

Specification No: SIM2022VPI

Title: Nondestructive location and inspection of subsurface pipes via CCTV Video Pipe inspection.

Purpose:

The purpose of this specification is to provide engineers, municipalities, contractors, and other clients a suggested framework for detailing the minimum requirements for a non-destructive location and inspection of pipes pre and post-excavation/ground disturbance. This report also delineates measures to mitigate cross-bores and serves as a guide for general pipe maintenance. These inspection services are documented in a comprehensive NASSCO report.

Accompanying Documents:

- Practice NASSCO PACP, MACP, and LACP Personnel Qualification and Certification in Nondestructive Testing.
- Subsurface Investigation Methodology (SIM), White Paper

1. Codes, Standards & Definitions

- 1.1 **Occupational Safety and Health Administration:** Safety and Health Standards Digest Construction Industry (OSHA) - 3149/1996)
- 1.2 **National Association of Sewer Service Companies (NASSCO):** NASSCO provides a comprehensive, uniform, and consistent template for pipe inspection services based on the current industry services and technologies. They have been created and reviewed by industry experts, including Contractors, Equipment Manufacturers, and their Representatives, Municipalities, Engineers, Operators, and Field Contractors.
- 1.3 **NASSCO PACP, MACP, and LACP Personnel Qualification and Certification in Nondestructive Investigation:** This recommended industry standard includes assessment for maintenance and rehabilitation of underground infrastructure and to assure the continued acceptance and growth of trenchless technologies. This program also exists to increase the awareness of aging underground infrastructure and provide viable solutions through pipe assessment and NASSCO reporting.
- 1.4 **Pipeline Assessment Certification Program (PACP):** A certification assessment provided by NASSCO that validates the proficiency of an individual's pipeline assessment abilities regarding sewer service damage mitigation and validation.
- 1.5 **Manhole Assessment Certification Program (MACP):** A certification assessment provided by NASSCO that validates the proficiency of an individual's manhole assessment abilities regarding sewer service damage mitigation and validation.
- 1.6 **Lateral Assessment Certification Program (LACP):** A certification assessment provided by NASSCO that validates the proficiency of an individual's lateral assessment abilities regarding sewer service damage mitigation and validation.
- 1.7 **Federal Communications Division (FCC):** The Federal Communications Commission (FCC) is an independent United States government agency. The FCC was established by the Communications Act of 1934 and is charged with regulating interstate and international communications by radio, television wire, satellite, and cable.
- 1.8 **Common Ground Alliance (CGA):** The CGA is a member-driven association of 1,700 individuals, organizations, and sponsors in every facet of the underground utility industry. Established in 2000, CGA is committed to saving lives and preventing damage to underground infrastructure by promoting effective damage prevention practices. CGA has established itself as the leading organization to reduce damages to underground facilities in North America through shared responsibility among all stakeholders. The underground utility location contractor shall adhere to all applicable safety guidelines in accordance with federal, state, and local ordinances.
- 1.9 **Definitions:**
 - 1.9.1 **Subsurface Investigation Methodology (SIM).** Set of methods, training, field mentoring, and necessary equipment required for a complete pipeline investigation of subsurface pipe infrastructure resulting in mark-out and inspection of critical targets. Examples: power, communication, water and sewer, storm, gas line, and other commercial/industrial buried service lines.

