

What Practitioners Need to Understand About Labor Availability and the Impacts of Natural Disasters

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The shortage of construction labor in the United States has been a major source of news in 2018 and 2019, thanks in part to a series of major natural disasters.¹ The headlines have not been subtle—the construction industry is in dire need of field labor, and skilled craft labor in particular. The Associated General Contractors of America published survey results from over

2,500 contractors confirming this sentiment is more than mere media blitz. In August 2018, 80 percent of contractors reported difficulty finding qualified craft workers.² In an unfortunate juxtaposition, that group represents the largest category of employees needed to keep up with current demand, with 76 percent of reporting employers indicating they need to hire additional craft personnel.³ Further, nearly half of reporting contractors rated the well-trained/skilled craft labor in their area as poor.⁴

A variety of factors contributed to the apparent labor shortage, including

1. Mass exodus of construction employees from the

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construction industry following the 2008–2009 recession, often referred to as the “Great Recession.” Indeed, from 2005 to 2010, the number of construction workers in the United States shrank from 11.197 million to 9.077 million.⁵ Construction work vanished during the Great Recession, and although work in the industry has more than recovered, the over 2 million workers who left have not returned.

2. U.S. immigration policy, especially in the current political climate, has resulted in increased scrutiny of immigrant workers, fewer available immigrant workers, and more frequent enforcement and harsher sanctions levied for immigration violations. Indeed, the total number of immigrant workers has declined or stayed roughly the same since reaching its peak in 2007.⁶ The obvious implication: The available workforce for many construction labor jobs has not increased proportionate to the amount of available work, especially in markets with large immigrant populations.⁷
3. Lower unemployment rates indicate there are more available jobs than there are employees to fill them. Recent statistics indicate that, across industry, there is only one employee available for one open job.⁸ This does not account for the skill required to perform the job, which means that there is an insufficient skilled workforce to fill the available jobs.
4. Younger workers more often opt for four-year degrees and pursue white-collar work as opposed to blue-collar work. The result is an aging field labor workforce with no backfill as the current generation begins to retire. According to a recent survey by the National Association of Home Builders, only 3 percent of survey respondents ages 18–25 selected a career field in construction.⁹
5. Similarly, males ages 18–25, typically the target age demographic for construction field workers, are disproportionately affected by the opioid crisis.¹⁰ Increased drug screening programs make it difficult to hire workers in this age range, especially in areas of the country that have been particularly hit hard by the opioid crisis.

As a result of these shortages, contractors report that they are putting higher prices into bids or contracts, and projects take longer and cost more than anticipated.¹¹ Further, 80 percent of responding contractors indicated that the skilled labor shortage is having an impact on worker and jobsite

safety.¹² In fact, in a 2018 Q3 report published by the USG Corp. and U.S. Chamber of Commerce Commercial Construction Index 6, 58 percent of reporting contractors believe lack of skilled workers is the primary cause of increased safety risk on construction job sites.¹³ There are increased litigation and claims resulting from schedule disruption and delays.¹⁴ And while currently there is no reported data to confirm, those in the construction industry speculate that with the decreased skilled workforce and increased workload, construction defect claims will increase.

Surveys may not accurately depict the severity or magnitude of the actual labor market condition. Therefore, practitioners need to understand how to identify, quantify, and substantiate labor shortage conditions to implement preventative and restorative measures in the event a natural disaster occurs. Labor availability is a simple problem of supply and demand. An increase in demand for labor would require a similar supply increase in the same market. However, if the demand was greater than the supply of labor in a market, a project may be experiencing a labor shortage condition. A labor shortage condition is generally defined as a market disequilibrium between supply and demand, in which the number of laborers demanded exceeds the supply available and willing to work at a prevailing wage and for a sustained period. Main drivers of labor shortage conditions include the increase in the demand for labor, decrease in the supply of labor, restrictions on prices of labor (i.e., wages), qualifications mismatch, movement to higher paying industries or markets (i.e., oil and gas), geographic trends, retirement ages, and the occurrence of natural disasters. Accordingly, to determine if a project is experiencing a labor shortage condition, one would need to quantify labor demand, supply, and wages for a given project and market.

Often, a project manager or executive is tempted to increase wages to eliminate a labor shortage condition. However, as demonstrated below, increasing wages may not eliminate or mitigate a labor shortage condition over the long term. Economists have provided static and dynamic definitions of labor shortage conditions to demonstrate why increasing wages may not eliminate labor shortage conditions.

