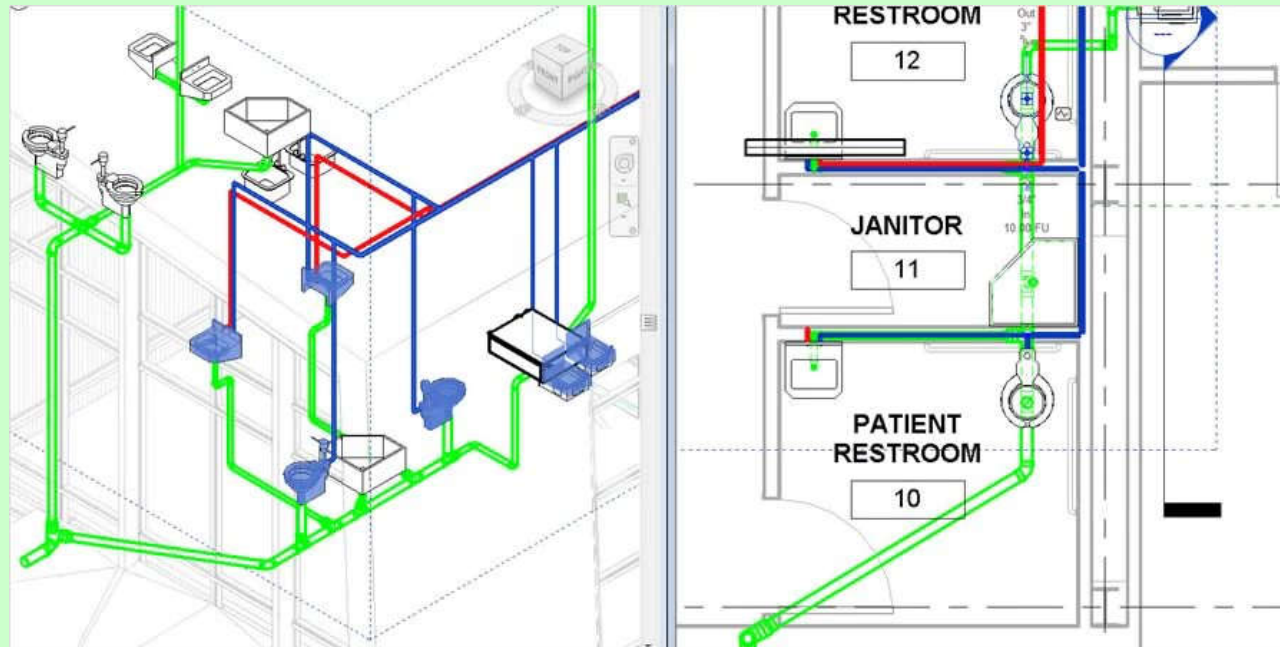


# SBS5411 Building Information Modelling for BSE

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



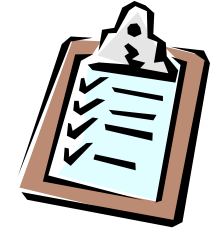
## Revit Plumbing



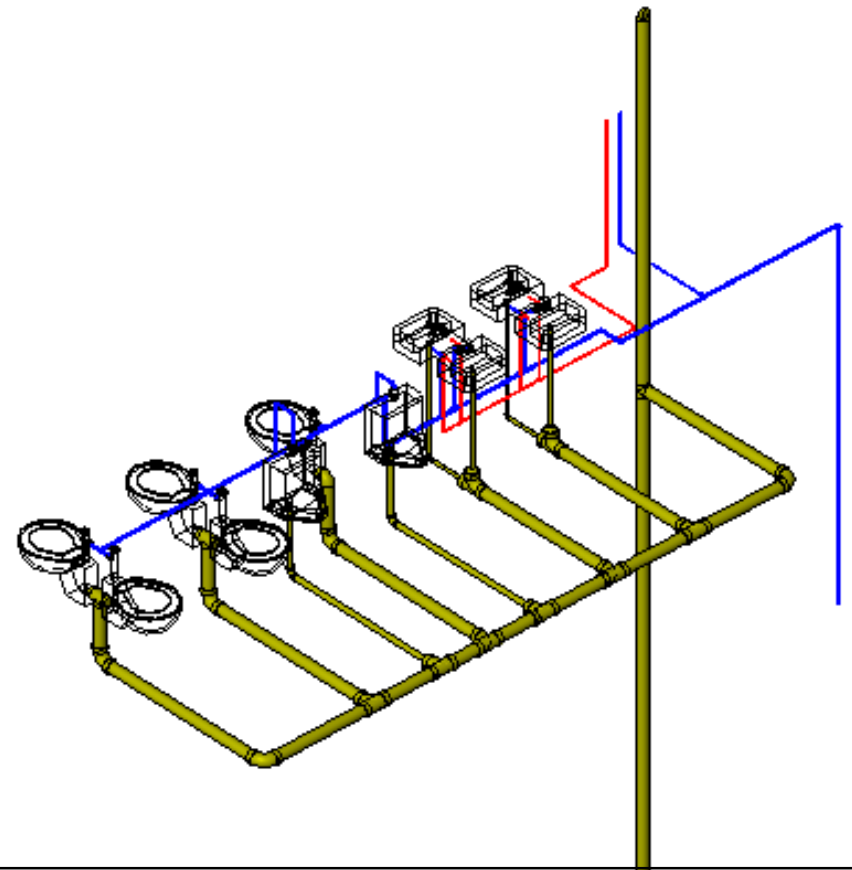
*Ir. Dr. Sam C. M. Hui*  
Faculty of Science and Technology  
E-mail: [cmhui@vtc.edu.hk](mailto:cmhui@vtc.edu.hk)

Sep 2018

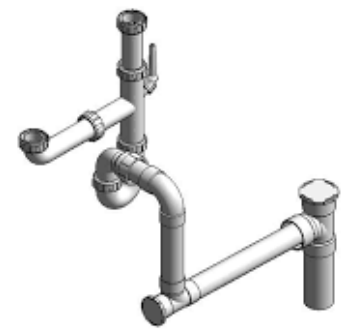
# Contents



- BIM for plumbing design
- Plumbing systems
- Revit Plumbing tutorials

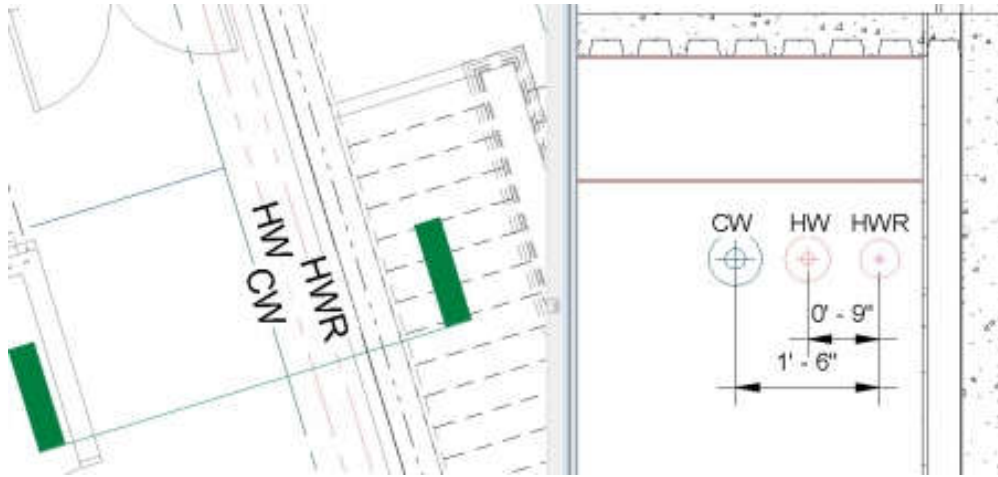


# BIM for plumbing design

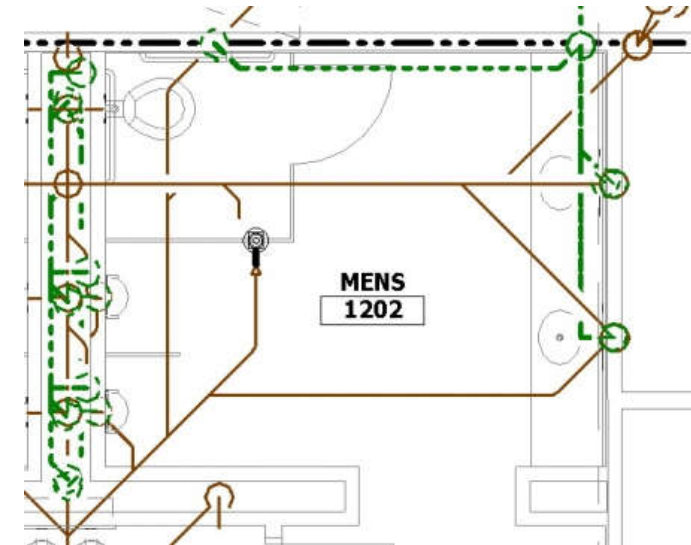


- Design & selection of plumbing systems
  - Both architect & plumbing engineer are involved
  - Traditional plumbing design/drafting practices: 2D drawing, diagrammatic (to improve clarity)
  - New practices for plumbing:
    - Using BIM modelling to create different views
    - Avoid false clash in overlapping views
    - Create riser diagrams in 3D view (much clearer and accurate than traditional)
    - Embrace the concept of parametric design

