



SAFETY
DESIGN
IN
BUILDINGS

Maintainability and Commissionability of Fire & Life Safety Systems in High Rise Cluster Towers

Presented By:
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Maintainability and Commissionability of Fire & Life Safety Systems In High Rise Tower Clusters



- Fire and life safety systems are commonly engineered and designed based on the operational effectiveness. What is equally important but often overlooked is the ease of maintenance, testing and even commissioning. A fire safety system that cannot be or is difficult to maintain or to test will result in systems not being tested or maintained which in turn will lead to systems not working properly.
- This presentation highlights the requirements and also typical examples of issues being found in High Rise Tower cluster projects.

Presenter



Peter Van Gorp

Director FLS & Acoustics at AESG

Peter has been working as a Fire Engineer for more than twenty-five years of which 15 years in the Middle East.

He handled building fire and life safety projects ranging from schools, hotels, hospitals to large shopping malls to multi occupancy high rise and industrial developments, from initial concept to assistance during construction.

Peter has also been involved in the fire safety system design and engineering fire safety system construction supervision and site management and in assistance and witnessing of testing and commissioning of fire and life safety systems.

He also has extensive experience in fire risk assessments ranging from qualitative fire risk assessments of refinery and chemical processes to quantitative fire risk assessments of installations. In his role, he has conducted numerous risk assessments involving gas installations and involving storage and handling of hazardous materials.

Learning Objectives



1. What are the testing and maintenance requirements in FLS systems
2. Typical observations
3. How to integrate/ guarantee the commissioning, testing and ease of maintenance of fire and life safety systems in the design process



Fire and Life Safety Systems

- Fire Suppression Systems
- Fire Protection Systems
- Fire Alarm & Detection Systems
- Life Safety Systems
- Fire Stopping Systems



Fire & Life Safety Legislative Framework

The “QCD – Fire and Life Safety Guidelines” references the required minimum compliance levels from International organizations such as ISO, BS, ASTM and NFPA



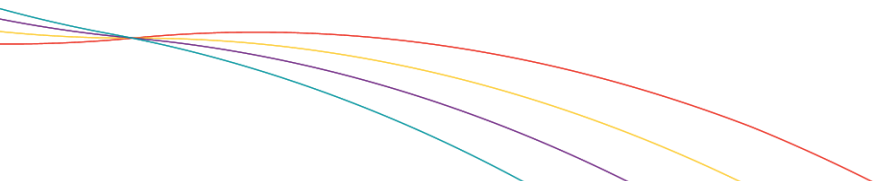
NFPA 3&4 Commissioning Definition

A systematic process that provides documented confirmation that **building systems function according to the intended design criteria** set forth in the project documents and **satisfy the owner's operational needs**, including compliance with governing laws, regulations, codes, and standards.



Quote

A fire safety system that is difficult to test or maintain will end up being a non working system.





Commissionability & Maintainability

- **Commissionability:** Determines that building(s) systems will function and can be commissioned to achieve the intended design criteria and compliance.
- **Maintainability:** Verifies that user/owner's operational needs can be achieved in regards to access and maintenance.



Commissionability

- **Capacities**
- **Compatibilities**
- **Coordination**



Commissionability: Capacities

Calculate, Analyze & Verify;

- Tanks / Pipes sizes and capacities
- Systems / Pumps / Fans capacities and volumes
- Electrical Loads and Emergency Power requirements



Commissionability: Compatibility

Assess, Analyze & Verify;

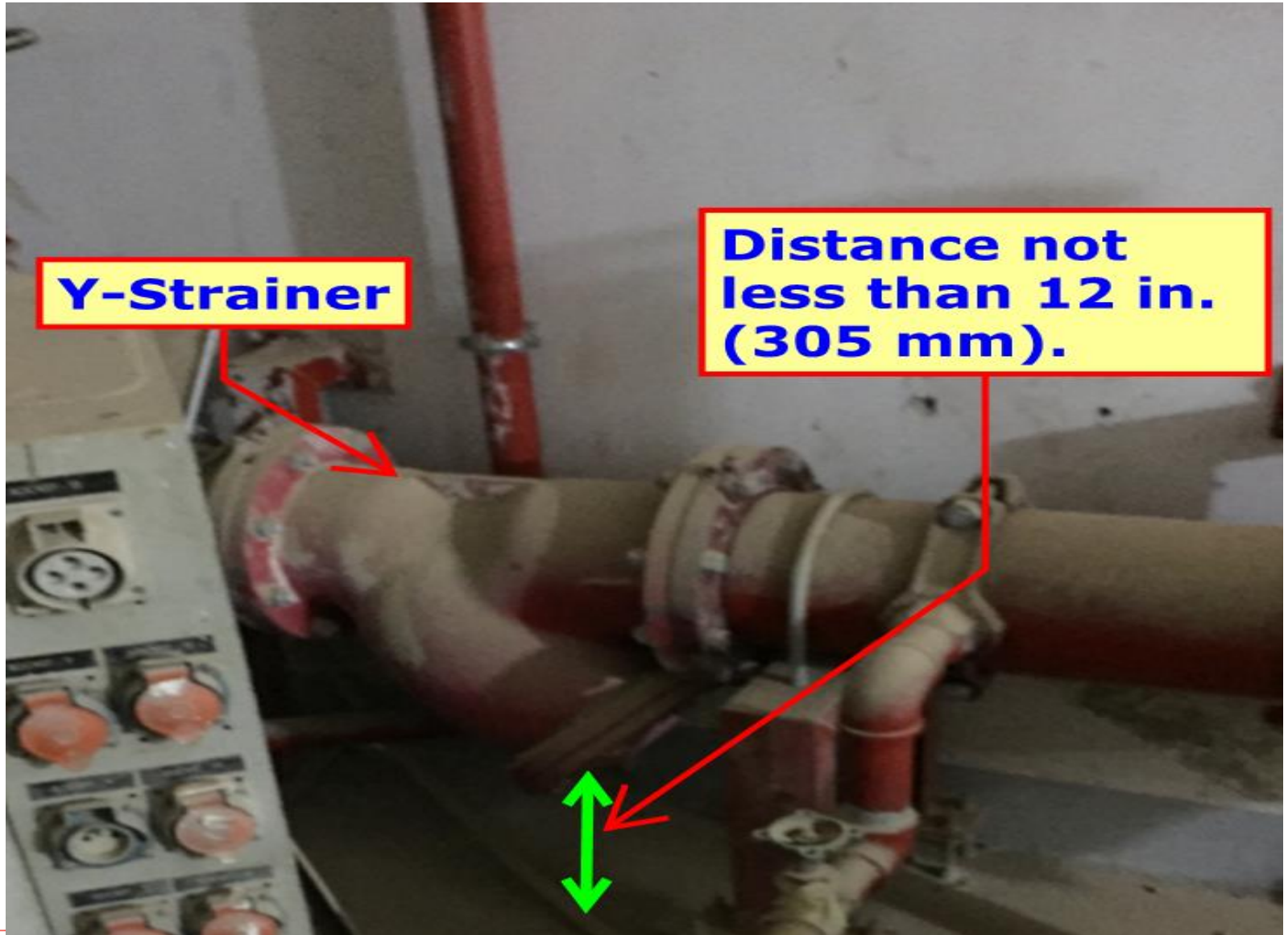
- Device Interface compatibilities from different vendors and manufacturers
- Systems/Motors operational requirements
- Systems Integration protocol requirements