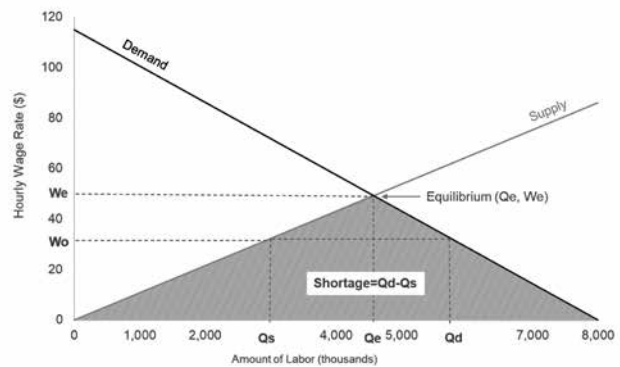
The Static Model of a Labor Shortage Condition

In the static model, a labor shortage condition is defined as a market condition in which the employer demand for labor is greater than the supply of workers. As a wage rate increases, more workers are willing to enter an occupation and current workers are generally willing to stay. Market equilibrium occurs when the quantity of workers willing to work at a wage (W_e) is equal to the quantity of workers needed by employers (Q_e). However, if the quantity of workers (Q_s) willing to work for a lower wage (W_o) is less than the quantity needed by employers (Q_d), then a labor shortage condition is occurring. In other words, if employers would like to hire a quantity of workers (Q_d) at a set wage (W_o), but the workers available at that wage (Q_s) is a lesser quantity, then a labor shortage condition is occurring. Therefore,

the difference between Q_d and Q_s is the amount of labor shortage under a static model. *Figure 1* depicts the occurrence of a labor shortage condition under the static model.

However, this model does not allow for a long-term labor shortage because competitive market forces lead to

Figure 1 – Supply and Demand Curve Representation of Static Labor Shortage

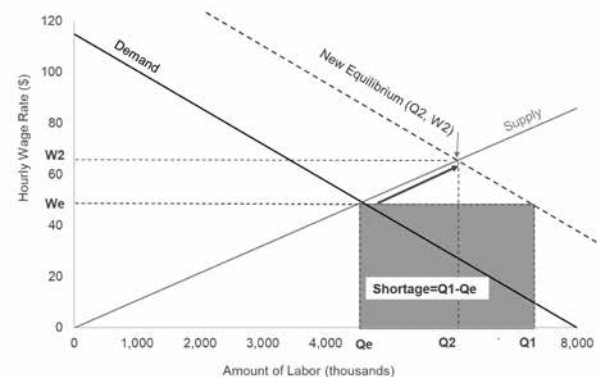


an increased wage rate, thereby resulting in more workers willing to work for the increased wage and fewer workers demanded by employers.

The Dynamic Model of Labor Shortage

In the dynamic model, labor shortage is defined as a dynamic market condition that occurs when the supply of workers increases less rapidly than the number demanded at the salaries paid.¹⁵ Economists Arrow and Capron define “labor shortage” as a shift to the right of the demand curve caused by an increase in the demand for workers.¹⁶ Under this condition, a shortage occurs if the wage remains at W_e , employers want to hire Q_1 workers, and only Q_e workers are available at the wage W_e . As a result, the amount of labor shortage is estimated as $(Q_1 - Q_e)$, and the new market equilibrium is represented by the point (Q_2, W_2) . *Figure 2* depicts the situation when a labor shortage condition occurs under the dynamic model.

Figure 2 – Supply and Demand Curves Representation of Dynamic Labor Shortage



Accordingly, static and dynamic models help practitioners understand why wages do not simply need to increase to eliminate labor shortage conditions. However, the development of

supply and demand curves is cumbersome and time-consuming. Therefore, an introduction of a labor availability metric as a reasonable measure that can help identify and quantify labor shortage conditions often proves more useful when analyzing labor shortage in a specific circumstance.

Labor Availability Metric

Labor availability (Y) is defined as the metric that determines whether or not unemployed workers have trouble finding a job opening in a given market.¹⁷ It is the ratio between the number of unemployed workers and the number of job openings for a specific trade and location.

