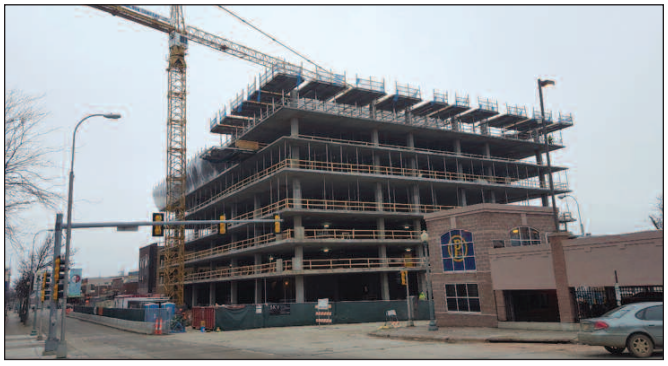
GEOTECHNICAL • CONSTRUCTION MATERIALS/NDT • ENVIRONMENTAL TESTING • INDOOR AIR QUALITY

WASHINGTON SQUARE

Project Information

The Washington Square project, located in downtown Sioux Falls, is an 8-story mixed-use building consisting of condominium housing, amenity space, retail space, office space, and parking. The lower level will be underground parking for condominium residents only. Level 1 will have 1-2 restaurants or retail shops with 22 parking spaces. Level 2 and 3 will provide an additional 116 parking spaces. Level 4 will provide corporate office space and level 5 through 7 will offer 22 luxury condominiums. Finally, level 8 will have space for entertaining, grilling, relaxing, an exercise facility, and a pet care area.

The new mixed-use building has two unique aspects that sets it apart from other buildings in the Sioux Falls area. The first aspect is that the building is almost entirely made out of concrete (over 7,000 cubic yards!). The second aspect is the use of unbonded post-tensioning for the concrete slabs in each level except in the lower level.



Brief Overview of Post-Tensioning

Post-tensioning strengthens the concrete by applying tension to the concrete slab after the concrete has set/reached a predetermined minimum compressive strength. After tension has been applied to the concrete slab, the concrete slab is put entirely into compression (i.e. concrete is strong in compression) thus providing several advantages over a concrete slab that is not post-tensioned. A few advantages include cost savings, quicker construction, and higher performance. The cost savings are due to thinner concrete members and the reduced amount of rebar required in each concrete slab. The quicker construction is due to being able to pour each level continuously with minimal control joints and fewer concrete pours. The higher performance is due to the reduction of deflections, improved crack control, longer spans, and fewer columns.

GeoTek's Involvement

GeoTek's initial role for the project was to perform several test borings as part of a geotechnical exploration program. Laboratory tests were performed on selected soil samples to aid in determining the index and strength properties of the underlying soils at the site. Due to the heavy column loads, a deep foundation system of driven H-piles or intermediate foundation system of aggregate piers were recommended. Aggregate piers were ultimately selected for support of the building.

GeoTek also provided the QA/QC oversight during the installation of the aggregate piers along with our professional and technical services for excavation observations, compaction testing of fill materials, visual observations on the concrete steel reinforcement and post-tensioning, concrete testing, floor flatness testing, structural steel (weld, bolts, etc.) observations, and masonry testing.

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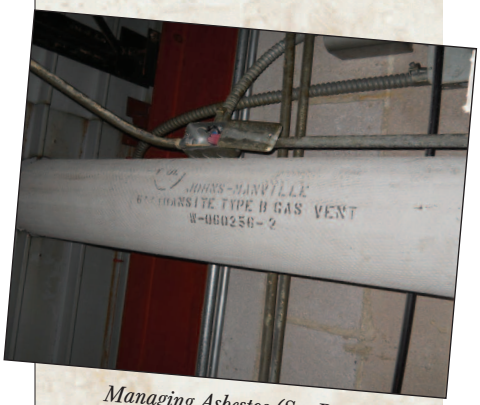


Managing Asbestos (See Page 2)

Managing Asbestos

If you are a manager or owner of one or more commercial buildings, you likely have encountered federal and state asbestos rules. The rules fall into a few main categories:

- EPA NESHAPs rules for inspection and abatement
- EPA AHERA rules for school buildings
- OSHA rules regarding employee exposure to asbestos
- EPA/DENR solid waste rules for asbestos containing wastes

Asbestos is a fibrous mineral that can cause diseases such as mesothelioma and lung cancer. It was used in older buildings in pipe insulation, boiler insulation, spray-on fireproofing, spray-on acoustical ceilings, ceiling tiles, floor tiles and mastic, etc.

