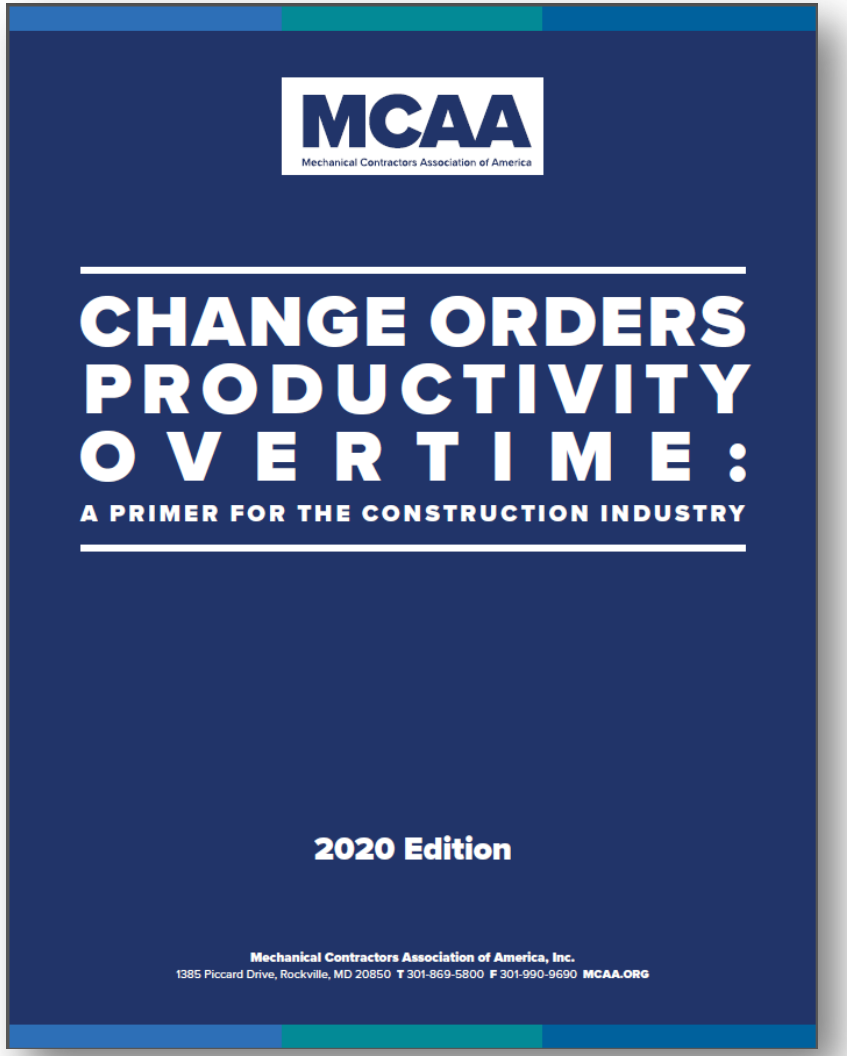
Using the MCAA's Publication to Quantify CV-19 Loss of Labor Productivity and Delay on Your Project



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Today's MCAA Webinar Agenda – All Derived from the 2020 Edition of the MCAA's Publication

1. Legal Counsel's Review of Your Contract & Project Documents
2. Specific Methodologies for Quantifying LoP:

- ✓ The Measured Mile Method
- ✓ The MCAA Factors Method
- ✓ The Cumulative Impact Method
- ✓ The Modified Total Cost (Labor Hour) Method

3. Methods of Assessing LoP Impacts As Potential Schedule Delays

Today's MCAA Webinar Agenda – All Derived from the 2020 Edition of the MCAA's Publication

Special Note: It is usually the case that the more project-specific and detailed the LoP analysis, the greater the opportunity for the claimant to be reasonably compensated. The choice of LoP quantification methodologies and their applications are also key elements in a reasonable recovery.

Reliance on nation-wide average impacts caused by the CV-19 pandemic may not result in a recovery due to the lack of a project-specific analysis. This seminar focuses on the need to perform project-specific LoP quantification analyses using methodologies that are recognized by courts and boards of contract appeals. Your presenters have testified as LoP experts using the proven methods described in this presentation.

Potential Liability for Delays Caused by COVID-19

- Delays in materials, equipment deliveries. Were submittals and procurement actions timely executed?
- Delays caused by job shutdowns for failing to screen obvious sick employees
- Critical path delays caused by CV-19 loss of labor productivity
- Concurrent Delay Issues
- Potential Liability to Maintain Safe Work Site

Before You Decide to Prepare and Submit a CV-19 Impact Claim, Consider the Following:

1. Fact: a well thought-out and prepared Request for Equitable Adjustment ("REA") or "claim" is time consuming and can be costly for your firm to develop.

2. Your firm's subcontract, change order forms and payment application forms may contain language that restricts or bars recovery of claim damages (time and/or costs) under certain conditions.

3. Federal and State COVID-19 directives may provide critical information as to the form and content of an REA.

4. Therefore, it is essential for your firm to have all of your subcontract documents, including change order and payment application forms, reviewed – along with current governmental COVID-19 guidelines – by an experienced construction attorney before you decide to prepare and submit an REA.

If You Decide to Prepare and Submit a COVID-19 Impact REA, How the REA Language is Crafted is Critical

1. **While it is unclear from present guidelines, and absent any case law, your firm may have an obligation to segregate CV-19 delay and labor inefficiency damages from any pre-CV-19 delays and impacts.**

2. **CV-19 recovery guidelines may categorize CV-19 delays and labor productivity impacts as *force majeure* events (time relief but no compensation), thus under what terms the REA or claim is submitted may be critical to a damages recovery.**

3. **Because a consistent method of CV-19 damage recovery by trade contractors has not been established on public or private projects, a construction attorney should be involved before an REA is prepared to craft covering language that best fits the contract terms, current trends, legal precedents and governmental directives.**

4. **There are a myriad of important strategic and legal considerations necessary to prepare and submit a CV-19 impact REA and conducting a legal review during and prior to submitting such an REA is a critical element in that process.**

Notice Requirements

- **Review all time extension, change order, scheduling, claim clauses in the contract/subcontract to make sure you are timely giving time/cost notices. Some onerous clauses state you waive any right to claim for time or money absent a timely notice. Do not assume that notice provisions will be waived for COVID-19 delays if you fail to follow them.**

- **Review all clauses requiring pricing or estimate of time impact required to be provided once notice is given. Give your best estimate and say it will be updated once the time and cost impacts can be better determined.**

COVID-19 Contractual Relief

- **Will most likely flow from Owner—General Contactor—Subcontractor**
- **Follow all subcontract pass-through requirements for notice, time, compensation**

What are Key Steps in Preserving Your Rights – Labor Productivity Impacts

What sorts of labor productivity impacts may arise during the pandemic period?

- ✓ **Crew *disruptions* caused by absenteeism of your workers, and potentially those of other trades and changed work sequences due to incomplete predecessor work of other trades**
- ✓ **Crew *diminishment* caused by the lack of replacement of workers on your crews for those who fall ill or who choose to "shelter in", also known as "crew size inefficiency"**
- ✓ **The learning curve effect, for new workers who arrive on site to replace absent workers**
- ✓ **Logistics – the lack of needed materials and/or equipment, whether suppled by the owner or the contractor, arising directly from the effects of the pandemic**
- ✓ **Dilution of supervision caused by the absence of key labor management personnel due to illness**
- ✓ **Unplanned and extended overtime schedules imposed to mitigate the effects of pandemic-caused project delay**

What are Key Steps in Preserving Your Rights – Labor Productivity Impacts

What can a labor intensive contractor do if the contract requires both notice and quantification of potential damages before an REA or claim will be considered by the prime or the owner?

What methods are available to a labor intensive contractor to measure the adverse effects of the pandemic on labor productivity in a forward looking analysis?

What are Key Steps in Preserving Your Rights – Labor Productivity Impacts

What sorts of labor productivity impacts may arise after the pandemic has passed?

- ✓ **The learning curve effect, for new workers who arrive on site to replace non-returning workers**
- ✓ **Crew size inefficiency caused by a requirement to increase your crews to mitigate delay**
- ✓ **Stacking of trades caused by project acceleration (compression of the work into a shorter period)**
- ✓ **Absence of reasonable site access due to the addition of crews and equipment of all trades**
- ✓ **Concurrent operations – unplanned stacking of your activities as a form of acceleration**
- ✓ **Crew flow disruption ("Reassignment of Manpower") caused by changing schedule priorities and interferences with other trades**
- ✓ **Adverse effects of extended overtime schedules to mitigate delays caused by the pandemic**
- ✓ **Delayed deliveries of materials and equipment caused by the pandemic effect**

What are Key Steps in Preserving Your Rights – Labor Productivity Impacts

Why is the measurement of labor productivity important during this pandemic crisis?