- 1.9.2 **Pipe Location:** The process of identifying and labeling public and private pipes that are underground. These lines may include telecommunication, natural gas, cable television, fiber optics, storm drains, water mains, and wastewater pipes.
- 1.9.3 **CCTV Video Pipe Inspection (VPI):** A service requiring a method of inspecting pipes typically using a variety of robotic cameras to reveal pipe and obstruction location, including CCTV robotic crawler cameras, push cameras, and lateral launch cameras.
- 1.9.4 **Owner:** Legal owner of the structure or property to be investigated.
- 1.9.5 **Contracting agency:** The contractor is hired directly or indirectly by the owner who is sub-letting the inspection requirements to an inspecting contractor.
- 1.9.6 **CCTV Video Pipe Investigation Contractor:** The contractor hired to perform the CCTV Video Pipe Inspection operation resulting in the location of subsurface pipes.
- 1.9.7 **Robotic Video Pipe Cameras:** Various robotic cameras are used to reveal pipe and pipe obstruction locations. CCTV robotic crawler cameras and lateral launch cameras are typically implemented in Video Pipe Investigations.
- 1.9.8 **Sonde:** A device that automatically transmits information about its surroundings from an inaccessible location, such as underground or underwater. For CCTV Video Pipe Inspection services, the probe generates frequencies between 33 kHz and 512 kHz.
- 1.9.9 **Segment:** A segment of pipe that lays between two access points. Access points are typically manholes, storm grates, clean out, etc.
- 1.9.10 **Push Cameras:** A small camera system with the ability to be manually fed into pipes smaller than 6 inches. Each camera is equipped with a sonde to allow for locating the pipe, laterals, and obstructions, along with the ability to record video.
- 1.9.11 **Robotic Lateral Launch Cameras:** A video tool used as a sewer inspection system allows Contractors to inspect laterals from the sewer main line. This service can perform cross bore investigations and map the interior condition of hard-to-reach pipes.
- 1.9.12 **Robotic CCTV Crawler:** Closed Circuit Television Crawlers are remote-controlled vehicles used to move through and investigate pipes for VPI services.

2. SIM Prerequisite Qualifications

- 2.1 CCTV Video Pipe Inspection frequency recommendation.
 - 2.1.1 All pipes are recommended to be inspected on a bi-annual basis (every two years).
 - 2.1.2 All pipes should have a pre-inspection and post-inspection when any directional drilling is completed within the vicinity of the pipelines.
- 2.2 CCTV Video Pipe Inspection contractor shall submit certification of experienced-based training that meets or exceeds the guidelines detailed in NASSCO document 'PIPE CONDITION ASSESSMENT USING CCTV - PERFORMANCE SPECIFICATION GUIDELINE.' The NASSCO document recommends 24 hours as a minimum for a certified NASSCO Contractor training.
- 2.3 CCTV Video Pipe Inspection contractor shall utilize detailed methods, Subsurface Investigation Methodology, SIM requirement for competent field personnel:
 - 2.3.1 Field mentoring, three weeks of application training from a SIM certified mentor.
 - 2.3.2 40 hours of classroom curriculum investigative software training, SIM training.
 - 2.3.3 Post classroom training mentoring, two weeks of the practical application of VPI equipment and investigative methods.
 - 2.3.4 Simulated on-site training within a dedicated training facility that prepares CCTV Video Pipe Inspection Contractors for real-world projects.
 - 2.3.4.1 The facility contains a storm drain, lateral line, and sewer line.
 - 2.3.4.2 The facility contains a manhole structure.
 - 2.3.5 Inspection software training on CCTV Video Pipe software that allows Contractors to interpret live video feed.
 - 2.3.5.1 Direct training from software representatives.
 - 2.3.5.2 Uploading reporting documentation of the live video feed to cloud-based same-day deliverable system.
 - 2.3.6 Field Contractors shall maintain a minimum OSHA 10 safety training certificate.
 - 2.3.7 Field Contractors shall maintain an OSHA Confined Space certificate.
 - 2.3.8 Field Contractors shall maintain an OSHA Hazwoper certificate.
 - 2.3.9 Field Contractors shall maintain NASSCO: PACP, MACP, LACP certificates.

- 2.3.10 CCTV Video Pipe Inspection contractor insurance requirements, commercial liability insurance \$1,000,000 limit with \$5,000,000 umbrella (includes auto and worker comp), professional liability \$2,000,000 limit.
- 2.3.11 CCTV VPI equipment provided by CCTV Video Pipe Inspection contractor:
 - 2.3.11.1 In-person CCTV Video Pipe Inspection equipment training provided by the manufacturer.
 - 2.3.11.2 Robotic CCTV Video Pipe Cameras, to include:
 - 2.3.11.3 Robotic CCTV Mainline Crawler with live video feed transmission and recording capabilities.
 - 2.3.11.4 Robotic CCTV Lateral Launch Camera with a live feed transmission and recording capabilities.
 - 2.3.11.5 CCTV Video Push Camera with a live feed transmission and recording capabilities.
 - 2.3.11.6 Various equipment applicable sonde capabilities and locating features.
- 2.3.12 Miscellaneous hardware, marking paint, and power supply.
- 2.3.13 Sonde equipment is capable of receiving radio frequency signals between 33Khz and 512 kHz.

