SECTION 22 14 00

SIPHONIC STORM DRAINAGE

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\*\* NOTE TO SPECIFIER \*\* MIFAB, Inc.; siphonic roof drains.
This section is based on the products of MIFAB, Inc., which is located at:
1321 W. 119th St.
Chicago, IL 60643
Toll Free Tel: 800-465-2736
Tel: 773.341.3030
Fax: 773-341-3047
Email:[request info (sales@mifab.com )](https://admin.arcat.com/users.pl?action=UserEmail&company=MIFAB,+Inc.&coid=38108&rep=&fax=773-341-3047)
Web:<http://www.mifab.com>
[[Click Here](https://www.arcat.com/arcatcos/cos38/arc38108.html)] for additional information.
Manufacturer of Commercial and Industrial Plumbing and Drainage Products.
Serving all the USA, Canada, Australia, and the Middle East, MIFAB can provide you with the quality, engineered plumbing and drainage solutions you need. Innovative product designs save the installer time and material cost and provides the owner with higher quality cast stainless steel drains and cleanouts for the same cost as the industry standard nickel bronze.

1. GENERAL
	1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Siphonic primary roof drains.
		2. Siphonic overflow roof drains.
		3. Storm drainage piping, buried.
		4. Storm drainage piping, above grade.
		5. Pipe flanges, unions, and couplings.
		6. Pipe hangers and supports.
	1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 22 05 03 - Pipe, Pipe Fittings, Pipe Hangers and Valves
		2. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.
		3. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
		4. Section 22 07 19 - Plumbing Piping Insulation.
		5. Section 22 08 00 - Fire Stopping.
		6. Section 22 10 00 - Plumbing Piping and Valves.
		7. Section 22 14 23 - Storm Drainage Piping Specialties.
		8. Section 22 40 00 - Plumbing Fixtures.
	1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. American Society of Mechanical Engineers (ASME):
			1. ASME A112.6.9 - Siphonic Roof Drains 2005 (Reaffirmed 2019).
			2. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2021.
			3. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2021.
			4. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2021.
			5. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV 2021.
			6. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings - DWV 2017.
		2. American Society of Plumbing Engineers (ASPE):
			1. ASPE/ANSI 45 - 2018: Siphonic Roof Drainage (First Established 2006)
		3. ASTM International (ASTM):
			1. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2018).
			2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.
			3. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016.
			4. ASTM A395 - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures 2018.
			5. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings 2021.
			6. ASTM A888 - Standard Specification For Hubless Cast Iron Soil Pipe And Fittings For Sanitary And Storm Drain, Waste, And Vent Piping Applications 2021a.
			7. ASTM B75 - Standard Specification for Seamless Copper Tube 2020.
			8. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2020a.
			9. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems 2020.
			10. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings 2020.
			11. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets 2020.
			12. ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80 2020.
		4. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS):
			1. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment 2019.
	1. SUBMITTALS
		1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
		2. A full set of Construction-Issue drawings shall be prepared, sealed, and signed by a professional engineer, licensed in the state of where the project is located.
		3. Construction-Issue Drawings: To include but not necessarily limited to the following.
			1. Roof Layout Drawings: Show positions of siphonic roof drains with each drain noting GPM and drain part number.
				1. Issued to contractor prior to start date to allow correct positioning and installation of the roof drains.
			2. Floor Plans: Indicate routes of siphonic pipework within the building with sufficient detail to instruct the installer on the size, orientation of pipe, fittings, and drains.
			3. Isometric Schematic Diagram: Show lengths, heights, and diameters as Master Set (Not drawn to scale for clarity) for each individual siphonic storm system.
			4. Lengths Shown on Installation Drawings: To be from center-of-fitting to center-of-fitting; the exception being the roof level to center-of-fitting on the initial vertical tailpipe.
			5. Calculation Reports: Proving hydraulic results are within ASPE 45 limitations
			6. Bills of Materials List: For each individual system.
			7. System Designer's name and contact details for notifying any Requests for Change
			8. Sectional Views and Details: To show but not necessarily be limited to the following:
				1. Detail drawing of roof drain installation and flashing.
				2. Typical configuration of tailpipes and main collector pipes.
				3. Indicate height of pipework
				4. Pipework Support: Bracketry to support pipework from the building structure and how the Designer envisages the method of pipework support.
				5. Method of Gravity Break: At termination of siphonic system.
			9. Shop Drawings Set: Prepared by installing contractor placing the required bracing on the final model given the parameters laid out in the stamped drawings.
		4. Product Data: Pipe materials, pipe fittings, valves, and accessories.
			1. Manufacturer's data sheets on each product to be used.
			2. Pipework Material Data: For PVC, cast iron, galvanized steel, or copper pipe.
			3. Preparation instructions and recommendations.
			4. Storage and handling requirements and recommendations.
			5. Typical installation methods.
		5. Project Record Documents:
			1. As Installed Drawing Set: Installer will keep a set of working drawings on site marked-up to show "as installed" routes, sizes, access locations, invert levels etc.
				1. Deviations from stamped drawings over 8 inches will require a recalculation of the system to confirm hydraulics are within balance.

