

**Civilian Radioactive Waste
Management System**

Management & Operating
Contractor



**TRW Environmental Safety
Systems Inc.**

Application of Commercial Practice to Cost-Effective Products

Presented at

NWTRB

**Alden M. Segrest
June 13, 1994**

B&W Fuel Company
Duke Engineering & Services, Inc.
Fluor Daniel, Inc.
INTERA Inc.

JK Research Associates, Inc.
E. R. Johnson Associates, Inc.
Logicon RDA

Morrison Knudsen Corporation
TRW Environmental Safety Systems Inc.
Winston & Strawn
Woodward-Clyde Federal Services

Objectives

- **Program needs an approach for effectively managing estimated costs and schedules**
- **Program need a consistent, credible basis for the estimated costs and schedules**
- **Identify potential targets for cost reductions through improved work processes**

Background

- **A high level review of engineering and construction cost estimates identified potential areas for improvement**
- **A rigorous analysis was conducted on a specific scope of work to compare YMP costs versus commercial project costs**
- **Rigorous application of requirements is very important on this project, but there is a process for questioning and challenging requirements which seem over restrictive**

Process

- **Identify generic approach**
- **Conduct initial estimate**
- **Tune estimate**
- **Get management concurrence**
- **Develop plan to institutionalize across program**

Initial Basis of Estimate Preparation

- **Scope of work**
- **Comparison basis**
- **Summary results**
- **Detailed results**
- **Cost difference justification**
- **Potential cost savings**
- **Methodology/approach evaluation**

Scope of Work

- **Design/construction of a warehouse building**
- **10,300 square feet single-story facility with a 1,300 square foot mezzanine**
- **Ground floor dimensions are 90' x 100'**
- **Provisions required for general storage, secure storage, mechanical equipment, offices, toilets, and lockers**
- **General warehouse receiving and storage usage. Occupancy is B2, non-combustible storage (per Uniform Building Code)**

Scope of Work

(Cont'd.)

- **Type II non-combustible construction, (per UBC) with clear span structural steel frame**
- **Steel columns anchored to concrete foundation with concrete floors**
- **Prefinished, painted metal roofing and siding**
- **Eave height of 20', allowing 15' for high storage racks**
- **Two recessed truck well/loading docks**

Scope of Work

(Cont'd.)

- **Roof canopies for docks**
- **Automatic fire sprinklers throughout**
- **Electric power/lighting throughout**
- **Air conditioning for office, remainder ventilated and heated**

Scope of Work

(Cont'd.)

- **Full insulation in entire building**
- **Mechanical systems require Energy Conservation Analysis as an input per DOE Order 6430.1A**
- **Fire Hazard Analysis also required per DOE Order 5480.7A**

Comparison Basis

- **Commercial construction costs were arrived at using *Means Construction Costs Data, 1993* and ESF Surface Design historical data**
- **A reduction of 20% was applied to the means estimate based upon commercial experience with competitive bidding**

Summary Results

| | <u>Commercial</u> | <u>YMP</u> |
|---------------------------|-------------------|--------------------|
| Construction Costs | \$376,000 | \$1,030,000 |
| Cost/Sq. Ft. | \$36.50 | \$100.00 |
| Design Costs | \$79,000 | \$292,000 |

Engineering Cost Estimate Basis ESF North Portal Warehouse Building Summary

| Discipline | | Common Act. | Drawings | Specs | Calcs | Totals |
|------------------------------|------|-------------|----------|-------|-------|--------------|
| Architectural | YMP | 185 | 470 | 80 | 130 | 865 |
| | Comm | 35 | 420 | 20 | 0 | 475 |
| Structural | YMP | 70 | 120 | 20 | 20 | 230 |
| | Comm | 25 | 120 | 10 | 0 | 155 |
| Electrical | YMP | 190 | 575 | 60 | 80 | 905 |
| | Comm | 25 | 300 | 20 | 0 | 345 |
| 1. Mechanical | YMP | 250 | 500 | 100 | 420 | 1,270 |
| | Comm | 25 | 300 | 20 | 0 | 345 |
| Total YMP Whrs | | | | | | 3,270 |
| Total Commercial Whrs | | | | | | 1,320 |

1. Includes Plumbing, Fire Protection, and HVAC

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Cost Difference Justification

Construction Differences

- **The following list contains significant cost factors which increase the costs of construction on this project above and beyond commercial standards**
 - **QA/QC program requirements**
 - **Government (DOE) requirements and orders**
 - **Special project requirements (environmental stipulations, water use reporting, etc.)**
 - **Remote project location (with special access requirements)**
 - **Non-competitive situation (cost reimbursable contract)**

Cost Difference Justification

(Cont'd.)

Engineering Differences

| | |
|--|------------------------|
| Adjusted commercial design cost (1,320 hours) | \$97,680 |
| Extra analyses and BFD preparation (650 hours) | \$48,100 |
| Reviews and coordination activities (585 hours) | \$43,290 |
| Additional design products (715 hours) | \$52,910 |
| Rework due to scope changes (675 hours) | <u>\$50,000</u> |

YMP Design Cost **\$291,980**

Potential Cost Savings

- **Exempt the Warehouse from requirements traceability. This would eliminate the need for the Basis for Design for the Warehouse (\$16,280)**
- **Exempt the design verification requirement for the Warehouse since it is a non-Q facility (\$25,000)**
- **Request exemption for DOE Order 6430.1A regarding the requirement for an Energy Conservation Study (\$11,840)**

Potential Cost Savings

(Cont'd.)

Cost of Design w/Performance Spec

| | | |
|--|----------------|------------------|
| Commercial | \$37,000 | |
| \$/Hr. Differential | 8,635 | |
| | \$45,635 | |
| If we still do DOE orders | +119,300 | 164,935 |
| (Less verification) | | |
| Rework | <u>+50,000</u> | <u>\$214,935</u> |
| <u>Cost of Design w/Full Engineering</u> | | <u>\$291,980</u> |
| <u>Cost of Construction</u> | \$554,600 | |

Potential Cost Savings

(Cont'd.)

- **Recommend that performance specification be utilized and that REECo competitively bid the construction of the Warehouse as opposed to using direct force construction. REECo would then act as General Contractor or Construction Manager**

or

- **Utilize full design package rather than performance specification, but REECo competitively bids the construction**

Implementation Plan

- **Approach**

- Utilize BOE outline developed on initial estimate

- Apply to

- ◆ All major surface free-standing structures
 - ◆ Discrete, definable sections or areas of the underground facility
 - ◆ Systems (mechanical, electrical, etc.) which support the ESF
 - ◆ Discrete, definable portions of roads, drainage features, etc.

Implementation Plan

(Cont'd.)

- **Identify, in priority order, where the greatest potential savings is in all major job areas**
 - **SBT facilities**
 - **SBT roads, etc.**
 - **ESF surface buildings**
 - **ESF surface roads, etc.**
 - **ESF underground facilities**
 - **ESF underground systems**

Implementation Plan

(Cont'd.)

- **Begin developing BOEs for the highest priority item in each area**
- **Tune, finalize and get DOE concurrence**
- **Apply to remaining items in each area**
- **Institutionalize in all new YMP work**
- **Routinely evaluate requirements to assure appropriate application and interpretation**