Skilled Labor Shortage Risk Mitigation
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# Skilled Labor Shortage Risk Mitigation

**WP–1101**  
January 2015

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List of Abbreviations

CLMA® Construction Labor Market Analyzer®
CII Construction Industry Institute (Resources)
CURT® Construction Users Roundtable®
CWDA Construction Workforce Development Assessment
FEE Front-end engineering
PLA Project labor agreement
PLF® Project Labor Forecaster®
RFID Radio frequency identification
T&M Time and materials

List of Organizations and Websites

CLMA® (www.myCLMA.com)
CII (www.construction-institute.org)
CURT® (www.curt.org)
CWDA (http://cwda.nccer.org)
Executive Summary

Skilled Labor Shortage Risk Mitigation

As the construction industry recovers from the recession, there is an increasing concern about severe labor shortages that could impact many projects. In past labor shortages, owners experienced significant cost increases and schedule delays.

To address this, the Construction Users Roundtable (CURT) initiated an effort to provide recommendations for owners and contractors to mitigate the risks of a labor shortage and minimize unexpected problems during execution. This document outlines risk mitigation opportunities based on the experiences of CURT owners and contractors.

The recommendations cover the following areas:

- Conduct a project risk assessment — Use the Construction Labor Market Analyzer® or other tools to analyze regional labor demand and availability and identify high risks. The earlier a problem is identified, the greater the range of available options.
- Change the project location or timing — For some owners it is possible to avoid local labor shortages by adjusting the project location or timing.
- Get the budget and schedule right — Labor shortages usually increase costs and delay startups. It is important that these factors be included in the project budget and schedule before commitments are finalized.
- Plan for a workforce shortage — To minimize the risks of a labor shortage, it is critical that the owner
get the right resources involved in the early front-end planning for the project.

- **Attract and recruit the best workers** — Owners need to optimize all of their opportunities to attract the best workers to their projects, including getting the right contractors with proven capability to staff projects.
- **Remove work from the project work site** — Typically a workforce shortage is limited to a specific region. By moving work to other areas using prefabrication, modularization and preassembly, it is possible to reduce the demand for local labor resources.
- **Leverage regional collaboration** — In many areas, owners and contractors effectively share information about their projects and collaborate on workforce development issues.
- **Alternate contracting strategies** — A labor shortage causes a high risk to a project’s successful completion. Contracting strategy is a means to share risks appropriately between owners and contractors, but it must be done carefully to achieve the best results.
- **Retain the best workers** — If the owner and contractor are successful in attracting skilled labor to their project, then it is essential to retain them through completion and not lose workers for small, incremental compensation differences. Providing a well-managed project with good working conditions is frequently successful in minimizing absenteeism and turnover issues.
- **Labor productivity** — Improving productivity can reduce the need for additional workers. By using proven tools for planning and executing the work,
contractors can optimize productivity on the site and reduce the risk of labor shortage problems.

In this white paper, each of these areas is further developed with specific recommendations, case studies of actual experience on projects and links to industry resources for further information. In total, the white paper is an excellent resource for owners and contractors to plan and execute their projects.
Introduction: The Problem

Several years after construction’s precipitous downturn, hopeful signs of a national recovery are being tempered by an equally ominous threat: Widespread labor shortages. According to Forbes and a host of other news outlets, a serious gap exists between the upcoming demand for labor and the number of available workers with the skills needed to fill those positions. After all, construction lost more jobs than any other sector during the Great Recession. It’s likely that many former workers, facing the loss of wages and benefits, have opted for new careers and won’t be coming back.

So, again, the construction industry faces a serious shortage of skilled workers. In some areas, projects are already competing for limited resources. There are multiple layers to the issue: Workers who left the industry during the recession, increased labor demands from new oil and gas projects, increased U.S. manufacturing construction, and baby boomer retirements. Given this complexity, the labor shortage can be expected to have an impact on all projects in all areas over the next few years.

In 2007, Construction Users Roundtable (CURT) owners experienced significant cost increases and longer schedules because of the workforce shortage. At that time, many of the issues were not expected and caused significant budget misses, startup delays and productivity challenges.

Today, the Construction Labor Market Analyzer® (CLMA®) is available to identify potential workforce issues for upcoming projects. There’s no reason to be surprised. The issue this white paper addresses is how to effectively plan and execute a project with certainty when you expect to have skilled workforce issues. The objective is for project outcomes to be predictable and under control.

Many CURT members are developing new approaches to their projects for mitigating risks and gaining control. This paper organizes and outlines CURT’s current thinking on the best ways owners can mitigate labor shortages, keep projects staffed and deliver projects on time in this new economic reality. The paper incorporates input from owners and contractors who have shared their approaches to this issue, what they have learned so far and what they are planning for the future. This identification of the risk mitigation options is a dynamic effort and will be followed by deeper dives into the issue.

Owners and contractors alike have learned that in a difficult labor shortage, collaboration is very important. It takes close communication and cooperative efforts to plan and execute most of the approaches recommended here for reducing risks and achieving successful projects. This includes effective early involvement by contractors for front-end planning and ongoing owner involvement as construction proceeds. Ongoing collaboration makes it possible to achieve the greatest benefit from these recommendations for risk mitigation.
2.0 Minimize the Impact

Owners expecting a significant labor shortage on a construction project have many options for minimizing the impact of the shortage on the project budget and schedule. The paragraphs that follow describe some of these methods.

2.1 Conduct a Project Risk Assessment

First, analyze the local labor market and identify potential skilled worker shortages that might impact the project. As mentioned, the CLMA® is a powerful, easy-to-use tool that produces actionable, dynamic skilled labor market intelligence for any area of the United States to improve the planning and risk management of projects. Other options include engaging a contractor or consultant to complete a labor survey.

If the analysis predicts a possible workforce shortage, the risks to be considered are:

1. **Cost risks:** The added cost in wages, benefits, incentive bonuses, overtime and lost productivity should be included in the project budget.

2. **Schedule risks:** If a shortage exists, work may take longer and/or completion dates may not be met.
3. **Safety risks:** Working with less-skilled workers and higher turnover means a higher risk of accidents.