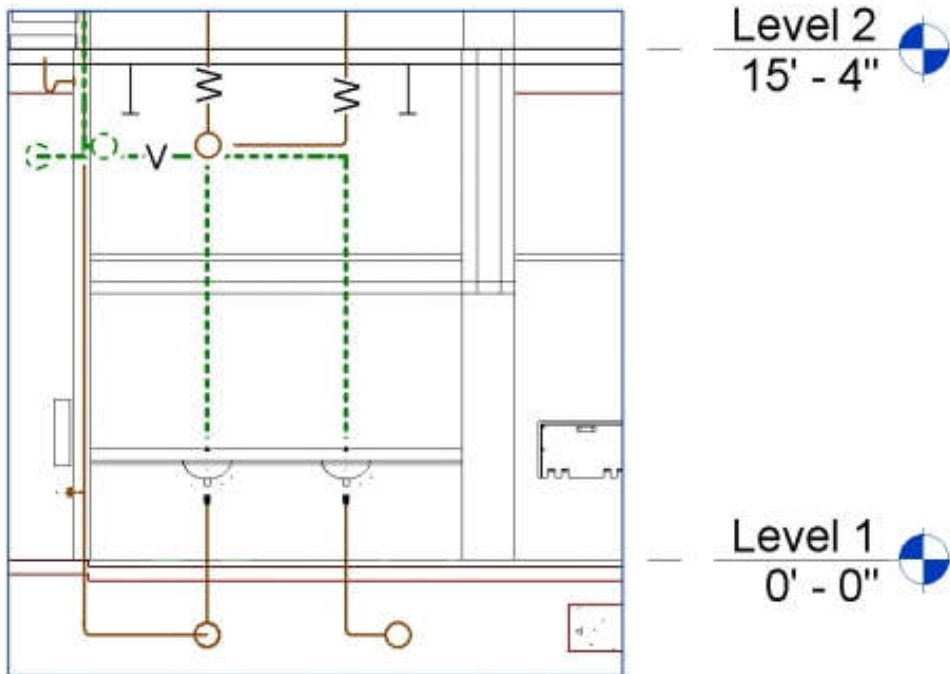
# New best practices for plumbing using BIM



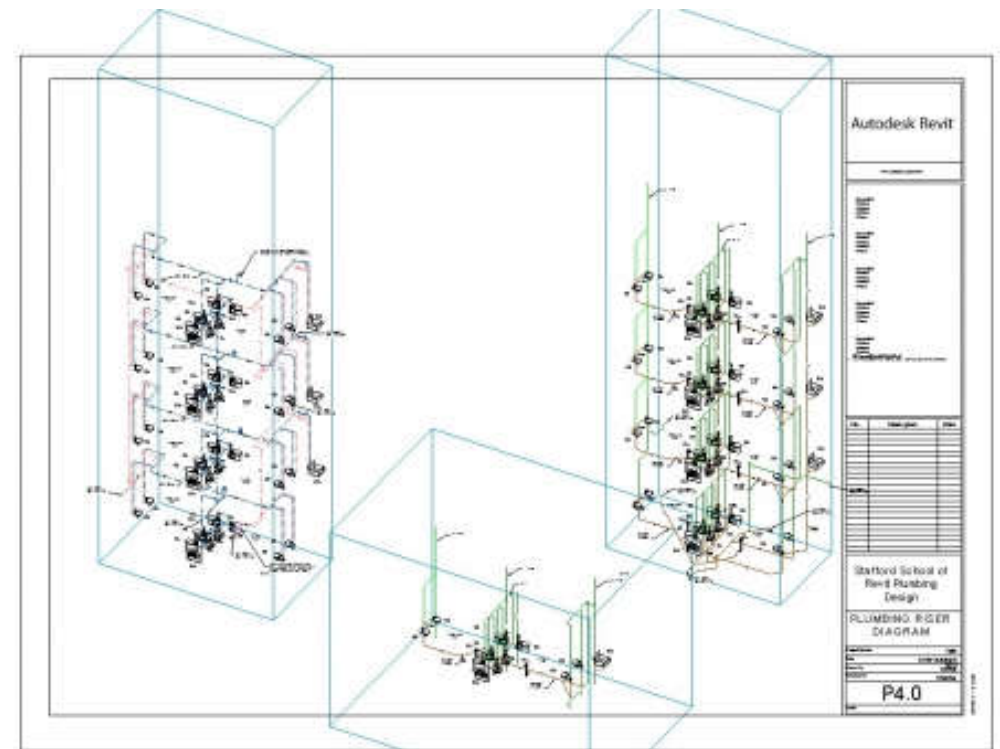
Diagrammatic 2D practice



Overlapping view ranges

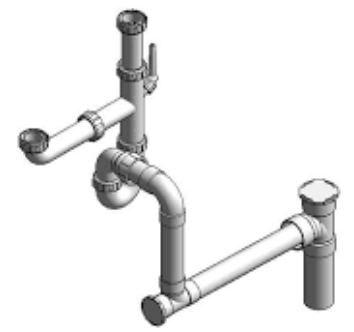


Overlapping section



3D riser diagram

# BIM for plumbing design

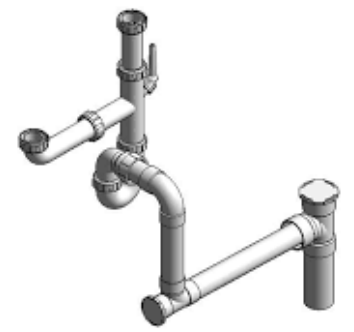


- Plumbing design in the BIM environment
  - Need to adjust the workflows & develop templates & content that enable us to adapt & function effectively
  - Revit is a powerful resource for plumbing engineer, but user customization is necessary to reach its full potential
  - Take time to tailor & craft a Revit template that fits the unique needs of the plumbing discipline in an organisation

# 12 ways to improve your Revit Plumbing Template

|   |  |
|---|--|
| 1. Use shared parameters & schedules to automate fixture unit calculations. | 7. Create construction lines.  |
| 2. Import spreadsheets for more complex calculations.                       | 8. Create a view template for working sections.                            |
| 3. Make use of parametrics to enhance your fixture & equipment tags.        | 9. Create more pipe slopes.  |
| 4. Create filters to hide unwanted fixture types.                           | 10. Eliminate repetitive sheet assembly tasks.                             |
| 5. Create a master keynote template file.                                   | 11. Convert general notes, demo notes, abbreviations, etc. into schedules. |
| 6. Create incremental pipe size charts for your template.                   | 12. Streamline general notes by adding 'editing notes'.                    |

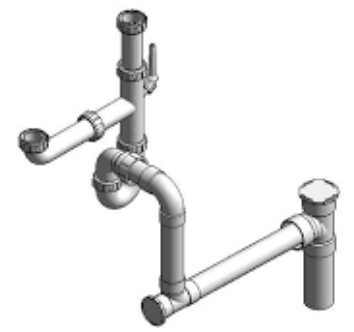
# BIM for plumbing design



- The use of BIM in plumbing projects creates deeper project knowledge, delivers a more robust product, and can reduce total project costs\*
- How to increase productivity with BIM
  - Use of Families & 3D parametric objects
  - Objects available in Revit format from the material or equipment manufacturers
  - Allocate enough time for collaboration



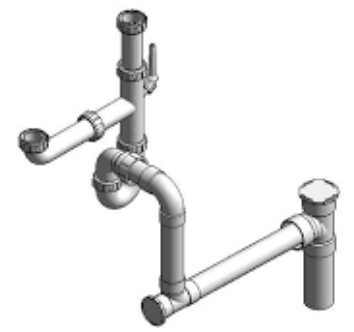
# BIM for plumbing design



- Revit design tips for plumbing design
  - Revit Plumbing is more complicated than HVAC or electrical design because it deals with sloped piping, sanitary drain vent, storm drain lines
  - It also requires lots of piping in small spaces
  - Plumbing design in AutoCAD is typically schematic in nature, so it requires a shift in mind-set for designers to start thinking of their components as real-life objects & how they will be installed during construction

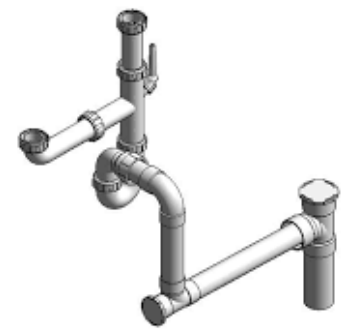


# BIM for plumbing design

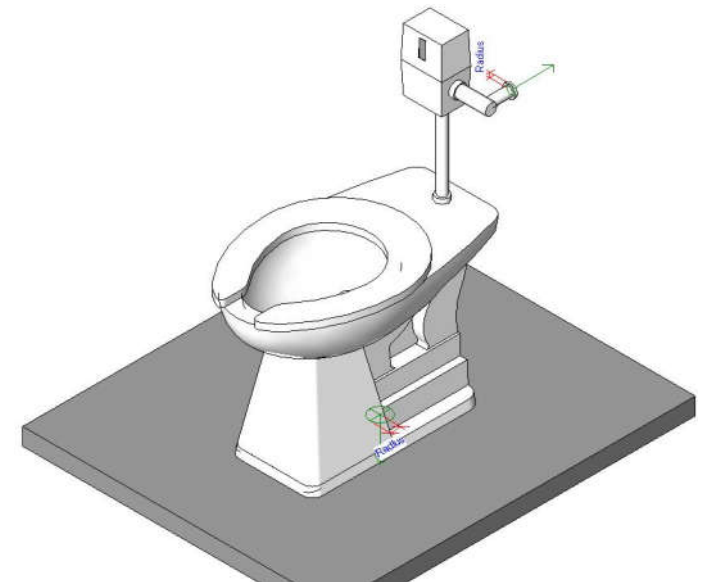


- Time savers for plumbing designers:
  - Save common designs in groups (> future projects)
  - Use drafting views to show details effectively
  - Adjust visibility graphics to cut the view depth
  - Use placeholders only during schematic design
  - Plumbing connections on the MEP model are not linked to the Architect's model
  - It is more appropriate to use Revit for document coordination rather than full documentation