Installer must notify the design professional responsible for the design to do the re-calculation.

To be done before install change can move forward.

* + - 1. As-Built Drawing Set: Installer will issue a Final Installation Record Drawing Set to the owner via the Engineer.
				1. As-Built Drawing Set: Incorporates the alterations of the As Installed Drawing Set onto their working drawings.
				2. Installation is not complete until the As-Built drawing set and where necessary revised calculations have been issued and accepted.
		1. Operating and Maintenance Manuals:
			1. Installer will issue two bound copies of Operating and Maintenance manuals for the rainwater disposal system to include the following as minimum;
				1. Indicating names and address of client, project manager, architect, consulting engineers, contractors, and installer.
				2. Description of systems installed.
				3. Planned maintenance requirements.
				4. Details of guarantee.
				5. Final Install Isometrics produced using 2D Layout.
				6. Final Calculation reports.
	1. QUALITY ASSURANCE
		1. Drains must be tested to ASME A112.6.9 Standard and certified by IAPMO.
		2. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.
		3. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.
		4. Installer Qualifications: Company specializing in performing storm drainage installation with minimum two years documented experience with projects of similar scope and complexity.
			1. Contractor Pre-Install Call with MIFAB HydroMax:
				1. Must be done before PO will ship.
		5. Perform work in accordance with applicable Codes/Standards.
		6. Perform work in accordance with City plumbing ordinances.
	2. PRE-INSTALLATION CONFERENCE
		1. Convene a conference a minimum of two weeks before scheduled commencement of the Project.
			1. Contractor Pre-Install Call with MIFAB HydroMax:
				1. Must be done before Purchase Order items will ship.

Contact: Brennan Doherty, National Specifications Manager; Email:bdoherty@MIFAB.com; Phone: 312-241-5224.

* + - * 1. Engineer attendance is optional.
				2. Call covers proper installation procedures and how to coordinate deviations.
	1. DELIVERY, STORAGE, AND HANDLING
		1. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
		2. Protect from damage due to weather, excessive temperature, and construction operations.
		3. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
		4. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
		5. Inspect drains for debris during final walkthrough
	2. FIELD CONDITIONS
		1. Do not install underground piping when bedding is wet or frozen.
		2. Throughout the installation of the siphonic rainwater system the installer will be responsible for preventing the entry of debris into the roof drain outlets and pipework.
		3. Roof areas will be kept free from debris and outlet inducers will be fitted as soon as the system is ready for use.
1. PRODUCTS
	1. MANUFACTURERS
		1. Acceptable Manufacturer: MIFAB, Inc., which is located at: 1321 W. 119th St.; Chicago, IL 60643; Toll Free Tel: 800-465-2736; Tel: 773.341.3030; Fax: 773-341-3047 ; Email:[request info (sales@mifab.com )](https://admin.arcat.com/users.pl?action=UserEmail&company=MIFAB,+Inc.&coid=38108&rep=&fax=773-341-3047); Web:<http://www.mifab.com>
			1. Basis of Design: System design shown in contract documents is based on MIFAB Hydromax siphonic roof drains and calculated with MIFAB HydroTechnic analytical design software program.

