

SECTION 093  
SPECIFICATIONS – CLEANING AND INSPECTION OF SEWERS

The purpose of inspecting sewers is to obtain information that will allow for the assessment of their conditions. As specified by the Engineer, information might be gathered using, but not limited to, closed-circuit television (CCTV), sonar survey and laser profiling equipment.

Unless specified otherwise by the Engineer, the purpose of cleaning sewers is to facilitate the inspection of sewers as specified by the Engineer. Sewers shall be cleaned to the extent required within these Specifications, using methods allowed in these Specifications and chosen by the Contractor.

Sewer cleaning and inspection shall include, but not be limited to, the following: the locating of manholes, the construction of access corridors for personnel and equipment including the removal of obstructions and the stabilization of surfaces; making manholes accessible; the control of flows where necessary to facilitate sewer cleaning and inspection operations; the provision of water necessary for sewer and manhole cleaning operations; the cleaning of sewers; the cleaning of manholes adjoining sewers to be cleaned; the disposal of materials collected as part of sewer cleaning operations; the inspection of sewers; and the production of information resulting from sewer inspection operations, including the creation, management and distribution of files and reports. It shall be understood that all other tasks not explicitly listed above but required to complete sewer cleaning and inspection operations are included in the scope thereof.

1.0 Sewer Flow Control

The purpose of controlling flows within sewers to be inspected-only using CCTV methods or both cleaned and inspected using the same is to allow the successful completion of sewer cleaning and inspection operations in accordance with these Specifications. Inspection of sewers using CCTV methods shall not proceed until ninety-percent (90%) of the internal circumference of a sewer is visible above the surface of the flow. Flow controls may be completed by either, one, inserting temporary sewer plugs into sewers upstream of those sewers to be inspected-only or cleaned and inspected or, two, using pumping equipment, bypassing flows around sewers. Alternatively, if, throughout the entire length of a sewer in question, using hydraulically-powered sewer cleaning equipment, flow can be temporarily controlled to the extent required in these Specifications, for the purpose of completing sewer inspection operations using CCTV methods, while flow is temporarily controlled, it will be permissible to couple sewer inspection operations with sewer cleaning operations.

When plugging a sewer, the plug assembly shall be designed such that all, or any, portion of the sewage, within the plugged sewer, can be released at varying rates. When a sewer is plugged, flow shall not be discharged from the sewer collection system except to a container specifically for the purpose and intended for transport; if necessary, in accordance with directions provided by the Engineer, the Contractor may collect and transport flows impeded by constructed plugs to the Sanitary District's wastewater treatment plant (WWTP) located at 2322 S. Darst St. in Peoria. The Contractor shall be solely responsible for determining the capacity of equipment necessary to transport flows to the WWTP.

When diverting flows around sewers in which work is to be performed, the Contractor shall provide pumping equipment with sufficient capacity to bypass wet weather flows. The Contractor shall understand that the Engineer does not have information regarding wet weather flows within specific sewers. The Contractor will be responsible for construction, operation, and deconstruction of pumping equipment, including any measures needed to protect public health and public safety. Engines shall be equipped to keep noise at a minimum. When flow in a sewer is bypassed, flow shall not be discharged from the sewer collection system except for collection and transport, if necessary.

## 2.0 Sewer and Manhole Cleaning

Where specified by the Engineer, sewers and manholes shall be cleaned such that ninety-five percent (95%) of the combination of materials foreign to the collection system and those not attached to the same are removed from the sewer collection system. Materials to be removed from sewers and manholes to be cleaned shall include, but not be limited to, sludge, mud, sand, rocks, stones, gravel, pebbles, bricks, solidified fats, solidified oils, solidified grease, pieces of broken pipe, root intrusions, hardened debris and deposits. Only when directed by the Engineer, and in accordance with these Specifications, protruding service connections shall be removed. Unless specified otherwise by the Engineer, the Contractor shall make arrangements for obtaining water for sewer cleaning.

If cleaning of an entire sewer, from manhole to manhole, cannot be successfully completed from either its upstream or downstream terminus, cleaning of the sewer shall be attempted from the opposite access structure, if accessible; however, if the Contractor believes that such a reverse set-up might result in the involuntary discharge of flows from the sewer collection system, then sewer cleaning from the opposite access location might be excused and continued cleaning efforts abandoned.

### 2.1 Equipment

Sewers and manholes shall be cleaned both in accordance with these Specifications and using hydraulically-powered, mechanically-powered or robotically-controlled equipment.