# BIM for plumbing design



- BIM content & objects relating to plumbing
  - [https://www.arcad.com/bim/divs/bim\\_22.shtml](https://www.arcad.com/bim/divs/bim_22.shtml)
  - For all major BIM & CAD software including AutoCAD, Sketch-Up, ArchiCAD
  - Formats:
    - RFA- Revit Object
    - RVT- Revit System
    - DWG- AutoCAD, Sketchup

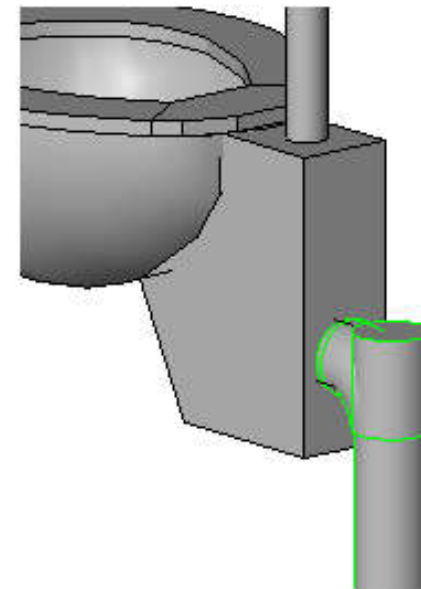
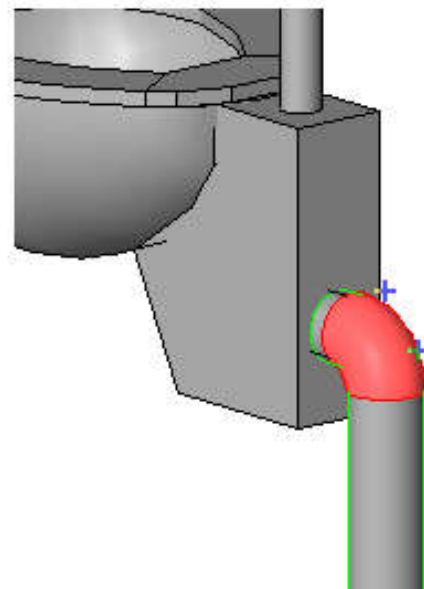
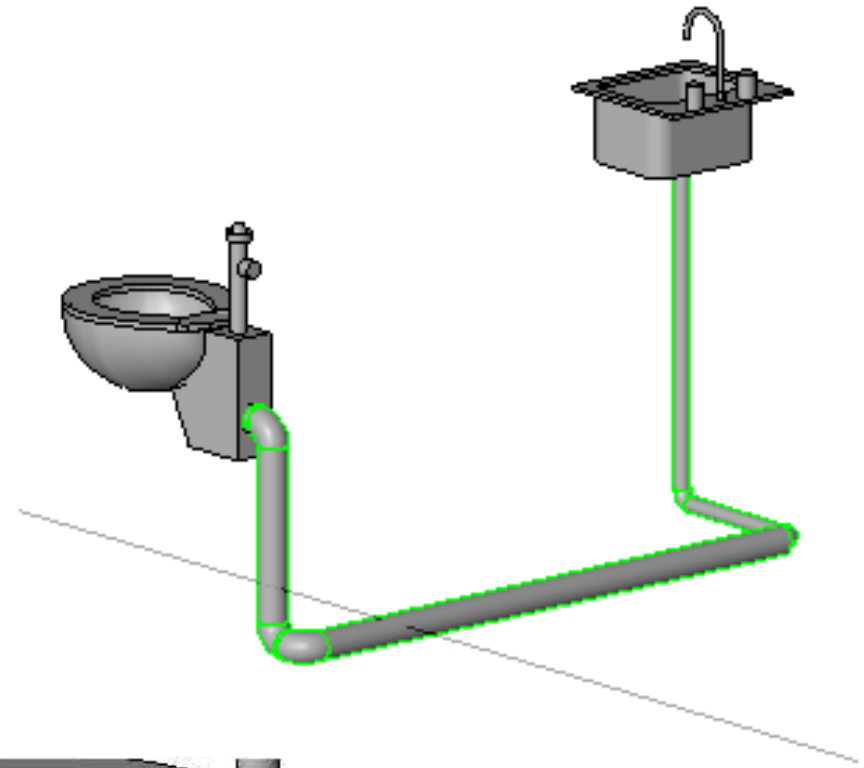
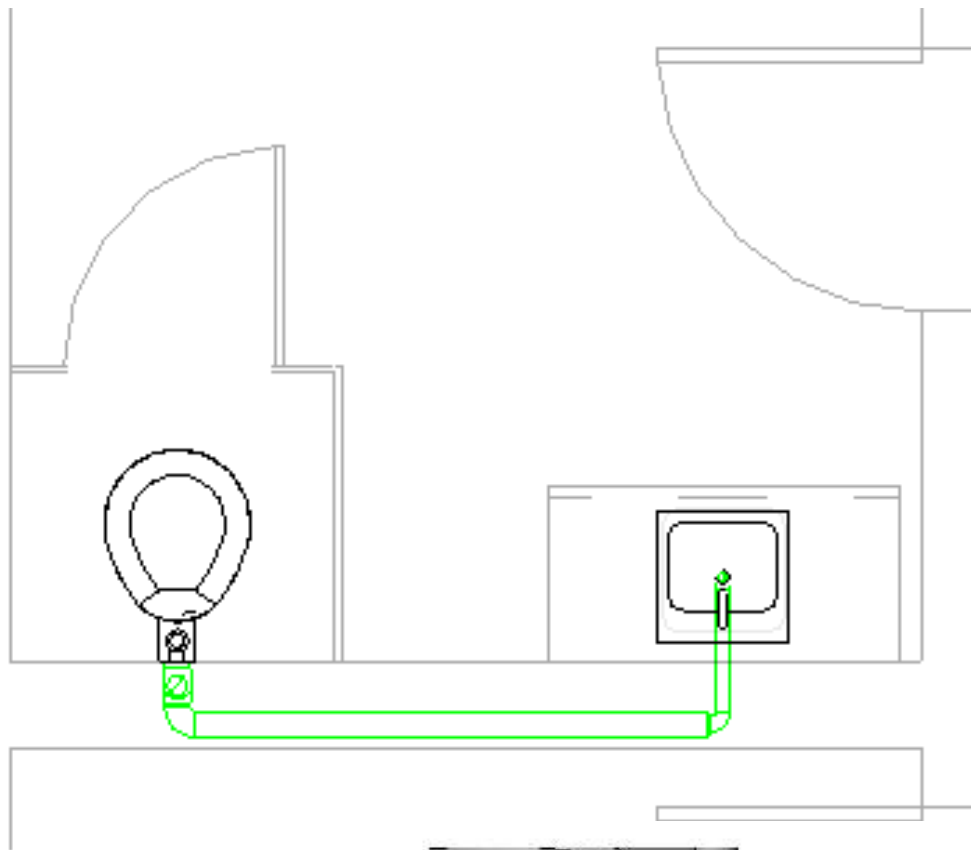


# Plumbing systems



- They are logical entities that facilitate calculations for flow & sizing of equipment
- They are independent of the piping that is placed in a project to show the routing & connections between plumbing fixtures
- 3 types of plumbing: domestic hot water, domestic cold water & sanitary systems
  - Can also create custom system types, e.g. compressed air system

# Plumbing fixtures & piping to create a sanitary system



# Plumbing systems



- Pipe sizing & calculation methods
  - Revit automatically calculates specific pipe sizing for the systems using friction and/or velocity sizing methods
  - Computes pressure losses in piping based on the geometry and roughness of piping, fluid density, and fluid dynamic viscosity
  - Uses the Excess Head (K) method to compute the head loss through a fitting

