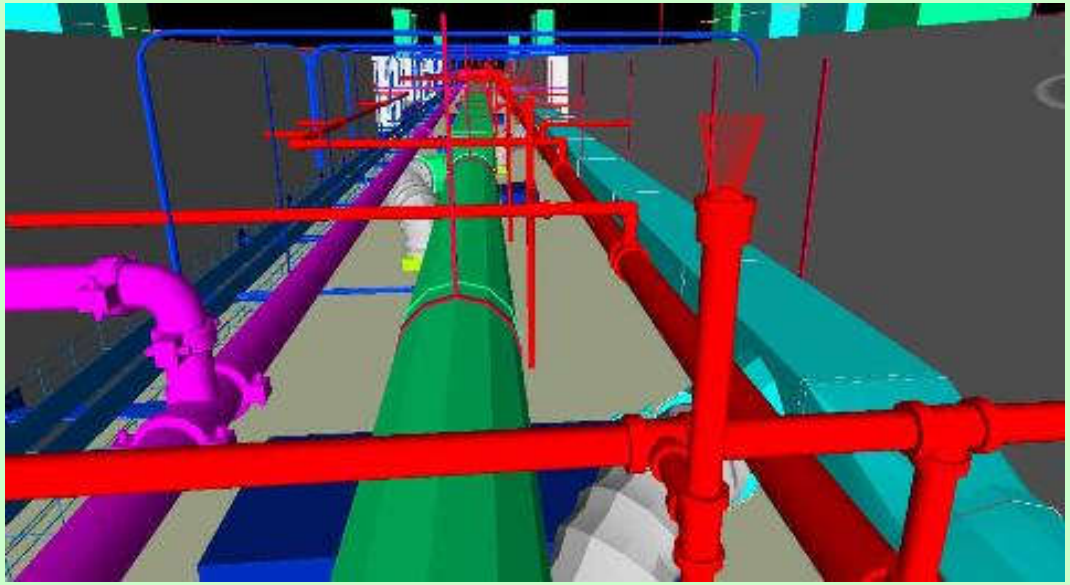
SBS5411 Building Information Modelling for BSE

http://ibse.hk/SBS5411/



Revit Fire Protection

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Sep 2018

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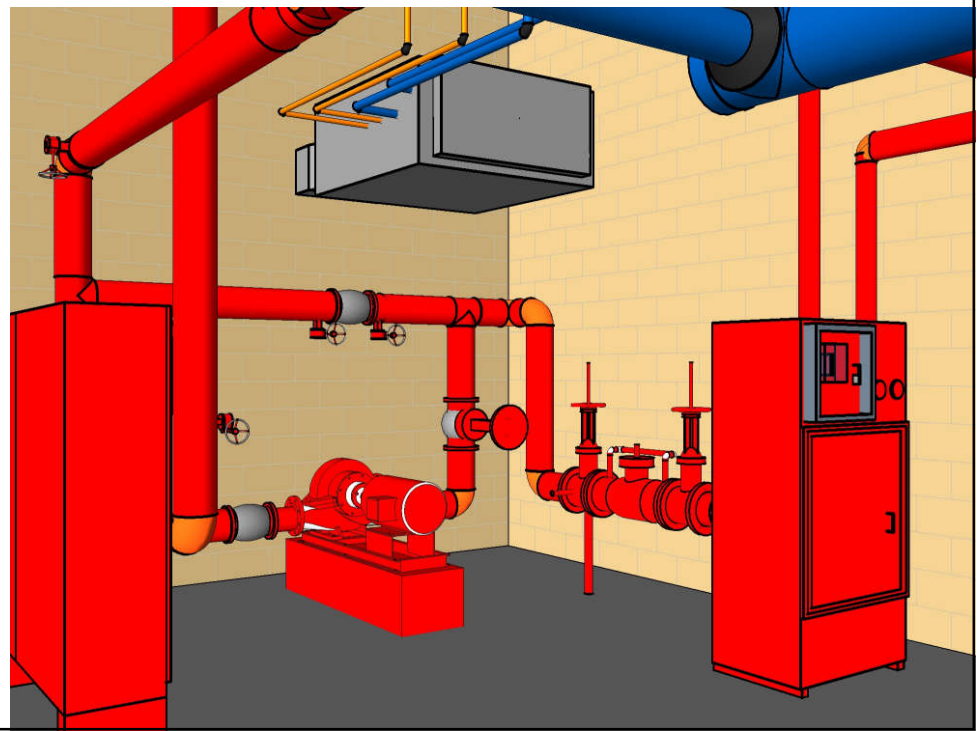


Fire protection systems

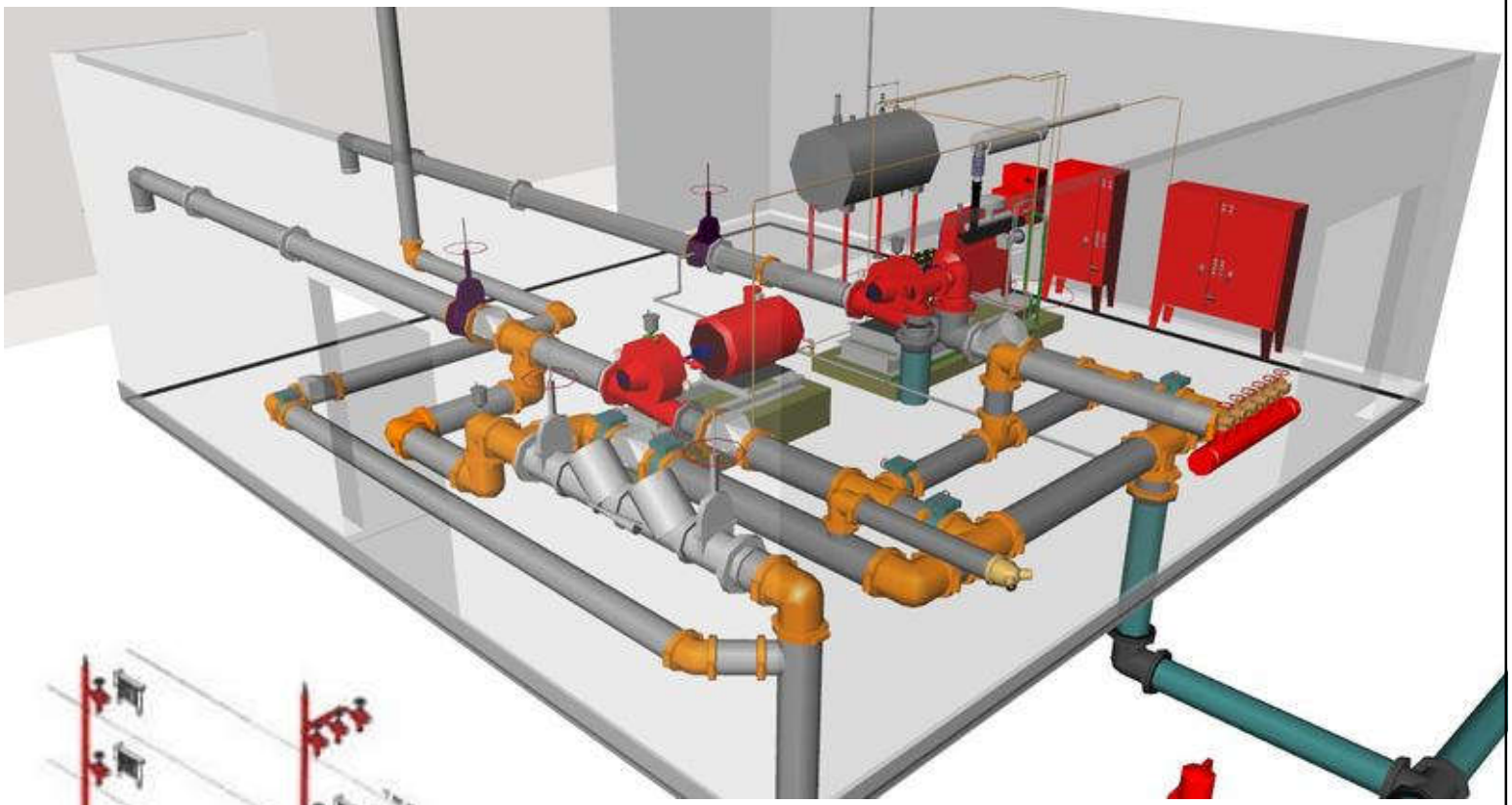
- Design of fire protection (services) systems
  - Active fire protection & passive fire protection
- Typical systems:
  - Fire hydrant & hose reel, automatic sprinkler, fire alarm & detection, fire extinguisher, gas discharge
  - Compartmentalization, fire-resistant walls/floors, fire stops, emergency evacuation, refuge floor
  - Emergency generator, emergency lighting, exit signs, fireman's lift, smoke control, staircase pressurization

