THE CITY OF NEW YORK
DEPARTMENT OF DESIGN & CONSTRUCTION
DIVISION OF INFRASTRUCTURE

Manual for the

Inspection of Distribution Water Main Installation

Training Session No.2:
"Typical Day"
for a
Distribution Water Main Inspector

March 2008

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Introduction

Distribution Water Main work is unique to the Agency as to the work just performed is tested and immediately restored to service for consumer use.

The manual is ordered in the manner the work is typically addressed. Planning aspects of the work are addressed in the sections entitled "Researching a Location" and "The Shutdown". Actual construction is broken down into its component parts and addressed in detail in the "Typical Day DWM Installation Activities" section.

"Water Chlorination Principals" provides a technical overview on how disinfection agents work, testing, disposal and its impact on the environment. The "Disinfection Procedure" section reviews all the steps taken to ensure a new distribution water main is sanitized before it is returned to service. Sample calculations to determine quantities of sanitizing agents mixed with water to create solutions of various concentrations that are employed in the disinfection process are provided in this section. High Test Calcium Hypochlorite Tables can be found in this section and provides dosages for the more commonly available disinfecting agents and based on pipe diameter and footage. The "Water Sampling" section includes a ten step process to aide you in collecting samples consistently, how to prevent contamination, interpret results and take remedial action as required.

The "Reference Material Section" includes copies of relevant SCOPS, forms and contact information.

Draft copies of the manual have been sent to various sections of the Agency for review. The resulting comments have been incorporated in this edition. If you, the user, would like to comment on or make suggestions to improve the future editions of this manual please feel free to contact me.

William Svilar, P.E.
Chief Construction Engineer

RESEARCHING A LOCATION

Records Overview
There are a variety of records and maps that document distribution water main installation and service connection work. These records aid the Department of Environmental Protection (DEP) in operating and maintaining the water distribution system for the City of New York and are a valuable asset when installing new distribution water mains.

Distribution Maps (DMs) and Detailed Distribution Maps (DDMs)
Maps can be obtained from DEP's Central Mapping and Records Unit by completing and submitting a request form. The Reference Material section of this manual contains a copy of DEP's request form for your use.

Distribution Maps or "DMs" are prepared in a smaller scale and provide an overall schematic of the distribution system. DMs use a pipe size legend and show approximate locations of valves, hydrants and other appurtenances. These maps are useful in determining water shutdown limits and provide an overview of the surrounding system and the shutdown's impact.

Detailed Distribution Maps or "DDMs" provide a slightly larger schematic view of the distribution system utilizing the same legend as the DMs. The larger schematic view includes lane dimensions, valve locations, the year the water main was installed and Field Card catalog numbers in some cases.

Field Cards
Field Cards can also be obtained from DEP's Central Mapping and Records Unit by completing and submitting a request form. The Reference Material section of this manual contains a copy of DEP's request form for your use. The Field Cards scanning project has been completed. DEP now utilizes a computer program to catalogue the JPEG images of the field cards. This will greatly improve turn-around time on information requests as all the searching and printing will be done by computer.

Before requesting cards from DEP, check with the project's Design Engineer. An extensive record search is typically conducted prior to designing a project and field cards are usually obtained at that time.

Field cards are detailed sketches that are typically hand drawn (recent field cards may be computer / CAD generated). They provide pipe details such as: pipe material, age, pipe lengths, location, cover, type of pipe joints, direction of bells, type of thrust restraint installed and its location. A list of service types and locations for that section of main may also be provided on the back of the field card. Water main locations are typically provided as a distance and direction from an existing curb. It is referred to as a "water main lane" or "lane".

As-Built Drawings / Record Drawings
As-built or record drawings of water main installation work may have been prepared for a third party if the work involved structural alterations to the party's subsurface structure. The most common type of as-built drawing produced involves pre-engineered notches for water main installation in shallow subway roofs particularly around stations. On occasion such drawings are produced for crossing shallow sewers and private tunnels connecting large facilities. If you suspect such facilities to exist on your project, a quick check to see if such drawings exist may be warranted. DEP or the facility operator may have the drawings in their archives.

Tax Maps
Tap records are organized by block & lot numbers. Prior to conducting a tap record search to obtain existing water service information, it is recommended that a tax map of the project location be obtained. Tax maps provide basic dimensions of private property lots, street addresses and their unique block & lot

numbers. Copies of tax maps (a.k.a. Sanborn Maps) can be obtained from DDC's Topographical Services Unit. Basic block & lot information can also be obtained by accessing GIS Mapping information through DCC's database program -- Project Info or through DDC's Geographic Information Data Link by accessing the website address -- http://ddcgis2/ddcgis/ using MS Internet Explorer. Please note that the Sanborn and tax lot filters must be activated to view block and lot information.

Tapping Records

A tap card is completed for every new house connection, a reconnection to a new main or whenever a service is repaired or replaced. Tap cards are also filed for plugging and abandoning existing taps. Tapping records are maintained by DEP in each borough and are organized by block & lot numbers. The addresses and phone numbers for the borough offices can be found in the Reference Material Section. For more current information, consult a copy of the "Orange Book - Official Directory of the City of New York" (formerly the "Green Book"). A comparison between the records and actual field conditions should be conducted to determine if the records are accurate or any are missing. A tap record search should be conducted for every new water main installation location whether it is a "re-lay" (a new water main installed in the same lane as old water main lane) or new lane installation.

Since each existing tap will be encountered as "re-lay" installation progresses, a tap record search may not appear to be necessary. However, simply counting homes and connections may not be enough.

Abandoned taps and services are routinely encountered. Reconnecting an abandoned service can potentially damage paved surfaces, private property and flood basements when re-activated accidentally.

On occasion an existing service may not be in use because the DEP had served a three-day notice to the property owner to repair a leaking service and subsequently shut the tap or wet connection when no action was taken preventing further damage to the roadway. Normally, the owner would hire a plumber and fix the service without delay. However, a few owners have delayed repairing a fire service since the service loss would not generate the amount of tenant complaints a domestic service loss would. If such a situation was encountered, the Resident Engineer should contact DEP to get a history on the shutdown service connection. If DEP had given notice to the owner and subsequently shutdown the service, a courtesy letter should be sent to the owner of record reminding him of the shutdown service requiring repair, a deadline to accomplish the repair should be provided coinciding with the commencement of permanent restoration work and a warning that the matter will be referred to the Dept. of Buildings (DOB) and the Fire Dept. (FDNY) if no action is taken.

Missing a live service will require the new water main to be re-excavated and the service reconnected. For corner properties, knowing how many services and their locations can also help troubleshoot a shutdown.

In addition to the problems encountered in a "re-lay" installation, a new lane installation yields two types of service reconnections: a shortened reconnection and an extended reconnection.

A shortened reconnection will typically be encountered while excavating the new water main trench. Depending on the material the service is made of, a section of the tubing located on the far side of the trench from the building it is servicing is pounded flat. The service is cut short just beyond the flattened section on the building side and reconnected to the new main with a new tap with a three foot long copper tubing "swing" of an appropriate diameter. The flattened section is folded over, flattened again and tied to prevent it from unfolding. This is a temporary way to abandon an old service connection. If the main the old service is connected is to be retired, no further action is required. If the old main is to remain live,

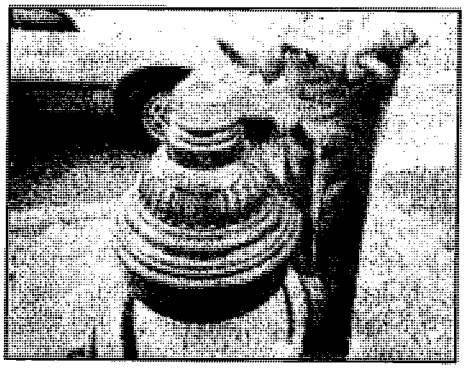
the old tap has to be exposed. The tap is closed, the service is disconnected and the tap threads connecting to the service destroyed. Sometimes, the tap is removed and a plug is installed in its place.

An extended reconnection requires the old tap to be located on the old water main and exposed. The old tap is closed, and the service is disconnected and straightened. A new piece of copper tubing is added to the old service extending it to the new main and tap for reconnection. Tapping records will take the guess work out of locating the existing taps and reduce the amount of test pits dug for service extension related work.

The Walk-Thru

The walk-thru has two objectives: the first is to locate all water main appurtenances (hydrants and valves) in accordance with the records; the second, is to conduct an initial survey of water sensitive businesses and premises located within and adjacent to the planned water shutdown area.

The main purpose of conducting a physical survey is to discover and remedy any problems that may delay obtaining a water shutdown. The contractor can be persuaded to provide some manpower and equipment to assist the survey as this will save him money by minimizing lost production due to bad or delayed shutdowns. The physical survey of water main appurtenances should include the following:



- Locate and test the operation of existing hydrants. Note the existence of custodian locks (magnetic) and anti-tampering caps on existing hydrants not scheduled for replacement that are involved in the upcoming shutdowns. Hydrants with custodian locks (magnetic) can be an issue. A special wrench is required to open and close these hydrants and their distribution is tightly controlled. If a hydrant is to be frequently utilized for shutdown purposes or a large amount of water main is to be replaced in an area where hydrant custodian locks are utilized, a special request can be made to DEP to have them temporarily removed. Promptly call DEP to have the custodian locks re-installed when all the water main work has been completed. DEP will not provide special wrenches for the contractor's use.
- Locate and open hydrant valve boxes to check the condition and accessibility of the operating nut of the valve. Note the location of hydrants that have valve boxes with inaccessible operating nuts and report them to DEP maintenance. Typically the inaccessibility is caused by a build up of debris in the valve box stem that can be vacuumed out or removed with a valve box cleaning tool or curb box auger.
- Verify existing water main lanes
- Locate and open mainline valve boxes to check the condition of the existing valves and operating nuts. Note the location of any valve stem "packing" leaks. Normally such leaks do not affect the quality of a shutdown. Operating the valve may make a packing leak worse. A large enough leak can exit the mainline valve box and flow into a nearby trench. Cold weather can freeze the water solid in the mainline valve box hampering its operation and ice up the roadway.
- Note any missing valve boxes. The castings may have been paved over when the street was overlaid.
- Report any defective hydrants, buried castings or leaks to DEP through the 718-DEP-HELP phone number. Obtain the "CC#" before hanging up and record it in the Resident Engineer's log. Allow enough time for DEP to remedy these issues prior to scheduling a shutdown. Keep in touch with DEP's maintenance unit and provide assistance as required.

RESEARCHING A LOCATION

Residential and Business & Merchant Surveys

The Resident Engineer (RE), along with the Community Construction Liaison (CCL), must conduct a survey of water sensitive businesses and premises prior to planning a water shutdown to commence water main work. The following are typical water sensitive businesses and premises that warrant special attention:

- Medical Facilities (dentist offices, kidney dialysis, x-ray facilities, etc.)
- Hospitals
- Pharmaceutical Production Facilities
- Schools
- Daycare Centers
- Religious Institutions
- Senior Centers
- Homeless Shelters
- Assisted Living Facilities
- Large Public Facilities (Libraries, Courthouses)
- Film Developers including radiologists
- Large Printing Facilities
- Beauty Parlors & Barber Shops
- Laundry Mats
- Food Service Facilities (McDonalds, diners, restaurants, delis, etc.)
- Businesses or Premises utilizing water-cooled equipment for refrigeration, air-conditioning, manufacturing, etc.

Each business and building owner and/or the building superintendent should be interviewed. Obtain their working hours and the exact location of their domestic and fire service (if applicable). Explain the work to be done and the likely impacts the shutdown would cause. Take the opportunity to pass out a project brochure that contains the Field Office's or the CCL's direct phone number. Also remember to write in the Field Office's telephone number on the shutdown notice or the complaints will enter the City's 311 system and may delay a timely response.

The RE must ensure that all steps are taken to minimize the impact and duration of the shutdown. Steps can include temporary connections by hose to live hydrants to provide limited service, repositioning valves, adding valves or installing temporary construction valves to limit the number of shutdowns experienced by any single business or building, etc.

Special attention must be given to medical facilities and schools when work may require to be rescheduled to avoid water service shutdown during normal operating hours.

A copy of SCOP-05-004G *Water Shutdown Planning* and SCOP-06-003W *DWM Temporary Construction Valves* has been included in the reference material section of this manual. Please read them and become familiar with their requirements.

The reference material section also contains a blank and sample shutdown notice. Examples of building/business/merchant and residential survey forms developed by DDC's Office of Community Outreach and Notification (OCON) can also be found in the reference section. OCON will gladly provide job specific forms for your use in addition to the customary brochures if requested.

RESEARCHING A LOCATION

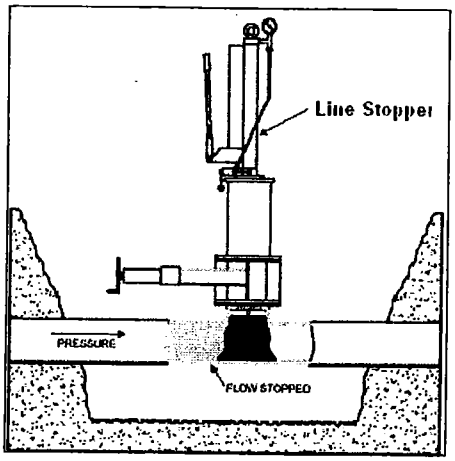
ADDITIONAL TIPS

- Please note that the street and curbs may have reconstructed several times since the existing water main was installed. The curb, a primary water main lane reference, may have moved due to street or sidewalk widening. Checking lane distances against the location of existing main line valves and hydrant valve box locations is a quick way to check if a curb has been moved.

- Grades can also change when roadways are reconstructed. The actual cover over a water main may differ from information provided on a field card. Water mains were typically replaced or re-installed when a roadway was significantly lowered to restore minimum covers for frost protection. When an existing roadway was raised, water mains may have been left in place or replaced / re-installed if the roadway grades significantly rose.

- A quick way to check for a significantly altered roadway grade is to measure the distance from the road grade to the top of a valve's operating nut. An approximate pipe cover can be then determined by adding two nominal valve or pipe diameters to the measurement. For more accuracy, don't forget to subtract half the difference between the three-way/tee/3W run and branch diameters from the previously determined cover to approximate the main or "run" pipe cover when using a hydrant valve for an initial measurement.

- Manhattan construction contracts (and known problem areas) may contain items for line stopping and installing insertion valves.



Line stopping involves the installation of a stopper into a live water main through a tapped hole. The process involves the installation of a tapping saddle with a special flanged outlet around a pipe. A control valve is mounted on the flange and a tapping machine is mounted on the valve. A hole is cut into the pipe. After the shell cutter head is withdrawn, the valve is closed. The tapping machine is removed and the line stopping machine is mounted on the flange of the control valve. The stopper is advanced into the pipe and the flow stopped. After the required work on the pipeline is completed, the stopper is withdrawn and the machine is replaced with completion plug setting machine. The plug has an o-ring gasket and a setting groove. Once advanced into place the plug is secured inside the flange of the tapping saddle by advancing shear bolts into the setting groove. After the setting machine and control valve are removed, a permanent blind flange is installed on the tapping saddle. Line stopping can be used to: temporarily isolate a water sensitive business or facility during a shutdown to maintain service; reduce the area affected by a given shutdown; allow pipe repairs and valve replacements to occur with minimal service loss, etc. Line stoppers can be used in a variety of configurations that permit the installation of temporary and permanent by-passes.

Insertion valves can be installed without a shutdown. The process involves the installation of a special split valve body around a pipe with ends sealed with a mechanical joint gasket and secured in place with split wedge retainer glands. The split valve body bonnet seal is round and flanged. A control valve is mounted on the flange and the pipe inside the special valve body is removed with a shell cutter mounted on the control valve. The mechanical "guts" of the valve is then installed using an insertion tool mounted on the control valve. The valve is secured in place

utilizing shear bolts and with the o-ring gaskets providing a watertight seal. The control valve and insertion tool are then removed and the permanent valve-body retaining ring is installed. Insertion valve systems and services are provided by Hydra-Stop, Severn-Trent and Occlude.

- While conducting your survey, it is good practice to note the ethnic and religious makeup of the neighborhood. Our contract boilerplate lists federal and state holidays when work is to be suspended. Unlisted religious and ethnic holidays, and groups that strictly observe the Sabbath may impact upon your ability to schedule service shutdowns. It is good practice to discuss these issues with local community, religious and ethnic group leaders to coordinate the work in order to minimize disruption to the project and neighborhood.

- Although street addresses and names may have changed over time, block & lot information typically remains constant. Utilizing block & lot information will facilitate a more thorough tap search.

- While conducting your Tapping Record search, note all the existing wet connections and their sizes. Compare your count to the bid quantity for installing wet connection / tapping sleeves and valves. If the records and bid quantities match, verify the count while conducting your Walk-Thru. If you suspect that the count is in error (i.e. records show a ¾-inch tap for a 6-story building), you can direct the contractor to dig up the connections or check the size of the service by entering the building. Domestic service connections (tap or wet connection) to the main are typically one size smaller than the service pipe. Typically the connection and service pipe are equal in size for fire or combination services. See SCOP governing service transfer rules for more details.

  DEP Maintenance forces cut wet connections for the contractor and it is very important to have an accurate count so the appropriate wet connection / tapping saddles can be ordered, mounted and cut prior to laying distribution water main. If your contract lacks such items and your Tapping Record search yields existing wet connections, a change order needs to be prepared in a timely fashion so as not to delay work. ,

THE "SHUTDOWN"

Test Shutdowns & the "Flushing" Crew
Contact the DEP's Distribution Engineer for the borough you are working in to discuss the need to conduct test shutdowns. The Distribution Engineer and his staff are familiar with the system's maintenance history and are aware of problem areas. DEP's maintenance unit is also a good source to help you determine the likely problems to be encountered during a shutdown in a given area. Several small water companies (Jamaica Water Supply, Woodhaven Water, Citizens Water) that the City eventually took over provided water to the residents of Queens. Valve operation direction, restraint methods, hydrants, water service materials, ownership of the water service and water service replacement criteria, etc. were not standardized between the companies. Being aware of these issues will improve your ability to achieve a successful shutdown and avoid problems.

DEP utilizes a "flushing" crew for several tasks: to flush hydrants in poor circulation areas to restore chlorine residuals, to flush accumulated debris for the valve seating surfaces and to test, exercise & operate valves and to conduct flow tests. Test shutdowns are usually performed overnight. A flushing crew will normally conduct a valve flushing operation while performing test shutdowns. You have to contact DEP's maintenance shop or Distribution Engineer to get the results of test shutdowns if they were scheduled and conducted overnight.

Determining the "Shutdown" Limits
When determining the limits of your shutdown you must include an operating hydrant within your shutdown limits in order to flush valve seats and to test the shutdown. Hydrants with custodian locks (magnetic) can be an issue (see Walk-Thru section in "Researching a Location" chapter for additional information). A special wrench is required to open and close these hydrants and their distribution is tightly controlled. If no hydrant is available and the shutdown cannot be extended, a screw tap can be installed for testing purposes but it will limit your ability to flush valve seats.

Minimize the limits of your shutdown to accommodate scheduled constructions activities. For example:

- A full day shutdown for the main pipe crew plus two half-day shutdowns on a side street to install side gate valves is permissible if the system can handle it.

- Do not call in a shutdown for the entire length of a five-block contract when a single water crew is scheduled to work. The shutdown should be limited to the contractor's water crew's capabilities.

Be aware of dead end streets and water mains as the limits of your shutdown and notification may have to be extended.

If your shutdown incorporates a regulator valve outlet, the appropriate DEP Distribution Engineer must be contacted before it can be scheduled. Work near a regulator valve chamber may have to coincide with a low demand period. Peak usage can be seasonal, based on a weekly or a daily cycle or on a local business's manufacturing schedule.