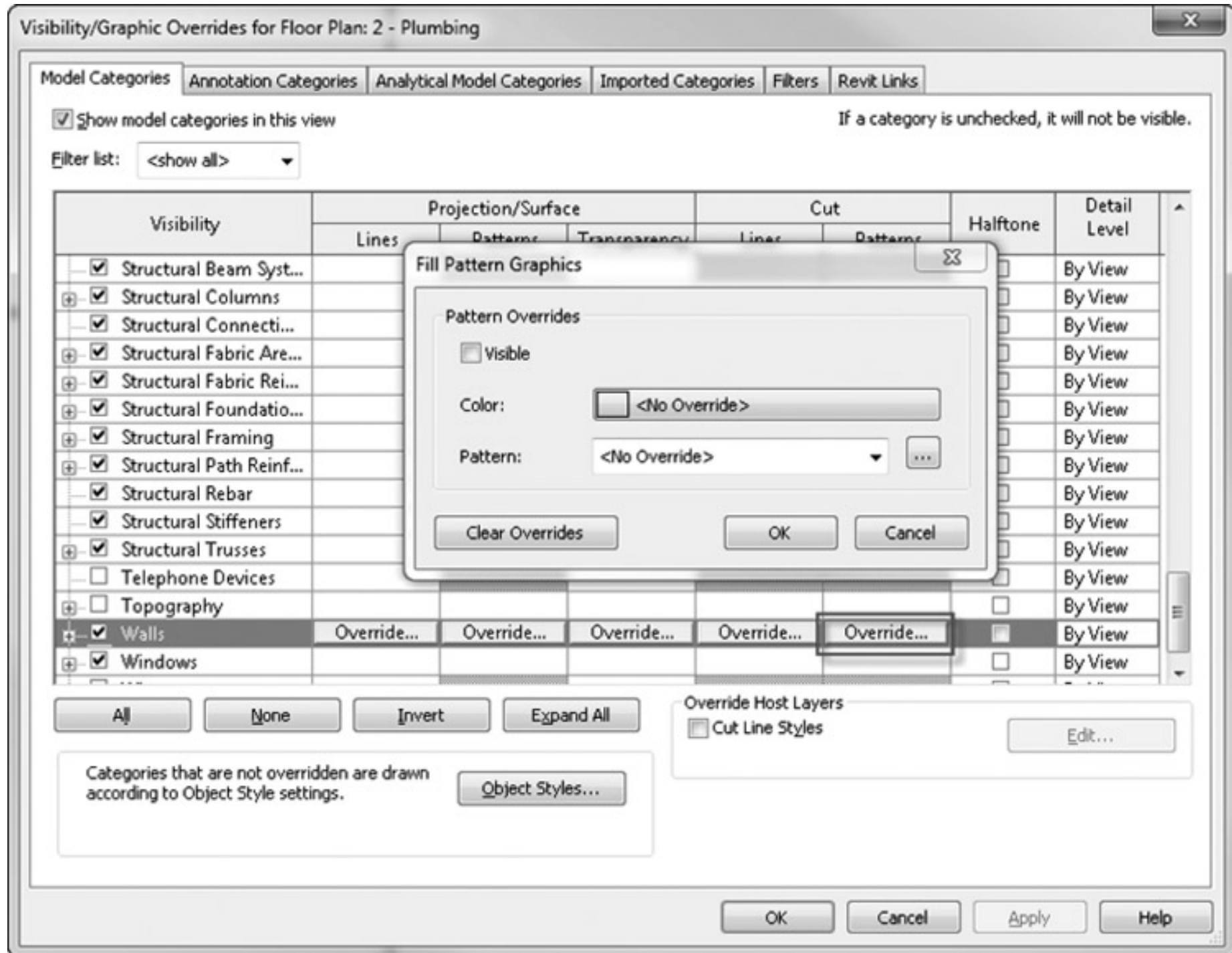
$$h_L = K \frac{V^2}{2g}$$

# Plumbing systems



- With BIM, a plumbing designer has to become a “virtual pipe installer”
- Configuring the plumbing views is important
  - Global settings and view-specific settings
    - Need to adjust several settings so the pipes are properly displayed
  - Defining systems visibility through filters
    - Define colour, line patterns & line weights
    - Display 3D views, using workset visibility to turn off unnecessary ones

# Visibility/Graphic overrides for plumbing systems





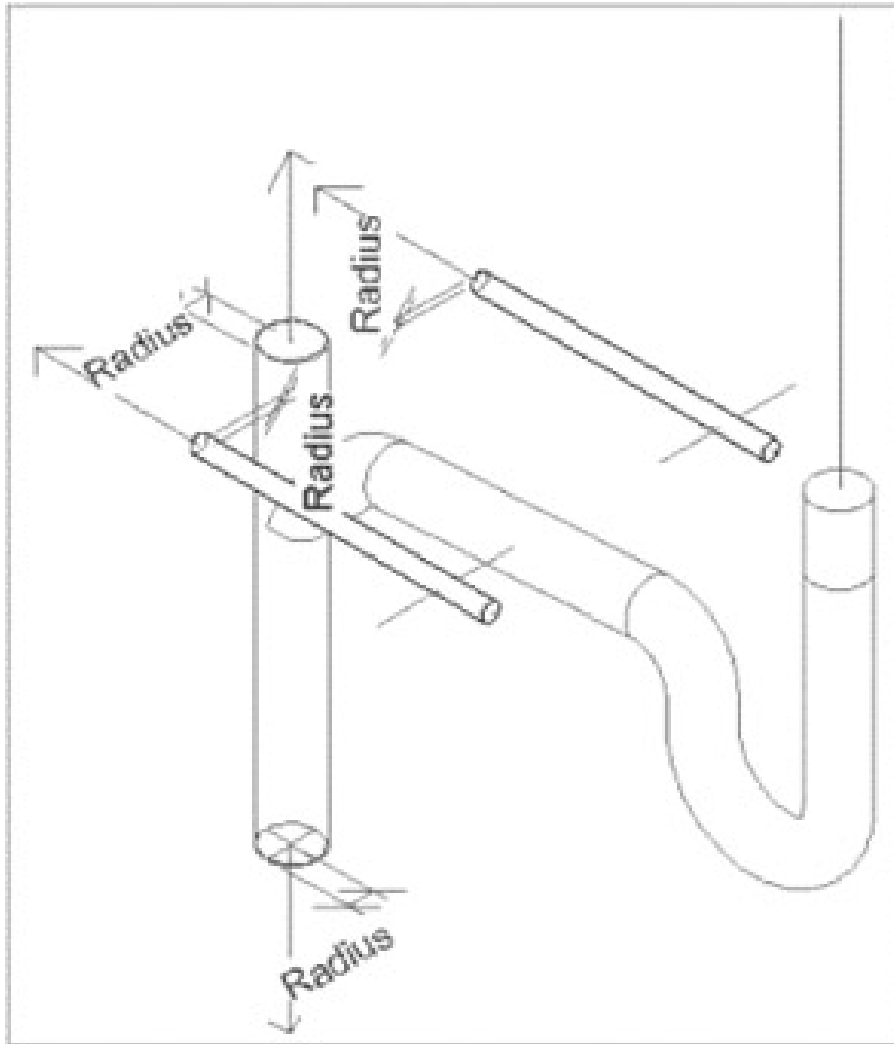


# Plumbing systems



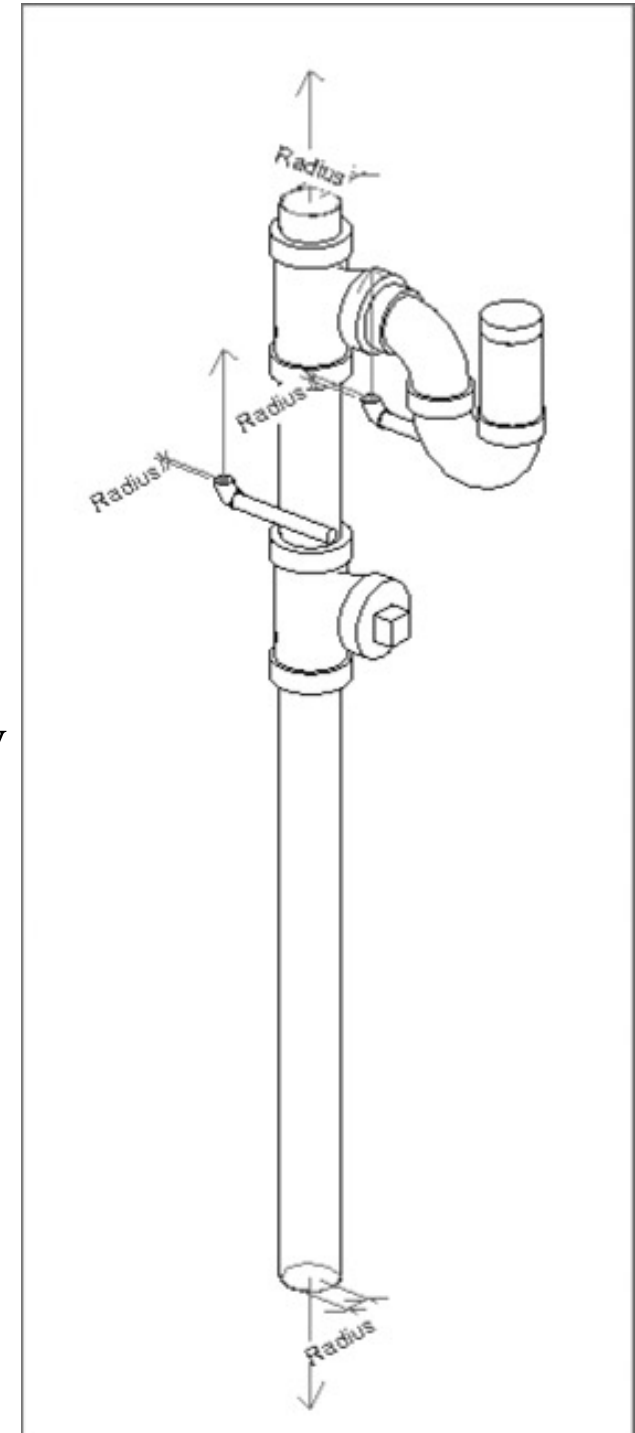
- Working with architectural linked-in plumbing models
  - Coordinated with any architectural plan changes
  - Two methods to create custom pipe assemblies:
    - Pipe assembly created with sweeps
    - Assemble nested families
      - Can allow for better quantity take-offs for all the fittings, create more-accurate dimensional information when supplied by manufacturers, and be easier for the designer to create
      - The downside is that it produces a larger family file

