



Guide Documentation

US Army Corps of Engineers Building Information Modeling Template for Revit

Template based on the 2012 Autodesk Revit Software

Mechanical Template v1.1

June 2012

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Special Thanks to contributions made by: Mobile, Sacramento, Seattle, Fort-Worth, Omaha, Norfolk, Baltimore Districts and Autodesk Consulting Services.

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Overview

The intent of the mechanical template is to provide a framework to facilitate mechanical design using Revit MEP. It is intended to include but not limited to HVAC and plumbing, fire suppression, and other mechanical systems as appropriate. This template was developed based on Revit MEP 2012.

This guide is NOT intend to be a Revit tutorial, but rather assumes that the user has a sufficient level of proficiency to comprehend the template descriptions outlined in this guide.

Browser and View Organization

The default browser setting in the template is organized by View Purpose, Discipline, and sub-discipline, and sorted by associated level.

Pre-defined Sub-Disciplines in the templates are HVAC, Plumbing, and Fire Suppression.

Pre-defined view purposes are COORD (coordination views), WORK (working views), and DOC (documentation). View purpose is defined as a project parameter and the uppercase abbreviation is also appended to the end of the view names to facilitate user recognition of the views.

Browser View Type	Grouping	Filter
View Purpose_USACE	Group by: View Purpose, Using All Characters Then by: Discipline, Using All Characters Then by: Sub-Discipline, Using All Characters Sort by: Associated Level, Ascending	<None>
Discipline_USACE	Group by: Discipline, Using All Characters Then by: Sub-Discipline, Using All Characters Then by: View Purpose, Using All Characters Sort by: Associated Level, Ascending	<None>
Not on Sheets_USACE	Group by: Family and Type Then by: <None> Then by: <None> Sort by: View Name, Ascending	Filter by: Sheet Name = <None> And: View Purpose = Documentation

Working Views

These views are intended to be used for laying out mechanical components allowing collaboration between the mechanical sub-disciplines and other disciplines.

Working View - Categories Visibility

Sub-Discipline	Hidden Categories	Overrides/Settings/Comments
HVAC 3D	All Annotation Categories All Analytical Categories Areas Detail Items Entourage Parking Raster Images Site Structural Area Reinforcement Structural Connections Structural Path Reinforcement Structural Rebar Structural Stiffeners Wires	
Plumbing 3D	All Annotation Categories All Analytical Categories Areas Detail Items Entourage Parking Raster Images Site Structural Area Reinforcement Structural Connections Structural Path Reinforcement Structural Rebar Structural Stiffeners Wires	
Fire Suppression 3D	All Annotation Categories All Analytical Categories Areas Detail Items Entourage Parking Raster Images Site Structural Area Reinforcement Structural Connections Structural Path Reinforcement Structural Rebar Structural Stiffeners Wires	
HVAC Plan	All Analytical Categories Areas Detail Items Entourage HVAC Zones Parking	All Annotation Categories hidden EXCEPT: Air Terminal Tags Duct Color Fill Duct Color Fill Legends

	<p>Raster Images Roads Site Structural Area Reinforcement Structural Beam Systems Structural Connections Structural Path Reinforcement Structural Rebar Structural Stiffeners Wires</p>	<p>Duct Tags Pipe Tags Reference Lines Reference Planes Reference Points Room Tags Sections Space Tags</p>
Plumbing Plan	<p>All Analytical Categories Areas Detail Items Entourage HVAC Zones Parking Planting Raster Images Roads Rooms Site Spaces Structural Area Reinforcement Structural Connections Structural Path Reinforcement Structural Rebar Structural Stiffeners Wires</p>	<p>All Annotation Categories hidden EXCEPT: Pipe Tags Reference Lines Reference Planes Reference Points Room Tags Sections Space Tags</p>
Fire Suppression Plan	<p>All Analytical Categories Areas Detail Items Entourage HVAC Zones Parking Planting Raster Images Roads Rooms Site Spaces Structural Area Reinforcement Structural Connections Structural Path Reinforcement Structural Rebar Structural Stiffeners Topography Wires</p>	<p>All Annotation Categories hidden EXCEPT: Generic Annotations Pipe Tags Reference Lines Reference Planes Reference Points Room Tags Sections Space Tags Sprinkler Tags</p>
HVAC Zones	<p>All Model Categories Hidden EXCEPT: Columns</p>	<p>Color scheme = HVAC Zones</p>

