

# Design for Producibility for Mid-Tiered Shipyards

All Panels Meeting 2009  
September 16, 2009



Technology Investment Agreement (TIA) 2007-380:

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# DFP Project Management Summary

- **Shipyard Participants**

- Bollinger Shipyards - Lockport, LLC (Prime)
  - POC: Dennis Fanguy (Project Manager)
- Todd Pacific Shipyards
  - POC: Bob Gilbert
  - Also: Scott Bawden, Eric Atkins
- Atlantic Marine – Jacksonville, LLC
  - POC: Chuck Nugent

- **Technical Council**

- Victoria Dlugokecki, P.E.
- Hepinstall Consulting Group, Inc.: Lisa Hepinstall

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## Why this project? ...from FMI Benchmark on DFP

- “...there is a low appreciation of the importance of *capturing production knowledge* and *defining facility constraints and attributes* in order to *define design parameters* that result in optimum production performance...”
- “...high turnover of staff in many of U.S. yards means there is often a *loss of DFP knowledge* during gaps in design activity...”

(NSRP, “A National Consensus Investment Strategy to Address the findings of the 2004 Global Shipbuilding Industry Base Benchmarking Study”, 2005)

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## Overarching Guiding Principle of Design for Production

- *Design a product to meet its specified technical and operational requirements and quality so that*
  - *the production costs will be minimized through*
    - *low work content,*
    - *ease of fabrication and*
    - *rationalized material choices.*

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# Final Project Deliverables

## “How To” Manual

- **Compilation of the “process” external deliverables**
  - Defines the entire development process for a shipyard’s DFP Manual
  - Provides “blank” ship production tables, and “sample” ship production tables and rules

**Final DFP Manual and Associated Manual Template**

## Shipyard DFP Manuals

- **Compilation of all the individual shipyard data gathered during the process**
  - Includes Facility Capabilities
  - Includes Steel Production Tables and Design Rules
  - Includes Outfitting Production Tables and Design Rules

**DFP Manual – Bollinger**  
**DFP Manual – Todd**  
**DFP Manual – Atlantic**

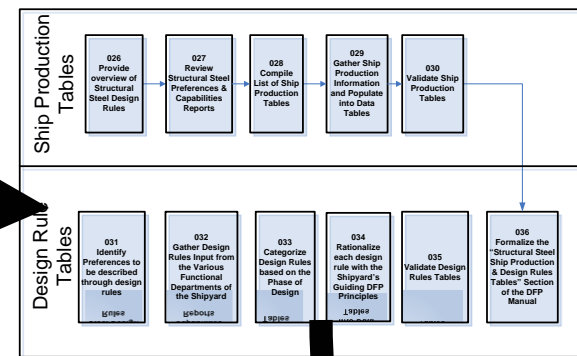
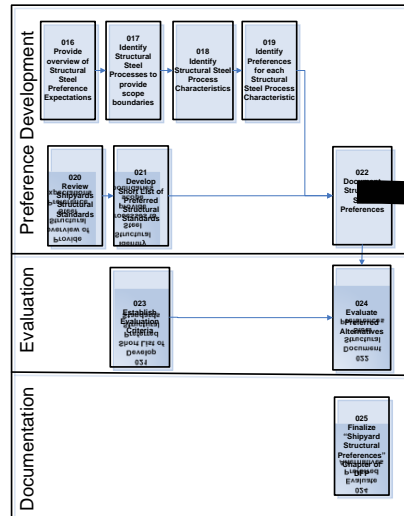
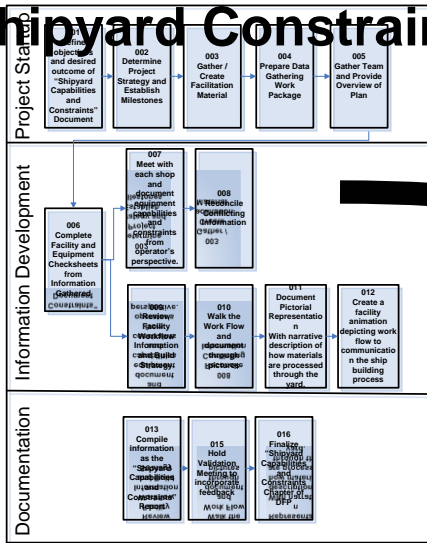
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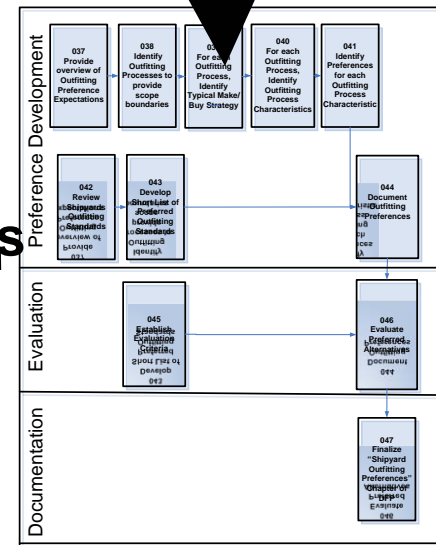
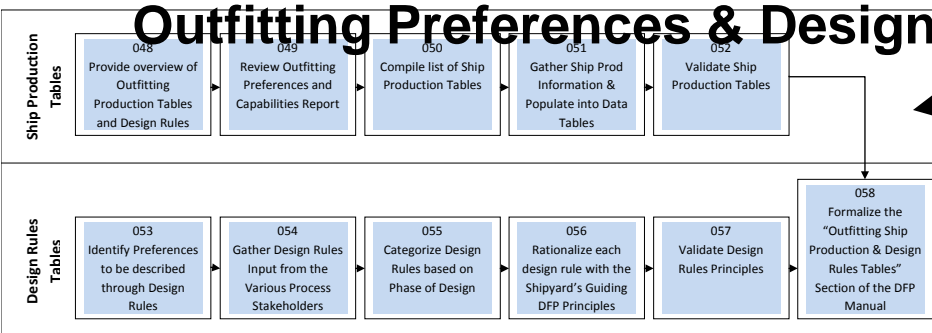
# Shipyards DFP Process

