

Generic Cost Estimating Relationships

New Ship Construction

Rates based upon average mid-size U.S. commercial shipyard having mid-2000's production facilities.
(factors available for other size yards, foreign and domestic, and for military contractors)

***Confidential & Proprietary
Data***

All material costs and equipment have been escalated for the year

2015

NOTE: To change material cost estimates to another year, insert that year above

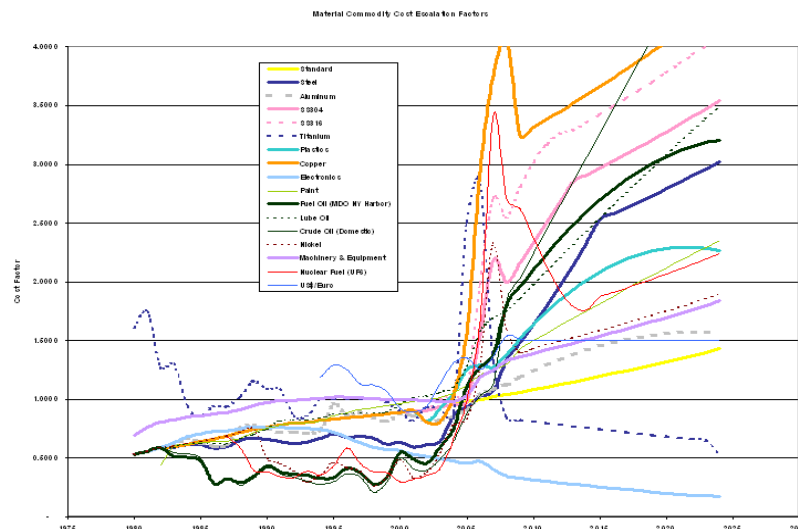


New Construction & Ship Repair Cost Libraries

SPAR's cost libraries are ready for estimating costs across a wide range of shipbuilding and repair applications and across a wide range of estimating planned years. The libraries (there are two, one for new construction and one for ship repair) contain cost estimating relationships (CERs) for shipyard labor hours and for material costs at various levels of detail from production processes to high level ship parameters. The CERs are provided with many different units of measure including weight, area, volume, length, and kW power as well as type material, type fabrication, and higher level units such as vessel ship type, displacement, cubic number, LOA, crew size and many other useful measures.

All material CERs are linked to appropriate commodity-based escalation tables that enable material costs to be adjusted consistently for any required year for an estimate. For example, different commodities historically have responded very differently to price changes. For example, steel prices have not been so erratic in price changes as has copper which affects electric cable more significantly. European machinery, electronic & equipment prices have been linked to the latest U.S. dollar to Euro and to British pound exchange rates.

These escalation tables help keep older costs to more current price levels to minimize the effort to maintain their usefulness.



Sample Display of SPAR's Commodity-Based Escalation Tables

SPAR's extensive CER libraries are continuously updated and expanded. The upgrades include revised commodity-based escalation tables that reflect current changes in prices for materials (steel, aluminum, paint, copper, fuels, etc.) and equipment.

These cost libraries are available for purchase either in the form of hard copy, Excel workbooks or pre-loaded into SPAR's *PERCEPTION® ESTI-MATE®* cost estimating system and database.

NOTICE

The New Construction Cost Estimating Relationships (CERs) should be regarded as representative of production costs for an average mid-size U.S. commercial shipbuilder.

The basis for the CERs has been pulled from a wide range of actual production cost data from many different shipyards, large and small, in the United States and Canada, over the past 10-15 years as well as from other sources. The CERs are the result of blending this data across the shipyards, each with different levels of productivity and manufacturing methods. Factors have been selectively applied to the data to account for shipyard size, its relative level of production technology and an assessment of its relative competence in its ability to manage its costs and schedules. SPAR's precise methods for blending are proprietary, and they are not offered for public use. However, the use of these CERs have yielded cost estimate results that have been tested on numerous occasions and have been found to be highly credible when compared with other independent cost estimating methods.