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
		2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.
			1. Alternate Systems Designed and Manufactured by Other Manufacturers will be Considered by Owner If:
				1. Contractor certifies the substitute system will achieve the same or better performance as specified and submit specified calculations, drawings, details, and material including construction.
				2. Contractor is also responsible for stamped final documents, signed and certified by a professional engineer licensed in the Project location.
	1. PERFORMANCE REQUIREMENTS AND DESIGN PARAMETERS
		1. Siphonic Rainwater Drainage System: To be designed, supplied, installed, and tested in full compliance with ASPE Plumbing Engineering and Design Standard 45.
			1. Siphonic Drains located at roof level will collect rainwater and discharge it to a below grade drainage system via a siphonic drainage system.
		2. Siphonic System Design Basis: Full-bore, flow conditions.
			1. Pipe Dimensions: Evaluated using the extended Bernoulli equation, the Darcy-Weisbach formula and Colebrooke-White formula.
				1. The Hazen-Williams formula be not to be used to design and dimension siphonic drainage systems.
			2. Calculations: Must use computer data to incorporate losses through fittings within the system design calculation.
			3. An independently tested and third party certified, analytical design software is to be used to calculate the system dimensioning.
		3. Design Calculation: Execute using an independently tested and proven analytical design software program designing in accordance with ASPE/ANSI Plumbing Engineering Design Standard 45.
		4. Calculations provided by the Designer, must contain the following information and within specified limits:
			1. Pipe Sizes: 1-1/2 to 24 inch. diameters.
			2. Pipe Material: PVC, Cast Iron, Galvanized Steel, or Copper.
			3. Negative Pressure: Not to exceed -26.247 water column.
			4. Minimum Velocity in Horizontal Piping: Not less than 3.0 ft per sec.
			5. Minimum Velocity in Vertical Piping: Not less than 7.5 ft per sec.
			6. Maximum Velocity: Not more than 26.7 ft per sec.
			7. Minimum Working Capacity Per Drain: 23 gal per minute.
			8. Out of Balance Pressure: Not to exceed 1.5 ft water column or 10 percent of the Disposable Head, whichever is less.
			9. System Fill Time: Not to exceed 120 seconds; calculated within independently accredited design software for complying with calculation method prescribed ASPE/ANSI Plumbing Engineering and Design Standard 45.
		5. Failure to install pipework as designed may adversely affect the siphonic action.
			1. Permitted tolerances:
				1. Piping 4 inches and Smaller:

Installed within plus or minus 4.039 inches of the designed length.

* + - * 1. Piping Larger than 4 inches:

Installed within plus or minus 8.787 inches of the designed length.

* + 1. Deviations from Stamped Drawings over 8 inches:
			1. Require recalculation of system to confirm hydraulics are within balance.
			2. Installer must notify the Design Professional responsible for the design to make the re-calculation.
			3. This must be done before any install change can move forward.
	1. RAINFALL RATE

\*\* NOTE TO SPECIFIER \*\* Install primary rainfall rate.

* + 1. Primary Siphonic Rainwater Disposal System: MIFAB HydroMax siphonic roof drains designed to \_\_\_\_ inches per hour rainfall intensity which should be equal or greater than code design rainfall rate.

\*\* NOTE TO SPECIFIER \*\* Install overflow rainfall rate.

* + 1. Overflow Secondary Siphonic Rainwater Disposal System: MIFAB HydroMax siphonic overflow roof drains designed to \_\_\_\_ inches per hour rainfall intensity which should be equal or greater than code design rainfall rate.
		2. Rainfall Rate for the Siphonic Rainwater System: Determined by the Engineer of Record and be equal to or greater than code requirement.
		3. Designer must ensure the maximum water depth on the roof is analyzed and that it is within acceptable tolerances for loadings on the roof and overflow.
	1. SIPHONIC PRIMARY ROOF DRAIN (RD-1)
		1. Certification: ASME A112.6.9 and certified by IAPMO file number 6009.
		2. Body: Lacquered cast iron with wide anchor flange and cast-iron waterproofing membrane clamping ring.
		3. Air Baffle: Ductile iron air baffle/inducer with Type 304 stainless steel allen key hardware.
		4. Resistance Factor (k-factor):
			1. 3 inch outlet = 0.05.
			2. 4 inch outlet = 0.07.
			3. 5 inch outlet = 0.06.
			4. 6 inch outlet = 0.11.
		5. Accessories: Coordinate with roofing type.
			1. Under deck clamp.
			2. Roof sump receiver (bearing pan).
			3. Debris guard.
		6. Manufacturers: MIFAB, Inc; Hydromax: MH-300,400,500,600-B-U.
	2. SIPHONIC OVERFLOW ROOF DRAIN (OD-1)
		1. Certification: ASME A112.6.9 and certified by IAPMO file number 6009.
		2. Body: Lacquered cast iron with wide anchor flange, cast iron waterproofing membrane clamping ring with 2 inch water dam.
		3. Air Baffle: Ductile iron air baffle/inducer with Type 304 stainless steel allen key hardware.
		4. Resistance Factor (k-factor):
			1. 3 inch outlet = 0.095.
			2. 4 inch outlet = 0.12.
			3. 5 inch outlet = 0.11.
			4. 6 inch outlet = 0.14.

