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## *Getting Started: The Basics of Fire Training Design*

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### **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 will be the first of two articles discussing the basics of Public Safety Training Facility design. This article will discuss the value of starting the project with a comprehensive Masterplan and the follow-up article will examine the various components that comprise a State-of-the-Art Training Facility.

Stewart-Cooper-Newell Architects is fortunate to have been involved with the planning and design of over twenty 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 Sand Hills Community College.

Our experience designing Public Safety Training Facilities extends back approximately 27 years, beginning with the design of the Gaston Regional Emergency Services Training Center in Dallas, North Carolina – which still sees extensive use - and culminating with the 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 for 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 we 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 arrived at, 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 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.

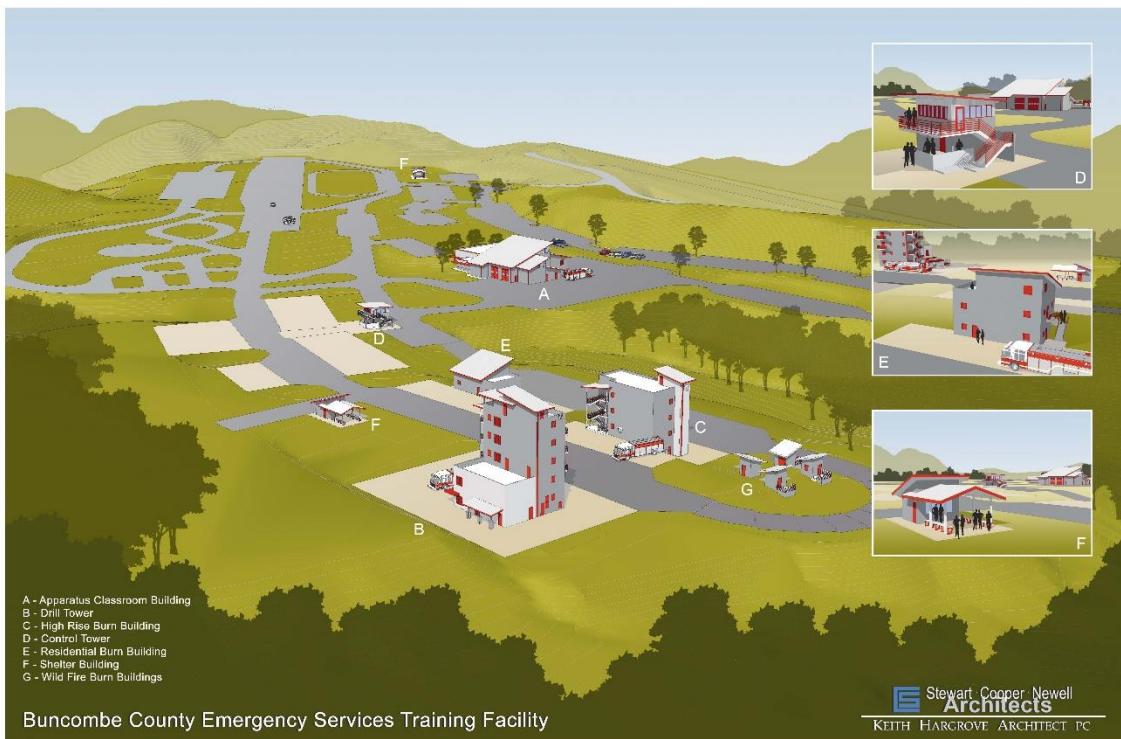
We are currently working with **Isothermal Community College** on the Masterplan of their new Public Safety Training Center. Several of the Stakeholders wanted both a traditionally constructed (masonry) Class-A Burn Building and Training Tower. However, the budget wouldn't allow for both of these to 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.



*Typical Pre-Engineered Burn Building*

The **Buncombe County Training Center** is another great example of using a Masterplan to ‘phase’ a project. The design and construction of the entire Training Center occurred over a five year period. **Phase I** included site work for the 35 acre site. This included moving 500,000 yards of earth due to the site’s mountainous location, which allowed for an expansive driving range. This created a suitable site on which to build subsequent phases of the project and created the opportunity to properly grade the site for future additions.

**Phase II** included the design and construction of all the training components, including the Class-A and Class-B burn buildings, the Training Tower and several other training structures. The Buncombe County Training Center also includes a high-angle extrication pad for vehicle rescue scenarios and a smaller training building designed to mimic a cell from the prison adjacent to the training site. These components were included in the original masterplan and designed and constructed during Phase II of the project. Finally, **Phase III** was the design and construction of a 41,000 square foot classroom building.



*The Buncombe County Training Center Masterplan*

## **PRIORITIES**

While Master Planning the **City of Marietta, Georgia Training Center**, it became apparent that having a Fire sub-station included on the site was the first priority. The site would have to accommodate a functioning fire station and incorporate all the essentials needed for quick response times.

