DEPARTMENT OF TRANSPORT MERCHANT SHIPPING NOTICE **No.M.1083**

EXPLOSIONS IN BOILER FURNACES

Notice to Shipowners, Superintendent Engineers, Engineer Officers and Crews of Merchant Ships

(This Notice supersedes M.902)

1. The dangers of boiler furnace explosions caused by accumulations of flammable gases in furnaces following burner defects, especially during flashing up procedures, are recognised and well known. However, the design of modern boilers, while safe in itself if control systems are operating correctly, is such that the consequences of gas explosions caused by defects or negligence are likely to be more dangerous. The recent increase in power and operating pressures also increases the potential hazard. In a recent incident, on a foreign flag vessel, such an explosion caused a failure of the membrane walls, which released the contents of the boiler under full pressure resulting in the death of 26 men. In another gas explosion on a British vessel one officer lost his life, due to displacement of the air trunking (further cases are on record).

2. In both of these cases the boilers involved were of normal modern design, being roof fired and fitted with high output burners and membrane walls. In both cases the automatic control system was partially inoperative. Burner logic systems are designed to safeguard the plant and personnel and when operating as designed, are perfectly satisfactory. Nevertheless when the systems are degraded, due to defects or due to manual overriding, extreme care is necessary on the part of the operators to ensure that hazardous conditions do not develop. The remoteness of the burners from control positions and the high throughput of each burner, cause added dangers when flashing-up, or following flame failures, when logic systems are inoperative for any reason. All boiler operators must be completely conversant with the logic system in use on the boiler in their charge and must understand the effect on the protection system of any changes in the logic system, being prepared to take extra precautions when boilers must be fired under such conditions. Operation under such conditions should be avoided whenever possible. Particular attention is drawn to the need to purge the furnace and gas passages with air following flame failure or ignition failure however short the period of failure or prior to any lighting up operation. This is normal good practice, but may not be enforced by a degraded logic system. When using distillate fuels in burners designed for use mainly with heavier fuels these dangers are increased and in those conditions steam atomisation should not be used. All precautions in the operating manual must be complied with at all times.

3. Instructions for boiler operation, both in instruction manuals and on notices near the boiler, should additionally contain adequate warning regarding extra precautions necessary when operating with degraded logic systems, or with manual or local overrides in use, and operators must be sure they understand all the implications of such instructions and act upon them. These instructions should also state the duration and rate of purge in accordance with the designers burner logic sequence. When the logic system is overridden by manual or local overrides this should be indicated at the control positions so the operator can take due care.

4. Operators should periodically check the condition of igniters and flame scanners, to ensure that they are in good working order. Automatic fuel oil shut offs should, as a routine, be tested to ensure that the fuel valves operate efficiently for fault conditions (e.g. flame failure and combustion air failure). Burners should be lit with fuel oil at the minimum firing rate compatible with flame establishment and operators should not attempt to light a burner immediately after its flame failure, off an adjacent burner which is in service. On no account should boiler safety valve settings be adjusted when the controls are in the automatic mode.

5. Membrane walls are now a common and generally accepted feature of boiler design but as a consequence of this form of construction the furnace is largely enclosed in a rigid shell. An explosive disruption of this shell may cause considerable structural damage to the boiler causing its contents to be suddenly released into the boiler room thus presenting greater danger to personnel. Such boilers are provided with extensive safety devices and alarms which must be maintained at high efficiency and which should not be overridden unless absolutely necessary. Such overriding must be used only with great care and with an awareness of the consequences. Even very small amounts of unburnt fuel entering a furnace can, when vaporised, cause big explosions leading to extensive damage and injuries.

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