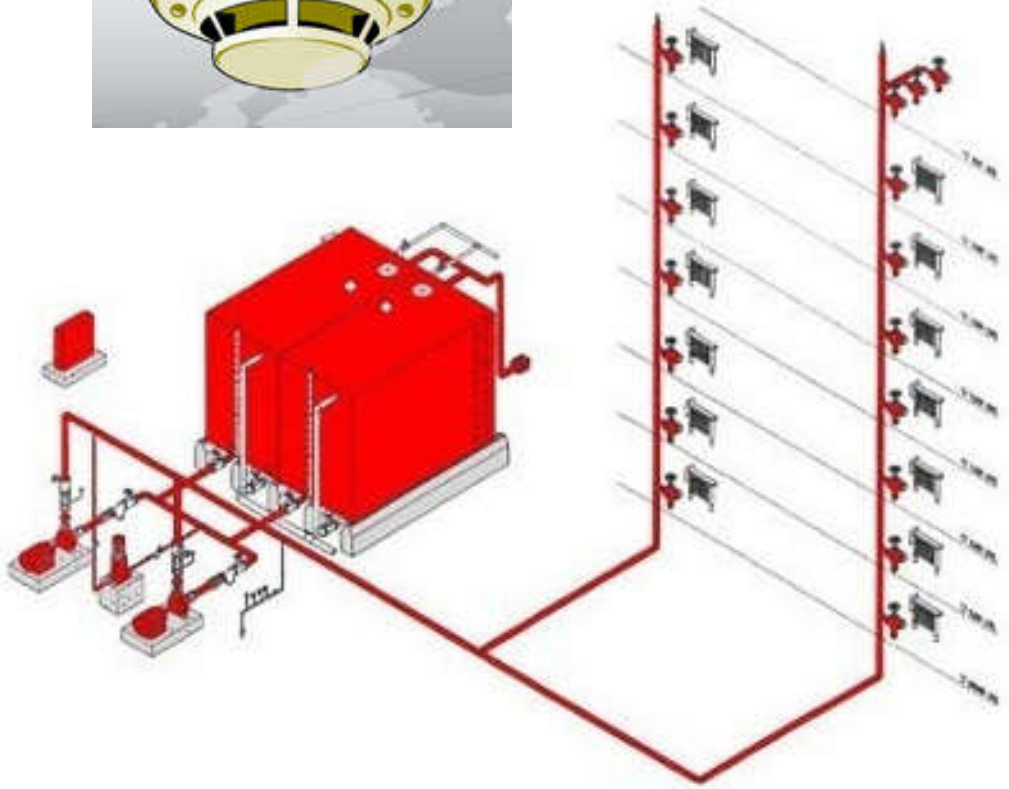
Fire protection systems

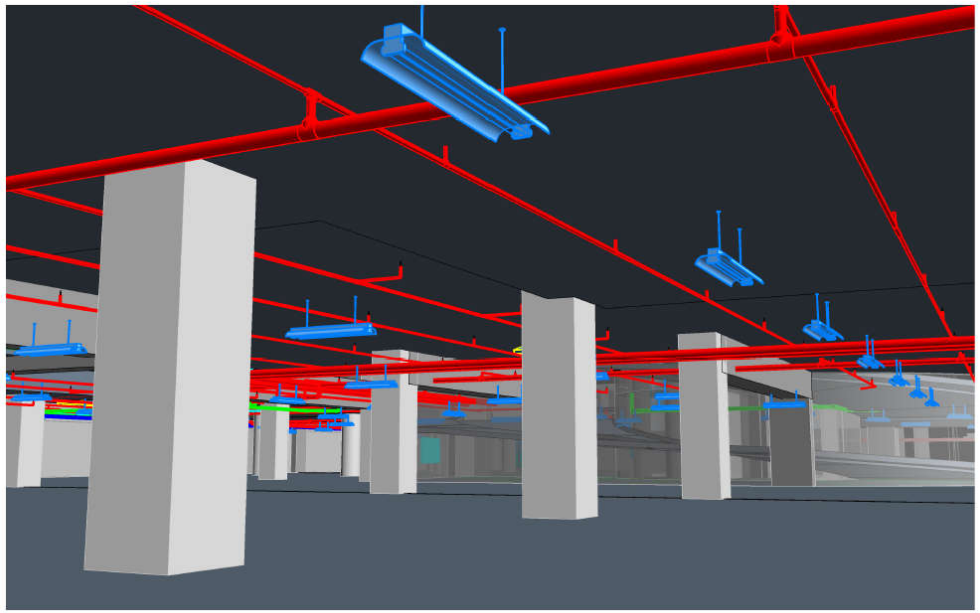
- BIM has been used in various forms throughout the fire protection industry*
  - However, most of the BIM work has been focused on stand-alone proprietary models developed by the contractors, such as
    - Fire sprinkler contractors
    - Fire alarm contractors
- Better to integrate them with other systems & models in the BIM environment

(*See also: Shino, G. K., 2013. BIM and fire protection engineering, *Consulting-Specifying Engineer*, 50 (3): 34-41, April. https://www.csemag.com/single-article/bim-and-fire-protection-engineering/)

