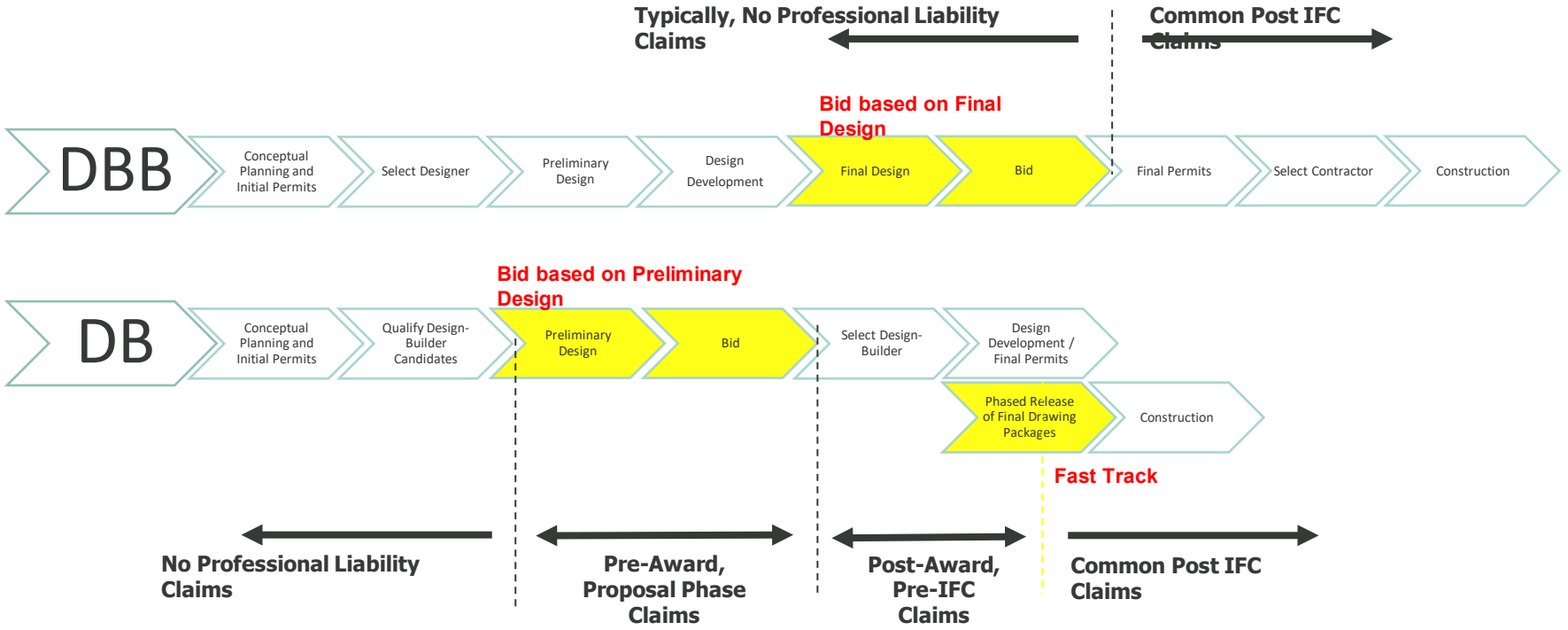
Claims Against Designers in Design-Build Projects

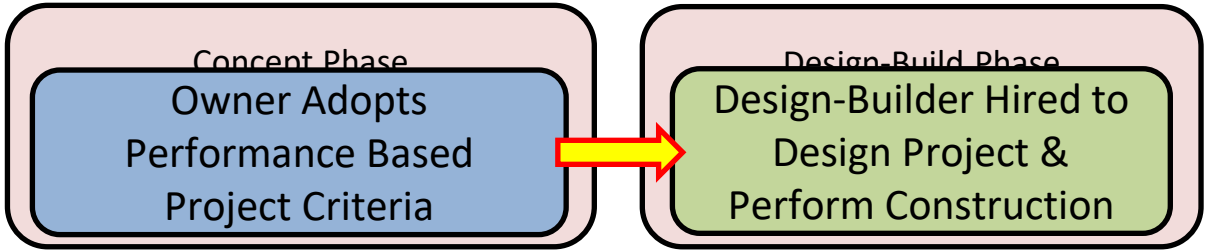
Paul L. Kelley, Senior Principal

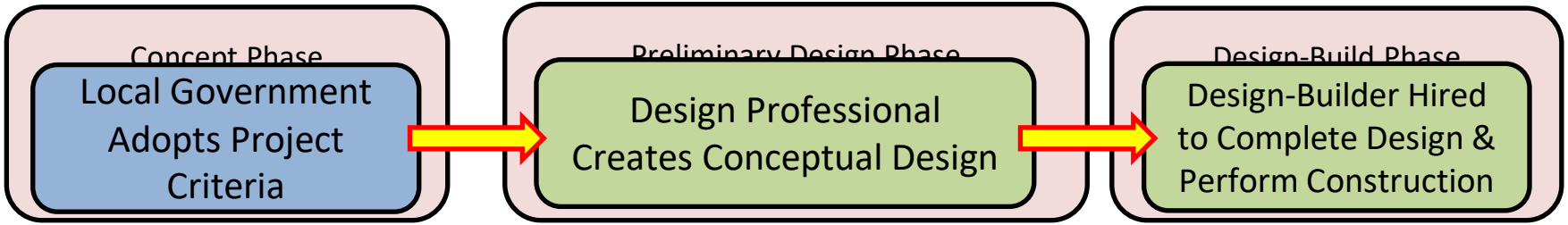
14 July 2022

Major Differences Between DB and DBB Claims…



Strict Performance-Defined Design-Build Projects in North America Today Are Rare – Most Are Defined By Combination of Performance and Prescriptive Requirements That Limit Design-Builder Innovation…





Traditional Assignment Of Imperfect-Design Risk To Owner In Design-Bid-Build Is Eliminated In Design-Build *But Who Bears It In Design-Build, And How Is It Valued?*

	Design-Bid-Build		Design-Build	
	Owner	Contractor	Owner	Contractor
Planning	2 units		5 units	
Design	10 units			10 units
Construction		100 units		100 units
Testing & Inspection	2 units			2 units
Owner Oversight	30 units		20 units	
Design Evolution/Fitness/Correction/Scope Increase Contingency	10 units		3 units	2 units
Construction Contingency		2 units		3 units
Subtotal	54 units	102 units	28 units	117 units
Total	**156 Units**		**145 Units**	

- **WHO NOW BEARS THE 10% DESIGN AND CONSTRUCTION CONTINGENCY RISK? If the BUILDER, the entire profit is at risk. If the DESIGNER, the entire fee is at risk!**
- **THE OWNER WINS and the DESIGN-BUILDER loses!**

Significant Feature of Design-Build Is Near Complete Transfer of Design Risk From Owner to Design-Builder…

The Escrow Bid Documents will be returned to the Contractor at Final Completion.

I. Certification

The Escrow Bid Documents will be submitted with a Certification as set forth below:

BID DOCUMENTATION CERTIFICATION

THE UNDERSIGNED HEREBY CERTIFIES THAT THE BID DOCUMENTATION CONTAINED HEREIN CONSTITUTES ALL THE INFORMATION USED IN PREPARATION OF THE BID AND THAT I HAVE PERSONALLY EXAMINED THESE CONTENTS AND HAVE FOUND THAT THIS BID DOCUMENTATION IS COMPLETE

The Contractor (Design Professional) shall have full responsibility for the design of the Project and, except as provided in paragraph 2, below, shall be the "Designer of Record".

A. Design Responsibilities

1. The Contractor (Design Professional) shall have full responsibility for the design of the Project and, except as provided in paragraph 2, below, shall be the "Designer of Record". Acknowledging that in the portions of the Contract Documents which include any preliminary Authority-produced or provided design product, the Authority has provided only conceptual or preliminary drawings and design documents, generally developed to approximately the 15% level and specifications ("Preliminary Design Documents"), the Contractor shall, through the Design Professional, advance the design of the Project through the various stages of design as set forth in Division 1 of the specifications included in the RFP, achieving Final Design Documents as necessary and appropriate for performance of the construction and other obligations which it has assumed under this Agreement and so as to fulfill the Scope of Work of the Project, as set forth above. The following items, which are included in the Scope of Work, are also deemed part of the Preliminary Design Documents for purposes of this Section IV.A: Authority Contract Drawings, Authority Contract Specifications, Other Agency Design Materials.

2. While the Contractor's Design Professional is not considered the "Designer of Record" as to (i) Authority Contract Drawings and related Authority Contract Specifications and (ii) Other Agency Design Materials, such Design Professional shall nevertheless be responsible for the integration of such Authority Contract Drawings and Authority Contract Specifications and/or Other Agency Design Materials into the overall Project design.

3. The Contractor acknowledges that except as to Authority Contract Drawings (and related Authority Contract Specifications) and Other Agency Design Materials, the Preliminary Design Document drawings are conceptual and preliminary in nature. The Contractor agrees that as part of its and/or the Design Professional's obligations, it shall also be responsible for resolving through the design and construction process, as necessary to complete the Final Design in accordance

1. The standard of care for all design services performed under this Agreement shall be the care and skill ordinarily used by members of the architectural or engineering professions, respectively, practicing under similar conditions at the same time and locality.

2. The design services performed under this Agreement shall be performed by New York State licensed individuals possessing the requisite degree of learning, skill and experience that is ordinarily possessed by similarly situated professionals in the community, using reasonable and ordinary care and diligence in the exercise of such skills, and exercising sound judgment in performance of its functions, duties, responsibilities and obligations under this Agreement.

3. All Final Design Documents and any revisions thereto, shall be signed and sealed by a professional Engineer/Architect duly licensed in the State of New York. Drawings and other documents included in the Final Design Documents produced by other design professionals shall be signed by appropriate New York State licensed professionals.

C. Warranty of Design

Significant Feature of Design-Build Is Near Complete Transfer of Design Risk From Owner to Design-Builder…

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Agency Design Materials.

C. Warranty of Design

Significant Feature of Design-Build Is Near Complete Transfer of Design Risk From Owner to Design-Builder…

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BID DOCUMENTATION CERTIFICATION

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The Contractor agrees that as part of its and/or the Design Professional's obligations, it shall also be responsible for resolving through the design and construction process, as necessary to complete the Final Design in accordance with the Project Scope of Work, any errors, omissions, inconsistencies and other defects in the Preliminary Design Documents.

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2. The design services performed under this Agreement shall be performed by New York State licensed individuals possessing the requisite degree of learning, skill and experience that is ordinarily possessed by similarly situated professionals in the community, using reasonable and ordinary care and diligence in the exercise of such skills, and exercising sound judgment in performance of its functions, duties, responsibilities and obligations under this Agreement.

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C. Warranty of Design

Most Pursuit/Teaming Agreements (Phase 1) and Subcontracts for Design (Phase 2) Are Negligence Based (Standard of Care); Beware of Elevated Standard of Care or Assumption of Any Warranties and/or Guarantees of Quantities…

CERTAIN TERMS AND CONDITIONS TO BE INCLUDED IN THE DESIGN CONTRACT

The term "Design-Builder" as used in this Schedule C shall mean "CJV Parties" as the term "CJV Parties" is used in the Agreement.

The term "Subcontract" as used in this Schedule C shall mean "Design Contract" as the term "Design Contract" is used in the Agreement.

1.0 Standard of Care.

Designer represents that it shall perform its services under the Subcontract in conformance with the care and skill ordinarily exercised by similar members of the profession providing similar services, practicing under similar conditions at the same time and in the same or similar locality. No other warranty except as expressly stated in the Subcontract is extended, made, or intended under the Subcontract or by the rendition of Designer's services under the Subcontract.

4.0 [Limitation of Liability.
It is agreed that the Design-Builder's maximum recovery against Designer for any damages, claims, costs, or expenses arising under the Subcontract, whether in contract, tort or otherwise, is [*]% of Designer's fee. It is expressly agreed that Design-Builder's sole and exclusive remedy against Designer under the Subcontract, whether based in contract, tort or otherwise, is the award of damages, costs or expenses not to exceed the stipulated figure of [*]% of Designer' fee. For delay related damages the Design-Builder's maximum recovery shall be a sub-cap of [*]% of Designer's fee.] **[NTD: Inclusion of a limitation of liability is to be discussed.]**

SCHEDULE 1.1 5|Page

Design-Build Process Has Many Differences When Compared to Traditional Design-Bid-Build that Need to be Considered When Evaluating Standard of Care…

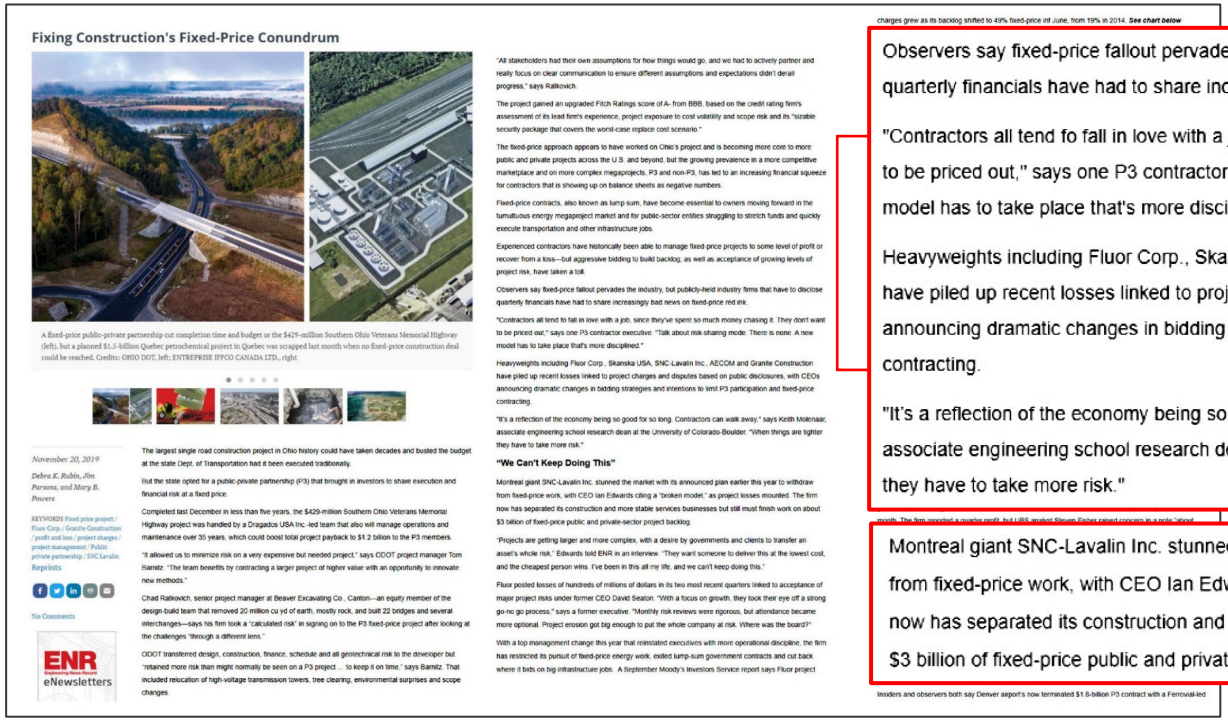
Item	Design-Build	Traditional Design-Bid-Build
Pricing	Preliminary Design + Contingency	Final Design
Engineer's Client	Contractor	Owner
Control of Sequencing and Timing of Design	Contractor to accommodate the contractor's perceived best sequence (including fast-track nature of Design-Build).	Owner
Responsibility for Constructability and Coordination	Blurred and Variable Lines Between Designer and Contractor. Proposal Phase interdisciplinary coordination cannot occur.	Responsibilities are more Clearly Segregated
Mega Project Impact	Longer Duration Projects, discontinuity in decision-making due to large teams, and often greater project complexity lead to more design revision.	Design is flushed out before bidding so less issues.
Owner Influence	More contentious due to preferential owner judgements that are not resolved until final design, which occurs well after contract submitted with hard dollar pricing.	Owner preferential judgements are incorporated in final bid documents.
Design Delegation to specialty vendors and suppliers and design-assist.	Design input needs to be timely.	Less design-delegation therefore less issue for integration.
Design Revisions	Continuous design revisions possible due to dynamic management attempts by the Contractor requiring constant coordination. Incorporating Means and Methods into Design.	Design revisions incorporated in the bid set therefore less ongoing coordination with the contractor.

Pre-Award, Proposal Phase Claims

Claims By Design-Build Contractors Against Design-Build Engineers Alleging Inadequacy Of Preliminary Design Documents For Pricing In North American Infrastructure Projects Are On The Rise...

1. Cost and time constraints force DESIGN-BUILDER to advance RFP documents to only partial design-development level
2. Hard dollar pricing of schematic designs creates MANY pricing risks
3. THE DEVIL ***(AND THE COSTS)*** ARE IN THE DETAILS
4. Design engineers are typically not cost savvy
5. Construction estimators are not mind readers
6. Low-price basis of PROJECT AWARD discourages appropriate contingencies
7. RISK TO DESIGN-BUILDER is GREAT!
8. Recent experience shows Contractor pushing cost-overrun risk to Design Professionals and their professional liability insurance

November 2019 ENR Article Reports on Fixed Price Epidemic…



Fixing Construction's Fixed-Price Conundrum

A fixed-price public-private partnership cut completion time and budget or the $429-million Southern Ohio Veterans Memorial Highway (left), but a planned $1.5-billion Quebec petrochemical project in Quebec was scrapped last month when no fixed-price construction deal could be reached. Credits: OHIO DOT, left; ENTREPRISE IFFCO CANADA LTD., right

November 20, 2019

Debra K. Rubin, Jim Parsons, and Mary B. Powers

KEYWORDS Fixed price project / Fluor Corp. / Granite Construction / profit and loss / project charges / project management / Public private partnership / SNC Lavalin

Reprints

No Comments

ENR Engineering News-Record eNewsletters

The largest single road construction project in Ohio history could have taken decades and busted the budget at the state Dept. of Transportation had it been executed traditionally.

But the state opted for a public-private partnership (P3) that brought in investors to share execution and financial risk at a fixed price.

Completed last December in less than five years, the $429-million Southern Ohio Veterans Memorial Highway project was handled by a Dragados USA Inc.-led team that also will manage operations and maintenance over 35 years, which could boost total project payback to $1.2 billion to the P3 members.

"It allowed us to minimize risk on a very expensive but needed project," says ODOT project manager Tom Bamitz. "The team benefits by contracting a larger project of higher value with an opportunity to innovate new methods."

Chad Ratkovich, senior project manager at Beaver Excavating Co., Canton—an equity member of the design-build team that removed 20 million cu yd of earth, mostly rock, and built 22 bridges and several interchanges—says his firm took a "calculated risk" in signing on to the P3 fixed-price project after looking at the challenges "through a different lens."