- ✓ **To provide information that the contractor's management may use to attempt to mitigate labor productivity losses**
- ✓ **To demonstrate excusable (or potentially compensatory) delay arising from losses of labor productivity experienced during the duration of, and caused by, the pandemic effects**
- ✓ **To provide the basis of notice to owners, CMs, or prime contractors regarding the magnitude of productivity losses arising from the pandemic effect**

What are Key Steps in Preserving Your Rights – Labor Productivity Impacts

How do you measure the before-and-after productivity rates of your crews?

- ✓ **The best method is an actual ("empirical") method that establishes a *productivity rate ratio* before the start of the pandemic effect, and then establishes a production rate ratio during the effects of the pandemic**

- ✓ **What is a *productivity rate ratio*? It is the number of field craft labor hours required to install an identifiable unit of work, e.g., hours per linear foot of pipe, hours per cubic yard of concrete**

- ✓ **What is this method called? It is the *measured mile method* of productivity measurement, and it is the most widely accepted method to quantify the loss of labor of productivity in the construction industry**

- ✓ **Must it be performed while the work is actually taking place? No, with a reasonably detailed labor plan that tracks actual labor hour by work activity codes, and the contract drawings, a measured mile analysis can usually be done after the fact**

- ✓ **If no reasonably detailed labor tracking was performed, is all lost? No . . .**

What are Key Steps in Preserving Your Rights – Labor Productivity Impacts

What if you could not perform a measured mile productivity analysis?

- ✓ **Then a non-empirical method may be utilized. These include, but are not limited to: an "Earned Value" analysis, an "MCAA Factors" (industry study) analysis methodology or a Modified Total Cost approach**

- ✓ **An MCAA Factors analysis involves the application of the MCAA's Factors Affecting Labor Productivity – the claimant refers to the 16 categories of labor inefficiencies enumerated in the MCAA's publication and by experience on the project or interviews of site personnel, selects the appropriate labor impact category and the associated intensity level**

- ✓ **An "Ibbs Curve" or Cumulative Impact analysis may be possible**

- ✓ **A less favored method is the "Modified Total Cost" (or "Total Cost") method whereby the claimant simply subtracts from the actual labor hours expended on the project its labor estimate, change order labor hours, T&M ticket hours and hours for contractor-caused deficiencies such as field rework and/or bid estimate errors**

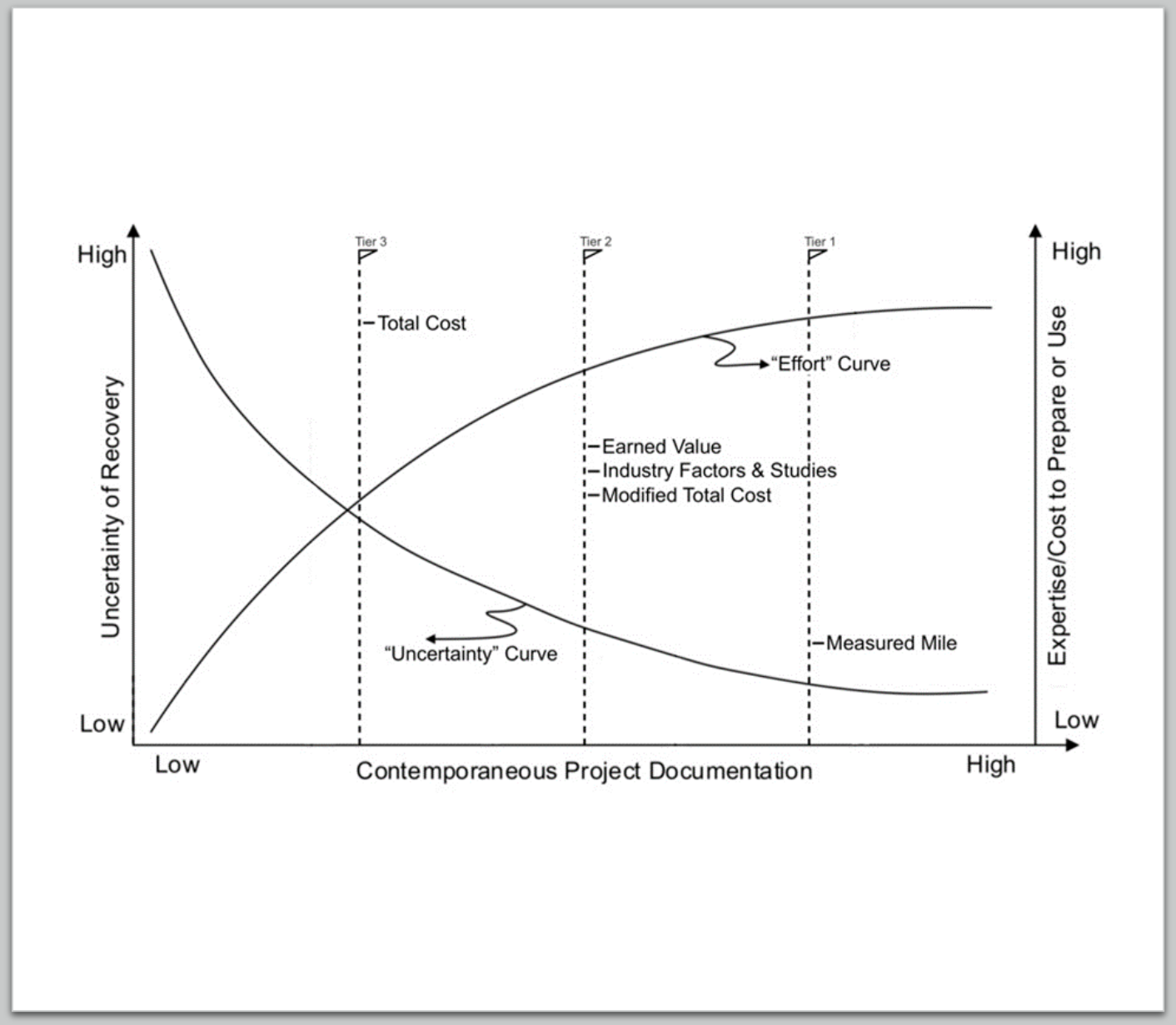
Quantifying Covid Impacts to Labor Productivity

Two step process

- Category 1: Establish separate cost codes for identifiable (direct) extra work.
  - Extra time to check-in
  - Extra PPE suit-up
  - Extra cleaning
  - Extra travel time
- Category 2: Use any of following methods to quantify indirect impacts

Claiming Loss of Labor Productivity

- Different methods
- Project Documentation required
- Time & $$$ required
- Credibility and Recoverability



Claiming Labor Productivity Impacts

- ✓ Best method: ***Productivity rate ratio*** before vs. ***Productivity rate ratio*** during disruptive event
- ✓ *Productivity rate ratio:* Number of labor-hours required to install unit of work, e.g., hours per LF of pipe
- ✓ Called ***Measured Mile method*** of productivity measurement
- ✓ Most widely accepted method to quantify the loss of labor of productivity
- ✓ Track actual labor-hours by work activity codes
- ✓ **Reference: MCAA 2020, pp. 163-180**

Measured Mile Approach

1. Identify an unimpacted (or less-impacted) baseline productivity
2. Determine actual Productivity rate for period of owner-caused disruptions
3. Compare baseline vs. actual Productivity rates

Δ Productivity = (25 – 12)

= 13 piles/day

Q1 20 piles/day 12.5 wd	**Q2** 25 piles/day 10 wd
Q4 25 piles/day 10 wd	**Q3** 12 piles/day 21 wd

Measured Mile Example

Sample Calculations to Identify Expected More Productive Areas

Area A: 3,000 linear feet of pipe – crew of 4 for 38 days = 2.47 LF/MH
Area B: 4,300 linear feet of pipe – crew of 4 for 52 days = 2.58 LF/MH
Area C: 2,500 linear feet of pipe – crew of 2 for 30 days = 5.21 LF/MH

Example of Calculations Used to Identify Expected Less Productive Areas

Area D: 3,800 linear feet of pipe – crew of 4 for 68 days = 1.75 LF/MH
Area E: 2,000 linear feet of pipe – crew of 2 for 63 days = 1.98 LF/MH

Determining the Weighted Average of the More Productive Areas, Less Any "Outliers"

