

MCIB

Marine Casualty Investigation Board
Bord Imscrúdú Taisní Muirí



**REPORT OF AN INVESTIGATION
INTO A
FIRE ONBOARD THE FERRY
“FRAZER TINTERN”
MIDWAY BETWEEN
BALLYHACK CO. WEXFORD
AND PASSAGE EAST
CO. WATERFORD
5 AUGUST 2021**

**REPORT NO. MCIB/311
(No.7 OF 2022)**

The Marine Casualty Investigation Board (MCIB) examines and investigates all types of marine casualties to, or onboard, Irish registered vessels worldwide and other vessels in Irish territorial waters and inland waterways.

The MCIB objective in investigating a marine casualty is to determine its circumstances and its causes with a view to making recommendations to the Minister of Transport - for the avoidance of similar marine casualties in the future, thereby improving the safety of life at sea and inland waterways.

The MCIB is a non-prosecutorial body. We do not enforce laws or carry out prosecutions. It is not the purpose of an investigation carried out by the MCIB to apportion blame or fault.

The legislative framework for the operation of the MCIB, the reporting and investigating of marine casualties and the powers of MCIB investigators is set out in the Merchant Shipping (Investigation of Marine Casualties) Act, 2000.

In carrying out its functions the MCIB complies with the provisions of the International Maritime Organisation's Casualty Investigation Code and EU Directive 2009/18/EC governing the investigation of accidents in the maritime transport sector.



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Glossary of Abbreviations and Acronyms

AC	Alternating Current
bhp	Brake Horse Power
BIM	Bord Iascaigh Mhara
CoP	Code of Practice
DC	Direct Current
GT	Gross Tonnage
GWP	Global Warming Potential
HFC	Hydrofluorocarbon
IST	Irish Standard Time
MCIB	Marine Casualty Investigation Board
MSO	Marine Survey Office
NT	Net Tonnage
S.I.	Statutory Instrument
SMS	Safety Management System
UTC	Coordinated Universal Time
VHF	Very High Frequency
Kilowatt	kW
Metres	m
Volts	V

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1. SUMMARY

- 1.1 At approximately 18.05 hours (hrs) on 5 August 2021, when en route to Passage East, Co. Waterford the Master of the vessel “*Frazer Tintern*” detected a strong smell of diesel fuel. At that point, a crewmember called him to say that he could also get a strong smell of diesel and was going to investigate. When the crewmember got to the mesh door at the number one (No.1) engine compartment he was met with black smoke and flames. The crewmember notified the Master straight away that they had a fire onboard. The Master immediately shut down the No.1 engine and turned off the engine room fans. Two crewmembers then activated two portable fire extinguishers and rigged fire hoses to provide boundary cooling. The vessel continued to the Passage East slipway to get passengers off as quickly and safely as possible. As a precaution all passengers were summoned to the muster station and issued with lifejackets. On the way to the Passage East slipway the fire was brought under control. On arrival at Passage East all passengers and vehicles were disembarked in a safe manner. The vessel was then secured, and the remaining engines shut down. When the smoke dispersed fully the crew investigated the engine room to confirm the fire had been extinguished.

Note: Times are local time = UTC + 1 (Co-ordinated Universal Time + 1).



2. FACTUAL INFORMATION

2.1 Vessel Details

Name: *“Frazer Tintern”*.

Build yard: Schiffswerft Oberwinter GmbH, Oberwinter, Germany.

Year completed: 1973.

Tonnage: Gross Tonnage (GT) 227. Net Tonnage (NT) 68.

Length over all: 55.2 metres (m).

Beam: 14.56 m.

Main propulsion units: Make, model and power outputs.

Deutz bf6m1013 180 Brake Horse Power (bhp) 134
Kilowatt (kW) x 4 engines which are liquid cooled.
Liquid is in turn cooled by a radiator and fan system on
each engine.

Capacities: Vehicles and passengers - 28 cars and 130 passengers.

2.1.1 The vessel is best described as a roll on roll off vehicle and passenger ferry designed for short river crossings. The lower deck consists of machinery spaces and storage tanks. The machinery space contains four main engines, two on each side driving propellor pods located on each corner of the vessel. There is an open space between the main engines containing a generator and diesel engine driven fire pump. There are no bulkheads between the engine spaces.

2.1.2 The car deck has space for up to 28 vehicles. It also has two accommodation blocks. The port block contains a workshop and access to the port machinery space. The workshop also contains a diesel generator set and the main switchboards. The fire flaps for the port machinery space are located midships on the port side alongside the fuel shut off pulls. The control for the machinery space fire suppression system is also located midships on the port side. The starboard block contains a galley, foot passenger room and access to the starboard machinery space. The fire flaps for the starboard machinery space are located midships on the starboard side together with the fan emergency stops.

2.1.3 The upper decks include railed off viewing platforms and liferaft stowage and launching areas. The navigation bridge is located on the starboard side midships. The navigation bridge contains emergency stops for all main engines and fans.

See Appendix 7.1 - *“Frazer Tintern”* General Arrangement.

2.2 Operational Requirements

2.2.1 There are no records of classification society involvement in the initial building or the ongoing operation of the vessel. Such vessels fall under the Merchant Shipping (Passenger Ship Construction Rules) of 1983 or 1985 as well as the Statutory Instruments (S.I.) relating to Lifesaving Appliance & Fire Protection etc. There is no Code of Practice (CoP). All domestic passenger ships are required by the Merchant Shipping Act 1992 to be surveyed annually by the Marine Survey Office (MSO) for the issue of a Passenger Ship Certificate.

2.2.2 The vessel operates under a Passenger Ship Certificate Class IV, granted annually by the MSO, following completion of an MSO Checklist. The certificate applies to the route between Passage East Co. Waterford and Ballyhack Co. Wexford only and is subject to 1983 rules for construction of passenger ships.

See Appendix 7.2 - Marine Survey Office Checklist for Class IV, V & VI Passenger Vessels.

2.2.3 The qualifications of deck officers on ships are governed by S.I. No. 242/2014 European Union (Training, Certification and Watchkeeping for Seafarers) Regulations 2014 as amended. In relation to Passenger Ships of Class IV there are currently no statutory instruments/regulations in force in relation to certification and competency requirements for masters, officers and crew, nor in relation to safe manning requirements.

2.2.4 The Master at the time of the incident had previously completed a Certificate of Proficiency in Fire Prevention and Fire Fighting. He had also completed the Bord Iascaigh Mhara (BIM) Basic Safety Training course. One crewmember had also completed the Certificate of Proficiency in Fire Prevention and Fire Fighting as well as Personal Survival Techniques. The other crewmember had completed the BIM Basic Safety Training course.

2.2.5 There was no Safety Management System (SMS) in place on the “*Frazer Tintern*” prior to the incident. When questioned the operators replied they had never been asked for one. A SMS has been put in place post the incident and a copy of this has been provided to the Marine Casualty Investigation Board (MCIB).

2.3 Systems

2.3.1 Fuel system on the vessel:

The fuel for No. 1 engine is taken from the main fuel tank via filters to the lift pump, from here the fuel is fed through a secondary filter to the injection pumps and returned via a pressure regulating valve to the fuel tank. Unusually the return line on all main engines has a lever shut off valve fitted. They were apparently fitted to assist priming of the fuel system.

See Appendix 7.3 - Photograph No. 1 - Return Fuel Line Shut Off Valve.

See Appendix 7.4 - Fuel System.

2.3.2 Fire Suppression System:

The vessel is fitted with a single reservoir containing Novec 1230 Fire Protection Fluid. This is a clean agent fire extinguishant which was developed as a halon replacement and hydrofluorocarbon (HFC) alternative. It belongs to a family of chemicals called halocarbons, a group which includes HFCs and fluoroketone. Novec 1230 fluid is a fluoroketone, while chemical clean agents like FM-200 are HFCs (HFC-227ea). Novec 1230 fluid has a global warming potential (GWP) of less than one while HFCs typically have a GWP of more than 3000. Novec 1230 fluid has the highest margin of safety for human occupancy among clean agents, including inert gas. This system is set up to flood the entire machinery space area of the lower deck thus shutting down all propulsion power. This would render the vessel powerless and could result in collision or grounding. The operating control is fitted in a locked box midships on the port side of the car deck. The keys are located in the bridge and the system is operated on the instruction of the Master.

2.4 Vessel History

2.4.1 The vessel operated in Germany until 2007 when it moved to Ireland to take up service on the Passage East to Ballyhack route.

2.4.2 As built, the vessel had a 24 volt (v) direct current (DC) electrical supply from two battery banks charged from four engine mounted alternators. This provided sufficient supply for propulsion control, ramp control operations and limited lighting.

2.4.3 The vessel had a major refit prior to taking up service in Ireland. All modifications carried out at this refit were agreed between the company and the MSO. As well as major re-plating of the hull this included the fitting of two diesel engine driven, three phase alternating current (AC) generators. One of these was fitted in the port side workshop and the other in the crossover space between the engine compartments. The switch gear for the AC system was also located in the port side workshop. One of the main reasons for fitting the AC system was to power forced draft and extraction fans to increase the airflow through the machinery spaces to assist cooling of the main engines. The forced draft fans are on the port side and the extraction fans on the starboard side of the superstructures. The airflow through the extraction fans however was insufficient which necessitated the access door to the starboard machinery space being left open when the engines are running. A grid was fitted to this access to deter members of the public entering the machinery space.

See Appendix 7.5 - Photograph No. 2 - Starboard Machinery Space Access Door.

2.5 Voyage Particulars

2.5.1 The vessel was providing a continuous vehicle and passenger ferry service across Waterford Estuary from Ballyhack Co. Wexford to Passage East Co. Waterford. The daily service had commenced at 07.00 hrs and was due to continue until 22.00 hrs on the day of the incident. Crewing of the vessel was arranged in two shifts changing over mid-afternoon.

2.6 Maintenance

2.6.1 Maintenance record of No.1 engine “*Frazer Tintern*” fitted new to the vessel December 2016:

- Before starting up a crewmember checks lube oil level and coolant level.
- Engine oil, oil and fuel filters changed every four weeks. Fan belts and auxiliary drive belts are also inspected at this time and adjusted or changed if required. Leak back pipes are also changed as required at this time.
- Once a year during the dry-docking period valve clearances are adjusted.
- Engine coolant and water pump is changed once a year during dry-docking period.
- The hydraulic pump for the ramps was changed on 5/4/2018.
- The engine’s fan belt tensioner was changed on the 8/11/2018.
- The fuel lift pump was changed 1/2/2019.
- The alternator was changed 10/10/2020.

2.6.2 There were no machinery logs kept on this vessel. Daily incidents occurring in the machinery spaces are now recorded in the vessel’s main log.

2.7 Marine Casualty Information

Type: Serious Marine Casualty.
Date of Incident: 5 August 2021.
Time of Incident: 18.05 hrs.
Location of Incident: Midway in River.
Duration of Incident: Approximately Five Minutes.

Type of Incident: Engine Compartment Fire.

Weather Conditions: Fair.

Visibility: Good.

Casualties: Nil.

Fatalities: Nil.

Equipment Damage: Substantial.

See Appendix 7.6 - Met Éireann Weather Report.