\*\* NOTE TO SPECIFIER \*\* Coordinate Accessories with roofing types.

* + 1. Accessories:
			1. Under deck clamp.
			2. Roof sump receiver; bearing pan.
			3. Debris guard.
		2. Manufacturer: MIFAB, Inc; Hydromax: Series MH-301, 401, 501, 601-B-U.
	1. STORM DRAINAGE PIPING, BELOW GRADE

\*\* NOTE TO SPECIFIER \*\* Delete piping options not required. Foam core PVC is not to be used under any circumstances.

* + 1. Piping: PVC. Per ASTM D2665; Schedule 40.
			1. Fittings: PVC, ASTM D2665.
			2. Joints: Solvent welded, with ASTM D2855 solvent cement.
		2. Piping: Cast Iron per ASTM A888, SW.
			1. Fittings: Cast Iron, ASTM A888, SW.
			2. Joints: Standard Duty No-Hub Couplings, with CISPI 310.
		3. Piping: Galvanized Steel per ASTM A53, Schedule 5 or 10.
			1. Fittings: Galvanized Steel, ASTM A153.
			2. Joints per ASTM A395.
		4. Piping: Copper per ASTM B75, Type M, L, or K.
			1. Fittings: Copper, ASME B16.29.
			2. Joints per ASTM A395.
	1. STORM DRAINAGE PIPING, ABOVE GRADE

\*\* NOTE TO SPECIFIER \*\* Delete piping options not required. Foam core PVC is not to be used under any circumstances.

* + 1. Piping: PVC Pipe per ASTM D2665, Schedule 40.
			1. Fittings: PVC, ASTM D2665.
			2. Joints: Solvent welded, with ASTM D2855 solvent cement.
		2. Piping: Cast Iron per ASTM A888, SW.
			1. Fittings: Cast Iron, ASTM A888, SW.
			2. Joints: Standard Duty No-Hub Couplings, with CISPI 310.
		3. Piping: Galvanized Steel per ASTM A53, Schedule 5 or 10.
			1. Fittings: Galvanized Steel, ASTM A153.
			2. Joints per ASTM A395.
		4. Piping: Copper per ASTM B75, Type M, L, or K.
			1. Fittings: Copper, ASME B16.29.
			2. Joints per ASTM A395.
	1. PIPE CLEANOUTS, FITTINGS, AND COUPLINGS

\*\* NOTE TO SPECIFIER \*\* Cleanout and access points will normally create an air-pocket which will interfere with the siphonic action.

