THE NATIONAL SHIPBUILDING RESEARCH PROGRAM

Proceedings of the REAPS Technical Symposium

Paper No. 13:
Ship Structural Cost Program

U.S. DEPARTMENT OF THE NAVY
CARDEROCK DIVISION,
NAVAL SURFACE WARFARE CENTER
# The National Shipbuilding Research Program


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SHIP STRUCTURAL COST PROGRAM

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ABSTRACT

A ship-cost computer tool has been developed to estimate U.S. Naval Surface Ship construction for both shop and field Engineered Uniform Method and Standards and current Naval shipbuilding practices.

This procedure has been incorporated into the Ship Structural Cost Program (SSCP) to provide a means of rapidly estimating structural cost for ship structures. In this form SSCP provides a three-phase cost analysis where the shop erection and field installation procedures are included in Phases 2 and 3 and the panel/grillage shop assembly procedures are included in Phase 1.

The overall aim of our cost program is to develop a cost/weight tradeoff tool that has the capability of performing weight/cost optimization tradeoff studies. This information will become useful for Navy research and design communities in assessing high cost areas in the new ship construction, identification of optimum plate-beam combinations with respect to cost and/or weight, and the identification of materials and design details which tend to reduce cost.
SHIP STRUCTURAL COST PROGRAM

AUTOMATED COST ESTIMATING TOOL

BASED ON NAVSEA

ENGINEERED UNIFORM METHODS & STANDARDS

FOR NAVAL SURFACE SHIP CONSTRUCTION

SHIP STRUCTURAL COST PROGRAM

SSCP

PHASE 1 - SUBASSEMBLY
PHASE 2 - SHOP ERECTION
PHASE 3 - FIELD INSTALLATION

SIGNIFICANT OPTIONS:
GEOMETRY
MONOHULL OR HIGH PERFORMANCE SHIP
HULL AND/OR DECKHOUSE
FLAT BAR STIFFENERS
MATERIALS
HS, HTS, HY88, ALUM
DETAILS

CAPABILITIES:
MATERIAL COST STUDIES
CONFIGURATION STUDIES
COST/WEIGHT OPTIMIZATION

FUTURE IMPROVEMENTS:
NEW DETAILS
ALUM FIRE PROTECTION COSTS
BALLISTIC PLATING COSTS
WELD BONDS COSTS
SHIP STRUCTURAL COST PROGRAM

OBJECTIVES

LONG TERM
- DEVELOP COST/WEIGHT TRADE-OFF CAPABILITY FOR EFFICIENT USE OF MATERIAL & STRUCTURES

SHORT TERM
- DEVELOP A COST ESTIMATION PROGRAM FOR SURFACE SHIP STRUCTURES
- INCORPORATE THE CAPABILITY OFNAVY DESIGN PROGRAMS WITH THE COST PROGRAM TO PERFORM COST/WEIGHT OPTIMIZATION STUDIES
- IMPROVE RELATIVE COST/WEIGHT TRADE-OFF CAPABILITY FOR R & D COMMUNITIES
- PROVIDE NAVAL SHIPYARDS WITH COMPUTERIZED METHOD FOR COST ESTIMATING REPAIR & CONVERSION
- EVALUATE HIGH COST AREAS OF SHIP CONSTRUCTION

COST/WEIGHT TRADE-OFF

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### SSCP APPLICATIONS

**RELATIVE COST COMPARISONS**

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<tr>
<th>Configuration Study</th>
<th>MS/HTS</th>
<th>HYGO</th>
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<th>MS</th>
<th>AL</th>
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<th>10' F.S.</th>
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### BASIC CONCEPT

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**STRUCTURAL UNIT**

**MATERIAL COST** $/LB

**CONSTRUCTION COST** (H-HD/H(L)/H-D)

**TOTAL GROUP 100 COST FOR UNIT**
ENGINEERED
UNIFORM METHODS & STANDARDS

TITLE: STRUCTURAL-LOFT LAYOUT & MACHINE

- LOFT
  DEVELOP & BUILD TEMPLATES & DRAWINGS 1/10 SCALE (PLATES & SHAPES)

- LAYOUT
  TRANSFERRING TEMPLATES & DRAWINGS (PLATES & SHAPES)

TITLE: BURN FLAME CUT PRODUCTION

- PLATES
  TELEREX 90° CUT
  RADIOGRAPH BEVEL CUTTING
  SAW CUT ALUM
  SHEARING AL & ST

- STIFFENERS & DETAILS
  MANUAL TAMP GUIDED
  90° CUT & BEVEL CUTTING
  SHEARING ALUM
ENGINEERED UNIFORM METHODS & STANDARDS

TITLE, ROLLING OPERATIONS

PLATING MAN HOURS AREA FUNCTION OF PLATE THICKNESS & WIDTH OF ROLL

STIFFENERS: MAN HOURS AREA FUNCTION OF THE TYPE OF MACHINE OPERATION

TITLE: STRUCTURAL SHOP ASSEMBLY

- PLATE ASSEMBLY
- STIFFENER ASSEMBLY
- DETAIL ASSEMBLY
- VAC-U-BLAST
- PNEUMATIC SERVICES
- BURNING & WELDING SERVICES
- CRANE SERVICES

TITLE: WELDING, STRUCTURAL PRODUCTION

- MANUAL WELDING (MS, HTS, HY80)
  - SHIELDED METAL ARC
- AUTOMATIC WELDING
  - SUBMERGED METAL ARC (MS, HTS)
  - GAS METAL ARC (ALUM)

INSPECTION
- A: ND N.D.T
- B: BASIC N.D.T
- C: FULL N.D.T

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PHASE 2 - SHOP ERECTION

COST INFORMATION

PLATE
STIFFENERS DETAIL ERECTION OF SUBASSEMBLY

PAN EL JOINTS

- STIFFENER BUTTED AGAINST HATE
- END STIFFENER CUT - STIFFENER BUTTED
- END STIFFENER CUT - CUT OUT PLATE, STIFFENER BUTTED
- STIFFENER BUTTED - SAME SIZE
FUTURE WORK

- AUTOMATED COST/WEIGHT OPTIMIZATION PROGRAM

- DEVELOP COST ESTIMATING TOOL (REPAIR & CONVERSION) FOR NAVAL SHIPYARDS

DEVELOP COST ESTIMATING TOOL (REPAIR & MAINTENANCE) FOR NAVAL SHIPYARD
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