3. NARRATIVE

- 3.1 On the morning of 5 August 2021 at approximately 07.45 hrs a deck crewmember of the ferry “*Frazer Tintern*” reported to the Master of the vessel that he smelled diesel fumes coming from the No.1/No.4 engine compartment. Upon further visual investigation, a diesel fuel leak was discovered where a fuel return line had become disconnected on the No.1 engine.
- 3.2 The engine was shut down and a phone call made to the company’s marine engineer to report the situation. As the engineer was unavailable at the time to attend the problem, the decision was taken to call out a local marine mechanic who had previously carried out repairs on the vessel.
- 3.3 The leak was repaired by the mechanic by refitting the return line and securing it with a hose clip and verified by the Master who ran up the engine to check the repair. The Master had worked on the vessel since its arrival in Ireland and was familiar with operating the machinery. The area around the No.1 engine compartment was cleaned by the crew with detergent and deemed free of diesel residue, as was the deck plating adjacent to the engine compartment. The vessel resumed normal service at approximately 08.20 hrs. The engine compartment was monitored hourly by the crew and there were no further reportable events for the remainder of that morning shift. There is no record of this incident being mentioned to the crew taking over for the evening shift at 13.00 hrs.
- 3.4 On the evening of 5 August at approximately 18.05 hrs while sailing from Ballyhack to Passage East, a strong smell of diesel fumes was noted by the Master and simultaneously by one of the deck crewmembers who called this over the radio to the wheelhouse. The same crewmember informed the Master that he was going to investigate the source of the diesel fumes by approaching the starboard machinery space access.
- 3.5 When the crewmember arrived at the mesh gate on the starboard side leading to the compartment of No.1/No.4 engines, he discovered smoke and flames pouring from the compartment and immediately informed the Master of the source and location of the fire. The Master immediately shut down No.1 engine and switched off the engine room fans. The fire flaps and fan shutdown for the starboard machinery space were inaccessible due to the location of the fire.
- 3.6 The two deck crewmembers accessed portable fire extinguishers and discharged them at the fire. The fire was knocked back and fire hoses were run out to provide boundary cooling, while the Master continued to navigate the vessel towards Passage East slipway. The machinery space fire suppression system was not operated.

- 3.7 The passengers were summoned to the muster station and instructed to don lifejackets that were handed out by crewmembers. The vessel docked at Passage East slipway where all passengers and vehicles were safely disembarked.
- 3.8 The vessel was moored up and the remaining engines were shut down. The three crewmembers then carried out a visual inspection of the engine compartment after the remaining smoke had dispersed and confirmed that the fire was fully extinguished.
- 3.9 The Master contacted the company marine engineer and informed him of the event and status of the vessel. The crew remained onboard the vessel until the arrival of the company marine engineer. The Port of Waterford authorities were also informed of the event. At no time during or after the event was a distress/Pan-Pan call made on Very High Frequency (VHF) radio.
- 3.10 The incident was reported to the MSO and the vessel was inspected prior to and on completion of repairs at New Ross, Co. Wexford Boat Yard.
- 3.11 No.1 engine was extensively damaged by fire as was the wiring loom and ancillary equipment. The machinery space around No.1 engine suffered heat and smoke contamination causing extensive damage to surface coatings. The area on the car deck between the access to No.1 engine compartment and the crew welfare space was badly scorched. The glass porthole in the welfare space was cracked because of the heat generated by the fire.
- See Appendix 7.7 - Photographs No. 3 to No. 11.
- 3.12 Due to the extent of the damage to No.1 engine it was replaced together with the wiring loom and ancillary equipment. Areas of surface coating damaged by heat and smoke were taken back, prepared, and re-coated. These repairs were specified by the company's marine engineer and agreed by the MSO.
- 3.13 The owners launched an internal enquiry into the incident. This took place immediately after the incident before any repairs were undertaken. This enquiry yielded some useful information on the history of the event. It did not clearly identify the root cause of the fire. This enquiry also stopped short of making any recommendations to prevent the same issue arising again. The result of the enquiry did lead to the operators adopting a SMS to improve processes onboard.
- 3.14 Since the incident the door leading to No.1 engine compartment was fitted with a weight and magnetic lock so that it closes automatically when the fire alarm is activated.

- 3.15 It was not possible to establish whether the shut off valve in No.1 engine fuel return line was open or closed at the time of the fire. It was noted during inspection after the repairs were done that the shut off valves on the fuel return lines on the other three engines were in the open position when the engines were running.

4. ANALYSIS

- 4.1 The weather on the day of the incident was warm with a maximum air temperature of around 20 Celsius (see Appendix 7.6 Met Éireann Report). The starboard side of the vessel being predominantly south facing is also subject to solar heating effect through the steel superstructure. The area around No.1 engine is the hottest area in the machinery space due to being the exit point for airflow through the area. The exhaust from No.2 generator which was also running at the time of the incident is routed past No.1 main engine. This would have further increased the temperature in the area. It is likely that gas oil spraying in this environment could be at, or close to, its flashpoint where it will ignite easily. The temperature in this area would have had a contributory influence on starting the fire.
- 4.2 The nature of the airflow through the machinery space could have led to a high degree of hot swirling air flow in the vicinity of No.1 main engine. This would have assisted atomisation of any diesel fuel leaking in the area contributing to starting the fire.
- 4.3 The ignition source of the fire may have been arcing, causing sparks in the engine mounted alternator, but more likely to have been the hot exhaust manifold or turbocharger casing of No.1 engine that was not lagged or enclosed. The exposed hot surfaces of the manifold and turbocharger would have provided an ignition source for the fuel.
- 4.4 The return fuel lines on the main engines on the vessel were seen to be fixed using three distinct methods. The original fixing by the manufacturer was by use of spring clips, but other pipes were attached using cable ties or hose (jubilee) clips. The repair to the fuel line on the morning of the incident was made by fitting a hose clip. This may have contributed to return fuel line failure.

See Appendix 7.8 - Photograph No. 12 - Return Fuel Line Attachments.

- 4.5 The extensive damage caused by the fire in a very short period indicated that a considerable amount of fuel was being released to support the fire while it was active. The fact that the fire died off quickly after No. 1 engine was shut down indicates that the fuel to the fire was being fed by mechanical means from the engine. Shutting off the fuel removed one of the sides of the fire triangle, the other two sides being the heat and air necessary for a fire to continue. Shutting the fire flaps would have restricted air flow and helped to contain the fire. Operating the quick closing fuel valves would have also stopped the fuel but would have also shut down the other main engines. The

considerable amount of fuel being released was likely to have been from the fuel lift pump. Should the fuel return line be blocked off in any way the pressure regulating valve will become inoperative resulting in a significant increase in fuel pressure on the return side of the system, consequently leading to a pipe failure. Note that the isolating valve shown in the photograph at Appendix 7.3 which is located in the return line pipework in series with the back pressure regulating valve is not indicated in the fuel diagram shown at Appendix 7.4.

- 4.6 The fire suppression system for the machinery space was not operated as the Master did not want to lose all propulsion at the time and deemed it safer to complete the short run and land the passengers at Passage East, Co. Waterford.

5. CONCLUSIONS

- 5.1 The fire was most likely caused by a return line fuel leak on No.1 main engine providing fuel to the area. The volume and pressure of the fuel was greatly increased by the fuel return line being blocked or shut off. The ambient high temperature and swirling air flow in the vicinity assisted in the atomisation of the fuel.
- 5.2 The fuel may have been ignited by arcing of the No.1 main engine alternator. It was more likely to have been from fuel spraying onto hot surfaces such as the engine exhaust manifold or turbocharger casing.
- 5.3 Shutting down the engine removed the source of fuel from the fire and would have had a far greater effect in extinguishing it than the use of portable extinguishers.
- 5.4 Due to the extent of the fire and subsequent damage to No.1 engine the exact location and cause of the fuel leak has been impossible to determine.
- 5.5 It is hard to rule out the No. 1 engine fuel leak on the morning of the event having an association with the fire. The repair was carried out by using a hose clip to re-attach the return fuel line rather than a spring clip as used by the manufacturer. If the hose clip was over tightened it may have damaged the hose resulting in failure later in the day. Return fuel lines on this engine would have been new with the engine in 2016.
- 5.6 Due to the airflow from No. 1 engine access door, the fire spread onto the car deck in an area open to the public. This also prevented access to the port side fire flaps and fan stops. Although the door has been modified to close on activation of the fire alarm, in this instance the fire would have spread to the public space prior to the door closing.
- 5.7 The fuel systems on this vessel include a shut off valve on the return line. If this valve is closed while the engines are in operation this would lead to over pressurisation of the fuel system leading to component failure and considerable fuel leakage at pressure.
- 5.8 The operators have stated that prior to the incident they carried out fire drills. There are no records of these being carried out or what was involved in the drills. Post incident, drills are carried out on a weekly basis with at least one of each drill (Man Overboard/Fire in Accommodation, Car Deck or Engine Room/Abandon Ship) carried out per month.

See Appendix 7.9 - Fire Drill.

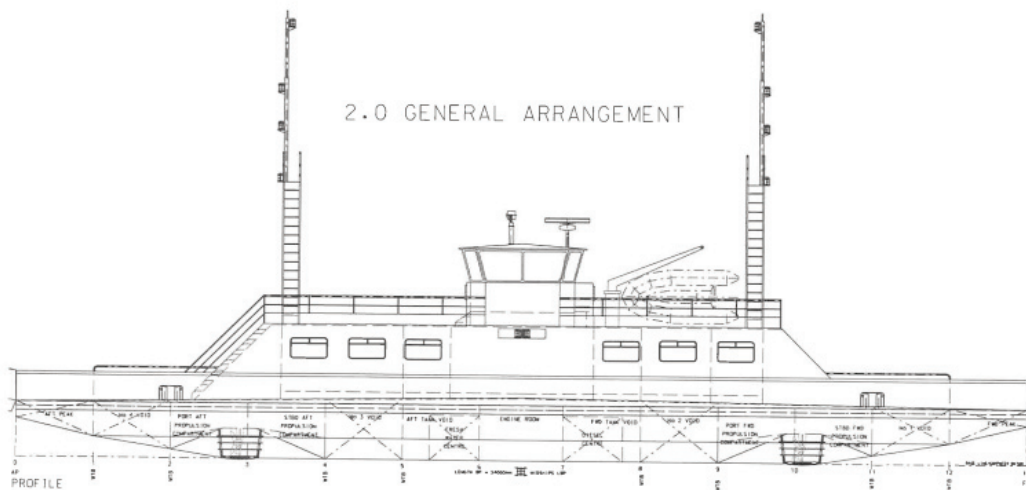
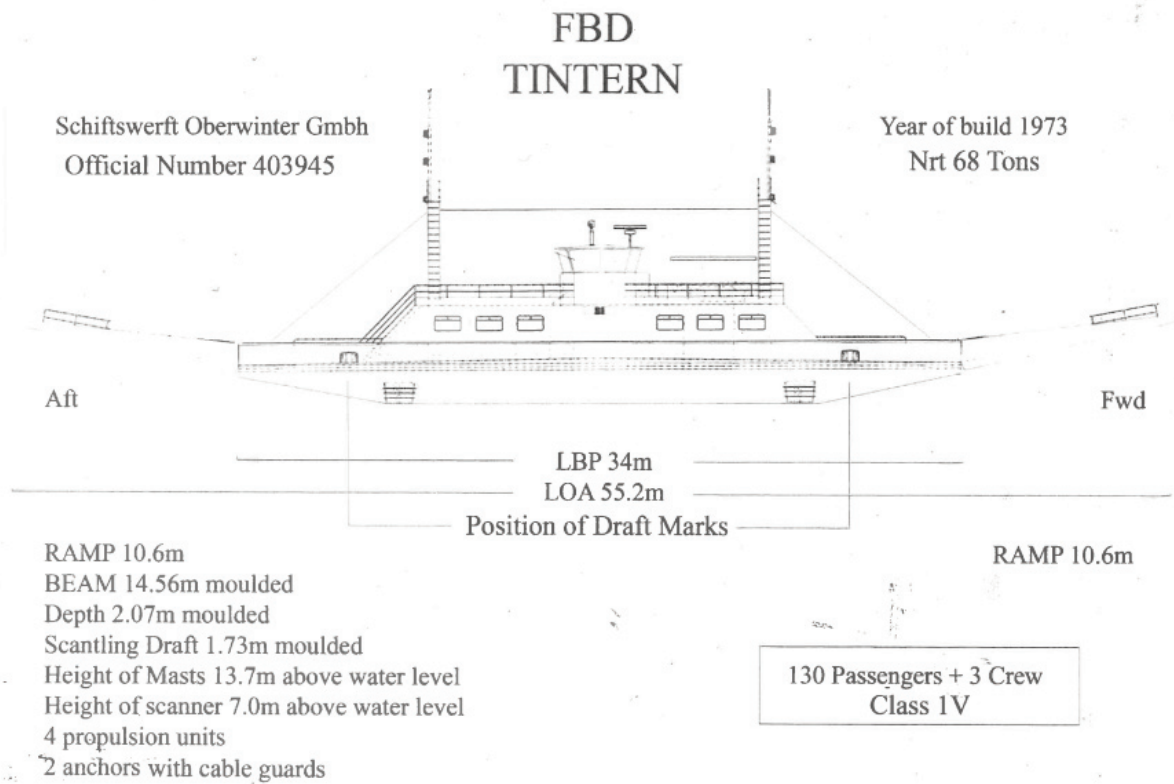
- 5.9 The operators have also put in place a Domestic SMS to ensure daily checks are carried out and a smooth handover between shifts has been introduced.
- 5.10 The Master of the vessel should have notified the Coast Guard of the fire by a VHF Pan-Pan call as soon as it was discovered.

