



The Benefits of Roof Consulting Services in Architectural and Engineering Design

By Thomas M. Gernetzke, RRC, CDT

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Introduction

Since the 1970s energy crisis, the demand for energy efficiency has created a Pandora's box of cause and effect relationships between increasingly complex building systems. As high performance insulation, HVAC, fenestration, and other systems have been introduced, energy saving requirements have further collided with modern economics where “faster, better, cheaper” is the unassailable business culture mantra. As building technologies continue to evolve under these intense pressures, design teams are called upon to merge profitability with multifaceted building necessities in tidy, “green-washed” construction packages.

Modern building technologies impact all phases of construction. Now more than ever, the designer must be technically correct in predicting the interaction of building system components during pre-design and design phases. Architects and engineers must also understand the technical requirements, product end use, limitations, and the detail required for the specified systems in order to convey the correct intent to the construction team. Finally, construction techniques and methods must be understood and specified in order to achieve desired outcomes during construction administration and post-construction phases.

The rapidly proliferating complexity of buildings often necessitates the expansion of design teams. For example, medium to

large construction projects may involve multiple architectural firms, structural engineers, special process or application consultants, HVAC engineers, electrical and plumbing consultants, cost consultants, landscape architects, LEED® consultants, and others. Roof consultants, however, are not commonly involved. While many design teams have realized the usefulness of roof consultants on green roofing, waterproofing, or other specialized applications, roof consultants can provide valuable assistance on *every* project.

Roof consultants can assist architects and engineers by limiting liability, maintaining profitability, reducing team workload, providing specialized design and problem-solving capabilities, and increasing diversification of project types.

Roof Consultants Limit Liability

In today's litigious atmosphere, design liability is not requisite to being sued and the limitation of liability is an absolutely critical consideration. A roof consultant can be a key asset to architects and engineers in this important task through his or her knowledge of building life cycles, specification development, contractor selection, and quality control.

The single most important roof consultant characteristic is his or her unique perspective in the complex building life cycle. On a daily basis, roof consultants are involved with every facet of the building life cycle, from commissioning and pre-design



Photos 1 and 2. Remedial through-wall masonry flashing repairs are often expensive and disruptive to an owner's operations. Roof consultants routinely investigate and specify transitions between systems, such as roofing and masonry.



services, to design-development, to post construction, to demolition. By necessity, architects and engineers are often forced to concentrate primarily on the first of these life-cycle phases. But roof consultants analyze the effectiveness and performance of roofing systems across all life-cycle phases. Daily experience in maintaining, repairing, and replacing the spectrum of roofing systems available enables a roof consultant to provide unbiased recommendations regarding system performance and return on investment information. Perhaps more importantly, the roofing consultant's training and experience can serve to provide quality control during roofing design and construction phases to help protect the client and limit architect/engineer (A/E) liability.

In limiting liability, building code implications must also be considered. According to Richard Canon, PE, FRCI, RRC, building codes clearly delineate roofing systems as cladding.¹ Cladding is a structural component of the building system and therefore must be designed by a licensed structural engineer or registered architect. It can be argued that this delineation of roofing responsibility to the engineer (or architect) creates more long-term liability for the design professional. If the engineer specifies a roofing system with a specified warranty period, any deficiency or problem during that period could be construed as a design deficiency. By ensuring that the system will actually perform, a roof consultant can provide a measure of protection and confidence to the architect and engineer.

For common reference, the International Building Code (IBC)

is used as a basis. IBC refers to ASCE-7 which defines roofing as an "engineered component relative to: gravity loads, fire, drainage, energy, and wind uplift resistance."

While many engineers can calculate and design the requirements necessary to satisfy code, knowledge of code requirements may not be sufficient to avoid selection of components that lack compatibility or desired performance. A roof consultant has the unique experience and training required to determine systems and components that are both compatible and capable of delivering performance consistent with and appropriate for existing (or future) conditions, ease of maintenance, life expectancy, and qualification for warranty.

While not qualified to perform the structural analysis required for a roofing system, a roof consultant is qualified, from a comprehensive viewpoint, to predict roofing

A roof that meets code will not necessarily perform. IBC references many separate entities that control or provide direction in separate areas of concern, such as plumbing code for drainage, UL and FM Global for fire resistance, ASCE-7 and FM Global for wind uplift, ASCE-7 for gravity loads, and ASHRAE for energy requirements. As long as a system, or the components of a system, meet the requirements of these individual entities (FM Global, UL, etc.) and satisfy their concerns, the system earns their approval. However, while the IBC list of entities appears comprehensive, each has a narrow area of emphasis. A single controlling entity concerned with high performance, long-term, sustainable roofing has yet to be developed. Roofing consultants are uniquely qualified, by nature of their experience and training, to understand these complex system relationships.

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Photo 3. Roof consultants are extensively involved during the pre-design and design phases of a project. Here, an owner's representative is inspecting existing flashing details with a roof consultant.

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system performance.

Finally, in limiting exposure to liability, the role of roofing system manufacturers must be carefully considered. The position of the manufacturer is quite clear – the system manufacturer is not and will not act as a design professional. In addition, membrane warranties are frequently issued in conjunction with non-warranted conditions and materials, such as tie-ins, standing water conditions, and most edge metals. Vapor retarders, insulations, and other roofing components may not be covered. If you have not read a manufacturer’s specification or system warranty, do so. All specification and warranty documents limit the liability of the manufacturer, not the design professional. The expertise of a roof consultant can help correlate roofing system products with desired outcome, assisting architects and engineers by having a thorough knowledge of critical protection components.