3D fire protection system design



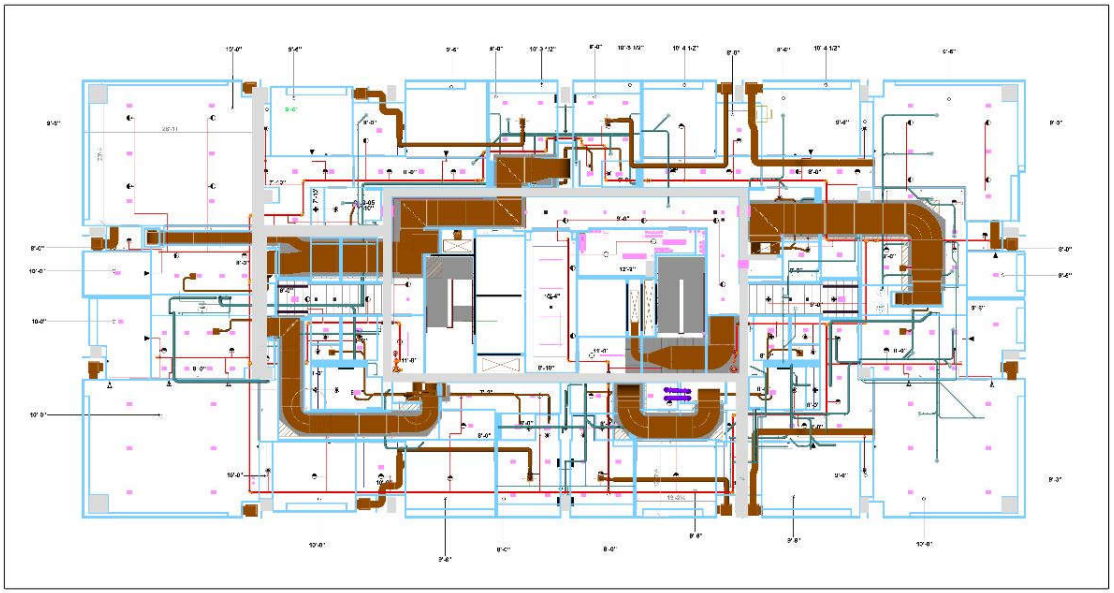


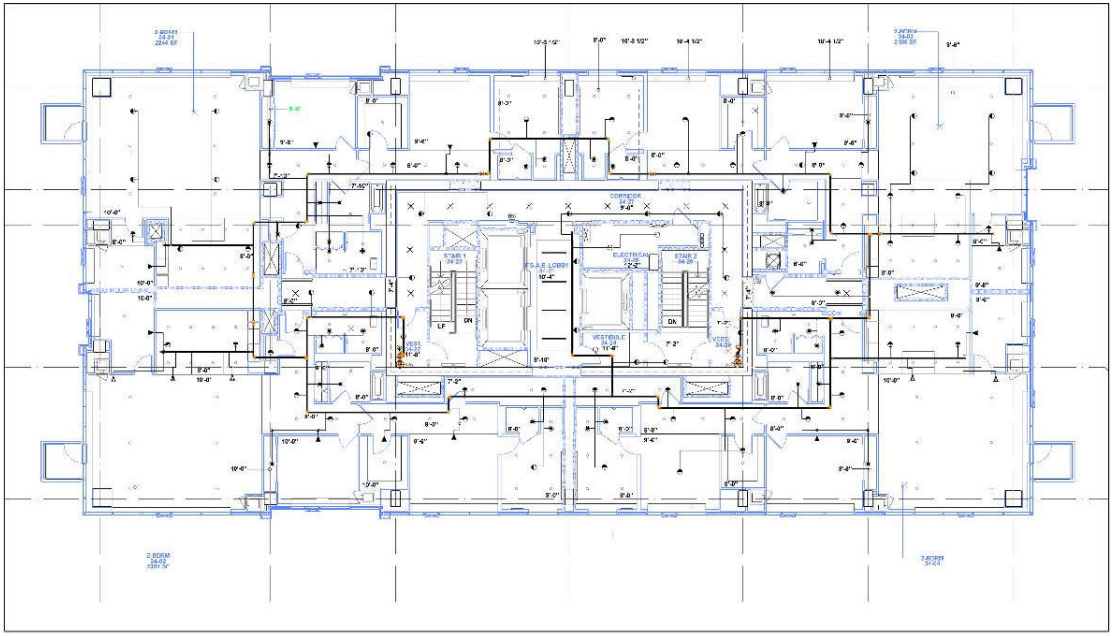


Fire protection systems

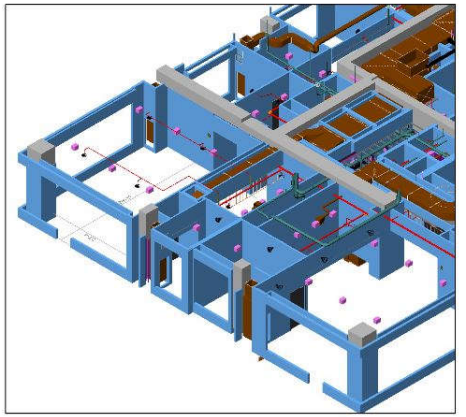
- Typical functions of customized fire sprinkler program: (such as https://www.autosprink.com/)
  - Develop systems in 3-D models
  - Automatically prepare hydraulic calculations
  - Print lists of system components
  - Put hangers & bracing on drawings based upon pipe sizes & dimensions
- Current limitation: cannot be shared with the building model

Fire sprinkler design drawings from a proprietary program



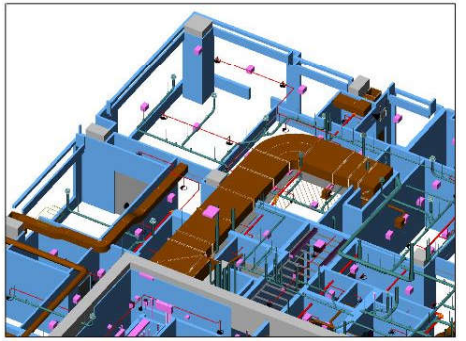


1 FIRE SPRINKLER PLAN



ISOMETRIC A

ISOMETRIC B



ISOMETRIC C

QUALITY Design, LLC

XX FIRE PROTECTION
201 SUNPAC AVE
HENDERSON, NV 89015

STATE LICENCE #58034-C41A STATE FIRE MARSHAL #3128

[jobname]
[jobaddress1]
[jobcity], [jobstate] [jobzip]

[sheet:description]

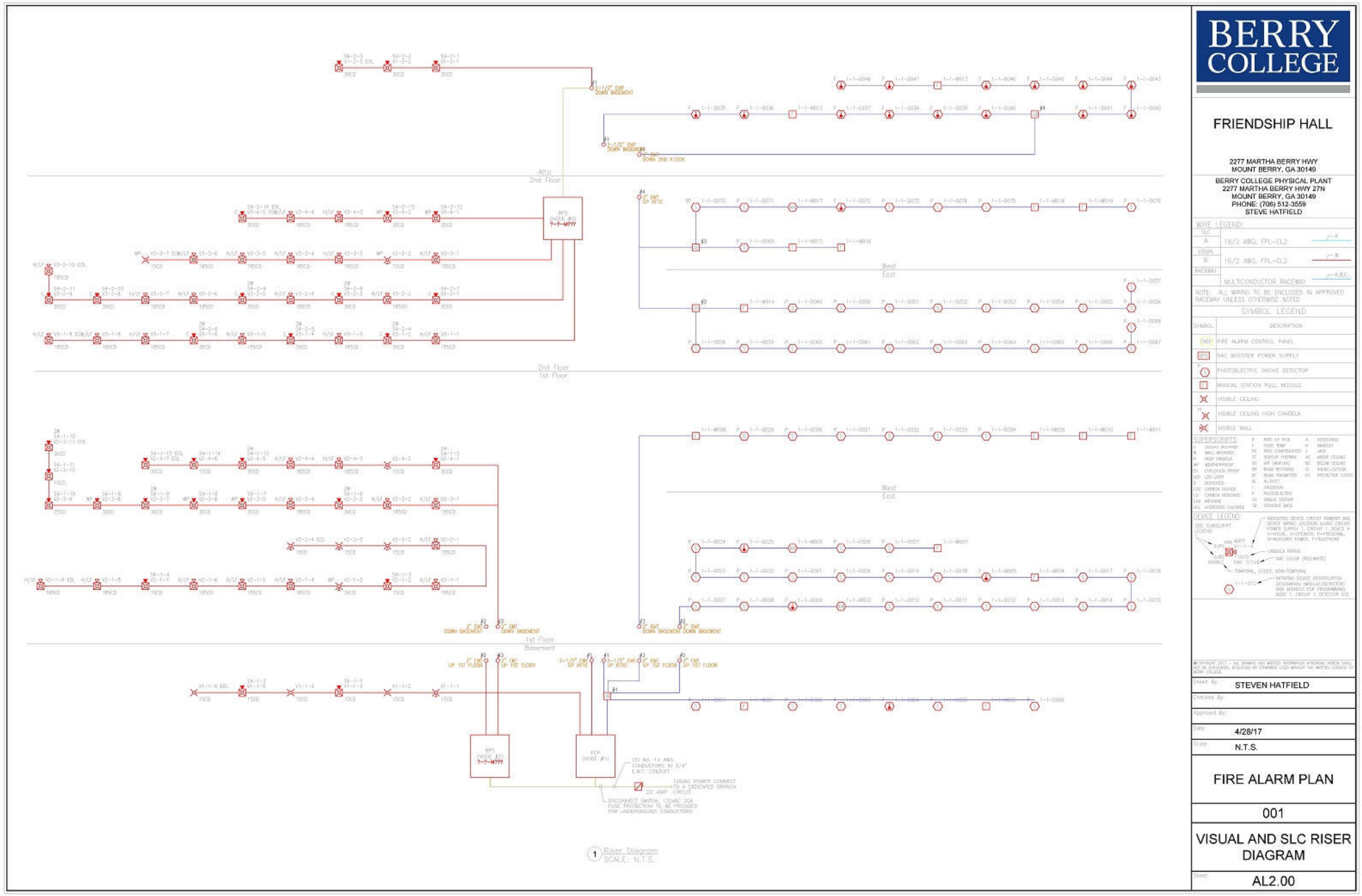
[sheet:number]

