NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

ENGINEERING CATALOG

60 HZ

API/OIL & GAS

COMMERCIAL

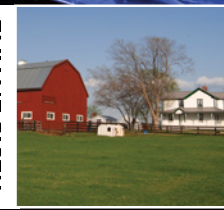
INDUSTRIAL

IRRIGATION

MINING

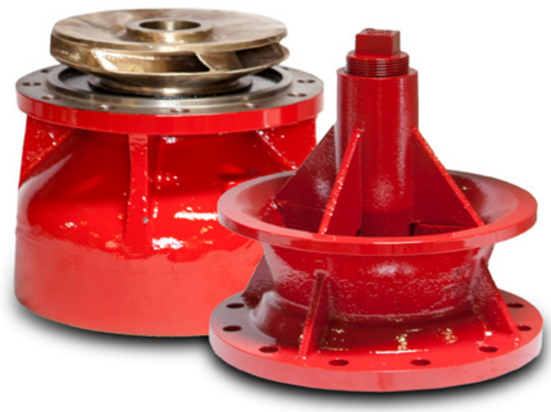
MUNICIPAL

RESIDENTIAL



PERFORMANCE | QUALITY | SERVICE | TRUST

NEW PRODUCTS FROM NPC



L10

The Model L10 pump line is newly designed to meet the stringent requirements of the API (oil and gas) and snow making markets. This pump consists of low flow and high head per stage that incorporates a low NPSH first stage impeller, required for both API and snow making. Design conditions – 300-400 GPM @ 50' TDH (1800 RPM) and 600-800 GPM @ 200' TDH (3600 RPM).

H16

Our new Model H16 pump line completes our product line, between our 14" & 18" pump models. This is a high efficiency pump, with a capacity range of 3,500 to 5,500 GPM @ 100' TDH, and is designed for the municipal, industrial, and agricultural markets.

STAINLESS STEEL CAST IMPELLERS AND BEARING RETAINERS

We have added Stainless Steel (304 and 316SS) cast impellers and bearing retainers to our product line. Available off the shelf for immediate shipment, many of our customers have a need for this product and we want to ensure we have the product in stock, should their need arise.

STAYING AHEAD OF THE CURVE

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

MAIN OFFICE

Certified to NSF/ANSI 61

ARIZONA

7706 N. 71st Avenue
Glendale, AZ 85303-1703
(623) 979-3560 • Fax (623) 979-2177
(800) 966-5240

ISO 9001 Registered

FACTORY BRANCH LOCATIONS

CALIFORNIA

2830 San Antonio Drive
Fowler, CA 93625
(559) 834-5437 • Fax (559) 834-5727
(800) 868-9755

FLORIDA

195 E. 3rd Street
Zolfo Springs, FL 33890
(863) 735-8222 • Fax (863) 735-8202
(800) 994-3045

MISSISSIPPI

11176 Green Valley Drive
Olive Branch, MS 38654
(662) 895-1110 • Fax (662) 895-5083
(866) 668-4914

TEXAS

LUBBOCK

4229 Adrian Street
Lubbock, TX 79415
(806) 745-5396 • Fax (806) 745-6668
(800) 745-5393

HOUSTON

109 North Richey
Pasadena, TX 77506
(713) 641-6818 • Fax (713) 641-4569
(800) 231-0590

Email: info@natlpump.com

www.nationalpumpcompany.com

National Keeps You Pumping Around The World

At National Pump, pump technology is our business. From principals and engineers to sales and service personnel, our key staff members have more than three centuries of combined industry experience. We want to help you achieve your goals and objectives, and we're big enough to meet your needs, yet small enough to provide the one-to-one service you deserve.

At every stage of our work, from research and development to design, production and testing, we use up-to-the-minute technologies and the most modern equipment available to ensure that every National Pump meets the highest possible standards of efficiency and reliability. Using conventional or special materials, we manufacture pumps for specific needs and conditions.

From gold mines to golf courses to grain fields, our pumps are hard at work around the world. Serving commercial, industrial, municipal, power, residential, mining, oil and gas and agricultural irrigation needs, each National Pump produced is an individual pumping system designed to do a specific pumping job. Precisely matched drivers, discharge heads, impellers, bowls and column /shaft assemblies deliver consistent pumping capacity.

We offer a full range of vertical turbine and submersible pumps, water or oil lubricated, of threaded or flanged construction, with capacities to 20,000 GPM and pressures up to 2,000 PSI. All pump models are in stock as standard materials, and they can be customized at the service center level. We also manufacture custom pumps, using special alloys and coatings to suit your specific needs. We have multiple patterns in order to meet special alloy requirements in a timely manner.

Even more important is the service we provide. We will be happy to provide pre-design information to help you develop the most efficient pumping system for your customer's needs. Whatever your application, we know that having equipment down causes unacceptable delays so each of our offices is a complete service / warehouse / assembly / finishing center.

Our branches are strategically located throughout the United States and staffed by experienced managers who are all technical experts, ready to help solve your problems on the phone or on site. No matter what brand of pump you have, when you need service, you get it now - not a two month delay while parts are ordered, or a several-day wait for a visit from service personnel.

Before you design your next pumping system, talk with a National Pump expert and take advantage of the knowledge and experience we have to offer. We're convinced you won't find better quality or service anywhere!

Creating Quality Pump Systems and Satisfied Customers

Visit us on the web at: www.nationalpumpcompany.com

REVISED OCTOBER 2022

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NATIONAL PUMP COMPANY

Subject to the terms and conditions set forth below, NATIONAL PUMP COMPANY ("National") warrants that its manufactured equipment is free from defects in workmanship and materials USING ITS SPECIFICATIONS AS A STANDARD. This warranty does not extend to anyone except the first purchaser to whom the goods are shipped from National.

National's obligation under this warranty is expressly limited to replacing or repairing, free of charge, F.O.B. point of manufacture, any defective part or parts of its manufactured equipment; however, NATIONAL SHALL HAVE NO SUCH LIABILITY EXCEPT WHERE IT IS SHOWN TO THE SATISFACTION OF NATIONAL THAT THE DAMAGE OR CLAIM RESULTED FROM BREACH OF THIS WARRANTY. All parts claimed defective must be delivered to National at its factory or any factory branch, freight or express thereon PREPAID.

Every claim under this warranty SHALL BE DEEMED WAIVED UNLESS MADE IN WRITING AND RECEIVED BY NATIONAL WITHIN THIRTY (30) DAYS OF THE DATE THE DEFECT WAS DISCOVERED OR SHALL HAVE BEEN DISCOVERED, and within one year of the date of installation. The installation date must be within six months of the date the pump was purchased from National.

This Warranty does not cover those parts of the manufactured equipment which are not manufactured by National except to extend to the purchaser the same warranty, if any which is given to National by the manufacturers of said parts.

National makes no other representation of warranty of any kind, express or implied, in fact or in law, including without limitation, the warranty of merchantability or the warranty of fitness for a particular purchase, other than the limited warranty set forth herein. In no event shall National be liable for any consequential or incidental damages resulting directly or indirectly from the use or loss of use of the manufactured equipment. National shall not be liable for any alleged negligence, breach of warranty, strict liability, or any other theory other than the limited liability set forth herein.

THIS WARRANTY CONTAINS THE ENTIRE WARRANTY RELATING TO THE MANUFACTURED GOODS OF NATIONAL, AND NO CONDUCT, ORAL STATEMENTS OR REPRESENTATIONS NOT CONTAINED IN THIS WARRANTY SHALL HAVE ANY FORCE OR EFFECT OR BE DEEMED A WAIVER THEREOF, THIS WARRANTY SHALL NOT BE MODIFIED IN ANY WAY EXCEPT IF IN WRITING AND SIGNED BY AN AUTHORIZED REPRESENTATIVE OF NATIONAL.

This Warranty, and any liability of National hereunder, shall be governed by, construed, and enforced in accordance with the laws of the State of Ohio.

STANDARD TERMS AND CONDITIONS OF SALE

1. **ACCEPTANCE OF ORDERS:** All orders are subject to acceptance by an Officer of the Company and orders and deliveries are subject to the Company's regular credit policy. The Company reserves the right to refuse any order based on a quotation containing a gross error.

2. **PRICES:** List prices and discount schedules are to be maintained at all times. Prices are for merchandise F.O.B. shipping points, freight collect or prepaid, and added to the invoice. Prices, discounts, quotations, and specifications are subject to change without notice and will be applied as in effect at time of shipment.

3. **TERMS:** All quotations are subject to National Pump Co., standard terms and conditions. Payment terms require credit department approval at our main office, Glendale, AZ. Interest at the maximum legal rate will be charged on all overdue amounts.

4. **TAXES:** Taxes imposed by any Federal, State, County, or Municipal law on the sale will be added to the invoice, unless a fully executed tax exemption certificate is received with the order.

5. **ORDER CHANGES:** No changes in orders will be accepted from the Purchaser except by special written arrangement with the executive office of National.

6. **RETURN OF GOODS:** Written permission from the factory must be obtained before returning any merchandise. All transportation charges must be borne by the Customer. New material of current design accepted by the Company for credit is subject to a restocking charge of at least 15 percent.

7. **CLAIMS:** All goods shall be deemed delivered to purchaser at the time they are placed in the hands of carrier and consigned to purchaser.

8. **ROUTING:** If routing of shipment is specified on Customer's order, it will be followed whenever practical.

9. **SUBSTITUTION:** The Company reserves the right to substitute materials and modify specification to the extent required in order to comply with any Government law or regulation.

10. **MINIMUM ORDER AMOUNT:** The minimum order amount to be charged on customer account is $50.00. All orders for less than this amount will be billed at the minimum of $50.00 not including tax or freight charges.

API / OIL AND GAS INSTALLATIONS

Materials of Construction: All nickel aluminum bronze construction / Kmonel shaft and hardware.

Pump Model: K20MC - 3 stage – submersible pump
M10LC - 2 stage – submersible pump

Design Conditions: 2 @ 5600 GPM @ 345 Feet TDH with 84% Eff. 650 HP
1 @ 900 GPM @ 345 Feet TDH with 80% Eff. 125 HP

Liquid Pumped: Sea Water

Comments: These submersible pumps were for process water on an oil platform in the South China Sea, off the coast of South Korea for KNOC (Korea National Oil Company). Quantity of 2 – 650 HP Submersibles and 1 – 125 HP Submersible. All pumps were complete with NI AI. bronze flanged column pipe and surface plate.

API / OIL AND GAS INSTALLATIONS

AZORES AFB, PORTUGAL
Pumping JP-8
Fuel Transfer Pumps
48 GPM 146' GPM
M6LC – 10 Stage

BAGRAM AFB, AFGANISTAN
Pumping JP-8 & Diesel
Fueling Pumps
50 GPM @ 5 HP
300 GPM @ 30 HP
600 GPM @ 50 HP
900 GPM @ 150 HP
M6MC, M8HC, J11MC, M12HC

CAMP EDWARDS, KOREA
Pumping JP-8
Fueling Pumps
300 GPM @ 230' TDH
M9HC – 8 Stage

CAMP CASEY, KOREA
Pumping JP-8
Fueling Pumps
200 GPM @ 92' TDH
M8MC – 4 Stage

CAMP PAGE, KOREA
Pumping JP-8
Fueling Pumps
301 GPM @ 407' TDH
M10LC - 8 Stage

CANNON AFB – CURRY, COLORADO
Pumping JP-8
Fueling Pumps
50 GPM @ 129' TDH
M6LC - 9 Stage

CB&I, YEMEN LNG, MARIB, YEMEN
Pumping LPG
Transfer Pumps
448 GPM @ 1974' TDH
M8MC – 25 Stage

CHEVRON / TEXACO
Pumping Sea Water
Submersible Pumps
500 GPM @ 375' TDH
M8MC – 4 Stage

GRANDFORKS AFB
Pumping JP-8
Fuel Transfer Pumps
300 GPM @ 250' TDH
M8MC - 9 Stage

HUSKY OIL COMP., CANADA
Pumping Crude Oil
Fuel Transfer Pumps
150 M3/H @183 M
M12LC – 9 Stage

KUSAN, KOREA
Pumping JP-8
Fueling Pumps
400 GPM @ 108' TDH
M8MC– 1 Stage
600 GPM @ 210' TDH
M8MC – 2 Stage

KWANGJU, KOREA
Pumping JP-8
Fuel Transfer Pumps
300 GPM @ 206' TDH
M8XLC – 2 Stage
300 GPM @ 75' TDH
M8HC – 3 Stage
300 GPM @ 50'
M8HC – 2 Stage
300 GPM - 224' TDH
M8XLC – 2 Stage

MCAS - BEAUFORT, S.C.
Pumping JP-8
Fuel Transfer Pumps
300 GPM @ 160' TDH
E6XHC – 4 Stage
600 GPM @ 425' TDH
M8MC – 4 Stage

MCAS MIRAMAR – MIRAMAR, CA
Pumping JP-8
Fuel Transfer Pumps
50 GPM @ 172' TDH
M6MC – 12 Stage

S & B ENGINEERS / PL PROPYLENE LLC
Pumping Hydrocarbon Condensate
Condensate Pumps
429 GPM @ 194' TDH
M8XHC – 7 Stage

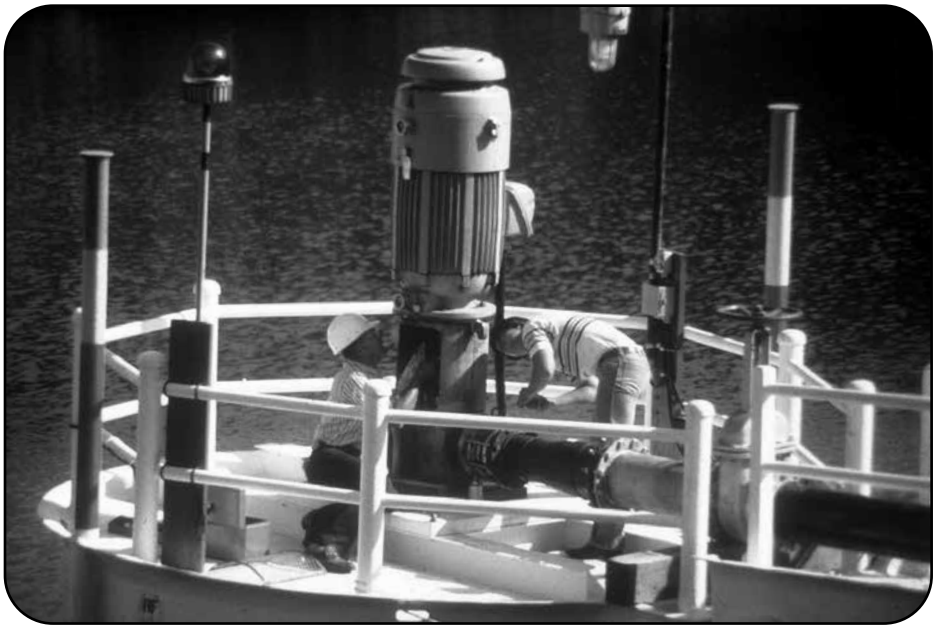
SOTO CANO, HONDURAS
Pumping Jet Fuel
Fuel Transfer Pumps
300 GPM @ 204' TDH
M8HC – 6 Stages
50 GPM @ 60' TDH
M6MC – 4 Stages

PLAINS PIPELINE
Pumping Crude Oil
Crude Oil Transfer Pumps
12,613 GPM @ 315' TDH
1250 HP
H24XHC – 4 Stages

TEMA OIL REFINERY
Pumping LPG
Loading Pump
120 M3/HR @ 92.9 Meters
J11MC – 7 Stage

WRIGHT PATTERSON AFB
Pumping JP-8
Flight Line Transfer Pumps
Transferring jet fuel
600 GPM @ 419' TDH
M10HC –8 Stage

MINING



Materials of Construction: Complete 316 S.S. can booster and two 316 S.S. barge mounted pumps using carbon graphite bearings, and 316 S.S. mechanical seals.

Pump Model:
Barge Pump – 4 stage M14MC bowl assembly
Barge Pump – 6 stage M14MC bowl assembly
Can Booster – 7 stage M14MC bowl assembly

Design Conditions:
1000 G.P.M. @ 370' T.D.H. – 150 H.P. VSS
Mill and Chem. TEFC motor.
1000 G.P.M. @ 580'T.D.H. – 250 H.P. VSS
Mill and Chem. TEFC motor.
1000 G.P.M. @ 640'T.D.H. – 250 H.P. VSS
Mill and Chem. TEFC motor.

Liquid Pumped:
Less than 10% H2 SO4 (sulfuric acid) and water solution.
Specific Gravity – 1.02

Comments: Reclaimed water utilized by the mine for the extraction of minerals (in particular copper) from the solution at the leaching process of the copper plants. The initial pump was floated on a fiberglass barge on a lake at the mine site to begin this process. This offshore pump was attached to the initial booster pump on shore via a flexible polypropylene pipe, boosting this mine solution to the 2nd booster pump, up the mountain and to the mine site for processing.

MINING INSTALLATIONS

GETTY OIL MINING COMPANY

SAN MATEO, CALIFORNIA

Mercur Gold Project
Pumping process water
In-Line Booster Pumps
620 GPM @ 920’ TDH
300 GPM @ 1,010’ TDH
300 GPM @ 1,550’ TDH

BECHTEL POWER CORPORATION

SAN FRANCISCO, CALIFORNIA

For Amselco Minerals, Inc.
Pumping sodium hydroxide
Process Pumps
1396 GPM @ 375’ TDH
1008 GPM @ 80’ TDH
180 GPM @ 250’
M14MC – 4 Stage
M11MC – 2 Stage
M8XLC – 10 Stage

NORANDA LAKESHORE MINES

ARIZONA

Pumping acid mine water
All 316 S.S. bowl assembly
1000 GPM @380’ TDH
M12MC – 5 Stage

CYPRUS-BAGDAD COPPER COMPANY

BAGDAD, ARIZONA

Pumping acid mine water
Canned Booster Pumps
1500 GPM @ 350’ TDH
4 Units

KENNECOTT CHINO MINES

HURLEY, NEW MEXICO

Pumping mine water
500 to 1000 GPM @ 500’ to 800’ TDH
6 Units

INSPIRATION CONSOLIDATED COPPER COMPANY, INC.

CLAYPOOL, ARIZONA

Pumping acid mine water
All 316 S.S. barge mounted and canned booster pumps
1000 GPM @ 580’ TDH
1000 GPM @ 370’ TDH
1000 GPM @ 640’ TDH

MAGMA NEVADA MINING COMPANY

RUTH, NEVADA

Iron constructed pumps for water
2550 GPM @ 230’ TDH
H14MC – 3 Stage
2500 GPM @ 160’ TDH
H14MC – 2 Stage

PEA RIDGE IRON ORE COMPANY

SULLIVAN, MISSOURI

Pumping river water
Booster Pumps
1200 GPM @ 690’ TDH
SE12MC – 11 Stage

NEVADA GOLD MINING

WINNEMUCCA, NEVADA

Pumping mine water
Iron constructed pumps
3100 GPM @ 300’ TDH
H12XHC – 4 Stage

CHAMCO INDUSTRIES

VANCOUVER, B.C., CANADA

Pumping mine process water
316 S.S. booster pumps

CODELCO MINES

CHILE, S.A.

Pumping mine production water
Well Pumps
H14XHC – 3 Stage
J8XHC – 4 Stage

POWER

Materials of Construction: Standard Cast Iron / Bronze
18" Fab Discharge Head / Flanged Column

Pump Model: 2 Stage H24MC Bowl Assembly
Quantity – 8

Design Conditions: 12500 G.P.M @ 80' T.D.H.
300 HP @ 1200 R.P.M.

Liquid Pumped: River Water

Comments: The eight pumps are used to pump water from the river, up through the cooling towers. This process keeps the core, where the electricity is made, cool. The water is then released back into the river at the same temperature it was originally, when it was pumped out of the river.

POWER INSTALLATIONS

DETROIT EDISON POWER PLANT

ST. CLAIR POWER PLANT

General service pumps
6,000 GPM @ 200’ TDH
J24HC – 2 Stage

PACIFIC GAS AND ELECTRIC

ANAHEIM, CALIFORNIA

All 316 S.S. With a TPL of 19’
2400 GPM @ 250’ TDH
H14MC – 4 Stage

SALT RIVER POWER PROJECT

PHOENIX, AZ

Water Supply Pumps
Various well pumps ranging from 500 GPM to 4,000 GPM

SAVANNAH RIVER PROJECT

SAVANNAH, GEORGIA

Pumping produce water
M12MC zinc less bronze construction with wear rings – 6 Stage
“O” Rings
316 S.S. Shaft and Hardware
1000 GPM @ 385’ TDH

TUCSON ELECTRIC POWER

SPRINGERVILLE, ARIZONA

Generating Station
Pumping well water from storage reservoir to power plant
2000 GPM @ 900’ TDH
1500 GPM @ 1250’ TDH
H14MC – 13 Stage
3500 GPM @ 600’ TDH
H14XHC – 8 Stage

MUNICIPAL

Materials of Construction: Standard Cast Iron / Zincless Bronze Impellers
18” Fab Discharge Head / Flanged Column

Pump Model: 8,680 G.P.M @ 232’ TDH

Design Conditions: 2 @ 5600 GPM @ 345 Feet TDH with 84% Eff. 650 HP
1 @ 900 GPM @ 345 Feet TDH with 80% Eff. 125 HP

Liquid Pumped: Finished Water

Comments: More pumping capacity was needed at a finished water pumping station. The pumps were required to supply water to system storage tanks as well as keep up with the demand of the distribution system. The requirements were well met with three 600 hp vertical turbine pumps, pumping 8,680 gpm @ 232 ft.

MUNICIPAL INSTALLATIONS

AUBURN WATER DISTRICT
TRUCKEE, CALIFORNIA
1000 GPM @ 540' TDH
E12MC – 9 Stage
500 GPM @ 730' TDH
M10HC – 12 Stage

CITIZENS UTILITIES
SUN CITY, ARIZONA
Deep well submersible pumps for produce water
1000 GPM @ 639' TDH
SM12HC – 9 Stage
1200 GPM @ 573' TDH
SM12HC – 9 Stage

CITY OF CAPE CORAL
FLORIDA
316 S.S. / 304 S.S. submersible pumps for reverse osmosis plant
175 GPM @ 150' TDH
750 GPM @ 230' TDH

CITY OF CHANDLER
ARIZONA
Deep well turbine pump for water production
4000 GPM @ 300' TDH
E18LC – 3 Stage

CITY OF CONWAY
SOUTH CAROLINA
For Pumping Potable Water
5,600 GPM @ 40' TDH
H24MC – 1 Stage

CITY OF INDIO
CALIFORNIA
Well Pump Design Conditions:
300 GPM @ 240' TDH
H14MC – 4 Stage
Jockey Pump Design Conditions:
800 GPM @ 158' TDH
E12XMC – 3 Stage
Can Booster Pump Design Conditions:
2000 GPM @ 138'
H12HC – 4 Stage

CITY OF SCOTTSDALE
ARIZONA
Water Treatment Plant
Deep Well Pump Design Conditions:
2500 GPM @ 640' TDH
H14MC – 9 Stage
Coated Water Passages & 316 S.S.
Can / Barrel Pump Design Conditions:
1800 GPM @ 50' TDH
H12HC – 3 Stage
Coated Water Passages & 316 S.S.
Water Supply from the Central Arizona Project Canal to the City of Scottsdale's three (3) booster stations
Ten (10) Raw Water Pumps
1500 GPM @ 388' TDH
M14MC – 4 Stage

DEL WEBB
SUN CITY, ARIZONA
Deep well submersible for produce water
1200 GPM @ 550' TDH
SE12MC – 10 Stage
1200 GPM @ 528' TDH
SE12MC – 8 Stage

DEPT. OF WATER RESOURCES
HAWAII
Deep Well Turbine Pump
500 GPM @ 1405'
M10LC – 27 Stage
All Ductile Iron Construction

DOWELL SCHLUMBERGER MUNICIPAL WATER SUPPLY UNITS
AUSTRALIA
Pumping Water
Service Water Supply Pumps
4000 GPM @ 345'
900 HP 3600 RPM
H12HC – 4 Stage
All Nickel Aluminum Bronze
Tungsten Carbide Shaft Journals, Bearings and K-Monel Shaft

EL PASO WATER UTILITIES
TEXAS
For Municipal Water Supply
Deep Well Pumps
1400 GPM @ 480' TDH
M14MC – 5 Stage

SHEA SUNBELT PLEASANT POINT CAN BOOSTER PUMPS FOR MUNICIPAL PROJECT
1750 GPM @ 115' TDH
600 GPM @ 115' TDH
1750 GPM @ 215' TDH
700 GPM @ 215 TDH
Vertical Turbine Deep Well Supply Pump
550 GPM @ 500' TDH
J11HC – 9 Stage

SUN CITY WATER COMPANY
SUN CITY, ARIZONA
Deep Well Submersible for produce water
1000 GPM @ 639' TDH
SM12HC – 9 Stage
1200 GPM @ 573' TDH
SE12MC - 9Stage

INDUSTRIAL / COMMERCIAL

Materials of Construction: Cast Iron Bowls, bronze impellers, stainless steel fitted, steel fabricated discharge head.

Pump Model: M10LC – 14 Stage

Design Conditions: 400 GPM @ 750’ TDH

Liquid Pumped: Water From Coal Mine

Comments: The pump was designed to pump mine water back to the prep plant to wash the coal after it went through the prep plant.

INDUSTRIAL / COMMERCIAL INSTALLATIONS

ARGO INDUSTRIAL

BELLEVUE, WASHINGTON

For Ice Harbor Project Office, Corps of Engineers "Ice Harbor Dam"
2000 GPM @ 80' TDH
M14XHC

ARIZONA BOILER WORKS

FLAGSTAFF, ARIZONA

Boiler Pump
350 GPM @ 46' TDH
M8MC – 2 Stage

ARIZONA CORRECTIONAL CENTER

LITCHFIELD PARK, ARIZONA

1000 GPM @ 42' TDH
M11MC – 1 Stage

ARMY COMMAND CENTER

FORT MCPHEARSON, GEORGIA

HVAC
Lineshaft Turbine Pumps

BROWN & ROOT, INC.

HOUSTON, TX

For salt water supply for mud pumps on off shore production platform
H14MC – 2 Stage
250 HP Ragd
Close-Coupled

BUREAU OF RECLAMATION

YUMA, ARIZONA

Submersible well pump, all bronze construction with 304 S.S. motor adapter
3250 GPM @ 43' TDH
SH14MC – 1 Stage
Plueger 50 HP
A-1 Construction

BUSCH GARDENS

TAMPA, FL

Congo River Rapids
M14 & H14 Bowl Assembly

CULLIM & BROWN

OKLAHOMA CITY, OKLAHOMA

For Gravel Pit
3000 GPM @ 150' TDH
H14XHC – 2 Stage

INTAMIN, INC.

MILLERSVILLE, MARYLAND

Amusement Park Rides: Busch Gardens, Tampa, FL.
Opryland U.S.A., Nashville, TN,
Great Adventure, Jackson, NJ .
Six Flags Over Georgia, Altlanta, GA.
Six Flags Over Texas, Dallas, TX
Six Flags Over Mid America, St. Louis, MO
Six Flags Magic Mountain, Valencia, CA. Adventure Land Park, Des Moines, IA

KENNER DRY DOCK

KENNER, LOUISIANA

For dry dock application, pumping river water out of dry dock
2300 GPM @ 26' TDH
H14XHC – 1 Stage

MARSHALL SPACE FLIGHT CENTER

HUNTSVILLE, AL

6000 GPM @ 80' TDH
J18MC – 1 Stage

TITANIC MOVIE SET

ROSARITO, BAJA, CALIFORNIA, MEXICO

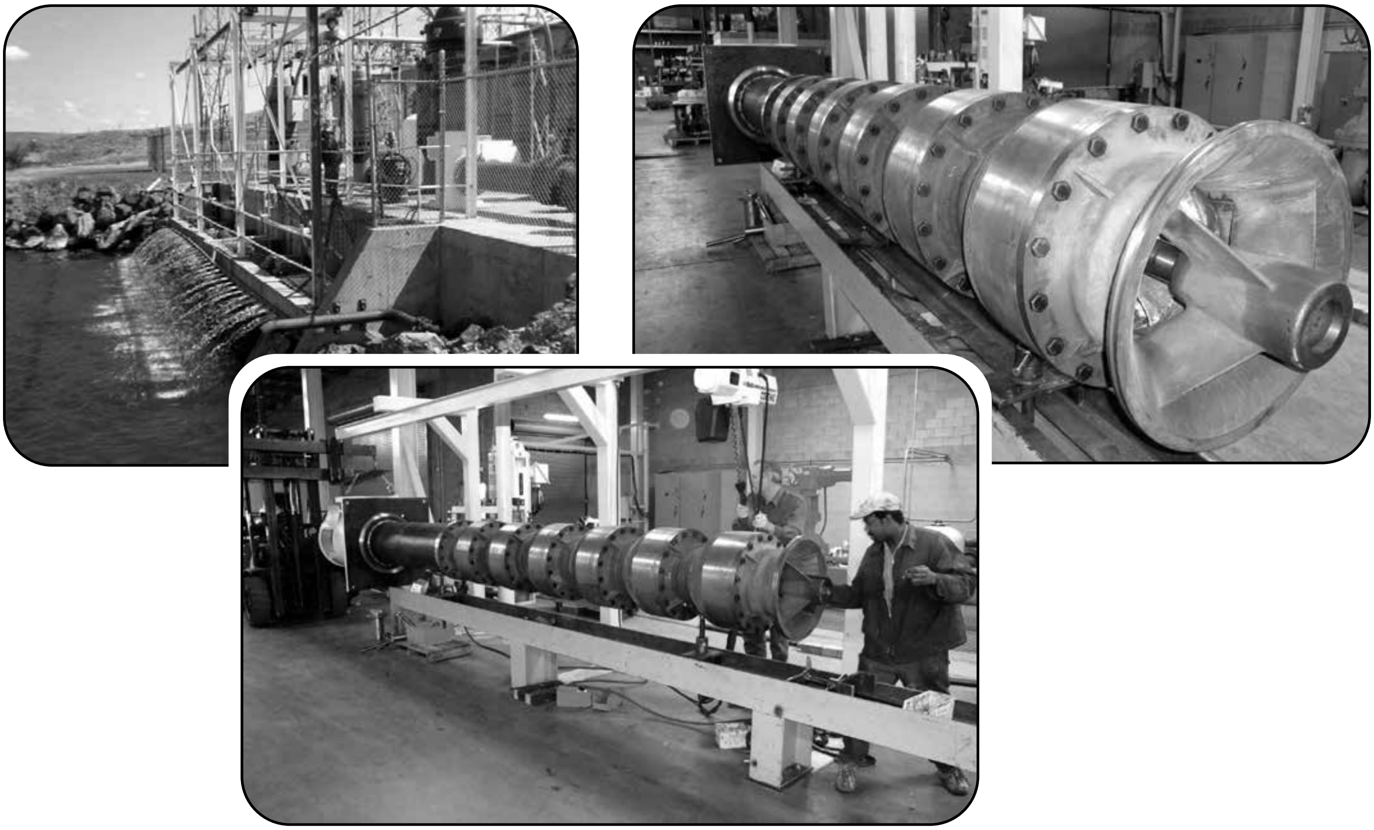
For Pumping Sea Water
Supply Pumps, all iron construction
3000 GPM @ 80' TDH
H14XHC – 1 Stage

PEPSI COMPANY

RIYADH, SAUDI ARABIA

Bottling Plant
316SS Material Construction
1050 GPM @ 1150' TDH
E12HC –16 Stage

AGRICULTURAL



Materials of Construction: Fabricated steel

Pump Model: 2 x 4 STAGE H24MC
1 x 5 STAGE H24MC

Design Conditions: 2 @ 7,750 G.P.M. @ 440 Feet, T.D.H. close coupled to a fabricated steel discharge head & fitted with 1,000 HP motors.
1 @ 9,400 G.P.M. @ 530 feet, T.D.H. with short column section coupled to a fabricated steel discharge head & fitted with a 1,500 HP motor.

Liquid Pumped: Irrigation Water

Comments: These 3 vertical turbine pumps are part of a larger irrigation process comprising of over one hundred vertical turbine pumps, up to 2,000 HP, delivering water from a river in the Pacific Northwest to 60,000 acres of farmland. Water is delivered through a network of underground pipelines to the various farming areas. More than 25 miles of 60” thru 72” mainlines feed hundreds of miles of smaller distribution lines, feeding center pivot irrigation systems.

AGRICULTURAL INSTALLATIONS

U.S. BUREAU OF INDIAN AFFAIRS
COOLIDGE, ARIZONA
San Carlos Irrigation Project
3500 GPM @ 395' TDH

INGENIO MAGDELENA - GUATELMALA
INGENIO LA UNION - GUATEMALA
INGENIO PANTELEON - NICARAGUA
Deep well irrigation pumps for sugar cane plantations
2 Stages – 8 Stages, depending on area being irrigated
J11HC, K12HC
M8HC, J8XHC

National Pump's 40 years of commitment and experience within the agricultural and turf irrigation markets has provided the opportunity to supply over 100,000 pumps throughout the Americas and around the world. When considering a 4" submersible or a large 24" canned line-shaft turbine pump, National Pump provides 'best-in-class' performance, reliability, availability, service and value when handling the toughest water applications.

GENERAL ARRANGEMENT (GA DRAWINGS) AVAILABLE FOR VARIOUS TYPES OF CONSTRUCTION WITH VARIOUS TYPES OF OPTIONS LISTED BELOW:
CONTACT FACTORY FOR DRAWINGS.

1. WELL PUMP LINESHAFT WITH THE FOLLOWING OPTIONS:

HEAD TYPE	DRIVER
FAB STEEL	ELECTRIC MOTOR
N260	RAGD
HI PROFILE	COMBINATION TYPE
DIESEL ENGINE	

2. WELL PUMP SUBMERSIBLE

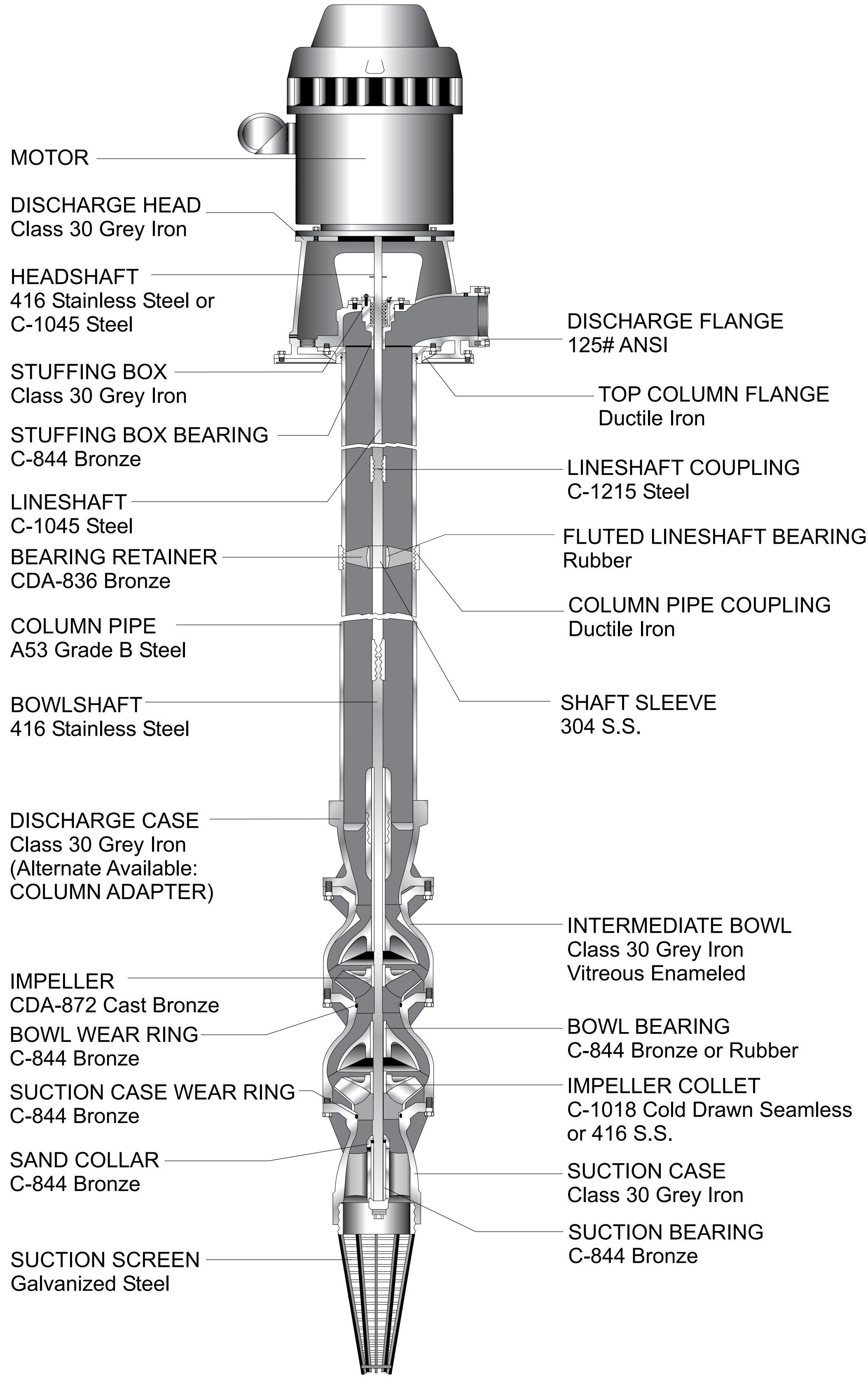
3. CLOSE COUPLED VERTICAL TURBINE PUMP LINESHAFT WITH THE FOLLOWING OPTIONS:

HEAD TYPE	COLUMN TYPE	DRIVER	TYPE OF DRIVER
FAB STEEL	THREADED	ELECTRIC MOTOR	HOLLOWSHAFT
N260	FLANGED	RAGD	SOLID SHAFT
HI PROFILE		COMBINATION TYPE	
UNDERGROUND DISCHARGE		DIESEL ENGINE	

4. CAN BOOSTER VERTICAL TURBINE PUMP LINESHAFT WITH THE FOLLOWING OPTIONS:

TYPE OF DRIVER	BARREL TYPE	DRIVER	TYPE OF DRIVER
HOLLOWSHAFT	BELOW GROUND SUCTION	ELECTRIC MOTOR	HOLLOWSHAFT
SOLID SHAFT	ABOVE GROUND SUCTION	RAGD	SOLID SHAFT
		COMBINATION TYPE	
		DIESEL ENGINE	

PRODUCT LUBRICATED DEEP WELL VERTICAL TURBINE PUMP



STANDARD PUMP SPECIFICATION
PRODUCT LUBRICATED
DEEP WELL VERTICAL TURBINE PUMP

GENERAL

The contractor shall furnish a deep well product lubricated lineshaft vertical turbine pump, manufactured by NATIONAL PUMP or equal, with above ground discharge and furnished with suitable driver and accessories to meet the requirements herein or as shown on the drawings. The pump shall be designed and furnished to conform to the Hydraulic Institute and AWWA specifications for Lineshaft Turbine Pumps and shall comply with all local and state sanitary and safety regulations.

INFORMATION REQUIRED IN PROPOSAL

1. Data sheet completely filled in.

2. Performance curve showing expected performance at design point. Curve will show head, capacity, efficiency, and horsepower based on bowl performances and shall cover the complete operation range of the pump from zero capacity to the maximum capacity.

3. Drawings of the proposed equipment giving general dimensions sufficient to determine how the equipment is to be supported and if it will fit within the space available.

4. Any additional information such as descriptive literature, manufacturer's specifications, and other data to demonstrate compliance with these specifications.

CONDITIONS OF SERVICE

Design conditions____________USGPM, @__________feet total dynamic head (TDH), Minimum bowl efficiency ____________%, Overall length, bottom of discharge head to bottom of strainer ____________feet, Well inside diameter____________inches, Maximum allowable speed____________RPM.

PUMP CONSTRUCTION

DISCHARGE HEAD: Shall be of close grained, cast iron ASTM A48 Class 30, or fabricated steel, accurately machined with a rabbet fit for mounting the driver and supporting the pump column assembly and with above ground discharge flange machined and drilled to ANSI standards for _______________# rating and _____________ inches inside diameter. The design shall allow for the headshaft to couple above the stuffing box.

The standard stuffing box shall be cast iron and rated for ___________ discharge pressure and shall contain a minimum of five acrylic graphite packing rings and shall have a grease chamber. The packing gland shall be bronze secured in place with stainless steel studs and adjusting nuts. The stuffing box bearing shall be C89835 bismuth bronze. A rubber slinger shall be installed on the top shaft above the packing gland. The top shaft shall be 416 S.S. and shall extend through the stuffing box.

The headshaft shall be C-1045 carbon steel. Impeller adjustment shall be provided at the top of the headshaft by means of an adjusting nut which shall be locked in place.

COLUMN PIPE shall be ASTM A53 grade B steel pipe, sized such that the friction loss will not exceed 5 ft. per 100 ft., based on the rated capacity of the pump and shall weigh not less than ____________ lbs/ft. The column pipe shall be furnished in interchangeable sections not more than (10) ft. in length for 1800 RPM and (5) ft. for 3600 RPM and shall be connected with threaded sleeve type couplings. The ends of each section of column pipe shall be machined with 8 threads per inch with 3/16" taper and faced parallel and the threads machined to such a degree that the ends butt against the bearing retainer shoulder to ensure proper alignment and to secure the bearing retainers when assembled.

NOTE: TOP AND BOTTOM SECTIONS SHALL NOT EXCEED 5 FT. IN LENGTH.

COLUMN ASSEMBLY - PRODUCT LUBRICATED

LINESHAFTS shall be C-1045 turned, ground and polished. They shall be furnished in interchangeable sections not over (10) feet in length. The shaft shall be sized in accordance with the maximum recommended horsepower for a given size of shaft, taking into account the effect of the hydraulic thrust on the pumping equipment and the weight of the shaft and suspended rotating parts. To ensure accurate alignment of the shafts, they shall be straight within 0.005 in. total indicator reading for a 10 ft. section. The butting faces shall be machined with center relief and square to the axis of the shaft. The lineshaft shall be provided with 304 stainless steel sleeves at the location of each bearing retainer. The lineshaft shall be coupled with 1215 steel couplings, and shall be held in place by bronze bearing retainers with neoprene bearings at each threaded joint.

BOWL ASSEMBLY

PUMP BOWLS shall be of close grained, cast iron ASTM A48 Class 30 and shall be free of blow holes, sand holes, or other detrimental faults and shall be accurately machined and fitted to close tolerances. The bowls shall have vitreous enamel lined waterways to reduce friction losses and provide a maximum efficiency and wear protection. The intermediate bowls shall be provided with bismuth bonze C89835 bearings. The intermediate bowls shall be fitted with replaceable wear rings of bismuth bonze C89835.