ODOT transferred design, construction, finance, schedule and all geotechnical risk to the developer but "retained more risk than might normally be seen on a P3 project … to keep it on time," says Bamitz. That included relocation of high-voltage transmission towers, tree clearing, environmental surprises and scope changes.

"All stakeholders had their own assumptions for how things would go, and we had to actively partner and really focus on clear communication to ensure different assumptions and expectations didn't derail progress," says Ratkovich.

The project gained an upgraded Fitch Ratings score of A- from BBB, based on the credit rating firm's assessment of its lead firm's experience, project exposure to cost volatility and scope risk and its "sizable security package that covers the worst-case replace cost scenario."

The fixed-price approach appears to have worked on Ohio's project and is becoming more core to more public and private projects across the U.S. and beyond, but the growing prevalence in a more competitive marketplace and on more complex megaprojects. P3 and non-P3, has led to an increasing financial squeeze for contractors that is showing up on balance sheets as negative numbers.

Fixed-price contracts, also known as lump sum, have become essential to owners moving forward in the tumultuous energy megaproject market and for public-sector entities struggling to stretch funds and quickly execute transportation and other infrastructure jobs.

Experienced contractors have historically been able to manage fixed-price projects to some level of profit or recover from a loss—but aggressive bidding to build backlog, as well as acceptance of growing levels of project risk, have taken a toll.

Observers say fixed-price fallout pervades the industry, but publicly-held industry firms that have to disclose quarterly financials have had to share increasingly bad news on fixed-price red ink.

"Contractors all tend to fall in love with a job, since they've spent so much money chasing it. They don't want to be priced out," says one P3 contractor executive. "Talk about risk-sharing mode. There is none. A new model has to take place that's more disciplined."

Heavyweights including Fluor Corp., Skanska USA, SNC-Lavalin Inc., AECOM and Granite Construction have piled up recent losses linked to project charges and disputes based on public disclosures, with CEOs announcing dramatic changes in bidding strategies and intentions to limit P3 participation and fixed-price contracting.

"It's a reflection of the economy being so good for so long. Contractors can walk away," says Keith Molenaar, associate engineering school research dean at the University of Colorado-Boulder. "When things are tighter they have to take more risk."

"We Can't Keep Doing This"

Montreal giant SNC-Lavalin Inc. stunned the market with its announced plan earlier this year to withdraw from fixed-price work, with CEO Ian Edwards citing a "broken model," as project losses mounted. The firm now has separated its construction and more stable services businesses but still must finish work on about $3 billion of fixed-price public and private-sector project backlog.

"Projects are getting larger and more complex, with a desire by governments and clients to transfer an asset's whole risk," Edwards told ENR in an interview. "They want someone to deliver this at the lowest cost, and the cheapest person wins. I've been in this all my life, and we can't keep doing this."

Fluor posted losses of hundreds of millions of dollars in its two most recent quarters linked to acceptance of major project risks under former CEO David Seaton. "With a focus on growth, they took their eye off a strong go-no go process," says a former executive. "Monthly risk reviews were rigorous, but attendance became more optional. Project erosion got big enough to put the whole company at risk. Where was the board?"

With a top management change this year that reinstated executives with more operational discipline, the firm has restricted its pursuit of fixed-price energy work, exited lump-sum government contracts and cut back where it bids on big infrastructure jobs. A September Moody's Investors Service report says Fluor project

charges grew as its backlog shifted to 49% fixed-price int June, from 19% in 2014. *See chart below*

Insiders and observers both say Denver airport's now terminated $1.8-billion P3 contract with a Ferrovial-led

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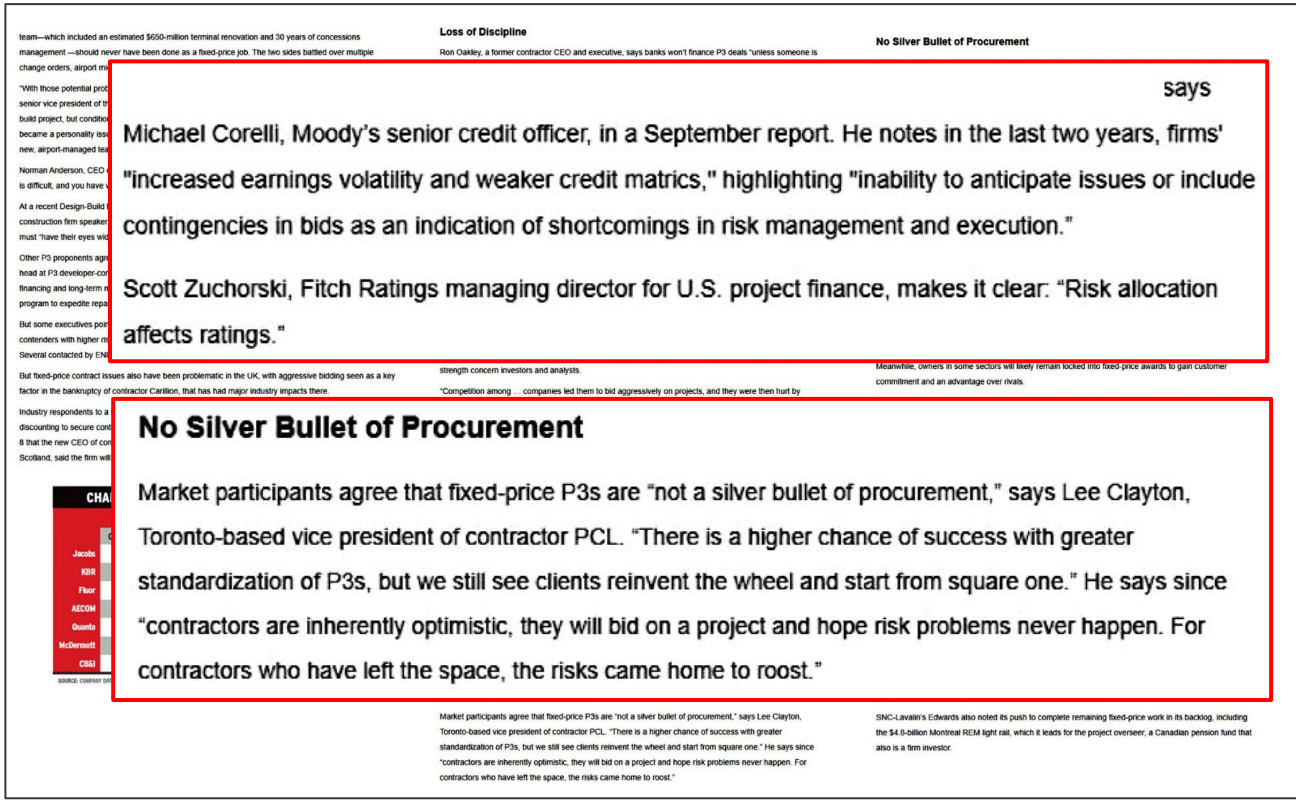
https://www.enr.com/articles/48168-fixing-constructions-fixed-price-conundrum?sfns=mo

November 2019 ENR Article Reports on Fixed Price Epidemic…

"At 30% complete drawings, there's a lot of risk and owners want builders to take that risk. On megaprojects, with the level of complexity, it's almost impossible to identify all the risk."

– *Paul Trombitas, FMI senior consultant*



says

Michael Corelli, Moody's senior credit officer, in a September report. He notes in the last two years, firms' "increased earnings volatility and weaker credit matrics," highlighting "inability to anticipate issues or include contingencies in bids as an indication of shortcomings in risk management and execution."

Scott Zuchorski, Fitch Ratings managing director for U.S. project finance, makes it clear: "Risk allocation affects ratings."

No Silver Bullet of Procurement

Market participants agree that fixed-price P3s are "not a silver bullet of procurement," says Lee Clayton, Toronto-based vice president of contractor PCL. "There is a higher chance of success with greater standardization of P3s, but we still see clients reinvent the wheel and start from square one." He says since "contractors are inherently optimistic, they will bid on a project and hope risk problems never happen. For contractors who have left the space, the risks came home to roost."

Recently Reported Study By Traveler's Reveals DB Projects Typically Not Profitable Because of Design-Risk Shift From Owner to DB and Early-Age Design Basis of Fixed Price…

ENR
Engineering News-Record

Project Delivery

Study Finds Design-Builder Profit Shortfall on Big Infrastructure Projects

The new Goethals Bridge provides a safer, state-of-the-art link at a key bistate crossing, but the project required input from many stakeholders not always in agreement.

PHOTO COURTESY OF PARSONS

August 24, 2021

Richard Korman

Big design-build infrastructure projects often turn out to be money-losers for design-build contractors, preventing contractors from covering their overhead, much less earning a profit, according to a new study. Large highway and bridge projects, many involving public-private partnerships, are the least profitable of all infrastructure work.

Carried out by Travelers Surety, the study looked at 224 highway, bridge, rail and tunnel projects with different project delivery methods from 2004 to 2020. Most had values between $250 million and $2 billion and were projects on which Travelers had been the surety or co-surety.

On more than four out of 10 design-build projects, the study found, the design-build contractor failed to cover its costs. And on mega-projects with a value of $250 million or more, the contractor often fared better when traditional design-bid-build procurement was used, according to the study

problems but I'm not sure the owners believe them."

There is a recent possible example, not mentioned in the study summary.

A Kiewit-led team is in federal court with the Port Authority of New York & New Jersey over disputed costs on the $1.5-billion replacement Goethals Bridge between New Jersey and Staten Island, N.Y. Work was completed in 2018, and Kiewit has made an estimated $100-million claim tied to its costs on that project that the agency refuses to pay.

A full copy of Travelers' research methods for its infrastructure study and results has not yet been made public, but the summary released this month echoes prior studies of design-build. Those studies suggest that design-build, in order to yield good results on big projects, must be carried out in a collaborative spirit, with a shared interpretation of the contract terms and an experienced team leader in charge of work.

Halliday says that in CM/GC arrangements, where the construction manager provides a price guarantee, and progressive design-build procurement models, work better. Those delivery methods usually involve the contractor or design-builder in the earliest phases of design development so that it can set the guaranteed maximum price at 50% to 75% or higher of the design.

"Contractors find they can't provide price on 30% design," says Halliday. "It's just not working. The under-billing results in a lot of claims."

According to Travelers' study, CM/GC contract "produce few if any unresolved claims and under-billings on infrastructure work, allowing contractors to make their expected profit."

"The jobs get done on time and aren't any disputes," adds Halliday.

Response to Design-Build Problems

There are many reasons that complicated mega-projects go over-budget and exceed schedules, notes Lisa Washington, chief executive of the Design-Build Institute of America. Not all can be traced to design-build.

But the Travelers study is another example that design-build "is not a panacea," says Washington, and must be executed with the proper amount of collaboration and experienced leadership in order to fulfill its promise.

study summary, because work should be done in a way that minimizes disputes, provides greater certainty about timely completion, best protects taxpayer dollars "and allows the contractors to have a reasonable chance of achieving an acceptable financial return."

Recent Articles By Richard Korman

"Contractors find they can't provide price on 30% design," says Halliday. "It's just not working. The under-billing results in a lot of claims."

INFRASTRUCTURE STUDY

Conclusions

- Procurement type is the most highly correlated factor with ultimate project financial performance.
- Based on our experience we believe contractors have been unable to accurately price work in the civil construction space based on a 30% design. There simply is too much uncertainty, especially with quantity risk. The only certainty when asking contractors to provide a firm fixed price at this point in the procurement process is it will be wrong.
- Contractual risk transfer is an important driver of ultimate project performance for both the Owner and Contractor. In our opinion, certain risks must be shared and cannot simply be shifted. Our data supports this assumption.

- Based on our experience we believe contractors have been unable to accurately price work in the civil construction space based on a 30% design. There simply is too much uncertainty, especially with quantity risk. The only certainty when asking contractors to provide a firm fixed price at this point in the procurement process is it will be wrong.

- The CM/GC and/or Progressive DB models where the Contractor and Designer collaborate over an extended period of time to determine the final design and construction budget have produced the most consistent and best results for both the Contractor and the Owner. The work is done on time, on budget, and the Contractor has earned on average an acceptable return.

Recurring Claim Types in Design-Build Projects – Proposal Phase Claims…

- Drainage
- Retaining Walls/Slope Stabilization
- Ground Improvements
- Roadway
- Concrete Reinforcement Density (Steel Weight/Concrete Volume)
- Concrete Durability Issues
- Structural Steel
- Missing Secondary Elements
- Space proofing, especially mechanical rooms
- Incomplete Absorption of RFP Reference Materials
- Inadequate identification/communication of technical risks to builder
- Inadequate/incomplete/uncoordinated Integration of third-party design inputs

Recurring Claim Types in Design-Build Projects – Proposal Phase Claims (1/2)…

- Drainage
  - Ditches versus buried piping
  - Minor structures including catch basins/inlets and related leader (small diameter) piping
  - Drainage on peripheral areas and Frontage roads
  - Existing downstream capacity improvements
  - Anticipation of post-award, third-party requirements
- Retaining Walls/Slope Stabilization
  - Identification of Intolerable Slopes
  - Selection of Wall Type or Slope Stabilization Method
  - Above Ground Wall Surface Area or Extent of Slope Stabilization
  - Below Ground Surface Area or Foundation Embedment Depth
- Ground Improvements
  - Identification of need for ground improvement
    - –Densification/consolidation
    - –Frost susceptibility
  - Extent of ground improvement (area and depth)
- Roadway
  - Geometric design of minor elements, e.g., ramps
  - Integration with frontage roads, intersecting roads, and adjacent properties
  - ROW Issues
  - Extent of pavement replacement versus rehabilitation (and linkage to optimization of maintenance)
  - Pavement type and section thickness

And sometimes the issue is the impact (knock-on effect effect) of the identified items on some other items.

Recurring Claim Types in Design-Build Projects – Proposal Phase Claims (2/2)…

- Reinforcement Density (Steel Weight/Concrete Volume)
- Concrete Durability Issues
  - Reinforcing Steel Materials (black, epoxy, stainless steel)
  - Concrete cover requirements
  - Concrete quality
- Structural Steel
  - Connections
  - Wind mitigation elements
  - Steel Grade (transportation structure requirements)
- Missing Secondary Elements
  - Median Strips Between Roadways or Track Beds
  - Maintenance access (catwalks)
- Incomplete Absorption of RFP Reference Materials
- Inadequate identification/communication of technical risks to builder
- Space proofing, especially mechanical rooms
- Inadequate/incomplete/uncoordinated Integration of third-party design inputs

Typical Teaming Agreement Scope Includes Two Major Scope Requirements For Designers – Development of Preliminary Design Documents To Satisfy Owner's RFP Requirements AND Documents and Information To Support Contractor's Development Price Proposal…

8/6/2102

AGREEMENT FOR DESIGN SERVICES (PHASE I)

I. PARTIES AND PROJECT

This Agreement for Design Services (Phase I), hereinafter "Design Agreement" is entered into as of August 2, 2012, by and between LLC., with offices at 929 West Adams Street, Chicago, Illinois 60607, ..., with offices at 585 West Beach Street, Watsonville, CA 95076, ... with offices at 92 Fishtown Ct., Cheshire, Connecticut 06410, together a Joint Venture (hereinafter the "Contractor" or " Inc., together a Joint Venture (hereinafter the "Architect/Engineer" or " individually referred to as "Party" and collectively referred to as the "Parties".

Name of Project:	
Project Address:	
Project Owner:	

Contractor hereby engages the Architect/Engineer to provide Architect/Engineering conceptual design and proposal Services for the Project, and the Architect/Engineer hereby agrees to provide these Services, as described in this Design Agreement (Phase I).

Contractor and the Architect/Engineer agree with each other as follows:

II. DEFINITIONS

A. "Architect/Engineer's Phase I Services" means the services to be performed by the Architect/Engineer as described in Article IV below, including basic and additional services.

8/6/2102

EXHIBIT A - PHASE I PAYMENT TERMS FOR PHASE I SERVICES
EXHIBIT B - PHASE I PHASE I SCOPE OF SERVICES
EXHIBIT C - PHASE I ARCHITECT/ENGINEER' PROJECT TEAM
EXHIBIT D - PHASE I PHASE I DELIVERABLES AND SCHEDULE
EXHIBIT E - PHASE I AGREEMENT FOR DESIGN AND OBSERVATION

A. **BASIC SERVICES.**

...contract documents, including: the Owner's Design-Build Agreement, the Design Agreement (Phase I) and the Design Agreement (Phase II), shall be construed and interpreted in a consistent, harmonious and supplementary manner. In the event the contract documents cannot be interpreted in a consistent, harmonious and supplementary manner, the most stringent shall apply. However, in the event there are irreconcilable conflicts, ambiguities or

1. The Architect/Engineer shall provide all architectural and architect/engineering design Services required to respond to the Owner's RFP (excepting however those design and Architect/Engineering Services identified by the Contractor IN WRITING as being provided by the Separate Consultants). The Architect/Engineer's Services shall include all Services reasonably required (1) to fully comply with the requirements of the Owner's RFP, including the design of the size, quality and character of the Project, its architectural, structural, mechanical and electrical systems, and the materials and such other elements of the Project, (2) to permit Contractor to do the cost estimating and scheduling, and (3) to coordinate and review the work of the Separate Consultants, as necessary or required by law.

requirements of the Project and shall review those requirements with Contractor.

3. The Architect/Engineer shall review and confirm for accuracy and completeness of information supplied by Contractor or contained in the Design Build portion of

5

8/6/2102

the Owner's RFP; in particular Architect/Engineer shall advise Contractor of additional studies and testing required for Project design and the impact results of such studies and testing may have on Contractor's price and schedule.

4. The Architect/Engineer shall provide, after consultation with Contractor, a preliminary evaluation of the Contractor's construction schedule as it relates to the Design Build portion of the Project, including recommendations as to how Designer can assure that the Project Schedule, which shall be attached to the Design Agreement (Phase II) as Exhibit D, and schedule for Preliminary Design Document development are consistent with each other and satisfy the requirements of the Owner's RFP.

5. The Architect/Engineer and Contractor shall prepare a Phase I Deliverables and Schedule, attached hereto as EXHIBIT D, setting forth the dates for completion of

11. The Architect/Engineer shall, before Contractor submits the Proposal, prepare and submit to Contractor a Proposal Audit, comparing the requirements of the RFP as it relates to the Design Build portion of the Project to the contents of the Proposal and providing comments and recommendations for measures to assure that the

6

Teaming Agreements Often Assign Designers Job of Vetting Owner's RFP Information…

TEAMING AGREEMENT

The "Parties", Fred's Construction Company (hereinafter "Contractor"), Build Stuff Services, Inc. (hereinafter "Contractor") and We Design Things, Incorporated (hereinafter "Designer") effect this "Agreement" as of the _____ day of _____ in the year 2010 for design services to be provided by Designer for the "Project."