# Two methods to create custom pipe assemblies

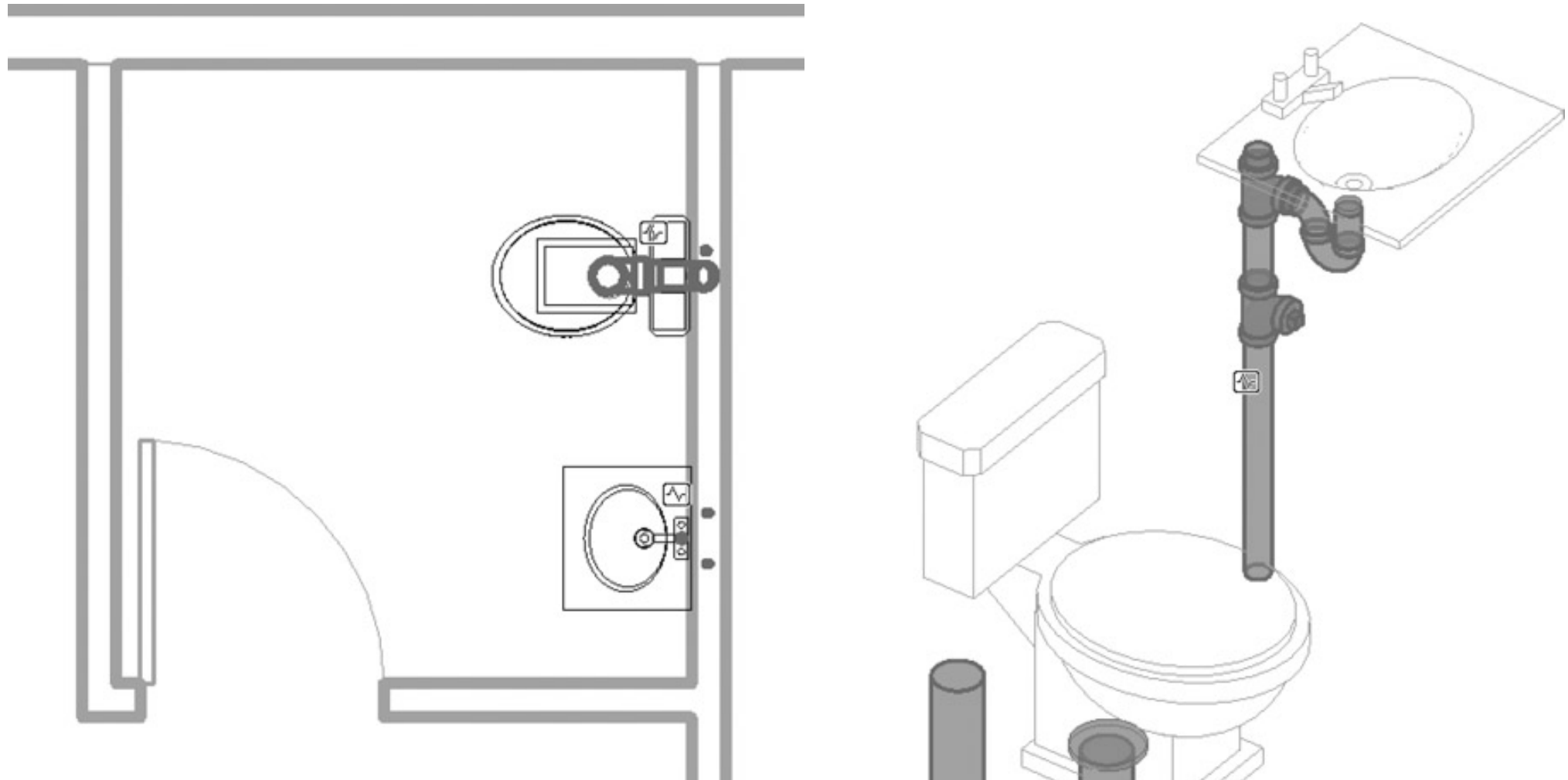


A pipe assembly created with sweeps

Nested  
pipe  
assembly



# Copying/Monitoring plumbing fixtures



Collaborate with the architect:

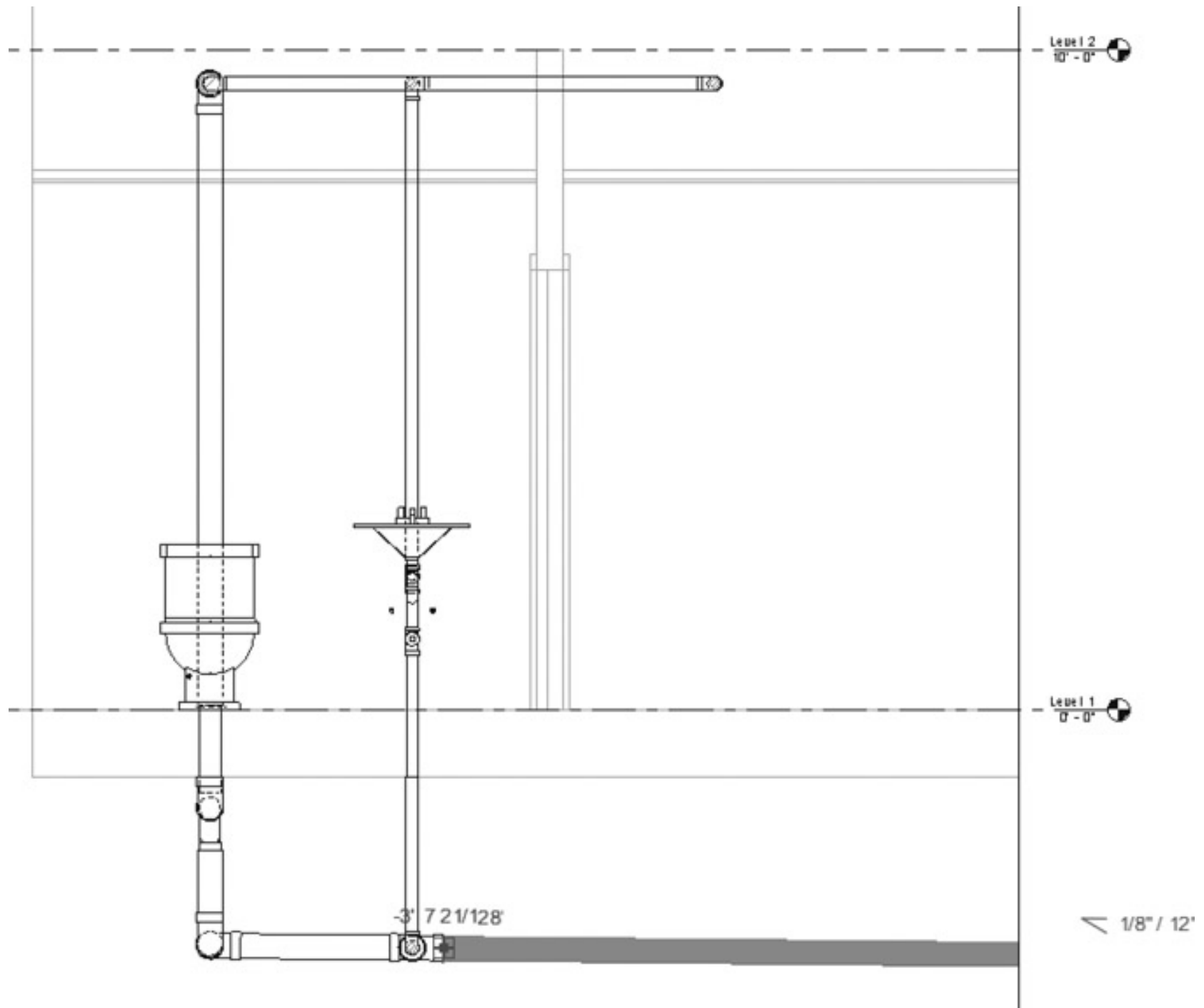
When the architect moves a plumbing fixture, you will receive a warning that you need to coordinate your view

# Plumbing systems



- Choosing pipe settings & pipe routing options
  - Apply the appropriate pipe material & pipe fittings
    - To get the invert elevation for sloping systems
  - Model sloping pipe:
    - Use either auto-route or manual routing feature
    - Locate the sanitary point of connection (POC) outside the building (draw from the main first)
  - Annotate invert elevation & the slope
    - Apply parametric elevation and slope annotations

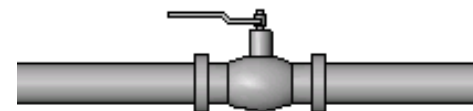
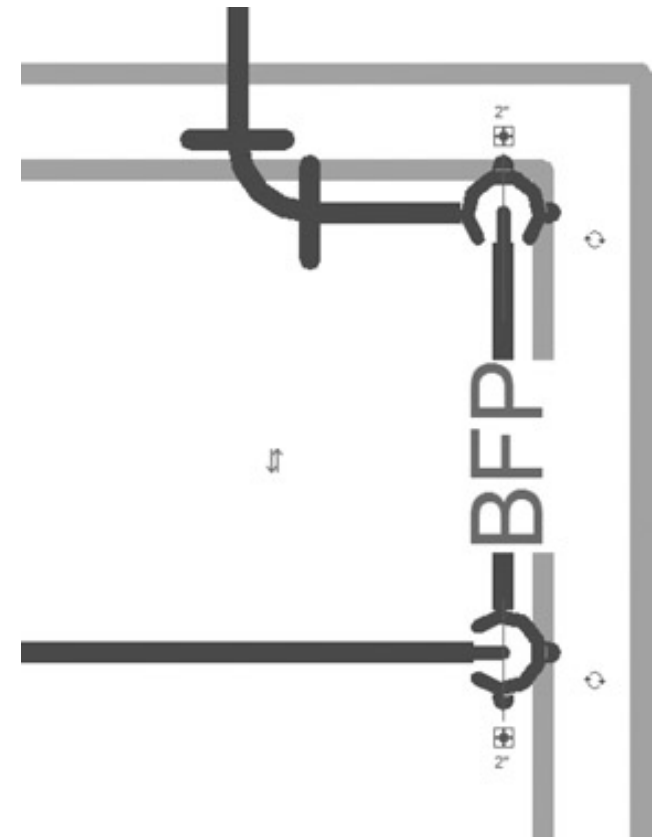
# Sanitary layout with sloped piping



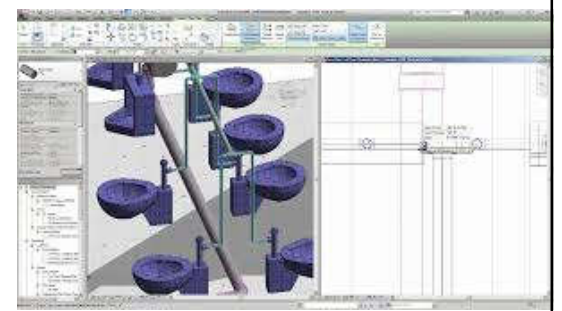
# Plumbing systems



- Using pipe fittings
  - Revit fitting families:
    - End cap
    - Tee, tap, wye, or cross
    - Transitions, couplings, or unions
    - Flange
  - Pipe fitting controls
  - Placing valves & pipe accessories

