

Delivering fire protection solutions for the offshore oil and gas, drilling and renewable sectors

Ultra Fog Fire Extinguishing System | Reliable and efficient | Environmentally friendly and safe



“ Machinery spaces and gas turbines – Engineering solutions for real world designs”



IWMC - Amsterdam
28th /29th October 2015

Mark Davies – Engineering Manager



Offshore

Land

Marine

The Subject.

To discuss the challenges & obstacles when engineering a HPWM systems for Gas Turbines and Machinery spaces.

- Looking at the pragmatic approach to achieve the desired solutions.
- Looking at the relationships with authorities, test laboratories and clients.
- To give greater confidence in water mist as a reliable solution for “unique and problematic” applications.



Contents.

BACKGROUND - Compare the Fire Test Enclosure and the clients product.

WORKFLOW – How can we solve the problem.

TESTING – Look at tests, results and findings.

SUMMARY – Findings and conclusions.



Offshore



Land



Marine

FM5560 APPENDIX D: Fire Tests for Water Mist systems for the Protection of Combustion Turbines in Enclosures with Volumes not Exceeding 9175 ft³ (260m³).

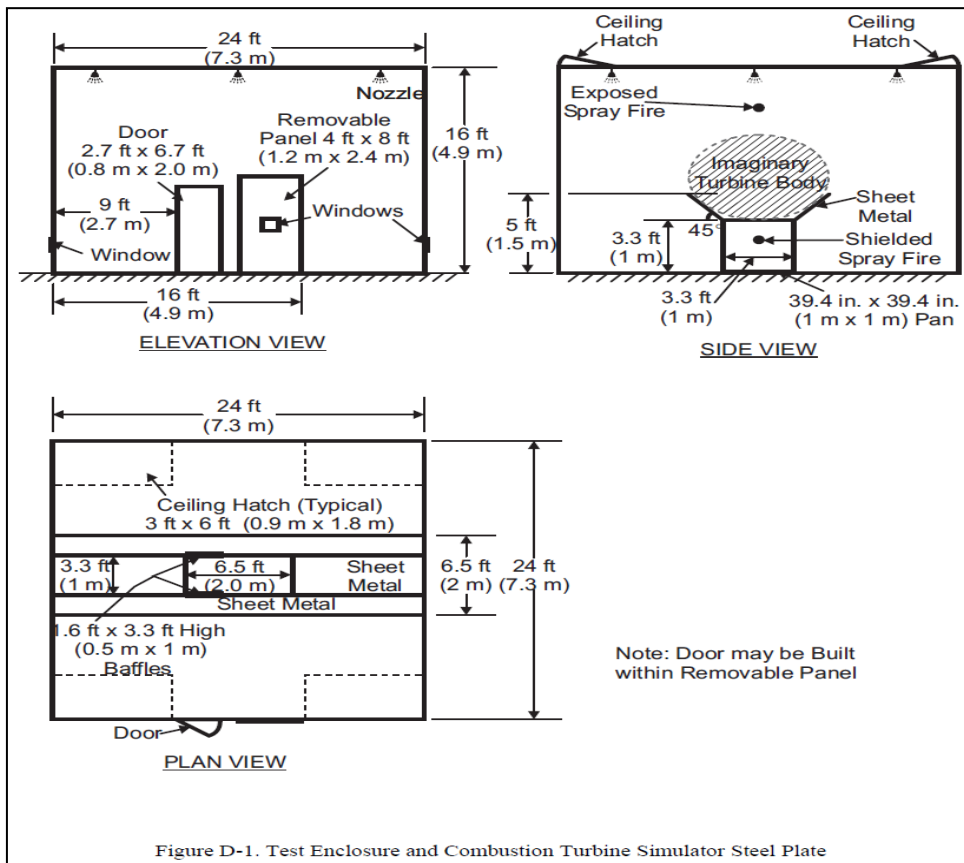
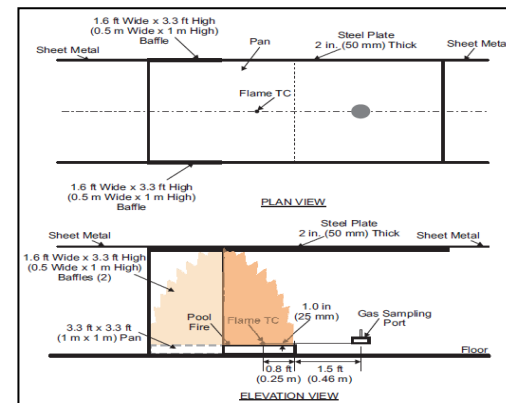
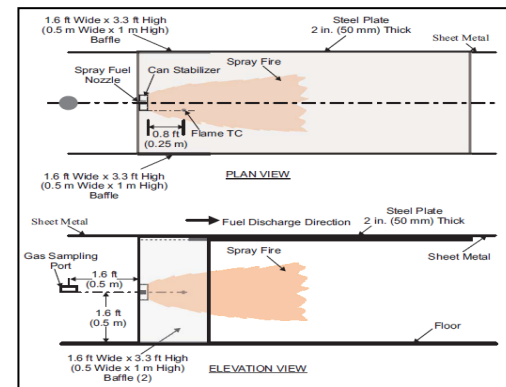
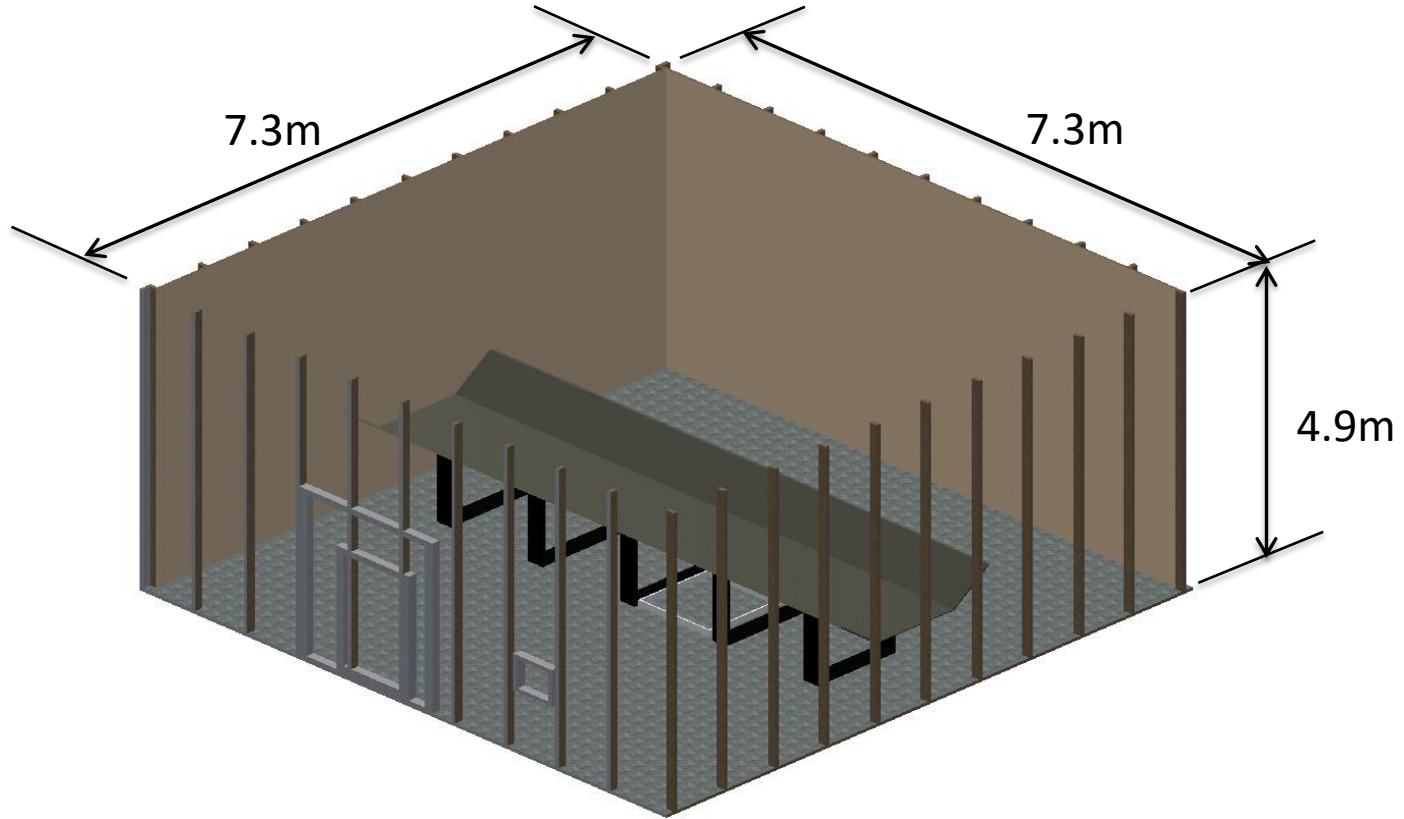


