

A Handbook for Excavators: When Natural Gas Facilities Are Involved



The Northeast Utilities System

HANDBOOK FOR EXCAVATORS

A Guide to Natural Gas Facilities & Underground/ Third Party Damage Prevention and Mitigation

Guidelines for excavations— when natural gas facilities are involved:

1. Plan for gas utility conflicts as part of all underground construction.
2. Markout the area of construction.
3. Properly notify Call Before You Dig, Inc. (CBYD), Connecticut's one-call system to protect public safety when excavating near underground utility facilities. CBYD can be reached toll-free at 1-800-922-4455 and training is available. (www.cbyd.com)
4. Provide adequate training and supervision on the job site to assure that good construction practices are followed.
5. Properly maintain all underground utilities' markings.
6. Hand dig in the area of underground gas facilities (see CBYD regulations).
7. Provide adequate protection and support for gas facilities.
8. Notify Yankee Gas **immediately** if a gas facility is damaged or disturbed so we can make repairs, if required. Call Yankee Gas toll-free, 24/7 at **1-800-992-3427**.
9. Use and properly install suitable backfill material around natural gas facilities.

Remember: Safety First. Don't Guess With Natural Gas!

Foreword

This book is for you, the excavator, who will be working in the vicinity of Yankee's natural gas distribution facilities. It provides useful information about natural gas and related subjects, our gas distribution facilities and construction methods that should be used around these facilities. We hope this handbook will help you to work safely around natural gas facilities, protecting you, your employees, the general public and our employees from harm.

Definitions

Approximate Location of Facilities—This is a strip of land not more than three feet wide or a strip of land extending not more than one-and-a-half feet on either side of the underground facilities.

Connecticut Gas Companies/Gas Companies—These are the natural gas companies that serve customers across Connecticut. They are Yankee Gas Services Company, Connecticut Natural Gas Company, Southern Connecticut Gas Company and Norwich Public Utilities.

Contact with Gas Facility—Includes without limitation the striking, scraping, denting, however slight, of any underground utility facility, including any underground utility line protective coating, tracing wire, housing or other protective device.

CBYD—Call Before You Dig is Connecticut's one-call system that serves as the central clearinghouse for all excavation notification in the state. They can be reached during normal business hours at **1-800-922-4455**. CBYD offers training seminars. More information can also be found at www.cbyd.com.

Damage—Includes but is not limited to the substantial weakening of structural or lateral support of a utility line; penetration or destruction of any utility line protective coating, housing or other protective device; or the severance, partial or complete, of any utility line.

Excavator—The person or entity performing the excavation work.

Hourglass—Narrowing a trench to a minimum width at the utility crossing (See *Appendix, Figure 1.*)

Main—Pipe that transports natural gas along streets and rights-of-way to the point of connection to a service.

Odorant—The chemical added to natural gas to give it a distinctive “rotten eggs” smell (natural gas in its purest form is odorless).

Service—A pipe which transports natural gas from the main in the street to the customer’s meter.

Us-We-Our—Yankee Gas Services Company and its agents.

You-Your—The person or entity or their agents who are responsible for the work being done.

Zone of Influence—The area measured from the bottom of a trench at an angle of 45 degrees in average soil conditions extending up to the surface. Underground facilities within the triangle may be potentially affected by construction (See *Appendix, Figure 2.*)

This handbook is only a guide. For a full explanation of your responsibilities, you must consult the Regulations of Connecticut State Agencies, Section 16-345—The Responsibility of Excavators.

Failure to comply with the statutes is punishable by fines up to \$10,000. This handbook is not intended to modify or replace those requirements.

About Yankee Gas

Yankee Gas Services Company (Yankee Gas) supplies safe, reliable natural gas service to nearly 200,000 residential, commercial and industrial customers in 71 communities Connecticut. A map of Yankee’s service territory is located on pages 12–13. This map also shows the service territories of Connecticut’s three other natural gas distribution companies. Yankee Gas is available 24/7 for gas emergencies by calling 1-800-992-3427. Our number is also located in the yellow pages of most phone books under “Gas Companies.”

Excavators and/or blasters should contact Yankee Gas to discuss projects involving extensive parallel construction, operations in areas of reduced cover, blasting and other unusual construction prior to the start of construction. Call 1-800-989-0900 and ask to speak to the Area Manager in your area. For a complete list of Yankee’s work areas and the towns served by them, please see pages 20–22.

