

**American Bar Association
Forum on the Construction Industry**

**THE REALITY BEHIND THE THEORY OF
LOSS OF LABOR PRODUCTIVITY**

**CHALLENGES TO ADMISSION OF – OR BELIEF IN – LOST
PRODUCTIVITY CLAIMS BASED ON INDUSTRY STUDIES**

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Vinny Gambini: I object to this witness being called at this time. We've been given no prior notice he'd testify. No discovery of any tests he's conducted or reports he's prepared. And as the court is aware, the defense is entitled to advance notice of any witness who will testify, particularly to those who will give scientific evidence, so that we can properly prepare for cross-examination, as well as to give the defense an opportunity to have the witness's reports reviewed by a defense expert, who might then be in a position to contradict the veracity of his conclusions.

Judge Chamberlain Haller: Mr. Gambini?

Vinny Gambini: Yes, sir?

Judge Chamberlain Haller: That is a lucid, intelligent, well thought-out objection.

Vinny Gambini: Thank you, Your Honor.

Judge Chamberlain Haller: Overruled.

My Cousin Vinny (1992).

I. INTRODUCTION

My presentation is directed primarily to the lawyers in attendance, and particularly to those who may not have often, or ever, wrestled with a claim for loss of labor productivity on a construction project. The first time one is faced with such a claim he or she will be hearing references to theories of recovery that are likely to be arcane and in many cases difficult to understand and evaluate, at least until after the engagement of a helpful expert consultant who can explain the issue. Thereafter, the lawyer can spend some time thinking about how to get a client's claim for lost productivity into evidence, or keep out an opponent's claim, or support or debase the credibility of the claim once in evidence.

Many lawyers reading this may have had the experience of opening a Rule 26 Expert Report and reading something like the following (actual) opinion:

The CII's study on the effects of changes on labor productivity found that on average, labor inefficiency when performing changes was about 70 percent of the efficiency when not performing changes. . . . Other industry studies (MCAA and NECA Studies of Productivity Factors) found that multiple contract changes cause manpower to be reassigned, dilutes supervision resulting in errors and omissions and have a negative effect on morale and attitude that can increase costs in the a range of 20 percent to 40 percent.¹

The author, relying upon these references, assigned a 30 percent inefficiency factor to all manhours worked by a general contractor's forces after a major disruption of a project to renovate public housing.

Another consultant testified, in a case involving construction of a municipal building and disputed changes in erection of structural steel, as follows:

Again, CII² and most published studies say a contractor should anticipate between six and ten percent on an average project for change. Anything in excess of that can be considered excessive changes and subject to impact and inefficiencies caused by excessive changes. . . . We look at the report that says okay, you should expect 30 percent impact and inefficiency when you have excessive changes. . . . Excessive changes cause 30 percent. . . . The items that I found from the mechanical contractors and electrical contractors associations factors which, according to the most recent studies I've seen, apply to all trades, percentages would be higher, but they are cumulative. They would be higher than 30 percent. I took the low end.

A (perhaps more cautious) expert submitting a report in a recent case involving changes to steel mill construction contracts, alleged to have resulted from late or incomplete engineering drawings, vaguely listed a number of references, including the "Leonard Study" and a couple of the CII reports referred to below, without referring to any specific pages, language or

¹ These acronyms refer to studies, described elsewhere in this presentation, by the Construction Industry Institute (CII), Mechanical Contractors Association of America (MCAA), and National Electrical Contractors Association (NECA).

² The witness was asked to provide the specific CII study to which he referred and eventually admitted he did not possess a complete copy, but did provide an excerpt from the August 1994 publication referred to at note 37, *infra*.

conclusions from any of them, then stated flatly that it is “generally accepted” that if a base construction contract receives more than 10 percent in change orders over the base price, a productivity loss occurs.

What is this “loss of productivity” effect that seems to crop up so often in construction cases? And what are these magic studies that seem to apply to all construction projects equally, and allow the mechanical assignment of productivity loss factors so easily? And can these studies really carry so much freight?

A. *What Is Lost Productivity?*

I defer to my fellow panelists, who are acknowledged experts on the subject of lost productivity, for the technical description; in layman’s terms a loss of labor productivity occurs when some element of construction requires more labor than it should have. If the excess labor hours can be shown to be the responsibility of another party, under circumstances where the contract or law affords a remedy, then a valid lost productivity claim may be made. In some of the cases, the reader will see these claims referred to as “inefficiency” or “loss of efficiency” or “disruption” claims. Moreover, any research on the subject in either the judicial or the scientific literature will lead one to a discussion of “cumulative impact,” which usually will involve claims of lost productivity based on a series of change orders or other disruptive events, often where the lost productivity claim was omitted from the original request for compensation.³

B. *When Is a Claim of Lost Productivity Likely To Be Encountered In a Construction Dispute?*

³ Cumulative impact is a matter beyond the scope of this portion of the presentation, but the interested reader may want to refer to William Ibbs & Long D. Nguyen, *Using the Classical Measured Mile Approach and Variants to Quantify Cumulative Impact Claims*, 32:1 THE CONSTR. LAW. 18 (Winter 2012), and William Ibbs & Long D. Nguyen, *Cases and Board Decisions on Cumulative Impact Claims*, 31:4 THE CONSTR. LAW. 32 (Fall 2011).

The cynical impulse would be to answer, “when a contractor has hired the right expert,” but let us focus instead on when a compensable loss of productivity is likely to have *occurred*, and then assume the ably represented contractor will present a claim for it. The literature on productivity, the presentations submitted by my co-panelists, and a number of industry sources referred to hereafter all provide guidance about the likely causes of productivity loss, but generally they refer to matters that disrupt a contractor’s planned work sequencing, scheduling, volume, manning, and flow. An article by Bill Ibbs and others, crediting Schwartzkopf,⁴ provides a list of six groups of controllable and uncontrollable factors which affect labor productivity: schedule acceleration, change in work, management characteristics, project characteristics, labor and morale and project location/external conditions; and quotes other authors who categorize the major components of productivity loss as “waiting or idle, traveling, working slowly, doing ineffective work, and doing rework.”⁵

Why are so many claims for lost productivity encountered at present? Experts have referred to an “epidemic of claims” in the construction industry, and reported the following: “No reliable estimates on the size or value of lost labor productivity could be found, but it is certainly a major portion of the \$65 billion total claim figure reported by Ibbs and Allen (1995).”⁶ Others have recently reported that “schedule delay due to lost productivity is one of the hottest topics in

⁴ WILLIAM SCHWARTZKOPF, *CALCULATING LOST LABOR PRODUCTIVITY IN CONSTRUCTION CLAIMS* § 12.03 (2d Ed. 2004).

⁵ William Ibbs, Long D. Nguyen & Seulkee Lee, *Quantified Impacts of Project Change*, *JOURNAL OF PROFESSIONAL ISSUES IN ENGINEERING EDUCATION AND PRACTICE* at 45 (January 2007).

⁶ William Ibbs & Min Liu, *Improved Measured Mile Analysis Technique*, *JOURNAL OF CONSTRUCTION ENGINEERING AND MANAGEMENT* 1249 (December 2005).

delay claims,”⁷ and a 1994 study of 24 construction projects found that 50 percent of the value of claims was for disruption or loss of productivity.⁸

One theory is that lost productivity claims are increasing because of an overall decline in productivity,⁹ although productivity “lost” in this way would not appear to be compensable under any normal theory. Whether the cause is decreasing productivity, or increasing recognition of the loss by contractors, or of presentation of claims for the loss by experts, the fact remains that these claims are often in issue, and many of them require us to deal with industry studies cited in their support. A final, intriguing theory is that lost productivity claims are proliferating because of the availability of industry studies to support them! “One of the factors contributing to the proliferation in such claims is the availability and convenience of labor productivity studies produced under the auspices of various institutions and industry groups, such as CII.”¹⁰

II. PROOF OF LOST PRODUCTIVITY – FOUNDATIONS OF EXPERT TESTIMONY

A. General Principles

The general subject of this presentation is “industry studies involving loss of labor productivity claims,” and I will concentrate on the evidentiary issues involved in claims based on

⁷ Jyh-Bin Yang, Quei-Mei Huang and Chang-Hung Lee, *Evaluation of Delay Analysis Methodologies on Lost Productivity in Construction Projects*, Presentation to 27th International Symposium on Automation and Robotics in Construction (2010).