4. **Other risks:** When the primary focus of a project team is staffing the project, other areas may get less attention. This imbalance compounds the risks to cost, schedule, safety and quality, as diligence in industry best practices and good management practices is reduced.

So, who should take the risk of labor shortages — owners or contractors? Is there a collaborative way for owners and contractors to strategically work together to make a win–win agreement? Since a labor shortage can cause significant cost increases and schedule delays, the contractor’s capability to reduce the risk should always be part of the contracting strategy, contractor selection and contract negotiation process. Owners cannot expect contractors to accept these risks without significant contingencies in their pricing. On the other hand, if owners accept the risk of labor shortages, then are they also accepting all the risk for productivity, quality and other normal project risk factors?

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**Other Resources on This Topic**

CURT documents:
- R-411, Construction Workforce: Building Comprehensive Labor Market Information
- UP-403, Managing the Construction Workforce
- WP-401, Confronting the Skilled Workforce Shortage
- WP-410, CURT–CWDC Joint Workforce Initiative

CII documents:
- RT-28, Construction Work Force
- RT-182, Addressing Shortages of Skilled Craft Workers in the U.S.
The best approach for each project must be compatible with the project objectives and the specific owner’s and contractor’s corporate approaches to contracting and procurement. So far, CURT has not identified a single best approach for all projects. Some owners have high tolerance for risk and are willing to include labor shortage risk and all risks in their contingencies. Other owners prefer the certainty of firm cost quotes from contractors and having contractors take the risk in their price. And, finally, some owners and contractors are trying innovative new approaches to identify and share risks for all parts of the project execution appropriately. This is an area of development with no clear recommended approach at this time.

2.2 Change Project Location or Timing

Many owners or contractors can change the location or timing of their project to minimize the impact of local labor shortages. For example, moving an installation to another company facility in another area is sometimes possible. Also, advancing or delaying the timing to avoid a short-term shortage can be effective, especially when the shortage is caused by a single large project that is nearing completion. In other words, not competing head-to-head with other projects may be the best approach.

2.3 Get the Budget and Schedule Right

When there is both a skilled labor shortage and competition between contractors and projects, project costs will increase and schedules can be delayed. During the 2007 peak, CURT owners experienced cost increases of at least 5% and many times over 20%.
These cost increases resulted from higher wages, per diems and bonuses, as well as extended overtime costs used to attract skilled labor to projects.

In addition, there can be a loss of productivity that leads to increased hours and higher costs. On the other hand, if alternative approaches are used in planning the project, the budget may also contain the cost of the alternates, including:

- Prefabrication or modularization
- Alternate contracting strategies used to provide additional labor sources
- On-site training

If contractors are not able to staff projects with skilled labor, then the work completion is delayed, milestones are mixed, and sometimes project completion is delayed.
Since meeting the project objectives is of primary importance, it is essential in a labor shortage that the project’s true expected costs and schedule be included in the direct cost estimates and/or the contingency allowances.

Estimates should include consideration of wages, benefits, bonuses and per diems required to attract labor, as well as the need for extended overtime. Secondary costs could also include reduced productivity, lower quality (more rework) and higher overhead costs resulting from additional recruiting of new workers, managing higher turnover and providing improved working conditions and on-site training.

**Other Resources on This Topic**

CURT documents:
- WP-1003, Optimizing the Construction Process
- WP-1004A, CURT’s Path Toward Lean Project Delivery
- WP-1202, Collaboration, Integrated Information and the Project Life Cycle in Building Design, Construction and Operation

CII documents:
- RT-39, Pre-Project Planning
- RT-113, Front End Planning
- RT-155, PDRI for General Building Planning
- RT-213, Support for Pre-Project Planning
- RT-221, Information Flow to Support Pre-Project Planning
- RT-242, Front End Planning for Renovation/Revamp Projects
- RT-268, Project Definition Rating Index Tool for Infrastructure Projects
- RT-241, Optimizing the Value of Construction in Front End Planning
- RT-3, Constructability
- RT-34, Constructability Implementation
- RT-191, Lean Principles in Construction
- RT-234, Implementation Road Map of Lean Construction at the Project Level
- RT-265, How Do We Use Industrial Engineering/Manufacturing Techniques for Enhancing Construction Project Performance?
- RT-111, Owner/Contractor Work Structure
- RT-204, Owners’ Role in Project Success
- RT-261, Optimizing Jobsite Organization
2.4 Plan for a Workforce Shortage

When an owner expects a significant workforce shortage, planning for the construction phase as early as possible is more important than ever. This approach provides more time for the owner and contractors to identify alternate approaches before construction starts.

Those who should be involved in project planning include:

▲ The owner
▲ The owner’s internal customer (when the project impacts operations or other projects at the location)
▲ Architect or engineering contractors
▲ Contractors and subs from all labor postures
▲ Equipment and material suppliers

Case Study: Major Utility

Energy projects require longer-range planning, and this major utility requires six to eight years to plan a “brownfield” project — longer if more extensive federal involvement is necessary. Even so, the company has experienced labor shortages at remote locations and relies extensively on traveling labor to address them, as these laborers tend to like working on power plants. The company takes advantage of the longer planning horizon of these projects to minimize the risks and impact.
Case Study: Independent Project Analysis

After analyzing its database of thousands of projects, Independent Project Analysis has identified that projects in hot labor markets with significant labor shortages experience reduced labor productivity for several reasons other than labor skills, including:

- **Aggressive Targets** — Projects executed in a hot market environment tend to have more schedule pressure from business, leading to incomplete scoping and aggressive schedule targets.

- **Inadequate Front-End Engineering** — FEE is often advanced on incomplete scope, leading to changes and delays in vendor data and, subsequently, engineering. In a hot market environment, the cost penalty for inadequate FEE is higher.

- **Inflexible Start of Construction** — Despite engineering delays, construction typically starts on time because scarce labor resources have been secured. The result is increased overlap of engineering and construction, which leads to less float, more missed engineering handoffs, and in some cases idle field labor.