The National Emissions Standards for Hazardous Air Pollutants (NESHAP; 40 CFR 61) applies to commercial and public buildings. This rule has been around since 1973, and was amended significantly in 1990. It regulates certain quantities and types of asbestos materials in structures undergoing renovation or demolition. There are requirements for inspection, notification to the regulatory agency, abatement, etc. Structures include commercial and public buildings, water towers, bridges, etc., but often exclude single family residences.

The Asbestos Hazard Emergency Response Act (AHERA; 40 CFR 763) was published in 1987. It is applicable to K-12 public and non-profit school buildings. Among other things, these rules require an inspection or asbestos building survey to identify what building materials contain asbestos, an initial building cleaning, re-inspections every 3 years, and surveillance of the materials every 6 months. AHERA does have some age criteria; for new school buildings constructed after October 12, 1988, a licensed architect or registered professional engineer who was personally responsible for the construction of the building may exclude the building from AHERA rules by a written statement that "no ACBM was specified as a building material in any construction document for the building, or to the best of his or her knowledge, no ACBM was used as a building material". Note that this is an exclusion only from the AHERA rule, and NESHAP rules would apply to renovation or demolition of the "new" building. Also note that AHERA covers mostly interior building materials where NESHAPs includes all building materials.

OSHA has established a permissible exposure limit of 0.1 fibers/cc of air over an 8 hour time-weighted average, and a 30 minute excursion limit of 1.0 fibers/cc (29 CFR 1910.1001, and 29 CFR 1926.1101). OSHA presumes thermal system insulation and surfacing material in 1980 and older buildings as asbestos containing, and asphalt or vinyl flooring in 1980 and older buildings must be treated as asbestos containing, unless it has been tested otherwise. OSHA also has rules for respiratory protection, exposure monitoring, prohibition of certain practices, notice to employees, medical surveillance, record keeping, etc.

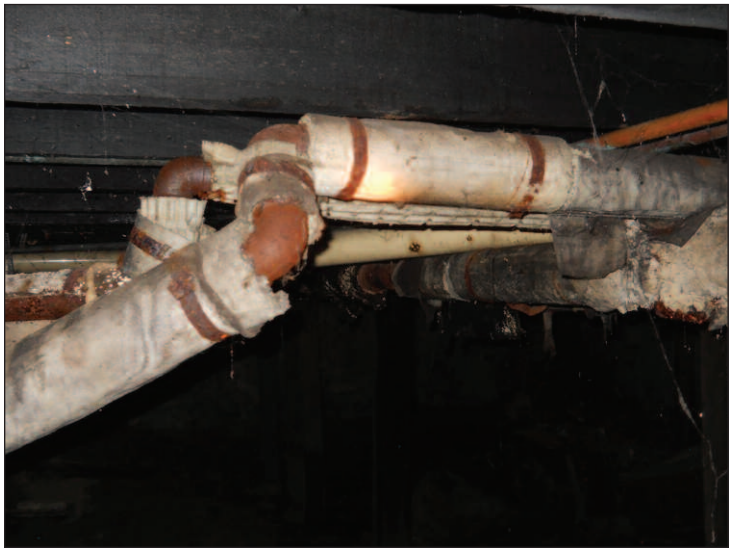
Solid Waste – The EPA NESHAPs rule requires asbestos waste be properly containerized, labeled and disposed of in a permitted landfill.

Scenarios that could encounter asbestos building materials include demolition, renovation, adding an elevator, replacing flooring, plumbing or similar mechanical work, routing new electrical or communications cables, and a fire/water or similar damage event.

An Asbestos Management Plan could include an asbestos survey, staff training, establishing procedures to properly deal with asbestos materials when building work is occurring, schedule abatement (i.e. removal) of asbestos and so on.

If asbestos is identified, it can be managed in place (or removed). The larger your facility, the more it makes sense to be proactive about conducting an asbestos building survey ahead of the time it will be needed. An asbestos survey and removal cost estimates can help budget and plan for future building work.

Please contact GeoTek staff for assistance with asbestos rule compliance and planning.



NDT – What Is It?

Nondestructive Testing (NDT) is a very broad field that plays a critical role in assuring that structural components and systems perform their function in a reliable and cost effective fashion. NDT technicians perform tests that locate flaws that might otherwise cause buildings and bridges to collapse, pipelines to leak, and a variety of other troubling events to occur. Tests are performed in a manner that does not affect the future usefulness of the object or material. NDT allows parts and material to be inspected and measured without damaging them. Because it allows inspection without interfering with a product's final use, NDT provides an excellent balance between quality control and cost-effectiveness. NDT methods are similar to those used in the medical industry.

