



# LPC Rules for Automatic Sprinkler Installations 2015 Incorporating BS EN 12845; Frequently Asked Questions Webinar

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# Aim of this webinar

To provide information to the recent editions of:

- The LPC Rules for Automatic Sprinkler Installations 2015 incorporating BS EN12845
- To answer frequently asked questions relating to the recent updates.
- To provide background information relating to the updates.

# From of this webinar

- Duration: expected to be approximately 45 minutes
- Questions and comments regarding the LPC sprinkler rules can be emailed to:  
[technical@thefpa.co.uk](mailto:technical@thefpa.co.uk)

# CII accreditation

- RISC Authority webinars are now accredited by the Chartered Insurance Institute
- Delegates participating in today's webinar and any other 2019 webinar can claim 45 CPD minutes towards the CII member scheme



## CII CPD accredited

Demonstrates the quality of the learning of the Fire Protection Association Webinars programme and confirms that it meets CII / Personal Finance Society member CPD scheme requirements.

# Development of UK Sprinkler Rules

- The FOC (Fire Officers Committee) published the first set of installation rules in London in 1888.
- LPC (Loss Prevention Council) now Fire Protection Association, later took over this function from FOC.
- These rules were the basis of most global standards and have evolved ever since their inception, e.g.
  - FOC .....27<sup>th</sup>, 28<sup>th</sup>, 29<sup>th</sup> editions.
  - BS5306 Part 2 1979 & 1990 + LPC Rules editions
  - BS EN 12845: 2003, 2004, 2009 & 2015 + LPC Rules editions.

# Continuous Improvement

- This model of standard development is really just a very mature example of continuous improvement.
- Combined with the inherent simplicity of the firefighting approach (*automatically, uniformly sprinkling water onto a fire*) has proven to be a winning formula



“Make everything as simple as possible, but not simpler.”  
— Albert Einstein

“Nature is pleased with simplicity. And nature is no dummy”  
— Isaac Newton

# Some bodies involved today

- CEN (European Committee for Standardization):
  - Produces 'EN 12845' by committee.
- BSI (British Standards Institution)
  - Adopts '**BS** EN 12845' (adds 'National Foreword' and 'National Annex').
- FPA (Fire Protection Association) & RISC Authority: publish the LPC Rules (with input from insurers, the sprinkler industry and other stakeholders)
  - Based upon BS EN 12845 + additional requirements (loss prevention and best practice)

# Acronyms

- **LPC Rules** – Understandably, often confused with the **LPCB**
- **LPC** – Loss Prevention Council – LPC Rules are published by the FPA in association with and funded through RISC Authority
- **LPCB** – Loss Prevention Certification Board (Third party accreditation and certification body and part of BRE Global)



# Improvement

- FPA & RISC Authority produce the LPC Rules by improving and supplementing the requirements of BS EN 12845
- With significant technical contributions from the Sprinkler industry and Insurers
- Based on: research and case study experience of real-world fire events (and escape of water or other failure events and component problems) – *lessons learned / continuous improvement*

# RISC Authority

The remit of RISC Authority Active Working Group is to:

- Wherever possible, anticipate future events that may detrimentally impact upon the business of the UK insurance industry, and invest accordingly to mitigate the consequences.
- Identify issues currently affecting UK property insurance and invest accordingly to provide insurers with a means of managing the situation.
- Maintain and improve the industry guidelines (LPC Rules) that underpin current insurer business and property protection practice.
- Make business and property protection financially and technically attractive to the insured property owner.
- Act as a focal point for all stakeholders with interests in business and property protection.