The CERs are in no way expected to reflect the actual cost performance of any given shipyard. Additional factors and considerations are always required when applying these CERs to a specific shipyard, its elected build strategy, and details of the ship design and selection of equipment and materials.

The blending of actual costs has been performed to develop a generic mid-size (500-1000 production employees) U.S. commercial shipyard that has mid-2000's production facilities including numerically controlled plate cutting and automated panel assembly line. However, special factors are provided for adjusting these generic CERs for larger and/or smaller commercial shipbuilders; for adjusting for combatant and naval auxiliary construction programs; and for adjusting cost performance for foreign shipyards.

Material cost CERs have been summarized and escalated to a common, current year value. Variations due to specific materials, equipment models and configurations, and vendor pricing methods should be expected. Costs assume commercial grade shipbuilding materials and quality management. Special factors are provided for expected higher material costs for naval construction requirements.

These CERs are proprietary information and are protected by copyright. All rights reserved. The use of these CERs should be undertaken with the same care as any level of business information that approximates or simulates any real-world situation. The CERs are not advertised to guarantee an exact correlation with the actual costs that would ultimately be incurred.

The CER information provided is always subject to change without notice.

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New Construction CER Category

Worksheet Name (Hyperlinked)

Electric Cable - Multi-Cable Transits (MCT)	Cable Work
Electric Cable - Packing	Cable Work
Electric Cable - Power Cable	Power Cable
Electric Cable - Preparation Work	Cable Work
Electric Cable - Pulling	Cable Work
Electric Cable - Shooting Studs	Cable Work
Electric Cable Tray - Galv. Horizontal Elbow Type Tray	Cable Trays Charts
Electric Cable Tray - Galv. Ladder Type Tray Horizontal Tee	Cable Trays Charts
Electric Cable Tray - Galv. Ladder Type Tray Radius	Cable Trays Charts
Electric Cable Tray - Galv. Ladder Type Tray Vertical Elbow	Cable Trays Charts
Electric Cable Tray - Galv. Solid Bottom Type Tray	Cable Trays Charts
Electric Cable Tray - Galv. Vented Trough	Cable Trays Charts
Electric Cable Tray - Galv. Vented Trough Horizontal Elbow	Cable Trays Charts
Electric Cable Tray - Galv. Vertical Elbow Type Tray	Cable Trays Charts
Electric Cable Tray - Install Galv Cable Tray w/Fittings & Accessories	Cable Trays Charts
Electric Cable Tray - Install SS Cable Tray w/Fittings & Accessories	Cable Trays Charts
Electric Fiber Optic - Cable	Fiber Optic Cable
Electric Fiber Optic - Cable Miscellaneous	Fiber Optic Cable
Electric Fiber Optic - Cable Splices	Fiber Optic Cable
Electric Fiber Optic - Cable Terminations	Fiber Optic Cable
Electric Fiber Optic - Hybrid Cable	Fiber Optic Cable
Electric Transits - Install Hawke HRT Circular Transit Frame	Transits Charts
Electric Wireways - "T" Box	Wireways
Electric Wireways - 90-Deg Elbow	Wireways
Electric Wireways - Fittings	Wireways
Electric Wireways - Panel Adapter	Wireways
Electric Wireways - Screw Cover	Wireways
Electrical - Battery Charging -	Electrical
Electrical - Electrical Labor	Electrical
Electrical - Electrical Power Distribution -	Electrical
Electrical - Emergency Power Cables -	Electrical Select
Electrical - Emergency Power Cables -	Electrical
Electrical - Emergency Power Generation -	Electrical
Electrical - General Electric - Misc CERs	Electrical
Electrical - General Electrical (CuNo)	Electrical
Electrical - General Electrical (kW & SHIPSETS)	Electrical
Electrical - General Power Conversion -	Electrical
Electrical - Habitation Area Deck Area	Electrical
Electrical - Habitation Area Volume	Electrical
Electrical - Labor	Electrical
Electrical - Lighting System Distribution -	Electrical Select
Electrical - Lighting System Distribution -	Electrical
Electrical - Lighting System Fixtures -	Electrical Select
Electrical - Lighting System Fixtures -	Electrical
Electrical - Machinery Space Electrical	Electrical
Electrical - Motor Control Centers (MCC)	Electrical Select
Electrical - Motor Control Centers (MCC)	Electrical
Electrical - Motor Controllers	Electrical Select
Electrical - Motor Controllers	Electrical
Electrical - Ship Service Power Cables -	Electrical
Electrical - Ship Service Power Cables -	Electrical
Electrical - Ship Service Power Generation -	Electrical
Electrical - Switchboards Power Distribution -	Electrical Select
Electrical - Switchboards Power Distribution -	Electrical
Electrical - Transformer	Electrical 2
Electrical - Uninterrupted Power Supply (UPS)	Electrical 2
Electrical Glands - High Voltage Glanding	Cable Glands
Electrical Glands - Stuffing Galnds	Cable Glands
Electronics - Automatic Identification System (AIS)	Security
Electronics - Bridge Simulator	Electronics
Electronics - Call System: Phones, Walkie Talkie	Electronics
Electronics - Centralized Machinery Control & Monitoring System	Electronics