6. SAFETY RECOMMENDATIONS

- 6.1 The owners/operators should ensure that all return line flexible fuel hoses are fixed as per the engine manufacturer's recommendations.
- 6.2 The owners/operators should arrange to have the airflow from the machinery space ducted away from the main car deck and clear of any public areas. This is to ensure that a fire in the machinery space will not impinge on public areas.
- 6.3 The owners/operators should arrange to have the shut off valves removed from the fuel system return lines to prevent the potential of over pressurisation of the system.
- 6.4 The owners/operators need to ensure that the firefighting procedures and Domestic Safety Management Systems put in place post the incident are followed and practiced and logged regularly.
- 6.5 The Minister for Transport should issue a Marine Notice to owners/masters of passenger vessels to remind them that in the case of a fire or other potentially serious incident a distress/Pan Pan call as appropriate should be made at the earliest opportunity.
- 6.6 The Minister for Transport should request a review of manning and crew qualification requirements for Class IV passenger vessels operating in restricted waters as per action 25 of the Maritime Safety Strategy of 2015 which states: *"The standards that will apply to crew on board domestic passenger ships and cargo ships on inland waters (i.e. non-sea-going) will be examined to ensure appropriate standards of crew operating the vessels and the number of qualified persons on board. (Start in 2017)."*

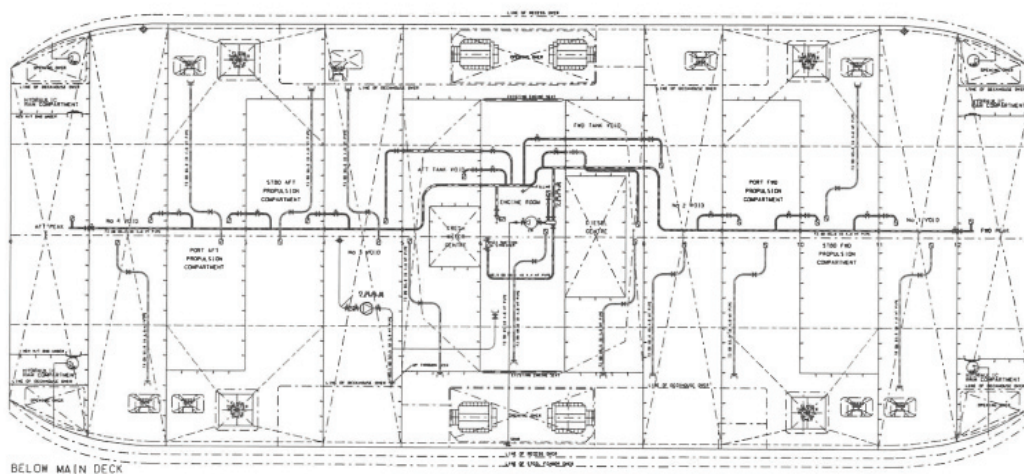
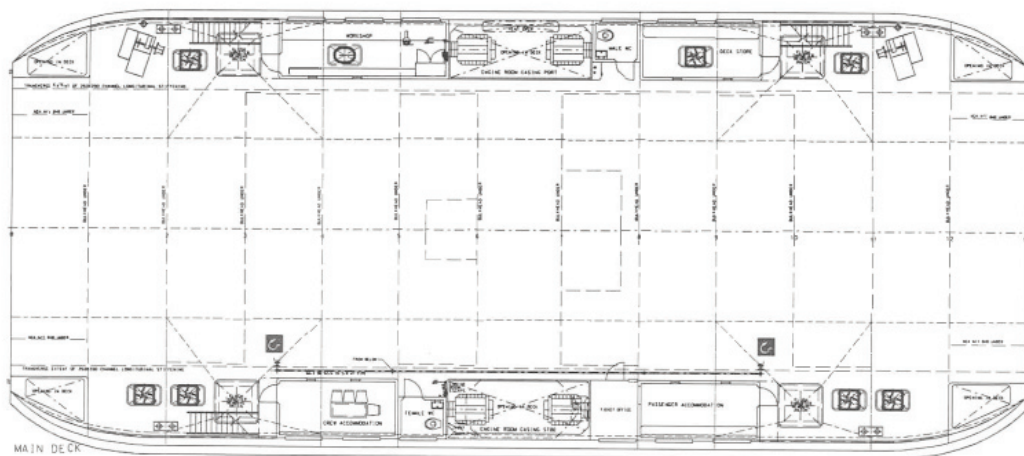
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Appendix 7.1 "Frazer Tintern" General Arrangement



APPENDIX 7.1

Appendix 7.1 "Frazer Tintern" General Arrangement



Appendix 7.2 Marine Survey Office Checklist for Class IV, V & VI Passenger Vessels

MSO 1002 CHECKLIST FOR CLASS IV, V & VI (Rev 1.0)

CHECKLIST FOR CLASS IV, V & VI PASSENGER VESSELS

LSA

Lifeboats/Rescue Boat condition satisfactory	Yes/No
Lifeboat stowage and launching arrangements satisfactory	Yes/No
Lifeboats engines inspected	Yes/No
Liferafts condition satisfactory	Yes/No
	Date of service/expiry
Hydrostatic release satisfactory	Yes/No
	Date of service/expiry
Liferafts stowage and launching arrangements satisfactory	Yes/No
Buoyant apparatus satisfactory	Yes/No
Distress pyrotechnics inspected	Yes/No
	Date of expiry
Manoverboard signal/lifebuoy/chute satisfactory	Yes/No
Quantity and condition of lifebuoys satisfactory	Yes/No
Quantity, stowage & condition of lifejackets satisfactory	Yes/No
2-way radio telephone apparatus for survival craft satisfactory	Yes/No
Line throwing appliances satisfactory	Yes/No
Emergency Muster lists displayed	Yes/No
Launching instructions for survival craft displayed	Yes/No
Means of recovery of survivors satisfactory	Yes/No

FIRE SAFETY & FIREFIGHTING EQUIPMENT

Fire Main, Hydrants, Valves & associated pipework satisfactory	Yes/No
Fire hoses & nozzles satisfactory	Yes/No
Fire extinguishers satisfactory	Yes/No
	Date of service
Fire buckets/lanyards satisfactory	Yes/No
Fixed fire extinguishing system satisfactory	Yes/No
	Date of service
CO2 alarm tested	Yes/No
Main fire pump inspected	Yes/No
Main fire pump tested	Yes/No
Emergency fire pump inspected	Yes/No
Emergency fire pump tested	Yes/No
Fire Control Plan displayed	Yes/No
Remote stops and closing devices satisfactory	Yes/No
Fire dampers for accommodation/machinery space satisfactory	Yes/No
Structural fire protection satisfactory	Yes/No
Fire detection/alarm satisfactory	Yes/No

Appendix 7.2 Marine Survey Office Checklist for Class IV, V & VI Passenger Vessels

<small>MSO 1002 CHECKLIST FOR CLASS IV,V&VI (Rev 1.0)</small>	
Fire blanket satisfactory	Yes/No
Cooking LPG storage satisfactory	Yes/No
<u>GENERAL SAFETY</u>	
Fire control plan and muster list satisfactory	Yes/ No
Emergency instructions & signs satisfactory	Yes/No
Training manual and instructions satisfactory	Yes/No
Means of escape inspected & satisfactory	Yes/ No
Gangway & Accommodation Ladder satisfactory	Yes/ No
Arrangements for embarking/disembarking disabled passengers satisfactory	Yes/ No
Medical first aid kit satisfactory	Yes/No
	Date of expiry
<u>LOADLINE/HULL STRUCTURE</u>	
Loadlines and freeboard marks inspected	Yes/ No
Deck plating & general structure satisfactory	Yes/ No
Weathertight doors/closures for ventilators, airpipes and openings where downflooding may occur, satisfactory	Yes/No
Hatch covers/seals/gaskets/securing devices satisfactory	Yes/No
Hatch coamings satisfactory	Yes/ No
Bulkheads, frames and plating of cargo holds satisfactory	Yes/ No
Ventilators/air pipes satisfactory	Yes/ No
Shipside rails/bulwarks satisfactory	Yes/ No
Freeing port openings/flaps satisfactory	Yes/No
<u>ENGINE ROOM AND MACHINERY</u>	
Engine Room cleanliness satisfactory	Yes/No
Main and Auxiliary machinery satisfactory	Yes/No
Emergency power source inspected	Yes/No
Emergency power source tested on load	Yes/No
Natural and powered ventilation satisfactory	Yes/No
Engine exhaust and lagging satisfactory	Yes/ No
Propeller & shafting satisfactory	Yes/ No
Engine controls satisfactory	Yes/No
Fuel system tanks/pipes/hoses satisfactory	Yes/ No
Steering gear satisfactory	Yes/No
Emergency steering gear satisfactory	Yes/No
Emergency steering gear change over instructions displayed	Yes/No
Bilge pumping/piping arrangement satisfactory	Yes/No
Bilge level alarm satisfactory	Yes/No

Appendix 7.2 Marine Survey Office Checklist for Class IV, V & VI Passenger Vessels

MSO 1002 CHECKLIST FOR CLASS IV, V & VI (Rev 1.0)

MOORING ARRANGEMENTS

Windlass, anchors and cables satisfactory Yes/No
 Mooring ropes and wires satisfactory Yes/No

NAVIGATION

Shipborne navigational equipment satisfactory Yes/No
 Charts & publications satisfactory Yes/No
 Radar inspected in good condition Yes/No
 Magnetic compass satisfactory Yes/No
 Navigation lights, shapes and sound signals satisfactory Yes/No

ACCOMMODATION

Ventilation, heating and lighting satisfactory Yes/No
 Sanitary facilities satisfactory Yes/No

DRILLS

Fire & abandon ship drills satisfactory Yes/No

DSM

~~Domestic Safety Management system satisfactory Yes/No~~

OPERATIONAL REQUIREMENTS

Damage control, abandon ship and firefighting satisfactory Yes/No
 Communication between key crew members and with passengers
 on board satisfactory Yes/No

RADIO EQUIPMENT

Radio equipment corresponding to the radio certificate and
 fulfilling the functional requirements Yes/No
 VHF installation satisfactory Yes/No
~~SART satisfactory Yes/No~~
~~Satellite EPIRB inspected and satisfactory Yes/No~~
 Source of energy satisfactory Yes/No
 Facilities for receiving marine safety information satisfactory Yes/No
 Competency of GMDSS operator satisfactory Yes/No
 Maritime Mobile Service Identities (MMSI) of radio installations
 Correct Yes/No
~~Radar Transponder satisfactory Yes/No~~
 Antenna condition satisfactory Yes/No
 Maintenance of equipment satisfactory Yes/No.