Commissionability: Coordination

Assess, Analyze & Verify;

- Accessibility for maintenance and testing
- Systems, Plant & Equipment replacement strategies and maintenance requirements



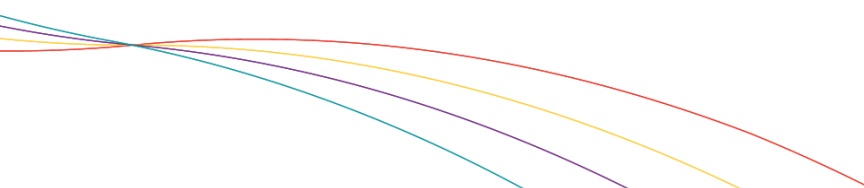
Y-Strainer

Distance not less than 12 in. (305 mm).



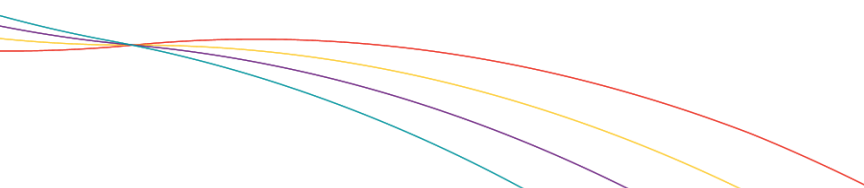
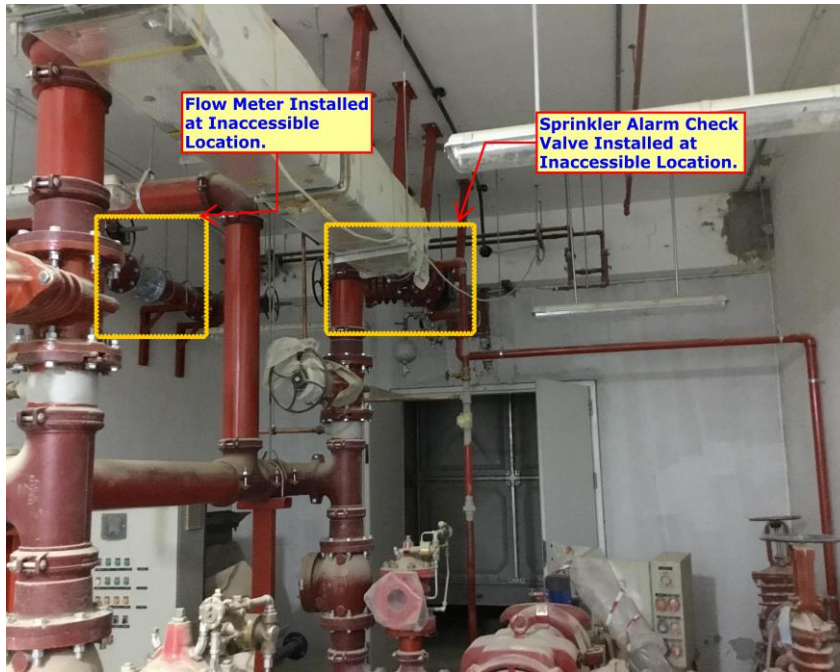


Commissionability in Design Stage: Benefits

- Design issues are corrected
 - Cx Teams engaged early reduces Major Risks as they are corrected when they are still minor issues
 - Failures that occur during Integrated Systems Testing are significantly reduced
 - The need for Systems modifications during operations are minimised
- 