Figure D-1. Test Enclosure and Combustion Turbine Simulator Steel Plate



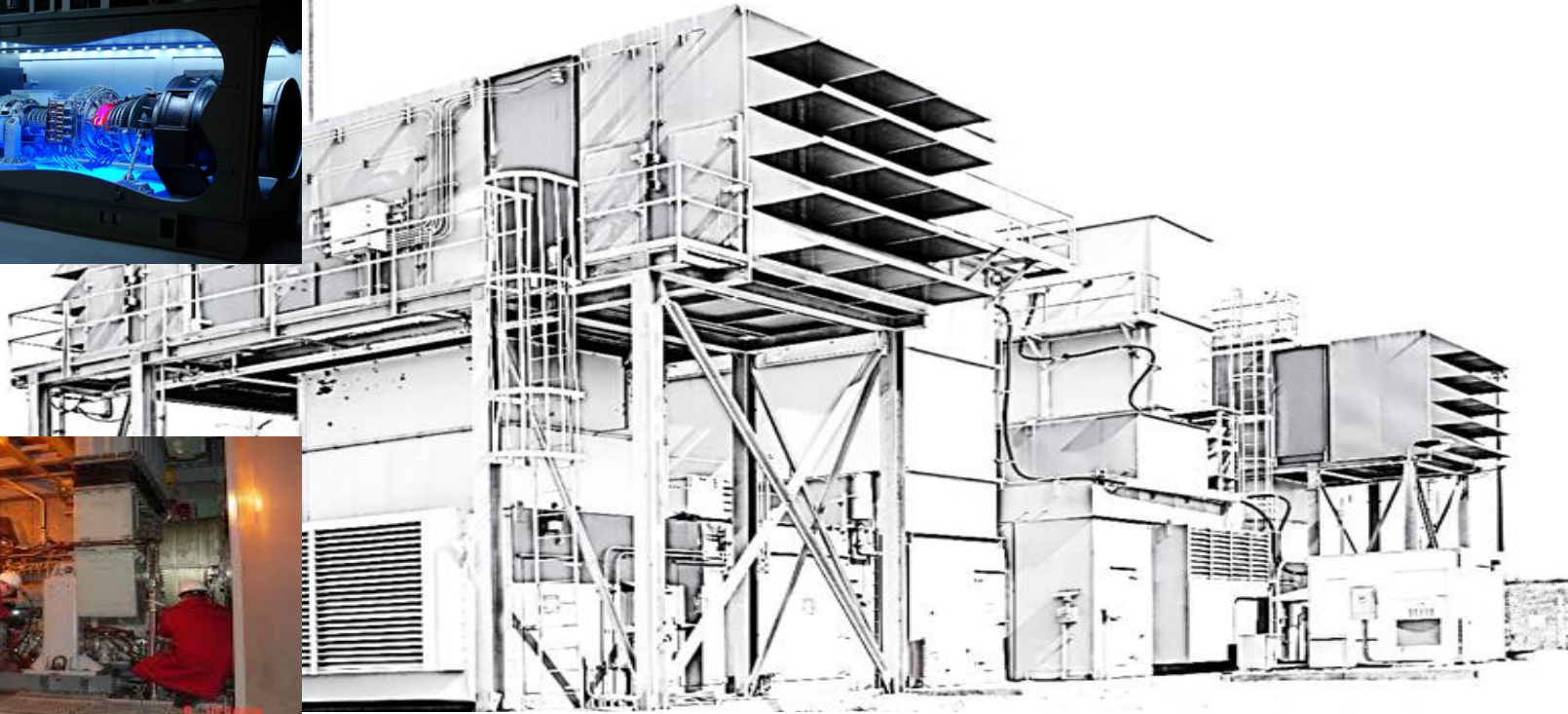
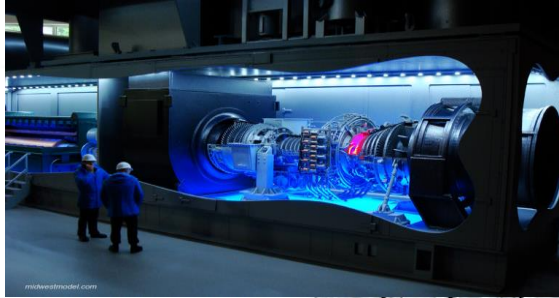
Translates to...



In turn , translates to...



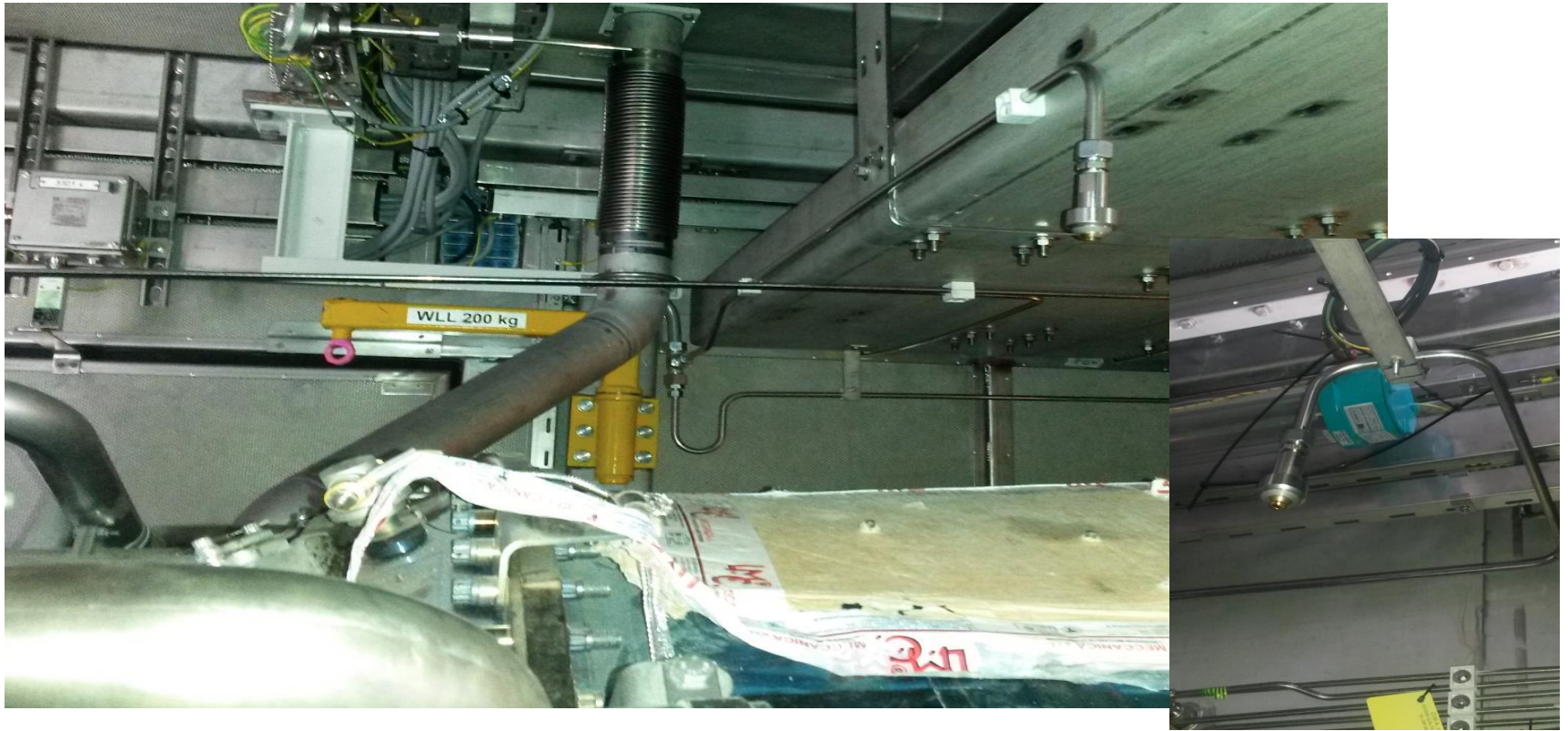
The clients product.