	<p>Curtain Panels Duct Fittings Duct Placeholders Ducts Generic Models HVAC Zones Lines Shaft Openings Spaces Structural Columns Walls Windows</p> <p>All Analytical Categories Hidden.</p>	<p>All Annotation Categories Hidden EXCEPT: Space Tags Zone Tags</p>
<p>Mechanical – Solar Study-Sun Path</p>	<p>All Annotation Categories All Analytical Categories Air Terminal Area Cable Tray Fittings Cable Trays Casework Ceilings Communication Devices Conduit Fittings Conduits Curtain Systems Data Devices ALL Duct Categories Fire Alarm Devices Flex Ducts Flex Pipes Furniture Furniture Systems Nurse Call Devices ALL Pipe Categories Plumbing Fixtures Security Devices Sprinklers Structural Area Reinforcement Structural Beam Systems Structural Connections Structural Path Reinforcement Structural Rebar Structural Stiffeners Telephone Devices Wires</p>	

Working Views - View Filters

Discipline	View Filters	View Filter Overrides
HVAC	Piping – ALL Domestic Water Piping – ALL Fire Protection Piping – Sanitary Piping – Sanitary Vent Piping – Natural Gas Equipment – Domestic Plumbing Equipment – Fire Protection	Line Color = Gray Haftone = True
Plumbing	Piping – ALL Fire Protection Piping – ALL Hydronics Duct – ALL Equipment – Fire Protection Equipment – Hydronic	Line Color = Gray Haftone = True
Fire Suppression	Piping – ALL Fire Protection Equipment – Fire Protection	Line Color = Red
	Piping – ALL Domestic Water Piping – ALL Hydronics Piping – Sanitary Piping – Sanitary Vent Piping – Natural Gas Duct – ALL Equipment – Hydronic Equipment – Domestic Plumbing	Line Color = Gray Haftone = True

Documentation Views

These views are intended to be placed on sheets. Depending on workflow in many, if not, most cases, mechanical design is done directly in the documentation views. Appropriate visibility and/or filter settings are applied to display only relevant categories and objects.

Documentation Views - Categories Visibility

Sub-Discipline	Hidden Categories	View Overrides
HVAC	Areas Cable Tray Fittings Cable Trays Communication Devices Conduit Fittings Conduits Curtain Panels Curtain Systems Curtain Wall Mullions	All Pipe categories Detail Level set to Coarse

	<p>Data Devices Entourage Fire Alarm Devices HVAC Zones Lighting Devices Light Fixtures Nurse Call Devices Parking Parts Planting Plumbing Fixtures Raster Images Roads Roofs Security Devices Site Sprinklers Structural Area Reinforcement Structural Beam Systems Structural Connections Structural Foundations Structural Path Reinforcement Structural Rebar Structural Stiffeners Telephone Devices Topography Wires</p>	
Plumbing	<p>Air Terminals Areas Cable Tray Fittings Cable Trays Ceilings Communication Devices Conduit Fittings Conduits Curtain Panels Curtain Systems Curtain Wall Mullions Data Devices Duct Accessories Duct Fittings Duct Insulation Duct Linings Duct Placeholders Ducts Electrical Equipment Electrical Fixtures Entourage Fire Alarm Devices Flex Ducts Furniture</p>	All Pipe categories Detail Level set to Coarse

	<ul style="list-style-type: none"> Furniture Systems HVAC Zones Lighting Devices Lighting Fixtures Nurse Call Devices Parking Parts Planting Raster Images Roads Rooms Security Devices Site Spaces Sprinklers Structural Area Reinforcement Structural Beam Systems Structural Connections Structural Path Reinforcement Structural Rebar Structural Stiffeners Telephone Devices Topography Wires 	
3D Plumbing Isometric	<p>All Model Categories Hidden EXCEPT:</p> <ul style="list-style-type: none"> Flex Pipes Generic Models Lines Mechanical Equipment Pipe Accessories Pipe Fittings Pipe Placeholders Pipes Plumbing Fixtures 	<p>Plumbing Fixtures set to Halftone and Transparent. Projection lines set to gray.</p> <p>View set to coarse and hidden line</p>
Fire Suppression	<ul style="list-style-type: none"> Air Terminals Areas Cable Tray Fittings Cable Trays Ceilings Communication Devices Conduit Fittings Conduits Curtain Panels Curtain Systems Curtain Wall Mullions Data Devices Duct Accessories Duct Fittings Duct Insulation Duct Linings 	