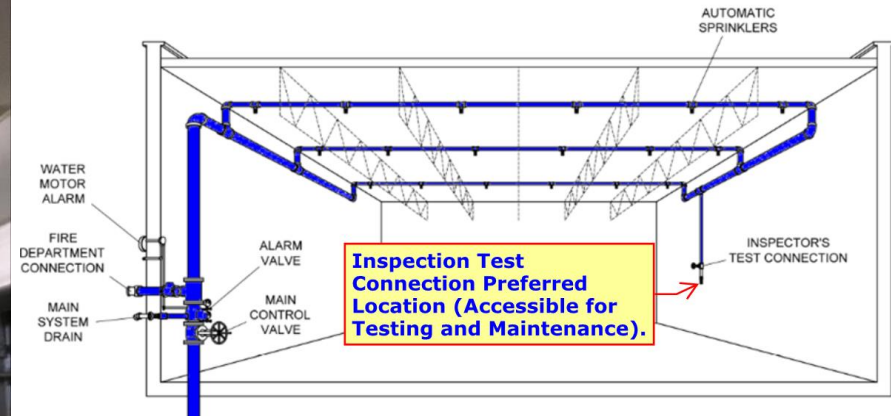
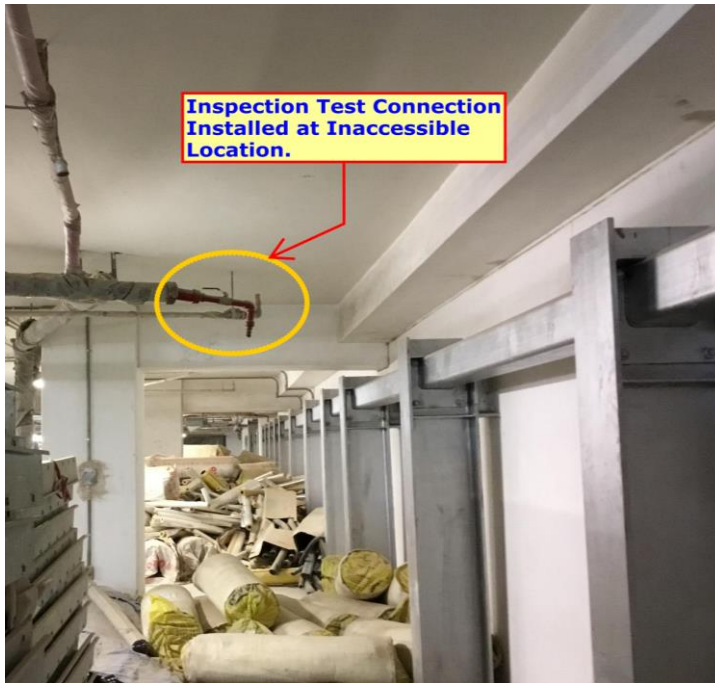


Common Issues – Sprinkler System





Common Issues – Sprinkler System



- Drain facility will be required for flow testing.



Common Issues – Sprinkler System

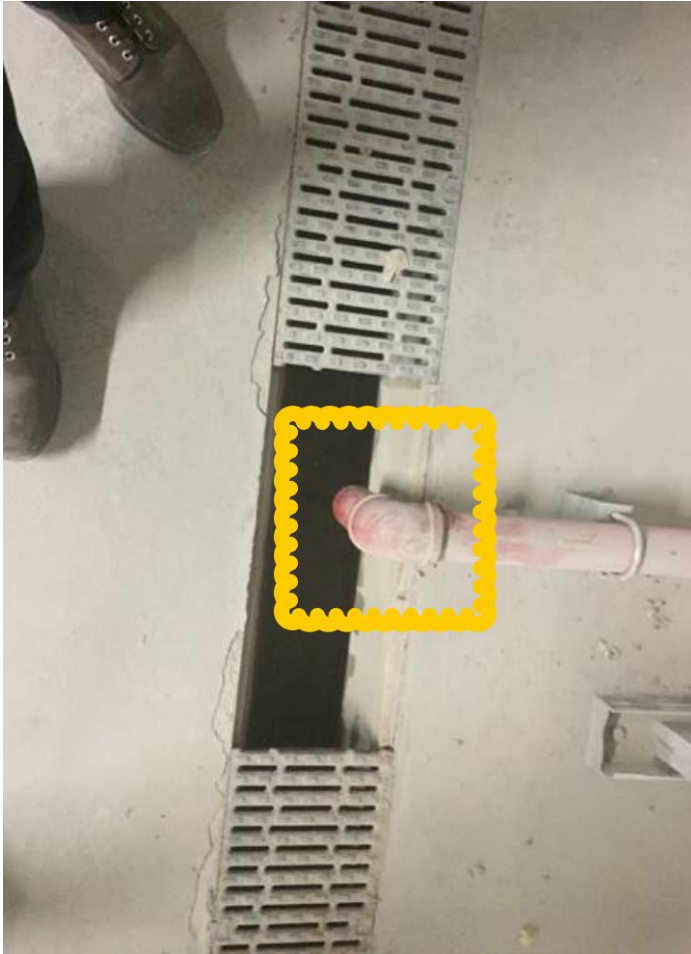


Sprinkler Alarm Check Valve Drain Pipe.

- Sprinkler alarm check valve drain pipe of test connection leads into a shaft where it cannot be seen where the water is flowing to.
- In the configuration shown it is certain that no testing will be done of the alarm check valve or system.



Common Issues – Sprinkler System



- Main drain connection leads to an open gutter in the car parking. Considering the high pressures which occur during the main drain test, water will splash all over the place. It would be better to provide an elbow at the end so that water will be directed in gutter avoiding splashing.
- It should also be verified that the floor drain system is able to cope with the high flow of water in case of the main drain test.