# Questions Received

1. Air Venting TB229
2. Hazard Review TB203
3. High Rise Building Protection TB206
4. Void Protection In Schools TB221
5. Control Valve sets TB232
6. Retrospective Adoption of TB234
7. Increased Design Density TB234
8. LPC/BS EN 12845
9. Air Venting TB229
10. Flushing Flow Rate TB237
11. Deluge Systems
12. Flushing – General TB237
13. Flushing Connections TB229



# 1 - Air Venting

## Question:

*A new requirement in TB229: 2018 to vent air from grid & looped installations has appeared in TB229.3.22: 2018, large parts of which have been repeated (with differences) at the end of TB229.3.15: 2018 “Flushing Connections”.*

# Technical Bulletin TB229, clause TB229.3.22 – is a publishing error and should therefore be ignored, this will be removed from future updates of the LPC Technical Bulletins.

## **TB229.3.15** *Flushing connections*

*Description of change:*

- Replaces BS EN clause 15.6 and D.3.3

Flushing connections shall be fitted with permanently installed valves. On installations, they shall be fitted on the spur ends of the hydraulically most remote installation distribution pipe(s). Each valve outlet shall be fitted with a brass plug cap. The connections, valves and any associated drain pipework shall be of the same nominal size as the distribution pipe to which they are attached. For pipes bigger than DN 40 flushing connections of DN 40 may be used, if connected to the lower side of the distribution pipe. Where flushing connections are larger than DN 40, they shall be permanently hard piped in an equal or greater size pipe to a drain. Adequate pipe supports shall be provided.

For system underground mains or sections of underground mains within installations, refer to [TB237 Flushing underground sprinkler mains](#) for requirements and guidance.

**Note:** It is not always necessary or desirable to vent trapped air from all wet pipe sprinkler installations.

However, in gridded pipework configurations, where the design and hydraulic efficiency of the system is based on the flow of water passing through all pipes in the grid or, in sections of distribution mains in looped pipework configurations, trapped air can significantly restrict or prevent this flow of water. In such cases, permanent and accessible facilities shall be provided to expel trapped air from affected sections of installation pipework, both at commissioning stage and after the subsequent refilling of installation pipework.

Suitable signage shall be displayed at each installation control valve set and each air vent valve to advise the system user/operator of both the procedure to be adopted and the location of the air vent valves.

Pipework, which is completely full of water, might be damaged by the increase in pressure due to ambient temperature rises. If complete venting of air in an installation is likely to occur, such as in the case of gridded layout, a pressure relief valve shall be fitted at the installation control valve and set to ensure compliance with [BS EN Clause 8.2](#), with the discharge pipework from the relief valve routed to drain.

### **COMMENTARY AND RECOMMENDATIONS ON TB229.3.15**

In warehouses where gridded systems are most commonly used and where range pipes run perpendicular to the line of the apex, venting all range pipes will be necessary to ensure the hydraulic performance of the installation(s). In such cases a single vent pipe connected to the high point of all range pipes and routed to a single manual air release valve located in an accessible location would be an acceptable practical arrangement.

Other arrangements for venting trapped air from different pipework configurations will need to be incorporated in the design of the installation.

To ensure the air is vented from the installation pipework each time the installation is drained and refilled, a suitably worded and prominent sign will need to be fixed adjacent to each installation control valve set confirming the importance of venting the system and explaining the procedure to be adopted. It would be beneficial to provide a block plan mounted adjacent to the installation control valve set(s) to identify the location of the manual vent valve(s) and a prominent label fitted to/adjacent to each manual air vent valve to identify the valve and procedure to be adopted to vent the installation pipework.

## *What do Other Standards say?*

*NFPA 13: 2016 & 2019: Requires a single vent connection to vent a limited amount of air from 'wet' installations and is intended to reduce the volume of air in an installation to 'reduce the amount of corrosion and microbial activity'.*

*In addition, it is stated; 'it is neither the intent nor practical to exhaust all trapped air from a single location on a wet pipe sprinkler system (sic)' [installation] and 'interconnection of branch line (sic) [range] piping for venting purposes is not necessary'. Multiple vent connections are explicitly not required.*

*A pressure relief valve is also a requirement but related to 'solar heating' and not venting.*

*FMG DS 2-0 states:*

*This requires a pressure relief valve related to solar heating but does not even raise the subject of installation venting.*