Recitals

Whereas, Contractor, operating as a Design/Build Contractor, intends to submit a "Proposal" to the "Owner", Very Large State Department of Transportation for a contract to design and construct the Project ("Contract"); and

Whereas, Designer does, in the normal course of its business, design permanent facilities and structures and represents that it has the skill and experience necessary to design facilities and structures of the type anticipated for this Project; and

Whereas, the Designer has reviewed, or will review, designs, specifications, performance criteria and engineering work product furnished by the Owner ("Owner Designs") as part of the Request for Proposal ("RFP"); and

Whereas, Designer and Contractor intend that Designer shall advance the Owner Designs in such a way that the Owner Designs and Designer's work product together are the preliminary designs for the Project ("Preliminary Design") which will be further advanced by Designer if Contractor is awarded the Contract under a design subcontract ("Subcontract").

Whereas, Designer and Contractor intend that Designer shall advance the Owner Designs in a prompt and diligent manner consistent with the preliminary design schedule for the Proposal (Attachment A, Preliminary Design Schedule).

Whereas, Designer understands that Contractor will rely on the Preliminary Design for purposes of developing Contractor's price proposal ("Project Price") and construction schedule ("Project Schedule") for the Project.

Whereas, Designer and Contractor intend that their dealings under this Teaming Agreement be **fair, good faith dealing, and** that, unless expressly provided otherwise herein, their actions shall be reasonable actions.

Now, therefore, in consideration of the mutual efforts and benefits set forth herein, the Parties enter into this Agreement in order to set forth the scope and conditions of their relationship for purposes of developing Preliminary Design for the Project.

1.2 The Services shall be deemed complete when the Preliminary Design has achieved, at the times, and in the sequence established in the Preliminary Design Schedule, the level of completion, by work element, provided for in the design plan (Attachment B, Design Plan). Designer's Services (for a typical highway project) shall include, as and when appropriate, without limitation:

(a) review, analyze, and verify Owner Designs, except such Owner Designs as Owner (i) expressly warrants to be accurate or (ii) declares Designer may rely on without verification, in writing;

(b) verify Owner Designs are sufficient to develop the Preliminary Design;

(c) identify additional information which must be provided by Owner for Designer to develop and advance the Preliminary Design;

(d) verify that geotechnical parameters provided by the Owner are based on adequate geotechnical data, and are sufficient for developing the Preliminary Design;

(e) review Project environmental requirements and related documents to ascertain how such requirements control and/or affect the Preliminary Design;

(f) identify and prepare questions to Owner regarding any ambiguities in the Owner's stated intentions, the Owner Designs and/or the RFP

(g) develop the scope of site investigation required by the Designer to prepare the Preliminary Design;

(h) timely advise Contractor of any additional site investigations, stipulations assumptions, exceptions, qualifications, clarifications and exclusions Designer recommends so that the Preliminary Design is sufficient for purposes of establishing the Project Price and Project Schedule;

Teaming Agreements Often Identify That Means & Methods, Quantity Estimates, and Pricing Are Contractor Responsibilities – But Not Always!

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2. Responsibilities of Contractor

2.1 Contractor shall undertake the management of the Proposal effort, including Proposal submission and preparation of Proposal text and appendices that are not identified as Designer's Responsibility. A designated representative of Contractor will direct these efforts.

2.2 Using the Preliminary Design, Contractor shall determine construction means and methods, and perform the quantity calculations, construction pricing and analysis required to establish the Project Price.

But Teaming Agreements Also Often Describe Risk Identification, But Not Risk Pricing, As Joint Exercise Between Design-Builder and Designer

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Whereas, Designer and Contractor intend that their dealings under this Teaming Agreement be **fair, good faith dealing, and** that, be reasonable actions.

Now, therefore, in consideration c enter into this Agreement in order purposes of developing Preliminar

2.4 Jointly with Designer, Contractor will, to the extent applicable to the Project:

(a) develop Project-specific special conditions for purposes of Contract negotiation;

(b) prepare work scope descriptions that represent the entire Project scope;

(c) identify discrepancies or deviations from the established Project performance specifications and/or criteria;

(d) allocate responsibilities under the proposed Contract documents among Designer and Contractor (e.g. surveying, inspection, quality control, etc);

(e) determine required and/or beneficial changes and/or additions to Owner's standard construction specifications;

(f) determine areas of conflict and overlap in work to be performed by other Owner contractors;

(g) identify apparent discrepancies that may result in scope and/or schedule changes during construction;

(h) identify possible alternative solutions whenever the Preliminary Design, including selection of materials, building systems and equipment, affects construction feasibility, cost, schedule or risk;

(i) identify applicable code and/or regulatory agency review protocols and interim approvals required and/or which may expedite the Project;

(j) perform risk assessment and develop mitigation strategies intended to eliminate or reduce identified risks that forseeably may affect Project cost and schedule;

(k) reconcile the Design Schedule with the Project Schedule;

fabricated elements;

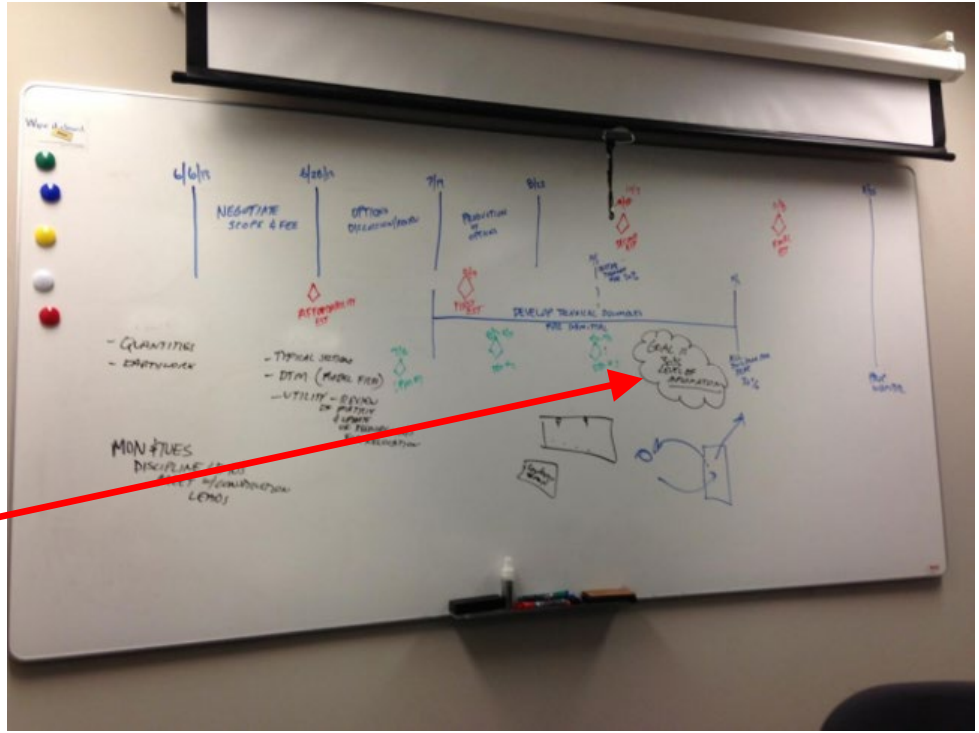
(o) determine unusual materials, installed equipment and labor requirements; and

(p) develop and agree on the Project specific Quantity Contingency Matrix.

(j) perform risk assessment and develop mitigation strategies intended to eliminate or reduce identified risks that forseeably may affect Project cost and schedule;

Snapshot of Project Whiteboard Memorializes Common Expectation that Preliminary Design Will Provide "30% Level of Information"…

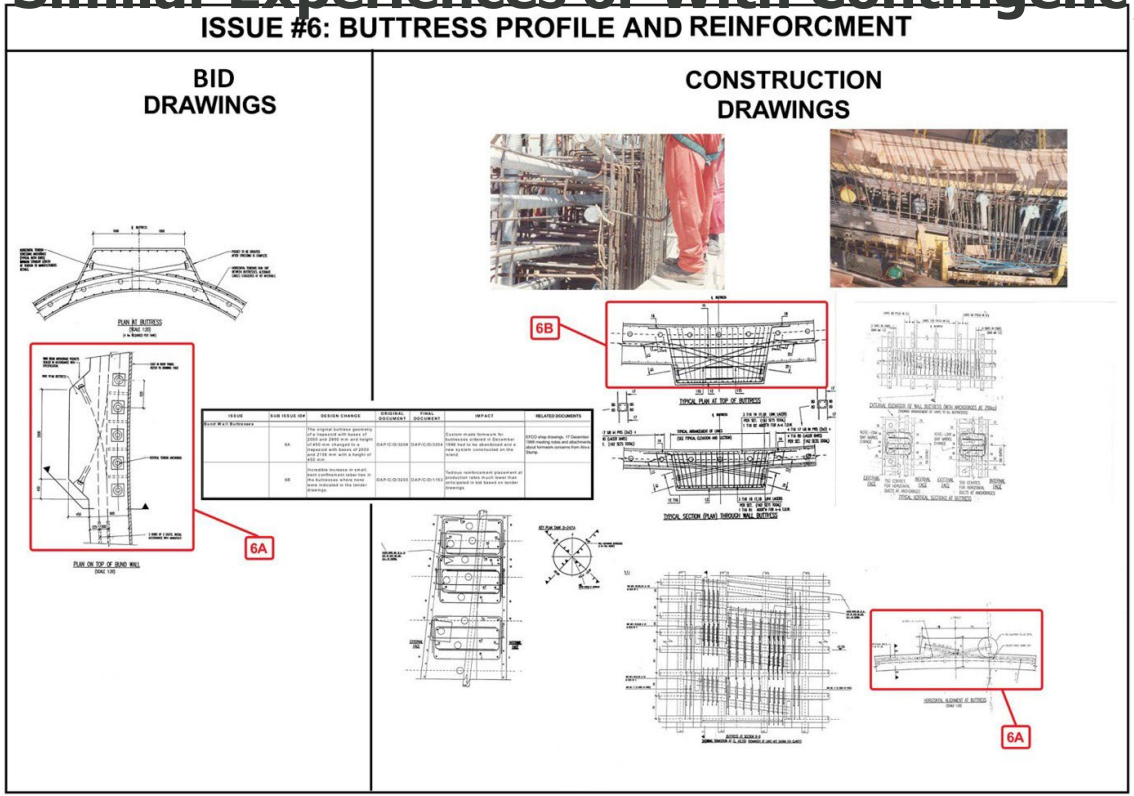
30% Design - Completion Target ("Goal is 30% Level of Information")



Be Aware of Open-Ended Language in Preliminary-Design Work Scopes In Teaming Agreements That May Infer More Effort and Detail Than Can Be Accomplished Within Available and Agreed Pre-Award Fee Structure and Design Schedule…

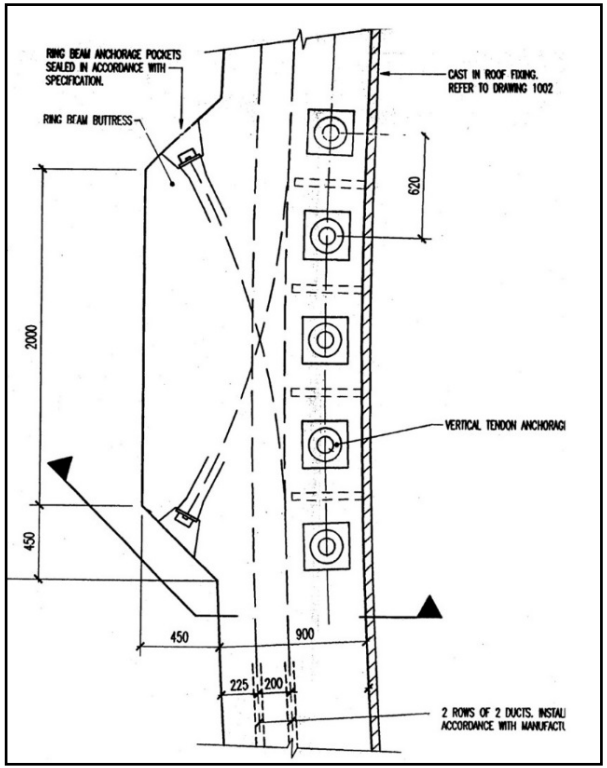
Task 4 - Drainage	
a. Inventory/Validate Existing Drainage Areas, Pipes and Structures (capacity & strength) - Memo b. Risk Assessment - Memo c. Concept Drainage Collection System for Bridges – Sketches & Schedule d. Concept Closed Storm Water Drainage Systems – Roll Plots & Schedule (w/approx depths) e. Concept Culverts, Outfall Structures and Rip Rap – Schedule f. Special Drainage Structures/ES Control Measures – Schedule g. Temporary Drainage System by Phase – Roll Plots	See Dates Below

When Hard-Dollar Bid Pricing Based On Preliminary Design – Estimators Must Forecast Final Detailing Based on Historical Similar Experiences or With Contingency…

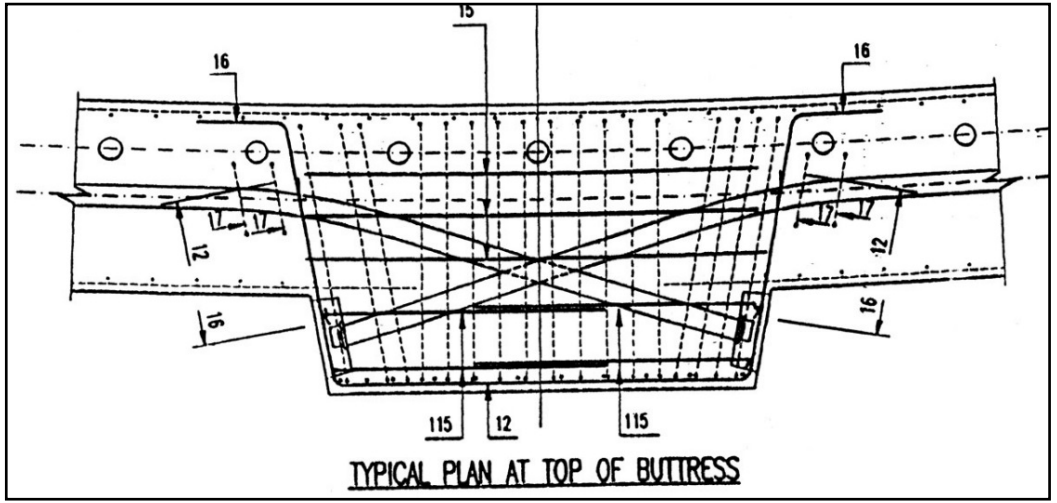


Preliminary Drawings Used For Hard Dollar Pricing in Design Build Lack Costly Detailing That Comes From Completion Of Design…

Preliminary Design Drawings



Construction Drawings



Preliminary Design Often Guided By Rules of Thumb – Pre-Award Time and Budget Does Not Allow Project Specific Analysis and Component Sizing and Detailing…

Caltrans Metric

BRIDGE DESIGN AIDS • MARCH 2005

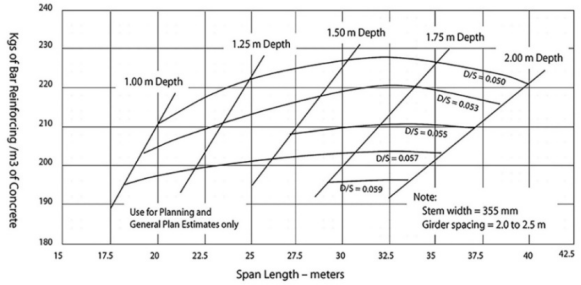
Bar Reinforcement /m³ of Concrete for Various Bridge Parts

The following are approximate quantities of Bar Reinforcement per cubic meter of concrete.
Use for Planning and General Plan Estimates only.

Deck slab on prestressed or steel girders	134 kg/m³
Bent Caps	90 kg/m³
Single column bents	268 kg/m³ (170-324 variation)
Multiple column bents	134 kg/m³ (57-208 variation)
Piers and walls of simulated closed end abutments	48 kg/m³
Footings	90-119 kg/m³
End diaphragm abutments	48 kg/m³
Cantilever and strutted abutments	Design Charts
Retaining walls	Page 11- 49
Seat Type Abutments Skews < 15°	54 kg/m³
Skews 15° to 45°	60 - 83 kg/m³
Bar Reinforcement/m² of Deck Area	
Cast-In-Place Reinforced Slab	64 kg/m²

Note: See "Sources of Quantities for Standard Details" shown in SECTION 11.

Preliminary Quantity Survey



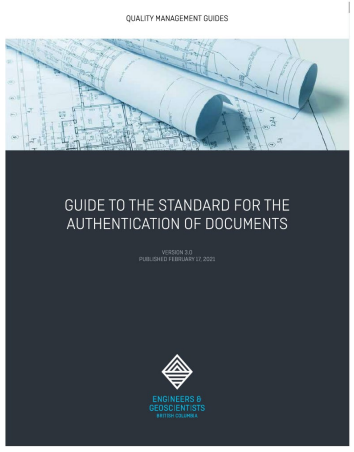
Conventionally Reinforced Box Girder Superstructure Bar Reinforcing

Example of Good, But Uncommonly Used, Design-Risk Language for Quantities at Bid…

Measurement

The amount of design and information that the Engineer has been able to consider and prepare during the bid period is limited due to time constraints inherent in the bid process. Subsequently the quantities and details the Engineer have shown may increase during the development of the bid design into final design and subsequent construction. These potential increases will depend on a number of factors, including errors and omissions, which the Engineer cannot predict at this stage in the design process. Many of these items should appear on the Risk Register and be dealt with accordingly by Contractor. Nevertheless, the Engineer recommends that an appropriate contingency is allowed in costing and schedule to take such matters and their consequences into account. The quantity estimates given for the individual elements may vary for a variety of factors, and any assessment of estimates against actual quantities should be against the overall estimate, rather than individual elements.

Requirements For Stamping of Preliminary Designs Is In Flux But Even Most Aggressive Positions Recognize Stamped Preliminary Designs May Not Be Complete Designs…



3.2.12 DESIGN-BUILD DRAWINGS/DOCUMENTS

3.2.12.1 Design-build Documents in a pre-bid package do not need to be Authenticated, as they are preliminary in nature and are prepared as part of the process of developing the final bid package for delivery. These Documents may include

ocument does not also need to be issued
the recipient of the field-issued
ocument; however, the Authenticated
ocument must be filed and retained as a
cord to meet the intent of this Guide.