Call-in Procedure
You have to contact the borough construction office to log in a shutdown. Depending on the borough you may have to call the DEP yard too. These calls must be made before noon on the day preceding the shutdown or by noon on Friday for a Monday shutdown or weekend work.

THE "SHUTDOWN"

Notification
Try to provide 48 hours notice the first time you conduct a shutdown at a new location. A typical house or apartment building may have a resident conducting in home kidney dialysis on particular schedule, etc. The initial 48-hour period will give you a chance to work around and resolve unforeseen problems. After the first notice, 24-hour advance notice will be sufficient.

Notices should be given to all homes within the block and to corner properties as well. Tape a notice up in building lobbies and give a bunch of copies to the building superintendent. Make sure the contract number and field office telephone number are on the notice and that all the emergency contact phone numbers are up to date. A sample notice can be found in the Reference Material Section.

Lock Out / Tag Out (LOTO) Procedures
DEP has instituted a Lock out / Tag Out (LOTO) procedure involving valve operation in order to prevent accidental operation during a shutdown. The procedure designates a responsible individual that must be contacted before service is restored by DEP maintenance. DWM work normally does not require the inspector to be involved in this process as the contractor restores service to the "shutdown" area by opening a single valve. DEP maintenance then opens the remaining valves after being notified that service has been restored at the end of the day's work. For long duration shutdowns (i.e. TWM tie-in work or replacement), DEP may require the RE to be the designated responsible individual.

The "Shutdown"
A typical shutdown has four phases:

1. The initial closing of the gate valves.
2. Evaluating the leakage.
3. Troubleshooting as required.
4. Checking behind the shutdown for service continuity.

Meet the DEP crew promptly at the designated time and place. Have your DDMs with you. DEP's maintenance crew may not be carrying DDMs. It is good practice to spray paint the rim of main line valve box (MLVB) frame if the shutdown is to be repeated (DEP's maintenance may spray paint and number the MLVB covers themselves if it is large shutdown). DEP's maintenance crew typically operates the existing valves. The contractor can operate valves installed under his contract that are part of the shutdown only. The contractor should assign a few laborers to assist DEP's maintenance crew if needed. Make sure DEP's crew is aware of any hydrants with custodian locks (magnetic) that were opened to test the shutdown and flush valves that are closed after service is restored at the end of the work day. Sometimes a contractor may possess a makeshift custodian lock hydrant wrench that can be used for this purpose.

The crew may need to exercise the valves to flush debris from the valve seats in order to provide a good shutdown. How good a shutdown is determined by the height of water exiting a 2½ or 4-inch hydrant nozzle measured by the width of a finger.

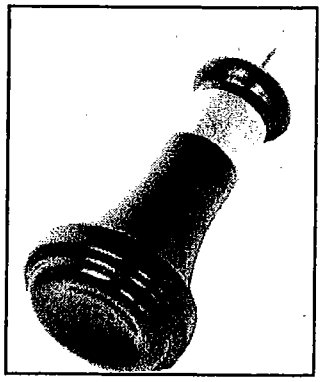
Water main installation work can be done with a small leak since the joints are made up with rubber gaskets. Lead joint work requires the pouring of molten lead and even a small leak can be a safety hazard and prevent the running molten lead from completely filling a joint. Working in a wet trench during the winter has its own set of problems. It is a better to achieve the tight shutdown and work in a dry environment.

THE "SHUTDOWN"

Troubleshooting a "Shutdown"
The following actions are typically taken by DEP's maintenance crew to troubleshoot and improve a shutdown:

Counting Turns
Prior to closing a valve, it is good practice to open the valve completely by turning the gate key in a clockwise direction until it stops. NYC standard valves open in the clockwise direction (left-handed open). Count the turns (full revolutions) until it is closed completely by turning the gate key in a counter-clockwise direction. The number of turns required to close a valve is determined by multiplying the valve's nominal diameter in inches by three and adding two or three additional turns to this total for seating purposes. If you achieve your computed turn count while closing the valve, it is likely to be operating properly.

Sounding a Valve
"Sounding a valve" or "checking the valve for noise" is accomplished by placing the steel bar on top of the valve's operating nut and pressing your ear against the bar to listen for a hissing sound after it has been closed. The DEP maintenance crew may be equipped with a device known as a sonoscope. It has a metal stem and disc encased in a plastic cone with a telephone earpiece. It amplifies the hissing sound when the metal tip is in contact with the bar. If a valve has bad leak, a vibration can sometimes be felt when gripping the bar lightly. If there are several valves to be closed in your shutdown, initially listening for vibrations may not be successful as the other open valves may impede flow through the closed valve being checked for noise. If a significant amount of water is steadily flowing out your test hydrant once all the valves involved in the shutdown are closed, each valve should be checked for noise.



Flushing a Valve
If noise is detected on a closed valve, it may be leaking. Normally the leak is caused by accumulated dirt and sediment in the valve seat that prevents the discs or wedge from sealing properly. To flush a valve, open the valve 4 to 6 turns. Watch the test hydrant for an increased flow that is dirty or brown in color. Once the flow of water clears up (usually 10 to 30 seconds), shut the valve and check for noise. Repeat the process until the valve is quiet or the noise significantly reduced. Proceed to the next closed valve to check for noise and flush as required. A good shutdown is usually achieved once this process has been completed for all the valves involved in the shutdown.

On occasion a small leak can get larger as the day goes on, the leak may be dislodging buildup in the valve seat that was not flushed. Check the valves located in the direction the leak is coming from. Squeeze shut any noisy valves again.

Other Things to Consider:
Right-Handed Open Valves
These valves open when turned in the same direction to close a standard NYC valve. A right-handed valve would be fully open when performing a conventional NYC shutdown. No noise will be detected on a valve when it is in a fully open position and all would think that it is closed with no leaks. If working in an area that may contain right-handed open valves, your test hydrant would be full flowing when completely open and appear as no shutdown had been attempted. If you suspect a right-handed open valve is involved, it can be tested for. Turning the gate key in a clockwise manner should open a standard

NYC valve. The initial few clockwise turns to open a closed standard NYC valve are difficult as the valves wedging action is being released and subsequent turns are lifting the gate. If the gate key turns relatively freely after a fraction of a turn, you might have a right-handed open valve. Continue turning in the clockwise direction counting turns. You should feel the signature valve closing signs: the last two or three turns increase in difficulty to seat and squeeze the valve with vibrations diminishing as the flow through the valve decreases and stops. Check your test hydrant for a reducing flow rate as the valve is being closed. Check the other valves, there may be more than one right-handed open valve.

Draining a Building

If a building does not close its service valve, your test hydrant may exhibit a significant flow that will reduce in volume and pressure over time. The water may be draining from a large building or its roof tanks. Check with the building superintendents to see that they have closed their service valves. Sometimes building superintendents rely on check valves to prevent backflow from roof tanks into their pumping system. Check valves need constant maintenance to keep them operating properly. Remind them to close the valve feeding their pumping system to prevent a backflow due to a faulty check valve.

Corner Property or Large Facility w/ Two Services

A corner property or large facility may have two services for redundancy and be connected to water mains separated by a valve on each fronting street. If the service valves are not closed, your test hydrant may exhibit a significant flow that will remain steady and pressurized over time. Check with the building's superintendent to see that they have closed their service valves located on the fronting street involved in the shutdown.

Checking Behind a "Shutdown"

The last step in completing a shutdown is to check that the adjoining mains located outside the shutdown limits are still under pressure. DEP's maintenance crew accomplishes this by opening hydrants on the adjoining mains to check for flow. If the adjoining main was affected, the maintenance crew will check and open any valves found closed outside the shutdown limits to restore service to the affected area.

If this check was not witnessed, the inspector should definitely ask the crew foreman if this was done and note it in his report. It may be difficult to conduct this check once the crew leaves if custodian locks are installed on hydrants in the area.

Extending a "Shutdown"

A shutdown can be extended to backup a faulty valve without notification provided that it will not affect additional consumers or adversely impact the system. In all other cases the day's work will be suspended and tests can be conducted to determine which valve is failing if possible.

Call-in the extended shutdown limits, conduct the notification and resume work the following day.

Emergency "Shutdown"

There may be an occasion when the new installation work may be subjected to an unexpected mechanical failure or disturb the existing main to such an extent as to cause a joint separation failure or a water main break. Two of the three incidents the writer experienced involved lack of proper joint restraint on the existing water main. The vertical offset restraint had relied on the weight of the pavement to hold it in place and once saw cut was unable to do so. The other incident involved settlement. An existing utility had been supported in place. After the trench had been backfilled, it settled onto the existing cast iron water main that had been tied into shearing it. Another potential source for an unexpected water main failure can occur while temporarily supporting a cast iron water main across or in a trench. Minor movement can cause lead joints to leak and if left unchecked can escalate into a more serious situation.

If such an incident occurs on your contract while the contractor and inspection staff is present, immediately expand your shutdown to minimize damage to private and public property and inform DEP immediately. Knock on doors to notify any affected consumers. Inform the Resident Engineer about the problem if necessary and notify your Engineer-in-Charge.

Restoring Service

After the water main has been sanitized at the end of the workday, a single valve will be opened to restore service to the consumers involved in the shutdown. Preferably, the valve to be operated will be one that the contractor had installed. If not, the contractor will open an existing valve under the inspector's supervision to restore service. A call to DEP maintenance informing them of the time that service was restored and the location of the valves remaining to be opened must be made at the end of the workday. Remind DEP maintenance to respond promptly and close shutdown test hydrants equipped with custodian locks that may have been left open.

THE "SHUTDOWN"

ADDITIONAL TIPS

- Brown water and the associated complaints are caused by stirred up sediment in a water main. Flushing valve seats and high flow velocities can scour the interior of a water main picking up and transporting sediment. Hydrants used for shutdowns and fire fighting can also cause brown water incidents. Brown water can clog corroded services and piping, water meters, faucets, flush-o-meters and control valves in appliances if it enters a building's plumbing system. The best way to guard against this problem is encourage homeowners to shut their service valves during a shutdown and not open them until the water main has been disinfected, flushed and put back in service.

- If a homeowner does not know much about his internal plumbing system, inspect his home and point out the valve he should be closing during a shutdown. The homeowner is responsible for keeping this valve in good working condition. A homeowner may make an issue over a bad valve in an effort to have it repaired, so do not operate or touch a service valve. A homeowner may take the opportunity to replace a service valve during a shutdown. Try to monitor such activity so that the main is not restored to service prior to the private work being completed.

- Shutdowns during the heating season can generate a lot of homeowner questions. In most cases a steam or hot water heating system has a water reservoir that can last for weeks before needing a refill if in good condition. Such questions should be directed to the homeowner's plumber or heating system service provider.

- Hot water generation requires water. During a shutdown, all hot water generation typically stops. Once the service valve is shut the plumbing system becomes a closed system. The shutdown notice directs the homeowner to open a hot water valve on an upper floor to allow the system to expand and release built up pressure (Please note that if the house service was open, the hot water system would release built up pressure by expanding back into the cold water system feeding it if no check valve was present). Again, such questions should be directed to the homeowner's plumber or heating system service provider.

- In South Queens, former Jamaica Water Supply valves are right-hand open valves meaning they open when turned in the counterclockwise direction. Small round valve boxes and covers approximately 6 or 8-inch in diameter provide operational access to these valves. When former Jamaica Water Supply valves are replaced with standard NYC valves a NYC standard 24-inch diameter MLVB is installed over the valve to provide operational and maintenance access. On rare occasion a former Jamaica Water Supply valve may have been replaced with a standard NYC valve and the old small valve box reused. Restoration patches around the valve box may alert you to such an instance.

- Be careful when leaving a test hydrant with a custodian lock open and running for DEP maintenance to close. DEP maintenance may not respond for hours if called during a shift change. The water may collect in an intersection and become a safety hazard. Vehicles may lose control hydroplaning on it or the water can freeze overnight if temperatures permit. The water may even flood a building or home and can undermine a temporarily restored trench. Briefly shutting down to put hydrant caps on an open test hydrant with a custodian lock before restoring service will cut the flow down considerably. If putting caps on the hydrant is not possible, consider closing the hydrant valve and putting a white ring on the hydrant as a last resort if you cannot turn off the hydrant. Inform DEP maintenance accordingly.

"TYPICAL DAY" D.W.M. Installation Activities

Material Release and Shipping Authorization

The inspector should familiarize themselves with the approved manufacturers and vendors for the project before work begins. DDC's Quality Assurance and Construction Safety unit (QACS) regularly visit manufacturing plants conducting quality assurance inspections and review material certifications and testing results to insure all manufactured items meet our specifications. Approved ductile iron pipe and valves has raised letters spelling "WSNY" and a casting date casted in the bell and valve bonnet, respectively. Most pipe manufacturers p rovide additional identification for approved the pipe with production stickers or by painting "WSNY" along the pipe barrel. All items shipped to our construction sites should be accompanied by a "Material Release and Shipping Authorization" form completed by QACS. The Resident Engineer should review the forms and file them with the project records. For details consult the copy of SCOP 05-011G: Material Release and Shipping Authorization - QACS included in the Material Reference Section of your manual.

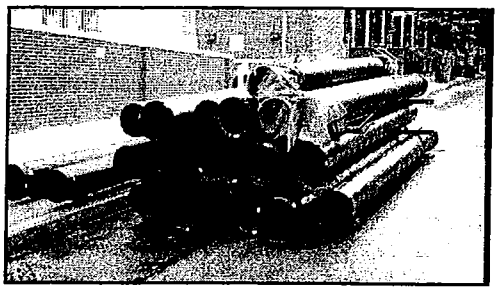
Saw-cutting

Vermeer cuts need to be filled in with cuttings or asphalt and tamped if done too far in advance due to the 3 to 4-inch wide cut and the potential trip hazard it creates. Pavement Excavation is easier because the cuts are wide and there is less physical contact with the adjacent pavements. Also, less damage will be done to the adjacent pavement and leaves a rougher surface for new concrete to bond to.

Pavement saw cuts are no more than a ¼" wide and pose no trip hazard. Saw-cutting can be done in advance. Cut surfaces are smooth and may need to be roughened-up for placement of new concrete on protected streets. More damage occurs to adjacent pavement due to tight physical restraints.

This is a good time to lay and station a baseline parallel to the proposed water main for inspection, recordkeeping and payment purposes.

Pipe Washing



Use a hose and clean water to remove large debris (sand, dirt etc.) from the inside of the ductile iron pipe. If the debris is caked on, scrubbing or high pressure hosing may be required. Remember!! This may have to be done before the shutdown due to the limited availability of live hydrants. After washing, the pipe ends should be covered with large burlap or plastic bags, plastic pipe plugs and/or wood plugs to keep the pipe clean inside.

"TYPICAL DAY" D.W.M. Installation Activities

Storing Pipe Along-side the Trench

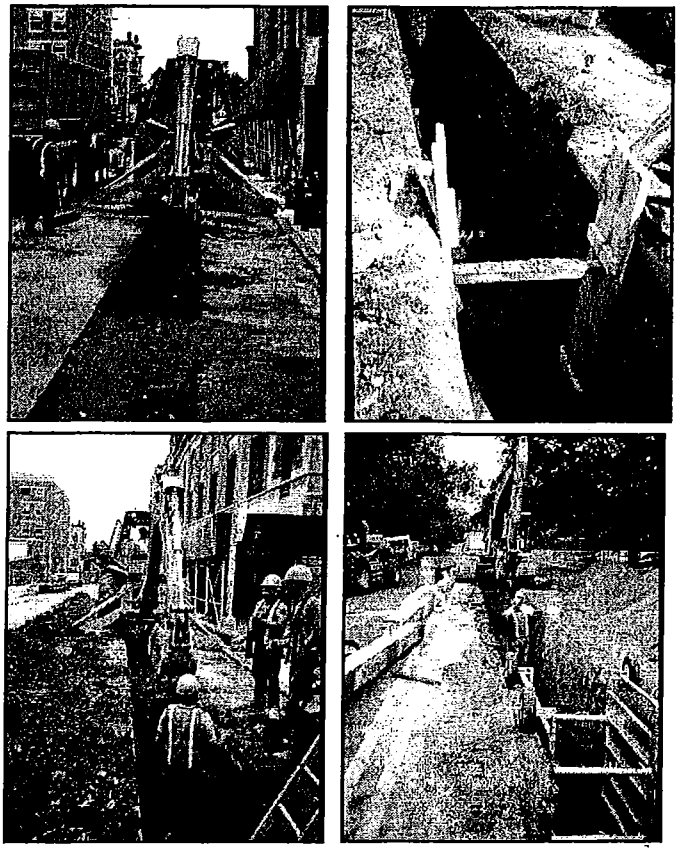
Pipe stored alongside the trench has to be raised off the pavement using wood blocks or sand bags and the ends covered to keep the pipe clean. Sand bags are the preferred method because as the pipe work progresses the bags can be used to support the pipe as its placed in the trench and maintain the 6" gap between the pipe and sub-grade. Sand bags can also be left in place. Wood blocking has to be removed. Excess bags can be used to support services, wet connections, fittings, weigh down barrels & barricades, etc.

Excavating a D.W.M. Trench

Excavating a distribution water main trench is typically done in two phases: pavement excavation and trenching. Pavement excavation involves the removal asphalt and concrete base (when found). Asphalt and concrete are recyclable materials. Up 40% of new asphalt can be composed of crushed and processed recycled asphalt. Old concrete can also be crushed to produce a road base foundation material. The contractor will cycle through several trucks early in the day to remove such material and return with clean fill for use around the pipe. Pavement excavation should be limited to the amount of pipe a contractor can install in a single day.

For distribution water main work, trenching is typically the excavation of material for an un-sheeted trench with the following limits:

- Width is nominal pipe diameter plus 2 feet
- 6-inches below the pipe
- and the following pipe covers:
  - 6 & 20-inch pipe - 4'-0" cover
  - 8-inch pipe - 3'-9" cover
  - 12-inch pipe - 3'-5" cover



Please note the 4'-0" cover for 20-inch pipe installation will require a trench excavation depth in excess of 5'-0". The installation of 20-inch pipe in shallower trenches can lead to frost problems and the lack of cover to properly install main line valves.

Care should be exercised so as not to disturb the trenches' sub-grade during excavation. If disturbed, the sub-grade should be re-compacted. If the walls of the un-sheeted trench are unstable, stay bracing or the use of tight sheeting may be required. The contractor must designate a "competent" person in writing to make decisions regarding the use sheeting for depths of 5'-0" or less. For trenches with depths in excess of 5'-0" or when located adjacent to a structure that could be undermined, the use of tight sheeting is required.

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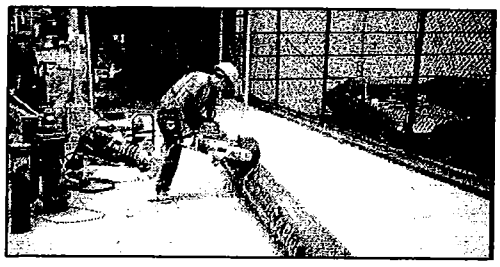
As the trench is being excavated, the existing fill should be inspected and a determination made as to whether it is suitable for reuse (with minor or no grooming) as backfill material in the zone located one foot above the pipe to grade or needs to be sent to a recycling plant for processing. Use of processed material will become more prevalent when the Arthur Kill Landfill closes and private dumping fees become the norm.

Preparing and Installing a Pipe Length

A lifting strap is placed around the pipe and the end covers are removed. The pipe is sprayed from both ends with a 1% chlorine solution and a push-on Field-Lok gasket can then be installed in the bell end. Wood plugs (soaked in chlorine solution) are then placed on both ends before the lowering the length of pipe length into the trench. The wooden plug is then removed from the bell end of the previously installed length of pipe in the trench. Sand bags are placed just behind the resting point of the bell of the pipe to be installed. The wood plugs are then removed from bell of the pipe in the trench and the spigot end of the pipe to be installed. Gasket paste is then applied to the gasket and the spigot end of the pipe. Do not apply the grease in advance to the spigot end as sand and debris can stick to it and foul up the tight seal. The pipe spigot end is lined up with the bell in the trench and the pipe is pushed in using a bar or the bucket of the excavator and a wood block. Pay attention to the final position of the gauge lines. The wood plug in the bell of the newly installed pipe is removed, a measured amount of chlorine powder is put into the pipe and the plug is re-installed.