	Duct Placeholders Ducts Electrical Equipment Electrical Fixtures Entourage Fire Alarm Devices Flex Ducts Furniture Furniture Systems HVAC Zones Lighting Devices Lighting Fixtures Nurse Call Devices Parking Parts Planting Raster Images Roads Rooms Roofs Security Devices Site Spaces Structural Area Reinforcement Structural Beam Systems Structural Connections Structural Path Reinforcement Structural Rebar Structural Stiffeners Telephone Devices Topography Wires	
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Documentation Views - View Filters

Discipline	View Filters	View Filter Overrides
HVAC	Piping – ALL Domestic Water Piping – ALL Fire Protection Piping – Sanitary Piping – Sanitary Vent Piping – Natural Gas Equipment – Domestic Plumbing Equipment – Fire Protection	Visibility OFF
Plumbing	Piping – Sanitary Vent	Visibility ON Override Line Pattern with DASH
	Piping – Domestic Cold Water Piping – Domestic Hot Water Piping – Domestic Hot Water Return	Visibility ON Override Line Patterns with AEC CADD STD compliant patterns

	Piping – Natural Gas Piping – ALL Fire Protection Piping – ALL Hydronics	Visibility OFF
3D Plumbing Isometric	Piping – Sanitary Vent Piping – Domestic Cold Water Piping – Domestic Hot Water Piping – Domestic Hot Water Return	Override Linetype – Dashed Override Linetype – CLDWTR Override Linetype – HWTR Override Linetype – HWTRR
	Piping – ALL Fire Protection Piping – ALL Hydronics Piping – Natural Gas Equipment – Fire Protection Equipment – Hydronic	Visibility OFF
Fire Suppression	Piping – ALL Domestic Water Piping – Sanitary Piping – Sanitary Vent Piping – Natural Gas Piping – ALL Hydronic Equipment – Hydronic Equipment – Domestic Plumbing	Visibility OFF

Coordination Views

Due to the unique workflow for MEP design, there are only a few times where there is a need for a coordination view separate and distinct from the working views. In the template, only one 3D_ALL_USACE_COORD view is provided. In this view, most categories' visibility settings are turned ON and section box is enabled.

Coordination Views - Model Categories Visibility

Sub-Discipline	Hidden Categories	View Overrides
Mechanical 3D	Areas Curtain System Detail Items Mass Wires	<p>All categories detail level set to Coarse except for:</p> <ul style="list-style-type: none"> Air Terminals All Duct categories All Pipe categories Generic Models Mechanical Equipment Plumbing Fixtures Sprinklers <p>Categories with Surface Patterns Hidden:</p>

		Floors Roofs Walls
Mechanical Elevations	Areas HVAC Zones Mass Nurse Call Devices Rooms Spaces Structural Area Reinforcement Structural Beam Systems Structural Connections Structural Path Reinforcement Structural Rebar Structural Stiffeners Wires	

View Filters

View filters on 3D views are intended to serve as an aid to viewing mechanical systems more clearly via color overrides. On Documentation views, the purpose of view filters is to facilitate the use of overrides for proper generation of printed drawing sheets. For filter rules, preference is first given to System Classification. When multiple system types are defined for one system classification, then System Type is used as the filter rule.

Tip: Note that the view filters list in Revit cannot be sorted. They are listed in the order they were created.

View Filter	Categories	Filter Rules
Duct - Supply	All Duct, Duct Placeholders & Flex Duct categories	System Type = Supply Air
Duct – Return	All Duct, Duct Placeholders & Flex Duct categories	System Classification = Return Air
Duct – Exhaust	All Duct, Duct Placeholders & Flex Duct categories	System Classification = Exhaust Air
Duct – Outside Air	All Duct, Duct Placeholders & Flex Duct categories	System Type = Outside Air
Piping – Sanitary	All Pipe, Pipe Placeholders & Flex Pipe categories	System Classification = Sanitary
Piping – Sanitary Vent	All Pipe, Pipe Placeholders & Flex Pipe categories	System Classification = Vent
Piping – Domestic Cold Water	All Pipe, Pipe Placeholders & Flex Pipe categories	System Classification = Domestic Cold Water
Piping – Domestic Hot Water	All Pipe, Pipe Placeholders & Flex Pipe categories	System Classification = Domestic Hot Water
Piping – Domestic Hot Water Return	All Pipe, Pipe Placeholders & Flex Pipe categories	System Type = Domestic Hot Water Return