Area A: 3,000 linear feet of pipe – crew of 4 for 38 days = 1,216 hours = 2.47 LF/MH
Area B: 4,300 linear feet of pipe – crew of 4 for 52 days = 1,664 hours = 2.58 LF/MH
Area C: 2,500 linear feet of pipe – crew of 2 for 30 days = 480 hours = 5.21 LF/MH
7,300 2,880
Weighted Average = 7,300 ÷ 2,880 = 2.54 LF/MH

Calculating the Weighted Average for Less Productive Areas

Area D: 3,800 linear feet of pipe – crew of 4 for 68 days = 2,176 hours = 1.75 LF/MH
Area E: 2,000 linear feet of pipe – crew of 2 for 63 days = 1,008 hours = 1.98 LF/MH
5,800 3,184
Weighted Average = 5,800 ÷ 3,184 = 1.82 LF/MH

Sample "Should Have Spent" Hours Calculation

5,800 LF in the impacted areas ÷ 2.54 LF/hour = 2,284 "should have spent" hours
3,184 hours actually spent – 2,284 hours = 900 hours of productivity loss

Sample Inefficiency Factor Calculations

1.82 LF/Hour ÷ 2.53 LF/Hour = .72; 1.0 – .72 = .28 x 100 = 28 percent inefficiency
3,184 hours in the impacted areas x 28 percent inefficiency = 892 hours of productivity loss

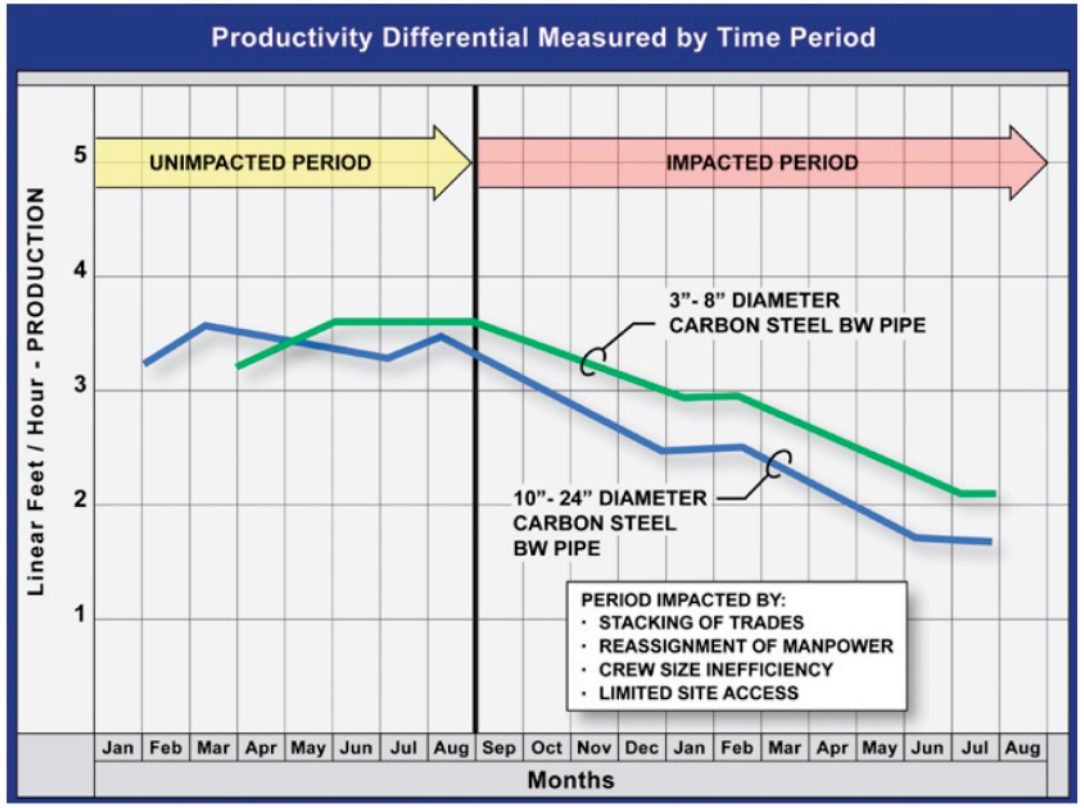
Selecting Measured Mile Period

Similarity, not Identicalness, required

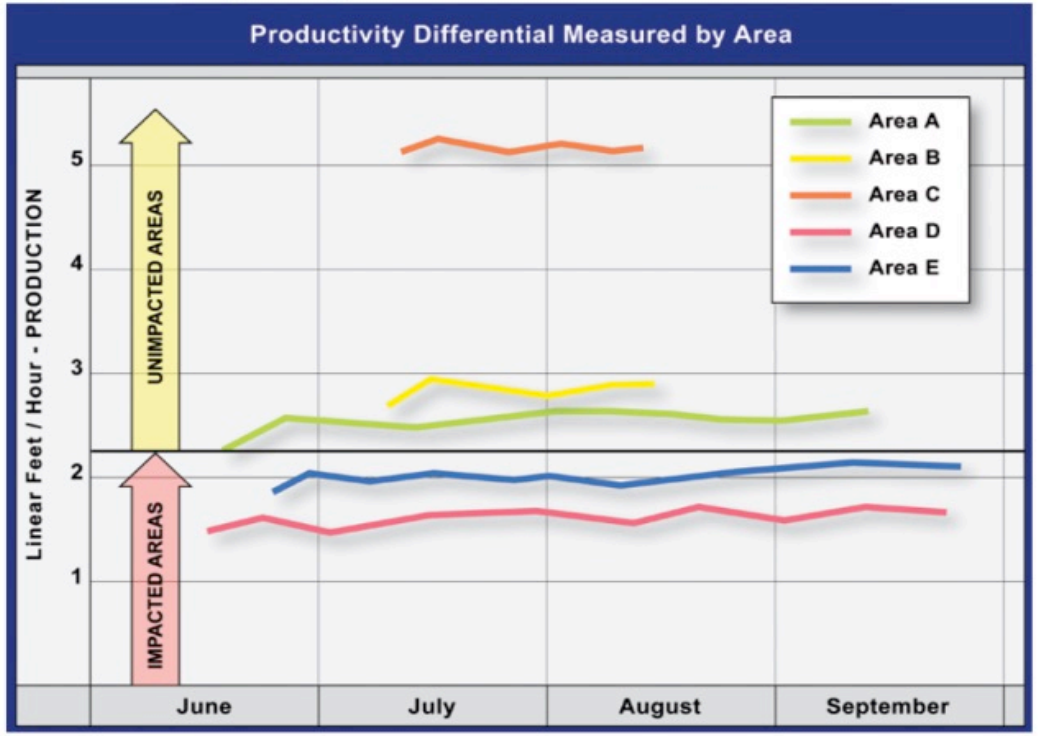
- Type of Work
- Means & methods
- Crew type/members/size
- Worker characteristics
- Supervision and management
- Project location, layout, and logistics
- Project schedule
- Weather/seasonality/time of year
- Overtime and shiftwork
- Logistics: Crowding/Congestion/Trade stacking.

Measured Mile Graphics

Sample Productivity Graphic by Time Period



Sample Productivity Chart by Area



What are the MCAA *Factors*?

- A set of estimating guidelines that have proven reliable and credible for over thirty years in estimating a mechanical contractor's loss of labor productivity
- Prepared by the Management Methods Committee of the MCAA in 1971 using an industry survey method of data collection
- Accepted by the major boards of contract appeals, other trial venues, and in arbitration tribunals as reliable and useful guidelines for estimating loss of labor productivity
- Reasonably simple to understand and employ within all levels of the mechanical contracting industry
- Can be used to forward price of retroactively price loss of productivity requests for equitable adjustment
- Supported by a user's manual published by the MCAA

Using the MCAA *Factors*

The MCAA *Factors* Provide for a Reasonable Estimate of the Labor Inefficiency Damages

- The MCAA *Factors* are not based on a statistical formula and are not represented to produce an exact measure of damages
- Reported cases have made it clear that a contractor's damages arising from inefficiency impacts do not need to be proven with mathematical exactness
- When using the MCAA *Factors*, a labor intensive contractor must employ knowledge of productivity concepts accepted in the industry, knowledge of the specific project conditions and a careful reading of each MCAA *Factor* category description

Using the MCAA *Factors*

What about those Three Percentages?

- **Each MCAA *Factor* has three percentages of impact intensity that must be considered and applied:**

  Minor - - Average - - Severe

- **These impact intensity ratings arrived at by interviewing the labor supervisors**

- **Considerations can include:**

  Crew size at the time of impact

  Number of trades working in the same areas

  Number of supervisors available to address changes

  Condition of the schedule – is the work critical?

