Lost Productivity: Claims for the Cumulative Impact of Multiple Change Orders

REGINALD M. JONES

I. Introduction

In the government contracts context, the U.S. Court of Claims and the various boards of contract appeals have recognized a general right to recover for the cumulative effect of a multitude of owner-directed changes that, when

Reginald M. Jones is an associate in the Atlanta, Georgia, office of Smith, Currie & Hancock, LLP. *The author gratefully acknowledges the assistance and support provided by James K. Bidgood, Jr. The views expressed in this Article are those of the author and not necessarily those of the firm or its clients.*

taken collectively, can be greater than the sum of the effects of the individual change orders.[1] Although a change order may directly add, subtract, or change the type of work being performed in one particular area of a construction project, it also may affect other areas of the work that are not addressed by the change order. In *Coates Industrial Piping*, the Veterans Affairs Board of Contract Appeals (VABCA) explained that it is a "change order's unforeseeable impact on [this] unchanged work that lies at the core of the cumulative impact claim."[2] According to this theory of recovery, "the issuance of an unreasonable number [or unusual kind] of change orders creates a synergistic disruptive impact such that the total disruption caused by the changes exceeds the sum of the disruptive impacts caused by the individual change orders when looked at independently."[3] Cumulative impact claims are exceedingly difficult to prove. However, because the costs of labor inefficiencies can dramatically alter the price of any complex construction project, contractors, the Government, and private owners likely will continue

1. Pittman Constr. Co., GSBCA No. 4897, 4923, 81–1 BCA ¶ 14,847, 73,297 *aff'd*, Pittman Constr. Co. v. United States, 2 Cl. Ct. 211 (1983).

The following cases are illustrative of decisions in which boards of contract appeals have awarded damages for cumulative impact claims: David J. Tierney Jr., Inc., GSBCA Nos. 7107, 6198 (5855)-Rein., 88–2 BCA ¶ 20,806, at 105,121 (awarding damages to a contractor for the cumulative impact of numerous changes to the contract made by the Government); Atlas Constr. Co., GSBCA Nos. 7903 *et al.*, 90–2 BCA ¶ 22,812, 114,564 (awarding contractor the full amount of its loss of labor productivity claim where the contractor's performance "was burdened by the number of change orders, hidden conditions and tenant directed changes"); Bechtel Nat'l, Inc., NASA BCA No. 1186–7, 90–1 BCA ¶ 22,549, 113,182 (finding that contractor was entitled to an equitable adjustment of $443,462 based on a $4,155,176 cumulative impact claim); Space Age Eng'g, Inc., ASBCA Nos. 25761, 25982, 26020, 26381, 28346, 86–1 BCA ¶ 18,611, 93,478 (awarding damages on a contractor's claim where the Government's failures caused the contractor's inefficiencies); Fruehauf Corp., PSBCA No. 477, 74–1 BCA ¶ 10,596, 50,221 (holding that contractor was entitled to impact costs resulting from the issuance of a large volume of changes late in the contract work). State cases include C. Norman Peterson Co. v. Container Corp. of Am., 218 Cal. Rptr. 592 (Cal. Ct. App. 1985); Amelco Elec. v. City of Thousand Oaks, 98 Cal. Rptr. 2d 159 (2000), *cert. granted*, 11 P.3d 956 (Cal. 2000).

2. "Cumulative impact is the unforeseeable *disruption of productivity* resulting from the 'synergistic' effect of an undifferentiated group of changes." Coates Indus. Piping, Inc., VABCA No. 5412, 99–2 BCA ¶ 30,479, 150,586. It should be noted that providing a specific definition suitable for every situation is an extremely difficult task because courts and boards have articulated a host of differing definitions. In fact, in some cases, boards have neither defined nor even mentioned the words "cumulative impact," but awarded such costs anyway. *See, e.g.*, Charles G. Williams Constr., Inc., ASBCA No. 33766, 89–2 BCA ¶ 21,733 (awarding contractor damages for the collective disruptive effect on labor productivity of twenty-six change orders that corrected errors in the drawings and specifications). Yet, in many of the other cases discussed in this Article, cumulative impacts were defined in great detail, but no equitable adjustment was granted.

3. Michael R. Finke, *Claims for Construction Productivity Losses*, 26 PUB. CONT. L.J. 311, 317 (1997).

to commit substantial resources to litigate or arbitrate the viability of these claims. Although this theory of recovery developed originally in the government contracts arena, the underlying logic appears to be equally applicable to a private commercial agreement under state law.[4] States often, however, use slightly different terminology when evaluating lost productivity claims.[5]

Despite a general recognition of the legal entitlement,[6] little agreement exists as to how the claim should be characterized and what the contractor must prove in order to prevail on such a claim. In general, a contractor seeking to recover for the impact costs of numerous changes on unchanged work must prove three essential elements: liability, causation, and resultant injury.[7] Of these three elements, causation and resultant injury present the largest obstacles to recovery. Causation and quantum of loss pose a problem because cumulative impacts remain largely an ill-defined concept.[8] As a result, boards and courts have not been able to identify a definite formula to determine whether numerous owner-caused changes are the underlying cause of lost productivity.

The problem with creating a workable formula for entitlement and the calculation of damages lies in determining the point in time when the claim arises. Cumulative impacts are unique in that disruption to the work does not necessarily result from the first, second, third, or even tenth change order. At some point, however, contractors assert that the changes cumulate and slow their ability to proceed in an orderly fashion. Even if the contractor's estimate contains some expectation of a less-than-perfect rate of productivity, when an owner's changes rise above those reasonably anticipated, the contractor will contend that it can no longer make progress on the job as it originally expected. The question then arises at what point the contractor should become aware that multiple change orders, in the aggregate, are causing additional labor costs on the project.

Because it is difficult to determine temporally when the claim arises, the General Services Board of Contract Appeals (GSBCA) in *Pittman Construc-*

4. *See, e.g.*, *Amelco Elec.*, 98 Cal. Rptr. 2d at 159.

5. *See, e.g., id.*

6. "It has been well established that financial recovery is likely for increased performance costs of unchanged work which resulted from the impact of owner-directed changes to the extent that the increased costs of performance of the unchanged work was directly attributable to the owner's changes." *Construction Delays: Quantification of the Financial Impact*, 11 Focus 1, at 7 (Aug. 1996).

7. Centex Bateson Constr. Co., VABCA Nos. 4613, 5162–5165, 99–1 BCA ¶ 30,153, 149,258, *aff'd*, Centex Bateson Constr. Co. v. West, 250 F.3d 761 (Fed. Cir. 2000); Acme Missiles & Constr. Corp., ASBCA Nos. 11256, 11716, 68–1 BCA ¶ 6873, 31,770.

8. Few empirical or quantitative studies have been performed on the impact of change orders. One such study was undertaken by Charles A. Leonard in his Master of Engineering thesis at Concordia University, Montreal, Quebec, Canada, entitled *The Effects of Change Orders on Productivity* (February 1988). In that study, Leonard examined ninety cases from fifty-seven projects and concluded that change orders have a ripple effect on productivity of unchanged work because of the interdependency of construction operations.

tion Co. began to analyze the problem in terms of foreseeability.[9] The GSBCA borrowed foreseeability from the tort law concept of proximate causation. Because causation is difficult to determine, boards began to focus on whether the contractor could foresee a potential impact when it negotiated the forward-priced change order most closely related in time to the disruption. If an impact is foreseeable, it is considered a direct impact and any right to claim the costs associated with the disruption is either priced, settled, or waived with the execution of a change order. If an impact is unforeseeable, it is considered to be indirect and the right to recover for an indirect impact is reserved, or, at a minimum, the contractor has not waived the right, and the possibility of recovery exists.

Closely connected to the concept of foreseeability as a limitation to recovery is the notion that a contractor must reserve its right to claim cumulative impact costs or risk waiving or releasing the right altogether. The Government and private owners often rely on the defense that each contract modification or change order and payment act as an accord and satisfaction for any costs that the contractor experiences on the project thereafter. In order to avoid prospectively relinquishing any rights to an impact claim, the current trend requires contractors to include an express reservation of that right in each change order or contract modification.[10] Courts and boards have consistently upheld such reservations.[11] Similarly, courts and boards also have regularly upheld express releases and contract language to the effect that all executed change orders act as a full and final settlement of all impacts arising out of each change order, whether the claim is known or unknown.[12]

II. Discussion

The magnitude and cumulation of owner-directed changes may have a significant disruptive impact on unchanged work in a construction project.[13] The Government, private owners, and contractors are frequently confronted with the issue of whether a contractor may recover for the impact or "ripple

9. GSBCA Nos. 4897, 4923, 81–1 BCA ¶ 14,847, 73,297 *aff'd*, Pittman Constr. Co. v. United States, 2 Cl. Ct. 211 (1983).

10. *See infra* Section V.E.

11. *See id.*

12. *See id.*

13. "When multiple changes on a project act in sequence or concurrently, there is a compounding effect—this is the most damaging consequence for a project and the most difficult to understand and manage. The net effect of the individual changes is much greater than the sum of the individual parts. Not only may increases in cost and time be required, but the project logic may also have to be redone." Robert F. Cushman & Stephen D. Butler, Construction Change Order Claims, *Claim for Damages*, § 13.12 Recovery of Impact Costs at 280 (Supp. 2000) (citing Hester, Kuprenas & Chang, *Construction Changes and Change Orders: Their Magnitude and Impact*, Construction Industry Institute, Source Document 66, at 35 (1991)).

effect" caused by either the size or large number of changes. The issue is essentially a question of risk of loss. Contractors look to private owners or the Government to compensate them for the effects of owner-caused changes to the working environment. The argument is premised upon the idea that where the Government issues a greater-than-expected number of changes, it has breached its implied duty of good faith and fair dealing.[14] In contrast, the Government and private owners want to prevent contractors from taking what they perceive to be a double payment for work that has been paid for under the original contract pricing and through the change order process.[15]

In response to the question concerning recoverability, courts and boards have repeatedly "recognized the existence of impact claims as a separate constructive change compensable under the Changes clause since the abrogation of the *Rice* doctrine in 1968.[16] This constructive change, although resulting from other contract changes, is independent of them and can survive an accord and satisfaction on a change, or a general release."[17] Nonetheless, the decisions have been inconsistent at best in terms of defining cumulative impacts and explaining what is necessary to maintain such a claim. Despite recognizing the existence of a cumulative impact claim, at least one board has stated that the concept of cumulative impacts is "somewhat amorphous."[18] At least one commentator has gone so far as to state that "there is no such thing as synergistic, greater-than-the-sum-of-its-parts cumulative disruption," but rather only local impact claims that the contractor failed to capture while pricing change orders.[19]

Regardless of how such claims are characterized, a consistent approach must be developed to how the loss should be identified and to whom it should be allocated. It would appear that boards and courts are attempting to accomplish such a result without implementing clear or consistent methodology. Courts and boards that award cumulative impact damages minimize their discussion of how they arrived at the decision, while courts and boards that

14. *See, e.g.*, Coates Indus. Piping, Inc., VABCA No. 5412, 99–2 BCA ¶ 30,479, 150,584, 150,587.

15. "To the Owner such a strategy [of reserving a right in change orders to recover increased costs on future work resulting from that change order] is disingenuous at best, and deceptive at worst. The reservation of right has the appearance of being a cure-all for the Contractor; a way of making up for everything from a bad bid to mismanagement." Brian Kasen & Victor C. Oblas, *Forward Pricing Impact Costs on Construction Projects*, *in* Wiley Construction Law Update 33, 35 (Overton A. Currie & Neal J. Sweeney eds., 1996).

16. *See infra* Section IV.A (discussing the *Rice* doctrine. The *Rice* doctrine precluded courts from considering the effects of changes on work not specifically covered by a change order. As damages the courts allowed for the cost of the changed work, but not for the cost of delay that the changes caused. *Rice v. United States*, 317 U.S. 61 (1942)).

17. *Coates Indus. Piping, Inc.*, 99–2 BCA ¶ 30,479, at 150, 584.

18. Centex Bateson Constr. Co., VABCA Nos. 4613, 5162–5165, 99–1 BCA ¶ 30,153, 149,258, *aff'd*, Centex Bateson Constr. Co. v. West, 250 F.3d 761 (Fed. Cir. 2000).

19. Finke, *supra* note 3, at 337.

deny such claims go to great length to analyze the underlying legal elements of a cumulative impact claim. The decision to either grant or deny relief appears to turn largely on the credibility of expert witness testimony and whether the expert, together with lay witnesses with first-hand knowledge and contemporaneous documentation, can convince the board or court that one side or the other bears responsibility.[20] Unfortunately, this process has resulted in a tangled hodge-podge of conflicting legal theories.

This Article seeks to sort out the differing theories through a comprehensive study of cumulative impact claims. The study begins with an attempt to develop a working definition of cumulative disruption. In order to develop a consistent methodology with which to analyze cumulative impact claims, it is important to understand the nature and meaning of these types of inefficiency claims. This Article seeks to provide this understanding by exploring the context in which cumulative impact claims originated and explaining how and why they developed over time. The analysis is divided into four sections. Section III attempts to define cumulative impacts by building upon a basic definition of productivity and lost efficiency. Section IV explains the historical development of cumulative impact claims in the U.S. Court of Claims, traces their beginnings to the cardinal change doctrine, and shows how boards of contract appeals have shifted to a theory of recovery based on the concept of constructive change. Section V evaluates the basic elements necessary to prove a cumulative impact claim and analyzes the different methods of calculating lost productivity. Finally, Section VI examines the related issue of whether a contractor must expressly reserve the right to bring an indirect impact claim in order to avoid the defenses of accord and satisfaction and waiver or release. This final section addresses the issue of whether a contractor loses its right to bring an inefficiency claim based on numerous change orders if the contractor signs general releases attached to the executed change orders.