New Construction CER Category

Insulation - Rigid
 Insulation - Sprayed-On
 Insulation - Tank
 Insulation - Wrap

Labor Rates, International - Average Shipbuilding Labor Rates
 Labor Rates, International - Average Shipbuilding Labor Rates
 Labor Rates, USA - Auxiliary Shipbuilder
 Labor Rates, USA - Average Regional Labor Rates
 Labor Rates, USA - Combatant Shipbuilder
 Labor Rates, USA - Commercial Mid-Tiered Shipbuilder
 Labor Rates, USA - Contracted Technical Services
 Labor Rates, USA - USCG Civilian Labor Rates
 Labor Rates, USA - USCG Military Labor Rates

Machinery - High Speed Diesel Engine Prices
 Machinery - Low Speed Diesel Engine Prices
 Machinery - Medium Speed Diesel Engine Prices
 Machinery - Skysails
 Machinery, Electric Generation - Auxiliary Power Units -
 Machinery, Electric Generation - Batteries
 Machinery, Electric Generation - Diesel Generators
 Machinery, Electric Generation - Diesel Generators
 Machinery, Electric Generation - Electric Generators
 Machinery, Electric Generation - Electric Generators
 Machinery, Electric Generation - Electric Motors
 Machinery, Electric Generation - Emergency Power Generation -
 Machinery, Electric Generation - Gas Turbines + HRSG
 Machinery, Electric Generation - Motor Gensets
 Machinery, Electric Generation - Power Take-Off (PTO) Units -
 Machinery, Electric Generation - Power Take-Off Units
 Machinery, Electric Generation - Ship Service Power Generation -
 Machinery, Electric Generation - Spark Ignition LNG/CNG Gas Engine GE
 Machinery, Electric Generation - Steam Turbines
 Machinery, Electric Generation - Wind Turbines

Machinery, Installations - Machinery & Components

Machinery, Miscellaneous - Air Cushion Vehicle Machinery
 Machinery, Miscellaneous - Anchor gear
 Machinery, Miscellaneous - Auxillary machinery
 Machinery, Miscellaneous - Ballast Water Treatment Systems
 Machinery, Miscellaneous - Cargo Pump Diesel Engines
 Machinery, Miscellaneous - Emissions Reduction Systems (Includes Insta
 Machinery, Miscellaneous - Added Cost for Tire-3 Engines
 Machinery, Miscellaneous - Added Cost for Tire-3 Engines
 Machinery, Miscellaneous - Added Cost for LNG Switching Equipment
 Machinery, Miscellaneous - Added Cost for LNG Switching Equipment
 Machinery, Miscellaneous - Added Cost for Tire-4 Engines (SCR)
 Machinery, Miscellaneous - Engine Weights
 Machinery, Miscellaneous - Equipment Spares
 Machinery, Miscellaneous - Hydraulic Lift Systems
 Machinery, Miscellaneous - Hydraulic Stablizers
 Machinery, Miscellaneous - Intercon Tug-Barge Connector
 Machinery, Miscellaneous - KUBOTA Diesels
 Machinery, Miscellaneous - Miscellaneous Equipment
 Machinery, Miscellaneous - Steering gear
 Machinery, Miscellaneous - Winches and warping gear

