

Innovations in Medical Gas Piping: NFPA 99-Approved Material

Projects previously impossible due to access or routing can now be completed with the flexibility of corrugated medical tubing.



By David Edler

Managers of aging health-care facilities face many challenges, such as efficient usage of space and completion of projects under harsh time constraints and tight budgets. The usage of modern design concepts and innovations of new medical gas piping materials and installation practices have the potential to address these challenges.

Prior to the release of NFPA 99-2018, Health Care Facilities Code, the most substantial change to the allowable piping material for piped medical gas and vacuum systems was in the 1993 edition of NFPA 99. The change stated that rigid copper tube must meet the requirements of ASTM B819, Standard Specification for Seamless Copper Tube for Medical Gas Systems.

While it improved the cleanliness of the pipe used in these systems, the basic technology remained unchanged and did not offer any benefits to address the evolving world of health-care facilities regarding schedules and budgets.

Starting with the NFPA 99-2018 edition, after years of design, development and work with the NFPA 99 Piping Systems Technical Committee, section 5.1.10.1.4 (2) was adopted into the code. This section added a second piping material, corrugated medical tubing (CMT), approved for the installation of piped medical gas and vacuum systems.

Safer Alternative

CMT is a semi-rigid tubing made from a copper alloy, the first significant advancement in medical gas piping since 1993. Its corrugated design allows for long, continuous runs to be installed without intermediate fittings, such as couplings and elbows, for changes in direction while providing a maximum-rated working pressure of 185 pounds/square inch gauge.

The reduction in fittings greatly reduces the amount of brazing/hot work needed to be done on-site. The reduction or elimination of hot work in an existing health-care facility can have a significant impact in lowering the risk to a facility. CMT is inherently resistant to seismic activity and offers a much faster facility return to operation after seismic events. [One brand of CMT, MediTrac from OmegaFlex, has been tested and certified to the technical requirements of the major U.S. seismic codes and standards.]

Another requirement in NFPA 99-2018 is that any CMT system must be third-party-listed to be recognized as an acceptable medical gas piping system. The development of UL 1365 provided a standardized method of evaluating CMT systems. The performance-based testing outlined in UL 1365 provides the minimum requirements listed in NFPA 99-2018 are met and ensures the listed CMT system is safe and reliable.

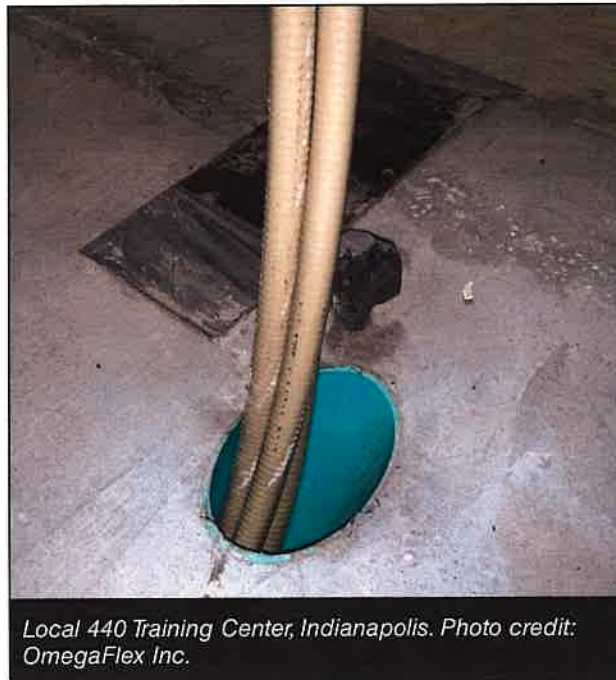
While CMT cannot be directly compared to rigid copper pipe because they are two different technologies, the fundamental functional aspects of the systems' end use were considered when UL 1365 was written. Testing includes pressure testing at 3.5 times the maximum-rated operating pressure of the product and the ability of CMT to be purged and pass purity requirements.

These tests, along with mechanical, electrical and high-temperature exposure performance tests, confirm that CMT can stand alone or work in conjunction with rigid copper pipe to supply a clean, continuous flow of medical gases and vacuum in all applications.