Equation 1 – Labor Availability

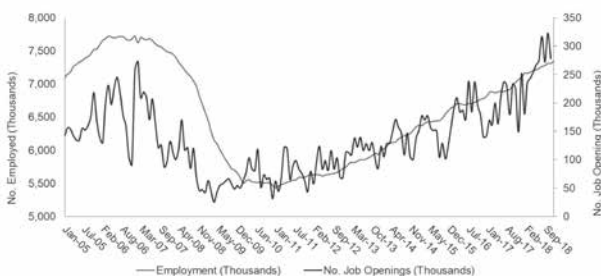
$$Y = \text{Labor availability} = \frac{\text{Number of unemployed people}}{\text{Number of job openings}}$$

For example, if there are 100 unemployed concrete workers and 500 concrete job openings in location *A*, then the labor availability is equal to 0.2. A labor availability that equals 0.2 means there are five concrete job openings for each unemployed concrete worker in location *A*. In that scenario, there is a labor shortage condition in the concrete market in location *A*. However, if there are 500 unemployed concrete workers and 100 concrete job openings in location *B*, then the labor availability is equal to 5. A labor availability that equals 5 means there are five unemployed concrete workers for each job opening in location *B*. In that scenario, the concrete market in location *B* does not experience a labor shortage condition.

Labor Availability Trends in Construction

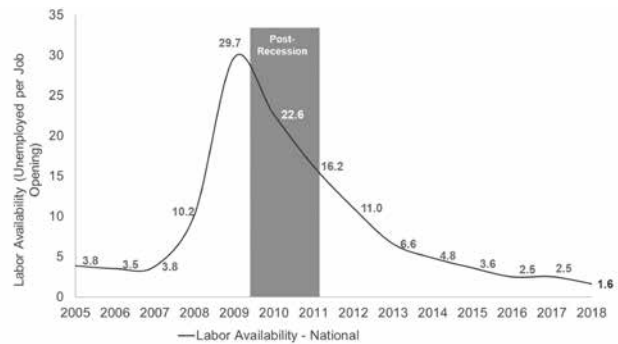
Labor availability in construction has substantially fluctuated in the past ten years. A review of historical employment data in the United States demonstrates that employment has increased by 30 percent since the recession on a national level, from 2010 to 2018, while the number of job openings in construction has increased by 415 percent over the same time. In addition, as of November 2018, the national unemployment and job opening data identified 19,000 more unemployed than construction job openings nationally. The number of unemployed per job opening in construction was equal to 1.07 (in November 2018). This indicates that for each job opening in the month of November, there was one available unemployed construction worker to fill the position. *Figure 3* depicts the construction employment trends on the national level.¹⁸

Figure 3: National Employment vs. Job Openings



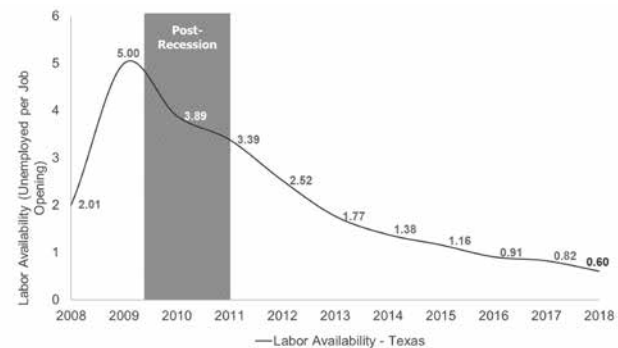
Nationally, the number of unemployed per construction job opening was equal to 22.6 in 2010 and changed to 1.6 in 2018, a 93 percent decrease. *Figure 4* depicts the historical labor availability in construction on the national level.

Figure 4 – Total Unemployed per Construction Job Opening on the National Level



While it appears that labor availability has decreased at the national level, a review at the state level is required. Labor availability statistics for specific states tend to be different from the national levels. For example, in Texas, there were 25,858 more construction job openings than unemployed construction workers in November 2018. The average number of unemployed construction workers in Texas per construction job opening was equal to 0.6 in 2018, which indicates there are less than 2 construction job openings for each unemployed construction worker in Texas (i.e., 1.67 = 1/0.6). These results suggest the construction industry in Texas is more likely to have experienced labor shortage conditions from 2016 through November 2018. *Figure 5* depicts the historical labor availability in construction in Texas.