⁸ Nuhu Braimah, Issaka Ndekugri & Rod Gameson, *A Review of Industry Standards and Publications/Charts for Adjusting Productivity Losses in Construction Contracts*, Presentation at the 22nd Annual ARCOM [Association of Researchers and Construction Management] Conference, Birmingham, UK at 49 (September 2006)

⁹ *Id.* (reporting on European studies indicating that up to 30 percent of construction is rework, labor is used at only 40-60 percent in figures of potential efficiency, accidents can account for three-six percent of total project costs and at least ten percent of materials are wasted).

¹⁰ *Construction Claims Experts Labor Productivity*, DISPUTES IN CONSTRUCTION (online publication of the Holloway Consulting Group, LLC at <http://www.disputes.in.construction.com/article-111>).

those studies, but it may be helpful to discuss briefly some of the basic approaches to proving these claims, for a number of reasons. For one, it will demonstrate the variety of techniques in use, related to the issue whether there is a single gold standard that courts should require. For another, in many cases an expert witness combines reliance on an industry study with some other technique to support his or her testimony. It is also helpful to know the preferred techniques, if only to inquire why an opposing expert isn't using one of them. Finally, one should not be shocked to realize that a witness may occasionally be presenting a claim based on one of the less-respected techniques but describing it as something more credible.

This introduction assumes that there will be an expert testifying, or trying to do so. Generally expert testimony will be required, except in the very rare case where a contractor has realized it was suffering productivity loss in time to keep detailed, credible records of its losses. These cases do not appear often in the literature or the reported judicial precedents.¹¹ Lost productivity claims are not easy to prove, and in most cases, the courts take the position that expert testimony is a necessity.

It is a rare case where loss of productivity can be proven by books and records; almost always it has to be proven by the opinions of expert witnesses. However, the mere expression of an estimate as to the amount of productivity loss by an expert witness with nothing to support it will not establish the fundamental fact of resultant injury nor provide a sufficient basis for making a reasonably correct approximation of damages.¹²

This latter point is critical – an expert, no matter what her qualifications, will not normally succeed in delivering a bald opinion on the amount of damages caused by a productivity loss without some sufficient factual basis for it.

¹¹ In one amusing example, a court rejected the argument of a claimant that its own schedules and productivity rates should have been ignored in favor of measuring its productivity by industry rates. *Georgia Power Co. v. Georgia Pub. Serv. Comm'n*, 396 S.E. 2d 562 (Ga. App.), *cert den'd*, ___ S.E. 2d ___ (Ga. 1990).

¹² *S. Comfort Builders, Inc. v. United States*, 67 Fed. Cl. 124, 144 (2005) (citations omitted).

Expert testimony alone will generally not be sufficient to establish lost productivity, particularly if the expert's opinion is not firmly grounded in the project records. On numerous occasions, courts and boards have found proffered expert testimony to be unpersuasive and insufficient to support an award of damages for lost productivity. “[A]fter-the-fact, conclusory’ opinions of expert witnesses are not sufficient proof of lost productivity.”¹³ On what foundation the expert's testimony about damages rests is the subject of this presentation.

One important point to keep in mind is that experts' use of industry studies (or other methods) to prove the amount of a productivity loss will be a useless exercise if the other elements of a successful lost productivity claim – liability and causation – cannot be established. Liability must be based either on a remedy-granting provision in the contract or on the owner's breach of contract, and evidence that the owner did something to hinder the contractor's performance such as denying it access or initiating a substantial number of changes. Causation requires proof that the loss of productivity was caused by the owner's conduct, rather than the contractor's poor estimate, inability to properly schedule its own work, or failure to coordinate the work; causation can be “an elusive commodity.”¹⁴

If these elements of proof are available, the claimant's expert will face a choice of methods to attempt to *quantify* its actual damages from lost productivity. Where actual detailed cost records, allowing allocation to periods of impacted productivity, are not available, a contractor might attempt to prove, on its own or through a damages expert, a total cost claim (my total costs less my estimated costs = my damages), but the courts and boards are highly skeptical

¹³ SCHWARTZKOPF, *supra* note 4, at § 12.03 (citations omitted).

¹⁴ Reginald M. Jones, *Update on Proving and Pricing Inefficiency Claims*, 25-3 THE CONSTR. LAW. 3 (Summer 2003).

of these.¹⁵ A modified total cost claim includes adjustments for those estimating errors and contractor-caused or otherwise non-compensable cost overruns which the contractor is willing to concede, and while it is obviously a more objective claim in the usual case than the total cost claim, it is not a favored method of proof.

More likely, the expert will express an opinion of the contractor's lost labor productivity based either on a scientific comparison of productivity rates under different circumstances, or on conclusions drawn from comparisons to published productivity studies, or both, bolstering his or her opinion to the maximum extent possible with whatever data is available from the contractor's records. Many writers and courts have declared that the former method, comparing productivity rates experienced by the contractor under different circumstances, is preferred where actual cost records don't make the case, and that the "measured mile" technique is the gold standard of estimating. For example,

There are several methodologies that have been employed traditionally for quantifying loss productivity. Those that are more favored by courts and boards specifically demonstrate the cause and effect relationship between the owner's act or omission and the inefficiency sustained. The 'Actual Cost' and 'Measured Mile' methods discussed below fall into this more favored category. The methods least favored by courts and boards are those that assess loss productivity damages more generally without distinguishing the separate causes for the loss. The 'Total Cost' and 'Modified Total Cost' methods described below fall into this, least favored, category. Other methodologies fall somewhere in between.¹⁶

¹⁵ Most experts are also aware of how suspicious tribunals are of total cost claims, and will go to some lengths to avoid admitting they are presenting one.

¹⁶ Lewis J. Baker, *Searching for the Holy Grail? Is There A New Way to Measure Loss Productivity and Will it Pass the Daubert/Kumho Threshold?* Presentation to the American Bar Association Forum On The Construction Industry meeting of May 6, 2004, Scottsdale, Arizona.; accord, Paul J. Gorman, Daniel Kwon, Paul A. Barela & David B. Wonderlick, *Pricing of Construction Claims*, in PATRICK A. MCGEEHIN, EDWARD G. BENES, PATRICK J. GREENE, JR., & WM. CARY WRIGHT, *CONSTRUCTION ACCOUNTING* at 217, 229 (2010) (footnote omitted) ("the Measured Mile approach is widely regarded as the best approach for labor inefficiency claims because it accounts for the contractor's own problems, is based on actual performance on the

My fellow panelists are far more qualified to describe “measured mile” technique, and some of the problems in applying it, than I.¹⁷ Experts opining about damages on the strength of a measured mile must do so diligently; a “misapplied measured mile analysis is as hurtful to a claim as a well-conceived analysis is helpful.”¹⁸ In *P. W. Construction, Inc. v. United States*,¹⁹ a court of appeals vacated the Court of Claims award of damages for lost productivity because the expert’s measured mile analysis had not compared equivalent types of work.

B. Proof of Lost Productivity by Reference to “Industry Studies”

Where one of these favored techniques is not available, for lack of records or of comparable labor statistics, the testifying expert will likely resort to forming an opinion supported by a study of productivity from some of the sources discussed in this presentation and those of my fellow panelists. The use of opinion testimony based on productivity studies is well-established in the cases, and approved in much of the literature, but obviously this type of analysis, like any other, is capable of being performed incorrectly. Ways in which this analysis can be evaluated, and possibly discredited, will be discussed below.

It is clear that industry studies²⁰ must be used sensibly, in order to be believable (possibly even admissible); to have one’s project superintendent testify to labor inefficiency caused by, for example, project acceleration, then whip out an industry study and assign a value to it, will not be likely to work.

project at issue, and establishes a link between the cause (claim issue) and the effect (labor inefficiency.”)

¹⁷ See, e.g., the Ibbs and Nguyen article on the subject cited at note 5, *supra*.

¹⁸ Lee Davis, Laura Stipanowich & Walter Bauer, *Does the “Measured Mile” Measure Up? When It Has, When It Hasn’t, and What May Happen Under Daubert/Kumho*. 2007-4 CONSTRUCTION BRIEFINGS at 3 (April, 2007).

¹⁹ 53 Fed. Appx. 555, 558 (Fed. Cir. 2002).

²⁰ I use the term “industry studies” to describe both publications of industry groups such as the MCAA and also academic studies such as Leonard’s or those published by the CII.