The Marietta master plan also revealed the need for a shooting range to be incorporated in a later phase. Because there is an elementary school adjacent to the Training Center site, it became a priority to pre-determine where the range would be located, both for safety

reasons and public perception. We needed to “site” both the fire station and the shooting range, and phase the rest of the training center around these two components.



*Marietta, GA Training Center Plan Phased around two priorities, a fire sub-station and a shooting range.*

### **GETTING THE MOST OUT OF YOUR AVAILABLE LAND**

A few years ago we were working with the **City of Fort Smith, Arkansas**, on the masterplan of their new Public Safety Training complex. Their site was surrounded by an existing landfill and only had access off a rural highway. The city initially wanted to build the first component of the training center - the Class-A burn building – near the highway. Their reasoning was that it will be a number of years until they can afford to add more components, and building the Class-A burn building near the highway would allow for the most economical initial construction costs and ease of access.

After we completed the masterplan, which included allocating space for a large driving track, offices and classroom facility, a drill tower and a shooting range, along with numerous other structures, we realized the initial Class-A building burn building actually needed to be deeper into the site. If we hadn't completed the masterplan first, the city would have built the initial burn building near the entrance to the site and it would have eventually made maximizing the entire site much more difficult.

Similarly, the Public Safety Training Center at **Cape Fear Community College** is built on an eleven acre site nestled between two wetlands. Completion of a comprehensive masterplan allowed for a wide array of training resources – including a 300 by 500 foot driving pad used by three different stakeholders – the College's Truck Driving Program, the Basic Law Enforcement Training Program (BLET), and the Firefighter Training Program.



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Cape Fear Community College Public Safety Training Center nestled between two wetlands.

As you can see, a comprehensive Masterplan is paramount to the design of a Training Facility of any size. Before constructing your project, make sure you and the design team prioritize and phase the project, master plan the site to best utilize your available land, and establish a budget.

### **ADMINISTRATIVE AND CLASSROOM FACILITIES**

Although Live Burn Buildings and Training Towers are the certainly the focal point of any Fire Training Facility you also need an operational place to manage the facility, and more importantly, teach the fire fighters. There are many administrative and teaching spaces you need to consider when creating your Facility. Included are classroom spaces, offices, possibly an auditorium, a computer lab, a library, many storage spaces, locker rooms, possibly dining facilities, and physical fitness spaces. Labs can be also be an integral part of any training facility and include CPR training, crime scene labs, or scenario rooms made to emulate bedrooms, bathrooms or even jail cells.

The recently completed Buncombe County Training Facility includes a sprinkler lab for training. In this lab are mockups of the typical sprinkler risers found throughout the county, each of which are plumbed to allow the fire fighters to both see and recognize the different configurations, but also to operate and become familiar with how they function. Piped off of the risers are actual live sprinkler heads that the trainees can operate to gain experience.

The crime scene lab, located in the classroom facility, is configured as if it was a small apartment. Although the space was originally envisioned by the Law Enforcement personnel, it receives equal use by both fire and EMS trainees as they learn how to search a small apartment, how to care for and move a patient in tight spaces - including moving a patient from the functioning bath tub and through the always-too-small door.

As you think through the spaces that you might consider in your Administration and Classroom facilities, be sure to consider all the specific and extensive storage needs. For example, where and how will you store the CPR dummies? Or, the storage of a “Tiny Town” model for Incident Command Training. Many of the “Tiny Town” models are not very tiny and are actually large and complex. Your Tiny Town might need a storage room which the model can be rolled to and from without disassembly. This storage room might also need an oversize door. Be sure to consider a classroom with exterior overhead doors, so that actual rescue trucks or ambulances can pull into it for training.

Also, consider the growth in support or training staff that may occur as your new facility grows in popularity and attracts other users. Where will you put the additional personnel? Do you have space designated for new hires?

### **SUPPORT FACILITIES**

Support spaces make any training facility operate more efficiently and effectively. These spaces can include apparatus storage and/or training bays, ‘dirty’ classrooms , (more) storage for training equipment such as hoses, ropes, nozzles, etc., turn-out gear cleaning and storage, hose drying, SCBA storage and refill room, facility maintenance spaces, showers and locker rooms and possibly even dormitories.

Other items that can be easily overlooked are where 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 master plan. 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 master plan 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 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 master plan 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 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 your Fire Training Facility. Including burn pads, roof venting, and possibly a flashover 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, 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 master plan 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. In part one of this article, 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 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. 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 particulate throughout the full structure. One way to increase the flexibility of these structures, regardless of the above 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 structures you decide to incorporate into your facility, they'll 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 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 a monitoring and recording system may want to be considered. As the design is considered and progresses, careful consideration needs to be given to NFPA 1402 and 1403 for both

construction and planning and also 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 the firefighters might 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.



*Guilford Tech Community College Training Tower - Elevator Shaft*

Several other structures may also be considered looked at. 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 a little out of 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.