Designation: C1920 – 21

Standard Practice for Cleaning of Vitrified Clay Sanitary Sewer Pipelines[1]

This standard is issued under the fixed designation C1920; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers the personnel requirements, operator training, operating procedures, and recommended equipment performance/design for the proper operation of pressure water-jet cleaning and cutting equipment as normally used by municipalities and contractors concerned with operations, maintenance and cleaning work of vitrified clay mainline sewer pipe.

1.2 The term "high-pressure water jetting" covers all water jetting, including the use of jets and hydromechanical tooling at pressures above 2000 psig (0.69 MPa).

1.3 This practice covers the "high-pressure water jetting" of vitrified clay pipe and should not be applied to other pipe and pipe lining materials without evaluating the recommended cleaning procedure from the manufacturer to avoid damage.

1.4 *Units*—The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *CDC Standard:*[2]

Guidance for Reducing Health Risks to Workers Handling Human Waste or Sewage

2.2 *Federal Standards:*

DOT CFR 49 Parts 106-107, 171-180, and 390-397 HAZMAT Transportation Regulations for Domestic Shipping and Transporting of Hazardous Materials[3]

OSHA Public Law 91-596 Section 5[4]

OSHA 29 USC 654 Duties of Employers and Employees[4]

29 CFR 1910.120 Hazardous waste operations and emergency response[3]

US EPA Optimizing Operation, Maintenance and Rehabilitation of Sanitary Sewer Collection Systems[5]

Vitrified Clay Pipe Engineering Manual, 2017[6]

Vitrified Clay Pipe Operations & Maintenance Handbook, 2020[6]

3. Terminology

3.1 *Definitions:*

3.1.1 *high velocity sewer cleaner, n*—these portable units have the capability of generating variable water pressures through a hose up to 3500 psi (24 MPa) and variable flow rates of 50-125 gal per min (gpm) (180-473 L per min).

3.1.2 *boom, n*—telescopic vacuum tube mounted on a sewer cleaning truck chassis.

3.1.3 *bucket, n*—a special device designed to be pulled along a sewer for the removal of debris from the sewer.

3.1.3.1 *Discussion*—The bucket has one end open with the opposite end having a set of jaws. When pulled from the jaw end, the jaws are automatically opened. When pulled from the other end, the jaws close. In operation, the bucket is pulled into the debris from the jaw end and to a point where some of the debris has been forced into the bucket. The bucket is then pulled out of the sewer from the other end, causing the jaws to close and retain the debris. Once removed from the manhole, the bucket is emptied and the process repeated.

[1] This test method is under the jurisdiction of ASTM Committee C04 on Vitrified Clay Pipe and is the direct responsibility of Subcommittee C04.20 on Methods of Test and Specifications.

Current edition approved Dec. 1, 2021. Published December 2021. DOI: 10.1520/C1920-21.

[2] Available from Centers for Disease Control and Prevention (CDC), 1600 Clifton Rd., Atlanta, GA 30329-4027, http://www.cdc.gov.

[3] Available from U.S. Government Publishing Office (GPO), 732 N. Capitol St., NW, Washington, DC 20401, http://www.gpo.gov.

[4] Available from Occupational Safety and Health Administration (OSHA), 200 Constitution Ave., NW, Washington, DC 20210, http://www.osha.gov.

[5] Available from United States Environmental Protection Agency (EPA), William Jefferson Clinton Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20460, http://www.epa.gov.

[6] Available from National Clay Pipe Institute, 850 N. Wisconsin St., Ste 102, Elkhorn, WI 53121, https://www.ncpi.org.

3.1.4 *bucket (machine) cleaning, n*—a powered winch machine designed for operation over a manhole. The machine controls the travel of buckets used to clean sewers

3.1.5 *jets, n*—sewer nozzle jets are manufactured from different materials and jet orifice sizes to allow for the calibration of the water flow and pressure exiting the nozzle.

3.1.6 *high velocity sewer cleaning, n*—best described as a hydraulic cleaning method that utilizes water pressure to remove obstructions and deposits in sewers or storm drains.

3.1.7 *hose guide, n*—protects the sewer hose from abrasion and chafing damage.

3.1.7.1 *Discussion*—Commonly referred to as "Tiger Tail."

3.1.8 *hydro-mechanical tooling, n*—mechanical devices in which water is employed to power rotational cleaning to the inside of a sewer pipe.