The clients product.



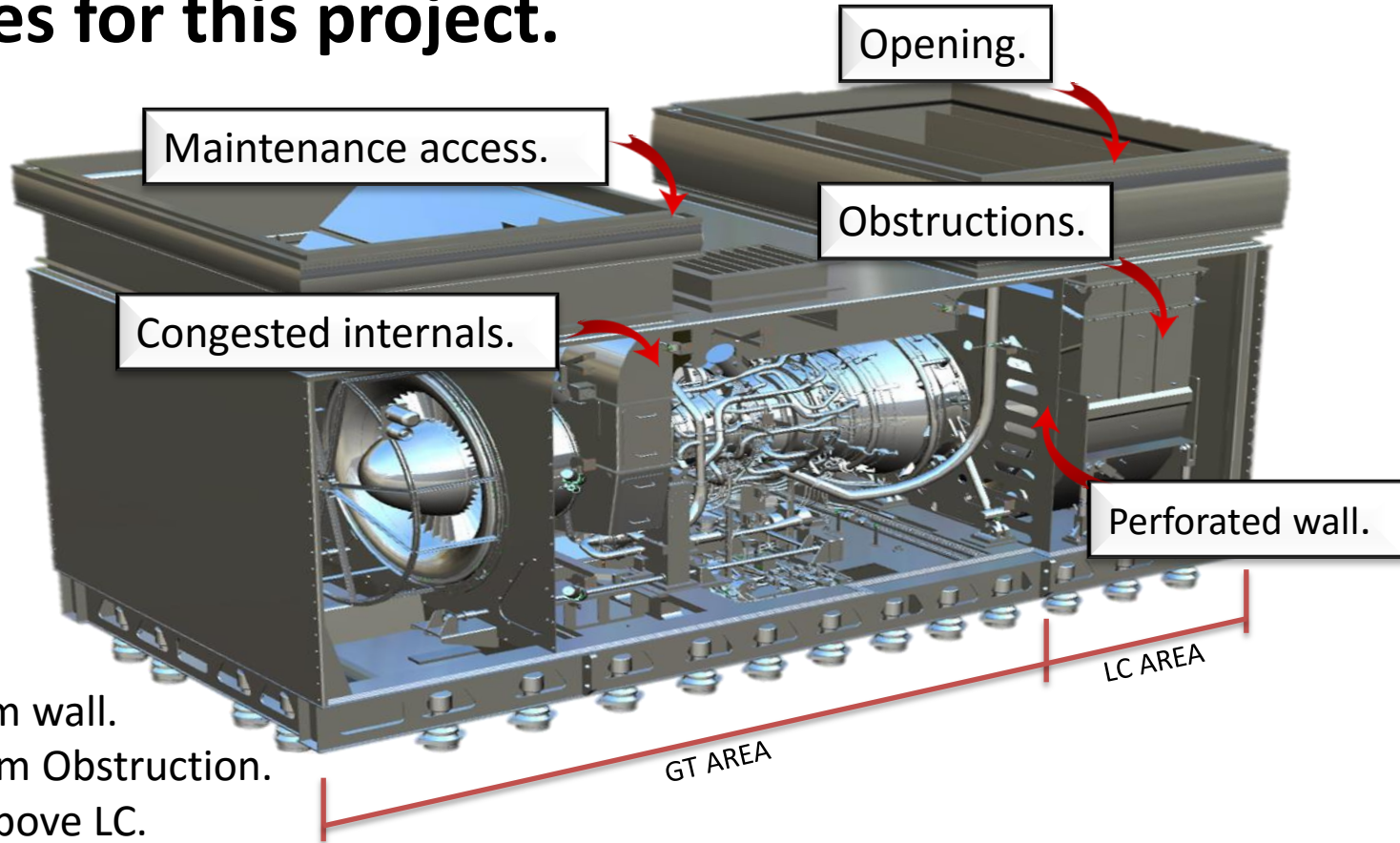
The clients product.



The clients product.



Challenges for this project.



- Perforated Plenum wall.
- GT Exhaust Plenum Obstruction.
- Ceiling opening above LC.
- Internals and maintenance access.

The chosen approach.



PROJECT SPECIFIC FIRE TESTS.



WITNESSED FIRE TESTS - to give greater longer term flexibility.

PHASE 1.

“...tests were to be developed, to reflect configuration of the Gas Turbine as close as possible within the time/cost resources and physical limitations of the test enclosure.” – UF & client.

