project team used a variety of input from internal LASH FIRE documents, research, interviews, ship visits and their own expertise to establish the best possible solutions on important improvements in manual screening of cargo and fire patrols. The objective, as with the whole of LASH FIRE, is to contribute to decreasing fire risks onboard ro-ro and ro-pax vessels, as well as endorse a continuous improvement of safety procedures and measures at sea.

We attempt to summarize the results in proposal for guidelines to be implemented by operators, namely relating to clearer and more efficient fire patrolling procedures, as well as increased awareness and detail in the cargo screening process.

This Deliverable, along with several other outputs of this Work Package, work in tandem to provide a suite of risk mitigation proposals and routines, that can hopefully guarantee some increase in fire safety onboard the addressed vessels.



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1 Executive summary

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Problem definition

This document reports the work conducted in LASH FIRE's "Effective Manual Operations" work package (WP06), namely in the action related to the manual screening of cargo fire hazards and effective fire patrols. The issue that the action addresses is improving the current state of cargo screening for fire hazards, along with the fire patrols done onboard ro-ro and ro-pax vessels.

Such as it is, the Project experiences there can be enhancements carried out to current IMO guidelines and internal procedures for ship operators when it comes to their screening and patrolling operations, and through this document we will propose ideas, solutions and methods which can benefit those procedures and, eventually, be incorporated into international guidelines.

Technical approach

The approach to this activity was developing a method that allowed the involved partners to recognize the main issues concerning manual screening of cargo fire hazards and fire patrolling onboard ro-ro vessels.

From the analysis of current practices, *in loco* data gathering and the expertise of the consortium, an important understanding of what could be done to improve the efficiency of these operations, which so crucial for onboard safety, was achieved, and the proposed guidelines are the reflection of the principal intention of this document: provide practical suggestions to improve the effectiveness of the screening of cargo for fire hazards and fire patrolling.

Within the context of the Project, this Deliverable will also pave the way for Deliverable D06.5 "Development of new standard for effective fire patrols and recommendations for manual screening of cargo fire hazards".

Results and achievements

With the work developed in the tasks that supported this Deliverable, we have managed to better understand the status of this type of operations in the context of ro-ro/ro-pax vessels, to look for ways in which small, incremental improvements can potentially be beneficial in a practical sense, and propose what these improvements could be, considering the context.

The achievements of this deliverable and indeed of the different Actions of WP06 contribute partially to the bigger picture objectives of the Project (as specified below), and will serve as input to further developments and documents that will continue the work that is being done and report on the progress of the partners in this topic.

Contribution to LASH FIRE objectives

This document will provide contribution to the following LASH FIRE Specific Objectives:

- Objective 1: LASH FIRE will strengthen the independent fire protection of ro-ro ships by developing and validating effective operative and design solutions addressing current and future challenges in all stages of a fire.
- Objective 4: LASH FIRE will propose new regulations and guidelines founded on common positions by drawing upon global research and experience and by facilitating international cooperation.

As well as concrete objectives of the Project's Work Package 06 "Effective Manual Operations":

- More effective fire managing operations in all stages of a ro-ro space fire through the design and evaluation of new operations, equipment, training and decision-making guidelines.

Exploitation and implementation

The results of this Deliverable, such as the ones achieved by Work Package 06 and the LASH FIRE Project as a whole, are intended to serve as recommendations for implementation by international ship operators, as well as regulatory and standardisation bodies. The proposed guidelines are the product of the expertise, research and work conducted by the partners, and their dissemination aims to kickstart a process of adoption by important players in the maritime industry, specifically in the ro-ro and ro-pax sector. As such, the exploitation of these outcomes is of the utmost importance, and the Project has the tools in place to make sure that the entities concerned will be able to pick up on these results easily.

2 List of symbols and abbreviations

APV - Alternatively Powered Vehicles

EMSA - European Maritime Safety Agency

GMDSS - Global Maritime Distress and Safety System

IMDGC - Maritime Dangerous Goods Code

IMO - International Maritime Organization

IR - Infrared

ISM - International Safety Management

LED - Light-Emitting Diode

MLC - Maritime Labour Convention

MSC - Maritime Safety Committee

QR - Quick Response

RV - Recreational Vehicle

SMS - Safety Management System

SOLAS - International Convention for the Safety of Life at Sea

SOPEP - Shipboard Oil Pollution Emergency Plan

STCW - Standards of Training, Certification, and Watchkeeping

UHF - Ultra High Frequencies

VHF - Very High Frequencies

3 Introduction

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The screening of cargo for fire hazards falls within the prevention aspect of firefighting and is one of the paramount ways of early identification of potentially dangerous occurrences onboard. The activities that served as input for this document concerned themselves with *manual* screening of cargo, and so despite trying to do a slight preview of the type of technology that might be helpful in these situations, the focus was on the human element and how human resources can act as best as possible as early detectors of potential fire hazards. We thus try to understand two aspects of the manual screening for fire hazards: cargo loading, and fire patrolling.

No explicit requirement for systematic cargo screening – with respect to fire safety – has been identified in the international regulations, except that any rolling cargo entering vehicle, ro-ro or special category spaces are assumed to be inspected for leakage.

When they are carried in a vehicle, special category or ro-ro space, vehicles do not fall in the scope of IMO's International Maritime Dangerous Goods Code. However, it can be outlined that IMDGC mentions that there should be *"no signs of leakage from the battery, engine, fuel cell, compressed gas cylinder or accumulator, or fuel tank when applicable"*¹

SOLAS requires efficient fire patrols to be organized onboard passenger ships carrying more than 36 passengers². The members of the fire patrol are to be:

- *"trained to be familiar with the arrangements of the ship as well as the location and operation of any equipment he may be called upon to use."*
- *"provided with a two-way portable radiotelephone apparatus."*

This document intends to study potential improvements to the current general practices of cargo screening of fire hazards and fire patrolling done in the context of ro-ro and ro-pax ships. In order to do it, several tasks under the "Effective Manual Operations" work package were undertaken to analyse different possibilities for developing the proposals presented here. It is the intention of this document, of the work package and of the Project as a whole to eventually contribute to the enhancement, even if minute, of the international regulations and guidelines on the manual screening of cargo and fire patrolling.

3.1 Scope and objectives

The objectives of this Deliverable are, then, to come up with a set of guideline proposals for:

- Manual screening of cargo, in the context of ro-ro and ro-pax vessels, to improve the early detection and prevention of fire and fire hazards.
- Fire patrolling, done onboard ro-ro and ro-pax vessels, to improve the effectiveness of the routes and patrols in order to detect and prevent fires and reduce the risk of occurrences onboard.

¹ IMDG Code Ch 3.3 SP 961

² International Maritime Organization (IMO), International Convention for the Safety of Life At Sea (SOLAS), Chapter II-2 Regulation 7, Section 8

3.2 Methodology and structure

The proposed methodology to approach the problem has been to identify the main areas of potential to act, and to propose ideas of the best-case scenario, along with realistic and practical guidelines that we feel will be easily adopted but yield effective results. The work was structured to focus on the issues that the partners felt could benefit the most from this analysis.

The intention is to develop a methodology that allows the manual screening of cargo and the implementation of effective fire patrol procedures and routines. In work done within Action 6-A “Manual screening of cargo fire hazards and effective fire patrols”, we have come to focus on four main areas of impact:

- Manual Screening
- Training
- Equipment
- Resources (on the Shoreside and Vessel)

These were the issues that concerned the biggest amount of work within the development of this Deliverable.

Manual Screening is the main focus of D06.2 as we are looking for improvements in human action, not automatic procedures. As such, the proposals developed are always going to focus on how the staff on shore and/or onboard can improve their methods to more effectively detect and prevent potential fires.

Training is the necessary mean by which any improvements will have to come into play. There can be no effectiveness to any guidelines unless the staff operating both the screening of cargo and the fire patrols are trained to understand the most efficient ways to analyse potential fire hazards, and how to act in each situation.

Equipment should also be in focus, insofar as it can help increase the effectiveness of the screening of cargo, be it in the loading or on the fire patrols. So, we will not be so concerned about the technicalities of the equipment itself, but on what type of equipment might be helpful to the screening and patrolling.

By Resources, we mean the Human Resources needed to efficiently reduce the risk of fire occurrences with the proposed new methods or guidelines. This will eventually lead to an ideal scenario where we might have people specifically dedicated to these tasks, but we will also try to approach the problem in a practical sense, as it is understood that this would bring a much higher cost than simply improving the manual screening, training the existing staff or getting new equipment.

For the formal presentation of the guidelines themselves, we have followed a structure internally by LASH FIRE’s partners, which was based on guides by EMSA and typical maritime guidelines³. Thus, these will follow a concise structure:

- Introduction
- Description of the guideline
- Purpose
- Application

³MSC.1/Circ.1500/Rev.1 GUIDANCE ON DRAFTING OF AMENDMENTS TO THE 1974 SOLAS CONVENTION AND RELATED MANDATORY INSTRUMENTS; MSC/Circ.930 GUIDELINES ON METHODS FOR MAKING REFERENCE TO IMO AND OTHER INSTRUMENTS IN IMO CONVENTIONS AND OTHER MANDATORY INSTRUMENTS

- o Audience

3.3 Relations to other deliverables / activities in the project

The work done was closely related to a couple of other actions within LASH FIRE, namely within Work Package 04 “Formal Safety Assessment” and Work Package 05 “Ship Integration”, specifically tasks T04.8 and T05.6. From these actions we gathered a lot of input regarding the fire causes in these types of ships, such as seen in Figure 1.

