

Work Breakdown Structure

Managing an
Efficient
Construction
Workflow





Managing an Efficient Construction Workflow

The purpose of this whitepaper is to define an operational process that creates an efficient work flow from pre-construction through the completed construction phase of a project.

We present some of the difficulties that may occur in a project that does not begin with a detailed, deliverable plan. A formal work breakdown structure (WBS) will then be introduced. We demonstrate how an accurate model of the construction work flow, if created at the pre-construction stage, can be used to extract measurable information. This creates better estimates with more effective collaboration with project management, accounting, general contractors and end users to consistently produce successful projects and higher profits.

The Contractors Challenge

There are three main obstacles that cause contractors to fall short of achieving an efficient, consistent work flow process between the stages of estimating and project management:

- ▶ Estimators have the pressure of time limitations for producing an estimate. Contractors are traditionally awarded only two out of ten projects they bid. Taking this into account, time spent estimating a project can be cost prohibitive. Consequently, many contractors will develop a WBS once a project bid has been awarded.
- ▶ Another obstacle is the investment in hardware and software, plus the time it takes to fully implement and utilize the technology. Estimating and project management software specific to the electrical and low voltage industries can be a very effective in the development and execution of a WBS.
- ▶ The third obstacle is educating and training office to field personnel on the importance of fully understanding the process of developing and adhering to a WBS. The objective of a WBS is to mitigate risk and maximize profits. The training time as well, including buy in from everyone on the project team is critical to the success of the process and the objective.

The objective of a WBS is to mitigate risk and maximize profits

Ed Coffin, ConEst





The Impact of an Inefficient Workflow

Lack of Accountability

Estimates that are not detailed are also not measurable. The success of an estimator is not simply measured by the volume of estimates produced, but by the profitability of each project. To achieve project goals and budgetary guidelines, the estimator must question, measure, quantify, verify and adhere to a plan. An estimator must have the ability to understand and itemize a plan that executes and delivers each project's scope of work with a positive outcome and be cost-effective.

Lost Profits

If estimates are not measurable, then how are profits measurable? Here are just three examples of how money can be lost on a project.

- ▶ Not knowing the actual labor hours accounted for in an estimate. This typically occurs when an estimate has been unit priced which leads to managing reactively, providing no indication of budget over runs.
- ▶ External influences. Poor customer communications, or disorganization with general contractors or sub-contractors, can cause a project to progress inefficiently leading to lost profits.
- ▶ Not being able to deliver the project on budget due to inefficiencies within the estimating and project management processes. Having a detailed plan to execute a project from pre-construction through construction provides a checklist for documents and correspondence, relative to specific project tasks and their status at any point in the plan. This process makes it easy for anyone to follow, understand and pin-point any issues before they can negatively impact the project. Best practice tells us we only get paid for what we document.

Loss of Credibility

Projects that are not planned well cannot be executed well. Poor performance is quickly perceived by the owner, architect, engineer, general contractor and other sub-trades as detrimental to the success of a project. Opportunities to be invited to participate in future projects can be jeopardized if a company's performance does not improve. This can lead to growth deficits. Having a plan is paramount for a project to be on time and on budget. Customers want contractors who can provide them with a detailed plan that ensures all critical paths are achieved, and meet or exceed the owner's expectations.

A process is a series of actions or steps that are taken and completed to achieve a result -- the outcome being a successful project, a happy customer and profits for the company performing the work.

The actions to accomplish the end result consist of the installation of one or multiple systems, including the physical and logistical construction restraints encountered on each project, that an electrical or low voltage contractor can be exposed to.

To achieve this outcome consistently, a detailed plan needs to be developed. Outlining each step of a project to create a proactive process, that can be measured at any point, will ensure compliance to the original plan to make certain that projected profits are maintained or exceeded.





A Simple and Easy Solution

Defining a Work Breakdown Structure

A work breakdown structure (WBS) is defined as a hierarchy of tasks that are representative of the real work flow of a construction project.