*FMG DS 2-1:*

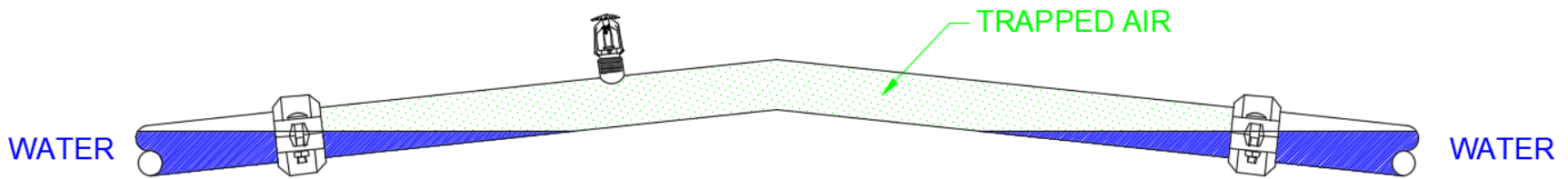
2.2.1.9 Remove trapped air from wet-pipe sprinkler systems. Install minimum 1/2 in. (13 mm) FM Approved automatic air-release valves or FM Approved manual valves at the system high points. Remove the air after each time the system is drained and refilled (see Figure 1).

A. Install an FM Approved pressure-relief valve of not less than ¼ in. (6.4 mm) in size (preferably at the riser or inspector's test connection) to relieve pressure increases caused by thermal expansion.

B. Set the relief valve to operate at pressures greater than the maximum rated working pressure of the system (175 psi [12 bar] typical).

Whilst changes/improvements to the LPC Rules are not dependant of following other standards, hydraulic calculations for gridded system are based on water flowing in all pipes in the grid.

Requirements of new or updated TBs are not intended to be imposed retrospective and sprinkler contractors would not be expected to carry out such system improvements at their own cost. However, it may be on some high value risks, insurers negotiate with some of their clients to make such system improvements retrospectively, but this would presumably be by negotiation on existing systems. For new systems this requirement of TB229.3.15 should be adopted.



### Example:

In the case of a warehouse with front and back track mains at eaves level, with range pipes routed up and over the apex linking these two mains, the water supply at one end of the warehouse with the remote AMAO at the other end, the ranges between the AMAO and the water source will all be flowing water in the hydraulic calculations. There will be no open heads on these ranges to expel the air and the difference between the pressure at the front track compared to the pressure at the back track at the point of intersection of ranges will be gradually less and less in the direction of the AMAO. These pressure differences will not be sufficient to move the air from the high point of all (if any) of the ranges so unlike the theoretical hydraulic calculations, there will be no flow in these ranges.

The design and hydraulic efficiency of the system is based on the flow of water passing through all pipes in the grid or, in sections of distribution mains in looped pipework configurations where trapped air can significantly restrict or prevent this flow of water.



## 2 - Hazard Review

Question(s):

- Could you advise whether you do any training courses on Hazard reviews for sprinkler systems?
- What are the requirements for undertaking hazard reviews?
- Who should carry out hazard reviews?

Hazard reviews for sprinkler systems are required in the LPC Rules for Automatic Sprinkler Installations 2015 Incorporating BS EN 12845, clause 20 and TB203.

It is assumed within industry that providing a sprinkler installer can demonstrate competence with a recognised third party accreditation scheme (LPS1048 or Firas), and they have the requisite qualified personnel who have attained the pass rate in the industry examinations, then they would have the experience and knowledge within the company to carry out a hazard review of the sprinkler system in accordance with clauses 20.3.2.2 and TB203.3.2.2, TB203.3.4.4, TB203.5.2 (b) & (c).

These reviews are periodical (quarterly & annually) of the existing sprinkler system and it's intended protection of the facility – these hazard reviews are not to be confused with yearly inspections which are to be carried out by an independent company:

**TB203.2.4      Yearly routine**

*TB203.2.4.1      Third party inspection (BS EN Clause 21)*

The sprinkler system shall be periodically inspected at least once a year by a third party. The inspection report shall assess whether the system is in accordance with this standard, with regard to maintenance, operation and adequacy for the risk involved. Where appropriate a list of deviations shall be issued for action. The criticality of each action shall be indicated.