- **Reduced Construction Management Capability** — When there are more projects, the construction management staff has less average experience, leading to lower quality planning and execution.

- **Permitting Delays** — When more projects are requesting permits, they take more time to process. Without including permits on the project’s critical path, permit delays cause project delays.

- **Late Deliveries** — With more projects in execution, many equipment or fabrication shops become overextended, causing more delays in the field. The backlog is compounded by changes to specifications driven by poor scope definition.

IPA recommends that owners with projects in hot labor markets focus on early scope closure, rigorous definition of that scope, setting reasonable schedule targets, and closely monitoring engineering progress to avoid putting in place the downward spiral to poor labor productivity.
2.5 Attract and Recruit the Best Workers

For an expected labor shortage, owners need to optimize every opportunity to get the best workers on their projects. The following are approaches that CURT owner members have identified as successful tools.

2.5.1 Select Contractors with Long-Term Workforce Strategies

Identifying contractors who have effective, long-term employment strategies that result in large core workforces more loyal to the contractor (and the contractor to the workers) means there will always be a base of skilled labor available for the project. These contractors also usually have supervisors who have significant skilled worker followings. The contractor’s ability to attract a core workforce is an important criterion in the contractor selection process.

In addition to a core workforce, most large projects probably also need additional skilled workers from the local area, or even traveling workers from other areas. In qualifying and selecting contractors, focus on their procedures for recruiting additional workers to your project.

Resources on This Topic

CII documents:
- RT-135, Attract/Maintain Skilled Work Force
- RT-200, Attract, Recruit, and Retain Construction Leaders
- RT-281, Project Management Skills of the Future

Other Resources on This Topic

CURT documents:
- T-404, Construction Labor: Craft Employee Training Evaluation Tool
- UP 801, Construction Safety: Contractor and Craft Worker Prequalification
Also, in a typical “best value” contractor selection process, including the contractor's process and results in staffing projects should be a high priority in the evaluation. Along with cost, schedule, quality and safety, “ability to staff” is an important element in prequalification and selection when a workforce shortage exists. Ensure that the contractors can demonstrate a disciplined commitment to forecasting, sourcing, recruiting, hiring and retaining craft labor. In addition, corporate-sponsored, ongoing training for professional, supervisory and craft skill development should be required. The Construction Workforce Development Assessment (CWDA) is a comprehensive tool for evaluating contractors in this area.
Recruiting Emerging Generation Youth to the Construction Industry

To develop the future construction workforce, it is essential that the industry recruit more young workers. Using older approaches may no longer be effective. Listed below are some recommendations on the emerging generation and recruitment strategies for bringing youth into the skilled trades.

1. Training is highly valued. Let new hires know they will have “value added” or transferable skills if they go into the construction industry.

2. Social media: How do you get the information to them? Social media (e.g., Facebook, Twitter, YouTube or all three) must be deployed to attract their attention. For example, one effective social media strategy might be a YouTube video for each craft showing:
   a. The work that is accomplished by the craft
   b. The current and future demand for the craft
   c. A message targeted to parents about the opportunities for a successful career

3. Explain the working conditions: Show them the facilities, tents, trailers and other surroundings.

4. Demonstrate management in action: How the site managers reach out to the craft workers.

5. Typically, engineering occurs in a silo: Getting engineers into the field and interacting with the craft workers makes a large difference in project planning.

6. Recognition goes a long way: For example, crews of the week, shaking of hands, good camaraderie.

7. Owners should consider requiring contractors to have effective programs for including younger workers in their projects, including apprenticeships and training.

8. Contractors can develop partnerships with workforce investment boards and veterans groups, which provides a fast track for young workers to become craft helpers and learn about opportunities before deciding which trade they want to work in.

9. Early partnership between owner and contractors would improve recruitment, as contractors will know in advance to prepare for the specific project requirements and to develop their recruiting strategy.
2.5.2 Alternate Labor Postures

All owners want to secure the best-trained labor force for the most reasonable cost. To accomplish this, many owners and contractors employ a mix of organized (union) and open-shop (non-union) labor on their projects to optimize the availability of skilled labor.

To reduce the risk of unexpected wage escalation, some owners and contractors effectively use multi-year project labor agreements (PLAs) with organized labor. For open-shop contractors, some owners have negotiated to create an equally shared contingency for increased wages throughout the project.

When there is high demand for a limited supply of labor, both organized and open-shop, labor forces can be expected to become more aggressive with demands for higher costs, overtime, and other worker-related expenses. This is a risk to the project regardless of labor posture.
In areas with prolonged workforce shortages, it is more likely that owners will be pursuing longer-term relationships with contractors that have proven capability to staff projects in the area. With longer-term relationships, contractors can be involved earlier in the project life cycle and, with the owner, can develop the project plans to mitigate the risk of labor shortages.

**Case Study: Major Manufacturing Company**

In building its 45 plants across the United States, this company has typically put together the best possible work force without regard to labor posture. They consider local conditions to be a more critical consideration. They have preferred to staff based on the availability of skilled workers, and before the CLMA® was available, they hired a consultant to determine the availability of organized and open-shop labor as well as any maintenance agreements. When they first introduced merit-shop labor to a site, the company conducted extensive contingency planning to mitigate any potential problems, but over time the need for contingency planning has been reduced. The experience is that both union and merit-shop contractors have been very competitive over many years.

**2.5.3 Foster Long-Term Contractor Relationships**

In areas with prolonged workforce shortages, it is more likely that owners will be pursuing longer-term relationships with contractors that have proven capability to staff projects in the area. With longer-term relationships, contractors can be involved earlier in the project life cycle and, with the owner, can develop the project plans to mitigate the risk of labor shortages.