## Structural Steel Preferences & Design Rules

### Shipyards Constraints



### Outfitting Preferences & Design Rules



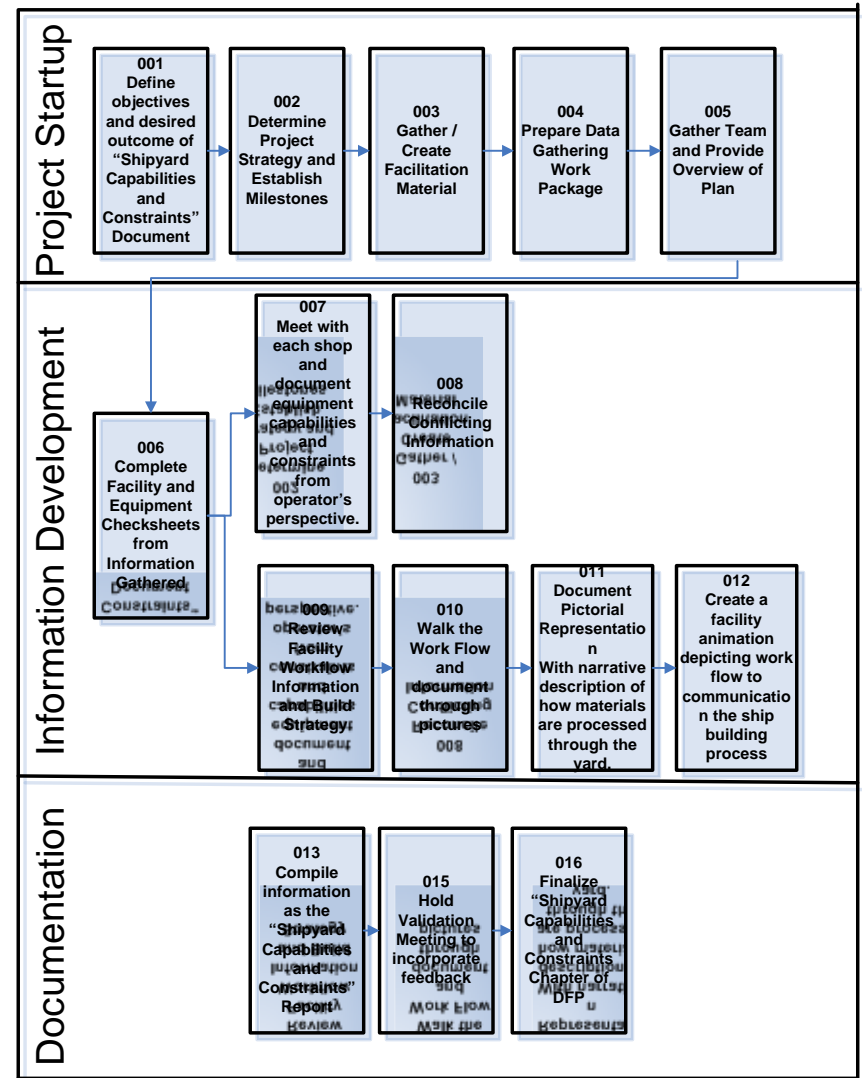
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# “How To” Manual

- Includes an overall definition of all of the process steps associated with each major DFP activity:
  - Shipyard Constraints
  - Steel Preferences
  - Steel Production Tables and Design Rules
  - Outfitting Preferences
  - Outfitting Production Tables and Design Rules



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# “How To” Manual

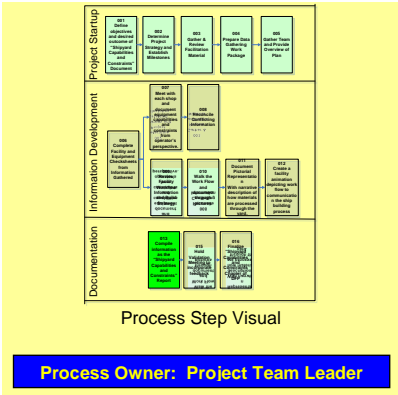
- For each major process step, reports include:
  - Purpose, Desired Outcome, Individual Process Steps, Inputs, and Deliverables
  - Inputs include process step guidelines, templates, instructions, questions, checklists, etc.

