	Design Considerations-Vacuum Sewer Systems
	If any of the following standards or criteria do not apply to a project or if the project has not been designed to comply with the following standards or criteria, please provide an explanation. An application for an individual permit is required for construction of a vacuum sewer system. [62-604.600(7)(a), Florida Administrative Code (F.A.C.)]
	General
___	1. The project is designed based on an average daily flow of 100 gallons per capita plus wastewater flow from industrial plants and major institutional and commercial facilities unless water use data or other justification is used to better estimate the flow. [RSWF 11.243]
___	2. The design includes an appropriate peaking factor (minimum ratio of 3 for peak hour/design average flow). [RSWF 11.243]
___	3. Procedures are specified for operation of the existing collection/transmission system during construction. [RSWF 20.15]
___	4. Except for on-lot facilities, the project is designed to be located on public right-of-ways, land owned by the permittee, or easements. [62-604.400(1)(b), F.A.C.]
___	5. A central management entity, be it public or private, is responsible for operation and maintenance of the on-lot facilities. [62-604.400(4), F.A.C.]
___	6. The project is designed to be located no closer than 100 feet from a public drinking water supply well and no closer than 75 feet from a private drinking water supply well; or documentation is provided showing that another alternative will result in an equivalent level of reliability and public health protection. [62-604.400(1)(c), F.A.C.]
___	7. The project is designed with no physical connections between a public or private potable water supply system. [RSWF 38.1 and 48.5]
___	8. The project is designed to preclude the deliberate introduction of storm water, surface water, groundwater, roof runoff, subsurface drainage, swimming pool drainage, air conditioning system condensate water, non-contact cooling water and sources of uncontaminated wastewater. [62-604.400(1)(d), F.A.C.]
___	9. At the completion of each days work, testing on vacuum mains and vacuum service pit connections laid that day is specified requiring; 1) the completed portion of the system be plugged and subjected to a vacuum of 22 inches Hg and then allowed to stabilize for 15 minutes prior to monitoring; and 2) a vacuum loss of less than l % per hour during the minimum testing period of 2 hours. [MOPFD-12 #1 Page 205]
___	10. Final testing on completed vacuum mains and vacuum service pit connections is specified requiring: 1) the completed portion of the system be plugged and subjected to a vacuum of 22 inches Hg and then allowed to stabilize for 15 minutes prior to monitoring; and 2) a vacuum loss of less than l % per hour during the minimum testing period of 4 hours. [MOPFD-12 #2 Page 205]
	Vacuum Collection System
___	11. The entire piping network is designed to keep the bore of the entire pipeline open; sections of pipeline are not purposely sealed. [MOPFD-12 #2 Page 200]

___	12. The vacuum sewer system is designed with a minimum air-to-liquid ratio of two parts air to one part liquid. [MOPFD-12 #5 Page 200]
___	13. The vacuum sewer system is designed with a maximum static loss of 13 feet and a maximum friction loss of 5 feet in any single flow path. [MOPFD-12 #6 and #7 Page 200]
___	14. The project is designed with no vacuum sewer mains less than 4 inches in diameter. [MOPFD-12 #2 Page 201]
	15. Pipe and fittings for vacuum sewer pipe is SDR 21 pressure rated PVC pipe with double-lipped, push-on gasketed joints. [MOPFD-12 #13 Page 202 and Page 129]
___	16. General design configuration for uphill transport is based on a saw tooth pipeline profile; or documentation is provided showing other vertical profiles are justified by appropriate engineering data. [MOPFD-12 #1 Page 201]
___	17. When vacuum sewer mains or branches must ascend a hill, multiple lifts are designed at a minimum distance of 20 feet apart. Between each lift, vacuum lines are installed with a uniform slope, so that minimum fall of 0.25 feet is achieved between these lifts. [MOPFD-12 #10 Pages 201 and 202]
___	18. The project is designed with no single lift of vacuum sewer main exceeding 3 feet in height. [MOPFD-12 #6 Page 201]
___	19. The project is designed with 5 maximum lifts in a series. A series of 5 lifts is designed to be separated by at least 100 feet of vacuum mains from the next lift or series of lifts, at least one energy input is designed in the zone of separation. [62-4.070(3), F.A.C.]
