

Watermist system design and review – The Matrix from IWMA

An instrument to assist fire engineers in selecting the suitable systems and the authority having jurisdiction in reviewing them for approval.



Luciano Nigro

Watermist can now be considered a mature fire-suppression technology as it enters the third decade of installation both in marine and in land-based applications. Initiated more than 30 years ago to support the Halon replacement on board ships, the technology grew very rapidly achieving almost 100% of the marine fire-protection market on board passenger ships, protecting all areas from the machine rooms to the accommodation and public spaces.

By the end of the millennium many applications in land-based occupancies were developed, based on several fire-test protocols published by international

▼ Watermist can be used to e.g. protect wooden buildings – inside and outside.



organizations including Factory Mutual Approvals, UL, VdS, LPCB and others. Nevertheless, in the land-based market the technology has not yet achieved full reach. This is for various reasons, one of which, in the opinion of the writer, is the difficulties that fire engineers find in the process of selecting the system appropriate for each application and in verifying the adequacy of the design parameters that have been used for each system.

To support the fire engineers in this commitment, the IWMA (International Water Mist Association) has developed, in past years, a descriptive document 'Project Water Mist – an Alternate Solution to Sprinkler Protection in Building Fire Protection', published in 2014, and a 'working tool' – THE MATRIX – available on the IWMA website (www.iwma.net), that is the subject of the present paper.

Documents available from the IWMA website

The first document, referred as 'the Project', also available from the association website, is a complete list of all the fire-test protocols available on the market at the date of its publication with the description of the occupancies to which they apply and the indication of the organizations that developed and published them. The MATRIX was then studied and developed by the IWMA Scientific Council, with advice from members, to be a real working tool for fire engineers. It has a structure more aligned with the design and review activity a fire engineer usually does and is updated on a constant basis to be representative of the 'state of the art' – a key point when designing and installing an advanced-technology fire-suppression system.

A partial view of the summary of the MATRIX outcome for the land-based applications is summarized by the table here, and the complete MATRIX is published both for marine and land-based applications at <https://iwma.net/the-matrix/land-based-applications>.

The MATRIX

The first column is very simple to interpret; it just refers to the business segment of the case under consideration, divided into Residential, Commercial and Industrial. There is nothing to add to this very simple differentiation.

The second column is the most important for the fire engineer; it is dedicated to the applications and is the key point for the correct interpretation of the MATRIX. The selection of the application that most accurately represents the fire hazard related to the 'formal' applications for which a test protocol exists requires considerable judgment from the fire engineer.

Of course, the real world is not so simple, because the applications listed in the Application column of the MATRIX are not easily related to the actual application under consideration; paragraph 4.1.3.2 of the EN 14972-1 states: 'Test protocols: one of the greatest challenges to engineering of water mist fire suppression systems lies in determining whether the conditions of a particular and recognized test protocol are representative of the actual conditions in a given application based on an understanding of the dynamics of the interaction of water mist with fire.'



▲ Luciano Nigro to explain The Matrix in Copenhagen during the International Water Mist Conference.

In some cases the applications very clear, for example 'car garages/parking garages', but there are also several applications that are not so well defined, such as 'residential occupancies' or 'data halls'. In these cases additional information is needed to relate the applications listed in the MATRIX to the real world.

The third column of the MATRIX is the Test Protocol column; and the third and fourth columns fully identify the test protocol(s) existing for a given application. The list is updated regularly by the Association and therefore it can be considered as the most up-to-date list of watermist fire-test protocols presently available worldwide.

As mentioned, there are many applications for which more than one protocol is available. How to select the protocol that best fits the actual application under consideration remains the responsibility of the fire engineer.

The last column identifies the type approval that can be obtained by 'positively passing' each test protocol mentioned in the previous two columns. This is also a very important column to consider because it distinguishes the test protocols that lead to a formal approval (with the organization granting the type approval is listed in column 5) from those protocols that do not lead to a formal approval but

are simply offered to the market as reference protocols to be used by the authorities having jurisdictions, the laboratories, the verification agencies, the manufacturers etc.