Many health-care facilities are limited on the space above the ceiling where HVAC, data services and piping are commonly routed. Installing and brazing traditional cleaned and capped copper pipe in these locations can be hazardous — to the facility and surrounding systems.

CMT offers a faster, safer alternative to routing piping

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Local 440 Training Center, Indianapolis. Photo credit: OmegaFlex Inc.

in these locations. It provides a safer system and reduces the installer's time on-site, resulting in less facility downtime and a quick return to full operation. When planned correctly, the tubing can be installed without having to light a torch on-site, making it possible to use a flameless installation.

Installation Considerations

In today's world, modern, sleek and visually appealing architectural designs are at the forefront of health-care construction. While this results in stunning architecture, little thought is put into the challenges created for piping installers, such as how to install rigid, straight sticks of copper pipe in a circular building.

Each change in direction or offset, be it vertically or horizontally, requires additional cutting of pipe, fittings, brazing and potential leak points throughout the run. CMT creates seamless solutions for these obstacles. Bending to meet the facility's needs, reducing the number of fittings and potential leak points and limiting installation time are just a few benefits afforded with CMT systems.

The tubing makes underground installation much easier. Previously, underground installations could only be done with rigid copper pipe; under-slab installations to floor-mounted outlets and pedestals created even more challenges. New supply lines from bulk oxygen tanks required days of trenching, brazing, pressure-testing and joining of conduit.

Most underground installations were completed with just a clamshell cover of the rigid copper pipe before backfill, leaving it exposed to the earth below. With CMT, installers can trench or horizontal-bore and install a watertight, nonmetallic conduit and backfill often in a single day, from the bulk tank location to the facility. This reduces the disruption to facility operations and allows the installer to come back later and pull a new CMT supply



Memphis, Tenn., COVID-19 facility. Photo credit: OmegaFlex Inc.

line through the conduit when the construction schedule permits.

The versatility of CMT makes it the clear choice for underground and under-slab installations. Pulling the pipe through the conduit takes minutes versus hours or days of brazing a rigid copper system. Additionally, a CMT system has no fittings or potential leak points underground because of its long, continuous lengths.

With the evolution of technology, many tools are available to installers. However, the installation of medical gas piping systems still requires specialized training. This holds true for CMT systems similarly to copper piping systems. CMT installers are required to be certified medical gas installers meeting the requirements of ASSE 6010 (or state equivalent) and hold a valid brazing and welding certificate, along with successfully completing a manufacture-required training course.

These strict requirements ensure that installers are providing the highest level of skill and care in the installation of vital medical gas supply systems.

New Technologies, Codes

One of the other challenges facing health-care facilities is how to incorporate new technologies into their buildings. Due to the nature of code revisions and adoptions, they are often working with code editions several years behind the most current editions. For example, in many states, the construction codes moved to NFPA 99 2018 or 2021 editions; however, our health-care facilities are still required to follow the 2012 edition.

This code difference led to many facilities asking how they could use a product such as CMT from a newer code

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and remain in compliance with an older standard. For CMT in particular, this led to the Centers for Medicare and Medicaid Services issuing a categorical waiver (QSO-20-40-LSC) regarding the use of CMT in September 2020. It allows the use of CMT in both new and existing health-care facilities.

The waiver requires the facility to document the use of CMT and that the system is installed according to all applicable provisions of NFPA 99. A detailed explanation of the documentation is included in the CMT categorical waiver at www.cms.gov/files/document/qso-20-40-lsc.pdf.

The impact of the usage of CMT in piped medical gas and vacuum systems is significant. Projects previously impossible due to access or routing can now be completed with the flexibility of CMT. Its use as a standalone system or in conjunction with cleaned and capped copper pipe in a hybrid configuration can give facilities new answers to existing problems.

CMT can be the difference between an on-time, on-budget, safe project or not completing the project at all.

David Edler is the director of MediTrac for OmegaFlex of Middletown, Conn. He has spent more than 20 years working as an engineer in the corrugated metal hose industry. Edler previously served as the vice chair of the ANSI LC-1/CSA 6.26 Technical Subcommittee. He has conducted various trainings and research projects, is well-versed in the installation practices of a variety of piping systems and has been involved in the U.S. codes and standards process.