AMERICAN UNIVERSITY OF BEIRUT

# ADMINISTRATIVE ACTIVITIES AND ROLES FOR MINIMIZING THE ENCOUNTERING OF DEFECTS IN CONSTRUCTION CONTRACT DOCUMENTS

by
FARAH HANI EZZEDDINE

A thesis
submitted in partial fulfillment of the requirements
for the degree of Master of Engineering
to the Department of Civil & Environmental Engineering
of the Maroun Semaan Faculty of Engineering and Architecture
at the American University of Beirut

Beirut, Lebanon
September 2020

# ADMINISTRATIVE ACTIVITIES AND ROLES FOR MINIMIZING THE ENCOUNTERING OF DEFECTS IN CONSTRUCTION CONTRACT DOCUMENTS

by

FARAH HANI EZZEDDINE

Approved by:

[Signature]

Dr. Mohamed-Asem Abdul-Malak, Professor — Advisor
Department of Civil and Environmental Engineering

[Signature]

Dr. Issam Srour, Associate Professor — Member of Committee
Department of Civil and Environmental Engineering

[Signature]

Dr. Ibrahim Alameddine, Assistant Professor — Member of Committee
Department of Civil and Environmental Engineering

Date of thesis/dissertation defense: [September, 2020]

# AMERICAN UNIVERSITY OF BEIRUT

# THESIS, DISSERTATION, PROJECT RELEASE FORM

Student Name:

| Ezzeddine | Farah | Hani |
|---|---|---|
| Last | First | Middle |

☑ Master's Thesis ○ Master's Project ○ Doctoral Dissertation

☐ I authorize the American University of Beirut to: (a) reproduce hard or electronic copies of my thesis, dissertation, or project; (b) include such copies in the archives and digital repositories of the University; and (c) make freely available such copies to third parties for research or educational purposes.

☑ I authorize the American University of Beirut, to: (a) reproduce hard or electronic copies of it; (b) include such copies in the archives and digital repositories of the University; and (c) make freely available such copies to third parties for research or educational purposes after:

**One ---- year from the date of submission of my thesis, dissertation, or project.**

**Two ---- years from the date of submission of my thesis, dissertation, or project.**

**Three ---- years from the date of submission of my thesis, dissertation, or project.**

Farah 11-September-2020

Signature Date

This form is signed when submitting the thesis, dissertation, or project to the University Libraries

# ACKNOWLEDGMENTS

At the end of this journey, I would like to express my sincere and exceptional appreciation to my thesis advisor, Dr. Mohamed-Asem Abdul Malak, for the professional knowledge he has provided to me, for his assistance, for his guidance, and most of all, for his continuous encouragement and motivation throughout the completion of this thesis. I have always been inspired by his passion for teaching and sharing his professional experience with his students, and his dedication for research work. It is because of his constructive feedback that I was able to make it this far. I am really blessed to have an exceptional advisor.

I would like to thank my thesis committee members, Dr. Issam Srour and Dr. Ibrahim Alameddine, for being on my committee and for their interest in the topic of my research.

I would also like to thank my dearest friends for believing in me and always pushing me forward to accomplish my goals. I am grateful for them.

Last but not least, I would like to express my deepest gratitude to my family, my parents, my brothers, and my fiancé, for their unconditional love and support and for the constant encouragement they gave me throughout this journey. It would not have happened if it wasn't for them.

# AN ABSTRACT OF THE THESIS OF

Farah Hani Ezzeddine for Master of Engineering
Major: Civil and Environmental Engineering

Title: Administrative Activities and Roles for Minimizing the Encountering of Defects in Construction Contract Documents

The construction contract documents clarify the scope of the intended work and serve to legally bind the parties to their defined or implied responsibilities, rights, duties, and liabilities in respect of the executed contract. It is not uncommon that contract documents are found to be defective, often leading to the arising of disputes. Recent literature revealed a set of recommendations for improving the quality of contract documents. These call on project owners to: know what you want, describe it very clearly, not assume that the other party knows what you want, tell them what you want, and not change your mind. However, these are only high-level theoretical guidelines that require validation.

Considering the severity of the consequences resulting from having defective documents in a construction project, along with the gap shown in the literature, this study aims at identifying the administrative activities and roles of the concerned project parties that could help minimize the encountering of defects in construction contract documents. This was done through a case law analysis of a set of fifty disputes that revolved around several types of deficiencies in contract documents. The case law review enabled the identification of the classes for the basis of defects that are prone to be the source of dispute. This helps the owner in knowing the areas of contract documents drafting that should be improved. Second, a validation of the righteousness of previously suggested theoretical guidelines was performed. Following that, the court rulings of the adopted cases were fully scrutinized to infer the detrimental practices that owners should avoid to eliminate having such documents being held in error. The findings showed 18 practical inferences that represent the root causes behind the occurrence of the studied disputes. Furthermore, an analysis was performed on the deduced inferences to identify the characteristics of the intervention of the concerned project parties in avoiding the occurrence of defects. The characteristics represent the reason behind the intervention expected of each party, the timing of their intervention, the documents in which they should intervene, and their scope and means of intervention. These were used to identify the attributed functional roles and activities that should be followed by concerned project entities during the preconstruction phase to minimize defects in contract documents. That said, this study succeeded in developing the previously suggested theoretical guidelines for enhancing the quality of contract documents by formulating practical ways of adopting them.

# TABLE OF CONTENTS

# ILLUSTRATIONS

Figure

# TABLES

Table

# LIST OF ABBREVIATIONS

A/E: Architect/engineer design consultant

PM: Project manager

CM: Construction manager

OR: Owner representative

TC: Technical controller

Specs: Specifications

Q&A: Questions & answers period

NTP: Notice to proceed

# CHAPTER 1

# INTRODUCTION

## 1.1 Background

A construction project is called to be successful when it is completed on time, within its determined budget, compliant with its corresponding specifications and to the satisfaction of the involved stakeholders (Long, Ogunlana, Quang, & Lam, 2004). The main key factors that are taken into consideration by project entities to ensure the success of the project are time, cost, and quality (Chua, Kog, & Loh, 1999). Despite the interest that these critical success factors have taken, poor performance of projects continues to be an unresolved problem in the engineering and construction sectors (P. Love, Lopez, Goh, & Davis, 2011). This is resulting in time and cost overrun, leading to lower levels of quality and often resulting in claims and disputes (S. A. Assaf & Al-Hejji, 2006; Larsen, Shen, Lindhard, & Brunoe, 2015; Mahamid, Bruland, & Dmaidi, 2011). Many factors have been identified as contributors to the decreased level of performance, including lack of sufficient funding, erroneous and incomplete contract documents, and deficiencies in construction work (Larsen et al., 2015). Moreover, O. Dosumu, Idoro, and Onukwube (2017) reported that defects in contract documents are considered as one of the most influential factors contributing to poor project performance.

Construction contract documents are considered the most important tool in any civil engineering project ("Civil Engineering Construction Contracts," 2016). These are written agreements that clarify the scope of the intended work of the project and serve to legally bind the contracting parties to their defined or implied responsibilities, obligations,

rights, duties, and liabilities in respect of the executed contract. The primary contract documents consist of drawings, specifications, contract conditions, contract forms, addenda, and contract modifications (Brook, 2016). In fact, the quality of these documents has a major influence on the efficiency and performance of a construction project (Burati Jr, Farrington, & Ledbetter, 1992). When the contract is represented explicitly and comprehensively, the extent to which the parties will abide by the terms of the agreement is ensured by the ease of interpretation of the contract language (Goddard, Fellner, & Ormand, 2011). The effectiveness of such interpretation is highly dependent on the ability of the contract documents to translate the project's requirements clearly, as represented in the agreement. This way, entities can have a proper understanding of the contractual language, which maintains a good owner to contractor relationship and ensures the delivery of the desired product (Mohamad & Madon, 2006). However, since owners are often eager to start their projects as soon as possible, they rush the stage of drafting the contract documents and begin with the construction. This results in the owners' failure to adequately express their assent, leaving parts of their contract vague, ambiguous, or even omitted (Goddard et al., 2011).

Over the past 15 to 20 years, the quality of contract documents in practice has considerably decreased (Laryea, 2011). In this regard, Sertyesilisik (2010) revealed that technical documents related issues were the second most important difficulties faced by construction companies. Wilson (2017) also reported that many of the legal disputes taking place in the construction industry revolve around issues related to contract ambiguities. Another recent study showed that the majority of claims are classified as contractual claims, which are due to defects and insufficiencies present in drawings and specifications (Hashem M. Mehany, Bashettiyavar, Esmaeili, & Gad, 2018). Mohamad

and Madon (2006) stated that the unclarity of contract documents could cause an improper understanding of the contract leading to erroneous interpretations. These often result in unnecessary rework, contractual problems, claims, disputes, and even litigation. Thus, defects found in contract documents represent a dangerous aspect affecting the success of a construction project.

## 1.2 Problem Statement

Throughout a construction project, key payers are likely to face disagreements, which might lead to the occurrence of claims and disputes. It is not uncommon that the root cause of such conflicts is often embedded in the presence of defects in the construction contract documents. Previous literature has thoroughly investigated the different types of such defects, their causes, and the severity of their consequences on many aspects of the project's performance. To solve this problem, many researchers have offered guidelines and recommendations to be followed by project entities to help in reducing defective documentation. For instance, a recent study proposed a set of high-level guidelines for improving the quality of contract documents, which address the owner to: know what you want, describe it very clearly, not assume that the other party knows what you want, tell them what you want, and not change your mind (Laryea, 2011). These recommendations represent useful strategies that owners must fulfill to enhance the drafting process of contract documents. Yet, such guidelines are considered to be general and theoretical since none of the previous studies validated their effectiveness in practice nor came up with practical ways to adopt them. Besides, other researchers have explored methods that help in determining the entity to blame for the presence of defects in contract documents during dispute resolution. However, these represent contributions to solve the problem after taking place, instead of preventing its occurrence.

Hence, this determines the research gap present in previous literature which calls the need for practical evidence to identify strategies to minimize the defects in contract documents as much as possible.

## 1.3 Research Objectives

In light of the backdrop present in previous literature, the aim of this research is to attempt to abridge the identified gap. The main goal of this study is to minimize the problem of defects found in construction contract documents through meeting the following objectives: (1) validating the righteousness of the previously suggested guidelines by Laryea (2011) in practice, (2) exploring the areas of contract drafting in which the documents are found to be erroneous, (3) examining the root causes behind the occurrence of defects from practical examples, (4) identifying the intervention specifics of each of the responsible project entities to avoid the occurrence of each of the deduced root causes, and (5) presenting the administrative roles and tasks that must be followed by responsible project entities during the pre-construction phase of the project to enhance the quality of construction contract documents.

## 1.4 Research Methodology

The methodology that will be adopted throughout this research to fulfill the above-stated objectives is represented in the diagram shown in Figure 1 below.

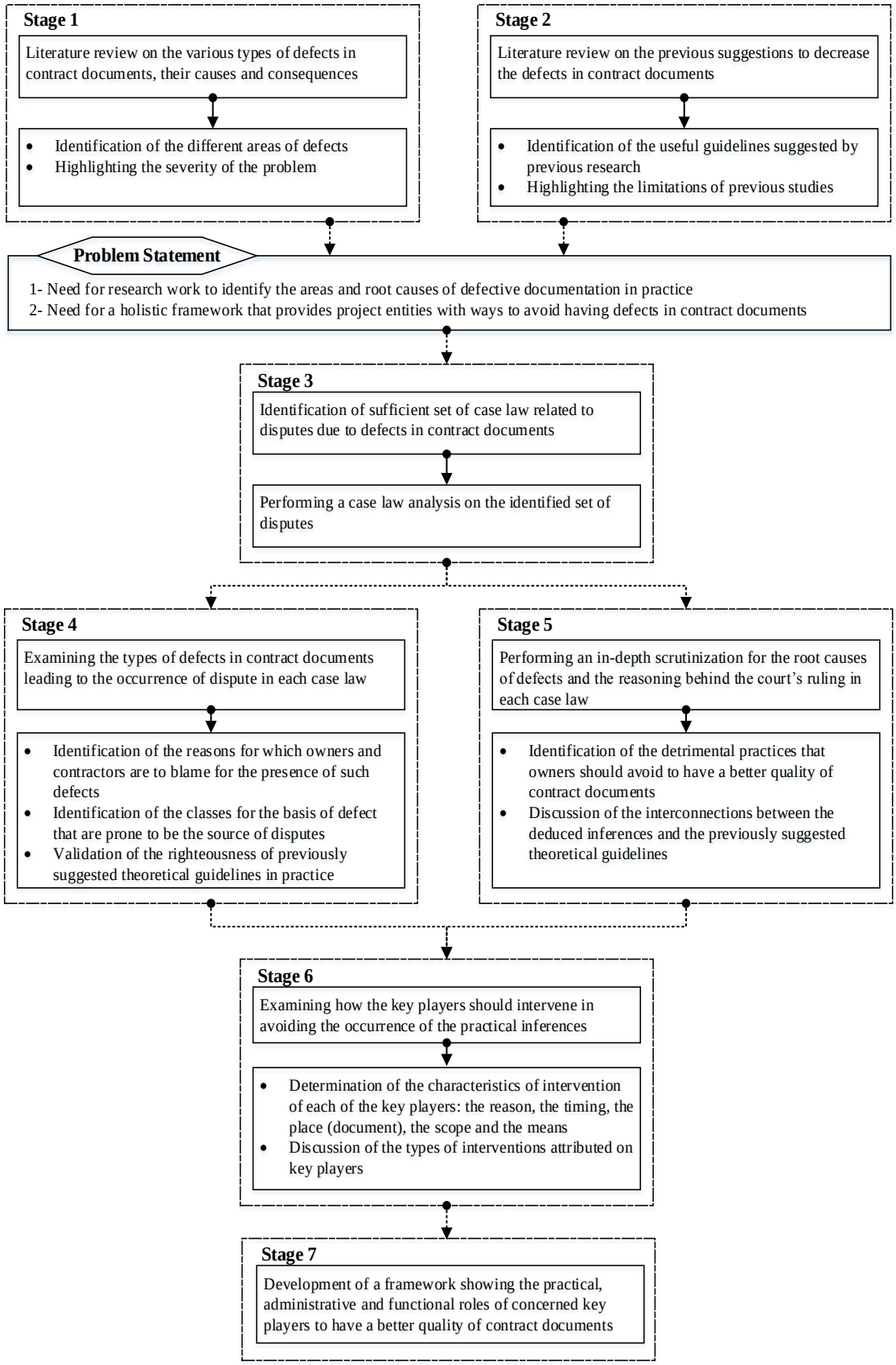


*Figure 1: Research methodology*

As can be seen from Figure 1, the methodology is divided into 7 main stages. In each sage, the method of work is explained along with its expected resulting findings. In addition, the interconnection between the different stages explains how the outcomes reached in each step are used to perform the steps that follow. To start with, the first step in this research consists of a literature review divided into two stages. Stage 1 entails a literature review on the various types of defects found in contract documents, their causes, and consequences. This will enable the identification of the different areas of defects as shown in previous research along with highlighting the severity of the problem that the study aims to solve. In Stage 2, a literature review is conducted to determine the previously done research that offers ways to minimize the severity of the problem. This is done to identify the guidelines offering useful suggestions to help in decreasing the problem along and to highlight their limitations. As a result, the findings in both stages triggered the need for (1) research that identifies the areas that are prone to be the source of defective documentation from practical evidence along with their respective root causes, and (2) a holistic framework that provides the project entities with practical ways to avoid having defects in contract documents. Consequently, in order to fulfill these objectives, Stage 3 consists of identifying a sufficient set case law in which defects in contract documents were found to be the reason behind the dispute. Upon that, a case law analysis is performed on the identified set which will lead to satisfying the outcomes of Stage 4 and Stage 5. In Stage 4, an examination for types of defects in contract documents leading to the disputes will allow (1) the identification of the reasons for which owners and contractors are to blame, (2) the identification of the classes for the basis of defects in contract documents, which represent the main areas of contract drafting that are prone to be the source of the dispute, and (3) the validation of the righteousness of the previously

suggested theoretical guidelines offered by Laryea (2011). Furthermore, in Stage 5, the cases will be revisited with the aim of performing an in-depth scrutinization of the root causes of defects and the reasoning behind the court ruling in each of the disputes. This is done to (1) deduce the direct inferences that owners should avoid to enhance the quality of contract documents, and to (2) discuss how the deduced inferences interrelate with the previously suggested theoretical guidelines offered by Laryea (2011). This latter step is done with the aim of showing how the deduced inferences represent practical ways to adopt the theoretical. In Stage 6, an examination is performed to study how the concerned key players should intervene to avoid the deduced inferences leading to disputes. This will enable the determination of the following characteristics of the intervention of key players in avoiding each of the deduced inferences: the reason behind their intervention, the timing of their intervention, the document in which they will intervene, and the scope and means of their intervention. After that, the types of intervention deduced from this stage will be summarized and explained. Finally, the outcomes of all the preceding stages will lead to Stage 7 where the development of a holistic framework showing the practical, administrative and functional activities and roles to be followed by the concerned project entities to ensure the production of a better quality of construction contract documents is presented.

## 1.5 Research Contribution

Enhancing the quality of contract documents might not be the goal of each project party in a construction project. However, avoiding having to deal with disputes is one of their main interests. Knowing that defective documentation is one of the root causes behind the occurrence of disputes, project entities will aim to avoid it. The importance of this research lies in offering a practical tool to be used by all the concerned project entities

to enhance the production of contract documents. This tool is depicted in a holistic framework that outlines the roles and activities that should be followed by each of the project parties. These administrative functions will be distributed on the different contract documents throughout the pre-construction phases of a project. By following the stated steps, the owner, the designer, and the contractor will contribute to preparing a clear, complete, and well-coordinated basket of contract documents having the minimum defects possible. The effect of improving the quality of these documents will be reflected in the overall performance of the construction project.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Preamble

This chapter summarizes the previous literature done concerning the defects found in contract documents. First, an overview of the contract documents, their functions, and their constituents will be presented. Then, the quality of the contract documents will be described briefly along with the types of encountered defects, their causes, and their consequences to highlight the severity of the problem. After that, previous suggestions and contributions done to reduce this problem will be introduced. Finally, since the contribution of this research lies in analyzing a set of case law to reach the study's objectives, a literature review of the legal concepts that are frequently used in courts to decide who is to blame in disputes due to defects in contract documents is presented. The concepts are the following: the Spearin doctrine, Contra proferentem, and the ruling based on the type of ambiguity: patent or latent ambiguities.

## 2.2 Construction Contract Documents: Overview

Construction contract documents are written and graphic documents, prepared by the A/E firm, that present the design of the desired project and the method of administrating the contract for its construction (Brook, 2016). These documents represent the means by which the owner's intentions for the desired work are conveyed to the contractor and the sub-contractors. Generally, the contractor's duty is to carry out the wok by following these documents provided to him during the bidding phase (Murdoch & Hughes, 2008).

### 2.2.1 *Functions*

The main purposes of these documents are represented in the following:

- Describing the project delivery method along with what the project entails;
- Communicating to the owner the scope of the intended work;
- Stating the materials to be used in the project along with their characteristics;
- Legally binding the contracting parties to their defined and implied responsibilities, obligations, rights, duties, and liabilities;
- Serving as means to control, administer and manage the project; and,
- Stating the requirements of regulatory and financial supports needed for construction(Surahyo, 2018).

### 2.2.2 *Constituents*

The formation of contract documents takes place prior to the start of the construction of a project, more precisely, before the bidding phase. Their production is formed throughout two main phases. First, the bidding documents are produced before the launching of the bidding phase. During this period, amendments might take place leading to additions and modifications to this package which will be presented in the basket of contract documents. These are formed by the end of the bidding phase, more precisely, after the contract signature (Wiley, 2011). The package of bidding documents, also known as tender documents, includes all the necessary information needed during the bidding process. These are mainly comprised of the following documents:

1- Conditions of contract: comprised of the particular and general conditions,
2- Contract forms: comprised of the contract agreement,
3- Project forms: comprised of the bonds and certificates,

4- Specifications: comprised of the general requirements divisions and the technical division,
5- Design drawings,
6- Resource drawings
7- Schedules,
8- Bidding requirements, and
9- Addenda (Surahyo, 2018).

The contract documents are made of the same documents excluding the bidding requirements, project forms, and resource drawings since their usage is specific to the bidding phase. In addition, the letter of acceptance, the letter of tender and the contract modifications are added to the above-listed documents to form the basket of construction contract documents (Surahyo, 2018).

### 2.2.3 *Quality*

It is commonly known in the construction industry that "good design" is characterized to be effective (serving the intended purpose), constructible, safe, and economic (McGeorge, 1988). However, for this design to be correctly executed, it should be effectively communicated using good quality of contract documentation (Tilley, McFallan, & Tucker, 1999). In fact, the level of quality of contract documents is measured by the extent to which certain drafting-related attributes are incorporated in them. Among those attributes are accuracy, clarity, timeliness, certainty, completeness, relevance, conformity, coordination, standardization, and final checking (Tilley et al., 1999; Tilley, Wyatt, & Mohamed, 1997). In addition to that, a proper allocation for responsibilities is identified by Mohamad and Madon (2006) as one of the crucial factors to determine if certain contract documents are considered to be of good quality. The authors also stated

that good documentation permits clear descriptions of the work to be done by the assigned contractor to earn his compensation.

Moreover, good quality of contract documents affects several aspects of a construction project. Throughout all the project stages, starting from project conception to design production, reaching construction and facility management, effective communication between project entities is highly affected by having a complete and coordinated set of contract documents (Construction Specifications, 2005). Besides, good quality of contract documents is necessary for effective overall project performance. When documents are well-coordinated and complete, the involved parties can ensure a better understanding of the requirements, which results in fewer claims and disputes (Surahyo, 2018). Also, since design documents contain the information and illustrations that enable contractors to transform the scope of the project desired by the owner into an actual end product, it is the quality of those documents that influence the efficiency and accuracy of the realization of this scope (Tilley et al., 1999).

Despite the stress present in the literature on the importance of good quality of contract documents to the success of a construction project, several studies have shown that the quality of contract documents in practice has decreased over the past couple of years. To illustrate, a previous study has reported that practitioners in the design and construction field were faced with a decline in the quality of both design and documentation over the past 12-15 years. The study also reported that the incorporation of drafting-related attributes concerned with ensuring a good quality of documents has decreased over the same past years. In addition to that, contractors often complained of receiving contract documents that are of a below-standard quality, insufficient, and containings errors, omissions, and discrepancies (Tilley et al., 1999). Besides, a recent

ethnographic study done by Laryea (2011) by assisting the whole bidding phase of two of the top 20 contracting companies in the UK revealed that the quality of tender documents in practice has considerably decreased over the past 15 to 20 years. Another study stated that problems encountered in contract documents were identified as the second most common difficulties faced by construction companies (Sertyesilisik, 2010).

## 2.3 Defects in Construction Contract Documents

Many previous studies reported that defects in contract documentation have been a common problem in the design and construction industry (A. Akintoye & Fitzgerald, 2000; Bajaj, Oluwoye, & Lenard, 1997; de Neufville & King, 1991; O. Dosumu et al., 2017; Liu & Ling, 2005). The sub-sections below will discuss the types, causes, and consequences of such defects.

### 2.3.1 *Types of Encountered Defects*

Different types of defects were identified in several previous studies and are presented in the table below:

*Table 1: Type of defects found in contract documents as identified in previous studies*

| Type of defect | Sources |
|---|---|
| Erroneous Information | (Ade-Ojo & Babalola, 2013; A. S. Akintoye & MacLeod, 1997; Alarcón & Mardones, 1998; S. Assaf, Hassanain, & Abdallah, 2017; S. A. Assaf & Al-Hejji, 2006; O. S. Dosumu, 2018; Gavilan & Bernold, 1994; Gunduz & Karacan, 2009; Jergeas & Hartman, 1994; Lam, Kumaraswamy, & Ng, 2007; Laryea, 2011; P. Love et al., 2011; Mansfield, Ugwu, & Doran, 1994; Odeh & Battaineh, 2002; Oluwaseun Sunday & Olumide Afolarin, 2013; Tilley et al., 1999) |

| | |
|---|---|
| Discrepancy or inconsistency between different documents | (Alarcón & Mardones, 1998; O. Dosumu et al., 2017; O. S. Dosumu, 2018; Laryea, 2011; Mansfield et al., 1994; Odeh & Battaineh, 2002; Sertyesilisik, 2010; Tilley et al., 1999) |
| Omissions/missing information | (Alarcón & Mardones, 1998; Arain, Pheng, & Assaf, 2006; S. Assaf et al., 2017; Brook, 2016; Cheung & Pang, 2012; Cox, Morris, Rogerson, & Jared, 1999; O. Dosumu et al., 2017; O. S. Dosumu, 2018; Gavilan & Bernold, 1994; Laryea, 2011; P. Love et al., 2011; Sertyesilisik, 2010; Tilley et al., 1999; von Branconi & Loch, 2004) |
| Unclear information | (Alarcón & Mardones, 1998; Cheung & Pang, 2012; Odeh & Battaineh, 2002; G. R. Smith & Bohn, 1999; von Branconi & Loch, 2004) |
| Inadequacy | (Ade-Ojo & Babalola, 2013; O. S. Dosumu, 2018; Jergeas & Hartman, 1994; Laryea, 2011; Sertyesilisik, 2010; G. R. Smith & Bohn, 1999; von Branconi & Loch, 2004) |
| Ambiguity | (Cheung & Pang, 2012; O. S. Dosumu, 2018; Gunduz & Karacan, 2009; Jergeas & Hartman, 1994; Shash, 1998; R. C. Smith, 2013) |
| Non-compliance with norms and building codes | (S. Assaf et al., 2017; Sertyesilisik, 2010) |
| Un-updated information | (Laryea, 2011) |
| Unreliable information | (Brook, 2016) |

The below sub-sections present a brief explanation for each of the most important listed types of defects.

#### 2.3.1.1 Erroneous Information

An error can have different meanings and usages depending on the way it is conceptualized (Oluwaseun Sunday & Olumide Afolarin, 2013). Generally, the term "erroneous", is used to refer to something containing mistakes and errors (Error, 2003). Busby (2001) defined errors as unexpected occurrences that cannot be attributed to a clear

circumstance. Besides, Reason (2000) defined errors as occasions in a planned sequence of mental or physical events that failed to accomplish their intended outcome. P. E. Love, Edwards, and Irani (2008) described an error to entail an unintentional deviation from the acceptable standards. Besides, Senders and Moray (1995) defined an error as something that took place in a process, which was not intended by the author, not desired by the observer and not leading to the acceptable and desired limits of the known standards.

With these definitions, erroneous information can be defined as mistaken ideas, descriptions, and facts leading to wrong understanding, deductions, conclusions, and decisions (Erroneous information, 2003). As for erroneous information found in contract documents, it was defined by O. S. Dosumu (2018) as accidental deviations from the acceptable standards done throughout the drafting process of these documents. Mohammed (2007) defined erroneous information in construction contract documents as a non-desired condition leading to the non-fulfillment of the needed requirements in these documents which will negatively affect one or more of the planned time, cost, and performance of the project.

Besides, one of the frequent types of erroneous information found in contract documents is a design error. It represents a mistaken description, illustration, or instruction present in the drawings or specifications that, if followed by the contractor, will either result in a construction failure leading to rework or will need a costly correction (Potts, 2016).

#### 2.3.1.2 Inconsistency or Discrepancy

When something is called to be inconsistent, this means that it contains elements that are incompatible with each other or with another fact or claim (Inconsistency, 2003).

Other terms used to refer to an inconsistency are incompatibility and discrepancy (Inconsistency, 2011)

The discrepancy that we refer to as a type of defect in contract documents is presented by having conflicting information in two or more of these documents. For instance, discrepancies are more likely to arise between drawings and specifications when a description or requirement is shown in one and duplicated in the other. In fact, last-minute modifications and changes are likely to cause the occurrence of such types of discrepancies (Wiley, 2011). Furthermore, discrepancies can also be present within the same document: a certain design element can be described in two conflicting ways within the same document (Potts, 2016).

#### 2.3.1.3 Omission

Generally, omission refers to a certain item or aspect being, accidentally or intentionally, left out or excluded from a group (Omission, 2003). The term can also mean a failure in completing a required task or obligation as a result of negligence or indifference of the doer. Exclusion is another term used to refer to an omission (Omission, 2011).

Omissions in design documents take place when an item, a description, an illustration, or detail is needed to complete the work as intended but is not present in these documents (Potts, 2016). In other cases, omissions occur when an entire document is omitted (for example a missing drawing) from the basket of contract documents. (Wiley, 2011).

#### 2.3.1.4 Unclear Information

The term unclear refers to something confusing that is hard be understood. Other words used to refer to something unclear are uncertain, doubtful and vague (Unclear, 2011)

Unclear information stated in contract documents represent statements, expressions, or representation that need further explanation to be understood. In other words, unclear information cannot stand on their own in contract documents (Construction Specifications, 2005).

#### 2.3.1.5 Inadequacy

In general, the inadequacy of a certain item means that it is not good enough as it is supposed to be. It can also refer to something that does not have the needed qualities to perform a certain task (Inadequacy, 2011). Insufficient, ineffective, and weak are also terms used to refer to something inadequate.

In relation to design documents, inadequacy refers to documents that are not well-prepared to serve the intended scope or the desired performance of the end product (Wiley, 2011).

#### 2.3.1.6 Ambiguity

Ambiguity is present in a term or a sentence when it can have more than one meaning (Goddard et al., 2011). It is defined as the uncertainty and indistinctness of the meaning of words or expressions in a written language (Ambiguity, 2011).

Sometimes the terms unclear and ambiguous can be confused when referring to the same type of defect in contract documents. However, the difference between the two

terms is that unclear refers to something that is not easy to understand whereas ambiguous is something that can be understood but has different meanings (Potts, 2016).

Contract documents are said to be ambiguous when the language used in them can have two or more reasonable interpretations *(Glover v. National Ins. Underwriters)*. Many courts distinguished between two types of ambiguities present in the contract: patent and latent (*Nat. Union Fire Ins. v. CBI INDUSTRIES*, *Shay v. Aldrich*, *Solis v. Kirkwood Resort Co*). A patent ambiguity is described as being apparent on the face of the written contract because of the language itself. As for a latent ambiguity, it is defined as the ambiguity that does not appear on the face of the contract. It arises from extraneous facts and collateral matters when the contract language is actually executed (*Nat. Union Fire Ins. v. CBI INDUSTRIES).*

### 2.3.2 ***Causes of Defects***

Previous literature has identified many reasons leading to defects in contract documents. These mainly include the following: insufficient time dedicated to the preparation of the contract documents, client's ignorance and incompetence in the managerial and construction field, poor communication and coordination between the project's entities, insufficient and inadequate designers' skills, low design fees, and other design-related deficiencies. The below sub-sections present a brief explanation of each of the listed causes.

#### 2.3.2.1 Insufficient Time for the Preparation of Documents

Some research studies related the problem of erroneous documentation to the time dedicated to the preparation of these documents. Laryea (2011) reported that one of the most influential causes of defective documentation is the client's impatience to start with

the project along with his reluctance to spend more time and money to prepare a well-coordinated basket of documents. Other studies also stated that the client's preference to accelerate the documents' drafting phases to start construction, is leading to an insufficient time dedicated to performing all the required steps of review to ensure a good quality of contract documents (O. Dosumu et al., 2017; Shash, 1998). The reason behind not giving sufficient time for documents' preparation is that owners usually prefer to rush such phases to be able to finish the construction process earlier and start making money from the built facility as soon as possible (Shash, 1998). Similarly, Palaneeswaran[1], Ramanathan, and Tam (2007) showed that defective documentation is frequently caused by taking uneducated and random assumptions during the design phase as a way to accelerate the start of the construction phase.

#### 2.3.2.2 Client's Ignorance and Incompetence

Other research highlighted the importance of the effect of the client's knowledge in the construction field on the quality of the documents produced. Laryea (2011) deduced that the client's ignorance in knowing what he actually wants along with his incompetence in many phases of the construction project are among the factors leading to defective documents in most of the construction projects in the UK. Another study performed on Nigerian construction projects showed that among the causes of errors found in contract documents are the negligence of the clients and their ignorance in the field of construction. In fact, it is the case in many construction projects that the owner is not familiar with the importance of the pre-bidding and contract signature phase on the performance of the construction project. Hence, not paying good attention to what this phase should entail leads to inadequately prepared documents resulting in an

unsatisfactory performance of the project (Oluwaseun Sunday & Olumide Afolarin, 2013).

#### 2.3.2.3 Poor Communication between Stakeholders

Another cause identified by previous research is poor communication between the essential stakeholders of the project. Palaneeswaran[1] et al. (2007) deduced that the lack of proper coordination between the project entities leads to insufficient transfer of the needed information between them resulting in inadequate design and documentation. Oluwaseun Sunday and Olumide Afolarin (2013) also showed that poor communication between stakeholders of the project during the pre-construction phase is among the root causes of errors found in contract documents leading to unsatisfactory performance levels of the construction project.

#### 2.3.2.4 Insufficient and Inadequate Designers' Skills

Other studies associated the problem of poor documentation to the design skills invested in the preparation of these documents. For instance, R. C. Smith (2013) showed that the level of skill of the party who is responsible for drafting these documents affects the resulting quality of these documents. In fact, the study reported that when the drafter is not familiar with the construction know-how, inadequate designs will result in erroneous documentation. Arain et al. (2006) also showed that the lack of the needed designer's knowledge is one of the most important causes of inconsistencies between the design and the construction interface.

#### 2.3.2.5 Low Design Fees

Some studies highlighted to impact of low design fees on the quality of design documents. McGeorge (1988) reported that increased project costs due to deficiencies in

contract documents are the result of largely reduced design fees to levels below optimal. In fact, others showed that when the owner tends to select a designer/architect office with low design fees, the quality of construction documents is likely to be negatively affected. In this case, practitioners are likely to be faced with documents having reduced levels of completeness, certainty, and coordination (Tilley et al., 1999).

#### 2.3.2.6 Other Design-Related Factors

In addition to the above-listed causes of defective documentation, some studies pinpointed several design-related factors affecting the quality of design documents. Goddard et al. (2011) reported that errors are mainly due to insufficient attention given to the details in descriptions and representations of design elements during the drafting process. A questionnaire survey conducted by Arain et al. (2006) on 27 Saudi Arabian contracting companies revealed that the insufficient plans' annotations are among the main causes leading to inconsistencies between the documents. Other research showed that using the same documents, drawings, and notes from other similar previous projects, also known as "copy and paste", is contributing to the increase of errors in designs. (Palaneeswaran[1] et al., 2007). In addition, other researchers reported that the client's frequent design changes also contribute to discrepancies in design documents (Oluwaseun Sunday & Olumide Afolarin, 2013).

### 2.3.3 *Consequences of Defects*

Defects in contract documents have led to several severe consequences affecting the construction projects' efficiency and performance on different levels. Time delays, cost overruns, claims, disputes, rework, increase in tender queries and change orders, the inadequacy of the submitted tender price and time, change in the bid/no-bid decision, increase in contingency, structural failures and owner's dissatisfaction are among the

frequent impacts of the problem that were identified in previous literature. The below sub-sections briefly explain the stated consequences.

#### 2.3.3.1 Time Delays

Several studies identified time delays of construction projects as one of the main consequences of errors in contract documents. Tilley et al. (1999) reported that design and documentation deficiencies are the reason behind the increase of the "non-desirable elements of construction", which most importantly include project delays and extensions of time done to rectify any found defects. Contractors in Saudi Arabia reported that mistakes and discrepancies in construction documents result in time spent in reviewing and adjusting these documents leading to many delays in the project's schedule (S. A. Assaf & Al-Hejji, 2006). Another study revealed that the level of accuracy of design documents along with the number of errors present in them are two of the main factors affecting the timely completion of a project which results in delaying contractors from signing up for other new construction projects (Ade-Ojo & Babalola, 2013). Laryea (2011) also explained how poor quality of contract documents lead to wasting time in trying to figure out what the owner really wants leading to time overruns. Besides, Mohammed (2007); Mukuka, Aigbavboa, and Thwala (2014) identified that errors in contract documents as one of the major factors leading to construction projects being overtime and non-conforming to the desired standards of quality. Similarly, many researchers including Odeh and Battaineh (2002); Tilley and Barton (1997); O. S. Dosumu (2018); von Branconi and Loch (2004); Oluwaseun Sunday and Olumide Afolarin (2013) and DA (1986), reported that the presence of errors and discrepancies in contract documents affects both owners and contractors by leading to stretched project schedules.

#### 2.3.3.2 Cost Overruns

Many studies associated the presence of errors in contract documents to the increased cost of the project. Laryea (2011) revealed that the problem of defective documentation faced by UK construction companies is contributing to project costs that are much higher than the expected budget. The study reported that the reason behind the increased project's cost is the inaccurate estimates made by contractors based on such defective bidding documents submitted to them during the bidding phase. Mohammed (2007); Mukuka et al. (2014); Tilley and Barton (1997) and DA (1986) identified cost overruns as one of the common impacts of poor quality of contract documents in construction projects. This increase in cost results from wasting more money in (1) correcting the detected defects in design or documentation, (2) reconstructing the resulting erroneously built construction elements affected by the detected defect in design documents, and (3) delaying the construction project as a whole (Mukuka et al., 2014). von Branconi and Loch (2004) determined the adequacy, consistency, and completeness of the specifications before contract signature as the first key driver among the eight business levers that the top management should pay attention to when preparing the contract. The researchers also reported that when the specifications are not well-defined before the contract signature, the risk of the increased cost is sufficiently higher.

#### 2.3.3.3 Claims and Disputes

Many studies related the quality of contract documents to the occurrence of claims and disputes. Cheung and Pang (2012) explained the reasons behind the defects leading to disputes are the occurrence of conflicts due to construction failure, increased costs resulting from rework, or unsatisfactory performance. A study conducted in the US identified deficiencies in the specifications as the principal source of disputes in

construction projects (Jahren & Dammeier, 1990). The study also explained that many disputes in construction projects could have been avoided if the contract documents are clear and well-coordinated. Cheung and Pang (2012) and Jergeas and Hartman (1994) reported that defective, incomplete, ambiguous, and inconsistent contract documents are the most significant factors contributing to an increased number of conflicts between contracting entities that might lead to litigation. Similarly, von Branconi and Loch (2004) stated that the number of claims raised in the later stages of the construction phase is affected by the concreteness of the specifications. Tilley et al. (1999) also reported that deficiencies found in the design and contract documents lead to an increased probability of occurrence of disputes, which is undesirable to both owners and contractors. In addition, the study conducted by Laryea (2011) showed that the lack of clarity of the contract documents is one of the major causes of occurrence of claims and disputes. Many other sources listed the increase in the number of claims and disputes among the main implications of flaws present in construction contract documents (A. S. Akintoye & MacLeod, 1997; Brook, 2016; DA, 1986; Lam et al., 2007; R. C. Smith, 2013).

#### 2.3.3.4 Rework

One of the frequently reported undesired results of defects in design and contract documents is design drafting and construction rework. Tilley and Barton (1997) stated that when errors are found to prevail in design documents, reworks and variations are necessary for correcting the design of erroneously designed work elements and reconstructing them according to the new design requirements. These steps lead to time and cost overruns, which affects both owners and contractors. Another recent study revealed that the presence of such errors in contract documents in several Nigerian construction projects led to increased undesirable construction rework which also

increased the project's cost and execution time (Oluwaseun Sunday & Olumide Afolarin, 2013). Moreover, Tilley et al. (1999) reported that design and documentation deficiencies are the reason behind the increase of the "non-desirable elements of construction", among which is rework.

#### 2.3.3.5 Increased Tender Queries and Change Orders

Another frequent consequence identified by previous literature is the increase in the number of tender queries and change order requests. Cox et al. (1999) identified design omissions and uncoordinated contract documents as two of the reasons that lead to increased change order requests taking place after contract award resulting in an increased project cost. Tilley et al. (1999) also stated that variations illustrated in change order requests are among the non-desirable consequences of having defective contract documents. Besides, the case studies analyzed by Laryea (2011) revealed that the poor quality of tender documents faced by two of the biggest UK civil engineering construction companies resulted in a large increase in the number of both, tender queries raised during the bidding phase and change orders done during the contractual period, which affected the project's productivity. The study also showed that the tender queries were related to many types of defects found in these documents. Figure 2 below presents an example of the categorization of the tender inquiries' responses in one of the analyzed case studies.

| Query category | Clarification | Missing information | Conflicting information | Inadequate specifications | Errors and mistakes | Omissions | Incomplete drawings | Total |
|---|---|---|---|---|---|---|---|---|
| Query responses | 27 | 2 | 4 | 24 | 5 | 18 | 10 | 90 |
| Percentage | 30% | 2% | 4% | 27% | 6% | 20% | 11% | 100% |

*Figure 2: Example of the categorization of the tender queries' responses in one of the Analyzed case studies done by Laryea (2011)*

In fact, Laryea (2011) also explained the negative effect of raising too many tender queries during the bidding phase on contractors. Instead of focusing on coming up with well-educated and accurate cost estimates, contractors waste their time in filing too many inquiries followed by waiting for responses from the client's team which are usually received late towards the end of the bidding submission date.

#### 2.3.3.6 Inadequate Tender Price and Time

Certain studies associated the presence of defects in tender documents to the tender price and time submitted by the contractor at the end of the bidding phase. Tilley et al. (1999) emphasized that if the bidding documents given to the contractor contain ambiguous and erroneous descriptions and representations of design elements and project requirements, the deduced time and cost estimates end up being also erroneous. Likewise, Gunduz and Karacan (2009) identified the ambiguity in tender documents as one of the reasons of abnormally low tenders in public construction works. Design errors lead to misunderstanding of the project's scope causing contractors to offer mistakenly lower bid prices. Laryea (2011) also explained how unclear tender documents lead to assumptions taken during pricing which in many cases lead to the submission of an inadequate tender price.

#### 2.3.3.7 Bid/No Bid Decision

Other studies showed the effect of the presence of defects in contract documents on the decision of bidders to bid or not on the project. Shash (1998) reported that the majority of sub-contractors in Colorado receive poor tender documents that contain insufficient and misleading data from general contractors which affect their bid/no-bid decision. Dulaimi and Shan (2002) deduced that the clearness and completeness of the contract documents represent the eight most influential factors (out of 40) affecting the

bid/no-bid decision of the contracting companies in Singapore. Bajaj et al. (1997) also identified the tender related issues, which include the time allowed to submit the tender along with the clarity of the given documents, as the primary factors affecting the bid/no-bid decisions in construction companies in Australia.

#### 2.3.3.8 Contingency and Bid Mark-up Decisions

Furthermore, several studies found that defects in construction contract documents are among the main factors contributing to the increased contingency in bids. A questionnaire study performed on 32 main contractors in Singapore identified "the completeness of project documents" is one of the 10 main factors (out of 40) influencing their bid mark-up decisions (Dulaimi & Shan, 2002). Another questionnaire done with 29 local contractors in the United States indicated that the completeness of contract documents, the design quality, and the time allowed to submit bids are among the factors that affect the contractor's decision to increase the contingency in his bid price (Liu & Ling, 2005). Other interviews done by G. R. Smith and Bohn (1999) with estimators and managers who are directly involved in the bidding process in 12 small-to-medium scale construction companies in the United States indicated that unclear contract documents were among the factors that lead to increasing contingency markup. The study also showed that inadequate design drawings prepared by engineering firms lead to "high-risks owners". The reason behind that is mainly the tendency of the owners faced with ambiguous documents to be on the safe side of the consequences of such ambiguities. Similarly, de Neufville and King (1991) deduced from interviews done with 30 US contractors that the quality of design in tender documents is among the project-risk factors affecting the level of markup in bidding.

#### 2.3.3.9 Structural Failures

Several studies highlighted the severity of the consequences resulting from defects in contract documents such as structural failures. Tilley et al. (1999) reported that the structural collapse of the buildings and their deteriorations can be the result of such prevalent defects in contract documents. DA (1986); Minato (2003); Sowers (1993) reported that defects in designs have led to severe impacts on construction projects such as catastrophic structural failures, deaths, and inadequate safety environments. In fact, 58% of the 500 construction projects' catastrophic failures evaluated by Sowers (1993) turned out to originate from defective design documents. In case projects do not catastrophically fail due to a defect in the design, they frequently end up with severe structural failures aside from the resulting delays, higher costs, and contract claims (DA, 1986).

#### 2.3.3.10 Owner's Dissatisfaction

Other research showed how defects in contract documents lead to the owner's dissatisfaction with the built facility. For example, Goddard et al. (2011) reported that poor drafting of contract documents results in having a contract that does not reflect the owner's expectations. And since contractors are given these contracts, they end up following erroneous project requirements leading to unsatisfactory performance of the built facility. Another study showed that errors in contract documents lead to the dissatisfaction of owners with the end product along with their lack of confidence in the architect/engineer or project consultant (Oluwaseun Sunday & Olumide Afolarin, 2013)

Further studies have stated other consequences resulting from defective documentation like a decrease in the productivity of a construction project, an increase in its complexity (O. S. Dosumu, 2018), abandonment of the construction project

(Oluwaseun Sunday & Olumide Afolarin, 2013), an increase in the construction waste (Gavilan & Bernold, 1994), lack of constructability (Alarcón & Mardones, 1998), and a disruption of the flow of construction works (A. S. Akintoye & MacLeod, 1997).

### 2.3.4 *Responsibility for the Presence of Defects*

Certain research studies blame the owner for the presence of defects in construction contract documents whereas other studies blame the consultant for that.

DA (1986) considered the owner to be responsible for the presence of such defects because he is the entity that contracts with the designer firm, sets the time constraints, sets the criteria for acceptable design, and most importantly warrants the accuracy, workability, and adequacy of the design presented in the drawings and specifications. In other words, when the owner provides the contractor with bid documents, this means that he has checked these documents and ensured that the information presented in them is accurate, adequate, constructible, and can be executed within the contract time. Thus, the contractor can assume that he can rely on the information provided to him without being blamed for any defect. Moreover, Laryea (2011) blamed the presence of defects in contract documents on the client since it is not the contractor's job "to sort the design out". The study concluded that the client's impatience to start making money, his reluctance to invest in preparing a good quality of contract documents, his ignorance and incompetence in the construction field should not impose on the contractor additional duties, like checking the correctness of contract documents and the effectiveness of the design, which are none of his responsibility. Sertyesilisik (2010) also reported that the owner is the entity to take responsibility for any defect found in the contract documents.