* + 1. Cleanout and Access Points: Should not be incorporated into a siphonic piping system.
			1. Permitted Use of Cleanout and Access Points: Where the fitting protects the integrity of the interior of the pipe without creating an air-pocket, such as spool type cleanouts.
			2. Install spool type cleanout in verticals before going underground.
		2. Eccentric Reducers and Increasers: Are the preferred style. Concentric reducers are permissible without recalculation if the eccentric reducers are not available.
			1. Eccentric should orient the flat side with the pipe crowns.
			2. Eccentric Reducers Placed in the Vertical: To have the flat side oriented with the outside radius of the elbow.
			3. Concentric reducers keep the centerline.
		3. Standard-Duty No-Hub Cast Iron Couplings are acceptable.
		4. Only allowed to restrict pipe in the vertical in the direction of flow.
		5. Piping System: Comprise of swept fittings with 1/4 (90 degree) bend or 1/8 (45 degree) bends and 1/8 (45 degree) wye branches.
			1. 90 degree branches; straight or sanitary tees, are not permitted at any time.
			2. Where a right-angle branch is required it should be made using a 45 degree wye branch connecting to a 45 degree bend or a combination wye and 1/8th bend.
			3. Tight or sharp bends are strictly forbidden in the siphonic system.
	1. PIPE HANGERS AND SUPPORTS
		1. Hangers and Supports: Comply with local PVC or CISPI hanging requirements.
			1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
			2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
			3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
			4. Support cast iron drainage piping at every joint.
			5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
			6. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
			7. Trapeze Hangers: Welded steel channel frames attached to structure.
		2. Lateral Restraints: Installed every 30 ft at each branch take-off, unless the hanger rod is less than 18 inches.
			1. Product: Gripple S/S Aircraft Hanger Cable with a clevis hanger for support.
		3. Appropriate thrust restraints and anchors restraints 1 to 2 ft away from every change of direction (45's, 90's, and WYE's).
			1. Product: Holdrite 117 bracket with a clevis hanger for support.
		4. Brace or bracket the pipework to the wall or column every 10 ft in the vertical.
			1. Support vertical piping at every other floor.
			2. Support riser piping independently of connected horizontal piping.
			3. Vertical Pipe Support: Steel riser clamp.
		5. Prime coat exposed steel hangers and supports.
			1. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
	2. SIPHONIC TERMINATION - GRAVITY BREAK
		1. A Siphon break at point of discharge to reintroduce atmosphere using:
			1. A WYE branch venting air to a MIFAB MH-F1460 area drain for up to 6 inch Siphonic discharge.
			2. A WYE branch venting air to a MIFAB MH-F1560 area drain for up to 12 inch Siphonic discharge.
			3. A manhole coordinated with civils using a slotted cover for larger than 12 inch Siphonic discharge
		2. A Siphon break in the vertical if horizontal break not possible
			1. Vent to atmosphere is equal diameter to pipe size of Siphonic Discharge
			2. Multiple systems can be discharged to the same collection point; free area of pipe used to calculate needed vent size.
		3. After atmosphere is reintroduced, pipe is sized back to gravity flow flowing local flow charts.
1. EXECUTION
	1. EXAMINATION
		1. Do not begin installation until substrates have been properly constructed and prepared.
		2. If substrate preparation is the responsibility of another installer, notify Designer in writing of unsatisfactory preparation before proceeding.
		3. Verify excavations are to required grade, dry, and not over-excavated.
		4. Confirm there is a reduction in pipe size in direction of flow on the main vertical stack.
		5. Identify bracing installed at every change of direction.
		6. Prior to Installation of Siphonic Pipework:
			1. Installer will verify:
				1. The working access equipment is suitable and safe for site conditions.
				2. Piping system is comprised of swept fittings with 1/4 (90 degree) bend or 1/8 (45 degree) bends and 1/8 (45 degree) wye branches.
				3. If a right-angle branch is required, it is to be made using a 45 degree wye branch connecting to a 45 degree bend or a combination wye and 1/8 bend.
				4. Cleanout and Access Points are not incorporated into the siphonic piping systems.
				5. Atmospheric break is diagramed.
			2. If necessary, contact the relevant personnel to rectify any of the above points.
	2. PREPARATION.
		1. Clean surfaces thoroughly prior to installation.
		2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
			1. Ream pipe and tube ends. Remove burrs.
			2. Remove scale and dirt, on inside and outside, before assembly.
	3. INSTALLATION
		1. Install the siphonic rainwater system in strict accordance with the design and specification.
		2. Pipe and Fittings: Installed in accordance with ASPE/ANSI Plumbing Engineering, Design Standard 45 Section 8 and 11, standards under which the materials are approved, and in accordance with manufacturers written instructions.
		3. Pipe and Fitting Joints: Including joint to the outlet to be in accordance with manufacturers written guidelines.
		4. Bends: Unless otherwise specified to be DWV 1/4 (90 degree) or 1/8 (45 degree) fittings per ASPE/ANSI Plumbing Engineering and Design Standard 45.
			1. Tight or sharp bends are not to be used in the siphonic system.
		5. All branches to be single 45 degree Wye branches.
			1. Do not use combination branches, 90 degree branches, or double branches.
		6. Piping to be securely braced to building structure in a manner preventing pipe sway and is braced against thrust forces generated by flowing water.
			1. Shop Drawings: Prepared by installing contractor placing the required bracing on the final model given the details laid out in the stamped drawings.
		7. Pipe Lengths not full 10 ft Lengths: Should have visible chalk or indelible markings visible from the ground identifying length.