IMPELLERS shall be of cast silicon bronze grade ASTM B584-C876 and shall be enclosed type accurately machined, balanced, and filed for optimum performance. They shall be securely fastened to the shaft with a taper split collet of ____________1215 steel or ____________316 stainless steel. Impellers shall be dynamically balanced to ISO 1940 G63 or better.

COLUMN ADAPTER OR DISCHARGE CASE shall be close grained cast iron ASTM A48 class 30, threaded to properly match the discharge column.

SUCTION CASE shall be fitted with a replaceable wear ring of bismuth bronze C89835, grease packed bismuth bronze C89835 bearing and protected by a bismuth bronze C89835 sand collar.

BOWL SHAFT shall be ASTM A276 grade 416 stainless steel, turned, ground and polished.

SUCTION PIPE AND STRAINER

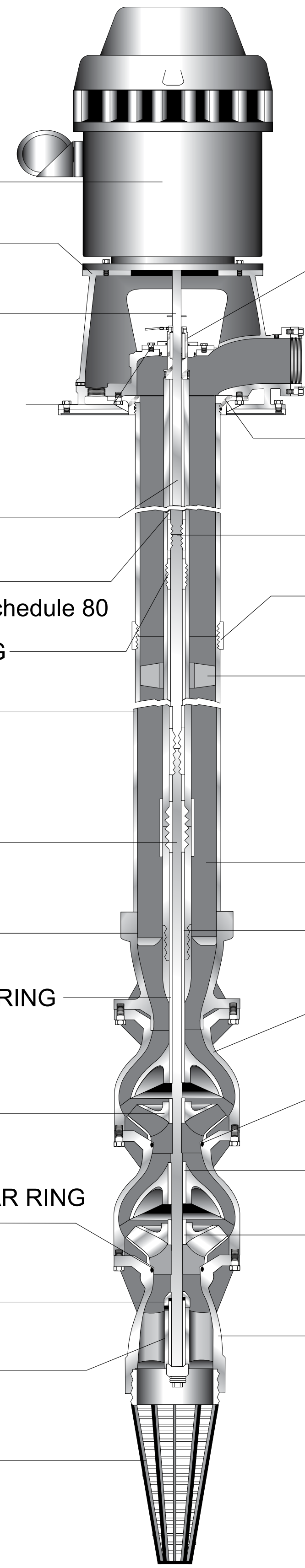
The suction pipe shall be ____________ft. in length and of a size and weight at least equal to that of the column pipe. A galvanized steel strainer shall be provided having a net inlet area equal to at least four times the suction pipe area.

MOTOR

The motor shall be squirrel cage induction design, NEMA design B, ____________ RPM vertical hollow shaft motor, with a non-reverse ratchet. Thrust bearing shall be chosen to handle the entire hydraulic thrust load of the pump plus the weight of the rotating parts. With an AFBMA B-10 one year minimum or five year average life under design conditions. The motor shall be premium efficiency with a WP-1 enclosure, 1.15 service factor, for use on _________ volt, three phase, 60 cycle electric service. The motor rating shall be such that at design it will not be loaded beyond nameplate rating and at no place on the pump curve shall the loading exceed the service factor.

NOTES

OIL LUBRICATED
DEEP WELL VERTICAL TURBINE PUMP



STANDARD PUMP SPECIFICATION
OIL LUBRICATED
DEEP WELL TURBINE PUMP

GENERAL

The contractor shall furnish a deep well oil lubricated lineshaft vertical turbine pump, manufactured by NATIONAL PUMP or approved equal, with above ground discharge and furnished with suitable driver and accessories to meet the requirements herein or as shown on the drawings. The pump shall be designed and furnished to conform to the Hydraulic Institute and AWWA specifications for Lineshaft Turbine Pumps and shall comply with all local and state sanitary and safety regulations.

INFORMATION REQUIRED IN PROPOSAL

1. Data sheet completely filled in.

2. Performance curve showing expected performance at design point. Curve will show head, capacity, efficiency, and horsepower based on bowl performances and shall cover the complete operation range of the pump from zero capacity to the maximum capacity.

3. Drawings of the proposed equipment giving general dimensions sufficient to determine how the equipment is to be supported and if it will fit within the space available.

4. Any additional information such as descriptive literature, manufacturer's specifications, and other data to demonstrate compliance with these specifications.

CONDITIONS OF SERVICE

Design conditions____________USGPM, @___________feet total dynamic head (TDH), Minimum bowl efficiency ____________%, Overall length, bottom of discharge head to bottom of strainer ____________feet, Well inside diameter____________inches, Maximum allowable speed____________RPM.

PUMP CONSTRUCTION

DISCHARGE HEAD: Shall be of close grained, cast iron ASTM A48 Class 30, or fabricated steel, accurately machined with a rabbet fit for mounting the driver and supporting the pump column assembly and with above ground discharge flange machined and drilled to ANSI standards for __________# rating and _____________ inches inside diameter. The design shall allow for the headshaft to couple above the tube tension assembly.

The tube tension assembly shall consist of a bronze CDA836 tension bearing installed in top oil tube, threaded tension nut to apply proper tension on oil tube, sealing between tension nut and discharge head shall be accomplished with "o" rings. Locknut with "o" ring and set screw to lock tension assembly after proper tension is accomplished.

Discharge head shall be furnished with one gallon oil reservoir with copper tubing, _________ manual or _________ solenoid valve and sight feed drip oiler.

The headshaft shall be C-1045 carbon steel. Impeller adjustment shall be provided at the top of the headshaft by means of an adjusting nut which shall be locked in place.

COLUMN PIPE shall be ASTM A 53 grade B steel pipe. Size shall be such that the friction loss will not exceed 5 ft. per 100 ft., based on the rated capacity of the pump and shall weigh not less than ____________ lbs/ft. The column pipe shall be furnished in interchangeable sections not more than (10) or (20) feet in length and shall be connected with threaded sleeve type couplings. The ends of each section of column pipe shall be machined with 8 threads per inch with 3/16" taper and faced parallel permitting the ends to butt insuring alignment.

NOTE: TOP AND BOTTOM SECTIONS SHALL NOT EXCEED 10 FT. IN LENGTH.

COLUMN ASSEMBLY - OIL LUBRICATED

SHAFT ENCLOSING TUBES shall be ASTM A53 Grade A schedule 80 steel pipe with the ends machined square and parallel and shall butt to ensure proper alignment and sealing, they shall be straight within 0.005 in. total indicator reading for a 5 ft. section. Threaded internally to receive the lineshaft bearings. The enclosing tube shall be stabilized and centered in the column pipe by rubber centering spiders spaced at 40 ft. intervals throughout the column pipe assemblies.

LINESHAFT BEARINGS shall be C-844 bronze, internally grooved to allow proper lubrication to enclosed lineshaft and threaded externally for connecting oil tube sections.

LINESHAFTS shall be C-1045 carbon steel, turned, ground and polished. They shall be furnished in interchangeable sections not over (10) or (20) feet in length to properly match the shaft enclosing tube and discharge column. The shaft shall be sized in accordance with the maximum recommended horsepower for a given size of shaft, taking into account the effect of the hydraulic thrust on the pumping equipment and the weight of the shaft and suspended rotating parts. To ensure accurate alignment of the shafts, they shall be straight within 0.005 in. total indicator reading for a 10 ft. section and 0.010 in. total indicator reading for a 20 ft. section. The butting faces shall be machined with center relief and square to the axis of the shaft. The lineshaft shall be coupled with 1215 steel couplings.

BOWL ASSEMBLY

DISCHARGE CASE shall be cast with by-pass ports to allow release of fluids through the throttle bearing. The discharge case shall be fitted with a Bowl Adapter Tube for connection to the enclosing tube and threaded for connection to the discharge column pipe. The Bowl Adapter Tube will have a bronze sleeve bearing in the bottom and threaded for a bronze lineshaft bearing on top.

TOP BOWL shall have an extra long throttle bearing with two seals to minimize the amounts of leakage through the drain ports.

PUMP BOWLS shall be of close grained, cast iron ASTM A48 Class 30 and shall be free of blow holes, sand holes, or other detrimental faults and shall be accurately machined and fitted to close tolerances. The bowls shall have vitreous enamel lined waterways to reduce friction losses and provide a maximum efficiency and wear protection. The intermediate bowls shall be provided with C89835 bismuth bronze bearings. The intermediate bowls shall be fitted with replaceable wear rings of C89835 bismuth bronze.

IMPELLERS shall be of cast silicon bronze grade ASTM B584-C876 and shall be enclosed type accurately machined, balanced, and filed for optimum performance. They shall be securely fastened to the shaft with a taper split collet of __________1215 steel or ____________316 stainless steel.

SUCTION CASE shall be fitted with a replaceable wear ring of bismuth bronze C89835, grease packed bismuth bronze C89835 bearing and protected by a bismuth bronze C89835 sand collar.

BOWL SHAFT shall be ASTM A276 grade 416 stainless steel, turned, ground and polished.

SUCTION PIPE AND STRAINER

The suction pipe shall be ____________ft. in length and of a size and weight at lease equal to that of the column pipe. A galvanized strainer shall be provided having a net inlet area equal to at least four times the suction pipe area.

MOTOR

The motor shall be squirrel cage induction design, NEMA design B, ____________ RPM vertical hollow shaft motor, with a non-reverse ratchet. Thrust bearing shall be chosen to handle the entire hydraulic thrust load of the pump plus the weight of the rotating parts. With an AFBMA B-10 one year minimum or five year average life under design conditions. The motor shall be premium efficiency with a WP-1 enclosure, 1.15 service factor, for use on _______volt, three phase, 60 cycle electric service. The motor rating shall be such that at design it will not be loaded beyond nameplate rating and at no place on the pump curve shall the loading exceed the service factor.

Selecting a Vertical Turbine Pump

(Information required from client)

1. Liquid to be pumped:____
   (Note: If liquid is not clear water, the following must also be ascertained).

   a. Foreign material present in liquid (describe):____
   b. Specific gravity at pumping temperature:____
   c. Vapor pressure at pumping temperature:____
   d. Viscosity at pumping temperature:____

2. Pumping temperature: __________________________F

3. Required capacity: ______________________________GPM

4. Required pressure at centerline of discharge flange: ________________________PSI

5. Pumping water level ______________ft. below centerline of pump discharge (static water level plus drawdown).

6. Inside diameter of well or sump: ___________inches. Note: Well or sump must be sufficiently straight or of sufficient diameter to allow bowl assembly and column to hang free and plumb).

7. Size of discharge ___________inches. Companion flange required? ______Yes ______No

8. Required length of column or overall length of pump ___________ft (indicate which).

9. Lineshaft lubrication arrangement (per below):

_____Open lineshaft (lubricated w/ liquid pumped)	____Enclosed lineshaft (oil lubricated)	_____Enclosed lineshaft (injection lubricated)
_____Rubber bearings	____Redwood bearings	_____Bronze bearings
_____Bronze bearings	____Bronze bearings	_____Rubber bearings

10. Suction pipe required? _____Yes length _________ft. _____No.

11. Strainer required? _____Yes (_____Conical _____Basket) _____No.

12. Special material requirements (describe)____

    If fluid is corrosive, list satisfactory materials____

13. Type of driver____

14. Speed of driver: ________________RPM Gear ratio_____________________

15. __________Self release coupling or ___________non reverse ratchet

16. Current characteristics ___________phase _____________Hz _____________volts

17. Other driver requirements____

"Sample" Pump Data
Selecting a Vertical Turbine Pump

(Information required from client)

1. Liquid to be pumped: _***Clear water***____
   (Note: If liquid is not clear water, the following must also be ascertained).

   a. Foreign material present in liquid (describe):__***None***____________________________________
   b. Specific gravity at pumping temperature:__***1.0***____
   c. Vapor pressure at pumping temperature:____
   d. Viscosity at pumping temperature:____

2. Pumping temperature: _____***Amb.***________________F

3. Required capacity: ________***800***_________________GPM

4. Required pressure at centerline of discharge flange: _____***30***________________PSI

5. Pumping water level___ ***180 + 20***___ ft. below centerline of pump discharge (static water level plus drawdown).

6. Inside diameter of well or sump: __16"__inches. Note: Well or sump must be sufficiently straight or of sufficient diameter to allow bowl assembly and column to hang free and plumb).

7. Size of discharge ______8"________inches. Companion flange required? ______Yes ___X__No

8. Required length of column or overall length of pump ____250____ft (indicate which).

9. Lineshaft lubrication arrangement (per below):

___***X***___Open lineshaft (lubricated w/ liquid pumped)	_____Enclosed lineshaft (oil lubricated)	_____Enclosed lineshaft (injection lubricated)
__***X***_ Rubber bearings	_____Redwood bearings	_____Bronze bearings
_____Bronze bearings	_____Bronze bearings	_____Rubber bearings

10. Suction pipe required? _***X***__Yes length ___***10'***_____ft. _____No.

11. Strainer required? __***X***__Yes (__***X***__Conical _____Basket) _____No.

12. Special material requirements (describe)____

    If fluid is corrosive, list satisfactory materials____

13. Type of driver___***Electrical Motor***____

14. Speed of driver: ___***1800***_________RPM Gear ratio_____________________

15. __________Self release coupling or ______***X***____non reverse ratchet

16. Current characteristics ______***3***____phase ______***60***_____Hz _____***460***_____volts

17. Other driver requirements___ ***Vertical Hollow Shaft, WPI enclosure***___________________________

Selecting a Vertical Turbine Pump

Since the inside diameter of the well is 16 inches, a 15 inch (or smaller bowl assembly must be selected. With this in mind, refer to the performance curves in the catalog for a unit whose capacity at or near the best efficiency point is 800 GPM. It is found that a J11HC at 1760 RPM will produce 72.3 feed head per stage at this capacity.

Tentative Total Head must be determined by a summation of the required lift, discharge pressure, and an assumed column loss (the actual column loss will be found later). Assume 5 feet loss per 100 feet of column (or 0.06 ft. per foot).

Calculate as follows:

Tentative Total Head = 180 + 20 + (30 x 2.31) + (0.05 x 250) = 281.8 ft.
Where: 180 = static water level below discharge.
20 = draw down in feet
30 = pressure at the centerline of the discharge in PSI
2.31 = feet of water equivalent to one PSI
0.05 = assumed loss per foot of column
250 = total length of column in feet

Number of Stages required is found by dividing the tentative total head by the head per stage as taken from the performance curve as follows:

$$\text{Number of stages} = \frac{281.8}{72.3} = 3.9$$

Where: 281.8 = tentative total head
72.3 = head per stage from performance curve
Since fractional stages are not feasible, the next larger whole number must be used. Or, in this case, 4 stages.

Efficiency as shown on the performance curve must be corrected in accordance with the schedule at the top of the performance curve for number of stages (corrections are also required when bowls and/or impellers are non-standard materials). Note that in this example, no efficiency correction is required and the bowl efficiency shown on the curve can be used.

Tentative Brake Horsepower can be calculated as follows:

$$\text{Tentative BHP} = \frac{281.8 \times 800 \times 1.0}{3960 \times .86} = 66.20$$

Where: 281.8 = tentative total head in feed
800 = capacity in gallons per minutes
1.0 = specific gravity of water
3960. = a constant for converting feed TDH and gallons per minutes to horsepower
0.86 = the efficiency as read from the performance curve and corrected by the schedule on the curve. (Expressed as decimal).

At this point, refer to the “Bowl Assembly Data and Limitations” table located in the Engineering Section of the catalog. This table shows that the maximum recommended number of stages for a J11HC is 20. Since the selection that has been made contains four stages, this is satisfactory.

It is further noted that the bowl diameter is 11-1/8" which is small enough to be installed in a 16" well. The maximum head (Bowl Assembly Data and Limitations) for this pump is 377 PSI (871 feet), but the required total head for this application is only 281.8 feet, therefore, this is satisfactory. It will also be noted in the Bowl Assembly Data and Limitation table that a J11HC has a 1-11/16" diameter bowl shaft. The horsepower rating chart for lineshafts shows that a 1-11/16" shaft is adequate for 335 horsepower therefore, since the estimated horsepower required for this application is 66.20, the standard bowlshaft size is satisfactory.

Lineshaft size depends on the speed, (RPM), horsepower and downthrust. The "Shaft Horsepower Rating" chart in the engineering section shows a 1 ¼" lineshaft to be adequate for this application.

Column size depends on the sizes which will fit any given bowl selection, the lineshaft size and the capacity in gallons per minute. From the pump data dimensions page (on the bottom of the curve sheet), it is found that a J11HC can be adapted to a column and from the Column Friction Loss Chart in the engineering section it is found that at 800 GPM, an 8" column with a 1 ¼" lineshaft produces a friction loss of 2.2 feet per 100 feet of column and that a 6" column size is not recommended for this capacity.

A generally accepted criteria for column size selection is that the size be selected such that the friction loss will not exceed 5 feet per 100 feet of column.

Total Head required can now be found by using the hydraulic friction loss for an 8" column with a 1 ¼" shaft as follows:

$$TDH = 180 + 20 + \frac{2.2 \times 250}{100} + (30 \times 2.31) + 0.11 = 274.9 \text{ ft.}$$

Where:
- 180 = static water level below discharge
- 20 = drawdown
- 2.2 = hydraulic friction loss per 100 ft. column
- 250 = length of column
- 30 = required pressure (PSI) at centerline of discharge
- 2.31 = feed of water equivalent to one PSI
- 0.11 = friction loss for 8" cast discharge head (engineering section)

Since four stages are required in this illustration, the head requirement per stage is 274.9 divided by 4 = 68.73 ft. Upon re-checking the performance curve in the catalog, it is found that the required head per stage at 800 GPM lies between the top curve and the middle curve and that the efficiency is 86%. In other applications in which the hydraulic condition point is found to lie above the highest head curve on the performance curve, it indicates that the pump will fall short of the desired hydraulic performance and that another stage should be added. In cases where the hydraulic condition point falls below the lowest head curve on the performance curve it suggests that the number of stages should be reduced or the factory contacted if reducing the number of stages is not practical.

Hydraulic Thrust = 274.9 x 7.8 = 2144 lbs.

Where:
- 274.9 = total head
- 7.8 = thrust factor for impeller

The thrust factor can be found on the performance curve or Bowl Assembly Data and Limitation page (Engineering section or bottom of the curve sheet).

Shaft Elongation can be found by using the value shown in the "Shaft Elongation Chart" (Engineering section). The elongation of a 1 ¼" lineshaft, 250 feet long, with 2144 pounds hydraulic thrust is 0.18" (0.070 x 2.5) (0.070 is interpolated). This shaft elongation must be less than the maximum lateral dimension shown in the Bowl Assembly Data and Limitation table. For a J11HC, the lateral dimension is 1". This indicates that the standard lateral available in the bowl assembly is adequate for the shaft stretch.

Total Downthrust is found by the summation of the hydraulic thrust and the total weight of the rotating assembly:

Total downthrust = 2144 + (18.5 x 4) + (250 x 4.17) = 3260.50 lbs.

Where: 2144 = hydraulic thrust
18.5 = weight of each stage taken from the Bowl Assembly Data and Limitation table.
4 = number of stages (or impellers)
250 = length of column (or shaft)
4.7 = weight per foot of 1 ¼ inch line shafting taken from the Shaft Weight Table (Section I)

Shaft Mechanical Friction Loss is found on the Shaft Friction Loss Chart (Engineering section). This chart show that 0.79 BHP is lost per 100 feet of 1 ¼" shafting at 1760 RPM. This loss must be included in the determination of the prime mover horsepower requirement as follows:

$$BHP = \frac{274.9 \times 800 \times 1.0}{3960 \times .86} + \frac{0.79 \times 250}{100} = 66.55$$

Where: 274.9 = total head in feet
800 = capacity in gallons per minute
1.0 = specific gravity of water
3960 = Ft-GPM/HP constant
0.86 = efficiency expressed as a decimal
0.79 = shaft losses per 100 feet
250 = length of column in feet

The above horsepower represents the requirement at the design point of 800 GPM and 30 PSI at the centerline of the discharge, but when selecting a prime mover, the maximum horsepower across the performance curve must also be considered.

Referring back to the J11HC performance curve it is found that the maximum horsepower is approximately 4 horsepower per stage higher at 1300 GPM that at 800 GPM for the top curve and 2 horsepower higher at 1250 GPM for the middle curve. Since the job requirements (hydraulic performance) lie between the top and middle curves it can be estimated that the maximum horsepower will be 3 horsepower per stage more than design horsepower and occur at 1275 GPM. The approximate maximum horsepower can be calculated as follows:

Max BHP =- 66.55 + (3 x 4) = 78.50

Where: 66.55 = design HP as calculated
3 = estimated rise in HP per stage
4 = number of stages

It is usually good practice and in many cases necessary to size the prime mover for the higher horsepower. The final decision as to whether or not the prime mover should be sized for the higher horsepower depends on the type of application. If the pump installation is such that they hydraulic conditions at the higher horsepower can never exist, then the higher horsepower is of no importance but, on the other hand, if there is a possibility that the unit may operate for an extended period at the higher horsepower conditions then the prime mover should be sized for the higher horsepower. From the above, it can now be said that the pump will require 66.55 horsepower when operating at design head and capacity but 78.5 horsepower may be required under other operating conditions. With this information and the other motor requirements as set forth by the client, a motor catalog can be consulted for further details.

Motor or engine and right angle gear size depends on the speed (RPM), total downthrust and horsepower requirement of the pump. In this illustration, a vertical hollowshaft electric motor is to be used, therefore, a right angle gear will not be required. Right angle gears are used only when the prime mover is designed for horizontal mounting, such as an engine, turbine, etc.

In this application it is apparent that we can use a 75 horsepower 1800 RPM, 3 phase, 60 cycle, 460 volt vertical hollow shaft motor in a weather protected enclosure with a non-reverse ratchet and thrust bearings capable of sustaining 3622 lbs. downthrust. Note that a 75 horsepower motor with a 1.15 service factor is capable of 86 horsepower (75 x 1.15) but may not be used for this application if the pump has to be non-overloading on the curve. A 100 HP motor should be used. At this point, it is advisable to recheck the horsepower rating of the lineshaft that was selected. In the preliminary selection of the lineshaft, hydraulic thrust was used whereas the total thrust should be used for final sizing. Also, the possibility that the pump may on occasions be operated at a higher horsepower was not taken into account. Upon rechecking the Lineshaft Horsepower Rating Chart, it is found that the previously selected 1 ¼” lineshaft with 3260 pounds downthrust has a horsepower limitation of 124 horsepower. Therefore, the lineshaft as initially selected is adequate for this application.

Discharge Head selection depends on the discharge size, column size and the base diameter (BD) of the driver. In this particular example, it will be noted in the electric motor catalog that a 75 horsepower 1800 RPM VHS motor has a BD dimension of either 16 ½ inches or 12 inches. Therefore an 8 inch discharge head with either a 12” or 16 ½” BD will be satisfactory.

Referring to the Discharge Head section of the catalog, it will be found that an N8-260 discharge head has a BD dimension of 16 ½” which is satisfactory for the motor required. The N8-260 discharge head will accept the 8” column and 1 ¼” shaft and has an 8” discharge and is satisfactory for 250’ setting.

Suction Pipe and Strainers should be selected to fit the intake connection of the bowl assembly. Referring to the performance curve; the J11HC will accept 8” suction pipe. It is common to use the same size suction pipe as column pipe so an 8” suction pipe would be selected.

Conical strainers are recommended for well service while the basket type strainers are used when pumping from sumps or other large bodies of liquid. Size to fit the suction pipe or bowl assembly.

Lubrication of the lineshaft bearings of an open lineshaft pump is accomplished by the pumped fluid, however some method of providing initial lubrication as start up must be provided see “Pre-lubrication Recommendations” in this section of the catalog.

Enclosed lineshaft pumps are usually lubricated by oil, the necessary reservoir and fittings for a manual system are included as standard equipment with the discharge head assembly.

The pump selection is now completed and can be summarized as follows:

1. Suction pipe with strainer
2. 4 stage J11HC bowl assembly
3. 250 feet of 8” x 1 ¼” column and open lineshaft
4. N8-260 discharge head assembly
5. 75 horsepower 1800 RPM 3/60/460 volt VHS weather protected motor for 3622 lbs. downthrust and with non-reverse ratchet.

INDUSTRIAL PUMP SPECIFICATION
PRODUCT LUBRICATED
CLOSE COUPLED TURBINE PUMP

GENERAL

The contractor shall furnish an industrial product lubricated lineshaft vertical turbine pump, manufactured by NATIONAL PUMP or approved equal, with above ground discharge and furnished with suitable driver and accessories to meet the requirements herein or as shown on the drawings. The pump shall be designed and furnished to conform to the Hydraulic Institute and AWWA specifications for Lineshaft Turbine Pumps and shall comply with all local and state sanitary and safety regulations.

INFORMATION REQUIRED IN PROPOSAL

1. Data sheet completely filled in.
2. Performance curve showing expected performance at design point. Curve will show head, capacity, efficiency, and horsepower based on bowl performances and shall cover the complete operation range of the pump from zero capacity to the maximum capacity.
3. Drawings of the proposed equipment giving general dimensions sufficient to determine how the equipment is to be supported and if it will fit within the space available.
4. Any additional information such as descriptive literature, manufacturer's specifications, and other data to demonstrate compliance with these specifications.

CONDITIONS OF SERVICE

Design conditions____________USGPM, @___________feet total dynamic head (TDH), Minimum bowl efficiency _________%, Overall length, bottom of discharge head to bottom of strainer ________feet, sump depth ______feet, Suction barrel (if required) length __________inches and diameter _________inches, Maximum allowable speed ____________RPM.

PUMP CONSTRUCTION

DISCHARGE HEAD: Shall be of close grained, cast iron ASTM A48 Class 30, or fabricated steel, accurately machined with a rabbet fit for mounting the driver and supporting the pump column assembly and with above ground discharge flange machined and drilled to ANSI standards for ___________# rating and _____________ inches inside diameter. The design shall allow for the headshaft to couple above the mechanical seal or stuffing box.

The standard stuffing box shall be cast iron and rated for ___________ discharge pressure and shall contain a minimum of five acrylic graphite packing rings and shall have a grease chamber. The packing gland shall be bronze secured in place with stainless steel studs and adjusting nuts. The stuffing box bearing shall be C89835 bismuth bronze. A rubber slinger shall be installed on the top shaft above the packing gland. The top shaft shall be 416 S.S. and shall extend through the stuffing box.

If a mechanical seal is used, then a four piece spacer type coupling shall be used to allow seal replacement without motor removal. This will require a motor stand to be used with a cast iron discharge head or an extra height fabricated steel discharge head.

Impeller adjustment shall be provided at the top of the headshaft by means of an adjusting nut which shall be locked in place.

COLUMN PIPE shall be ASTM A 53 grade B steel pipe. Size shall be such that the friction loss will not exceed 5 ft. per 100 ft., based on the rated capacity of the pump and shall weigh not less than _________ lbs/ft. The column pipe shall be furnished in interchangeable sections not more than (10) feet in length for 1800 RPM and (5) feet for 3600 RPM and shall be threaded or flanged. If threaded, the ends of each section of column pipe shall be machined with 8 threads per inch with 3/16" taper and faced parallel and the threads machined to such a degree that the ends butt against the bearing retainer shoulder to ensure proper alignment and to secure the bearing retainers when assembled.

NOTE: TOP AND BOTTOM SECTIONS SHALL NOT EXCEED 5 FEET IN LENGTH.

COLUMN ASSEMBLY - PRODUCT LUBRICATED

LINESHAFTS shall be 416 stainless steel, turned, ground and polished. They shall be furnished in interchangeable sections not over (10) feet in length for 1800 RPM and (5) feet for 3600 RPM to properly match the discharge column. The shaft shall be sized in accordance with the maximum recommended horsepower for a given size of shaft, taking into account the effect of the hydraulic thrust on the pumping equipment and the weight of the shaft and suspended rotating parts. To ensure accurate alignment of the shafts, they shall be straight within 0.005 in. total indicator reading for a 10 ft. section. The butting faces shall be machined with center relief and square to the axis of the shaft. The lineshaft shall be coupled with 304 S.S. stainless steel couplings, and shall be held in place by bronze bearing retainers with neoprene bearings at each flanged or threaded joint.

BOWL ASSEMBLY

PUMP BOWLS shall be of close grained, cast iron ASTM A48 Class 30. Shall be free of blow holes, sand holes, or other detrimental faults and shall be accurately machined and fitted to close tolerances. The bowls shall have vitreous enamel lined waterways to reduce friction losses and provide a maximum efficiency and wear protection. The intermediate bowls shall be provided with bismuth bonze C89835 bearings. The intermediate bowls shall be fitted with replaceable wear rings of bismuth bonze C89835.

IMPELLERS shall be of cast silicon bronze grade ASTM B584-C876 and shall be enclosed type accurately machined, balanced, and filed for optimum performance. They shall be securely fastened to the shaft with a taper split collet of ____________1215 steel or ____________316 stainless steel. Impellers shall be dynamically balanced to ISO 1940 G63 or better.

COLUMN ADAPTER shall be of close grained cast iron ASTM A48 class 30, threaded to properly match the discharge column. (Note: If column pipe is flanged, column adapter is not required.)

SUCTION BELL shall be fitted with a replaceable wear ring of bismuth bronze C89835, grease packed bismuth bronze C89835 bearing and protected by a bismuth bronze C89835 sand collar. Suction shall be fitted with a galvanized steel clip on type basket strainer.

BOWL SHAFT shall be ASTM A276 grade 416 stainless steel, turned, ground and polished.

MOTOR

The motor shall be squirrel cage induction design, NEMA design B, ____________ RPM vertical hollow shaft motor*, with a non-reverse ratchet. Thrust bearing shall be chosen to handle the entire hydraulic thrust load of the pump plus the weight of the rotating parts. With an AFBMA B-10 one year minimum or five year average life under design conditions. The motor shall be premium efficiency with a WP-1 enclosure, 1.15 service factor, for use on _____ volt, three phase, 60 cycle electric service. The motor rating shall be such that at design it will not be loaded beyond nameplate rating and at no place on the pump curve shall the loading exceed the service factor.

* Solid shaft with mechanical seal.

Selecting a Short Coupled Vertical Turbine Pump

Step 1 Bowl Selection

From the catalog rating curves select the bowl assembly which will meet the customer's requirements with respect to capacity and total dynamic head. Usually the operating speed (RPM) will be specified. 1800 RPM (nominal) is the most common operating speed, although 3500 RPM is widely used for clean fluid service. In general, lowering the operating speed will lower the noise and vibration level, increase the life expectancy of the pump and increase the initial investment.

Step 2 Column and Shaft Assembly

Select the length of column and shaft to suit the overall length of the pump. Refer to the "Bowl Assemblies" section for dimensional data on bowl assemblies. Due to the relative short lengths of column involved it is common to select column size for higher friction losses than would be desirable for deep well units. A friction loss of 7-1 /2' per 100' is generally acceptable.

On units requiring less than 5 feet of column length at speeds up to 1800 RPM, a bearing will not be included in the column. Should, for example, the column requirements work out to be 12'0", two bearings will be installed at 5' intervals above the bowl assembly, with a 2' column pipe below the discharge head. Therefore, the column assembly should be selected as follows:

1800 RPM Maximum*

up to 5' column length required	1 section
5' to 10' column length required	2-5' sections
10' to 15' column length required	3-5' sections
More than 15'	2-5' sections and additional 10' sections as required.

Above 1800 RPM
5' bearing centers required.

Lineshaft size DOES NOT necessarily have to match the bowl shaft size. For the shaft size and horsepower ratings refer to the "Engineering Section" of the catalog. Minimum recommended line shaft size for short coupled pumps regardless of horsepower is 1".

Step 3 Discharge Head

Once the column and shaft sizes have been determined, the head selection follows. The discharge size will usually be specified, if not, the following can be used as a guideline.

Discharge Size	Maximum Recommended Capacity*
4"	475 GPM
6"	1050 GPM
8"	1900 GPM
10"	3000 GPM
12"	4700 GPM
14"	5700 GPM

**Based on velocity of 12 F.P.S.*

Check the driver mounting flange for compatibility with the discharge head. Remember ----a 10" B.D. drive will mount on a 12" BD discharge head and vice-versa, also a 16 ½" BD driver will mount on a 20" BD discharge head. We must know the driver manufacturer, "CD" dimension, "BD" dimension, clutch size and keyway, and frame number if the customer furnishes his own driver (preferably send certified prints with order).

Remember, the maximum working pressure of the standard cast iron discharge head is 175 PSI for the N-260 model and 275 PSI for the HI-PRO model. Above this, a fabricated discharge head must be used. A hi-pressure packing box will be required if the pressure exceeds 175 PSI (price addition required).

A discharge companion flange will usually not be required, if desired a price addition is required. Applicable discharge head dimensions can be found in the "Discharge Head" section of the catalog.

Step 4 Driver

The driver requirements are usually specified. Hollow shaft drivers are more common due to the ease of the shaft adjustment and lower initial cost (up to about 250 HP) of the complete unit. Solid shaft drivers should be considered for the larger units and for certain mechanical seal applications (see mechanical seal pages in "Discharge Head" section for details). Hollow shaft motors are available equipped with a steady bushing. Steady Bushings are required when mechanical seals are used in conjunction with hollow shaft motors regardless of speed, and when the shaft span between the packing box and motor clutch on 3600 RPM units exceed the following:

Shaft Diameter	Maximum Span
1"	36"
1 3/16"	41"
1 ½"	47"
1 11/16"	50"

Solid shaft drivers provide rigid shaft support near the shaft sealing device and can always be recommended where the cost is not prohibitive. Adjustable couplings must be used with solid shaft drivers. Spacer type adjustable couplings are recommended when mechanical seals are used to allow removal of the mechanical seal without removing the driver. See "Discharge Head" section for details on adjustable couplings.

Step 5 Special Requirements

The specifications and/or service requirements should be carefully reviewed for special requirements such as strainers, non-standard materials, mechanical seals, driver protective devices, special painting or coating, tests, etc. See Engineering (Pump Selection) section for further detailed instructions on pump selection.

Step 6 Assembly and Shipping

All close coupled vertical turbine pumps as standard will be shipped assembled (bowl, column and discharge head) as long as the total pump length (T.P.L.) as measured from the bottom of the discharge head or base plate, if used, to the bottom of the suction bell, suction case, or strainer, if used, does not exceed 15 ft.

The driver, drive coupling, head shaft and mechanical seal are never shipped assembled to the pump to prevent damage during transit.

When the T.P.L. exceeds 15 ft. the pump will be shipped in separate assemblies (bowl assembly, column assembly, discharged head assembly, drives, mechanical seal and miscellaneous parts).

For pumps requiring assembly that exceed 15 ft. T.P.L. as defined above, contact the factory for special price additions.

NOTES

STANDARD BOWL ASSEMBLY LIMITATIONS DATA

This pages lists the limitations of National Pump bowl assemblies. See next page for additional notes.

MODEL	THRUST DATA										MAXIMUM ALLOWABLE NON-SHOCK PRESSURE OPERATING (6)
	FACTOR "K" (1)	1 STG. WEIGHT	ADDL. STG. WT.	BOWL LATERAL (2)		SHAFT DIA.	WR2 (WET) LBS. (3)	EYE AREA IN.2	SPHERE SIZE MAX. (4)	MAX # STG. (5)	
				STD.	MAX.						
L6LC	1.30	7.5	3.5	3/16	3/8	1	0.14	5.38	0.15	60	430
M6LC	2.40	8.00	3.90	3/16	3/8	1	0.14	3.82	0.15	55	500
M6MC	2.40	8.00	3.90	3/16	3/8	1	0.14	3.88	0.20	55	500
M6HC	2.30	8.00	3.90	3/16	3/8	1	0.14	4.89	0.28	55	500
E6XHC	3.00	8.25	4.00	3/16	3/8	1	0.14	7.12	0.39	32	390
H7LC	4.40	20.00	10.50	3/4	7/8	1 1/4	0.22	9.09	0.47	29	520
H7HC	4.40	21.50	11.50	3/4	7/8	1 1/4	0.25	9.09	0.47	29	520
K8LC	4.70	17.00	10.60	3/4	1	1 1/4	0.27	8.05	0.56	30	480
K8HC	4.70	17.20	8.11	3/4	1	1 1/4	0.27	8.05	0.56	30	480
M8XLC	4.40	20.60	10.60	3/4	7/8	1 1/4	0.32	7.72	0.27	27	460
M8MC	4.40	20.60	10.60	3/4	1 1/4	1 1/4	0.32	8.74	0.34	27	460
M8HC	4.40	20.60	10.60	3/4	1	1 1/4	0.32	8.84	0.34	27	460
M8XHC	4.50	20.60	10.60	5/8	3/4	1 1/4	0.32	10.70	0.50	27	460
J8XHC	8.20	22.00	12.00	1 3/8	1 5/8	1 1/4	0.36	12.81	0.59	22	410
M9MC	4.30	21.00	11.50	5/8	1 1/8	1 1/4	0.49	9.78	0.45	25	440
M10LC	6.10	32.50	17.00	1	1 3/8	1 1/2	0.78	13.25	0.38	20	390
M10HC	6.10	33.50	18.00	1	1 3/8	1 1/2	0.78	13.25	0.38	20	390
H10MC	7.40	32.50	17.00	1 1/4	1 3/8	1 1/2	0.75	16.89	0.56	20	370
H10HC	7.40	32.50	17.00	1 1/4	1 3/8	1 1/2	0.75	16.89	0.56	20	370
J10HC	9.90	32.80	17.10	1 1/4	1	1 1/2	0.69	21.80	0.25	20	300
K10LC	6.60	21.25	12.50	1	TBD	1 1/2	0.73	13.80	0.69	22	370
K10MC	6.60	21.25	12.50	1	TBD	1 1/2	0.78	13.80	0.69	22	370
K10HC	6.60	21.25	12.50	1	TBD	1 1/2	0.78	13.80	0.69	24	370
L10LC	4.50	10.00	8.00	1/2	TBD	1 1/2	0.44	8.53	0.50	30	500
L10MC	4.50	10.00	8.00	1/2	TBD	1 1/2	0.44	8.53	0.50	30	500
L10HC	4.50	10.00	8.00	1/2	TBD	1 1/2	0.44	8.53	0.50	30	500
E10HC	11.60	34.50	18.00	3/4	1	1 1/2	0.59	26.50	0.75	20	330
E10HO	11.60	34.50	18.00	3/4	1	1 1/2	0.59	26.50	0.75	20	330
J11LC	7.90	38.50	18.50	3/4	1 1/4	1 11/16	1.02	15.90	1.00	20	340
J11LO	10.00	38.50	18.50	3/4	1 1/4	1 11/16	1.02	15.90	1.00	20	340
J11MC	7.90	38.50	18.50	3/4	1 1/4	1 11/16	1.02	15.90	1.00	20	340
J11MO	10.30	38.50	18.50	1	1 1/4	1 11/16	1.02	15.90	1.00	20	340
J11HC	7.90	38.50	18.50	1	1 1/4	1 11/16	1.02	15.90	1.00	20	340
J11HO	10.00	38.50	18.50	1	1 1/4	1 11/16	1.02	15.90	1.00	20	340
M12LC	8.50	40.00	23.50	1	1 1/4	1 11/16	1.51	18.39	0.47	17	330
M12MC	8.30	40.00	23.50	1	1 1/4	1 11/16	1.51	18.39	0.47	17	330
M12HC	8.40	40.00	23.50	1	1 1/4	1 11/16	1.51	18.39	0.63	17	330
E12LC	8.30	43.00	22.50	15/16	1 1/4	1 11/16	1.20	14.07	0.63	19	330
E12MC	8.10	43.00	22.50	15/16	1 1/4	1 11/16	1.20	14.07	0.63	19	330
E12HC	8.10	43.00	22.50	15/16	1 1/4	1 11/16	1.20	14.07	0.63	19	330
K12HC	10.50	41.00	26.00	7/8	1 1/8	1 11/16	1.20	21.50	0.75	19	340
K12HO	13.40	41.00	26.00	7/8	1 1/8	1 11/16	1.20	21.50	0.75	19	340
H12MC	15.80	47.50	26.60	1	1 1/2	1 11/16	2.23	33.40	0.90	16	410
H12HC	15.80	47.50	26.60	1	1 1/2	1 11/16	2.32	33.40	0.90	16	410
H12HO	19.20	47.50	26.60	1	1 1/2	1 11/16	2.32	33.40	0.90	16	410
J12XHC	13.70	68.50	42.50	1 3/8	1 1/2	1 15/16	2.71	36.70	0.75	16	280
J12XHO	19.70	68.50	42.50	1 3/8	1 1/2	1 15/16	2.71	36.70	0.75	16	280

STANDARD BOWL ASSEMBLY LIMITATIONS DATA

Continued from prior page

MODEL	THRUST DATA										
	FACTOR "K" (1)	1 STG. WEIGHT	ADDL. STG. WT.	BOWL LATERAL (2)		SHAFT DIA.	WR2 (WET) LBS. (3)	EYE AREA IN.2	SPHERE SIZE MAX. (4)	MAX # STG. (5)	MAXIMUM ALLOWABLE NON-SHOCK PRESSURE OPERATING (6)
				STD.	MAX.						
M14MC	11.90	68.50	42.50	1-1/8	1-7/8	1-15/16	3.50	25.32	0.60	15	310
M14HC	11.90	68.50	42.50	1-1/8	1-7/8	1-15/16	3.62	25.32	0.60	15	310
M14XHC	11.90	68.50	42.50	7/8	1-1/2	1-15/16	3.62	25.32	0.64	15	310
M14XXHC	11.90	68.50	42.50	7/8	1-1/2	1-15/16	3.62	25.32	0.64	14	310
H14LC	20.80	78.00	53.00	1-1/4	1-3/4	2-3/16	4.15	38.96	0.92	14	340
H14MC	20.30	78.00	53.00	1-1/4	1-3/4	2-3/16	4.15	38.96	0.92	14	340
H14MO	24.30	78.00	53.00	1-1/4	1-3/4	2-3/16	4.15	38.96	0.92	14	340
H14XHC	20.30	78.00	53.00	1-1/4	1-3/4	2-3/16	4.52	38.96	0.92	14	340
H16MC	24.10	90.00	60.00	15/16	TBD	2-3/16	9.15	58.70	1.05	12	350
H16XHC	23.50	90.00	60.00	15/16	TBD	2-3/16	9.15	58.70	1.05	12	350
E18LC	29.10	114.00	82.50	5/8	1	2-3/16	9.01	63.88	1.13	13	360
E18HC	28.70	114.00	82.50	5/8	1	2-3/16	9.26	63.88	1.13	13	360
K20LC	33.00	127.50	91.60	1	1-1/4	2-7/16	12.23	72.60	1.50	10	300
K20MC	33.00	127.50	91.60	1	1-1/4	2-7/16	12.23	72.60	1.50	10	330
K20HC	33.00	127.50	91.60	1	1-1/4	2-7/16	12.23	72.60	1.50	10	300
H24LC	53.80	197.40	148.30	1-1/4	1-1/2	2-11/16	51.10	148.40	1.50	9	280
H24MC	53.60	197.40	148.30	1-1/4	1-1/2	2-11/16	51.10	148.40	1.50	9	280
H24XHC	53.10	197.40	148.30	1-1/4	1-1/2	2-11/16	51.10	148.40	1.50	9	280

The previous page and this page lists the limitations of National Pump bowl assemblies. These limitations may be varied by changing the design and or materials. These changes require factory approval and special price quotations. Temperature limits for standard construction = 0 - 180 degrees F. If rubber neoprene bearings are used, the maximum temperature is 150 degrees F.