Figure 5 – Total Unemployed per Construction Job Opening in Texas



Impact of Severe Weather Conditions and Natural Disasters on Labor Availability

Labor availability in construction has been considerably decreasing since the Great Recession, both nationally and locally. Even prior to the devastation of California’s fires and Hurricanes Harvey and Irma, states like Texas and California have further suffered from acute shortages in construction workers, especially in the past three years. Unfortunately, natural disasters that struck the United States have heavily contributed in plunging the construction

industry into deeper labor shortages.

In 2012, Hurricanes Isaac and Sandy resulted in extensive damages across several northeastern states and southeastern states due to high wind and coastal storm surge. Sandy's impact on major population centers caused widespread interruption to critical water and electrical services and caused multiple deaths and over \$73 billion in damages. More recently, in 2017, Hurricanes Maria, Irma, and Harvey resulted in over \$270 billion in financial losses. Hurricane Harvey, in particular, caused over \$127 billion in widespread damage across Texas. Harvey's devastation was aggravated

Figure 6 – Review of Financial Losses Resulting from Natural Disasters in the U.S.

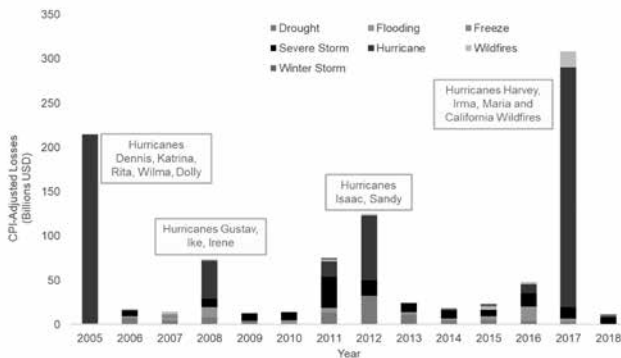
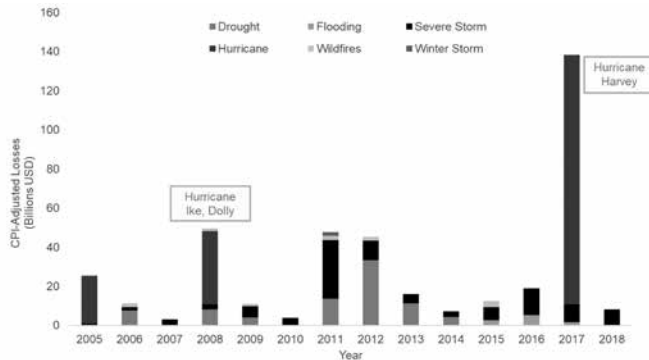


Figure 7 – Review of Financial Losses Resulting from Natural Disasters in Texas

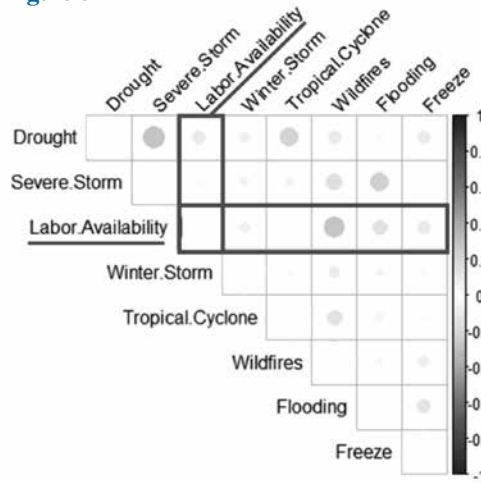


by extreme rainfall producing historic flooding across Houston and surrounding areas, resulting in massive flooding that displaced over 30,000 people and damaged or destroyed over 200,000 homes and businesses.¹⁹ With these massive and destructive natural disasters, affected buildings needed to be restored and rebuilt, which resulted in an increased demand on construction workers in markets that already were suffering from labor-shortage conditions. Figures 6 and 7 illustrate the magnitude of financial losses resulting from natural disasters on the national level and in Texas.

To further assess the impact of natural disasters on labor availability, a correlation study was performed using historical labor availability and several natural disaster types. The correlation study demonstrates that labor availability is inversely correlated to wildfires and flooding, indicating that wildfires and flooding are likely to result in labor availability

issues in the construction market. Figure 8 is an illustration of the correlation between labor availability in construction, nationally, and natural disaster types.