About Natural Gas

Natural gas is a safe, efficient fuel and is the cleanest of the fossil fuels, making it an environmentally friendly energy source.

Methane is the primary ingredient of natural gas. It is lighter than air and will rise and diffuse rapidly when it escapes to an outside area. Escaping natural gas follows the path of least resistance. If natural gas is confined it may follow the path of other underground utilities, such as sewer, electric or telephone facilities.

Natural gas, in its natural state, is odorless. We add an odorant called mercaptan to give it a “rotten eggs” smell, making gas leaks readily detectable. Natural gas is *not* poisonous.

Natural gas, when mixed with air in concentrations of 5 to 15 percent, will form a combustible or explosive mixture. If it’s below four percent, there isn’t enough gas present to support combustion; if it’s above 15 percent, there is not enough air to

support combustion. The ignition point of natural gas is approximately 1,150 degrees. This temperature is reached by flint sparks, matches and sparks from electrical switches or motors. Natural gas has a heat content of approximately 1,030 BTU per cubic foot.

If an odor is detected, natural gas detection instruments carried by Yankee Gas employees can be used to determine the source of the odor. These instruments are part of our operating equipment. If you suspect a gas leak, **call Yankee Gas immediately at 1-800-992-3427.**

Natural Gas Emergencies

If a gas odor is detected or you suspect that a main or service has been damaged, **you must call Yankee Gas immediately.** Even if you come in contact with a natural gas main but there's no obvious damage to the main or service, it is **imperative that you call Yankee Gas immediately** so that we may inspect our facilities to ensure they are safe and don't require repair. Also, do not call from the facility where the gas leak is located.

Natural gas emergencies can involve these basic situations:

- Gas escaping outside
- Gas burning outside
- Gas escaping inside

Gas Escaping Outside

Natural gas which escapes an excavation, open pipe, manhole, sewer or vault will rise and diffuse in the air. You should take the following actions if natural gas is escaping outside:

- Shut down all machinery
- Clear a safe area around the site
- Remove all sources of ignition (smoking materials, open flames, etc.)

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- **Call Yankee Gas (1-800-992-3427)**

- Do not attempt to block or stop the flow of natural gas by bending or plugging a broken or leaking pipe
- Do **not** attempt to repair the pipe yourself—leave that to Yankee Gas

Gas Burning Outside

Natural gas that burns outdoors will not explode and you should not attempt to extinguish such a fire. Spraying water on burning natural gas will fill the area around the leak with mud and water, making it much more difficult for Yankee's crews to locate and repair the damage. Do take precautions to ensure that surrounding materials do not catch fire. If natural gas is burning outdoors, you should take these actions:

- Shut down all machinery
- Clear a safe area around the site
- **Call Yankee Gas (1-800-992-3427)**
- **Call the fire department (911 in most cases)**
- Do not attempt to put the fire out

Gas Escaping Inside

If natural gas is escaping to the inside of a building, this is the most serious of situations because the gas can build up inside the structure to an explosive level. When a natural gas facility such as a service is damaged, sometimes the greatest amount of damage does not occur in the excavation at the point of contact. The damage may occur someplace else on the facility such as at a connection underground, or at the end of the facility—inside a building. Facility damage and leakage may allow gas to migrate along underground structures (pipes, utility lines, sewer lines) and enter the building or cause the gas to escape directly into the building.

If you damage any gas service or other gas facility in close proximity to the building, you should:

- Notify the building occupants to be aware that damage may have occurred and that if they detect a natural gas odor, they should evacuate the building immediately
- **Call Yankee Gas from outside the building (1-800-992-3427)**

Natural Gas Distribution Systems

Natural gas is transported to Connecticut by interstate gas transmission companies. These interstate transmission mains typically operate at pressures between 350 and 1,400 psig. The gas is transferred to Yankee Gas at gate stations, which are equipped with metering and regulating equipment that reduce the pressure to between 30 and 200 psig for distribution through Yankee's gas mains, to its customers. The pipes are located along streets and rights-of-way and range in size from a half-inch to 36 inches. Services are the smaller diameter pipes that carry the gas from the mains to the customer.

Mains and services are typically made up of one of the following materials: cast iron, steel or plastic. While Yankee's facilities have been designed to meet all federal and state requirements, construction around and adjacent to them can subject them to conditions that may be detrimental to them, to you and to the general public. Construction activities in the vicinity of different materials present different problems to you and to Yankee Gas.