___	20. If not uphill transport, vacuum sewer mains are designed with a minimum slope of 0.20%. For profile changes less than 125 feet apart, the minimum fall between profile changes is 0.25 feet. [MOPFD-12 #3 Page 201]
___	21. If directional drilling, installation tolerances for vacuum sewer main slope are specified the same as those required for open trenching. [62-4.070(3), F.A.C.]
___	22. The maximum design flows (i.e., peak flows) for vacuum sewer main sizing is designed as follows: 4-inch pipe/38 gallons per minute (gallons per minute (gpm)); 6-inch pipe/105 gpm; 8-inch pipe/210 gpm; and 10-inch pipe/375 gpm. For vacuum mains larger than 10-inches, flow data supports the peak design flow capacity of that pipe size. [MOPFD-12 #4 Page 201]
___	23. The project is designed with 2000 feet maximum length for any one run of 4-inch diameter vacuum sewer main. [MOPFD-12 #5 Page 201]
___	24. For changes in horizontal alignment, two 45-degree bends connected by a short section of piping are designed, rather than one 90-degree bend. [MOPFD-12 #8 Page 201]
___	25. The project is designed with isolation valves at every branch connection and at intervals no greater than 1500 feet on vacuum sewer mains. Resilient coated wedge gate valves and a valve box or other approved apparatus, to facilitate proper use of the valve, are specified. [MOPFD-12 #9 Page 201]
___	26. The vacuum sewer system is designed to prevent damage from superimposed loads. [RSWF 33.7]
___	27. The vacuum sewer system is designed to meet the “Stream Crossings” portion (Items 27-33) of the Collection/Transmission System Design Information beginning on page 4 of DEP Form 62-604.300(8)(a), Notification/Application for Constructing a Domestic Wastewater Collection/Transmission System. [62-604.300(8)(a), F.A.C.]
___	28. New or relocated vacuum sewers are located to provide horizontal distance of at least three feet, and preferably ten feet, between the outside of the vacuum sewer and any existing or proposed water main; or documentation is provided showing technical or economic justification for each exemption and providing alternative construction features that offer a similar level of reliability and public health protection. [62-604.400(3) and 62-555.314(1)(b) and (5), F.A.C.]

___	29. New or relocated vacuum sewers crossing any existing or proposed water main are located so the outside of the water main is at least six inches, and preferably 12 inches, above or at least 12 inches below the outside of the vacuum sewer; or documentation is provided showing technical or economic justification for each exemption and providing alternative construction features that offer a similar level of reliability and public health protection. [62-604.400(3) and 62-555.314(2)(a) and (5), F.A.C.]
___	30. At the vacuum sewer and water main crossings described in Item 29 above, one full length of vacuum sewer pipe is centered above or below the water main so that the vacuum sewer joints are as far as possible from the water main, or alternatively, the vacuum sewer and water pipes are arranged so that vacuum sewer joints are at least three feet from all water main joints; or documentation is provided showing technical or economic justification for each exemption and providing alternative construction features that offer a similar level of reliability and public health protection. [62-604.400(3) and 62-555.314(2)(c) and (5), F.A.C.]
___	31. New or relocated vacuum sewers are located to provide horizontal distance of at least three feet, and preferably ten feet, from the drains of any existing or proposed fire hydrants with underground drains. [62-604.400(3) and 62-555.314(4), F.A.C.]
___	32. New or relocated vacuum sewers are located to provide the same horizontal, vertical and joint distance for any existing or proposed reclaimed water main as specified in Items 28, 29 and 30 above for a water main; or documentation is provided showing technical or economic justification for each exemption and providing alternative construction features that offer a similar level of reliability and public health protection. [62-4.070(3), F.A.C.]