Mechanical Joints and Fittings

Ductile Iron fittings installed in the NYC distribution water main system are all bell end and mechanical joint. Restraint is provided by several approved models of wedge-type retainer glands (WRG) and US Pipe's MJ Field Lok Gasket restraint system. Please refer to the DWM Manual No.1 or the Water Main Specifications for the current list of approved WRG(s). The manufacturers' catalog cut sheets and installation instructions can be found in the aforementioned manual.



The installation of a mechanical joint fitting or valve usually requires the ductile iron pipe to be cut. Only gauged pipe should be field cut. Gauged pipe has been tested for roundness and OD tolerances. Gauged pipe has identifying markings which vary by manufacturer (see Reference Material section of DWM Manual No.1 for specifics). Oversized pipe may require grinding whereas undersized pipe may not actuate restraint systems properly or provide a watertight seal. Ductile iron pipe is typically field cut using an abrasive saw. Proper safety equipment should be used when cutting the pipe such as safety glasses, headphones or ear plugs, a spark arresting barrier and sound attenuation equipment (as required).

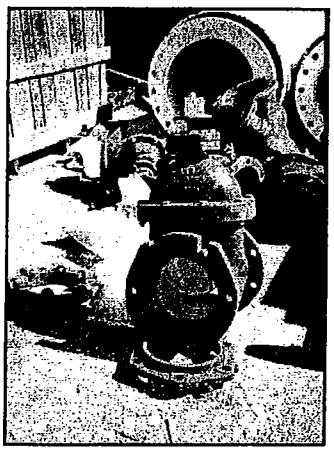
Unlike push-on joints, the cut spigot end does not need to be ground down and shaped. Mechanical joint gasket depth mark should be drawn of the cut spigot end to facilitate joint assembly. The inside of the

mechanical joint bell and the outside of the spigot end of the pipe (8-inch length) shall be thoroughly cleaned to remove oil, grit, excess coating and other foreign matter, and then painted with a soap solution or an approved gasket lubricant. The WRG and then the gasket shall be slipped over the plain end of the pipe. Care should be exercised when slipping a mechanical joint gasket over the cut end of the pipe so as not to damage the gasket. The small side of the gasket and the lip side of the gland shall face the socket. The gasket shall then be painted with soapy water or gasket lubricant. The pipe or fitting shall be pushed forward to seat the spigot end in the bell. The gasket shall then be pressed into place within the bell. Care shall be taken to locate the gasket evenly around the joint. The gland shall be moved along the pipe into position for bolting, all of the T-bolts inserted with the nuts finger tightened. Make any necessary deflections at this time before any wedge restraints are actuated to ensure a proper gasket seal. Present specifications require the T-bolts to be coated with a flouropolymer coating to prevent corrosion and facilitate assembly. WRG T-bolts nuts are typically tightened to a torque of 85 foot-pounds using a calibrated torque wrench. Nuts spaced 180 degrees apart shall be tightened alternately to produce an equal pressure on all parts of the gland. Tighten the torque limiting twist off nuts in a clockwise direction until all wedges are in firm contact with the pipe barrel. Continue tightening in an alternating manner until all the nuts have been twisted off. If removal is necessary, utilize the ⅝-inch hex heads provided. If reassembly is required, assemble the joint in the same manner as described above. Tighten the wedge bolts to the manufacturer's recommended torque (typically 90 foot-pounds) using a torque wrench.

US Pipe's MJ Field Lok Gasket restraint system installation follows the same procedure above but eliminates the need to tighten torque limiting twist off nuts to engage the restraint wedges. The restraint wedges are located in the gasket and are actuated as the T-bolts are tightened. The recommended T-bolt torque for the MJ Field Lok system is higher than that required for a WRG. MJ Field Lok gaskets 4-inch to 8-inch require a T-bolt torque of 90 ft-lbs and gaskets 10-inch to 24-inch require a T-bolt torque of 120 ft-lbs. MJ 120 ft-lbs for 10-inch to 24-inch gaskets. MJ Field Lok Gasket must be installed with a MJ Field Lok gland. Although they resemble plain glands, MJ Field Lok Glands are designed for higher torques and for restraint. Some of the mechanical joint restraint systems are available in individually boxed kits containing the gland, gasket, T-bolts and a small tube of lubricant to complete a single joint. Eventually these pre-packaged boxes will be available with T-bolts coated with a flouropolynmer. Presently all the components will ship separately when special T-bolt treatment or materials are required.

Main Line Valve Installation

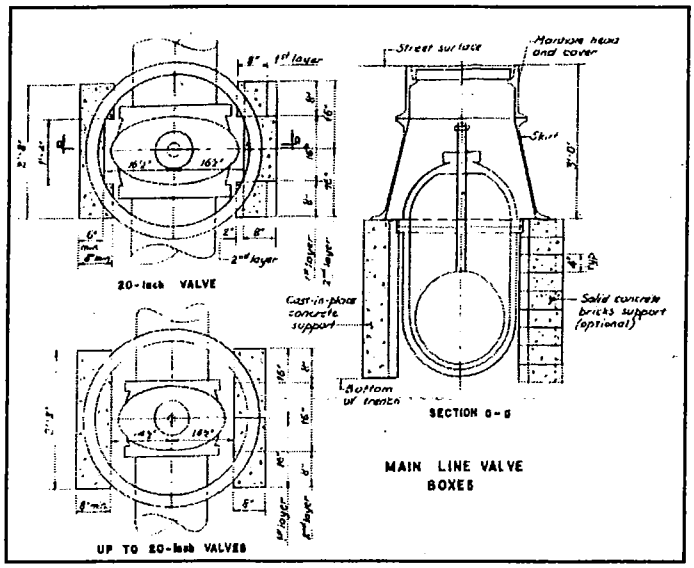
Two types of valves are presently used in the City water distribution system: double disc gate valves (left) and resilient seated wedge gate valves (right). Gate valves are used throughout the distribution system to isolate sections of pipe for repair or improvement and to establish pressure zones.



Valves with mechanical joint ends have two "cut out" bolt holes located below the bonnet flange due to the lack of thru-bolt space between the flange of the mechanical joint

"TYPICAL DAY" D.W.M. Installation Activities

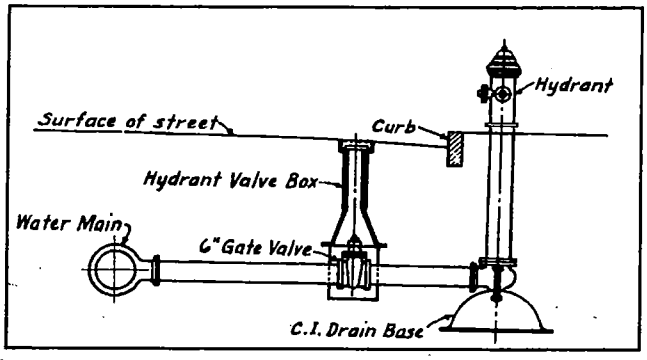
bell and the valve body. T-bolts with square necks should be used in the "cut out" bolt holes to hasten joint assembly. A T-bolt head jams against the body of a fitting or valve lifting and simultaneously locking it into place in a bolt hole as it is tightened. A "cut out" bolt hole does not allow the "lift and lock" action to occur. The square neck locks the bolt in place for tightening in "cut out" bolt holes. Valves should never be lifted by nylon straps, cable slings or chains wrapped around their operating nuts or just beneath the valve stem stuffing box due to the potential damage that could be caused. Valves can be lifted by wrapping a strap, sling or chain around its body below the bonnet flange. Before installing a valve, it is good practice to open and close it checking its operation. Spray the valve and wedge with a 1% chlorine solution before installation.



Gate valves are typically installed at the projected building line near intersections for accessibility purposes. A mainline valve box, consisting of a 12" deep manhole frame with a 24" diameter cover and a skirt, are installed on a cast-in-place concrete or block foundation over a valve to provide easy access for maintenance and operation. The standard drawing for valve box foundations permits the use of cast-in-place concrete but it is rarely used due to the delays it imposes on backfilling operations. Concrete blocks should be placed on the trench sub-grade and stacked until the top of the last row of blocks is three feet below grade. Care should be exercised when placing the skirt so that the bottom does not come into contact with pipe. This prevents transmission of impact forces into the pipe from vehicles riding over the castings. Under no circumstances should the skirt be cut to accommodate a shallow installation. Try utilizing a 6-inch deep manhole frame instead. If that is insufficient the pipe and valve assembly should be lowered. Sand bags are jammed into the opening between the top of the pipe and the bottom of the skirt to prevent backfill from migrating into the valve box. Clean fill should be placed up to the mid point of the bonnet in the valve box. Minor grade adjustments can be made by placing steel wedges between the manhole frame and skirt and sealing the gap with mortar.

Hydrant Installation

The City utilizes two types of hydrants: a Dresser type hydrant (D-2-LP) and a Smith type hydrant (S-2-LP). The two types of hydrants are of a "dry" barrel design, open in the clockwise direction, provided with a standard 6-inch diameter mechanical joint (MJ) bell connection and are designed to "breakaway" at pre-determined points. Hydrants are connected to the main with a 6-inch diameter branch controlled by a 6-inch gate valve with operational access through a hydrant valve box. Both types of hydrants can also be fitted with custodian locks after installation.



"TYPICAL DAY" D.W.M. Installation Activities

When a hydrant is closed, a drainage valve opens allowing the water in the "dry" barrel to drain into a cast iron drain basin (CIDB) through a piece of ¾-inch, type K copper tubing connected to the hydrant with a ¾-inch M.I.P thread x flared end straight coupling. When field conditions dictate, drainage can be provided by the construction of a blind drain and an extended copper tubing connection. A blind drain is a bottomless concrete box with a separate roof slab and filled with ¾ CY of stone. If a blind drain is utilized or the drain is plugged due to a high water table, the hydrant must be set on a concrete block not less than one foot square and 6-inches thick.

In order for the "breakaway" components to function properly, the center of the standpipe coupling on Smith type hydrant or the center base flange on a Dresser type hydrant must be set minimum of 3-inches but no more than 6-inches above the finished concrete. Dresser type hydrants have a raised "bury" ring casted into the standpipe that is installed just above the finished concrete to obtain the recommended minimum clearance. Smith type hydrants have no standpipe "bury" rings and should be marked with chalk or a lumber crayon before installation. The minimum clearance allows for the replacement of the standpipe coupling or breakaway lugs on the respective hydrant. New installations should not be adjusted to proper clearances using extension kits. If field conditions warrant, the contractor should obtain a hydrant with shallower or deeper "bury" dimension as required. Hydrants are available with standpipe "bury" dimensions ranging from 2'-6" to 6'-0" in 6-inch increments.

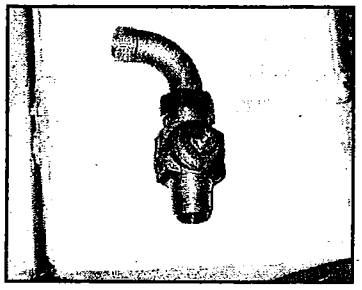
The hydrants are protected from minor contact by 6-inch diameter steel fenders filled with concrete. The fender pipe and caps must be set 4-inches below the top of the operating nut on the hydrant. The fenders are set in such a manner as to not block access to the hydrants nozzles. In addition, the concrete flag is separated from the surrounding sidewalk with an expansion joint. This provides for minimum amount of sidewalk to be disturbed if replacement requires buried components to be removed by excavation. Please refer to standard drawing numbers 45161-A-Z or WM0030 for fender layout details.

The size of the main to which the hydrant is connected to must be stenciled to the standpipe just below the nozzles facing the street in white numerals 5-inches high. Hydrants attached to mains less than 24-inches in diameter are to be painted black and aluminum. Hydrants attached to mains 24-inches in diameter and larger are to be painted red and aluminum. Hydrants that are installed in high ground water areas are installed with a drain plug and are marked with the letter "P" next to the size of the main it is connected to. These hydrants are checked more frequently in the winter and are pumped dry after each use during the winter by the Fire Department to prevent freezing.

"TYPICAL DAY" D.W.M. Installation Activities

Service Transfers

Taps / Corporation Stops

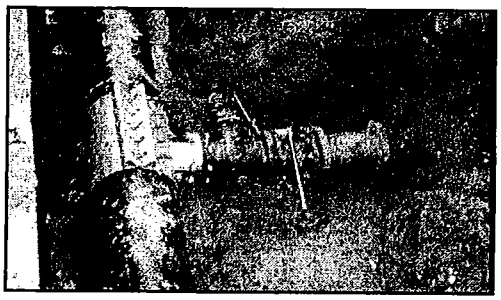


Tap (a.k.a. corporation stops) installation involves drilling a hole and cutting tapered threads into the water main and inserting the tap. Taps have tapered threads, ground key stop valve and a quarter bend with a swivel nut and M.I.P. end that accepts a F.I.P. x flared end coupling. Taps are not to be installed on a fitting or a hydrant branch or within 24 inches of a hub, hydrant branch or dead end. The minimum spacing is 18 inches for ¾ and 1-inch and 24 inches for 1½ and 2-inch corporation stops. A tapping machine utilizes a combination drill and tapping bit to cut and tap a hole in the pipe. A power pack (electric or pneumatic) can be employed to perform the operation. Tapping machines normally utilize pressurized water from a live main to cool the bit and flush out metal chips and debris. Tapping on DDC projects is normally performed dry requiring the use of a harden bit and an approved cutting grease. Under no circumstances should motor oil, thread bolting paste or any unapproved grease be used to tap a water main. Taps are installed on the pipe between the 1:00 & 2:00 o'clock position or between 10:00 & 11:00 o'clock position pointing toward the property the connection is to serve.

A type K copper tubing swing or gooseneck is formed in the shape of a question mark with the tail end being connected to the existing service using a coupling. Type K copper tubing is connected to the tap and new service using flared fittings. Flared connections provide restraint and pull apart resistance. Special adapting couplings are used when the existing service is not copper tubing. The type of coupling selected to connect to the existing service depends on the material the existing service is made of. Taps and couplings are made of red brass, a soft alloy. They have flat surfaces to facilitate the use of smooth jaw adjustable wrenches to tighten the connections. The teeth of a pipe wrench jaw can cut into the brass and damage the fitting. Over-tightening can also distort the fitting causing it to leak and make it susceptible to a stress corrosion failure. A tap's final position should have the centerline of its plug valve parallel to the pipe. This position provides the valve portion of the tap greater protection from damage by directing backfilling shock loads from the service to stronger sections of the tap. Placing a sandbag between the service swing and pipe helps to minimize backfilling shock loads by preventing movement. After the tap and reconnection work is completed, close the tap to prevent the 300 PPM chlorinated water from entering the building or home. The tap will be opened once the main is thoroughly flushed. On DDC projects, corporation stops are installed by plumbers working under the supervision of NYC licensed plumber hired by the contractor.

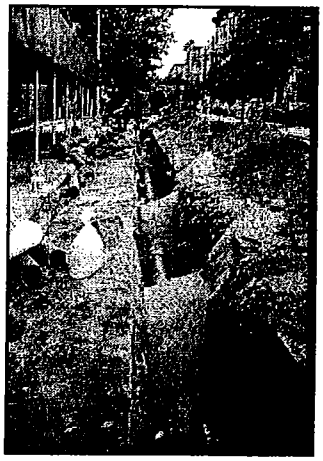
"TYPICAL DAY" D.W.M. Installation Activities

Wet Connections



Service connections that are 3-inches and larger utilize a tapping sleeve and a tapping valve. The City specifies tapping sleeve made of heavy gauge stainless steel with reinforced stainless steel armors, a stainless steel pipe branch, a stainless steel flange and stainless steel carriage bolts. The seal to the pipe is provided by a gridded gasket bonded to the sleeves' body. Tapping valves are flanged x mechanical joint end gate valves of double disc or resilient seat wedge design. A tapping valve has a slightly larger waterway diameter than a regular valve to accommodate a cutting shell. The tapping sleeve is installed on the pipe and the valve mounted on the flange sideways (operating stem parallel to the pipe) to prevent the valve gate from dropping due to gravity and obstructing flow if the operating mechanism fails or is damaged. Prior to cutting, the installation is tested for leaks using a hand pump with a pressure gauge and a bucket of water. DEP maintenance forces provide cutting services. DEP's borough tapping division must be contacted and arrangements made for cutting the connections. Adequate lead-time must be provided for arranging cutting services. Normally, wet connection cuts are done dry at the site or in the contractor's yard in the middle of a full-length pipe. If a cut is to be performed in the trench, a secure excavation with dimensions as specified in Reference Drawing No. 10200-Z must be provided for the maintenance crew. After the tapping sleeve and valve is installed and reconnection work is completed, close the valve to prevent the 300 PPM chlorinated water from entering a building. The valve will be opened once the main is thoroughly flushed.

Open-Trench Leakage Test



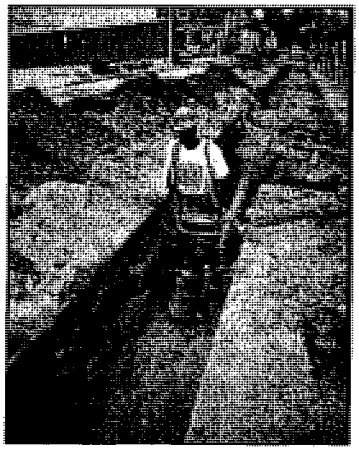
Near the end of the workday, the contractor's crew will cease laying pipe and typically install a night cap assembly (spigot/spigot piece with a mechanical joint cap restrained to the pipe with a "wedge-type" retainer Gland and a 1½-inch tap) by pushing it into the bell of the last piece of pipe installed using a regular push-on gasket.. Do not use a Field-Lok gasket because disassembling the joint is nearly impossible without specialized equipment and may require the bell to be cut off. The night cap is braced axially and laterally to prevent movement. The new pipe can be braced against the old. The extent of bracing and supplemental restraint provided is commensurate to the size of pipe being installed. Contractors have driven short I-beams and plates with backfill support to brace caps against. Although all pipe 24-inches in diameter and smaller has restrained joints, backfill around the pipe is still required to generate resistance against movement. After the cap has been braced, the "feed" valve is opened slightly and the main filled slowly. Air is allowed to escape through the 1½ -inch tap and after the main is filled the tap is temporarily closed to conduct the open-trench leakage test. It is good practice to allow the contractor to place select granular fill around the pipe leaving the joints and service connections exposed. The weight of the fill will keep the pipe from moving and hasten the completion of the backfilling operation after the test is successfully completed. The pressure in the water main must be at least 40 psi to conduct an open-trench leakage test. Conduct your test by visually inspecting each joint and service connection. Have the contractor repair any leaks found. Some repairs may require the main to be de-pressurized. Re-check the leaks after pressure has been restored. Once the leaks (if any) have been addressed the contractor can resume

backfilling the pipe joints only and slightly open the 1½-inch tap to start the disinfection process. Remember the service connection taps and valves were closed after installation. After the 300 PPM chlorine solution has been flushed from the main, the taps and valves can be opened pressurizing the service connections. Check the service connection for leaks and repair any leaks found. The contractor can now backfill the service connection work.

