

# SCOPING IT OUT: COST ESTIMATES EXCEL WITH DATA-DRIVEN SCOPES OF WORK

*Accurately evaluating and writing the Scope of Work demands data essential to successful building projects – capturing, analyzing and estimating real costs*

By C.C. Sullivan, Contributing Editor

**W**hat's the most critical step in creating a new building? Savvy architects, owners and developers find this question easy to answer: It's the *scope*, of course. With every project start and every new building team, the first and often most daunting hurdle is establishing a decent budget estimate. In preconstruction meetings, when questions arise about budget – especially errors, omissions, misinterpretations and just plain “forgot it” – fingers point back to the original scope of work, or SoW.

Behind the most effective SoWs are multitudes of useful specifics and real data, according to Jory MacKay of project management app maker Planio. “The SoW is a powerful tool to keep everyone accountable and on task,” he explains. “It might seem like a lot of work to do up front, but the more you can make clear, the easier the rest of the project will flow.”

On top of that, cost estimating demands a clear scope. It's a simple statement, yet it is among the most serious challenges for today's building teams. Aligning budgets requires explicit advance understanding of a range of project needs, planned timeframes, shared responsibilities and expected conflicts, prevailing standards and codes, site conditions and more. Attaining a clear picture of these variables is only possible through the hard work of dedicated professionals.

## LEARNING OBJECTIVES

After reading this article, you should be able to:

- + **DEFINE** what a scope of work (SoW) is and why it is essential to successful building project delivery
- + **EXPLAIN** core challenges of creating a clear, accurate and full scope of work for a construction project
- + **LIST** types and sources of information and cost data that can be used to create a successful scope of work
- + **DESCRIBE** the characteristics of an effective scope of work and potential outcomes related to its use

## CHALLENGES TO SCOPING CONSTRUCTION



There are many challenges to developing an adequate scope of work, including material delivery limitations and environmental requirements. (Image courtesy Gordian)

All too often, however, a lackluster scope-setting effort is a source of frustration, realized losses and missed opportunity. For building owners and their representatives, budget estimate creation is an unappealing but elemental step in the preconstruction process. “There is never enough data on hand. The work itself is time-consuming and tedious,” says Tim Duggan, Vice President of Data and Analytics at Gordian and a construction professional specializing in estimating. “Yet the stakes are incredibly high.” It’s actually true: Lowball or highball estimates can become roadblocks to career advancement or AEC firm business development. Overstating a budget means funding is tied up that otherwise could be used elsewhere by the organization or investor. More commonly, wishful budgets are eclipsed by far higher bids from qualified contractors and construction managers.

The downsides of insufficient scoping are just as urgent. Amendments to construction contracts that change the scope of work, including change orders and construction disputes, often stem from an unclear original scope, according to Luke J. Farley Sr. of Conner Gwyn Schenck in an article for the American Bar Association. “Change orders create a lot of work for construction lawyers. Owners and contractors can never seem to agree on whether something is a change (which costs more money) or part of the original contract scope (and included in the original price),” says Farley.

In all these cases, the inaccurate estimate – often resulting from an incomplete scope of work – forces the hand of the project owner. They must either shed scope or make more funds available – or both. These last resorts have bottom-line implications. Scope cuts mean less effective or desirable buildings that may not meet their full original functional and aesthetic intent. Adding to the budget means someone suffers a loss elsewhere, whether due to added financing or a loss of available funds. It’s clear: Scope is a building block for good fiscal and organizational management.