Appendix 7.2 Marine Survey Office Checklist for Class IV, V & VI Passenger Vessels

MSO 1002 CHECKLIST FOR CLASS IV,V&VI (Rev 1.0)

ACCIDENT PREVENTION

Access to the ship and working spaces satisfactory	Yes/No
Deck openings and machinery presenting hazards to personnel satisfactorily protected	Yes/No
Warning notices or signs displayed	Yes/No

MARPOL

Sewage holding/treatment satisfactory	Yes/No
---------------------------------------	--------

CERTIFICATES/DOCUMENTS

Passenger Certificate	Yes/No
Certificates of competency/service/permits satisfactory	Yes/No
Number of crew on board satisfactory	Yes/No
Stability Information satisfactory	Yes/No
Ships log book with respect to the records of tests & drills and the log for records of inspection & maintenance of lifesaving appliances and arrangements satisfactory	Yes/No
Certificate of Registry satisfactory	Yes/No

ELECTRICAL

Batteries/ battery box satisfactory	Yes/No
Wiring installation satisfactory	Yes/No
Instrument panels satisfactory	Yes/No
Emergency lighting system satisfactory	Yes/No

Appendix 7.3 Photograph No. 1 - Return Fuel Line Shut Off Valve



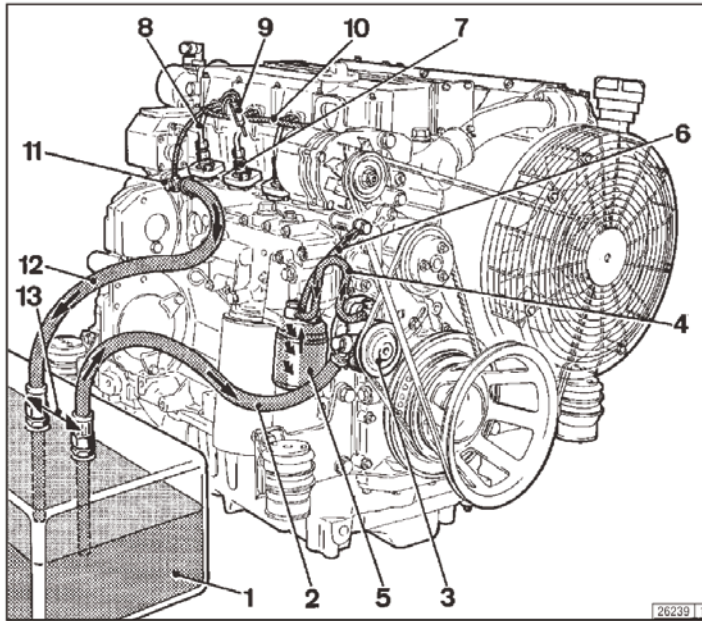
Appendix 7.4 Fuel System

Engine Description

2.4 Fuel System

2

2.4.1 Fuel System Schematic



- 1 Fuel tank
- 2 Line to fuel pump
- 3 Fuel pump
- 4 Line to fuel filter
- 5 Fuel filter
- 6 Line to injection pumps
- 7 Injection pump
- 8 Line to injector
- 9 Injector
- 10 Back leak fuel pipe
- 11 Banjo bolt with pressure-regulating valve
- 12 Return line to fuel tank
- 13 Keep this spacing as wide as possible

Appendix 7.5 Photograph No. 2 - Starboard Machinery Space Access Door



Appendix 7.6 Met Éireann Weather Report



Met Éireann

The Irish Meteorological Service

Climate Services
Glasnevin Hill
Dublin 9

Seirbhísí Aeráide
Cnoc Ghlas Naíon
Baile Átha Cliath 9

Tel: +353-1-8064260
Email: enq@met.ie
Email: legal@met.ie

Marine Casualty Investigation Board
Leeson Lane
Dublin 2

Sent by post and email: info@mcib.ie

04/02/2022

Our Ref: WS1730/2202_5
Your Ref: MCIB/12/311

Estimated weather conditions for location: Mid-river between Passage East Harbour and Ballyhack Harbour (approximate in decimal degrees: 52.24 -6.96) on Thursday 5th August 2021 between 06:00 and 18:00 hours Local Time (=UTC+1)

Dear Madam/Sir,

Please find below the requested weather report.

An invoice for €90 plus VAT will follow by email, please include invoice and reference number with your payment. Please note Met Éireann no longer accepts cheques.

Should you have questions or queries with regard to the enclosed report please contact Climate Services – Legal Unit on legal@met.ie and please include the reference number of this report in the subject line.

Yours sincerely,



Appendix 7.6 Met Éireann Weather Report



Met Éireann

The Irish Meteorological Service

Climate Services
Glasnevin Hill
Dublin 9

Seirbhísí Aeráide
Cnoc Ghlas Naíon
Baile Átha Cliath 9

Tel: +353-1-8064260
Email: enq@met.ie
Email: legal@met.ie

Our Ref: WS1730/2202_5
Your Ref: MCIB/12/311

Estimated weather conditions for location: Mid-river between Passage East Harbour and Ballyhack Harbour (approximate location (decimal degrees): 52.24 - 6.96) on Thursday 5th August 2021 between 06:00 and 18:00 hours Local Time (=UTC+1)

Meteorological Synopsis: A slow-moving depression (990hPa) with active frontal troughs (occlusion) tracked eastwards over Ireland on 5-August-2021.

Wind: Winds in the Passage East Harbour & Ballyhack Harbour area were fresh to strong at first on the morning of the 5th, south-southeasterly Beaufort Force 5 or 6 (mean speed 17 - 22 knots) and gusts up to 35 knots occurred between 7am and 9am. By forenoon winds had veered southwesterly and eased to moderate Beaufort Force 4 and remained so for the rest of the day (mean wind speed 12 – 16 knots) with gusts up to 22 knots.

Weather: Overcast and misty in the morning with persistent rain and heavy falls between 6am and 9am was followed by a mostly dry period with variable cloud, sunny spells and isolated passing showers until around 3pm when showers became frequent and heavy. Between 5pm and 7pm a band of persistent rain with heavy thundery downpours affected the area in question.

Visibility: Visibility was moderate to poor (1 – 4 nm) in mist, rain and heavy showers otherwise visibility was good (greater than 5 nm).

Temperature: Air temperature ranged between a minimum of 14 degrees Celsius in the morning to a maximum of 18 or 19 degrees Celsius in the early afternoon.

Sea temperature: 15 to 16 degrees Celsius at M5.

This report was issued on: 04 February 2022

Appendix 7.6 Met Éireann Weather Report



Met Éireann

The Irish Meteorological Service

Climate Services
Glasnevin Hill
Dublin 9

Seirbhísí Aeráide
Cnoc Ghlas Naíon
Baile Átha Cliath 9

Tel: +353-1-8064260
Email: enq@met.ie
Email: legal@met.ie

Appendix 1a Observations nearby land-based Daily Station Report station Johnstown Castle Co Wexford (approximately 30 km east of the location)

Daily Station Report

Station: JOHNSTOWN CASTLE 2 Date: 05-Aug-2021

Hour (utc)	ind	Rainfall (mm)	Temperature (C)	Dew Pt (C)	RH (per)	MSL (hpa)	Wind Sp (kt)	Wind Dir (deg)
1	0	0.0	15.1	14.1	93	1004.9	10	180
2	0	0.0	15.1	13.8	92	1003.9	9	180
3	0	0.2	14.8	14.0	94	1002.4	11	180
4	0	0.0	14.7	13.3	91	1001.5	10	170
5	0	0.4	14.2	13.3	94	1000.1	11	160
6	0	0.2	14.2	13.6	96	998.8	14	160
7	0	0.0	14.5	14.2	98	997.7	16	160
8	0	4.0	15.1	14.9	98	996.5	16	160
9	0	3.1	15.5	15.5	99	996.2	16	170
10	0	1.4	16.0	15.9	99	995.9	13	190
11	0	0.0	16.5	16.3	98	995.0	10	200
12	0	0.0	16.9	16.1	95	994.4	10	210
13	0	0.0	17.3	15.4	88	993.9	11	210
14	0	0.0	17.9	15.8	87	993.7	11	210
15	0	0.0	16.8	15.3	91	993.2	11	210
16	0	0.0	17.4	15.0	85	992.7	11	210
17	0	0.0	16.6	15.0	90	992.7	11	210
18	0	0.0	16.3	14.8	91	992.2	10	210
19	0	0.0	16.0	15.0	93	992.2	9	220
20	0	0.0	15.6	14.6	93	992.1	9	220
21	0	0.0	15.5	14.8	95	992.2	8	230
22	0	0.0	15.4	14.9	96	992.3	4	250
23	0	0.0	15.4	14.5	94	992.3	6	260
24	0	0.0	15.3	14.2	93	992.4	7	260

Daily Weather Summary (00 to 00 utc)

Max Temp (C)	Min Temp	Grass Min (C)	Rainfall (mm)	Mean Wind Speed (kt)	Max Gust (kt)	Sun (hours)
18.2	14.1	13.8	9.3	10.5	28	

Appendix 7.6 Met Éireann Weather Report



Met Éireann

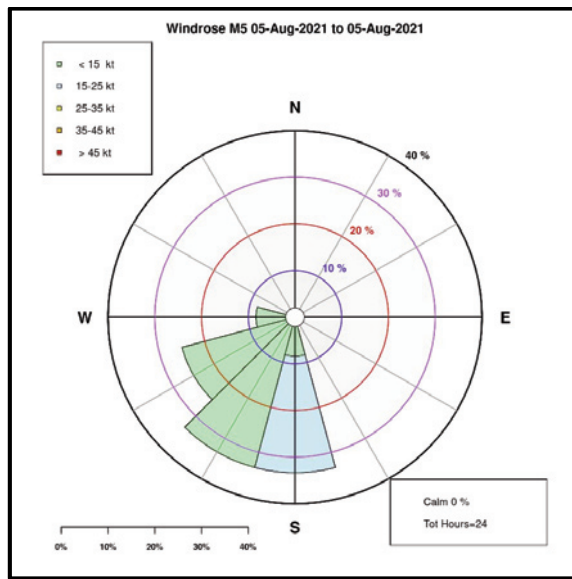
The Irish Meteorological Service

Climate Services
Glasnevin Hill
Dublin 9

Seirbhísí Aeráide
Cnoc Ghlas Naíon
Baile Átha Cliath 9

Tel: +353-1-8064260
Email: enq@met.ie
Email: legal@met.ie

Appendix 1b Observations Buoy M5 (id=62094) Buoy M5 is located off the south Wexford coast south of Hook Head



