

# Tech Brief

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## Quality Control in Construction Projects

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Photos by **Julie Black**, courtesy of Morgantown Utility Board

### Summary

Utility systems need infrastructure to last as long as possible. One way to ensure longevity is through quality control. To have good quality control in construction projects is to perform good inspections. Remember, you can inspect it now or fix it later.

Quality control is critically important to a successful construction project and should be adhered to throughout a project from conception and design to construction and installation. Inspection during construction will prevent costly repairs after the project is completed. The inspector, engineer, contractor, funding agency, permit agency, and system personnel must work together to inspect, document, and correct deficiencies.

### What is quality control?

For construction projects, quality control means making sure things are done according to the plans, specifications, and permit requirements. The days of easy federal money seem to be over, making it imperative that communities get the most out of their infrastructure projects.

One of the best ways to assure good construction projects is to use an inspector. The first step an inspector should take is to become familiar with the plans, specification, and permit requirements and, equally important, to have some common sense. Quality control during all construction phases needs to be better, and the utility system needs to know what is being installed while the work is being done. On most construction jobs, the inspection is one of the last things to be done—if it gets done at all.

### Inspectors

The utility system may or may not be required to have an inspector through the project engineer. Checking with the project funder clears up any doubt about whether this is mandatory. This does not mean the utility system can't have its own inspector

on the project site as well. A good candidate for this role is someone who already works with the utility system, particularly the chief operator.

Why should the utility system have to pay twice for the same inspection? Often it is the only way to assure quality control. The utility system may want to use a third party for inspections versus using their own or one hired by the project engineer. Again, check with the funding agency to see if this is allowed.

The inspector should know the plans and specifications inside-out, including the financial parameters for the particular project. He or she should also know the state or primacy agency requirements for water and sewer projects.

Some utilities may have their own specifications that are more rigorous than the state or primacy requirements. Be sure the plans and specifications are what the utility wants before they go out to bid. It's a good idea to let the chief operator and other treatment plant staff take a look at the plans. After all, these are the people who have to fix something after the warranty is expired or if the

job is not done correctly the first time.

Never forget that the utility system is the client. Everyone associated with the project needs to be aware of this fact, especially the project engineer. Although the project engineer is often seen as the boss, he or she has to answer to the utility system, the permit or primacy agency, and the funding agency. The only one the project engineers do not have to answer to is the contractor.



This photo shows a water line crossing under a sewer line. This arrangement violates health codes in every state because a sewer leak could contaminate the water line below. (Photo by Allen Marchan)

### The Inspector's Job

While on the job, the inspector should keep an eye out for improper procedures and sloppy work. A few items to look for include:

- improper thrust blocking (e.g., using unopened bags of mortar or concrete);
- waterline being bent beyond allowable radius;
- improper or lack of pipe bedding;
- bad alignment between manholes;
- leaking manholes (e.g., no sealant);
- inappropriate backfill material (e.g., big rocks);
- inadequate compaction;
- wrong pipe material;
- no drainage for fire hydrants;
- inadequate clearances with other utility lines (particularly sewer, but also electric and gas lines); and
- customer lawn restorations.

### Roles in Construction Project

Even a relatively small construction project is complex and there are several different roles associated with its success.

**The Utility System**—One of the first things the system manager must do is to select an engineer. A good way to start this process is to call nearby utility systems and talk with them about engineers they may have used in the past. The more places you call, the better.

The most important thing the utility system can do is review the plans and specifications. Don't wait to look at the plans right before they're ready to go to bid. The utility system needs to be intimately involved with the design process from the very beginning.

Don't take for granted that the engineer will have everything exactly the way the utility system needs or wants it.

Let your operator(s) look at the plans and specifications. If there is something that is not right or the utility system would like to change, take a red pencil or red pen and mark it right on the plan and specifications.

**The Project Engineer**—If the utility system does not have an engineer on staff (and most systems don't), one is usually retained through a selection process. Certain procedures may dictate how the engineering firm is selected. The utility system should check with their state's utility commission, their funding agency, and possibly the state primacy or permitting agency.

The engineer designing the project provides plans and specifications. This person also usually conducts the primary inspection—in some cases the only inspection. The utility system should contract with the engineer to provide them as-built plans. These plans are very important for future reference. The utility system is responsible for telling the engineer specific items that they need or want in the project.

**The Funding Agency**—Most utility systems do not have enough money to finance a major project. The funding agencies are the people who lend the money (e.g., Rural Development Utility Services loans and grants, state revolving loan funds, community development block grants). Agencies typically review the plans and specifications and have certain requirements that must be followed. They may also inspect the project.