**58 Process Steps**  
**129 Templates / Etc.**

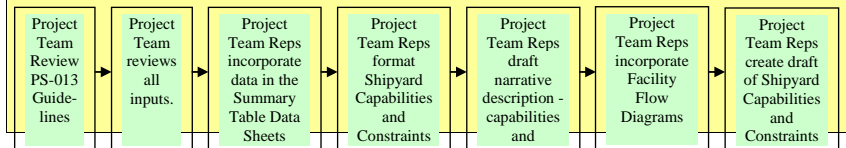
## PROCESS STEP 013 Compile Information as the Shipyard Capabilities and Constraints Chapter of the DFP Manual

**Purpose:**  
To consolidate the facility and equipment capabilities and constraints of the shipyard through “easy-to-use” summary tables and associated detailed information tables.

**Desired Outcome:**  
A draft of the Shipyard Capabilities and Constraints Chapter of the DFP Manual is documented.



### Process Steps:



**Inputs:**

- [Process Step 013 Guidelines \(A13\)](#)
- [Summary Table Data Sheets \(11" x 17"\) \(A55\)](#)
- [Facility Flow Diagram \(A49\)](#)
- [Shop Flow Diagrams \(A50\)](#)
- [Facility Flow Animation \(A54\)](#)
- [Pictorial Representation of Work Flow for Shops \(A53\)](#)
- Pictorial Representation of Work Flow through Facility.
- Completed Shipyard Data Collection Work Package.
- [Project Strategy Document \(A16\)](#)

**Deliverables:**

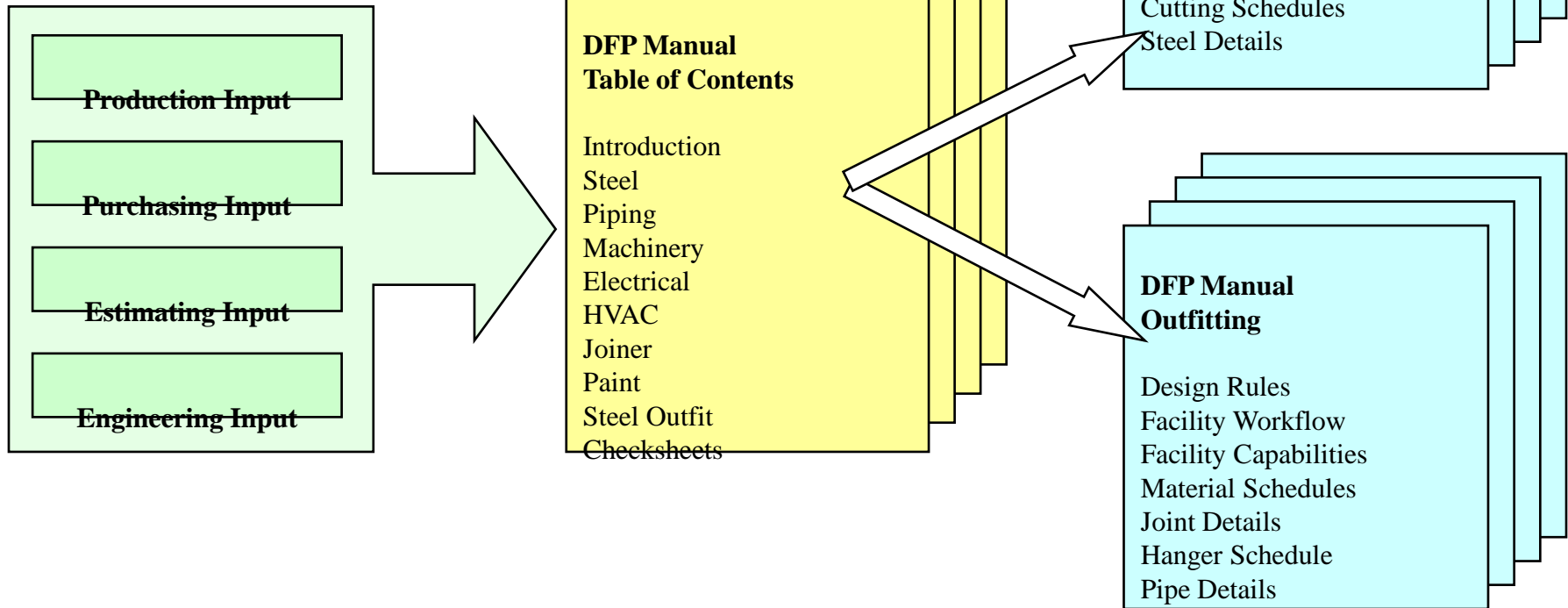
- [Draft "Shipyard Capabilities and Constraints" Chapter of the DFP Manual. \(A56\)](#)

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# Shipyard-Specific DFP Manuals

Shipyard-Specific DFP Manuals create for each participating shipyard



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# Shipyard DFP Manuals: Steel and Outfitting Production Tables

Construction Discipline	Bollinger	Todd	Atlantic
Modeling and PI	9	9	9
Build Strategy	2	2	4
Steel	9	10	13
Pipe	17	16	18
Electrical	9	9	11
Machinery	0	0	0
HVAC and Ventilation	2	3	3
Joiner and Insulation	3	1	4
Paint	0	0	2
Metal Outfit	1	1	1
<b>TOTAL</b>	<b>52</b>	<b>51</b>	<b>65</b>