III. Defining the Cumulative Impact Claim

Cumulative impact or disruption is the effect of a series of changes, design clarifications, or late responses to requests for information (RFIs) on labor productivity and project cost.[21] According to one author, disruption can be defined as "any change in the method of performance or planned work se-

20. *See, e.g.*, Hensel Phelps Constr. Co., ASBCA No. 49270, 99–2 BCA ¶ 30,531, at 150,792–93 & 150,796 (finding an expert's testimony unpersuasive where the expert neither reviewed the relevant contemporaneous documentation nor interviewed the project personnel who negotiated the contract modifications that allegedly led to the disruption); *see also infra* Section V.B.3 (discussing the role of expert witness credibility in conjunction with the measured-mile analysis); Section V.C. (discussing the role of expert witness credibility in conjunction with proving causation).

21. Geoffrey T. Keating & Thomas R. Burke, *Cumulative Impact Claims: Can They Still Succeed?*, Constr. Law. 30 (Apr. 2000).

quence contemplated by the contractor at the time the project was bid that prevents the contractor from actually performing in that manner."[22] On construction projects, changes are often the underlying source of disruption. Extraordinary numbers of change orders, design changes, or even the failure to respond to contractor RFIs are factors that contribute to loss of labor productivity and schedule delays.[23] Unlike the direct impact claim, which can be recognized when a change order is issued, the cumulative impact claim represents a claim for lost productivity on unchanged work that contractors claim is not foreseeable at the time the change order is issued. Specifically, unchanged work refers to the contract work not covered by a specific contract change order.

A. *The Basic Definition of Disruption or Loss of Productivity*

In order to understand how multiple changes in the aggregate can cause a loss of efficiency, it is important to understand the meaning of labor productivity and loss of labor productivity.[24] In simple terms, "[p]roductivity is defined as the [craft] hours necessary to produce a unit of finished product."[25] "Loss of [productivity] is the decline in [efficiency] on all work, particularly the work not changed, caused by the change."[26] More recently, the VABCA summarized the relationship between loss of productivity and impact costs in *Centex Bateson Construction Co.*:

> Impact costs are additional costs occurring as a result of the loss of productivity; loss of productivity is also termed inefficiency. Thus, impact costs are simply increased labor costs that stem from the disruption to labor productivity resulting from a change in working conditions caused by a contract change. Productivity is inversely propor-

22. Robert F. Cushman *et al.*, Proving and Pricing Construction Claims § 3.01, at 69 (3d ed. 2001).

23. Although numerous changes can cause delays, a cumulative impact claim differs from a claim for delay in that the contractor need not prove that contract performance was extended beyond the planned completion date in order to recover. Sauer, Inc. v. Danzig, 224 F.3d 1340, 1348 (Fed. Cir. 2000). Delay claims usually include indirect costs such as extended overhead, increased equipment, and financing costs. In contrast, impact claims include direct costs such as "increased labor costs for additional employees used to perform extra work; increased costs for inefficiency caused by altered work conditions or overtime; and increased equipment and material costs." Cushman, *supra* note 22, § 3.02, at 69–71; *see also* Thomas R. Burke, *Productivity Loss Claims*, a paper presented to the Surety and Fidelity Claims Conference Association, Apr. 18, 1991.

24. This Article focuses on cumulative impact claims for loss of labor productivity, rather than claims for extended overhead. Loss of productivity makes up the greatest portion of cumulative impact claims. In addition, very few cases characterize delay claims as cumulative impact claims. *See, e.g.*, Haas & Haynie Corp., GSBCA Nos. 5530 *et al.*, 84–2 BCA ¶ 17,446, 86,897 (rejecting a claim where a contractor argued that the number of changes extended its stay on the project beyond its completion date and thereby increased its administrative overhead).

25. Finke, *supra* note 3, at 312.

26. Howard W. Wright & James P. Bedingfield, Government Contracts Accounting 341 (1979).

> tional to the man-hours necessary to produce a given unit of product. As is self-evident, if productivity declines, the number of man-hours of labor to produce a given task will increase. If the number of man-hours increases, labor costs obviously increase.[27]

Productivity can be affected by many factors that disrupt the efficient performance of the work. The contractor anticipates that it will perform the work in a logical sequence with a reasonable number of workers and under normal working conditions.[28] When external events interrupt that flow of work, the contractor often must shift workers back and forth between tasks or increase the total number of workers on the project while continuing to operate under a rigid schedule. "Multiple changes, interference, delays, alterations in the sequence of work, suspension and acceleration of performance are not infrequent in an environment of fast-tracking scheduling and fast-shifting priorities as [owners] try to meet their various [goals]."[29]

Many different organizations such as the Mechanical Contractors Association of America, Inc. (MCAA), the National Electrical Contractors of America (NECA), the Army Corps of Engineers, and the Business Roundtable have identified factors that adversely affect labor productivity.[30] For example, the MCAA's Bulletin No. 58 lists factors and labor productivity ratios, which provide estimates for how these factors can degrade efficient performance of the contract work.[31] The MCAA factors include (1) stacking of trades, (2) morale and attitude, (3) reassignment of craft-personnel, (4) crew size inefficiency, (5) dilution of supervision due to diversion of supervisors to analyze and plan for changes, (6) site access, (7) changes in one trade's work affecting another trade's work, (8) control over material flow to work areas, and (9) season and weather changes.[32]

Cumulative impact claims for multiple-owner-directed changes represent just one type of claim for loss of labor productivity. Unlike some of the factors that directly affect productivity such as a differing site condition or lack of access to the job site, numerous changes or contractor requests for information do not directly cause loss of productivity. Instead, they gradually alter

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27. Centex Bateson Constr. Co., VABCA Nos. 4613, 5162–5165, 99–1 BCA ¶ 30,153, 149,257, *aff'd*, Centex Bateson Constr. Co. v. West, 250 F.3d 761 (Fed. Cir. 2000).

28. Thomas E. Shea, *Proving Productivity Losses in Government Contracts*, 18 PUB. CONT. L.J. 414, 415 (1989).

29. *Id.* at 415.

30. Mechanical Contractors Association of America (MCAA), Management Methods Bulletin No. 58 (1976); U.S. Army Corps of Engineers, Modification Impact Evaluation Guide, EP 415–1-3 (July 1979); *see also* Roy S. Cohen, *Survey of Courts' Reactions to Claims for Loss of Productivity and Inefficiency*, as part of panel discussion of the Business Roundtable, Session 612: High Tech or Black Box—Proving Loss of Productivity Claims (December 10, 1998); BARRY B. BRAMBLE & MICHAEL T. CALLAHAN, CONSTRUCTION DELAY CLAIMS § 5.19 (2d ed. 1992).

31. MCAA Management Methods Bulletin No. 58 (1976), *supra* note 30, *republished in* Bulletin PD-2 (1994).

32. *Id.*

working conditions and can cause the above-referenced factors to come into play.[33] That is, the presence of significant numbers of changes can cause "additional congestion in the work area, loss of momentum, [and] change in work sequence."[34] It is, therefore, the effect of the changes to the environment in which the work is done that causes a loss of productivity.[35]

Disruption or loss of productivity is defined as the "increased cost of performance caused by a change in the contractor's anticipated or planned working conditions, resources, or manner of performing its work."[36] As one analyst explained:

> Foremen and journeymen, who know what they are doing, what they will be doing next, and how their activities relate to the successful completion of the project, develop a job rhythm. Labor productivity is at its optimum when there is good job rhythm. When that job rhythm is interrupted, the productivity of those engaged in the interrupted work is definitely impacted and the effect can spread to other concurrent activities as well.[37]

Multiple contract changes may cause contractors to reassign workers, stack trades, and perform work out of sequence. These factors in turn may degrade planned productivity and cause labor costs to increase.

Cumulative impacts remain difficult to define because few researchers have undertaken quantitative analyses of the cumulative disruption caused by numerous change orders. Charles A. Leonard's 1988 Master's thesis, "The Effects of Change Orders on Productivity," represents one of the few comprehensive studies on the subject.[38] In that early thesis, Leonard examined ninety cases from fifty-seven different projects to determine the disruptive effect of change orders on unchanged base contract work.[39] His statistical analysis examined the percentage of the total number of hours performed on change order work compared with the total number of hours performed on the project.[40] Leonard concluded that loss of labor productivity was greatest where the hours spent on change order work exceeded 10 to 15 percent of the normal base contract hours.[41] He concluded that the cumulation of change orders results in the following causes of loss of productivity: "stop-and-go operations; out-of-sequence work; loss of productive rhythm; demo-

33. William Schwartzkopf *et al.*, Calculating Construction Damages § 2.24 (Supp. 1997) (citing H. Randolph Thomas & Carmen Napolitan, *The Effects of Changes on Labor Productivity: Why and How Much*, Construction Industry Institute Source Document 99, at 26, 62, 64 (1994)).

34. *Id.*

35. *Id.*

36. Finke, *supra* note 3, at 313.

37. Burke, *supra* note 23.

38. Charles A. Leonard, *The Effects of Change Orders on Productivity* (Feb. 1988) (unpublished Master's thesis, Concordia University) (on file with author); *see also* Schwartzkopf, *supra* note 33, § 4.4, 47–49.

39. Leonard, *supra* note 38, at iii.

40. *Id.* § 3.4.

41. *Id.* § 4.3.

tivation of work force; loss in learning curve; unbalanced crews; excessive manpower fluctuations; unbalancing of successive operations; lack of management and engineering support; and acceleration when equitable time extensions are not granted."[42]

Leonard's conclusions, however, have been subject to criticism.[43] For example, the Corps of Engineers Board of Contract Appeals (ENG BCA) recently declined to accept the study, stating that the Government's expert had discredited the study and concluding, "[n]o court has adopted the Leonard study approach in measuring productivity loss/inefficiency."[44] The ENG BCA explained that the study was based upon "relatively small building and facility projects, consisting of 94 contracts totaling $220 million."[45] Thus, the board reasoned that the study was inapplicable to heavy civil engineering projects such as the massive flood protection project to protect a historic town, at issue in *J.A. Jones Construction*.[46]

More recently, the Construction Industry Institute (CII) organized a cumulative change order impact research team composed of representatives from the construction industry and from the University of Wisconsin–Madison to study the cumulative effect of change orders on labor productivity and to develop a method to quantify cumulative impact.[47] The research team set out to develop two models: (1) an impact model to determine whether a cumulative impact has occurred on a project, and (2) a quantification model to measure the extent of the impact on the projects where it was determined to have occurred.[48] The team limited their analysis to electrical and mechanical contractors.[49]

The researchers used data obtained through questionnaires from sixty-eight separate electrical and mechanical contractors on 116 different projects, including industrial, institutional, and commercial construction projects as well as a small sample of residential projects.[50] Unlike the earlier Leonard study, the CII analysis sampled both impacted and unimpacted jobs as well as projects with and without claims by contractors.[51] For the first model, the research team assembled a list of seventy-five factors that could potentially impact a project.[52] Using statistical regression analysis to determine the correlation between these factors and loss of productivity, the researchers concluded that their model could determine whether a project has been impacted

42. *Id.* § 6.1.
43. J.A. Jones Constr. Co., ENG BCA Nos. 6348, 6386–6391, 00–2 BCA ¶ 31,000.
44. *Id.* at 153,097.
45. *Id.* at 153,096.
46. *Id.*
47. *Quantifying the Cumulative Impact of Change Orders for Electrical and Mechanical Contractors*, Construction Industry Institute Research Summary 158–1 (2000).
48. *Id.* at v. & 2.
49. *Id.* at 4.
50. *Id.* at 6–7.
51. *Id.* at 20.
52. *Id.* at 7.

by the cumulation of change orders with 80 percent certainty.[53] For the second model, the team distilled the seventy-five variables down to six independent variables that "significantly affect productivity loss."[54] These included (1) percent of change in terms of the original budgeted work-hours, (2) percent of time the project manager spent on the job site, (3) percent of change orders initiated by the owner, (4) whether the contractor tracked productivity, (5) whether the project was overstaffed, and (6) the amount of time it took the owner to approve change orders.[55] The team subsequently developed a linear regression equation to predict the value of the loss of efficiency resulting from the six factors.[56]

Although the CII study serves as a positive contribution to understanding the elusive cumulative impact claim, neither model has yet been tested by a BCA, the U.S. Court of Claims, or any state appellate court. Therefore, the issue of whether either of these models can be used to prove or disprove the three elements of a cumulative impact claim—liability, causation, and damages—remains to be seen. Until that time, however, the models may prove useful for the Government, private owners, and contractors to negotiate equitable adjustments before they reach the claims stage.

