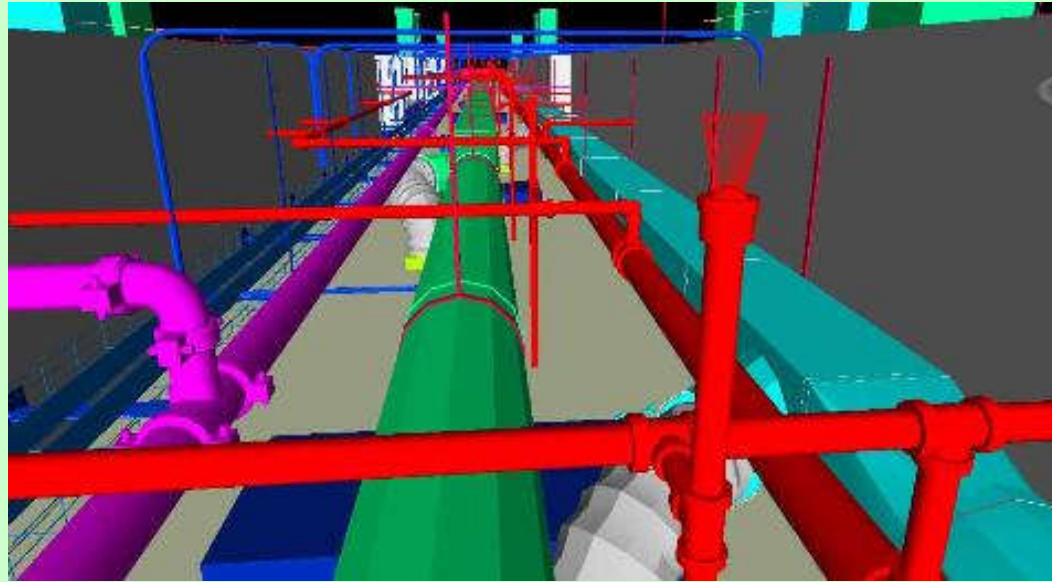


# SBS5411 Building Information Modelling for BSE

<http://ibse.hk/SBS5411/>



## Revit Fire Protection



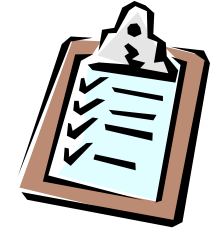
*Ir. Dr. Sam C. M. Hui*

Faculty of Science and Technology

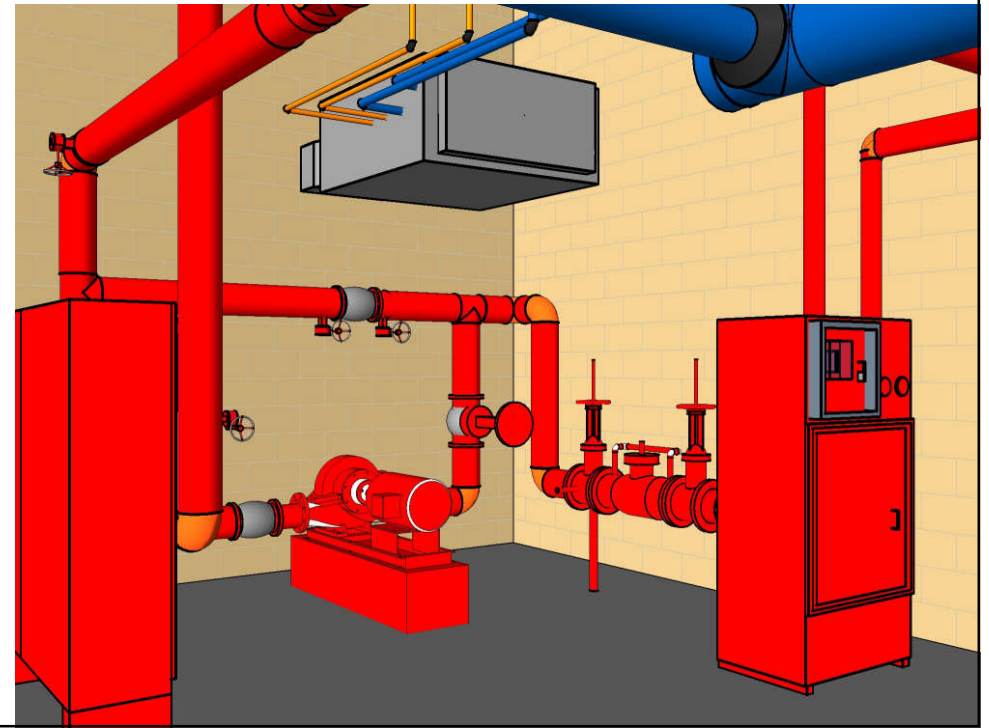
E-mail: [cmhui@vtc.edu.hk](mailto:cmhui@vtc.edu.hk)

Sep 2018

# Contents



- Fire protection systems
- Revit fire systems design
- Revit fire systems tutorials
- Emerging trends