ESIGN-BUILD DRAWINGS/DOCUMENTS

esign-build Documents in a pre-bid
ackage do not need to be Authenticated,
they are preliminary in nature and are
epared as part of the process of
veloping the final bid package for
elivery. These Documents may include
partially complete reports, letter reports, design briefs, memos, field memos, specifications, drawings, maps, or plans that provide recommendations, designs, directions, estimates, calculations, opinions, and interpretations or observations that involve technical professional engineering or professional geoscience matters. These Documents are typically prepared by the design-build team under contract with a construction contractor or contractor joint venture for the purpose of developing a commercial bid for a project procured via design-build, engineering procurement construction, or public-private partnerships (P3).

3.2.12.2 The final bid package that will be submitted to the client(s), as well as any subsequent Documents, must be Authenticated prior to delivery. The design-build project model, which is commonly employed in P3 projects, involves preparing design-build drawings/Documents intended for use by those receiving and reviewing bid packages. Bid packages prepared for these purposes can vary in percentage of completion. There is a degree of uncertainty with respect to cost and impact on the final design.

3.2.12.2 The final bid package that will be submitted to the client(s), as well as any subsequent Documents, must be Authenticated prior to delivery. The design-build project model,

Registrant responsible for the professional engineering or professional geoscience work should incorporate the following declaration into the Documents that are being prepared and delivered at this stage of a project:

"The seal and signature
undersigned on this doc
certifies that the accura
completeness of the
design/information in th
is appropriate for the de
tender stage of the proj
state of completion of th
reflects that limited use.

The undersigned does n
warrant or guarantee, n
responsibility for, the us
documents for any purp
than the design-build te

3.2.13 FINAL DESIGN DRAWINGS

3.2.13.1 Engineers and Geoscientists
recommends that the Profes
Record responsible for desig
review services must Authen
final design drawings upon c
the construction project. The
reflect design changes made
construction and incorporate
related items such as adden
orders, but do not include as
information provided by oth

3.2.14 AS-BUILT OR AS-CONSTR DRAWINGS

3.2.14.1 Engineers and Geoscientists
use of the terms "as-built dr
"as-constructed drawings," a
imply that the drawings sho
was built or constructed (in

"The seal and signature of the undersigned on this document only certifies that the accuracy and completeness of the design/information in the document is appropriate for the design-build tender stage of the project, and the state of completion of the document reflects that limited use.

The undersigned does not intend, warrant or guarantee, nor accept any responsibility for, the use of these documents for any purposes other than the design-build tender stage."

Numerous Studies Confirm That Estimate Accuracy Is Function of Design Completeness – Isn't It Logical To Expect A Contingency Sized To Balance Inaccuracy…

GUIDE TO COST PREDICTABILITY IN CONSTRUCTION:

AN ANALYSIS OF ISSUES AFFECTING THE ACCURACY OF CONSTRUCTION COST ESTIMATES

Prepared by the
Joint Federal Government / Industry Cost Predictability Taskforce

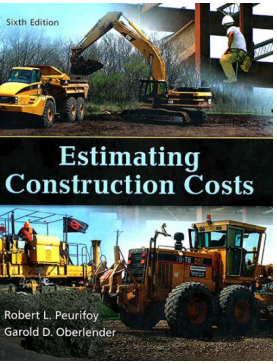
November 2012

Cost Estimate Variance Matrix

The following matrix has been developed to provide a range of estimate variance (plus or minus), based on the level of construction documents completion, in combination with an evaluation of the level of complexity of the project:

COST ESTIMATE VARIANCE MATRIX ± %			
Class of Estimates	**Based On**	**Project Complexity** LOW	HIGH
D	Concept sketch design	20	30
C	33% Design development	15	20
B	66% Design development	10	15
A	100% complete tender documents	5	10
Unique Projects, Circumstances, or Risks		Varies	Add to Above %

Estimators Use Contingency to Cover Known-Unknown and Unknown-Unknown Risks…



RISK ASSESSMENT

Assessing risk and assigning contingency to the base estimate is one of the most important tasks in preparing early estimates. Risk assessment is not the sole responsibility of the estimators. Key members of the project management team must provide input on critical issues that should be addressed by the estimators in assessing risk. Risk assessment requires a participatory approach with involvement of all project stakeholders including the business unit, engineering, construction, and the estimating team.

The owner is responsible for overall project funding and for defining the purpose and intended use of the project. The design organization is responsible for producing the contract documents, the plans and specifications, to construct the project. The estimating team is responsible for preparing an estimate of the probable final cost to construct the project, including direct and indirect costs, and assessing risk and assigning contingency.

RISK ANALYSIS

Typically, risk analysis is a prerequisite to assigning contingency. Based on the acceptable risks and the expected confidence level, a contingency is established for a given estimate. Risk analysis and the resultant amount of contingency help management to determine the level of economic risk involved in pursuing a project. The purpose of risk analysis is to improve the accuracy of the estimate and to instill management's confidence in the estimate.

Numerous publications have been written to define risk analysis techniques. Generally, a formal risk analysis involves either a Monte Carlo simulation or a statistical range analysis. There are also numerous software packages for risk analysis. The lead estimator for a project must assess the uniqueness of each project and select the technique of risk analysis that is deemed most appropriate. For very early estimates, the level of scope definition and the amount of estimate detail may be inadequate for performing a meaningful cost simulation.

CONTINGENCY

Contingency is a real and necessary component of an estimate. Engineering and construction are risk endeavors with many uncertainties, particularly in the early stages of project development. Contingency is assigned based on uncertainty. Contingency may be assigned for many uncertainties, such as pricing, escalation, schedule, omissions, and errors. The practice of including contingency for possible scope expansion is highly dependent on the attitude and culture toward changes, particularly within the business unit.

In simple terms, contingency is the amount of money that should be added to the base estimate to better predict the total installed cost of the project. Contingency can be interpreted as the amount of money that must be added to the base estimate to account for work that is difficult or impossible to identify at

the time a base estimate is being prepared. In some owner or contractor organizations, contingency is intended to cover known unknowns. That is, the estimator knows there are additional costs, but the precise amount is unknown. Howeve
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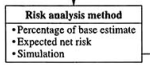

FIGURE 3.3 | Risk assessment

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It is less
Son
the class of estimate. Company policy rather than a numerical analysis governs
this method. In some situations, contingency is applied as a percentage of major

CONTINGENCY

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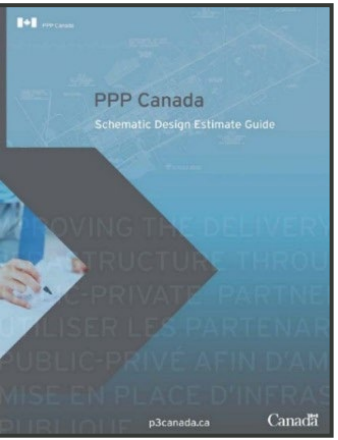
AACE International document 18R-97 defines contingency as "An amount of money or time (or other resources) added to the base estimate to: (a) achieve a specific confidence level; or (b) allow for changes that experience shows will likely be required."

Design-Build Pricing Should Incorporate Sizable Contingency For Incomplete-Design Risks…

Pg. 15: Section 3.5 - Allowances

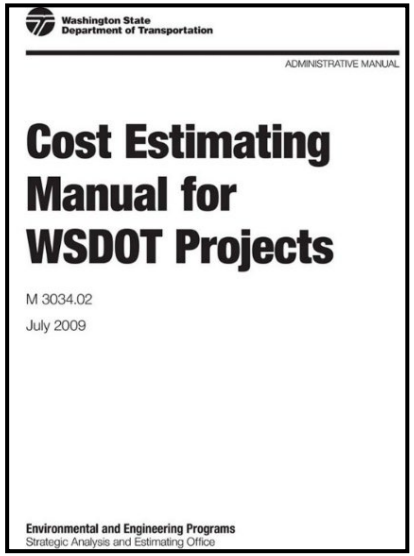
1. Design and Estimating Allowances are added to reflect the early state of the project design. The contingencies are to cover omissions and unknown project elements resulting that can be expected to be discovered over the design process.

Pg. 26: Section 6 - Conclusion



For P3 projects, this Guide recommends a Cost Analysis with an accuracy of +/- 15% which is generally supported by a Schematic Design at a 30% level. The Schematic Design Estimate focuses the capital costs of the project during the construction phase. This approach allows for the development of robust cost estimates for decision-making, while minimizing any potential to impede private sector innovation and duplicate efforts in a P3. It is generally an accepted industry standard that a Schematic Design Estimate is prepared in Elemental Format, which is approved by the Canadian Institute of Quantity Surveyor. However, developing a Schematic Design Estimate varies based on the type of infrastructure being constructed. Although different classes of infrastructure will have many common features there will be departure points, therefore, the required background information, elemental categories, and final outputs will be different among infrastructure classes.

Industry Standards for Contingency Show Need for Design AND Construction Contingencies…


Washington State Department of Transportation

ADMINISTRATIVE MANUAL

Cost Estimating Manual for WSDOT Projects

M 3034.02

July 2009

Environmental and Engineering Programs
Strategic Analysis and Estimating Office

Cost Estimating Data

An estimator calculates the cost of work items, then applies markups such as mobilization, sales tax, preliminary engineering (PE), Miscellaneous Item Allowance in Design (only for historical bid-based, cost-based, and risk-based methods), and construction engineering (CE). Table 1 presents a summary of recommended values for various elements.

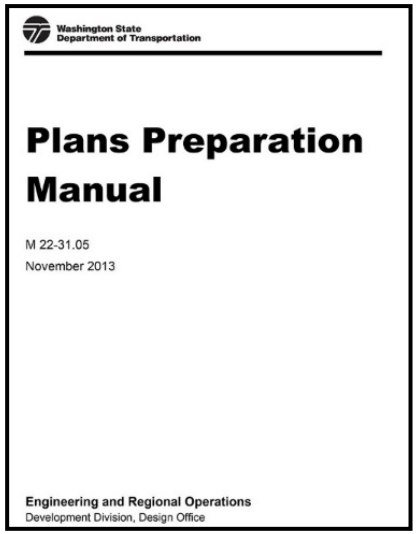
Cost Estimating Elements	Planning	Scoping	Design	PS&E
Identification of Work Items	> $50,000	> $10,000	All Items	All Items
Mobilization	Per *Plans Preparation Manual*, 830.02			
Sales Tax	Site-specific, based on Control Section. Data can be found in TRIPS or EBASE. Specific direction is found in Standard Specification 1-07.2.			
Preliminary Engineering	See Table 3		PM's Workplan + Actuals to Date	Actual
Miscellaneous Item Allowance in Design[3]	30% to 50%	20% to 30%	10% to 20%	0% (all items should be defined)
Contingency	Applies to parametric, historical bid-based and cost-based estimates only. Per *Plans Preparation Manual*, 830.03			

3. Miscellaneous Item Allowance in Design accounts for lack of scope definition and those items too small to be identified at that stage of the project. This allowance is eliminated entirely in PS&E estimates as the scope will then be fixed and all estimate items should be identified.

2. Report cost estimates in current dollars to program management. The Construction Cost Index (CCI) will be used to inflate the estimate to midpoint of construction by program management.

3. Miscellaneous Item Allowance in Design accounts for lack of scope definition and those items too small to be identified at that stage of the

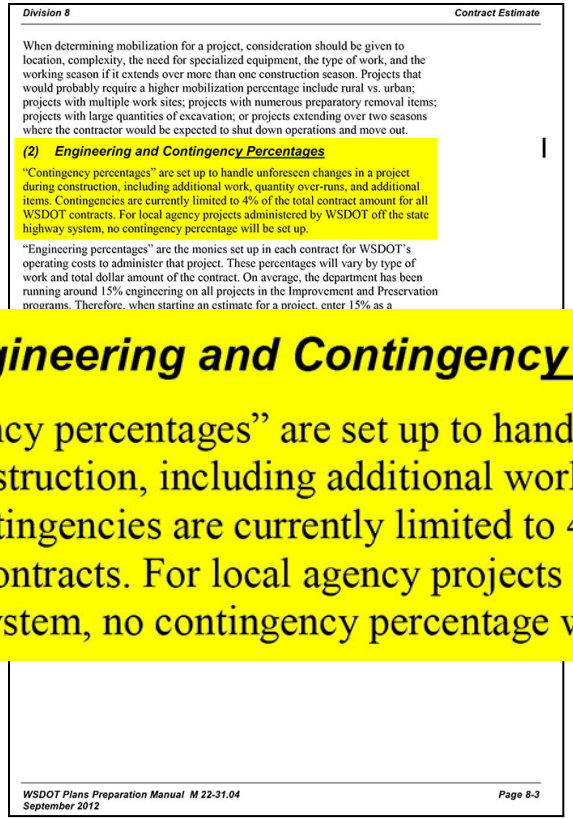
Even When Design is Complete – A Construction Period Contingency Needed for Design Amendment AND Unanticipated Construction-Period Impacts…


Washington State Department of Transportation

Plans Preparation Manual

M 22-31.05
November 2013

Engineering and Regional Operations
Development Division, Design Office


Division 8 *Contract Estimate*

When determining mobilization for a project, consideration should be given to location, complexity, the need for specialized equipment, the type of work, and the working season if it extends over more than one construction season. Projects that would probably require a higher mobilization percentage include rural vs. urban; projects with multiple work sites; projects with numerous preparatory removal items; projects with large quantities of excavation; or projects extending over two seasons where the contractor would be expected to shut down operations and move out.

(2) Engineering and Contingency Percentages

"Contingency percentages" are set up to handle unforeseen changes in a project during construction, including additional work, quantity over-runs, and additional items. Contingencies are currently limited to 4% of the total contract amount for all WSDOT contracts. For local agency projects administered by WSDOT off the state highway system, no contingency percentage will be set up.

"Engineering percentages" are the monies set up in each contract for WSDOT's operating costs to administer that project. These percentages will vary by type of work and total dollar amount of the contract. On average, the department has been running around 15% engineering on all projects in the Improvement and Preservation programs. Therefore, when starting an estimate for a project, enter 15% as a

WSDOT Plans Preparation Manual M 22-31.04 *Page 8-3*
September 2012

(2) Engineering and Contingency Percentages

"Contingency percentages" are set up to handle unforeseen changes in a project during construction, including additional work, quantity over-runs, and additional items. Contingencies are currently limited to 4% of the total contract amount for all WSDOT contracts. For local agency projects administered by WSDOT off the state highway system, no contingency percentage will be set up.

Need for Design Contingency on Early Stage Designs Is Nationally Recognized…

ICF INTERNATIONAL

NCHRP 8-36 Task 72: Guidelines for Cost Estimation Improvements at State DOTs

Requested by:
American Association of State Highway and Transportation Officials (AASHTO) Standing Committee on Planning

Prepared by
ICF International
Christine Paulsen
Frank Gallivan
Megan Chavez

and

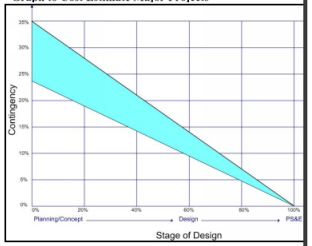
Venner Consulting
Marie Venner, Principal Investigator
July 2008

Transportation Research Board of the National Academies
July 2008

Passion. Expertise. Results.

ICF International 1

Exhibit 7. Ohio DOT Uses a Project Development Process Graph to Cost Estimate Major Projects



Typical contingency ranges by phase are as follows:

- Planning and Concept Development Phase—30 to 40 perce
- Public Involvement Phase—25 percent
- Semifinal Phase—15 percent
- Final Review—5 to 10 percent
- PS&E—0 percent

Guidance on developing and monitoring contingency amounts s
guidance on cost estimation and risk estimation.

4.2.5 Conduct Audits of Cost Estimates

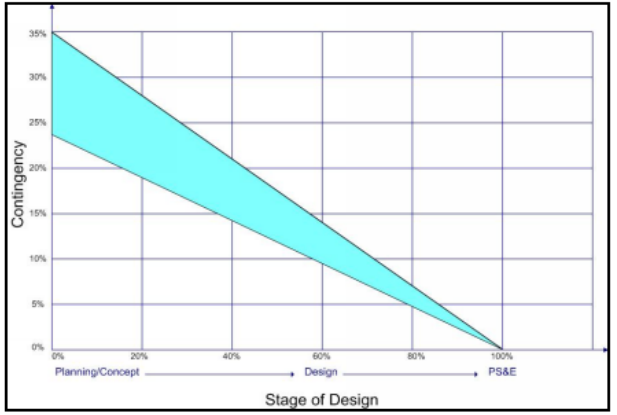
DOTs can conduct internal audits of cost estimates and estimate
improvements or refinements to the process are needed. Missou
agencies that have implemented rigorous auditing processes for
internal audits to find sources of variation in cost estimates.