(Source: https://www.autosprink.com/)

Fire protection systems

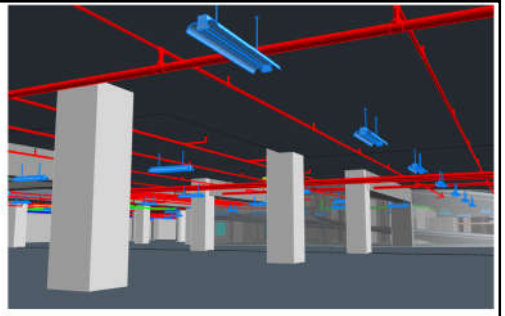
- Typical functions of fire alarm drafting program: (such as http://www.mepcad.com/alarmcad/)
  - Build fire alarm systems in 2-D or 3-D
  - Automatically assign network addresses to devices
  - Calculate voltage drops
  - Perform battery calculations
  - Prepare riser diagrams
- Current limitation: seldom used by other designers or stakeholders

Example drawings from a fire alarm drafting program



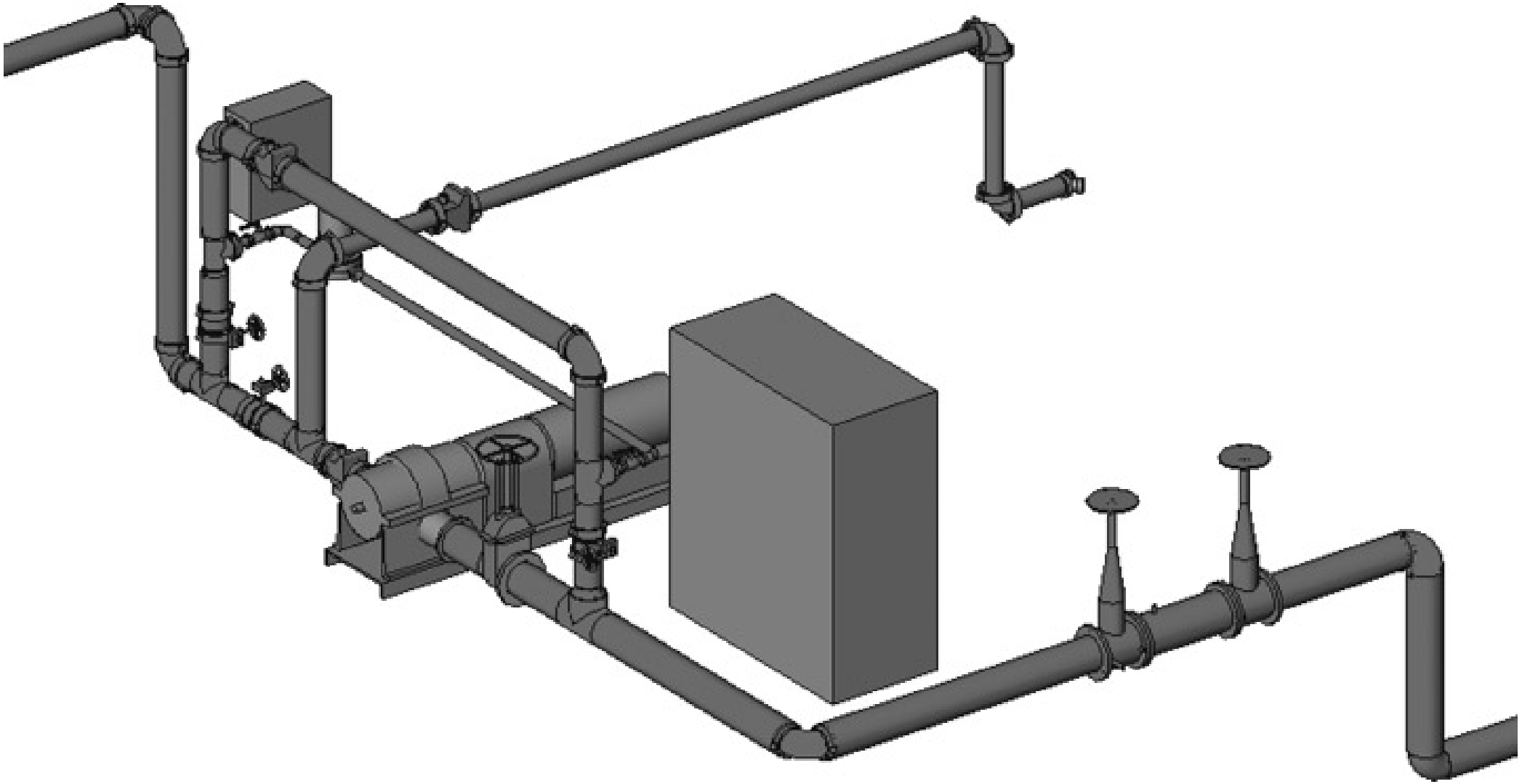
(Source: https://www.designalarms.com/Example-Drawings.html --- with more example drawings)