#### 2.1.1 Hydraulically-Powered Equipment

Hydraulically-powered, sewer cleaning equipment shall be capable of producing a range of scouring velocities sufficient to clean sewers as specified without causing involuntary discharge of flows from the sewer collection system. When using hydraulic cleaning equipment, care shall be taken when accessing a sewer from an upstream manhole where it is known that connections are present. In such situations, the scouring velocity of the cleaning water shall be reduced to avoid causing damage to property upstream of connections. When using hydraulic cleaning equipment from a downstream manhole, care shall be taken to avoid depositing solids in connections that might occur during the propelling of the cleaning head and hose upstream.

The Contractor shall also have available a high pressure hand gun system to allow for washing and scouring all components of a manhole including corbels, walls, troughs and inverts. The gun shall also be capable of producing a range of water pressures both sufficient enough to completely clean designated manholes to the level specified yet gentle enough not to displace existing manhole components.

Removal of foreign materials from sewers may be accomplished by physically impacting the materials with either hydraulically-driven chain cutters or hydraulically-driven, rotating saws. When using such an impact device, care shall be taken by the Contractor to avoid damage to sewers. To minimize the risk, and severity, of such damage the Contractor shall only use chain cutters in conjunction with inspection equipment so that the chain-cutting operations can be continuously monitored.

### 2.1.2 Mechanically-Powered Equipment

Sewer-cleaning equipment powered by mechanical devices such as winches shall be allowed. "Bucket" machines are one such example. When using cabled equipment such as winches, the Contractor shall exercise precautions to avoid damage to the sewer collection system.

### 2.1.3 Robotically-Controlled Cutters and Grinders

Remotely-controlled cutters and grinders shall be allowed.

## 2.2 Material Removal

During, or immediately after completion of, sewer cleaning operations, all materials resulting from sewer cleaning operations shall be removed from the sewer being cleaned. Neither passing material from one sewer to another nor accumulations of materials in structures shall be permitted. Both upstream and downstream manholes are to be cleaned as a respective sewer is cleaned.

All materials resulting from the cleaning operations shall be removed from the site and disposed of by the Contractor. The Contractor shall not be allowed to accumulate and store materials overnight at the site(s) of work except in totally enclosed containers approved by the Engineer. Normal domestic sewage collected by the Contractor as part of the completion of this Project can be disposed of by the Contractor at the premises of the Sanitary District's WWTP at 2322 S. Darst St. in Peoria; if delivered to the District's WWTP, no disposal fee will be charged and the Engineer shall provide disposal directions. If disposal of normal domestic sewage or other materials generated by the Contractor as part of the completion of this Project are disposed of at a location(s) other than the Sanitary District's WWTP, the Contractor shall be responsible for disposal fees.

## 2.3 Root Removal

Only that equipment described above shall be allowed for the removal of the roots from sewers; no chemical removal methods may be used. All sewers that require root removal will be both cleaned and inspected in their entirety after root removal is completed. While root removal operations are being executed, inspection recordings may be paused and continued after root removal is complete such that the inspection recording of the whole of sewers is contained within one electronic file.

## 2.4 Protruding Service Connections

Removal of protruding service connections shall be performed by the Contractor when such connections either do not permit the passing of the inspection camera or, in the opinion of the Engineer, might be problematic in the performance of future sewer repairs. Protruding service connections shall be removed using equipment referenced above to within one-half (1/2) inch of the interior surface of the host sewer. The removal of protruding service connections shall be completed without breaking protruding service connections, creating jagged-edges on remaining service connections or removing service connections beyond the limits specified above. Any sewer in which a protruding service connection is removed shall be subsequently cleaned and inspected in its entirety after the protruding service connection is removed.

## 2.5 Special Circumstances

It is recognized that situations will occur where further sewer cleaning, or a particular method of cleaning, is undesirable. Examples of such a situation might be the discovery of a sewer that is in

advanced stages of deterioration and further deterioration is likely if sewer cleaning continues. Another situation might be when poor hydraulics within a sewer limits the methods able to be used to clean the system out of concern of involuntarily discharging flows from the collection system. Should the Engineer or the Contractor identify such a circumstance, the Contractor shall proceed according to the Engineers' directions.

If the Contractor informs the Engineer of a discovered potential defect in a sewer that may prevent further sewer cleaning, the Contractor shall safely inspect as much of the sewer in question as possible then submit all recorded inspections to the Engineer. Upon review the Engineer will either instruct the Contractor to cease sewer cleaning or to continue cleaning of the sewer in question using methods detailed in these Specifications.