Auditing provides an important feedback loop for DOTs to asse
process improvement implementation. DOTs can:

- Conduct quality assurance reviews (QARs) of district p
produced and produced by consultants (e.g. Ohio DOT,
- Use a standardized form for project estimate audits (e.g
- Survey district cost estimation procedures for complian
- Review and compare estimating procedures used by int
Caltrans)

ICF International 31

Exhibit 7. Ohio DOT Uses a Project Development Process Design Completion Risk Graph to Cost Estimate Major Projects



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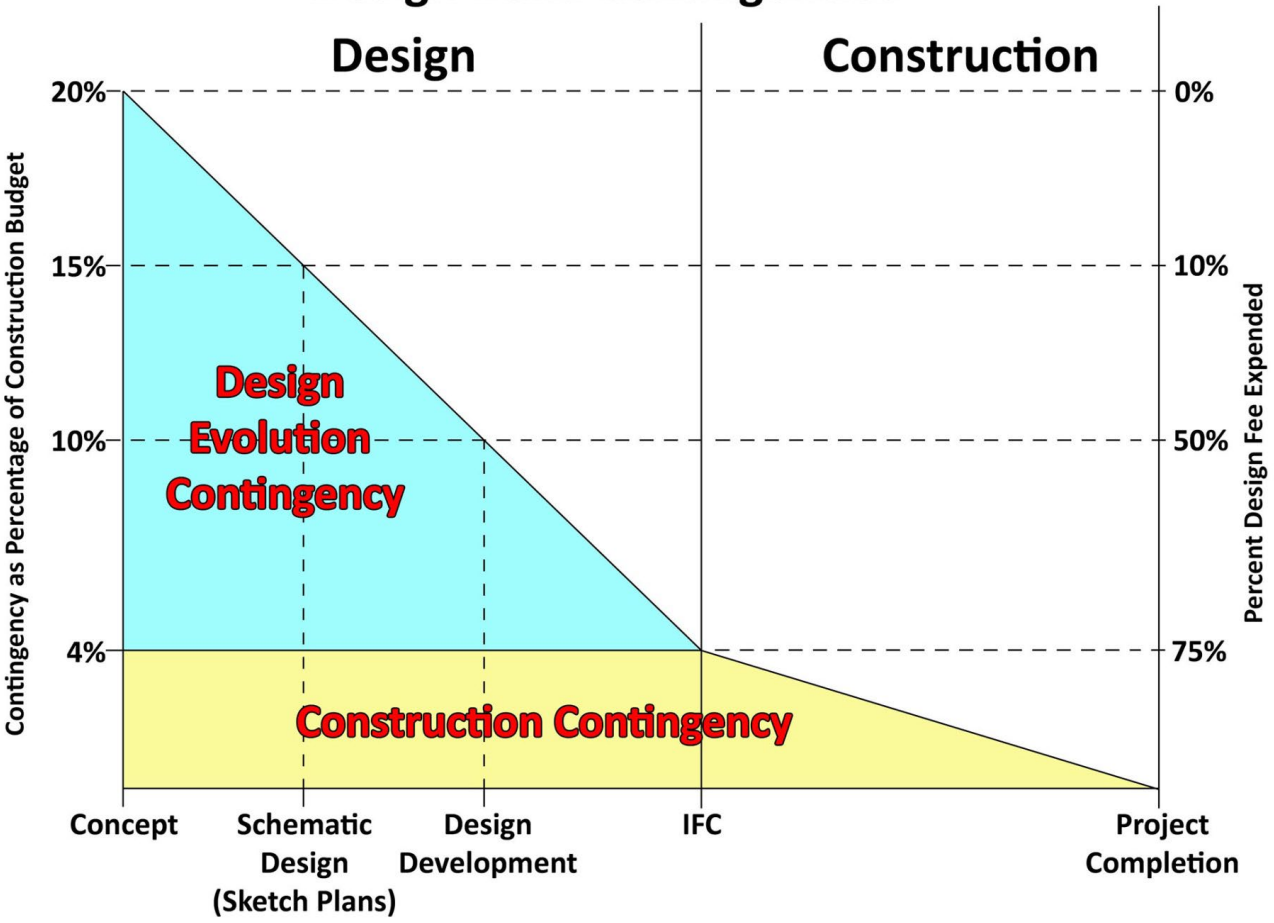
- Public Involvement Phase—25 percent
- Semifinal Phase—15 percent
- Final Review—5 to 10 percent
- PS&E—0 percent

Guidance on developing and monitoring contingency amounts should be included in each D
guidance on cost estimation and risk estimation.

Design-Build Contingencies



Participate in Identification and Mitigation of Risks with the Contractor…

1. Successful design-build teams **partner** to identify, mitigate, and manage risk
2. Efficient use of the limited dollars during pursuit demands identification and attention to the most impactful unknowns in the early-phase – whether quantity unknown, complexity unknown, production unknown, or external unknown
3. Good checklists guide discussion
4. Perfect place to memorialize worries and hopefully get them addressed or priced

Sample Typical Bridge Cost Breakdown…

ITEM		UNIT	QUANTITY	UNIT COST	TOTAL COST
	Substructure				
206	Structure Excavation	CY	2,770	$15.00	$41,550.00
206	Structure Backfill (Class 1)	CY	630	$18.00	$11,340.00
206	Structure Backfill (MSE)	CY	2,221	$30.00	$66,630.00
206	Shoring	LS	1	$100,000.00	$100,000.00
503	Drilled Caisson (54" Diameter)	LF	925	$280.00	$259,000.00
503	Drilled Caisson (36" Diameter)	LF	520	$200.00	$104,000.00
507	Concrete Slope Paving	CY	70	$250.00	$17,500.00
512	Bridge Bearing Device (Type I)	EA	74	$500.00	$37,000.00
512	Bridge Bearing Device (Type II)	EA	44	$1,000.00	$44,000.00
601	Concrete (Class D - Footings)	CY	300	$300.00	$90,000.00
601	Concrete (Class D - Abutments)	CY	400	$325.00	$130,000.00
601	Concrete (Class D - Piers & Pier Caps)	CY	1,430	$375.00	$536,250.00
601	Structural Concrete Coating	SF	28,850	$0.50	$14,425.00
602	Reinforcing (Epoxy Coated)	LB	705,920	$0.55	$388,256.00
	Substructure Total				$1,839,951.00
	Superstructure				
403	Hot Bituminous Pavement (Asphalt)	TON	1,567	$35.00	$54,845.00
515	Waterproofing (Membrane)	SY	10,166	$10.00	$101,660.00
518	Expansion Joint (0" to 9" Capacity)	LF	202	$700.00	$141,400.00
518	Expansion Joint (0" to 4" Capacity)	LF	101	$150.00	$15,150.00
601	Concrete (Class D - Deck)	CY	3,522	$325.00	$1,144,650.00
601	Concrete (Class D - Approach Slab)	CY	196	$260.00	$50,960.00
601	Concrete (Class D - Sidewalk)	CY	420	$100.00	$42,000.00
601	Structural Concrete Coating	SF	110,200	$0.50	$55,100.00
602	Reinforcing (Epoxy Coated)	LB	1,280,000	$0.55	$704,000.00
606	Bridge Railing (Median - Traffic)	LF	1,178	$60.00	$70,680.00
606	Bridge Railing (Exterior - Traffic)	LF	2,356	$60.00	$141,360.00
606	Bridge Railing (Pedestrian)	LF	2,356	$100.00	$235,600.00
618	Prestressed Concrete I (BT84)	LF	8,822	$160.00	$1,411,520.00
618	Prestressed Concrete I (BT84 - Post-Tensioned)	LF	4,863	$230.00	$1,118,490.00
618	Post-Tensioning Strand (Longitudinal)	LB	72,820	$1.50	$109,230.00
	Superstructure Total				$5,396,645.00
	Total				$7,236,596.00
	Contingency (15%)				$1,085,489.40
	Mobilization				$1,500,000.00
	Grand Total				**$9,822,085.40**
	Cost/SF (118,352 SF)				**$83**

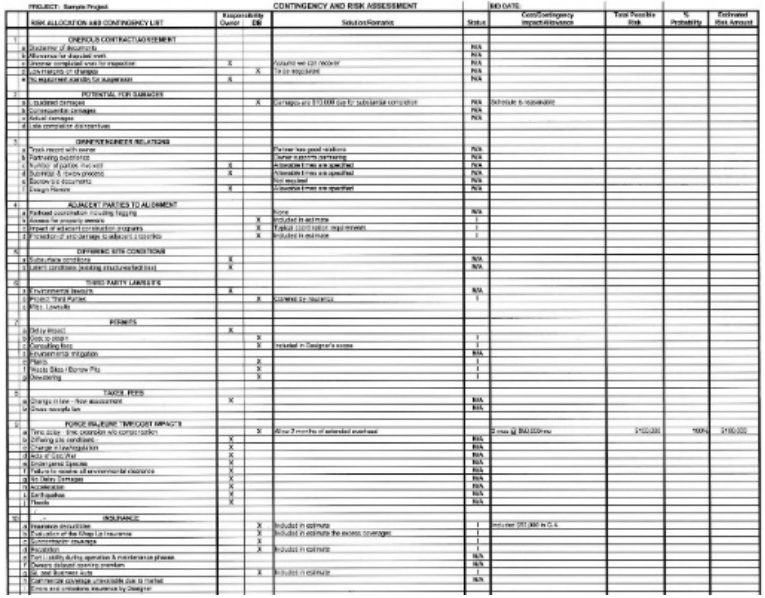
Risk of Quantity Change

Risk of Complexity Change

Contingency Needed

Adjusted Total Cost

Effective Risk Identification Aided By Checklists of Many Types of Risks Including Contract Terms, Design Evolution, Permitting, Schedule, Material Escalation, Etc…



		RISK DESCRIPTION
1		ONEROUS CONTRACT/AGREEMENT
2		POTENTIAL FOR DAMAGES
3		OWNER/ENGINEER RELATIONS
4		ADJACENT PARTIES TO ALIGNMENT
5		DIFFERING SITE CONDITIONS
6		THIRD PARTY LAWSUITS
7		PERMITS
8		TAXES, FEES
9		FORCE MAJEURE TIME/COST IMPACTS
10		INSURANCE
11		LEGAL
12		FINANCIAL
13		SCOPE OF WORK
14		DESIGN
15		ROW ENGINEERING & ACQUISITION
16		PRODUCTION RISKS ON WORK OPERATIONS
17		LABOR
18		MATERIAL
19		EQUIPMENT
20		SUBCONTRACT
21		WEATHER
22		PUBLIC RELATIONS
23		MAINTENANCE OF TRAFFIC
24		UTILITY RELOCATION & UTILITY SERVICES
25		ENVIRONMENTAL
26		HAZARDOUS MATERIAL
27		GEOTECHNICAL
28		WATER/DEWATERING
29		EARTHWORK/SUBGRADE
30		BORROW/WASTE
31		STRUCTURES
32		PAVEMENT
33		TRAFFIC MANAGEMENT & OTHER SYSTEMS
34		OTHER SELF-PERFORMED WORK
35		QA / QC
36		WARRANTY, MAINTENANCE, PRESERVATION

PROJECT: Sample Project

		RISK ALLOCATION AND CONTINGENCY LIST	Responsibility Owner	Responsibility DB
1		ONEROUS CONTRACT/AGREEMENT		
	a	Disclaimer of documents		
	b	Allowance for disputed work		
	c	Uncover completed work for inspection	X	
	d	Low margins on changes		X
	e	No equipment standby for suspension	X	
2		POTENTIAL FOR DAMAGES		
	a	Liquidated damages		X
	b	Consequential damages		
	c	Actual damages		
	d	Late completion disincentives		
3		OWNER/ENGINEER RELATIONS		
	a	Track record with owner		
	b	Partnering experience		
	c	Number of parties involved	X	
	d	Submittal & review process	X	
	e	Escrow bid documents		
	f	Design Review	X	
4		ADJACENT PARTIES TO ALIGNMENT		
	a	Railroad coordination including flagging		
	b	Access for property owners		X
	c	Impact of adjacent construction programs		X
	d	Protection of and damage to adjacent properties		X
5		DIFFERING SITE CONDITIONS		
	a	Subsurface conditions	X	
	b	Latent conditions (existing structures/facilities)	X	
6		THIRD PARTY LAWSUITS		
	a	Environmental lawsuits	X	
	b	Protect Third Parties		X
	c	Misc. Lawsuits		
7		PERMITS		
	a	Delay impact	X	
	b	Cost to obtain		X
	c	Consulting fees		X
	d	Environmental mitigation		
	e	Plants		X
	f	Waste Sites / Borrow Pits		X
	g	Dewatering		X

Example By Risk Identification AND Allowance Development By Work Category...

Schedule of Potential Increase Allowances for Design Contingencies — **Appendix 2**

Discipline	Package	Deliverable	Notes	Potential Increase Allowances
	Pavement	Quantities of major items	• May vary depending on strength of sub grade • Area of merges and diverges may increase depending on traffic flows • Tie ins to existing pavement/ regulating not measured • Temporary diversions not included	+3%
	Drainage	Quantities of major items and drawings	• Mainly over the edge and ditches • Major drainage quantities provided • Details not defined • Ditch quants in earthworks • Lining allowed for in steep ditches/ at entrances/ exits from culverts/ pipes • May need to be additional balancing lagoons, may help earthworks balance • Pumping station at Chateauguay may reduce the need for deep drainage • Additional outfall may be required	+10%
	Signs	Quantities & drawings of major Traffic Signs	• Preliminary schedule of signs type for mainline and side road. • Signage of remote areas not included • Tourist information signs not measured • Estimate of typical number of small sign given on a per km basis	+10%

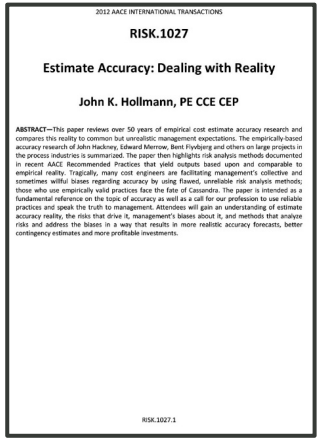
Example of Identification of Different Risk Types …

	Quantity Growth Risk	Other Deisgn Risk
Additional milling for slope correction, profile correction or ride quality requirement.	X	
Additional overlay requirements where ramps tie into the existing frontage roads (i.e. overlaying the frontage roads).	X	
Widening of on the west side of from a 4-ft median to a 16-ft median (would increase aesthetics and curb/gutter)		X
Encountering high sulfate content soils that will require removal of soils. Limited soils tests available, tests do indicate issues around the cross street.	X	
Pavement design assumed a value of 4,500-psi for flexible pavement design, value could vary along the corridor.	X	
Depth of soil stabilization increase due to requirements for an effective PI of 25. Three locations have been identified as having potential issues, Sta. 935, 1215 and 1460. Information based on only 27 borings along the corridor. Lack of information south of Sta. 910 and north of Sta. 1560.	X	
Existing shoulder pavement section is not structurally adequate and must be removed and replaced. Have assumed that the existing pavement section matches the mainline based on review of the available as-builts for pretty much the entire corridor.		X
Frontage road pavement design used for cross street pavement design. Insufficient traffic information available to develop cross street pavement design. Potential is for an underestimate of traffic and insufficient pavement thickness.		X
believes that we can get the HMA thickness down to 2.5-inches when used under the CRCP or CPCD. This differs from what we provided in our ATC. Would save on HMA thickness, but would likely increase subgrade stabilization or low PI import borrow.		X
Connection to project based on available drawings from 2009, may not be current and is our responsibility to ensure connectivity.		X
Project was flown to generate a new DTM, there were some reconciliation issues north of the bridge. There is a significant amount of milling and overlay in this portion of the project that could be impacted.	X	
Slip ramp design has been developed for ingress/egress points to the managed lanes. No detail has been provided by , so assumed tappers have been developed. No gate information has been provided by the system integrator.		X
RFP states that sidewalks shall be provided where a visible worn path is found. There is subjectivity associated with this requirement.		X

D-B Scope Growth Claims Most Often Related to Underestimate of Estimate Uncertainty Related to Immature Design…

Estimate Accuracy: Dealing with Reality

John K. Hollmann, PE CCE CEP


2012 AACE INTERNATIONAL TRANSACTIONS

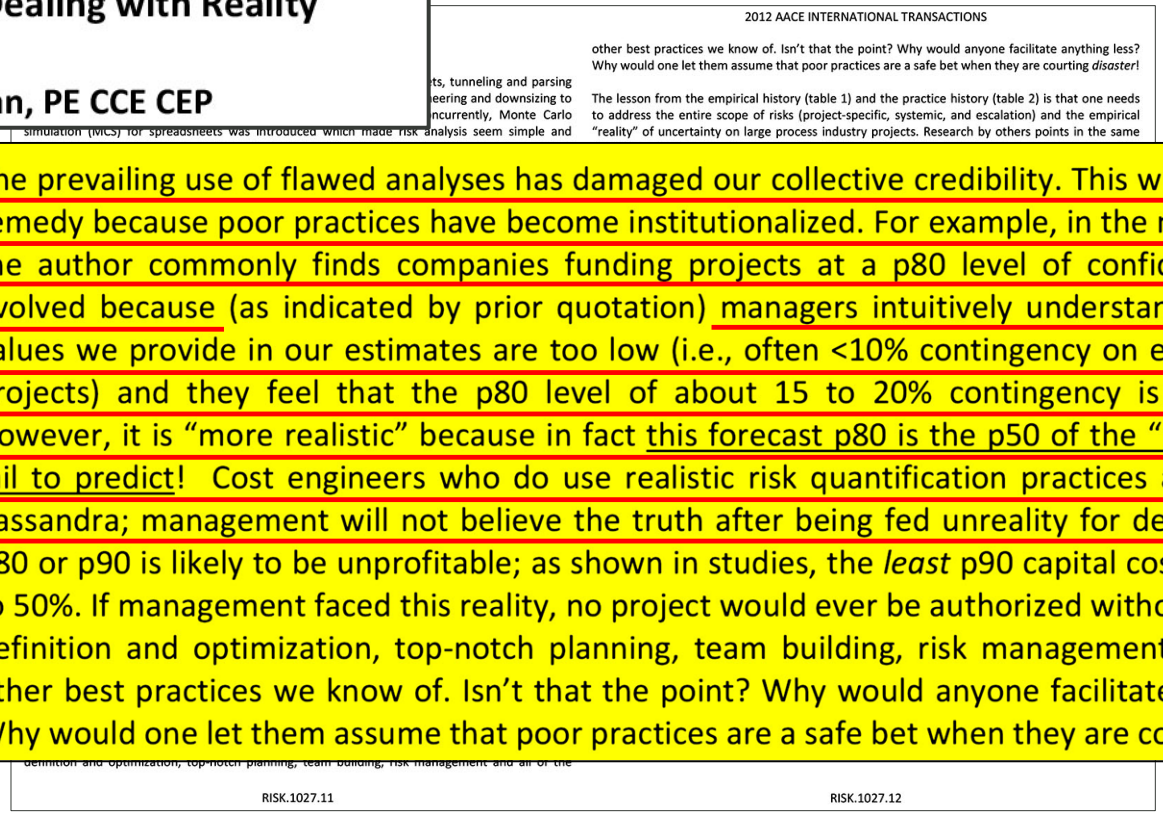
RISK.1027

Estimate Accuracy: Dealing with Reality

John K. Hollmann, PE CCE CEP

ABSTRACT—This paper reviews over 50 years of empirical cost estimate accuracy research and compares this reality to common but unrealistic management expectations. The empirically-based accuracy research of John Hackney, Edward Merrow, Bent Flyvbjerg and others on large projects in the process industries is summarized. The paper then highlights risk analysis methods documented in recent AACE Recommended Practices that yield outputs based upon and comparable to empirical reality. Tragically, many cost engineers are facilitating management's collective and sometimes willful biases regarding accuracy by using flawed, unreliable risk analysis methods; those who use empirically valid practices face the fate of Cassandra. The paper is intended as a fundamental reference on the topic of accuracy as well as a call for our profession to use reliable practices and speak the truth to management. Attendees will gain an understanding of estimate accuracy reality, the risks that drive it, management's biases about it, and methods that analyze risks and address the biases in a way that results in more realistic accuracy forecasts, better contingency estimates and more profitable investments.

RISK.1027.1


2012 AACE INTERNATIONAL TRANSACTIONS

…ts, tunneling and parsing …eering and downsizing to …ncurrently, Monte Carlo simulation (MCS) for spreadsheets was introduced which made risk analysis seem simple and

other best practices we know of. Isn't that the point? Why would anyone facilitate anything less? Why would one let them assume that poor practices are a safe bet when they are courting *disaster*!