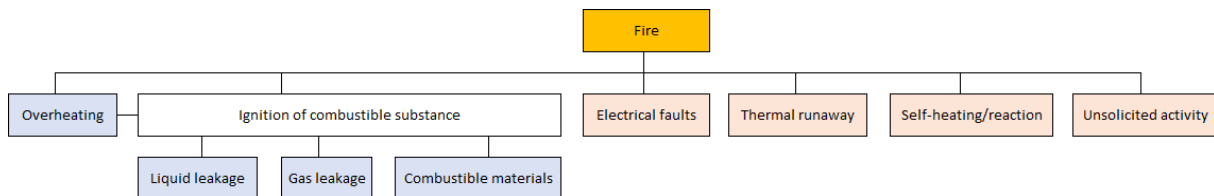


Figure 1 - Simple tree describing different fire causes in ro-ro spaces. (via LASH FIRE D04.1)

A LASH FIRE report on “Automatic screening and management of cargo hazards requirement definition”, was also helpful in determining different types of automatic methods that can complement the manual operations. Work done in the Project, particularly in the Work Packages related to *Ship Integration* and *Effective Manual Operations* also led us to understand some indicators point to potential hazards, such as:

- Fuel leakage (solid, gas)
- Presence of ignition sources (like sparks or hot spot/surfaces)
- Electrical faults
- Presence of smoke
- Suspicious noises or smell
- Thermal runaway on Li-ion batteries
- Self reactions with IMDG
- Unsolicited activity
- Hand made electrical installations on vehicles
- Lashing arrangements failure

4 Main Cargo Fire Hazards

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From the information gathered through other LASH FIRE activities, namely Deliverable 04.1 “Review of accident causes and hazard identification report”, we understand that there are types of cargo that possess inherently more considerable potential fire hazards. With Figure 2 it stands clear that reefer units should also be the main focus of a preliminary analysis to approaching the screening for fire hazards.

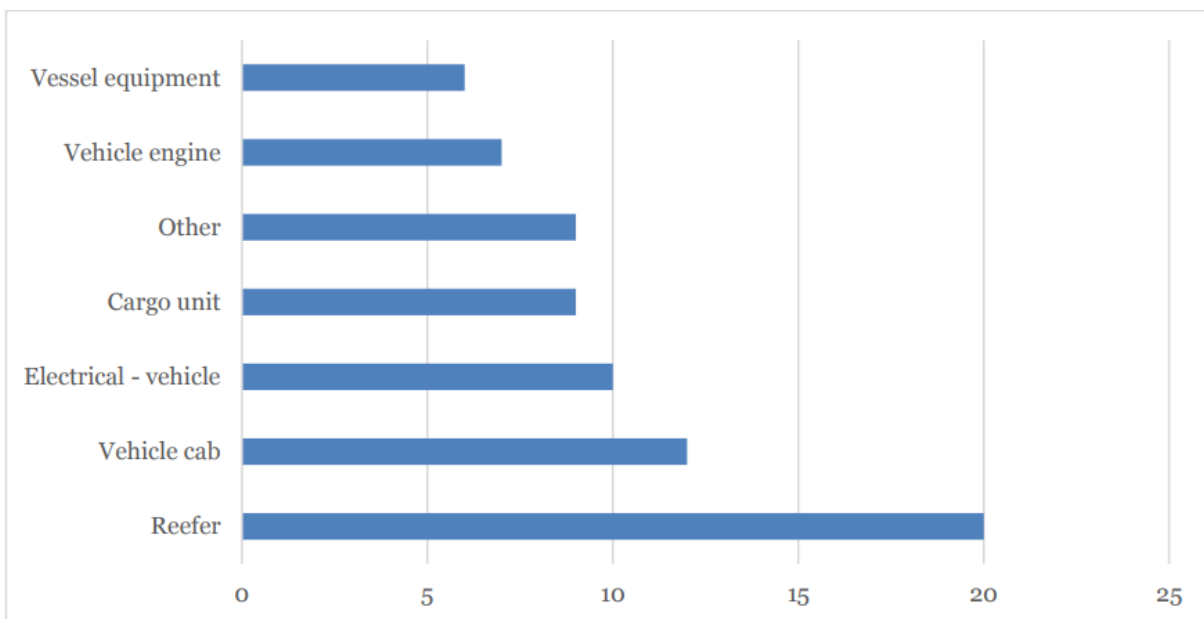


Figure 2 - Ignition sources on ro-ro vehicle decks 1994–2011 (IUMI) based on FSI 21/5. (via LASH FIRE D04.1)

This leads to different interesting questions to be assessed. Assuming reefer units will be the main focus of any screening of patrolling, what should you look for in order to examine the potential hazard? Should all reefer units loaded be inspected, or just the ones in key locations? What sort of monitoring should be done on a constant basis (and in this, equipment will be beneficial), and what should be periodic – only in patrols, for example?

These and other questions already help foresee some of the main points that any screening or patrolling will have to address, and so the methodology used was to predict what sort of issues these main points would create, and offer suggestions on the understanding of the number of vehicles and rolling cargo to be loaded (including mentions to specific known dangerous cargo such as reefers), specific known hazards, visible leaks or suspicious noises, coordination between crew on shore and onboard, frequency and focus of patrols, leveraging of equipment to make processes more efficient, preparation of crews for new guidelines.

Work done in the Project helps us understand that there can be some focus points of concern when dealing with reefer units, namely: the connection boxes and the connections; the state of sockets and plugs; the cable reeling drums; the earthing; and possible leaks.

After reefer units, the research and practical experience shows that the next major point of attention should be given to vehicles, namely Alternatively Powered Vehicles (APV). An APV is a motor vehicle that runs on alternative fuel, an energy other than traditional petroleum fuels (petrol or Diesel fuel); the term also refers to any technology of powering an engine that does not involve solely petroleum (e.g., electric car, hybrid electric vehicles, solar-powered vehicles). How to act and what to look for when dealing with APV should be high on the priority list for any new guideline proposals.

From LASH FIRE's own developments, namely the October 2020 Webinar "Fires in Alternatively Powered Vehicles Onboard Ships"⁴, in which speakers from the Project, with their own expertise and external contributions from other projects (such as FIRESAFE), it is established as interim guidelines by the IMO (MSC.1/Circ.1615) that there should be: appropriate cable protection and maintenance; Connection/disconnection by "trained personnel or other persons under the supervision of ship's crew"; "During voyages when vehicles powered by compressed natural gases or hydrogen are carried, the hazards associated with accumulation of flammable gases and gases lighter than air under ceilings need to be addressed."; and "The company should establish a fire-fighting plan that, in particular, identifies any risks specific to alternatively powered vehicles, [...]. The company should ensure adequate training and good access to any specialized fire-fighting equipment for alternatively powered vehicles."⁵ On the other hand, some of the conclusions of the analyses presented were that the increasing use of electric vehicles is increasing the number of those transported by sea; during transport, electric vehicles are expected to be charged; to date, we do not have specific solutions for charging electric vehicles on board; and land solutions need to be adapted and standardized for marine use.

These questions and issues arising from the analysis of potential fire hazards are extremely helpful to understand the main points that any crew member should keep in mind when approaching these operations. Exactly what to look for and screen, and how to do it properly, should be the two most important questions that the ones responsible for these tasks should be attempting to answer.

Of course, an operator will greatly benefit from the appropriate equipment to help them identify hazards that they will not necessarily recognize easily and assist in the confirmation, communication, and first response to eventual risks.

On the other hand, new routines and staff training should reflect all of these questions, by getting more and more knowledge in the hands of the staff on shore and crew onboard to improve their capacity to act and react in the development of these operations.

This document attempts to deal with everything that revolves around these tasks, concerning itself primarily with the best way to improve current state of affairs, aiming towards the ideal situation, but the guidelines should focus on practicality and ease of understanding to the "target", that is, the staff responsible for the screening and/or patrolling that will be implementing these new proposals.

⁴ <https://lashfire.eu/media/2020/09/LASH-FIRE-Webinar-Programme.pdf>

⁵ INTERIM GUIDELINES FOR MINIMIZING THE INCIDENCE AND CONSEQUENCES OF FIRES IN RO-RO SPACES AND SPECIAL CATEGORY SPACES OF NEW AND EXISTING RO-RO PASSENGER SHIPS

5 Development of Guidelines for Manual Screening of Cargo Fire Hazards and Effective Fire Patrols

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5.1 Development of Guidelines

How the proposals for guidelines were developed, description of work within WP06, namely Action 6-A, which had the objective of developing a methodology that allows the manual screening of cargo and the implementation of effective fire patrol procedures and routines. Both subsections will explore the methodology and what the partners did within WP06. Also, as already mentioned, the formal structure of the guidelines presented is based on a method developed within the work done in LASH FIRE, informed by international guidance and practices.

5.1.1 Approach

As explained, the main tools used within the development of this task and deliverable was the appropriation of knowledge gathered by research for this specific task, by work done through research in other activities of the project, and also practical trips and trials onboard real vessels of different operators within the network of the partners.

5.1.2 Activities within LASH FIRE's "Effective Manual Operations" Work Package

Different trips were organized by the project partners to assess the operation onboard a real vessel. In this section we give an account of the advantages brought to the specific goals of this deliverable by those trips.

Stena-Flavia February 2020

In this trip, the partners involved had the opportunity to follow and film a fire patrol onboard a vessel, going through the different steps and chatting with the onboard staff to understand the different procedures and equipment utilized. The video that was produced was a powerful tool to help further develop the practical understanding of the on-site challenges, and in it we can already perceive several helpful indications namely relating to the thoroughness of the patrol, the type of equipment with potential to be used (IR camera, check point controls), that can inform the guidelines proposals intended in this deliverable.



Figure 3 - Pictures from trip onboard Stena-Flavia (water tight door + control room)

The cargo screening for fire hazards was also filmed, and one of the more interesting points was the lack of opportunity to really interfere within the loading of cargo to thoroughly inspect and screen every single vehicle, container or other cargo being loaded. It is a process that must be done as quickly as possible (because the loading process is carried out very fast), which brings difficulty to any potential proposition of added guidelines to it.

Stena-Flavia July 2021

In this trip several different aspects were analysed, namely the manual screening of the cargo loading and cargo storage processes. In this case the fire patrols weren't followed.

Particular attention is given to reefer units, coinciding with the priority determined by the already discussed data. Another potential threat identified were APV. Besides that, a special interest was given to fuel tanks as having particularly hazardous potential, since clients often alter or overfill such tanks; this coupled with the fact that these types of cargo aren't properly locked and/or kept on ramps, can increase this hazard potential. Poor cargo securing is indeed a threat, as it may cause cargo (specifically the case that most concerns LASH FIRE, as it is rolling cargo), which can lead to a potential fire threat.



Figure 4 - Pictures from trip onboard Stena-Flavia, July 2021 (control room + ship moored alongside)

A questionnaire was also distributed to gather information from the staff on multiple issues, the results of which can be seen in Annex A.

Balearia July 2021

Another trip was taken by members of the project onboard a Balearia vessel in Spain.

In this case there were also various points of interest to the deliverable, as the fact that there is no interest or indeed possibility to increase the number and/or frequency of fire patrols, as those types of trips are very short (so if any modifications are to be proposed, it should be towards making them more efficient).

