

TELLUS
UNDERGROUND TECHNOLOGY, INC.

▶ Keyhole Technology

A MINIMALLY INVASIVE & COST EFFECTIVE
METHOD FOR THE MAINTENANCE, REPAIR AND
MAPPING OF UNDERGROUND UTILITIES



▶ Section 1

WHAT IS KEYHOLE TECHNOLOGY



SIMILAR TO ARTHROSCOPIC AND LAPAROSCOPIC SURGERY METHODS, KEYHOLE TECHNOLOGY IS A MINIMALLY INVASIVE TECHNIQUE FOR THE LOCATION AND REPAIR OF UNDERGROUND UTILITIES

- All Keyhole Processes begin above ground by designating a precise location for the underground infrastructure that is to be repaired or pinpointed.
- This is followed by cutting a round pavement opening, thus establishing a repairable opening that will permit access to the underground utility.
- After removing the cut core, a soft excavation process known as vacuum excavation is performed to gain access to the utility line or fitting that is to be documented or repaired.
- Repairs or location documentation is now performed using specially designed long handle tools or surveying equipment.
- Upon completion of these tasks the excavation is restored by replacing the soil and reinstalling the core that was cut from the pavement during the core cutting event.



ADVANTAGES OF KEYHOLE TECHNOLOGY

- Less traffic disruption.
- Paving costs are eliminated.
- Lower plant repair and maintenance cost.
- The street restoration is a permanent repair that leaves the pavement as good as before excavation.
- Safer operations because operating personnel never enter the excavation.
- Keyhole technology eliminates the use soft tissue injury causing tools such as jackhammers.
- Keyhole pavement cuts are round thus eliminating the possibility of cracks propagating from the corners of square and rectangular pavement cuts .
- Tellus has developed a single vehicle to support all facets of any keyhole process thus eliminating complicated job scheduling and the need for multiple vehicles at the work site.



THE FOUR CAPABILITIES THAT ARE THE BASIS OF ANY KEYHOLE PROCESS

1. Diamond tipped core cutting drums up to 24 “ diameter can cut cores up that can be as much as 22” thick.
2. A powerful jet of compressed air or water is utilized to break up the soil followed by vacuum excavating the soil from the excavation and into a spoils tank using a powerful pneumatic conveying system.
3. Specially designed long handle tools facilitate the repair and maintenance tasks on underground systems
4. The previously cut cores are reinstated into the cut opening using a quick curing grout thus allowing the street to be reopened to traffic within a short time of beginning the keyhole process



Core Cutting



Vacuum Excavation



Keyhole Tooling



Excavation
Restoration



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▶ Section 2

TELLUS HAS DEVELOPED A COMPREHENSIVE SOLUTION WHICH OFFERS ONE VEHICLE TO PERFORM ALL ASPECTS OF ANY KEYHOLE PROCESSES



THE TELLUS TEAM IS DEDICATED TO THE IMPLEMENTATION OF KEYHOLE TECHNOLOGY

- **Specialized Capabilities:** Our engineered approach brings together a broad range of solutions and professional experience.
- **Personalized Solutions:** Our integrated approach provides advice and solutions tailored to your unique needs.
- **Integration of Keyhole Technology:** We understand the special needs of keyhole methods and will help you make informed decisions to integrate this technology into your operations.
- **Experienced Keyhole Provider:** As an experienced provider of keyhole technology our team has the knowledge necessary to provide you with the latest equipment, tooling and operating methods.



WHY DO WE CORE CUT

Pavement can be cut using jackhammers or concrete saws but cored openings have numerous advantages

CORE RESTORATIONS ARE LESS EXPENSIVE:

Core cutting provides the ability to reinstate with the same pavement that has been removed from the street or walkway thus reducing costs and improving the appearance of repairs provided by alternate repair methods.

PERMANENT HI-INTEGRITY REPAIR:

Core restorations are not merely pavement patches, they are permanent pavement restorations that can provide all of the strength and durability characteristics of the original pavement.