The common thread running through decisions and cases in which construction industry studies are approved is when the claimant uses such studies in conjunction with qualified expert opinion testimony; as opposed to the blind application of such studies in a vacuum, e.g., without regard to the facts of the particular construction project. Indeed, academics and construction law practitioners have noted that a mere expression of an estimate is not sufficient but, instead, a claimant must establish a sufficient basis for making a reasonable approximation of the amount of damages incurred. In other words, application of a labor productivity study, whether well-known or obscure, by a qualified expert in a reasonable manner can, in the right circumstances, be a legitimate means to calculate damages.²¹

Not only should the study be utilized by a qualified expert, however, but it should also, ideally, be used to support an opinion that has another foundation.

The primary utility of academic and industry studies lies in bolstering the credibility of a claim prepared using another method, such as a Measured Mile analysis. . . . If the contractor has no other options, use of industry and academic studies can be helpful, although recovery on a claim based *solely* on such studies can be a daunting proposition, and few court decisions have permitted such claims.²²

What do we mean by these studies? There are a number of industry or academic studies in publication,²³ many of which are described in the portions of this presentation produced by my fellow panelists, who have been involved in actually producing a number of them. My experience has exposed me primarily to manuals or publications generated by the Mechanical Contractors Association of American, to what is referred to as the “Leonard Study,” analyzing the effects of change on labor productivity, and to certain publications of the Construction

²¹ Gregory J. Dukellis, *The Contractor’s Prospective: Proving Productivity Losses*, URS CLAIMS RESOURCE 2, 3 (Summer 2004).

²² Paul J. Gorman, Daniel Kwon, Paul A. Barela & David B. Wonderlick, *Pricing of Construction Claims*, in PATRICK A. MCGEEHIN, EDWARD G. BENES, PATRICK J. GREENE, JR., AND WM. CARY WRIGHT, Eds., CONSTRUCTION ACCOUNTING at 217, 232-33 (2010).

²³ The AACEI Recommended Practice, cited at note 68, *infra*, contains a detailed listing of numerous studies on the subject.

Industry Institute (although there are many more, some highly arcane, and other construction lawyers' experiences have no doubt been entirely different from mine).

1. MCAA

The study seemingly most often discussed is the “MCAA manual,” most recently revised in 2012,²⁴ which provides a list of 16 factors affecting labor productivity, with a percentages of loss for each factor, according to whether the factor’s impact is “minor,” “average” or “severe,” along with an article on how to use these factors.²⁵ These factors can be used to derive the “should have spent” hours on the project, which can then be deducted from the total, adjusted actual hours spent to determine hours of lost productivity. Hypothetically, “should have spent” hours ought to equal the estimated hours, although for various reasons this almost never happens.²⁶ The MCAA bulletin contains its own cautions about overuse of these factors, discussing the desirability of using actual labor cost records where available, and advising against over-reliance on its percentage factors, but where an actual cost claim has been impossible, experts have successfully relied on the MCAA factors. The authors recommend that a modified total cost method analysis of productivity loss be prepared as a sort of sanity check on the estimated loss of productivity resulting from using the MCAA factors.²⁷

Though the apparent simplicity of the use of the MCAA factors may tempt contractors to try to generate their own in-house analyses, MCAA regards it as

vital that the contractor retain an experienced and independent expert to perform the inefficiency analysis, prepare the expert report, and testify as

²⁴ CHANGE ORDERS PRODUCTIVITY OVERTIME – A PRIMER FOR THE CONSTRUCTION INDUSTRY (MCAA 2012) (“the MCAA factors have gained wide acceptance in the construction industry and before various courts, boards of contract appeals and tribunals of the American Arbitration Association.” *Id.* at 82).

²⁵ *Id.* at 77-78, 81

²⁶ *Id.* at 96.

²⁷ *Id.* at 99.

an independent expert if necessary. . . . Even when an independent expert is utilized, it must be underscored that the MCAA factors should be applied in a reasoned manner, relying on the methodology set forth in this chapter. Outlandish and unsupportable inefficiency analyses will draw deserved skepticism from the courts and boards of contract appeals.²⁸

The publication also includes a chapter on how to apply the measured mile analysis and a chapter on analyzing productivity losses from overtime, relying on various studies such as the Business Roundtable and NECA publications.

Research indicates that the MCAA factors appear to have received more acceptance as foundations, or partial foundations, for expert testimony on productivity losses than any of the other studies. For example, in *Clark Construction Group, Inc. v. United States*,²⁹ the board stated:

We will utilize the productivity factors from the MCAA Manual as the best method to arrive at the percentage estimates of PKC's and USM's undeniable productivity losses. We find no other basis in the record on which we could better calculate the amount of PKC's productivity losses in this appeal and, . . . the MCAA productivity factors are a reasonable starting point to estimate efficiency losses. Despite the inherent subjectivity of the MCAA factors, the Record here demonstrates that *the MCAA factors are a widely used industry standard method of accounting for the impact of inefficiency on mechanical work*.³⁰

Likewise, the board in *Stroh Corp. v. General Services Administration*³¹ approved of use of a ten percent factor from the MCAA manual for marking up actual costs to reflect inefficient labor.

2. *The Leonard Study*

²⁸ *Id.* at 103-104.

²⁹ VABCA No. 5674, 00-1 BCA ¶ 30870 (VABCA 2000).

³⁰ *Id.* (emphasis supplied).

³¹ GSBCA No. 11029, 96-1 BCA ¶ 28265 (1996); *see also* *Clark Concrete Contractors, Inc. v. Gen. Servs. Admin.*, GSBCA No. 14340, 99-1 BCA ¶ 30280 (1999), rejecting GSA's measured mile analysis as improperly performed, and accepting the use of the MCAA Manual to support a lost productivity claim, commenting that "the publication is generally accepted in the mechanical industry for this purpose [measuring impacts]."

As demonstrated by my introduction, a work often called the “Leonard Study” is relied upon heavily by some experts. Some of them have probably never *read* the Leonard Study,³² since it was an unpublished paper submitted thirty-five years ago in partial satisfaction of the requirements for an advanced Canadian degree, but its results were summarized in a 1987 publication by the Revay firm of consultants, with which Leonard was associated.³³

Leonard studied 90 cases on which his firm was engaged where the contractor had reported productivity losses as a result of change orders. These involved 57 independent projects categorized as either electrical/mechanical contracts, or civil/architectural contracts, on building and industrial construction. Leonard concluded that

25 percent change orders, with no other major causes of productivity loss, decrease productivity by 20 percent on electrical/mechanical work and by 17 percent on civil/architectural work. At 50 percent change orders, productivity decreases by 23 percent on civil/architectural work and by a greater amount, 31 percent on electrical/mechanical work.³⁴

These bold, round numbers have made his study attractive to claimants.

The study itself has received a good deal of criticism, described below, although, as far as the head of the Revay firm was concerned, its fundamental conclusions (if not perhaps all its details) stood up well.³⁵ Steven Revay acknowledged the validity of some criticisms of the Leonard Study, wrote that Revay personnel have found a reasonable correlation between it and other projects, but noted that “one cannot blindly apply any general study to a specific project and expect a high degree of correlation.” To summarize the position Leonard would support, Revay stated:

³² I haven’t either.

³³ Charles A. Leonard, *The Effect of Change Orders on Productivity*, 6:2 THE REVAY REPORT 1 (August 1987).

³⁴ *Id.* at 2.

³⁵ See Stephen O. Revay, *Coping With Extras*, 21:2 THE REVAY REPORT 1 (September 2002).

The inescapable conclusion can only be that ‘numerous’ changes can and do affect productivity. Equally, it is not only impractical but also impossible to determine the impact of each change as it occurs. If they want to see the impact priced on each change, owners must consider accepting one of the above studies as a basis for that payment as there is no other means, short of simply guessing, to arrive at a number.³⁶

It must be owners who are responsible for contractors’ use, or misuse, of the Leonard study.

3. *Studies Published by the Construction Industry Institute*

As in some of the sample opinions I quoted at the outset, some claims consultants find support for their opinions about lost labor productivity in some of the research studies published by the Construction Industry Institute, or CII. One favorite may be a 1994 study³⁷ for which the authors collected productivity data from four active construction projects for electrical and mechanical crafts, constructed between 1989 and 1992, involving a process plant, a manufacturing plant, a paper mill and a refinery. Evaluating the data collected from these projects, the authors drew certain conclusions including the following: “On average, there is a 30 percent loss of efficiency when changes are being performed, although it is possible to perform some change without a loss of efficiency. The key variable is believed to be the timing of the change.”³⁸ “Change” for the authors’ purposes was defined to mean any change made to the original scope of work, without regard to whether payment is promised or due or why the change was needed, including “rework” which may have resulted from design errors or poor workmanship, weather, or other factors. Again, a study which reaches a conclusion so seemingly universal, with a big, round percentage figure in it, will often prove popular, as this one has.