Common Issues – Sprinkler System



- The alarm bell drain line is connected with the main drain. In case the main drain opened there will be a backpressure exposing the alarm bell to excessive pressure causing damage to the bell and possibly other components of the alarm valve trimming.
- It is recommended to either provide a check valve or to lead the alarm bell drain line directly to an open drain.



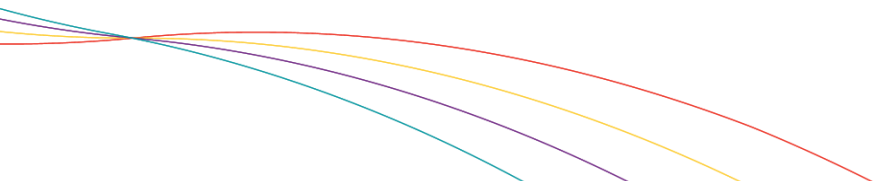
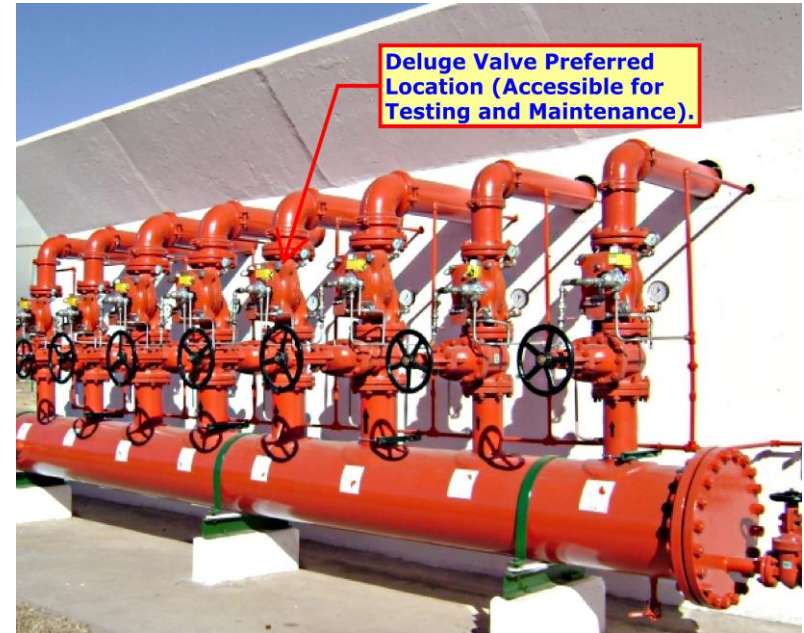
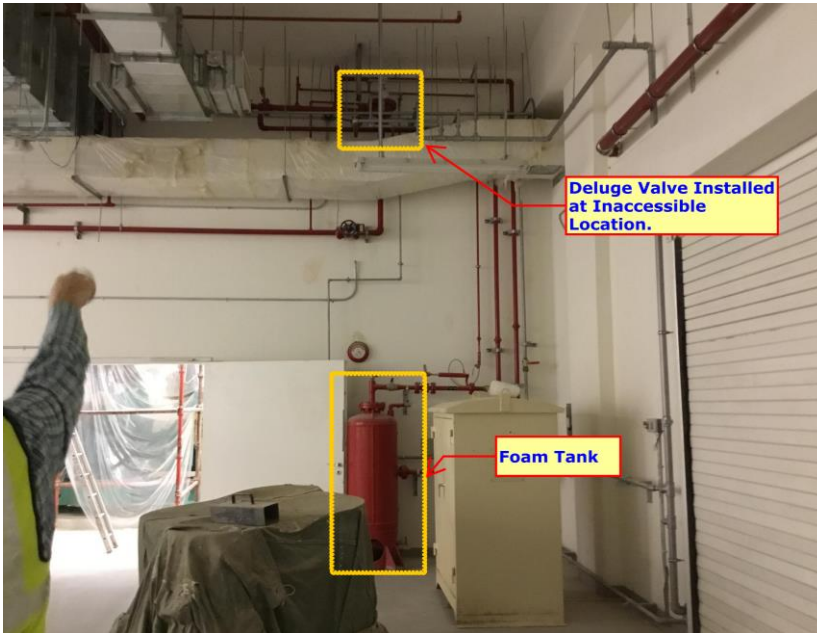
Common Issues – Sprinkler System



- On this picture it can be seen that the sprinkler drain pipe is connected with a sleeve pipe. The water tightness of this connection is questionable.

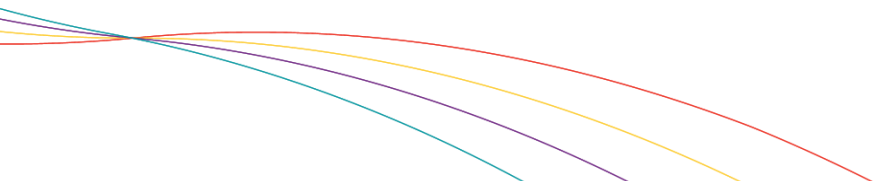
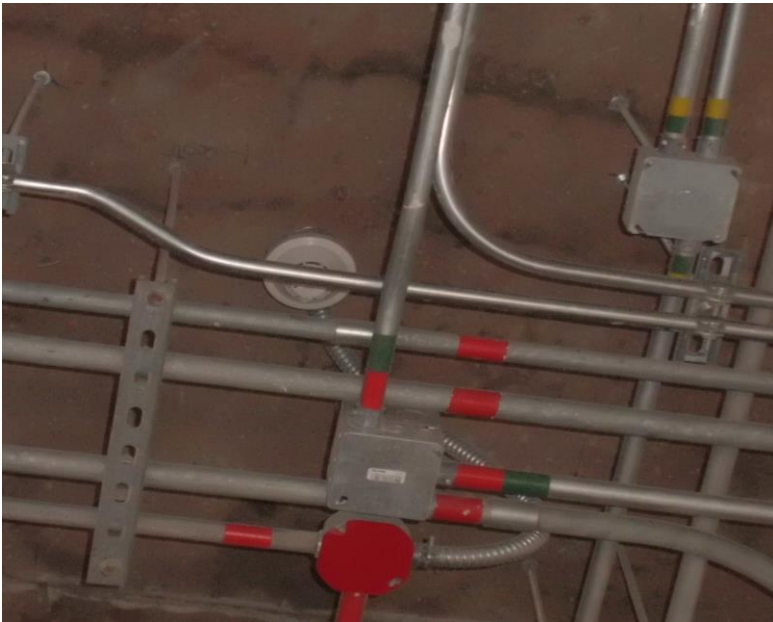