	Vacuum Valves
___	33. Vacuum valves with the ability to pass a 3-inch spherical solid are specified. [MOPFD-12 #1 Page 204]
___	34. Valves that are vacuum-operated on opening and spring-assisted on closing are specified. [MOPFD-12 #2 Page 204]
___	35. Valve configuration is designed so that the collection system vacuum ensures positive valve seating. Valve plunger and shaft is designed to be completely out of the flow path when valve is in the open position. [MOPFD-12 #3 Page 204]
___	36. The valve is designed to be equipped with a sensor-controller that relies on atmospheric air and vacuum pressure from the downstream side of the valve for its operation, thereby requiring no other power source. The controller is designed to be capable of maintaining the valve fully open for a fixed period of time and be field-adjustable over a range of 3 to 10 seconds. [MOPFD-12 #4 Page 204]
___	37. With the exception of the gravity lateral line air-intake, no other external sources of air are designed as a part of the valve assembly. [MOPFD-12 #5 Page 204]
___	38. An internal sump breather unit arrangement is designed to connect the valve controller to its air source and provide a means of ensuring that no liquid can enter the controller during system shutdowns and restarts. It shall also be designed to prevent sump pressure from forcing the valve open during low-vacuum conditions and provide positive sump venting, regardless of traps in the home gravity service line. [MOPFD-12 #6 Page 204]
	Valve Pits
___	39. Peak flow to any vacuum valve pit is designed to a maximum of 3 gallons per minute. [MOPFD-12 #3 Page 202]
___	40. When specific valve service lines having suction lifts in excess of 5.5 feet are designed, the static losses added to the losses for that main do not exceed 13 feet. [MOPFD-12 #6 Page 200]

___	41. Suction lifts from the bottom of the holding sump to the valve centerline do not exceed 8 feet. [MOPFD-12 #6 Page 200]
___	42. A single valve pit is designed to serve a maximum of four separate building sewers, but no more than 3 gallons per minute. [MOPFD-12 #1 Page 202]
	43. On a system-wide design basis, the overall separate building sewer to valve pit ratio does not exceed 2.5: l. [MOPFD-12 #1 Page 202]
___	44. No single property or parcel is designed to be served by more than one valve pit, unless justification is provided to support multiple valve pits. [MOPFD-12 #2 Page 202]
___	45. Valve pits installed within a road right-of-way or other area subject to vehicular traffic shall be designed and installed to withstand appropriate traffic loads. [MOPFD-12 #4 Page 202]
___	46. Valve pits are designed to have a receiving sump with a minimum of 50 gallons of storage. [MOPFD-12 #5 Page 202]
___	47. Valve pits are designed to prevent entrance of water in the sump and for the vacuum valve to remain fully operational if submerged. [MOPFD-12 #6 Page 203]
___	48. Valve pit locations are designed to be easily accessible, so that valves may be easily removed and replaced. [MOPFD-12 #7 Page 203]
___	49. Valve pits are designed to include a 3” flexible PVC connector connected directly to the valve pit between the valve pit and vacuum sewer main. [MOPFD-12 Page 162]
___	50. Valve pits are designed to include gravity service connection stub-outs piping to which the sewer customer will ultimately connect. Customer connections are designed via gravity flow to the vacuum pit location. [MOPFD-12 #9 Page 203 and #1 Page 209]
	Buffer Tanks