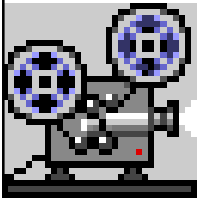


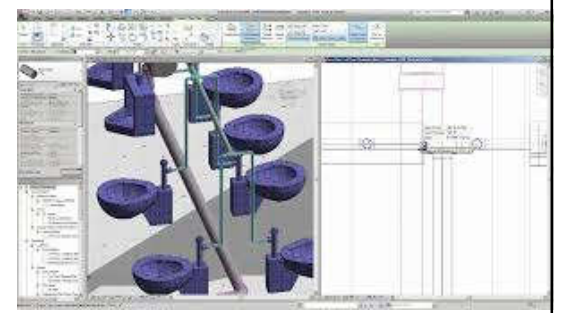




# Revit Plumbing tutorials

- Video: Revit MEP Lesson 16: How To Create a Sanitary Plumbing System (13:16)
  - <https://youtu.be/ASHODy2NpyA>
  - Demonstrate how to create a sanitary system on Revit MEP
- More video tutorials on plumbing:
  - REVIT MEP EXAM REVIEW\_MODELING\_HOW TO DO PLUMBING IN REVIT 2017 (26:25) [https://youtu.be/ESHY\\_ojZYlw](https://youtu.be/ESHY_ojZYlw)
  - REVIT MEP EXAM REVIEW\_MODELING\_HOW TO DO PLUMBING PART 2 IN REVIT 2017 (23:45) <https://youtu.be/N1eICAUmAXQ>

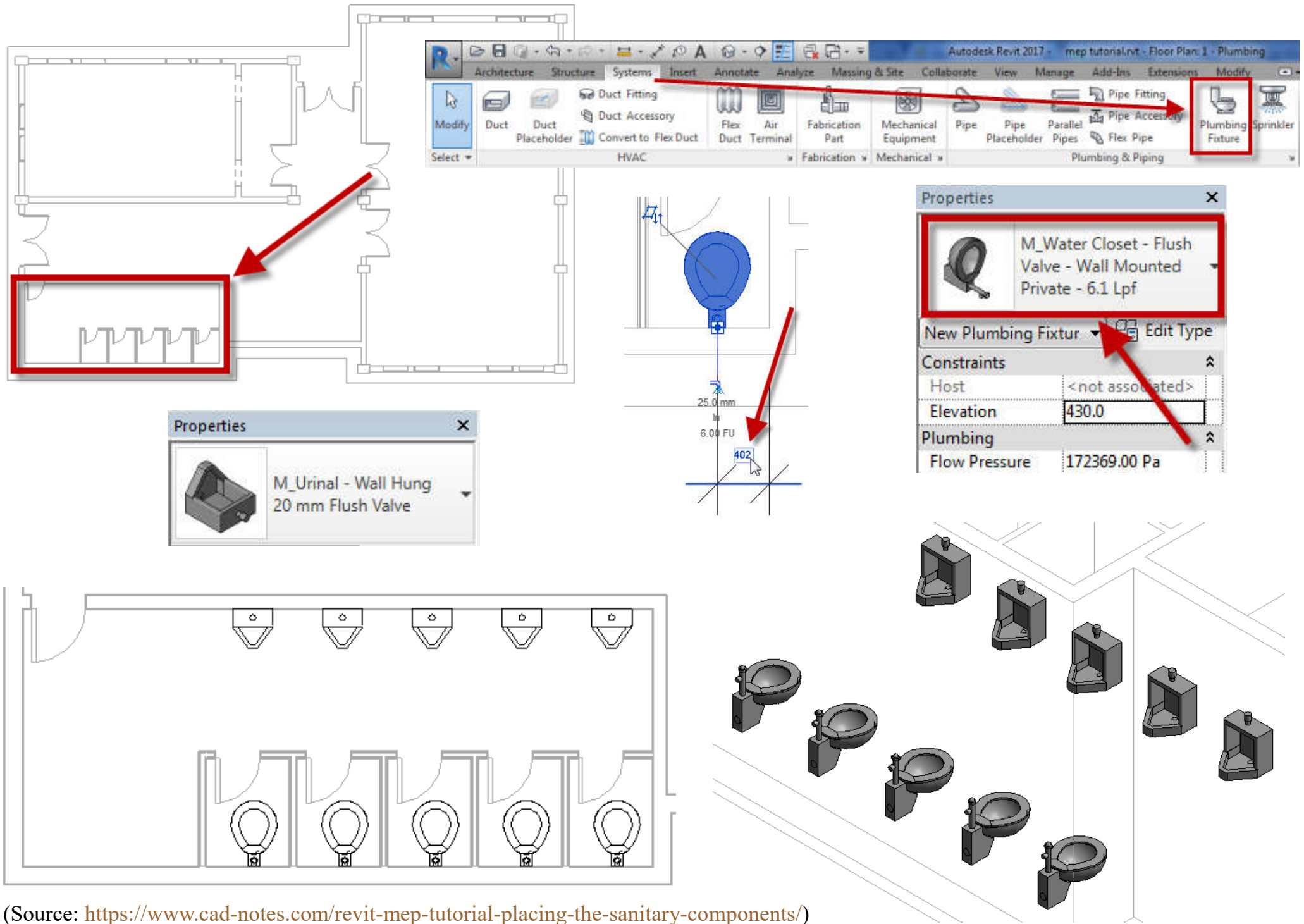




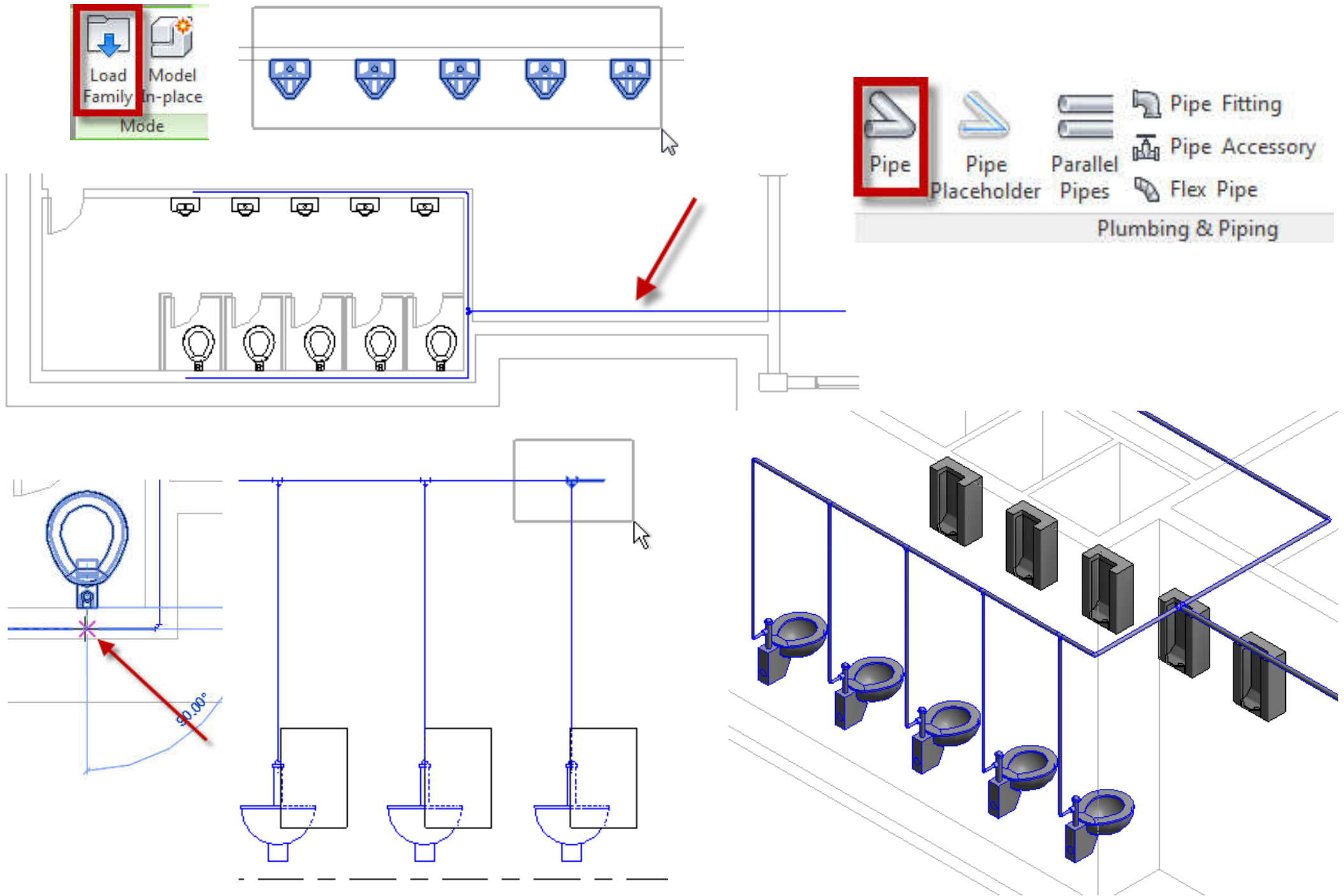
# Revit Plumbing tutorials

- Revit MEP tutorial for plumbing:
  - <https://www.cad-notes.com/tag/revit-mep-basic/page/2/>
  - Placing the Sanitary Components
  - Creating Water Supply Route
  - Connecting Plumbing Fixture to Pipe Route
  - Creating Drain Route
  - Modifying Route