Common Issues – Deluge System



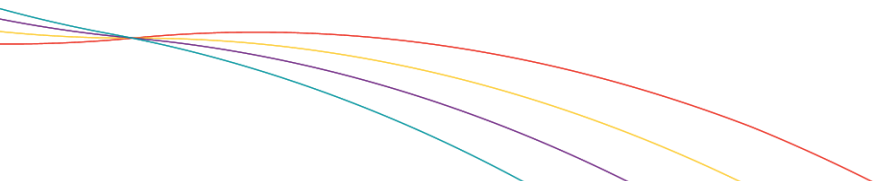


Common Issues – Fire Alarm System

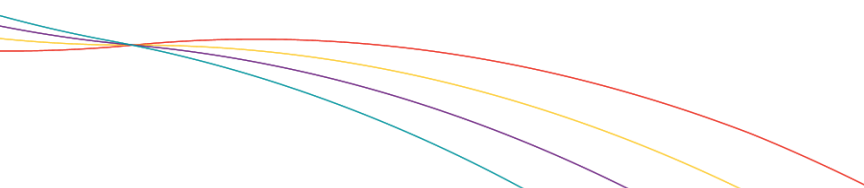
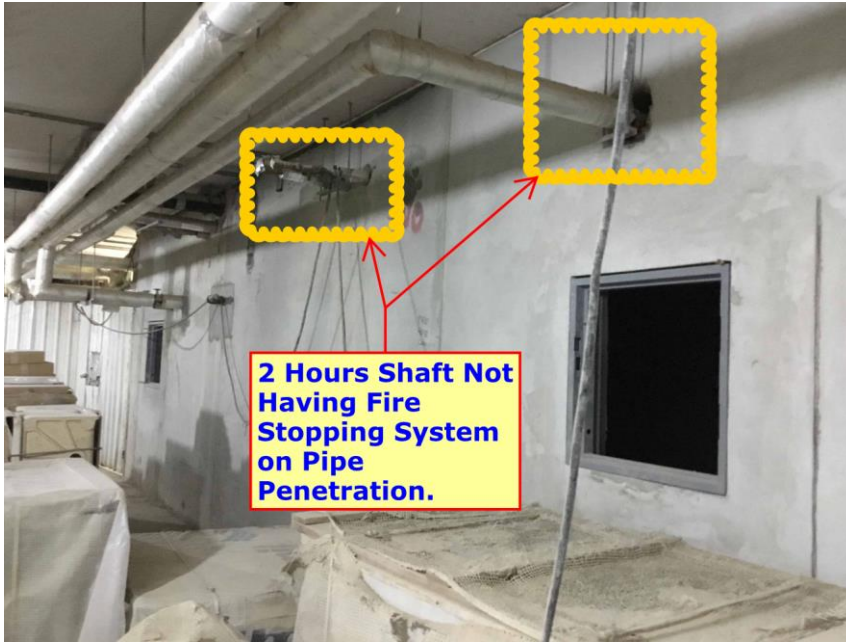




Common Issues – Hydrants

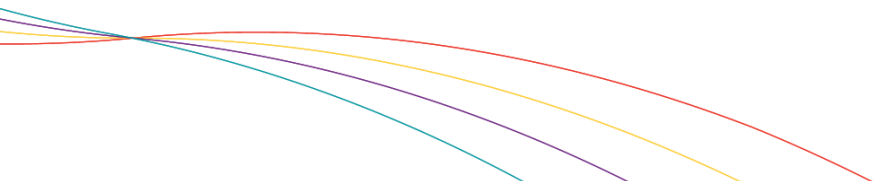


Common Issues – Fire Stopping System





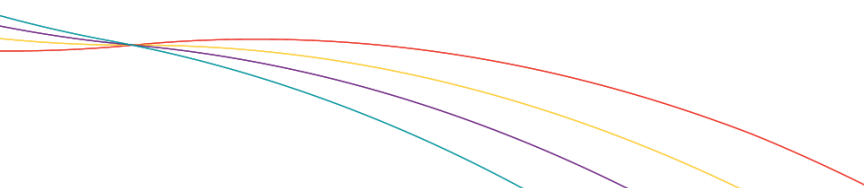
Common Issues – Fire Dampers





Commissionability: Current Industry Practice

Commissionability (including Access and Maintenance) Studies are seldom carried out due to;

- Late engagement of CxA Teams on Projects
 - Confused with design reviews
 - Deemed as unneeded exercises
 - Lack of understanding of the benefits in industry
 - Commissionability is not yet standardized
- 