Footnotes

1. For use in calculating hydraulic thrust.
2. Shaft elongation must *not exceed* available standard bowl lateral, contact the factory.
3. WR^2 is in lb. ft. for one stage of the rotating assembly (impeller, collet & shaft). Multiply by the number of stages for WR2 for a complete bowl assembly. Multiply by 144 for WR^2 in lb. in^2.
4. Maximum sphere size is the size of the water-passage ways in the pump -- not an indication of the size of solids which the pump can handle. Based on standard lateral and operation from uppermost lateral position.
5. Based on the available lengths of commercial shafting and assembly considerations.
6. Based on the SAE grade 5 standard bolting and ASTM A48 Class 30 material for the bowl walls. Pressure rating must be adjusted for special materials (see chart below). "O" ringed joints are recommended for pressures that exceed 250 PSI, may be lower pressures for some applications.
7. Data for Low NPSH first stage impellers is available. Contact Factory.

Special Material Pressure Ratings	Material	304 Stainless	316SS	410SS	Alloy 20	C876 Bronze	Class 45 Cast Iron	Ductile Iron	Ni-Resist	Steel	Zincless (AL-Bronze)
	Multiplier	2.1	2.3	3.0	2.1	1.3	1.5	2.0	0.8	2.33	2.1

When bowl assemblies or other cast parts are constructed of special material, the above multipliers must be applied to the standard pressure ratings.

NOTE: When higher pressure applications are needed--than published--and standard materials are satisfactory, a steel jacket may be fitted around the bowl assembly for an additional presure rating. This will provide approximately 300% to the standard material construction. Do not use this type of construction with oil lubricated pumps.

Line Shaft Size	1"	1 3/16"	1 1/4"	1 1/2"	1 11/16"	1 15/16"	2 3/16"	2 7/16"	2 11/16"	2 15/16"
Weight per Foot with Coupling	2.71	3.9	4.2	6.08	7.7	10.22	12.78	15.86	19.8	23.56

STANDARD SHAFT MATERIALS, ALLOWABLE STRESS & CORRECTION FACTORS

	Material	ASTM	Stress (psi)			Rating
			Ultimate	Yield	Allowable	Mutliplier
Stock	416SS	A582 TYPE 416	110,000	85,000	19,800	-
	C-1045	A108 GRADE 1045	90,000	60,000	16,200	0.81
	316SS	A276 TYPE 316	75,000	30,000	9,000	0.42
	17-4PH 1150	A564 TYPE 17-4PH CONDITION H1150	135,000	105,000	24,300	1.23
Special Order	316L	A276 TYPE 316L	70,000	25,000	7,500	0.33
	NITRONIC 50	A276 TYPE XM-19	100,000	55,000	16,500	0.83
	K500	B865 ALLOY 500	140,000	100,000	25,200	1.28
	DUPLEX	A276 2205	100,000	75,000	18,000	0.91
	S.DUPLEX	A479 2507	115,000	80,000	20,700	1.05
	17-4PH 900	A564 TYPE 17-4PH CONDITION H900	175,000	155,000	31,500	1.61

Note: Rating Multiplier based on thrust listed in table 0.

MECHANICAL FRICTION HORSEPOWER LOSSES PER 100' OF OPEN OR ENCLOSED LINESHAFT

SHAFT DIAMETER (INCHES)	MECHANICAL H.P. LOSS AT RPM SHOWN								
	3550	2900	2200	1760	1450	1160	970	860	720
1	1.10	.88	.69	.53	.44	.35	.29	.26	.23
1-1/4	1.60	1.33	.96	.79	.67	.48	.44	.38	.31
1-1/2	2.20	1.85	1.42	1.14	.96	.74	.62	.56	.47
1-11/16	2.80	2.33	1.68	1.40	1.18	.94	.78	.70	.59
1-15/16	—	—	—	1.83	1.55	1.20	1.00	.90	.76
2-3/16	—	—	—	2.30	2.00	1.50	1.30	1.20	1.00
2-7/16	—	4.83	3.66	2.92	2.40	1.90	1.60	1.40	1.19
2-11/16	—	5.38	4.08	3.27	2.70	2.10	1.81	1.60	1.31
2-15/16	—	6.59	5.00	4.00	3.30	2.60	2.21	1.90	1.60

THREADED SHAFT QUICK REFERENCE POWER RATING CHART – 416SS

Shaft Diameter	Thread Minor Diameter	Thrust	hp/100 rpm	60 Hz Speeds (rpm)					50 Hz Speeds (rpm)		
(in)	(in)	(lb)		3600	1800	1200	900	720	3000	1500	1000
1.00	0.8773	5000	4.1	147	73	49	37	29	122	61	41
1.19	1.0648	7500	7.3	262	131	87	65	52	218	109	73
1.25	1.1273	10000	8.5	308	154	103	77	62	256	128	85
1.50	1.3773	12500	15.7	567	283	189	142	113	472	236	157
1.69	1.5648	15000	23.2	834	417	278	209	167	695	348	232
1.94	1.8148	20000	36.2	1302	651	434	325	260	1085	542	362
2.19	2.0648	27000	53.2		957	638	478	383		797	532
2.44	2.3148	30000	75.3		1355	903	677	542		1129	753
2.69	2.5700	33000	103.3		1860	1240	930	744		1550	1033
2.94	2.8200	36000	136.9		2463	1642	1232	985		2053	1369
Maximum Allowable Stress =			19,800	psi							

THREADED SHAFT QUICK REFERENCE POWER RATING CHART – C-1045

Shaft Diameter	Thread Minor Diameter	Thrust	hp/100 rpm	60 Hz Speeds (rpm)					50 Hz Speeds (rpm)		
(in)	(in)	(lb)		3600	1800	1200	900	720	3000	1500	1000
1.00	0.8773	5000	3.3	119	59	40	30	24	99	49	33
1.19	1.0648	7500	5.9	212	106	71	53	42	176	88	59
1.25	1.1273	10000	6.9	248	124	83	62	50	206	103	69
1.50	1.3773	12500	12.7	458	229	153	115	92	382	191	127
1.69	1.5648	15000	18.8	676	338	225	169	135	563	282	188
1.94	1.8148	20000	29.3	1055	527	352	264	211	879	439	293
2.19	2.0648	27000	43.0		775	516	387	310		645	430
2.44	2.3148	30000	61.1		1099	733	550	440		916	611
2.69	2.5700	33000	84.0		1512	1008	756	605		1260	840
2.94	2.8200	36000	111.4		2005	1336	1002	802		1671	1114
Maximum Allowable Stress =			16,200	psi							

The above ratings are based on the following formula:

$$P = \frac{ND^3}{321{,}000}\left[S^2 - \left(\frac{2F}{\pi D^2}\right)^2\right]^{1/2}$$

P = Power transmitted (in horsepower)
N = RPM
D = Shaft diameter (at root of threads)
S = Combined allowable shear stress (psi)*
F = Axial thrust

*S shall not exceed 30% of elastic limit or 18% of ultimate tensile strength of shafting.

THRUST BEARING HORSEPOWER LOSS

$$\text{H.P. LOSS} = \frac{0.0075 \times \text{RPM}}{100} \times \frac{\text{TOTAL DOWNTHRUST (LBS.)}}{1000}$$

COLUMN FRICTION LOSS CHART
50 - 1400 GPM

LOSS IN FEET OF HEAD PER 100 FEET OF COLUMN
OPEN OR ENCLOSED LINESHAFT

COL. SIZE	SHAFT SIZE	CAPACITY IN GALLONS PER MINUTE															
		50	60	70	80	90	100	125	150	175	200	225	250	275	300	325	350
4	1	.9	1.2	1.5	1.9	2.4	2.8	4.2	5.7	7.5	9.5	11.5	14.0				
	1-1/4	1.6	2.2	2.9	3.6	4.4	5.3	7.7	10.5	13.5							
5	1							1.0	1.3	1.7	2.2	2.7	3.3	3.9	4.5	5.2	5.9
	1-1/4						.9	1.4	1.9	2.5	3.1	3.9	4.6	5.5	6.4	7.2	8.3
	1-1/2 - 1-11/16					1.0	1.2	1.8	2.5	3.2	4.0	5.0	6.0	7.1	8.3		
6	1											.9	1.1	1.3	1.5	1.7	2.0
	1-1/4										1.0	1.2	1.4	1.7	2.0	2.3	2.6
	1-1/2 - 1-11/16								.9	1.1	1.4	1.7	2.0	2.4	2.8	3.2	3.6
	1-15/16							.9	1.3	1.7	2.2	2.7	3.3	3.9	4.5	5.2	6.0

COL. SIZE	SHAFT SIZE	CAPACITY IN GALLONS PER MINUTE															
		375	400	450	500	550	600	650	700	750	800	900	1000	1100	1200	1300	1400
5	1	6.6	7.5	9.3	11.2												
	1-1/4	9.4	10.5														
6	1	2.2	2.5	3.1	3.7	4.4	5.2	6.0	6.8	7.7	8.6	10.7					
	1-1/4	2.9	3.3	4.1	4.9	5.8	6.8	7.8	9.0	10.1							
	1-1/2 - 1-11/16	4.1	4.6	5.7	6.9	8.1	9.5	11.0									
	1-15/16	6.7	7.5	9.3	11.5												
8	1						1.0	1.2	1.4	1.7	2.0	2.5	3.0	3.5	4.2	4.8	5.5
	1-1/4				.9	1.1	1.3	1.5	1.7	1.9	2.2	2.7	3.2	3.8	4.5	5.2	6.0
	1-1/2 - 1-11/16			.9	1.1	1.3	1.5	1.8	2.0	2.3	2.6	3.2	3.9	4.6	5.4	6.2	7.2
	1-15/16	.9	1.0	1.2	1.5	1.8	2.1	2.4	2.8	3.2	3.6	4.5	5.4	6.4	7.5	8.8	10.0
	2-3/16 - 2-7/16	1.3	1.5	1.8	2.2	2.6	3.0	3.5	4.1	4.6	5.2	6.4	7.8	9.4			
10	1														1.1	1.2	1.4
	1-1/4													1.0	1.2	1.4	1.6
	1-1/2 - 1-11/16												1.0	1.2	1.4	1.6	1.8
	1-15/16											1.0	1.2	1.4	1.6	1.9	2.2
	2-3/16 - 2-7/16										.9	1.2	1.4	1.7	2.0	2.3	2.7
	2-11/16								1.0	1.1	1.3	1.6	1.9	2.2	2.6	3.0	3.5

Maximum friction loss as recommended by A.W.W.A. is 5' per 100' of column.

COLUMN FRICTION LOSS CHART
1,500 - 12,000 GPM

LOSS IN FEET OF HEAD PER 100 FEET OF COLUMN
OPEN OR ENCLOSED LINESHAFT

COL. SIZE	SHAFT SIZE	CAPACITY IN GALLONS PER MINUTE																	
		1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000	4250	4500	4750	5000
8	1	6.2	6.9	8.6	10.5														
	1-1/4	6.8	7.6	9.4	11.4														
10	1	1.6	1.8	2.2	2.7	3.2	3.7	4.3	5.0	5.6	6.3	7.0	7.8	8.7	9.6				
	1-1/4	1.8	2.0	2.5	3.0	3.6	4.2	4.9	5.6	6.4	7.1	8.0	8.9	9.8					
	1-1/2 - 1-11/16	2.0	2.3	2.8	3.5	4.1	4.8	5.6	6.4	7.2	8.2	9.1							
	1-15/16	2.5	2.8	3.4	4.2	5.0	5.8	6.8	7.8	8.9	10.0								
	2-3/16 - 2-7/16	3.0	3.4	4.3	5.2	6.1	7.2	8.2	9.4										
	2-11/16	3.9	4.5	5.5	6.7	7.9	9.3												
12	1-1/4			1.0	1.2	1.4	1.7	1.9	2.2	2.5	2.8	3.1	3.5	3.9	4.2	4.8	5.3	5.8	6.4
	1-1/2 - 1-11/16		.9	1.1	1.4	1.6	1.9	2.2	2.5	2.9	3.2	3.6	4.0	4.4	4.8	5.3	6.0	6.6	7.3
	1-15/16	.9	1.0	1.3	1.6	1.9	2.2	2.5	2.9	3.3	3.7	4.1	4.6	5.1	5.6	6.3	7.0	7.8	8.5
	2-3/16 - 2-7/16	1.1	1.2	1.5	1.8	2.1	2.5	2.9	3.3	3.8	4.3	4.8	5.4	5.9	6.5	7.2	8.0	8.8	9.7
	2-11/16	1.3	1.4	1.8	2.1	2.5	3.0	3.5	4.0	4.5	5.1	5.7	6.4	7.1	7.8	8.8	9.9		
14	1-1/2 - 1-11/16						1.0	1.2	1.3	1.5	1.7	1.9	2.1	2.3	2.6	2.9	3.2	3.6	4.0
	1-15/16					.9	1.1	1.3	1.5	1.7	1.9	2.1	2.4	2.6	2.9	3.2	3.5	3.9	4.3
	2-3/16 - 2-7/16				.9	1.1	1.3	1.5	1.7	2.0	2.2	2.4	2.7	3.0	3.3	3.7	4.0	4.4	4.9
	2-11/16			.9	1.0	1.2	1.4	1.7	2.0	2.2	2.5	2.7	3.1	3.4	3.8	4.2	4.6	5.0	5.5
	2-15/16	.9	1.0	1.1	1.4	1.6	1.9	2.2	2.5	2.9	3.2	3.6	4.0	4.4	4.9	5.4	5.9	6.7	7.2
16	1-1/2 - 1-11/16											1.0	1.1	1.2	1.3	1.4	1.6	1.8	1.9
	1-15/16										.9	1.1	1.2	1.3	1.4	1.6	1.7	1.9	2.1
	2-3/16 - 2-7/16									.9	1.0	1.1	1.3	1.4	1.5	1.7	1.9	2.1	2.3
	2-11/16								.9	1.0	1.1	1.2	1.4	1.5	1.6	1.8	2.0	2.2	2.5
	2-15/16							.9	1.0	1.1	1.3	1.4	1.6	1.8	1.9	2.1	2.4	2.7	2.9

COL. SIZE	SHAFT SIZE	CAPACITY IN GALLONS PER MINUTE														
		4500	4750	5000	5500	6000	6500	7000	7500	8000	8500	9000	9500	10000	11000	12000
14	1-1/2 - 1-11/16	3.2	3.6	4.0	4.7	5.6	6.4	7.4	8.5	9.7						
	1-15/16	3.5	3.9	4.3	5.1	6.0	7.0	8.0								
	2-3/16 - 2-7/16	4.0	4.4	4.9	5.8	6.9	8.0	9.2								
	2-11/16	4.6	5.0	5.5	6.7	8.0	9.3									
	2-15/16	5.9	6.7													
16	1-1/2 - 1-11/16	1.6	1.8	1.9	2.3	2.6	3.1	3.6	4.1	4.6	5.2	5.8	6.4	7.1	7.8	8.6
	1-15/16	1.7	1.9	2.1	2.5	3.0	3.4	3.8	4.3	4.8	5.4	6.0	6.6	7.2	7.9	
	2-3/16 - 2-7/16	1.9	2.1	2.3	2.7	3.3	3.8	4.4	5.0	5.6	6.3	7.0	7.7	8.5		
	2-11/16	2.0	2.2	2.5	2.9	3.5	4.0	4.6	5.3	5.9	6.5	7.3	8.0	8.8		
	2-15/16	2.4	2.7	2.9	3.5	4.1	4.7	5.4	6.1	6.8	7.6	8.3	9.0			

Maximum friction loss as recommended by A.W.W.A. is 5' per 100' of column.

DISCHARGE HEAD FRICTION LOSS CHART

CAST DISCHARGE HEADS

DISCHARGE SIZE	CAPACITY IN GALLONS PER MINUTE												
	100	125	150	175	200	250	300	350	400	450	500	550	
3	.25	.38	.55	.75	1.0	1.5	2.2	3.0					
4		.12	.18	.24	.32	.49	.70	.97	1.2	1.5	1.9	2.3	
6											.37		
	CAPACITY IN GALLONS PER MINUTE												
	600	800	1000	1250	1500	1750	2000	2500	3000	3500	4000	4500	5000
6	.54	.96	1.5	2.4	3.4								
8	.17	.31	.47	.74	1.1	1.5	2.0	3.0					
10			.19	.30	.43	.59	.77	1.2	1.7	2.4	3.0		
12					.21	.29	.37	.58	.85	1.2	1.5	1.9	2.3
14							.20	.31	.45	.65	.80	1.0	1.2

FABRICATED DISCHARGE HEADS

DISCHARGE SIZE	CAPACITY IN GALLONS PER MINUTE											
	100	125	150	175	200	250	300	350	400	450	500	600
3	.36	.57	.82	1.1	1.5	2.3	3.2					
4	.12	.19	.27	.38	.50	.79	1.1	1.5	2.0	2.5		
5					.20	.31	.45	.61	.80	1.0	1.2	1.9
6											.60	.86
8											.20	.29
	CAPACITY IN GALLONS PER MINUTE											
	800	1000	1250	1500	1750	2000	2500	3000	3500	4000	4500	5000
5	3.1											
6	1.5	2.4										
8	.51	.78	1.2	1.8	2.3	3.2						
10	.20	.31	.48	.69	.95	1.2	1.9	2.8				
12		.16	.24	.34	.48	.61	.96	1.4	1.9	2.4	3.0	
14			.16	.23	.31	.41	.63	.92	1.3	1.6	2.1	2.5

FRICTION LOSS OF WATER IN FEET PER 100 FEET LENGTH OF PIPE, BASED ON WILLIAMS & HAZEN FORMULA USING CONSTANT 100 SIZES OF STANDARD PIPE IN INCHES.

U.S. Gals. per Minute	1/2"Pipe		3/4"Pipe		1"Pipe		1-1/4"Pipe		1-1/2"Pipe		2"Pipe		2-1/2"Pipe		3"Pipe		4"Pipe		5"Pipe		6"Pipe		U.S. Gals. per Minute
	Vel. Ft/Sec.	Loss in Feet	Vel. Ft/Sec.	Loss in Feet	Vel. Ft/Sec.	Loss in Feet	Vel. Ft/Sec	Loss in Feet	Vel. Ft/Sec	Loss in Feet	Vel. Ft/Sec	Loss in Feet	Vel. Ft./Sec	Loss in Feet	Vel. Ft/Sec	Loss in Feet	Vel. Ft./Sec	Loss in Feet	Vel. Ft/Sec	Loss in Feet	Vel. Ft./Sec	Loss in Feet	
2	2.10	7.4	1.20	1.9																			2
4	4.21	27.0	2.41	7.0	1.49	2.14	.86	.57	.63	.26													4
6	6.31	57.0	3.61	14.7	2.23	4.55	1.29	1.20	.94	.56	.61	.20											6
8	8.42	98.0	4.81	25.0	2.98	7.8	1.72	2.03	1.26	.95	.82	.33	.52	.11									8
10	10.52	147.0	6.02	38.0	3.72	11.7	2.14	3.05	1.57	1.43	1.02	.60	.65	.17	.45	0.07							10
12			7.22	53.0	4.46	16.4	2.57	4.3	1.89	2.01	1.23	.79	.78	.23	.54	.10							12
15			9.02	80.0	5.60	25.0	3.21	6.5	2.36	3.00	1.53	1.08	.98	.36	.68	.15							15
18			10.84	108.2	6.69	35.0	3.86	9.1	2.83	4.24	1.84	1.49	1.18	.50	.82	.21							18
20			12.03	136.0	7.44	42.0	4.29	11.1	3.15	5.20	2.04	1.82	1.31	.61	.91	.25	.51	.06					20
25					9.30	64.0	5.36	16.6	3.80	7.30	2.55	2.73	1.63	.92	1.13	.38	.64	.09					25
30					11.15	89.0	6.43	23.0	4.72	11.0	3.06	3.84	1.96	1.29	1.36	.54	.77	.13	.49	.04			30
35					13.02	119.0	7.51	31.2	5.51	14.7	3.57	5.10	2.29	1.72	1.59	.71	.89	.17	.57	.06			35
40					14.88	152.0	8.58	40.0	6.30	18.8	4.08	6.6	2.61	2.20	1.82	.91	1.02	.22	.65	.08			40
45							9.65	50.0	7.08	23.2	4.60	8.2	2.94	2.80	2.04	1.15	1.15	.28	.73	.09			45
50							10.72	60.0	7.87	28.4	5.11	9.9	3.27	3.32	2.27	1.38	1.28	.34	.82	.11	.57	.04	50
55							11.78	72.0	8.66	34.0	5.62	11.8	3.69	4.01	2.45	1.58	1.41	.41	.90	.14	.62	.05	55
60							12.87	85.0	9.44	39.6	6.13	13.9	3.92	4.65	2.72	1.92	1.53	.47	.98	.16	.68	.06	60
65							13.92	99.7	10.23	45.9	6.64	16.1	4.24	5.4	2.89	2.16	1.66	.53	1.06	.19	.74	.076	65
70							15.01	113.0	11.02	53.0	7.15	18.4	4.58	6.2	3.18	2.57	1.79	.63	1.14	.21	.79	.08	70
75							16.06	129.0	11.80	60.0	7.66	20.9	4.91	7.1	3.33	3.00	1.91	.73	1.22	.24	.85	.10	75
80							17.16	145.0	12.59	68.0	8.17	23.7	5.23	7.9	3.63	3.28	2.04	.81	1.31	.27	.91	.11	80
85							18.21	163.8	13.38	75.0	8.68	26.5	5.56	8.1	3.78	3.54	2.17	.91	1.39	.31	.96	.12	85
90							19.30	180.0	14.71	84.0	9.19	29.4	5.88	9.8	4.09	4.08	2.30	1.00	1.47	.34	1.02	.14	90
95									14.95	93.0	9.70	32.6	6.21	10.8	4.22	4.33	2.42	1.12	1.55	.38	1.08	.15	95
100	8"PIPE								15.74	102.0	10.21	35.8	6.54	12.0	4.54	4.96	2.55	1.22	1.63	.41	1.13	.17	100
110									17.31	122.0	11.23	42.9	7.18	14.5	5.00	6.0	2.81	1.46	1.79	.49	1.25	.21	110
120									18.89	143.0	12.25	50.0	7.84	16.8	5.45	7.0	3.06	1.17	1.96	.58	1.36	.24	120
130									20.46	166.0	13.28	58.0	8.48	18.7	5.91	8.1	3.31	1.97	2.12	.67	1.47	.27	130
140	.90	.08							22.04	190.0	14.30	67.0	9.15	22.3	6.35	9.2	3.57	2.28	2.29	.76	1.59	.32	140
150	.96	.09									15.32	76.0	9.81	25.6	6.82	10.5	3.82	2.62	2.45	.88	1.70	.36	150
160	1.02	.10	10"PIPE								16.34	86.0	10.46	29.0	7.26	11.8	4.08	2.91	2.61	.98	1.82	.40	160
170	1.06	.11									17.36	96.0	11.11	34.1	7.71	13.3	4.33	3.26	2.77	1.08	1.92	.45	170
180	1.15	.13									18.38	107.0	11.76	35.7	8.17	14.0	4.60	3.61	2.94	1.22	2.04	.50	180
190	1.21	.14									19.40	118.0	12.42	39.6	8.63	15.5	4.84	4.01	3.10	1.35	2.16	.66	190
200	1.28	.15									20.42	129.0	13.07	43.1	9.08	17.8	5.11	4.4	3.27	1.48	2.27	.62	200
220	1.40	.18	.90	.06							22.47	154.0	14.38	52.0	9.99	21.3	5.62	5.2	3.59	1.77	2.50	.73	220
240	1.53	.22	.96	.07	12"PIPE						24.51	182.0	15.69	61.0	10.89	25.1	6.13	6.2	3.92	2.08	2.72	.87	240
260	1.66	.25	1.06	.08							26.55	211.0	16.99	70.0	11.80	29.1	6.64	7.2	4.25	2.41	2.95	1.00	260
280	1.79	.28	1.15	.09									18.30	81.0	12.71	33.4	7.15	8.2	4.58	2.77	3.18	1.14	280
300	1.91	.32	1.22	.11									19.61	92.0	13.62	38.0	7.66	9.3	4.90	3.14	3.40	1.32	300
320	2.05	.37	1.31	.12									20.92	103.0	14.52	42.8	8.17	10.5	5.23	3.54	3.64	1.47	320
340	2.18	.41	1.39	.14									22.22	116.0	15.43	47.9	8.68	11.7	5.54	3.97	3.84	1.62	340
360	2.30	.45	1.47	.15			14"PIPE						23.53	128.0	16.34	53.0	9.19	13.1	5.87	4.41	4.08	1.83	360
380	2.43	.50	1.55	.17	1.08	.069							24.84	142.0	17.25	59.0	9.69	14.0	6.19	4.86	4.31	2.00	380
400	2.60	.54	1.63	.19	1.14	.075							26.14	156.0	18.16	65.0	10.21	16.0	6.54	5.4	4.55	2.20	400
450	2.92	.68	1.84	.23	1.28	.96									20.40	78.0	11.49	19.8	7.35	6.7	5.11	2.74	450
500	3.19	.82	2.04	.28	1.42	.113	1.04	.06							22.70	98.0	12.77	24.0	8.17	8.1	5.68	2.90	500
550	3.52	.97	2.24	.33	1.56	.136	1.15	.07							24.96	117.0	14.04	28.7	8.99	9.6	6.25	3.96	550
600	3.84	1.14	2.45	.39	1.70	.159	1.25	.08	16"PIPE		20"PIPE				27.23	137.0	15.32	33.7	9.80	11.3	6.81	4.65	600
650	4.16	1.34	2.65	.45	1.84	.19	1.37	.09									16.59	39.0	10.62	13.2	7.38	5.40	650
700	4.46	1.54	2.86	.52	1.99	.22	1.46	.10									17.87	44.9	11.44	15.1	7.95	6.21	700
750	4.80	1.74	3.06	.59	2.13	.24	1.58	.11									19.15	51.0	12.26	17.2	8.50	7.12	750
800	5.10	1.90	3.26	.66	2.27	.27	1.67	.13									20.42	57.0	13.07	19.4	9.08	7.96	800
850	5.48	2.20	3.47	.75	2.41	.31	1.79	.14	1.36	.08							21.70	64.0	13.89	21.7	9.65	8.95	850
900	5.75	2.46	3.67	.83	2.56	.34	1.88	.16	1.44	.084			24"PIPE				22.98	71	14.71	24.0	10.20	10.11	900
950	6.06	2.87	3.88	.91	2.70	.38	2.00	.18	1.52	.095									15.52	26.7	10.77	11.20	950
1000	6.38	2.97	4.08	1.03	2.84	.41	2.10	.19	1.60	.10	1.02	.04							16.34	29.2	11.34	12.04	1000
1100	7.03	3.52	4.49	1.19	3.13	.49	2.31	.23	1.76	.12	1.12	.04							17.97	34.9	12.48	14.55	1100
1200	7.66	4.17	4.90	1.40	3.41	.58	2.52	.27	1.92	.14	1.23	.05							19.61	40.9	13.61	17.10	1200
1300	8.30	4.85	5.31	1.62	3.69	.67	2.71	.32	2.08	.17	1.33	.06									14.72	18.40	1300
1400	8.95	5.50	5.71	1.87	3.98	.78	2.92	.36	2.24	.19	1.43	.064			30"PIPE								1400
1500	9.58	6.24	6.12	2.13	4.26	.89	3.15	.41	2.39	.21	1.53	.07									15.90	22.60	1500
1600	10.21	7.00	6.53	2.39	4.55	.98	3.34	.47	2.56	.24	1.63	.08									17.02	25.60	1600
1800	11.50	8.78	7.35	2.96	5.11	1.21	3.75	.58	2.87	.30	1.84	.10	1.28	.04							18.10	26.90	1800
2000	12.78	10.71	8.16	3.59	5.68	1.49	4.17	.71	3.19	.37	2.04	.12	1.42	.05									2000
2200	14.05	12.78	8.98	4.24	6.25	1.81	4.59	.84	3.51	.44	2.25	.15	1.56	.06									2200
2400	15.32	14.2	9.80	5.04	6.81	2.08	5.00	.99	3.83	.52	2.45	.17	1.70	.07	1.09	.02							2400
2600			10.61	5.81	7.38	2.43	5.47	1.17	4.15	.60	2.66	.20	1.84	.08	1.16	.027							2600
2800			11.41	6.70	7.95	2.75	5.84	1.32	4.47	.68	2.86	.23	1.98	.09	1.27	.03							2800
3000			12.24	7.62	8.52	3.15	6.01	1.49	4.79	.78	3.08	.27	2.13	.10	1.37	.037							3000
3200			13.05	7.80	9.10	3.51	6.68	1.67	5.12	.88	3.27	.30	2.26	.12	1.46	.041							3200
3500			14.30	10.06	9.95	4.16	7.30	1.97	5.59	1.04	3.59	.35	2.49	.14	1.56	.047							3500
3800			15.51	13.4	10.80	4.90	7.98	2.36	6.07	1.20	3.88	.41	2.69	.17	1.73	.05							3800
4200					11.92	5.88	8.76	2.77	6.70	1.44	4.29	.49	2.99	.20	1.91	.07							4200
4500					12.78	6.90	9.46	3.22	7.18	1.64	4.60	.56	3.20	.22	2.04	.08							4500
5000					14.20	8.40	10.50	3.92	8.01	2.03	5.13	.68	3.54	.27	2.26	.09							5000
5500							11.55	4.65	8.78	2.39	5.64	.82	3.90	.33	2.50	.11							5500
6000							12.60	5.50	9.68	2.79	6.13	.94	4.25	.38	2.73	.13							6000
6500							13.65	6.45	10.39	3.32	6.64	1.10	4.61	.45	2.96	.15							6500
7000							14.60	7.08	11.18	3.70	7.15	1.25	4.97	.52	3.18	.17							7000
8000									12.78	4.74	8.17	1.61	5.68	.66	3.64	.23							8000
9000									14.37	5.90	9.20	2.01	6.35	.81	4.08	.28							9000
10000									15.96	7.19	10.20	2.44	7.07	.98	4.54	.33							10000
12000											12.25	3.41	8.60	1.40	5.46	.48							12000
14000											14.30	4.54	9.95	1.87	6.37	.63							14000
16000													11.38	2.40	7.28	.81							16000
18000													12.76	2.97	8.18	1.02							18000
													14.20										

ENGINEERING

SHAFT ELONGATION
INCHES PER 100 FT. OF SHAFT

HYDRAULIC THRUST LBS.	SHAFT DIAMETER									
	3/4	1	1-1/4	1-1/2	1-11/16	1-15/16	2-3/16	2-7/16	2-11/16	2-15/16
400	0.037	0.021	0.013	0.009	0.007					
600	0.056	0.032	0.020	0.014	0.011	0.008				
800	0.075	0.042	0.027	0.019	0.015	0.011	0.009			
1000	0.094	0.053	0.034	0.023	0.019	0.014	0.011	0.009		
1200	0.112	0.063	0.041	0.028	0.022	0.017	0.013	0.011	0.009	
1400	0.131	0.074	0.047	0.033	0.026	0.020	0.015	0.012	0.010	0.009
1600	0.150	0.084	0.054	0.035	0.030	0.022	0.018	0.014	0.012	0.010
1800	0.169	0.095	0.061	0.042	0.033	0.025	0.020	0.016	0.013	0.011
2000	0.187	0.105	0.067	0.047	0.037	0.028	0.022	0.018	0.015	0.012
2400	0.225	0.127	0.081	0.056	0.044	0.034	0.026	0.021	0.018	0.015
2800	0.262	0.148	0.094	0.066	0.052	0.039	0.031	0.025	0.020	0.017
3200	0.300	0.169	0.108	0.075	0.059	0.045	0.035	0.028	0.023	0.020
3600		0.190	0.121	0.084	0.067	0.050	0.040	0.032	0.026	0.022
4000		0.211	0.135	0.094	0.074	0.056	0.044	0.036	0.029	0.024
4400		0.232	0.148	0.103	0.081	0.062	0.048	0.039	0.032	0.027
4800		0.253	0.162	0.112	0.089	0.067	0.053	0.043	0.035	0.029
5200		0.274	0.175	0.122	0.096	0.073	0.057	0.046	0.038	0.032
5600		0.295	0.189	0.131	0.104	0.079	0.062	0.050	0.041	0.034
6000			0.202	0.141	0.111	0.084	0.066	0.053	0.044	0.037
6500			0.219	0.152	0.120	0.091	0.072	0.058	0.047	0.040
7000			0.236	0.164	0.130	0.098	0.077	0.062	0.051	0.043
7500			0.253	0.176	0.139	0.105	0.083	0.067	0.055	0.046
8000			0.270	0.187	0.148	0.112	0.088	0.071	0.058	0.049
9000			0.303	0.211	0.167	0.126	0.099	0.080	0.066	0.055
10000				0.234	0.185	0.140	0.110	0.089	0.073	0.061
12000				0.281	0.222	0.168	0.132	0.106	0.088	0.073
14000				0.328	0.259	0.197	0.154	0.124	0.102	0.085
16000					0.296	0.225	0.176	0.142	0.117	0.098
18000					0.333	0.253	0.198	0.160	0.131	0.110
20000						0.281	0.220	0.177	0.146	0.122
22000						0.309	0.242	0.195	0.161	0.134
24000							0.264	0.213	0.175	0.147
26000							0.286	0.231	0.190	0.159
28000							0.308	0.248	0.204	0.171
30000								0.266	0.219	0.183

Shaft elongation is caused by both hydraulic thrust produced by the pump and static weight of the rotating pump elements. Once the static weight has been compensated for by lifting the impellers off of the bottom of the bowls, only the hydraulic thrust remains a factor. The shaft lateral available in the bowls must be sufficient enough to allow for the shaft elongation produced by the hydraulic thrust when pump is in operation. This is to prevent the impellers from rubbing on the bottom of the bowls. The impellers must be raised off the bottom of the bowls to allow for this stretch plus the proper running clearances.

$$e = \frac{1 \times HT}{E \times A}$$

e = Shaft Elongation, (in.)
1 = Shaft Length, (in.)

E = Modulus of elasticity (29×10^6 lbs./in.^{2})
HT = Hydraulic Thrust (lbs.)
A = Shaft Area (in.^{2})

COLUMN ELONGATION

INCHES PER 100 FT. OF COLUMN

(FOR OPEN LINESHAFT COLUMN, MULTIPLY VALUES BY 1.3)

COLUMN DIAMETER Standard pipe, nominal I.D. except as indicated by *									
HYDRAULIC THRUST LBS.	3"	4"	5"	6"	8"	10"	12"	14"*	16"*
500	.007	.005	.004	.003					
600	.008	.006	.005	.004					
800	.011	.008	.006	.005					
1000	.013	.010	.008	.006	.004				
1200	.016	.012	.009	.007	.005				
1400	.019	.014	.011	.008	.006				
1600	.021	.016	.012	.009	.007	.005			
1800	.024	.018	.014	.011	.008	.006			
2000	.027	.020	.015	.012	.009	.007			
2400	.032	.023	.019	.014	.010	.008	.006		
2800	.037	.027	.022	.016	.012	.010	.007		
3200	.043	.031	.025	.019	.014	.011	.008		
3600	.048	.035	.028	.021	.016	.012	.009	.008	
4000		.039	.031	.023	.017	.014	.010	.008	
4400		.043	.034	.026	.019	.015	.0110	.009	
4800		.047	.037	.028	.021	.016	.013	.010	.009
5200		.051	.040	.030	.023	.018	.014	.011	.010
5600		.055	.043	.033	.024	.019	.015	.012	.011
6000			.046	.035	.026	.020	.016	.013	.011
6500			.050	.038	.028	.022	.017	.014	.012
7000			.054	.041	.030	.024	.018	.015	.013
7500			.058	.044	.033	.025	.020	.016	.014
8000			.062	.047	.035	.027	.021	.017	.015
9000				.053	.039	.030	.023	.019	.017
10,000				.059	.043	.034	.026	.021	.019
12,000				.070	.052	.041	.031	.025	.023
14,000				.082	.061	.048	.036	.029	.026
16,000				.094	.070	.054	.042	.034	.030
18,000					.078	.061	.047	.038	.034
20,000					.087	.068	.052	.042	.037
22,000					.096	.075	.057	.046	.041
24,000					.104	.082	.063	.050	.045
26,000					.113	.088	.068	.055	.049
28,000						.095	.073	.059	.052
30,000						.102	.078	.063	.056
32,000						.109	.083	.067	.060
34,000						.115	.089	.071	.064
36,000						.122	.094	.076	.068
38,000						.129	.099	.080	.071
40,000						.136	.104	.084	.075

Downthrust due to the hydraulic thrust of the pump causes the shaft and column to stretch after the pump is in operation. Unless the impellers can be and are raised off the bottom of the bowls enough to allow for this stretch plus some running clearance, the impellers will drag, causing the pump to wear and increase the horsepower required. With the total hydraulic downthrust known and the Column Elongation determined from this Chart, the total stretch of the column tube for the setting in question can be determined. To find the NET elongation, subtract from Column Elongation the Shaft Elongation.

MAXIMUM ALLOWABLE BEARING SPACING
(INCHES)

OPEN LINESHAFT CONSTRUCTION

SHAFT SIZE	NON RUBBER BEARINGS ①									
	RPM (60 CYCLES)					RPM (50 CYCLES)				
	3600	1800	1200	900	720	3000	1500	1000	750	600
1"	30	40	40	60	60	30	40	60	60	60
1-1/4"	30	60	60	60	60	40	40	60	60	60
1-1/2" - 2-3/16"	40	60	60	60	60	40	60	60	60	60
2-7/16" - 2-11/16"		60	60	60	60		60	60	60	120

OPEN LINESHAFT CONSTRUCTION

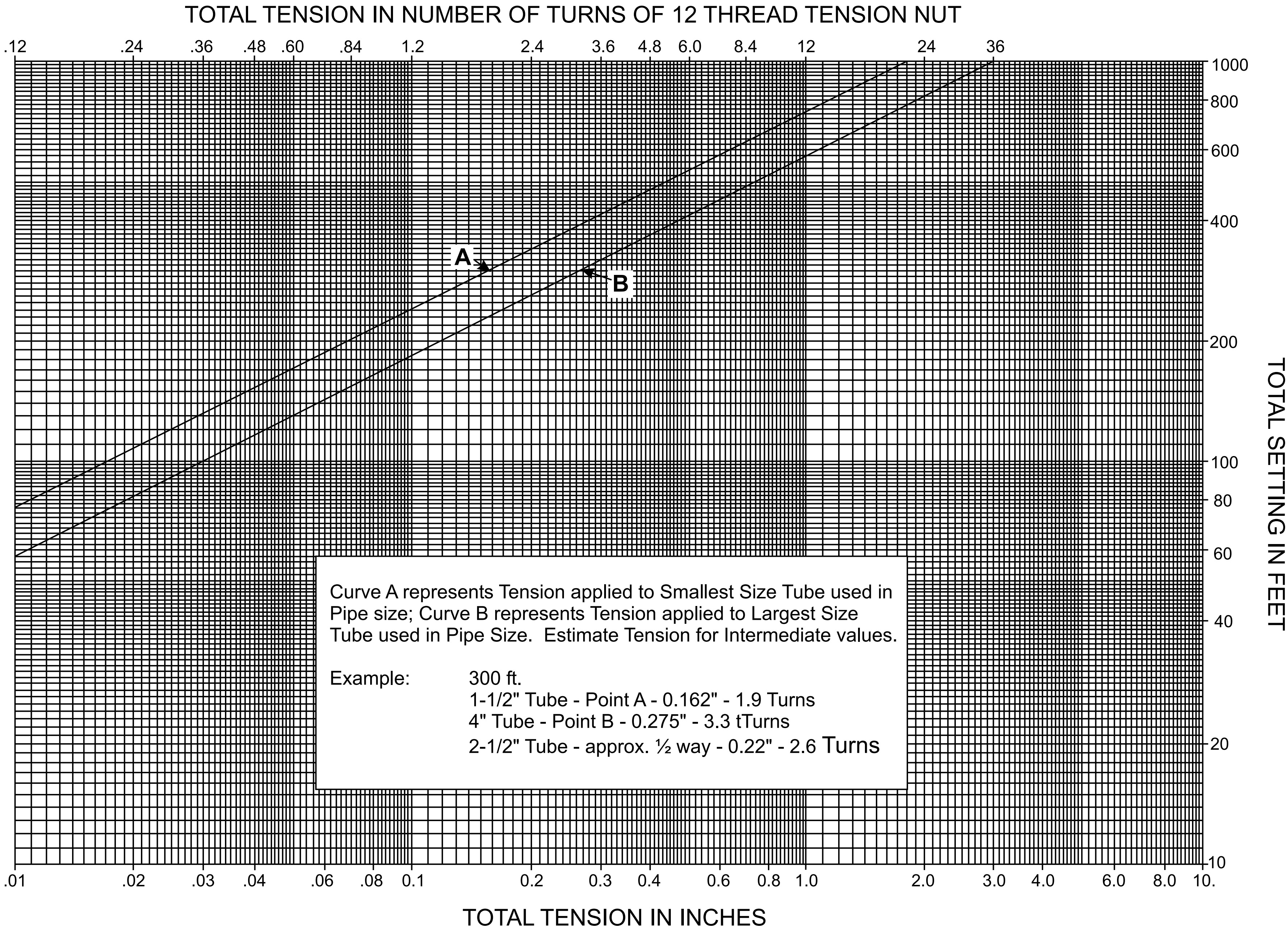
SHAFT SIZE	RUBBER BEARINGS ①									
	RPM (60 CYCLES)					RPM (50 CYCLES)				
	3600	1800	1200	900	720	3000	1500	1000	750	600
1"	60	120	120	120	120	60	60	120	120	120
1-1/4"	60	120	120	120	120	60	60	120	120	120
1-1/2" - 2-3/16"	60	120	120	120	120	60	120	120	120	120
2-7/16" - 2-11/16"		120	120	120	120	60	120	120	120	120

ENCLOSED LINESHAFT CONSTRUCTION

SHAFT SIZE	NON RUBBER BEARINGS ①									
	RPM (60 CYCLES)					RPM (50 CYCLES)				
	3600	1800	1200	900	720	3000	1500	1000	750	600
1"	30	40	40	60	60	30	40	60	60	60
1-1/4"	30	40	60	60	60	40	40	60	60	60
1-1/2" - 2-3/16"	40	60	60	60	60	40	60	60	60	60
2-7/16" - 2-11/16"		60	60	60	60		60	60	60	120

① FOR SPECIFIC APPLICATIONS THAT MAY DIFFER FROM THE ABOVE, CONTACT FACTORY.
DIMENSIONS LISTED ABOVE ARE TO BEARING CENTERS.