# Shipyard DFP Manuals: Steel and Outfitting Design Rules

Construction Discipline	Bollinger	Todd	Atlantic
Steel	57	70	70
Pipe	37	35	44
Electrical	31	22	22
Machinery	23	19	21
HVAC and Ventilation	27	27	26
Joiner and Insulation	27	25	27
Paint	6	12	15
Metal Outfit	14	16	26
<b>TOTAL</b>	<b>222</b>	<b>226</b>	<b>251</b>



# Shipyard Implementation and Early Successes

- Arrangements optimized for build strategy considerations by incorporating the grid coolers into a single subassembly.
  - **Cost Avoidance –approximately 1050 mhrs**



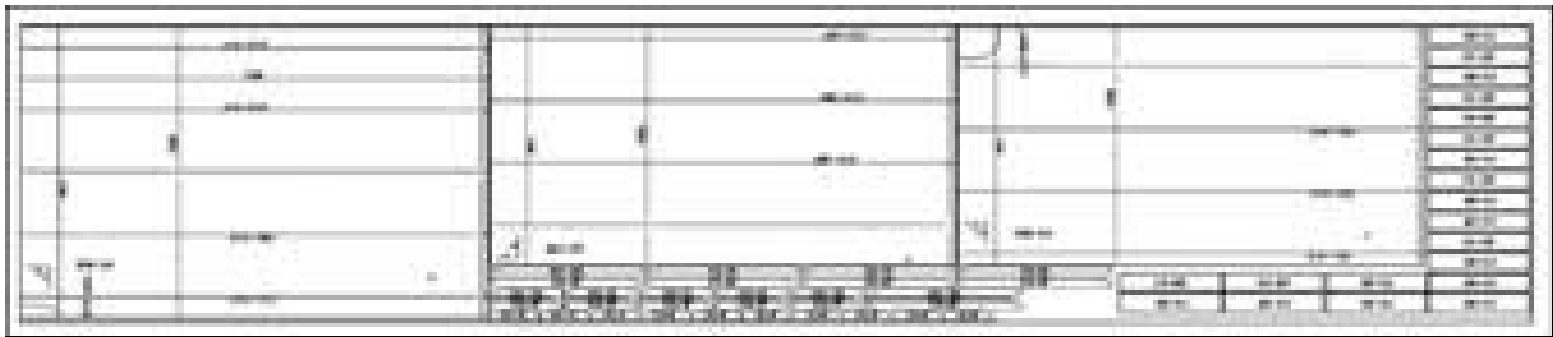
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# Shipyard Implementation and Early Successes

- Nesting of Flat Bars eliminated purchased flat bars and added zero plate by using scrap and remnants
  - **Cost Avoidance – approximately \$25K Material; 200 mhrs**



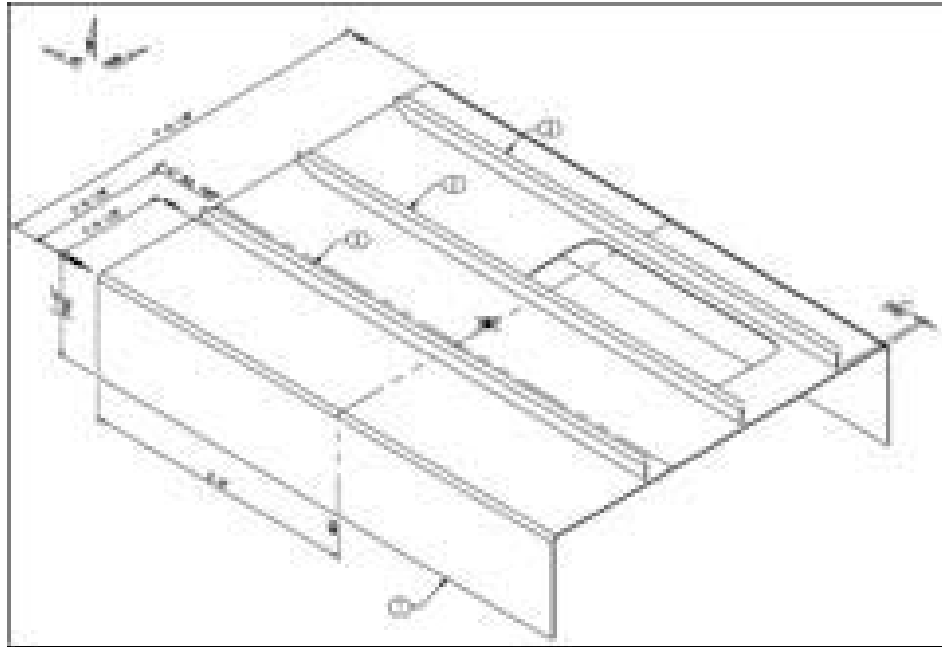
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# Shipyard Implementation and Early Successes

- Eliminated subassemblies: Piece Parts to Flange Parts in the Deckhouse
  - **Cost Avoidance – approximately 120 mhrs**