On the other hand, Oluwaseun Sunday and Olumide Afolarin (2013) blamed both owners and designers for the presence of defects in the construction contract documents. First, owners were blamed for not allowing adequate time for the preparation of these documents along with not adopting the most suitable procurement method for the delivery of the project. Second, designers were blamed for not engaging in partnering during the preparation of the basket of documents.

Besides, other studies held the consultant firm that prepares the documents to be fully responsible for the problems encountered in them. O. Dosumu et al. (2017) reported that most of the causes of the presence of defects are related to the method of work of the consulting organizations. The consultants are responsible for issuing a good quality of design documents by using quality assurance measures for all the generated designs. S. A. Assaf and Al-Hejji (2006) also blamed the architect/engineer for discrepancies or mistakes found in design documents. They also reported that the contractor should not waste his time trying to figure out errors present in the documents provided to him.

## 2.4 Previous Research to Reduce Defects in Contract Documents

This section presents the contributions presented by several previous studies to decrease the problem of defects in contract documents. These include suggestions, recommendations, frameworks, flowcharts, and theoretical guidelines.

### 2.4.1 *Suggestions and Recommendations*

Several previous studies have suggested general recommendations that help in decreasing the defects in construction contract documents. A study performed on Turkish construction companies reported that carefully choosing a professional consultancy firm will warrant the production of a coordinated set of drawings that are compliant with the

local norms along with a detailed set of specs that are compliant with those drawings (Sertyesilisik, 2010). Besides, S. A. Assaf and Al-Hejji (2006) recommended that the architect/engineering firms should pay more attention to the review process to avoid the occurrence of mistakes and discrepancies in design documents, which will decrease the time overruns in construction projects.

A recently done assessment for deficiencies in design documents performed on large construction projects in Saudi Arabia proposed the following suggestions to help in reducing the severity of defects in design documents: enforcing the building codes, requiring the registration of the designers to ensure they have the needed engineering knowledge, determining the design fee for the aim of a better quality of design rather than a lower cost, performing a constructability analysis during the production of design documents and preparing training sessions for designers (S. Assaf et al., 2017). Wilson (2017) suggested several tools that would help in improving the quality of the contract. These include the following: using "plain and straightforward terms and clauses", defining technical terms that might have a different understanding, including a written language in the contract that covers every oral agreement, adding references to the standards stated in the contract, explaining the priority among the different clauses and documents, and using correct punctuation.

Other researchers suggested that owners should allow sufficient time for preparing the construction contract documents in addition to adopting appropriate procuring methods throughout the project. The authors also recommended that project entities should have a better communication during all the project stages, educated project management techniques, enhanced design review management and sufficient financial provisions (Oluwaseun Sunday & Olumide Afolarin, 2013). Tilley et al. (1999) advised

owners to assign sufficient time and funds for the planning, design and documentation phases in a project in order to increase the construction efficiency and decrease the overall project costs to the least possible. This can be done by using selection criteria that take into consideration the knowledge, skills, and experience of the designer to be selected. Besides, O. S. Dosumu (2018) recommended that designers should be more conscious during the drafting process of the drawings because these documents represent the base upon which most of the other documents are based.

As can be seen, the above-stated studies only provide practitioners with general recommendations to enhance the quality of contract documents but do not provide them with concrete practices to properly implement them.

### 2.4.2 *Frameworks and Flowcharts*

Other studies produced explanatory flowcharts and frameworks that guide the professionals responsible for contract administration in dealing with disputes arising due to defects in contract documents. Cheung and Pang (2012) proposed anatomy for contractual and speculative disputes in construction projects through a fault-tree framework, that lists the events leading to disputes with their link to logic gates. The framework enables construction stakeholders to understand the factors contributing to disputes along with their likelihood to occur to make the most suitable preventive actions. Since the authors identified the incompleteness of contract documents as the root causes of the occurrence of disputes, the proposed tool allows project entities to detect the events leading to incomplete contracts in order to determine the entity to blame.

Thomas, Smith, and Wirsching (1995) presented a reliable method to resolve disputes arising from defective specifications through a decision diagram containing key questions that were deduced from an analysis of more than 100 court decisions related to

this area. The flowchart is used to help courts and contract administrators to be able to identify the responsible entity of the resulted defects that have led to the occurrence of the dispute. The main key inquiries that were addressed are the following: the cause of the failure, the party that had control over this cause of failure, whether or not the builder followed the specifications correctly, whether or not there was another method to be used that could have avoided the failure and whether or not the contractor warranted the final outcome to the client.

Moreover, Abdul-Malak and Hamie (2019) presented a framework that shows a comprehensive set of rules that can help engineers and architects, who are involved in contract administration on the behalf of owners, to properly construe their interpretations of the construction contract documents' requirements. By relying on the proposed framework, engineers can attempt clear interpretations when faced with disputes due to defects in contract documents.

This being said, the above contributions are useful methods in enhancing the resolution of dispute due to mistakes in contract documents but do not offer concrete methods to avoid having defects in these documents in the first place.

### 2.4.3 *Theoretical Guidelines*

Another recent ethnographic study was done by Laryea (2011) to determine the quality of tender documents used by stakeholders in practice through assisting the whole bidding phase of two of the top 20 contracting companies in the UK. It concluded with a set of recommendations given to owners to improve the quality of contract documents which are shown in the following:

1- Know what you want;

2- Describe it very clearly;

3- Do not assume that the other person knows what you want;

4- Tell them what you want; and,

5- Do not change your mind.

Laryea (2011) blames the defects present in contract documents on the owner by saying that if he knows what he really wants, describes them very clearly in the documents, does not assume that the other party (the designer or the contractor) knows what he wants, tells them what he wants and does not change his mind, he will help in decreasing the defects in construction contract documents.

Even though these suggestions offer the owner with steps to avoid having errors in documents, they represent theoretical guidelines that need to be validated to prove their effectiveness in practice. this shows the gap present in the literature due to the lack of previous contributions to offer owners practical methods to adopt these theoretical guidelines.

## 2.5 Rules for Solving Disputes due to Defects in Contract Documents

Defects in contract documents have been among the common reasons for the occurrence of claims and disputes. This is where the debate on who is to blame takes place. For that reason, it is important to shed light on the legal concepts that are frequently used in courts to decide the entity to blame. The legal concepts that will be shown in the sub-sections below are the following: the Spearin doctrine, Contra Proferentem, and the ruling based on the type of ambiguity: patent or latent ambiguities.

### 2.5.1 *The Spearin Doctrine*

The Spearin Doctrine, also known as “the owner’s implied warranty” of adequate plans and specifications, originated from the historic case *United States v. Spearin (1918)* (Sweet, 2010). Mainly, the case revolves around a contracting company, named Spearin,

that signed a contract with the Navy Bureau of Yards and Docks to construct a dry dock located in Brooklyn. The contractor was required to first excavate the site, then relocate and construct the sewer by following the drawings and specifications provided by the government. A sudden heavy rainstorm took place which led to the generation of internal water pressures that broke the sewer and flooded the excavation of the dry-dock. The cause behind the damage was the presence of a dam that was not shown in the drawings and specs that were given to Spearin nor in the plans of the city. The government assumed that the responsibility rests on the contractor until the final completion and acceptance of the project. However, the United States Supreme Court held the government liable for breaching his implied warranty to provide adequate plans and specs (*United States v. Spearin*).

In fact, Spearin doctrine has been used frequently in many courts to defend contractors for claims against defective work. The doctrine states that when an owner provides the contractor with plans and specifications to be followed in executing the work, he is providing and implied warranty that the plans and specifications are adequate to meet his desired requirements. Hence, if a contractor who followed the plans and specifications resulted in non-conforming work, and the cause of the problem is defective plans and specifications, Spearin doctrine shifts the risk to the owner who is held liable for the resulting damage or defective work (Sweet, 2010).

### 2.5.2 *The Doctrine of Contra Proferentem*

A rule that has been frequently used in many court rulings of disputes due to ambiguities in contract documents is “contra proferentem” also known as “ruling against the drafter”, and “ambiguity rule.” The roots of this doctrine go back to the English

common law (Liggett, 2008) representing “one of the most common grounds of the law” (Bacon, 2002).

#### 2.5.2.1 Definition

It was defined by Bacon (2002) as the rule that “a man’s deeds and his words shall be taken strongest against himself”. As presented by Abdul-Malak and Hamie (2019), contra proferentem is when “[a]mbiguous contract terms are construed most strongly against the party responsible for drafting them.” So, whenever a particular agreement or term is ambiguous in the contract documents, the meaning that should prevail is the one that serves against the interests of the party that drafted the document in hand (Thomas & Ellis Jr, 2007). Besides, the contra proferentem rule is not used to determine the real intent of the project’s parties. However, it is used to allocate the burden of the ambiguity present in the contract language on the entity that drafted it (Flynn, 1980).

Two theories were advanced to support the use of this rule in the process of contract interpretation. The first theory states that the draftsman of the contract documents can, by using exact and precise expressions, avoid any error or ambiguity in the language used in these documents. And, in case he fails to do that, he is the entity that should suffer from the resulting consequences. This way, the theory can push the drafters toward enhancing their drafting exercises and improving the quality of contract documents (Boardman, 2005). The second theory, as explained by Flynn (1980), states that in the case of the presence of a disputed language in the contract, it is unconscionable to allow the interpretation of the stronger party (i.e., the drafter) to dominate that of the weaker party (i.e., the contractor).

2.5.2.2 How and When this Rule is Applied

Although the application of the contra proferentem rule may seem straightforward, however, it is considered by courts as a last resort after trying all the conventional methods of contract interpretation (*Klapp v. United Ins. Group Agency, Inc.*). Flynn (1980) identified four major contract interpretation concepts that should be satisfied to be able to use the contra proferentem rule. The concepts are the following: (1) the requirement of reasonable interpretation, (2) the duty to seek clarification, (3) the requirement of reliance, and (4) the identification of the draftsman of the contract. These will be explained in the following:

1- Reasonable Interpretation:

This interpretation method aims to discover each party's intent by examining extrinsic and intrinsic evidence.

- In assessing extrinsic evidence, courts aim to determine if the two entities reached the same interpretation of the language used in the contract. This is done by considering the following: the discussions that took place between the parties before the dispute, any of their actions that might indicate their intent, and whether one party knew about the other party's interpretation of contract language prior to the dispute.
- As for the evaluation of intrinsic evidence, courts aim to read the contract "as a whole" to analyze the meaning of every word put into it to see if a clear intent for the disputed language can be deduced.

Simultaneously, along with ascertaining the parties' intent, courts must determine whether the interpretations offered by the contracting parties fall within the zone of reasonableness. To do so, courts "place themselves in the shoes of the potential contractor

and view the situation as it was viewed by that party when required to make the interpretation" (Flynn, 1980). Courts cannot determine if the contractor's interpretation is reasonable in a vacuum. Still, they have to consider all the factors that may have impacted his reasoning in reaching the resulting analysis. Besides, when the contractor's interpretation is found to be reasonable, it can directly be adopted under the contra proferentem rule, without regard to the draftsman's interpretation, even if it was more reasonable.

2- Duty to seek clarification:

This rule states that when a contractor is faced with an ambiguity which he is aware, or should have been aware, and does not seek clarification from the owner prior to contract signature, he cannot rely on the contra proferentem rule to put the blame on the drafter (Torbert, 2014). The ambiguity which the contractor is expected to be aware of is the patent ambiguity. However, he is not obligated to raise an inquiry of any hidden patent ambiguity since he is "not expected to exercise clairvoyance in spotting hidden ambiguities in the bid documents…" (*Blount Brothers Construction Company v. United States*).

In *S.O.G. of Arkansas v. United States*, the court referred to the act of resolving a patent ambiguity in the contract before contract award as "a major device of preventive hygiene" to avoid disputes. The duty to seek clarification also contributes to having an "informed bidding" where all the bidders have an equal understanding of the contract, which will result in truly comparable bids. Besides, the court reported that this rule aims to prevent having a bidder, who is aware or should have been aware of an interpretation problem, from taking advantage of such a situation to submit a lower bid. As a result, this bidder, having submitted a lower bid price than the others, will be able to win the project.

And later on, when the owner's interpretation proves to be different than that of the contractor, this latter will argue for a change order to cover the additional expenses due to the presence of ambiguous requirements in the contract. Such an act is unfair to both the owner and the other bidders who submitted bids that were necessarily higher because they included the additional costs of the work that was not taken into consideration in the bid price submitted by the contractor who was assigned on the project. Hence, this rule necessitates bidders to have good faith when preparing their bids, otherwise they will be held responsible for any resulting consequences.

Furthermore, the duty to seek clarification of ambiguities in the contract is inherent (Flynn, 1980). In other words, this duty does not depend on having a clause in the bidding package stating that it is mandatory, even though it might be included in some contracts. For example, in *Beacon Construction Co. v. United States*, the agreement included a clause requiring the contractor to seek clarification from the owner when he is faced with an interpretive problem. The case revolved around the presence of a glaring ambiguity in the contract where the contractor failed to inquire about it, which led the court to blame him. On the other hand, in *Space Corp. v. United States*, a clause stating the duty to inquire about discrepancies in the contract was not present. The contractor was aware that a drawing was omitted, but did not enquire about it and assumed his own analysis for what was missing. Even though the contract of this case lacked a clause like that in *Beacon*, the court ruled against the contractor by stating that "an obligation to seek clarification as to an obvious omission is inherent." Similarly, in *Blount Brothers Construction Co. v. United States*, where the contract contained an ambiguous description that required the contractor to inquire about it, the court stated that "[e]ven if the invitation for bids should fail to state that requests for interpretation of the specifications and

drawings are to be made to the Government agency…it would seem that the obligation to seek clarification as to a patent ambiguity is inherent".

3- Reliance:

If the contractor succeeded in proving a reasonable interpretation and wants to benefit from the contra proferentem rule, he should prove that he actually relied on that interpretation to submit his bid. When the project entities 'interpretation of a certain issue in the contract differs, it is usually the case where the owner's interpretation costs more than that of the contractor. For that reason, for the contractor to prove that he relied on the less expensive manner of performance, he should establish that his bid did not include the cost of the more expansive manner of performance relating to the owner's interpretation in his bid (Flynn, 1980).

4- Draftsman Identification:

If the contractor wants to benefit from the contra proferentem rule, he should prove that the draftsman of the document in which the interpretive problem exists is the other party. The manner in which the courts and boards identify the entity that drafted the document in hand is dependent on the type of contract. For example, Government contracts are known to be wholly drafted by the Government. So the rule of contra referendum can automatically be applied when the above prerequisites are satisfied (Flynn, 1980).

### 2.5.3 *Ruling Based on the Type of Ambiguity: Patent or Latent*

The distinction between patent and latent ambiguity was previously described in section 2.3.1.6.

It is important to note that since a patent ambiguity is apparent on the face of the document, it does not need extrinsic evidence to be proved. Whereas for a latent ambiguity that could not be detected until executing the contract language, extrinsic evidence is needed to prove its existence because the language by itself is clear and unambiguous (*Nat. Union Fire Ins. v. CBI INDUSTRIES*, *Shay v. Aldrich*, *Solis v. Kirkwood Resort Co*).

Concerning the issue of allocating the risks resulting from a contract ambiguity, courts have stated that in the case of patent ambiguity, the contractor is responsible for raising the issue to the owner in order to request for clarifications and guidance early on, during the bidding phase. Hence, the contractor is not entitled to any compensation resulting from a patent ambiguity in case of failure to alert the owner and he is held responsible for the increased cost and the extra time needed to perform in accordance with the owner's interpretation of the documents. Whereas in the case of latent ambiguity, the contractor will not be able to determine its presence before commencing the works, hence, has no duty to report the issue and will be entitled to compensation whenever the case is reasonable (Loulakis & Santiago, 1997).

# CHAPTER 3

# LEGAL EVIDENCE FOR CLASSES OF DEFECTS IN CONTRACT DOCUMENTS

## 3.1 Preamble

The findings of the literature review chapter highlighted the severity of the problem of defective construction contract documents on many aspects of the project's performance. It also presented the contributions of several previously done research in minimizing the problem at hand. These provided the project entities with suggestions and recommendations to reduce the errors in contract documents. However, these guidelines remain to be high-level, simple, general, and theoretical which emphasizes the need for concrete and practical methods to prevent such documents from being in error.

This chapter will present a case law analysis of a sufficient set of disputes that evolved around deficiencies encountered in contract documents. The study's findings show the court ruling' decision concerning the entities that were to blame in each of the cases along with the reasoning behind it. This will help in the distribution of the respective roles upon them in subsequent chapters. The analysis also determines a classification for the basis of defects encountered in the documents that are prone to be the source of dispute. This will help in determining the root causes behind the document being in error in the next chapter. In addition to that, the study concludes with a validation of the righteousness of the theoretical guidelines deduced in previous research done by Laryea (2011).

## 3.2 Legal Perspective

This section presents the study findings associated with the case law analysis. After an in-depth review of a sufficient number of judicial cases revolving around issues related to defective documentation, a total of 50 cases in which the direct root cause of the dispute was an error in contract documents were identified. These were analyzed and classified into three main categories. The first category consists of disputes due to various types of defects in contract documents in which the owner was the entity to blame. The second category of cases is also related to different types of defective documentation, where the contractor was the entity to blame. And the third category represents disputes due to faulty design that led to erroneous documentation, most of which the owner was the entity to blame. After a thorough scrutinization of the case law, the reasons behind the owner or the contractor being the entity to blame are explained.

### 3.2.1 *Case Law where the Owner is the Entity to Blame*

Table 2 below presents the first category that consists of 24 cases in which the owner is the entity to blame for the various types of defects encountered in contract documents. It shows brief verbatim descriptions of each of the disputes along with their respective court ruling. The detailed descriptions and court rulings for the case law in which the accountability for defects rests on the owner are shown in Appendix A.

*Table 2: Summary of cases particulars related to defects in contract documents in which the owner is the entity to blame*

| Case Code | Case Name | Case Description | Courts' Citation |
|---|---|---|---|
| C1 | *United States v. Spearin (1918)* | "… it was discovered that there was a dam from 5 to 5 1/2 feet high... but the dam was not shown either on the city's plan nor on the Government's plans …" | "…the articles prescribing the character, dimensions and location of the sewer imported a warranty that, if the specifications were complied with, the sewer would be adequate…The duty to check plans did not impose the obligation to pass upon their adequacy…" |
| C2 | *Marine Colloids, Inc. v. MD Hardy, Inc. (1981)* | "…contractor was required to build only a free-standing curtain wall that would stand between two buildings without being bonded to them… during a winter storm, the firewall fractured…" | "…the firewall was to serve as an interior curtain wall rather than an exposed end wall…Marine Colloids' damage was caused by its own decision to put the firewall to a use for which it was not designed…" |
| C3 | *Hollerbach v. United States (1914)* | "…it was found that said dam was not backed with broken stone, sawdust, and sediment as stated in paragraph 33 of the specifications, but that said backing was composed of a soft slushy sediment… Bidders, or their authorized agents, are expected to examine the maps and drawings…to visit the locality of the work, and to make their own estimates" | "We think this positive statement of the specifications must be taken as true and binding upon the Government, and that upon it…must fall the loss resulting from such mistaken representations… If the Government wished to leave the matter open to the independent investigation of the claimants it might easily have omitted the specification as to the character of the filling back of the dam" |
| C4 | *Kubby v. Crescent Steel (1970)* | "Following completion of the work Kubby refused to pay Crescent. Kubby's position was that Crescent had not performed the job in a workmanlike manner because water leaked into the shed between the roof and the masonry wall… leakage could have been prevented by flashing" | "… this particular structure was not a weatherproof structure but was merely a shed open on three sides…the specifications furnished by Kubby could have provided for flashing or caulking but did not do so. In addition, Crescent was not responsible for building the entire shed but only for constructing the metal roof" |
| C5 | *Southern New England Contracting Co. v. State (1974)* | "Both the heating subcontractor and the electrical subcontractor had read their… specifications…to exclude the line voltage temperature control wiring from the work which they were required to do …" | "...we cannot justifiably hold that the plaintiff "should have known" of the defect in the specifications prior to the time that it did…the trial court awarded damages to the plaintiff …" |
| C6 | *Teufel v. Wienir (1966)* | "Leaks in the curtain wall have developed and are due to the inadequacy of the prescribed curtain wall for the high-rise building…" | "…if an item is installed in accordance with the specifications…the contractor is not liable if the item's failure to function properly is due to its design being improper for the intended use." |

| | | | |
|---|---|---|---|
| C11 | *Christie v. United States (1915)* | "…claimants examined the drawings and they showed gravel, sand and clay… the material actually to be excavated "consisted largely of stumps below the surface of the earth, buried logs, of cemented sand and gravel…and of sandstone conglomerate"..." | "Where there is a deceptive representation in the specifications…and it is admitted by the Government that time did not permit borings to be made by the contractor to verify the representations, the latter is entitled to an allowance for the actual amount expended over what would have been the cost had the boring sheets been accurate…" |
| C22 | *Fuchs v. Parsons Construction Co. (1961)* | "…The primary cause of the damage appears to have been the settling of the piles…It is the contention of plaintiffs that the specifications required the piling to be driven to refusal and that this was not done" | "…Factors were lacking in the specifications to accurately determine the meaning of "refusal" as used therein…Plaintiffs have therefore failed to show a breach of contract on the part of the defendant contractor…" |
| C25 | *A.S. McCaughan Co. v. Barram (1997)* | "Although the specifications required that the sprinkler heads be placed "where indicated on the drawings," the drawings themselves stated that the sprinkler head locations were "suggested" and for "design intent only." …the contractor did not install the sprinkler heads in the center of the ceiling tiles…" | "… the court held that a latent ambiguity existed in the contract specifications and drawings, entitling the contractor to the cost impact… there was more than one reasonable interpretation... however, [it] was not so glaring as to trigger a duty of inquiry on the part of the contractor" |
| C26 | *DOT v. Bracken Construction Co. (1983)* | "Section 666.5…"Bridge Approach Slabs will be paid for at the contract unit price per square yard, complete in place as specified, which will include the premolded expansion joint filler, joint backing material, joint sealing material, and closed cell neoprene sponge, when specified, at the joint adjacent to the bridge superstructure…"… DOT contended that the cost of the rebars was included in the [of] the approach slabs" | "Section 666.5 does not expressly mention the approach slab rebars… the mention of certain items implies the purposeful exclusion of other items of the same general character… The ambiguity in this contract was not blatant and glaring; it was minor and subtle. We, therefore, construe the ambiguity against the author of the contract, DOT" |
| C27 | *Galloway Corp. v. S.B. Ballard Construct (1995)* | ""…The Contractor shall pay the Subcontractor each progress payment within three working days after the Contractor receives payment from the Owner. If the Architect does not issue a Certificate of Payment or the Contractor does not receive payment for any cause which is not the fault of the Subcontractor, the Contractor shall pay the Subcontractor, on demand, a progress payment"… Galloway struck out all the language following the word "Owner"…" | "…the phrases "after the Contractor receives payment from the Owner" and "has received payment from the Owner" constitute latent ambiguities in the contracts…could be interpreted to require Galloway to pay a subcontractor only if it received a payment demanded from Rowe identifiable with the progress or completion of a subcontract, or merely to provide for a reasonable time to pay after such demand was made to Rowe… the trial court properly construed the contract to permit Galloway only a reasonable amount of time in which to make progress and final payments to Ballard" |

| | | | |
|---|---|---|---|
| C28 | *States Roofing v. Winter (2009)* | "States Roofing's President… observed the roofing work that had previously been performed in cells A and B by a different contractor…had used waterproofing paint on the parapet walls in these cells... Navy objected to the use of waterproofing paint on the parapet walls… and required use of three-ply felt flashing material to waterproof the parapet walls..." | "The Board found that there was "no specification for the parapet wall waterproofing membrane," for the Navy stated that it had "inadvertently" omitted this specification…it used "layers" and "plies" "interchangeably," … different words have different meanings … ambiguity in the contract was latent…States Roofing is entitled to recover the additional costs" |
| C34 | *United States v. Seckinger (1970)* | "…"[contractor] shall be responsible for all damages to persons or property that occur as a result of his fault or negligence"…While working on this project … employee accidentally came into contact with the wire…and was seriously injured…[contractor] commenced a suit …against the United States... on the theory that his injuries had been sustained as the proximate result of the Government's negligence" | "…the United States had been grossly negligent in failing to de-energize the wire…Government alleged that Seckinger…was obligated "to perform the work properly and safely …" The provision, in short, is what the Court of Appeals called "a simple responsibility clause."… If the Government wants to impose additional liabilities…I would require it to do so openly, so that every bidder may clearly know the extent of his potential liability" |
| C37 | *Mountain Home Contractors v. United States (1970)* | "Kitchen exhaust fans were to be installed "where shown," yet the notation on the drawings said fans were to be bid as an alternate. Then there was no alternate for a kitchen exhaust fan. Plaintiff interpreted this lack of an alternate …to mean that the government did not desire the fans in the 298 duplex units …" | "…there was in actuality a discrepancy on the face of this contract between the specifications, the drawings…But this is not the kind of "glaring" discrepancy that we have said must exist before a contractor is required to shoulder the burden of seeking clarification…Plaintiff evaluated the contract documents as a whole… Plaintiff's interpretation of this ambiguity was reasonable" |
| C38 | *Driscoll Const. Co., Inc. v. State (2004)* | "Portions of the contract indicate that permanent lane closures are prohibited…portions of the contract indicate that permanent lane closures are not prohibited." | "the specifications about the use of permanent lane closures were ambiguous… the writing is strictly construed against the drafter… instead of using language that allowed for two reasonable alternative explanations, DOT could have stated, Permanent lane closures are prohibited at all times." |
| C39 | *Metric Constructors, Inc. v. National Aeronautics & Space Administration (1999)* | "At issue are three sections of those specifications relating to the installation of lamps…Metric and Meisner interpret these sections to require replacement of only defective, burned out, or broken lamps immediately before project completion. NASA contends that they require replacement of all lamps, known as "relamping" in the industry, before project completion…" | "… specifications are susceptible to two different reasonable interpretations …this court does not perceive the ambiguity as "so glaring as to raise a duty to inquire." Because this contract contains a latent ambiguity, this court construes that ambiguity against the drafter, NASA." |

| | | | |
|---|---|---|---|
| C40 | *Mattingly Construction Co., Inc. v. Hartford Underwriters Ins. Co. (2010)* | "Section 16.5, stated that K.B.K. and Mattingly "waive[d] all rights against ... each other and any of their subcontractors" for damages caused by perils such as fire "to the extent covered by property insurance obtained pursuant to [Section] 16.4 *or other property insurance applicable to the Work*…" (emphasis added)." | "The court determined that the waivers of subrogation clause, when read in tandem with the definition of "the Work" and provision regarding final payment, was ambiguous…any ambiguities in the interpretation of the performance bond must be construed against the party drafting or adopting the document—in this case, the surety" |
| C41 | *Wingate Construction Co. v. United States (1964)* | "… specifications did describe concrete sidewalks, some of which were included under Section G which pertained to road paving, and some of which were included as an additive alternate…the section dealing with additive alternates, including sidewalks, had been deleted." | "… ambiguity existed in both the drawings plaintiff possessed and the specifications…Plaintiff's interpretation of the contract was reasonable. The contract did not require the installation of sidewalks in the off-site area." |
| C42 | *United States v. Smith (1921)* | "A large part of the material, arbitrarily stated to be clay, gravel, sand and boulders, was in fact limestone rock and limestone bed rock, and was not the material specified in the contract…" | "… we think, against the explicit declaration of the contract of the material to be excavated and its price … "the right" of the appellees "to recover the price for the work done by them is indisputable"" |
| C43 | *United States v. Atlantic Dredging Co. (1920)* | "The material to be removed is believed to be mainly mud, or mud with an admixture of fine sand… bidders are expected to examine the work, however, and decide for themselves as to its character and to make their bids accordingly...the map did not contain a true description of the character of the material which was to be encountered, and was encountered..." | "There was not only a clear declaration of the belief of the Government that its representation was true, but the foundation of it was asserted to be the test of actual borings… the direction to contractors to visit the site and inform themselves of the actual conditions of a proposed undertaking, will not relieve from defects in the plans and specifications...the contractor should be relieved, if he was misled by erroneous statements in the specifications…" |
| C44 | *Hills Materials Co. v. Rice (1992)* | "… the contract's Accident Prevention Clause… requires the contractor to "[c]omply with the standards *issued* by the Secretary of Labor at 29 CFR part 1926…"(emphasis added) …The company based its bids, in part, on the cost of complying with … (OSHA) regulations governing slope requirements... After Hills Materials submitted its bids, OSHA issued final regulations which substantially modified 29 C.F.R. § 1926.652 by requiring ditches with flatter slopes…" | "…the word "issued" in the past tense logically refers to regulations already issued, and not to changes which may occur in the future…if a contract is reasonably susceptible of more than one interpretation, it is ambiguous…Where such a latent ambiguity exists, the court will construe the ambiguous term against the drafter of the contract when the nondrafter's interpretation is reasonable…" |
| C48 | *US v. Turner Const. Co. (1987)* | "…specification § 17010, is as follows: "Air Volume Control Centers (QAC)… shall consist of metal cabinet | "The government, for example, argued that the word "etc." in paragraph 6A was intended to include the |

| | | | |
|---|---|---|---|
| | | constructed of 14 gage [sic] steel with hinged front, key locked doors, necessary guages, [sic] meters, controllers, etc., as specified herein and as shown on drawings…" The description of the contents of the metal cabinet does not mention the transmitter…" | transmitter in the contents list. The board rejected this argument, concluding that it is unlikely that the transmitter…would be referred to in such a minor and secondary fashion…The absence of the transmitter in the crucial paragraph, 6A, however, is just as strong a suggestion that the location of the transmitters was… a discretionary decision" |
| C49 | *L. Rosenman Corporation v. United States (1968)* | "Since the drawings for floors 8 through 15 did not indicate any connection between the thermostats and radiators whereas the drawings for the first five floors plus floor six did so indicate, plaintiff reasonably assumed from the beginning that the contract did not intend valves for floors 8 through 15." | "GSA Board of Contract Appeals did not think the valves were clearly required. (In fact, they thought the valves were clearly not required) … If it had wanted automatic radiator valves on all 15 floors, it should have said so explicitly…" |
| C50 | *Hensel Phelps Const. Co. v. US (1989)* | "…specifications called for a minimum of 18 inches of non-expansive fill under the concrete floor slabs, whereas a note on the drawings called for 36 inches of non-expansive fill…[subcontractor] relied on the "Order of Precedence" clause and prepared [its] bid based upon the 18 inches…" | "…we hold that an order of precedence clause may be relied on to resolve a discrepancy between the specifications and drawings even though the discrepancy is known to the contractor prior to bid or is patent." |

2

After a thorough analysis of the above-listed cases, the underlying reasons for which the owner is the entity to blame were identified. When a contractor is bound to perform the work by following plans and specifications provided by the owner, he is not to blame if an ambiguity in the contract documents that is not glaring nor blatant, but rather latent was present. In this case, if the contractor's interpretation of the contract is reasonable, the ambiguity is construed against the entity who drafted the faulty documents: the owner. For example, in C3, the specifications provided by the owner contained the wrong type of soil, which led to the damage of the dam. The court blamed the drafter (the owner) for having mistaken representations in the specifications that could not be discovered by the contractor until the work had started. Thus, owners should invest more time in the process of specification drafting to ensure the delivery of proper information concerning the existing conditions to the contractor. Another example is shown in C5, where the specifications of both the heating and the electrical subcontractors lacked the activity of the line of voltage installation. The court considered this ambiguity as latent since none of the subcontractors would have known that there was a missing item in their specs. Hence, aside from enhancing the drafting of specifications, owners should pay more attention to coordinating the different classes of contracts when the work is divided on multiple contractors.

Furthermore, in some cases, owners tend to shift the liability of defective plans to contractors by requiring them to perform in a workmanlike manner or according to defined standard practices. However, courts reported that such responsibility only applies to good performance, materials, and workmanship but does not act as a complete liability clause that relieves owners from damages due to defects in their plans and specifications. For example, in C4, Crescent (the contractor) was required to construct the metal roof "in

a workmanlike manner according to standard practices" and following the plans and specifications provided by Kubby (the owner). After the water leaked into the ceiling, Kubby claimed that Crescent did not perform in a workmanlike manner since he did not fill the gaps by flashing. However, the court ruled against the owner since the specifications provided by him did not call for flashing or caulking and the standards of workmanlike performance do not place such responsibility on the contractor. In addition to that, the requirement to perform in a workmanlike manner cannot be used as means to shift the responsibility of defective specification upon the contractor. Also, it is worth noting that the work was divided between Crescent and another masonry contractor, which affirms the reasonableness of Crescent's interpretation that flashing might have been the duty of the second contractor or Kubby himself. Thus, this case emphasizes the necessity of improving the drafting process of the specifications to minimize the omissions of work requirements. On top of that, coordinating the different classes of contracts should be done when the work is divided between several independent entities.

Another way that was used by owners to shift the responsibility of defects in contract documents to the contractors is by including disclaimers requiring contractors to: inspect the site, inform themselves of the project's requirements, or check the plans and specifications. However, courts considered that such disclaimers do not require contractors to pass upon the adequacy of the specs or drawings and do not relieve owners from their responsibility to provide a good quality of the basket of documents. For instance, in C1, the contractor was required to follow the plans offered by the owner, which turned out to be missing the representation of an existing dam. Even though the owner requested the contractor to check the plans before the start of construction, the court blamed the owner for faulty drawings, stating that "[t]he duty to check plans did not

impose the obligation to pass upon their adequacy." Similarly, in C43, the owner positively asserted the type of soil of the existing conditions which turned out to be erroneous. Even though the owner directed the bidders to examine the conditions in order to decide for themselves the real character of the existing material, the court ruled against him. The reason behind this ruling, as stated by the court, is that "the direction to contractors to visit the site and inform themselves of the actual conditions of a proposed undertaking will not relieve from defects in the plans and specifications…" Cases C1 and C43 are examples of disputes due to omissions and erroneous information, respectively, found in the plans provided to the contractor, which highlights the need to enhance the process of drafting the drawings before submitting them to bidders.

Besides, the owner was held liable in cases where the language used in the conditions of contracts was considered latently ambiguous. For example, in C44, the contract conditions stated a requirement for the contractor to comply with the standards "issued" by the OSHA. After the contract signature, when this organization modified particular requirements in its standards, the owner ordered the contractor to comply with the updated version, which led to increased costs. The contractor argued that the provision in the conditions of contracts only required him to abide by the standards that were already "issued" before the contract signature which relieves him from accounting for the extra cost. The court considered his interpretation to be reasonable by stating that "[b]y its plain meaning, the word "issued" in the past tense logically refers to regulations already issued…" Thus, owners can avoid such conflicts by improving the process of drafting of contract conditions by paying more attention to the choice of verb tenses.

Furthermore, where a discrepancy is present between plans and specifications, the contractor has the right to rely on the order of precedence clause, which states that

specifications should govern over drawings. In such cases, the owner is the entity to blame for the inconsistency between the documents. For example, in C50, there was a discrepancy between the plans (which called for 36 inches of fill) and the specifications (which called for 18 inches of fill). Since an order of precedence clause was present in the contract stating that the specifications shall control in case of conflict, the contractor relied on the description presented in the specification. It turned out that the later was erroneous and the correct description is the one shown in the plans. The court ruled against the owner by holding that "an order of precedence clause may be relied on to resolve a discrepancy between the specifications and drawings even though the discrepancy is known to the contractor prior to bid or is patent." Accordingly, owners should ensure good coordination between the information presented in the plans and specs.

On the other hand, in the absence of the order of precedence provision, the court usually examines if the discrepancy was patent or latent to determine the entity to blame. An illustration of such a case is presented in C25, where a dispute took place because of a discrepancy between the drawings and specifications. The specs required the contractor to install the sprinkler head in the center of the ceiling, whereas the plans left that decision to the contractor. In the absence of an order of precedence clause, the court examined the type of ambiguity, which turned out to be latent. For that reason, it held the owner accountable for the discrepancy between the two documents. Consequently, these two cases are examples of defects in contract documents that can be eliminated if owners enhance the coordination between the design documents.

Therefore, owners should pay more attention to the above-discussed reasons in which they are to blame to decrease the occurrence of the resulted disputes.

### 3.2.2 *Case Law where the Contractor is the Entity to Blame*

Table 3 below presents the second category consisting of 13 cases in which the contractor is the entity to blame for the various types of defects encountered in contract documents. It shows brief verbatim descriptions of each of the disputes along with their respective court ruling. The detailed descriptions and court rulings for the case law in which the accountability for defects rests on the contractor are shown in Appendix B.

1 *Table 3: Summary of cases particulars related to defects in contract documents in which blame is on the contractor*

| Case Code | Case Name | Case Description | Courts' Citation |
|---|---|---|---|
| C8 | *Dobler v. Malloy (1973)* | "It is agreed that the First Party [Dobler] will…do a proficient workmanlike job according to the highest standards of labor… damages for defects in the house discovered … due to lack of proper elevation of the house, and…a defective joist system..." | "If the plans and specifications on hand were not sufficient… Dobler, being an experienced builder, should have been aware of the facts… Dobler [should] "do a proficient workmanlike job according to the highest standards of labor... " This is an express warranty…" |
| C10 | *Lewis v. Anchorage Asphalt Paving Co. (1975)* | "Lewis… asked for a "good" and "complete" paving job… he wanted the contractor to do whatever was necessary to achieve a satisfactory pavement which would last the normal useful life…defects and deficiencies began to appear in the pavement some three to four weeks after the completion…" | "…there were express and implied warranties that the work would be done in a workmanlike manner which included placing a layer of gravel under the asphalt… Anchorage Asphalt knew or reasonably should have known of the subsurface conditions and consequently had a duty to warn Lewis of the possibility of the sort of failure…" |
| C12 | *Simpson v. United States (1899)* | "The United States by the written contract guaranteed the nature of the soil under the site of the proposed dock…in the specifications… [it was only stated] that the dock was to be built in the navy yard upon a site which was "available"." | "…the word "available" has not naturally the meaning… to support the contention that there was a warranty as to the condition of the soil…there is not contained a word implying that a particular piece of ground in the navy yard, having soil of a specially stable character …" |
| C18 | *Mayville-Portland Sch., etc. v. CL Linfoot (1978)* | "…it was discovered that the tank was severely damaged and unfit for its intended use… the architect rejected the tank… The School District contends that the risk of loss in the contract was on Linfoot until final acceptance by the architect…" | ""…the language of a contract should be interpreted most strongly against the party who caused the uncertainty to exist" …In this case, a certificate of substantial completion was never issued, and thus the risk of loss remained with the contractor…" |
| C29 | *Interstate Gen. Govt. Contractors v. Stone (1992)* | "…[owner] IGGC's Material Approval Submittal which indicated an intent to use conventional motor starters instead of more expensive variable speed fan power controllers (VSPCs)... the contracting officer advised IGGC that it was required to provide VSPCs in accordance with the contract specifications…" | "… the contract fails to express clearly the intention of the parties…the ambiguity is patent… the references to motor starters and VSPCs were intended to refer to different types of devices, it is not clear which was required … IGGC did not attempt to clarify its obligations under the contract at any time prior to bidding, it is precluded from recovering..." |
| C30 | *Hitt Contracting, Inc. v. U.S (2008)* | "…That amendment revised section 1.6 by striking out one sentence and adding another, so that it read: "… ~~The~~ | "…the ambiguity was a glaring one. Hitt failed to inquire, and therefore cannot recover now…Contrary to |

| | | | |
|---|---|---|---|
| | | ~~Police inspection station is on P Street and South Capitol Street S.E.~~ Coordinate deliveries with the US Capital [sic] Police by contacting them at 202-224-0908" … the Capitol Police required Anderson's trucks to be inspected six or seven blocks away…" | Hitt's contention, striking out language specifying the location of an inspection station does not justify an assumption that there will be no off-site inspection station at all. Modification of this solicitation language created a glaring ambiguity as to whether inspections would be on- or off-site." |
| C31 | *P.R. Burke Corp. v. U.S. (2002)* | ""b. The plant shall remain in operation during the entire construction period and the Contractor shall conduct his operations so as to cause the least possible interference…" …Burke submitted its demolition and construction plan…[it] required the shutdown of the existing trickling filter… Burke alleges the contract term "the plant shall remain in operation" is ambiguous" | "In denying Burke's claim for delay damages, the court determined that Burke's contract interpretation was unreasonable because it would have shut down the trickling filter…shutting down the trickling filter… meant the plant would not have "remain[ed] in operation." … ambiguity was patent…Burke, however, failed to clarify the ambiguity before submitting its bid…" |
| C33 | *Beacon Constr. Co. of Mass. v. United States (1963)* | "… specification starts by referring only to strips for entrance doors, not windows — but then that very opening sentence ends by requiring a weather-tight seal "on all 4 edges of doors … and double hung sash…" plaintiff's officers did not read the contract as calling for weather-stripping on the normal windows…" | "…there are surfacial inconsistencies, at the least, within the specification itself and between the specification and the drawing … which were and must have been obvious to plaintiff from the time it began to prepare its bid…Plaintiff did not, however, consult the defendant's representatives in settling this problem…" |
| C35 | *Fortec Constructors v. United States (1985)* | "Two alternative structures are shown for double curtain reinforcement. The detail on the left shows the rebar from the interior distribution rib stopping at the exterior grade beam. The detail on the right depicts the rebar from the interior distribution rib running into the exterior beam. No instruction was provided … to select either of these two alternative reinforcement schemes…" | "The Board's decision … found that the drawings, notes, and details were not a model of clarity… We hold as a matter of law that the contract was patently ambiguous… [it] raises the duty of inquiry, regardless of the reasonableness of the contractor's interpretation… Fortec did not seek clarification of the rebar requirements; it instead exercised its own judgment." |
| C36 | *Space Corporation v. United States (1972)* | "…there was no drawing [Drawing 202]…relating to a monitoring system…the chief estimator thereupon decided…that the cost of the monitoring system would come to about $35.00 per unit…the per unit cost was $410.00 rather than the $35.00 estimate that had been included in its bid." | "…the plaintiff did in fact know that there was an omission in the RFQ and that it should have known that it was an omission of the type that required further inquiry… The duty… is upon the contractor to call the government's attention to obvious omissions. It was the contractor, not the government, who was aware of the problem …" |
| C45 | *Edward R. Marden* | "Section 55-8 of the specifications contains the notation "4A" for roo0m 5B110, as does drawing # 1-41. | "…the specifications are in conflict with each other… contract is reasonably susceptible of more than one |

| | | | |
|---|---|---|---|
| | *Corporation v. United States (1971)* | However, unlike the 18 rooms in question, there was no symbol on any of the drawings which indicated that the floor of this room was to be covered with composition flooring…" | interpretation …there was indeed a latent ambiguity… Marden did not rely on an interpretation that composition or latex flooring was unnecessary in the mechanical rooms… [this] precludes the contractor's right to recover…" |
| C46 | *Newsom v. United States (1964)* | "Two parts of the contract said very different things: the specifications required construction on the second floors of buildings 81, 82, and 85, whereas the drawings required construction on the second floor of only building 85. Petitioner at no time inquired about this discrepancy …petitioner included in his bid the costs of the second floor of building 85 only…" | "The board held against petitioner on the ground that the error on page 8 of the drawings was a patent ambiguity which imposed upon the contractor a duty to inquire about it… It is impossible from the words of the contract to determine what was really meant…No interpretation ... can in the instant case, eliminate the substantial, obvious conflict between the drawings and the specifications" |
| C47 | *S.O.G. of Arkansas v. United States (1976)* | "On the face of the diagram was a notation stating that the diagram was "schematic and for the purpose of estimating only." The notation on the diagram also stated that "[d]esign of the diversion scheme will be in accordance with the applicable provisions of the specifications."… S.O.G. says that it based its bid on its own plan, believing that the diagram provided in the bid documents was in no way mandatory…" | "If the diagram itself could be entirely disregarded (because of the legend …) then there were specific parts of the specifications which appeared to implement the general plan of the diagram and were very hard to harmonize with plaintiff's position…the contradiction was not subtle, hidden, or minor but patent, blatant, and significant…Rather than ask for clarification, and despite the warning given it by the bid documents, S.O.G. ignored the conflict inherent in these documents…" |

2

The main reason behind the contractor being the entity to blame in the above-presented cases is the fact that the ambiguities found in the contract documents are patent. In other words, they are not hidden, or minor, but rather glaring and obvious on the face of the contract. So, the contractor should have known about them from the bidding phase and should have raised an inquiry to the owner concerning them before submitting his bid. So, even if the contractor's interpretation is reasonable, he will not be able to seek recovery of damage if he did not inquire about it before contract signature. An example of latent ambiguity is present in C36, where drawing #202 (the drawing of the monitoring system) was missing from the basket of bidding documents given to the contractor. This latter, instead of inquiring about the missing drawing, assumed the cost of the system and submitted his bid accordingly. Later during construction, when the assumed cost differed from that of the desired monitoring system presented in drawing 202, the court considered this omission as patent and ruled against the contractor because "the duty… is upon the contractor to call the government's attention to obvious omissions." Even though such a dispute could have been avoided if the contractor raised an inquiry concerning the missing drawing, the owner essentially has to enhance the drafting of the drawings and the preparation of a complete basket of bid documents to avoid the possibility of having such omissions. Another example of a patent discrepancy is shown in C46, which represents a dispute due to conflicts present between the plans and the specifications. The drawings required that construction of the second floor is only for building 85, whereas the specs required that to take place in buildings 81, 82, and 85. The court ruled against the contractor by saying that "the error on page 8 of the drawings was a patent ambiguity which imposed upon the contractor a duty to inquire about it…"

Therefore, contractors should take considerable time during the tender phase to study and review the tender documents to be able to identify ambiguities, if any. This way, contractors can report the uncertainty to owners during the bidding phase and resolve it before contract signature leading to fewer conflicts throughout the construction phase.

### 3.2.3 *Case Law Concerned with Defective Design*

This sub-section presents the identified case law related to disputes due to one type of defective documentation: defective design presented in defective design documents.