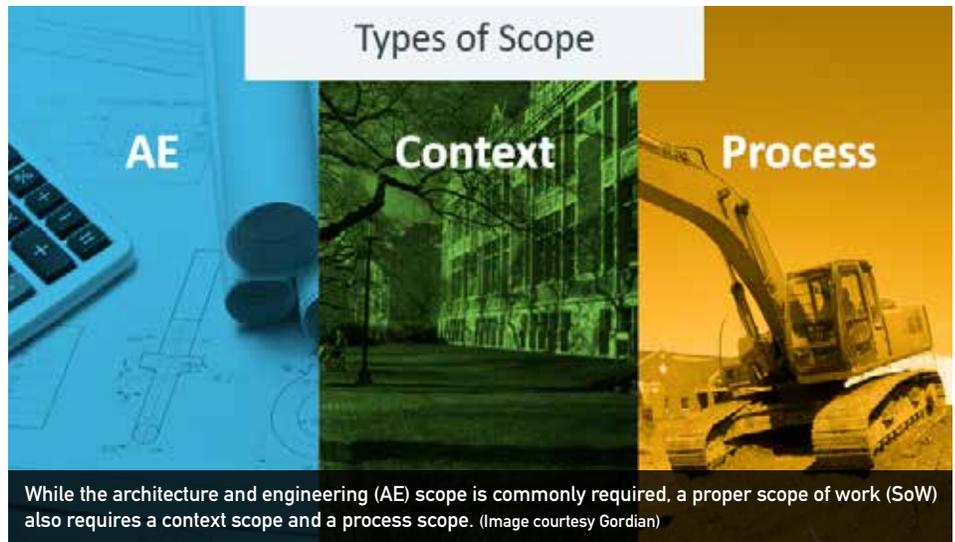
## 1. Defining Scope

Starting from the beginning, how should an AEC building professional understand scope, and what must a scope contain?

This is an easy question with a long, definitive answer. The SoW should provide a detailed statement of everything expected from the full team executing the construction contract. It’s more than plans and specifications, though that contribution from the architecture and engineering (AE) team is essential to defining scope. It must include all of the equipment, scheduling milestones and explicit deliverables needed. Is there a technology requirement for project delivery, such as use of BIM? The SoW should show it. Where will the general contractor (GC) and specialty trades have laydown space for materials and equipment storage? That goes in the SoW, too. When are workers allowed on the job site, and when will the owner need access to or through the site? Yes, all these questions inform the definitive scope.

“Your scope of work, sometimes referred to as a *statement of work*, should describe in detail what is expected of the contractor and subcontractors,” according to the Ross Group, based in Portage, Ind. “It will later be used as a measuring tool for your construction manager as your project progresses.” As a starting point, The Ross Group says “a basic scope of work should include the following components”:

- ▶ **Project Overview** – A brief summary of the project and key objectives.
- ▶ **Project Deliverables** – Detailed expected project objectives and targets, with “all relevant information that will help a contractor to understand the requirements.”
- ▶ **Project Scope** – All quantifiable goals for the project, including completion milestones.
- ▶ **Project Schedule** – A timeline of required tasks with specified completion details. An overall expected project duration is included here, with delivery dates and restrictions.
- ▶ **Project Management** – This includes details on contracts, payments, change orders, and any legal requirements.



A complete scope is the most valuable starting point for a construction project. It calls out the who, what, when, where and how of a project. The scope of work is highly detailed, exacting and comprehensive, so it demands the participation of every project team member. It also includes three complementary types of inputs. In particular, the SoW must include these elements:

- ▶ **The Context Scope.** Drawing together a variety of physical and site-specific factors, *context scope* requires an overview of field conditions and a description of the physical location of the site. It should include details such as expected weather and environmental issues, existing operations

on the property, security needs and issues on adjacent sites, such as a school, valuable trees or a stream running near the construction site.

The context scope describes all of the hurdles, imperfections and red flags the project team might encounter in an effort to prevent losses, such as surprise conditions or unexpected costs. With a proper context scope, the building team will have informed and realistic expectations for the build.

- ▶ **The Architect-Engineer Scope.** Perhaps the opposite of the context scope's compilation of warts and warning signs, the *architect-engineer* (AE) *scope* presents a frictionless, flat backdrop for the plans and specifications. It accounts for all work to be done, the materials and systems and finishes, component standards and testing, as well the anticipated people and teams who will realize the work. Although the AE scope tends to define the site and environmental requirements in certain ways, it will not present the full picture of the build as the context scope does.
- ▶ **The Construction Process Scope.** Called the "execution scope" in some circles, the construction process scope covers the required processes, machinery, tools and preparations needed to perform the work. Defining how the construction will get done, the construction process scope includes equipment, safety protocols, and staging that will be used in the delivery of construction services and the final building.

Taken together, these three complementary scope types offer an integrated and thorough picture of the expectations and demands of the work. Armed with a complete SoW to diffuse any ambiguity, the building team and especially the construction entities are ready for a trouble-free project they can deliver on time and on budget.

## 2. Thinking Like a Contractor

As one certified estimating professional, Bellingham, Wash.-based Rory Woolsey, CEP, has said, "Think like a contractor and scope beyond plans and specifications." It's good advice. The contractor is tasked with building it, not conceiving it. Scoping like this requires knowing the context of the work, not just the design of it. That means getting your feet on the ground and hands on every piece that goes into the building.