  Will overtime be employed to mitigate delay?

Important Recent BCA Case Accepting the MCAA Factors

Turner Construction Company, Appellant
v
Smithsonian Institution, Respondent

Labor inefficiency costs. Because the disruptive impacts were constant and pervasive, Welch & Rushe could not identify a portion of its work that was not affected by these factors for the purposes of performing a measured mile analysis. Transcript at 2441-42. Welch & Rushe's expert, Paul Stynchcomb, testified that, because Welch & Rushe worked with different materials and different sizes of pipes, identifying a "measured mile" analysis would have been difficult. *Id.* at 3008.

Instead, Welch & Rushe relied on the Mechanical Contractors Association of America, Inc. (MCAA) factors to quantify its labor inefficiency claim. Mr. Stynchcomb recommended, and Welsh & Rushe applied, four MCAA factors: reassignment of manpower, concurrent operation, dilution of supervision, and site access. Exhibit 41 at 672; Transcript at 2568-69. Welch & Rushe's superintendent explained how each of these factors was appropriate, given the difficulties that Welch & Rushe experienced on the project. Transcript at 2687-703. Based upon the severity of these factors, Welch & Rushe calculated a 42% loss of productivity on a portion of its total labor costs. *Id.* at 2568-69.

Important Recent BCA Case Accepting the MCAA Factors

Suffolk Construction Company, Appellant
v
General Services Administration

(vi) Loss of Labor Productivity in the Basement and Subbasement

Suffolk and NB Kenney seek $863,997 for the loss of labor productivity in its work in the basement and sub-basement mechanical areas. Mr. Nims testified that numerous design changes and concealed conditions caused NB Kenney a significant loss of labor productivity. He identified the following impacts: limitations on the use of a slab opening between the basement and sub-basement for transporting equipment and materials, changes arising from the inadequate steam station support structure and heat exchanger support structure, the change involving extra insulation of condenser water piping, and the redesign of the structural supports for the piping systems due to spalling/deteriorated concrete ceilings. Messrs. Stevens and Stynchcomb prepared an analysis of loss of labor productivity in the basement using the Mechanical Contractors Association of America (MCAA) factors of reassignment of manpower, crew size inefficiency, site access, dilution of supervision, and overtime. For each week of work in the basement, they applied an MCAA inefficiency percentage depending on severity and type of impacts. Mr. Stevens determined that NB Kenney expended a total of 29,194 hours in the basement through late April 2009. Mr. Stevens and Mr. Stynchcomb opined that NB Kenney suffered loss of productivity in the basement totaling 10,212 hours. We conclude that the record supports finding that the changes impacted the flow of NB Kenney's work in the basement and sub-basement and caused inefficiency. We find that the record supports a total of 7300 hours for labor inefficiency. With markups, we grant this claim in the amount of $608,000.

What are Key Steps in Preserving Your Rights – Labor Productivity Impacts

The MCAA Factors productivity tables and user instructions are contained in the MCAA's publication titled "Change ● Orders Productivity ● Overtime A Primer for the Construction Industry" pp 135-136

Factor	Percent of Loss per Factor		
	Minor	Average	Severe
1. STACKING OF TRADES: Operations take place within physically limited space with other contractors. Results in congestion of personnel, inability to locate tools conveniently, increased loss of tools, additional safety hazards and increased visitors. Optimum crew size cannot be utilized.	10%	20%	30%
2. MORALE AND ATTITUDE: Excessive hazard, competition for overtime, over-inspection, multiple contract changes and rework, disruption of labor rhythm and scheduling, poor site conditions, etc.	5%	15%	30%
3. REASSIGNMENT OF MANPOWER: Loss occurs with move-on, move-off men because of unexpected changes, excessive changes, or demand made to expedite or reschedule completion of certain work phases. Preparation not possible for orderly change.	5%	10%	15%
4. CREW SIZE INEFFICIENCY: Additional workers to existing crews "breaks up"original team effort, affects labor rhythm. Applies to basic contract hours also.	10%	20%	30%
5. CONCURRENT OPERATIONS: Stacking of this contractor's own force. Effect of adding operation to already planned sequence of operations. Unless gradual and controlled implementation of additional operations made, factor will apply to all remaining and proposed contract hours.	5%	15%	25%
6. DILUTION OF SUPERVISION: Applies to both basic contract and proposed change. Supervision must be diverted to (a) analyze and plan change, (b) stop and replan affected work, (c) take-off, order and expedite material and equipment, (d) incorporate change into schedule, (e) instruct foreman and journeyman, (f) supervise work in progress, and (g) revise punch lists, testing and start-up requirements.	10%	15%	25%

Factor	Percent of Loss per Factor		
	Minor	Average	Severe
7. LEARNING CURVE: Period of orientation in order to become familiar with changed condition. If new men are added to project, effects more severe as they learn tool locations, work procedures, etc. Turnover of crew.	5%	15%	30%
8. ERRORS AND OMISSIONS: Increases in errors and omissions because changes usually performed on crash basis, out of sequence or cause dilution of supervision or any other negative factors.	1%	3%	6%
9. BENEFICIAL OCCUPANCY: Working over, around or in close proximity to owner's personnel or production equipment. Also badging, noise limitations, dust and special safety requirements and access restrictions because of owner. Using premises by owner prior to contract completion.	15%	25%	40%
10. JOINT OCCUPANCY: Change cause work to be performed while facility occupied by other trades and not anticipated under original bid.	5%	12%	20%
11. SITE ACCESS: Interferences with convenient access to work areas, poor man-lift management or large and congested worksites.	5%	12%	30%
12. LOGISTICS: Owner furnished materials and problems of dealing with his storehouse people, no control over material flow to work areas. Also contract changes causing problems of procurement and delivery of materials and rehandling of substituted materials at site.	10%	25%	50%
13. FATIGUE: Unusual physical exertion. If on change order work and men return to base contract work, effects also affect performance on base contract.	8%	10%	12%
14. RIPPLE: Changes in other trades' work affecting our work such as alteration of our schedule. A solution is to request, at first job meeting, that all change notices/bulletins be sent to our Contract Manager.	10%	15%	20%
15. OVERTIME: Lowers work output and efficiency through physical fatigue and poor mental attitude.	10%	15%	20%
16. SEASON AND WEATHER CHANGE: Either very hot or very cold weather.	10%	20%	30%

The MCAA Factors and CV-19 Labor Productivity Impacts

The MCAA factors have proven to be a reliable means of estimating the loss of labor productivity on construction projects for over 30 years. The specific values shown in the factor tables must be applied with careful consideration and a review of the facts surrounding the events, which caused the loss of productivity. The applications of the various MCAA factor percentages will vary as project conditions dictate. This chapter will provide specific guidelines and examples of several methods of application for the proper use of the MCAA factors in calculating the loss of labor productivity on construction projects.

Page 139

What types of CV-19 LoP impacts can be described by the 16 MCAA Factor categories?

#1 Stacking of Trades
#3 Reassignment of Manpower ("Disruption")
#4 Crew Size Inefficiency
#5 Concurrent Operations
#6 Dilution of Supervision
#7 Learning Curve
#11 Site Access
#12 Logistics (Material Supply Chain)
#14 Ripple Effect
#15 Overtime
#16 Unanticipated Weather Impacts

PP 135-136

The MCAA Factors and CV-19 Labor Productivity Impacts

For quantifying CV-19 impacts, there are three methods for the application of the MCAA Factors:

- ✓ **Evaluate the 16 Factor categories and determine which impact descriptions apply to the types of CV-19 being experienced on your project, reference pages 135-136**

- ✓ **For each impact category, determine the intensity level (the "Percent of Loss per Factor" column)**

- ✓ **Determine which application method will best quantify your project's LoP impacts:**
  1. **The total estimated field craft labor hour forward priced method**
  2. **The estimated field craft labor hour for the impact period only method**
  3. **The temporal field craft labor hour retrospective method**

- ✓ **If using the temporal approach (recommended), determine the time frames and hours for each – and the craft field labor hours that apply to each time frame; see the example from page 157:**

Contract Period	Week 40	Week 41	Week 42	Week 43	Week 44	Week 45
Actual Payroll Hours	1,600	1,600	1,800	2,400	2,400	3,200
Deducted Hours		–80	–120	0	–120	–120
Revised Actual Hours	1,600	1,520	1,680	2,400	2,280	3,080
Reassignment of Mpw	5%	5%	5%	10%	10%	10%
Dil of Supervision	0%	10%	10%	10%	10%	10%
Crew Size Ineff	0%	0%	10%	10%	10%	10%
Total MCAA factor	5%	15%	25%	30%	30%	30%
Est Loss of Productivity	76	198	336	554	526	711
					Total	2,401

The MCAA Factors and CV-19 Labor Productivity Impacts

For quantifying CV-19 impacts, there are four methods for the application of the MCAA Factors:

- ✓ **Evaluate the 16 Factor categories and determine which impact description applies to the types of CV-19 being experienced on your project**

- ✓ **Determine which application method will best quantify your project's LoP impacts:**
  1. **The total estimated labor hour forward priced method**
  2. **The estimated labor hour for the impact period only method**
  3. **The temporal (time based) labor hour retroactive method**
  4. **A combination of 2. and 3.**

The MCAA Factors were originally designed to capture the LoP impacts solely to the changed work itself. Contractors were to apply the appropriate MCAA Factors to forward priced change order proposals. This original application did not quantify the ripple effect of changes to the base contract labor hours, as has been clearly described and recognized in modern board of contract decisions.