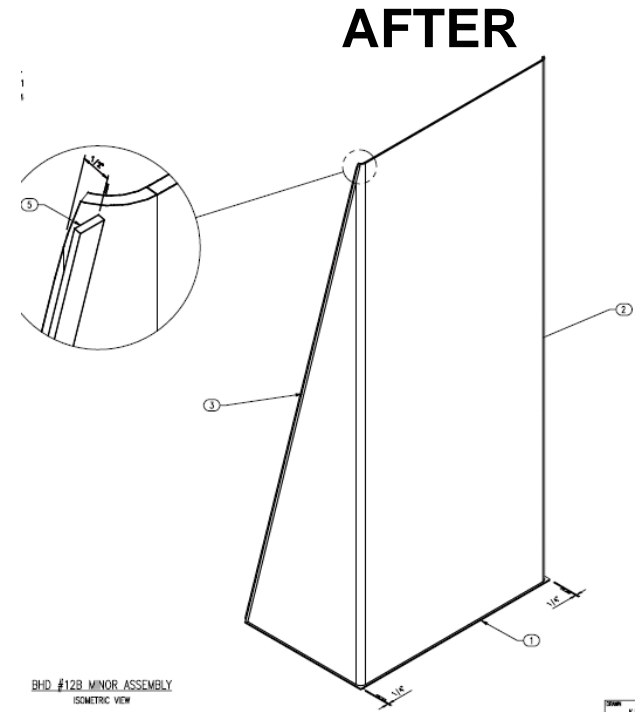
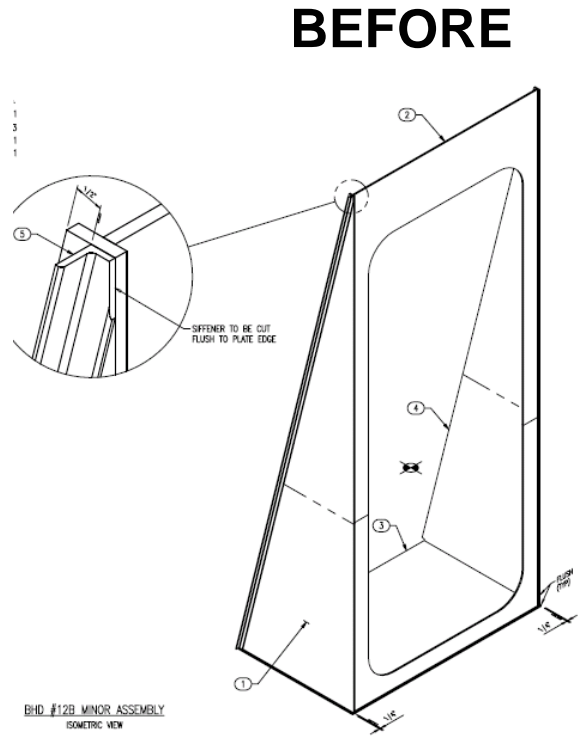
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# Shipyard Implementation and Early Successes

