Outline

- Payment Schemes
  - Fundamentals
    - Lump sum
    - Unit prices
    - Cost plus percentage fee
    - Cost plus fixed fee
    - Guaranteed maximum price
    - Incentive
  - Award Methods
    - Bidding
    - Negotiation
    - Best Value
Contractors are often highly risk averse

For risks that contractor can’t control, may be willing to pay a risk premium (charge less for contract) to owner to take over

For risks that contractors can control, may be willing to manage risk than to pay a risk premium (charge less for contract)
Fundamental Ideas

- Structure contract so that
  - Risks contractor can better handle are imposed on contractor
    (i.e. contractor will lose $ if don’t control)
    - To be competitive, will have to manage these
  - Risks owner can better handle are kept by owner
Fundamental Balance

- Impose *high* enough risk incentive to get contractor do job efficiently
  - within the specifications of the contract
    - E.g. Incentive to finish on time, incentive to stay within budget
- Impose *low* enough risk to have reasonably low bid
- Impose according to contractor ability to tolerate
Derivative Results of Risks:

Impact on Construction Timing

- More risk on contractor, the longer will delay construct.
  - Also, in terms of cost
    - Given uncertainty, contractor will charge more up front
    - Owner doesn’t want to pay a huge amount up front
- Owner can expedite – by paying higher price (risk premium) to contractor or by shouldering risk
- Remember; delay can have major costs – but so can wrangling over change orders!
Addenda and Change Orders

- **Addenda**
  - Any changes that arise before bid opening and during the bidding period become part of the bid package.

- **Change Orders**
  - Any changes that arise after the contract is signed due to:
    - Different Site Conditions
    - Errors/ Omissions in the Contract Documents
    - Owner’s Requirement
    - Others
  - Requires adjustments in scope, time, and cost.
Note on Change Orders

- Changes contract (cost/schedule/scope/etc.)
- Can lead to costs beyond contract specification
- Anticipated costs incorporated in “contingency”
  - Often 1-10% on top of agreed upon price
- Often only paid for additional direct costs
  - Big problem if disruption in work
- Source of very large risk
CITY OF PALM SPRINGS  
ENGINEERING DIVISION

ADDENDUM NO.1

To all prospective bidders under Specifications for Re-roofing the Police Department Building, City Project No. 93-52, for which bids are to be received by the City of Palm Springs at the office of the purchasing manager at 3200 East Tahquitz Canyon Way, Palm Springs, California 92262 until 4:00 pm on Tuesday 21 March 1995.

I. The existing three bid schedules in the Specifications and Drawings for this contract have been revised. Bid schedules “A”, “B”, and “C” have been changed and revised bid Schedules have been included as a part of this Addendum No.1.

II. The Specifications as originally issued, along with revised Schedules “A”, “B”, and “C” shall be used in submitting bids, and acknowledgement of receipt of this Addendum No.1 shall be entered on Page 1 of the Bid. Failure to provide such acknowledgement shall render the bid as non-responsive and subject to rejection.

BY ORDER OF THE CITY OF PALM SPRINGS

13 March 1995

SAMPLE

By Robert J. Rocket, PE
City Engineer
Civil Engineer C 28209

Source: Fisk, 2003
E.R. FISK & ASSOCIATES
P.O. Box 6448 Orange CA 92613-6448

CHANGE ORDER

PROJECT TITLE: Dalles Hydroelectric Project
PROJECT No.: F-409  CONTRACT NAME: w34-6759  CONTRACT DATE: 29 OCT 1990
CONTRACTOR: International Constructors, Inc.

The following changes are hereby made to the contract Documents: Construction of access bridge abutment No.1 drainage system; and Reset two penstock bearing plates. All in accordance with revised DWG S-17209 Revision 3, dated 28 August 1991.

JUSTIFICATION: Unforseen soil conditions

CHANGE TO CONTRACT PRICE
Original Contract Price: $13,231,053.00
Current Contract Price as adjusted by previous change orders: $13,257,760.00
The Contract Price due to this change order will be increased by $14,342.00
The new Contract Price due to this change order will be: $13,272,102.00

CHANGE TO CONTRACT TIME
The Contract time will be increased by 21 calendar days
The date for completion of all work under the contract will be 24 June 1992.

APPROVALS REQUIRED
To be effective, this order must be approved by the Owner if it changes the scope or objective of the project., or may otherwise be required under the term of the Supplementary General Conditions of the Contract.

Ordered by: Dalles Power Company  (date 02 Sep 1991)
Accepted by: International Constructors, Inc.  (date 09 Sep 1991)
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Lump Sum or Fixed Price

- The Owner knows the actual cost of the project before it begins
- Contractor required to achieve the project at the Bid/Negotiated Contract Value
- Minimize the risk for the Owner if the project is well estimated, contractual documents accurate, and project clearly defined
Lump Sum or Fixed Price

- High risk for the Contractor in case of many unforeseen problems

- Generally utilized with the Traditional Method & usually not possible with Fast Track

- Usually a high incentive to finish early at low cost
Cost Versus Price for Lump Sum

Lump-Sum Contract

- **A**: If final cost is $9,500, contractor profit is $800 (8.42%)
- **B**: If final cost is $10,000, (as expected), contractor profit is $300 (3%)
- **C**: If final cost is $10,500, contractor loss is $200 (-1.9%)

*(Price is fixed at $10,300)*

Figure by MIT OCW.