\*\* NOTE TO SPECIFIER \*\* The pipe labeling paragraph is not an ASPE 45 requirement but is good practice and therefore optional. The paragraph may be removed.

* + 1. Labeling Requirement: Pipework must have markings stating, "Engineered Siphonic Rainwater Piping. DO NOT ALTER PIPE WORK WITHOUT ENGINEER OF RECORD CONSENT."
		2. Failure to install pipework as designed and supplied may adversely affect siphonic action. Deviations from stamped drawings over 8 inches require a system recalculation to confirm hydraulics are within balance. Installer must notify design professional responsible for design to make the necessary re-calculation. Must be done before the install change can move forward.
			1. A Request for Alteration should be made. Installer must provide as much information as possible including a dimensioned sketch where applicable and return to the Design Professional.
				1. This information will be used with the Hydraulic Calculation software program.
				2. The Design Professional will advise the Installer within one business day of results.
		3. Installation of Horizontal Pipework:
			1. Installed level without any pitch gradient to ensure an efficient priming process to creates the siphonic action.
			2. Installed with top of pipe (crown) level. No Pitch. Any changes in diameter are created with the transition slope at the invert. The drawings will notate the Center of Fitting dimensions
			3. The horizontal collector pipework will be suspended from the structure of the building by means of pre-determined fixing methods.
			4. Installs with no slope in the ceiling, as well as in the groundwork.
			5. Generally, support fixings will be installed consistent with accepted industrial practice at no more than the pipe manufacturer's written instruction or with the governing plumbing codes for piping full of water.
			6. Additional brackets to be installed at both sides of every 45 or 90 change of direction within 1 to 2 feet.
			7. Additional brackets to be installed at all three sides of every Wye branch within 1 to 2 feet.
			8. Pipework should be bracketed to building structure to form lateral restraint at convenient locations at no more than 30 ft intervals reducing possibility of movement and vibration during operating conditions.
			9. As installation of horizontal collector pipe progresses, ensure specified heights to center of fitting level are achieved throughout the run and branches in collector pipe coincide with roof drain locations.
		4. Connecting to Roof Drains
			1. Ensure the roof drain has correct connection for compatibility with piping materials.
			2. Installer must refer to design calculation sheets to identify correct lengths of pipes, locations of reducers, etc for each tailpipe connecting to the horizontal collector pipe.
			3. Increase in diameter on the vertical section of the tailpipe below the roof drain is not permitted. It is common to have a reducer used for the roof drain connection.
			4. Ensure pipework is firmly fixed at both vertical and horizontal tail pipes below roof drains.
		5. Vertical Pipework: Downpipes.
			1. Supported from structure of building by means of pre-determined fixing methods.
			2. When fixing to cladding rails, attach a length of secondary support steel or channel rail to the structural elements of cladding.
				1. Pipe supports can be positioned to suit locations as required.
				2. Spacing of brackets should be in accordance with local administrative authority having jurisdiction.
			3. If circumstances arise where cleanouts are used, the cleanout fittings must not create an air pocket, A spool type cleanout may be used for this purpose.
			4. Eccentric reducers placed on the vertical just after an elbow turning down shall have the flat side oriented with the outside radius of the elbow. Concentric reducers are permissible without recalculation if the eccentric reducers are not available.
		6. Connection to Below Grade Drainage:
			1. Siphonic Pipework is to connect to the underground pipework by means of a connection as detailed by the Engineer of Record and compliant with ASPE/ANSI Plumbing Engineering and Design Standard 45.
				1. The siphon break connection is to include a method of admitting air and downstream be sized for gravity flow for the noted GPM discharge.
			2. Refer to assembly detail drawing for typical layout detail.
		7. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
		8. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
		9. Sleeve pipes passing through partitions, walls, and floors.
		10. Sleeve and watertight mechanical seal on underground floor and wall penetrations.
	1. FIELD TESTS AND INSPECTIONS
		1. Verify, inspect, and test systems according to requirements by the authorities having jurisdiction. In the absence of specific test and inspection procedures proceed as indicated in the "Field Tests and Inspections" article in this specifications.
		2. Test Results: Document and certify successful results. If inspection and test results are not successful, repair, document, and retest until successful results are achieved.
		3. Inspection and Testing Procedures:
			1. Testing and inspection of installed piping is to verify workmanship and product quality.
			2. Siphonic pipework must be tested prior to the installation of insulation, where required, and prior to the final handover to the Owner.
				1. Testing must be carried out as described in the relevant specification.