**COMMENTARY AND RECOMMENDATIONS ON TB203.2.4.1**

Inspections should be undertaken by an independent third party (eg not the system owner, building occupier, system installer or service and maintenance provider).

Inspections undertaken by insurers for their commercial and underwriting purposes cannot be assumed to fulfil the intent of this requirement.

**21 Third party inspection**

TB203.2.4.1

The sprinkler system shall be periodically inspected at least once a year by a third party. The inspection report shall assess whether the system is in accordance with this standard, with regard to maintenance, operation and adequacy for the risk involved. A list of deviations shall be issued for action.

# 3 - High Rise Building Protection

A Fire consultant has confirmed he does not want to protect the toilets within a building designed to BS EN 12845 with LPC Technical Bulletins, Ordinary Hazard Group 3.

It is a multistage system with an overall building height from Basement to top floor of 54m.

Our contractors stance is that due to the building being over 30m and in order to fully comply with LPC/BSEN 12845 TB206 Clause 4.2 then the toilets would need to be fully sprinkler protected, therefore if the toilets aren't protected, this would be a deviation and needs to be noted on the certificate as such.

## Consultant Response to contractor;

'I would quite robustly argue even under the application of the LPC rules, the contractors interpretation is incorrect. They construe the table relating to occupancies (where they cite + 30 m) to trump the permitted exceptions, but they intend to serve two different purposes.

- By an occupancy, the TBs intend substantial rooms / usage areas - as the building is over 30 m, the TBs (quite reasonably) note we couldn't, for example, choose to omit sprinklers from one of the retail units;
- The permitted exceptions, however, are sub-spaces that are of a lesser risk, and can be treated differently.

This is not just our interpretation. Other fire engineers on the development have concluded the same.'

On the basis the occupancy of the building is essentially offices and is 54m high and the sprinkler system in question is being designed to BS EN 12845 plus TBs, to Ordinary Hazard Group 3 classification and intended to provide both property protection and life safety, the contractors interpretation of Table TB206:T2 is correct.

Whilst Table TB206:T2 takes cognisance of the fire resistances listed in the FPA Design Guide for Fire Protection of Buildings: Protected Zone: 2004 other aspects were considered in determining the specific fire resistances and qualifications outlined in Table TB206:T2 and without attempting to list all these considerations here, aspects such as the following were just some of the factors taken into account:-

1. The Fire & Rescue Service safe intervention to extinguish fires in non-sprinkler protected parts of buildings over 30m high, and;
2. In the context of 1. above, or similar considerations, the cost / benefit analysis of sprinkler protecting area of 'Permitted Exceptions' such as toilets where sprinkler protection is provided throughout the rest of the building, would therefore involve the relatively minor additional cost of installing pipework and sprinkler heads etc., to what typically are relatively small areas.

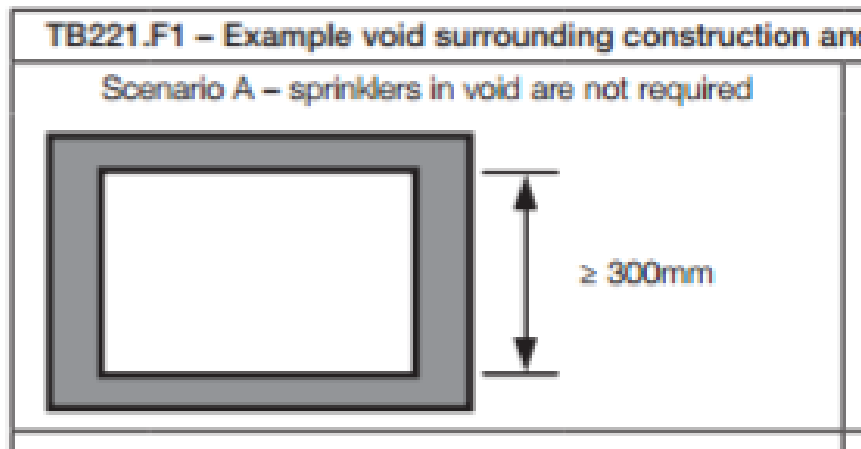
As a result, Table TB206:T2 does not allow the 'Permitted Exceptions' in office buildings over 30m high, hence the final paragraph of Clause TB206.4.2.1, referring users to the overriding conditions detailed in Table TB206:T2.