Source: Macomber, 1989
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Unit Price Contract

- Agreement on the price charged per unit by the Contractor to the Owner

- Contractor overhead must be integrated in the Unit’s Prices

- The lowest bidder is normally selected

- Necessity of an Owner presence on site to measure the actual quantities
Unit Price Contract

- Highly dependant on the accuracy of the estimation of the quantities given by the Owner/Designer
  - Difficult to accurately quantify the work necessary
  - Contractor can make a more profit because payment is based on actual quantities but he can also lose money in the same way
  - The total cost for the Owner can be greater than planned
Unit Price: Example

- **Activities:**
  - Footings: $80/sq ft
  - Columns: $1,550/unit

- **Scheduled quantities:**
  - Footings: 100 sq ft
  - Columns: 9 units

- **Contract initial value:**
  \[ 80 \times 100 + 1,550 \times 9 = 14,750 \] $
Example: Pile Driving

- Too risky to just charge fixed price
  - Geotechnical uncertainties make length of piles uncertain

- Risk allocation
  - Price risk more under contractor control (efficiency, crew and equipment selection): to contractor
  - Length out of contractor control: to owner

- Owner must precisely monitor length used
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Cost Plus Percentage Fee

- The Owner is paying the actual cost plus a fixed percentage fee
- High risk for the Owner
- Maximum flexibility for the Owner
- Used only if the pricing could not be calculated in any other way and if it is urgent
- No financial insurance of ultimate cost
Cost Plus Percentage Fee

- Little incentive to reduce costs
- The Contractor agrees to do his/her best efforts to achieve the goals
- Whatever the quality of the work, the reward is the same but the owner gets the quality he/she pays for
- Permits collaboration at the early stages of the Project
Cost Versus Price for Cost Plus %

Time-and-Materials Contract

A = If final cost is $9,500, contractor profit is $475 (5%)
B = If final cost is $10,000, contractor profit is $500 (5%)
C = If final cost is $10,500, contractor profit is $525 (5%)

(Price = cost plus 5%)

Figure by MIT OCW.

Source: Macomber, 1989
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Cost Plus Fixed Fee

- Cost may vary but the fee remains firm
- The fee is independent of the duration of the project
- Used only if the pricing could not be determined in an alternative manner
- No financial insurance of ultimate cost
Cost Plus Fixed Fee

- Little incentive to reduce costs but high incentive to finish early
- The Contractor agrees to make best efforts to complete the work
- Promotes collaboration at the early stages of the project
Outline

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Guaranteed Maximum Price (GMP)

- Variation of the Cost Plus a Fee by having a cap, or GMP

- The Contractor assumes any additional costs after the “Ceiling” Point is reached

- Similar to CPFF but quality may be sacrificed to avoid increases in cost beyond GMP

- Variation: Usually, GM Shared Savings - Below the guaranteed maximum, savings are shared between Owner and Contractor
Guaranteed-Maximum-Price Contract

$10,500

$10,000

$10,000

$9,500

Final Price

Final Cost

A = If final cost is $9,500, contractor profit is $500 (5.26%)
B = If final cost is $10,000, contractor profit is $500 (5%)
C = If final cost is $10,500, contractor profit is $0 (0%)

(Price = cost of work plus fixed fee of $500 with a maximum price of $10,500)

Source: Macomber, 1989
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Principles of Incentive Contracts

Additional Profits are Possible by Lowering Cost
Customer and Contractor Share Cost Savings

- CUSTOMER PAYS 80% OF OVERRUN
- CONTRACTOR PAY 20% OF OVERRUN
- PROFIT IS $1500 LESS CONTRACTOR’S 20%

- CUSTOMER KEEPS 80% OF UNDERRUN
- CONTRACTOR KEEPS 20% OF UNDERRUN
- PROFIT IS $1500 PLUS CONTRACTOR’S 20%

Note: Limitations may be Imposed on Price or Profit

Source: Kerzner, 2000
Incentive Contracts: Example

- **Fixed Price Incentive Fee**
  - Sharing: 70/30 (O/C)
  - Target Cost: 10,000
  - Target Fee: 850
  - Target Price: 10,850
  - Price Ceiling: 11,500

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<th>10000</th>
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<td>11500</td>
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</table>
Incentive Contracts: Example

- **Cost Plus Incentive Fee**
  - Sharing: 85/15 (O/C)
  - Target Cost: 10,000
  - Target Fee: 750
  - Maximum Fee: 1350
  - Minimum Fee: 300