³⁶ *Id.* at 3.

³⁷ H. RANDOLPH THOMAS & CARMEN L. NAPOLITAN, THE EFFECTS ON CHANGES OF LABOR PRODUCTIVITY, WHY AND HOW MUCH (Construction Industry Institute Source Document 1999, August 1994).

³⁸ *Id.* at 63.

CII published a later study,³⁹ of which Bill Ibbs was a principal author, of the effects of project change on productivity. Its results indicated a general acceptance of the proposition that the later a change occurs in a project, the less efficiently it is implemented. However, the authors noted that their data, collected in an attempt to test this hypothesis, did not produce statistically significant findings.⁴⁰ They referred to many variables that affect productivity on a given project other than the amount of change, the timing, rate, and type of changes, all of which must be taken into account, and they cautioned that because the results of their study “indicate relationships from a broad, total project perspective, they cannot be used to accurately calculate the cost of an individual change or a group of changes.”⁴¹

A third CII publication,⁴² also featuring Bill Ibbs’ work, tested the research hypothesis that changes occurring late in a project are implemented less efficiently than changes occurring earlier, but were not able to prove it to a meaningful level of statistical significance. The findings indicated that construction change greater than five percent results in negative construction productivity, or productivity less than planned; the more construction change the more negative impact on construction productivity, and “[w]hen construction change approaches 34 percent, construction productivity is approximately 90 percent of norm.”⁴³

There are other studies, including some published by the Business Roundtable and the National Electrical Contractors Association, and formerly (now mysteriously vanished) by the U. S. Army Corps of Engineers, as well as by academics, which one may find cited in support of a labor productivity claim, but which the length of this presentation will not allow me to address.

³⁹ QUANTITATIVE EFFECTS OF PROJECT CHANGE (Publication 43-2, Dec. 1994).

⁴⁰ *See id.* at 19.

⁴¹ *Id.* at 3.

⁴² C. W. IBBS & WALTER E. ALLEN, QUANTITATIVE IMPACTS OF PROJECT CHANGE (Source Document 108, May 1995).

⁴³ *Id.* at 52 (citation omitted).

Be assured that, as to most or all of these, there are also either reported decisions, or published commentary, which could be added to that discussed in Part IV as bases to criticize their use to support a claim.

III. APPLICABLE STANDARDS OF ADMISSIBILITY OF EXPERT TESTIMONY ON LOST PRODUCTIVITY BASED ON INDUSTRY STANDARDS

The first question an advocate should consider when considering proposed witness testimony about loss of productivity damages based on industry studies is: How do I get that into/keep that out of evidence? Though the cases on the subject are not particularly promising for the person defending against the claim, we will look at various standards of admissibility, and how they may apply.

A. Witness Qualifications

Under any standard of admissibility of expert opinion testimony, a minimum requirement will be that the proposed testimony be offered by an expert who possesses the qualifications to give the opinion,⁴⁴ and that point may be helpful in attempting to argue the inadmissibility of an expert's opinion of lost productivity. It is somewhat difficult to determine just exactly what type of credentials an expert must possess to evaluate the quantum of a productivity loss. What sort of expertise may be appropriate or indispensable depends on whom you ask. For example, a well-known consultant has decried the prevalent level of expertise in pretty caustic terms, as follows:

Lured ostensibly by the prospects of immediately higher income, we encounter a troubling number of consultants who have chosen to graduate from college, skip traditional employment with an owner or contractor in estimating, project management, superintendents or engineering, to instead become a consultant. . . . While these consultants may have been trained to use "Primavera and CPM techniques in 'chronicling' the effects of

⁴⁴ *E.g.*, Rule 702, F. R. EVID.

certain events on a CPM schedule, they will have no true industry experience in, or supportable basis for, evaluating and assigning responsibility for causal events and analyses of delay, acceleration, labor productivity, damages, etc. At the end of the day, there are likely to be skewered and rotisserized by skilled counsel and shown to be mere ‘technicians’ whose opinions on causation and/or damages should be little, if any, weight by the panel, court or jury.⁴⁵

This consultant opines that “an expert should be on relatively safe ground here” if he/she has:

- Worked as a manager in the field for a contractor or owner such as ARAMCO, Fluor, or Bechtel, developing, implementing and maintaining productivity management systems.
- Studied and mastered key studies, texts and treatises.
- Otherwise acquired the necessary knowledge, skill and experience described in Rule 702.⁴⁶

The courts have not imposed such lofty standards. For example, in *Ace Constructors, Inc. v. United States*,⁴⁷ the contractor supported its claim for reduced productivity by the testimony of its own president, relying upon a study published by the Business Roundtable, and interpolating between some of its figures. Having found that a productivity loss was recoverable, the court proceeded to quantify it.

Productivity is, by its very nature, difficult to measure or quantify. The impossibility of proving the amount of loss of productivity with exactitude does not bar recovery for the loss. . . . In this case at hand, Ace has relied upon the Business Roundtable Report on reduced productivity and that Report appears to be both credible and relevant. The Court finds no errors in Ace’s interpolation of the data in the Business Roundtable Report to apply those data to Ace’s actual circumstances.⁴⁸

⁴⁵ Steve Holloway, *How Experts and Attorneys Have Shot Themselves in the Foot*, 1:5 DRI DAUBERT ONLINE (August 8, 2007) at 2, 3.

⁴⁶ *Id.*

⁴⁷ 70 Fed. Cl. 253 (2006).

⁴⁸ *Id.* at 283 (citation omitted).

United States ex rel. Poong Lim/Pert Joint Venture v. Dick Pacific/Ghemm Joint Venture,⁴⁹ involved a *Daubert* motion challenging the defendant's damages expert's qualification to testify on costs because he was not an accountant; the Court disagreed and noted the expert was an engineer with a minor in mathematics and ample experience in construction management. In *United States ex rel M. L. Young Construction Corp. v. Austin Co.*,⁵⁰ the defendant's challenge to the admissibility of the testimony of the plaintiff's expert witness argued several grounds including his failure to author any articles relating to construction scheduling or delay damage calculations. The Court held that the lack of published technical or other articles did not disqualify him from offering testimony in his field of expertise.

Some experts' credentials are such that a challenge is probably a waste of time. For example, in *Hensel Phelps Construction Co. v. General Services Administration*,⁵¹ the respondent challenged the qualifications of an expert who had worked his way up through the ranks in the field of mechanical construction, working at different times as a laborer, apprentice, project engineer, assistant superintendent, scheduler and project manager, was a licensed contractor with academic training in construction management and an abundance of hands-on project management experience in mechanical construction. The court considered that, "[d]ifficult as the task may be, we believe that an expert with this experience and background should be able to comment competently even on such subtle realities of the workplace as cadence and rhythm of work or worker morale."⁵²

⁴⁹ No. 3:03-CV-00290-JWS, 2006 WL 5230015 (D. Alaska, March 2, 2006).

⁵⁰ No. CIV-04-0078-T, 2005 WL 600505 (W.D. Okla., Sept. 29, 2005).

⁵¹ GSBCA No. 14877, 01-1 BCA ¶ 31249 (2001).

⁵² *Id.*

There are limits, of course. For example, in *Havens Steel Co. v. Randolph Engineering Co.*,⁵³ to support its claim for loss of productivity, the claimant proved that a large number of overtime hours were worked, but encountered difficulty with the requirement to provide the court with some method of determining what the loss might have been. Claimant offered the testimony of an engineer who had never engaged in any studies regarding how to calculate the decrease in efficiency, and admitted that he didn't consider himself competent to state an opinion on the subject other than what he had read in the studies. He identified a chart (whose origin was unknown) as a document with which he was familiar and which contained information from "reliable sources." The court held,

Generally speaking, the very nature of a labor inefficiency claim requires expert testimony. . . . Aside from a general observation that overtime leads to decreased efficiency – a generality over which there is no quarrel, . . . [The expert] had neither training nor experience in how one would calculate that inefficiency. . . . In fact [he] actually expressed no 'opinion' at all on the point, aside from observing that the chart offered to him contained information from 'reliable sources.' His testimony thus stands not as an expert's opinion, with reliance upon the chart as a basis therefor, but instead simply a vehicle for attempting to introduce information from the chart. Havens' objection to that expert would be sustained.⁵⁴

And no expert, no matter how well qualified, will be permitted to testify to opinions about matters that are beyond the scope of proper expert testimony. *Weitz Co., LLC v. MacKenzie House, LLC*,⁵⁵ involved exclusion of an expert's proposed testimony about what constituted a breach of contract, the motivations of the parties, and interpretation of contract terms.

