

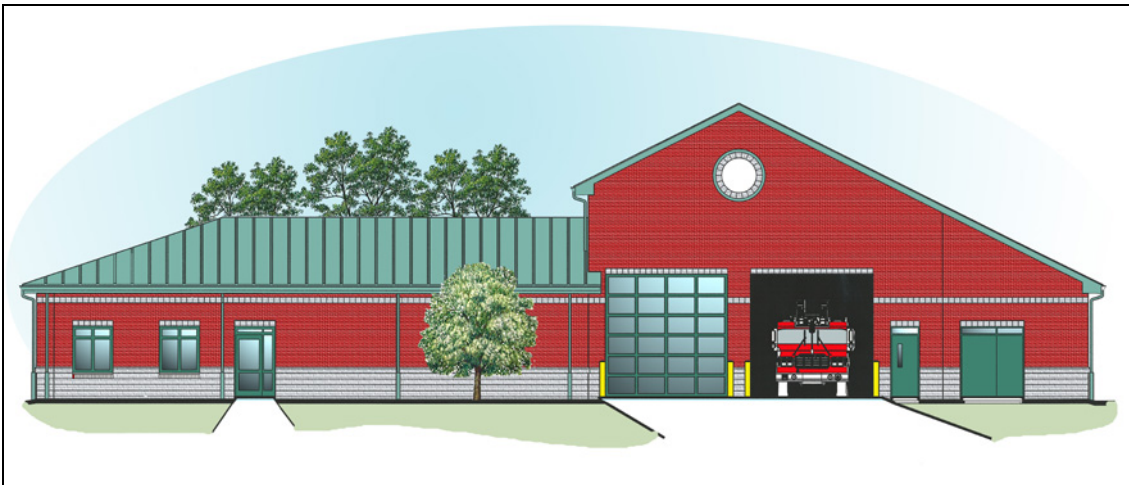
Modern Fire Station Design

By James Stumbo AIA, NCARB
Stewart Cooper Newell Architects

Fire Station design has changed drastically in the last 20 years. Today a station must function equally well as a residence, a garage, a training center, and an office. Blending these separate, but intertwined, activities into a functional building challenges any architect- even those with vast amounts of experience with the fire service.

At Stewart Cooper Newell Architects, we strive to design fire stations to best utilize the owner's budget to meet the above requirements while also minimizing the long term cost of maintenance and upkeep

As an example, we will discuss the newly completed North Carolina National Guard ARFF Fire Station. This new 6,430 sq.ft. facility replaces the existing out-of-date station. The new facility will house ARFF vehicles including a Military Tactical Fire Fighting Truck (TFFT), a Heavy Expanded Mobility Tactical Truck with two 2000 gallon water distribution modules and a Humvee. The major facility components include apparatus bays and equipment storage, administration offices, training areas for support staff and a physical fitness training area. Using this station as an example, we will provide ideas and suggestions on how to design a facility that will meet the needs of the fire service, minimize operational costs, and stand up to the abuse of their equipment.



Air Army National Guard, Salisbury, NC

The first, and arguably the most important, design issue that we face in designing facilities similar to this is the layout of the interior spaces, along with the location of the facility in relationship to other key elements on the site. Specifically, for the North Carolina National Guard, we had to address the immediate response needs to four very different scenarios: 1) the military flight-line, 2) civilian tarmac, 3) off-site military training support, and 4) off-site civilian mutual aid support for the local fire departments. Very careful placement of the new facility in relationship to the military flight line, exterior off-site access, and across airport access to the civilian tarmac was

carefully balanced to accommodate each of these needs. Along with the physical placement, travel paths and access gates had to be planned for both quick access to the emergency and the ability to maintain the base security. With this in mind, the fire department has signal switches as the personnel enter the Apparatus Bay to man the equipment that not only open the bay doors but also operates access gates from the military base to both off-site areas to allow minimum response times. To maintain security after exiting the base, all gates automatically close behind the vehicles.