# 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



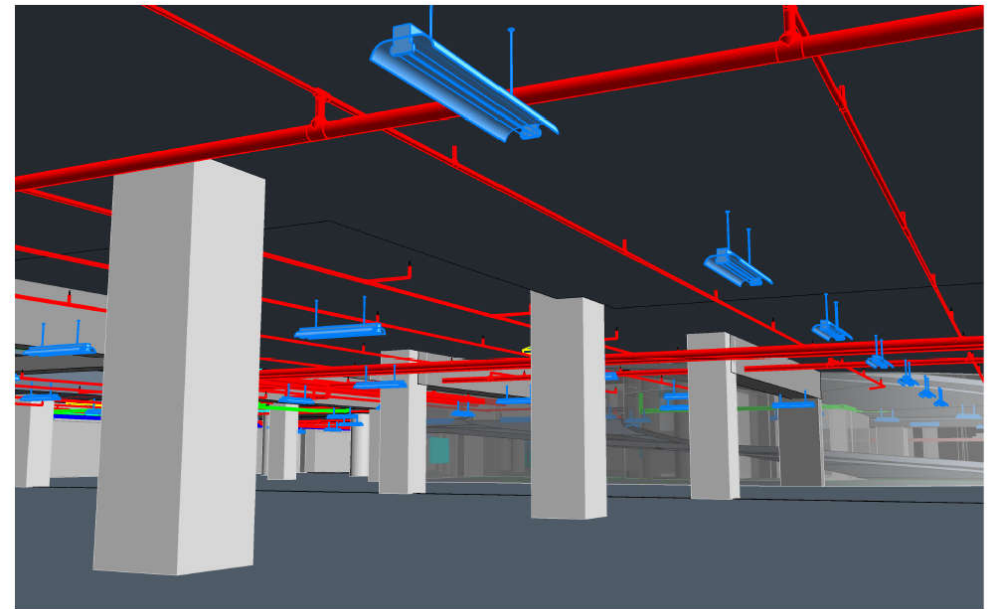
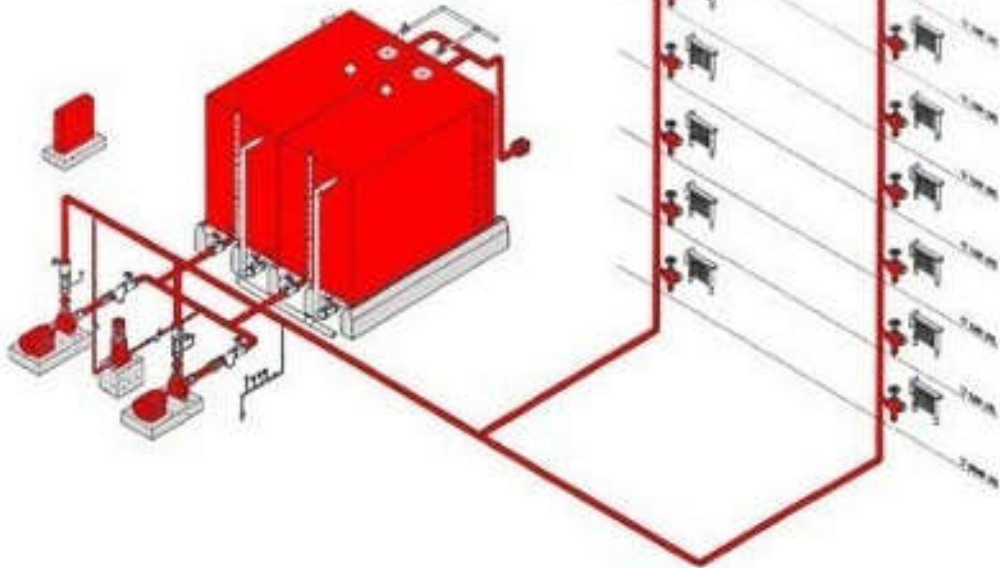
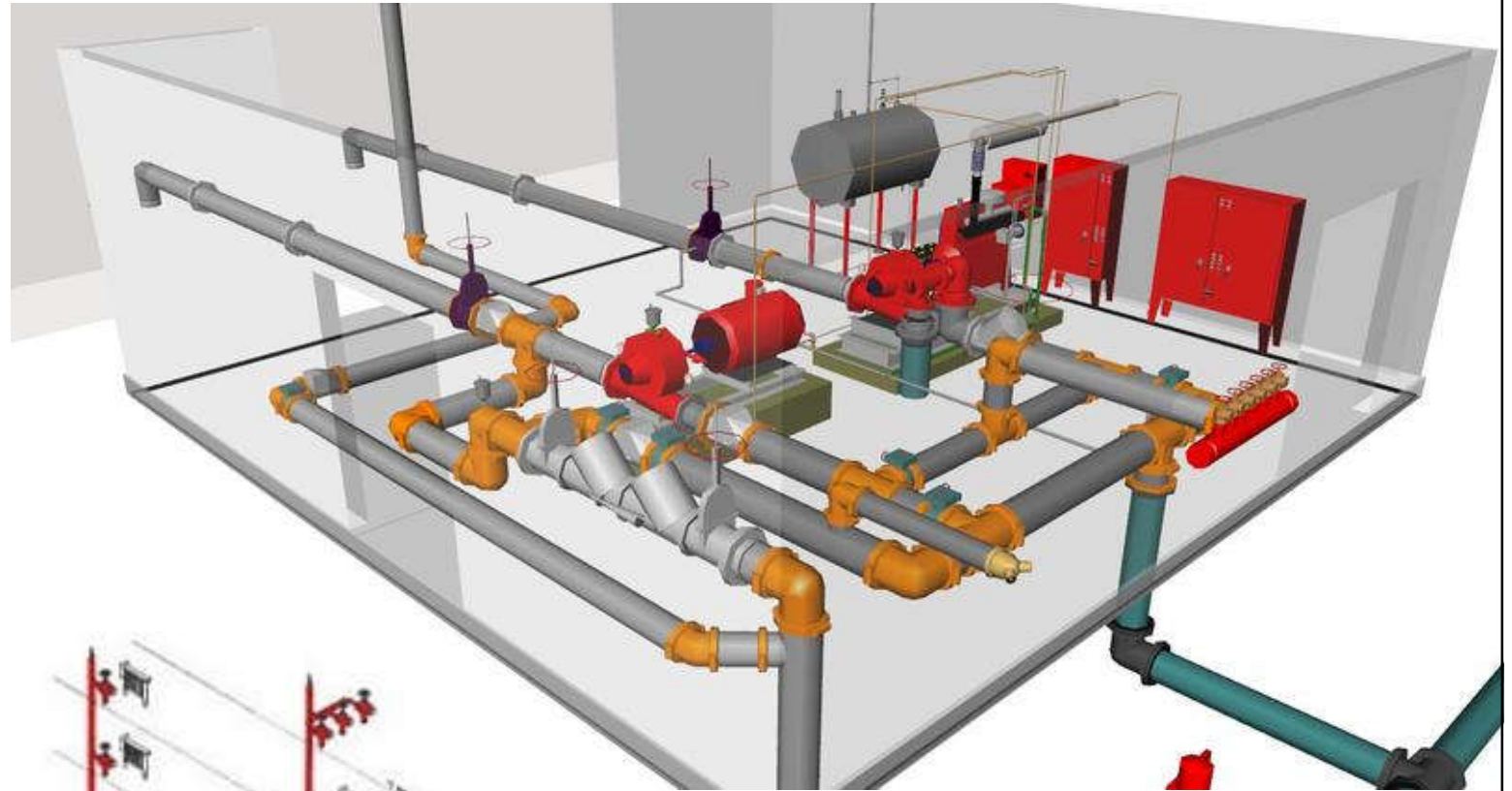
# Fire protection systems