B. *Cumulative Disruption as Defined by Boards and Courts*

The first case to provide a thorough examination of cumulative impact or disruption was the GSBCA case *Pittman Construction Co.*[57] In *Pittman*, the GSBCA recognized two types of impact costs: direct costs and indirect or cumulative costs.[58] According to this dichotomy, direct costs "refer to costs that are, more or less, the direct consequences of a change. Such costs are readily foreseeable, and a contractor is expected to recognize them in forward pricing a change."[59] In contrast, cumulative impact costs are:

> [The] costs associated with impact on distant work, [that] are not as readily foreseeable or, if foreseeable, not as readily computable as direct impact costs. The source of such costs is the sheer number of and scope of changes to the contract. The result is an unanticipated loss of efficiency and productivity which increases the contractor's performance costs and usually extends his stay on the job.[60]

Unlike direct impact costs, cumulative impacts theoretically cannot be captured in a forward-priced change order because one cannot foresee the

53. *Id.* at 12.
54. *Id.* at 15.
55. *Id.* at 16.
56. *Id.* at 15.
57. GSBCA Nos. 4897, 4923, 81–1 BCA ¶ 14,847.
58. *Id.* at 73,297.
59. Haas & Haynie Corp., GSBCA Nos. 5530, 6224, 6638, 6919–20, 84–2 BCA ¶ 17,446, 86,897 (discussing *Pittman*).
60. *Id.*

impact of an unreasonable number of changes yet to occur.[61] Following this dichotomy to its logical conclusion, a contractor is able to price its cumulative impacts only in backward-priced change orders.[62]

In *Triple "A" South*, the Armed Services Board of Contract Appeals (ASBCA) explained the conceptual framework in greater detail:

> It is undisputed that the costs of performing changed work include both (a) those costs directly related to the accomplishment of the changed work, called "hardcore costs," and (b) those costs arising from the interaction between the changed work and unchanged work or expended to offset inefficiencies experienced as a result of changes, called "impact." Viewed broadly "impact" embraces:
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> > The man hours, labor costs, and material costs that are expended to offset inefficiencies experienced as a result of Government-caused or contractor-caused changes or other departures from the plan. Included is the process by which the above inefficiencies in the performance of contract work are created.
> >
> > Among other things, "impact" includes:
> >
> > Inefficiencies due to overcrowding, over or undermanning, skill dilution, extended overtime, shift work and local and cumulative disruption.
>
> "Local [or direct] disruption" refers to the direct impact that changed work has on other unchanged work going on around it. Conceptually, for purposes of this appeal "cumulative disruption":
>
> > is the disruption which occurs between two or more change orders and basic work and is exclusive of that local disruption that can be ascribed to a specific change. It is the synergistic effect . . . of changes on the unchanged work and on other changes.[63]

Other boards have recited the language from *Triple "A" South* because they find it difficult to reach the definitional core of cumulative impacts.[64] "Synergistic effect" is at the core of the definition. Synergism is defined as "the simultaneous action of separate agencies, which together, have greater total effect than the sum of their individual effects."[65] Contractors claim that it is that compounding effect that should allow them to recover for the effects of numerous changes.

Most recently, the VABCA described cumulative disruption in a far less clear and more ethereal manner:

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61. *But cf*. Kasen & Oblas, *supra* note 15 (advocating the forward pricing of cumulative impacts based on the concept of partnering).

62. *But cf*. Dyson & Co., ASBCA No. 21,673, 78–2 BCA ¶ 13,482, 65,956. In *Dyson*, the Armed Services Board of Contract Appeals concluded that although impact costs generally could only be determined at the end of the construction project, these costs nonetheless could only be measured by way of estimates. *Id*. at 65,970. Under the contract provisions involved in the case, the contractor was obligated to negotiate all changes during the contract modifications process whether or not they could be quantified. As a result, the board found that the contractor had waived its claims because the contract required it to establish the impact in a forward-priced change order.

63. Triple "A" South, ASBCA No. 46866, 94–3 BCA ¶ 27,194, 135,523.

64. *See* Centex Bateson Constr. Co., VABCA Nos. 4613, 5162–5165, 99–1 BCA ¶ 30,153, 149,257–58, *aff'd*, Centex Bateson Constr. Co. v. West, 250 F.3d 761 (Fed. Cir. 2000).

65. Webster's New World Dictionary (2d ed. 1984).

> Cumulative impact is the unforeseeable disruption of productivity resulting from the "synergistic" effect of an undifferentiated group of changes. Cumulative impact is referred to as the "ripple effect" of changes on unchanged work that causes a decrease in productivity and is not analyzed in terms of spatial or temporal relationships. This phenomenon arises at the point the ripples caused by an indivisible body on two or more changes on the pond of a construction project sufficiently overlap and disturb the surface such that the entitlement to recover additional costs resulting from the turbulence spontaneously erupts . . . This result is unforeseeable and indirect.[66]

When the VABCA states that cumulative impacts cannot always be analyzed in terms of spatial and temporal relationships, it means that the costs cannot be tied to individual contract changes. This is the board's method of explaining that the validity of a cumulative disruption claim cannot be determined by multiplying the direct impacts of each change by the total number of changes. Despite recognizing this problem of causation, the board in *Centex Bateson Construction Co.* required the contractor to provide some analysis to demonstrate that "the undifferentiated group of contract changes affecting the changed and unchanged work resulted in the loss of productivity."[67]

The allure of the cumulative impact claim lies in the simple idea that the effect of two or more changes to a project may be more severe than the effect of one change. This idea is common to everyday life. For example, multiple incoming phone calls can interrupt an attorney's attempt to draft a memorandum. The attorney may be able to resume where he or she left off after the first phone call, but likely will have to go back and reread a good portion of the draft after the second, third, or fourth phone call in order to complete the memo. Alternatively, to use a sports analogy, it is common for a certain number of professional baseball players on a team to become injured each year. If one player becomes injured, the team can usually integrate a replacement player into the line-up without suffering in terms of the team's overall performance. If, however, two or more players become injured, it becomes increasingly more difficult for the team as a whole to continue to play as well as it did before the injuries to its line-up. On a more sophisticated level, the synergistic effect of consuming various prescription drugs together can have a massive unintended impact on a person's well-being.

Although courts and boards have been quick to recognize that in theory synergism can have negative repercussions, they appear to have difficulty in determining how a contractor should establish that the size, number, or quality of contract changes caused the resultant injury. Undoubtedly, factors other than the number of owner-directed changes could be responsible for schedule delays and decreased productivity on a project. Courts and boards want to ensure that the Government or private owner, and not the contractor, was in fact the source of any inefficiency. The concern that the party responsible

66. *Centex Bateson Constr. Co.*, 99–1 BCA ¶ 30,153, at 149,259.
67. *Id.* at 149,259.

for the loss of productivity should bear the costs often drives both judicial acceptance of cumulative impact claims and reluctance to permit recovery.

Consequently, a contractor seeking to recover should attempt (as close as is feasible under the circumstances) to quantify the size of the disruption and connect the impact to its owner-related sources. Unfortunately, the contractor is caught somewhat in a Catch-22. If the contractor can establish that the disruption resulted from specific change orders, the court may categorize the claim as a direct or local impact and find that the contractor failed to negotiate recovery in a forward-priced change order. Alternatively, if the contractor is only able to demonstrate its losses through a comparison of its bid with the actual costs, the claim may be rejected for failure to sufficiently prove its claim. In any event, the theory behind these definitions can be critical in persuading a judge that the claim is viable, but as this Article will show, the elements—liability, causation, and resultant injury—must be demonstrated with a high degree of definiteness.

C. *Does the Local/Cumulative Distinction Always Matter?*

Determining whether to proceed under a direct or indirect impact theory can be difficult for any contractor. The distinction is largely a matter of quality of proof of quantum and entitlement. Direct impact claims are essentially for items that could have been recovered at the time a particular change order was executed (i.e., they were foreseeable), but for one reason or another the contractor did not claim the costs at that point. A direct impact claim, as its name implies, covers the changed work's direct effect on unchanged work, rather than the changed work's effect on working conditions that will indirectly affect the unchanged work. Absent the issues of waiver, reservation of right and accord and satisfaction, boards generally appear to be more receptive to direct impact claims because of the direct and visible link between cause and effect. Therefore, direct impact claims can be easier to prove provided the contractor can show specifically how a certain change order or group of change orders affected specific base contract work. At the same time, because the manner in which quantum must be proven is very similar (i.e., lost productivity can be measured using techniques such as the measured mile approach, modified total cost method, jury verdict method, etc.), it sometimes becomes difficult for a board to determine which theory is at issue.[68]

Such was the case in *Clark Construction Group, Inc.*, in which the contractor did not differentiate between its direct and cumulative impact

68. Because of the similarity in the proof of direct and cumulative impact claims, contractors must be careful in choosing how to proceed. Some boards have rejected cumulative impact claims because the contractor has offered the same proof of entitlement and damages to demonstrate direct and cumulative impact. *See, e.g.*, Southwest Marine, Inc., DOT BCA No. 1663, 94–3 BCA ¶ 27,102, 135,078–79.

claims.[69] As a result, the VABCA considered both types of claims and rejected the indirect loss of efficiency claims:

> [t]o the extent that [the claim] includes loss of labor productivity caused by the combined effect of the change of sequence, wet conditions and late RFI responses in addition to the alleged direct efficiency losses, [the subcontractor] has not met the test we established in *Centex Bateson* to show that the combination of the alleged conditions cumulatively impacted the work and reduced labor efficiency.[70]

In *Clark*, the prime contractor brought a claim on behalf of its subcontractor, Poole and Kent Company (PKC), the real party in interest, to recover for the costs of its labor inefficiencies and those of its subcontractor, United Sheet Metal Company (USM), allegedly caused by the Government. The contract called for the construction of a general medical, surgical, intermediate care, and psychiatric hospital for the Department of Veterans Affairs (VA) in West Palm Beach, Florida.[71] The area upon which the project was to be constructed was several feet below the water table and thus the site required extensive dewatering.[72] During the construction phase, the local water management authorities issued two stop pump orders to halt the dewatering activities when the VA failed to obtain the necessary permits. Although the subcontractor did not claim that the Government was liable for lost productivity based on the sheer number of changes or late responses to RFIs, PKC did assert that changes in the construction sequence caused by the stop pump orders resulted in increased lost productivity. PKC also asserted that it encountered excessively wet conditions and that the Government's endemic failure to timely respond to RFIs adversely impacted its labor coordination drawing costs.

The board equitably adjusted the contract in favor of PKC for the change of sequence and portions of the wet conditions claims, but denied the subcontractor's claim for disruption allegedly caused by the VA's late responses to contractor RFIs.[73] Because the contractor did not differentiate between claims, the board evaluated this claim as an indirect impact claim and applied the loss of productivity analysis from *Centex Bateson*.[74] In this case, PKC alleged that 260 of 750 RFIs that related to its work adversely affected labor productivity, but it never claimed that the sheer number of late responses was the source of the problem.[75] The board held that the contractor failed to prove by a preponderance of the evidence that the late RFI responses caused a loss of labor productivity.[76] The VABCA explained that establishing

69. Clark Constr. Group, Inc., VABCA No. 5674, 00–1 BCA ¶ 30,870, 152,413.
70. *Id.*
71. *Id.* at 152,388.
72. *Id.* at 152,392.
73. *Id.* at 152,420–21.
74. *Id.* at 152,413.
75. *Id.* at 152,399.
76. *Id.* at 152,417.

entitlement for a loss of efficiency claim requires proof of "daily logs, CPM fragnets, correspondence and other contemporaneous Contract documentation to support that the late RFI responses changed the expected working conditions and that the change to working conditions disrupted [the subcontractor's] labor and the extent of the disruption."[77] The board noted that its "expectation . . . [was] heightened by the fact that most of the late RFI problems were experienced at the initial stages of the project and [the subcontractor] knew very early in the project that its labor costs were running substantially above budget."[78]

In *Clark*, the VABCA noted that although the contractor's expert testified that the Government was supposed to respond to RFIs within fourteen days, this testimony was based neither on any language in the contract nor upon any contemporaneous project documentation, but was merely passed on orally by the contractor's team.[79] Consequently, the contractor could not prove liability, which is generally perceived to be the easiest element. The board was particularly skeptical because the contractor did not become aware of and document the problem before project completion even though most of the late RFIs occurred early in the project. The *Clark* decision reveals the difficulty of determining how and when to separate direct impact claims from cumulative impact claims. Moreover, *Clark* underscores the need, under either theory, of supporting loss of productivity claims with contemporaneous documentation that shows how changes or late responses to RFIs impacted either the working conditions or the unchanged work.

IV. The Historical Basis for Cumulative Disruption Claims

Cumulative impact claims have a long and complicated history.[80] The history is complicated because the theories of recovery often have been implicitly tied to jurisdictional issues between the U.S. Court of Claims and the various boards of contract appeals. In *Utah Mining & Construction Company v. United States*, the U.S. Supreme Court limited the jurisdiction of the boards of contract appeals to cases arising under the relief-giving provisions of the contract.[81] Therefore, until the enactment of the Contract Disputes Act of 1978, boards of contract appeals did not have jurisdiction to decide

77. *Id.*
78. *Id.*
79. *Id.*
80. The history of disruption claims can be traced as far back as biblical times. For example, in Exodus, God commanded Moses to deliver the Israelites out of Egypt. Exodus 3:8. Accordingly, Moses told Pharaoh to free the Israelites, to which Pharaoh responded by having the taskmasters deny them access to straw to make bricks and required the enslaved people to maintain the same level of productivity as when they had straw. *Id.* at 5:1–23.
81. 384 U.S. 394, 395 (1966).

implied contract or breach of contract cases.[82] Consequently, boards developed creative approaches to awarding compensation in cases that involved situations where the Government exceeded its authority to change work under the Changes clause. Such a claim would normally constitute a breach of contract. Therefore, boards developed the legal fiction that there was no breach of contract, but rather the Government had informally ordered changes without following the procedures in the contract. Although the jurisdictional issues are not germane to the application of the cumulative impact claim to a private commercial setting, it is important to understand that the courts and boards employ certain terminology as a result of the claim's original jurisdictional underpinnings.

Since the abrogation of the *Rice* doctrine in 1968, the basis for recovery has gradually shifted from requiring a cardinal change to requiring proof of a constructive change. Although the prevailing theory of recovery is generally based upon the concept of constructive change, the most recent decisions have referred interchangeably and somewhat erratically to both concepts. For example, in the 1999 case *Coates Industrial Piping, Inc.*, it is unclear whether a cumulative impact claim arises out of the contract in the form of a constructive change or whether it is more closely analogous to a breach of contract in the form of a cardinal change.[83]

Under the constructive change theory, the Government has caused the contract work to change, but the Government has not followed the procedures of the Changes clause contained in the contract.[84] This theory acts as an exception to the formal requirement of a change order.[85] The Government has the right to make changes under the terms of the contract and in fact has changed the work, but has not followed the formal contract procedures.