Piping – Natural Gas	All Pipe, Pipe Placeholders & Flex Pipe categories	System Type = Natural Gas
Piping – Fire Protection Dry	All Pipe, Pipe Placeholders & Flex Pipe categories	System Type = Fire Protection Dry
Piping – Fire Protection Wet	All Pipe, Pipe Placeholders & Flex Pipe categories	System Type = Fire Protection Wet
Piping - ALL Domestic Water	All Pipe, Pipe Placeholders & Flex Pipe categories	System Classification contains Domestic
Piping - ALL Fire Protection	All Pipe, Pipe Placeholders & Flex Pipe categories	System Classification contains Fire Protection
Piping - ALL Hydronics	All Pipe, Pipe Placeholders & Flex Pipe categories	System Classification contains Hydronic
Equipment – Hydronics	Mechanical Equipment	System Classification contains Hydronic
Equipment – Domestic Plumbing	Mechanical Equipment	System Classification contains Domestic
Equipment – Fire Protection	Mechanical Equipment	System Classification contains Fire

Piping Systems

System Type	System Classification	Abbreviation	Color	Pattern*
Condensate	Other	C	-	-
Domestic Cold Water	Domestic Cold Water	CW	Blue	CLDWTR
Domestic Hot Water	Domestic Hot Water	HW	Red	HWTR
Domestic Hot Water Return	Domestic Hot Water	HWR	Light Red	HWTRR
Fire Protection Dry	Fire Protection Dry	FPD	-	-
Fire Protection Other	Fire Protection Other	FPO	-	-
Fire Protection Pre-Action	Fire Protection Pre-Action	FPPA	-	-
Fire Protection Wet	Fire Protection Wet	FPW	-	-
Natural Gas	Gas	G	Orange	
Hydronic Chilled Water Return	Hydronic Return	CHWR	RGB 82,103,165	-
Hydronic Chilled Water Supply	Hydronic Supply	CHWS	Cyan	-
Hydronic Hot Water Return	Hydronic Return	HWR	Light Red	-
Hydronic Hot Water Supply	Hydronic Supply	HWS	Red	-
Other	Other	-	-	-
Sanitary	Sanitary	SS	Purple RGB 145,82,165	-
Vent	Vent	V	Green	DASHED

* Pattern Override for Documentation views, AEC CADD Standard compliant line pattern where applicable.

Duct Systems

System Type	System Classification	Abbreviation	Color	Pattern
Exhaust Air	Exhaust Air	EA	Green	-
Outside Air	Supply Air	SA	Yellow	-

Return Air	Return Air	RA	Orange	-
Supply Air	Supply Air	SA	Cyan	-
Supply Air – High Pressure	Supply Air	SA-HP	Blue	-

Schedules

Schedule	Fields	Heading	Filter Rules
Circulating Pump	Mark Type Comments Flow Head ----- Pump HP Voltage Phase Electrical Hertz	SYMBOL TYPE CAPACITY HEAD ELECTRICAL HP VOLTAGE PHASE HZ	Mark begins with CP-
Diffuser & Register	Type Mark Type Description Family Type Comments Max Flow Min Flow Count	MARK FACE/NECK SIZE DESCRIPTION TYPE TYPE COMMENTS MAX. FLOW MIN. FLOW COUNT	
Plumbing Fixture	Type Mark Description CW_DIAMETER HW_DIAMETER W_DIAMETER Count Comments	SYM DESCRIPTION CW HW W COUNT REMARKS	
VAV	Mark Type Type Comments MINIMUM_AIRFLOW MAXIMUM_AIRFLOW PRESSURE INLET_SIZE System Name kW LEAVING_DB HEATING_AIRFLOW Level Current	MARK SIZE/TYPE TYPE MIN. AIRFLOW MAX. AIRFLOW MAX. INLET DESIGN AIR S.D. – IN.W.G. INLET SIZE – IN. SYSTEM kW LEAVING DB HEATING AIRFLOW LEVEL CURRENT	Mark begins with VAV-
Elec Water Heater	Mark Type Comments Description Voltage kW Electrical Hertz Comments	MARK TYPE DESCRIPTION VOLTAGE kW Hz NOTES	Mark begins with EWH-

zHVAC Spaces	Level Zone Name Room: Name Number Room: Number Area Volume Number of People Occupiable Plenum Actual HVAC Load Space Type Design Cooling Load Calculated Cooling Load Design Heating Load Calculated Heating Load Calculated Supply Airflow Specified Supply Airflow Actual Supply Airflow Return Airflow Airflow Differential		
zHVAC Zones	Name Level Gross Area Gross Volume Occupied Area Occupied Volume Service Type Calculated Cooling Load Calculated Supply Airflow Calculated Supply Airflow per area		
zSheet List	Sheet Number SHEET_TITLE_1 SHEET_TITLE_2 SHEET_TITLE_3 Current Revision Publish Order SHEET_NO Approved By Checked By Designed By Drawn By FILE_NO FILENAME Sheet Issue Date Sheet Name		