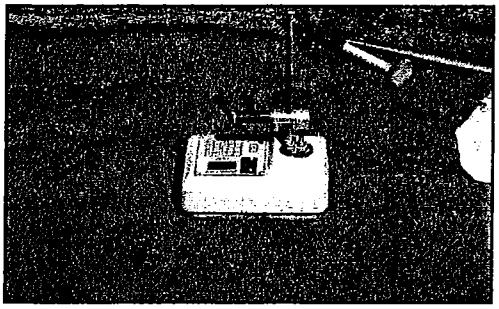
Backfilling the D.W.M. Trench

The first step in backfilling is to remove any debris (garbage, pavement, wood blocking, etc.) that fell into the trench while the pipe was being installed. Select granular fill (well-graded sand with less than 5% fines and particles no larger than ¼-inch) is placed around the pipe using a combo or front end loader with the following minimums: 6-inches below the pipe, 12-inches on each side of the pipe and 12-inches on top of the pipe. The backfill is placed in lifts. The top of the first lift is located just below the top of the pipe. The fill is compacted mechanically with jumping jacks / rammer tampers or vibratory plate tampers. Rammer tamper's have a narrow foot print allowing the backfill to be compacted under the pipe and below the pipe's spring line. The next lift is 12-inches above the pipe and coincides with the upper limit of select granular material. This layer is also mechanically compacted. The remainder of the trench is then filled in lifts with approved excavated suitable fill, clean fill and/or processed fill and compacted.

Clean fill must be comprised of less have 12% "fines" (material passing a no. 200 sieve), all three forms of fill cannot have stones exceeding 6-inches in its largest dimension and must also be well-graded so that "all interstices are filled with fine material". Larger mechanical compaction equipment, such as walk behind or riding vibratory rollers and reversible vibratory plates, equipment can be employed to compact the remainder of the trench.



The backfill material must be compacted to a minimum of 95% of Standard Proctor Dry Density. Proctor Analysis must be performed on all soils used to backfill the trench to determine the maximum dry density and optimum moisture content of soils being tested. Native soil samples should be collected for a Proctor Analysis when its composition changes from what was previously tested. Imported select granular fill should be subject to a Proctor Analysis initially and repeated if a new source is utilized. In-place density tests can be performed using a sand cone or nuclear gauge. Several tests should be performed on various



compacted soil layers at different depths of select granular fill, approved excavated suitable fill, clean fill and/or processed fill. Please note that nuclear gauges must be calibrated regularly and are suspect in soils with high moisture levels.

Disinfecting / Sanitizing and Flushing the D.W.M.

This is the last step of the disinfection process and typically occurs during the open-trench leakage test and backfilling phases. Check to make sure every newly installed hydrant is closed to prevent the disinfection solution from escaping accidently. Open a mainline valve slightly to fill the new main slowly so as not to wash the calcium hypochlorite powder to the end of the newly installed pipe. Open the flushing tap installed on the night cap assembly to allow air to escape. Once filled, close the flushing tap. Each newly installed hydrant should be slightly opened filling the hydrant and branch with the 300 PPM disinfecting solution and to allow air to escape. The hydrant should be immediately closed once water is detected at the nozzle. Please note that the new screw taps and tapping valves are closed at this time preventing the disinfecting solution from entering a consumer's system. The disinfection solution's effective contact time with pipe's interior can be increased by closing the flushing tap while conducting your open-trench (visual) leakage test. The extra time gained can vary but will allow the disinfection process more time to achieve 100% kill of the microorganisms and bacterium. After the leakage test is completed, open the tap slightly to commence to 15 minute contact time period. Direct the flushed disinfecting solution into a sanitary or combined sewer manhole. After 15 minutes, open the flushing tap completely to flush the disinfecting solution out of the new main. Estimate the time to completely exchange the water once in the newly installed water main using the tables located in the disinfection procedure section of this manual. After the time expires to exchange the water a single time, test the chlorine residuals of the flushed water and at a feed hydrant. If the residuals do not match (or are above 2.0 PPM), continue flushing and retest the flushed water after an additional 5 to 10 minutes expire. Keep retesting the flushed water periodically until the residuals match. Once the chlorine residual readings match what is obtained at the feed, flush every newly installed hydrant and then open all the new service taps, valves and connections so they can be checked for leaks. Continue flushing until the water in the main is exchanged several times or until backfill operations are completed and the main secured for the evening. Water samples will be collected the following morning for testing.

Temporary Restoration

Temporary restoration is to be performed immediately after the completion of the backfilling and compaction operations. Typically, trench restoration work is done early the following day. Steel plates are placed over the backfilled trenches in intersections and with barrels strung out over the remainder of the trench that was backfilled to grade. Temporary restoration work consists of stripping away fill to place 4-inches of plant mixed binder over the trench and flush with the adjacent pavements. In Staten Island, an additional fill material is stripped from the trench to place 4-inches of plant mixed binder on a 6-inch broken stone base. Permanent restoration work cannot begin until a six week settlement period expires. The contract may also impose a lineal foot upper limit on temporarily restored trenches that triggers permanent restoration work due to phasing or multiple locations.

"TYPICAL DAY" D.W.M. Installation Activities

Permanent Restoration

Permanent restoration of a water main trench is dependent on the type of contract the main is being installed under. Permanent restoration can be full road reconstruction, a curb to overlay or just trench restoration. Permanent trench restoration for an unprotected street with a concrete base requires a 9-inch wide cutback on the asphalt portion. New concrete is placed matching the thickness of the concrete base and surface. After curing, 12-inch wide reflective cracking membrane is centered over the new/old concrete and applied. Tack coat is brushed, rolled or sprayed on the concrete base and membrane. New asphalt (plant mixed binder and a wearing course) is placed and rolled level to adjacent pavement and edges sealed. Pavement cores are later taken to confirm thickness, strength of concrete and compaction of the asphalt. See NYCDOT Standard Detail of Construction No. H-1042B for permanent restoration details for sheeted or unsheeted trenches in unprotected or protected streets.

WATER CHLORINATION PRINCIPLES

Discovery

Chlorine was "discovered" in a laboratory in Sweden in 1774 over two hundred and fifty years ago. In 1810, it was identified as a chemical element. It was named after a Greek word "chloros" meaning pale green for its characteristic color when in a gaseous state (Cl_2). Several decades later its use as a disinfectant would be fully recognized.

Early Concepts and Use

Odors were thought to be the cause for transmission of diseases up until the mid-1880's when the germ theory of disease was established. The earliest applications of chlorine, around 1835, were to control odors. The crude techniques would sometimes impart a more objectionable chlorinous odor to the water than it was meant to overcome. It was not until the latter part of the 1890's that chlorine and chlorine containing products would be evaluated and demonstrated to be effective disinfecting agents.

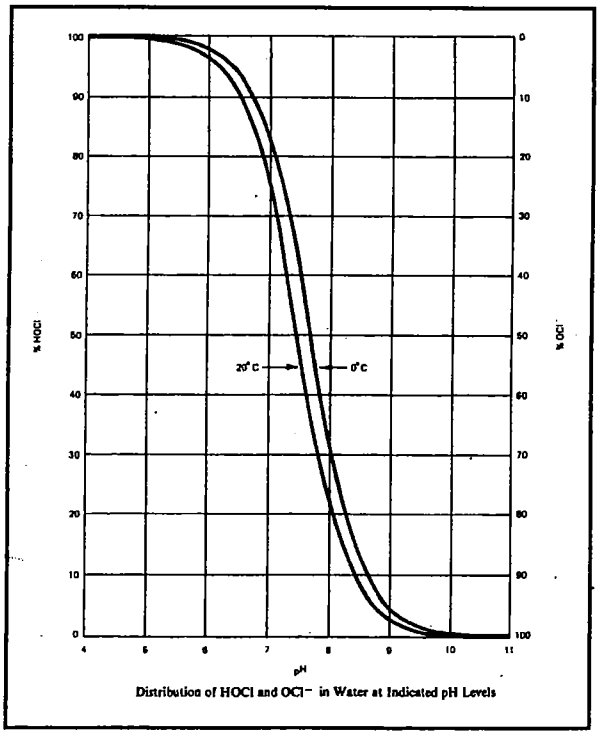
Its earliest reported experimental use in North America was in 1896 in Louisville, Kentucky. In 1897, it was employed for short period in England to disinfect water distribution mains following a typhoid epidemic. Its first continuous use would be in 1902 in Belgium. In North America, the first continuous, municipal application of chlorine was to disinfect water from the 40 MGD Boonton Reservoir supplying Jersey City in 1908. Contested in the courts, the use of chlorine as a water supply disinfectant was declared a public safeguard that allowed its use to spread rapidly throughout the country.

Basic Chemistry of Chlorine Reaction

When chlorine is added to pure water, a mixture of hypochlorous (HOCL) and hydrochloric acid (HCL)is formed:

$$Cl_2 + H_2O \leftrightarrow HOCl + H^+ + Cl^- \qquad \text{(EQ1)}$$

The reaction is essentially completed within seconds at normal water temperatures. In a dilute solution and at a pH level of about 4, the equilibrium of the reaction shifts to the right and very little Cl_2 remains in solution. Aside from the concentrated solution fed through chlorinators, the amount of chlorine supplied to the water does not produce a concentrated solution that would yield such a low pH. The oxidizing power of the chlorine is retained in the HOCl formed. It is also in this form that the disinfecting action of aqueous chlorine solution occurs.



Hypochlorous acid instantly ionizes into hydrogen (H^+) and hypochorite ions (OCl^-). The reaction is reversible and the level of ionization is dependent upon temperature and pH (see chart on right):

$$HOCl \leftrightarrow H^+ + OCl^- \qquad \text{(EQ2)}$$

Hypochlorous acid is weak and ionizes poorly at pH levels below 6. Therefore, chlorine exists mostly as HOCl at low pH levels. Between pH of 6.0 and 8.5 a sharp change from HOCl to complete ionization occurs. Hypochlorite ions predominate at 20°C (68°F) and pH levels of about 7.5 and at 0°C (32°F) and pH levels of about 7.8. They exist exclusively at a pH level of 9.5. The pH of chlorinated water

supplies is normally within the range where both hypochlorous acid and hypochlorite ions exist.

Chlorine existing in water as hypochlorous acid and hypochlorite ions is defined as <u>Free Available Chlorine</u>. The oxidizing capacity of free chlorine solutions varies with pH levels due to the resultant $HOCl:OCl^-$ ratio that increases at low pH levels favoring the formation of HOCl and decreases at high pH levels where OCl^- formation predominates.

NYC reservoir water has an average pH level of about 7.3. The temperature of the water entering the distribution system can vary from 18°C (65°F) to 1°C (34°F).

Reactions of Chlorine-Containing Compounds

Disinfection of newly constructed distribution and trunk water mains is performed using chlorine-containing compounds. The two most commonly used chlorine-containing compounds are high-test calcium hypochlorite, $Ca(OCl)_2$, and sodium hypochlorite, NaOCl. The two compounds ionize in water yielding hypochlorite ions:

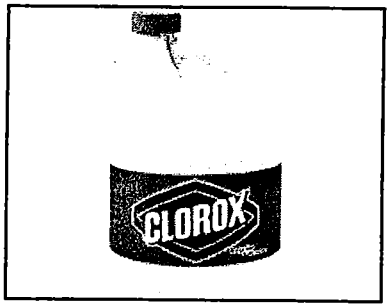
$$Ca(OCl)_2 + H_2O \leftrightarrow Ca^{+2} + 2OCl^- + H_2O \qquad \text{(EQ3)}$$

$$NaOCl + H_2O \leftrightarrow Na^+ + OCl^- + H_2O \qquad \text{(EQ4)}$$

The hypochlorite ions also establish equilibrium with hydrogen ions, depending on the pH, as shown by EQ2. The same equilibriums are established in the water regardless of whether gaseous chlorine or hypochlorite chlorine compounds are used. The only distinction between the two disinfectants is the resultant pH and its effect on the HOCl : OCl^- ratio at equilibrium. Chlorine tends to decrease initial pH levels favoring formation of HOCl while hypochlorites tend to increase it. Hypochorites always contain excess alkali for stability and tend to raise pH levels by insignificant amounts.

NYC reservoir water is relatively soft and lacks significant quantities of hardness producing materials that buffer the water from significant changes in pH.

Calcium hypochlorite is available in powder and tablet form and ranges between 65 to 74% available chlorine. It is commonly known as pool chlorine or by brand names such as HTH (high test hypochlorite). The powder granules can vary from regular to quick dissolving forms. Quick dissolving granules resemble ping pong balls and when the part of the shell is dissolved or broken through the contact area doubles.



Sodium hypochlorite is normally available in liquid form and ranges between 3 to 15% available chlorine. It is more commonly known as bleach. Household bleach ranges between 3 to 5% available chorine while industrial versions range between 12 to 15% available chlorine.

These compounds are caustic and must be handled with care utilizing proper safety equipment and precautions.

Chlorine - Ammonia Reactions

Chlorine reacts with organic and inorganic nitrogenous materials, like ammonia (NH_3). These reactions are of great significance in the water chlorination disinfection process. When chlorine is added to water containing ammonia, the ammonia reacts with HOCl to form various chloramines that retain the oxidizing

power of chlorine. However, chloramines are less reactive and less potent disinfectants than the free available chlorine forms. The following equations represent chlorine and ammonia reactions:

$$NH_3 + HOCl \rightarrow NH_2Cl \text{ (Monochloramine)} + H_2O \quad \text{(EQ5)}$$

$$NH_2Cl + HOCl \rightarrow NHCl_2 \text{ (Dichloramine)} + H_2O \quad \text{(EQ6)}$$

$$NHCl_2 + HOCl \rightarrow NCl_3 \text{ (Trichloramine)} + H_2O \quad \text{(EQ7)}$$

The distribution of the reaction products is dependent on the formation rates of monochloramine and dichloramine, which are dependent on pH, temperature, time and the initial $Cl:NH_3$ ratio. High ratios, low temperatures and low pH levels favor the formation of dichloramine. Much like a free chlorine solution, the oxidizing capacity of a chloroamine solution varies with pH, due to the resultant ratios of $NHCl_2$: NH_2Cl in which monochloramine predominates at high pH levels. ***Chlorine existing in water in chemical combination with ammonia-nitrogen or organic-nitrogen compounds is defined as Combined Available Chlorine.***

NYC reservoir water is relatively free of ammonia and other nitrogenous materials. These materials tend to be more prevalent in groundwater.

Other Chlorine Reactions

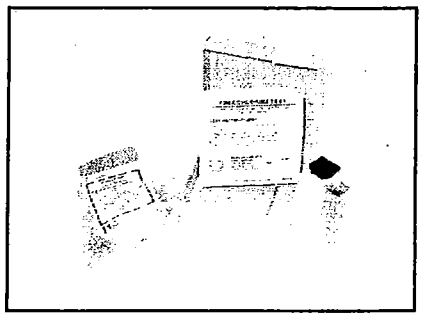
There are a variety of inorganic reducing materials that react with and reduce the amount of oxidizing chlorine compounds that are available for disinfection purposes. Hydrogen sulfide (H_2S) reacts with chlorine to produce chloride ions (Cl^-) in which the oxidizing power of chlorine does not exist. The presence of iron (Fe) and manganese (Mn) in water can affect chlorination practices if the pH level is high enough and sufficient amounts of chlorine are available to permit hydroxide formation. The ferrous and manganous forms of the metals will oxidize forming insoluble hydroxides. Nitrites may be present in some waters that are contaminated by domestic and certain industrial wastes. Nitrites are readily oxidized to nitrates by chlorine. Fertilizer is a major source of nitrite contamination and is commonly found in higher concentrations in groundwater. Although present in very small quantities in NYC reservoir water, much higher concentrations of iron and manganese are typically found in groundwater.

Chlorine Residual (Free, Combined & Total)

NYC reservoir water from the Catskill / Delaware system is of high quality requiring little filtration and a small amount of disinfection to produce potable drinking water. ***Chlorine residual is defined as: the total amount of available chlorine (combined and free available chlorine) remaining in the water at the end of a specified contact period following chlorination.*** The effectiveness (and continued effectiveness) of the disinfection process is demonstrated by the presence of a chlorine residual throughout the system. Chlorine residuals average between 0.2 to 1.0 mg/L or PPM. In our system, the chlorine residual is primarily composed of free available chlorine. The portion of combined chlorine in our chlorine residual is usually very small.

Testing for Chlorine

The Agency provides several types of chlorine test kits to its in-house construction inspection forces. The most common kit provided addresses the measurement of free available chlorine as a residual with concentrations between 0 to 2.5 mg/L or PPM. The kit provided is a Hach chlorine test cube (cat. no. 20603) and utilizes the colorimetric DPD method to determine free available chlorine concentrations.

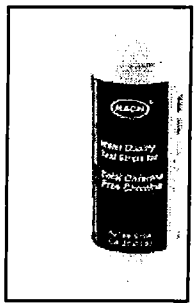


WATER CHLORINATION PRINCIPLES

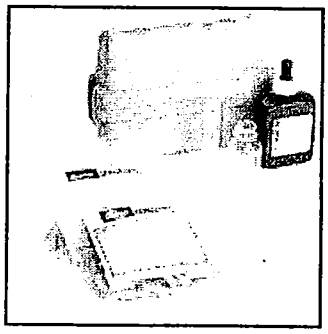
Colorimetric DPD is the most widely used method. It is inexpensive, is easy to perform, requires little apparatus and adapts well to field conditions. DPD (N, N diethyl-p-phenylenediamine) is oxidized by chlorine causing a magenta (red) color. The intensity of color is directly proportional to the chlorine concentration. DPD reacts the same way with other oxidants such as bromine, hydrogen peroxide, iodine and ozone.

To measure free available chlorine, hypochlorous acid and hypochlorite ions oxidize DPD causing a magenta color. The reaction is pH dependent. DPD and an appropriate buffer are packaged together in DPD Free Chlorine Reagent Powder Pillows, from Hach, to handle high levels of hardness without precipitation.

To measure total (free and combined) available chlorine, potassium iodide is added to the reaction to determine combined available chlorine forms and total chlorine. Chloramines oxidize the iodide to iodine which then reacts with DPD to form the magenta color. DPD Total Chlorine Reagent Powder Pillows, from Hach, contain DPD, a buffer and potassium iodide.



Free and total chlorine test strips (photo to the left) are available from Hach with the following ranges of chlorine concentrations: 0 to 10mg/L (cat. no. 2745050) and 0 to 600 mg/L (cat. no. 2890200). The test strips have a reagent pad at the tip and use proven chemistries based on standard reference methods. The test strip is dipped into the sample and the color develops over an allotted time period. The color of the reacted pad is then compared to the chart printed on the bottle.



Another test kit provided is a Hach high range chlorine test kit, model no. CN-21P (cat. no. 24444-00). This test kit measures total (free and combined) available chlorine concentrations ranging from 0 to 200 mg/L in increments of 10 mg/L using a drop count titration based on the starch-iodide test. Potassium iodide, the indicator, is added to a measured water sample turning it yellow in color when residual chlorine is present. The titrant, sodium thiosulfate, is added drop by drop until the test solution clears. The number of drops multiplied by ten determines the total available chlorine in mg/L or PPM. Higher concentrations can be measured by diluting the sample.