Alternatively, a cardinal change is a change that fundamentally alters the contemplated scope of work.[86] More precisely, a "cardinal change is a breach of contract by the owner that occurs when an owner effects an alteration in the work so drastic that the contractor is required to perform duties materially different from those for which it contracted."[87] Unlike a constructive change, a cardinal change is "by definition . . . so profound that it is not redressable under the contract, and thus renders the government in breach."[88] With cardinal changes, the contractor generally bears a heavier burden of proof

82. John Cibinic Jr. & Ralph Nash Jr., Administration of Government Contracts 429 (3d ed. 1995).

83. VABCA No. 5412, 99–2 BCA ¶ 30,479, 150,584.

84. Cibinic & Nash, *supra* note 82.

85. *See* Michael Simon, Construction Claims and Liability § 11.10 (1989).

86. Atlantic Dry Dock Corp. v. United States, 773 F. Supp. 335, 339 (M.D. Fla. 1991); George E. Powell Jr., *The Cardinal Change Doctrine and Its Application to Government Construction Contracts*, 24 Pub. Cont. L.J. 377, 378 (1995).

87. Cushman & Butler, *supra* note 13.

88. *Atlantic Drydock Corp.*, 773 F. Supp. at 339 (quoting Allied Materials & Equip. Co. v. United States, 569 F.2d 562, 563–64, 215 Ct. Cl. 406 (1978)).

than when proceeding under a constructive change theory. The contractor must prove that the excessive change orders materially or fundamentally altered the scope of the work or nature of the bargain such that the work no longer resembles the original contract.[89] Stated differently, a contractor must show that the Contracting Officer or owner exceeded his authority under the Changes clause to "make changes within the general scope" of work.[90]

A. *The* Rice *Doctrine and Its Effect on Cumulative Impact Claims*

Cumulative impact claims arising under federal government contract law were originally barred by the *Rice* doctrine, which precluded courts from considering the effect of change orders upon aspects of the work not directly or specifically covered by the change order.[91] Specifically, a "contractor that incurred costs associated with delays in performance or with disruption of contract work as the result of contract change was entitled, under the terms of the standard Changes clause, only to the increased costs of the changed work and to a time extension equal to the delay period."[92]

Rice v. United States was a differing site conditions case involving the construction of a veterans facility. During construction, the contractor encountered unsuitable soil conditions. As a result, the construction of the superstructure took place during the winter, which in turn caused decreased labor productivity and increased field overhead costs.[93] The Court held that an equitable adjustment was appropriate for the work changed by the plan and specification revisions, but an adjustment was not appropriate for the increased cost of completing the unchanged work.[94] Under *Rice*, a contractor was prevented from recovering the costs of government-caused delay and the costs of lost labor productivity on unchanged work.

To avoid an inequitable result, the doctrine was abolished[95] in late 1967 by revising the standard federal contracts Changes clause language to include new language.[96] It currently reads as follows:

> If any such change causes an increase or decrease in the cost of, or the time required for, performance of any part of the work under this contract, whether *or not changed*

89. Aragona Constr. Co. v. United States, 165 Ct. Cl. 382, 391 (1964).
90. Triple "A" South, ASBCA No. 46866, 94–3 BCA ¶ 27,194, 135,541.
91. Rice v. United States, 317 U.S. 61 (1942).
92. Pittman Constr. Co., GSBCA Nos. 4897, 4923, 81–1 BCA ¶ 14,846, 73,294.
93. *Rice*, 317 U.S. at 63.
94. *Id.* at 64–65.
95. With respect to delay claims, the GSBCA in *Pittman Construction Co.*, 81–1 BCA ¶ 14,847, at 73,295, explained that the impact of the *Rice* doctrine was ameliorated by exceptions created by the U.S. Court of Claims even before the doctrine's express abandonment. Moreover, the Government's subsequent adoption of the Suspension of Work clause allowed contractors to recover for unreasonable delay, although not the increased costs for unchanged work.
96. Ingalls Shipbuilding Division, ASBCA No. 17579, 78–1 BCA ¶ 13,038, 63,663.

> *by the order*, the Contracting Officer shall make an equitable adjustment in the contract price, the delivery schedule or both, and shall modify the contract. [97]

Although a change in contractual language ostensibly eliminated the doctrine, it did not leave cumulative impact cases decided during its existence completely without value. In one of the first board of contract appeals decisions to evaluate the viability of "ripple effect" claims, the ASBCA in *Dyson & Co.* looked to the U.S. Court of Claims for guidance on how to address these types of claims.[98] In *Dyson*, the ASBCA explained that the U.S. Court of Claims analyzed claims by contractors in which contractors sought to "establish that the magnitude or cumulation of changes amounts to what the court characterizes as a 'cardinal change,' exceeding the rights reserved under the Changes clause and entitling the contractor to relief for breach of contract."[99] The board then appeared to apply the U.S. Court of Claims' cardinal change test (i.e., fundamental alteration of the scope of work) to deny the contractor's cumulative impact claim, which was based on a constructive change theory of recovery.[100]

B. *Cardinal Change as a Basis for a Claim*

In early federal cumulative impact cases, the U.S. Court of Claims required that a contractor demonstrate proof of a cardinal change.[101] The effect of requiring the cumulative disruption to rise to the level of cardinal change effectively operated to bar recovery for a cumulative impact claim except in the most egregious cases.

The Court of Federal Claims developed the cardinal change doctrine to deal with those cases where the "[G]overnment had breached its contracts by ordering changes that were outside the scope of the [C]hanges clause."[102] Typically, the Government would argue that all changes were within the broad language of the clause and the contractor would counter with the argument that there are limits to the Changes clause.[103] In essence, the doctrine became an easy way to describe changes that went beyond the reach of the Changes clause. Although the cardinal change approach made cumulative impact claims more difficult to prove, in other cases, a cardinal change could move a contractor out from under the terms of the contract and allow recovery for the reasonable value of its labor and materials, plus a reasonable markup for overhead and profit.[104]

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97. 48 CFR 52.243–1(b) (2001) (emphasis added).
98. Dyson & Co., ASBCA No. 21673, 78–2 BCA ¶ 13,482, 65,970–71.
99. *Id.* at 65,970.
100. *Id.*
101. *See generally* Finke, *supra* note 3.
102. Cushman & Butler, *supra* note 13, § 10.3 (1994).
103. *Id.*
104. *Id.* § 10.1; *see, e.g.*, Amelco Elec. v. City of Thousand Oaks, 98 Cal. Rptr. 2d 159 (2000), *cert. granted*, 11 P.3d 956 (Cal. 2000).

Two federal cases illustrate how this early theory operated in the context of cumulative impact claims and how the cardinal change typically served to deny claims for additional compensation for loss of productivity. The two cases are *Aragona Construction Co. v. United States*[105] and *Wunderlich Contracting Co. v. United States*.[106] Although the *Rice* doctrine was never expressly referred to by the U.S. Court of Claims in either *Aragona* or *Wunderlich*, it is logically consistent that the doctrine, together with permissive language in the pre-1968 Changes clause, drove the courts' analyses in those decisions.

1. *Aragona Construction Co., Inc. v. United States*

In *Aragona Construction Co., Inc. v. United States*, the U.S. Court of Claims couched the issue as "whether the cumulative effect of the changes in [the substitution of certain building] materials necessitated by [Government mandated] priority orders caused a cardinal change beyond the permissible limits of the contracting officer's discretion."[107] The U.S. Court of Claims held that the contractor was not entitled to contract damages for the effect of sixty-five change orders because it failed to prove that the changes materially altered the nature of the bargain.[108]

The contractor entered a contract with the VA to construct a hospital in 1941 and 1942.[109] Due to the onset of World War II, the Government issued orders that prevented the contractor from using materials such as steel, copper, brass, and aluminum in the construction.[110] Acting under the Changes clause or article of the contract, the Contracting Officer required the contractor to substitute wood, cast iron, or plastic, and fabric in place of the scarce materials.[111] In addition, the Government issued sixty-five change orders and final completion was delayed approximately 429 days.[112] The contractor sought to recover by arguing that "it was compelled to construct a wholly different project from that called for under the original specifications."[113]

The court rejected the idea that the number of changes was in itself determinative and held that that the Government did not abuse its discretion under the changes provision by issuing sixty-five change orders or by substituting materials.[114] Moreover, the court rather harshly explained that

105. Aragona Constr. Co. v. United States, 163 Ct. Cl. 382 (1964).
106. Wunderlich Contracting Co. v. United States, 173 Ct. Cl. 180, 351 F.2d 956 (1965).
107. *Aragona Constr. Co.*, 163 Ct. Cl. at 390.
108. *Id.* at 389–90.
109. *Id.* at 384. It is unclear from the decision why this case was first decided by the U.S. Court of Claims in 1964 when the project was completed in 1943.
110. *Id.* at 384–85.
111. *Id.* at 385.
112. *Id.* at 384, 389.
113. *Id.* at 385.
114. *Id.* at 390.

"[p]laintiff contracted to build a reinforced concrete hospital building on a certain site at Fort Howard, Maryland, and that is exactly what it built."[115]

2. *Wunderlich Contracting Co. v. United States*

Wunderlich Contracting Co. v. United States[116] is probably the case most often cited by courts and practitioners in favor of the cardinal change doctrine in cumulative impact cases.[117] Ironically, as several writers have recognized, the *Wunderlich* case does not completely support the cardinal changes approach because the case did not involve a claim for breach of contract, but rather a claim for the reasonable value of the work under the doctrine of *quantum meruit*.[118] *Quantum meruit* is the correct measure of damages for a claim for abandonment, but not for breach of contract.[119] Nonetheless, *Wunderlich* contains an excellent discussion of the standard required to prove a cardinal change.

Similar to *Aragona*, *Wunderlich* also involved the construction of a VA hospital by a general contractor. In *Wunderlich*, however, the contract provided for the construction of an enormous fourteen-building hospital complex, the largest of its kind ever undertaken at that time.[120] Because no prototype for the proposed facility existed, the architectural firm encountered serious difficulties in the performance of the design contract before the bid for the project opened.[121] Once underway, construction was seriously delayed due to the inadequacy and ambiguities of the plans and specifications.[122] The Government was forced to make extensive alterations and corrections. The contractor issued 470 estimates for increased labor, material, and equipment, which eventually translated into thirty-five change orders.[123]

Like the court in *Aragona*, the *Wunderlich* court concluded that the changes ordered by the Contracting Officer were not cardinal in nature and that they were within the scope of the Government's discretion under the Changes clause. The court stated: "[m]anifestly, plaintiff's performance has been lengthier and costlier than anticipated at the time the bid was submitted, but in the long run they constructed essentially the same project as that described in the contract."[124] Together, these two decisions illustrate how the

115. *Id.* at 391.
116. 351 F.2d 956 (Cl. Ct. 1965).
117. *See, e.g.*, CUSHMAN & BUTLER, *supra* note 13, § 10.3 at 179 (1994).
118. *Wunderlich*, 351 F.2d at 960; Keating & Burke, *supra* note 21.
119. *See, e.g.*, Peter Kiewit Sons' Co. v. Summit Constr. Co., 422 F.2d 242 (8th Cir. 1969).
120. *Wunderlich*, 351 F.2d at 960.
121. *Id.* at 960–61.
122. *Id.* at 962.
123. *Id.*
124. *Id.* at 966.

U.S. Court of Claims used the cardinal change doctrine to deny claims for the cumulative impact of numerous government-directed change orders.

3. The Application of the Cardinal Change Doctrine in State Law Cases

Although courts and boards infrequently rely exclusively on the cardinal change doctrine, it does occasionally appear in cumulative impact cases arising under state law. In those cases, the doctrine is normally used to compensate an affected contractor.[125] Instead of applying the terminology of cardinal change, state courts often characterize these claims as an abandonment of the contract by the owner. Two California cases and one from Kentucky illustrate this point.

First, in *C. Norman Peterson Co. v. Container Corp. of America*, a contractor sought to recover its cost overruns at a paper mill modernization project.[126] The California Court of Appeals for the First District held that the private owner had imposed hundreds of changes upon the contractor and thereby so altered the scope of the work under the contract that the owner had effectively abandoned the contract.[127] The court explained:

> In the specific context of construction contracts . . . it has been held that when an owner imposes upon the contractor an excessive number of changes such that it can fairly be said that the scope of the work under the original contract has been altered, an abandonment of the contract properly may be found. In these cases, the contractor, with the full approval and expectation of the owner, may complete the project. Although the *contract* may be abandoned, the *work* is not. Under this line of reasoning, the trial court was well justified in determining that, by their course of conduct, the parties abandoned the terms of the written contract.[128]

C. Norman Peterson established that under California law, a contractor could recover in *quantum meruit* for the effect of numerous changes from a private owner under the theory that the owner had effectively abandoned the contract.[129]

More recently, California's Court of Appeals revisited the precedent set forth in *C. Norman Peterson* and addressed the issue of a public owner's right to order extra work under a construction contract's Changes clause.[130] In

125. Hous. Auth. v. E.W. Johnson Constr. Co., 573 S.W.2d 316 (Ark. 1998) (upholding an award based upon cardinal change resulting from a breach of warranty of plans and specifications); MARTA v. Green Int'l, Inc., 509 S.E.2d 674 (Ga. Ct. App. 1998) (affirming a $2.8 million jury verdict in favor of a contractor arising out of a claim for defective specifications and the owner's failure to administer the contract in a timely fashion); Oberer Constr. Co. v. Park Plaza, Inc., 179 N.E.2d 168, 170–71 (Ohio Ct. App. 1961) (awarding the reasonable value of the excavation services to the contractor without expressly mentioning cardinal change).

126. C. Norman Peterson Co. v. Container Corp. of Am., 218 Cal. Rptr. 592 (Cal. Ct. App. 1985).

127. *Id.* at 598.

128. *Id.* (citations omitted).

129. *Id.* at 601.

130. Amelco Elec. v. City of Thousand Oaks, 98 Cal. Rptr. 2d 159 (Cal Ct. App. 2000), *cert. granted*, 11 P.3d 956 (Cal. 2000).