Steel Pipe Fitting Lookup Table

Included with the mechanical template is a “Pipe Fitting – Steel.csv” file for used in defining steel pipes. The CVS file should be copied to the Revit MEP lookup table location, C:\ProgramData\Autodesk\RME 2012\Lookup Tables\Pipe\.

Plumbing Schematic Isometric Risers

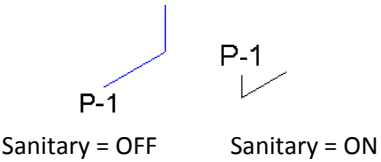
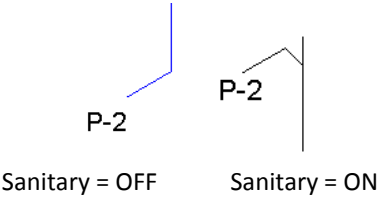
The preferred method of presenting isometric risers is to embellish locked 3D views. For situations where this is not practical due to various reasons including complexity of the models or for congested areas, additional tools for hand drafting isometric risers are available to facilitate such drafting within Revit.

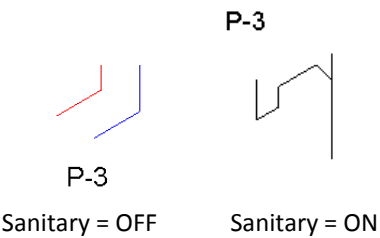

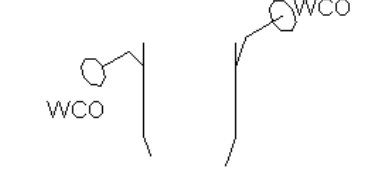
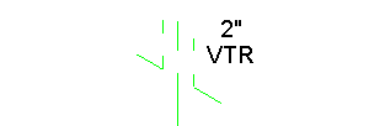
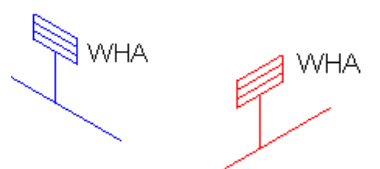
The drafting view entitled Plumbing Riser Template_DOC provides an optional method to layout plumbing isometric risers within Revit using detail components. A background ISO GRID GUIDE helps aligning to the proper isometric angle.

Special detail component families for pipes, crossings, and tees with filled regions allow for the proper display of overlapping lines without manually breaking lineworks. This also allows for fast editing and moving of components.

Similarly, fixtures are designed for easy manipulation with flip controls, type marks, and visibility settings.