Figure 8



Available Legal Remedies When a Labor Shortage Busts the Schedule or Budget

A well-known construction law treatise cautions that “[o]nly in unusual circumstances may the contractor look to another, such as the owner, to absolve it of the responsibility to provide sufficient skilled labor to accomplish the work.”²⁰ Labor shortage resulting from a weather event arguably presents such an “unusual circumstance,” allowing a contractor to shift the costs resulting from a labor shortage to the owner. Although there are a few statutory remedies available in public works contracts that allow for an increase in price resulting from extended labor shortages,²¹ the primary mechanism in place to allow for such shift is the force majeure clause of the construction agreement.

A standard force majeure clause typically includes protections against labor strikes or other acts of a labor union, floods, earthquakes, acts of God, and acts of war. While an argument could be made that a weather event that results in a decreased skilled labor pool falls within that definition, even if not explicitly stated, such an argument would likely fail. Indeed, courts are reticent to extend a force majeure clause beyond the explicit language contained in the governing contract. For instance, in *S&B/Bibb Hines PB 3 Joint Venture v. Progress Energy Florida, Inc.*,²² the Eleventh Circuit Court of Appeals analyzed whether a contractor could use a force majeure clause to recover additional labor and material costs when construction was delayed and completing the work on schedule became much more expensive following several natural disasters. Specifically, four hurricanes struck the jobsite at issue during construction.²³ As a result of the hurricanes, the construction labor market decreased, resulting in insufficient skilled labor available to complete construction.²⁴ After construction was complete, the contractor filed suit against the owner seeking roughly \$40 million above the contract price, including, in part, costs for increased and unforeseen labor costs due to the shortage.²⁵ The Eleventh Circuit found that the fixed-price

contract negotiated between the parties “foreclosed any recovery of additional compensation beyond the contract price.”²⁶ However, in support of its right to recover the additional costs, the contractor relied on the construction contract’s force majeure clause.²⁷ That force majeure clause included “adverse weather” and “labor disturbances”²⁸ as qualified events, but only allowed for an extension of time under the contract, *not costs*, providing “in no event shall Contractor be entitled to any increased costs, such as additional compensation, or damages of any type resulting from such Force Majeure delays.”²⁹

The opinion in *S&B/Bibb Hines PB 3 Joint Venture* does not address whether the labor shortage constitutes a force majeure event, so it appears there was no dispute on this issue at the Eleventh Circuit. However, the contractor argued that, although the plain language of the contract provides that its only remedy following a force majeure event is to seek additional time, the contract should be read to include an implicit “obligation on [the part of the owner] to compensate [contractor] for any costs it incurs in responding to a Force Majeure event.”³⁰ The Eleventh Circuit rejected this reading.³¹ Indeed, the court held:

No natural reading of the contracted language gives rise to an interpretation that [contractor’s] contractual obligation to mitigate costs in the event of a Force Majeure delay implicitly requires [owner] to reimburse it for non-delay costs. To read into the parties’ contract such an obligation would nullify, not harmonize, multiple contract provisions. Furthermore, it would subvert the entire purpose of a fixed price contract to allow [contractor] to recover additional labor and material costs when the benefit of a fixed price contract is to protect against price increases, labor shortages, material shortages, and the like. In contracting for the fixed price construction job, “the parties thoroughly addressed and allocated the risks” inherent in the project and [contractor] could have increased its prices to reflect the risks it was assuming.³²

According to the court, the contractor’s exclusive remedy following the hurricanes was to seek additional time to complete its work, not additional compensation.³³ It is interesting to note that the project in this case *was* finished on time.³⁴ Based on this holding, the contractor may have been better off seeking an extension of time to complete the work, thereby not incurring additional labor costs due to the shortage, and finished the project after the original completion date. It is unclear whether this would have been a cost-saving option—perhaps material cost increases were the majority of the claim and would have existed regardless of when the project was completed. However, when facing a similar situation, contractors (at least those within the Eleventh Circuit) may consider requesting additional time under a force majeure clause rather than finishing the job on time because, unless the contract explicitly allows for additional compensation for increased costs following a force majeure

event, such costs will not be permitted.