Plastic pipe is softer and more susceptible to damage from puncture or scratching. Since plastic pipe is non-metallic, a tracer wire is installed to facilitate location of the pipe.

Steel main is usually installed with a protective coating designed to prevent corrosion. Some older pipe may be uncoated. While steel pipe is the most resistant to damage, unrepaired damage

to the coating may result in corrosion and deterioration of the pipe. Further denting or kinking of pipe may result in stress failure of the pipe.

Cast iron main is less resistant to stresses imposed by impacts, changes in soil compaction and subsidence and lack of proper support.

GUIDELINES FOR EXCAVATORS

Damage can result from direct contact with our facilities, soil subsidence as a result of your excavation, or as a result of vibration of extra loads imposed by heavy construction equipment traveling over our facilities. In order for you to complete your project successfully, it is necessary that you work closely with Yankee Gas to prevent damage to our facilities.

Some of the excavation requirements are established by law while others are simply adherence to good construction practices. Regulations of Connecticut State Agencies, Public Act 16-345, govern excavation near underground facilities. The Occupational Safety & Health Administration (OSHA) regulates trenching and shoring requirements for personnel safety. Yankee Gas recognizes the safe practices that are required by law, but Yankee is not an enforcement agent of these laws.

Provide Adequate Supervision

The contractor must assure that a knowledgeable representative of the excavator is on site with evidence that CBYD was notified of the job and that the job is adequately supervised at all times. This includes:

- Well-trained personnel who are following good construction practices to assure that natural gas facilities are being protected
- Prompt and appropriate action is taken in the event of contact with a natural gas facility
- Equipment has been selected and is operated properly to minimize damage to natural gas facilities
- Necessary liaison is maintained with Yankee Gas during the course of the excavation work

Notify Call Before You Dig (CBYD)

In Connecticut, the law requires you to notify Call Before You Dig, Inc. (CBYD) at least **two full working days** before you plan

to begin your work. CBYD can be reached at **1-800-922-4455**. Information about the requirements under the one-call system can also be found on their Web site—www.cbyd.com. CBYD offers training for those who need it, too.

The purpose of the one-call law is to allow utilities to mark their underground facilities *before* any excavation begins. There are also specific requirements for excavation around gas mains. Failure to follow the law can result in significant fines. Failure to follow the law may also result in serious injury, or worse, to your employees, our employees or the general public.

Markout of the Construction Area

You are responsible for marking out in white the area of the intended construction, in accordance with Section 16-345-5.

Maintaining Facilities' Markings

You are responsible for maintaining all utility facilities markings. You should avoid covering or removing surface markings or stakes indicating underground facilities during construction activity, until you are ready to excavate.

Hand Digging

Once the road surface is removed, you must **hand dig around known buried gas facilities**. You must hand dig in the vicinity of Yankee's facilities and you must use proper excavating techniques, including shoring, if required, to prevent undermining of facilities or trench collapse. You may be required to hourglass your trench in the vicinity of our facilities. (*See Appendix, Figure 1*)

Protection of Exposed Natural Gas Facilities

Once you expose Yankee's facilities, you must protect them from damage. Natural gas facilities can be damaged by cave-in, falling pavement, dropped construction material or failure/ improper support.

Excavation Outside Limits of Construction

If your construction requires you to excavate outside the previously defined construction area or deeper than you had planned, **you must notify Call Before You Dig and Yankee Gas immediately.**

Blasting

In addition to excavation, if blasting is required, you must notify us and CBYD of your proposed blasting activities. Blasting specifications may be required to assess the effect on Yankee's natural gas facilities. Contact us for specific requirements.

Facilities Not Found Where Marked

If you do not find facilities where they are marked, you should call Yankee Gas **immediately.** If you have made a reasonable attempt to locate the facilities, Yankee will provide an on-site assessment to provide assistance, possibly in the form of specialized detection equipment or technical advice. This may include the need for and advice concerning placement of a test hole to be made at your expense.

If you have not made a reasonable effort to locate facilities before calling Yankee for on-site assistance, you may be required to pay for our costs in assisting you.

Unknown Facilities

If you find a facility that has not been identified or marked, **notify Yankee Gas immediately (1-800-992-3427).**

Odors

If you smell natural gas, **call Yankee Gas immediately (1-800-992-3427).**

Support of Facilities

You must provide temporary and permanent support for facilities wherever they are required. This support includes, but is not limited to, shoring, temporary bridging, suspension supports and proper backfilling under and around facilities. Yankee Gas can suggest methods to aid you in the design of support facilities.