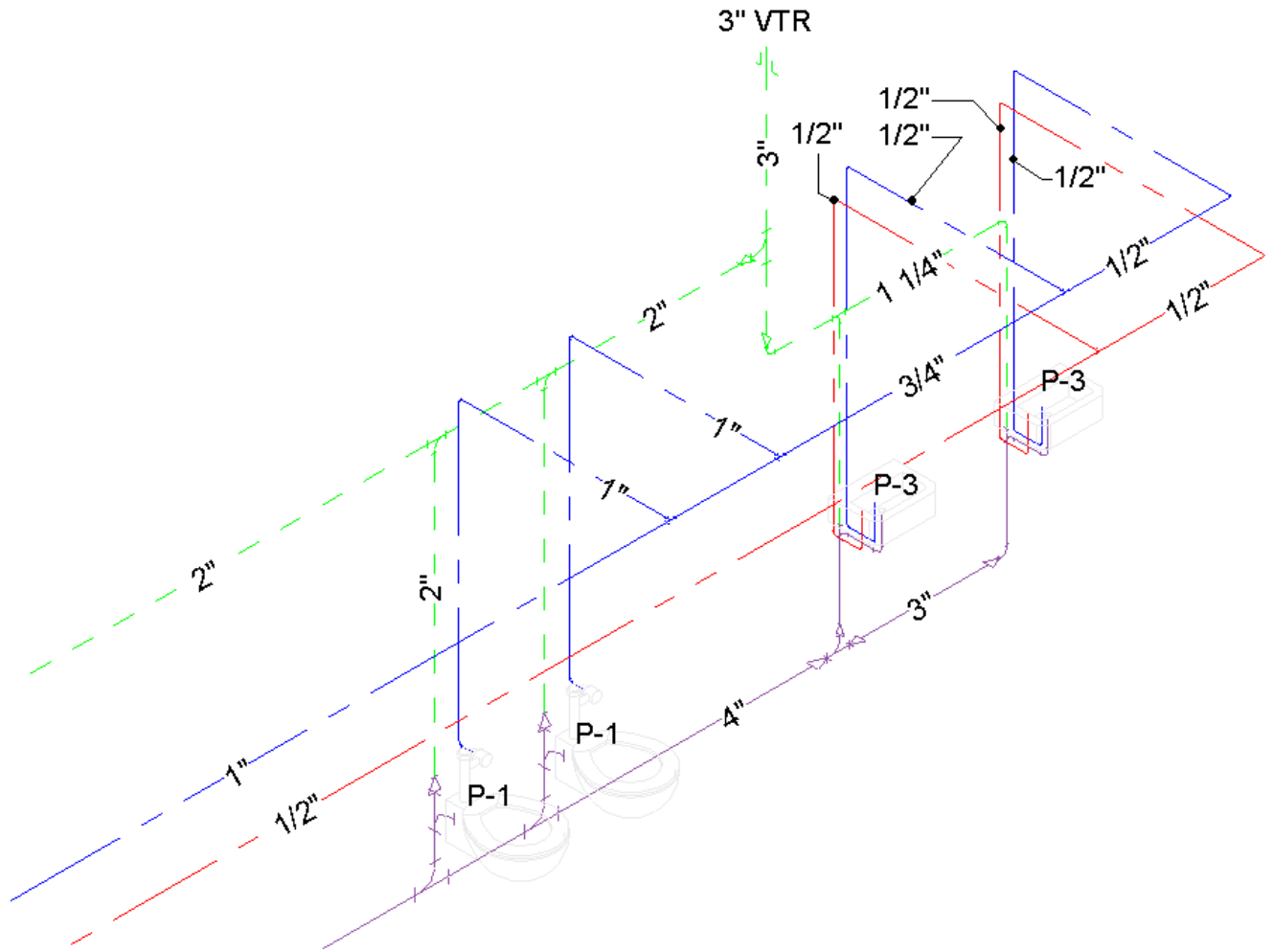
Tip: Use Revit's Bring to Front and Send to Back tools to achieve the appropriate linework breaking.

Detail Component Family	Graphics	Notes
DetailComp_PlumbingIsometric_WC_USACE.rfa		Water Closet detail component family with 'Sanitary' visibility parameter OFF and ON. The P-1 label is a type mark tag.
DetailComp_PlumbingIsometric_Urinal_USACE.rfa		Urinal detail component family with 'Sanitary' visibility parameter OFF and ON. The P-2 label is a type mark tag.

DetailComp_PlumbingIsometric_Lavatory_USACE.rfa		Lavatory detail component family with 'Sanitary' visibility parameter OFF and ON. The P-3 label is a type mark tag. The lavatory component detail family also has an additional FLIP_HOTCOLD parameter to rectify the hot-cold piping when mirroring the fixture.
DetailComp_PlumbingIsometric_FD_USACE.rfa		Floor Drain detail component family with 'Sanitary' visibility parameter OFF and ON. Water connection is intended as a trap primer. The FD-1 label is a type mark tag.
DetailComp_PlumbingIsometric_WCO_USACE.rfa		Wall Clean Out detail component family with RIGHT and LEFT parameters. The WCO label is a type mark tag.
DetailComp_PlumbingIsometric_VTR_USACE.rfa		Vent Through Roof detail component family. The 2" VTR label is a type mark tag.
DetailComp_PlumbingIsometric_WHA_USACE.rfa		Water Hammer Arrester detail component family. DCW/DHW representation is a type parameter. The WHA label is a type mark tag.

APPENDIX A - Sample Revit plumbing isometric using a locked 3D view

Sample 3D plumbing isometric based on the template 3D view "Plumbing Isometric_DOC."



APPENDIX B - Sample Revit plumbing isometrics using a drafting view