Think of the WBS as a visual model of the project that identifies each piece of the scope of work and how it's delivered to the customer. It can be as simple or as complex as needed for each individual project. Parent tasks can be subdivided into child tasks. Breaking a task down into small segments, or sub-tasks, makes it manageable and more controllable.

At the pre-construction stage, the WBS can be used to produce a more detailed and accurate estimate, providing meaningful information and cost analysis to your customers. At the construction stage, the WBS helps manage and execute the project efficiently and profitably. It can also be used as a measuring stick of actual costs and completeness of the scope of work.

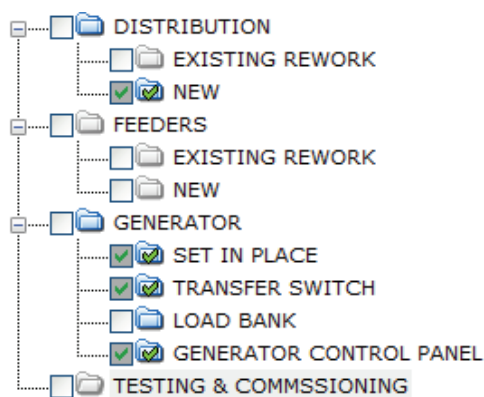
A WBS can be thought of as a template for a repeatable process. This provides a standard for all estimators, project managers and field supervisors to follow. Management can rely on the consistency that a defined process affords – when a process is universally adopted and refined, it will become second nature to everyone in the company.

Applying a Work Breakdown Structure

Figure 1 shows an example of a WBS that lays out a plan for a generator installation to an existing distribution system. The main project tasks have been sub-divided separating the new work from the existing installation that needs to be reworked.

At the construction stage, a WBS helps manage and execute the project efficiently and profitably.

Figure 1



This model displays a practical representation of how the project will actually be executed and provides a number of benefits that can be utilized from the pre-construction stage of a project through construction.



The Benefits at the Pre-Construction Stage

The visual breakdown of a WBS provides an easier understanding of the scope of work for management and all project team members.

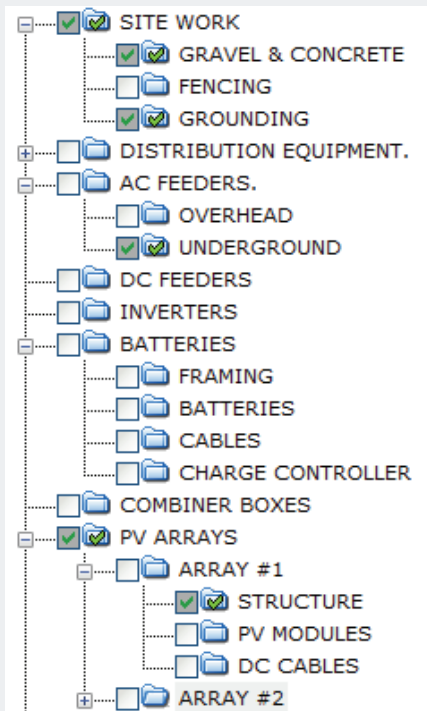
Many projects involve occupied premises, so accounting for the additional labor cost is critical in maintaining budgets. In Figure 1 above, tasks separate the existing work and new work and can be used to adjust the labor installation hours for all the existing areas of the project due to customer occupancy. The structure shown in Figure 1 also allows the flexibility to include overtime costs at any time for one-to-many of the occupied areas of the project.

The project laid out in Figure 1 shows job conditions that include the installation of all the feeders in both existing and new construction areas with 30ft ceilings. The WBS easily allows the estimator to account for the additional labor and equipment required for those tasks.

Provide the ability for better presentation of the project's budgets to the customer. Figure 2 below shows another example of a WBS for a photovoltaic installation.

The WBS easily allows the estimator to account for additional labor and equipment as needed for each project task.

Figure 2



Each parent and child task of the WBS can be presented in terms of quantities, material cost before tax and labor hours as well as both overall cost of the task and sell price to the customer.