More financial risk for the owner in a CPIF, the target fee is usually less than in an FPIF contract and the contractor’s portion of the sharing ratio is small.
Contractor’s Risks

LEGEND

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<tr>
<td>CPPF</td>
<td>COST PLUS PERCENTAGE FEE</td>
</tr>
</tbody>
</table>

Source: Kerzner, 2000
Contractual Risk Allocation

RISK SHARING METER
Modified from Kerzner, 2000

100 %

Lump-Sum (Fixed Price)

100 %

Fixed-Price w/ Economic Price Adjustments

0 %

Fixed-Price Incentive

0 %

Cost-Plus Incentive

100 %

Cost-Plus Fixed Fee

0 %

Cost-Sharing

100 %

Cost-Plus Percentage

RISK Allocation

CONTRACTOR'S RISK

OWNER'S RISK
Conclusion

- When the market is not very good, clients insist on fixed price bids whereas when the project offers are numerous, it is more difficult to obtain those conditions.

- The Choice of payment scheme (i.e., contract type) must depend on:
  - The accuracy of the estimation
  - The ultimate cost known since the beginning or at least the maximum
  - The desired risk
  - The priority of the goal of quick completion of work
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  ✓ Incentive

➢ Award Methods
  ➢ Bidding
    ▪ Negotiation
    ▪ Best Value
**Competitive Bidding – Lowest Price**

- Traditional & Widely Used
- Time consuming process involving a bidding period as well as a bid evaluation & review period prior to issuing notice to proceed with construction
- Work awarded to lowest bidder
- Project constructed with specified quality at lowest price
- Formal procedure for public agencies
- Two main types
  - Open Form: Bid open & read publicly
  - Closed Form: No public opening
- Contractor estimates cost of building project along with profit
  - Unit-Price
  - Lump-Sum
- Loss is absorbed by the Contractor, if actual cost exceeds contracted amount
Issues with Bids

- Low bidders can be unreliable
  - Prequalify aggressively!

- Pressure for lowest bid can create
  - Cutting corners
  - Low-quality personnel
  - Bad feelings

- Growing Frequency: innovative bidding method
  - Multi-parameter bidding (e.g., low bid + other factors)
To Bid or Not to Bid

- Strategic Goals of the Company
- Capabilities of the Company
- Location of the Work
- Bid Logistics
- Licensing
- Pre-Qualification
- Bonding
- Scope of Work
- Resource Requirements
Protection for Owner against Contractor’s Default
The Miller Act (1935) – the level of bonding required for federally funded projects.

Source: Halpin and Woodhead, 1998
Bonding

- **Bid Bond:** will the selected bidder start the project?
  - Public
    - ~20% or as low as 5% of Bid
  - Private
    - 5% to 10% of Bid

- **Performance Bond:** will the contract work be completed and comply with project specification?
  - 100% Complete Job at Bid Price

- **Payment Bond:** will a contractor pay any associated charges (e.g., subcontractor fee)?
  - Cover Unpaid Bills by Contractor
    - 50% for < $1M
    - 40% for $1M < X < $5M
    - 2.5M for > $5M
  - Most Institutions Now Require 100%

- **Bonding Capacity Calculation**
  - No Track Record: (5 or 6) × Net Quick Assets
  - Old Reliable Record: (40+) × Net Quick Assets
    - Net Quick Assets = Quick Assets – Current Liabilities

Source: Halpin and Woodhead, 1998
MIT Wood Inc.

- Bonding Capacity
  - $2,500,000

- Potential New Jobs
  - PP1: $750,000
  - PP2: $1,000,000

- Current Jobs as Sub
  - P1: $1,000,000; 25% Complete
  - P2: $1,000,000; 50% Complete

- Current Job as GC
  - P3: $500,000; 50% Complete
Bonding

- Potential New Jobs
  - PP1: $750,000
  - PP2: $1,000,000

- Current Jobs as Sub
  - Performance
    - P1: $1,000,000*0.75 = $750,000
    - P2: $1,000,000*0.50 = $500,000

- Current Job as GC
  - Performance
    - P3: $500,000*0.50 = $250,000
  - Payment
    - P3: $500,000*0.50*0.50 = $125,000

- Used Up Bonding
  - $1,625,000

- Available Bonding
  - $875,000
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  ➢ Negotiation
    ▪ Best Value
Negotiation

- Pre-selected Contractor

- Common practice for private owners

- Owner picks Contractor on basis of:
  - Reputation
  - Overall qualifications to do the job

- Typical financial contract types are:
  - Cost Plus Fee
  - Guarantee Maximum Price (GMP)
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Best Value

- Used by the Federal Government
- Provides a uniform set of procurement regulations
- Request for Proposal (RFP) states:
  - Relative importance of price
  - Technical merit
  - Technical evaluation criteria and their weights
- Selection of Contractor is based on the best value of the proposed work
  - Price
  - Technical Factors