- **Enclosure modified to “reflect” product.**
 - Perforated wall (to replicate the Perforated plenum wall)
 - Obstruction (to replicate the GT exhaust plenum)
 - Ceiling opening (to replicate the opening above the LC)
- **Fire Tests “based” on FM5560 APPENDIX D.**
 - Fire tests were based on D4.3 and D4.4

FIRE TEST PARAMETERS

	GT Compartment Fire	LC compartment Pool Fire
Shielded	Shielded 2 MW Diesel Spray Fire,	Shielded (1 m2) Diesel Pool Fire
fuel	Diesel	Diesel
Type	Horizontal spray	10.8 ft2 (1.0 m2) pool fire
Spray Nozzle	2 MW spray nozzle	N/A
Fire Location	The test fire shall be located below the table at a position. The test fire shall be located 20 in. (50 cm) above the floor, centred between the baffles underneath the test table, with the fuel spray nozzle aimed horizontally.	The pool test fire shall be centred below the steel plate and located in the outlet plenum



Fire tests were based on D4.3 and D4.4 in FM5560 Appendix D.

TEST ENCLOSURE PARAMETERS

Fire Test Enclosure 7.4m L x 3.7m W x 5.0m H
(Actual GT Enclosure 6.6m L x 3.2m W x 3.4m H)



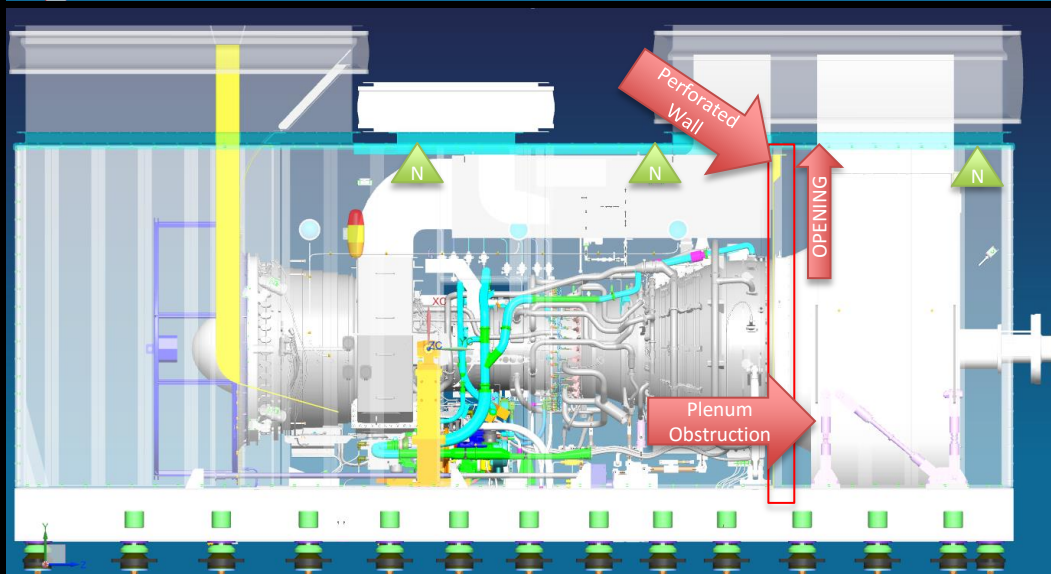
TEST ENCLOSURE FEATURES



FIRE TESTING OBJECTIVES

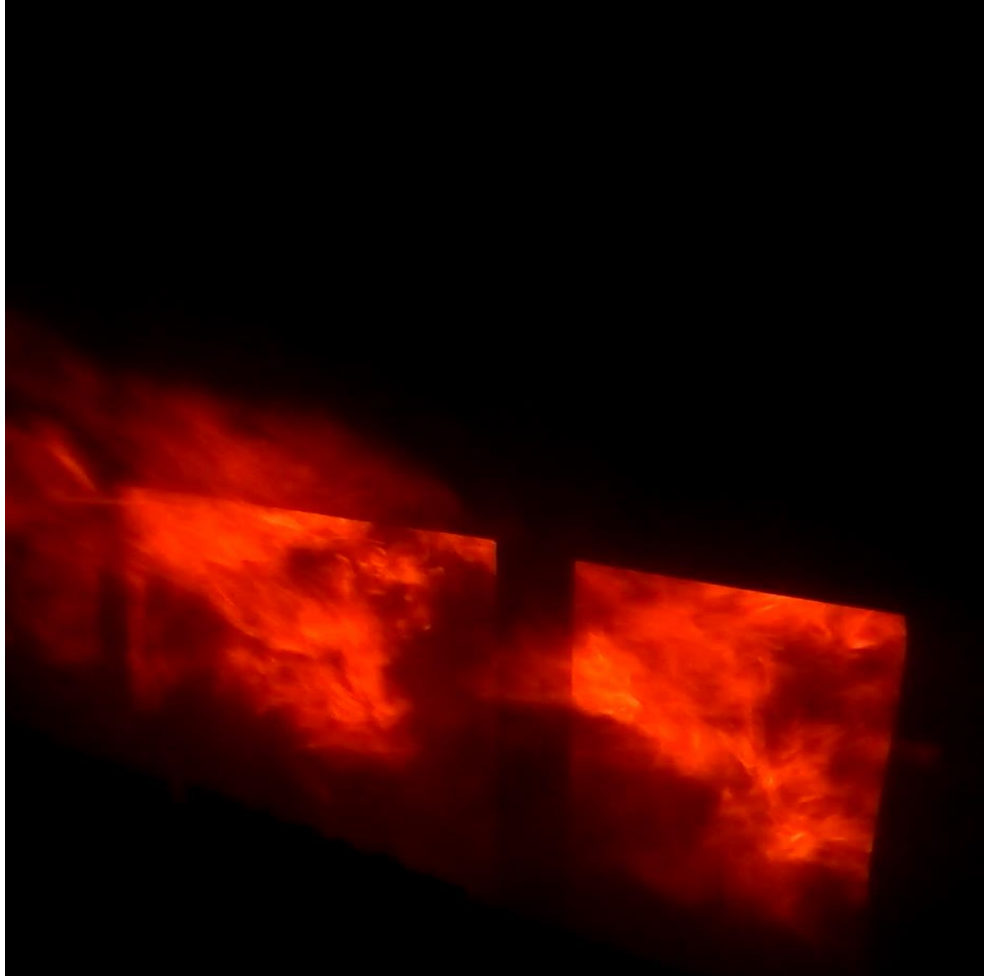
“...Preliminary tests were conducted for Ultrafog to evaluate the effects of the opening in the ceiling - [the major concern]. Whilst some tests were not passed this was an important exercise in arriving at the final solution.” – UF.