Damage or Contact

If you damage or contact a natural gas facility, you should **notify Yankee Gas immediately.** The damage at the point of contact may appear slight to you, but may place stresses on the facility, damage protective coatings or cause damage elsewhere to the facility. We want to know *immediately* if you come in contact with our facilities.

Backfill

You must use suitable backfill material free of all stones around gas facilities. Further, all backfill in the area adjacent to gas facilities must be installed so as to achieve full compaction.

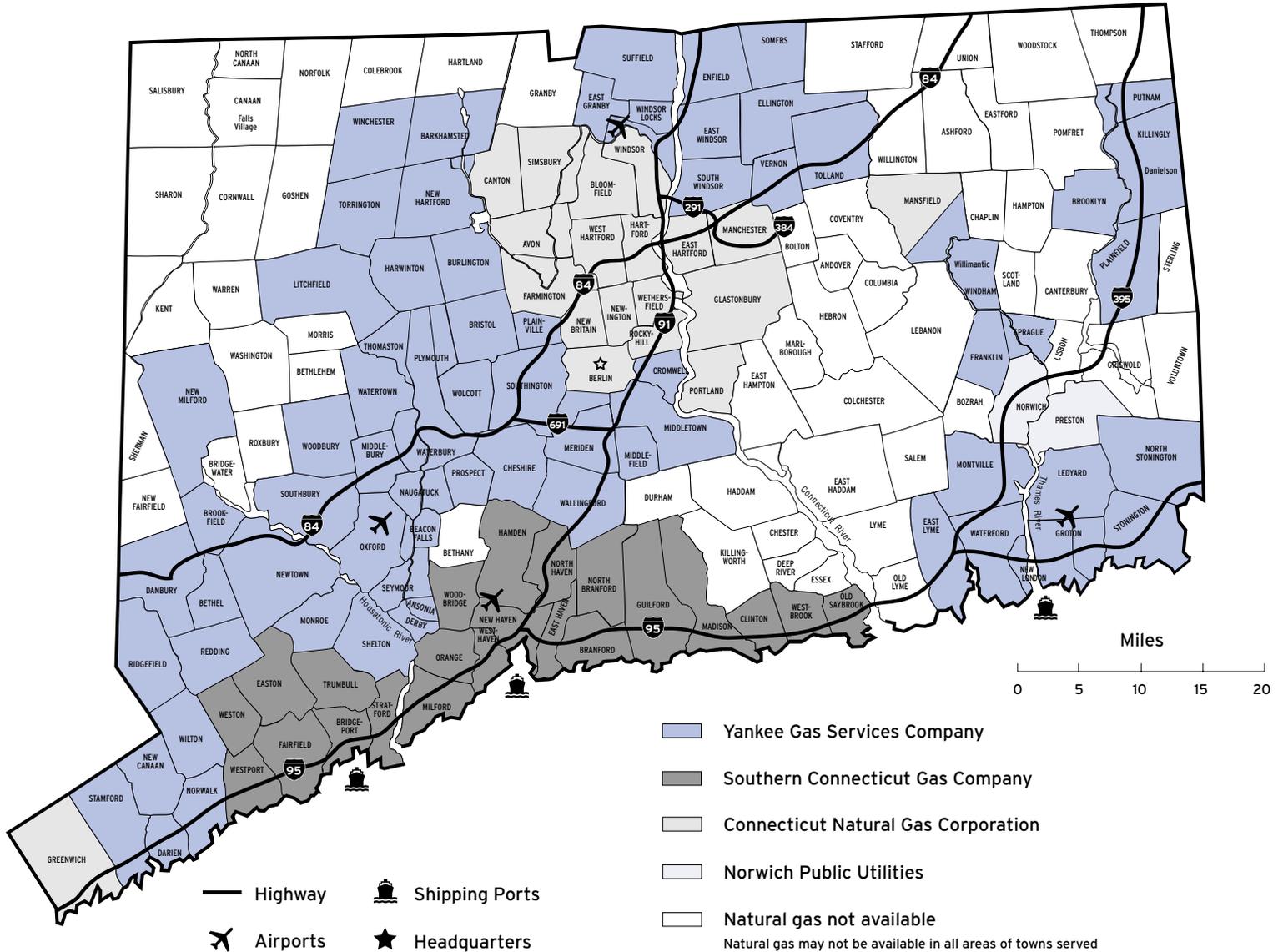
Broken Tracer Wire or Warning Tape

You should notify Yankee Gas of broken tracer wire or warning tape so that we may repair it.