- 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

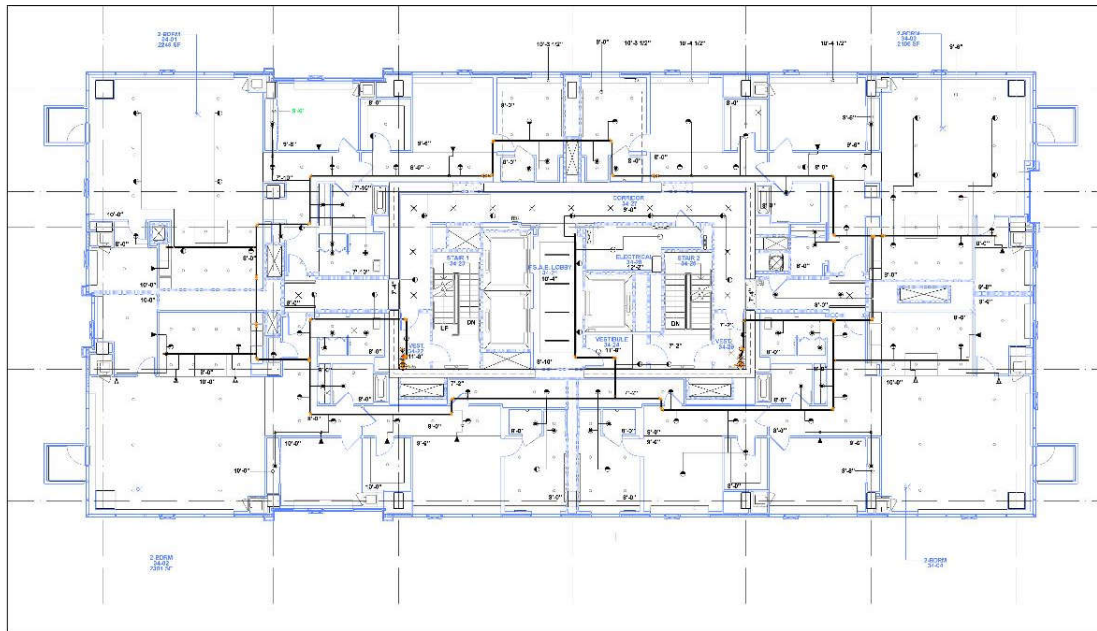
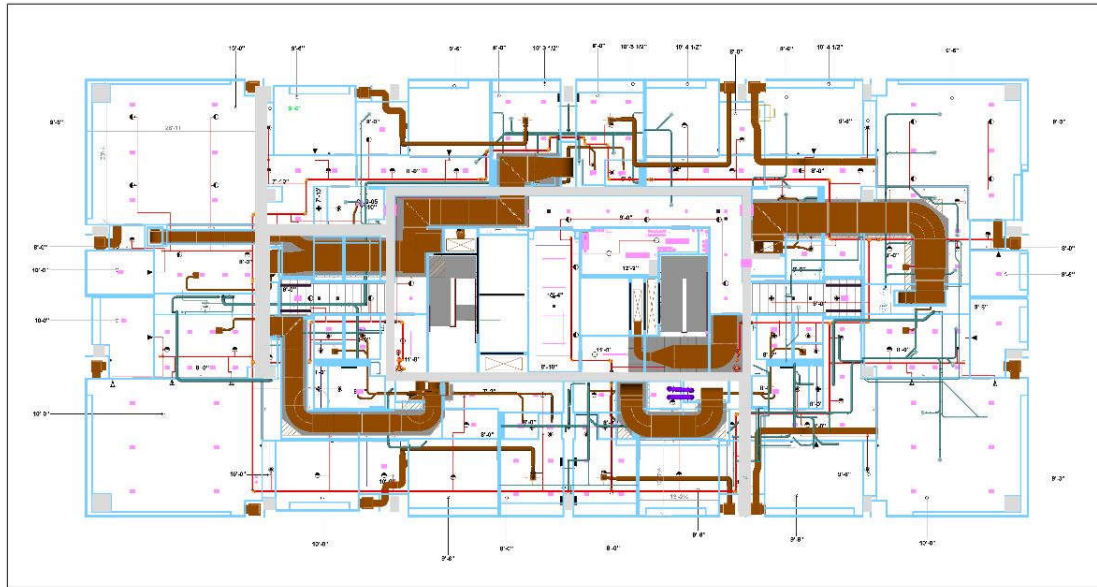




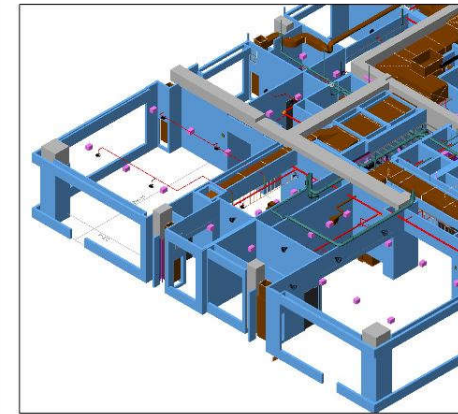
# Fire protection systems

- 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



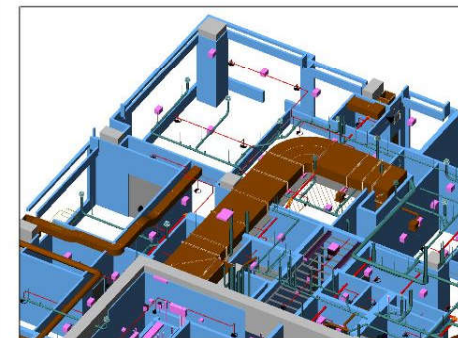
1 FIRE SPRINKLER PLAN  
[sheet:nomtag] 1 of 1  
0" = 2' 4"



ISOMETRIC A



ISOMETRIC B



ISOMETRIC C



QUALITY Boston, LLC  
100 WASHINGTON ST. SUITE 200  
ROSELAND, MA 01968  
TEL: 978.281.1111 FAX: 978.281.1112  
WWW.QBOS.COM

PROJECT: SL  
DATE: 01/25/10  
JOB #: 10-0764

CLIENT: CTD GROUP  
1012222-00  
INSTALLATION CONTRACTOR

XX FIRE PROTECTION  
281 SHANPAC AVE  
HENDERSON, NV 89015  
STATE LICENCE #85034-C-1-A STATE FIRE MARSHAL #03128

NO.	DESCRIPTION	DATE	BY	CHKD.
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3	ISSUED FOR AS-BUILT	01/25/10	[initials]	[initials]
4	ISSUED FOR RECORD	01/25/10	[initials]	[initials]
5	ISSUED FOR ARCHIVE	01/25/10	[initials]	[initials]