Daily Buoy Report
Buoy M5 62094 Date: 05-Aug-2021

Hour (utc)	Temp (C)	Rel Hum (percent)	Wind Speed (kt)	Wind Dir (deg)	CBL Pressure (hpa)	Sea Period (s)	Sea Height (m)	Sea Temp (C)
1	16.2	85.547	13.554	194.414	1005.2	3.984	1.1	15.6
2	16.1	85.449	15.034	195.117	1004.0	3.984	1.2	15.6
3	16.0	86.523	17.312	188.789	1002.6	3.867	1.2	15.6
4	14.9	91.504	22.096	179.648	1001.0	3.984	1.6	15.4
5	15.0	92.969	20.957	172.969	999.7	4.336	1.9	15.4
6	15.2	95.508	21.754	171.562	998.4	4.688	2.0	15.4
7	15.5	95.605	21.185	171.914	997.3	4.688	2.3	15.4
8	15.8	95.996	19.363	179.648	996.9	5.273	2.7	15.3
9	16.1	96.094	13.668	198.281	996.5	5.391	2.7	15.3
10	15.7	94.824	12.529	215.508	996.2	5.273	2.3	15.3
11	15.9	93.457	13.212	226.758	996.0	5.625	2.4	15.3
12	15.7	95.508	10.820	205.312	995.5	5.625	2.3	15.3
13	16.0	93.750	13.326	223.242	995.0	5.391	2.0	15.3
14	15.5	95.410	13.895	222.891	994.7	5.156	1.8	15.3
15	15.5	95.312	10.934	215.508	994.2	5.391	2.0	15.4
16	15.8	95.215	12.756	221.133	993.7	5.391	2.0	15.3
17	16.4	90.723	14.237	238.359	993.6	5.273	2.0	15.4
18	16.3	91.895	11.959	233.438	993.4	5.508	2.1	15.4
19	16.3	92.383	14.351	228.164	993.2	5.156	2.0	15.4
20	16.0	93.945	13.440	235.195	993.3	5.156	1.9	15.4
21	16.1	93.164	12.301	246.094	993.4	5.391	2.0	15.4
22	16.2	92.773	14.123	256.641	993.7	5.508	2.1	15.4
23	16.3	92.090	14.351	269.297	993.6	5.391	2.1	15.3
24	16.3	89.453	16.059	261.914	994.0	5.742	2.3	15.3

Appendix 7.6 Met Éireann Weather Report



Met Éireann

The Irish Meteorological Service

Climate Services

Glasnevin Hill

Dublin 9

Seirbhíse Aeráide

Cnoc Ghlas Naíon

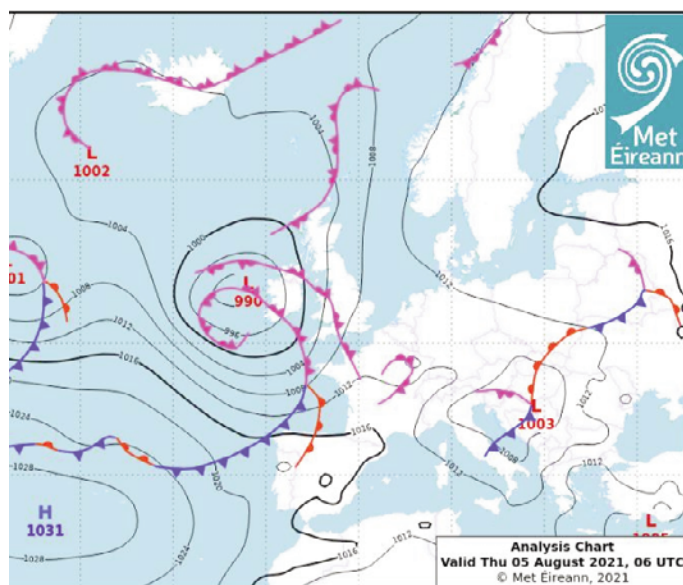
Baile Átha Cliath 9

Tel: +353-1-8064260

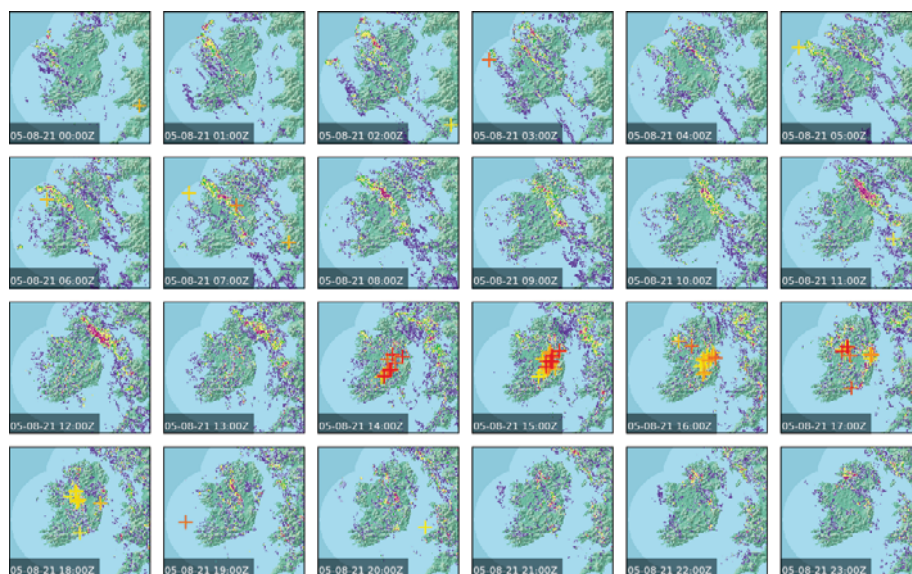
Email: enq@met.ie

Email: legal@met.ie

Appendix 1c Synoptic surface chart 06UTC 5-Aug-2021





Appendix 1d 24 hour Rainfall plus lightning (sferics) Radar Images 5-Aug-2021



Met Éireann | Climate Services | Legal Unit | Email: legal@met.ie


Appendix 7.6 Met Eireann Weather Report

	<p>Text of Gale Warning</p> <p>Nil</p> <p>Text of Small Craft Warning</p> <p>1. South to southeast winds will reach force 6 or higher at times tonight (Wednesday), and tomorrow (Thursday) on all Irish Coasts. 2. Northwesterly winds will reach force 6 or higher on Thursday afternoon on Irish Coasts from Hook Head to Mizen Head to Erris Head.</p> <p>Coastal Reports</p> <p>Malin Head Automatic East, 9 Knots, Moderate rain, 3 Miles, 1004, Falling</p> <p>Dublin Airport South-Southeast, 4 Knots, Cloudy, 26 Miles, 1006, Falling slowly</p> <p>Buoy M5 51° 41'N 6° 42'W South-Southwest, 12 Knots, Wave ht: 1.1 m, The visibility at Tuskar is greater than 10 Miles, 1008, Falling slowly</p> <p>Roches Point Automatic South, 15 Knots, Cloudy, 18 Miles, 1005, Falling</p> <p>Sherkin Island Automatic South, 19 Knots, Cloudy, 21 Miles, 1004, Falling</p> <p>Valentia Automatic South, 9 Knots, Gust 22 Knots, Rain Shower, 10 Miles, 1002, Falling rapidly</p> <p>Mace Head Automatic Southeast, 12 Knots, Cloudy, 26 Miles, 1002, Falling</p> <p>Belmullet Automatic East-Southeast, 7 Knots, Cloudy, 21 Miles, 1002, Falling</p> <p>Buoy M1 53° 8'N, 11° 12'W Report not available</p> <p>Buoy M2 53° 29'N, 5° 26'W South, 16 Knots, Wave ht: 1.1 m, 1007, Falling slowly</p> <p>Buoy M3 51° 13'N, 10° 33'W South, 25 Knots, Wave ht: 1.6 m, 1002, Falling rapidly</p> <p>Buoy M4 56° 07'N 10° 0'W Southeast, 9 Knots, Wave ht: 1.1 m, 1003, Falling</p> <p>Buoy M6 53° 47'N 15° 56'W Southwest, 15 Knots, Wave ht: 2.2 m, 992, Falling slowly</p> <p>Disclaimer: buoy locations are approximate and are not for navigational purposes</p> <p>Sea Crossings</p> <p>Dublin - Holyhead Moderate</p> <p>Rosslare - South Wales Moderate increasing rough on Thursday night, decreasing moderate Friday night</p> <p>Cork - South Wales Moderate increasing rough on Thursday night, decreasing moderate Friday night</p> <p>Rosslare - France Moderate, increasing rough to very rough Thursday evening, decreasing moderate to rough Friday night</p> <p>Cork - France Moderate, increasing rough to very rough Thursday evening, decreasing moderate to rough Friday night</p> <p>Next update before 0700 Thursday, 05 August 2021</p>
	<h3>24-hour Sea Area Forecast</h3> <p>Updated at 0000 / 0600 / 1200 / 1800</p> <p>Sea Area Forecast until 0000 Friday, 6 August 2021 Issued at 0000 Thursday, 5 August 2021</p> <p>1. Gale warning: Nil Small craft warning: In operation</p> <p>2. Meteorological situation at 2100: Ireland lies in a strengthening southerly airflow associated with an approaching 983hPa low situated 250nm west of Belmullet as a showery occlusion approaches the west coast and will track over the country tonight followed by a very unstable airmass with embedded troughs on Thursday.</p> <p>3. Forecast for Irish coastal waters from Carnsore Point to Mizen Head to Erris Head</p> <p>Wind: Southerly force 5 to 7 and gusty, gradually veering southwest to west and easing force 4 to 6. Later further veering west to northwest and increasing force 5 to 7 and gusty.</p> <p>Weather: Showery outbreaks of rain, heavy and possibly thundery. Soon scattered showers and Thunderstorms.</p> <p>Visibility: Moderate or poor in precipitation, otherwise moderate to good.</p> <p>Forecast for Irish coastal waters from Erris Head to Rossan Point to Bloody Foreland</p> <p>Wind: Southeast force 4 to 6 imminently. Later becoming cyclonic variable force 2 to 4, occasionally reaching northwesterly force 5 south of Rossan point by the end of the period.</p> <p>Weather: Showery outbreaks of rain, heavy and possibly thundery. Soon scattered showers and Thunderstorms.</p> <p>Visibility: Moderate or poor in precipitation, otherwise moderate to good.</p> <p>Forecast for Irish coastal waters from Bloody Foreland to Belfast Lough to Carnsore Point and for the Irish Sea</p> <p>Wind: Southeast force 4 to 6 imminent. Soon increasing force 5 to 7 and gusty. Later gradually decreasing south to southeast force 4 or 5.</p> <p>Weather: Scattered showers, merging to rain overnight, heavy and possibly thundery. Later, scattered showers and Thunderstorms.</p> <p>Visibility: Moderate or poor in precipitation, otherwise moderate to good.</p> <p>Warning of Heavy Swell: Nil</p> <p>4. Outlook for a further 24 hours until 0000 Saturday 07 August 2021: Fresh to near gale mainly westerly winds, but becoming light to moderate easterly in northern sea areas. Weather: Showers or longer spells of heavy rain. Ongoing risk of thunderstorms and hail, especially in the north and west.</p> <p>Forecasts provided by Met Eireann. Customer Services (Tel) 01-8064244. (Email) customer.liaison@met.ie. Met Eireann Copyright.</p>

