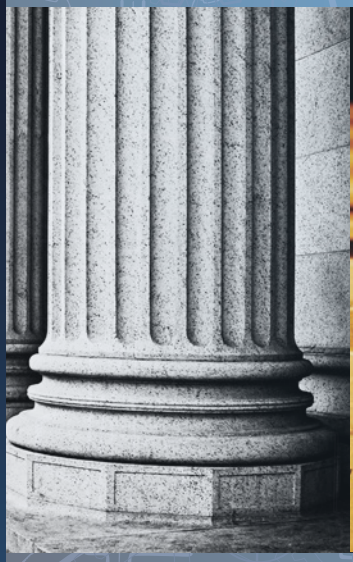
CONTRACTS *for* ENGINEERS

Intellectual Property, Standards, *and* Ethics

Robert D. Hunter



CRC Press
Taylor & Francis Group

CONTRACTS *for* ENGINEERS

Intellectual Property, Standards, *and* Ethics

CONTRACTS *for* ENGINEERS

Intellectual Property, Standards, *and* Ethics

Robert D. Hunter

CRC Press
Taylor & Francis Group
Boca Raton London New York

CRC Press is an imprint of the
Taylor & Francis Group, an **informa** business

CRC Press
Taylor & Francis Group
6000 Broken Sound Parkway NW, Suite 300
Boca Raton, FL 33487-2742

Version Date: 2011916

International Standard Book Number-13: 978-1-4398-5287-3 (eBook - PDF)

Visit the Taylor & Francis Web site at
http://www.taylorandfrancis.com

and the CRC Press Web site at
http://www.crcpress.com

To the Memory of Linda Sue Hunter

Contents

List of Figures xix
List of Tables xxi
Preface xxiii
Acknowledgments xxv
The Author xxvii

1 Common Law Contracts 1
Introduction 1
Definition of Common Law Contract 1
Statute of Frauds 2
Parties (Natural Persons) 3
Parties (Artificial Persons) 3
Classification of Contracts 3
Purposes (Subject Matter) of Contract 4
Consideration 4
Promissory Estoppel 5
Valid, Void, Voidable, and Unenforceable Contracts 5
Contract Formation Process (Offer and Acceptance) 5
Offer 6
Duress and Undue Influence 7
Termination and Revocation of Offer 7
Acceptance 8
Offeree's Attempt to Change Terms in Acceptance 8
Silence as Acceptance 8
Time of Contract Creation 9
More Complex Negotiated Contracts 9
Incomplete Agreements 9
Integrated Agreements 10
Interpretation of Integrated Agreements 10
Mistakes, Mutual Mistakes, Fraud, and Duress 10
Mistakes 10
Mutual Mistake 11
Fraud 11
Duress 11
Compact Summary of Case: *Austin Instrument v. Loral Corp.* Court of Appeals of New York, 1971 (Based on Published Decision) 11
Standardized Agreements as Integrated Agreements 12
Contents of the Resulting Contract 12

Performance 13
Express Conditions 13
Implied Conditions 13
Excused Performance 14
Force Majeure Clauses 14
Discharge of a Contract 14
Unconscionable Clauses and Contracts 15
Breach of Contract 15
Damages for Breach 15
Contracting on the Web 16
Electronic Signatures in Global and National Commerce (ESIGN) 17
Summary 17
Additional Reading 18

2 Sales Contracts under the Uniform Commercial Code 19
Introduction 19
UCC Distinguishes between Agreement and Contract 21
Statute of Frauds under the UCC 21
Parties to UCC Contracts 22
Firm Offers and Acceptance 22
Incomplete Agreements 23
Integrated Agreements 23
Interpretation of Integrated Agreements, including Duress (Coercion) 23
Performance 23
Substantial Performance and Excused Performance 24
Unconscionable Contract or Clause 24
Breach of Contract and Remedies for Breach 24
Contracting on the Web 25
Compact Summary of Case: *ProCD, Inc. v. Zeidenberg*, United States Court of Appeals, Seventh Circuit, 1986 25
United Nations Convention on Contracts for the International Sale of Goods (CISG) 26
Summary 28
References 28

3 Contracts of Special Interest to Engineers 29
Introduction 29
Employment Agreements 29
Excerpts from Typical Employment Agreement 31
Consulting Contracts 31
Private Sector Construction Contracts 32
The Parties 32
Contracts as Infrastructure of Process 33
Standardized Contracts between the Parties 38
Standardized Contracts for Architectural Projects 38

Standardized Contracts for Engineering Projects....40
Special Clauses of Construction Contracts....42
Specifications Clauses....44
Interpretations of Construction Contracts....44
Public Sector Construction Contracts....44
Federal Government Contracts....44
52.227-1 Authorization and Consent....47
Parts 1 and 2 of the FAR....48
Part 13—Simplified Acquisition Procedures....50
Part 14—Sealed Bidding....50
Part 15—Contracting by Negotiation....51
Part 16—Types of Contracts....52
Part 33—Protests, Disputes, and Appeals....53
Compact Summary of Case: *Bonneville Associates, Limited Partnership, et al., Petitioners v. David J. Barram, Administrator, General Services Administration*—On Petition for a Writ of Certiorari to the United States Court of Appeals for the Federal Circuit (No. 98-1688 in the Supreme Court of the United States)....53
Special Categories of Contracting (Parts 34 and 35)....54
Part 36—Construction and Architect–Engineer Contracts....56
Part 39—Acquisition of Information Technologies....59
References....59
Additional Reading....60

4 Intellectual Property: Emphasis on Patents....61
Introduction....61
Patent as Contract....61
Patent as a Grant....62
Organization and Functions of the U.S. Patent and Trademark Office (PTO)....62
Utility Patents....63
§ 100 Definitions....63
§ 101 Inventions Patentable....64
§ 102 Conditions for Patentability; Novelty and Loss of Right to Patent....64
§ 103 Conditions for Patentability; Nonobvious Subject Matter....65
§ 104 Invention Made Abroad....67
§ 105 Inventions in Outer Space....68
Modern Development of Patent Law....68
Patent Reform....69
Origin of the Court of Appeals for the Federal Circuit....70
Patenting of Life Forms....71
Computer Programs and Business Methods....71
Infringement....73
Shop Right....73

Anatomy of a U.S. Utility Patent 74
Plant Patents 74
Design Patents 75
Compact Summary of Case: *Sears, Roebuck & Co. v. Stiffel Co.*, 376 U.S. 225 (1964) 76
Patent Clauses in Government Contracts 77
27.301 Definitions 78
27.302 Policy 79
Business Reasons for Applying for a Patent 80
References 80
Additional Reading 81

5 Patent Processes 83
Introduction 83
Starting the Process 84
Making the Decisions to File and How to File 84
Prosecution of Application as Contract Negotiation 85
Provisional Application for Patent 87
Divisional Applications 88
Final Rejection 88
Continuation or Continuation-in-Part Applications 88
Abandonment, Voluntary and Involuntary 88
Issue of Patent and Possible Extension of Term 89
Reexamination of Patents 89
Promotion and Exploitation of a Patent 89
Sale of a Patent 90
Licensing of a Patent 90
Licensing in Patent Pools 90
Alternative Dispute Resolution (ADR) 91
Litigation 91
References 92

6 Copyright 93
Introduction 93
Copyright as Contract 94
Compact Summary of Case: *Eric Eldred et al., Petitioners v. John D. Ashcroft, Attorney General* (No. 01-618). Argued October 9, 2002; decided January 15, 2000. 95
Survey of Copyright Law in Title 17 U.S.C. 96
Chapter 1: Subject Matter and Scope of Copyright 96
§ 101 Definitions 96
§ 102 Subject Matter of Copyright: In General 97
§ 103 Subject Matter of Copyright 98
§ 104 Subject Matter of Copyright: National Origin and 104A 98

§ 105 Subject Matter of Copyright: United States Government Works 99
§ 106 Exclusive Rights in Copyrighted Works 99
§ 107 Limitations on Exclusive Rights: Fair Use 99
§§ 108–116 100
§ 117 100
§§ 118–119 100
§ 120 Scope of Exclusive Rights in Architectural Works 100
Chapter 2: Copyright Ownership and Transfer 100
Chapter 3: Duration of Copyright 100
§ 302 Duration of Copyright: Works Created on or after January 1, 1978 101
Chapter 4: Copyright Notice, Deposit, and Registration 101
§ 401 Notice of Copyright: Visually Perceptible Copies 101
Chapter 5: Copyright Infringement and Remedies 102
§ 501 Infringement of Copyright 102
§ 512 Limitations on Liability Relating to Material Online 102
§ 513 Determination of Reasonable License Fees for Individual Proprietors 103
Chapter 6: Manufacturing Requirements, Importation, and Exportation 103
Chapter 7: Copyright Office 103
Chapter 8: Proceedings by Copyright Royalty Judges 103
Chapter 10: Digital Audio Recording Devices and Media 103
Chapter 11: Sound Recordings and Music Videos 104
Chapter 12: Copyright Protection and Management Systems 104
Additional Notes on Copyright and Computer Programs 105
Collected Algorithms from ACM (Association for Computing Machinery) 105
Algorithm 816: *r2d2lri*—An Algorithm for Automatic Two-Dimensional Cubature 105
Apple Computer, Inc. v. Franklin Computer Corp. 106
The Copyright: Handmaiden of Open Source 106
Survey of Noncopyright Law in Title 17 106
Chapter 9: Protection of Semiconductor Chip Products 107
Chapter 13: Protection of Original Designs 108
§ 1330 Common Law and Other Rights Unaffected 109
Federal Acquisition Regulation (FAR) Subpart 27.4—Rights in Data and Copyrights 109
27.401 Definitions 109
27.402 Policy 110
27.403 Data Rights—General 110
Summary of 27.404 through 27.409 111
References 111
Additional Reading 112

7 Trade Secrets 113
Introduction 113
Basic Legal Requirements 113
Contractual Nature of Trade Secrets 113
Historical Overview 114
Uniform Trade Secrets Act 115
A Departing Employee Action 115
Economic Espionage Act 116
Public Disclosures of Trade Secrets 117
Disclosure by Publication, Other Media, or Speeches, etc. 117
Reverse Engineering 117
Policy and Management Issues in Trade Secrets 118
Options for Selecting Trade Secret versus Other Forms of IP Protection 118
Use and Abuse of Nondisclosure Agreements (NDAs) 118
Compact Summary of Case: *Smith v. Dravo Corp.,* No. 10683, United States Court of Appeals Seventh Circuit, April 10, 1953 119
References 120

8 Trademarks 121
Introduction 121
Definitions of the Marks (15 U.S.C. 1127) 122
Trade Name (Commercial Name) 122
Trademark 122
Service Mark 122
Certification Mark 123
Collective Mark 124
Mark 124
Abandonment of Mark 124
Dilution 125
Colorable Imitation 125
Selection and Use of Mark 125
Registration and Use of Marks 125
Confusing Similarity 126
Examination of Marks in the PTO 126
Infringement of Mark 127
Maintenance and Policing of Marks 127
Secondary Meaning and Trade Dress 127
Compact Summary of Case: *Two Pesos, Inc. v. Taco Cabana, Inc.*, Supreme Court of the United States, 505 U.S. 763 (1992) 128
Cybersquatting on Internet Domain Names 129
Foreign Country Trademarks 129
Practical Trademark Issues in the European Union 130
References 130

9 Standards, Codes, and Regulations 131
Introduction 131
Aims of Standards 132
Types of Standards 132
Basic Standards 133
De Facto Standards 133
De jure Standards 133
Environmental Protection Standards 133
Industrial Standards 133
Interface Standards 134
Management Systems Standards 134
Materials Standards 134
Open Standards 134
Product Standards 134
Product Protection Standards 134
Proprietary Standards 135
Quality Standards 135
Safety Standards 135
Service Standards 135
Terminology Standards 135
Testing Standards 136
Quality of Standards 136
International Standards 136
Regional Standards 137
European Union (EU) 137
North American Free Trade Agreement (NAFTA) 138
Asia–Pacific Economic Cooperation (APEC) 138
Pan American Standards Commission (COPANT) 138
Pacific Area Standards Congress (PASC) 138
Regional Telecom Standards 138
National Standards 139
Company Standards 139
Typical Format of a Standard 140
Cover and Title Page 140
Table of Contents 140
Scope 140
Foreword and Introduction 140
Terminology 141
Marking 141
Requirements 141
Normative Annexes 141
Informative Annexes and Bibliographies 141
Indexes 142
Access to Standards 142
Codes 142

Regulations 143
References 143

10 Standards Bodies and Their Products 145
Introduction 145
Overview of International Standards Bodies 145
Apex International Standards Bodies (ISO, IEC, ITU) 146
International Organization for Standardization (ISO) 147
Major ISO Standards 147
The International Electrotechnical Commission (IEC) 149
Major IEC Standards 149
International Telecommunication Union (ITU) 150
Some Major ITU Standards 150
Regional Standards Bodies 151
European Committee for Standardization (CEN) 151
European Committee for Electrotechnical Standardization (CENELEC) 151
European Telecommunications Standards Institute (ETSI) 152
Asia–Pacific Economic Cooperation (APEC) 152
American Standards Commission (COPANT) 153
Council for Harmonization of Electrotechnical Standards of the Nations of the Americas (CANENA) 153
Regional Telecom Standards Bodies 154
National Standards Bodies 154
Traditional Standards Developing Organizations (SDOs) 156
American Society of Mechanical Engineers–International 157
ASTM International (formerly American Society for Testing and Materials) 157
Electronics Industries Alliance (EIA) 157
National Fire Protection Association (NFPA) 158
Institute of Electrical and Electronics Engineers (IEEE) 158
International Committee for Information Technology Standards (INCITS) 158
Underwriters Laboratories (UL) 158
Consortia Standards Bodies 159
Internet Engineering Task Force (IETF) 159
World Wide Web Consortium (W3C) 159
Open Group (OG) 160
Summary 160
References 160

11 Development of Standards, Codes, and Regulations 161
Introduction 161
Development of Standards by Conventional Bodies (SDOs) 161

Compact Summary of Case: *Allied Tube and Conduit Corp. v. Indian Head, Inc.* ... 162
Due Process in Standard Setting ... 162
Appeals and Patent Issues ... 163
ISO/IEC Standards Development Rules ... 165
ISO/IEC Joint Technical Committee 1 (JTC 1) ... 166
Standards Process in the International Telecommunications Union (ITU) ... 166
Common Patent Policy for ISO/IEC/ITU ... 167
Consortia Methods of Standard Setting ... 167
Internet Engineering Task Force (IETF) ... 168
Development of Codes ... 169
Development of Federal Regulations in the United States ... 169
Development of Regional Regulations in the European Union (EU) ... 171
References ... 171

12 Conformity Assessment ... 173
Introduction ... 173
Conformity Assessment Technology and Skills ... 174
Private Sector Conformity Assessment Bodies in the United States ... 175
Compact Summary of Case: *American Society of Mechanical Engineers v. Hydrolevel, Inc.* 456 U.S. 556 (1982) ... 177
Federal Conformity Assessment in the United States ... 178
Examples of Federal Conformity Assessment in the United States ... 179
Conformity Assessment in International Trade ... 183
IEC Conformity Assessment Systems ... 183
Regional Approaches to Conformity Assessment ... 184
References ... 185

13 Accreditation ... 187
Introduction ... 187
Federal Accreditation Systems in the United States ... 188
Nationally Recognized Testing Laboratory (NRTL) Program ... 190
National Voluntary Laboratory Accreditation Program (NVLAP) ... 191
National Voluntary Conformity Assessment Systems Evaluation (NVCASE) ... 191
Private Accreditation Bodies in the United States ... 192
ANSI and the ANSI–ASQ National Accreditation Board (ANAB) ... 192
American Association for Laboratory Accreditation (A2LA) ... 193
International Accreditation Bodies ... 193
Regional Accreditation Bodies ... 194
References ... 195

14 Ethics for Individual Engineers 197
Introduction 197
IEEE Code of Ethics 198
National Society of Professional Engineers: Code of Ethics for Engineers 199
Statement by NSPE Executive Committee 204
Texas Engineering Practice Act and Rules (Effective June 13, 2010) 205
Subchapter C: Professional Conduct and Rules 205
§137.51 General Practice 205
§137.53 Engineer Standards of Compliance with Professional Services Procurement Act 206
§137.55 Engineers Shall Protect the Public 207
§137.57 Engineers Shall Be Objective and Truthful 207
§137.59 Engineers' Actions Shall Be Competent 208
§137.61 Engineers' Responsibility to the Profession 208
§137.65 Action in Another Jurisdiction 209
Compact Summary of Case: Expert Witness Appears in Court of Another Jurisdiction 210
Standards Engineering Society (SES) Code of Ethics 211
Preamble 211
Section I: Fundamental Principles 211
Section II: Standardization Activities 212
Section III: Standards Procedures 212
Section IV: Standardization Cautions 213
Underwriters Laboratories (UL) Code of Ethics for UL Standards Technical Panel (STP) Members 213
Code of Ethics 214
1.0 Purpose 214
2.0 Scope 214
3.0 Responsibility 214
4.0 UL, STP Members and the Law 216
5.0 Use of Corporate Name or Influence 216
6.0 Seeking Guidance and Reporting Potential Violations 216
Institute of Electrical and Electronics Engineers (IEEE) and Association for Computing Machinery (ACM) Software Engineering Code of Ethics and Professional Practice 217
Preamble 217
Principles 218
Principle 1: Public 218
Principle 2: Client and Employer 219
Principle 3: Product 220
Principle 4: Judgment 220
Principle 5: Management 221

Principle 6: Profession 222
Principle 7: Colleagues 222
Principle 8: Self 223
Applications of the IEEE/ACM Code of Ethics and Professional Practice 224
References 224
Other Resources on Ethics 225

15 Ethics for Organizations 227
Introduction 227
The Foreign Corrupt Practices Act of 1977 (as Amended) 227
Compact Summary of Case: *Kirkpatrick Co. v. Environmental Tectonics Corp.*, 493 U.S. 400 (1990), Certiorari to the United States Court of Appeals for the Third Circuit No. 87-2066 228
ENRON 229
Sarbanes–Oxley Act 230
Restoration of Trust 230
Where Are the Contracts? 231
Chinese Wallboard Issue 231
BP/Deepwater Horizon Blowout in the Gulf of Mexico 232
The Story (from Media Reports) 232
BP's Role in the Accident 234
Schedule and Cost Issues 234
BP's Track Record 234
Transocean's Role 235
Halliburton's Role 235
Role of Cameron International 236
Role of the Regulator: The Minerals Management Service (MMS) 236
Summary of the Deepwater Horizon Accident 237
What Can We Expect as a Result of the Deepwater Horizon Accident? 237
Excerpts from the National Oil Spill Commission Report 238
Organizational Ethics for Government Contractors 240
References 252
Additional Reading 253

Appendix 1 United Nations Convention on Contracts for the International Sale of Goods 255

Appendix 2 The Associated General Contractors of America (AGC of America) Summaries of American Council of Engineering Companies (ACEC) and the Engineering Joint Contracts Documents Committee (EJCDC) Standardized Contracts for Engineering Projects 283

Appendix 3 Title 48, Code of Federal Regulations—Federal Acquisition Regulations System 299

Appendix 4 Outline of the World Trade Organization's Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) 303

Appendix 5 ACM Code of Ethics and Professional Conduct 311

List of Figures

Figure 2.1 The Uniform Commercial Code. 20

Figure 3.1 Parties in a typical construction contract. 33

Figure 3.2 Design contracts for buildings. 34

Figure 3.3 Numbering structure of Federal Acquisition Regulations (FAR) 45

Figure 3.4 Title 48—Code of Federal Regulations. 46

Figure 4.1 Bookshelves containing the U.S. Code Annotated. 64

Figure 4.2 Operation of the wind turbine of Patent 7,772,713. 75

Figure 5.1 Locations of the PTO search room and the PTO scientific library. 85

Figure 5.2 Main entrance of the Patent and Trademark Office (PTO) 86

Figure 5.3 Search room of the PTO. 87

Figure 8.1 Trademark promotion at the PTO. 123

Figure 10.1 Simplified organization of a standards body. 146

Figure 10.2 ANSI organization chart 155

Figure 11.1 A typical SDO standard development process 164

Figure 13.1 Connections between guides and standards for standards, conformity assessment, and accreditation. 189

Figure 13.2 Specific example of an accreditation system in the United States. 190

List of Tables

Table 3.1 Some Standards and Codes Applicable to Construction 35

Table 3.2 Uniform Contract Format in Federal Acquisition Regulations (FAR) 51

Table 6.1 Chapters and Appendices of Title 17 U.S.C. 94

Table 7.1 Some Examples of Potential Trade Secrets 114

Table 10.1 International Standards Bodies of Interest to Engineers 147

Table 10.2 Major Traditional Standards Developing Organizations (SDOs) in the United States 156

Table 12.1 List of Major International Conformity Assessment Standards 174

Table 12.2 Some of the Nationally Recognized Testing Laboratories (NRTLs) in the United States 176

Table 12.3 Merchant Electromagnetic Compatibility (EMC) Testers in the United States 176

Table 15.1 Examples of Decisions That Increased Risk at Macondo while Potentially Saving Time 240

Preface

Engineers encounter various forms of contracts at nearly every turn in their careers. It is not the purpose of this book to make engineers independent of legal advice, but it is designed to help them avoid the most fundamental pitfalls. One does not need to take a lawyer on every motor trip to tell him what the speed limits are! A major goal of this book is to enhance an engineer's ability to communicate contractual issues to a lawyer and to help the engineer to better understand the lawyer's advice.

The plan of this book is to leverage the concepts of *contracts* to introduce the reader to other subjects such as intellectual property (including patents, copyrights, trademarks and trade secrets). Also included under the contract concept are standards (including standards bodies, standards development, conformity assessment, and accreditation) as well as ethics, at both the micro and macro levels.

Chapter 1 briefly introduces common law contracts and includes some simple examples of their underlying principles. Chapter 2 includes a fragment of a sample of the Uniform Commercial Code (UCC) relating to the sales of goods. Chapter 3 surveys the elements of several distinct kinds of contracts that are frequently encountered by engineers, including employee agreements (and related consulting agreements), construction contracts, and government contracts.

Chapter 4 provides an overview of intellectual property from a contract perspective and focuses on the different kinds of patents, describing the roles they play in commerce. Chapter 5 provides a brief introduction to the *process* of obtaining patents, including the rationale for investing in that process. Chapter 6 reviews copyright as a form of contract and touches on recent developments in that area. Chapter 7 includes an introduction to trade secrets (usually enforced by contracts), and Chapter 8 includes an approach to trademarks.

Chapter 9 provides an introduction to standards as multiparty agreements. Chapter 10 describes standards bodies (international, regional, and national). Chapter 11 introduces standards development, and Chapter 12 reviews conformity assessment as a contract between the assessors and their clients. Chapter 13 covers accreditation of conformity assessors and other bodies.

Chapter 14 includes ethical standards for individual engineers in contract terms and reviews several prominent professional codes of ethics and conduct. Chapter 15 shows how the ethical standards of an organization rely on the ethics of individual members, especially the officers and higher-level managers.

Acknowledgments

Many people have contributed in various ways but special mention must be made of Austin architect, Tim Davis and Bruce G. Williams, PE. I also thank my publisher, Nora Konopka, and the following at Taylor & Francis: project coordinator, Jennifer Ahringer and project editor, Frances Weeks. Barbara Hunter's help is acknowledged as is the help of Bright Leaf's Joanne Saathoff and Emily Sharp. Significant contributions were also made by Dr. Otto M. Friedrich, Jr. PE; Dr. Darrell R. Word, PE; David G. Kilpatrick, PE; Richard Marcotte, PE; and Maureen Lopez. Tim David prepared Figure 3.2 and Table 3.1. Bruce G. Williams reviewed the proof copy.

The Author

Robert D. (Bob) Hunter, PE, lives in Austin, Texas, and has been involved in standards, conformity assessment, and accreditation as a company employee and as a consultant to several technical and computer companies for more than 30 years. Bob served on standards committees at both national and international levels, and has written and lectured on standards-related subjects and in his major fields of interest including regulatory compliance, intellectual property, electromagnetic compatibility, product safety, and other technical subjects. Hunter served on the Industrial Advisory Committee (IAC) of Underwriters Laboratories (UL), which developed one of the first national standards (UL 1950) that was based on a major International Standard (IEC 60950). Bob obtained B.S. and M.S. degrees in electrical engineering from Drexel University in 1959 and 1962, respectively, and taught electrical engineering subjects at Drexel Evening College. He served as a quality control engineer and as a patent engineering specialist before becoming involved in regulatory compliance engineering.

He is a member of the Institute of Electrical and Electronics Engineers (IEEE) and served as chairman of the Central Texas Section (1979–1980); he won the IEEE Centennial Medal in 1984. Bob is also a member of the Association for Computing Machinery (ACM). His consulting firm, Robert D. Hunter Associates, is a member of the American National Standards Institute (ANSI) and ASTM International. Bob is also a member of the Standards Engineering Society (SES) and won first place in the National Standards Day paper competition in 1992. Bob's book *Standards, Conformity Assessment, and Accreditation for Engineers* was published by CRC Press/Taylor & Francis in 2009.

1

Common Law Contracts

Introduction

The objectives of this chapter are very modest: first, to provide an overview of the common law of contracts and, second, to supply a foundation for the treatment in subsequent chapters of the many areas that may be cast in terms of contracts to provide rapid assimilation of the concepts involved.

There are many kinds of contracts that share a foundation in common law. There are several definitions of common law, depending on the context in which the term is used, but a salient one is the cumulative body of law resulting from judicial decisions, sometimes called "judge-made law." Courts trying common law cases should reach decisions based on *precedent*, that is, the previous decisions made by other courts, especially higher level courts in the same jurisdiction, on cases with similar facts or "boundary conditions." Most major areas of the law are interconnected, but it is convenient to partition contract law into two major areas: the first involving common law contracts, treated in this chapter, and the second relating to part of the Uniform Commercial Code (UCC) contracts covered in Chapter 2. These topics are sometimes separated for discussion in texts on contracts but are often integrated, since each area complements (and to some extent competes with) the other. Both common law and UCC contracts are within the jurisdiction of the states; there is no federal common law of contracts. Many of the elements of common law contracts will not be covered in this text—for example, a treatment of remedies when contracts are breached. Other specialized but important areas of law not treated here are frequently involved such as agency, tort, and equity.

Definition of Common Law Contract

A contract, loosely defined, is an agreement between two or more parties to do, or not to do, a particular thing (performance) that the parties intend

to be enforceable at law. An authoritative definition from the Restatement (Second) of the Law of Contracts reads: "A contract is a promise or a set of promises, the breach of which is given a remedy by law, or the performance of which the law in some way recognizes as a duty."* Other related terms are defined in the Restatement of the Law of Contracts (including First and Second) but they will not be repeated here. The Restatement of Contracts (Second) is one of several "Restatements of the Law" that attempt to collect and coordinate court decisions in a particular area of the law such as torts (including product liability). Restatements are "secondary authorities" as compared to "primary authorities" which are the original decisions.

Statute of Frauds

The original statute of frauds was an English law passed by parliament and titled "An Act for Prevention of Frauds and Perjuries." The goal of the statute was to prevent fraudulent making of contracts and perjury. Similar laws are usually included in common laws and the UCC. The term *statute of frauds* is used here to denote the adoptions in state laws that apply the principles of the original statute of frauds. A contract need not be in writing to be enforceable unless it falls under a modern version of the statute of frauds. Statutes of frauds require a written and signed form of contract for certain transactions including others of no interest here:

- Sales or leases of land
- Contracts for sale of goods above a specified value
- Any contract that cannot be performed within a year
- Any change to a contract that would be performed in a year that extends the performance period to beyond a year
- Contracts where one party agrees to pay another party's debt

An exception to a defense based on the statute of frauds is available if the only way to avoid injustice is to enforce a promise in spite of its pro forma violation of the statute of frauds. The avoidance of the statute of frauds in this manner depends on the lack of other available remedies. A contract that should but does not comply with the provisions of the statute of frauds may be voidable (set aside) in most states. Only a party to the contract may raise the issue of noncompliance. There are some preliminary issues involved in the formation

* This definition of contract is from the *Restatement (Second) of the Law of Contracts*, copyright 1981 by the American Law Institute. Reprinted here with permission. All rights reserved.

of a contract; these involve the parties, the classification of the contract, the purposes of the contract, and the considerations given by the parties.

Parties (Natural Persons)

In the law, a *person* can be a natural person or an "artificial person" such as a corporation or other business entity. There is a basic set of requirements for natural persons to make a legally enforceable contract, and two conditions against this:

- Minors (called *infants* in law) cannot make most kinds of contracts until they are adults (ages 18–21 in various jurisdictions). An exception is the ability of minors to contract for *necessities*.
- Mental incapacity due to mental illness, intoxication, or drug use, etc.

Parties (Artificial Persons)

When one or both parties to a contract are corporations, or certain other artificial persons in various situations, several questions of "competence" can arise. Corporations must have a "charter" to legally do business in a state; the charter outlines the kinds of things the corporation can do legally. If a corporation contracts to something not authorized by its charter, this is called an *ultra vires* transaction that usually cannot be legally defended in case of fault by another party. Another major issue that arises when a party to a contract is a corporation is one of the *authority* of the natural person (or electronic agent involved) in the making of the contract. Corporations and other legal persons generally have delegations of authority in which various officers and others (notably buyers) are authorized to make legally enforceable contracts. The delegations of authority often have dollar limits on contracts that may be made by the several classes of people.

Classification of Contracts

There are many kinds of contracts from a legal perspective. These range, for example, from *executed contracts*, like the simple purchase of an item in a store, to *executor contracts*, where the parties promise to perform in the future.

An executory *implied contract* may arise from the actions of the parties, even in the absence of a deliberate formation of a contract. Formal contracts are sealed, written documents that clearly show that the parties intended to make a binding contract, and are usually enforceable. Simple or *informal* contracts are not required to carry a seal, and may be either written or oral. If the contract is formed by the exchange of promises, it is called a *bilateral* contract. A *unilateral contract* is one in which only the offeree is required to perform, based on an offer from an offeror. Other methods of formation may also be used to classify contracts. In addition, there are many forms of contracts that have been classified by the industry or trade that uses them, for example, construction contracts, government contracts, international contracts, subcontracts, contracts for sale of land, noncompete contracts, option contracts and many others. A *quasi-contract* is an invention of a court that permits a party performing something to be compensated for work, even in the absence of a contract.

Purposes (Subject Matter) of Contract

The purposes of a contract must be legal for the contract to be enforceable. A contract calling for a *per se* violation of a statute cannot be enforced at law. A contract calling for the violation of a U.S. Environmental Protection Agency regulation, for example, could not be enforced. Similarly, an employment contract that required a worker to work for a wage lower than that prescribed by law would not be legal. It is sometimes said that in the United States, everything not prohibited is permitted but in Europe and elsewhere, everything not permitted is prohibited!

Consideration

Each party to a contract must give the other party something of value called a *consideration*. A promise, in contract law, is a written or oral expression of an intent to be legally bound if a contract is formed. The promise given by each party is a usual form of sufficient consideration. A promise to do something that a party is already obligated to do is not consideration. Nominal consideration in money agreements such as loans may not be legally sufficient if grossly out of balance. Consideration of ten cents for a loan of 10,000 dollars for 2 years would be recognized as a sham consideration. A promise not given in return for consideration from the other party is unenforceable. The dollar value of the consideration does not have to be large but it cannot be totally

without value. A promise to do something, or refrain from doing something (unless either is illegal), is lawful consideration. The two things of value, considerations, are sometimes called the quid pro quo (something for something) of the contract. A situation where one of the considerations becomes insufficient after a contract is formed is sometimes called a "failure of consideration."

Promissory Estoppel

A possible exception to the requirement for consideration is called a *promissory estoppel*.

That situation is one where a promise might be enforced, even one without consideration, if the promisee had changed his position due to the promise.

Valid, Void, Voidable, and Unenforceable Contracts

A *valid* contract, or contract provision, is one that meets all of the requirements outlined above for competent parties, legal purposes, sufficient consideration, and genuine offer and acceptance or their equivalents. Valid contracts and provisions will be enforced by the courts. *Invalid* contracts and provisions will not be enforced by the courts.

A *void* contract or contract provision is one that has no legal existence and one which cannot be cured to make it a valid contract; it is not binding and has no legal purpose.

A *voidable* contract or term is one that may be avoided or found to be legally void but not one that is "incurable" to make it a valid contract or term. A simple example is when a minor (infant) contracts with another competent party. The contract is voidable by the minor unless it is for necessities.

Unenforceable contracts or terms are those that, for a variety of reasons, cannot be enforced. A contract or provision that violates the statute of frauds, for example, would normally be unenforceable, but see the exception noted in the statute of frauds discussed before.

Contract Formation Process (Offer and Acceptance)

The "offer and acceptance" model has been a mainstay for describing the formation of a common law contract. While it is still practically and

conceptually useful, it does have limitations in many actual situations. If the forgoing requirements of competent parties, legitimate subject matter (purpose), and consideration are met, then an offer followed by acceptance will normally form a contract, subject to other requirements on the offer and the acceptance. The party making the offer is referred to as the "offeror," while the party receiving the offer is called the "offeree."

Offer

An offer is the communication of the offeror's intention to give a consideration and create a contract in exchange for a consideration (promise, money or performance) given by the offeree or his agent. The Restatement, Second, defines an offer as: "An offer is a manifestation of a willingness to enter into a bargain so made as to justify another person in understanding that his assent to that bargain is invited and will conclude it."* The terms of the offer must be sufficiently certain to form a contract, although terms implied by law would not have to be included to make such an offer definite. Terms that include the definition of a breach and the resulting remedy usually help satisfy the certainty requirement. An indefinite offer may be made definite by including another document by reference, to a standard form contract for example. The offer may be validated by the conduct of the offeror to indicate to the offeree that his acceptance is all that is required to form a contract. The offer can take many forms, except that it must comply with the statute of frauds mentioned above. An invitation to negotiate that does not include the elements of an offer outlined above is not an offer and creates no legal obligations.

Advertisements, even those including price quotations, do not usually constitute an offer in common law contract formation. The rationale of this principle is that advertisements are normally directed to many unknown parties, thus making an offer to a known party impossible. An exception might occur where the advertisement includes sufficient information, including price, and a provision that a contract may result if the first person to contact the offeror communicates its acceptance of such an offer. An advertisement offering a reward for the return of a lost pet is an example. As a result, advertisements and similar matter are normally considered to be only invitations to make an offer. A *letter of intent* is merely a record of the parties' initial understanding of the terms of the bargain; it would not be definite as an offer unless there is an expressed intent to make it binding.

* Restatement, Second, Contracts, copyright 1981 by the American Law Institute, reprinted here with permission. All rights reserved.

It would be a good practice to specifically indicate in such a letter if it is intended by the parties to be binding.

Duress and Undue Influence

The offeror must not obtain the assent (acceptance) of the offeree by the use of *duress.* A finding of duress goes beyond the storied "making him an offer he can't refuse" of mobster movie and TV fame which threatens physical violence or death to the offeree. Where the offeree's free will to contract is threatened by significant economic or other loss, the resulting contract or contract provision may be avoided. An interesting example of duress that occurred in the performance of a contract is described in the following Compact Summary Case.

Termination and Revocation of Offer

An offer is terminated when it is rejected by the offeree and the rejection has been communicated to the offeror. In the usual course of events, a counter-offer terminates the original offer and the counter-offer itself becomes an offer if it meets the requirements of a valid offer. Offers can normally be revoked before an acceptance of a common law contract upon receipt of the revocation by the offeree. An exception is the offer for an option contract. An option contract may result from a written and signed offer that includes consideration for the option and proposes an exchange (on fair terms) within a reasonable time unless a time limit is included in the offer. The buyer of the option has essentially bought a "parcel" of time during which the offer cannot be legally revoked (which would be analogous to a failure of consideration). For other kinds of contracts, a reasonable time for an offer to be effective is usually applicable unless a specified time limit for acceptance is included in the offer. An offeror cannot revoke its offer if the offeree has begun to perform as a means of acceptance of a unilateral contract unless the offeror would have no way of knowing that performance had begun. In that case, the offeree is obligated to inform the offeror of his acceptance. A unilateral contract is one in which offeree initiates performance as a mode of acceptance. An offer will be terminated by the death or incapacity of the offeror or the offeree if either event occurs before an acceptance is made, that is, no contract was formed. An offer to paint an existing bridge will be terminated if the bridge is destroyed before the work can be performed.

In instantaneous communications such as by telephone, video conferencing, or in person-to-person discussions, an offer is usually understood to lapse at the end of the "conversation" unless there was evidence that the offeree was permitted by the offeror to act on the extant offer within a reasonable time. An offer can also be revoked by an offeror's action which is not consistent with a continuing desire to be bound.

Acceptance

An offer can be accepted only by the party to whom it is directed, not by another. An acceptance of the offer by the offeree brings a legally binding contract into being. The acceptance (assent) may take many forms unless a particular form is required in the offer. A contract will not be formed in the event the offerer requires acceptance communicated in a particular manner and the "acceptance" is communicated in another manner. Genuine assent on both sides is determined by the objective intentions of the parties. In some cases, a performance by the offeree may itself be required or permitted to constitute acceptance; the resulting contract is then called a "unilateral contract." The offeree must usually notify the offeror if it is accepting by performance, especially when the offeror is not in a position to become aware of the fact that performance is being or has been performed. The ability of the offeree to create a contract is often called the "power of acceptance." This means that the offeror cannot revoke the offer after it has received the acceptance (and even earlier in some cases pursuant to the so-called "mail box rule" where a contract is formed on the date that the acceptance is mailed). It is fairly well settled that an acceptance, to be effective, cannot be communicated to an offeror by a means that is slower than that used to communicate the offer. Thus, a contract may be brought into existence despite the fact that the offeror has not received the acceptance. The manner of acceptance can otherwise be a requirement in the offer including the offeror's specification of the time during which the offer is open. Absent such a specification, the offeror may revoke the offer prior to acceptance. Once the offeree has rejected the offer, he cannot change his mind and accept it.

Offeree's Attempt to Change Terms in Acceptance

Offeree's attempt to add new terms, delete offered terms, or significantly change the offered terms in his acceptance results in no contract being formed. Such action actually terminates the offer and becomes a new offer that must meet the common law of contract formation. Offeree's "reminder" to insert new terms that would have been implied by law in any event probably does not constitute rejection of the offer. Offeree's suggestion (versus demand) that a new term be considered or an existing term changed would not constitute rejection.

Silence as Acceptance

Acceptance by silence is available in very narrow situations, for example, where the offeror realizes the benefits of the offer and where silence is a normal mode of acceptance between the parties, or where the offer itself indicates that silence is acceptance.

Time of Contract Creation

If the parties have reached agreement, and no writing or "memorial" of the agreement is planned, the contract is usually created when an agreement is reached. If the parties plan to reduce the agreement to written form before assenting to be bound, then the contract formation will not occur until the contract document has been prepared and signed. If, on the other hand, the parties agree to be bound by the agreement before it is reduced to writing and signed, they should make that intention clear in some way. A "letter of intent" is a documented agreement of the parties to continue bargaining in good faith to develop a formal contract at a later time. Letters of intent can be binding or not, depending on the intentions of the parties. To avoid ambiguity, the letter of intent should specify if it is binding or not.

More Complex Negotiated Contracts

Many contracts do not fit the simple model of "offer and acceptance" outlined above. In many such contracts there is an extensive chain of offers and counter-offers such that it may not be practical to analyze which parts of the agreement were offers and which counter-offers. In a sense, it doesn't matter since the two assents are given to seal the bargain. Contracts that do not comply with the statute of frauds, where it is applicable, are void in most jurisdictions.

Incomplete Agreements

Valid contracts sometimes fail to include terms that are applicable to the subject matter and the contracting situation. If an applicable term is missing from the contract, it may be supplied by a court involved in resolving a legal dispute. Good faith and fair dealing are required in common-law contracts. Good faith implies that a party will try to satisfy the valid expectations of the other party. Good faith implies that a party does not intend to defraud the other party. Fair dealing has similar connotations. Missing but applicable contract terms may also be required by statute or by the conduct of the parties. Trade usage may also imply certain terms unless it was customary to not include them in the written contract. A commitment to fair dealing applies to both parties and implies that the parties will not deal with each other in an unfair manner. Evidence of additional terms that are consistent with the rest of the contract may be admissible unless the contract is integrated.

Integrated Agreements

An *integrated agreement* is a written statement that includes all of the terms finally agreed to by the parties. An integrated agreement is characterized by finality and completeness. A court will normally determine if a contract is an integrated agreement before addressing questions of *interpretation* or the applicability of the *parole evidence rule*.

Interpretation of Integrated Agreements

The meaning of the words in integrated agreements is usually a question of fact, that is, what is the meaning of the term *accuracy* as opposed to the term *precision*? In common usage, these terms are nearly synonymous, whereas in technical areas they are greatly different. This means that arguments may arise as to whether an interpretation of a word is a question of law or a question of fact! Questions of law are decided by a judge while questions of fact are decided by a jury in a jury trial. The integrity of the written contract that is completely integrated cannot be challenged by parole evidence, sometimes called extrinsic evidence. Such extrinsic evidence may be allowed to support charges of mistake, fraud, duress or certain other issues.

Mistakes, Mutual Mistakes, Fraud, and Duress

It sometimes happens, during or after the formation of a contract, that mistakes were made. There are also examples of fraud or duress during the formation of a contract.

Mistakes

A *mistake* is a misunderstanding of the facts or of the law; the latter is frequently treated as a misunderstanding of the facts. Mistakes are classified as *unilateral* or *mutual*. A unilateral mistake is one made by only one of the parties to the contract. A contract may be voidable by the party making the mistake if it can be shown that the other party knew or should have known of the mistake under the circumstances. A small unilateral mistake may not be grounds for making the contract void, but a large obvious mistake is more likely to permit the party making it to make the contract void. A mistake as to the meaning of the contract or its terms will not usually support its being declared void.

Mutual Mistake

If both parties form a contract based on a mutual mistake, the contract is voidable by the party most adversely affected by that mistake, especially if the mistake has a substantial impact on the agreement. A contract would not be voidable due to a mutual mistake in *judgment*. A claim and counter-claim by the parties where the mutual mistake involves differing understandings of a word may result in the failure of both claims.

Fraud

A *fraud*, in common law contracting, is a deliberate misrepresentation of a significant fact that the perpetrator intends the other party to rely on, followed by the injured party's reliance on the misrepresented fact. An innocent misrepresentation would not constitute fraud. A fraud may also occur when a party fails to supply important information that would have affected the other party's acceptance of the contract. In modern times the courts have narrowly construed the statute of frauds to avoid creating another fraud.

Duress

The possible use of *duress* by an offeror, in an attempt to force acceptance of the offer, was mentioned in the preceding section titled "Offer." A case of economic duress may also arise during the performance of the contract. A typical scenario is when a party supplying an item at a stated price attempts to force the buyer to agree to a price increase by withholding the item being supplied. A prominent case of such a situation is summarized in the next section.

Compact Summary of Case: *Austin Instrument v. Loral Corp.* Court of Appeals of New York, 1971 (Based on Published Decision)

The defendant, Loral Corporation, seeks to recover payment for goods delivered under a contract that it had with the plaintiff, Austin Instruments, Inc., on the ground that the evidence establishes, as a matter of law, that it was forced to agree to an increase in price on the items in question under circumstances amounting to economic duress. In July of 1965, Loral was awarded a $6,000,000 contract by the navy for the production of radar sets. The contract contained a schedule of deliveries, a liquidated damages clause applying to late deliveries, and a cancellation clause in case of default by Loral. Loral solicited bids for some of the precision gear parts needed to produce the radar

sets and awarded Austin a subcontract to supply some of those parts. Loral received a second navy contract for additional radar sets and solicited bids for the gear from potential subcontractors at the time that Austin was still producing the gears. Loral advised Austin that the second subcontract for the gears would be awarded to Austin only if it was the low bidder. Austin refused to bid for less than Loral's total requirement and advised Loral that it would cease deliveries unless Loral agreed to a substantial price increase that would apply not only to all the gears delivered under the first subcontract but to all the gears produced under the second subcontract. Austin did stop delivery under the first subcontract. After unsuccessfully attempting to obtain gears in time to meet the schedule from any of the other potential subcontractors, Loral agreed to the price increase as applied to both subcontracts. When all of the parts for the second contract were received by Loral, it declined to pay Austin a substantial final payment. Austin sued to recover the amounts owed it. Several lower courts found for Austin but the Court of Appeals of New York reversed those decisions, finding in favor of Loral on the basis that "the evidence makes out a classic case, as a matter of law, of such duress."

Standardized Agreements as Integrated Agreements

Standardized agreements are generally the result of contracting experience and dispute resolution concerning such transactions and are, therefore, considered sufficiently well formed as to qualify as integrated agreements with some exceptions. If a provision of a standard agreement is modified by a specifically prepared "typed" form, the typed form will often prevail in case of disputes. If either the standard or "typed" form is modified by a handwritten change, that change will govern. Standardized agreements are often used in construction, as outlined in Chapter 3. Their use tends to reduce misunderstanding and provide for forms of alternative dispute resolution rather than a lawsuit.

Contents of the Resulting Contract

The contents of a contract depend on the type of the contract, (each type of contract, e.g., construction, sales, etc.) but most contracts include at least the following components:

- Unambiguous identification of competent parties
- Considerations provided by both parties

- Type or classification of the contract
- Purposes of the contract
- Genuine offer that meets all legal requirements or the equivalent result in negotiations
- Genuine acceptance that meets all legal requirements or the equivalent result in negotiations
- Beginning and ending dates of the contract
- Specification of the appropriate jurisdiction (state) for interpretation
- A method within the contract for resolving disputes

Performance

When one party to a contract has a duty to perform at a given time, he must perform at that time or be in breach of the contract. Contracts often contain *conditions.* A condition is an event that may or may not occur. A condition may be termed a *condition precedent* or a *condition subsequent.* A condition precedent is one in which a party will be required to perform before the duty of the other party is owed. A condition subsequent is an event that will discharge an existing duty or even terminate an existing contract. A variety of other conditions have different consequences. Conditions also fall into one of two classes, *express* and *implied.*

Express Conditions

An express condition is one that the parties have formally agreed to in their contract.

In a life insurance policy, for example, the death of the insured is a condition that requires the insurer to pay the beneficiary in the event of the insured's death. The duty of the life insurer to pay may be (and often is) conditioned on the promise of the insured that he will not smoke. If the insured dies of lung cancer attributable to smoking, the insurer might be relieved of a duty to pay. A promise not to smoke on the part of the insured is expected to result in lower insurance premiums than would be required if that condition was not expressly agreed to.

Implied Conditions

An implied condition may be found in a contract even when not expressed. The parties may have intended that an event must occur before a duty is created or excused. Prior performance, dealing, or usage of trade may give rise to an implied condition. The UCC spells out specific rules on such conditions.

A down payment on an item, for example, may be a condition permitting a purchaser to take possession (but not title) to the item. Some jurisdictions do not recognize implied conditions. A *constructive condition* is a form of implied condition that is provided by a court when it is not evident from the intentions of the parties.

Excused Performance

Performance of a duty under a contract may be excused if the performance becomes *impossible*, through no fault of the party having the duty. Performance when the duty of one party becomes manifestly impractical, to the great detriment of the other party, may also be excused under rather unusual circumstances. Events that might excuse performance include the death of a person necessary for the performance, the destruction of something needed to perform, or an intervening law that would make performance illegal. An example of the latter is where a contractor agrees to sell advanced electronic equipment to a foreign customer but cannot obtain the required "export license" from the Department of Commerce. A "frustration of purpose" may also excuse performance in cases where there would be no benefit deriving from the performance. Mere economic or commercial frustration does not usually excuse a duty to perform.

Force Majeure Clauses

At the time a contract is formed, the parties may not be willing or able to commit to a performance in the event of a major occurrence such as war or "acts of God." The excused performance in such cases is conditioned on the occurrence of a major disruption affecting the contract that is beyond the control of the parties. Examples would include the Arab oil embargo or the destruction of the World Trade Center in New York. Such clauses are common in construction and other contracts.

Discharge of a Contract

A *discharge* of a contract eliminates any further duties of the parties. All of the contractual duties of both parties (in a bilateral contract) have been performed. Discharge is normally the result of both parties producing "substantial performance" under the contract. An example of substantial performance may occur in the construction of a house. The builder made a small mistake in following the architect's plan but the mistake did not substantially affect the usefulness or market value of the house. A reasonable buyer of the completed house might agree to discharge the contract for a small compensatory payment. Discharge may also result in the expiration of a stated time for the life of the contract. Discharge may also occur because of the impracticality or impossibility of performance, a condition

subsequent, as mentioned above. A discharge of an uncompleted contract may also result from an agreement of the parties. A contract might be discharge by operation of law as in the example above where an export license could not be obtained.

Unconscionable Clauses and Contracts

Courts do not normally police the fairness of contracts. Each party is expected to look after its own interests. If a proffered contract is manifestly unfair, the target of the offer should just walk away. A court may refuse to enforce a contract that is totally unjust to one of the parties. Unconscionable clauses and contracts are addressed in the UCC (Chapter 2).

Breach of Contract

The unexcused failure of a party to perform at an agreed time and under a specified condition is a *breach* of the contract. The clear and definite refusal of a party to perform is likewise a breach. Breaches may be considered *material* when their impact is large or they may be *nonmaterial* (partial) when their impact is small. A material breach may be curable or incurable. A material breach, if incurred in some way, or a partial breach may constitute a *substantial performance.* For example, a supplier of integrated circuits may commit a material breach if a lot of units supplied had too many defects. That breach might be cured if the supplier screens the lot to remove most of the defects and replace the defective parts with good parts. That would leave only the time lost by the buyer as a consideration. That material breach may thus become a substantial performance. A breach may involve a party's refusal or failure to perform a duty, or it may involve a party's performance of an act that it agreed not to do.

Damages for Breach

The injured party to a breached contract has a variety of remedies available to it. It may sue for several remedies or it may waive the breach (usually for a consideration) in order to restore the other provisions of the contract. The damages obtainable by the injured party are *direct* or *consequential.* Most contracts bar consequential damages. To obtain direct damages, the injured party would have to show that it took reasonable steps to *mitigate* those damages. Some contracts, by their terms, do not permit a waiver of a breach.

There are frequently limits for liquidated damages specified in the terms of the contract; liquidated damage is the price paid for a party's breach without involving a law suit. In relatively rare cases, a court may require the breaching party to perform on its duties under the contract. An example of such a situation is where a part being supplied by a breacher cannot be obtained elsewhere (this situation is covered in the UCC). If the breach is a threat to take an action, prohibited by the contract, the court may grant an *injunction* that would order the breacher not to take that action. The injured party of a breach may also cancel the contract.

Contracting on the Web

The law of contract formation and management on the Web is based on the same common law and Uniform Commercial Code (UCC) adoptions (by the states) that govern contract activities offline. An early effort to fill the gaps in the UCC, so as to clarify electronic contracting, was a proposed change to Article 2 called UCC2B (modern versions of the UCC have long had an Article 2A). It will be recalled that Article 2 governs sales and leases. The UCC2B proposal was very favorable to software makers but was not approved by the American Law Institute (ALI), the partner of the National Conference of Commissioners on Uniform State Laws (NCCUSL), which prepares the UCC. The NCCUSL rebranded the UCC2B proposal to call it the Uniform Computer Information Transactions Act (UCITA). Although, like its predecessor, UCITA was vigorously opposed by legal authorities and many in the computing community such as the Association for Computing Machinery (ACM), it was put forward by the NCCUSL for adoption by the states. UCITA was adopted by only two states, Virginia and Maryland, apparently in the hope that the software firms would flock to those states. The NCCUSL then went back to the drawing board and approved a replacement for UCITA called the Uniform Electronic Transactions Act (UETA) at its 1999 meeting in Denver, Colorado.

UETA is a model code designed for adoption by the states in the same manner as the UCC and has been adopted in most of the states including Virginia and Maryland. UETA is designed to legitimize the substitution of computer records for written documents so as to promote online transactions between people relating to business, commercial and governmental affairs. The following statement appears in UETA: "It is important to understand that the purpose of the UETA is to remove barriers to electronic commerce by validating and effectuating electronic records and signatures. It is *not* a general contracting statute – the substantive rules of contracts remain unaffected by UETA. Nor is it a digital signature statute. To the extent that

a state has a Digital Signatures Law, the UETA is designed to support and complement that statute."

Electronic Signatures in Global and National Commerce (ESIGN)

The U.S. Congress passed a law with the short title Electronic Signatures in Global and National Commerce (ESIGN) in June of 2000. ESIGN applies to interstate electronic transactions in the United States as well as to *international electronic transactions.* ESIGN, as its name implies, addresses the issue of verifying electronic signatures on documents transmitted over the Web and the treatment of electronic records as legally equivalent to paper and other records. Oral communications do not qualify as "records" under ESIGN. The requirements of ESIGN also apply to federal and state governments. The passage of ESIGN encouraged the states to adopt UETA, at least in part, by permitting a limited exemption to the ESIGN law for those states adopting UETA (as was done in Texas). UETA requires that electronic records be accurate and retained so as to be reproducible after the fact. UETA's purpose is to encourage electronic commerce and *not* to rewrite contract law, as seemed to be the intent of UCITA. The provisions of UETA may provide "gap fillers" for UCC contracts.

Summary

It almost goes without saying that this treatment of common law contracts should not be used to provide guidance in practical situations where the advice of an attorney is essential.

The evolving common law of contracting has been profoundly influenced by the Uniform Commercial Code, which is updated more often than the Restatement of Contracts. Contracts play such an important part of our everyday lives that it is an important area of law in its own right but is linked to other areas of law including agency, torts, and business law. The essentials of contract law are relatively easy to understand but the complexity is mind boggling. The intentions of the parties in forming contracts provide the important principle. Emphasis has been placed on consideration and competence of the parties in contract formation. There are cases where consideration is less important; these are covered in Chapter 2 on the UCC. The modern versions of the statute of frauds have changed from earlier concepts.

The misconduct of a party in forming and performing a contract has received special attention in the Compact Summary of Case in this chapter. Breach of contract and the available remedies have only been mentioned.

Additional Reading

Blum, B.A. 2007. *Contracts, Examples and Explanations*, New York: Aspen Law & Business.

Court of Appeals of New York, 29 NY2d 124, Austin Instrument v Loral Corp.

Rohwer, C.D. and M. Skrocki 2006. *Contracts.* New York: Thomson-West.

2

Sales Contracts under the Uniform Commercial Code

Introduction

The aim of this chapter is to introduce engineers to the Uniform Commercial Code. (It has been reported that many engineering graduates have not even heard of the UCC!) The UCC is organized into Articles, Parts, and Sections. In addition to the articles themselves, the UCC contains extensive "Official Comments" that explain the origin of the articles, including their case law foundations. The focus of this treatment is on Articles 1 and 2 of the UCC. Article 1, titled "General Provisions," sets forth the overall policies, and some of the basic definitions that apply to the UCC as a whole (with certain exceptions). Article 2 (Sales) is devoted to sales contracts. The other articles of the UCC are:

Article 2A—Leases,
Article 3—Negotiable Instruments,
Article 4—Bank Deposits and Collections,
Article 4A—Funds Transfers,
Article 5—Letters of Credit,
Article 6—Bulk Sales,
Article 7—Documents of Title,
Article 8—Investment Securities,
Article 9—Secured Transactions.

The complexity of the UCC is illustrated by the photo in Figure 2.1 which shows what the 2-in. thick document looks like. Article 6 on bulk sales is too specialized to be of direct interest to engineers and so is not discussed here.

The motivation of the UCC is to reduce the variety of provisions in interstate contracts to facilitate interstate commerce within the United States and its possessions. As mentioned in Chapter 1, the UCC is the joint product of two groups, the National Conference of Commissioners on Uniform State Laws (NCCUSL) and the American Law Institute (ALI). The UCC was first

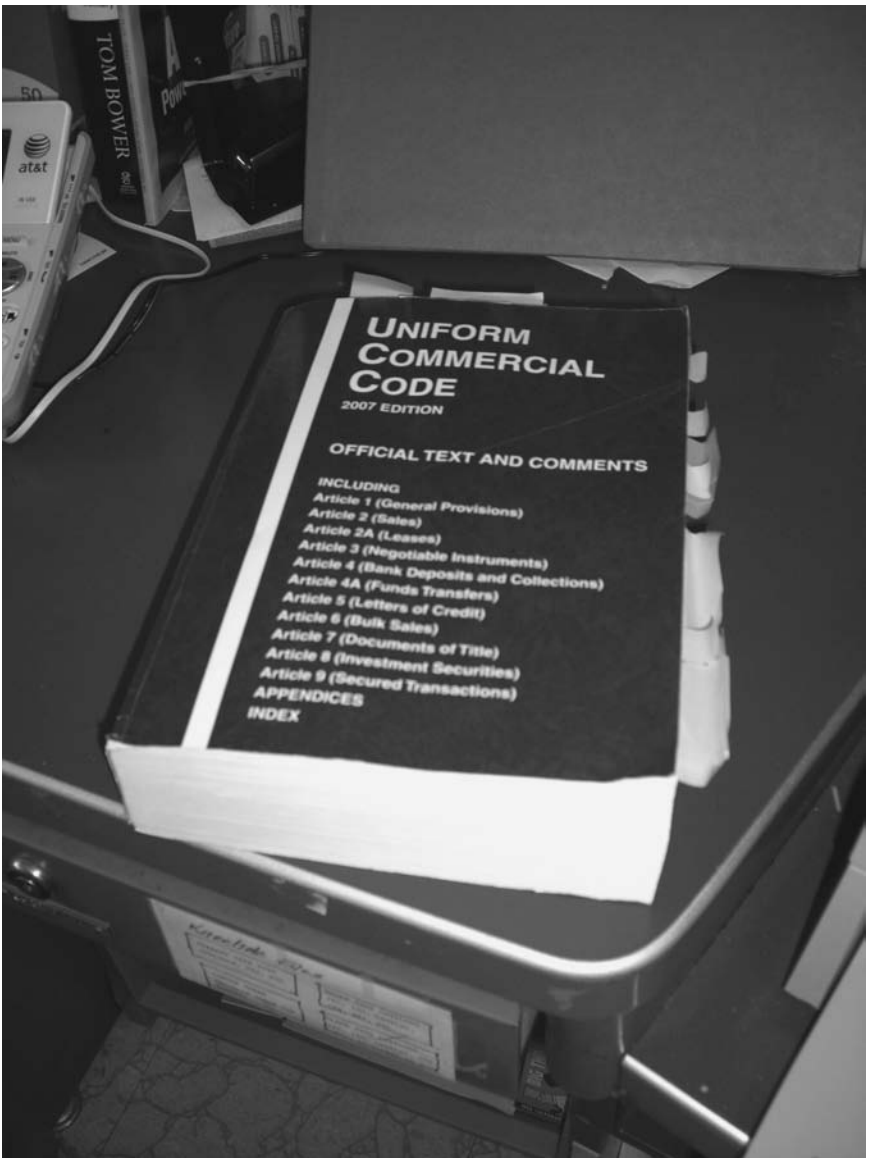


FIGURE 2.1
The Uniform Commercial Code. (Photo by author.)

published in 1952 and has been periodically revised since then (the most recent being in 2007). The scope of Article 2 of the UCC includes many kinds of "goods" but does not apply to sales of land, certain financial transactions, and some other things. A "sale" is defined as the transfer of title from a seller to a buyer for a price (§ 2-106). "Goods" are defined as things that are movable

and includes, for example manufactured goods as well unborn animals and many other things (§ 2-103(k)).

Uniform Commercial Code contracts grew out of and are based on the common law contracts covered in Chapter 1 of this book. In general, the requirements for making UCC contracts are less stringent than those for making common law contracts. The UCC is a "model code" that has no legal effect until it is incorporated into state laws (codes or statutes) by state legislatures. It is essential that state legislators not make too many changes to the official UCC; that would tend to limit its usefulness in promoting commerce between the states.

In order to show how the UCC reinforces and is contrasted with common law contracts, the following uses the general subject headings in Chapter 1 of this book.

UCC Distinguishes between Agreement and Contract

The *agreement* in UCC terminology is only a part of the *contract* (see § 1-201 [b] (3)). A UCC contract includes the agreement and any other applicable laws that would be "read into" it. Thus, the UCC contract includes the total obligations of the parties to the agreement and certain other factors, including course of performance, course of dealing, and usage of trade as outlined in § 1-303. These factors were mentioned in Chapter 1 under the heading "Incomplete Agreements." A contract for sale is further defined in § 2-106 as "the passing of title from the seller to the buyer for a price." Section 2-204 illustrates the flexibility of contract formation as compared with that in common law contracts. In particular, § 2-204(4)(a) articulates the manner in which a contract may be formed between electronic agents and between agents and persons. Section 2-211 provides that contracts formed electronically are legal, subject to some limitations.

Statute of Frauds under the UCC

Article 2 of the UCC states that the contract for the sale of goods worth over $5,000 is unenforceable unless there is a suitable *record* (previously called "writing") of the transaction. The basic elements of the modern statute of frauds are thus carried over to the Uniform Commercial Code. The common law requirement that performance time cannot exceed one year is waived pursuant to § 2-201 (4). Remedies for fraud are broadened in the UCC in § 2-721, Remedies for Fraud.

Parties to UCC Contracts

In UCC contracts for sales, the parties are, for certain aspects, divided into *merchants* and the public. A merchant is one who has special skills and understanding of the goods and the market and so bears more responsibility than the public for meeting its responsibilities of the sale (see § 2-104 (1)). Since many important commercial transactions take place "between merchants," the term "between merchants," (for which some UCC requirements are framed) is defined in § 2-104(3). The definition of "person" in the UCC is very broad and includes almost any kind of trading entity (see § 1-201[b](27)), including those mentioned in Chapter 1 here. The term *buyer* is defined in § 1-201(9) as a person who buys goods in good faith and that is authorized to take possession of the goods subject to sale.

Firm Offers and Acceptance

A firm offer to buy or sell goods made by a merchant in a signed record is not revocable because it lacks consideration; that is in contrast to the situation in the common law offer. Then, § 2-205 provides for a reasonable period of revocability, if none is specified, but that period of revocability must not exceed 3 months. The offer and acceptance model of the common law described in Chapter 1 applies to UCC sales contract formation except that a suitable acceptance may be valid even if it includes terms different from those proposed in the offer (§ 2-206(3)), which states "acceptance in a record operates as acceptance even if it contains terms additional to or different from the author." That is contrasted with the common law contract view that an offeree's attempt to change the terms in acceptance constitutes a counteroffer. The "battle of the forms" issue is addressed by providing that terms that actually become part of the contract are specified in § 2-207(c) "terms supplied or incorporated under any provision of this Act." If there are "gaps" in the terms of the agreement, the so-called "gap fillers" of Articles 2-305 (contract may be formed even though a price is not specified), 2-308 (unspecified place of delivery), and 2-309 (unspecified time but construed to be a reasonable time unless otherwise specified) are used to supplement the agreement and thus define the contract.

It may be noticed that the "time of contract creation," so important in common law contracting is of much less concern in sales contracts covered by Articles 1 and 2 of the Uniform Commercial Code.

Incomplete Agreements

As noted above, many contracts for sale of goods are incomplete but they are honored in most instances by the operation of § 2-207 and the gap fillers identified above. As in the case of common law contracts, good faith, and fair dealing are requirements of UCC contracts (§ 1-201[20]) and § 1-304. These requirements may not be "bargained away" in a UCC contract (§ 1-302).

Integrated Agreements

As outlined in Chapter 1, integrated agreements are viewed as complete documents that do not require the addition of unspecified terms such as *incomplete agreements*. In addition to expressing the parole evidence rule discussed in Chapter 1, § 2-202(1)(b) rules out the addition of missing terms in a "complete and exclusive statement of the terms of the agreement."

Interpretation of Integrated Agreements, including Duress (Coercion)

The UCC is supplemented by other laws in the area of duress and coercion (§ 1-103(b)), which state that the other areas of the law, including equity, capacity of parties to contract, the laws governing principals and agents, fraud, mistakes, and other aspects of common law apply unless replaced by specific provisions of the UCC. A leading case on duress is the Compact Summary of Case: *Austin Instrument v. Loral Corp.* included in Chapter 1.

Performance

The common law requirements for performance may supplement, but not replace, the UCC requirements in Part 5 (Performance) of Article 2. The elements of the course of performance, course of dealing, and usage of trade mentioned in Chapter 1 are codified in the UCC at § 1-303, which defines these terms and also prioritizes which ones prevail over which others. Express terms,

of course, prevail over all of these requirements. In some special cases where the goods being sold *are unique to a buyer's requirements, the buyer may have a right to replevin (§ 2-716). Replevin* is a word/concept which means that a court could decree that the seller must perform as originally contracted (specified performance); this was also covered in Chapter 1. An important duty of a merchant seller is to provide a warranty of title and to indemnify the buyer against adversely held claims, such as claims for patent infringement (see Chapter 4).

Substantial Performance and Excused Performance

The concept of substantial performance was introduced in Chapter 1. That concept is amplified in § 2-614, Substituted Performance, and applies when an obligation becomes commercially impractical but can be met by an alternative (substantial) performance. If there is a failure of a presupposed condition (a contingency), the seller may be excused from performance as contracted (§ 2-615, Excuse by Failure of Presupposed Conditions).

The seller must promptly notify the buyer that there will be a delay or nonperformance. Section 2-508 (Cure by Seller of Improper Tender or Delivery; Replacement) deals with the seller's options for cure when a buyer legitimately rejects delivered goods. Consumer contracts are exempted from the requirements of § 2-508.

The flexibility of the UCC, as compared to common law contracts, is illustrated in § 2-311, Options and Cooperation Respecting Performance. The specifications for the goods are controlled by the buyer and shipping arrangements, unless otherwise specified, are at the option of the seller.

Unconscionable Contract or Clause

As pointed out in Chapter 1, courts do not generally police the fairness of contract clauses. In some cases, however, a court may refuse to enforce, or only partially enforce, an unconscionable contract or clause (§ 2-302).

Breach of Contract and Remedies for Breach

Article 2, Part 6 of the UCC defines breach, repudiation and excuse in a contract for the sale of goods. A key provision of Part 6 is the specification of

what constitutes acceptance of goods (§ 2-606). A buyer may indicate to a seller that it accepts the goods, even if nonconforming, or after inspection of the goods, rejects them. Acceptance of goods can become part of the acceptance of previously unspecified contract terms in some cases like the *ProCD, Inc. v. Zeidenberg* compact summary of a case that appears in this chapter. Remedies for breach of a UCC-based contract appear in Article 2, Part 7. A buyer's breach of the contract is defined in § 2-703, which includes a menu of options that are available remedies for the seller. Buyer's remedies for a breach by seller are explained in § 2-711, which includes a menu of remedies available to the buyer. Section 2-719(3) provides that a limitation of consequential damages for personal injury is unconscionable (a seller may not contract away product liability). A limitation of damages where the loss is commercial is not unconscionable.

Contracting on the Web

This topic is covered in Chapter 1 on common law contracting. The UCC exception to the federal Electronic Signatures in Global and National Commerce Act is specified in (4) of § 2-108, Transactions Subject to Other Law. Section 2-108(1), articulates the areas where common law provisions rule. The UCC requirement that electronic contracts, records, and signatures be legally recognized is addressed in § 2-211, Legal Recognition of Electronic Contracts, Records, and Signatures. Pursuant to Section 2-204(4)(b), a contract formed by an individual and an electronic agent does not include terms supplied by the individual if the individual knows that the agent couldn't respond to a proposed change.

Compact Summary of Case: *ProCD, Inc. v. Zeidenberg*, United States Court of Appeals, Seventh Circuit, 1986

This case relates to the so-called shrink-wrap licenses on software that constitute a contract that prohibits buyers from copying the software for resale; it illustrates how the Uniform Commercial Code provides flexibility in the formation of contracts that did not exist in common law contracting.

Plaintiff ProCD compiled the information from more than 3,000 telephone directories to produce a computer database that was very useful and sold it to two markets, one a business market and one a market for consumer use (at a lower price than it charged businesses). Matthew Zeidenberg bought the ProCD database at the consumer price and used it to produce a

Web-service software package that was made available on the Internet at a price below what ProCD charged.

ProCD brought suit in a district court in Wisconsin that, after some twists and turns, developed into a suit for breach of contract on the ground that Zeidenberg was unable to assent to the license terms because they were not disclosed in detail on the box before he bought it, and hence could not be a part of the sales contract. The rationale of the district court's finding for Zeidenberg was based on the failure of the proposed Article 2B to the UCC (see Chapter 1), which had apparently invalidated the shrink-wrap license terms.

The appeals court agreed with the lower court's finding that the sales contract that included the terms was governed by the common law of contracts *and the UCC* (emphasis added) but disagreed with its decision. The appeals court focused first on UCC 2-204 (subsections have changed since this 1986 decision so are not included here) to show that contracts could be formed in new ways including the shrink-wrap notice and others. The appeals court pointed also to UCC 2-606 that covers the acceptance of goods. In this case, the acceptance of contract terms was made by accepting the goods and failing to reject the terms as provided in Section 2-606. Thus, the terms of the sales contract under the UCC terms were not complete since the acceptance of the goods without objection constituted the acceptance of the contract. Zeidenberg could have, if he had wanted, refused to accept the contract terms by promptly returning the product to the seller pursuant to UCC Section 2-606. An interesting aspect of this case is the extent to which the appeals court relied on economic rationale as well as legal precedent in reaching its decision. (Note that the full decision of the appeals court may readily be found on the Web and elsewhere.)

United Nations Convention on Contracts for the International Sale of Goods (CISG)

In addition to the ESIGN treaty described in Chapter 1, the United Nations Commission on International Trade Law (UNCITRAL) developed the United Nations Convention on Contracts for the International Sale of Goods (CISG). In a sense, the CISG is an international version of the UCC but is much more limited in scope, that is, it does not apply to ordinary home product sales to consumers. Over 70 countries, called "contracting States" in the document, have ratified the treaty, many without major modifications. The influence of the UCC is very evident, and the CISG provides some of the flexibility inherent in the UCC. Article 1 succinctly summarizes the "Sphere of Application" of the CISG:

> (1) This Convention applies to contracts of sale of goods between parties whose places of business are in different States (a) when the States are Contracting States, or (b) when the rules or private international law lead to the application of the law of a Contracting State. (2) The fact that the parties have their places of business in different States is to be disregarded whenever this fact does not appear either from the contract or from any dealings between, or from information disclosed by, the parties at any time before or at the conclusion of the contract. (3) Neither the nationality of the parties nor the civil or commercial character of the parties or of the contract is to be taken into consideration in determining the application of this Convention.

The U.S. Ratification of 1980 United Nations Convention on Contracts for the International Sale of Goods was announced in the Federal Register/Vol. 52, No. 40/Monday, March 2, 1987/Notices.

