

#### WHITE PAPER

# Considerations for Skid-Built Fabrication Pathways on Natural Gas Projects

## By Rebekah Lehr, PE

During the design and construction of pipeline facilities and equipment, companies can choose to stick-build or skid-build equipment. Skid-building equipment has the potential to save money by shortening construction duration and increasing the quality of the product being fabricated. The decision between stick-building or skidded fabrication for a specific project depends on multiple factors.



The U.S. depends on natural gas as one of its main sources for heating and electrical power generation. As the demand for natural gas increases, so does the need for additional gas infrastructure. This leads to a growing number of developing pipelines, compressor stations, meter and regulating stations, and other associated equipment and facilities.

When deciding to build a natural gas facility and equipment, companies can choose to prefabricate (skid-build in a fabrication shop) or stick-build (field-build on a construction site). Skid-built assemblies are prefabricated, self-contained systems that can include piping, valves, instrumentation, junction boxes (prewired), canopies or pre-engineered buildings, and metering or regulating equipment placed on a steel-framed skid. Skidded equipment for natural gas systems is commonly made for pig traps, metering skids, regulating skids and electrical/analyzer buildings. During the fabrication process, the equipment can undergo hydrostatic testing, X-ray testing, nondestructive testing, calibration, coating inspections, third-party inspections and factory acceptance testing (FAT). Once fully fabricated and tested, a skid is shipped to its location, placed on a foundation and connected to the piping system.

The main advantages to skid builds are improved schedule, expense management, help with sourcing materials, and increased quality during fabrication activities, such as welding in a controlled environment. While upfront fabrication can require an increase in upfront spending, the end product can shorten the construction timeline. In northern states where winter comes quickly and for long periods, snow and ice tend to limit the times of year when construction can be completed. Skid builds enable year-round construction and allow any site permitting processes to occur simultaneously with equipment fabrication. Additionally, on-site field welding labor can be pricier than fabrication shop labor. Once a company selects to prefabricate the assembly, success is highly dependent upon communication and clarity regarding project responsibility between the natural gas company and the fabricator. Based on many years of experience working within this industry from concept to in-the-field implementation, Burns & McDonnell can share honed planning practices, which prescribe the extent to which a company or its advocate should manage the scope of skid-build fabrication processes.

#### Variables Worth Considering

When designing a pipeline facility, one of the first big decisions is whether to stick- or skid-build systems. There are two essential questions that natural gas companies can ask themselves that help lead to the optimal solution. This white paper addresses each question in turn.

### 1. Does the project budget and/or schedule have constraints that would make it easier to procure skidded equipment?

Some projects schedules may have years before an in-service date. Other times, the schedule is tight and the in-service date is fast approaching.

When a construction window is short, skidded equipment can help meet the internal construction timelines. It is quicker to install a skid than to stick-build the corresponding system.

However, if the overall project schedule is short, a skid probably isn't the right solution. The company would already have an urgent need to source materials, then get them tested and shipped to the field, meaning there most likely wouldn't be time to hire a fabricator, review the drawings, ship materials to the fabricator, and give the fabricator time to build and test the equipment once all the materials come in. With a shorter schedule, there isn't much room for flexibility or delays on any company's end. In this scenario, it may be better to design a stick-built facility, because you can procure materials quickly and adjust plans as needed.

If the project has a longer timeline, a skid can be a great idea. More planning on the front end can shorten construction duration. Skids make stations more uniform and provide a better-quality product overall. Some companies use advanced project planning on a larger scale to cut overall project timelines and cost by standardizing fabricated assemblies and having skids ready to be shipped and installed as needed.

Project budget is another consideration, but skid-built assemblies can support an overall reduction in project cost by reducing costly field changes and reducing the overall construction duration. The industry has been leaning toward electrical/analyzer buildings that are prefabricated with all required equipment, including all mounted panels and junction boxes. This reduces the time needed to field-install all the equipment in an empty building.

# 2. Does the pipeline/equipment size, site size and/or project location provide clarity on whether skids or stick-built equipment would be preferable?

Details from a specific project will provide big indicators of which approach is preferable.

The size of the pipe is a good place to start. Much like Goldilocks' quest for "just right," there is a sweet spot for using skids. When the piping is relatively small, skids won't be as cost-effective as stick-building because it won't take long for a construction contractor to weld together something of this size. Time typically isn't an issue for small-bore, stick-built equipment since it is quick to weld up, test and install. If a skid wouldn't save money or time, it's not a great fit for this situation. However, putting the piping system into skids could become cost-effective if the system became complex. For example, if the small-bore piping system had several runs, considerable instrumentation, the addition of a building and required prewiring, one could argue a skid would be a good choice.

Strangely enough, when the pipe is guite large, it also doesn't make much sense to skid. Suppose you have four 24-inch flow control runs. the skids would need to be broken up into interlocking skids, because the skid lengths and widths depend on Department of Transportation-regulated truckloads. This starts to get quite expensive and harder to ship. It also squeezes the runs together to the minimum Occupational Safety and Health Administration (OSHA) requirements, whereas one might want another foot or two in between each set of runs or between a run and skid-mounted building wall. In this case, stick-building would save money and could provide a more ergonomic arrangement. Single- or dual-run skids could still be economical by minimizing the number of field welds on large-bore pipe, as such welds can be difficult and expensive compared to shop welds.

Another significant variable is the site size and condition. At a small site with a lot of equipment or crossing pipelines, stick-built may be the only way to fit everything on the site. Keep in mind, though, that sometimes on a small or crowded site, a skid may help fit more exactly into a tight area and keep it organized — especially if a skid-mounted building or canopy is desired. At a large site, this wouldn't matter as much, because stick-built and skidded equipment would both fit well.



Project location also merits consideration. Some project locations may be in a flood zone, experience high snowfall, have significant seismic activity or other natural concerns. These factors can weigh heavily on whether skid- or stick-built equipment would complement a site. For example, if a site has lots of flooding, pooling and mud, it may be a good idea to lift a skid off the ground, allowing an operator to maintain the equipment and prevent it from being submerged during flooding. This would be especially useful if the operator needed to operate the equipment during an emergency. It's always important to design around the area's site conditions.

### Conclusion

Companies want site design and equipment to accommodate the projects they are constructing. When building pipeline facilities, it is sensible to evaluate if a skid could add significant value to a project scope. There are many variables that can help indicate if skidded equipment would be right for a project and how it could add value in terms of cost, construction time, project planning or for operations. Local conditions and project-specific details ultimately should guide the selection.

#### About Burns & McDonnell



Burns & McDonnell is a family of companies bringing together an unmatched team of engineers, construction and craft professionals, architects, and more to design and build our critical infrastructure. With an integrated

construction and design mindset, we offer full-service capabilities. Founded in 1898 and working from dozens of offices globally, Burns & McDonnell is 100% employee-owned. For more information, visit **burnsmcd.com**.