Charges for Damage

You may be required to pay for damages that you cause to Yankee's natural gas facilities.

YANKEE GAS SERVICE TERRITORY MAP



YANKEE'S RESPONSIBILITY

Markout

We will mark out natural gas facilities after proper notification from CBYD. The markout is an approximate location. Note: The depth of facilities cannot be accurately determined, so we will **not** provide depth information.

Preconstruction Meetings

We will meet with you to explain our requirements for the protection of natural gas facilities, your employees and the general public.

During Construction

Yankee Gas will work cooperatively with you to resolve any problems that arise during the course of construction.

Site Inspection

We may inspect the construction site at any time to assure that you are performing the work in a manner that will ensure our gas facilities are not damaged. Yankee Gas will work cooperatively with all code enforcement agencies to assure protection of facilities as well as the safety and health of our employees and the public. If you are not adequately protecting natural gas facilities, we will institute prompt remedial action, including requesting a shutdown of the job by the proper enforcement agency.

EXCAVATIONS & GAS DISTRIBUTION FACILITIES

Planning Construction Activities

Before bidding the job, you probably visited the site to determine how these specific conditions had to be accounted for during your project:

- Traffic
- Nearness to structures and their condition
- Soil
- Surface and ground water
- Water table
- Weather & other seasonal conditions

But, did you consider overhead and underground utilities and any special conditions that they may impose? If the excavation is large and/or deep, you may want to consult with each affected utility early in the planning process so they can work with you to mitigate problems during construction and to advise you of measures that must be taken to protect gas facilities. Yankee is available to assist you with your construction planning to minimize conflict with and damage to underground natural gas facilities.

Marking Out Your Excavation & CBYD

Once your preplanning work is complete and you are ready to schedule the work, you should mark the excavation area in white and contact CBYD at least two full working days before the construction begins. (You can reach CBYD at 1-800-922-4455.) Yankee Gas will mark out its facilities using yellow paint, or stakes. *Note: This is an approximate location.*

Before Starting the Job

The most important thing before starting the job is for you and your employees to *review the job*. No matter how many

excavation jobs you have done in the past, each job should be approached with the utmost care and caution. Each job is different due to differing field conditions. Your employees should be taught how to recognize hazards and to take the appropriate safety precautions.

- Are all employees trained in the operation of the equipment they are going to be using on this project?
- Do they understand all aspects of the job?

Construction

Excavation is a complex operation because of the number of factors involved. Some considerations that must be taken into account include:

- Soil classification
- Water content or soil
- Changes to weather & climate
- Superimposed loads
- Vibration
- Other operations in the vicinity

Soil Classification

The type of soil must be identified. Excavation in wet, sandy soil or areas that have been recently backfilled is relatively unstable. Yankee has an established rule of thumb in protecting natural gas facilities. It is known as **the zone of influence**. This is an area from the bottom of the trench extending up to the ground surface at an angle of 45 degrees in average soil conditions. (See *Appendix, Figure 2*) If natural gas facilities fall within this zone of influence, special construction practices are required.

Weather Conditions

Changing weather conditions and climate will affect an excavation. A rainstorm can turn a stable trench into a mass of loose soil. Excess water from rain or melting snow can loosen and erode soil. A sudden thaw can undermine a trench or shoring. Even excessively dry conditions can reduce soil cohesiveness. Large excavations, in particular, are subject to changing weather conditions because they are generally open for longer periods of time.

Superimposed Loads

Superimposed loads in the vicinity of a trench or excavation increase the pressure on excavation faces. Heavy equipment and materials, such as pipe or timbers, should be kept well back of the excavation. Proper storage of the spoil bank is also required. These superimposed loads may cause trench wall collapse which could result in damage to natural gas facilities.

Vibration

Vibration or sudden shock or stress from passing vehicles or railways, blasting and equipment such as pile drivers, vibratory rollers and some tools can contribute to trench wall cave-in or loosening of the soil and stress or damage to the pipes. You should contact Yankee Gas for specific requirements.

Other Operations in the Vicinity

Other contractors operating in the vicinity of your project may affect your operations and you should be aware of this.