Table TB206: T2 Recommended fire resistances between unsprinklered and sprinklered compartments <sup>(1)</sup>				
Occupancy type <sup>(2)</sup>		Storey	Building depth/height (m)	Minimum fire resistance (min)
1a	Residential: flat, maisonette	Not covered in TB206		
1b/1c	Residential: flat, maisonette	Not covered in TB206		
2a	Residential: hospital and institution	Basement <sup>(3)</sup> , including floor over	>10m (deep)	90
			<10m (deep)	60
2b	Other residential: including hotel, hall of residence	Ground or upper	≤5 <sup>(4)</sup>	
			≤18 <sup>(4)</sup>	90
			≤30 <sup>(4)</sup>	120
			>30 <sup>(4)</sup>	180
3	Office	Basement <sup>(3)</sup> , including floor over	>10m (deep)	90
			<10m (deep)	60
		Ground or upper	≤5 <sup>(4)</sup>	
			≤18 <sup>(4)</sup>	90
			≤30 <sup>(4)</sup>	120
		>30 <sup>(4)</sup>	Not permitted	

# 4 - School Protection of Voids

Question:

Can you please clarify the following.



Scenario A does not set an upper limit for the depth of the void. So voids over 800mm that are made of non-combustible construction and do not contain combustible contents do not require protection. TB221.F1 overrides TB230.3.1(b). Please confirm.



TB221.1 states within the last sentence – *‘TB221 takes precedence over any other requirements of the LPC Rules’*, however it does only qualify this for the protection of schools, whereas TB230 isn’t specifically related to schools.

The intent of TB221,F1 - Scenario A is not to sprinkler protect voids constructed of non-combustible [as defined in Notes on TB221.3.2 (c), 1] and containing non-combustibles [other than those listed in TB221.3.2 (c), 2 ], even if they exceed the 800mm depth defined in TB230.

In addition to the above TB221.3.2 – Optional Exceptions is qualified by TB221.3.1, which states that All exceptions to sprinkler protection shall be agreed with the insurer and the AHJ’s, therefore the insurers and AHJ’s can consider all factors/issues relating to the void/s, which TB221 cannot hope to define and should always be based on a project by project basis. The challenge is to establish the non-combustible aspect relating to the voids at the construction and post construction stage so that the insurers/AHJ’s are satisfied and can conclusively decide on the protection or non-protection as they see fit.

# 5 - Control Valve Set(s)/Annex 'F'

Question:

Can you please clarify TB232.1 and TB232.5 C&R.

TB232.1 states that the TB specifies the requirements for installation control valve sets other than for Annex F. But TB232.5 C&R states that a single installation control valve set will not be permissible for installations which are designed to comply with Annex F, a bit of a contradiction.

We assume that TB232.5 C&R is saying that you can't have a single installation control valve set with bypass for Annex A and that you must have duplicate valve sets as per TB232.F2. This is the point we would like clarification of.

For installations to comply with Annex F – they will be required to be duplicate installation valves. A by-pass valve would not have the facilities to be fully operational in all aspects as below:

## F.5 Control valve set

During servicing and maintenance of the installation alarm valves, the sprinkler installation shall be fully operational in all aspects.

NOTE In some countries duplicate installation control valve sets are required.

### COMMENTARY AND RECOMMENDATIONS ON TB 232.5

A single installation control valve set will not be permissible for installations which are designed to comply with [Annex F](#).