Also, interesting to consider was the company's colour coding for different sectors and characteristics, facilitating the division of areas, communication between staff, and all-around safety.

Another pertinent point was the analysis of equipment utilized by the staff, namely in the fire patrols. Tools such as an IR camera, checkpoint reader, gas detector and radio (with a “press to talk” button). There were a couple of blind spots also found onboard, something which was noted, as shown in Annex B, as an improvement opportunity and that should be taken into account.

An interesting point within this trip was the identification of a gasoline leak from one of the vehicles that was going to go onboard. This was an important discovery *before* the loading, clearly indicating that investing in this process can reduce potential hazards.



Figure 5 - Pictures from trip onboard Balearia vessel, July 2021 (patroller equipped + scanner)

5.2 Current practices for screening of cargo fire hazards and fire patrols

So, what can we say are the current general practices, within the contexts that have been addressed, upon which these guidelines will try to improve?

We understand, and have stated above, how international regulation mentions the screening of cargo and fire patrolling; there are some very basic regulatory instructions on how these actions should be undertaken. As such, ship operators tend to have slight variations in their approaches to screening and patrolling.

On top of that, with the development of Action 6-A and other complementary activities, coupled with the expertise of LASH FIRE’s consortium, we can provide some sense of the state of affairs in this topic, that is to say the conditions for manual screening of cargo and efficient fire patrols. This is analysed in detail in Appendix 1.

5.2.1 Screening of cargo

In the case of the screening of cargo for fire hazards, the work and research done, interviews conducted and visits carried out let us conclude a few different relevant conclusions. No detailed and/or specific IMO legislation established for this activity, so despite it being mentioned in SOLAS, there is room for consolidating the practices and guidelines followed by different operators.

In many cases, loading staff must concentrate on loading and, as such, during loading their screening will only notice obvious hazards. Another case is the possibility that the loading process can be carried out by loading two vehicles simultaneously, so the screening becomes even more challenging. Risk identification is about the most obvious issues: fuel leaks, sparks (electrical failures), suspicious noises or even smoke/real fires, but with the technological developments in reefer units, the rise of APV cargo-type and other, constantly changing types of rolling cargo, there is a need to identify new challenges and hazards.

It is important to realize that it is one of the most time-critical tasks within the operation of these ships, which is why any new routine added to the process must aim to be the most efficient possible, consuming the least amount of time with the best possible results.

5.2.2 Fire patrols

On the other hand, when talking about the case of fire patrolling, some pertinent points to consider were also agreed. SOLAS has some specificities when it comes to requirements for fire patrolling on board, but not as detailed as necessary. Nevertheless, several international recommendations or guidelines suggest some specific detailed such as IMO's Circular 1615⁶ which suggests that *"portable thermal imaging devices be used for screening during fire rounds and upon suspicion to detect hot areas and overheated electrical equipment."* Most inquired crew members reported their only equipment utilized were radios, and the majority suggested using better equipment like infra-red (IR) cameras.

From those inquiries also came the emphasis on the lack of autonomy given to patrolling crew members to act upon emergency systems, such as the fact that most patrolling staff are not able to deploy the emergency system straight away or at all, and as we have described already, quick response is crucial, so this hinders that response; the fact that a big part does not receive written detailed instructions on how to perform the patrol, what kind of hazards to look for, and first response were also important points. It is important to note that despite being information given by inquiries and corresponding to real scenarios that must surely be mitigated, this is not something common in all parts of the world fleet, and thus not a broad overarching situation. It can also come as a result of the fact that patrolling personnel are neither familiar with their duties (under the job description manual of Safety Management System) nor trained with onboard drills that simulate a real case of fire hazard in cargo spaces. The typical fire patrol frequency is between every 45 to 60 minutes (typical fire patrol can be different from ship to ship (depends on size of ship, number of personnel onboard, capacity of cargo, etc...), according to on the safety management system (SMS) of the ship (under ISM Code) developed by the Shipping Company for that specific ship.); or once during trips with shorter durations, and we know these can include more than two-dozen locations to be controlled, as shown in Annex C. Furthermore, first response is paramount for the success in preventing and fighting any instances.

Coincidentally, during the development of the task in which this Deliverable was done, there was an occurrence onboard a vessel from one of the partners: the fire of electrical origin inside a vehicle (not-APV) that was being transported was spotted quickly and the crew managed to act by smashing a window and releasing three fire extinguishers.

⁶ [http://shippingregs.org/Portals/2/SecuredDoc/Circulars/MSC.1-Circ.1615%20-%20Interim%20Guidelines%20For%20Minimizing%20The%20Incidence%20And%20Consequences%20OfFires%20In%20Ro-Ro%20Spaces%20A...%20\(Secretariat\).pdf?ver=2019-07-25-104758-230](http://shippingregs.org/Portals/2/SecuredDoc/Circulars/MSC.1-Circ.1615%20-%20Interim%20Guidelines%20For%20Minimizing%20The%20Incidence%20And%20Consequences%20OfFires%20In%20Ro-Ro%20Spaces%20A...%20(Secretariat).pdf?ver=2019-07-25-104758-230)

As already described, fire patrols are directed by legislation to be conducted onboard within the context of each specific vessel. This, of course, means that there are very distinct procedures for fire patrols, according to the operator and ship concerned.

5.3 Hazards

Just before proceeding with the proposals, it is perhaps important to pause and study what, in general, is being considered when there is mention of identification of hazards in the context of manual screening and fire patrolling.

As is the ambition of this deliverable and of WPO6 to contribute with practical suggestions, the partners worked together in an exercise of establishing hands-on ways of detecting the most common hazards with potential fire risks and what could be done, and in theoretically how much time, to identify them.

As laid out more in detail in Appendix 2, looking at the following hazards:

- The status of reefer units.
- Substandard electrical connections.
- Suspicious noise or smell.
- Fuel leakage (solid, gas)
- Portable fuel containers or added fuel tanks.
- Handmade installations on RVs like Christmas trees or heaters.
- Stowaways' activities.
- Presence of ignition sources (hot spot/surfaces)
- Thermal runaway on Li-ion batteries of APV
- Self-reactions with IMDG
- Lashing arrangements failure (specifically with bad weather forecast)
- Other obvious fire hazards (smoke, sparks)

We can estimate what could be done to detect them in practice, where it would be feasible to do so, and in how much time could it be done. This exercise naturally informs the suggestions presented in the next section, as they aid us in understanding what would be necessary, for example, to undertake pre-screening of cargo, or what sort of considerations should be taken to write the instructions for fire patrols.

Again, the exercise detailed in Appendix 2 is not the complete picture of what can be done, and how, but it is an important piece of the puzzle when taking into account what is required to make incremental improvements to these operations.

6 Guidelines for Manual Screening of Cargo Fire Hazards and Effective Fire Patrols

6.1 Introduction

The purpose of these guidelines is to improve the current general practices of cargo screening of fire hazards and fire patrolling done in the context of ro-ro and ro-pax ships. Their development has taken into account different conditions in which screening of cargo is relevant, why it is important and the main issues that can arise due to it being implemented, both in terms of cargo loading and within the context of fire patrols. In consideration was the work conducted within Work Package 06 of the LASH FIRE Project. The main goal is to reduce fire risk onboard whilst not losing efficiency in operations that are sometimes severely time-constrained

These guidelines are developed in the project LASH FIRE.



The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 81497.

The Agency (CINEA) and the members of the consortium of LASH FIRE are not responsible for any use that may be made of the information in these guidelines.

6.2 Application

The guidelines developed are to be applied in the context of new and existing generic ro-ro ships as defined in the LASH FIRE project, namely the three main categories of: ro-pax ships, ro-ro cargo ships and vehicle carriers.

6.3 Guidelines for manual screening of cargo fire hazards

For the screening for fire hazards during cargo loading, these are the guidelines recommended:

6.3.1 Guideline for manual screening of cargo before loading

The screening of cargo while still on shore and not being loaded can provide gains in time and efficiency. A designated crew member from the shipping company in the port of call will assist in this task, having been provided with the cargo manifest and stowage plan (in cases where stowage plan exists). For quicker routes with fast turnarounds this operation may not be efficient, but should nonetheless be aimed for at least for the most dangerous fire hazards. The person responsible for this task (onshore staff, but which can also be the same person responsible for the screening during loading) shall have the same information and equipment as crew members responsible for screening during loading, including a list of hazard priority and the number of cargo units that should be screened before loading starts. It shall focus on:

- The status of reefer units.
- Substandard electrical connections.
- Suspicious noise or smell.
- Heat radiations.
- Any leakage.
- Portable fuel containers or added fuel tanks.
- Handmade installations on RVs like Christmas trees or heaters.
- Stowaways' activities.
- Other obvious fire hazards.

This guideline also recommends the implementation of the following points:

- **Identifying cargo with the highest potential fire hazards – this can feedforward to fire patrols**
 - Cargo with most potential hazard is identified within manifesto.
- **Marking cargo with highest potential hazards – clear indicators, colour coding/QR stamps**
 - Crewmember/Shore staff marks cargo with red/orange/green colour coding (or similar), or specific QR stamps that can be quickly read later in the patrols. This would be done at port by specially assigned shore staff at the arrival of the cargo on site.

6.3.1.1 Purpose

The objective is that the cargo listed as hazard priority (that is, whichever contains the items above), is screened before loading has even begun; this will prevent potential occurrences by minimizing the amount of known to be dangerous cargo that gets loaded without being screened, whilst speeding up the loading processes. The operation should spend between 30 and 60 minutes per departure, so the cargo should be screened as most as possible in that timeframe.

6.3.1.2 Contexts

Contexts where there is availability of staff at port of call; when there are delays and/or ship turnaround in port is paramount, as it can help reduce loading time. Scanning is to be performed in terminal area or just before the ramp by a trained crewmember with proper equipment, that is, this solution is proposing a screening of the cargo at the terminal that precedes the screening done at the ramp when loading.

6.3.1.3 Audience

Any added resource from ro-ro/ro-pax vessel, added resource from shore staff, shipping company. Crew/staff responsible for screening and loading ro-ro/ro-pax vessels.