Table 4 below shows brief verbatim descriptions of each of the 13 identified disputes, their respective court ruling along with the entity to blame. The detailed descriptions and court rulings for the case law due to defective design present in contract documents are shown in Appendix C.

1 *Table 4: Summary of cases particulars involving defective design in contract documents*

| Case code | Case name | Case description | Courts' citation | Entity to blame |
|---|---|---|---|---|
| C7 | *Co-operative C. Stor, Bldrs., Inc. v. Arcadia Foods, Inc. (1974)* | "…as soon as defendant began to use it [concrete block walk-in meat cooler], Daly [defendant's president] noted a serious defect—water dripped from the ceiling in many areas… It appears thus the problem was created by a poor design, coupled with poor workmanship." | "If an undertaker fails to do the work he has contracted to do, or if he does not execute it in the manner and at the time he has agreed to do it, he shall be liable in damages for the losses …If the contractor is knowledgeable in the field where the plans are faulty, it is his duty to warn the owner…" | Contractor |
| C9 | *Home Furniture, Inc. v. Brunzell Construction Co. (1968)* | "The faulty performance complained of is narrowed to the specified tolerance level of the slab finish of the concrete, prestressed sixth floor, or roof, which, it was found, several months after the building had been occupied, puddled, or retained "bird baths" after the summer showers…" | "… where he [contractor] makes a contract to perform a given undertaking in accordance with prescribed plans and specifications… he is not permitted to vary from [them] …and therefore cannot be held to guarantee that work performed as required by them will be free from defects…" | Owner |
| C13 | *MacKnight Flintic Stone Co. v. the Mayor (1899)* | "The form of its promise was to furnish "the materials and labor for the purpose, and make water-tight the boiler room, etc... in the manner and under the conditions prescribed and set forth in the annexed specifications," and that it would turn the work over to the city in perfect order …" | "If there was an implied warranty of sufficiency, it was made by the party who prepared the plan and specifications … The fault of the defendant's plan should not prevent the plaintiff from recovering payment for good work done and good materials furnished precisely as the defendant required…" | Owner |
| C14 | *Sunbeam Construction Co. v. Fisci (1969)* | "… the complaint alleged that the roof was not fit for that purpose in that defendants did not provide a crown or slope thereto, and as a proximate result water collected thereon, causing the roof to break…" | "The trial court pointed out that … if the plans show no pitch in a roof, the roof is built without pitch… there cannot be an implied warranty that the contractor will supplement the inadequacy of the plans" | Owner |
| C15 | *Kurland v. United Pac. Ins. Co. (1967)* | "The air conditioning system was incorrectly and inadequately designed for the purpose for which it was intended…it was physically impossible to furnish or produce an air conditioning system sufficient to cool said apartment building by thirty | "… subcontractor did not warrant or guarantee that the system embodied in the architect's plans and specifications would produce the desired variation from outside temperature for the cooling of the apartment building…" | Owner |

| | | | | |
|---|---|---|---|---|
| | | degrees in extreme summer conditions by following or complying with said plans and specifications" | | |
| C16 | *American and Foreign Ins. Co. v. Bolt (1997)* | "… The new purlins were placed between the original purlins and bolted to the existing frame of the building utilizing a "gusset plate", rather than being bolted to the roof deck as the original purlins had been… the manner in which Bolt affixed the purlins complied with his snow load notation…inclement weather resulted … in its collapse." | "…Bolt had breached neither the contract nor the implied warranty of good workmanship. However, the jury did find that Bolt had been negligent, and that his negligence was the proximate cause of the roof collapse… Bolt knew that the manner in which he installed the additional purlins was wrong…Under Michigan law, Bolt failed to live up to a duty of care imposed on him…" | Contractor |
| C17 | *Miller v. Guy H. James Const. Co. (1982)* | "The engineering plans were defective…After Subcontractor [Miller] had partially completed the ditch liner, runoff from a heavy rainstorm washed it out… the slope grade should have been such as to allow water to travel no more than two feet per second…" | "The evidence is almost undisputed that: (1) the plans were defective; (2) they were furnished by Owner's engineer; (3) they were a part of Subcontractor's contractual obligation; and (4) Subcontractor fully complied with the terms of the contract... Subcontractor free from negligence …" | Owner |
| C19 | *WH Lyman Constr. Co. v. Vil. of Gurnee (1980)* | "A high ground water table was also discovered, and this required that Lyman install numerous dewatering wells. Due to the high subsurface hydrostatic pressures, the manhole bases as designed were unable to be sealed by the means permitted in the plans and specifications." | "… the design of a manhole base which when constructed could not withstand the hydrostatic sub-surface pressures …by the plans and specifications… defendant…negligently and in breach of implied warranty of accuracy and sufficiency of its plans and specifications…" | Owner |
| C20 | *Puget Sound Nat. Bank v. C. B Lauch Const co. (1952)* | "…one of the claimed deficiencies listed was the unsatisfactory condition of the exterior paint applied by Saxon; that to conform the exterior paint to the specifications made a part of all contracts, and to secure final approval required an additional coat of paint on all exterior surfaces" | "The contract called for a two coat paint job, not three …whether or not this was sufficient was a matter over which Saxon had no control…No faulty work on the part of Saxon was shown…the subcontractor is bound by the conditions and specifications contained in the original contract" | Owner |
| C21 | *Blue Bell, Incorporated v. Cassidy (1961)* | "… soil conditions were encountered which required a change in the design of the piles…it was discovered by defendant that certain columns supporting the structural steel beams had settled or sunk into the ground which caused excessive water to pond or stand on the roof… As this situation | "…underlying cause of the partial collapse of this building was either faulty design of the footings upon which the columns rested, or bad soil conditions or both… a construction contractor in this state is not liable for the collapse of a building, in the absence of a warranty on his part, where he | Owner |

| | | | | |
|---|---|---|---|---|
| | | developed…a portion of the roof of the building collapsed" | has followed plans and specifications furnished by the owner without a showing of negligence…" | |
| C23 | *Kansas Turnpike Authority v. Abramson (1960)* | "The contractor performed his contract in a satisfactory and acceptable manner…but before final acceptance as provided in the contract, unusual rains over a period of two weeks softened the "upper lifts" of the embankment…" | "…the contractor is not permitted to vary from the prescribed plans and specifications …and therefore cannot be held to guarantee that work performed as required by them will be free from defects…" | Owner |
| C24 | *Trustees of First Bap. Ch. v. McElroy (1955)* | "Nearly two years after completion of the church…the chimney flue exploded, causing considerable damage to the church. Appellee had nothing to do with the building of the chimney…" | "If any dangerous condition existed in connection with the vents installed by appellee, it resulted from plans and specifications prepared by appellant's architect, and which appellee was required to follow…" | Owner |
| C32 | *White v. Edsall Const. Co., Inc. (2002)* | "Mr. Oakey [designer] placed a disclaimer on one of the drawings, drawing S13, stating: "Canopy door details, arrangements, loads, attachments, supports, brackets, hardware etc must be verified by the contractor prior to bidding…"…After the contract award, USI discovered that the three-pick-point design would not work…" | "The Board found that the specifications incorporated defective design characteristic**s** … the disclaimer places the responsibility of verifying physical details, such as door size or the number of brackets needed, on Edsall, but it does not obligate Edsall to analyze the Government's design to determine whether it will work for its intended purpose." | Owner |

2

As we can see in Table 4, in most of the cases, the owner is identified as the entity to blame. This is explained by the fact that, when a contractor is asked to work following plans and specifications, he is not permitted to depart from them. And in the absence of any warranty on his part in the contract, he cannot guarantee that the given design will accomplish the intended purpose of the owner or that the resulting work will be free from any defect. Hence, when the contractor has adequately followed plans and specifications, without showing negligence from his part, he is relieved from any liability of defective design. An illustrative example is presented in C21, where the contractor followed the design provided in the plans and specifications, which turned out to be inadequate, leading to the collapse of the roof. The court blamed the owner stating that: "a construction contractor in this state is not liable for the collapse of a building, in the absence of a warranty on his part, where he has followed plans and specifications furnished by the owner without a showing of negligence." A similar case is shown in C32, where the three-pick-point design shown in the drawings provided by the contractor was not suitable for its intended performance. Even though the owner included a disclaimer on the plans stating that the contractor should verify the details prior to the submission of bid, the court ruling was done in favor of the contractor. The court explained the reason behind its ruling by saying that: "the disclaimer on drawing S13 did not shift any risk for design inadequacies to Edsall [the contractor]."

In other cases, where faulty design is also encountered, the contractor was the entity to blame. The underlying reasons for blaming the contractor in these cases are the following: he is knowledgeable in the field of construction, a duty of care was imposed on him, a warranty of effective design was given to him, and there was evidence of his negligence in performing the work. C7 is an example of a dispute where the contractor,

who is considered “knowledgeable in the field,” was blamed for defective design of the concrete meat cooler presented in the contract documents. The reason behind this ruling, as stated by the court, is that “[i]f the contractor is knowledgeable in the field, where the plans are faulty, it is his duty to warn the owner.” Another illustration is shown in C16, where the collapse of the roof was caused by the contractor’s negligence. The court said that: “Bolt knew that the manner in which he installed the additional purlins was wrong… Bolt failed to live up to a duty of care imposed on him…”

Defective design is a common problem that is often encountered in contract documents, which is leading to disputes. For that reason, owners should ensure that the design produced by the A/E firm is workable and suitable for the desired performance of the project. To do that, owners should enhance the design techniques to guarantee the correctness of the rendered design. On the other hand, contractors should be well aware of their responsibilities especially when these include warranties of effective design.

### 3.3 Identified Classes for the Basis of Defects in Contract Documents

After a thorough analysis of the 50 cases in hand, six major classes for the basis of defects in contract documents were identified. These represent the main areas of concern to the owner, which need to be enhanced for ensuring a better documentation quality. The classes were determined by examining each case law and determining where the documents were in error. The determined classes are the following: drafting of specifications, drafting of drawings, drafting of conditions of contracts, the correctness of rendered design, coordination between specification and drawings, and coordination between different classes of contracts. Table 5 below classifies the analyzed disputes

based on the class of impacted documents. It is important to note that some cases faced more than one type of defective class.

*Table 5: Identified classes for the basis of defects*

| Classes for the basis of defects | Cases |
|---|---|
| **Drafting of specifications** | C2, C3, C4, C5, C6, C8, C11, C12, C22, C26, C28, C29, C30, C31, C38, C39, C42, C43, C45, C48 |
| **Drafting of drawings** | C1, C8, C11, C35, C36, C49 |
| **Drafting of conditions of contracts** | C3, C10, C18, C27, C34, C40, C44 |
| **Correctness of rendered design** | C7, C9, C13, C14, C15, C16, C17, C19, C20, C21, C23, C24, C32 |
| **Coordination between specs and drawings** | C25, C33, C37, C41, C46, C47, C50 |
| **Coordination between different classes of contracts** | C4, C5, C24 |

To visualize the areas in which the documents were most frequently held in error, Figure 3 below shows the frequency of occurrence of each of the classes of defective documentation.

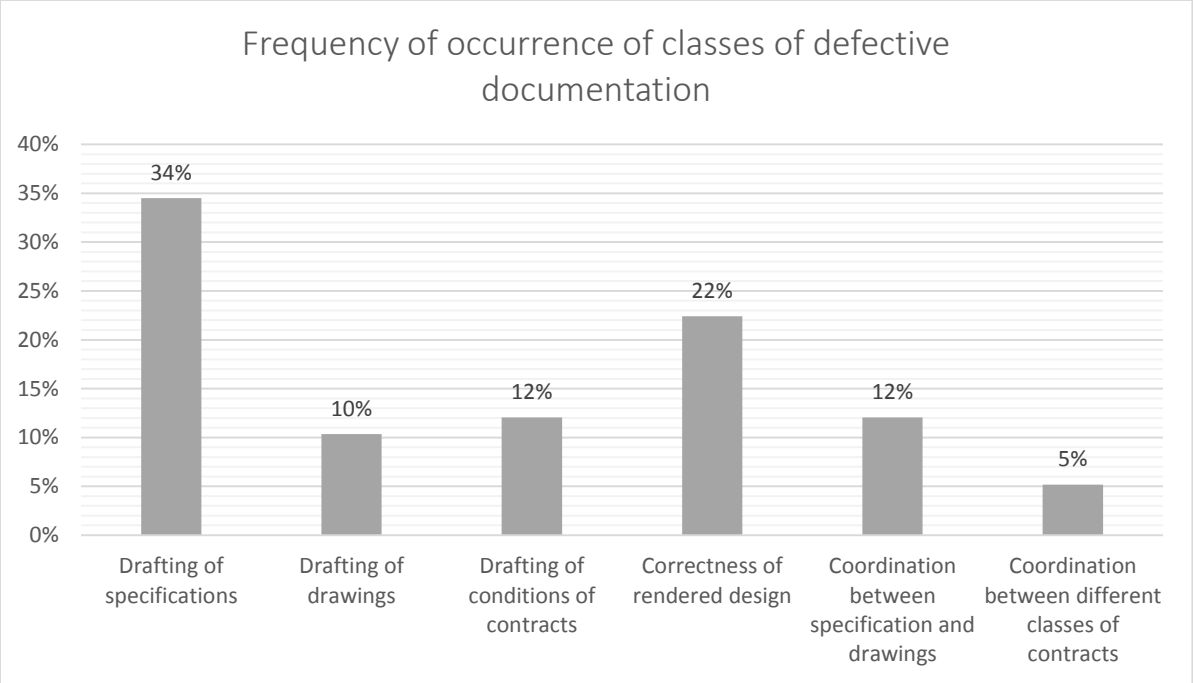


*Figure 3: Frequency of occurrence of classes of defective documentation*

The below sub-sections explain briefly each of the identified classes.

### 3.3.1 *Drafting of Specifications*

As can be seen from the figure above, the drafting of the specification is the area that scored the highest frequency of occurrence. This class is represented by cases where errors, ambiguities, and omissions present in the specifications have led to the occurrence of the dispute. As an illustration, the reason behind the dispute that took place in C2 is the presence of erroneous descriptions of the function of the firewall to be built in the specifications: “the firewall was to serve as an interior curtain wall rather than an exposed end wall”. In C3, mistaken representations for the existing conditions were shown in the specifications: “it was found that said dam was not backed with broken stone, sawdust,

and sediment as stated in paragraph 33 of the specifications, but that said backing was composed of a soft slushy sediment…and below that…sound logs filled with stones…" Similarly, in C11, "untrue" and "misleading" statements describing the type of soil were present in the specifications. For that reason, owners should intervene in the process of specification drafting to ensure a better quality of produced documents.

### 3.3.2 *Correctness of Rendered Design*

The area having the second-highest frequency of occurrence is the correctness of the rendered design. It represents the cases where the defective design of elements present in the contract documents is the root cause behind the resulting damages that led to the occurrence of the dispute. In fact, having a faulty design leads to inadequate and erroneous design documents. For example, the dispute that took place in C14 was caused by defective design present in the plans and specifications: "the roof was not fit for that purpose in that defendants did not provide a crown or slope". Similarly, in C15, a defectively designed air conditioning system was shown in the design drawings. The system was not able to serve its intended purpose to cool the apartments in the building by over 30 years during summer. Hence, owners should ensure a functional design that serves the realization of the intended performance of the facility before producing the design documents based on it.

### 3.3.3 *Drafting of Conditions of Contracts*

Drafting of conditions of contracts is another area of defects in contract documents that were found to prevail in several cases. It represents the cases where contract conditions contain ambiguous or defective clauses leading to confusion between project entities. For example, in C34, ambiguity resulted from the responsibilities imposed on the contractor from the general clause requiring him "to perform the work properly and safely

and to provide workmanlike service in the performance of said work". Similarly, in C44, latent ambiguities arose from the term "issued" used in the contract's accident prevention clause requiring the contractor to " comply with the standards *issued* by the Secretary of Labor at 29 CFR part 1926…" Consequently, owners should improve the drafting of contract conditions to eliminate ambiguities in order to avoid the resulting consequences.

### 3.3.4 *Drafting of Design Drawings*

Furthermore, the drafting of drawings is identified as one of the classes that are prone to be the source of disputes. In some cases, contractors were faced with erroneous and ambiguous representations presented in the drawings, as shown in C11: erroneous type of soil. In other cases, some elements were omitted from the plans like in C49 where the connecting lines indicating the installation of the valves were missing. Other examples of poorly drafted drawings are shown in C35 which presented two alternative reinforcement schemes for the same elements leading to confusion as to which detail should be executed. As a result, owners should put more effort into enhancing the process of drafting of drawings to eliminate the occurrence of disputes.

### 3.3.5 *Coordination of Specifications and Drawings*

Moreover, coordination between specifications and drawings is another area that needs more attention from the owner. In several cases, disputes took place because of the discrepancies present between specifications and drawings. In other words, design documents present different discerptions or representations for the same elements leading to a wrong understanding. For example, the specifications in C46 required the second floor to be constructed in buildings #81, #82, and #85. However, the drawings stated that the second floor of building #85 only should be constructed. Similarly, in C50, where the specifications required fill of 18 inches, whereas drawings required fill of 36 inches. Thus,

owners should ensure that drawings and specifications contain consistent descriptions of work requirements to reduce resulting confusion.

### 3.3.6 *Coordination of Classes of Contracts*

Finally, coordination between different classes of contracts is identified as one of the classes of defective documentation. It is represented in cases where the scope of work is divided between multiple contractors without correct coordination between their respective packages. An example illustrating this class is shown in C5 where both packages of subcontractors, the one responsible for heating works and the other responsible for electrical works, excluded the task of the line of voltage installation. Another example is represented in C24 where lack of coordination between the steam generator installation package and that of chimney installation resulted in the chimney flue's explosion. Hence, owners should ensure good coordination between different classes of contracts when the work is divided into multiple packages.

## 3.4 Validation of the Theoretical Guidelines

After conducting a case law review for a sufficient set of disputes that occurred due to defects in contract documents, validation of the righteousness of the five previously suggested broad guidelines by Laryea (2011) is done to ensure their effectiveness in practice.

The validation was performed by testing the guidelines on each of the analyzed cases. This was done by checking if the dispute in each case law could have been avoided had the owner: knew what he wanted, described it very clearly, did not assume that other people know what he wanted, told them what he wanted, and did not change his mind. Table 6 presents all the analyzed cases with an explanation of how they relate to each of

the five guidelines. The explanation is written using the same language used in the five guidelines to explicitly state what the owner could have done to avoid the resulted defects.

As an example, the guidelines related to the defect in C1 are: “Know what you want” and “Describe it very clearly.” In other words, the dispute resulting from C1 could have been avoided if the owner:

1- Knew what he exactly wanted: knew that he wanted to build a dry-dock in a sewer where a dam is located
2- Described it very clearly in the specifications: described the conditions of the sewer by clearly indicating that a dam was present

Another illustration s shown in C2, which is related to the following guideline: “Do not change your mind.” For instance, the resulted dispute was not to happen if the owner did not change his mind concerning the function of the firewall. Before construction, the firewall was to serve as an interior curtain wall, whereas after construction, the owner changed his mind and decided to use it as an unsupported free-standing end wall.

A similar explanation is done for the other cases and is summarized in Table 6 below.

*Table 6: Detailed explanations of the guidelines corresponding to each of the analyzed cases*

| Case Code | Guideline Code | Corresponding Detailed Explanations |
|---|---|---|
| C1 | G1 | Know that you want to construct a dry dock in a sewer where there is an existing dam |
| | G2 | Describe the conditions of the sewer very clearly by indicating that a dam is present |
| C2 | G5 | Do not change your mind about the intended function of the firewall |
| C3 | G1 | Know that you want to repair a dam that is backed with soft slushy sediments (instead of broken stone, sawdust, and sediment) |
| | G2 | Clearly describe the responsibility of the contractor to check the type of backfill material by himself and not to rely upon the positively stated description in the specs |
| C4 | G3 | Do not assume that the contractor knows that flashing is required to perform in good workmanship without stating it in the specifications |
| | G4 | Tell the contractor that he should complete the flashing activity |
| C5 | G3 | Do not assume that the contractor knows that he is required to install the line of voltage without stating it in the specifications |
| | G4 | Tell the contractor he should that he should install the line of voltage |
| C6 | G1 | Know that you want a type of curtain wall that is suitable for high rise buildings |
| | G5 | Do not change your mind about the type of material that is most suitable for your use |
| C7 | G1 | Know that you want a functional design for the concrete block cooler that would not allow water to drip from the ceiling |
| C8 | G2 | Clearly describe the details of the joist system in the plans and specifications |
| | G3 | Do not assume that the contractor knows the suitable span and strength of joist by simply requiring him to do a workmanlike job |
| C9 | G1 | Know that you want a functional design that states the suitable tolerance level for the concrete slab finish of all the floors |
| C10 | G3 | Do not assume that the contractor knows what you mean by "good" and "complete" paving job |
| | G4 | Tell the contractor the detailed characteristics of the paving job you desire |
| C11 | G1 | Know that the material that you want the contractor to excavate consists of stumps, buried logs and cemented gravel and sand (instead of gravel, sand, and clay) |
| C12 | G2 | Describe the soil type of the yard over which the dock was to be built |
| | G3 | Do not assume that the contractor understood that he has the liability of examining the conditions of the soil by only stating that the site is "available" |
| C13 | G1 | Know that you want a functional design that ensures a waterproof boiler room |
| C14 | G1 | Know the needed characteristics of the roof that you want (the slope of pitch characteristic) to ensure its proper functioning |
| | G2 | Clearly describe the responsibility of the contractor to check the adequacy of the plans in meeting the project's requirement if you wish to impose on him such liability |

| | | |
|---|---|---|
| C15 | G1 | Know that you want a design that ensures the ability of the air conditioning system to cool the apartment by thirty degrees in extreme summer conditions |
| | G2 | Clearly describe the liability of the contractor to ensure that the design will enable the desired cooling temperature if you wish to impose on him such liability |
| C16 | G1 | Know the appropriate manner in which you want to install the purlins to ensure their proper functioning |
| C17 | G1 | Know the suitable slope grade that you want for the desirable functioning of the drainage ditch |
| C18 | G2 | Describe clearly the liability of the contractor to ensure the good functioning of the facility even if he properly followed the plans and specifications |
| C19 | G1 | Know that the sewer that you want to construct is located on water-bearing sandy and silty soil (instead of clayey soil) |
| | G1 | Know that the suitable manhole for the sanitary sewer that you want should withstand hydrostatic sub-surface pressures |
| | G2 | Clearly describe the responsibility of the contractor to check the type of soil rather than simply stating a duty to inspect the site |
| C20 | G1 | Know that the desired quality of paint that you want requires three coats instead of two |
| C21 | G1 | Know that the columns of the building you want should be designed against settlement |
| C22 | G2 | Describe the pilling process very clearly |
| | G3 | Do not assume that the contractor knows what it means to drive the pile to “refusal” |
| C23 | G1 | Know what design characteristics are needed to ensure good performance of the roadbed that you want |
| C24 | G1 | Know the proper location where you want to install the steam generator to avoid any contact with the chimney |
| C25 | G1 | Know whether you want the sprinklers to be installed in the center of the ceiling tile (as stated on drawings), or according to the code requirements (as stated in specs) |
| | G2 | Describe the mode of installation of the sprinklers very clearly, and describe clearly what you mean by “design intent only” |
| | G5 | Do not change your mind throughout contract drafting concerning the location of installation of the sprinklers |
| C26 | G3 | Do not assume that the contractor knows that you want to include the price of the rebars in the price of the slab without listing it among the components |
| | G4 | Tell the contractor that the rebars will be paid within the unit price of the slab |
| C27 | G2 | Clearly describe the payment clause and explicitly state the “pay when paid” relationship with the contractor |
| C28 | G2 | Describe clearly the characteristics of the waterproofing design of the parapet walls |
| | | Clearly describe that you want to apply flashing material in certain areas rather than paint by explicitly stating that instead of simply showing three random parallel lines |
| | G3 | Do not assume that the contractor knows what the three parallel lines on the drawing mean |

| | | |
|---|---|---|
| | | Do not assume that the contractor knows that the words “layers,” “coats” and “piles” refer to the same element |
| C29 | G2 | Clearly describe that you want to install VSPCs and not motor starters |
| | G3 | Do not assume that the contractor knows that the term “motor starters” is used to refer to VSPCs |
| C30 | G3 | Do not assume that the contractor knows that inspection could take place on-site or off-site |
| | G4 | Tell the contractor that you want inspections to be done off-site |
| | G5 | Do not change your mind about the location where the inspection is going to take place without notifying the contractor about the new location |
| C31 | G2 | Describe very clearly that you want all the parts of the plant to remain in operation throughout the whole construction period |
| C32 | G1 | Know that the three-pick-point design is not suitable for the proper performance of the facility you want |
| | G3 | Do not assume that, by placing a general disclaimer to check drawings, the contractor understood that he has a responsibility to verify the three-pick-point design |
| C33 | G1 | Know whether you want to perform weather-stripping for entrance doors only or windows as-well |
| | G2 | Describe very clearly the weather-stripping activity |
| | G5 | Do not change your mind throughout contract drafting regarding the elements over which weather-stripping is required |
| C34 | G2 | Describe clearly the liabilities that you want to impose on the contractor |
| | G4 | Tell the contractor that you want to shift the ultimate responsibility for any negligence (even that caused by you) on him |
| C35 | G2 | Describe very clearly which alternative reinforcement scheme you want the contractor to follow |
| C36 | G2 | Describe very clearly the characteristics of the monitoring system that you want to use |
| C37 | G2 | Describe very clearly in which buildings you want to install the kitchen exhaust fans |
| C38 | G2 | Describe very clearly which lane closure type (temporary or permanent) you want the contractor to use |
| C39 | G2 | Describe very clearly the process of relamping |
| | G3 | Do not assume that the contractor knows what you mean by the word “relamping” |
| C40 | G2 | Describe very clearly the meaning of broad terms such as “work” in contract clauses |
| | G3 | Do not assume that the contractor knows what you mean by the term “work” |
| C41 | G2 | Describe very clearly whether the concrete sidewalks are to be built |
| C42 | G1 | Know that the type of soil where you want to the excavation of the ship channel to take place is limestone rock and limestone bedrock (instead of clay, gravel, sand, and boulders) |
| C43 | G1 | Know the correct character of the existing soil where you want to excavate |
| | G3 | Do not assume that the contractor knows that, by telling him to examine the existing conditions, he is held liable for the accuracy of the description in the specs |

| | | |
|---|---|---|
| C44 | G2 | Describe very clearly the duty of the contractor to comply with the OSHA regulations for slope requirements including any upgraded version of it |
| | G3 | Do not assume that the contractor knows that the verb "issued," used in the past tense, does not limit the regulation to the already issued versions before the bid submission |
| C45 | G2 | Describe very clearly the latex flooring activity and whether it should be performed for mechanical rooms or not |
| | G5 | Do not change your mind throughout contract drafting regarding the requirement of latex flooring for mechanical rooms |
| C46 | G2 | Describe very clearly if you want construction on the second floor to take place in buildings 81, 82 and 85 or just in building 85 |
| | G5 | Do not change your mind throughout contract drafting regarding which buildings you want construction on the second floor to take place |
| C47 | G3 | Do not assume that the contractor knows what you mean by the expression "schematic and for the purpose of estimation only" |
| | G4 | Tell the contractor that you want him to abide by the construction scheme of the project depicted in the schematic diagram |
| C48 | G2 | Describe very clearly the location where the transmitter should be installed |
| | G3 | Do not assume that the contractor knows that, by using the term "etc." at the end of the list of components of the QAC, you mean to refer to the transmitter |
| | G4 | Tell the contractor that you want the transmitter to be installed in the QAC |
| C49 | G2 | Describe very clearly which floors require the installation of thermostats and radiator valves |
| C50 | G2 | Describe very clearly the minimum requirements of the fill under the concrete floor slab |
| | G5 | Do not change your mind throughout contract drafting regarding which buildings you want construction on the second floor to take place |

Figure 4 below presents a diagram showing the interrelation between the theoretical recommendations and the analyzed cases which is deduced from Table 6.

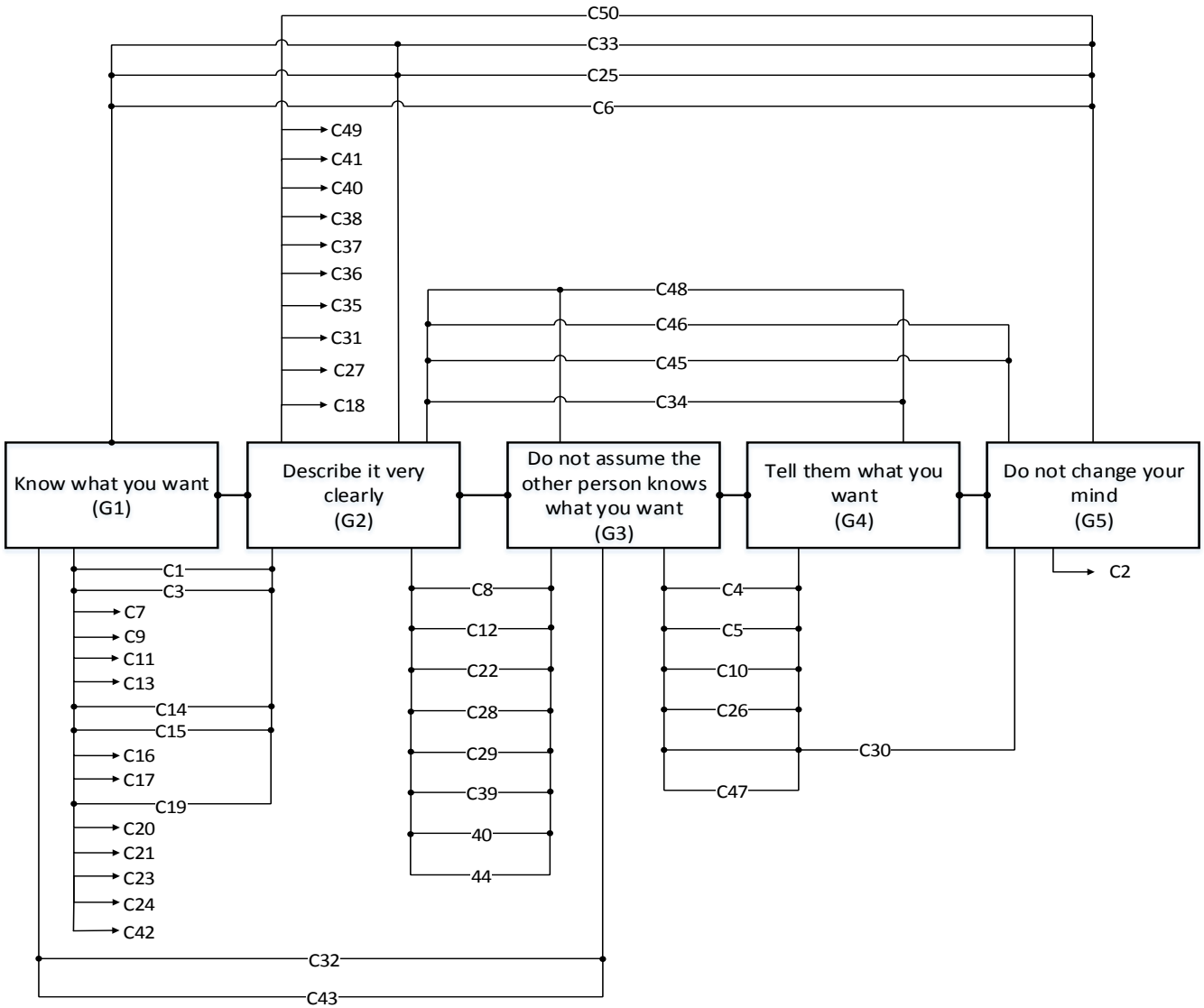


*Figure 4: Interrelation between the analyzed cases and the five theoretical guidelines*

The diagram shows that the effectiveness of the five theoretical guidelines has been validated by all the 50 scrutinized cases. In fact, some cases are connected to only one guideline (like C7, C9, C18, C27…), whereas other cases are connected to more than one guideline (like C1, C3, C25, C33…). This explains that the guidelines themselves are sometimes interrelated to each other. In other words, in some cases, for the owner to follow a certain guideline, he must first ensure the realization of another guideline leading to it (the guideline that is prerequisite to it). For example, the cases that are connected to G1 and G2 (like C1, C3, C14…), for the owner to describe clearly what he wants, he should know what he really wants in the first place. Similarly, for the cases connected to G3 and G4 (like C4, C5, C10…), the owner should not assume that the other person knows what he wants in order to be able to tell him properly what he wants. On the other hand, other case law proved that the owner might know well what he wants but his failure to describe it very clearly in the contract documents results in defective documentation.

# CHAPTER 4

# INFERRED DETRIMENTAL PRACTICES IN DRAFTING CONTRACT DOCUMENTS

## 4.1 Preamble

The findings of the previous chapter highlighted the classes in which contract documents are frequently held in error using legal evidence. These bring the attention of the owner to improve the identified areas of impacted documents which are prone to be the source of disputes.

In this chapter, the identified classes for the basis of defects are extended into what we call the "practical inferences". These represent the direct root causes behind the occurrence of disputes in each of the analyzed cases. The idea here is to infer the means with which owners can avoid having such documents being held in error.

## 4.2 Classification of Case Law Per Deduced Inferences

After deducing the general areas where contract documents are found to be defective, the second round of case law scrutinization is performed. In order to identify the direct root causes behind the occurrence of each of the disputes, the reasoning behind the decision taken by the court was analyzed. This enabled the determination of 18 practical inferences representing what should be avoided to ensure a better quality of contract documents.

Table 7 below presents the list of the 18 deduced inferences along with the cases relating to it. Verbatim language extracted from the court ruling's decision is used in deducing some of them. Others were determined from the reasoning behind the court's

decision. For instance, it is important to mention that in some cases, more than one root cause for defective documentation was determined. This explains why some cases are shown in different inferences.

*Table 7: Classification of cases per deduced inferences*

| # | Inferences | Case Law |
|---|---|---|
| **I1** | "Mistaken representations"[a] of existing conditions | C1, C3, C11, C19, C42, C43 |
| **I2** | Ill-coordinated sequencing of work packages' activities | C2, C24 |
| **I3** | Use of "Positive Assertion"[a] | C3, C11, C19, C42, C43, C44 |
| **I4** | Uncoordinated assignment of scope to multiple contracts | C4, C5 |
| **I5** | Broadly specifying work to be done in a "workmanlike manner or according to standard practices"[b] | C4, C8, C10, C14, C44 |
| **I6** | Selection of inferior material not commensurate with its intended use | C6 |
| **I7** | Clearly described defective design leading to unsatisfactory performance | C7, C9, C13, C14, C15, C16, C17, C19, C20, C21, C23, C24, C32 |
| **I8** | Lack of "factors that accurately determine the meaning"[c] of broad terms or expressions | C12, C22, C25, C31, C38, C39, C40, C47 |
| **I9** | "Surfacial inconsistencies"[d] in describing design elements within and between different documents | C25, C29, C33, C35, C37 C45, C46, C50 |
| **I10** | Non-comprehensive descriptions of integrative work item constituents | C26, C48 |
| **I11** | Striking out language from the contract without providing explicit clarifications or alternative provisions | C27, C30, C41 |
| **I12** | Use of "innocuous boilerplate language"[e] for assigning/transferring liabilities | C2, C15, C18, C19, C34 |
| **I13** | "Interchangeabl[e]"[f] usage of synonyms for referring to the same work item | C28, C29 |
| **I14** | "General disclaimers requiring the contractor to check plans and determine project requirements"[g] | C1, C3, C32, C41, C43 |
| **I15** | "Language that allow[s] for two reasonable alternative explanations" | C38 |

| | | |
|---|---|---|
| **I16** | Referring to essential components using "indirect and secondary means" making them a "discretionary and not a proprietary feature of the contract" | C48 |
| **I17** | "Inadvertently omitt[ing]"[f] certain items from specifications and/or drawings | C1, C4, C5, C12, C28, C36, C49 |
| **I18** | Use of improper, arbitrarily chosen verb tenses in contract clauses limiting the intended applicability of referenced standards | C44 |

[a] Adopted from C3
[b] Adopted from C4
[c] Adopted from C22
[d] Adopted from C33
[e] Adopted from C34
[f] Adopted from C28
[g] Adopted from C32

### 4.2.1 *Reasoning Behind the Deduced Inferences*

The sub-sections below present explanations for each of the deduced inferences by giving examples from the associated cases.

#### 4.2.1.1 "Mistaken Representations" of Existing Conditions

The first inference, "mistaken representation" of existing conditions, is identified as one of the main pitfalls present in contract documents which have led to the occurrence of disputes in several cases. This takes place when drawings or specifications contain erroneous information, descriptions, or representations for certain existing conditions of the project. In other words, the state of the site on which the project will be constructed is claimed to be different than how it is in reality. As a result, contractors prepare their bid based on mistaken information which leads to conflicts during the construction phase. In fact, the verbatim expression "mistaken representation" is adopted from the court ruling in C3.

For example, in C1, the plans provided by the owner to the contractor for the construction of a dry dock were missing an existing dam that was located in the sewer. In

C3, the specifications stated that the dam was backed with broken stone, sawdust, and sediment. However, upon the start of construction, the material turned out to be soft slushy sediment. Thus, the specs provided the contractor with “mistaken representation” for the existing conditions of the soil. Similarly, in C11, “erroneous and deceptive drawings” described the type of existing soil to be sand, clay, and gravel. However, the soil turned out to consist of stumps, buried logs, along with cemented sand and gravel. Also, in C42, the court explained the root cause behind the dispute by saying that the “large part of the material, arbitrarily stated to be clay, gravel, sand, and boulders, was, in fact, limestone rock and limestone bedrock, and was not the material specified in the contract.”

#### 4.2.1.2 Ill-Coordinated Sequencing of Work Packages' Activities

Ill-coordinated sequencing of work packages' activities is among the defects that were identified to be the source of disputes. When the scope of the project is divided into several trade packages, it is prone to face such type of deficiency in its respective contract documents. The reason behind facing such pitfall is the random, uneducated, and uncoordinated sequence in which the different trade packages are launched.

To illustrate, in C2, the contractor signed a contract to build a firewall that serves as an interior curtain wall standing between two buildings: an existing pilot plant and the expanded part of it (which is another pilot plant to be built directly after the wall). Accordingly, the drawings and specifications provided to him presented the methods of work and design elements satisfying the intended scope of the wall to be built. However, after that the contractor finished the construction of the firewall, the owner changed his mind and decided not to build the new pilot plant. This caused the already-built firewall to serve as an exposed, unsupported free-standing end wall rather than simply being an

interior curtain wall. Since the design of the wall was not done for such purpose, a winter storm caused it to fall leading to the damage of the surrounding buildings. Thus, one can deduce that in order to avoid the occurrence of such a problem, the work packages of different trades should be coordinated and lunched in synchronization with one another. In fact, it would have been better if the firewall was to be built after the construction of the new pilot plant because it was not intended to function properly in the absence of the new building. This way, if the owner changed his mind and decided not to build the new pilot plant, he would have designed the firewall to serve as an end-wall from the beginning.

#### 4.2.1.3 Use of "Positive Assertion"

The use of "positive assertion" is among the other defects that were found to prevail in several cases. It characterizes the situation where positive statements are used to describe certain aspects of existing conditions or design elements, but turn out to be erroneous. In fact, the verbatim expression "positive assertion" was also adopted from the court ruling in C3.

To illustrate, the specifications in C3 assured the contractor that the dam was backed with broken stone, sawdust, and sediment. The court stated that "the specifications spoke with certainty as to a part of the conditions to be encountered by the claimant" which turned out to be wrong. As a result, the court ruled against the owner by saying that: "In its positive assertion of the nature of this much of the work it made a representation upon which the claimants had a right to rely without an investigation to prove its falsity…" Also, in C11, the type of soil was positively stated in the plans, so "the claimants believed the information furnished [to] them to be accurate and reliable." Another example is case C42, where "the explicit declaration of the contract of the

material to be excavated" turned out to be mistaken, leading to additional construction costs. Thus, to avoid the occurrence of disputes due to erroneous representations, it is important to verify the accuracy of the information before positively stating it.

#### 4.2.1.4 Uncoordinated Assignment of Scope to Multiple Contracts

Uncoordinated assignment of scope to multiple contracts is a potential pitfall that can take place when the scope of the project is divided into several trade packages. This is illustrated in C4, where the construction of a metal shed was divided between two trade contractors: the first contractor is to build the masonry wall and the second contractor is to build the metal roof. This latter was required to perform his work in a workmanlike manner and in accordance with the drawings and specifications provided by the owner. The problem that took place was due to the flashing activity, which was not mentioned in the plans. The owner assumed that it was not necessary to mention flashing in the contract since completing the construction of the roof without this activity will not be considered a work performed in a workmanlike manner. On the other hand, the contractor, who is bind to follow the plans and specifications, assumed that this activity is not included in his work package (and might be included in the package of the other trade contractor responsible for the execution of the masonry wall). Thus, having multiple contractors doing different parts of the work requires more attention from the designer to include all the details of the required activities that each trade contractor must execute. Problems like these have less probability of occurring if the project is not divided into several packages. A similar conflict took place in C5 where the "line voltage temperature control wiring was not included in the plans, specifications or contract price" of any of the sub-contractors (the heating sub-contractor and the electrical sub-contractor). Thus, the task of installing the line voltage was left unexecuted.

#### 4.2.1.5 Broadly Specifying the Work to Be Done in a "Workmanlike Manner or According to Standard Practices"

The general expression requiring the contractor to work in a "workmanlike manner or according to standard practices" has led to confusion as to what work this statement exactly entails. In C4 discussed above, the contract stating that "the job was to be performed in a workmanlike manner according to standard practices" lead to a conflict between the owner and the contractor concerning the flashing requirement of the metal roof.

The same expression was stated in the contracts in C14 where the contractor was bound to construct the roof in a workmanlike manner and according to the provided specifications. The roof ended up not serving the purpose because it did not include a slope that would eliminate the collection of water. To the owner, the requirement of construction in a workmanlike manner impose on the contractor the obligation of providing a slope. However, to the contractor, he was bound to follow the specifications as is. Thus, this expression adds an ambiguity concerning what the owner expects the contractor to complete vis-à-vis how the contractor understands what he is required to do. For that reason, it is advisable to avoid using such broad expressions in the contract and as an alternative, clearly and explicitly stating the requirements that the contractor must achieve.

#### 4.2.1.6 Selection of Inferior Material Not Commensurate with its Intended Use

The selection of inferior material not commensurate with its intended use was identified among the pitfalls of the construction contract documents leading to construction damages and disputes. In C6, where the scope of the project was to construct a high-rise apartment building, the owner's architect chose a "less costly curtain wall and

one of lighter construction which was not suitable to the high rise building," resulting in numerous construction defects. Therefore, designers should avoid choosing a less costly type of material in the plans and specifications if it is not suitable for the intended use of the facility.

#### 4.2.1.7 Clearly Described Defective Design Leading to Unsatisfactory Performance

A clearly described defective design leading to unsatisfactory performance was determined as the inference with the highest frequency of occurrence in the analyzed set of cases, which were listed as a separate category in table 3. An illustrative example is shown in C15, where "the air conditioning system was incorrectly and inadequately designed for the purpose for which it was intended." Another example is shown in C17, where "the engineering plans were defective according to the evidence presented at trial," causing the ditch to be washed out by a rainstorm. Likewise, in C19, where "the design of a manhole base which when constructed could not withstand the hydrostatic sub-surface pressures," which lead to severe damages. For this reason, the owner should make sure that the design, represented in the plans and specifications given to the contractor leads to the desired scope of the designed element.

#### 4.2.1.8 Lack of "Factors that Accurately Determine the Meaning" of Broad terms or Expressions

This inference is illustrated by the use of general words in contract documents that might be understood in several ways, without explaining their exact meaning. As an illustration, in C22, the specifications stated that the pilling should be driven to "refusal," leading to the occurrence of debate concerning the actual meaning of this term. Contractors thought that it means that "the piles should be driven until they would not move downward," whereas the engineer contended that refusal represents the point

“where we expect to develop the resistance that is adequate for this particular job.” According to the court, this confusion took place because “factors were lacking in the specifications to accurately determine the meaning of “refusal.”

Similarly, in C39, the contract required “relamping” before the finish of the construction. Because of using this term, the court explained that “specifications are susceptible to two different reasonable interpretations.” To the knowledge of the contractor, the term “relamping” is never used in a new construction project. Usually, this term is used in renovation projects where all the old lamps need to be replaced, unlike the current case, which was the construction of a new facility. For that reason, the contractor considered that the use of the term “relamping” in the project at hand was meant to require the replacement of the burned-out, damaged, and broken lamps only by the end of the construction. However, for the owner, this term was used to require the contractor to replace all lights in the facility.

Another example is represented in C47 where a notation appeared on the drawings saying that the diagram was “schematic” and “for estimation only.” The contractor understood from this expression that the suggested dam design was not mandatory, and he was free to prepare his plan as long as he meets the desired aim of the dam. However, the owner intended to use this expression as a liability shift to the contractor to make sure that the design is workable. Hence, broad terms should be provided with clear explanations to avoid any resulting confusion.

#### 4.2.1.9 "Sufacial Inconsistencies" in Describing Design Elements Within and Between Different Documents

Discrepancies happen when the description or representation of the same item differs between drawings and specifications or when within the same document (drawings, for example), the same element is described differently. An example of this inference is shown in C33, where one part of the specification required the weather-stripping for the entrance doors only, whereas the drawings and other parts of the specifications demanded weather-stripping for the windows as well as the entrance doors. The court stated that "there are surfacial inconsistencies, at the least, within the specification itself and between the specification and the drawing," causing two conflicting instructions for the same activity.

Another example is shown in C46, where the court reported that a "substantial, obvious conflict between the drawings and the specifications" resulted in having "two parts of the contract [saying] very different things" concerning the construction taking place on the second floor. Specifications described the work to be performed on the second floor in buildings 81, 82, and 85, whereas drawings required construction on the second floor to be done in building 85 only. Similarly, in C50, specifications required a minimum fill width of 18 inches to be placed under the concrete floor slabs while the drawings called for a fill of 36 inches width. Thus, owners should focus on providing consistent information between all the contract documents instead of relying on the order of precedence clause that might not serve in favor of the owner's requirements.