Machinery, Propulsion - 2-Stroke Outboards
 Machinery, Propulsion - 4-Stroke Outboards
 Machinery, Propulsion - AZIMUTH Pod Units
 Machinery, Propulsion - Boilers & HRSG
 Machinery, Propulsion - Bow & Stern Thrusters
 Machinery, Propulsion - Diesel Electric Drive - Twin AZIMUTH PODS
 Machinery, Propulsion - Diesel Electric Drive - Twin FPP
 Machinery, Propulsion - Diesel Electric Drive Propulsion Systems

Worksheet Name (Hyperlinked)

[Duct & Wrap Insulation Prices](#)
[Outfit Insulation](#)
[Duct & Wrap Insulation Prices](#)
[Duct & Wrap Insulation Prices](#)

[International Labor Rates](#)
[International Labor Rates Chart](#)
[US Labor Rates](#)
[Regional Wage Rates](#)
[US Labor Rates](#)
[US Labor Rates](#)
[US Labor Rates](#)
[US Labor Rates](#)
[US Labor Rates](#)

[More Machy Graphs](#)
[More Machy Graphs](#)
[More Machy Graphs](#)
[Machinery Equations](#)
[Machinery](#)
[Machinery](#)
[Machinery](#)
[Machinery Graphs](#)
[Machinery Cost Models](#)
[Elect.Generators](#)
[Machinery Graphs](#)
[Machinery](#)
[Gas Turbines + HRSG](#)
[Machinery](#)
[Machinery](#)
[Machinery Graphs](#)
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[Machinery](#)
[Steam Turbines](#)
[Machinery](#)

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[2-Stroke Outboards](#)
[4-Stroke Outboards](#)
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[Machinery](#)
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[Machinery](#)

New Construction CER Category

Worksheet Name (Hyperlinked)