If the Contractor declares all or any portion of a sewer to be inaccessible for cleaning, for any reason, the Engineer shall have the exclusive right to provide for alternative arrangements for obtaining sewer cleaning services for the portion of sewer in question. If cleaning of any portion of the declared inaccessible portion is obtained by services not provided by the Contractor, the Engineer may, at his sole discretion, make the Contractor responsible for the costs of those services performed by a third-party for the completion of work required in the Contract.

### 3.0 Sewer Inspection

As specified by the Engineer, sewer inspections are to be completed using closed-circuit television (CCTV), sonar survey or laser profiling equipment. Sewer inspections shall include not only sewer inspection operations but also documentation of CCTV sewer inspections.

#### 3.1 Sewer Inspections Completed Using CCTV

The purpose of inspecting sewers using CCTV is to obtain quality, recorded images of the entire interior condition of sewers, connecting sewers as viewable from the receiving, downstream, sewers without use of camera launching devices, and adjoining manholes. Recorded images may be produced by either inspection equipment that provides the field operator thereof with pan, tilt and zoom capabilities or inspection equipment that produces inspection recordings that, when coupled with enabling software, allow off-site users the capability to pan, tilt and zoom the entire lengths and circumferences of inspected sewers.

Prior to the commencement of the Project, the Contractor shall provide the Engineer with the domain of feature descriptions made part of the inspection software. The Engineer shall review the domain and, if any, provide the Contractor with modifications that are to be made to the domain to be used as part of this Project. At minimum, domains shall include the following descriptions of features commonly witnessed in sanitary sewers: tee connection, plugged; wye connection, plugged; tap connection, plugged; tee connection; wye connection; tap connection; lamphole; manhole; and flush tank. Additionally, the descriptions shall reference the orientation of features relative to the direction of camera travel; for example, left, right, crown and invert.

##### 3.1.1 CCTV Sewer Inspection Equipment

The basic functions of systems made part of the camera and transport assembly, include, but are not limited to, the following: illumination of the interior of the sewers to be inspected; transport of inspection camera(s) throughout the full length of the sewers to be inspected; measurement of the relative location of the assembly; clear, focused inspection of the whole of the sewers to be inspected; and recording of images generated by the inspection of sewers.

#### 3.1.1.1 Camera Lighting

Lighting for the camera(s) shall be integrated into the camera(s) and allow a clear picture of the entire circumference of sewers being inspected not only at the location of the camera(s) but also at least twenty feet (20') in front of and beyond. Additionally, the lighting shall be sufficient to allow for the production of images that clearly show at least ten feet (10') of the interior of sewer service connections upstream of the connection to the public sewer assuming the absence of inhibitive fittings.

#### 3.1.1.2 Transport

Transport assemblies shall be capable of moving through sewers designated for inspection at rates that facilitate the acquisition of inspection recordings in accordance with these Specifications. Transporter selection shall be such that the position of the camera(s) and lighting systems is centered in the sewers being inspected. Transport devices shall not obstruct or interfere with inspections. Transport assemblies shall be able to negotiate gradual bends and sweeps in sewers.

Inspection equipment may be driven, floated or winched through sewers to be inspected; personnel shall not be allowed to manually transport inspection equipment through sewers. When floating a camera assembly, the rate of travel must be controlled.

#### 3.1.1.3 Location Measurements

Camera and transport assemblies shall be provided with accurate systems to determine the locations of the assemblies at all times during sewer inspection operations. An acceptable alternative for satisfying this requirement is the provision of distance measurements relative to inspection starting locations.

Distance measurements shall include a footage counter that shall be set up to track the distances that camera and transport assemblies have traveled within sewers being inspected. Counters shall range from 0.0 feet to 9999.9 feet. Units of measurement other than the standard foot will not be accepted. Recorded inspections of sewers are to begin at the center of entry manholes and the corresponding counters are to begin at 0.0 feet. Distances shall be represented in tenths of a foot. On the recorded images of the interior of the sewers, the distance of the transporter from the center of the entry manhole shall be visible at all times

The distances provided shall be accurate within, plus or minus, one (1) foot. Accuracy of the distance meter shall be checked by use of a walking meter, steel tape, or other suitable device. The counter shall correspond to the distance as measured at the surface from the center of the entry manhole to the center of the receiving sewer structure. The inspection of a sewer shall not be accepted in which the footage counter is found to be inaccurate. The following are intended to be examples, but not a complete listing, of situations that may invalidate a distance measurement: an inaccuracy in the footage displayed on the counter is discovered by use of a separate method to verify distances; the operator reverses the progress of the transport and introduces redundancy in the distance measurement by twice including the length of a section of sewer; the counter at

the beginning of a inspection is in error; the starting position of the counter is other than the center of the entry manhole; and slack in the cable allows the transport to traverse through the line without the corresponding increase in the footage counter.