TUBING TENSION



PUMP LINESHAFT ELONGATION

Pump lineshaft elongation is caused by the weight of the shaft and the hydraulic thrust of the pump. Weight stretch is compensated for by field adjustment. Hydraulic thrust elongation must be calculated and allowed for in the shaft lateral adjustment. HYDRAULIC ELONGATION ALLOWANCE BEGINS ONLY AFTER THE WEIGHT STRETCH HAS BEEN ADJUSTED. The weight adjustment is accomplished by turning the motor shaft nut until the shaft starts to turn freely.

SHAFT HYDRAULIC ELONGATION EXAMPLE

M9MC, 14 Stage Bowl Assembly

500 foot setting of 6” x 2” x 1-1/4” column, tube and shaft, 400 GPM, 550 feet of head

FROM CATALOG CHART..OR............................FOR EXACT CALCULATION

SHAFT ELONGATION
Hydraulic Thrust = K factor X TDH
From Catalog page 33, K = 5.1
5.1 x 550 = 2,805 Lbs.
From Page 41, 2,800 Lb. thrust with 1-1/4" shaft
Elongation = 0.094" per 100 ft. of setting

$\frac{500}{100} \times 0.094 = 0.470"$

$$\frac{F \times L \times 12}{29 \times 10^6 \times A}$$

F = HYDRAULIC FORCE
L = SHAFT LENGTH
A = SHAFT CROSS SECTION AREA $IN.^2$

$$\frac{2{,}805 \times 500 \times 12}{29 \times 10^6 \times 1.23} = 0.472"$$

FROM CATALOG CHART..OR............................FOR EXACT CALCULATION

COLUMN AND TUBE ELONGATION
The total column thrust = pipe I.D. area x $\frac{TDH}{2.31}$ minus impeller wear ring area

Hydraulic Thrust = $\frac{6.065^2 \times .785 \times 550}{2.31}$ -2,805 Lbs. = 4,070 Lbs.

From page 42, 4,000 Lbs. thrust for 6" col. = 0.023" per 100 Ft. of setting $\frac{500}{100} \times 0.023" = 0.115"$

$$\frac{F \times L \times 12}{26 \times 10^6 \times (A_C + A_T)}$$

F = HYDRAULIC FORCE
L = COLUMN AND TUBE LENGTH
A_C = COLUMN METAL AREA
A_T = TUBE METAL AREA

$$\frac{4{,}070 \times 500 \times 12}{29 \times 10^6 \times (5.6 + 1.5)} = 0.119"$$

Using the catalog numbers the net stretch is 0.470” - 0.115” = 0.355”
From catalog Pg. 33 the available standard lateral for M9MC bowl assembly is 0.625”. Subtract 0.355” from 0.625” is 0.270” net available lateral.

FIELD LATERAL ADJUSTMENT

(for above example)

Lift the shaft to the point where the shaft turns freely. Since the net stretch is 0.355” add 0.125” for impeller seal ring running clearance 0.355 + 0.125 = 0.480” lift required after the shaft turns freely.

DEFINITION OF TERMS COMMONLY USED IN DESCRIBING MOTOR CONTROL EQUIPMENT

STARTER: Device to connect motor to power supply. Normally provides overload protection for all three power lines (commonly called legs) as this is required by virtually all electrical codes.

DISCONNECT SWITCH: Device to disconnect starter from power supply. Uses fuses, fusetrons or circuit breakers to provide short circuit protection to motor.

MANUAL: Term used to describe any device in which the contactors are opened and closed by manual operation.

MAGNETIC: Term used to describe any device in which the contactors are opened and closed electrically by magnetic coils.

COMBINATION MAGNETIC STARTER: General designation applied to all devices which contain a starter and a disconnect switch within a common enclosure. Pumping plant panels are included in this classification.

PUMPING PLANT PANEL: Consists of a starter and a disconnect switch in one common weather resistant (NEMA 3) enclosure. Also known as a combination outdoor starter.

FUSETRON: Trade name for a bi-metallic type fuse. Allows a smaller fuse clip size to be used in some sizes, thus reducing price.

OVERLOAD RELAY: Device used in starters to prevent motor from operating at an excessive overload for a long period of time. Also provided protection when ambient temperature is high.

INRUSH CURRENT: A momentary surge of current which takes place when a motor is started. Most power companies have rules regulating the maximum allowable inrush current. NEMA code letters have been assigned to motors classifying them according to the relation of their inrush current to their horsepower. A code “F” motor has a higher inrush current than a code “C” motor of the same horsepower.

FULL VOLTAGE STARTER: Most widely used starter for motors up to 200 horsepower. Applies full-line voltage across motor instantaneously. This causes high inrush current, normally in the magnitude of 500% to 600% of full load current.

PART WINDING STARTER: (Also known as Increment Start.) Starter which reduces inrush current to motor by energizing only a portion (1/2 to 2/3) of the motor windings until the motor reaches approximately 80% speed when the remaining windings are also energized. Any 230/460 dual voltage motor is suitable for use with a part winding starter if the line voltage is 230 volts. If the line voltage is 460 volts, the motor must be specially wound. Part winding is the most economical method of reducing motor inrush current.

VFD (VARIABLE FREQUENCY DRIVE) or AFD (ADJUSTABLE FREQUENCY DRIVE): A motor controller that controls the start and run speeds of a motor by varying the frequency that is output to the motor. This allows for accurate motor speed control based on the pressure and/or flow of the system.

AUTO TRANSFORMER REDUCED VOLTAGE STARTER: Starter which reduces inrush current by using a transformer to obtain a lower than line voltage with which the motor is started. Voltages normally available are 50%, 65% and 80% of full voltage. Can be used with any standard motor.

DEFINITION OF TERMS COMMONLY USED IN DESCRIBING MOTOR CONTROL EQUIPMENT CONT.

PRIMARY RESISTOR REDUCED VOLTAGE STARTER: Starter using a resistor in series with the motor windings to reduce the inrush current . Standard starter is a two point, single step type. Multiple step starters are also available. Can be used with any standard motor.

WYE-DELTA REDUCED VOLTAGE STARTER: Starter which reduces inrush current by switching motor leads from wye connection at start to delta connection for running. Motors for use with this type of starter must be ordered special.

BACK SPIN TIMER: (Time delay relay.) Timing device which prevents pump from being restarted until pump has had time to complete back spin after stop.

PRESSURE SWITCH: Switch which is actuated by the pressure in an enclosed system. Switch operates starter to turn pump off and on.

UNDER VOLTAGE RELAY: Device which automatically actuates starter to stop motor if line voltage drops below a predetermined level. Relay must be reset manually.

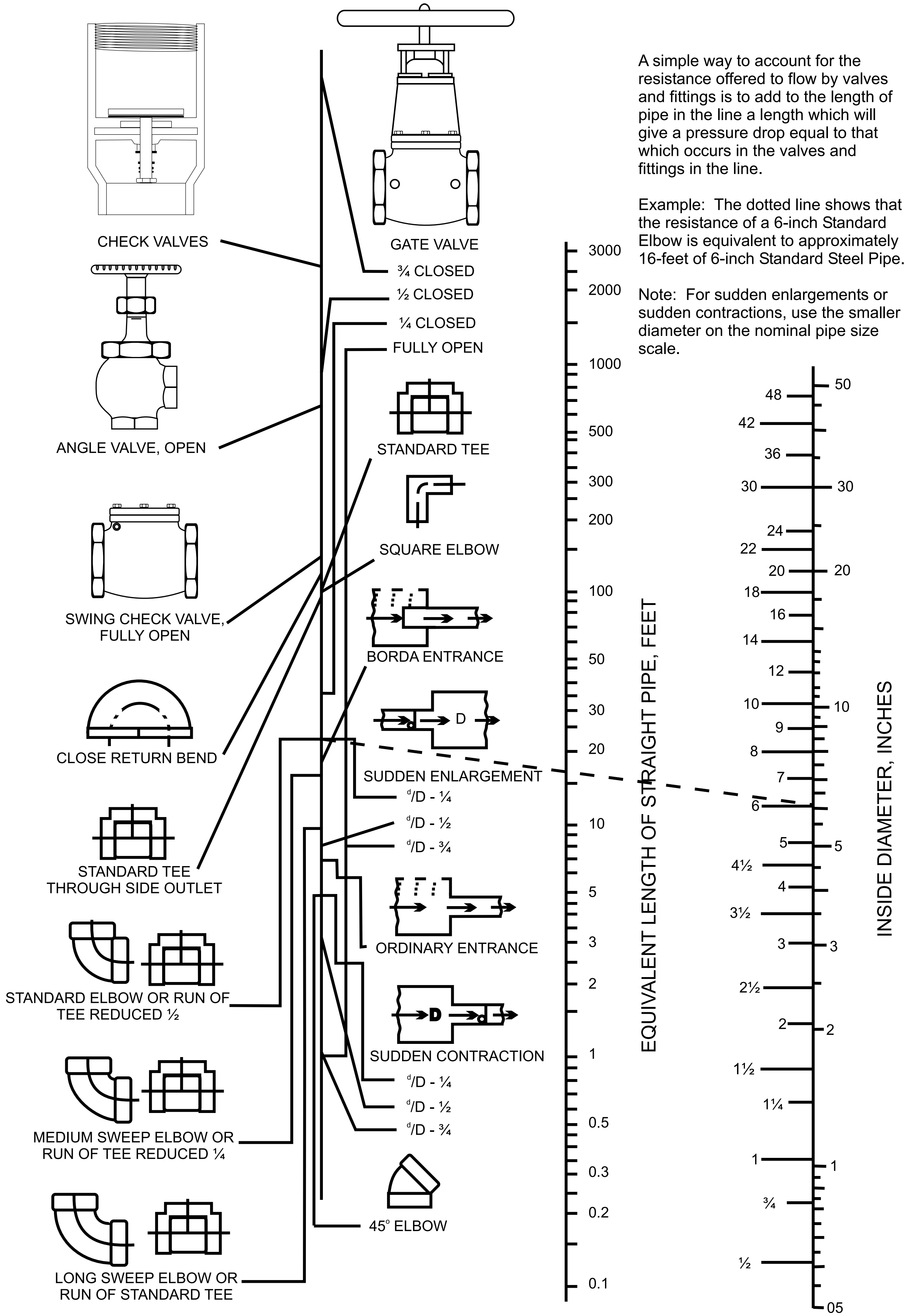
PHASE FAILURE AND REVERSE RELAY: Device to prevent operation of motor if any of the three power supply leads are disconnected or crossed. Two different versions of this type relay are available. The less expensive model is known as “starting open phase and phase sequence reversal” and will prevent a motor from starting if one of the three power leads is disconnected but will not necessarily stop a motor which is running. The more expensive model is known as “running open phase and phase sequence reversal” and will stop a motor which is running if one of the three power leads is disconnected.

RESISTANCE OF VALVES AND FITTINGS TO FLOW OF FLUIDS

A simple way to account for the resistance offered to flow by valves and fittings is to add to the length of pipe in the line a length which will give a pressure drop equal to that which occurs in the valves and fittings in the line.

Example: The dotted line shows that the resistance of a 6-inch Standard Elbow is equivalent to approximately 16-feet of 6-inch Standard Steel Pipe.

Note: For sudden enlargements or sudden contractions, use the smaller diameter on the nominal pipe size scale.



GENERAL ELECTRICAL INFORMATION
ELECTRICAL DATA

ENGINEERING

FOOT-POUNDS = Unit of work.

HORSEPOWER (HP) = (33,000 ft. pounds per min. - 746 watts - .746 kilowatts = Unit for measurement of power or rate of work.

VOLT AMPERES = Product of volts and amperes.

KILOVOLT - AMPERES (KVA) = 1000 volt-amperes.

WATT-HOUR = Small unit of electrical work - watts times hours.

KILOWATT-HOUR (K.W.Hr.) = Large unit of electrical work - 1000 watt-hours.

HORSEPOWER-HOUR (H.P.Hr.) = Unit of mechanical work.

To determine the cost of Power, for any specified period of time - working hours per day, week, month, or year:

$$\frac{\text{No. working hours} \times .746 \times \text{HP motor}}{\text{Efficiency of motor}} = \text{K.W.Hr. consumed at motor terminals}$$

K.W.Hr. consumed at Motor Terminals x Rate per K.W.Hr. = Total Cost current for time specified

TORQUE is that force which produces or tends to produce torsion (around on axis). Turning effort. It may be thought of as a twist applied to turn a shaft. It can be defined as the push or pull in pounds, along an imaginary circle of one foot radius which surrounds the shaft, or, in an electric motor, as the pull or drag at the surface of the armature multiplied by the radius of the armature, the term being usually expressed in foot-pounds (or pounds at 1 foot radius).

STARTING TORQUE is the torque which a motor exerts when starting. It can be measured directly by fastening a piece of belt to a 25" diameter pulley, wrapping it part way around and measuring the pounds pull the motor exerts, with a spring balance. In practice, any pulley can be used, for Torque = Lbs. pull x pulley radius in feet. A motor that has a heavy starting torque is one that starts up easily with a heavy load.

RUNNING TORQUE is the pull in pounds a motor exerts on a belt running over a pulley 24" in diameter.

FULL LOAD TORQUE is the turning moment required to develop normal horsepower output at normal speed.

The torque of any motor at any output with a known speed may be determined by the formula: $T = \frac{\text{Brake HP}}{\text{RPM}} \times 5250$

With a known foot-pounds torque, the horsepower at any given speed can be determined by the formula::

$$HP = \frac{T \times RPM}{5250} \quad \text{or} \quad HP = \frac{T \times \text{speed of belt on 24" pulley in feet per minute}}{33000}$$

COST OF PUMPING WATER

Cost per 1000 gallons pumped: $\frac{.189 \times \text{Power Cost per kilowatt-hour} \times \text{Head in feet}}{\text{Pump Eff.} \times \text{Motor Eff.} \times 60}$

EXAMPLE:

Power costs .01 per k.w.-hour; pump efficiency is 75%; motor efficiency is 85%; total head is 50 feet:

$\frac{.189 \times .01 \times 50}{.75 \times .85 \times 60} = \$.0025$ The cost of pumping 1000 gallons of water under the above conditions is 1/4 of a cent,

Cost per hour of pumping: $\frac{.000189 \times \text{GPM} \times \text{Head in feet} \times \text{Power Cost per kilowatt-hour}}{\text{Pump Eff.} \times \text{Motor Eff.}}$

Cost per acre foot of water: $\frac{1.032 \times \text{Head in feet} \times \text{Power per kilowatt-hour}}{\text{Pump Eff.} \times \text{Motor Eff.}}$

Pump efficiency: $\frac{\text{GPM} \times \text{Head in feet}}{3960 \times \text{BHP (to pump)}}$ Head: $\frac{3960 \times \text{Pump Eff.} \times \text{BHP}}{\text{GPM}}$

BHP (brake horsepower) to pump: Motor efficiency x HP at motor

BHP: $\frac{\text{GPM} \times \text{Head in feet}}{3960 \times \text{Pump Eff.}}$ GPM: $\frac{3960 \times \text{Pump Eff.} \times \text{BHP}}{\text{Head in feet}}$

COMPUTING HP INPUT FROM REVOLVING WATT HOUR METERS
(Disk Constant Method)

Kilowatts Input = KW in = $\frac{K \times R \times 3.60}{t}$

HP Input = HP in = $\frac{K \times R \times 3600}{t \times 746} \times \frac{4.83 \times K \times R}{t}$

K = Constant representing numbers of watt-hours through meter for one revolution of the disk. (Usually found on meter name-plate or face of disk.)

R = Number of revolutions of the disk.

t - Seconds for R revolutions.

Cost per 1000 gallons of water: $C = \frac{746 \times r \times \text{HP in.}}{\text{GPH}}$

C = Cost in dollars per 1000 gallons.

r = Power rate per kilowatt hour (dollars).

HP in = HP input measured at the meter (see above).

H = Total pumping head.

GPH = Gallons per hour discharged by pump.

Cost per 1000 gallons of water -

For each foot of head: $C = \frac{746 \times r \times \text{HP in.}}{H \times \text{GPH}}$

Cost per hour: $C^1 = .746 \times r \times \text{HP in.}$

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

USEFUL FORMULAS

Water Horsepower = $\frac{\text{GPM x 8.33 x Head}}{33000} = \frac{\text{GPM x Head}}{3960}$	WHERE: GPM = Gallons per minute 8.33 = Pounds of water per gallon 33000 = Ft. Lbs. per minute in one horsepower Head = Difference in energy head in feet (field head)
Laboratory BHP = $\frac{\text{Head x GPM x Sp. Gr.}}{\text{3960 x Eff.}}$ *Field BHP* = Laboratory BHP + Shaft Loss *Total BHP* = Field BHP + Thrust Bearing Loss	WHERE: GPM = Gallons per minute Head = Lab. head (including column loss) Eff. = Lab. eff. of pump bowls (from price book curves) Shaft Loss = HP Loss due to mechanical friction of lineshaft bearings (See Page 1) Thrust Bearing Loss = HP loss in driver thrust bearings (1)
Input Horsepower = $\frac{\text{Total BHP}}{\text{Motor Eff.}}$	Motor Eff. from motor mfg. (as a decimal)
Field Efficiency = $\frac{\text{Water Horsepower}}{\text{Total BHP}}$	Water HP as determined above Total BHP as determined above
Overall Plant Efficiency = $\frac{\text{Water Horsepower}}{\text{Input Horsepower}}$	Water HP as determined above Input HP as determined above (2)

Electrical	Input Horsepower = $\frac{\text{BHP}}{\text{Motor Eff.}} = \frac{\text{4.826 x K x M x R}}{\text{T}} = \frac{\text{1.732 x E x 1 x PF}}{746}$ BHP = Brake horsepower as determined above Mot. Eff. = Rated motor efficiency K = Power company meter constant M = Power company meter multiplier, or ratio of current and potential transformers connected with meter R = Revolutions of meter disk T = Time in sec. for R E = Voltage per leg applied to motor I = Amperes per leg applied to motor PF = Power factor of motor 1.732 = Factor for 3-phase motors. This reduces to 1 for single phase motors.
	Kilowatt Input to Motor = .746 x I.H.P. = $\frac{\text{1.732 x E x 1 x PF}}{1000}$
	KW-Hrs. per 1000 Gallons of Cold Water Pumped per Hour = $\frac{\text{HD in ft. x 0.00315}}{\text{Pump Eff. x Mot. Eff.}}$
Miscellaneous	Discharge Head (in feet of fluid pumped) = $\frac{\text{Discharge Pressure (PSI) x 2.31}}{\text{Sp. Gr. of Fluid Pumped}}$
	Velocity Head = $\frac{V^2}{2G}$ V = Velocity of Water G = Accelerated due to gravity = 32.2 ft/sec^2
	Torque (foot pounds) = $\frac{\text{HP x 5250}}{n}$ HP = Horsepower n = RPM

1. Thrust Bearing Loss = .0075 HP per 100 RPM per 1000 lbs. thrust
2. Overall plant efficiency sometimes referred to as "Wire to Water" efficiency

CONVERSION FACTORS

1 U.S. Gallon =	8.33 lbs. 231 cu. inches 0.1337 cu. feet 3.785 liters 0.833 imp. gallon	1 Lb./Sq. Inch =	2.31 ft. head of water 2.04 in. of mercury 0.0703 kg./sq. centimeter
1 Imperial Gallon =	1.2 U.S. gal. 9.988 lbs.	1 Atmosphere =	10.35 meters of water 29.92 in. of mercury 34.0 ft. of water 14.7 lbs./sq. inch
1 Cubic Foot =	7.48 U.S. gal. 28.316 liters 0.0283 cu. meter 62.35 lbs.	1 Inch of Mercury =	0.49 lbs./sq. inch 1.132 ft. of water
		1 Lb. of Water =	27.71 cu. inches 0.12 U.S. gallon
1 Cubic Ft./Sec. =	449 U.S. GPM	1 Kilogram =	2.2 lbs.
1 Cubic Meter =	264.2 U.S. gal. 35.31 cu. ft. 220 Imp. gal.	1 Kg./Sq. Centimeter =	14.22 lbs./sq. inch
1 Cubic Meter/Hr. =	4.4 U.S. GPM	1 Foot of Water =	0.0295 atmosphere 0.433 lbs./sq. inch
1 Million Gal./Day =	695 U.S. GPM	2000 Lbs. of Water =	240.2 U.S. gallons
1 Million U.S. Gal. =	3.07 Acre ft.	Metric Ton =	2204.6 lbs.
1 Acre Foot =	325,829 U.S. gal.	1000 Lbs. Water/Hour = GPM (Water @ 205°F.) =	2 U.S. GPM (39°F.) Boiler H.P. x 0.072
1 Acre Ft./Day =	227 U.S. GPM	1 Second Foot =	40 CA, NV, MT, Miner's In. 50 ID, NM, UT, Miner's In. 38.4 CO Miner's Inches
1 Liter =	0.2642 U.S. gal. 0.03531 cu. ft. 0.22 Imp. gal.		
1 Liter/Second =	15.85 U.S. GPM	1 Miner's Inch CA, NV, MT = 1 Miner's Inch ID, NM, UT = 1 Miner's Inch CO = 1 Miner's Inch CA, NV, MT = 1 Miner's Inch ID, NM, UT = 1 Miner's Inch CO =	11.22 U.S. GPM 8.98 U.S. GPM 11.69 U.S. GPM 1.5 cu. ft. minute 1.2 cu. ft. minute 1.563 cu. ft. minute
1 Inch =	2.54 Centimeter 25.4 Millimeter		
1 Centimeter =	0.3937 Inch		
1 Meter =	39.37 Inch 3.281 Feet		
1 Kilometer =	3281 Feet	100 U.S. GPM =	0.223 second-foot
1 Mile =	5280 Feet 1.61 Kilometer	1 Meter Head Water =	1.42 lbs./sq. inch
F° = 9/5 C°(+)32° ---------- Temperature ---------- C° = 5/9 (F°(-)32°)			

UNITS OF USAGE COSTS

1 Kilowatt = 1.341 horsepower = 737.5 ft. pounds per sec.

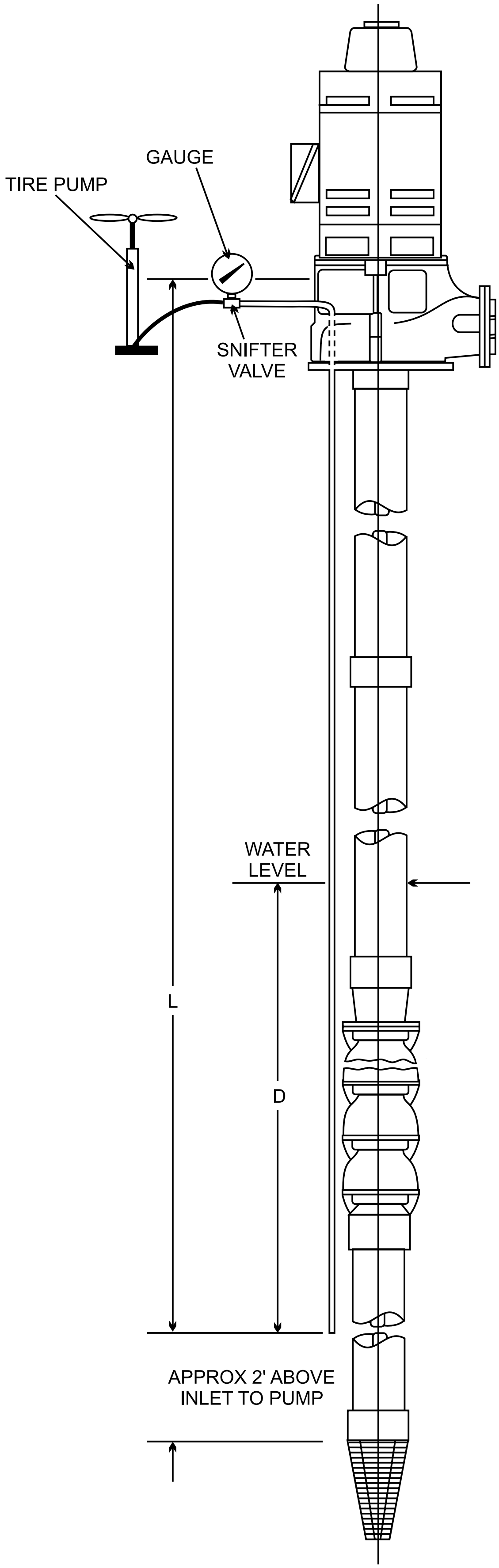
KWH per 1000 gallons $= \dfrac{\text{Head in feet x 0.00315}}{\text{Overall efficiency in \%}}$

Cost per Gallon per each foot of Head $= \dfrac{\text{0.00315 x Power cost per KWH}}{\text{Overall efficiency in \%}}$

Cost per hour $= \dfrac{\text{0.000189 x GPM x total head x power rate}}{\text{Overall efficiency in \%}}$

Cost per Acre Foot $= \dfrac{\text{1.032 x total head x power rate}}{\text{Overall efficiency in \%}}$

WATER LEVEL TESTING



There are two commonly used methods to determine the water level in wells - airline and gauge, or an electric sounder.

AIRLINE METHOD:

The airline method can use a standard pressure gauge, indirect reading depth gauge, or direct reading depth gauge.

Installation: The airline is installed so that the lower end is near the bottom of the pump - for reliable readings the airline should extend 20' below low water level if possible. All airline joints must be air tight for proper operation. The upper end of the airline is connected to a gauge and snifter valve. Exact vertical length of the airline must be noted at time of installation, this length should be recorded on the face of the gauge.

Operation: A tire pump is used to expel all water from the airline, when this point is reached the gauge reading will remain constant. The maximum maintained pressure is equal to the height of water above the end of the airline (D). Indirect Reading Depth Gauge (Fixed Dial): Pump up airline until maximum pressure (all water is expelled from airline) is reached, reading on gauge will be distance "D". Water level (below surface) is obtained by subtracting "D" from "L" (WL = L - D).

Direct Reading Depth Gauge (Movable Dial): Set the movable gauge dial so that the length of airline (L) is at the pin stop (gauge pointer position at) pressure). Pump airline to maximum pressure, gauge will read water level (L - D) direct.

Pressure Gauge: A pressure gauge can be used by converting PSI to feet of water as follows:

Feet of Water = PSI x 2.31

Operation would be identical to indirect reading gauge.

ELECTRIC SOUNDER METHOD

The electric sounder consists essentially of a battery, a spool of well insulated waterproof wire and a millivolt meter. One terminal of the battery is connected to the pump head and the other through the potentiometer to one end of the spool of wire. The other end of the wire from the spool must be protected so that it will not close the circuit if it should bump against the pump in being lowered into the well, but at the same time so arranged that the circuit will be closed when the end of the wire contacts the water in the well. The wire from the spool is then lowered into the well until the needle of the potentiometer deflects, indicating that the water level has been reached an the contact closed. The wire is then properly marked, pulled from the well and measured with a steel tape to determine the water level. (It is possible to calibrate the spool of wire so that it is direct reading).

MEASURING FLOW ORIFICE METHOD

MEASURING WATER USING AN ORIFICE

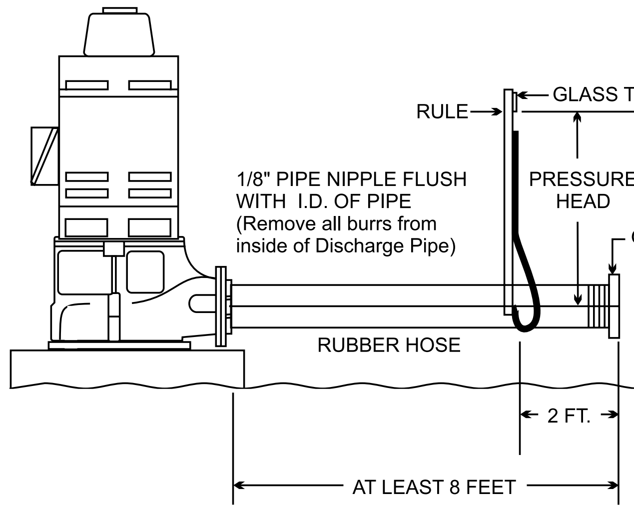
The use of an orifice is one of the simplest methods of accurately measuring the discharge from a vertical turbine pump in the field. The equipment and method is as illustrated.

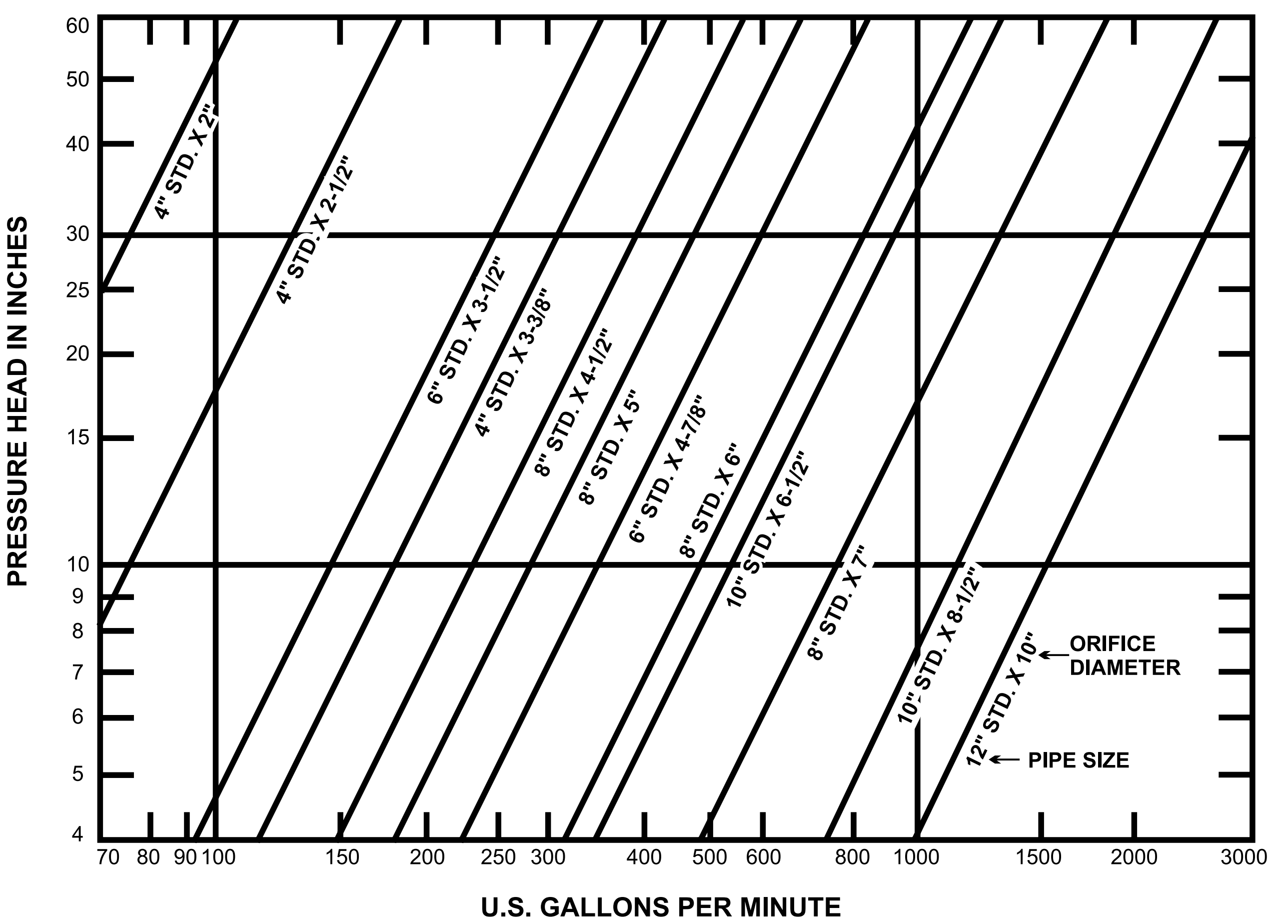
a. Discharge pipe must be horizontal and measuring tube connection in center of pipe.

b. Pipe must be flowing full with clear water free of sand and air, with a minimum pressure head 2" above top of pipe.

c. Pressure head is the vertical distance from the horizontal center line of the orifice to the level of the water in the measuring tube.

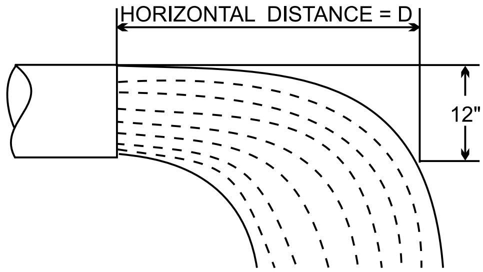
d. Rubber hose and glass tube must be free of air bubbles.





FULL PIPE METHOD

Where no instruments are available to accurately measure the flow of water from a pump, the following method will serve as an approximation.



FLOW FROM FULL HORIZONTAL PIPE

FLOW (GPM) = A X D X 1.015
WHERE: A = AREA OF PIPE IN SQUARE INCHES
D = HORIZONTAL DISTANCE IN INCHES
1.015 = CORRECTION FACTOR

Using an ordinary ruler or carpenter's square, measure the horizontal distance from the end of the discharge pipe to a point exactly 12 inches above the falling stream of water. The discharge pipe must be level and running full of water when the reading is taken. Multiply this distance (in inches) by the cross sectional area of the pipe in square inches and the answer will be the approximate capacity in gallons per minute. For example: assume that the horizontal distance from the end of an 8" discharge pipe is 20". Multiplying 20" by the cross sectional area of an 8" pipe (approximately 50 sq. in.) we obtain a capacity of 1000 GPM.

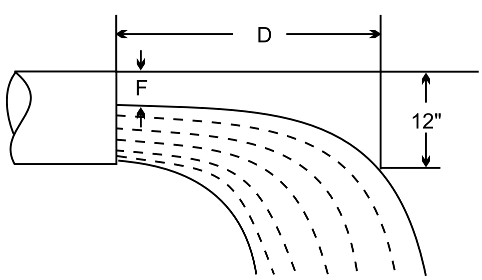
By checking this method of estimation using accurate flow meters it has been found a correction factor of 1.015 should be applied. The table below gives the approximate rates of flow for various distances after applying this factor.

APPROXIMATE FLOW IN GALLONS PER MINUTE WITH PIPE RUNNING FULL

DIA. PIPE INCHES	HORIZONTAL DISTANCE D IN INCHES									
	12	14	16	18	20	22	24	26	28	30
4	150	181	207	232	258	284	310	336	361	387
6	352	410	470	528	587	645	705	762	821	880
8	610	712	813	915	1017	1119	1221	1322	1425	1527
10	960	1120	1280	1440	1600	1760	1920	2080	2240	2400
12	1378	1607	1835	2032	2286	2521	2760	2980	3210	3430

MEASURING FLOW AREA FACTOR METHOD

(PIPE NOT RUNNING FULL)



FLOW FROM HORIZONTAL PIPE (NOT FULL)

FLOW (GPM) = A X D X 1.039 X F
WHERE: A = AREA OF PIPE IN SQUARE INCHES
D = HORIZONTAL DISTANCE IN INCHES
F = EFFECTIVE AREA FACTOR SHOWN BELOW
AREA OF PIPE EQUALS INSIDE DIA. X 0.7854

RATIO F/D = R %	EFF. AREA FACTOR F	RATIO F/D = R %	EFF. AREA FACTOR F
5	0.981	55	0.436
10	0.948	60	0.373
15	0.905	65	0.312
20	0.858	70	0.253
25	0.805	75	0.195
30	0.747	80	0.142
35	0.688	85	0.095
40	0.627	90	0.052
45	0.564	95	0.019
50	0.500	100	0.000

EXAMPLE: D = 20 INCHES - PIPE INSIDE DIAMETER = 10 INCHES
F = 2-1/2 INCHES
A = 10 X 10 X 0.7854 = 78.54 SQUARE INCHES
R = 2-1/2 / 10 = 25%
F = 0.805
FLOW = 78.54 X 20 X 0.805 = 1314 GPM

DATA REQUIRED BY PUMP MANUFACTURERS FOR PROPER SELECTION OF MATERIAL

1. SOLUTION TO BE PUMPED (Give common name, where possible, such as "spinning bath", "black liquor", "spent pickle", etc.______

______

______

2. PRINCIPAL CORROSIVES (H_2SO_4, HCI, ETC)______% by weight
(In the case of mixtures, state definite percentages by weight. For example: mixture contains 2% acid, in terms of 96.5% H_2SO_4.)______

______

______

3. pH (if aqueous solution)______ at ______ F.

4. Impurities or other constituents not given in "2" (List amounts of any metallic salts, such as chlorides, sulphates, sulphides, chromates, and any organic materials which may be present, even though in percentages as low as .01%. Indicated, where practical, whether they act as accelerators or inhibitors on the pump material.)

______

______

5. SPECIFIC GRAVITY (solution pumped)______at ______F.

6. TEMPERATURE OF SOLUTION: Maximum ______F, Minimum ______F, Normal ______ F.

7. VAPOR PRESSURES AT ABOVE TEMPERATURES: Maximum ______Minimum ______Normal ______
(indicate units used, such as pounds, gauge, inches water, milimeters mercury.)

______

______

8. VISCOSITY ______SSU; or ______centistokes; at ______F.

9. AERATION: Air-Free ______Partial ______Saturated ______

Does liquid have tendency to foam?______

______

______

10. OTHER GASES IN SOLUTION ______ppm, or ______cc per liter

______

______

11. SOLIDS IN SUSPENSION: (state types)______

______

______

COMMON MATERIALS OF CONSTRUCTION FOR VARIOUS LIQUIDS

MATERIAL SELECTION	ASTM NUMBER	REMARKS
A		ALL BRONZE CONSTRUCTION
B		BRONZE FITTED CONSTRUCTION
C		ALL IRON CONSTRUCTION
3	A216-WCB	CARBON STEEL
4	A217-C5	5% CHROMIUM STEEL
5	A743-CA15	12% CHROMIUM STEEL
6	A743-CB630	20% CHROMIUM STEEL
7	A743-CC50	28% CHROMIUM STEEL
8	A743-CF-8	19-9 AUSTENITIC STEEL
9	A743-CF-8M	19-10 MOLYBDENUM AUSTENITIC STEEL
10	A743-CN-7M	20-29 CHROMIUM NICKEL AUSTENITIC STEEL WITH COPPER & MOLYBDENUM
11		A SERIES OF NICKEL-BASED ALLOYS
12	A518	CORROSION-RESISTANT HIGH-SILICON CAST IRON
13	A436	AUSTENITIC CAST IRON - 2 TYPES
13(a)	A439	DUCTILE AUSTENITIC CAST IRON
14		NICKEL-COPPER ALLOY
15		NICKEL

pH VALUE OF SOLUTIONS GENERAL GUIDE FOR PUMP CONSTRUCTION

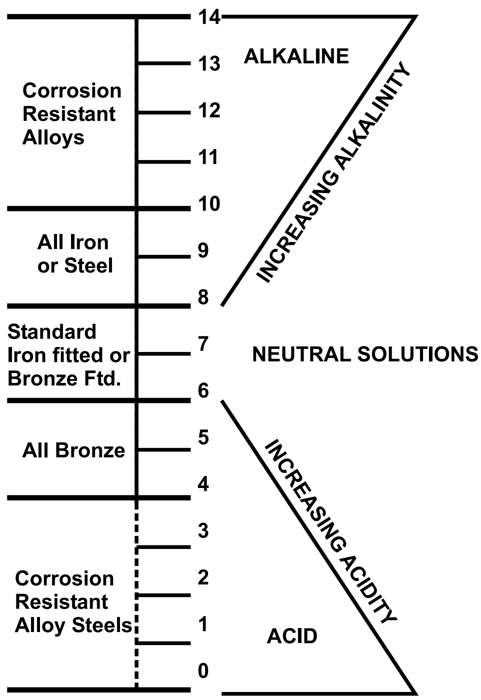


Table shows the materials commonly used for pumping various liquids. The material selection codes shown in column 5 are described below. When pumping liquids other than water, it may be necessary to specify special pump construction and/or shaft seal materials that will be compatible with the liquid being pumped. The following pump materials guide for various liquids is intended only as a guide. It merely suggests materials of construction which have been used successfully and does not constitute a guarantee of performance.

pH INDICATORS

pH OF COMMON ACIDS

ACIDS (pH <7)	MOLARITY	pH
ACETIC	N	2.4
ACETIC	0.1N	2.9
ACETIC	0.01N	3.4
ALUM	0.1N	3.2
ARSENIOUS	SATURATED	5.0
BENZOIC	0.1N	3.0
BORIC	0.1N	5.3
CARBONIC	SATURATED	3.8
CITRIC	0.1N	2.1
FORMIC	0.1N	2.3
HYDROCHLORIC	N	0.1
HYDROCHLORIC	0.1N	1.1
HYDROCHLOIRC	0.01N	2.0
HYDROCYANIC	0.1N	5.1
HYDROGEN SULFIDE	0.1N	4.1
LACTIC	0.1N	2.4
MALIC	0.1N	2.2
ORTHOPHOSPHORIC	0.1N	1.5
OXALIC	0.1N	1.3
SUCCINIC	0.1N	2.7
SALICYLIC	SATURATED	2.4
SULFURIC	N	0.3
SULFURIC	0.1N	1.2
SULFURIC	0.01N	2.1
SULFUROUS	0.1N	1.5
TARTARIC	0.1N	2.0
TRICHLORACETIC	0.1N	1.2

pH OF COMMON BASES

ACIDS (pH >7)	MOLARITY	pH
AMMONIA	N	11.6
AMMONIA	0.1N	11.1
AMMONIA	0.01N	10.6
BARBITAL SODIUM	0.1N	9.4
BORAX	0.01N	9.2
CALCIUM CARBONATE	SATURATED	9.4
CALCIUM HYDROXIDE	SATURATED	12.4
FERROUS HYDROXIDE	SATURATED	9.5
LIME	SATURATED	12.4
MAGNESIA	SATURATED	10.5
POTASSIUM ACETATE	0.1N	9.7
POTASSIUM BICARBONATE	0.1N	8.2
POTASSIUM CARBONATE	0.1	11.5
POTASSIUM CYANIDE	0.1N	11.0
POTASSIUM HYDROXIDE	N	14.0
POTASSIUM HYDROXIDE	0.1N	13.0
POTASSIUM HYDROXIDE	0.01N	12.0
SODIUM ACETATE	0.1N	8.9
SODIUM BENZOATE	0.1N	8.0
SODIUM BICARBONATE	0.1N	8.4
SODIUM CARBONATE	0.1N	11.6
SODIUM HYDROXIDE	N	14.0
SODIUM HYDROXIDE	0.1N	13.0
SODIUM HYDROXIDE	0.01N	12.0
SODIUM METASILICATE	0.1N	12.6
SODIUM SESQUICARBONATE	0.1N	10.1
TRISODIUM PHOSPHATE	0.1N	12.0

pH INDICATORS
pH OF COMMON ACIDS

INDICATOR	ACID COLOR	pH	BASE COLOR
CRESOL RED #1	RED	0.2-1.8	YELLOW
CRESOL PURPLE #1	RED	1.2-2.8	YELLOW
THYMOL BLUE	RED	1.2-2.8	YELLOW
METANIL YELLOW	RED	1.2-2.3	YELLOW
TROPAEOLIN LL	RED	1.4-3.2	YELLOW
2,6 DINITROPHENOL	NO COLOR	1.7-4.4	YELLOW
BENZYL ORANGE	RED	1.9-3.3	YELLOW
2,6 DINITROPHENOL	NO COLOR	2.0-4.7	YELLOW
BENZO YELLO	RED	2.4-4.0	YELLOW
p-DIMETHYLANINOAZOBENZENE	RED	2.9-4.0	YELLOW
BROMOPHENOL BLUE	RED	3.0-4.6	VIOLET
CONGO RED	BLUE	3.0-5.0	RED
BROMOCHLOROPHENOL BLUE	YELLOW	3.0-4.6	PURPLE
METHYL ORANGE	RED	3.1-4.4	YELLOW
BROMOCRESOL GREEN	YELLOW	3.8-5.4	BLUE
2,5 DINITROPHENOL	NO COLOR	4.0-5.8	YELLOW
METHYL RED	RED	4.4-6.0	YELLOW
AZOLITMIN (LITMUS)	RED	4.4-6.6	BLUE
PROPYL RED	RED	4.6-6.6	YELLOW
p-NITROPHENOL	NO COLOR	4.7-7.9	YELLOW
BROMOCRESOL PURPLE	YELLOW	4.8-6.8	PURPLE
BROMOPHENOL RED	YELLOW	4.8-6.8	PURPLE
CHLOROPHENOL RED	YELLOW	5.0-6.9	PURPLE
BROMOTHYMOL BLUE	YELLOW	6.0-7.6	BLUE
m-NITROPHENOL	NO COLOR	6.6-8.6	YELLOW
NEUTRAL RED	RED	6.8-8.0	YELLOW
PHENOL RED	YELLOW	6.8-8.4	RED
ROSOLIC ACID	BROWN	6.9-8.0	RED
CRESOL RED #2	YELLOW	7.2-8.8	PURPLE
a-NAPHTHOLPHTHALEIN	BROWN	7.3-8.7	GREEN
ORANGE I	YELLOW	7.6-6.9	ROSE
m-CRESOL PURPLE #2	YELLOW	7.6-9.2	PURPLE
THYMOL BLUE #2	YELLOW	8.0-9.6	BLUE
o-CRESOLPHTHALEIN	NO COLOR	8.2-9.8	RED
PHENOLPHTHALEIN	NO COLOR	8.3-10.0	RED
PHTHALEIN RED	YELLOW	8.6-10.2	RED
THYMOLPHTHALEIN	NO COLOR	9.3-10.5	BLUE
TOLYL RED	RED	10.0-11.6	YELLOW
b-NAPHTHOL VIOLET	YELLOW	10.0-12.0	VIOLET
ALIZARIN YELLOW R	YELLOW	10.0-12.1	BROWN
ALIZARIN YELLOW GG	YELLOW	10.0-12.0	ORANGE
NITRAMINE	NO COLOR	10.8-13.0	BROWN
PARAZO ORANGE	YELLOW	11.0-12.6	ORANGE
[PORROER BLUE	BLUE	11.0-13.0	RED
TROPAEOLIN O	YELLOW	11.1-12.7	ORANGE
ACYL BLUE	RED	12.0-13.6	BLUE

pH VALUES ARE APPROXIMATE VALUES AND HAVE BEEN ROUNDED OFF TO THE NEAREST TENTH. VALUES ASSUME A TEMPERATURE OF 25° C (77° F).