Amelco, the court held that when an owner imposes an excessive number of changes, a court may find an abandonment of the contract and allow the contractor to recover the reasonable value of its work to complete the project.[131] This case is exceptional because it marks the first occasion under California law that a contractor could recover in *quantum meruit* from a public entity, rather than being limited to a breach of contract remedy. Although the California Supreme Court could overrule this decision, it nonetheless illustrates how a state court may apply logic similar to the federal cardinal change doctrine (although in unjust enrichment, rather than for breach of contract).[132]

In *Amelco*, the City of Thousand Oaks appealed a jury verdict awarding the contractor $2,134,586 for the city's abandonment and breach of contract to perform certain electrical work during the construction of the city's Civil Arts Plaza.[133] In 1992, the city solicited bids for the construction of the Civil Arts Plaza, which consisted of a 400-seat theater and city council chamber, an 1800-seat performing arts theater, public meeting rooms, and other administrative facilities.[134] The bid documents stated that the technical specifications and electrical drawings were complete and the city's electrical consultant later confirmed that the bid specifications contained no major omissions.[135] The city accepted the contractor's bid of $6,158,378 and the contractor began to work.[136]

During the construction phase, the "city furnished 1,018 sketches to clarify or change the original contract drawings."[137] In the end, the city and the contractor agreed upon thirty-two change orders to cover the changed work and the city increased the contract price by over $1,000,000.[138] Nonetheless, the contractor believed that it was not possible to estimate the cumulative impact of the changes on productivity.[139]

In theory, the changes process operated as follows: the contractor learned of the city's requested changes through the construction manager (CM).[140] The contractor would then provide an estimate of the cost to perform the work.[141] When necessary, the contractor would submit RFIs.[142] After the CM and the city's design professionals would approve the estimate, the contractor

131. *Amelco Elec.*, 98 Cal. Rptr. 2d at 168.
132. The California Supreme Court granted a petition for review, but no decision has been made. *Amelco Elec.*, 11 P.3d 956 (Cal. 2000).
133. *Amelco Elec.*, 98 Cal. Rptr. 2d at 162.
134. *Id.*
135. *Id.* at 163.
136. *Id.* at 162.
137. *Id.* at 163.
138. *Id.*
139. *Id.* at 164.
140. *Id.* at 163.
141. *Id.*
142. *Id.*

would perform the work.[143] In practice, the CM instructed the contractor to perform changes on a time and materials basis before the city approved the changes, both the city and the CM were slow to respond to the RFIs, and the CM failed to coordinate the trades.[144]

The city's drawings were often on a different scale than the contract drawings and the specific changes were not highlighted on the sketches, thereby making them difficult to read.[145] The low quality of the sketches required that the contractor hire additional personnel with experience, leading to higher labor costs. In addition, the number of these changes caused scheduling and sequencing problems.[146] The contractor's work often was either delayed or accelerated because the changes required the contractor to shift workers among different tasks.[147] The contractor continually complained to the CM about the volume of changes and the lack of coordination of the trades.[148] The contractor submitted a change order for additional funds to hire a draftsperson to update the drawings when the CM failed to perform this task.[149] The CM rejected the request, claiming that this cost was already included in the contract price.[150] Upon completion of the project, the contractor submitted a request for equitable adjustment for $1,700,000 as a result of the design changes and poor project coordination.[151] The contractor later revised the claim to $2,224,842.[152]

In the end, the city generated more drawings than any of the contractor's personnel anticipated or had ever seen on other projects.[153] At trial, the contractor introduced evidence that the city had changed "every part of the electrical work at least once."[154] The contractor's expert testified that given the substantial number of changes issued during construction, "the electrical design was not complete at the time of bid" opening.[155] Based on the fact that many of the drawings resulted in changes rather than clarifications to the design, the expert declared that no contractor could have adequately estimated the impact from each sketch.[156]

143. *Id.*
144. *Id.*
145. *Id.*
146. *Id.*
147. *Id.*
148. *Id.*
149. *Id.* at 163–64.
150. *Id.* at 164.
151. *Id.*
152. *Id.*
153. *Id.* at 163.
154. *Id.*
155. *Id.*
156. *Id.*

The California Court of Appeal held that the city had dramatically expanded the scope of work to the point where it had effectively abandoned the terms of the written contract.[157] The court explained that

> [a] construction contract is abandoned where, after it is awarded, so many changes are made to the design that the project actually constructed is substantially different from the project described in the contract. The changes must be extensive and of a magnitude beyond that contemplated by the parties when they executed the contract.[158]

The court found that there was substantial evidence to support abandonment by the city because it changed every aspect of the electrical work.[159] In support of its decision, the court cited the number of changes, witness testimony that corroborated that 1,018 detail sketches were an unusually high number, and the city's deviation from the procedures outlined in the Changes clause.[160]

Abandonment under California law represents an application of the cardinal change test, with the end result being a recovery in *quantum meruit*, rather than being limited to contract damages. Although the remedy differs, contractors seeking to recover under either theory must prove that the owner, public or private, fundamentally altered the contemplated scope of work such that the project constructed differed materially from the original project scope.

The third case involved both a claim for abandonment and a cardinal change claim and discussed the distinction between cardinal and constructive changes. In *L.K. Comstock*, a federal district court applying Kentucky law recognized that the doctrines of either constructive or cardinal change "may properly be utilized to establish a basis for recovery outside the original contract in cases where the contractual obligations of a construction contractor vary materially from the original expectations of the parties regarding the scope and manner of the work."[161] The U.S. District Court for the Eastern District of Kentucky adopted the decision of Special Master Thomas Stipanowich, formerly a professor of construction law at the University of Kentucky School of Law, and denied a subcontractor's claim against the prime contractor.[162] The case involved the construction of an automotive assembly plant for Toyota in Georgetown, Kentucky.[163] An electrical and mechanical subcontractor sued the prime contractor in charge of utility work in *quantum meruit* to recover the reasonable value of additional labor, material, and services to perform substantial change work.[164]

157. *Id.* at 168.
158. *Id.* at 167.
159. *Id.*
160. *Id.*
161. L.K. Comstock & Co. v. Becon Constr. Co., 932 F.Supp. 906, 931 (E.D. Ky. 1993).
162. *Id.* at 910.
163. *Id.* at 911.
164. *Id.* at 912.

The special master denied the abandonment claim because the subcontractor was aware at the time it entered the contract that the schedule would be extremely tight and that the owner would order substantial extra work.[165] Specifically, the special master reasoned that it was unreasonable for the subcontractor to claim that it did not know that the project's design was incomplete and that, as a result, a significant volume of additional work would be necessary.[166]

For much the same reason, the special master rejected the subcontractor's cardinal change claim.[167] The court affirmed that the appropriate standard of proof for both abandonment and cardinal change was the clear and convincing evidence standard.[168] The special master held that the subcontractor did not prove by clear and convincing evidence that the owner-directed changes amounted to a cardinal change because the subcontractor reaffirmed the contract with the prime contractor when its work was 90 percent complete.[169] The subcontractor initially began to perform on the project under a letter of intent.[170] The parties, however, did not execute the actual subcontract agreement until more than one year later when the work was over 90 percent complete and nearly fifty out of 208 total change orders had been finalized.[171] In light of the general theory that cardinal changes cannot normally be evaluated until the end or near the end of a project, the special master found that the subcontractor lost its opportunity to claim breach by excessive changes when it affirmed the subcontract contract at such a late date with no reservation of right.[172] The special master reasoned that by the conclusion of the contract, the subcontractor should have begun to suspect that the numerous changes were rising to the level of a breach of contract and taken some affirmative action to preserve its right to claim a breach.

These three cases illustrate that in cases involving cumulative disruption, state courts have accepted and applied logic similar to that used by federal courts and boards of contract appeals. Although the claim may be characterized somewhat differently under state law, the general principles remain the same. As a result, contractors, private owners, and state and local governments may be able to look to the better-developed body of federal public contract law for guidance on cumulative impact claims.

C. *Modern Trend: Constructive Changes as the Basis for a Claim*

Since the 1968 elimination of the *Rice* doctrine, claims for the productivity impact of multiple change orders on unchanged base contract work have

165. *Id.* at 935.
166. *Id.*
167. *Id.* at 946–47.
168. *Id.* at 946.
169. *Id.*
170. *Id.* at 912.
171. *Id.* at 930.
172. *Id.* at 946–47.

been decided almost exclusively by the various boards of contract appeals rather than the U.S. Court of Claims. The transition appears to have occurred in the 1978 ASBCA case, *Dyson & Co.*, in which the board denied a contractor's claim for a separately compensable constructive change.[173]

In *Dyson*, the ASBCA addressed a claim brought by a prime contractor on behalf of its mechanical subcontractor.[174] The subcontractor sought additional compensation for performing changed work for which compensation was already provided under four executed change orders and for the increased costs of unchanged work caused by the magnitude and cumulation of numerous change orders.[175] The board began its analysis of the cumulative impact claim with a review of the U.S. Court of Claims cases decided under the cardinal change approach and during the period in which the *Rice* doctrine was in effect.[176] The board explained: "The Court of Claims has addressed this type of contention in analogous cases where the contractor seeks to establish that the magnitude or cumulation of changes amounts to what the court characterizes as a 'cardinal change,' exceeding the rights reserved under the Changes clause and entitling the contractor to relief for breach of contract."[177] The board referred specifically to the U.S. Court of Claims decision in *Aragona Construction Co.* for the test that the cumulation of changes must materially alter the nature of the parties' original bargain in order to qualify as a cardinal change.[178] The ASBCA applied *Aragona*'s standard to prove cardinal change to the contractor's inefficiency claim, although it was presented as a constructive change claim.[179] The ASBCA explained: "In the instant appeal we are similarly unpersuaded that the magnitude and cumulation of directed changes resulted, altogether, in a separately compensable constructive change. . . . [O]ur record establishes that appellant constructed essentially the same hospital structure required under the contract as awarded."[180]

The ASBCA decision in *Dyson* appears to be one of the first board cases to consider a cumulative impact claim in the construction context under a constructive change theory of recovery. At the time the case was decided, the Contract Disputes Act of 1978 had not yet been enacted, and, therefore, the board would have lacked jurisdiction over the matter had it been a car-

173. Dyson & Co., ASBCA No. 21673, 78–2 BCA ¶ 13,482. Constructive change has been described as owner "conduct which is not a formal change order, but which has the effect of requiring the contractor to perform work different from that prescribed by the original contract, but in theory, which could have been ordered under the Changes clause." Robert C. Gusman, *"Constructive Change"—A Theory Labeled Wrongly*, 5 PUB. CONT. L.J. 229 (1974).

174. *Dyson & Co.*, 78–2 BCA ¶ 13,482.

175. *Id.* at 65,956.

176. *Id.* at 65,970.

177. *Id.*

178. *Id.*

179. *Id.*

180. *Id.*

dinal change or breach of contract case.[181] Consequently, the ASBCA had no other avenue but to decide the case as a constructive change.

After *Dyson*, the first board decision to hold definitively that cumulative impact costs were properly recoverable in the form of an equitable adjustment was *Pittman Construction Co.*[182] In its general background discussion of the compensability of impact costs under the Changes clause, the GSBCA concluded that the "*Dyson* opinion is singularly unclear about what a constructive change based on cumulative impact is."[183] From this brief mention of *Dyson* in the historical section of the decision, the GSBCA quickly concluded that a cumulative disruption claim is a constructive change, albeit a loosely defined constructive change. Accordingly, the board stated: "[t]he cumulative impact claim appears to be more of a historical accident than a distinct constructive change."[184]

This historical accident survived. In the 1999 case *Centex Bateson Construction Co.*, the VABCA, although acknowledging the cardinal change theory, found that a cumulative impact claim was more appropriately described as a constructive change:

> Although there is no need to engage in a pre–*Contract Disputes Act* analysis of whether cumulative impact is a separate constructive change or a cardinal change in order to preserve our jurisdiction, it seems to us that cumulative impact must be viewed as a separate constructive change under the CHANGES clause. This constructive change, although resulting from them, is independent of other contract changes and can survive an accord and satisfaction on a change, or a general release.[185]

V. Analysis of the Essential Elements of Cumulative Impact Claims

The essential elements of a cumulative impact claim are the same as those that courts and boards require for most other cost overrun cases. The contractor must prove liability, causation, and resultant injury.[186] In *Wunderlich*, the U.S. Court of Claims stated that although a contractor did not need to prove damages with mathematical exactitude, "this leniency as to the actual mechanics of computation does not relieve the contractor of its essential burden of establishing the fundamental facts of liability, causation and resultant injury."[187] Although the U.S. Court of Claims was applying these

181. The ASBCA decided *Dyson* on September 21, 1978, and the Contract Disputes Act of 1978, 41 U.S.C. §§ 601–613, was enacted on November 1, 1978.

182. GSBCA Nos. 4897, 4923, 81–1 BCA ¶ 14,847.

183. *Id.* at 73,296.

184. *Id.* at 73,297.

185. Centex Bateson Constr. Co., VABCA Nos. 4613, 5162–5165, 99–1 BCA ¶ 30,153, 149,258, *aff'd*, Centex Bateson Constr. Co. v. West, 250 F.3d 761 (Fed. Cir. 2000).

186. *Id.*; Bechtel Nat'l, Inc., NASA BCA No. 1186–7, 90–3 BCA ¶ 22,549, 113,177; Acme Missiles & Constr. Corp., ASBCA Nos. 11,256, 11,716, 68–1 BCA ¶ 6873, 31,770.

187. Wunderlich Contracting Co. v. United States, 351 F.2d 956, 968 (Ct. Cl. 1965).

elements to the contractor's claim for delay under the Suspension of Work clause, the ASBCA in *Acme Missiles & Construction Corp.* later applied the *Wunderlich* elements to a cumulative impact claim.[188] Specifically, the ASBCA in *Acme Missiles* stated:

> Certainly there has been nothing to establish a doctrine that the ordering of a reasonable number of changes on an ordinary construction contract is proof, per se, that the contractor suffers impact costs. In order to recover a contractor must bear an essential burden of establishing the fundamental facts of liability, causation and resulting injury.[189]

Although courts and boards repeatedly refer to the three key elements of proof, courts mean that the contractor must prove "entitlement and quantum, *i.e.*, that the Government or owner is responsible for the condition giving rise to the claim and that a specific amount of additional costs were incurred."[190] Consequently, causation and resultant injury lie at the heart of proving an inefficiency claim.