Maintain Profitability and Reduce Workload

Most architects and engineers lack passion in designing roofing systems, especially low-slope systems that often serve no aesthetic purpose. Add a measure of complexity to a non-aesthetic system, and profitability, focus, and accuracy can become difficult to achieve. Outsourcing this aspect of the process to a roofing consultant can help to avoid unanticipated costs.

Delegating roofing design and related efforts to a roof consultant has other benefits as well. A roof consultant can take on many aspects of roofing-related design, thus reducing internal workload. If roofing-specific requirements have not been considered, a roof consultant will ask the right questions and provide appropriate recommendation. A roof consultant can also provide specifications and details developed through consistent, monitored use.

Additionally, a roof consultant can be valuable during bidding and construction

phases. Roof consultants can make bid recommendations and help select qualified contractors. Delegating approval of tedious roofing-related submittals during construction can further reduce A/E workload.

Provide Specialized Design and Problem-solving Capabilities

Air barriers, green roofing, and Energy Star® systems are relatively new to the industry. Their specification and use often require specialized design and can also introduce new problems, interactions, and consequences to building systems. The addition of a roof consultant to a design team can help to avoid such problems via pre-construction assessments and evaluations, peer review, construction observations, and post-construction problem solving. Discussion of the roof consultant’s specialized knowledge and problem-solving capabilities follows.

The number of buildings with improper air barriers indicates a lack of understanding of air barrier code. Perhaps more misunderstood are requirements to bridge all envelope systems for a complete air barrier system. Air barrier systems must be compatible and maintainable over the life expectancy of a building. Consider the following common detail: can an EPDM membrane be taped to a polyethylene air barrier? Absolutely. Will the adhesion between air barrier and EPDM last for the life expectancy of the building? Not likely. While wall systems are not as simple as a “roof turned vertical,” roof consultants are routinely involved in

building envelope systems, particularly the interaction between roofing and wall systems.

The United States Green Building Council’s (USGBC’s) LEED® construction program offers many new opportunities and imposes many new requirements for projects seeking LEED® certification. It is often assumed that a green roof or Energy Star®-rated roofing system is required on a project. However, if a lower certification level is desired, this may not be the case. A roof consultant can provide information to the LEED® professional to properly assess whether or not these systems are required to achieve certification. In addition to this assessment, the roof consultant can include cost-benefit, return on investment, or similar economic analyses for the project.

Green roofing systems require unique design considerations. Component proliferation is overwhelming. To many, a green roofing system is visualized as the finished appearance of an inviting garden or useable interactive pedestrian environment. To a roof consultant, a green roofing system is visualized as the membrane system performing for the long-term as the key characteristic with something aesthetically pleasing on top. Contrary to commonly held beliefs and some manufacturer literature, green roofs are not standard roofing systems buried under something supporting plant growth. Green roofing systems designed in this manner are doomed to premature failure. Membranes, drainage mats,



Photo 4. The roofing on this contemporary home has four different roof structures, each with different roofing and cladding systems. A roof consultant’s involvement may have increased efficiency for the design team during design and construction administration phases.



Photo 5. The ratchet straps on the barrel ends holding down the roofing are not clearly visible. Although an extreme case, the materials that are visible are FM- and UL-approved. Specification of approved materials is not necessarily a good assurance of performance.

insulations, overburdens, plant media, etc., all need to be carefully considered. All components must be compatible for the duration of the expected lifespan. Replacement considerations must also be carefully weighed. Replacement of green roofing systems (or overburden covered waterproofing systems) often exceeds \$40 per square foot.

Energy Star®-rated roofing is less complicated. However, questions do remain. Is the proposed system sustainable? Will it maintain the required performance levels over the lifespan of the system? Will the system need to be cleaned and maintained regularly? Most importantly (and unfortunately often overlooked), will it meet the owner's performance and lifespan requirements?

Diversify Project Types


Architects and engineers often find and are trapped by a niche building type. As with any endeavor, stepping out of a comfortable paradigm is difficult at best and damaging at worst. While the basic tenets of building design remain the same, the complexity and differences of a new building type often spell disaster in the details. If the challenge of a different building type is accepted, selection of design team members is critical. Additionally, unique construction types require unique roofing systems. Adding a roof consultant to the team can help diversify projects without having to invest in the specialized training of internal assets.

Exploring and researching any new building system is tedious and overwhelm-

ing. Inquiries are made to trusted vendors, contractors, and sales representatives. At times, Sweets® catalogs or other trade reference information is used, or the Internet is employed. While these sources can provide valuable information, they present varying degrees of bias. A roof consultant can provide unbiased recommendations regarding roofing system types and manufacturers. Additionally, a roofing consultant can provide valuable recommendations to integrate unfamiliar systems with other components.

Educating the owner can also be a difficult task for an architect or engineer. With a roof consultant on the design team, an architect can more confidently pursue intelligent, alternative roofing systems with an owner. A roof consultant can provide system performance, lifecycle cost analysis, and warranty information for the architect to present to the owner to facilitate the decision-making process.

Conclusion

Complex building relationships need not lead to the proverbial Pandora's box. These interactions, especially when related to the building envelope, are critical to building performance. Roof consultants utilize a unique perspective of the building lifecycle to provide assistance on every phase of a project, from pre-design to construction administration. While the design professional is best suited to determine who participates on the design team, a roofing consultant can prove to be a worthwhile investment. Call a roof consultant to find out how he or she can help with a specific project. 

Footnote

¹ Canon, Richard P., FRCI, RRC, PE, "Delineation of Roof Design Services," *Proceedings of the 20th International Convention of the Roof Consultants Institute*, March 31 – April 5, 2005, pp. 3–20.

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