As we move from the exterior to the interior of the facility the design of the actual spaces and their relative locations need to address several important factors: 1) Ease of access from primary use spaces to the emergency response vehicles, 2) privacy of firefighter personnel, 3) Security of the facility, and 4) applicable code requirements. The primary responsibility of the fire fighter is to respond to an incident within a maximum amount of time that will allow the department to protect and/or save personnel and contain and extinguish the fire. Many studies have proven what the NFPA Standards require, which is a total response time of six minutes from initial contact. This total of six minutes is a compilation of three elements which are call processing, turn out time and travel time. The turn out time, which is only 60 seconds, is the piece that we can directly help...or hinder...in designing our facility. We need to layout our spaces to provide for maximum efficiency to help the fire fighter to move from the space he is occupying to the apparatus bay, suit-up and man the equipment in under the time allowed. The second and third items in laying out the facility go hand-in-hand, privacy and security. The North Carolina National Guard Fire Station is a little different than most fire departments, as it does not have 24 hour personnel. It therefore; has no sleep rooms, day rooms or kitchen/dining rooms that would be seen in many fire stations. When you have these additional spaces, and to even to some degree in this particular station, you need to provide for privacy of the fire fighter who truly lives at the station, and in doing this you also provide for security. These can be simply accomplished by separating the public space such as offices and conference/meeting areas from the private areas previously mentioned. You do not want to bring a visitor into the facility directly by the firefighter's private bedrooms to meet with the fire chief in the conference room, and you want to provide secure doors that prevent visitors from just wandering through the facility. The fourth item to consider in the layout of the facility are code requirements. As the facility is, at a minimum, two different types of occupancies and many times, three or four, the different occupancies have to be correctly separated. For example all apparatus bays (designated as S2 - Storage Occupancy) are required to be separated from the remainder of the building with a minimum of 2 hour fire resistant construction, the other occupancies, office (B-Business), bunk rooms (R Residential) and possibly Training Rooms (A-Assembly) may also have specific requirements depending on the size of the facility and if it is or is not sprinkled. Many other items, too numerous for the scope of this article also need to be reviewed in the code, items ranging from bay ventilation (Plymo-Vent direct piped, filtered or other mechanical ventilation) and carbon-monoxide detectors in sleep rooms to accessible toilets, showers and different building levels, if a required.

Once your facility is built and paid for, equipment purchased, and the fire station occupied, the main cost of the facility; other than personnel cost, is the operational cost of the facility. The utilities cost and the maintenance and upkeep cost make up the bulk of this long term cost. Both of these costs can be controlled and minimized with smart design. The utility costs are controlled by building an energy efficient station and providing the proper equipment and controls. For example, at the National Guard fire station we have provided rigid insulation panels with an R-Value of 19 for the roofing system with an exposed liner of a heavy duty aluminum. This allows not only good thermal protection and vapor barrier, but provides a cleanable surface and not the traditional draped vinyl faced insulation commonly used and commonly seen with tape peeling, tears, and rips. But it is not as simple as looking at insulation; the overall building envelope including foundation walls, building walls, roof systems, windows and doors need to be carefully reviewed and materials selected to be sure your new facility is as energy conscious as reasonably practical. Along with this the mechanical systems and controls need to be carefully selected to be both functional and efficient. One example not commonly considered in a fire station is the apparatus bay heating. When the alarms go off and the trucks roll out of the building, some form of ventilation is activated in the bay to discharge the exhaust fumes. An interconnection between the bay doors, the ventilation system AND the heating system is critical, you do not want to spend valuable money on utilities heating exterior spaces with either the doors up or the fans on!

Another important goal for the new facility should be to use materials that are as maintenance-free and durable as possible, this will assist in keeping your maintenance cost down. Many have fallen victim to a new facility that looks great for the first year but deteriorates quickly with normal use. Thank goodness for people who love to paint but I doubt the fire fighters want to spend most of their “non-call” time with a paint brush in their hand. Try to use materials that require very little maintenance. There are enough exterior finish choices that you should be able to select something that you will be happy with years from now. Examples include brick, as used on the National Guard station, and prefinished metal and vinyl sidings. Keep in mind that emergency service personnel can be very abusive to buildings. Ladders, racks, hose, etc., all will challenge the durability of the building materials. It is difficult enough to get funding for the new project the first time. You sure don't want to rebuild parts of it in a few years because durable materials were not selected.

The same arguments are true for the building's interior. For example, if the budget will allow, use floor finishes that don't require constant striping and waxing. Hard tile gives you a surface that only requires damp mopping. Some manufacturers make a recycled, hard tile can be used for just slightly more than vinyl floors. Also, emergency service personnel seem to carry about 10 pounds of “stuff” on their belts. This can really scar the walls while they are running to answer a call. Use wall materials or protection so that you're not repairing/painting the walls every few months.

Having the correct expertise and taking the time to design and build a new facility correctly has many benefits from helping the fire fighters with response time, privacy and

safety to saving the facility owners' money long term by minimizing maintenance and operating cost.