Appendix 7.6 Met Eireann Weather Report

<div style="text-align: right; font-size: small;">Weather Forecast From Met Eireann</div> <div style="text-align: center; font-weight: bold; font-size: 24px; margin-top: 20px;">24-hour Sea Area Forecast</div> <div style="text-align: center; font-size: small;"> Updated at 0000 / 0600 / 1200 / 1800 Sea Area Forecast until 0600 Friday, 6 August 2021 Issued at 0600 Thursday, 5 August 2021 </div> <div style="margin-top: 10px;"> <p>1. Gale warning: Nil Small craft warning: In operation</p> <p>2. Meteorological situation at 0300: Ireland lies in a strong southerly airflow associated a 960hPa low situated 100nm west of Belmullet, as a showery occlusion tracks across the country, this will be followed by an unstable airmass today with embedded troughs in the flow.</p> <p>3. Forecast for Irish coastal waters from Carnsore Point to Roschees Point to Loop Head Wind: Southerly force 5 to 7 and gusty, imminently veering westerly and easing force 4 to 6. Later, further veering west to northwest and increasing force 5 to 7 and gusty. Weather: Scattered showers and thunderstorms. Later becoming mostly fair with isolated showers. Visibility: Moderate or poor in precipitation, otherwise moderate to good.</p> <p>Forecast for Irish coastal waters from Loop Head to Slyne Head to Rossan Point Wind: Southeast force 4 to 6 imminently becoming westerly or cyclonic variable force 2 to 4, later becoming northwesterly and increasing force 4 to 6 and gusty. Weather: Showery outbreaks of rain, heavy and possibly thundery. Soon scattered showers and thunderstorms. Later showers or longer spells of rain. Visibility: Moderate or poor in precipitation, otherwise moderate to good.</p> <p>Forecast for Irish coastal waters from Rossan Point to Malin Head to Belfast Lough Wind: Southeast to east force 4 to 6. Soon gradually easing easterly or cyclonic variable force 2 to 4. Later further easing cyclonic variable force 3 or less. Weather: Showery outbreaks of rain, heavy and possibly thundery at times. Visibility: Moderate or poor in precipitation, otherwise moderate to good.</p> <p>Forecast for Irish coastal waters from Belfast Lough to Howth Head to Carnsore Point and for the Irish Sea Wind: South to southeast force 5 to 7 imminent. Later easing south to southeast force 3 to 5 before veering southwest to west force 3 to 5, occasionally reaching force 6 in the south Irish Sea by the end of the period. Weather: Showery outbreaks of rain, heavy and possibly thundery at times. Soon, scattered showers and isolated thunderstorms. Visibility: Moderate or poor in precipitation, otherwise moderate to good.</p> <p>Warning of Heavy Swell: Nil</p> <p>4. Outlook for a further 24 hours until 0600 Saturday 07 August 2021: Generally fresh to strong west to northwest winds occasionally reaching near gale. Remaining light to moderate easterly or cyclonic variable in northern sea areas until Friday night when winds will back west to northwest and fresher. Weather: Showers or longer spells of heavy rain with an ongoing risk of thunderstorms and hail in the north and west, becoming mostly fair in the south.</p> </div>	<div style="text-align: right; font-size: small;">Weather Forecast From Met Eireann</div> <div style="margin-top: 10px;"> <p>Text of Gale Warning Nil</p> <p>Text of Small Craft Warning 1. South to southeast winds will reach force 6 or higher at times today (Thursday) on Irish Coasts from Slyne Head to Belfast Lough to Roschees Point. 2. Northwesterly winds will reach force 6 or higher at times this evening (Thursday) and overnight on Irish Coasts from Carnsore Point to Valentia to Rossan Point.</p> </div> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <td style="width: 20%;">Coastal Reports</td> <td>5 AM Thursday, 05 August 2021</td> </tr> <tr> <td>Malin Head Automatic</td> <td>Southeast, 7 Knots, Cloudy, 18 Miles, 999, Falling</td> </tr> <tr> <td>Dublin Airport</td> <td>South-Southeast, 8 Knots, Cloudy, 13 Miles, 1001, Falling</td> </tr> <tr> <td>Buoy M5 51° 41'N 6° 42'W</td> <td>South, 22 Knots, Wave ht. 1.0 m, The visibility at Tuskar is 9 Miles, 1001, Falling rapidly</td> </tr> <tr> <td>Roschees Point Automatic</td> <td>South-Southeast, 23 Knots, Gust 34 Knots, Mod rain shower, 1.2 Miles, 997, Falling rapidly</td> </tr> <tr> <td>Sherkin Island Automatic</td> <td>South-Southwest, 15 Knots, Recent drizzle, 4 Miles, 996, Falling rapidly</td> </tr> <tr> <td>Valentia Automatic</td> <td>South-Southwest, 11 Knots, Recent drizzle, 5 Miles, 994, Falling</td> </tr> <tr> <td>Mace Head Automatic</td> <td>Southeast, 22 Knots, Rain shower, 2 Miles, 993, Falling rapidly</td> </tr> <tr> <td>Belmullet Automatic</td> <td>East-Southeast, 14 Knots, Recent drizzle, 21 Miles, 994, Falling rapidly</td> </tr> <tr> <td>Buoy M1 53° 8'N, 11° 12'W</td> <td>Report not available</td> </tr> <tr> <td>Buoy M2 53° 29'N, 6° 26'W</td> <td>South-Southeast, 20 Knots, Wave ht. 1.4 m, 1002, Falling</td> </tr> <tr> <td>Buoy M3 51° 13'N, 10° 33'W</td> <td>West-Southwest, 19 Knots, Wave ht. 2.2 m, 995, Falling</td> </tr> <tr> <td>Buoy M4 55° 0'N 10° 0'W</td> <td>Southeast, 18 Knots, Wave ht. 1.3 m, 996, Falling rapidly</td> </tr> <tr> <td>Buoy M6 53° 4'N 15° 56'W</td> <td>West-Northwest, 16 Knots, Wave ht. 2.1 m, 990, Falling slowly</td> </tr> </table> <p style="font-size: x-small;">Disclaimer: buoy locations are approximate and are not for navigational purposes</p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <td style="width: 20%;">Sea Crossings</td> <td>State of sea until 0600 Saturday 07 August 2021</td> </tr> <tr> <td>Dublin - Holyhead</td> <td>Moderate</td> </tr> <tr> <td>Rosslare - South Wales</td> <td>Moderate increasing rough on Thursday night, decreasing moderate Friday night</td> </tr> <tr> <td>Cork - South Wales</td> <td>Moderate increasing rough on Thursday night, decreasing moderate Friday night</td> </tr> <tr> <td>Rosslare - France</td> <td>Moderate, increasing rough to very rough Thursday evening, decreasing moderate to rough Friday night</td> </tr> <tr> <td>Cork - France</td> <td>Moderate, increasing rough to very rough Thursday evening, decreasing moderate to rough Friday night</td> </tr> </table> <div style="margin-top: 10px;"> <p>Next update before 1300 Thursday, 05 August 2021 A detailed forecast may be obtained by dialing If weatherline on 1550 123 855.</p> </div> <div style="text-align: right; font-size: x-small; margin-top: 10px;"> Forecasts provided by Met Eireann. Customer Services (Tel) 01-8964244, (Email) customer.liaison@met.ie, Met Eireann Copyright. </div>	Coastal Reports	5 AM Thursday, 05 August 2021	Malin Head Automatic	Southeast, 7 Knots, Cloudy, 18 Miles, 999, Falling	Dublin Airport	South-Southeast, 8 Knots, Cloudy, 13 Miles, 1001, Falling	Buoy M5 51° 41'N 6° 42'W	South, 22 Knots, Wave ht. 1.0 m, The visibility at Tuskar is 9 Miles, 1001, Falling rapidly	Roschees Point Automatic	South-Southeast, 23 Knots, Gust 34 Knots, Mod rain shower, 1.2 Miles, 997, Falling rapidly	Sherkin Island Automatic	South-Southwest, 15 Knots, Recent drizzle, 4 Miles, 996, Falling rapidly	Valentia Automatic	South-Southwest, 11 Knots, Recent drizzle, 5 Miles, 994, Falling	Mace Head Automatic	Southeast, 22 Knots, Rain shower, 2 Miles, 993, Falling rapidly	Belmullet Automatic	East-Southeast, 14 Knots, Recent drizzle, 21 Miles, 994, Falling rapidly	Buoy M1 53° 8'N, 11° 12'W	Report not available	Buoy M2 53° 29'N, 6° 26'W	South-Southeast, 20 Knots, Wave ht. 1.4 m, 1002, Falling	Buoy M3 51° 13'N, 10° 33'W	West-Southwest, 19 Knots, Wave ht. 2.2 m, 995, Falling	Buoy M4 55° 0'N 10° 0'W	Southeast, 18 Knots, Wave ht. 1.3 m, 996, Falling rapidly	Buoy M6 53° 4'N 15° 56'W	West-Northwest, 16 Knots, Wave ht. 2.1 m, 990, Falling slowly	Sea Crossings	State of sea until 0600 Saturday 07 August 2021	Dublin - Holyhead	Moderate	Rosslare - South Wales	Moderate increasing rough on Thursday night, decreasing moderate Friday night	Cork - South Wales	Moderate increasing rough on Thursday night, decreasing moderate Friday night	Rosslare - France	Moderate, increasing rough to very rough Thursday evening, decreasing moderate to rough Friday night	Cork - France	Moderate, increasing rough to very rough Thursday evening, decreasing moderate to rough Friday night
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Buoy M1 53° 8'N, 11° 12'W	Report not available																																								
Buoy M2 53° 29'N, 6° 26'W	South-Southeast, 20 Knots, Wave ht. 1.4 m, 1002, Falling																																								
Buoy M3 51° 13'N, 10° 33'W	West-Southwest, 19 Knots, Wave ht. 2.2 m, 995, Falling																																								
Buoy M4 55° 0'N 10° 0'W	Southeast, 18 Knots, Wave ht. 1.3 m, 996, Falling rapidly																																								
Buoy M6 53° 4'N 15° 56'W	West-Northwest, 16 Knots, Wave ht. 2.1 m, 990, Falling slowly																																								
Sea Crossings	State of sea until 0600 Saturday 07 August 2021																																								
Dublin - Holyhead	Moderate																																								
Rosslare - South Wales	Moderate increasing rough on Thursday night, decreasing moderate Friday night																																								
Cork - South Wales	Moderate increasing rough on Thursday night, decreasing moderate Friday night																																								
Rosslare - France	Moderate, increasing rough to very rough Thursday evening, decreasing moderate to rough Friday night																																								
Cork - France	Moderate, increasing rough to very rough Thursday evening, decreasing moderate to rough Friday night																																								

Appendix 7.6 Met Eireann Weather Report




24-hour Sea Area Forecast

Updated at 0000 / 0600 / 1200 / 1800

Sea Area Forecast until 1200 Friday, 6 August 2021
Issued at 1200 Thursday, 5 August 2021

- 1. Gale warning:** Nil
Small craft warning: In operation
- 2. Meteorological situation at 0900:** Ireland lies in a mainly fresh to strong and unstable southerly airflow with a depression of 990hPa centred off the west coast. Associated showery troughs will track across the country today.
- 3. Forecast for Irish coastal waters from Strangford Lough to Howth Head to Carnsore Point and for the Irish Sea**
Wind: Southeast to south force 6 or 7, decreasing force 5 or 6 and gusty imminently. Soon veering south to southwest force 4 or 5, later increasing southwest to west force 5 or 6.
Weather: Heavy rain, possibly thunder at times. Soon clearing to scattered heavy showers with the risk of thunderstorms.
Visibility: Moderate or poor in precipitation.
- Forecast for Irish coastal waters from Carnsore Point to Roches Point to Loop Head**
Wind: West to northwest force 5 to 7 and gusty imminent, strongest in the southwest. Soon becoming force 6 or 7 and gusty, later decreasing force 5 or 6 and gusty.
Weather: Scattered showers, heavy at times with the risk of thunderstorms. Later becoming fair apart from isolated showers.
Visibility: Moderate or poor in precipitation, otherwise good.
- Forecast for Irish coastal waters from Loop Head to Slyne Head to Erris Head**
Wind: Northwest force 4 or 5 imminent, soon increasing force 5 or 6 and gusty. Later increasing west to northwest force 6 or 7 and gusty.
Weather: Scattered heavy showers with the risk of thunderstorms. Longer spells of rain developing later.
Visibility: Moderate or poor in precipitation.
- Forecast for Irish coastal waters from Erris Head to Malin Head to Strangford Lough**
Wind: Southeast to south force 5 or 6 and gusty, but force 3 or 4 between Erris Head and Bloody Foreland. Soon becoming cyclonic variable force 3 or 4 and gusty. Later decreasing cyclonic variable force 3 or less, but remaining force 3 or 4 between Erris Head and Rossan Point.
Weather: Heavy rain, possibly thunder at times, imminently clearing to scattered heavy showers with the risk of thunderstorms.
Visibility: Moderate or poor in precipitation.
- Warning of Heavy Swell:** Nil
- 4. Outlook for a further 24 hours until 1200 Saturday 07 August 2021:** Fresh to strong and gusty westerly winds generally, near gale force at times in the west. Winds will be light to moderate cyclonic variable on northern sea areas. Heavy showers or longer spells of rain with an ongoing risk of hail and thunderstorms in the west and north.