MATERIALS OF CONSTRUCTION FOR PUMPING VARIOUS LIQUIDS

COLUMN 1 LIQUID	COLUMN 2 CONDITIONS OF LIQUID	COLUMN 3 CHEMICAL SYMBOL	COLUMN 4 SPECIFIC GRAVITY	COLUMN 5 MATERIAL SELECTION
ACETALDEHYDE		C_2H_4O	0.78	C
ACETATE SOLVENTS				A, B, C, 8, 9, 10, 11
ACETONE		C_3H_6O	0.79	B, C
ACETIC ANHYDRIDE		$C_2H_6O_3$	1.08	8, 9, 10, 11, 12
ACID, ACETIC	CONC. COLD	$C_2H_4O_2$	1.05	8, 9, 10, 11, 12
ACID, ACETIC	DIL. COLD			A, 8, 9, 10, 11, 12
ACID, ACETIC	CONC. BOILING			9, 10, 11, 12
ACID, ACETIC	DIL. BOILING			9, 10, 11, 12
ACID, ARSENIC, ORTHO		$H_2AsO_4.1/2H_2O$	2.0-2.5	8, 9, 10, 11, 12
ACID, BENZOIC		$C_7H_6O_2$	1.27	8, 9, 10, 11
ACID, BORIC	AQUEOUS SOL.	H_3BO_3		A, 8, 9, 10, 11, 12
ACID, BUTYRIC	CONC.	$C_4H_8O_2$	0.96	8, 9, 10, 11
ACID, CARBOLIC	CONC. (M.P. 106°F)	C_6H_6O	1.07	C, 8, 9, 10, 11
ACID, CARBOLIC	(SEE PHENOL)			B, 8, 9, 10, 11
ACID, CARBONIC	AQUEOUS SOL.	$CO_2 + H_2O$		A
ACID, CHROMIC	AQUEOUS SOL.	$CR_2O_3 + H_2O$		A, 8, 9, 10, 11, 12
ACID, CITRIC	AQUEOUS SOL.	$C_6H_8O_7 + H_2O$		A, 8, 9, 10, 11, 12
ACIDS, FATTY (OLEIC, PALMITIC, STEARIC, ETC.)				A, 8, 9, 10, 11
ACID, FORMIC		CH_2O_2	1.22	9, 10, 11
ACID, FRUIT				A, 8, 9, 10, 11, 14
ACID, HYDROCHLORIC	COML CONC.	HCI	1.19(38%)	11, 12
ACID, HYDROCHLORIC	DIL. COLD			10, 11, 12, 14, 15
ACID, HYDROCHLORIC	DIL. HOT			11,12
ACID, HYDROCYANIC		HCN	0.70	C, 8, 9, 10, 11
ACID, HYDROFLUORIC	ANHYDROUS, WITH HYDRO CARBON	HF + HxCx		3, 14
ACID, HYDROFLUORIC	AQUEOUS SOL.	HF		A, 14
ACID, HYDROFLUOSILCIC		H_2SiF_6	1.30	A, 14
ACID, LACTIC		$C_3H_6O_3$	1.25	A, 8, 9, 10, 11, 12
ACID, MINE WATER				A, 8, 9, 10, 11
ACID, MIXED	SULFURIC + NITRIC			C, 3, 8, 9, 10, 11, 12
ACID, MURIATIC	(SEE ACID, HYDROCHLORIC)			____
ACID, NAPHTHENIC				C, 5, 8, 9, 10, 12
ACID, NITRIC	CONC. BOILING	HNO_3	1.50	6, 7, 10, 12
ACID, NITRIC	DILUTE			5, 6, 7, 8, 9, 10, 12
ACID, OXALIC	COLD	$C_2H_2O_4.2H_2O$	1.65	8, 9, 10, 11, 12
ACID, OXALIC	HOT	$C_2H_2O_4.2H_2O$		10, 11, 12
ACID, ORTHO-PHOSPHORIC		H_3PO_4	1.87	9, 10, 11
ACID, PICRIC		$C_6H_3N_3O_7$	1.76	8, 9, 10, 11, 12
ACID, PYROGALLIC		$C_6H_6O_3$	1.45	8, 9, 10, 11
ACID, PYROLIGNEOUS				A, 8, 9, 10, 11
ACID, SULFURIC	>77% COLD	H_2SO_4	1.69-1.84	C, 10, 11, 12
ACID, SULFURIC	65/93%. 175°F			11, 12
ACID, SULFURIC	65/93%, 175°F			10, 11, 12

MATERIALS OF CONSTRUCTION FOR PUMPING VARIOUS LIQUIDS

COLUMN 1 LIQUID	COLUMN 2 CONDITIONS OF LIQUID	COLUMN 3 CHEMICAL SYMBOL	COLUMN 4 SPECIFIC GRAVITY	COLUMN 5 MATERIAL SELECTION
ACID, SULFURIC	10-65%			10, 11, 12
ACID, SULFURIC	10%			A, 10, 11, 12, 14
ACID, SULFURIC (OLEUM)	FUMING	$H_2SO_4 + SO_3$	1.92-1.94	3, 10, 11
ACID SULFUROUS		H2SO3		A, 8, 9, 10, 11,
ACID, TANNIC		$C_{14}H_{10}O_9$		A, 8, 9, 10, 11, 14
ACID, TARTARIC	AQUEOUS SOL.	$C_4H_6O_6.\ H_20$		A, 8, 9, 10, 11, 14
ALCOHOLS				A, B
ALUM	(SEE ALUMINUM SULPHATE AND POTASH ALUM)			
ALUMINUM SULPHATE	AQUEOUS SOL.	$AL_2(SO_4)_3$		10, 11, 12,14
AMMONIA, AQUA		NH_4OH		C
AMMONIUM BICARBONATE	AQUEOUS SOL.	NH_4HCO_3		C
AMMONIUM CHLORIDE	AQUEOUS SOL.	NH_4Cl		9, 10, 11, 12, 14
AMMONIUM NITRATE	AQUEOUS SOL.	NH_4NO_3		C, 8, 9, 10, 11, 14
AMMONIUM PHOSPHATE, DIBASIC	AQUEOUS SOL.	$(NH_4)_2HPO_4$		C, 8, 9, 10, 11, 14
AMMONIUM SULFATE	AQUEOUS SOL.	$(NH_4)_2SO_4$		C, 8, 9, 10, 11
AMMONIUM SULFATE	WITH SULFURIC ACID			A, 9, 10, 11, 12
ANILINE		C_6H_7N	1.02	B, C
ANILINE HYDROCHLORIDE	AQUEOUS SOL.	$C_6H_5NH_2HCl$		11, 12
ASPHALT	HOT		0.98-1.4	C, 5
BARIUM CHLORIDE	AQUEOUS SOL.	$BaCl_2$		C, 8, 9, 10, 11
BARIUM NITRATE	AQUEOUS SOL.	$Ba(NO_3)_2$		C, 8, 9, 10, 11
BEER				A, 8
BEER WORT				A, 8
BEET JUICE				A, 8
BEET PULP				A, B, 8, 9, 10, 11
BENZENE		C_6H_6	0.88	
BENZINE	(SEE PETROLEUM ETHER)			
BENZOL	(SEE BENZENE)			B, C
BICHLORIDE OFMERCURY	(SEE MERCURIC CHLORIDE)			
BLACK LIQUOR	(SEE LIQUOR, PULP MILL)			
BLEACH SOLUTIONS	(SEE TYPE)			
BLOOD				A, B
BOILER FEEDWATER	(SEE WATER, BOILER FEED)			
BRINE, CALCIUM CHLORIDE	pH>8	$CaCl_2$		C
BRINE, CALCIUM CHLORIDE	pH<8			A, 10, 11, 13, 14
BRINE, CALCIUM AND MAGNESIUM CHLORIDES	AQUEOUS SOL.			A, 10, 11, 13, 14
BRINE, CALCIUM AND SODIUM CHLORIDE	AQUEOUS SOL.			A, 10, 11, 13, 14
BRINE, SODIUM CHLORIDE	UNDER 3% SALT, COLD	NaCl		A, C, 13
BRINE, SODIUM CHLORIDE	OVER 3% SALT, COLD		1.02-1.20	A, 8, 9, 10, 11, 13, 14
BRINE, SODIUM CHLORIDE	OVER 3% SALT, HOT			9, 1, 11, 12, 14
BRINE, SEAWATER			1.03	A, B, C
BUTANE			0.60 @32°F	B, C, 3

MATERIALS OF CONSTRUCTION FOR PUMPING VARIOUS LIQUIDS

COLUMN 1 LIQUID	COLUMN 2 CONDITIONS OF LIQUID	COLUMN 3 CHEMICAL SYMBOL	COLUMN 4 SPECIFIC GRAVITY	COLUMN 5 MATERIAL SELECTION
CALCIUM BISULFITE	PAPER MILL	$Ca(HSO_3)$	1.06	9, 10, 11
CALCIUM CHLORATE	AQUEOUS SOL.	$Ca(C10_3)_2 2H_2O$		10, 11, 12
CALCIUM HYPOSCHLORITE		$Ca(OCl)_2$		C, 10, 11,12
CALCIUM MAGNESIUM	(SEE BRINES)			
CHLORIDE				
CANE JUICE				A, B, 13
CARBON BISULFIDE		CS_2	1.26	C
CARBONATE OF SODA	(SEE SODA ASH)			
CARBON TETRACHLORIDE	ANHYDROUS	CCl_4	1.50	B, C
CARBON TETRACHLORIDE	PLUS WATER			A, 8
CATSUP				A, 8, 9, 10, 11
CAUSTIC POTASH	(SEE POTASSIUM			
	HYDROXIDE)			
CAUSTIC SODA	(SEE SODIUM HYDROXIDE)			
CELLULOSE ACETATE				9, 10, 11
CHLORATE OF LIME	(SEE CALCIUM CHLORATE)			
CHLORIDE OF LIME	(SEE CALCIUM			
	HYPOCHLORITE)			
CHLORINE WATER	(DEPENDING ON CONC.)			9, 10, 11, 12
CHLOROBENZENE		C_6H_5Cl	1.1	A, B, 8
CHLOROFORM		$CHCl_3$	1.5	A, 8, 9, 10, 11,14
CHROME ALUM	AQUEOUS SOL.	$CrK(SO_4)_2.12H_2O$		10, 11, 12
CODENSATE	(SEE WATER, DISTILLED)			
COPPERAS, GREEN	(SEE FERROUS SULFATE)			
COPPER AMMONIUM	AQUEOUS SOL.			C, 8, 9, 10, 11
ACETATE				
COPPER CHLORIDE (CUPRIC)	AQUEOUS SOL.	$CuCl_2$		11, 12
COPPER NITRATE		$Cu(NO_3)_2$		8, 9, 10, 11
COPPER SULFATE,BLUE VITRIOL	AQUEOUS SOL.	$CuSO_4$		8, 9, 10, 11, 12
CREOSOTE	(SEE OIL, CREOSOTE)			
CRESOL,META		C_7H_9O	1.03	C, 5
CYANIDE	(SEE SODIUM CYANIDE			
	AND POTASSIUM CYANIDE)			
CYANOGEN	IN WATER	$(CN)_2$GAS		C
DIPHENYL		$C_6H_5.C_6H_5$	.99	C, 3
ENAMEL				C
ETHANOL	(SEE ALCOHOLS)			
ETHYLENE CHLORIDE	COLD	$C_2H_4Cl_2$	1.28	A, 8, 9, 10, 11, 14
(DI-CHLORIDE)				
FERRIC CHLORIDE	AQUEOUS SOL.	$FeCl_3$		11,12
FERRIC SULPHATE	AQUEOUS SOL.	$FE_2(SO_4)_3$		8, 9, 10,11, 12
FERROUS CHLORIDE	COLD, AQUEOUS	$FeCL_2$		11, 12
FERROUS SULPHATE	AQUEOUS SOL.	$FeSO_4$		9, 10, 11, 12, 14
(GREEN COPPERAS)				
FORMALDEHYDE		CH_2O	1.08	A, 8, 9, 10, 11
FRUIT JUICES				A, 8, 9, 10, 11, 14
FURFURAL		$C_5H_4O_2$	1.16	

MATERIALS OF CONSTRUCTION FOR PUMPING VARIOUS LIQUIDS

COLUMN 1 LIQUID	COLUMN 2 CONDITIONS OF LIQUID	COLUMN 3 CHEMICAL SYMBOL	COLUMN 4 SPECIFIC GRAVITY	COLUMN 5 MATERIAL SELECTION
GASOLINE			0.68-0.75	B, C
GAUBES SALT	(SEE SODIUM SULFATE)			
GLUCOSE				A, B
GLUE	HOT			B, C
GLUE SIZING				A
GLYCEROL (GLYCERIN)		$C_3H_8O_3$	1.26	A, B, C
GREEN LIQUOR	(SEE LIQUOR, PULP MILL)			
HEPTANE		C_7H_{16}	0.69	B, C
HYDROGEN PEROXIDE	AQUEOUS SOL.	H_2O_2		8, 9, 10, 11
HYDROGEN SULFIDE	AQUEOUS SOL.	H_2S		8, 9, 10, 11
HYDROSULFITE OF SODA	(SEE SODIUM HYDROSULFITE)			
HYPOSULFITE OF SODA	(SEE SODIUM THIOSULFATE)			
KAOLIN SLIP	SUSPENSION IN WATER			C, 3
KAOLIN SLIP	SUSPENSION IN ACID			10, 11, 12
KEROSENE	(SEE OIL KEROSENE)			
LARD	HOT			B, C
LEAD ACETATE (SUGAR OF LEAD)	AQUEOUS SOL.	$Pb(C_2H_3O_2)_2.\ 3H_2O$		9, 10, 11, 14
LEAD	MOLTEN			C, 3
LIME WATER (MILK OF LIME)		$Ca(OH)_2$		C
LIQUOR-PULP MILL: BLACK				C, 3, 9, 10, 11, 12, 14
LIQUOR-PULP MILL: GREEN				C, 3, 9, 10, 11, 12, 14
LIQUOR-PULP MILL:WHITE				C, 3, 9, 10, 11, 12, 14
LIQUOR-PULP MILL: PINK				C, 3, 9, 10, 11, 12, 14
LIQUOR-PULP MILL: SULFITE				9, 10, 11
LITHIUM CHLORIDE	AQUEOUS SOL.	LiCl		C
LYE, CAUSTIC	(SEE POTASSIUM AND SODIUM HYDROXIDE)			
MAGNESIUM CHLORIDE	AQUEOUS SOL.	$MgCl_2$		10, 11, 12
MAGNESIUM SULFATE (EPSON SALTS)	AQUEOUS SOL.	$MgSo_4$		C, 8, 9, 10, 11
MANGANESE CHLORIDE	AQUEOUS SOL.	$Mnc1_2.4H_2O$		A, 8, 9, 10, 11, 12
MANGANOUS SULFATE	AQUEOUS SOL.	$MnSO_4.\ 4H_2O$		A, C, 8, 9, 10, 11
MASH				A, B, 8
MERCURIC CHLORIDE	VERY DILUTE AQUEOUS SOL.	$HgCl_2$		9, 10, 11, 12
MERCURIC CHLORIDE	COMPL. CONC. AQUEOUS SOL.	$HgCl_2$		11, 12
MERCURIC SULFATE	IN SULFURIC ACID	$HgSO_4 + H_2SO_4$		10, 11, 12
MERCUROUS SULFATE	IN SULFURIC ACID	$Hg_2SO_4 + H_2SO_4$		10, 11, 12
METHYL CHLORIDE		CH_3Cl	0.52	C
METHYLENE CHLORIDE		CH_3Cl_2	1.34	C, 8
MILK			1.03-1.04	8
MILK OF LIME	(SEE LIME WATER)			
MINE WATER	(SEE ACID, MINE WATER)			
MISCELLA	(20% SOYBEAN OIL & SOLVENT)		0.75	C
MOLASSES				A, B

MATERIALS OF CONSTRUCTION FOR PUMPING VARIOUS LIQUIDS

COLUMN 1 LIQUID	COLUMN 2 CONDITIONS OF LIQUID	COLUMN 3 CHEMICAL SYMBOL	COLUMN 4 SPECIFIC GRAVITY	COLUMN 5 MATERIAL SELECTION
MUSTARD				A, 8, 9, 10, 11, 12
NAPHTHA			0.78-0.88	B, C
NAPHTHA, CRUDE			0.92-0.95	B, C
NICOTINE SULFATE		$(C_{10}H_{14}N_2)_2H_2SO_4$		10, 11, 12, 14
NITRE	(SEE POTASSIUM NITRATE)			
NITRE CAKE	(SEE SODIUM BISULPHATE)			
NITRO ETHANE		$C_2H_5NO_2$	1.04	B, C
NITRO METHANE		CH_3NO_2	1.14	B, C
OIL, COAL TAR				B, C, 8, 9, 10, 11
OIL, COCONUT			0.91	A, B, C, 8, 9, 10, 11, 14
OIL, CREOSOTE			1.04-1.10	B, C
OIL, CRUDE	COLD			B, C
OIL, CRUDE	HOT			3
OIL, ESSENTIAL				A, B, C
OIL, FUEL				B, C
OIL, KEROSENE				B, C
OIL, LINSEED			0.94	A, B, C, 8, 9, 10, 11, 14
OIL, LUBRICATING				B, C
OIL, MINERAL				B, C,
OIL, OLIVE			0.90	B, C
OIL, PALM			0.90	A, B, C, 8, 9, 10, 11, 14
OIL, QUENCHING			0.91	B, C
OIL, RAPESEED			0.92	A, 8, 9, 10, 11, 14
OIL, SOYA BEAN				A, B, C, 8, 9, 10, 11, 14
OIL, TURPENTINE			0.87	B, C
PARAFFIN	HOT			B, C
PERHYDROL	(SEE HYDROGEN PEROXIDE)			
PEROXIDE OF HYDROGEN	(SEE HYDROGEN PEROXIDE)			
PETROLEUM ETHER				B, C
PHENOL		C_6H_6O	1.07	
PINK LIQUOR	(SEE LIQUOR, PULP MILL)			
PHOTOGRAPHIC DEVELOPERS				8, 9, 10, 11
PLATING SOLUTIONS	(VARIED AND COMPLICATED, CONSULT PUMP MFRS.)			
POTASH	PLANT LIQUOR			A, 8, 9, 10, 11,13, 14
POTASH ALUM	AQUEOUS SOL.	$Al_2(SO_4)_3K_2SO_4.24H_20$		A, 9, 10, 11,12, 13, 14
POTASSIUM BICHROMATE	AQUEOUS SOL.	$K_2Cr_2O_7$		C
POTASSIUM CARBONATE	AQUEOUS SOL.	K_2CO_3		C
POTASSIUM CHLORATE	AQUEOUS SOL.	$KClO_3$		8, 9, 10, 11, 12
POTASSIUM CHLORIDE	AQUEOUS SOL.	KCl		A, 8, 9, 10, 11, 14
POTASSIUM CYANIDE	AQUEOUS SOL.	KCN		C
POTASSIUM HYDROXIDE	AQUEOUS SOL.	KOH		C, 5,8,9,10,11,13,14, 15
POTASSIUM NITRATE	AQUEOUS SOL.	KNO_3		C, 5, 8, 9, 10, 11
POTASSIUM SULFATE	AQUEOUS SOL.	K_2SO_4		A, 8, 9, 10, 11
PROPANE		C_3H_8	0.59@48°F	B, C, 3

MATERIALS OF CONSTRUCTION FOR PUMPING VARIOUS LIQUIDS

COLUMN 1 LIQUID	COLUMN 2 CONDITIONS OF LIQUID	COLUMN 3 CHEMICAL SYMBOL	COLUMN 4 SPECIFIC GRAVITY	COLUMN 5 MATERIAL SELECTION
PYRIDINE		C_5H_5N	0.98	C
PYRIDINE SULFATE				10, 12
RHIDOLENE				B
ROSIN (COLOPHONY)	PAPER MILL			C
SALT AMMONIAC	(SEE AMMONIUM CHLORIDE)			
SALT LAKE	AQUEOUS SOL.	Na_2SO_4 + IMPURITIES		A, 8, 9, 10. 11, 12
SALT WATER	(SEE BRINES)			
SEA WATER	(SEE BRINES)			
SEWAGE				A, B, C
SHELLAC				A
SILVER NITRATE	AQUEOUS SOL.	$AgNo_3$		8, 9, 10, 11, 12
SLOP, BREWERY				A, B, C
SLOP DISTILLERS				A, 8, 9, 10, 11,
SOAP LIQUOR				C
SODA ASH	COLD	Na_2CO_3		C
SODA ASH	HOT			8, 9, 10, 11,13, 14
SODIUM BICARBONATE	AQUEOUS SOL.	$NaHCO_3$		C, 8, 9, 10, 11, 13
SODIUM BISULFATE	AQUEOUS SOL.	$NaHSO_4$		10, 11, 12
SODIUM CARBONATE	(SEE SODA ASH)			
SODIUM CHLORATE	AQUEOUS SOL.	$NaClO_3$		8, 9, 10, 11, 12
SODIUM CHLORIDE	(SEE BRINES)			
SODIUM CYANIDE	AQUEOUS SOL.	NaCN		C
SODIUM HYDROXIDE	AQUEOUS SOL.	NaOH		C, 5, 8, 9, 10, 11, 13, 14, 15
SODIUM HYDROSULFITE	AQUEOUS SOL.	$Na_2S_20_4, 2H_20$		8, 9, 10, 11
SODIUM HYPOCHLORITE		NaOCl		10, 11, 12
SODIUM HYPOSULFITE	(SEE SODIUM THIOSULFATE)			
SODIUM META SILICATE				C
SODIUM NITRATE	AQUEOUS SOL.	$NaNO_3$		C, 5, 8, 9, 10, 11
SODIUM PHOSPHATE: MONOBASIC	AQUEOUS SOL.	NaH_2PO_4, H_20		A,8, 9, 10, 11
SODIUM PHOSPHATE: DIBASIC	AQUEOUS SOL.	$Na_2HPO_4. 7H_2O$		A, C, 8, 9, 10, 11
SODIUM PHOSPHATE: TRIBASIC	AQUEOUS SOL.	$NaPO_4.12H_2O$		C
SODIUM PHOSPHATE: META	AQUEOUS SOL.	$Na_4P_4O_{12}$		A, 8, 9, 10, 11
SODIUM PHOSPHATE: HEXAMETA	AQUEOUS SOL.	$(NaPo_3)_6$		8, 9, 10, 11
SODIUM PLUMBITE	AQUEOUS SOL.			C
SODIUM SULFATE	AQUEOUS SOL.	Na_2SO_4		A, 8, 9, 10, 11
SODIUM SULFIDE	AQUEOUS SOL.	Na_2S		C, 8, 9, 10, 11
SODIUM SULFITE	AQUEOUS SOL.	Na_2SO_3		A, 8, 9, 10,11
SODIUM THIOSULFATE	AQUEOUS SOL.	$Na_2S_2O_3.5H_2O$		8, 9, 10, 11
STANNIC CHLORIDE	AQUEOUS SOL.			11, 12
STANNOUS CHLORIDE	AQUEOUS SOL.	$SnCl_2$		11, 12
STARCH		$(C_6H_{10}O_5)x$		A, B

MATERIALS OF CONSTRUCTION FOR PUMPING VARIOUS LIQUIDS

COLUMN 1 LIQUID	COLUMN 2 CONDITIONS OF LIQUID	COLUMN 3 CHEMICAL SYMBOL	COLUMN 4 SPECIFIC GRAVITY	COLUMN 5 MATERIAL SELECTION
STRONTIUM NITRATE	AQUEOUS SOL.	$Sr(NO_3)_2$		C, 8
SUGAR	AQUEOUS SOL.			A, 8, 9, 10, 11, 13
SULFITE LIQUOR	(SEE LIQUOR, PULP MILL)			
SULFUR	IN WATER	S		A, C, 8, 9, 10, 11
SULFUR	MOLTEN	S		C
SULFUR CHLORIDE	COLD	S_2Cl_2		C
SYRUP	(SEE SUGAR)			
TALLOW	HOT		0.99	C
TANNING LIQUORS				A, B, 9, 10, 11, 12, 14
TAR	HOT			C, 3
TAR AND AMMONIA	IN WATER			C
TETRACHLORIDE OF TIN	(SEE STANNIC CHLORIDE)			
TETRAETHYL LEAD		$Pb(C_2H_5)_4$	1.66	B, C
TOLUENE (TOLUOL)		C_7H_8	0.87	B, C
TRICHLOROETHYLENE		C_2HCl_3	1.47	A, B, C, 8
URINE				A, 8, 9, 10, 11
VARNISH				A, B, C, 8, 14
VEGETABLE JUICES				A, 8, 9, 10, 11, 14
VINEGAR				A, 8, 9, 10, 11, 12
VITRIOL BLUE	(SEE COPPER SULFATE)			
VITRIOL, GREEN	(SEE FERROUS SULFATE)			
VITRIOL, OIL OF	(SEE ACID, SULFURIC)			
VITRIOL, WHITE	(SEE ZINC SULFATE)			
WATER, BOILER FEED	NOT EVAPORATE pH>8.5		1.00	C
WATER, BOILER FEED	HIGH MAKEUP pH<8.5			B
	LOW MAKEUP			
WATER, BOILER FEED	EVAPORATED, ANY pH		1.00	4, 5, 8, 14
WATER, DISTILLED	HIGH PURITY		1.00	A, 8
WATER, DISTILLED	CONDENSATE			A, B
WATER, FRESH				B
WATER, MINE	(SEE ACID, MINE WATER)			
WATER, SALT AND SEA	(SEE BRINES)			
WHISKEY				A, 8
WHITE LIQUOR	(SEE LIQUOR, PULP MILL)			
WHITE WATER	PAPER MILL			A, B, C
WINE				A, 8
WOOD PULP (STOCK)				A, B, C
WOOD VINEGAR	(SEE ACID PYROLIGNEOUS)			
WORT	(SEE BEER WORT)			
XYLOL (XYLENE)		C_8H_{10}	0.87	B, C, 8, 9, 10, 11
YEAST				A, B
ZINC CHLORIDE	AQUEOUS SOL.	$ZnCl_2$		9, 10, 11, 12
ZINC SULFATE	AQUEOUS SOL.	$ZnSO_4$		A, 9, 10, 11

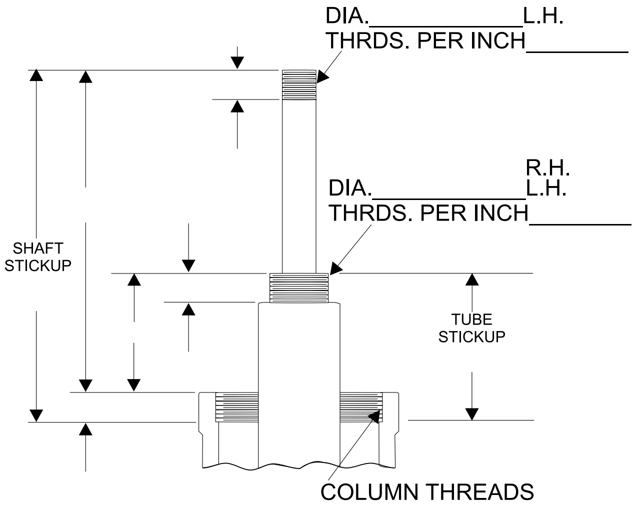
ADAPTING NATIONAL PUMP BOWL ASSEMBLIES TO SPECIAL COLUMNS

MACHINING DATA REQUIREMENTS: NO MACHINE WORK CAN BE DONE ON A REPLACEMENT BOWL UNTIL WE HAVE A COPY OF THIS CHART SHOWING THE NECESSARY INFORMATION REQUIRED.

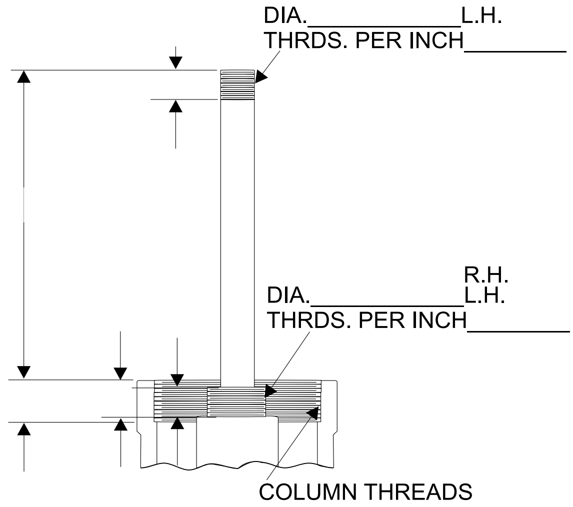
CUSTOMER:______________________ MANUFACTURER OF PUMP:______________________
BOWL ASSEMBLY: ______________________ NO. OF STAGES: __________ JOB NO: __________

THREAD DIAMETERS TO BE MICROMETER DIMENSIONS

THREADED DISCHARGE CONNECTION



OUTSIDE DIA.____________ THRDS. PER INCH ____________
TAPER PER FOOT______________________
BOWL THREADS-INSIDE ____________ OUTSIDE ____________

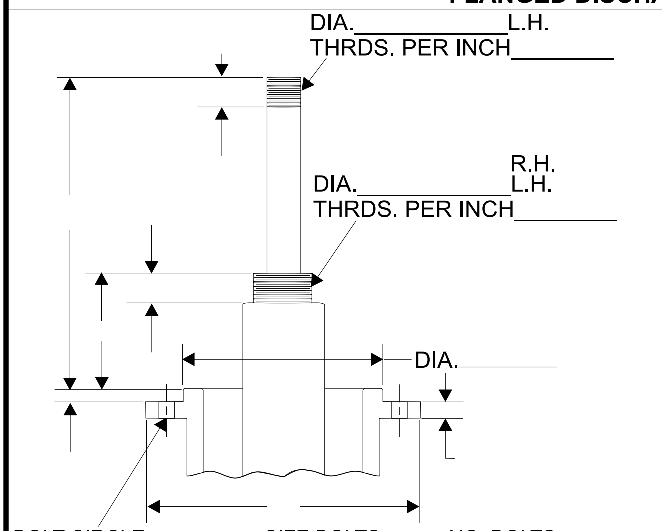


OUTSIDE DIA.____________ THRDS. PER INCH ____________
TAPER PER FOOT______________________
BOWL THREADS-INSIDE ____________ OUTSIDE ____________

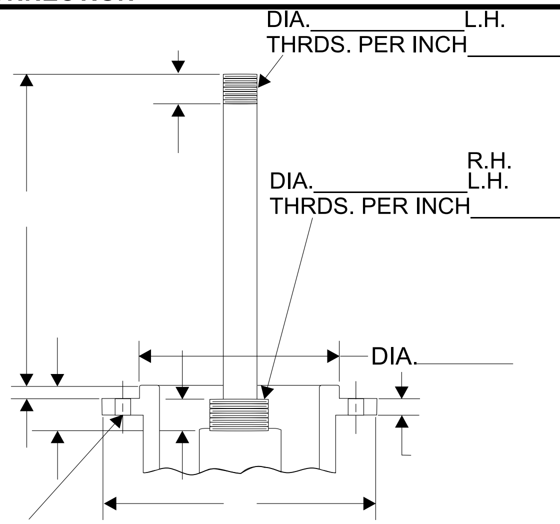
THREADED SUCTION CONNECTION

SIZE	STD. PIPE	SPECIAL THREAD	THREADS PER INCH	TAPER PER FOOT	BOWL THREADED
					INSIDE
					OUTSIDE

FLANGED DISCHARGE CONNECTION



BOLT CIRCLE __________ SIZE BOLTS ______ NO. BOLTS __________
FLANGE ON BOWL DRILLED____________ TAPPED __________
FLANGE ON PIPE DRILLED____________ TAPPED __________



BOLT CIRCLE __________ SIZE BOLTS ______ NO. BOLTS __________
FLANGE ON BOWL DRILLED____________ TAPPED __________
FLANGE ON PIPE DRILLED____________ TAPPED __________

FLANGED SUCTION CONNECTION

FLANGE O.D.	FLANGE I.D.	BOLT CIRCLE	SIZE BOLTS	NO. OF BOLTS	FLANGE ON BOWL	FLANGE ON PIPE
					DRILLED	DRILLED
					TAPPED	TAPPED

“N-260” DISCHARGE HEADS

CAST IRON DISCHARGE HEAD
175 PSI MAXIMUM DISCHARGE PRESSURE

“N-260” discharge head assemblies include the following:

PRODUCT-LUBRICATED

Cast iron head, 416 S.S. top shaft, C-1045 steel headshaft through motor, acrylic graphite packing, bronze gland and bearing, headshaft nut, lock screws, gib key, threaded shaft coupling below motor, cast iron top column flange, bolts, nuts, and gaskets as required. Pre-lubrication system not included.

A. Manual water pre-lube system consists of 30 gal. min. tank, manual shut-off valve, and necessary fittings.

B. Automatic water pre-lube system consists of 30 gal. min. tank, solenoid valve (specify voltage), and necessary fittings.

C. Specify which is required when ordering (manual or automatic).

D. IMPORTANT: 5 foot top and bottom column assemblies required on all product lube pumps. When pumping water level is greater than 50’ pre-lube system is required.

OIL- LUBRICATED

Same as product lubricated except the stuffing box is replaced with a tube tension assembly and a manual oiler with oil pot. Head/topshaft is one piece or two piece steel with steel coupling; specify which is required when ordering.

A. For automatic oil lube system with solenoid valve (specify voltage).

PRODUCT & OIL LUBRICATED

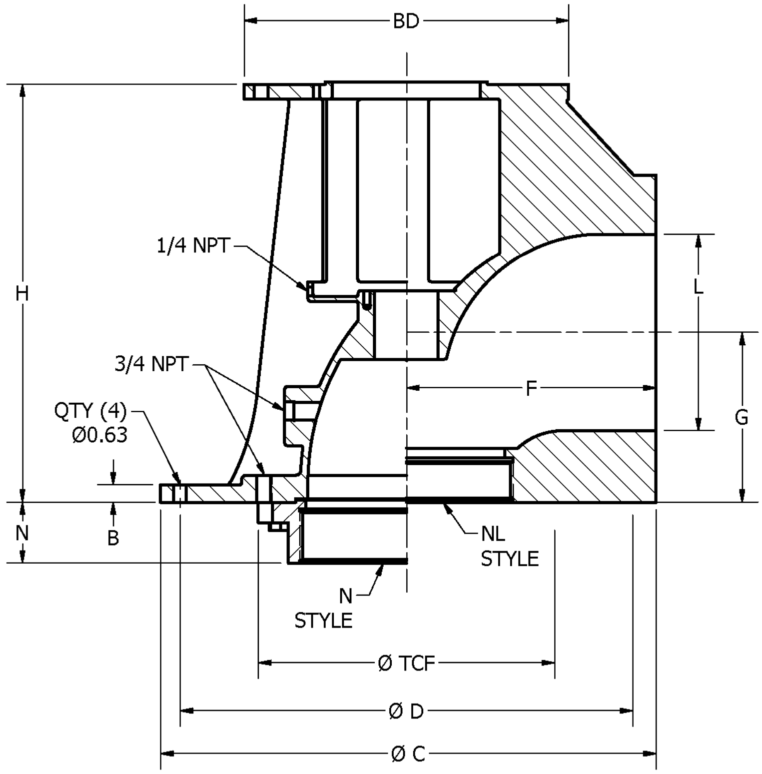
A. For size other than “L” on the dimension print, a female threaded reducing companion flange with gasket, nuts, and bolts is furnished.

B. Combination drive headshafts available.

C. Contact factory for use with solid shaft drivers and/or mechanical seals!

NOTE: For threaded column pipe connection on the Model NL8 and NL10 Discharge Head, Top Column Flange is not required.

DIMENSIONS
"N-260" DISCHARGE HEAD



THREADED COLUMN

MODEL	DRIVER BD	COL. SIZE	MAX. SHAFT SIZE	DIMENSIONS IN INCHES									WEIGHT LBS
				B	C	D	F	G	H	L	N	TCF	
N4	10 & 12	3, 4	1.69	0.75	16.00	14.25	8.50	5.38	15.75	4.00	2.00	7.50	195
N6	10, 12 & 16.5	5, 6		0.75	19.00	17.00	9.75	6.75	17.25	6.00	2.50	9.75	245
N8	10, 12 & 16.5	6, 8		0.75	25.00	23.00	12.50	6.75	19.25	8.00	3.75	11.25	275
NL8	10, 12 & 16.5	8		0.75	25.00	23.00	12.50	6.75	19.25	8.00	-	-	275
N10	10, 12 & 16.5	8, 10		0.88	25.00	23.00	12.69	8.63	21.25	10.00	3.06	15.13	350
NL10	10, 12 & 16.5	10		0.88	25.00	23.00	12.69	8.63	19.25	10.00	-	-	350

MAXIMUM SETTING DEPTH AND MINIMUM WELL CASING

MODEL	COLUMN	MAX. STETTING FEET(1)		MIN. WELL CASING(2)
		OIL LUBE	PRODUCT LUBE	
N4	3	280	330	8.00
	4	230	250	8.00
N6	5	330	375	10.00
	6	240	280	10.00
N8	6	370	410	12.00
	8	270	320	12.00
NL8	8	270	320	10.00
N10	8	260	300	16.00
	10	210	250	16.00
NL10	10	210	210	12.00

NOTE:
(1) SETTING DEPTH BASED ON NATIONAL PUMP COMPANY STANDARD PIPE WALL THICKNESS PIPE, CONTACT FACTORY WHEN USING HEAVIER PIPE.
(2) MIN. CASING SIZE WHEN CASING IS FLUSH WITH FOUNDATION.