For those that are not familiar with the type-approval process, we can say that the fire-test protocols are the procedures issued by the organizations involved in watermist fire-suppression technology to run each test. They list the materials to be used, the procedure to run the tests and the pass-fail criteria to determine the outcome of the tests.

To complete these considerations, it should be noticed that the organizations issuing fire-test protocols for watermist applications are not so many and can be divided into two groups: the Approval Bodies and the Standardization Bodies.

Approval Bodies for water mist applications include FM Approvals¹, UL² and VdS³; the Standardization Bodies include the CEN⁴ committee on watermist systems and the BSI⁵. As we can see in the MATRIX table, the Approval Bodies always grant a type-approval for the system passing the test protocol for the specific application; the Standardization Bodies normally don't, except for the residential applications tested

Luciano Nigro, Jensen Hughes Italy
– Member of the Board of IWMA –
luciano.nigro@jensenhughes.com



according to BS standard 8458 that are approved by the LPCB⁶.

The approval issued by an Approval Body is a very useful information document also for use in the correlation between the test protocol and the actual application under consideration. An example is the chapter 1.2 of the FM standard 55607 where all 16 applications for which FM Approvals has issued a test protocol are described in detail with all the applicable limitations and/or extensions.

The same does not apply to the test protocols issued by the Standardization Bodies. These also include a paragraph for each protocol describing the scenarios to which the protocol can be applied, but this information is 'embedded' in the test protocol text and is not easily available to the fire engineer.

The above is a complete description of the MATRIX content; it should be added that all the information included in the table is carefully verified and checked by the IWMA Scientific Council, which includes some of the most relevant professionals dealing with watermist technology worldwide.

However, there are some comments and actions to take into consideration to

make it better and even more useful to the fire engineer.

Comments

As mentioned previously, the correlation between the fire-test protocol and the actual application under consideration is not easy for the fire engineer. This correlation is possible when talking about test protocols issued by Approval Bodies, which are liable for what they indicate and give all the information necessary for the correct use of the protocols; it is less straightforward for the Standardization Body protocols.

The second and most important comment is related to the real availability of the system on the market. With the MATRIX it is only possible to say that, for a given application, one or more test protocols exist and whether they lead to a type approval or not, but no information is given about the availability of one or more manufacturers that can provide a watermist system designed and installed in accordance with the test protocol under consideration. The identification of the manufacturer(s) holding an approval or having carried out a fire test according to one of the test procedures issued by

◀ **Watermist demonstration – CEN demands: 90% of the droplets must be smaller than 1,000 microns in size.**

the Standardization Bodies remains the responsibility of the fire engineer in charge of the system design.

Future steps

The maintenance of the MATRIX is of utmost importance, both for the tool and for the Association, in order to provide concrete help to fire engineers involved in the design, installation or verification of a watermist system in land-based applications.

The addition of a column that describes in detail the application to which the protocol is applicable, or the implementation of a 'second page' in the summary with each line of the protocols completed with a description of the applicable scenarios given in the protocol itself, could be of help in finding the correct protocol to use for a given application.

Finally, the availability of watermist systems on the market: this is an issue going beyond the scope of the association.

In conclusion, the MATRIX provides the list of occupancies and protocols, but the demonstration that a company has successfully passed a protocol remains with the fire engineer to ascertain because, as stated in the last sentence of the introduction to EN 14972-1: 'Water mist is a specific application solution which needs to be proven for each individual application and/or occupancy.'