6.3.2 Guideline for periodic training in manual screening of cargo fire hazards

Intensifying training given to staff related to the manual screening of cargo for fire hazards, providing more expertise and know-how in detecting and responding to potential occurrences. As such, within IMO's Mandatory STCW Fire Fighting A-VI/3, and dividing into theoretical and practical aspects of training, some points would be added, as such:

Theoretical

- Contextualization within current legislation
- Study of main fire hazards in cargo in the context of ro-ro and ro-pax ships
- Understanding of conditions and requirements for manual screening of cargo during loading
- Study of equipment to be utilized in the context of manual screening of cargo during loading

Practical

- Learning to identify and mark cargo with well-known potential fire hazards (reefer units, substandard electrical connections, suspicious noise or smell, heat radiations, leakages, portable fuel containers or added fuel tanks, handmade installations on RVs, stowaways' activities, other obvious fire hazards) in the context of loading – colour coding, QR stamps, app, etc. – in the scope of a practice load.

These routines should not take more than 5% of the allocated time for the “cargo loading” part of a given staff member's mandatory Advanced Fire Fighting training. At the end of the training, the crew/staff member must be able to correctly identify and mark cargo fire hazards within the context of a loading operation.

6.3.2.1 Purpose

Realizing that “the human element is about behaviour, about what people do, instead of what they should do, about what is forgotten, misinterpreted, done correctly or incorrectly, and how to avoid mistakes.”⁷, and thus to propose some steps towards trying to minimize those mistakes in an effective and not overly time-consuming manner. As such, the purpose is to make sure that the developments done in dealing with specific cargo fire hazards are incorporated into the know-how of the crew members responsible for loading and screening.

6.3.2.2 Contexts

The implementation of specific periodic training towards shall be done either independently for staff already trained in screening of cargo for fire hazards or integrated within the training for first-time personnel. The point here is to incorporate these routines as seamlessly as possible into the already existing training which operators are mandated to have.

6.3.2.3 Audience

Crew members/shore staff responsible for loading of cargo in ro-ro/ro-pax vessels. Crew and shore staff responsible for carrying out training, or external entities responsible for providing training for onboard crew on the loading of cargo on ro-ro/ro-pax vessels.

⁷ Murdoch, Eric et al., The Standard Club, 2018, *Fire Safety on Ferries*. The Standard Club.

6.4 Guidelines for effective fire patrols

For the improvement of fire patrolling, these are the guideline recommended:

6.4.1 Guideline for written step-by-step instructions in fire patrolling

The procedure must be made crystal clear to the AB conducting the patrol. To that extent, it is advisable to lay out an easy-to-follow list of instructions on how to conduct the patrol, what to look for in the most effective way possible.

Patrol members should wear outer layer clothing, wearing long sleeves, long trousers, and safety shoes. The gear will protect against radiant heat in case the fire patrol member needs to approach to an incipient fire.

Fire patrol member should keep physically fit to walk long distances (between 2 or 3 kms up/downstairs) and be mentally prepared to act as first responder.

Fire patrols periodically inspect critical zones preventing risks from a double perspective (safety & security). Security inspections are out of the scope of the LASH FIRE. Focusing on the fire safety prevention, fire patrol members should look for the identification of potential fire hazards such as:

- | | |
|---|---|
| ▪ Fuel leakage (solid, gas) | ▪ Self-reactions with IMDG |
| ▪ Presence of ignition sources (like sparks or hot spot/surfaces) | ▪ Unsolicited activity |
| ▪ Electrical faults | ▪ Handmade electrical installations on vehicles |
| ▪ Presence of smoke | ▪ Lashing arrangements failure (specifically with bad weather forecast) |
| ▪ Suspicious noises or smell | |
| ▪ Thermal runaway on Li-ion batteries of APV | |

Most critical zones to be inspected are:

- | | |
|---------------------------------------|--------------------------|
| • Main cargo deck | • Galley |
| • Weather deck (if the vessel has WD) | • Pax cabin corridor |
| • Car deck | • Crew cabin corridor |
| • Ramp access. Control room | • Laundry |
| • Hydraulic room | • Fire pump |
| • Drencher room | • Paint locker |
| • SOPEP | • Battery locker (GMDSS) |
| • Engine Control Room | • Chart room |
| • Compressor room | • Emergency Generator |

This guideline also recommends the implementation of the following points:

- **Identifying cargo with the highest potential fire hazards**
 - The crewmember registers the cargo identified as most hazardous in sheet or app that he utilizes during the patrol, according to IMDGC (several exceptions to the provision are described in the Code)⁸ and known high-risk cargo such as reefer units and APVs.
- **Pinpointing the location of top potential hazards – top 5/10.**
 - The crewmember registers in his patrol sheet/app the location of cargo with potential fire hazards that are not yet on the mapping.
- **Mini-patrols targeting location of cargo with top potential hazards**

⁸ IMDG Code Special Provision 961

- The crew member takes extra patrols, smaller but more frequent than ordinary patrols/app if there is a high-risk situation identified, in order to adapt route.
- In such scenarios, this pre-identified cargo should be positioned in specific, extra accessible deck area for extra more effective attention.
- (Although ideal, we understand this in practice might not be feasible. Also, working hours of the crew should be within the international conventions such as MLC 2006 convention)⁹.

6.4.1.1 Purpose

This will aid the efficiency and preparation of a fire patrol, helping reduce potential occurrences by having a clear set of instructions and targeting the most well-known potential hazards and critical zones.

6.4.1.2 Contexts

All onboard fire patrols in ro-ro/ro-pax vessels.

6.4.1.3 Audience

Ro-ro/ro-pax vessels' crew members responsible for patrolling.

6.4.2 Guideline for assisting equipment in fire patrolling

Fire patrol members need to be as agile as possible when screening for and identifying potential fire hazards. This is due to the importance that a quick response has on preventing and fighting fire occurrences. Patrolling crew shall then be supplied with assisting equipment that facilitates hands-free utilization,

Some examples are:

- Check point reader that can check the label of the location without direct contact with the metal pin-tag reducing the time of the whole fire patrol
- Technology for localization of first responders through digital information processed via network (e.g., smartphones, with Nearest Neighbour Network software: app will send messages (text, audio, video or images) to the crew around the activated fire detector with important safety information); this type of solution can be used instead of check point reader.
- Light (around 60gr) and robust safety torch that can be magnetic attached to the helmet with enough LED intensity (around 100 lumens) to detect leaks or smoke under low visibility conditions.
- IR light handheld neck-cord that can be hung around the neck for hot spots detection. Desired Specs: Dimensions (like a smart-phone, light around 250g, temperature range from below zero up to 150°C). IR handhelds and other thermal imaging instruments render infrared radiation as visible light, permitting to see such areas through low-lit spaces, smoke, and other barriers. They give the quick and efficient possibility of detecting differences in temperatures in a screening or patrol which can sometimes help in the early detection of potential fire hazards.

⁹ Maritime Labour Convention ("MLC") 2006

→ Press to talk buttons (PTT) for the portable VHF/UHF radios that keep both hands free.



Figure 6 - Some equipment examples (check-point reader, light, IR handheld, PTT)

6.4.2.1 Purpose

increase the efficiency of onboard fire patrolling, facilitate first response, make fire confirmation and communication faster and easier.

6.4.2.2 Contexts

All onboard fire patrols of ro-ro/ro-pax vessels.

6.4.2.3 Audience

Ro-ro/ro-pax vessels' crew members (at least the ones responsible for patrolling).

6.4.3 Guideline for periodic training in fire patrolling

A proposal for implementing periodic training specifically to intensify the importance given to safety operations such as fire patrolling, and provide crewmembers with a higher level of expertise in these activities.

Dividing into theoretical and practical aspects of training, this would be done as such:

Theoretical

- Contextualization within current legislation
- Study of main fire hazards in cargo in the context of ro-ro and ro-pax ships
- Lessons learnt from previous occurrences/accidents
- Understanding of conditions and requirements for manual screening of cargo during fire patrols
- Study of equipment to be utilized in the context of manual screening of cargo during fire patrols
- Trained on the route to be followed during patrolling, should be familiar with the whole ship's layout and the different locations to be inspected. The fire patrol route should be completed without hesitation before commencing a patrol. They must know how to unlock doors and be familiar with loading plans and high-risks units. They must be trained on reaching different decks from different entrances (those different from the standard fire patrol route)
- Awareness to the fact that there is a higher risk of fire incident within the first 1.5 h after departure

Practical

- Training to detect fires in their initial stage and training to provide the first response
- Familiarization with risks associated with APVs; Ability to switch off the main power in case of an emergency
- Training on the use of first firefighting equipment (handheld extinguishers)
- Training to trigger the drencher system
- Training on the use of equipment
- Reading patrol sheet/app for identification of main potential hazards in a practice patrol
- Reading/using patrol sheet/app for identifying locations of main potential hazards in a practice patrol
- Using patrol sheet/app to report on deviations in the status of potentially hazardous cargo in a practice patrol – special focus should be granted to well-known high-risk cases

These routines should not take more than 10% of the allocated time for the Fire Safety Module within the context of Safety Training of a given staff member. At the end of the training, the crew/staff member must correctly identify cargo fire hazards, register and patrol the specific locations of that cargo and update its status within the context of a fire patrol.

6.4.3.1 Purpose

The main objective of periodic training routines is to work towards more efficient ways of conducting fire patrols, by making the process of screening of cargo during these operations more effective, in order to prevent potential hazards and to increase crew preparation and first response capacity.

6.4.3.2 Contexts

The idea is to incorporate these routines into the already existing training of crewmembers and staff that operators implement periodically. Despite having standards and bases that are common

throughout the sector, training is naturally distinct from an entity to an entity, only insofar as we can propose common routines that it makes sense to propose any routine at all.

6.4.3.3 Audience

Crew members on ro-ro/ro-pax vessels responsible for carrying out safety patrols and checks. The crew responsible for carrying out safety training, or external entities responsible for providing training for onboard crew.

7 New Standards for Effective Fire Patrols – relationship with D06.5

Main author of the chapter: Filipe Ribeiro, MAG

As part of Work Package 06, “Effective Manual Operations”, D06.2 is connected to other tasks and deliverables related to this topic and, of course, also to other points of the LASH FIRE Project.

Specifically, this and other developments/reports will serve as some of the input towards the Deliverable 06.5, called “Development of new standard for effective fire patrols and recommendations for manual screening of cargo fire hazards”, which will look to capitalize on the work undertaken and knowledge gathered within WP06 so far and structure it in a way that could be appropriate for the implementation of new standards within the sector, related to fire patrols and manual screening of cargo.