Text of Gale Warning
Nil

Text of Small Craft Warning
1. Southeast to south winds will reach force 6 or higher at times today (Thursday) on Irish coasts from Malin Head to Carlingford Lough to Carnsore Point.
2. West to northwest winds will reach force 6 or higher at times this evening (Thursday), tonight and tomorrow (Friday) on Irish coasts from Carlingford Lough to Roches Point to Rossan Point.

Coastal Reports
11 AM Thursday, 05 August 2021

Malin Head Automatic	East-Southeast, 17 Knots, Rain shower, 7 Miles, 995, Falling
Dublin Airport	Southeast, 17 Knots, Gust 28 Knots, Mod rain, 3 Miles, 995, Falling
Buoy M6 51° 41'N 6° 42'W	Southwest, 13 Knots, Wave ht: 2.3 m, The visibility at Tuskar is 5 Miles, 996, Falling slowly
Roches Point Automatic	South-Southwest, 16 Knots, Cloudy, 10 Miles, 994, Falling slowly
Sherkin Island Automatic	West-Southwest, 19 Knots, Recent rain, 8 Miles, 994, Falling slowly
Valentia Automatic	West-Southwest, 10 Knots, Recent rain, 15 Miles, 993, Steady
Mace Head Automatic	South, 5 Knots, Light rain, 4 Miles, 991, Falling slowly
Belmullet Automatic	South-Southeast, 8 Knots, Cloudy, 15 Miles, 991, Falling slowly
Buoy M1 53° 8'N, 11° 12'W	Report not available
Buoy M2 53° 29'N, 6° 26'W	South-Southeast, 21 Knots, Wave ht: 1.4 m, 997, Falling
Buoy M3 51° 13'N, 10° 33'W	West, 18 Knots, Wave ht: 2.3 m, 994, Steady
Buoy M4 55° 0'N, 10° 0'W	Southeast, 16 Knots, Wave ht: 2 m, 992, Falling slowly
Buoy M6 53° 41'N 15° 56'W	North-Northwest, 19 Knots, Wave ht: 2.1 m, 995, Rising rapidly


Disclaimer: buoy locations are approximate and are not for navigational purposes

Sea Crossings
Dublin - Holyhead
Moderate.
Rosslare - South Wales
Moderate, increasing rough to very rough on Thursday night. Decreasing rough on Friday morning and moderate on Friday night.
Cork - South Wales
Moderate, increasing rough to very rough on Thursday night. Decreasing rough on Friday morning and moderate on Friday night.
Rosslare - France
Moderate, increasing rough to very rough on Thursday night. Decreasing rough on Friday and moderate on Saturday morning.
Cork - France
Moderate, increasing rough to very rough on Thursday night. Decreasing rough on Friday and moderate on Saturday morning.

Next update before 1900 Thursday, 05 August 2021

Forecasts provided by Met Eireann. Customer Services (Tel) 01-8064244. (Email) customer.service@met.ie. Met Eireann Copyright.

Appendix 7.6 Met Eireann Weather Report



24-hour Sea Area Forecast
Updated at 0000 / 0600 / 1200 / 1800

Sea Area Forecast until 1800 Friday, 6 August 2021
Issued at 1800 Thursday, 5 August 2021

1. Gale warning: Nil
Small craft warning: In operation

2. Meteorological situation at 1500: Ireland lies in a mainly fresh to strong and unstable southerly veering westerly airflow with a depression of 980hPa centred over the northwest. Associated showery troughs track across the country.

3. Forecast for Irish coastal waters from Malin Head to Belfast Lough to Strangford Lough
Wind: Southeast force 6 and gusty, decreasing force 4 or 5 imminent. Soon becoming cyclonic variable force 3 or 4.
Weather: Heavy scattered showers with the risk of thunderstorms.
Visibility: Moderate or poor in precipitation.

Forecast for Irish coastal waters from Strangford Lough to Wicklow Head to Carnsore Point and for the Irish Sea
Wind: South force 4 or 5 and gusty. Soon veering southwest force 3 or 4. Later increasing force 5 or 6 and gusty.
Weather: Heavy scattered showers with the risk of thunderstorms.
Visibility: Moderate or poor in precipitation.


Forecast for Irish coastal waters from Carnsore Point to Mizen Head to Erris Head
Wind: West to northwest force 5 or 6, occasionally force 7 along southern coasts. Later west force 7 will develop between Loop Head and Slynne Head.
Weather: Scattered heavy showers with the risk of thunderstorms. Longer spells of rain developing later.
Visibility: Moderate or poor in precipitation.

Forecast for Irish coastal waters from Erris Head to Bloody Foreland to Malin Head
Wind: Cyclonic variable force 3 or 4. Later becoming north force 3 or 4, increasing force 4 or 5 by the end of the period.
Weather: Scattered heavy showers with the risk of thunderstorms.
Visibility: Moderate or poor in precipitation.

Warning of Heavy Swell: Nil

4. Outlook for a further 24 hours until 1800 Saturday 07 August 2021: Fresh to strong and gusty westerly winds generally, near gale force at times in the west. Winds will be light to moderate cyclonic variable on northern sea areas. Heavy showers or longer spells of rain with an ongoing risk of hail and thunderstorms in the west and north.

Forecasts provided by Met Eireann. Customer Services (Tel) 01-8064244. (Email) customer.liaison@met.ie. Met Eireann Copyright.



Weather Forecast From Met Eireann

Text of Gale Warning	Nil
Text of Small Craft Warning	1. Southeast to south winds will reach force 6 or higher at times this evening (Thursday) on Irish coasts from Malin Head to Belfast Lough to Carlingford Lough. 2. West to northwest winds will reach force 6 or higher at times this evening (Thursday), tonight and tomorrow (Friday) on Irish coasts from Strangford Lough to Mizen Head to Erris Head.

Coastal Reports	6 PM Thursday, 05 August 2021
Malin Head Automatic	East-Southeast, 22 Knots, Rain shower, 3 Miles, 992, Falling
Dublin Airport	East-Southeast, 6 Knots, Recent rain shower, 10 Miles, 991, Falling slowly
Buoy M5 51° 41'N 6° 42'W	Southwest, 13 Knots, Wave ht: 2 m, The visibility at Tuskar is greater than 10 Miles, 993, Falling slowly
Roches Point Automatic	South-Southwest, 16 Knots, Recent rain, 13 Miles, 992, Falling slowly
Sherkin Island Automatic	West-Southwest, 17 Knots, Mist, 3 Miles, 993, Falling slowly
Valentia Automatic	West, 13 Knots, Recent drizzle, 7 Miles, 993, Steady
Mace Head Automatic	West, 9 Knots, Fair, 24 Miles, 991, Steady
Beinn Bulbin Automatic	West-Northwest, 7 Knots, Cloudy, 16 Miles, 990, Steady
Buoy M1 53° 8'N, 11° 12'W	Report not available
Buoy M2 53° 29'N, 6° 28'W	South-Southeast, 17 Knots, Wave ht: 1.9 m, 992, Falling slowly
Buoy M3 51° 13'N, 10° 33'W	West, 22 Knots, Wave ht: 2.6 m, 994, Falling slowly
Buoy M4 55° 0'N 10° 0'W	North-Northeast, 6 Knots, Wave ht: 1.7 m, 991, Steady
Buoy M6 53° 4'N 16° 56'W	Northwest, 19 Knots, Wave ht: 4.5 m, 1000, Rising slowly

Disclaimer: buoy locations are approximate and are not for navigational purposes

Sea Crossings	State of sea until 1800 Saturday 07 August 2021
Dublin - Holyhead	Moderate
Rosslare - South Wales	Moderate, increasing rough to very rough on Thursday night. Decreasing rough on Friday morning and moderate on Friday night.
Cork - South Wales	Moderate, increasing rough to very rough on Thursday night. Decreasing rough on Friday morning and moderate on Friday night.
Rosslare - France	Moderate, increasing rough to very rough on Thursday night. Decreasing rough on Friday and moderate on Saturday morning.
Cork - France	Moderate, increasing rough to very rough on Thursday night. Decreasing rough on Friday and moderate on Saturday morning.

Next update before 0100 Friday, 06 August 2021
A detailed forecast may be obtained by dialing *Heatherradio* on 1550 123 855.

Forecasts provided by Met Eireann. Customer Services (Tel) 01-8064244. (Email) customer.liaison@met.ie. Met Eireann Copyright.

Appendix 7.6 Met Éireann Weather Report

**Met Éireann****The Irish Meteorological Service**Climate Services
Glasnevin Hill
Dublin 9Seirbhísí Aeráide
Cnoc Ghlas Naíon
Baile Átha Cliath 9

Tel: +353-1-8064260

Email: enq@met.ie

Email: legal@met.ie

Appendix 3b Terminology Sea State & Visibility**Wave Heights / State of Sea:**

The wave height is the vertical distance between the crest and the preceding or following trough. The table below gives a description of the wave system associated with a range of significant wave heights.

The Significant wave height is defined as the average height of the highest one-third of the waves. (It is very close to the value of wave height given when making visual observations of wave height.)

Sea State (Descriptive)	Significant Wave height in meters
Calm	0 – 0.1
Smooth (Wavelets)	0.1 – 0.5
Slight	0.5 – 1.25
Moderate	1.25 – 2.5
Rough	2.5 – 4
Very rough	4 – 6
High	6 – 9
Very high	9 – 14
Phenomenal	Over 14

Individual waves in the wave train will have heights in excess of the significant height. **The highest wave of all will have a height about twice the significant height.**

Visibility Descriptions:

Visibility (Descriptive)	Visibility in nautical miles (kilometres)
Good	More than 5 nm (> 9 km)
Moderate	2 – 5 nm (4 – 9 km)
Poor	0.5 – 2 nm (1 – 4 km)
Fog	Less than 0.5 nm (< 1km)

Please Note:

If there are no measurements or observations available for an exact location, then the estimated conditions in this report are based on all available meteorological measurements and observations which have been correlated on the routine charts prepared by Met Éireann.

Appendix 7.7 Photographs No. 3 to No. 11

Photograph No. 3 – Flame Impingement Path

Engine Compartment Flame Impingement Path



Flame Path is Outlined in Dashed Red Lines, from Left to Right. Flames scorched bulkhead surfaces aft to the Galley PortLight, cracking the Tempered Glass.

NOTE: Photos are not matching in scale.