⁵³ 613 F.Supp. 514 (W.D. Mo. 1985), *affirmed*, 813 F. 2d 186 (8th Cir. 1987).

⁵⁴ 613 F. Supp. at 540.

⁵⁵ No. 07-0103-CV-W-ODS, 2009 WL 4030756 (W.D. Mo., Nov. 19, 2009).

Most often, a lawyer will not be fortunate enough to have an opponent unable to engage a professional claims consultant, cost engineer, or other qualified expert, so will usually need to find another basis for avoiding admission of adverse opinion testimony about productivity.

B. *Daubert/Kumho Tire*

Most readers are familiar with the Supreme Court decisions about federal trial judges' "gatekeeping" responsibilities with respect to admission of expert testimony, and there is plenty of good commentary in print on the subject. To briefly summarize, *Daubert v. Merrill Dow Pharmaceuticals*⁵⁶ imposed a new requirement on federal judges to inquire into both relevance and reliability of scientific expert testimony⁵⁷ and exclude from evidence what Justice Scalia has called "expertise that is *fausse* and science that is *junky*."⁵⁸ In *Kumho Tire v. Carmichael*,⁵⁹ the Court held that the gatekeeping requirement applies not only to scientific expert opinion, but to all expert testimony including that based on technical or other specialized knowledge.

The gatekeeping requirement has found its way into the Federal Rules of Evidence as well, which provide

A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:

- (a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
- (b) the testimony is based on sufficient facts or data;
- (c) the testimony is the product of reliable principles and methods; and
- (d) the expert has reliably applied the principles and methods to the facts of the case.⁶⁰

⁵⁶ 509 U.S. 579 (1993).

⁵⁷ In *Daubert* itself, the evidence related to the scientific cause of birth defects.

⁵⁸ *Kumho Tire v. Carmichael*, 526 U.S. 137, 158 (1999) (concurring opinion).

⁵⁹ *Id.* at 137.

⁶⁰ Rule 702, F. R. Ev.

It is now well accepted that the *Daubert/Kumho Tire* test applies to the type of testimony that is commonly offered in construction disputes by experts such as scheduling and claims consultants, and as a general matter its requirements in such cases have been described with reference to “what has been described as the trilogy of restrictions on expert testimony: (1) qualification [of the testifying expert], (2) reliability, and (3) fit (otherwise known as relevance).”⁶¹

In applying the reliability test to nonscientific testimony by construction experts, the *Daubert* factors may not be applicable; here instead the court should

make certain that an expert . . . employs in the courtroom the same level of intellectual rigor that characterizes the practice of an expert in the relevant field; . . . In making its reliability determination, the court should not decide the validity of the expert’s conclusions, but instead consider the soundness of the general principles or reasoning on which the expert relies and the propriety of the methodology that applies those principles to the facts of the case.⁶²

Relevance is a well-known standard, but even relevant testimony shouldn’t be presented if it isn’t helpful to the trier of fact.

The Boards of Contract Appeals apply the *Daubert* rule, as required under Rule 702, Federal Rules of Evidence.⁶³ As in many cases elsewhere, however, the Boards may pay lip service to the *Daubert* rule but not actually use it to exclude expert opinion. For example, in *Appeal of Luhr Bros., Inc.*,⁶⁴ the Board of Contract Appeals cited *Daubert*, among other references, in deciding that it would “decline to adopt” expert testimony which had actually been

⁶¹ Christopher J. Heffernan, Jocelyn L. Knoll, Tracy L. Steedman & Rebecca Weisenberger, *Defending and Asserting Daubert Challenges in Construction Disputes*, 32:2 THE CONSTR. LAW. 6, 9 (Spring 2012).

⁶² *Id.* at 10 (footnotes omitted).

⁶³ *See, e.g.*, *Appeal of Parsons-UXB Joint Venture*, ASBCA No. 56481, 12-1 BCA ¶ 34919 (2012) (granting a motion in limine to exclude expert witness testimony which probably would not have been admissible prior to *Daubert*).

⁶⁴ ASBCA No. 52887, 01-2 BCA ¶ 31443 (2001).

admitted and heard. Litigators are generally familiar with the judicial attitude that a judge is capable of admitting and hearing all kinds of evidence but wisely only crediting that which is worthy of credit; in cases where no jury is sitting, judges will often consider that no “gatekeeping” is necessary.

Although the prospect of disqualifying an opposing expert with a *Daubert* motion is appealing, I have found no reported decision, and have neither been involved in nor learned of an unreported decision, in which such a motion has resulted in exclusion of an expert’s labor productivity opinion based on industry studies, so alternative plans obviously should be made.

C. The Frye Rule

The prevailing rule in the federal courts prior to *Daubert*, still applicable in some state courts, was based on *Frye v. United States*,⁶⁵ which tested admissibility of expert opinion testimony based on whether it had gained general acceptance in the particular field to which it belonged. *Daubert* expressly rejected as too rigid the *Frye* “general acceptance” test for evaluating the admissibility of scientific testimony given by experts under Rule 702 and suggested separating the expert’s methodology from her conclusion.”⁶⁶

No matter what technique an expert witness uses to calculate and support a quantification of damages for lost labor productivity, keeping that opinion out of evidence in a jurisdiction where the *Frye* rule still applies will be a challenge, since it is difficult to establish that almost any technique lacks “general acceptance.” The expert who proposes to testify, for one, will confidently assert that his or her technique is generally acceptable, and will probably be able to show where he or she has been allowed to give something like it before.

⁶⁵ 293 F. 1013 (D.C. Cir. 1923).

⁶⁶ See Benjamin E. Griffith, *Daubert Motions in Governmental Litigation*, presentation at IMLA’s Seventieth Annual Conference (September 28, 2005) (citations omitted).

In almost all cases, competing experts will disagree on whether their respective testimony is based on reliable application of principles and methods to the facts of the case. Because proper application is an opinion, not an underlying fact, the experts' competing testimony will generally be admitted and the judge or jury left to determine who to believe.⁶⁷

Moreover, the industry itself has not really been very definitive in determining what methods are "generally acceptable;" hence much of the published writing on the subject refers pretty tolerantly to a number of alternative quantification methods.

Construction damages theory is not a scientific discipline like astronomy or medicine or mathematics where certain basic truths are simply accepted by all serious scholars. If an expert were to propose to testify that exposure to asbestos causes polio, or the moon is 300 miles away or the area of a rectangle is calculated by dividing its length by its width, the lack of general acceptance of such an assertion would be obvious. However, if an expert proposes to testify that on a mechanical construction project "severe" impact on labor productivity of trade-stacking can cause an increase in affected labor hours of approximately 30 percent, who can say confidently that she is espousing a principle that isn't "generally accepted"?

To attempt to identify a likely source of consensus opinion on what methods are "generally acceptable," one might well look to the publications of the cost engineers' organization AACE International (AACEI), particularly its Recommended Practice on Estimating Lost Labor Productivity in Construction Claims.⁶⁸ A consultant in a firm which has announced that it is no longer in the testifying business, but will perform confidential peer reviews of expert testimony, has opined that the nearest thing there is to an industry standard for

⁶⁷ Howard W. Ashcraft, Jr., *Measuring Lost Productivity: Lord Kelvin and Federal Rule of Evidence 702*, URS CLAIMS RESOURCE 1, 5 (Fall 2006).

⁶⁸ AACE INTERNATIONAL, RECOMMENDED PRACTICE NO. 25R-03 (April 2004).

productivity or efficiency evaluations would be found either in the AACEI guidelines or in some of the books on the subject such as Schwartzkopf's.⁶⁹

To focus on AACEI, the Recommended Practice gives “a list of various identified methods for estimating lost productivity, in order of preference, which is based upon the weight of published literature.” These are treated in detail elsewhere,⁷⁰ so let us just note here that the order of preference ranges from “Project Specific Studies,” such as the measured mile, down to the total labor cost method.

