WHITE PAPER

Distinguishing between build models in the cannabis industry environment

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INTRODUCTION

DISTINGUISHING BETWEEN CONSTRUCTION BUILD MODELS, INSTALLATION CONTRACTORS, AND EQUIPMENT MANUFACTURER APPLICATION ENGINEERS IN THE CANNABIS INDUSTRY ENVIRONMENT

In the construction world, the countless variations in definitions, categorizations, and assembly options for construction teams can be confusing to new production facility builders. Out of this plethora of options, two primary models stand out for owners to contemplate when building a facility: the Plan and Spec Model and the Design and Build Model. Other options include working directly with installation contractors or equipment manufacturer application engineers.

This paper will discuss the differences between the Plan and Spec Model, the Design and Build Model, Equipment Manufacturing Application Engineers and Installation Contractors, offering the pros and cons of each.

Plan and Spec Model

In the traditional Plan and Spec Model, the ownership group hires an architect or general contractor (GC) to be the point person responsible for assembling the rest of the team and bringing the project in on time and on budget. The architect or GC typically engages specialty engineering firms — architectural, mechanical, civil, structural, and electrical — to design the layout of the building, see to permitting, and manage the construction to meet the design intent. These engineering groups generate the necessary drawings while working with one another to develop a building construction bid set for estimating purposes. In this bid set, the standard drawings are denoted by A (architectural), C (civil), E (electrical), M (mechanical), P (plumbing), and S (structural).

Each engineering firm must have a registered professional engineer in the firm's specific discipline who can stamp the firm's plan sets. The architect or GC makes sure all team members are coordinating with each other, are on time with deliverables, and are staying close to the original budget. The GC or architect usually has enough experience with the various engineering disciplines to provide guidance on costs to the owners and to resolve any issues that may arise. However, this point person depends on the specialty subcontractors for in-depth expertise and recognition of design constraints, collaborating with them to assemble a complete set of plans for construction permitting. The local municipality must review these plans for conformance to local code before the build-out can begin. For a remodel or retrofit of an existing building, some of the aforementioned engineering groups may not be needed. Still, the changes required to house a cannabis production facility tend to be rather significant, so more often than not, all will be required.

"We shape our buildings; thereafter they shape us" – Winston Churchill

It can take several months for the engineering firms to develop the necessary plans and specifications depending on size and complexity. The more that is unknown when the process begins and/or the more changes that are implemented throughout the design process, the longer the timeframe and costs will be to get these vital documents. Once the documents are close to completion, the architect or GC will put the project out to bid by subcontractors in each of the relevant trades, including heating, ventilation and air conditioning, electrical, and plumbing.

In the Plan and Spec Model, the owner typically makes an initial investment in an architect or GC, which includes the fees for the required subcontracted engineers. Alternatively, the owner may assume the responsibility of the GC by soliciting bids themselves from subcontractors in each trade.

At this point in the project, the owner learns with some level of certainty the total costs and the expected timeline for the project. These projections will be much more accurate than the budget the architect or GC initially developed. With detailed plans and specifications in hand, subcontractors are all bidding on the same thing. Assuming that all the subcontractors bidding have similar levels of experience, this simplifies the selection process to a matter of choosing those who can deliver quality work within the specified timeframe at the best price.

The primary goal of the Plan and Spec Model is that it enables competitive bidding, theoretically on an "apples to apples" basis. To reach that point, though, the engineering groups must spend significant time developing detailed plans and specifications so that bidders know exactly what the project entails. Without sufficient detail, the project becomes subject to change orders during construction, resulting in unforeseen costs for elements that were not communicated in the bid documents. The overall process involved in the Plan and Spec Model may take longer than other approaches, but it means the architect or GC can obtain multiple competitive bids that are comparable in scope, thus finding the best possible prices.

One risk to using this approach is that an engineer without the proper experience in a cannabis cultivation facility may botch the design job, creating incorrect specifications that result in the need for numerous change orders. Contractors and subcontractors are well within their rights to demand more money for work that was not included in the plans or was specified incorrectly and most contractors will charge a premium for the added scope. For a cannabis cultivation facility — a newer type of industrial building with many unknowns and few established experts — the chances of going over budget can be considerable.

Another factor when considering the Plan and Spec Model for developing a cultivation facility is the critical role of the mechanical system in the project. It also represents a significant, if not the largest, cost associated with any build. It is essential that the mechanical system be designed correctly to maximize yields with healthy plants that pass testing. If a mechanical engineer gets a comfort cooling application wrong in a traditional building, it will result in complaints about the temperature and comfort of the tenants. While this would no doubt be a nuisance, it wouldn't make or break the building's profit. But a mistake that results in subpar yields in a cultivation facility will have a major impact on profit. Consider what just a 10% to 20% reduction in output can cost a business. Therefore, it is absolutely essential that the architect or GC hire a mechanical engineering firm with expertise in the cannabis field. Selecting a firm with more general experience and trusting that the engineers will figure it out on the fly is not a risk worth taking.