Photograph No. 4 – Stop and Pull Handles

Engine Compartment Manual Pull Handles



Manual Pull Handles & Ventilation Fan Shut- off Control, Scorched from Fire.

Appendix 7.7 Photographs No. 3 to No. 11

Photograph No. 5 Galley Porthole

Crew Galley Port-Light

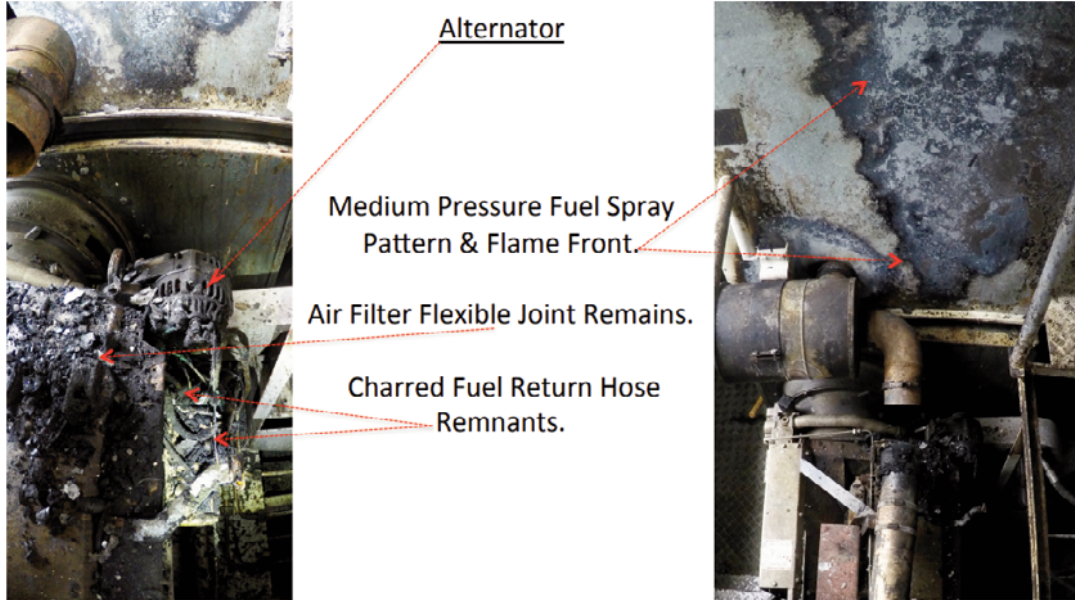
Flame Front extended aft to crack the Port-Light Glass

Photograph No. 6 – Alternator

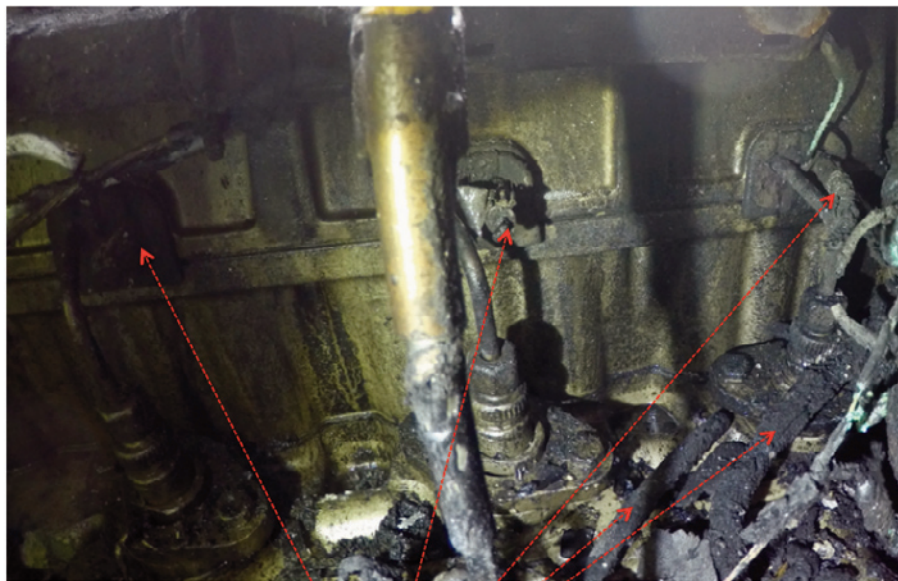
Remains of Engine Driven Alternator & Cables

Appendix 7.7 Photographs No. 3 to No. 11

Photograph No. 7 – Fuel Spray Path



Photograph No. 8 – Charred Fuel Hoses



Charred Fuel Return Hose Remnants.

Appendix 7.7 Photographs No. 3 to No. 11

Photograph No. 9 – Upper Machinery Space and Vent Fan



Photograph No. 10 – Flame Impingement on Air Ducting



The Spray Pattern of Fuel & Flame Impingement on Air Intake Ducting

Appendix 7.7 Photographs No. 3 to No. 11

Photograph No. 11 – Drive End of Engine



Intake Boot & Breather hoses.

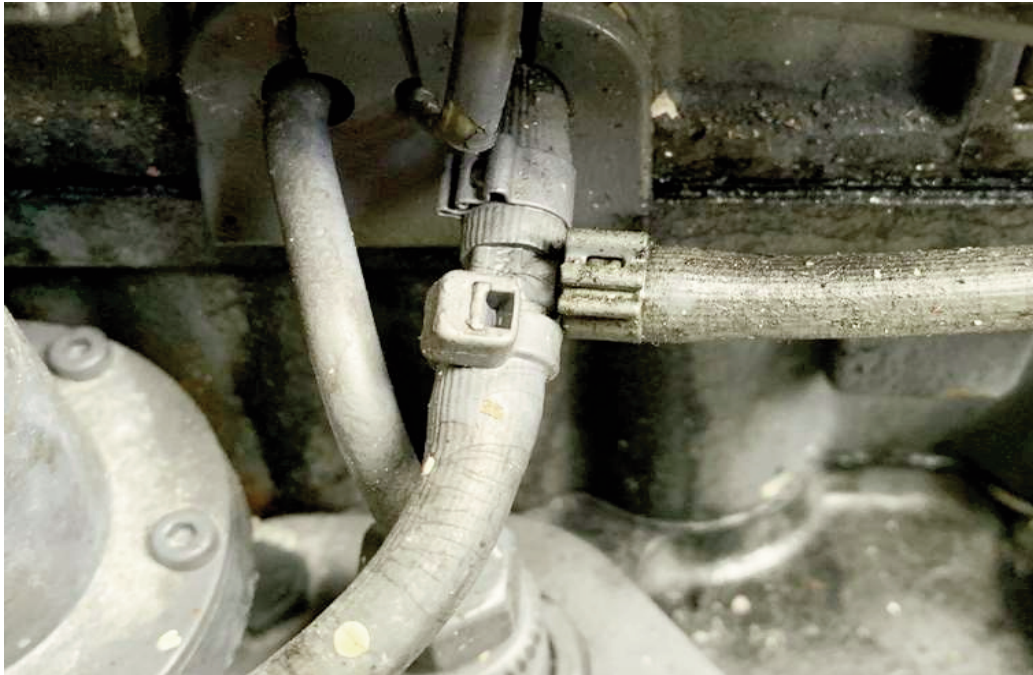
Engine Control Cables

Totally Damaged beyond repair.

The Spray Pattern of Fuel & Flame Impingement on Engine Drive-End Accessories.

Appendix 7.8 Photograph No. 12 - Return Fuel Line Attachments

Refurbished Core Engine Fuel Return Hoses,
Typical arrangement.



Appendix 7.9 Fire Drill



FIRE

Fire/Explosion

Engine room fire

Captain

- Indicate by P.A./radio to ticket collector and gate attendant, which engine / fire alarm
- Co-ordinate fire fighting
- *Stop engine and fans
- Pax CONTROL BY p.a.
- Give command to drop Anchor
- contact AS APPROPRIATE.
 - > fire BRIGADE
 - > coastal rescue service
 - > office
- consider distributing Pax LIFE JACKETS

Gate Attendant

- in charge AT SCENE OF FIRE
- shut OFF FUEL TO APPROPRIATE ENGINE
- Start fire pump
- Fight Fire with extinguisher Co2/foam if appropriate

(using NOVEC FIRE SUPPRESSION SYSTEM)

- Open (RED) BOX DOOR ON PORT SIDE*
- On signal from Captain release NOVEC FIRE SUPPRESSION SYSTEM BY PULLING RED HANDLE
- Drop anchor

Ticket collector

- Close vents
- Close engine room doors
- Confirm to Captain that all vents and doors are closed
- Check head count
- Run out hose and commence boundary cooling
- Passenger control

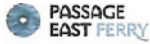
** Nb. Ensure all personnel are out of engine room before activating NOVEC FIRE SUPPRESSION SYSTEM

Accommodation Space Fire

CAPTAIN:

- Fire Alarms
- P.A. Announcements
- Turn Vessel head to wind if required
- Passenger control

Appendix 7.9 Fire Drill



DRILL/EXERCISE REPORT FORM

Vessel: MV FRAZER TINTERN **Date:** 03-12-2021

Persons Involved: [REDACTED]

DESCRIPTION OF DRILL:

Enter a brief description of the exercise, the time taken, scenario, equipment used, etc...

Engine Room Fire:

- Announced that fire drill was to be carried out. Passengers remain in car.
- Raise alarm, fire in engine 1.
- Shut off fuel and prepare fire pump hose - [REDACTED]
- Close engine room doors/vents etc and inform captain of pass count.
- Stop No 2 engine & fans. Confined nobody in Engine Room.
- Noise Fire Suppression System release drill carried out.
- Fire pump running for mock boundary casting. ↓ working well.
- Time taken 2-3 mins in total.
- Conditions good fine & calm day.

* Overall a successful drill, will continue to work on timing and coordination and teamwork. Well executed.

Name of Captain: [REDACTED]

Signature: [REDACTED]

SECTION 36 PROCESS

Section 36 of the Merchant Shipping (Investigation of Marine Casualties) Act, 2000

It is a requirement under Section 36 that:

- (1) Before publishing a report, the Board shall send a draft of the report or sections of the draft report to any person who, in its opinion, is likely to be adversely affected by the publishing of the report or sections or, if that person be deceased, then such person as appears to the Board best to represent that person's interest.
- (2) A person to whom the Board sends a draft in accordance with subsection (1) may, within a period of 28 days commencing on the date on which the draft is sent to the person, or such further period not exceeding 28 days, as the Board in its absolute discretion thinks fit, submit to the Board in writing his or her observations on the draft.
- (3) A person to whom a draft has been sent in accordance with subsection (1) may apply to the Board for an extension, in accordance with subsection (2), of the period in which to submit his or her observations on the draft.
- (4) Observations submitted to the Board in accordance with subsection (2) shall be included in an appendix to the published report, unless the person submitting the observations requests in writing that the observations be not published.
- (5) Where observations are submitted to the Board in accordance with subsection (2), the Board may, at its discretion -
 - (a) alter the draft before publication or decide not to do so, or
 - (b) include in the published report such comments on the observations as it thinks fit.'

The Board reviews and considers all observations received whether published or not published in the final report. When the Board considers an observation requires amendments to the report, those amendments are made. When the Board is satisfied that the report has adequately addressed the issue in the observation, then no amendment is made to the report. The Board may also make comments on observations in the report.

Response(s) received following circulation of the draft report (excluding those where the Board has agreed to a request not to publish) are included in the following section.

The Board has noted the contents of all observations, and amendments have been made to the report where required.

8. MSA 2000 - SECTION 36 OBSERVATIONS RECEIVED

No correspondence was received on the draft of this report.



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