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**Other Resources on This Topic**

CII documents:
- RT-17, Partnering
- RT-102, Partnering II
- RT-24, Contracting Phase II

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**Case Study: Major Petroleum Company**

This company implements some 1,400 projects annually, with another 1,500 to 1,700 in their 1–2 year portfolio. They succeed by beginning the planning for core contractor projects up to a year in advance and considering projects by contractor and region. This works now because of everyone’s shared experience working on projects together for many years. Longer-range planning also helps the owner help its contractors level their workload in the long term.
2.5.4 Consider Alternate Approaches to Recruiting Labor

When skilled labor is limited, additional effort is required to recruit skilled labor to the project beyond those long-term workers that the contractor brings to the project. These additional efforts include using the contractor’s in-house systems for recruiting both local and regional workers to the project. Part of this effort may include attracting more “travelers,” or workers from other regions, to the project. Also, some contractors use construction skilled labor suppliers to provide specific skills required.

Case Study: Incorporating Traveling Workers Into a Project Strategy

Even with crew sizes between 100 and 150, one owner often finds it hard to staff projects with local labor only. To cover the gaps, they turn to “travelers” to staff their projects. While requiring additional costs, the need for these non-local workers, identified early enough and budgeted accordingly, can be used to mitigate the labor shortage.

2.5.5 Provide On-Site Skills Training

One method for providing the skills required for a specific project is to provide additional on-site training for workers at the project. The additional cost of training is a project cost, but would reduce the other costs and

Other Resources on This Topic

CII documents:

- RT-14, Education and Training
- RT-231, Construction Industry Craft Training
- RT-137, Multi-skilled Craft Capabilities
- RT-157, Technology-Assisted Learning
- RT-201, Achieving Learning Organizations in the EPC Industry
- RT-292, Knowledge Transfer from the Near-Retirement Generation to the Next Generation
risks of recruiting additional skilled workers to the work site. On-site, project-specific training is in addition to other corporate-sponsored training for skills and professional development that owners and contractors may provide on an ongoing basis. On-site training is usually focused on specific task training or skills development to meet specific needs identified for the project. These on-site training initiatives should include the following attributes identified by industry experts at a recent CURT workshop:

▲ **Prioritize supervisory training.** To be effective, supervisors should be trained to implement the on-site skills training program.

▲ **Create accountability and responsibility for worker productivity with the site supervision.** When supervisors are accountable for the results, they can manage the priorities of training and work assignments to optimize the results without conflict.

▲ **Create a key talent program** to recognize and develop potential in younger workers and keep them engaged.

▲ **Compare needed skills with existing skills** and identify needed training from the results.

▲ **Provide training on reading engineering drawings and on basic math skills** (these are sometimes observed as areas of weakness).

▲ **Provide task-specific, on-site training:** for example, how to bend conduit or make terminations; ultimately, this helps unskilled workers move into the ranks of the skilled.

▲ **Provide full apprentice training and possibly full recognized skill certification** as an option,
frequently scheduled for after hours. Give a company-wide recognition of completion and/or recognition by the training organization or contractor organization.

▲ **Develop and offer stepwise apprenticeships** that would provide, for example, a path from apprentice to journeyman.

▲ **Provide cross-training** to workers who want to acquire new skills; identify workers with dated skills as being good candidates for cross-training and offer it to them.

▲ **Provide classroom training** where possible, including evaluation.

▲ **Leverage technology in learning:** Use e-learning, gaming, simulations, and other new technologies where possible.

▲ **Develop a structure to pay for training.**

▲ **Help provide transportation options:** Offer assistance with carpools, daycare or other ongoing needs which would allow for employees to stay after work to train.

### 2.5.6 Alternate Work Schedules

Owners and contractors should consider alternate schedule approaches which balance labor peaks or attract additional skilled workers to the project.
Shiftwork

The work schedule for a project (e.g., five eight-hour days, four 10-hour days, five 10-hour days, shifts, overtime, etc.) usually impacts the likelihood of attracting additional skilled labor for the project. The owner, construction manager (CM)/general contractor (GC), and subcontractors should collaborate on the best approach to the specific project.

Overtime

In many cases, additional extended overtime is needed to attract skilled labor to a remote site or when there are competing projects in the area, even when the project schedule does not require overtime to achieve the project objectives. Many studies have indicated that the use of extended overtime can reduce productivity and increase costs, and should therefore be considered as a last resort. Review the CURT White Paper (R-402A) on this subject for more information.

Extending the Project Duration

Extending the schedule (when compatible with the owner’s objectives) will require a smaller peak workforce, which reduces the need for recruiting and training and the risk of exceeding local supply. Longer-term projects also help retain workers by allowing more job security and developing longer relationships with the project, the contractor and other workers. In many cases, it could also mean having more local workers and fewer travelers.
Adjusting the Sequence of Work to Balance the Workforce Peak
Consider “out-of-normal-sequence work” to lessen impact of labor shortage or risks — this could lower craft peaks and lessen risk. This approach may cost more in the short term, but it may also result in lower craft peaks and savings in total labor costs.

2.6 Remove Work from the Project Work Site
If there is an expected local or regional labor shortage that will impact on a specific project work site, often it is possible to minimize the field work required at that work site by moving some of the work hours to other locations.

2.6.1 Constructability and Value Engineering
Bringing construction expertise into the front-end planning and design process usually identifies opportunities to reduce the labor hours required to complete the projects. Also, value engineering techniques can be used to identify opportunities to use alternate approaches, which can reduce the need for critical skilled craft labor.

2.6.2 Alternate Materials Selection
Many times identified in constructability and value engineering studies, but worth looking at closely, is the selection of materials and specifications for the project; for example, precast concrete vs. formed and poured in...
the field and/or masonry. Also, there are many new technologies for connecting materials, pipes, and so forth that may not be considered on a project, but which may be justified with the added labor cost during a workforce shortage.

2.6.3 Prefabrication and Modularization

Prefabrication and modularization have been used effectively for many years to build units in areas of high labor availability or lower cost and to ship completed units to remote areas with labor restrictions. In this case, the local labor shortage may make prefabrication and modularization an attractive alternate that may not have been pursued under normal labor conditions.

Prefabrication and modularization may not always be the right solution for a project. They require significant lead time and often mean intense logistics planning to move a modular unit into place.

Modularization requires additional time in early phases of a project. The cost of these additional planning needs must be balanced against the cost savings realized in an off-site, controlled labor environment and the potential higher cost of attracting workers to the project site. A realistic cost–benefit analysis should always be completed before pursuing prefabrication and modularization.