Perhaps the wording in the C&R on TB232.5 should note bypass!

# 6 – Retrospective Rules Application

Question:

What are the expectations for sprinkler systems that were designed and installed before the new changes regarding design approach where there is excessive roof / ceiling clearance.

Should protection be enhanced / upgraded retrospectively?

It is not a requirement to retrospectively apply new standards (TB234.4.2) to existing systems, however the application of additional discharge density for excessive clearance was already part of the LPC requirements prior to the new Technical Bulletin updates.

With some high value risks, insurers might wish to negotiate with some of their clients to make such system improvements retrospectively, but this would presumably be by negotiation on existing systems.

For new systems the requirement of TB234.4.2 should be adopted.

# 7 - Increased Design Density

Question:

What is the reason for the increase in design density for excessive roof heights above storage, is this based on fire testing, and is it proven??

Fire test evidence investigating the phenomena is limited due to cost and complexity of undertaking testing at the scale and severity. Work is going on in this area.

Current evidence that is available demonstrates that increased water discharge rates with uniform distribution and large water droplets are helpful for firefighting in these circumstances.

Adopting this option, all stakeholders should be consulted with their agreement sought.

Note: There is no fully proven design solution for this problem!

## 8 - LPC/BS EN 12845 Rules

Question:

Are there plans to update the EN 12845 rules, they are not well written and could be much more informative.



The BS EN 12845 is currently under revision and being re-written.

This is being developed by:

**CEN** (European Committee for Standardization) who will produce the '**EN 12845**' by committee, and;

**BSI** (British Standards Institution) who will adopt the '**BS EN 12845**' and add the 'National Foreword' and 'National Annex'.

The due date for this updated standard is currently unknown, however there will be a full review by RISC Authority/FPA with LPC Technical Bulletin revisions following the issue of the standard.

# 9 - Air Venting

Question:

Confirmation that all ranges on a gridded or looped systems need to be vented. Do ranges that are installed level also require venting ?

The requirement of both F.M. Global and N.F.P.A. is to install automatic air vents/air venting to increase the longevity of the pipework by removing trapped air that contributes to the accelerated corrosion of the pipework irrespective of the pipework configuration.

RISC Authority introduced (TB229.3.15) manual air venting for two reasons:

1. To remove air from the system to assist flow of water through all pipes (especially in gridded and looped systems) as designed by contractors undertaking full hydraulic calculations.
2. To remove air/oxygen from the system to reduce corrosion rates.

It is therefore assumed that all future sprinkler installations irrespective of pipe configuration/sloped or level pipe installations will have the facility to remove as much air as possible from the sprinkler system.

# 10 - TB237 Flushing

## Question:

If water supplies are not capable of providing the flow rates for flushing, can the full flow of the available water supply be used and accepted.

## TB237 confirms the following where flow rates from table TB237.T1 cannot be achieved:

### *TB237.3.7*

If the water supply is not capable of delivering the relevant flushing flow rate given in [Table TB237.T1](#), the underground trunk main may be flushed at a flow rate equivalent to:

- (a) In the case of fully hydraulically calculated systems, at the sprinkler system design 'maximum flow demand (Q<sub>max</sub>)'
- (b) In the case of pre-calculated systems, at the maximum relevant flow rate given in '[BS EN 12845:2015 – Table 6](#)', unless the water supplies are provided by fire pump(s) sized to comply with the flow and pressures detailed in [TB210.T5](#), in which case at the nominal flow rate of the pump

# 11 – Deluge Systems

Question:

Will the EN 12845 or LPC rules ever address deluge system design??

Currently there are no plans to include deluge systems in the LPC Technical Bulletins.

We (the FPA) are not aware if there are any plans to include deluge systems in the next version of the BS EN 12845!

# 12 - TB237 Flushing

Question:

We all know that debris can be ingested into below ground sprinkler pipework if the installation is sloppy and insufficient precautions are taken to prevent it. This applies equally to sprinkler installers and Water Authority contractors.