That deliverable will attempt to propose these new standards, by analysing current status quo of the sector, focusing on different aspects deemed important (e.g., human factor, technical aspects) to develop a formal proposal that is in line with international regulations. It will, of course, build upon work already developed in Deliverables such as this 06.2 and others, but also new, evolving knowledge and expertise from the partners, along with, ideally, practical onboard trials and demonstration.

8 Conclusion

Main author of the chapter: Filipe Ribeiro, MAG

Deliverable 06.2 reports on the advancements of Action 6-A of the LASH FIRE Project. With this document, the partners looked to elucidate their own expertise, research and ideas to help improve the current conditions of screening of cargo fire hazards and fire patrols onboard ro-ro and ro-pax vessels.

These operations are important to prevent and quickly react to fire occurrences, and as such fall perfectly in line with the objectives of the Project. Along with other activities of Work Package 06, the partners are looking to develop a set of proposals to take the state of the industry further along in terms of fire safety, and ultimately this is what is intended by this document – continuous improvement of safety onboard. Whether this be through the enhancement of patrolling and manual screening, through the evolution of safety equipment, the capacitation of crewmembers or any other developments, this is the main goal of the WP and of LASH FIRE as a whole.

The guidelines recommended in this document will certainly be subject to improvements themselves, which is an expected part of the process, but the partners are confident that they really can contribute to increase fire-related safety onboard ro-ro and ro-pax vessels.

The natural next steps for the work done in this Action and reported in this document is the continuation of the efforts already in place, namely the work towards a potential new standard for the industry in these operations. As explained, some of the work done that contributed to this document will also help in the development of other reports and further work under Work Package 06.

The partners look forward to keeping up with the developments in this Work Package and expect to provide more and more inputs that can be scrutinized within the Project and then publicly, with the ultimate goal of refining manual operations in these environments, and creating safer spaces onboard these vessels.

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10 ANNEXES

10.1 ANNEX A – Questionnaire onboards Stena-Flavia july 2021



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 814975



Voluntary recruitment about interviews and technical inquiries for on-board crew deck officers and Captains

The LASH FIRE project, <https://lashfire.eu/> works to find solutions that can prevent and combat fires on RoRo and RoPax ships (ships that carry both passengers and rolling cargo). The project receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 814975.

The interviews and studies where you will participate is meant to examine the current daily routines, the procedures and equipment used on board European ro-ro fleet so that the members of the LASH FIRE consortium can consult or corroborate their studies within the Project with the crew currently working and sailing on board ro-ro and ro-pax vessels. In the end, the data we collect will be used to ensure the correct on-board implementation of the planned technical solutions.

During the answer to the planned questions and queries you will give your inputs based on your own experience as ro-pax crew member. We estimate that your participation will take 1 hour of your time.

We are committed to protecting your privacy and any sensitive or personal data will be treated confidentially. During the analysis, all individual utterances are grouped together. When data is presented in project reports there will be no way of determining the source of information if you decide not to do it. Only project researchers with legitimate reasons will have access to the data. Because we may want to contact you on a later occasion with additional questions or clarifications, contact information will be kept in a separate file which will be stored safely. Results from our research will be shared within the project group, on our project website www.lashfire.eu, on conferences and in scientific journals.

We want to thank you for taking the time to participate in this activity. If you have any further questions afterwards, please do not hesitate to contact us.

Jaime Bleye,
jaimebv@centrojovellanos.es

Informed consent of participation

- I have been fully informed about the purpose of this study, how information is gathered and treated.
- I have been given opportunity to ask questions about my participation before it begins and know who to contact with further questions
- I have been informed that my participation is voluntary and anonymous and that I, whenever I feel the need, may cancel my participation without stating a reason
- I hereby consent to participating in this activity which is part of the LASH FIRE project.

Place/Date/Year

[Redacted signature area]

Name/email and signature of the participant

[Redacted signature area]



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 814975



T06.4 DEVELOPMENT & DEMONSTRATION OF EFFECTIVE FIRE PATROL PROCEDURES AND EQUIPMENT. Study of frequency, process, equipment and physique

1. What is the schedule of fire patrol in night time?

Minutes	30	60	90	120
PATROL FREQUENCY	ABOUT 45 MIN.			

2. What is schedule of fire patrol in day time?

Minutes	30	60	90	120
PATROL FREQUENCY	ABOUT 45 MIN			

Number of locations to be inspected: 31

Are there any locations you feel is not necessary? YES

Location or locations not included in the fire round; you would add: GYM;

Number of people required in every fire patrol (1 or 2 AB)/ other: 1

3. What equipment is carried by the fire patrol today?

Radio	Long sleeved clothing	Flashlight	Infra Red Camera	Check point reader	Helmet
✓		✓	✓	✓	

Equipment you would skip for a more efficient patrolling:

INFRA RED CAMERA :)

Equipment you would add for a more efficient patrolling:

EVERYTHING ENOUGH :)

Time required for a whole fire patrolling: ITS DEPENDS SITUATION.

Could you measure total distance/ number of steps: FULL FIRE ROUND ABOUT 2000 STEPS

Could you provide a list of scanning points or map/GA of the patrol route?

EACH GUWATCHMANS HAVE DIFFERENT WAYS, BUT RESULTS ARE THE SAME.

NAME OF PERSON (S) INVOLVED (voluntary):



NAME OF THE VESSEL/LOCATION:

M/V STENA FLAVIA

DATE AND SIGN:

01-07-21





This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 814975



LASHFIRE project - EFFICIENT MANUAL SCREENING ON RAMP OF CARGO FIRE HAZARDS

AIM: Identification of potential risks during the loading of cargo is of great importance to avoid fire hazards onboard. You as a loading officer has an important role to contribute to this.

1. What type of risk did you identify so far or see that you can identify with today's procedures?

POTENTIAL RISK IDENTIFICATION	YES	NO
Electrical fault in reefer unit	yes	
Overheating. Exhaust fumes. Hot spots	yes	
Fuel leaks (liquid or gases)	yes	
Chemical reactions	yes	
Home-made installations (non-approved or manufactured)		ND
Undesired presence (not allowed like stowaways)		ND

ADDITIONAL NOTES

2. What other tasks are in your responsibility during loading?

OTHER TASKS DURING THE LOADING OF CARGO	YES	NO
traffic management	yes	
stowage plan (presence of dangerous goods or APV)	yes	
lashing arrangements	yes	
communication with chief mate	yes	
ballast conditions		ND
Management of hoistable ramps	yes	
Simultaneous operations (bunkering, hot works, maintenance, catering, laundry)	yes	

ADDITIONAL NOTES

3. What other persons contribute today or could contribute to cargo hazard screening?

POSITION/PERSON	NUMBER	HOW TO CONTRIBUTE
[REDACTED]	1	collecting boarding cards and monitor trailers.
DECK RAITINGS		during loading monitor cargo condition.
LOADING OFFICER		checking all incoming and out coming units in particular dangerous goods carrying ARTIKS

ADDITIONAL NOTES

NAME OF PERSON (S) INVOLVED (voluntary): [REDACTED]

NAME OF THE VESSEL/LOCATION: STENA FLAVIA / Bridge

DATE AND SIGN: 01.07.2021



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 814975



Voluntary recruitment about interviews and technical inquiries for on-board crew deck officers and Captains

The LASH FIRE project, <https://lashfire.eu/> works to find solutions that can prevent and combat fires on RoRo and RoPax ships (ships that carry both passengers and rolling cargo). The project receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 814975.

The interviews and studies where you will participate is meant to examine the current daily routines, the procedures and equipment used on board European ro-ro fleet so that the members of the LASH FIRE consortium can consult or corroborate their studies within the Project with the crew currently working and sailing on board ro-ro and ro-pax vessels. In the end, the data we collect will be used to ensure the correct on-board implementation of the planned technical solutions.

During the answer to the planned questions and queries you will give your inputs based on your own experience as ro-pax crew member. We estimate that your participation will take 1 hour of your time.

We are committed to protecting your privacy and any sensitive or personal data will be treated confidentially. During the analysis, all individual utterances are grouped together. When data is presented in project reports there will be no way of determining the source of information if you decide not to do it. Only project researchers with legitimate reasons will have access to the data. Because we may want to contact you on a later occasion with additional questions or clarifications, contact information will be kept in a separate file which will be stored safely. Results from our research will be shared within the project group, on our project website www.lashfire.eu, on conferences and in scientific journals.

We want to thank you for taking the time to participate in this activity. If you have any further questions afterwards, please do not hesitate to contact us.

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- I hereby consent to participating in this activity which is part of the LASH FIRE project.

Place/Date/Year

MV STENA FLAVIA / 06.07.2021

Name/email and signature of the participant

[Redacted signature area]



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 814975



Chief officer - not normally working on deck cargo

LASHFIRE project - EFFICIENT MANUAL SCREENING ON RAMP OF CARGO FIRE HAZARDS

AIM: Identification of potential risks during the loading of cargo is of great importance to avoid fire hazards onboard. You as a loading officer has an important role to contribute to this.

1. What type of risk did you identify so far or see that you can identify with today's procedures?

POTENTIAL RISK IDENTIFICATION	YES	NO
Electrical fault in reefer unit	✓	
Overheating. Exhaust fumes. Hot spots		✓
Fuel leaks (liquid or gases)	✓	
Chemical reactions		✓
Home-made installations (non-approved or manufactured)	✓	
Undesired presence (not allowed like stowaways)	✓	

ADDITIONAL NOTES

2. What other tasks is in your responsibility during loading?

OTHER TASKS DURING THE LOADING OF CARGO	YES	NO
traffic management		✓
stowage plan (presence of dangerous goods or APV)	✓	
lashing arrangements	✓	
communication with chief mate	✓	
ballast conditions		
Management of hoistable ramps		✓
Simultaneous operations (bunkering, hot works, maintenance, catering, laundry)	✓	

ADDITIONAL NOTES

3. What other persons contributes today or could contribute to cargo hazard screening?

POSITION/PERSON	NUMBER	HOW TO CONTRIBUTE
<i>Loading officer</i>	1	
<i>AB's</i>		
<i>Super cargo</i>	1	

ADDITIONAL NOTES

NAME OF PERSON (S) INVOLVED (voluntary): [REDACTED]

NAME OF THE VESSEL/LOCATION: *STENA FLAVIA*

DATE AND SIGN: [REDACTED]



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 814975



Voluntary recruitment about interviews and technical inquiries for on-board crew deck officers and Captains

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The interviews and studies where you will participate is meant to examine the current daily routines, the procedures and equipment used on board European ro-ro fleet so that the members of the LASH FIRE consortium can consult or corroborate their studies within the Project with the crew currently working and sailing on board ro-ro and ro-pax vessels. In the end, the data we collect will be used to ensure the correct on-board implementation of the planned technical solutions.