Even if a force majeure clause allows for the recovery of costs in addition to an increase in performance time, proper notice must be given before a party will be granted additional time or money to complete the performance of the contract. Although outside the construction industry, *Aquila v. C.W. Mining*³⁵ provides an excellent example of the notice required to invoke a force majeure provision on the basis of a labor shortage. In *Aquila, C.W. Mining (CWM)*, a mining cooperative, could not meet its shipment obligations pursuant to its contract with Aquila, a utility provider.³⁶ CWM’s performance was affected by a labor strike that resulted in labor shortage and geological issues in several of its mines.³⁷ While Aquila had knowledge of some of the geological issues, CWM only provided written notice that it was invoking the force majeure clause due to the labor shortage caused by the strike.³⁸ Aquila filed suit to recover its losses stemming from CWM’s breach and cancellation of the contract between the parties.³⁹ After a bench trial, the district court awarded Aquila \$24 million. CWM appealed, arguing that the labor dispute and geological events constituted force majeure events and excused its performance of the contract.⁴⁰ In an opinion written by now Supreme Court Justice Neil Gorsuch, the Tenth Circuit Court of Appeals disagreed, and affirmed the district court.

First, the Tenth Circuit in *Aquila v. C.W. Mining* held that the evidence supported a finding that the delays were not caused by the labor shortage.⁴¹ For instance, witness testimony indicated that the mines were not safe or otherwise available to be mined (there was nowhere for miners to work even if they were not on strike).⁴² Further, CWM only advertised for three open positions during that time frame.⁴³ The court reasoned it was unlikely that a labor shortage of three could warrant disruption of CWM’s performance under the contract.⁴⁴ Accordingly, there was sufficient evidence that the mine’s geological issues, not the labor disruption, were the primary and independent cause of CWM’s inability to perform under the contract.⁴⁵ While the geological issue may have sufficed as a qualifying force majeure event, CWM did not describe the mining issues as having such an impact until the litigation began. Indeed, CWM “downplayed its geological problems and represented that they would be overcome shortly.”⁴⁶ At trial, CWM argued that Aquila had “actual notice” of the geological issues with the mines, which substituted for written notice required by the contract.⁴⁷ The Tenth Circuit also rejected this argument, finding:

[t]o be sure, Aquila had notice that CWM was experiencing geological problems. But, the district court expressly found that Aquila did not have actual notice that CWM considered its geological problems a force majeure event. . . . [C]lassifying an event as a force majeure has powerful ramifications—at the very least, receiving notice that an event is considered a force majeure allows a party to evaluate the validity of a claimed force majeure event and permits it to make other arrangements to mitigate its damages if it suspects the event is serious and will persist.⁴⁸

The holding implies that had CWM provided adequate notice under the contract invoking force majeure for both the labor dispute and the geological issues, the clause could have excused its performance. However, absent such explicit written notice, CWM could not claim that its failure to perform was a force majeure event resulting from geological issues in the mine. The takeaway here is to be explicitly clear when invoking a force majeure clause and include all events that could constitute a force majeure. Similarly, be prepared to provide sufficient evidence that the circumstances alleged actually contributed to or resulted in the delay or increased cost. The evidence in *Aquila v. C.W. Mining* failed to show the labor shortage affected CWM's ability to perform, proving fatal to its force majeure defense.

In addition to strict construction and proper notice, the cases interpreting force majeure are very factually intensive—so much so, that it is unlikely these cases will be resolved on summary judgment and is more likely they will be decided by some trier of fact, whether it be arbitrator, judge, or jury. This fact should be considered when determining how to resolve a dispute involving a force majeure event. If the case goes to litigation or arbitration, the parties should be prepared to go the full distance of the matter through trial.⁴⁹

Handling the Labor Shortage in the Construction Industry

With severe weather conditions and natural disasters, labor shortage conditions are further accelerated and result in decreased worker productivity and safety, increased construction defects, slippage to project schedule, and increase in costs and claims. Construction professionals are therefore required to implement preventive measures to alleviate the impacts of labor shortage conditions by better planning their project, modifying the contract language, and including cost, schedule, and risk adjustments. Restorative measures can also be implemented to mitigate labor shortage conditions, including trade unions, cross-training, workforce stability, labor sourcing, student outreach, perception change, immigration initiatives, and increased benefits.

Contractors should modify their contract language to include escalation, force majeure clauses, and better-drafted labor-related contract provisions. Applying the lessons learned from the cases above, with the right contract language and compliance

with applicable notice requirements, a contractor could successfully claim that a labor shortage condition qualifies as a force majeure event if the contractor demonstrates that the lack of qualified labor available made work performance impracticable. However, this demonstration could require an analysis of the following: (1) the

contract and bid documents, (2) the foreseeability of the labor shortage condition, (3) the extent and severity of the labor shortage condition, (4) the extent and severity of the hardship caused by the labor shortage condition, (5) whether an appropriate labor supply was a mutual assumption in the contract, and (6) whether a notice of the labor shortage condition was sent promptly to the owner. Contractors also should include reasonable assumptions for labor and material costs in their bids and proposals.