As a result, contractors can apply the MCAA Factors in a way that recognizes the effect of change to the entire pool of base contract hours. CV-19 is a changed condition that, usually, does not impact a subset of the contractor's labor hours, but all labor hours expended during the impacted period.

The MCAA Factors and CV-19 Labor Productivity Impacts

In today's CV-19 impact environment, contractors are experiencing LoP impacts retroactively, that is, in a previous period, and prospectively, in some future period of time. Thus, applying a dual method of MCAA Factor application could be the most reasonable.

The retrospective method. Assume you are a contractor in August 2020 asked to quantify your firm's LoP impacts from the start of the pandemic effects on your project (say, February 24, 2020) to the present (August 4, 2020) and then to estimate (forecast) the LoP impacts from August 5th to October 31, 2020.

The retroactive method would apply for the first period (historic period) up to the present. Referencing the MCAA publication starting at page 150, the appropriate MCAA Factor categories and intensity percentages would be used to calculate (using the retroactive formula on page 153) the contractor's LoP. Moreover, if sufficient specific records are available, the contractor can use the recommended temporal approach to applying the retroactive method (see page 152). This adds specificity to the contractor's application of the Factors.

From "time now" forward, the contractor can apply a prospective LoP estimate using the MCAA Factors. Assuming the contractor can estimate the labor hours that will be expended on a monthly basis into to a time certain in the future, the contractor can apply the Factors to estimated (or planned) labor hours on a temporal basis.

The MCAA Factors and CV-19 Labor Productivity Impacts

Retrospective Period (Actual Labor Hours) | **Prospective Period (Planned Labor Hours)**

Feb - May	June – July	August - October
High Impact Period	Medium Impact	Estimated to be Medium Impact
4,000 FCLH	**2,000 FCLH**	**10,000 FCLH**
#3 Reassignment of MP 15%	#3 10%	#1 Stacking of Trades 10%
#4 Crew Size Ineff 10%	#4 10%	#3 Reassignment of MP 5%
#6 Dil of Supervision 15%	#6 10%	#11 Site Access 12%
Total 40%	Total 30%	Total 27%
Formula: actual craft hours divided by 1.% inefficiency = efficient hours Actual craft hours – efficient hours = inefficiency		Formula: planned field craft labor hours X estimated inefficiency = loss of productivity
4,000 FCLH ÷ 1.40 = 2,857 4,000 FCLH – 2,857 = 1,143 1,143 inefficient hours	2,000 FCLH ÷ 1.30= 1,539 FCLH 2,000 – 1,539 = 461 inefficient hrs	10,000 FCLH x 27% = 2,700 inefficient hours

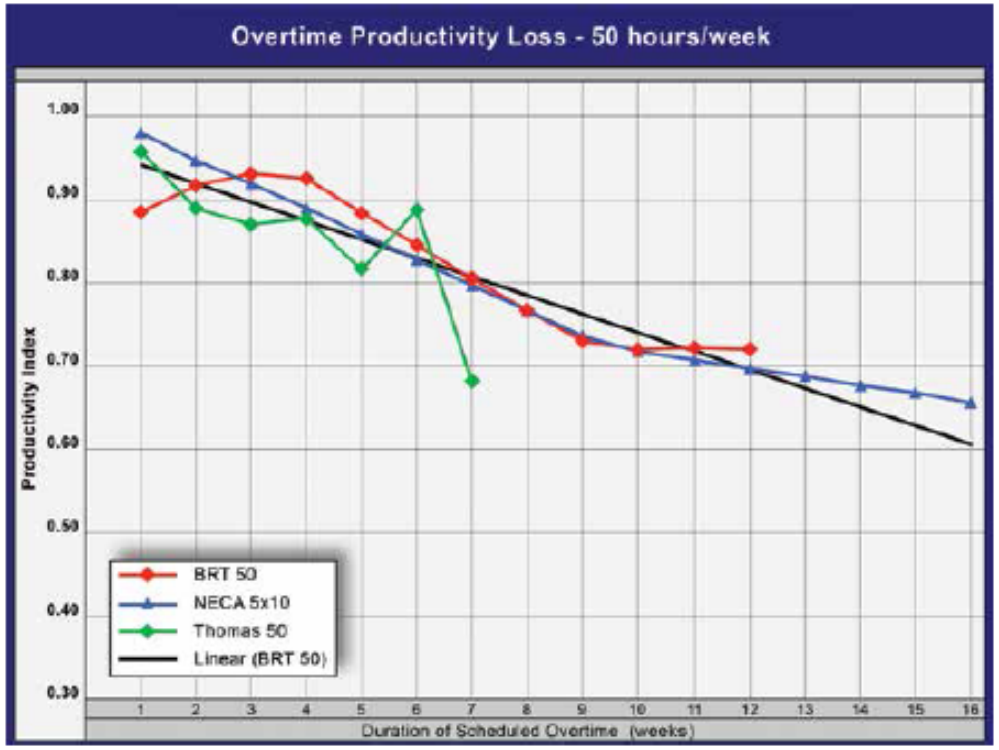
PP 144-156

If the contractor applies the MCAA Factors in a prospective manner (i.e., looing forward into the future), it is essential that the contractor attached a statement of reservations of rights that clearly state that the contractor has provided an estimate of impacts that may change, given actual circumstances, and that the contractor reserves its right to adjust its claim for damages based on actual events and conditions.

What if Your Firm is Required to Accelerate? – OT Impacts

Assume your project is delayed by CV-19 impacts, and under your subcontract, you are directed to accelerate by way of an overtime schedule. You can estimate the duration and work schedule required, so you can forward price the direct payroll costs, but how do you include the inefficiency costs in your forward priced ROM notice or cost proposal?

Refer to the chapter titled "How to Estimate the Impacts of Overtime on Labor Productivity" pp 217-231



Overtime LoP is predictable based on the schedule to be worked and the duration of that schedule. Historical data published by NECA, the Business Round Table and Dr. Randolph Thomas, PE can be used to forward price an acceleration effort, or estimate the LoP impact after the overtime as been completed. These data have been compiled and plotted to show expected LoP per week of overtime, up to 16 weeks.

The overtime LoP data is to be applied to <u>both</u> the overtime hours and the straight time hours that are expended during the overtime work schedule.

What if Your Firm is Required to Accelerate? – OT Impacts

Refer to the chapter titled "How to Estimate the Impacts of Overtime on Labor Productivity" pp 217-231

The LoP data has also been compiled in a table, based on the three studies (page 225).

As the OT proceeds from week to week, the LoP percent increases. The data from these curves and tables are to be used for forward pricing OT LoP change requests. If the contractor is applying these data retrospectively, the retrospective formula is to be applied, (pp 226-228).