Revit fire systems design



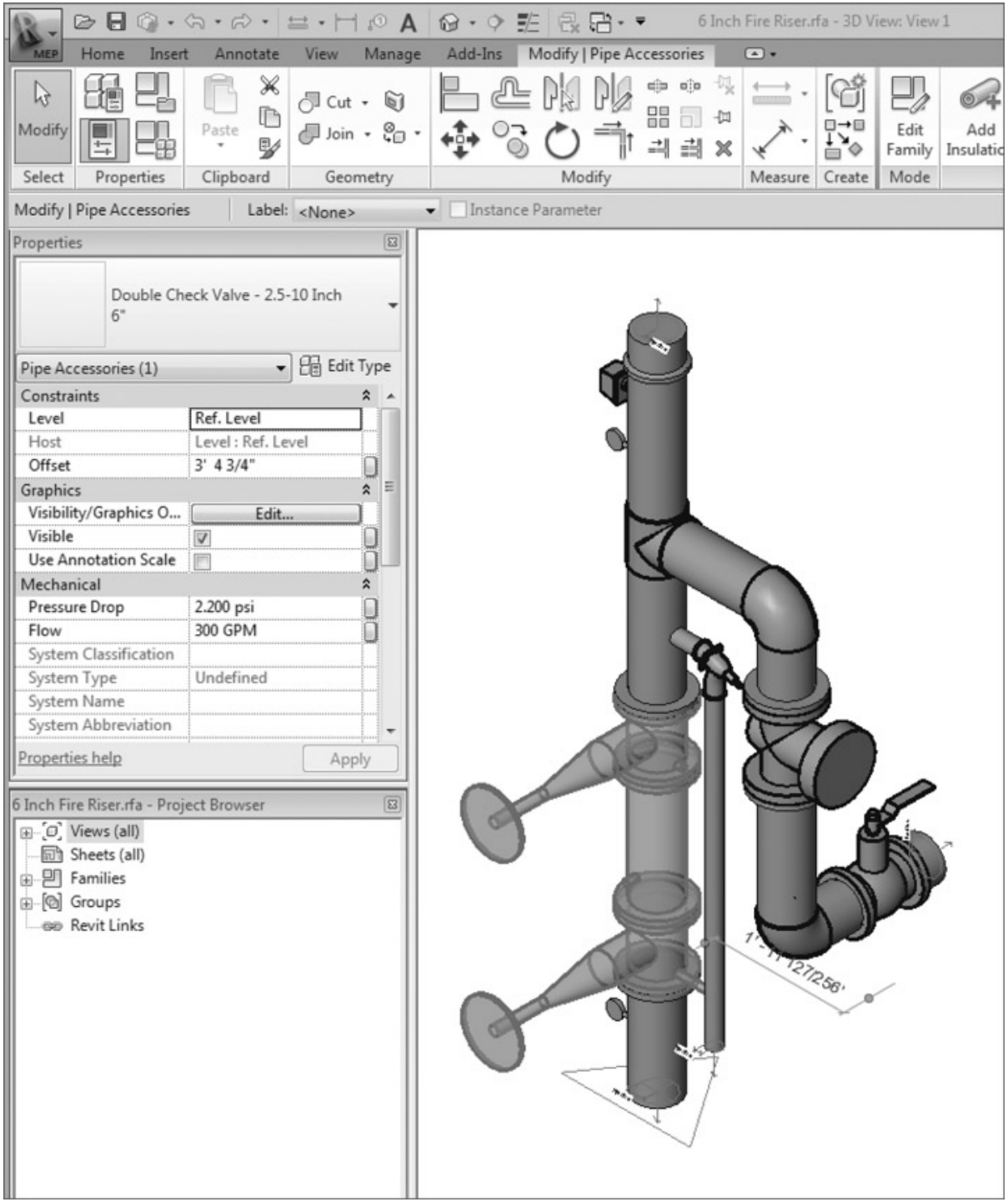
- Fire-protection designers use a variety of methods & software programs to lay out fire-protection systems
  - Can use BIM for coordination and clash detection with other services and building elements
  - Need to use proper design methods to verify whether a fire pump is required on a project & determine the point of connection, POC (where water supply starts)
- Fire pump >> Fire riser >> Sprinkler heads

Preassembled fire pump



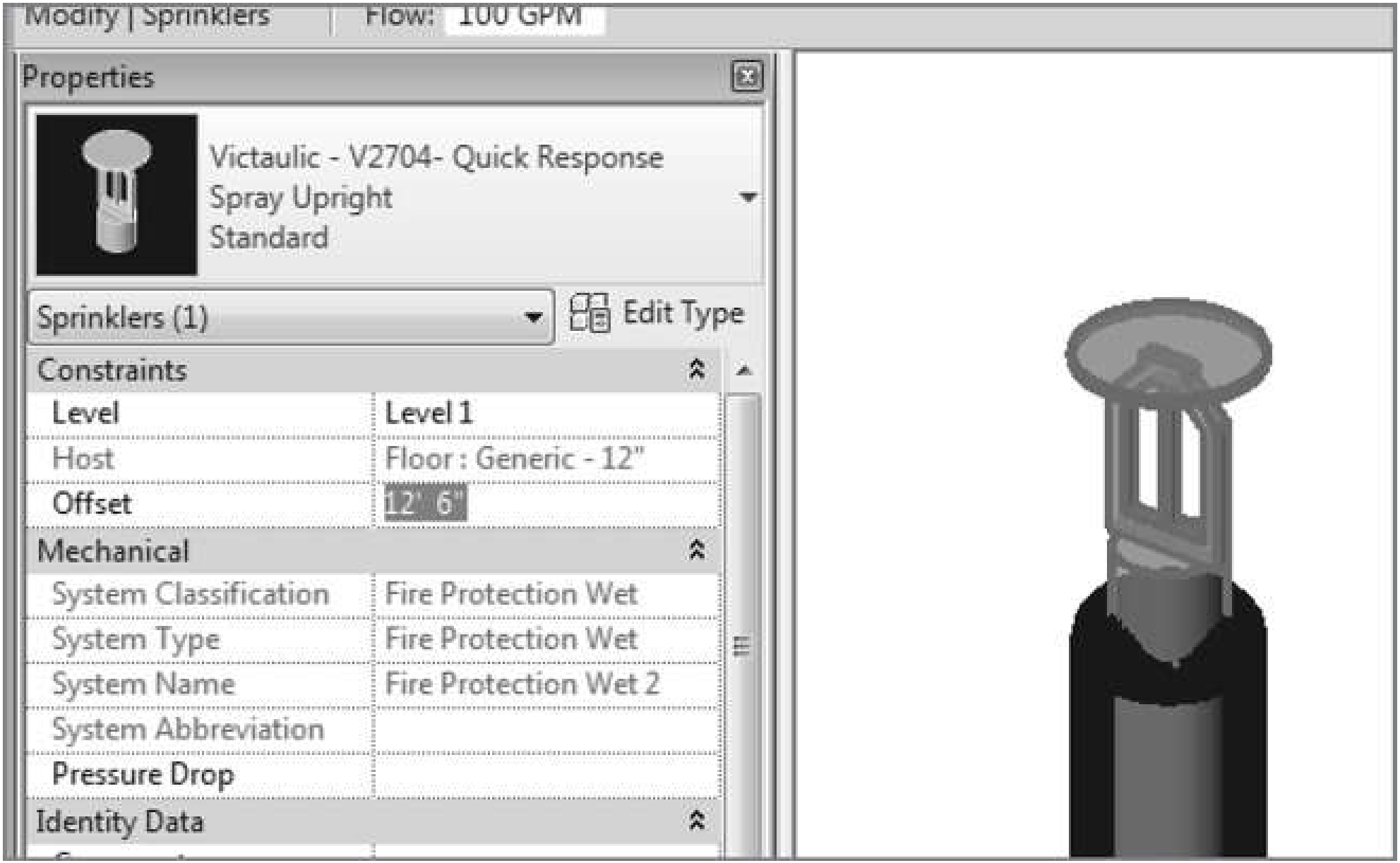
(Source: Bokmiller, D., Whitbread, S. and Hristov, P., 2013. *Mastering Autodesk Revit MEP 2014*, Sybex, Indianapolis, Ind.)

Fire riser assembly (with control valves)



(Source: Bokmiller, D., Whitbread, S. and Hristov, P., 2013. *Mastering Autodesk Revit MEP 2014*, Sybex, Indianapolis, Ind.)