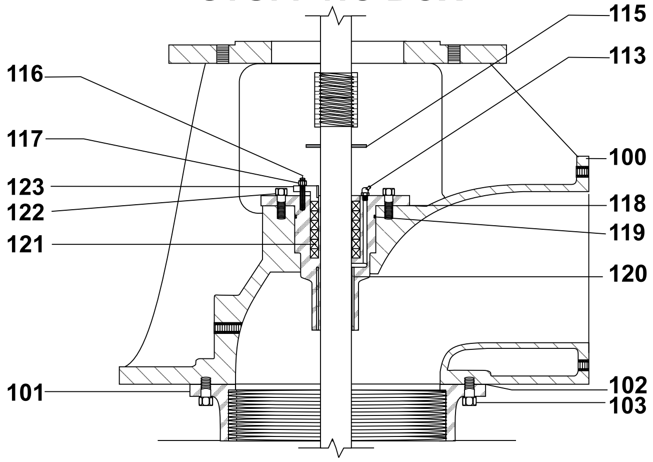
MAXIMUM POWER RATING

MODEL	3600 RPM	1800 RPM	1200 RPM
N4	60	40	20
N6	125	60	40
N8	200	100	60
NL8	200	100	60
N10	250	200	125
NL10	250	200	125

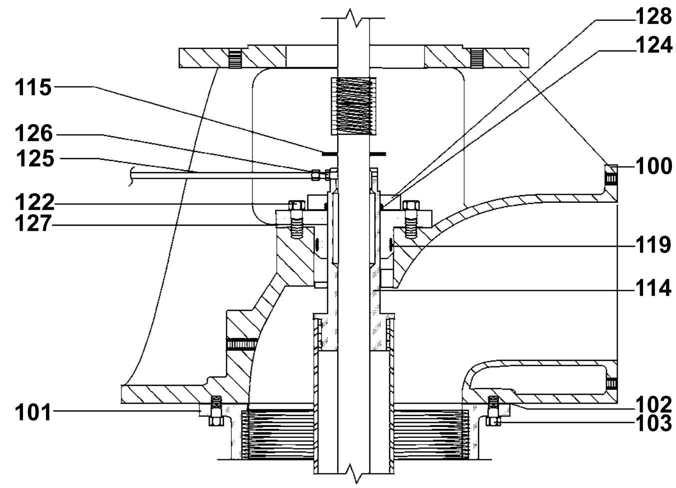
CONTACT FACTORY FOR HIGHER RATINGS

"N-260" DISCHARGE HEAD

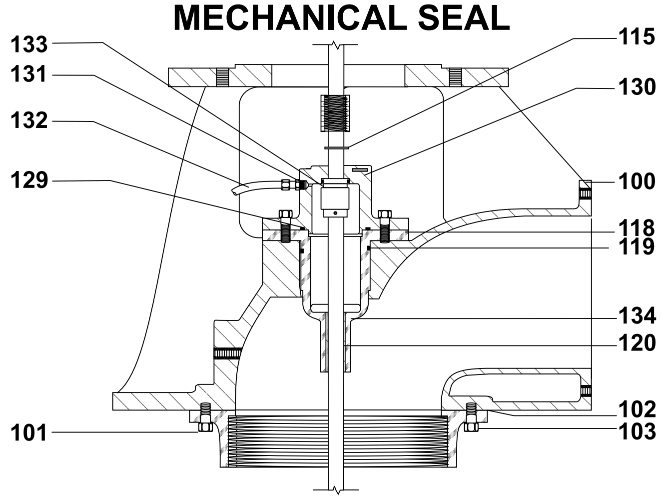
PRODUCT LUBRICATED STUFFING BOX



OIL LUBRICATED



PRODUCT LUBRICATED MECHANICAL SEAL



ITEM	PART DESCRIPTION	MATERIAL
100	DISCHARGE HEAD	CLASS 30 GREY IRON
101	TOP COLUMN FLANGE	CLASS 30 GREY IRON
102	TOP COLUMN FLANGE GASKET	VELLUMOID
103	TOP COLUMN CAP SCREW	GRADE 5 STEEL
113	GREASE ZERK	SAE J534 STEEL
114	TENSION BEARING	C-844 BRONZE
115	SLINGER	RUBBER
116	PACKING GLAND STUD	18.8 S.S.
117	GLAND STUD NUT	18.8 S.S.
118	STUFFING BOX	CLASS 30 GREY IRON
119	STUFFING BOX "O" RING	BUNA - N
120	STUFFING BOX BEARING	C-844 BRONZE
121	STUFFING BOX PACKING	TEFLON

ITEM	PART DESCRIPTION	MATERIAL
122	STUFFING BOX CAP SCREW	GRADE 5 STEEL
123	PACKING GLAND	C-844 BRONZE
124	LOCK NUT "O" RING	BUNA - N
125	COPPER TUBING	COPPER
126	FERRULE FITTING	ASA J512 BRASS
127	TENSION NUT	DUCTILE IRON
128	LOCK NUT	CLASS 30 GREY IRON
129	SEAL GLAND CAP "O" RING	RUBBER
130	MECHANICAL SEAL GLAND CAP	CAST IRON
131	TUBING CONNECTOR	BRASS
132	COPPER TUBING	COPPER
133	JOHN CRANE MECHANICAL SEAL	SPECIFY MATERIAL
134	MECHANICAL SEAL RETAINER	CAST IRON

HI - PRO DISCHARGE HEAD

"HI - PROFILE"
CAST IRON DISCHARGE HEAD

"Hi-Profile" discharge head assemblies include the following:

PRODUCT-LUBRICATED

Cast iron head, 416 S.S. top shaft, C-1045 steel headshaft thru motor, acrylic graphite packing, bronze gland and bearing, headshaft nut, lock screws, gib key, threaded shaft coupling below motor, ductile iron top column flange, bolts, nuts, and gaskets as required. Pre-lubrication system not included.

A. Manual water pre-lube system consisting of 30 gal. min. tank, manual shut-off valve, and necessary fittings available.

B. Automatic water pre-lube system consisting of 30 gal. min. tank, solenoid valve (specify voltage), and necessary fittings available.

C. Add for high pressure stuffing box when pressure at stuffing box exceeds 175 PSI.

D. IMPORTANT: 5 foot top and bottom column assemblies required on all product lube pumps.
When pumping water level is greater than 50' pre-lube system is required.

OIL-LUBRICATED

Same as product lubricated except the stuffing box is replaced with a standard tube tension and a manual oiler with oil pot. Head/topshaft is one piece or two piece steel with steel coupling; specify which is required when ordering.

A. Automatic oil lube system with solenoid valve available (specify voltage).

PRODUCT AND OIL LUBRICATED

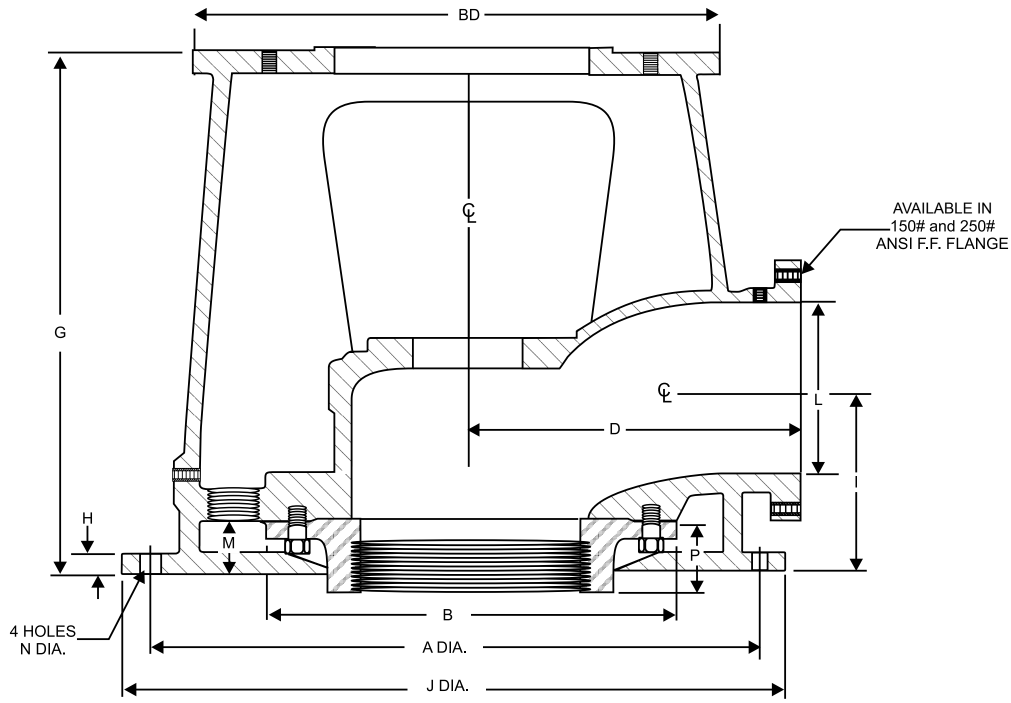
A. For size other than "L," on the dimension print, a female threaded reducing companion flange with gasket, nuts, and bolts is furnished.

B. Combination drive headshafts available as adder.

C. Contact factory for use with solid shaft drivers and/or mechanical seals.

D. Max. shaft size for any combination is 2-3/16".

DIMENSIONS
"HI - PROFILE" DISCHARGE HEAD



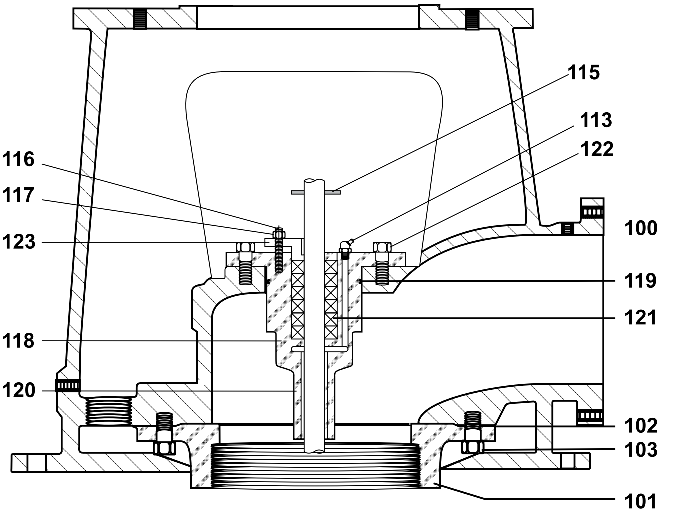
MODEL	BD	A	B	D	G	H	I	J	L	M	N	WEIGHT
16 X 6	16-1/2, 20	20-1/2	11	13	21-1/2	1"	9	22	6	2-1/4	7/8	400
16 X 8	16-1/2, 20	23	15	13-1/2	22-1/2	1"	9	24-1/2	8	2-1/4	7/8	450
16 X 10	16-1/2, 20	25	17	14-7/8	24-1/2	1"	10-1/2	26-1/2	10	2-1/4	7/8	560
20 X 12	20	24	17	15	29	1-1/8"	12	27	12	2-3/4	1-1/4	685

MODEL	DISCH. SIZE	COLUMN	P	MIN. WELL CASING (3)	MAX. SETTING D.I.TCF	MAX. SHAFT SIZE	RPM	HORSE POWER	MAX. THRUST
16 X 6	6"	5"	3-15/16	10"	1100'	2-3/16"	3600	800	20,000
		6"	3-15/16	10"	1000'		1800	700	20,000
							1200	475	20,000
16 X 8	8"	6"	3-15/16	10"	1000'	2-3/16"	3600	800	20,000
		8"	4-3/16	12"	800'		1800	700	20,000
		10"	4-15/16	16"	700'		1200	475	20,000
16 X 10	10"	8"	2-5/16	12"	800'	2-3/16"	3600	800	20,000
		10"	3-1/16	14"	700'		1800	700	20,000
		12"	3-1/16	16"	500'		1200	475	20,000
20 X 12	12"	12"	3-1/16	16"	500'	2-3/16"	3600	500	13,000
							1800	435	13,000
							1200	300	13,000

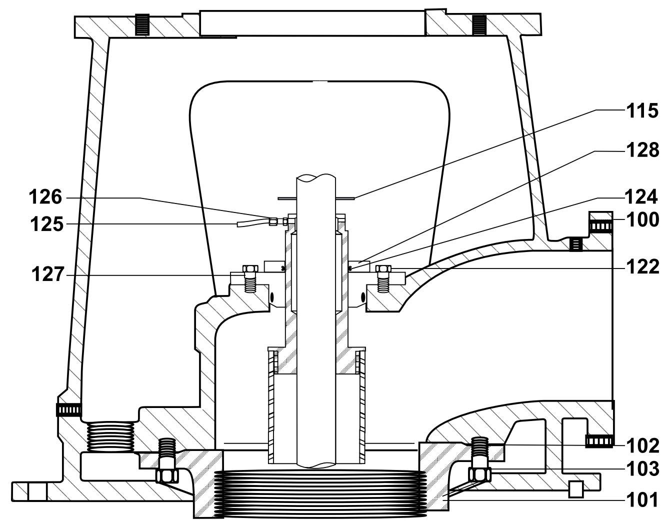
1. 16" min. casing required when allowing casing to stick up 1-7/8" max. above foundation pad without grout plate for 16 x 8.
2. 18" min. casing required when allowing casing to stick up 1-7/8" max. above foundation pad without grout plate for 16 x 10.
3. Referring to chart; min. casing size when casing is flush with foundation pad.
4. Head should be raised by lifting lugs ONLY. If necessary to insure stabilization, secure lifting strap to top of base to prevent tilting.

"HI - PROFILE" DISCHARGE HEAD

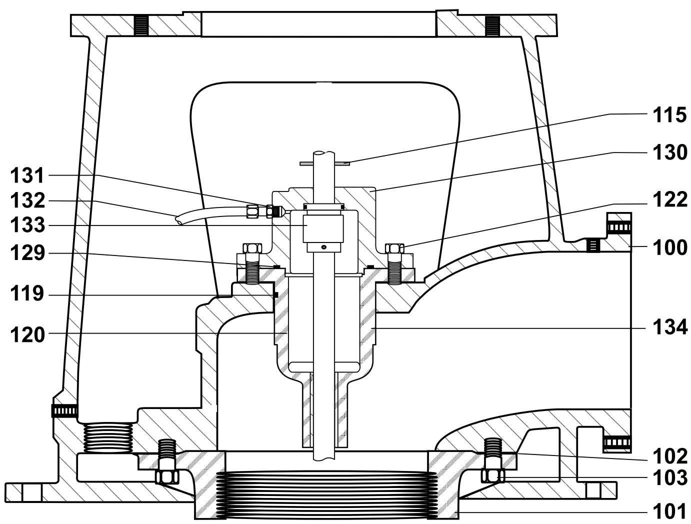
PRODUCT LUBRICATED STUFFING BOX



OIL LUBRICATED



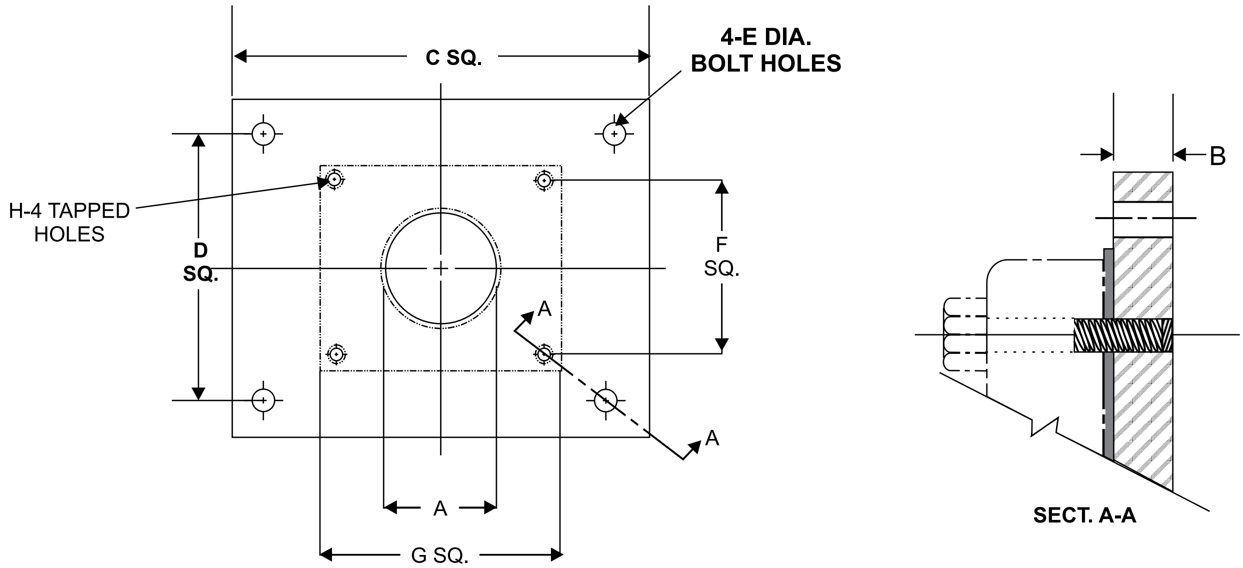
PRODUCT LUBRICATED MECHANICAL SEAL



ITEM	PART DESCRIPTION	MATERIAL
100	DISCHARGE HEAD	CLASS 30 GREY IRON
101	TOP COLUMN FLANGE	CLASS 60 DUCTILE IRON
102	TOP COLUMN FLANGE GASKET	VELLUMOID
103	TOP COLUMN CAP SCREW	GRADE 5 STEEL
113	GREASE ZERK	SAE J534 STEEL
114	TENSION BEARING	C844 BRONZE
115	SLINGER	RUBBER
116	PACKING GLAND STUD	18.8 S.S.
117	GLAND STUD NUT	18.8 S.S.
118	STUFFING BOX	CLASS 30 GREY IRON
119	STUFFING BOX "O" RING	BUNA - N
120	STUFFING BOX BEARING	C844 BRONZE
121	STUFFING BOX PACKING	ACRYLIC GRAPHITE

ITEM	PART DESCRIPTION	MATERIAL
122	STUFFING BOX CAP SCREW	GRADE 5 STEEL
123	PACKING GLAND	C844 BRONZE
124	LOCK NUT "O" RING	BUNA - N
125	COPPER TUBING	COPPER
126	FERRULE FITTING	ASA J512 BRASS
127	TENSION NUT	DUCTILE IRON
128	LOCK NUT	CLASS 30 GREY IRON
129	SEAL GLAND CAP "O" RING	RUBBER
130	MECHANICAL SEAL GLAND CAP	CAST IRON
131	TUBING CONNECTOR	BRASS
132	COPPER TUBING	COPPER
133	JOHN CRANE MECHANICAL SEAL	SPECIFY MATERIAL
134	MECHANICAL SEAL RETAINER	CAST IRON

DIMENSIONS
GROUT PLATES



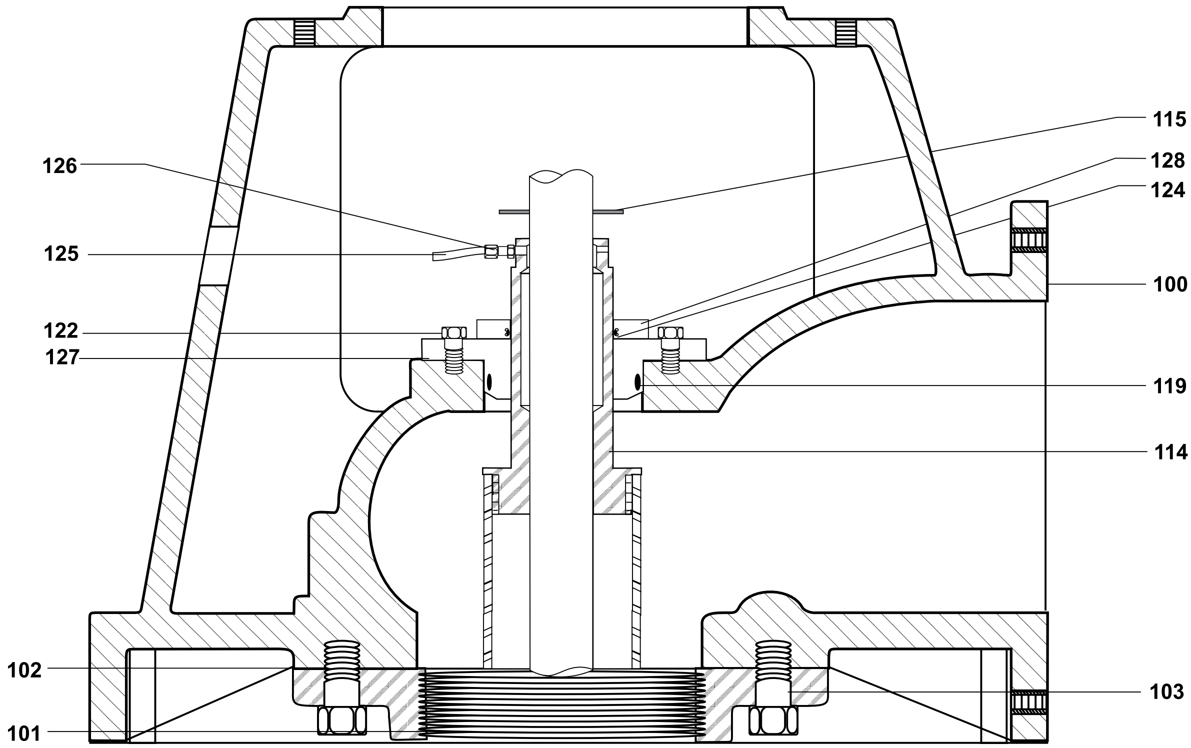
DISCHARGE HEAD & B.D.	DIMENSIONS IN INCHES								WT. LBS.
	A*	B	C	D	E	F	G	H	
N4-260	9	1	16	13-1/4	3/4	10	16 (1)	1/2-13UNC	55
N6-260	12	1	19	16	3/4	12	19 (1)	1/2-13UNC	70
N8-10-260	17	1	25	22	7/8	16-1/4	25 (1)	1/2-13UNC	140
HiPRO 16 x 6	13	1	24	21	7/8	14-1/2	22 (1)	3/4-10UNC	125
HiPRO 16 x 8	17	1	25	22	7/8	16-1/4	24-1/2 (1)	3/4-10UNC	140
HiPRO 16 x 10	19	1-1/4	27	24	1-1/8	17-11/16	26-1/2 (1)	3/4-10UNC	185
HiPRO 20 x 12	19	1-1/4	39	35	1-1/4	17	26-1/2 (1)	1-1/8-7UNC	440
NF3-4x10-12	11	1	21	18-1/2	3/4	13	16	5/8-11UNC	120
NF3-4x16-1/2	13	1	24	21-1/2	7/8	16	19	3/4-10UNC	155
NF5-6x10-12	11	1	21	18-1/2	3/4	13	16	5/8-11UNC	120
NF5-6x16-1/2	13	1	24	21-1/2	7/8	16	19	3/4-10UNC	155
NF8x10-12	14	1	23	20-1/2	7/8	15	18	5/8-11UNC	130
NF8x16-1/2	14	1-1/4	27	23-1/2	1-1/8	18	21	3/4-10UNC	200
NF8x20	19	1-1/4	31	27-1/2	1-1/8	22	25	3/4-10UNC	285
NF10x16-1/2	19	1-1/4	31	27-1/2	1-1/8	22	25	3/4-10UNC	285
NF10x20	19	1-1/4	33	29-1/2	1-1/8	24	27	3/4-10UNC	340
NF10x24-1/2	19	1-1/4	34	30-1/2	1-1/8	25	28	7/8-9UNC	390
NF12x16-1/2	19	1-1/4	31	27-1/2	1-1/8	22	25	3/4-10UNC	285
NF12x20	19	1-1/4	33	29-1/2	1-1/8	24	27	3/4-10UNC	340
NF12x24-1/2	19	1-1/4	38	34	1-1/4	27	30	7/8-9UNC	400

1. THESE HEADS HAVE ROUND BASE. ALL THE OTHERS ARE SQUARE.
   Steel plate machined on one side to match machined bottom of head and steel cap screws for securing head to plate. (Anchor bolts by others.) Contact factory for dimension variations or larger sizes.

**Ensure largest diameter component will pass through this hole. Larger I.D. holes cane used if necessary.*

“HD” DISCHARGE HEAD

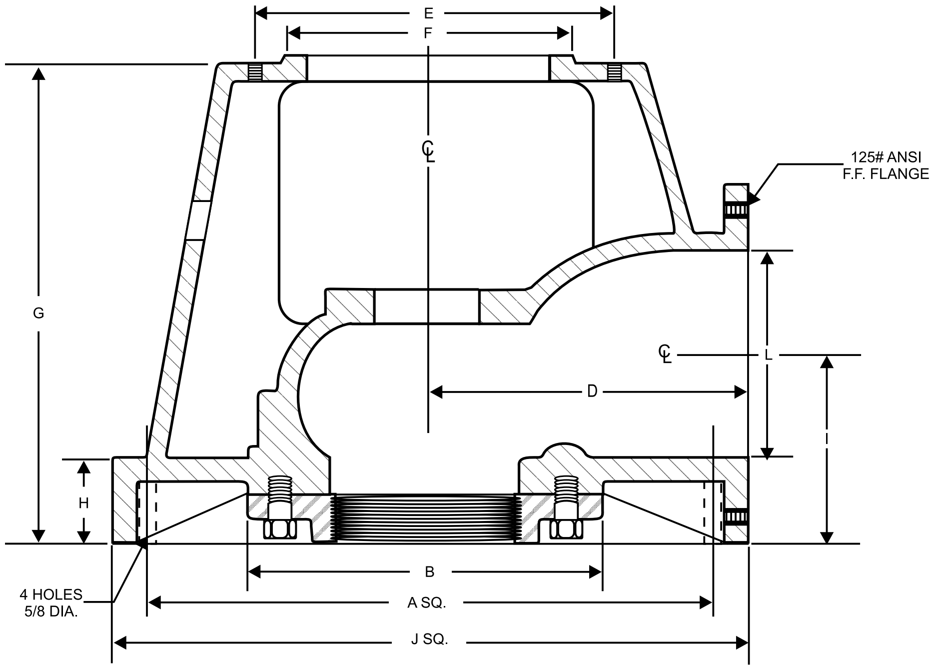
OIL LUBRICATED ONLY
175 PSI MAXIMUM DISCHARGE PRESSURE



ITEM	PART DESCRIPTION	MATERIAL
100	DISCHARGE HEAD	CLASS 30 GREY IRON
101	TOP COLUMN FLANGE	CLASS 30 GREY IRON
102	TOP COLUMN FLANGE GASKET	VELLUMOID
103	TOP COLUMN CAP SCREW	GRADE 5 STEEL
114	TENSION BEARING	C844 BRONZE
115	SLINGER	RUBBER
119	TENSION NUT "O" RING	BUNA - N
122	TENSION NUT CAP SCREW	GRADE 5 STEEL
124	LOCK NUT "O" RING	BUNA - N
125	COPPER TUBING	COPPER
126	FERRULE FITTING	ASA J512 BRASS
127	TENSION NUT	DUCTILE IRON
128	LOCK NUT	CLASS 30 GREY IRON

DIMENSIONS
"HD" DISCHARGE HEAD

OIL LUBRICATED



MODEL	A	B	C	D	E	F	G	H	I	J	L
10 X 6	16-1/2	11	3	9	9-1/8	8-1/4	12-3/4	4	7-1/4	18	6
10A X 6	16-1/2	11	3	9	14-3/4	13-1/2	13-1/2	4	7-1/4	18	
16 X 8	21	13-1/2	2	11-1/2	14-3/4	13-1/2	14-1/2	3	7-3/16	23	8
16A X 8	21	13-1/2	2	11-1/2	18-1/4	13-1/2	15-1/4	3	7-3/16	23	
16 X 10	21	16	2-1/8	11-1/2	14-3/4	13-1/2	14-1/4	3	8-1/2	23	10
16A X 10	21	16	2-1/8	11-1/2	18-1/4	13-1/2	15	3	8-1/2	23	
20 X 10	23-1/2	16	1-7/8	12-1/2	18-1/4	13-1/2	17-7/8	3	8-1/4	25	
20A X 10	23-1/2	16	1-7/8	12-1/2	18-1/4	13-1/2	18-5/8	3	8-1/4	25	
24 X 12	30-1/2	19	1-7/8	16-1/4	18-1/4	13-1/2	20-5/8	4	12	32-1/2	12

MODEL	COLUMN SIZES	SHAFT SIZE	DRIVER BD	MAX (1) SETTING	WEIGHT LBS.
10 X 6	4,5,6	1, 1-1/4	10	500'	356
10A X 6			16-1/2	500'	386
16 X 8	5, 6, 8	1, 1-1/4, 1-1/2, 1-11/16	16-1/2	600'	568
16A X 8			20	600'	635
16 X 10	8, 10	1, 1-1/4, 1-1/2, 1-11/16, 1-15/16	16-1/2	300'	483
16A X 10			20	300'	535
20 X 10			20	600'	848
20A X 10			24	600'	943
24 X 12	12	1-1/4, 1-1/2, 1-11/16, 1-15/16,2-3/16	24	800'	1,460

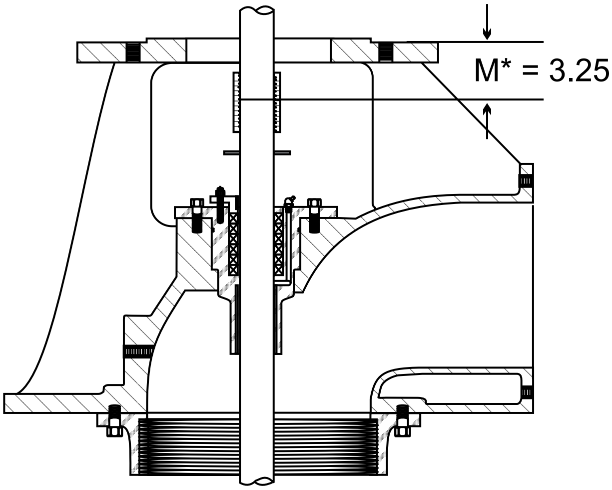
ALL DIMENSIONS ARE IN INCHES EXCEPT (1)

1. Includes: Cast iron discharge head, top column flange, make up tube assembly, C-1045 steel headshaft, key adjusting nut, bolts, nuts and gaskets as required, manual oiler with oil pot.
2. Automatic oil lube system with solenoid available.
3. Combination drive headshafts available.
4. Contact factory for grout plates.
5. For size other than "L" on the dimension print, a female threaded reducing companion flange with gasket, nuts, and bolts is available.
6. Contact factory for use with solid shaft drivers.

HEAD SHAFT LENGTHS

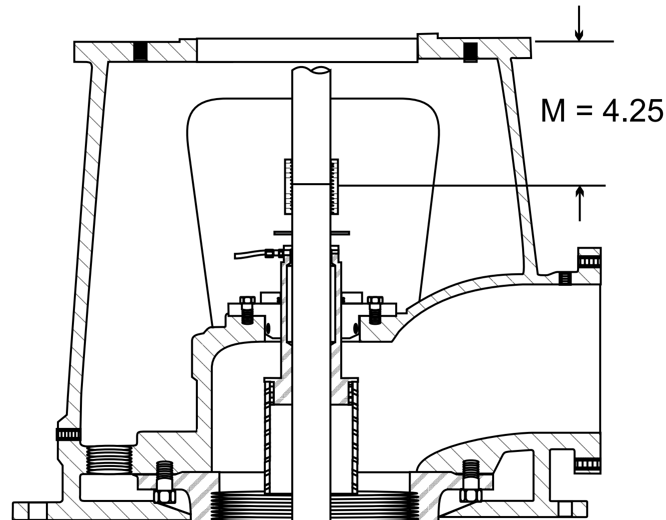
DRIVER "CD" + M + NUT ALLOWANCE

N260 DISCHARGE HEAD



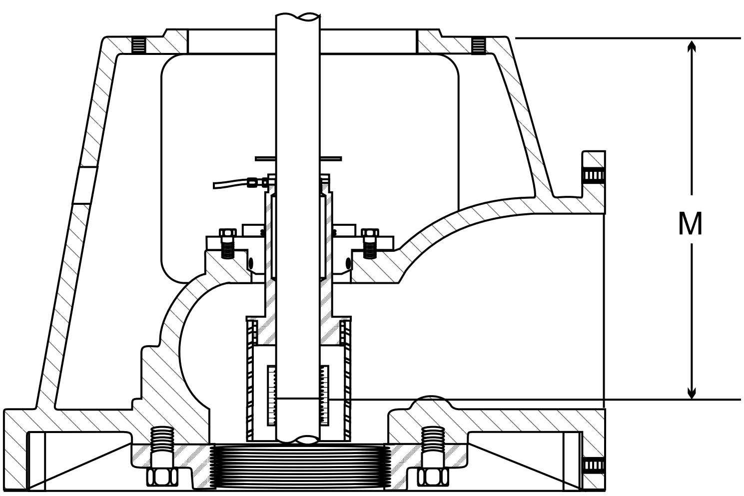
*IF 16" STICK-UP, USE 5.25"
FOR N8, NL8, & N10

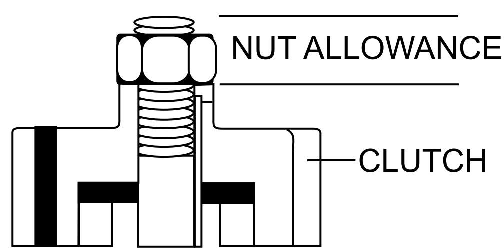
HI-PRO DISCHARGE HEAD



TOP SHAFT LENGTH OF 26"
MUST BE ADDED TO THE HEAD SHAFT
IF HEAD SHAFT IS TO EXTEND BELOW
THE DISCHARGE HEAD BASE.

HD DISCHARGE HEAD





NUT ALLOWANCES FOR:
1" DIA. SHAFT = 2"
1-1/4" DIA. SHAFT = 2-1/2"
1-1/2" DIA. SHAFT = 2-1/2"
1-11/16" DIA. SHAFT = 3"
1-15/16" DIA. SHAFT = 3"
2-3/16" DIA. SHAFT = 3-1/2"

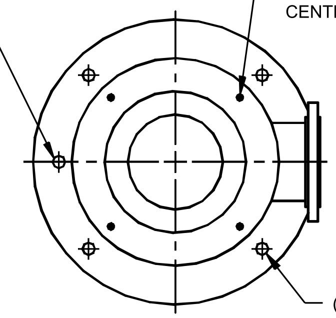
"HD" DISCHARGE HEAD
TWO PIECE HEADSHAFT
REQUIRES MOTOR STAND

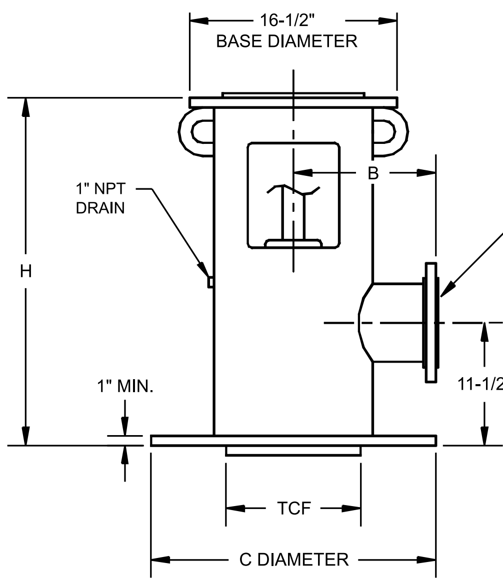
M =

10 X 6 = 13.12
16 X 8 = 15.75

16 X 10 = 15.50
20 X 10 = 20.25
25 X 12 = 22.00

DIMENSIONS
"LDF" DISCHARGE HEAD
(LIGHT DUTY FABRICATED)

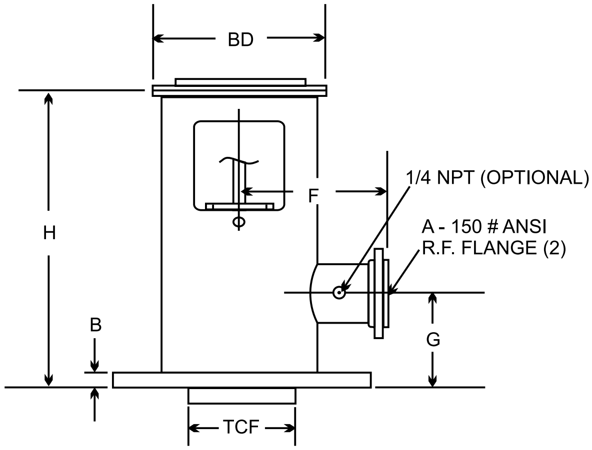


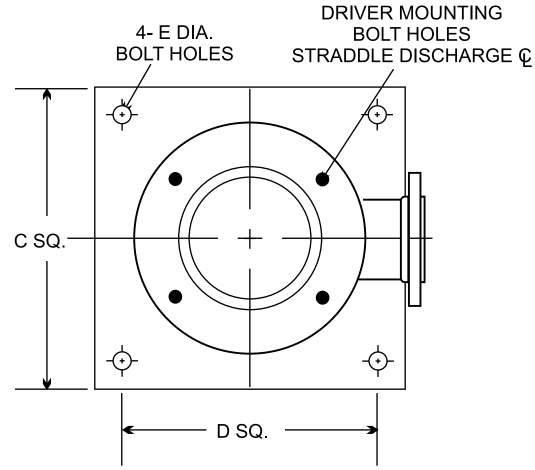


DIMENSIONS IN INCHES						APPROX. WEIGHT
DISCHARGE SIZE A	B	C	D	H	TCF	
4	10	20	15-3/8	27-1/2	7-1/2	242
6	10	20	15-3/8	27-1/2	9-3/4	244
8	10	20	15-3/8	27-1/2	11-1/4	252
10	11	22	17-1/4	32	15-1/8	275
12	12	24	19-1/4	32	17	295

1. Dimensions are for standard construction. Special designs and dimensions are not available with this particular discharge head.
2. Standard construction heads are rated for 275 PSI working pressure. For higher pressure ratings, contact factory.

DIMENSIONS
"NF" DISCHARGE HEAD





DISCHARGE SIZE A(2)	DIMENSIONS IN INCHES											WEIGHT LBS.
	DRIVER BD	B	C (3)	D	E	F	G	H (1) H_1	H_2	H_3	TCF	
3, 4	10 or 12	1-1/2	16	13	3/4	9	8	23	26	30	9	340
	16-1/2	1-1/2	19	16	7/8	11	8	23	27	31		410
5	10 or 12	1-1/2	16	13	3/4	10	9	24	27	31	10	360
	16-1/2	1-1/2	19	16	7/8	12	9	24	28	32		430
6	10 or 12	1-1/2	16	13	3/4	10	10	26	29	33		380
	16-1/2	1-1/2	19	16	7/8	12	10	26	30	34		430
8	10 or 12	1-1/2	18	15	3/4	11	11	29	32	36	15	420
	16-1/2	1-1/2	21	18	7/8	13	11	29	33	37		480
	20	1-1/2	25	22	7/8	14	11	29	33	37		570
10	16-1/2	1-3/4	25	22	7/8	14	12	33	37	41	17	610
	20	1-3/4	27	24	7/8	15	12	33	37	41		670
	24-1/2	1-3/4	28	25	1	19	12	33	39	43		730
12	16-1/2	1-3/4	25	22	7/8	15	14	36	40	44		770
	20	1-3/4	27	24	7/8	16	14	36	40	44		950
	24-1/2	1-3/4	30	27	1	20	14	36	42	46		970

1. "H" - Standard dimension when shaft coupling as outlined below is used. This dimension may vary at factory option.

   "H_1" - For standard headshaft with or without the threaded lineshaft coupling below hollow shaft driver. With threaded coupling and mechanical seal configuration, a lower steady bushing is required in the driver.
   "H_2" - For adjustable or rigid flanged coupling.
   "H_3" - For adjustable flanged spacer coupling

2. Victaulic or plain end discharge is available for no additional charge.

3. Dimensions are for standard construction. For special designs and dimensions, consult factory.

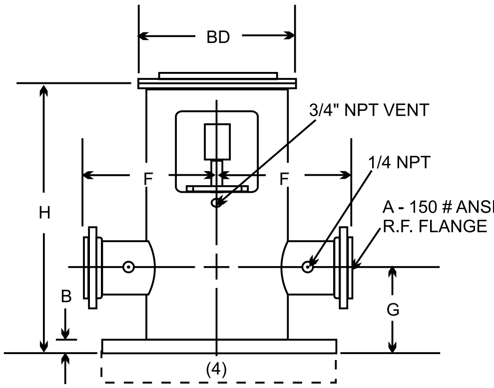
A. "NF" discharge head assemblies include the following:

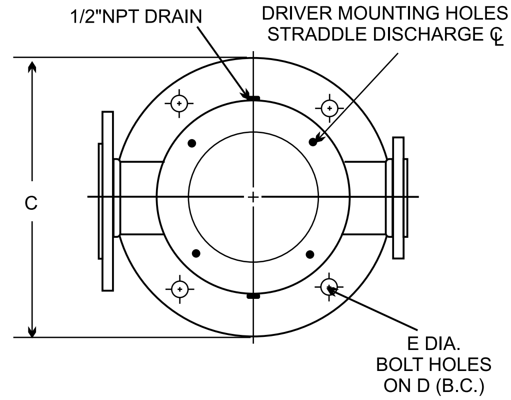
   Product Lubricated: Fab. steel head with square base, 416S.S. top shaft, C-1045 steel headshaft thru motor, Teflon packing, bronze gland and bearing, headshaft nut, lock screws, gibkey, threaded shaft coupling below motor, cast iron top column flange, bolts, nuts, and gaskets as required. Pre-lubrication system not included.
   Oil Lubricated: Same as product lubricated except the stuffing box is replaced with a standard tube tension assembly and a manual oiler with oil pot. Head/topshaft is one piece or two piece steel with steel coupling; specify which is required when ordering.

B. Extra head height is required when using a solid shaft driver, flanged coupling, and/or mechanical seal.
C. High pressure packing box is required when pressure at packing box exceeds 175 PSI.
D. Plain end discharge or discharge with victaulic coupling groove available.
E. Standard construction head is rated for 275 PSI working pressure. For higher pressure rating, contact factory.
F. Manual pre-lubrication system, automatic pre-lubrication system, and automatic oil lubrication system available.

API COMPLIANCE FOR DISCHARGE HEADS AVAILABLE.