3.1.9 *mechanical sewer cleaning, n*—clearing pipe by using equipment that scrapes, cuts, pulls or pushes the material out of the pipe.

3.1.9.1 *Discussion*—Mechanical cleaning devices or machines include bucket machines, power rodders and hand rods.

3.1.10 *nozzles, n*—primarily used to deliver water streams to the entire internal circumference of sewer pipes to clean, flush, and remove deposits.

3.1.11 *power rodders, n*—a sewer cleaning machine fitted with auger rods which are inserted in a sewer line to dislodge and remove debris.

3.1.12 *water jetting, n*—see *high velocity sewer cleaning*.

4. Significance and Use

4.1 Hydraulic cleaning methods include equipment that uses water and water velocity to clean the invert and walls of the vitrified clay sewer pipe.

4.2 The practice of high-velocity sewer cleaning is best described as a hydraulic cleaning method that uses water pressure to remove obstructions and deposits in sewers or storm drains.

4.3 There are different configurations of high-velocity sewer cleaning machines. These units have the capability of generating variable water pressures up to 3500 psi (24 MPa) and variable flow rates of 50-125 gal per min (gpm) (180-473 L per min).

4.4 The water tank capacity on these units varies from 1000-1500 gal (3785-5678 L).

4.5 The hose lengths vary between 500 and 1000 ft (152 and 305 m) in length with a diameter of ¾ - 1¼ in. NPT.

4.6 There are number of different nozzles and tools that may be used during the cleaning process.

4.7 Some high-velocity sewer cleaners have a vacuum conveyance system that use large fans or positive displacement vacuum pumps for material removal capabilities. With this type of system, material can be vacuumed from the manhole into a debris tank as it is brought back with the jet or tool and taken to a disposal area. These systems can be either trailer or truck mounted and are generally known as combination machines.

4.8 The Occupational Safety and Health Administration (OSHA) has set guidelines for the safe removal of hazardous and nonhazardous substances as stated in OSHA Section 5 of Public Law 91-596; OSHA 29 USC 654; 29 CFR 1910.120; as well as DOT CFR Parts 106-7, 171-180, and 390-397.

5. Hazards/Safety

5.1 See 4.8, 7.3, 7.4, and Section 5 for specific hazards statements.

5.2 It is the responsibility of every employee to ensure that all applicable safety rules and regulations are adhered to during the performance of their duties.

5.3 As a general rule, every employee is responsible to ensure that all activities are performed in a safe manner and, if the work cannot be performed safely, then it is not to be performed.

5.4 The following items are minimum activities required to mitigate the hazards that may be encountered during the high-velocity sewer-cleaning process.

5.4.1 Personal Protective Equipment (PPE)

5.4.1.1 The high-velocity cleaning crew shall be periodically trained in the use of PPE and they should use that equipment, as necessary, to protect themselves from hazards that may be encountered from human waste or sewage. It is essential that this equipment is inspected and maintained on a periodic basis.

5.4.1.2 Additionally, supervisors and safety personnel should ensure that sewer-cleaning activities are being safely performed in a manner consistent with the applicable state, local, and federal policies and regulations.

5.4.1.3 The Center for Disease Control and Prevention (CDC) Guidance for Reducing Health Risks to Workers Handling Human Waste or Sewage states, "Workers handling human waste or sewage should be provided proper PPE, training on how to use it, and hand washing facilities. Workers should wash hands with soap and water immediately after removing PPE." The following PPE is recommended for workers handling human waste or sewage:

(1) Goggles to protect eyes from splashes of human waste or sewage,

(2) Protective face mask or splash-proof face shield to protect nose and mouth from splashes of human waste or sewage,

(3) Liquid-repellent coveralls to keep human waste or sewage off clothing,

(4) Waterproof gloves to prevent exposure to human waste or sewage, and

(5) Rubber boots to prevent exposure to human waste or sewage.

5.4.2 Traffic Safety

5.4.2.1 Traffic control requirements may vary depending on the location and safety risk to operating personnel and the public.

5.4.2.2 All traffic control shall conform and be safely performed in a manner consistent with the applicable state, local, and federal policies and regulations.

5.4.2.3 OSHA states "There must be a traffic control plan for the movement of vehicles in areas where there are also workers conducting other tasks. Drivers, workers on foot, and pedestrians must be able to see and understand the routes they are to follow."

5.4.3 Maintenance Hole (MH) Safety— Before any persons enter a confined space, all confined space procedures shall be followed as outlined. In addition, all open maintenance holes shall be guarded (an attendant shall be present or a mechanical barrier shall be in place).