- But why wait until now to introduce it?
- Has there been recent evidence of serious impairment?



This was a TB which the insurers felt was needed (presumably from what they were finding in the field) as normal engineering good practice which should be adopted in terms of flushing underground mains prior to burying was clearly not always being carried out as a matter of course.

The creation of this TB was also welcomed by BRE / LPCB, FIRAS and BAFSA when they were consulted during the drafting phase, so whilst we agree it has been well overdue, we don't believe there was any evidence of a more pressing need to produce it now particularly.

Question:

Do you have any confidence that Insurers will require this flushing to be undertaken by the Insured?

Insurer members of RISC Authority were one of the bodies who felt the need for this TB and whilst this doesn't mean each and every insurer will always insist on this flushing, we expect most of them will, unless there is a project specific compelling reason not to, but again this is not for this standard to try to address such cases.

## Question:

Do you think that sprinkler service companies will be able to convince their Clients to carry out the immediate, and then regular flushing, of existing main pipes as required in TB237.T2, bearing in mind the high cost, disruption to the Client's operation, isolation of the sprinkler installation(s) whilst the test tee, valve and flow meter are installed and the test is carried out, and problems involving the disposal of the water.

We do not think it is a matter for a standard on good practice to necessarily be influenced by what the system owner might want to do, there is a compelling argument to flush the mains immediately if there is evidence of debris being flushed into the installation, or the existing main is modified, or if the flow rates through the main are deteriorating due to debris.

System owners might take issue with the need for flushing solely because there is no evidence the main in question has not previously been flushed, but this doesn't mean flushing is not necessary under these circumstances and surely TB237 will assist the sprinkler service companies to explain the need to system owners.

# 13 – TB229 Flushing

Question:

This has replaced Annex D.3.3. The 'old' Annex D 20mm flushing valve (or better described as a test valve) at the remote end of a zone which was to be used for testing continuity of pipework, and the zonal, installation control valve and pump alarms after a zone had work carried out it, has been replaced by the flushing valve at the ends of distribution spur pipes.

This confuses two different operations: testing alarms and flushing debris from pipework. Surely there is a need for both?

A 40mm flushing valve will not simulate the flow through a single sprinkler as the 20mm valve would have done so is an unrealistic test of the alarms.

Does it mean that end of line zone testing is no longer required to prove the integrity of the connection and the various alarms?

TB229.3.15 does replace D.3.3, but it does not replace D.3.5, which deals with the test facility mentioned, bearing in mind if parties are / were using the 20mm flushing valve for this alarm test, this is not replicating the effects of a single sprinkler opening, so is/was not complaint.

In answer to the concerns, replacing D.3.3 with the requirements of TB29.3.15 does not confuse two different operations, it keeps them separate, because as stated, there is a need for both, and the zone testing is still required to prove the integrity of the connection and the various alarms.

What this amendment should however do, is highlight that the flushing valve should not be used for testing the alarm facilities, even though it has always been incorrect to do so.

Question:

Are you expecting Insurers to require that air release valves are fitted to all of their clients looped and gridded installations?



Yes, in the case of the gridded systems, we would expect insurers to require this air release improvement to be adopted.

We would also expect system designers to adopt the air venting in line with this Technical Bulletin TB229.3.15 as a matter of course from now on.

## Final Words:

For those who have taken the time to send in your questions/queries many thanks.

Should anyone have any further questions please feel free to submit these to us.

Comments and proposals regarding the LPC Rules can be submitted to us at any time on the email below;

Email: [technical@thefpa.co.uk](mailto:technical@thefpa.co.uk)

# Electronic LPC Sprinkler Rules:

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# Learning out comes

Just a reminder that today's webinar should have provided information to the recent editions of :

- The LPC Rules for Automatic Sprinkler Installations 2015 incorporating BS EN12845
- To answer frequently asked questions relating to the recent updates.
- To provide background information relating to the updates.



## LPC Rules sales enquiries

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