- **Fires to be fully extinguished.**
 - To align with previous witnessed tests.
- **To conduct as many fire tests as possible within test program.**
 - Worst case scenarios.
- **Nozzle configurations.**
 - To optimize for efficiency, thus resulting in smaller system/footprint.

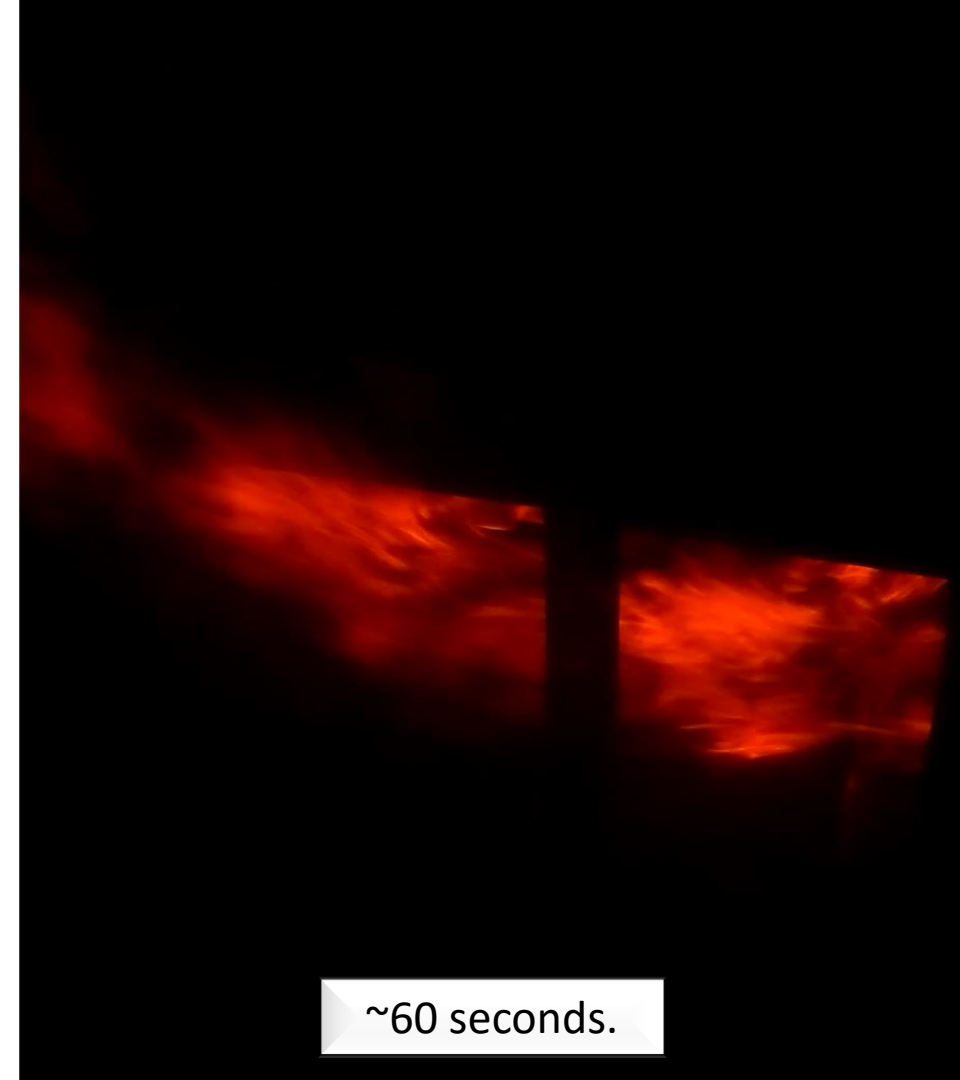




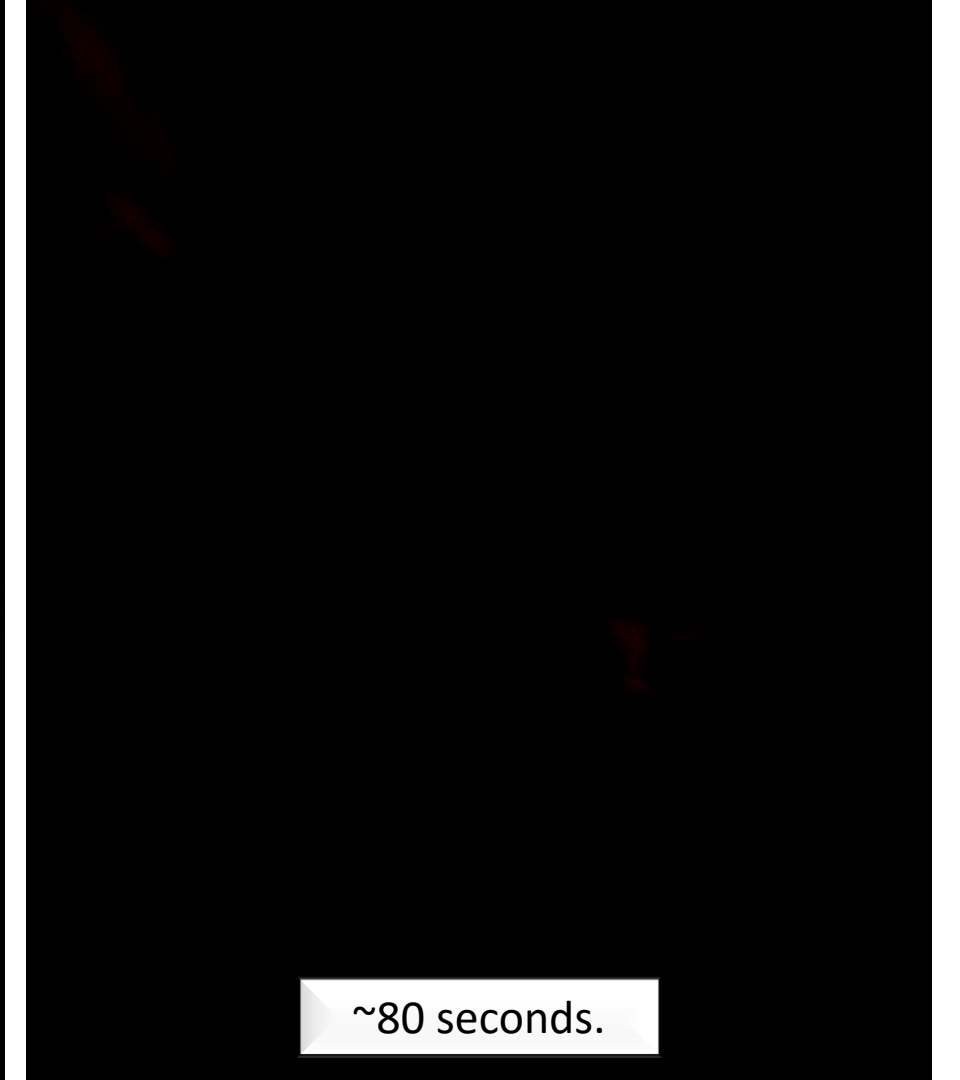
~20 seconds.



~40 seconds.



~60 seconds.



~80 seconds.

CONCLUSION

“... testing proved, the opening in the ceiling represented the biggest challenge, however, it was overcome.” – UF/client.

- **Configuration**
 - Four nozzles (2 in the GT area) and 2 in the LC area.
- **Based on these results and considering installation & maintenance requirements it was agreed that the following was acceptable for the LC area:**