#### 4.2.1.10 Non-Comprehensive Descriptions of Integrative Work Item Constituents

Non-comprehensive descriptions of integrative work item constituents take place when, in a statement of components of an element in contract documents, certain items

belonging to the same character are excluded. This leads to an incorrect assumption that only the listed constituents are to be installed or constructed. In C46, the section in the specifications describing the basis of payment of the bridge approach slabs stated that its unit price includes the following: the pre-molded expansion joint filler, joint backing, and joint sealing material and the closed-cell neoprene sponge. It did not list the rebars of the slab as one of its components. Disagreement concerning the basis of payment of the rebars took place between the owner and the contractor. The latter assumed that the rebars, since not mentioned among the components of the slab, will be paid separately; nevertheless, the owner believed that the rebars are inherent components, and the cost of their installation is included in the mentioned unit price of the approach slab. The court found that "the mention of certain items implies the purposeful exclusion of other items of the same general character" and that the owner "could have easily listed every component that it intended to include in the unit price for approach slabs." Hence, a comprehensive description of the components of the integrative work items is necessary to avoid resulting ambiguities.

#### 4.2.1.11 Striking Out Language from the Contract Without Providing Explicit Clarifications or Alternative Provisions

This pitfall is represented by cases where owners strike out certain sentences from the contract without explaining the new resulting meaning of the context, leading to confusion. An illustrative example is shown in C30, where the owner struck out a sentence from the section describing the inspection process in the specification. The phrase that was removed indicated the location where inspections for trucks were to take place, which was a particular street far from the project's site. So, since this sentence was removed, and nothing in the contract mentioned that there could be off-site inspections,

the contractor understood that inspections are going to take place on-site and submitted his bid accordingly. However, after the start of the construction, it turned out that investigations are going to take place six to seven blocks away from the site, leading to much higher transportation costs. The owner explained that the reason behind striking out that sentence was that during the bidding phase, he knew that he wanted to change the old location where the inspection is going to take place, but he did not know the new site and decided to leave it for later. The court mentioned that the "modification of this solicitation language created a glaring ambiguity as to whether inspections would be on- or off-site."

In C27, the general contractor stuck out a sentence present in the progress payment and the final payment clause of the contract with his subcontractor. The part of the clause that was removed stated that in case the owner was not paying the general contractor, this latter still has to pay the subcontractor on demand. Removing this sentence with no clarifications resulted in an ambiguity in the contract. The subcontractor understood that the removal of the statement is just to allow the general contractor a reasonable time to be able to pay the subcontractor in case the owner is not paying him. Whereas for the general contractor, by striking out this sentence from the clauses of payments, he wanted to establish a "pay when paid" relationship with his subcontractor, where paying him is a condition precedent to receipt of payment from the owner. Hence, such ambiguity could have been avoided if, upon removing the sentence from the payment's clause, clarifications were provided by clearly stating that payments are under the "pay when paid" defense.

#### 4.2.1.12 Use of “Innocuous Boilerplate Language” for Assigning/Transferring Liabilities

The use of "innocuous boilerplate language" for assigning/transferring liabilities is explained by the event where the owner uses general, commonly used liability clauses to increase the contractor’s responsibilities without explicitly stating them. As an example, in C34, the owner introduced the following clause in the contract: “the private contractor shall be responsible for all damages to persons or property that occur as a result of his fault or negligence...”. During construction, one of the contractor’s employees was severely injured because of accidental contact with an electric wire. Knowing that one of the duties of the owner was to make sure all the wires in the location of work are properly de-energized, the contractor claimed for the accident’s resulting expenses. The owner argued that the aim of introducing the above clause was to shift the responsibility to the contractor. However, this latter, after re-examining the clause, clearly understood that he is responsible for damages resulting from his negligence and not from the owner’s. The court did not approve the use of “a simple responsibility clause” or “obscure clause” containing “innocuous boilerplate language” to hold the contractor liable for all types of damages. The court also concluded that if the owner wanted to “shift the ultimate responsibility for its negligence to its various contractors, the mutual intention of the parties to this effect should appear with clarity from the face of the contract”. For that reason, if owners wish to impose additional liabilities on contractors, they should state that clearly and explicitly.

#### 4.2.1.13 “Interchangeable” Usage of Synonyms for Referring to the Same Work Item

In C28, the specifications and drawings of the roofing work project used “inconsistent terminology” to indicate the same element: layers, coats, piles. It led to a

conflict causing the contractor to think that each term had a different meaning. In the contract of C29, numerous references were made to the use of motor starters and what is known by variable speed fan power controllers (VSPC). Several provisions required that motor starters are to be installed while other provisions referred specifically to VSPC. Since the two items have the same function, the contractor thought that he is free to choose between the two and based his bid on the cheaper one, which is the motor starter. At a later stage during construction, the owner rejected the contractor's material approval submittal requiring the installation of VSPC, causing additional costs. The owner clarified that the use of the term motor starters was only as a reference to the VSPC. After the board's examination for the problem at hand, it stated that "the contract at issue is ambiguous regarding the obligation to install motor starters or VSPCs." It also reported that "it is not clear which was required to be used" and that if "taken as a whole, the contract fails to express clearly the intention of the parties." Hence, avoiding the use of different terminologies of similar meanings to refer to the same element would reduce such resulting ambiguities in contract documents.

#### 4.2.1.14 "General Disclaimers Requiring the Contractor to Check Plans and Determine Project Requirements"

The use of "general disclaimers requiring the contractor to check plans and determine project requirements" was reported by the board of C32 to be the root cause behind the occurrence of the ambiguity that led to the dispute. The disclaimer written on one of the drawings stated the following: "canopy door details, arrangements, loads, attachments, supports, brackets, hardware etc must be verified by the contractor prior to bidding." The owner testified that the disclaimer aimed to inform the bidders of their responsibility to verify if the three-pick-point design is workable. However, the

contractor, upon reading the disclaimer on that specific drawing, understood that there might be basic representation problems in those drawings. Later during construction, upon discovery that the three-pick-point design would not work and that a four-pick-point design is needed, the contractor submitted a new design that was accepted by the owner with no additional expenses given to the contractor. The board found that the disclaimers introduced to the drawing: "do not overcome the implied warranty, and thus do not shift the risk of design flaws to contractors who follow the specifications." Hence, owners should be aware that putting general disclaimers on drawings or specifications to require contractors to check the workability of the design will not shift this responsibility to the contractor. Avoiding the use of such disclaimers and instead clearly stating the responsibilities of each party in the contract will reduce such type of confusion between the project entities.

#### 4.2.1.15 "Language that Allows for Two Reasonable Alternative Explanations"

The court in C38 reported that the root cause of the ambiguity lies in the use of a "language that allows for two reasonable alternative explanations". This problem is faced in cases where vague and unclear language is used in the contract documents allowing several interpretations. In C38, the language used in the contract was interpreted to allow two different alternatives for lane closures (temporary and permanent). It did not prevent a certain type of lane closure. Even though the documents referenced both types of lane closures several times, the owner asserted that the contract prohibited the use of permanent lane closures. The court found that if the owner intended to prohibit permanent lane closure, he should have clearly stated that in the contract instead of using a language that allows for different reasonable interpretations. Thus, defects in contract documents

can be minimized if owners explicitly state the alternative to be followed when the contract offers different options.

#### 4.2.1.16 Referring to Essential Components Using "Indirect and Secondary Means" Making Them a "Discretionary and Not a Proprietary Feature of the Contract"

An illustrative example is found in C48, where a debate revolved around whether the air volume control center (QAC) includes the transmitter, or this latter is to be installed at other locations. The contractor contends that the transmitter is not mentioned among the components of the QAC. However, the owner argues that the sentence stating the components of the QAC ends with "etc." which was intended to refer to the transmitter. Knowing that the transmitter is one of the most expensive components of the QAC, the board rejected the owner's argument since it is not possible for a "proprietary item" to "be referred to in such a minor and secondary fashion." As a result, the contractor assumed that its location is "discretionary and not a proprietary feature of the contract." In other words, referring to essential elements by general means like "etc." will lead to incorrectly assuming that they are not present. Hence, avoiding the use of secondary fashion to refer to principal components will reduce such resulting conflicts.

#### 4.2.1.17 "Inadvertently Omitting" Certain Items from Specifications and/or Drawings

The omission of elements from specification and drawings is among the frequent pitfalls that were identified from the cases. In C1, the owner's plans were missing an existing dam. Similarly, in C4, the specifications omitted the flashing activity. In C5, both drawings and specifications did not show the line of voltage temperature control wiring. Similarly, in C12, the type of soil was not mentioned in the specifications. As for case C28, as stated by the court, the owner "inadvertently omitted the specifications regarding the parapet wall waterproofing membrane." Besides, in C36, plans were missing the

drawing related to the monitoring system. In fact, the omissions resulted in ambiguities in the contract which were the essential contributors to the occurrence of the resulted dispute. Hence, owners should be careful that documents do not omit essential elements or descriptions.

#### 4.2.1.18 Use of Improper, Arbitrarily Chosen Verb Tenses in Contract Clauses Limiting the Intended Applicability of Referenced Standards

Lastly, the use of improper, arbitrarily chosen verb tenses in contract clauses has contributed to confusion between project entities leading to disputes. Case C44 is an example of such pitfall. The disagreement that took place was concerned with the verb "issued" in the following clause: the contractor has to "[c]omply with the standards issued by the Secretary of Labor at 29 CFR part 1926…". After the contractor submitted his bid, the Secretary of Labor updated the standard mentioned above by requiring ditches to have flatter slopes. As a result, disagreement took place concerning whether or not the contractor has to abide by the updated version of the law. In the owner's opinion, the contractor is obliged to comply with the mentioned standard along with any applicable changes or updates to it. However, the contractor reports that the clause contained the word "issued," which is used in the past tense. This means that it only required him to comply with the "already issued" version of it at the time of submission of the bid. The court reported that "[b]y its plain meaning, the word "issued" in the past tense logically refers to regulations already issued, and not to changes which may occur in the future." It also stated that the owner's argument "tends to render the language of that clause superfluous." For that reason, verb tenses should be carefully chosen to serve the proper aim of the clause.

### 4.2.2 *Verbatim Evidence for the Deduced Inferences*

The previous section explained the reasoning behind the identification of each of the inferred detrimental practices using selective examples from the analyzed cases.

Table 8 below presents the verbatim expressions extracted from the case descriptions and court rulings of each of the analyzed cases. These expressions act as an evidence for the reasoning behind the inferred detrimental practices that owners should avoid in contract documents drafting.

*Table 8: Verbatim evidence for the deduced inferences extracted from the analyzed cases*

| # | Inferences | Verbatim Explanation from Case Law |
|---|---|---|
| **I1** | "Mistaken representations" of existing conditions | **C1:** "Upon investigation, it was discovered that there was a dam from 5 to 5 1/2 feet high... but the dam was not shown either on the city's plan, nor on the Government's plans"<br>**C3:** "it was found that said dam was not backed with broken stone, sawdust, and sediment as stated in paragraph 33 of the specifications, but that said backing was composed of a soft slushy sediment… the specifications assured them of the character of the material.... We think this positive statement of the specifications must be taken as true and binding upon the Government, and that upon it rather than upon the claimants must fall the loss resulting from such mistaken representations"<br>**C11:** "drawings … "showed gravel, sand and clay of various descriptions, and showed no other material...That the material actually to be excavated "consisted largely of stumps below the surface of the earth, buried logs, of cemented sand and gravel (none of the sand or gravel being described in the said drawings as cemented), and of sandstone conglomerate""<br>**C19:** "the sewer had to be constructed through subsurface soil that was for the most part water-bearing sand and silt, rather than clay as indicated by the soil boring logs shown on the plans"<br>**C42:** "A large part of the material, arbitrarily stated to be clay, gravel, sand and boulders, was in fact limestone rock and limestone bed rock, and was not the material specified in the contract."<br>**C43:** "the map did not contain a true description of the character of the material which was to be encountered" |
| **I2** | Ill-coordinated sequencing of work packages' activities | **C2:** "the contractor was required to build only a free-standing curtain wall that would stand between two buildings without being bonded to them; he was not asked to construct either a weight-bearing wall or an end wall that would be exposed to the elements...Hardy completed the firewall … later, Marine Colloids |

| | | |
|---|---|---|
| | | told Hardy that the Pilot Plant expansion was to be held in abeyance indefinitely… Greet communicated to Hardy his concern that the firewall might not be stable in the absence of the abutting Pilot Plant expansion. After examining the firewall in Greet's presence, Hardy told Greet that he had no confidence in the firewall's ability to serve as an exposed end wall rather than as an interior curtain wall...during a winter storm, the firewall fractured horizontally and fell to the north, damaging the existing Pilot Plant and other property…"<br>**C24:** "Nearly two years after completion of the church, and several months after the steam generator had been converted from oil to natural gas, the chimney flue exploded, causing considerable damage to the church. Appellee had nothing to do with the building of the chimney… This chimney was some distance from the place where the steam generator and hot water heater were installed" |
| **I3** | Use of "Positive Assertion" | **C3:** "dam was not backed with broken stone, sawdust, and sediment as stated in paragraph 33 of the specifications…in its positive assertion of the nature of this much of the work it made a representation upon which the claimants had a right to rely without an investigation to prove its falsity…positive statement of the specifications must be taken as true and binding"<br>**C11:** "drawings … "showed gravel, sand and clay of various descriptions, and showed no other material... the material actually to be excavated "consisted largely of stumps below the surface of the earth, buried logs, of cemented sand and gravel (none of the sand or gravel being described in the said drawings as cemented), and of sandstone conglomerate"...the statement in the specifications was untrue in fact and misleading"<br>**C19:** "the sewer had to be constructed through subsurface soil that was for the most part water-bearing sand and silt, rather than clay as indicated by the soil boring logs shown on the plans"<br>**C42:** "A large part of the material, arbitrarily stated to be clay, gravel, sand and boulders, was in fact limestone rock and limestone bed rock, and was not the material specified in the contract..." ... "explicit declaration of the contract of the material to be excavated"<br>**C43:** "the map did not contain a true description of the character of the material which was to be encountered"<br>**C44:** "Contract's Accident Prevention Clause, which requires the contractor to "[c]omply with the standards ***issued*** by the Secretary of Labor…part 1926. . ." After Hills Materials submitted its bids, OSHA issued final regulations which substantially modified 29 C.F.R. § 1926.652 by requiring ditches with flatter slopes on their sides…Hills Materials' assertion that the word "issued" limits the contractual obligation on which it based its bid to compliance with the version of part 1926" |

| | | |
|---|---|---|
| **I4** | Uncoordinated assignment of scope to multiple contracts | **C4:** "the specifications furnished by Kubby could have provided for flashing or caulking but did not do so. In addition, Crescent was not responsible for building the entire shed but only for constructing the metal roof…the record here simply does not affirmatively show … responsibility for the absence of flashing on Crescent rather than upon the masonry contractor or on Kubby himself, who furnished the specifications"<br>**C5:** "Both the heating subcontractor and the electrical subcontractor had read their respective divisions of the state's specifications (divisions 29 and 30 respectively) to exclude the line voltage temperature control wiring from the work which they were required to do." |
| **I5** | Broadly specifying work to be done in a "workmanlike manner or according to standard practices" | **C4:** "The contract between the parties herein provided that the job was to be performed "in a workmanlike manner according to standard practices" … the plans did not specifically call for flashing…the record here simply does not affirmatively show that standards of good workmanship placed responsibility for the absence of flashing on Crescent rather than upon the masonry contractor or on Kubby himself, who furnished the specifications"<br>**C8:** "It is agreed that the First Party [Dobler] will provide and furnish all materials and that said materials are to be of top quality, equipment, skills and labor necessary to do a proficient workmanlike job according to the highest standards of labor in the Dickinson area"<br>**C10:** "All material is guaranteed to be as specified. All work is to be completed in a workmanlike manner according to standard practices… portions of these streets settled…Lewis argued that there were express and implied warranties that the work would be done in a workmanlike manner which included placing a layer of gravel under the asphalt if necessary for a properly built subgrade"<br>**C14:** "…defendants entered into a contract in writing to roof the apartment building for plaintiff in a good and workmanlike manner… the roof was not fit for that purpose in that defendants did not provide a crown or slope thereto, and as a proximate result water collected thereon, causing the roof to break… the roof was constructed in a good and workmanlike manner and in exact conformance to the plans and specifications furnished by it, which did not call for a pitch, slope or crown"<br>**C44:** "The company based its bids, in part, on the cost of complying with Occupational Safety and Health Administration (OSHA) regulations governing slope requirements for trenching and excavations which had been in force since the early 1970's. 29 C.F.R. §§ 1926.650-.652 (1989). After Hills Materials submitted its bids, OSHA issued final regulations which substantially modified 29 C.F.R. § 1926.652 by requiring ditches with flatter slopes on their sides." |

| | | |
|---|---|---|
| **I6** | Selection of inferior material not commensurate with its intended use | **C6:** "The construction specifications prepared by defendants' architect prescribed the use of a trade name type of curtain wall: "Teclar Projected Casement Series No. 1600." The specifications were modified by defendants' architect by a reduction to "Casement Series No. 1400… This change resulted in a less costly curtain wall and one of lighter construction which was not suitable to this high-rise building. Leaks in the curtain wall have developed and are due to the inadequacy of the prescribed curtain wall for the high-rise building" |
| **I7** | Clearly described defective design leading to unsatisfactory performance | **C7:** "Various engineering experts explained the dripping was caused by the use of a metal ceiling that impeded proper air circulation, by faultily installed insulation and a defective vapor barrier. It appears thus the problem was created by a poor design...", coupled with poor workmanship."<br>**C9:** "The faulty performance complained of is narrowed to the specified tolerance level of the slab finish of the concrete, prestressed sixth floor, or roof, which, it was found, several months after the building had been occupied, puddled, or retained "bird baths" after the summer showers"<br>**C13:** "defendant insists that performance is not complete because the plaintiff warranted that the plan and specifications when carried into effect would result in a water-proof boiler room, and that the boiler room is not water proof... if I agree to produce that result by strictly following the plan prepared by another party, he impliedly warrants its sufficiency"<br>**C14:** "the roof was not fit for that purpose in that defendants did not provide a crown or slope thereto, and as a proximate result water collected thereon, causing the roof to break, causing damage to the apartments"<br>**C15:** "the air conditioning system "was incorrectly and inadequately designed for the purpose for which it was intended, that is, the adequate cooling of said 22-unit apartment house"<br>**C16:** "It is undisputed that the first set of plans drawn up for the project failed to note that the disparity in height created a potential "Canadian snow load" problem"<br>**C17:** "The construction plans, including engineering and specifications for the dirt and grade work... were defective according to the evidence presented at trial"<br>**C19:** "the manhole bases as designed were unable to be sealed by the means permitted in the plans and specifications"<br>**C20:** "The contract called for a two-coat paint job, not three, and whether the job was sufficient or not, it was the specification under which Saxon did the painting"<br>**C21:** "It is beyond question that the basic underlying cause of the partial collapse of this building was either faulty design of the footings upon which the columns rested, or bad soil conditions or both. It cannot be said that defendant had any responsibility for either"<br>**C23: "**Each lift was to be laid, rolled and inspected before another layer was placed on top of it... The contractor performed his contract in a satisfactory and acceptable manner... unusual rains over a period of two weeks softened the "upper lifts" of the |

| | | |
|---|---|---|
| | | embankment to such an extent that it was necessary to rework and recompact them in order to bring them up to specifications"<br>**C24:** "the proximate cause of the explosion and resulting damage to the church was the negligent manner in which the vents were interconnected running from the breeching of the steam generator to the chimney... that a proper installation required that the vent from the steam generator and the vent from the hot water heater be connected to the chimney independently; that to connect the two vents together was dangerous in that fumes and unburned gas from the forced draft steam generator would tend to collect in the water heater vent. It was also claimed that the angles of the connecting vents were not proper and were calculated to trap fumes and any unburned gas that might escape."<br>**C32:** "After the contract award, USI discovered that the three-pick-point design would not work... Edsall's pre-bid review of the specifications was reasonable and that the disclaimer on drawing S13 did not shift any risk for design inadequacies to Edsall" |
| **I8** | Lack of "factors that accurately determine the meaning" of broad terms or expressions | **C12:** "the dock was to be built in the navy yard upon a site which was "available,"… the word "available" has not naturally the meaning which must be attributed to it in order to support the contention that there was a warranty as to the condition of the soil." ➔ *ambiguity due to using the word "available" to describe the site without stating that its conditions should be inspected*<br>**C22:** "Factors were lacking in the specifications to accurately determine the meaning of "refusal"… Plaintiffs contend that it means that the piles should be driven until they would not move downward. We cannot agree with this definition under the evidence adduced in this case. The term "refusal" is rather meaningless unless the weight and fall of the hammer is prescribed. Certainly, the point of refusal as defined by plaintiffs would be less with a 500-pound hammer and a 10-foot drop than a 3,000-pound hammer with a 15-foot drop" ➔ *ambiguity due to using the term "refusal" without defining it*<br>**C25:** "... the drawings themselves stated that the sprinkler head locations were "suggested" and for "design intent only"" ➔ *ambiguity due to referring to the location of installation as "suggested" and for "design intent only" without explaining what they mean*<br>**C31:** "The plant shall remain in operation during the entire construction period... Burke alleges the contract term "the plant shall remain in operation" is ambiguous" ➔ *ambiguity due to using the expression "the plant shall remain in operation" without explaining that it means that the facility should not shut down*<br>**C38:** "DOT contends that "permanent lane closures" referred to shoulder closures. Driscoll produced evidence that DOT's assertion is contrary to the trade usage of the term "permanent lane closures" in the road construction industry" ➔ *ambiguity due to using the expression "permanent lane closures" instead of "shoulder closure" without explaining that*<br>**C39:** "Metric and Meisner interpret these sections to require replacement of only defective, burned out, or broken lamps immediately before project completion. NASA contends that they require replacement of all lamps, known as "relamping" in the |

| | | |
|---|---|---|
| | | industry, before project completion" ➔ *ambiguity due to using the word "relamping" without clearly defining it*<br>**C40:** "the waivers of subrogation provision, read in tandem with the definition of "the Work," was ambiguous and "reasonably [could] be read to have more than one meaning, temporally."… "the Work" varies throughout the contract" ➔ *ambiguity due to using the word "the Work" without clearly defining it*<br>**C47:** "On the face of the diagram was a notation stating that the diagram was "schematic and for the purpose of estimating only"… S.O.G. contends that the Government's diagram was in no way binding…accordingly, plaintiff says it was free to design completely the river diversion scheme as long as its plan followed sound engineering and construction practices and accomplished the Government's essential end-objectives…The Government however, urges that the diagram and specifications clearly called for the use of cofferdams and a two-stage diversion and construction scheme within the river banks" ➔ *ambiguity due to using the expression "schematic and for the purpose of estimating only" without clearly explaining it* |
| **I9** | "Surfacial inconsistencies" in describing design elements within and between different documents | **C25:** "a note to the drawings required the contractor to "mount ceiling fixtures in the center of a ceiling tile" unless noted otherwise. The specification dealing with sprinkler location, however, only required the contractor to "space, locate, and position sprinkler heads in accordance with NFPA 13" and did not refer to the contract drawings… another note to the drawings stated that the sprinkler head locations were shown for design intent only and directed the contractor to locate the sprinkler heads according to the code requirements as specified"<br>**C29:** "contract at issue is ambiguous regarding the obligation to install motor starters or VSPCs…several provisions indicate that motor starters were required… On the other hand, the contract contains twenty-one provisions… referring specifically to VSPCs"<br>**C33:** "there are surfacial inconsistencies, at the least, within the specification itself and between the specification and the drawing — part of the specification appearing to provide weather-stripping only for the entrance doors, while another part as well as the drawings seem to cover windows as well"<br>**C35:** "The detail on the left shows the rebar from the interior distribution rib stopping at the exterior grade beam. The detail on the right depicts the rebar from the interior distribution rib running into the exterior beam. No instruction was provided which would have enabled Fortec to select either of these two alternative reinforcement schemes"<br>**C37:** "there was in actuality a discrepancy on the face of this contract between the specifications, the drawings with the notation, and the list of alternates… Kitchen exhaust fans were to be installed "where shown," yet the notation on the drawings said fans were to be bid as an alternate. Then there was no alternate for a kitchen exhaust fan"<br>**C45:** "Section 55-8 of the specifications contains the notation "4A" for room 5B110, as does drawing # 1-41. However, unlike the 18 rooms in question, there was no symbol on any of the |

| | | |
|---|---|---|
| | | drawings which indicated that the floor of this room was to be covered with composition flooring…the specifications are in conflict with each other…"<br>**C46:** "Two parts of the contract said very different things: the specifications required construction on the second floors of buildings 81, 82, and 85, whereas the drawings required construction on the second floor of only building 85."<br>**C50:** "specifications called for a minimum of 18 inches of non-expansive fill under the concrete floor slabs, whereas a note on the drawings called for 36 inches of non-expansive fill" |
| **I10** | Non-comprehensive descriptions of integrative work item constituents | **C26:** "Section 666.5…"Bridge Approach Slabs will be paid for at the contract unit price per square yard, complete in place as specified, which will include the premolded expansion joint filler, joint backing material, joint sealing material, and closed cell neoprene sponge, when specified, at the joint adjacent to the bridge superstructure"… Section 666.5 does not expressly mention the approach slab rebars… the mention of certain items implies the purposeful exclusion of other items of the same general character"<br>**C48:** "Air Volume Control Centers (QAC) shall be factory assembled and calibrated. It shall consist of metal cabinet constructed of 14 gage [sic] steel with hinged front, key locked doors, necessary gauges, [sic] meters, controllers, etc., as specified herein and as shown on drawings, to achieve the function intended… The government, for example, argued that the word "etc." in paragraph 6A was intended to include the transmitter in the contents list. The board rejected this argument, concluding that it is unlikely that the transmitter, the most expensive component of the QAC, would be referred to in such a minor and secondary fashion… The absence of the transmitter in the crucial paragraph, 6A, however, is just as strong a suggestion that the location of the transmitters was, at the very least, a discretionary decision" |
| **I11** | Striking out language from the contract without providing explicit clarifications or alternative provisions | **C27:** "…The Contractor shall pay the Subcontractor each progress payment within three working days after the Contractor receives payment from the Owner. ~~If the Architect does not issue a Certificate of Payment or the Contractor does not receive payment for any cause which is not the fault of the Subcontractor, the Contractor shall pay the Subcontractor, on demand, a progress payment~~"… Galloway struck out all the language following the word "Owner"…the contracts in question could be interpreted to require Galloway to pay a subcontractor only if it received a payment demanded from Rowe identifiable with the progress or completion of a subcontract, or merely to provide for a reasonable time to pay after such demand was made to Rowe... this ambiguity was not patently evident on the face of the contract"<br>**C30:** "That amendment revised section 1.6 by striking out one sentence and adding another, so that it read: 1. All personnel entering the Capitol Power Plant grounds will be required to check in at a security gate. 2. Clearance: Special arrangements for all deliveries shall be arranged a minimum of 48 hours in advance of arrival to permit inspection by the United States Capitol Police. ~~The Police inspection station is on P Street and South Capitol Street S.E~~ [this is the phrase that was struck out]. Coordinate |

| | | |
|---|---|---|
| | | deliveries with the US Capital [sic] Police by contacting them at 202-224-0908 [This is the phrase that was added] …Modification of this solicitation language created a glaring ambiguity as to whether inspections would be on- or off-site"<br>**C41:** "specifications did describe concrete sidewalks, some of which were included under Section G which pertained to road paving, and some of which were included as an additive alternate… In the specifications distributed with the invitations to bid, the section dealing with additive alternates, including sidewalks, had been deleted. Accordingly, plaintiff did not include an estimate for the construction of concrete sidewalks in its bid… Plaintiff's interpretation of the specifications was that the deletion of the additive alternate providing for the concrete sidewalks completely eliminated any requirement on plaintiff's part to build concrete sidewalks…Defendant contends that the deletion of the additive alternate providing for sidewalks only eliminated the requirement that plaintiff build those sidewalks which were additive alternates and the off-site drawings contained a requirement for sidewalks which were not additive alternates…" |
| **I12** | Use of "innocuous boilerplate language" for assigning/transferring liabilities | **C2:** "…contractor was obliged under the terms of the bid request to "guarantee soundness of construction for a minimum period to be specified as one year from completion of the contract"'<br>**C15:** "the primary question to be resolved on this appeal is whether the language quoted in the preceding paragraph of this opinion, as embodied in the subcontract and in the bond, constituted a warranty or guaranty on the part of the subcontractor that the air conditioning system which the subcontractor undertook to install would in fact "establish at least a 30 degree variation from outside temperature for cooling."…It would not be reasonable to construe the language of "guarantee" as being sufficiently broad to constitute a basis for a transfer to the subcontractor of responsibility for defective plans and specifications procured by the owners"<br>**C18:** '"The School District contends that the risk of loss in the contract was on Linfoot until final acceptance by the architect. The tank was damaged and was therefore properly rejected by the architect. According to the School District, since Linfoot did not tender a tank acceptable to the architect, then, under the contract, Linfoot has the responsibility of replacing the tank. The School District contends this is true regardless of the cause of the defect in the tank…Linfoot, on the other hand, contends that the risk of loss as set out in the contract was on the School District. It points to the document, General Conditions, Supplementary Conditions and Modifications, 0104, section 8: "The Contractor is relieved of responsibility for damages to the work due to causes beyond the control of and without fault of the contractor or negligence of the contractor."'<br>**C19:** "…"Instructions to Bidders" which require the contractor to make an independent inspection of the work site, including subsurface conditions…There was nothing in the plans in the case at bar which might have indicated to the plaintiff that the soil-boring logs shown on the plans were meant to be specially relied |

| | | |
|---|---|---|
| | | upon so as to relieve the contractor of its contractual responsibility to inspect the site, including subsurface conditions…"<br>**C34:** "...the construction of a provision common to fixed-price government construction contracts that states that the private contractor "shall be responsible for all damages to persons or property that occur as a result of his fault or negligence"…The provision, in short, is what the Court of Appeals called "a simple responsibility clause." But today this innocuous boilerplate language is turned inside out. For the Court says that the provision really is a promise by the contractor to reimburse the Government for losses it incurs resulting from its negligence...To be sure, the Court does not go quite so far as to hold that this obscure clause operates as a complete liability insurance policy. But the Court does hold that the clause requires the contractor to indemnify the Government "to the full extent that its negligence, if any, contributed to the injuries to the employee." |
| **I13** | "Interchangeabl[e]" usage of synonyms for referring to the same work item | **C28:** "The Board found that there was "no specification for the parapet wall waterproofing membrane," for the Navy stated that it had "inadvertently" omitted this specification…it used "layers" and "plies" "interchangeably," … different words have different meanings …"<br>**C29:** "…the references in the contract to both motor starters and VSPCs were "discrepanc[ies]," presumably meaning that such references were inherently inconsistent. A reasonable finder of fact, viewing the contract as a whole, could not find that references to motor starters and VSPCs were intended to refer to the same type of device…The provision is drafted in such a manner as to allow the contracting parties to choose among alternative terms" |
| **I14** | "General disclaimers requiring the contractor to check plans and determine project requirements" | **C1:** "This implied warranty is not overcome by the general clauses requiring the contractor, to examine the site,[1] to check up the plans,[2] and to assume responsibility for the work until completion and acceptance.[3] The obligation to examine the site did not impose upon him the duty of making a diligent enquiry into the history of the locality with a view to determining, at his peril, whether the sewer specifically prescribed by the Government would prove adequate. The duty to check plans did not impose the obligation to pass upon their adequacy to accomplish the purpose in view."<br>**C3:** "Bidders, or their authorized agents, are expected to examine the maps and drawings in this office, which are open to their inspection, to visit the locality of the work, and to make their own estimates of the facilities and difficulties... It is expected that each bidder will visit the site of this work....and obtain the information necessary to enable him to make an intelligent proposal"<br>**C32:** "Mr. Oakey [designer] testified that he added the disclaimer as an "informational flag" to bidders that they should verify the three-pick-point design… [also] placed a disclaimer on one of the drawings, drawing S13, stating: "Canopy door details, arrangements, loads, attachments, supports, brackets, hardware etc must be verified by the contractor prior to bidding" … After the contract award, USI discovered that the three-pick-point design would not work… the disclaimer on drawing S13 did not shift any |

| | | |
|---|---|---|
| | | risk for design inadequacies to Edsall… general disclaimers requiring the contractor to check plans and determine project requirements do not overcome the implied warranty, and thus do not shift the risk of design flaws to contractors who follow the specifications"<br>**C41:** "We think that the Special Provisions clause (SP 1-02, supra) in and of itself, is not sufficient to shift the burden of the ambiguity to plaintiff… If the defendant chafes under the continued application of this check, it can obtain a looser rein by a more meticulous writing of its contracts and especially of the specifications. Or it can shift the burden of ambiguity (to some extent) by inserting provisions in the contract clearly calling upon possible contractors aware of a problem-in-interpretation"<br>**C43:** "It was stated that "bidders are expected to examine the work, however, and decide for themselves as to its character and to make their bids accordingly, as the United States does not guarantee the accuracy of this description."… the map did not contain a true description of the character of the material which was to be encountered, and was encountered" |
| **I15** | "Language that allow[s] for two reasonable alternative explanations" | **C38:** "The specifications did not specifically prohibit the use of permanent lane closures. Nor did the conceptual plans detail intended lane closures, either temporary or permanent… instead of using language that allowed for two reasonable alternative explanations, DOT could have stated, PERMANENT LANE CLOSURES ARE PROHIBITED AT ALL TIMES. DOT did not explicitly express its purported intent to prohibit permanent lane closures" |
| **I16** | Referring to essential components using "indirect and secondary means" making them a "discretionary and not a proprietary feature of the contract" | **C48:** "Air Volume Control Centers (QAC) … shall consist of metal cabinet constructed of 14 gage [sic] steel with hinged front, key locked doors, necessary guages, [sic] meters, controllers, etc., as specified herein and as shown on drawings, to achieve the function intended… the government focuses on paragraph 6A and argues that the contract is unambiguous, citing the word "etc." and "as specified herein" as indications that the metal cabinet clearly included the transmitter"…The suggestion that "as specified herein" was intended to include the transmitter is unacceptable for the same reasons the board stated regarding "etc." It is improbable that the most expensive, and by implication the most prominent, component of the QAC would be designated by indirect and secondary means"…the location of the transmitters was, in the final contract, discretionary and not a proprietary feature of the contract" |
| **I17** | "Inadvertently omitt[ing]" certain items from specifications and/or drawings | **C1:** "the dam was not shown either on the city's plan, nor on the Government's plans and blue-prints, which were submitted to Spearin"<br>**C4:** "the plans did not specifically call for flashing"<br>**C5:** "the line voltage temperature control wiring was not included in the plans, specifications or contract price"<br>**C12:** "there is not contained a word implying that a particular piece of ground in the navy yard, having soil of a specially stable character, was to be the site on which the dock was to be placed" |

| | | |
|---|---|---|
| | | **C28:** "the Navy admitted to having "inadvertently" omitted the specifications regarding the parapet wall waterproofing membrane"<br>**C36:** "there was no drawing which was indicated on the EPL as drawing number 10608202 (Drawing 202) relating to a monitoring system"<br>**C49:** "The plans for floors 8 through 15 do not contain the broken line running from thermostats to radiators. It was understood by both parties that automatic radiator valves would be installed only where the radiator was to be connected to a thermostat" |
| **I18** | Use of improper, arbitrarily chosen verb tenses in contract clauses limiting the intended applicability of referenced standards | **C44:** "Contract's Accident Prevention Clause, which requires the contractor to "[c]omply with the standards ***issued*** by the Secretary of Labor…part 1926. . ." After Hills Materials submitted its bids, OSHA issued final regulations which substantially modified 29 C.F.R. § 1926.652 by requiring ditches with flatter slopes on their sides…Hills Materials' assertion that the word "issued" limits the contractual obligation on which it based its bid to compliance with the version of part 1926…the word "issued" in the past tense logically refers to regulations already issued, and not to changes which may occur in the future" |

## 4.3 Interconnections Between Practical Implications and Theoretical Guidelines

After determining the underlying root causes leading to defective contract documents, the interrelation between the deduced practical inferences and the previously suggested theoretical guidelines done by Laryea (2011) can be established.

Table 9 below represents how each of the guidelines (listed on the right) can be satisfied by avoiding the respective inferences (listed on the left). The tick mark is to show that, in order to satisfy a certain theoretical guideline, owners should avoid the occurrence of the respective practical inferences.

*Table 9: Classification of the deduced inferences based on theoretical guidelines*

| # | Deduced Inferences | "Know what you want" | "Describe it very clearly" | "Do not assume that the other person knows what you want" | "Tell them what you want" | "Do not change your mind" |
|---|---|---|---|---|---|---|
| **I1** | "Mistaken representations" of existing conditions | √ | √ | √ | --- | --- |
| **I2** | Ill-coordinated sequencing of work packages' activities | --- | --- | --- | --- | √ |
| **I3** | Use of "Positive Assertion" | √ | √ | √ | --- | --- |
| **I4** | Uncoordinated assignment of scope to multiple contracts | --- | --- | √ | √ | --- |
| **I5** | Broadly specifying work to be done in a "workmanlike manner or according to standard practices" | √ | √ | √ | √ | --- |
| **I6** | Selection of inferior material not commensurate with its intended use | √ | --- | --- | --- | √ |
| **I7** | Clearly described defective design leading to unsatisfactory performance | √ | √ | √ | --- | --- |
| **I8** | Lack of "factors that accurately determine the meaning" of broad terms or expressions | --- | √ | √ | √ | --- |
| **I9** | "Surfacial inconsistencies" in describing design elements within and between different documents | √ | √ | √ | --- | √ |
| **I10** | Non-comprehensive descriptions of integrative work item constituents | --- | --- | √ | √ | --- |
| **I11** | Striking out language from the contract without providing explicit clarifications or alternative provisions | --- | √ | √ | √ | √ |

| | | | | | | |
|---|---|---|---|---|---|---|
| **I12** | Use of “innocuous boilerplate language” for assigning/transferring liabilities | √ | √ | --- | --- | --- |
| **I13** | “Interchangeabl[e]” usage of synonyms for referring to the same work item | --- | √ | √ | --- | --- |
| **I14** | “General disclaimers requiring the contractor to check plans and determine project requirements” | √ | √ | √ | --- | --- |
| **I15** | “Language that allow[s] for two reasonable alternative explanations” | --- | √ | --- | --- | --- |
| **I16** | Referring to essential components using “indirect and secondary means” making them a “discretionary and not a proprietary feature of the contract” | --- | --- | √ | √ | --- |
| **I17** | “Inadvertently omitt[ing]” certain items from specifications and/or drawings | √ | √ | √ | √ | --- |
| **I18** | Use of improper, arbitrarily chosen verb tenses in contract clauses limiting the intended applicability of referenced standards | --- | √ | √ | --- | --- |

As can be seen from Table 9, each recommendation is satisfied by more than one inference. This means that, in order to apply a certain theoretical recommendation, owners are required to avoid several pitfalls in contract documents. The following example illustrates how Table 9 validates the theoretical guidelines. For owners to apply the "Know what you want" guideline, they have to avoid I1, I3, I5, I6, I7, I9, I12, I14, and I17. Similar explanation applies to the other guidelines.

This interrelation is presented to show that the deduced inferences represent a practical approach to adopt the theoretical guidelines previously suggested by Laryea (2011). Owners now know what to avoid during the drafting of contract documents to minimize having defects in these documents. To this end, the question that is of our interest to investigate in the following chapters of this study is: What are the roles and activities that should be satisfied by the owner to avoid the deduced inferences?

# CHAPTER 5

# CHARACTERISTICS OF THE INTERVENTION OF PROJECT ENTITIES

## 5.1 Preamble

The inferences deduced in chapter 4 enable the owner to be knowledgeable of the frequent root causes of defective documentation leading to the occurrence of disputes. The importance of these inferences lies in presenting the owner with what should be avoided to have a better quality of contract documents. However, knowing what to avoid does not clearly show the tasks that should be done to avoid it. In addition, knowing that this problem affects several project entities implies that the responsibility of avoiding defects does not rest on the owner alone. In fact, different stakeholders can contribute differently to enhance the quality of such documents.

In what follows, we will put the deduced inferences into practical words to present what can be done by the concerned project entities to avoid having contract documents in error. This will be done by determining the main key players that should intervene, the reason for their intervention, the time of their intervention, in which document they will intervene, the scope of their intervention, and the respective means of intervention.

## 5.2 Parameters of the Analysis

As stated previously, this chapter aims to put the deduced inferences in practical words explaining the roles of the entities that must intervene to help in avoiding defects in contract documents. To do so, we should determine the parameters or factors upon which the analysis will be performed. In order to decide on these parameters, we started asking several questions relating to each inference. For example, in I1: what should be

done practically to avoid inference I1? In order words, what should be done to avoid having mistaken representations of existing conditions? What should the owner do? Who is also responsible for avoiding such defects? What does this inference mean in producing the documents? In reading the documents? In interpreting the documents? Who produces the documents? Who reads them? Who interprets them? And so on… Many similar cycles of brainstorming all the questions that need to be answered to determine the aspects upon which the analysis will be performed was done on several inferences. As a result, we decided on six main questions upon which the analysis performed in this chapter will be built on. These are listed in the following:

1- **Who** will intervene?

2- **Why** should they intervene?

3- **When** should they intervene?

4- **Where** should they intervene?

5- **What** should they do?

6- **How** should they do so?

The characteristics that we aim to determine from answering these questions are briefly explained below.

The "who" represents the key players that should intervene to avoid the defects in contract documents. As we already stated before, the owner is not the only entity that is affected by the presence of defective documentation. Hence, this arises the need for determining all the stakeholders that should intervene to ensure a better quality of contract documents.

The “why” represents the reason for the intervention of each of the key players. The reason is usually a benefit or merit that each entity will acquire from such intervention. In fact, none of the entities will do an effort to ensure a better quality of contract documents unless they have a personal benefit from doing it.

The “when” represents the time of intervention. It differs between one and another because the entities are engaged in the project during different phases.

The “where” represents the documents in which the intervention is taking place. The documents in which each entity will intervene to avoid the defects depend on the type of responsibilities attributed to him. For example, certain entities are responsible for producing the documents, others are responsible for approving the produced documents and others receive them.

The “what” represents the scope of intervention. Generally, the scope of intervention is deduced from basic responsibilities, duties, and obligations attributed to each of the project entities. The responsibilities represent the actions that the entities must perform under professional and contractual liabilities arising out of not fulfilling them. The duties are the tasks that an entity is expected to do once it is engaged in the project, even if they are not explicitly stated in the contract. There is also a liability arising out of not fulfilling such duties. As for the obligations, they represent the actions that an entity must perform because of his negligence in not properly performing other related tasks.

The “How” represents the means of intervention. The means of intervention are taken as the functional actions that each entity will complete to avoid the occurrence of each of the inferences.

Figure 5 below summarizes the above-discussed characteristics of intervention.

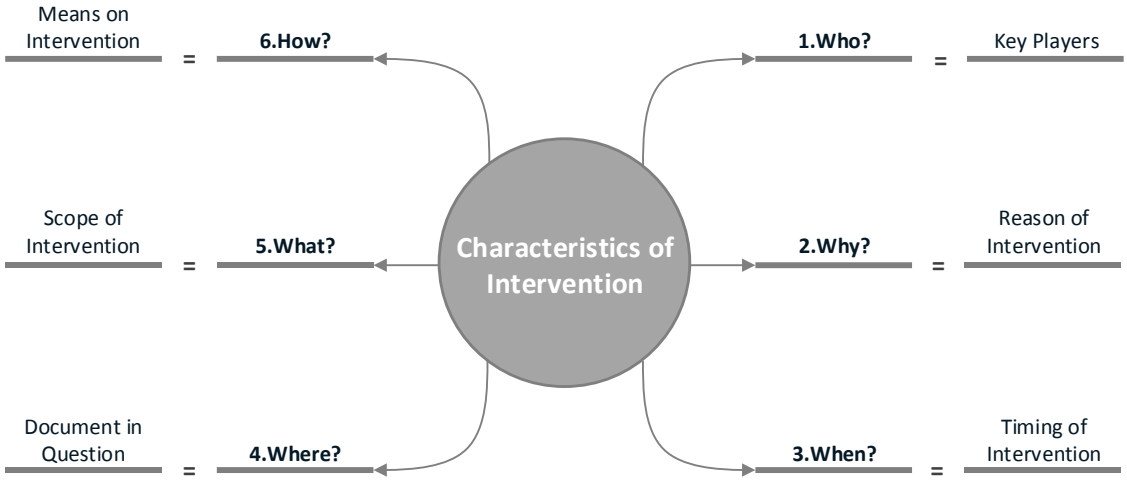


*Figure 5: Characteristics of intervention*

In what follows, the attributes for the identified characteristics will be identified and explained.

## 5.3 Identification of the Concerned Project Entities (The Who)

First, to determine the stakeholders that must intervene in enhancing the quality of contract documents, we determined all the potential entities that are generally engaged in construction projects.

These are the following:

- Owner Staff/Owner Representative
- Architect/Engineer (A/E) Design Consultant
- Project/Construction Management Consultant
- Sustainability/Green Consultant
- Technical Controller
- Governmental Authorities and Other Concerned Bodies
- General and Specialty/Trade Contracting Firms

In fact, many medium-to-small scale projects might not have all the above-mentioned parties within their stakeholders' structure because some entities might be responsible for more than one role.