Dechlorination

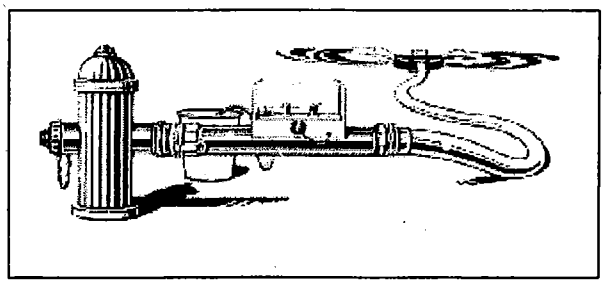
After the contact time for a specific concentration of chlorine has been achieved, the disinfection solution is flushed from the water main until the chlorine residual returns to a concentration that matches the feed. The chlorinated discharge must be directed into a sanitary sewer where it will dissipate as it travels to a treatment plant in most instances. On occasion, the time and distance traveled is not sufficient to handle the discharge quantity and initial concentration. Other means must be employed to reduce the concentration of the chlorine in the discharged water. Under no circumstances should the chlorinated water discharge be directed to a storm sewer system without it first being dechlorinated to acceptable levels for discharge. ***Dechlorination is the partial or complete reduction of residual chlorine in water by any chemical or physical treatment.***

The EPA is mandating that the discharge of chlorinated water to the environment be eliminated. This is to protect aquatic wildlife and other animals from the toxic effects of chlorine, especially as chloramines, that come into contact with chlorine treated discharges. Utilities, contractors, fire departments, and all others that must discharge chlorinated water into the environment must remove the chlorine to allowable

discharge levels. All states have adopted discharge requirements with some states enacting requirements that go beyond the EPA requirements.

Aeration of chlorinated water will lead to the release of some residual chlorines. In the case of free available residuals, reduction is limited because calcium and sodium hypochlorite formed by the reaction of HOCl with natural alkalinity of the water is nonvolatile. Trichloramine (Nitrogen trichloride), if formed, and free chorine (Cl_2) can be readily volatilized by any aeration process. Dichloramine (exists at low pH levels) can be substantially reduced by aeration. Monochloramine (exists at high pH levels) concentration are relatively unaffected by aeration. Prolonged storage, especially in the presence of sunlight, will also result in the gradual dissipation of residual chlorine.

Dechlorination by sulfur dioxide and its derivatives (sodium bisulfite, sodium sulfite and sodium thiosulfate) is feasible, rapid and precise. These materials are often called dechlors and function as reducing agents. Sodium sulfite (Na_2SO_3) is ordinarily used in practice because it is cheaper, more stable and readily available in tablet form for field applications. Use of ascorbic acid tablets as dechlorination media is gaining acceptance for field applications.



The basic setup involves a metering device that introduces a measured amount of reducing agents to a known flow rate and concentration of chlorinated water that will react with and reduce the residual chlorine to acceptable levels for discharge. After successful treatment, the discharge can be directed to a catch basin by hose and/or a directional nozzle.

DISINFECTION PROCEDURE

Introduction

The most important aspect of the disinfection procedure is avoiding recontamination of previously cleaned pipe, fittings and other appurtenances during installation. A successful outcome to the last step of a disinfection process will be difficult to achieve if the entire procedure is not followed diligently.

The disinfection process is based on the concentration of a chlorine disinfecting solution and the resultant contact time. Contact time is defined as the amount of time a known concentration of a chlorine disinfecting solution requires to achieve a 100% kill of microorganisms and bacterium it comes into contact with. Basically the higher the concentration of the chlorine disinfecting solution, the less contact time required to achieve a 100% kill. The concentration levels and related contact times were developed by DEP and the New York State and New York City Departments of Health.

Please note that the contact times provided are based on the even distribution of the chlorine disinfecting solution throughout the section of pipeline to be sanitized.

Disinfection Procedure Review

Cleaning the pipe and initial disinfection by 1% chlorine solution spray

The day the pipe is to be installed, the length of pipe is pressure hosed and scrubbed (if necessary) to remove all dirt and debris that accumulated in the pipe during storage. After being washed out, the interior surface of the pipe shall be thoroughly sprayed with a 1% chlorine solution. The 1% chlorine solution can be made from diluting liquid bleach or by mixing water with a measured amount of a chlorine-containing compound (calcium hypochlorite). The same cleaning and spraying procedure applies to fittings and other pipe appurtenances (valves). The cleaning and application of the 1% chlorine solution shall be repeated as required in order to keep the pipe, fittings and pipe appurtenances free of dirt and other debris. Immediately after the pipe has been sprayed, the ends of the pipe must be sealed using wood or rubber plugs to keep debris from entering the pipe. The plugs must be washed and dipped into a 1% chlorine solution before each use.

Storing the Pipe

If the cleaned pipe is laid alongside the trench in the street prior to installation, the lengths must be placed on top of sand bags or wood blocking raising the pipe above the street surface by several inches. This prevents debris and water from being washed into the pipe during a rain event or while water from the trench is being pumped out. Fitting and valves to be installed must be stored and kept clean in a similar manner.

While the pipe is being installed

The plugs are only removed to make up the joint in the trench. Care should be exercised as the pipe is lowered into the trench as not to contaminate the spigot end with dirt and debris. Gasket grease should be placed on the spigot pipe end and gasket just before the joint is made up. Gasket grease always seems to attract dirt and soil. Once contaminated, the grease must be wiped off completely and reapplied.

After the pipe is installed

The plug in the bell of the newly installed pipe is briefly removed to toss in a measured amount of calcium hypochlorite powder that will reach a chlorine concentration of 300 PPM when the main is filled. Please refer to the proper concentration of Chlorine-Containing Compound tables to determine the measured amount to be used for a given pipe diameter and length. The formula to determine the amount of a chlorine-containing compound for a pipe size or length not given in the tables can be found at the end of this chapter. Care must be exercised to keep the newly laid pipe interior clean and prevent debris or water from entering the pipeline during the installation work. The consistent use of pipe plugs is the best safeguard against contaminating the inside of a cleaned pipe.

DISINFECTION PROCEDURE

Filling the pipe & 15 minute contact time

After the days work has been completed, a night cap is typically placed on the end of the main (unless it is being tied into the existing main). The configuration varies but always includes a 1½-inch tap for flushing purposes. Open the tap and slowly fill the main so as not to wash all the calcium hypochlorite powder to the cap. Once the main is filled, close the tap and check the exposed pipe joints, taps, tapping sleeves and tapping valves (a.k.a. wet connections) for leaks. After completing the visual leakage check, open the 1½-inch tap slightly for at least 15 minutes to achieve the minimum required contact time for the 300 PPM chlorine solution to disinfect the interior of the newly installed section of water main. If untreated, the flushed solution must be directed into a sanitary sewer manhole by using a hose.

Thoroughly flush the new main

After the minimum required contact time of 15 minutes has been achieved, the main can be flushed through the 1½-inch tap installed on the night cap by opening it completely or by utilizing a properly positioned hydrant. If untreated, the flushed water should be directed into a sanitary sewer manhole by using a hose. The main should be thoroughly flushed until the chlorine residual exiting the newly installed pipe matches the chlorine residual of the feed (chlorine residuals can range from 0.5 to 1.0 PPM). After the main has been thoroughly flushed, the flushing tap can be closed and all the new taps and wet connection valves can now be opened and checked for leaks without the fear of pushing super chlorinated water into a building's or a home's plumbing system.

When the main cannot be flushed thoroughly

When working in a intersection or making a final connection to a run of water main, it may be impossible to thoroughly flush a 300 PPM chlorine solution out of the water main. Do not add chlorine powder to the main!! Instead, liberally spray the length of pipe or fitting with the 1% chlorine solution wetting the entire interior surface once it is installed in the trench. Keep using the pipe plugs in the normal manner. At the end of the day's work, restore service to the main in such a manner that will allow water to pass through the sprayed section of water main and be flushed out through a tap or hydrant. Thoroughly flush the main until the chlorine residual exiting the flushing point matches the chlorine residual of the feed. Open all the new taps and wet connection valves once the chlorine residuals match.

Calculating the Quantity of Chlorine-containing Compound needed for Disinfection

1 cubic foot (ft^3) of water = 7.48 gallons = 62.4 pounds (lb)
Wt. of CCC = Weight of Chlorine-containing Compound
% Cl by Wt. = Percentage of Chlorine by Weight in Chlorine-containing Compound
PPM = Parts per million (by weight) or 300 PPM = $300/10^6$
D = pipe diameter in inches L = length of pipe in feet

Wt. of CCC = [Wt. of water] x [desired concentration in PPM] $/10^6$ / [% Cl by Wt.]

DISINFECTION PROCEDURE

Sample Calculations

Example No.1

How much Calcium Hypochlorite ($Ca(OCl)_2$) powder (65% Chorine by weight) is needed to prepare a 300 PPM solution in a 12-inch diameter main that is 18 feet long? For a 12-inch diameter main that is 250 feet long?

1 pound (lb) = 16 ounces (oz) [wt.]

For 18 feet of 12-inch pipe:

Wt. of CCC = [Wt. of water] x [desired concentration in PPM] /10^6 / [% Cl by Wt.]

Wt. of $Ca(OCl)_2$ Powder (65%) = [(π/4 x (12 in)^2 / 144 in^2/ ft^2) x 18 ft x 62.4 lb / ft^3] x (300/10^6) / (0.65)
= 0.4072 lb → **SAY - 0.41 lb**
= 0.4072 lb x 16 oz/lb
= 6.5144 oz [wt.] → **SAY - 6.5oz [wt.]**

For 250 feet of 12-inch pipe:

Using the High Test Calcium Hypochlorite (65%) 300 PPM Table on page 30. For 100 feet of 12-inch diameter pipe, 2.27 lb of High Test Calcium Hypochlorite (65%) is needed to create a 300 PPM disinfecting solution.

Wt. of $Ca(OCl)_2$ Powder (65%) = (250 ft/ 100 ft) x 2.27 lb
= 5.68 lb → **SAY - 5.7 lb**

Example No.2

How much Calcium Hypochlorite powder (65% Chorine by weight) is needed to prepare a 1% chlorine solution in a 5 gallon sprayer?

1 gallon of water = 8.34 lb 1% = 10,000 PPM

Wt. of $Ca(OCl)_2$ Powder (65%) = [5 gallons x 8.34 lb/gallon] x [10,000]/10^6 / (0.65)
= 0.64 lbs
= 0.64 lbs x 16 oz/lb
= 10.27 oz [wt.] → **SAY - 10½ oz [wt.]**

Example No.3

What is the volume of liquid bleach (5% chlorine by weight) needed to prepare a 1% chlorine solution in a 3 gallon sprayer?

1 gallon of water = 8.34 lbs

1 gallon = 4 quarts (qt) = 128 ounces (oz) [vol.]

Wt. of Liquid Bleach (5%) = [3 gallons x 8.3454 lbs/gallon] x [10,000]/10^6 / (0.05)
= 5.0072 lbs

Volume of Liquid Bleach (5%) = 5.0072 lbs / (8.3454 lbs/gallon)
= 0.6000 gallons or 77 oz [vol.] → **SAY - 2½ qt**

** Pour 2½ quarts of liquid bleach into the spray container and then fill it with water to the 3 gallon mark.

DISINFECTION PROCEDURE

High Test Calcium Hypochlorite Tables

25 PPM; 24 hour contact time (dry lay)

Nominal Pipe Diameter (inches)	65% Chlorine; High Test Calcium Hypochlorite [by weight]		
	Oz. Per. 100 LF	Oz. Per. 18 LF	Oz. Per. 20 LF
6	0.76	0.14	0.15
8	1.34	0.24	0.27
12	3.02	0.54	0.60
16	5.37	0.97	1.07
20	8.39	1.51	1.68
24	12.08	2.17	2.42

100 PPM; 3 hour contact time (dry lay)

Nominal Pipe Diameter (inches)	65% Chlorine; High Test Calcium Hypochlorite[by weight]		
	Oz. Per. 100 LF	Oz. Per. 18 LF	Oz. Per. 20 LF
6	3.02	0.54	0.60
8	5.37	0.97	1.07
12	12.08	2.17	2.42
16	21.48	3.87	4.30
20	33.56	6.04	6.71
24	48.32	8.70	9.66

300 PPM; 15 minute contact time (relay or wetlay)

Nominal Pipe Diameter (inches)	65% Chlorine; High Test Calcium Hypochlorite[by weight]					
	Per. 100 LF		Per. 18 LF		Per. 20 LF	
	Oz.	LB	Oz.	LB	Oz.	LB
6	9.06	0.57	1.63	0.10	1.81	0.11
8	16.11	1.01	2.90	0.18	3.22	0.20
12	36.24	2.27	6.52	0.41	7.25	0.45
16	64.43	4.03	11.60	0.72	12.89	0.81
20	100.67	6.29	18.12	1.13	20.13	1.26
24	144.96	9.06	26.09	1.63	28.99	1.81

DISINFECTION PROCEDURE

ADDITIONAL TIPS

- The measured amount of calcium hypochlorite powder is added to each pipe length as work progresses so when the main is completely filled the disinfection process / contact time begins. Closing the tap while conducting your open-trench (visual) leakage test increases the chlorine disinfecting solution effective contact time with pipe's interior. The time to conduct a visual leakage test can vary but the increased contact time will allow the disinfection process more time to ensure a 100% kill of the microorganisms and bacterium. Once the tap is slightly opened the actual 15 minute contact time period begins.

- A hydrant flow chart is included in the reference material section of this manual. The chart can be used to estimate flow rates and the time required to flush and exchange the chlorine disinfecting solution in section of water main with clean water. Please note the velocity of water moving through a pipe being flushed plays a significant role in mixing clumps of calcium hypochlorite powder with water and dissolving it into solution. Water mains are sized to maintain an average flow rate of about 3 to 4 ft/sec. A velocity over 4 ft/sec can scour the interior of a pipe. The flow rate through a 2-inch hose flowing full at street pressure is about 150 gallons per minute (GPM). The flow rate through a 4-inch hydrant nozzle flowing full at street pressure is about 500 to 600 GPM. This yields the following velocities and times to completely exchange water in a two hundred foot section of pipe for a given pipe diameter:

Pipe Dia. (inch)	**Velocity** at 150 GPM (ft / sec)	**Time** to Exchange H_2O in 200 LF of Pipe (min : sec)	**Velocity** at 500 GPM (ft / sec)	**Time** to Exchange H_2O in 200 LF of Pipe (min : sec)
8	0.96	03:29	3.19	01:03
12	0.43	06:50	1.42	02:21
20	0.15	21:46	0.51	06:32

Twenty minutes of flushing through a 1½-inch tap and 2-inch hose will exchange the water in a 200 LF section of 8-inch pipe over 5½ times and in a 200 LF section of 12-inch pipe almost 3 times. Twenty minutes of flushing through a 1½-inch tap and 2-inch hose for a 200 LF section of 20-inch pipe is inadequate as it will not completely exchange the water once. Therefore, for a 20-inch pipe, the flushing flow rate or the flushing time needs to be increased.

Several complete exchanges of water in the disinfected section of pipe need to occur before the chlorine residual exiting the disinfected section of pipe will match the chlorine residual of the feed. Under no circumstance should the chlorine concentrations be reduced to decrease flushing times.

WATER SAMPLING

Collecting Water Samples

Water samples must be collected after each day distribution water mains are installed in wet lay or relay mode. The samples are collected after the main has been disinfected and thoroughly flushed to obtain stable chlorine residuals and water temperatures at the FEED and NEW MAIN sampling points. Water samples are typically collected the following morning. Samples collected at the end of the day must be refrigerated overnight. If samples are refrigerated, please note so in the comment section on the sample card. All samples must be kept cool when being delivered to DEP's laboratory located in the low-rise building on the Horace Harding Expressway (west bound LIE service road) in Lefrak City.

One sample card (see reference material section for example) must be filled out for each "set" of sample bottles collected. Each set consists of two bottles: one plastic 125 milliliter (ml) bottle for bacteriology and second plastic 500 ml bottle for chemistry.

The 125 ml plastic bacteriological bottle contains a chemical preservative and an expiration date. Always obtain fresh bacteriological bottles before collecting samples. Do not use any expired sample bacteriological bottles. Return expired sample bacteriological bottles to the laboratory for reuse. The 500 ml plastic chemistry bottle has no expiration date.

The **FEED** sample is collected at an outlet - typically a (2½-inch) nozzle on a hydrant attached to the existing main that "feeds" water into the section of pipe being tested. The **NEW MAIN** sample is collected at an outlet - typically the flushing tap located on the night cap installed at the end of the day's work or at a new hydrant that is located near the end of the newly installed pipe.

Ten Steps for Collecting Water Samples

1. Make sure your sampling kit is complete (cooler, icepack, thermometer, chlorine residual test kit, spray bottle filled with bleach, indelible markers, brush, paper towels, sample bottles and sample cards). Obtain a *"set"* of sample bottles and one sample card for each outlet to be sampled. A *"set"* contains one plastic 500 ml bottle for chemistry and one plastic 125 ml bottle for bacteriology testing. Make sure the expiration date on the bacteriological sample bottle has not expired. If expired, obtain fresh bacteriological sample bottles. Remember: two sets of samples (**FEED** and **NEW MAIN**) must be collected to test a new water main installation.

2. Using an indelible marker or pen, write the following information on the sample bottle labels: sample no., contract no., location, date collected and type of sample (**FEED** or **NEW MAIN**).

3. Clean the hydrant nozzle with paper towel or brush then spray inside of hydrant and nozzle with a 10,000 PPM (1%) chlorine solution or undiluted bleach using the spray bottle or the contractor's spray can. If a tap is used for sampling, clean and disinfect the tap. Flush and rinse the nozzle or tap thoroughly of any bleach or chlorine residue. **NEVER COLLECT A SAMPLE THROUGH A HOSE!!**

4. Flush the **FEED** hydrant for at least five minutes at full nozzle flow until the water is clear. The clarity and color of the water can be checked by filling a clear plastic or glass bottle and holding it up to a white background. Measure the chlorine residual using your test kit. Measure the temperature of the water by filling a chemistry sample bottle with water and placing the thermometer in it. Read it after it sits in the water for at least a minute. The chlorine residual for the sample should be between 0.2 and 1.0 PPM and the temperature should be between 34°F & 70°F depending on the time of year. If the results are acceptable, note them on the sample card. If continued flushing still does not result in acceptable color, chlorine residual or temperature consider an alternate location for the **FEED** hydrant only.

5. Reduce the flow rate at the outlet. Wait a few minutes at low flow prior to collecting samples.

6. Rinse the chemistry bottle and cap to ensure that there is no residue remaining from the previous color sampling and temperature taking before final sampling. Fill the bottle to its neck and reseal.

7. Open the bacteriological sample bottle carefully – **DO NOT TOUCH THE BOTTLE OPENING OR THE INSIDE OF THE CAP!! DO NOT RINSE THE BOTTLE OR OVERFLOW IT WHILE FILLING!!** Fill the bottle directly from the outlet (hydrant nozzle or tap gooseneck) to the marked line and reseal.

8. Place the bottles inside a cooler with an ice pack for transporting to the Laboratory. If samples are stored overnight, they should be refrigerated. If samples are refrigerated, please note so in the comment section on the sample card.

9. Enter all the pertinent data on the sample card.

10. Repeat the above procedure to collect NEW MAIN water samples after the disinfection process has been completed and the main thoroughly flushed.

WATER SAMPLING

Water Sample Testing & Results, Remedial Action & Re-sampling

The Environmental Protection Agency (EPA) establishes standards for drinking water which fall into two categories -- Primary Standards and Secondary Standards. Primary Standards are based on health considerations and Secondary Standards are based on taste, odor, color, corrosivity, foaming, and staining properties of water. The collected water samples are subject to the following tests:

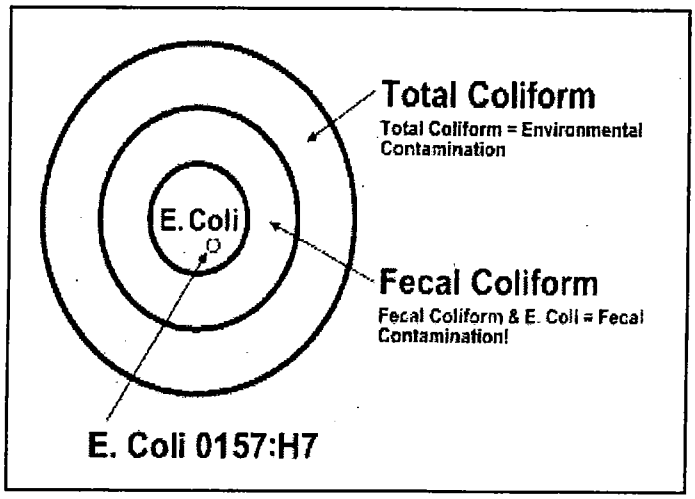
- Coliform / E. coli (Primary Standard)
- Turbidity
- Color
- Conductivity
- pH

Coliform / *E. coli*

Public water systems are required to deliver safe and reliable drinking water to their customers 24 hours a day, 365 days a year. If the water supply becomes contaminated, consumers can become seriously ill. Fortunately, public water systems take many steps to ensure that the public has safe, reliable drinking water. One of the most important steps is to regularly test the water for coliform bacteria.