Well, if even *the total cost method*, to which the courts' general hostility is well known, is a “recommended” practice by a group expressing consensus views about acceptable methods of proving productivity losses, it is difficult to hold out much hope for an argument that any theory an expert might espouse – perhaps other than a plea for a court to apply a “jury verdict” analysis since proof was simply absent – could confidently be regarded as “lacking in general acceptance.” Recent criticism suggests that there *is* no industry standard to determine the reliability of productivity studies, and one can find a “so-called ‘study’ to support nearly any imaginable proposition.”⁷¹

D. Arbitration Rules

The essential fact is that rules of evidence don't apply in arbitration.⁷² There is nothing in the history of the *Daubert* cases that suggests that their rule applies in arbitration, nor are

⁶⁹ Private communication with the author. The Schwartzkopf text is cited at note 13, *supra*.

⁷⁰ This work is discussed thoroughly in the presentation authored by Lee Schumacher.

⁷¹ Robert Seals & Mark C. Friedlander, *Examining Studies Used to Support Expert Opinions: Does the Study Make the Grade? An Illustrative Test for Suitability*, 5:1 JOURNAL OF THE AMERICAN COLLEGE OF CONSTRUCTION LAWYERS 127, 129 (Winter 2011).

⁷² *See, e.g.*, AAA Construction Rules, Rule R-33(a) (“The parties may offer such evidence as is relevant and material to the dispute and shall produce such evidence as the arbitrator may deem necessary to an understanding and determination of the dispute. Conformity to legal rules of evidence shall not be necessary.”); JAMS Rules, Rule 22(d) (“Strict conformity to the rules of

parties assured that their arbitrators will know the rules of evidence. There have been few cases on the subject, in part because of the limited availability of judicial review of an arbitrator's admission of evidence.⁷³ One decision directly on point involved a motion to vacate an arbitration award, alleging that the arbitrator allowed testimony by one of the parties' expert "that failed to meet even the most basic standards of admissibility" and "either did not conduct a *Daubert* type analysis or did so while totally disregarding the pertinent evidence."⁷⁴ A federal court confirmed the award, holding that "[w]ith respect to [MPJ's expert] testimony the AAA's Commercial Rules of Arbitration do not require a party sponsoring an expert witness necessarily to satisfy *Daubert*, as conformity to the rules of evidence is not always necessary."⁷⁵ Since an arbitration award can be vacated where the panel improperly excluded evidence,⁷⁶ but will never be overturned on grounds of excessive admission of evidence, the odds of having expert testimony excluded from an arbitration are vanishingly slim.

Commentators have frequently assured (or warned) practitioners about the effect of liberal arbitration rules on expert testimony. "Introducing technical and scientific arguments and evidence is usually easier in arbitration. The arbitrators typically do not preclude the

evidence is not required, except that the Arbitrator shall apply applicable law relating to privileges and work product"): CPR Rules, Rule 12.2 (essentially the same as JAMS Rules).

⁷³ See, e.g., *Morrill v. G. A. Wright Marketing, Inc.*, No. 04-CV-01744-MSK-BNB, 2006 WL2038419 at *4 (D. Colo. July 18, 2006) (denying a motion to vacate which was based in part on the arbitrator's admission of and reliance upon expert testimony on damages, because "procedural' questions, such as matters relating to the admissibility of evidence, are matters left to the arbitrator's discretion, and beyond the scope of the court's review.").

⁷⁴ *MPJ, My Personal Jet v. Aero Sky, LLC*, 673 F.Supp.2d 475, 489 (W.D. Texas 2009).

⁷⁵ *Id.* at 501 (footnote omitted) (noting that the arbitrator had permitted the moving party to conduct an extensive voir dire for *Daubert* purposes before allowing the expert to state his opinions).

⁷⁶ See, e.g., Federal Arbitration Act, 9 U.S.C. § 10(a)(3).

introduction of an expert's point of view based on specific reliability criteria."⁷⁷ And on our specific topic, arbitrators "are more likely [than judges] to accept industry studies, coupled with expert testimony, or other less precise measurements, if convinced that a contractor's efficiency was compromised by the act of another."⁷⁸

Keeping a qualified expert's damages opinion out of evidence in an arbitration is likely to be practically impossible.

E. Arguments Based on Credibility

Though credibility is normally a matter for the finder of fact to weigh, and not an admissibility criterion, some testimony can become so incredible that it may be kept out of evidence, although most likely by exclusion from consideration after it has already been introduced. The arguments listed in Part IV below, suggested for use in discrediting expert opinion, may be useful in support of an exclusion motion in the event of a truly appalling opinion.

F. Conclusion

Experience shows that courts and boards, not to mention arbitrators, are usually loathe to hold a qualified expert's opinion on a disputed matter completely inadmissible; they are far more likely to hear it, then reject it, or at least to elect to accept contrary testimony. Therefore, the balance of this presentation will discuss thoughts about how a party may attempt to discredit an expert opinion that is in, or coming into, evidence.

⁷⁷ Alan W. Kowalchuk, *Resolving Intellectual Property Disputes Outside of Court: Using ADR to Take Control of Your Case* at 6 (American Arbitration Association 2012), online at www.adr.org/aaa/ShowPDF?doc=ADRSTG_0011420.

⁷⁸ Baker, *supra* note 16.

IV. TECHNIQUES FOR DISCREDITING EXPERT TESTIMONY ON LOST PRODUCTIVITY BASED ON INDUSTRY STUDIES

The tribunal has denied your *Daubert* or similar motion, and your opponent's expert's testimony, using one or more industry studies to support a quantification of alleged damages for lost productivity, is coming in. What are you going to do to try to prevent it from being accepted and believed?

In almost all cases, the way one avoids losing on account of adverse proof is not by keeping it out of evidence, but by showing it unworthy of belief or acceptance, and this principle applies as well to experts' productivity damages testimony as to anything else. For example, in *Appeal of Hensel Phelps Construction Co.*,⁷⁹ the board declined to accept the plaintiff's experts opinion about labor inefficiency in part because, though admitted, it was "intrinsically unpersuasive." The courts have given lawyers plenty of hints along these lines, such as "[a]ll of these arguments may provide fertile ground for impeachment, but they do not demonstrate [the expert's] opinions are inadmissible;"⁸⁰ and "[t]o the extent the Defendant believes . . . calculations are based on inaccurate evidence or otherwise in error, such concerns can be addressed through cross-examination at trial;"⁸¹ and, denying a motion to exclude plaintiff's expert's testimony because his methodology for calculating damages "is either non-existent or makes no sense," "these findings do not mean that the Court intends to credit this testimony."⁸²

How do you go about keeping the Court or board or panel from believing your opponent's expert?

A. *Discredit the Study the Expert Relies On*

⁷⁹ ASBCA No. 49270, 99-2 BCA ¶ 30531 (ASBCA 1999).

⁸⁰ *Weitz Co., LLC v. MacKenzie House, LLC*, No. 07-0103-CV-W-ODS, 2009 WL 4030756 at *3 (W.D. Mo., Nov. 19, 2009),

⁸¹ *Safeco Ins. Co. of America v. S&T Bank*, 81 Fed. R. Evid. Serv. 738 (W.D. Pa. 2010)

⁸² *Gasa, Inc. v. United States*, 88 Fed. Cl. 752, 757 (2009).

With your own expert, or whatever discrediting matter you can compel the opposing expert to admit, try to show the Court that the study relied upon is not a valid or credible source of data on quantifying labor productivity damages. Fortunately, there is a lot of raw material available for use in this fashion, a good bit of it from other expert consultants.

- If faced with an expert relying on the MCAA factors, consider these arguments:

First, no matter what its merits, the MCAA is a body representing the interests of contractors – claimants – and not owners, with a vested interest in the results, and its factors arguably suffer from a lack of objectivity as a result. Moreover the MCAA factors have been criticized on other bases.

Of all the current methods, the MCAA factors are the easiest to use, which undoubtedly explains their popularity. However, the arbitrary and subjective nature of these factors undermines their credibility. In fact, even the MCAA notes that factors should be applied with care since the addition of multiple factors can lead to unreliable results.⁸³

Though application of the MCAA’s factors depends on whether they are “minor,” “average” or “severe,”

[t]he source of this information is not explained. Likewise, proper application is not explained: What is the definition of ‘severe? Are the reduction factors applied to the entire project or just the window of work that is affected by the changed condition? How should instances be analyzed where more than one of these 16 factors is present so that redundancy and double-counting are avoided?⁸⁴

A court has criticized a claim based on these factors in the following language:

The court . . . finds that plaintiff’s calculations that were based upon data contained in the MCA Manual are arbitrary and speculative and do not represent a reliable measure of damages. Specifically, plaintiff’s estimate

⁸³ William Ibbs & Gerald McEniry, *Evaluating the Cumulative Impact of Changes on Labor Productivity – An Evolving Discussion*, 50:12 COST ENGINEERING 23, 26-27 (December 2008).