Backfilling

Once your excavation is completed and your facilities installed, the excavation must be backfilled. Backfill must be suitable material and placed in lifts and compacted to achieve a stable trench. Compaction rates of 95 percent should be achieved to

assure a stable trench. Damage to natural gas facilities often occurs after construction as a result of soil movement caused by substantial backfill material, poor backfilling practices, or failure to install supports as required. You are responsible for damages of this type.

Blasting Operations

If blasting is going to be used on the job, it may be necessary for Yankee Gas to take special precautions to assure that the blasting does not damage company facilities. This will require close cooperation between you and Yankee Gas. Company representatives may have to be on-site to monitor blasting activities and to survey for leaks after the blasting operation is complete.

APPENDIX

Figure 1—Hourglassing

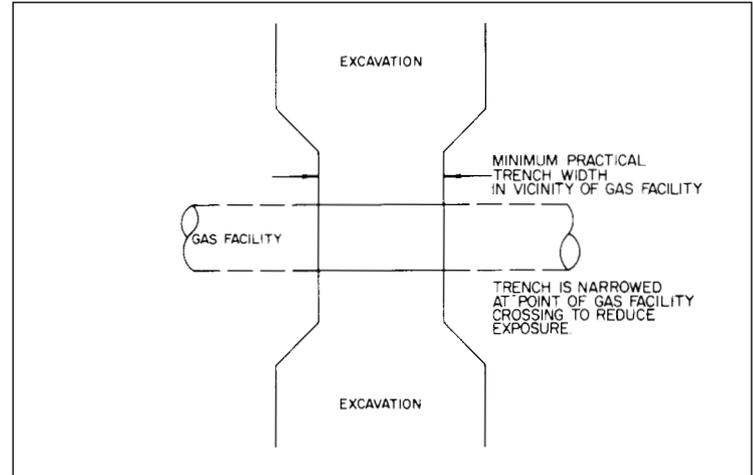
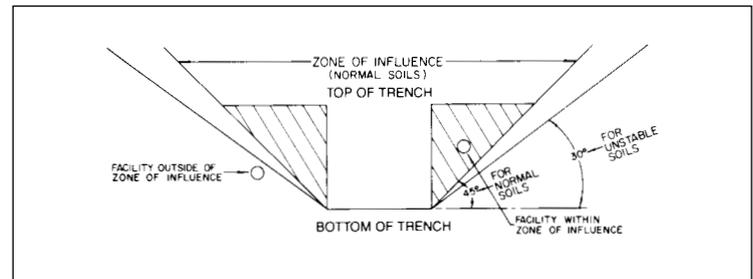


Figure 2—Zone of Influence



YANKEE GAS SERVICE TERRITORY

Cities, towns served by Yankee Gas regional work centers

To arrange assistance or consultation for your excavation project, please call **1-800-989-0900** and ask to speak to the Area Manager covering your town from the list below. (For example, if your project is in New London, you would ask to speak to the Area Manager in Yankee's Waterford office.)

Please note that many communities have smaller, localized sections—such as the Yalesville section of Wallingford—which are not listed separately here.

Waterbury Regional Work Center

Barkhamsted
Beacon Falls
Middlebury
Naugatuck
New Hartford
Oxford
Prospect
Seymour
Southbury
Thomaston
Torrington
Waterbury
Watertown
Winchester
Winsted
Wolcott
Woodbury

Meriden Regional Work Center

Berlin
Bristol
Burlington
Cheshire

Cromwell
Meriden
Middletown
Plainville
Plymouth
Southington
Terryville
Wallingford

Danbury Regional Work Center

Ansonia
Bethel
Brookfield
Danbury
Derby
Huntington
Monroe
New Milford
Newtown
Ridgefield
Shelton

Norwalk Regional Work Center

Darien
Norwalk
Redding
Stamford
Wilton
New Canaan

East Windsor Regional Work Center

East Granby
East Windsor
Ellington

IMPORTANT NUMBERS TO KEEP HANDY

Yankee's Gas Leak Emergency Hotline (24/7)
1-800-992-3427

Yankee Gas Customer Service (to reach an Area Manager)
1-800-989-0900

Call Before You Dig
1-800-922-4455

Other:

*This handbook can also be found on our Web site,
www.yankeegas.com.*



The Northeast Utilities System

Expanding Connecticut's Energy Options

www.yankeegas.com



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