BIM for Industry: Best Practice

BIM in the industry currently can be utilized for;

- Engineering Analysis & Systems optimization
- Programming
- Visualization of Systems
- Design Reviews & 3D Coordination (Clash Detection)
- Sustainability & Energy Assessments
- Cost Estimation & Quantification
- Facilities Management
- Asset Management

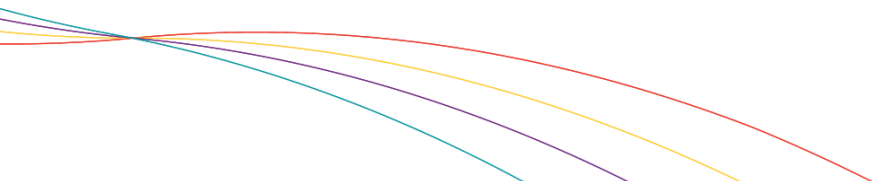
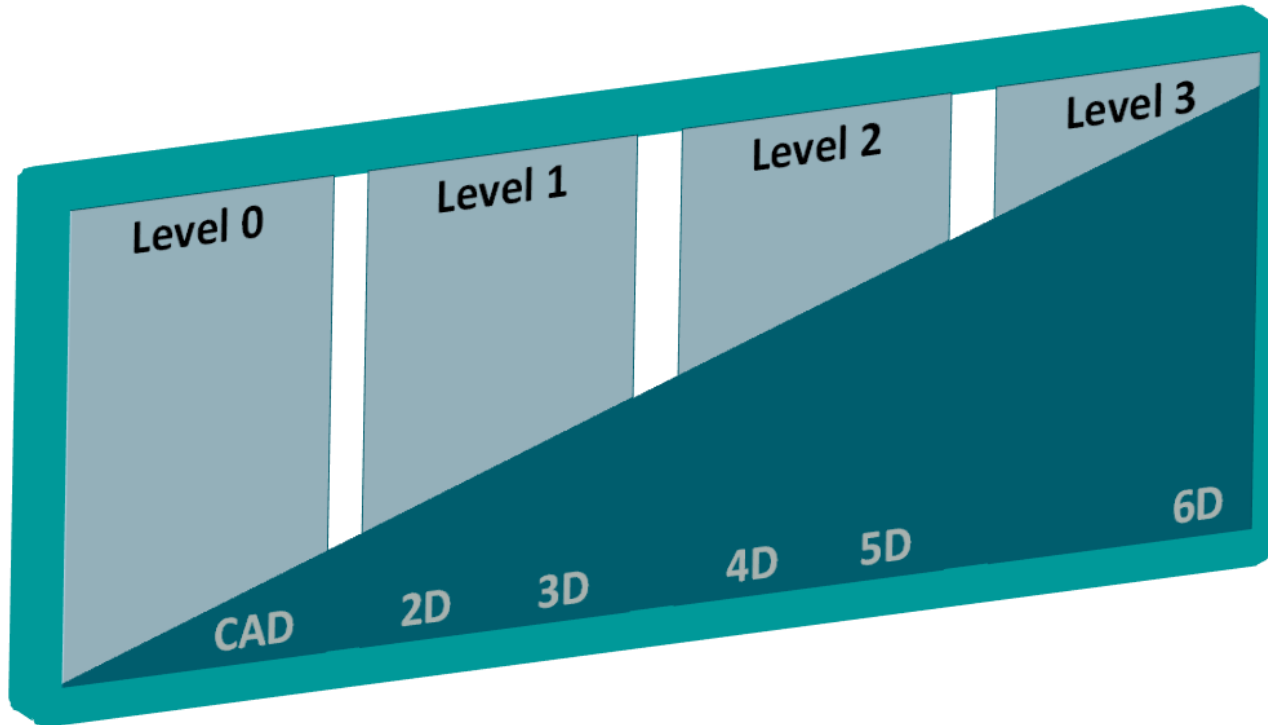


BIM for Industry: Overall Benefits

- Value Engineering
- Expedites Commissionability, Maintainability and Coordination reviews
- Ascertains the systematic Data required for 'scoping' the systems
- Generates accurate quantity take-offs and producing Asset schedules
- Optimizes building efficiency and system designs early on
- Eliminates conflicts and late changes



BIM for Industry: Levels





BIM for Industry: Dimensions

3D



- MEP Coordination
- Commissionability
- Accessibility
- Maintainability

4D



- Construction sequencing
- Planning optimization
- Enhances Timely Project Completion