As an anecdotal illustration of his point, Woolsey has described the ultimate failure to think in terms of the context scope: a lighthouse project where the site wasn't accurately scoped. In the early 1800s on the coast of Scotland, a team was assembled to construct the Bell Rock Lighthouse. Commissioned with this major public work, the team created a comprehensive AE scope defining everything needed for this new building: plans for all five floors, details of the structure and materials, as well as all specialties and finish specifications. For an architect, it was perfect. Yet the cost to build it was 50% more than expected. What happened?

Context happened: The AE scope failed to mention there was a shortage of the granite that was required for the lighthouse. It also didn't describe the area's lack of labor and skilled trades, due to wartime scarcity. Even more challenging, the site's area where the lighthouse was located would be underwater seven months of the year and impacted by weather conditions, dramatically reducing the window for construction operations. These considerations were omitted from the scope of work, making it seem much easier on paper than on the brutal shores of Scotland.

"Good estimators are made great through their knowledge of construction and their ability to mentally build the project multiple times before the project is actually built," says Woolsey, speaking out of his 40-plus years of experience in estimating.



### 3. Clarifying for Completeness

In addition to completeness – as shown in the lighthouse example – clarity is essential to writing a scope of work. Juan Rodriguez, a professional civil engineer and seasoned large project manager, states “Clear wording is key to minimizing the risk of claims, litigation, and other related problems. A SOW should avoid ambiguous phrasing and must identify the project deliverables and its objectives.”

“The best way to review a scope of work is to ask if it each element clearly lead the reader to one specific conclusion, leaving no room for interpretation,” says Gordian’s Duggan. “If an action is mandatory, the statement of work should use the words ‘shall’ or ‘must.’ It is better to over-explain than to leave open the possibility of a misunderstanding.”

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In addition to using highly specific and clear language for each task, the SoW can include photographs, drawings, charts and diagrams to enhance clarity. Bulleted lists, emphatic and boldface items, and other text presentation tools can also reduce confusion

and encourage the best possible understanding of the project requirements. In this way, the SoW leads the readers to only one specific conclusion rather than a range of outcomes based on individual interpretation.

### 4. Documenting with Data

Using the above concepts, building professionals, designers and construction executives can better write scopes of work and begin to evaluate the effectiveness of SoWs written by others. The next step is to ensure the contents and details in the scope of work are complete, transparent and presented properly.

To keep the project team out of trouble, a complete and exhaustive SoW stands to eliminate ambiguity and answer all the questions for the construction team. A typical scope of work should be developed until it includes all the following core elements:

- ▶ **Purpose statement.** An overview of the project, this introductory section describes the structure being built and its intended functions.
- ▶ **Contractor responsibilities.** This portion describes requirements for project management and subcontractor oversight and should include language relevant to advising on and accepting design documentation.
- ▶ **Owner responsibilities.** Among the chief concerns for the owner section include approvals of plans, as well as communication requirements for any disputed items.
- ▶ **Project execution.** Standards, regulations and special requirements are included in these portions of the SoW.
- ▶ **Quantity, quality and means of execution.** This portion details the project in terms that ensure effective estimating of labor costs by the

contractor. More explicit direction will improve both the estimates and the satisfaction with the completed work.

- ▶ **Project timeline.** With key milestones in the schedule, the project’s timeframe and deadlines are given in the scope of work. “For example, when do the electricians need to finish in order for your insulation team to do their job? What specific materials does the insulation crew require and what is the budget?” as the Ross Group describes it.
- ▶ **Payment and reporting schedules.** Related to the above timeline, the owner’s and construction leader’s requirements for payment and project reporting should align with the overall project timeframe.
- ▶ **Related tasks and duties.** Are there any other responsibilities or deliverables needed to obtain the expected results? For example, are performance mockups and special field inspections essential to delivering the performance and quality required? Does the construction team have to produce submittals to authorities having jurisdiction (AHJs) or owner representatives? Include all these known responsibilities needed in accordance with the project goal.
- ▶ **Contractor performance evaluation.** Outline the evaluation methods and metrics that will be employed to assess the completeness and quality of the work. If the construction team knows how it will be judged on its effectiveness, the more likely it will be to conform to the overall project goals, according to Gordian.