 - Nozzle for C of GT = Centreline of GT (+/- 250mm)
 - Nozzle for possible floor pool locations = 250 to 500mm from the floor.

PHASE 2.

“... project specific testing is not always feasible or cost effective, therefore flexibility was required for nozzle placement,” – UF & client.

- **New witnessed Fire Tests to give greater flexibility.**
 - Fire tests to allow for nozzles to be positioned in alternative positions, allowing for more flexible configurations.
- **Fire Tests conforming to FM5560 APPENDIX D.**
 - FM witnessed Fire tests.



Offshore



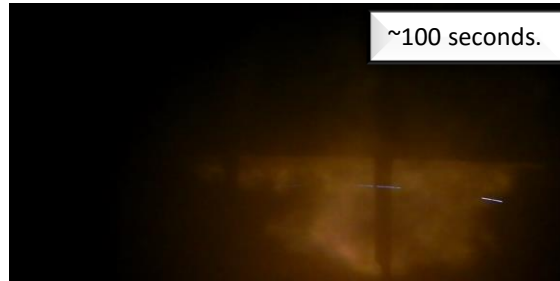
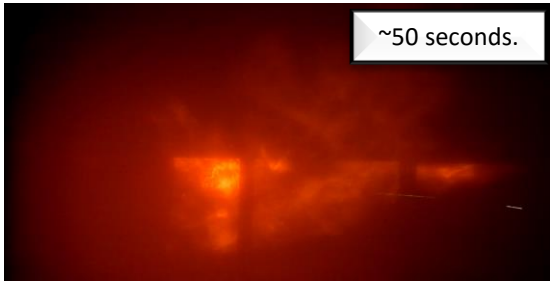
Land