The lesson from the empirical history (table 1) and the practice history (table 2) is that one needs to address the entire scope of risks (project-specific, systemic, and escalation) and the empirical "reality" of uncertainty on large process industry projects. Research by others points in the same

definition and optimization, top-notch planning, team building, risk management and all of the

RISK.1027.11

RISK.1027.12

The prevailing use of flawed analyses has damaged our collective credibility. This will be difficult to remedy because poor practices have become institutionalized. For example, in the mining industry, the author commonly finds companies funding projects at a p80 level of confidence. This has evolved because (as indicated by prior quotation) managers intuitively understand that the p50 values we provide in our estimates are too low (i.e., often <10% contingency on even the riskiest projects) and they feel that the p80 level of about 15 to 20% contingency is more realistic. However, it is "more realistic" because in fact this forecast p80 is the p50 of the "reality" that we fail to predict! Cost engineers who do use realistic risk quantification practices are treated like Cassandra; management will not believe the truth after being fed unreality for decades. The *real* p80 or p90 is likely to be unprofitable; as shown in studies, the *least* p90 capital cost growth is >40 to 50%. If management faced this reality, no project would ever be authorized without stellar scope definition and optimization, top-notch planning, team building, risk management and all of the other best practices we know of. Isn't that the point? Why would anyone facilitate anything less? Why would one let them assume that poor practices are a safe bet when they are courting *disaster*!

Recent Developments In Teaming Agreements Show Contractor Attempts To Contractually Bind Designers To Quantity-Growth Risks…

Architect/Engineer shall provide Contractor with notice of the date on which the Architect/Engineer requires a response and a reasonable time to respond. Unless caused by Architect/Engineer or its Subconsultants, any unreasonable delays by Contractor shall entitle Architect/Engineer to seek an equitable adjustment of schedule as provided for in IV-B, CHANGES/ADDITIONAL SERVICES.

6. Nothing contained in this Design Agreement, the Proposal, or any other document or instrument of service prepared by the Architect/Engineer under this Design Agreement shall create any obligation or contractual relationship between any third party and either Party.

7. The Architect/Engineer shall promptly respond to requests from Contractor for information related to Architect/Engineer's scope, Contractor requires to complete the Proposal.

8. Architect/Engineer shall furnish Services of geotechnical architect/engineers and

12. The Parties acknowledge that the Project quantity estimates shall be based upon partial design development, the RFP documents, publically available reference documents and any studies and tests performed during Proposal preparation. Prior to submittal of the Proposal, the Parties will make a mutual determination regarding quantity contingencies, additional studies and testing required for design development, and probability of substantial changes in estimated quantities, all of which shall be set forth in the Design Agreement (Phase II), Exhibit G.

Contractor and its Affiliates Work.

12. The Parties acknowledge that the Project quantity estimates shall be based upon partial design development, the RFP documents, publically available reference documents and any studies and tests performed during Proposal preparation. Prior to submittal of the Proposal, the Parties will make a mutual determination regarding quantity contingencies, additional studies and testing required for design development, and probability of substantial changes in estimated

9

quantities, all of which shall be set forth in the Design Agreement (Phase II), Exhibit G.

D. **THE ARCHITECT/ENGINEER'S PROJECT REPRESENTATIVE.** The Architect/Engineer shall designate a representative ("Architect/Engineer's Representative") authorized to act on the Architect/Engineer's behalf with respect to the Project and all matters arising from or otherwise relating to the Project.

E. **ARCHITECT/ENGINEER'S STANDARD OF CARE.** The standard of care for all professional Services provided by the Architect/Engineer pursuant to this Design Agreement shall be the care and skill ordinarily exercised by members of the same profession currently practicing in United States, on projects of similar size and complexity at the time the Services are performed.

V. CONTRACTOR'S RESPONSIBILITIES

1. The Architect/Engineer shall communicate with the Owner and/or with Contractor's Separate Consultants only through or with the consent of Contractor. However, it is understood that an open line of communication between Owner, and/or with Contractor's Separate Consultants and the Architect/Engineer is in the best interest of a successful Project. Contractor agrees to involve Architect/Engineer in or promptly inform Architect/Engineer of discussions, meetings or other proceedings affecting the design portion of the Services.

10

Typically, But Not Always, Engineer Asked To Assist Contractor In Identification of Quantity-Growth Risk But Very Infrequently Does Contractor Involve Engineer in Monetization of Risk

Element		Pre-Bid Design	
Over- defined a % that will not be exceed		WILL NOT EXCEED %	DESIGN CAN BE BETTERED %
Under- defined as %, Conservative design that can be bettered		% Over	% Under
ROADWAY			
	Horizontal/Vertical Alignments		
	Profile line revisions		20%
	Earthwork		
	Total Acres Clear & Grub	10%	
	Total Cu Yd of Roadway Excavation	10%	10%
	Total Cu Yd of Detention Pond Excavation		
	Total Additional Cu Yd undercut		10%
	Pavement		
	Total Sq Yd of Pavement Widening - Asphalt	2%	
	Total Sq Yd of Pavement Widening - Concrete	2%	
	Total Sq Yd of Pavement Milling & Overbuild - Asphalt	5%	10%
	Total Sq Yd of Removal - Asphalt	10%	
	Total Sq Yd of Removal - Concrete	10%	
	Total Cu Yd of Flex Base		
	Total Sq Yd of Subgrade Stabilization areas		
	Total Sq Yd of flatwork concrete (Rip Rap, curb, etc)		
	Road Side Design		
	Total LF of Concrete Barrier Rail	5%	5%
	Total LF of Concrete Traffic Barrier	2%	0%
	Total LF of Guardrail	5%	
	Total # of Crash Cushion Attenuators	2%	
	Stripping		
	Total LF Pavement Marking Removal	2%	
	Total LF Striping and pavement marking - Perm	2%	
	Total LF Striping and pavement marking - Temp	2%	

Latest Evolution In Risk Transfer to Engineer…

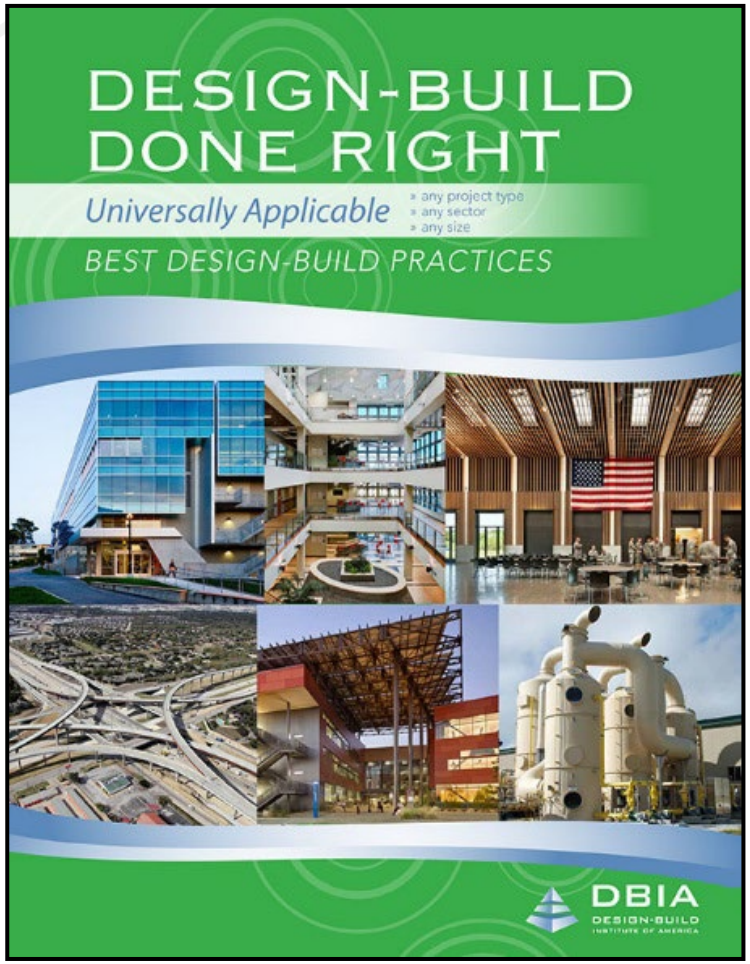
Element – Item Description	Unit	Quantity	Decrease Rare	Decrease Likely	Increase Likely	Increase Rare
4000 psi Structural Concrete	cy	67,000	5%	2%	4%	7%
Steel Reinforcing Bars	tons	6,700	2%	1%	5%	10%
Drainage Inlets	ea	84	10%	5%	5%	8%

- The **Matrix** lists the items, which in Engineer's opinion with feedback from Contractor, have a reasonable probability of changing during advancement of RFE documents to RFC documents, as well as **estimates of the likely and rare percentage increases** and percentage decreases in quantities.
- Contractor and Architect/Engineer agree that **damages of Engineer payable to Contractor** for increases in the quantity of materials shall be **defined by actual costs for quantity growth**, as measured by comparing the RFE to RFC designs, **that exceed the "rare" percentage increases in the Matrix.**
- **Contractor reserves the right with respect to Engineer's errors and omissions related to Design Quantity Growth to proceed against Engineer and/or its insurer.**

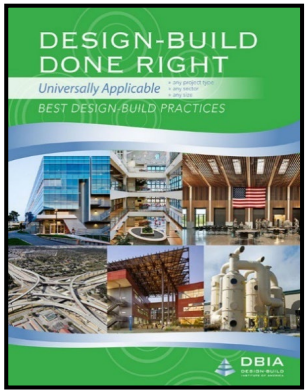
Other Comments on Contingency…

- Quantity and pricing claims against design professionals for work in Pursuit Phase fundamentally relate to cost of design evolution from early to final design stages
- Contingencies are funds to mitigate risk
- There are many risks in Design-Build, but two fundamental groupings are design-evolution risks and construction-period risks
- By their definition early designs are incomplete subject to modification and correction and most importantly final detail development – historically design-evolution contingencies from 10 to 20 percent are used to account for this design evolution
- Design-evolution contingency should not be considered a fund for negligent “errors and omissions” – it is the estimate of costs expected as the fine-tuning of the design occurs until it is final
- Standard-of care measurements of early designs are difficult – but certainly one would expect that an early design, say schematic design, that could support a final cost estimate to an accuracy of plus or minus 15% would be viewed within the standard of care as demonstrated by the referenced documents

DBIA is a Great Source Of Information



Successful Design-Build Projects Include Design Evolution Contingency to Protect Designer and Contractor…



II. Contracting for Design-Build Services (Cont.)

2. The contract between the owner and design-builder should address the unique aspects of the design-build process, including expected standards of care for design services.

In furtherance of this practice, the following implementing techniques apply:

a. Owners should, consistent with their overall procurement strategy, evaluate and use appropriate contractual incentives that facilitate the alignment of the performance of their design-build teams with the owner's project goals.

b. If the design-builder is expected to meet performance guarantees, the contract should clearly identify such guarantees, and the guarantees should be capable of being measured and reasonably achievable by a design-builder performing its work in a commercially reasonable fashion.

c. The contract should clearly specify the owner's role during project execution, particularly relative to: (a) the process for the design-builder reporting to and communicating/meeting with the owner; (b) the owner's role in acting upon design and other required submittals; and (c) the owner's role, if any, in QA/QC.

d. The contract should clearly define the role of the designer(s)-of-record and how it/they will communicate with the owner.

e. The contract should clearly define the commissioning and project closeout processes, including documentation associated with such processes.

f. The contract should clearly define requirements for achieving project milestones, inclusive of substantial completion, final completion and final payment.

3. The contracts between the design-builder and its team members should address the unique aspects of the design-build process.

e. The contract should ensure that there is a clear understanding as to how the team members will communicate with each other and with the owner, including meetings that each party is expected to attend.

f. The contract should have a clear and commercially-appropriate "flow-down" of obligations from the prime design-build contract.

b. The design-builder and its designer(s) should develop an understanding, at the outset of their relationship, of the key commercial aspects of their relationship, including: (a) the designer's compensation, if any, during the proposal period; (b) the designer's role in reviewing/approving the proposal; (c) the contractual liability of the designer for problems, including delays, during execution; and (d) the designer's right to use project contingency for its execution-related problems, and capture these understandings in the written teaming agreement.

Rare But Good Contract Clause That Defines Designer Access To Contingency For "Design Creep" *AND* "Design Error"…

Value Architect/Engineering

This contingency fund will be used to address design issues which arise after the initial RFP proposal.

If the Architect/Engineer proposes a change that will enhance the design and lower the job cost, the savings will be added to the contingency total. The Architect/Engineer's cost of designing the VE will be a cost that can be paid from the contingency.

cost of the VE design will be the design cost less an agreed amount of what the base bid design for that feature would have been if no change were made.

If the scope of work increases due to design creep or design error, the cost will be deducted from the contingency total.

able to perform the work for the estimated cost.

The Executive Committee will discuss and agree to the status of the contingency fund,

At the end of the job, any funds in the contingency fund will be split TBD between the Contractor and the Architect/Engineer.

Most Teaming Agreements Avoid Clear Statements About Designer's Access to Contingency…

Best to Date:

"Contractor acknowledges that the documents utilized for pricing were of a preliminary design detail and as such Contractor has included a contingency in its budget for design related detailing and growth."

An Added Improvement:

One measure of the Designer's Standard of Care in this Agreement is that the documents provide enough information for the Contractor to identify at least 85% of the construction cost.

Post-Award Pre-IFC Claims

Recurring Claim Types in Design-Build Projects – Post-Award, Pre-IFC Claims…

- Late Delivery of Design Documents
  - Time impacts
  - Increased Fast-Track risks
  - Late Third-Party design inputs
- Evolution/Modifications (as opposed to Changes) in Design Basis
- Project Agreement (PA) Compliance Debates with Owner
  - Inordinate Frequency of Owner comments
  - Untimely Resolution of Owner Comments
  - Preferential Owner Interpretation of PA

Over Design (Lack of Optimization)

Constructability

- Timeliness of Contractor Input
- Expectation of Designer Expertise with Means & Methods
- Late value engineering initiatives

Coordination/Clash Detection

- Fast tracking impacts
- Coordination with third-party design inputs

Post-IFC Claims

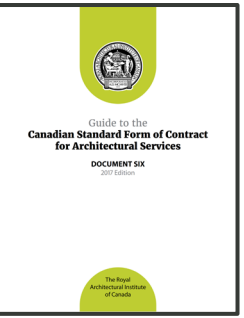
Recurring Claim Types in Design-Build Projects – Post-IFC Claims…

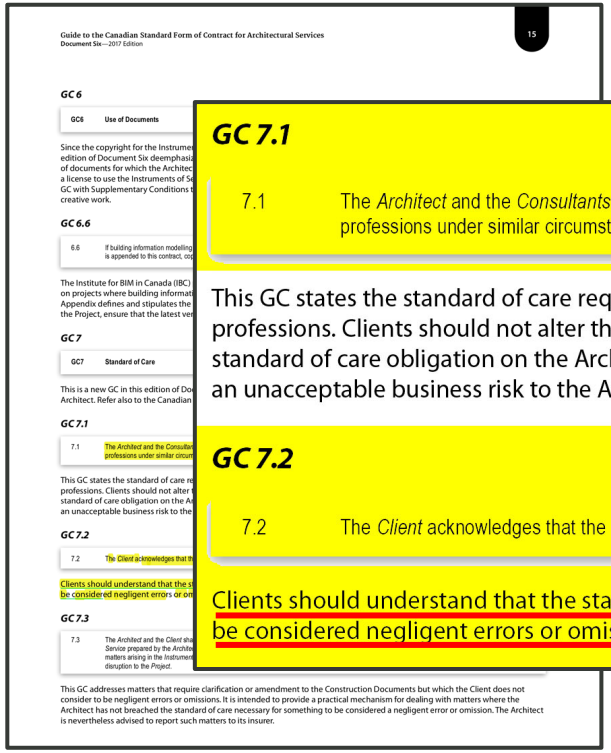
- Coordination
  - Sequentially released, Fast-Track packages
    - Miscellaneous metal packages versus MEP
    - Embedded conduits
    - Interdisciplinary design and construction coordination issues
  - New utilities versus existing buried utilities
  - New foundations versus new and existing utilities
- Delegated Design
  - Electrical Conduit Congestion
  - Heat tracing
  - Security Devices
  - Highway ITS equipment

Unforeseen Conditions
Inadequate or Absence of Documented Independent Review of Design
Contractor Changes to Construction Sequencing/Means and Methods
Procurement Risk Issues
    Impact of use of Pre-IFC documents in subcontracts
    Accommodation of Vendor substitutions
Changes Initiated by Others or Late Input by Others
Related Schedule/Acceleration or Other Time-Impacts

Notably, to date, there have been very few claims by Owner or Concessionaire related to design defects in permanent and completed work.

Design-Builders Typically Do Not Grasp That Standard of Care Is Not A Standard of Perfection or a Guarantee of No Errors and Omissions…





GC 7.1

Engineer

7.1 The *Architect* and the *Consultants* engaged by the *Architect* shall perform the *Services* to the standard of care ordinarily exercised by other members of their professions under similar circumstances, at the same time and in the same or similar locale.

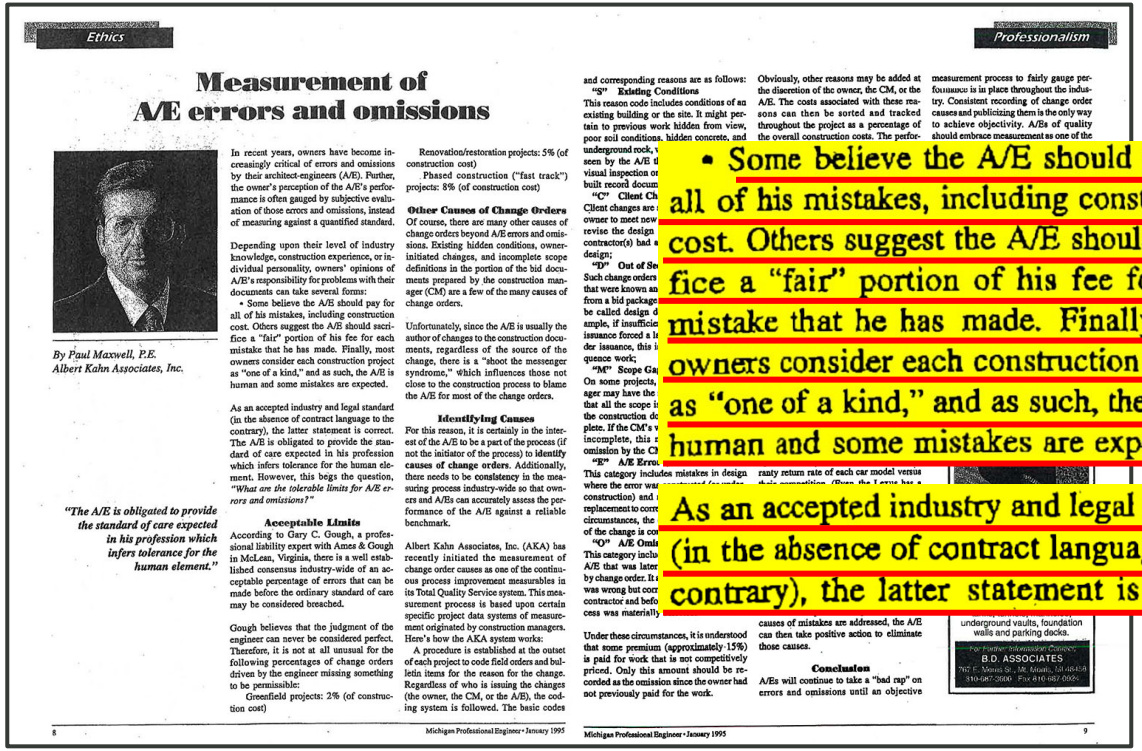
This GC states the standard of care required of an Architect as established by law. It is similar to the standard of care required of other professions. Clients should not alter this standard of care by means of Supplementary Conditions that attempt to impose a higher standard of care obligation on the Architect. Doing so may jeopardize the Architect's professional liability insurance and thus present an unacceptable business risk to the Architect.