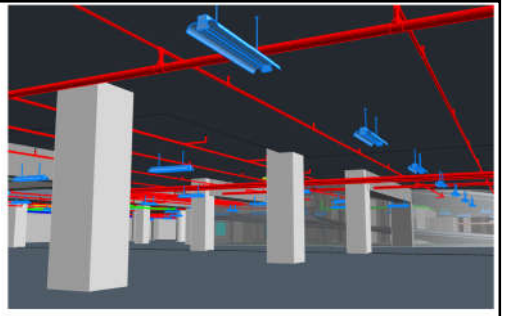
Nonhosted sprinkler heads



*Also refer to the details & information from fire equipment manufacturer, such as Victaulic http://www.victaulic.com/

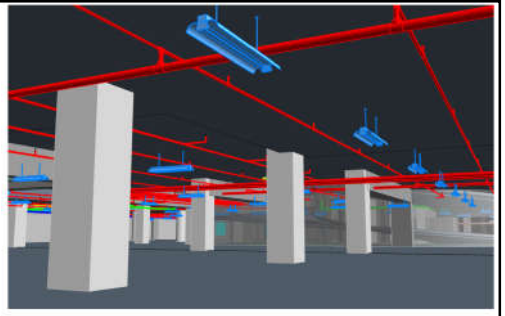
(Source: Bokmiller, D., Whitbread, S. and Hristov, P., 2013. *Mastering Autodesk Revit MEP 2014*, Sybex, Indianapolis, Ind.)

Revit fire systems design



- Create fire-protection systems
  - Wet fire protection (when freezing is not expected)
  - Dry fire protection (avoid damage from freezing)
  - Pre-action (for a deluge system)
  - Others (e.g. chemical suppression system)
- The system does not calculate & autosize as it does for domestic water systems
  - Add filters to enable easy fire protection views
  - Also refer to “Mechanical Piping” for design/route

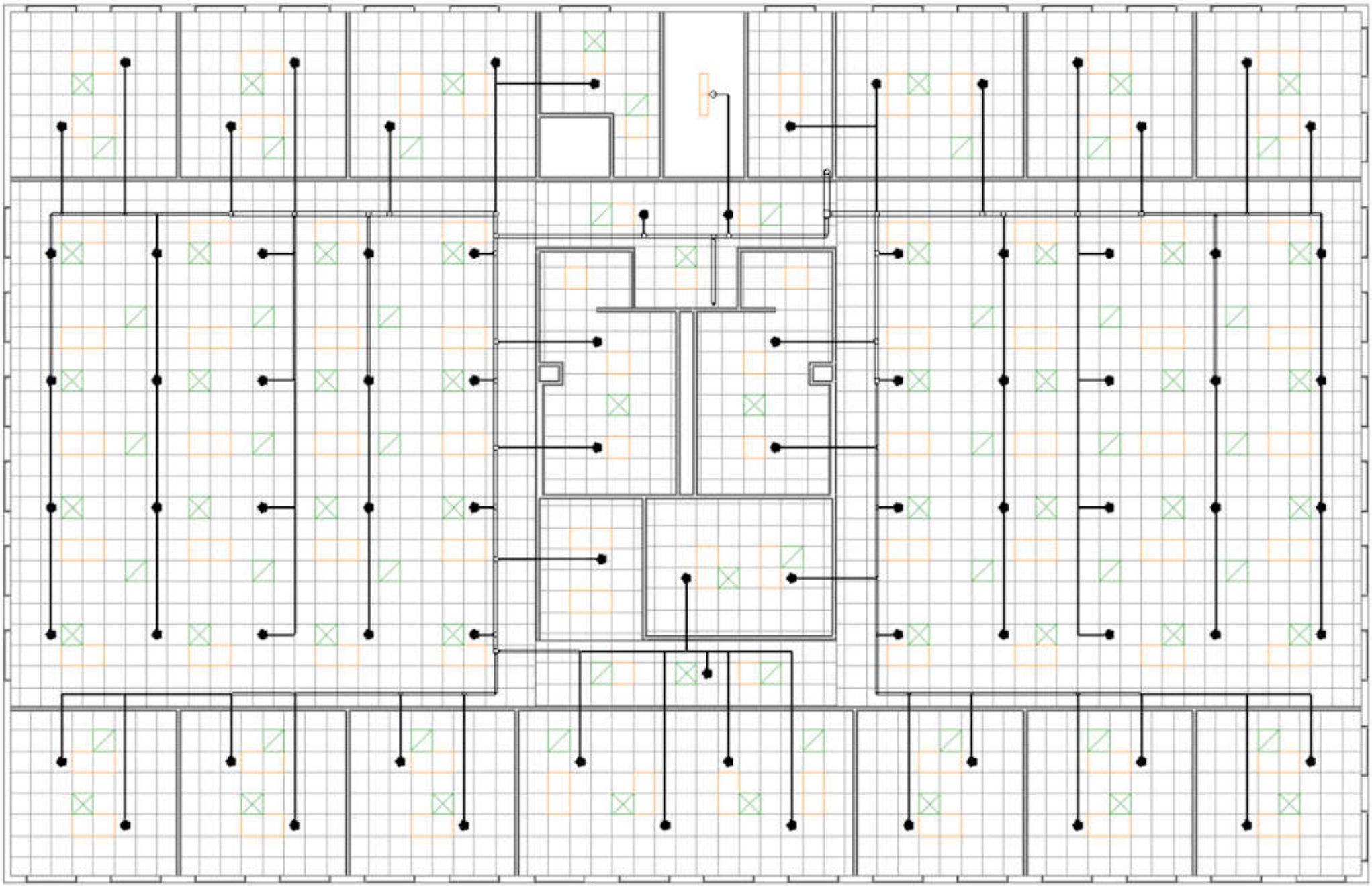
Revit fire systems design



- Typical design & modelling tasks*
  - Prepare fire protection system modelling
  - Create sprinkler design schedule
  - Place & connect sprinklers
  - Modify & tag pipe diameters & rooms
  - Add fire cabinet
  - Add fire-alarm devices & control panels
  - Connect systems & devices, set up routing
  - Interference checking with other building systems

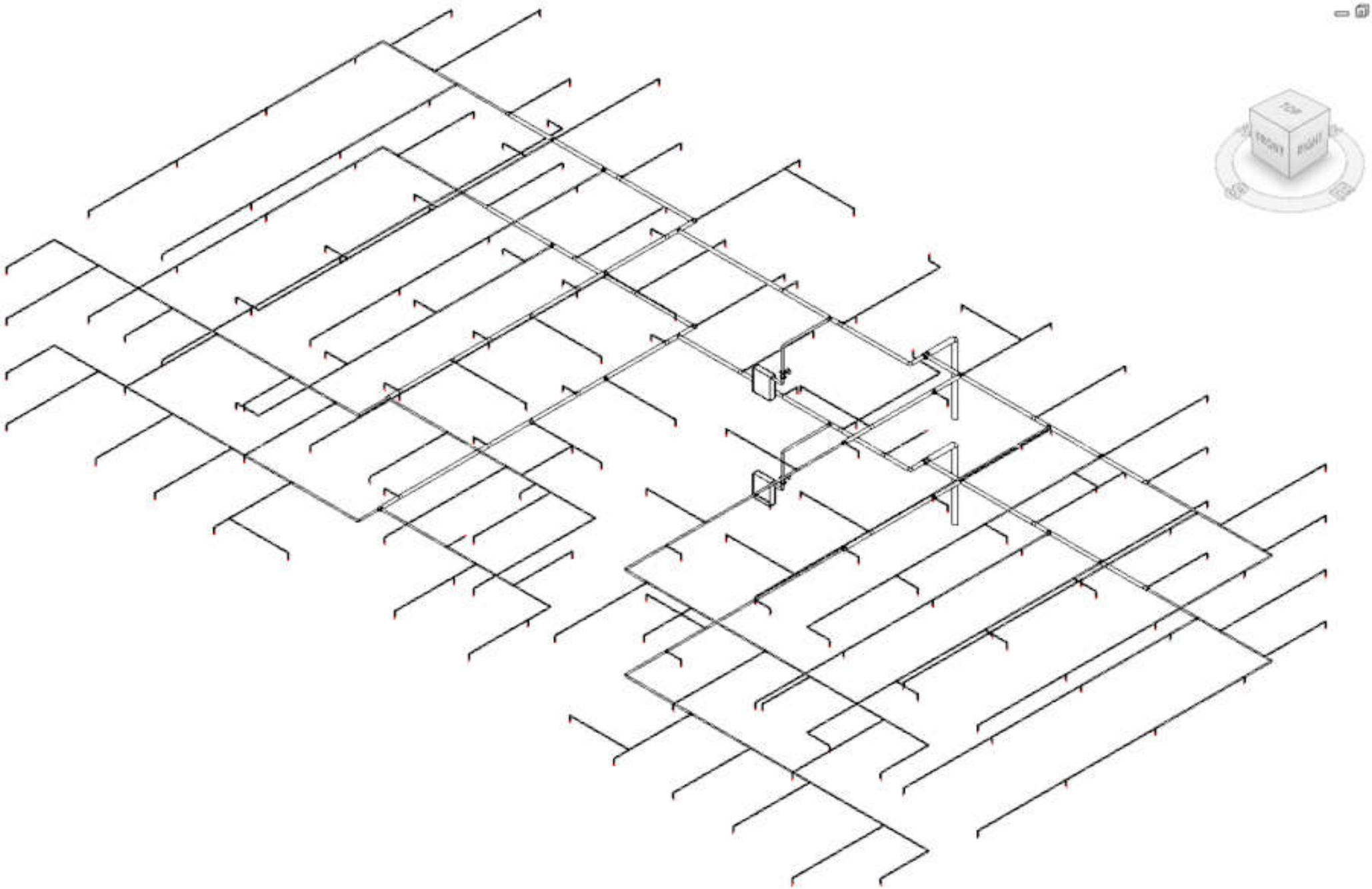
(See also: Chang, Lu-Yen, 2017. *Revit MEP Step by Step*, 2018 Metric Edition, Chapter 6 Fire Protection Systems.)