The prefabrication and modularization site should be viewed the same as any another construction site.

Other Resources on This Topic

CII documents:
- RT-171, Modularization and Offsite Assembly
- RT-29, Modularization
- RT-283, Modularization
- RT-232, Examination of the Shipbuilding Industry
- RT-255, Adaptation of Shipbuilding Production Systems to Construction
It has all the same controls and management that are required on the more typical construction site.

Early contractor involvement with the modular fabricator is important. Frequently, this requires earlier contractor selection.

Managing change is essential on projects with significant modularization or prefabrication. With final design, modular fabrication and on-site construction in progress, all critical interfaces must be managed to avoid major issues for final installation.

Module fabricators, prefabrication suppliers and construction contractors should be selected carefully for their skills and experience working with projects with significant off-site work. There are specific skills required for successful projects, and these should be considered in prequalification and selection.

The following are additional suggestions for effective modularization and prefabrication:

▲ Design components so they can be lifted and erected efficiently.

▲ Design cable installation and general electric distribution in the 3D model.

▲ Involve travel and logistics specialists to ensure the best shipping method and timing.

▲ Be aware of potential high risks included in shipping and handling of large modules.

▲ Schedule shipping and handling to avoid bad weather.

▲ For cost savings, look at opportunities of reducing the size of the facility, reducing the length of pipe and cabling and overall module size.
2.6.4 Vendor or Off-Site Assembly

Many times, process components and materials are shipped to the work site unassembled and requiring additional field work for final assembly before installation. In a labor shortage, it may work better for the supplier and/or an off-site, pre-assembly locale to complete as much of the assembly as possible to minimize the on-site effort required.

Case Study: Alaska Pipeline Work

In Alaska, work shortages are not necessarily a driving force in project planning, but modularization and prefabrication still play a role. One petroleum company implemented a means of developing work packages that satisfy regulatory requirements. Prefabrication off-site is a big part of their approach in that it also shifts some of the safety and environmental requirements away from the main site.

Case Study: Major Global Contractor

This company has taken a global approach to sourcing work and materials. They shared these experiences:

- Modular assembly in Canada is attractive because of lower cost.
- The U.K. is a high-regulation environment with significant worker shortages, so modularization and prefabrication are advantageous approaches to projects there.
- The company built modules in Abu Dhabi to install in Saudi Arabia — ostensibly to address a timing concern, but as it turned out, a labor shortage existed in Saudi Arabia that would have made assembly there problematic.
- Where the approach has been unsuccessful, it’s been because project leaders did not completely understand it.
When considering modularization, owners and contractors should think about:

▲ Storage issues — Plan for how the items need to be stored and positioned while in transit and staging.

▲ Transportation issues — Plan for permitting, cost and issues related to crossing oceans.

▲ Early planning — Modularization tends not to work when introduced mid-project; its advantages are best realized when it is planned for early in the project.

2.7 Leverage Regional Collaboration

Regional collaboration exists when owners or contractors get together to plan for regional workforce shortages, including sharing data on current projects, coordinating schedules to avoid workforce peaks and collaborating on regional workforce development initiatives. It has been most often seen in regions where high-dollar, long-range projects are taking place or where natural disasters (hurricanes, etc.) have created an increased need for skilled labor. Regional collaboration may include local user councils, contractor associations, and/or one-on-one owner or contractor collaborations.
Case Study: Gulf Coast Hurricanes

After hurricanes Katrina, Rita and Wilma lashed the U.S. Gulf Coast, owners found it difficult to get their arms around the enormous workforce demand that resulted. To tackle the problem, owners collaborated via discussion, listening to the organized and open-shop labor markets from the Florida Panhandle to Louisiana. The resulting group put together the nation’s first workforce disaster plan and continues to work productively together.

Case Study: Major Chemical Industry Owner

This company found success in making itself more visible and getting contractors on board even though the need was not yet fully understood. Transparency greatly improved contractor relations.
2.8 Alternate Contracting Strategies

A labor shortage causes a high risk to a project’s successful completion. Contracting strategy is a means to share the risks appropriately between owners and contractors, but it must be done very carefully to achieve the best results.

Other Resources on This Topic

CURT documents:
- UP-1001, Construction Strategy: Selecting Contracting Strategies
- UP-1002, Construction Strategy: Selecting the Right Contractor
- UP-601, Construction Purchasing: Capital Purchasing and Contracting
- UP-801, Construction Safety: Contractor and Craft Worker Prequalification

CII documents:
- RT-21, Project Team Risk/Reward Allocation
- RT-114, Contractor Compensation
- RT-165, Project Delivery and Contract Strategy
- RT-210, Contracting to Appropriately Allocate Risk

2.8.1 Lump-Sum vs. Time and Materials Approaches

When a labor shortage exists, there is additional risk involved in completing the project. If that risk is shifted to a contractor in a lump-sum contract, the contractor will evaluate the risk and include the appropriate allowances in their estimate or contingency to mitigate that risk. In a competitive bid approach for lump-sum contracts, all the contractors will include these allowances in their bid. When the contract is awarded, the owner is committed to the higher cost even if the actual cost is less than estimated. In some
cases of high risk, owners have used reimbursable time and materials (T&M) contracts and have absorbed the risk with appropriate allowances in their own budget and contingency. In the event the labor increases were less than expected, the owner realizes the savings. This issue is one of many that can have an impact on contract approaches and should be considered in a full evaluation of all of the costs and benefits of alternate approaches.

In most cases, reimbursable T&M contracting approaches require more owner involvement during construction execution than traditional fixed-price contracts. This should be considered in the final evaluation and decision.

### 2.8.2 Additional Subcontracting

Most successful subcontractors have significant core long-term workforces whom they expect to use on all of their projects. In a workforce shortage, it is an advantage to have more core skilled workers who are loyal to the contractors and are easier to get on a project and less likely to leave for higher wages.