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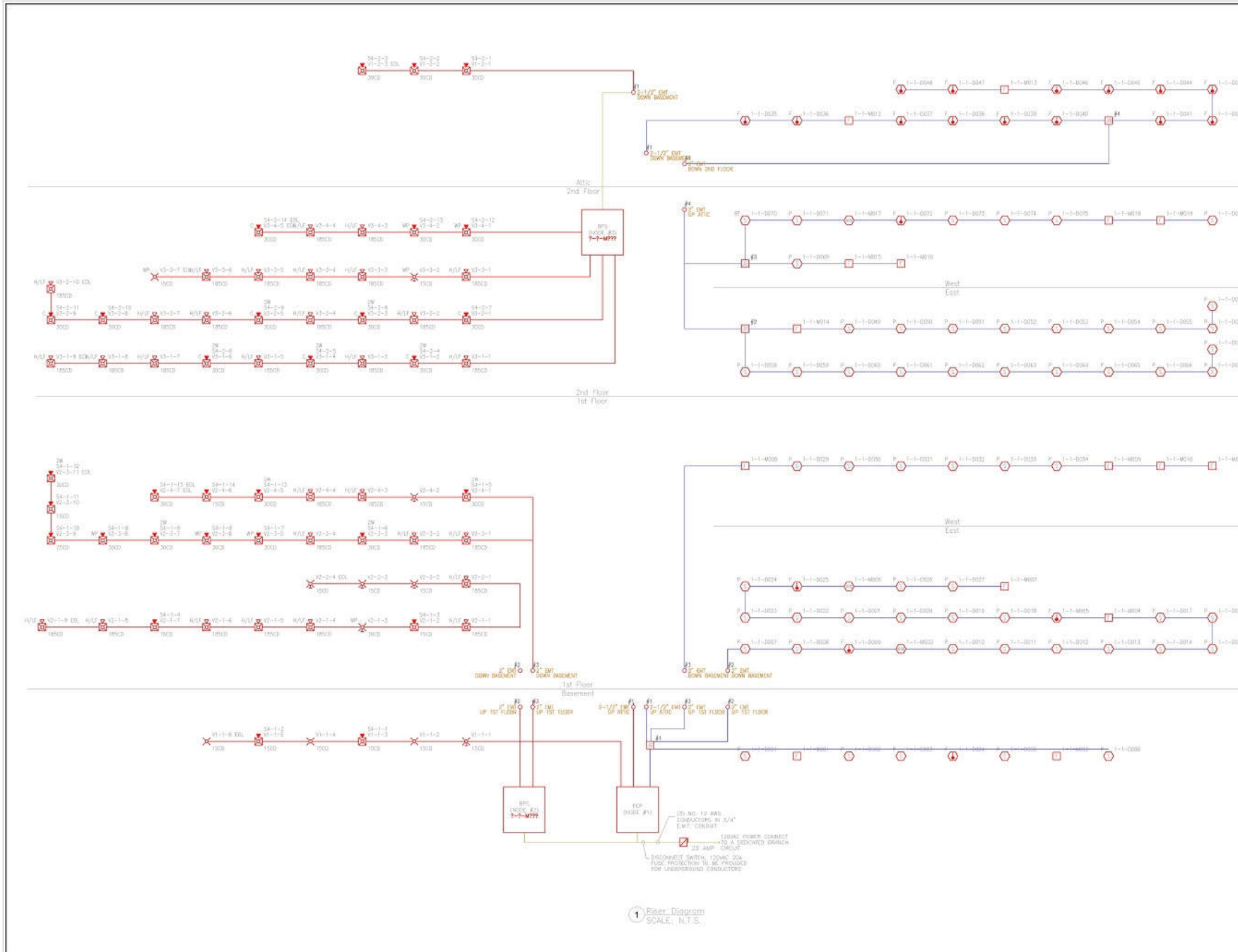


# Fire protection systems

- 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



## BERRY COLLEGE

---

**FRIENDSHIP HALL**

2277 MARTHA BERRY HWY  
MOUNT BERRY, GA 30149

BERRY COLLEGE PHYSICAL PLANT  
2277 MARTHA BERRY HWY 27N  
MOUNT BERRY, GA 30149  
PHONE: (706) 512-3556  
STEVE HATFIELD

---

**WIRE LEGEND:**

A	18/2 AWG, FPL-CL2	
B	16/2 AWG, FPL-CL2	
A/B/C	MULTICONDUCTOR RACEWAY	

NOTE: ALL WIRING TO BE ENCLOSED IN APPROVED RACEWAY UNLESS OTHERWISE NOTED

---

**SYMBOL LEGEND**

SYMBOL	DESCRIPTION
	FIRE ALARM CONTROL PANEL
	MAC REDUCER POWER SUPPLY
	PHOTOELECTRIC SMOKE DETECTOR
	MANUAL STATION PULL MODULE
	VISIBLE CEILING
	VISIBLE CEILING HIGH CANDELA
	VISIBLE WALL

---

**SUBSCRIPTIONS:**

R	WALL MOUNTED	F	NOISE FREE	A	RECTIFIER
H	HIGH CANDELA	E	END TEMP	M	MISC COMPONENT
W	WATERPROOF	ST	STAMP PERMAN	HC	HORN SOUND
CH	CHARTRON PROOF	AD	ART SIGHTING	DE	DECON DEVICE
UL	UL LISTED	BM	BOMB RESISTANT	SD	SMOKE DETECTOR
U	UNIDIRECTION	SM	SMALL FORMATS	PV	PROTECTIVE COVER
U	UNIDIRECTION	W	WATERPROOF	CD	CANDELA
OP	OPEN MOUNT	C	CANDELA		
EP	OPEN MOUNT	P	PHOTOELECTRIC		
HW	WATERPROOF	SC	SMOKE DETECTOR		
UL	UL LISTED	CD	CANDELA		

**DEVICE LISTING:**

INDICATE DEVICE CIRCUIT NUMBER AND DEVICE WIRING DESIGNATION ALONG WITH POWER SUPPLY, CHECK 1, CHECK 2, CHECK 3, ADDRESS, SUBSCRIPTION, PARALLEL, ANTI-DRIFT, INVERT, 1-2/3/4/5

INDICATE DEVICE CIRCUIT NUMBER AND DEVICE WIRING DESIGNATION ALONG WITH ADDRESS FOR PROGRAMMING AND ADDRESS FOR PROGRAMMING MODE 1, CHECK 1, CHECK 2

---

◆ CORRECT CTD --- ALL DRAWING ARE WITH INFORMATION REGARDING HOW TO CORRECT CTD. IF CORRECTED, PLEASE DO CHANGE THE WORK TO BE CORRECTED TO BEYOND CHASE.

Drawn By: **STEVEN HATFIELD**

Checked By:

Approved By:

Date: **4/28/17**

Scale: **N.T.S.**

---

**FIRE ALARM PLAN**

**001**

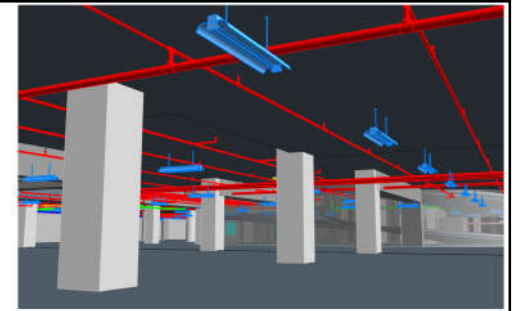
**VISUAL AND SLC RISER DIAGRAM**

---

Drawn:

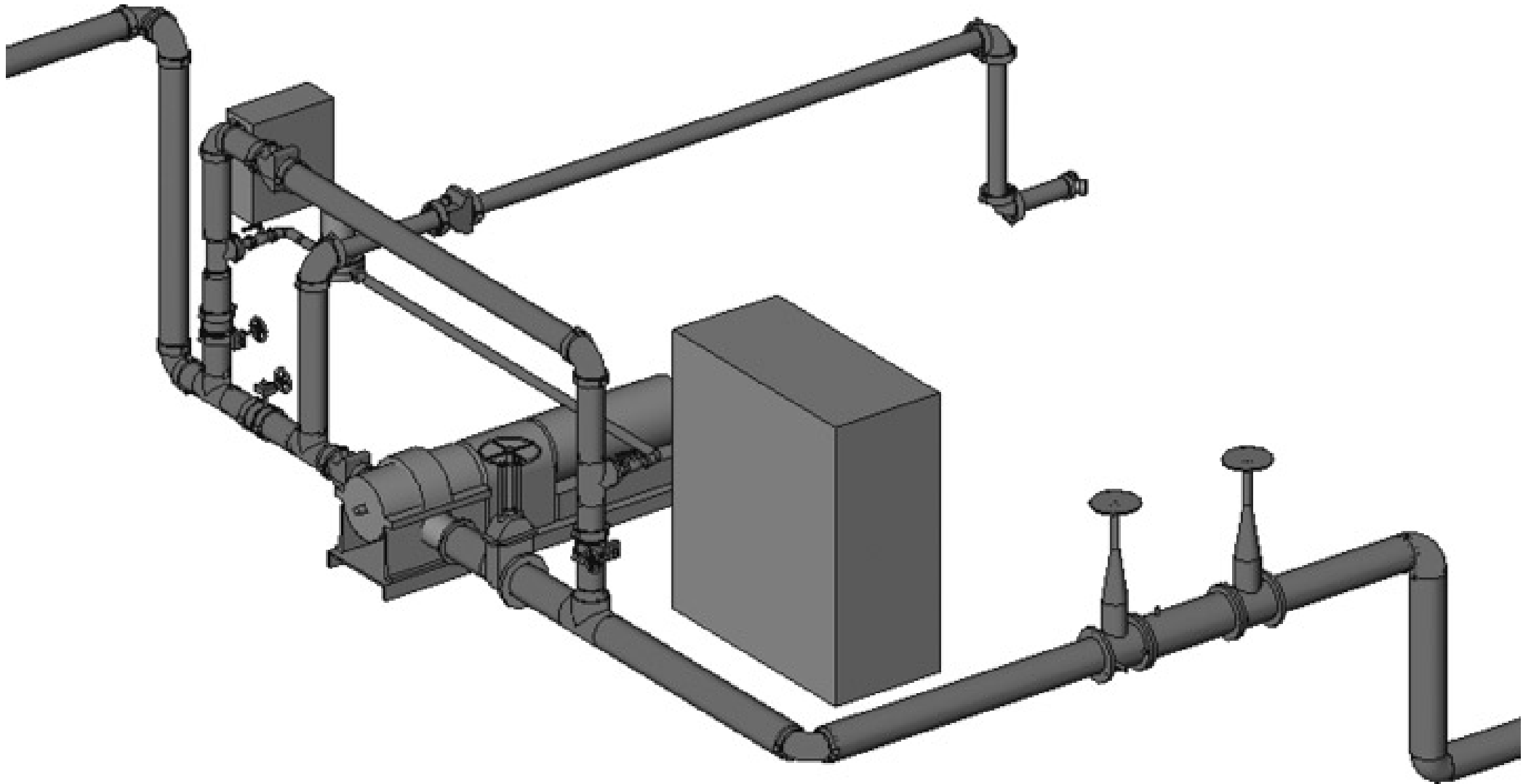
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# Revit fire systems design

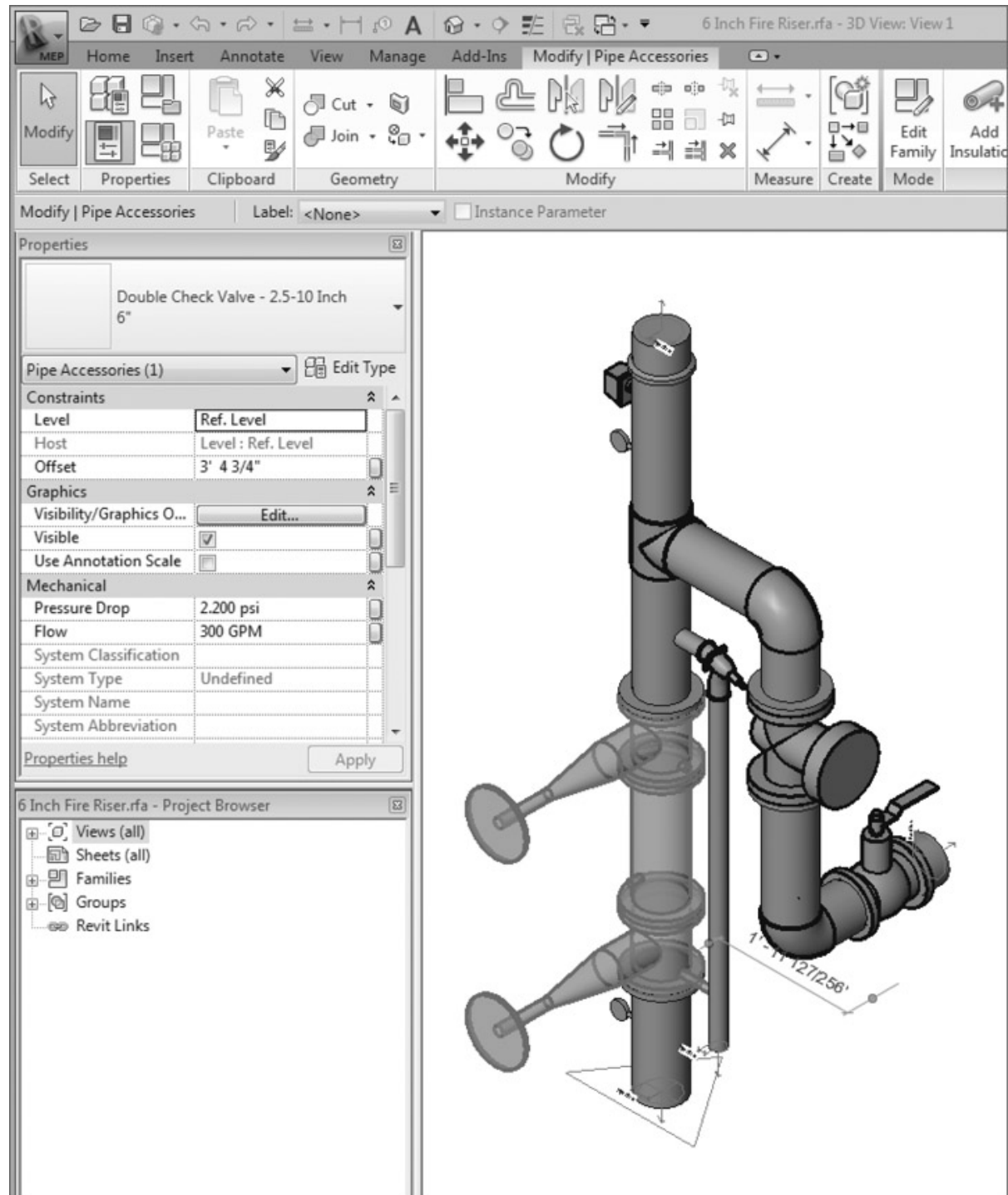


- Fire-protection designers use a variety of methods & software programs to lay out fire-protection systems
  - Can use BIM for coordination and clash detection with other services and building elements
  - Need to use proper design methods to verify whether a fire pump is required on a project & determine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