Coliform bacteria are commonly found in the environment (e.g., soil or vegetation) and are generally harmless. Coliform bacteria can be found in the feces of all warm-blooded animals and humans. Most disease-causing organisms (pathogens) that contaminate water supplies come from the feces of humans or animals. Testing drinking water for all possible pathogens is complex, time-consuming, and expensive. It is relatively easy and inexpensive to test for coliform bacteria. The presence of coliform bacteria in drinking water indicates that pathogens could be in the water system, water system operators work to find the source of contamination and restore safe drinking water. There are three different groups of coliform bacteria; each has a different level of risk.

Total coliform, fecal coliform, and *E. coli* are all indicators of drinking water quality. The total coliform group is a large collection of different kinds of bacteria. Fecal coliforms are types of total coliform that mostly exist in feces. *E. coli* is a sub-group of fecal coliform. The risk of pathogen contamination of the drinking water increases as the presence of each coliform subgroup is detected. A specific strain of *E. coli* bacteria known as *E. coli O157:H7* is the cause of most *E. coli* outbreaks that receive media attention and temporary orders to boil water before use. Boiling contaminated drinking water destroys all forms of E. coli, including *O157:H7*.



When a water sample is sent to a lab, it is tested for total coliform. If total coliform is present, the sample will also be tested for either fecal coliform or *E. coli,* depending on the analytical testing method employed.

Interpreting bacteriological test results from samples collected at this point in the system can be a little challenging. Two sets of samples (FEED & NEW MAIN) are collected for testing and comparison purposes. If the FEED source (typically a hydrant on an existing main) is thoroughly flushed and

produces a respectable chlorine residual (0.5 to 1.0 PPM), the sample should yield negative results when tested for the presence of coliform or *E. coli.* testing unless the sample was contaminated during collection. Simply touching the inside of the bacteriological bottle could yield a false-positive test result for the presence of coliform or *E. coli.* If your FEED sample tested positive just for coliform or for positive for coliform and *E. coli,* and your NEW MAIN sample was negative, an extended flushing period at a moderate flow rate would be warranted before re-sampling. If the same results re-occur on the second set of samples, consider using another existing hydrant as a FEED sample source. If no other FEED source is available, follow the instructions for sanitizing a hydrant before re-sampling in the Additional Tips section of the chapter.

Assuming your samples were not contaminated during collection and the FEED & NEW MAIN samples test positive for coliform but negative for *E. coli.*, shutdown activities that stir up sediment or dislodge deposits from an unlined pipe or valves can also slough off pieces of biofilms from tubercles. Biofilms contains strains of coliform and could be the cause of your positive test results. Flushing the main for an extended period at a moderate flow rate would normally resolve this issue – then re-sample.

Assuming your samples were not contaminated during collection, NEW MAIN samples testing positive for coliform and *E. coli.* can be worrisome. Flushing the main for an extended period at a moderate flow rate could resolve this issue. If the second set of NEW MAIN samples test positive for coliform and *E. coli.*, further investigation and remedial action must be taken. Remedial action may require repeating the disinfection process and/or exposing and cutting the main open to conduct an internal inspection. Re-sampling would follow any remedial action.

Turbidity

Turbidity refers to how clear the water is. The greater the amount of total suspended solids (TSS) in the water, the murkier it appears and the higher the measured turbidity. Turbidity is reported in nephelometric units (NTUs) which refers to the type of instrument (turbidimeter or nephelometer) used for estimating light scattering from suspended particulate material. In lakes and streams, there are three major types of particles: algae, detritus (dead organic material), and silt (inorganic, or mineral, suspended sediment). Usually, we measure turbidity to provide a cheap estimate of the TSS concentration.

High concentrations of particulate matter can modify light penetration, cause shallow lakes and bays to fill in faster, and smother benthic habitats - impacting both organisms and eggs. As particles of silt, clay, and other organic materials settle to the bottom, they can suffocate newly hatched larvae and fill in spaces between rocks which could have been used by aquatic organisms as habitat. Fine particulate material also can clog or damage sensitive gill structures, decrease their resistance to disease, prevent proper egg and larval development, and potentially interfere with particle feeding activities. If light penetration is reduced significantly, macrophyte growth may be decreased which would in turn impact the organisms dependent upon them for food and cover. Reduced photosynthesis can also result in a lower daytime release of oxygen into the water. Effects on phytoplankton growth are complex depending on too many factors to generalize. Very high levels of turbidity for a short period of time may not be significant and may even be less of a problem than a lower level that persists longer.

Turbidity also adds real costs to the treatment of surface water supplies used for drinking water since the turbidity must be virtually eliminated for effective disinfection (usually by chlorine in a variety of forms) to occur. Particulates also provide attachment sites for heavy metals such as cadmium, mercury and lead, and many toxic organic contaminants such as PCBs and many pesticides.

The major effect turbidity has at this point in the distribution system might be simply aesthetic - people don't like the look of dirty water. The likely causes may be stirred up sediment or dislodged deposits from an unlined pipe or valve caused by shutdown related activity. Other sources could be sand, soil and sediment that accidently entered the pipe during installation. An extended flushing period at a moderate flow rate will generally resolve this problem.

Color

Ideally tap water should appear to be colorless. Color may be indicative of dissolved organic material and/or inorganic contaminants such as metals (primarily iron and manganese). Iron produces a rusty color in water and stains red to orange in color. Manganese produces a brown to black color in water and stains black. A standard scale has been developed for measuring color intensity in water samples. When a water sample is rated as having a color of 5 units, it means: the color of the water is equal in intensity to the color of distilled water containing 5 milligrams of platinum as potassium chloroplatinate per liter.

Excessive color lacks appeal from an aesthetic standpoint in potable water and can cause staining. U.S. EPA Secondary Drinking Water Regulations recommend that potable water possess color of less than 15 units. In general, color is reduced or removed from water through the use of coagulation, settling and filtration techniques. Superchlorination, activated carbon filters and potassium permanganate have been used with varying degrees of success in removing color.

The discovery of excess color at this point in the distribution system might be simply aesthetic - people expect tap water to be practically colorless. The likely causes may be the presence of iron and manganese in stirred up sediment or dislodged deposits caused by shutdown related activity. Again, an extended flushing period at a moderate flow rate will generally resolve this problem.

Conductivity

Conductivity is a measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminum cations (ions that carry a positive charge). Organic compounds like oil, phenol, alcohol, and sugar do not conduct electrical current very well and therefore have a low conductivity when in water. Conductivity is also affected by temperature: the warmer the water, the higher the conductivity. For this reason, conductivity is reported as conductivity at 25 degrees Celsius (25° C).

Conductivity is useful as a general measure of water quality. A stream tends to have a relatively constant range of conductivity that, once established, can be used as a baseline for comparison with regular conductivity measurements. Significant changes in conductivity could indicate that a discharge or some other source of pollution has entered the system. Conductivity measurements can also be used to test for total dissolved solids (TDS) and salinity. The TDS concentration in milligrams per liter (mg/L) can also be calculated by multiplying the conductivity result by a factor between 0.55 and 0.9, which is empirically determined.

The following table can be used as a generalization of the relationship of TDS to water quality problems:

Cations combined with Carbonates
CaCO3, MgCO3 etc. - Associated with hardness, scale formation, bitter taste
Cations combined with Chloride
NaCl, KCl - Salty or brackish taste, increase corrosivity & conductivity

An elevated TDS concentration is normally not a health hazard. The TDS concentration is a secondary drinking water standard and therefore is regulated because it is more of an aesthetic rather than a health hazard. However, with respect to trace metals, an elevated TDS concentration may suggest that the water contains elevated levels of ions that are above the Primary or Secondary Drinking Water Standards, such as: an elevated level of nitrate, arsenic, aluminum, copper, lead, iron, etc. It is important to keep in mind that water with a very low TDS concentration may be corrosive and corrosive waters may leach toxic metals such as: copper and lead from the household plumbing. This also means that trace metals could be present at levels that may pose a health risk.

High conductivity at this point in the distribution system is usually an aesthetic issue. It may be caused by stirred up sediment related to shutdown activity and to cations released by calcium hypochlorite and/or sodium hypochlorite during the disinfection process. Once again, an extended flushing period at a moderate flow rate will generally resolve this problem.

pH

pH is one of the most common water quality tests performed. pH indicates the sample's acidity, but is actually a measurement of the potential activity of hydrogen ions (H+) in the sample. pH measurements run on a scale from 0 to 14, with 7.0 considered neutral. Solutions with a pH below 7.0 are considered acids. Solutions with a pH above 7.0, up to 14.0 are considered bases. The pH scale is logarithmic, so every one-unit change in pH actually represents a ten-fold change in acidity. In other words, pH 6.0 is ten times more acidic than pH 7.0; pH 5 is one hundred times mores acidic than pH 7.0.

The pH of a body of water is affected by several factors. One of the most important factors is the bedrock and soil composition through or over which the water moves. Some rock types such as limestone can, to an extent, neutralize acid while others, such as granite, have virtually no effect on pH. Another factor which affects the pH is the amount of plant growth and organic material within a body of water. When this material decomposes carbon dioxide is released. The carbon dioxide combines with water to form carbonic acid. Although a weak acid, large amounts of it will lower the pH. A third factor that affects the pH of a body of water is the dumping of chemicals into the water by individuals, industries, and communities. A fourth factor which affects pH is the amount of acid precipitation that falls in the watershed. Acid rain is caused by nitrogen oxides (NOx) and sulfur dioxide (SO2) in the air combining with water vapor. These pollutants are primarily from automobile and coal-fired power plant emissions. A fifth factor stems from coal mine drainage. Iron sulfide, a mineral found in and around coal seams, combines with water to form sulfuric acid. This acid, ferrous oxide, and huge quantities of silt are the major pollutants from coal mining. Combined with the problem of acid rain, the pH of some stream waters can be drastically lowered.

Acidic waters can enhance the reactivity of certain chemicals and increase the solubility of heavy metals. This often makes them more poisonous than normal. As an example: fish that usually can withstand pH values as low as 4.8 will die at pH 5.5 if the water they're swimming in contains as little as 0.9 mg/L of iron. Mix acidic water with small amounts of aluminum, lead, or mercury, and you create a similar problem - one that far exceeds the usual dangers of these substances. Heavy metals can accumulate in the gills of fish or cause deformities in young fish, reducing their chance of survival. Changes in the pH value of water are important to many organisms. Most organisms have adapted to life in water of a specific pH and may die if it changes even slightly. This is especially true of aquatic macro-invertebrates and fish eggs and fry. The pH is a critical factor determining the health of a waterway. The factors that control it are obviously complicated. As with many environmental concerns, we need to be aware of the implications of any impacts we have upon the environment.

WATER SAMPLING

The average pH(s) of the in the Catskill/Delaware and the Croton system are pH 7.3 and pH 7.7, respectively. At this point in the distribution system our concern involves elevated levels of pH that are caused by high concentrations of calcium and sodium hypochlorites and the stabilizing alkalis commonly found in these disinfectants. Another factor that can contribute to an elevated pH in new main installations involves the alkalinity of cement mortar linings. Low flows in small mains or dead end sections can cause an undesirable rise in the pH of the water. Please note, the alkalinity of the cement mortar lining provides a high pH barrier and over time a physical barrier against the ductile iron pipe wall that prevents tuberculation. Once again, an extended flushing period at a moderate flow rate will expel the excess alkalis and reduce the pH of the water to acceptable levels.

WATER SAMPLING

ADDITIONAL TIPS

- The old clear glass pint and quart sized "milk" bottles previously provided by DEP for chemistry sampling are excellent for conducting clarity and color checks on the water during a flushing operation. Keep it with your sampling kit.

- Sometimes the water appears "milky" when checking clarity and color. This may be fine air bubbles trapped in water under intermediate to high pressure. Let the sample sit for few minutes to allow the air to escape before checking clarity and color.

- Existing hydrants are typically used to collect FEED samples. If you get successive positive results for coliform or for coliform and E. Coli. but your NEW MAIN samples are negative, the hydrant is likely to be contaminated. If no alternate FEED source is available to collect samples, try disinfecting the hydrant. Hydrants with missing caps can be used as a depository for any kind of garbage (cans, bottles, dog feces, needles, etc.). To disinfect a hydrant, aggressively flush it to dislodge any garbage then reduce the flow gradually to allow the debris to escape through the nozzle. Wear gloves and be careful if you use your hands to dislodge garbage stuck in the nozzle or barrel. Turn off the hydrant and pour a couple of gallons of 1% chlorine solution into the hydrant barrel and spray the inside of the barely with liberally with a 1% solution. Wait about 5-10 minutes for the chlorine to work and then flush the hydrant thoroughly. Repeat the process if necessary.

Reference Material Section

Relevant Standard Construction Operating Procedures (SCOP) Listing

SCOP No.	Title
00-001G	Cold Weather Protection of Water Services
00-004G	Daily Water Main Shutdown Log
01-001G	Extended Water Shutdown Notice
01-009W	Water Main In-Service Notification
02-002G	Water Service Repair Log
04-012G	Daily Water Main Shutdown Log
04-014G	Water Shutdown Planning for Holidays and Special Events**
05-004G	Water Shutdown Planning**
05-007W	Water Main Tap Cards
05-011G	Material Release and Shipping Authorization – QACS**
06-003W	Use of Temporary Construction Valves on Distribution Water Mains**
06-005W	Water Main Field Card
08-001W	Transfer of Water Services to New Mains**

** Copy Included in Reference Material Section

Reference Material Section

DEP: Request for Information (Field Cards & Maps) Form

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER AND SEWER OPERATIONS CENTRAL MAPPING AND RECORDS
59-17 JUNCTION BLVD. - 12TH FL. CORONA, N.Y. 11368 FAX: (718)595-5781

REQUEST FOR INFORMATION FORM

NAME _____

FIRM/AGENCY _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

TELEPHONE # _____ FAX # _____

BOROUGH (Check one)

BRONX ( )
BROOKLIN ( )
MANHATTAN ( )
QUEENS ( )
STATEN ISLAND ( )

TYPE OF WORK BEING DONE

DRILLING/BORING/EXCAVATION( )
PLANNING/ANALYSIS( ) SPECIFY _____
STREET DEMAPPING ( ) STREET RECONSTRUCTION ( )
TOPOGRAPHICAL SURVEY( ) UTILITY SURVEY ( )
DESIGN ( ) **SPECIFY DESIGN TYPE BELOW**
WATER SERVICE ( ) SEWER CONNECTION ( )
BACKFLOW PREVENTER ( ) NEW SEWER ( )
NEW WATER MAIN ( )
OTHER DESIGN TYPE ( ) SPECIFY _____
ENVIRONMENTAL IMPACT STATEMENT( )
OTHER WORK TYPE( ) SPECIFY _____

IF YOU HAVE BEEN RETAINED BY A CITY, STATE OR FEDERAL AGENCY INDICATE NAME BELOW (IF NONE, INDICATE N/A BELOW)

_____

AGENCY CONTRACT NUMBER _____

PROVIDE A DESCRIPTION OF THE PROJECT YOU ARE WORKING ON THAT REQUIRES THE ABOVE INFORMATION. For example, designing a new 10" sanitary sewer, drilling contract, etc. NO REQUEST WILL BE PROCESSED WITHOUT AN EXPLANATION.

_____

_____

_____

LOCATION WHERE WORK IS BEING DONE

STREET NAME	FROM	TO

PLEASE CALL TO HAVE INFORMATION PICKED UP IN PERSON!
PACKAGE WILL ONLY BE HELD FOR TWO BUSINESS DAYS, THEN IT WILL BE AUTOMATICALLY MAILED

FOR OFFICE USE ONLY
DATE IN _____ DATE OUT _____ ASSIGNED TO _____
RECORDS DEPT.

Contact Information: Borough Tapping Offices
(December 2007)

Bronx Tapping
1932 Arthur Avenue, Room 607
Bronx, New York 10457

Tel. No.: 718-579-6988
Fax No.: 718-579-6989

Brooklyn Tapping
250 Livingston Street, 8th Floor
Brooklyn, New York 11201

Tel. No.: 718-923-2671
Fax No.: 718-923-2698

Manhattan Tapping
40 Worth Street, 3rd Floor - Room 338
New York, New York 10013

Tel. No.: 212-442-1904
Fax No.: 212-442-1914

Queens Tapping
120-55 Queens Boulevard, Room 1-280
Kew Gardens, New York 11415

Tel. No.: 718-286-2600
Fax No.: 718-286-2605

Staten Island Tapping
10 Richmond Terrace, Room 425
Staten Island, New York 10301

Tel. No.: 718-816-2330
Fax No.: 718-876-0705

Reference Material Section

SCOP 04-014G: Water Shutdown Planning for Holidays & Special Events (page 1 of 1)

STANDARD CONSTRUCTION OPERATING PROCEDURE

City of New York Department of Design and Construction
Division of Infrastructure Bureau of Construction

SUBJECT: **WATER SHUTDOWN PLANNING FOR HOLIDAYS AND SPECIAL EVENTS**

APPROVED: ORIGINAL SIGNED BY
Assistant Commissioner - Richard Zetterlund, P.E.

SCOP.....	: 04 -014G
CATEGORY....	: CONSTRUCTION
Subcategory	: Water Main
Keywords ..... :	Water Main Shutdown
Supersedes...	: N/A
Supplements....	: 04-012G
Sheet...	: 1 of 1
Issue Date.....	: May 5, 2005

Contract section 1.06.23 (P) - HOURS OF WORK, restricts work on the following officially designated major legal holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day. As per this contract section, if the day before any of these holidays falls on a normal work day, then no water shutoffs will be allowed on the day before the holiday.

The contract typically does not place restrictions on water main shutdoffs on other holidays or during local events. However, water main shutoffs may become an issue on these days. The Office of Community Outreach and Notification maintains a list of these holidays and events for your reference. Observers of some holidays will need water on the day of the holiday and some also on the day before. You should try to identify the areas you intend to work in during know holidays and event days, and then contact the respective Community Boards to see if they feel there will be any issues with water shutoffs. We should try to limit water shutoffs on those days as much as possible by planning ahead. For example some contractors have been agreeable to schedule restoration or other activities that do not involve water shutoffs for these days. If not, contact your Assistant Commissioner for further direction.

Reference Material Section

SCOP 05-004G: Water Shutdown Planning (page 1 of 1)

DDC

City of New York Department of Design and Construction
Division of Infrastructure Bureau of Construction

STANDARD CONSTRUCTION OPERATING PROCEDURE

SUBJECT: **WATER SHUTDOWN PLANNING**

SCOP.....	: 05 - 004G
CATEGORY....	: CONSTRUCTION
Subcategory	: Water Main
Keywords : ... :	Water Main Shutdown, Water Sensitive Business
Supersedes.	: N/A
Supplements.....	: 04-012G; 05-002G
Sheet.....	: 1 of 1
Issue Date.....	: October 4, 2005

APPROVED: ORIGINAL SIGNED BY
Assistant Commissioner - Richard Zetterlund, P.E.

The Resident Engineer (RE), along with the Community Construction Liaison (CCL), must perform a survey of water sensitive businesses and premises within the project site prior to commencement of water main work and before any planned water shut down. The RE must ensure steps are taken to minimize the impact and duration of water shut downs.

