

Engineered siphonic roof drainage system

This checklist provides guidance to ensure the plan submission of engineered siphonic roof drainage systems is complete for review to the Minnesota Plumbing Code, Chapter 4714. The design engineer is responsible for the design of the engineered siphonic roof drainage system and for compliance with Minnesota Rules, Chapter 4714, Section 1110. Siphonic roof drainage system plan review will take significantly longer than conventional roof drainage system review and design-built projects should not consider engineered siphonic roof drainage systems due to the unique design and significant details critical in installation. To minimize delays on your project during the plan review and construction, the following information and documentation should be reviewed carefully and be addressed in advance of submitting plans. All required documentation listed below must be submitted to our office. Please be advised that the checklist is subject to change and additional requirements may apply.

General/administrative

1. Siphonic roof drainage system is not allowed at a Minnesota Department of Health (MDH) Licensed Healthcare Facility, unless specific approval is granted from our office, the administrative authority and the MDH licensing authority.
2. Signed documentation from proper administrative authority must state that a siphonic roof drainage system is acceptable for the proposed project. The official must confirm that final engineer certification will be filed with the city and a copy forwarded to our office prior to issuing a certificate of occupancy.
3. Submit a complete set of engineered plans and specifications signed by the Minnesota-licensed professional engineer that is responsible for the design.
4. Provide documentation from the design engineer that includes the following information:
 - The design engineer is practicing within their areas of expertise.
 - The siphonic roof drainage system is designed in accordance with American Society of Plumbing Engineers Standard 45 (ASPE 45) and in accordance with all manufacturer recommendations/requirements.
 - Calculations of the siphonic roof drainage must be signed and sealed, and must include performance data, including minimum/maximum operating pressures and velocity.
 - The design engineer shall confirm that the siphonic to gravity transition location has been designed according to the siphonic roof drainage sizing and venting requirements (see ASPE 45, section 9.9) and coordination has been made with the civil site engineer to make provisions for proper transition location.
 - Pipe freezing provisions and possible surcharge to the building storm drainage system must be addressed.
 - The design engineer understands: Upon completion of installation of the system and prior to final plumbing inspection, the engineer shall provide written certification to our office and the

- administrative authority, that the installed siphonic roof drainage system has been inspected by the design engineer and that the system as installed is in accordance with their certified design, plans, specifications and calculations according to ASPE 45.
5. Manufacturer design software must be in accordance with ASPE 45. Required documentation from the manufacturer must be submitted stating that the software complies with ASPE 45.
 6. To ensure proper operation and maintenance of the system, the design engineer should provide the owner final design drawings, specifications, and recommended and required maintenance and operation procedures at the completion of the final walk-through.
 7. Siphonic roof drainage system designs may be subject to third party certification by an independent Minnesota-licensed professional engineer when requested by the administrative authority, paid by the applicant.

Design criteria

1. The siphonic roof drainage system must be sized at a minimum rainfall rate of 4-inches per hour.
2. Secondary (overflow) roof drainage system:
 - Siphonic roof drainage system shall not be utilized for overflow roof drainage system design. Overflow roof drainage system must be conventional designs in accordance with Chapter 1305 and Chapter 4714, for gravity flow.
 - Overflow (secondary) roof drainage system must not be connected to a primary siphonic roof drainage system.
3. Design to ASPE 45 and followed all manufacturer's recommendations and requirements.
4. Roof drains must meet Standard ASME A112.6.9, Siphonic Roof Drains, and have strainers provided in accordance with Chapter 4714, Sections 1105.2 and 1105.3.
5. For water accumulation for control flow, the roof must be designed for the maximum possible water accumulation according to Chapter 1305 and Chapter 4714, Section 1108.1(7).
6. Pipe materials must be in accordance with ASPE 45. The following documentation is required:
 - Manufacturer approval of the proposed material for the siphonic drainage system (see ASPE 45, section 2.1.3).
 - Manufacturer warranty of the proposed material at testing conditions specified in ASPE 45, section 12.6 (1.5 times maximum pressure but not less than a pressure of 13 psig or a 30 foot water column).
 - Because of the unique pipe configuration for balancing the system for proper functioning, additional manufacturer information is required when plastic piping is considered for the project. The engineer must review the expansion and contraction of the plastic material to the extreme design performance of the siphonic system and obtain manufacturer documentation stating that the selected plastic material will not impact the design and operation of the system.
7. Transition to gravity flow must be at an approved location by the administrative authority and meets the following conditions:
 - Proper transition manhole should be located outside of building.
 - Transition manhole is vented in accordance with ASPE 45, section 9.9.2. A catch basin grate cover in accordance with section 9.9.2 may be used.

- Where necessary, freezing provisions for exterior piping and connections must be made (see Chapter 4714, Section 312.6).
8. The velocity at the transition location has been reduced to less than 3 feet per second to break from siphonic action or as approved by the administrative authority. Inlet piping to manhole must be flare out at a minimum run of 10 or more pipe diameters prior to the manhole. See ASPE 45, section 9.9.3.
 - Inlet pipe into the manhole must enter at higher elevation than outlet pipe.
 - The gravity portions of the building storm sewer (manhole outlet pipe) must meet the gravity flow sizing (Chapter 4714, Section 1106). All gravity flow must be sloped at minimum 1% slope.
 9. Minimum pipe size must be 1-1/2 inches.
 10. Horizontal pipe size must not reduce in the direction of flow.
 11. Pipe sizes and cleanouts in the drainage system must be designed and installed according to ASPE 45.
 12. The plans and specifications for the drainage system must indicate the siphonic roof drainage system as an engineered method used for the design.
 13. System marking requirements:
 - The specifications must include requirements for the siphonic roof drainage piping to be permanently and continuously marked at approved intervals, should not be more than 25 feet, and clearly at points where piping passes through walls and floors.
 - Roof drains must be marked in accordance with ASME A112.6.9.
 14. Provisions must be made to prevent movement in the piping and fittings. Above ground horizontal pipe and fittings must be supported or braced accordingly (at all changes in direction) per ASPE 45.
 15. The design has incorporated cleanout provision in accordance with ASPE 45 for proper maintenance.

Testing requirements

Chapter 4714, Section 1110.3.1 requires testing be performed in accordance with ASPE 45, section 12.6. The following shall be considered:

- All pipe sections tested at 1.5 times maximum pressure but not less than a pressure of 13 psig or a 30 foot water column and maintained for one hour. For safety considerations, hydrostatic testing is recommended.
- The engineer shall verify and make provision in the project specification to have the plumbing contractor confirm the capability to meet the testing requirements specified in ASPE 45. The plumbing contractor must provide documentation confirming they are aware and able to perform the required test safely.