3. Investigation Scope

- 3.1 CCTV Video Pipe Inspection contractor will utilize job site information, available as-builts prints/plans, and previously detailed equipment to investigate, locate, and mark-out subsurface pipes and unknown defects.
- 3.2 Sewer sections shall be inspected by means of remote CCTV. If a blockage hampers the inspection of the sewer in one direction, then the Contractor shall attempt to complete the section by televising from the other manhole to complete the section. The Contractor must immediately report the obstruction to the Owner or his representative (hereinafter referred to as "Owner"). All CCTV work shall conform to Current NASSCO-PACP standards.
- 3.3 CCTV inspections will be delivered entirely in electronic format. 1. All PACP Header information shall be completed in accordance with PACP Guidelines. In addition to mandatory Header fields, additional fields are required as noted on the attached Header Field Matrix.
 - 3.3.1 2. The documentation of the work shall consist of PACP CCTV Reports, PACP database, logs, electronic reports, etc. noting important features encountered during the inspection. The speed of travel shall be slow enough to inspect each pipe joint, tee connection, structural deterioration, infiltration and inflow sources, and deposits, but should not, at any time, be faster than 30 feet per minute, except as noted otherwise in this document.
 - 3.3.2 The camera must be centered in the pipe to provide accurate distance measurements to provide locations of features in the sewer and these footage measurements shall be displayed and documented on the video. All PACP Observations shall be identified by audio and on PACP log. All videos must be continuously metered from manhole. The pipe should be clean enough to ensure all defects, features, and observations are seen and logged. If cleaning is required, see NASSCO Performance Specification Guideline for Sewer Pipe Cleaning.
- 3.4 Subsurface investigation of pipe segments within a designated area to locate and identify pipes and pipe defects
- 3.5 This mark-out may include depth estimates of targets.
- 3.6 Review of equipment capabilities and potential job-site performance impedances.

4. SIM Pre-inspection

SIM Pre-inspection Steps:

- 4.1 Job Hazard Analysis, form review, or equal site safety review documentation. Review and sign site safety plan if applicable.
- 4.2 Site walk and project scope meeting, review pipe segment inspection locations. Note: look for visible clues such as manholes, storm grates, cleanouts, or any other identifiable access points to enter the pipes.
- 4.3 Site contact interview, review known pipe information, discuss possible unknowns and anticipated pipe debris. Review site post-investigation scope of work.

- 4.4 Gather various marking materials (paint, flags, tape, other).
- 4.5 Verify client deliverable requirements, report format/documentation.

5. SIM Inspection Procedures

- 5.1 Quality of CCTV Video Pipe Inspection data
- 5.2 It is recommended that the CCTV Video Pipe Inspection contractor inspect VPI equipment systems to match the conditions at each site. This inspection is performed to determine the CCTV equipment's capabilities and ensure its viability during the inspection process.
- 5.3 Perform pressurized tests on robotic VPI equipment to ensure the equipment's watertight integrity and to meet industry standard equipment guidelines
- 5.4 Review the clarity of the video feed. Adjustments in equipment feed or lens may be necessary.

6. SIM Methods for Complete Investigation

Conclusion: Follow and document the SIM methods applied.