Some NDT Techniques:

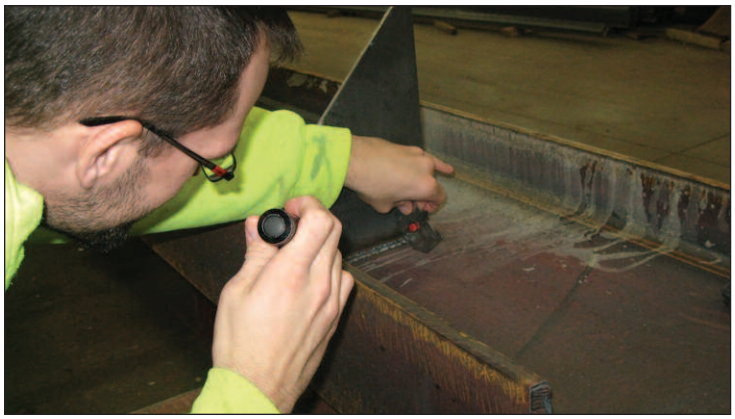
Many people are already familiar with some of the technologies that are used in NDT. Most people have had an X-ray taken and many mothers have an ultrasound when they are pregnant to check on the baby before birth. X-rays and ultrasound are only a few of the technologies used in the field of NDT. The most commonly used methods are listed below.

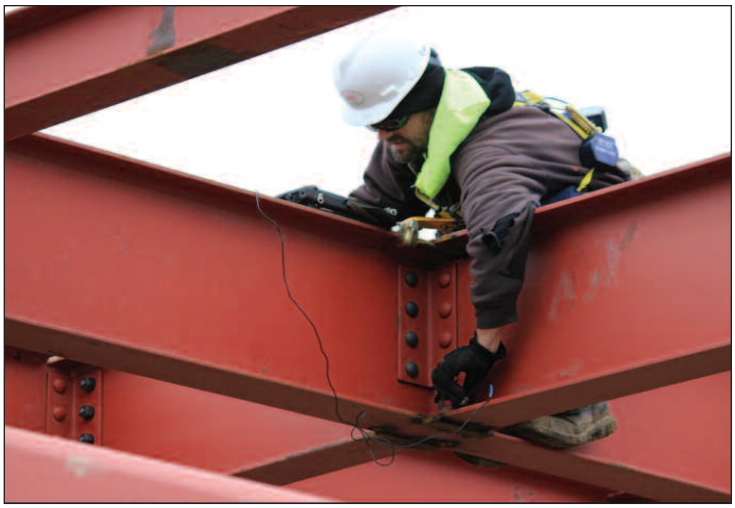
Visual Testing (VT)

The most basic NDT method is visual examination. Visual inspection follows procedures that range from simply looking at a part to see surface imperfections, using weld gauges to accurately check welds of varying sizes or using computer controlled camera systems to automatically measure components. Visual testing is the first method used and is usually just the start of an examination.

Penetrant Testing (PT)

Penetrant testing is a low-cost inspection method used to locate surface-breaking defects in non-porous materials. The test material has a penetrant applied to the surface of it and then removed, but the penetrant is left in surface-breaking defects. A developer is then applied to draw the penetrant out of the defects allowing imperfections to be readily seen. Penetrant testing is commonly used to test large components like castings or machined parts.





Magnetic Particle Testing (MT)

This testing method is performed by inducing a magnetic field into the part and then dusting the surface with iron particles. Surface and slightly sub-surface flaws disrupt the flow of the magnetic field within the part and the iron particles are attracted to the flaw. This produces a visible indication of defect on the surface of the material. Magnetic particle testing is commonly used on pipelines and storage tanks.

Ultrasonic Testing (UT)

In ultrasonic testing, high-frequency sound waves are transmitted into a material to detect imperfections in materials. The most commonly used ultrasonic testing technique is pulse echo, where sound is introduced into an object and reflections (echoes) from internal imperfections are returned to a receiver. Ultrasonic testing is commonly used to test welding on structural steel buildings, bridges and pipelines.

