# Executive summary

Ft. Detrick Defense Medical Logistics Center (DMLC) is a three-story office building located on the Ft. Detrick military base in Frederick, MD. The building is 129,960 square feet and it houses the top medical planning organizations within the Department of Defense representing the Army, Navy, Air Force, and Marines. It was designed to meet ASHRAE 62.1 and ASHRAE 90.1 for indoor air quality and energy efficiency, and it was also designed for occupant safety in the incidence of a terrorist attack.

A complete heating, ventilating, and air conditioning system with DDC controls is provided for Ft. Detrick. Two gas-fired boilers, two inline boiler circulation pumps, and two variable speed pumps provide hot water to the building. A decoupled loop system with two rotary screw water-cooled chillers, two constant volume evaporator pumps, and two variable volume pumps provide chilled water to the building. Condenser water is provided via two induced-draft cooling towers and two constant volume condenser pumps. The building's VAV reheat boxes are served by six AHUs during regular operation and one emergency AHU that runs by generator power. The glycol system serves air conditioning units in the communication rooms and the emergency AHU with a drycooler. The systems are appropriate for their application, but improvements can be made to increase energy efficiency and occupant comfort.

Energy consumption can be reduced by supplying air at a higher temperature. This can be achieved through an under floor air distribution (UFAD) system. A UFAD system will be used in conjunction with a dedicated outdoor air system (DOAS). A DOAS will also decrease the amount of energy used, and it may even decrease the number of air handlers required for operation. The DOAS will dehumidify the space, which improves indoor air quality. Chilled beams as a passive cooling system will be used. This is feasible for an office space because they can easily be incorporated into the ceiling grid. There would be no additional energy needed to power these systems because they cool through convection.

The structural and electrical systems will also be analyzed to determine if the redesign has impact on these systems. Tools used for this will be the manual for steel construction, R.S. Means, and Microsoft Excel. Tools for the mechanical analysis will include Trane Trace 700 for load and energy calculations, manufacturer's data to determine size, cost, and capacity, and the SPiRiT rating system for recalculating sustainability. With the redesign of mechanical, structural, and electrical systems, Ft. Detrick will hopefully have a better solution to the design requirements.

# Breadth Topics

The mechanical redesign topics discussed in the previous section would change other building systems if implemented. The following sections go over the changes to the structural and electrical systems that will be analyzed.

**Structural Breadth**

By changing the building's air distribution from overhead to under floor, the location of the plenum space will change. Currently, a steel framed system with concrete floors supports the building, and steel beams are located in the plenum. However, the plenum may be smaller with a UFAD system, so it will need to be determined if the beams can still support this load and if they still fit in the plenum space. Also, replacing the existing equipment with a dedicated outdoor air system will change the load on the beams in the mechanical rooms. A load analysis will need to be done to resize the supports in those spaces. Research will also need to be done to determine if the weight of the chilled beams impacts the structure. If so, this will be taken into consideration when performing the structural breadth. The redesign will be done keeping in mind AT/FP structural guidelines, such as preventing progressive collapse. A cost analysis will be done after resizing the beams to determine if changing the mechanical systems results in a more expensive structural system.

**Electrical Breadth**

Implementing new mechanical systems will change the loads to the building's central plant. Because of this, the boilers, chillers, and their pumps will be resized. This will change the overall amount of power required for the building. Because of this, the distribution panels will need resized. Also, changing equipment will require different sized wiring. A cost analysis will be done on the new panels and wiring.