GC 7.2

7.2 The *Client* acknowledges that the standard of care prescribed in GC 7.1 does not require perfection.

Clients should understand that the standard of care does not require perfection and therefore that not all errors and omissions should be considered negligent errors or omissions. A finding of negligence can ultimately only be determined by a court of law.

Standard of Care Evaluation Should Consider the Amount of Change Order Compared to the Total Project Cost…



Ethics

Professionalism

Measurement of A/E errors and omissions

By Paul Maxwell, P.E.
Albert Kahn Associates, Inc.

"The A/E is obligated to provide the standard of care expected in his profession which infers tolerance for the human element."

In recent years, owners have become increasingly critical of errors and omissions by their architect-engineers (A/E). Further, the owner's perception of the A/E's performance is often gauged by subjective evaluation of those errors and omissions, instead of measuring against a quantified standard.

Depending upon their level of industry knowledge, construction experience, or individual personality, owners' opinions of A/E's responsibility for problems with their documents can take several forms:

- Some believe the A/E should pay for all of his mistakes, including construction cost. Others suggest the A/E should sacrifice a "fair" portion of his fee for each mistake that he has made. Finally, most owners consider each construction project as "one of a kind," and as such, the A/E is human and some mistakes are expected.

As an accepted industry and legal standard (in the absence of contract language to the contrary), the latter statement is correct. The A/E is obligated to provide the standard of care expected in his profession which infers tolerance for the human element. However, this begs the question, *"What are the tolerable limits for A/E errors and omissions?"*

Acceptable Limits

According to Gary C. Gough, a professional liability expert with Ames & Gough in McLean, Virginia, there is a well established consensus industry-wide of an acceptable percentage of errors that can be made before the ordinary standard of care may be considered breached.

Gough believes that the judgment of the engineer can never be considered perfect. Therefore, it is not at all unusual for the following percentages of change orders driven by the engineer missing something to be permissible:

Greenfield projects: 2% (of construction cost)

Renovation/restoration projects: 5% (of construction cost)

Phased construction ("fast track") projects: 8% (of construction cost)

Other Causes of Change Orders

Of course, there are many other causes of change orders beyond A/E errors and omissions. Existing hidden conditions, owner-initiated changes, and incomplete scope definitions in the portion of the bid documents prepared by the construction manager (CM) are a few of the many causes of change orders.

Unfortunately, since the A/E is usually the author of changes to the construction documents, regardless of the source of the change, there is a "shoot the messenger syndrome," which influences those not close to the construction process to blame the A/E for most of the change orders.

Identifying Causes

For this reason, it is certainly in the interest of the A/E to be a part of the process (if not the initiator of the process) to identify causes of change orders. Additionally, there needs to be consistency in the measuring process industry-wide so that owners and A/Es can accurately assess the performance of the A/E against a reliable benchmark.

Albert Kahn Associates, Inc. (AKA) has recently initiated the measurement of change order causes as one of the continuous process improvement measurables in its Total Quality Service system. This measurement process is based upon certain specific project data systems of measurement originated by construction managers. Here's how the AKA system works:

A procedure is established at the outset of each project to code field orders and bulletin items for the reason for the change. Regardless of who is issuing the changes (the owner, the CM, or the A/E), the coding system is followed. The basic codes and corresponding reasons are as follows:

"S" Existing Conditions
This reason code includes conditions of an existing building or the site. It might pertain to previous work hidden from view, poor soil conditions, hidden concrete, and underground rock, v
seen by the A/E u
visual inspection o
built record docum

"C" Client Ch
Client changes are
owner to meet new
revise the design
contractor(s) had a
design;

"D" Out of Sc
Such change orders
that were known an
from a bid package
be called design d
ample, if insufficie
issuance forced a la
der issuance, this i
quence work;

"M" Scope Ga
On some projects,
ager may have the
that all the scope i
the construction do
plete. If the CM's v
incomplete, this
omission by the CM

"E" A/E Erro
This category includes mistakes in design where the error was
construction) and
replacement to corre
circumstances, the
of the change is co

"O" A/E Omi
This category inclu
A/E that was later
by change order. It
was wrong but cor
contractor and befo
cess was materially

Under these circumstances, it is understood that some premium (approximately 15%) is paid for work that is not competitively priced. Only this amount should be recorded as the omission since the owner had not previously paid for the work.

Obviously, other reasons may be added at the discretion of the owner, the CM, or the A/E. The costs associated with these reasons can then be sorted and tracked throughout the project as a percentage of the overall construction costs. The performance measurement process to fairly gauge performance is in place throughout the industry. Consistent recording of change order causes and publicizing them is the only way to achieve objectivity. A/Es of quality should embrace measurement as one of the

ranty return rate of each car model versus

causes of mistakes are addressed, the A/E can then take positive action to eliminate those causes.

Conclusion

A/Es will continue to take a "bad rap" on errors and omissions until an objective

underground vaults, foundation walls and parking decks.

For Further Information Contact:
B.D. ASSOCIATES
707 E. Maple St., Mt. Morris, MI 48458
810-687-3600 Fax 810-687-0995

8 Michigan Professional Engineer • January 1995

Michigan Professional Engineer • January 1995 9

• Some believe the A/E should pay for all of his mistakes, including construction cost. Others suggest the A/E should sacrifice a "fair" portion of his fee for each mistake that he has made. Finally, most owners consider each construction project as "one of a kind," and as such, the A/E is human and some mistakes are expected.

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Acceptable Limits

Therefore, it is not at all unusual for the following percentages of change orders driven by the engineer missing something to be permissible:

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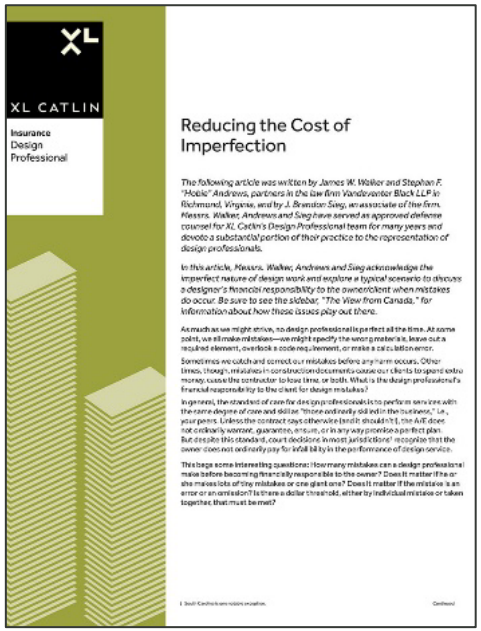
Standard of Care Evaluation Should Consider the Amount of Change Order Compared to the Total Project Cost…


XL CATLIN

Insurance
Design
Professional

Reducing the Cost of Imperfection

The following article was written by James W. Walker and Stephan F. "Hobie" Andrews, partners in the law firm Vandeventer Black LLP in Richmond, Virginia, and by J. Brandon Sieg, an associate of the firm. Messrs. Walker, Andrews and Sieg have served as approved defense counsel for XL Catlin's Design Professional team for many years and devote a substantial portion of their practice to the representation of design professionals.

In this article, Messrs. Walker, Andrews and Sieg acknowledge the imperfect nature of design work and explore a typical scenario to discuss a designer's financial responsibility to the owner/client when mistakes do occur. Be sure to see the sidebar, "The View from Canada," for information about how these issues play out there.

As much as we might strive, no design professional is perfect all the time. At some point, we all make mistakes—we might specify the wrong material, leave out a required element, overlook a code requirement, or make a calculation error.

Sometimes we catch and correct our mistakes before any harm occurs. Other times, though, mistakes in construction documents cause our clients to spend extra money, cause the contractor to lose time, or both. What is the design professional's financial responsibility to the client for design mistakes?

In general, the standard of care for design professionals is to perform services with the same degree of care and skill as "those ordinarily skilled in the business," i.e., your peers. Unless the contract says otherwise (and it shouldn't!), the A/E does not ordinarily warrant, guarantee, ensure, or in any way promise a perfect plan. But despite this standard, court decisions in most jurisdictions[1] recognize that the owner does not ordinarily pay for 100% liability in the performance of design service.

This begs some interesting questions: How many mistakes can a design professional make before becoming financially responsible to the owner? Does it matter if he or she makes lots of tiny mistakes or one giant one? Does it matter if the mistake is an error or an omission? Is there a dollar threshold, either by individual mistake or taken together, that must be met?

[1] South Carolina is a notable exception.

(continued)

The "You Didn't Pay for Perfection" principle

Suppose that the switch and wire change order comes to $5,000 and of that, $2,500 represents the out-of-sequence cost. Suppose also that the GMP for the job is $5 million. Whether we look at the total cost of the change or just the out-of-sequence added cost, we're talking about a miniscule fraction of the job cost, which should be within the expected range of added costs given the less-than-perfect standard, unless…

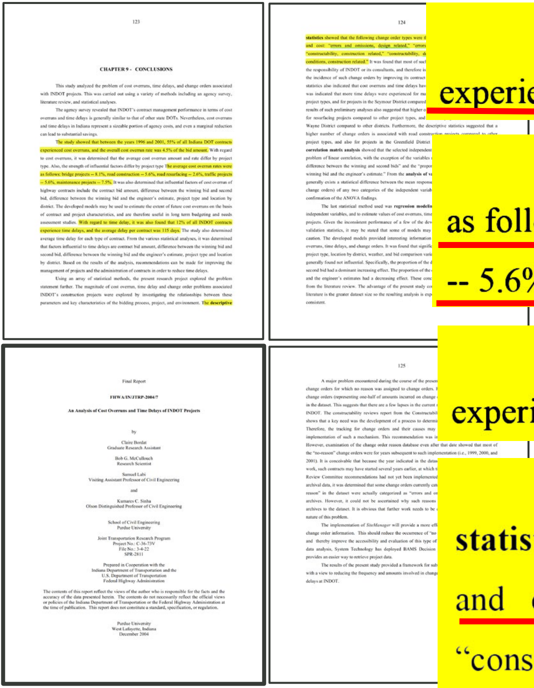
The "Death by a Thousand Cuts" scenario

Imagine that the change order is one of 315 other small change orders on the job resulting from errors or omissions, representing an aggregate total cost of $300,000 and aggregate out-of-sequence cost of $200,000. Now, the aggregated costs added to the job as a result of A/E errors or omissions are a more sizeable percentage of total construction costs—about 4 to 6 percent.

Suppose the industry's track record shows that, on average, projects of this type and delivery method typically experience change orders due to A/E errors or omissions in the range of 2 to 3 percent of the cost of construction. Does the design professional pay for all errors and omissions from dollar one, or just for the compensable costs in excess of the tolerance threshold? Case law on this point is unclear in the U.S., as there haven't been enough test cases to create a precedent.

Design-Related Post-IFC Change Almost Always Occurs – Even In Projects Completed By Reasonably Skilled and Experienced Engineers…

SGH


CHAPTER 9 - CONCLUSIONS

Final Report

FHWA/IN/JTRP-2004/7

An Analysis of Cost Overruns and Time Delays of INDOT Projects

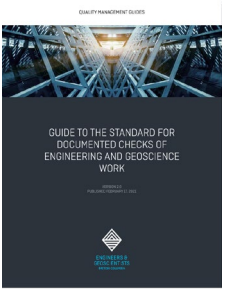
The study showed that between the years 1996 and 2001, 55% of all Indiana DOT contracts experienced cost overruns, and the overall cost overrun rate was 4.5% of the bid amount.

The average cost overrun rates were as follows: bridge projects -- 8.1%, road construction -- 5.6%, road resurfacing -- 2.6%, traffic projects -- 5.6%, maintenance projects -- 7.5%.

With regard to time delay, it was also found that 12% of all INDOT contracts experience time delays, and the average delay per contract was 115 days.

The **descriptive statistics** showed that the following change order types were the most critical in terms of frequency and cost: “errors and omissions, design related,” “errors and omissions, quantity related,” “constructability, construction related,” “constructability, design related,” and “changed field conditions, construction related.”

Proactive, Documented Internal and External QA/QC During Design Production Mitigate Post-IFC Claims And Bolster Standard-of-Care Defenses…



3.3.4.4 Calculations used as the basis for the professional engineering or professional

3.3.5 TYPES OF CHECKS

3.3.5.1 Depending on the requirements of paragraph 3.3.4.3 above, types of Checking may include:

- self-Check or Check by others of calculations;
- intra-disciplinary Checks to identify and solve any problems, and to verify that work prepared by any one discipline meets the Input Requirements;
- inter-disciplinary Checks to coordinate the work of several disciplines to identify and solve any problems, and verify that the work of all disciplines collectively meets the Input Requirements and does not conflict;
- revision Checks throughout the project or work, as the professional engineering or professional geoscience work is revised;
- Checks to confirm compliance with applicable codes, standards, regulations, and Bylaws;
- constructability or operational Checks to confirm that work can be constructed as shown or will operate as planned;

constructed as shown or will operate as planned;

- health, safety, and environmental Checks to assure that the end product is safe in operation and will not have an inappropriate impact on the environment;
- verification to confirm that the completed work satisfies Input Requirements;
- validation to confirm that the professional engineering or professional geoscience work is capable of meeting its intended purpose and will perform under expected conditions;
- deliverable Checks to see that the work is represented clearly, consistently, completely, and professionally;
- Checks by an independent party to verify that the work satisfies the Input Requirements (commonly called peer reviews);
- testing or surveying of a process, installation, program, or product;
- third-party Checks for a stakeholder to confirm that the work satisfies their Input Requirements; and
- sub-consultant or supplier Checks to confirm that work prepared by the sub-consultant or supplier meets all Input Requirements and does not conflict with other work before it is incorporated into the design or used in the product.

CHECKLIST AND SIGNOFF FOR AN INDEPENDENT REVIEW OF STRUCTURAL DESIGNS

[Print clearly and legibly]

RE:

Name of project or work

Address of project or work

PROFESSIONAL OF RECORD

P.Eng. or P.L.Eng. name

Firm name

Permit to Practice number

Address of firm

ITEM	REVIEWED INITIALS	REMARKS
1. Design code loadings and serviceability limits		
2. Material specifications and geotechnical recommendations		
3. Concept and integrity of the gravity load resisting system		
4. Concept and integrity of the lateral load resisting system (e.g., wind, seismic)		
5. Drawing completeness and continuity of load paths		
6. Design check of representative structural elements		
7. Review of representative structural details		
8. Concerns discussed with the Professional of Record		

INDEPENDENT REVIEWER

P.Eng. or P.L.Eng. name

Firm name

Permit to Practice number

Address of firm

Date: (yy/mm/dd)

Signature

Questions or Comments?

Contact Information

Paul L. Kelley
PLKelley@sgh.com
Tel. 617.907.9000

Simpson Gumpertz & Heger
400 Totten Pond Road
Waltham, MA 02451

20 Years DONOVAN | HATEM LLP
counselors at law

Design-Build: Professional Liability Risk Implications For Consulting Engineers

New Jersey |

Presented by: David J. Hatem PC

July 14, 2022

Boston | Connecticut| New York | New Jersey | Rhode Island

Presentation Focus

01 **Design-Build: Problems and Challenges**

- Procurement and Contractual Issues
- Professional Liability Risk and Claims Experience in North America: Implications for Consulting Engineers and Their Professional Liability Insurers

02 **Design-Build: Procurement and Contractual Solutions**

03 **Gain a Design-Build: Project-Specific Professional Liability Insurance: Experience and Path Forward**

- Adverse Claims/Losses Experience
- Impact and Influence on Contractual and Risk Management Precautions, Practices, and Initiatives

04 **Summary**

Design-Build: Problems and Challenges

Procurement and Contractual Issues

Design-Build: Procurement and Contractual Issues

Typical Regime of DB Procurement and Contracting on Infrastructure Projects

- Project Owner, or Sponsor RFP Solicitation and Procurement Process for DB Teams
- DB Teams: Construction Contractor (or Joint Venture) Leads and Assumes Prime Contractual Position with Owner
- Contractor enters into Subconsultant Contracts with Consulting Engineer
  - Teaming Agreement: Proposal Phase
  - Design Services Agreement: Design and Construction Phases
- Proposal Phase: Owner Procurement Documents
  - Compressed Proposal/Response Period
  - Minimal Conceptual Design Provided by Owner
  - Project Specific Output Specifications (PSOS) Requirements
  - Highly Prescriptive Design for Certain Aspects
  - Limited Information (e.g. subsurface data)
  - Disclaim DB Team's Reliance Rights
- DB Team Awarded the Prime Contract Will Be Obligated To:
  - Commit to a Fixed Price
  - Be Responsible for Design and Construction
  - Typically Agree to Imbalanced Risk Allocation Terms.

Owner

Design-Builder

Consulting Engineer

Design-Build: Procurement and Contractual Issues

Root Problems

- Fixed Price Contractual Commitment Based on Inadequately-Defined Scope: Price Certainty, Scope Uncertainty
- Imbalanced Risk Allocation

Design-Build: Procurement and Contractual Issues

- **Statement of the Problem and the Challenges**
- Substantial Increases In Final Design and Construction Cost **Compared** to DB Pricing Proposal and Contract Fixed Price
- Increases Manifest During Post-Award Design Development Process
- Design-Builder Has No (or Limited) Contractual Cost Adjustment Remedy From Project Owner
- Design-Builder Seeks Alternative Source for Recovery of “Cost Overrun” – Genesis of Professional Liability Claim Against Consulting Engineer

Design-Build: Procurement and Contractual Issues

The Basic Issues:

- During the Proposal Phase, can the DB Team **realistically** understand and **competitively** price on a fixed basis all of the components required to design and construct the project in compliance with Owner requirements and expectations
- Can the DB Team **realistically** assess, accept, tolerate and manage the significant degree of risk contractually allocated to it?

