

Getting Started: The Basics of Fire Training Design



an article by
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By Jim Stumbo

WHEN THE CALL COMES

When the public calls 911, they not only expect a timely response of the emergency personnel, they also expect the personnel to be highly trained to handle their specific emergency. A state-of-the-art training facility is a key link in the chain of training these personnel to respond to, and meet the public's need in their critical hour. This article will discuss the basics of Public Safety Training Facility design and the value of starting the project with a comprehensive masterplan.

Stewart-Cooper-Newell Architects is fortunate to have been involved with the planning and design of over twenty-five Public Safety Training Facilities across the southeast; from Arkansas to Georgia and even as far north as Pennsylvania. The majority of these facilities are right here in the Carolinas, including Buncombe County, York County, Cape Fear Community College, Hilton Head Island and Sandhills Community College in Pinehurst, NC.

Our experience designing Public Safety Training Facilities began with the design of the Gaston Regional Emergency Services Training Center in Dallas, North Carolina – which still sees extensive use - and with our most recent achievement; a new, state-of-the-art Buncombe County Public Safety Training Facility managed by a partnership between Buncombe County and AB Tech in Asheville.

The majority of these projects started with the creation of a comprehensive masterplan. A well-conceived masterplan allows you to prioritize and phase the project, getting the most out of your available land, and establish a budget. Further, the masterplan will help ensure that all stakeholders are identified, represented and heard throughout the project. Ultimately, the initial master-planning, programming, and design of your Public Safety Training facility,

whether a single building or a full campus, will ensure that it supports the needs of its occupants and users for many years to come.

IDENTIFYING THE END USERS, PRIORITIZING & PHASING THE PROJECT

The two keys to starting any Training Center project will be identifying the end users and identifying the needs of those end users. The first question will begin to set the course for the second question and is very important; is the facility going to be a Fire Training facility only, or will you also have law enforcement, emergency medical services or possibly other municipal needs - for example municipal vehicle driver training such as buses or refuse trucks? There are many advantages to bringing in additional end users as the potential for additional funding sources can increase the size and/or diversity of the training grounds, improving the ability to train individually or with other agencies. After the end users are identified, it is very important to "program" or list each and every function or training scenario that must occur on the training grounds, along with any physical structure that might be required to carry out the training. This would range from driving tracks or pads to burn buildings, tear gas structures, shooting ranges, classrooms, offices and a host of other possible structures.

SETTING THE BUDGET

Once we have identified all of the facility



Typical Pre-Engineered Burn Building

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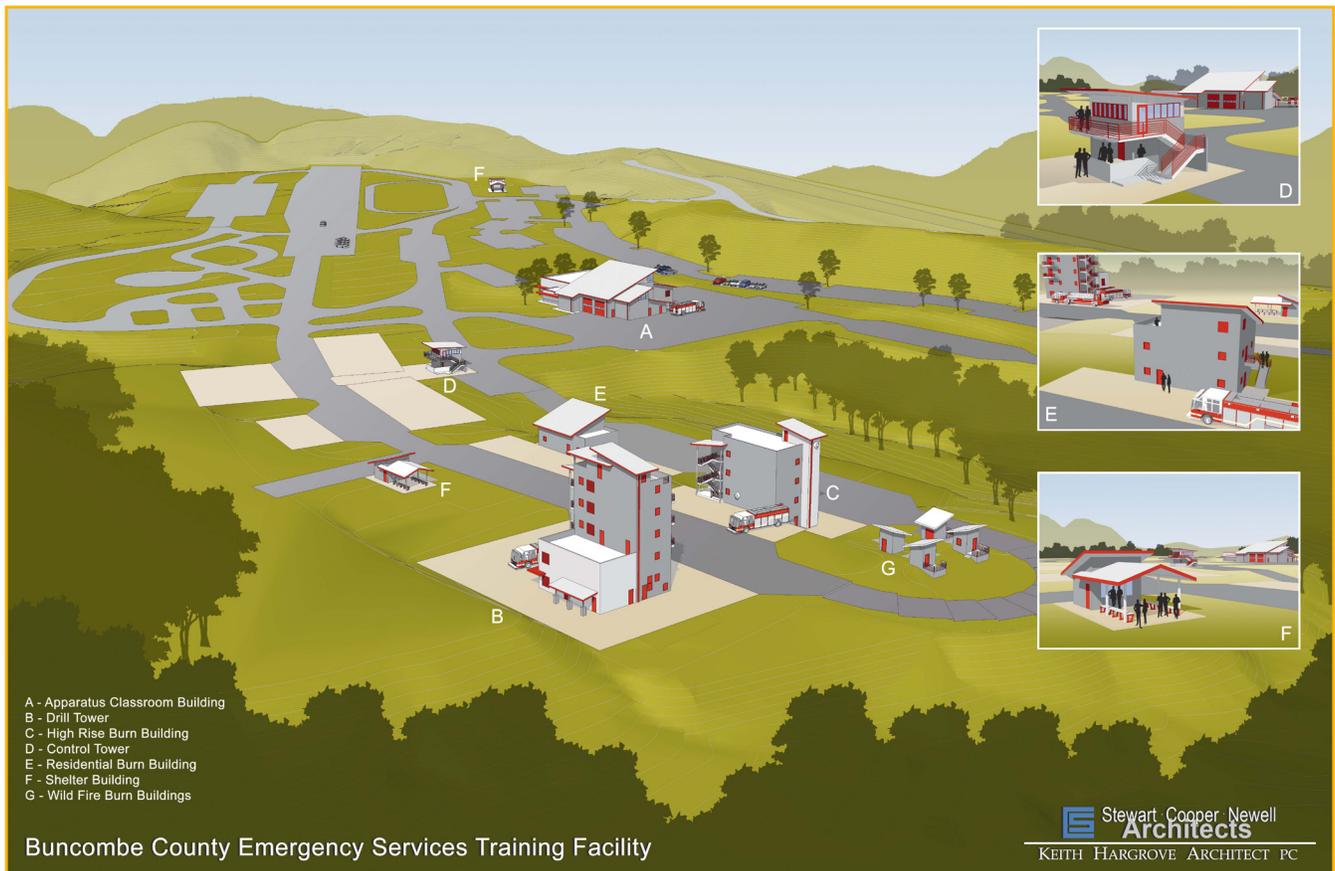
requirements we can begin establishing the project budget. A masterplan can be used to affirm the budget in two ways. If you have a pre-determined budget, a masterplan can define the size and variety of components your center can afford. Without a pre-determined budget, a compilation of all stakeholder wish-lists has to be used to determine how much funding will be needed to complete the training facility. Many times the budget does not reflect the entirety of all the training structures desired so the masterplan will have to incorporate a Phasing Plan to establish when different components will be built.