Machinery, Propulsion - Diesel Engine Components	Machinery
Machinery, Propulsion - Diesel w/ CPP	Machinery Cost Models
Machinery, Propulsion - Diesel w/ FPP	Machinery Cost Models
Machinery, Propulsion - Diesel w/ Waterjet	Machinery Cost Models
Machinery, Propulsion - Diesel w/ Z-Drive	Machinery Cost Models
Machinery, Propulsion - Diesel-Electric w/ FPP	Machinery Cost Models
Machinery, Propulsion - Diesel-Electric w/ Pod	Machinery Cost Models
Machinery, Propulsion - Diesel-Electric w/ Waterjet	Machinery Cost Models
Machinery, Propulsion - Electric Loiter Motors	Machinery
Machinery, Propulsion - Fuel Cells	Machinery
Machinery, Propulsion - Gas Turbine w/ FPP	Machinery Cost Models
Machinery, Propulsion - Gas Turbine w/ Pod	Machinery Cost Models
Machinery, Propulsion - Gas Turbine w/ Waterjet	Machinery Cost Models
Machinery, Propulsion - Gas Turbines	Machinery
Machinery, Propulsion - Gear Boxes	Machinery
Machinery, Propulsion - High Performance Gas Engines	High Performance Gas Engines
Machinery, Propulsion - High Speed Diesel Engines	Machinery
Machinery, Propulsion - High Speed Diesel w/ Water Jet	Machinery
Machinery, Propulsion - High Speed Geared Diesel Propulsion Systems	Machinery
Machinery, Propulsion - KORT Nozzle	Machinery
Machinery, Propulsion - LNG Capable Diesel Engines	Machinery
Machinery, Propulsion - Low Speed Diesel Engines	Machinery
Machinery, Propulsion - Low Speed Direct Drive Diesel Propulsion System	Machinery
Machinery, Propulsion - Medium Speed Diesel Engines	Machinery
Machinery, Propulsion - Medium Speed Geared Diesel Propulsion System	Machinery
Machinery, Propulsion - Misc. Supplemental Propulsion	Machinery Cost Models
Machinery, Propulsion - Nuclear Electric Drive	Machinery
Machinery, Propulsion - Nuclear-Gas Turbine Electric Drive w/ FPP	Machinery Cost Models
Machinery, Propulsion - Nuclear-Gas Turbine Electric Drive w/ Pod	Machinery Cost Models
Machinery, Propulsion - Nuclear-Gas Turbine w/ Waterjet	Machinery Cost Models
Machinery, Propulsion - Propellers - CPP	Machinery
Machinery, Propulsion - Propellers - FPP	Machinery
Machinery, Propulsion - Propulsion Controls	Machinery
Machinery, Propulsion - Propulsion Cost Comparison Graphs	Propulsion Cost Graphs
Machinery, Propulsion - Shafting	Machinery
Machinery, Propulsion - Sky Sails	Machinery
Machinery, Propulsion - Steam Turbine w/ FPP	Machinery Cost Models
Machinery, Propulsion - Steam Turbines	Machinery
Machinery, Propulsion - Thrusters	Machinery Cost Models
Machinery, Propulsion - Thrusters	Thrusters
Machinery, Propulsion - Water Jets	Machinery
Machinery, Propulsion - Waterjets	Waterjets
Miscellaneous - Excavation Services	Excavation Services