After determining all the parties that are engaged in construction projects, we specified the ones that can intervene to avoid having defective documentation. This was done by identifying the parties that were held responsible for the case law review performed in chapter 3. The identified entities are the internal key players: all the above-listed excluding the governmental authorities. These are among the key players, but we are concerned with the roles that are related to the internal, rather than external, project organization. Besides, in order to simplify the assignments of different intervention attributes in later stages of this chapter, we grouped them into three main teams as it follows:

1- Owner's Team, consisting of:
    - Owner/Owner Representative
    - Project/Construction Manager
    - Technical Controller
    - Sustainability/Green Consultant
2- Architect/Engineer Design Consultant's Team
3- General Contractor/Trade Contractors' Team

## 5.4 Identification of the Timing of Intervention (The When)

After identifying the entities that are to intervene to avoid the presence of defects in contract documents, a determination of the different phases in which such intervention will take place is performed. To do that, we first identified the main project phases which are the following:

1- Prior to Bidding and Contract Formation Phase

2- During Bidding and Contract Formation Phase

3- Post Bidding and Contract Formation Phase

However, our study aims to prevent the documents from being defective as opposed to finding solutions to the problem after it takes place. Thus, the intervention of the project entities should be before the start of the construction. Hence, the timings of intervention that will be considered in the analysis are prior to the bidding and contract formation phase and during the bidding and contract formation phase only.

## 5.5 Identification of the Documents of Intervention (The Where)

The place of intervention is represented by the documents in which the key players will intervene to avoid the presence of errors in them. Since all the documents are prone to be erroneous, the study will consider all the constituents of both baskets of documents: the tender documents package and the contract documents package.

Figure 6 below shows the process of the emergence of contract documents throughout the three main phases of a construction project.

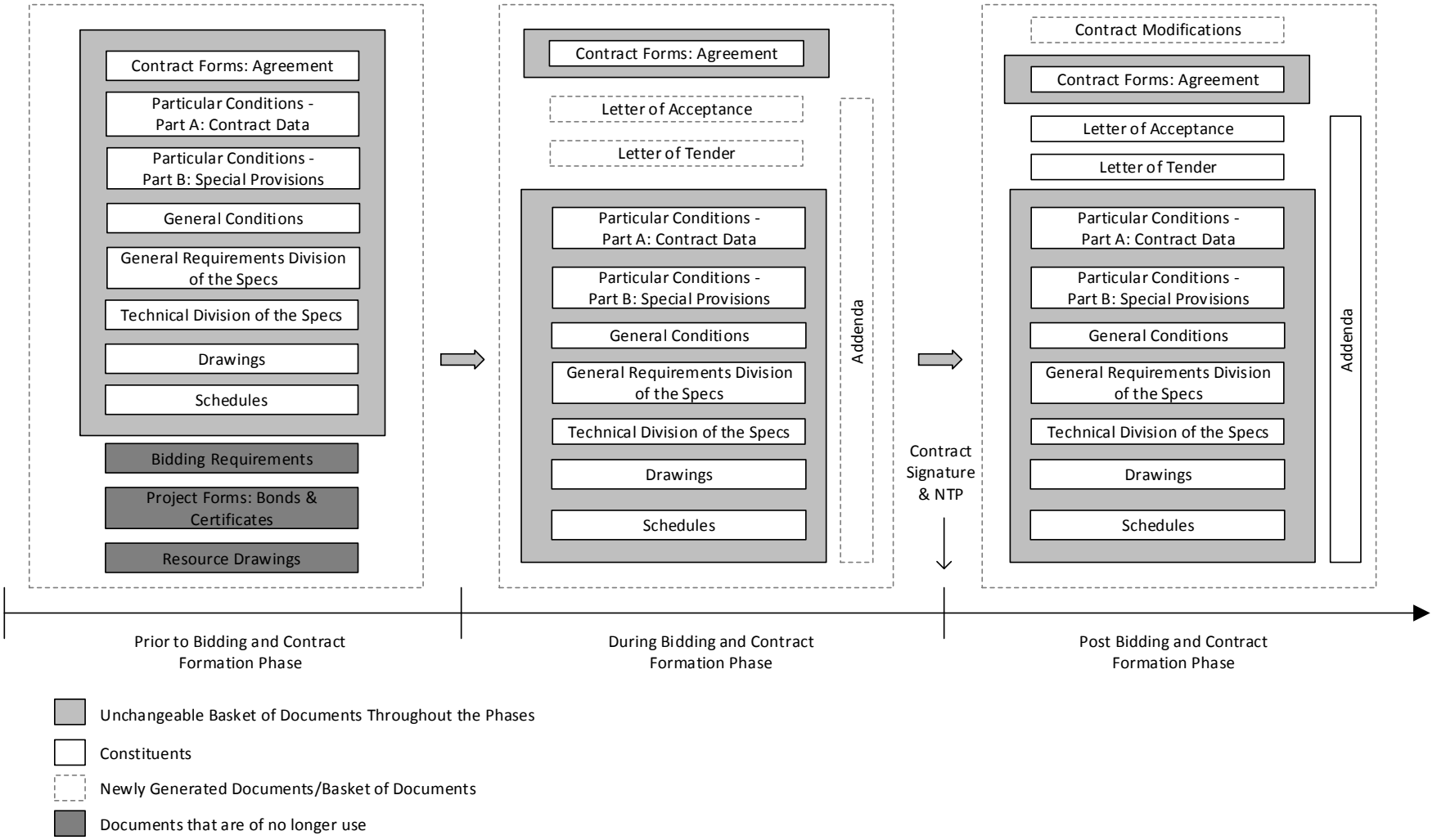


*Figure 6: Depiction of the process of contract documents emergence*

In Figure 6, the group of documents shown prior and during the bidding represents the tender documents. This group is transformed into for the basket of contract documents shown in the post bidding and contract formation phase. It is important to note that the documents are listed in a descending order of priority based on Hamie and Abdul-Malak (2018). However, the separation of Part A (Contract Data) and Part B (Special Provisions) in particular contract conditions is an addition based on FIDIC (2017). As we can see, the bidding requirements, the project forms, and the resource drawings represent the documents that are specific to the bidding phase since they include information that is needed during this phase only. Besides, the letter of acceptance, letter of tender, and addenda are formed by the end of the bidding and contract formation phase. These form part of the contract documents. As for contract modifications, these are formed in the post-bidding phase since they include any changes done during construction. In fact, the rest of the documents remain unchanged throughout the three phases of the project. These consist of the contract forms, the particular conditions (Part A and Part B), the general conditions, the specifications (the general requirements division and the technical division), the drawings, and the schedules.

We can conclude from the diagram that the formation of contract documents takes place prior to the bidding phase along with some additions and amendments during the bidding phase. For that reason, in order to end up with a good quality of contract documents, contributions should be made during the two preceding phases. Thus, the depiction showed above answered the following questions: “When should they intervene?” and “Where should they intervene?”. It will be revisited later in the next chapter after identifying the attributes of the other intervention characteristics.

## 5.6 Identification of the Reason, Scope and Means of Intervention (The Why, What and How)

In previous sections of this chapter, an identification of the attributes pertaining to the key players, the time of intervention, and the document in which they will intervene was presented. However, the identification of the reason, scope, and means of the intervention of the key player is not as straightforward as the other characteristics. For that, the determination of the attributes pertaining to these characteristics of intervention will be done through two main stages. First, a general description of the responsibilities of each project entity in avoiding the 18 deduce inferences will be presented. After that, the reason, scope, and means of intervention will be identified.

### 5.6.1 *General Responsibilities of Project Entities*

The inferences have presented to the owner 18 root causes of defects in contract documents that should be avoided to have a better quality of documentation. However, the inferences are not enough to guide the concerned entities of how to avoid these root causes from taking place. For example, in I1, owners are directed to avoid having mistaken representations of existing conditions. As a result, the following questions arise: how can owners avoid having mistaken representations of existing conditions? What should be done exactly to ensure that? And why should the owner intervene to avoid this problem? In addition, as stated previously, the architect/engineer consultant team and the contractor/trade contractors' team is also involved in solving this problem. Table 10 below presents a description of the intervention of each key player in avoiding each of the 18 identified inferences.

*Table 10: Descriptions of the interventions of project entities*

| # | Inferences | Documents | Description of Intervention of Internal Key Players | | |
|---|---|---|---|---|---|
| | | | **Architect/Engineer (A/E) Design Consultant Team** | **Owner's Team: Owner, Owner's representative (OR), Project/Construction Manager (PM/CM), Technical Controller (TC), Green Consultant (GrC)** | **General Contractor (GC)/ Trade Contractors (TC)** |
| **I1** | "Mistaken representations" of existing conditions | - Resource Drawings [a]<br>- Design Drawings<br>- Specifications | A/E is responsible for producing the scope and terms of reference of the existing conditions study, judging compliance in respect thereof, and producing the design documents while relying on the outcomes of the delivered study | PM should be diligent in reviewing the scope and the terms of engagement of the existing conditions study and advising the process of its commissioning | Contractor should review the resource drawings and design drawings and specs during the bidding phase and notify about any obvious discrepancies |
| **I2** | Ill-coordinated sequencing of work packages' activities | - Specifications<br>- Program of Work [b] | A/E should specify related work contributing to preserving the structural integrity of the work in question | - PM is responsible for packaging the job right and sequencing the launching of its parts in a synchronized way<br>- TC is responsible for reviewing the design documents for adherence to structural integrity requirements | Contractor should review the design documents during the bidding phase and notify about any unaddressed work coordination/ sequencing issues |

| | | | | | |
|---|---|---|---|---|---|
| **I3** | Use of "Positive Assertion" | - Specifications<br>- Contract Conditions | A/E must properly draft design documents by ensuring the accuracy of the statements/descriptions that are positively asserted | - PM should be diligent in reviewing the design specs, detecting statements containing positive assertions and verifying their accuracy<br>- OR should ensure that positively asserted statements in contract conditions are not subject to change | - Contractor should review the design specs during the bidding phase and notify of any obvious discrepancies<br>- Contractor should be able to clarify the basis of pricing when positive assertions are present in contract conditions |
| **I4** | Uncoordinated assignment of scope to multiple contracts | - Specifications<br>- Drawings | A/E must ensure completeness of scope and an all-inclusive design | PM is responsible for deciding on the proper assignment/coordination/delineation of the scope and related work requirements in each of the trade contractor's specs | Contractor should review design documents during the bidding phase and seek clarification on work interfacing with the work included in his package |
| **I5** | Broadly specifying work to be done in a "workmanlike manner or according to standard practices" | - Contract Conditions<br>- Specifications | A/E should affirmatively describe/show what the standards of good workmanship entail | - OR/PM should be diligent in reviewing design documents to ensure that the scope of work and the related requirements are clearly and explicitly described<br>- PM should affirmatively describe/show what the standards of good workmanship entail when the contractor is asked to work according to them in contract conditions | Contractor should review contract documents during the bidding phase and notify the owner about any ambiguities concerning the expectations/ the requirements of work to be specified |

| | | | | | |
|---|---|---|---|---|---|
| **I6** | Selection of inferior material not commensurate with its intended use | - Specifications | A/E should ensure that the choice of the type of material is suitable for the intended use | TC should review specs and ensure that the material specified by the A/E is suitable for the intended use | Contractor should review contract documents during the bidding phase and seek clarifications when in doubt of defective specifications |
| **I7** | Clearly described defective design leading to unsatisfactory performance | - Design Drawings<br>- Specifications | A/E is responsible for producing a sound design, which represents a prerequisite for producing specifications | PM/TC should review design documents and should be able to detect defective design | Contractor should review contract documents during the bidding phase and seek clarifications when in doubt of defective design |
| **I8** | Lack of "factors that accurately determine the meaning" of broad terms or expressions | - Design Drawings<br>- Specifications | A/E shall rely on explicit rather than broad language in describing work items/aspects | PM should review design documents to ensure clarity of the language used | Contractor should review the drawings and specs during bidding and notify the owner about any ambiguity present in the language |
| **I9** | "Surfacial inconsistencies" in describing design elements within and between different documents | - Design Drawings<br>- Specifications | A/E is responsible for producing complementary design documents containing consistent descriptions of work items/aspects | PM should review drawings and specs to ensure consistency in the descriptions of the same elements | Contractor should review the design documents during the bidding phase and notify the owner about any obvious discrepancy within and between the drawings and specifications |
| **I10** | Non-comprehensive descriptions of integrative work item constituents | - Specifications | A/E is responsible for ensuring completeness of descriptions of work item constituents by expressly stating them in specifications and/or BOQ | PM/TC should review the specs to ensure the inclusiveness of the constituents of integrative work items | Contractor should review specs during the bidding phase and notify the owner about any obvious exclusion of work aspects pertaining to specified integrative work items |

| | | | | | |
|---|---|---|---|---|---|
| **I11** | Striking out language from the contract without providing explicit clarifications or alternative provisions | - Contract Conditions<br>- Specifications | When certain descriptions of work items are deleted from the specs, A/E is responsible for providing explicit clarifications and alternative provisions | - OR/PM should review specs to ensure that explicit clarifications/alternative provisions are given in respect of any expression that is struck out<br>- OR/PM should provide explicit clarifications for any struck-out provisions in contract conditions | Contractor should review contract documents during the bidding phase and seek clarifications about any ambiguity induced from struck-out provisions as opposed to making own assumptions in respect thereof |
| **I12** | Use of "innocuous boilerplate language" for assigning/transferri ng liabilities | - Bidding Requirements<br>- Bond/ Guarantee/ Warranty<br>- Contract Conditions<br>- Specifications | A/E should adopt clear and explicit, instead of obscure, language for assigning/transferring liabilities | OR/PM or GC [c] should adopt clear and explicit, instead of obscure, language for assigning/transferring liabilities, or review relevant contract documents to ensure the appropriateness of adopted language | Contractor/Subcontractor [c] should review contract documents during the bidding phase and seek clarifications regarding obscure language intended for assigning/transferring liabilities |
| **I13** | "Interchangeable" usage of synonyms for referring to the same work item | - Design Drawings<br>- Specifications | A/E must adopt the same terms/expressions for referring to the same elements throughout the design documents to avoid confusions | PM should be diligent in reviewing the drawings and specs to ensure consistency in the choice of expressions used to refer to the same elements | Contractor should review the drawings and specs during the bidding phase and when in doubt of any interchangeable usage of synonyms, should seek clarifications about such discrepancies |
| **I14** | "General disclaimers requiring the contractor to check plans and | - Design Drawings<br>- Specifications<br>- Contract Conditions | - A/E should verify the workability/soundness of design prior to the release of bid documents | - PM should be diligent in reviewing design documents, such that, when disclaimers are adopted by the A/E, he should ensure that their usage is | Contractor should review contract documents during the bidding phase to pinpoint/filter out such general disclaimers, resolve their implications to understand his role and seek |

| | | | | | |
|---|---|---|---|---|---|
| | determine project requirements" | | - A/E should not rely on disclaimers as means for verifying the design | warranted while recognizing that they will not shift the risk<br>- If PM/OR wishes to shift the risk of flaws in contract documents to the contractor, he should explicitly state that in the contract conditions | clarifications as to the scope of review of which he is expected to fulfill |
| **I15** | "Language that allows for two reasonable alternative explanations" | - Specifications | A/E (or specifier) should carefully select/choose sufficiently explicit language to ensure one clear understanding (or to eliminate possibility of multiple reasonable interpretations) | PM should be diligent in reviewing the design documents by testing the language used for potentially affording or offering alternative explanations | - Contractor should review specs during the bidding phase and notify the owner about any discrepancy present due to having reasonable alternative explanations<br>- Contractor should warrant that his pricing/planning is based on reasonable interpretations regardless of whether other reasonable explanations may be found to prevail as well at a later stage |
| **I16** | Referring to essential components using "indirect and secondary means" making them a "discretionary and not a proprietary feature of the contract" | - Specifications | A/E shall establish what are the essential and most prominent components to ensure that they are included in describing the scope of work items | PM should be diligent in reviewing the specs to ensure that all work items' elements/constituents are stated explicitly | Contractor should review design documents during the bidding phase, pinpoint/filter out any secondary means used for specifying the inclusion of work items constituents and seek clarifications about them |

| | | | | | |
|---|---|---|---|---|---|
| **I17** | "Inadvertently omitting" certain items from specifications and/or drawings | - Design Drawings<br>- Specifications | - A/E should provide a complete basket of design documents<br>- A/E should present complete descriptions and representations of design elements | PM/TC should be diligent in reviewing the basket of design documents produced by the A/E to ensure incorporation of all referenced design documents and completeness of specification requirements pertaining to design elements | Contractor should review the design drawings and specs during the bidding phase and notify about any obvious omission of design documents or omission of specification requirements of design elements |
| **I18** | Use of improper, arbitrarily chosen verb tenses in contract clauses limiting the intended applicability of referenced standards | - Contract Conditions<br>- Specifications | When relying on referenced standards method of specifying, A/E shall explicitly state the applicable standards to be those published prior to the base date | PM should be diligent in reviewing the contract conditions and ensuring that all referenced standards are those to be explicitly stated to have been published before the base date | Contractor should review contract documents during the bidding phase, pinpoint/filter out any referenced standard that is not tied to the base date, and seek clarification about it |

Primary Intervention

Secondary Intervention

[a]: It is inferred that there must be resource drawings that the engineer relied on in producing the design drawings and specifications

[b]: It is inferred that the work program should have highlighted the connection between the different work packages

[c]: Relating to a GC-Subcontractor type of case

The descriptions of the interventions presented above were deduced by examining the responsibility of each entity in relation to the root causes (presented in the deduced inferences) that led to the occurrence of the disputes. The table also includes the bidding documents and/or contract documents in which defects are found in each of the inferences which are deduced from the analyzed cases.

Besides, the intervention of each entity is classified into two main types: primary (labeled in dark grey) and secondary (labeled in light grey). Primary intervention refers to the roles that require the entity to produce, perform, or support a certain matter. This mainly takes place when the entity's responsibility is to produce the document in question. For example, when a certain inference is identified to prevail in the design documents, the entity who is responsible for producing these documents will have a primary intervention. However, when the entity's duty is concerned with reviewing a certain document or deliverable or informing/seeking information about something, the intervention is classified as secondary. In other words, the type of intervention depends on the responsibility of each project entity towards the documents.

In what follows, examples showing the reasoning behind the determined interventions of the key players are presented. Besides, an explanation for why these interventions were classified as primary or secondary will be provided.

#### 5.6.1.1 Reasoning Behind the Intervention to Avoid I1

In I1, the documents that were found to suffer from mistaken representations of existing conditions in the analyzed cases are mainly the design drawings and specifications. However, resource drawings are also stated among the defect documents since it is inferred that such defects are found initially in the resource drawings on which

the engineer relies to produce the design documents. Moreover, primary intervention is attributed to the owner and the A/E. Since having mistaken representations in design documents are most likely to be due to defective resource drawings, the responsibility lies upon the party responsible to produce these documents. Generally, the owner commissions the existing conditions' survey to a company that goes to the site to inspect the conditions in order to describe them in the report. For that reason, he must properly advise the process of its commissioning to ensure a good quality of the survey's deliverables.

In fact, when the scope of this survey and the terms of reference are not well-prepared, then, there will not be a clear way to judge the compliance of the representations shown in the report with the determined scope of the study. Since the A/E is the entity that knows better the technical relevance of the information that will be offered in this report, he is responsible for setting a clear scope and determining the terms of reference of the study. This way he will be able to judge the compliance of the outcomes of the survey in respect of the determined scope. It is important to note that the A/E and the PM cannot verify the accuracy or correctness of the study, however, they are responsible for judging its completeness with the determined scope. After that, A/E will produce design documents based on the outcomes of the existing conditions' study.

As for the contractor, his intervention is considered to be secondary since it is only centered around a review process. During the bidding phase, the contractor is responsible for reviewing the bidding documents (which include the resource drawings and the design drawings) upon which he will prepare his bid price. Since he is responsible for doing a visual inspection for the site during the bidding phase, he will be able to judge the correctness of the representations presented in these documents. Thus, when he

encounters a discrepancy between the representations in the resource drawings and what he saw on the ground, he must notify the owner about it before the end of the bidding phase.

#### 5.6.1.2 Reasoning Behind the Intervention to Avoid I2

Even though ill-coordinated sequencing of work packages' activities showed defects in the specifications of certain case law, it is inferred that the source of such a problem initiates from defectively prepared programs of work of different trade packages. Both the A/E's team and the owner's team have primary contributions in solving the problem. First, concerning the A/E's role, during the preparation of the design documents of a certain package of work, he should specify the related work, if any, in part 1 of the specifications. This will enable trade contractors to be knowledgeable of the works interfering or affecting their package to ensure structural integrity.

On the other hand, the PM must certify that each package of the work is properly prepared and launched at the right time/sequence. In other words, when a certain package is dependent on the work to be done by another one, it cannot be launched before it. For example, in C2, if the package of the trade contractor responsible for building the firewall was launched after that of the trade contractor responsible for building the pilot plant expansion, the resulting structural damages could have been avoided. For that reason, when the work is divided into multiple packages, the owner's team needs to take into consideration the time schedules of different packages put into one overall program. In addition to that, the TC is responsible for ensuring that the design documents produced by the A/E adhere to the structural integrity requirements.

Although the contractor's intervention is shown to be secondary, his role is of great importance since it contributes to avoiding the occurrence of such defects before the start of the construction phase. First, when the trade contractor's package includes certain work that will end up structurally unsafe when executed (like the case of a free-standing wall in C2), the contractor, being the one with the know-how, has to notify about it. Besides, when the trade contractor's package does not contain a section showing the related work in its specifications, he must ask for it from the responsible entities.

#### 5.6.1.3 Reasoning Behind the Intervention to Avoid I3

Both the A/E and the owner have primary interventions in solving the defects resulting from positive assertions. This resulted from the presence of erroneous positively asserted statements in the specifications (which are produced by the A/E) and in the contract conditions (which are produced by the owner) of the analyzed cases.

The architect/engineer's responsibility is to intervene in avoiding positive assertions present in the specs. This usually happens when the A/E positively asserts the nature or state of certain existing conditions, but turn out to be wrong. Here, the root cause of the problem is that the A/E took the outcomes of the resource documents as cast-in-stone and positively asserted them in the design documents. By doing that, he asserted what the resource documents said through a contract document, at the time where the resource documents could have been used by the contractor only for pricing purposes. In other words, he made these statements binding at the time where he could have left it for the contractor to make his own interpretation of what the document offers. Besides, even if the A/E had not positively asserted such information in its design documents, the problem is still present in the resource drawings. However, if erroneous positive assertions are found in resource drawings, the problem would have been of a lesser

consequence on the owner as compared to the presence of such erroneous expressions in the specs. It is also important to note that we do not aim to avoid all kinds of positive assertions to prevent such defects from taking place. The reason is positive assertions play a role in mediating a wide range of bid prices that might result due to having contractors taking very high and various contingency levels. Thus, A/E should only positively assert accurate information.

Besides, the owner's team should intervene to solve the problem when positive assertions are present in both the specs and in the contract conditions. In the first place, the PM is responsible for reviewing the design deliverables produced by the A/E. During this review, he should pinpoint the statements containing positive assertions and check the accuracy of the stated information. If the accuracy of the positively asserted information cannot be proven, they should be removed. Secondly, when positive assertions are found in the contract conditions (like in C44 where the contractor was directed to comply with a standard that is already "issued"), OR should ensure that such statements are not subject to change. In other words, when the owner makes a positive assertion in the contract conditions, he should be willing to endure the resulting consequences if the conditions later change. To illustrate, the contract conditions in C44 required the contractor to execute the work according to the "issued" version of the regulation. By asserting the term "issued", the owner should be willing to endure the extra costs resulting from changed conditions due to newer versions of this standard.

Moreover, the contractor's intervention is identified to be secondary. Like the previously discussed inferences, the contractor is responsible for reviewing the design documents and notify about any obvious discrepancy due to erroneous positively asserted descriptions. However, for cases where erroneous positive statements are present in

contract conditions like in C44, the contractor cannot notice such discrepancy thus, he cannot inquire about it. For that, he should assert the basis on which he is pricing to make sure that such conditions will not be subject to change.

#### 5.6.1.4 Reasoning Behind the Intervention to Avoid I4

Uncoordinated assignment of scope is identified as the root cause of defects found in design documents (drawings and specs). It is the primary responsibility of the A/E and the owner to avoid such defects. To start with, it is important to note that this inference was deduced from cases where certain work items were missing from the work packages of all the trade contractors assigned on the project. As a matter of fact, an uncoordinated assignment of scope to multiple packages initiates form an incomplete scope of work leading to incomplete design documents. So, to enable the owner to properly assign the scope on multiple trade packages, the A/E should produce design documents based on complete work requirements.

If the design deliverables produced by the A/E represent an all-inclusive design, then it is the responsibility of the PM now to properly assign/delineate the scope of work on each of the trade contractors. This is ensured by proper coordination of the related work requirements shown in the specs of each of the trade contractors.

The contractor's secondary responsibility is to review the design documents during the bidding phase and seek clarification about any work that interfaces with the work included in his package. In fact, as a trade contractor, he should question the package of work of the other trade contractors to be able to know if their work might interface with parts of his. Thus, it is the responsibility of the contractor to ask for the work related to his package to be able to coordinate accordingly.

#### 5.6.1.5 Reasoning Behind the Intervention to Avoid I5

This inference was found to take a presence in the specifications and contract conditions of the several analyzed cases. For that, both the architect/engineer and the owner have primarily responsible to avoid their occurrence. Since the root cause of the problem is the use of broad expressions, the A/E should use affirmative and explicit language that describes what the standard of good workmanship entails. In other words, instead of requiring the contractor to work "in a workmanlike manner", he should state the method of work to be followed. Also, instead of requiring the contractor to work according to standard practices, the A/E should describe the characteristics of such practices.

The owner's team must intervene to avoid the problem of broad expressions describing the work in both specifications and contract conditions. It is the responsibility of the PM (or the OR) while reviewing the design deliverables produced by the A/E, to pinpoint any broad expressions, and rephrase by explicitly describing the work requirements. Similarly, PM should avoid using broad expressions when drafting then for the contract conditions. Instead, he should affirmatively describe the standards of good workmanship.

As for the contractor, his secondary intervention lies in reviewing the contract documents during the bidding phase, pinpointing and filtering out any such broad expressions requiring him to work according to general standards, and inquiring about any such ambiguity.

#### 5.6.1.6 Reasoning Behind the Intervention to Avoid I6

Inferior material not commensurate for its intended use show presence in the specification of the analyzed case law. In fact, the responsibility of the presence of such defects rests primarily on the architect/engineer since the defect represents a design-related error. When producing the design documents, A/E must make an educated choice of the material to serve the intended use of the facility.

Besides, a secondary type of responsibility rests on the owner's team. Usually, the TC, on the behalf of the owner, reviews the design produced by the A/E and check if the material specified is suitable for its intended use. To do so, TC should ask the A/E for sufficient justifications or calculations that demonstrate the suitability of the chosen material for its intended use. This highlights the need for design-related technical competency in the owner's team to make the needed judgments to avoid such defects.

The secondary responsibility of the contractor is similar to the previously explained interventions.

#### 5.6.1.7 Reasoning Behind the Intervention to Avoid I14

General disclaimers requiring the contractors to check the plans and determine project requirements before submitting their bids are found frequently in the design drawings, specifications, and contract conditions. To solve this problem, designers and owners have a primary responsibility to intervene. The reason behind the architect/engineer using such disclaimers in the design is to impose indirect responsibilities to check the drawings and specs on the contractor. In other words, the A/E wants to attempt to use the bidding phase as a venue to check the workability of the design by the contractor to correct it. However, if the A/E is not sure about the workability of a

certain design element, he should consult a specialty contracting entity to help him in choosing the right design before the drafting of the design documents. In fact, the design exercise/review requires a considerable amount of time. Thus, it cannot be expected from the contractor to be able to check the workability of the design during the bidding phase, which is dedicated to the pricing process only. Therefore, shifting such responsibility on the contractor is not possible from a legal, time, and engineering hours perspective (based on what is shown in the analyzed case law). Hence, the A/E should not rely on such disclaimers as a means for verifying the design. Instead, such verification should be done even prior to the preparation of the design documents.

As for the owner, he has a primary intervention in avoiding such defects. The PM is responsible for reviewing the design documents produced by the A/E and filtering out any present general disclaimers. When such disclaimers are found, the PM should resolve the necessity of using them by recognizing that they will not shift the risk of the workability of the design. To do that, he should make sure that their usage is warranted and is not done for the aim of indirectly shifting the responsibility to check the workability of the design on the contractor. Besides, if it is desired to shift the risk, the PM should use explicit language that clearly states the imposed responsibilities on the contractor when drafting the contract conditions.

As for the contractor, his responsibility lies in carefully reviewing the contract documents during the bidding period and filtering out any present general disclaimers requiring him to check the plans and specifications before pricing. When such disclaimers are found, he should seek clarifications as to the scope of work that he expected to fulfill and whether he is afforded the time and cost to do what is expected from him. Thus, the contractor is responsible for resolving the implications of such general disclaimers to

understand well his role. As a result, if he is required to check the workability of designs, the extra time and cost needed will be taken into consideration in his submitted bid.

#### 5.6.1.8 Reasoning Behind the Intervention to Avoid I18

The use of arbitrarily chosen verb tenses is found in contract conditions and specifications. This explains the primary responsibility attributed to the designer and the owner. First, it is important to explain that, by using arbitrarily chosen verb tenses in contract clauses requiring the contractor to work following a certain applicable standard, the owner and the designer are limiting the version of the applicable standard. This is shown in C44 where, upon release of a new version of the standard that the contractor was requested to follow, the owner wanted the work to be performed by following the new version of this standard. However, because of using the past tense of the verb "issued", he limited the applicability of the standard that he referenced at the time of tender. Besides, when the owner or the designer requires the contractor to perform a certain task by following referenced standards, the contractor should abide by the version of such standards as related to the base date. The base date of referenced standards is the newest version present not less than 28 days before the date of submission of tender. If a new version is launched after this period, and the owner requires the contractor to abide by it, the contractor has the right to ask for extra money for performing it. Hence, when relying on the referenced standards method of specifying, the A/E shall explicitly state the applicable standards to be those published before the base date. And in his turn, the PM should ensure that all referenced standards are those to be explicitly stated to have been published before the base date.

The contractor's role is to pinpoint any referenced standard that is not tied to the base date and seek clarifications about it to avoid the resulting consequences.

The same reasoning is applied to deduce the interventions to avoid other inferences. These are clearly explained in Table 10. In the following section, the deduced descriptions will enable us to expand these general descriptions into detailed characteristics showing the reason, scope, and means of the intervention of each key player.

### 5.6.2 *Characteristics of the Intervention of Project Entities*

In this section, the descriptions of the interventions of each of the internal key players which were presented above are classified into three essential characteristics: the reason, scope, and means of the intervention of each entity. This will enable us to answer the three questions that are left: Why should each entity intervene? What should each entity do? And How should each entity intervene? Similar to Table 10, the analysis will be done per each inference.

Table 11 below presents the characteristics of the intervention of the three internal key players to avoid each of the 18 inferences.

*Table 11: Characteristics of the interventions of the project entities*

| # | Inference | Document (Where) | Inter-vention | Internal Key Players (Who) | | |
|---|---|---|---|---|---|---|
| | | | | **Architect/Engineer (A/E) Design Consultant Team** | **Owner's Team** | **General Contractor (GC)/ Trade Contractors (TC)** |
| **I1** | "Mistaken representations" of existing conditions | - Resource Drawings<br>- Design Drawings<br>- Specs | **Reason (Why):** | - Knowing better the technical relevance of sought information | - Avoiding having to deal with claims related to this work aspect | - Serving proper construction cost pricing |
| | | | **Scope (What):** | - Scoping existing conditions study<br>- Ensuring compliance of the study's deliverables with the determined scope | - Ensuring proper administration of the procurement of relevant studies<br>- Ensuring completeness of the existing conditions study<br>- Ensuring compliance of the study's deliverables and design deliverables with the determined scope | - Detecting any obvious discrepancies in existing conditions among own visual inspection, resource documents, design documents, etc… |
| | | | **Means (How):** | - Producing terms of reference for existing conditions study<br>- Reviewing the study's deliverables<br>- Producing design documents based on sound deliverables | - Advising on terms of engagement and process of commissioning of the existing conditions study<br>- Reviewing the scope and the terms of reference to existing conditions study<br>- Detecting any omission in the scope presented in the existing conditions' study<br>- Remedying any such present omission | - Carefully (i.e., in good faith) reviewing resource drawings, design drawings, and specs<br>- Notifying PM or A/E of such specific encountered discrepancies |

| | | | | | | |
|---|---|---|---|---|---|---|
| **I2** | Ill-coordinated sequencing of work packages' activities | - Specs<br>- Program of Work | **Reason (Why):** | - Owing to the owner the standard of care duty in delivering the design instruments<br>- Avoiding being held liable for any structural failures and resulting consequences | - Avoiding having to deal with claims related to this work aspect<br>- Avoiding any resulting defects leading to re-work | - Avoiding being held liable for any structural failures and resulting consequences |
| | | | **Scope (What):** | - Ensuring structural integrity of the work<br>- Ensuring work safety | - Ensuring proper packaging of the job<br>- Ensuring proper sequencing of packages' work | - Detecting any obvious ill-sequenced execution work activities |
| | | | **Means (How):** | - Specifying related work<br>- Incorporating relevant specifications requirements | - Clearly delineating the scope of work packages<br>- Proper drafting/reviewing of the specifications' general requirements<br>- Coordinating the work programs of related packages<br>- Synchronizing the execution of related work packages | - Carefully (i.e., in good faith) reviewing tender documents<br>- Notifying PM or A/E of any unsynchronized sequence of work potentially leading to unsafe conditions |
| **I3** | Use of "Positive Assertion" | - Specs<br>- Contract Conditions | **Reason (Why):** | - Avoiding being held liable for any structural failures and resulting consequences | - Avoiding having to deal with claims related to this work aspect | - Serving proper construction cost pricing |
| | | | **Scope (What):** | - Ensuring accuracy of positively asserted statements/descriptions | - Ensuring correctness of positively asserted statements/descriptions<br>- Ensuring that positively asserted conditions are not subject to change | - Detecting any obvious erroneous positively asserted statements/descriptions |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | **Means (How):** | - Proper drafting of design documents by positively asserting accurate statements/descriptions only | - Reviewing design deliverables produced by A/E<br>- Pinpointing statements containing positive assertions<br>- Verifying that positively asserted statements/descriptions are true<br>- Proper drafting of contract conditions by positively asserting conditions/requirements that are not subject to change | - Carefully (i.e., in good faith) reviewing tender documents<br>- Specifically pinpointing and filtering out any erroneous positive assertion<br>- Notifying PM or A/E of such specific encountered errors<br>- Clarifying the basis of pricing when positive assertions are present in contract conditions |
| **I4** | Uncoordinated assignment of scope to multiple contracts | - Specs<br>-Drawings | **Reason (Why):** | - Owing the standard of care duty to the owner in delivering the design instruments<br>- Avoiding being held liable for any structural failures and resulting consequences | - Avoiding having to deal with claims related to this work aspect<br>- Serving proper realization of the intended scope/design | - Avoiding being held liable for any structural failures and resulting consequences |
| | | | **Scope (What):** | - Ensuring completeness of scope of work | - Ensuring proper packaging of the job<br>- Ensuring proper division of scope among trades | - Detecting any obvious omitted work activities |
| | | | **Means (How):** | - Producing an all-inclusive design | - Clearly delineating the scope of work packages<br>- Proper drafting/reviewing of the specifications' general requirements | - Carefully (i.e., in good faith) reviewing tender documents<br>- Notifying PM or A/E of such specific encountered omissions |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | - Coordinating the work requirements of related packages | - Seeking clarifications on work interfacing with the work included in his package |
| **I5** | Broadly specifying work to be done in a "workmanlike manner or according to standard practices" | - Contract Conditions<br>- Specs | **Reason (Why):** | - Owing to the owner the standard of care duty in delivering the design instruments<br>- Avoiding being held liable for any resulting consequences | - Avoiding having to deal with claims related to this matter<br>- Serving proper realization of the intended scope/design | - Serving proper construction cost pricing |
| | | | **Scope (What):** | - Ensuring explicitness of scope of work and related requirements | - Ensuring explicitness of scope of work and related requirements | - Detecting any ambiguities arising due to using broad expressions in describing the scope of work and related requirements |
| | | | **Means (How):** | - ***Affirmatively*** describing/showing what the standards of good workmanship entail | - Reviewing design deliverables produced by A/E<br>- Pinpointing broad expressions requiring the contractor to follow the standards of good workmanship in design documents<br>- ***Affirmatively*** rephrasing/detailing/describing/ showing what the standards of good workmanship entail | - Carefully (i.e., in good faith) reviewing tender documents<br>- Specifically pinpointing and filtering out any broad expressions specifying work to be done in a workmanlike manner or according to standard practices<br>- Seeking clarifications regarding the expectations/requirements of work to be specified |
| **I6** | Selection of inferior material not commensurate | - Specs | **Reason (Why):** | - Avoiding being held liable for any structural failures and resulting consequences | - Avoiding having to deal with claims related to this matter<br>- Serving proper realization of the intended scope/design | - Avoiding being held liable for any structural failures and resulting consequences |

| | | | | | | |
|---|---|---|---|---|---|---|
| | with its intended use | | | | - Avoiding any resulting defect leading to re-work | |
| | | | **Scope (What):** | - Making a suitable and educated choice of material to serve for its intended use | - Ensuring suitability of the selected type of material in serving its intended use | - Detecting any obvious defective design of any work element |
| | | | **Means (How):** | - Providing sufficient justification to demonstrate suitability of selected material | - Reviewing design deliverables produced by A/E<br>- Verifying credibility of presented demonstration | - Carefully (i.e., in good faith) reviewing tender documents<br>- Seeking clarifications when in doubt of defectively designed work elements |
| **I7** | Clearly described defective design leading to unsatisfactory performance | - Design Drawings<br>- Specs | **Reason (Why):** | - Owing to the owner the standard of care duty in delivering the design instruments<br>- Avoiding being held liable for the resulting consequences | - Avoiding having to deal with claims related to this matter<br>- Serving proper realization of the intended scope<br>- Avoiding any resulting defect leading to re-work | - Avoiding being held liable for any structural failures and resulting consequences<br>- Serving proper construction cost pricing |
| | | | **Scope (What):** | - Ensuring soundness of generated design | - Ensuring correctness of generated design | - Detecting any obvious defectively designed elements |
| | | | **Means (How):** | - Providing proper documentation of calculations in support of adopted design solutions<br>- Proper drafting of design documents based on sound and workable design | - Verifying soundness of presented documentations of calculations of design solutions<br>- Reviewing design deliverables produced by A/E<br>- Remedying any such present defect | - Carefully (i.e., in good faith) reviewing tender documents<br>- Seeking clarifications when in doubt of defective design |
| **I8** | Lack of “factors that accurately determine the meaning” of broad | - Design Drawings<br>- Specs | **Reason (Why):** | - Avoiding being held liable for the resulting consequences | - Avoiding having to deal with claims related to this matter<br>- Serving proper realization of the intended scope | - Serving proper construction cost pricing |

| | | | | | | |
|---|---|---|---|---|---|---|
| | terms or expressions | | **Scope (What):** | - Making clear definition of broad terms and expressions | - Ensuring clear understanding of broad terms and expressions | - Detecting any ambiguities present in the language used to define broad terms or expressions |
| | | | **Means (How):** | - Describing work items/aspects using detailed and explicit, rather than broad, language | - Reviewing design deliverables produced by A/E<br>- Pinpointing ill-defined broad terms and expressions<br>- Remedying any such present ambiguous expressions | - Carefully (i.e., in good faith) reviewing tender documents<br>- Specifically pinpointing and filtering out any ill-defined broad terms<br>- Seeking clarifications regarding such specific ambiguities |
| **I9** | "Surfacial inconsistencies" in describing design elements within and between different documents | - Design Drawings<br>- Specs | **Reason (Why):** | - Avoiding being held liable for the resulting consequences | - Avoiding having to deal with claims related to this matter<br>- Serving proper realization of the intended scope | - Serving proper construction cost pricing |
| | | | **Scope (What):** | - Ensuring consistency in the descriptions of the same design elements within and between different documents | - Ensuring consistency in the descriptions of the same design elements within and between different documents | - Detecting any obvious discrepancy present in describing design elements within and between different documents |
| | | | **Means (How):** | - Uniformly describing the work items/aspects within the same design document<br>- Producing consistent/compatible design documents | - Reviewing design deliverables produced by A/E<br>- Pinpointing conflicting descriptions of design elements within and between different documents<br>- Remedying any such present discrepancies | - Carefully (i.e., in good faith) reviewing tender documents<br>- Specifically pinpointing and filtering out conflicting descriptions of design elements<br>- Notifying PM or A/E of encountered discrepancies |
| **I10** | Non-comprehensive descriptions of | - Specs | **Reason (Why):** | - Avoiding being held liable for the resulting consequences | - Avoiding having to deal with claims related to this matter | - Serving proper construction cost pricing |

| | | | | | | |
|---|---|---|---|---|---|---|
| | integrative work item constituents | | | | - Serving proper realization of the intended scope | |
| | | | **Scope (What):** | - Ensuring completeness of descriptions of work item constituents | - Ensuring inclusiveness of the constituents of integrative work items | - Detecting any obvious exclusion of work aspects pertaining to specified integrative work items |
| | | | **Means (How):** | - ***Expressly*** stating all of the work aspects pertaining to specified integrative work items in specifications and/or BOQ | - Reviewing design deliverables produced by A/E<br>- Pinpointing any omitted essential constituents of integrative work items<br>- Remedying any such present omissions | - Carefully (i.e., in good faith) reviewing tender documents<br>- Specifically pinpointing and filtering out any obvious exclusion of work aspects pertaining to specified integrative work items<br>- Notifying PM or A/E of such specific omissions |
| **I11** | Striking out language from the contract without providing explicit clarifications or alternative provisions | - Specs<br>- Contract Conditions | **Reason (Why):** | - Avoiding being held liable for the resulting consequences | - Avoiding having to deal with claims related to this matter | - Serving proper construction cost pricing<br>- Ensuring proper understanding of own contractual rights |
| | | | **Scope (What):** | - Ensuring explicitness of clarification in respect of any struck-out descriptions of work items | - Ensuring explicitness of clarification in respect of any struck-out provisions in contract conditions or descriptions of work items in specifications | - Detecting any obvious ambiguities induced from struck-out descriptions or provisions |
| | | | **Means (How):** | - Providing alternative provisions for any struck-out expressions in the specifications | - Providing alternative provisions for any struck-out expressions in the contract conditions<br>- Reviewing design deliverables produced by A/E | - Carefully (i.e., in good faith) reviewing tender documents<br>- Specifically pinpointing and filtering out any struck-out descriptions or provisions without clarifications |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | - Pinpointing any descriptions of work items that are struck out without providing alternative provisions<br>- Remedying any such ambiguity | - Seeking clarifications regarding such specific ambiguities as opposed to making own assumptions in respect thereof |
| **I12** | Use of "innocuous boilerplate language" for assigning/ transferring liabilities | - Bidding Requirements<br>- Bond/ Guarantee/ Warranty<br>- Contract Conditions<br>- Specs | **Reason (Why):** | - Avoiding being held liable for the resulting consequences | - Avoiding having to deal with claims related to this matter | - Serving proper construction cost pricing<br>- Ensuring proper understanding of own contractual liabilities/responsibilities |
| | | | **Scope (What):** | - Ensuring explicitness of assigned/transferred liabilities | - Ensuring explicitness of assigned/transferred liabilities | - Detecting any obvious ambiguities induced from using obscure language intended for assigning/transferring liabilities |
| | | | **Means (How):** | - Clearly stating imposed/transferred liabilities using direct, instead of ***obscure***, language | - Clearly stating imposed/transferred liabilities using direct, instead of ***obscure***, language in relevant contract documents<br>- Reviewing design documents produced by A/E<br>- Pinpointing obscure expressions used to impose/transfer liabilities on other entities<br>- Remedying any such ambiguous language | - Carefully (i.e., in good faith) reviewing tender documents<br>- Specifically pinpointing and filtering out any obscure language intended for assigning/transferring liabilities<br>- Seeking clarification regarding encountered ambiguities |

| | | | | | | |
|---|---|---|---|---|---|---|
| **I13** | "Interchangeable" usage of synonyms for referring to the same work item | - Design Drawings<br>- Specs | **Reason (Why):** | - Avoiding being held liable for the resulting consequences | - Avoiding having to deal with claims related to this matter<br>- Serving proper realization of the intended scope | - Serving proper construction cost pricing |
| | | | **Scope (What):** | - Ensuring consistency in the choice of expressions used to refer to the same elements | - Ensuring consistency in the choice of expressions used to refer to the same elements | - Detecting any obvious discrepancies due to interchangeable use of synonyms for referring to the same elements |
| | | | **Means (How):** | - Adopting the same terms/expressions for referring to the same elements throughout the design documents | - Reviewing design deliverables produced by A/E<br>- Pinpointing different terms/expressions for referring to the same element throughout the design documents<br>- Remedying any such discrepancy in the expressions used | - Carefully (i.e., in good faith) reviewing tender documents<br>- Specifically pinpointing and filtering out different terms/expressions used for referring to the same element<br>- Seeking clarification regarding encountered discrepancies |
| **I14** | "General disclaimers requiring the contractor to check plans and determine project requirements" | - Design Drawings<br>- Specs<br>- Contract Conditions | **Reason (Why):** | - Owing to the owner the standard of care duty in delivering the design instruments | - Avoiding having to deal with claims related to this matter | - Serving proper construction cost pricing<br>- Ensuring proper understanding of own contractual liabilities/responsibilities |
| | | | **Scope (What):** | - Ensuring accuracy of design of work elements<br>- Ensuring explicitness of assigned/shifted responsibilities | - Ensuring warranted usage of disclaimers<br>- Ensuring explicitness of assigned/shifted responsibilities | - Detecting any obvious ambiguity induced from general disclaimers requiring the contractor to check plans and determine project requirements |
| | | | **Means (How):** | - Verifying the soundness/workability of | - Reviewing design deliverables produced by A/E | - Carefully (i.e., in good faith) reviewing tender documents |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | the design prior to the release of bid documents instead of relying on general disclaimers as means for validating it<br>- Clearly stating that the risk of flaws will be transferred to other entities when it is the case | - Resolving the necessity of using general disclaimers<br>- Recognizing that they do not serve to ***shift the risk of flaws*** in contract documents to other entities<br>- Clearly stating that the risk of flaws will be transferred to other entities when it is the case | - Specifically pinpointing and filtering out general disclaimers requiring the contractor to check plans and determine project requirements<br>- Seeking clarifications as to the implications of such disclaimers<br>- Seeking clarifications as to the scope of review of which he is expected to fulfill |
| **I15** | "Language that allows for two reasonable alternative explanations" | - Specs | **Reason (Why):** | - Avoiding being held liable for the resulting consequences | - Avoiding having to deal with claims related to this matter<br>- Serving proper realization of the intended scope | - Serving proper construction cost pricing |
| | | | **Scope (What):** | - Ensuring uniformity of understanding/interpretation of contract requirements | - Ensuring uniformity of understanding/interpretation of contract requirements | - Detecting any obvious discrepancies in the language used allowing multiple reasonable alternative explanations |
| | | | **Means (How):** | - Carefully selecting/choosing a sufficiently explicit language to ensure one clear understanding | - Reviewing design deliverables produced by A/E<br>- Testing the language used for potentially affording or offering alternative explanations<br>- Remedying any such language allowing for several interpretations | - Carefully (i.e., in good faith) reviewing tender documents<br>- Warranting a pricing/planning based on one reasonable interpretation regardless of whether other reasonable explanations may be found to prevail as well at a later stage |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | - Notifying PM or A/E of encountered discrepancies present in the language |
| **I16** | Referring to essential components using "indirect and secondary means" making them a "discretionary and not a proprietary feature of the contract" | - Specs | **Reason (Why):** | - Avoiding being held liable for the resulting consequences | - Avoiding having to deal with claims related to this matter<br>- Serving proper realization of the intended scope | - Serving proper construction cost pricing |
| | | | **Scope (What):** | - Making explicit inclusion of all essential work items' constituents | - Ensuring explicitness of the terms used to refer to essential work items' constituents | - Detecting any obvious ambiguities induced from the presence of indirect and secondary means when stating work items' constituents |
| | | | **Means (How):** | - Specifying/Establishing the essential and most prominent components<br>- Clearly stating essential and most prominent components when describing the scope of work items | - Reviewing design deliverables produced by A/E<br>- Pinpointing any secondary means for specifying the inclusion of work items constituents<br>- Remedying any such defective language | - Carefully (i.e., in good faith) reviewing tender documents<br>- Specifically pinpointing and filtering out any indirect and secondary means used for specifying the inclusion of work items constituents<br>- Seeking clarifications regarding such specific ambiguities |
| **I17** | "Inadvertently omitting" certain items from specifications and/or drawings | - Design Drawings<br>- Specs | **Reason (Why):** | - Owing to the owner the standard of care duty in delivering the design instruments<br>- Avoiding being held liable for the resulting consequences | - Avoiding having to deal with claims related to this matter<br>- Serving proper realization of the intended scope | - Serving proper construction cost pricing |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | **Scope (What):** | - Ensuring incorporation of all referenced design documents<br>- Ensuring completeness of specification requirements pertaining to design elements | - Ensuring incorporation of all referenced design documents<br>- Ensuring completeness of specification requirements pertaining to design elements | - Detecting any obvious omission of referenced design documents or omission of specification requirements pertaining to design elements |
| | | | **Means (How):** | - Providing a complete basket of design documents<br>- Presenting comprehensive descriptions and representations of design elements | - Reviewing design deliverables produced by A/E<br>- Detecting any missing referenced design documents<br>- Detecting any omitted specification requirements of design elements<br>- Remedying any such omission | - Carefully (i.e., in good faith) reviewing tender documents<br>- Specifically pinpointing any omitted referenced design document<br>- Specifically pinpointing any omitted specification requirement pertaining to design elements<br>- Notifying PM or A/E of encountered omissions |
| **I18** | Use of improper, arbitrarily chosen verb tenses in contract clauses limiting the intended applicability of referenced standards | - Contract Conditions<br>- Specs | **Reason (Why):** | - Avoiding being held liable for the resulting consequences | - Avoiding having to deal with claims related to this matter | - Serving proper construction cost pricing |
| | | | **Scope (What):** | - Making educated and suitable choice of verb tenses in contract clauses when referring to standards that must be followed | - Ensuring educated and suitable choice of verb tenses in contract clauses when referring to standards that must be followed | - Detecting any obvious discrepancies induced from references to standards not tied to the base date |
| | | | **Means (How):** | - Explicitly stating the applicable standards to be those published prior to the base date | - Reviewing design deliverables produced by A/E | - Carefully (i.e., in good faith) reviewing tender documents<br>- Specifically pinpointing and filtering out any referenced |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | - Pinpointing any referenced standard that is not tied to the base date<br>- Remedying any such defective language | standard that is not tied to the base date<br>- Seeking clarifications about encountered discrepancies |

The deduced reason, scope, and means of the intervention of project entities shown in Table 11 will be explained below.