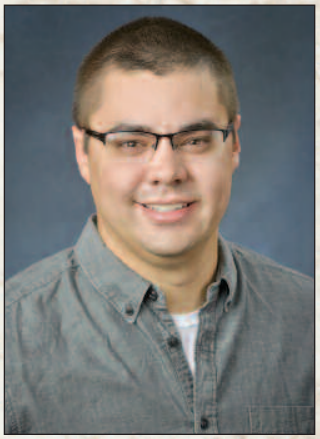
Radiography (RT)

Radiography uses radiation on materials to detect internal flaws. An X-ray or radioactive isotope is used as the source of radiation. Radiation is directed through the material and onto film. The shadowgraph shows the internal flaws and soundness of the part. Radiography is commonly used in boilers, pressure vessels and pipelines.

GeoTek provides the above services with the exception of RT.

Nick Bierle, PE

Nick Bierle, a staff engineer with GeoTek Engineering & Testing Services, Inc., Sioux Falls, SD, recently fulfilled the educational and professional requirements of a Professional Engineer (PE) per the South Dakota Board of Technical Professions. Nick has a Bachelor of Science degree in Civil Engineering from South Dakota State University, Brookings, South Dakota, and a Master of Engineering degree in Civil Engineering (Geotechnical Emphasis) from Iowa State University, Ames, Iowa. He has been employed at GeoTek since 2014, and has 3 years of experience.



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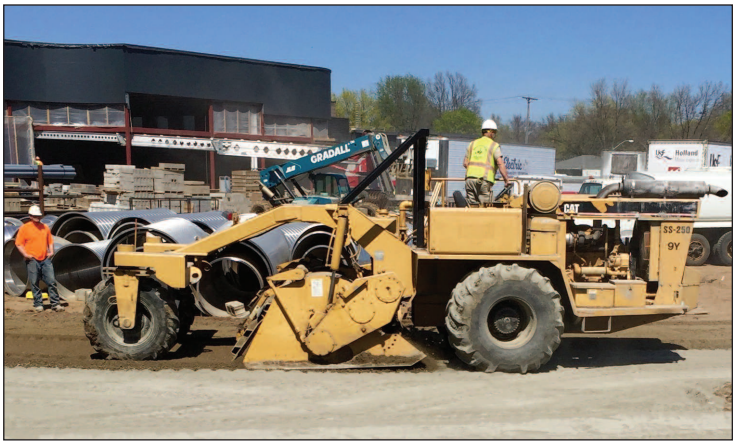
Soil-Cement

According to the American Society of Civil Engineers, Portland cement has been used to stabilize soil subgrades and granular bases below pavements since 1935. The use of Portland cement to stabilize poor pavement subgrades has steadily increased in the Sioux Falls area over the last several years. It has been used locally on streets, parking lots and to stabilize staging areas at construction sites.

In general, the stabilization process consists of: 1) grading the subgrade soils to the design elevation, 2) uniformly spreading cement on the subgrade, 3) mixing the subgrade soils (typically 12 inches) with the cement using a pulvamixer, 4) compacting the soil-cement mix using a pad foot roller, 5) using a blade or dozer equipped with GPS to re-achieve the design subgrade elevation and 6) compacting the surface disturbed materials using a flat face or rubber tire roller. The stabilization process is relatively fast. After the cement and soil are mixed, initial compaction is recommended to be completed within 30 minutes and surface compaction within 2 hours. Upon completion, the mix is watered and cured for a minimum of 48 hours.

The cement stabilization process has several benefits over other subgrade stabilization methods. These include: 1) it provides an almost immediate improvement in the stability of wet soils so that the work can progress, 2) problem areas can be easily retreated by increasing the stabilized depth and/or percentage of cement, and 3) once stabilized, the subgrade acts as an all-weather working surface.

In addition to the above benefits, the stabilized subgrade can also be incorporated into the pavement design using the AASHTO layer design method. Incorporating the stabilized subgrade into the pavement design can minimize the aggregate base layer or pavement thickness and also reduce the volume of subgrade soil that needs to be hauled off-site.



If the stabilized subgrade will be used as a structural component of the pavement section, then a mix design is typically performed to establish the optimum cement content. Quality control is also considered an integral part of the overall project.

While any soil type can be stabilized using this process, it works best on soils with a high silt/clay content (>75 percent) and liquid limit less than 45. Soil-cement may not be the best choice for every project. The subgrade soils should be observed and tested prior to construction by a person who has experience with soil-cement.

We worked with the City of Sioux Falls earlier this year to develop a standard specification for the use of soil-cement on City streets and would be happy to discuss the use of soil-cement on your upcoming project.

Station 22 Before

Station 22 After