Design-Build: Procurement and Contractual Issues

Project profile and characteristics: relevance to professional liability risk

Infrastructure Projects

- Highways
- Light rail/transportation
- Bridges
- Tunnels
- Airports

Vertical Projects

- Generally, less concerning
- More scope definition
- Less varied and multiple stakeholder inputs and influences
- Private sector
- More reliable historic cost/labor data and experience
- Professional liability claims tend to be based more on conventional grounds, i.e., alleged negligence in **final** design, or in the capability/suitability of **final** design to achieve performance for other design criteria or standards.

Power, Water, Wastewater

- Generally, less concerning
- More scope definition
- Performance-based design
- More design and construction collaboration and integration
- Private Sector

Design-Build: Procurement and Contractual Issues

P3s Distinguished From DB

P3s: DB^{++}

Elevated Professional Liability Risk

- Aggressive Upstream Risk Allocation: Relational Risk Allocation Impacts Upon Consulting Engineer
- Unrealistic Concessionaire Completed/Permanent Works Expectations:
  - O&M Cost
  - Sustainability
- Conflicts Between DB Team and Concessionaire
- Conflicts Between Design-Builder and Concessionaire – Related Ownership and Management
- Conflicts Within Design-Builder Joint Venture

Design-Build: Procurement and Contractual Issues

Common Types of Design-Build Claims

1. Pre-Award, Proposal Phase Claims
   - Design Growth
   - Scope Omission
2. Post Award to Pre-IFC Claims
   - Quantity Growth
   - PSOS Interpretation
   - Delay
3. Post IFC Claims
   - Co-ordination of disciplines
   - Errors or Omissions
   - IFC Plan Delay

Design-Build: Procurement and Contractual Issues

DB Project Exposures

Why Have Design-Build/P3 Projects in North America Resulted In Significantly Adverse/Severe Professional Liability Claims Experience?

The Basic Issues:

During the Proposal Phase, can the Design-Build Team **realistically** understand and **competitively** price on a fixed basis all of the components required to design and construct the project in compliance with Owner requirements and expectations

Can the Design-Build Team **realistically** assess, accept, tolerate and manage the significant degree of risk contractually allocated to it?

Design-Build: Procurement and Contractual Issues

DB Project Exposures

Answer – No.
Consequences of that failure to properly price and allocate risk.

Substantial increases in final design and construction cost compared to Design-Build pricing proposal and contract fixed price

Increases manifest during Post-Award design development process

Design-Builder has no (or limited) contractual cost adjustment remedy from Project Owner

Design-Builder seeks alternative source for recovery of “Cost Overrun” – Genesis of Professional Liability claim against consulting engineer

Professional Liability Claims Experience for Consulting Engineers in DB in North America

Professional Liability Claims Experience for Consulting Engineers in DB in North America

Context Relevant to Professional Liability Claims

- November 2019 Engineering News-Record ("ENR") article: "Fixing construction's Fixed-Price Conundrum"
  - Article focused on problems for **Contractors** in Design Build
  - What do those problems represent for **Consulting Engineers**?
  - See D.J. Hatem Letter to ENR Editor, published December 16, 2019 **(Appendix 1)** https://www.donovanhatem.com/wp/wp-content/uploads/2022/03/032122-Letter-to-the-Editor-ENR.pdf
- Travelers Infrastructure Study A 17-Year Deep Dive Into Heavy Civil Projects in North American (2021).
  - Key Findings
- See D.J. Hatem, Rethinking and Recalibrating Design-Build, Design and Construction Management Reporter (Donovan Hatem LLP, December 2020) **(Appendix 2)**

Professional Liability Claims Experience for Consulting Engineers in DB in North America

Proposal Phase Services in DB: "Cost Overrun" Professional Liability Claims

- Most **frequent** source of professional liability claims by Design-Builders against Consulting Engineers
- Source of most **severe** professional liability claims by Design-Builders against Consulting Engineers

Typical "Cost Overrun" Professional Liability Claim against Consulting Engineer in DB:

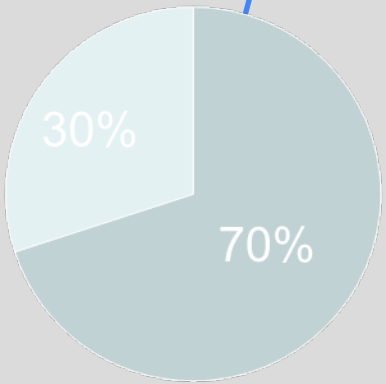
- Consulting Engineer's conceptual or preliminary Proposal Phase design or studies, investigations or recommendations did not meet the Standard of Care, resulting in "cost overruns" in final design and construction that Design-Builder cannot recover under the terms of the prime DB Contract with the Owner.

The professional liability claims experience for Consulting Engineers in DB

What are the sources of professional liability claims against Consulting Engineers on DB projects?

- 40% based on Proposal Phase services
- 30% based on post-award services

- Construction and design defects in completed project work



- Claims asserted prior to construction start and based on services performed prior to construction start

Professional Liability Claims Experience for Consulting Engineers in DB in North America

Professional Standard of Care

- Contractual Terms
  - Appropriate: Reasonable Care Under Relevant Circumstances
  - Elevated: "Free of Errors or Defects"

Professional Standard of Care

- Application Based on Relevant Services
  - Proposal Phase
  - Execution Phase
- Professional Standard of Care – Proposal Phase Services
  - Lack of published, recognized standards or guidelines
  - Extremely limited authoritative legal precedent
  - Much opportunity for expert "creativity"

Professional Liability Claims Experience for Consulting Engineers in DB in North America

Professional Standard of Care Application

Cont.

Proposal Phase Services: Relevant Factors

1)Designer's Scope of Services

2)Design Management Role of Design-Builder

3)Distribution and Delegation of Design Responsibilities Among Various Project Participants other than Designer

4)Limited Information Available

5)Limited Reliance Rights Upon Owner-Furnished Information

6)Limited Purpose of Designer's Services (RFP requirements)

7)Expectation of need for substantial post-award

- Investigations and studies that will inform and influence design development, potentially at variance from Proposal Phase conceptions
- Design Development Progression
- Interdisciplinary design interfaces and development
- Review, comment and input from Owner and other project stakeholders in the design development and review process

Professional Liability Claims Experience for Consulting Engineers in DB in North America

Professional Standard of Care Application

8) Expectation that Design-Builder will realistically (a) price the cost of design and construction and (b) include in its pricing reasonable contingency for cost and time impacts associated with design development and design revisions unrelated to PSOC departures
9) Compressed time within which Proposal Phase Services are performed.
10) Directions or other controls, prescriptions, mandatory criteria/standards or other constraints imposed by Design Builder during the Proposal Phase.

Cont.

Professional Liability Claims Experience for Consulting Engineers in DB in North America

Professional Standard of Care Application

Cont.

Execution Phase Services: Relevant Factors

1) Designer's scope of services
2) Design development will be informed and influenced by studies, investigations, evaluation and verification/validation of assumptions based on owner-formed information or otherwise during the Proposal Phase
3) Design-Builder's Design Management Role and Responsibilities
4) The Roles and Responsibilities of other Project Participants
5) The extent to which actions or inactions of other project participants impacted the Designer's performance or resulted in cost or time impacts
6) The reality that the design development will be influenced and impacted by input, comments and preferences of the Owner and/or other project stakeholders.
7) Design development will be impacted by regulatory/code interpretations, reviews and approvals.
8) Design development will be impacted and influenced by Design-Builder's constructability and related means and methods choices or preferences, and modifications.

Professional Liability Claims Experience for Consulting Engineers in DB in North America

Professional Standard of Care Application

9) The IFC documents will be severally and sequentially issued in design (or trade) – specific packages, i.e., prior to the completion of all project design, potentially (probably) necessitating design revisions after IFC issuance and during the construction process to address coordination and interface – related issues

10) In any final and integrated design context, (e.g on DBB), there is a reasonable expectation as to some level (degree or percentage) of design errors or omissions that singularly, or even cumulatively, do not represent a PSOC departure(s).

11) The timeliness of the Designer's receipt of

- Design performed by others
- Value engineering proposals
- Stakeholder input or requirements

12) The impact of site/subsurface conditions different from those reasonably expected either (a) during the Proposal Phase and/or (b) prior to the commencement of construction

13) The expectation that the Design-Builder will have included in its pre-award pricing and contingencies realistic and reasonable risk assessments and funding for cost and time implications of the above factors and circumstances.

Professional Liability Claims Experience for Consulting Engineers in DB in North America

Design-Builder Claim Profiles and Professional Liability Experience: Common Characteristics and General Observations

1. Claim Values asserted against Consulting Engineers: $10m - $460m
2. Fee Claim/Withholding: $5m - $75m
3. Claim Profile:
    - **80%** of claim value – Proposal Phase design development services;
    - **15%** - Errors/Omissions – in Final Design;
    - **5%** Design Defects in Permanent and Completed Work
4. Professional Standard of Care – Uncertainties, Risk and Contention; Widely Divergent and Highly Subjective Expert Opinions
5. Contractual Roles and Responsibilities – Actual Performance Disconnects
6. Compressed Procurement Period
7. Limited Information Available during Proposal Phase; No Reliance Rights
8. Aggressive Design-Builder Fixed Pricing and Inadequate Contingencies
9. Imbalanced Risk Allocation in Prime DB Contract

Professional Liability Claims Experience for Consulting Engineers in DB in North America

Design-Builder Claim Profiles and Professional Liability Experience: Common Characteristics and General Observations

10. Significant Fact and Expert Disagreements as to Adequacy, Purpose and Relevance of Design Development Contingency in Standard of Care Defense
11. Document lapses and gaps
12. Relevance of contract terms and scope; applicable standard of care, limitation of liability, merger/integration clauses as between Teaming Agreement and Design Services Agreement
13. Large Design-Builder claims do not equal large recoveries: Design Builder recoveries typically less than 10% of claim value; typically some recovery on Engineer's fee
14. Significant Transaction cost: legal and expert
15. Convergence of, and tension between, Commercial (i.e., fee payment claims/ withholding/backcharges) and Professional Liability Risks

Significant Factual, Legal and Expert Evaluation Uncertainty = Significant Risk

Published Legal Decisions are Sparse

No Appellate Court Decisions to Date

Design-Build: Procurement and Contractual Issues

- More Discriminating and Selective Utilization of DB:
  Is DB The Optimum Delivery Method for Major and Complex Public Infrastructure Projects?
  - Inadequate Scope Definition and Comprehension
  - Complexity and Scope Issues: Inadequately defined or Unknown design details for site/subsurface conditions at time of procurement
  - Inadequate time or opportunity to realistically comprehend and assess project scope, pricing, contingency and risk
  - Number of Stakeholders with Differing and Conflicting Interests
  - Detailed and Prescriptive Design Criteria or Requirements (often directed by non-project Owner)

Design-Build: Procurement and Contractual Issues

- Is DB The Optimal Delivery Method for Major and Complex Public Infrastructure Projects?
- Procurement/Contractual Issues
  - Disclaimers and Non-Reliance as to Available Information
  - Limited Available Information
  - Compressed Procurement Period
  - Imbalanced Risk Allocation: Premium/Hidden Cost of Substantial Risk Transfer
  - Performance v. Prescriptive Design
  - Timing of Fixed Price Commitment

See excellent discussion in R. Drake, W. Hansmire, Getting Metro Owners the Best Value from their Major Underground Projects, 2020 Proceedings, North American Tunneling, Society for Mining, Metallurgy and Exploration, PP. 256-262.

Design-Build: Procurement and Contractual Issues

- Balancing and Improving Upstream and Relational Risk Allocation in DB
  - Transportation Research Board, Guidelines for Managing Geotechnical Risks in Design-Build Projects, NCHRP Research Report 884 (September, 2018)
  - Essex, R., Hatem, D., Reilly, J., "Alternative Delivery Drives Alternative Risk Allocation Methods," North American Tunneling Conference, Washington, D.C., 24-27 June, 2018
  - D.J. Hatem, Subsurface Conditions and Design Adequacy Risk Allocation in Design Build: Dynamics, Interactions and Interdependencies, Tunnel Business Magazine, October 2018
  - D.J. Hatem, Rethinking and Recalibrating Design-Build, December 2020 Design and Construction Management Reporter (Donovan Hatem LLP).
- Mandatory Minimum Contingencies
- See D.J. Hatem, Design-Build: Recalibrating Procurement and Contractual Approaches, George A. Fox Conference (May 2022), **(Appendix 3)**

Design-Build: Procurement and Contractual Issues

- Progressive Design-Build: Qualifications-based or best value selection, followed by a process in which the Owner and Design-Build Team collaboratively progress design development to 60%+ level prior to contractual commitments as to scope, price and risk allocation
- Improving and Informing Design-Builder Understandings As To
  - Project Scope
  - Required Design Approaches
  - Alternative Design Approaches
  - Investigation, Data, Evaluations, Studies
  - Design Development
  - Risk Allocation
  - Construction Means/Methods
  - Interaction/collaboration with Project Owner
- D. J. Hatem, "Improving Risk Allocation on Design-Build Subsurface Projects" June 2020 Tunnel Business Magazine. (A version of that article with more detailed footnotes and related commentary may be obtained by emailing dhatem@donovanhatem.com).
- A. Cho, Transportation World Eyes Benefits of Progressive Design-Build, Engineering News Record, April 11, 2022

Design-Build: Procurement and Contractual Issues

Contractual Terms: Consulting Engineer Subconsultant Agreements

- Qualified Flow Down of Prime DB Contact
- Teaming Agreements
- Design Services Agreement

Design-Build: Procurement and Contractual Issues

Contractual Responses:
Effective Design-Build Teaming Agreements

- Elements of Effective Design-Build Teaming Agreements* to Manage and Limit Design Development Risk:
  - Scope and Limitations of Proposal Phase Services of Consulting Engineer
  - Recommendations as to Proposal Phase Studies, Investigations, and Disciplines/Levels of Design Development
  - Quantity Estimates
  - Design Development Contingency
  - Standard of Care
  - Limitation of Liability
  - Survival
- See D.J. Hatem, Effective Design-Build Teaming Agreements Between Design-Builders and Consulting Engineers, Dec. 15, 2020, ACEC/MA Webinar, **(Appendix 4)**

*Teaming Agreements are also labeled as a Phase I Agreement, Memorandum of Understanding, or Proposal Phase Agreement

Contractual Responses: Elements of Effective Design-Build Design (or Engineering) Services Agreement to Manage and Limit Design Development Risk

- Threshold Limitation of Liability

"Notwithstanding any provision of this Agreement to the contrary, and to the fullest extent permitted by law, the Design-Builder shall release, defend, indemnify and hold harmless the Engineer for the first $5m in claims, costs or liabilities alleged or proven by the Design-Builder, or any of its subcontractors or suppliers, arising out of any errors, omissions or other professional acts or service deficiencies or failures of Engineer, or any of its subconsultants ("Professional Liability Exposure"). Any liability of Engineer and its Subconsultants in excess of that $5m amount shall be (a) determined in accordance with the standard of care as defined in Section X of this Agreement and (b) subject to the consequential damages waiver in Section Y and the Aggregate Limitation of Liability in Section Z of this Agreement."

Contractual Responses: Elements of Effective Design-Build Design (or Engineering) Services Agreement

- Design (or Engineering) Services Agreement: Managing and Limiting Design Development Risk
  - Standard of Care
  - Qualified Flow Down
  - No (or Limited) Quantity/Design Development Risk
  - Limited Fee Withholding/Backcharge Rights
  - Consequential Damages Waiver
  - Limitations of Liability
    - Aggregate
    - Specific Risk Exposures (e.g. liquidated damages)

Design-Build: Project-Specific Professional Liability Insurance: Path Forward

- Adverse Claims/Losses Experience
- Impact of Professional Liability Claims Experience in North America on PSPL availability and capacity. (See Appendix 2)
- Need for contractual and risk management precautions, practices and initiatives
- Task Force: D.J. Hatem, Project-Specific Professional Liability Insurance on Design-Build and Public-Private Partnerships Projects in North America: A Path Forward (May 2022) **(Appendix 5)**

Appendices:

Appendix 1: D.J. Hatem Letter to ENR Editor, published December 16, 2019
Appendix 2: D.J. Hatem, Rethinking and Recalibrating Design-Build, Design and Construction Management Reporter (Donovan Hatem LLP, December 2020)
Appendix 3: D.J. Hatem, Design-Build: Recalibrating Procurement and Contractual Approaches, George A. Fox Conference (May 2022)
Appendix 4: D.J. Hatem, Effective Design-Build Teaming Agreements Between Design-Builders and Consulting Engineers, Dec. 15, 2020, ACEC/MA Webinar
Appendix 5: D.J. Hatem, Project-Specific Professional Liability Insurance on Design-Build and Public-Private Partnership Projects in North America: A Path Forward (May 2022)

Appendix 1

D.J. Hatem Letter to ENR Editor, published December 16, 2019
https://www.donovanhatem.com/wp/wp-content/uploads/2022/03/032122-Letter-to-the-Editor-ENR.pdf

Appendix 2

D. J. Hatem, Rethinking Recalibrating Design-Build, December 2020 Design and Construction Management Reporter (Donovan Hatem LLP)
https://www.donovanhatem.com/wp/wp-content/uploads/2020/12/DH_Rethinking-and-Recalibrating-Design-Build_December2020.pdf

Appendix 3

D.J. Hatem, Design-Build: Recalibrating Procurement and Contractual Approaches, George A. Fox Conference (May 2022)
https://www.donovanhatem.com/wp/wp-content/uploads/2022/03/121721-Design-Build-Improving-Procurement-and-Contractual-Approaches-January-18-2022-George-Fox-Conference.pdf

Appendix 4

D.J. Hatem, Effective Design-Build Teaming Agreements Between Design-Builders and Consulting Engineers

https://www.donovanhatem.com/wp/wp-content/uploads/2022/03/Effective-Design-Build-Teaming-Agreements-Between-Design-Builders-and-Consulting-Engineers-Presentation.pdf

Appendix 5

D.J. Hatem, Project-Specific Professional Liability Insurance on Design-Build and Public-Private Partnership Projects in North America: A Path Forward

(May 2022)

https://www.donovanhatem.com/wp/wp-content/uploads/2022/05/Project-Specific-Professional-Liability-Insurance-on-Design-Build-and-Public-Private-Partnership-Projects-in-North-America_-A-Path-Forward.pdf

Questions & Discussion

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