An example of fire sprinkler layout



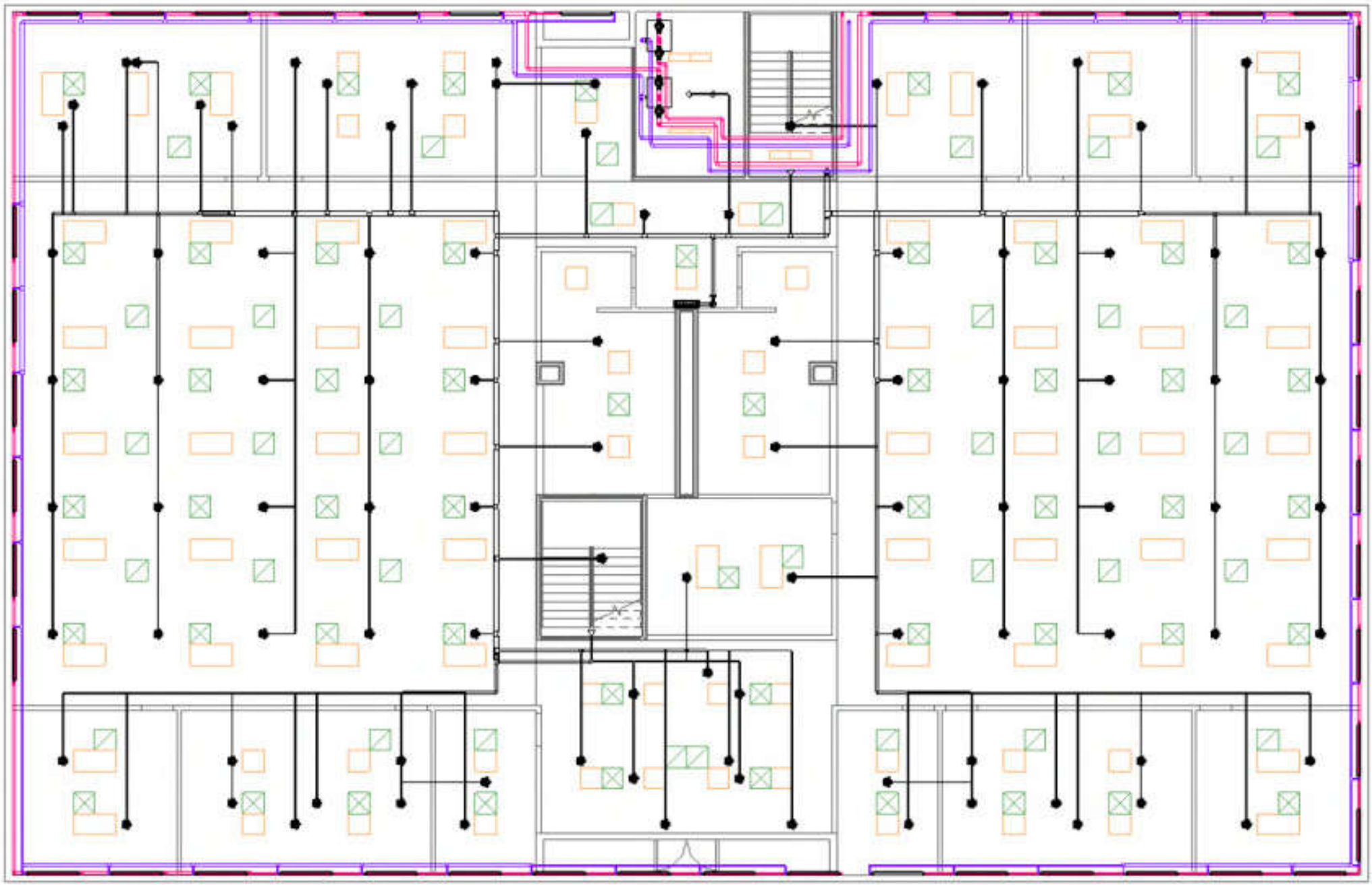
(Source: Chang, Lu-Yen, 2017. *Revit MEP Step by Step*, 2018 Metric Edition.)

3D view of the fire sprinkler layout



(Source: Chang, Lu-Yen, 2017. *Revit MEP Step by Step*, 2018 Metric Edition.)

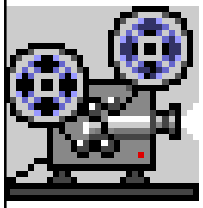
Interference checking of fire sprinkler layout with other systems



(Source: Chang, Lu-Yen, 2017. *Revit MEP Step by Step*, 2018 Metric Edition.)

Revit fire systems tutorials

- Video tutorials:



  - How to Create A Fire Sprinkler System in Revit (9:04) https://youtu.be/uEkPqEymD_s
  - Revit MEP Lesson 17: How To Create a Fire Protection System (13:48) https://youtu.be/TIgkT_b_9vU
  - Revit HVAC - Fire Protection System - A How To Guide (4:23) https://knowledge.autodesk.com/support/revit-products/learn-explore/caas/screencast/Main/Details/cd5eeb54-7cef-4ff1-be50-3881fc8691c9.html