Sandhills Community College started their training center design with a comprehensive masterplan, which spanned multiple phases over several years. They then used their masterplan to establish a budget and phasing schedule, which was then used to raise the funds needed for future phases. The masterplan also allowed for the civil engineers to plot roadways and elevations for specific components that would be required in upcoming phases.

Phase I consisted of gaining access to the site and constructing the drafting pits. Phase II involved the design and construction of a residential Class-A burn building, a drill tower and grading in preparation for future structures. When they have the budget to complete Phase III, it will include the construction of a commercial burn building, a driving pad, and possibly a shooting range.

We are currently working with Isothermal Community College on the masterplan of their new Public Safety Training Center. Several of the stakeholders wanted both a traditionally constructed (masonry) Class-A burn building and training tower. However, the budget wouldn't allow for both of these to be constructed, it was a choice of one or the other. They would be able to afford both the Class-A burn facility and the training tower if they used a combined pre-engineered steel structure. After much debate, they elected to utilize the pre-engineered system and build a combined structure.

The Buncombe County Training Center is another



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you will store your Class A Burn materials – what do you do with the hay and pallets? Where will you park the ‘Gator’ you use to move around and maintain the facilities? And speaking of maintenance, do you have a location for light maintenance or repairs and the storage of supplies for these repairs?

Now let’s discuss what we all think of when we are considering Training Centers...the actual training components. We will divide these into two categories – the Site or Exterior Training Facilities and the Training Structures. Let’s visit the site training components first.

SITE OR EXTERIOR TRAINING FACILITIES

We’ll start with the driving pads, which typically encompass either a driving range or track - or sometimes a mix of both. These pads are basically a large expanse of concrete or asphalt, but still demand detailed consideration in the masterplan. Is the facility going to be a Fire Training only? Or, will Law Enforcement and emergency medical services train on the pad as well? What about municipal vehicle driver training - such as buses or refuse trucks?

Many driving pads include different road surfaces, skid pads, drop-off edges, and recovery zones. A masterplan will help you to determine which scenario training areas you want to include, such as mock rail-road track crossings or gravel drives, residential scale roads with curbs or cul-de-sacs along with large city street scale areas.

One thing to always consider when laying out the driving range is flexibility and multiple scenario training. A large rectangle of paving may be the most economical way to provide training; however, it will require the most work to setup with safety cones

for different courses...but it is ultimately very flexible in how it is used. Conversely, a series of different road configurations can be designed to cover all of the driver training courses (VFIS, as one example) with no layout required. This will allow different scenarios to train concurrently, but comes at a higher price and less flexibility.