A. *Liability*

Liability can be established with proof that the Government or private owner breached its contractual obligation by initiating a substantial number of contract changes, modifications, or design clarifications. For example, in *Bechtel National, Inc.*, the NASA Board of Contract Appeals found that because the contractor needed to submit large numbers of RFIs to the Government to correct defects in its specifications, the Government was liable for any resulting cumulative impact.[191] Alternatively, in *Centex Bateson Construction Co.*, the board found that liability was not an issue because neither side disputed that all of the events allegedly giving rise to the cumulative impact claim arose out of certain supplemental agreements for which the Government was responsible.[192]

B. *Resultant Injury*

Resultant injury is the claimed loss of labor productivity. Contractors often seek to relate loss of efficiency to cost overruns and unanticipated schedule delays.[193] Proving the actual extent of loss, however, can be very tricky be-

188. 68–1 BCA ¶ 6873, 73,296.
189. *Id.*
190. Gilbert J. Ginsburg & Brian A. Bannon, Calculating Loss of Efficiency Claims — Course Manual 27 (1986).
191. *Bechtel Nat'l, Inc.*, 90–3 BCA ¶ 22,549, at 113,177.
192. Centex Bateson Constr. Co., Inc., VABCA Nos. 4613, 5162–5165, 99–1 BCA ¶ 30,153, 149,258.
193. *See supra* Section III.A (defining the cumulative impact claim).

cause it is integrally linked to causation.[194] In *Coates Industrial Piping, Inc.*, the VABCA rejected one contractor's claim because of its inability to prove resultant injury by stating that "there is no evidence of what the impact was, how it impacted the work, or at what cost to the [contractor]."[195] The problem was that "the quantity of loss is, in effect, offered as proof of the loss for which the owner is liable."[196]

Contractors must offer clear proof of damages suffered as the result of the breaching disruption; they can do so through a number of common methods.

1. Total Cost Method

In calculating cumulative inefficiency, some contractors begin by introducing evidence based on a total cost method.[197] According to the VABCA, "[t]he current case law recognizes that using the 'synergy' analysis of cumulative impact necessarily leads to a total cost damages analysis."[198] The total cost method is the most basic approach to calculating damages for loss of productivity.[199] Under this method, the estimated labor costs for the project are subtracted from the costs as actually incurred, including profit, to arrive at the amount of the equitable adjustment.[200] Contractors generally rely on this method only when no documentation in either the project or field files exists to prove damages with greater certainty. Although courts and boards are reluctant to allow contractors to rely on the total cost method, on occasion they have allowed the method in the disruption cases on the theory that "the very factors that produce loss of productivity can also serve to preclude the accurate and precise record-keeping."[201]

For example, in *Atlas Construction Co.*, the GSBCA applied the total cost method to award damages for labor inefficiency resulting from the Government's interference with the project.[202] In *Atlas*, the Government issued a large number of change order directives and design variances/clarifications.[203]

194. It is difficult to separate causation from resultant injury because proof of one often entails showing proof of the other. As a result, boards often discuss resultant injury simultaneously with causation. In *Bechtel Nat'l, Inc.*, 90–3 BCA ¶ 22,549, at 113,177, the board stated that the record supported the fact that the Government's RFIs caused loss of productivity, but denied the claim because the contractor offered no contemporaneous documentation to substantiate the extent of the cumulative impacts claimed.

195. Coates Indus. Piping, Inc., VABCA No. 5412, 99–2 BCA ¶ 30,479, 150,587.

196. Ginsburg & Bannon, *supra* note 190, at 1, 36.

197. Atlas Constr. Co., GSBCA Nos. 7903 *et al.*, 90–2 BCA ¶ 22,812, 114,557; Amelco Elec. v. City of Thousand Oaks, 98 Cal. Rptr. 2d 159 (2000), *cert. granted*, 11 P.3d 956 (Cal. 2000).

198. Centex Bateson Constr. Co., VABCA Nos. 4613, 5162–5165, 99–1 BCA ¶ 30,153, 149,261.

199. Shea, *supra* note 28, at 419.

200. *Id.*

201. *Id.* at 416, 419–21.

202. *Atlas Constr. Co.*, 90–2 BCA ¶ 22,812.

203. *Id.* at 114,564.

The board rejected the Government's argument that the contractor failed to present a sufficient quantum of proof because the contractor relied on a total cost method.[204] The board determined that the total cost approach was a "valid starting point" for proof of damages.[205] The difference between the labor estimate in the bid and the actual labor costs was $96,699.[206] Based on testimony by the contractor's employees that there was 50 percent more interference on this project, the board found that the contractor was entitled to $59,515.[207]

The total cost method is not favored and often is not accepted by courts and boards because it does not eliminate the causal factors for which the Government was not responsible.[208] A simple comparison of the estimated cost and the actual cost to complete the project does not differentiate among problems caused by the Government, private owner, and contractor. The VABCA, in *Centex Bateson*, declared that the total cost method was a method of last resort and could be used only if the contractor showed

(1) The impracticality of proving actual losses directly;
(2) The reasonableness of its bid [or estimate for the project];
(3) The reasonableness of its actual costs; and,
(4) Lack of responsibility for the added costs.[209]

In that case, the contractor failed to prove that its bid was reasonable. The only evidence offered by the contractor was the testimony of two individuals who did not prepare the bid.[210] The board inferred from the fact that no one who worked on the bid preparation testified was tantamount to a negative inference that their testimony would not support the contractor's assertions.[211] Internal reports made at the time the bid was submitted, which showed that the contractor underbid the project, were even more damaging to the contractor's cause.[212]

Despite the method's disfavor, some state courts nonetheless permit contractors to use some form of the total cost method based on a state law standard for proving contract damages. For example, in *MARTA v. Green International, Inc.*, the Georgia Court of Appeals affirmed a trial court ruling awarding a contractor $2.8 million for increased performance costs caused by

204. *Id.* at 114,564–65.
205. *Id.* at 114,565.
206. *Id.*
207. *Id.*
208. "The total cost method is not favored, in part, because it is extremely difficult to assure that the contract is not transformed into a de facto cost reimbursement contract and that costs which should be borne by [contractor] are excluded." McMillin Bros. Constructors, Inc., EBCA No. 328–10–84, 91–1 BCA ¶ 23,351, 1990 WL 140900 (E.B.C.A.).
209. *Centex Bateson Constr. Co.*, VABCA Nos. 4613, 5162–5265, 99–1 BCA ¶ 30,153, 149,261.
210. *Id.*
211. *Id.*
212. *Id.*

inadequate plans and specifications and the owner's failure to correct or properly administer the contract.[213] At issue in the appeal was whether the contractor failed to prove damages proximately caused by the owner's failure to timely correct the design deficiencies.[214] The owner relied on case law from other jurisdictions to discredit the contractor's use of the total cost method by arguing that the contractor failed to meet the four-part test discussed above.[215] The court determined that the four-part test was not relevant to Georgia's standard for proving damages.[216] The court explained that the trial court's ruling was supported by lay and expert testimony that the poor quality of the plans required the contractor to submit over 350 RFIs and resulted in over 1,000 revised drawings.[217] Specifically, the court found that the contractor supported its claim with an expert "who conducted a detailed evaluation of the claim, including review of all construction documents, interviews with [project] personnel, and scheduling and cost analysis."[218] As a result, the court reaffirmed that under state law, "'if a plaintiff can show with reasonable certainty the total amount of damages and the degree to which those damages are attributable to defendant, that is sufficient to support an award.'"[219] Therefore, under Georgia law, it appears unnecessary for the court to reach the issue of whether a claim involves calculation of damages based on a total cost method because all that is required is that the jury be provided with sufficient data to estimate damages with certainty.

Alternatives to the total cost method include the modified total cost method, the measured mile approach, and the jury verdict method. Contractors have used all three methods in an effort to prove cumulative impact claims, but in terms of reliability and judicial acceptance, the order of merit likely places measured mile[220] above modified total cost and modified total cost above the least favored jury verdict approach. Despite this ranking, it is unclear whether the method of calculating inefficiency or the credibility of the expert witness presenting the method drives the final outcome of the case. For example, the jury verdict method has been applied in cumulative impact cases to determine the amount of the equitable adjustment, but it appears to have been used only after the court or board has already concluded subjectively that the contractor is entitled to recover.[221]

213. MARTA v. Green Int'l, Inc., 509 S.E.2d 674, 676 (Ga. Ct. App. 1998).
214. *Id.*
215. *Id.* at 677 n.1.
216. *Id.*
217. *Id.* at 676–77.
218. *Id.* at 677.
219. *Id.* at 678.
220. H. Randolph Thomas & Victor E. Sanvido, *Quantification of Losses Caused by Labor Inefficiencies: Where Is the Elusive Measured Mile*, CONSTR. L. & BUS. 1 (Summer 2000) ("The most widely accepted way to quantify losses is the so-called *measured mile* approach.").
221. David J. Tierney, Jr., Inc., GSBCA Nos. 7107, 6198 (5855)-Rein., 88–2 BCA

2. Modified Total Cost Method

As is evident from the discussion above, the two most significant shortcomings of the total cost method are that it fails to consider problems caused by the contractor[222] and it "assumes the contractor's [underlying] bid is correct."[223] The modified total cost method eliminates the dependence on the original estimate and accounts for non-owner-related performance factors by requiring the contractor to account for "performance factors for which the owner is not responsible."[224] In order to calculate the inefficiency cost, the contractor must begin with the actual cost of performing the project and subtract out (1) costs incurred due to contractor error and (2) the bid price for the project.[225]

In *Amelco Electric v. City of Thousand Oaks*, the California Court of Appeal endorsed the contractor's use of the modified total cost method for determining damages where the only instruction given to the jury described this method.[226] The jury was instructed that the measure of damages in the event of a breach was the reasonable value of the contractor's work, "less the payments made by the city, and less any costs incurred by [the contractor] which are not fairly attributable to the city."[227] During the trial, the contractor admitted that it had made no effort to track the cost impact of each individual change.[228] The contractor attempted in the initial stages to track the costs attributable to each individual change order, but it abandoned the practice when it became too time-consuming and difficult.[229] As a result, the court allowed the contractor to prove its damages by comparing its estimate to the actual number of hours it took to complete the project.[230] The actual hours reflected a 40 percent increase, of which almost 17 percent were covered by the 32 change orders.[231] The court's endorsement, however, should not be taken to mean that the modified total cost method will always be successful, but rather only that the city in that case did not—or could not—persuade

¶ 20,806, 105,173–74; Bechtel Nat'l, Inc., NASA BCA No. 1186–7, 90–3 BCA ¶ 22,549, 113,182.

222. *See* Urban Plumbing & Heating Co. v. United States, 408 F.2d 382, 394 (Ct. Cl. 1969).

223. *See* Shea, *supra* note 28, at 421.

224. *Id.*

225. Cohen, *supra* note 30; *see also* Servidone Constr. Corp. v. United States, 931 F.2d 860, 862 (Fed. Cir. 1991).

226. Amelco Elec. v. City of Thousand Oaks, 98 Cal. Rptr. 2d 159, 173 (Cal Ct. App. 2000), *cert. granted*, 11 P.3d 956 (Cal. 2000).

227. *Id.* at 173.

228. *Id.* at 164.

229. *Id.*

230. *Id.* at 168.

231. *Id.*

the court to issue limiting instructions that this method is appropriate only when proving actual losses is impracticable.

3. Measured Mile Approach

In comparison, the measured mile approach is an accepted form of impact cost analysis that examines retrospectively what the project should have cost.[232] This method involves a comparison of the productivity achieved by the contractor in an undisrupted area of work with the contractor's productivity on a similar task during a disrupted work period.[233] In most cases, the contractor will select an unimpacted area on the same project, but also may select an unimpacted area of work from a different project involving the same or similar type of work. This approach can provide an excellent basis for calculating the extent of damages if a suitable benchmark can be selected.[234] The greatest obstacle lies in "identifying an unimpacted period in which the work being performed was sufficiently similar to that work performed in the impacted period."[235]

Even with the widely accepted measured mile approach, expert witness credibility plays a significant role in the outcome of a cumulative impact claim. In a recent case, *J.A. Jones Construction Co.*, the Corps of Engineers Board of Contract Appeals (ENG BCA) rejected a contractor's attempted use of a modified form of measured mile analysis where it found the expert's methodology to be flawed.[236] The case involved a $27 million flood protection project in Matewan, West Virginia, including the construction of a 2,650-foot flood wall with various gates and openings for highway and pedestrian traffic and the raising of an entire area of the outlying town above flood level by burying a subdivision under twenty to twenty-five feet of backfill.[237] After the project was complete, the contractor sought compensation for labor inefficiencies that resulted from the effects of forty-nine change orders that increased its total labor costs to perform unchanged contract work by 28 percent.[238]

The contractor, J.A. Jones, offered the testimony of its expert, Paul L. DeMent, to calculate the cumulative inefficiency impact based on the ex-

232. Clark Concrete Contractors, Inc. v. GSA, GSBCA No. 14340, 99–1 BCA ¶ 30,280, 149,746–49, *recons. denied*, GSBCA No. 14340-R, 99–2 BCA ¶ 30,393 ("[The GSBCA] will accept a [measured mile] comparison if it is between kinds of work which are reasonably alike, such that the approximations it involves will be meaningful."); Cohen, *supra* note 30.

233. U.S. Indus., Inc. v. Blake Constr. Co., 671 F.2d 539 (D.C. Cir. 1982).

234. *See* DANAC, Inc., ASBCA No. 33,394, 97–2 BCA ¶ 29,184, 145,152; Flex-Y-Plan Indus., GSBCA No. 4117, 76–1 BCA ¶ 11,713; A.W. Burton, AGBCA No. 431, 77–1 BCA ¶ 12,307.