Week of Extended OT	50 hrs/wk	54-56 hrs/wk	60 hrs/wk	63 hrs/wk	70-72 hrs/wk	84 hrs/wk
1	0.94	0.93	0.9	0.87	0.83	0.75
2	0.92	0.89	0.88	0.82	0.78	0.7
3	0.91	0.86	0.85	0.77	0.73	0.65
4	0.89	0.82	0.81	0.72	0.68	0.6
5	0.85	0.79	0.76	0.67	0.63	0.55
6	0.86	0.75	0.72	0.62	0.58	0.5
7	0.76	0.72	0.67	0.58	0.54	0.47
8	0.77	0.7	0.64	0.55	0.51	0.44
9	0.74	0.68	0.62	0.54	0.5	0.43
10	0.72	0.66	0.61	0.52	0.49	0.42
11	0.72	0.65	0.6	0.51	0.48	0.41
12	0.71	0.64	0.59	0.5	0.47	0.4
13	0.69	0.63	0.56	0.49	0.46	0.39
14	0.68	0.62	0.55	0.48	0.45	0.38
15	0.67	0.61	0.54	0.47	0.44	0.37
16	0.66	0.6	0.53	0.46	0.43	0.36

Retrospective Pricing Table

Week Ending	Act Hrs Worked	# Mechanics working over 40 hrs	Total Hours Subject to Loss of Productivity	Loss (pct) from 5/10 Table	Inefficient Hours
6-Feb-10	50	25	1,250	6%	71
13-Feb-10	50	24	1,200	8%	89
20-Feb-10	50	22	1,100	9%	91
27-Feb-10	50	22	1,100	11%	109
6-Mar-10	50	21	1,050	15%	137
13-Mar-10	40	22	880	0%	0
20-Mar-10	40	24	960	0%	0
27-Mar-10	50	25	1,250	6%	71
3-Apr-10	50	23	1,150	8%	85
10-Apr-10	50	23	1,150	9%	95
17-Apr-10	50	20	1,000	10%	91
				TOTAL	839

As noted, the OT LoP factors are to be applied to both the overtime hours and the straight time hours that are expended during the OT work schedule.

Overtime Inefficiency

- Precautions must be taken to notify that premium labor costs and labor inefficiencies will be recovered for overtime schedules
- If possible, establish the means of estimating the overtime inefficiency before the overtime schedule is implemented
- Overtime inefficiencies can be retroactively estimated, but by that time, the contractor has incurred the damage
- Include the inefficiency in the change order billing along with the premium payroll costs
- Use the appropriate table to forward price the overtime inefficiencies

- **DO NOT accelerate (i.e., work overtime) as a volunteer unless the delay is your fault !**

Overtime Inefficiency Including LOP

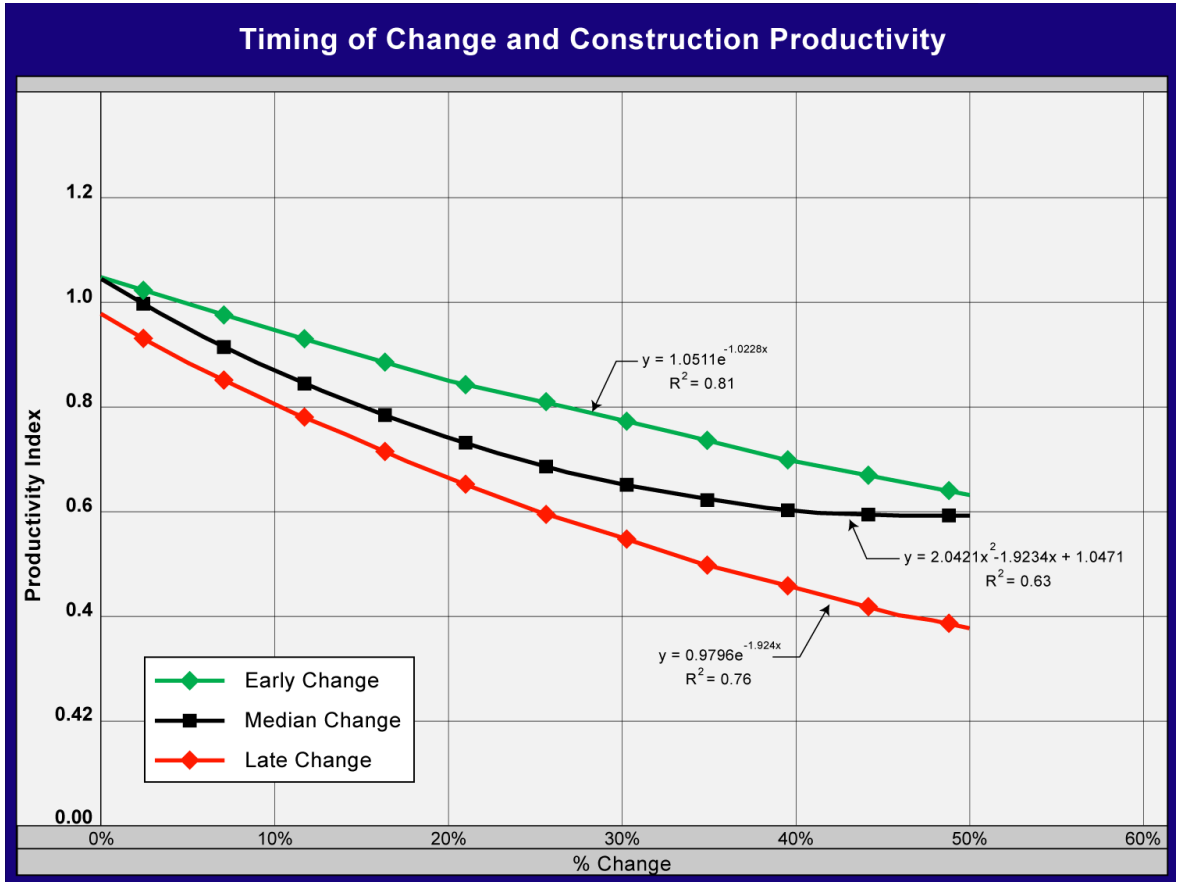
"The overtime pricing contained herein includes the added payroll costs for the overtime schedule provided by your office. Furthermore, this change order proposal contains a loss of labor productivity estimate based on the overtime schedule that we have received from your firm. The proposed overtime schedule provided by your office is the basis of our estimate for direct and inefficiency costs associated with this change order request. Amalgamated Mechanical Contractors expressly reserves the right to submit a separate change order proposal in the event the overtime schedule changes in any manner from that upon which we have relied in the pricing of this proposed change order."

Overtime Inefficiency – Qualified Proposal

"This change order proposal represents the direct additional payroll costs arising from the requested overtime schedule. No overtime inefficiencies are included in this proposal. Amalgamated Mechanical Contractors expressly reserves its rights to request compensation for labor efficiencies attendant to the requested overtime schedule. A revision to this change order proposal containing the costs for overtime labor inefficiencies will be forwarded for processing as soon as these costs can be computed. We estimate that the labor inefficiencies arising from this overtime schedule will not be less than ____ %."

Another Loss of Productivity Measurement Method

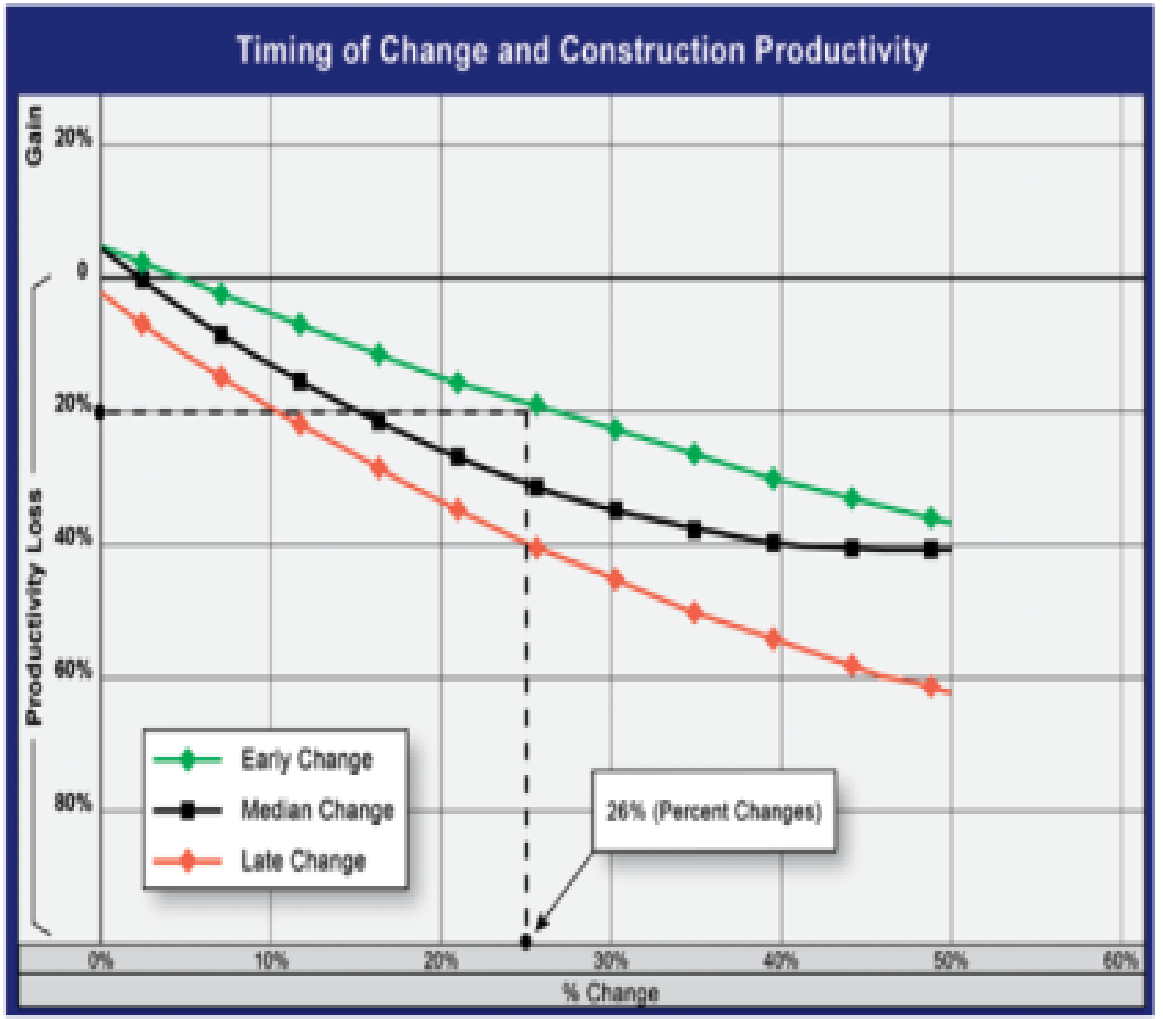
- ✓ Ibbs Curves to Measure Loss of Productivity (LoP)
- ✓ More change => More LoP
- ✓ Late change => More LOP
- ✓ Empirically-based
- ✓ Industry accepted.