The language of the Convention is "plain," so as to simplify its interpretation and to permit its translation into the other five official languages—Arabic, Chinese, French, Russian and Spanish—with a minimum of ambiguity. The statute of frauds requirement that contracts in excess of a specific dollar amount must be in writing is repudiated (Article 11). Subject to some conditions, Article 16(1) states "Until a contract is concluded an offer may be revoked if the revocation reaches the offeree before he has dispatched an acceptance." Subject to some conditions, Article 18 (1) provides "A statement made by or other conduct of the offeree indicating assent to an offer is an acceptance. Silence or inactivity does not in itself amount to acceptance."

Article 30 articulates the "obligations of the seller" in a manner like the UCC: "The seller must deliver the goods, hand over any documents relating to them and transfer the property in the goods, as required by the contract and this Convention." In Article 53 that addresses "obligations of the buyer," "The buyer must pay the price for the goods and take delivery of them as required by the contract and this Convention." This also tracks well with the UCC requirements.

A major difference between CISG and UCC contracting appears in Article 19; this is a throwback to the so-called mirror image rule of acceptance in common law contracts:

> (1) A reply to an offer which purports to be an acceptance but contains additions, limitations or other significant modifications is a rejection of the offer and constitutes a counter offer.
> (2) However, a reply to an offer which purports to be an acceptance but contains additional or different terms which do not materially alter the terms of the offer constitutes an acceptance, unless the offeror, without undue delay, objects orally to the discrepancy or dispatches a notice to that effect. If he does not so object, the terms of the contract are the terms of the offer with the modifications contained in the acceptance.

> (3) Additional or different terms relating, among other things, to the price, payment, quality and quantity of goods, place and time of delivery, extent of one party's liability to the other or the settlement of disputes are considered to alter the terms of the offer materially.

A complete copy of the CISG appears in Appendix 1. It is worth studying since it emphasizes the principles in both the common law of contracts and the UCC.

Summary

Many important topics covered by Articles 1 and 2 of the UCC cannot be included here for lack of space. Again, this material is no substitute for the advice of an attorney that specializes in contracts.

References

American Law Institute and National Conference of Commissioners on Uniform Sales Laws, Uniform Commercial Code, 2007 Edition, Official Text and Comments. © 2007 by The American Law Institute and National Conference of Commissioners on Uniform State Laws: Published by Thomson/West.

Federal Register / Vol. 52. No. 40 / Monday, March 2, 1987 / Notices: DEPARTMENT OF STATE [Public Notice 1004] pp. 6262 et seq., U.S. Ratification of the 1980 United Nations Convention on Contracts for the International Sale of Goods: Official English Text.

3

Contracts of Special Interest to Engineers

Introduction

In their working lives, most engineers encounter many of the kinds of contracts affecting the public at large, as well as specific contracts not directly affecting the public. For example, few engineers directly encounter entertainment contracts (another specialty contract form) such as those common in media businesses. Specialized contracts that do directly affect most engineers include employment agreements (which are similar to consulting agreements), engineering and construction contracts, and government contracts (the latter at all levels, federal, state, and local). The goal of this chapter is to survey these specialized forms of contracts.

Employment Agreements

Employment agreements, sometimes called employment contracts, are actually legally enforceable contracts, generally within the common-law contracting structure (see Chapter 1) of the states. The *consideration* given by the employer to the employee is the employee's compensation and benefits; the *consideration* given by the employee to the employer includes faithful service (agreement not to compete) and a number of undertakings regarding intellectual property rights (among other things of little interest here). An interesting case of the faithful service (agreement not to compete) is reported by Casey (2008). Mattel, Inc. (of Barbie Doll fame) accused a toy competitor, MGA Entertainment (maker of a line of "Bratz" dolls) of aiding a breach of duty of loyalty by hiring Mattel designer Carter Bryant to produce the Bratz line. A jury found for Mattel which showed that Bryant had actually conceived of the Bratz doll line while still employed by Mattel. Industrial research and development could not be sustained in the absence of employment agreements. Noncompetition agreements vary widely among the

states; some states have even outlawed such agreements, so they will not be discussed in detail here.

Most employment agreements require the employee to promptly disclose to employer all *inventions* conceived or made in the course of his employment. Further, an employee is required to assign (transfer ownership of) each invention, assist in the preparation of a patent application for each invention, and do such other things as are required by the employer to obtain and protect its rights in each invention. These obligations survive the inventor's employment but postemployment activity required by the employer will be compensated by the employer. The scope of these requirements may vary but the general principle is that the employer's requirements apply to all inventions that relate to the employer's current and foreseeable business areas, or are conceived or made using employer's facilities and resources. Some employment agreements include a "box" where inventions made prior to his employment may be documented. Some states have reportedly outlawed the taking of an employee's invention by an employer if the invention was made completely on his own time without any use of employer's resources. Employers should, and some do, encourage inventiveness by employees by bonus payments, promotions, and other incentives. Hewlett-Packard (HP) reportedly pays $175 for each invention disclosure and $1,750 for each patent application. A plaque is also awarded to encourage employee invention. Care must be taken, however, to assure that the teamwork spirit is not damaged by such recognition of individuals. Because of the complexity of modern technology, relatively few modern inventions can be made in a "tinkerer's garage." Some engineers rail at the blanket taking of rights in inventions by employers but few are equipped or well enough financed to make a living by inventing.

Engineers should read and understand their obligations pursuant to the employment contract before accepting an offer of employment. If the employment agreement offered is too onerous, the engineer should seek employment elsewhere! Employment agreements that are overreaching may be found to be unenforceable because they are against public policy (see Chapter 1). A recently publicized case of an unconscionable employment agreement was that of Hooters with its employees where the arbitration clause prescribed involved three arbitrators, two of whom were paid by Hooters! That contract was struck down as being unconscionable (Rosenthal 2010). Unwritten employment agreements can be enforced but are very hard to prove; in that case an equity proceeding might find that the employer obtained an unassignable *shop right* where the employee used the facility of the employer to make the invention. A shop right permits the employer to use the invention in its business. Inventions and patents are discussed at greater length in Chapters 4 and 5 on intellectual property.

Employment agreements also require the employed engineer to transfer copyright ownership in his writings and other original works, including computer programs. As explained in Chapter 6 on Copyrights, this confirms the ownership of "works for hire" as defined in the Copyright Law.

Most employers have a portfolio of proprietary information including but not limited to *trade secrets*. The terms of an employment agreement normally require that such proprietary information be kept in confidence and not publicly disclosed without written permission from an officer of the firm. This requirement for confidentiality survives the engineer's employment and is frequently litigated by firms that lose a key employee and firms that hire that employee. The employee's obligation to maintain the confidentiality expires when the information is made public through no fault of the employee. Employers possessing proprietary information must educate their employees on the handling of it and clearly mark all such information to minimize misunderstandings. As explained further in Chapter 7 on trade secrets, much important modern technology is not patentable or is better protected as a trade secret.

Excerpts from Typical Employment Agreement

> I hereby agree to promptly disclose to Employer and hereby assign to Employer my entire right title and interest in each invention and technical innovation (whether patentable or not), including all rights to acquire, perfect, and enforce patents and other proprietary rights developed during the period of my employment, whether or not made during working hours, that pertain to any of Employer's work or investigations. It is understood that no rights are conveyed hereby in those inventions, if any, that I have made prior to my employment and disclosed in the enclosed material and that no confidential material of others is included in that material.
>
> I agree to hold in confidence and not to use or disclose either during or after termination of my employment, unless authorized by an officer of Employer, any information I create or obtain during the period of my employment, pertaining to Employer's business, that is not generally known, or is proprietary information of Employer until such information is made public or until 5 years after the termination of my employment, whichever is earlier. I further agree not to make copies of such information except as authorized by Employer and return to it, at my termination, all such information I possess including drawings, specifications, computer files, and equipment.

Consulting Contracts

Engineering consultants are normally required to preassign their inventions made in the course of their consulting. The software prepared by a consultant may sometimes not be considered a "work for hire" as is the case for the employed inventor. The disposition of intellectual property rights poses thorny issues for both consultants and their clients. A consultant needs to retain a "tool kit" of concepts for future clients that does not run afoul of the rights transferred by consultant to any client. One solution is to require

a consultant to grant a client a nonexclusive license under any patents he owns. Some important projects for consultants have foundered when the parties could not agree on the disposition of intellectual property rights.

Consulting contracts also usually require that consultant maintain the confidentiality of all "proprietary information" that is disclosed to him in the performance of his duties (frequently called a nondisclosure agreement or NDA). A consultant must obviously take care not to disclose the proprietary information of previous clients. The following clause of a consulting contract is typical:

> Employer retains all rights it is entitled to under the patent, copyright, trade secret, trademark, and other laws of the United States and the laws of foreign countries which protect proprietary or confidential information. Consultant is hereby made aware that monetary damages may not be sufficient remedy for unauthorized disclosure of employer's confidential information and that Employer shall be entitled to seek a remedy at law or equity to such injunctive or equitable relief as may be awarded by a court of competent jurisdiction.

Note that some states have long had criminal penalties for trade secret theft but they are seldom applied. As explained in Chapter 7 on trade secrets, a relatively new federal law also punishes the theft of certain trade secrets.

Private Sector Construction Contracts

Private sector construction contracts are based on the common law of contracts as outlined in Chapter 1 and the Uniform Commercial Code surveyed in Chapter 2. At the federal level, construction contracts are based on federal law with a special section on construction contracts (covered in the next part of this chapter). Construction contracts generally include the elements shown in Chapter 1, as well as many special elements and clauses that are discussed in the following.

The Parties

As shown in Figure 3.1, the parties to most private sector construction contracts include the *architect* or *engineer*, the *owner,* the consulting engineers (e.g., sustainability and structural), the *contractor*, the *subcontractors*, and suppliers. Many other parties are typically involved in construction projects, for example, lenders, legal counsel, material suppliers, labor, and others such as land surveyors and geotechnical engineers.

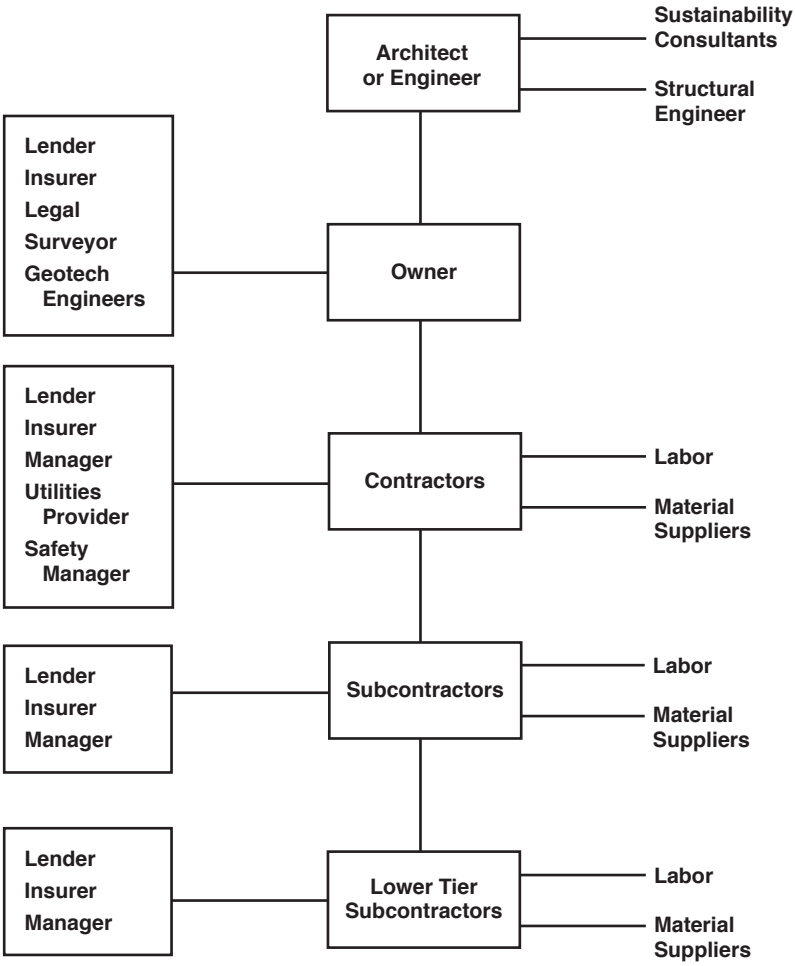


FIGURE 3.1
Parties in a typical construction contract.

Contracts as Infrastructure of Process

The owner of the construction site typically contracts with surveyors and geotechnical engineers to determine the site surface and subsurface soil conditions to assure that the site is suitable for the kind of construction envisioned. The owner contracts with the architect or engineer to produce designs and plans for the construction. Where public funding is not involved, as assumed here, the owner has great flexibility in how to proceed. The owner may act as general contractor itself or may contract with several contractors to build different parts of the project. The *work* defines what the

contractor is to do as part of the (larger) *project*. In the classical "design–bid–build" scheme, the owner advertises an "invitation to bid" to which qualified contractors may respond after studying the design and the site conditions. In private projects, a limited list of prequalified contractors are often selected to bid the work.

There are many possible variations in the process; the one shown in Figure 3.1 is typical for a design–bid–build project. The owner also contracts with the lender, the insurer, legal services, surveyors and others to document the construction site. The owner then generally contracts with an architectural or engineering firm to produce the design, plans, and specifications of the building or structure. The owner is free to do as it pleases in regards to the Advertisement and Invitation for Bids; it may dispense with that process and negotiate directly with potential constructors if it has the requisite know-how of the construction industry. The preparation of a responsive bid or a design package is not a trivial task, even for relatively small projects. Figure 3.2 (by Austin architect Tim Davis), depicts the contracts frequently used by architects to prepare complete drawings, plans, and specifications for a project. Some large architect/engineer (A/E) design firms can perform these tasks in-house, but most must contract with outsiders for specialized work as indicated. The drawings, plans, and specifications prepared by the bidder (architect or engineer) must fulfill all the requirements of the applicable *standards and codes* as shown in Table 3.1. More on standards and codes can be found in Chapter 9 of this book.

The owner then puts out a bid package to potential contractors who competitively bid for the construction contract. The signed and sealed bid forms constitute *offers* made by the bidders. A Notice of Acceptance constitutes the owner's *acceptance* of an offer, thus resulting in a *contract*. The winning contractor must then subcontract for labor, services, and goods (goods, of course, are covered by the Uniform Commercial Code, reviewed here in Chapter 2).

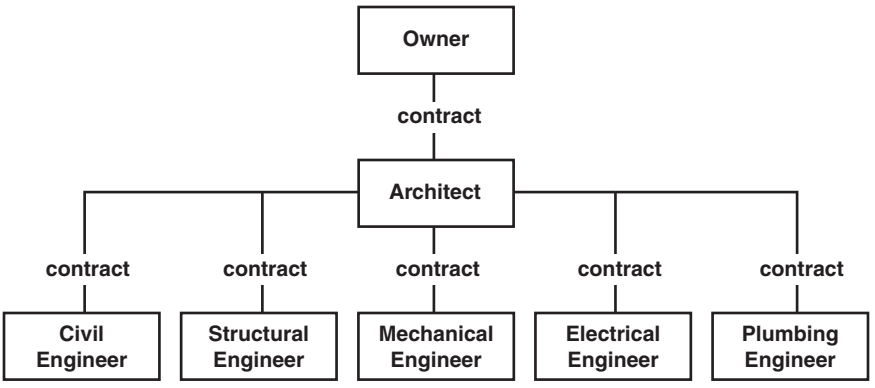


FIGURE 3.2
Design contracts for buildings.

TABLE 3.1

Some Standards and Codes Applicable to Construction

	Category	Item	Type	Code	Environmental
Site	Encroachment	Zoning code		IZC	
		Deed restrictions		LOCAL	
	Preservation		Historic preservation	IEBC	N T F H P
	Property maintenance			IPMC	
	Pollution	Noise		IZA	GREEN ENERGY
		Light		IZA	ENERGY STAR
		Visual		HBA	
	Transportation			DOT	
Building	Building code	Strength	Structural	IBC – IRC	
			Seismic	IBC	
			Wind	IBC	
		Fire protection	Fire	IBC – IRC	
		Fire exiting	Clearance	IBC	
		Durability	Materials	IBC – IRC	
	Elevator code		Vertical transportation	ASMEA17	
	Manufactured bldg.		Trailers and prefabricated structures	IBC	
	Manufactured items		Furnishings, window treatments, and other nonattached items	NSC - UL	ENERGY STAR

Continued

TABLE 3.1 (continued)

Some Standards and Codes Applicable to Construction

	Category	Item	Type					Code	Environmental
Energy	Delivery system	Air	Plenum	Metal	Ductboard	Ductstock		IMC	IPCBF
		Coolants	Copper	Plastics	Chemical			IECC	LEED
		Dehumidification	Dissicantive	Mechanical/ refrigerative				IMC	
		Water	Wood	Lead	Iron	Copper	Plastics	IPC	
		Steam	Iron	Copper				SBPVR	
		Heat sink—PCM	Evaporative	Chemical	Ground source	Heat pump		GHPC	NPDES
		Nuclear						NRC	
		Electrical power	Copper	Aluminum	Metallic	Plastics		IEC	GREEN ENERGY
		Fuel	Carbon	Solar	Water	Fuel cell	Wind	IFC	GREEN ENERGY
		Communications	Copper	Aluminum	Fiber optic	Wireless		FCC	
	Quality	Air quality	Plenum	Metal	Ductboard	Ductstock	Louvers	SMACNA	ENERGY STAR
		Water quality	Potable	Gray water				NPDES	GREEN ENERGY
	Waste management	Abatement	Hazardous materials					NPDES	
		Reuse and recycle	Paper, wood, metals, plastics, and oil					IPSDC	GREEN ENERGY
Safety	Building fire	Fire suppression	Dry chemical	Liquid	Sprinklers			IFC	
	Wildland fire		Chemical					IUWIC	
	Construction	Job safety						OSHA	

Access	Site and buildings	ADA regulations	ANSI 117.1	Title I (coverage)	Title II (government)	Title III (public)	ADAAG
		Fair Housing Act	Prohibition against discrimination				UFAS
	Transportation		ANSI 117.1	Title I (coverage)	Title II (government)	Title III (public)	ADAAG

Abbreviations

ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTMI	ASTM International
DOT	U.S. Department of Transportation
FCC	Federal Communications Commission
GHPC	Geothermal Heat Pump Consortium
HBA	Highway Beautification Act
IBC	International Building Code®
IEBC	International Existing Building Code®
IEC	International Electrotechnical Commission®
IECC	International Energy Conservation Code®
IFC	International Fire Code®
IMC	International Mechanical Code®
IPC	International Plumbing Code®
IPCBF	International Performance Code for Buildings and Facilities®
IPMC	International Property Maintenance Code®
IPSDC	International Private Sewage Disposal Code®
IRC	International Residential Code®
IUWIC	International Urban-Wildland Interface Code®
IZC	International Zoning Code®
LEED	The Leadership in Energy and Environmental Design
NFPA	National Fire Protection Association
NPDES	National Pollutant Discharge Elimination System (EPA)
NSC	The National Safety Council
NTHP	The National Trust for Historic Preservation
OSHA	The United States Occupational Safety and Health Administration
PCM	Phase Change Materials
SBPVR	Steam Boiler and Pressure Vessel Regulations
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
TAS	Texas Accessibility Standards
UFAS	Uniform Federal Accessibility Standards
UL	Underwriters Laboratories Inc.

An important principle involved is that the applicable requirements of the contract between the owner and the contractor must be "flowed down" to the subcontractors and the lower-tier subcontractors. The use of standardized contracts between the parties tends to assure the integrity of the process. Using standardized contracts also increases fairness to the several parties and minimizes disputes.

Standardized Contracts between the Parties

There are two major families of standardized contracts between the owner and the other parties, one for architectural projects and another one for engineering projects. The advantage of using standardized contracts are realized, especially by relatively inexperienced owners, since they incorporate contracting experience, the specialized rules of law involved, fairness to the parties, and standard dispute resolution arrangements. Moreover, the use of standardized contracts reduces transaction costs for the contractors and others who move from one project to another. Attorneys, managers, and staff do not have to learn a new contract system with each change of project. A feature of most standardized contracts is the declaration that the bid and other pre-contract documents are not included in the contract unless specifically identified as applying. That reflects the parole evidence rule of common law contracts mentioned in Chapter 1.

Standardized Contracts for Architectural Projects

After the owner has obtained the reports from the surveyor and geotechnical engineer, it supplies them to the architect pursuant to a Standard Form of Agreement Between Owner and Architect based on AIA™ Document B101™-2007. The Standard Form of Agreement outlines the responsibilities of both the architect and the owner and incorporates by reference the AIA Document A201™-2007, General Conditions of the Contract for Construction. The B101 document defines the deliverables to the owner, including the designs, plans, and specifications for the project. B101 also provides a menu of additional services that the architect may agree to provide to the owner, indicating options for dispute resolution.

The owner may then, by competitive bidding or negotiation, contract with the contractor for its work on the construction project using AIA® Document A101™-2007 Standard Form of Agreement Between Owner and Contractor, where the basis of payment is a stipulated sum (fixed price). The A101™-2007 document incorporates A201™-2007 by reference. Other Standard Forms of Agreement are also available as indicated in the following text. The A101-2007 Standard Form of Agreement forms the basis of the complete package of contract documents, including the General Conditions, the Supplementary Conditions, the Drawings, the Specifications and the

Modifications. Additional AIA Standard Form documents in the A201 family which (among others) may be used include:

A401™-2007, Agreement Between Contractor and Subcontractor

A503™-2007, Guide for Supplementary Conditions

A701™-1997, Instructions to Bidders

Since the General Conditions of the Contract for Construction (A201™-2007) is the central coordinating document in the contractual chain that binds owner, architect, contractor, subcontractors, and possibly others, it is briefly reviewed shortly. These General Conditions are normally supplemented by many other documents, including "Supplementary Conditions" and "Other Conditions." Modifications of the general conditions are placed in the supplementary conditions. A201™ is the major part of a family of AIA standard contracts including (in addition to those identified above):

A102™-2007, Standard Form of Agreement Between Owner and Contractor (Cost Plus Fee, with GMP [guaranteed minimum profit])

A103™-2007, Standard Form of Agreement Between Owner and Contractor (Cost Plus Fee, without GMP)

A401™-2007, Standard Form of Agreement Between Contractor and Subcontractor

A503™-2007, Guide for Supplementary Conditions

B101™-2007, Standard Form of Agreement Between Owner and Architect

B103™-2007, Standard Form of Agreement Between Owner and Architect for a Large or Complex Project

B201™-2007, Architect's Services: Design and Construction Contract Administration

B209™-2007, Architect's Services: Construction Contract Administration

B503™-2007, Guide for Amendments to AIA Owner–Architect Agreements

C401™-2007, Standard Form of Agreement Between Architect and Consultant (for use in any family).

The A201 Family is augmented by a number of standard contract administration documents (G-series) used generally for processing payments to the contractor and for formalizing changes in the work. The guiding principle is that each party has a contract with only one other party, except the contractor who has contracts with the numerous subcontractors and suppliers.

The several models of construction contracts can be parsed in several ways. One is by financial arrangement, for example, fixed price (stipulated sum), several arrangements of cost plus fixed fee (CPFF), and other variants.

Construction contracts can also be classified as architectural projects or engineering projects, depending on which kind of organization designs and manages the project. Another form is the professional contract manager, hired by the owner, who manages the construction project for the owner. There are several other options for contract management, including assigning the task to the owner, the architect, or to the contractor. In addition to the "Special Clauses of Construction Contracts" in the following text, these standardized contracts include clauses addressing the contract documents, the general provisions, and similar provisions defining the work and the contract price.

Summaries of the AIA A-Series: Owner/Contractor Agreements are found at

http://www.aia.org/contractdocs/AIAS076742 (accessed on 6/13/2010)

Summaries of the AIA B-Series: Owner/Architect Agreements are found at

http://www.aia.org/contractdocs/AIAS076745 (accessed on 6/13/2010)

Summaries of the AIA C-Series: Other Agreements are found at

http://www.aia.org/contractdocs/AIAS076747 (accessed on 6/13/2010)

Summaries of the AIA D-Series: Miscellaneous Documents are found at

http://www.aia.org/contractdocs/AIAS076750 (accessed on 6/13/2010)

Summaries of the AIA E-Series: Exhibits are found at

http://www.aia.org/contractdocs/AIAS076751 (accessed on 6/13/2010)

Summaries of the AIA G-Series: Contract Administration and Project Management Forms are found at

http://www.aia.org/contractdocs/AIAS076752 (accessed on 6/13/2010).

Standardized Contracts for Engineering Projects

The American Council of Engineering Companies (ACEC) and the Engineers Joint Contract Documents Committee (EJCDC) have also developed a family of standardized contracts. The EJCDC includes the American Society of Civil Engineers (ASCE), the American Council of Engineering Companies (ACEC), National Society of Professional Engineers (NSPE) in Private Practice, the Associated General Contractors of America (AGCA), and some 15 other professional engineering, design, construction, owner, legal, and

risk management organizations. A sample of the EJCDC Contract Documents List includes the following:

A-990: Full Design–Bid–Build Document Set
C-990: Construction Related Documents, including the next document
C-520: Suggested Form of Agreement Between Owner and Contractor; Stipulated Price
C-700: Standard General Conditions of the Construction Contract (2007)
C-800: Guide to the Preparation of Supplementary Conditions (2007)
C-520: Suggested Form of Agreement Between Owner and Contractor, Stipulated Price (2007)
R-700: Standard General Conditions of the Contract Between Owner and Environmental Remediator (2005)
P-700: Standard General Conditions for Procurement Contracts (2000)
D-700: Standard General Conditions of the Contract Between Owner and Designer/Builder (2002)

These contract documents are organized into families of documents as follows:

Full Design–Bid–Build Document Set
Construction Related Documents
Owner Engineer Documents
Engineer Subconsultant Documents
Environmental Remediation Documents
Procurement Documents
Design–Build Documents
Joint Venture Between Engineers Document
Peer Review Document
Guides, Commentaries and References.

The EJCDC Document C-520 plays a role in engineering construction projects like that played by A101™-2007 mentioned above. The EJCDC Document C-700, Standard General Conditions of the Construction Contract (2007), plays a role in engineering projects analogous to that played by A201™-2007 in architectural projects. The following is an abbreviated table of contents of C-700:

Article 1—Definitions and Terminology
Article 2—Preliminary Matters
Article 3—Contract Documents: Intent, Amending, Reuse

Article 4—Availability of Lands; Subsurface and Physical Conditions; Hazardous Environmental Conditions; Reference Points
Article 5—Bonds and Insurance
Article 6—Contractor's Responsibilities
Article 7—Other Work at the Site
Article 8—Owner's Responsibilities
Article 9—Engineer's Status During Construction
Article 10—Changes in the Work
Article 11—Cost of the Work; Allowances; Unit Price Work
Article 12—Change of Contract Price; Change of Project Times
Article 13—Tests and Inspections; Correction, Removal or Acceptance of Defective Work
Article 14—Payments to Contractor and Completion
Article 15—Suspension of Work and Termination
Article 16—Dispute Resolution
Article 17—Miscellaneous

Summaries of the EJCDC documents are found in Appendix 1.

Special Clauses of Construction Contracts

Most standardized General Conditions in construction contracts emphasize that the contract is a "completely integrated contract" and thus interpreted as it is in common law contracts (see Standardized Agreements as Integrated Agreements in Chapter 1). Each clause of a construction contract must be viewed in the context of the whole document rather than as an isolated one.

Different site conditions: One of the more important special terms is the Different Site Conditions (DSC) clause. As sometimes happens, the excavation at a construction site finds conditions, for example, Indian burial grounds, that were not expected or identified in the owner's site plan. When such Different Site Conditions are encountered, the contractor must immediately suspend all work and consult with the owner and local authorities on how to proceed. A standardized DSC clause in a construction contract helps avoid disputes and litigation or arbitration when DSCs are encountered.

Intellectual property: Liability for *Infringement*, for example, of patents and copyrights, generally falls on the owner where a specific method is specified by the owner. Contrarywise, the use by the contractor of a "performance specification" that leaves the method up to the contractor will usually make the contractor liable for patent

and copyright infringement. This parallels the treatment of the subject in common law and UCC contracts. The designs and plans, and even the contract documents identified previously, are protected under the copyright laws. Intellectual property is covered in more detail in Chapters 4 through 8 of this book.

Changes clauses are one of the most prolific sources of disputes, litigation, and arbitration between the parties to construction contracts. The guiding principle is that all significant changes to the work must be promptly posted in writing and approved by all the affected parties. A hierarchy of changes is used in standard contracts to distinguish when and how changes are to be made and which party is financially responsible for them. The use of standard contracts provides process control for this important aspect of construction contracting.

Dispute resolution: Most standardized General Conditions in construction contracts prescribe a dispute resolution *process*, which invokes standard, but optional, methods of dispute resolution. The process usually starts with empowering the architect or engineer to resolve disputes. If that fails, selections from a menu of methods is available by prearrangement of the parties. Successively more involved methods, such as mediation, arbitration, and finally litigation or other identified methods (minitrial) are also available.

In federal government contracts and when several states are involved, the arbitration used is required to comply with the Federal Arbitration Act (Title 9, US Code, Section 1-14, as amended).

Reference standards: Reference standards, specifications, codes of technical societies, local building codes, or federal regulations are usually included in contracts for construction. Such documents do not always take precedence over the contract requirements when there is a conflict.

Federal Accessibility standards: Architectural and engineering requirements for accessibility are legal requirements for construction as prescribed in the Americans with Disabilities Act (ADA) Regulations (see ANSI 117.1) and the Americans with Disabilities Act Accessibility Guidelines (ADAAG). These codes and regulations with which design must comply are summarized in Table 3.1 and were kindly supplied by Austin architect Tim Davis. Standards and Codes are discussed in more detail in Chapters 9 through 13 of this book.

Force Majeure *Clauses*: Most construction contracts include a *force majeure* clause in some form. As explained in Chapter 1, such clauses may excuse the performance of the contractor in the event of a war or other "acts of God."

Clauses related to mechanic's liens: A mechanic's lien is a claim against the owner that arises when goods or services supplied as part of

the work have not been paid for. Several standard clauses involving notice and the disposition of such claims are included in standardized construction contracts.

Specifications Clauses

The specifications prepared by the architect or engineer and included in the owner's contract with the contractor must assure compliance with all applicable laws, regulations, and codes. If, for example, the specifications did not assure compliance with an applicable *building code*, the specification might be held to be defective. In such cases, the contractor would not be liable if it was required to strictly adhere to those specifications in its contract. The contractor might become liable for such omissions if given more latitude of action such as in the use of performance standards rather than design standards.

Interpretations of Construction Contracts

The words of a construction contract have the conventional meanings normally found in the construction industry. In cases of disputed interpretation, the rule is sometimes applied most stringently against the drafter. Like the common law of contracting and the Uniform Commercial Code, the rules of contract interpretation include the concepts of "course of performance," "course of dealing," and "trade practices" outlined in Chapters 1 and 2.

Public Sector Construction Contracts

Public sector construction contracts are used at the federal, state, and local levels for buildings, roads, bridges, and other structures. Because much state and even local construction is accomplished using federal funding, in whole or in part, many of the federal regulations governing construction become applicable to the state and local projects. In fact, many of the federal contract provisions in construction contracts have been adopted in state and local construction contracts. Since federal construction contracts have become the model for other government entities, those contracts will be covered in the following section on federal government contracts.

Federal Government Contracts

Many engineers will work on government contracts during their careers. Federal government contracts are based on common law contracting and the UCC but are incredibly more complex than most of those contracts because of their myriad requirements, including their so-called socioeconomic aspects.

Also, many protective clauses must be inserted into government contracts to avoid public funds from being misspent. An important principle in government contracting is that only the Contracting Officer can make changes to a contract.

In 1984, federal government contracting was reformed to make government contracts more uniform, pursuant to a public law, that established the Federal Acquisition Regulations, or FAR. The FAR is found in the U.S. Code of Federal Regulations (Title 48; see Figure 3.4). Although federal acquisition is now more uniform than it was previously, many agencies still use specialized variations of the FAR in their contracting. The FAR includes eight subchapters, A through H, that total 53 parts. The subchapters include:

Subchapter A—General, Parts 1–4
Subchapter B—Competition and Acquisition Planning, Parts 5–12
Subchapter C—Contracting Methods and Contracting Types, Parts 13–18
Subchapter D—Socioeconomic Programs, Parts 19–26
Subchapter E—General Contracting Requirements, Parts 27–33
Subchapter F—Special Categories of Contracting, Parts 34–41
Subchapter G—Contract Management, Parts 42–51
Subchapter H—Clauses and Forms, Parts 52–53

The titles of all of the FAR clauses are listed in Appendix 2.

The structure of FAR provisions and clauses are numerically identified as shown in Figure 3.3. The text of all clauses is set forth in Part 52, Subpart 2. The section, keyed to the subject matter, is denoted by the next two digits

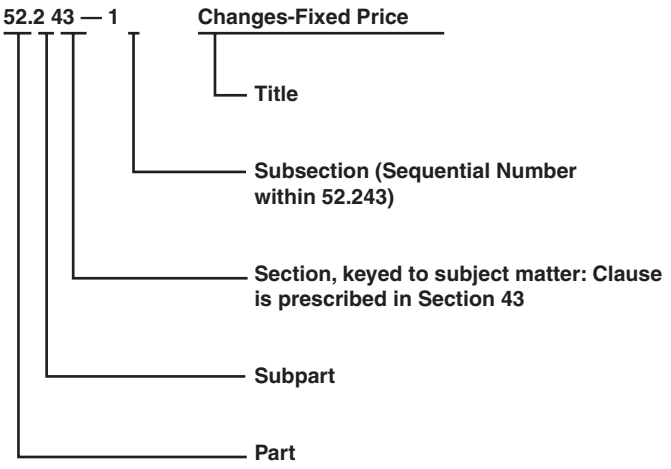


FIGURE 3.3
Numbering structure of Federal Acquisition Regulations (FAR).

FIGURE 3.4
Title 48—Code of Federal Regulations.

("43" in the example of Figure 3.3). The subsection is denoted by the digits after the dash and the title is as indicated.

If necessary, the FAR clause format may be expanded by subdivisions below the section or subsection level by using parenthetical alpha numerics with the following sequence:

(a)(1)(i)(A)(1)(i).

Many FAR provisions can be modified to meet specific contractual requirements.

The several parts of the FAR may be accessed on the Web at the following (example shows address for FAR Part 01):

https://www.acquisition.gov/far/html/FARTOCP01.html (accessed on 7-30-10)

The actual clauses to be included in contracts are gathered in Part 52, and the forms to be used in contract administration are collected in Part 53.

The U.S. government enjoys a status called *sovereign immunity*, along with a few state governments that have not abandoned it. Sovereign immunity

means that a suit may not be pressed against such a government entity unless it gives its permission to be sued.

How does a government give its permission to be sued? One way is the insertion into the government contract of an Authorization and Consent (A&C) Clause.

52.227-1 Authorization and Consent

As prescribed in 27.201-2(a)(1), insert the following clause:

> Authorization and Consent (DEC 2007)
>
> (a) The Government authorizes and consents to all use and manufacture, in performing this contract or any subcontract at any tier, of any invention, described in and covered by a United States patent—
>
> (1) Embodied in the structure or composition of any article the delivery of which is accepted by the Government under this contract; or
>
> (2) Used in machinery, tools or methods whose use necessarily results from compliance by the Contractor or subcontractor with (i) specifications or written provisions forming a part of this contract or (ii) specific written instructions given by the Contracting Officer directing the manner of performance. The entire liability to the Government for infringement of a United States patent shall be determined solely by the provisions of the indemnity clause, if any, included in this contract or any subcontract hereunder (including any lower-tier subcontract), and the Government *assumes liability* (emphasis added) for all other infringement to the extent of the authorization and consent hereby granted.
>
> (b) The Contractor shall include the substance of this clause, including the paragraph (b), in all contracts that are expected to exceed the simplified acquisition threshold.

However, omission of this clause from any subcontract, including those at or below the simplified acquisition threshold, does not affect this authorization and consent.

The reason for including the authorization and consent in government contracts follows from the consideration that a patent owner should not be able to prevent important government work from going forward. Also, the failure to include the A&C clause as required by law does not remove it from the contract in accordance with the so-called Christian Doctrine and common law contracts.

There are other intellectual property clauses in 52.227 relating to patent and data rights that are addressed in Chapters 5 and 6. A patent indemnity clause (one of several) for construction contracts is found in 52.227-4, which reads as follows:

> Patent Indemnity-Construction Contracts (DEC 2007) FAR 52.227-4
>
> Except as otherwise provided, the Contractor shall indemnify the Government and its officers, agents, and employees against liability, including costs and expenses, for infringement of any United States patent (except a patent issued upon an application that is now or may hereafter be withheld from issue pursuant to a Secrecy Order under 35 U.S.C. 181) arising out of performing this contract or out of the use or disposal by or for the account of the Government of supplies furnished or work performed under this contract.

Selected parts of the FAR are reviewed in the following as they pertain to the aims of this book. Parts not selected are equally important but not discussed because of space limitations.

The Federal Acquisition Regulations System is established for the codification and publication of uniform policies and procedures for acquisition by all executive agencies. The Federal Acquisition Regulations System consists of the FAR, which is the primary document, and agency acquisition regulations that implement or supplement the FAR. The Department of Defense (DoD) for example, has its own Defense Acquisition Regulations System (DFAR), which is set forth in Chapter 2 of Title 48. The FAR derivatives for the other agencies are contained in Chapters 3 through 63 of Title 48 and Chapter 99 includes the Cost Accounting Standards of the Office of Management and Budget (OMB).

Parts 1 and 2 of the FAR

Among the principles of the FAR articulated in Part 1 are the realization of cost effective, flexible contracting that minimizes administrative costs, maximizes competition, and fulfills public policy objectives. A basic assumption is that the acquisition team exercises its authority in flexible ways if such ways are not addressed in the FAR, and not prohibited by law, Executive order or other regulation. The authority of the FAR derives from the requirements of the Office of Federal Procurement Policy Act of 1974 (Pub. L. 93-400), as amended by Pub. L. 96-83. The preparation, issuance, and maintenance of the FAR systems is prescribed jointly by the Secretary of Defense, the Administrator of General Services, and the Administrator of the National Aeronautics and Space Administration.

The FAR applies to all acquisitions as defined in Part 2 of the FAR, except where expressly excluded.

Part 2 (Subpart 2.1) includes a number of definitions (it runs to 12 pages). Some of the most interesting ones from the perspective of this book include (at least in pertinent part):

> "Architect–engineer services" as defined in 40 U.S.C. 1102 means—
>
> (1) Professional services of an architectural or engineering nature, as defined by state law, if applicable, that are required to be

performed or approved by a person licensed, registered, or certified to provide those services;

(2) Professional services of an architectural or engineering nature performed by contract that are associated with research, planning, development, design, construction, alteration, or repair of real property; and

(3) Those other professional services of an architectural or engineering nature, or incidental services, that members of the architectural and engineering professions (and individuals in their employ) may logically or justifiably perform, including studies, investigations, evaluations, consultations, comprehensive planning, program management, conceptual design, plans and specifications, value engineering, construction phase services, soils engineering, drawing reviews, preparation of operating and maintenance manuals, and other related services.

"Basic research" means that research directed toward increasing knowledge in science. The primary aim of basic research is a fuller knowledge or understanding of the subject under study, rather than any practical application of that knowledge.

"Building or work" means construction activity as distinguished from manufacturing, furnishing of materials, or servicing or maintenance work.

"Construction" means construction, alteration, or repair (including dredging, excavating, and painting of buildings, structures, or other real property). For purposes of this definition, the terms "buildings, structures, and other real property" include, but are not limited to improvements of all types, such as bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, cemeteries, pumping stations, railways, airport facilities, terminals, docks, piers, wharves, ways, lighthouses, buoys, jetties, breakwaters, levees, canals, and channels. Construction does not include the manufacture, production, furnishing, construction, alteration, repair, processing or assembling of vessels, aircraft, or other kinds of personal property (there is an exception cited).

"Contract" means a mutually binding legal relationship obligating the seller to furnish the supplies or services (including construction) and the buyer to pay for them. It includes all types of commitments that obligate the Government to an expenditure of appropriated funds and that, except as otherwise authorized, are in writing. In addition to bilateral instruments, contracts include (but are not limited to) awards and notices of awards; job orders or task letters issued under basic ordering agreements; letter contracts; orders, such as purchase orders, under which the contract becomes effective by written acceptance or performance; and bilateral contract modifications.

> "Shop drawings" means drawings submitted by the construction contractor or a subcontractor at any tier or required under a construction contract, showing in detail either or both of the following:
>
> (1) The proposed fabrication and assembly of structural elements,
>
> (2) The installation (i.e., form, fit, and attachment details) of material or equipment.
>
> "Voluntary consensus standards" means common and repeated use of rules, conditions, guidelines or characteristics for products, or related processes and production methods and related management systems. Voluntary consensus standards are developed or adopted by domestic and international voluntary consensus standards making bodies (e.g., International Organization for Standardization (ISO) and ASTM International).

(See OMB Circular A-119.)

Note that ethics in government contracting is covered in FAR Part 3 (and in Part 52 at 52.203-13) but that discussion is postponed to Chapter 15 of this book.

Part 13—Simplified Acquisition Procedures

> **13.000 Scope of part**
>
> This part prescribes policies and procedures for the acquisition of supplies and services, including construction, research and development, and commercial items, the aggregate amount of which does not exceed the simplified acquisition threshold (see 2.101). Subpart 13.5 provides special authority for acquisition of commercial items exceeding the simplified acquisition threshold but not exceeding $5 million ($10 million for acquisitions as described in 13.500(e)), including options. See Part 12 for policies applicable to the acquisition of commercial items exceeding the micro-purchase threshold. See 36.602-5 for simplified procedures to be used when acquiring architect-engineer services.

The remainder of Part 13 describes the policies and procedures used to implement it. The goal of this part is to simplify relatively small (from government's perspective) contracts.

Part 14—Sealed Bidding

> **14.000**
>
> This part prescribes –
>
> (a) The basic requirements of contracting for supplies and services (including construction) by sealed bidding;
>
> (b) The information to be included in the solicitation (invitation for bids);

TABLE 3.2

Uniform Contract Format in Federal Acquisition Regulations (FAR)

Section	Title
Part I—The Schedule	
A	Solicitation/contract form
B	Supplies or services and prices
C	Description/specifications
D	Packaging and marking
E	Inspection and acceptance
F	Deliveries or performance
G	Contract administration data
H	Special contract requirements
Part II—Contract Clauses	
I	Contract clauses
Part III—List of Documents, Exhibits, and Other Attachments	
J	List of documents, exhibits, and other attachments
Part IV—Representations and instructions	
K	Representations, certifications, and other statements of bidders
L	Instructions, conditions, and notices to bidders
M	Evaluation factors for award (end of document)

(c) Procedures concerning the submission of bids;
(d) Requirements for opening and evaluating bids and awarding contracts; and
(e) Procedures for two-step sealed bidding.

Part 14 is particularly suited to fixed-price contracts, including construction contracts.

It mandates the use of the Uniform Contract Format, shown here in Table 3.2, with certain exceptions where a Simplified Contract Format may be used pursuant to 14.201-9. Subparts 14.3 and 14.4 detail the Submission of Bids and the Opening of Bids, respectively, as well as the award to a responsible bidder. A more involved procedure is covered in Subpart 14.5—Two-Step Sealed Bidding.

Part 15—Contracting by Negotiation

Many government contracts are established by a process of negotiation. This part describes how source selection is accomplished by the solicitation of proposals and information. The Uniform Contract Format described earlier is also used here. A key issue of the negotiated contract is the source selection process detailed in Subpart 15.3.

The "track record" of a potential contractor is one of the key elements along with price.

Contractor profits are limited by the limitations specified (15% for research work under a cost-plus-fixed-fee contract and 6% of the cost for architecture-engineering services).

When make-or-buy contracts are involved, the government reserves the right to approve contractor-selected subcontractors. Protests against an announced contract award are made pursuant to the following Part 33. Unsolicited proposals are covered by Subpart 15.6.

Part 16—Types of Contracts

There is a wide variety of contract types available to the government and its contractors so that acquisition flexibility is realized. The two major contract types are fixed-price contracts and cost reimbursement contracts. Each of these major types includes varieties of subtypes whose goals are to balance the risk and reward to the contractor with the most efficient (least cost to the government) procurement. The old cost-plus-a-percentage-of-cost system of contracting used historically has been outlawed since the contractor has a disincentive to control costs. The selection of a contract type can be negotiated in light of the price structure and incentive to the contractor. The types of fixed-price contracts contemplated in the FAR are:

Firm-fixed-price contracts

Fixed-price contracts with economic price adjustment

Fixed-price incentive contracts

Fixed-price contracts with prospective price redetermination

Firm-fixed-price, level-of-effort term contracts

The types of cost-reimbursement contracts identified in FAR Part 16 include:

Cost contracts

Cost-sharing contracts

Cost-plus-incentive-fee contracts

Cost-plus-award-fee contracts; cost-plus-fixed-fee contracts

Additional types of contracts identified in Part 16 include:

Indefinite-delivery contracts

Time-and-materials, labor-hour, letter contracts

Agreements, including basic agreements (BA) and basic ordering agreements (BOA)

Part 33—Protests, Disputes, and Appeals

A *protest* is generally a written objection, by an interested party, to, among other things, an award or proposed award of a government contract. Protests are often filed by disappointed bidders who did not win a contract competition. A prominent recent example was the protest by Boeing of the award of the Aerial Refueling Tanker Contract, one involving billions of dollars, to the Airbus Consortium (EADS), a European concern. The FAR policy is that protests should be resolved by alternate dispute resolution (ADR) methods if that is possible. Protests to the agency are filed with the Contractng Officer. The protester may then file its protest with the General Accountability Office (GAO, formerly the General Accounting Office). The GAO decision may then be appealed to the U.S. Court of Federal Claims (COFC).

Subpart 33.2—Disputes and appeals. These are based on the Contract Disputes Act of 1978. The government's policy is to attempt to resolve disputes at the Contracting Officer level via ADR pursuant to the Administrative Dispute Resolution Act (ADRA) (5 U.S.C. 571 , *et seq.)* or similar methods. The Contracting Officer's decision in a dispute may be appealed to an agency board of contract appeals (ASBCA), for example, the Armed Services Board of Contract Appeals (ASBCA). Administrative and other remedies for resolving disputes are the subject of the Contract Disputes Act of 1978. The Contracting Officer's final decision may, pursuant to 33.211, also be appealed to the U.S. Court of Federal Claims (COFC). Both decisions of the ASBCA and the COFC may be appealed to the U.S. Court of Appeals for the Federal Circuit (CAFC), which was established in 1982.

Compact Summary of Case: *Bonneville Associates, Limited Partnership, et al., Petitioners v. David J. Barram, Administrator, General Services Administration*—On Petition for a Writ of Certiorari to the United States Court of Appeals for the Federal Circuit (No. 98-1688 in the Supreme Court of the United States).

The question presented: Whether the attempt of petitioners to reinstate an appeal to the General Services Board of Contract Appeals was untimely because it was not filed within the 90-day limitations period established under the Contract Disputes Act of 1978, 41 U.S.C. 606.

The Contract Disputes Act of 1978 (CDA), 41 U.S.C. 601-613, provides two alternatives for a government contractor to appeal a decision of a Contracting officer. First, the contractor may appeal to the agency's board of contract appeals within 90 days from the receipt of the Contracting Officer's decision.

Alternatively, the contractor may seek review in the U.S. Court of Federal Claims by filing an action within 12 months from the date of receipt of the decision.

This case involves petitioner's sale to the General Services Administration (GSA) of an office building in Las Vegas, Nevada. Following the sale, a dispute arose between petitioners and GSA regarding the structural integrity of the building and petitioner's failure to make required repairs and alterations. After years of negotiations, the Contracting Officer issued a final decision on August 21, 1991, demanding $5,195,069 to cover the costs of correcting building deficiencies. The decision advised petitioners that they could appeal to the General Services Board of Contract Appeals (GSBCA) within 90 days or to the U.S. Court of Federal Claims (USCOFC) within 1 year of receipt (of the contracting officer's final decision).

On November 19, 1991, petitioners submitted a timely notice of appeal to the GSBCA challenging the contracting officer's final decision. On January 8, 1992, however, petitioners "Withdrawal of Notice of Appeal," stated that they would pursue review of the contracting officer's decision in the court of federal claims. The GSBCA granted petitioner's request on January 22, 1992, and dismissed the appeal without prejudice pursuant to GSBCA Rule 28(a)(1), 48 C.F.R. 6101.28(a) (1991).

Meanwhile, on January 13, 1992, petitioners filed a complaint with the court of federal claims. The government moved to dismiss the complaint on the ground that petitioner's election to submit a notice of appeal to the GSBCA foreclosed the court from entertaining the complaint. The court agreed, holding that, because the GSBCA had jurisdiction to entertain petitioner's claims, the *doctrine of election of remedies* (emphasis added) precludes the exercise of jurisdiction by the court of federal claims. That position was upheld by the court of appeals for the federal circuit. On December 29, 1994, petitioners sought to reinstate their appeal to the GSBCA but that was denied since the previously dismissed appeal could not be reinstated after expiration of the 90-day deadline established in the CDA. The federal circuit affirmed the GSBCA's decision, invoking the Federal Rules of Civil Procedure. After citing additional cases, the U.S. Supreme Court denied the writ of certiorari (i.e., refused to hear the case).

Special Categories of Contracting (Parts 34 and 35)

Part 34—Major Systems Acquisition and Part 35—Research and Development Contracting are joined at the hip since one of the areas of application of Part 35 is to support research and development (R&D) that is integral to the acquisition of major weapons systems. The other activity included in the scope of Part 35 is the independent research and development (IR&D) covered in Part 31.205-18 (relating to costs). The policies and procedures in Part 34 are established pursuant to Office of Management and Budget (OMB) Circular No. A-109, Major Systems Acquisitions.

The acquisition strategy is tailored to specific major system acquisition programs. The major consideration is to satisfy the *mission need* in the most cost-effective and timely manner. The Part 34 competition requirements call for participation of two or more independent contractors as well as competition between alternative major system concepts. Short-term concept exploration contracts are also countenanced as well as demonstration contracts, full-scale development contracts, and full production contracts.

Subpart 34.1—Testing, Qualification and Use of Industrial Resources Developed Under Title III, Defense Production Act (50 U.S.C. App.2091-2093) provides for the use by a contractor of certain government resources, as appropriate and approved by the contracting officer.

The aim of government-sponsored R&D programs is to advance scientific and technical knowledge that supports agency and national goals. Part 35 contracts are not intended to support grants or cooperative agreements where the purpose is to stimulate or support R&D efforts toward another public purpose. The key to successful R&D contracting under Part 35 is to produce a clear and complete *work statement* that allows a contractor needed flexibility to pursue that work. The articulation of R&D contract work statements also depends on the type of contract envisioned (usually negotiated as opposed to competitively bid). In soliciting only selected firms, the availability and qualifications of the technical personnel is a key consideration. It may also be desirable to negotiate directly with a concern without competition, especially on unsolicited proposals. Subcontracting parts of an R&D contract generally require specific contracting officer approval. The R&D contract must specify the technical data to be delivered since a technical data package may be used to obtain competition in production contracts. The R&D contract must also have an appropriate *patent rights clause* that provides the government with an equitable right in inventions developed (more on this in Chapters 4 and 6 on Intellectual property). A prominent program identified as falling under Part 35 is the famous "Skunk Works" operated for the Air Force, which develop very advanced airframe projects, such as the stealth aircraft (Keyes 2004).

Contracts for research with educational institutions and nonprofit organizations are covered in Section 35.015; examples of such contracts include nuclear research at the University of California at Berkeley and various applied research tasks at the Southwest Research Institute in San Antonio, Texas. A Basic Agreement may be useful if the number of contracts is sufficient but such agreements must be reviewed at least annually.

Federally Funded Research and Development Centers (FFRDCs) are addressed in section 35.017. There are some 37 major national laboratories, in addition to the two mentioned above, that are included in the list of the National Science Foundation (NSF) in Arlington, Virginia, which provides oversight of these programs. The FFRDCs addresses long-term R&D needs that cannot be effectively met by regular contractors. They enjoy a special

relationship with the government, which permits them access to government data beyond that which is normally available to contractors (since they do not bid for production contracts). A "birth control" method for preventing an undue proliferation of FFRDCs is included in 10 U.S.C. 2367 unless the head of the agency proposing the creation of a new one submits that proposal to Congress.

Part 36—Construction and Architect–Engineer Contracts

Part 36 of the FAR prescribes policies and procedures peculiar to contracting for construction and architect–engineer services, and identifies applicable contract clauses and contract forms. The specialized clauses are a subset of Part 52 clauses. Article 36 takes "pushes" (in black-jack parlance) when its terms come into conflict with other parts of the FAR. The definitions in Subpart 36.1 (General) include terms like those used in private construction contracts. Record drawings, as compared to "Plans and Specifications" show the construction of a particular structure or work as actually completed under the contract. Sealed bids are the preferred method of awarding construction contracts. Contracting officers are directed to acquire the classical method of design–bid–build as prescribed by the Brooks Architect–Engineer Act (40 U.S.C. 1101 *et seq.*). Otherwise, the contracting officer is directed to use the two-phase selection procedures prescribed elsewhere in the U.S. Code. Construction for the Department of Defense (DoD) is carved out of Part 36 and described in 10 U.S.C. 2862. (Note that the Brooks Act of 1972 resulted from a joint action of the Council on Federal Procurement of Architectural and Engineering Services (COFPAES) as related by Stone [2010]).

Subpart 36.2—Special Aspects of Contracting for Construction requires the evaluation and reporting of contractor performance. The FAR section 36.202 (Specifications) requires that (a) construction specifications shall conform to the requirements in Part 11 of this (FAR) regulation and (b) whenever possible, contracting officers shall ensure that references in specifications are to widely recognized standards or specifications promulgated by governments, industries, or technical societies. FAR Part 11 describes the policies and procedures for describing agency needs and covers the selection and development of requirements documents as well as their use and maintenance. Other sections of Subpart 36.2 relate to costs and pricing. Section 36.209 (Construction Contracts with Architect-Engineer Firms) states "No contract for the construction of a project shall be awarded to the firm that designed the project or its subsidiaries, except with the approval of the head of the agency or authorized representative."

Special procedures for price negotiation in construction contracting reference Part 15 of the FAR and Part 15 is also referenced in Subpart 36.3—Two-Phase Design–Build Selection Procedures. In phase 1 the scope of the work is established and not more than five A-E firms are offered an opportunity

to submit technical proposals (but not complete design packages) without prices. After an evaluation, the contracting officer selects the most highly qualified offerors who are invited to submit phase-two proposals including technical and price proposals that are evaluated separately.

One of the more interesting clauses from Part 52 that is inserted into Part 36 construction contracts follows.

52.236-21 Specifications and Drawings for Construction

As prescribed in 36.521, insert the following clause:

(a) The contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

(b) Wherever in the specifications or upon the drawings the words "directed," "required," ordered," "designated," prescribed," or words of like import are used, it shall be understood that the "direction," "requirement," "order," "designation," or "prescription," of the Contracting Officer is intended and similarly the words "approved," "acceptable," "satisfactory," or words of like import shall mean "approved by," "acceptable to," or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.

(c) Where "as shown," "as indicated," "as detailed," or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place," that is "furnished and installed."

(d) Shop drawings means drawings, submitted to the Government by the Contractor, subcontractor, or any lower-tier subcontractor pursuant to a construction contract, showing in detail (1) the proposed fabrication and assembly of structural elements, and (2) the installation (i.e., fit, and attachment details) of materials or equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the contractor to explain specific portions of the work required by the contract. The Government may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with contract requirements and shall show its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the Government's reasons therefor. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) of this clause.

(f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Contracting Officer approves any such variation, the Contracting Officer shall issue and appropriate contract modification, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.

(g) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated) of all shop drawings will be retained by the Contracting Officer and one set will be returned to the Contractor. (End of clause.)

Subpart 36.6—Architect–Engineer Services, provides policies and procedures for the competitive selection of firms for A-E contracts. A-E firms are encouraged to submit proposals that consider energy conservation, pollution prevention and waste reduction as much as possible (i.e., "green" proposals). An evaluation board, made up of peer professionals, not including any of the bidders, then assists the contracting officer's evaluation of the proposals. A-E firms may be liable for additional government costs that result from defective designs pursuant to 36.608. The contract clauses to be incorporated in A-E contracts appear in 36.609. A-E firms are required to design within funding limitations and to use registered or licensed design professionals.

All of the contract clauses applicable to government construction projects are identified in sections of Part 52, from 52.236-1 to 52.236-28. These clauses may be found on the Web at:

https://www.acquisition.gov/Far/current/html/52_233_240.html (accessed on 7/5/2010)

Part 39—Acquisition of Information Technologies

Part 39 prescribes policies and procedures for the acquisition of information technology, including financial management systems pursuant to OMB Circular No. A-127, Financial Management Systems and OMB Circular No. A-130, Management of Federal Information Resources. Part 39 does not apply to the acquisition of information technology for national security systems, which is acquired via 40 U.S.C.11302. "Modular contracting" is defined in Subpart 39.1 as the use of one or more contracts to acquire information technology systems in successive interoperable *increments* where the success of each increment is coordinated with, but not dependent on, other increments. This requirement is traced to the Clinger–Cohen Act of 1996 (Public Law 104-106). Y2K compliance is mandated by "Year 2000 compliant" requirements per section 39.106.

To promote compatibility (i.e., interoperability), each increment (module) of a program should comply with commercially available IT *standards* and shall conform to the agency's master information technology architecture. Contracts must be structured so that the government is not required to contract for additional increments

Electronic and information technology is addressed in Subpart 39.2. This subpart includes requirements for accessibility pursuant to Section 508 of the Rehabilitation Act of 1973 (29 U.S.C. 794d) and the Architecture and Transportation Barriers Compliance Board Electronic and Information Technology (EIT) Accessibility Standards (36 CFR Part 1194). Further information on Section 508 is available on the Web at

http://www.section508.gov. (accessed on 7-30-10).

Section 39.204 lists exceptions to the accessibility requirements in Section 39.203.

References

American Council of Engineering Companies (ACEC) and the Engineers Joint Contract Documents Committee (EJCDC), 2007, *EJCDC Documents List.*

American Institute of Architects (AIA®), 2007. *A201™-2007: General Conditions of the Contract for Construction.*

Casey, N. 2008. Mattel prevails over MGA in Bratz-Doll trial. *The Wall Street Journal*: July 18: B1–B2.

Keyes, W.N. 2004. *Government Contracts in a Nutshell,* 4th Ed. Pepperdine University School of Law, California: Thompson-West, 427.

Rosenthal, A. 2010. Beware the fine print. *The New York Times*, June 27, 2010: 9.
Stone, C.M. 2010. NSPE's work in Washington means big savings for small firms. *PE—The Magazine for Professional Engineers*, July 2010: 35.

Additional Reading

Sweet, J. and M.M. Schnier. 2009. *Legal Aspects of Architecture, Engineering and the Construction Process*, 7th Ed. Berkeley, Thompson: University of California.
Thomas, H.R. and R.D. Ellis Jr. 2007, *Interpreting Construction Contracts*: *Fundamental Principles for Contractors, Project Managers, and Contract Administrators.* Reston, Virginia: ASCE Press.
Bartholomew, S.H. 1998. *Construction Contracting: Business and Legal Principles*. Chico, California, Prentice-Hall, Upper Saddle River, New Jersey.
Murdoch, J. and W. Hughes. 2008. *Construction Contracts: Law and Management*, 4th Ed. London: Taylor & Francis.

4

Intellectual Property: Emphasis on Patents

Introduction

The term *intellectual property* (IP) is deprecated by some scholars in the field (Burk and Lemley 2009). That terminology appears here because of its widespread use and general recognition. The term *IP* is generally considered to encompass four major areas: patents, copyrights, trademarks, and trade secrets. Patents are covered in this chapter, patent processes are reviewed in Chapter 5, copyrights are addressed in Chapter 6, trade secrets are surveyed in Chapter 7, and trademarks are reviewed in Chapter 8. The unqualified term *patent* is generally taken to mean a *utility patent*, which is emphasized in this chapter as being of most interest to engineers. *Plant patents* and *design patents* are also covered briefly.

The term *patent* has several definitions and connotations. It was used earlier in our history to indicate a grant of land to an individual by a government or royalty. It also denotes clarity and openness such as appears in the often-used phrase "patently obvious."

Patent as Contract

Pursuant to the major theme of this book, a patent is defined here as a *contract*. The contract is between the public, represented by the U.S. Government Patent and Trademark Office (PTO), and a natural person, the *inventor.* The consideration given by the inventor is a new and useful *invention*, something the public did not previously possess. The consideration given to the inventor, or his assigns, is the right to exclude others, for a limited time, from making, using, selling, offering for sale, or importing the patented invention. The framing of a patent as a contract is not particularly new but is not often invoked, even though it has a legal background articulated in a case: *National Carbon Company, Inc. v. The Western Shade Cloth Co.*, USPQ Vol. 35, p. 104. Quoting District Judge Lindly:

> In this situation it appears advisable, if not necessary, to advert to some elementary principles. Specifications of the patent, including the description and claims, *constitute a contract* between the public and the patentee, under which the public, through the government, agrees that, in consideration of the inventor's disclosure of his teaching and his grant of the right to use the same after his monopoly expires, he shall be protected in his exclusive use during the life of the patent [emphasis added].

Some writers, like this author, like to distinguish "invention" from "innovation." Briefly put, an invention (or discovery) is something that one can get a patent on, whereas an innovation is the process of bringing something new (but not necessarily patentable) to market. An innovation may, of course, include one or more inventions. A patent is thus a right to exclude others rather than a right to market the invention since there may be other patents that prevent the inventor from marketing his invention. Many of the complex products of modern technologies involve the patent rights of many parties, sometimes called the "patent thicket."

Patent as a Grant

The usual definition of a patent is a formal grant to an inventor by the government of the rights outlined above pursuant to the U.S. Constitution, in Article I, Section 8 (in pertinent part):

> The Congress shall have the power … to promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries.

The "limited time" of the inventor's exclusive right is now 20 years from the date that the application for patent is filed. Until recently the term of a patent was for 17 years after the issuance of the patent. Under certain circumstances, the term of a patent may be extended.

An example is where a pharmaceutical patentee could not practice the invention after issuance of the patent because of a lack of regulatory approval by the Food and Drug Administration (FDA). See §156—Extension of Patent Term.

Organization and Functions of the U.S. Patent and Trademark Office (PTO)

The organization and function of the Patent and Trademark Office (PTO) is specified in the United States Code, Title 35—Patents, Part 1. The PTO is

an agency of the U.S. Department of Commerce. The function of the PTO is to examine patent applications, to grant patents if applicants are entitled to them, and to examine and register trademarks. The PTO also advises the president of the United States, the secretary of commerce, the bureaus and offices of the U.S. Department of Commerce and other agencies of the government in matters involving all domestic and global aspects of its areas of intellectual property by the preservation, classification, and dissemination of patent and trademark information.

The PTO records assignments of patents, maintains search files of U.S. and foreign patents, and maintains a public search room for the public's use in searching issued patents and examining records. The PTO provides copies of patents and official records to the public; it also provides training to practitioners on the requirements of the patent statutes and regulations. The PTO also publishes the Manual of Patent Examining Procedure to guide both examiners and applicants. A primary publication is the Official Gazette of the United States Patent and Trademark Office (the OG). The OG is published weekly (on Tuesdays) and is issued in two parts, one describing patents and one describing trademarks. The OG contains a claim and a selected drawing, if one is available, for each patent granted on that day. The OG also includes legal notices of patent and trademark lawsuits, indexes of patents and patentees, list of patents available for license or sale, and general information such as changes in rules, changes in the classification of patents and other information.

The PTO's Web site is http://www.uspto.gov.

Utility Patents

Chapter 10 of 35 U.S.C provides the following on utility patents (the shelves of books of the U.S. Code—Annotated or U.S.C.A, appear in Figure 4.1):

§ 100 Definitions

When used in this title unless the context otherwise indicates—

(a) The term "invention" means invention or discovery.
(b) The term "process" means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material.
(c) The terms "United States" and "this country" mean the United States of America, its territories and possessions.
(d) The word "patentee" includes not only the inventor to whom the patent was issued but also the successors in title to the patentee.
(e) The term "third-party requester" means person requesting ex parte reexamination under Section 302 or inter parties reexamination under section 311 who is not the patent owner.

FIGURE 4.1
Bookshelves containing the U.S. Code Annotated. (U.S.C.A., Photo by the author).

Note that *ex parte* denotes a judicial action involving a single party, as opposed to *inter parties* where several parties are involved.

§ 101 Inventions Patentable

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

§ 102 Conditions for Patentability; Novelty and Loss of Right to Patent

A person shall be entitled to a patent unless—

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States, or
(c) he has abandoned the invention, or

(d) the invention was first patented or caused to be patented, or was the subject of an inventor's certificate, by the applicant or his legal representatives or assigns in a foreign country prior to the date of the application for patent in this country on an application for patent or inventor's certificate filed more than twelve months before the filing of the application in the United States, or

(e) the invention was described in—

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section122(b) only if the international application designating the United States was published under article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a); or

(f) he did not himself invent the subject matter sought to be patented, or

(g) (1) during the course of an interference conducted under the section 135 or section 291, another inventor involved therein establishes, to the extent permitted in section 104, that before such person's invention thereof the invention was made by such other inventor and not abandoned, suppressed, or concealed, or (2) before such person's invention thereof, the invention was made in this country by another inventor who had not abandoned, suppressed, or concealed it. In determining priority of invention under this subsection, there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, by a time prior to conception by the other.

§ 103 Conditions for Patentability; Nonobvious Subject Matter

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

(b) (1) Notwithstanding subsection (a), and upon timely election by the applicant for patent to proceed under this subsection, a

biotechnological process using or resulting in a composition of matter that is novel under section 102 and nonobvious under section (a) of this section shall be considered nonobvious if—

(A) claims to the process and the composition of matter are contained in either the same application for patent or in separate applications having the same effective filing date, and

(B) the composition of matter, and the process at the time it was invented, were owned by the same person or subject to an obligation of assignment to the same person.

(2) A patent issued on a process under paragraph 1—

(A) shall also contain the claims to the composition of matter used in or made by that process, or

(B) shall, if such composition of matter is claimed in another patent, be set to expire on the same date as such other patent, notwithstanding section 154.

(3) For purposes of paragraph (1), the term "biotechnological process" means—

(A) a process of genetically altering or otherwise inducing a single or multi-celled organism to-

(i) express an exogenous nucleotide sequence,

(ii) inhibit, eliminate, augment, or alter expression of an endogenous nucleotide sequence, or

(iii) express a specific physiological characteristic not naturally associated with said organism;

(B) cell fusion procedures yielding a cell line that expresses a specific protein, such as a monoclonal antibody; and

(C) a method of using a product produced by a process defined by subparagraph (A) or (B), or a combination of subparagraphs (A) and (B).

(c) (1) Subject matter developed by another person, which qualifies as prior art only under one or more of subsections (e), (f), and (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the claimed invention was made, owned by the same person or subject to an obligation of assignment to the same person.

(2) For purposes of this subsection, subject matter developed by another person and a claimed invention shall be deemed to have been owned by the same person or subject to an obligation of assignment to the same person if—

(A) the claimed invention was made by or on behalf of parties to a joint research agreement that was in effect on or before the date the claimed invention was made;

(B) the claimed invention was made as a result of activities undertaken within the scope of the joint research agreement; and

(C) the application for patent for the claimed invention discloses or is amended to disclose the names of the parties to the joint research agreement.

(3) For purposes of paragraph (2), the term "joint research agreement" means a written contract, grant, or cooperative agreement entered into by two or more persons or entities for the performance of experimental, developmental, or research work in the field of the claimed invention.

§ 104 Invention Made Abroad

(a) In general:
  (1) Proceedings—In proceedings in the Patent and Trademark Office, in the courts, and before any other competent authority, an applicant for a patent or a patentee, may not establish a date of invention by reference to knowledge or use thereof, or other activity with respect thereto, in a foreign country other than a NAFTA country or a WTO member country, except as provided in sections 119 and 365 of this title.
  (2) Rights—If an invention is made by a person, civil or military—
    (A) while domiciled in the United States, and serving in any other country in connection with operations by or on behalf of that NAFTA country, or
    (B) while domiciled in a NAFTA country and serving in another country in connection with operations by or on behalf of that NAFTA country, or
    (C) while domiciled in a WTO member country and serving in another country in connection with operations by or on behalf of that WTO member country, that person shall be entitled to the same rights of priority in the United States with respect to such invention as if such invention had been made in the United States, that NAFTA country, or that WTO member country, as the case may be.
  (3) Use of information—To the extent that any information in a NAFTA country or a WTO member country concerning knowledge, use, or other activity relevant to proving or disproving a date of invention has not been made available for use in a proceeding in the Patent and Trademark Office, a court, or any other competent authority to the same extent as such information could be made available in the United States, the Director, court, or such other authority shall draw appropriate inferences, or take other action permitted by statute, rule, or regulation, in favor of the party that requested the information in the proceeding.
(b) Definitions—As used in this section—
  (1) the term "NAFTA country" has the meaning given that term in section 3501(10) of title 19; and
  (2) the term "WTO member country" has the meaning given that term in section 3501(10) of title 19.

Note that NAFTA is the acronym for the North American Free Trade Agreement, including Canada, the United States, and Mexico. WTO is the

abbreviation for the World Trade Organization that includes most of the world's countries.

§ 105 Inventions in Outer Space

(a) Any invention made, used or sold in outer space on a space object or component thereof under the jurisdiction or control of the United States shall be considered to be made, used or sold within the United States for the purposes of this title, except with respect to any space object or component thereof that is specifically identified and otherwise provided for by an international agreement to which the United States is a party, or with respect to any space object or component thereof that is carried on the registry of a foreign state in accordance with the Convention on Registration of Objects Launched into Outer Space.

(b) Any invention made, used or sold in outer space on a space object or component thereof that is carried on the registry of a foreign state in accordance with the Convention on Registration of Objects Launched into Outer Space, shall be considered to be made, used or sold within the United States for the purposes of this title if specifically so agreed in an international agreement between the United States and the state of registry.

Note that The Convention on Registration of Objects Launched into Outer Space (UNOOSA) is an international agreement brokered by the United Nations that came into force in 1976. It provides that the launching state should furnish to the United Nations, as soon as practicable, detailed information on certain launches into outer space.

Modern Development of Patent Law

The increasing complexity of modern patent law is driven mostly by the forces of international trade, the increased complexity of modern technology, and by the broadening of inventions deemed patentable, including especially computer software, methods of doing business and the availability of patents for life forms.

The codification of modern patent law started with the Patent Act of 1952 which was enacted into law by Public Law 593, 82nd Congress, 2nd Session, Chap. 950, 66 Stat. 792, approved July 19, 1952 and approved to take effect on January 1, 1953 (see *Journal of the Patent Office Society*, Vol. 34, No. 8, pp. 543–683). But Senate Report No. 1464 (U.S. Senate 1956) published a few years later, concluded:

> No basic changes in our patent system or its underlying principles have been made since 1836 when our "modern" patent statute came into being. Amendments have either dealt with specific, and often relatively minor, problems or have been largely revisory or declaratory in nature.

Later that same year (1956), Dr. Vannevar Bush, at the request of the Subcommittee on Patents, Trademarks, and Copyrights, prepared a research study (Bush 1956). Dr. Bush, arguably the most famous American electrical engineer since C. P. Steinmetz, was himself an inventor. His report addressed many of the problems inherent in the environment of an archaic patent system's interaction with modern invention. Bush recommended the presumptive validity of issued patents be enhanced by higher quality operation of the Patent Office. Many of Dr. Bush's recommendations are still valid today!

There has been relatively little in the way of legislative remedy for curing the ills of the patent system. Most of the significant changes to patent law have occurred through judicial decisions. Nearly every word in the Patent Act of 1952 has been interpreted and reinterpreted by the courts to develop modern patent law.

Patent Reform

Is the patent system broken? There is significant positive consensus on that subject. Much of it is due to the wide publicity of the so-called one-click patent (5,960,411 obtained by Amazon on September 28, 1999). Reports indicate that the 411 patent was subjected to a rather exhaustive reissue examination (see Chapter 5) and survived. Patent Attorney Robert Plotkin has succinctly pointed out how software patents are not handled properly by a system that historically worked on structure and function as separate issues (Plotkin 2002). Plotkin shows how software is different, since the concepts of structure and function merge in the *source code* that defines it. Plotkin concludes with some interesting recommendations for reform of software patenting. Another authority has made good arguments for patent reform and also offered some concrete suggestions (Samuelson 2004). But others are opposed to the "broken" concept, saying that software patents are no different from other patents (Denton 2010). Congress was working on a reform bill in 2010 but has seemed powerless to do anything constructive. That might possibly change with the elevation of Congressman Lamar Smith (R.-Tex.) to the Chairmanship of House Judiciary Committee in 2011. Smith was cosponsor of the House Patent Reform Act of 2009 (H.R. 1260). In remarks at the Texas Global IP Leadership Summit (Austin, TX 11-22-2010), PTO Director

David J. Kappos claimed that the United States is essentially a "first-to-file" country now because of the very low success rate of "junior parties" in interference proceedings (Kappos 2010). The proposed 2009 patent reform act would make "first-to-file" the law of the land, thus eliminating interferences. Interferences would be replaced by special "derivation proceedings" the goal of which would be to prevent a first filer who derived the invention from the true inventor from winning a patent.

As a result of Congress's recent failures to effect patent reform, some scholars suggest that the reform is best left up to the courts as explained in Burk and Lemley. They posit that the patent system is already balkanized and that formal recognition of that fact would improve things (see the Conclusion—New Directions on pages 167 through 170). Other writers still hold out for the legislative remedy (Jaffe and Lerner 2004). The PTO has recently been seen as a source of funds by both political parties. As a result, the PTO does less than the best job of issuing patents with a genuine presumption of validity. It has become modern practice to use postgrant reexamination as a "quality control tool" for patents.

Origin of the Court of Appeals for the Federal Circuit

Pursuant to Senate Resolution 236 of the 85th Congress, Second Session, Margaret M. Conway of the Legislative Reference Service, Library of Congress, prepared Study No. 20 in the series of patent studies, writing (Conway 1959):

> Prior to the creation of the United States Circuit Courts of Appeal in 1891, all appeals in patent cases went directly from the United States circuit courts, which had exclusive jurisdiction in the first instance, to the United States Supreme Court.

With their establishment in 1891, the U.S. circuit courts of appeals, were given final jurisdiction in all cases arising under the patent laws of the United States subject, of course, to the authority of the Supreme Court to call any case before it on *certiorari*.

The result was that conflicting decisions between the circuit courts of appeals made life uncertain for patentees. But Congress failed to act to correct this problem despite the fact that the American Bar Association had advocated the establishment of a special court of patent appeals.

The Congress finally established a single court of patent appeals, which also hears appeals in other selected federal issues, by passing the Federal Courts Improvement Act of 1982. The Court of Appeals for the Federal Circuit (CAFC), which was mentioned in Chapter 3 regarding appeals of certain government contract issues, almost became the single patent court previously

envisioned, although it has more issues to contend with than a single court of patent appeals would have had. The CAFC has had an expansive attitude on what can be patented as reported by Allison, et al. (Footnote 17, p. 129) of (Merges, Menell, and Lemley 2010). But such an expansive attitude appears to be somewhat attenuated by a 2007 U.S. Supreme Court decision in *KSR International Co. v. Teleflex Inc.* (590 U.S. 398). In that case the Supreme Court held that the S. J. Engelgau patent owned by Teleflex was obvious in view of the combination of two references in the prior art (Merges et al., p. 247 *et seq.*).

Patenting of Life Forms

When the Supreme Court looked into the legislative history of the 1952 Patent Act, it decided that "anything under the sun that is made by man" may be patentable under section 101 if the other requirements of Title 35 are met (see H. R. Report No. 1923, at 6, in connection with the Supreme Court decision in *Diamond v. Chakrabarty* [447 U.S. 303 (1980)]. Thus, a new microorganism was found to be patentable as a "composition of matter." P. J. Manso points out that the patenting of "life forms" is not new (Manso 1989). Manso points out, though not directed to modern gene tinkering, that L. Pasteur's patent for "pure yeast" received a U.S. patent in 1873. He also mentions the Cutler patent for a "vaccine virus" (for smallpox) patented a few years later.

Computer Programs and Business Methods

Diamond v. Chakrabarty laid the groundwork for the patentability of computer programs as decided in *Diamond v. Diehr*. An in-depth treatment of software patents is found in a book by Stobbs devoted to that subject (Stobbs 1995). Whole volumes like Stobbs' have been written on computer software patents so a meaningful coverage here is clearly out of the question. Suffice it to say that Burk and Lemley point out, on page 120, that software patents need not disclose either source or object code in a patent application but must merely disclose the *function* of the software! Some guidance appears in the PTO Manual of Patent Examining Procedure available at

http://www.uspto.gov/web/offices/pac/mpep/documents/2100_2161_01.htm (accessed on 8/9/2010)

A decision by the CAFC in 1998 opened the door to the patenting of business methods, especially in the environment of those using computer programs

(software). The case titled *State Street Bank & Trust Co. v. Signature Financial Group* held that financial services software containing an algorithm was patentable. Signature obtained its Patent No. 5,193,056 on a data processing system for hub and spoke financial services configuration. State Street sought a declaratory judgment claiming the patent was unenforceable, that it (State Street) did not infringe the patent and asked for a summary judgment that the patent was invalid because it did not comply with § 101. The CAFC held that a patent claim is acceptable if it involves some practical application and produced a useful, concrete and tangible result, even if it contains an *algorithm.*

Another important case in this area was the June 28, 2010 decision of the U.S. Supreme Court in *Bilski et al. v. Kappos* (Director, U.S. PTO). The petitioner (Bilski) sought protection for an invention that explains how commodities buyers and sellers in the energy market can protect, or hedge, against the risk of price changes using a simple mathematical formula. The PTO rejected Bilski's patent application on the ground that it was not implemented on specific apparatus and merely manipulates an abstract idea in solving a purely mathematical problem. The Board of Patent Appeals and Interferences agreed and the CAFC also affirmed. The Supreme Court heard the case in November 2009 and affirmed the CAFC's decision in 2010, stating that "This Court's precedents provide three specific exceptions to § 101's broad principle: laws of nature, physical phenomena and abstract ideas." Moreover, the Supreme Court stated (from the Syllabus):

> The categorical exclusion (of business method patents) argument is further undermined by the fact that federal law explicitly contemplates the existence of at least some business method patents: Under §273(b)(1), if a patent-holder claims infringement based on 'a method in [a] patent, the alleged infringer can assert a defense of prior use. By allowing this defense, the statute itself acknowledges that there may be business method patents. Section 273 thus clarifies the understanding that a business method is simply one kind of "method" that is, *at least in some circumstances*, eligible for patenting under §101 (emphasis added).

In III of the actual decision, the Court states:

> Rather than adopting categorical rules that might have wide-ranging and unforeseen impacts, the Court resolves this case narrowly on the basis of this Court's decisions in *Benson, Flook,* and *Diehr*, which show that petitioner's claims are not patentable processes because they are attempts to patent abstract ideas. Indeed, all members of the Court agree that the patent application at issue here falls outside of §101 because it claims an abstract idea.

Many observers expected that the U.S. Supreme Court would invalidate *all* methods of doing business but it left that option open. That would have invalidated most of the patents in the PTO class 705!

Algorithms have never been patentable; ironically they are the most valuable part of a computer program! One of the most famous of these is the so-called Cooley–Tukey algorithm which is the basis of the fast Fourier transform (Cooley and Tukey 1965). While no patent apparently ever issued on the Cooley–Tukey algorithm, numerous computer implementations were patented later. Computer programs and algorithms can be copyrighted and that is the protection preferred by the Association for Computing Machinery (ACM), which licenses those (more on that in Chapter 6 on copyright). It is also interesting that the World Trade Organization's *Agreement on Trade-Related Aspects of Intellectual Property Rights* **(TRIPS)** states that: "The TRIPS agreement ensures that computer programs will be protected as literary works under the Berne Convention and outlines how databases should be protected." (More on TRIPS appears in Chapter 5.)

Some interesting statistics on patenting by software start-ups, compared to medical device and biotechnology firms, were recently published (Samuelson 2010). The paper summarizes an extensive 2008 Berkeley Patent Survey. Nearly two-thirds of the software entrepreneurs that were not seeking venture capital backing (at the time) indicated that they do not have and do not seek patent protection for their products! Venture-backed start-ups tended to be more interested in obtaining patents. The reasons for not seeking software patent protection ranged from the cost (reportedly $30,000) to the follow-on costs of enforcing patents.

Infringement

An infringement occurs when one makes, uses, offers to sell, or sells a patented invention within the United States or imports any patented invention during the patent's term (§ 271 of 35 U.S.C.). Recall from Chapter 2 on the UCC (2.312), a seller who is a merchant dealing in goods of the kind warrants that goods shall be free of infringement.

Shop Right

No discussion of intellectual property would be complete without the outline of the shop right. Shop right is a nonstatutory property right in an invention that is made by an employee who has no obligation to assign the patent to his employer. An early case is *Blauvelt vs. Insulator Co.*, 80 Fed. 906. Employee Blauvelt invented a machine for welding pipes. While being employed by Insulator Co., he obtained a patent but was not compensated by Insulator Co.

for its use. The holding was that Insulator Co. had an implied license under the patent (now called a shop right). The shop right is property that is not transferable, as in bankruptcy (Semmes and Van Deventer 1922).

Anatomy of a U.S. Utility Patent

Issued U.S. patents have a regular format that is reviewed here with US 7,772,713 as an example. The patent number appears at the top of the first page along with document code B2 that is specified by the World Intellectual Property Organization (WIPO). The inventors (Huang et al.) and the date of patent (Aug. 10, 2010) follow. The title, "Method and System for Controlling a Wind Turbine," follows, along with the names of the inventors, X. Huang et al., and their countries of citizenship. Next is the assignee (here, General Electric Company, Schenectady, New York). That is followed by the application number (12/570,676) and the filing date (September 30, 2009). A prior publication number (US 2010/0133827 A1) is followed by the U.S. Class (here 290/44) and the Field of Classification Search. Thereafter follows the "References Cited" (U.S. Patent Documents). The references cited by the examiner are identified with (*). Next items are the foreign patent documents, the primary examiner, the attorney, agent or firm, the number of claims (20), four sheets of drawings, and the following Claim 1.

What is claimed is:

> 1. A control system for a wind turbine having a tower, a generator, and at least one rotor blade, said control system comprising:
> a sensor configured to measure the angle of inclination of the tower with respect to a surface; at least one pitch assembly configured to adjust a pitch angle of the rotor blade; and, a controller configured to control at least one of said pitch assembly and the generator based on the angle of inclination.

Figure 4.2 in this book is based on Figure 3 of the patent—a block diagram of an exemplary control loop suitable for use with the wind turbine.

Plant Patents

Chapter 15 of Title 35 U.S.C. covers plant patents in §161 through §164. A plant patent may be granted

> to whoever invents or discovers and asexually reproduces any distinct or new variety of plant, including cultivated sports, mutants, hybrids, and newly found seedlings, other than a tuber propagated plant or a

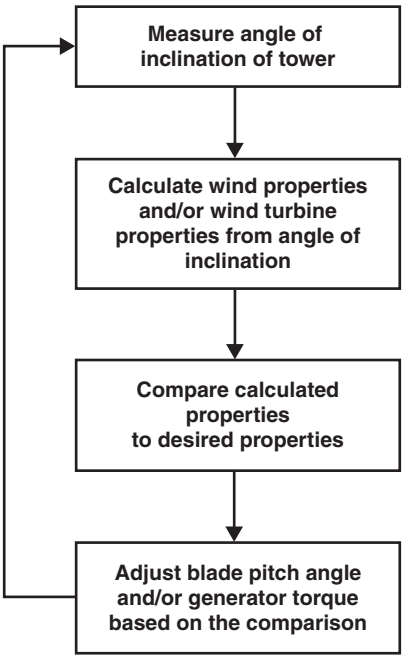


FIGURE 4.2
Operation of the wind turbine of Patent 7,772,713.

> plant found in an uncultivated state, may obtain a patent therefor, subject to the conditions and requirements of this title. The provisions of this title relating to patents for inventions shall apply to patents for plants, except as otherwise provided. Plant patents have only a single Claim and the invention is protected for 20 years after the application date. The President may, by Executive Order, direct the Secretary of Agriculture to assist the PTO Director in special circumstances.

The Plant Variety Protection Act (Public Law 91577, approved December 24, 1970) [7 U.S.C. §2321-2582], or PVPA for short, provides protection for *sexually* reproduced varieties not covered by plant patents. The protection is provided not by a patent but by a "Certificate of Plant Variety Protection." This protection is administered by the Plant Variety Protection Office within the Department of Agriculture located in Beltsville, Maryland.

Design Patents

The statutory basis for design patents appears in Title 35 §171 through §173. §171 states:

> Whoever invents any new, original and ornamental design for an article of manufacture may obtain a patent therefore, subject to the conditions and requirements of this title. The provisions of this title relating to patents for inventions shall apply to patents for designs, except as otherwise provided.

The determinations of what constitutes "prior art" and infringement in design patent cases are much more subjective than they are in most utility patent cases. Designs that are confusingly similar to prior art designs may not obtain patent protection. A major disadvantage of design patents is that they take too long to obtain for a fast-moving "style-oriented" market. Design patents have a term of 14 years from the issue date. Like plant patents, design patents have only a single claim.

Compact Summary of Case: *Sears, Roebuck & Co. v. Stiffel Co.*, 376 U.S. 225 (1964)

This U.S. Supreme Court case examined the question whether a state's unfair competition law can, consistently with the federal patent laws, impose liability for or prohibit the copying of an article which is protected by neither a federal patent nor a copyright.

The Stiffel Co. made and sold a very successful pole lamp. The pole lamp was the subject of two patents, a utility patent and a design patent, both of which were invalidated. Sears copied the pole lamp and sold it at a lower price. Stiffel sued Sears in the U.S. District Court for Northern Illinois for patent infringement and, under Illinois State law, unfair competition. The district court found both patents invalid (not inventions) but ruled Sears guilty of unfair competition and enjoined Sears from selling the lamp. The U.S. Court of Appeals for the Seventh Circuit affirmed the lower court's decision.

Sears then took the case to the U.S. Supreme Court. The injunction was dismissed. The federal patent law prevents copying of a product only when there is a valid patent. If there is no valid patent, the product could be copied and a state law could not give protection that is not recognized by the federal law. Thus, the federal law established the boundaries of protection and the state can not move those boundaries. The fact that the state law spoke in terms of "unfair competition" did not alter the fact than an injunction would give a monopoly to that which is not entitled to a monopoly under the federal patent law.

Note that it is important to note that Sears did not "palm off" its pole lamp as a Stiffel product and that it developed the copy by legal "reverse engineering" and not by an illegal act of some kind. Putting the case title into a standard Web browser will yield additional information on this case.

Patent Clauses in Government Contracts

A typical Authorization and Consent Clause in a government contract, one of several available in Part 52.227 of the Federal Acquisition Regulations (FAR), and a typical patent indemnity clause from the FAR (52.227-3), appear in Chapter 3 in the section on "Government Contracts." There are many more government contract clauses relating to patents but only a few are considered here. Interestingly, the requirement for inclusion of a patent indemnity clause in a government contract for commercial off-the-shelf (COTS) items puts the government contractor in basically the same position he would hold in a commercial sale of goods pursuant to the Uniform Commercial Code (UCC)! The U.S. Army Signal Corps, in its contract with the Wright Brothers for the first airplane delivered to the Government, required the Wright Brothers to indemnify the Government for patent infringement.

Chapter 18 of Title 35 U.S.C. Patent Rights in Inventions Made with Federal Assistance provides the statutory basis of the distribution of patent rights in government contracts. The FAR patent rights policies and clauses are drafted pursuant to Chapter 18 (§200 through §212). These requirements are summarized in Subpart 27.104 General Guidance.

(a) The Government encourages the maximum practical commercial use of inventions made while performing Government contracts.
(b) Generally, the Government will not refuse to award a contract on the grounds that a prospective contractor may infringe a patent.
(c) Generally, the Government encourages the use of inventions in performing contracts and, by appropriate contract clauses, authorizes and consents to such use, even though the inventions may be covered by U.S. patents and indemnification against infringement may be appropriate.
(d) Generally, the Government should be indemnified against infringement of U.S. patents resulting from performing contracts when the supplies or services acquired under the contracts normally are or have been sold or offered for sale by any supplier to the public in the commercial open market or are the same as such supplies or services with relatively minor modifications.
(e) The Government acquires supplies or services on a competitive basis in accordance with Part 6, but it is important that the efforts directed toward full and open competition not improperly demand or use data relating to private developments.
(f) The Government honors the rights in data resulting from private developments and limits its demands for such rights to those essential for Government purposes.
(g) The Government honors rights in patents, data, and copyrights, and complies with the stipulations of law in using or acquiring such rights.

(h) Generally, the Government requires that contractors obtain permission from copyright owners before including privately-owned copyrighted works in data required to be delivered under Government contracts.

Subpart 27.3—Patent Rights under Government Contracts prescribes policies, procedure, and contract clauses with respect to inventions made in the performance of work under a government contract or subcontract thereunder if a purpose of the contract or subcontract is the conduct of experimental, developmental or research work, except when special agency laws (e.g., NASA and DOE) require different policies, procedures and clauses.

27.301 Definitions

As used in this subpart—

"Invention" means any invention or discovery that is or may be patentable or otherwise protectable under Title 35 of the U.S. Code or any novel variety of plant that is or may be protectable under the Plant Variety Protection Act (7 U.S.C. 2321, et seq.).

"Made" when used in relation to any invention, means the *conception* or *first actual reduction to practice* of such invention (emphasis added).

"Nonprofit organization" means a university or other institution of higher education or an organization of the type described in section 501(3) of the Internal Revenue Code of 1954 (26 U.S.C. 501(c), and exempt from taxation under section 501(a) of the Internal Revenue Code (26 U.S.C. 501(a)), or any nonprofit scientific or educational organization qualified under a State nonprofit organization statute.

"Practical application" means to manufacture, in the case of a composition or product, to practice, in the case of a process or method, or to operate in the case of a machine or system; and, in each case, under such conditions as to establish that the invention is being utilized and that its benefits are, to the extent permitted by law or Government regulations, available to the public on reasonable terms.

"Small business firm" means a small business concern as defined at 15 U.S.C. 632 and implementing regulations of the Administrator of the Small Business Administration. (For the purpose of this definition, the size standard contained in 13 CFR 121.308 for small business contractors and in 13 CFR 121.3-12 for small business subcontracts will be used. See FAR Part 19.)

"Subject invention" means any invention of the contractor conceived or first actually reduced to practice in the performance of the work under a Government contract, provided, that in the case of a variety of plant, the date of determination defined in section 41(d) of

> the Plant Variety Protection Act, 7 U.S.C. 2401(d) must also occur during the period of contract performance.

Interesting historical note: A government contractor disputed the rights received by the government under a subject invention of an aircraft on the basis that it had actually reduced the invention to practice by extensive wind tunnel testing of models but the holding was that no amount of experimental wind tunnel testing amounted to an actual reduction to practice, which results when the aircraft is actually built and flown.

27.302 Policy

> (a) Introduction. The policy of this section is based on Chapter 18 of Title 35, U.S.C. (Pub.L.95-517, Pub.L.98-620, 37 CFR Part 401), the Presidential Memorandum on Government Patent Policy to the Heads of the Executive Department and Agencies dated February 18, 1983, and Executive Order 12591, which provides that, to the extent permitted by law, the head of each Executive Department and agency shall promote the commercialization, in accord with the Presidential Memorandum, of patentable results of federally funded research by granting to all contractors, regardless of size, the title to patents made in whole or in part with Federal funds, *in exchange for royalty-free use by or on behalf of the Government* [emphasis added]. The objectives of this policy are to use the patent system to promote the utilization of inventions arising from federally supported research or development, to encourage maximum participation of industry in federally supported research and development efforts; to ensure that these inventions are used in a manner to promote free competition and enterprise; to promote the commercialization and public availability of the inventions made in the United States by United States industry and labor; to ensure that the Government obtains sufficient rights in federally supported inventions to meet the needs of the Government and protect the public against nonuse or unreasonable use of inventions; and to minimize the costs of administering policies in this area.

The contractual nature of the exchange in this paragraph is apparent. There follows much verbiage on the details of how contractor's rights and government's rights are determined in various situations. This subpart includes the "march-in rights" that permit the government to grant licenses in certain situations. The minimum rights to contractor in a subject invention (when the government acquires title) is a revocable, nonexclusive, royalty-free license to that invention throughout the world. The actual patent rights clauses are specified in 52.227-11 Patent Rights—Ownership by the Contractor, and 52.227-13 Patent Rights—Ownership by the Government.

Business Reasons for Applying for a Patent

For the small start-up with a "new idea," the obvious motivation for applying for a patent is to secure its position and obtain venture capital funding. There is little reason to debate the pros and cons of filing. Depending on the nature of the new idea, it may be preferable to rely on trade secret protection (see Chapter 7 on trade secrets). Another reason for filing is to obtain a seat at the patent pool for that industry and to participate in standard setting (see Chapter 11). Both of these motivations are fraught with legal hazards and should be carefully coordinated by legal counsel. A good patent stake can be leveraged into cross licensing deals that permit the small firm greater freedom of action. It is important to be flexible. The tragic story of Bob Kearns, the inventor of the intermittent windshield wiper, is a case in point (Seabrook 2008). Kearns was obsessed with using his patent to monopolize the production of intermittent windshield wipers. He should have licensed the major car companies but refused to do so. In the end, he lost his family, broken up by divorce due to the strain of his involvement in constant litigation to retain the rights to his inventions.

For the larger firm, the situation is somewhat different. Patent applications are like investments of risk capital. As firms grow, they may find it advantageous to build patent portfolios that permit cross licensing, thus saving license fees and enlarging their spheres of business activities. Otherwise, all of the considerations outlined above also apply. The management of a patent portfolio requires special attention to many conflicting considerations. A good source for this activity is the book by Steven J. Frank (Frank 2006).

References

Burk, D.L. and M.A. Lemley. 2009. *The Patent Crisis and How the Courts Can Solve It.* Chicago and London: The University of Chicago Press, p. vii.

Bush, V. 1956. *Proposals for Improving the Patent System,* Committee Print (84th Congress, 2d Session), S.Res.167, Study No. 1.

Cooley, J.W. and J.W. Tukey 1965. An algorithm for the machine calculation of complex Fourier series. *Mathematics of Computation* 19, 90: 297–301 (April 1965).

Denton, F.R. 2010. Software Isn't a Special Patent Case. *The Wall Street Journal*: July 27, p. A18.

Frank, S.J. 2006. *Intellectual Property for Managers and Investors-A Guide to Evaluating, Protecting, and Exploiting IP*. Cambridge: Cambridge University Press.

Jaffe, A.B. and J. Lerner 2004. *Innovation and Its Discontents*. *How our broken patent system is endangering innovation and progress, and what to do about it*. Princeton: Princeton University Press.

Kappos, D.J. 2010. Texas Global Intellectual Property Leadership Summit (attended also by James Pooley, Deputy Director General for Information and Technology at the World Intellectual Property Organization (WIPO), Lee Sowon, Commissioner of the Korean Intellectual Property Office, and other notables).

Manso, P.J. 1989. Biotechnology and patents. In *What Every Engineer Should Know about Patents*, 2nd Ed., W.G. Konold, B. Tittel, D.F. Frei, and D.S. Stallard, 59–67 and Appendix F, New York and Basel: Marcel Dekker (Taylor & Francis).

Merges, R.P., P.S. Menell and M.A. Lemley. 2010. *Intellectual Property in the New Technological Age*, 5th Ed. New York: Wolters Kluwer.

Plotkin, R. 2002. Intellectual property and the process of invention: Why software is different. In Social implications of information and communication technology. *Proceedings of IEEE 2002 International Symposium on Technology and Society.* Ed. J.R. Herkert, New York: IEEE, pp. 236–243.

Samuelson, P. 2004. Why reform the U.S. patent system? *Communications of the ACM* 47, 6: 19–23.

Samuelson, P. 2010. Why do software startups patent (or not)? *Communications of the ACM* 53, 11: 30–32.

Seabrook, J. 2008. *Flash of Genius and Other True Stories of Invention*. New York: St. Martin's Griffen.

Semmes, H.H. and H.R. Van Deventer 1922. *Law Charts and Patent Engineering*. Washington D.C.: The Hayworth Publishing House, p. 93.

Stobbs, G.A. 1995. *Software Patents.* New York: Wiley Law Publications.

U.S. Senate 1956, *Review of the American Patent System*, Report of the Committee on the Judiciary, United States Senate, Eighty-Fourth Congress, Second Session, made by its Subcommittee on Patents, Trademarks and Copyrights, pursuant to S. Res. 92, on The American Patent System, January 30, 1956 (available from the GPO).

Additional Reading

Davis, R., P. Samuelson, M. Kapor, and J. Reichman. 1986. A new view of intellectual property and software. *Communications of the ACM.* 39, 3: 21–29.

5

Patent Processes

Introduction

This is not a "how-to" book, but only an introduction to the subjects treated under the rubric of *contract.* There are several how-to books out there but the first and the best is by San Francisco patent attorney David Pressman (Pressman 2009). Pressman's 15th Edition of *Patent It Yourself* has just been published (May 2011). Not all patent processes have a direct connection to the subject of contract, but the major parts of the process are surveyed here for continuity.

Referring to the semantics of *invention*, the common use of the term is a secondary dictionary definition of something invented or developed. Patent professionals and their clients often use the term to mean something that meets the statutory requirements for protection by a patent as surveyed in Chapter 4 here.

It is understatement to say that the processes are complex! That is especially true in view of the developments in patents on the international stage pursuant to several treaties including the Patent Cooperation Treaty (PCT). The PCT is administered in the United States by the Patent and Trademark Office (PTO). The statutory part of the PCT is covered in 35 U.S.C., Part IV. Patent Cooperation Treaty that includes §351 through §376. In addition to Title 35 U.S.C., patent processes are covered in Title 37 Code of Federal Regulations and the Manual of Patent Examining Procedure (MPEP) mentioned in Chapter 4.

The World Trade Organization (WTO), formerly the General Agreement on Tariffs and Trade (GATT), developed the Agreement on Trade-Related Aspects of Intellectual Property (TRIPS) in 1994. Among other things, the TRIPS agreement permits patentees to attack infringers for the importation of goods infringing the patentees' rights. Other major aspects of TRIPS affecting patents are summarized in Merges et al. (2010) on p. 376. The major provisions of the TRIPS agreement are also summarized in Appendix 4 and at http://www.wto.org/english/thewto_e/whatis_e/agrm7_e.htm (Accessed on 8/17/2010).

Starting the Process

Defining and documenting the invention is very important. Every book about patents that the author has ever seen emphasizes the importance of good record keeping. That is true for any inventor regardless of his situation (self-employed or working for a large company). It is usually desirable to make or have made a search to determine, at least to some extent, the *novelty* of the idea. One may have another person, such as a patent attorney or patent agent, do a search or use a professional searcher. There are distinct advantages to the inventor to do the search himself. He may learn something more of the prior art that surrounds his concept, and thus might sharpen his perception of his "invention." It will also help the inventor work more effectively with the attorney or agent handling his application. Importantly, it may save the inventor substantial time and money by finding "dead ringer" prior art that prevents him from obtaining a patent. Even more importantly, it may avoid the expense of a lost trial for infringement when the infringer finds the damaging prior art that was missed by the PTO examiner's search. There are potential disadvantages of citing prior art that are best explained by a patent attorney. Searching may be conducted online, or at one of the Patent and Trademark Depository Libraries (PTDLs) located around the country. The most efficient search may be performed at the Search Room of the PTO. The Search Room is located at Madison East, First Floor, 600 Dulany Street, in Alexandria, Virginia. Figure 5.1 shows the locations of the Search Room and the Scientific and Technical Library areas of the PTO. Figure 5.2 shows the main entrance to the PTO. Figure 5.3 shows the search room of the PTO.

Making the Decisions to File and How to File

After reviewing the prior art, the inventor or his employer must make a decision on the filing of a patent application. Unemployed inventors can, of course, prepare and file their own patent applications as explained in detail by Pressman. He has even developed a "formula" for helping the unemployed inventor decide whether to file the application himself or have a patent attorney or agent do it (p. 3). There is another option I call the "hybrid option." A bright young engineer of my acquaintance posed the problem. The very small start-up company he worked for could ill afford to have a patent attorney prepare the patent application. I gave him a copy of *Patent It Yourself*, and suggested that he prepare the specification of the patent himself, then have a patent attorney review it and prepare the claims. That procedure worked very well, and the start-up received the following patent:

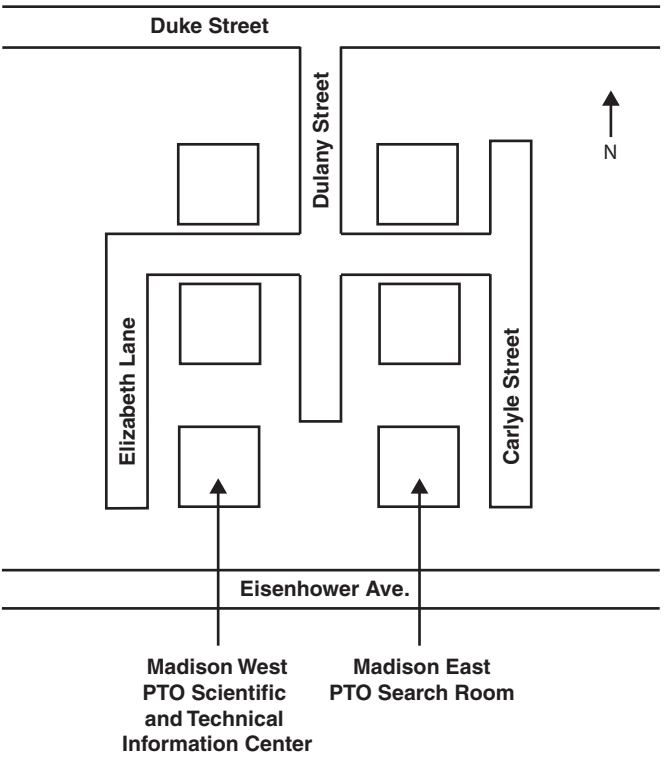


FIGURE 5.1
Locations of the PTO search room and the PTO scientific library.

Occupancy Sensor and Method of Operating Same
USPTO Utility Patent Application No. 08/795,327, Filed February 4, 1997
Patent No. 5,986,357, granted on Nov. 16, 1999.

With that patent in its "portfolio," the start-up was later purchased by a large electrical products company! Decisions on foreign filing should doubtless be made sooner than later to avoid the loss of the U.S. filing date.

Prosecution of Application as Contract Negotiation

The filing of a patent application may be regarded as the *offer* of the invention to the public (after patent expiration) in exchange for a monopoly of limited duration. The Notice of Allowance represents *acceptance*, in contract terms, of the proposed contract.

FIGURE 5.2
Main entrance of the Patent and Trademark Office (PTO). (Photo by the author.)

The patent examiner and the PTO are agents of the public who negotiate the contract. Occasionally, when a pioneering invention is submitted, the examiner may have trouble believing that the invention will work as described and claimed. That was the case for the invention of negative feedback by H. S. Black who was employed at the Bell Telephone Laboratories, Inc.

FIGURE 5.3
Search room of the PTO. (Photo by the author.)

(U.S. Patent 2,102,671, patented December 21, 1937, and others). The examiner did not believe that using negative feedback, as taught by Black, would actually reduce nonlinear amplitude distortion. Harold Black and his attorney had to prepare an elaborate demonstration of the effect by using a linear piecewise approximation to a nonlinear amplifier characteristic to convince the examiner that it actually worked! This happened even though PTO examiners have technical as well as legal expertise in order to perform their tasks.

A detailed flowchart for making decisions on filing is available from the PTO. It can be downloaded at

http://www.uspto.gov/patents/process/index.jsp (accessed 9-6-2010)

Provisional Application for Patent

The USPTO now offers inventors the option of filing a provisional application that is designed to provide a lower-cost first-patent filing. It is unnecessary to include claims and other formal papers, but it does call for filing the description and the drawings; that gives the inventor an early filing date in a subsequent formal application that must be filed within 12 months of the filing of

the provisional application. The filing of a provisional application permits the inventor to mark "patent pending" on his product (Stim and Pressman 2003).

Divisional Applications

If the application as originally filed contains two or more distinct inventions, the PTO director may require the application to be restricted to only one of the inventions (§121 of Title 35 U.S.C.). The other invention may be made the subject of one or more divisional applications.

Final Rejection

After a final rejection at the PTO, the applicant may appeal to the PTO Board of Patent Appeals and Interferences (§134 of 35 U.S.C.). That would be analogous to the filing of an appeal in a contract dispute to the lowest level of appeal. If the Board of Appeals and Interferences decision goes against the applicant, he may appeal to the court of appeals for the federal circuit (CAFC), and, theoretically, to the U.S. Supreme Court (which very seldom accepts such cases). Alternatively, applicant may, after final rejection, file a continuation application or continuation-in-part application.

Continuation or Continuation-in-Part Applications

After a final rejection by the PTO, the applicant may file a continuation application in which he submits new claims he believes to be acceptable. Applicant may not introduce "new matter" in a continuation, only new claims. In a continuation-in-part, applicant may add new matter as well as new claims. These actions are roughly analogous to the reopening of new negotiations in a contractual setting.

Abandonment, Voluntary and Involuntary

If an applicant fails to meet a stated deadline for answering an office action, the application is held to be abandoned (§133 of 35 U.S.C.). An application is

held by the PTO to be abandoned if the applicant files a foreign application in spite of the PTO's imposition of a secrecy order (§181 of 35 U.S.C.) demanding that the application not be filed abroad (§182 of 35 U.S.C.).

Issue of Patent and Possible Extension of Term

A notice of allowance sets the stage for the issuance of the applicant's patent pursuant to §151 of Title 35 U.S.C. The term of a patent is usually 20 years after the application filing date but may, under certain circumstances, be equitably extended if issuance was delayed by an interference action or if a regulatory agency (like the Food and Drug Administration, for example) prevented the marketing of the invention for a time after the patent issued.

Reexamination of Patents

Chapters 30 and 31 of Title 35 U.S.C. cover several situations in which an issued patent may be reexamined as determined by the director of the PTO. Prior art not cited in the patent may invalidate one or more claims of the patent. If all the patent claims were then found to anticipate the invention of the issued patent, the patent could be declared invalid which, in contract terms, is analogous to a failure of consideration (there was no invention given to the public).

Promotion and Exploitation of a Patent

The publication of an application or the announcement of a patent in the *Official Gazette* (*OG*) will likely result in some inquiries from interested parties who watch the *OG* and published applications for such material. The availability of a patent for sale or licensing may also be advertised in the *OG*. Most companies are allergic to "outside inventor" submissions unless based on an issued patent; they do not want to be accused of the theft of an outside inventor's idea. The classic story there is the demise of the Stutz "Bearcat." An outside inventor submitted his proposed design to Stutz Motor Co. for consideration. After reviewing it, Stutz advised the submitter that it could not use the design and that Stutz engineers were coming out with similar designs every day. Stutz later came out with a car very similar to the design that had been submitted by the outsider. The outsider sued (*Booth v. Stutz Motor Car Co.*,

7 Cir., 56F .2d 962). The damages nearly bankrupted Stutz Motors! A good survey of the exploitation options for the lone inventor of a software patent appears in a paper by Abril and Plant (Abril and Plant 2007).

Sale of a Patent

Large companies who can afford the purchase price of a significant patent sometimes buy the patent outright. A sale usually occurs when the buyer sees the patent as an important addition to its portfolio or a likely infringement produced by one of its products. Some significant patents have been purchased when they had only a few remaining years left of their terms. A patent should not be purchased merely to prevent a technology from being used! In some countries, there are legal penalties for such "nonworking" of a patent.

Licensing of a Patent

A patent license is basically a c*ontract*. The consideration given by the licensor is a promise *not* to sue the licensee for infringement of licensor's patent. The consideration given by the licensor is some "good and valuable consideration," usually money. The payment may be made in a lump sum for a royalty-free paid-up license or some other arrangement based on a percentage of the sales of the licensed product. Many patent licenses are exclusive, that is, there is only one firm licensed under the patent. In some cases, a nonexclusive license may be appropriate where more than one firm, or even many firms, are licensed under the patent as when it is adopted by a standards body.

Licenses are often more complex than the simple model described above. In many cases, the licensor and licensee agree to cross license patent portfolios or parts thereof. In many cases, there is also considerable know-how transferred in license agreements, sometimes including trade secrets (see Chapter 7).

Licensing in Patent Pools

Many modern technologies are so complex that they require the licensing of many different patents in order to make manufacturing practical! A solution of that issue often resides in the formation of a patent pool (Hunter 2009). A

patent pool is frequently necessary if several patentees hold "blocking patents," all of which are needed to manufacture a product (or import it). So a patent may be considered an "admission ticket" to a patent pool. As pointed out in Hunter (p. 170), the operations of patent pools are scrutinized by the Federal Trade Commission (FTC) and the Department of Justice (DoJ) for violations of federal law. As a consequence, all such operations must be undertaken with competent legal advice on these issues. The operation of a patent pool is roughly analogous to a multiparty contract negotiation where the contributions are weighed to determine the compensation for each patentee.

A "reverse" patent pool is reported wherein patentees donate software patents to a common patent pool started by Richard Stallman (Besaha 2003). The participants then use the patents in the pool royalty free (and litigation free).

Alternative Dispute Resolution (ADR)

When a potential licensor and licensee cannot agree on the terms for a license, it is sometimes prudent to seek an alternative to litigation in the form of an alternate dispute resolution using mediation or arbitration (Frank 2006). Economies in the process may be realized by using specialized mediators or arbitrators with knowledge and experience in resolving patent disputes. If the litigants are resident in different countries, the TRIPS framework provides an alternative dispute resolution analogous to all trade related disputes.

Litigation

Litigation is frequently considered to be a failure of the system in some areas. Lawsuits are very expensive and time consuming and take management's attention away from running its business. The outcome is uncertain and subject to appeal. There is a tendency to "forum shop" by plaintiffs in infringement actions. A prime example of that is the widely used Federal District Court for the Eastern District of Texas in Marshall, Texas. The District Court in Marshall established a quick way of handling its patent cases in what is called a "rocket docket." The court in Marshall is reportedly biased in favor of patentees and reportedly hands out very generous damages. There are so many patent infringement suits filed in Marshall that they have become a local industry for the town, in addition to the pottery production and outstanding Christmas lights which bring in many tourists (Head 2010).

Another popular method for patentees to pursue infringers is to file a complaint with the U.S. International Trade Commission to stop the importation

of allegedly infringing products. Lexmark, the printer maker, recently (2010) filed such a complaint as well as a regular infringement suit in federal court, against the importing and sale of replacement laser printer cartridges (Stynes 2010).

References

Abril, P.S. and R. Plant. 2007. The patent holder's dilemma: Buy, sell or troll?. *Communications of the ACM* 50, 1: 37–44, Jan. 2007.

Besaha, R. 2003. Viewpoint—bounty hunting in the patent base. *Communications of the ACM*. 46, 3: 27–29, Mar. 2003.

Frank, D.J. 2006. *Intellectual Property for Managers and Investors*. Cambridge: Cambridge University Press.

Head, A. 2010. We Are Marshall. *Texas Highways Travel Magazine*. Austin: Texas Department of Transportation. pp. 10–11.

Hunter, R.D. 2009. *Standards, Conformity Assessment and Accreditation for Engineers*. Boca Raton: Taylor & Francis.

Merges, R.P., P.S. Menell, and M.A. Lemley. 2010. *Intellectual Property in the New Technological Age*, 5th Ed. New York: Wolters Kluwer.

Stim, R. and D. Pressman. 2003. *Patent Pending in 24 Hours*, 2nd Ed., Step-by-step instructions for preparing & filing a provisional patent application. Berkeley, California: NOLO Press.

Stynes, T. 2010. Printer Maker Claims Firms Infringed on Its Patents. *The Wall Street Journal*, August 24, B2.

Pressman, D. 2006. *Patent It Yourself*: *Your Step-By-Step Guide to Filing at the U.S. Patent Office*, 14th Ed. Berkeley: NOLO Press.

6

Copyright

Introduction

The copyright laws are included in Chapters 1 though 8 and Chapters 10 through 12 of Title 17 of the U.S. Code (U.S.C.). The copyright laws are based on The Copyright Act of 1976 which was enacted on October 19, 1976 as Pub. L. No. 94-553, 90 Stat. 2541. There have been approximately 50 amendments to the copyright law since then, only a few of which are of interest here. These statutory enactments include amendments related to copyright protection for computer programs (Pub. L. 96-517, enacted on December 12, 1980); the Semiconductor Chip Protection Act (Pub. L. No. 98-620, Nov. 8, 1984, adding Chapter 9 to Title 17); the Berne Convention Implementation Act (Pub. L. No. 100-568 enacted October 31, 1988) and the Architectural Works Copyright Protection Act (Pub. L. No. 10-650, enacted on December 1, 1990). Other major amendments affecting Title 17 U.S.C. include the North American Free Trade (NAFTA) Implementation Act (Pub. L. No. 103-182 enacted December 8, 1993); the No Electronic Theft (NET) Act (Pub. L. No. 105-147, enacted December 16, 1997), and the Sonny Bono Copyright Term Extension Act (Pub. L. 105-298) enacted October 27, 1998 (CTEA). The Digital Millennium Copyright Act (Pub. L. No. 105-304) enacted October 28, 1998 (DMCA) had a major impact on the copyright law as will be surveyed here. It should be noted that Chapters 9 and 13 of Title 17 include statutory design protections that are not included in the copyright law as such. Title 17 of the U.S.C. is published in Circular 92 along with related laws. Circular 92 is available online at:

http://www.copyright.gov/title17/index.html (accessed 9/6/2010).

A print copy may also be ordered from the U.S. Government Bookstore ($28).

As indicated in Chapter 4 here on patents, this is not a how-to book. Much of that is covered in Title 37 C.F.R. and in other publications such as *The Copyright Handbook* by attorney Stephen Fishman (Fishman 2004).

The Copyright Office is part of the Library of Congress and is located at 101 Independence Avenue SE in Washington, D.C. The Register of Copyrights is the director of the Copyright Office and is appointed by the Librarian of Congress to whom she reports. The general responsibilities and organization

TABLE 6.1

Chapters and Appendices of Title 17 U.S.C.

Preface: Amendments to Title 17 since 1976
Chapter 1: Subject Matter and Scope of Copyright
Chapter 2: Copyright Ownership and Transfer
Chapter 3: Duration of Copyright
Chapter 4: Copyright Notice, Deposit and Registration
Chapter 5: Copyright Infringement and Remedies
Chapter 6: Manufacturing Requirements, Importation and Exportation
Chapter 7: Copyright Office
Chapter 8: Proceedings by Copyright Royalty Judges
Chapter 9: Protection of Semiconductor Chip Products
Chapter 10: Digital Audio Recording Devices and Media
Chapter 11: Sound Recordings and Music Videos
Chapter 12: Copyright Protection and Management Systems
Chapter 13: Protection of Original Designs
Appendix A: The Copyright Act of 1976
Appendix B: The Digital Millennium Copyright Act of 1998
Appendix C: The Copyright Royalty and Distribution and Reform Act of 2004
Appendix D: The Satellite Home Viewer Extension and Reauthorization Act of 2004
Appendix E: The Intellectual Property Protection and Courts Amendment Act of 2004
2009 Appendix F, Title 18: The Prioritizing Resources and Organization for Intellectual Property Act of 2008
2009 Appendix G, Title 18: Crimes and Criminal Procedure, U.S. Code
2009 Appendix H, Title 28: Judiciary and Judicial Procedure, U.S. Code
2009 Appendix I, Title 44: Public Printing and Documents, U.S. Code
2009 Appendix J: The Berne Convention Implementation Act of 1988
2009 Appendix K: The Uruguay Round Agreements Act of 1994
2009 Appendix L: GATT/Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement, Part II
2009 Appendix M: Definition of "Berne Convention Work"

of the Copyright Office and related matters are included in § 701 through § 709 of Chapter 7 in Title 17. Additional regulations for the operation of the Copyright Office appear in Chapters II and III of Title 37 Code of Federal Regulations (CFR).

Table 6.1 includes the following Chapters and Appendices of Title 17 U.S.C.

Copyright as Contract

As may be recalled from Chapter 4 here, the same Copyright and Patent clause of the Constitution, Art. I, §8, cl. 8 that provides rights to inventors also

provides rights to authors. The contractual nature of this concept is readily apparent as it is for patents. The original right under the copyright law was for a term of 14 years, with a one term addition of 14 more years available (to surviving authors). Congress' power to extend the duration of copyright was exercised in 1831, 1909, and 1976. For a natural person author, the CTEA extended the copyright term from the life of the author plus 50 years to the life of the author plus 70 years (well over a century for a young author). The terms of corporate holders of rights was also extended into the century time frame. There is a coterie of people (natural and otherwise) who maintain that copyright should be perpetual, in spite of the constitution's "limited times" requirement. It is rather difficult for a person not learned in the law, like this author, to understand how such long copyright terms "promote the progress" aim of the constitution. This looks, to the uninitiated, like a "failure of consideration" (in contract terms) where the bargain for the public welfare is frustrated. The 20-year extension of copyright resulting from CTEA was challenged in the courts by some who thought that it was excessive and beyond Congress' power (Lessig 2004). The combined effect of the NET and CTEA legislation would make some people felons who had previously enjoyed the rights inherent in the public domain. One of those people is Eric Eldred, who published public domain material on the Internet. Petitioners Lessig and others filed suit in the U.S. District Court for the District of Columbia (Washington, D.C.) to overturn CTEA. The district court found against the petitioners as did the U.S. Court of Appeals for the District of Columbia Circuit. As a result, the case, *Eldred v. Ashcroft*, was granted certiorari by the U.S. Supreme Court. The following Compact Summary of Case surveys the issue. Placing the case in the usual search engines will provide more details.

Compact Summary of Case: *Eric Eldred et al., Petitioners v. John D. Ashcroft, Attorney General* (No. 01-618). Argued October 9, 2002; decided January 15, 2000.

In 1998, Congress increased the duration of copyrights by 20 years by the Copyright Term Extension Act (CTEA), Pub. L. 105-298, amending 17 U.S.C. §302 and §304. Petitioners hold that products and services that build on the *public domain* were "short-changed" by CTEA and ask the court to find that Congress exceeded its authority to extend the copyright term in view of the "limited times" requirement of the Copyright Clause. Petitioners also opposed the extension on other grounds of little direct interest here. Petitioners did not challenge the CTEA extension for new works but challenged the extension of copyright terms for existing works. One of the arguments made by Respondent for extending the copyright term was a 1993 European Union (EU) Directive that required EU Member countries to

establish a copyright term of author's life plus 70 years. Pursuant to the Berne Convention, the EU directed its members to deny that term to the works of any non-EU country whose laws did not secure the same life + 70-year term. The Court found for defendants, that Congress did not exceed its authority in extending the copyright term by 20 years.

In his memoir on the Eldred case, Lawrence Lessig maintains that the Eldred case could have (and should have) been won; he blames himself for that failure (see Chapter 13 of Lessig). The resulting shrinkage of the public domain, works whose copyrights have expired or been dedicated to the public, has been lamented by many, including librarians (Gasaway 2009).

Survey of Copyright Law in Title 17 U.S.C.

This survey does not include all of the chapters or even all of the sections in selected chapters. The goal is to *survey* that part of Title 17 that is of most interest to engineers. The definitions in §101, for example, run to over six pages, too long for this work. So only selected definitions are included here (most of the deleted ones are intuitively clear enough). Also, the chapter end notes, indicated in superscripts, have been deleted for brevity.

Chapter 1: Subject Matter and Scope of Copyright

§ 101 Definitions

Except as otherwise provided in this title, as used in this title, the following terms and their variant forms mean the following:

> An "architectural work" is the design of a building as embodied in any tangible medium of expression, including a building, architectural plans, or drawings. The work includes the overall form as well as the arrangement and composition of spaces and elements in the design, but does not include individual standard features.
>
> A "collective work" is a work, such as a periodical issue, anthology, or encyclopedia, in which a number of contributions, constituting separate works in themselves, are assembled into a collective whole.
>
> A "compilation" is a work formed by the collection and assembling of preexisting materials or of data that are selected, coordinated, or arranged in such a way that the resulting work as a whole constitutes an original work of authorship. The term "compilation" includes collective works.
>
> A "computer program" is a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result.

A work is "created" when it is fixed in a copy or phonorecord for the first time; where a work is prepared over a period of time, the portion of it that has been fixed at any particular time constitutes the work as of that time, and when the work has been prepared in different versions, each version constitutes a separate work.

A "derivative work" is a work based upon one or more preexisting works, such as a translation, musical arrangement, dramatization, fictionalization, motion picture version, sound recording, art reproduction, abridgment, condensation, or any other form in which a work may be recast, transformed, or adopted. A work consisting of editorial revisions, annotations, elaborations, or other modifications, which, as a whole, represent the original work of authorship, is a "derivative work."

A "joint work" is a work prepared by two or more authors with the intention that their contributions be merged into inseparable or interdependent parts of a unitary whole.

"Literary works" are works, other than audiovisual works, expressed in words, numbers, or other verbal or numerical symbols or indicia, regardless of the nature of the material objects, such as books, periodicals, manuscripts, phonorecords, film tapes, disks, or cards, in which they are embodied.

A "work of the United States Government" is a work prepared by an officer or employee of the United States Government as part of that person's official duties.

A "work made for hire" is—

(1) a work prepared by an employee within the scope of his or her employment; or

(2) a work specially ordered or commissioned for use as a contribution to a collective work…if the parties expressly agree in a written instrument signed by them that the work shall be considered a work made for hire.

AUTHOR'S NOTE: The definition of a work made for hire abstracted above is more complex, than shown here but it does illustrate the importance of a *contract* in resolving such issues (see Chapter 3 on employment and consulting agreements).

§ 102 Subject Matter of Copyright: In General

(a) Copyright protection subsists, in accordance with this title, in original works of authorship fixed in any tangible medium of expression, now known, or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device. Works of authorship include the following categories:

(1) literary works;

(2) musical works, including any accompanying words;

(3) dramatic works, including any accompanying music;

(4) pantomimes and choreographic works;
(5) pictorial, graphic, and sculptural works;
(6) motion pictures and other audiovisual works;
(7) sound recordings; and
(8) architectural works.

(b) In no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work.

AUTHOR'S NOTE: Computer programs are copyrighted as "literary works" in § 102(a). Paragraph 102 (b) is usually stressed in writings on copyright. It is often referred to as the "idea-expression dichotomy." The idea cannot be copyrighted in view of subsection (b), only the *expression* of the idea (procedure, process, system, method of operation, concept, principle, or discovery) is protectable by copyright. A further development of this principle is called the "merger doctrine," where the idea is expressible in only one way (or a very few ways). That seems to violate a principle of general semantics! Ontology is supposed to provide several ways of describing the same thing. In any event, the merged idea-expression is deemed to be outside of copyright protection.

§ 103 Subject Matter of Copyright

Compilations and derivative works:

(a) The subject matter of copyrights as specified by section 102 includes compilations and derivative works, but protection for a work employing preexisting material in which copyright subsists does not extend to any part of the work in which such material has been used unlawfully.

(b) The copyright in a compilation or derivative work extends only to the material contributed by the author of such work, as distinguished from the preexisting material employed in the work, and does not imply any exclusive right in the preexisting material. The copyright in such work is independent of, and does not affect or enlarge the scope, duration, ownership, or subsistence of, any copyright protection in the preexisting material.

§ 104 Subject Matter of Copyright: National Origin and 104A

Copyrights in restored works are not of direct interest to engineers, so they are not discussed here.

§ 105 Subject Matter of Copyright: United States Government Works

Copyright protection under this title is not available for any work of the U.S. government, but the U.S. government is not precluded from receiving and holding copyrights transferred to it by assignment, bequest, or otherwise.

§ 106 Exclusive Rights in Copyrighted Works

Subject to sections 107 through 122, the owner of copyright under this title has the exclusive rights to do and authorize any of the following:

(1) to reproduce the copyrighted work in copies or phonorecords;
(2) to prepare derivative works based on the copyrighted work;
(3) to distribute copies or phonorecords of the copyrighted work to the public by sale or other transfer of ownership, or by rental, lease, or lending;
(4) in the case of literary, musical, dramatic, and choreographic works, pantomimes, and motion pictures and other audiovisual works, to perform the copyrighted work publicly;
(5) in the case of literary, musical, dramatic, and choreographic works, pantomimes, and pictorial, graphic, or sculptural work, to display the copyrighted work publicly; and
(6) in the case of sound recordings, to perform the copyrighted work publicly by means of a digital audio transmission.

Section 106A relates to works of visual art and hence it is of little interest here.

§ 107 Limitations on Exclusive Rights: Fair Use

Notwithstanding the provisions of Sections 106 and 106A, the fair use of a copyrighted work, including such use by reproduction in copies or phonorecords or by any other means specified in that section, for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research, is not an infringement of copyright. In determining whether the use made of a work in any particular case is a fair use the factors to be considered shall include—

(1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes;
(2) the nature of the copyrighted work;
(3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and
(4) the effect of the use upon the potential market for or value of the copyrighted work.

The fact that a work is unpublished shall not itself bar a finding of fair use if such finding is made upon consideration of all of the above factors.

§§ 108–116

Of little current interest to most engineers and so are not included here.

§ 117

Permits the noninfringing copy or adaptation of a computer program pursuant to Pub. L. 96-517 in 1998 (the Computer Maintenance Competition Assurance Act) subject to certain restrictions. This section was stipulated as Title III of the Digital Millennium Copyright Act (DMCA) of 1998.

§§ 118–119

Of little interest to most engineers and so are omitted here.

§ 120 Scope of Exclusive Rights in Architectural Works

(a) Pictorial Representations Permitted. The copyright in an architectural work that has been constructed does not include the right to prevent the making, distributing, or public display of pictures, paintings, photographs, or other pictorial representations of the work, if the buildings in which the work is embodied is located in or ordinarily visible from a public place.

(b) Alterations to and Destruction of Buildings. Notwithstanding the provisions of section 106(2), the owners of a building embodying an architectural work may, without the consent of the author or owner of the architectural work, make or authorize the making of alterations to such building, and destroy or authorize the destruction of such building.

Sections §§ 121–122
Of little interest to most engineers and so are omitted here.

Chapter 2: Copyright Ownership and Transfer

Except for works made for hire, the owner of the copyright vests in the original author or authors. Ownership of the copyright may be transferred in whole or in part, by suitable *contract*, will, etc. A distinction is made between the ownership of the copyright and the ownership of the material object in which the work is embodied. Terminations of transfers and licenses granted by the author are discussed in § 203. Section 204 prescribes how transfers of copyright ownership may be executed and Section 205 relates to the recordation of transfers and other documents.

Chapter 3: Duration of Copyright

§ 301
Preempts state laws and certain other laws on and after January 1, 1978.

§ 302 Duration of Copyright: Works Created on or after January 1, 1978

(a) In General. Copyright in a work created on or after January 1, 1978, subsists from its creation and, except as provided by the following subsections, endures for a term consisting of the life of the author and 70 years after the author's death.
(b) Joint Works. In the case of a joint work prepared by two or more authors who did not work for hire, the copyright endures for a term consisting of the life of the last surviving author and 70 years after such last surviving author's death.

The remaining subsections, (c), (d), and (e), articulate the durations of "Anonymous Works, Pseudonymous Works, and Works Made for Hire," as well as related recordation issues. Sections 303, 304, and 305 further define the durations of copyrights under various scenarios. A convenient source that summarizes the various durations of copyrights under different conditions appears in Table 4.1: Duration of Copyright Protection, p. 509 of Merges et al. (2010).

Chapter 4: Copyright Notice, Deposit, and Registration

§ 401 Notice of Copyright: Visually Perceptible Copies

(a) General Provisions. Whenever a work protected under this title is published in the United States or elsewhere by authority of the copyright owner, a notice of copyright as provided by this section may be placed on publicly distributed copies from which the work can be visually perceived, either directly or with the aid of a machine or device.
(b) Form of Notice. If a notice appears on the copies, it shall consist of the following three elements:
    (1) the symbol © (the letter C in a circle), or the word "Copyright," or the abbreviation "Copr."; and
    (2) the year of first publication of the work; in the case of compilations or derivative works incorporating previously published material, the year date of first publication or derivative work is sufficient. The year date may be omitted where a pictorial, graphic or sculptural work, with accompanying text matter, if any, is reproduced in or on greeting cards, postcards, stationery, jewelry, dolls, toys, or any useful articles; and
    (3) the name of the owner of copyright in the work, or an abbreviation by which the name can be recognized, or a generally known alternative designation of the owner.

The remaining subsections (c) and (d) as well as the sections 402 through 406 specify the required notices for various circumstances. Sections 407–412 relate to the deposit of copies in the Library of Congress and copyright registration (registration is not a requirement but is needed before a suit for infringement is instituted).

Chapter 5: Copyright Infringement and Remedies

§ 501 Infringement of Copyright

(a) Anyone who violates any of the exclusive rights of the copyright owner as provided by sections 106 through 122 or of the author as provided in section 106A, or who imports copies or phonorecords into the United States in violation of section 602, is an infringer of the copyright or right of the author, as the case may be. For purposes of this chapter (other than section 506), any reference to copyright shall be deemed to include the rights conferred by section 106A(a). As used in this subsection, the term "anyone" includes any State, and any officer or employee of a State or instrumentality of a State acting in his or her official capacity. Any State, and any such instrumentality, officer or employee, shall be subject to the provisions of this title in the same manner and to the same extent as any nongovernmental entity.

(b) The legal or beneficial owner of an exclusive right under a copyright is entitled, subject to the requirements of section 411, to institute an action for any infringement of that particular right committed while he or she is the owner of it. The court may require such owner to serve written notice of the action with a copy of the complaint upon any person shown, by the records of the Copyright Office or otherwise, to have or claim an interest in the copyright, and shall require that such notice be served upon any person whose interest is likely to be affected by a decision in the case. The court may require the joinder, and shall permit the intervention, of any person having or claiming an interest in the copyright.

Subsections (c) through (f) relate to infringement involving cable and satellite systems and are of limited interest to most engineers, so they are omitted here. Sections 502 to 511 relate to remedies, criminal offenses, legal actions, notifications, seizure and forfeiture, cable systems and States' liabilities, and are not of sufficient interest to most engineers to be included here.

§ 512 Limitations on Liability Relating to Material Online

The Online Copyright Infringement Liability Act, Title II of the Digital Millennium Copyright Act, Pub. L. No. 105-304 added a new §512 to Title 17 U.S.C. (October 28, 1998). The DMCA thus provided a limited immunity of Internet service providers (ISPs) for infringement of copyright material transferred over or stored in their networks. This limited immunity, sometimes called the "safe harbor," requires the ISP to take certain actions to avoid liability; the main action is the taking down (removal of accused material) when demanded by copyright owners. The ISP must comply with rules concerning the "refreshing, reloading, or other updating when the originator makes the online material available online *in accordance with a generally*

accepted industry standard protocol" (emphasis added). This points up again the importance of standards as outlined in Chapter 9 of this book.

§ 513 Determination of Reasonable License Fees for Individual Proprietors

This section relates to performing rights societies, such as ASCAP, and is of little interest to engineers.

Chapter 6: Manufacturing Requirements, Importation, and Exportation

Chapter 6 covers the manufacture, importation, and public distribution of certain copies, defines infringing importation of copies or phonorecords and importation prohibitions. It is of little interest to engineers.

Chapter 7: Copyright Office

Chapter 7 describes the organization of the Copyright Office, its regulations and procedures for handling forms, fees and other matters. Some of this material has been included earlier in Chapter 6 of this book.

Chapter 8: Proceedings by Copyright Royalty Judges

Chapter 8 describes the establishment and function of the copyright royalty judges but is of limited interest to engineers.

Chapters 9 and 13, Protection of Semiconductor Chip Products and Protections of Original Designs are not part of the copyright laws as such; they are covered below under Noncopyright Parts of Title 17.

Chapter 10: Digital Audio Recording Devices and Media

Chapter 10 was added to Title 17 by the Audio Home Recording Act of 1992 (Pub. L. No. 102-563). The act was a major departure from classical copyright regime in that licenses for audio works were mandated for the first time. Copyright holders were concerned that digital audio recorders would permit unlimited copying of their works without compensation. Recording devices were required to incorporate the Serial Copy Management System or an equivalent system that prevents the making of more than one copy of an audio record (§ 1002). There was also a prohibition of circumvention of the copying control system.

"Royalty payments" (§ 1003) are actually levies on both the recording devices and the media on which copies might be made. These levies are administrated by the Register of Copyrights, which requires the filing of quarterly and annual statements of account regarding royalties paid (§ 1004). The royalty payments are placed into accounts administered by the Register of Copyrights and several licensing organizations to be periodically shared

with the artists whose audio (usually music) was used. The allocation of royalty payments within the several groups involved is submitted to a copyright royalty judge when voluntary agreement cannot be reached. Arbitration thus replaces litigation (§ 1007) and certain infringement actions are prohibited (§ 1008) although civil remedies are permitted under § 1009. The arbitration of certain disputes is prescribed in § 1010, including a possible appeal to the U.S. Court of Appeals for the District of Columbia Circuit. Chapter 10 was the first example of the application of copying controls.

Chapter 11: Sound Recordings and Music Videos

The Uruguay Round Agreements Act (Pub. L. No. 103-465) added Chapter 11 to Title 17 in 1994. The purpose of Chapter 11 is to prevent the unauthorized recording, and subsequent copying, of sound recordings and music videos without the consent of the *live* performers (emphasis added). That copying at live performances is apparently becoming more common and difficult to control (Jurgensen 2010).

Chapter 12: Copyright Protection and Management Systems

Chapter 12 of Title 17 includes the WIPO Copyright and Performances and Phonograms Treaties Implementation Act of 1998 is Title I of the Digital Millennium Copyright Act (DMCA) mentioned earlier. Chapter 12 includes two topics of major interest here, the circumvention of copyright protection systems (§ 1201) and the integrity of copyright management information (§ 1202).

Copyright protection systems are those that employ a "technical measure" that prevents the unauthorized access to a copyrighted work. Rule-making proceedings to implement § 1201 are entrusted to the Librarian of Congress, the Register of Copyrights, and the Assistant Secretary for Communications and Information of the Department of Commerce. It is a violation of this section to manufacture, import, offer to the public, provide, or otherwise traffic in any technology, product, service, device, component, or part that is primarily designed or produced for the purpose of circumventing a technological measure that effectively controls access to a work protected under this title. Extensive adverse commentary on the Digital Rights Management (DRM as it is called), appeared in the April 2003 issue of the Communications of the ACM. One of the best treatments there is a paper by Pamela Samuelson (Samuelson 2003).

Certain exemptions to the requirements of § 1201 are carved out for nonprofit libraries, archives, and educational institutions, as well as for law enforcement, intelligence, and other governmental activities, including encryption research.

Copyright management information is defined in § 1202 (c) and includes, among other things, the title and information identifying the work to

preserve the integrity of copyright management systems. The alteration of this information, or the provision of false information is prohibited in this chapter. Again, an exception is carved out for law enforcement, intelligence, and other government activities. The remainder of Chapter 12 on civil remedies, criminal offenses, and penalties are of much interest to engineers.

Additional Notes on Copyright and Computer Programs

The following material is intended to provide some practical information on the copyright of algorithms and computer programs. It is far from exhaustive but should be of interest to engineers outside of the "computer professions." The first is this author's brief abstract of a published algorithm.

Collected Algorithms from ACM (Association for Computing Machinery)

Algorithm 816: *r2d2lri*—An Algorithm for Automatic Two-Dimensional Cubature

(AUTHOR'S NOTE: Cubature is a numerical analysis method of evaluating multiple integrals)

Ian Robinson and Michael Hill, both of La Trobe University, Bundoora, Victoria 3086 Australia

This paper describes a non-adaptive algorithm implemented in C++ for performing automatic cubature over a wide variety of finite and non-finite two-dimensional domains. Of interest here is the way in which the ACM handles the copyright issue.

Apple Computer, Inc. v. Franklin Computer Corp.

This prominent copyright infringement case resulted when Franklin Computer Corp. copied some of Apple's "firmware" that was resident in ROM (Read Only Memory). Franklin admitted copying the program for use in its Apple-compatible computer but claimed that copyright law does not cover programs resident on ROM. The District Court (Eastern District of Pennsylvania) found for Franklin but Apple appealed to the Court of Appeals for the Third Circuit. The Court of Appeals, relying on its own previously developed case law, not only found that ROM resident object code could be copyrighted but that the computer operating system itself could be copyrighted. Entering the title of the case in any search engine will supply more details.

The Copyright: Handmaiden of Open Source

Most people understand the basic notion of "open source" in the software world, and many actually use open source software to replace proprietary software, for example, Gmail instead of a proprietary email software package. Much current interest on open systems is focused on Linux, a variant of UNIX®. This UNIX Trademark is now owned by the Open Group, a standards development consortium described by Hunter (Hunter 2009). Developers of Linux software operate as developers of "derivative works." This makes copyright more complex for Linux but also makes licensing much more flexible (Lindberg 2008). The trademark for Linux is owned by its creator, Linus Torvalds. A good survey of open source that profiles the development of Linux was published in 2002 (Dempsey et al. 2002). Lindberg defines open source in terms of free distribution, use of source code, derivative works, license distribution, and other conditions that preserve control of the open source software. General Public Licenses (GPL), including the GNU General Public License, are among those described. Lindberg reviews the damping effect of the Digital Millennium Copyright Act on reverse engineering, which he also addresses. A major feature of Lindberg's book is an Open Source License List in Appendix B.

Survey of Noncopyright Law in Title 17

As pointed out previously, Chapter 9, Protection of Semiconductor Chip Products and Chapter 13, Protection of Original Designs, were included in Title 17 even though they are not part of the copyright laws as such. Both of

these programs are hybrids of patent and copyright law, using some of the language from each but administered by the Director of Copyrights. Both were influenced by the TRIPS international intellectual property agreements.

Chapter 9: Protection of Semiconductor Chip Products

The manufacture of integrated circuits (ICs) usually involves the making of one or more *masks* that define the circuit layout. The process is described briefly in Figure 4.1 of *Introduction to VLSI Systems*, which shows how pattern generation and mask making enter into the process (Meade and Conway 1980). Early on, the mask designs that IC manufacturers used in the fabrication process were subject to copying by competitors who could thus avoid the considerable time and expense required for the process. To remedy this problem, the Semiconductor Chip Protection Act of 1984 added Chapter 9 to Title 17. "A "mask work" is defined in § 901(a)(2) as a series of related images, however fixed or encoded-(A), having or representing the predetermined three-dimensional pattern of metallic, insulating, or semiconductor material present or removed from the layers of a semiconductor chip product, and (B) in which series the relation of the images to one another is that each image has the pattern of the surface of one form of the semiconductor chip product."

The subject matter of protection was expanded in § 902(a)(2) by Presidential Proclamation pursuant to the TRIPS agreement. As it does in copyright law, the owner of a mask work is the person who created it, unless it is a work for hire, in which case the employer owns it. The ownership, transfer, licensing, and recordation may be recorded in the Copyright Office but there is nothing compared to the examination of a patent application as required under Title 35 U.S.C. (patents). The rights in a mask work have a 10-year duration (§ 904). The exclusive rights in mask works includes the right to do or authorize any of the following: (1) to reproduce the mask work by optical, electronic, or any other means; (2) to import or distribute a semiconductor chip product in which the mask work is embodied; and (3) to induce or knowingly cause another person to do any of the acts described in (1) and (2). Reverse engineering is permitted under § 906. Innocent infringement is excused prior to notice by § 907.

The registration of claims of protection may be obtained upon suitable application to the Register of Copyrights. The mechanics of registration are prescribed by the Register of Copyrights in Title 37, Code of Federal Regulations (CFR). A mask work notice may be placed on the masks or the semiconductor chips embodying the mask work by using the terms "mask work," the symbol *M*, or the symbol M (in a circle) and the owner or the trade name by which the owner is generally known (§ 909). The remaining sections of Chapter 9 involve the enforcement of exclusive right, civil actions, relation to other laws, and other material of interest mostly to lawyers.

Chapter 13: Protection of Original Designs

The designs protected are outlined in § 1301 as "original design of a *useful article* that makes it attractive or distinctive in appearance to the purchasing or using public." The emphasis on "useful article" in Chapter 13 distinguishes such designs from the design patent and copyright regimes which do not apply to useful articles. Section 1301(a)(2) through 1301(b)(6) focuses on "vessel hulls" with a "carve out" in § 1302(4) itemization of designs that are not subject to protection. This part of Chapter 13 implements the Vessel Hull Design Protection Act, Title V of the Digital Millennium Copyright Act

(Pub. L. No. 105-304, enacted October 28, 1998). Designs that are not subject to protection (§ 1302) are those that are (1) not original, (2) staple or commonplace such as a standard geometric figure, a familiar symbol, an emblem, or motif, or another shape, pattern, or configuration which has become standard, common, prevalent, or ordinary, (3) different from a design excluded by paragraph (2) only in insignificant details or elements commonly used in the relevant trades, or (4) embodied in a useful article that was made public by the designer or owner in the United States or a foreign country more than 2 years before the date of application for registration under this chapter.

The application for registration of a design is made to the Administrator (the Register of Copyrights) at the Copyright Office of the Library of Congress. Unlike patent applications, no detailed examination of the application is performed. Like copyrights, the employer is the owner of the design if it is a work made for hire (§ 1310(g)). Notices of registered designs are published and are subject to an "opposition proceeding" under § 1313 if a person believes she/he will be damaged by that registration. Once a design is registered, it may be marked to indicate that by the words "Protected Design," the abbreviation "Prot'd Des.," or the letter "D" in a circle, or the symbol "*D*," or the date that protection starts and the name of the owner (§ 1306). The protection for a design starts on its publication of the registration or the date that the design is first made public (§ 1304). Section 1305 specifies a 10-year duration, beginning on the date specified in § 1304.

Section 1308 defines the exclusive rights of the owner of a design to make, have made, or import, for sale or for use in trade, any useful article embodying the design, and to sell or distribute for sale or for use in trade any useful article embodying that design. Section 1309 defines infringement as the violation of any of the exclusive rights of the owner of the design. The available remedy for infringement, including arbitration, is covered in Section 1321. Injunctions and recoveries are specified in § 1322 and § 1323, respectively. When appropriate, a court may order a registration that is refused by the Director or may order the cancellation of a registration (§ 1324). The issuance of a design patent under Title 35, United States Code, for an original design for an article of manufacture shall terminate any protection of the original design under this chapter.

§ 1330 Common Law and Other Rights Unaffected

Nothing in this chapter shall annul or limit—

(1) common law or other rights or remedies, if any, available to or held by any person with respect to a design which has not been registered under this chapter; or

(2) any right under the trademark laws or any right protected against unfair competition.

Federal Acquisition Regulation (FAR) Subpart 27.4—Rights in Data and Copyrights

FAR contract provisions, including those that affected construction, were reviewed in Chapter 3. The patent rights clauses for Government contracts were surveyed in Chapter 4 on patents; the rights in Data and Copyrights are explored here.

27.401 Definitions

As used in this subpart—

"Data" means recorded information, regardless of form or the media on which it may be recorded. The term includes technical data and computer software. The term does not include information incidental to contract administration, such as financial, administrative, cost or pricing or management information.

"Form, fit, and function data" means data relating to items, components, processes that are sufficient to enable physical and functional interchangeability, as well as data identifying source, size, configuration, mating and attachment characteristics, functional characteristics, and performance requirements; except that for computer software it means data identifying source, functional characteristics, and performance requirements, but specifically excludes the source code, algorithm, process, formulae, and flow charts of the software.

"Limited rights" means the rights of the Government in limited rights data, as set forth in a Limited Rights Notice if included in a data rights clause of the contract.

"Limited rights data" means data, other than computer software, that embody trade secrets or are commercial or financial and confidential or privileged (see 27.404(c)).

"Restricted computer software" means computer software developed at private expense and that is a trade secret; is commercial or financial and confidential or privileged; *or is published copyrighted*

computer software (emphasis added); including minor modifications of such computer software.

"Restricted rights" means the rights of the Government in restricted computer software as set forth in a Restricted Rights Notice, if included in a data rights clause of the contract, or as otherwise may be included or incorporated in the contract.

"Technical data" means data other than computer software, which are of a scientific or technical nature.

"Unlimited rights" means the rights of the Government to use, disclose, reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publically, in any manner and for any purpose, and to have or permit others to do so.

27.402 Policy

(a) It is necessary for the departments and agencies, in order to carry out their missions and programs, to acquire or obtain access to many kinds of data produced during or used in the performance of their contracts. Agencies require such data to: obtain competition among suppliers; fulfill certain responsibilities for disseminating and publishing the results of their activities; ensure appropriate utilization of the results of research, development, and demonstration activities including the dissemination of technical information to foster subsequent technological developments; and meet other programmatic and statutory requirements. Further, for defense purposes, such data are also required by agencies to meet specialized acquisition needs and ensure logistics support.

(b) At the same time, the Government recognizes that its contractors may have a legitimate proprietary interest (e.g., a property right or other valid economic interest) in data resulting from private investment. Protection of such data from unauthorized use and disclosure is necessary in order to prevent the compromise of such property right or economic interest, avoid jeopardizing the contractor's commercial position, and preclude impairment of the Government's ability to obtain access to or to use such data. The protection of such data by the Government is also necessary to encourage qualified contractors to participate in Government programs and apply innovative concepts to such programs. In light of the above considerations, in applying these policies, agencies shall strike a balance between the Government's need and the contractor's legitimate proprietary interest.

27.403 Data Rights—General

All contracts that require data to be produced, furnished, acquired, or specifically used in meeting contract performance requirements, must contain terms

that delineate the respective rights and obligations of the government and the contractor regarding the use, duplication, and disclosure of such data, except certain contracts resulting from sealed bidding or similar situations which require only existing data (other than limited rights data and restricted computer software) to be delivered and reproduction rights are not needed for such data. As a general rule the data rights clause at 52.227-14, Rights in Data—General, including Alternates I, II, III, IV, and V, where deemed to be appropriate as discussed in 27.404, is to be used for that purpose. However, in certain contracts either the particular subject matter of the contract or the intended use of the data may require the use of other prescribed clauses, or may not require the use of any prescribed clause as described in 27.405 and 27.408. Also, in selecting a data rights clause, it is important to note that any such clause does not specify the data (in terms of type, quantity, or quality) that is to be delivered, but only the respective rights of the government and the contractor to use, disclose, or reproduce such data. Accordingly, the contract should also include appropriate terms to specify the data to be delivered.

Summary of 27.404 through 27.409

The government normally acquires unlimited rights in data that is first produced in the performance of the contract with some exceptions. The government respects copyrighted works and does not want any so marked delivered unless the government is given a license or another arrangement is negotiated by the contractor. Extensive guidance is supplied for selecting the appropriate rights in data clause. Contractors are normally authorized to claim copyright on technical or scientific articles published in academic, technical or professional journals. In such cases the Government is granted a paid-up nonexclusive, irrevocable, worldwide license to reproduce and prepare derivative works. Additional data requirements may be added to contracts for experimental, research and development makes it impossible to accurately predict the need for the delivery of such data. Appropriate provisions and contract clauses reflecting the equity principles outlined above are to be negotiated. The rights in data clauses, 52.227-14 through 52.227-227 may be viewed on the following Web page.

https://www.acquisition.gov/Far/current/html/FARTOCP52.html (accessed 9-22-2010)

References

Dempsey, B.J., D. Weiss, P. Jones, and J. Greenberg. 2002. Who Is An Open Source Software Developer? *Communications of the ACM* 45, 2: 67–72.

Fishman, S. 2004. *The Copyright Handbook.* 8th Ed. Berkeley: NOLO.

Gasaway, L.N. 2009. A defense of the public domain: A scholarly essay. *Law Library Journal* 101: 4. Chicago: American Association of Law Libraries.
Hunter, R. 2009. *Standards, Conformity Assessment and Accreditation for Engineers*. Boca Raton: Taylor & Francis.
Jurgensen, J. 2010. Is video killing the concert vibe? *The Wall Street Journal*, September 24: W1–W2.
Lessig, L. 2004. *Free Culture*. New York: Penguin Group, chap. 13.
Lindberg, V. 2008. *Intellectual Property and Open Source*. Cambridge: O'Reilly.
Mead, C. and L. Conway. 1980. *Introduction to VLSI (Very Large Scale Integrated) Systems*. Reading, MA: Addison-Wesley.
Merges, R.P., P.S. Menell, and M.A. Lemley. 2010. *Intellectual Property in the New Technological Age*, 5th Ed. Austin: Wolters Kluwer.
Samuelson, P. 2003. DRM {AND, OR, VS.} The Law. *Communications of the ACM* 46, 4: 41–45.

Additional Reading

Choate, P. 2005. *Hot Property*. New York: Alfred A. Knopf.

7

Trade Secrets

Introduction

The increasing variety of "trade secret" litigation makes definitions suspect. That issue is made worse by the development of new technology and business practices that also continue to expand the definitions of the term *trade secret*. Insider trading, for example, based on trade secret business information, is not only unethical and in violation of employee agreements on confidentiality but is also, of course, *per se* illegal. The recent (2010) news is replete with accounts of alleged violations of trade secrets from high-tech executives to Wall Street brokers and computer analysts. Accordingly, I have prepared a composite list of the *major* examples of trade secrets that have recently emerged. Some of these are old (very old), and others are relatively new examples from the information technology age and the Internet. They include, among other things, the items listed in Table 7.1.

Basic Legal Requirements

A trade secret must actually be secret and have economic value that gives its owner an advantage over competitors who do know or use it; it must also not be obvious, or readily learned, by an examination of the product that is on public display (one form of "reverse engineering"). Moreover, the trade secret must have been the object of reasonable efforts by the owner to maintain its secrecy.

Contractual Nature of Trade Secrets

Akin to the contractual nature of patents and copyrights, the public exchanges the legal framework that makes trade secrets possible for the expected

TABLE 7.1

Some Examples of Potential Trade Secrets

Business information, including plans, prices, and lists of customers
Formulations such as pharmaceuticals (which can also be patented)
Database compilations including directories
Computer programs (both source code and object code)
Various patterns used in design and manufacturing
Materials processing steps as in integrated circuit manufacture
Broad technology information such as details of hybrid automobiles
Circuit design tools for integrated circuits
Results of scientific investigations in industrial applied research
Technical data of various kinds
Strains of useful bacteria, e.g., pesticides, pollution eaters, etc.
Means for encrypting copyrighted material

economic benefit that those trade secrets provide. The economic theory is that the considerable cost of developing a trade secret will be rewarded with a system for maintaining the secret. The role of employment agreements (contracts) that require an employee to protect his employer's trade secrets was discussed in Chapter 3.

Historical Overview

Trade secrets are the oldest form of intellectual property, dating back to Roman times at least. The early guilds and other organizations developed trade secrets to increase their economic value. Stories abound of how early artisans were impounded, maybe on an island to prevent their escape, and pursued and killed when they did escape!

In the United States, early trade secret law grew out of the common law and varied widely among the industrialized states. The First Restatement of Torts, published by the American Law Institute in 1939, included several definitions of trade secrets and related material (Rockman 2004). In the Second Restatement of Torts, the material on trade secrets was removed and placed in the Restatement on Unfair Competition which had developed over the intervening period (Merges 2010). During the 1960s and 1970s, some of the Eastern industrial states, including New York, Pennsylvania, and New Jersey, had developed trade secret law that made the theft of a trade secret a criminal offense. Trade secret litigation remained very uncertain because of the variance in state laws and the lack of reliable precedents.

The National Conference of Commissioners on Uniform State Laws (NCCUSL) published a model code, the Uniform Trade Secrets Act (UTSA),

in 1979. That model code was intended for adoption by the states after the manner of the states' adoptions of the model Uniform Commercial Code described in Chapter 2 and had the same general purpose, that is, to make state laws on trade secrets more uniform. Trade secret law thus became statutory rather than exclusively common law.

In the 1990s, it became apparent that international espionage that collected valuable industrial trade secrets was becoming a serious threat to the U.S. economy. As a result, the Congress enacted the Economic Espionage Act (EEA) of 1996 (18 U.S.C., § 1831 and the following).

Uniform Trade Secrets Act

The Uniform Trade Secrets Act has been adopted by many of the states at least in part. Some states have opted for other codes of a similar nature. The Act includes some definitions, including those for "improper means," "misappropriation," and "trade secret." The UTSA codifies the basic elements of common law trade secrets and provides a model of injunctive relief when a trade secret is misappropriated or threatened with misappropriation, as in the case of a departing employee. The Act also specifies damages, including exemplary damages for misappropriation.

A Departing Employee Action

Apple, Inc., hired Mark Papermaster, longtime IBM executive, to oversee some of its products including its iPod and iPhone. IBM sued Papermaster for alleged violation of his employee agreement because it feared a threatened misappropriation of IBM trade secrets. A U.S. District Court judge in New York ordered Papermaster to cease his work for Apple. Papermaster, in his defense, claimed that Apple and IBM were not competitors and that his employment contract did not cover his action (Staff and Wire Reports 2008). It was reported later that the case was settled out of court, as many are.

One of the practical problems with litigating trade secret misappropriation is the potential for the disclosure of the trade secret during the process. Article 5 of the UTSA provides that a court must preserve the secrecy of the trade secret by ordinary means, such as sealing of records, at its disposal. The Act replaces existing state law on trade secrets but has no effect on other law such as contract, other civil remedies not based on misappropriation, or criminal law remedies. One of the cases of interest involving the First Amendment right of free speech versus trade secret publication is described

by Pamela Samuelson (Samuelson 2003). The California Supreme Court rejected the First Amendment defense to that publication.

Economic Espionage Act

The major provisions of the Economic Espionage Act of interest here are included in the following provision.

> § 1831. Economic Espionage
>
> (a) In General. Whoever, intending or knowing that the offense will benefit any foreign government, foreign instrumentality, or foreign agent, knowingly—
>
> (1) steals, or without authorization appropriates, takes, carries, or conceals, or by fraud, artifice, or deception obtains a trade secret:
>
> (2) without authorization copies, duplicates, sketches, draws, photographs, downloads, uploads, alters, destroys, photocopies, replicates, transmits, delivers, sends, mails, communicates, or conveys a trade secret:
>
> (3) receives, buys, or possesses a trade secret, knowing the same to have been stolen or appropriated, obtained or converted without authorization:
>
> (4) attempts to commit any offense described in any of the paragraphs (1) through (3); or
>
> (5) conspires with one or more other persons to commit any offense described in any of the paragraphs (1) through (4), and one or more of such persons do any act to effect the object of conspiracy, shall, except as provided in subsection (b), be fined not more than $500,000 or imprisoned not more than 15 years, or both.
>
> (b) Organizations. Any organization that commits any offense described in subsection (a) shall be fined not more than $10,000,000.

A provision to maintain the confidentiality of a trade secret during prosecution or other proceeding under the act is ordered pursuant to § 1835, analogous to the provision in the Uniform Trade Secrets Act outlined above. The definition of a trade secret in the act tends to roughly follow the definition in the UTSA. One of the first convictions under the EEA was reported in the *Wall Street Journal*. Chinese-born engineer Dongfan Chung, employed by Boeing, was found guilty of economic espionage in connection with the U.S. space program.

A summary of cases prosecuted under the EEA is available at:

http://www.justice.gov/criminal/cybercrime/eea.html (accessed 9/25/2010).

Public Disclosures of Trade Secrets

Most publications of trade secrets, unless they are obscure or unrecognized in value, destroy the trade secret. It matters not if the publication was intentional or accidental. It is sometimes said that public disclosure is inevitable in the long run. That is true especially for "ingredients" trade secrets like the fabled trade secret for Coca Cola (which is reportedly no longer a trade secret). The modern availability of powerful analytical techniques such as mass spectroscopy, electron microscopy, and materials engineering (Van Vlack 1982) makes the protection of such "recipes" rather difficult. With a list of ingredients and some process experimentation, it is often possible to duplicate such recipe trade secrets.

Disclosure by Publication, Other Media, or Speeches, etc.

Disclosure of a trade secret in a published patent application or patent or in a copyrighted work does, of course, destroy the trade secret. Even a temporary posting on the Internet has been held to constitute publication of a trade secret.

Reverse Engineering

Reverse engineering is not a single technique but a complex of technologies for legally (sometimes illegally) discovering a trade secret. In its original form, reverse engineering was simple; buy a product on the open market and tear it apart to discover any trade secrets involved in its construction. This kind of "tear down" analysis is the stuff of trade journals. As outlined above, powerful analytical techniques may be used to uncover many kinds of trade secrets. Source code is sometimes retained by its developer as a trade secret in a copyrighted computer program. That is possible since "decompilation" does not reliably yield the original source code but may produce another source code. The use of reverse engineering in computer areas is discussed in Chapter 13 of Van Lindberg's book (Lindberg 2008). In addition to reviewing several applicable cases, Lindberg provides step-by-step direction on the so-called "clean room" technique for reverse engineering computer programs (pages 245–251).

As discussed in Chapter 6, the anticircumvention provisions of the Digital Millennium Copyright Act (DMCA) put a damper on the reverse engineering of copy controls. Other critiques of attacks on reverse engineering, including *contractual banning* of the technique, are included in Samuelson's paper (Samuelson 2002).

Policy and Management Issues in Trade Secrets

Recall that this is not a how-to book. There are some operational issues involved in trade secret protection that should be briefly examined.

Options for Selecting Trade Secret versus Other Forms of IP Protection

It is rather obvious that one of the best ways to protect a trade secret is to keep even its existence a secret for as long as possible! While older papers and books speak about the necessity of making an election on pursuing trade secret versus copyright or patent protection, it now seems possible to avail one's self of simultaneously exercising several options (patent, copyright, and trade secret). Management techniques for making practical choices between trade secrets and patents as well as choices between trade secrets and copyrights (and even patents and copyrights) are covered in Chapter 2 of Steven Frank's book (Frank 2006).

Use and Abuse of Nondisclosure Agreements (NDAs)

Every author of "how-to" treatments emphasizes the importance of NDA contracts (see also Chapter 3 here). One of the modern problems that arise through increased product complexity is the unnecessary proliferation of NDA agreements the average engineer is urged to sign. This multiplicity of NDAs raises an interesting question. How many people who sign NDAs tend to constitute "public knowledge"? The proliferation of NDAs also, of course, greatly increases the likelihood of eventual public disclosure and the destruction of the trade secret involved.

Compact Summary of Case: *Smith v. Dravo Corp.*, No. 10683, United States Court of Appeals Seventh Circuit, April 10, 1953

Leathem D. Smith conceived and designed uniformly sized shipping containers that were adapted to being handled by both ship and rail carriers. Smith's containers were manufactured through his firm Safeway, which built and successfully tested Smith's shipping container. The result was an expression of interest by several large shippers. Defendant (DRAVO) officials expressed an interest in buying some of the Safeway containers but the sales inquiry morphed into defendant's interest in acquiring the whole Safeway Company. Because of DRAVO's interest in acquiring the whole company, a Safeway representative supplied DRAVO people with much confidential information, including patent application, plans, business plans and the letters from prospective customers expressing interest in buying Safeway containers, that is, a rudimentary list of potential customers. Purchase of Safeway's assets by DRAVO finally collapsed and DRAVO then proceeded to come out with its own line of similar but incompatible containers, which put Safeway out of business.

Plaintiff's heirs (hereinafter Smith) brought suit against DRAVO that included charges of patent infringement and use of trade secret information provided in confidence to DRAVO to facilitate DRAVO's entry into the shipping container business. The district court found for defendant on the basis that the patents were invalid and that DRAVO had no obligation to Smith's heirs because the negotiations were "arm's length." Smith appealed that decision to the Court of Appeals for the Seventh Circuit. The court of appeals found for plaintiff in spite of the fact that the Smith designs *could have been, but were not* derived from inspection and measurement of Smith's containers by "reverse engineering." Thus, the confidential relationship that resulted from the negotiations to buy Smith's assets produced an obligation on DRAVO's part not to use the "trade secrets" to its own advantage to the injury of Smith.

It is interesting to note that *Booth v. Stutz Motor Car Co.*, described briefly in Chapter 5, was cited as precedent several times in the appeals court's opinion. The practical "lesson" of these decisions is that a confidential relationship can be produced by an arm's length negotiation and that what the defendant actually did was more important than what it could have done. The timing was important, too. In both the Stutz and DRAVO cases, the defendant produced a very similar item *after* the creation of the confidential relationship. The fact situation suggests that this development of shipping containers was an important prelude to the development of ISO's (International Organization for Standardization) very important standard for shipping containers. That is discussed in more detail in Chapter 9 on standards.

References

Frank, S.J. 2006. *Intellectual Property for Managers and Investors*. Cambridge: Cambridge University Press.

Lindberg, V. 2008. *Intellectual Property and Open Source*. Cambridge: O'Reilly.

Merges, R.P. et al. 2010. *Intellectual Property in the New Technological Age*, 5th Ed. New York: Wolters Kluwer.

Rockman, H.B. 2004. *Intellectual Property Law for Engineers and Scientists*. Piscataway: IEEE Press.

Samuelson, P. 2002. Reverse Engineering Under Siege. *Communications of the ACM,* 45, 10: 15–20.

Samuelson, P. 2003. Trade Secrets vs. Free Speech, *Communications of the ACM*, 46, 6: 19–23.

Staff and Wire Reports 2008. Ex-IBM exec ordered to cease Apple work. *Austin American-Statesman*. Nov. 8: B7–B8.

Van Vlack, L.H. 1982. *Materials for Engineering*. Reading, MA: Addison-Wesley.

8

Trademarks

Introduction

The *contract* nature of trademarks is similar to that of a patent. The public, via its trademark laws at various levels, makes it possible to protect manufacturers (and service providers and others) from unscrupulous imitators who would pass off their goods as coming from the original manufacturer. In exchange, the public receives a usually reliable guide for selecting products and services that it admires for their quality and usefulness. Trademarks can be enforced at common law without registration and can even be enforced in local areas by state trademarks. Since most modern businesses operate over a broader geographical area than a single state, there is a substantial incentive for them to obtain federal registration. Most of the emphasis here is on federally registered marks. Trademarks, like trade secrets, are very old as shown in the pottery and other artifacts of ancient times.

The federal law on trademarks is covered by 15 U.S.C. 1051 *et seq.* This federal law, known as the 1946 Lanham Act (as amended), provides the legal framework for national coverage and also provides entry to international trademark protection. The detailed mechanics of the process are covered in the 37 CFR Part 2, Rules of Practice in Trademark Cases. The modus operandi of the trademark side of the Patent and Trademark Office (PTO) bears some resemblance to that of the Patent Office side. Formal applications must be filed and fees paid. The Trademark Examiner then performs a search of existing trademarks to determine if the applicant can receive one. The PTO then provides the applicant with a certificate attesting to the validity of the trademark. If a newcomer applies for a trademark identical to or confusingly similar to an existing mark, the application will be refused. "Branding" has recently become the mantra of the marketing folks; branding relies on trademarks and similar work. Nationwide franchising is also heavily dependent on trademarks. Figure 8.1 shows a recent trademark promotion at the PTO.

A more important role for trademarks has developed in the last 20 years or so due to the great increase in international trade. That increase has been accompanied by an explosive gain in counterfeit products and components (Balfour 2005). The importation of bogus electrical equipment marked with

counterfeit Listing Marks of Underwriters Laboratories (UL) has forced UL to come up with new holographic labels to resist label counterfeiting (Lief 1997). The counterfeiting of critical components has even spilled over into the parts used in military equipment, including aircraft and ships (Grow, et al. 2008). To counter the counterfeiting problem, several laws have been enacted. One is the Trademark Counterfeiting Act of 1984 (Pub. L. No. 98-473), which appears as Title II, § 1502 (a) and the other is the Anticounterfeiting Consumer Protection Act of 1996, Pub. L. No. 104-153.

Definitions of the Marks (15 U.S.C. 1127)

In addition to trademarks and service marks, there are several other kinds of marks of interest here. Trade names, for example, are often confused with trademarks.

Trade Name (Commercial Name)

The terms "trade name" and "commercial name" mean any name used by a person to identify his or her business or vocation.

Trademark

Trademark. The term "trademark" includes any word, name, symbol, or device, or any combination thereof—

(1) used by a person, or
(2) which a person has a *bona fide* intention to use in commerce and applies to register on the principal register established by this Act, to identify and distinguish his or her goods, even if the source is unknown.

Note that the purpose of the mark on goods is to form an association in the buyer's mind between a particular piece of goods and its manufacturer, thus making product selection easier and more certain.

Service Mark

The term "service mark" means any word, name, symbol, or device, or any combination thereof—

(1) used by a person, or
(2) which a person has a bona fide intention to use in commerce and applies to register on the principal register established by this Act,

FIGURE 8.1
Trademark promotion at the PTO. (Photo by the author.)

> to identify and distinguish the services of one person, including a unique service, from the services of others and to indicate the source of the service, even if the source is unknown. Titles, character names, and other distinctive features of radio or television programs may be registered as service marks notwithstanding that they, or the programs, may advertise the goods of the sponsor.

A service mark is the same as a trademark, except that it identifies and distinguishes the source of a service rather than a product.

Certification Mark

The term "certification mark" means any word, name, symbol, or device, or any combination thereof—

> (1) used by a person other than its owner, or
> (2) which its owner has a *bona fide* intention to permit a person other than the owner to use in commerce and files an application to register on the principal register established by this Act, to certify regional or other origin, material, mode of manufacture, quality, accuracy, or other characteristics of such person's goods or services or that the work or labor on the goods or services was performed by members of a union or other organization.

Collective Mark

The term "collective mark" means a trademark or service mark

(1) used by the members of a cooperative, an association, or other collective group or organization, or
(2) which such cooperative, association, or other collective group or organization has a bona fide intention to use in commerce and applies to register on the principal register established by this Act, and includes marks indicating membership in a union, an association, or other organization.

Note that the following description of collective and certification marks that can be registered appears here in pertinent part [adapted from 15 U.S.C. 1054]:

Collective and certification marks, including indications of regional origin, shall be registerable under this (trademark) act, in the same manner and with the same effect as are trademarks, by persons, and nations, states, municipalities, and the like, exercising legitimate control over the use of the marks.. even though not possessing an industrial or commercial establishment, and when registered they shall be entitled to protection provided herein in the case of trademarks, *except in the case of certification marks when used so as to represent falsely that the owner or user thereof makes or sells the goods or performs the services on or in connection with which such mark is used* (emphasis added).

Mark

The term "mark" includes any trademark, service mark, collective mark, or certification mark.

Abandonment of Mark

A mark shall be deemed to be "abandoned" when either of the following occurs:

(1) When its use has been discontinued with intent not to resume such use. Intent not to resume may be inferred from circumstances. Nonuse for 3 consecutive years shall be *prima facie* evidence of abandonment. "Use" of a mark means the *bona fi*de use of such mark made in the ordinary course of trade, and not made merely to reserve a right in the mark.
(2) When any course of conduct of the owner, including acts of omission as well as commission, causes the mark to become the generic name for the goods or services on or in connection with which it is used or otherwise to lose its significance as a mark. Purchaser motivation shall not be a test for determining abandonment under this paragraph.

Dilution

The term "dilution" means the lessening of the capacity of a famous mark to identify and distinguish goods or services, regardless of the presence or absence of—

(1) competition between the owner of the famous mark and other parties, or
(2) likelihood of confusion, mistake, or deception.

Colorable Imitation

The term "colorable imitation" includes any mark which so resembles a registered mark as to be likely to cause confusion or mistake or to deceive.

Selection and Use of Mark

While this is not a "how-to" work, a word of caution is appropriate. Before using or attempting to register a trademark, a search of the trademark database at the PTO should be performed under the direction of an IP attorney. Use of a conflicting mark could, of course, invite a lawsuit and trying to register an already registered trademark could also lead to difficulties and wasted effort.

A person claiming rights in a mark may use the "TM" (trademark) or "SM" (service mark) designation to alert the public to her claim, even if she hasn't filed an application with the USPTO. A person may use the federal registration symbol ® *only after the PTO registers the mark* (not while the application is pending). A person may use the registration symbol with the mark only on or in connection with the goods and/or services listed in the federal trademark registration.

Registration and Use of Marks

The PTO registers marks on the *Principal Register*, pursuant to § 1051 through § 1072, or on the *Supplemental Register*, pursuant to § 1091 through § 1096. If the registration of a mark on the Principal Register is denied, the mark may sometimes be registered on the Supplemental Register. Registration on the Supplemental Register is not a bar to eventual registration on the Principal Register if the objections have been overcome. The registration of a mark on the Supplemental Register also facilitates the filing of an application for

trademark abroad, pursuant to international agreements on trademarks. The scope of registrations is determined by the International Classification for Standards (ICS) in which registration is granted.

The federal registration of marks on the Principal Register confers certain advantages on the mark owner:

- Constructive notice to the public of the registrant's claim to ownership of the mark
- A legal presumption of the registrant's ownership of the mark and the registrant's exclusive right to use the mark nationwide on or in connection with the goods and/or services listed in the registration
- The ability to bring an action concerning the mark in federal court
- The use of the U.S. registration as a basis to obtain registration in foreign countries
- The ability to file the U.S. registration with the U.S. Customs Service to prevent importation of infringing foreign goods.

Confusing Similarity

There is no need for invention (as in patents) or for literary merit (as in copyrights) when it comes to trademarks. The important criterion is the subjective one that seeks to avoid confusing similarity (see the definition of "colorable imitation" above).

Examination of Marks in the PTO

The PTO Trademark Examiner reviews an application for a trademark after it has been determined that the application meets formal requirements. The examiner searches the PTO database of registered marks to determine if there is another mark in any of the same classes specified by the applicant, either issued or pending, that is close enough to that proposed by applicant to be confusingly similar. The answer may be biased to a positive one if the goods are competitive in the marketplace, complementary to any of those goods, or sold in the same stores so that a potential buyer might be led to understand that the goods (or services) come from the same source. If the trademark examiner finds a conflict between applications for the same or similar marks, she cannot reject the "junior party's" application until the

senior party's mark is actually registered (priority is based on actual use). The mark applied for is then published in the trademark part of the *Official Gazette* of the Patent and Trademark Office so that the proposed registration may be opposed by interested parties (e.g., others already using or wanting to use the same or similar marks). A certificate of registration, appropriate for the register involved, may then be issued.

Infringement of Mark

The infringement of a trademark or service mark depends on the criterion outlined above (confusing similarity). A court may find a trademark valid but not infringed under certain circumstances.

Maintenance and Policing of Marks

A trademark or service mark lasts for 10 years as long as it is used and not abandoned by its owner or removed by other legal action. It is interesting to note that the Federal Trade Commission (FTC) may request that the Trademark Office remove a mark from the Principal Register for cause (on a finding that the use was intended to deceive buyers). To keep the mark in force, the owner must periodically apply for renewals, showing that the mark's use is continuing, and pay the specified fees. The protected mark may possibly last "forever" if these requirements are met. Mark owners must themselves police the unauthorized use of their registered marks. Watching for and reporting trademark violations has apparently become a "cottage industry." Mark owners are also required to pursue infringers of their marks in order to keep them from becoming "generic" and thus failing one of the criteria for a mark (that it not be generic). The classic example of a trademark failure because it became generic is the one for "Aspirin" that was lost as an enforceable trademark through extensive unregulated public use.

Secondary Meaning and Trade Dress

Descriptive terms cannot be protected as trademarks unless they acquire a *secondary meaning*. To become a secondary meaning, a descriptive term

must form an association in the minds of the public, through long usage and advertising, to become associated with a product. An applicant or plaintiff claiming secondary meaning must show, sometimes through public opinion surveys, that the secondary meaning of a descriptive term has matured in the public's mind to form a connection with the product. Generic terms are never protected by trademark even though they do acquire a secondary meaning.

Trade dress is defined as product packaging, product design, or other characteristics of the product (somewhat open ended). Trade dress "marks" can, in some cases, be placed on the Supplemental Register but confer no more rights to the owner than is provided by common law.

An example of the use of color as a trade dress is the characteristic shade of pink, touted by the Pink Panther film character, that applies to a certain brand of insulation. An interesting example of the wide variety of protectable trade dress is due to an account in the *Wall Street Journal* where the trade dress consisted of "goats on the roof of a restaurant" (Scheck and Woo 2010). A Wisconsin restaurant (Al Johnson's Swedish Restaurant) gained some popularity by having goats on its roof and obtained trade dress protection for that. A restaurant in Georgia also began to employ that trade dress and was sued by the Johnson interest in a federal court in Georgia.

Compact Summary of Case: *Two Pesos, Inc. v. Taco Cabana, Inc.*, Supreme Court of the United States, 505 U.S. 763 (1992)

Taco Cabana, a restaurant specializing in "Tex-Mex" food, was started in San Antonio, Texas and rapidly became popular. A competitor also specializing in Tex-Mex food named Two Pesos started in Houston, Texas. The owners of Two Pesos approached Taco Cabana about expanding a joint operation but the proposal was rejected. Two Pesos then proceeded to copy the ambiance of the Taco Cabana stores and even hired away a Taco Cabana chef to assist in the program. Taco Cabana sued Two Pesos for trade secret theft and the infringement of its trade dress that involved the distinctive appearance of its restaurants (a patio arrangement and brightly colored lighting).

Taco Cabana won its suit in the Federal Court of South Texas. Two Pesos appealed the case (hence the case name *Two Pesos v. Taco Cabana*) but the court of appeals found that Taco Cabana's trade dress was entitled to protection, even in the absence of a secondary meaning. Two Pesos continued to appeal, eventually to the supreme court which affirmed the appeals court's decisions. The damages wiped out Two Pesos which, as part of a final settlement, was then acquired by Taco Cabana (Merges, Menell, and Lemley 2010). Putting the supreme court case information into a standard search engine will provide many additional details.

Cybersquatting on Internet Domain Names

Internet Protocol addresses have been registered by companies and others to pitch their products and services since the early days of the Internet. A coterie of "entrepreneurs" decided to make some easy money by registering domain names corresponding to the trade names and trademarks of existing companies (at a very low price) and then extorting large sums of money from those companies. The term for the practice became "cybersquatting." The then-existing trademark law was not very well adapted to managing this practice. As a result, congress passed the *Anticybersquatting Consumer Protection Act* (ACPA) which added a new paragraph, Cyberpiracy prevention, to the trademark law: 15 U.S.C. § 1125(d). The civil actions of plaintiffs injured by cybersquatting were facilitated by the new law.

The criteria used to determine if those who registered domain names on the Network Solutions, Inc. (NSI), in violation of the ASPA, included factors such as bad faith with intent to profit, registration, trafficking or using domain names that are confusingly similar to registered marks, the acquisition of multiple unrelated domain names, and others.

The formation of the Internet Corporation for Assigned Names and Numbers (ICANN) started dealing with cybersquatting by a private dispute resolution process called Uniform Dispute Resolution Procedure (UDRP). The registration of a name requires applicants to agree to the use of the UDRP rather than actions under the trademark law. Although the operation of the UDRP has been criticized, it seems to be working fairly well. Thousands of "cases" have been resolved by the dispute resolution process pursuant to a *contract*. Courts do not take notice of the failed dispute resolution when the parties resort to legal action. The international community is somewhat concerned that the ICANN is a U.S. creature rather than an international one so some heartburn about ICANN still exists.

Foreign Country Trademarks

As mentioned earlier, obtaining a registered trademark facilitates the acquisition of a trademark in foreign countries; the details are beyond the scope of this book. The two major international treaties that facilitate the registration of U.S. trademarks in foreign countries are the Madrid Protocol and the World Intellectual Property Organization (WIPO). These arrangements simplify procedures and permit the acquisition of foreign trademarks without having to apply to each country individually. There are "trademark bandits" in places other than on the Internet! Howard Rockman reports that one of his

clients was forced to pay $100,000 to "buy back" a trademark from a pirate in Argentina (Rockman 2004).

Practical Trademark Issues in the European Union

The idealized handling of foreign trademark issues mentioned above is really much more complicated in the European Union (Bechtold 2011). Stephan Bechtold, Associate Professor of Intellectual Property, ETH Zurich, describes the potential legal issues with Google AdWords in connection with European trademark law and asks the question "Is Google violating trademark law by operating its AdWords system?" It seems that, at some level, legal issues on trademarks in the EU are settled at the European Court of Justice, while other issues remain the province of the courts in the EU member countries (in France in the reported example). A problem, according to Bechtold, is that national courts will interpret European trademark law in different ways. A related issue is the liability of various parties, such as Internet service providers, for trademark infringement involving the use of trademarks on fake products (mentioned above).

References

Balfour, F. 2005. FAKES! The global counterfeit business is out of control, targeting everything from computer chips to life-saving medicines. *Business Week*, February 7: 54–64.

Bechtold, S. 2011. Google AdWords and European trademark law: Is Google violating trademark law by operating its AdWords system? *Communications of the ACM* 54, 1: 30–32, Jan. 2011.

Grow, B. et al. 2008. Dangerous fakes: How counterfeit, defective computer components from China are getting into U.S. warplanes and ships. *Business Week*, October 13: 034–044.

Leif, L. 1997. Shocking! Bogus safety labels. *Business Week,* March 3: 69–70.

Merges, R.P., P.S. Menell, and M. A. Lemley. 2010. *Intellectual Property in the New Technological Age*, 5th Ed. Austin: Wolters Kluwer, 764–766.

Rockman, H.B. 2004. *Intellectual Property Law for Engineers and Scientists*. Piscataway: IEEE Press.

Scheck, J. and S. Woo. 2010. Lars Johnson has goats on his roof and a stable of lawyers to prove it. *The Wall Street Journal*: September 17, A1–A16.

9

Standards, Codes, and Regulations

Introduction

A *standard* may be thought of as a multiparty *contract* that is developed by a process similar to contract negotiation. What is a standard? There are more definitions of the term *standard* than there are authors who write about them! As a result, there is some understandable confusion on the part of newcomers to the field as to the definition of the term. One of the authoritative definitions comes from the Definitions in Subpart 2.1 of the Federal Acquisition Regulations (FAR), introduced in Chapter 3:

> "Voluntary consensus standards" means common and repeated use of rules, conditions, guidelines or characteristics for products, or related processes and production methods and related management systems. Voluntary consensus standards are developed or adopted by domestic and international voluntary consensus standard making bodies (e.g., International Organization for Standardization [ISO] and ASTM International). See OMB Circular A-119.

Note that OMB (Office of Management and Budget) Circular A-119 is a directive to the administrative agencies of the U.S. government to use voluntary consensus standards developed in the private sector where practical. That saves the public monies that would otherwise be spent by government agencies in attempting to develop suitable standards, especially highly technical standards.

The ISO and the IEC (International Electrotechnical Commission) have promulgated a more elegant definition of the term *standard* in ISO/IEC Guide 2 Standardization and related activities—General Vocabulary. That definition also appears in Chapter 1 of Hunter's book on standards (Hunter 2009). The ISO/IEC definition of standard includes the concepts of "voluntary" and "consensus." The ISO/IEC Guide 2 definitions of terms is modular; for example, the term *standard* may be combined with the defined term *safety* to indicate a safety standard. Henk J. de Vries has critiqued the ISO/IEC definition and offered a definition of his own (de Vries 1999). The General Vocabulary of Guide 2 is recommended as an antidote to terminology confusion in standards.

As to physical (measurement) standards, such as the standard ohm, the standard meter, etc., the French have a word for that *kind* of standard, *etalon.*

Aims of Standards

One of the most essential aims of a standard is to communicate. A standard permits a buyer to efficiently communicate what it wants, and a standard also permits a seller to efficiently communicate what it has to offer. A buyer of laboratory services, for example, is much more likely to select a laboratory that is accredited to test to a formal standard than one which is not accredited. Standards are thus said to reduce the "transaction costs" of contracting. ISs are also essential for facilitating international trade. Modern international trade would be impossible without standards that are recognized and used by the importing and exporting countries. Standards are used in conformity assessment and accreditation, and also are used in *regulations*. Standards are vehicles for technology transfer, especially from more industrialized countries to underdeveloped countries.

One of the major aims of standards is *variety reduction* (called "variety control" in the ISO/IEC Guide 2). Real economies of scale in manufacture, as well as in other areas, are realized by reducing product variety and simplifying both products and processes. Use of standard terms is another example of simplification. One of the early unrecognized advantages of the standardized quality management programs of the ISO 9000 series was the cost savings realized in the training of personnel, the accreditation of quality programs, and similar activities (servicing, inventory management, etc.). Southwest Airlines, until very recently, used only one type of jet (from the Boeing 737 family). That produced substantial savings in pilot training, spare parts stocks, reservations and flight planning, airplane maintenance, and other things. Variety reduction can, of course, be abused. One example was the expectation that a heavy land-based fighter plane could be used on aircraft carriers! Limiting the number of standards developing organizations (SDOs) can make their coordination easier and better. Variety reduction is even useful in such things as contracts, as indicated in Chapter 3, where a few standard contracts greatly reduce transaction costs in construction contracts.

Types of Standards

While many standards are hybrids of the types identified in ISO/IEC Guide 2, it is useful to assign a general "type" to many standards. ISO/IEC Guide 2,

for example, is a *terminology standard.* Terminology standards may be relatively narrow or relatively broad. An example of the latter is the International Electrotechnical Vocabulary (IEV), which collects most of the terms used in standards for the electrical and electronics fields. The IEV is a multivolume work that can be freely accessed online at:

http://www.electropedia.org/ (accessed 12/7/10)

Basic Standards

Basic standards are those that have broad applicability across a complete field. A good example of a basic standard is the IEC 60917—(Metric) Modular Order for the development of mechanical structures for electronic equipment. This standard replaces the traditional (nonmetric) 19-inch rack for electronic equipment. The series of standards, under IEC Subcommittee 47, provides standardized metric measurements for semiconductor devices as well.

De Facto Standards

De facto standards are those that dominate a field and are not necessarily published as standards.

The best known examples of *de facto* standards include the Windows™ Operating System and the "QWERTY" keyboard. The IBM standards for computers were *de facto* standards since IBM then controlled 70% or more of the computer market. In the same way, the technical standards of the AT&T were *de facto* standards.

De jure Standards

Most of the voluntary consensus standards that exist today are considered to be of the type also known as *de jure* standards, standards prepared by a recognized standards body. In earlier days, some writers assigned *de jure* standards the meaning of what is now called "regulation," that is, a standard enforced by law.

Environmental Protection Standards

Environmental protection standards are those that address the protection of the natural environment. The major International Environmental Protection standards include those issued by the ISO in its 14000 series of standards. Environmental protection standards should not be confused with "Product Protection" standards, which are described below and in ISO/IEC Guide 2.

Industrial Standards

Most of the standards of interest here are sometimes called *industrial standards* to distinguish them from other standards such as academic standards,

generally accepted accounting principles, medical standards, ethical standards (see Chapters 14 and 15) and numerous others.

Interface Standards

Interface standards are a form of compatibility standards that are necessary to make disparate systems and subsystems interoperate. These are often also called interoperational standards. An example might be an analog to digital conversion circuit or device that is necessary to interconnect analog and digital systems.

Management Systems Standards

Many important standards focus on "management systems" to a large degree. Some of the most important ones include the ISO Quality Management family of standards, ISO 9000, and others. A "companion" management system family of standards is the ISO 14000 series of standards on Environmental Management.

Materials Standards

The American Society for Testing and Materials, now named ASTM International, was started early in the industrial revolution to provide metallurgy standards and testing for compliance for the steel in the Pennsylvania Railroad. Many of its modern standards relate to building materials as well as, for example, standards for copper and other metals.

Open Standards

An open standard is any standard that is produced in a public process and is free of continuing control by a single private entity. Many of the other types of standards are also open standards. An example of the open standard operating system called Linux was discussed in Chapter 6 on copyright. As will be seen later, the boundaries of open standards and *proprietary standards* may sometimes become blurred.

Product Standards

Product standards are those that address requirements for a specific product or class of products.

An example of a product standard is a fastener standard that specifies the dimensions, material and other characteristics of fasteners such as bolts and screws.

Product Protection Standards

Product protection standards deal with the protection of products from the adverse effects of environment (e.g., salt spray, moisture, dust, extreme temperature, etc.). See ISO/IEC Guide 2.

Proprietary Standards

Proprietary standards are those that are developed and controlled by a single organization. Again the dividing line between proprietary standards and open standards has been blurred by the translation of some originally proprietary standards to open industry standards such as the IBM Token Ring standard for intersystem communication.

Quality Standards

In addition to the Quality Management Standards family, ISO 9000, there are many standards related to product and service quality. The American Society for Quality (ASQ) publishes many such standards that address sampling, conformity assessment, and a wide range of related topics.

Safety Standards

A broad type of standard that focuses on safety is one of the most important standards used by engineers. Most of the Underwriters Laboratories (UL) standards address *product safety*. The Institute of Electrical and Electronics Engineers (IEEE) National Electrical Safety Code C2 is directed to the safety of overhead electrical energy transmission lines and related power installations. The National Electrical Code (NEC, NFPA 70) produced by the NFPA (National Fire Protection Association) is also of special importance to electrical engineers as is the companion NFPA 70E for electrical safety in the workplace.

Service Standards

Service standards address the requirements that control the provision of services. These include, for example, standards of service for restaurants, telecommunications, transportation, including car rentals, package delivery, and many other service providers. In telecom systems, there are QoS (Quality of Service) standards.

Terminology Standards

In addition to that mentioned above, an important terminology standard is the ISO/IEC Guide 99:2007 International Vocabulary of Metrology—Basic and General Concepts and Associated Terms [VIM] (ISO/IEC 2007). An early informal terminology standard was assembled by Donald R. Mackay (Mackay 1990). An important early standard of electrical terms was published by the American Institute of Electrical Engineers (AIEE) in 1941 (AIEE 1941). ISO has published a number of terminology standards including ISO 704:2000, Terminology Work—Principles and Methods.

Testing Standards

Testing standards relate to testing of many kinds, some of which are parts of conformity assessment. One of the best known of the testing standards is produced by the ASTM International, originally known as the American Society for Testing and Materials (ASTM). The crucial role of ASTM ISs was mentioned in Chapter 3 in connection with the testing and qualification of construction materials.

Quality of Standards

Much has been written about the quality of standards. Some of the criteria for good quality standards appear in Hunter's book on standards on page 46. Good standards arrive at the right time, meet the social, economic, trade, and technical needs of users, and can readily be understood by people who did not prepare the standard. Good standards should make maximum use of *performance* provisions rather than *descriptive* provisions. That requirement is mandated in paragraph 5 of Guide 59 (ISO/IEC 1959). It should be pointed out that some of what appear to be descriptive (design) provisions are really performance provisions in disguise. An example would be the specification of a certain alloy of copper, which is backed up by a long history of high performance. Some standards are too verbose and replete with countless *normative* references and unneeded requirements.

International Standards

There are several dozen international standards (ISs) bodies that produce ISs covering a very wide range of topics. The primary ones of interest here include the ISs of the previously mentioned ISO and IEC, as well as those of the International Telecommunications Union (ITU). The ISO and IEC are international membership organizations that are independent of government, each national standards member body having a vote in developing standards. The ITU, on the other hand, is a treaty organization that interfaces directly with the governments of the national members. In the United States, the interface with the ITU is largely via the State Department.

The United States Government, through its International Trade Representative, has taken the position that certain national standards (as defined in the ISO/IEC Guide 2) are in fact the meaning of that term that was changed some years ago by the World Trade Organization (WTO). That

action became necessary because of the relatively slow adoption of international standards, especially the metric standard, in the United States. While it is true that some U.S. national standards such as those of ASTM International, the American Society of Mechanical Engineers—International (ASME), the Institute of Electrical and Electronics Engineers (IEEE), and others have enjoyed widespread acceptance around the world, the United States is apparently the only major country that claims its national standards qualify as "international standards" under the WTO trade regulations. Most industrialized and emerging nations are adopting ISs as national standards or harmonizing their national standards with ISs, as indeed the United States has done to some extent.

Regional Standards

Regional standards were basically unheard of until late in the 20th century when the European Union (EU) moved forward to establish the European Norm (EN) regional standards (*norm* is another (French) name for standards). While many regional standards programs have emerged, only a relative handful has made nearly as much progress as that in the European Union. Most regional standards organizations focus on the adoption of ISs as regional standards.

European Union (EU)

The European Union currently includes some 21 countries. All of the member countries in the European Union are required to replace their national standards with "harmonized" European norms. The European norms were harmonized with ISs to make the European region a "free trade" zone and to leverage ISs in world trade. Many Eastern European countries, recognizing the success of the EU system have joined, or are trying to join, the EU. It is sometimes said that in Europe, nothing not allowed is permissible; in the United States, contrarily, everything is permissible except that which is not allowed (Charlemagne).

The standards produced by the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENELEC) include European Norms (ENs), Harmonization Documents (HDs), European prestandards (ENVs) and CEN/CENELEC Workshop Agreements (CWAs). The ICT standards in the EU are produced by the European Telecommunications Standards Institute (ETSI) which produces European Telecommunications Standards (ETSs).

North American Free Trade Agreement (NAFTA)

The United States and Canada have long had extensive cooperation in the development of standards. That tradition was enshrined in the United States–Canada Free Trade Agreement that predated, but formed the basis of, the North American Free Trade Agreement which now includes the United States, Canada, and Mexico. Many of the most important standards have been harmonized in the NAFTA countries to facilitate trade. All Canadian national standards must be published in both English and French. Canadian standards have been internationalized more quickly than U.S. standards; that was facilitated by Canada's "cold turkey" adoption of the metric system (without any business failures). The Council for Harmonization of Electrotechnical Standards of the Nations of the Americas (CANENA), including both North and South America promotes the harmonization of electrical standards in the Americas.

Asia–Pacific Economic Cooperation (APEC)

APEC includes the major countries around the Pacific Rim, including the United States, China, Canada, Australia, Japan, Mexico, Chile, Republic of Korea (South Korea), New Zealand, Peru, and 11 other countries on the Pacific Rim. South Korea, now a highly industrialized country, appears to have taken the lead in the development of "regional" standards and conformity assessment in APEC (see Chapter 7 of Hunter). South Korea has long been a leader in standards education. Part of the motivation of the APEC formation appears to be an attempt to mimic the success of the model, the European Union, without seeking the EU's level of political unity.

Pan American Standards Commission (COPANT)

COPANT includes the national standards bodies in the countries of Latin America.

Pacific Area Standards Congress (PASC)

The Pacific Area Standards Congress is concerned mostly with the adoption of ISs of the ISO, IEC and ITU. It includes many APEC members' national committees and works to influence international standards.

Regional Telecom Standards

The standards prepared by the European Telecommunication Standards Institute (ETSI) have unified telecom standards in Europe, mainly by using, and influencing, the standards developed by the International

Telecommunications Union (ITU). ETSI acts to some extent as a portal for other standards groups into the ITU.

The Asia Pacific Telecommunity (APT) is connected to the United Nations and its specialized agency the ITU. APT's purpose is to promote the coherence of ICT (Information and Communications Technology) throughout its Southeast Asia region which includes 34 member countries, including Australia.

The Inter-American Telecommunication Commission (CITEL) is organized under the Organization of American States (OAS). CITEL focuses more on issues other than the setting of standards.

National Standards

Purely national standards are becoming an endangered species in the modern world of trade that relies so much on ISs. The adoption of ISs, with needed modifications, has become a strategy for developing national standards. The adoption of ISs in the United States has accelerated since the turn of the century. Many Underwriters Laboratories standards have been replaced by IEC standards, with suitable changes. The Canadian Standards Association (CSA) has led the way in Canada's adoptions of ISs.

The extremely wide variation in conditions in the several states, from north to south and from east to west, require that standards used in states be flexible. Earthquake-resistant construction standards, for example, are vital to the states of California, Oregon, and Washington, where major tremblers are commonplace. Such standards seem less necessary in the central part of the United States where the last major shake was the New Madrid episode that changed the course of the Mississippi River.

Company Standards

Most major companies have "internal standards" as well as "external standards." The company's marriage of these sometimes disparate standards will depend on the market it sees for its products or services. Since most companies hope to grow into international firms eventually, they should carefully consider the mix of standards with an emphasis on ISs. A modern treatment of standards and standardization at the company level appears in Hesser et al. (2007), including chapters on product development and design, and standardization within a company. A strategic perspective, and external standardization as company strategy is covered in Hesser et al. An early

paper on standards and competitiveness, stressing the use of standards in all of a company's activities, to make it more competitive, was published in 1992 (Hunter 1992), and a series of papers on company standardization was published by the American National Standards Institute (ANSI) in (1990), including "hands on" material in seven different industries that appear in Chapter 20 of Toth (1990). Other chapters explore the establishment of a "standards department" in a company and related issues.

Typical Format of a Standard

The formats of standards vary widely with different standards bodies and different purposes. There are, however, some common threads of format that many standards exhibit. The following parts were abstracted from several existing standards and give a general idea of the structure of many standards.

Cover and Title Page

This part of a typical standard usually includes the logo of the standards body, the title and number of the standard, an abstract of the standard for information retrieval purposes, and other relevant information. The edition of the standard is frequently specified and the copyright notice is also included.

Table of Contents

A table of contents, a requirement of almost any kind of publication of any complexity, is often included to help the reader quickly find the material of interest.

Scope

The purpose of the scope is to articulate the boundaries of coverage of the standard and how its scope differs from, or complements, the scopes of related standards. Some complex standards have correspondingly complex scopes and may, in some cases, further define the scope with a "not covered" statement that helps define the scope and hopefully avoids the misapplication of the standard to subjects not intended to be covered.

Foreword and Introduction

Some standards include a foreword in order to explain the motivation and the historical development of the standard and how the current edition

differs from previous editions if the standard is not a first edition. The foreword may identify committee members who helped develop the standard. A disclaimer is sometimes included to the effect that the foreword itself is not a formal part of the standard. Some standards also include an Introduction to further explain the background of the standard.

Terminology

Most standards include references to the terminology standards that are used in the standard or include terms that are especially defined for the purposes of the standard. This is one of the most important parts of any standard! ASTM—ISs must include information on the terminology at a specific place in every standard.

Marking

Many standards for *products* include the requirement for markings on the product. Markings may include compliance statements to show that the product complies with a certain standard. Markings of the electrical ratings are normally required on electrical equipment and components. Markings may include the date code of manufacture for certain items such as car tires and other "age-related items and materials."

Requirements

The *requirements* form the body of the standard. This part of a typical standard may also include instructions for the performance of *tests* that may be required to show compliance of a product with the standard.

Normative Annexes

As an alternative to the "References" part mentioned above, most ISs include a normative annex that performs the same function as the references section used in other standards. Normative references, like other references, form part of the standard and may include dozens of other standards like the UL standard 60950-1 on the safety of information technology equipment (ITE).

Informative Annexes and Bibliographies

Many standards include one, or even both, of these parts to provide additional technical background that is deemed helpful in understanding complex technical issues involved in such standards. Informative annexes and bibliographies do not, of course, become parts of the standards in the same sense as do references.

Indexes

Most standards of appreciable length or complexity include an index to help readers find particular parts of the documents ("documents" here include "soft copies" resident on any computer or other media as well as "hard copy" printed documents).

Access to Standards

Access to standards is much simpler than it was historically. Many public and private libraries now facilitate access to standards. One of the major resources is the National Center for Standards and Certification Information (NCSCI) located at the National Institute of Standards and Technology (NIST) headquarters in Gaithersburg, Maryland. One may physically visit the center or access it on the Web at www.nist.gov. The NCSCI is the U.S. Inquiry Point for the World Trade Organization and the Technical Barriers to Trade (WTO TBT). NCSCI is also the inquiry point for the North American Free Trade Agreement (NAFTA) and the International Organization for Standardization (ISO) Information Network (ISONET). NCSCI also permits one to track, on a daily basis, technical regulations issued by the U.S. government and state governments, as well as the 150 member countries of the WTO.

Codes

The term *code* is one of the most interesting and most ambiguous terms around—from the famous Morse code for telegraphy to zoning codes in most U.S. cities (except Houston). Several important codes have already been encountered in this book: the Uniform Commercial Code in Chapter 2 and the International Building Codes in Chapter 3 (see Table 3.1) are two. For the purposes of this book, a code is a special technical standard that is meant to be included, completely or by reference, in other laws and regulations. The National Electrical Safety Code (produced by the IEEE) has already been mentioned as has the National Electrical Code (NEC) produced by the National Fire Protection Association (NFPA). The 2011 version of the NEC has just been announced. The Code of Good Practice for Standardization (Guide 59) has already been mentioned in this chapter. The ASME (American Society of Mechanical Engineers—International Boiler and Pressure Vessel Code [BPVC]) is one of the most important of the many codes around. It

was recently announced that the State of Rhode Island was the first U.S. state to adopt the International Green Construction Code developed by the International Code Council. The Guide 2 defines Code of Practice as applying to the various aspects of equipment, structures or products.

Numerous references to the Code of Federal Regulations (CFR) have also been made in previous chapters. As mentioned elsewhere, federal regulations have the force of law which brings up the next topic (*regulation).*

Regulations

ISO/IEC Guide 2 defines both "regulation" and "technical regulation" in paragraphs 3.6 and 3.7, respectively. Many codes and other standards are incorporated into federal, state, and local regulations, frequently incorporated "by reference." This saves the government, hence the taxpayers, substantial sums of money that would be required to produce such codes and standards. Government agencies, in general, are very poor developers of technical regulations. The "publish and comment" procedures have been found to lack convergence by the Federal Communications Commission (FCC) and other agencies. The only practical response to the situation is to adopt standards developed in private industry and recognized as American National Standards (ANSs) by ANSI.

References

AIEE. 1941. *American Standard Definition of Electrical Terms (ASA C2)*. New York: AIEE.

De Vries, H.J. 1999. *Standardization—A Business Approach to the Role of National Organizations.* Boston/Dordrecht/London: Kluwer Academic Press.

Hesser, W., A. Feilzer, H. de Vries et al. 2007. *Standardization in Companies and Markets,* 2nd Ed. Hamburg: Helmut Schmidt University of Hamburg.

Hunter, R.D. 1992. Standards enhance competitiveness. *Standards Engineering* 44(6): 133–137.

Hunter, R.D. 2009. *Standards, Conformity Assessment and Accreditation for Engineers*. Boca Raton: Taylor & Francis.

ISO/IEC 2007. ISO/IEC Guide 99:2007. *International Vocabulary of Metrology—Basic and General Concepts and Associated Terms [VIM]*. Geneva: ISO/IEC.

ISO/IEC 1994. *ISO/IEC Guide 59—Code of Good Practice for Standardization.* Geneva: ISO.

Mackay, D.R. 1990. Glossary of standards-related terminology: In *Standards Management—A Handbook for Profit*, ed. R. B. Toth, 495–503. New York: ANSI.

Toth, R.B., Ed. 1990. *Standards Management—A Handbook for Profits*. New York: ANSI.

10

Standards Bodies and Their Products

Introduction

The term *standards body* is defined in ISO/IEC Guide 2 Standardization and Related Activities—General Vocabulary (2004). Because of the rise in unconventional standards bodies, such as the Internet Engineering Task Force (IETF), and for the reasons mentioned in Chapter 9, the lines between international and national standards bodies has become somewhat blurred. The traditional definitions will, when possible, be used with that understanding.

A simplified organization of a typical standards body is shown in Figure 10.1. The administrative part of the organization sets overall policies, provides a manual for guiding development of standards, handles the final balloting (voting) on standards, and publishes the approved standards ("publishing" here includes presentation on the net or otherwise and not always in a paper publication). One or more of these functions are handled by the "Secretariat" as indicated. There is usually an "administrative function" to take care of personnel matters, finances, etc. A crucial part of the standards body is the Committee to Authorize New Work. This "gatekeeping" function is necessary to make sure that a proposed new work item is within the organizational competence of the body and that it does not duplicate standards projects being prepared, or already published, by another standards body.

Overview of International Standards Bodies

There are some 70 international standards organizations (see Chapter 6 of Hunter (Hunter 2009)). There are three apex international standards bodies: the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), and the International Telecommunications Union (ITU). Both ISO and IEC are independent organizations, but the ITU is an agency of the United Nations (UN). The apex bodies do cooperate very closely in order to prevent significant overlap of their issued standards, and their policies tend to align even though they deal with disparate

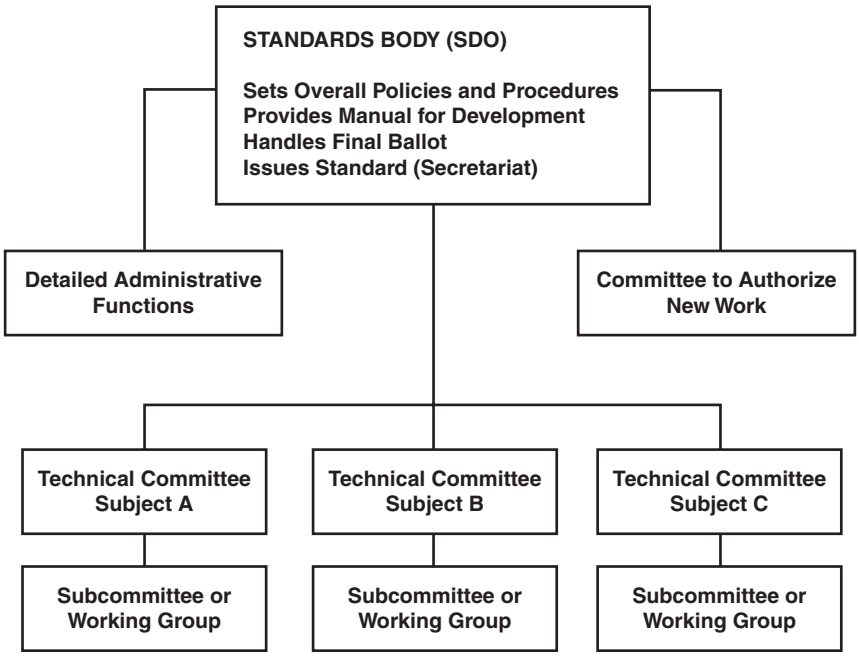


FIGURE 10.1
Simplified organization of a standards body. (Copyright © 2009, From Standards, Conformity Assessment, and Accreditation, by Robert D. Hunter. Reproduced by permission of Taylor and Francis Group, LLC, a division of Informa plc.)

technical fields from somewhat different perspectives (private versus public). The ISO focuses on mechanical and related subjects while the IEC covers electrical and electronics subjects. Selected examples of important but much more specialized international standards bodies of interest to engineers are listed in Table 10.1. Those that are *treaty organizations* are indicated by *.

Apex International Standards Bodies (ISO, IEC, ITU)

The ISO focuses on "mechanical" topics, as well as more general subjects such as standards and guides for standards development, management standards, quality standards, environmental protection standards, conformity assessment, and accreditation. The IEC covers electrical and electronics, as well as some specialized areas of conformity assessment and accreditation. The ITU develops standards for radio, cable, and satellite communications. Pursuant to its United Nations mandates, ITU works to help underdeveloped countries obtain access to modern communications systems.

TABLE 10.1

International Standards Bodies of Interest to Engineers

International Academy for Quality (IAQ)
International Accounting Standards Committee (IASC)
International Accreditation Forum (IAF)
International Atomic Energy Agency (IAEA)*
International Bureau of Weights and Measures (BIPM)*
International Civil Aviation Organization (ACAO)*
International Commission on Radiation Protection (IRCP)*
International Commission on Illumination (CIE)
International Commission on Radiation Units and Measurement (ICRU)
International Conference on Large Voltage Electrical Systems (CIGRE)
International Container Bureau (BIC)
International Federation for the Application of Standards (IFAN)
International Federation for Information Processing (IFIP)
International Frequency Registration Board (IFRB)*
International Laboratory Accreditation Conference (ILAC)
International Society of Photogrammetry & Remote Sensing (ISPRS)
International Organization for Legal Metrology (OIML)*
International Union of Producers and Distributors of Electrical Energy (UNIPEDE)
International Union of Radio Sciences (URSI)
World Health Organization (WHO)*
World Intellectual Property Organization (WIPO)*

Note: Organizations indicated by *.

International Organization for Standardization (ISO)

The term *standardization* in ISO's name is a bit of a misnomer. It is generally understood that "standardization" is the whole process of developing standards and implementing them. ISO has no mechanism for the implementation of its standards. The ISO includes the *national* standards bodies of over 160 countries. Each country is allowed only a single member in ISO. Some countries do not have voting memberships but are correspondent members (participate but not to vote) and subscriber members who merely track ISO developments and do not otherwise participate. The official languages of ISO are English, French, and Russian. The ISO headquarters, including the general secretariat, is located in Geneva, Switzerland. ISO was established in 1947, right after World War II, but it emerged out of the ruins of several prewar organizations. An engaging history and details of the ISO and its operation are included in a recent book by Craig N. Murphy and JoAnne Yates (Murphy and Yates 2009). Murphy and Yates describe the development of the ISO container standards and the form of governance provided by consensus standards developers like ISO. The ISO Web page is www.iso.org (accessed 12/7/10).

The overall direction of the ISO is set by its General Assembly that includes its principal officers and the delegates of the member bodies. The management of the ISO is the responsibility of the Council. In addition to the Central Secretariat, the Technical Management Board (TMB), the Policy development committees, the Council standing committees (finance and strategy) and an ad hoc advisory board report to the Council. The policy development committees include CASCO (Committee on Conformity Assessment), the COPOLCO (Committee on Consumer Policy) and DEVCO (Committee on Developing Country Matters).

The Technical Management Board oversees the operation of the Committee on Reference Materials (REMCO). Reference materials are physical standards (etalons) that are used in the calibration of measuring equipment; an example is equipment for maintaining a standard volt. Among the most important technical committees (TCs) managed by the TMB is the Joint Technical Committee 1. The JTC-1 is a joint technical committee with the International Electrotechnical Commission (IEC). JTC-1 took over the handling of information technology standards when the old separate ISO and IEC committee structure failed to achieve the desired results.

Major ISO Standards

The ISO container standards, reported by Murphy and Yates to include over 100 standards, among them ISO 1496-2, made the modern container shipping systems practical. The important thing about the family of standards is that it coordinates not only the containers themselves but also the myriad infrastructure (cranes, etc.) required to handle them.

The OSI reference model is ISO/IEC International Standard 7498-1; Information Technology; Open Systems Interconnection, Basic Reference Model (1994). This standard's development was far too slow for the rapidly advancing Internet technology and so was replaced by other standards developed by the Internet Engineering Task Force and others. The model is still used as a reference point to explain the positioning of other Internet standards (data link, network, transport, session, presentation, and application).

The ISO 9000 family of standards, including ISO 9001, ISO 9004, and ISO 19011, are doubtless the best known of the ISO standards. The basic uniformity of quality management standards afforded by the ISO 9000 family has simplified the accreditation and conformity assessment activities in modern supply chains.

The ISO 14000 series of standards on environmental protection are far too numerous and complex to even list here. They were coordinated early on with the ISO 9000 family so as to minimize overhead requirements for firms implementing both.

JTC-1 standards comprise the largest package of standards in the ISO portfolio. The procedures of JTC-1 were streamlined to permit the "fast track" publication of ISO/IEC standards on information technology so as to keep

up with rapid advances. The latest important standard to be approved for publication is ISO 26000, Guidance on Social Responsibility. More information is available at the ISO Web site.

The International Electrotechnical Commission (IEC)

A proposal for the establishment of an international electrical standards group was approved at the 1904 International Electrical Congress held in St. Louis, Missouri. The IEC was actually formed in London several years later and moved to Geneva in 1948 so as to better liaise with the ISO. British scientist Lord Kelvin was the first IEC president. Like the ISO, the official languages of the IEC are English, French, and Russian. IEC membership includes a representative of the IEC National Committee of each IEC member country. In the United States, national interests in IEC standards come under the U.S. National Committee of the IEC (USNC), which is lodged in the American National Standards Institute (ANSI).

IEC governance is provided by the Council of National Committees, an executive committee, a council board, and the Central Office along with some management advisory committees. The Standardization Management Board manages the Technical Committees, including the Joint Technical Committee–1, and other standards advisory boards. An important element of the IEC organization is the International Special Committee on Radio Interference (CISPR). CISPR develops standards used throughout the world, and by the International Telecommunications Union (ITU), for the control of radio frequency interference that had become a serious problem in the 1930s. Technical Committee 77 in IEC also develops EMC standards for both low frequency and high frequency applications. A major difference between the organization of the IEC and that of the ISO is that the IEC has three conformity assessment systems and a board to manage them. The IEC conformity assessment programs are considered in Chapter 12 on Conformity Assessment. The Web page for the IEC is www.iec.ch (accessed December 7, 2010).

Major IEC Standards

IEC 60335 covers the safety of household and similar electrical appliances.

IEC 60364 includes standards for electrical installations of buildings (it is the IEC equivalent of the U.S. National Electrical Code).

IEC 60601 is a family of standards for the safety of electrical medical equipment.

IEC 60664 is a family of standards on insulation coordination (for low-voltage systems).

IEC 60950 is a standard for the safety of information technology equipment.

IEC 60825 is a standard for the safety of laser products.

International Telecommunication Union (ITU)

The ITU, as contrasted with the ISO and IEC, is a treaty organization, a specialized agency of the United Nations formed in 1947. The roots of the organization go back to the turn of the 20th century when radio interference started to become a serious problem. The ITU, once based in Bern, Switzerland, was transferred to Geneva where it joins the other apex international standards bodies. The development of the ITU is described by W. H. Bellchambers et al. (Bellchambers 1984). The official languages of the ITU include English, French, and Spanish as well as Chinese, Russian, and Arabic. The ITU plays the essential role in the standardization and regulation of international telecommunications, including modern developments such as fiber optics and satellite communications. Its main goal is worldwide spectrum management for all of these services. Access to the ITU by U.S. parties goes through the U.S. State Department.

The overall management of the ITU is vested in the Plenipotentiary Conference, which meets at least every four years. The Council provides the day-to-day management of the ITU. The Secretary General and the General Secretariat perform the usual functions in a standards organization. The ITU-D (Telecommunication Development Sector) pursues the UN social goals of bringing modern ICT (Information Computer Technologies) to underdeveloped countries. The ITU-T (Telecommunication Standardization Sector) is responsible for the development of ITU Recommendations (standards) using both traditional techniques and "fast-track" development procedures. The ITU-R (Radiocommunication Sector) provides the spectrum allocation function of the ITI via the Radio Regulation Board and other departments. The ITU relies on the CISPR International Standards for detailed standards of electromagnetic interference measurement and control. ITU documents are referenced in the U.S. Federal Communications Commission (FCC) in 47 CFR. A major achievement of the ITU was the establishment of a common codec (coder/decoder) for both wireline and wireless services, a project strongly supported by ETSI (Varga et al. 2006). The ITU Web page is www.itu.int (accessed on 12/7/10).

Some Major ITU Standards

(**Note:** ITU-T recommendations can be downloaded from http://itu.int/rec/T-REC-G (accessed on 12/7/10))

- ITU-R Rep. M.2134, Requirements Related to Technical Performance for IMT-Advanced Radio Interfaces, 2008
- ITU-T G711.1, Extending G.711 to Higher-Quality Wideband Speech
- G.718: A New Embedded Speech and Audio Coding Standard with High Resilience to Error-Prone Transmission Channels

G.719: The First ITU-T Standard for High-Quality Conversational Fullband Coding

ITU-T G.729.1, Scalable Codec for New Wideband Services

G.hn: The New ITU-T Home Networking Standard

Regional Standards Bodies

The European Union developed the first major regional standards bodies in the mid-1980s. Three EU standards bodies emerged: the European Committee for Standardization (CEN), the European Committee for Electrotechnical Standardization (CENELEC), and the European Telecommunications Standards Institute (ETSI). These standards bodies prepare EU standards that implement EU Directives, such as the Low Voltage Directive (electrical safety).

European Committee for Standardization (CEN)

CEN receives its agenda and some of its funding from the EU. It has a general structure like that of Figure 10.1, complemented by additional bodies such as trade associations and ICT standards consortia (see Hunter, pp. 112–114). English, French, and German are the official languages of CEN. CEN is situated in Brussels, and has as its goal the creation of "harmonized standards" for the European Union member countries. Once a CEN standard is promulgated, the member countries have a certain schedule for replacing their own national standards with the harmonized CEN standards.

As its name implies, CEN organization mirrors that of ISO with its standards committees and working groups. CEN has a formal working agreement with the ISO called the Vienna Agreement. Many CEN standards are ISO standards with suitable modifications.

Unlike the ISO, CEN has a certification board that monitors conformity assessment schemes like the Keymark. The Technical Board of CEN manages the Technical Committees and the Working Groups. CEN has developed an analog of the JTC-1 ISO/IEC body called the Information Society Standardization System (ISSS). The ISSS issues prestandard documents called CEN Workshop Agreements (CWAs). Outside bodies such as consortia can participate in the work of the ISSS

European Committee for Electrotechnical Standardization (CENELEC)

Like CEN, CENELEC takes its direction from the EU. CEN is also located in Brussels. CENELEC mirrors the IEC organization and adopts many IEC standards to produce European standards. CENELEC has a special agreement

with the IEC called the Dresden Agreement. CENELEC's technical committees, subcommittees, and working groups mirror those of the IEC. CEN and CENELEC, like the ISO and IEC, have common rules for standards work. Like the IEC, CENELEC has a Conformity Assessment Forum that is described in Chapter 12 on Conformity Assessment. CENELEC standards may, in some cases, be more stringent than the basic IEC standard in order to implement the European "precautionary principle." Like the ISO/IEC arrangements, CEN has similar connections to CENELEC. CEN also works closely with the European Telecommunications Standards Institute (ETSI).

European Telecommunications Standards Institute (ETSI)

In the aftermath of global deregulation of telecommunications, the European Union established ETSI in 1988 to provide much needed standards to meet the "EU 1992" deadline (1992 is the date that the EU planned to complete the internal arrangements to eliminate trade barriers between the EU member nations). ETSI is located in Sophia Antipolis, France, and is relatively open to outside participation in its standard setting. ETSI has a very long list of contributing standards developers including the Internet Engineering Task Force (IETF) and other trade and professional groups. ETSI reportedly has over 700 members from over 50 countries. That makes ETSI a "virtual" international standards body. Because of its close relationship with the ITU, ETSI serves to some extent as a gateway into the ITU that is unencumbered by the U.S. State Department. The *quid pro quo* for that access is that ETSI and the EU greatly benefit from state-of-the-art U.S. and other telecom standards! ETSI cooperates closely with the IEC on standards issues.

One of the major achievements of ETSI was the development of the GSM cell phone standards. That permitted Europeans to use cell phones anywhere in the EU and in any other country that adopted the standard (many did). That is in contrast with the fragmented U.S. standards (letting the market decide), which put the U.S. cell phone makers far behind its European competitors such as Nokia. The ETSI Web site is www.etsi.org (accessed December 7, 2010).

Asia–Pacific Economic Cooperation (APEC)

APEC includes the major countries around the Pacific Rim, including the United States, China, Australia, Chile, Japan, Mexico, New Zealand, South Korea, and 13 other countries. South Korea, now a highly industrialized country, appears to have taken the lead in the development of regional standards and conformity assessment in APEC (see Chapter 7 of Hunter). South Korea has long been a leader in standards education. Part of the motivation of the APEC formation appears to be an attempt to mimic the success of the

European Union model without setting up regional standards bodies like CEN. APEC has installed a regional telecom MRA. APEC has also organized a number of standards-related bodies including:

Asia–Pacific Laboratory Accreditation (APLAC),
Asia–Pacific Legal Metrology Forum (APLMF),
Asia–Pacific Metrology Program (APMP),
Pacific Accreditation Cooperation (PAC), and the
Pacific Area Standards Congress (PASC).

The PASC plans to participate in international standards setting at the apex bodies.

American Standards Commission (COPANT)

COPANT includes the standards bodies of the Americas (North, Central, and South).

The official language is Spanish, and COPANT has some 32 members; it was started in 1956 and has worked to develop regional equivalents of the applicable international standards. The American National Standards Institute (ANSI) is a leading member of the organization. COPANT assists developing countries in the Americas to establish national standards and conformity assessment systems. COPANT's secretariat is located in Caracas, Venezuela, but its headquarters are in Buenos Aires, Argentina. COPANT is connected to the Apex International Standards Bodies as well as other treaty and nontreaty standards bodies.

Council for Harmonization of Electrotechnical Standards of the Nations of the Americas (CANENA)

CANENA was formed in 1992 pursuant to the North American Free Trade Agreement (NAFTA). Most of CANENA's work is done by Technical Harmonization Committees, which cooperate with both the IEC and CENELEC.

Additional regional standards bodies include (among others):

African Regional Organization for Standardization (ARSO)
Arab Organization for Standardization and Metrology (ASMO)
ASEAN Consultative Committee on Standards and Quality.

Regional Telecom Standards Bodies

The Asia Pacific Telecommunity (APT) is part of the United Nations' outreach program implemented by the ITU. APT's purpose is to promote coherence of the ICT (Information and Communications Technology) throughout its Southeast Asia region. The APT includes 34 members including Australia.

The Inter-American Telecommunications Commission (CITEL) grew out of the Organization of American States (OAS) treaty. CITEL is headquartered in Washington, D.C., and includes over 30 members in the Americas. ETSI was the model for CITEL but CITEL does more in conformity assessment than in standard setting.

National Standards Bodies

The principal national standards body in the United States is the American National Standards Institute (ANSI). ANSI calls itself a federation; it is a private nonprofit membership organization. Most of the significant national standards bodies in the United States are members of ANSI. ANSI does not itself develop standards, but it puts its imprimatur on standards that are developed by member standards bodies provided that the member bodies use the ANSI methods for standards development. ANSI has a strong working relationship with the National Institute for Standards and Technology (NIST) and other government agencies. ANSI headquarters is located in Washington, D.C., and the "back room" business is performed at its New York City offices. As shown in Figure 10.2, its policy committees include the Conformity Assessment Policy Committee (CAPC), the Intellectual Property Rights Policy Committee (IPRPC), the National Policy Committee (NPC), the ANSI ISO Council (AIC), the International Policy Committee (IPC), and the U.S. National Committee of the IEC Council (USNC). The CAPC includes the International Conformity Assessment Committee (ICAC), the Accreditation Committee for Product Certifiers, and the Personnel Certification Accreditation Committee. The National Policy Committee includes the Appeals Board, the Board of Standards Review, the Executive Standards Council, and the Committee on Education.

The AIC is the U.S. interface with the ISO of which ANSI is a member. The USNC is the U.S. interface with the IEC via the USNC. There are four classes of membership in the several forums and several standards panels that address important current issues such as homeland security. More details on standards development, conformity assessment, and accreditation appear in Chapters 11, 12, and 13, respectively. The Web site for ANSI is www.ansi.org (accessed December 7, 2010).

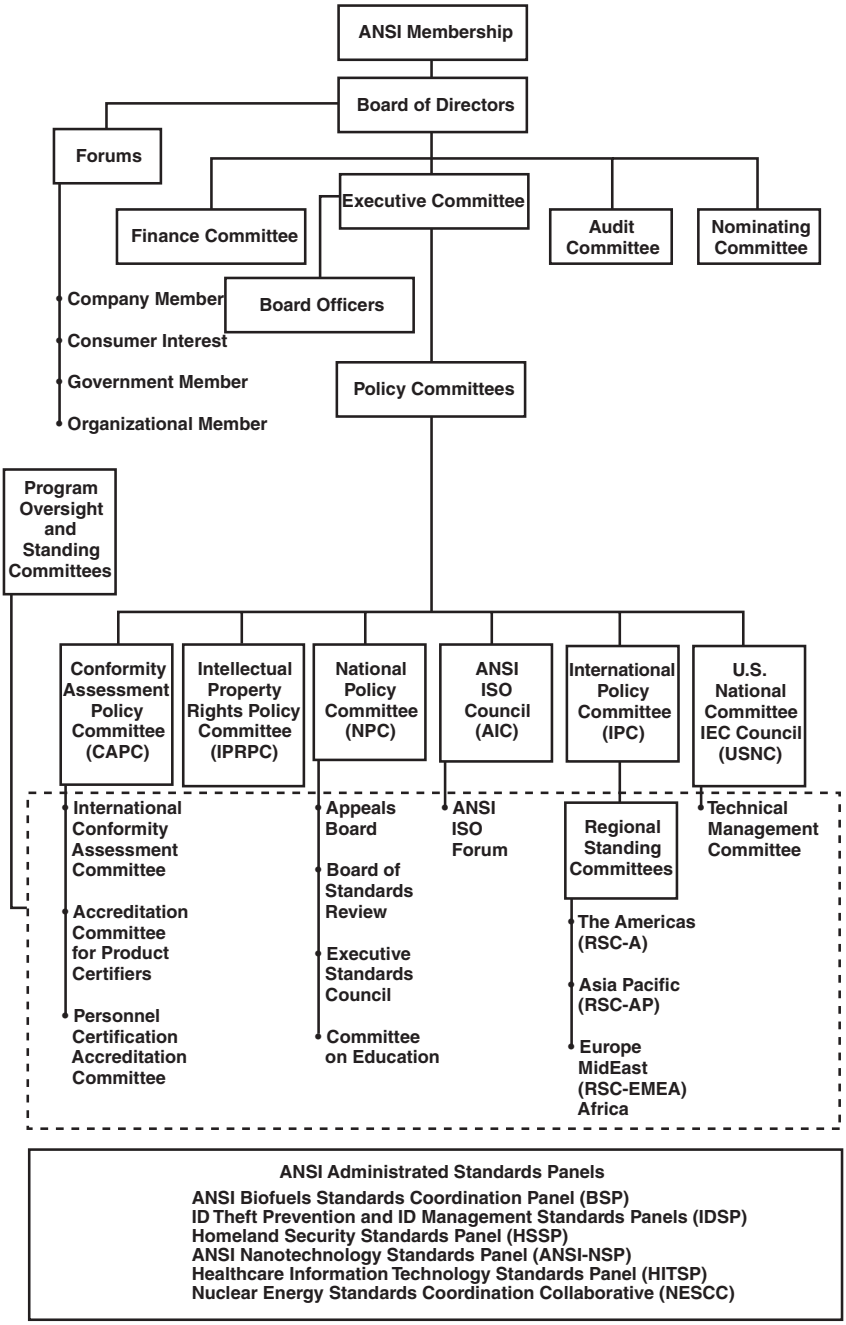


FIGURE 10.2
ANSI organization chart. (Copyright © 2010 American National Standards Institute, All Rights Reserved. Used here by permission.)

Traditional Standards Developing Organizations (SDOs)

Table 10.2 shows the major traditional standard developing organizations in the United States. This table is an updated version of Table 1 in NIST Special Publication 806 (Toth 1996).

Available space here permits the treatment of only a small sample of U.S. Standards Developing Organizations. The standards produced by these

TABLE 10.2

Major Traditional Standards Developing Organizations (SDOs) in the United States

Organization (Abbreviation)
Alliance for Telecommunications Industry Solutions (ATIS)
American Association of Blood Banks (AABB)
American Association of State Highway and Transportation Officials (AASHTA)
American Conference of Government Industrial Hygienists (ACGIH)
American Oil Chemists Society
American Petroleum Institute (API)
American Railway Engineering Association
American Society of Mechanical Engineers (ASME)
American Welding Society (AWS)
AOAC International (formerly Association of Official Analytical Chemists)
Association for the Advancement of Medical Instrumentation (AAMI)
Association of American Railroads (AAR)
Cosmetic, Toiletry & Fragrance Association
Electronics Industries Alliance (EIA)
Electronic Components, Assemblies and Materials Assoc. (ECA)
Government Electronics and Information Technology Association (GEIA)
JEDEC Solid State Technology Association
Telecommunications Industry Association (TIA)
Institute of Electrical and Electronics Engineers (IEEE)
InterNational Committee for Information Technology Standards (INCITS)
ISA-The Instrumentation, Systems and Automation Society
National Association of Photographic Manufacturers
National Electrical Manufacturers Association (NEMA)
National Fire Protection Association (NFPA)
Semiconductor Equipment and Materials International (SEMI)
Society of Automotive Engineers International (SAE)
Society of Cable and Telecommunications Engineers (SCTE)
Society of Motion Picture and Television Engineers (SMPTE)
Underwriters Laboratories (UL)
Uniform Code Council (UCC—administers Universal Product Code: UPC)
U. S. Pharmacopeial Convention (USP)

groups can only be hinted at. The bodies listed here are all ANSI recognized to develop standards in their areas of competence. Most are very broadly active in setting standards, sometimes using consortia-like approaches.

American Society of Mechanical Engineers–International

The impetus for the formation of the ASME in 1880 was a series of boiler explosions at the dawn of the industrial age. The ASME Boiler and Pressure Vessel Code (BPVC) is sued around the world. ASME standards include those for many mechanical products including fasteners. ASME became embroiled in a famous standards-based litigation known as *ASME v. Hydrolevel* (see Hunter, p. 160).

ASTM International (formerly American Society for Testing and Materials)

ASTM International is a nonprofit organization headquartered in West Conshohocken, Pennsylvania (a northwestern Philadelphia suburb). ASTM's original goal was to produce standards and conformity assessment technology to improve the steel that was being used to build the Pennsylvania Railroad. ASTM International later branched out into many diverse standards and conformity assessment topics and, as mentioned in Chapter 3, has a very large portfolio of standards for construction materials. ASTM International has not historically itself been in the conformity assessment business but that is reportedly changing. It publishes a widely respected list of accredited laboratories that test to ASTM standards. ASTM International President Jim Thomas was the first to declare ASTM an International Standards Body because its standards were used around the world and the processes complied with the World Trade Organization's definition of such a body.

Electronics Industries Alliance (EIA)

The EIA is the modern version of the Radio Manufacturers Association and its successor, the Radio-Electronics-Television Manufacturers Association (RETMA), which is famous for the 19-inch rack for the mounting of electronic equipment of all kinds. The old Joint Electron Device Engineering Council (JEDEC) is now part of the EIA. The EIA also includes the Telecommunications Industry Association (TIA), and several other organizations. The EIA has stepped into the "consortium model" to help it set some standards more quickly. The JEDEC became famous for a long-running litigation involving RAMBUS, whose patents were incorporated into a JEDEC standard while RAMBUS was participating in the deliberation on the standard. The litigation apparently continues.

National Fire Protection Association (NFPA)

All firemen use NFPA standards in their work, including the famous National Electrical Code previously mentioned. The independent nonprofit organization is based in Quincy, Massachusetts. Many of its standards and codes are recognized by ANSI and are incorporated in local building codes nationwide. The NFPA was involved in a celebrated case of "standards committee packing," which is known as *Allied Tube and Conduit Corporation v. Indian Head, Inc.* (Hunter p. 163).

Institute of Electrical and Electronics Engineers (IEEE)

The IEEE was formed by the merger of the Institute of Radio Engineers (IRE) with the American Institute of Electrical Engineers (AIEE). IEEE is a very broad-interest professional and technical organization that has been involved in electrical energy technology as well as radio, computer, and communications technologies. IEEE is the largest engineering society in the world and can also be considered an International Standards Organization (it was once the U.S. National Committee of the IEC). The IEEE is world famous for its 802® family of standards that have evolved to embrace many forms of information and telecommunications (wired and wireless). IEEE is also famous for its "Fire Wire" standard (1394), which is now an International Standard. The IEEE standards work is handled now by the IEEE Standards Association, which has developed some forward-looking ways to help unaffiliated groups develop a standard in a manner like the "Consortia Bodies" reviewed below.

International Committee for Information Technology Standards (INCITS)

INCITS, which grew out of the old CBEMA (Computer and Business Equipment Manufacturers Association) has long had a dominant role in ICT standards setting. INCITS is located in Washington, D.C., and is accredited by ANSI to discharge the U.S. obligations of ISO/IEC JTC-1. INCITS interacts with other organizations including the IEEE; its Web address is www.incits.org (accessed December 7, 2010).

Underwriters Laboratories (UL)

Underwriters Laboratories is an independent nonprofit standards developer and conformity assessment body located in Northbrook, Illinois. UL specializes in product safety for electrical systems and flammability standards for materials, including plastics. UL is also a Quality Management System (QMS) Registrar, coordinating with its conformity assessment and certification activities.

UL develops and maintains its standards using Standards Technical Panels (STPs), and has harmonized its standards with appropriate international

standards. The main certification activity of UL is called a "listing," which is required on many electrical systems, components, and materials before people will buy and use them (e.g., including fire extinguishers). UL performs a continuing surveillance of its clients to assure that production continues to meet UL standards. UL has an extensive "outreach" program; it can certify products for Canada and, through the IEC CB Scheme, in many foreign countries. It is a world-class organization with offices around the world.

Consortia Standards Bodies

As mentioned in Chapter 6, several consortia have sprung up to speed up the setting of standards in rapidly developing technology areas, including the Internet Engineering Task Force (IETF) and the World Wide Web Committee (W3C). A consortium is a connected group of independent companies that band together to achieve a certain result, like the setting of a standard. Some consortia are short-lived, like those organized to make a joint bid on a contract (especially a government contract) and others endure. Consortia tend to be concentrated in computer programs, having emerged in the 1980s and been described at some length in a 1995 issue of the ACM *Standard View* (Cargill 1955). As mentioned above, the modus operandi of consortia have been incorporated into that of conventional SDOs in the EIA and the IEEE. More on that subject appears in Chapter 11.

As the roles of consortia standards bodies have grown to be included in other kinds of standards developers, the distinction between consortia and the competition between SDOs and consortia has abated somewhat.

Internet Engineering Task Force (IETF)

The IETF, although a consortium, has other characteristics that distinguish it from most consortia, including openness and doing business exclusively on the Web. IETF standards are published on the Web and available free; that is made possible by the funding arrangement of the IETF, which gets most of its support from the Internet Society (ISOC). The policies of the ISOC and the IETF are set by ISOC's financial supporters, which include several levels of membership. The modus operandi of the IETF is described in Chapter 11. The URL for the IETF is www.ietf.org (accessed December 7, 2010).

World Wide Web Consortium (W3C)

The W3C is responsible for the setting of standards for the Web, including XML (Extensible Markup Language), HTTP (Hypertext Transfer Protocol),

and related standards that are used to implement the World Wide Web. The W3C's Web page is at www.w3.org (accessed 12/7/10).

Open Group (OG)

The Open Group consortium addresses the standardization of computer software that is *open* (see Chapter 6). The Open Group, like some others, is an emergent international standards body with worldwide reach and membership. Open Group standards, such as the Unix specification, have been transposed to international standards. The Open Group Architecture Forum consists of many diverse firms and includes government agencies and varied other groups. The Open Group was established under the policy of the U.S. National Cooperative Research and Production Act of 1993. The Open Group is on the Web at www.opengroup.org (accessed December 7, 2010).

Summary

The standards bodies treated in this chapter are only a sample of those extant but will give the reader some insights into this important subject.

References

Bellchambers, W.H. et al. 1984. The international telecommunications union and development of worldwide telecommunications. *IEEE Communications Magazine* 22(5): 72–82, May 1984.

Cargill, C.F. 1995. *StandardView*. Association for Computing Machinery 3(4).

Hunter, R.D. 2009. *Standards, Conformity Assessment and Accreditation for Engineers*. Boca Raton: Taylor & Francis.

Murphy, C.N. and J. Yates. 2009. *The International Organization for Standardization (ISO).* New York: Routledge (an imprint of Taylor & Francis).

Toth, R.B. 1996. *Standards Activities of Organizations in the United States*. NIST Special Publication 806, U.S. Department of Commerce. National Institute of Standards and Technology.

Varga, I., R.D. De lacov, and P. Usai. 2006. Standardization of the AMR wideband speech codec in 3GPP and ITU-T. *IEEE Communications Magazine*, 34(5): 66–73, May 2006.

11

Development of Standards, Codes, and Regulations

Introduction

Standards are developed in a variety of ways that tend to converge around the methods of the so-called Standards Developing Organizations (SDOs) and the methods of Consortia, some of which were identified in Chapter 10. Codes are developed by organizations like the BOCA (Building Officials Code Administrators) that produce the international building codes (IBCs) described in Chapter 3. Also important (to engineers) are the fire codes of the National Fire Protection Association (NFPA). The National Electrical Code (NEC), produced by the NFPA, is one of the more important codes for electrical engineers, along with the IEEE National Electrical Safety Code, which relates to electrical transmission lines and related power engineering equipment. These codes are frequently reviewed and revised on a 3-year cycle to keep them current. Regulations are developed in various ways at all government levels but only the development of federal regulations is treated here.

Development of Standards by Conventional Bodies (SDOs)

Many standards people feel that the best way to develop a new standard is not to! The finding and adoption of a suitable standard is always a way to conserve valuable resources, especially human resources. In any event, the environment of standards into which a new standard must comfortably fit is an important consideration in determining the scope of a new standard. One theory of standards development held by many is to let various standards bodies develop competitive standards and let the market decide which one (or which ones) will ultimately prevail. That is the mode often preferred in the United States. A major downside of that approach is the example of the conflicting cell phone and other communication standards. First responders found that they couldn't communicate in major disasters (like 9/11) in the

United States because there were incompatible standards involved! The European Union used a "top-down" approach to develop a single standard for Europe, which ultimately became a de facto world standard. This different approach is also being championed by Andrew Updegrove, the lawyer guru of consortium formations, in the November–December 2010 issue of his online publication *Standards Today* (Updegrove 2010). Updegrove's editorial is headed "It's Time to Forge a New Public–Private Partnership in U.S. Standards Development."

Compact Summary of Case: *Allied Tube and Conduit Corp. v. Indian Head, Inc.*

Carlon, a division of Indian Head, Inc., brought out a plastic (PVC) conduit for electrical wires but could not market it without the approval of the NFPA. The manufacturers of steel-based conduit, which was approved by the NFPA, feared that Carlon's PVC conduit would be very damaging to their business. Accordingly, the steel conduit makers banded together through Allied Tube to stack the NFPA Code Making Panel with many people who had no technical background in the merits of the case (Hunter 2009). Carlon's application for NFPA approval of its conduit at the 1981 NFPA Meeting was narrowly defeated. Carlon appealed the adverse decision to the appeals board of the NFPA who refused to reverse it because the NFPA standards development rules had not been violated.

Carlon then sued both Allied and the NFPA but dropped the NFPA from the suit before the trial began. The jury trial found in favor of Indian Head and recommended multimillion dollar damages on the defendant (Allied), which the judge set aside. Indian Head appealed that decision to the U.S. Court of Appeals for the Second District, which reversed the court and reinstated the damages. Allied then appealed to the U.S. Supreme Court (hence the name of the case). The supreme court upheld the appeals court decision to reinstate the multimillion dollar damages. This decision sent shock waves through the standards community and forced major reevaluations of standard setters' procedural rules for developing standards (Swankin 1990).

Due Process in Standard Setting

As a result of the Allied Tube case outlined above, standard developing organizations scrutinized their rules for standard development in light of the

Swankin report. The result was the establishment of "due process" in standards setting which, broadly, included the steps outlined below and assured that each organization had a suitable appeals process for members that are dissatisfied with a consensus ruling. Due process requires, among other things, that a body:

Notify affected parties of the plan to set a standard.
Have written procedures and good record keeping.
Be open to all materially affected parties.
Have a balance of interests on the developer's committee.
Handle comments and negative ballots is a fair way.
Support each requirement with a rationale statement.
Make sure that consensus is achieved.
Provide an appeal route.
Provide a plan for the periodic review and maintenance of the standard

A typical SDO standards development *process* appears in Figure 11.1. A written proposal for new work must be submitted to a vote or similar decision-making function. In IEEE parlance, the proposal is called a Project Authorization Request (PAR). If the project is rejected, the proposal must be revised, abandoned, or presented to another venue. Accepted proposals go to a standards committee, subcommittee or working group, which produces a consensus document (committee draft or CD). If a consensus, defined somewhat differently in different standards developers but usually a substantial (2/3) consensus can be achieved, the working group document goes to a parent committee for review. If the proposed draft meets *proforma* and other requirements, a committee draft (CD) is prepared and balloted. If the ballot fails, the document is revised to respond to negative votes and then reballoted. This process loop is then continued (usually) until a "Draft Standard" (or revision) can be prepared by the SDO and submitted to another ballot.

Assuming that the draft standard finally survives a ballot, it becomes a "published" standard (publication only on the Web may be involved). Some authors have stressed the "process control" aspects of standard development (Hohmann 1989). This hierarchal approach to standards development explains, in part, why it takes so long to develop standards in this way. International and regional standard development frequently takes longer times because of the requirement for translation into several languages.

Appeals and Patent Issues

Standard Development Organizations that are accredited by the American National Standards Institute (ANSI) must provide a mechanism that

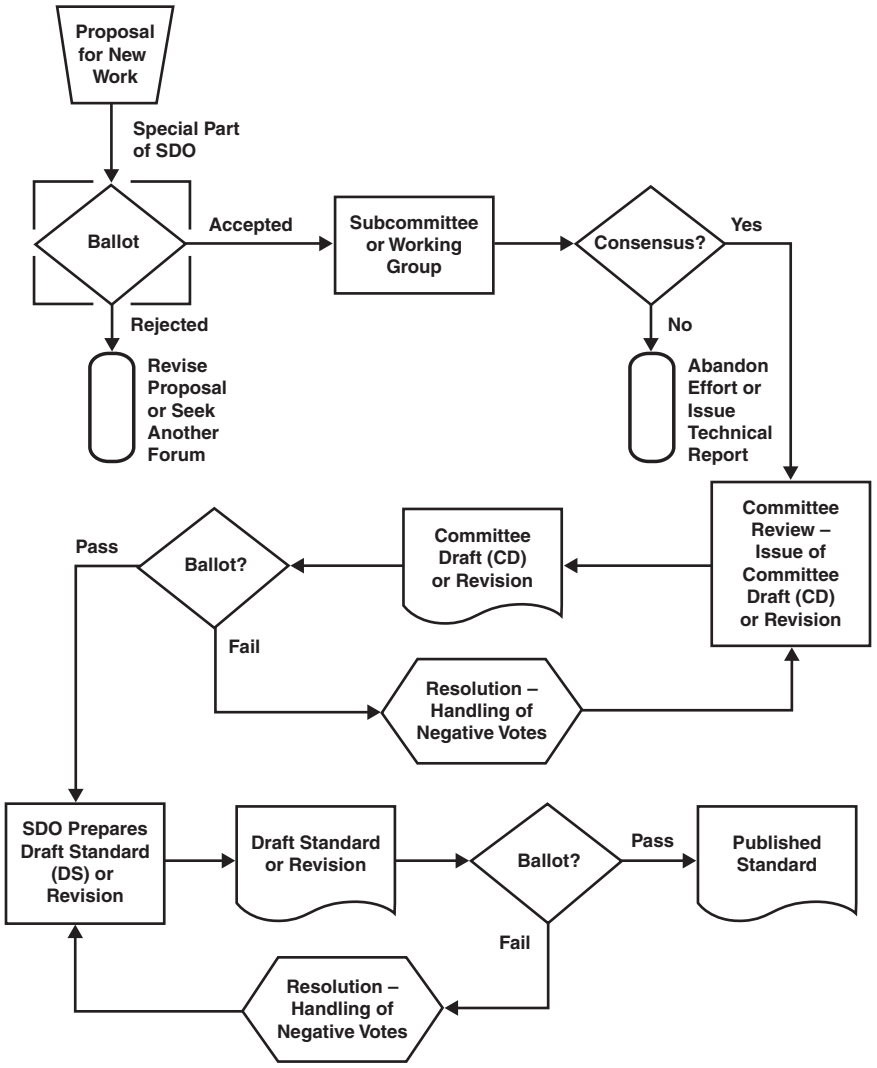


FIGURE 11.1
A typical SDO standard development process. (Copyright © 2009, From *Standards, Conformity Assessment, and Accreditation*, by Robert D. Hunter. Reproduced by permission of Taylor and Francis Group, LLC, a division of Informa plc.)

complies with the ANSI Essential Requirements–Due Process Requirements for American National Standards (ANSs). This document is available on the Web at www.ansi.org in the Library–Public Documents area. In some cases, an SDO member, or even an outsider, may appeal the results (or the methods) of the standards produced but not until the internal appeals process of the SDO have been completed.

It is possible to game the system by getting a patented item or process into a standard so that all users of the standard must pay a royalty, sometimes an exorbitant one. Standards bodies obviously want to avoid that situation. ANSI's patent policy in its Essential Requirements permits the inclusion of patented items in its standards if it is considered that technical reasons justify that approach. In those cases, ANSI requires that the patent owner provide a written assurance that a license will be made available without compensation or that a license will be made available to applicants on reasonable terms and conditions that are free of unfair discrimination (reasonable and nondiscriminatory or RAND conditions). Historically, the issuance of some standards, especially in highly technical areas where ready alternatives are not available, have resulted in considerable delay in the completion of a standard. The IEEE has enhanced its policies to deal with such situations "up front" in its standards process.

ISO/IEC Standards Development Rules

The development of international standards at the ISO and the IEC generally follows the format outlined above. There are two common directives for ISO/IEC standards development:

ISO/IEC Directives–Part 1. Procedures for the technical work

ISO/IEC Directives–Part 2. Rules for the structure and drafting of international standards.

In addition to the two directives outlined above, the ISO and IEC each have supplemental procedures:

ISO/IEC Directives—ISO Supplement, Procedures specific to ISO

ISO/IEC Directives—IEC Supplement, Procedures specific to IEC

Compliance with these requirements is facilitated in ISO by "ISO Templates" which tend to assure compliance with the format of ISO standards. The IEC has similar arrangements.

U.S. representatives appointed to the U.S. National Committee of the IEC (USNC) participate directly with their counterparts in other countries and in the IEC. These representatives are advised by Technical Advisory Committees (TAGs) of experts in the subject matter of the standards being developed. U.S. experts work through similar arrangements in helping ISO develop its standards. Several ANSI committees work directly with ISO committees such as the ISO Conformity Assessment Committee, which forms recommendations and votes on Conformity Assessment standards

such as the ISO/IEC FDIS 17021 Requirements for bodies providing audit and certification of management systems.

ISO/IEC Joint Technical Committee 1 (JTC 1)

The setting of information technology standards in ISO and IEC has been handled for many years by the JTC 1 as mentioned in Chapter 10. JTC 1 is empowered to transpose Publicly Available Specifications (PASs) developed by consortia and other bodies into ISO/IEC standards under its own development rules. The IEEE 802® standards have been fast tracked into the ISO/IEC system for two decades, making the rapid expansion of ICT standards in both ETSI and ITU possible for the developing Web and Internet. The Unix® standard mentioned in Chapter 6 was handled through JTC 1.

The open standards community took a major hit in March of 2008 when a review meeting in Geneva approved Microsoft's "Office Open XML" as an ISO/IEC International Standard 29500. There were media charges that Microsoft had packed some of the National Committees on JTC 1 in order to achieve its approval and that the Microsoft OOXML, as it is called, was not fit to be an international standard. To some, it looked like a replay of the committee-stacking episode in the Allied Tube and Conduit case described above. The ISO issued a PR release called "FAQs on ISO/IEC 29500." It was stated elsewhere that if OOXML has won, the credibility and integrity of the formal standards system has been lost.

This raises an interesting fundamental question about the *process* of standards setting. There are apparently some processes that cannot be controlled by any conceivable automatic control. Is the standards setting process one of them?

Standards Process in the International Telecommunications Union (ITU)

The functions of the Working Groups in the ISO/IEC schemes are performed by Study Groups in the ITU. The ITU has two basic processes:

- Traditional Approval Procedures (TAPs) that schedule a 9-month approval cycle after the completion of the work of the Study Group
- Alternative Approval Procedure with a minimum 4-week approval cycle, following the completion of the Study Group.

Most of the ICT standards developed by the ITU are performed in the ITU-T Telecommunication Standardization Sector. ITU-T Study Groups comprise a "baker's dozen" collection, which prepare standards on all phases of ICT including telecommunication management, protection against electromagnetic interference (with the help of IEC and CISPR standards), network

protocols, optical networks (such as IEEE 802® standards), terminals, telecom software (with help from the IETF and others), and mobile communications. ITU-T cooperates closely with ETSI, JTC 1 and other national, regional, and international standards bodies. The development of ITU standards has been retarded in the past by debates over the inclusion of patented items.

The Radio Communication Sector of ITU (ITU-R) addresses radio frequency spectrum management issues and maintains the Table of Frequency Allocations, which was made mandatory by international agreement in 1912. This work is supported by World Radiocommunication Conferences. The Radio Regulations Board (RRB) investigates major issues of radio-frequency interference, and its regulations are adopted by nations, as in the 47 CFR Part 2–Frequency Allocations and Radio Treaty Matters–General Rules and Regulations.

Common Patent Policy for ISO/IEC/ITU

In order to avoid delays in the setting of standards, the ISO, IEC, and ITU have developed a common patent policy. The ISO has established a patents database that includes 11 data elements concerning the intersection of patents and international standards. The database records all issued patents and patent applications relating to the three standards bodies. The common policy is that a patent involved in a standard or any other deliverable must be accessible to all without excessive restraint. The options for a patent holder under this policy include:

The patentee is willing to permit the use of its patent on a royalty-free basis, or the patentee is willing to license all comers on reasonable terms and conditions, like the "RAND" policy of ANSI outlined in this chapter. The IS bodies will not be involved in negotiations that are left up to the patentees themselves.

Unless a patentee or applicant is willing to abide by one of these options, no standard or deliverable will be issued! Patentees who hope that their patents will be included in a standard are required to file a "Patent Statement and Licensing Form" with one of the bodies that includes no restrictive conditions. This policy makes it much more difficult to "game" the standards system with patent rights as has occurred in the past.

Consortia Methods of Standard Setting

Consortia methods of standards setting vary all over the lot! Consortia methods, for the most part, were promoted to speed up standards setting

in fast-moving areas such as information technology and communications on the Web. Some of the detractors of consortia methods claimed that they trashed due process in order to speed things up. Consortia legal guru Andrew Updegrove begs to differ (Updegrove 1995a). As Updegrove points out, some *de jure* standards, such as IEEE standards, are actually built into consortia standards such as the X Window System. Because consortia standard setters frequently involve competitors, they have to be especially careful not to run aground of due process principles lest they attract the interest of the Department of Justice (DoJ, on Antitrust grounds) or the Federal Trade Commission (FTC, on unfair trade practices). While consortia were earlier considered to be unwelcome standard setters by the SDO community, there is now (2011) a better understanding between these groups. Some SDO standards setters have actually embraced "consortia methods" to complement their traditional activities. Some consortia, such as the Open Group described in Chapter 10, have actually brought in government agencies in partnerships as Updegrove suggested. Two consortia, at opposite ends of the spectrum to some extent, are the Semiconductor Equipment and Materials International (SEMI®) Trade Association and the Internet Engineering Task Force (IETF).

In the early days of the semiconductor, there were few if any standards for processes and tools for semiconductor manufacture. Wafer sizes had not been standardized so the area was ripe for a simple exercise in variety reduction! Like many trade associations, SEMI promotes education and other activities as well as setting standards. SEMI has established branches in Europe and Japan so its standards, although specialized, are "international standards." Because the members of SEMI are competitors in many cases, the standards setting takes care to observe the due process model, including an appeal mechanism. SEMI's Web page is at www.semi.org (accessed 12/7/10).

Internet Engineering Task Force (IETF)

Following the invention of the Internet protocols by Vinton G. Cerf and Robert E. Kahn (Cerf and Kahn 1974), it became possible to automatically interconnect existing packet switching networks using the TCP/IP protocols. Later on it fell to the IETF to set the standards for the rapid expansion of the Internet. The speed of standard setting required made conventional SDO methods impractical. The IETF standards setting has little in the way of extensive review and due process that is demanded of SDOs. The guiding principles of standard setting call for one engineer from each organization. There is no formal voting in the IETF; it operates on "rough consensus and running code" (Alvestrand 2004). There is relatively little representation of users. The "rough consensus" allows for more rapid standard setting than in a conventional SDO. The IETF does all of its business on the Web so there are no publication delays. Internet standards are called Requests

for Comments or RFCs. A proposed standard will not be considered unless two working embodiments have been demonstrated. All business is conducted in a single language (English), which also speeds things up considerably. Most of all, the "instant" communication of all of the participants helps speed standard setting.

Very importantly, the IETF fits itself into the complex standards world with extensive connections to the ITU and many other standards bodies. The Internet standards are freely available on the Web at www.ietf.org (accessed 12/7/10).

Development of Codes

The development methods for codes depends entirely on the organizational practices of the code maker. The Boiler and Pressure Vessel Code (B&PVC), for example, follows the rules of the sponsor, the American Society of Mechanical Engineers International (ASME International). The National Electrical Safety Code (sometimes confused with the National Electrical Code) is prepared under the standards regime of the Institute of Electrical and Electronics Engineers (IEEE). The National Electrical Code is developed under the rules of the National Fire Protection Association (NFPA). Most code making bodies use variants of the ANSI Essential Requirements to assure compliance with the due processes explained earlier in this chapter and illustrated in Figure 11.1. Most such codes reference standards developed by other bodies. Most of the codes of interest to engineers are "voluntary" until they are incorporated into laws and regulations at the federal, state, or lower levels. The Uniform Commercial Code (UCC) described in Chapter 2 of this book is another example of a code that is adopted by states. The several codes of ethics for engineers are covered in Chapter 14 here. To obtain the largest possible public review, many codes proposals and changes are published in the Federal Register.

Development of Federal Regulations in the United States

Once again we are looking at a *process*. A federal regulation can start with an act of Congress, such as the Telecommunications Act of 1996, which amended the Communications Act of 1934 (47 U.S.C. 151 *et seq*.). Since compliance with federal law is usually measured by the regulations issued pursuant to it, there is usually a delay between the passage of an act and the actual implementation of it. The economic rationale for regulation springs from an earlier

era when monopolists tended to gouge the public by charging excessive prices ("robber barons," etc.). Today (2011), the financial community is facing many new regulations because of the financial meltdown of 2008–2009.

The Federal Acquisition Regulations (FAR) reviewed in Chapter 3 is by now a familiar example. Many government agencies, such as the Department of Defense (DoD) have developed derivative acquisition regulation regulations such as the DFAR. Most of these processes are governed by the Administrative Procedures Act (5 U.S.C.). A basic principle of regulation is that a regulated firm can charge a price for its product or service that covers costs and permits a reasonable profit.

The Congress sometimes does not recognize that a problem requires regulation until it is well into the crisis stage. It normally takes Congress, through its committees, hearings, and investigations, several years to actually pass the needed legislation.

The next step is often the publication in the Federal Register (FR) of a Notice of Proposed Rule Making (NPRM). The public may then make a "Comment" on (criticize) the proposed rules, with the result that a revision is prepared and again published in the FR. That part of the process usually takes several more years. Once issued (published in the Federal Register), the rules and regulations are often challenged in the courts. The surviving regulations then become part of the federal regulatory system. While this method of producing regulations is sometimes successful, it often fails when the subject matter is highly technical, as it was in the failure of the Federal Communications Commission to arrive at some rules for reducing electromagnetic interference produced by computers. That problem was solved by permitting the IEEE C63 standards committee to develop standards that could then be adopted in the FCC regulation.

Supplementary methods for making regulations include "negotiated rule making," the adoption of a private sector standard, and the use of E-rulemaking. These alternatives are available in more limited situations where the regulator is acting within the broad scope authorized by Congress. In negotiated rule making, a group of experts from the bodies being regulated are brought together with the agency to hammer out a proposed rule. Since such a proposed rule already represents a consensus, it can often sail through the notice and comment phase of rule making more easily than rules developed by the classical method alone.

A regulatory agency may also decide to adopt a private sector "industry standard" that has been arrived at by a consensus process. That process takes place with the cooperation, or even the sponsorship, of the agency. This practice is now official government policy.

Since private standards developers have an ethic of producing "performance standards," where possible, instead of prescriptive (design) standards, this superior method of regulation development usually produces better regulations. Moreover, private standards must be revised or replaced periodically, which tends to prevent continued use of obsolete standards. Another

promising development for shortening the classical cycle is the application of E-rulemaking; that was used at the Department of Agriculture to partially automate the handling of comments.

It is, of course, necessary to recognize that the making of regulations is, in the final analysis, a *political process* as described in connection with the failed Fastener Quality Act (Hunter 2009).

Development of Regional Regulations in the European Union (EU)

The development of regulations in the European Union is more of a "top-down" process and probably not quite as political as that in the United States. The *Official Journal of the European Union* is roughly analogous to the *Federal Register* in the United States. The Directives of the EU are analogous to legislation in the United States; *The Directive on General Product Safety* (Directive 92/59/EEC) is an example. A major directive that addresses electrical product safety is the *Low Voltage Directive* (2006/95/EC). The LVD, as it is called, "incorporates by reference" more than 600 harmonized standards! Another interesting EU directive is the Safety of Toys Directive (NIST 2001). Electromagnetic compatibility standards are incorporated by reference in the C 71/1 (IV Notices) [2010/C 71/01]. This document includes over 100 CEN and CENELEC EMC standards, many of which are derived from CISPR standards.

References

Alvestrand, H. 2004. The role of the standards process in shaping the Internet. In *Proceedings of the IEEE* 92(6), eds. S. Trumpy and M. Gagnaire. New York: IEEE, 1371–1374.

Cerf, V.G. and R.E. Kahn. 1974. A protocol for packet network interconnection. *IEEE Transactions on Communications* COM-22 (5) (May 1974): 637–648.

Hohmann, L. 1989. Process control in standards bodies. *IEEE Communications Magazine* 27(9): 59–61.

Hunter, R.D. 2009. *Standards, Conformity Assessment, and Accreditation for Engineers.* Boca Raton: Taylor & Francis, 185–187.

NIST 2001. NIST GCR 01-823. *A Guide to the EU Safety of Toys Directive*, eds. Helen Delaney and Rene van de Zande. Gaithersburg: National Institute of Standards and Technology.

Swankin, D. 1990. *How Due Process in the Development of a Voluntary Standard Can Reduce the Risk of Anti-Trust Liability.* NIST/GCR 90/571.

Updegrove, A.A. 2010. It's time to forge a new public-private partnership in U.S. standards development. In *Standards Today* IX No. 4. On-line at ConsortiumInfo.org.

Updegrove, A.B. 1995a. Consortia and the role of government in standard setting. In *Standards Policy for Information Infrastructure,* ed. B. Kahin and J. Abbate. Cambridge: The MIT Press, 321–348.

12

Conformity Assessment

Introduction

The International Standard for Conformity Assessment is ISO/IEC 17000 Conformity Assessment—Vocabulary and General Principles (November 1, 2004). Conformity assessment principles were previously included in ISO/IEC Guide 2 but the connection between these documents remains since ISO/IEC 17000 is a normative reference in ISO/IEC Guide 2. The notion of conformity is fairly intuitive in many situations but becomes more difficult to define as the complexity of the subject matter increases, as in computer programs. As indicated in the Scope of ISO/IEC 17000, it is impractical to fully define all of the terms that occur in various examples of conformity assessment. Conformity assessment, briefly put, is a determination that an object (broadly defined) meets the *requirements* of the relevant standard.

A *first-party* conformity assessment is performed when the supplier of an item declares it to conform to a specific standard or standards. A *second-party* conformity assessment is performed by the purchaser or user of the item. A *third-party* conformity assessment is performed by a party independent of both first-party and second-party conformity assessors. It is redundant to refer to a third-party *certifier* since certification is itself defined as third-party conformity assessment. Occasionally, a third-party conformity assessor does not in fact certify the object but recommends to another organization (possibly related) that actually issues the certification.

The *process* of conformity assessment includes the selection of the appropriate standard followed by the gathering of data on the object of the conformity assessment, followed in turn by the determination of conformity and the attestation after a suitable review. The objects of conformity assessment include products, services, processes, systems, and persons. In addition to the ISO/IEC 17000 standard for conformity assessment *per se*, there is a family of more specialized supporting guides and standards that are produced by the ISO Committee on Conformity Assessment (ISO/CASCO). Some of the more important of these appear in Table 12.1.

TABLE 12.1

List of Major International Conformity Assessment Standards

ISO/IEC Guide 60: 2004. *Conformity Assessment—Code of good practice*
ISO/IEC Guide 65: 1996. *General requirements for bodies operating product certification systems*
ISO/IEC 17011: 2004. *Conformity assessment—General requirements for accrediting bodies accrediting conformity assessment bodies*
ISO/IEC 17020: 1998. *General criteria for the operation of various types of bodies performing inspection*
ISO/IEC 17021: 2006. *Conformity assessment—Requirements for bodies providing audit and certification of management systems*
ISO/IEC 17024: 2010. *General requirements for bodies operating certification of persons*
ISO/IEC 17025: 2005. *General requirements for the competence of testing and calibration laboratories*
ISO/IEC 17030: 2003. *Conformity assessment—General requirements for third-party marks of conformity*
ISO/IEC 17040: 2005. *Conformity assessments—General requirements for peer assessment of conformity assessment bodies and accreditation bodies*
ISO/IEC 17050-1: 2004. *Conformity assessment—Supplier's declaration of conformity—Part 1: General requirements.*

Conformity Assessment Technology and Skills

The increasing complexity of conformance, frequently called "compliance," with new federal regulations, such as the FCC's requirements on electromagnetic emissions for computers, showed that a new subspecialty of engineering was emerging, the "regulatory compliance engineer." Regulatory compliance engineers were faced with an increasing thicket of "regulations," some of which were in conflict. A simple example was the low (3.5 mA) leakage current requirements for the safety of information technology equipment (computers) and the relatively high leakage current of conventional power line filters used to suppress "conducted" emissions (due mainly to the increased use of "switch mode" power supplies). In addition, other requirements for ITE equipment were being incorporated into IEC standards such as IEC 60 950. The result was sometimes called the "regulatory thicket" because of its increasing complexity.

One of the central issues in conformity assessment is that the "portability" of the results depends on the product standard. If a product standard has too many alternatives that comply with it, the portability of the conformity assessment is thrown into doubt.

Environmental regulations called for massive changes in the technology that had been developed. The exacting sciences of analytical chemistry (ASTM International's strong point) added further complexity to the mix.

The removal of lead and other heavy metals, such as cadmium, from products required basic changes in design. The ISO/IEC Guides Compendium (third edition) published in 1995 included some 20 guides and definitions documents applicable to conformity assessment.

The ISO/IEC Guide 99:2007, International Vocabulary of Metrology—Basic and General Concepts and Associated Terms (VIM), runs to over 90 pages.

Private Sector Conformity Assessment Bodies in the United States

Conformity assessment bodies in the United States have been growing in the last several decades. Some of these CA bodies are government agencies, for example, the U.S. Department of Agriculture, which inspects meat and other products for conformity to its standards. Many others are private bodies such as the Underwriters Laboratories (UL). UL people like to point out that UL was doing what is now called *conformity assessment* for over a century (long before it came to be called conformity assessment). Others that have traditionally avoided conformity assessment activities are now entering the field (ASTM International). Many standards bodies, such as those identified in Chapter 9, have "code interpretation committees," which are an important form of conformity assessment. One such body is the American Society of Mechanical Engineers (ASME). A celebrated legal case involving a conformity assessment of the Boiler and Pressure Vessel (B&PV) standards committee is described in the following Compact Summary of Case.

Private sector conformity assessment bodies tend to be small and serve relatively local clients. A concrete core testing laboratory, for example, usually serves a relatively small area. Several dozen testing bodies with national reach advertise in the back pages of ASTM International's *Standardization News*; a special issue of that publication with good papers on conformity assessment was published in 1996 (Schindler 1996). Many others are industry specific and in some cases even owned by large manufacturers. Underwriters Laboratories has facilities in Canada, and the Canadian Standards Association (CSA) has facilities in the United States. CSA can provide certification marks for the United States as well as Canada and UL can provide certification marks for Canada as well as the United States. A sample of some of the product safety testing laboratories that provide safety marks as "Nationally Recognized Testing Laboratories" appears in Table 12.2 (some of these firms also provide EMC testing). A list of EMC test houses is included in Table 12.3.

TABLE 12.2

Some of the Nationally Recognized Testing Laboratories (NRTLs) in the United States

Applied Research Laboratories (ARL)
Canadian Standards Association
Communication Certification Laboratory (CCL) [now owned by NEMKO]
Curtis-Strauss LLC (CSL)
Electrical Reliability Services, Inc. (ERS)
Entela, Inc. (ENT)
FM Global (formerly Factory Mutual, consortium of insurers)
Intertek (supplies acquired ETL Listing Mark)
MET Laboratories (recently acquired Dell Regulatory Laboratories)
National Technical Systems (NTS)
NSF International (NSF)
SGS U.S. Testing Company
Southwest Research Institute (SwRI)
TUV (Technischer Uberwachungsverin—several variations with offices Worldwide, including:
TUV America, Inc. (TUVAM)
TUV Product Services GmbH (TUVPSG)
TUV Rheinland of North America (TUV)
Underwriters Laboratories, Inc. (UL)
Wyle Laboratories, Inc. (WL)

TABLE 12.3

Merchant Electromagnetic Compatibility (EMC) Testers in the United States

Applied Physical Electronics, LC
Bay Area Compliance Labs, Inc.
CKC Laboratories, Inc.
Communications Certification Laboratories
Compliance Testing
Dayton T. Brown, Inc.
D.L.S. Electronic Systems, Inc.
ETS-Lindgren
MET Laboratories, Inc.
Montrose Compliance Services, Inc.
NEMKO USA
Professional Testing (EMI), Inc.
Pulver Laboratories, Inc.
Retlif Testing Laboratories
Underwriters Laboratories, Inc.
Southwest Research Institute
TUV Rheinland of North America, Inc.

Other private sector conformity assessment activities include:

Good Housekeeping Magazine
Solar Rating and Certification Corp. (SRCC)
Consumers Union
American Gas Association (AGA)
Association of Home Appliance Manufacturers (AHAM)
Air Conditioning and Refrigeration Institute (ARI)
National Certified Testing Laboratories (NCTL)
Metallurgical Engineers of Atlanta, and over 100 others

Compact Summary of Case: *American Society of Mechanical Engineers v. Hydrolevel, Inc.* 456 U.S. 556 (1982)

Boilers that traditionally had a mechanism for fuel cutoffs that operated when the water level was dangerously low were covered by the ASME Boiler & Pressure Vessel (B&PV) Code. McDonnell and Miller, Inc. (M&M) had long dominated the market for such devices, and some of its officers served on the applicable B&PV Code-Making Panel. Hydrolevel, a competitor to M&M, came out with a probe device that was structurally different from the M&M device and tried to market it to the industry. Buyers of cutoff devices would not buy Hydrolevel's units unless Hydrolevel could show that its probe complied with (conformed to) the Code. When Hydrolevel applied to the Code Panel for an interpretation that its probe conformed to the Code, the officers of M&M conspired to declare it nonconforming as a way of stifling competition! This act was clearly unethical (see Chapter 14) and obviously illegal as well.

Hydrolevel sued ASME for violation of the Sherman Antitrust Act (15 U.S.C.). The jury at the district court level found in favor of Hydrolevel and assessed treble damages, pursuant to the Sherman Act. Further appeals by the ASME finally brought the case to the U.S. Supreme Court. The supreme court agreed with the lower court's decisions in favor of Hydrolevel, pointing out the potential of standards bodies for anticompetitive behavior. This decision, along with that of Allied Tube described in Chapter 9, forced the standards community to rethink its standards development procedures and furthered the development of due process in standards bodies.

An important point that the Hydrolevel decision emphasized was that standards should employ *performance requirements* wherever possible rather than "design requirements." The issue would have been avoided if the Boiler Code had included a performance requirement rather than the design requirement that it did incorporate.

Federal Conformity Assessment in the United States

Federal conformity assessment processes provide assurance that the products and services regulated or acquired by federal agencies meet the necessary requirements. Agency conformity assessments include many different activities including sampling, testing, inspection, and certification by the agency or another organization. All three methods (first-party, second-party, and third-party) of conformity assessment are used by federal agencies.

The National Institute of Standards and Technology (NIST), formerly the National Bureau of Standards (NBS), is part of the Department of Commerce (DoC) and has a long history as a major component of conformity assessment in the United States. Its traditional role in legal metrology has directly supported state and private conformity assessment bodies. When you pump gasoline into your car you are assured of its octane by conformity assessment using an ASTM international standard as to its quantity (the gallon); each state's monitoring of an honest gallon is traceable to the NIST! NIST is headquartered in Gaithersburg, Maryland, and has a major operation specializing in electromagnetics in Boulder, Colorado.

NIST was given larger oversight of both federal and private conformity assessment by the National Technology Transfer and Advancement Act (NTTAA) of 1995 (P.L. 104-113). This Act assigned to NIST a role "to coordinate federal, state, and local technical standards activities and conformity assessment activities, with the goal of eliminating unnecessary duplication and complexity in the development and promulgation of conformity assessment requirements and measures." The NTTAA also directs government agencies to utilize private conformity assessment procedures in meeting regulatory and procurement objectives including those of the National Cooperation for Laboratory Accreditation (NACLA), the ISO/CASCO, ANSI, and other groups dealing with conformity assessment. The Technology Services function at NIST contains many of the available national and international sources of information on conformity assessment. NIST's new Web site for information on standards and conformity assessment is at www.gsi.nist.gov/global/index.cfm.

NIST Special Publication 739 (Breitenberg 1999) covers some 18 federal agencies that have major conformity assessment activities. Some details as to the modus operandi, the enforcement methods, the related standards, codes, and regulations are included. The agencies involved include:

Department of Agriculture
Department of Commerce
Department of Defense
Department of Energy

Department of Health and Human Services
Department of Housing and Urban Affairs
Department of the Interior
Department of Justice
Department of Labor
Department of Transportation
Department of Treasury
Department of Veterans Affairs
Consumer Product Safety Commission
Environmental Protection Agency
Federal Communications Commission
Federal Trade Commission
General Services Commission
Nuclear Regulatory Commission

Examples of Federal Conformity Assessment in the United States

Only a few of the federal conformity assessment programs can be covered here. The Department of Agriculture (USDA) has broad responsibilities for the protection of U.S. consumers from defective meats, grains, dairy products, fruits and vegetables, processed foods, "organic" foods, plants, livestock, and biological products for both import and export. Some of these functions are shared with states' departments of agriculture. One of its conformity assessment functions referred to in Chapter 5 (plant patents) is to certify plant varieties. World trade has, unfortunately, provided portals of entry for nonnative species that the USDA cannot control.

NIST, in addition to its conformity assessment functions described previously, administers a federal recognition of conformity assessment activities called NVCASE, which is designed to enhance domestic conformity assessors' recognition in foreign markets. NIST also has responsibilities for the assessment of computer software using both internal and external testing resources. The Federal Information Processing Standards (FIPS) are used as part of that program (Keblawi and Sullivan 2007). NIST also provides Certified Reference Materials (CRMs or etalons). These certified reference materials are used in government, as well as state and international metrology programs. The calibration program at NIST provides measurement services so that state and other users can trace their calibrations to "a national agency."

The Department of Defense (DOD) performs major conformity assessment functions via its Qualified Product Lists (QPLs) and its Qualified Manufacturers Lists (QMLs). Compliance with these programs is

mandatory pursuant to Part 9 of the Federal Acquisition Regulations (FARs). Manufacturers must maintain an effective quality management program patterned after ISO 9001.

The Department of Energy (DOE), along with the Environmental Protection Agency (EPA), administers the Energy Star energy conservation program for electrical appliances pursuant to the Energy Policy Act and related public laws. This largely voluntary program has enjoyed some success but has recently (2010) shown to be gamed by some producers and importers of covered appliances in spite of hefty fines for such activity.

The Center for Devices and Radiological Health (CDRH) of the Food and Drug Administration (FDA) in the Department of Health and Human Services (DHHS) is responsible for conformity assessment of medical devices, a subject of interest to biomedical engineers. The authority for the program is the Medical Device Amendments (P.L. 94-295) to the Food, Drug and Cosmetic Act (Title 21 U.S.C.). The purpose of this program is to assure that medical devices are both safe and effective for their intended uses. Unless exempted by regulation, all medical device manufacturers are required to give the FDA 90-days notice before they intend to market a device by submitting a premarket notification. The FDA, during the 90-day period, determines if the device is equivalent to a preamendment device. A medical device may not be marketed until the manufacturer receives a notice from the agency that its device does not require premarket approval (PMA).

The Federal Housing Administration (FHA) of the Department of Housing and Urban Development (HUD) provides for the certification, using conformance tests by government laboratories, third-party laboratories, manufacturers' laboratories or state and local government laboratories, to assure that building products arriving at the job site (see Chapter 3 here) comply with specified standards. A notable failure of this system is the current problem with "drywall" construction, which emits hazardous gases (most drywall is made in China). The FHA also administers conformity assessments for materials used to build manufactured housing.

The Mine Safety and Health Administration (MSHA) of the Department of Labor (DOL) requires conformity with mandatory safety standards. Most of the activity is directed to assuring that electrical equipment and other possible sources of ignition are prevented from igniting explosions and fires in underground mines, including coal mines where flammable gas and dust is prevalent. This conformity assessment program has made loss-of-life accidents relatively rare in U.S. coal and other mines. The NRTL (Nationally Recognized Testing Laboratory) is also administered by the DOL's Occupational Safety and Health Administration (OSHA). This program requires that third-party certification bodies meet the criteria of competency and independence in 29 CFR 1910.7. OSHA standards include many nongovernment standards incorporated by reference including

those of ANSI, ASME, NFPA, and UL, as well as international standards and guides.

One of the most comprehensive and effective conformity assessment activities of the U.S. Government is performed by the Federal Aviation Administration (FAA) in the Department of Transportation (DOT). The civilian aircraft certification service provides a Type Certificate when it has been shown that a specific type of aircraft, including engines, meet safety requirements. Airworthiness Certificates are also issued for each approved aircraft. Parts Manufacturer Approval (PMA) is also required by FAA regulations (14 CFR Parts 1-199).

Certification marks are required on both airframes and approved parts. The FAA also has conformity assessment functions relating to airports and related facilities. The DOT, through its Federal Highway Administration (FHWA), also administers requirements for highways that are part of the National Highway System and that include bridges, tunnels and pavement. Most of the inspection is performed by state inspectors. Railroad trains and equipment are also covered by DOT's Federal Railroad Administration (FRA). Motor vehicle safety and fuel economy are also governed by the National Highway Traffic Safety Administration (NHTSA) in the DOT. The agency tests for compliance with Federal Motor Vehicle Safety Standards (FMVSS) in 49 U.S.C., Chapter 301. Tires also come under the NHTSA regulations that require a quality grading system that includes a conventional 4-digit date code (mmyy). Pipelines for gas and hazardous liquids come under the purview of the DOT through its Office of Pipeline Safety.

The Consumer Product Safety Commission (CPSC) is an independent agency that strives to reduce accidents due to defective products and other causes. It was implemented by the Consumer Product Safety Act and also works to prevent poisoning pursuant to the Poison Prevention Packaging Act. It makes discarded refrigerators safer by implementing the Refrigerator Safety Act (doors must be removed from discarded fridges to avoid child entrapment). The CPSC relies on private-sector standards for the most part, for example, standards developed by Underwriters Laboratories (UL) and ASTM International. The CPSC also uses private-sector laboratories in assessing conformity. The commission requires manufacturers to promptly notify it of any hazards found by the manufacturers and can force manufacturers to recall dangerous products. CPSC pays special attention to fabrics issued pursuant to the Flammable Fabrics Act (16 U.S.C. 1191 *et seq*.). The certification mark for compliant fabrics is a label that is authorized. The CPSC also addresses hazardous household substances, toys, and articles intended for use by children, implementing the Federal Hazardous Substances Act (15 U.S.C. 1261 *et seq*.). Hazardous substances may be recalled and or banned from the market.

The Environmental Protection Agency (EPA) has very broad responsibility for limiting damage to the environment and thus to the public. In addition

to regulating motor vehicle fuels and fuel additives, the EPA defines environmentally preferable products for government procurement. The EPA enforces the Clean Air Act (42 U.S.C. 7541 and 40 VFDR Part 85) by policing automotive aftermarket parts. The conformity assessment method most used is the first-party method that permits the manufacturer to mark affected parts "Certified to EPA Standards." The EPA also regulates automobile and light-truck motor vehicle engines, both gasoline and diesel. Testing is done by government laboratories, government-accredited laboratories, and manufacturers' laboratories. Certain busses and diesel trucks must meet Clean Air Act requirements. Nonroad engines, including lawn and garden equipment, construction equipment, and others, must also meet the Clean Air Act under EPA supervision. The agency sets requirements for implementation at the state level for vehicle inspection and maintenance programs. To protect human health, safety, and the environment, the EPA rules prevent underground storage tanks from leaking petroleum or other hazardous substances into the environment pursuant to the Resource Conservation and Recovery Act.

The Safe Drinking Water Act (42 U.S.C. 300) and other regulations are implemented by the Office of Ground Water and Drinking Water. The Office of Pesticide Programs assures compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (P.L. 94149 and P.L. 95396). The EPA also protects applicators and agricultural workers from pesticide poisoning. The EPA regulates radon measurement, mitigation, training, and education required by the Radon Abatement Act (IRAA) of 1988. As mentioned earlier in the DOE description, the EPA works with the DOE on the Energy Star program. The Energy Star concept is also applied to buildings to promote energy management investment in profit-based building upgrades. Asbestos mitigation services and processing facilities are also in the province of the EPA's enforcement of the Clean Air Act. Coal burning boilers and power plants are regulated by the EPA's Office of Air Quality Planning and Standards to reduce the risk to health and the environment, and to reduce acid rain.

The Federal Communications Commission (FCC) discussed elsewhere is charged with spectrum management and related tasks pursuant to the Communications Act of 1934, as amended; the National Environmental Policy Act of 1969; and the Telecommunications Act of 1996 (see 47 CFR). In addition to regulating cable television, the FCC regulates international radio, telecommunications, and satellite communications in accordance with ITU rules. The FCC is currently (2010) considering how, and whether, to regulate the Internet.

The Nuclear Regulatory Commission (NRC), through its Office of Nuclear Reactor Regulation, is responsible for regulating nuclear power and waste pursuant to the Atomic Energy Act, as amended. The NRC develops regulations for programs and activities it regulates, reviews applications, and issues licenses and performs inspections to assure the safety of nuclear energy. Its job would have been much simpler if the design of reactors had been

standardized, as it was in some countries. Radioactive material for medical, industrial and academic uses, as well as radioactive material packaging and containers, are also the responsibility of the NRC. The control of nuclear waste, still an unresolved issue, is also the responsibility of the NRC.

Conformity Assessment in International Trade

Conformity assessment in national trade has not historically been a large issue. But the conformity assessment issue in international trade looms very large. The World Trade Organization (WTO) has observed that country-to-country variations in conformity assessment can act as nontariff barriers to international trade, and has prescribed their reduction through coordinated conformity assessment practices. This process is enhanced by the *accreditation* of conformity assessment bodies, which is covered in Chapter 13.

The International Organization for Standardization (ISO) does not perform any conformity assessments but prepares the International Standards that govern conformity assessment. It also accredits Reference Materials via its REMCO branch. Reference materials are "etalons." That word defines a physical unit such as the 1 kg mass standard. The International Electrotechnical Commission (IEC), on the other hand, has three conformity assessment schemes, the IECEE system for conformity assessment of electrical systems, the IECQ-CECC quality assessment systems for electronic components, and the IECEx, that certifies electrical equipment for use in explosive atmospheres (like the BP-operated drilling platform that recently exploded and burned in the Gulf of Mexico).

IEC Conformity Assessment Systems

The IEC/IECEE system for conformity testing and certification of electrical equipment is the Global Approval Program for Photovoltaics (PV GAP). The CB Scheme provides for the recognition of test certificates for electrical equipment in the member countries so that one standard, one test, and one mark provides portability of conformity assessments. The advantage to computer makers, for example, is that they don't have to go country-by-country for safety approvals as they did historically (the resulting time saving and economics are obvious). The other IECEE scheme is the CB-FCS Scheme. This program is similar to the CB Scheme and is based on ISO/IEC Guide 67—Conformity Assessment/Fundamentals of Product Certification. This scheme is the "graduate school" scheme for those firms with good track records in the CB scheme and who, in addition, have in place a certified (accredited) quality management system.

The IEC/IECQ Quality Assessment Systems for Electronic Components provides certifications of components that require very high documented reliability such as military and aerospace components. Certifiable products include integrated circuits, printed wiring boards, electromagnetic components such as relays, and other components. The IECQ system relies on quality management system standards such as ISO 9001 and related standards.

The IECEx Scheme is a conformity assessment and certification system that is needed for electrical components that are used in hazardous atmospheres such as facilities processing petroleum and distillates, grain handling elevators, coal mines, and the like. The certifications are based on IEC 60079 and other standards. Both the manufacture and repair of IECEx certified components are performed under the program's supervision.

Regional Approaches to Conformity Assessment

The formation of the single market in the European Union in 1992 required a reordering of the conformity assessment of the individual country members of the union. The development of European Norms as EU standards resulted in a new approach to conformity assessment. The problem of variations in the several available conformity assessment systems available led to the development of the "Module Decision" (Hunter 2009). This resulted in a variety reduced set of conformity assessment procedures that could be incorporated by reference in each directive. Some of these permit the use of manufacturer's conformity assessment declarations involving the use of the "CE Mark" to indicate conformity with the EU directives such as the Low Voltage Directive mentioned in Chapter 9. For more complex situations, the conformity assessments were predicated on "Notified Body" conformity assessments with additional requirements. Notified Bodies are premier national agencies that are notified to the EU to perform conformative assessment functions. The requirements became more restrictive at higher levels of risk—for example, in medical device products where a mix of Notified Body Examination of product and Quality Management Systems accreditation is required. For some products, the Notified Bodies also carry out surveillance activities like the UL Follow-Up Service procedures. CENELEC has a Conformity Assessment Forum (CCAF) that monitors various mutual recognition agreements (MRAs) and other agreements on conformity assessment in the European Union.

The European Telecommunications Standards Institute (ETSI) was described in Chapter 10 on standards bodies. In addition to its setting of standards, ETSI performs a very important conformity assessment function for information communications technologies (ICT). It was thought at one time that conformance to a standard guaranteed interoperability in the ICT

field, but that was found to be untrue. Conformity may be said to be a necessary but not a sufficient condition for interoperability in ICT. ETSI provides a Protocol Testing and Competence Center (PTCC). PTCC testing for interoperability involves host equipment that generates protocol signals to the equipment under test (EUT) and measures the EUT's responses. In addition, ETSI provides a Plugtest™ Service that experimentally tests equipment for end-to-end functionality with two or more communications systems.

A useful but dated document on the EU conformity assessment systems is found in NIST Special Publication No. 951, available on the NIST Web page at www.nist.gov (publications section).

Other regions, such as those in the Americas, developed conformity assessment procedures along the lines established by the NAFTA conformity assessment procedures that rely on coordinated actions by each country. Many of the other regional standards bodies actually focus more on the "adoption" of an appropriate international standard and the development of regional methods for conformity assessment that may or may not be patterned after the EU approach. The more robust of these are in the Asia-Pacific Economic Cooperation (APEC) mentioned in Chapter 9. APEC has a Subcommittee on Standards and Conformance (APEC SCSC) that has recognized the Asia-Pacific Legal Metrology Forum (APLMF), the Asia-Pacific Metrology Program (APMP), and several accrediting agencies that are mentioned in Chapter 13 on accreditation. The Association of Southeast Asian Nations (ASEAN), some of whom are also members of APEC, have also developed robust arrangements for conformity assessment in the telecom and other areas using memoranda of understanding (MoUs) and similar arrangements to provide regional cohesion in conformity assessment. ASEAN has adopted the EU Notified Body approach in some cases but does not plan on achieving the political unity of the EU.

References

Breitenberg, M., ed. 1999. *Directory of Federal Government Certification and Related Programs.* Gaithersburg: NIST Special Publication 739.

Enright, C. 2011. ASTM Standardization News. 39(3).

Hunter, R.D. 2009. *Standards, Conformity Assessment and Accreditation for Engineers.* Boca Raton: Taylor & Francis.

Keblawi, F. and D. Sullivan. 2007. The case for flexible NIST security standards. *Computer* 40(6): 19–26.

Schindler, B., ed. 1996. *ASTM Standardization News.* 24(8).

13

Accreditation

Introduction

The portability of conformity assessments, covered in Chapter 12, depends heavily on *accreditation,* itself a form of certification, at the next higher level. Accreditation and certification share many concepts, but the critical distinction lies at the level of the actions. Certification is performed by a conformity assessment body (CAB), while accreditation reflects a form of approval of the CAB (or another entity in some cases). At the accreditation level, attention is directed more to the management aspects of the object of accreditation, including personnel qualifications, than it is in the case of conformity assessment. Both accreditation and conformity assessment share some common concepts and are sometimes confused.

One of the driving functions for accreditation is the importance of that process to international trade.

Conformity assessment results performed in one country have long been suspect from the perspective of trading partners unless the CABs are accredited. Manufacturers and businesses have long wanted to enjoy the advantages of "one standard, one test" (conformity assessment level) accepted worldwide (enhanced by suitable international accreditations). Another motivation for accreditation lies in legal and similar requirements such as the safety testing performed by CABs pursuant to the National Electrical Code (NEC).

The major International Standard for accreditation is ISO/IEC 17011, *Conformity assessment—General requirements for accreditation bodies accrediting conformity assessment bodies.* In addition to guiding accreditation bodies in their assessments of CABs, ISO-IEC 17011 guides the peer evaluation processes that support mutual recognitions between accreditation bodies. The focus on management assessments of an accreditor are recognized by the fact that the ISO 9000 family of quality management standards is a normative reference in ISO/IEC 17011. Accreditors must be impartial, thus requiring high ethical standards (Chapter 14 here) and clear independence from both CABs and their clients. Like conformity assessment, accreditation

is viewed as a *process*, with process controls being derived from applicable standards. An accreditor organized pursuant to ISO/IEC 17011 must have some kind of connection with the federal government. In that regard, the Standards Council of Canada (SCC) has a distinct advantage over many U.S. accreditors in that it is a Crown corporation, thus meeting the requirement for a "government connection." As a result, many U.S. conformity assessment bodies have been accredited by the SCC.

Moreover, the SCC has been authorized by the Standards Council of Canada Act to accredit CABs in all WTO countries!

The interconnections between the various Guides and International Standards is illustrated in Figure 13.1. The connecting links between ISO/IEC Guides 59 and 60 and the Guide 2 on standards and ISO/IEC 17000, respectively, are indicated by the dashed lines. As mentioned previously, ISO/IEC 17000 is a normative reference in Guide 2, while ISO/IEC 17011 appears in the references of IS 17000. A listing of these titles on the Guides and Standards in Figure 13.1 appears in Chapter 12.

Accreditors must be the masters of two universes, the protocols for accreditation in ISO/IEC 17011 and the many more specialized guides and standards concerned with conformity assessment. One of the more important international standards supporting accreditation is ISO/IEC 17021 (*Conformity assessment—Requirements for bodies providing audit and certification of management systems*). ISO/IEC 17021 includes the requirements for competence, consistency, and impartiality of the audit and certification of management systems of all types, including quality and environmental management systems. The new version (2006) is designed as a single source of internationally harmonized requirements for certification bodies; it comprehends existing standards such as ISO 9001, ISO 14001, new management standards for food safety (ISO 22000), information security (ISO/IEC 27001), and other standards. Like the standards, ISO/IEC 17021 involves a *process* approach to achieving accreditation. ISO/IEC 17021 has benefited from the feedback on it from accrediting bodies. A newer version of ISO/IEC 17021 is in the works.

Federal Accreditation Systems in the United States

There are many different forms of accreditation at the federal level but relatively few have the rigor the ISO/IEC 17011 requires. Many are very specialized to meet particular agencies' needs. Terminology also varies by program. A General Accountability Office report found the use of 10 different terms for "accreditation" with at least 18 different meanings in the 20 some programs it reviewed. Many specialized federal accreditation programs involve

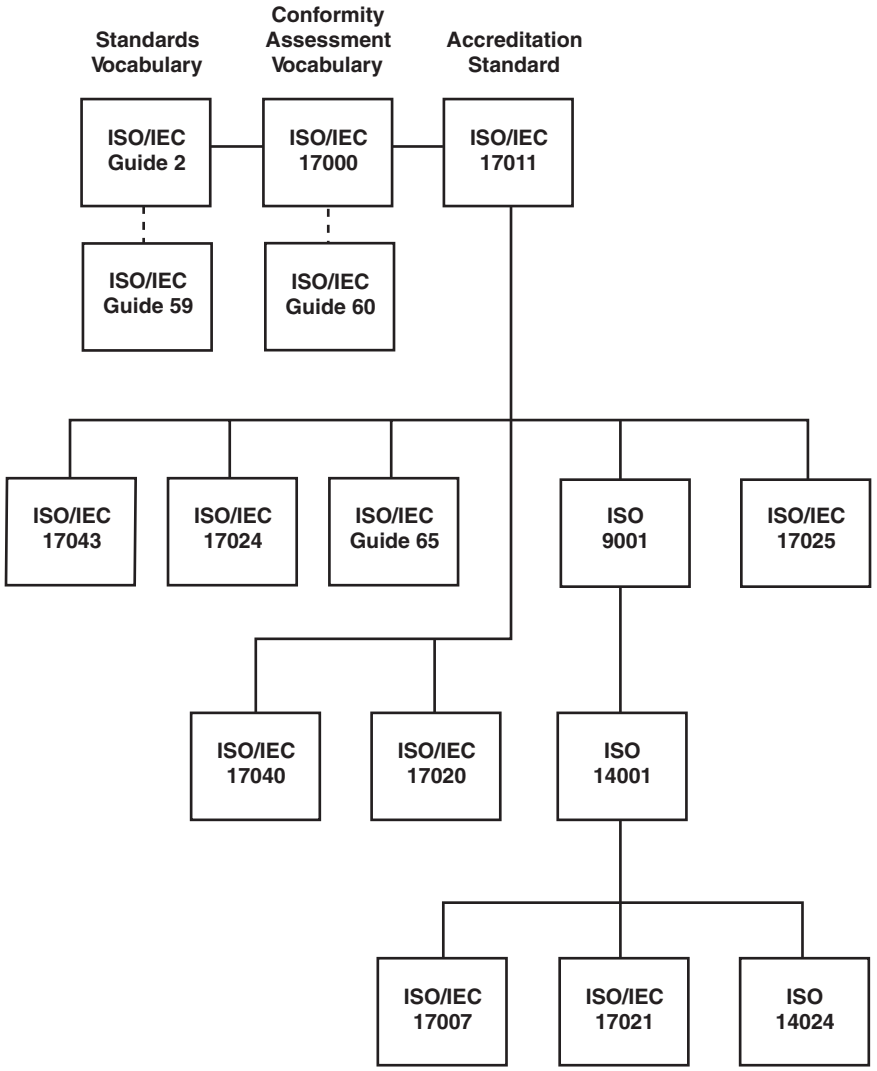


FIGURE 13.1
Connections between guides and standards for standards, conformity assessment, and accreditation. (Copyright © 2009, From *Standards, Conformity Assessment, and Accreditation for Engineers*, by Robert D. Hunter. Reproduced by permission of Taylor and Francis Group, LLC, a division of Informa, plc.)

working with states so that they may evaluate laboratories for enforcing government regulations—for example, quality of drinking water mentioned in Chapter 12. In some cases, the laboratories accredited by federal agencies, such as the Mine Safety and Health Administration (MSHA) are not continuously reaccredited.

Nationally Recognized Testing Laboratory (NRTL) Program

The Occupational Safety and Health Administration (OSHA), prominently mentioned in Chapter 3 on construction workplace safety, is lodged in the U.S. Department of Labor (DOL, reviewed in Chapter 12). The requirements for a nationally recognized testing laboratory (NRTL) are spelled out in the 29 CFR reference indicated in Figure 13.2. Definitions and requirements for a nationally recognized testing laboratory generally follow the rigor of the ISO/IEC 17011. The process of accreditation follows the classical Administrative Procedures Act (5 U.S.C.). The accreditor's assessment of a proposed NRTL includes the use of applicable standards in determining the adequacy of its testing facilities, the competence of its people, and the sufficiency of its management structure. NRTLs are accredited for a particular scope of activities and are audited periodically to assure that they continue to meet accreditation criteria. Underwriters Laboratories (UL) is used as the example of a NRTL in Figure but there are others as indicated in Chapter 12, Table 12.2. The *scope* of accreditations issued under the NRTL program is relatively limited to electrical product safety.

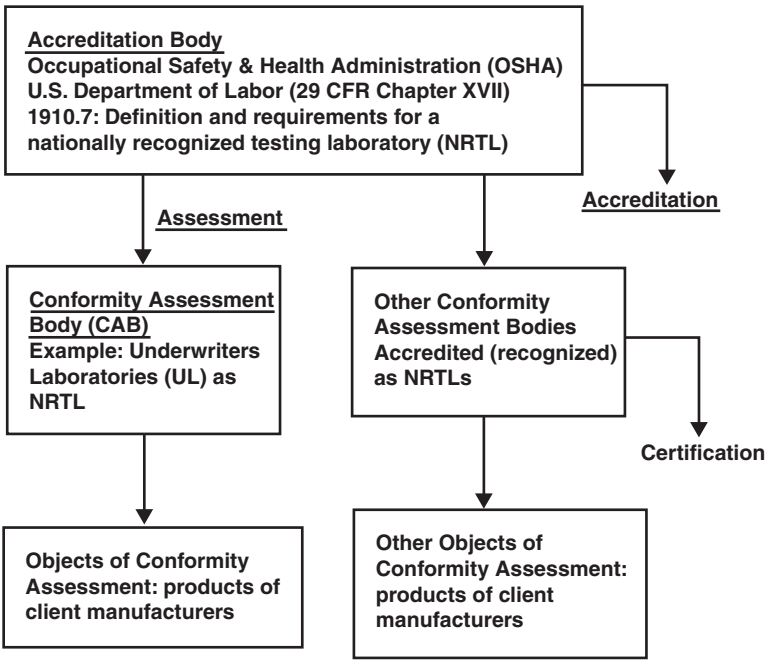


FIGURE 13.2
Specific example of an accreditation system in the United States. (Copyright © 2009, From *Standards, Conformity Assessment, and Accreditation for Engineers*, by Robert D. Hunter. Reproduced by permission of Taylor and Francis Group, LLC, a division of Informa, plc.)

National Voluntary Laboratory Accreditation Program (NVLAP)

The scope of the NVLAP Program accreditations is very broad; it was originally described in 15 CFR Subtitle A, Part 7 as an accreditation for U. S. conformity assessors that would meet international standards and thus provide portability of conformity assessments in international commerce. The program was established in the Department of Commerce in 1976 and the first director and visionary of the NVLAP program was Howard I. Forman, a Philadelphia patent attorney. Many conformity assessment bodies obtained Laboratory Accredited Programs (LAPs) in their specialized areas of interest. One of the more important areas was the field of electromagnetic measurements for meeting both FCC and military (MIL-STD-462) requirements. Other LAPs initially included:

Evaluation of thermal insulation
Testing of freshly mixed field concrete
Testing the flammability of carpet products
Calibration services for the Ionizing Dosimetry Program and others

Programs were developed later for acoustics, energy efficiency and calibration services. The NVLAP Procedures and General Requirements, patterned after ISO/IEC Guide 25 (later ISO/IEC 17025), were published in a NIST Handbook 150 published in 1994. The current NVLAP programs are specified in Title 15—Commerce and Foreign Trade, Chapter II—National Institute of Standards and Technology Department, Department of Commerce, Part 285. Overall, the NVLAP program has been successful. It did suffer a major defeat in connection with the LAPs for the Fastener Quality Act when that particular program was dismantled due to extreme political pressure (Hunter 2009).

National Voluntary Conformity Assessment Systems Evaluation (NVCASE)

The NVLAP program proved adequate for accrediting the conformity assessment of *unregulated products* but came up short for accrediting the conformity assessment of *regulated products*. As a result of negotiations between the U.S. Secretary of Commerce and the European Commission, a new program, National Voluntary Conformity Assessment Systems Evaluation (NVCASE), was established in 1994 to address that issue (15 CFR Subtitle B, Ch. II Part 286). NVCASE activities are classified by level:

1. *Conformity level*: This level encompasses comparing a product, process, service, or system with a standard or specification. The evaluating body may be a testing laboratory, product certifier, or certification body, or a quality system registrar.

2. *Accreditation level*: This level encompasses the evaluation of a testing laboratory, a certification body, or a quality system registrar by an independent body, an accreditation body, based on requirements for acceptance of those bodies, and granting of accreditation to those that meet the established requirements.
3. *Recognition level*: This level encompasses the evaluation of an accreditation body based requirements for its acceptance, and the recognition by the evaluating body of the accreditation body that satisfies the established requirements.

The objective of the NVCASE program is to identify the activities of requesting U.S.-based conformity assessment bodies that have been evaluated as meeting requirements established for their acceptance by foreign governments. The evaluation may be provided by NIST or by bodies recognized by NIST for this purpose. As a result of the successful initiation of the NVCASE Program, the U.S.–EU Mutual Recognition Agreement was reached that identified U.S. EMC test laboratories and U.S. Radio and Telecommunication Terminal Equipment (RTTE) test laboratories in 2003 and 2005, respectively. A public–private partnership for providing the *recognition* specified in (3) in the previous list is the National Cooperation for Laboratory Accreditation (NACLA).

Private Accreditation Bodies in the United States

There are several private accreditation bodies in the United States but the most significant are the American National Standards Institute (ANSI), American National Standards Institute–American Society for Quality (ANSI–ASQ) American National Accreditation Board (ANAB), and the American Association for Laboratory Accreditation (A2LA).

ANSI and the ANSI–ASQ National Accreditation Board (ANAB)

The lack of competent accreditors for the ISO 9000 family of Quality Management Standards (QMS) Management Systems Certification Bodies was the motivation for the formation of the ANAB. The need became even more acute with the arrival of the need to register the ISO 14000 family Environmental Management Standards (EMS) conformity assessment bodies. Thus, the early Registrar Accreditation Body (RAB), a joint body of ANSI and ASQ, matured into the modern ANAB. The accreditation functions of ANAB came up with several "brands"—ANAB for certification bodies for the several management systems assessors and ACLASS for the accreditation of

laboratories. All areas of the ANAB accreditation activity work to the ISO/IEC 17011 requirements. The ACLASS Laboratory Accreditation activity is performed pursuant to ISO/IEC 17025 (see Chapter 12). This activity also includes oversight of reference material providers (ISO Guide 34) and Proficiency Testing Providers (ISO/IEC 17043). Another area for ACLASS activity is the accreditation of inspection bodies in accordance with International Standard ISO/IEC 17020. The ANAB accreditation of Certification Bodies relies on the ISO/IEC 17021 standard (*Conformity assessment—Requirements for bodies providing audit and certification of management systems*).

ANSI separately accredits Product Certifiers per ISO Guide 65 (*General requirements for bodies operating certification systems*) and Personnel Certifiers per ISO/IEC 17024. ANSI also separately accredits Greenhouse Gas (GHG) Validation and Verification Bodies using ISO 14065 (*Greenhouse gasses: Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition*).

Many government agencies have utilized ANSI and ANAB accreditations to qualify conformity assessment bodies serving them, including the Federal Communications Commission (FCC), the Consumer Product Safety Commission (CPSC), and many others including the Department of Defense (DoD).

American Association for Laboratory Accreditation (A2LA)

The American Association for Laboratory Accreditation (A2LA) is a nonprofit service membership society. A2LA provides training as well as laboratory accreditation. In addition to ISO/IEC 17011, A2LA's accreditation is based on ISI.IEC 17025 (*General requirements for the competence of testing and calibration laboratories*). A2LA's recognition is based on a number of Recognition Agreements including 46 countries and over 30 federal, state, and local agencies. A2LA accreditation of EMC test laboratories is recognized by the FCC. As pointed out earlier, many of the conformity assessment (testing) bodies that advertise in the back of the ASTM International *Standardization News* are accredited by the A2LA. A2LA is also an ANSI member and participates on its several committees.

International Accreditation Bodies

The International Accreditation Forum (IAF) and the International Laboratory Accreditation Cooperation (ILAC) are the major international accreditation bodies. These organizations cooperate closely and also work with the ISO and the IEC. The IAF supports national accreditation bodies in their roles in accrediting both quality management and environmental management bodies. The IAF has Multilateral Recognition Agreements (MRAs)

with other organizations at both the national and international levels. The IAF uses ISO/IEC 17021 to accredit Certification Bodies.

The International Laboratory Accreditation Cooperation addresses recognition issues for testing laboratories, calibration laboratories, and inspection laboratories. The members of the ILAC Agreement operate peer review programs to assure the highest level of performance for those bodies. The IAF and ILAC have formal agreements with ISO and also have a joint licensing agreement for their approval marks. ANAB is a member body of the IAF. The URL for the ILAC is www.ilac.org (accessed December 7, 2010).

ANSI recently announced a historical agreement among the IEC, ILAC, and IAF (the IAF Tripartite Memorandum of Understanding). This agreement will significantly reduce cost, time, and complexity for the reassessment of certification bodies and testing laboratories that are accredited by IAF and ILAC accreditation bodies. The IEC, ILAC, and the IAF have put in place a successful pilot program to test the new approach through the establishment of a dedicated Web site to implement the agreement:

www.iec-ilac-iaf.org (accessed December 25, 2010)

One of the objectives of the memorandum of understanding is to facilitate the application of ISO/IEC standards and guides covering the assessment of certification bodies operating in the IEC Conformity Assessment Bodies described in Chapter 12. The emphasis is placed on the mutual understanding of technical issues and the harmonization of their assessment procedures. Plans have also been laid to establish training and workshops for lead assessors and joint development of harmonized procedures and policies.

Regional Accreditation Bodies

The European Union (EU) accredits "Notified Bodies" (NBs) in the EU member states that roughly correspond to accredited conformity assessment bodies, and the Nationally Recognized Testing Laboratories, in the United States and elsewhere (Breitenberg 1997). Under the "new approach" to technical harmonization of standards, each EU member nation provides the European Commission with a list of certifiers and other conformity assessors that the member state considers to be competent to perform specified conformity assessments listed in the several EU directives. These Notified Bodies can certify that a regulated product conforms to the essential requirements included in the applicable directive(s). These NBs must comply with the EN 45000 series of standards on conformity assessment.

Because the scope of its accreditation activities is regional, covering North America, the Standards Council of Canada (SCC) may be considered to be

a regional accreditation body as well as an international accreditation body. The Asia-Pacific Laboratory Accreditation Cooperation, patterned after the ILAC, and the Pacific Accreditation Cooperation provide regional accreditations in their respective areas. Similar regional accrediting organizations exist in other parts of the world.

References

Breitenberg, M. 1997. *The ABC's of the U. S. Conformity Assessment System* (NISTIR 6014). Gaithersburg: NIST.

Hunter, R.D. 2009. *Standards, Conformity Assessment, and Accreditation for Engineers*. Boca Raton: Taylor & Francis, 185.

14

Ethics for Individual Engineers

Introduction

In keeping with the theme of this book, this chapter emphasizes the *contract* nature of ethics. The parties to the contract, at the most basic level, are the individual and society at large that permits individual engineers, and by extension scientists and technical managers, to occupy a special position of trust in a free enterprise economy. The "consideration" given to the public for this special position is a duty to hold the public safety and health paramount in considering alternatives. The "contract theory" is explored in some more detail in Richard Bowen's book (Bowen 2009). The modest goals of this chapter are to increase the sensitivity of engineers to ethical issues and to familiarize them with the substance and rationale of some well-known (and some not so well known) ethical *standards*, which are commonly called ethical codes. This chapter treats only relatively simple ethical issues because space limitations prohibit any treatment of more complex issues that are currently arising in advanced technical areas such as bio-ethics, nanotechnology and others (National Academy of Engineering 2004). These advanced ethical issues must, of course, be studied in detail by engineers working in those areas. In an earlier and simpler era, simple codes of ethics were usually satisfactory. More recently, however, more complex and more prescriptive codes of ethics are the norm. Since computer science and technology are penetrating many formerly arts and "soft sciences," the special codes applicable to them have become increasingly important. Most of the bodies that promulgate codes of ethics also have organizational elements that handle questions and complaints but that is beyond the scope of this book.

The distinction between illegal and unethical, but not illegal, actions sometimes becomes fuzzy, but many unethical acts have been determined, after the fact, to be illegal. As ethical codes and their applications are reviewed in this chapter, references are made to ethical issues on matters described in other chapters. Honesty and fair dealing, for example, are requirements for the contracts reviewed in Chapters 1 through 3. Ethical issues applicable to intellectual property, Chapters 4 through 8, are also indicated. Respect for IP

is an obvious ethical requirement. The roles of ethics in standards, conformity assessment and accreditation, Chapters 9 through 13, are also covered (especially the high ethical standards required for accreditors). Specialized ethical concerns arise for engineers who are consultants and expert witnesses in dispute resolution in the courts and alternative dispute resolution outside the courts. Chapter 15, ethics in organizations, addresses the increased need for more emphasis on ethics education, especially in business schools, than has been the historical norm due to the litany of scandals involving Enron and others (including Wall Street). In renewing their memberships in the Institute of Electrical and Electronics Engineers (IEEE), members are required to observe the following IEEE Code of Ethics.

IEEE Code of Ethics

WE, THE MEMBERS OF THE IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree:

1. to accept responsibility in making engineering decisions consistent with the safety, health and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;
2. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they exist;
3. to be honest and realistic in stating claims or estimates based on available data;
4. to reject bribery in all its forms;
5. to improve the understanding of technology, its appropriate application, and potential consequences;
6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after a full disclosure of pertinent limitations;
7. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;
8. to treat fairly all persons regardless of such factors as race, religion, disability, age, or national origin;
9. to avoid injuring others, their property, reputations, or employment by false or malicious action;
10. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics.

Commentary: The preamble terms "commit" and "agree" emphasize the contractual nature of the IEEE Code of Ethics. The *public* "counter party" in (1) completes the contract; the inclusion of "environment" in (1) is of relatively recent vintage. The words "perceived conflicts of interest" in (2) recognize the fact that perceived conflicts of interest are often just as damaging as actual conflicts of interest. The honesty requirement in (3) reminds us that honesty is a requirement for all kinds of contracts. The requirement for the maintenance and improvement of technical competence in (6) is a sometimes overlooked duty. The offering of "honest criticism" in (7) must be squared with the avoidance of injury to the reputations of others in (9). The IEEE Code of Ethics emphasizes the positive aspects rather than the negative (proscriptive) approach.

National Society of Professional Engineers: Code of Ethics for Engineers

Published by permission of the NSPE.

Preamble

Engineering is an important and learned profession. As members of this profession, engineers are expected to exhibit the highest standards of honesty and integrity. Engineering has a direct and vital impact on the quality of life for all people. Accordingly, the services provided by engineers require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare. Engineers must perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.

I. Fundamental Canons

Engineers, in the fulfillment of their professional duties, shall:

1. Hold paramount the safety, health, and welfare of the public.
2. Perform services only in the areas of their competence.
3. Issue public statements only in an objective and truthful manner.
4. Act for each employer or client as faithful agents or trustees.
5. Avoid deceptive acts.
6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

II. Rules of Practice

1. Engineers shall hold paramount the safety, health, and welfare of the public.
   a. If engineers' judgment is overruled under circumstances that endanger life or property, they shall notify their employer or client and such other authority as may be appropriate.

   b. Engineers shall approve only those engineering documents that are in conformity with applicable standards.
   c. Engineers shall not reveal facts, data, or information without the prior consent of the client or employer except as authorized or required by law or this code.
   d. Engineers shall not permit the use of their name or associate in business ventures with any person or firm that they believe is engaged in fraudulent or dishonest enterprise.
   e. Engineers shall not aid or abet the unlawful practice of engineering by a person or firm.
   f. Engineers having knowledge of any alleged violation of this Code shall report thereon to appropriate professional bodies and, when relevant, also to public authorities, and cooperate with the proper authorities in furnishing such information or assistance as may be required.
2. Engineers shall perform services only in the areas of their competence.
   a. Engineers shall undertake assignments only when qualified by education or experience in the specific technical fields involved.
   b. Engineers shall not affix their signatures to any plans or documents dealing with subject matter in which they lack competence, nor to any plan or document not prepared under their direction and control.
   c. Engineers may accept assignments and assume responsibility for coordination of an entire project and sign and seal the engineering documents for the entire project, provided that each technical segment is signed and sealed only by the qualified engineers who prepared each segment.
3. Engineers shall issue public statements only in an objective and truthful manner.
   a. Engineers shall be objective and truthful in professional reports, statements, or testimony. They shall include all relevant and pertinent information in such reports, statements, or testimony, which should bear the date indicating when it was current.
   b. Engineers may express publicly technical opinions that are founded upon knowledge of the facts and competence of the subject matter.
   c. Engineers shall issue no statements, criticisms, or arguments on technical matters that are inspired or paid for by interested parties, unless they have prefaced their remarks by explicitly identifying the interested parties on whose behalf they are speaking, and by revealing the existence of any interest the engineers may have in matters.
4. Engineers shall act for each employer or client as faithful agents or trustees.
   a. Engineers shall disclose all known or potential conflicts of interest that could influence or appear to influence their judgment or the quality of their services.

   b. Engineers shall not accept compensation, financial or otherwise, from more than one party for services on the same project, or for services pertaining to the same project, unless the circumstances are fully disclosed and agreed to by all interested parties.
   c. Engineers shall not solicit or accept financial or other valuable consideration, directly or indirectly, from outside agents in connection with the work for which they are responsible.
   d. Engineers in public service as members, advisors, or employees of a governmental or quasi-governmental body or department shall not participate in decisions with respect to services solicited or provided by them or their organizations in private or public engineering practice.
   e. Engineers shall not solicit or accept a contract from a governmental body on which a principal or officer of their organization serves as a member.
5. Engineers shall avoid deceptive acts.
   a. Engineers shall not falsify their qualifications or permit misrepresentation of their or their associates' qualifications. They shall not misrepresent or exaggerate their responsibility in or for the subject matter of prior assignments. Brochures or other presentations incident to the solicitation of employment shall not misrepresent pertinent facts concerning employers, employees, associates, joint ventures, or past accomplishments.
   b. Engineers shall not offer, give, solicit, or receive, either directly or indirectly, any contribution to influence the award of a contract by public authority, or which may reasonably be construed by the public as having the effect or intent of influencing the awarding of a contract. They shall not offer any gift or other valuable consideration order to secure work. They shall not pay a commission, percentage, or brokerage fee in order to secure work, except to a bona fide employee or to a bona fide established commercial or marketing agencies retained by them.

III. Professional Obligations

1. Engineers shall be guided in all their relations by the highest standards of honesty and integrity.
   a. Engineers shall acknowledge their errors and shall not alter or distort the facts.
   b. Engineers shall advise their clients or employers when they believe a project will not be successful.
   c. Engineers shall not accept outside employment to the detriment of their regular work or interest. Before accepting any outside engineering employment, they will notify their employers.
   d. Engineers shall not attempt to attract an engineer from another employer by false or misleading pretenses.
   e. Engineers shall not promote their own interest at the expense of the dignity or integrity of the profession.

2. Engineers shall at all times strive to serve the public interest.
   a. Engineers are encouraged to participate in civic affairs, career guidance for youths; and work for the advancement of the safety, health and well-being of their community.
   b. Engineers shall not complete, sign, or seal plans and/or specifications that are not in conformity with applicable engineering standards. If the client or employer insists on such unprofessional conduct, they shall notify the proper authorities and withdraw from further service on the project.
   c. Engineers are encouraged to extend public knowledge and appreciation of engineering and its achievements.
   d. Engineers are encouraged to adhere to the principles of sustainable development [1] in order to protect the environment for future generations.
3. Engineers shall avoid all conduct or practice that deceives the public.
   a. Engineers shall avoid the use of statements containing a material misrepresentation of fact or omitting a material fact.
   b. Consistent with the foregoing, engineers may advertise for recruitment of personnel.
   c. Consistent with the foregoing, engineers may prepare articles for the lay or technical press, but such articles shall not imply credit to the author for work performed by others.
4. Engineers shall not disclose, without consent, confidential information concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve.
   a. Engineers shall not, without the consent of all interested parties, promote or arrange for new employment or practice in connection with a specific project for which the engineer gained particular and specialized knowledge.
   b. Engineers shall not, without the consent of all interested parties, participate in or represent an adversary interest in connection with a specific project or proceeding in which the engineer has gained particular specialized knowledge on behalf of a former client or employer.
5. Engineers shall not be influenced in their professional duties by conflicting interests.
   a. Engineers shall not accept financial or other considerations, including free engineering designs, from material or equipment suppliers for specifying their product.
   b. Engineers shall not accept commissions or allowances, directly or indirectly, from contractors or other parties dealing with clients or employers of the engineer in connection with work for which the engineer is responsible.
6. Engineers shall not attempt to obtain employment or advancement or professional engagements by untruthfully criticizing other engineers, or by other improper or questionable methods.

   a. Engineers shall not request, propose, or accept a commission on a contingent basis under circumstances in which their judgment may be compromised.
   b. Engineers in salaried positions shall accept part-time engineering work only to the extent consistent with policies of the employer and in accordance with ethical considerations.
   c. Engineers shall not, without consent, use equipment, supplies, laboratory, or office facilities of an employer to carry on outside private practice.
7. Engineers shall not attempt to injure, maliciously or falsely, directly or indirectly, the professional reputation, prospects, practice, or employment of other engineers. Engineers who believe others are guilty of unethical or illegal practice shall present such information to the proper authority for action.
   a. Engineers in private practice shall not review the work of another engineer for the same client, except with the knowledge of such engineer, or unless the connection of such engineer with the work has been terminated.
   b. Engineers in governmental, industrial, or educational employ are entitled to review and evaluate the work of other engineers when so required by their employment duties.
   c. Engineers in sales or industrial employ are entitled to make engineering comparisons of represented products of other suppliers.
8. Engineers shall accept personal responsibility for their professional activities, provided, however, that engineers may seek indemnification for services arising out of their practice for other than gross negligence, where the engineer's interests cannot otherwise be protected.
   a. Engineers shall conform with state registration laws in the practice of engineering.
   b. Engineers shall not use association with a nonengineer, a corporation, or partnership as a "cloak" for unethical acts.
9. Engineers shall give credit for engineering work to those to whom credit is due, and will recognize the proprietary interests of others.
   a. Engineers shall, whenever possible, name the person or persons who may be individually responsible for designs, inventions, writings, or other accomplishments.
   b. Engineers using designs supplied by a client recognize that the designs remain the property of the client and may not be duplicated by the engineer for others without express permission.
   c. Engineers, before undertaking work for others in connection with which the engineer may make improvements, plans, designs, inventions, or other records that may justify copyrights or patents, should enter into a positive agreement regarding ownership.
   d. Engineers' designs, data, records, and notes referring exclusively to an employer's work are the employer's property. The employer should indemnify the engineer for use of the information for any purpose other than the original purpose.

e. Engineers shall continue their professional development throughout their careers and should keep current in their specialty fields by engaging in professional practice, participating in continuing education courses, reading in the technical literature, and attending professional meetings and seminars.

[1] "Sustainable development" is the challenge of meeting human needs for natural resources, industrial products, energy, food, transportation, shelter, and effective waste management while conserving and protecting the environmental quality and the natural resource base essential for future development. The revised of July 2007 and the Statement by the NSPE executive Committee (including the Note) are included in the PSPE Code of Ethics.

(**As revised July 2007)**
"By order of the United States District Court for the District of Columbia, former Section 11(c) of the NSPE Code of Ethics prohibiting competitive bidding, and all policy statements, opinions, rulings or other guidelines interpreting its scope, have been rescinded as unlawfully interfering with the legal right of engineers, protected under the antitrust laws, to provide price information to prospective clients; accordingly, nothing contained in the NSPE Code of Ethics, policy statements, opinions, rulings or other guidelines prohibits the submission of price quotations or competitive bids for engineering services at any time or in any amount."

Statement by NSPE Executive Committee

In order to correct misunderstandings which have been indicated in some instances since the issuance of the Supreme Court decision and the entry of the Final Judgment, it is noted that in its decision of April 25, 1978, the Supreme Court declared: "The Sherman Act does not require competitive bidding."

It is further noted that as made clear in the Supreme Court decision:

1. Engineers and firms may individually refuse to bid for engineering services.
2. Clients are not required to seek bids for engineering services.
3. Federal, state, and local laws governing procedures to procure engineering services are not affected, and remain in full force and effect.
4. State societies and local chapters are free to actively and aggressively seek legislation for professional selection and negotiation procedures by public agencies.
5. State registration board rules of professional conduct, including rules prohibiting competitive bidding for engineering services, are not affected and remain in full force and effect. State registration boards with authority to adopt rules of professional conduct may adopt rules governing procedures to obtain engineering services.

6. As noted by the Supreme Court, "nothing in the judgment prevents NSPE and its members from attempting to influence governmental action."

NOTE: In regard to the question of application of the Code to corporations *vis-a-vis* real persons, business form or type should not negate nor influence conformance of individuals to the code. The code deals with professional services, which services must be performed by real persons. Real persons in turn establish and implement policies within the business structures. The code is clearly written to apply to the engineer, and it is incumbent on members of NSPE to endeavor to live up to its provisions. This applies to all pertinent sections of the code.

The NSPE Code of Ethics serves two related purposes, it provides a code for its members, and by extension, to the engineering community at large, and it serves in part as a "model code," some of whose provisions are adopted by other bodies such as state engineering licensing boards.

> The Cannon I 4. "Act for each employer or client as *faithful agent* (emphasis added) or trustee." has recently come in for some discussion. John H. Fielder has pointed out that this language derives from earlier engineering codes of ethics based on the so-called agency model in which the engineer's primary loyalty is to his employer. This, as Fielder explains has roots in the legal principle of *agency* (Fielder 2005).

The NSPE also has materials on engineering ethics available at its Web site www.nspe.com.

Texas Engineering Practice Act and Rules (Effective June 13, 2010)

Note that in approving the use of this limited part of the Texas Engineering Practice Act and Rules, Executive Director Lance Kinney, P.E., points out that other parts of the act also include ethical requirements and that any of these requirements is subject to change. See www.tbpe.tx.us/.

Subchapter C: Professional Conduct and Rules

§137.51 General Practice

(a) In order to safeguard life, health and property, to promote the public welfare, and to establish and maintain a high standard of

integrity and practice, the rules relating to professional conduct in this title shall be binding on every person holding a license authorized to offer or perform engineering services in Texas.

(b) License holders having knowledge of any alleged violation of the Act and/or board rules shall cooperate with the board in furnishing such information or assistance as may be required.

(c) A license holder shall promptly answer all inquiries concerning matters under the jurisdiction of the board, and shall fully comply with final decisions and orders of the board. Failure to comply with these matters will constitute a separate offense of misconduct subject to any of the penalties provided under §1001.502 of the Act.

(d) Any license holder who directly or indirectly enters into any contract, arrangement, plan, or scheme with any person, firm, partnership, association or corporation or other business entity which in any manner results in a violation of §137.77 of this title (relating to Firm Registration Compliance) shall be subject to legal and disciplinary actions available to the board. Professional engineers shall perform or directly supervise the engineering work in a part-time arrangement with a firm not otherwise in full compliance with §131.81(10) of this title (relating to Definitions). Under no circumstances shall engineers work in a part-time arrangement with a firm not otherwise in full compliance with §137.77 of this chapter (relating to Firm Registration Compliance) in a manner that would enable such firm to offer or perform professional engineering services.

(e) A licensed professional engineer may offer or perform engineering services on a full or part-time basis as a firm (including a sole practitioner) or other business entity if registered pursuant to the requirements of Chapter 135 of this title (Relating to Firm Registration).

§137.53 Engineer Standards of Compliance with Professional Services Procurement Act

(a) A licensed engineer shall not submit or request, orally or in writing, a competitive bid to perform professional engineering services for a governmental entity unless specifically authorized by state law and shall report to the board any requests from governmental entities and/or their representatives that request a bid or cost and/or pricing information or any other information from which pricing or cost can be derived prior to selection based on demonstrated competence and qualifications to perform the services.

(b) For the purposes of this section, competitive bidding to perform engineering services includes, but is not limited to, the submission of any monetary cost information in the initial step of selecting qualified engineers. Cost information or other information from

which cost can be derived must not be submitted until the second step of negotiating a contract at a fair and reasonable cost.

(c) This section does not prohibit competitive bidding in the private sector.

§137.55 Engineers Shall Protect the Public

(a) Engineers shall be entrusted to protect the health, safety, property, and welfare of the public in the practice of their profession. The public as used in this section and other rules is defined as any individual(s), client(s), business or public entities, or any member of the general population whose normal course of life might reasonably include an interaction of any sort with the engineering work of the license holder.

(b) Engineers shall not perform any engineering function which, when measured by generally accepted engineering standards or procedures, is reasonably likely to result in the endangerment of lives, health, safety, property, or welfare of the public. Any act or conduct which constitutes incompetence or gross negligence, or a criminal violation of law, constitutes misconduct and shall be censurable by the board.

(c) Engineers shall first notify involved parties of any engineering decisions or practices that might endanger the health, safety, property or welfare of the public. When, in an engineer's judgment, any risk to the public remains unresolved, that engineer shall report any fraud, gross negligence, incompetence, misconduct, unethical or illegal conduct to the board or to proper civil or criminal authorities.

(d) Engineers should strive to adequately examine the environmental impact of their actions and projects, including the prudent use and conservation of resources and energy in order to make informed recommendations and decisions.

§137.57 Engineers Shall Be Objective and Truthful

(a) Engineers shall issue statements only in an objective and truthful manner. Engineers should strive to make affected parties aware of the engineers' professional concerns regarding a particular action or project, and of the consequences of engineering decisions or judgments that are overruled or disregarded.

(b) The issuance of oral or written assertions in the practice of engineering shall not be:
   (1) fraudulent,
   (2) deceitful, or
   (3) misleading or shall not in any manner whatsoever tend to create a misleading impression.

(c) The engineer shall disclose a possible conflict of interest to a potential or current client or employer upon discovery of the possible conflict.

(d) A conflict of interest exists when an engineer accepts employment when a reasonable probability exists that the engineer's own financial, business, property, or personal interests may affect any professional judgment, decisions, or practices exercised on behalf of each client or employer. An engineer may accept such employment only if all parties involved in the potential conflict of interest are fully informed in writing and the client or employer confirms the knowledge of the potential conflict in writing. An engineer in a conflict of interest employment shall maintain the interests of the client and other parties as provided by §137.61 of this title (relating to Engineers Shall Maintain Confidentiality of Clients) and other rules and statutes.

§137.59 Engineers' Actions Shall Be Competent

(a) Engineers shall practice only in their areas of competence.
(b) The engineer shall not perform any engineering assignment for which the engineer is not qualified by education or experience to perform adequately and competently. However, an engineer may accept an assignment which includes phases outside of the engineer's area of competence if those other phases are performed by qualified licensed professionals, consultants, associates or employees.
(c) The engineer shall not express an engineering opinion in deposition or before a court, administrative agency, or other public forum which is contrary to generally accepted scientific and engineering principles without fully disclosing the basis and rationale for such an opinion. Engineering opinions that are rendered as expert testimony and contain quantitative values shall be supported by adequate modeling or analysis of the phenomena described.

§137.61 Engineers' Responsibility to the Profession

(a) Engineers shall engage in professional and business activities in an honest and ethical manner. Engineers should strive to promote responsibility, commitment, and ethics both in the education and practice phases of engineering. They should attempt to enhance society's awareness of engineers' responsibilities to the public and encourage the communication of these principles of ethical conduct among engineers.
(b) The engineer shall:
    (1) endeavor to meet all the applicable professional practice requirements of federal, state and local statutes, codes, regulations, rules, ordinances or standards in the performance of engineering services;
    (2) exercise reasonable care or diligence to prevent the engineer's partners, associates, and employees from engaging in conduct which, if done by an engineer, would violate any provision of

the Texas Engineering Practice Act, general board rule, or any of the professional practice requirements of federal, state and local statutes, codes, regulations, rules or ordinances in the performance of engineering services;

(3) exercise reasonable care to prevent the association of the engineer's name, professional identification, seal, firm or business name in connection with any venture or enterprise which the engineer knows, or should have known, is engaging in trade, business or professional practices of a fraudulent, deceitful, or dishonest nature, or any action which violates any provision of the Texas Engineering Practice Act or board rules;

(4) act as faithful agent for their employers or clients;

(5) conduct engineering and related business affairs in a manner that is respectful of the client, involved parties, and employees. Inappropriate behaviors or patterns of inappropriate behaviors may include, but are not limited to, misrepresentation in billing; unprofessional correspondence or language; sale and/or performance of unnecessary work; or conduct that harasses or intimidates another party; and

(6) practice engineering in a careful and diligent manner.

(c) The engineer shall not:

(1) aid or abet, directly or indirectly, any unlicensed person or business entity in the unlawful practice of engineering;

(2) maliciously injure or attempt to injure or damage the personal or professional reputation of another by any means. This does not preclude an engineer from giving a frank but private appraisal of engineers or other persons or firms when requested by a client or prospective employer;

(3) retaliate against a person who provides reference material for an application for a license or who in good faith attempts to bring forward an allegation of wrongdoing;

(4) give, offer or promise to pay or deliver, directly or indirectly, a commission, gift, favor, gratuity, benefit, or reward as an inducement to secure any specific engineering work or assignment;

(5) accept compensation or benefits from more than one party for services pertaining to the same project or assignment; or

(6) solicit professional employment in any false or misleading advertising.

§137.65 Action in Another Jurisdiction

(a) The engineer shall not practice or offer to practice engineering in any other jurisdiction in violation of the laws regulating the practice of professional engineering in that jurisdiction. A finding by such jurisdiction of illegal practice or offer to practice is misconduct and will subject the engineer to disciplinary action in Texas.

(b) Any disciplinary actions taken by another jurisdiction on a matter which would constitute a violation of the Texas Engineering Practice Act or board rules shall be sufficient cause for disciplinary

> action by this board. A certified copy of the board Order or Final Action from another jurisdiction shall be sufficient evidence to take disciplinary action in this state.

Compact Summary of Case: Expert Witness Appears in Court of Another Jurisdiction

NOTE: The parties and detailed circumstances of this case must remain unidentified in order to prevent embarrassment of the parties and to avoid a violation of **§137.63 (c)(2)** of the Texas Engineering Practice Act reproduced above.

Jane Doe, a mature engineer, did not become registered until relatively late in life; she didn't feel she needed that credential to do her electronics design work for a large company. She did ultimately become a consultant and expert witness in her specialty. During a very busy part of her consulting career, Jane received a call from a friend John W., with whom she had worked on an industry standards committee. John's company was being sued for product liability involving an accident with computer equipment in another jurisdiction; he asked Jane to appear as an expert witness for the defendant. Jane was very busy and, at first, declined because of her busy schedule, but she later relented and agreed to serve as an expert witness for John's company.

Jane traveled to the city in another jurisdiction in which the action was due to be heard for a deposition, as is common in such trials. The plaintiff's attorney and an expert witness, one Jim Hower, deposed her several weeks before the case came to trial. They asked the usual questions about Jane's credentials, including her P.E. registration, and some technical details about the case. After she was sworn and seated in the witness box at the trial, plaintiff's attorney rose to ask the judge to remove Jane from the case since she was not registered in that state and the state's equivalent to the Texas Engineering Practice Act and Rules defined appearance as an expert witness as the practice of engineering and therefore illegal in that jurisdiction (that is common in most states' equivalents to the Texas Engineering Practice Act). The judge denied plaintiff's request to remove Jane from the case but her appearance was a per se violation of the equivalent of the Texas Act **§137.65 Action in Another Jurisdiction.**

Jane's ethical lapse in this case was due in part to her failure to realize that appearing as an engineering expert witness constituted unauthorized practice in that distant jurisdiction. She attributed that to her busy schedule and lack of *sensitivity* to the potential ethical issue. Jane could have been disciplined for this ethical lapse in her home state. Jane later reflected on the ethics of her opposing expert, John W. Should he have advised her at

her deposition that she was violating the engineering practice act of that faraway state instead of springing that fact on her at the trial (especially since he was a member of the professional engineering board of that state)?

Standards Engineering Society (SES) Code of Ethics

The SES Code of Ethics is reproduced here with the permission of the Society for Standards Professionals (SES). For subscription or membership information contact SES, 1950 Lafayette Road, Box 1, Portsmouth, New Hampshire 03801; (603) 926-0750; admin@ses-standards.org.

Preamble

Standards engineering and the development of standards are an important part of the engineering profession. Those engaged in standards engineering recognize that their work has a direct and vital impact on the quality of life for all people. Consequently, it is imperative that standards engineers and other engaged in the practice of standardization, conduct their activities in an ethical manner that merits the confidence of their employers, colleagues, employees, and clients, as well as the general public. Members of the Standards Engineering Society are expected to conduct themselves in accordance with this code and with all applicable laws, and to support others who do the same.

Section I: Fundamental Principles

Standards Engineers shall:

1. Maintain high standards of diligence, state-of-the-art, and productivity.
2. Accept responsibility for their actions and undertake standards development activities to the degree that their qualifications allow.
3. Be realistic in collecting information or estimating standards values from available data and experience.
4. Maintain professional skills at the level of the state-of-the-art standards and recognize the importance of developing standards for new technology.
5. Advance the integrity and prestige of the standards engineering profession by practicing in a dignified manner.
6. Treat fairly all colleagues and coworkers, regardless of their international or political status, technical background, or position as competitors.

7. Seek, accept, and offer honest comments on proposed standards and properly credit authors and contributors.
8. Cooperate in advancing the development of the profession by exchanging information with SES members and all others engaged in standards engineering activities.
9. Endeavor to provide opportunities for the professional development and advancement of students and personnel under their supervision.
10. Support and participate in the activities and programs of the Standards Engineering Society and other organizations engaged in the development or use of standards.

Section II: Standardization Activities

SES members should engage in standardization activities that seek to accomplish one or more of the following objectives:

1. Enhance the safety and welfare of the public.
2. Facilitate engineering improvements that result in greater reliability and interchangeability of equipment.
3. Improve the efficiency of design, development, production, and use of materials and equipment.
4. Minimize the variety of items, processes, and practices associated with the development and production of materials and equipment.
5. Conserve time, materials and resources.
6. Improve understanding between buyers and sellers.
7. Reduce the need for government regulation through increased reliance on voluntary standards.

SES members should not be involved in standardization activities that involve the following:

1. Rigid requirements that would impede innovation.
2. Restrictive criteria that only the products of a dominant manufacturer or group of manufacturers could meet.
3. Agreements that have a potential for restraining trade or otherwise reducing competition.

Section III: Standards Procedures

SES members should actively encourage standardization groups to develop standards subject to the following provisions:

1. Provide advance notice of meetings and proposed standards actions to all interested parties.
2. Provide the opportunity for all interested parties to attend meetings and comment on proposed standards and on proposed standards actions.
3. Use performance criteria in lieu of design, material, or construction specifications, whenever feasible.

4. Consider the use of relevant and acceptable existing national and international standards.
5. Provide test methods that allow for the measurement of conformance.
6. Respond to objections and appeals in a timely manner.
7. Maintain records of standards development proceedings including the minutes of the meetings, results of balloting, and the handling of objections and appeals.
8. Establish decisions on the basis of substantial agreement of all parties at interest (consensus) after attempting to resolve all substantial negative comments.

Section IV: Standardization Cautions

SES members who participate in standardization activities should refrain from initiating or becoming involved in discussions pertaining to the following subjects:

1. Establishment of industry-wide prices, terms, or conditions of sale, or marketing policies.
2. Allocation of customers, markets, or production quotas.
3. Proprietary designs or production methods.
4. Imposition of sanctions on competitors, suppliers, or customers.

SES members who participate in standardization activities where such subjects are mentioned should take immediate action to terminate any discussion concerning these subjects. If such discussion is not terminated, the SES member should announce their concern and immediately leave the meeting.

SES members should have the proper regard for the safety, health, and welfare of the public in the performance of their duties. If an engineering judgment is overruled by a nontechnical authority, the member should clearly point out the consequences. An SES member should notify the proper authority of any observed condition that provides the potential for endangering public safety or health.

COMMENTARY: This more specialized code of ethics addresses the "due process" issues that may arise in standards development as well as public safety and similar considerations found in the other codes of ethics.

Underwriters Laboratories (UL) Code of Ethics for UL Standards Technical Panel (STP) Members

NOTE: Underwriters Laboratories develops and maintains a comprehensive set of product safety standards both by the adoption of International Standards and by setting national standards. It is a genius of the UL system that permits it to both develop standards and to perform third-party conformity assessment of clients' products to those standards without conflicts. Alternative certifiers generally use UL standards in their activities.

Code of Ethics

1.0 Purpose

As a good corporate citizen, Underwriters Laboratories, Inc. (UL) has always endeavored to conduct its business in a manner conforming to the highest standards. UL's reputation for unquestionable integrity is one of its most valuable assets in its relationships with clients, customers, suppliers, employees, the communities in which its facilities are located, and national and international members of the safety and regulatory organizations in which UL participates.

2.0 Scope

The statements of business principles contained within the Code of Ethics for STP members have been prepared to guide the conduct of STP activities to comply with the highest ethical and legal standards. It is essential that all STP Members conform to these principles in performing their duties and carrying out activities on behalf of UL. These principles are not intended to provide specific guidance for every business activity, but rather to provide guidelines for the continuing policies of the corporation on ethical business behavior, which must be observed by all STP Members throughout the world. Where the Code of Ethics is specific, it should be followed to the letter. If certain situations are not expressly covered, STP Members are expected to consider the spirit of this Code of Ethics in determining the most appropriate course of action. UL takes violations of the STP Code of Ethics very seriously. Violations of this Code may result in an immediate termination of STP Membership.

3.0 Responsibility

3.1 STP Members shall read and become familiar with, and adhere to, the Regulations Governing Standards Technical Panels.

3.2 STP Members shall act honestly and in good faith with a view to the best interest of the UL Standards Development Process. Although it is recognized that legitimate differences of opinion can exist on individual issues, STP Members should support and promote the defined broad objectives of the STP.

3.3 STP Members are expected to stay current with all UL standards development activities in which they are directly or indirectly

involved. STP Members should encourage full participation in UL's Standard Development Process by all interested persons, and they should encourage and facilitate the full and open dissemination of all information necessary to enable full and fair consideration of all points of view.

3.4 In all discussion, debate and deliberation within the UL Standards Development Process, STP Members shall confine their comments to the merits of the scientific, technical, and procedural issues under review. Although STP Members may forcefully advocate their views or positions, they shall refrain from debate and discussion that is disrespectful, threatening, or otherwise unprofessional in tone or which is unduly personalized or damaging to other STP Members and the overall process of achieving consensus.

3.5 STP Members shall take appropriate steps to ensure that any public statements, either written or oral, which are not official statements of UL, are properly portrayed as the opinion or position of that individual STP Member. STP Members must take care to ensure that their statements do not mislead the public.

3.6 STP Members have a continuing obligation to provide UL with timely, accurate and complete information concerning their qualifications, organization affiliations and interest classification.

3.7 STP Members shall actively and diligently perform all duties required of them. This includes fully preparing for STP meetings they are attending; reading and becoming familiar with all comments and discussions relating to proposals on which their STP is to act; promptly completing all ballots; and promptly and thoroughly taking all actions necessary to complete the processing of documents within their STP. STP Members are encouraged to attend all STP meetings.

3.8 STP Members who have been classified General Interest comprise a category of independent consultants and experts who are generally unallied with any particular business of commercial interest. On occasion, however, independent consultants in this category may be retained by a client to advocate on behalf of the client with regard to a specific issue or issues before the STP. Accordingly, the consultant shall declare those interests to the STP in a timely fashion and shall refrain from voting on any proposal relating to the issue(s) in which the interests of the consultant's client are or may be potentially involved.

3.9 STP Members frequently receive funding from their employers, organizations, or other sources for their participation in UL's Standards Development Process, and they have an affirmative and continuing obligation to declare those sources of funding. STP Members must not solicit or accept gifts, hospitality, or transfers of economic benefit, other than unsolicited gifts or other benefits of nominal value, i.e., USD $100.00 or less, from persons, groups, or organizations having dealings with their STP or under any circumstances in which the benefit would be or could appear to be

bestowed or accepted for the purpose of influencing the member's activities within the STP Standards Development Process. This Section 3.9 is not intended to prohibit authorized reimbursements by UL for travel and living expenses of STP members nor authorized honorariums paid by UL.

3.10 STP Members shall treat all persons with respect and fairness and should not offer or appear to offer preferential treatment to any person or group.

3.11 STP Members shall refrain from disseminating false or misleading information or from withholding information necessary to a full, fair, and complete consideration of the issues before their STP.

3.12 STP Members shall not harass, threaten or coerce other members in an effort to persuade or sway votes. This does not preclude the straightforward lobbying of other STP Members for support or opposition to issues, proposals, etc.

3.13 STP Members shall comply with UL's Patent Policy as specified in UL's Regulations.

3.14 STP Members shall respect UL's copyrights and the copyrights of other individuals and organizations.

4.0 UL, STP Members and the Law

4.1 It is UL's policy to comply fully with all laws and regulations that govern its operations in the various communities, states and countries in which it operates, and to conduct its affairs in keeping with the highest moral, legal, and ethical standards.

4.2 Honesty is not subject to compromise at any time in any culture and, even where the law may be permissive, UL will follow the course of highest integrity. The reputation of UL for scrupulous dealings is a priceless asset, just as it is for individuals. It is the intent of this STP Code of Ethics to maintain and continuously develop this asset.

5.0 Use of Corporate Name or Influence

STP Members shall not use the name or influence of UL for personal purposes.

6.0 Seeking Guidance and Reporting Potential Violations

6.1 Guidance—STP Members should consult Donald Snyder, Manager of Standards, (919 549-1850; Donald.E.Snyder@us.ul.com) if they have any questions or concerns regarding this Code or determining an appropriate course of action.

6.2 Reporting—STP Members may report issues concerning violations of this Code of Ethics to the appropriate STP Chair. The STP Chair will review the issue and will take appropriate action if necessary.

Institute of Electrical and Electronics Engineers (IEEE) and Association for Computing Machinery (ACM) Software Engineering Code of Ethics and Professional Practice

This remarkable code of ethics (Gotterbarn et al. 1999) was developed by Professor Donald Gotterbarn, Professor Keith Miller, and Simon Rogerson (executive committee) and a team of some 22 joint task force members from around the world! This code of ethics and professional practice applies to a *technical area* rather than just to the members of a particular organization. The principles are ordered to reflect their priorities.

Preamble

Computers have a central and growing role in commerce, industry, government, medicine, education, entertainment, and society at large. Software engineers are those who contribute, by direct participation or by teaching, to the analysis, specification, design, development, certification, maintenance, and testing of software systems. Because of their roles in developing software systems, software engineers have significant opportunities to do good or cause harm, or to influence others to do good or cause harm. To ensure, as much as possible, that their efforts will be used for good, software engineers must commit themselves to making software engineering a beneficial and respected profession. In accordance with that commitment, software engineers shall adhere to the following Code of Ethics and Professional Practice.

The Code contains eight Principles related to the behavior of and decisions made by professional software engineers, including practitioners, educators, managers, supervisors, and policy makers, as well as trainees and students of the profession. The Principles identify the ethically responsible relationships in which individuals, groups, and organizations participate and the primary obligations within these relationships. The Clauses of each Principle are illustrations of some of the obligations included in these relationships. These obligations are founded in the software engineer's humanity, in special care owed to people affected by the work of software engineers, and in the unique elements of practice of software engineering. The Code prescribes these as obligations of anyone claiming to be or aspiring to be a software engineer.

It is not intended that the individual parts of the Code be used in isolation to justify errors of omission or commission. The list of Principles and Clauses is not exhaustive. The Clauses should not be read as

separating the acceptable from the unacceptable in professional conduct in all practical situations. The Code is not a simple ethical algorithm that generates ethical decisions. In some situations, standards may be in tension with each other or with standards from other sources. These situations require the software engineer to use ethical judgment to act in a manner that is most consistent with the spirit of the Code of Ethics and Professional Practice, given the circumstances.

Ethical tensions can best be addressed by thoughtful consideration of fundamental principles, rather than blind reliance on detailed regulations. These Principles should influence software engineers to consider broadly who is affected by their work; to examine if they and their colleagues are treating other human beings with due respect; to consider how the public, if reasonably well informed, would view their decisions; to analyze how the least empowered will be affected by their decisions; and to consider whether their acts would be judged worthy of the ideal professional working as a software engineer. In all these judgments concern for the health, safety and welfare of the public is primary; that is, the "Public Interest" is central to this Code.

The dynamic and demanding context of software engineering requires a code that is adaptable and relevant to new situations as they occur. However, even in this generality, the Code provides support for software engineers and managers of software engineers who need to take positive action in a specified case by documenting the ethical stance of the profession. The Code provides an ethical foundation to which individuals within teams and the team as a whole can appeal. The Code helps to define those actions that are ethically improper to request of a software engineer or teams of software engineers.

The Code is not simply for adjudicating the nature of questionable acts; it also has an important educational function. As this Code expresses the consensus of the profession on ethical issues, it is a means to educate both the public and aspiring professionals about the ethical obligations of all software engineers.

Principles

Principle 1: Public

Software engineers shall act consistently with the public interest. In particular, software engineers shall, as appropriate:

1.01. Accept full responsibility for their own work.
1.02. Moderate the interests of the software engineer, the employer, the client, and the users with the public good.
1.03. Approve software only if they have a well founded belief that it is safe, meets specifications, passes appropriate tests, and does not diminish the quality of life, diminish privacy, or harm the

environment. The ultimate effect of the work should be to the public good.

1.04. Disclose to appropriate persons or authorities any actual or potential danger to the user, the public, or the environment, that they reasonably believe to be associated with software or related documents.

1.05. Cooperate in efforts to address matters of grave public concern caused by software, its installation, maintenance, support, or documentation.

1.06. Be fair and avoid deception in all statements, particularly public ones, concerning software or related documents, methods, and tools.

1.07. Consider issues of physical disabilities, allocation of resources, economic disadvantage, and other factors that can diminish access to the benefits of software.

1.08. Be encouraged to volunteer professional skills to good causes and to contribute to public education concerning the discipline.

Principle 2: Client and Employer

Software engineers shall act in a manner that is in the best interests of their client and employer, consistent with the public interest. In particular, software engineers shall, as appropriate:

2.01. Provide service to their areas of competence, being honest and forthright about any limitations of their experience and education.

2.02. Not knowingly use software that is obtained or retained either illegally or unethically.

2.03. Use the property of a client or employer only in ways properly authorized, and with the client's or employer's knowledge and consent.

2.04. Ensure that any document on which they rely has been approved, when required, by someone authorized to approve it.

2.05. Keep private any confidential information gained in their professional work, where such confidentiality is consistent with the public interest and consistent with the law.

2.06. Identify, document, collect evidence, and report to the client or the employer promptly if, in their opinion, a project is likely to fail, prove to be too expensive, to violate intellectual property laws, or otherwise to be problematic.

2.07. Identify, document, and report significant issues of social concern, of which they are aware, in software or related documents, to the employer or client.

2.08. Accept no outside work detrimental to the work they perform for their primary employer.

2.09. Promote no interest adverse to their employer or client, unless a higher ethical concern is being compromised; in that case, inform the employer or another appropriate authority of the ethical concern.

Principle 3: Product

Software engineers shall ensure that their products and related modifications meet the highest professional standards possible. In particular, software engineers shall, as appropriate:

3.01. Strive for high quality, acceptable cost, and a reasonable schedule, ensuring significant tradeoffs are clear to and accepted by the employer and the client, and are available for consideration by the user and the public.
3.02. Ensure proper and achievable goals and objectives for any project on which they work or propose.
3.03. Identify, define, and address ethical, economic, cultural, legal, and environmental issues related to work projects.
3.04. Ensure that they are qualified for any project on which they work or propose to work, by an appropriate combination of education, training, and experience.
3.05. Ensure that an appropriate method is used for any project on which they work or propose to work.
3.06. Work to follow professional standards, when available, that are most appropriate to the task at hand, departing from these only when ethically or technically justified.
3.07. Strive to fully understand the specifications for software on which they work.
3.08. Ensure that specifications for software on which they work have been well documented, satisfy the user's requirements, and have the appropriate approvals.
3.09. Ensure realistic quantitative estimates of cost, scheduling, personnel, quality, and outcomes on any project on which they work or propose to work and provide an uncertainty assessment of these estimates.
3.10. Ensure adequate testing, debugging, and review of software and related documents on which they work.
3.11. Ensure adequate documentation, including significant problems discovered and solutions adopted for any project on which they work.
3.12. Work to develop software and related documents that respect the privacy of others who will be affected by that software.
3.13. Be careful to use only accurate data derived by ethical and lawful means, and use it only in ways properly authorized.
3.14. Maintain the integrity of data, being sensitive to outdated or flawed occurrences.
3.15. Treat all forms of software maintenance with the same professionalism as new development.

Principle 4: Judgment

Software engineers shall maintain integrity and independence in their professional judgment. In particular, software engineers shall, as appropriate:

4.01. Temper all technical judgments by the need to support and maintain human values.
4.02. Only endorse documents either prepared under their supervision or within their areas of competence and with which they are in agreement.
4.03. Maintain professional objectivity with respect to any software or related documents they are asked to evaluate.
4.04. Not engage in deceptive financial practices such as bribery, double billing, or other improper financial practices.
4.05. Disclose to all concerned parties those conflicts of interest that cannot reasonably be avoided or escaped.
4.06. Refuse to participate, as members or advisors, in a private, governmental, or professional body concerned with software-related issues in which they, their employers, or their clients have undisclosed potential conflicts of interest.

Principle 5: Management

Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance. In particular, those managing or leading software engineers shall, as appropriate:

5.01. Ensure good management for any project on which they work, including effective procedures for promotion of quality and reduction of risk.
5.02. Ensure that software engineers are informed of standards before being held to them.
5.03. Ensure that software engineers know the employer's policies and procedures for protecting passwords, files, and information that is confidential to the employer or confidential to others.
5.04. Assign work only after taking into account appropriate contributions of education and experience tempered with a desire to further that education and experience.
5.05. Ensure realistic quantitative estimates of cost, scheduling, personnel, quality, and outcomes on any project on which they work or propose to work, and provide an uncertainty assessment of these estimates.
5.06. Attract potential software engineers only by full and accurate description of the conditions of employment.
5.07. Offer fair and just remuneration.
5.08. Not unjustly prevent someone from taking a position for which that person is suitably qualified.
5.09. Ensure that there is a fair agreement concerning ownership of any software, processes, research, writing, or other intellectual property to which a software engineer has contributed.
5.10. Provide for due process in hearing charges of violation of an employer's policy or this Code.

5.11. Not ask a software engineer to do anything inconsistent with this Code.
5.12. Not punish anyone for expressing ethical concerns about a project.

Principle 6: Profession

Software engineers shall advance the integrity and reputation of the profession consistent with the public interest. In particular, software engineers shall, as appropriate:

6.01. Help develop an organizational environment favorable to acting ethically.
6.02. Promote public knowledge of software engineering.
6.03. Extend software engineering knowledge by appropriate participation in professional organizations, meetings, and publications.
6.04. Support, as members of a profession, other software engineers striving to follow this code.
6.05. Not promote their own interest at the expense of the profession, client, or employer.
6.06. Obey all laws governing their work, unless, in exceptional circumstances, such compliance is inconsistent with the public interest.
6.07. Be accurate in stating the characteristics of software on which they work, avoiding not only false claims but also claims that might reasonably be supposed to be speculative, vacuous, deceptive, misleading, or doubtful.
6.08. Take responsibility for detecting, correcting, and reporting errors in software and associated documents on which they work.
6.09. Ensure that clients, employers, and supervisors know of the software engineer's commitment to this Code of Ethics, and the subsequent ramifications of such commitment.
6.10. Avoid associations with businesses and organization which are in conflict with this Code.
6.11. Recognize that violations of this Code are inconsistent with being a professional software engineer.
6.12. Express concerns to the people involved when significant violations of this Code are detected unless this is impossible, counterproductive, or dangerous.
6.13. Report significant violations of this Code to appropriate authorities when it is clear that consultation with people involved in these significant violations is impossible, counterproductive, or dangerous.

Principle 7: Colleagues

Software engineers shall be fair to and supportive of their colleagues. In particular, software engineers shall, as appropriate:

7.01. Encourage colleagues to adhere to this Code.
7.02. Assist colleagues in professional development.

7.03. Credit fully the work of others and refrain from taking undue credit.
7.04. Review the work of others in an objective, candid, and properly documented way.
7.05. Give a fair hearing to the opinions, concerns, or complaints of a colleague.
7.06. Assist colleagues in being fully aware of current standard work practices including policies and procedures for protecting passwords, files, and other confidential information, and security measures in general.
7.07. Not unfairly intervene in the career of any colleague; however, concern for the employer, the client, or public interest may compel software engineers, in good faith, to question the competence of a colleague.
7.08. In situations outside of their own areas of competence, call upon the opinions of other professionals who have competence in those areas.

Principle 8: Self

Software engineers shall participate in lifelong learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession. In particular, software engineers shall continually endeavor to:

8.01. Further their knowledge of developments in the analysis, specification, design, development, maintenance, and testing of software and related documents, together with the management of the development process.
8.02. Improve their ability to create safe, reliable, and useful quality software at reasonable cost and within a reasonable time.
8.03. Improve their ability to produce accurate, informative, and well written documentation.
8.04. Improve their understanding of the software and related documents on which they work and of the environment in which they will be used.
8.05. Improve their knowledge of relevant standards and the law governing the software and related documents on which they work.
8.06. Improve their knowledge of this Code, its interpretation, and its application to their work.
8.07. Not give unfair treatment to anyone because of any irrelevant prejudices.
8.08. Not influence others to undertake any action that involves a breach of this Code.
8.09. Recognize that personal violations of this Code are inconsistent with being a professional software engineer.

NOTE: The ACM Code of Ethics and Professional Conduct appears in Appendix 5. It is included as another example of a code of ethics and to illustrate its influence of the IEEE/ACM Code of Ethics and Professional Practice. Professor Gotterbarn was a main contributor to the ACM code also.

Applications of the IEEE/ACM Code of Ethics and Professional Practice

Professors Gotterbarn and Miller prepared a follow-on paper emphasizing the priority of the public interest aspects of the code and its applications to a variety of situations where faulty software produced disastrous results (Gotterbarn and Miller 2009). This paper shows the robustness of the "Software Engineering Code of Ethics and Professional Practice" as it is applied to relatively complex situations. Gotterbarn and Miller use several software engineering disasters to illustrate the application of the code in two accidents involving the Airbus autopilot. Another example cited is the software-related accident at the National Oncology Institute of Panama City that resulted in over a dozen deaths and many serious injuries. The authors describe a previous similar mishap involving the software for the Therac 25 in 1985–1986. That accident, the authors point out, should have served as a warning to software engineers to use extra care in designing software for radiation-producing equipment.

The ACM/IEEE-CS Code of Conduct (CoC for brevity) has even been used to resolve legal disputes (Aiken et al. 2010).

References

Aiken, P., R.M. Stanley, J. Billings, and L. Anderson. 2010. Using codes of conduct to resolve legal disputes. *Computer* 43(4): 29–34, April 2010.

Bowen, W.R. 2009. *Engineering Ethics—Outline of an Aspirational Approach*. London: Springer-Verlag.

Fielder, J.H. 2005. Organizational loyalty. In *Engineering Ethics*, ed. M. Davis. Aldershot Hants (England): Ashgate Publishing Limited, 359–378.

Gotterbarn, D., K. Miller, and S. Rogerson. 1999. Computer society and ACM approve software engineering code of ethics. *Computer* 32(10): 84–88, Oct. 1999.

Gotterbarn, D. and K.W. Miller. 2009. The public is the priority: Using the software engineering code of ethics. *Computer* 42(6): 66–73, June 2009.

National Academy of Engineering. 2004. *Emerging Technologies and Ethical Issues in Engineering*. Washington, D.C.: National Academies Press.

Other Resources on Ethics

Bay, R.D. et al. 1977. *Ethics, Professionalism and Maintenance of Competence*. *Conference of March 10–11, 1977.* Ohio State University, Columbus, Ohio; New York: American Society of Civil Engineers.

Davis, M., Ed. 2005. *Engineering Ethics* (a compendium of published papers). Aldershot Hants (England): Ashgate Publishing Limited.

Fleddermann, C.B. 2008. *Engineering Ethics*, 3rd Ed., Upper Saddle River: Pearson/ Prentice Hall.

Harris, E.H., M.S. Pritchard, and M.J. Rabins. 2009. *Engineering Ethics—Concepts and Cases*. Belmont: Wadsworth.

National Institute for Engineering Professionalism (NIEE), The Murdough Center for Engineering Professionalism, Texas Tech University—College of Engineering www.niee.org (accessed 12-6-10).

Pinkus, R.L. et al. 1997. *Engineering Ethics – Balancing Cost, Schedule, and Risk—Lessons Learned from the Space Shuttle*. Cambridge: The Press Syndicate of the University of Cambridge.

Vann, W.P. 2009. *Engineering Ethics References.* Murdough Center for Engineering Professionalism, College of Engineering, Texas Tech University at Lubbock: National Institute for Engineering Ethics (NIEE): www.niee.org/biblio-1.htm (accessed 12-6-2010).

15

Ethics for Organizations

Introduction

The separation of ethical behavior of individuals from that of organizations is somewhat artificial since, as pointed out in the NSPE Code of Ethics in Chapter 14, "Real persons (subject to the code of ethics) in turn establish and implement policies within the business structures." While that is true, it is generally recognized that the *corporate culture* in which the engineer works is a very important determinant of the ethical environment. Business ethics and engineering ethics are considered by some to be "members of the same family" (Bowie 2005). Bowie claims that neither business nor engineering are "professions." Others argue that engineering is a profession but that business is not (Weil 2005). The top management of large companies tends to be populated more by lawyers and professional managers than by engineers. A study of how companies may influence the ethical choices made by individuals is reported in the Communications of the ACM (Kreie and Cronan 2000). So it's clearly a two-way street; individuals affect the ethical culture of companies, and companies, in turn, affect the ethical behavior of individuals. The IEEE/ACM Software Engineering Code of Ethics and Professional Practice, reproduced in Chapter 14, has reportedly been adopted by several software companies as an *organizational* code of ethics.

The Foreign Corrupt Practices Act of 1977 (as Amended)

As stated elsewhere, it is generally unethical to break a law. One of the most difficult ethical/legal issues facing firms with sales abroad is the *culture* in many foreign countries that accepts that bribery is merely "business as usual." In the 1970s, a number of prominent American companies were ensnared in foreign bribery scandals. As a result, the Congress enacted the Foreign Corrupt Practices Act of 1977 (amended in 1988) 15 U.S.C. §§ 78dd, et seq. (FCPA). That act makes bribery and certain related accounting practices

illegal. The following overview is from the U.S. Department of Justice at http://www.justice.gov/criminal/fraud/fcpa (accessed on December 30, 2010).

> The FCPA was enacted for the purpose of making it unlawful for certain classes of persons and entities to make payments to foreign government officials to assist in obtaining or retaining business. Specifically, the anti-bribery provisions of the FCPA prohibit the willful use of the mails or any means of instrumentality of interstate commerce corruptly in furtherance of any offer, payment, promise to pay or authorization of the payment of money or anything of value to any person, while knowing that all or a portion of such money or thing of value will be offered, given, or promised, directly or indirectly, to a foreign official to influence the foreign official in his or her official capacity, induce the foreign official to do or omit to do an act in violation of his or her lawful duty, or to secure any improper advantage in order to assist in obtaining or retaining business for or with, or directing business to, any person.
>
> Since 1977, the anti-bribery provisions of the FCPA have applied to all U.S. persons and certain foreign issuers of securities. With the enactment of certain amendments in 1988, the anti-bribery provisions of the FCPA now also apply to foreign firms and persons who cause, directly or through agents, an act in furtherance of such a corrupt payment to take place within the territory of the United States.
>
> The FCPA also requires companies whose securities are listed in the United States to meet its accounting provisions. See 15 U.S.C. § 278m. These accounting provisions, which were designed to operate in tandem with the anti-bribery provisions of the FCPA, require corporations covered by the provisions to (a) make and keep books and records that accurately and fairly reflect the transactions of the corporation and (b) devise and maintain an adequate system of internal accounting controls.

Compact Summary of Case: *Kirkpatrick Co. v. Environmental Tectonics Corp.*, 493 U.S. 400 (1990), Certiorari to the United States Court of Appeals for the Third Circuit No. 87-2066.

> According to respondent's complaint, petitioners obtained a construction contract from the Nigerian government by bribing officials. Nigerian law prohibits both the payment and receipt of such bribes. Respondent, an unsuccessful bidder for the contract, filed an action for damages against petitioners and others under various federal and state statutes. The district court ruled that the suit was barred by the act of state doctrine, which in its view precluded judicial inquiry into the motivation of a sovereign act that would result in embarrassment to the sovereign, or constitute interference with the conduct of U.S. foreign policy. The court

granted summary judgment for petitioners because resolution of the case would require imputing to foreign officials an unlawful motivation (the obtaining of bribes), and accordingly might embarrass the Executive Branch in its conduct of foreign relations. The court of appeals reversed and remanded the case for trial, holding that on the facts of this case the doctrine did not apply because no embarrassment of the Executive in its conduct of foreign affairs was evident.

Held: The act of state doctrine does not apply because nothing in the present suit requires a court to declare invalid the official act of a foreign sovereign. See, for example, *Ricaud v. American Metal Co.*, 246 U.S. 304. It does not suffice that the facts necessary to establish respondent's claim will also establish that the Nigerian contract was unlawful, since the contract's legality is simply not the question that the district court must decide, *American Banana Co. v. United Fruit Co.*, 213 U.S. 347, 357–358 (Holmes, J.), distinguished. Nor does it suffice that a judgment in favor of respondents will require the court to impute to foreign officials improper motivation in the performance of official acts. To say that international comity, respect for the sovereignty of foreign nations, and the avoidance of embarrassment to the Executive Branch in its conduct of foreign relations are the policies underlying the act of state doctrine is not to say that the doctrine is applicable whenever those policies are implicated. The doctrine is not a rule of abstention which prohibits courts from deciding properly presented cases or controversies simply because the Executive's conduct of foreign relations may be adversely [493 U.S. 400, 401] affected; it is a rule of decision which requires that, in the process of deciding, the acts of foreign sovereigns taken within their own jurisdictions be deemed valid. Pp. 404–410.

ENRON

Enron was not the first U.S. business to fail due to ethical lapses, but it was a watershed for ethics in American business when the 7th largest company in the United States went bankrupt in 2001. Interestingly, Enron *did* have an ethics code, but it was commonly observed in the breach whenever it was convenient to do so (Cruver 2002). The foreword of Cruver's book, written by Professor Steve Salbu, of the McCombs School of Business at the University of Texas, included something of a *mea culpa* in that business schools generally had not sufficiently emphasized ethical behavior (it was usually an elective course and not taken by many M.B.A. students). That was in contrast to the usual practice in *undergraduate* business schools (Twomey, Jennings, and Fox 2005) but many M.B.A. students did not study business as undergraduates. Enron's collapse (loss estimated at $80 billion) came during the work of an

Enron Board Special Investigating Committee chaired by University of Texas Law School Dean William Powers, Jr. Powers' report was not kind to Enron's senior management, its directors, and its auditor Anderson (O'Donnell and Strauss 2002). The SEC (Securities and Exchange Commission), the ratings firms, and Enron's outside law firm were also criticized. In his testimony to the House Financial Services subcommittee, Powers said: "Frankly, what we found was absolutely appalling. We found a systematic and pervasive attempt by management to misrepresent financial transactions."

Anderson was helping Enron structure its Special Purpose Entities that were designed to hide Enron's massive debt while also providing outside audits for presentation to the SEC, an obvious conflict of interest. The SEC was, at that time, under funded as part of the popular deregulation era in Washington and that added to the problem. Other firms were experiencing similar issues at about that time including Tyco International, Worldcom, Adelphia, and Qwest.

Sarbanes–Oxley Act

The spectacular collapse of Enron, and the failure of Global Crossing at about the same time, prompted Congress to act with unusual speed to pass the Sarbanes–Oxley Act (variously called Sox or Sarbox) in July 2002 "to protect investors by improving the accuracy and reliability of corporate disclosures made pursuant to the securities laws, and for other purposes." Sarbanes-Oxley established a Public Company Accounting Oversight Board to require auditing, quality control, and *ethics standards* (emphasis added) to improve audits on which the SEC and investors depend (Section 103(a)). Accounting standards are also defined and invoked in Sec. 108 (b). Title II-Auditor Independence, prohibits an auditor from providing other services to clients as happened in the Enron case. Section 302 requires that the principal executive officer and financial officer certify each annual or quarterly report to the SEC. Title IV-Enhanced Financial Disclosures calls for better disclosures and prohibits personal loans to executives. Section 406 requires the disclosure of a code of ethics for senior financial officers. Other provisions of the act address conflicts of interest for securities analysts and prohibits the destruction or alteration of documents in federal investigations and bankruptcy. Penalties for violating the act were also increased.

Restoration of Trust

The importance of trust has been emphasized by several sources. Trust is the lubricant that makes the machinery of free enterprise capitalism work without seizing up. A *Business Week Special Report* titled "Restoring Trust in Corporate America" was published in 2002 (Byrne 2002). A more complete analysis and recommendations were published by the American Academy

of Arts and Sciences (Ed. Lorsch, Berlowitz, and Zelleke 2005). Among the recommendations was a focus on improved professional ethics of the *gatekeepers*, that is, the auditors, the boards of directors, the regulatory agencies, the attorneys, the investors, the stock exchanges and analysts, accountants, journalists, and others. It was commonly accepted that the only duty of a business was to its *stockholders* (usually attributed to Nobel Memorial Prize winning economist Milton Friedman). This philosophy continues to be cited in business publications such as the *Wall Street Journal*. While the subject of "organizational ethics" is very broad (including, for example, organizations that are not businesses as such), the emphasis here is on business ethics, since that is where many engineers meet ethical issues. As pointed out in Chapter 14, illegal acts are nearly always unethical; the IEEE/ACM Code (6.06) cites a possible exception.

Where Are the Contracts?

If the only duty of a business is to its stockholders, that is the only "contract" involved. But the employees and officers of many modern companies are also major stockholders, which gives rise to the "greed is good" slogan and belief (not much has been heard of that slogan recently in view of the Enronization of Wall Street and the financial meltdown that imperiled the world's economies). Thus, the narrow view of the ethical duties owed by businesses may readily give rise to serious conflicts of interest and similar ethical issues. The "social contract" emphasizing a duty to protect the public, as described in the ethical codes described in Chapter 14, is missing in action in such contexts.

A broader view of business ethics includes duties owed to *stakeholders*, that is, the larger group of people that are significantly affected by unethical acts of business organizations. This expansion is also somewhat vague since unethical acts by businesses that pollute the environment affect the public at large and are therefore in violation of the *social contract* (Oram 2010).

Chinese Wallboard Issue

In 2009, and earlier, some new home buyers in Florida, and other states in the Southeast and elsewhere, began to notice a severe problem with their new homes. The gypsum drywall became malodorous (smelling like hydrogen sulfide) and producing discomfort and possibly even health issues. In addition, the fumes emitted by the drywall, mostly made by 10 firms in China, was corroding electrical wiring and other metal parts of the houses. It was so bad that many residents were forced to flee their homes (Martin 2010). The Consumer Product Safety Commission (CPSC) got into the act, and it was finally determined that the drywall product of Knauf Plasterboard Tianjin (KPT) and others was responsible for the problems. The only practical

solution of the problem, recommended by the CPSC, was the replacement of all of the drywall and the affected wiring and appliances in the house. That easily cost $100,000 or more for even a modest home. A court case in New Orleans showed that roughly 5,600 homeowners were suing some 1,500 defendants, including manufacturers, builders, and others (Chinese manufacturers claimed immunity from court decisions in the United States). Various other settlements of actions are or were underway including KPT's settlement with Beazer Homes USA in Atlanta. U.S. taxpayers took a hit when the IRS announced it would permit homeowners to deduct the expense of replacement and repair of damaged homes and appliances.

In addition to the ethical questions surrounding the manufacturers, some of the U.S. *distributors* of the Chinese drywall did not come forward when the issue was first reported. That would have avoided the expansion of the problem to so many people. It was also alleged that the manufacturers and distributors never notified the government, as required by CPSC regulations.

BP/Deepwater Horizon Blowout in the Gulf of Mexico

The historic methane gas and crude petroleum leak from the failed Deepwater Horizon drilling rig was the worst environmental disaster to strike the United States in modern times. While the exact causes have not been determined by the end of 2010, a substantial consensus has developed, and is being refined. Because 11 of the people most closely connected with the accident perished in the explosion and fire that engulfed the rig and sent it to the sea floor, the precise cause(s) of the accident may never be known! That is in contrast to the *Challenger* space shuttle disaster where the decision makers survived to tell about it, and one book on engineering ethics is devoted to that accident (see the Pinkus resource referenced in Chapter 14). Some ethicists decry the use of "engineering disasters" to illustrate ethical principles, but the BP story lends itself to that use.

Calibration: The reader is advised that the author is not an ethicist, not an expert on petroleum engineering, and (especially) is not one of the coterie of people who always paint "big oil" in a bad light; some of my friends and relatives are, or have been, employed in the oil industry but that gives me no particular insight or bias on the subjects described here.

The Story (from Media Reports)

The BP Maconda well suffered a "blowout" (an uncontrolled release of oil and methane gas) on April 20, 2010. The rush of gas was ignited by an

unidentified source, variously thought to be a spark generated by the machinery on board the platform or an open flame in a control room. The resulting explosion and fire ignited the oil, and the resulting fire destroyed the drilling rig, which collapsed into the Gulf two days later. The blowout was supposed to be prevented by a "blowout preventer" (BOP), a gigantic structure made by Cameron, but the BOP failed to stem the flow. A remotely operated vehicle (ROV) was sent to the well head to try to operate the BOP but that failed. The oil spill was one of the worst environmental disasters of modern times. BP made several attempts to "kill" the well but none worked until the installation of a "capping stack," a form of blowout preventer, over the original BOP at the well head. The final sealing of the errant well was achieved by the so-called "bottom kill," the insertion of concrete by a relief well drilled to intercept the well at a point below the sea bottom (Schempf 2010).

BP owned the well but was supported by a leased drilling rig, the Deepwater Horizon, owned and operated by Transocean, an oil industry well drilling company. The exploratory well was in the process of being completed for transition to a producing well when the accident happened. A crucial part of that transition was the cementing of the well, a task performed by Halliburton, a firm specializing in that kind of work. This contracting and subcontracting mode of operation is common in the oil industry where a number of firms have established specialized skills and materials for oil well exploration and production. There were other specialists on board the Deepwater Horizon but the work was mostly performed by Transocean and Halliburton, under BP's direction.

Two processes were commonly used to avoid gas problems with wells. The drilling mud was usually recirculated to make sure that it did not contain excessive gas. The cementing task required that cement be placed into the space between the main pipe and the rock surrounding it. That required, and Halliburton allegedly recommended, that a standard number of centering spacers be used. BP reportedly did not follow industry standards in either of these processes, and that is thought to have contributed to the blowout (Casselman and Gold 2010). Recall that failure to follow applicable standards is a violation of the NSPE Code of Ethics reproduced in Chapter 14. The final safeguard, the BOP, was reportedly not maintained properly and not recertified in 2005 as reportedly required by regulations.

Another player on the scene was the Minerals Management Service (MMS), a U.S. Interior Department agency charged with regulatory oversight of operations like the Maconda well project in federally controlled waters. The MMS, moreover, was charged with going too easy on regulating the offshore oil and gas industry (potential ethical lapses). Federal inspectors reportedly failed to perform many of the required inspections. As a result of the criticism, several ranking MMS people resigned or took early retirement. The MMS was then divided into three bureaus, the Bureau of Ocean Energy

Management (BOEM), the Bureau of Safety and Environmental Enforcement (BSEE), and the Bureau of Natural Resources Revenues (BNRR).

BP's Role in the Accident

BP owned the Maconda well and therefore must bear the ultimate responsibility for the accident. There are other stakeholders in the project, including Anadarko Petroleum, and all of them have been sued by the U.S. government in a civil action (Serrano and Banerjee 2010). The government hopes to recover, pursuant to the Clean Water Act, $4,300 for each of 4.9 million barrels reportedly spilled (comes to approx. $20B, the amount negotiated by BP and the United States). But to its credit, BP is the only party to step forward and accept the financial responsibility for the accident. BP reportedly used a cheaper design, the so-called long string design, for some of its deep-water wells including the Maconda (Gold and McGinty 2010); if that is true, it suggests a possible ethical lapse on the part of BP management in spite of the report that, like Enron, BP did have a corporate code of ethics. The long string design reportedly uses a single piece of pipe between the well head and the reservoir rather than the more expensive two-pipe design frequently used by other deep-water drillers.

Schedule and Cost Issues

The drilling of the Maconda well had been difficult, almost from the beginning. BP had been drilling for several months longer than planned and was spending almost $2 million per day in the process. The schedule pressure is reminiscent of that on the ill-fated *Challenger* space shuttle and should serve as a warning when making ethical decisions. A preliminary report by the Presidential Oil Spill Commission said that while BP made decisions that saved time, it found no evidence that employees consciously chose saving money, a curious gaffe (media reports). Several reports indicated that there was a major clash between the BP manager on the rig and the Transocean's primary driller and others. Transocean's primary driller died in the resulting explosion and fire. The issue involved the removal of the heavy mud and replacing it with lighter sea water (Bustillo 2010).

BP's Track Record

BP was considered by its peers in the industry as short on technical ability and engineering management. The *safety culture* of the company was suspect because of a series of serious accidents and violations of EPA and OSHA Regulations. BP's operations in Alaska, both for wells and for pipelines, was

plagued by accidents and spills, some attributed to relentless cost cutting. The cost cutting culture was blamed for the Texas City Refinery explosion in March of 2005, which resulted in the loss of 15 workers (who were subcontractors rather than BP employees). The Texas City refinery also reportedly sent benzene into the air, starting on April 6, 2010, prompting an investigation by the Environmental Protection Agency (Plushnick–Masti 2010). Another alleged failure of BP's technical expertise was the damage to its Thunder Horse drilling platform in the Gulf of Mexico, produced in part by Hurricane Dennis, but apparently caused by poor design by BP (Bower 2010b). Final demerit badges for BP resulted from the March 2006 spill of over 260,000 gallons of crude from its Trans-Alaska pipeline and an even worse spill several months later. Technical investigations of the oil pipeline leaks were reportedly due to corrosion in the pipe, allegedly caused by BP's cost cutting and substandard maintenance (Bower 2010a). Alaska pipeline issues continued into 2011. It was also reported that BP narrowly escaped a potential disaster in 2008 in a gas leak in Azerbaijan.

Transocean's Role

Transocean, the owner operator of the drilling rig Deepwater Horizon, was responsible for the blowout preventer, which was reported to be in poor condition; it was reportedly leaking hydraulic fluid and perhaps had a dead battery (Weber 2010a). Weber also reported that the blowout preventer was not recertified in 2005 as required by federal regulations. According to testimony of a rig worker to a government panel investigating the accident, the warning sirens on the rig were inhibited so as not to disturb sleeping rig workers (Brown 2010). It was also reported that other systems, including computers, on the rig were prone to problems that were apparently not remedied. If these allegations are true, it appears that the engineering management of the rig may not have lived up to its ethical duties. Transocean had reportedly been cited several times by British regulators for failing to adequately maintain a BOP that failed in 2006 (Lipton and Broder 2010).

Halliburton's Role

A Halliburton employee told the joint panel of the U.S. Coast Guard and the Bureau of Ocean Energy Management, Regulation, and Enforcement that the handling of the mud on the Deepwater Horizon bothered him, that there was too much going on at the time (Weber 2010b).

According to media reports, the Presidential Commission investigating the Deepwater Horizon accident found that the cement used at the well had failed laboratory tests (i.e., failed conformity assessments against industry standards). If that is true, then both BP and Halliburton should have ethically refused to use it at the doomed well. The exact division of responsibilities remains to be determined. The Commission asked Shell to test samples of the cement and was advised by Shell that it conducted nine tests and were unable to demonstrate stable foam with any of the tests.

Role of Cameron International

Cameron made the blowout preventer or BOP that was used in the BP well. A U.S. House investigating committee is investigating that issue; it was pointed out that the 2010 Gulf spill was not the first time that a Cameron BOP had failed (Power and Emshwiller 2010). The BOP has been secured for testing by federal regulators, and a report is expected in 2011.

Role of the Regulator: The Minerals Management Service (MMS)

In addition to the possible regulatory lapses described above, the Minerals Management Service has received substantial criticism for its role in the accident. To its credit, the MMS reportedly warned offshore rig operators in 2004 and 2009 that backup systems should be added to the BOPs as is required in other countries. Also, the government's mandate to have federal agencies use "industry standards," rather than develop their own (see Chapter 9 herein), is reported to have resulted in the MMS granting safety oversight to the industry (Gold and Power 2010). It is likely that the fault was not only with the industry standards but with the *implementation* of those standards. The policy of having regulators use industry standards has worked very well for many other agencies, including the Department of Defense and the Federal Communications Commission. It has been pointed out that the deep-water drilling technology has outpaced the rules (DeParle 2010). On the other hand, the oil industry has vigorously opposed new safety regulations that were proposed in 2009 (Frommer 2010).

The Interior secretary acknowledged lax oversight of offshore drilling activities in an appearance at a senate panel hearing that was looking into the spill (Hebert and Frommer 2010). The lax oversight of the industry by the

MMS appears to be readily explainable due to the deregulatory mantra that reigned in Washington for several decades in both administrations. In an online report in the *Washington Post*, the Interior Department's inspector general was said to be planning to tell the House Natural Resources Committee, looking into the accident that "elected officials should consider imposing ethics rules on oil and gas companies that do business with the federal government."

Someone forgot to tell her that the Federal Acquisition Regulations already contain extensive requirements for the ethics of government contractors as outlined in this chapter.

Summary of the Deepwater Horizon Accident

It is true that accidents like the Deepwater Horizon happen despite engineering efforts to prevent them. The story of this episode is still being written, but it does appear that potential ethical lapses occurred in the main organizations involved: BP, Transocean, Halliburton, Cameron, and the MMS. More precise diagnostic work on the organizational ethics involved will surely be forthcoming. The main points in the account above appear to be supported by Loren C. Steffy in a recently published book (Steffy 2011). Some aspects of organizational ethics are reviewed in a collection of papers in *Part IV Professional Autonomy in Large Organizations* (Davis 2005). Two of the 10 papers in this part of the collection are written by Davis, including one on the ethics of whistle blowing. Other papers review aspects of the ethical climate in large organizations.

The Deepwater Horizon accident has been held by some to be a fluke, something that seldom happens; therefore, it is claimed, a new special regulatory regime for offshore drilling is not required. On balance, that seems to be untrue in view of other reported accidents including the Thunderhorse episode outlined above and the accident at the offshore platform Piper Alpha in 1988. That accident resulted in the complete destruction of the platform and over 160 deaths as reported by Paul Gruhn at

http://www.isa.org/InTechTemplate.cfm? (accessed December 30, 2010).

What Can We Expect as a Result of the Deepwater Horizon Accident?

Gruhn posits that the American Petroleum Institute (API) standard API 14C does not apply to deepwater drilling and that the industry should move away from prescriptive standards and toward performance standards

such as ISA84, which is apparently an adoption of IEC Standard 61511. While more and better regulation is needed, there is a danger that "overkill" regulation will unnecessarily hamper deepwater exploration and production and thus make our energy situation much worse than it already is.

An interesting technical question that has not been prominently asked regards the source of the ignition of the emerging methane gas. Some oil well blowouts do not explode and catch fire like the Deepwater Horizon. Theoretically, all of the electrical and other potential ignition sources should have been suppressed by conformance to the IECEx standards mentioned in Chapter 9 (the National Electrical Code calls such areas hazardous (classified) locations in its "special occupancies." The IECEx standards are reviewed by Hunter in Chapter 6 (Hunter 2009).

The reported absence of significant participation in investigating the accident by the federal Chemical Safety and Hazard Investigation Board is also puzzling. That organization specializes in analyzing explosions and fires and produced a rather complete report on the accident at the BP refinery at Texas City.

Excerpts from the National Oil Spill Commission Report

The Final Report of the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling was issued on January 1, 2011. It is available from the Government Printing Office and also online at:

http://www.oilspillcommission.gov/ (accessed January 12, 2011).

Much of the report (National Oil Spill Commission 2011) addresses the environmental issues; indeed, some critics of the report complained that there were too many environmentalists and not enough scientists and engineers on the panel that produced the report.

This author downloaded Chapter 3, which explored the role of the Minerals Management Service and found nothing (in a brief scan) to contradict the description of the role of the MMS outlined above. I also downloaded Chapter 4 of Part II, which describes the blowout and its aftermath, and also explores the possible causes of the blowout in some detail (with numerous endnote references). The National Oil Spill Commission (hereafter, NOSC for brevity) states on p. 90:

> The well blew out because a number of separate risk factors, oversights, and outright mistakes combined to overwhelm the safeguards meant to prevent just such an event from happening. But most of the mistakes and oversights at Macondo can be traced back to a single overarching

> failure—a failure of management. Better management by BP, Halliburton, and Transocean would almost certainly have prevented the blowout by improving the ability of the individuals involved to identify the risks they faced, and to properly evaluate, communicate, and address them. A blowout in deepwater was not a statistical inevitability.

The inherently uncertain cementing process is described on p. 99 of the NOSC Report, citing a MMS study that "identified cementing problems as one of the "most significant factors" leading to blowouts between 1992 and 2006." The report further states (on p. 100) that:

> BP made a third compromise by limiting the volume of cement that Halliburton would pump down the well. Pumping more cement is a standard industry practice to insure against uncertain cementing conditions: more cement means less risk of contamination and less risk that the cement job will be compromised by slight errors in placement. But more cement at Macondo would mean a higher cement column in the annulus, which in turn would exert more pressure on the fragile formation below. Accordingly, BP determined that the annular cement column should extend only 500 feet above the uppermost hydrocarbon-bearing zone (and 800 feet above the main hydrocarbon zones), and that this would be sufficient to fulfill MMS regulations of "500 feet above the uppermost hydrocarbon-bearing zone." However, it did *not* satisfy BP's own internal guidelines, which specify that the top of the annular cement should be 1,000 feet above the uppermost hydrocarbon zone (emphasis in original). As designed, BP would have Halliburton pump a total of approximately 60 barrels of cement down the well—a volume that its own engineers recognized would leave little margin for error (Endnote references not included here).

In the discussion of the cementing job on p. 118 of the NOSC Report, the following statement appears.

> Even more serious, Halliburton documents strongly suggest that the final foam stability test results indicating a stable slurry may not even have been available before Halliburton pumped the primary cement job at Macondo. If true, Halliburton pumped foam cement into the well at Macondo at a time when all available test data showed the cement would, in fact, be unstable.

The first page of Chapter 4 of the report repeats the oft-quoted phrase reported in the media:

> But, who cares, it's done, [we] will probably be fine and we'll get a good cement job.

There is much more descriptive material in Chapter 4 with far too much detail to even survey here. Nothing seen in a scan reading contradicts the

TABLE 15.1

Examples of Decisions That Increased Risk at Macondo while Potentially Saving Time

Decision	Was There A Less Risky Alternative?	Less Time Than Alternative?	Decision-Maker
Not waiting for more centralizers of preferred design	Yes	Saved time	BP on shore
Not waiting for foam stability test results and/or redesigning slurry	Yes	Saved time	Halliburton (and perhaps BP on shore)
Not running cement evaluation log	Yes	Saved time	BP on shore
Using spacer made from combined lost circulation materials to avoid disposal issues	Yes	Saved time	BP on shore
Displacing mud from riser before setting surface cement plug	Yes	Unclear	BP on shore
Setting surface cement plug 3,000 ft. below the mud line	Yes	Unclear	BP on shore (approved by MMS)
Not installing additional physical barriers during temporary abandonment procedure	Yes	Saved time	BP on shore
Not performing further well integrity diagnostics in light of troubling and unexplained negative pressure test results	Yes	Saved time	BP (and perhaps Transocean) on rig
Bypassing pits and conducting other simultaneous operations during displacement	Yes	Saved time	Transocean (and perhaps BP) on rig

Source: From National Oil Spill Commission 2011. Deepwater—The Gulf Oil Disaster and the Future of Offshore Drilling—Figure 4.10 of the Final Report to the President. Washington, D.C.: GPO.

information from previous sources outlined above. Table 15.1, derived from Figure 4.10 on p. 125 of the NOSC report, encapsulates the major decisions that increased the risk of a blowout while potentially saving time.

Organizational Ethics for Government Contractors

A narrative treatment of ethics in government contracts appears in a book by attorney W. Noel Keyes (Keyes 2004). The Federal Acquisition Regulations (FAR), introduced here in Chapter 3, include ethical requirements for both

government personnel and contractors in Part 3 and elsewhere. A sample of the pertinent subparts are included here.

3.000 Scope of Part

This part prescribes policies and procedures for avoiding improper business practices and personal conflicts of interest and for dealing with the *apparent* or actual occurrence (emphasis added).

Subpart 3.1 – Safeguards

3.101 Standards of conduct

3.101-1 General

Government business shall be conducted in a manner above reproach and, except as authorized by statute or regulation, with complete impartiality and with preferential treatment for none. Transactions relating to the expenditure of public funds require the highest degree of public trust and an impeccable standard of conduct. The general rule is to avoid strictly any conflict of interest or even the appearance of a conflict of interest in Government-contractor relationships. While many Federal laws and regulations place restrictions on the actions of Government personnel, their official conduct must, in addition, be such that they would have no reluctance to make a full public disclosure of their actions.

3.101-2 Solicitation and acceptance of gratuities by Government Personnel

As a rule, no Government employee may solicit or accept, directly or indirectly, any gratuity, gift, favor, entertainment, loan, or anything of monetary value from anyone who (a) has or is seeking to obtain Government business with the employee's agency, (b) *conducts activities that are regulated by the employee's agency* (emphasis added), or (c) has an interest that may be substantially affected by the performance or nonperformance of the employee's official duties. Certain limited exceptions are authorized in agency regulations.

3.101-3 Agency regulations

(a) Agencies are required by Executive Order 11222 of May 8, 1965, and 5 CFR 735 to prescribe "Standards of Conduct." These agency standards contain-
    (1) Agency-authorized exceptions to 3.101-2; and
    (2) Disciplinary measures for persons violating the standards of conduct.
(b) Requirements for employee financial disclosure and restrictions on private employment for former Government employees are in Office of Personnel Management and agency regulations implementing Public Law 95-521, which is amended 18 U.S.C. 207.

NOTE: The balance of Subpart 3.1 is too lengthy to be completely included here. It prescribes implementations of the policies and procedures outlined above and calls for an "Agency Ethics Official" to be named to oversee ethical requirements of agency regulations and various parts of 5 U.S.C. The emphasized 3.101-2(b) above appears to address the allegations that MMS inspectors accepted favors from the parties they were inspecting. Subpart 3.10, reproduced in pertinent part below, calls for contractors to have a corporate code of ethics.

The main headings of the additional subparts along with implementing clauses from Subpart 52.2 give the flavor of the issues involved:

3.103 Independent Pricing

52.203-2 Certificate of Independent Price Determination.
As prescribed in 3.103-1, insert the following provision. If the solicitation is a request for Quotations, the terms "Quotation" and "Quoter" may be substituted for "Offer" and "Offeror."

Certificate of Independent Price Determination (Apr 1985)

(a) The offeror certifies that –
  (1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other offeror or competitor relating to-
    (i) Those prices;
    (ii) The intention to submit an offer; or
    (iii) The methods or factors used to calculate the prices offered.
  (2) The prices in this offer have not been and will not be knowingly disclosed by the offeror, directly or indirectly, to any other offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and
  (3) No attempt has been made or will be made by the offeror to induce any other concern to submit or not submit an offer for the purpose of restricting competition.
(b) Each signature on the offer is considered to be a certification by the signatory that the signatory-
  (1) is the person in the offeror's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to (a)(1) through (a)(3) of this provision; or
  (2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to paragraphs (a)(1) through (a)(3) of this provision _____ [insert full name of person(s) in the

offeror's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the offeror's organization];

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) of this provision have not participated, and will not participate, in any action contrary to paragraphs (a)(1) through (a)(3) of this provision; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to paragraphs (a)(1) through (a)(3) of this provision.

(c) If the offeror deletes or modifies paragraphs (a)(2) of this provision, the offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

(End of provision)

3.104 Procurement Integrity

3.2 – Contractor Gratuities to Government Personnel

52.203-3 Gratuities.

As prescribed in 3.202, insert the following clause:

Gratuities (Apr 1984)

(a) The right of the Contractor to proceed may be terminated by written notice if, after notice and hearing, the agency head or a designee determines that the Contractor, or its agent, or another representative-

(1) Offered or gave a gratuity (e.g., an entertainment or gift) to an officer, official, or employee of the Government; and

(2) Intended, by the gratuity, to obtain a contract or favorable treatment under a contract.

(b) The facts supporting this determination may be reviewed by any court having lawful jurisdiction.

(c) If this contract is terminated under paragraph (a) of this clause, the Government is entitled-

(1) To pursue the same remedies as in a breach of the contract; and

(2) In addition to any other damages provided by law, to exemplary damages of not less than 3 nor more than 10 times the cost incurred by the Contractor in giving gratuities to the person concerned, as determined by the agency head or a designee. (This paragraph (c)(2) is applicable only if this contract uses money appropriated to the Department of Defense.)

(d) The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided under this contract.

(End of clause)

3.3 – Reports of Suspected Antitrust Violations

3.4 - Contingent Fees

52.203-5 Covenant Against Contingent Fees.
As prescribed in 3.404, insert the following clause:

Covenant Against Contingent Fees (Apr 1984)

(a) The Contractor warrants that no person or agency has been employed or retained to solicit or obtain this contract upon an agreement or understanding for a contingent fee, except a bona fide employee or agency. For breach or violation of this warranty, the Government shall have the right to annul this contract without liability or, in its discretion, to deduct from the contract price or consideration, or otherwise recover, the full amount of the contingent fee.
(b) "Bona fide agency," as used in this clause, means an established commercial or selling agency, maintained by a contractor for the purpose of securing business, that neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds itself out as being able to obtain any Government contract or contracts through improper influence.

"Bona fide employee," as used in this clause, means a person, employed by the contractor and subject to the contractor's supervision and control as to time, place, and manner of performance, who neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds out as being able to obtain any Government contract or contracts through improper influence.

"Contingent fee," as used in this clause, means any commission, percentage, brokerage, or other fee that is contingent upon the success that a person or concern has in securing a Government contract.

"Improper influence," as used in this clause, means any influence that induces or tends to induce a Government employee or officer to give consideration or to act regarding a Government contract on any basis other than the merits of the matter.

3.5 – Other Improper Business Practices

3.501 Buying-in

3.502 Subcontractor kickbacks

3.503 Unreasonable restrictions on subcontractor sales

52.203-6 Restrictions on Subcontractor Sales to the Government
As prescribed in 3.503-2, insert the following clause:

Restrictions on Subcontractor Sales to the Government (Sept 2006)

(a) Except as provided in (b) of this clause, the Contractor shall not enter into any agreement with an actual or prospective subcontractor, nor otherwise act in any manner, which has or may have

the effect of restricting sales by such subcontractors directly to the Government on any item or process (including computer software) made or furnished by the subcontractor under this contract or any follow-on production contract.

(b) The prohibition in (a) of this clause does not preclude the Contractor from asserting rights that are otherwise authorized by law or regulation.

(c) The Contractor agrees to incorporate the substance of this clause, including this paragraph (c), in all subcontracts under this contract which exceed the simplified acquisition threshold.

(End of Clause)

Alternate I (Oct 1995). As prescribed in 3.503-2, substitute the following paragraph in place of paragraph (b) of the basic clause:

(b) The prohibition in paragraph (a) of this clause does not preclude the contractor from asserting rights that are otherwise authorized by law or regulation. For acquisition of commercial items, the prohibition in paragraph (a) applies only to the extent that any agreement restricting sales by subcontractors results in the Federal Government being treated differently from any other prospective purchaser for the sale of the commercial item(s).

3.6 – Contracts with Government Employees or Organizations Owned or Controlled by Them

3.7 – Voiding and Rescinding Contracts

3.8 – Limitation on the Payment of Funds to Influence Federal Transactions

3.9 – Whistleblower Protections for Contractor Employees
Most of these provisions are supported by a specified *Contract Clause* from Part 52 of the FAR.

That brings us to Subpart 3.10 on Contractor Code of Business Ethics and Conduct.

Subpart 3.10 – Contractor Code of Business Ethics and Conduct

3.1000 Scope of Subpart
This subpart prescribes policies and procedures for the establishment of contractor codes of business ethics and conduct, and display of agency Office of Inspector General (OIG) fraud hotline posters.

3.1001 Definitions
As used in this subpart-

"Subcontract" means any contract entered into by a subcontractor to furnish supplies or services for performance of a prime contract or a subcontract.

"Subcontractor" means any supplier, distributor, vendor, or firm that furnishes supplies or services to or for a prime contractor or another subcontractor.

"United States" means the 50 states, the District of Columbia and outlying areas.

3.1002 Policy

(a) Government contractors must conduct themselves with the highest degree of integrity and honesty.
(b) Contractors shall have a written code of business ethics and conduct. To promote compliance with such code of business ethics and conduct, contractors should have an employee business ethics and compliance training program and an internal control system that-
    (1) Are suitable to the size of the company and extent of its involvement in Government contracting;
    (2) Facilitate timely discovery and disclosure of improper conduct in connection with Government contracts; and
    (3) Ensure corrective measures are promptly instituted and carried out.

3.1003 Requirements

(a) Contractor requirements.
    (1) Although the policy at 3.1002 applies as guidance to all Government contractors, the contractual requirements set forth in the clauses at 52-203-13, Contractor Code of Business Ethics and Conduct, and 52.203-14, Display of Hotline Poster(s) are mandatory if the contracts meet the conditions specified in the clause prescription at 3.1004.
    (2) Whether or not the clause at 52.203-13 is applicable, a contractor may be suspended and/or debarred for knowing failure by a principal to timely disclose to the Government, in connection with the award, performance, or closeout of a Government contract performed by the contractor or a subcontract awarded thereunder, credible evidence of a violation of Federal criminal law involving fraud, conflict of interest, bribery, or gratuity violations found in Title 18 of the United States Code or a violation of the civil False Claims Act. Knowing failure to timely disclose credible evidence of any of the above violations remains a cause for suspension and/or debarment until 3 years after the final payment on a contract (see 9.406-2(b)(1)(vi) and 9-407-2(a)(8)).
    (3) The payment clause at FAR 52.212-4(i)(5), 52.232-25(d), and 52.232-27(1) require that, if the contractor becomes aware that the Government has overpaid on a contract financing or invoice payment, the contractor shall remit the overpayment amount to the Government. A contractor may be suspended and/or debarred for knowing failure by a principal to timely disclose credible evidence of a significant overpayment, other than overpayments resulting from contract financing payments as defined in 32.001 (see 9.406-2(b)(1)(vi) and 9-407-2(a)(8)).
(b) *Notification of possible contractor violation*. If the contracting officer is notified of possible contractor violation of Federal criminal law involving fraud, conflict of interest, bribery, or gratuity violations

found in Title 18 U.S.C.; or a violation of civil False Claims Act, the contracting officer shall-

(1) Coordinate the matter with the agency Office of the Inspector General; or

(2) Take action in accordance with agency procedures.

(c) Fraud Hotline Poster.

(1) Agency OIGs are responsible for determining the need for, and the content of, their respective agency OIG fraud hotline poster(s).

(2) When requested by the Department of Homeland Security, agencies shall ensure that contracts funded by disaster assistance funds require display of any fraud hotline poster applicable to the specific contract. As established by the agency OIG, such posters may be displayed in lieu of, or in addition to, the agency's standard poster.

3.1004 Contract Clauses

(a) Insert the clause at FAR 52.203-13, Contractor Code of Business Ethics and Conduct, in solicitations and contracts if the value of the contract is expected to exceed $5,000,000 and if the performance period is 120 days or more.

(b) (1) Unless the contract is for the acquisition of a commercial item, or will be performed entirely outside the United States, insert the clause at FAR 52.203-14, Display of Hotline Poster(s), if-

(i) The contract exceeds $5,000,000 or a lesser amount established by the agency; and

(ii) (A) The agency has a fraud hotline poster; or

(B) The contract is funded by disaster assistance funds.

(2) In paragraph (b)(3) of the clause, the contracting officer shall-

(i) identify the applicable posters; and

(ii) insert the website link(s) or other contact information for obtaining the agency and/or Department of Homeland Security poster.

(3) In paragraph (d) of the clause, if the agency has established policies and procedures for display of the OIG fraud hotline poster at a lesser amount, the contracting officer shall replace "$5,000,000" with the lesser amount that the agency has established.

52.203-13 Contractor Code of Business Ethics and Conduct.

As prescribed in 3.1004(a), insert the following clause:

CONTRACTOR CODE OF BUSINESS ETHICS AND CONDUCT (DEC. 2008)

(a) *Definitions.* As used in this clause-

"Agent" means any individual, including a director, an officer, an employee, or an independent Contractor, authorized to act on behalf of the organization.

"Full cooperation"-

(1) Means disclosure to the Government of the information sufficient for law enforcement to identify the nature and extent of the offense and the individuals responsible for the conduct. It includes providing timely and complete response to Government auditors' and investigators' request for documents and access to employees with information;

(2) Does not foreclose any Contractor rights arising in law, the FAR, or the terms of the contract. It does not require-

(i) A Contractor to waive its attorney-client privilege or the protections afforded by the attorney work product doctrine; or

(ii) Any officer, director, owner, or employee of the Contractor, including sole proprietor, to waive his or her attorney client privilege or Fifth Amendment rights; and

(3) Does not restrict a Contractor from-

(i) Conducting an internal investigation; or

(ii) Defending a proceeding or dispute arising under a contract or related to a potential or disclosed violation.

"Principal" means an officer, director, owner, partner, or a person having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment; and similar positions).

"Subcontract" means any contract entered into by a subcontractor to furnish supplies or services to or for performance of a prime contract or a subcontract.

"Subcontractor" means any supplier, distributor, vendor, or firm that furnished supplies or services to or for a prime contractor or another subcontractor.

"United States" means the 50 States, the District of Columbia, or outlying areas.

(b) Code of business ethics and conduct.

(1) Within 30 days after contract award, unless the Contracting Officer establishes a longer time period, the Contractor shall-

(i) Have a written code of business ethics and conduct, and

(ii) Make a copy of the code available to each employee engaged in performance of the contract.

(2) The Contractor shall-

(i) Exercise due diligence to prevent and detect criminal conduct, and

(ii) Otherwise promote an *organizational culture* (emphasis added) that encourages ethical conduct and a commitment to compliance with the law.

(3) (i) The Contractor shall timely disclose, in writing, to the agency Office of the Inspector General (OIG), with a copy to the Contracting Officer, whenever, in connection with the award, performance, or closeout of this contract or any

subcontract thereunder, the Contractor has credible evidence that a principal, employee, agent, or subcontractor of the Contractor has committed-

(A) A violation of Federal criminal law involving fraud, conflict of interest, bribery, or gratuity violations found in Title 18 of United States Code; or

(B) A violation of the civil False Claims Act (31 U.S.C. 3729-3733).

(ii) The Government, to the extent permitted by law and regulation, will safeguard and treat information obtained pursuant to the Contractor's disclosure as confidential where the information has been marked "confidential" or "proprietary" by the company. To the extent permitted by law and regulation, such information will not be released by the Government to the public pursuant to a Freedom of Information Act request, 5 U.S.C. Section 552, without prior notification to the Contractor. The Government may transfer documents provided by the Contractor to any department or agency within the Executive Branch if the information relates to matters within the organization's jurisdiction.

(iii) If the violation relates to an order against a Government-wide acquisition contract, multi-agency contract, a multiple award schedule contract such as the Federal Supply Schedule, or any other procurement instrument intended for use by multiple agencies, the Contractor shall notify the OIG of the ordering agency and the IG of the agency responsible for the basic contract.

(c) Business ethics awareness and compliance program and internal control system. This paragraph (c) does not apply if the Contractor has represented itself as a small business concern pursuant to the award of this contract or if this contract is for the acquisition of a commercial item as defined at FAR 2.201. The Contractor shall establish the following within 90 days after a contract award, unless the Contracting Officer establishes a longer time period.

(1) An ongoing business ethics awareness and compliance program.

(i) This program shall include reasonable steps to communicate periodically and in a practical manner the Contractor's standards and procedures and other aspects of the Contractor's business ethics awareness and compliance program and internal control system, by conducting effective training programs and otherwise disseminating information appropriate to an individual's respective roles and responsibilities.

(ii) The training conducted under this program shall be provided to the Contractor's principals and employees, and as appropriate, the Contractor's agents and subcontractors.

(2) An internal control system.
  (i) The Contractor's internal control system shall-
    (A) Establish standards and procedures to facilitate timely discovery of improper conduct in connection with Government contracts; and
    (B) Ensure corrective measures are promptly instituted and carried out.
  (ii) At a minimum, the Contractor's internal control system shall provide for the following:
    (A) Assignment of responsibility at a sufficiently high level and adequate resources to ensure the effectiveness of the business ethics awareness and compliance program and internal control system.
    (B) Reasonable efforts not to include an individual as a principal, whom due diligence would have exposed as having engaged in conduct that is in conflict with the Contractor's code of business ethics and conduct.
    (C) Periodic reviews of company business practices, procedures, policies, and internal controls for compliance with the Contractor's code of business ethics and conduct and the special requirements of Government contracting, including-
      (1) Monitoring and auditing to detect criminal conduct;
      (2) Periodic evaluation of the effectiveness of the business ethics awareness and compliance program and internal control system, especially if criminal conduct has been detected; and
      (3) Periodic assessment of the risk of criminal conduct, with appropriate steps to design, implement, or modify the business ethics awareness and compliance program and the internal control system as necessary to reduce risk of criminal conduct identified through this process.
    (D) An internal reporting mechanism, such as a hotline, which allows for anonymity or confidentiality, by which employees may report suspected instances of improper conduct, and instructions that encourage employees to make such reports.
    (E) Disciplinary action for improper conduct or for failing to take reasonable steps to prevent or detect improper conduct.
    (F) Timely disclosure, in writing, to the agency OIG, with a copy to the Contracting Officer, whenever, in connection with the award, performance or closeout of any Government contract performed by the Contractor or

a subcontractor thereunder, the Contractor has credible evidence that a principal, employee, agent, or subcontractor of the Contractor has committed a violation of Federal criminal law involving fraud, conflict of interest, bribery, or gratuity violations found in Title 18 U.S.C. or a violation of the civil False Claims Act (31 U.S.C. 3729-3733).

(1) If a violation relates to more than one Government contract, the Contractor may make the disclosure to the agency OIG and Contracting Officer responsible for the largest dollar value contract impacted by the violation.

(2) If the violation relates to an order against a Governmentwide acquisition contract, a multi-agency contract, a multiple-award schedule contract such as a Federal Supply Schedule, or any other procurement instrument intended for use by multiple agencies, the contractor shall notify the OIG of the ordering agency and the IG of the agency responsible for the basic contract, and the respective agencies' contracting officers.

(3) The disclosure requirement for an individual contract continues until at least 3 years after final payment on the contract.

(4) The Government will safeguard such disclosures in accordance with paragraph (b)(3)(ii) of this clause.

(G) Full cooperation with any Government agencies responsible for audits, investigations, or corrective actions.

(d) Subcontracts.

(1) The Contractor shall include the substance of this clause, including this paragraph (d), in subcontracts that have a value in excess of $5,000,000 and a performance period or more than 120 days.

(2) In altering this clause to identify the appropriate parties, all disclosures of violation of the civil False Claims Act or of Federal criminal law shall be directed to the agency office of the Inspector General, with a copy to the Contracting Officer.

(End of clause)

Clause 52.203-14 Display of Hotline Poster(s) includes details that are not particularly germane to the purpose of this book and therefore is not included (although referenced) here.

References

Bower, T. 2010a. Drilling down: A troubled legacy in oil: The spill in the Gulf of Mexico is the latest disaster for which BP, has been haunted by a history of cost cutting. *The Wall Street Journal*, May 1–2, p. 7.

Bower, T. 2010b. *Oil-Money, Politics, and Power in the 21st Century*. New York: Hachette Book Group, pp. 29–30.

Bowie, N.E. 2005. Are business ethics and engineering ethics members of the same family? In *Engineering Ethics*, ed. M. Davis. Aldershot Hantz (England): Ashgate Publishing Limited, pp. 9–18.

Brown, R. 2010. Oil rig sirens were kept off, technician says-waking crew was issue. *The New York Times*, July 24, pp. 1–11.

Bustillo, M. 2010. Big spat on rig preceded explosion. *The Wall Street Journal*, May 27, p. A7.

Byrne, J.A. 2002. Restoring trust in corporate America—business must lead the way to real reform. *Business Week*, June 24, pp. 30–35.

Casselman, B. and R. Gold. 2010. Unusual decisions set stage for BP disaster. *The Wall Street Journal*, May 27, pp. 1–6.

Cruver, B. 2002. *Anatomy of Greed—The Unshredded Truth from an Enron Insider*. New York: Carroll and Graf Publishers.

Davis, M. 2005. *Engineering Ethics.* Burlington: Ashgate Publishing Company.

DeParle, J. 2010. Leading the way into deep water—minerals service operated under a mandate to produce results. *The New York Times*, August 8, pp. 1–12.

Frommer, F.J. 2010. Mariner among companies to fight offshore safety rule. *Austin American-Statesman*, September 4, p. A11.

Gold, R. and T. McGinty. 2010. BP relied on cheaper wells—WSJ analysis shows oil giant used "risky" design more often than most peers. *The Wall Street Journal*, June 19, pp. 1–5.

Gold, R. and S. Power. 2010. Oil agency ceded oversight of safety to drilling industry. *The Wall Street Journal*, May 7, pp. 1–4.

Hebert, H.J. and F.J. Frommer. 2010. Interior secretary acknowledges lax oil oversight. *Austin American-Statesman*, May 19, p. A5.

Hunter, R.D. 2009. *Standards, Conformity Assessment and Accreditation for Engineers*. Boca Raton: Taylor & Francis, p. 94.

Keyes, W.N. 2004. *Government Contracts.* St. Paul: West.

Kreie, J. and T.P. Cronan. 2000. Making ethical decisions. *Communications of the ACM* 43(12): 66–71, Dec. 2000.

Lipton, E. and J.M. Broder. 2010. Regulators warned of need for oil rig backup systems. *The Austin American-Statesman*, May 8, p. A8.

Lorsch, J.W., L. Berlowitz, and A. Zelleke, eds. 2005. *Restoring Trust in American Business*. Cambridge: MIT Press.

Martin, A. 2010. Drywall flaws: Owners gain limited relief—Chinese product forces many from homes. *The New York Times*, September 18, pp. 1–3.

National Oil Spill Commission 2011. Final Report, Deepwater, The Gulf Oil Disaster and the Future of Offshore Drilling—Report to the President. Washington, D.C.: GPO

O'Donnell, J. and G. Strauss. 2002. Enron investigator blasts senior managers. *USA Today*, February 5, pp. 1–3.

Oram, D. 2010. Designing for sustainability-negotiating ethical implications. *IEEE Technology and Society Magazine* 29(3): 31–36, Fall 2010.
Plushnick-Masti, R. 2010. Toxic gas release at BP refinery in Texas City sparks EPA probe. *Austin American-Statesman*, September 18, pp. 7–9.
Power, S. and J.R. Emshwiller. 2010. Investigators focus on failed device. *The Wall Street Journal*, May 6, p. A5.
Schempf, F.J. 2010. Top, bottom kill prospects leave Macondo just a nasty memory. *Offshore* 10: 50–52.
Serrano, R.A. and N. Banerjee. 2010. Justice department sues BP, other companies over Gulf oil spill. *Austin American-Statesman*, Dec. 16, p. A4.
Steffy, L.C. 2011. *Drowning in Oil – BP and the Reckless Pursuit of Profit*. New York: McGraw-Hill.
Twomey, D.P., M. M. Jennings, and I. Fox. 2005. *Anderson's Business Law and the Legal Environment* 19th Ed. United States: West.
Weber, H.R. 2010a. Key oil spill evidence raised to Gulf's surface. *Product Design and Development*, Sept. 5.
Weber, H.R. 2010b. Mud activities before blast made oil worker uncomfortable, he says. *Austin American-Statesman*, Dec. 8, p. A9.
Weil, V. 2005. Is engineering ethics just business ethics?: What can empirical findings tell us? In *Engineering Ethics*, ed. M. Davis. Aldershot Hants (England): Ashgate Publishing Limited, pp. 19–23.

Additional Reading

McLean, B. and P. Elkind. 2005. *The Smartest Guys in the Room—The Amazing Rise and Scandalous Fall of Enron*. New York: Penguin Group.

Appendix 1: United Nations Convention on Contracts for the International Sale of Goods

AUTHOR'S NOTE: The term "STATES" as used in this document means the Nation States such as the United States, Canada, et al. States that "join" or adopt this International Agreement are also referred to as "Contracting States."

THE STATES PARTIES TO THIS CONVENTION,

BEARING IN MIND the broad objectives of the resolutions adopted by the sixth special Session of the General Assembly of the United Nations on the establishment of a New International Economic Order,

CONSIDERING that the development of international trade on the basis of equality and mutual benefit is an important element in promoting friendly relations among States,

BEING OF THE OPINION that the adoption of uniform rules which govern contracts for the international sale of goods and take into account the different social, economic and legal systems would contribute to the removal of legal barriers in international trade and promote the development of international trade,

HAVE AGREED as follows:

Part I Sphere of Application and General Provisions

Chapter I Sphere of Application

Article 1

(1) This Convention applies to contracts of sale of goods between parties whose places of business are in different States:

(a) when the States are Contracting States; or

(b) when the rules of private international law lead to the application of the law of a Contracting State.

(2) The fact that the parties have their places of business in different States is to be disregarded whenever this fact does not appear either from the contract or from any dealings between, or from information

disclosed by, the parties at any time before or at the conclusion of the contract.

(3) Neither the nationality of the parties nor the civil or commercial character of the parties or of the contract is to be taken into consideration in determining the application of this Convention.

Article 2

This Convention does not apply to sales:

(a) of goods bought for personal, family or household use, unless the seller, at any time before or at the conclusion of the contract, neither knew nor ought to have known that the goods were bought for any such use;

(b) by auction;

(c) on execution or otherwise by authority of law;

(d) of stocks, shares, investment securities, negotiable instruments, or money;

(e) of ships, vessels, hovercraft or aircraft;

(f) of electricity.

Article 3

(1) Contracts for the supply of goods to be manufactured or produced are to be considered sales unless the party who orders the goods undertakes to supply a substantial part of materials necessary for such manufacture or production.

(2) This Convention does not apply to contracts in which the preponderant part of the obligation of the party who furnishes the goods consists in the supply of labor or other services.

Article 4

This Convention governs only the formation of the contract of sale and the rights and obligations of the seller and buyer arising from such a contract. In particular, except as otherwise expressly provided in this Convention, it is not concerned with:

(a) the validity of the contract or of any of its provisions or of any usage;

(b) the effect which the contract may have on the property in the goods sold.

Article 5

This Convention does not apply to the liability of the seller for death or personal injury caused by the goods to any person.

Article 6

The parties may exclude the application of this Convention or, subject to article 12, derogate from or vary the effect of any of its provisions.

Chapter II General Provisions

Article 7

(1) In the interpretation of this Convention, regard is to be had to its international character and to the need to promote uniformity in its application and observance of good faith in international trade.

(2) Questions concerning matters governed by this Convention which are not expressly settled in it are to be settled in conformity with the general principles on which it is based or, in the absence of such principles, in conformity with the law applicable by virtue of the rules of private international law.

Article 8

(1) For the purposes of this Convention statements made by and other conduct of the party are to be interpreted according to his intent where the other party knew or could not have been aware of what that intent was.

(2) If the preceding paragraph is not applicable, statements made by and other conduct of a party are to be interpreted according to the understanding that a reasonable person of the same kind as the other party would have had in the same circumstances.

(3) In determining the intent of a party or the understanding a reasonable person would have had, due consideration is to be given to all relevant circumstances of the case including the negotiations, any practices which the parties have established between themselves, usages and any subsequent conduct of the parties.

Article 9

(1) The parties are bound by any usage to which they have agreed and by any practices which they have established between themselves.

(2) The parties are considered, unless otherwise agreed, to have impliedly made applicable to their contract or its formation a usage of which the parties knew or ought to have known and which in international trade is widely known to, and regularly observed by, parties to contracts of the type involved in the particular trade concerned.

Article 10

For the purposes of this Convention:

(a) if a party has more than one place of business, the place of business is that which has the closest relationship to the contract and its performance, having regard to the circumstances known to or contemplated by the parties at any time before or at the conclusion of the contract;
(b) if a party does not have a place of business, reference is to be made to his habitual residence.

Article 11

A contract of sale need not be concluded in or evidenced by writing and is not subject to any other requirement as to form. It may be proved by any means, including witnesses.

Article 12

Any provision of article 11, article 29 or Part II of this Convention that allows a contract of sale, or its modification or termination by agreement or any offer, acceptance or other indication of intention to be made in any form other than in writing does not apply where any party has his place of business in a Contracting State which has made a declaration under article 96 of this Convention. The parties may not derogate from or vary the effect of this article.

Article 13

For the purposes of this Convention "writing" includes telegram and telex.

Part II Formation of the Contract

Article 14

(1) A proposal for concluding a contract addressed to one or more specific persons constitutes an offer if it is sufficiently definite and indicates the intention of the offeror to be bound in case of acceptance. A proposal is sufficiently definite if it indicates the goods and expressly or implicitly fixes or makes provision for determining the quantity and price.

(2) A proposal other than one addressed to one or more specific persons is to be considered merely as an invitation to make offers, unless the contrary is clearly indicated by the person making the proposal.

Article 15

(1) An offer becomes effective when it reaches the offeree.

(2) An offer, even if it is irrevocable, may be withdrawn if the withdrawal reaches the offeree before or at the same time as the offer.

Article 16

(1) Until a contract is concluded an offer may be revoked if the revocation reaches the offeree before he has dispatched an acceptance.

(2) However, an offer cannot be revoked:

(a) if it indicates, whether by stating a fixed time for acceptance or otherwise, that it is irrevocable; or

(b) it was reasonable for the offeree to rely on the offer as being irrevocable and the offeree has acted in reliance on the offer.

Article 17

An offer, even if it is irrevocable, is terminated when a rejection reaches the offeror.

Article 18

(1) A statement made by or other conduct of the offeree indicating assent to an offer is an acceptance. Silence or inactivity does not in itself amount to acceptance.

(2) An acceptance of an offer becomes effective at the moment the indication of assent reaches the offeror. An acceptance is not effective if the indication of assent does not reach the offeror within the time he has fixed or, if no time is fixed, within a reasonable time, due account being taken of the circumstances of the transaction, including the rapidity of the means of communication employed by the offeror. An oral offer must be accepted immediately unless the circumstances indicate otherwise.

(3) However, if by virtue of the offer or as a result of practices which the parties have established between themselves or of usage, the offeree may indicate assent by performing an act, such as one relating to the dispatch of the goods or payment of the price, without notice to the offeror, the acceptance is effective at the moment the act is

performed, provided the act is performed within the period of time laid down in the preceding paragraph.

Article 19

(1) A reply to an offer which purports to be an acceptance but contains additions, limitations or other modifications is a rejection of the offer and constitutes a counter-offer.

(2) However, a reply to an offer which purports to be an acceptance but contains additional or different terms which do not materially alter the terms of the offer constitutes an acceptance, unless the offeror, without undue delay, objects orally to the discrepancy or dispatches a notice to that effect. If he does not so object, the terms of the contract are the terms of the offer with modifications contained in the acceptance.

(3) Additional or different terms relating, among other things, to the price, payment, quality and quantity of goods, place and time of delivery, extent of one party's liability to the other or the settlement of disputes are considered to alter the terms of the offer materially.

Article 20

(1) A period of time for acceptance fixed by the offeree in a telegram or a letter begins to run from the moment the telegram is handed in for dispatch or from the date shown on the letter or, if no such date is shown, from the date shown on the envelope. A period of time for acceptance fixed by the offeror by telephone, telex or other means of instantaneous communication, begins to run from the moment that the offer reaches the offeree.

(2) Official holidays or non-business days occurring during the period for acceptance are included in calculating the period. However, if a notice of acceptance cannot be delivered at the address of the offeror on the last day of the period because that day falls on an official holiday or non-business day at the place of business of the offeror, the period is extended until the first business day which follows.

Article 21

(1) A late acceptance is nevertheless effective as an acceptance if without delay the offeror orally so informs the offeree or dispatches a notice to that effect.

(2) If a letter or other writing contains a late acceptance shows that it has been sent in such circumstances that if its transmission had been normal it would have reached the offeror in due time, the late acceptance is effective as an acceptance unless, without delay, the offeror

orally informs the offeree that he considers his offer as having lapsed or dispatches a notice to that effect.

Article 22

An acceptance may be withdrawn if the withdrawal reaches the offeror before or at the same time as the acceptance would have become effective.

Article 23

A contract is concluded at the moment when an acceptance of an offer becomes effective in accordance with the provisions of this Convention.

Article 24

For the purposes of this Part of the Convention, an offer, declaration of acceptance or any other indication of intention "reaches" the address when it is made orally to him, or delivered by any other means to him personally, to his place of business or mailing address or, if he does not have a place of business or mailing address, to his habitual residence.

Part III Sale of Goods

Chapter I General Provisions

Article 25

A breach of contract committed by one of the parties is fundamental if it results in such a detriment to the other party as substantially to deprive him of what he is entitled to expect under the contract, unless the party in breach did not foresee and a reasonable person of the same kind in the same circumstances would not have foreseen such a result.

Article 26

A declaration of avoidance of the contract is effective only if made by notice to the other party.

Article 27

Unless otherwise expressly provided in this Part of the Convention, if any notice, request or other communication is given or made by a party in

accordance with this Part and by means appropriate in the circumstances, a delay or error in the transmission of the communication or its failure to arrive does not deprive that party of the right to rely on communication.

Article 28

If, in accordance with the provisions of this Convention, one party is entitled to require performance of any obligation by the other party, a court is not bound to enter a judgment of specific performance unless the court would do so under its own law in respect of similar contracts of sale not governed by this Convention.

Article 29

(1) A contract may be modified or terminated by the mere agreement of the parties.

(2) A contract in writing which contains a provision requiring any modification or termination by agreement to be in writing may not be otherwise modified or terminated by agreement. However, a party may be precluded by his conduct from asserting such a provision to the extent that the other party has relied on that conduct.

Chapter II Obligations of the Seller

Article 30

The seller must deliver the goods, hand over any documents relating to them and transfer the property in the goods, as required by the contract and this Convention.

Section I. Delivery of the Goods and Handing over of Documents

Article 31

If the seller is not bound to deliver the goods at any particular place, his obligation to deliver consists:

(a) if the contract of sale involves carriage of goods – in handing the goods over to the first carrier for transmission to the buyer;

(b) if, in cases not within the preceding subparagraph, the contract relates to specific goods, or identified goods to be drawn from a specific stock or to be manufactured or produced, and at the time of the conclusion of the contract the parties knew that the goods were at, or were to be manufactured or produced at, a particular place – in placing the goods at the buyer's disposal at that place;

(c) in other cases – in placing the goods at the buyer's disposal at the place where the seller has his place of business at the time of the conclusion of the contract.

Article 32

(1) If the seller, in accordance with the contract of this Convention, hands the goods over to a carrier and if the goods are not clearly identified to the contract by markings on the goods, by shipping documents or otherwise, the seller must give the buyer notice of the consignment specifying the goods.

(2) If the seller is bound to arrange for carriage of the goods, he must make such contracts as are necessary for carriage to the place fixed by means of transportation appropriate in the circumstances and according to the usual terms for such transportation.

(3) If the seller is not bound to effect insurance in respect of the carriage of the goods, he must, at the buyer's request, provide him with all available information necessary to enable him to effect such insurance.

Article 33

The seller must deliver the goods:

(a) if a date is fixed or determinable from the contract, on that date;

(b) if a period of time is fixed by or determinable from the contract, at any time within that period unless circumstances indicate that buyer is to choose a date; or

(c) in any other case, within a reasonable time after the conclusion of the contract.

Article 34

If the seller is bound to hand over documents relating to the goods, he must hand them over at the time and place and in the form required by the contract. If the seller has handed over documents before that time, he may, up to that time, cure any lack of conformity in the documents, if the exercise of this right does not cause the buyer unreasonable inconvenience or unreasonable expense. However, the buyer retains any right to claim damages as provided for in this Convention.

Section II. Conformity of the Goods and Third-Party Claims

Article 35

(1) The seller must deliver goods which are of the quantity, quality and description required by the contract and which are contained or packaged in the manner required by the contract.

(2) Except where the parties have agreed otherwise, the goods do not conform with the contract unless they:

(a) are fit for the purpose for which the goods of the same description would ordinarily be used;

(b) are fit for any particular purpose expressly or impliedly made known to the seller at the time of the conclusion of the contract, except where the circumstances show that the buyer did not rely, or that it was unreasonable for him to rely, on the seller's skill and judgment;

(c) possess the qualities of goods which the seller has held out to the buyer as a sample or model;

(d) are contained or packaged in the manner usual for such goods or, where there is no such manner, in a manner adequate to preserve and protect the goods.

(3) The seller is not liable under subparagraphs (a) through (*d) of the preceding paragraph for any lack of conformity of the goods if at the time of the conclusion of the contract the buyer knew or could not have been unaware of such lack of conformity.

Article 36

(1) The seller is liable in accordance with the contract and this Convention for any lack of conformity which exists at the time when the risk passes to the buyer, even though the lack of conformity becomes apparent only after that time.

Article 37

If the seller has delivered goods before the date for delivery, he may, up to that date, deliver any missing part or make up any deficiency in the quantity of the goods delivered, or deliver goods in replacement of any non-conforming goods delivered or remedy any lack of conformity in the goods delivered, provided that the exercise of this right does not cause the buyer unreasonable inconvenience or unreasonable expense.

However, the buyer retains any right to claim damages as provided for in this Convention.

Article 38

(1) The buyer must examine the goods, or cause them to be examined, within as short a period as is reasonable under the circumstances.

(2) If the contract involves carriage of the goods, examination may be deferred until after the goods have arrived at their destination.

(3) If the goods are redirected in transit or redispatched by the buyer without a reasonable opportunity for examination by him at the

time of the conclusion of the contract the seller knew or ought to have known of the possibility of such redirection or redispatch, examination may be deferred until after the goods have arrived at the new destination.

Article 39

(1) The buyer loses the right to rely on the lack of conformity of the goods if he does not give notice to the seller specifying the nature of the lack of conformity within a reasonable time after he has discovered it or ought to have discovered it.

(2) In any event, the buyer loses the right to rely on a lack of conformity of the goods if he does not give the seller notice thereof at the latest within a period of two years from the date on which the goods were actually handed over to the buyer, unless this time-limit is inconsistent with a contractual period of guarantee.

Article 40

The seller is not entitled to rely on the provisions of articles 38 and 39 if the lack of conformity relates to facts which he knew or could not have been unaware and which he did not disclose to the buyer.

Article 41

The seller must deliver goods which are free from any right or claims of a third party, unless the buyer agreed to take the goods subject to that right or claim.

However, if such right or claim is based on industrial property or other intellectual property, the seller's obligation is governed by article 42.

Article 42

(1) The seller must deliver goods which are freed from any right or claim of a third party based on industrial property or other intellectual property, of which at the time of the conclusion of the contract the seller knew or could not have been unaware, provided that the right or claim is based on industrial property or other intellectual property:

(a) under the law of the State where the goods will be resold or otherwise used, if it was contemplated by the parties at the time of the conclusion of the contract that the goods would be resold or otherwise used in that State; or

(b) in any other case, under the law of the State where the buyer has his place of business.

(2) The obligation of the seller under the preceding paragraph does not extend to cases where:

(a) at the time of the conclusion of the contract the buyer knew or could not have been unaware of the right or claim; or

(b) the right or claim results from the seller's compliance with technical drawings, designs, formulas or other such specifications furnished by the buyer.

Article 43

(1) The buyer loses the right to rely on the provisions of article 41 or article 42 if he does not give notice to the seller specifying the nature of the right or claim of a third party within a reasonable time after he has become aware or ought to have become aware of the right or claim.

(2) The seller is not entitled to rely on the provisions of article 41 or article 42 if he does not give notice to the seller specifying the nature of the right or claim of the third party within a reasonable time after he has become aware or ought to have become aware of the right or claim of the third party and the nature of it.

Article 44

Notwithstanding the provisions of paragraph (1) of article 39 and paragraph (1) of article 43, the buyer may reduce the price in accordance with article 50 or claim damages, except for loss of profit, if he has a reasonable excuse for his failure to give the required notice.

Section III. Remedies for Breach of Contract by the Seller

Article 45

(1) If the seller fails to perform any of his obligations under the contract or this Convention, the buyer may:

(a) exercise the rights provided in articles 46 to 52;

(b) claim damages as provided in articles 74 to 77.

(2) The buyer is not deprived of any right he may have to claim damages by exercising his right to other remedies.

(3) No period of grace may be granted to the seller by a court or arbitral tribunal when the buyer resorts to a remedy for breach of contract.

Article 46

(1) The buyer may require performance by the seller of his obligations unless the buyer has resorted to a remedy which is inconsistent with this requirement.

(2) If the goods do not conform to the contract, the buyer may require delivery of substitute goods only if the lack of conformity constitutes a fundamental breach of contract and a request for substitute goods is made either in conjunction with notice given under article 39 or within a reasonable time thereafter.

(3) If the goods do not conform with the contract, the buyer may require the seller to remedy the lack of conformity by repair, unless this is unreasonable having regard to all the circumstances. A request for repair must be made either in conjunction with notice given under article 39 or within a reasonable time thereafter.

Article 47

(1) The buyer may fix an additional period of time of reasonable length for performance by the seller of his obligations.

(2) Unless the buyer has received notice from the seller that he will not perform within the period as fixed, the buyer may not, during that period, resort to any remedy for breach of contract. However, the buyer is not deprived thereby of any right he may have to claim damages for delay in performance.

Article 48

(1) Subject to article 49, the seller may, even after the date for delivery, remedy at his own expense any failure to perform his obligations, if he can do so without unreasonable delay and without causing the buyer unreasonable inconvenience or uncertainty of reimbursement by the seller of expenses advanced by the buyer. However, the buyer retains any right to claim damages as provided for in this Convention.

(2) If the seller requests the buyer to make known whether he will accept performance and the buyer does not comply with the request within a reasonable time, the seller may perform within the time indicated in his request. The buyer may not, during that period of time, resort to any remedy which is inconsistent with performance by the seller.

(3) A notice by the seller that he will perform within a specified period of time is assumed to include a request, under the preceding paragraph, that the buyer make known his decision.

(4) A request or notice by the seller under paragraph (2) or (3) of this article is not effective unless received by the buyer.

Article 49

(1) The buyer may declare the contract avoided:

(a) if the failure by the seller to perform any of his obligations under the contract or this Convention amounts to a fundamental breach of contract; or

(b) in case of non-delivery, if the seller does not deliver the goods within the additional period of time fixed by the buyer in accordance with paragraph (1) of article 47 or declares that he will not deliver within the period as fixed.

(2) However, in cases where the seller has delivered the goods, the buyer loses the right to declare the contract avoided unless he does so:

(a) in respect of late delivery, within a reasonable time after he becomes aware that delivery has been made;

(b) in respect to any breach other than late delivery, within a reasonable time:

(i) after he knew or ought to have known of the breach;

(ii) after the expiration of any additional period of time fixed by the buyer in accordance with paragraph (1) of article 47, or after the seller has declared that he will not perform his obligations within such an additional period; or

(iii) after the expiration of any additional period of time indicated by the seller in accordance with paragraph (2) of article 48, or after the buyer has declared that he will not accept performance.

Article 50

If the goods do not conform to the contract and whether or not the price has already been paid, the buyer may reduce the price in the same proportion as the value of the goods actually delivered had at the time of the delivery bears to the value that conforming goods would have had at that time. However, if the seller remedies any failure to perform his obligations in accordance with article 37 or article 48 or if the buyer refuses to accept performance by the seller in accordance with these articles, the buyer may not reduce the price.

Article 51

(1) If the seller delivers only a part of the goods or if only a part of the goods delivered is in conformity with the contract, articles 46 to 50 apply in respect of the part which is missing or does not conform.

(2) The buyer may declare the contract avoided in its entirety only if the failure to make delivery completely or in conformity with the contract amounts to a fundamental breach of the contract.

Article 52

(1) If the seller delivers the goods before the date fixed, the buyer may take delivery or refuse to take delivery.

(2) If the seller delivers a quantity of goods greater than that provided for in the contract, the buyer may take delivery or refuse to take delivery of the excess quantity. If the buyer takes delivery of all or part of the excess quantity, he must pay for it at the contract rate.

Chapter III Obligations of the Buyer

Article 53

The buyer must pay the price for the goods and take delivery of them as required by the contract and this convention.

Section I. Payment of the Price

Article 54

The buyer's obligation to pay the price includes taking such steps and complying with such formalities as may be required under the contract or any laws and regulations to enable payment to be made.

Article 55

Where a contract has been validly concluded but does not expressly or implicitly fix or make provision for determining the price, the parties are considered, in the absence of any indication to the contrary, to have impliedly made reference to the price generally charged at the time of the conclusion of the contract for such goods sold under comparable circumstances in the trade concerned.

Article 56

If the price is fixed according to the weight of the goods, in case of doubt it is to be determined by the net weight.

Article 57

(1) If the buyer is not bound to pay the price at any other particular place, he must pay it to the seller:
   (a) at the seller's place of business; or
   (b) if the payment is to be made against the handing over of the goods or of documents, at the place where the handing over takes place.

(2) The seller must bear any increase in the expense incidental to payment which is caused by a change in his place of business subsequent to the conclusion of the contract.

Article 58

(1) If the buyer is not bound to pay the price at any other specific time, he must pay it when the seller places either the goods or documents controlling their disposition at the buyer's disposal in accordance with the contract and this Convention. The seller may make such payment a condition for handing over the goods or documents.

(2) If the contract involves carriage of the goods, the seller may dispatch the goods on terms whereby the goods, or documents controlling their disposition, will not be handed over to the buyer except against payment of the price.
(3) The buyer is not bound to pay the price until he has had an opportunity to examine the goods, unless the procedures for delivery or payment agreed upon by the parties are inconsistent with his having such an opportunity.

Article 59

The buyer must pay the price on the date fixed by or determinable from the contract and this Convention without the need for any request or compliance with any formality on the part of the seller.

Section II. Taking Delivery

Article 60

The buyer's obligation to take delivery consists:

(a) in doing all the acts which could reasonably be expected of him in order to enable the seller to make delivery; and
(b) in taking over the goods.

Section III. Remedies for Breach of Contract by the Buyer

Article 61

(1) If buyer fails to perform any of his obligations under the contract or this Convention, the seller may:
  (a) exercise the rights provided in articles 62 to 65;
  (b) claim damages as provided in articles 74 to 77.
(2) The seller is not deprived of any right he may have to claim damages by exercising his right to other remedies.
(3) No period of grace may be granted to the buyer by a court or arbitral tribunal when the seller resorts to a remedy for breach of contract.

Article 62

The seller may require the buyer to pay the price, take delivery or perform his other obligations, unless the seller has resorted to a remedy which is inconsistent with this requirement.

Article 63

(1) The seller may fix an additional period of time of reasonable length for performance by the buyer of his obligations.
(2) Unless the seller has received notice from the buyer that he will not perform within the period so fixed, the seller may not, during that

period, resort to any remedy for breach of contract. However, the seller is not deprived thereby of any right he may have to claim damages for delay in performance.

Article 64

(1) The seller may declare the contract avoided:
  (a) if the failure by the buyer to perform any of his obligations under the contract or this Convention amounts to a fundamental breach of contract; or
  (b) if the buyer does not, within the additional period of time fixed by the seller in accordance with paragraph (1) of article 63, perform his obligation to pay the price or take delivery of the goods, or if he declares that he will not do so within the period so fixed.

(2) However, in cases where the buyer has paid the price, the seller loses the right to declare the contract avoided unless he does so:
  (a) in respect of late performance by the buyer, before the seller has become aware that performance has been rendered; or
  (b) in respect to any breach other than late performance by the buyer, within a reasonable time:
    (i) after the seller knew or ought to have known of the breach; or
    (ii) after the expiration of any additional period of time fixed by the seller in accordance with paragraph (1) of article 63, or after the buyer has declared that he will not perform his obligations within such an additional period.

Article 65

(1) If under the contract the buyer is to specify the form, measurement or other features of the goods and he fails to make such specification either on the date agreed upon or within a reasonable time after receipt of a request from the seller, the seller may, without prejudice to any other rights he may have, make the specification himself in accordance with the requirements of the buyer that may be known to him.

(2) If the seller makes the specification himself, he must inform the buyer of the details thereof and must fix a reasonable time within which the buyer may make a different specification. If, after receipt of such a communication, the buyer fails to do so within the time so fixed, the specification made by the seller is binding.

Chapter IV Passing of Risk

Article 66

Loss of or damage to the goods after the risk has passed to the buyer does not discharge him from his obligation to pay the price, unless the loss or damage is due to an act or omission of the seller.

Article 67

(1) If the contract of sale involves carriage of the goods and the seller is not bound to hand them over at a particular place, the risk passes to the buyer when the goods are handed over to the first carrier for transmission to the buyer in accordance with the contract of sale. If the seller is bound to hand the goods over to a carrier at a particular place, the risk does not pass to the buyer until the goods are handed over to the carrier at that place. The fact that the seller is authorized to retain documents controlling the disposition of the goods does not affect the passage of the risk.

(2) Nevertheless, the risk does not pass to the buyer until the goods are clearly identified to the contract, whether by markings on the goods, by shipping documents, by notice given to the buyer or otherwise.

Article 68

The risk in respect to goods sold in transit passes to the buyer from the time of the conclusion of the contract. However, if the circumstances so indicate, the risk is assumed by the buyer from the time the goods were handed over to a carrier who issued the documents embodying the contract of carriage. Nevertheless, if at the time of the conclusion of the contract of sale the seller knew or ought to have known that the goods had been lost or damaged and did not disclose this to the buyer, the loss of damage is at the risk of the seller.

Article 69

(1) In cases not within articles 67 and 68, the risk passes to the buyer when he takes over the goods or, if he does not do so in due time, from the time when the goods are placed at his disposal and he commits a breach of contract by failing to take delivery.

(2) However, if the buyer is bound to take over the goods at a place other than a place of business of the seller, the risk passes when delivery is due and the buyer is aware of the fact that the goods are placed at his disposal at that place.

(3) If the contract relates to goods not then identified, the goods are considered not to be placed at the disposal of the buyer until they are clearly identified to the contract.

Article 70

If the seller has committed a fundamental breach of contract, articles 67, 68 and 69 do not impair the remedies available to the buyer on account of the breach.

Chapter V Provisions Common to the Obligations of the Seller and the Buyer

Section I. Anticipatory Breach and Installment Contracts

Article 71

(1) A party may suspend the performance of his obligations if, after the conclusion of the contract, it becomes apparent that the other party will not perform a substantial part of his obligations as a result of:

(a) a serious deficiency in his ability to perform or in his creditworthiness; or

(b) his conduct in preparing to perform or in performing the contract.

(2) If the seller has already dispatched the goods before the grounds described in the preceding paragraph become evident, he may prevent the handing over of the goods to the buyer even though the buyer holds a document which entitles him to obtain them. The present paragraph relates only to the rights in the goods as between the buyer and the seller.

(3) A party suspending performance, whether before or after dispatch of the goods, must immediately give notice of the suspension to the other party and must continue with performance if the other party provides adequate assurance of his performance.

Article 72

(1) If prior to the date of performance of the contract it is clear that one of the parties will commit a fundamental breach of contract, the other party may declare the contract avoided.

(2) If time allows, the party intending to declare the contract avoided must give reasonable notice to the other party in order to permit him to provide adequate assurance of his performance.

(3) The requirements of the preceding paragraph do not apply if the other party has declared that he will not perform his obligations.

Article 73

(1) In the case of a contract for delivery of goods by installments, if the failure of one party to perform any of his obligations in respect to any installment constitutes a fundamental breach of contract with respect to that installment, the other party may declare the contract avoided with respect to that installment.

(2) If one party's failure to perform any of his obligations in respect of any installment gives the other party good grounds to conclude that a fundamental breach of contract will occur with respect to future installments, he may declare the contract avoided of the future, provided that he does so within a reasonable time.

(3) A buyer who declares the contract avoided in respect to any delivery may, at the same time, declare it avoided in respect of deliveries already made or of future deliveries if, by reason of their interdependence, those deliveries could not be used for the purpose contemplated by the parties at the time of the conclusion of the contract.

Section II. Damages

Article 74

Damages for breach of contract by one party consist of a sum equal to the loss, including loss of profit, suffered by the other party as a consequence of the breach.

Such damages may not exceed the loss which the party in breach foresaw or ought to have foreseen at the time of the conclusion of the contract, in light of the facts and matters of which he then knew or ought to have known, as a possible consequence of the breach of contract.

Article 75

If the contract is avoided and if, in a reasonable manner and within a reasonable time after avoidance, the buyer has bought goods in replacement or the seller has resold the goods, the party claiming damages may recover the difference between the contract price and the price in the substitute transaction as well any further damages recoverable under article 74.

Article 76

(1) If the contract is avoided and there is a current price for the goods, the party claiming damages may, if he has not made a purchase or resale under article 75, recover the difference between the price fixed by the contract and the current price at the time of avoidance as well as any further damages recoverable under article 74. If, however, the party claiming damages has avoided the contract after taking over the goods, the current price at the time of such taking over shall be applied instead of the current price at the time of avoidance.

(2) For the purposes of the preceding paragraph, the current price is the price prevailing at the place where delivery of the goods should have been made or, if there is no current price at that place, the price at such other place as serves as a reasonable substitute, making due allowances for differences in the cost of transporting the goods.

Article 77

A party who relies on a breach of contract must take such measures as are reasonable in the circumstances to mitigate the loss of profit, resulting from the breach. If he fails to take such measures, the party in breach may claim a reduction in the damages in the amount by which the loss should have been mitigated.

Section III. Interest

Article 78

If a party fails to pay the price or any other sum that is in arrears, the other party is entitled to interest on it, without prejudice to any claims for damages recoverable under article 74.

Section IV. Exemptions

Article 79

(1) A party is not liable for a failure to perform any of his obligations if he proves that the failure was due to an impediment beyond his control and that he could not reasonably be expected to have taken the impediment into account at the time of the conclusion of the contract or to have avoided or overcome it or its consequences.

(2) If the party's failure is due to the failure of a third person whom he has engaged to perform the whole or a part of the contract, that party is exempt from liability only if:

  (a) he is exempt under the preceding paragraph; and

  (b) the person whom he has so engaged would be so exempt if the provisions of that paragraph were applied to him.

(3) The exemption provided this article has effect for the period during which the impediment exists.

(4) The party who fails to perform must give notice to the other party of the impediment and its effect on his ability to perform. If the notice is not received by the other party within a reasonable time after the party who fails to perform knew or ought to have known of the impediment, he is liable for damages resulting from such non-receipt.

(5) Nothing in this article prevents either party from exercising any right other than to claim damages under this Convention.

Article 80

A party may not rely on a failure of the other party to perform, to the extent that such failure was caused by the first party's act or omission.

Section V. Effects of Avoidance

Article 81

(1) Avoidance of the contract releases both parties from their obligations under it, subject to any damages which may be due. Avoidance does not affect any provision of the contract for the settlement of disputes or any other provision of the contract governing the rights and obligations of the parties consequent upon the avoidance of the contract.

(2) A party who has performed the contract either wholly or in part may claim restitution from the other party of whatever the first party has supplied or paid under the contract. If both parties are bound to make restitution, they must do so concurrently.

Article 82

(1) The buyer loses the right to declare the contract avoided or to require the seller to deliver substitute goods if it is impossible for him to make restitution of the goods substantially in the condition in which he received them.

(2) The preceding paragraph does not apply:

(a) if the impossibility of making restitution of the goods or of making restitution of the goods substantially in the condition in which the buyer received them is not due to his act or omission;

(b) if the goods or part of the goods have perished or deteriorated as a result of the examination provided for in article 38; or

(c) if the goods or part of the goods have been sold in the normal course of business or have been consumed or transformed by the buyer in the course of normal use before he discovered or ought to have discovered the lack of conformity.

Article 83

A buyer who has lost the right to declare the contract avoided or to require the seller to deliver substitute goods in accordance with article 82 retains all other remedies under the contract and this Convention.

Article 84

(1) If the seller is bound to refund the price, he must also pay interest on it, from the date on which the price was paid.

(2) The buyer must account to the seller for all benefits which he has derived from the goods or part of them:

(a) if he must make restitution of the goods or part of them; or

(b) if it is impossible for him to make restitution of all or part of the goods or to make restitution of all or part of the goods substantially in the condition in which he received them, but has nevertheless declared the contract avoided or required the seller to deliver substitute goods.

Section VI. Preservation of the Goods

Article 85

If the buyer is in delay in taking delivery of the goods or, where payment of the price and delivery of the goods are to be made concurrently, if he fails to pay the price and the seller is either in possession of the goods or otherwise able to control their disposition, the seller must take such steps as are reasonable in the circumstances to preserve them. He is entitled to retain them until he has been reimbursed his reasonable expenses by the buyer.

Article 86

(1) If the buyer has received the goods and intends to exercise any right under the contract or this Convention to reject them, he must take such steps to preserve them as are reasonable in the circumstances. He is entitled to retain them until he has been reimbursed his reasonable expenses by the seller.

(2) If goods dispatched to the buyer have been placed at his disposal at their destination and he exercises the right to reject them, he must take possession of them on behalf of the seller, provided that this can be done without payment of the price and without unreasonable inconvenience or unreasonable expense. This provision does not apply if the seller or a person authorized to take charge of the goods on his behalf is present at the destination. If the buyer takes possession of the goods under this paragraph, his rights and obligations are governed by the preceding paragraph.

Article 87

A party who is bound to take steps to preserve the goods may deposit them in a warehouse of a third person at the expense of the other party provided that the expense incurred is not unreasonable.

Article 88

(1) A party who is bound to preserve the goods in accordance with article 85 or 86 may sell them by any appropriate means if there has

been an unreasonable delay by the other party in taking possession of the goods or in taking them back or in paying the price or the cost of preservation, provided that reasonable notice of the intention to sell has been given to the other party.

(2) If the goods are subject to rapid deterioration or their preservation would involve unreasonable expense, a party who is bound to preserve the goods in accordance with article 85 or 86 must take reasonable measures to sell them. To the extent possible he must give notice to the other party of his intention to sell.

(3) A party selling the goods has the right to retain out of the proceeds of sale an amount equal to the reasonable expense of preserving the goods and of selling them. He must account to the other party for the balance.

Part IV Final Provisions

Article 89

The Secretary-General of the United Nations is hereby designated as the depository for this Convention.

Article 90

This Convention does not prevail over any international agreement which has already been or may be entered into and which contains provisions concerning the matters governed by this Convention. Provided that the parties have their places of business in States parties to such agreement.

Article 91

(1) This Convention is open for signature at the concluded meeting of the United Nations Conference on Contracts for the International Sale of Goods and will remain open for signature by all states at the Headquarters of the United Nations, New York until 30 September 1981.

(2) This Convention is subject to ratification, acceptance or approval by the signatory States.

(3) This Convention is open for accession by all states which are not signatory States as from the date it is open for signature.

(4) Instruments of ratification, acceptance, approval and accession are to be deposited with the Secretary-General of the United Nations.

Article 92

(1) A Contracting State may declare at the time of signature, ratification, acceptance, approval or accession that it will not be bound by Part II of this Convention or that it will not be bound by Part II of this Convention.

(2) A Contracting State which makes a declaration in accordance with the preceding paragraph in respect to Part II or Part III of this Convention is not to be considered a Contracting State within paragraph (1) of Article I of this Convention in respect of matters governed by the Part to which the declaration applies.

Article 93

(1) If a Contracting State has two or more territorial units in which, according to its constitution, different systems of law are applicable in relation to the matters dealt with in this Convention, it may, at the time of signature, ratification, acceptance, approval or accession, declare that this Convention is to extend to all its territorial units or only to one of them, and may amend its declaration by submitting another declaration at any time.

(2) These declarations are to be notified to the depositary and are to state expressly the territorial units to which the Convention extends.

(3) If, by virtue of a declaration under this article, this Convention extends to one or more but not all of the territorial units of a Contracting State, and if the place of business of a party is located in that State, this place of business, for the purposes of this Convention, is considered not to be in a Contracting State, unless it is in a territorial unit to which the Convention extends.

(4) If a Contracting State makes no declaration under paragraph (1) of this article, the Convention is to extend to all territorial units of that State.

Article 94

(1) Two or more Contracting States which have the same or closely related legal rules on matters governed by this Convention may at any time declare that the Convention is not to apply to contracts of sale or to their formation where the parties have their places of business in those States. Such declarations may be made jointly or by reciprocal unilateral declarations.

(2) A Contracting State which has the same or closely related legal rules on matters governed by this Convention as one or more non-Contracting States may at any time declare that the Convention is not to apply to contracts of sale or to their formation where the parties have their places of business in those states.

(3) If a State which is the object of a declaration under the preceding paragraph subsequently becomes a Contracting State, the declaration will, as from the date on which the Convention enters into force in respect of the new Contracting State, have the effect of a declaration made under paragraph (1), provided that the new Contracting State joins in such declaration or makes a reciprocal unilateral declaration.

Article 95

Any State may declare at the time of the deposit of its instruments of ratification, acceptance, approval or accession that it will not be bound by subparagraph (1)(b) of article 1 of this Convention.

Article 96

A Contracting State whose legislation requires contracts of sale to be concluded in or evidenced by writing may at any time make a declaration in accordance with article 12 that any provision of article 11, article 29, or Part II of this Convention, that allows a contract of sale or its modification or termination by agreement or any offer, acceptance, or other indication of intention to be made in any form other than in writing, does not apply where any party has his place of business in that State.

Article 97

(1) Declarations made under this Convention at the time of signature, are subject to confirmation upon ratification, acceptance or approval.

(2) Declarations and confirmations of declarations are to be in writing and be formally notified to the depository.

(3) A declaration takes effect simultaneously with the entry into force of this Convention in respect of the State concerned. However, a declaration of which the depository receives formal notification after such entry into force takes effect on the first day of the month following the expiration of six months after the date of its receipt by the depository. Reciprocal unilateral declarations under article 94 take effect on the first day of the month following expiration of six months after the receipt of the latest declaration by the depository.

(4) Any State which makes a declaration under this Convention may withdraw it at any time by a formal notification in writing addressed to the depository. Such withdrawal is to take effect on the first day of the month following the expiration of six months after the date of the receipt of the notification by the depository.

(5) A withdrawal of a declaration made under article 94 renders inoperative, as from the date on which the withdrawal takes effect, any reciprocal declaration made by another State under that article.

Article 98

No reservations are permitted except those expressly authorized in this Convention.

Article 99

(1) This Convention enters into force, subject to the provisions of paragraph (6) of this article, on the first day of the month following the expiration of twelve months after the date of deposit of the tenth instrument of ratification, acceptance, approval or accession, including an instrument which contains a declaration made under article 92.

(2) When a State ratifies, accepts, approves or accedes to this Convention after the deposit of the tenth instrument of ratification, acceptance, approval or accession, this Convention, with the exception of the Part excluded, enters into force with respect to that State, subject to the provisions of paragraph (6) of this article, on the first day of the month following the expiration of twelve months after the date of deposit of its instrument of ratification, acceptance, approval or accession.

(3) A State which ratifies, accepts, approves or accedes to this Convention and is a party to either or both the Convention relating to a Uniform Law on the Formation of Contracts for the International Sale of Goods done at the Hague on 1 July 1964 (1964 Hague Formation Convention) and the Convention relating to a Uniform Law on the International Sale of Goods done at the Hague on 1 July 1964 (1964 Hague Sales Convention) shall at the same time denounce, as the case may be, either or both the 1964 Hague Sales Convention and the 1964 Hague Formation Convention by notifying the Government of the Netherlands to that effect.

(4) A State party to the 1964 Hague Sales Convention which ratifies, accepts, approves or accedes to the present Convention and declares or has declared under article 92 that it will not be bound by Part II of this Convention shall at the time of ratification, acceptance, approval or accession denounce the 1964 Hague Sales Convention by notifying the Government of the Netherlands to that effect.

(5) A State party to the 1964 Hague Formation Convention which ratifies, accepts, approves or accedes to the present Convention and declares or has declared under article 92 that it will not be bound by Part III of this Convention shall at the time of ratification, acceptance, approval

or accession denounce the 1964 Hague Formation Convention by notifying the Government of the Netherlands to that effect.

(6) For the purpose of this article, ratifications, acceptances, approvals and accessions in respect to this Convention by States parties to the 1964 Hague Formation Convention or to the 1964 Hague Sales Convention shall not be effective until such denunciations as may be required on the part of these States in respect of the latter two Conventions have themselves become effective. The depository of this Convention shall consult with the Government of the Netherlands, as the depository of the 1964 Conventions, so as to ensure necessary co-ordination in this respect.

Article 100

(1) This Convention applies to the formation of a contract only when the proposal for concluding the contract is made on or after the date when the Convention enters into force in respect of the Contracting States referred to in subparagraph (1)(a) or the Contracting State referred to in subparagraph (1)(b) of article 1.

(2) This Convention applies only to contracts concluded on or after the date when the Convention enters into force in respect of the Contracting States referred to in subparagraph (1)(a) or the Contracting State referred to in subparagraph (1)(b) of article 1.

Article 101

(1) A Contracting State may denounce this Convention, or Part II or Part III of the Convention by a formal notification in writing addressed to the depository.

(2) The denunciation takes effect on the first day of the month following the expiration of twelve months after the notification is received by the depository. Where a longer period for the denunciation to take effect is specified in the notification, the denunciation takes effect upon the expiration of such longer period after notification is received by the depository.

DONE at Vienna, this day of eleventh day of April, one thousand nine hundred and eighty, in a single original, of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic.

IN WITNESS WHEREOF the undersigned plenipotentiaries, being duly authorized by Their respective Governments, have signed this Convention.

[FR Doc. 87-4205 Filed 2-27-87; 8:45 am]

Appendix 2: The Associated General Contractors of America (AGC of America) Summaries of American Council of Engineering Companies (ACEC) and the Engineering Joint Contracts Documents Committee (EJCDC) Standardized Contracts for Engineering Projects

Document:

Full Design-Bid-Build Document Set:

Design-Bid-Build Documents, Full Set: (6 families) A-990
Construction Set (C-990)
Owner-Engineer Set (E-990)
Engineer-Subcontractor Set (E-991)
Remediation Set (R-990)
Procurement Set (P-990)
Funding Agency Editions Set (F-990)

Program Manager:

Model Form of Agreement Between Owner and Program Manager (2004) E-582

This document is ideal for situations where an owner engages a program manager to assist with the project. It defines the general terms and conditions that govern the relationships and performance of the owner and the program manager, including scope of services, responsibilities, invoicing and payment, performance standards, authorized project representatives,

design and construction phase services, insurance, dispute resolution, environmental condition, indemnification and mutual waiver, and more.

Construction Related Documents:

Construction Related Documents, Full Set C-990

Special combined offer for greater flexibility: Get a CD-ROM of all Construction Related Documents.

Standard General Conditions of the Construction Contract (2002) C-700

Use this document to establish the basic terms between the owner and the contractor. This details the contractor's basic duties and responsibilities, including bonds and insurance; progress and final payments; substantial completion; status of the engineer during construction; owner's responsibilities; subsurface and hidden site conditions; changes in the work, contract price, or contract time; contractor warranties and guarantees; correction or rejection of defective work; work suspension or termination; and dispute resolution.

Guide to the Preparation of Supplementary Conditions (2007) Free

This comprehensive guide discusses specific changes in the definitions in the General Conditions. It includes the proposed schedule of events, from the bid opening to the start of work; provisions of the General Conditions concerning subsurface conditions; identification of technical data and possible use of different language; insurance coverage required to supplement the provisions of the General Conditions; subcontractor and supplier selection; various aspects of multiprime contracting; and approaches to unit pricing work.

Owner's Instructions Regarding Bidding Procedures & Construction Contract Documents (2007) C-050

Details and specifics to help owners optimize the construction bidding process, including bidder selection, advertising, bid openings, pre-bid inquiries, site investigation requirements, bid modifications, and more.

Engineer's Request for Instructions on Bonds & Insurance for Construction (2007) C-051

Use this document, formatted as a prototype letter to the owner, to request instructions as to types of coverage and amount of insurance to be stated in

the contract documents. A form is included for the owner to fill out if the customary arrangements for liability or property coverage are to apply.

Owner's Instructions Concerning Bonds & Insurance for Construction (2007) C-052

This document is designed to provide the engineer with sufficient information to prepare the Supplementary Conditions that set the terms and conditions of performance, labor, material bonds, and insurance coverage.

Guide to the Preparation of Instructions to Bidders (2007) C-200

This guide discusses the rules prior to the award of the contract and stipulates requirements as bidder qualifications, subsurface tests, site examination, bid security, bid forms, date and place of bid submission, bid modification and withdrawal, bid opening procedures, special legal requirements, and award considerations and procedure.

Suggested Bid Form for Construction Contracts (2007) C-140

Recognizing that legal requirements vary, this document sets out a listing of items to consider in bid documents for construction contracts. It includes commentary on additional information that local laws and practice may require, and follows the Uniform Location of Subject Matter (E 1910-16).

Bid Bond, Penal Sum Form (2007) C-430

Bind the bidder and surety to a commitment to pay the owner, upon default of the bidder, the penal sum set forth on the face of the bond.

Bid Bond, Damages Form (2007) C-435

Bind the bidder and surety to a commitment to pay to the owner, upon default of the bidder, any difference between the total amount of the bidder's bid and the total amount of the next lowest, responsible, and responsive bidder, as determined by the owner, for the work required by the contract documents.

Notice of Award (2007) C-510

Use this document to notify the successful bidder who is being awarded the contract. This is a key document, since many scheduled events and parties' rights are keyed to the award.

Suggested Form of Agreement Between Owner & Contractor, Stipulated Price (2007) C-520

This document sets the basic terms between the owner and the Contractor with this contract. It details the contractor's basic duties and responsibilities, including bonds and insurance; progress and final payments; substantial completion; status of the engineer during construction; owner's responsibilities; subsurface and hidden site conditions; changes in the work, contract price, or contract time; contractor warranties and guarantees; correction or rejection of defective work; work suspension or termination; and dispute resolution.

Standard Form of Agreement Between Owner & Contractor, Cost-Plus (2007) C-525

Similar in format and outline to C-520, this document applies to agreements between owners and contractors based on the cost of the work plus a fee, with a provision for a guaranteed maximum price.

Notice to Proceed (2007) C-550

This document fixes the date when the contract time starts to run and when contractor may begin work.

Construction Performance Bond (2007) C-610

This bond assures the availability of funds to complete construction. This document was prepared through the joint efforts of the EJCDC, the Surety Association of America, and the American Institute of Architects.

Construction Payment Bond (2007) C-615

This bond assures the availability of sufficient funds to pay for labor, materials, and equipment used in construction. For public work, this form provides rights of recovery for workers and suppliers that are similar to their rights under the mechanics lien laws, which apply to private work.

Contractor's Application for Payment (2007) C-620

This document provides the agreed schedule of values for various work categories involved and the quantity and amount of work completed in each category, along with the gross amount due, less retainage, amount due to date, less previous payments, and amount due on the application. This form also contains a contractor's certificate pertaining to previous progress payments and titles to material and equipment.

Certificate of Substantial Completion (2007) C-625

This form identifies the project and indicates acceptance of the work to the extent stated. It is designed to be accompanied by a punch list of items to be completed or corrected. Use this form to record the respective responsibilities of the owner and contractor for security, operation, safety, maintenance, heat, utilities, and insurance during the period after substantial completion and prior to final payment.

Work Change Directive (2007) C-940

Use this form in situations involving changes in work that may delay the project if not processed expeditiously. These changes, often initiated on site, may affect the contract price or contract time. This document serves as a field directive to proceed with the work that is expected to be included in a subsequent change order.

Change Order (2007) C-941

Initiates a work change, including price or time changes—or both—and for a description of the authorized change.

Field Order (2007) C-942

Initiates minor changes in accordance with the General Conditions without changes in the contract price or time.

Owner Engineer Documents

Owner Engineer Documents, Full Set

Special combined offer for greater flexibility: Get a CD-ROM of all Construction-Related Documents.

Standard Form of Agreement Between Owner & Engineer for Professional Services (2002) E-500

Use this document to cover the key phases of services provided by the engineer to the owner: study and report, preliminary design, final design, bidding and negotiating, construction, and operation. It includes owners' responsibilities, additional services, schedule, payments and reimbursable expenses, opinion of costs, and general considerations. It also includes optional exhibits and guide sheets: basic engineering services; payment and

reimbursable expenses; duties, responsibilities, and limitations of authority; notice of acceptability; construction cost limit; insurance dispute resolution; and risk allocation.

Short Form of Agreement Between Owner & Engineer for Professional Services (2002) E-520

Invaluable for projects of limited scope and complexity, which do not require the level of detail provided in the full version of Standard Form of Agreement Between Owner and Engineer for Professional Services (E-500). This concise document contains the basic provision: basic agreement; payment procedures; additional services; termination; controlling law; successors and assigns, and beneficiaries; general considerations and four payment options to suit your needs.

NOTE: Available in hard copy.

Standard Form of Agreement Between Owner & Geotechnical Engineer (1996) 1910-27A

Use this document when the owner employs a geotechnical engineer for continuous services during design and construction of a project. Endorsed by the Association of Engineering Firms Practicing in the Geosciences.

Standard Form of Agreement Between Owner and Engineer for Study and Report Phase (2004) E-525

This document is for use between engineer and owner to provide advice in connection with an analysis of the owner's requirements. It is ideal for services similar to the normal study and report in the Standard Form of Agreement Between Owner & Engineer for Professional Services (E 500), but without a commitment for professional services should the assignment lead to a design commitment. Use this also for utility rate analyses or plant operation studies that do not include consideration of improvements requiring engineering design services. Includes main document and exhibits.

Standard Form of Agreement Between Owner and Engineer for Professional Services, Task Order Edition (2004) E-505

Use this document UPDATED FOR 2004: This document is designed for owners and engineering firms that wish to contract for work on a series of yet unspecified projects. It defines responsibilities, allocates risks, and defines the usual matters, for example, term, hazardous environment, and controlling law. Individual projects are then defined in a Task Order, which is included in this form. Includes main document plus eleven exhibits.

Engineer Subconsultant Documents

Engineer Subconsultant Documents, Full Set

Special combined offer for greater flexibility: Get a CD-ROM of all Engineer-Subconsultant Documents.

Standard Form of Agreement Between Engineer & Architect for Professional Services (1997)

Use this document to define the architect's services, engineer's responsibilities, and the period of service. The provisions of this document are closely coordinated with those of the owner-engineer agreement (E-500), under which the engineer who employs the architect will have been employed by the owner.

NOTE: Available in hard copy.

Standard Form of Agreement Between Engineer & Consultant for Professional Services (1997) 1910-14

Use this document when consultant services are provided to the engineer by specialists who are not necessarily engineers, for example, archaeologists, surveyors, acoustical consultants, librarians, landscape architects, and accountants. It defines the relationship, services to be provided by the consultant, the engineer's responsibilities, and the period of service.

NOTE: Available in hard copy.

Amendment to Engineer-Consultant Agreement (1999) E-571

This document formalizes changes and additions to the Standard Form of Agreement Between Engineer and Consultant for Professional Services (1910-14).

Standard Form of Agreement Between Engineer & Geotechnical Engineer for Professional Services (1996) 1910-27B

Use this document when Contracting between engineer and a geotechnical engineer for continuous services during design and construction of a project. Endorsed by the Association of Engineering Firms Practicing in the Geosciences.

NOTE: Available in hard copy.

Environmental Remediation Documents

Environmental Remediation Documents, Full Set R-990

Special combined offer for greater flexibility: Get a CD-ROM of all Environmental Remediation Documents.

Use this family of documents on hazardous remediation projects. Developed jointly with ACEC's Environmental Business Action Coalition, these forms address the roles of owners, design professionals, and contractors in this very specialized design and construction arena.

- Standard General Conditions of the Contract Between Owner & Environmental Remediator (2006) R-700
- Commentary on EJCDC Environmental Remediation Documents (2006) R-001
- Standard Form of Agreement Between Owner & Environmental Remediator, Stipulated Price (2006) R-520
- Standard Form of Agreement Between Environmental Remediator & Subcontractor, Stipulated Price (2006) R-521
- Standard Form of Agreement Between Owner & Environmental Remediator & Subcontractor, Cost-Plus (2006) R-525
- Standard Form of Construction Subagreement Between Environmental Remediator & Subcontractor, Cost-Plus (2006) R-526
- Standard General Conditions of the Subagreement Between Environmental Remediator & Subcontractor (2006) R-750

Procurement Documents

Procurement Agreement Documents, Full Set P-990

Special combined offer for greater flexibility: Get a CD-ROM of all Procurement Documents.

Commentary on Procurement Documents P-001

This document provides an explanation of the intended applications and highlights of key provisions of the Procurement Documents. It also contains a discussion of pertinent provisions of Article 2 of the Uniform Commercial Code.

Standard General Conditions for Procurement Contracts (2000)

Presents a detailed description of what is expected of both the buyer and seller, including: definitions and terminology, preliminary matters, intent of the documents, bonds and insurance, sellers' responsibilities, delivery, changes, buyers' rights, role of the engineer, payment, cancellation, suspension and termination, licenses and fees, and dispute resolution. This comprehensive document covers everything you will need to know on any procurement issue.

Guide to the Preparation of Procurement Supplementary Conditions for Procurement Contracts (2000) P-800

Provides guidelines for use in preparing procurement supplementary conditions for procurement contracts.

Suggested Instructions to Bidders, Procurement Contracts (2000) P-200

This document was prepared for use with Standard General Conditions for Procurement Contracts (P-700) and Suggested Form of Agreement Between Buyer and Seller for Procurement Contracts (P-520). Any change to one may necessitate a change to the others.

Suggested Bid Form for Procurement Contracts (2000) P-400

This document contains a suggested format and language that will be applicable in most situations. It is to be used with other procurement documents. A change in one may require a change in the others.

Suggested Form of Agreement Between Buyer & Seller for Procurement Contracts (2000) P-520

This document contains a suggested format and language that will be applicable in most situations. It is to be used with other procurement documents. A change in one may require a change in the others.

Suggested Performance Bond for Procurement Contracts (2000) P-610

This single-sheet document provides the performance bond form on the front with detailed instructions on the back. Since the project it potentially covers could be worth its weight in diamonds, you won't go far without it.

Payment Bond for Procurement Contracts (2000) P-615

Very useful bond form with instructions on the back.

Funding Agency Documents

Funding Agency Documents, Full Set; Includes 13 Documents P-990

C-710 Standard General Conditions of the Construction Contract; Funding Agency Edition (2002)
C-521 Suggested Form of Agreement Between Owner &
Contractor Stipulated Price; Funding Agency Edition (2002)
C-200 Guide to the Preparation of Instructions to Bidders (2002)
C-410 Suggested Bid Form for Construction Contracts (2002)
C-430 Bid Bond, Penal Sum Form (2002)
C-510 Notice of Award (2002)
C-800 Guide to Preparing Supplementary Conditions (2002)
C-610 Construction Performance Bond (2002)
C-615 Construction Payment Bond (2002)
C-620 Contractor's Application for Payment (2002)
C-941 Change Order (2002)
C-550 Notice to Proceed (2002)
C-625 Certificate of Substantial Completion (2002)

Standard General Conditions of the Construction Contract, Funding Agency Edition (2002) C-710

This document is a modified version of Standard General Conditions of the Construction Contract (C-700), designed for use on RUS-funded water and wastewater projects. Includes definitions and terminology; preliminary matters; contract documents: intent, amending, reuse; availability of lands; subsurface and physical conditions; hazardous environmental conditions; reference points; bonds and insurance; contractor's responsibilities; other site work; owner's responsibilities; engineer's status during construction; work changes; claims; cost; allowances; unit price work; change of contract price; change of contract times; tests and inspections; correction, removal or acceptance of defective work; payments to contractor and completion; suspension of work and termination; dispute resolution; miscellaneous; and federal requirements.

Suggested Form of Agreement Between Owner & Contractor, Stipulated-Price; Funding Agency Edition (2002) C-521

This agreement is designed for use on RUS-funded water and wastewater projects. It has been prepared for use with the EJCDC's Guide to

the Preparation of Instructions to Bidders (C-200) and Standard General Conditions of the Construction Contract, Funding Agency Edition (C-710). For guidance in the preparation of supplementary conditions and coordination with instructions to bidders, see also EJCDC's Guide to the Preparation of Supplementary Conditions (C- 800) and Suggested Bid Form (C-410).

Standard Form of Agreement Between Owner & Engineer for Professional Services; Funding Agency Edition (2002) E-510

This agreement is a modified funding agency version of the Standard Form of Agreement Between Owner and Engineer for Professional Services (E-500), for use on RUS-funded water and wastewater projects. Includes engineer's services, owner's responsibilities, schedule of services, invoices and payments, opinions of cost, general considerations, definitions, and exhibits and special provisions.

Design-Build Documents

Design-Build Documents, Full Set D-990

Special combined offer for greater flexibility: Get a CD-ROM of all Design-Build Documents.

Guide to Use of EJCDC Design/Build Documents (2002) D-001

This commentary on the use of the design/build family of documents is an essential guide to achieving the contracting goals of these documents. It includes guidance on preparing RFP5, proposal language, proper use of the documents, and the preparing supplementary conditions.

Standard General Conditions of the Contract Between Owner & Design-Builder (2002) D-700

Use this document to allocate the basic duties and responsibilities between the owner and design-builder.

Standard General Conditions of the Subcontract Between Design-Builder & Subcontractor (2002) D-750

Use this document to set out the general conditions of the subagreement between the design-builder and a subcontractor providing construction services.

Standard Form of Agreement Between Owner & Owner's Consultant for Design Professional Services on Design/Build Projects (2002) D-500

Use this agreement to set the duties and responsibilities of an engineer who provides services directly to the Owner such as study and report phase services, preparation of the request for proposal, review of design-builder's drawings and specifications, and construction administration services.

Standard Form of Subagreement Between Design-Builder & Engineer for Design Professional Services (2002) D-505

Design-builders use this document to retain an engineer to provide design professional services.

Standard Form of Agreement Between Owner & Design-Builder for Preliminary Services (2002) D-510

Use this agreement to set the basic duties and responsibilities between the owner and design-builder for preliminary services. Covering all phases: study and report, technical exhibit, and proposal. It includes standards of performance, use of documents, electronic media, study and design phase insurance, dispute resolution, and more.

Standard Form of Agreement Between Owner & Design-Builder, Stipulated Price (2002) D-520

Use this agreement between owner and design-builder when compensation is based on lump sum payment, unit price, or both. This agreement also covers contract times, design-builder's representations, and other provisions.

Suggested Form of Subagreement Between Design-Builder & Subcontractor, Stipulated Price (2002) D-521

Design-builders use this document for agreements with subcontractors where compensation is based on lump sum payment, unit price, or both.

Suggested Form of Agreement Between Design-Builder on the Basis of Cost-Plus (2002) D-525

Similar in format and outline to D-520, this document applies to agreements between owners and design-builders based on the cost of the work plus a fee, with a provision for a guaranteed maximum price.

Suggested Form of Subagreement Between Design-Builder & Subcontractor, Cost-Plus (2002)

Similar in format and outline to D-521, this document provides for compensation based on the cost of the work plus a fee, with a provision for a guaranteed maximum price.

Design/Build Contract Performance Bond (2002) D-610

Use this document to assure the availability of funds to complete a design/build project.

Design/Build Contract Payment Bond (2002) D-615

Use this document to assure the availability of funds to pay for labor, materials, and equipment used in design/build projects.

Joint Venture Between Engineers Document

Standard Form of Joint Venture Agreement Between Engineers for Professional Services (1999) E-580

Use this document to define the relationship between two engineering firms collaborating on a project. It leads the firms to establish matters such as finance, capital, contributions, management, liability, and authority.

NOTE: Available in hard copy.

Peer Review Document

Standard Form of Agreement Between Owner, Designer, & Project Peer Reviewers (1999) E-581

Use this document to define the responsibilities, authorities, scope of work, and other terms among owners, designers, and peer reviewers for independent project peer reviews.

NOTE: Available in hard copy.

Guides, Commentaries and References

Commentary on the Terms and Conditions of the Associated Owners and Developers (AOD) Standard Form of Agreement Between Owner and Contractor COM-01

EJCDC prepared this document to help users of EJCDC documents make informed decisions.

NOTE: Available in hard copy.

Contract Documents Bibliography (1996)

Concise and useful reference to books and periodicals that pertain to various aspects of contract documents.

NOTE: Available in hard copy.

Focus on Shop Drawings (1985)

Noted attorney John Clark alerts parties in the construction process to the common pitfalls and well-documented problems relating to shop drawing submission, review, and approval procedures. This classic guide draws on EJCDC language as well as general professional practices and several recent, significant court decisions, in discussing the duties and responsibilities of the engineer and contractor with respect to the shop-drawing process.

NOTE: Available in hard copy.

Indemnification by Engineers—A Warning (1990)

With increasing frequency, engineers are requested to indemnify their clients against any losses the clients may suffer in connection with projects the engineers have designed. This document not only alerts engineers and clients to the potential ramifications of these and similar hold-harmless clauses but also gives practical advice. Among the issues covered are the meaning of indemnification, its historical background in engineering agreements, and current trends in the use of indemnification clauses.

NOTE: Available in hard copy.

Limitation of Liability in Design Professional Contracts (1986) 1910-9E

This legal analysis examines the possibility of sharing all or partial liability risks of a project with the owner, through indemnification, hold-harmless agreements, or other language to control the engineer's extent of exposure.

NOTE: Available in hard copy.

Recommended Competitive Bidding Procedures for Construction Projects (1987) 1910-9D

NOTE: Available in hard copy.

Uniform Location of Subject Matter (1995) 1910-16

The practice of engineers and architects addressing the same subject matter in different locations in their respective bidding and construction documents has led to confusion and unanticipated legal consequences. This document is intended to lead to a more standardized approach that will benefit all parties involved in a construction project. Sets up tabular listings of subject matter and keys for easy reference.

NOTE: Available in hard copy.

Appendix 3: Title 48, Code of Federal Regulations—Federal Acquisition Regulations System

Chapters

1 Federal Acquisition Regulation (parts listed in the following)
2 Defense Acquisition Regulations System, Department of Defense
3 Department of Health and Human Services
4 Department of Agriculture
5 General Services Administration
6 Department of State
7 Agency for International Development
8 Department of Veterans Affairs
9 Department of Energy
10 Department of the Treasury
12 Department of Transportation
13 Department of Commerce
14 Department of the Interior
15 Environmental Protection Agency
16 Office of Personnel Management, Federal Employees Health Benefits Acquisition Regulation
17 Office of Personnel Management
18 National Aeronautics and Space Administration
19 United States Information Agency
20 Nuclear Regulatory Commission
21 Office of Personnel Management, Federal Employees Group Life Insurance, Federal Acquisition Regulation
23 Social Security Administration
24 Department of Housing and Urban Development
25 National Science Foundation
28 Department of Justice

29 Department of Labor
30 Department of Homeland Security, Homeland Security Acquisition Regulation
34 Department of Education Acquisition Regulation
35 Panama Canal Commission
44 Federal Emergency Management Agency
51 Department of the Army Acquisition Regulations
52 Department of the Navy Acquisition Regulations
54 Defense Logistics Agency, Department of Defense
57 African Development Foundation
61 General Services Administration Board of Contract Appeals
63 Department of Transportation Board of Contract Appeals
99 Cost Accounting Standards Board, Office of Federal Procurement Policy, Office of Management and Budget

Listing of the Parts in Chapter 1 of the Federal Acquisition Regulations (FAR)

Part

1 Federal Acquisition Regulations System
2 Definitions of words and terms
3 Improper business practices and personal conflicts of interest
4 Administrative matters
5 Publicizing contract actions
6 Competition requirements
7 Acquisition planning
8 Required sources of supplies and services
9 Contractor qualifications
10 Market research
11 Describing agency needs
12 Acquisition of commercial items
13 Simplified acquisition procedures
14 Sealed bidding
15 Contracting by negotiation
16 Types of contracts

17 Special contracting methods
18 [Reserved]
19 Small business programs
20 [Reserved]
21 [Reserved]
22 Application of labor laws to Government acquisitions
23 Environment, energy and water efficiency, renewable energy technologies, occupational safety, and drug-free workplace
24 Protection of privacy and freedom of information
25 Foreign acquisition
26 Other socioeconomic programs
27 Patents, data, and copyrights
28 Bonds and insurance
29 Taxes
30 Cost accounting standards administration
31 Contract cost principles and procedures
32 Contract financing
34 Major system acquisition
35 Research and development contracting
36 Construction and architect-engineer contracts
37 Service contracting
38 Federal supply schedule contracting
39 Acquisition of information technology
40 [Reserved]
41 Acquisition of utility services
42 Contract administration and audit services
43 Contract modifications
44 Subcontracting policies and procedures
45 Government property
46 Quality assurance
47 Transportation
48 Value engineering
49 Termination of contracts
50 Extraordinary contractual actions
51 Use of Government sources by contractors
Federal Acquisition Regulation (FAR) Index

NOTE: Updates to this FAR Parts Listing may be obtained at: http://www.access.gpo.gov/nara/cfr/waisidx_05/48cfrv1_05.html (accessed on 7/2/2010).

Appendix 4: Outline of the World Trade Organization's Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)

This agreement was concluded at the 1986–1994 Uruguay Round of the General Agreement on Tariffs and Trade (GATT), the WTO's predecessor.

Ideas and knowledge are an increasingly important part of trade. Most of the value of new medicines and other high-technology products lies in the amount of invention, innovation, research, design, and testing involved. Films, music recordings, books, computer software, and online services are bought and sold because of the information and creativity they contain, not usually because of the plastic, metal, or paper used to make them. Many products that were formerly traded as low-technology goods or commodities now contain a higher proportion of invention and design—for example, brand-named clothing or new varieties of plants.

Creators can be given the right to prevent others from using their inventions, designs, or other creations and to use that right to negotiate payment in return for others using them.

These are "intellectual property rights." They take a number of forms. For example, books, paintings, and films come under copyright; inventions and discoveries can be patented; brand names and product logos can be registered as trademarks; and trade secrets can be protected by national and international laws that penalize their theft. Governments and parliaments have given creators these rights as incentives to produce ideas that will benefit society as a whole.

The extent of protection and enforcement of these rights varied widely around the world; as intellectual property became more important in trade, these differences became sources of tension in international economic relations. New internationally agreed trade rules for intellectual property rights were seen as a way to introduce more order and predictability, and for disputes to be settled more systematically. The Uruguay Round achieved that. The TRIPS Agreement attempts to narrow the gaps in the minimum levels of protection that each government gives to the intellectual property of fellow WTO members. In doing so, it tries to strike a balance between the long-term benefits and possible short-term costs to society. Society may benefit in the long term when IP rights are protected around the world, and brought under common international rules. It establishes intellectual property protection to encourage creation and invention, especially when the period of

protection expires and the creations and inventions enter the public domain. Governments are allowed to reduce any short-term costs through various exceptions, for example, to deal with public health problems. When trade disputes on IP develop, the WTO's dispute settlement system is now available (at least in theory).

The TRIPS agreement covers five broad issues:

- How basic principles of the trading system and other international IP agreements should be applied
- How to give adequate protection to IP rights
- How countries should enforce those rights adequately in their own territories
- How to settle disputes on IP between the members of the WTO
- Special transitional arrangements during the period when the new system is being introduced

Basic Principles: National Treatment, MFN, and Balanced Protection

As in GATT and its previous organization GATS, the starting point of the TRIPS agreement relies on basic principles. As in the other two agreements, nondiscrimination is prominently featured. *National treatment*, treating one's own nationals and foreigners equally, and *most favored nation* (MFN) treatment (equal treatment for nationals of all trading partners in the WTO) are also key principles in TRIPS. National treatment is also a key principle in other IP agreements outside the WTO.

The TRIPS agreement has an additional important principle: IP protection should contribute to technical innovation and technology transfer. Both producers and consumers should benefit, and social welfare should be enhanced under the agreement.

How to Protect Intellectual Property: Common Ground Rules

The second part of the TRIPS agreement surveys different kinds of IP rights and how to protect them. The purpose is to ensure that adequate standards of protection exist in all member countries. The starting point here includes the

obligations of the main international agreements of the World Intellectual Property Organization (WIPO) that existed before the WTO was created:

- The Paris Convention for the Protection of Industrial Property (patents, industrial designs, etc.)
- The Berne Convention for the Protection of Literary and artistic works (copyrights)

Some areas were not covered by these conventions. In some cases, the standards of protection were thought to be inadequate, so the TRIPS agreement adds a significant number of new or higher standards.

Copyright

The TRIPS agreement ensures that computer programs will be protected as literary works (see Chapter 6 here) and provides for the protection of databases; it also expands international copyright rules to cover rental rights. Authors of computer programs and producers of sound recordings must have the right to prohibit the commercial rental of their works to the public. A similar exclusive right applies to films, where commercial rental has led to widespread copying (affecting the copyright owner's potential earnings from their films).

According to the agreement, performers must also have the right to prevent unauthorized recording, reproduction, and broadcast of live performances (bootlegging) for no less than 50 years. Producers of sound recordings must have the right to prevent unauthorized reproduction of recordings for a period of 50 years.

Trademarks

The agreement defines what kinds of marks must be eligible for protection as trademarks and what minimum rights are conferred on their owners. It states that service marks must be protected in the same way as trademarks used for goods. Marks that have become well known (famous) in a country enjoy additional protection.

Geographical Indications

A place name is often used to identify a product (think Idaho potatoes). This "geographical indication" does not only state where the product was made, but more importantly, it identifies the product's special characteristics, which are the result of the product's origins. Well-known examples include "Champagne," "Scotch," "Tequila," and "Roquefort" cheese. Wine and

spirits makers are particularly concerned about the use of place names to identify products, and the TRIPS Agreement contains special provisions for them. The issue is also important for other types of goods. Using the place name when the product was made elsewhere, or when it does not exhibit the usual characteristics, can mislead consumers and lead to "unfair competition." The TRIPS agreement gives countries the right to prevent the misuse of place names. For wines and spirits, the agreement provides higher levels of protection, even where there is no danger of the public being misled.

Some exceptions are allowed, for example, if the name is already protected as a trademark or if it has become a generic term. For example, "cheddar" now refers to a particular type of cheese, one not necessarily made in Cheddar in the United Kingdom. But a country wanting to make an exception for these reasons must be willing to negotiate with the country that wants to protect the geographical indication in question. The agreement provides for further negotiations in the WTO to establish a multilateral system of notification and registration of geographical indications for wines. These are now part of the Doha Development Agenda, and they include spirits. Also being debated in the WTO is whether to negotiate extending this higher level of protection beyond wines and spirits.

Industrial Designs

Under the TRIPS agreement, industrial designs must be protected for at least 10 years. Owners of protected designs must be able to prevent the manufacture, sale, or importation of articles bearing or embodying a design that is a copy of a protected design (the *Sears v. Stiffel* case might have turned out differently under this regime).

Patents

The agreement requires that patent protection must be available for inventions for at least 20 years. Patent protection must be available for both products and processes in almost all fields of technology. Governments can refuse to issue a patent for an invention if its commercial exploitation is prohibited for reasons of public order or morality; they can also exclude diagnostic, therapeutic, and surgical methods, plants and animals (other than microorganisms), and biological processes for the production of plants or animals (other than microbiological processes).

Plant varieties, however, must be protectable by patents or by a special system (such as the breeder's rights provided in the conventions of UPOV—the International Union for the Protection of New Varieties of Plants).

The agreement describes the minimum rights that a patent owner must enjoy. But it also allows certain exception. A patent owner could abuse his rights, for example, by failing to supply the product on the market. The

agreement states that governments can deal with that possibility by issuing a "compulsory license," allowing a competitor to produce the product or use the process under license. This can only be done under certain conditions aimed at safeguarding the legitimate interests of the patent owner.

If a patent is issued for a production process, then the rights must extend to the product directly obtained from the process. Under certain conditions, alleged infringers may be ordered by a court to prove that they have not used the patented process.

An issue that has arisen recently is how to ensure patent protection for pharmaceutical products that do not prevent people in poor countries from having access to medicines—while at the same time maintaining the patent system's role in providing incentives for research and development of new medicines. Flexibilities such as compulsory licensing were written into the TRIPS Agreement, but some governments were unsure how they would be interpreted and how far their right to use them would be respected. A large part of the issue was settled when WTO ministers issued a special declaration at the Doha Ministerial Conference in November of 2001. They agreed that the TRIPS Agreement does not and should not prevent members from taking measures to protect public health. They underscored countries' ability to use the flexibilities that are built into the TRIPS Agreement. They agreed to extend exemptions on pharmaceutical patent protection for least developed countries until 2016. They assigned further work on one remaining question—to sort out how to provide extra flexibility, so that countries unable to produce pharmaceuticals domestically can import patented drugs made under compulsory licensing. A waiver providing this flexibility was agreed on August 30, 2003.

Integrated Circuits Layout Designs

The basis for protecting integrated circuit designs in the TRIPS Agreement is the Washington Treaty on Intellectual Property in Respect to Integrated Circuits that comes under the World Intellectual Property Organization (WIPO). That was adopted in 1989 but has not yet entered into force. The TRIPS Agreement adds a number of provisions: for example, protection must be available for at least 10 years.

Undisclosed Information and Trade Secrets

Trade secrets and other types of "undisclosed information" that has commercial value must be protected against breach of confidence and other acts contrary to honest commercial practices. But reasonable steps must have been taken to keep the information secret. Test data submitted to governments in order to obtain marketing approval for new pharmaceutical or agricultural chemicals must also be protected against unfair commercial use.

Curbing Anticompetitive Licensing Contracts

The owner of a copyright, patent, or other form of intellectual property right can issue a license for someone else to produce or copy the protected trademark, work, invention, design, etc. The agreement recognizes that the terms of the licensing contract could restrict competition or impede technology transfer. It (the agreement) says that under certain conditions, governments have the right to take action to prevent anticompetitive licensing that abuses IP rights. It also states that governments must be prepared to consult each other on controlling anticompetitive licensing.

Enforcement: Tough But Fair

Having intellectual property laws is not enough; they have to be enforced. That is covered in Part 3 of TRIPS. The agreement says that governments have to ensure that intellectual property rights can be enforced under their laws, and that penalties for infringement are tough enough to deter further violations. The procedures must be fair and equitable and not unnecessarily complicated or costly. They should not entail unreasonable time-limits or unwarranted delays. The people involved should be able to ask a court to review an administrative decision or to appeal a lower court ruling.

The agreement describes in some detail how enforcement should be handled, including rules for obtaining evidence, provisional measures, injunctions, damages, and other penalties. Further, courts should have the right, under certain conditions, to order the disposal or destruction of pirated or counterfeit goods. Willful trademark counterfeiting or copyright piracy on a commercial scale should be a criminal offense. Governments should make sure that IP rights owners can receive the assistance of customs authorities to prevent imports of counterfeit and pirated goods.

Technology Transfer

Developing countries, in particular, see technology transfer as part of the bargain in which they have agreed to protect IP rights. The TRIPS Agreement includes a number of provisions for that. For example, it requires a developed country's government to provide incentives for their companies to transfer technology to least-developed countries.

Transition Arrangements

When the WTO agreements took effect on January 1, 1995, developed countries were given 1 year to ensure that their laws and practices conform with the TRIPS Agreement. Developing countries and (under certain conditions) transition economies were given 5 years, until 2000. Least-developed

countries had 11 years, until 2006—now extended to 2013 in general and to 2016 for pharmaceutical patents and undisclosed information.

If a developing country did not provide product patent protection in a particular area of technology when the TRIPS agreement became applicable to it, it had up to five additional years to introduce the protection. But for pharmaceutical and agricultural chemical products, the country had to accept the filing of patent applications from the beginning of the transitional period (January 1, 1995), though the patent did not need to be granted until the end of this period. If the government allowed the relevant pharmaceutical or agricultural chemical to be marketed during the transition period, it had to—subject to certain conditions—provide an exclusive marketing right for the product for 5 years, or until a product patent was granted, whichever was shorter.

Subject to certain exceptions, the general rule is that obligations in the agreement apply to IP property rights that existed at the end of a country's transition period as well as new ones.

Appendix 5: ACM Code of Ethics and Professional Conduct[*]

Preamble

Commitment to ethical professional conduct is expected of every member (voting members, associate members, and student members) of the Association for Computing Machinery (ACM).

This Code, consisting of 24 imperatives formulated as statements of personal responsibility identifies the elements of such a commitment. It contains many, but not all, issues professionals are likely to face. Section 1 outlines fundamental ethical considerations, while Section 2 addresses additional, more specific considerations of professional conduct.

Statements in Section 3 pertain more specifically to individuals who have a leadership role, whether in the workplace or in a volunteer capacity such as with organizations like ACM.

Principles involving compliance with this Code are given in Section 4.

The Code shall be supplemented by a set of Guidelines, which provide explanation to assist members in dealing with various issues contained in the Code. It is expected that the Guidelines will be changed more frequently than the Code.

The Code and its supplemented Guidelines are intended to serve as a basis for ethical decision making in the conduct of professional work. Secondarily, they may serve as a basis for judging the merit of a formal complaint pertaining to violation of professional ethical standards.

It should be noted that although computing is not mentioned in the imperatives of Section 1 the Code is concerned with how these fundamental imperatives apply to one's conduct as a computing professional. These imperatives are expressed in a general form to emphasize that ethical principles which apply to computer ethics are derived from more general ethical principles.

It is understood that some words and phrases in the code of ethics are subject to varying interpretations, and that any ethical principle may conflict with other ethical principles in specific situations. Questions related to ethical conflicts can best be answered by thoughtful consideration of fundamental principles, rather than reliance on detailed regulations.

[*] Adopted by ACM Council 10/16/92.

Contents and Guidelines

1. **General Moral Imperatives.**
2. **More Specific Professional Responsibilities.**
3. **Organizational Leadership Imperatives.**
4. **Compliance with the Code.**
5. **Acknowledgments.**

1. General Moral Imperatives

As an ACM member I will …

1.1 Contribute to Society and Human Well-Being

This principle concerning the quality of life of all people affirms an obligation to protect fundamental human rights and to respect the diversity of all cultures. An essential aim of computing professionals is to minimize negative consequences of computing systems, including threats to health and safety. When designing or implementing systems, computing professionals must attempt to insure that the products of their efforts will be used in socially responsible ways, will meet social needs, and will avoid harmful effects to health and welfare.

In addition to a safe social environment, human well-being includes a safe natural environment. Therefore, computing professionals who design and develop systems must be alert to, and make others aware of, any potential damage to the local or global environment.

1.2 Avoid Harm to Others

"Harm" means injury or negative consequences, such as undesirable loss of information, loss of property, property damage, or unwanted environmental impacts. This principle prohibits use of computing technology in ways that result in harm to any of the following: users, the general public, employees, employers. Harmful actions include intentional destruction or modification of files and programs leading to serious loss of resources or unnecessary expenditure of human resources such as the time and effort required to purge systems of "computer viruses."

Well-intended actions, including those that accomplish assigned duties, may lead to harm unexpectedly. In such an event the responsible person or persons are obligated to undo or mitigate the negative consequences as much as possible. One way to avoid unintentional harm is to carefully consider potential impacts on all those affected by decisions made during design and implementation.

To minimize the possibility of indirectly harming others, computing professionals must minimize malfunctions by following generally accepted standards for system design and testing. Furthermore, it is often necessary to assess the social consequences of systems to project the likelihood of any serious harm to others. If system features are misrepresented to users, coworkers, or supervisors, the individual computing professional is responsible for any resulting injury.

In the work environment the computing professional has the additional obligation to report any signs of system dangers that might result in serious personal or social damage. If one's superiors do not act to curtail or mitigate such dangers, it may be necessary to "blow the whistle" to help correct the problem or reduce the risk. However, capricious or misguided reporting of violations can, itself, be harmful. Before reporting violations, all relevant aspects of the incident must be thoroughly assessed. In particular, the assessment of risk and responsibility must be credible. It is suggested that advice be sought from other computing professionals. See principle 2.5 regarding thorough evaluations.

1.3 Be Honest and Trustworthy

Honesty is an essential component of trust. Without trust an organization cannot function effectively. The honest computing professional will not make deliberately false or deceptive claims about a system or system design, but will instead provide full disclosure of all pertinent system limitations and problems.

A computer professional has a duty to be honest about his or her own qualifications, and about any circumstances that might lead to conflicts of interest.

Membership in volunteer organizations such as ACM may at times place individuals in situations where their statements or actions could be interpreted as carrying the "weight" of a larger group of professionals. An ACM member will exercise care not to misrepresent ACM and/or positions and policies of ACM or any ACM units.

1.4 Be Fair and Take Action Not to Discriminate

The values of equality, tolerance, respect for others, and principles of equal justice govern this imperative. Discrimination on the basis of race, sex, religion, age, disability, national origin, or other such factors is an explicit violation of ACM policy and will not be tolerated.

Inequities between different groups of people may result from the use or misuse of information and technology. In a fair society, all individuals would have equal opportunity to participate in, or benefit from, the use of computer resources regardless of race, sex, religion, age, disability, national origin or other such similar factors. However, these ideals do not provide an adequate basis for violation of any other ethical imperatives of this code.

1.5 Honor Property Rights Including Copyrights and Patent

Violation of copyrights, patents, trade secrets and terms of license agreements is prohibited by law in most circumstances. Even when software is not so protected, such violations are contrary to professional behavior. Copies of software should be made only with proper authorization. Unauthorized duplication of materials must not be condoned.

1.6 Give Proper Credit for Intellectual Property

Computing professionals are obligated to protect the integrity of intellectual property. Specifically, one must not take credit for another's ideas or work, even in cases where work has not been explicitly protected by copyright, patent, etc.

1.7 Respect the Privacy of Others

Computing and communication technology enables the collection and exchange of personal information on a scale unprecedented in the history of civilization. Thus there is increased potential for violating the privacy of individuals and groups. It is the responsibility of professionals to maintain the privacy and integrity of data describing individuals. This includes taking precautions to ensure the accuracy of data, as well as protecting it from unauthorized access or accidental disclosure to inappropriate individuals. Furthermore, procedures must be established to allow individuals to review their records and correct inaccuracies.

This imperative implies that only the necessary amount of personal information be collected in a system, that retention and disposal periods for that information be clearly defined and enforced, and that personal information gathered for a specific purpose not be used for other purposes without the consent of the individual(s). These principles apply to electronic communications, including electronic mail, and prohibit procedures that capture or monitor electronic user data, including messages, without the permission of users or bona fide authorization related to system operation and maintenance. User data observed during the normal duties of system operation and maintenance must be treated with strictest confidentiality, except in cases where it is evidence for the violation of law, organizational regulations, or this Code. In these cases, the nature or contents of that information must be disclosed only to proper authorities.

1.8 Honor Confidentiality

The principle of honesty extends to issues of confidentiality of information whenever one has made an explicit promise to honor confidentiality or, implicitly, when private information not directly related to the performance

of one's duties becomes available. The ethical concern is to respect all obligations of confidentiality to employers, clients, and users unless discharged from such obligations by requirements of the law or other principles of this Code.

2. More Specific Professional Responsibilities

As an ACM computing professional I will …

2.1 Strive to Achieve the Highest Quality, Effectiveness and Dignity in Both the Process and Products of Professional Work

Excellence is perhaps the most important obligation of a professional. The computing professional must strive to achieve quality and to be cognizant of the serious negative consequences that may result for poor quality in a system.

2.2 Acquire and Maintain Professional Competence

Excellence depends on individuals who take responsibility for acquiring and maintaining professional competence. A professional must participate in setting standards for appropriate levels of competence, and strive to achieve those standards. Upgrading technical knowledge and competence can be achieved in several ways: doing independent study; attending seminars, conferences, or courses; and being involved in professional organizations.

2.3 Know and Respect Existing Laws Pertaining to Professional Work

ACM members must obey existing local, state, province, national and international laws unless there is a compelling ethical basis not to do so. Policies and procedures of the organizations in which one participates must also be obeyed. But compliance must be balanced with the recognition that sometimes existing laws and rules may be immoral or inappropriate and, therefore, must be challenged. Violation of a law or regulation may be ethical when that law or rule has inadequate moral basis or when it conflicts with another law judged to be more important. If one decides to violate a law or rule because it is viewed as unethical, or for any other reason, one must fully accept responsibility for one's actions and for the consequences.

2.4 Accept and Provide Appropriate Professional Review

Quality professional work, especially in the computing profession, depends on professional reviewing and critiquing. Whenever appropriate, individual members should seek and utilize peer review as well as provide critical review of the work of others.

2.5 Give Comprehensive and Thorough Evaluations of Computer Systems and Their Impacts, Including Analysis of Possible Risks

Computer professionals must strive to be perceptive, thorough, and objective when evaluating, recommending, and presenting systems descriptions and alternatives. Computer professionals are in a position of special trust, and therefore have a special responsibility to provide objective, credible evaluations to employers, clients, users, and the public. When providing evaluations the professional must also identify any relevant conflicts of interest as stated in imperative 1.3.

As noted in the discussion of principle 1.2 on avoiding harm, any signs of danger from systems must be reported to those who have opportunity and/or responsibility to resolve them. See the guidelines for imperative 1.2 for more details concerning harm, including the reporting of professional violations.

2.6 Honor Contracts, Agreements, and Assigned Responsibilities

Honoring one's commitments is a matter of integrity and honesty. For the computer professional this includes ensuring that system elements perform as intended. Also, when on contracts for work with another party, one has an obligation to keep that party properly informed about progress toward completing that work.

A computing professional has a responsibility to request a change in any assignment that he or she feels cannot be completed as defined. Only after serious consideration and with full disclosure of risks and concerns to the employer or client, should one accept the assignment. The major underlying principle here is the obligation to accept personal accountability for professional work. On some occasions other ethical principles may take greater priority.

A judgment that a specific assignment should not be performed may not be accepted. Having clearly identified one's concerns and reasons for that judgment, but failing to procure a change in that assignment, one may yet be obligated, by contract or by law, to proceed as directed. The computing professional's ethical judgment should be the final guide in deciding whether or not to proceed. Regardless of the decision, one must accept the responsibility for the consequences.

However, performing assignments "against one's own judgment" does not relieve the professional of responsibility for any negative consequences.

2.7 Improve Public Understanding of Computing and Its Consequences

Computing professionals have a responsibility to share technical knowledge with the public by encouraging understanding of computing, including the impacts of computer systems and their limitations. This imperative implies an obligation to counter any false views related to computing.

2.8 Accessing Computing and Communication Resources Only When Authorized To Do So

Theft or destruction of tangible and electronic property is prohibited by imperative 1.2 – "Avoid Harm to Others." Trespassing and unauthorized use of a computer or communication system is addressed by this imperative. Trespassing includes accessing communication networks and computer systems, or accounts and/or files associated with those systems, without explicit authorization to do so. Individuals and organizations have the right to restrict access to their systems so long as they do not violate the discrimination principle (see 1.4).

No one should enter or use another's computer system, software, or data files without permission. One must always have appropriate approval before using system resources, including communication ports, file space, other system peripherals, and computer time.

3. Organizational Leadership Imperatives

As an ACM member and an organizational leader, I will …

BACKGROUND NOTE: This section draws extensively from the draft IFIP Code of Ethics, especially its sections on organizational ethics and international concerns. The ethics obligations of organizations tend to be neglected in most codes of professional conduct, perhaps because these codes are written from the perspective of the individual member. This dilemma is addressed by stating these imperatives from the perspective of the organizational leader. In this context "leader" is viewed as any organizational member who has leadership or educational responsibilities. These imperatives generally may apply to organizations as well as their leaders. In this context "organizations" are corporations, government agencies, and other "employers," as well as volunteer professional organizations.

3.1 Articulate Social Responsibilities of Members of an Organizational Unit and Encourage Full Acceptance of Those Responsibilities

Because organizations of all kinds have impacts on the public, they must accept responsibilities to society. Organizational procedures and attitudes oriented toward quality and the welfare of society will reduce harm to members of the public, thereby serving public interest and fulfilling social responsibility. Therefore, organizational leaders must encourage full participation in meeting social responsibilities as well as quality performance.

3.2 Manage Personnel and Resources to Design and Build Information Systems That Enhance the Quality of Working Life

Organizational leaders are responsible for ensuring that computer systems enhance, not degrade, the quality of working life. When implementing a

computer system, organizations must consider the personal and professional development, physical safety, and human dignity of all workers. Appropriate human-computer ergonomic standards should be considered in system design and in the workplace.

3.3 Acknowledge and Support Proper and Authorized Uses of an Organization's Computing and Communication Resources

Because computer systems can become tools to harm as well as to benefit an organization, the leadership has the responsibility to clearly define appropriate and inappropriate uses of organizational computing resources. While the number and scope of such rules should be minimal, they should be fully enforced when established.

3.4 Ensure That Users and Those Who Will Be Affected by a System Have Their Needs Clearly Articulated during the Assessment of Design Requirements; Later the System Must Be Validated to Meet Requirements

Current system users, potential users and other persons whose lives may be affected by a system must have their needs assessed and incorporated in the statement of requirements. System validation should ensure compliance with those requirements.

3.5 Articulate and Support Policies That Protect the Dignity of Users and Others Affected by a Computing System

Designing or implementing systems that deliberately or inadvertently demean individuals or groups is ethically unacceptable. Computer professionals who are in decision making positions should verify that systems are designed and implemented to protect personal privacy and enhance personal dignity.

3.6 Create Opportunities for Members of the Organization to Learn the Principles and Limitations of Computer Systems

This complements the imperative on public understanding (2.7). Educational opportunities are essential to facilitate optimal participation of all organizational members. Opportunities must be available to all members to help them improve their knowledge and skills in computing, including courses that familiarize them with the consequences and limitations of particular types of systems. In particular, professionals must be made aware of the dangers of building systems around oversimplified models, including the improbability of anticipating and designing for every possible operating condition, and other issues related to the complexity of this profession.

4. Compliance with the Code

As an ACM member I will …

4.1 Uphold and Promote the Principles of This Code

The future of the computing profession depends on both technical and ethical excellence. Not only is it important for ACM computing professionals to adhere to the principles expressed in this Code, each member should encourage and support adherence by other members.

4.2 Treat Violations of This Code as Inconsistent with Membership in the ACM

Adherence of professionals to a code of ethics is largely a voluntary matter. However, if a member does not follow this Code by engaging in gross misconduct, membership in ACM may be terminated.

This Code and the supplemental Guidelines were developed by the Task Force for the Revision of the ACM Code of Ethics and Professional Conduct: Ronald E. Anderson, Chair, Gerald Engel, Donald Gotterbarn, Grace C. Hertlein, Alex Hoffman, Bruce Jawer, Deborah G. Johnson, Doris K. Lidtke, Joyce Currie Little, Dianne Martin, Donn B. Parker, Judith A. Perrolle and Richard S. Rosenberg. The Task Force was organized by ACM/SIGCAS and funding was provided by the ACM SIG Discretionary Fund. This Code and the supplemental Guidelines were adopted by the ACM Council on October 16, 1992.

ACM/Code of Ethics. Last Update 05/12/03.

General Engineering

Engineers encounter different types of contracts at nearly every turn in their careers. **Contracts for Engineers: Intellectual Property, Standards, and Ethics** is a tool to enhance their ability to communicate contractual issues to lawyers—and then better understand the legal advice they receive.

Building on its exploration of contracts, this book expands discussion to

- Patents, copyrights, trademarks, trade secrets, and other intellectual property issues
- Development of standards and the bodies that govern them, as well as conformity assessment and accreditation
- Ethics at both the micro and macro levels—a concept under intense scrutiny after several major disasters, including the Gulf of Mexico oil spill, the collapse of Boston's Big Dig, and a coal-mining accident that resulted in many deaths

With a brief introduction to common law contracts and their underlying principles, including basic examples, the book presents a sample of the Uniform Commercial Code (UCC) regarding the sale of goods. It evaluates elements of the different contracts that engineers commonly encounter, such as employee and associated consulting agreements and contracts involved in construction and government.

Approaching intellectual property from a contract perspective, this reference focuses on the many different types of patents and their role in commerce. It touches on the application of trademarks and recent developments in the use of copyright as a form of contract and explains the process of obtaining patents, including the rationale for investing in them. Ethical standards receive special attention, which includes a review of several prominent professional codes of ethics and conduct for both organizations and individual engineers, particularly officers and higher-level managers.

K12434

CRC Press
Taylor & Francis Group
an informa business
www.crcpress.com

6000 Broken Sound Parkway, NW
Suite 300, Boca Raton, FL 33487
711 Third Avenue
New York, NY 10017
2 Park Square, Milton Park
Abingdon, Oxon OX14 4RN, UK

ISBN: 978-1-4398-5286-6
90000
9 781439 852866