#### 3.1.1.4 Inspection Camera

Inspection cameras shall be capable of producing steady, clear, solid state, color images of all aspects of the internal condition of sewers. Images shall not be geometrically distorted. If images produced do not meet these Specifications, the inspection recordings shall be rejected.

Inspection equipment that provides field operators with pan, tilt and zoom capabilities shall have cameras capable of meeting the following specifications or be an equal approved prior to the receipt of proposals: cameras shall have both optical and digital zoom ranges of at least 10x and 4x, respectively, with a digital zoom of at least 40x with optical zoom and a total effective zoom ratio shall be no less than 40:1; the image pick-up device shall be a ¼", solid state, color CCD capable of providing at least 379,392 elements (NTSC); the lens shall be 10x zoom with a focal length range from 4.2mm to 42mm and an aperture range from f1.8 to f2.9; images shall be comprised of at least 470 TV lines of horizontal resolution; and an electronic shutter range from ¼ s to 1/10,000s in 20 steps. The camera shall also include both an automatic white balance feature and an auto-centering feature, the latter shall be provided to allow auto-repositioning of the camera field of vision to the zero degree X-Y axis position.

Inspection equipment that provides field operators with pan, tilt and zoom capabilities shall have full pan and rotation capabilities relative to both the horizontal and the vertical. This type of inspection equipment shall be fully operational from remote terminals and be capable of operating while transporters are in forward drive, reverse drive and neutral.

#### 3.1.1.5 Software

The Contractor shall utilize software that is capable of providing both inspection recording files and reports in accordance with these Specifications. In either MPG or VOB format, the sewer inspection and recording equipment shall be capable of producing files that include images recorded throughout sewer inspections. Recordings provided in VHS format will not be accepted.

In Adobe PDF format, the Contractor shall provide the Engineer with a report of each sewer inspection. Reports shall include the same information inputted into the log of the sewer inspection as detailed below.

#### 3.1.2 CCTV Sewer Inspection Procedure

Sewer inspections completed using CCTV equipment shall be done one sewer at a time, from ending structure to ending structure. The camera shall be moved through the sewer at a consistent, moderate speed that will allow for general viewing of the recording. The preferred direction of camera travel is from the upstream structure to the downstream; travel from downstream to upstream shall only be attempted if access to the upstream structure is impossible or previous attempts from the upstream structure have been arrested prior to completion of inspection. While traveling through the sewer, the camera shall at all times be

oriented such that the flow is shown at the bottom of the image.

The Contractor must continue inspections until the camera is completely within or below adjoining structures including manholes, lampholes, flush tanks, etc. The Contractor shall take care to both completely inspect the entire circumferences of all joints between structures and inspected sewers. Each manhole shall be inspected as much as possible.

When using inspection equipment that provides field operators with pan, tilt and zoom capabilities, the camera shall be stopped to inspect all connections including, but not limited to, tees, taps, wyes, risers, connecting sewers and lampholes. The camera shall pause to inspect both upstream into connections and entire circumferences of joints between connections to sewers. Additionally, the camera shall be stopped and the camera head swiveled to better view any actual, or suspected, pipe damage. Once documentation of a problem is completed, the camera shall continue traveling through the sewer.

When using inspection equipment that provides field operators with pan, tilt and zoom capabilities, during inspections, at each feature encountered, including, but not limited to, discovered defects and sewer service connections, from the approved domain of feature descriptions, the Contractor shall input a description of the feature into an electronic record. Meticulous logging of features encountered, coupled with input into the header of each file created, will be the basis for reports. Inputted into the log of each sewer inspection shall be features encountered, their distance from the entry manhole and their orientation within the sewer.

If, during the CCTV inspection operation, the camera will not pass through the entire sewer, the Contractor shall set up his equipment so that the inspection can be performed from the opposite manhole, if one is available. If the sewer has only one adjoining manhole and a reverse setup is not possible, the inspection of the sewer shall be considered complete. If again, upon setup at the opposite manhole, the camera fails to pass through the entire sewer, the inspection shall be considered complete and no additional inspection work will be required. Based upon the Contractor's footage counter, the Contractor shall report uninspected portions of sewers to the Engineer and the reason(s) that inspection was halted. When performing an inspection from a reverse setup, the Contractor shall only be required to inspect that portion of the sewer that was not inspected on the previous setup.