- Simplified bulkhead connection

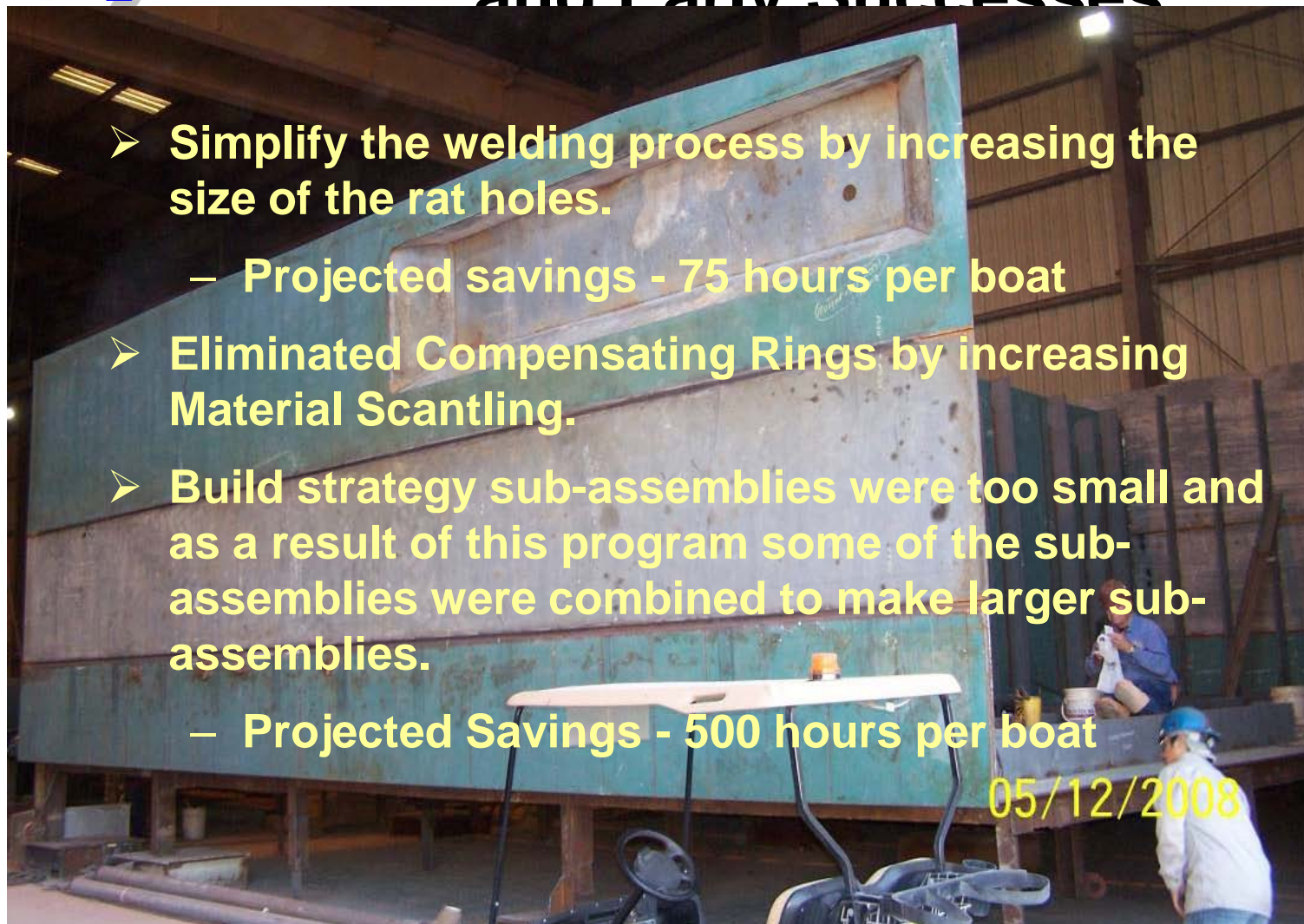


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# Shipyard Implementation and Early Successes



- Simplify the welding process by increasing the size of the rat holes.
  - Projected savings - 75 hours per boat
- Eliminated Compensating Rings by increasing Material Scantling.
- Build strategy sub-assemblies were too small and as a result of this program some of the sub-assemblies were combined to make larger sub-assemblies.
  - Projected Savings - 500 hours per boat

05/12/2008

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# Practical Applications of Design For Producibility



TEAM MEMBERS

**VT Halter Marine, Inc.**

MARINETTE MARINE  
PROVEN PERFORMANCE IN THE MARINE INDUSTRY

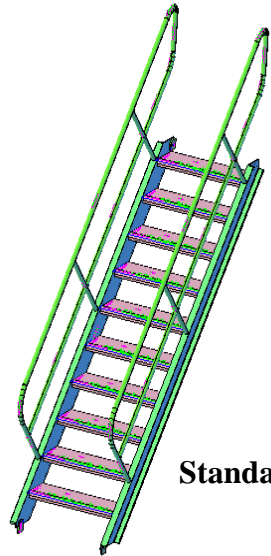


**NORTHROP GRUMMAN**

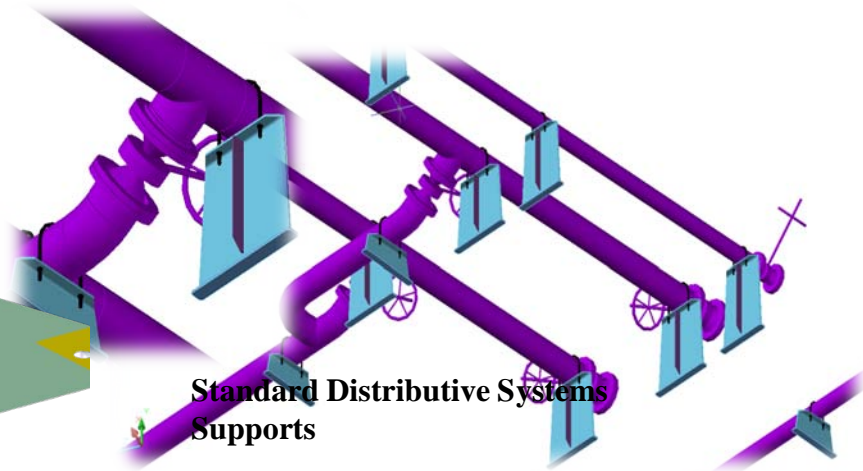
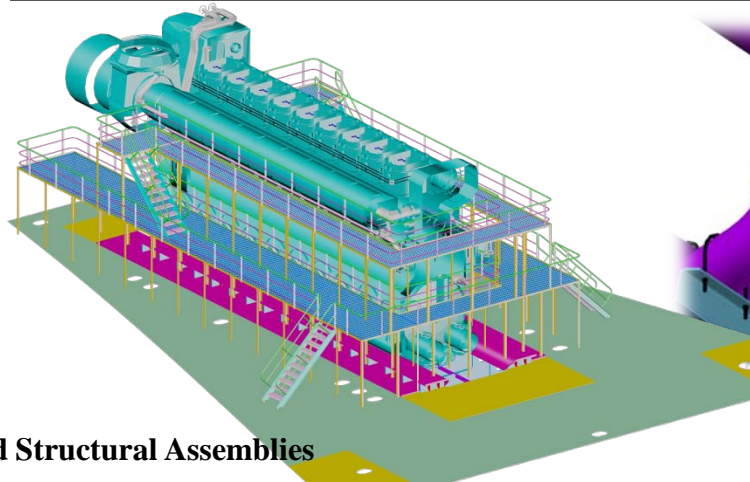
**ShipConstructor**  
Software USA, Inc.