This is valuable when negotiating with customers on price. Knowing each task's true cost makes it easier to isolate and modify or remove that portion of the scope for value engineering to help the customer meet their budget.





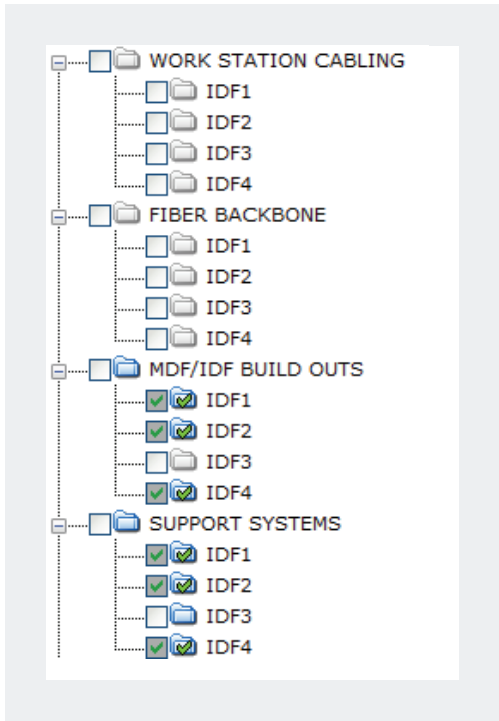
Cost codes used by both accounting and project managers provide consistent breakdowns of all projects in a common form so that all the projects can be rolled up for profit and loss analysis. Cost codes provide operations and project managers with a chronological order of events for Rough, Wire, Trim and Test. This allows them to be more effective in knowing what material is needed on the job and when.

The thoroughness and completeness of an estimate is critical. Figure 3 shows the WBS of a networking cabling installation, subdivided into tasks for each telecom room or IDF of the project. There are gray folders, blue folders, and blue folders with checkmarks. Using software to define complete and incomplete tasks is another benefit of a WBS. Being able to monitor the progress and completeness of an estimate is critical to the overall success of a project.

Conventional standards indicate that clear folders contain portions of an estimate that have yet to be started, while blue folders contain estimate information that is underway but not complete. Checkmarks on blue folders indicate that phase of the estimate has been completed. Using these conventions allows estimators, project managers and owners to quickly identify what areas of an estimate need to be completed before the estimate is due.

Being able to monitor the progress and completeness of an estimate is critical to the overall success of a project.

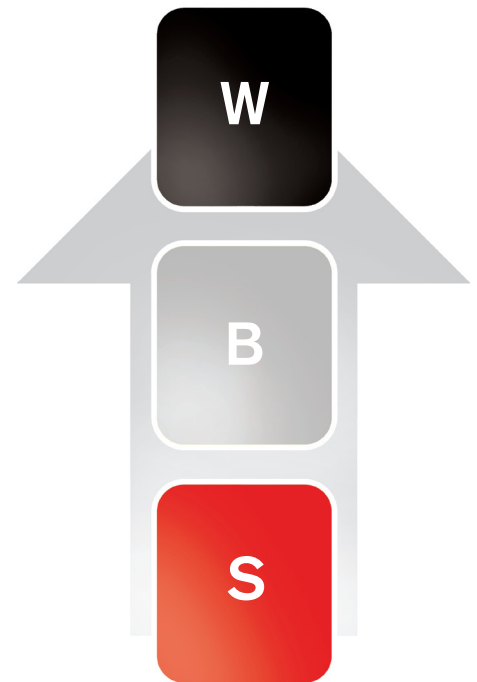
Figure 3





Benefits of a WBS at the Construction Stage

- ▶ Project managers gain a quick understanding of the project scope with defined budgets allowing more effective and controllable management of the project.
- ▶ Provide field supervisors with a clear understanding of the project, ensuring that everyone is on the same page. Again, quick understanding of the scope of all project team members affords efficiency and completeness of a project.
- ▶ Having detailed budgets that can be measured against the actual costs of the project. Early detection of a project task that is falling behind can be quickly corrected, resulting in less damage to the budgets.
- ▶ The estimate's budgets established by the WBS effectively become the project's schedule of values (SOV) for progress billing.
- ▶ Scope changes can easily be identified and itemized within the WBS.
- ▶ Better communication externally with owners and general contractors about budgets and timelines. Material procurement and labor scheduling can be more effective ensuring the right material and labor resources are on the job when needed.