In order to accomplish this, the RE should obtain all water tap records/field cards within the work zone from DEP and locate the sensitive businesses/premises and their taps. A detailed sketch that includes the sensitive businesses/premises and their tap information should then be produced. A log book with details of the water shutdown must also be maintained.

Conduct a survey of each water sensitive business or premises like Beauty Parlors, Laundromats, Dentists, Dialysis Centers, premises with water cooled refrigeration, Medical Centers, Hospitals, Schools, Food Service Premises, Daycare Centers, Senior Centers, Homeless Centers, or other sensitive establishments that may be adversely affected by the water shutdown. Interview each business and building owner and/or the building superintendent and obtain from each business or premises their working hours. Explain the work to be done and obtain the exact location of the domestic and sprinkler water services and the side of the street where the feed is coming from. Special attention must be given to medical facilities and schools, where work must be rescheduled to avoid total shutdown during normal business hours.

The above procedure must be performed strictly by the RE or under his strict supervision and direction. The EIC is to review the shutdown plan before the work is started.

Reference Material Section

NEW YORK CITY DEPARTMENT OF DESIGN + CONSTRUCTION

Residential Survey

Date_____

BOROUGH_____

Community Board _____

Contract Name_____

Contract Number _____

Please answer all questions that apply. The information you provide will be helpful in planning the ongoing reconstruction of your street. Your cooperation with the DDC Community Construction Liaison or DDC Representative is necessary in the attempt to minimize the construction impact. If you have any questions, please call 718-391-2347.

Office of Community Outreach and Notification

Describe Property Type (circle aone) One or Two Family Multiple Dwelling Apartment Building

Property Owner(s)/Renter/Superintendent _____

Property Address _____

AKA/Corner Property _____

DO YOU NEED SPECIAL ACCOMMODATIONS? _____

NUMBER OF SENIOR CITIZENS _____

NUMBER OF CHILDREN _____ Ages _____

SCHOOL BUS? _____ Days _____

Pick Up Location_____ Time _____

Drop Off Location _____ Time _____

24-hour Emergency Contact Name & Phone Number (Family Contact or Building Custodian) _____

E-Mail Address_____ Fax_____

PLEASE ANSWER THE FOLLOWING QUESTIONS

Do your have critical water needs? _____ i.e. dialysis _____

Is there a MAIN SHUT OFF? _____ A Roof Tank? _____

Does it have multiple feeds for domestic (drinking) water supply?_____ Street Locations_____

FIRE SPRINKLER SYSTEM _____

Do you have OIL HEAT/COAL? _____ Connection Location_____ SEWER/SEPTIC & WATER LINE_____ Location _____

Do you have an active DRIVEWAY? _____

SANITATION PICK-UP DAYS Regular Days & Time_____ Recycle Day & Time_____ Bulk Day_____

Private Carter _____ Dumpster _____ Days _____ Time _____

ADDITIONAL INFORMATION and/or COMMENTS (i.e. moving, restoration, pool installation, events, large deliveries)

Person interviewed _____

PLEASE PRINT

Community Construction Liaison (Please Print) _____

Resident Engineer _____

Field Office Address _____ Phone_____

Office of Community Outreach & Notification
DEPARTMENT OF DESIGN & CONSTRUCTION
30-30 Thomson Avenue ⇔ Long Island City, NY 11101

Reference Material Section

RESIDENTIAL SURVEY

The information requested in this survey will assist the Department of Design and Construction in the planning and implementation of this project.

All information provided will be regarded as confidential and will be kept on file in the project field office.

While we cannot assure that every concern will be addressed to individual satisfaction every effort will be made to reduce interruption to the normal course and quality of life in your community.

We thank you for your cooperation.

BUILDING INFORMATION THE BRONX HWX-21B1

home owner name _____

address _____

phone _____ work phone _____

emergency contact name _____

relationship _____

home phone _____ work phone _____

neighbor-local contact (extension period) _____

home phone _____ work phone _____

Please indicate concerns you have related to the following:

Water Service Interruption _____

Ensuing Medical Concerns (e.g. Dialysis) _____

Special needs accommodations (e.g. Access-A-Ride) _____

Number of Senior Citizens in your household _____

Number of Children in your household _____

ages: 1 ____ 2 ____ 3 ____ 4 ____ 5 ____ 6 ____

Thank you for your cooperation

Visit our Web Site: www.nyc.gov/buildnyc

New York City DDC Department of Design & Construction

A NEW YORK CITY CAPITAL INFRASTRUCTURE PROJECT

SPONSORING AGENCIES

DEP

WORK TO BE PERFORMED

- Water Service
- Sewer
- Sidewalk
- Roadway Work
- Traffic Signs
- Street Lighting

DIAL 311 Government Services Information for NYC

Be prepared to give the following information so your call can be directed properly:

- Your Name
- Borough
- Project Number
- Address in Question
- Telephone Number

What You Need to Know

Contract Number: HWX421B1 PHASE 2

Start: Fall 2004

Project Completion: Summer 2005

Project Cost: $14,750,699

Community Construction Liaison: Mauricio Mayer

DDC Resident Engineer: Manuel Sosa

DDC Engineer In Charge: Nasreen Patel, P.E.

DDC Borough Construction Office: Joseph P. Cassidy, P.E. / Perihan M. Ali, P.E. Bronx, NY 10458

Office of Community Outreach & Notification Director: Sean R. Davis

Project HWX421B1
DDC FIELD OFFICE
Department of Design and Construction
326 Huntington Ave.
Bronx, NY 10457

ATTENTION: Mauricio Mayer
Community Construction Liaison

FIRST CLASS STAMP

DDC New York City Department of Design & Construction

30-30 Thomson Avenue on Long Island City, NY 11101

Michael R. Bloomberg, Mayor — David J. Burney, AIA, Commissioner

WATER MAINS/COMBINED SEWERS
ROADWAY RECONSTRUCTION
SIDEWALKS/RAMPS
HWX421B1

RESIDENTIAL SURVEY

CONSTRUCTION START
AUTUMN – 2004

Reference Material Section

BUILDING MERCHANT SURVEY FORM

This survey is of extreme importance in providing vital information which will help us to expedite the project and prevent unnecessary disruption to your regular routine. Please take a few moments to provide the information required and return this survey form to the Department of Design and Construction, as soon as possible.

BUILDING INFORMATION: Throgs Neck—The Bronx HWX421B1

building address _____

building description (please circle which apply) residential commercial medical

other _____

building manager's name _____

phone _____

emergency contact name _____

24-hour contact phone _____

please CIRCLE ( ) YES or NO as you answer the following questions:

1.	Is building occupied 24 hours per day?	YES	NO
2.	Does building have a roof tank?	YES	NO
3.	Does building have multiple feeds for domestic water supply?	YES	NO
	If YES to question #3, please indicate street locations for domestic feeds:		
	a. _____		
	b. _____		
4.	Does your building have critical water needs?	YES	NO
	If YES, please explain _____		
5.	Do you have evening or night time deliveries?	YES	NO
	If YES, approximate delivery times _____		
6.	Do you have weekend deliveries?	YES	NO
	If YES, approximate delivery times _____		
7.	Do you have basement vaults that extend beyond your building line?	YES	NO
8.	Does building have private, underground facilities within the street?	YES	NO
	If YES, what type? _____		

Thank you for your cooperation

Visit us at Web Site: www.nyc.gov/buildnyc

New York City DDC Department of Design & Construction

A NEW YORK CITY CAPITAL IMPROVEMENT PROJECT

SPONSORING AGENCIES

NYC DEP

WORK TO BE PERFORMED

- Water Mains
- Sewers
- Roadway
- Pedestrian Ramps
- Traffic Signs
- Street Lighting

DIAL 311 — Be prepared to give the following information so your call can be directed properly:

- Your Name
- Borough
- Project Number
- Address in Question
- Return Phone Number

What You Need to Know

Contract Number: HWX421B1

Start: Fall 2004

Projected Completion: Summer 2006

Project Cost: $14,730,650

Community Construction Liaison: Marlon Mayer

DDC Resident Engineer: Martin Smith

DDC Engineer In Charge: Nandkumar Patel, P.E.

DDC Borough Commissioner's Office
Joseph P. Cassidy, P.E.
1 Fordham Plz, 5th Fl.
Bronx, NY 10458

Office of Community Outreach & Notification
Director: Sybil R. Dennis

DDC FIELD OFFICE
Department of Design and Construction
326 Huntington Ave.
Bronx, NY 10467

ATTENTION: Marlon Mayer
Community Construction Liaison

DDC

NEW YORK CITY DEPARTMENT OF DESIGN & CONSTRUCTION
30-30 Thomson Avenue at Long Island City, NY 11101

Michael R. Bloomberg, Mayor — David J. Burney, FAIA, Commissioner

WATER MAINS/COMBINED SEWERS
ROADWAY RECONSTRUCTION
SIDEWALKS/RAMPS
HWX421B1

BUSINESS & MERCHANT SURVEY

CONSTRUCTION START
AUTUMN — 2004

Reference Material Section

SCOP 06-003W: DWM Temporary Construction Valves (page 1 of 1)

STANDARD CONSTRUCTION OPERATING PROCEDURE

NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION
Division of Infrastructure
Bureau of Construction

SCOP..... : 06 -003W

CATEGORY.. : CONSTRUCTION
Subcategory : WATER MAIN

SUBJECT: USE OF TEMPORARY CONSTRUCTION VALVES ON DISTRIBUTION WATER MAINS

Keywords ..... : Valves

Supersedes..... : N/A
Supplements..... : N/A
Sheet. .. .. : 1 of 1

APPROVED: ORIGINAL SIGNED BY
Assistant Commissioner - Richard Zetterlund, P.E.

Issue Date..... : June 27, 2006

The use of temporary construction valves during Distribution Water Main (DWM) installation can reduce the number of service shutdowns experienced by the affected homeowners or businesses . Temporary construction valves can be used to isolate and maintain service to water sensitive facilities (i.e., hospitals, schools, etc.) from ongoing work on a long block, or on a block where work is progressing slowly due to site conditions.

Before utilizing a temporary construction valve, the Resident Engineer in consultation with the Engineer-In-Charge, and DEP Borough Distribution Engineer or representative, should consider reconfiguration of the valve installation plan or installing additional valves.

If there is no compelling reason to make the temporary valve permanent, the valve should be installed in a manner allowing for quick removal. Typical installation meeting this requirement would involve two sleeves and two short sections of pipe.

The last task on this section of DWM work will require a shutdown, removal of the temporary valve and replacement with a short section of pipe. Reusing of the sleeves and wedge restriant glands is permitted provided that they are in good condition and reinstalled properly.

Field cards should show replacement pipe and sleeves in final position. In-service sheets must show temporary valve locations. New In-service sheets must be submitted when removed.

Payment will be made under the appropriate bid items and/or through a change order as appropriate.

NOTICE

THE WATER SUPPLY TO YOUR BUILDING WILL BE SHUT OFF

DUE TO CONSTRUCTION

date _____ time _____ am / pm

for approximately _____ hours

INSTRUCTIONS FOR BUILDING MANAGEMENT STORE OWNERS & TENANTS

- Shut off the main house valve
- Open ore HOT WATER faucet above the level of the hot water tank
- Shut OFF all water cooled appliances which may include air conditioners, etc.
- Check that there is sufficient water in the steam boiler
- Water Service will be restored at the end of the work day
- Low Water Pressure may occur in surrounding areas

MAKE SURE THAT YOU STORE ENOUGH WATER FOR USE DURING THIS PERIOD.

Rudolph W. Giuliani
Mayor

The City of New York

For Further Information Contact the FIELD or BOROUGH Office

Para mas informacion cominiquese con la oficina de Construccion

THE BRONX

☐ FIELD OFFICE

_____

☐ BOROUGH OFFICE
1-718-365-2106

IF NO ANSWER

CALL

[SI NO CONTESTA LLAME AL]
1-718-391-1000

New York City DDC Department of Design & Construction — Community Outreach & Notification

Luis M. Fermenta, P.E.
Commissioner
Department of Design & Construction

AVISO

INTERRUPCION DEL SERVICIO DE AGUA

El Servicio Del Agua Sera Interrumpido

DEBIDO A CONSTRUCCIÓN

fecha _____ a la(s) _____ am / pm

aproximadamente _____ horas

INFORMACION PARA ADMINISTRADORES, SUPERINTENDENTES, INQUILINOS, Y DUEÑOS DE TIENDAS

- Cierre la válvula central del edificio
- Abra una llave de agua caliente sobre el nivel del tanque de agua caliente.
- Cierre todas las válvulas de agua fría y de aire acondicionado.
- Asegúrese que haya suficiente agua en la caldera de vapor.
- El servicio de agua regresará al final del día.
- La presión del agua puede bajar en la vencindad.

¡ASEGURESE DE TENER SUFICIENTE AGUA ALMACENA DURANTE ESTE PERIODO!

DDC98

ATTACHMENT 9
THE BRONX

Reference Material Section

SCOP 08-001W: Transfer of Water Services to New Mains (page 1 of 5)

STANDARD CONSTRUCTION OPERATING PROCEDURE

NEW YORK CITY DEPARTMENT OF
DESIGN + CONSTRUCTION
Division of Infrastructure
Bureau of Construction

SCOP..... : 08 - 001W

CATEGORY..: CONSTRUCTION
Subcategory : WATER MAIN

SUBJECT: TRANSFER OF WATER SERVICES TO NEW MAINS

Keywords .....: Water Mains, Taps, Wet Connections Service Connections
Supersedes..... : N/A
Supplements.. .. : 05-004G, 05-007W
Sheet..... : 1 of 5

APPROVED: ORIGINAL SIGNED BY
Chief Construction Engineer- William Sviiar, P.E.

Issue Date..... : February 8, 2008

Attached is a letter from DEP's Director of Engineering to DDC's Deputy Commissioner of Infrastructure, outlining rules governing the transfer of old taps and wet connections to new water mains. The rules are in bold and are followed by some background information for clarity. The procedures below are the end result of the "tap search" task described in the DWM Inspection Manual No. 2 section entitled "Researching a Location".

Please ensure that all DDC field staff, Consultants and Contractors are informed of these rules and that they are reviewed at all pre-construction and critical phase meetings.

Attachments: Letter from DEP to DDC and associated detailed explanation;
Sample letter to Property Owners.

Reference Material Section

SCOP 08-001W: Transfer of Water Services to New Mains (page 2 of 5)

NEW YORK CITY DEPARTMENT OF DESIGN + CONSTRUCTION

MEMO

DATE: February 8, 2008

TO: Infrastructure Construction Staff

FROM: William Svilar, P.E.
Chief Construction Engineer

SUBJECT: Rules Governing the Transfer of Water Services to New Water Mains

Attached is a letter from DEP's Director of Engineering to DDC's Deputy Commissioner of Infrastructure, outlining rules governing the transfer of old taps and wet connections to new water mains. The rules are in bold and are followed by some background information for clarity. The procedure below are the end result of the "tap search" task described in the DWM Inspection Manual No.2 section entitled "Researching a Location".

1. **Install a new tap or wet connection in the new water main in front of the premises and complete a tap card.**
   This rule is self- explanatory.

2. **If existing taps or wet connection were open, leave new taps or wet connections open.**
   This rule is self-explanatory.

3. **If existing taps or wet connection were closed, leave new taps or wet connections closed.**
   On occasion an existing service may not be in use because DEP had served a three-day notice to the property owner to repair a leaking service and subsequently shut the tap or wet connection when no action was taken preventing further damage to the roadway. Normally, the owner would hire a plumber and fix the service without delay. However, a few owners have delayed repairing a fire service since the service loss would not generate the amount of tenant complaints a domestic service loss would. If such a situation was encountered, the Resident Engineer should contact DEP Maintenance to get a history on the shutdown service connection. If DEP had given notice to the owner and subsequently shutdown the service, a courtesy letter should be sent to the owner of record reminding him of the shutdown service requiring repair, a deadline to accomplish the repair should be provided coinciding with the commencement of permanent restoration work and a warning that the matter will be referred to the Dept. of Buildings (DOB), the Fire Dept. (FDNY) and their insurance carrier if no action is taken. Our primary goal is to have repairs completed in areas where full reconstruction or a curb to curb asphalt resurfacing will be done for permanent restoration. Follow-up accordingly.

4. **If the existing tap or wet connection is less than one (1) size smaller than the service line, install a tap or wet connection one size smaller than the service line.**
   This rule applies to domestic service lines only. Taps are available in the following sizes ¾-inch, 1-inch, 1¼-inch, 1½-inch and 2-inch. Some older mains may have ½-inch and ⅝-inch taps which must be replaced with a ¾-inch (the smallest size) tap on the new main. A ¾-inch tap can accommodate a service line up to 1-inch in diameter. For example: a 2-inch or 1¾-inch service line will require a 1 ½-inch tap to be installed. A 1½-inch service line will be reconnected to a new 1¼-inch tap. A 2-inch tap may be connected to variety of existing service lines (brass, tubing, ductile iron, galvanized steel) that are greater than 2-inches but less than or equal to 3-inches in diameter. Service

Reference Material Section

SCOP 08-001W: Transfer of Water Services to New Mains (page 3 of 5)

lines with diameters greater than 3-inches but less than or equal to 4-inches require a 3-inch wet connection. Service lines with diameters greater than 4-inch require a 4-inch wet connection. DOB determines approves the size of the service and tap/wet connection for new buildings, facilities and homes. Existing tap cards may require a wet connection larger than 4-inches to be installed. Items to install wet connections and valves larger than 4-inches will be included in your contract.

5. **If the existing tap or wet connection is supplying a fire service, sprinkler service, standpipe service or a combined fire/domestic service, install a tap or wet connection equal to the size of the service line unless the service line is larger than 4-inches.**
This rule is self-explanatory. Current DOB codes require fire protection for service areas and kitchens to be installed in multi-family dwellings (3 units or more). The combination fire/domestic service connection for a new three family dwelling would be governed by this rule. If tapping records reveal connections larger than 4-inches, items to install wet connections and valves larger than 4-inches will be included in your contract.

6. **If an existing tap or wet connection for a property is not transferred to the new water main, prepare a tap card which indicates that the existing tap or wet connection was not transferred to the new water main.**
This rule is for recordkeeping purposes. Once an existing service is not transferred to a new main, the completed tap card indicating so would close the "account" at Water Registry. There are many instances where a service is no longer in use and has been abandoned without a tap card indicating so. Basically, this rule requires the inspector to reconcile what was found on the old main and what is transferred to the new main with the existing tapping records and remedy any inconsistencies. For example: A house or building demolished by DOB on an emergency basis would require a private plumber to be hired to disconnect the service at the tap and destroy the tap or remove it and install a plug in the tapped hole. The private utilities (gas, electric) would address their own facilities. In this example the plumber was hired and the service was capped at the building line before demolition. When encountered during new main installation the tap and service line would appear to be servicing a vacant lot and was just abandoned. However, tapping records would indicate the tap was still in use. The inspector would fill out a new tap card indicating the encountered abandoned service was "Not Transferred to the New Main – Abandoned Service Vacant Lot".

7. **Destroyed taps or wet connections should not be transferred to the new water main.**
This rule is self-explanatory. On a record keeping basis, a tap card would have been previously filled out noting the destruction of a tap or wet connection or removing a tap and plugging the tapped hole would close the "account". The inspector would fill out a new tap card indicating the encountered abandoned service was "Not Transferred to the New Main – Old Tap Destroyed or Plugged".

8. **Abandoned taps or wet connections should not be transferred to the new water main.**
This rule is self-explanatory. On occasion DEP-Maintenance would shut taps or wet connection valves to leaking services that were abandoned. A tap card would be filled out indicating that DEP shut the tap to abandoned service. When encountered during a new main installation, a new tap card indicating the aforementioned service was "Not Transferred to the New Main – DEP previously closed tap to Abandoned Service" must be prepared.