The following provision is an example describing the impact of labor shortage on project delays and liquidated damages:

Shortage of Supply: Contractor shall promptly notify the Owner of any occurrence of which it becomes aware that it expects will result in a likely labor shortage, whether due to a force majeure or otherwise, or prevent Contractor from performing work in conformity with the project schedule set forth in the contract documents. In this case, Contractor shall include in such notice its best estimate of the duration of the delay, the reasons for the delay, and whether the reason impacts the project critical activities.

Adjustment multipliers can be used to develop reasonable baseline schedules and cost estimates, accounting for labor shortage risks in the market, as described in the table below.

Companies should develop cross-training programs to create a diversified workforce. Establishing an apprenticeship program, for occupations that do not require a college degree, is a potential training method through onsite or classroom training. In some cases, employers are not required to pay for the training as courses can be partially or fully funded by federal programs, including the Workforce Investment Act (WIA), state training programs, or educational institutions.

Impacted companies should create programs to develop and maintain workforce stability and improve working conditions. These programs could include tenure recognition programs, training programs to deal with stress related to the occupation, or programs encouraging involvement in company operations. Companies can also use bonuses, overtime opportunities, loyalty rewards, and promotions as incentives to retain their workforces.

Table 1

Craft Labor Staffing Difficulty	OSHA Number of Recordable Incident Cases per 200,000 Work Hours	Average Cost Change (%) (95% Confidence Interval)	Average Schedule Change (%) (95% Confidence Interval)
Moderate/Severe	0.94 (0, 2.84)	17.3% (8.4%, 26.2%)	22.5% (11.5%, 33.4%)
Slight	0.43 (0, 1.72)	3.2% (-0.9%, 7.3%)	12.8% (7.7%, 17.9%)
No Difficulty	0.26 (0, 1.25)	-6.2% (-10.7%, -1.8%)	6.4% (1%, 11.8%)

Source: CII Implementation Resource 318-2: Is There a Demographic Craft Labor Cliff That Will Affect Project Performance?

Figure 9 – Framework to Define and Identify Labor Shortage Conditions in Construction

1. Define the study space and time variables:
 - The region and city perceived to experience a labor shortage condition.
 - The timeframe or period when the labor shortage condition was observed.
2. Determine if a labor shortage condition exists in the construction industry:
 - Estimate the labor availability.
 - Determine if the construction market is under a labor shortage condition at the regional level (i.e., if Labor availability < 1).
3. Define the specific trade suspected to encounter a labor shortage condition (e.g., carpenters, concrete workers, construction managers, etc.).
4. Contact the state labor commission, union halls, and local construction organizations for labor market data.
 - Employment market trends
 - Unemployment rates for the specific trade
 - Number of job openings for the specific trade
 - Data on help wanted online/job advertising
5. Reestimate the labor availability for the specific trade, in the determined space and time conditions.
 - If Labor availability < 1, the construction labor market for the specific trade is undergoing a labor shortage condition

Based on the supply and demand curve analysis described in the previous sections, increasing wages may improve labor availability in a particular occupation, but generally not for a long period of time. However, in extreme cases, if the supply of workers is inelastic for a certain period (i.e., not responsive to wage changes), increased wages would not lead to any changes in the number of qualified workers. Improving employees' fringe benefits can also attract more employees. In some cases, employers are usually able to reduce their vacancy rates by improving their fringe benefits rather than increasing wages by a similar amount. Additionally, supply and demand for labor vary across each state and nationally. Contractors experiencing reduced labor availability in a specific market should source subcontractors and workers in areas where a labor shortage condition is not occurring. Contractors can prefabricate portions of the project in areas where a labor shortage condition is not occurring or compensate workers to relocate to the project site. At the same time, the construction industry must reengage at the student level. By reestablishing and better educating students about vocational-technical schools and construction industry trade education, the industry may be able to attract the high school students that are still deciding what they want to do after school. Finally, the respect that the skilled worker once held must be regained. Owners, employers, and contractors must

celebrate the work that skilled laborers provide and recognize how they help to keep the economy moving forward.