235. *See* Cohen, *supra* note 30, at 6.

236. J.A. Jones Constr. Co., ENG BCA Nos. 6348, 6386–6391, 00–2 BCA ¶ 31,000, 153,099–105.

237. *Id.* at 153,079–80.

238. *Id.* at 153,097.

pert's own variation of a "measured mile" analysis.[239] The ENG BCA began its review of the contractor's presentation of its inefficiency claim with an evaluation of the expert's credentials.[240] The board observed that Mr. DeMent held only a bachelor's degree in building construction, he had no formal education in measuring lost productivity, and his methodology for measuring productivity was gained by on-the-job training.[241] He neither belonged to any professional societies nor had he published anything on the topic.[242] In contrast, when the board examined the Government's case-in-rebuttal, it began by noting that the Government's expert, Dr. H. Randolph Thomas, held a bachelor's degree in architectural engineering, a Master's in civil engineering, and a Ph.D. in civil engineering.[243] For fifteen years, he had taught a graduate course in labor productivity.[244] Further, the Government's expert belonged to numerous professional organizations; had published numerous articles on labor productivity, including productivity quantification studies; and had received numerous honors, including a Fulbright Scholarship.[245]

J.A. Jones's expert, Mr. DeMent, measured inefficiency by comparing a base (cost-coded) period during which the contractor performed only non-impacted work with an impacted period, during which both base contract and change order work were performed.[246] Mr. DeMent derived his base period using a period where only unchanged work was performed.[247] For each activity, "he divided the quantity of units produced (*e.g.*, cubic feet of concrete placed) by the number of labor hours required to produce that quantity."[248] Mr. DeMent claimed that this figure accurately reflected the rate of productivity that J.A. Jones should have been able to achieve in the absence of numerous change orders.[249] He compared this base period with an impacted period, in which both changed and unchanged work were performed.[250] The impacted period included all of the hours that were actually spent on each cost-coded activity during the impacted period.[251] To identify what the total number of craft hours should have been for each work area during the impacted period, he multiplied the base period rate of productivity (craft hours

239. *Id.* at 153,097–99.
240. *Id.* at 153,097.
241. *Id.*
242. *Id.*
243. *Id.* at 153,100.
244. *Id.*
245. *Id.*
246. *Id.* at 153,097. Note that a base period is one covered by the original contract specifications, and an impacted period includes base work plus work required by change orders.
247. *Id.*
248. *Id.*
249. *Id.*
250. *Id.* at 153,098.
251. *Id.*

per unit of production) for each work activity by the total quantity of units actually produced for that activity during the impacted period.[252] He then subtracted this total from the actual number of hours required for each activity to obtain the amount of inefficiency.[253]

The first factor to complicate Mr. DeMent's analysis came in determining what activities were to be included in the impacted area. Apparently, Mr. DeMent developed his own criteria to determine which unchanged base contract cost-coded work activities were included.[254] To make this determination, he applied six-, seven-, or eight-hour-per-day "filters" or minimum amounts of craft hours that could be spent on change order work before an item could be assigned to the impacted period.[255] The example provided by the board looked at one member of a crew who worked on change order work for six hours and who also spent time on base contract work.[256] The entire block of that crew member's time as well as the time for the whole crew for the entire month was, under this analysis, placed in the impacted period because the expert relied upon monthly reports.[257] To reliably quantify the extent of the impact, the expert used these three filters and three separate base period quantity filters that placed a floor on the minimum amount of base contract work that had to be included before an item could be considered impacted. He calculated the difference between the total hours actually spent during the impacted period and the hours that it should have required nine different times.[258]

The ENG BCA rejected Mr. DeMent's analysis because he failed to isolate specific impacts caused by individual changes or eliminate other potential causes of loss of productivity on the unchanged work.[259] According to the board, the absence of a cause-and-effect analysis, together with his lack of detailed knowledge about the project, undermined the credibility of his analysis.[260]

The board further referred to the testimony of the Government's expert that the analysis did not qualify as a true measured mile approach.[261] Dr. Thomas's testimony was based on his observations that Mr. DeMent did not examine contemporaneous project documentation to ascertain what work the contractor actually performed and why productivity fluctuated from week to week.[262] Moreover, Mr. DeMent's methodology allows a *single* impacted

252. *Id.*
253. *Id.*
254. *Id.*
255. *Id.*
256. *Id.*
257. *Id.*
258. *Id.*
259. *Id.* at 153,107.
260. *Id.*
261. *Id.* at 153,100.
262. *Id.* at 153,108.

day to determine whether whole months of data went into the "impacted pile" versus the "unimpacted pile."[263] The Government's expert thus succeeded in undermining both the contractor's expert and the contractor's overall claim.

The *J.A. Jones* decision illustrates the importance of selecting a particular method to prove quantum, and of selecting an expert who understands how to calculate labor productivity and who can persuade the trier of fact. In that case, the contractor's expert lacked formal training and appeared to avoid the question of what other variables could have contributed to the lost productivity.[264] The expert should have conducted a thorough and detailed study of the project documents to isolate and eliminate other factors that could have been responsible for the inefficiency. The expert's flawed methodology, together with his lack of knowledge of the project documents, ultimately undermined his credibility and therefore damaged the contractor's position.

4. Jury Verdict Method

Boards and courts primarily apply the jury verdict method after they have determined that causation has been established but the amount of damages cannot be ascertained with certainty. Such was the case in *David J. Tierney, Jr., Inc.*, where the GSBCA determined that although the contractor could not "pinpoint, day by day, the effect" of numerous government-issued change orders, the changes issued nonetheless impacted the project.[265] The board used a "jury verdict" to determine a reasonable amount to award the contractor.[266] This approach amounts to nothing more than an educated guess based on information available to the trier-of-fact.[267] Given the uncertainty of the state of cumulative impact claims, it would be unwise for a contractor to base its case on the jury verdict approach until it was confident that causation had been established. Further, in light of the fact that proof of quantum often implicates causation, both a measured mile analysis and the modified total cost method provide better measures for calculating inefficiencies than the jury verdict method.

C. *Causation*

Causation is the most difficult element to prove. Without proof of a causal link between the owner-directed changes and the ensuing loss of efficiency, there is no entitlement to recovery.[268] The contractor seeking recovery must submit evidence that "the number, timing, and effect of the changes that

263. *Id.*
264. *Id.* at 153,097.
265. David J. Tierney, Jr., Inc., GSBCA Nos. 7107, 6198 (5855)-Rein., 88–2 BCA ¶ 20,806, 105,121.
266. *Id.* at 105,173–74.
267. Cohen, *supra* note 30, at 6.
268. Finke, *supra* note 3, at 314 n. 14.

were issued" impacted its ability to plan and perform its work.[269] Making this connection is not easy; as one board noted causation "can be an elusive commodity."[270] One point is clear from the case law: the existence of a substantial number of changes in itself is insufficient evidence of causation.[271]

Much like the difficulties of demonstrating resultant injury, the biggest problem with proving causation involves separating internally (contractor) caused inefficiencies from externally (Government or private owner) caused inefficiencies. The issue of segregation appears in most of the major cumulative impact cases. In *Pittman Construction Co.*, the Government issued 206 change orders, extending contract performance by 102 days.[272] The board determined that over half of the extension resulted from events for which the Government was not responsible.[273] Contract performance was extended thirty-four days for inclement weather and eighty-two days for a carpenter's strike.[274] The board found that the contractor's story was simply not credible:

> We consider the more plausible version to be that [the contractor] accurately assessed the complete cost of the change, including impact, but was required to absorb additional costs associated with its own inefficiency, the carpenter's strike, and other causes not attributable to the Government.[275]

In *Centex Bateson Construction Co.*, the VABCA required proof of a "causal connection . . . showing that the undifferentiated group of contract changes affecting the changed and unchanged contract work resulted in the loss of productivity on that work."[276] The board suggested that causation could be established by demonstrating that "there [were] no other reasons for a loss of productivity for which the Government is not responsible."[277] *Centex Bateson* requires the contractor to prove a negative by showing that the contractor was not the cause of the increased labor costs.[278]

The board in *Centex Bateson* concluded that cases awarding recovery have done so as the result of subjective conclusions rather than thorough objective analysis.[279] Although there may be some truth to the board's conclusion, the

269. Bechtel Nat'l, Inc., NASA BCA No. 1186–7, 90–3 BCA ¶ 22,549, 113,177.

270. Centex Bateson Constr. Co., VABCA Nos. 4613, 5162–5165, 99–1 BCA ¶ 30,153, 149,258, *aff'd*, Centex Bateson Constr. Co. v. West, 250 F.3d 761 (Fed. Cir. 2000).

271. *Id.* at 14,259; Freeman-Darling, Inc., GSBCA No. 7112, 89–2 BCA ¶ 21,882.

272. Pittman Constr. Co., GSBCA Nos. 4897, 4923, 81–1 BCA ¶ 14,847, 73,300–301, *aff'd*, Pittman Constr. Co. v. United States, 2 Cl. Ct. 211 (1983).

273. *Id.* at 73,301.

274. *Id.*

275. *Id.* at 73,302.

276. Centex Bateson Constr. Co., VABCA Nos. 4613, 5162–5165, 99–1 BCA ¶ 30,153, 149,258, *aff'd*, Centex Bateson Constr. Co. v. West, 250 F.3d 761 (Fed. Cir. 2000).

277. *Id.*

278. Keating & Burke, *supra* note 21, at 30, 31.

279. *Centex Bateson Constr. Co.*, 99–1 BCA ¶ 30,153, at 149,258, 149,259.

board's decision to deny an award was no less subjective. The board did not find the contractor's evidence of causation credible. Despite the contractor's elaborate efforts to characterize the problem differently, the board stated that the claim was "firmly rooted in the fact that [the contractor] expended more for labor . . . than it budgeted in its bid."[280]

The contractor based its claim on the testimony of its on-site project engineer and the scheduling reports he prepared for the proceeding.[281] Although the project engineer was a licensed master electrician with more than thirty years' experience with electrical construction, the board concluded that he was "neither familiar with nor experienced in the usual analyses or preparation of 'impact' claims."[282] The board found the evidence submitted by the contractor to be contrived solely for the purpose of litigation. The board further determined that the claim rested on the mistaken assumption that when a construction activity listed on the critical path type schedule (CPM schedule) took longer to complete as shown on revised CPM schedules, that event necessarily impacted unchanged work.[283]

Another example of how not to prove cause and effect can be found in *Southwest Marine, Inc.*, in which the Department of Transportation Board of Contract Appeals (DOT BCA) rejected the contractor's claim because the contractor only provided evidence that fifteen of 202 government change requests actually disrupted the work.[284] In that case, the contractor sought to recover for 14,022 craft hours of cumulative disruption allegedly resulting from more than 200 government-issued changes.[285] The contractor based its claim on the testimony of its scheduling expert and exhibits prepared by the expert.[286] In addition, the contractor limited its proof to disruptions caused by fifteen representative changes and offered only one exhibit, providing a summary of the date the contractor issued inspection deficiency reports and the change requests corresponding to each report, to support the adverse effect of the remaining 187 changes.[287] The DOT BCA concluded that the exhibit did not prove the link between the change orders and the disruptions.[288]

Boards also have found that a contractor's attempt to prove causation can be undermined by the prime contractor's failure to maintain a CPM schedule.[289] In *Haas & Haynie Corp.*, the prime contractor argued that "the number

280. *Id.* at 149,261.
281. *Id.* at 149,260.
282. *Id.* at 149,207.
283. *Id.* at 149,260.
284. Southwest Marine, Inc., DOT BCA No. 1663, 94–3 BCA ¶ 27,102, 135,078.
285. *Id.* at 135,078.
286. *Id.*
287. *Id.*
288. *Id.*
289. Haas & Haynie Corp., GSBCA Nos. 5530 *et al.*, 84–2 BCA ¶ 17,446, 86,898.

and scope of changes . . . extended its stay on the project beyond its projected completion date" and resulted in increased administrative overhead costs.[290] The GSBCA rejected the claim because of the contractor's failure to adequately supervise the work of its subcontractors.[291] Although the contractor started the project with a CPM schedule, the schedule was not maintained and the subcontractors never received copies of the schedule.[292] Because the contractor abandoned the schedule, the board found it impossible to determine whether the original completion date was possible. Moreover, the board was unable to distinguish between the contractor-caused delays from the government-caused delays.[293]

What can be gleaned from this line of decisions is that a contractor, seeking to recover for cumulative impacts, must carefully develop its claim by combining expert testimony with that of lay witnesses who experienced firsthand the effects of numerous owner-directed changes.[294] The credibility of the contractor's lay and expert witnesses appears, in many cases, to be the most essential element of a successful claim. The foundation for any credible expert is reliance on, and an understanding of, the contract and contemporaneous project documents. Further, if an expert uses exhibits that summarize or use representative examples of the effects of numerous changes, the contractor should be sure to present into evidence the documentation that backs up the exhibit and be able to demonstrate that the evidence is in fact representative.

Preparing for possible litigation, the contractor should reserve the right to bring a cumulative impact claim in each change order before such a claim ever arises. The contractor also should establish that it raised the issue of loss of productivity once it became aware of the possibility of a problem.

With respect to proving quantum of damages, the contractor may begin with a total cost method, but should be sure to introduce evidence that meets the four threshold requirements listed in *Centex Bateson*. A more reliable option would be to use either the modified total cost method, which does not depend on the accuracy of the original estimate, or, in the alternative, the measured mile approach, which compares impacted versus unimpacted sections of the work on one or more projects. These approaches are commonly used in loss of labor productivity cases, although they do not appear frequently in cumulative impact claims.