In addition to including these contents in every scope of work, building teams – and especially the owners and end-users – will also benefit from SoWs that include all the relevant data that undergird and quantify budget and technical requirements. In the SoW’s project scope section, says the engineer Rodriguez, the critical data contribute to two key parts: “Technical considerations – specific techniques or methodologies relevant to the contractor’s performance and how it will be measured,” as well as “Tasks – specific requests and tasks that are needed to satisfy project objectives, with detailed milestones and results that should be obtained from these tasks.”

To gather and present useful data for a strong project SoW, the building team leaders should look for relevant sources of information. Construction cost data resources present one critical reference, casting a wide net to produce authoritative, comparable unit costs and task costs to inform critical assumptions about the work. There are many other valuable data sources, however, including:

- ▶ **Past project plans and specifications.** Look at similar or even identical projects. Their documentation already contains answers to key scoping concerns for the current work in planning. Savvy building teams study the existing plans-and-specs to improve their own construction documentation (CDs) and to produce a full and clear SoW. “These documents -- which include the scope-- are a treasure trove of information including drawings, the materials and products used, installation methods and quality of work,” says Gordian’s Duggan, adding that plans and specs are instrumental in writing the *AE Scope*.
- ▶ **As-built documentation.** Similarly, as-built drawings and specs, which show how the existing work deviates from the original CDs, help the



project team avoid the changes and pitfalls behind those changes (and change orders).

- ▶ **Site visits.** Inspecting and understanding the project site may be the most essential aspect of writing the *Context Scope*, as the estimator Woolsey concludes from his lighthouse anecdote and years of personal experience. Site visits will uncover challenges for delivery of equipment and materials, shed light on the conditions and operations of the existing facility, and even identify potential concerns about site security or sensitive adjacencies. Walking the project area, SoW writers mentally “build” the project before the construction crew sets foot on the site.
- ▶ **Vendors, suppliers and subcontractors.** Experts in construction consult the key trades and product and system suppliers all the time. For an accurate and complete scope of work, consulting with contractors and vendors will provide valuable insights and experience. In order to “think like a contractor,” consulting with the specialty contractors and other system experts will help ensure a wealth of experience informs the SoW.
- ▶ **Third-party cost data.** While widely considered the basis of project estimating, a construction cost database can also be foundational to scope development and writing an unassailable, authoritative SoW. First, the cost data are verified and impartial. Second, they fill in gaps and details often overlooked in an owner’s scope of work. Some cost sources, such as RSMeans data, include “assembly models where construction tasks are grouped together and square foot models that provide an early idea of overall costs,” according to *Engineering News-Record*. “This sort of data includes all the components and labor associated with complex jobs and is invaluable in the early planning stages and for validating estimates.”

End-users attest to this value regularly. For example, Mike Wemhoff, a facilities officer in Nebraska’s coordinating commission for postsecondary education, says “Square foot costs data has been very helpful in validating institutional project costs that are requesting tax funds.” In these settings, a clear and bulletproof scope of work is essential. Yet for any project, the scope sets the tone for delivery: “Owners should leave no stone unturned and no question unasked,” says Gordian’s Duggan. “There is no such thing as too much data.”

## 5. Making it SMART

Effective scopes of work will also present a few characteristics of the best organizational management thinking. Dating back to the early 1980s work by management guru Peter Drucker and referenced in an influential article by George T. Doran in *Management Review* magazine, the SMART acronym describes everything an effective scope of work should contain: specific, measurable, achievable, relevant, and time-bound goals.

As mentioned above, specificity is critical to the SoW: Make it well-defined and unambiguous for the best outcomes. In addition, one should be able to measure the outcomes related to scope setting. According to the Ross Group, “Materials, budget and deadlines should all be clearly defined for each stage of the project.”

As for achievable – or “agreed-upon,” which the Ross Group prefers for the letter “a” in SMART – the scope of work can’t include ambiguous, unrealistic or poorly informed requirements. All parties to the project should be able to agree that the scope is credible and attainable in the normal course of project delivery. In this regard, “The objectives need to be sensible,” the Ross Group adds, given such constraints as the schedule, budget and prevailing regulatory domains. With that in mind, the SoW should lay out the time needed for each project phase, milestone and required trade.

With a SMART and well-developed scope of work, the stage is set for not only fiduciary management but also operational execution. The SoW helps prevent setbacks that can delay or hamstring a building project as it saves money and time. With detailed AE, Context, and Construction Process scopes, the SoW’s benefits “extend beyond the budget estimate and ripple throughout the life of the project,” according to *Facility Executive Magazine*.