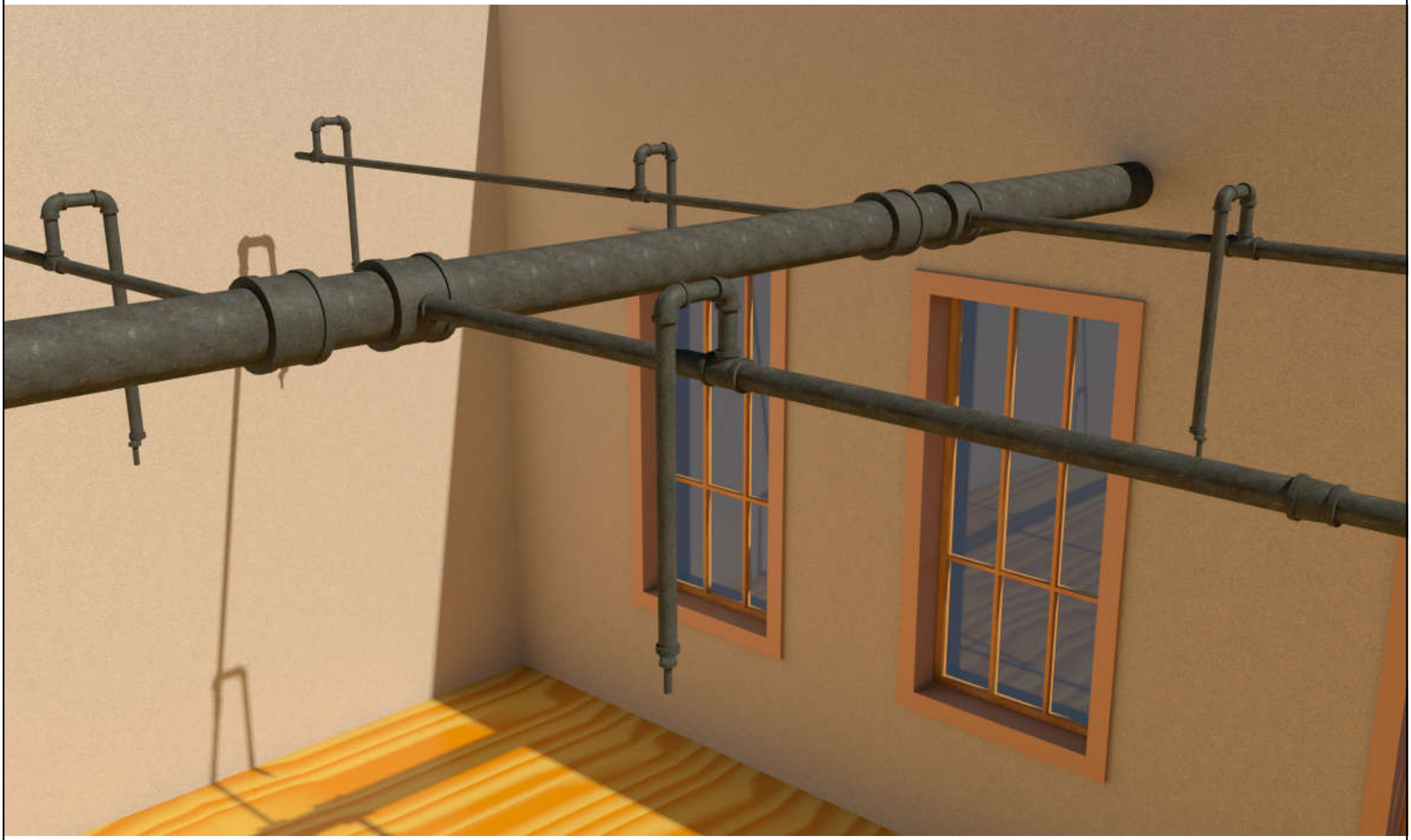
Revit fire systems tutorials

- More video tutorials on Revit Fire Protection:
  - HOW TO CREATE SPRINKLER VIEW IN REVIT 2017 (14:52) https://youtu.be/Qb_pAcp0emk
  - HOW TO ADD SPRINKLER HEAD IN REVIT 2018 (6:54) https://youtu.be/cEPVcL_Hf_U
  - HOW TO ADD MAIN PIPE FOR FIRE PROTECTION IN REVIT 2018 (11:40) https://youtu.be/Mvw9qnTts6o
  - HOW TO ADD BRANCH PIPE FOR FIRE PROTECTION IN REVIT (7:32) https://youtu.be/wQVuIeQ1J3I

Revit fire systems tutorials

- Useful App: Fire Sprinkler 2018 (AGACAD)
  - https://apps.autodesk.com/RVT/en/Detail/Index?id=9820771744418172 39
  - http://www.aga-cad.com/products/bim-solutions/mep-engineering-smart-sprinklers
  - This app makes it quick & easy to design high-quality fire sprinkler protection systems in Autodesk Revit, with automated real-time updates for project changes

Sprinkler pipe design using Fire Sprinkler 2018 app



(Source: https://apps.autodesk.com/RVT/en/Detail/Index?id=982077174441817239)

Revit fire systems tutorials

- Useful resources:
  - BIM objects: Fire detection and alarm systems https://www.nationalbimlibrary.com/en/fire-detection-and-alarm-systems/
  - Revit files (for Viking sprinklers, valves, and systems) http://www.vikingcorp.com/resources/revit-files-0
  - Victaulic: Resources: Software https://www.victaulic.com/resource-software/

Emerging trends

- Fire protection engineering should consider:
  - Active & passive suppression systems
  - The overall life safety of buildings & the occupants
- With BIM, life safety integration can be better applied in planning, design, installation, operation & maintenance (O&M), troubleshooting of the fire services systems
  - Such as for large buildings or campuses

Emerging trends

- BIM allows fire designers to create intelligent environments for information sharing
  - The BIM model can identify the make, model, flow, and pressure of the fire pump as well as the pump performance curve
  - If the pump motor is selected, the information may include make, model, voltage, amperage, horsepower, & service factor. It could also include preventive maintenance information as well as replacement part information

Emerging trends

- Using BIM to identify conflicts & support commissioning process in fire engineering
  - When doing renovation for large buildings, identify & mitigate costly impacts to the building
  - During commissioning, use a tablet with BIM cloud models & drawings can improve efficiency; testing & inspection can be input & viewed directly from the model
  - The model can serve as a database for evaluation & future revisions

Emerging trends

- BIM & passive fire protection
  - BIM models allow the fire-resistance rated walls to be differentiated & can be set up to limit and/or restrict penetrations & openings
  - Can use BIM software routines to check if piping or ductwork has penetrated a wall & what type of damper & pipe penetration rating are required
  - During commissioning, can use tablets or hand-held devices to read/examine the information on fire-resisting rating, penetrations & openings

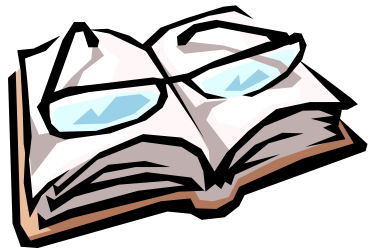
Emerging trends

- Industry acceptance
  - The primary limitation for BIM technology today is the amount of content available from manufacturers & in a coordinated standard
  - BIM can help with integrating the life safety systems across multiple trades
  - If all manufacturers create common standards for BIM tools & develop the content, BIM will become an even more powerful design tool

Emerging trends

- Challenges and issues
  - BIM requires a significant shift from traditional workflow to digital & collaborative workflow
  - BIM as an information database
  - Contractual & legal issues concerning intellectual property rights and how BIM models are accessed or made available
  - All active and passive fire protection systems can be managed and maintained by all parties associated with buildings

Further reading



- Bokmiller, D., Whitbread, S. and Hristov, P., 2013. *Mastering Autodesk Revit MEP 2014*, Sybex, Indianapolis, Ind. [TH 6010 .B65 2013 (ebook)]
  - Chapter 11 - Mechanical Piping
  - Chapter 16 - Fire Protection
- Chang, Lu-Yen, 2017. *Revit MEP Step by Step*, 2018 Metric Edition. (ebook) https://books.google.com.hk/books?id=tndJDwAAQBAJ
  - Chapter 6 Fire Protection Systems
- Shino, G. K., 2013. BIM and fire protection engineering, *Consulting-Specifying Engineer*, 50 (3): 34-41, April.
- Vaughn, A., 2017. Coordinating fire protection designs via BIM, *Consulting-Specifying Engineer*, 54 (3): 30-34, April.