CON 244

Construction Contracting

Lesson 1

Student Guide

May 2016

This page intentionally left blank.

Table of Contents

This page intentionally left blank.

CON 244 Course Syllabus

A. Course Title: Construction Contracting

B. Course Number: CON 244

C. Course Prerequisites: CON 127, CON 216, CLC0056

D. CLPs/CEUs/Number of ACE: 3.2/32

E. Course Manager: Christy Watts
   a. Phone: (937) 781-1053
   b. E-mail: christy.watts@dau.mil

Performance Learning Director (HQ DAU): Ray Ward, Ph.D.
   a. Phone: (804) 425-2945
   b. E-mail: ray.ward@dau.mil

F. Course Description:

This course focuses on unique construction contracting issues, such as acquisition planning, contract performance management, funding, environmental concerns, construction contract language, and construction contracting in the commercial setting, the contract wage rate requirements statue, design/build, basic schedule delay analysis, constructive changes, acceleration, and construction contract quality management.

G. Course Objective :

CON 244 is a position specific specialty course and is one of several Contracting Level III elective courses. Construction contracting is a complex business. As an advanced contracting course, many of the answers will require research outside of the FAR/DFARS and may include specific applications of agency supplements, environmental law, fiscal law, zoning regulation and public safety.

H. The following concepts (ideas, goals, topics) will be covered

1.0 Given a construction requirement to build a new facility, renovate an existing one, or maintain existing facilities, apply the Federal acquisition laws, regulations, Department of Defense supplementation, policies, procedures, and best business practices in soliciting and administering construction contracts.
2.0 Given a contract requirement**,** determine if it is a construction requirement and describe how to devise a Construction Acquisition Plan in accordance with FAR Part 7, DFARS 207 and agency policies and procedures.
3.0 After receipt of a construction contracting request, describe how to develop a construction solicitation package in accordance with FAR, DFARS, and agency policy and procedures.

4.0 After receiving bids or proposals in response to a construction solicitation, evaluate the bids/proposals for award of the construction contract.
5.0 Given a construction contract, diagnose and determine the applicable construction contract administration (compliance) approach, using FAR, DFARS, DOD regulation/guidelines, and best business practices.
6.0 Given a changed condition on a construction contract, select the appropriate clause and describe the remedy for the situation in accordance with Federal and DoD acquisition laws, regulations, and best business practices.
7.0 Given a construction contractor's invoice, verify for construction progress payment and, at contract conclusion, describe appropriate actions necessary to construction contract closeout

I. Course Materials: CON 244 Student Guide

J. The following critical performances are required in this course:

a. Performance: Students must earn at least 80% of all possible points to pass (see Evaluation).

b. Behavioral: CON 244 is not a college course and the objective of the course is not to educate—rather, it is to train the student how to apply the FAR/DFARS on their own in an operational environment. To be successful in CON 244, students will have to apply effective habits and skills. The instructor's role will be to guide the student in their training—not to provide information that a student can easily look up on his/her own. As such, students shouldn't be offended when an instructor tells them to "look it up" or doesn't provide the answer that they want. Students must also accept that, despite their prior academic achievements, they will often be wrong during this course. This is part of the learning process. It is much better to make mistakes in the classroom when they are of little consequence than in the workplace where they can cost taxpayers millions of dollars and embarrass the Government. Lastly, students must arrive to class and return from breaks punctually. Students must actively participate in classroom activities and complete all assignments to be successful.

K. Evaluation (How performance will be assessed): Students will be evaluated individually using an objective examination, research paper and in group assignments that apply the concepts presented in the course. A breakdown of the evaluation scheme is provided below:

Assignment	Points
Pre-Course Research Paper	15
Modification Case Study	20
Group Macro Case Study and Presentation	25
Exam	40
Total	100
MINIMUM REQUIRED (80%)	**80**

M. Course Policies

a. Attendance: Student attendance is mandatory. Students are not authorized to miss any class time. Failure to be present during all class hours is grounds for removal. In extreme cases, the instructor may, at his/her discretion, excuse student absences provided that the student has requested and obtained approval prior to the absence. In no circumstance will a student be permitted to miss more than 2 hours of class.

b. Student Responsibility: Students are responsible for ensuring that they are attaining the learning objectives. As such, students must communicate any problems or difficulties that they are encountering to the instructor.

c. Academic Freedom: Students shall have the privilege of debate with discretion on any subject related to curricula within the school forum.

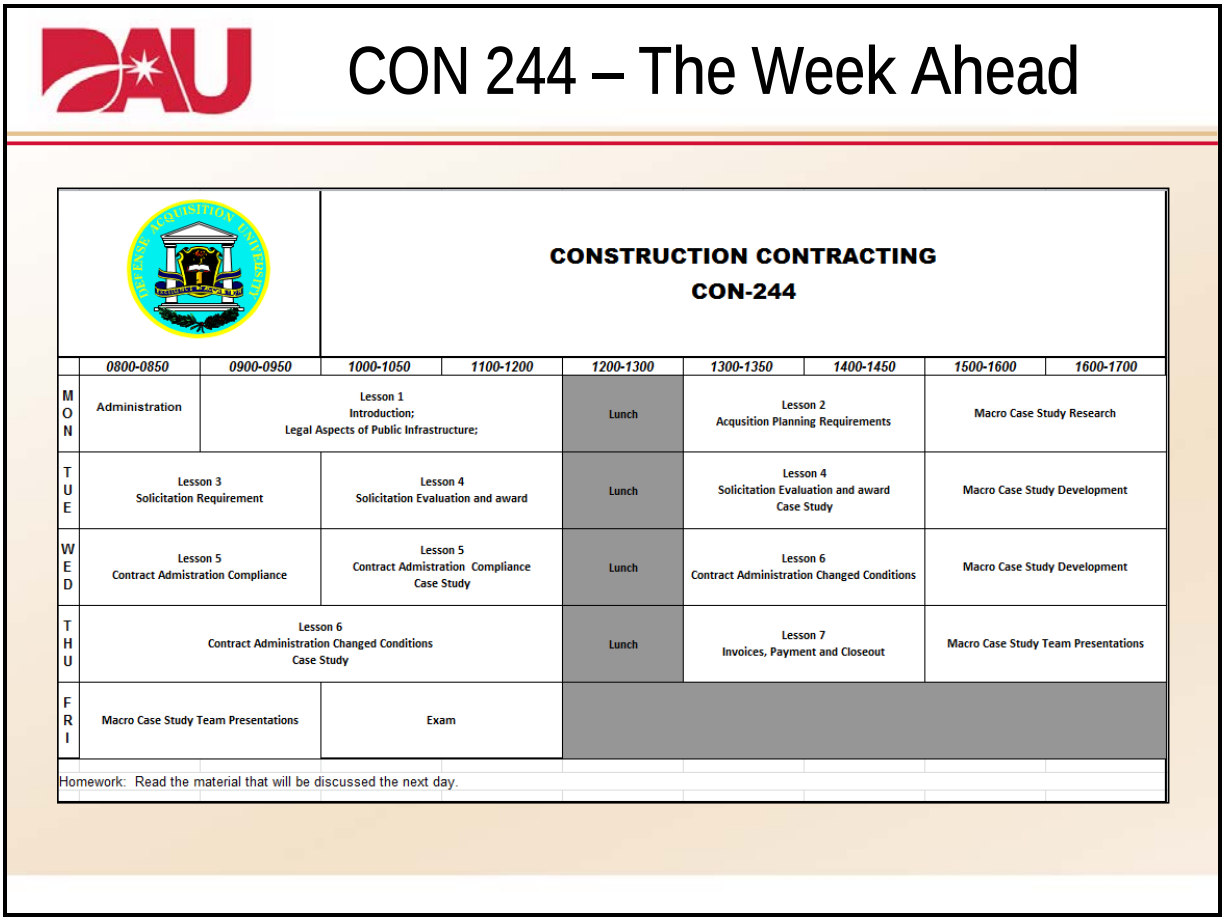
d. Nonattribution: Students shall treat statements made in the school forum as privileged information not to be attributed to a specific individual when outside the school forum.

e. Make-ups and Extra Credit: There will be no opportunity for making up missed quizzes/exams nor will there be an opportunity for students to earn extra credit.

f. Student Issues/Concerns: DAU encourages students who have an issue or concern with the learning environment to discuss it with their instructor. Students who feel their issue is not resolved satisfactorily may go to the department chair/site manager or Regional Associate Dean for Academics.

N. Course Sequence/Time Schedule: CON 244 will begin each day promptly at 08:00 and end at 17:00. There will be a one-hour lunch break. The last 60 minutes of each day, 16:00 to 17:00, are usually set aside for individual classroom study. Instructors may, at their discretion, permit students to leave the classroom and study on their own. A typical course schedule is provided below.

CON 244 Schedule



CON 244 – The Week Ahead

CONSTRUCTION CONTRACTING
CON-244

	0800-0850	0900-0950	1000-1050	1100-1200	1200-1300	1300-1350	1400-1450	1500-1600	1600-1700
MON	Administration	Lesson 1 Introduction; Legal Aspects of Public Infrastructure;			Lunch	Lesson 2 Acqusition Planning Requirements		Macro Case Study Research	
TUE	Lesson 3 Solicitation Requirement		Lesson 4 Solicitation Evaluation and award		Lunch	Lesson 4 Solicitation Evaluation and award Case Study		Macro Case Study Development	
WED	Lesson 5 Contract Admistration Compliance		Lesson 5 Contract Admistration Compliance Case Study		Lunch	Lesson 6 Contract Administration Changed Conditions		Macro Case Study Development	
THU	Lesson 6 Contract Administration Changed Conditions Case Study				Lunch	Lesson 7 Invoices, Payment and Closeout		Macro Case Study Team Presentations	
FRI	Macro Case Study Team Presentations		Exam						

Homework: Read the material that will be discussed the next day.

Course Design – How CON 244 "Works"

CON 244 is a very rigorous course, and it will require a considerable amount of focused effort and discipline on your part to be successful. CON 244 will most likely be quite different than any other class you have taken before, and it is also very likely that nothing has prepared you for reading, interpreting, and applying the FAR and DFARS. Therefore to be successful, you must also develop the habit of looking things up before answering any questions and must not rely on your intuition and conventional wisdom. This will take some getting used to. The following description of the design of CON 244—How CON 244 "works" is provided in order to assist with this adjustment.

Application of Bloom's Taxonomy to CON 244

Like most Defense Acquisition University courses, CON 244 was designed in accordance with Bloom's Taxonomy of the Cognitive Domain. The cognitive domain developed by Dr. Benjamin Bloom and his associates is the most widely accepted in the development of competency/performance-based, criterion-referenced instructional designs. Bloom's Taxonomy is a classification scheme that breaks down cognitive processes into six steps/levels: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. Bloom's Taxonomy is considered a learning hierarchy because the next higher level subsumes each level of learning. That is, it is assumed that in order to function at the Application level, a learner must also be able to function at all levels below Application (Comprehension and Knowledge). Bloom's cognitive learning hierarchy is analogous to climbing a set of stairs. A learner must acquire factual knowledge before he or she can understand theory. She or he must comprehend theory before they can apply it, and so on up the hierarchy.

CON 244, are expected to complete the homework reading and research each evening *Knowledge* (Bloom's Level 1) as part of the preparation of the Capstone Case study. Each morning, your instructor will lead a discussion that will help you *Comprehend* (Bloom's Level 2) the information discussed the previous day and that you found in your homework readings. The instructor will explain (or ask students to explain) some of the key concepts regarding that particular topic. After the discussion, you will be spending most of the day engaged in group exercises and problems where you will be given an opportunity to *Apply* (Bloom's Level 3) what you have learned to real-world scenarios. This is where the majority of your learning will take place.

Student Workbook

Your student workbook is intended to be a reference guide and as such contains many examples and graphics that may help you recall that particular topic when you face it in your specialty assignment. Your primary reference material in will be the FAR, DFARS, and DFARS PGI. However as a specialty course, you will need to also access GAO protests and case studies, GAO Redbook ASCBA case law, Environmental Law, Labor Laws and Executive Orders covering a range of topics The typical lesson in the

student workbook will contain a discussion of a specific topic and the thumbnails of the slides that highlight that particular section. It is critical to your success in the class and in the field: the lesson is not contained in the slides, these are merely pointers to guide your way through the course.

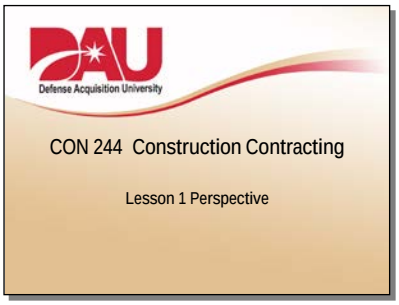
In-Class Exercises and Problems

Construction is one of the most litigious businesses in the nation and many times there is not a "right" answer" to a particular scenario. All of the case studies used in this course actually happened. But the same juxtaposition of facts will not ever occur again and your success in the future will rely on your judgment. The classroom answers are based on either factual information that can be found in the regulations or on an authoritative interpretation of the regulations found in decisions of the Government Accountability Office (GAO), the Armed Services Board of Contract Appeals (ASBCA), and the federal courts. However, there is no point in being correct if you cannot convince others that you are correct. Once the correct answer is revealed, it is critical that you understand why the given answer is the correct choice. The purpose of these exercises is for you to practice locating, interpreting, and applying information the in FAR, DFARS, and DFARS PGI to real world scenarios.

Course Exam

There will be one final open-book exam.

Lesson 1 – Perspectives



Lesson 1 introduces the course and is intended to answer the "so what" question. As a Level III elective, the prospective student should already be well versed in the FAR/DFARS. As such CON 244 focus should be on what is different when the contract is for facilities and not supplies. There are many factors which make this specialty field unique.

Overview

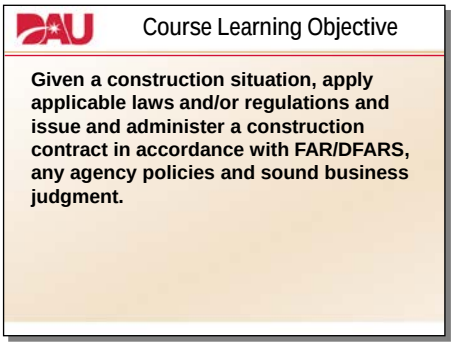
CON 244 is a position specific specialty course
And is one of several Contracting Level III elective courses.
Construction contracting is a complex business.
As an advanced contracting course, many of the answers will require research outside of the FAR/DFARS and may include specific applications of agency supplements, environmental law, fiscal law, zoning regulation and public safety.

As a Contracting Level III elective course, students are expected to be working at an advanced level and their work should reflect mature judgment, sound research and may require proper application or interpretation of conflicting regulatory guidance, to include Public Law, FAR, DFARS, Agency Supplements to the FAR, and legal precedence.

This lesson was designed to introduce the specialty field, the vocabulary, and highlight the topical areas where this specialty area is governed by unique regulations and requirements.

Lesson Details

Lesson Title	Perspectives
Terminal Learning Objective	Given a construction requirement to build a new facility, renovate an existing one, or maintain existing facilities, apply the Federal acquisition laws, regulations, Department of Defense supplementation, policies, procedures, and best business practices in soliciting and administering construction contracts.
Enabling Learning Objectives	• Examine the legislative history of Government contracting laws, regulations and procedures as they relate to facilities construction, operations and maintenance. • Summarize the most recent changes of law, as well as proposed ongoing changes, that will effect construction contracting.
Time Required	2 hours
Method of Instruction	Lecture, Exercises
References, Supplemental Readings	None.
Evaluation Method	Student performance will be assessed on Course exam and Capstone Case Study.



Lesson 1 – Perspectives

Introduction

This is a course in the particulars of construction contracting. The fundamental expectation is that the student already knows about the contracting processes required by the Federal Regulatory Guidance and therefore we will spend little time on those skills already covered in the other DAU Contracting courses. Instead we will focus on the differences and special considerations encountered in the Architect-Engineering or Construction contracting environments. As a point of reference chapter 1 includes a brief historical lesson to introduce the concepts and help identify the importance of these differences.

The purpose of this lesson is to provide a foundation for the basis of a construction contract, its history and an overview of some of the laws and regulations that impact construction contracts. The student will further develop the information they receive in this lesson to successful complete lessons 2 through 7 of the course.

Learning Objectives

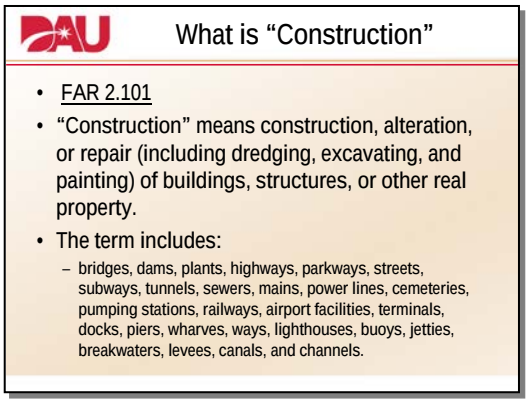
TLO: Given a construction requirement to build a new facility, renovate an existing one, or maintain existing facilities, apply the Federal acquisition laws, regulations, Department of Defense supplementation, policies, procedures, and best business practices in soliciting and administering construction contracts.

To achieve this learning objective, students must demonstrate the ability to:

- Examine the legislative history of Government contracting laws, regulations and procedures as they relate to facilities construction, operations and maintenance.

- Summarize the most recent changes of law, as well as proposed ongoing changes, that will effect construction contracting.

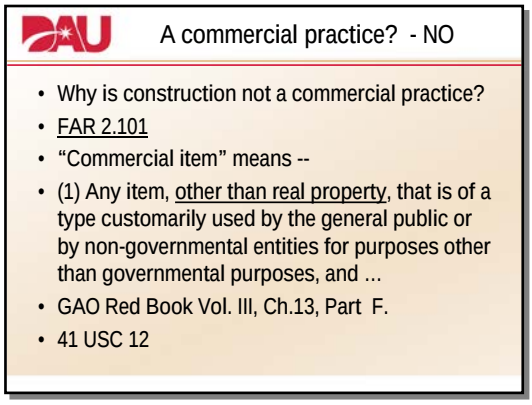
Construction vs Commercial Practices



1) What does the Federal Acquisition Regulations say about construction?

FAR 2.101 "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, or 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 (except that for use in subpart 22.5, see definition at 22.502).

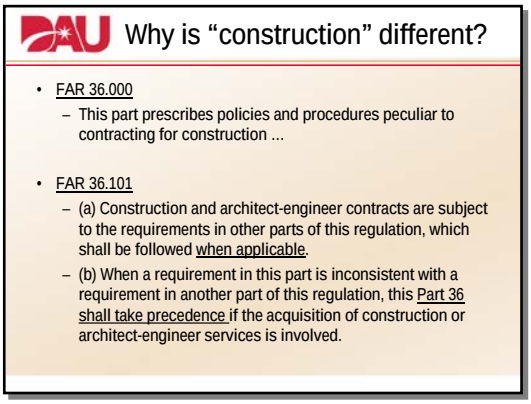


Many in the federal government believe that construction can be classified as a commercial category. However this is not true, as the Federal Acquisition Regulations require construction to be accomplished in accordance with Part 36 and further define the term "commercial" differently than we might do so in our private lives.

"Commercial item" means --

*(1) Any item, **other than real property**, that is of a type customarily used by the general public or by non-governmental entities for purposes other than governmental purposes, …"*

The term "real property" is further defined within the FAR definition of construction with the stipulation that it "includes but is not limited to" a wholesale list of anything that looks like a facility. Clearly the regulation anticipates that there are unique aspects of federal facilities and specifically sets them aside from commercial procedures.



Contracting professionals are often confused by this contrasting definition since "everyone" buys construction on the "commercial market" so it must be a commercial practice. However, even though it is a normal business to hire a construction firm, that singular event is not the whole story. In fact what comes with the initiation of a building project is a host of other professionals to include the city engineer, building inspector, city planners, zoning ordinances, building codes and a host of other possible conflicts.

The regulations also call out the term Building or work to further discriminate between construction and manufacturing:

"Building or work" means ***construction activity as distinguished from manufacturing, furnishing of materials, or servicing and maintenance work.*** *The terms include, without limitation, buildings, structures, and improvements of all types, such as bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, heavy generators, railways, airports, terminals, docks, piers, wharves, ways, lighthouses, buoys, jetties, breakwaters, levees, canals, dredging, shoring, rehabilitation and reactivation of plants, scaffolding, drilling, blasting, excavating, clearing, and landscaping.*

The manufacture or furnishing of materials, articles, supplies, or equipment (whether or not a Federal or State agency acquires title to such materials, articles, supplies, or equipment during the course of the manufacture or furnishing, or owns the materials from which they are manufactured or furnished) is not "building" or "work" within the meaning of this definition unless conducted in connection with and at the site of such building or work as is described in the foregoing sentence, or under the United States Housing Act of 1937 and the Housing Act of 1949 in the construction or development of the project.

Discussion: What is a Facility?

Each base and the facilities on it represents a platform from which the operations or functions will be run. But the distinction incorporates more than efficient and functional buildings. The ramifications of the facility design and construction extend far beyond the perimeter of the base itself and include traffic patterns, municipal economies, and public safety as well as air, water, and energy.

The Department of Defense Base Structure Report FY 2013 lists 555,074 buildings, structures, and linear structures worldwide with a stated Plant Replacement Value (PRV) at more than $847B. These facilities range from small communications stations to the newly renovated $1B Bethesda Hospital. Each of these facilities are expected to remain in service and functioning at state of the art levels for their entire design life – which is often as much as 100 years. Facilities themselves are further classified as expeditionary, temporary, semi-permanent or permanent a ranking which implies a life expectancy, level of service and to a certain extent the type of funding that can be anticipated.

In addition to buildings and structures DoD also manages over 28.5 million acres of land worldwide in the form of bases, installations and training ranges each of which requires an extensive array of utilities and transportation systems. As with the buildings themselves, there are a host of concerns that extend from protection of endangered species to protection of clean air and water, force protection issues and include safety of the public.

Real estate actions themselves – the buying, selling or leasing of public land - are regulated under Title 10 USC and are not included in the Federal Acquisition Regulations. Once in the public domain however, each of these parcels of land is operated by the military services in much the same manner as municipal public works. Building code enforcement, public safety and protection of the environment are paramount concerns. Similar to our municipal counterparts requiring citizens to obtain building permits and construction inspection before allowing a certificate of occupancy, federal regulations require base engineering personnel to maintain current licenses in their field as engineers, architects and public surveyors, current certifications as electricians, plumbers as well requiring host and tenant commands to process facility requirements through a design review and approval process.

DoD facilities often take on a life of their own due to the extended time required to complete environmental studies, real estate actions, design, construction, and commissioning services. Many in the acquisition workforce are not familiar with these requirements and legal ramifications which lead to conflicts as weapons systems are fielded. It is critical that new systems and revisions of existing systems be coordinated with the facility engineer.

Discussion Questions:

What is Plant Replacement Value (PRV)?

What is PRV based on and what does it lead to?

What is the average age of a DoD Facility?

What is the process used in the private sector market?

Reading Assignment

Consider the following vignette: Let's suppose you have a house and you want to build a deck on the back. You have a wonderful view and want to spend your evenings enjoying the evening sights. The choices are hire a contractor or perhaps even do it yourself. As a handyperson, you consider yourself pretty good, so you go to the local hardware store and buy the required tools and materials: lumber, screws, the joist hangers and piers. You may even buy a predesigned set of deck plans. And then you set to work. Sawing and nailing, leveling and bracing. Finally you are done and adjusting the deck chair for the evening show and there is a knock on the door: the city engineer with a citation for failure to file a building permit. Greatly troubled, you slowly walk back towards the deck but before you can refill your glass, there is another knock on the door from the leader of the local neighborhood association with a complaint – it seems your new deck encroached on your neighbor's view. Now permits, zoning, and building code: what in the world is going on?

Is this quandary the result of modern life? Actually, no, this type of scenario not new at all: In fact, this scenario has played out several times in mankind's history. As part of the agricultural revolution between 10,000 and 4,000 BC, the people living along the Nile River started building irrigation canals to control the annual flooding of the river. This system of canals increased until the covered literally hundreds of miles. The result of the irrigation systems that powered this first agricultural revolution was that a single farmer could now grow more crops than they needed for their individual survival and by their excess could feed others.

Now with increased leisure time people began developing other specializations and what grew from this was an entirely new civilization with a national government, and the beginnings of urban life with scribes, priests, artists, warriors and so on.[1] As settlements gave way to towns and then to cities, a division of labor and professional crafts like masonry, metalworking and woodworking emerged. Simple machines like levers and pulleys came into use, as well as nails. Arches, vaults and domes were used to create spans. As populations grew more numerous and denser than ever before in the valleys of the Nile, Euphrates and the Indus technology made the city-state obsolete. Since a river system is best managed as a whole, governments evolved and first began to regulate construction in an effort to establish and control local urban planning. From then to present day, the evolution of technology and civilization are inextricably interwoven.[2]

The first written account of this historical evolution is found nearly four thousand years ago when a number of Babylonian decisions were collected in what has come to be known as the "Code of Hammurabi", after the sixth ruler of the First Dynasty of Babylon.

[1] Florman, Samuel C. The Civilized Engineer, St Martins Press, New York, New York, 1987 p. 31.
[2] De Camp, L. Sprague, The Ancient Engineers, Barnes and Noble, New York, N.Y., 1960 p. 18

> *If a builder build a house for a man and does not make its construction firm, and the house which he has built collapse and cause the death of the owner of the house, that builder shall be put to death.*
>
> *If it cause the death of the son of the owner of the house, they shall put to death the son of that builder.*
>
> *If it cause the death of a slave of the owner of the house, he shall give to the owner of the house a slave of equal value.*
>
> *If it destroy property, he shall restore whatever it destroyed, and because he did not make the house which he built firm and it collapsed, he shall rebuild the house that collapsed from his own property.*
>
> *If a builder build a house for a man and do not make its construction meet the requirements and a wall fall in, the builder shall strengthen the wall at his own expense.*[3]

It is interesting that when reading a 1935 newscast about the most dangerous professions one gets a feeling that little had changed. "*The construction industry, perhaps, comes closer home, as most persons have watched the steel men, riveting the girders together; they have seen the bricklayers, carpenters, plumbers, roofers, tile setters, glaziers, at their work. Yet few persons probably realize that construction work ranks as one of the three most dangerous occupations. One-half the casualties in this field are caused either by falls of persons or by falling objects."*[4] In 1933, around 46 men died each workday across in the United States. And so it is that today, modern versions of the Code of Hammurabi are found in both the International Building Code and in Department of Labor Wage Determinations and Occupational Safety and Health regulations protecting owner and workman alike.

As the agricultural revolution created excess food, it also created leisure time where humans were no longer worried about mere survival. Archaeology provides some interesting examples of the works accomplished as a result of the relative leisure that was accompanied the change from hunter/gatherer to agrarian society. For example: Stonehenge was constructed over as much as 1000 years before taking its final form around 1500 BC. The Great Wall of China, the Inca's city of Machu Picchu and the new stone age settlement of Catalhuyuk all provide physical examples of mankind attempting construction feats for purposes larger than their own immediate family.[5] However, the first project for which records survive was the wall of the city of Memphis in early Egypt. This city was the capital of the Old Kingdom and was located about 12 miles above modern Cairo. [6]

---

[3] Petroski, Henry. To Engineer is Human, Barnes and Noble, New York, N.Y. 1985 p.3-4.
[4] http://blog.modernmechanix.com/2007/07/20/the-worlds-most-dangerous-jobs/
[5] Brown, David J. How Things Were Built Random Houser New York, N.Y., 1992.
[6] De Camp, p 29.

History is somewhat one-sided and we have learned much about the great kings and, warriors and priests, philosophers and artists but little about the engineers who built the stages on which these figures posed. While Julius Ceaser is almost a household name, the name Sergius Orata is almost unknown. However it was Sergius that developed the first system that enabled central indoor heating in the time of Julius Caesar. [7]

The first builder we know by name was Imhotep who was born in Memphis around 2700 B.C. and was charged with building a tomb for the Egyptian Pharaoh Zoser of the Third Dynasty. Imhotep chose to elaborate on the mastabas of the First Dynasty and created the first "stepped" pyramid by placing facing stones on a traditional mastabas and then piled stone on top.[8]

Virtually all of the early towns and cities developed on the banks of a river or navigable waterway. When any of these early settlements lacked in terms of self sufficiency of locally grown or produced items they depended upon a system of trade. In many cases a rudimentary system of trade can be traced back even to stone age people. For example in Boulder Colorado a Clovis Era stone tool cache was discovered during the excavation of a building foundation. The stone used for these tools came from Utah and Wyoming. Further, the specific flaking of these tools was unique and point to an individual toolmaker rather than a larger field of tool makers. Additionally a biochemical analysis traced the tools to the hunting and butchering of particular ice age animals and allowed scientists to establish a positive connection to 13,000 years ago.[9]

While most early civilized trade was by accomplished by water transportation, as settlements grew and spread to other fertile lands formally, which were not accessible, a system of roads became necessary both for the movement of goods and as a system for collection of taxes [10] The Arkadiko Bridge in Greece (13th century BC), one of the oldest arch bridges in existence is one of four Mycenaean corbel arch bridges part of a former network of roads, designed to accommodate chariots, between Tiryns to Epidauros in the Peloponnese, in Greece. Dating to the Greek Bronze Age (13th

[7] De Camp P.24
[8] De Camp p. 31, Petroski p. 54.
[9] http://www.colorado.edu/news/r/1124c0243883c267a7759da4bc4a2902.html
[10] Landels, J.G. Engineering in the Ancient World, University of California Press, Berkeley CA, 1978 p.170-186.

century BC), it is one of the oldest arch bridges still in existence and use. Several intact arched stone bridges from the Hellenistic era can be found in the Peloponnese in southern Greece.

When the development of settlements first gave way to towns and then on to cities, the people built houses close together and pretty much where they pleased. The resultant community was laid out with narrow winding alleys that ultimately led to congestion and problems of waste disposal and fire protection. Cities literally rose on hills of their own debris and older buildings could easily be distinguished since their entrances were below the current street level. In order to combat disease and congestion, even ancient metropolis were therefore forced to begin the regulation of traffic, waste disposal and building design.[11]

Urban Planning was first formalized by Hippodamus of Miletos (498 BC — 408 BC). Hippodamus is considered to be the "father" of urban planning and is the namesake of *Hippodamian plan* of city layouts (grid plan). He was born in Miletos and lived during the 5th century BC, on the spring of the Ancient Greece classical epoch. His plans of Greek cities were characterized by order and regularity in contrast to the more intricacy and confusion common to established cities of that period. He is seen as the originator of the idea that a town plan might formally embody and clarify a rational social order. This idealized city could be inhabited by 10,000 men (free male citizens), while the overall population including the correspondent women, children and slaves would reach 50,000 people. He studied the functional problems of cities and linked them to the state administration system. As a result he divided the citizens into three classes (soldiers, artisans and 'husbandmen'), with the land also divided into three (sacred, public and private).[12]

His "diamond" grid plans that he invented (and later named after him) consisted of series of broad, straight streets, cutting one another at forty-five and one hundred thirty-five degree angles. In Miletus we can find the prototype plan of Hippodamos. What is most impressive in his plan is wide central area, which was kept unsettled according to his macro-scale urban prediction/estimation and in time evolved to the "agora", the center of both the city and the society.

The "Urban Planning Study for Peiraeus" (451 BC), which is considered to be a work of Hippodamus, formed the planning standards of that era and was used in many cities of

[11] De Camp. P 56.

[12] Reeve, C.D.C. (1998), Aristotle's *Politics*. Indianapolis, Hackett Publishing. This incorporates text from a publication now in the public domain: Chisholm, Hugh, ed (1911). *Encyclopædia Britannica* (Eleventh ed.). Cambridge University Press.

the classical epoch. According to this study, neighborhoods of 240 square meter blocks were constructed where small groups of 2-floor houses were built. The houses were lined up with walls separating them while the main facets were towards the south. The same study uses polynomial formulas for the pumping infrastructure manufacture.

The ancient Romans used a consolidated scheme for city planning, developed for military defense and civil convenience. The basic plan consisted of a central forum with city services, surrounded by a compact, rectilinear grid of streets, and wrapped in a wall for defense. To reduce travel times, two diagonal streets crossed the square grid, passing through the central square. A river usually flowed through the city, providing water, transport, and sewage disposal.[13] The city was surrounded by a wall to protect it from invaders and to mark the city limits. Areas outside city limits were left open as farmland. At the end of each main road was a large gateway with watchtowers. A portcullis covered the opening when the city was under siege, and additional watchtowers were constructed along the city walls. An aqueduct was built outside the city walls.

Many European towns, such as Turin, preserve the remains of these schemes, which show the very logical way the Romans designed their cities. They would lay out the streets at right angles, in the form of a square grid. All roads were equal in width and length, except for two, which were slightly wider than the others. One of these ran east–west, the other, north–south, and intersected in the middle to form the center of the grid. All roads were made of carefully fitted flag stones and filled in with smaller, hard-packed rocks and pebbles. Bridges were constructed where needed. Each square marked by four roads was called an *insula*, the Roman equivalent of a modern city block. Each insula was 80 yards (73 m) square, with the land within it divided. As the city developed, each insula would eventually be filled with buildings of various shapes and sizes and crisscrossed with back roads and alleys. Most insulae were given to the first settlers of a Roman city, but each person had to pay to construct his own house.

The collapse of Roman civilization saw the end of Roman urban planning, among other arts. Urban development in the Middle Ages, characteristically focused on a fortress, a fortified abbey, or a (sometimes abandoned) Roman nucleus, occurred "like the annular rings of a tree",[14] whether in an extended village or the center of a larger city. Since the new center was often on high, defensible ground, the city plan took on an organic character, following the irregularities of elevation contours like the shapes that result from agricultural terracing.

The global evolution of urban planning continued through the renaissance and into the “modernist era of the 1920’s and has been paralleled by the various developments of the industrial revolution. With the transition from animal power to mechanical power, modern industrial factories came into existence as well as new building materials which

[13] Vitrivius, *The Ten Books on Architecture, Bk I*. Harvard University Press, 1914

[14] Siegfried Giedion, *Space, Time and Architecture* (1941) 1962, in reference to an air view (fig.8) of the medieval Italian town of Bagnocavallo. Giedion's source was Luigi Piccinati, "Urbanistica Medioevale" in *Urbanistica deal Antichità ad Oggi* (Florence 1943).

in turn, enabled ever larger, taller buildings and longer spans. With the development of newer building materials came a renewed building code which today is an international body of regulations called The International Building Code (IBC). The IBC is a model building code developed by the International Code Council (ICC). It has been adopted throughout most of the United States and much of the developed world.

Further development of this process remains ongoing to this day and vivid examples of the results of building code enforcement can be seen by contrasting the magnitude of devastation brought by recent earthquakes in Turkey, Haiti and Peru. In Haiti where corruption is rampant and building codes are all but non-existent, the city of Port-a-Prince was all but leveled. While a larger and more powerful quake in Peru resulted in far less widespread damage and significantly fewer lives lost in part due to construction standards and building code enforcement.

As Henry Petroski stated in To Engineer is Human, *"The risks that engineered structures pose to human life and environments pose to society often conflict with the risks of economy that striving for absolute perfection would bring… All bridges could be built ten times as strong as they presently are, but a tremendous increase in cost, whether financed by taxes or private investment. And, it could be argued, why ten times stronger? Since so few bridged collapse now, surely ten times stronger would be structural overkill."* [15] This overkill would no doubt strain the economy and so the hypothetical argument continues to a reduction in the factor safety to only five. But even there the argument can be made that since so few actually collapse perhaps that is still too high a price for the economy to bear.

It is true that less developed areas tend to see poorer construction technique utilized and with that comes a higher level of devastation and at what would appear to the uninformed as uncommon frequency.

It should be clear that a facility is fundamentally different from normal supplies and services. The contracting officer is bound by FAR 1.602 to ensure that all matters of law and regulation are covered in the contract and compliance with the same is attained in the processes used and the completed product. Federal, state and municipal governments represent the long term needs of a civilized society and the design, construction and the related topics of urban planning, building code and zoning are a unique and important aspect of modern life that must be regulated in order for the society to remain safe and effective.

When facilities are constructed off the military installation, the local municipality is responsible for enforcing the building codes, public safety and environmental protection. By contrast, on post, this responsibility rests with the field contracting office. And it has been this way since the beginning.

[15] Petroski, p. 6.

Discussion Questions:

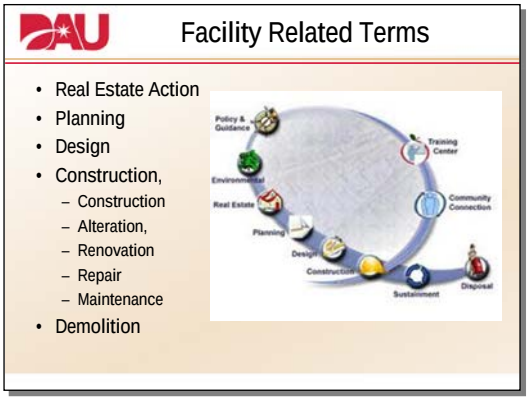
1. Why does the FAR break Buildings and “other real property” out from the potential for commercial contracting?

2. How does the government contract for Maintenance of real property?

3. The definition at FAR 2.101 does not include “demolition.” How do we contract for demolition of real property?

4. When should contracting be involved in the acquisition planning of a building or other real property?

Facility Related Terms



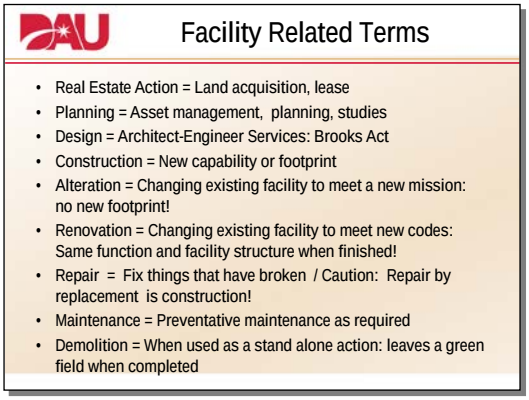
Facility related terms can be summed up in the FAR definition of "real property" which encompasses the following specialty areas :

Real Estate:

A contract involving the license, lease, purchase or disposal of Class 1 (Land) or Class 2 (Improvements to the Land) Real Property.

Planning:

Professional services responsible for urban design, asset management and forecasting future demands to ensure efficient use of federal facilities and the efficient connections to commercial utilities and local municipal interface.



Design:
Professional services contract involved in the development of technical plans, project specifications, and engineering details for construction, environmental studies, or facilities planning.

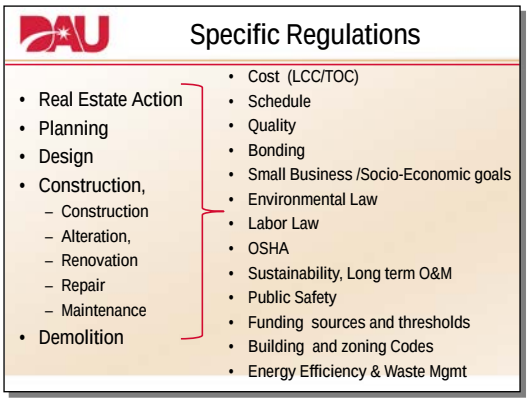
Construction:

"Construction, alteration, or repair (includes dredging, excavating, and painting) of buildings, structures, or other real property". Typically the contract format for these types of contracts uses Construction Specification Institute (CSI).

Service:
A contract that directly engages the time and effort of a contractor whose primary purpose is to perform an identifiable task rather than to furnish a product or supply. Most often, as outlined in the FAR these types of contracts use the Uniform Contract Format (UCF).

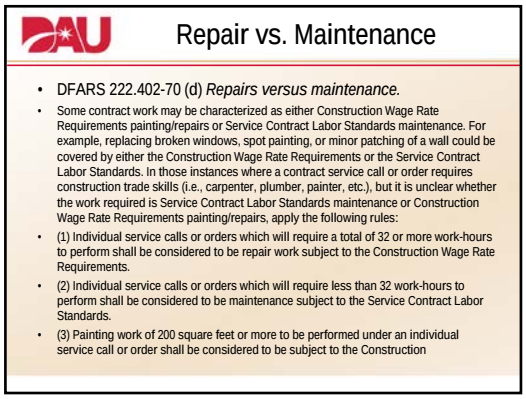
Utilities:
A contract for the purchase of utility services from a commercial source such as a power company or gas company.

Specific Regulations



Each of these terms are based on FAR 2.101, DoD FMR, and case law. Each of these represent significant concerns for the contracting professional and will be further discussed in this course.
Note FAR 1.602-1 (b) No contract shall be entered into unless the contracting officer ensures that all requirements of law, executive orders, regulations, and all other applicable procedures, including clearances and approvals, have been met.

It is important to establish a distinction between each of these terms or contract phases. Each of which is based on federal law or regulations. Proper classification of the type of work is critical and may have a significant impact on type of contract, management required and types of funding allowed.



DFARS 222.402-70 Installation support contracts.

(a) Apply both the Service Contract Labor Standards statute and the Construction Wage Rate Requirements statute to installation support contracts if—

(1) The contract is principally for services but also requires a substantial and segregable amount of construction, alteration, renovation, painting, or repair work; and

(2) The aggregate dollar value of such construction work exceeds or is expected to exceed $2,000.

(b) Service Contract Labor Standards statute coverage under the contract. Contract installation support requirements, such as plant operation and installation services (i.e., custodial, snow removal, etc.) are subject to the Service Contract Labor Standards. Apply Service Contract Labor Standards clauses and minimum wage and fringe benefit requirements to all contract service calls or orders for such maintenance and support work.

(c) Construction Wage Rate Requirements statute coverage under the contract. Contract construction, alteration, renovation, painting, and repair requirements (i.e., roof shingling, building structural repair, paving repairs, etc.) are subject to the Construction Wage Rate Requirements statute. Apply Construction Wage Rate Requirements

clauses and minimum wage requirements to all contract service calls or orders for construction, alteration, renovation, painting, or repairs to buildings or other works.

(d) Repairs versus maintenance. Some contract work may be characterized as either Construction Wage Rate Requirements painting/repairs or Service Contract Labor Standards maintenance. For example, replacing broken windows, spot painting, or minor patching of a wall could be covered by either the Construction Wage Rate Requirements or the Service Contract Labor Standards. In those instances where a contract service call or order requires construction trade skills (i.e., carpenter, plumber, painter, etc.), but it is unclear whether the work required is Service Contract Labor Standards maintenance or Construction Wage Rate Requirements painting/repairs, apply the following rules:

(1) Individual service calls or orders which will require a total of 32 or more work-hours to perform shall be considered to be repair work subject to the Construction Wage Rate Requirements.

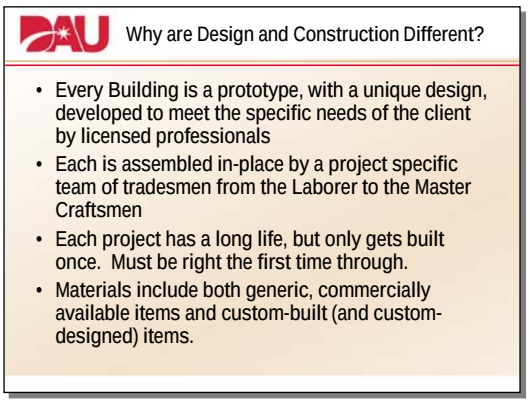
(2) Individual service calls or orders which will require less than 32 work-hours to perform shall be considered to be maintenance subject to the Service Contract Labor Standards.

(3) Painting work of 200 square feet or more to be performed under an individual service call or order shall be considered to be subject to the Construction Wage Rate Requirements statute regardless of the total work-hours required.

(e) The determination of labor standards application shall be made at the time the solicitation is prepared in those cases where requirements can be identified. Otherwise, the determination shall be made at the time the service call or order is placed against the contract. The service call or order shall identify the labor standards law and contract wage determination which will apply to the work required.

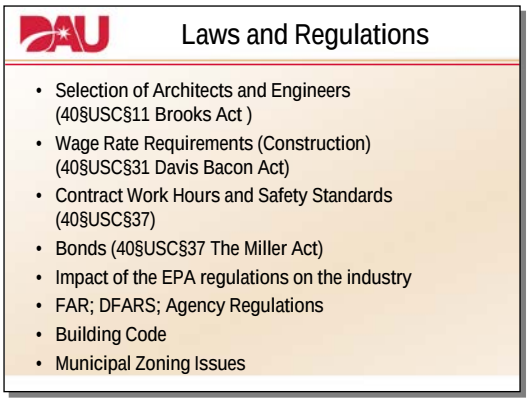
(f) Contracting officers may not avoid application of the Construction Wage Rate Requirements statute by splitting individual tasks between orders or contracts.

What is the Difference?



Regardless of the acquisition vehicle selected, all construction projects require development of a design. Ultimately, the primary purpose of the design is to PROTECT THE LIFE SAFETY OF THE PUBLIC. This is the reason for licensure of design professionals in every State in the Union. The public at large has the right to expect that buildings and structures that they may occupy will be safe for their entry. This includes a myriad of issues from structural integrity to means of safe egress and fire protection requirements.

Further, every construction project is a prototype, uniquely designed to suit the application at hand and built once, on the particular site, using skilled tradesmen. No design can be placed on a unique individual site without a thorough review of the site-specific issues including foundations, drainage, and environmental impact and so on. Even seemingly simple repair and rehab projects are fraught with potential life-safety and other issues requiring professional analysis. Changing out system furniture can have unanticipated and life threatening effects on emergency egress or fire suppression system patterns.



Through the 1930a designs were predominately done by in-house engineers and architects. In 1939 the first laws were enacted allowing A/E services to be contracted. This granted Contracting authority, but did not provide selection procedures.

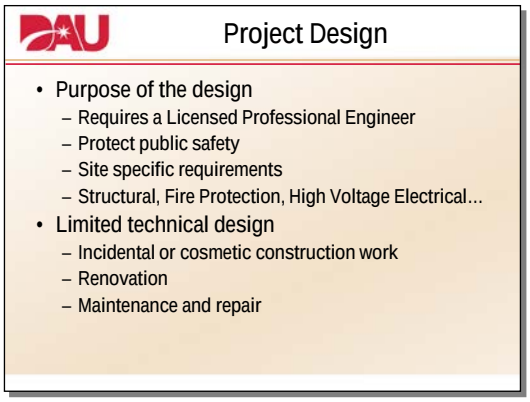
In 1972 the Brooks Act was passed.[16] This formally established procedures for a Technical competition similar to source selection procedures. Specifically the process required selecting firms on qualifications – "Best Qualified." In fact cost cannot be used as an evaluation factor and is not discussed until after the determination of the best technically qualified. The process is considered

[16] In 2014, the Brooks Act was renamed Selection of Architects and Engineers Statute

to be in compliance with competition in contracting act and requires a Public Announcement of all A/E services and formal selection criteria.

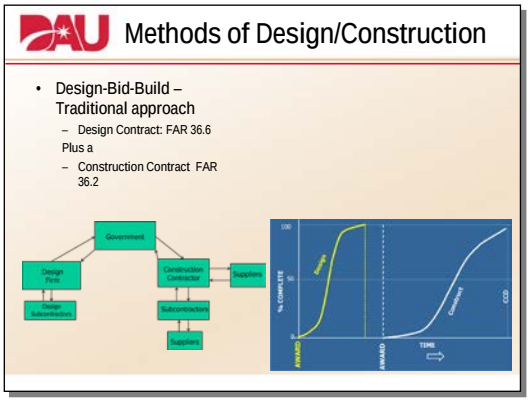
Interested firm must submit or update qualifications statements annually and are selected Qualification and Competence – only. The top 3 firms are ranked and negotiations to obtain a fair and reasonable price are held only with the highest qualified firm.

Design and Construction



A design is essential to construction, and no project should be undertaken without one. Note that construction is NOT considered to be a "commercial item" by the FAR.[17] Merely changing ceiling tiles can affect the Heating Ventilating and Cooling System (HVAC) or cause unintended electrical or communication system failures.

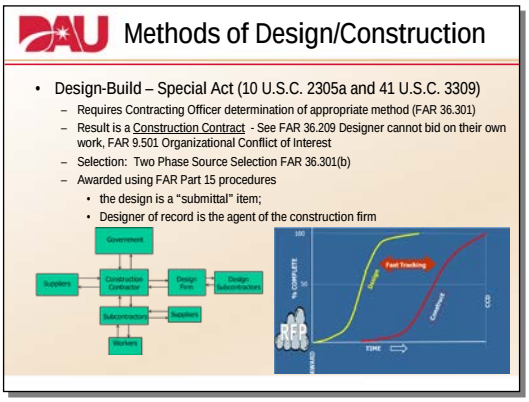
The timing of when the design is developed and who accomplishes the design is flexible, as long as it is accomplished, reviewed and approved prior to the construction taking place. This is the primary difference between the Design-Bid-Build approach and the Design-Build approach.



In the Design-Bid-Build approach there are two contracts in which the client utilizes the expertise of the A/E firm to fully develop requirements including reasonable alternatives before contracting for the construction. The Architect Engineer portion is awarded using the procedures required under the Selection of Architects and Engineers Statute. To properly define the requirements, Construction Specifications Institute (CSI) Guide Specifications are used by the designers. The construction portion of a Design-Bid-Build contract is awarded using Sealed Bidding Procedures or Negotiated Procedures. If the requirements for the work are well defined and no discussions with the prospective contractors are required, FAR 36.103 and FAR 6.104(a) mandates sealed bidding as the traditional and preferred method. However, if any one of the four reasons at FAR 6,104(a) does not apply, like there is a need to hold discussion, then contracting office may select negotiated procedures.

[17] FAR Part 2.101 reads in part "Commercial item means – (a) Any item, *other than real property*, that is of a type customarily used … "

The Design-Build process is a single construction contract that requires the government to define the requirements for the project in terms of a broad performance specification. Construction contractors either as joint venture or retaining an architect as a sub-contract, then propose design solutions to meet the requirements as stated. Since discussions are vital to ensuring that the government's requirements are met, these contracts are typically awarded using a Negotiation Procedure of one kind or other, such as "Lowest Price – Technically Acceptable" or "Trade off".



Design-Build contracts typically provide some advantages in that procurement lead time can be significantly reduced by combining the design and construction procurement process and that the number of modifications can be greatly reduced by transferring responsibility for design errors and omissions to the A/E/Construction team vice the A/E/Government team. However, this strategy is only appropriate where the customer can clearly define their requirements in terms of performance, without the detailed description provided by a design.

In Design Build, the single contract is awarded via FAR Part 15 procedures and is therefore a construction contract by definition and the architect/engineer team represents the contractor: They cannot represent the government or serve two masters. This partnership assists in communication between designer and constructor and the government is no longer in between. The down side is the designer is now on a for profit basis as opposed to best design or government's best interest.

Customer requested changes or mission changes can be extremely costly in Design-Build contracts due to design change impacts. Design-Build contracts are generally firm fixed price type.

The method of contracting is generally Negotiation, (Source Selection). A formal design for the project is still required, and is submitted after award by the successful contractor to the government for approval. The approved design contains the normal technical requirements for execution of the construction. The roles of the government and the contractor during execution remain the same, with the exception that the role of the designer is contained within the construction contractor.

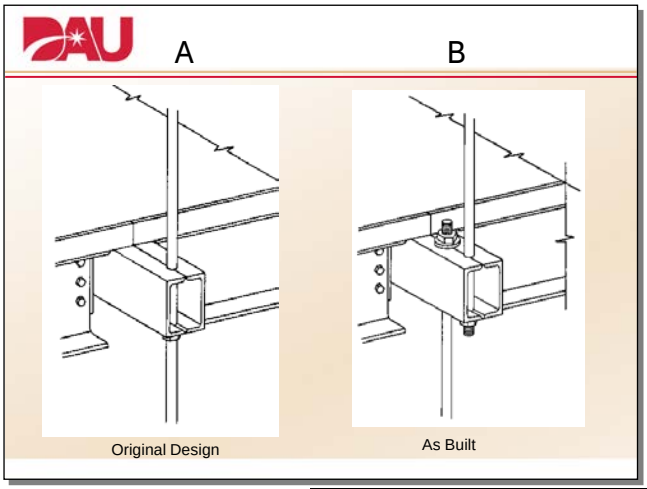
Case Study

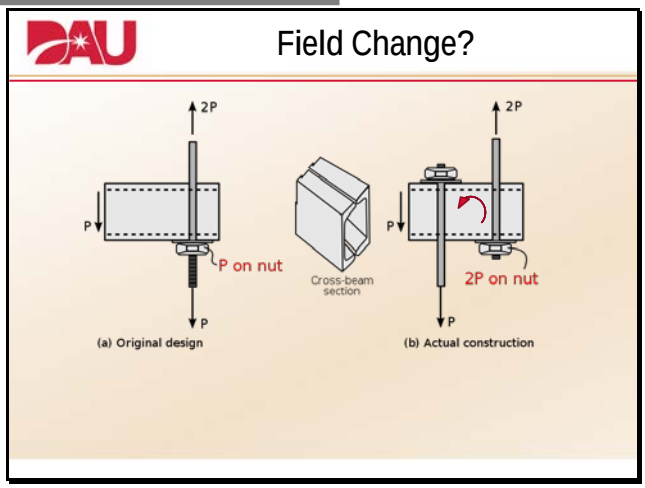
One of the defining features of the facility was its lobby, which incorporated a multistory atrium spanned by elevated walkways suspended from the ceiling. These steel, glass and concrete crossings connected the second, third and fourth floors between the north and south wings. The walkways were approximately 120 ft (37 m) long and weighed approximately 64,000lb (29,000kg). The fourth level walkway aligned directly above the second level walkway.[18]

This facility was considered to be state of the art. One evening, approximately 1,600 people gathered in the atrium to participate in and watch a dance competition. Many people stood on the two connected walkways. At 7:05 p.m. the second-level walkway held approximately 40 people with more on the third and an additional 16 to 20 on the fourth level who watched the activities of the crowd in the lobby below.

As designed, the fourth floor bridge was suspended directly over the second floor bridge, with the third floor walkway offset several meters from the others.

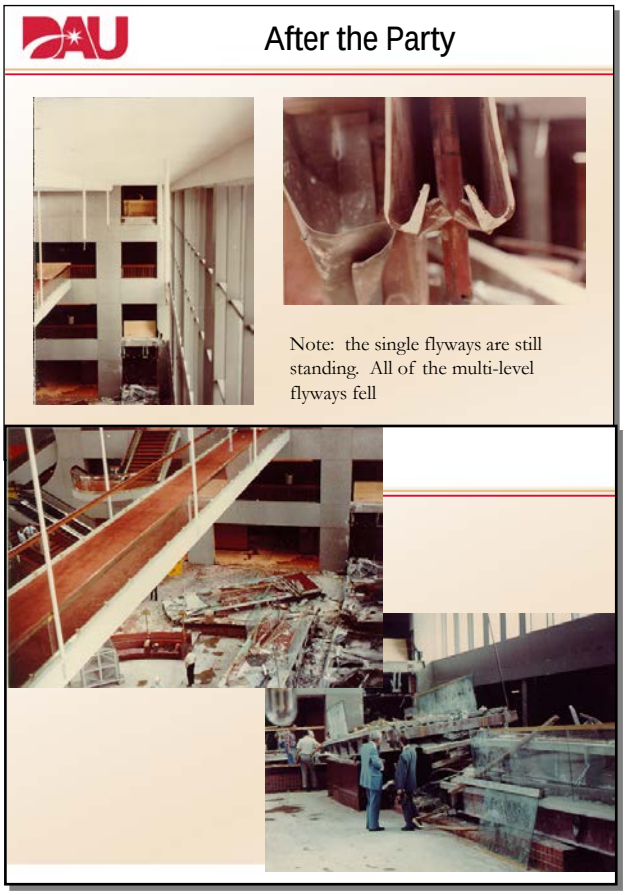
[18] http://www.commandsafety.com/2011/07/17/the-hyatt-regency-walkway-collapse-1981-the-begining-of-urban-heavy-rescue/





The two walkways were suspended from a set of 1.25 in (32 mm) diameter steel tie rods, with the second floor walkway hanging directly under the fourth floor walkway. The fourth floor walkway platform was supported on three cross-beams suspended by steel rods retained by nuts. The cross-beams were box girders made from C-channel strips welded together lengthwise, with a hollow space between them.

The contractor responsible for manufacturing the rods, objected to the original plan, since it required the whole of the rod below the fourth floor to be screw threaded in order to screw on the nuts to hold the fourth floor walkway in place. These threads would probably have been damaged and rendered unusable as the structure for the fourth floor was hoisted into position with the rods in place. In place of this design, they proposed an alternate plan in which two separate sets of tie rods would be used: one connecting the fourth floor walkway to the ceiling, and the other connecting the second floor walkway to the fourth floor walkway.



This new design was barely adequate to support the dead load weight of the structure itself, much less the added weight of the spectators. The connection failed, and the fourth-floor walkway collapsed onto the second-floor walkway. Both walkways then fell to the lobby floor below, resulting in 111 deaths at the scene and 219 injuries. Three additional victims died after being transported to hospitals, bringing the total number of deaths to 114.

Note the single flyways are still standing but multi-level ones all fell.

This represents one of many subtleties of the original design, often conflicting regulations and the request for field changes due to “easier” or “more efficient construction.” In this case the field change approved by the designers during construction more than doubled the load on a singular nut.

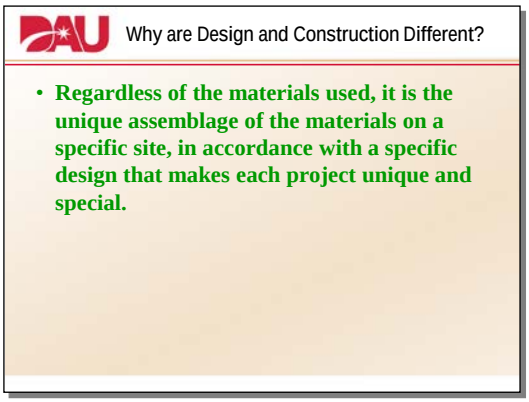
Discussion Questions:
1) .Describe the responsibility of the Designer/Engineer of Record.

2. Describe the responsibility of the construction contractor.

3. Describe the responsibility of the facility owner.

4. Describe the responsibility of the Contracting Officer (had this been a government project).

Summary



"Why is Construction different?: Regardless of the materials used, it is the unique assemblage of the materials on a specific site, in accordance with a specific design that makes each project unique and special.

The reason this field is different and will remain different from "commercial" practices as defined by the FAR is that:

- Every Building is a prototype, with a unique design, developed to meet the specific needs of the client by licensed professionals

- Each is assembled in-place by a project specific team of tradesmen from the Laborer to the Master Craftsmen

- Each project has a long life, but only gets built once. Must be right the first time through.

Materials include both generic, commercially available items and custom-built (and custom-designed) items.

And finally, Regardless of the materials used, it is the unique assemblage of the materials on a specific site, in accordance with a specific design that makes each project unique and special.

And it has been this way since the beginning of the agricultural revolution. This difference is why this course exists and why the FAR separates "real property" from all other acquisitions.