Miscellaneous - Highways	Highways
Miscellaneous - Ship Characteristics	Ship Characteristics
Miscellaneous - Units of Measure	Units of Measure
Miscellaneous - Work Type	Work Type
Oil & Gas Equipment - Subsea Power Cable	Oil-Gas Equipment
Oil & Gas Equipment - Floating Oil Transfer Hose	Oil-Gas Equipment
Oil & Gas Equipment - Subsea Active Heavy Compensated Crane	Outfit Equipment
Outfit - Anchor	Anchor & Mooring
Outfit - Anchor & Anchor Gear	Outfit Equipment
Outfit - Anchor Chain	Anchor & Mooring
Outfit - Anchor Chain Stopper	Anchor & Mooring
Outfit - Anchor Chain Swivel	Anchor & Mooring
Outfit - Anchor Winch	Anchor & Mooring
Outfit - Anchor Windlass	Outfit Equipment
Outfit - ATB Connectors	Outfit Equipment
Outfit - Berthing Areas	Outfit
Outfit - Bollards, Chocks & Fairleads	Outfit Equipment
Outfit - Bulker Hatch Covers	Outfit Equipment
Outfit - Capstan	Anchor & Mooring
Outfit - Cathodic Protection	Outfit
Outfit - Ceilings	Outfit

New Construction CER Category

Outfit - Container Cell Guides & Handling Equipment
 Outfit - Cranes
 Outfit - Davits
 Outfit - Deck Coverings
 Outfit - Doors
 Outfit - Drilling Equipment
 Outfit - Elevators & Lift Equipment
 Outfit - Evacuation Systems
 Outfit - Fenders & Fender Gear
 Outfit - Fenders & Fender Gear
 Outfit - Fire Fighting Equipment
 Outfit - Floors, Ladders, Walkways, & Grates
 Outfit - Food Prep Area
 Outfit - Forklift Equipment
 Outfit - Fuel Tanks
 Outfit - General Zone Outfit
 Outfit - Hatches
 Outfit - Hull Designations And Markings
 Outfit - Joiner Work & Furnishings
 Outfit - Laundry Facilities
 Outfit - Life & Rescue Boats
 Outfit - Life Buoys
 Outfit - Life Buoys
 Outfit - Life Jackets & Survival Suits
 Outfit - Life Rafts
 Outfit - Life Rafts & Raft Davits
 Outfit - LNG Tanks
 Outfit - Lockers
 Outfit - Machinery Spaces Furnishings
 Outfit - Manholes & Cleaning Ports
 Outfit - Masts and Spars
 Outfit - Medical Facilities
 Outfit - Metal Sheathing & Bulkheads
 Outfit - Mooring & Towing Gear
 Outfit - Mooring Winch
 Outfit - Mooring/Tow Synthetic Rope
 Outfit - Mooring/Tow Wire Rope
 Outfit - Office Equip & Furn in Wheelhouse
 Outfit - PAX Lounge Facilities
 Outfit - Pollution Control Equipment
 Outfit - Purchased Vehicle Ramps
 Outfit - Railings
 Outfit - Rigging & Canvas
 Outfit - Ro/Ro Bow Doors & Ramps
 Outfit - Ship's Office Facilities
 Outfit - Shops & Storerooms
 Outfit - Signage, Label Plates & ID Tags
 Outfit - Smoke Stacks & Uptakes
 Outfit - Synthetic Mooring Rope
 Outfit - Tanks
 Outfit - Tanks, Steel
 Outfit - US Navy Sonar Domes - Polymer/Composite
 Outfit - Vehicle Deck Tie Downs
 Outfit - Wheelhouse & Chartroom Furnishings
 Outfit - Windows & Ports
 Outfit - Wire Rope