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- I hereby consent to participating in this activity which is part of the LASH FIRE project.

Place/Date/Year

STENA FLAVIA 10/10/21

Name/email and signature of the participant

[Redacted Signature]

AB2



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 814975



Voluntary recruitment about interviews and technical inquiries for on-board crew deck officers and Captains

The LASH FIRE project, <https://lashfire.eu/> works to find solutions that can prevent and combat fires on RoRo and RoPax ships (ships that carry both passengers and rolling cargo). The project receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 814975.

The interviews and studies where you will participate is meant to examine the current daily routines, the procedures and equipment used on board European ro-ro fleet so that the members of the LASH FIRE consortium can consult or corroborate their studies within the Project with the crew currently working and sailing on board ro-ro and ro-pax vessels. In the end, the data we collect will be used to ensure the correct on-board implementation of the planned technical solutions.

During the answer to the planned questions and queries you will give your inputs based on your own experience as ro-pax crew member. We estimate that your participation will take 1 hour of your time.

We are committed to protecting your privacy and any sensitive or personal data will be treated confidentially. During the analysis, all individual utterances are grouped together. When data is presented in project reports there will be no way of determining the source of information if you decide not to do it. Only project researchers with legitimate reasons will have access to the data. Because we may want to contact you on a later occasion with additional questions or clarifications, contact information will be kept in a separate file which will be stored safely. Results from our research will be shared within the project group, on our project website www.lashfire.eu, on conferences and in scientific journals.

We want to thank you for taking the time to participate in this activity. If you have any further questions afterwards, please do not hesitate to contact us.

Jaime Bleye,
jaimebv@centrojoellanos.es

Informed consent of participation

- I have been fully informed about the purpose of this study, how information is gathered and treated.
- I have been given opportunity to ask questions about my participation before it begins and know who to contact with further questions
- I have been informed that my participation is voluntary and anonymous and that I, whenever I feel the need, may cancel my participation without stating a reason
- I hereby consent to participating in this activity which is part of the LASH FIRE project.

Place/Date/Year

FLAVIA 07.07.21

Name/email and signature of the participant



AB2



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 814975



LASHFIRE project - EFFICIENT MANUAL SCREENING ON RAMP OF CARGO FIRE HAZARDS

AIM: Identification of potential risks during the loading of cargo is of great importance to avoid fire hazards onboard. You as a loading officer has an important role to contribute to this.

1. What type of risk did you identify so far or see that you can identify with today's procedures?

POTENTIAL RISK IDENTIFICATION	YES	NO
Electrical fault in reefer unit	X	
Overheating. Exhaust fumes. Hot spots	X	
Fuel leaks (liquid or gases)	X	
Chemical reactions		X
Home-made installations (non-approved or manufactured)		X
Undesired presence (not allowed like stowaways)	X	

ADDITIONAL NOTES

2. What other tasks are in your responsibility during loading?

OTHER TASKS DURING THE LOADING OF CARGO	YES	NO
traffic management	X	
stowage plan (presence of dangerous goods or APV)		X
lashing arrangements	X	
communication with chief mate	X	
ballast conditions		X
Management of hoistable ramps	X	
Simultaneous operations (bunkering, hot works, maintenance, catering, laundry)		X

ADDITIONAL NOTES

3. What other persons contribute today or could contribute to cargo hazard screening?

POSITION/PERSON	NUMBER	HOW TO CONTRIBUTE

ADDITIONAL NOTES

NAME OF PERSON (S) INVOLVED (voluntary): [REDACTED]

NAME OF THE VESSEL/LOCATION: FLAVIA

DATE AND SIGN: 07.07.21 [REDACTED]

AB2



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 814975



T06.4 DEVELOPMENT & DEMONSTRATION OF EFFECTIVE FIRE PATROL PROCEDURES AND EQUIPMENT. Study of frequency, process, equipment and physique

1. What is the schedule of fire patrol in night time?

Minutes	30	60	90	120
PATROL FREQUENCY		X		

2. What is schedule of fire patrol in day time?

Minutes	30	60	90	120
PATROL FREQUENCY		X		

Number of locations to be inspected: 32 FIRE POINTS

Are there any locations you feel is not necessary?

ECR

Location or locations not included in the fire round; you would add: EMERGENCY FIRE PUMP ROOM

Number of people required in every fire patrol (1 or 2 AB)/ other: 1

3. What equipment is carried by the fire patrol today?

Radio	Long sleeved clothing	Flashlight	Infra Red Camera	Check point reader	Helmet
X	X	X	X	X	X

Equipment you would skip for a more efficient patrolling: HELMET

Equipment you would add for a more efficient patrolling: PEPPER GAS

Time required for a whole fire patrolling: 60 min

Could you measure total distance/ number of steps: 1,9 km

~~Could you provide a list of scanning points or map/GA of the patrol route?~~

NAME OF PERSON (S) INVOLVED (voluntary): [REDACTED]

NAME OF THE VESSEL/LOCATION: FLAVIA

DATE AND SIGN: 07.07.21 [REDACTED]

AB1



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 814975



Voluntary recruitment about interviews and technical inquiries for on-board crew deck officers and Captains

The LASH FIRE project, <https://lashfire.eu/> works to find solutions that can prevent and combat fires on RoRo and RoPax ships (ships that carry both passengers and rolling cargo). The project receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 814975.

The interviews and studies where you will participate is meant to examine the current daily routines, the procedures and equipment used on board European ro-ro fleet so that the members of the LASH FIRE consortium can consult or corroborate their studies within the Project with the crew currently working and sailing on board ro-ro and ro-pax vessels. In the end, the data we collect will be used to ensure the correct on-board implementation of the planned technical solutions.

During the answer to the planned questions and queries you will give your inputs based on your own experience as ro-pax crew member. We estimate that your participation will take 1 hour of your time.

We are committed to protecting your privacy and any sensitive or personal data will be treated confidentially. During the analysis, all individual utterances are grouped together. When data is presented in project reports there will be no way of determining the source of information if you decide not to do it. Only project researchers with legitimate reasons will have access to the data. Because we may want to contact you on a later occasion with additional questions or clarifications, contact information will be kept in a separate file which will be stored safely. Results from our research will be shared within the project group, on our project website www.lashfire.eu, on conferences and in scientific journals.

We want to thank you for taking the time to participate in this activity. If you have any further questions afterwards, please do not hesitate to contact us.

Jaime Bleye,
jaimebv@centrojoellanos.es

Informed consent of participation

- I have been fully informed about the purpose of this study, how information is gathered and treated.
- I have been given opportunity to ask questions about my participation before it begins and know who to contact with further questions
- I have been informed that my participation is voluntary and anonymous and that I, whenever I feel the need, may cancel my participation without stating a reason
- I hereby consent to participating in this activity which is part of the LASH FIRE project.

Place/Date/Year

Steno Flavio 07.07.2021

Name/email and signature of the participant

AB 1



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 814975



T06.4 DEVELOPMENT & DEMONSTRATION OF EFFECTIVE FIRE PATROL PROCEDURES AND EQUIPMENT. Study of frequency, process, equipment and physique

1. What is the schedule of fire patrol in night time?

Minutes	30	60	90	120
PATROL FREQUENCY		50 min		

2. What is schedule of fire patrol in day time?

Minutes	30	60	90	120
PATROL FREQUENCY		about 45 min		

Number of locations to be inspected: 31

Are there any locations you feel is not necessary? *NON*

Location or locations not included in the fire round; you would add: *Fire round secures all locations*

Number of people required in every fire patrol (1 or 2 AB)/ other: 1

3. What equipment is carried by the fire patrol today?

Radio	Long sleeved clothing	Flashlight	Infra Red Camera	Check point reader	Helmet
✓	✓	✓	✓	✓	

Equipment you would skip for a more efficient patrolling: *NON*

Equipment you would add for a more efficient patrolling: *NON*

Time required for a whole fire patrolling: *about 50-60 min, depending on cargo*

Could you measure total distance/ number of steps: *about 3,500 steps*

Could you provide a list of scanning points or map/GA of the patrol route?

NAME OF PERSON (S) INVOLVED (voluntary): [REDACTED]

NAME OF THE VESSEL/LOCATION: *STENA Flavia*

DATE AND SIGN: *07 07 2021* [REDACTED]

AB1



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 814975



LASHFIRE project - EFFICIENT MANUAL SCREENING ON RAMP OF CARGO FIRE HAZARDS

AIM: Identification of potential risks during the loading of cargo is of great importance to avoid fire hazards onboard. You as a loading officer has an important role to contribute to this.

1. What type of risk did you identify so far or see that you can identify with today's procedures?

POTENTIAL RISK IDENTIFICATION	YES	NO
Electrical fault in reefer unit	✓	
Overheating. Exhaust fumes. Hot spots	✓	
Fuel leaks (liquid or gases)	✓	
Chemical reactions	✓	
Home-made installations (non-approved or manufactured)		✓
Undesired presence (not allowed like stowaways)		✓

ADDITIONAL NOTES

2. What other tasks are in your responsibility during loading?

OTHER TASKS DURING THE LOADING OF CARGO	YES	NO
traffic management	✓	
stowage plan (presence of dangerous goods or APV)	✓	
lashing arrangements	✓	
communication with chief mate		✓
ballast conditions		✓
Management of hoistable ramps	✓	
Simultaneous operations (bunkering, hot works, maintenance, catering, laundry)		✓

ADDITIONAL NOTES

3. What other persons contribute today or could contribute to cargo hazard screening?

POSITION/PERSON	NUMBER	HOW TO CONTRIBUTE

ADDITIONAL NOTES

NAME OF PERSON (S) INVOLVED (voluntary): [REDACTED]

NAME OF THE VESSEL/LOCATION: STENA Flavia

DATE AND SIGN: 07.07.2021 [REDACTED]

10.2 ANNEX B – Survey done during trip in Balearia vessel – July 2021

The LASH FIRE project works to find solutions that can prevent and combat fires on RoRo and RoPaxships (ships that carry both passengers and rolling cargo). The project receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 814975. This particular study is organized by Salvamento Marítimo (SAS)

The survey where you will participate is meant to examine the effectiveness of the manual screening of cargo and fire patrols. The purpose of this survey is to know the on-board routines during the manual screening of cargo and fire patrols. In the end, the data we collect will be used to assess the on-board daily routines. Participants in this survey are chosen based on a selection made during a training course. During the survey you will answer to some short and simple questions. We estimate that your participation will take 1 hour of your time.