To take advantage of subcontractor skilled core workforces, it may be necessary to subcontract more work that the general contractor was expecting to self-perform and/or to include more subcontractors in the project than normally expected. For example, breaking the project into smaller areas, it may be possible to use two or more subcontractors with their core workforce in each area. This may be an advantage over having a general contractor or single subcontractor trying to attract additional workers to the project from the general industry.
Case Study: Owner

This company prefers to do mostly fixed-price contracting, so around 2007 it began to issue reimbursable contracts, at times fixing the reimbursement with fixed overhead. They have found when fixing the rate and getting the price right from the contractor, they can then rebalance overages against savings. They caution that the owner must be cognizant of all subcontractors’ contracting activity as well, and that their contracting methods are also fixed price.

Case Study: Major Utility

Most of this company’s projects are large T&M efforts; they do have one fixed-price contract active. This company would also prefer to do more fixed-price work, but they find that getting that lump sum right is difficult due to the size and complexity of the work.

Recently they have brokered a labor arrangement, but the company is frustrated they cannot be more involved.

They also keep a close eye on subcontracting strategies. Some aspects of arrangements that subcontractors make with third-tier providers must match those developed for the prime contract.

Prequalification and selection are other areas this company watches closely. They describe their prequalification processes as rigorous. They find that in hopes of prequalifying, more subcontractors are emphasizing their HR and maintenance capabilities as well as the more traditional factors like safety record, references and quality reputation.

Case Study: Shortages Appear In the Support Trades

A major general contractor on industrial projects reports shortages of painters, insulators and other support trade professionals. A successful approach for them has been to subdivide work packages so as to bring in more contracting companies as well as more supervisor-level staffers. This company has also looked closely at compensation packages to ensure that wages and per diem amounts are competitive.

Case Study: Major Engineering/Construction Contractor

This company largely uses regional factors when considering the decision about contracting type. For example, their work on the new large project in New York City is T&M, but outside New York City, they prefer to pursue fixed-price. They have a rigorous prequalification process.
2.8.3 Longer-Term Relationships and Preferred Suppliers

Establishing longer-term relationships among owners, contractors and subcontractors can be an effective approach to having more established workforces of craft labor and professional staff (project managers, supervisors, etc.) available for projects. Joint planning of current and upcoming projects allows for collaboration on moving key resources between projects and minimizes loss to other projects.

2.8.4 Prequalification

All owners should be evaluating contractors and subcontractors on their company commitment and involvement in workforce development. The CWDA tool is recommended.

2.8.5 Communications with Contractors

In a workforce shortage, it is important that there be open and complete communication between the owner and contractor on all issues that could affect workforce staffing and changes. If owners know about potential major changes, including significant scope additions or reductions, the contractor should be aware of these changes so they can plan their recruiting and staffing.
2.9 Retain the Best Workers

After the best workers are on your projects, it is essential to focus on retaining them with minimal absenteeism and turnover.

2.9.1 Well-Planned and Executed Projects

Skilled workers want to work on well-managed, clean, safe projects. They work for contractors who have a good reputation for planning the work thoroughly and executing projects with a minimum of surprises, disruptions and changes. Owners and contractors who collaborate on effective front-end planning and who ensure effective execution of the planned work will attract and retain the better-skilled workers, even when other projects are offering higher wages or benefits.

Many owners and contractors believe that effective planning and execution can be as effective as higher wages in retaining workers. Good workers prefer good projects and will not leave for small wage increments.

Better planning also improves productivity and safety and results in lower absenteeism and turnover rates.

To be effective, all planning efforts should be effectively communicated through the workforce. Having first-line supervisors involved in look-ahead scheduling and sharing information with their crews improves overall efficiency and morale on projects.
2.9.2 Good Working Conditions on Site

Good working conditions on the work site are also important to retaining skilled workers. Good housekeeping; ready access to quality tools and equipment; efficient materials management; good conditions for working, lunch, restrooms, and so forth, individually and collectively, make a significant difference. Good working conditions are as effective as higher wages in reducing turnover and retaining the

Other Resources on This Topic

CURT documents:
- R-807, Construction Owners' Safety Blueprint Training Module
- TM-809, Construction Owners' Safety Blueprint Training Module
- UP-801, Construction Safety: Contractor and Craft Worker Prequalification
- UP-802, Construction Safety: The Owner's Role
- UP-803, Construction Safety: Pre-bid and Bid Clarification Meetings
- UP-804, Construction Safety: Contract Terms and Conditions
- UP-805, Construction Safety: Monitoring Performance
- UP-806, Construction Safety: Improving Safety Programs

CII documents:
- RT-13, Safety
- RT-32, Zero Accidents
- RT-160, Making Zero Accidents a Reality
- RT-190, Owners' Role in Construction Safety
- RT-216, Target Safety: Programs Focused on Preventing Specific Injuries
- RT-284, Leading Indicators for Safety
- RT-293, Strategies for HSE Hazard Recognition
- RT-101, Design for Safety
- RT-269, Real-time Pro-Active Safety in Construction
- RT-256, Project Site Leadership Role in Improving Construction Safety

best workers on your projects. On-site logistics should minimize inconvenient travel times for breaks, lunches, restrooms and parking areas. Tool and material management programs should provide effective support for the work teams with the right tools and
materials, in good condition and convenient to the workplace.

2.9.3 Safety

Skilled workers also expect to work safely. Effective programs to eliminate all unsafe conditions and to provide a clean, safe, accident-free environment are a major factor in retaining skilled workers. Specific recommendations for an effective safety program are included in the CURT Owner Safety Blueprint, which includes a comprehensive program for eliminating accidents on construction projects for owners and contractors.

It should be noted that on some public projects, owners are restricted in their ability to contribute to some of these recommendations for retaining workers (i.e., contractor planning, work conditions, etc.), but there are no restrictions that limit public agencies from requiring and enforcing safety on a project. For this reason, most public agencies make safety a primary focus on their projects.

2.9.4 Effective Supervision and Industrial Relations

The first line of contact with skilled workers is the contractors’ leaders, supervisors and superintendents. Supervisors must be well trained in effective industrial relations management and must provide appropriate communication and leadership for the crews. In the construction industry, a long-term relationship frequently exists between supervisors and skilled
workers, and developing these relationships will help in attracting and retaining workers on your project.