290. *Id.* at 86,897.
291. *Id.* at 86,900.
292. *Id.*
293. *Id.*
294. Frank Baltz & J. Russell Morrissey, *Contractor's Claims for Cumulative Impact: Valid but Difficult to Recover*, 32 Procurement Law. 18 (Fall 1996).

D. *Foreseeability as a Limitation*

Boards also have included "foreseeability" of the changed working conditions as an additional factor in determining whether a claim is compensable.[295] Foreseeability represents a judicial attempt to determine causation when the boards and courts are unsure of what caused inefficiency to occur on the project. Foreseeability first became an issue in 1981 in *Pittman Construction Co.*, in which the GSBCA raised foreseeability as a possible means to analyze cumulative impact claims. According to the board:

> The problem [of proving cumulative impact claims] is almost a tort problem—foreseeability. When pricing the changes individually, the contractor may not have taken into account the synergistic effect of all the changes collectively, and it may therefore recover in the changes only those impact costs relatively easy to foresee, *i.e.* those that are customarily referred to as "direct" impact costs. Failing to foresee the so-called cumulative impact costs, the contractor fails to claim them, and thereby obtains less than full compensation for the change being negotiated.[296]

Foreseeability, in the world of loss of productivity claims, has been used to limit rather than expand liability where cause-in-fact is difficult to prove.[297] If the contractor could foresee that unchanged work would or even could be impacted by a change request, then the contractor is expected to negotiate the cost of that impact in a change order that should follow the impact immediately. The corollary to this rule is that the contractor must prove that the impact was either unforeseeable or simply not known when the parties agreed to the price of the change order closest in time to the impact. An impact is foreseeable, and therefore direct and compensable, if it can be related in time to a specific change.[298]

A contractor is expected to anticipate that it will have to perform all work reasonably foreseeable from the bid documents.[299] If certain impacts to the project could have been foreseen when the contractor and owner entered into the contract, or later when the parties modified the contract, then the contractor is expected to have taken that disruption into account when pricing the contract modifications or change orders. For example, if a solicitation includes contingency options that the owner may choose to award after work on the project has begun, the contractor may not seek to recover for the cumulative impact of the activation of these prepriced options.[300] In sum, no

295. Pittman Constr. Co., GSBCA Nos. 4897, 4923, 81–1 BCA ¶ 14,847, 73,297; Haas & Haynie Corp., GSBCA Nos. 5530 *et al.*, 84–2 BCA ¶ 17,446, 86,897; Finke, *supra* note 3, at 314.

296. *Pittman Constr. Co.*, 81–1 BCA ¶ 14,847, at 73,297–98.

297. *Id.*

298. Centex Bateson Constr. Co., Inc., VABCA Nos. 4613, 5162–5165, 99–1 BCA ¶ 30,153, 149,259, *aff'd*, Centex Bateson Constr. Co. v. West, 250 F.3d 761 (Fed. Cir. 2000).

299. Finke, *supra* note 3, at 315 n.16.

300. Southwest Marine, Inc., DOT BCA No. 1663, 94–1 BCA ¶ 27,102, 135,059–60.

entitlement to an equitable adjustment exists if the impact to the unchanged work was foreseeable at the time the contractor executed the underlying change orders.

E. *Reserving the Right to Claim Cumulative Impact*

As an adjunct to the concept of foreseeability, the initial obstacle to recovering for a cumulative impact claim is avoiding release or waiver of the claim before the contractor is even aware that such disruption has occurred.[301] The trend in the law appears to require contractors to expressly reserve the right to request an equitable adjustment for the cumulative disruption, even before any impact becomes known.[302] Failure to make an express reservation of right in change orders or contract modifications may prevent a contractor from seeking recovery under the affirmative defense of accord and satisfaction. The issue is generally a question of fact (whether rights were reserved) and not a question of law. Accordingly, courts and boards look to the language contained in the contract modifications or to the general conditions of the contract to determine whether a contractor has waived or released its rights. Only when the contract is ambiguous does the inquiry "look to extrinsic evidence to determine the intent of the parties."[303]

Where a contractor has included express reservations of right in the change orders, supplemental agreements, or contract modifications, the cases consistently hold that express reservations of right preserve the contractor's right to make a claim in the future.[304] In contrast, where a change order or particular contract provision contains language releasing the owner for liability for delays and disruption stemming from that change, the Government or private owner may raise waiver, release, or accord and satisfaction as defenses.[305] Specifically, the owner can argue that each contract modification

301. *The Waiver or Reservation of Impact Costs*, 23 Constr. Claims Monthly 1, 7 (Feb. 2001) (recognizing that the traditional change order language may not adequately address the impact of change order work on unchanged work and recommending that contract modifications expressly take cumulative impacts into account as well as establish ground rules for handling such claims).

302. "A contractor may reserve a claim for impact where there is no way to accurately ascertain or estimate the impact until contract completion." Bechtel Nat'l, Inc., NASA BCA No. 1186–7, 90–1 BCA ¶ 22,549, 113,181.

303. Centex Bateson Constr. Co., Inc., VABCA Nos. 4613, 5162–5165, 99–1 BCA ¶ 30,153, 149,259, *aff'd*, Centex Bateson Constr. Co. v. West, 250 F.3d 761 (Fed. Cir. 2000).

304. *See* David J. Tierney, Jr., Inc., GSBCA Nos. 7107, 6198 (5585)-Rein., 88–2 BCA ¶ 20,806, 105,171; *Bechtel Nat'l, Inc.*, 90–1 BCA ¶ 22,549, 113,181; Triple "A" South, ASBCA No. 46866, 94–3 BCA ¶ 27,194, 135,540; *Centex Bateson Constr. Co*, 99–1 BCA ¶ 30,153, at 149,253; Amelco Elec. v. City of Thousand Oaks, 98 Cal. Rptr. 2d 159, 170 (Cal. Ct. App. 2000), *cert. granted*, 11 P.3d 956 (Cal. 2000).

305. Dyson & Co., ASBCA No. 21673, 78–2 BCA ¶ 13,482, 65,957–58 & 65,970; Atl. Drydock Corp. v. United States, 773 F. Supp. 335, 338 (M.D. Fla. 1991).

operates as a full and final settlement for all impacts arising out of each supplemental agreement, even if the impacts were unforeseeable or unknown at the time.[306]

In the most recent federal case to touch on this issue, the United States Court of Appeals for the Federal Circuit affirmed the ASBCA's finding of fact that the contractor reserved its right to recover cumulative impact.[307] In *Centex Bateson*, the contractor reserved its right to seek additional time and compensation in the future for impact.[308] The term "impact" was not defined as direct or cumulative. The Government argued that the entire contractor's claims represented "direct and indirect costs of the contract changes for which the parties reached accord and satisfaction under the terms of the supplemental agreements."[309] Because of the ambiguity of what the term "impact" encompassed, the board looked to extrinsic evidence.[310] Based on the testimony of the authors of the reservation, the board concluded that the supplemental agreements resolved all claims for direct impact related to each agreement, but not claims for cumulative impact unknown at the time the agreements were entered.[311] The Federal Circuit affirmed the board's decision, which found that as a matter of fact, the agreements did not include "unknowable costs," and, thereby, implicitly recognized that a right to recover for unforeseeable impacts does exist despite an earlier release.[312]

In the recent California case, *Amelco Electric*, the court found that the jury correctly concluded that the contractor did not waive its claim for damages by failing to comply with a ten-day notice provision.[313] Reaching its holding, the court determined that the city had actual knowledge of the loss of productivity and, more importantly, each of more than 200 change orders contained the following reservation:

> Please be advised that we are not asking for additional time for this change; however, should this change, or the accumulation of changes impact the original schedule, installation sequences creating delays or accelerations which affect our work, we reserve the right to submit our cost for additional compensation.[314]

It is interesting to note that the court also rejected the city's argument that there was a failure of notice by ruling that the notice terms are inappli-

306. *See, e.g., Dyson & Co.*, 78–2 BCA ¶ 13,482, at 65,957–58, 65,970.
307. Centex Bateson Constr. Co. v. West, 250 F.3d 761 (Fed. Cir. 2000) (affirming decision of VABCA).
308. *Centex Bateson Constr. Co.*, 99–1 BCA ¶ 30,153, 149,254.
309. *Id.* at 149,253.
310. *Id.* at 149,254.
311. *Id.*
312. *Id.*
313. Amelco Elec. v. City of Thousand Oaks, 98 Cal. Rptr. 2d 159, 170 (Cal. Ct. App. 2000), *cert. granted*, 11 P.3d 956 (Cal. 2000).
314. *Id.* at 170, n.2.

cable to claims arising out of breaches of contract by the other party.[315] The court reasoned that the party that breaches the contract may not insist on written notice of its own breach.[316]

There is some support for the idea that where a contract does not include an express reservation to recover for the cumulative impacts of multiple owner-directed changes, the contractor forfeits its right to do so. In *Uhle v. Tarlton*, the Missouri Court of Appeals affirmed a directed verdict against a subcontractor seeking damages for extra work and lost productivity.[317] The subcontractor claimed that certain "'change orders were signed to cover the direct costs of doing the extra work and that they did not cover the indirect costs and impact costs of doing the work.'"[318] The court declined to follow federal precedent, reasoning that the subcontract at issue did not contain language similar to the federal Changes clause, which expressly authorizes an equitable adjustment for changes that increase or decrease the cost and time required for work under the contract, "'whether or not changed by any such order.'"[319] The court acknowledged that change orders may delay a project, disrupt productivity, and increase costs, but asserted that if a contractor does not intend to waive its inefficiency claims, it must reserve that right in the contract. Specifically, the court explained:

> To avoid such an unfavorable occurrence, a contract could provide that in the event of such situations, the contract reserves its right to claim impact costs until the full impact of the changed or "extra work" is appreciated. Or, the contract could contain a clause patterned after the federal [Changes clause].[320]

In *Haas & Haynie*, the GSBCA stated:

> [A] pricing agreement with respect to a given change or series of changes extinguishes all entitlement of the contractor to an equitable adjustment under the Changes clause for all costs it incurs after the change has taken place—unless the Board can find, as we did here for "cumulative impact," that the parties expressly or impliedly agreed to exclude certain costs.[321]

The GSBCA picked up on this idea again by reiterating that as a general rule a contract modification signed without reservation extinguishes the right to subsequently claim cumulative impacts.[322] At the same time, boards in similar types of cases have found that an express reservation of right is not necessary. For example, in *Beaty Electric Co., Inc.*, the Department of Energy Board of Contract Appeals (EBCA) held that a contractor does not waive its right to maintain a subsequent delay claim for extended overhead where

315. *Id.* at 170.
316. *Id.*
317. Uhle v. Tarlton, 938 S.W.2d 594 (Mo. Ct. App. 1997).
318. *Id.* at 597.
319. *Id.* at 597 n.3.
320. *Id.* at 599.
321. Haas & Haynie Corp., GSBCA Nos. 5530 *et al.*, 84–2 BCA ¶ 17,446, 86,897, 86,899.
322. *Id.* at 86,899

the change orders contained neither language of waiver or release, nor an express reservation to claim such costs.[323] In the absence of specific contractual language, the board in *Beaty* had to determine the intent of the parties by examining extrinsic evidence.[324] Instead of leaving the question to the judgment of a board or a court, "prudence dictates that contractors expressly reserve the right to such a claim when signing off on change orders."[325]

VI. Conclusion

The courts and various boards of contract appeals have recognized a general entitlement to an equitable adjustment for the cumulative disruptive impact of multiple owner-directed changes, whose effect on productivity and cost exceed the direct costs of the changed work associated with each underlying change order. This cause of action is, however, not easy to prove and courts and boards are not always consistent in their treatment of cumulative impact claims. Inconsistent treatment stems from the intellectual appeal of the cumulative impact claim on the one side (i.e., the underlying notion common to everyday life that the effect of two or more changes on a project can be more severe than the effect of one change) and the dearth of comprehensive, peer-reviewed studies in the field of labor productivity measurement on the other side. Because the law appears to have "leapfrogged" the labor productivity experts by recognizing a right to recovery in *Pittman Construction Co.*, the outcome of each case will likely continue to turn on factually intensive inquiries and on the credibility of the expert and lay witnesses.

Generally, the first obstacle on the road to recovery is the Government's or private owner's argument that each executed change order constitutes a full and final agreement with respect to all costs arising out of that change. As a result, contractors generally have to expressly reserve the right in change orders and ensure that they do not give the right away in the general conditions of the contract before any impact ever arises.

Because the theoretical bases for the claim have changed over time, contractors must be prepared to proceed under several different theories. The claim may be brought as a direct impact claim if causation between specific changes and specific impacts can be established or as a cumulative impact change, where causation is by definition more difficult to prove. The claim may be characterized as a separate constructive change compensable under the Changes clause or as a cardinal change that materially alters the contemplated scope of work. Some states characterize the cardinal change doctrine

323. Beaty Elec. Co., EBCA No. 408–3-88, 90–2 BCA ¶ 22,829, 114,632, 114,635.
324. *Id.* at 114,635.
325. *The Cumulative Impact of Multiple Changes*, 18 Constr. Claims Monthly 1, 7 (May 1996).

as an abandonment of the contract, and effectively lower the standard of proof normally applied to cardinal changes in government contracts.[326]

No matter how the claim is characterized, the contractor still must prove the essential elements of liability, causation, and resultant injury. A contractor seeking to recover must demonstrate that the impact was not foreseeable, and that when the disruptive effect became known, the contractor documented its occurrence and requested reimbursement. In order to establish the elements, the contractor must rely on a mutually supportive combination of expert and lay testimony, based on first-hand project experience and on a detailed review of contemporaneous project documentation.

326. C. Norman Peterson Co. v. Container Corp. of Am., 218 Cal. Rptr. 592, 598 (1985); Amelco Elec. v. City of Thousand Oaks, 98 Cal. Rptr. 2d 159, 164 (Cal. Ct. App. 2000), *cert. granted*, 11 P.3d 956 (Cal. 2000).