# Preassembled fire pump



# 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

Modify | Sprinklers | Flow: 100 GPM

Properties



Victaulic - V2704- Quick Response  
Spray Upright  
Standard

Sprinklers (1) Edit Type

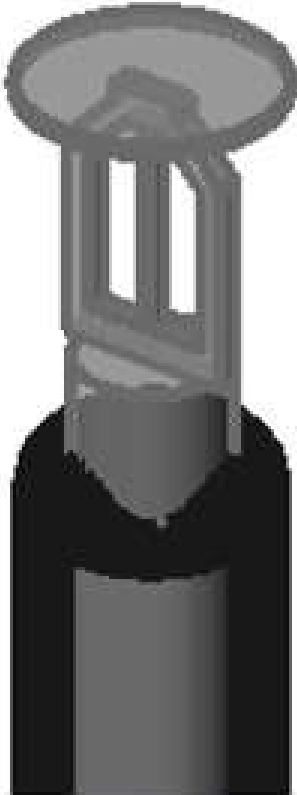
Constraints

Level	Level 1
Host	Floor : Generic - 12"
Offset	12' 6"

Mechanical

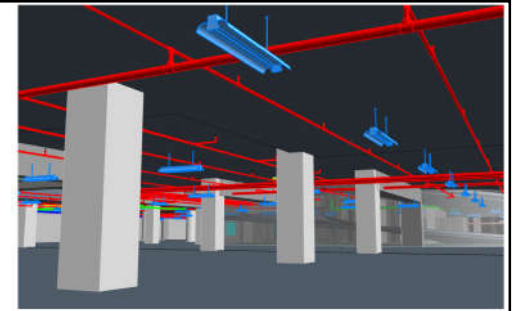
System Classification	Fire Protection Wet
System Type	Fire Protection Wet
System Name	Fire Protection Wet 2
System Abbreviation	
Pressure Drop	

Identity Data

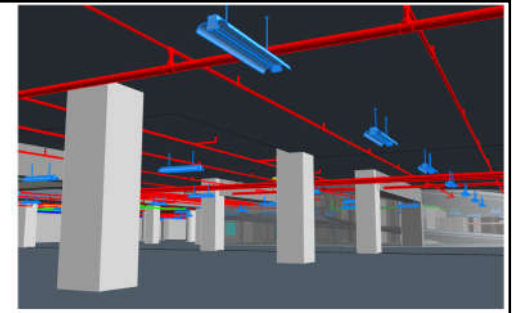


\*Also refer to the details & information from fire equipment manufacturer, such as Victaulic  
<http://www.victaulic.com/>

# Revit fire systems design



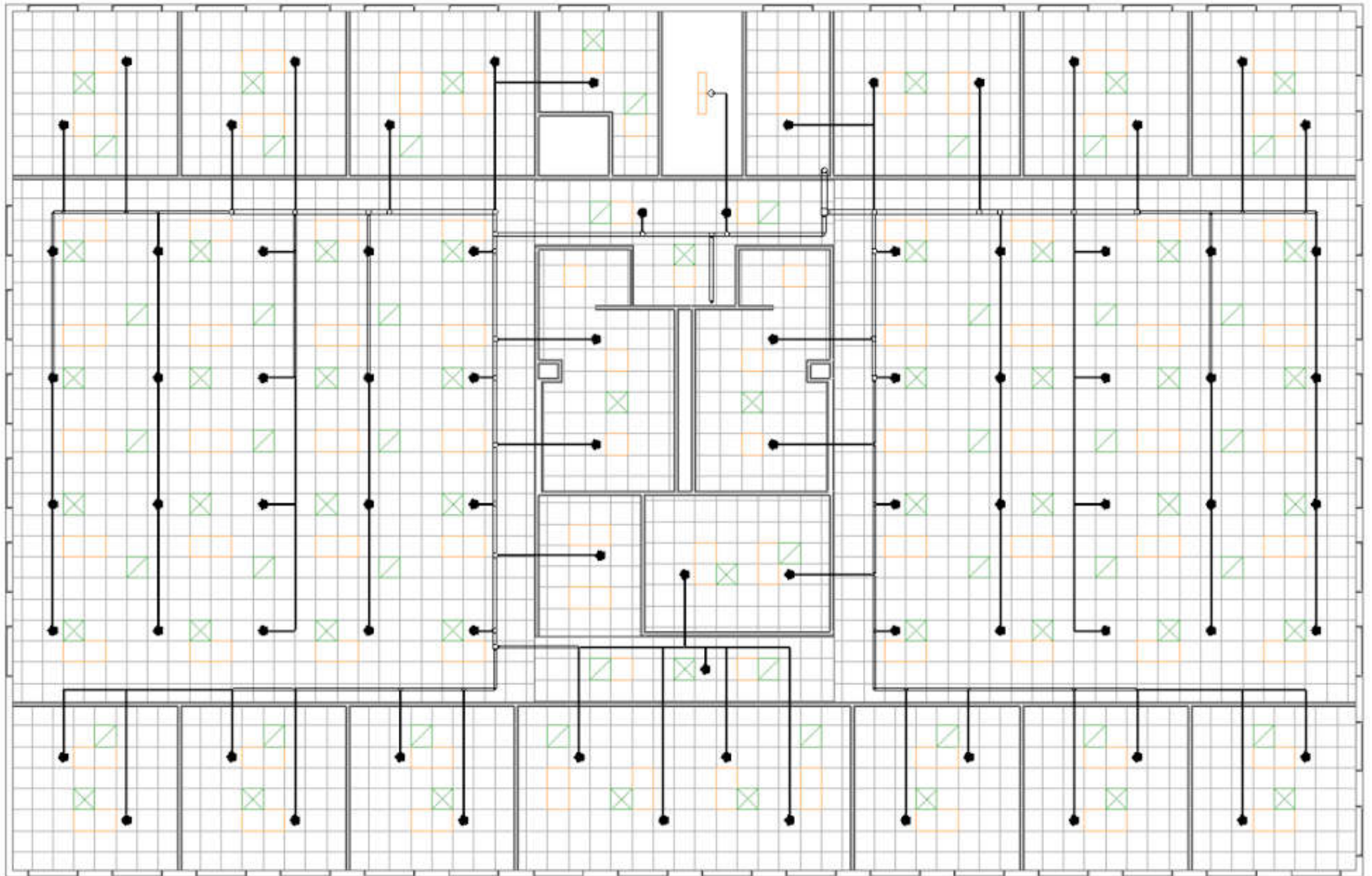
- Create **fire-protection systems**
  - Wet fire protection (when freezing is not expected)
  - Dry fire protection (avoid damage from freezing)
  - Pre-action (for a deluge system)
  - Others (e.g. chemical suppression system)
- The system does not calculate & autosize as it does for domestic water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