First, the reason for the intervention of each entity is determined by asking the following question: why is this entity going to intervene in avoiding the occurrence of this inference? Usually, the answer to this question represents two options: either the compliance with a certain responsibility or the fulfillment of a certain benefit or interest. For example, in I1, the reason behind the intervention of the contractor to avoid mistaken representations of existing conditions is to fulfill his interest in serving proper construction cost pricing. In other words, if he contributes to avoiding mistaken representations of existing conditions, he will benefit by being able to properly price the project. Besides in I2, one of the reasons behind the intervention of the A/E to avoid ill-coordinated sequencing of work packages' activities is owing to the owner the standard of care duty in delivering the proper design instruments. This represents a responsibility that he must abide by. The second reason for the A/E's intervention represents his interest in avoiding being held liable for any resulting structural failures or consequences that might result due to such defect. Several other reasons for the interventions of the key players were deduced as shown in Table11 using the same rationale.

The scope and means are deduced from the general descriptions of the interventions of the key players presented in Table 10. As already explained, the scope generally represents the role attributed to each of the project entities in avoiding a particular inference. This is based on his responsibilities, duties, and obligations in the project. To identify the scope, the following questions should be answered: What should this entity ensure to avoid this inference? Or what is this entity responsible for ensuring to avoid the occurrence of such defects? Besides, the means of intervention represent the

set of tasks and actions that should be performed by each entity to fulfill their respective scope. In other words, the means represent the practical side of the roles stated in the scope. For example, if the defect is present in the design documents, the task of the A/E would be to properly draft or produce a certain deliverable, whereas the task of the owner's team would be to review and remedy the design deliverables. Mainly, the question that enables the identification of the means from the determined scope is the following: How should this entity intervene to fulfill the determined scope that avoids the occurrence of this inference? Several examples are presented in what follows to explain how the scope and means shown in Table 11 were deduced from the general descriptions of the interventions shown in Table 10.

As an illustration, in I7, the A/E's responsibility described in Table 10 is to produce a sound design, which represents a prerequisite for producing specifications. From this description, we identified the scope and means of his intervention to avoid clearly described defective design leading to unsatisfactory performance. First, the scope represents the responsibility of the engineer in relation to the problem: he has to ensure the soundness of the generated design. After that, the means are determined by identifying the tasks or actions that should be performed to ensure that the scope is realized. So, to ensure the soundness of the generated design, the architect/engineer should provide the with owner proper documentation of the detailed calculations in support of the adopted design solutions. This represents evidence for the workability of the produced design. Following that, the A/E must properly draft the design documents based on the generated sound design. Besides, the owner's role, as described in Table 10, is to review the design documents and to detect defective design. Thus, the scope of his intervention is similar to that of the engineer: he has to ensure the soundness of the generated design. However, the

means differ since these depend on the role of each entity in the project. The owner's team should verify the workability of the design solutions using the calculations provided by the A/E. In addition to that, the team should review the design documents produced by the A/E and remedy any such defective design. Hence, the identified tasks attributed on the A/E are represented by the following action verbs: "*Provide*" and "*Draft*" whereas those attributed on the owner are illustrated by the action verbs: "*Verify*", "*Review*" and "*Remedy*". This explains the difference in the type of intervention of these two entities. Even though the designer and the owner have primary responsibilities to ensure the same scope (ensure the soundness of the design), their means differ since they depend on their respective roles as project entities in relation to the specific defect.

Similarly, in I9, the scope of intervention of the designer's team and the owner's team is to ensure a consistent description of the same design elements within and between different documents. However, their means of intervention are different since they depend on the roles of the project entities in avoiding such defects. In fact, their roles depend on the documents that are prone to face such type of defects. This explains the different types of responsibilities imposed on them: the A/E has a primary intervention whereas the owner has a secondary intervention. Here in I9, the defect is present in the design documents, so the responsibility of the A/E lies in uniformly describing the work items/aspects within the same design document in addition to producing consistent/compatible design documents. As for the owner's team, the scope of intervention is fulfilled by reviewing the design deliverables produced by A/E, pinpointing conflicting descriptions of design elements within and between different documents, and remedying any such present discrepancy. As a result, the primary intervention of the designer's team is presented in his tasks to "Describe" and "Produce".

While the secondary intervention of the owner is justified by his role to “Review”, “Pinpoint” and “Remedy”.

Furthermore, the scope and means of the intervention of the contractor’s team in each inference are identified in the same way. In fact, one can notice that the secondary intervention attributed to him is repetitive throughout the inferences in Tables 10 and 11. To illustrate, in I9, the contractor should review the design documents during the bidding phase and notify the owner about any obvious discrepancy within and between the drawings and specifications as mentioned in Table 10. Subsequently, the scope of intervention of the contractor to avoid the occurrence of surficial inconsistencies is to detect any obvious discrepancy present in describing design elements within and between different documents. To do that, he has to carefully review the tender documents, pinpoint and filter out any conflicting descriptions of design elements, and notify PM or A/E of such encountered discrepancies. In fact, as a contractor, if you detect any discrepancy or defect in the documents, you owe it to the client to notify about this defect. This is the reason behind the Q&A period taking place during the bidding phase which gives room to the contractor to actually make his voice heard in terms of any detected defects in contract documents. Similar reasoning is adopted in other inferences to identify the scope and means attributed to the contractor. Mainly, his secondary intervention is illustrated in “Reviewing” documents, “Pinpointing/Filtering out” defects, and “Notifying/Seeking clarifications” about them.

## 5.7 Types and Forms of Intervention of Key Players

This section offers a summary of the deduced types and forms of interventions of the three internal key players in relation to each inference. This summary is presented in Table 12 shown below.

*Table 12: Type and form of intervention of internal key players*

| Inferences | Internal Key Players | | |
|---|---|---|---|
| | **A/E's Team** | **Owner's Team** | **Contractor's Team** |
| **I1** | *Produce/Review* | *Advise/Review/Remedy* | *Review/Notify* |
| **I2** | *Specify/Incorporate* | *Delineate/Draft/Review /Coordinate/Synchronize* | *Review/Notify* |
| **I3** | *Draft* | *Review/Pinpoint /Verify/Draft* | *Review/Pinpoint/Filter out/Notify/Clarify* |
| **I4** | *Produce* | *Delineate/Draft/Review /Coordinate* | *Review/Notify/Seek Clarification* |
| **I5** | *Describe/Show* | *Rephrase/Detail/Describe /Pinpoint/Review* | *Review/Pinpoint/Filter out/Seek Clarification* |
| **I6** | *Provide* | *Review/Verify* | *Review/Seek Clarification* |
| **I7** | *Provide/Draft* | *Review/Verify/Remedy* | *Review/Seek Clarification* |
| **I8** | *Describe* | *Review/Pinpoint/Remedy* | *Review/Pinpoint/Filter out/Seek Clarification* |
| **I9** | *Describe/Produce* | *Review/Pinpoint/Remedy* | *Review/Pinpoint/Filter out/Notify* |
| **I10** | *State* | *Review/Pinpoint/Remedy* | *Review/Pinpoint/Filter out/Notify* |
| **I11** | *Provide* | *Provide/Review/Pinpoint /Remedy* | *Review/Pinpoint/Filter out/ Seek Clarification* |
| **I12** | *State* | *State /Review/Pinpoint /Remedy* | *Review/ Pinpoint/Filter out/ Seek Clarification* |
| **I13** | *Adopt* | *Review/Pinpoint/Remedy* | *Review/ Pinpoint/Filter out/ Seek Clarification* |
| **I14** | *Verify/State* | *Review/Resolve/Recognize /State* | *Review/Pinpoint/Filter out/Seek Clarification* |
| **I15** | *Select/Choose* | *Review/Test/Remedy* | *Review/Warrant/Notify* |
| **I16** | *State* | *Review/Pinpoint/Remedy* | *Review/Pinpoint/Filter out/Seek Clarification* |
| **I17** | *Provide/Present* | *Review/Detect/Remedy* | *Review/ Pinpoint/Notify* |
| **I18** | *State* | *Review/Pinpoint/Remedy* | *Review/Pinpoint/Filter out/Seek Clarification* |

Primary Intervention, Secondary Intervention

The types of intervention (primary or secondary) are deduced from the general descriptions of interventions showed in Table 10. As for the forms of intervention, these are inferred from the language used in explaining the means of the intervention of each project entity as presented in Table 11. The forms of the intervention of each project entity are depicted as action verbs to summarize the deduced duties and responsibilities of each entity in solving the different types of defects. In addition, these action verbs help in understanding the reason behind

As it can be seen from Table 12 above, primary contributions require the key players to *Produce* or *Draft* a certain document, *Describe* a certain aspect, *Show* a certain representation, *State* certain information, *Adopt* certain criteria, *Choose* or *Select* certain option, *Provide* or *Present* a certain outcome, etc… Whereas secondary interventions require the key players to *Review, Verify* or *Remedy* certain documents produced by others, *Pinpoint* defective representations done by others, *Notify* or *Seek Clarifications* from others, etc.… So, it is mainly based on doing secondary actions related to deliverables or outcomes produced by primary key players. It is also important to note that in certain inferences, project parties have primary and secondary responsibilities. For example to *Draft* a certain document and *Review* another deliverable. In such cases, the intervention is classified as primary.

Figure 7 below summarizes the types of interventions attributed to each project entity to solve the problem of defects in contract documents.

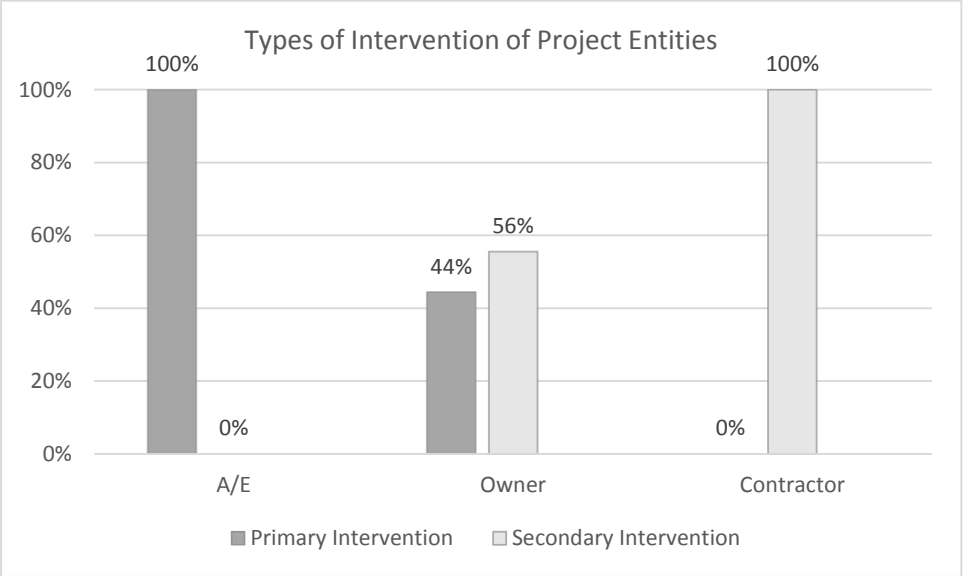


*Figure 7: Types of interventions of project entities*

Based on the classifications of the types of interventions of project entities shown in Table 12, the percentages of primary and secondary interventions attributed to each party are generated and shown in Figure 7 above.

Based on the findings of this chapter, all the entities are responsible to avoid the presence of defects in the contract documents. However, their mode of intervention differs. The architect/engineer has a primary responsibility to avoid the occurrence of all the identified types of defects found in the contract documents of the analyzed cases. As for the owner, he has to intervene in a primary manner to solve 44% of the identified defects and in a secondary manner to solve 56% of the other types of defects. Finally, the contractor has a secondary responsibility to avoid the occurrence of the defects found in the analyzed cases.

If we are to compare our findings with those presented by Laryea (2011), we can notice that the previous studies blamed the owners for the presence of defects and recommended that they follow the suggested theoretical guidelines. However, our

findings reveal that it is the responsibility of the three main internal key players of a construction project to contribute to the prevention of defects in contract documents.

# CHAPTER 6

# ADMINISTRATIVE ROLES AND TASKS OF PROJECT ENTITIES

## 6.1 Preamble

In the previous chapter, the attributes of the intervention of the internal key players to avoid each of the 18 inferences were identified: the reason behind their intervention, the time of their intervention, the documents in which they intervene, the scope of their intervention and the means of their intervention.

In this chapter, the deduced attributes of intervention will be sorted into administrative functional aspects of work pertaining to each entity. This will be presented through a framework showing the roles and tasks required from each project entity during the phases concerned with the production of contract documents. As such, the theoretical guidelines done by Laryea (2011), which offered the owner with a set of recommendations to follow in order to enhance the quality of documents, will be developed into detailed, practical, administrative functional aspects and roles for each of the main internal key players concerned with the construction project.

## 6.2 Project Entities' Involvement in the Cycle of Production of Contract Documents

In Chapter 5, a depiction of the cycle of production of contract documents was shown in Figure 6. The development of the constituents of the contract documents throughout the main phases of a construction project was presented. However, such

representation did not show the roles of the project entities in relation to the production of these documents throughout the project phases. For that, Figure 8 below represents a framework showing the way each entity is involved in the cycle of production of contract documents.

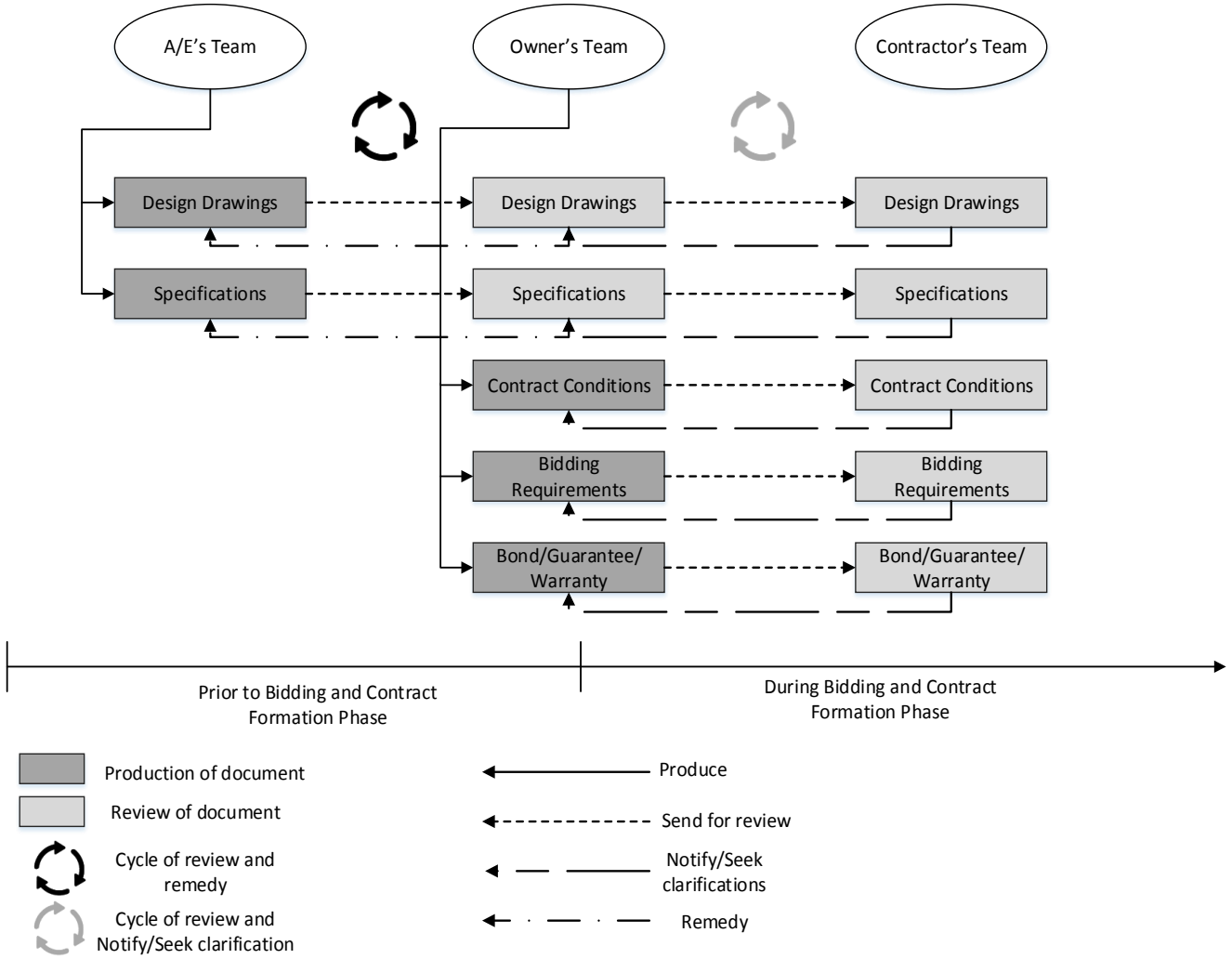


*Figure 8: Project entities' involvement in the cycle of production of contract documents*

As can be seen in Figure 8 above, the framework presents the cycle of production of the contract documents prior to, and during the bidding and contract formation phase. The reason behind considering these two phases is that they represent the phases in which the contract documents are produced. In addition, since our study aims to ensure a better quality of contract documents before the start of construction, we are not interested in including the post bidding and contract formation phase. Moreover, the constituents of the contract documents that are shown in the above framework represent a summarized version of those shown in the depiction in Figure 6. In fact, the constituents shown in the framework are those identified to contain defects in the analyzed cases. Thus, we do not aim to show the detailed constituents of contract documents as in Figure 6 for simplicity and a better understanding of the findings that will be presented in this chapter.

As can be seen from the framework, the architect/engineer consultant's team is responsible for the production of the design drawings and specifications which takes place prior to the bidding and contract formation phase. These documents are then given to the owner's team for review. In case defects were detected, the owner's team will discuss the corrections with the A/E's team and will send them back the design documents for review. This process represents a cycle of "review and remedy" which takes place prior to the bidding and contract formation phase. This cycle could be repeated for as many iterations as needed to result in a better quality of the produced documents. On the other hand, the owner's team is responsible for the production of contract conditions, bidding requirements, bonds, guarantees, and warranties. Upon finishing the review of design documents and the production of the other contract documents, the bidding phase is launched. During this phase, the owner provides the bidders (here shown as contractors) with the basket of documents in order to prepare their bid. However, contractors are

required to review these documents during the bidding phase. If defects or ambiguities were found, the contractor is required to notify or seek clarifications from the owner about them. When the identified defects are found in the contract documents produced by the owner, this latter has to adjust them and send them back to bidders in the form of addenda. Besides, when the detected defects are found in the design documents, the cycle of "review and remedy" taking place between the owner and the A/E will be repeated. Upon adjustments of the documents, these will be sent again to the contractor for review. This explains the cycle of "review and notify or seek clarification" shown between the owner and the contractor taking place during the bidding and contract formation phase.

## 6.3 Deduced Practical Roles and Activities of Project Entities

In this section, the roles and tasks that should be satisfied by the project entities throughout the different phases of the production of contract documents are presented. These were deduced from the scope and means of the intervention of the internal key identified in the previous chapter. The framework shown in Figure 9 below, represents the practical roles and activities specific to the three main project entities during the production of contract documents. As we can see, it represents the same framework showed in Figure 8, but with the addition of the classes of scopes and means of intervention that should be fulfilled by each entity.

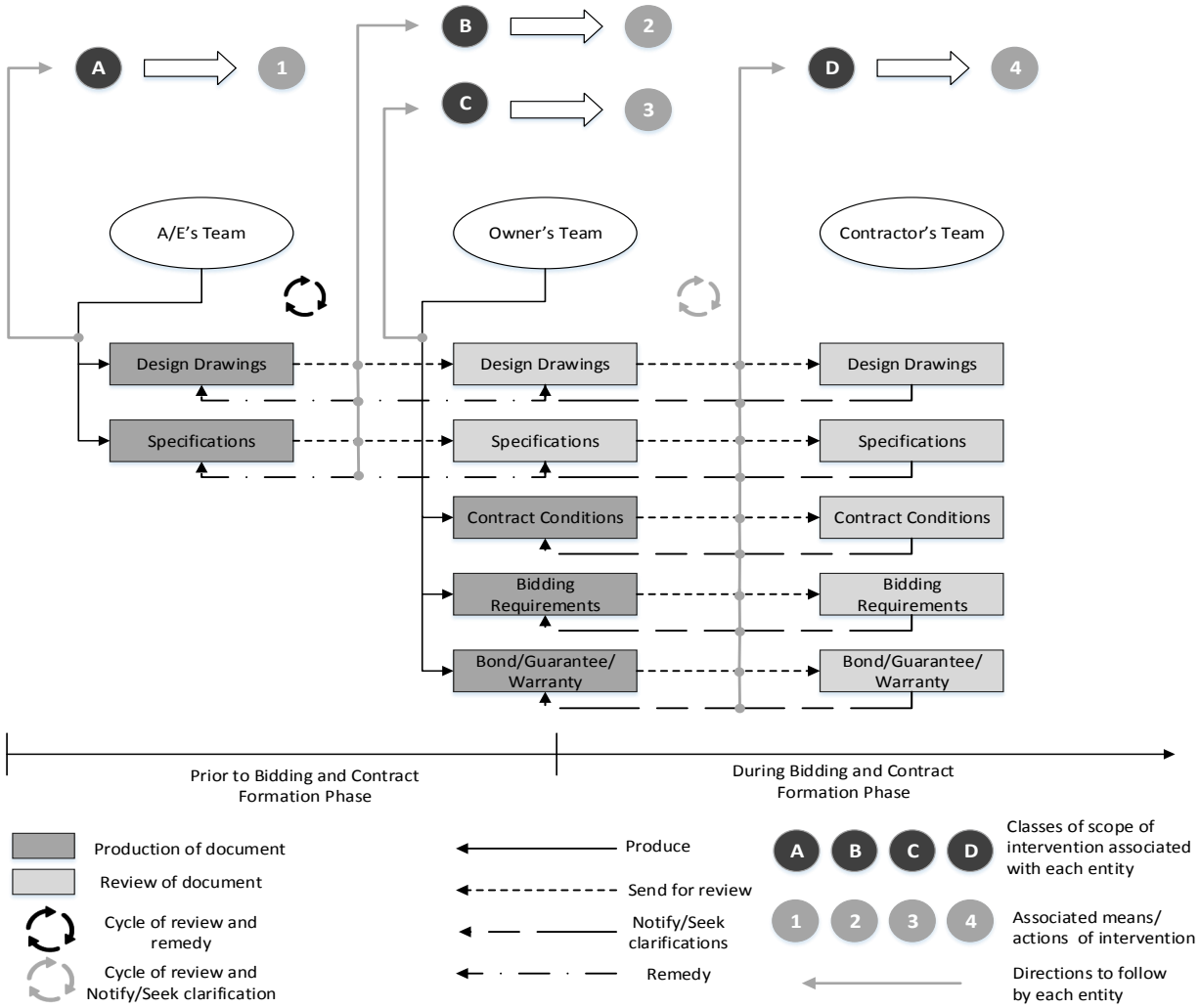


*Figure 9: Practical roles and activities of project entities throughout the production of contract documents*

To illustrate, prior to the bidding and contract formation phase, the A/E is responsible for producing the design drawings and specifications. However, while producing these documents, the A/E must ensure the realization of the scope "A" by following the required tasks shown in "1". As for the owner, his intervention comes in two types: primary and secondary. For that, he has two sets of classes of scope associated with two sets of attributed means. Prior to the bidding and contract formation phase, when reviewing the design deliverables produced by the A/E, the owner's team must satisfy the list of the scope of work, referred to as "B", by following the tasks shown as "2". Besides, when producing the contract documents, the owner's team must ensure the realization of the scope of work, referred to as "C", by following the list of actions referred to as "3". Finally, during the bidding and contract formation phase, the contractor should satisfy the scope of work, referred to as "D", by following the list of actions referred to as "4". Hence, when the entities abide by the instructions presented in this framework, they contribute to enhancing the quality of construction contract documents prior to the start of construction.

The classes of the scope of intervention associated with each entity (referred to as "A", "B", "C" and "D") along with the list of attributed means/tasks (referred to as "1", "2", "3" and "4") are presented in the form of tables shown in the sub-sections below.

### 6.3.1 *Administrative Functions of the Architect/Engineer*

Table 13 below lists the identified scope ("A") and means ("1") of intervention that the architect/engineer must follow during the production of the design documents.

*Table 13: Administrative functions that should be followed by the architect/engineer's team during the production process of design documents*

| A: Scope of Intervention of A/E's Team During the Production Process | | 1: Means of Intervention of A/E's Team During the Production Process |
|---|---|---|
| **Ensuring completeness of:** | Scope of work | Producing an all-inclusive design |
| | Descriptions of work item constituents | Expressly stating all of the work aspects pertaining to specified integrative work items in the specifications and/or BOQ |
| | Referenced design documents | Providing a complete basket of design documents |
| | Specification requirements pertaining to design elements | Presenting comprehensive descriptions and representations of design elements |
| **Ensuring explicitness of:** | Scope of work and related requirements | Affirmatively describing/showing what the standards of good workmanship entail |
| | Definitions of broad terms and expressions | Describing work items/aspects using detailed and explicit, rather than broad, language |
| | Clarifications in respect of any struck-out descriptions of work items | Providing alternative provisions for any struck-out expressions in the specifications |
| | Assigned/transferred liabilities | Clearly stating them using direct, instead of obscure, language |
| | Assigned/shifted responsibilities | Clearly stating that the risk of flaws will be transferred to other entities when it is the case |
| | All the essential work items' constituents | - Specifying/Establishing the essential and most prominent components<br>- Clearly stating essential and most prominent components when describing the scope of work items |
| **Ensuring consistency in:** | The descriptions of the same design elements within and between different documents | - Uniformly describing the work items/aspects within the same design document<br>- Producing consistent/compatible design documents |
| | The choice of expressions used to refer to the same elements | Adopting the same terms/expressions for referring to the same elements throughout the design documents |
| **Ensuring correctness/ soundness/ accuracy of:** | Positively asserted statements/descriptions | Proper drafting of design documents by positively asserting accurate statements/descriptions only |

| | | |
|---|---|---|
| | Generated design of work elements | - Providing proper calculation documentation in support of adopted design solutions<br>- Proper drafting of design documents based on sound design<br>- Verifying the soundness/workability of the design prior to the release of bid documents instead of relying on general disclaimers as means for validating it |
| **Ensuring suitability of:** | The choice of material to serve for its intended use | Providing sufficient justification to demonstrate the suitability of selected material |
| | The choice of verb tenses in contract clauses when referring to standards that must be followed | Explicitly stating the applicable standards to be those published prior to the base date |
| **Ensuring uniformity of:** | The understanding/ interpretation of contract requirements | Carefully selecting/choosing a sufficiently explicit language to ensure one clear understanding |
| **Scoping**: | The existing conditions study | Producing terms of reference for existing conditions study |
| **Ensuring compliance of:** | The existing conditions study's deliverables with the determined scope | - Reviewing the study's deliverables<br>- Producing design documents based on sound deliverables |
| **Ensuring structural integrity/ safety of:** | The work | - Specifying related work<br>- Incorporating relevant specifications requirements |

To illustrate, the following is an example to show how the functional roles attributed to the A/E as shown in the framework along with the accompanying table (Table 13 above) are to be applied: Prior to the bidding and contract formation phase, the A/E's team is responsible for producing the design drawings and specifications. However, while producing these documents, he should ensure the completeness of the descriptions of work item constituents by expressly stating all of the work aspects pertaining to specified integrative work items in the specifications and/or BOQ. He should also ensure explicitness of the scope of work and related requirements by affirmatively describing/showing what the standards of good workmanship entail. The same applies to the other scopes and means of intervention.

### 6.3.2 *Administrative Functions of the Owner*

Table 14 below shows the scope of work ("B") that must be ensured by the owner's team while reviewing the design documents produced by the A/E along with the tasks ("2") that must be followed.

*Table 14: Administrative functions that should be satisfied by the owner's team during the review process of design deliverables*

| **B: Scope of Intervention of the Owner's Team During the Review Process** | | **2: Means of Intervention of the Owner's Team During the Review Process** |
|---|---|---|
| **Ensuring completeness of:** | Existing conditions study | Detecting any omission in the scope of the study |
| | Constituents of integrative work items | Pinpointing any omitted essential constituents of integrative work items |
| | - Referenced design documents<br>- Specification requirements pertaining to design elements | - Detecting any missing referenced design documents<br>- Detecting any omitted specification requirements of design elements |
| **Ensuring explicitness of:** | Scope of work and related requirements | - Pinpointing broad expressions requiring the contractor to follow the standards of good workmanship in design documents<br>- Affirmatively rephrasing/showing what the standards of good workmanship entail |
| | Understanding of broad terms and expressions | Pinpointing ill-defined broad terms and expressions |
| | Clarifications in respect of any struck-out provisions or descriptions of work items | Pinpointing any descriptions of work items that are struck out without providing alternative provisions |
| | Assigned/transferred liabilities | - Pinpointing any obscure expressions used to impose/transfer liabilities on other entities |
| | Assigned/shifted responsibilities | - Resolving the necessity of using general disclaimers<br>- Recognizing that they do not serve to shift the risk of flaws in contract documents to other entities<br>- Clearly stating that the risk of flaws will be transferred to other entities when it is the case |
| | Terms used to refer to essential work items' constituents | Pinpointing any secondary means for specifying the inclusion of work items constituents |

| | | |
|---|---|---|
| **Ensuring consistency in:** | The descriptions of the same design elements within and between different documents | Pinpointing conflicting descriptions of design elements within and between different documents |
| | The choice of expressions used to refer to the same elements | - Pinpointing any discrepancy due to using different terms/expressions for referring to the same element throughout the design documents |
| **Ensuring correctness/ soundness/ accuracy of:** | Positively asserted statements/descriptions /requirements | - Pinpointing statements containing positive assertions<br>- Verifying that positively asserted statements/descriptions are true |
| | Generated design of work elements | - Verifying soundness of presented documentations of calculations of design solutions |
| **Ensuring suitability of:** | The selected type of material in serving its intended use | - Verifying credibility of presented demonstration |
| | The choice of verb tenses in contract clauses when referring to standards that must be followed | Pinpointing any referenced standard that is not tied to the base date |
| **Ensuring proper:** | Administration of procurement of relevant studies | Advising on terms of engagement and process of commissioning of the study of the existing conditions |
| | Packaging of the job | - Clearly delineating the scope of work packages<br>- Proper drafting/reviewing of the specifications' general requirements |
| | Sequencing of packages' work | - Coordinating the work programs of related packages<br>- Synchronizing the execution of related work packages |
| | Division of scope among trades | - Coordinating the work requirements of related packages |
| **Ensuring compliance of:** | The existing conditions study's deliverables and design deliverables with the determined scope | - Reviewing existing conditions study<br>- Detecting any discrepancy in representations between determined scope, existing conditions study's deliverables and design deliverables |
| **Ensuring uniformity of:** | The understanding/interpretation of contract requirements | - Testing the language used for potentially affording or offering alternative explanations/interpretations |

Table 15 below presents the scope of work ("C") and tasks ("3") to be followed by the owner's team when producing the other concerned contract documents as shown in Figure 9.

*Table 15: Administrative functions that should be satisfied by the owner's team during the production process of contract documents*

| **C: Scope of Intervention of the Owner's Team During the Production Process** | | **3: Means of Intervention of the Owner's Team During the Production Process** |
|---|---|---|
| **Ensuring explicitness of:** | Scope of work and related requirements | Affirmatively detailing/describing/showing what the standards of good workmanship entail |
| | Clarifications in respect of any struck-out provisions or descriptions of work items | Providing alternative provisions for any struck-out expressions in the contract conditions |
| | Assigned/transferred liabilities of other project entities | Clearly stating imposed/transferred liabilities using direct, instead of ***obscure***, language in relevant contract documents |
| | Assigned/shifted responsibilities | Clearly stating that the risk of flaws will be transferred to other entities when it is the case |
| **Ensuring stability of:** | Positively asserted statements/descriptions/ requirements | Proper drafting of contract conditions by positively asserting conditions that are not subject to change |
| **Ensuring warranted usage of:** | General disclaimers | Recognizing that they do not serve to shift the risk of flaws in contract documents to other entities |

To illustrate, the following is an example showing how the functional roles of the owner's team are shown in the framework and the associated tables (Table 14 and 15): Prior to the bidding and contract formation phase, when reviewing the design documents produced by the A/E, the owner's team must follow the administrative functions presented in Table 14. One of these functions is to ensure the explicitness of the terms used to refer to essential work items' constituents by pinpointing any secondary means used in the design documents for specifying the inclusion of these constituents. When such ambiguities are detected, the owner should coordinate with the A/E to remedy such

defects. In addition, also prior to the bidding and contract formation phase, when producing the contract conditions/bidding requirements/etc…, the owner's team must follow the administrative functions presented in Table 15. One of them is to ensure the explicitness of the assigned/transferred liabilities of other project entities by clearly stating them using a direct, instead of obscure, language in relevant contract documents.

### 6.3.3 *Administrative Functions of the Contractor*

Table 16 below lists the identified scope ("D") and means ("4") of intervention that the contractor must follow when carefully (i.e., in good faith) reviewing the provided contract documents during the bidding phase.

*Table 16: Administrative functions that should be satisfied by the contractor during the bidding phase*

| D: Scope of Intervention of the Contractor During the Review Process | | 4: Means of Intervention of the Contractor During the Review Process |
|---|---|---|
| **Detecting any obvious discrepancies:** | Present among own visual inspection, resource documents, design documents, etc… | - Specifically pinpointing and filtering out any discrepancies found in the descriptions/representations of existing conditions when comparing own visual inspection with the resource drawings and design documents<br>- Notifying PM of such specific encountered discrepancies |
| | Present among different design documents/ within the same document | - Specifically pinpointing and filtering out conflicting descriptions of design elements<br>- Seeking clarifications regarding which descriptions should be followed |
| | | - Specifically pinpointing and filtering out different terms/expressions used for referring to the same element<br>- Seeking clarification regarding whether these terms refer to the same or different elements |
| | In the language used in documents | - Specifically pinpointing and filtering out any language allowing multiple reasonable alternative explanations<br>- Seeking clarification regarding the true interpretation of such language<br>- Warranting a pricing/planning based on one reasonable interpretation regardless of whether other reasonable explanations may be found to prevail as well at a later stage |

| | | |
|---|---|---|
| | Induced from references to standards | - Specifically pinpointing and filtering out any referenced standard that is not tied to the base date<br>- Notifying PM of such invalid referenced standards |
| **Detecting any obvious errors/defects:** | In positively asserted statements/ descriptions | - Specifically pinpointing and filtering out any erroneous positively asserted statements<br>- Notifying PM of such specific encountered errors<br>- Clarifying the basis of pricing when positive assertions are present in contract conditions |
| | In the design | - Specifically detecting any defectively designed work elements<br>- Seeking clarifications when in doubt of defectively designed work elements |
| | In the sequence of work activities | -Specifically pinpointing and filtering out any unsynchronized sequence of work potentially leading to unsafe conditions<br>- Notifying PM of such encountered defects |
| **Detecting any obvious omissions:** | Of work activities interfacing with own package | - Specifically pinpointing and filtering out any obvious exclusion of the related work that might interface with his own package<br>- Notifying PM of encountered omissions |
| | In the descriptions of integrative work items | - Specifically pinpointing and filtering out any obvious exclusion of work aspects pertaining to specified integrative work items<br>- Notifying PM of such specific omissions |
| | Of design documents or specification requirements | - Specifically pinpointing any omitted referenced design document<br>- Specifically pinpointing any omitted specification requirement pertaining to design elements<br>- Notifying PM of encountered omissions |
| **Detecting any obvious ambiguities:** | In broad requirements | - Specifically pinpointing and filtering out any broad expressions specifying work to be done in a workmanlike manner or according to standard practices<br>- Seeking clarifications regarding the expectations/requirements of work to be specified |
| | In broad terms and expressions | - Specifically pinpointing and filtering out any ill-defined broad terms<br>- Seeking clarifications regarding the meaning of such terms |
| | Induced from struck-out descriptions or provisions | - Specifically pinpointing and filtering out any struck-out descriptions or provisions without clarifications<br>- Seeking clarifications regarding such specific ambiguities as opposed to making own assumptions in respect thereof |

| | | |
|---|---|---|
| | Induced from using obscure language | - Specifically pinpointing and filtering out any obscure language intended for assigning/transferring liabilities<br>- Seeking clarification regarding such ambiguities |
| | Induced from using general disclaimers | - Specifically pinpointing and filtering out general disclaimers requiring the contractor to check plans and determine project requirements<br>- Seeking clarifications as to the implications of such disclaimers<br>- Seeking clarifications as to the scope of review of which he is expected to fulfill |
| | Induced from the presence of indirect and secondary means to refer to work items | - Specifically pinpointing and filtering out any indirect and secondary means used for specifying the inclusion of work items constituents<br>- Seeking clarifications regarding such specific ambiguities |

To illustrate, the functional roles of the contractor can be read using the framework in Figure 9 and Table 16 as it follows: during the bidding phase, the contractor is responsible for reviewing the contract documents provided by the owner, detecting any obvious discrepancy due to interchangeable use of synonyms for referring to the same elements, by pinpointing and filtering out such terms and seeking clarification regarding whether these terms refer to the same element or not. Another example of the role attributed to the contractor while reviewing the bidding documents is to specifically pinpoint and filter out any discrepancy found in the descriptions/representations of the existing conditions by comparing the outcome of his own visual inspection with the resource drawings and design documents.

In conclusion, the outcomes of this chapter, presented in Figure 9, Tables 13, 14, 15, and 16, provide the project entities with practical and administrative activities and roles to be followed in order to ensure the production of a better quality of contract

documents. Thus, this study succeeded in transforming the theoretical guidelines suggested by Laryea (2011) into practical means for adopting them.

# CHAPTER 7

# CONCLUSIONS

## 7.1 Research Summary

Construction contract documents define the scope of work, the roles, the responsibilities, the rights, and the duties that legally bind the project parties under a construction contract. Defects in contract documents have become a frequently occurring problem faced by construction projects. In fact, the presence of such defects is leading to severe consequences affecting the project performance including the occurrence of disputes. Previous literature sheds light on the different types of defects, their causes, and their consequences. Many researchers have provided project parties with recommendations to follow to minimize the defects in contract documents. For instance, recent literature offered a set of guidelines that project owners can adopt to improve the quality of contract documents which are the following: know what you want, describe it very clearly, do not assume that the other party knows what you want, tell them what you want, and do not change your mind. However, these are only high-level theoretical guidelines that need to be validated and backed up with practical evidence to ensure their effectiveness in practice. Thus, to fill this gap, the main objective of this study is to formulate practical ways to be adopted by concerned project entities to avoid having defective documentation.

To carry out this study, a thoroughly designed methodology consisting of six major stages was followed. The first stage consists of a literature review on the various types of defects found in contract documents, their causes, and consequences. The second stage comprises a literature review on the contributions done by previous research to solve the

problem in hand. Based on the gaps detected in the literature, the problem statement and the research objectives were determined. The third stage of this study consists of identifying and reviewing a sufficient set case law in which defects in contract documents were found to be the reason behind the dispute. The fourth stage entails an examination of the types of defects in contract documents leading to the occurrence of the dispute in each case law. The fifth stage consists of performing an in-depth review of the root causes of defects and the reasoning behind the court's ruling in each case law. As for the sixth stage, it comprises of examining how the key players should intervene in avoiding the occurrence of each of the deduced inferences. Finally, this will enable the development of a holistic framework that presents the roles and activities to be followed by concerned key players to have a better quality of contract documents.

## 7.2 Research Conclusions

The research conclusions represent the outcome reached by fulfilling the research objective by following the above-explained methodology stages.

Among the outcomes resulting from the case law analysis performed in this study are the reasons for which owners and contractors are to blame in disputes for the presence of defects in contract documents. The following are the underlying reasons for which the owner was the entity to blame in the analyzed cases: (1) the presence of a latent ambiguity in contract documents of which the contractor is bound to follow, (2) requiring the contractor to work in a workmanlike manner or according to defined standard practices as means to shift the responsibility for defects, (3) the presence of disclaimers as means to impose additional liabilities on contractors by requiring them to inspect the site, inform themselves of the project's requirements, or check the plans and specifications, (4) the presence of latently ambiguous language used in the conditions of contracts, (5)

discrepancies between plans and specification in the presence of an order of precedence clause on which contractors were allowed to rely on, and finally (6) the presence of faulty design in design documents of which the contractor is not permitted to depart from. Besides, the main reasons for which contractors are to blame are: (1) the presence of patent, glaring and obvious defects found on the face of contract documents and (2) the presence of defective design in the cases where the contractor is considered as knowledgeable in the field of construction, a duty of care was imposed on him, a warranty of effective design was given to him, and there was an evidence of his negligence in performing the work.

Moreover, the classes for the basis of defects in contract documents were identified from the case law review. These represent the main areas of contract drafting that need to be improved by project owners. The classes are the following: (1) drafting of specifications, (2) drafting of drawings, (3) drafting of conditions of contracts, (4) correctness of rendered design, (5) coordination between specs and drawings, and (6) coordination between different classes of contracts. In addition to that, a validation for the righteousness of the theoretical guidelines presented by Laryea (2011) was performed, which showed their effectiveness in practice.