We are committed to protecting your privacy and any sensitive or personal data will be treated confidentially. Data will be entered into a database and all references to you as a person (name, workplace, organization, contact information) will be removed. During the analysis, all individual utterances are grouped together. When data is presented in project reports there will be no way of determining the source of information. Only project researchers with legitimate reasons will have access to the data.

Because we may want to contact you on a later occasion with additional questions or clarifications, contact information will be kept in a separate file which will be stored safely. Results from our research will be shared within the project group, on our project website www.lashfire.eu, on conferences and in scientific journals.

We want to stress that your participation in this survey is entirely voluntary. You have the right to withdraw from its activities at any time without stating a reason, and without any consequences.

We want to thank you for taking the time to participate in this survey. If you have any further questions afterwards, please do not hesitate to contact us.

Jaime Bleye,

jaimebv@centrojevellanos.es

Informed consent of survey participation

- I have been fully informed about the purpose of this survey, how information is gathered and treated
- I have been given opportunity to ask questions about the survey before it begins and know who to contact with further questions
- I have been informed that my participation is voluntary and anonymous and that I, whenever I feel the need, may cancel my participation without stating a reason
- I hereby consent to participating in this survey which is part of the LASH FIRE project.

Place/Date/Year

On board "Napoles" ro-pax vessel owned by Spanish ship operator "Balearia"

Signature of the participant

Original copies are kept by Jaime Bleye (SAS)

Position on board/year of birth/Nationality

- Romanian 1983 (Motorman, 1966- Ordinary seaman (O/S), 1958- Ordinary seaman (O/S), 1980 – 2nd Officer, 1989 Ordinary seaman (O/S), 1991 Wiper), Ukrainian (1979 Motorman, 1968 ETO, 1980 Fitter/welder, 1957 Deck fitter), Bulgarian (1995 Able seaman (A/B), 1984 Motorman, 1974 Motorman), Croatian (1979 Able

seaman (A/B)), Panamanian (1981 Able seaman (A/B)), Spanish (1992 Deck cadet, 1972 Botswain)



1. What is the fire patrol frequency usually carry out on board (1 hour or less, 2 hour, only night time..)?
 - 2 hours (2)
 - Every four hours (4)
 - 3 hours during navigation (1)
 - 1 hour or even less (1)
 - Continuously (2)
 - I don't know (2)
 - I don't belong to the fire patrol (not interested in this survey) (5)

2. What is the number of members of the fire patrol (one AB or two)?
 - 1 AB (9)
 - 1 OS Ordinary Seaman (3)
 - I don't belong to the fire patrol (not interested in this survey) (5)

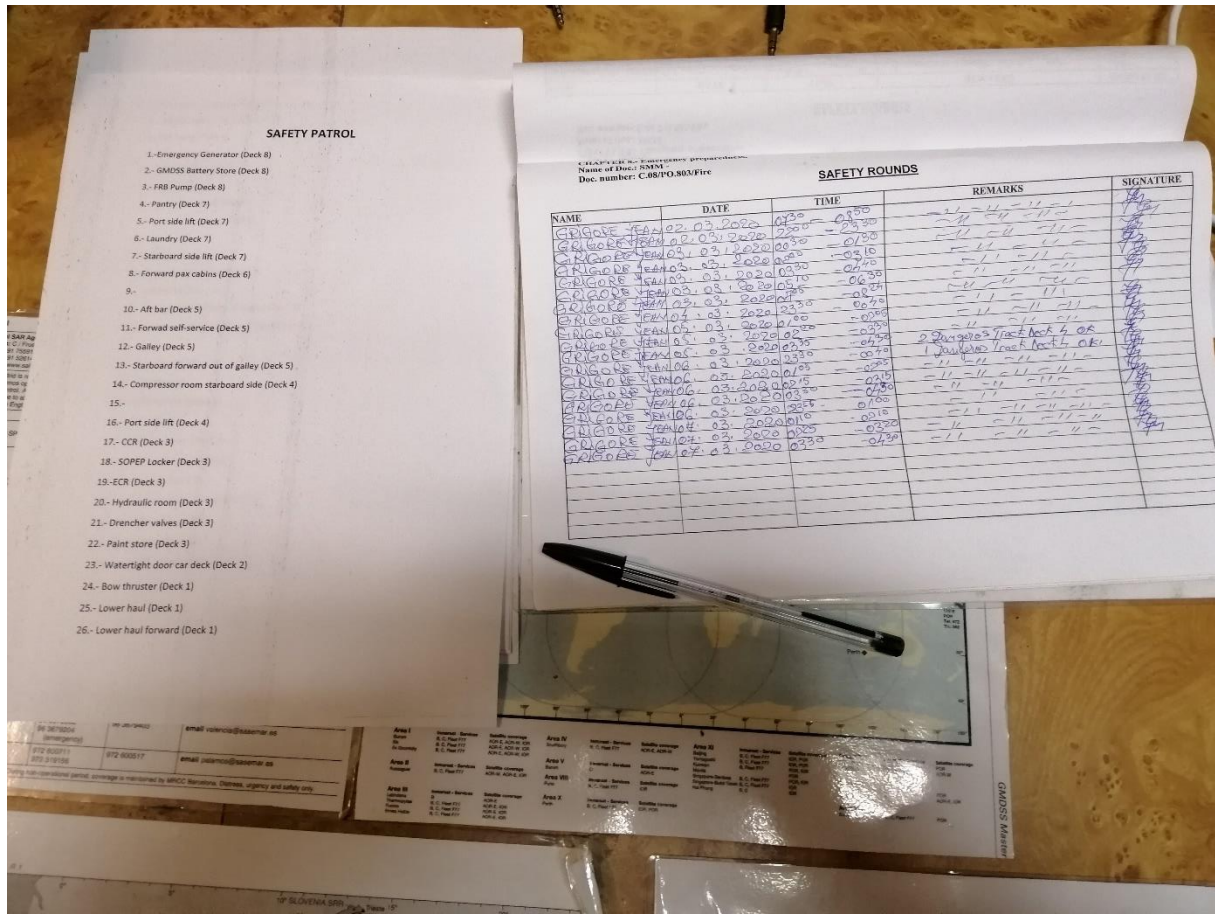
3. How do you get the communication with the OOW? Do you find any blind spots on board?
 - VHF (6) Some
 - UHF (5)
 - Emergency telephone (1)
 - I don't belong to the fire patrol (not interested in this survey) (5)

4. What is the equipment used during the fire patrol?
 - Only radio (6)
 - Radio and check point reader (4)
 - Radio and torch (2)
 - I don't belong to the fire patrol (not interested in this survey) (5)

- Do you have a suggestion for a better/easier equipment?
 - I don't know (5)
 - IR camera (7)
 - I don't belong to the fire patrol (not interested in this survey) (5)

5. Do you know how to operate the drencher system? Are you allowed to trigger the system in case of emergency?
- Yes (5)
 - No (7)
 - I don't belong to the fire patrol (not interested in this survey) (5)
- Are you allowed to trigger the system in case of emergency?
- No (12)
 - I don't belong to the fire patrol (not interested in this survey) (5)
6. Have you ever rejected cargo vehicles that you find risky/suspicious/in bad conditions during the manual screening at port?
- Yes (5)
 - No (7)
 - I don't belong to the fire patrol (not interested in this survey) (5)
7. Do you have the feeling that fire patrols are useful to avoid incidents?
- Yes (12)
 - I don't belong to the fire patrol (not interested in this survey) (5)
8. Do you have an idea for a better effectiveness of your duties on board during fire patrols?
- I don't know (12)
 - I don't belong to the fire patrol (not interested in this survey) (5)
9. How is the patrol walking route defined?
- I don't know (5)
 - Through the cargo decks (5)
 - I don't belong to the fire patrol (not interested in this survey) (5)
10. Do you have any written instruction onboard on how to perform the fire patrol, what to look for, first response etc?
- Yes (5)
 - I don't know (3)
 - No (4)
 - I don't belong to the fire patrol (not interested in this survey) (5)
11. Do you feel well prepared for correct immediate action for all possible events that may be discovered by patrol?
- Yes (5)
 - I don't know (5)
 - I don't belong to the fire patrol (not interested in this survey) (5)

10.3 Annex C – Fire patrol documents and check points



11 Appendixes

11.1 Appendix 1 – Conditions for screening

Conditions - Screening of cargo/vehicles at terminal

Sources of information in section 2.2.3-2.2.9 are interviews with numerous crewmembers of multiple Stena ro-pax vessels, various Stena office staff and authors experience.

- Today screening of incoming cargo is managed by each terminal individually [Stena]
- Staff availability sets limit for what can be done
- Cargo tends to arrive late, leaving little time for inspections
- Must have a risk based selection system to put resources right
- Cargo/Task management systems like *rePORT* [Stena] allows for assigning status check task in terminal and onboard. Tasks may be based on known or gate-scanned vehicle data. System can provide information and task and position onboard for each unit.
- Instructions to truck drivers on how to act
- Stena instructions and task management system see Appendix C & D.
- In some ports is written inspection instructions given today, in some port is all information in the Smartphone App.

Conditions - Screening of cargo at time of loading

Loading deck officers and crew have to focus on loading process, stowing and traffic management. Time and focus to execute conscious checking of vehicles is very limited. Only very obvious conditions will be noticed at passage on ramp.

In some ports stevedores execute loading and lashing, not crew.

Regarding reefers, general policy is that reefer units are forwarders responsibility. Ship operator is to interfere as little as possible to avoid being responsible for temperature issues and destroyed cargo.

Fuel leakage and suspicious noise is generally noticed and acted upon.