Pipe Bending - Black Steel
 Pipe Bending - Black Steel
 Pipe Bending - Copper
 Pipe Bending - Copper
 Pipe Bending - Copper Nickel
 Pipe Bending - Copper Nickel
 Pipe Bending - CRES
 Pipe Bending - CRES
 Pipe Bending - Galvanized
 Pipe Bending - Galvanized

Worksheet Name (Hyperlinked)

[Outfit Equipment](#)
[Outfit Equipment](#)
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[Outfit Equipment](#)
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[Outfit Equipment](#)
[Fenders](#)
[Outfit Equipment](#)
[Outfit](#)
[Outfit](#)
[Outfit Equipment](#)
[Outfit Equipment](#)
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[Outfit Equipment](#)
[Life Rafts & Life Buoys](#)
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[Outfit Equipment](#)
[Pipe Bends Charts](#)
[Pipe Bending PBI](#)
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[Pipe Bending PBI](#)

New Construction CER Category

Worksheet Name (Hyperlinked)

Pipe Fabrication - CRES	CRES Pipe Fab PBI
Pipe Specs - ANSI	ANSI Pipe Specs
Piping Systems - Ballast Treat Systems	Pumps & Piping
Piping Systems - Bilge & Ballast Systems	Pumps & Piping
Piping Systems - Charts Pipe, Fits & Hangers	Charts Pipe, Fits & Hangers
Piping Systems - Compressed Air Systems	Pumps & Piping
Piping Systems - Container Shore Facility Crane	Outfit Misc.
Piping Systems - Deck Heating Systems	Pumps & Piping
Piping Systems - Exhaust, Smoke Stacks & Uptakes	Pumps & Piping
Piping Systems - Fire Extinguishing Systems	Pumps & Piping
Piping Systems - Fresh Water Cooling Systems	Pumps & Piping
Piping Systems - Fresh Water Distiller	Pumps & Piping
Piping Systems - Fuel Burning Systems	Pumps & Piping
Piping Systems - Fuel Fill, Transfer & Purify Systems	Pumps & Piping
Piping Systems - Fuel Oil Heating Systems	Pumps & Piping
Piping Systems - Fuel Vent Systems	Pumps & Piping
Piping Systems - Garbage Disposal Systems	Pumps & Piping
Piping Systems - Helicopter Refueling System	Pumps & Piping
Piping Systems - HVAC Piping	Pumps & Piping
Piping Systems - Hydraulic Systems	Pumps & Piping
Piping Systems - Large-Scale Desalination Plants (MSF-Multi-Stage Fla	Outfit Misc.
Piping Systems - Liquid Cargo Systems	Pumps & Piping
Piping Systems - LNG Re-Liquidation Systems	Pumps & Piping
Piping Systems - Lube Oil Systems	Pumps & Piping
Piping Systems - Misc. Machinery Piping	Pumps & Piping
Piping Systems - Navigation Light	Outfit Misc.
Piping Systems - Offshore Gas Steel Tube Umbilical (Aker - Norway)	Outfit Misc.
Piping Systems - Pipe - Bondstran	Bondstran FRP Pipe & Fits
Piping Systems - Pipe - Bondstran	Bondstran FRP Pipe & Fits
Piping Systems - Pipe - Copper Nickel	CuNi & Titanium Pipe
Piping Systems - Pipe - Copper Nickel	CuNi & Titanium Pipe Prices
Piping Systems - Pipe - Copper Nickel	Non-Steel Pipe Graphs
Piping Systems - Pipe - PVC	PVC Pipe
Piping Systems - Pipe - Rolled Plate Tubes	Rolled Plate Tubes
Piping Systems - Pipe - Stainless Steel	CuNi & Titanium Pipe Prices
Piping Systems - Pipe - Stainless Steel, 304, 316, SCH 40, SCH 80	StainlessPipeMaterial
Piping Systems - Pipe - Stainless Steel	SS Pipe \$M
Piping Systems - Pipe - Stainless Steel	SS Pipe \$FT
Piping Systems - Pipe - Stainless Steel	SS Pipe Price Graphs
Piping Systems - Pipe - Stainless Steel	316L SS Pipe & Fits
Piping Systems - Pipe - Stainless Steel Fittings	316L SS Pipe & Fits
Piping Systems - Pipe - Steel Black & Seamless	Steel Pipe \$M
Piping Systems - Pipe - Steel Black & Seamless	Steel Pipe \$Foot
Piping Systems - Pipe - Steel Black (Seamless, ERW & Welded)	Steel Pipe Price Graphs
Piping Systems - Pipe - Steel Galvanized Pipe	Steel Pipe Price Graphs
Piping Systems - Pipe - Steel Pipe Characteristics	Pipe Specs
Piping Systems - Pipe - Steel Pipe Prices	Pipe Specs
Piping Systems - Pipe - Titanium	CuNi & Titanium Pipe
Piping Systems - Pipe - Titanium	CuNi & Titanium Pipe Prices
Piping Systems - Pipe - Titanium	Non-Steel Pipe Graphs
Piping Systems - Pipe - Titanium	TitaniumPipeMaterial
Piping Systems - Plumbing Systems	Pumps & Piping
Piping Systems - Pump Installation	Charts-Pumps
Piping Systems - Pumps	Pumps & Piping
Piping Systems - Sea Water Cooling Systems	Pumps & Piping
Piping Systems - Searchlight	Outfit Misc.
Piping Systems - Sewerage Treatment Systems	Pumps & Piping
Piping Systems - Steam Condensate & Feed Systems	Pumps & Piping
Piping Systems - Uncontaminated SW & Incubator Systems	Pumps & Piping
Piping Systems - Valve Prices & Installation Hours	Valve Graphs
Piping Systems - Valves, Ball	Valves
Piping Systems - Valves, Butterfly	Valves
Piping Systems - Valves, Check	Valves
Piping Systems - Valves, Gate	Valves

New Construction CER Category

Piping Systems - Valves, Globe
 Piping Systems - Valves, Motor-Operated
 Piping Systems - Valves, Pressure/Vacuum
 Piping Systems - Valves, Relief
 Piping Systems - Waste Oil Systems
 Piping Systems - Watermakers

Productivity Factors - Hull Size Productivity Factors
 Productivity Factors - International Shipyards
 Productivity Factors - U.S. Shipyards
 Productivity Factors - Stage of Construction
 Productivity Factors - On-Board Work Areas
 Productivity Factors - Work Height
 Productivity Factors - Mild Steel
 Productivity Factors - HT Steel
 Productivity Factors - HY80 Steel
 Productivity Factors - HSLA80 Steel
 Productivity Factors - HY100 Steel
 Productivity Factors - HSLA100 Steel
 Productivity Factors - HSLA100M Steel
 Productivity Factors - HY130 Steel
 Productivity Factors - CP Ti50 A Titanium
 Productivity Factors - Ti130 Titanium
 Productivity Factors - Aluminum 5086
 Productivity Factors - Aluminum 5456