# Revit MEP tutorial: Placing the Sanitary Components



# Revit MEP tutorial: Creating Water Supply Route



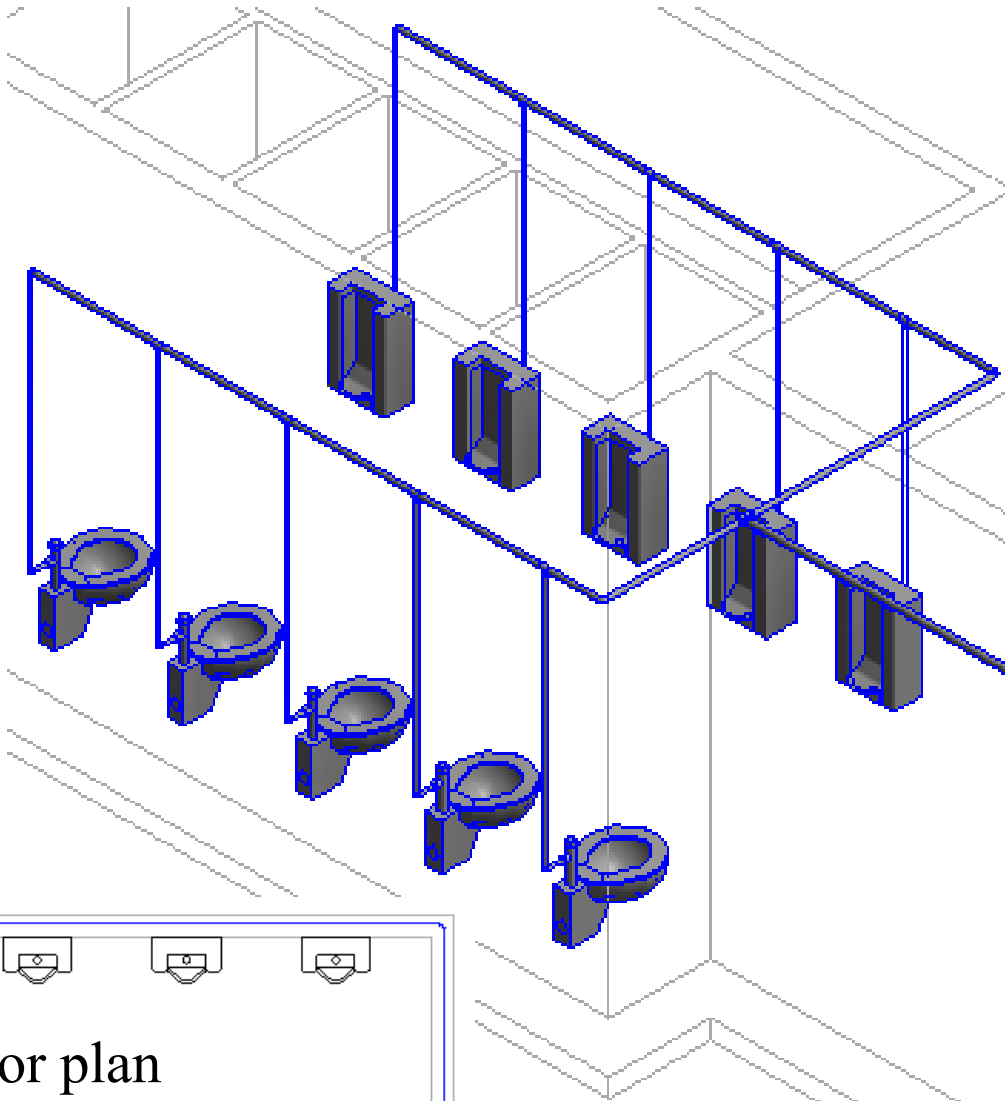
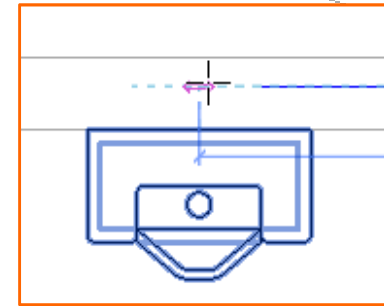
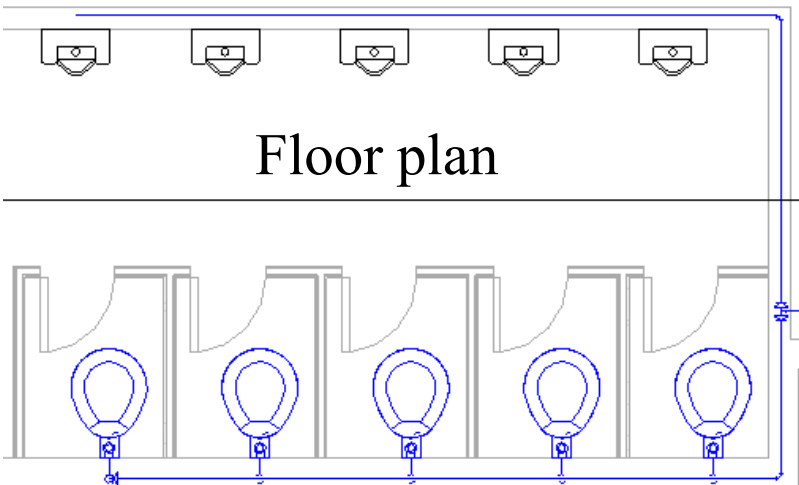
# Revit MEP tutorial: Connecting Plumbing Fixture to Pipe Route

Water closet

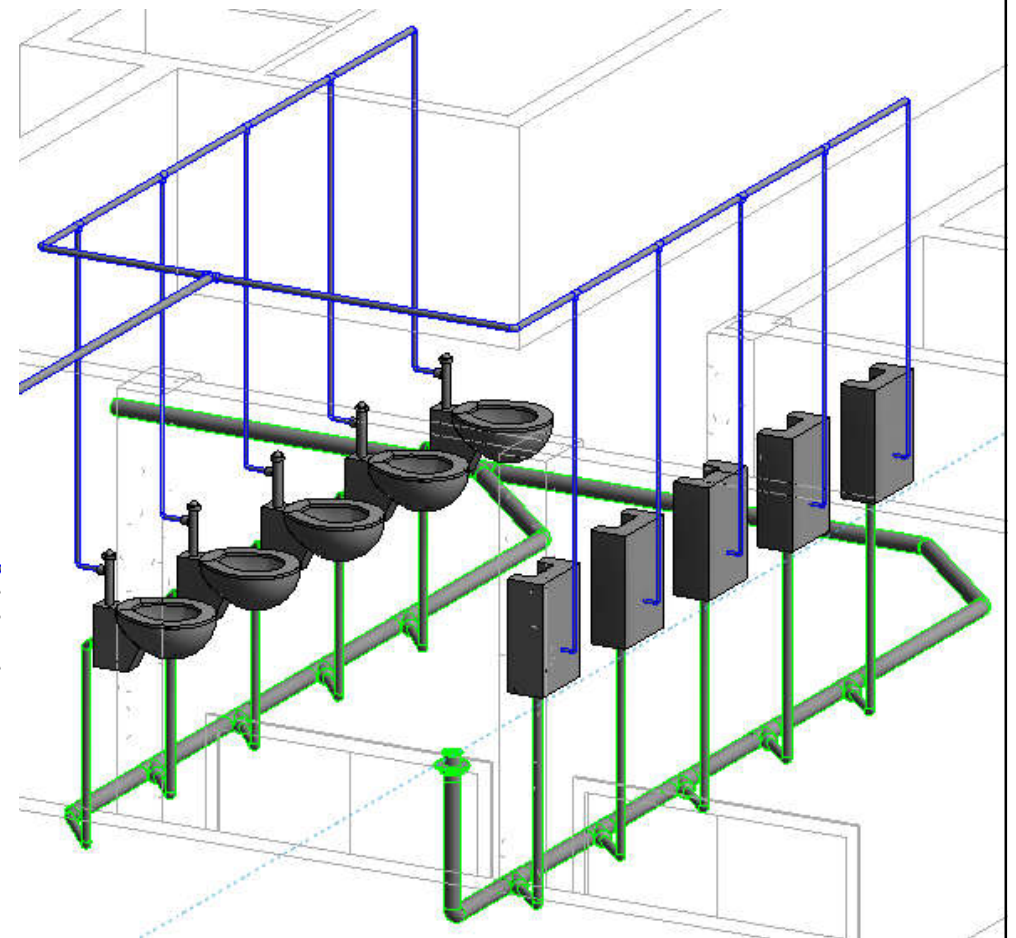
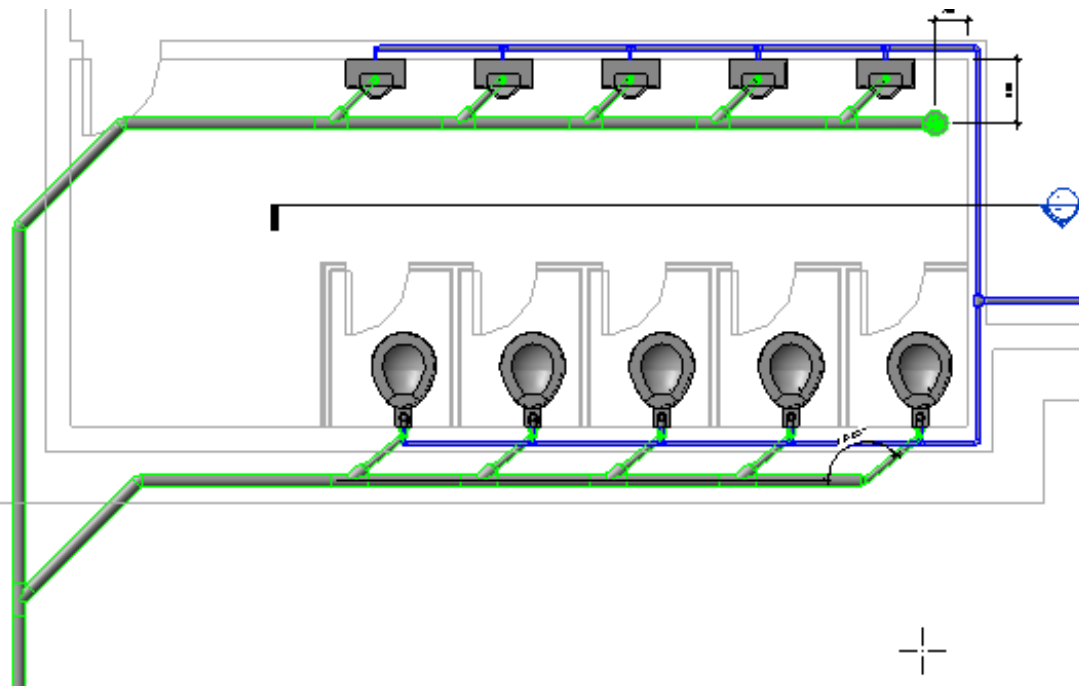
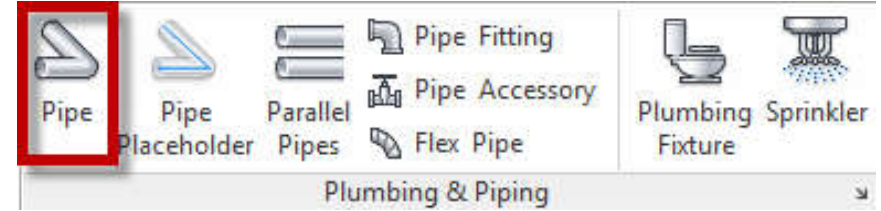
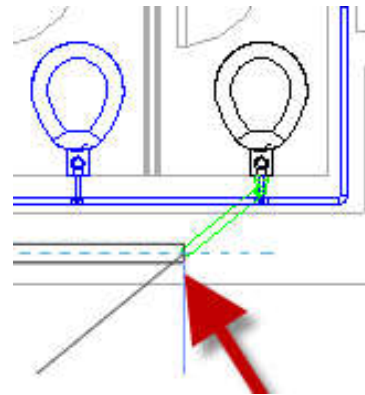
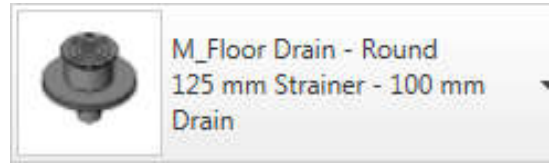
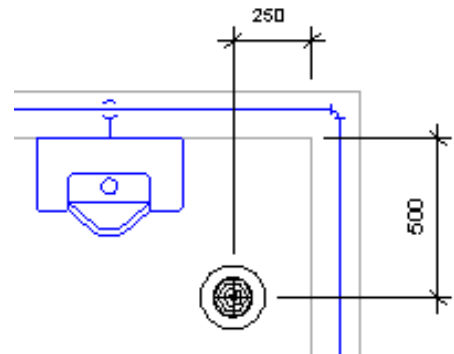
Urinal