The masterplan that we performed for Ft. Smith, Arkansas is a great example of incorporating the best elements of both a fixed rectilinear pad and driving tracks / roads. In this layout, a large 300x500 foot pad was designed that could be laid out with cones for any scenario. However, the pad was attached to a series of roads that would provide more realistic driver training.



There are numerous exterior training props that are useful in teaching fire-fighting technique. All of these should be considered when master-planning a Fire Training Facility. Including burn pads, roof venting, and possibly a flash-over unit. On the burn pads one can provide mock ups ranging from the standard ‘Christmas Tree’ to vehicle(s), airplanes, propane or other cylinders or tanks. The types of props you can incorporate are only limited by your imagination. You need to also consider how will you provide fire to these props? Will you buy pre-packaged units such as those manufactured by Fire-Blast or Kidde,

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or will you provide home piped propane systems and controls? Either way, consider the required infrastructure of both liquid and gas propane lines, water and electrical both for the props you are install on day one and the possible props that come later.

In addition to training props that involve fire, a concise masterplan will include props used to teach various rescue techniques. Examples include swift water rescue, high angle rescue, trench rescue and terrain-specific search and rescue. For example, because Buncombe County is mountainous, and the home to a large prison, the Training Center includes a high-angle extrication pad for vehicle rescue scenarios, as well as a smaller training building designed to mimic a cell from the prison.

Finally, your Training Facility could include an ATV track, Urban Search and Rescue (USAR) scenarios, a hazmat tanker, an aircraft trainer, and pumper test pits for drafting. Some training facilities may be planned for the necessary spaces and props to host a Fireman's Challenge.

TRAINING STRUCTURES

Let's finish with a discussion of Training Structures, including the focal point of any Fire Training Facility – burn buildings and training towers.

Live burn structures require the most discussion when planning your new Training Center. What type of fuel will you use? Class A or propane? Perhaps both. Are you trying to teach smoke behavior or fire behavior or hose technique? How many Firefighters will train at the facility? And, perhaps the most important question, what can your building and training budget support?

Should the structure be pre-engineered or masonry? There are benefits and caveats to both. We discussed our recent project at Isothermal Community College. Several of the stakeholders wanted both a traditionally constructed (masonry) Class-A burn building and training tower. However, the budget wouldn't allow for both, it was a choice of one or the other. They would be able to afford both the Class-A burn facility and the training tower if they used a combined pre-engineered steel structure. After much debate, they elected to utilize

the pre-engineered system and build a combined structure. These can be complicated and difficult decisions that need to be carefully considered with your design team.

How big will your live burn building(s) and training tower need to be? Will the burn building be configured as a residential, commercial, a combined structure or possibly multiple buildings? You may wish to consider having the training tower connected to the burn building to increase the overall size of the facility for larger scenarios – but consider the pros and cons of such a decision, as this could impact the ability for multiple scenarios and would spread some of the Class A burn particulates throughout the full structure. One way to increase the flexibility of these structures, regardless of the decisions is to incorporate a movable wall system so that the interior wall arrangement can be changed between scenarios to prevent trainees from learning the “pre-programmed” routes.

Regardless of the size or construction type of the



Guilford Tech Community College Training Tower - Elevator Shaft

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structures you decide to incorporate into your facility, they will need to be maintained and protected. Make sure you employ the correct structural protection, such as sacrificial masonry walls and Westec, HTL or Padgenite thermal liners. When considering these options be cognizant of not only the cost of the initial product and installation but the longevity and susceptibility to damage. You also will need to consider how the burn rooms will dissipate heat with the different products.

Another important tool in protecting your facility is temperature monitoring, so you may want to consider a monitoring and recording system. As the design is considered and progresses, careful consideration needs to be given to NFPA 1402 and 1403 for both construction and planning as well as for the use of and standard operating procedures for the burn rotations to have both a safe structure and safe training.

When designing your training tower be sure to incorporate as many training aids as possible that reflect the real life scenarios firefighters may face. The obvious items we would see, are tested rappelling anchors, confined space rescue areas, maybe an

elevator shaft with actual doors and a car mock-up. Also, consider non-energized electrical panels for lock-out training, non-plumbed valves and any specialized valves that might be encountered in area buildings.

Several other structures may also be considered. Do you need a tear gas building to keep the law enforcement trainers from trying to use their tear gas or flash bangs in your training structures? Is the center large enough to need remote shelters, recovery areas, or toilet facilities? What about remote storage? Be sure to think outside the box and be sure to consider all options!

As you can see, it is paramount to incorporate the right components into the masterplan and design of your Training Facility. These components should be specific to your training needs, and fit your budget. Ultimately, selecting the correct components during the initial master-planning, programming, and design of your Public Safety Training facility, whether a single building or a full campus, will ensure that it supports the needs of its occupants and users for many years to come.



Chester County, PA Fire Training Center and Tactical Village