If any portion of the sewer is able to be inspected but not due to the halting of the camera transport before complete inspection is performed, the inspection of the sewer in question shall be considered incomplete. If the Contractor declares all or any portion of a sewer to be inaccessible for inspection, for any reason, the Engineer shall have the exclusive right to provide for alternative arrangements for obtaining sewer inspection services for the portion of sewer in question. If cleaning of any portion of the declared inaccessible portion is obtained by services not provided by the Contractor, the Engineer may, at his sole discretion, make the Contractor responsible for the costs of those services performed by a third-party for the completion of work required in the Contract.

### 3.2.3 Documentation of CCTV Sewer Inspections

Proper and correct documentation of a CCTV inspection of a sewer is imperative. An inspection that is not properly and correctly documented, in accordance with these Specifications, shall invalidate the recording of the images produced from the inspection and subject it to rejection by the Engineer. A rejection, for any reason, of any inspection will

require that the Contractor repeat the cleaning and inspection of the sewer in question.

Header information shall be provided at the beginning of each inspection recording and shall include the following: the name of the Greater Peoria Sanitary District which can be referred to as GPSD; the Project number; the Contractor's name; the starting time, ending time and date of sewer inspection; using the District's manhole identifications, the identification of the entry manhole; using the District's manhole identifications, the identification of the destination structure; the direction of camera travel; using the District's main identifications, the identification of the sewer being inspected; and characteristics of the pipe including the pipe diameter. Sewer and manhole identifications shall be as provided by the Engineer.

For each sewer to be inspected and each attempt to inspect the same, separate files shall be produced and provided to the Engineer. Each file shall include the inspection recording, in whole or in part, of one and only one sewer, from the point of entry of the inspection equipment to the terminus of the sewer. Files that contain the whole or partial inspection recordings of multiple sewers shall be rejected. Files shall not be spliced, split, cut or a collection of joined files. Files shall be produced to meet the requirements of these Specifications yet minimize file sizes. File names shall be in the following format: two letter designations for the year, month and date; followed by a space and then the Project number; finally, another space and the identification of the sewer inspected. For example, a file might be named "131211\_2378\_P20A001328".

Files shall be provided to the Engineer using one of the following mediums: one, Memorex, DVD, +R, discs with a minimum of 4.7 GB of storage or another disc make and model approved by the Engineer prior to the receipt of proposals; two, a third-party, web-based, file transfer site such as Drop Box or another site approved by the Engineer prior to the receipt of proposals; and, three, an external storage device that shall have been purchased new by the Contractor specifically for this Project, unused prior to this Project and shall become the property of the Engineer upon receipt from the Contractor.

Inspection recordings shall only be considered complete once files are transferred to the Engineer, successfully accessed and reviewed for conformance with these Specifications. The Contractor is encouraged to duplicate and keep copies of all files transferred to the Engineer.

### 3.2 Sewer Inspections Completed Using Sonar Survey

This subsection of this Section of these Specifications has not yet been developed.

### 3.3 Sewer Inspections Completed Using Laser Profiling

This subsection of this Section of these Specifications has not yet been developed.

## 4.0 Locating Manholes and Making Them Accessible

The Contractor shall locate and either chip-out or raise those manholes necessary to complete specified sewer cleanings and inspections.

Some of the methods that might be used to locate manholes include, but are not limited to, probing, use of a magnetic locator, jack hammering street surface in pavement conditions and digging the surface in earthen areas. Information that might be used includes, but is not limited to, information from the Plans or distance



measurements from inspections. If the locating of the manholes requires damage to the surface, whether pavement or earthen areas, the Contractor shall repair said damage in accordance with these Specifications.

The purpose of raising and chipping out of manholes is to make structures accessible for sewer inspection and cleaning operations. A chip-out manhole shall be defined as one that is buried less than one inch in a pavement area; the Engineer shall judge which manholes are to be chipped-out. A manhole that must be raised is defined as being buried greater than or equal to one-inch. The Contractor shall make field depth measurements to the Engineer's satisfaction.

The Contractor shall be responsible for disposing of all excavated materials resulting from the raising and chipping-out of manholes. Manhole adjustments shall be in accordance with these Specifications.

END OF SECTION