2.9.5 Worker Involvement and Incentive Plans

Some owners and contractors have implemented programs of enhanced worker involvement and/or incentive programs to build a stronger relationship with the skilled workers so that they are more likely to stay with a project. Owners should collaborate with the CM/GCs and subcontractors to identify opportunities for specific projects.

2.9.6 Absenteeism and Turnover Tracking

Since retaining skilled workers is critical, owners and contractors should be implementing proven procedures to measure and track absenteeism and turnover. Managing the results and developing corrective actions to retain workers are important management functions.

2.9.7 Personal Quality of Life

Treat all workers with respect. Simple greetings and regular one-on-one communications from project supervisors demonstrate your commitment and encourage workers to stay with the project.
2.9.8 Work–Life Balance

All workers need time off and time with their families and friends. Planning the project schedule to avoid excessive overtime and burnout and allowing for appropriate time in evenings and weekends will reduce turnover and absenteeism.

2.9.9 Clear, Consistent Work Rules

A consistent set of work rules for the project, including rules for applying per diems, overtime and other incentives, is essential to project morale and retaining workers. Clear communication and consistent, fair application are required.

2.9.10 Recognition and Celebrations

Regular recognition of significant milestones for schedule, safety, and other measures demonstrates the owners’ and contractors’ recognition for the effort and commitment required. Some projects have also used competition between crews or crafts to achieve important milestones.

2.9.11 Open Communications Between Management and Craft Labor

Scheduled group lunches with management, surveys of the craft labor force to identify key issues, soliciting specific feedback for work improvements, involving craft workers in work planning, and other active programs to increase two-way communications are effective means to establish more connection and loyalty.

An additional approach is to increase cultural effort to establish a longer-term joint relationship with craft workers, including more family-oriented events (picnics,
parties, site tours, etc.), more communications with families through newsletters, etc., and more joint management/labor events.

2.9.12 Mentoring Program

Pairing less experienced workers with journeymen or supervisors develops internal relationships that encourage workers to stay with a project. Contractors could use this approach across projects to maintain loyalty. To be effective, the program needs to be monitored and managed with appropriate feedback and adjustments.

2.9.13 Highly Skilled Task Force

Recognize the best workers with assignments to a special task force of highly skilled workers who are assigned to the more challenging and difficult tasks and are personally recognized for their specific skills in other ways.

2.9.14 Composite Crews

Some repetitive work can be performed more efficiently by using a composite crew including multiple trades that can execute similar tasks on multiple projects. This approach optimizes the skills required and the long-term benefits of repetition and learning curves.

Case Study: Composite Workforce

From a maintenance/turnaround/outage capacity, a major utility created “work packages” for specific types of projects; this increased the overall productivity of the crew throughout the turnaround season. The composite crew traveled from plant to plant, performing the same functions in each plant. This crew increased productivity by 10 to 15% by the end of the season and decreased their turnover rate dramatically. This resulted in fewer skilled workers required to perform the same task than by using a traditional approach.
2.10 Labor Productivity

All effective owners and contractors focus on increasing labor productivity on all projects, but when there is a labor shortage, improving productivity becomes essential. Since labor costs will be increased, higher productivity will allow completing the project with fewer hours and reduced need for as many skilled crafts. Also, skilled workers will stay on projects which are well managed and highly productive.

Other Resources on This Topic

CURT documents:
- R-402A, Extended Overtime on Construction Projects
- UP-101, Construction Measures: Key Performance Indicators
- UP-408, Improving Productivity on Union Projects

CII documents:
- RT-2, Productivity Measurements
- RT-33, Overtime
- RT-143, Craft Productivity Improvement
- RT-215, Workforce View of Construction Productivity
- RT-252, Craft Productivity Research Program

2.10.1 Work Planning

Work planning consists of front-end planning of the total project, effective pre-construction and mobilization planning, and workface planning. Planning is always the key part of a highly productive project. Supervisors who understand the importance of planning and who provide crews with all of the right engineering,

Other Resources on This Topic

CII documents:
- RT-272, Enhanced Work Packaging: Design through WorkFace Execution
materials and tools will be most productive and will also retain the best workers.

2.10.2 Productivity Measures and Tracking

Using proven tools for measuring on-site labor productivity (work sampling, earned value and others) is essential for management to ensure that labor productivity is being maintained and also to identify problem areas that need correction.

2.10.3 Materials Management

One of the most significant areas of productivity loss on many projects is the wasted effort required for materials management. When this is not done effectively, materials are frequently moved, damaged, stolen or lost. There is wasted effort in working around, finding, cleaning, repairing and replacing materials that were not stored adequately. Long distances between storage and workplaces require lost time.

However, material delivery, receipt, storage and on-site handling can be streamlined to eliminate waste and minimize ineffective work.
2.10.4 **Tools and Equipment Management**

All construction requires tools and equipment. Contractors that have effective systems for providing the right tools, in the right location, and in the right condition will be more productive and will also be able to retain more skilled workers on their projects.

2.10.5 **Handoffs to Construction**

Construction is dependent on many handoffs, such as engineering packages from design, materials from suppliers, process equipment from vendors, and others. To be productive, these handoffs need to be well managed and seamless. In addition, good communication systems that reliably report on the status of all required components are essential for the high productivity of field work crews.

2.10.6 **Change Management**

Late changes during construction are a significant waste of construction labor. Changes can cause delays in installation and rework in the field. Besides requiring additional labor hours, frequent late changes will affect project morale and cause skilled workers to leave the project.
for better-managed work. Owners and contractors must implement proven methods for high-quality front-end engineering decisions and for effective change management during the project to ensure that changes are not putting additional strain on a limited skilled workforce.

2.10.7 Technology

Current proven technology can be effectively applied to improving labor productivity. For example, radio frequency identification (RFID) for materials management and on-site logistics and using handheld devices for engineering and productivity tracking have been used effectively on many projects.

2.10.8 Lean Project Delivery

Many owners and contractors have adopted approaches developed in the manufacturing industry to reduce waste in the construction process. Recently, many specific lean approaches have been developed specifically for the construction industry.