___	51. Buffer tanks are designed instead of single valve pits if there are nonresidential/commercial or high flow inputs greater than 3-gpm peak flow or if there is no other practical method of serving the property by additional vacuum mains and valve pits. [MOPFD-12 #1 Page 203]
___	52. Buffer tanks are designed to have an operating sump of no less than 10 gallons at a wastewater depth of 10 to 14 inches. [MOPFD-12 #3 Page 203]
___	53. No more than 25% of the total peak design flow on a system-wide basis is designed to enter through buffer tanks, unless justification is provided depending on static and friction loss and buffer tank location. [MOPFD-12 #4 Page 203]
___	54. No more than 50% of the total peak design flow is designed to enter a single vacuum main through buffer tanks, unless justification is provided depending on static and friction loss and buffer tank location. [MOPFD-12 #5 Page 203]
___	55. One 3-inch vacuum valve is designed to be used for every 15 gpm at peak wastewater flow. For higher flows, the wastewater is designed to be admitted to a splitter manhole which will evenly split and divert the flow to multiple valve buffer tank units. [MOPFD-12 #6 Page 203]
___	56. When specific buffer tank valve pits having suction lifts in excess of 5.5 feet are designed, the static losses added to the losses for that main do not exceed 13 feet. [MOPFD-12 #6 Page 200]
___	57. Suction lifts from the bottom of the holding sump to the valve centerline do not exceed 8 feet. [MOPFD-12 #6 Page 200]
___	58. Dual buffer tanks are designed to be connected to a 6-inch or larger vacuum main; where three or more valves are used, an 8-inch vacuum main or larger is specified. [MOPFD-12 #7 Page 204]

___	59. The design requires: 1) buffer tanks be constructed of minimum 4-feet internal diameter precast concrete manhole sections; and 2) all joints and connections on the buffer tank must be water-tight. Above ground venting of the vacuum valve must be installed, to ensure proper venting, in the event that the buffer tank becomes filled with wastewater. [MOPFD-12 #8 Page 204]
___	60. Provisions are included with the buffer tank design to allow for separation of the valve access area from the sanitary wastewater storage area. [MOPFD-12 #9 Page 204]
___	61. Provisions are included with the buffer tank design for maintenance personnel access. [MOPFD-12 #9 Page 204]
	Individual Gravity Laterals
___	62. Inspection and approval of individual gravity laterals are specified before final connection and vacuum valve installation requiring: 1) laterals be no less than 4 inches in diameter; and 2) laterals be schedule 40 PVC or pressure-rated PVC (SDR 21 or SDR 26) or similar. [MOPFD-12 #2 and #5 Page 210]
___	63. Air-intakes for each individual gravity lateral are specified requiring that: 1) air-intake piping and fittings be the same diameter as the lateral; 2) air-intakes extend a minimum of 2 feet above ground level with a gooseneck to protect against flooding; 3) air-intakes contain a stainless-steel screen to prevent the entry of rodents, insects, and debris; and 4) air-intakes be located to prevent damage to the piping. As an alternative to air-intakes, 6-inch Dedicated Air Terminals are specified. [MOPFD-12 #8 Page 203 and #4 Page 210]
	Vacuum/Pump Stations
___	64. In areas with high water tables, stations are designed to withstand flotation forces when empty. When siting the station, the design considers the potential for damage or interruption of operation because of flooding. Station structures and electrical and mechanical equipment are designed to be protected from physical damage by the 100-year flood. Stations are designed to remain fully operational and accessible during the 25-year flood unless lesser flood levels are appropriate based on local considerations, but not less than the 10-year flood. [62-604.400(2)(e), F.A.C.]