**ShipConstructor**  
Software Inc.



Standard Structural Assemblies



Standard Distributive Systems  
Supports

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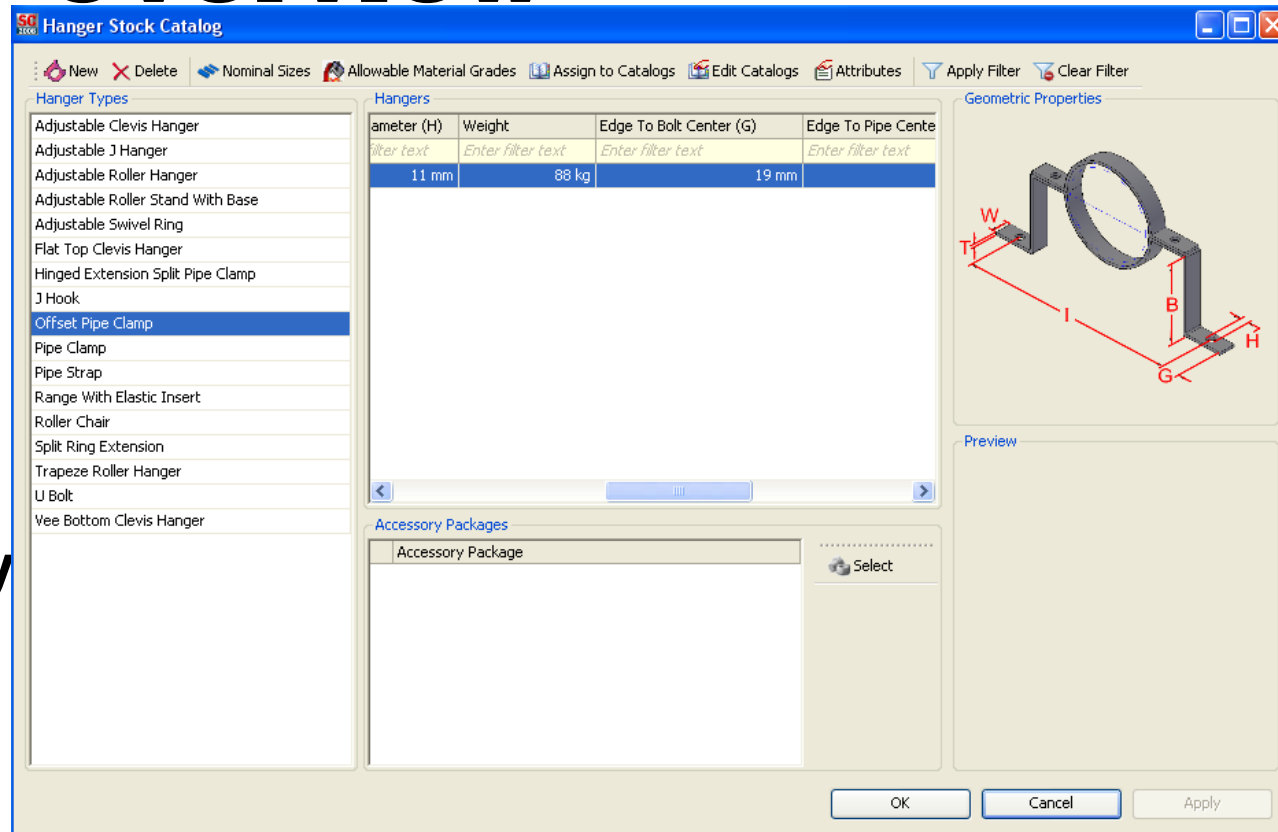
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# Distributed System Supports