- 6.1 Confirm information collected from sections 4.2 and 4.3.
 - 6.1.1 As-built site plans, original design plans.
 - 6.1.2 Site walk aboveground access point indicators.
 - 6.1.3 Meet with the client and verify the scope of the project.
- 6.2 Investigate with CCTV Video Pipe Inspection equipment.
 - 6.2.1 Arrive at starting location and identify the initial access point.
 - 6.2.1.1 Access point can but is not limited to be manhole, storm grate, cleanout, etc.
 - 6.2.2 Walk entirety of pipeline to be inspected to identify all access points.
 - 6.2.2.1 Set up a safety perimeter with appropriate barriers and cones in the surrounding area.
 - 6.2.2.2 Set up fencing around the manhole if necessary.
 - 6.2.3 Turn on and test CCTV Video Pipe Inspection equipment as denoted in 5.2 and 5.3.
 - 6.2.3.1 Equipment tested at surface level to verify if the aforementioned equipment is working properly.
 - 6.2.4 Gain entry to access point (opening manhole lid, storm grate, exposing a cleanout, etc.)
 - 6.2.4.1 Visually identify the size of the pipe.
 - 6.2.5 Use information gathered about the size of the pipe to specifically select the appropriate equipment.
 - 6.2.5.1 Projects requiring CCTV Robotic Video Pipe Inspection equipment will require an appropriate selection of wheel sizes.
 - 6.2.5.2 Factors to consider will be the size, material, and length of the pipe.
 - 6.2.5.3 Additionally, the CCTV Video Pipe Contractor needs to consider whether laterals will be located or inspected.
 - 6.2.6 Lower equipment into the access point. If equipment is robotic, ensure to utilize appropriate pole-mounted hook or rope to avoid any confined space entry.
 - 6.2.6.1 Use vehicle winch if necessary to lower equipment into the available and starting access point.
 - 6.2.7 Setup project software for CCTV live video feed for project inspection.
 - 6.2.7.1 CCTV Video Pipe Contractor must verify and input appropriate project information for inspection.
 - 6.2.8 Investigate designated pipe segment and functional defects according to NASSCO PACP, MACP, and LACP codes.
 - 6.2.8.1 Inspection should include all pipe sizes ranging 2" or greater as designated by the client.
 - 6.2.8.2 A formal investigation may not be applicable if the client does not warrant the NASSCO report.
 - 6.2.9 Perform appropriate mapping and locating procedures as defined by the project's scope as designated by the client.

- 6.2.9.1 To comprehensively locate, the CCTV Video Pipe Contractor needs to walk along the surface directly above the pipe with a locator to accurately detect a sonde.
- 6.2.9.2 CCTV Video Pipe Inspection Contractor will visually map the pipeline along the surface with visual markers such as paint or flags.
- 6.2.9.3 CCTV Video Pipe Contractor will then capture the GPS location data of the visually marked points.
- 6.2.10 Write and finalize the completion report.

7. SIM Post Investigation Completion and Deliverables

- 7.1 Secure access point
- 7.2 Deconstruct safety barricades and safety perimeter fencing.
- 7.3 Clean off CCTV Video Pipe Inspection equipment using the van-provided water reservoir and cleaning equipment.
- 7.4 Securely stow all CCTV Video Pipe Inspection equipment.
- 7.5 If possible, provide a recap and review of findings with the site contact.
- 7.6 Explain markings and visual indicators to client preceding video review if applicable.
- 7.7 Explain depth estimates of markings if applicable.
- 7.8 Bring the client into the work vehicle to review material on the interior video desk monitor system.
- 7.9 Review software report data with the client.
- 7.10 Indicate visual markers and indicators using three vehicle video monitors.
- 7.11 Explain investigation findings: explain all conclusive and inconclusive data findings.
- 7.12 Review client concerns and provide an in-depth analysis of findings.
- 7.13 Upload and deliver NASSCO reporting to the client via a cloud-based delivery system.
 - 7.13.1 NASSCO deliverable is delivered to the client the same day as the service provided.
- 7.14 Review original scope to confirm expectations were met/exceeded.
- 7.15 Review the status of the work site to ensure the area is clear of debris.

This specification details steps and methods that ensure the best CCTV Video Pipe Inspection results. There is an emphasis on the value of training and mentorship because of the many potential scenarios a field Contractor may encounter and how the equipment can be applied. The SIM approach (experienced-based training combined with technology) has proven to be consistently accurate and efficient in accounting for site variability.

Please visit www.simspec.org for more information and detailed SIM specification.

*Relevant sections of the above SIM specification are directly referencing NASSCO report specifications.