5D



- Quantity harvesting
- Application of Cost
- Reduction in Carbon data

6D

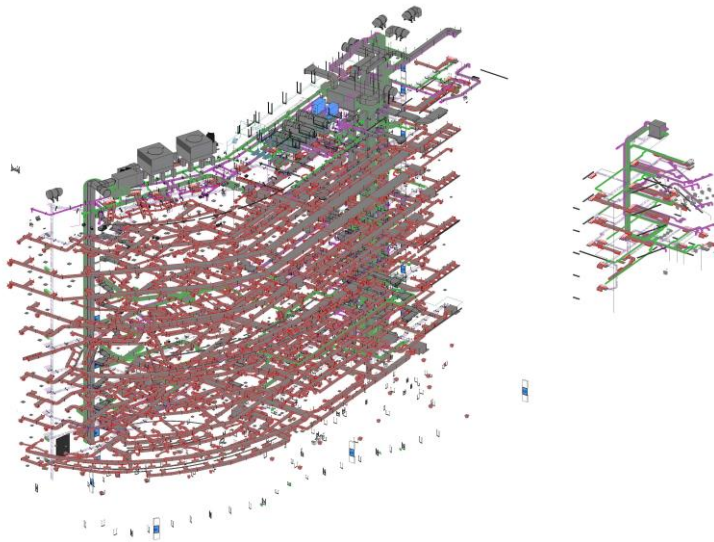


- Assist FM Efficiency
- Facilitate FM Tracking
- Simulate FM Testing

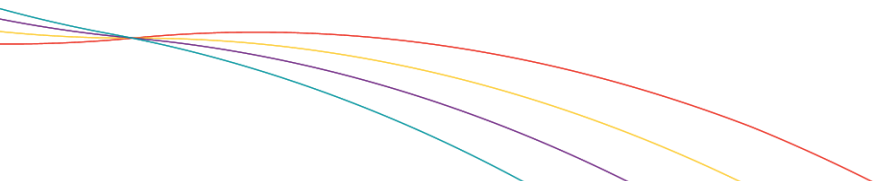
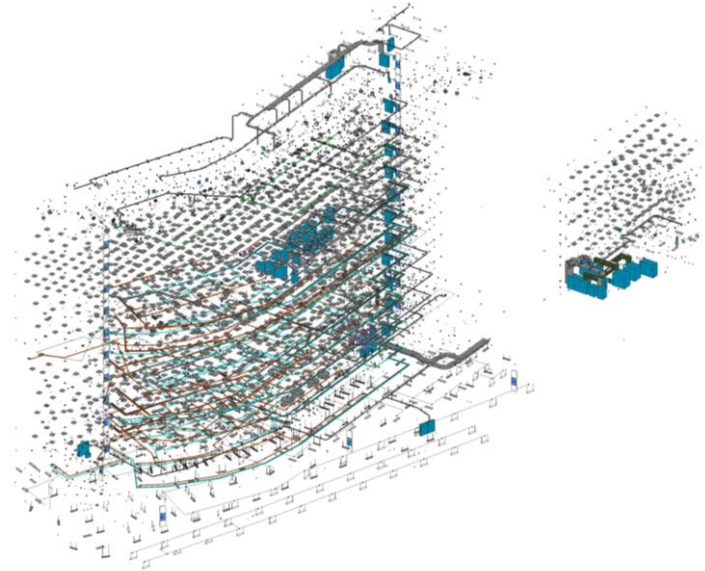


BIM for Commissionability: Systems

Mechanical BIM Model



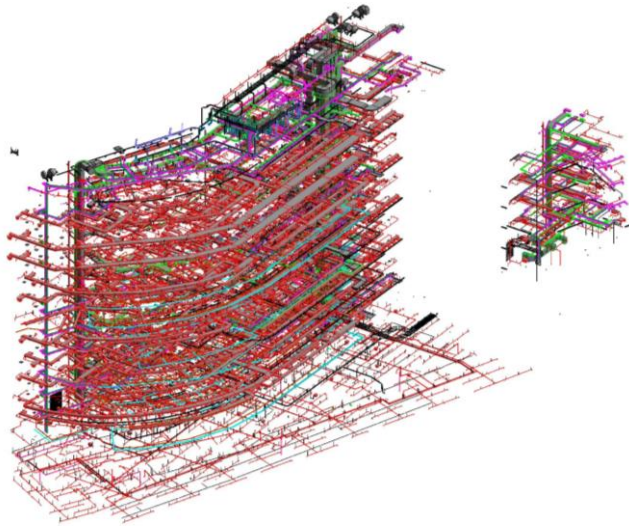
Electrical BIM Model



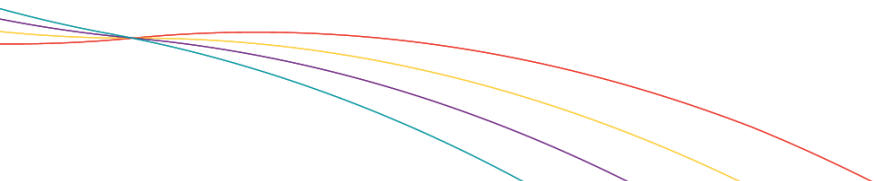
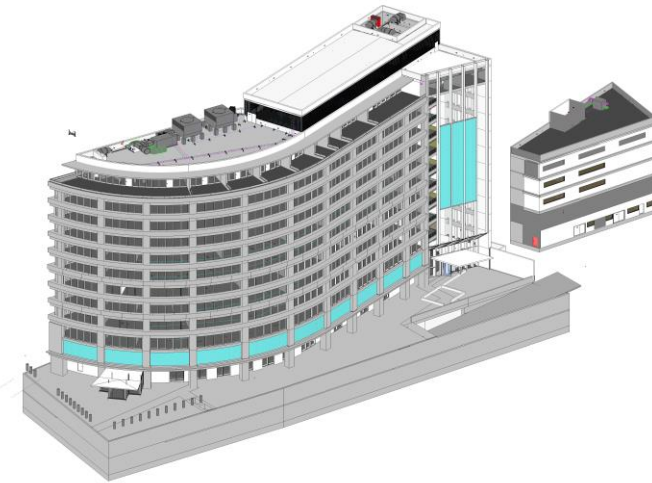