Science Equipment - Acoustic Systems
 Science Equipment - Centerboard and Trunk [controls & outfitting]
 Science Equipment - Hydrographic Research A-Frame
 Science Equipment - Hydrographic Research Deck Equipment
 Science Equipment - Hydrographic Research Electronics
 Science Equipment - Hydrographic Research Lab Equipment
 Science Equipment - Hydrographic Research Miscellaneous
 Science Equipment - Oceanographic Science Equipment
 Science Equipment - Science Communications
 Science Equipment - Science Deck Equipment
 Science Equipment - Science Outfit and Furnishings
 Science Equipment - Sub-Sea Vehicles
 Science Equipment - Trawl Outfit and Equipment

Security Registration - Ship Registration
 Security Registration - Ship Security Certification
 Security Registration - Ship Security Plan
 Security Registration - Training, Ship Security Officer (MTSA/ISPS/TWIC)

Shipyards Services - Barging Hull Blocks -
 Shipyards Services - Crew Training
 Shipyards Services - Equipment Rentals - No Resident Equipment
 Shipyards Services - Fire department
 Shipyards Services - Freight - Average Equipment & Material
 Shipyards Services - Inland Tug/Barge
 Shipyards Services - Inspection Fees
 Shipyards Services - Inspection, Coating Destructive
 Shipyards Services - Inspection, Radiographic
 Shipyards Services - Jigs & Fixtures
 Shipyards Services - Land Transportation of Hull Blocks
 Shipyards Services - Launching party
 Shipyards Services - Material Expediting
 Shipyards Services - Material Handling
 Shipyards Services - Miscellaneous
 Shipyards Services - Mock Ups
 Shipyards Services - Monthly Services
 Shipyards Services - NDT Testing of Welds-Pt (liquid penetrant)
 Shipyards Services - Patterns
 Shipyards Services - Preparation, holds, quarters, machinery spaces
 Shipyards Services - Production Engineering
 Shipyards Services - Production Planning

Worksheet Name (Hyperlinked)

[Valves](#)
[Valves](#)
[Valves](#)
[Valves](#)
[Pumps & Piping](#)
[Watermakers](#)

[Structural Size Factors](#)
[Internat'l Perform. Factor](#)
[Shipyards Performance Factors](#)
[Shipyards Performance Factors](#)
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New Construction CER Category

Shipyard Services - Project Administration
 Shipyard Services - Protection Services
 Shipyard Services - Quality Control
 Shipyard Services - RO-RO Sea Transport
 Shipyard Services - Staging & Scaffolding
 Shipyard Services - Staging and Launching
 Shipyard Services - Supervision & Production Control
 Shipyard Services - Tank Air Test (per tank)
 Shipyard Services - Temporary lights, heating, power, etc.
 Shipyard Services - Testing
 Shipyard Services - Tools & instruments
 Shipyard Services - Tools & General Spares
 Shipyard Services - Trials
 Shipyard Services - Transport Vessel Cradles
 Shipyard Services - Transport Vessel Services
 Shipyard Services - Tug Services - Hampton Roads Area
 Shipyard Services - Tug Services - Philadelphia Area
 Shipyard Services - Tugs - per hour per tug
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Structural Material Process - Cutting, Laser Plate Cutting
 Structural Material Process - Cutting, Oxy-Fuel Plate Cutting
 Structural Material Process - Cutting, Plasma Plate Cutting
 Structural Material Process - Cutting, Waterjet Plate Cutting
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Structures, Aluminum - Aluminum Plate Prices
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Structures, Blocks & Assemblies - Aluminum Block Structures
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 Structures, Blocks & Assemblies - Structure - Mild Steel Blocks
 Structures, Blocks & Assemblies - Structure Hull Distribution

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Structures, Metals - Compare Metals Characteristics
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 Structures, Metals - Weight & Labor Conversion Factors

Structures, Stainless Steel - Stainless Steel Plate Prices
 Structures, Stainless Steel - Stainless Steel Plate Prices

Structures, Steel - Steel Plate & Shapes Prices
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Structures, Steel - Steel Plate Prices
Structures, Steel - Steel Plate Units of Measure

Structures, Titanium - Titanium Plate Prices
Structures, Titanium - Titanium Plate Prices

Structures, Fixed BallastFixed Ballast Material

Tubing - Aluminum
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