PAVING COSTS CAN BE ELIMINATED:

Municipalities and property owners demand that their pavement be properly restored which can result in considerable paving costs for the contractor or utility. When core cutting is performed the restored core is the pavement restoration.

SAFETY:

Core cutting does not demand to use of pneumatic jackhammers which are often associated with soft tissue and back injuries.



VACUUM EXCAVATION SYSTEM

Dry or wet excavation. Local soil conditions dictate the soft excavation process that best suits operating conditions.

DRY EXCAVATION IS A LESS CAPITAL INTENSIVE METHOD:

The “wet” excavation process requires water to be transported to the excavation site and the excavated mud be transported away from the site. Dry excavation vehicles performing Keyhole processes can be purchased and operated for less than half the cost of a comparable hydro-excavation truck.

DRY EXCAVATED SOIL CAN OFTEN BE USED FOR RESTORATION:

When the “dry” excavation process is utilized the spoils that have been removed from the excavation can often be reused to backfill the excavation. The soil is returned to the excavation in multiple “lifts” and tamped to insure proper soil compaction.

WHEN SOIL CONDITIONS FAVOR HYDRO-EXCAVATION THERE ARE EXCAVATING METHODS THAT REDUCE REQUIRED WATER QUANTITY :

Experienced operators have developed wet/dry excavation methods that minimize the use of water when working with non-porous/sticky soil conditions.

SAFETY:

The use of high-pressure water jets can be challenging when working around electrical utilities. The use of a non-conductive air lance eliminates this issue.



KEYHOLE TOOLING & METHODS

All Keyhole processes require specially designed long handle tools so that the operator can access the underground utilities from street level.

TOOLING DESIGN IS DRIVEN BY THE PROCESS TO BE PERFORMED:

Before we can design Keyhole tooling we must determine a process that best suits the task to be performed. The Tellus staff has more than 25 years of experience in designing tooling to support keyhole processes.

DEVELOP A SAFE, SECURE AND COST EFFECTIVE TOOL SET TO COMPLETE AN ENTIRE PROCESS FROM START TO FINISH:

Well designed Keyhole tools are not merely “tools on a stick”. They are remote controlled power tools, machining devices, pressure isolation chambers and specialized hand tools designed for underground utility professionals.

TELLUS DELIVERS A WRITTEN OPERATING PROCEDURE THAT SUPPORTS THE OPERATING PROCESS FOR EVERY TOOLING SET:

Every operating process is made up of a specific sequence of steps. If any step in a procedure is overlooked or not adequately supported with functional tools, the process falls apart. The underground utility mechanic has no ability to safely reach into an excavation that is more than 3 feet deep to correct any tooling or process deficiency.



IMPLEMENTATION TEAMS ARE IMPORTANT IN THE DEVELOPMENT OF SUCCESSFUL KEYHOLE TECHNOLOGY PROGRAMS

Enrolment Stage:

1. Carefully select team members.
2. Explain the reasons for selection.
3. Define clear roles of responsibility.
4. Frame the project as implementing new technology with new procedures.

Preparation Stage:

1. Conduct joint training sessions.
2. Encourage openness and feedback.
3. Make reasons for change clear.

Trial Stage:

1. Seek input.
2. Accept attempts to do things differently.

Evaluation Stage:

1. Close each week with a debriefing and work review to discuss possible changes.



PROCESSES THAT ARE REGULARLY PERFORMED USING KEYHOLE TECHNOLOGY

- **Underground plant location**
- **Anode installation**
- **Service retirement (Service cut-offs)**
- **Leak location and repair**
- **Test station installation**
- **Corrosion control**
- **Service installation**
- **Camera launch and system inspection**
- **Service renewal**
- **Tracer wire repair**
- **Tie-overs on main replacement**
- **Gas evacuation: emergency leaks**