Furthermore, the scrutinization of the root causes of defects and the reasoning behind the court's ruling in each case law revealed a set of 18 inferences that owners must avoid to have a better quality of contract documents. The deduced inferences are the following: (1) "Mistaken representations" of existing conditions, (2) Ill-coordinated sequencing of work packages' activities, (3) Use of "Positive Assertion", (4) Uncoordinated assignment of scope to multiple contracts, (5) Broadly specifying work to be done in a "workmanlike manner or according to standard practices", (6) Selection of

inferior material not commensurate with its intended use, (7) Clearly described defective design leading to unsatisfactory performance, (8) Lack of "factors that accurately determine the meaning" of broad terms or expressions, (9) "Surfacial inconsistencies" in describing design elements within and between different documents, (10) Non-comprehensive descriptions of integrative work item constituents, (11) Striking out language from the contract without providing explicit clarifications or alternative provisions, (12) Use of "innocuous boilerplate language" for assigning/transferring liabilities, (13) "Interchangeabl[e]" usage of synonyms for referring to the same work item, (14) "General disclaimers requiring the contractor to check plans and determine project requirements", (15) "Language that allow[s] for two reasonable alternative explanations", (16) Referring to essential components using "indirect and secondary means" making them a "discretionary and not a proprietary feature of the contract", (17) "Inadvertently omitt[ing]" certain items from specifications and/or drawings, and finally, (18) The use of improper, arbitrarily chosen verb tenses in contract clauses limiting the intended applicability of referenced standards. An interconnection between the deduced inferences and the previously suggested theoretical guidelines was performed to show how avoiding the occurrence of these inferences represents a practical way to adopt the 5-point theoretical strategy.

Following the deduced inferences, a determination of how the key players should intervene, the reason behind their intervention, the timing of their intervention, the documents in which they should intervene, along with the scope and means of their intervention was performed. This allowed the classification of their intervention into two main types: primary and secondary. Results showed that the architect/engineer has a primary intervention in avoiding all types of defects found in the analyzed cases. As for

the owners, they have a primary intervention to avoid 44% of the identified defects and a secondary intervention to avoid 56% of the types of defects. Lastly, contractors have a secondary responsibility to avoid the occurrence of all the 18 deduced inferences. In fact, if we are to compare this research's outcomes to the guidelines suggested by Laryea (2011), our findings reveal that the prevention of defects in contract documents is not only the responsibility of the owner but also the responsibility of the A/E and the contractor.

Finally, based on the findings above, a holistic framework was developed showing the practical, administrative, and functional roles and activities attributed to each concerned project entity for ensuring a better quality of contract documents.

## 7.3 Research Recommendations

This study recommends that designers must fulfill the activities and roles shown in the deduced framework during the process of drafting of drawings and specifications throughout the pre-bidding and contract formation phase. Besides, the study also suggests that owners must follow the administrative and functional roles shown in the holistic framework to ensure an effective review process for the design drawings produced by the A/E. In addition, owners should fulfill the tasks provided to him during the preparation of the contract conditions, bidding requirements, and project forms. This way, owners and designers can ensure a better quality of bidding documents to be provided to bidders during the bidding phase. Finally, suggestions of this study include that contractors must carefully review the bidding documents during the bidding phase by following the functional roles and activities attributed to them as shown in the deduced framework. As a result, if defects were not eliminated before the start of the bidding phase, contractors can contribute to solving the problem before the start of the construction. As a result, if

all project entities follow the suggested practical guidelines, defects in contract documents will be avoided, resulting in a sufficiently reduced number of disputes.

## 7.4 Work Contribution

Previously done researches provided theoretical guidelines to be followed by owners to decrease the defects in contract documents. However, these lacked practical evidence on how such guidelines can be adopted in practice. The merit of this research lies in providing a major step towards improving the quality of construction contract documents. This step lies in bringing the attention of the owner on areas in contract drafting that must be improved based on practical evidence. In addition, the new knowledge brought by this research is represented in the inferences that show the direct root causes behind the defects that led to the occurrence of disputes in 50 case law related to this matter. Finally, the outcomes of this research are of value to the three main key players of a construction project and not only to the owner. This is presented in the form of a practical framework showing the roles and activities that must be fulfilled by project entities during the preconstruction phase to ensure a better quality of contract documents.

## 7.5 Research Limitations

The number of cases analyzed is considered as the main limitation present in this research. The study was based on a case law review for 50 cases, which represent a sufficient set of disputes to deduce the root causes of defects and to identify the steps and roles attributed to project entities to avoid them. Further analysis of additional cases can be done to validate the deduced inferences and roles or to add additions to them. However, it is important to note that any additional case law review will not negate the study's outcomes. Thus, our conclusions remain valid and of value to the practitioners.

Another limitation is shown by the project delivery method of the construction projects of the analyzed cases. Since these have a design-bid-build project delivery method, the resulting framework did not show the functional and administrative roles of the project entities in cases where contractor is engaged from the beginning of the planning phase.

In addition, the identified cases showed a biasness that is worth mentioning. For example, a bias is shown in the type of projects represented in the analyzed cases. Some of them relate to a construction project, but others are. Moreover, one can question the large span of years over which the analyzed cases take place. These are mainly between the year 1899 and 2010. However, we took advantage of this factor and deduced that the problem of defects in contract documents was present back then in 1899 and is still present up until now regardless of the new technologies that have taken place in terms of handling the project delivery process (like BIM for example). For that, we deduced that this problem initiates from human errors which accentuates on the importance of this study.

## 7.6 Proposed Future Work

Future work can be done to solve the above-presented limitations in different ways. First, future researches can enrich the outcomes of this study by tackling additional case law revolving around disputes due to defects in contract documents. This will enable the formation of a more inclusive framework offering the key players with a wider set of practical guidelines to avoid as many root causes of defects as possible. Other interesting future research can be done by testing the validity of the proposed framework. This can be implemented in two different ways. The first way lies in identifying other case law related to defective documentation and checking if the disputes could have been avoided

if the project entities have followed the tasks presented in the holistic framework. As for the second way, it is based on getting access to shadow the pre-construction phases of two real projects of similar nature. In this exercise, practitioners of the first project will not be asked to follow any guidelines whereas practitioners in the second project will be bound to follow the framework throughout the pre-construction phase. Validation of the effectiveness of the deduced guidelines in practice can be done by comparing the number of disagreements, conflicts, claims, or disputes resulting from defects found in contract documents in the two projects.

Further, future studies can detail the framework into several types of project delivery methods to enable different projects to use it. In other words, the framework can be developed into several sub-frameworks pertaining to 3 approaches for example: design-bid-build, design-build and phased approach. This can be done by investigating more case studies where different types of approaches were used.

# REFERENCES

***List of Cases***


*American and Foreign Ins. Co. v. Bolt*, 106 F.3d 155 (6th Cir. 1997).

*A.S. McCaughan Co. v. Barram*, No. 96-1315, 16 FPD 48 (Fed. Cir. 1997).

*BEACON CONSTRUCTION COMPANY OF MASS. v. United States*, 314 F.2d 501 (Ct. Cl. 1963).

*Blount Brothers Construction Company v. United States*, 346 F.2d 962 (Ct. Cl. 1965).

*Blue Bell, Incorporated v. Cassidy*, 200 F. Supp. 443 (N.D. Miss. 1961).

*Christie v. United States*, 237 U.S. 234, 35 S. Ct. 565, 59 L. Ed. 933 (1915).

*CO-OPERATIVE C. STOR, BLDRS., INC. v. Arcadia Foods, Inc.*, 291 So. 2d 403 (La. Ct. App. 1974).

*Driscoll Const. Co., Inc. v. State*, 853 A.2d 270, 371 N.J. Super. 304 (Super. Ct. App. Div. 2004).

*Dobler v. Malloy*, 214 N.W.2d 510 (N.D. 1973).

*DOT v. Bracken Construction Co.*, 72 Pa. Commonwealth Ct. 620, 457 A.2d 995 (Commw. Ct. 1983).

*Edward R. Marden Corporation v. United States*, 442 F.2d 364 (Fed. Cir. 1971)

*Fortec Constructors v. United States*, 760 F.2d 1288 (Fed. Cir. 1985).

*Fuchs v. Parsons Construction Co.*, 111 N.W.2d 727, 172 Neb. 719 (1961).

*Galloway Corp. v. S.B. Ballard Construct*, 250 Va. 493 (Va. 1995).

*Hensel Phelps Const. Co. v. US*, 886 F.2d 1296 (Fed. Cir. 1989).

*Hills Materials Co. v. Rice*, 982 F.2d 514 (Fed. Cir. 1992)

*HITT CONTRACTING, INC. v. U.S.*, No. 07-823 C (Fed. Cl. Sep. 29, 2008)

*Hollerbach v. United States*, 233 U.S. 165, 34 S. Ct. 553, 58 L. Ed. 898 (1914).

*Home Furniture, Inc. v. Brunzell Construction Co.*, 440 P.2d 398, 84 Nev. 309, 84 Nv 309 (1968).

*Interstate Gen. Govt. Contractors v. Stone*, 980 F.2d 1433 (Fed. Cir. 1992).

*Kansas Turnpike Authority v. Abramson*, 275 F.2d 711 (10th Cir. 1960).

*Klapp v. United Ins. Group Agency, Inc.*, 663 N.W.2d 447, 468 Mich. 459 (2003)

*Kubby v. Crescent Steel*, 466 P.2d 753, 105 Ariz. 459 (1970).

*Kurland v. United Pac. Ins. Co.*, 251 Cal. App. 2d 112, 59 Cal. Rptr. 258 (Ct. App. 1967).

*Lewis v. ANCHORAGE ASPHALT PAV. CO.*, 579 P.2d 532 (Alaska 1978).

*L. Rosenman Corporation v. United States*, 390 F.2d 711 (Fed. Cir. 1968)

*MacKnight Flintic Stone Co. v. the Mayor*, 160 N.Y. 72 (N.Y. 1899).

*Marine Colloids, Inc. v. MD Hardy, Inc.*, 433 A.2d 402 (Me. 1981).

*MATTINGLY CONSTRUCTION CO., INC. v. Hartford Underwriters Ins. Co.*, 999 A.2d 1066, 415 Md. 313 (2010).

*MAYVILLE-PORTLAND SCH., ETC. v. CL LINFOOT*, 261 N.W.2d 907 (N.D. 1978).

*Metric Constructors, Inc. v. National Aeronautics & Space Administration*, 169 F.3d 747 (Fed. Cir. 1999)

*Miller v. Guy H. James Const. Co.*, 653 P.2d 221, 1982 O.K.C.I.V.A.P.P. 34 (Okla. Ct. App. 1982).

*Mountain Home Contractors v. United States*, 425 F.2d 1260, 192 Ct. Cl. 16 (Ct. Cl. 1970).

*Nat. Union Fire Ins. v. CBI INDUSTRIES*, No. No. D-4353, 907 517 (Tex: Supreme Court 1995).

*Newsom v. United States*, 335 F.2d 237 (5th Cir. 1964)

*P.R. Burke Corp. v. U.S.*, 277 F.3d 1346 (Fed. Cir. 2002).

*Puget Sound Nat. Bank v. C. B LAUCH CONST CO.*, 245 P.2d 800, 73 Idaho 68 (1952).

*Shay v. Aldrich*, No. Docket No. 138908, 790 629 (Mich: Supreme Court 2010).

*Simpson v. United States*, 172 U.S. 372, 43 L. Ed. 482, 19 S. Ct. 212 (1899).

*S.O.G. of Arkansas v. United States*, 546 F.2d 367 (Fed. Cir. 1976)

*Solis v. Kirkwood Resort Co*, No. No. C036987, 114 265 (Cal: Court of Appeal, 3rd Appellate Dist. 2001).

*Southern New England Contracting Co. v. State*, 165 Conn. 644, 345 A.2d 550, 345 A. 29 (1974).

*Space Corporation v. United States*, 470 F.2d 536, 200 Ct. Cl. 1 (Ct. Cl. 1972).

*States Roofing v. Winter*, 587 F.3d 1364 (Fed. Cir. 2009).

*Sunbeam Construction Co. v. Fisci*, 2 Cal. App. 3d 181, 82 Cal. Rptr. 446 (Ct. App. 1969).

*Teufel v. Wienir*, 411 P.2d 151, 68 Wash. 2d 31 (1966).

*TRUSTEES OF FIRST BAP. CH. v. McElroy*, 78 So. 2d 138, 223 Miss. 327 (1955).

*United States v. Atlantic Dredging Co.*, 253 U.S. 1 (1920)

*United States v. Seckinger*, 397 U.S. 203, 90 S. Ct. 880, 25 L. Ed. 2d 224 (1970).

*United States v. Smith*, 256 U.S. 11, 65 L. Ed. 808, 41 S. Ct. 413 (1921).

*United States v. Spearin*, 248 U.S. 132, 39 S. Ct. 59, 63 L. Ed. 166 (1918).

*US v. Turner Const. Co.*, 819 F.2d 283 (Fed. Cir. 1987).

*White v. Edsall Const. Co.*, Inc., 296 F.3d 1081 (Fed. Cir. 2002).

*WH Lyman Constr. Co. v. Vil. of Gurnee*, 403 N.E.2d 1325, 84 Ill. App. 3d 28, 38 Ill. Dec. 721 (App. Ct. 1980).

*Wingate Construction Co. v. United States*, 164 Ct. Cl. 131 (1964).

***Work Cited***


Abdul-Malak, M.-A. U., & Hamie, J. M. (2019). Proposed Framework for the Rendering of Construction Contract Document Interpretations by Engineering Professionals. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction, 11*(3), 04519016.

Ade-Ojo, C., & Babalola, A. (2013). Cost and time performance of construction projects under due process reform in Nigeria. *International journal of Engineering and Science, 3*(6), 1-6.

Akintoye, A., & Fitzgerald, E. (2000). A survey of current cost estimating practices in the UK. *Construction Management & Economics, 18*(2), 161-172.

Akintoye, A. S., & MacLeod, M. J. (1997). Risk analysis and management in construction. *International journal of project management, 15*(1), 31-38.

Alarcón, L. F., & Mardones, D. A. (1998). *Improving the design-construction interface.* Paper presented at the Proceedings of the 6th Annual Meeting of the International Group for Lean Construction.

Arain, F. M., Pheng, L. S., & Assaf, S. A. (2006). Contractors' views of the potential causes of inconsistencies between design and construction in Saudi Arabia. *Journal of Performance of Constructed Facilities, 20*(1), 74-83.

Assaf, S., Hassanain, M. A., & Abdallah, A. (2017). Assessment of Deficiencies in Design Documents for Large Construction Projects. *Journal of Performance of Constructed Facilities, 31*(5), 04017086.

Assaf, S. A., & Al-Hejji, S. (2006). Causes of delay in large construction projects. *International journal of project management, 24*(4), 349-357.

Bacon, F. (2002). *The elements of the common lawes of England*: The Lawbook Exchange, Ltd.

Bajaj, D., Oluwoye, J., & Lenard, D. (1997). An analysis of contractors' approaches to risk identification in New South Wales, Australia. *Construction Management & Economics, 15*(4), 363-369.

BEACON CONSTRUCTION COMPANY OF MASS. v. United States, No. No. 44-58, 314 501 (Court of Claims 1963).

Boardman, M. E. (2005). Contra Proferentem: The Allure of Ambiguous Boilerplate. *Mich. L. Rev., 104*, 1105.

Brook, M. (2016). *Estimating and tendering for construction work*: Routledge.

Burati Jr, J. L., Farrington, J. J., & Ledbetter, W. B. (1992). Causes of quality deviations in design and construction. *Journal of construction engineering and management, 118*(1), 34-49.

Busby, J. (2001). Error and distributed cognition in design. *Design studies, 22*(3), 233-254.

Cheung, S. O., & Pang, K. H. Y. (2012). Anatomy of construction disputes. *Journal of construction engineering and management, 139*(1), 15-23.

Chua, D. K. H., Kog, Y.-C., & Loh, P. K. (1999). Critical success factors for different project objectives. *Journal of construction engineering and management, 125*(3), 142-150.

Civil Engineering Construction Contracts. (2016). In (7th ed., pp. 1-1): ICE Publishing.

Collins Online Dictionnary. (2011) Omission. In *Collinsdictionary.com.* Retrieved April 7, 2020, from https://www.collinsdictionary.com/dictionary/english /omission

Collins Online Dictionnary. (2011) Inadequacy. In *Collinsdictionary.com.* Retrieved April 7, 2020, from https://www.collinsdictionary.com/dictionary/english /Inadequacy

Collins Online Dictionnary. (2011) Inconsistency. In *Collinsdictionary.com.* Retrieved April 7, 2020, from https://www.collinsdictionary.com/dictionary/english /Inconsistency

Construction Specifications, I. (2005). *The project resource manual: CSI manual of practice* (5th, expand and updat ed.). New York: McGraw-Hill.

Cox, I., Morris, J., Rogerson, J., & Jared, G. (1999). A quantitative study of post contract award design changes in construction. *Construction Management & Economics, 17*(4), 427-439.

DA, V. (1986). Owner and contractor review to reduce claims. *Journal of construction engineering and management, 112*(1), 104-111.

de Neufville, R., & King, D. (1991). Risk and need-for-work premiums in contractor bidding. *Journal of construction engineering and management, 117*(4), 659-673.

Dosumu, O., Idoro, G., & Onukwube, H. (2017). Causes of errors in construction contract documents in Southwestern, Nigeria. *Journal of Construction Business and Management, 1*(2), 11-23.

Dosumu, O. S. (2018). Perceived effects of prevalent errors in contract documents on construction projects. *Construction Economics and Building, 18*(1), 1-26.

Dulaimi, M. F., & Shan, H. G. (2002). The factors influencing bid mark-up decisions of large-and medium-size contractors in Singapore. *Construction Management & Economics, 20*(7), 601-610.

FIDIC (International Federation of Consulting Engineers). 2017. Conditions of contract for construction. 2nd ed. Geneva: Thomas Telford

Flynn, J. T. (1980). The Rule Contra Proferentem in the Government Contract Interpretation Process. *Public Contract Law Journal*, 379-425.

Gavilan, R. M., & Bernold, L. E. (1994). Source evaluation of solid waste in building construction. *Journal of construction engineering and management, 120*(3), 536-552.

Goddard, C., Fellner, A., & Ormand, R.-A. (2011). *Basic Principles of Contract Drafting*. Retrieved from https://www.ulapland.fi/loader.aspx?id=60a15dd5-ebc6-4d06-a730-c363a4cf4327

Gunduz, M., & Karacan, V. (2009). Damage to treasury: Abnormally low tenders in public construction works. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction, 1*(3), 130-136.

Hamie, J. M., & Abdul-Malak, M.-A. U. (2018). Model language for specifying the construction contract's order-of-precedence clause. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction, 10*(3), 04518011.

Hashem M. Mehany, M. S., Bashettiyavar, G., Esmaeili, B., & Gad, G. (2018). Claims and project performance between traditional and alternative project delivery methods. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction, 10*(3), 04518017.

Jahren, C. T., & Dammeier, B. F. (1990). Investigation into construction disputes. *Journal of Management in Engineering, 6*(1), 39-46.

Jergeas, G. F., & Hartman, F. T. (1994). Contractors' construction-claims avoidance. *Journal of construction engineering and management, 120*(3), 553-560.

Lam, P. T., Kumaraswamy, M. M., & Ng, T. (2007). International treatise on construction specification problems from a legal perspective. *Journal of Professional Issues in Engineering Education and Practice, 133*(3), 229-237.

Larsen, J. K., Shen, G. Q., Lindhard, S. M., & Brunoe, T. D. (2015). Factors affecting schedule delay, cost overrun, and quality level in public construction projects. *Journal of Management in Engineering, 32*(1), 04015032.

Laryea, S. (2011). Quality of tender documents: case studies from the UK. *Construction Management and Economics, 29*(3), 275-286.

Liggett, B. D. (2008). Contra Applicantem or Contra Proferentem Applicatio: The Need for Clarification of the Doctrine of Contra Proferentem in the Context of Insured-Created Ambiguities in Insurance Applications. *BYU L. Rev.*, 211.

Liu, M., & Ling, Y. Y. (2005). Modeling a contractor's markup estimation. *Journal of construction engineering and management, 131*(4), 391-399.

Long, N. D., Ogunlana, S., Quang, T., & Lam, K. C. (2004). Large construction projects in developing countries: a case study from Vietnam. *International journal of project management, 22*(7), 553-561.

Loulakis, M. C., & Santiago, S. J. (1997). Patent versus latent contract ambiguities: Who bears the increased costs of performance? *Civil Engineering, 67*(9), 69.

Love, P., Lopez, R., Goh, Y. M., & Davis, P. (2011). Systemic modelling of design error causation in social infrastructure projects. *Procedia Engineering, 14*, 161-168.

Love, P. E., Edwards, D. J., & Irani, Z. (2008). Forensic project management: An exploratory examination of the causal behavior of design-induced rework. *IEEE Transactions on Engineering Management, 55*(2), 234-247.

Mahamid, I., Bruland, A., & Dmaidi, N. (2011). Causes of delay in road construction projects. *Journal of Management in Engineering, 28*(3), 300-310.

Mansfield, N. R., Ugwu, O., & Doran, T. (1994). Causes of delay and cost overruns in Nigerian construction projects. *International journal of project management, 12*(4), 254-260.

McGeorge, J. F. (1988). Design productivity: a quality problem. *Journal of Management in Engineering, 4*(4), 350-362.

Merriam Webster. (n.d.) Ambiguity. In *Merriam-Webster.com dictionary*. Retrieved April 6, 2020, from https://www.merriam-webster.com/dictionary/ambiguity

Merriam Webster. (n.d.) Erroneous Information. In *Merriam-Webster.com dictionary*. Retrieved April 7, 2020, from https://www.merriam-webster.com/dictionary/erroneous%20information

Merriam Webster. (n.d.) Error. In *Merriam-Webster.com dictionary*. Retrieved April 7, 2020, from https://www.merriam-webster.com/dictionary/error

Merriam Webster. (n.d.) Inconsistency. In *Merriam-Webster.com dictionary*. Retrieved April 7, 2020, from https://www.merriam-webster.com/dictionary/inconsistency

Minato, T. (2003). Design documents quality in the Japanese construction industry: factors influencing and impacts on construction process. *International Journal of Project Management, 21*(7), 537-546.

Mohamad, I., & Madon, Z. (2006). *Understanding contract documentation.* Paper presented at the Malaysia: Proceedings of the 6th Asia-Pacific Structural Engineering and Construction Conference (APSEC 2006).

Mohammed, R. E. (2007). *An exploratory system dynamics model to investigate the relationships between errors that occur in construction documents in Saudi Arabia and their possible causes.* Heriot-Watt University,

Mukuka, M., Aigbavboa, C., & Thwala, W. (2014). *A Theoretical review of the causes and effects of construction projects cost and schedule overruns.* Paper presented at the International Conference on Emerging Trends in Computer and Image Processing (ICETCIP'2014).

Murdoch, J. R., & Hughes, W. P. D. (2008). *Construction contracts: law and management* (4th ed.). London: Taylor & Francis.

Odeh, A. M., & Battaineh, H. T. (2002). Causes of construction delay: traditional contracts. *International journal of project management, 20*(1), 67-73.

Oluwaseun Sunday, D., & Olumide Afolarin, A. (2013). Causes, effects and remedies of errors in Nigerian construction documents. *Organization, technology & management in construction: an international journal, 5*(1), 676-686.

Palaneeswaran[1], E., Ramanathan, M., & Tam, C.-m. (2007). Rework in projects: Learning from errors. *ISSN 1816-9554 Copyright© 2007 All rights reserved and*

*reproduction in any form prohibited unless permitted in writing by the Hong Kong Institute of Surveyors.*, 47.

Potts, P. (2016). Dealing with errors and omissions. Retrieved from https://www.constructionspecifier.com/dealing-with-errors-and-omissions/

Reason, J. (2000). Human error: models and management. *Bmj*, *320*(7237), 768-770.

Senders, J. W., & Moray, N. P. (1995). Human error: Cause, prediction, and reduction.

Sertyesilisik, B. (2010). Investigation on particular contractual issues in construction. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, *2*(4), 218-227.

Shash, A. A. (1998). Bidding practices of subcontractors in Colorado. *Journal of construction engineering and management*, *124*(3), 219-225.

Smith, G. R., & Bohn, C. M. (1999). Small to medium contractor contingency and assumption of risk. *Journal of construction engineering and management*, *125*(2), 101-108.

Smith, R. C. (2013). *Estimating and tendering for building work*: Routledge.

Sowers, G. F. (1993). Human factors in civil and geotechnical engineering failures. *Journal of geotechnical engineering*, *119*(2), 238-256.

Space Corporation v. United States, No. No. 328-70, 470 536 (Court of Claims 1972).

Surahyo, A. (2018). Construction contract administration. In *Understanding construction contracts* (pp. 225-241): Springer.

Sweet, J. (2010). Historic Cases: Spearin v. United States. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, *2*(4), 188-189.

Thomas, H. R., & Ellis Jr, R. D. (2007). *Interpreting construction contracts: Fundamental principles for contractors, project managers, and contract administrators*.

Thomas, H. R., Smith, G. R., & Wirsching, S. M. (1995). Understanding defective specifications. *Journal of construction engineering and management*, *121*(1), 55-65.

Tilley, P. A., & Barton, R. (1997). *Design and documentation deficiency-causes and effects.* Paper presented at the Proceedings of the First International Conference of Construction Process Reengineering, Gold Coast, Australia.

Tilley, P. A., McFallan, S. L., & Tucker, S. (1999). Design and documentation quality and its impact on the construction process.

Tilley, P. A., Wyatt, A., & Mohamed, S. (1997). *Indicators of design and documentation deficiency.* Paper presented at the Proceedings of the Fifth Annual Conference of the International Group for Lean Construction.

Torbert, P. M. (2014). A Study of the Risks of Contract Ambiguity. *Peking U. Transnat'l L. Rev.*, *2*, 1.

Unclear. (2011). In Collins English's Dictionary Retrieved from https:// www.collinsdictionary.com/dictionary/english/unclear

von Branconi, C., & Loch, C. H. (2004). Contracting for major projects: eight business levers for top management. *International Journal of Project Management, 22*(2), 119-130.

Wiley, J. (2011). *The CSI Construction Specifications Practice Guide*: John Wiley & Sons.

Wilson, M. (2017). The importance of clear contract terms. Retrieved from https://www.lexology.com/library/detail.aspx?g=1acd609a-ed42-466e-aa61-66bf94cfc075

# APPENDIX A

**Detailed description of cases particulars related to defects in contract documents in which the owner is the entity to blame**

| Case code | Case name | Case description | Courts' citation |
|---|---|---|---|
| C1 | *United States v. Spearin (1918)* | "Spearin contracted with the Brooklyn Navy Yard to build a dry dock for 757,800$ in accordance with plans and specs which the government had prepared… About a year after this relocation of the 6-foot sewer there occurred a sudden and heavy downpour of rain coincident with a high tide…Internal pressure broke the 6-foot sewer… and the excavation of the dry-dock was flooded… it was discovered that there was a dam from 5 to 5 1/2 feet high... but the dam was not shown either on the city's plan nor on the Government's plans …" | "…the insertion of the articles prescribing the character, dimensions and location of the sewer imported **a warranty that**, if the specifications were complied with, **the sewer would be adequate**…The obligation to examine the site did not impose upon him the duty of making a diligent enquiry into the history of the locality with a view to determining, at his peril, whether the sewer specifically prescribed by the Government would prove adequate. **The duty to check plans did not impose the obligation to pass upon their adequacy** to accomplish the purpose in view. And the provision concerning contractor's responsibility cannot be construed as abridging rights arising under specific provisions of the contract…" |
| C2 | *Marine Colloids, Inc. v. MD Hardy, Inc. (1981)* | "contractor was obliged…to "guarantee soundness of construction for a minimum period to be specified as one year from completion of the contract"... contractor was required to build only a free-standing curtain wall that would stand between two buildings without being bonded to them… "construction to be all as per…specifications and dwgs"… Hardy completed the firewall....One day later, Marine Colloids told Hardy that the Pilot Plant expansion was to be held in abeyance indefinitely...during a winter storm, the firewall fractured horizontally and fell to the north, damaging the existing Pilot Plant and other property." | "Colloids' description of the firewall in its bid request led all the bidders reasonably to believe that **the firewall was to serve as an interior curtain wall rather than an exposed end wall**. Only after Hardy had completed the firewall did it learn that the Pilot Plant would not be expanded. Therefore, the referee found Marine colloids' decision not to expand the Pilot Plant left the firewall "to stand exposed and unsupported on its north side and serving the purpose of an exterior end wall rather than the purpose of a firewall for which it was designed and built… Marine Colloids' **damage was caused by its own decision to put the firewall to a use for which it was not designed**…Contractor Hardy followed Marine Colloids' specifications for the construction of the firewall Hardy could not be liable for damages resulting…Marine Colloids had no reason to believe that the firewall would remain standing indefinitely without the expansion of the Pilot Plant or other efforts to buttress the wall..." |

| | | | |
|---|---|---|---|
| C3 | *Hollerbach v. United States (1914)* | "As the contractors proceeded with the work …it was found that said dam was not backed with broken stone, sawdust, and sediment as stated in paragraph 33 of the specifications, but that said backing was composed of a soft slushy sediment…and below that…sound logs filled with stones…The specifications provide, among other things: 20...the given are approximate only… Bidders, or their authorized agents, are expected to examine the maps and drawings…, to visit the locality of the work, and to make their own estimates… drawings .. shall not be departed from except as may be found necessary" | "In paragraph 33 the **specifications spoke with certainty as to a part of the conditions to be encountered** by the claimants. True the claimants might have penetrated the seven feet of soft slushy sediment by means which would have discovered the log crib work filled with stones which was concealed below, but the **specifications assured them of the character of the material**.... We think **this positive statement of the specifications must be taken as true and binding** upon the Government, and that upon it rather than upon the claimants must fall the loss resulting from such **mistaken representations**…If the Government wished to leave the matter open to the independent investigation of the claimants it might easily have omitted the specification as to the character of the filling back of the dam. In its **positive assertion** of the nature of this much of the work it made a representation upon which the **claimants had a right to rely without an investigation** to prove its falsity…" |
| C4 | *Kubby v. Crescent Steel (1970)* | "The contract was … to construct the metal roof of the shed for appellant...in accordance with plans and specifications provided by Kubby. The shed, open on three sides, consisted essentially of a masonry wall and the metal roof. The masonry wall was to be built by others than Crescent…the job was to be performed "in a workmanlike manner according to standard practices" … Following completion of the work Kubby refused to pay Crescent. Kubby's position was that Crescent had not performed the job in a workmanlike manner because water leaked into the shed between the roof and the masonry wall…Crescent's failure to fill the gaps by means of flashing or caulking was a breach of its warranty of good workmanship… the plans and specifications were furnished by Kubby, and **they did not clearly call for caulking or flashing**…" | "A contractor who undertakes to perform a contract in accordance with plans and specifications furnished by the contractee is not liable for damages due to defects in the plans… The central issue here is whether standards of good workmanship required Crescent to insure that water did not leak between the edge of the roof and the masonry wall. The trial court resolved this issue in favor of Crescent…The evidence shows that leakage could have been prevented by flashing, and further that flashing is normally used in construction. However, the record in this case does not contain sufficient evidence to require reversing the judgment of the trial court and to hold that Crescent was required to install flashing. We must consider that this particular structure was not a weatherproof structure but was merely a shed open on three sides…the **specifications furnished by Kubby could have provided for flashing or caulking but did not do so**. In addition, Crescent was not responsible for building the entire shed but only for constructing the metal roof. Thus the record here simply does not affirmatively show that standards of good workmanship placed responsibility for the absence of flashing on Crescent rather than upon the masonry contractor or on Kubby himself, who furnished the specifications" |

| | | | |
|---|---|---|---|
| C5 | *Southern New England Contracting Co. v. State (1974)* | "Both the heating subcontractor and the electrical subcontractor had read their… specifications…to **exclude the line voltage temperature control wiring** from the work which they were required to do…The subcontractors continued to deny responsibility for the wiring and refused to do the work without a change order. The plaintiff eventually agreed to install the wiring at its own cost under protest while reserving its rights to recover…" | "...**we cannot justifiably hold that the plaintiff "should have known" of the defect in the specifications prior to the time that it did**…The trial court subsequently found that the **line voltage temperature control wiring was not included in the plans**, specifications or contract price, that the state had failed to take any action to resolve the impasse that had arisen from this error, and that, in addition to the labor and material costs incurred by the plaintiff in the installation of the wiring, the state's inaction had further injured the plaintiff by delaying completion of the project for four months…The trial court awarded damages to the plaintiff …" |
| C6 | *Teufel v. Wienir (1966)* | "The construction specifications prepared by defendants' architect prescribed the use of a trade name type of curtain wall: "Teclar Projected Casement Series No. 1600." The specifications were modified by defendants' architect by a reduction to "Casement Series No. 1400."... Upon completion of the building and acceptance by defendants' architect, numerous defects were found to exist. Final payment was withheld pending correction." | "This change resulted in a less costly curtain wall and one of lighter construction which was **not suitable to this high rise building**. Leaks in the curtain wall have developed and are due to the inadequacy of the prescribed curtain wall for the high rise building…Any No. 1400 curtain wall would have presented the same problem…It is too light a wall to serve the purpose ... that is not a question that the contractor had any control over. That was what was specified and that is what they put in...We thus hold that **if an item is installed in accordance with the specifications**…the **contractor is not liable if the item's failure to function properly is due to its design being improper for the intended use**." |
| C11 | *Christie v. United States (1915)* | "…claimants examined the drawings and they showed gravel, sand and clay...the material actually to be excavated "consisted largely of stumps below the surface of the earth, buried logs, of cemented sand and gravel…and of sandstone conglomerate"... The **statement in the specifications was untrue in fact and misleading**, causing the claimants to propose to do the work upon the basis shown by the drawings and not upon the basis of the more difficult and expensive work" | "There were representations made which were relied upon by claimants, and properly relied upon by them, as **they were positive**... Where there is **a deceptive representation in the specifications** as to the material to be excavated which actually misleads the bidder who obtains the contract, and it is admitted by the Government that **time did not permit borings to be made by the contractor to verify the representations**, the latter is entitled to an allowance for the actual amount expended over what would have been the cost had the boring sheets been accurate, notwithstanding there was no sinister purpose whatever." |
| C22 | *Fuchs v. Parsons* | "…architects prepared plans and specifications for the building…The west side of the building settled…Windows in the building cracked, and | "The foregoing issue involves the meaning of the term "refusal" contained in the specifications. Plaintiffs [owner] contend that it means that the piles should be driven until they would not move |

| | | | |
|---|---|---|---|
| | *Construction Co. (1961)* | interior partitions pulled away from the ceiling and floor. The floor settled…The primary cause of the damage appears to have been the settling of the piles…It is the contention of plaintiffs that the specifications required the piling to be driven to refusal and that this was not done, and that there was no written modification of the specifications that would permit the defendant to drive the piles otherwise." | downward. We cannot agree with this definition… **Factors were lacking in the specifications to accurately determine the meaning of "refusal"** as used therein… [ Architects] defined the term as the point "where we expect to develop the resistance that is adequate for this particular job." We think this definition must be accepted in the absence of a more specific definition in the contract…We conclude that the defendant contractor drove the piles in accordance with the plans and specifications…It is at least apparent that the piles were driven in accordance with directions of the architects and their consulting structural engineer. Plaintiffs have therefore **failed to show a breach of contract** on the part of the defendant contractor…" |
| C25 | *A.S. McCaughan Co. v. Barram (1997)* | "… a note to the drawings required the contractor to "mount ceiling fixtures in the center of a ceiling tile" unless noted otherwise. The specification dealing with sprinkler location, however, only required the contractor to "space, locate, and position sprinkler heads in accordance with NFPA 13" and did not refer to the contract drawings…another note to the drawings stated that the sprinkler head locations were shown **for design intent only**…the contractor did not install the sprinkler heads in the center of the ceiling tiles… the government ordered the contractor to install the sprinkler heads in the center of the ceiling tiles at an additional cost to the contractor" | "As a general rule, the court stated that a contract must be interpreted as a whole to give reasonable meaning to all of its terms and to avoid conflict or surplusage of its provisions… the court held that a **latent ambiguity existed in the contract specifications and drawings**, entitling the contractor to the cost impact of the government's directive to relocate the sprinkler heads. Although the specifications required that the sprinkler heads be placed "where indicated on the drawings," the drawings themselves stated that the sprinkler head locations were "suggested" and for "design intent only." Therefore, an ambiguity existed because there was more than one reasonable interpretation: that the heads must be centered in the ceiling or that the heads may be placed at the discretion of the contractor, so long as the heads complied with NFPA 13. The **ambiguity, however, was not so glaring as to trigger a duty of inquiry on the part of the contractor**…" |
| C26 | *DOT v. Bracken Construction Co. (1983)* | "The principal source of disagreement is the section of the contract providing for payment for the approach slabs...Section 666.5…Bridge Approach Slabs will be paid for at the contract unit price per square yard, complete in place as specified, which will include the premolded expansion joint filler, joint backing material, joint sealing material, and closed cell neoprene sponge, when specified, at the joint adjacent to the bridge | "The board concluded, and we agree, that the contract is ambiguous. Two reasonable people reading this contract could fairly and reasonably arrive at different conclusions about how DOT would pay for the approach slab rebars. **Section 666.5 does not expressly mention** the approach slab rebars, and neither do the nine entries in the tabular schedule of prices…If DOT had specifically included the approach slab rebars in Section 666.5, or had listed them on the summary sheets as part of one of the nine rebar items, there would have been no ambiguity… **the mention of** |

| | | | |
|---|---|---|---|
| | | superstructure… the tabular schedule of prices in the contract included nine entries specifying a price for rebars separately…Bracken argued that DOT should pay for the rebars by the pound at the unit price bid; DOT contended that the cost of the rebars was included in the price it had paid Bracken for the approach slabs" | **certain items implies the purposeful exclusion of other items of the same general character**… In drafting this section, DOT could have easily listed every component that it intended to include in the unit price for approach slabs… The **ambiguity in this contract was not blatant and glaring; it was minor and subtle**. We, therefore, construe **the ambiguity against the author of the contract**, DOT, and affirm the board's order that DOT pay Bracken at the contract price of $.22 per pound for the rebars used in the approach slabs" |
| C27 | *Galloway Corp. v. S.B. Ballard Construct (1995)* | "The Contractor shall promptly pay each Subcontractor, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's Work, the amount to which said Subcontractor is entitled…The Contractor shall pay the Subcontractor each progress payment within three working days after the Contractor receives payment from the Owner. If the Architect does not issue a Certificate of Payment or the Contractor does not receive payment for any cause which is not the fault of the Subcontractor, the Contractor shall pay the Subcontractor, on demand, a progress payment… Galloway struck out all the language following the word "Owner", initialed the change and requested that the subcontractor initial the change…" | "…we conclude that the phrases "after the Contractor receives payment from the Owner" and "has received payment from the Owner" constitute **latent ambiguities** in the contracts…may reasonably be **interpreted in either of two ways**…could be interpreted to require Galloway to pay a subcontractor only if it received a payment demanded from Rowe identifiable with the progress or completion of a subcontract, or merely to provide for a reasonable time to pay after such demand was made to Rowe. Because this ambiguity was not patently evident on the face of the contract, the trial court was permitted to look beyond the contract and determine the intent of the parties using parol and other extrinsic evidence… Under that agreement, before and after signing the contract, Ballard received twelve progress payments from Galloway without Galloway first receiving a payment from Rowe identifiable to the work performed by Ballard. Based upon this evidence, the trial court properly construed the contract to permit Galloway only a reasonable amount of time in which to make progress and final payments to Ballard" |
| C28 | *States Roofing v. Winter (2009)* | "States Roofing's President… observed the roofing work that had previously been performed in cells A and B by a different contractor…had used waterproofing paint on the parapet walls in these cells; States Roofing formulated its bid accordingly... Navy objected to the use of waterproofing paint on the parapet walls…[and] disagreed with States Roofing's understanding of the contract, and required use of three-ply felt flashing material to waterproof the parapet walls. | "The Board found that **there was "no specification for the parapet wall waterproofing membrane**," for the Navy stated that it had **"inadvertently" omitted this specification**…States Roofing's interpretation was within the zone of reasonableness, in view of… the prior use of waterproofing paint on parapet walls of the same roof, the Board's agreement that waterproofing paint was required for some parapet walls, the consistent use of "ply" and other more precise terms wherever flashing material was specified, the Navy's **admitted omission** of the relevant specification, the conflicting expert testimony, and with due attention to the rule |

| | | | |
|---|---|---|---|
| | | It was eventually agreed that States Roofing would apply a one-ply waterproofing flashing material having the brand name "DynaClad,"…deemed a comparable substitute… The Navy's contracting officer held that the use of DynaClad was a no-cost change, reasoning that the contract required three-ply flashing material, not paint.” | of contra proferentem…The Board offered no explanation for the contract's **use of these different terms** if the same three-ply flashing material were intended and required to be used to waterproof the parapet walls, and acknowledged a potential ambiguity "arising out of the references to `coats,' `layers' and `plies.'"… Nor has the Navy, in its brief, provided any explanation for this **inconsistent terminology**… argues that it used "layers" and "plies" "**interchangeably**," … **different words have different meanings** … **ambiguity in the contract was latent,** rather than patent…States Roofing is entitled to recover the additional costs” |
| C34 | *United States v. Seckinger (1970)* | ““[contractor] shall be responsible for all damages to persons or property that occur as a result of his fault or negligence” …While working on this project … there was an electric wire that carried 2,400 volts of electricity. The employee accidentally came into contact with the wire, was thrown to the ground 18 feet below, and was seriously injured…he injured employee recovered benefits under South Carolina's workmen's compensation law... and then commenced a suit …against the United States ..on the theory that his injuries had been sustained as the proximate result of the Government's negligence” | “… the United States had customarily de-energized its electric wires whenever Seckinger employees were required to work dangerously near them…the **United States had been grossly negligent in failing to de-energize the wire in this particular case**…Government alleged that Seckinger…was obligated "to perform the work properly and safely and to provide workmanlike service in the performance of said work” …The provision, in short, is what the Court of Appeals called "**a simple responsibility clause."** But today this **innocuous boilerplate language** is turned inside out…the Court does not go quite so far as to hold that this **obscure clause** operates as a complete liability insurance policy… If the Government wants to impose additional liabilities upon those with whom it contracts to do its work, I would require it **to do so openly**, so that every bidder may clearly know the extent of his potential liability” |
| CC37 | *Mountain Home Contractors v. United States (1970)* | “298 of the 300 units were in duplex type buildings. The specifications called for installation of the kitchen exhaust fans where shown on the contract drawings. Drawings numbers 72-77 related to all the buildings…picture kitchen exhaust fans. But drawings 72-76, covering the 298 duplex type units… contained the following notation: Note: kitchen exhaust fans, duct work grille to be under alternate bid. Drawing 77, for the two single-unit buildings designed for the colonels, did not | “…there was in actuality a discrepancy on the face of this contract between the specifications, the drawings with the notation, and the list of alternates. Kitchen exhaust fans were to be installed "where shown," yet the notation on the drawings said fans were to be bid as an alternate. Then there was no alternate for a kitchen exhaust fan. But **this is not the kind of "glaring" discrepancy that we have said must exist before a contractor is required to shoulder the burden of seeking clarification** of the government's ambiguous specifications from a contracting officer…**It was neither glaring nor substantial nor patently obvious**… Plaintiff evaluated the contract documents as a whole, considered the |

| | | | |
|---|---|---|---|
| | | contain this notation…Plaintiff interpreted this lack of an alternate covering a kitchen exhaust fan to mean that the government did not desire the fans in the 298 duplex units, but only wanted them in the two more expensive units…The contracting officer … called for fans in all 300 units, and ordered plaintiff to proceed with installation. This the plaintiff did, and requested additional consideration for the work." | notation on the drawings, the lack of an alternate covering kitchen exhaust fans, and the fact that the only two homes with fans in the drawings (and no notation excepting them) were the more deluxe homes designed for colonels. His interpretation of these provisions was that the government did not intend to have kitchen exhaust fans in the other 298 housing units. **Plaintiff's interpretation of this ambiguity was reasonable**, and he is therefore entitled to be reimbursed for the costs incurred in the installation of the 298 kitchen exhaust fans." |
| C38 | *Driscoll Const. Co., Inc. v. State (2004)* | "Appellant [Driscoll]… contends that the contract permitted permanent lane closures, the use of concrete barriers that remain in place throughout the project. Respondent [DOT]… asserts that the contract only permitted the use of temporary lane closures, the use of signs and cones that are removed and replaced daily. Because DOT refused to permit the use of permanent lane closures, Driscoll performed the contract using temporary lane closures and then sued DOT for over $3,000,000, the extra cost of using temporary lane closures…The specifications did not specifically prohibit the use of permanent lane closures. Nor did the conceptual plans detail intended lane closures, either temporary or permanent." | "Portions of the contract indicate that permanent lane closures are prohibited…portions of the contract indicate that permanent lane closures are not prohibited. The contract prohibits the use of "non-permanent lane closures" during events at Veterans Stadium, suggesting that the use of permanent lane closures during these times is permitted. The contract indicates that on other unspecified occasions Driscoll is not permitted to interfere with traffic, "but work within all permanent lane closures will be permitted at all times." Driscoll understood that this project-specific language allowed the use of permanent lane closures…DOT contends that "permanent lane closures" referred to shoulder closures. Driscoll produced evidence that DOT's assertion is contrary to the trade usage of the term "permanent lane closures" in the road construction industry. Further, DOT's interpretation conflicts with specific references to "shoulder closures" in other parts of the contract…where an **ambiguity exists** in the contract allowing at least **two reasonable alternative interpretations, the writing is strictly construed against the drafter**… instead of using language that allowed for two reasonable alternative explanations, DOT could have stated, Permanent lane closures are prohibited at all times. DOT **did not explicitly express its purported intent** to prohibit permanent lane closures." |
| C39 | *Metric Constructors, Inc. v. National Aeronautics &* | "At issue are three sections of those specifications relating to the installation of lamps…Metric and Meisner interpret these sections to require replacement of only defective, burned out, or broken lamps immediately before project | "… **specifications are susceptible to two different reasonable interpretations**. The evidence shows that the electrical industry commonly uses the term "relamping" to mean the total replacement of lamps at a particular facility… relamping is rarely performed in connection with a newly constructed facility…Metric's reliance on |