# Revit fire systems design

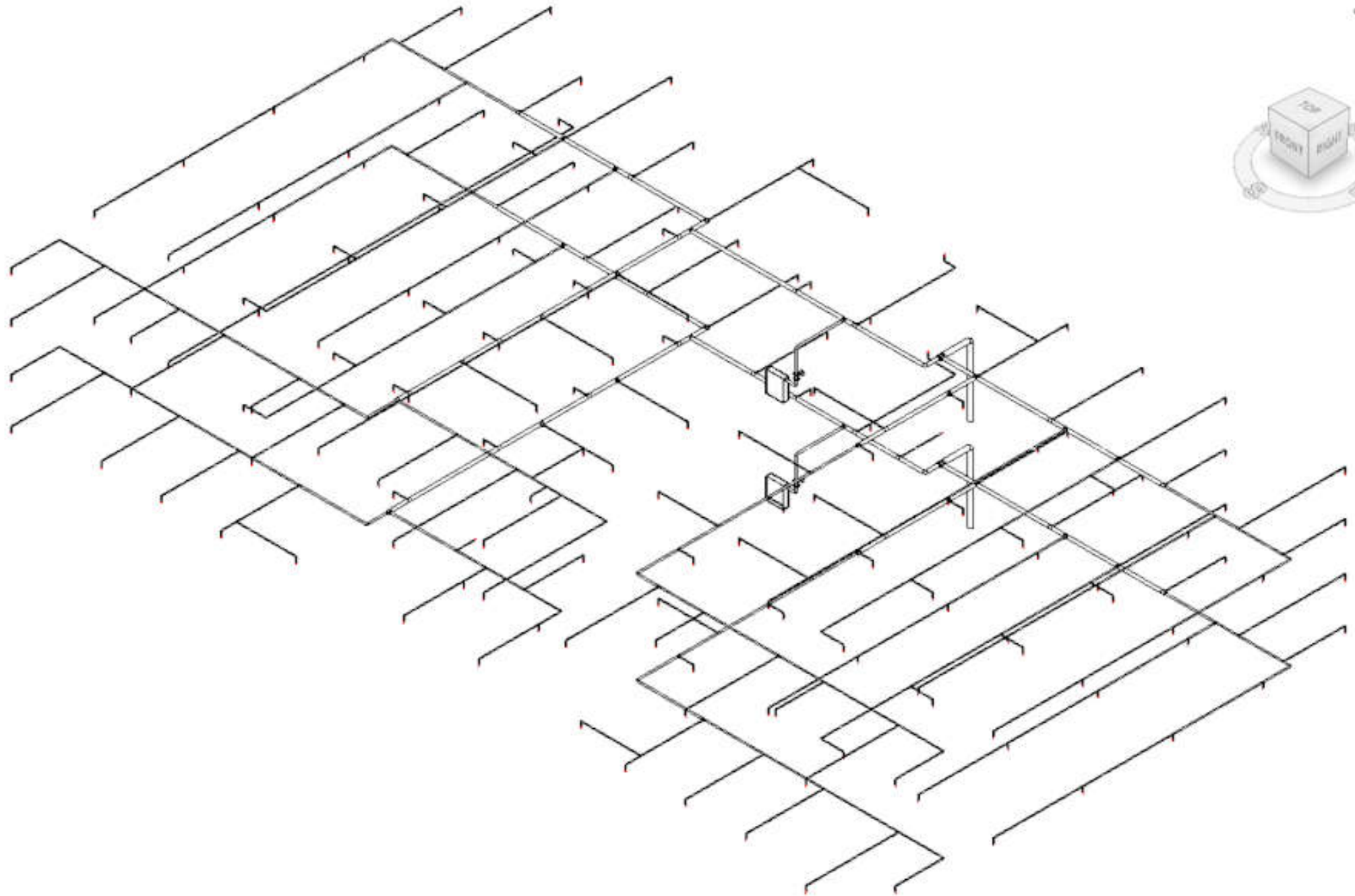
- Typical design & modelling tasks\*
  - Prepare fire protection system modelling
  - Create sprinkler design schedule
  - Place & connect sprinklers
  - Modify & tag pipe diameters & rooms
  - Add fire cabinet
  - Add fire-alarm devices & control panels
  - Connect systems & devices, set up routing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

