Estimating the Cost of Repair & Refit Using *PERCEPTION*
Computerized Cost Estimating

- Computer-based tools to quickly formulate a cost estimate
- Manage cost data from central database
- Maintain current catalog of actual costs
- Maintain catalog of prior estimates
Establish Libraries of Centrally Available Cost Data
Benefits

- Fewer cost surprises
- Faster bid response
- Lower cost risk
- Greater profit potential
- More competitive bids
Basic Tool Set:

- Application of learning curves
- Complexity & productivity factors
- Cost escalation
- Cost risk analysis
- Cost trade-off
- Global edits and update features
- Return cost data analysis
- User documentation of cost estimate
- Tracking of estimate sources and changes
Work Breakdown Structures

The cost estimates are developed according to a Work Breakdown Structure (WBS):

• Identify work items
• Identify work process costs
Identify Work Items

Work Items may be cataloged by

- Ship System WBS (SWBS)
- Shipyard Product WBS (PWBS)
- Ship Owner’s WBS
- Government Contract Line Item (CLIN)

Each structure can be customized by shipyard, by contract.
Identify Work Process

Work Process **may** be cataloged by

- **Stage of Construction (Rip-Out, Shop Work, On-Unit, On-Block, On-Board, Test)**
- **Shipyard Department (COA)**

*Each structure can be customized by shipyard, by contract.*
Cataloging Standard Costs

Catalog Standard Cost Estimating Relationships (CERs) onto Computer Database
Cataloging Standard Costs By Sequence

- Rip-Out
- Replace
- Repair
- Install
- Test
Cataloging Standard Costs By Work Type (SWBS)

- Structural Work
- Machinery
- Piping
- HVAC

- Electrical
- Paint
- Outfit
- Shipyard Services
Variations of CERs:

**Line Item CER:**

Single V-butt weld size 3/16" - 5/16" (2 pass) | 0.250 | MH/FT

**Re-Use Package CER:**

<table>
<thead>
<tr>
<th>Welding Repairs:Cracks</th>
<th>Labor CER Labor UoM Material CER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drill Out</td>
<td>0.500 MH/FT $ -</td>
</tr>
<tr>
<td>Welding Repairs:</td>
<td>0.250 MH/FT $ 1.4680</td>
</tr>
<tr>
<td>Gen Labor:</td>
<td>0.250 MH/FT $ -</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td>1.000 MH/FT $ 1.4680</td>
</tr>
</tbody>
</table>
Cost Adjustments

Cost = \( f_{\text{adjust}} \times \text{Standard Cost} \)
Automating Cost Adjustments

- Work Productivity
- Work Site
- Work Access
- Economic Cost Escalation
- Learning Experience
- Standard Material Savings
- Material Waste Adjustments
Impact of Work Productivity

• **Alternate Methods**: Expensive staging versus mobile lift
• **Automation**: Manual versus automated welding
• **Alternate Resources**: In-House versus Sub-Contract
• **Worker Skill Level**
Impact of Work Site

Added Cost Factor

- In Shop
- On Block
- On Board
Impact of Work Access:

Added Cost Factor

- On Weather Deck
- Oil Tanks
- Engine Room
- Superstructure
- Pump Room
- Holds
- Double Bottoms
Impact of Work Access:

Over-Head

Down-Hand

More Difficult = More Expensive
Impact of Cost Escalation:

Cost Escalation Index

Year


Escalation Index
Impact of Learning:

Cost Reductions From Repeatability

Percent of First Item Cost

Number of Similar Items Worked
Impact of Standard Materials:

- **Standard material items** typically less expensive than non-standard items.
- **Standard material deliveries** less expensive than high-priority rush orders.
Cost Risk Analysis

Cost Risk

Minimum | Expected | Maximum
--- | --- | ---
$0 | $1,000 | $1,800

Range of Costs
Cost Risk Analysis
Hardware Options

Single User Laptop

Single User Desktop
Hardware Options

Multi-User Network
Many Report Formats

• Detail Cost Item Reports
• WBS Summary Reports
• Major Equipment Lists
• Detail Bills of Material
Cost Detail Information

- Labor Hours
- Labor Costs
- Material costs
- Total Direct Costs
- Taxes & Duties
- Indirect Costs
- Profit
- Total Cost
Other Capabilities:

- **Import/Export**: Spreadsheets & Databases
- **Data Analysis Module**: statistical analysis of cost information to develop CERs
- **Return Cost Module**: link to shipyard production management systems
- **Link to CAD systems**: automated cost estimating from design process
- **Link to CAD systems**: automated down-loading of bills of material
Over 35 Years Serving the Shipbuilding & Repair Industry

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