➔ **For more information, go to <https://iwma.net/the-matrix>**

Reference

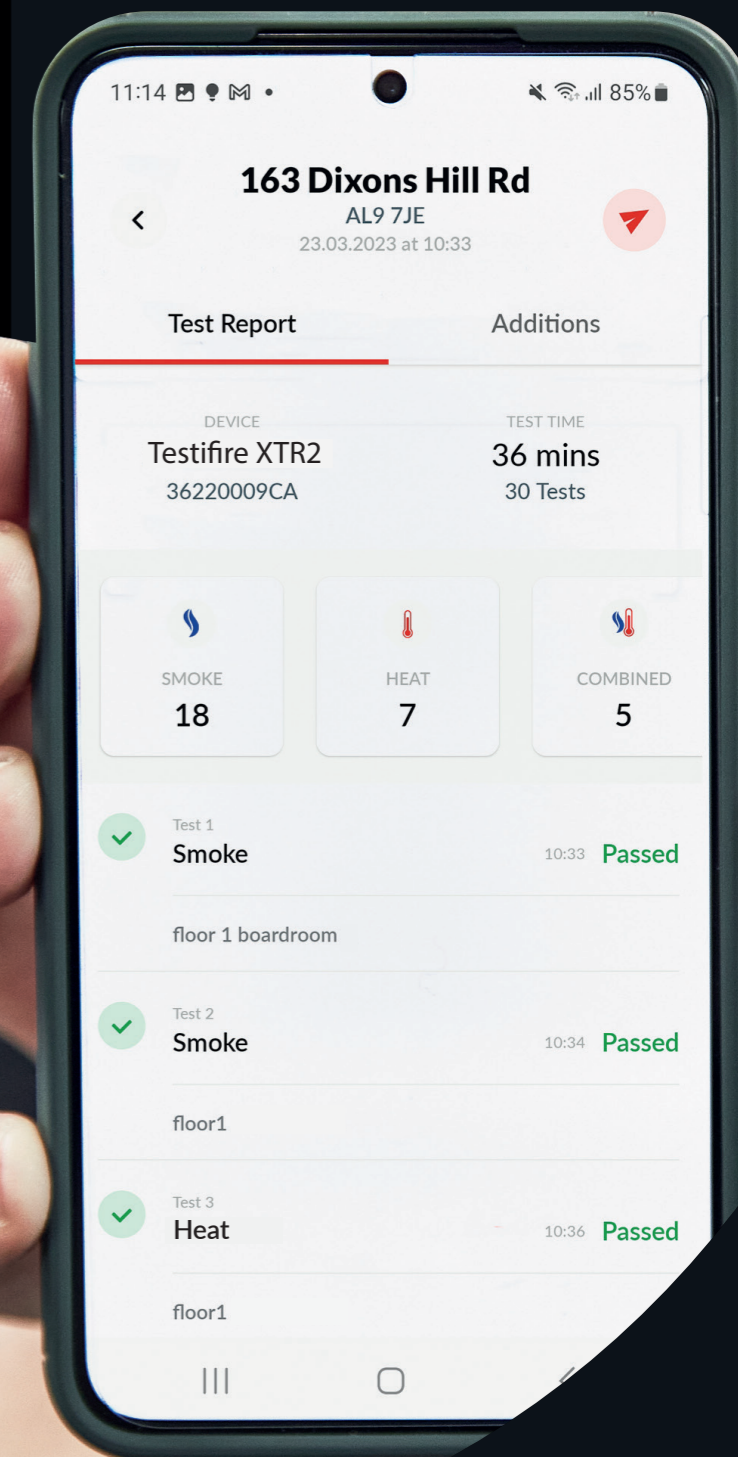
- 1. SFPE Handbook of Fire Protection Engineering – Chapter 46 – Water Mist Fire Suppression Systems.
- 2. FM Approvals – <https://www.approvalguide.com/search?searchParams=groupid=ODU=>
- 3. UL – <https://www.ul.com/services/water-mist-system-equipment-component-testing>
- 4. VdS – <https://vds.de/en/certification/companies-and-specialist-professionals/fire-protection/installer-company-for-fire-extinguishing-systems>
- 5. CEN – CEN/TC191/WG10 – Water Mist Fire Fighting Systems – EN 14972 series
- 6. BS – <https://www.bsigroup.com/en-GB/search-results?q=Water%20Mist%20Systems&Page=1&tab=Standards>
- 7. LPCB – <https://www.redbooklive.com/pdfdocs/redbook-vol1part3.pdf?r=47100>
- 8. FM Class Number 5560 – Examination Standard for Water Mist Systems – January 2021 edition



detectortesters.com/new

TEST REPORT SHARE

TESTIFIRE XTR2 COMBINES TESTING AND REPORTING TO DELIVER ON COMPLIANCE - GIVING FIRE COMPANIES AND BUILDING OWNERS THE INSIGHT AND ASSURANCE THEY DEMAND.



Subscription required for some features.