Other Resources on This Topic

CURT documents:

- WP-1004A, CURT’s Path Toward LEAN Project Delivery
Appendix 1:
Other Innovative Approaches to Skilled Labor Risk Mitigation

Skilled labor work shortages are high risk with many uncertainties. Sometimes our best approaches and/or proven techniques are not adequate to reduce our risk and execute a project successfully. We recommend that all owners and contractors approach these projects with an open mind and search out new and innovative approaches that might be more effective for your project. At a 2014 CURT workshop, the owners and contractors in attendance brainstormed new ideas for managing labor risk (listed below). While these ideas remain untested, we believe they represent a good example of the kind of ideas all owners and contractors should be considering.

▲ **Credentialing** of workers or leaders can help to improve quality and mitigate loss. Often a credentialed person proves immediately that he or she can do the work, which improves the morale of other workers. Credentialed workers can be the leaders in a buddy system which ultimately will help the project achieve and maintain quality.

▲ **Hiring more loyal workers** will help ensure the stability of the workforce; however, there may be significant challenges to this approach.

▲ **Owners should develop a more complete understanding of the construction labor market.** Workers tend to move in groups,
which have the potential to enhance stability; however, the opposite effect could also occur.

▲ Understand macroeconomics of the region to facilitate better planning. Besides worker availability and movement, this may also include looking at the availability of materials and commodities, along with better metrics on worker aging and expected attrition.

▲ Can unions be compelled/encouraged to provide data about availability and demographics of their membership?

Resources on This Topic
CII documents:
- RT-271, Innovative Project Delivery Processes — Is There a Better Way?

▲ Make the many underused training facilities in the U.S. available to multiple trades.

▲ Look to other countries for labor. The government will, for example, provide visas for qualified pipefitters.

▲ “Team hiring” – finding groups of workers and offering salary/incentive packages accordingly.

▲ Develop and provide a “project boot camp” – training before the project begins to level-set expectations and skills insofar as possible.
Appendix 2:
The Construction Labor Market Analyzer®

The Construction Labor Market Analyzer® (CLMA®) is an online labor market intelligence tool designed to help owners, contractors, unions and other industry stakeholders dynamically understand the skilled labor market in a collaborative environment and more effectively know how to employ risk mitigation strategies. The CLMA® employs a proprietary tool called the Project Labor Forecaster® (PLF®) to help identify which skilled workers are needed, when and where. The CLMA® then displays a project labor risk analysis along with mitigation options and enables the user to visualize how their project(s) are competing for skilled labor during project construction.

Owners provide project data to the CLMA® and refresh that data every 90 days to ensure a reliable, critical mass of project put-in-place market information to dynamically understand the labor market.

Contractors, unions, labor providers and self-performing owners provide data on the skilled labor they employ by importing that information directly from payroll into the CLMA® and refreshing it every 90 days. These data enable the user to visualize available supply, attrition and mobility to understand market imbalances.

Overall, the CLMA® and its related services are designed to replace less formal or reliable labor planning systems and services that lack interaction, scale, and rigor; and
which result in risk, error and costly delays to construction projects already facing widespread skilled labor shortages in North America, today and into the foreseeable future.

The CLMA® has been designed to adhere to strict confidentiality protocols and is compliant with the federal antitrust regulations to ensure the data provided by industry stakeholders are protected.

Learn more at www.myCLMA.com.
Construction Users Roundtable Publications

The purpose of developing CURT publications is to disseminate recommendations, guidelines, and reports developed by the Construction Users Roundtable. CURT is focused on improving the cost effectiveness of the U.S. construction industry. These publications have been developed from the point of view of owners or users of construction services. Efforts by all segments of the industry, however, are vital if major improvement is to be the result.

This publication is one of a series from committees or study teams addressing a problem area. Findings and recommendations of CURT are included in publication series classified as White Papers (WP), Reports (R), or User Practices (UP). In addition to these classifications, CURT publications are numbered based on the category of the topic:

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Examples:

WP-1201: A CURT White Paper on Reverse Auction
R-402: A CURT Report on Tripartite Initiatives
UP–801: A CURT User Practice on Construction Safety in Contractor and Craft Worker Prequalification

Available CURT Publications

White Papers

WP-401, Confronting the Skilled Construction Workforce Shortage
WP-410, CURT|CWDC Joint Workforce Initiative
WP-1003, Construction Strategy: Optimizing the Construction Process
WP-1004A, Construction Strategy: CURT's Path Toward LEAN Project Delivery
WP-1201, Guidelines on the Use of Reverse Auction Technology
WP-1202, Collaboration, Integrated Information and the Project Lifecycle in Building Design, Construction and Operation

Reports

R-402, CURT Tripartite Initiative (CTI) Executive Summary
R-402A, CTI Study on Extended Overtime on Construction Projects
R-402B, CTI Study on Absenteeism in Construction
R-402C, CTI Report: Eliminating Work Disruptions & Jurisdictional Disputes
R-405, CTI Report: Project Stakeholder Responsibilities

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R-411, Construction Workforce: Building Comprehensive Labor Market Information (digital copy only)
R-807, Construction Owners' Safety Blueprint (OSB)
R-807A, Construction Owners' Safety Blueprint | China Supplement

User Practices
UP-101, Construction Measures: Key Performance Indicators
UP-201, Construction Project Controls: Cost, Schedule, & Change Management
UP-403, Construction Labor: Managing the Construction Workforce
UP-408, Construction Workforce: Improving Productivity on Union Projects
UP-601, Construction Purchasing: Capital Purchasing & Contracting
UP-701, Construction Quality: Achieving Quality on Capital Projects
UP-801, Construction Safety: Contractor and Craft Worker Prequalification
UP-802, Construction Safety: The Owner's Role
UP-803, Construction Safety: Prebid and Bid Clarification Meetings
UP-804, Construction Safety: Contract Terms and Conditions
UP-805, Construction Safety: Monitoring Contractor Performance
UP-806, Construction Safety: Improving Safety Programs
UP-1203, BIM Implementation: An Owner's Guide to Getting Started