✓ **Ref: MCAA 2020, pp. 181-214**

Total Hours	= 30,000
Bid Errors	= 2,500
Scope Change	= 5,500
Actual Contract Hours	= 22,000
% Change	= 5500/22,000
% Change	= 25%
Should-Have hours	= 22,000 / (1.2)
Should-Have Hours	= 18,333
Loss of Prod Hours	= 22,000 – 18,333
	= 3,667 Hours

Figure 8



The Modified Total Cost (Labor Hour) Method to Quantify CV-19 LoP Impacts

In the AACEi's hierarchy of preferred methods to quantify a loss of labor productivity, the two methods at the bottom of the list are the Modified Total Cost (Labor Hour), "MTC" method and the Total Cost method. One reason for this low ranking is due to the lack of particularization and specificity provided by these methods.

However, using any LoP methodology, the presenters recommend that the claimant prepare a MTC approach using field craft labor hours and not dollars or costs. Why – because this method identifies the maximum amount the claimant can claim without citing a "windfall" or "loss of profit" in labor hours.

The MTC formula:

1) **Total field craft labor hours actually expended on the project**
2) **(Less) the original estimated, or planned, field craft labor hours**
3) **(Less) approved change order field craft labor hours**
4) **(Less) pending PCOs or unapproved change order field craft labor hours**
5) **(Less) time and material ticket field craft labor hours**
6) **(Less) estimate labor adjustments for missed items or improper factoring**
7) **(Less) field craft labor hours to repair/address contractor errors in the field**

8) **Results in the total unallocated field craft labor hour loss on the project**

The total unallocated field craft hours derived from the MTC (Labor Hour) approach can be compared with the LoP quantifications derived by use of other, more specific methodologies, such as the measured mile or MCAA Factors' methods. It can also be used as a stand-alone quantification approach, although not favored.

What are Key Steps in Preserving Your Rights – CV-19 LOP Delays and the Project Schedule

The project CPM schedule, accurately updated to the time the impacts of the pandemic were measurable on the progress of the project, is a vital document to demonstrate the condition of the project's progress before, during and after, the adverse effects of the pandemic are identified

Under many contracts, in order to preserve rights (excusable and potentially compensable), the contractor or subcontractor claimant must show that the effect of the pandemic was the sole cause of critical path delay

In the case of critical path delays that existed prior to experiencing the effects of the pandemic, the contractor or subcontractor claimant should document the duration and cause of those delays, to the extent known by the contractor or subcontractor, to establish the "baseline" for measuring

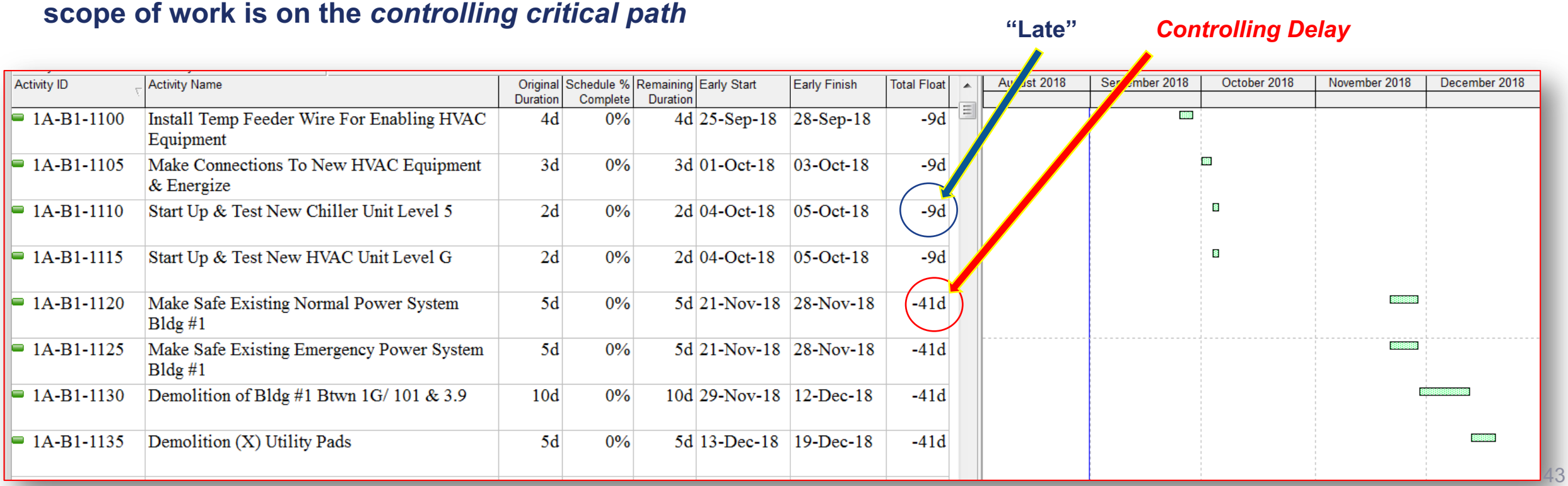
But what if you are a subcontractor and are denied access to the project schedule information? Write a letter to the prime contractor or CM affirming that any critical path delays to the project completion date recorded at the time the impacts of the pandemic began to affect your project, were not caused by your firm.

To the fullest extent possible, ensure that all necessary materials and equipment, particularly those items that may be affected by pandemic-related procurement/transport/shipping delays, are timely ordered and received on site

What are Key Steps in Preserving Your Rights – the Project Schedule

For instance, the mechanical subcontractor in the example below may have activities that are "late" in starting, however only the activities on the *controlling critical path* dictate the amount of project delay that is being experienced – in this example, the power system work is the controlling critical path

If the pandemic effect is causing schedule slippage, each contractor on a project must know if their scope of work is on the *controlling critical path*