DIMENSIONS
"NTF" DISCHARGE HEAD





BARREL SIZE	DIMENSIONS IN INCHES												APPROX. WT.
	DRIVER BD	DISCH. SIZE DS	SUCTION SIZE SS	B MIN.	C (3)	D (B.C.)	E QTY.	F	G	H (1) H_1	H_2	H_3	
8-5/8	10 or 12	3 or 4	4	1-1/8	13-1/2	11-3/4	7/8	10	6-1/2	22-1/2	26-1/2	31-1/2	240
		4 or 6	6				8		8-1/2	26-1/2	28-1/2	33-1/2	263
10-3/4	10, 12 or 16-1/2	4 or 6	6	1-3/16	16	14-1/4	1	10	8-1/2	26-1/2	29-1/2	34-1/2	290
		6 or 8	8				12		10-1/2	29-1/2	32-1/2	37-1/2	365
12-3/4	12 or 16-1/2	4 or 6	6	1-1/4	19	17	1	12	8-1/2	26-1/2	29-1/2	34-1/2	390
		6 or 8	8				12		10-1/2	29-1/2	32-1/2	37-1/2	410
14	12, 16-1/2 or 20	4 or 6	6	1-3/8	21	18-3/4	1-1/8	12	8-1/2	26-1/2	29-1/2	34-1/2	410
		6 or 8	8				12		10-1/2	29-1/2	32-1/2	37-1/2	440
16	16-1/2 or 20	4 or 6	6	1-7/16	23-1/2	21-1/4	1-1/8	14	10-1/2	26-1/2	29-1/2	34-1/2	410
		6 or 8	8				16		11-1/2	29-1/2	32-1/2	37-1/2	440
18	16-1/2, 20 or 24-1/2	6 or 8	8	1-9/16	25	22-3/4	1-1/4	16	10-1/4	29-1/4	32-1/4	37-1/4	440
		8 or 10	10				16		11-1/4	32-1/4	35-1/4	40-1/4	680
20	20, 24-1/2 or 30-1/2	6 or 8	8	1-11/16	27-1/2	25	1-1/4	16	10-1/4	29-1/4	32-1/4	37-1/4	680
		8 or 10	10				20		11-1/4	32-1/4	35-1/4	40-1/4	780
24	20, 24-1/4 or 30-1/2	8 or 10	10	1-7/8	32	29-1/2	1-3/8	18	11-1/4	32-1/4	35-1/4	40-1/4	720
		10 or 12	12				20		13-1/4	36-1/4	39-1/4	45-1/4	898
30	20, 24-1/2 or 30-1/2	8 or 10	10	2-1/8	38-3/4	36	1-3/8	22	13	32	35	40	720
		10 or 12	12				38		14	36	39	45	898

1. "H" - Standard dimension when shaft coupling as outlined below is used. This dimension may vary at factory option.

   "H_1" - For standard headshaft with or without the threaded lineshaft coupling below hollow shaft driver. With threaded coupling and mechanical seal configuration, a lower steady bushing is required in the driver.

   "H_2" - For adjustable or rigid flanged coupling.

   "H_3" - For adjustable flanged spacer coupling

2. Standard construction is designed with the suction and discharge flanges on the same horizontal centerline and located 180° apart. Other locations may be furnished if required. Standard suction and discharge flanges are 150# A.N.S.I. flanges. Victaulic or plain end discharge is available for no additional charge.

3. Dimensions are for standard construction. For special designs and dimensions, contact the factory.

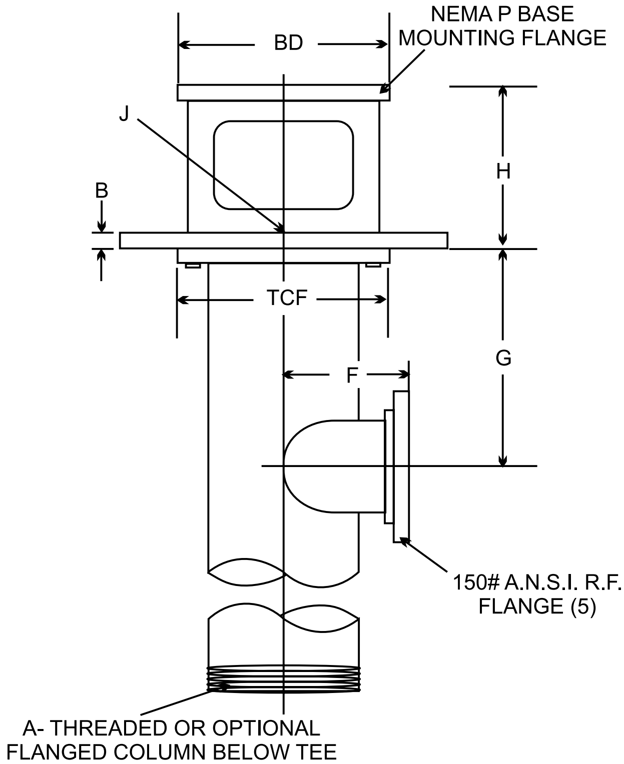
Type "NTF" discharge head assemblies include the following parts: Fabricated steel discharge head with 150# raised face suction and discharge flanges, standard stuffing box assembly with a bronze bearing, head shaft, head shaft nut, lock screws, gib key, threaded shaft coupling below motor. Also, bolts, nuts, and gaskets, as required.

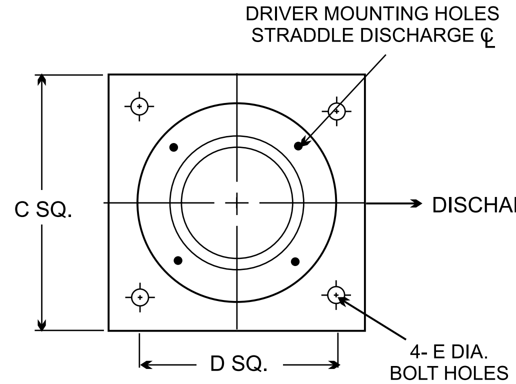
A. Standard construction head has 150# discharge flange (rated for 275 PSIG) 300# discharge flange is available. For higher pressure ratings, contact factory. Pressure ratings are based on A.N.S.I. flange rating for 20° to 100°f. water service.
B. High pressure packing box assembly required when pressure at packing box exceeds 175 PSI. When pressure exceeds 300 PSIG, contact factory.
C. Extra height required when using a solid shaft driver with a flanged coupling and/or mechanical seal.
D. For larger shaft sizes contact factory.

NOTE: Suction barrel must be selected for service and/or suction pressure.

API COMPLIANCE FOR DISCHARGE HEADS AVAILABLE.

DIMENSIONS
"NUF" DISCHARGE HEAD





BD	H★			MIN.C (1)	APPROX. WT. *
	H_1	H_2	H_3		
10 OR 12	13	16	20	15	230
16-1/2	14	17	21	20	350
20	14	17	21	26	425
24-1/2	15	18	22	30	600

A	B	C (1)	D	E	F	MIN. G (2)	J (3)	MAX. TCF	MIN. HOLE (4)	APPROX. WT. **
4	1-1/4	15	13	3/4	6	8	1/2	9	11	110
5	1-1/4	20	17	3/4	6	9	1/2	10	13	160
6	1-1/4	20	17	3/4	7	9-1/2	3/4	11	14-1/2	190
8	1-1/4	26	23	7/8	9	10	3/4	13-1/2	18	285
10	1-1/2	26	23	1	10-1/2	11	1	16	21	410
12	1-1/2	30	27	1	11-1/2	13	1	19	24	550

*** PEDESTAL**
**** 5 FT. COLUMN AND DISCHARGE ELBOW**

★ "H" - Standard dimension when shaft coupling as outlined below is used. This dimension may vary at factory option.

"H_1" - For standard headshaft with or without the threaded lineshaft coupling below hollow shaft driver. With threaded coupling and mechanical seal configuration, a lower steady bushing is required in the driver.
"H_2" - For adjustable or rigid flanged coupling.
"H_3" - For adjustable flanged spacer coupling

1. "C" is determined by the size of the column pipe except when "BD" required larger min. "C" as indicated.
2. Minimum for fabrication. Will probably increase due to mounting structure.
3. N.P.T. for automatic air release valves.
4. Standard flanged discharge tee will pass through this diameter opening, IF lateral movement is possible during installation.
   All column above the tee must be flanged and may be supplied smaller at factory option.
   Discharge size can not exceed column size at the tee.
5. Optional victaulic groove or plain end discharge available for no additional charge.

1. "NUF" Type Underground Discharge Head Assemblies include the following:

   Product Lubricated: Fabricated steel motor stand, standard stuffing box with bronze bearing, headshaft, headshaft nut, lock screws, gibkey, threaded shaft coupling below motor, bolts, nuts, and gaskets, as required. 150# discharge flange welded into the column as required (6). Pre-lubrication system not included (7).
   Oil Lubricated: Same as product lubricated except the stuffing box is replaced with a standard tube tension assembly and a manual oiler with oil pot (7).

   Extra height required when using a solid shaft driver with a flanged coupling.
2. High pressure stuffing box required when pressure at the box exceeds 175 PSI. Standard steel fabrications are rated for 275 PSI working pressure.
3. Automatic air release valves are required on all "NUF" heads. 1/2" and 3/4" are 150 PSI; 1" is 300 PSI.
4. Optional Plain end discharge or victaulic groove available for no additional charge..
5. Manual pre-lube system, Automatic pre-lube system and Automatic oil lube system available.

NOTE: All column above discharge head tee must be welded/flanged column pipe.

API COMPLIANCE FOR DISCHARGE HEADS AVAILABLE.

SUCTION BARREL SIZE SELECTION

RECOMMENDED CAPACITY IN USGPM*

NOMINAL BOWL SIZE	BARREL SIZE										
	8	10	12	14	16	18	20	24	30	36	42
6	340	780									
7	180	625	1160								
8		440	980	1370							
10			540	925	1620	2420					
11			280	670	1360	2160					
12				385	1085	1880	2775				
14					450	1240	2140	4420	7895		
16						510	1400	3480	6325		
18							570	2795	6330		
20									5800	10700	
24										8600	14200

*Recommended Capacity Based on a Fluid Velocity of 5 Ft./Sec.

- If flanged column is used, the flange diameter should not be larger than the bowl diameter.
- If a suction fitting on the suction barrel is located below the bowl assembly, the above chart can be disregarded. Use the barrel size next larger than the bowl assembly.

SUCTION BARREL WALL THICKNESS

BARREL SIZE O.D.	0-275 PSIG RATING BARREL SHELL		275-720 PSIG RATING BARREL SHELL		720-1440 PSIG RATING BARREL SHELL	
	I.D.	WALL	I.D.	WALL	I.D.	WALL
8-5/8	8.071	0.277	7.981	0.322	7.439	0.593
10-3/4	10.020	0.365	10.020	0.365	9.314	0.718
12-3/4	12.000	0.375	11.750	0.500	11.064	0.843
14	13.250	0.375	13.0000	0.500	12.126	0.937
16	15.250	0.375	14.312	0.844	13.564	1.218
18	17.250	0.375				
20	19.250	0.375				
24	23.250	0.375				
30	29.000	0.500				
36	35.000	0.500				
42	40.875	0.562				

FOR LARGER BARREL SIZES THAN SIZES SHOWN, CONTACT THE FACTORY.

FORMULA TO CALCULATE VELOCITY OF FLUID THROUGH BARREL:

V = Velocity of flow, Ft./Sec. (recommended to be less than 5 Ft./Sec.)
Example: 500 GPM, H7HC Bowl Assembly, 10" Barrel

V = Q/A

Q = Capacity, Ft^3/Sec. (GPM x 0.002228 = Ft^3/Sec.)
A = Non-Restricted flow area, Ft^3

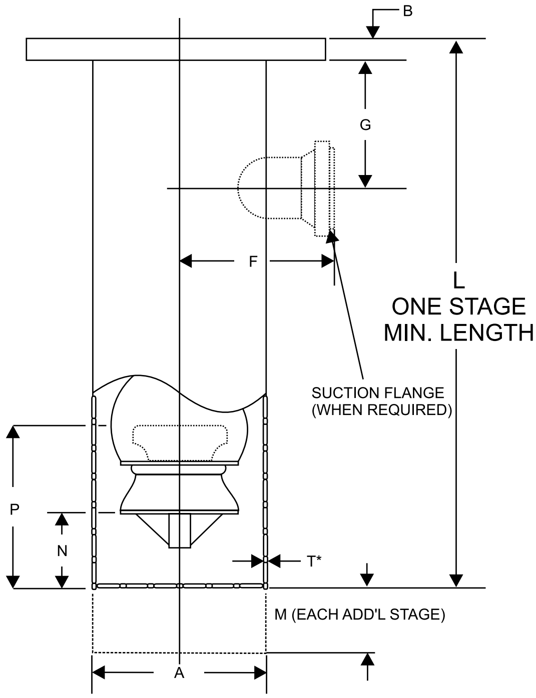
V = Q/A
V = 500/Area (Barrel I.D.) - Area (bowl O.D.)
V = 1.114 Ft^3/Sec./(.548 Ft^2 - .279 Ft^2)
V = 4.1 Ft./Sec.

Velocity does not exceed 5 Ft./Sec. - OK

API COMPLIANCE FOR BARRELS AVAILABLE.

DIMENSIONS SUCTION BARREL

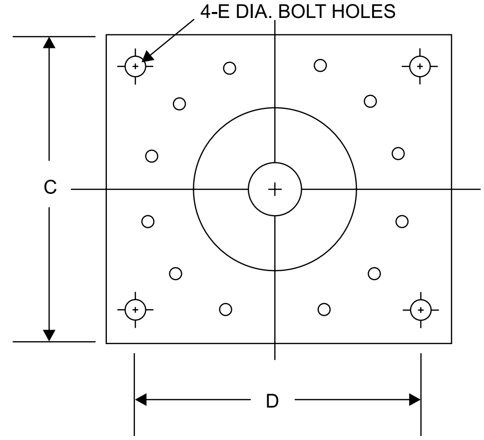
BOWL	DIMENSIONS IN INCHES			
SIZE	L	M	N	P
L6	15	3.75	3.84	8.38
M6	15-1/2	4	3	10
E6	18	6-1/2	3	10
J6	16-3/4	4-3/4	4	10
H7	20	6-3/4	3-1/2	12
K8	18-1/2	6-1/2	6-1/2	12-1/2
M8	18-1/2	7-1/4	4	10
J8	24-1/2	8-7/8	4	14
M9	19-1/4	8	4	11
M10	23-1/2	9-5/8	5-1/4	12
H10	24-1/2	9-5/8	5	13
J10	24-7/8	9-3/4	5-1/2	13-1/4
K10	24-1/4	8-7/8	6-7/8	15-3/8
E10	25-1/4	9-5/8	6	17
M11	25-1/4	10	6	16-3/4
J11	24-3/4	9-7/8	6	16-3/4
E12	25-1/4	10-1/2	6	13
K12	25-1/4	11-5/16	6	13
M12	26-1/4	10-1/2	6	13
H12	32-3/4	12-1/2	6	18
J12	31-1/4	12-3/8	7	19
M14	29	13-1/4	7	14
H14	30-1/2	14-1/8	7	14
E18	36-1/2	15	9	20
K20	40	8-1/4	11-1/4	23
H24	45	21-3/4	18-1/2	23-1/4



DO NOT USE FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.

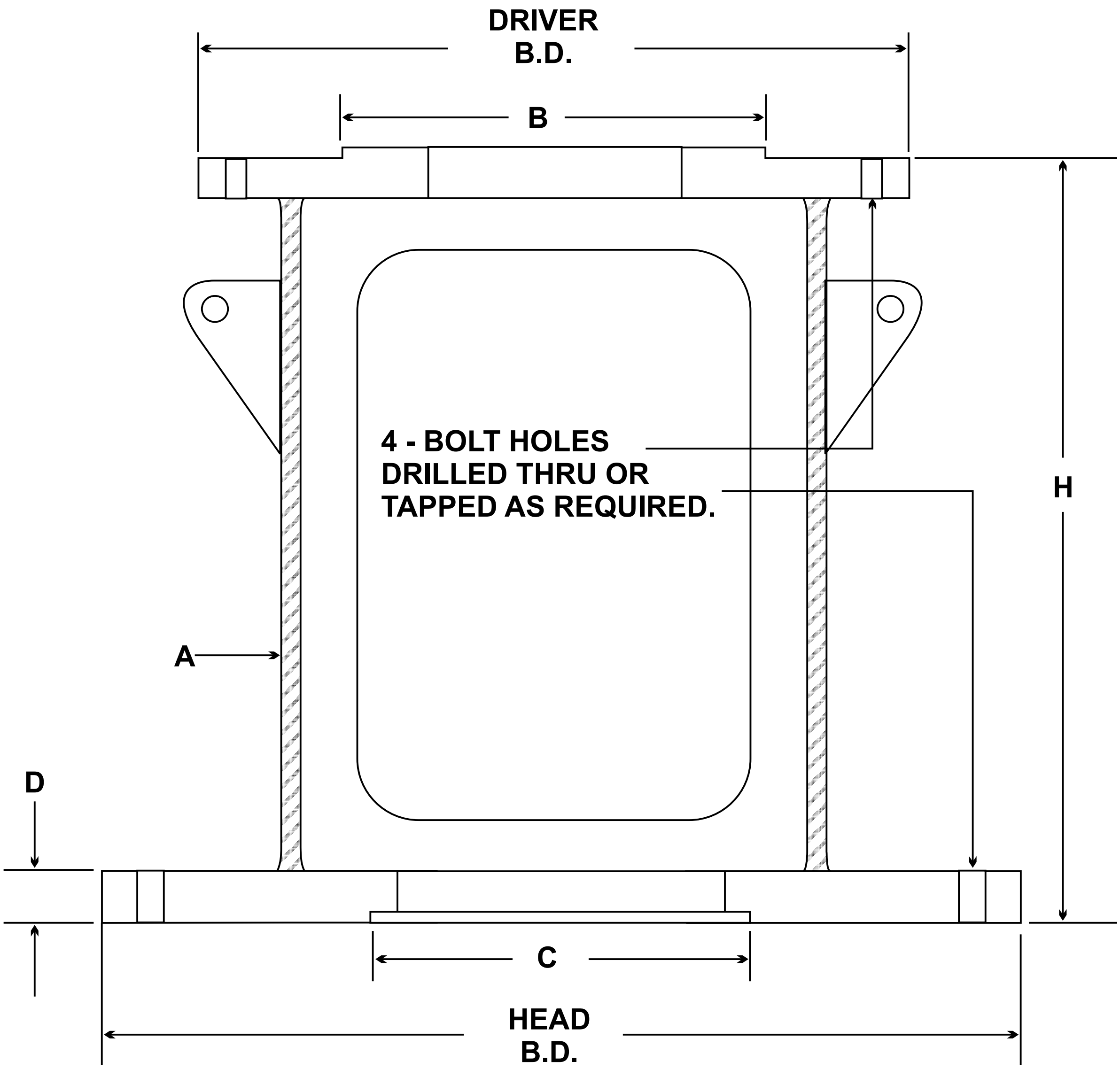
BARREL	WALL	DIMENSION IN INCHES						APPROX. WT.
SIZE A	THICKNESS T*	B	C	D	E	F	G	
8-5/8	0.322	1-1/2	16	14	3/4	10	8	25
10-3/4	0.365	1-1/2	18	16	3/4	10	9	41
12-3/4	0.375	1-1/2	20	17	7/8	12	11	50
14	0.375	1-1/2	23	20	7/8	12	12	55
16	0.375	1-1/2	25	22	7/8	14	13	63
18	0.375	1-3/4	26	23	7/8	16	14	71
20	0.375	1-3/4	29	26	7/8	16	15	79
24	0.375	1-3/4	33	30	1-1/8	18	17	95
30	0.500	2	41	37	1-1/8	22	20	157

1. *Standard barrel wall thickness. For heavier wall construction, consult the factory.
2. Pressure rating - 275 PSIG for standard construction. Based on temperature range from -20° to 100° F.
3. Gaskets will be furnished as standard for pressure ratings not exceeding 275 PSIG.
4. O" rings will be furnished as standard for pressure ratings exceeding 275 PSIG.
5. Suction barrel includes: barrel with mounting plate (drilled and tapped to match discharge flange bolting -- 150# A.N.S.I.), gasket, and bolts for mounting discharge head. Foundation bolts not included.
6. Maximum height of barrel above the floor mounting plate is 5'. For additional height, contact the factory.
7. Flanged suction includes: A.N.S.I. raised face flange with nipple welded to the above suction barrel, if required.
8. Plain end suction nipple or suction nipple with victaulic coupling groove available.



API COMPLIANCE FOR BARRELS AVAILABLE.

MOTOR STANDS

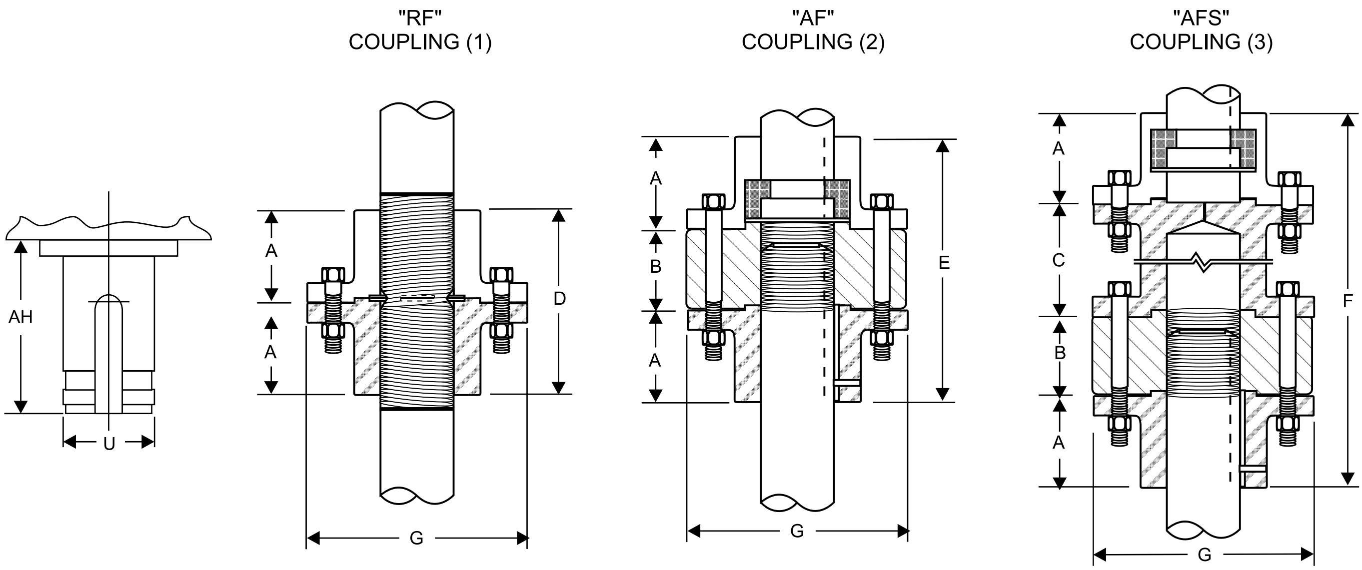


DIMENSIONS										
DRIVER B.D.	HEAD B.D.	STD. H	H MIN.	H MAX.	A	B	C	D	E	APPROX. WT.
10, 12	10, 12	12	4	18	A.R.	8-1/4	8-1/4	7/8	7/8	66
10,12	16-1/2	12	4	18	A.R.	8-1/4	13-1/2	7/8	1	90
16-1/2	16-1/2	12	4	24	A.R.	13-1/2	13-1/2	1	1	104
16-1/2	20	12	4	24	A.R.	13-1/2	13-1/2	1	1	147
20	20	12	4	24	A.R.	13-1/2	13-1/2	1	1	203
20	24-1/2	12	4	24	A.R.	13-1/2	13-1/2	1	1-1/8	290
24-1/2	24-1/2	24	6	30	A.R.	13-1/2	13-1/2	1-1/8	1-1/8	378
24-1/2	30-1/2	24	6	30	A.R.	13-1/2	22	1-1/8	1-3/8	481
30-1/2	30-1/2	24	6	30	A.R.	22	22	1-3/8	1-3/8	584

NOTE: A.R. = AS REQUIRED

API COMPLIANCE FOR DISCHARGE HEADS AVAILABLE.

RIGID FLANGE COUPLINGS FOR SOLID SHAFT MOTORS



COUPLING SIZE	HP@ 1770 RPM	HP@ 3550 RPM	THRUST CAP. LBS.	NEMA STD.		DIMENSIONS IN INCHES						
				AH	U	A	B	C*	D	E	F	G
1	74.34	149.10	4500	2-3/4	1-1/8	2	1-1/4	4-5/16	4	5-1/8	9-9/16	3
2	184.08	369.20	11000	4-1/2	1-5/8	2-1/4	1-1/2	4-5/16	4-1/2	6	10-5/16	3-7/8
3	823.05	1650.75	31000	4-1/2	2-1/8	2-11/16	1-3/4	4-5/16	5-3/8	7-1/8	11-7/8	5
4	920.40	---	31000	5	2-3/8	2-15/16	3-1/2	4-5/16	5-7/8	9-3/8	13-11/16	5-3/4
5	969.96	---	31000	5	2-5/8	3-7/16	3-1/2	4-5/16	6-7/8	10-3/8	14-11/16	6-1/4
6	1490.34	---	41000	6	3-1/8	4	3-1/2	4-5/16	8	11-1/2	15-13/16	6-3/4
7	3274.50	---	73000	7-1/2	3-7/8	4-3/8	4	4-5/16	9-1/4	13-1/4	17-9/16	8-15/16

*Standard spacer length; however, length may vary upon application or customer request. "F" dimension will vary accordingly; contact factory.

1. "RF" Coupling - Rigid Flanged Coupling
   A rigid flanged ("RF" type coupling, non-adjustable, is used when a flanged coupling is required but not an adjustment feature. One could be used between a combination R.A.G.D. and a vertical hollow shaft motor.

2. "AF" Coupling - Adjustable Flanged Coupling
   An adjustable flanged ("AFT") type coupling is used with solid shaft driver. Coupling is complete with adjusting nut used for adjusting (raising or lowering) the pump shaft.

3. "AFS" Coupling - Adjustable Flanged Spacer Coupling
   An adjustable flanged spacer ("AFS") type coupling is identical to the "AF" type coupling, but also includes a removable spacer. This spacer allows the installation and removal of a mechanical seal without removing the driver (usually solid shaft).

NOTE: Extra head height is required by the use of these couplings for all fabricated and cast iron discharge heads. Cast iron discharge heads will require a motor stand.

DO NOT USE FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.

MECHANICAL SEAL

NATIONAL PUMP COMPANY CAN PROVIDE MECHANICAL SEALS FROM ANY MANUFACTURE, INCLUDING BUT NOT LIMITED TO:

- AESSEAL
- CHAMPION
- CHESTERTON
- EAGLEBURGMANN
- FLOWSERVE
- JOHN CRANE

THE FOLLOWING IS A LIST AND BASIC PRODUCT INFORMATION ON SEVERAL JOHN CRANE SEAL TYPICALLY PROVIDED BY NATIONAL PUMP COMPANY.

TYPE 4610:
SELF ALIGNING CARTRIDGE SEAL
RECOMMENDED FOR USE WITH HOLLOW SHAFT MOTOR WITH STEADY BUSHING

SHAFT SIZE	SEAL SIZE	MAX. PRESSURE
1.00	1.00	225
1.19	1.25	
1.25	1.25	
1.50	1.50	
1.69	1.75	

STANDARD = CARBON VS SILICON CARBIDE
OPTIONAL = SILICON CARBIDE VS. SILICON CARBIDE
FLUID = WATER
MAX. TEMP = 150F

TYPE 5610 (DUAL O-RING) / 5611 (ELASTOMER BELLOWS
SELF ALIGNING CARTRIDGE SEAL

SHAFT SIZE	SEAL SIZE	MAX. PRESSURE
1.00	1.00	225
1.19	1.25	
1.25	1.25	
1.50	1.50	
1.69	1.75	
1.94	2.00	200
2.19	2.25	185
2.44	2.50	160
2.69	2.75	140

STANDARD = CARBON VS SILICON CARBIDE
OPTIONAL = SILICON CARBIDE VS. SILICON CARBIDE
FLUID = WATER
MAX. TEMP = 175F

TYPE 8B1

SHAFT SIZE	SEAL SIZE	MAX. PRESSURE
1.00	1.13	825
1.19	1.50	
1.25	1.50	
1.50	1.75	
1.69	2.00	
1.94	2.25	
2.19	2.50	780
2.44	2.75	750
2.69	3.00	675

STANDARD = CARBON VS SILICON CARBIDE
FLUID = WATER
MAX. TEMP = 175F

TYPE 48
HIGH PRESSURE SEAL THAT EXCEEDS THE RATING OF A 8B1
NON-API 682 HYDROCARBON MECHANICAL SEAL, SINGLE OR DUAL UNPRESSURIZED

TYPE 1648 & 2648
API 682 HYDROCARBON MECHANICAL SEAL, SINGLE OR DUAL UNPRESSURIZED

DISCHARGE HEAD TYPE AND SEAL USAGE

	N260	HI-PRO	LDF	NF	NTF	NUF
4610	Y	Y	Y	Y	Y	Y
5610/5611	Y	Y	Y	Y	Y	Y
8B1	N	N	N	Y	Y	Y
48	N	N	N	Y	Y	Y
1648/2648	N	N	N	Y	Y	Y

NOTES:
[1] A STEADY BUSHING IS REQUIRED FOR ALL HOLLOW SHAFT MOTORS.
[2] A MOTOR STAND IS REQUIRED FOR N260, HI-PRO AND LDF DISCHARGE HEADS WHEN A SOLID SHAFT MOTOR AND AFS COUPLING IS REQUIRED.

UNLESS OTHERWISE SPECIFIED ALL MECHANICAL SEALS ARE PROVIDED WITH A PLAN 13 FLUSH.

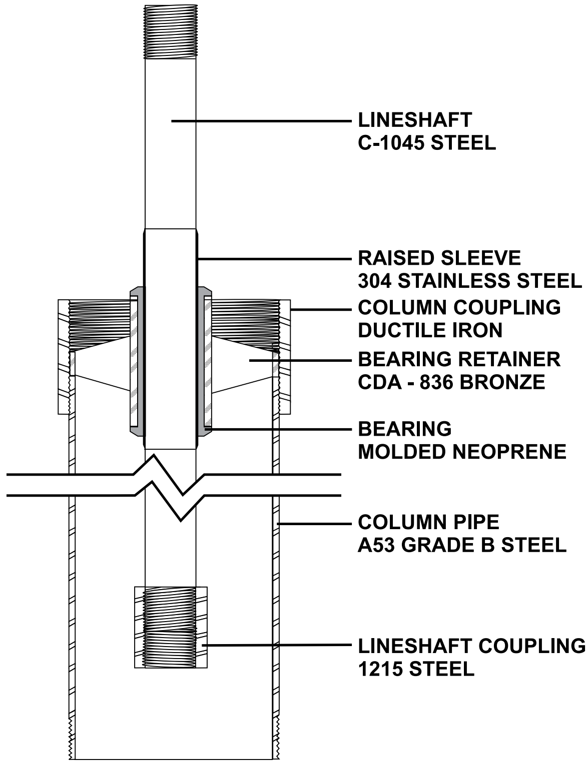
API SECONDARY SEALING SYSTEMS AND FLUSH PLANS:
PLAN 52 – SEAL RESERVOIR, UTILIZES A BUFFER FLUID TO REDUCE NET LEAKAGE RATES AND PROVIDE REDUNDANCY IN THE EVENT OF A FAILURE.
PLAN 65 – LEAK DETECTOR, TYPICALLY USED ON SINGLE SEALS TO PROVIDE AN ALARM OR EQUIPMENT SHUT-DOWN WHEN EXCESSIVE LEAKAGE IS DETECTED.
PLAN 76 – GAS CONTROL PANEL, UTILIZES A DRY RUNNING SECONDARY SEAL WHICH DIVERTS NON-CONDENSING PRIMARY SEAL LEAKAGE TO A FLARE OR VAPOR RECOVERY SYSTEM.

NOTES

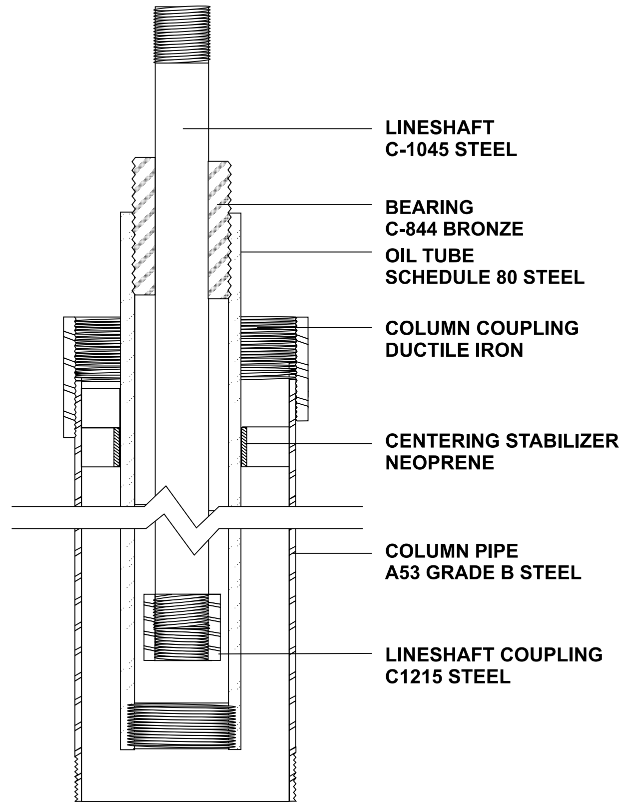
NOTES

THREADED COLUMN ASSEMBLY

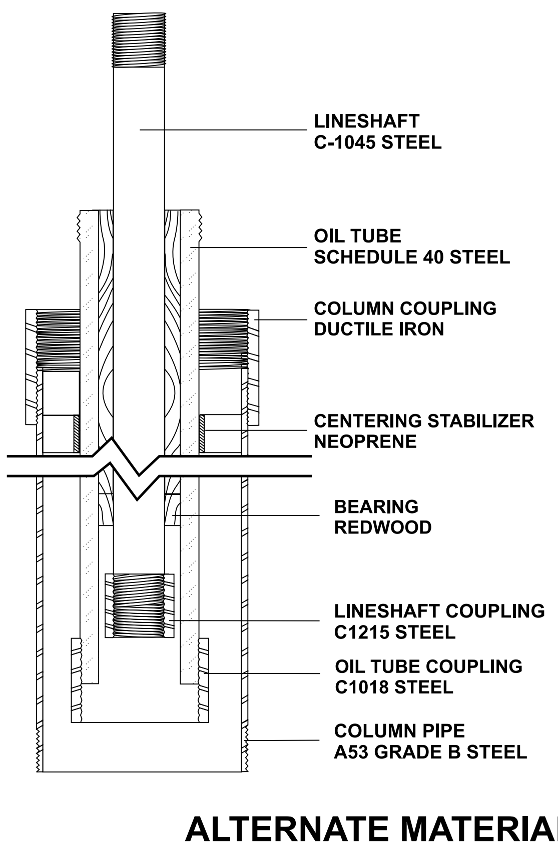
THREADED COLUMN ASSEMBLY PRODUCT LUBRICATED (PRL)



THREADED COLUMN ASSEMBLY BRONZE BEARING OIL LUBRICATED (BZL)



THREADED COLUMN ASSEMBLY REDWOOD OIL LUBRICATED (RWL)



PRODUCT LUBRICATED SHAFT
THREADED COLUMN ASSEMBLY

1. Complete column consists of steel column pipe, sleeve type couplings, C-1045 steel lineshaft with 304 S.S. sleeve at bearing journals, steel lineshaft couplings, bronze bearing retainer with neoprene bearing.
2. Complete column consists of steel column pipe, sleeve type couplings 416 S.S. lineshaft, with 304 S.S. lineshaft couplings, bronze bearing retainer with neoprene bearings.

PRODUCT LUBRICATED SHAFT
THREADED COLUMN ASSEMBLY - 5 FOOT BEARING SPACING

1. Complete column consists of two 5-foot sections steel column pipe, sleeve type couplings, 10-foot C-1045 steel lineshaft with 304 S.S. sleeve at bearing journals, steel lineshaft couplings, two bronze bearing retainers with neoprene bearings.
2. Complete column consists of two 5-foot sections steel column pipe, sleeve type couplings, 10-foot 416 S.S. lineshaft, with 304 S.S. lineshaft couplings, two bronze bearing retainers with neoprene bearings.

OIL LUBRICATED SHAFT
THREADED COLUMN PIPE - BRONZE BEARING

1. Complete column assembly consists of steel column pipe, sleeve type couplings, steel oil tube ASTM A-53 Grade A Sch. 80, with bronze bearings, carbon steel lineshaft and couplings, neoprene centering stabilizers at 20-foot intervals. SPACING BASED ON 5-FOOT BEARING CENTERS.

► ***FOR SPEEDS HIGHER THAN 1800 RPM, CONTACT FACTORY.***

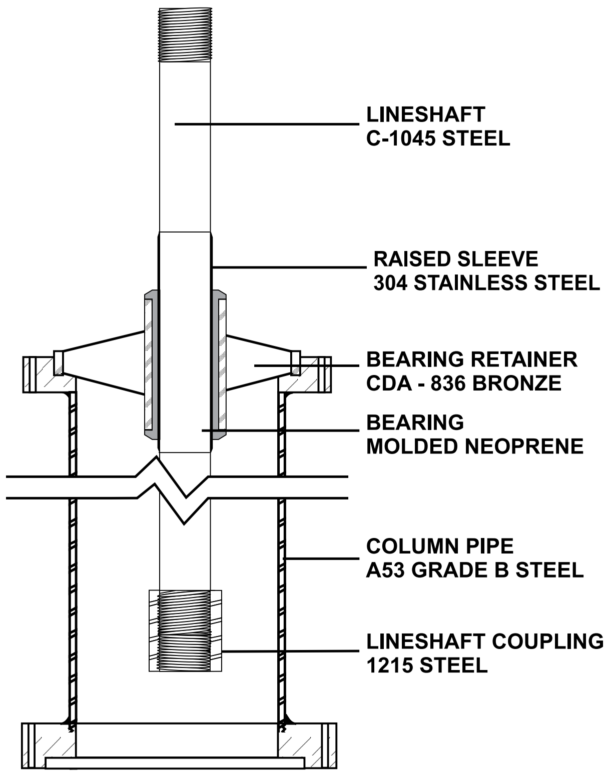
OIL LUBRICATED
THREADED COLUMN PIPE - REDWOOD OIL LUBRICATED

1. Complete column assembly consists of steel column pipe, sleeve type column couplings, steel ASTM A-53 Grade A Sch. 40 oil tube, with oil impregnated redwood lined bearing, carbon steel lineshaft and coupling, neoprene centering stabilizers at 20-foot intervals.

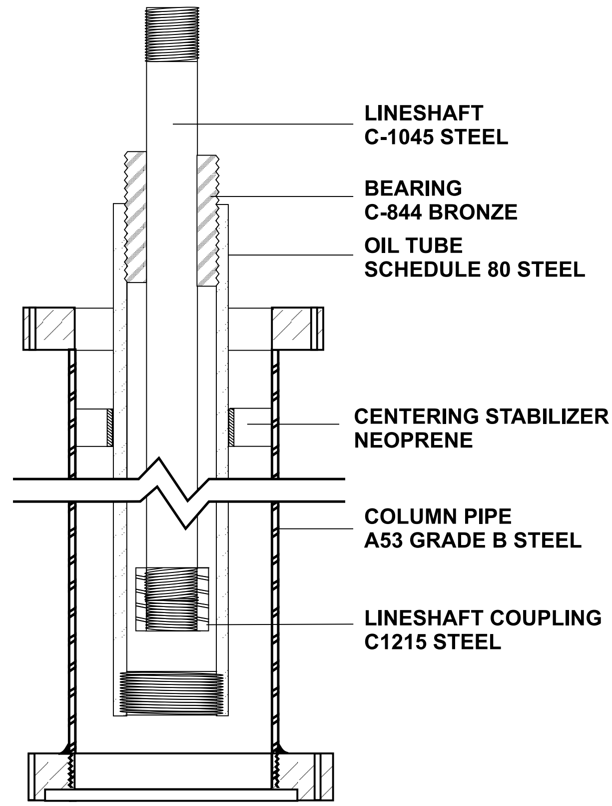
ALTERNATE MATERIALS AVAILABLE UPON REQUEST.

FLANGED COLUMN ASSEMBLY

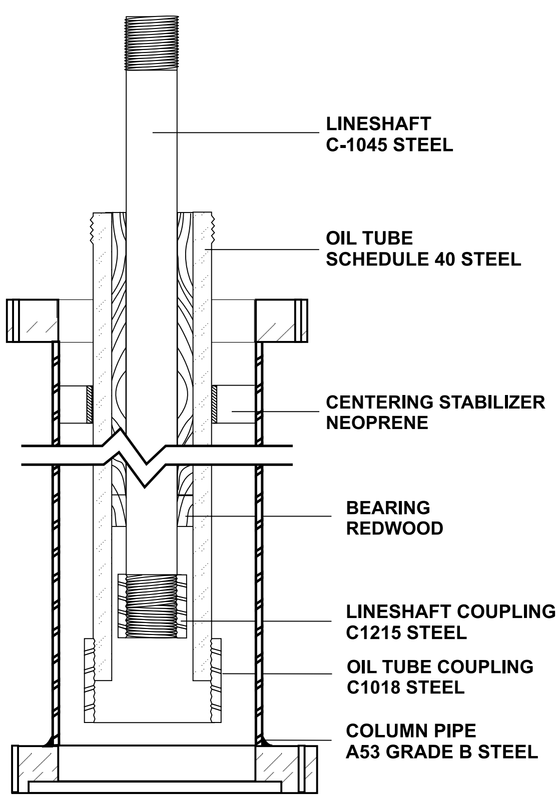
FLANGED COLUMN ASSEMBLY PRODUCT LUBRICATED (PRL)



FLANGED COLUMN ASSEMBLY BRONZE BEARING OIL LUBRICATED (BZL)



FLANGED COLUMN ASSEMBLY REDWOOD OIL LUBRICATED (RWL)



PRODUCT LUBRICATED SHAFT FLANGED COLUMN ASSEMBLY

1. Complete column consists of flanged steel column pipe, C-1045 steel lineshaft with 304 S.S. sleeve at bearing journals, steel lineshaft couplings, bronze bearing retainer with neoprene bearing.
2. Complete column consists of flanged steel column pipe, sleeve type couplings 416 S.S. lineshaft, with 304 S.S. lineshaft couplings, bronze bearing retainer with neoprene bearings.

PRODUCT LUBRICATED SHAFT FLANGED COLUMN ASSEMBLY - 5 FOOT BEARING SPACING

1. Complete column consists of two 5-foot sections flanged steel column pipe, 10-foot C-1045 steel lineshaft with 304 S.S. sleeve at bearing journals, steel lineshaft couplings, two bronze bearing retainers with neoprene bearings.
2. Complete column consists of two 5-foot sections flanged steel column pipe, sleeve type couplings, 10-foot 416 S.S. lineshaft, with 304 S.S. lineshaft couplings, two bronze bearing retainers with neoprene bearings.