| | | | |
|---|---|---|---|
| | *Space Administration (1999)* | completion. NASA contends that they require replacement of all lamps, known as "relamping" in the industry, before project completion…The parties discovered their divergent views when NASA performed a "walkdown" of the project...The resulting NASA punchlist identified relamping as a requirement. The relamping requirement appeared on subsequent punchlists" | its interpretation is reflected in its bid, which included labor to install only one set of lamps and the cost of only one set of lamps… The warranty provision …required Metric to "[l]eave entire electrical system in proper working order." The Board reasoned that this provision would already require the replacement of broken lamps before project completion… only required Metric to leave the "electrical system" in proper working order. It did not hold Metric accountable for everything plugged into the electrical system, such as lamps …this court does not perceive the ambiguity as "so glaring as to raise a duty to inquire[.]" Because **this contract contains a latent ambiguity, this court construes that ambiguity against the drafter**, NASA." |
| C40 | *Mattingly Construction Co., Inc. v. Hartford Underwriters Ins. Co. (2010)* | "Section 16.5, governing "Waivers of Subrogation," stated that K.B.K. and Mattingly "waive[d] all rights against ... each other and any of their subcontractors" for damages caused by perils such as fire "to the extent covered by property insurance obtained pursuant to [Section] 16.4 *or other property insurance applicable to the Work*…" (emphasis added). The issue is whether property insurance underwritten by Hartford, secured after completion of the restaurant, comes within this phrase, "other property insurance applicable to the Work," abrogating any rights of subrogation. Mattingly and Phoebus assert that this language plainly refers to the construction period as well as the completed restaurant… Hartford counters that **the use of the phrase "the Work" varies throughout the contract** …." | "the waivers of subrogation clause, in which the words "the Work" are prominent, is internally inconsistent, and ergo, ambiguous…The court determined that the waivers of subrogation clause, when read in tandem with the definition of "the Work" and provision regarding final payment, was ambiguous. To resolve the ambiguity, the court gave preference "to the specific provisions over the general" and reasoned that the final payment provision was more specific than the waivers of subrogation clause, such that the subrogation waiver terminated upon completion of construction and final payment… but we cannot reconcile the ambiguity without consideration of the parties' intent. Our precepts of contract interpretation dictate that when faced with an ambiguous contract, "the court must consider extrinsic evidence which sheds light on the intentions of the parties at the time of the execution of the contract… "any ambiguities in the interpretation of the performance bond must be construed **against the party drafting or adopting the document**—in this case, the surety"" |
| C41 | *Wingate Construction Co. v. United States (1964)* | "Defendant contends that the sidewalk construction at issue was included in the contract… specifications did describe concrete sidewalks, some of which were included under Section G which pertained to road paving, and some of which were included as an additive alternate… The term "additive alternate" is used | "**The ambiguity of the contract, caused as it was by the deletion in the specifications of the additive alternate section** is further supported by the drawings which plaintiff received with the invitation to bid…defendant followed no one system of designating which sidewalks were additive alternates and which were not. In those drawings the words "additive alternate" were sometimes used with parallel solid lines and sometimes with parallel broken lines. |

| | | | |
|---|---|---|---|
| | | to designate an item which is desirable but not essential…the section dealing with additive alternates, including sidewalks, had been deleted. Accordingly, plaintiff did not include an estimate for the construction of concrete sidewalks in its bid… Plaintiff's interpretation of the specifications was that the deletion of the additive alternate providing for the concrete sidewalks completely eliminated any requirement on plaintiff's part to build concrete sidewalks…Defendant contends that the deletion of the additive alternate providing for sidewalks only eliminated the requirement that plaintiff build those sidewalks which were additive alternates and the off-site drawings contained a requirement for sidewalks which were not additive alternates…The contracting officer directed that the sidewalks be constructed…Upon completion of the sidewalks plaintiff submitted a claim for additional compensation in the sum of $4,684.21…" | By way of illustration, sheet 8 of the drawings delineates a sidewalk designated an additive alternate in both parallel broken lines and parallel solid lines. But defendant argues that even if the contract is ambiguous, plaintiff was bound to present the ambiguity to the contracting officer for resolution… contractor…is not normally required (**absent a clear warning in the contract**) to seek clarification of any and all ambiguities, doubts, or possible differences in interpretation…We think that the Special Provisions clause (SP 1-02, supra) in and of itself, **is not sufficient to shift the burden of the ambiguity to plaintiff**. While that clause does specifically provide that any requirement shown either in the drawings or the specifications must be considered as a requirement of the contract, it does not affect the present situation since **ambiguity existed in both the drawings plaintiff possessed and the specifications**…We think the contract as a whole could reasonably be read as plaintiff read it…The contract between plaintiff and defendant for the construction of off-site utilities was ambiguous with regard to the construction of the contested sidewalks. Plaintiff's interpretation of the contract was reasonable. The contract did not require the installation of sidewalks in the off-site area." |
| C42 | *United States v. Smith (1921)* | "A large part of the material, arbitrarily stated to be clay, gravel, sand and boulders, was in fact limestone rock and limestone bed rock, and was not the material specified in the contract…Appellees protested and asked for the fixing of an extra price for doing the work. This was refused and they were told that if they did not remove the same they would be declared defaulting contractors; that the work would be taken from them…and be paid for from the retained percentages for work already performed…" | "We think the right of plaintiffs…to recover the price for the work done by them is indisputable…And we think, against **the explicit declaration of the contract of the material** to be excavated and its price. The contract provided. for the excavation of a ship channel 20 and 21 feet deep and that "the material to be removed consists of clay, sand, gravel, and boulders, all in unknown proportions." To these explicit provisions and their contractual force…We concur, therefore, with the declaration of the Court of Claims that "the right" of the appellees "to recover the price for the work done by them is indisputable," including the loss to them while waiting for the engineer "to locate their work."" |
| C43 | *United States v. Atlantic* | "bidders were invited to base their bids upon the specifications…[which] stated…The material to be removed is believed to be mainly mud, or mud | "The court below having found…the appellee is entitled to recover, as for **a breach of warranty** or condition…There was not only a **clear declaration** of the belief of the Government that its |

| | | | |
|---|---|---|---|
| | *Dredging Co. (1920)* | with an admixture of fine sand… bidders are expected to examine the work, however, and decide for themselves as to its character and to make their bids accordingly, as the United States does not guarantee the accuracy of this description…No guaranty is given as to the correctness of these borings in representing the character of the bottom over the entire vicinity in which they were taken, although the general information given thereby is believed to be trustworthy...**the map did not contain a true description of the character of the material** which was to be encountered, and was encountered..." | representation was true, but the foundation of it was asserted to be the test of actual borings, and the reference to maps as evidence of what the borings had disclose…where it is stated that the direction to contractors to visit the site and inform themselves of the actual conditions of a proposed undertaking, will not relieve from defects in the plans and specifications...**the contractor should be relieved, if he was misled by erroneous statements in the specifications**… There is no intimation of bad faith against the officers of the Government and the Court of Claims regarded **the representation of the character of the material as the nature of a warranty**" |
| C44 | *Hills Materials Co. v. Rice (1992)* | "The company based its bids, in part, on the cost of complying with Occupational Safety and Health Administration (OSHA) regulations governing slope requirements for trenching and excavations...After Hills Materials submitted its bids, OSHA issued final regulations which substantially modified 29 C.F.R. § 1926.652 by requiring ditches with flatter slopes on their sides. The company requested an equitable adjustment for increased costs associated with the revised regulations. The contracting officer denied the request, and ordered it to comply with the revised regulations… the contract's Accident Prevention Clause, which requires the contractor to "[c]omply with the standards *issued* by the Secretary of Labor at 29 CFR part 1926…"(emphasis added)" | "Hills Materials contends that by using the word "issued" in the Accident Prevention Clause, the government limited the company's general obligation under the Permits and Responsibilities Clause to compliance with the specific version of 29 C.F.R. part 1926 in effect at the time the bids were submitted. While compliance with subsequent changes would not be excused, it could entail additional compensation. This is a reasonable interpretation of the contract. By its plain meaning, **the word "issued" in the past tense logically refers to regulations already issued**, and not to changes which may occur in the future…if a contract is reasonably susceptible of more than one interpretation, it is ambiguous…Where such a **latent ambiguity** exists, the court will construe **the ambiguous term against the drafter of the contract** when the nondrafter's interpretation is reasonable…Where specific and general terms in a contract are in conflict, those which relate to a particular matter control over the more general language…" |
| C48 | *US v. Turner Const. Co. (1987)* | "…specification § 17010, is as follows: Air Volume Control Centers (QAC)… shall consist of metal cabinet constructed of 14 gage [sic] steel with hinged front, key locked doors, necessary guages, [sic] meters, controllers, etc., as specified | "The government, for example, argued that the word "etc." in paragraph 6A was intended to include the transmitter in the contents list. The board rejected this argument, concluding that it is unlikely that the transmitter, the most expensive component of the QAC, would be **referred to in such a minor and secondary fashion**… |

| | | | |
|---|---|---|---|
| | | herein and as shown on drawings…The question really is whether or not an "air volume control center" must include the transmitter. **The description of the contents of the metal cabinet does not mention the transmitter**…Turner…says that the contract does not specify the location of the transmitters and they were therefore at liberty to place the transmitters near the source of the air, as they did. The government…insisted that the transmitters be relocated from the "field" to the metal cabinets containing the QAC, resulting in additional costs…" | the board concluded that the location of the transmitters was, in the final contract, **discretionary and not a proprietary feature of the contract**… It is improbable that the most expensive, and by implication the most prominent, component of the QAC would be **designated by indirect and secondary means**…we find no provisions "so glaring as to raise a duty to inquire," and therefore no patent ambiguity…The absence of the transmitter in the crucial paragraph, 6A, however, is just as strong a suggestion that the location of the transmitters was, at the very least, a discretionary decision…Having concluded that Turner's interpretation of the contract was reasonable, we apply the rule of contra proferentem, which requires that a **contract be construed against the party who drafted the document**…" |
| C49 | *L. Rosenman Corporation v. United States (1968)* | "Since the drawings for floors 8 through 15 did not indicate any connection between the thermostats and radiators whereas the drawings for the first five floors plus floor six did so indicate, plaintiff reasonably assumed from the beginning that the contract did not intend valves for floors 8 through 15. Defendant, however, contends that **the omission** of the connecting lines does not negate the clear directions of the specifications and the detail drawing to install automatic radiator valves throughout the entire building including floors 8 through 15." | "GSA Board of Contract Appeals did not think the valves were clearly required. (In fact, they thought the valves were clearly not required). Nor do we think the contract specifications and detail drawings were so clear as to create a duty to seek clarification of the omission of the broken lines… the representations of the specifications and drawings themselves which represent defendant's intent. And **these were not so clear as to compel plaintiff to seek clarification**… If it had wanted automatic radiator valves on all 15 floors, **it should have said so explicitly**…plaintiff was **reasonable** both in the manner it interlaced the various parts of the contract as well as its substantive interpretation of the contract provisions and drawings…The notation was, in effect, another **explicit signpost** used in this contract to direct the contractor or where not to install the automatic valves…we hold that the directions of the contracting officer to install automatic radiator valves on floors 8 through 15 was a change in the contract for which plaintiff is entitled to an equitable adjustment." |
| C50 | *Hensel Phelps Const. Co. v. US (1989)* | "specifications called for a minimum of 18 inches of non-expansive fill under the concrete floor slabs, whereas a note on the drawings called for 36 inches of non-expansive fill…[subcontractor] relied on the "Order of Precedence" clause and prepared [its] bid based upon the 18 inches set out | "The Court of Claims has held that when the requirements of the specifications of a government contract conflict with the drawings and the contract contains an order of precedence clause, the specifications shall control as the order of precedence clause provides…The plaintiff is entitled to take the Government sponsored order of precedence clause at face value. Once its right |

in the specification, rather than the 36 inches called for by the contract drawings…The contracting officer directed that 36 inches of non-expansive fill should be placed under the concrete floor slabs as required by the drawings…Hensel Phelps timely submitted a $100,983.00 claim, properly certified, for equitable adjustment in the contract price based on an asserted modification of contract terms. The claim was denied by the contracting officer."

3

to do so in the present situation is recognized, no conflict sufficient to occasion inquiry remains... a **discrepancy between the specifications and drawings**, a matter covered by the order of precedence clause, will generally be resolved in the manner prescribed by that clause…we hold that **an order of precedence clause may be relied on to resolve a discrepancy between the specifications and drawings even though the discrepancy is known to the contractor prior to bid or is patent**. If the contractor is required to perform work in addition to that called for by application of the order of precedence clause, he may seek an equitable adjustment in the price of the contract for such work"

# APPENDIX B

**Detailed description of cases particulars related to defects in contract documents in which blame is on contractor**

| Case code | Case name | Case description | Courts' citation |
|---|---|---|---|
| C8 | *Dobler v. Malloy (1973)* | "It is agreed that the First Party [Dobler] will provide and furnish all materials and that said materials are to be of top quality, equipment, skills and labor necessary to do a proficient workmanlike job according to the highest standards of labor in the Dickinson area…(1) specific damages for defects in the house discovered … due to lack of proper elevation of the house, and (2) a defective joist system...Dobler further argues that the inadequacy of the joists and the elevation of the building are due to the lack of adequate plans or specifications by the owner." | "…that the joists were of less than the best quality and were substantially overspanned; that the parties agreed that the elevation of the Malloy house would be the same as the elevation of the Gackle house a few hundred feet away…it was discovered that the elevation of their house was much lower; that if the house had been constructed to the agreed elevation there would have been no damage from flooding…If the plans and specifications on hand were not sufficient, or if the oral agreements between the parties were inadequate for the purpose, Dobler, **being an experienced builder, should have been aware of the facts…**The contract further provides that Dobler… "do a proficient workmanlike job according to the highest standards of labor in the Dickinson area." This is an **express warranty**… the owner is no more to blame than is the contractor." |
| C10 | *Lewis v. Anchorage Asphalt Paving Co. (1975)* | "Lewis… asked for a "good" and "complete" paving job during the preliminary negotiations indicating he wanted the contractor to do whatever was necessary to achieve a satisfactory pavement which would last the normal useful life…Other than the fact that he wanted hot mix asphalt, Lewis presented **no plans or specifications** for the paving job and even left the amount of asphalt surface to be applied up to the discretion of the contractor… minor defects and deficiencies began to appear in the pavement some three to four weeks after the completion… settled causing a roller-coaster effect…[contractor] asserted that the asphalt used was not defective, and it denied the | "there were **express and implied warranties** that the work would be done in a workmanlike manner which included placing a layer of gravel under the asphalt if necessary for a properly built subgrade … we believe Anchorage Asphalt was required to inquire about, if not test, the soil conditions… it is undisputed that placing paving directly on frost-susceptible material was not in accordance with workmanlike standards since the result would be the precise type of failure of the paved surface which occurred here…We conclude that Anchorage Asphalt **knew or reasonably should have known** of the subsurface conditions and consequently had a duty to warn Lewis of the possibility of the sort of failure which occurred in this case. Having failed to warn Lewis of this possibility, Anchorage Asphalt is liable to Lewis for those damages |

| | | | |
|---|---|---|---|
| | | existence of any implied warranty of the roads other than as to the quality of the materials used…" | necessary to put Lewis in as good a position as that in which he would have been had such a warning been given." |
| C12 | *Simpson v. United States (1899)* | "the construction of the said dry dock and its accessories and appurtenances herein contracted for shall conform in all respects to and with the plans and specifications …The United States by the written contract guaranteed the nature of the soil under the site of the proposed dock, and assumed the entire burden which might arise in case it should be ascertained, during the progress of constructing the dock, that the soil under the selected site differed to the detriment of the contractors from that delineated upon the profile plan…in the specifications… The only word which it is claimed supports the contention that a warranty was undertaken by the United States as to the condition of the soil is the statement…that the dock was to be built in the navy yard upon a site which was "available,"" | "…the word "available" has not naturally the meaning which must be attributed to it in order to support the contention that there was a warranty as to the condition of the soil…**there is not contained a word implying that a particular piece of ground in the navy yard, having soil of a specially stable character**, was to be the site on which the dock was to be placed…The contractors were experienced and competent dock builders…If it had been their intention to only undertake to build the dock for the price stipulated, provided a guarantee was afforded them by the United States that the soil upon which the dock was to be constructed was to be of a particular nature conforming to a plan then existing, a purpose so important, so vital, would necessarily have found direct and positive expression in the bid and specifications, and would not have been left to be evolved by a forced and latitudinarian construction of the word "available," used only in the nature of a recital in the specifications and not in the contract" |
| C18 | *Mayville-Portland Sch., etc. v. CL Linfoot (1978)* | "The contract also required Linfoot to follow the specifications of Owens/Corning, the manufacturer of the fiberglass tank, in the installation of the tank…The fiberglass tank was supplied by and installed by Linfoot … It was understood by the parties at the time the tank was backfilled in December that the tank site would have to be partially re-excavated the following spring to complete work on the tank installation… When the tank site was uncovered…it was discovered that the tank was severely damaged and unfit for its intended use… the architect rejected the tank. Demand was then made by the School District upon Linfoot to replace the tank. Linfoot refused to replace the tank unless it was compensated for doing so" | "Linfoot points…: "But if the contractor is bound to build according to plans and specifications prepared by the owner, the contractor will not be responsible for the consequences of defects in the plans and specifications"…The School District contends that **the risk of loss in the contract was on Linfoot until final acceptance by the architect**…Linfoot, on the other hand, contends that the risk of loss as set out in the contract was on the School District. It points to… "the contractor is relieved of responsibility for damages to the work due to causes beyond the control of and without fault of the contractor or negligence of the contractor is ambiguous and, as such, must be construed in favor of the Plaintiff, School District…". In cases of **uncertainty not removed by the preceding rules**, **the language of a contract should be interpreted most strongly against the party who caused the uncertainty to exist**…In this case, a certificate of substantial completion was never |

| | | | |
|---|---|---|---|
| | | | issued, and thus the risk of loss remained with the contractor… Linfoot must bear all costs of correcting such rejected work" |
| C29 | *Interstate Gen. Govt. Contractors v. Stone (1992)* | "…the contracting officer rejected IGGC's Material Approval Submittal which indicated an intent to use conventional motor starters instead of more expensive variable speed fan power controllers (VSPCs). IGGC then sought clarification of the contract requirements ...the contracting officer advised IGGC that it was required to provide VSPCs in accordance with the contract specifications…Accordingly, IGGC installed VSPCs and related equipment at an additional cost of $48,186.70, for which it filed a claim for an equitable adjustment…The contracting officer denied the claim and IGGC appealed to the Board…IGGC argues that because the contract makes **numerous references to motor starters and VSPCs**, it is ambiguous." | "We agree with IGGC that the contract at issue is ambiguous regarding the obligation to install motor starters or VSPCs. Taken as a whole, the **contract fails to express clearly the intention of the parties**…The record clearly establishes that this contract is ambiguous and that the **ambiguity is patent**…To the extent that the references to motor starters and VSPCs were intended to refer to different types of devices, **it is not clear which was required to be used**… The provision is drafted in such a manner as to **allow the contracting parties to choose among alternative terms**. The Paragraph recites in pertinent part: The air flow control center shall provide output [signals] to the [volume control damper] [fan inlet vanes] [fan speed control] [fan variable switch] actuators to provide the required air flow rates… Not only is the contract **internally inconsistent and confusing**, it even **contains several "boiler plate" provisions** relating to plumbing and piping requirements that are completely irrelevant to the intended task… **Because IGGC did not attempt to clarify its obligations under the contract at any time prior to bidding, it is precluded from recovering on its claim**." |
| C30 | *Hitt Contracting, Inc. v. U.S (2008)* | "Among the Special Security Requirements…That amendment revised section 1.6 by striking out one sentence and adding another, so that it read: "… ~~The Police inspection station is on P Street and South Capitol Street S.E.~~ Coordinate deliveries with the US Capital [sic] Police by contacting them at 202-224-0908 [This is the phrase that was added]"…Beginning on or about June 13, 2003, the Capitol Police required Anderson's trucks to be inspected six or seven blocks away… Anderson notified Hitt that it considered the off-site inspections to be a contract change, adding at least thirty minutes to each round trip. Id. Hitt submitted a claim for additional costs, which the contracting officer denied" | "Both Hitt and the Government agree that the **contract did not expressly specify a location for inspections**. Hitt argues that in the **absence of an express provision** for off-site inspections, interpreting the contract to allow for off-site inspections would be unreasonable… Hitt argues that "the fact that section 1.6 of the contract originally provided for use of an offsite inspection facility located at P Street and South Capitol Street does not indicate that inspections would take place off-site."…the **ambiguity was a glaring one. Hitt failed to inquire, and therefore cannot recover now**…Contrary to Hitt's contention, striking out language specifying the location of an inspection station does not justify an assumption that there will be no off-site inspection station at all. Modification of this solicitation language created a glaring ambiguity as to whether inspections |

| | | | |
|---|---|---|---|
| | | | would be on- or off-site. The Government is entitled to summary judgment because the **contract was patently ambiguous**." |
| C31 | *P.R. Burke Corp. v. U.S. (2002)* | " "b. The plant shall remain in operation during the entire construction period and the Contractor shall conduct his operations so as to cause the least possible interference with the normal operations of the activity"…Burke submitted its demolition and construction plan…[it] required the shutdown of the existing trickling filter for the duration of the contract work…Burke alleges **the contract term "the plant shall remain in operation" is ambiguous** because, Burke argues, it was impossible to perform the various contract demolition and construction tasks so that the plant remained in operation." | "… even if Burke's interpretation were reasonable, Burke still could not prevail because it **had a duty to inquire about a patent ambiguity** in the contract language. Specifically, the court held, Burke had a duty before bidding to clarify the meaning of the contractual requirement that the plant "remain in operation" …In denying Burke's claim for delay damages, the court determined that Burke's contract interpretation was unreasonable because it would have shut down the trickling filter… And shutting down the trickling filter, the court reasoned, meant the plant would not have "remain[ed] in operation."…because any **ambiguity was patent**, and contractors will have such an ambiguity construed against them unless they inquired about the correct meaning of the terms at issue…Burke, however, **failed to clarify the ambiguity before submitting its bid**, leading the court to find it "responsible for the delay that ensued."" |
| C33 | *Beacon Constr. Co. of Mass. v. United States (1963)* | "The contract provided for storm windows (in addition to the regular windows) and plaintiff installed those. But plaintiff's officers **did not read the contract as calling for weather-stripping on the normal windows**…no such weather-stripping was furnished…After completion of the project, the defendant insisted that stripping was part of the contract and should have been supplied; on plaintiff's refusal to do this work, the Government entered into a substitute contract with another contractor, expending $16,144.81 which was withheld from plaintiff. Relief was denied by the contracting officer and the head of the agency, both of whom decided that the contract documents required that metal weather strips be furnished and installed on all regular windows…" | "Anyone reading these contract papers as carefully as a prospective builder could not help but notice that, with respect to the weather-stripping of windows, something was gravely askew. The written specification starts by referring only to strips for entrance doors, not windows — but then that very opening sentence ends by requiring a weather-tight seal "on all 4 edges of doors and casement and double hung sash [i.e., windows]…We think it undeniable that there are **surfacial inconsistencies, at the least, within the specification itself and between the specification and the drawing** — part of the specification appearing to provide weather-stripping only for the entrance doors, while another part as well as the drawings seem to cover windows as well — which were and must have been obvious to plaintiff from the time it began to prepare its bid…**Plaintiff did not, however, consult the defendant's representatives in settling this problem**, but decided for itself that weather-strips were required solely for the doors and not for windows" |

| | | | |
|---|---|---|---|
| C35 | *Fortec Constructors v. United States (1985)* | "Fortec had installed the rebar in the interior distribution ribs so that it butted up against the exterior grade beams without extending or lapping into them. The Corps area engineer informed Fortec that the rebar was improperly placed because the interior distribution rib rebar did not overlap the exterior grade beam rebar… Thirty-five junctions were demolished; only two junctions met lapping requirements... **Two alternative structures** are shown for double curtain reinforcement. The detail on the left shows the rebar from the interior distribution rib stopping at the exterior grade beam. The detail on the right depicts the rebar from the interior distribution rib running into the exterior beam. **No instruction was provided** which would have enabled Fortec to select either of these two alternative reinforcement schemes" | "The Board's decision … found that the **drawings, notes, and details were not a model of clarity**… We hold as a matter of law that **the contract was patently ambiguous**. Our review of the record before this court shows that no direction was provided as to which of the two rebar schemes shown in ACI 315-74, figure 2-9, "Typical intersection details for double curtain reinforcement," was required…The existence of a patent ambiguity in the contract raises the duty of inquiry, regardless of the reasonableness of the contractor's interpretation…**Fortec did not seek clarification of the rebar requirements**; it instead exercised its own judgment. In deciding the correct meaning of a contract containing a patent ambiguity it is proper to consider the trade standards and practices of the relevant business community…Fortec's claim for equitable adjustment was properly denied." |
| C36 | *Space Corporation v. United States (1972)* | "…**a missing drawing created an obvious omission**… there was no drawing… (Drawing 202) relating to a monitoring system…the chief estimator thereupon decided…that the cost of the monitoring system would come to about $35.00 per unit. Plaintiff …pointed out that some specifications and drawings were missing and, on request, gave as examples drawings which existed but which lacked detail. The government…advised that all required detail was present and that plaintiff was required to furnish only to the extent of detail shown…chief estimator **did not refer to Drawing 202 or inquire about the monitoring system**… the per unit cost was $410.00 rather than the $35.00 estimate that had been included in its bid." | "…**the plaintiff did in fact know that there was an omission** in the RFQ and that it should have known that it was an omission of the type that required further inquiry…plaintiff's representative, the same man who realized that Drawing No. 202 was missing initially, commented only that some details were missing from certain drawings. Upon checking, the government representative said, with regard to the specific examples given it by the plaintiff, that the plaintiff should proceed with the bidding with the details that it had. But plaintiff had never even mentioned Drawing No. 202; thus, we could not in good conscience construe the government's statement as meaning plaintiff should bid without Drawing No. 202…The duty… **is upon the contractor to call the government's attention to obvious omissions**. It was the contractor, not the government, who was aware of the problem here and thus should be held to the greater duty…Accordingly the plaintiff's motion for summary judgment is denied" |
| C45 | *Edward R. Marden Corporation* | "Section 55-8 of the specifications contains the notation "4A" for room 5B110, as does drawing # 1-41. However, unlike the 18 rooms in question, there was no | "I. The Board's conclusion, that at the time its bid was submitted, Marden **should have known that a serious conflict existed between the specifications and drawings**…II. The |

| | | | |
|---|---|---|---|
| | *v. United States (1971)* | symbol on any of the drawings which indicated that the floor of this room was to be covered with composition flooring…3 months after the contract award, Mr. Hoffman submitted a request for information regarding Section 55 … The letter stated that the room finish schedules in **Section 55 did not list any latex mastic floor covering, whereas such a covering was shown on various sectional views on the drawings**…**a conflict existed between the specifications and drawings**, and stating that in case of a conflict, the "specifications usually take precedence."…the VA advised the contractor that latex mastic floor deck covering was required in all of the new mechanical rooms…the contracting officer testified… that the contractor had included nearly $50,000 for the composition flooring in the bid, this made him… believe that Marden's original interpretation of the contract was that the mastic flooring was required." | contractor's principal argument in this appeal is that the specifications clearly provide that each of the mechanical room floors shall be finished in concrete and that since this provision is in conflict with the drawings, the order of precedence clause requires a holding in its favor. We reject this contention, because here…**the specification are in conflict with each other**… Since we find that there is a substantial doubt as to which of the inconsistent directions of the specifications should govern in this case, we reach the same result and hold that the order of precedence clause does not resolve the issue before us. III.... if a contract is reasonably susceptible of more than one interpretation, it is ambiguous…there was indeed a **latent ambiguity in the contract**…where a contractor seeks recovery based on his interpretation of an ambiguous contract, he must show that he relied on this interpretation in submitting his bid. Here it is obvious that in the preparation of its bid, which was accepted by the Government, **Marden did not rely on an interpretation that composition or latex flooring was unnecessary in the mechanical rooms**. Therefore, adherence to well established principles of contract law **precludes the contractor's right to recover**…allowance of the contractor's claim would require us to ignore the clearly demonstrated intent of both parties." |
| C46 | *Newsom v. United States (1964)* | "Each paragraph had two parts: the first described the first floor of the building and referenced page 7 of the drawings; the second described the second floor of the building and referenced page 8 of the drawings. Conversely, the caption block on page 7 of the drawings indicated that it described work for all three buildings, 81, 82, and 85. However, page 8 of the drawings indicated only building 85. **Petitioner at no time inquired about this discrepancy**…It is not entirely clear whether a drawing of building 85 on page 8 of the drawings would have also described buildings 81 and 82, or whether separate drawings of buildings 81 and 82 | "The board held against petitioner on the ground that the error on page 8 of the drawings was a **patent ambiguity which imposed upon the contractor a duty to inquire about it**…Two parts of the contract said very different things: the specifications required construction on the second floors of buildings 81, 82, and 85, whereas the drawings required construction on the second floor of only building 85. It is impossible from the words of the contract to determine what was really meant. The contractor speculated that it meant that part of the project had been dropped along the way. Looking at the same language, the Government can insist that it was clearly a drafting error…No interpretation ... can in the instant case, |

| | | | |
|---|---|---|---|
| | | were omitted from page 8…petitioner included in his bid the costs of the second floor of building 85 only…" | eliminate **the substantial, obvious conflict between the drawings and the specifications**" |
| C47 | *S.O.G. of Arkansas v. United States (1976)* | "The Government's bid documents included a schematic diagram…On the face of the diagram was a notation stating that the diagram was "schematic and for the purpose of estimating only." The notation on the diagram also stated that "[d]esign of the diversion scheme will be in accordance with the applicable provisions of the specifications."… S.O.G. says that it based its bid on its own plan, believing that the diagram provided in the bid documents **was in no way mandatory** …the contracting officer eventually rejected it on the ground that it did not comply with the contract specifications. S.O.G. was thereafter required to implement the river diversion plan depicted on the contract diagram, causing plaintiff (it asserts) to incur $2,000,000 in additional expenses…S.O.G. contends that the Government's diagram was **in no way binding since it was designated as "schematic and for the purpose of estimating only."**"" | "The case presents another example of a contractor who, faced with a **patent ambiguity** in Government bid documents, **did not meet his responsibility to have the ambiguity resolved before bidding**… If the diagram itself could be entirely disregarded (because of the legend that it was "schematic" and "for the purpose of estimation only") then there were specific parts of the specifications which appeared to implement the general plan of the diagram and were very hard to harmonize with plaintiff's position… plaintiff relies primarily on the diagram's legend and the absence of any statement that the diagram plan was mandatory; on the references in the specifications to the contractor's responsibility for the "design"…the explicit and unqualified statement that the contractor would be responsible "for the adequacy of the plan."…the **contradiction was not subtle, hidden, or minor but patent, blatant, and significant**…Rather than ask for clarification, and despite the warning given it by the bid documents, S.O.G. ignored the conflict inherent in these documents and assumed the right to disregard the diagram... S.O.G. **acted without seeking to resolve this patent ambiguity**…plaintiff's motion for summary judgment is denied" |

6

# APPENDIX C

**Detailed description of cases that involve a defective design in contract documents**

| Case code | Case name | Case description | Courts' citation |
|---|---|---|---|
| C7 | *Co-operative C. Stor, Bldrs., Inc. v. Arcadia Foods, Inc. (1974)* | "The contract … specified plaintiff would build a concrete block walk-in meat cooler…Designed for storing large quantities of prime beef and processed meat…as soon as defendant began to use it, Daly [defendant's president] noted a serious defect—water dripped from the ceiling in many areas…Various engineering experts explained the dripping was caused by the use of a metal ceiling that impeded proper air circulation, by faultily installed insulation and a defective vapor barrier. It appears thus the problem was created by a **poor design**, coupled with poor workmanship." | "If an undertaker fails to do the work he has contracted to do, or if he does not execute it in the manner and at the time he has agreed to do it, **he shall be liable in damages for the losses that may ensue from his non-compliance with his contract**…Plaintiff's second contention is that the work was performed in accordance with the plans and specifications, thus, if the design is defective, the contractor is not responsible…If the contractor is **knowledgeable in the field where the plans are faulty**, it is **his duty to warn the owner**…Not only did **plaintiff's employee draft the plans**, but this firm holds itself out as **specialists in designing coolers**… costs to be borne by the appellant." |
| C9 | *Home Furniture, Inc. v. Brunzell Construction Co. (1968)* | "The construction contract... is most complete in its detailed specifications as to the materials to be used and the manner in which the prestressed concrete slab floors were to be poured and jacked into position. The plans and specifications were drawn and prepared by the appellant's architect… The faulty performance complained of is narrowed to the specified tolerance level of the slab finish of the concrete, prestressed sixth floor, or roof, which, it was found, several months after the building had been occupied, puddled, or retained "bird baths" after the summer showers… Appellant…asserting that respondent had not constructed the building in accordance with appellant's plans and specifications and that appellant had been | "… where he [contractor] makes a contract to perform a given undertaking in accordance with prescribed plans and specifications, this rule does not apply. Under such a contract **he is not permitted to vary from the prescribed plans and specifications** even if he deems them improper and insufficient and therefore cannot be held to guarantee that work performed as required by them will be free from defects, or withstand the action of the elements, or accomplish the purpose intended…Appellant failed to show any deviation by the contractor from the architect's plans and specifications. On the contrary, Mr. Berger, the architect, testified that the prestressed concrete slab floor in question was poured in accordance with the specifications of the contract… the trial |

| | | | |
|---|---|---|---|
| | | damaged as a result of respondent's faulty performance in the sum of $40,000…" | judge…find[s] that respondent contractor had performed in accordance with the plans and specifications of the contract" |
| C13 | *MacKnight Flintic Stone Co. v. the Mayor (1899)* | "The form of its promise was to furnish "the materials and labor for the purpose, and make water-tight the boiler room, etc... in the manner and under the conditions prescribed and set forth in the annexed specifications," and that it would turn the work over to the city in perfect order and guaranteed absolutely water and damp proof for five years from the date of the acceptance of the work" | "The promise is not to make water tight, but to make water tight by following the plan and specifications prepared by the defendant, from which the plaintiff had no right to depart... If there was an implied warranty of sufficiency, it was made by the party who prepared the plan and specifications … The fault of the defendant's plan should not prevent the plaintiff from recovering payment for good work done and good materials furnished precisely as the defendant required…It was **not a guaranty of the perfection of the plan**, but of the materials and workmanship…" |
| C14 | *Sunbeam Construction Co. v. Fisci (1969)* | "… defendants were specialists in this work and that plaintiff relied upon them to perform the work; that they completed the roofing and impliedly warranted to plaintiff that the roof was fit to protect the apartments below against rain and the elements…the complaint alleged that the roof was not fit for that purpose in that defendants did not provide a crown or slope thereto, and as a proximate result water collected thereon, causing the roof to break…Plaintiff concedes that the roof was constructed in a good and workmanlike manner and **in exact conformance to the plans and specifications furnished by it, which did not call for a pitch, slope or crown**." | "The trial court pointed out that where the plans call for a flat roof the contractor should not put a pitch in it in the absence of an arrow indicating the way the water was to flow… and if the plans show no pitch in a roof, the roof is built without pitch… the authorities hold that where the plans and specifications were prepared by the owner's architect and not by the subcontractor…it cannot reasonably be concluded that the subcontractor assumed responsibility for the adequacy of the plans and specifications to meet the purpose of the owner, and where the contractor faithfully performs the work as specified, **there cannot be an implied warranty that the contractor will supplement the inadequacy of the plans**" |
| C15 | *Kurland v. United Pac. Ins. Co. (1967)* | "The equipment… and all of the duct work, piping, wiring…described in the plans and specifications were installed in a workmanlike manner…The air conditioning system **was incorrectly and inadequately designed for the purpose** for which it was intended…M.F.S. Inc. [subcontractor] reasonably and in good faith believed and relied upon the plans and specifications… as representing a | "subcontractor did not warrant or guarantee that the system embodied in the architect's plans and specifications would produce the desired variation from outside temperature for the cooling of the apartment building…Since the plans and specifications were prepared by the owners' architect and not by the subcontractor, and since the subcontractor undertook to do the work in accordance with his specific proposal, we |

| | | | |
|---|---|---|---|
| | | system which would be adequate to cool said apartment building by thirty degrees in extreme summer conditions…it was physically impossible to furnish or produce an air conditioning system sufficient to cool said apartment building by thirty degrees in extreme summer conditions by following or complying with said plans and specifications" | cannot reasonably conclude that the subcontractor assumed responsibility for the adequacy of the plans and specifications to meet the purpose…It would not be reasonable to construe the language of "guarantee" as being sufficiently broad to constitute a basis for a transfer to the subcontractor of responsibility for defective plans and specifications procured by the owners" |
| C16 | *American and Foreign Ins. Co. v. Bolt (1997)* | "…the first set of plans drawn up for the project failed to note that the disparity in height created a potential "Canadian snow load" problem... a note was added to the plans indicating that this problem required that the lower roof be strengthened…The new purlins were placed between the original purlins and bolted to the existing frame of the building utilizing a "gusset plate", rather than being bolted to the roof deck as the original purlins had been… the manner in which Bolt affixed the purlins complied with his snow load notation…inclement weather resulted in a large accumulation of snow/ice/slush on the roof of the lower building, culminating in its collapse. The collapse resulted in property damage in the amount of $210,980.89." | "…Bolt had breached neither the contract nor the implied warranty of good workmanship. However, the jury did find that Bolt had been **negligent**, and that his negligence was the proximate cause of the roof collapse… it seems unlikely to this Court that the Michigan Supreme Court would adopt a rule that allows a contractor to escape liability for negligence on the ground that he was following the owner's plans. The owner is usually not a construction professional and depends on the contractor to know what may or may not be safe. In this case, **Bolt knew that the manner in which he installed the additional purlins was wrong**…Under Michigan law, **Bolt failed to live up to a duty of care** imposed on him… the jury's verdict, holding Bolt liable for negligence relating to the improper fortification of the roof, is reinstated." |
| C17 | *Miller v. Guy H. James Const. Co. (1982)* | "The construction plans, including engineering and specifications for the dirt and grade work, were contracted by Owner … and were furnished to Prime Contractor [Guy]. The **engineering plans were defective**…After Subcontractor [Miller] had partially completed the ditch liner, runoff from a heavy rainstorm washed it out…the contract between Prime Contractor and Subcontractor is silent as to which of the parties should bear the risk of such a loss…Subcontractor filed suit after Prime Contractor and Owner refused to reimburse him for the repair work. The suit against Prime Contractor alleged the | "The evidence is almost undisputed that: (1) the plans were defective; (2) they were furnished by Owner's engineer; (3) they **were a part of Subcontractor's contractual obligation**; and (4) Subcontractor fully complied with the terms of the contract...the slope grade should have been such as to allow water to travel no more than two feet per second…There is evidence from which the court could conclude the plans were defective in two ways: (1) they permitted "point loading" instead of "sheet loading"; and (2) the steep grade permitted the water to flow at an excessive velocity… the court could properly find Subcontractor free from negligence and the |

| | | | |
|---|---|---|---|
| | | plans were defective. Suit against Owner was to foreclose a materialman's lien against the property." | major contributing cause of the damage to be the defective plans…" |
| C19 | *WH Lyman Constr. Co. v. Vil. of Gurnee (1980)* | 1-"… it was discovered that the sewer had to be constructed through subsurface soil that was for the most part water-bearing sand and silt, rather than clay as indicated by the soil boring logs shown on the plans."<br>2-"A high ground water table was also discovered, and this required that Lyman install numerous dewatering wells. Due to the high subsurface hydrostatic pressures, the manhole bases as designed were unable to be sealed by the means permitted in the plans and specifications." | 1-"There was nothing in the plans in the case at bar which might have indicated to the plaintiff that the soil-boring logs shown on the plans were meant to be specially relied upon so as to relieve the contractor of its **contractual responsibility to inspect the site**, including subsurface conditions…"<br>2- "the design of a manhole base which when constructed could not withstand the hydrostatic sub-surface pressures and which could not be sealed by any of the methods permitted by the plans and specifications… defendant…negligently and **in breach of implied warranty of accuracy and sufficiency of its plans and specifications**…" |
| C20 | *Puget Sound Nat. Bank v. C. B Lauch Const co. (1952)* | "Six months after Saxon had completed the painting job, objection to the work was made by the owner, or those acting for it. This objection was not made on the grounds that the paint used did not conform to specifications…The objection was entirely on other grounds…one of the claimed deficiencies listed was the unsatisfactory **condition of the exterior paint** applied by Saxon; that to conform the exterior paint to the specifications made a part of all contracts, and to secure final approval **required an additional coat of paint on allexterior surfaces**" | "The **contract called for a two coat paint job, not three**, and whether the job was sufficient or not, it was the specification under which Saxon did the painting…There is no contention that the paint used did not fully comply with the specifications under which the work was done…whether or not this was sufficient was a matter over which Saxon had no control…No faulty work on the part of Saxon was shown… a subcontractor is bound by the contract of the original contractor with the owner, where the specifications are made a part of the contract, and the subcontractor is bound by the conditions and specifications contained in the original contract" |
| C21 | *Blue Bell, Incorporated v. Cassidy (1961)* | "…Defendant was relieved of responsibility for damages to the work due to causes beyond his control or without fault or negligence on his part… soil conditions were encountered which required a change in the design of the piles…it was discovered by defendant that certain columns supporting the structural steel beams had settled or sunk into the ground which caused excessive water to pond or stand on the roof…As this situation developed, plaintiff's engineers designed devices | "…before the collapse it had been raining and snowing and that there was snow and ice on buildings… But, this evidence does not justify a finding that the collapse of the roof was due to an excessive accumulation of ice and water…underlying cause of the partial collapse of this building was either **faulty design of the footings** upon which the columns rested, **or bad soil conditions or both**. It cannot be said that defendant had any responsibility for either… plaintiff has not shown, by a |

| | | | |
|---|---|---|---|
| | | known as pile caps and shims to raise the settled columns, to lessen the load upon the friction-type piles …Defendant obtained these materials as designed by the engineer and commenced installing them…two columns, upon which caps and shims had not been installed, gave way and a portion of the roof of the building collapsed" | preponderance of the evidence, that defendant negligently failed to protect the work, or, that any negligence on his part contributed in any way to the partial collapse of the building…a construction **contractor in this state is not liable** for the collapse of a building**, in the absence of a warranty on his part, where he has followed plans and specifications furnished by the owner without a showing of negligence**…plaintiff's complaint must be dismissed with cost to defendant" |
| C23 | *Kansas Turnpike Authority v. Abramson (1960)* | "The construction contract obligated the contractor to construct, according to specifications, a road bed suitable for the paved surface of the turnpike…The contractor performed his contract in a satisfactory and acceptable manner on certain parts of the contract area, but before final acceptance as provided in the contract, unusual rains over a period of two weeks softened the "upper lifts" of the embankment to such an extent that it was necessary to rework and recompact them in order to bring them up to specifications… the contractor refused to do the work without additional compensation…" | "Where, however, the contract provides for the performance of a given undertaking in accordance with prescribed plan and specification…the contractor is not permitted to vary from the prescribed plans and specifications even if he deems them improper and insufficient; and therefore **cannot be held to guarantee that work performed as required by them will be free from defects**… the plans and specifications, considered as a whole, contemplated that the contractor would be paid for recompacting the embankment which he had constructed according to specifications and which **failed through no fault of his**" |
| C24 | *Trustees of First Bap. Ch. v. McElroy (1955)* | "Appellee entered into a contract for the plumbing and heating [for the church], including the installation of a designated type steam generator for heating the building and a certain designated type hot water heater … Nearly two years after completion of the church…the chimney flue exploded, causing considerable damage to the church. Appellee had nothing to do with the building of the chimney… [which] was some distance from the place where the steam generator and hot water heater were installed…Appellants sued appellee in tort, alleging that the proximate cause of the explosion and resulting damage to the church was the negligent manner in which the vents were interconnected… that a proper installation required that the | "…a construction contractor who has followed plans or specifications furnished by the contractee, his architect or engineer, and which have proved to be defective or insufficient, will not be responsible to the contractee for loss or damage which results solely from the **defective or insufficient plans or specifications**, **in the absence of negligence on the contractor's part, or any express warranty by him as to their being sufficient or free from defects** … If any dangerous condition existed in connection with the vents installed by appellee, it resulted from plans and specifications prepared by appellant's architect, and which appellee was required to follow by the terms of the |

| | | | |
|---|---|---|---|
| | | vent from the steam generator and the vent from the hot water heater be connected to the chimney independently…" | contract…There is no proof that appellee was negligent in doing what he did do — follow the plan and specifications. Nor was there any contention made that appellee expressly warranted the sufficiency of the plan and specifications. The contract contained no such warranty" |
| C32 | *White v. Edsall Const. Co., Inc. (2002)* | "Mr. Oakey [designer] placed a disclaimer on one of the drawings, drawing S13, stating: "Canopy door details, arrangements, loads, attachments, supports, brackets, hardware etc must be verified by the contractor prior to bidding…" Mr. Oakey testified that he added the disclaimer as an "informational flag" to bidders that they should verify the three-pick-point design…USI [subcontractor]…testified that he read the disclaimer on drawing S13 as a "heads up that there may be problems with the drawings." After the contract award, USI discovered that the **three-pick-point design would not work**…submitted a structural drawing for the four-pick-point design, which the CO approved …Edsall submitted USI's claim for an additional $70,000 based on the new design. The Army rejected the claim in July 1998 because USI had not requested the design change before bidding, as allegedly required by the disclaimer" | "The Board found that the **specifications incorporated defective design characteristics**…Edsall's pre-bid review of the specifications was reasonable and that the **disclaimer on drawing S13 did not shift any risk for design inadequacies** to Edsall. Accordingly, the Board awarded Edsall its additional costs…When the Government provides a contractor with design specifications, such that the contractor is bound by contract to build according to the specifications, the **contract carries an implied warranty that the specifications are free from design defects**… Only express and specific disclaimers suffice to overcome the implied warranty that accompanies design specifications…the contractor is entitled to any additional costs reasonably incurred to produce a satisfactory result…the disclaimer places the responsibility of verifying physical details, such as door size or the number of brackets needed, on Edsall, but it does not obligate Edsall to analyze the Government's design to determine whether it will work for its intended purpose." |