___	65. Stations are designed to be readily accessible by maintenance vehicles during all weather conditions. [RSWF 41.2]
___	66. The total volume of the vacuum collection tank is designed to be three times the collection tank operating volume, plus 400 gal, with a minimum size of 1000 gallons. [MOPFD-12 #3 Page 207]
___	67. Necessary pipe, fittings, and valves are specified to allow for emergency pumping out of the vacuum collection tank. [MOPFD-12 #9 Page 206]
___	68. A minimum of two pumping units are specified for both the vacuum pumps and the wastewater pumps, with each being capable of handling peak flow conditions with the other out of service. [MOPFD-12 #3 Page 206]
___	69. The design includes provisions to automatically alternate the pumps in use. [RSWF 42.4]
___	70. Vacuum pumps are designed for both peak flow from the vacuum valves adjusted to a 2:1 air-liquid inlet time ratio and for a system pump down time between 1 and 3 minutes with one pump not in service. [MOPFD-12 #2 Page 207 and 208]
___	71. Wastewater discharge pumps are designed using an appropriate peaking factor. [MOPFD-12 #2 Page 206 and 207]
___	72. Pumps handling raw wastewater are designed to pass spheres of at least 3 inches in diameter. Pump suction and discharge openings are designed to be at least 4 inches in diameter. [RSWF 42.33]
___	73. The design requires pumps be placed such that under normal operating conditions they will operate under a positive suction head. [RSWF 42.34]
___	74. Wastewater discharge pumps are adequate to maintain a minimum velocity of 2 feet per second in the force main. [RSWF 42.38]

___	75. Certification is specified from the pump manufacturer stating that wastewater discharge pumps are suitable for use in a vacuum sewer installation. [MOPFD-12 #5 Page 206]
___	76. The design requires: 1) suitable shutoff valves (plug valves or resilient coated wedge gate valves) be placed on the suction line of wastewater discharge pumps; 2) suitable shutoff and check valves be placed on the discharge line of each wastewater discharge pump; 3) a check valve be located between the shutoff valve and the wastewater discharge pump; 4) check valves be suitable for the material being handled; 5) check valves be placed on the horizontal portion of discharge piping (except for ball checks, which may be placed in the vertical run); 6) all valves be capable of withstanding normal pressure and water hammer; and 7) all shutoff and check valves be operable from the floor level and accessible for maintenance. [MOPFD-12 #6 and #8 Page 206 ands RSWF 42.5]
___	77. Isolation valves are specified between the vacuum collection tank, vacuum pump(s), influent line, and raw wastewater discharge pipe. [MOPFD-12 #7 Page 206]
___	78. Vacuum station piping and fittings 4 inches and larger are specified to be 150 #ANSI flanged ductile iron. Piping and fittings less than 4 inches are specified to be schedule 80 PVC with solvent-welded joints. [MOPFD-12 #10 Page 206]
___	79. Station testing requirements are specified in accordance with the vacuum system manufacturer's standard. [MOPFD-12 #12 Page 206]
___	80. Instrumentation and control systems to provide operational functionality are specified to manufacturer’s standard. Provisions for automatic pump alternation are included in the instrumentation and control system. The instrumentation and control system to bear the UL label, per the requirements of UL 508 and UL 508A. [MOPFD-12 #1 and #2 Page 208]
___	81. The design requires: 1) stations be protected from lightning and transient voltage surges; and 2) stations be equipped with lighting arrestors, surge capacitors, or other similar protection devices and phase protection. [62-604.400(2)(b), F.A.C.]
___	82. The design provides for adequate ventilation in accordance with RSWF 42.7. [MOPFD-12 Page 208 and RSWF 42.7]
___	83. Electrical equipment and installation are designed to meet the requirements of the National Electrical Code. [MOPFD-12 #2 Page 208]
___	84. Adequate temperature control is designed for the main electrical equipment and primary power distribution. [MOPFD-12 #5 Page 209]
___	85. Potable water, power, and telephone service is specified to be provided to the vacuum/pump station. [MOPFD-12 #6 Page 209]
___	86. Outdoor lighting for security is specified. [MOPFD-12 #9 Page 209]
___	87. Stations are designed and located on the site to minimize adverse effects from odors, noise, and lighting. [62-604.400(2)(c), F.A.C.]
___	88. The design requires stations be enclosed with a fence or otherwise designed with appropriate features to discourage the entry of animals and unauthorized persons. Posting of an unobstructed sign made of durable weather resistant material at a location visible to the public with a telephone number for a point of contact in case of emergency is specified. [62-604.400(2)(d), F.A.C.]