This is especially important for very large projects, as detailed in an article by McKinsey & Co. The authors emphatically highlight the importance of clear scopes, accurate cost estimating, and completion of design and risk analysis *before* starting construction. “Doing so clearly improves project performance,” the article concludes, alluding to work by Edward Merrow, founder of the Independent Project Analysis consultancy, showing that “the best examples of project-definition work reduce both project timelines and costs by roughly 20 percent.”

One of the one of the greatest benefits of clear scopes is **minimizing overruns**, according to studies by data provider Gordian. Contractors can only create realistic budget estimates with clearly defined scopes. Detailed SoWs also ascertain critical milestones and benchmarks that create boundaries for cost impact and delivery schedule. While these are not always infallible or unassailable, the explicit targets create an environment for greater precision and professionalism. And construction experts agree that a poorly conceived SoW practically ensures project overruns.

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In the experience of building teams (and as documented by project management specialists), a complete and clear SoW tends to **reduce project communications**, including requests for information (RFIs) and change orders. In this way, the scope of work reduces the need for interpretation or supplemental directives – everything is laid out and explicit. The design team is working from a full understanding of the building’s conception, requirements and intended functionality. They and project field personnel generate less paperwork, fewer emails and less interruption of the mission-critical work and revenue-generating activities required.

Seasoned building teams have connected effective SoWs with improved project collaboration and even **better relationships**. For example, since RFIs and change orders often produce transactional or confrontational situations, a degradation of team cohesiveness and work fulfillment may result. A 2017 *SmartMarket Report* from Dodge Data & Analytics concluded that 75% percent of building owners and contractors had “experienced a dispute or claim in the last three years.” Seemingly in answer to this specific concern, nine of 10 respondents to the same survey cited “collaboration” as an essential means of limiting exposure to financial risk.

Positive relationships between project stakeholders are possible even when they face a lack of clarity or a raw disagreement related to a change order. Yet as the Dodge Data & Analytics study showed, the environment for negative perceptions and behaviors on a project vastly increases when the scope of work is incomplete or unclear. The better path -- a professional and precise SoW – clears the way for smooth job delivery and productive positive interactions between building owners, design teams, contractors, subcontractors and even behind-the-scenes players such as investors, insurers and AHJs.

There’s another interpersonal advantage of a well-written scope of work, say experts like Woolsey and Ross: An effective SoW communicates the ultimate objectives of the project and what each major system or element must accomplish. With this starting point, experienced leaders can make recommendations of better materials and methods. The SoW sets up early-phase collaboration in pre-planning, often laying out alternatives to meet the same goals faster or with less money – or both.

Also rooted in a good SoW is project quality. That means end-users and building occupants all become indirect beneficiaries of a clear and comprehensive scoping document. The scope of work sets the stage for excellence in delivery as well as the facilities that result.

## Estimating Well Demands a Clear Scope

With an accurate, clear and comprehensive scope of work (SoW), a building team can confidently put together a detailed estimate based on due diligence and full project sign-off. Unlike a ballpark estimate or a budget estimate, the SoW allows the building team to create a scope-of-work estimate, which stands as a definitive and authoritative method for fully and accurately estimating the total project cost.

According to Ben Aston of The Digital Project Manager, the definitive SoW estimate is only an option when the team has “completed all due diligence and requires project budget approval.”

Adds Steve Kuhn, president of Integrity Construction Services LLC, a management consulting firm specializing in preconstruction services and construction project management, “A detailed review of scope to determine that bidders have sufficiently covered their required scope of work in their bid is essential prior to contract award.” In this process, the building team can ensure that all bids provide “apples-to-apples” comparisons, “to ensure that an apparent low bidder will not seek to make up ground via change orders if awarded the work.”

The construction documents are impacted by scope development, adds Kuhn in his white paper on preconstruction services: “How the [preconstruction] manager communicates the scope of work to bidders has a significant impact upon what documents the design team will be expected to produce and when they will be needed.” Many CM firms create detailed SoWs for specific bid packages and receive sealed bids for each package, including a “general trades package which may include work from more than a dozen specification sections.”

Kuhn’s advice for building teams? “Provide clear scopes of work to all bidders either via written scopes of work or through scope check sheets that clearly define what is expected,” he recommends. “Creating a bid manual incorporating all requirements such as form of subcontract agreement, insurance requirements, safety requirements, general provisions, and instructions to bidders is a great way to simplify the review of bids received.”