The Benefits to Your Business Overall

Accountability

Taking time at the estimate or design phase of a project to develop a work breakdown structure is a valuable investment in the commitment and liability you take on when signing a contract. The basis of a good estimate is understanding the scope of work, not just in terms of what is being installed but also where and when. As mentioned, installation difficulty and logistical construction restraints can greatly affect the budget and overall profits of a project. High ceilings, occupied premises and premium time all need to be accounted for. In practice, estimating is very time sensitive, but the requirements for detail in construction has become more complex and critical.

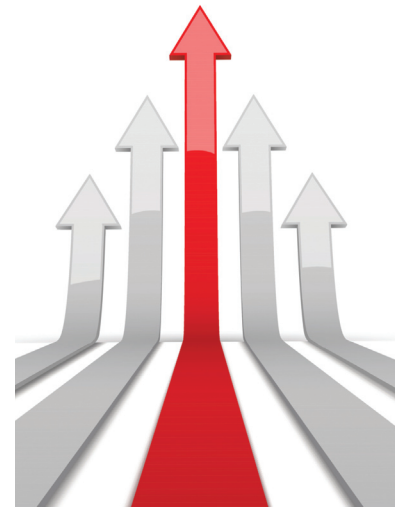




By taking time to create a detailed WBS beginning with the estimate, the estimator can use it as a punch list to make sure all projects tasks tabled in the WBS have been completed and accounted for, providing the confidence of completeness and thoroughness of the estimate prior to submitting it for bid.

Maximized Profits and Growth

When an estimate is bid the way it is constructed, the detail becomes meaningful and can be effectively used to measure against the actual costs during the construction phase. Understanding your costs as well as being able to accurately reconcile profits at any point along the critical path with accurate progress billing is critical for sustainable growth. Not all projects go as planned; but with a detailed estimate, a project can be tracked. If a project task starts to move off target, project management can proactively make immediate decisions to mitigate any further loss. After consistent use of a WBS on many projects, historical information will start to produce trends on how your company is actually performing versus the estimated values. This type of analysis or job costing will help improve the accuracy and competitiveness of your estimates, a more efficient construction work flow that leads to accountability, consistency and maximized profits.



Increased Credibility

A WBS can help your customers understand the budgets when they are detailed and itemized to represent the project work flow. Many times an initial projects design is over budget that can cause revisions to the original design. Scope changes can be easily identified and modified and costs can be quickly presented back to the customer. Complex projects can be presented in a logical and understandable manner with a detailed work breakdown structure. A WBS can also help to foresee and solve construction issues that can keep a project on time and on budget. The perception of your customers that you are organized and willing to work with them builds trust and long term relationships.



Conclusion

Implementing the use of a Work Breakdown Structure as a standard workflow process for every project is essential for consistent and sustainable growth. Today's electrical and ICT (information and communications technology) contractors are under time constraints when estimating their projects because of the many price options that are requested by their customers. The use of a WBS can help a contractor communicate their costs to their customers more efficiently, including itemizing scope changes to specific project tasks.

An estimate that is defined and built from a detailed WBS will provide effective project execution where actual costs can be tracked against budgeted costs. A project's workflow is defined by the WBS, and references to any project task are easily itemized at any point during the construction phase.

Estimating and project management software can play a strong role in helping a contractor incorporate an effective WBS into their estimating process. The investment in software and training is quickly returned due to greater operational efficiency and projects that are on time and under budget.

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