5.4.4 Personal Hygiene—All operating personnel shall observe good hygiene practices. Each vehicle shall be equipped with cleaning materials and first aid supplies. Areas where food or clothing is stored shall be kept clean to avoid the possibility of cross contamination.

5.4.5 Lockout/Tagout—Remember that rotating shafts and charged pressure systems can cause serious injury or death. All moving parts and sources of energy shall be locked out and tagged out before anyone works on the vehicle. Refer to the division's lockout/tagout policy for specific instructions each type of equipment.

6. Pre-Operations Procedures

6.1 Any person required to operate or maintain pressure water-jetting equipment, nozzles, and hydromechanical tooling shall have been trained and have demonstrated the ability and knowledge to do so in accordance with the original equipment manufacturer's instructions, specifications, and training programs.

6.2 All equipment, tooling, and/or the vehicle shall be inspected at the start of each working day to ensure that the equipment is in safe working order.

6.3 Ensure that an approved dump facility is available to dispose of debris recovered during the cleaning process.

7. Operational Procedures

7.1 The standard operational procedure of high velocity cleaning a vitrified clay pipe is to safely remove all obstructions and deposits from the pipeline and restore the pipe to a minimum of 95 % of operational design capacity. The basics of this procedure may be used for other types of sewer cleaning and inspection.

7.2 The crew shall locate the structures where the cleaning is to be performed.

7.3 The crew shall place all required safety and traffic control devices as needed.

7.4 A black sewer leader hose shall be attached at the end of the colored hydro hose in conjunction with a hose guide sleeve to protect the hose from abrasion and chafing damage. The black leader hose also warns the operator when the end of the hose is approaching the maintenance hole structure.

7.5 Properly position the hose reel in line with the pipe to be cleaned.

7.6 The crew shall install a debris trap or a vacuum tube in the downstream maintenance hole (MH) outlet.

7.7 If safety permits, open the upstream MH during the cleaning process to prevent air being forced up a lateral pipe that is connected to the pipe that is being cleaned.

7.8 The nozzle shall be attached to a wired legged proofing skid (or centralizer) calibrated to 95 % of the inside diameter of the pipe to be cleaned. The proofing skid will act as a Go/No Go gauge to indicate that the pipe has been cleaned to proper operational capacity as it travels through the sewer during the cleaning process.

7.9 Place the hose, nozzle, and skid into the pipe a minimum of 3 ft (0.9 m) before engaging the pump in order to deliver pressurized water to the nozzle or cleaning tool.

7.10 The initial cleaning pass should be 50-100 ft (15-30.5 m) traveling upstream. Depending on the results, you may need to change the nozzle or tool and repeat the cleaning process or continue to clean the entire pipe.

7.11 The crew shall visually verify the cleaning equipment has traveled from MH to MH.

7.12 If the crew is unable to verify 95 % capacity on the first attempt, the crew shall change the nozzle/tool and remove the obstruction(s) in the line.

7.13 The crew shall remove all debris that has been collected in the trap.

7.14 The crew shall remove all traffic/safety control devices and clean the work area.

7.15 The crew leader shall complete the work order and report any pipeline anomalies found.

7.16 To ensure the proper operation and maintenance of a wastewater collection system it is essential that accurate records of O&M be maintained. It is imperative that all wastewater crews accurately report all work accomplished, especially the condition of the maintenance hole, the structures, and pipeline before and after cleaning. This information is vital when not only determining the optimal maintenance interval for a specific pipeline asset, but also for staffing and budgetary purposes as well as regulatory requirements.

8. Use of Nozzles and Hydro-Mechanical Tools

8.1 Static(non-rotational) and rotational nozzles are available with a wide range of jet angles to suit any cleaning need and are manufactured in a variety of sizes and shapes.

8.2 The calibration of the nozzle jet orifices to the high velocity sewer cleaner pump output (GPM and PSI) is key to achieving the optimal performance for both maximum cleaning efficiency and flushing power from the nozzle or tool to ensure the pipe is returned to 95 % of operational capacity.

8.2.1 *Cleaning Nozzle*—A nozzle is primarily used to clean the entire circumference of the pipe. Jets are radially indexed at a higher jetting angle (30-90°).

8.2.2 *Flushing Nozzle*—A flushing nozzle is designed to move debris from sewer pipes with the use of radially indexed jets set at a lower jetting angle (6-20°).