___	89. The design provides for suitable and safe means of access in accordance with RSWF 42.23. [RSWF 42.23]
___	90. Specified construction materials are appropriate under conditions of exposure to hydrogen sulfide and other corrosive gases, greases, oils, and other constituents frequently present in wastewater. The ferrous metal components of the vacuum pump station are specified to be protectively coated to prevent corrosion. [MOPFD-12 #11 Page 206 and RSWF 42.25]
___	91. The design includes provisions to facilitate removing pumps, motors, and other mechanical and electrical equipment. [RSWF 42.22]
___	92. The design requires suitable devices for measuring wastewater flow at all pump stations. Indicating, totalizing, and recording flow measurement are specified for stations with a 1200 gpm or greater design peak flow. [RSWF 42.8]

___	93. The station is designed with no physical connections with any potable water supplies. If a potable water supply is brought to a station, reduced-pressure principle backflow-prevention assemblies are specified. [RSWF 42.9 and 62-555.360(4), F.A.C.]
	Emergency Operations for Vacuum/Pump Stations
___	94. Stations are designed with an alarm system which activates in cases of power failure, pump failure, unauthorized entry, or any cause of pump station malfunction. Station alarms are designed to be telemetered to a facility that is manned 24 hours a day. If such a facility is not available, the alarm is designed to be telemetered to utility offices during normal working hours and to the home of the responsible person(s) in charge of the lift station during off-duty hours. Note, if an audio-visual alarm system with a self-contained power supply is provided in lieu of a telemetered system, documentation is provided showing an equivalent level of reliability and public health protection. [RSWF 45]
___	95. The design requires emergency pumping capability be provided for all stations. For stations discharging through pipes 12 inches or larger, the design requires uninterrupted pumping capability be provided, including an in-place emergency generator. Where portable pumping and/or generating equipment or manual transfer is used, the design includes sufficient storage capacity with an alarm system to allow time for detection of station failure and transportation and connection of emergency equipment. [62-604.400(2)(a)1. and 2., F.A.C., MOPFD-12 #4 Page 209 and RSWF 46.423 and 46.433]
___	96. The design requires: 1) emergency standby systems to have sufficient capacity to start up and maintain the total rated running capacity of the station, including lighting, ventilation, and other auxiliary equipment necessary for safety and proper operation; 2) special sequencing controls be provided to start pump motors unless the generating equipment has capacity to start all pumps simultaneously with auxiliary equipment operating; 3) a riser from the force main with rapid connection capabilities and appropriate valving be provided for all stations to hook up portable pumps; and 4) all station reliability design features be compatible with the available temporary service power generating and pumping equipment of the authority responsible for operation and maintenance of the collection/transmission system. [62-604.400(2)(a)3., F.A.C. and RSWF 46.431]
___	97. The design provides for emergency equipment to be protected from operation conditions that would result in damage to the equipment and from damage at the restoration of regular electrical power. [RSWF 46.411, 46.417, and 46.432]
___	98. For permanently-installed internal combustion engines, underground fuel storage and piping facilities are designed in accordance with applicable state and federal regulations; and the design requires engines to be located above grade with adequate ventilation of fuel vapors and exhaust gases. [RSWF 46.414 and 46.415]
___	99. For permanently-installed or portable engine-driven pumps are used, the design includes provisions for manual start-up. [RSWF 46.422]
___	100. Where independent substations are used for emergency power, each separate substation and its associated transmission lines is designed to be capable of starting and operating the pump station at its rated capacity. [RSWF 46.44]
	Conventional Force Mains, Pump Stations, Gravity Sewers and Manholes
___	101. For conventional force mains, pump stations, gravity sewers and manholes used after leaving the vacuum/pump station, the project design meets the "General Requirements" and applicable portions of the Collection/Transmission System Design Information beginning on page 2 of DEP Form 62-604.300(8)(a), Notification/Application for Constructing a Domestic Wastewater Collection/Transmission System. [62-604.300(8)(a), F.A.C.]

(RSWF) "Recommended Standards for Wastewater Facilities"; Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers; 1997 (Adopted by Rule 62-604, 300(5)(g), F.A.C.).

(MOPFD-12) "Alternative Sewer Systems, Manual of Practice No. FD-12"; Water Environment Federation; 2008 (Note, since this is an updated version of manual adopted by Rule 62-604.300(5)(c), F.A.C., use for guidance only).