## • Feature Overview

### • Hanger Library



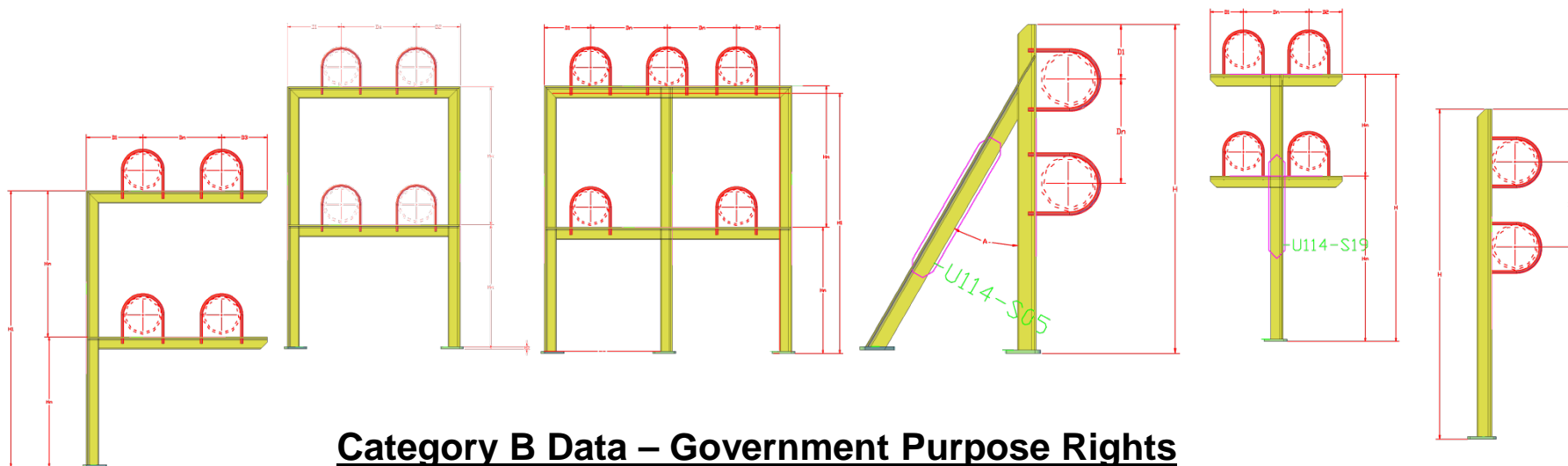
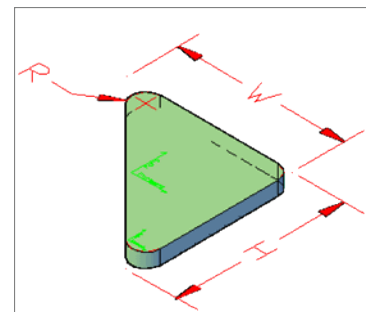
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# Distributed System Supports

## • Feature Overview

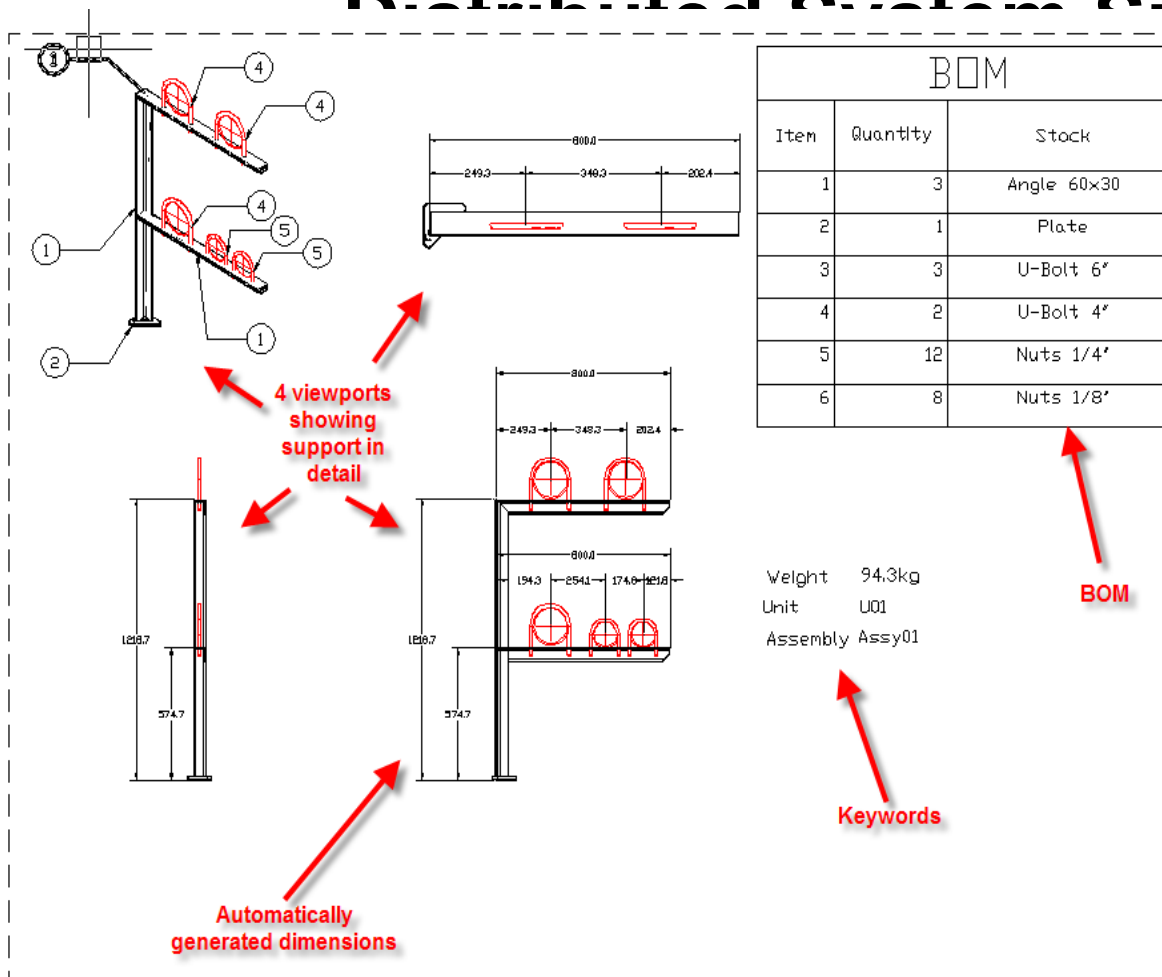
- Support Library



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