Reference Material Section

SCOP 08-001W: Transfer of Water Services to New Mains (page 4 of 5)

The City of New York

DEPARTMENT OF ENVIRONMENTAL PROTECTION
59-17 Junction Boulevard
Flushing, New York 11373

Emily Lloyd
Commissioner

James J. Roberts, P.E.
Deputy Commissioner

Bureau of Water and Sewer Operations

Tel (718) 595-6330
Fax (718) 595-6342
jroberts@dep.nyc.gov

September 25, 2007

Eric Mac Farlane, P.E.
Deputy Commissioner, Infrastructure
Department of Design & Construction
30-30 Thomson Avenue
Long Island City, NY 11101

2007 SEP 26 PM 1:56

Re: Transferring of Old Tap & Wet Connections to New Water Mains by DDC Contractors

Dear Mr. Farlane:

This office has been advised by staff that reiterating the reinforcement of the Department of Environmental Protection (DEP) procedure for the Department of Design & Construction (DDC) engineers and inspectors supervising transfer of taps and wet connections by DDC contractors from old water mains to new water mains would be beneficial at this time.

DDC engineers and inspectors should be advised to direct contractors to strictly adhere to the following procedures:

1) Install new tap or wet connection in new water mains in front of the premises and complete a tap card.
2) If existing taps or wet connections were open, leave new taps or wet connections open.
3) If existing taps or wet connections were shut, leave new taps or wet connections shut.
4) If the existing tap or wet connection is less than one (1) size smaller than the service line, install a tap or wet connection one (1) size smaller than the existing service line.
5) If the existing tap or wet connection is supplying a fire service, sprinkler service, standpipe service or combined fire/domestic service, install a new tap or wet connection which is equal to the size of the service line unless the service line is larger than 4."
6) If an existing tap or wet connection for a property is not transferred to the new water main, prepare a tap card which indicates that the existing tap or wet connection was not transferred to the new water main.
7) Destroyed taps or wet connection should not be transferred to the new wate main.
8) Abandoned taps or wet connections should not be transferred to the new water main.

If your staff has any questions regarding this matter, please direct them to contact Mr. Herbert Kass, P.E., Chief Division of Permitting & Connections at (718) 595-5401.

Very truly yours,

Magdi Farag, P.E.
Director of Engineering

DDC99-1-356

Reference Material Section

SCOP 08-001W: Transfer of Water Services to New Mains (page 5 of 5)

NEW YORK CITY DEPARTMENT OF DESIGN + CONSTRUCTION

DAVID J. BURNEY, AIA
Commissioner

ERIC C. MACFARLANE, P.E.
Deputy Commissioner
Infrastructure

RICHARD W. ZETTERLUND, P.E.
Associate Commissioner
Infrastructure
Construction

SAMPLE COURTESY LETTER TO REGISTERED PROPERTY OWNERS

DATE:

MR/MS 1ST NAME LAST NAME
STREET ADDRESS
CITY, STATE ZIP

RE: CAPIS ID:
Contract Reg. #:
JOB DESCRIPTION:
Borough:
Ref: Transfer of Water Services to *(Property Address, Block & Lot Nos.)*

Dear *Mr./Ms. (Name):*
We are in the process of installing new water mains adjacent to your property and found your existing *(service size in inches) (fire/domestic/combination)* service was shutdown. Further investigation revealed that NYCDEP Maintenance issued a "3-day notice", on *(date)*, directing you to hire a licensed plumber to repair your leaking service. Subsequently, DEP shutdown the service, on *(date)*, to prevent further damage to the roadway after you failed to take necessary action.

You are urged to hire a plumber and start repairs as soon as possible. The repair work must be completed one month prior to the scheduled final restoration commencement date of *(date)*. Please notify *(name)*, the Resident Engineer, at *(field office tel. no.)* when the repairs are completed and service restored.

This matter will be referred to the New York City Department of Buildings (DOB), the Fire Department of New York City (FDNY) and your insurance carrier for further action if you fail to commence and complete the repair work one month prior to the scheduled date for commencement of final restoration work.

If you have any further questions, please contact *(name)*, the Engineer-In-Charge for this project, at *(phone number)*.

Very truly yours,

(Name)
Resident Engineer
Infrastructure/Construction

cc: DIR., DD., E.I.C., R.E., file

DDC99-1-357

30 - 30 Thomson Ave L.I.C., NY 11101 Telephone: 718 391 1901 Facsimile: 718 391 2384 www.nyc.gov/buildnyc

Reference Material Section

SCOP 05-011G: Material Release and Shipping Authorization - QACS (page 1 of 4)

STANDARD CONSTRUCTION OPERATING PROCEDURE

City of New York — Department of Design and Construction
Division of Infrastructure Bureau of Construction

SUBJECT: MATERIAL RELEASE AND SHIPPING AUTHORIZATION - QACS

APPROVED: ORIGINAL SIGNED BY
Assistant Commissioner - Richard Zetterlund, P.E.

SCOP.....	: 05 -011G
CATEGORY....	: CONSTRUCTION
Subcategory	: MATERIAL ACCEPTANCE
Keywords	Material Certification Testing, Shipping
Supersedes...	: N/A
Supplements.....	: N/A
Sheet.....	: 1 of 1
Issue Date.....	: October 3, 2005

All sewer and watermain materials listed under Exhibit- 2 are subject to release and shipping authorization by DDC Quality Assurance and Construction Safety (QACS) Unit, by means of the serialized, signed and dated Material Release and Shipping Authorization form on Exhibit- 1 (attached). The Resident Engineer and their staff shall not accept any of the listed items unless accompanied by this release form.

For items formally released using the referenced form, additional documents such as Material Certifications and Test Reports will not be required for acceptance on site. Such documents will be maintained by QACS which can be contacted directly for verification or for copies.

Material acceptance requirements for the items not listed under Exhibit 2 will continue in accordance with the applicable contract specifications and standards.

ATTACHMENTS: Exhibit- 1: Material Release and Shipping Authorization form # 2005; Exhibit- 2: Items Subject to DDC QACS Release; Exhibit- 3: Sample/Explanation of Material Release Form # 2005.

Reference Material Section

SCOP 05-011G: Material Release and Shipping Authorization - QACS (page 2 of 4)

DDC

City of New York Department of Design and Construction

Supplier: _____
Contract No: _____
Purchase Order No: _____
Issuing Party: _____
Quantity: _____
(To be filled by Supplier)

EXHIBIT- 1

David J. Burney, A.I.A
Commissioner

Mark A. Canu
Assistant Commissioner
Technical Support

30-30 Thomson Avenue
Long Island City, NY 11101

Tel. 718 / 391-1391
Fax 718 / 391-1651
www.nyc.ny.us/buildnyc

MATERIAL RELEASE & SHIPPING AUTHORIZATION # 2005-

DATE:
CONTRACT NO/TITLE:
MANUFACTURER/VENDOR:
ISSUING AGENCY/PARTY/PURCHASE ORDER NUMBER:
MATERIAL/ITEM DESCRIPTION:
TO: **Part:** **Qty** **Part ID** **Fabrication Date:** **Heat**
CC:

WAIVER: This office is waiving inspection requirements regarding the referenced material item(s), showing compliance with the requirements of the applicable contract specifications and with those indicated by the referenced Purchase Order. The submitted certificate(s) have been found acceptable by this office. **(Signature Section A to be completed by QA. No further action is necessary.)**

SOURCE RELEASE: A source inspection has been conducted to physically verify material(s) and review supportive documentation to assure that material(s) item(s) indicated in the referenced Purchase Order and Material/Item Description are in compliance with the requirements of the applicable contract specifications and those indicated by the referenced P.O. **(Signature Section A to be completed by QA. No further action is necessary.)**

CONDITIONAL RELEASE: Material acceptance pending evaluation of the following inspections/testing/action **(Signature Section A to be completed by QA. Upon satisfactory inspections/testing/action Signature Section B must also be completed by QA prior to use of the product by the contractor/supplier)**

_____
_____
_____

This Shipping Authorization is based on our source inspection and/or acceptance of supportive documentation covering only the materials and workmanship as to their compliance with the requirements of the applicable contract specification. Since it is the Contractor's, his/her agent's or representative's responsibility to specify in the Purchase Order the required quantities, sizes, dimensions, and type of articles used under the contract, this authorization shall not be interpreted as an expressed or implied approval or acceptance by the Agency regarding any or all of these specifics.

DIVISION OF TECHNICAL SUPPORT
BUREAU OF QUALITY ASSURANCE & CONSTRUCTION SAFETY

A. ☐ WAIVER ☐ SOURCE RELEASE ☐ CONDITIONAL RELEASE (check the applicable box)

NAME: _____ TITLE: _____

SIGNATURE: _____ DATE: _____

B. FINAL ACCEPTANCE OF CONDITIONALLY RELEASED MATERIAL

ON: _____ BY: _____

FOR: DDC Technical Support QACS
cc: Resident Engineer, QACS File
others: (specify)

Revised 08/04KP

EXHIBIT- 2

ITEMS SUBJECT TO DDC QACS RELEASE

PIPES & FITTINGS

Spiral Welded Steel Pipes & Fittings
Extruded/Welded Steel Pipes
Ductile Iron Pipes & Fittings
Clay Pipes (ESVP)
Concrete Pipes (RCP)

VALVES

Metropolitan Gate Valves
Resilient Seated Gate Valves
Tapping Valves (R/S and Met)
Pressure Regulator Valves
Butterfly Valves

FIRE HYDRANTS

Dresser Type (D-2-LP)
Smith Type (S-2-LP)

CASTINGS

Sewer Castings (Manholes, Catch Basins)

OTHER ITEMS

Fasteners (Bolts and Nuts)
Wedge Restraint Glands
SS Tapping Sleeves
Expansion Joints
Steel couplings
Flow Meters/Venturi Meters

Reference Material Section

SCOP 05-011G: Material Release and Shipping Authorization - QACS (page 4 of 4)

NEW YORK CITY DEPARTMENT OF DESIGN + CONSTRUCTION

Supplier: *SUPPLIER'S NAME*
Contract No: *DDC PROJECT NO.*
Purchase Order No: *CONTRACTOR PO #*
Issuing Party: *CONTRACTOR'S NAME*
Quantity: *QTY, SERIAL #S*
(To be filled by Supplier)

EXHIBIT- 3

David J. Burney, A.I.A
Commissioner

Mark A. Canu
Assistant Commissioner
Technical Support

30-30 Thomson Avenue
Long Island City, NY 11101

Tel. 718 / 391-1391
Fax 718 / 391-1651
www.c.nyc.ny.us/ddc/nyc

THE ABOVE BOX TO BE FILLED BY THE SUPPLIER FOR
SUPPLIER STOCK ITEMS

MATERIAL RELEASE & SHIPPING AUTHORIZATION # 2005-XXX

DATE: *RELEASE DATE*
CONTRACT NO/TITLE: *DDC PROJECT NUMBER*
MANUFACTURER/VENDOR: *MANUFACTURER'S OR SUPPLIER'S NAME AS APPLICABLE*
ISSUING AGENCY/PARTY/PURCHASE ORDER NUMBER: *DDC OR SUPPLIER NAME & PO*
MATERIAL/ITEM DESCRIPTION: *GENERAL MATERIAL DESCRIPTION*
TO: *MANUFACTURER'S NAME* **Part:** **Qty** **Part ID** **Fabrication Date:** **Heat**
ATTENTION OF *PART DETAIL QTY* *SERIAL NO, FABRICATION DATE HEAT #*
CC: *AS NECESSARY*

WAIVER: This office is waiving inspection requirements regarding the referenced material item(s), showing compliance with the requirements of the applicable contract specifications and with those indicated by the referenced Purchase Order. The submitted certificate(s) have been found acceptable by this office. **(Signature Section A to be completed by QA. No further action is necessary.)**

SOURCE RELEASE: A source inspection has been conducted to physically verify material(s) and review supportive documentation to assure that material(s)/items(s) indicated in the referenced Purchase Order and Material/Item Description are in compliance with the requirements of the applicable contract specifications and those indicated by the referenced P.O. **(Signature Section A to be completed by QA. No further action is necessary.)**

CONDITIONAL RELEASE: Material acceptance pending evaluation of the following inspections/testing/action **(Signature Section A to be completed by QA. Upon satisfactory inspections/testing/action Signature Section B must also be completed by QA prior to use of the product by the contractor/supplier)**
WHEN WAIVER OR SOURCE RELEASE BOXES ARE CHECKED, NO FURTHER ACTION IS REQUIRED. WHEN CONDITIONAL RELEASE BOX IS CHECKED, THIS MEANS THAT ITEMS WERE RELEASED URGENTLY DUE TO FIELD REQUEST & THE FINAL RELEASE OF THESE ITEMS WILL BE SUBJECT TO QACS INSPECTION, SEE "SECTION B" BELOW

This Shipping Authorization is based on our source inspection and/or acceptance of supportive documentation covering only the materials and workmanship as to their compliance with the requirements of the applicable contract specification. Since it is the Contractor's, his/her agent's or representative's responsibility to specify in the Purchase Order the required quantities, sizes, dimensions, and type of articles used under the contract, this authorization shall not be interpreted as an expressed or implied approval or acceptance by the Agency regarding any or all of these specifics.

DIVISION OF TECHNICAL SUPPORT
BUREAU OF QUALITY ASSURANCE & CONSTRUCTION SAFETY

A. ☐ WAIVER ☐ SOURCE RELEASE ☐ CONDITIONAL RELEASE (check the applicable box)
THIS SECTION IS SELF EXPLANATORY

NAME: _____ TITLE: _____

SIGNATURE: _____ DATE: _____

B. FINAL ACCEPTANCE OF CONDITIONALLY RELEASED MATERIAL
ITEMS THAT ARE CONDITIONALLY RELEASED TO THE FIELD WILL NEED THIS SECTION TO BE COMPLETED BY QACS FOR FINAL ACCEPTANCE AND RELEASE. THESE WILL BE VERY FEW IN NUMBER

ON: _____ BY: _____

FOR: DDC Technical Support / QACS
cc: Resident Engineer, QACS File

DDC-99-1-305

Reference Material Section

HYDRANT FLOW CHART

How to approximate a flow rate using this chart:

1. The hydrant height dimension (H) is measured from the top of the asphalt to the centerline of the hydrant nozzle. An average hydrant height (H) of 2'-3" (2.25 FT) is used in these calculations.

2. The "L" dimension is measured from the edge of the nozzle to the center of the stream of water striking the asphalt. Place a mark on the asphalt for the "L" dimension corresponding to the flow rate to be established.

3. Remove the hydrant cap from the nozzle to be used to approximate the flow rate (leave the other cap on).

4. Adjust the flow so that the center of the water stream is landing on the mark.

5. If you are adjusting the flow rate to achieve a chlorination contact time, adjust the center of the stream to be 2-3 inches shy of the mark this will reduce the flow rate slightly to ensure a desired contact time. If you are timing a flushing operation, adjust the center of the stream 2-3 inches beyond the mark to slightly increase the flow rate.

Formulas:

Area of Circle = A (Diameter in inches) = A(D) = PI*D^2/4

H = 0.5*g*t^2; t = SQRT(2*H/g)

L = V(L)*t; V(L) = L/SQRT(2*H/g)

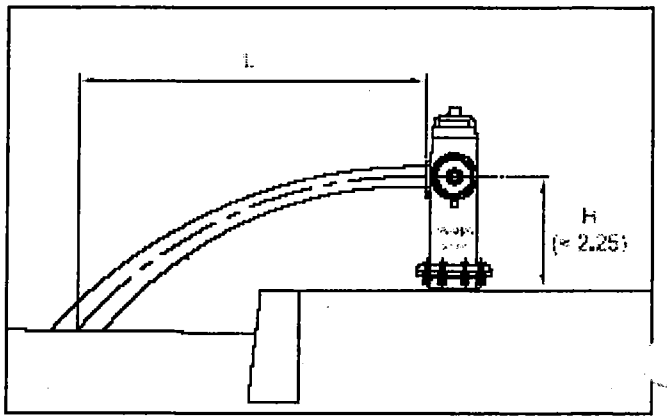
Q(D/L) = A(D)*V(L) = PI*D^2/4*L/SQRT(2*H/g)

Constants & Conversions:

g = 32.2 FT/sec^2

PI = 3.14159

1 CF of Water = 7.4805 Gallons



L (FT)	Q(2.5-inch) CF/sec	Q(2.5-inch) GAL/min	Q(4-inch) CF/sec	Q(4-inch) GAL/min
1.00	0.0912	40.93	0.2334	104.77
1.25	0.1140	51.16	0.2918	130.97
1.50	0.1368	61.39	0.3502	157.16
1.75	0.1596	71.62	0.4085	183.35
2.00	0.1824	81.85	0.4669	209.55
2.25	0.2052	92.09	0.5252	235.74
2.50	0.2280	102.32	0.5836	261.93
2.75	0.2508	112.55	0.6420	288.13
3.00	0.2736	122.78	0.7003	314.32
3.25	0.2964	133.01	0.7587	340.51
3.50	0.3192	143.24	0.8170	366.71
3.75	0.3419	153.48	0.8754	392.90
4.00	0.3647	163.71	0.9337	419.09
4.25	0.3875	173.94	0.9921	445.29
4.50	0.4103	184.17	1.0505	471.48
4.75	0.4331	194.40	1.1088	497.67
5.00	0.4559	204.64	1.1672	523.87

Reference Material Section

Water Sample Card - Blank

The City Of New York
Department Of Environmental Protection
Bureau Of Water Supply,Quality & Protection
Construction

Sample No.

Description (circle)
New Main
Feed

Boro (circle)
Bx Bklyn SI
Mn Qns

Time Collected:

Sample Location (Address,etc)

Date Collected:

Hydrant Tap Other (explain)

Date Main Installed:

PLEASE PRINT

Report Of Analytical Examination

		Colonies from MFT (Bacteriology)			
Temperature, F		Type/ No	Presumptive	Confirmed	Lab Comments:
Res. Chlorine, mg/l		Typical	24 hr		
Turbidity, NTU			48 hr		
Color, u		Atypical	24 hr		
Spec. Cond. umho/cm			48 hr		
pH		Coliform/100 ml			
		E.coli/ 100 ml			

Field Comments:

Category to be used for reporting purposes (circle all applicable):

Distribution Main **Wet Lay**

Trunk Main **Dry Lay**

Private Main

Contract Number:

Collector's Name:

Signature:

Collector's Telephone #:

Reference Material Section

Water Sample Card - Completed Sample

The City Of New York
Department Of Environmental Protection
Bureau Of Water Supply, Quality & Protection
Construction

Sample No. 2F
Description (circle): New Main 20" (Feed)
Boro (circle): Bx Bklyn (SI) Mn Qns
Time Collected: 7:45 AM
Sample Location (Address, etc): Hydrant (Tap) Other (explain) On Night Cap IFO #285 Richmond Rd.
Date Collected: 11/15/06
Date Main Installed: 11/14/06

PLEASE PRINT

Report Of Analytical Examination

		Colonies from MFT (Bacteriology)			
		Type/ No.	Presumptive	Confirmed	
Temperature, F	50°F				
Res. Chlorine, mg/l	0.5	Typical	24 hr		Lab Comments:
Turbidity, NTU			48 hr		
Color, u		Atypical	24 hr		
Spec. Cond. umho/cm			48 hr		
pH		Coliform/100 ml			
		E.coli/ 100 ml			

Category to be used for reporting purposes (circle all applicable):

(Distribution Main) (Wet Lay)
Trunk Main Dry Lay
Private Main

Contract Number: RED-354
Collector's Name: Walter Sampler
Signature: W Sampler
Collector's Telephone #: 718-391-3000

Field Comments: