

The Quest for Scope Descriptions

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Presentation Outline

1. What is a Scope Description
2. Two major types of Scope Descriptions
3. Why are Scope Descriptions Important
4. What the Buyer (you) can do to Improve Scope Descriptions
5. Mechanics of Writing Scope Descriptions
6. Estimating, Pricing, and Paying to Match Scope Descriptions

Definitions

- **Purpose** – the original intent of production. The reason for which something is done or created or from which something exists.
- **Scope** – the extent of the area or subject matter that something deals with or is relevant
- **Description** – representation or account of a person, object, or event
- **Specification** - an act of describing or identifying something precisely or of stating a precise requirement; a detailed description of the design and materials used to make something; a standard of workmanship, materials, etc., required to be met in a piece of work.
- **Contract** – An agreement concerning employment, sales, or tenancy to be enforceable by law; an agreement between two or more parties for the doing or not-doing specified.

Note: For the purpose of this presentation “specifications” are a type of “description.” The word “specifications” or “scope of work” or “statement of work” are avoided to reduce confusion.

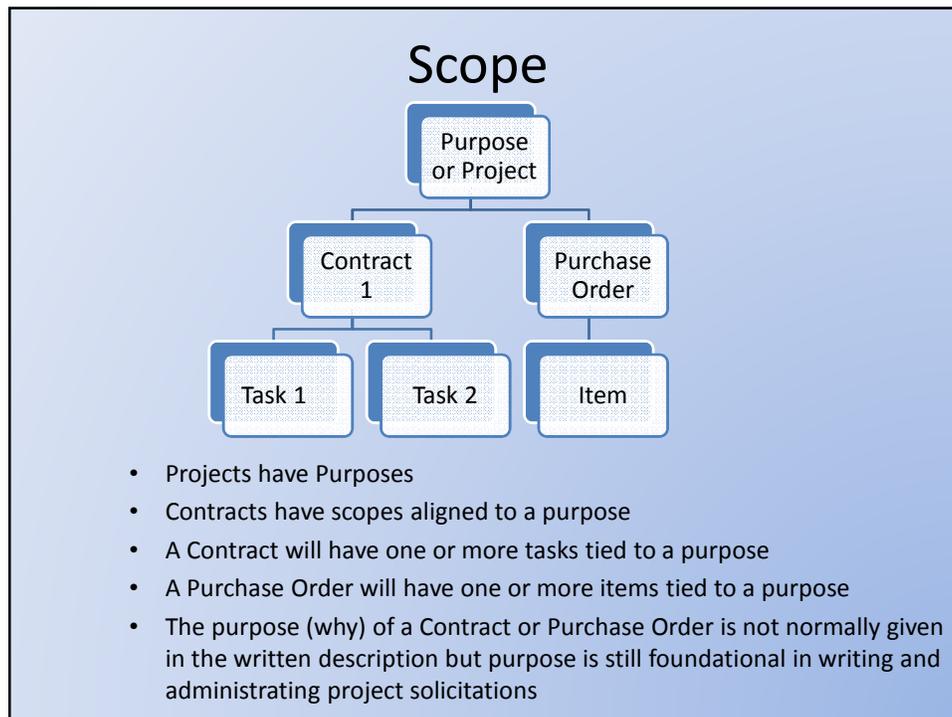
What is Purpose?

- Where is the greatness of a man or a woman?

“The greatness of a man or a woman is determined by the purpose he or she lives for; and his or her readiness and willingness to pay the price to achieve it.” *Michael Masambu, Inspirational Speaker and Trainer of Youth in Kenya, member of Kenya Anti-Corruption Task Force*

- What is the purpose or value in a contract?

“The value of a contract is determined by its purpose or use, and the readiness and willingness of the parties engaged to pay the price and commit the required resources to achieve it.”



“Scope Description” for Goods or Services

- **Scope Description for Contracts.** A representation or account of a person, object, activity, or event for the purpose of achieving clearly defined tasks or objectives that the parties agree to and ready and willing to pay to achieve it.
- **May take numerous forms, but typically:**
 - Performance descriptions (perform as intended)
 - Design descriptions (perform as indicated)

Scope Descriptions: Performance vs. Design

Performance Descriptions (Results) = As Intended

- Contractor has responsibilities to meet results with whatever means, methods or techniques selected based on performance criteria.
 - Requirement, criterion, test based on attributes and characteristics
 - Example - The HVAC system shall be capable of maintaining the interior temperature at 72 degrees, when exterior temperatures range from - 20° F to 115° F.

Design Descriptions (Method or Detail) = As Indicated

- Materials, installation requirements, procedures, methods, techniques, cookbook, shopping list.
 - Example - Concrete installation is 3000 PSI, hand or batch mixed (ACI 318)
 - Example - Steel is ASTM A6 erected per AISC Steel Detailing Manual

Why Not Both?

- Can and is often done.
- However, it is unwise to do both (causes duplications, confusion)

The Importance of Scope Descriptions

- The scope description is the Heart of the decision of how to procure. It is the Heart of the contract or Agreement.
- Without a good description:
 - Type of contract for the risk cannot be properly chosen
 - Complete bids or proposals will not be received
 - Evaluation of responsive / non-responsive will be very difficult
 - Incomplete descriptions may result in incomplete performance, increased cost, or potential litigation
 - Performance monitoring (acceptance criteria) difficult or impossible to enforce

Ask Questions: “Pay now, or pay later”

Does the Buyer know what is wanted? This is not just a technical problem...

What to Ask:

- What is the problem that is being solved? Purpose
- Is the Project or Technical representative vested in the scope?
- What technical skills are required: Engineering, Project Management, Planning, Safety, Quality, Manufacturing, Construction, Finance, IT,...
- What is the end product (performance descriptions)? Are design specs needed? Design or performance descriptions?
- Specify “what”, not “how” if possible. Clear, concise, complete, correct, comprehensive, comprehensible.
- Red Flags? Price determined, negotiating strategies, noticing mixed motivation, dealing with exposure and control issues, resistance

How to Ask:

- Always be: Assertive, supportive, listen, consider the group (political) aspects.
- Express trust/confidentiality, be direct, be true to yourself.
- Solicit feedback, and be helpful.
- Know you have a right to your own needs in any relationship: To be included, to have access and ask questions, you are entitled to have your needs met.
- Ultimately, it is manager’s choice. Be sure to make them conscious of their choices. Be grateful and gracious.



Ref. Flawless Consulting, Peter Block, “Techniques Are Not Enough.”

What the Buyer Can Do

- It is up to you to make sure your contract will work or your going to have a lot of late nights fixing what is broke.
- Assure that all parts of the description are in accordance with company procedures.
- Review the description for contractibility
 - Are there potential issues of impossibility to perform?
 - Is the work arranged in a logical sequence?
 - Is there sufficient time for performance?
 - Conflicts between drawings, description, and CADD model?
 - Duplications?
- Determine how well the scope is described
- How much risk is being imposed on potential contractors to price the work?
- How will price be determined based on the scope description and pricing instructions?

What the Buyer Can Do: Opportunities Missed

- A fair process will reduce costs, and increases competition.
- Honest communications increase understanding and decrease risks.
- Contractors want to work collaboratively and to be co-participants in the process
- The parts together can be larger than the whole.
- Negotiate. If scope is on the table, there may be ways to decrease cost at no loss of anything of value. The better the Buyer understands scope, the greater the possibility of win-win negotiations.

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My Process At Hanford

- First check SOW (and all associated contract documents, and all references) for **duplications or irrelevance and eliminate**.
- Second, ensure all **tasks are described, placed in logical order, and are completely priceable**.
- For **building erection**. **Insist on detailed design specifications** using Building System Design or other similar specification subscription service using engineers or architects experienced in CSI specifications, and Hanford specific requirements.
- There is a common belief that **"commercial methods" are less safe than "Hanford procedures."** **This is not the case.** For contractors engaged in specialty construction, **using methods different from their industry is less safe**. Be conscious, therefore of these types of decisions. Our procedures are not always best, but they may be, and are often unavoidable standards. **What is different from industry needs to be minimized to what is valuable and necessary.** Find out from industry if you don't know, and check it against what you are hearing from the originator.
- Check **SOWs against company standard templates, and basic engineering process requirements**. This requires a Procurement Engineering skill set but is often vital for large, complex, multi-phase solicitations. Know enough about project and engineering procedures to ask intelligent questions like: "What will be the interfaces between the Contractor and the Operating Facility hosting the construction activity?" Understand the roles of all the parties in a position to impact the Contractor.
- **Don't just accept a new SOW from a user. Sit down and talk with originator.** Have them describe the mechanics and expectations of the project. There is much to learn in EPC coordination, project phasing, and construction sequencing that bears on price and efficiency. Learning these processes is necessary in my opinion for contract professionals. I have learned that EPC, Facility Design Build, D&D, Roads, Roofs, Electrical Upgrades, Large Pump Contracts, and many other types of procurements are done differently from each other. Spend time listening and learning.
- Next read the **SOW out loud, and follow the "Mechanics of Description Writing" section** of this presentation to improve the language. This should be done with all the Contact Documents, and changes to SOW accepted by the originator.
- Where possible, **set up a pricing table that accounts** for each task (performance specification), or for quantiles of every item (design specifications based on drawing take off tables as commonly used for heavy civil projects like highways, or environmental remediation).

Buyer to Coordinate Scope with Other Contract Aspects

Consider the following before you start:

- What is in scope?
- In writing? Sometimes interrupting work flow can also be a change.
- Who has authority to authorize the change?
- Consent of surety?
- Price agreement?
- Schedule agreement?
- Fee agreement?
- Performance or design (procedure) Descriptions?
- Disrupt previously planned sequence of work, deliveries, coordination, schedule logic?
- Method of work changed?
- Longer time on site?
- Backtracking and rework?
- **Only the Contracting Officer can authorize!**

Examples from Experience

- For large centrifugal pump procurements at Hanford for domestic water supply. A decrease of nearly \$500,000 was achieved once expectations for welding program certifications, and other nuclear grade requirements were removed for the commercialized specifications in exchange for commercial pumps and standard manufacture warranty provisions which were more beneficial and exceeded the original requirements.
- A decrease in contract drilling prices were achieved by: 1) competing all drilling contracts on a unit price basis for the period of a year based on typical level of effort; 2) submittal and training coordination difficult for the subcontractor at the Hanford site in exchange for price reductions from all suppliers; 3) immediate and fair evaluations of all subcontractors delay and impact claims in lieu of summary avoidance decisions by the BTR for all delays
- Well crafted SOW, plus market research on numerous procurements with potential subcontractor experts produced greater competition in the areas of : 1) Nondestructive Assay Projects, 2) Heat Exchangers, 3) Roads, 4) Roofs, 5) Environmental Documentation, 6) Tanks and Vessels, 7) Fabrication Procurements, 8) Procurements for Engineering Services (Task Based, and Resource Based).

Scope Descriptions are For?

- Contractor's Estimator
- Contractor's Job Site Superintendent / Project Manager
- Contract Officer
- Engineering Office
- Field Office
- Client or Project Sponsor
- Material Providers and Subcontractors

Mechanics of Description Writing

Writing Basics (any method)

- Clear (complete, correct, comprehensible)
- Concise: **Contractor** shall **(perform what)** at **(location)** in accordance with **(Descriptions and drawings)**.
- Not repetitive (demonstrates poor organization)
- Written in contracting language so all parties understand their respective roles and interfaces
 - “Contractor shall”
 - “Client will”
- Avoid legal phraseology
- Get organized! Knowing where to look is critical.

Example

Contractor **shall** construct XYZ facility **at** ABC location **in accordance with** attached civil/structural drawings and division 1-4 Descriptions. Work **indicated** is as follows... all work shall be completed by **date**.

Addresses: **Why**, who, **what**, where, how many and applicable standards

When: **When** is addressed if it represents a constraint for “outage requirements” or by a completion date. Otherwise leave the sequence, and schedule details to contractor’s bid/proposal. It is best to address **when** in the contract documents or bid instructions.

How: Left for the Contractor to determine based on means, methods, and techniques.

Differences Between “Design Descriptions” and “Performance Description” Writing (Cont.)

- Design Descriptions
 - Write in passive voice, making the material or service the subject of the sentence. Never make the contractor the subject of the sentence. Indicate in passive voice.
 - *Concrete installation is 3000 PSI, hand or batch mixed*
 - *Steel is ASTM A6 erected per AISC Steel Detailing Manual*
 - Descriptions are shopping lists and cookbooks.

Differences Between “Design Descriptions” and “Performance Description” Writing (Cont.)

- Performance Description
 - Write in active voice, making the Contractor (Buyer or others) the subject of the sentence.
 - *The Contractor shall construct the XYZ facility by (date)*
 - *Buyer will provide the following equipment.*
 - *Contractor shall provide and install 3000 psi concrete*

Common Scope Description Problems

- Contain descriptions which do not apply
- Too wordy and difficult to read
- Conflict with contract, drawings, or within the description itself
- Not written by experts
- Mix “as intended” and “as indicated” descriptions unwittingly.

The Role of Descriptions

- Constitute one of the contract documents, together with the drawings and the agreement
- Written instructions
- Adjudged by the courts as having greater importance than drawings when in conflict
- Segregates information depicted on drawings into various description sections so that a contractor can generally let subcontracts on the basis of the description breakdown of sections (*applies to design descriptions only*)

Source: Principles and Practices of description Writing, Harold Rosen, PE, FCSI

1st Law of Description Writing

Say it once, and only once

Do not:

- Duplicate information in both drawings and descriptions
- Try to amplify – different words cause conflict and ambiguity

2nd Rule of Description Writing

- Be precise, not vague
 - Vague language cannot be enforced
 - Vague language still costs the Client money
 - Measurable; Smooth = how smooth?
- Avoid :
 - Discussion on why, project history
 - Materials or services not in the scope of the contract, except when the interface is not clear:
 - Example: “The cable will be terminated in the control panels by Western.”
 - Using old descriptions; get rid of what is not applicable

Description Language

- Every word used has a price tag
 - Avoid legalese, pettifogging, and equivocation - use plain language
 - Write at the level of the worker
 - Use clear, complete, concise, correct, comprehensible (5Cs) language
- Avoid words like:
 - *May be required*
 - *Unless waived*
 - *Reasonable or Acceptable (unless specifically defined)*
- Minimize Cross-References
- Break complex tasks into parts and organize

Avoid All-inclusive Phraseology

- “The Contractor shall provide all labor, materials, equipment, and each and every item of expense regardless as to whether the item is indicated in the drawings or Descriptions, **or not specifically shown in the drawings or Descriptions**, but as necessary for the full and complete construction of the building.”
- Statement is fine if the job is cost plus
- The incompetent always hide behind lazy, unclear, unfair, and oppressive contracting clauses
- These are called murder clauses by many contractors

Estimating, Pricing, and Paying to Match Scope Descriptions

Estimator's Needs

- From the drawings and Descriptions provided.
 - Perform a take off for materials
 - Identify tasks
 - Develop bid schedule
 - Reduce time in complying with complex pricing exercises since compensation is unlikely

Estimating, Pricing, and Paying to Match Scope Descriptions

Contract Specialists Needs:

- Establish basis for fair and reasonable pricing
- Manage changes to scope, or equitable adjustments for delays caused by Client
- Reduce to a minimum frivolous changes and harassing claims
- Conform to FAR and procurement policy

Estimating, Pricing, and Paying to Match Scope Descriptions

Suggestions

- Choose only one type of contract: FP/FUP, T&M, or Cost.
- Keep pricing structure simple use unit pricing as needed.
- Identify risk, and areas of likely changes such as Client caused delays
 - Clearly and succinctly delegate these liabilities, or
 - Work out a mechanism for equitable adjustment
- Do not hide risk or rely on legal catch phrases
- Answer, listen, be considerate, be just
- Never pay a dime which is not reimbursable or give in to contractor tactics

This will reduce cost in the long run.

Example

SECTION B SUPPLIES OR SERVICES AND PRICES BIDDING SCHEDULE _____ SUBSTATION, STAGE __					
Item No.	Work or Material	Estimated Quantity	Unit	Unit Price	Amount
1.	Mobilization and preparator		LS	\$	
2.	Demolition		LS	\$	
3.	Concrete foundations		CY	\$	
UNIT ABBREVIATIONS					
CY = cubic yards EA = each LF = linear feet LS = for the lump sum of					

1. Start by identifying major scoped elements
2. Provide an engineer's estimate of quantities (these will be checked by Offerors, but help to clarify a common understanding of the Work)
3. Ensure each service task / product is specified or in the drawings
4. Provide a cross-reference for easy checking by the Offerors
5. Make this as easy as possible

Questions?



Back up Materials

- These materials are not part of the presentation, but are back up materials from similar presentations.

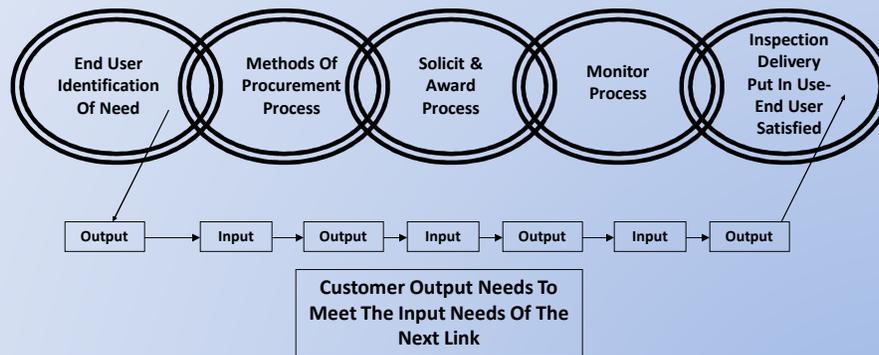
The Award

Monitoring
Changing
Paying
Accepting

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Supply Chain Process

(The Chain Is Only As Strong As The Weakest Link)



THE SUPPLY CHAIN IS A SERIES OF SEAMLESS, VALUE ADDED PROCESSES THAT CROSS INTERNAL AND EXTERNAL BOUNDARIES TO MEET THE NEEDS OF THE END CUSTOMER.

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Changes

There Just is No Substitute for Doing the Job Right!

“In their effort to insulate themselves from liabilities and extra costs born out of defects in the contract or its administration, the drafters of construction contracts combine layer upon layer of phrases, clauses, references, standards, boilerplates, exculpatory language, and so on in a scramble to shield themselves from every conceivable impregnation, to the point where the front-end documents have finally become fatter than the technical description. It all seems foolish.

Ironically, it is this overly enthusiastic abundance of complicated dissertations on contractor’s responsibilities that may actually increase the likelihood of conflict – and therefore change orders.”

- “Contractor’s Guide to Change Orders”, page 35, Andrew M. Civitello, Jr.

Changes



Spearin Doctrine

United States v. Spearin, 248 U.S. 132, 39 S.Ct. (1918).

Spearin Doctrine: "If [a] contractor is bound to build according to plans and Descriptions prepared by the owner, the contractor will not be responsible for the consequences of defects in the plans and Descriptions."

Examples:

- Descriptions clear, but size and shape or quantity not shown on drawings
- Drawings and Descriptions inadequate to meet stated performance objectives and supplied by the Owner
- Permanent lane closures not prohibited by bid documents. Contractor's plan described method, subsequently not permitted
- Confusion over quantities
- Multiple options allowable by reference standards

Additional Checklists and Backup Materials

Make It Better. From Civil Engineering Handbook – Descriptions Writing 101

- Avoid repetition
- Use correct grammar
- Give all facts necessary
- Be specific, not indefinite
- Direct rather than suggest
- Specify in the positive form
- Do not justify a requirement
- Use short rather than long sentences
- Do not specify both methods and results
- Be brief, avoid unnecessary words or phrases
- Do not specify requirements in conflict with each other



Make It Better. From Civil Engineering Handbook – Descriptions Writing 101

- Avoid sentences that require other than the simplest punctuation
- Avoid words that are likely to be unfamiliar to users of the Descriptions, especially if words have more than one meaning
- Be particularly careful when requiring approval by the engineer (or COR) – can relieve the contractor of responsibility



Make It Better. From Civil Engineering Handbook – Descriptions Writing 101

- Refer to “these” Descriptions rather than “this” description; use the plural
- Workmanship should be in accordance with, and materials should conform to, a reference description
- “Shall” for the Contractor, and “Will” for the Owner. Do not confuse Descriptions for a statement/scope of work
- “May”, “Should” gives the contractor a choice and should be avoided
- Descriptions should not be encumbered with legal phrases obscuring their meaning or subordinate their function to that of a legal document

Big Picture

- Leaders and Clients
 - Specify “Why” and “What” to
 - Create a vision of what is wanted, and
 - To establish trust and purpose in the supply chain
- Managers and Subcontractors
 - Propose “How” and “When” to meet the description
 - Control and manage the contract in accordance with established Descriptions and contract requirements
- Subcontracting process establishes “Who”

Ref. Leadership in Supply Chain Management, Anna E. Flynn, Ph.D pages 1-7

Descriptions in Detail

- Use titles for all articles
- Capitalize
 - Titles for Articles
 - Owner
 - Contractor
 - Subcontractors
 - Agreement
 - General Conditions
 - Drawings and Descriptions
 - Structural Grade Plywood

Descriptions in Detail

- “All”
 - Is it necessary to say “all” or is it implied?
- “Any” or “Either”
 - Do not use unless there is a choice
 - “Any submittals rejected will be resubmitted”
 - “Submittals rejected shall be resubmitted”
 - “Resubmit rejected submittals”
 - Examples:
 - Except for the area marked, “lunatic’s room,” a door knob will be installed on ~~either~~ both sides of the door
- Etc.
 - Don’t use: “*Better to be wrong, than indefinite.*”

Eliminate useless words

- Eliminate these words whenever possible:
 - “Which” - “same”
 - “Who” - “said”
 - “that” - “and/or”
 - “the” - “etc.”
 - “a” - “furnish and install”
 - “an” - “to the approval of the Engineer”
 - “of” - “first-class”
 - “must” - “Is to”
- Example: “The door hardware schedule, which is applicable to the administration annex, is on the Architectural drawings.”
- “For door hardware in the administration annex see Architectural drawings.”
- Why say anything at all?

Descriptions in Detail

- Numbers
 - Use numbers. “Install system at 6 locations.”
 - Do not write out. “Install system at Six locations.”
 - Do not do both. “Install system at Six (6) locations.”
- Use accepted abbreviations
- Use simple imperative mood
 - “Install fixtures furnished by Client.”

“Shall” vs “will”

- “Shall” is imperative, directive, and proactive
- “Will” is vague, indefinite, or in the “to be” sense
- Use “Shall” for Contractors and “Will” for Client
 - Example. “Client will move the mobile substation”
 - Example. “Contractor shall construct the new substation”
- Examples:
 - “Contractor shall construct” (good)
 - “Contractor will be responsible for construction” (bad)

Descriptions in Detail

When specifying, start with the exceptions first

- Example: Concrete
 - 4000 psi concrete foundations
 - 3000 psi concrete columns and beams
 - 2500 psi for non-load bearing, non-architectural concrete
 - 3500 psi all other concrete work
- Avoid exceptions and don’t list obvious exceptions

Descriptions in Detail

- Include where necessary to clarify
 - Concrete:
 - Foundations for electrical and mechanical equipment are found in the respective equipment Descriptions
- Do not include in work for other's sections what is not normally expected
 - Painting:
 - Work Not Included
 - Painting of asphalt tile, glass, or marble



“Or Equal” Descriptions – Typical Problems

- If assumed, bidder may be forced to pay a higher price
- If not assumed, bidder may lose the contract
- What is appropriate in one case, may not be in another.
- Adaptation (or failure) of interfacing sub-assemblies
- Usually submitted at the last possible moment
- Not approving - favoritism by a supplier?
- Approving - liability it creates when it fails or is inadequate
- It is impossible to list all possibilities
- May be required to obtain competitively priced materials
- Must be able to confirm quality level meets the intended standard
- Client or Contractor determines “or equal” - Who should determine?
- “Square D” is no longer in business

“Or Equal” Solutions

- Do not specify brand names or proprietary marks
 - Use reference Descriptions instead
 - Use a performance description (name characteristics and attributes in description for that item)
 - “...at type and grade material from any source.”
- Require all substitutions to be presented either with the proposal or prior to start of field work, or with bid/proposal
- Note: When using a “brand name or equal” purchase description, the description writer must set forth those salient physical, functional, or other characteristics of the referenced products that are essential to the minimum needs of the Client.

Typical Sources of Changes

- Site material composition
- Benchmarks and utility locations
- Property lines and potential impacts
- Site access, agency approvals, and permits
- Adequacy of plans and Descriptions (design errors or omissions)
 - Built as designed
 - Fit as indicated
 - By reasonable means
 - Clear, concise, complete, correct, and comprehensible
 - Disclosing superior knowledge
 - Defective (cut-and-paste, silly, old, inconsistent, impossible, incomplete, conflicts between disciplines)
- Adequacy of time (if specified), timeliness of reviews, prompt resolution of changes

Typical Sources of Changes (cont.)

- Different sections of contracts written by different persons (companies)
- Good contracts identify risks and uncertainties, while bad contracts cover risks and uncertainties with “boiler-plate” language used to disguise risk and shift the blame
 - Since law, basic business practice, and industry practice do not support the strategy of disguised risk under boiler-plate indemnification and fuzzy contract language - risk can not ultimately be shifted except by clearly recognizing the risks and assigning these risks contractually when known
- Changes in market conditions
- Changes in Client requirements
- Unknown or undisclosed existing conditions
- Better, faster, cheaper ideas

National Research Council



Improving Project Management in the Department of Energy

- DOE’s inability to complete projects on time and on budget has been widely reported by the U.S. Congress, the GAO, and DOE’s Office of the Inspector General (Project Management, p.21).
- 48% more expensive than comparable projects by industry and other government agencies (p.23).
- Average of three time longer than in industry (p23).
- Factor: Project scope treated as a contingency (p.24).
- Factor: Project definition is a continuing problem for the DOE (p.24).
- Cost of a value engineering program is 0.5% of the anticipated savings.
- Turn over of DOE Project Managers twice the industry rate (p.25)
- DOE’s policy guidelines for project management have not been applied widely or systematically.
- Guidance for design and construction in place, but comparable guidelines for early conceptual and pre-conceptual phases not in place, although potential for substantial savings is high (p.30)
- Finding: DOE project documentation is not up to the standards of the private sector and other government agencies.

National Research Council

Improving Project Management in the Department of Energy

- Setting Baselines Prematurely – pressure to adjust estimated costs to fit the anticipated budget authorization. Established after only 2 or 3 percent of the design work has been completed.
- No designated source of funding for the preparation of baselines, and does not explicitly budget for prebaseline engineering (p. 37-38)

National Research Council

Improving Project Management in the Department of Energy

- Project estimates are not the same as budgets.
- An estimate is a forecast of project costs.
- A budget includes the estimate plus contingency factors to cover future uncertainties, modified by professional judgment.
- A budget may be a target figure for the project, a cap that the project must meet, and a tool for project discipline.
- It is often erroneously believed that reducing budgets can reduce costs, but this is rarely true; reducing budgets may only increase budget overruns.
- Costs are reduced by:
 - faster project completions,
 - reductions in scope,
 - better project definitions,
 - value engineering,
 - change control,
 - quality control,
 - effective management and efficient design, and
 - construction through stronger incentives,
 - shared lessons learned.

National Research Council

Improving Project Management in the Department of Energy

- Contingency allowances are required to pay for unforeseen but inevitable circumstances that cause costs to increase during the course of a project.
- Unfortunately, experience suggests that risk management is not central to DOE's planning, budgeting, and acquisition process.
- DOE has often taken the following risks on projects that private industry, or other government agencies would not have taken:
 - Commitments based on unproven technologies.
 - Commitments to a single cleanup technology without investigating alternatives.
 - Awarding fixed-price contracts without clearly defined scope or conditions
 - Initiating remediation projects before wastes are adequately characterized
 - Initiating projects based on estimates made at very early stages of definition and with very low degrees of confidence
 - Initiating projects without preconstruction planning
 - Initiating projects before project managers and other required staff have been identified.
- Poorly defined scopes of work is the number one cause of project failure in DOE projects.

INPO Engineering Guidance

- Problem Identification
 - Operations and maintenance history
 - Physical plant walkdowns to view symptoms firsthand
- Root Cause Analysis
 - Interview of personnel
 - Joint walk downs by experienced representatives
 - Review of testing and analysis
 - Final report to include conclusions reached, potential investigations
 - Possible causes validated or eliminated
- Alternative Solutions
 - Correct the problem and eliminate the problems
 - Recommend the most desirable alternative and justify the recommendation
 - If solution does not resolve problem/causes, obtain senior management buy in
 - Verify as-built plant configuration
 - Joint walkdowns with particular emphasis on design details impacting constructability, operability, maintainability, and radiological protection
 - Design basis (original), and design requirements (current), and checked for compatibility
- Design Output Documents (drawings, calculations, Descriptions)
 - Checked, cross-discipline review
 - Independent review
 - Design verification for safety review (decrease chance of safety event through safety analysis)
 - Sufficient documentation of reviews
 - Safety review
 - Independence
 - Design changes

Changes – Examples

- If the R-rating for insulation is specified, but does not meet the temperature control requirements for the building, this is a Client cost (specify design or effect, but not both)
- If 10-15 sand is specified, it should also be commercially available
- If battleship gray paint is specified for manufactured equipment, that color must be available from the manufacturer
- If a specific chiller or evaporator is specified, it should also fit in the room

Cost Considerations of Changes

- Direct costs (labor, materials, supervision)
- Indirect costs (overhead, delays, opportunity costs)
- Consequential costs (interference, disruption, re-sequence)

Levels of Scope Development, Relationship to Cost, Type of Contract.



- **Type I - Cost-Plus-Fixed-Fee Contracts :** Most suitable for projects with goals that are not clearly definable in measurable and objective terms (National Research Council). Fee offers flexibility to the contracts manager by providing incentives for superior performance. However the subjective nature of the award process makes it subject to charges of bias, favoritism, and abuse. May be useful for Design/Build until such point as the contract can be converted to Firm Fixed Price (National Research Council).
 - Estimate accuracy (-25% to +75%) based on a Rough Order of Magnitude Estimate
 - Rough pre-conceptual information (e.g. number of square feet in a facility, type of construction); and a basic description of required engineering deliverables and construction work to be performed.
 - Functional and Operational requirements/brief project descriptions.
 - Recommended contingency – 15 to 35%

Levels of Scope development, relationship to cost, type of contract.

- **Type IIA - Time and Material Contracts:** Level of effort definable, although scope is not strictly defined. Staff Augmentation, consulting, and other periodic or level of service type activities.
 - Check labor hours, capability and classification. Mix appropriate for the proposed effort? Duplication of effort? Travel? ODCs?
- **Type IIB - Fixed Unit Price Contracts:** When it is not possible to delineate on the drawings the exact limits for the various items of work in the contract, the work is broken down for payment purposes into major elements with respect to the kind of work and trades involved. Each element designated as a payment item, with its number of estimated units, called estimated quantity, is listed in the proposal, and the Offerors are required to write in price for each unit. An example is the number of cubic yards of concrete to bid at a unit price per cubic yard. The total cost is obtained by summing the amounts, in dollars, for all items listed in the proposal, arrived at by multiplying the estimated number of units for each item by the corresponding unit price (Ref. Civil Engineering Handbook, Types of Contracts, Section 3-3).
 - Estimate accuracy -10% to +25%
 - A good quality scope of work.
 - Review of site conditions by scope writer and contractors.
 - Detailed work breakdown structure (to activity level)
 - Completed one-line, general arrangement or layout drawings, P&ID drawings, and a list of other expected drawings and equipment lists, layout drawings.
 - Required support organization reviews.
 - A firm understanding of applicable industry, site standards, administrative requirements, and applicable national and consensus standards.
 - Appropriate escalation factors, labor rates, applied mark-ups
 - Recommended contingency 15% to 25%

Levels of Scope development, relationship to cost, type of contract.

- **Type III - Fixed Price Contracts:** Best used with routine services, or for services that can be well defined. Inappropriate for work involving major uncertainties, such as work involving a new technology, poorly characterized waste and site conditions, or open-ended work scopes. More difficult to reconcile with accelerating project development as in design-build approaches. Skills used to managed fixed price contracts very different than cost-plus type work (National Research Council). It is imperative that the drawings and Descriptions be comprehensive and show in complete detail all features and requirements of the work (Ref. Civil engineering Handbook, Types of Contracts, Section 3-3).
 - Estimate accuracy -5% to +15%
 - The above required elements of a conceptual or baseline cost estimate
 - A definitive estimate prepared from well defined data, Descriptions, drawings, etc. A detailed take off based on engineering drawings, Descriptions, and equipment lists is required.
 - Hours estimate cross checked for accuracy against the Construction Management and Inspection plans
 - Actual or historical costs should be used where possible
 - Contingency 5% to 15%.

Project Controls - Overview



- WBS, Resource Assignment Matrix, Organizational Breakdown Structure, Gant Chart
- Estimating, Budgeting, Change Control
- Scheduling, CPM
- BCWP, ACWP, BCWS, S-Curves, Cash Flow Analysis, Variance Analysis, Forecasting, Trending, re-baselining, Profitability.
- Resource loading and leveling, workaround and contingency planning
- What it all means: Risk and how to manage it. Risk, responsibility, and opportunity for reward should be tied together.

Project Management concepts. Uncertainty, models, unknowns, margin.



- Unconventional uncertainty and risk management
- Project Management, Operations Management, Urban and Regional Planning, Other Management methods – use different assumptions in management philosophy
- Knowns, known unknowns, true unknowns
- Need for design margins in procurement

Project and facility life cycles.

- Engineering, Procurement, and Construction Subprojects (Temporary Modifications)
 - Strategic Planning
 - Requirements
 - Design
- Operations and Maintenance Major Projects
 - Operate
 - Maintain
 - Strategic Planning end state definitions
- Decontamination and Demolition Projects/Facilities
 - Decommission
 - Deactivation
 - Decontamination
 - Demolition

Resistance

Ref. Peter Block, Flawless Consulting, Chapters 8 &9

- Defense mechanisms
 - Give me more detail – Is it ever enough?
 - Too much detail – not clear yet
 - Time is a little off – translation, no
 - Impractical – academic?
 - Attack – Don't take it personally, it is just resistance.
 - Confusion – another form of purposeful avoidance
 - Silence – the reaction is being blocked
 - Intellectualizing – facing up is difficult
 - Moralizing – “I understand, they don't”
 - Compliance – beware, especially if commitment is low energy.
 - Methodology – delay or action?
 - Flight into Health – smoothing it over
 - Pressing for solutions – skips the development phase
- Don't take resistance personally
 - Name it.
 - Present the problem.
 - Make a recommendation.
 - Let the manager decide, and let them live with the consequences.
 - Support the decision to the extent possible. On the other hand...
 - Don't play the hero. Heroes have hard lives.
 - Be grateful, and give credit to others when a good decision is made. It takes a team.