⁸⁴ WILLIAM IBBS, THE IMPACT OF CHANGE’S TIMING ON LABOR PRODUCTIVITY 4 (Paper No. CO/2003/022889).

of the subjective factors that are quantified in the manual, such as attitude and morale, were not supported by the greater weight of the evidence.⁸⁵

Though the factors may have actually been misused in that case, the issue of their subjectivity will be present wherever they are used.

- If your opposing expert relies on the Leonard Study, consider that it has been twice held unreliable as a measure of productivity loss, including by a court that described it as follows:

The ‘Leonard Thesis’ purports to establish a ‘formula’ by which lost labor productivity can be accurately determined simply by comparing the number of ‘change order hours’ to the initial estimated contract hours and the total number of hours spent on the contract. This formula is wholly unreliable because it is based on unfounded assumptions, biased and incomplete data, and speculative determinations.⁸⁶

One of those courts disparaged the study in these terms: “*No court has adopted the Leonard Study approach in measuring productivity loss/inefficiency. It was discredited by the government’s expert, . . . and we consider it to be inappropriate for use here.*”⁸⁷

A particularly pointed critique of Leonard’s work appears in a recent article which analyzed the study’s reliability against a test of academic research completely independent of *Daubert* or *Frye* or any other judicial theory, and since the same analysis can readily be applied (and some of the same criticisms may pertain) to any other industry study, it is described at length.

⁸⁵ Norment Security Group, Inc. v. Ohio Dep’t. of Rehabilitation & Correction, No. 2001-11472, 2003 WL 22890088 at *7 (Ohio Ct. Cl. 2003).

⁸⁶ Special Master’s report, adopted by district court in Aetna Cas. & Sur. Co. v. George Hyman Constr. Co., No. Civ. A. 93-4750, 1998 WL 1988825 (E.D. Pa., May 15, 1998), quoted in Howard W. Ashcraft, Jr., *Measuring Lost Productivity: Lord Kelvin and Federal Rule of Evidence 702*, URS CLAIMS RESOURCE (Fall 2006) 1, 5; Appeal of J. A. Jones Constr. Co., ENGBCA No. 6386, et al., 00-2 BCA ¶ 31000 (2000).

⁸⁷ J. A. Jones Constr. Co., *supra* note 86 (emphasis supplied). Even though disparaging the Leonard Study, the board did not exclude it from evidence under *Daubert* or otherwise; the claimant’s “abandonment” of Leonard may have prevented such a ruling.

In litigation and arbitration, where the goal is to win (or avoid losing) money rather than to discern scientific truth, there is a far greater tendency to rely unjustifiably on the conclusions of studies that support the litigant's position without carefully examining the studies' context in methodology. It is not uncommon for expert witnesses to cite in summary fashion various studies as authority for their testimonial conclusions without examining and approving the studies' methodology and context. A study becomes regarded as synonymous with its conclusions, and thereafter apply to situations for which it was never intended and for which it does not bear the indicia of scientific reliability. This is bad science, but occurs frequently in litigation, arbitration and other contested situations. Nowhere is this more true than in the construction industry.⁸⁸

The authors selected the Leonard Study to illustrate how to analyze a study on labor inefficiency, and found that it fails four of their six evaluation criteria, which they described as "generally accepted within the academic community for the evaluation and design of objective research,"⁸⁹ and listed as follows: (1) Objectivity; (2) Representative value [i.e., the strength of the correlation between what is being measured in the study and the work to which the study is being applied]; (3) Timeliness; (4) Research design; (5) Intervening variables; and (6) Reporting of information.

The authors conclude that the Leonard Study, as commonly used, fails the criterion of objectivity in part because it is based entirely on data from claims which the researcher's employer had prepared, and it incorporates the opinions of the Revay firm itself (possibly including Mr. Leonard as one of its consultants). Leonard's data are of limited representative value, because based only on small contracts, many of them subcontracts, and many of them representing only a single-trade or renovation work. The study fails the criterion of timeliness since its data are 20 to 30 years old. The authors give it a passing grade on research design

⁸⁸ Seals & Friedlander, *supra* note 68, at 128-29.

⁸⁹ The criteria are apparently largely taken from JOHN W. CRESWELL, RESEARCH DESIGN, QUALITATIVE, QUANTITATIVE, AND MIXED METHODS APPROACHES (2d Edition 2002), and EARL BABBIE, THE PRACTICE OF SOCIAL RESEARCH (10th Edition 2003).

despite the “student nature” of the original work. Leonard failed the test of intervening variables due to failure to address numerous intervening variables including project size and scope, regulatory environment, and morale and experience of a management team, and also failed the final criterion of reporting of information, since he admitted re-assessing data (or “manipulation of the data” in the authors’ language). Any other study may be analyzed in light of these same criteria.

Another consultant comments that “[p]redictions obtained from Leonard’s document are approximations, which do not account for the specific circumstances of a particular job.”⁹⁰ The Leonard study, though a favorite of some expert witnesses, has been significantly debunked in the literature, and derided by some courts, and provides an easy target for criticism.

- If dealing with an expert’s reliance on CII studies, consider the following:

Consultants from the Revay firm opine that, “[n]eedless to say, the rather vague quantitative conclusions [of the 1994 CII study (Source Document 98)] render their application to a loss of productivity calculation highly questionable.”⁹¹

A familiar critic has the following to say about some of CII’s methodology:

Industry experts agree that this document [CII’s Cumulative Impact of Change Orders for Electrical and Mechanical Contractors publication] was prepared in such a way as to produce bias and unreasonable results, and to encourage the document’s misuse. In addition, industry experts agree that asking contractors to participate in the preparation of the document that might be used in the future by those same contractors in an effort to ‘validate’ their claims against owners is patently unreasonable. . . . This document appears to be based more on subjective perception than objective analysis.

Upon a review of this document, defendant owners and their counsel will quickly discover that the single largest component used to calculate “%

⁹⁰ *Construction Claims Experts Labor Productivity*, *supra* note 10, at 4-5.

⁹¹ Regula Bernies & Zey Emir, *Calculating Loss of Productivity Due to Overtime Using Published Charts – Fact or Fiction*, 20:3 THE REVAY REPORT 1, 5 (November 2001).

Delta” or percent of lost craft labor productivity resulting from change orders, is called the “Constant.” This Constant is likely to equal 37 percent in your contractor’s claim, which means that the contractor believes that, just by handing you the claim document, you owe him an additional 37 percent of total incurred man-hour dollars. This “Constant” is a product of an unreasonable and subjective data collection process.⁹²

B. Distinguish the Study

Even the most rigorous and reliable study does not apply to every situation. If the opposing expert is trying to stretch the limits of what the study’s authors legitimately established, call him on it. It has been pointed out, specifically referring to the MCAA Manual and the Leonard study (among others), that “[t]o the extent that these studies have come under fire, it is because contractors, often without the assistance of an expert, have attempted to base their claims entirely on the productivity rates contained in these studies without corroborating the study with the actual conditions experienced on the project.”⁹³

Other scholars suggest that

the application of Industry studies in disruption claims should be done with caution. Claimants asserting lost productivity claims have to understand and document the surrounding circumstances of a claims situation and compare this situation to that of the published study for similarity. Important questions that would guide one in choosing a study include: Why/when/where was the study done? How closely does the study fit to the case at hand? In what way does the study not conform to the case at hand?⁹⁴

The Engineering Board of Contract Appeals has spoken on the efforts of some claimants to stretch industry studies (here Leonard’s) beyond their legitimate value: “The Leonard Study is applicable to projects experiencing greater than 10 to 15 percent change orders, as measured by

⁹² *Construction Claims Experts Labor Productivity*, *supra* note 87, at 4-5.

⁹³ Jones, *supra* note 14, at 5.

⁹⁴ Nuhu Braimah, Issaka Ndekugri & Rod Gameson, *A Review of Industry Standards and Publications/Charts for Adjusting Productivity Losses in Construction Contracts*, Presentation at the 22nd Annual ARCOM Conference, Birmingham, UK at 49, 54 (September 2006).

labor hours, not labor costs or overall construction costs. The Leonard Study also is not applicable to heavy civil engineering projects like the Matewan project.”⁹⁵ Why should a grading contractor’s claim be properly supported by a NECA or MCAA study? Where the expert attempts this feat, a serious challenge is easy to make.