# An example of fire sprinkler layout

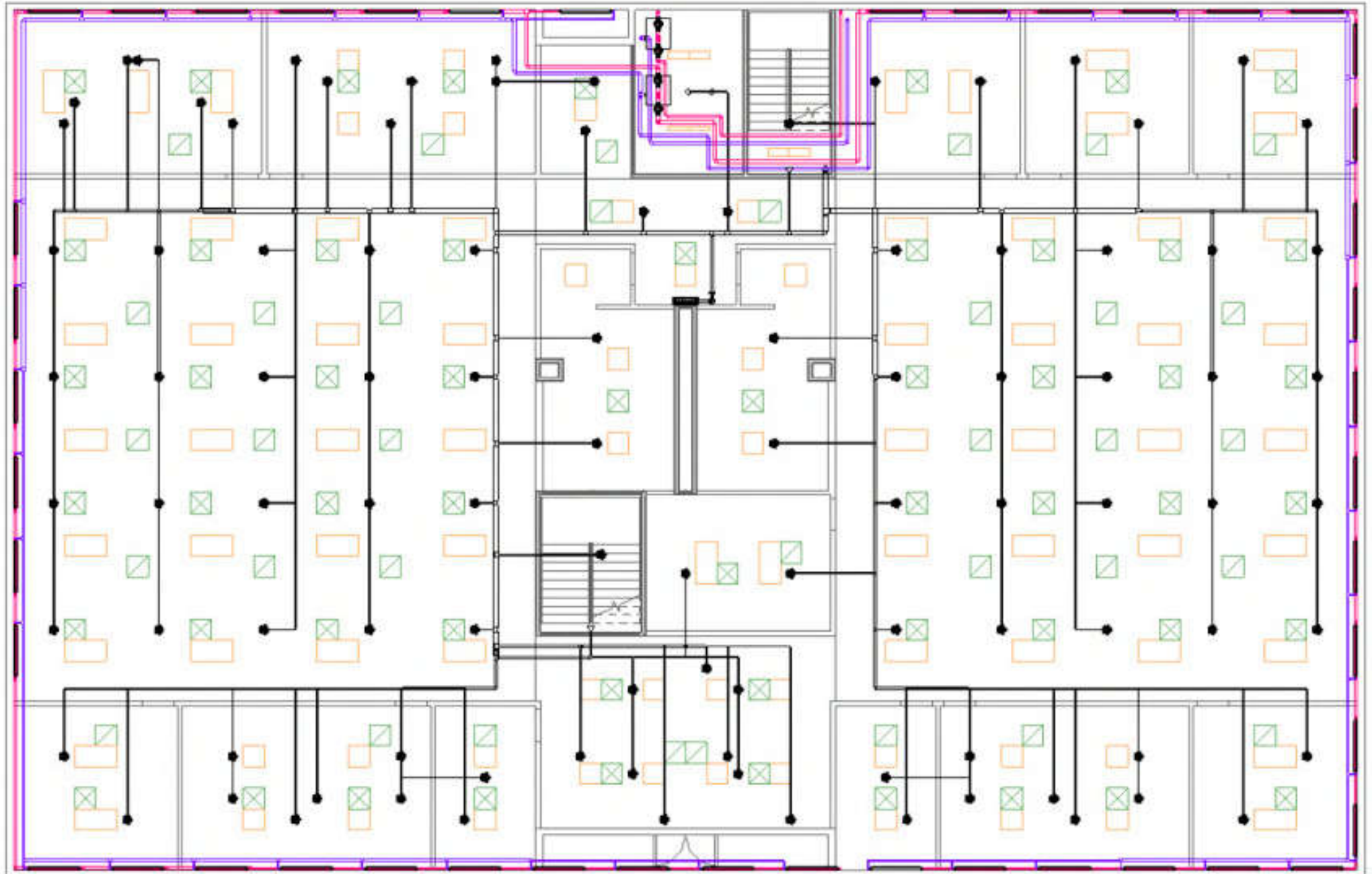




# 3D view of the fire sprinkler layout



# Interference checking of fire sprinkler layout with other systems



# Revit fire systems tutorials

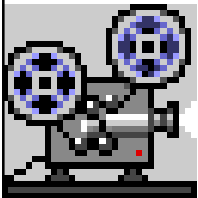


- Video tutorials:

- How to Create A Fire Sprinkler System in Revit (9:04) [https://youtu.be/uEkPqEymD\\_s](https://youtu.be/uEkPqEymD_s)

- Revit MEP Lesson 17: How To Create a Fire Protection System (13:48) [https://youtu.be/TIgkT\\_b\\_9vU](https://youtu.be/TIgkT_b_9vU)

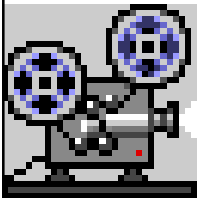
- Revit HVAC - Fire Protection System - A How To Guide (4:23) <https://knowledge.autodesk.com/support/revit-products/learn-explore/caas/screencast/Main/Details/cd5eeb54-7cef-4ff1-be50-3881fc8691c9.html>



# 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](https://youtu.be/Qb_pAcp0emk)
  - HOW TO ADD SPRINKLER HEAD IN REVIT 2018 (6:54) [https://youtu.be/cEPVcL\\_Hf\\_U](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

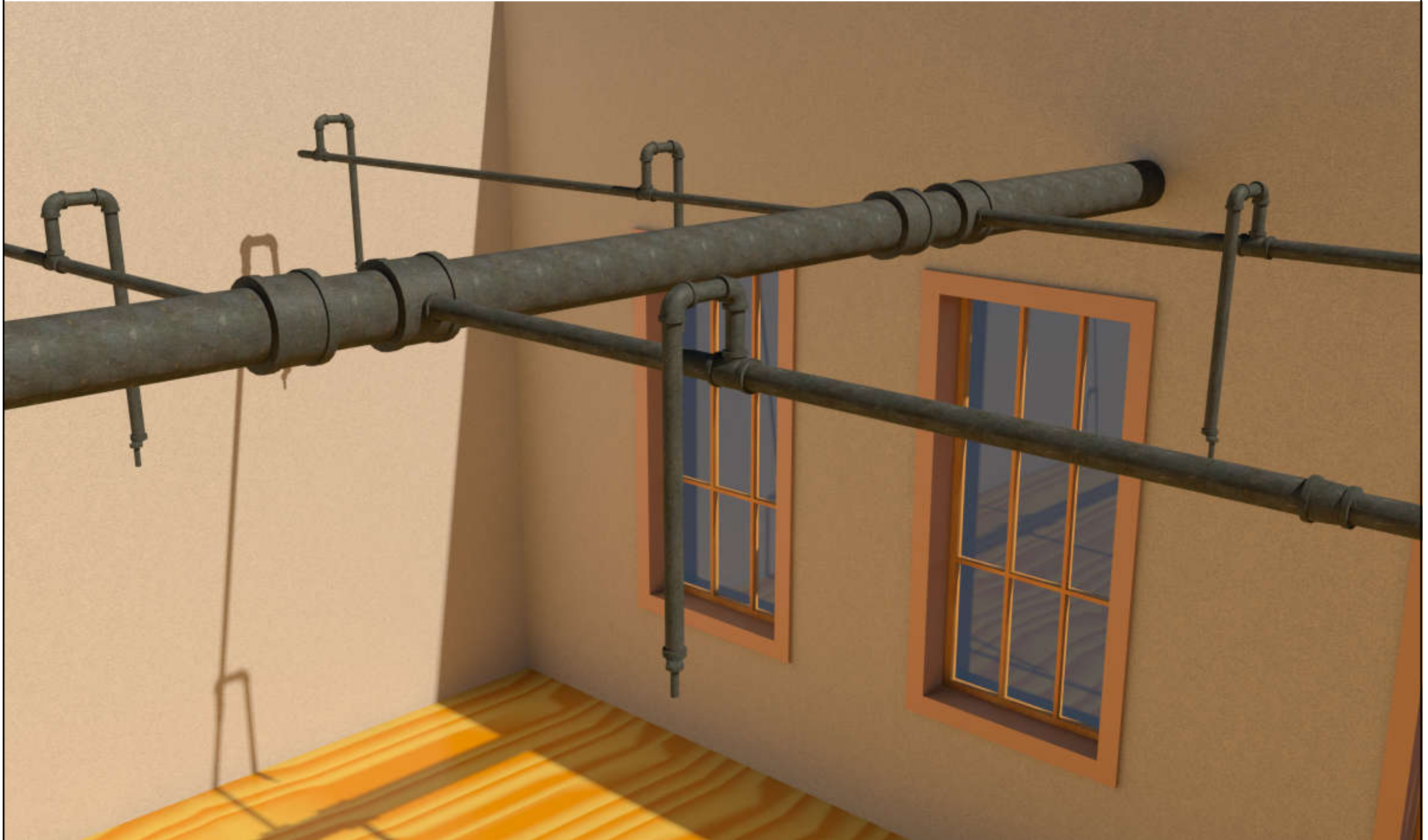


- Useful App: Fire Sprinkler 2018 (AGACAD)



- <https://apps.autodesk.com/RVT/en/Detail/Index?id=982077174441817239>
- <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



# 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.