\*\* NOTE TO SPECIFIER \*\* It is impractical to perform operational and flow tests of siphonic systems.

* + - 1. Operational tests and flow tests are not required.
			2. Testing to Obtain Full Warranty of theMIFAB HydroMax Siphonic Roof Drainage System by MIFAB Inc.is as Follows:
				1. Piping Material Tests: Equivalent to ASTM and or manufacture's testing requirements for applicable piping material.

Cast Iron Soil Pipe and Schedule 40 PVC: Acceptability of piping material.

Must achieve and sustain 10 ft of water column at 4.3 psi for 2 hours without failure.

* + - * 1. Piping Systems Tests: In accordance with procedures defined in the MIFAB HydroMax Installation Manual.

Successful testing ensures the system will function properly and be fully warranted by MIFAB Inc.

\*\* NOTE TO SPECIFIER \*\* Air tests create negative safety issues and should not be employed.

* + - * 1. Air Tests are not acceptable by MIFAB Inc.
				2. Upon Test Completion: Sealing plugs and temporary joint restraints must be removed from roof drains and pipework at the earliest opportunity to prevent damage caused by flooding or water ingress.
			1. Before Insulation Installation: The Engineer of Record must be notified, and a site visit made to inspect the installation for accordance with this specification.
				1. In the event the inspection by the Engineer of Record is deemed unsatisfactory correct the unsatisfactory conditions and have the Engineer of Record reinspect.

Repeat until the Engineer of Record is satisfied with the inspection.

* 1. SERVICE CONNECTIONS
		1. Provide new storm sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts, and ensure these can be properly connected with slope for drainage and cover to avoid freezing.
	2. CLEANING AND PROTECTION
		1. Clean products in accordance with the manufacturers recommendations.
		2. Touch-up, repair or replace damaged products before Substantial Completion.
	3. SCHEDULES
		1. Pipe Hanger Spacing:
			1. Metal Piping:
				1. Pipe Size: 1-1/2 inch to 2 inch:

Maximum Hanger Spacing: 10 ft.

Hanger Rod Diameter: 3/8 inch.

* + - * 1. Pipe Size: 2-1/2 inch to 3 inch:

Maximum Hanger Spacing: 10 ft.

Hanger Rod Diameter: 1/2 inch.

* + - * 1. Pipe Size: 4 inch:

Maximum Hanger Spacing: 10 ft.

Hanger Rod Diameter: 5/8 inch.

* + - * 1. Pipe Size: 6 inch to 8 inch:

Maximum Hanger Spacing: 10 ft.

Hanger Rod Diameter: 3/4 inch.

* + - * 1. Pipe Size: 10 inch to 12 inch:

Maximum Hanger Spacing: 10 ft.

Hanger Rod Diameter: 7/8 inch.

* + - * 1. Pipe Size: 14 inch to 18 inch:

Maximum Hanger Spacing: 10 ft.

Hanger Rod Diameter: 1 inch.

* + - * 1. Pipe Size: 20 inch to 24 inch:

Maximum Hanger Spacing: 10 ft.

Hanger Rod Diameter: 1-1/4 inch.

* + - 1. Plastic Piping:
				1. Pipe Size: 1-1/2 inch to 2 inch:

Maximum Hanger Spacing: 4 ft.

Hanger Rod Diameter: 3/8 inch.

* + - * 1. Pipe Size: 2-1/2 inch to 4 inch:

Maximum Hanger Spacing: 4 ft.

Hanger Rod Diameter: 1/2 inch.

* + - * 1. Pipe Size: 6 inch:

Maximum Hanger Spacing: 4 ft.

Hanger Rod Diameter: 5/8 inch.

* + - * 1. Pipe Size: 8 inch to 12 inch:

Maximum Hanger Spacing: 4 ft.

Hanger Rod Diameter: 3/4 inch.

* + - * 1. Pipe Size: 14 inch to 18 inch:

Maximum Hanger Spacing: 4 ft.

Hanger Rod Diameter: 1 inch.

* + - * 1. Pipe Size: 20 inch to 24 inch:

Maximum Hanger Spacing: 4 ft.

Hanger Rod Diameter: 1-1/2 inch

END OF SECTION