Marine

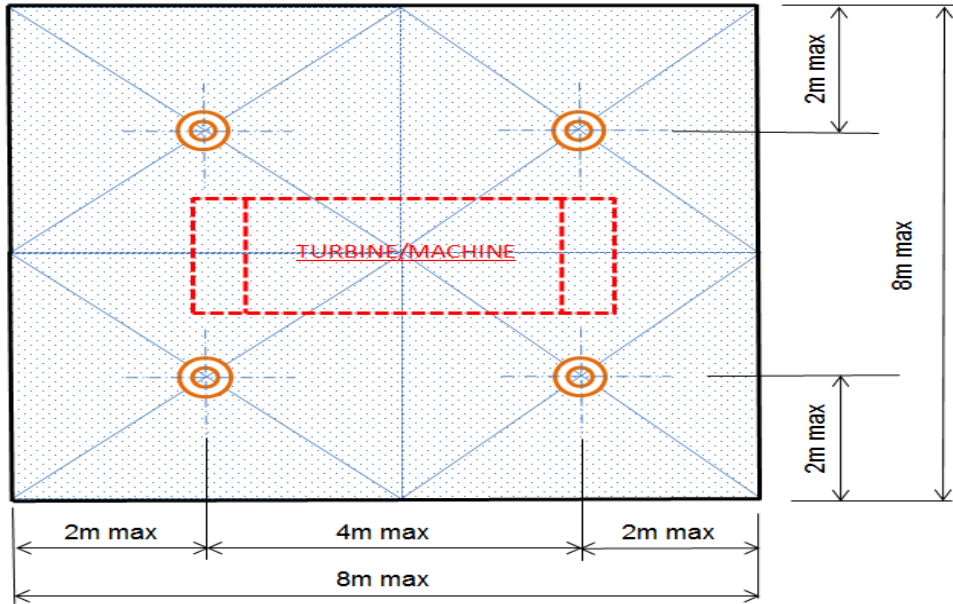
FIRE TEST

- Enclosure “in accordance with ” FM5560 APPENDIX D.
- Witnessed Fire Tests “in accordance with ” FM5560 APPENDIX D.
 - 25 Fire Tests Performed.




Fire tests witnessed by
FM Approvals.

The Conventional Configuration.

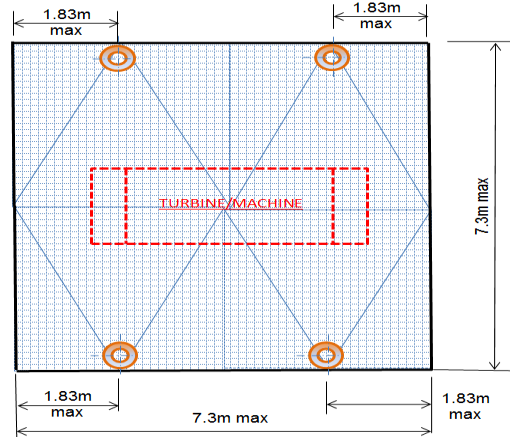
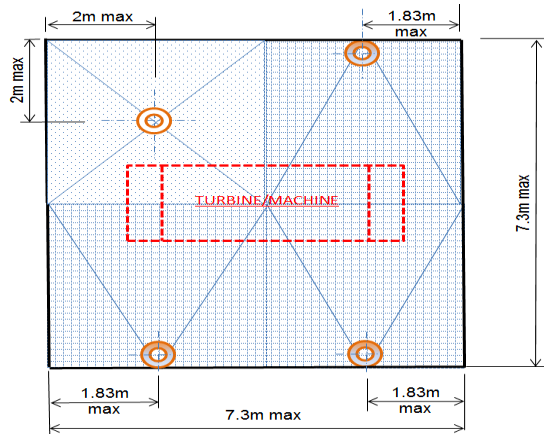
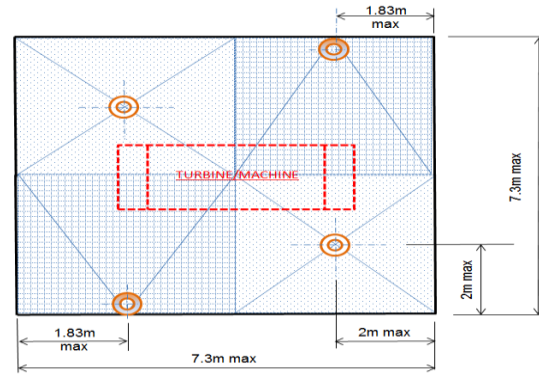
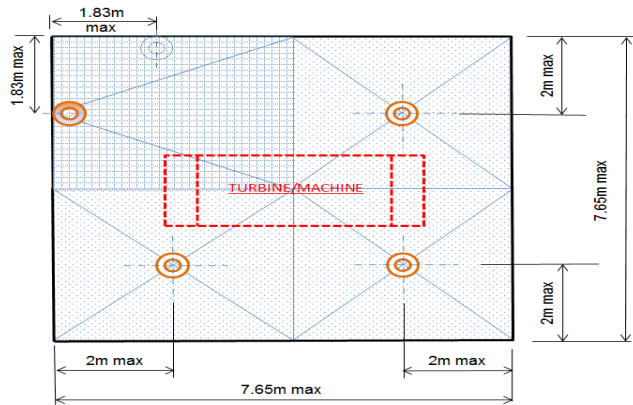



Nozzle
(ceiling mounted)


Nozzle - horizontal
(wall mounted)


Nozzle - horizontal
(wall mounted)
POSSIBLE
ALTERNATIVE
LOCATIONS

The flexible Configurations.



CONCLUSION

- Based on these results
 - Flexible configuration allows the client more options for nozzle placement.
 - Reduction in the quantity of nozzles, leads to a smaller footprint for the water delivery unit.
 - Both contribute to reduce installation maintenance costs.



IN SUMMARY

- **Working with Test Laboratories.**
 - The ability to quickly and efficiently set up testing configurations.
- **Working with authorities (FM).**
 - Witness testing for an approved system, that when installed in accordance with the recommendations described in FM Global Data Sheets will provide a 'Highly Protected Risk'.
- **Working with clients.**
 - Demonstrating the “fire” – understanding the influences.
 - Giving confidence by testing.

“...the way forward for all parties is collaboration” – UF.



Delivering fire protection solutions for the
offshore oil and gas, drilling and renewable sectors

Ultra Fog Fire Extinguishing System | Reliable and efficient | Environmentally friendly and safe



Thank you for your attention.