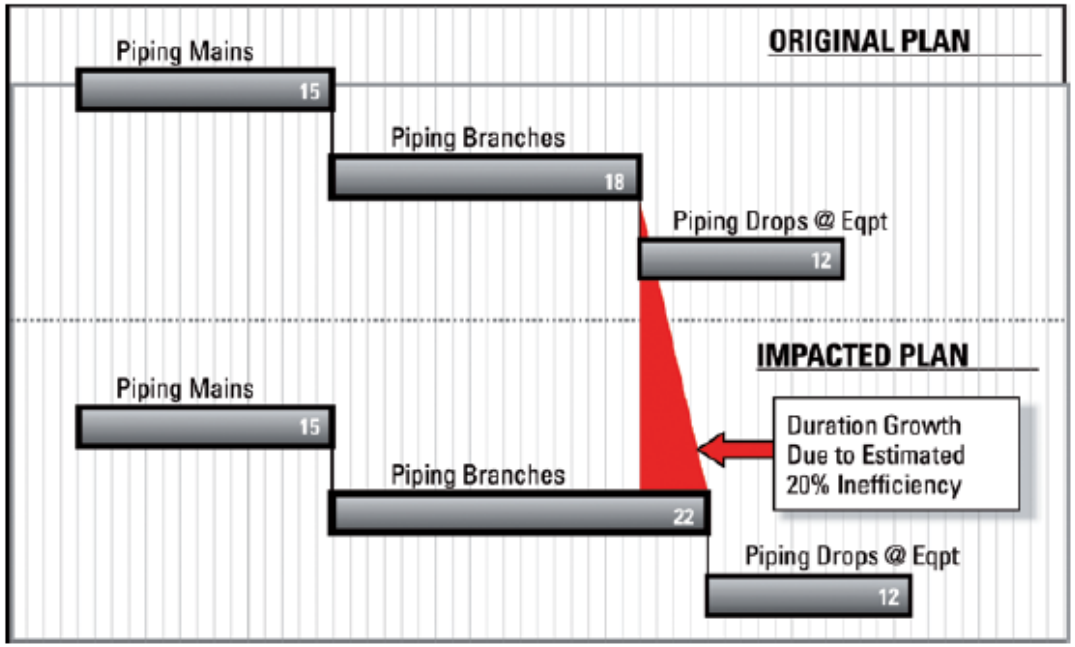
Activity ID	Activity Name	Original Duration	Schedule % Complete	Remaining Duration	Early Start	Early Finish	Total Float
1A-B1-1100	Install Temp Feeder Wire For Enabling HVAC Equipment	4d	0%	4d	25-Sep-18	28-Sep-18	-9d
1A-B1-1105	Make Connections To New HVAC Equipment & Energize	3d	0%	3d	01-Oct-18	03-Oct-18	-9d
1A-B1-1110	Start Up & Test New Chiller Unit Level 5	2d	0%	2d	04-Oct-18	05-Oct-18	-9d
1A-B1-1115	Start Up & Test New HVAC Unit Level G	2d	0%	2d	04-Oct-18	05-Oct-18	-9d
1A-B1-1120	Make Safe Existing Normal Power System Bldg #1	5d	0%	5d	21-Nov-18	28-Nov-18	-41d
1A-B1-1125	Make Safe Existing Emergency Power System Bldg #1	5d	0%	5d	21-Nov-18	28-Nov-18	-41d
1A-B1-1130	Demolition of Bldg #1 Btwn 1G/ 101 & 3.9	10d	0%	10d	29-Nov-18	12-Dec-18	-41d
1A-B1-1135	Demolition (X) Utility Pads	5d	0%	5d	13-Dec-18	19-Dec-18	-41d

Key Steps in Preserving Your Rights – the Project Schedule

How does a contractor forecast estimated time impact of labor inefficiencies arising from pandemic in CPM schedule?

- ✓ Evaluate CPM schedule update closest to the commencement of pandemic-related impacts for accuracy; do the activities reflect the contractor's scope of work? is logic correct? is progress reporting accurate? and is forecasted end date of project reasonably reflected in schedule?
- ✓ Perform a forward-looking labor productivity impact analysis estimate using one of the methodologies that will be discussed in the next section of this webinar
- ✓ From that forward looking, estimated labor productivity impact analysis, determine an overall percent of inefficiency for the crews that will potentially be affected by the pandemic
- ✓ Apply that estimated inefficiency percentage to the planned durations of all of the field labor activities that are expected to be adversely affected by the pandemic and recalculate the schedule to ascertain the time impacts
- ✓ If your forward-looking estimate of time impacts arising from the pandemic is to be submitted to an owner or prime contractor for consideration / relief, prepare a detailed reservations of rights cover letter that will allow refinement of the loss of productivity estimate as events actually unfold

Loss of Productivity May Result in Schedule Impacts and Delay to Project Completion Date



Pages 106 - 109

- Use a current and accurate version of the project CPM schedule's native file
- Quantify the loss of labor productivity as an impact percent (in the example, a 20% LoP impact)
- Identify the activity or activities that sustained the LoP impact (percentages may vary)
- Factor the planned duration(s) of the affected activity(ies) by the percentages of LoP impact
- Re-run time analysis to determine if the added LoP durations affect the schedule
- Include a request for an extension of time in conjunction with relief for the LoP damages

Loss of Productivity May Result in Schedule Impacts and in Delay to the Project's Completion Date

- **What if the prime contractor refuses to provide the native CPM schedule update files?**

  - ✓ **Compile a list of the affected activities with their planned durations and their impacted durations, with a notation of the percent of LoP used to factor each activity**

  - ✓ **Submit the list to the prime or general contractor requesting that the duration adjustments be entered into the update of the CPM schedule closest to the time of the impacts**

  - ✓ **Request (in writing) that the prime contractor update the impacted CPM schedule to determine if the added durations resulting from the LoP affect the project's critical path or the critical path of your company's work, and to provide detailed output reports**

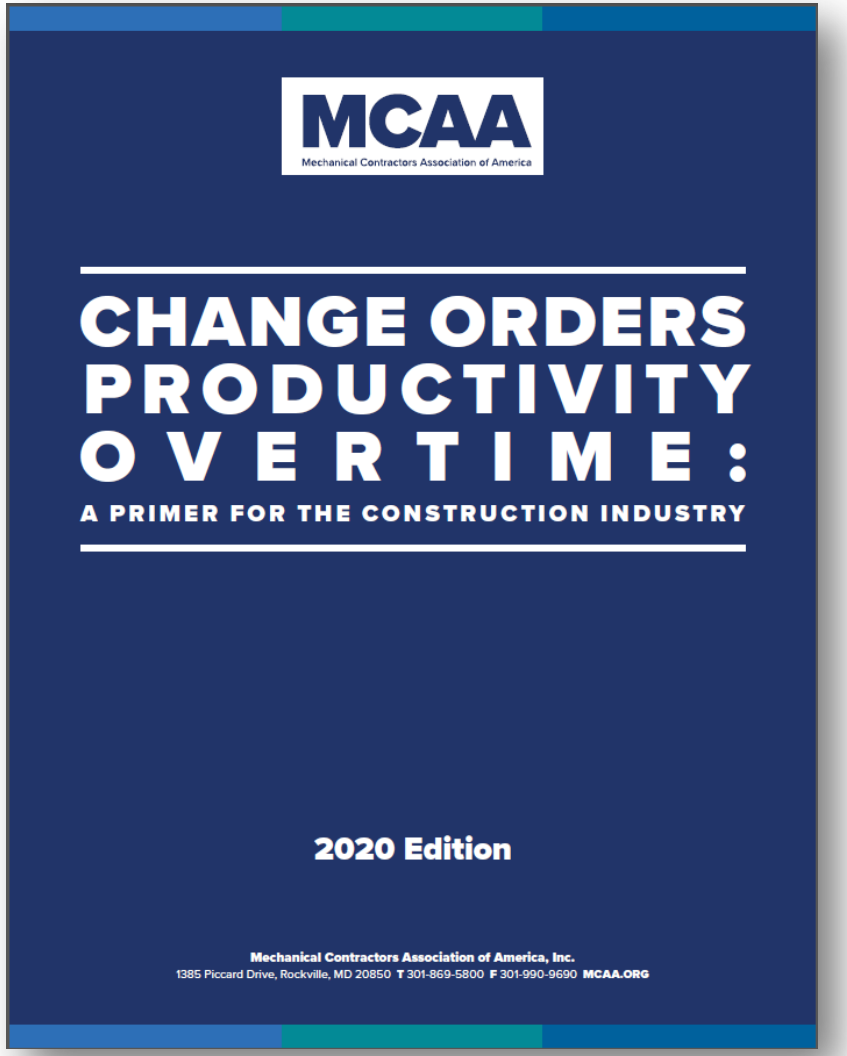
  - ✓ **Send a written Reservations of Rights letter stating that due to the prime contractor's refusal to provide the native schedule files, your firm expressly reserves the right to review and if necessary, correct the results of the schedule impact analysis, once the native schedules files are made available**

What are Key Steps in Preserving Your Rights – Project Impact Analyses

Regardless of what method is used to estimate time impacts and/or loss of labor productivity:

- ✓ **Accompany the estimated impact results with a narrative that explains how the delay time impact and/or loss of labor productivity estimates were prepared and what assumptions were made**
- ✓ **Label the time impact / loss of productivity estimates as a "ROM", Rough Order of Magnitude**
- ✓ **Suggest ways that the expected delays and/or loss of labor productivity could be mitigated**
- ✓ **Include a comprehensive reservations of rights letter that clearly states the loss of productivity, and / or any time impact / delay quantifications, are estimates based on assumptions being made at a given date, and that these ROMs may change given actual circumstances.**

Using the MCAA's Publication to Quantify CV-19 Loss of Labor Productivity and Delay on Your Project



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