Design and Build Model

In the Design and Build Model, ideally, the owner engages all the desired critical specialist engineering and construction subcontractors at the beginning, after vetting them based on experience. By identifying experts in cultivation and engaging them early, the owner is able to communicate with subcontractors from the start of a project, setting a budget with their input and obtaining feedback throughout the planning process about how to stay within that budget. If costs should exceed the budget, these same subcontractors can provide feedback as to why it happened. In this model, since the costs and performance targets are set with their input, subcontractors are more accountable for hitting those targets as well as staying in budget.

Subcontractors with relevant experience in the indoor agriculture space know what equipment has worked well in the past for particular applications, so they know what equipment they should be considering. Due to their expertise in the field, they don't have to take as much time developing detailed documents as the Plan and Spec Model requires for competitive bidding.

In the Design and Build Model, the contractor needs to provide only enough detail in the plans as is required for permitting, and it won't be necessary to spend time looking for alternates. This results in a much quicker turnaround time for design and execution prior to permitting, which means building can begin sooner than with the Plan and Spec Model.

Essentially, because the various experts are already familiar with the alternatives based on their past experience, they are able to pick the most appropriate and cost-effective options for the project up front, leading to reduced time to market, optimal cost value, and decreased build time, resulting in the very best performing system for the owner.

Equipment Manufacturer Application Engineers

An important distinction for those new to the commercial building world is that of mechanical equipment reps with engineering degrees or "Sales or application engineers" versus a true system designer or professional engineer (PE) who stamps the drawings mentioned earlier. Most equipment manufacturer application engineers are not HVAC designers. Likewise, equipment manufacturers may have engineers on staff, but they are not design engineers. Rather, they work for a manufacturer and support design engineers. This means that owners working directly with equipment manufacturers are responsible for doing the load calculations themselves or will have to hire a mechanical engineer to do them. Then, the equipment manufacturer will recommend the equipment to perform the work.

An owner may like a particular type of equipment, but if an engineer hasn't designed around that piece of equipment before or isn't familiar with it, the owner may end up paying for the engineer's learning curve as the engineer tries to apply it properly. Although manufacturers will ardently promote the features of their equipment, they are generally not experts in sizing or applying that piece of equipment for the owner's purposes. Furthermore, they are not responsible for stamping the drawings, and they can't guarantee their equipment will perform as needed in the owner's cultivation environment. And the equipment itself is particularly important.

There is a significant difference between comfort cooling equipment and purpose-built equipment for the cannabis industry. Comfort cooling equipment is built for human comfort, and human comfort has different parameters than plant metabolism. The load calculations are vastly different for the two because comfort cooling HVAC is based on seasonal differences, meaning the only calculations are for heat loss or gain from a building. The equipment will turn on for a period of perhaps three to five years because it will be

constantly running, which it is not designed to do.

In contrast, purpose-built equipment is designed primarily to account for what is happening inside the building rather than the outside conditions. Thus, the overwhelming majority of factors to consider in load calculations are related to the environment within the structure. The only effect that ambient conditions have with regard to HVAC equipment selection for cannabis cultivation is derating for conditions.

Furthermore, calculating a massive dehumidification load, which in most cases exceeds the sensible cooling load, is incredibly complex because of all the variables affecting dew point temperatures and system performance in connection with dehumidification. With purpose-built equipment, the sensible heat ratio can be changed as needed. This is the ratio of cooling that is dedicated to dehumidification versus comfort cooling.

Ensuring that the equipment will continue to operate even when the ambient temperature is low is a further differentiator, because the interior environment will still need air conditioning, even if the outside temperature is -37 degrees Fahrenheit. Redundancy is another critical factor in an HVAC equipment specification, because the potential loss of product, worth millions of dollars, is so great if the equipment should fail.

Equipment built specifically for the purpose of controlling interior cultivation conditions has a much greater longevity than comfort cooling equipment in growing facilities, easily performing for 15 to 20 years before needing to be replaced.

Installation Contractors

Installation contractors are installers, not engineers. Their primary function is to provide labor, and they are often aligned with particular equipment vendors. Some design and build contractors may have an engineer in-house or a relationship with an engineering firm, but in general, they do not have engineering expertise. This means these contractors may not be able to do proper load calculations.

Contractors that primarily install comfort cooling systems in residences might push variable refrigerant flow (VRF) systems, because those are what they are certified to install. However, VRF systems are not ideal for cultivation facilities. Remember, the mechanical systems in a growing environment must cool and dehumidify 24/7, every day of the year. Therefore, VRF should not be the first choice for any grower.

An installation contractor is often the first person a grower thinks to call when planning a new facility, but such individuals are usually not the most qualified for the job. They are also the least neutral, inclined to recommend the equipment they use most often, which is not necessarily the right equipment for cannabis applications. It's best to engage an installation contactor much later in the process, after a qualified engineer has specified the necessary mechanical equipment.