Another of the boards has stated, “We find the auditor’s method of calculation of lost labor efficiency preferable to that used by appellant, not because we reject the National Electrical Contractors Association Manual of Labor Units as credible evidence, but rather because the auditor’s method reflects the actual experience of *this* electrical contractor on *this* job, rather than an approximation of the average experience of all electrical contractors. The auditor’s [the opposing expert] method is the more reasonable.”⁹⁶

Claims consultants caution that the

use of published charts in an after-the-fact claim situation is more problematic. Each of the studies containing original data applies only to a very specific project environment for specific trades only. It is, therefore, of the utmost importance to understand and document the surrounding circumstances of the claim situation. It is then up to the experienced analyst to compare the claim scenario to the published study which resembles it most and introduce adjustments if deemed necessary. . . . *For many types of projects no published data are available. Such projects include road work, pipelines, transmission lines or extensive cut and fill operations just to name a few.* However, the absence of such data is not surprising. On these types of projects, contractors typically record actual quantities and hours of work, allowing for a loss of productivity calculation based on actual data. *Thus, an attempt to rely on undated published data on these types of projects will invariably be treated with suspicion. . . . In claims situations where the loss of productivity is a result of extended overtime and other parallel causes, none of the published charts offer any help in calculating cumulative losses.* Conversely, relying on published charts for the isolation of one specific cause such as overtime may yield unreliable results. However, if there is no other practical way to calculate such loss, the analyst may have no

⁹⁵ Appeal of J. A. Jones Constr. Co., ENGBCA No. 6386, et al., 00-2 BCA ¶ 31000 (2000).

⁹⁶ Appeal of Capital Elec. Co., GSBICA No. 5316, etc., 83-2 BCA ¶ 16548 (1983).

choice but to rely on a study which best fits the project situation under scrutiny, to calculate an approximate loss.⁹⁷

C. *Demonstrate the Expert's Misuse of the Study Relied Upon*

Expert witnesses may draw conclusions from published studies that aren't warranted by the results and weren't intended by the original authors of the study.⁹⁸ Be prepared to show up this sort of misuse. "Contractors and their claims consultants often rely on studies which have a very little to do with the specific situation under scrutiny. In fact, they may have never examined the actual study and simply relied on a single chart reproduced in a book or by a trade association."⁹⁹

A lengthy discourse on misuse of industry studies expresses the view that

In litigation and arbitration, where the goal is to win (or avoid losing) money rather than to discern scientific truth, there is a far greater tendency to rely unjustifiably on the conclusions of studies that support the litigant's position without carefully examining the studies' context in methodology. It is not uncommon for expert witnesses to cite in summary fashion various studies as authority for their testimonial conclusions without examining and approving the studies' methodology and context. A study becomes regarded as synonymous with its conclusions, and thereafter apply to situations for which it was never intended and for which it does not bear the indicia of scientific reliability. This is bad science, but occurs frequently in litigation, arbitration and other contested situations. Nowhere is this more true than in the construction industry."¹⁰⁰

And an expert consultant, criticizing other, "unqualified labor productivity consultants" believes they have caused self-inflicted wounds in ways including these:

- based lost labor productivity claims on industry studies which had little, if any, relevance to the alleged cause of the loss;

⁹⁷ Bernies & Emir, *supra* note 91, at 7.

⁹⁸ "It has been Holloway Consulting's experience that both general and specialty contractors, on a wide variety of construction projects, are using (and misusing) industry studies in an attempt to justify their labor productivity claims." *Construction Claims Experts Labor Productivity*, *supra* note 10, at 4.

⁹⁹ Bernies & Emir, *supra* note 91, at 1.

¹⁰⁰ Seals & Friedlander, *supra* note 71, at 128-89.

- never even read the study upon which their claim relies, but rather simply included a chart or conclusion from the study, book or trade publication; and
- misapplied studies of mechanical and electrical trades to claims in the civil trades.¹⁰¹

A careful analysis of some of the ways witnesses have made use of the Leonard study concludes that it has been “misunderstood and misused by contractors attracted by the simplicity of the graphs but also unfamiliar with the details of the study and limitations to its use;” examples included contractors who, “despite Leonard’s instructions to the contrary,”

- make no effort to use the differential or measured mile method where possible, contrary to Leonard’s recommendation. Contractors use the Leonard Study as a substitute for project-specific analysis.
- attribute all overrun in hours as being the result of owner caused changes and make no adjustments for other factors such as estimating errors or contractor inefficiency.
- miscalculate “percentage change orders” as:
 - A function of the dollar value of changes instead of hours.
 - A portion of estimated hours rather than actual base contract hours.
- fail to demonstrate a cause and effect link between the alleged inefficiency and the change.¹⁰²

D. Engage a Superior Expert Witness or Use a Superior Technique

Of course, lawyers defending against inefficiency claims will understand that they should consult with qualified experts to evaluate the claimants’ expert opinions about the claims, and consider putting on their own proof about the correct quantification of damages if there is no denying that some amount of productivity loss has occurred. Sometimes instead of just

¹⁰¹ Holloway, *supra* note 45, at 2.

¹⁰² Gerald McEniry, *The Cumulative Effect of Change Orders on Labour Productivity – The Leonard Study “Reloaded,”* 26:1 THE REVAY REPORT 1, 3 (May 2007) (footnote and citations omitted).

criticizing the opposing expert for having elected an unreliable quantification technique, one may want to have an expert analyze labor productivity by one of the preferred methods, showing how extreme the opponent's results are. One may instead prefer to debunk the claimant's expert opinion without offering the tribunal an alternative theory of damages, in which case she may want to engage an expert simply to denounce the spurious nature of the claimant's proof, in hopes that it will be rejected as a whole.

The dream/nightmare example of the strategy appears in *Daewoo Engineering and Construction Co., Ltd. v. United States*,¹⁰³ in which a government contractor presented a multi-million dollar construction claim, largely predicated on lost labor productivity and eventually supported at trial by expert testimony based on a measured mile analysis. At the conclusion of the plaintiff's case, the government amended its pleadings to assert a fraud claim – based on the plaintiff's case. After thirteen weeks of trial, the Court of Claims stated, “Daewoo’s case against the United States is wholly without merit; its claims are fraudulent.”¹⁰⁴ The government used as its expert a certified fraud examiner who testified that the contractor’s consulting firm’s behavior in the case had been “at best ‘professionally irresponsible’;” he also testified that the consulting firm’s approach to the assignment had “bordered on the unprofessional,” and the Court agreed.¹⁰⁵

It’s probably not often that we will have the chance to make good use of the testimony of a *fraud examiner* to rebut an expert’s proof on labor productivity, but often a well-prepared construction claims expert can legitimately and successfully scoff at an opposing expert’s efforts.

¹⁰³ 73 Fed. Cl. 547 (2006).

¹⁰⁴ *Id.* at 550.

¹⁰⁵ *Id.* at 572, 581. After disparaging the testimony of all of the claimant’s witnesses, including their experts, the court denied the contractor’s claim and entered judgment against it and in favor of the government in the amount of over \$50 million for fraud.

For example, in *Appeal of J. A. Jones Construction Co.*,¹⁰⁶ the government called an expert witness to testify that the contractor's expert was negligent in preparing his measured mile report, which had "no basis in fact," and which in fact did not qualify as a measured mile analysis. In a case arising out of a building construction project at a Florida Air Force base,¹⁰⁷ claimant's expert presented a productivity loss claim calculated using a modified total labor cost method, and attributing delay causes to many of the factors in the MCAA Manual. The Government's expert's testimony asserted, and convinced the court, that the claimant's approach to measuring lost productivity was "not recognized as an accepted approach by his peers or by any trade association."¹⁰⁸

V. CONCLUSION

While a *Daubert* motion may be an effective means to hold an opposing expert to his or her actual area of expertise, or to prevent admission of some of the dreamier conclusions that might be developed, for the present the field of productivity analysis seems to be insufficiently monolithic to allow one to state confidently what is or isn't beyond the general pale of acceptable opinion. Therefore, it appears most likely that opinions based on industry studies of labor productivity will be accepted in evidence, and that lawyers opposing their sponsors will need to discredit them using the traditional methods of exposing their flaws and refuting them with more believable proof.

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¹⁰⁶ ENGBCA No. 6386, et al., 00-2 BCA ¶ 31000 (2000).

¹⁰⁷ *Sunshine Constr. & Eng'g, Inc. v. United States*, 64 Fed. Cl. 346, 371 (2005).

¹⁰⁸ *Id.* at 371