Inline pump

Floor plan

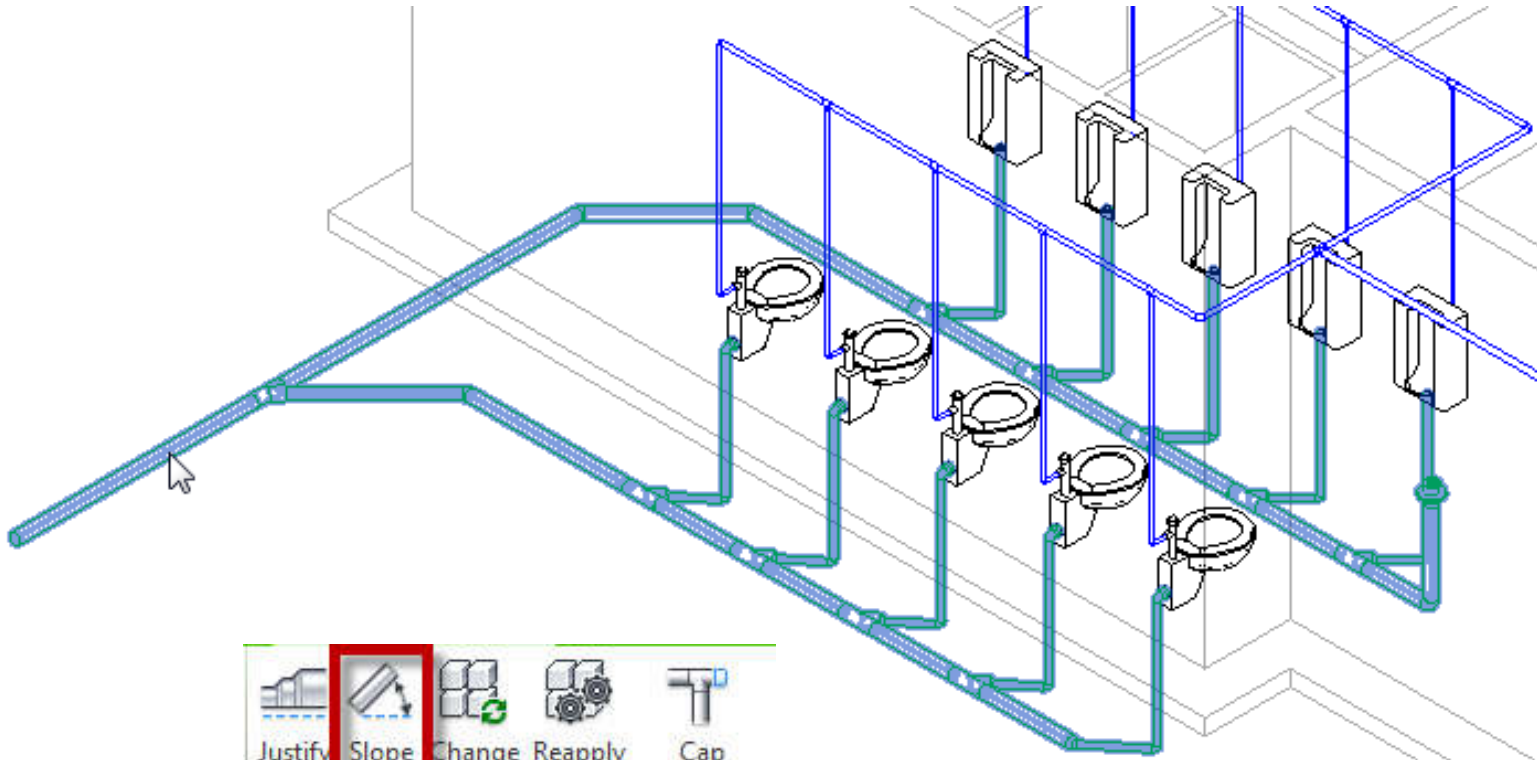


# Revit MEP tutorial: Creating Drain Route

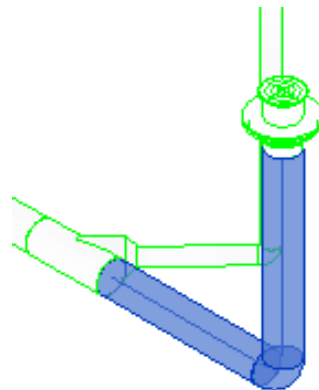
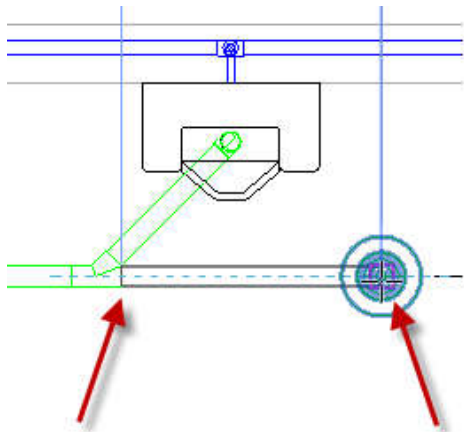
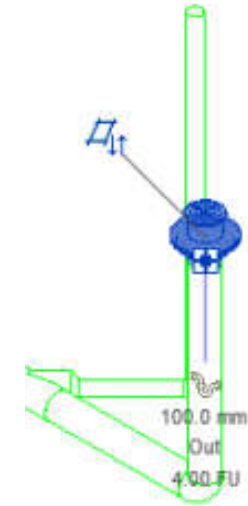




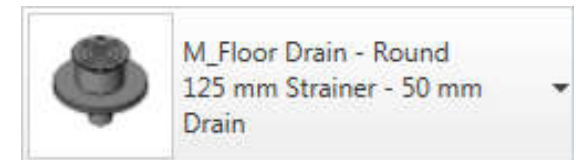
# Revit MEP tutorial: Modifying Route



Change the pipe size from urinal



Change the pipe slope







# Further reading

- Bokmiller, D., Whitbread, S. and Hristov, P., 2013. *Mastering Autodesk Revit MEP 2014*, Sybex, Indianapolis, Ind. [TH 6010 .B65 2013 (ebook)]
  - Chapter 15 - Plumbing (Domestic, Sanitary, and Other)
- Chang, Lu-Yen, 2017. *Revit MEP Step by Step*, 2018 Metric Edition. (ebook) <https://books.google.com.hk/books?id=tndJDwAAQBAJ>
  - Chapter 5 Plumbing Systems
- Videos: Plumbing Engineering
  - <http://help.autodesk.com/view/RVT/2018/ENU/?guid=GUID-5B457BA7-E6E9-43C2-A64E-F5AADA41F044>
  - Watch these videos to learn how to work with plumbing engineering tools to build systems.