Pros and Cons

Having explored several approaches to constructing and equipping a cannabis cultivation facility, let's sum up the pros and cons for each.

Plan and Spec

Pros:

◊ The owner relies on a single point of contact, such as the architect, to obtain competitive bids based on detailed plans and specifications.

Cons:

◊ The owner pays a lot of money up front to have the plans drawn up prior to bidding and must trust that the architect is able to identify experienced subcontractors with the relevant expertise.

◊ The owner does not know the total budget until after paying engineers to draw up plans. This could mean potentially spending hundreds of thousands of dollars before knowing what it will ultimately cost to build the facility. The architect may be able to provide a rough budget, but because the plans have to be so detailed, it can take many more months to develop them than with other approaches.

◊ If the numbers that eventually come in are grossly out of line with the architect's rough estimate, the project could cost anywhere from 30% to even 100% more than what the owner can afford to spend. In that case, the owner must start over and re-engineer the project, meaning more time and money — perhaps several months and tens of thousands of dollars.

◊ After all the preliminary work is done, the owner may find that the project is simply much too expensive to proceed as planned. This may lead the owner to pivot to the Design and Build Model, wasting all the money already spent on plans and specifications.

Design and Build

Pros:

◊ Because the engineers and equipment providers have done the same type of project many times before, they can respond quickly and efficiently. Many times, within a few days, an owner can know the cost of the necessary mechanical and engineering services. Cons:

◊ The engineering and equipment providers can help the owner evaluate costs at the beginning of the process, giving the owner the choice to bring costs down with value engineering before wasting time or money.

◊ This approach is generally quicker than the Plan and Spec Model because team members are engaged and involved in conversations with one another from the very start of the project. Everyone knows who is responsible for each aspect of the job, so things get accomplished more quickly.

Cons:

◊ Because the owner isn't necessarily requesting competitive bids on the project, the final price might not be the best price possible. Providers who are already relatively confident of their place on the team may not be as competitive with their bids as they might be otherwise.

Equipment Manufacturer Application Engineers

Pros:

◊ Some offer purpose-built equipment.

Cons:

◊ Most are not HVAC designers.

◊ Most do not have registered mechanical engineers on staff and therefore cannot stamp drawings.

Installation Contractors

Pros:

◊ Some offer purpose-built equipment.

Cons:

◊ Most are not HVAC designers.

◊ The owner will be at the mercy of whichever equipment manufacturer the contractor favors.

CONCLUSION

Building a cultivation facility requires numerous permits, including a permit for the mechanical design — arguably the most important aspect of the project. Using either the Plan and Spec Model or the Design and Build Model, owners should insist on working with a mechanical engineer who has experience in designing for cannabis environments, understands the specifics of a cultivation facility, and can address the needs of such facilities on a mechanical level.

Using a mechanical engineer without the right experience can lead to a failed inspection or a setup that doesn't work properly. Either way, it will cost the owners significant time and money in the long run. Worse yet, they might not even know the equipment isn't suitable until it's up and running. If the owners choose the Plan and Spec Model, they should make sure the architect selects a qualified mechanical engineer with specific expertise in cannabis cultivation projects, because this individual is truly key to building a successful, efficient facility.

ABOUT SURNA

SURNA PROVIDES ENERGY AND WATER EFFICIENT SOLUTIONS THAT ALLOW GROWERS TO MEET THE UNIQUE DEMANDS OF A CANNABIS CULTIVATION ENVIRONMENT.

When Surna Co-Founders Brandy and Stephen Keen began growing cannabis to help medicate Stephen's epilepsy, they became frustrated with the HVAC equipment available at the time. It was meant for comfort cooling, and they wanted something designed specifically for the challenges of indoor cannabis cultivation. In a sweltering Austin, TX garage in 2006, they built the foundation for what would grow into the Surna we are today, innovating the cannabis industry and striving for efficiency.

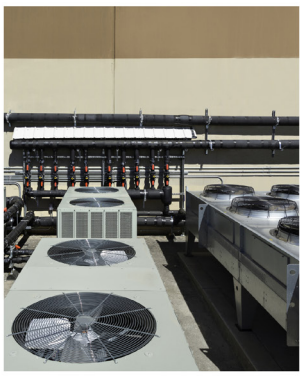
Now with a team of experienced engineers, technical advisors and project managers, Surna has completed over 800 cultivation projects and has been serving the cannabis industry for over a decade. Brandy Keen is proud of the partnership cultivators have found in the company she helped to build, stating, "Having started looking at mechanical designs and energy efficiencies in cultivation facilities all the way back in 2006, that was well before this industry "green rush" really happened. We made mistakes back in 2008 that other companies are just now making. So that experience and that longevity really sets us apart."

Our experience serves to provide you with a custom design that you can rely on. Whatever your goals are, we can sit down together and create a solution:

Cultivation Products
- Controlled Climate Systems
- Controls
- Biosecurity

Grow Room Services
- MEP Consultants
- Engineering
- Odor Control
- Installation Support





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