Conditions - Fire patrols

- Purpose:
 - a. To detect fires or related risk situations and other events endangering ship safety
 - b. If so found, inform OOW on situation
 - c. Act in first response at the scene
- Minimum watchkeeping manning is for ro-pax (>12 pax) vessels 2 ABs and for ro-ro (<= 12 pax) vessels 1 AB.
- Fire patrols only required for passenger ships (>36 pax)
- Special conditions may be valid for first and last patrol of voyage due to preparations for voyage or departure. Timing of fire rounds at departure and arrivals may be influenced by navigational or other operational conditions
- Fire patrol to be properly trained on first response equipment, best is if combined duties as fire crew
- Fire patrol to be properly informed and trained on his authorities in terms of use of fire suppression measures such as drencher, fire hose, or extinguisher
- 45 min max duration for one round, in order to fit into 1 hour watch schedule and allow for additional duties and a short break before next patrol
- Not only cargo space, also crew accommodation, service areas, public areas and outside deck areas are patrolled.
- Knowledge needed to make successful patrolling needs to be limited, and clear instructions are required, to allow for temporary staff
- Views many times obstructed by high cargo
- Not possible to get close to all vehicles due to tight parking
- Patrol should be alert to indirect cargo fire threats such as vessel system hydraulic leaks, electric failures.
- Patrol to be alert to damaged/disabled fire safety equipment
- Patrol to be alert to suspicious behaviour of passengers/crew.
- Increased risk of fire up to 1,5h after departure and just before arrival according to statistics
- Late arriving vehicles: Increased risk and limited time for proactive scanning
- Check points to be selected wisely to support good coverage of patrol path
- Patrol to cover weak spots in fixed detection systems
- Sometimes instructions are not followed due to no time, for example during loading operations
- What fire screening is made in ro-ro vessels where no fire patrols are required by rules?
- Current stipulated equipment: IR camera, radio, checkpoint reader, flashlight
- Physical fitness of patrol crew must be considered

Observations on a ro-pax vessel

- Crew pulls reefer cable to connection point on reefer unit, hands it over to driver, but does not connect. Driver makes connection.
- Before arrival, crew disconnects cable and stows on bulkhead (cable reels or coiling manually)

- Cable reels prone to damage due to drivers forgetting to disconnect before setting off. Therefore the routine that crew disconnects cable.
- (On Gothenburg- Kiel route electrician connects reefers)
- Departure 1600 arrival 1915, fire patrols 1700 & 1800
- Departure 2015 arrival 2350, fire patrols 2100, 2200 and 2300?
- No fire patrols in day time 0800-1600
- Sometimes crew discovers reefer units running on diesel on closed cargo deck, in such case crew shuts down and informs driver.
- No written instruction on how to act on fire patrol, instructions are transferred verbally from a colleague at time of introduction
- A plastic list of all check point supports fire patrol if needed
- Internal telephone needed to get full “radio” communication coverage in all spots of fire round
- Some of patrol crew carries heat camera, others not
- Total patrol time 25-35 minutes of which 5-7 minutes covers cargo decks 3 & 5
- Speed of walk on patrol varies significantly, as well as focus on detecting dangers
- Most common observation on patrol is leaking fuel: in such case photo is taken, absorbent is applied and OOW informed.
- Protective trousers and shoes worn, but not long sleeve protective sweater.
- If parking is too tight, fire patrol may take other route

Summary of observation on 3 large and standard ro-pax vessels in North Sea operation

- Patrols commenced as soon as “At sea”, day and night
- 30 minutes duration of patrols
- On one vessel the registration of patrol points displayed on bridge in real time.
- IR camera standard equipment
- Radio coverage good, recent upgrades. Some known blind spots.
- Written down instructions for fire patrol exist
- General opinion is that fire patrol motivation is good
- Reefers run on diesel on open and weather decks
- Reefers connected by driver on closed decks, disconnected by crew. On one vessel crew is “supporting” at time of connection.

Port operations as of today in a Scandinavian port

- 4 tug master, 5 staff serves daily 10-100, average 50/day loose trailer in one direction of which 1-2 are reefers. 3 departures per day.
- Number of trucks with driver are average 160/day of which 15 are reefers, however very large seasonal/daily variations.
- Loose trailer cut-off 90 min before departure, driven vehicles 60 min to keep slot, gate closes 15 min before departure.
- Target is as little manual checking as possible

- Manual checking today is unit dimension LxBxH, outside damages and DG marking matching information given at booking. Only when suspicion for any reason of some problem deeper check is made. Refrigeration units are not checked, driver is responsible for plugged in or diesel operation while parked in terminal.
- Reefers are plugged in by crew onboard. Few times per year reefer trailer electric connections are rejected as not fit by ship and sent ashore. (In some cases when parked on closed deck and electric system fails, reefers are powered by diesel run 1h intermittent by fire patrol)
- Reefer units are generally (90% on this route) equipped with remote monitoring including temperature, position and failure codes if any. Data is sent to forwarder who contacts Stena if needed. (Not working outside 4G network?)
- Stena checks cargo temperatures according to agreement with forwarder. If temperature out of bounds, Stena informs forwarder, never operates reefer unit.
- No information in booking system on APV vehicles, no separate routines on arrival.

Port operations today in North Sea port

- Stevedores do all cargo handling onboard
- No fire risk related manual screening today, can for sure be done if resources are provided
- Drivers instructed to turn of heaters
- No special treatment of electric battery cars
- Waste transport marked "A"
- Fuel leakage and suspicious noise acted upon
- Large number of units passes terminal, some arriving just in time for departure.
- Automatic screening would be of great help, system and physical infrastructure is in place already
- Manual and automatic screening activities on incoming vehicles are today focused on vehicle damages and stowaways. When fire activities are discussed coordination should be made with these areas.

11.2 Appendix 2 – Exercise on systematization of hazard screening

Hazard	How to detect in practice	Where possible?			
		Vehicle Hot Spot Automatic Detection at terminal	Manual screen and inspection at terminal before loading NOTE: For possible screening, expected time per unit is written in red	Ramp/loading screening by deck officer	Fire patrol
1. The status of reefer units.	Strange smell/noise while running diesel/electric mode	YES. Heat screen	NO. Identification of cracked hoses/belts is hidden under plastic cover	NO	NO. Identification of cracked hoses/belts is hidden under plastic cover
2. Substandard electrical connections.	Socket inspection	NO	YES. Identification of corrosion/damage/deterioration Expected time: 8 seconds per unit	NO	YES. Identification of corrosion/damage/deterioration
3. Suspicious noise or smell.	Walk close and hear/smell	NO	YES. Senses. Expected time: walk through terminal 5 seconds per unit	YES. Noises	YES. Senses
4. Fuel leakage (solid, gas)	Visual under vehicle. Presence of pools. Humidity or dirt stick on the transport unit	NO	YES. Visual Identification. The operator will bend and inspect underneath the unit pointing with a flashlight. Expected time: 10 seconds per unit	YES. Only the obvious leaks or drips	YES. Visual Identification. The operator will inspect underneath the unit pointing with a flashlight

<p>5. Portable fuel containers or added fuel tanks.</p>	<p>Visual inspection. Diesel tank on reefer is located underneath the unit. May cause overflows</p>	<p>NO</p>	<p>YES. Visual Identification. The operator will bend and inspect underneath the unit pointing with a flashlight. Expected time: 10 seconds per unit</p>	<p>NO. Very difficult. Lack of time</p>	<p>YES. Visual Identification. The operator will bend and inspect underneath the unit pointing with a flashlight. Ship's movements may cause overflows and therefore fuel leakage</p>
<p>6. Handmade installations on RVs like Christmas trees or heaters.</p>	<p>Visual inspection inside the cabin</p>	<p>NO</p>	<p>YES/NO. Visual Identification inside the cabin can detect some handmade installations (Christmas trees or electric decorations) but heaters are almost impossible to detect. Expected time: 5 seconds per unit (no need to stop, only detection of hand-made installations)</p>	<p>NO. Very difficult. Lack of time</p>	<p>YES/NO. Visual Identification inside the cabin can detect some handmade installations (Christmas trees or electric decorations) but heaters are almost impossible to detect</p>
<p>7. Stowaways' activities.</p>	<p>Damaged covers, visible people, noise. Bags with clothes laid on the dockside.</p>	<p>YES. Heat screen</p>	<p>YES/NO. Visual Identification will be very difficult as stowaways will be cleverly hidden. Expected time: 8 seconds per unit (quick inspection)</p>	<p>NO</p>	<p>YES/NO. Visual Identification will be very difficult as stowaways will be cleverly hidden</p>
<p>8. Presence of ignition sources (hot spot/surfaces)</p>	<p>By IR camera. Some of them may provoke smoke</p>	<p>YES. Heat screen</p>	<p>NO. No time for each unit IR scanning</p>	<p>NO</p>	<p>YES. IR. Only in case of finding something suspicious</p>

<p>9. Thermal runaway on Li-ion batteries of APV</p>	<p>Look for visual gases Heat or strange sound</p>	<p>YES. Heat screen</p>	<p>YES/NO. Visual Identification of strange noises. Initial battery gas release have a cloud appearance. Expected time: 8 seconds per unit (only obvious thermal runaway in process may be detected)</p>	<p>NO. Only visual Identification.</p>	<p>YES/NO. Visual Identification of strange noises. Initial battery gas release have a cloud appearance. As exothermic reaction, IR confirmation would be needed</p>
<p>10. Self-reactions with IMDG</p>	<p>Look for visual smoke. Reaction with water on IMO class 4 type Scan for heat</p>	<p>YES. Heat screen</p>	<p>YES/NO. Visual Identification. IR confirmation of self-heating substances. DG are hidden under tarpulin. Expected time: 8 seconds per unit (only obvious self reactions can be detected)</p>	<p>YES/NO. Visual Identification. DG are hidden under tarpulin</p>	<p>YES/NO. Visual Identification. IR confirmation of self-heating substances. DG are hidden under tarpulin</p>
<p>11. Lashing arrangements failure (specifically with bad weather forecast)</p>	<p>Visual. Some units may be moved.</p>	<p>NO. No lashing</p>	<p>NO. No lashing</p>	<p>YES. Visual Identification once onboard. Lashin problems can be notified by steevedores</p>	<p>YES. Visual Identification. Chains on deck. Shif of cargo. Dangerous to inspect during sailing DO NOT WALK BETWEEN TIGHT PARKED CARGO</p>
<p>12. Other obvious fire hazards (smoke, sparks)</p>	<p>Visual inspection. Easy to detect</p>	<p>YES. Heat screen</p>	<p>YES. Visual Identification of smoke, even flames. Expected time: walk through terminal 5 seconds per unit (easy to detect)</p>	<p>YES. Visual Identification of smoke, even flames</p>	<p>YES. Visual Identification of smoke, even flames</p>