General Framework for Labor Shortage Condition Identification

Labor availability, as defined in previous sections of this paper, can be an appropriate metric to quantify and identify labor shortage conditions. However, the ability to effectively estimate the labor availability for a given market, in a given space and time, depends on the data available. Figure 9 represents a general framework that could help define and identify labor shortage conditions in the construction industry.

What We Can Expect Through 2020

To conclude this article, we have used statistical modeling techniques—in particular, a multiple linear regression (MLR) model—to examine the impact of multiple explanatory variables on labor availability, including time, wage, construction cost index, consumer price index, the U.S. population growth percentage, working age population, and number of women in construction.⁵⁰ After first examining the statistical significance of the explanatory variables, we selected a final MLR model to explain the variation in labor availability using historical data and describe the changes in labor availability as a function of time, hourly wages, consumer price index, U.S. population growth, and working age population. The results of this model predicted that labor availability in construction on the national level would be roughly 1.01 by the end of 2018, 0.57 by the end of 2019, and 0.3 by the end of 2020. We then used data obtained from the U.S. Bureau of Labor Statistics to validate the model's predictions. For example, the actual labor availability in November 2018 was equal to 1.07 and the predicted labor availability, using the final MLR model, is equal to 1.01 for 2018, which only represents a 6 percent error. This 6 percent difference could be a result of externalities and weather conditions that drive the construction industry and accelerate the occurrence of labor shortage conditions in the future. The 6 percent error also validated that the final MLR model provides a reasonable prediction of the labor availability in the short term. However, as depicted by the model results, construction labor availability is predicted to be roughly 0.57 by the end of 2019, indicating that labor availability will continue to worsen on the national level. Considering potential market externalities and potential severe weather conditions and natural disasters, the actual labor availability might decrease much faster than predicted in the next two years. Construction professionals are therefore highly encouraged to start proactively implementing the recommended preventive measure outlined above. 🏗️

Endnotes

1. See, e.g., Jeff Cox, *The U.S. Labor Shortage Is Reaching a Critical Point*, CNBC NEWS (July 5, 2018), <https://www.cnbc.com/2018/07/05/the-us-labor-shortage-is-reaching-a-critical-point>.

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2. ASSOCIATED GEN. CONTRACTORS OF AM., AGC 2018 WORKFORCE SURVEY RESULTS, available at <https://www.agc.org/news/2018/08/29/eighty-percent-contractors-report-difficulty-finding-qualified-craft-workers-hire> (last visited Mar. 29, 2019).

3. *Id.*

4. *Id.*

5. *Number of Employees in the U.S. Construction Industry from 2000 to 2017 (in 1,000s)*, STATISTA: THE STATISTICS PORTAL, <https://www.statista.com/statistics/187412/number-of-employees-in-us-construction> (last visited Mar. 29, 2019).

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22. 365 F. App'x 202 (11th Cir. 2010).

23. *Id.* at 203.

24. *Id.*

25. *Id.*

26. *Id.*

27. *Id.* at 204.

28. *Id.* at 204 n.2.

29. *Id.* at 204.

30. *Id.*

31. *Id.* at 205.

32. *Id.* at 205–06.

33. *Id.* at 206.

34. *Id.* at 206 n.4.

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36. *Id.* at 1260.

37. *Id.* at 1261.

38. *Id.* at 1261–62.

39. *Id.* at 1262.

40. *Id.*

41. *Id.* at 1263.

42. *Id.*

43. *Id.*

44. *Id.*

45. *Id.* at 1264.

46. *Id.* at 1262.

47. *Id.* at 1265.

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49. *See also* Shenango, Inc. v. Massey Coal Sales, Co., 2009 WL 2901296 (W.D. Pa. Sept. 10, 2009) (coal mining company permitted to argue force majeure arising from labor shortage at trial because there was sufficient expert and corporate witness testimony indicating that there was insufficient labor to complete mining at the available mines).

50. MLR updated by Dr. Nour Bouhou in reliance on paper authored by Nour Bouhou, Anthony Gonzales & Marcelo Azambuja, *Identifying and Predicting Labor Availability in the Construction Industry*, COST ENG'G, Sept./Oct. 2018, at 12, available at <https://www.spireconsultinggroup.com/wp-content/uploads/2018/09/Cost-Engineering-Labor-Availability-in-Construction-Industry.pdf>.