**The Primacy or Permit Agency**—The state

Four problems are visible in the photo at the right. Clockwise from the top right, (1) an inadequate thrust block is used, (2) improper clearance from an abandoned cast iron pipe is evident, (3) an open, terra cotta sanitary sewer line is seen near the water line, and (4) the water line is actually touching a sewer line. (Photo by Julie Black)



Contractors often use substandard practices. These bags of quick-drying concrete are being used to seal the sewer line and abandoned cast iron pipe shown in the photo above. (Photo by Julie Black)



primacy or permit agency (usually the same entity) will review the plans and specifications to see if they meet the minimum requirements for that state. They may have comments for the project engineer to address and send back corrected plans and specifications before issuing a permit. They can and sometimes will do their own inspection on the construction project.

**The Contractor**—The contractor (or, on really big jobs, more than one contractor) builds the project as set forth by the plans and specifications. Contracting companies are profit motivated, but most of the time they also have to be the lowest bidder for the project. Some—but by no means all—contractors are tempted to cut corners in order to realize more profit on a job.

**The Water or Sewer Customer**—The water or sewer customer ultimately pays the bills and receives the service. Don't take the customers for granted. Before, during, and after construction projects, treat their property with respect, especially when it comes to right-of-way issues and lawn restoration. If there is a question or a problem, don't

hesitate to ask.

These are the main roles in construction projects. Many support people in between also make the whole thing come together.

## Inspectors, Communication, and Command

Because so many different groups have a role in a construction project, there could be one inspector representing each of the following:

- Funding agency
- Permit agency
- Project engineer
- Utility system

There should be an inspector for each construction crew. In other words, if the contractor has six different crews throughout the utility system, it would be beneficial to have six inspectors, so one inspector does not have to go from crew to crew and run the risk of missing something. This may seem extreme, but it will generally pay off in the long run.

Good communication is essential for a construction project whether you have one inspector or 15. Communication has to be coordinated with all those involved in the project, including the lead inspector, the project engineer, the utility system, the permit agency, and the contractor(s). Public meetings may also be required or desirable. This is a lot of people and to communicate effectively, there needs to be a set chain of command.

Establishing a chain of command is easier said than done. The permit agency or utility system (the client) would normally dictate, but the funding agency holds the purse strings. The channels of communication and chain of command should be spelled out at the very first project or pre-bid meeting, and should be in writing. Agreeing on this arrangement before the construction starts will make it much easier once the project gets going.

To be able to have good communication, you must assemble everyone in one place, such as weekly construction meetings and monthly project meetings. The lead inspector may want to confer with the other inspectors and contractor(s) on a daily basis. Take notes or videotape the meetings.

## Assuring Good Quality Control

The lead inspector for the project needs to have the authority to make some import-



The backfill seen in this photo is of a much larger size than recommended. (Photo by Julie Black)

ant calls on the job, even to shut it down if necessary. Don't be a passive inspector and just observe; make calls and point things out. Remember, if you have a question about the project, the first thing to refer to are the plans and specifications.

The old adage states that the three most important factors in real estate are location, location, and location. Similarly with quality control, the inspector has to remember three important things: document, document, and document. This is also known as good record keeping.

When dealing with a problem, put it in writing (usually addressed to the utility system) making everyone else a copy of the letter. Some of the best tools that can be used for documentation are pencil and paper and a daily logbook. Make sure the inspector has a logbook that is weather resistant, like "Rite-in-the-Rain" products. This can allow the inspector to take notes at the worksite. Don't force the inspector to remember what needs to be recorded until he or she gets to the job

trailer or office.

Write it down and never erase; cross out mistakes. If an inspector has a good logbook that has dates and times and locations and is signed or initialed (each page), it can be used in a court of law. But if there are erasure marks, it will most likely be thrown out.

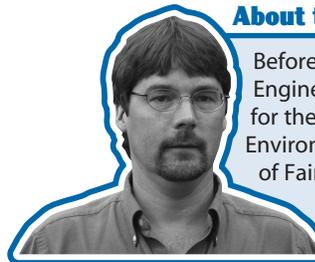
Another good idea is to note the names of the people involved or that are at the site each day. Be very specific, especially when there is a problem. It is a good idea to take pictures and videotape before, during, and after construction. Keep in mind, though, that some courts will not allow digital photos or video, so use conventional cameras if this is the case in your area.

As the water or sewer utility in your community, you have a responsibility to see that construction projects are carried out correctly. Having an inspector on site may seem like an unnecessary expense, but in reality, these efforts often save money down the road.

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### About the Author



Before joining NESCS's technical services unit, Engineering Scientist **Zane Satterfield** worked for the West Virginia Bureau of Public Health, Environmental Engineering Division, the city of Fairmont Engineering Department, and McMillen Engineering a private firm based in Uniontown, Pennsylvania.