BIM for Commissionability: Systems

Combined MEFP BIM Model

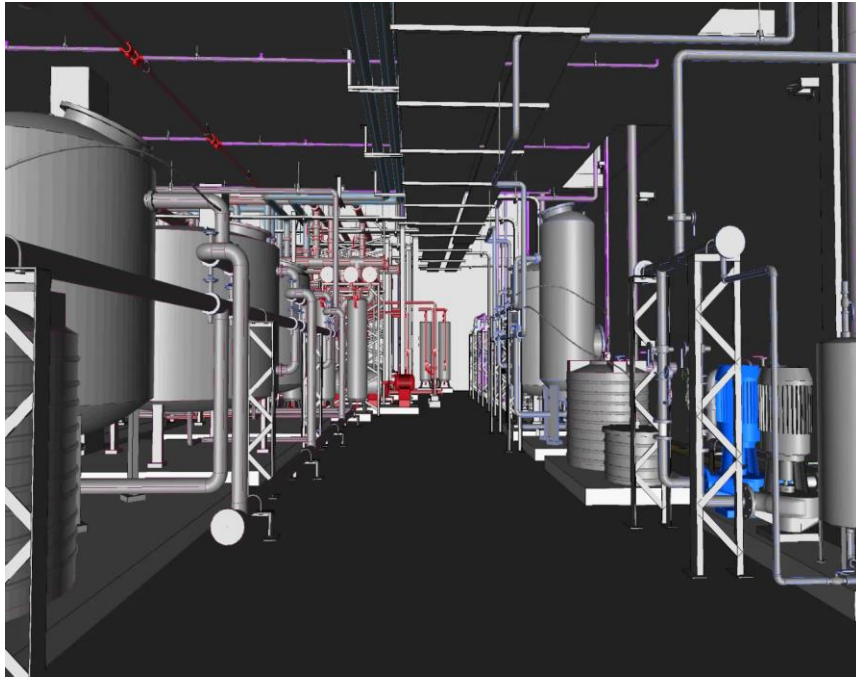


Combined ASMEFP BIM Model

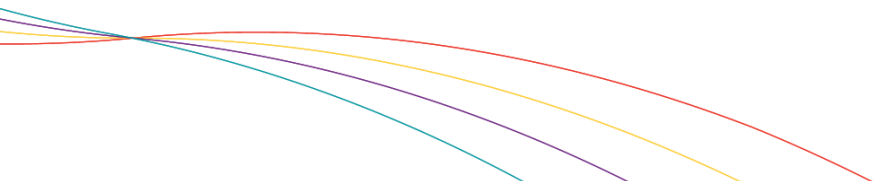




BIM for Commissioning: 3D Coordination

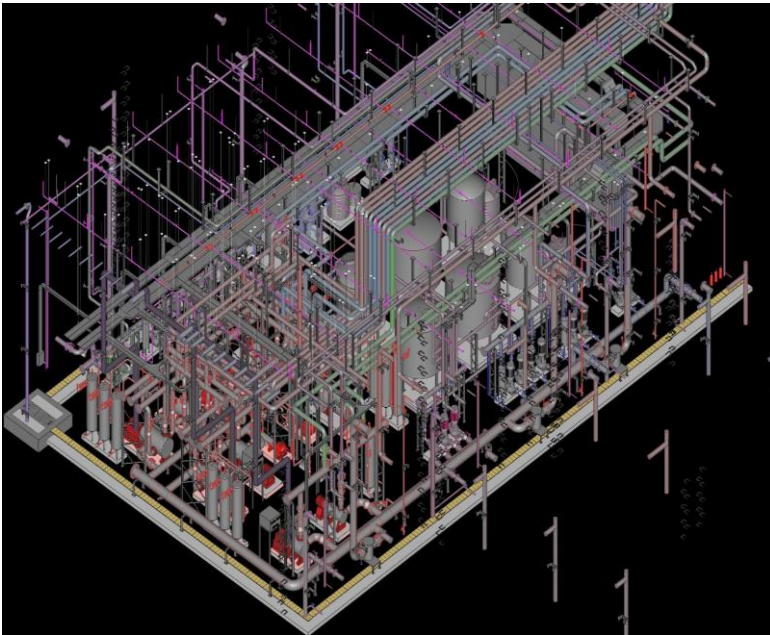


Allows for Virtual Walkthrough of Plant Rooms

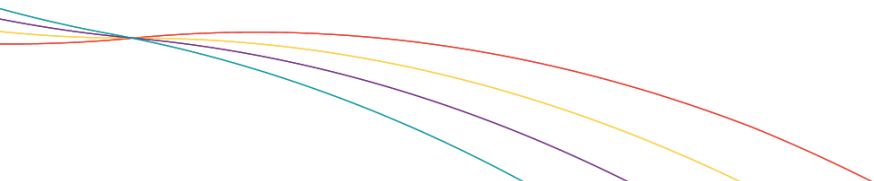




BIM for Commissioning: 6D Maintainability



- Allows for visual analysis the systems
- Enhances overall Operational performance
- Helps FM easily locate system assets and components during operations
- Accurately tracks maintenance history
- Provides FM with maintenance reliability
- Decreases FM time and costs
- Increases FM productivity



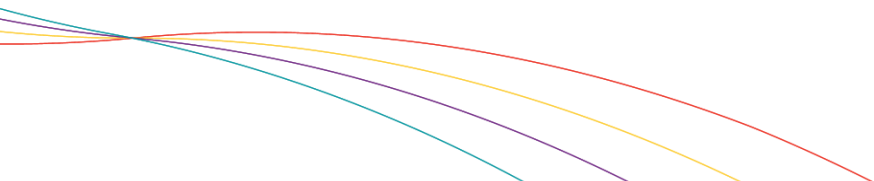


Commissionability & Maintainability

Conclusion

BIM for Commissionability & Maintainability should be standardized

"Without Commissionability at the right time, Systems performance and Maintainability will remain at risk"





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Thank you