OIL LUBRICATED SHAFT FLANGED COLUMN PIPE - BRONZE BEARING

1. Complete column assembly consists of flanged steel column pipe, steel oil tube ASTM A-53 Grade A Sch. 80, with bronze bearings, carbon steel lineshaft and couplings, neoprene centering stabilizers at 20-foot intervals. SPACING BASED ON 5-FOOT BEARING CENTERS. ***FOR SPEEDS HIGHER THAN 1800 RPM, CONTACT FACTORY.***

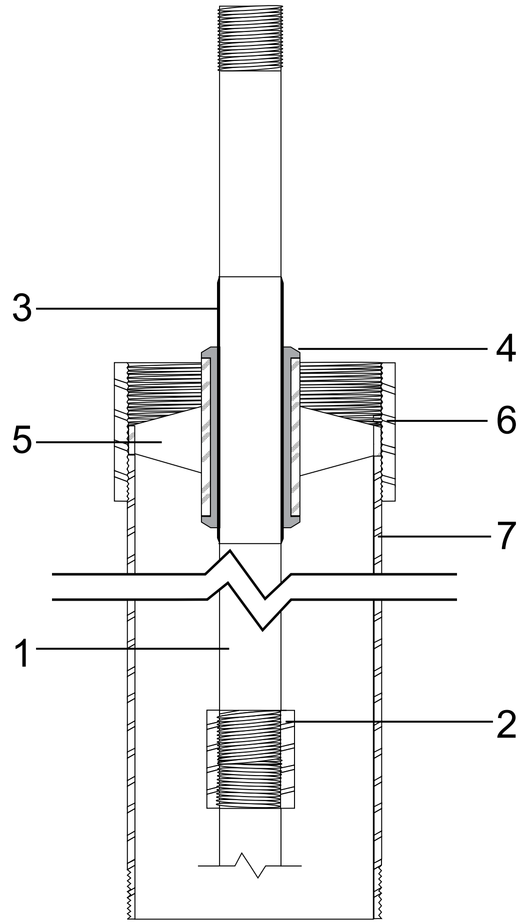
OIL LUBRICATED FLANGED COLUMN PIPE - REDWOOD OIL LUBRICATED

1. Complete column assembly consists of flanged steel column pipe, steel ASTM A-53 Grade A Sch. 40 oil tube, with oil impregnated redwood lined bearing, carbon steel lineshaft and coupling, neoprene centering stabilizers at 20-foot intervals.

COLUMN ASSEMBLY
PRODUCT LUBRICATED TYPE
FOR LINESHAFT TURBINE PUMPS

COLUMN SIZE SCH. WALL THICKNESS	SHAFT SIZE	WEIGHT IN LBS. 5 FT.	WEIGHT IN LBS. 10 FT.	MAX. AWWA RECMD. GPM	O.D. PIPE CPLG.
4" SCH. 40 0.237"	1"	71	139	150	5.20"
	1-3/16"	77	150	100	
	1-1/4"	79	154	100	
5" SCH. 40 0.258"	1"	95	182	325	6.30"
	1-3/16"	101	193	250	
	1-1/4"	103	197	250	
	1-1/2"	113	216	225	
6" SCH. 40 0.280"	1"	118	227	600	7.39"
	1-3/16"	124	238	500	
	1-1/4"	126	242	500	
	1-1/2"	136	261	400	
	1-11/16"	144	277	400	
8" SCH. 30 0.277"	1"	172	329	1350	9.63"
	1-3/16"	178	340	1300	
	1-1/4"	180	344	1300	
	1-1/2"	190	363	1150	
	1-11/16"	198	379	1150	
	1-15/16"	212	405	950	
10" 0.279"	1"	245	461	2800	11.75"
	1-3/16"	251	472	2600	
	1-1/4"	253	474	2600	
	1-1/2"	263	495	2450	
	1-11/16"	271	511	2450	
	1-15/16"	285	538	2000	
12" SCH. 30 0.330"	1"	304	565	4700	14.00"
	1-3/16"	310	577	4300	
	1-1/4"	312	581	4300	
	1-1/2"	322	602	4000	
	1-11/16"	330	616	4000	
	1-15/16"	344	642	3600	
	2-3/16"	359	671	3400	

THREADED COLUMN ASSEMBLY
PRODUCT LUBRICATED (PRL)



TYPICAL COLUMN ASSEMBLY CONSISTS OF:

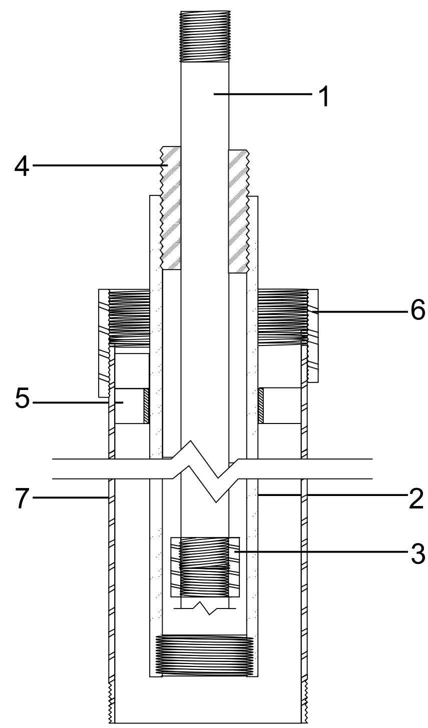
1. C-1045 STEEL LINESHAFT
2. 1215 STEEL SHAFT COUPLING
3. 304 STAINLESS SLEEVE
4. NEOPRENE LINESHAFT BEARING
5. CDA-836 BRONZE BEARING RETAINER
6. DUCTILE IRON PIPE COUPLINGS
7. A53 GRADE B STEEL PIPE

CONSULT THE FACTORY FOR MATERIAL AVAILABILITY AND PRICES OTHER THAN STANDARD.

COLUMN ASSEMBLY
OIL LUBE/BRONZE BEARING TYPE
FOR LINESHAFT TURBINE PUMPS

COLUMN SIZE SCH. WALL THICKNESS	SHAFT SIZE	WEIGHT IN LBS. 5 FT.	WEIGHT IN LBS. 10 FT.	WEIGHT IN LBS. 20 FT.	MAX. AWWA RECMD. GPM	O.D. PIPE CPLG.
4" SCH. 40 0.237"	1" X 1-1/2"	92	182	358	150	5.20"
	1-3/16" X 2"	105	209	414	100	
	1-1/4" X 2"	108	212	417	100	
5" SCH. 40 0.258"	1" X 1-1/2"	116	225	439	325	6.30"
	1-3/16" X 2"	129	252	495	250	
	1-1/4" X 2"	132	255	498	250	
	1-1/2" X 2-1/2"	157	305	596	225	
6" SCH. 40 0.280"	1" X 1-1/2"	139	270	528	600	7.39"
	1-3/16" X 2"	152	297	584	500	
	1-1/4" X 2"	155	300	587	500	
	1-1/2" X 2-1/2"	180	350	685	400	
	1-11/16" X 2-1/2"	186	370	725	400	
8" SCH. 30 0.277"	1" X 1-1/2"	175	311	649	1350	9.63"
	1-3/16" X 2"	188	338	705	1300	
	1-1/4" X 2"	191	341	708	1300	
	1-1/2" X 2-1/2"	216	391	806	1150	
	1-11/16" X 2-1/2"	222	411	846	1150	
	1-15/16" X 3"	244	466	956	950	
10" 0.279"	1" X 1-1/2"	221	413	794	2800	11.75"
	1-3/16" X 2"	234	440	850	2600	
	1-1/4" X 2"	237	443	853	2600	
	1-1/2" X 2-1/2"	262	493	951	2450	
	1-11/16" X 2-1/2"	268	513	991	2450	
	1-15/16" X 3"	290	568	1101	2000	
12" SCH. 30 0.330"	1" X 1-1/2"	298	553	1059	4700	14.00"
	1-3/16" X 2"	311	580	1115	4300	
	1-1/4" X 2"	314	583	1118	4300	
	1-1/2" X 2-1/2"	339	633	1216	4000	
	1-11/16" X 2-1/2"	345	653	1256	4000	
	1-15/16" X 3"	367	708	1366	3600	
	2-3/16" X 3-1/2"	394	768	1477	3400	

THREADED COLUMN ASSEMBLY
BRONZE BEARING OIL LUBRICATED (BZL)



TYPICAL COLUMN ASSEMBLY CONSISTS OF:

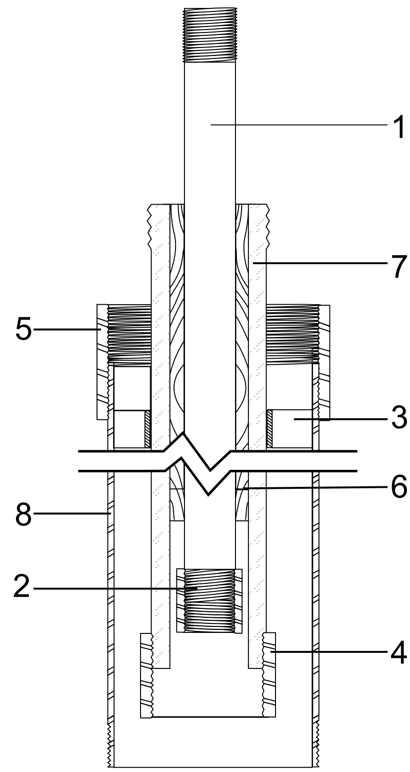
1. C-1045 STEEL LINESHAFT
2. SCH. 80 STEEL TUBING
3. 1215 STEEL SHAFT COUPLING
4. C-844 BRONZE LINESHAFT BRG.
5. RUBBER CENTERING STABILIZER *(1 FOR EACH 40 FT.)*
6. DUCTILE IRON PIPE COUPLINGS
7. A53 GRADE B STEEL PIPE

CONSULT THE FACTORY FOR MATERIAL AVAILABILITY AND PRICES OTHER THAN STANDARD.

COLUMN ASSEMBLY
OIL LUBE/REDWOOD BEARING TYPE
FOR LINESHAFT TURBINE PUMPS

COLUMN SIZE WALL THICKNESS/ SCH.	SHAFT SIZE	WEIGHT IN LBS.			MAX. AWWA RECMD. GPM	O.D. PIPE CPLG.
		5 FT.	10 FT.	20 FT.		
4" SCH. 40 0.237"	1" X 1-1/2"	87	168	299	160	5.20"
	1-3/16" X 2"	98	190	375	100	
	1-1/4" X 2"	100	194	382	100	
5" SCH. 40 0.258"	1" X 1-1/2"	111	211	380	325	6.30"
	1-3/16" X 2"	122	233	455	250	
	1-1/4" X 2"	124	237	463	250	
	1-1/2" X 2-1/2"	146	278	542	225	
6" SCH. 40 0.280"	1" X 1-1/2"	134	256	469	600	7.39"
	1-3/16" X 2"	145	278	544	500	
	1-1/4" X 2"	147	282	552	500	
	1-1/2" X 2-1/2"	169	323	631	400	
8" SCH. 30 0.277"	1" X 1-1/2"	170	297	590	1350	9.63"
	1-3/16" X 2"	181	319	665	1300	
	1-1/4" X 2"	183	323	673	1300	
	1-1/2" X 2-1/2"	205	364	752	1150	
10" 0.279"	1" X 1-1/2"	216	399	735	2800	11.75"
	1-3/16" X 2"	227	421	810	2600	
	1-1/4" X 2"	229	425	818	2600	
	1-1/2" X 2-1/2"	251	466	897	2450	
12" SCH. 30 0.330"	1" X 1-1/2"	293	539	1000	4700	14.00"
	1-3/16" X 2"	304	561	1075	4300	
	1-1/4" X 2"	306	565	1083	4300	
	1-1/2" X 2-1/2"	328	606	1162	4000	
	1-11/16 X 2-1/2	334	619	1188	3900	

THREADED COLUMN ASSEMBLY REDWOOD OIL LUBRICATED (RWL)



TYPICAL COLUMN ASSEMBLY CONSISTS OF:

1. C-1045 STEEL LINESHAFT
2. 1215 STEEL SHAFT COUPLING
3. RUBBER CENTERING STABILIZER
   (1 FOR EACH 40 FT.)
4. C-1018 STEEL TUBE COUPLING
5. DUCTILE IRON PIPE COUPLING
6. REDWOOD SHAFT BEARING
7. SCHEDULE 40 STEEL TUBING
8. A53 GRADE B STEEL PIPE

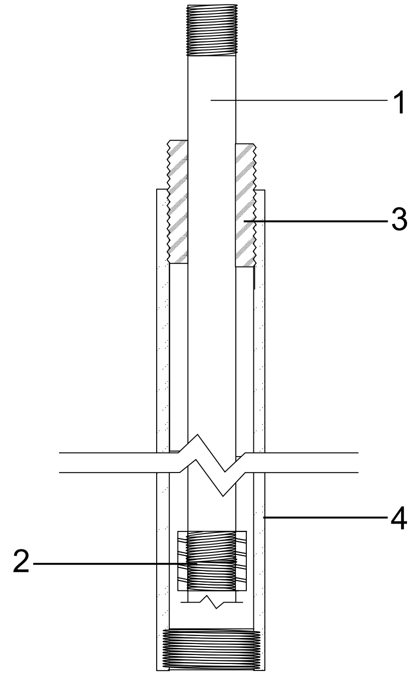
CONSULT THE FACTORY FOR MATERIAL AVAILABILITY AND PRICES OTHER THAN STANDARD.

INNER COLUMN ASSEMBLY
FOR LINESHAFT TURBINE PUMPS

COLUMN ASSEMBLY

BRONZE BEARING

SIZE	WEIGHT IN LBS. 5 FT.	10 FT.	20 FT.	O.D.TUBE
1" X 1-1/2"	34	70	138	1.900
1-3/16" X 2"	47	97	194	2.375
1-1/4" X 2"	50	100	197	2.375
1-1/2" X 2-1/2"	75	150	295	2.875
1-11/16" X 2-1/2"	81	170	335	2.875
1-15/16" X 3	103	225	445	3.500
2-3/16" X 3-1/2"	130	285	556	4.000

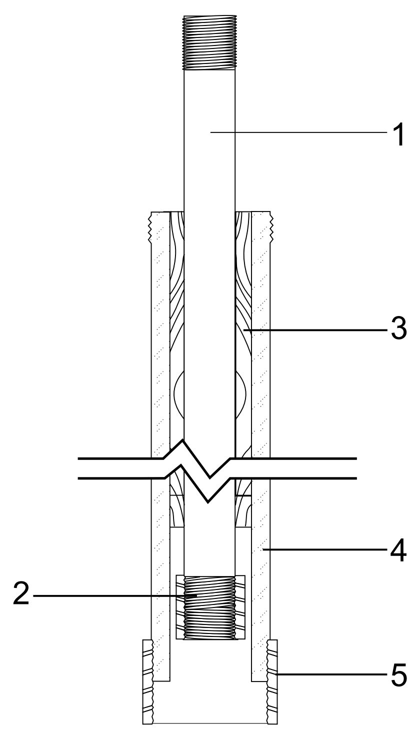


TYPICAL INNER COLUMN ASSEMBLY CONSISTS OF:

1. C-1045 STEEL LINESHAFT
2. 1215 STEEL SHAFT COUPLING
3. C-844 BRONZE LINESHAFT BEARING
4. SCH. 80 STEEL OIL TUBE

REDWOOD BEARING

SIZE	WEIGHT IN LBS. 5 FT.	10 FT.	20 FT.	O.D.TUBE
1" X 1-1/2"	29	56	79	2.25
1-3/16" X 2"	40	78	154	2.75
1-1/4" X 2"	40	78	154	2.75
1-1/2" X 2-1/2"	64	123	241	3.25
1-11/16" x 2-1/2"	70	136	267	3.25



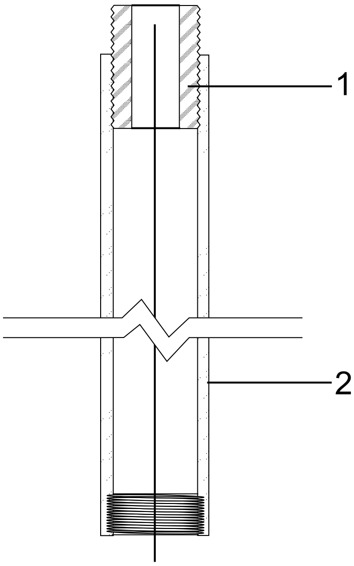
TYPICAL INNER COLUMN ASSEMBLY CONSISTS OF:

1. C-1045 STEEL LINESHAFT
2. 1215 STEEL SHAFT COUPLING
3. REDWOOD SHAFT BEARING
4. SCH. 40 STEEL OIL TUBE
5. C-1018 STEEL TUBE COUPLING

TUBE LINE WITHOUT SHAFT
FOR LINESHAFT TURBINE PUMPS

BRONZE BEARING

SIZE	WEIGHT IN LBS. 5 FT.	10 FT.	20 FT.	O.D.TUBE
1" X 1-1/2"	18	36	72	1.900
1-3/16" X 2"	25	50	100	2.375
1-1/4" X 2"	25	50	100	2.375
1-1/2" X 2-1/2"	38	76	152	2.875
1-11/16" X 2-1/2"	38	76	152	2.875
1-15/16" X 3	51	102	204	3.500
2-3/16" X 3-1/2"	66	157	300	4.000

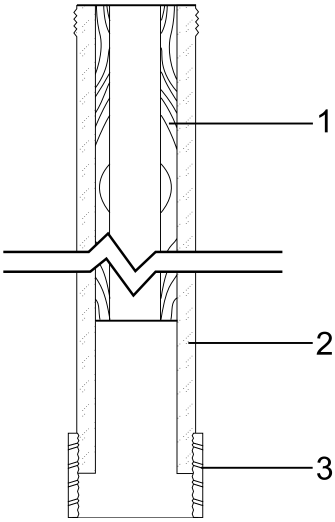


TYPICAL INNER COLUMN ASSEMBLY CONSISTS OF:

1. C-844 BRONZE LINESHAFT BEARING
2. SCH. 80 STEEL OIL TUBE

REDWOOD BEARING

SIZE	WEIGHT IN LBS. 5 FT.	10 FT.	20 FT.	O.D.TUBE
1" X 1-1/2"	15	29	57	2.25
1-3/16" X 2"	21	40	78	2.75
1-1/4" X 2"	21	40	78	2.75
1-1/2" X 2-1/2"	33	62	120	3.25
1-11/16" X 2-1/2"	32	60	115	3.25



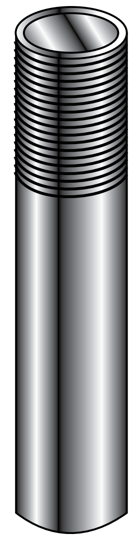
TYPICAL INNER COLUMN ASSEMBLY CONSISTS OF:

1. REDWOOD SHAFT BEARING
2. SCH. 40 STEEL OIL TUBE
3. C-1018 STEEL TUBE COUPLING

SHAFT
OIL LUBE & PRODUCT LUBE TYPE
FOR LINESHAFT TURBINE PUMPS

SHAFT/C-1045 TBE OIL LUBE TYPE

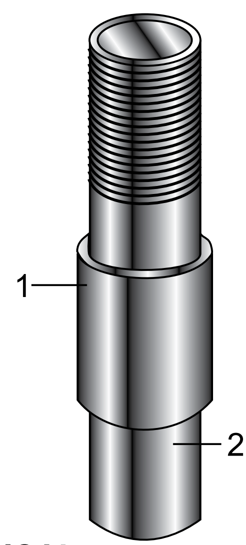
SIZE	WEIGHT		
	5 FT.	10 FT.	20 FT.
1"	14	27	54
1-3/16"	19	38	76
1-1/4"	21	42	84
1-1/2"	30	60	120
1-11/16"	38	76	152
1-15/16"	50	100	200
2-3/16"	64	128	256
2-7/16”	80	159	318
2-11/16”	97	194	387



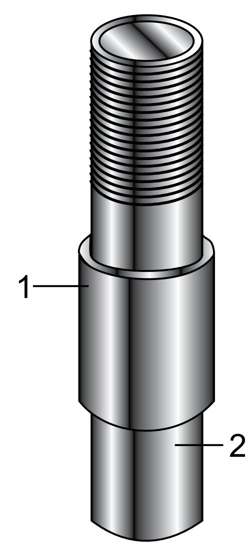
TYPICAL:
SHAFT - TBE C1045
CARBON STEEL

SHAFT/C-1045 TBE PRODUCT LUBE TYPE
&
SHAFT/416 S.S. TBE PRODUCT LUBE TYPE

SIZE	WEIGHT		
	5 FT.	10 FT.	SLEEVE O.D. - IN.
1"	15	28	1.25
1-3/16"	19.5	38.5	1.50
1-1/4"	21.5	42.5	1.375
1-1/2"	31	61	1.6875
1-11/16"	39	77	1.9375
1-15/16"	51	101	2.1875
2-3/16"	65	129	2.4375
2-7/16”	82	161	2.6875
2-11/16”	99	196	2.9375



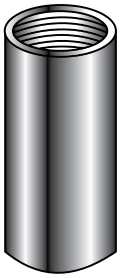
TYPICAL:
1. 304 S.S. SLEEVE
2. SHAFT - TBE C1045
CARBON STEEL



TYPICAL:
1. 304 S.S. SLEEVE
2. SHAFT - TBE 416
STAINLESS STEEL

SHAFT COUPLINGS

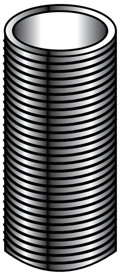
SIZE	WEIGHT CARBON	WEIGHT 416 S.S.	WEIGHT 304 S.S.	O.D.
1"	0.50	0.50	0.50	1.38
1-3/16"	0.75	0.75	0.75	1.62
1-1/4"	1.00	1.00	1.00	1.62
1-1/2"	1.75	1.75	1.75	2.06
1-11/16"	2.00	2.00	2.00	2.13
1-15/16"	4.25	4.25	4.25	2.63
2-3/16"	6.10	6.10	6.10	2.75



TYPICAL SHAFT COUPLING
1215 STEEL

BRONZE LINESHAFT BEARINGS

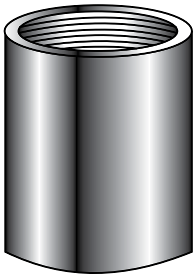
TUBE AND SHAFT SIZE	WEIGHT.
1" X 1-1/2"	1.00
1-3/16" X 2"	2.00
1-1/4" X 2"	2.00
1-1/2" X 2-1/2"	4.00
1-11/16" X 2-1/2"	3.75
1-15/16" X 3"	6.00
2-3/16" X 3-1/2"	8.50



TYPICAL LINESHAFT BEARING
C-844 BRONZE

TUBE COUPLING
REDWOOD TYPE

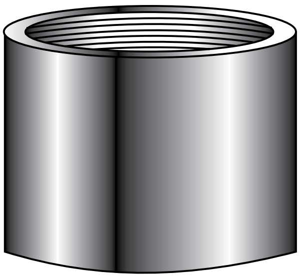
TUBE SIZE	WEIGHT.	O.D.
1-1/2"	1.25	2.25
2"	1.75	2.75
2-1/2"	2.50	3.25



TYPICAL REDWOOD COUPLING
C-1018 STEEL

COLUMN PIPE COUPLING
8 TPI - R.H.

PIPE SIZE	WEIGHT.
4"	4
5"	9
6"	10
8"	17
10"	31
12"	45

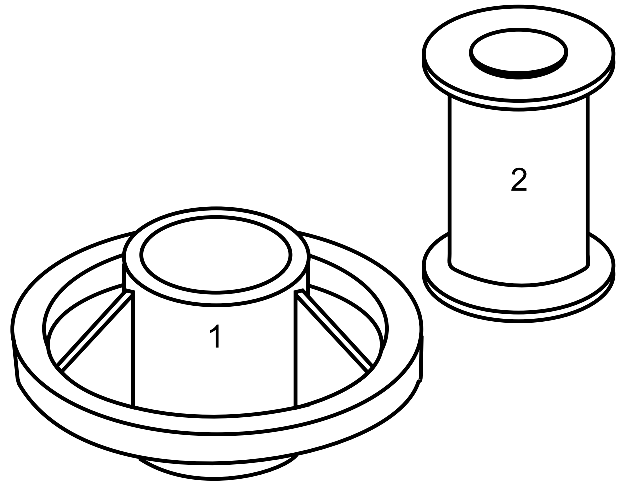


TYPICAL COLUMN PIPE COUPLING
DUCTILE IRON

COLUMN ASSEMBLY

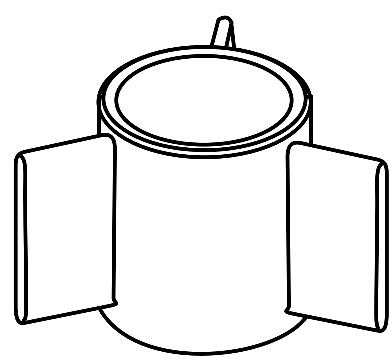
CENTERING STABILIZERS
PRODUCT LUBE & OIL LUBE TYPE
FOR LINESHAFT TURBINE PUMPS

PIPE SIZE	SHAFT SIZE W.L.	TUBE SIZE O.L.	WEIGHT	
			PRODUCT LUBE	OIL LUBE
4"	1"	1-1/2"	1.6	0.4
	1-3/16"	2"	1.5	0.5
	1-1/4"	2"	1.4	0.5
5"	1"	1-1/2"	2.7	0.5
	1-3/16"	2"	2.6	0.5
	1-1/4"	2"	2.6	0.5
	1-1/2"	2-1/2"	3.3	0.9
6"	1"	1-1/2"	3.3	0.8
	1-3/16"	2"	3.2	0.8
	1-1/4"	2"	3.2	0.8
	1-1/2"	2-1/2"	3.3	0.9
	1-11/16"	2-1/2"	3.2	0.9
8"	1"	1-1/2"	4.6	0.9
	1-3/16"	2"	4.4	1.1
	1-1/4"	2"	4.4	1.1
	1-1/2"	2-1/2"	4.8	1.3
	1-11/16"	2-1/2"	4.7	1.3
	1-15/16"	3"	4.6	1.4
10"	1"	1-1/2"	7.8	1.4
	1-3/16"	2"	7.7	1.5
	1-1/4"	2"	7.7	1.5
	1-1/2"	2-1/2"	7.5	1.5
	1-11/16"	2-1/2"	7.5	1.5
	1-15/16"	3"	7.4	1.6
12"	1"	1-1/2"	10.8	2.1
	1-3/16"	2"	10.7	2.6
	1-1/4"	2"	10.7	2.6
	1-1/2"	2-1/2"	10.6	2.9
	1-11/16"	2-1/2"	10.5	2.9
	1-15/16"	3"	10.4	3.2
	2-3/16"	3-1/2"	10.4	3.3



TYPICAL PRODUCT LUBE CENTERING STABILIZER CONSISTS OF:

1. CDA - 875 BRONZE BEARING RETAINER
2. MOLDED NEOPRENE BEARING

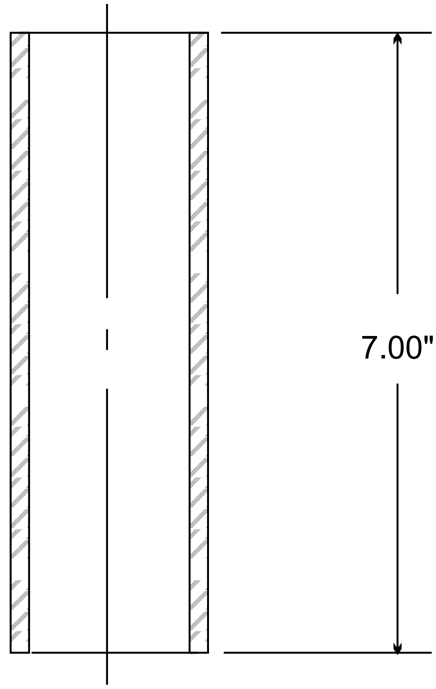


TYPICAL OIL LUBE CENTERING STABILIZER CONSISTS OF:

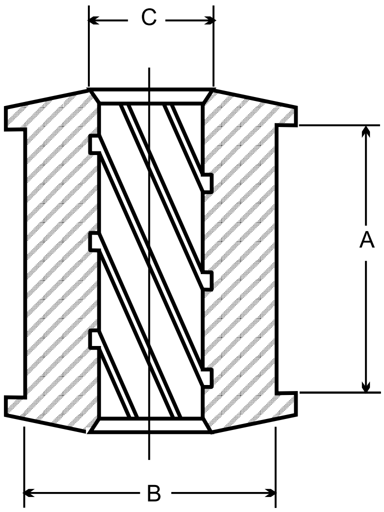
1. RUBBER CENTERING SPIDER

304 STAINLESS SLEEVES & NEOPRENE BEARING INSERTS

304 S.S. SLEEVE	WEIGHT OUNCES
1" X 1-1/4"	14
1-3/16" X 1-3/8"	8
1-1/4" X 1-3/8"	8
1-1/4" X 1-1/2"	9
1-1/2" X 1-11/16"	14
1-11/16" X 1-15/16"	16
1-15/16 X 2-3/16"	18
2-3/16" X 2-7/16"	20



SHAFT SLEEVE	BEARING HUB	A	B	C	WEIGHT OUNCES
1" X 1-1/4"	1.38	2.75	1.39	1.28	5
1" X 1-1/4"	2.00	3.13	2.01	1.28	4
1" X 1-1/4"	3.00	4.50	3.01	1.28	10
1-3/16" X 1-3/8"	1.75	2.75	1.76	1.405	5
1-3/16" X 1-3/8"	2.00	3.125	2.01	1.405	4
1-3/16" X 1-3/8"	3.00	4.50	3.01	1.405	10
1-1/4" X 1-3/8"	1.75	2.75	1.76	1.405	5
1-1/4" X 1-3/8"	2.00	3.125	2.01	1.405	4
1-1/4" X 1-3/8"	3.00	4.50	3.01	1.405	10
1-1/4" X 1-1/2"	1.75	2.75	1.76	1.535	5
1-1/4" X 1-1/2"	2.00	3.125	2.01	1.535	4
1-1/4" X 1-1/2"	3.00	4.50	3.01	1.535	10
1-1/2" X 1-11/16"	2.50	3.625	2.51	1.722	6
1-1/2" X 1-11/16"	3.00	4.50	3.01	1.722	8
1-11/16" X 1-15/16"	2.50	3.625	2.51	1.972	6
1-11/16" X 1-15/16"	3.00	4.50	3.01	1.972	10
1-15/16" X 2-1/8"	2.50	3.625	2.51	2.155	6
1-15/16" X 2-1/8"	3.00	4.50	3.01	2.155	10
2-3/16" X 2-7/16"	3.00	4.50	3.01	2.4675	8

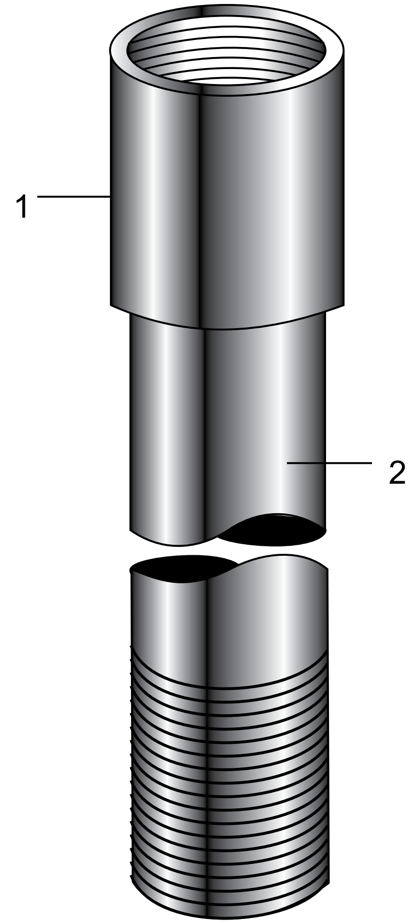


COLUMN PIPE - T & C
OIL LUBE & PRODUCT LUBE TYPE
FOR LINESHAFT TURBINE PUMPS

COLUMN PIPE - T & C OIL LUBE TYPE

PIPE SIZE	WALL SIZE	WEIGHT			COUPLING O.D.
		5 FT.	10 FT.	20 FT.	
4"	.237*	58	112	220	5.20
5"	.258*	82	155	301	6.30
6"	.250	95	180	350	7.39
6"	.280*	105	200	390	7.39
8"	.219	115	214	410	9.63
8"	.250	129	241	464	9.63
8"	.277*	141	261	511	9.63
8"	.322	160	303	588	9.63
10	.250	171	311	592	11.75
10"	.279*	187	343	656	11.75
10"	.307	202	373	716	11.75
10"	.365	233	436	841	11.75
12"	.250	212	379	713	14
12"	.330*	264	483	921	14

* STANDARD WALL PIPE



COLUMN PIPE - T & C PRODUCT LUBE TYPE

PIPE SIZE	WALL SIZE	WEIGHT		COUPLING O.D.
		5 FT.	10 FT.	
4"	.237*	57	111	5.20
5"	.258*	81	154	6.30
6"	.250	94	179	7.39
6"	.280*	104	199	7.39
8"	.219	113	212	9.63
8"	.250	127	239	9.63
8"	.277*	139	263	9.63
8"	.322	158	301	9.63
10	.250	169	309	11.75
10"	.279*	185	341	11.75
10"	.307	199	370	11.75
10"	.365	230	433	11.75
12"	.250	209	376	14
12"	.330*	261	480	14

* STANDARD WALL PIPE

TYPICAL COLUMN PIPE WITH COUPLING CONSISTS OF:

1. DUCTILE IRON COUPLING
2. A53 GRADE B STEEL

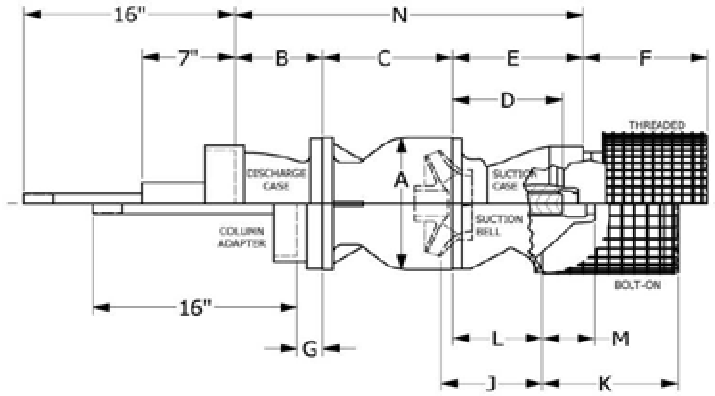
A.N.S.I. PIPE SCHEDULES

PIPE SIZE	O.D. IN INCHES	10	20	30	40	STD	60	80 (E.H.)
1-1/2	1.900	.109 **2.085**			.145 **2.718**	.145 **2.718**		.200 **3.631**
2	2.375	.109 **2.638**			.154 **3.653**	.154 **3.653**		.218 **5.022**
2-1/2	2.875	.120 **3.531**			.203 **5.793**	.203 **5.793**		.276 **7.661**
3	3.5	.120 **4.332**			.216 **7.576**	.216 **7.576**		.300 **10.25**
3-1/2	4.0	.120 **4.973**			.226 **9.109**	.226 **9.103**		.318 **12.51**
4	4.5	.120 **5.613**			.237 **10.79**	.237 **10.79**	.281 **12.66**	.337 **14.98**
4-1/2	5.0					.247 **12.53**		.375 **20.78**
5	5.563	.134 **7.770**			.258 **14.62**	.258 **14.62**		.432 **28.57**
6	6.625	.134 **9.289**			.280 **18.97**	.280 **18.97**		.500 **43.39**
7	7.625					.301 **23.57**		.593 **64.33**
8	8.625	.148 **13.40**	.250 **22.36**	.277 **24.70**	.322 **28.55**	.322 **28.55**	.406 **35.64**	.387 **88.51**
9	9.625					.342 **33.90**		.750 **106.1**
10	10.75	.165 **18.70**	.250 **28.04**	.307 **34.24**	.365 **40.48**	.365 **40.48**	.500 **54.74**	.843 **136.5**
11	11.75					.375 **45.55**		.937 **170.8**
12	12.75	.180 **24.20**	.250 **33.38**	.330 **43.77**	.406 **53.53**	.375 **49.56**	.562 **73.16**	1.031 **208.9**
14	14.0	.250 **36.71**	.312 **45.68**	.375 **54.57**	.437 **63.37**	.375 **54.57**	.593 **84.91**	1.218 **296.4**
16	16.0	.250 **42.05**	.312 **52.36**	.375 **62.58**	.500 **82.77**	.375 **62.58**	.656 **107.5**	
18	18.0	.250 **47.39**	.312 **59.03**	.437 **82.06**	.562 **104.8**	.375 **70.59**	.750 **138.2**	
20	20.0	.280 **42.73**	.375 **78.60**	.500 **104.1**	.593 **122.9**	.375 **78.60**	.812 **166.4**	
24	24.0	.250 **63.41**	.375 **94.62**	.562 **140.8**	.689 **171.2**	.375 **94.62**	.968 **238.1**	

LIGHT FIGURES **= Wall Thickness** **BOLD FIGURES = Weight per Foot**

COLUMN ASSEMBLY

LINESHAFT BOWL ASSEMBLY DIMENSIONS



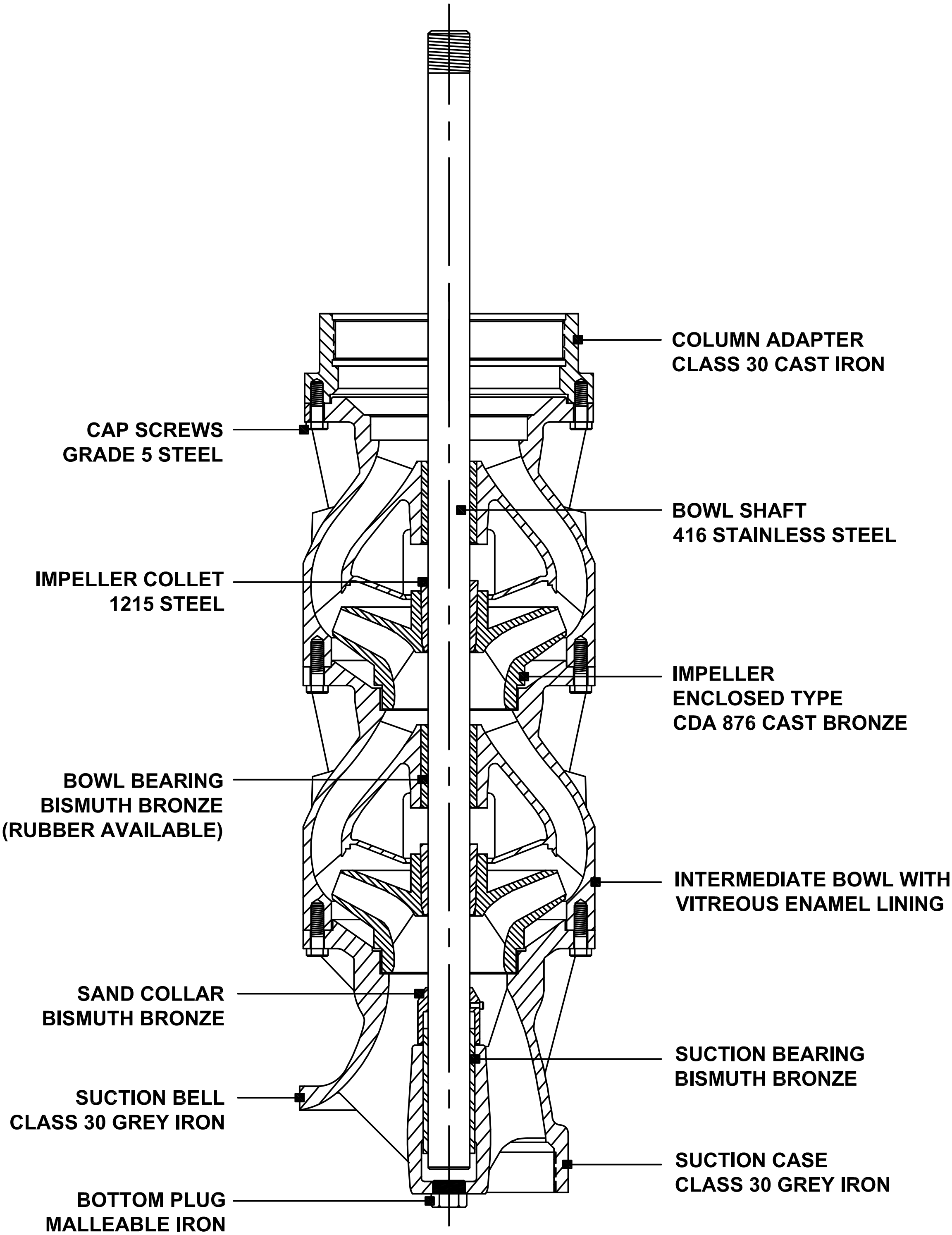
MODEL	A [9]	B	C	D	E	F	G	J	K	L	M	N	B.S. LGTH. P.L.	B.S. LGTH. O.L.
L6	5.50	N/A	3.75	4.75	N/A	N/A	2.69	3.19	N/A	3.00	3.38	N/A	27.19	N/A
M6	5.50 [6]	2.69	4.00	3.69	7.06	4.75	2.69	N/A	N/A	N/A	N/A	15.00	26.38	26.38
E6	5.63	3.94	6.19	3.69	7.06	4.75	2.69	N/A	N/A	N/A	N/A	17.19	28.57	29.82
H7	7.00 [7]	5.50	6.75	6.38	8.25	6.56	1.12	8.75	N/A	N/A	N/A	20.50	30.25	34.63
K8-SC	7.63	5.53	6.50	6.50	8.38	6.31	0.94	6.00	N/A	N/A	N/A	20.41	29.94	34.53
K8-SB	7.63	5.53	6.50	6.31	N/A	N/A	0.94	N/A	6.13	5.62	2.50	N/A	29.75	34.34
M8	8.13	5.53	7.25	6.31	8.38	6.31	1.12	6.00	6.13	5.62	2.50	21.16	30.68	35.09
J8	7.75	8.56	8.88	6.00	9.25	6.63	2.06	N/A	N/A	N/A	N/A	26.69	32.94	39.44
M9-SC	9.00	5.53	8.00	6.31	8.38	6.31	1.12	6.50	5.13	6.62	2.50	21.91	31.43	35.84
M9-BL	9.00	5.53	8.00	6.94	8.38	6.31	1.12	6.50	5.13	6.62	2.50	21.91	32.06	36.47
L10	9.83	N/A	6.50	6.61	N/A	N/A	1.43	4.00	N/A	4.13	3.75	N/A	30.54	N/A
M10	10.13	5.19	9.63	9.25	10.69	7.56	1.43	7.50	8.12	7.00	3.19	25.51	36.31	40.07
K10	9.75	5.50	8.88	9.25	8.19	10.06	1.56	8.50	8.12	7.00	3.13	22.26	35.69	39.63
H10-SC	9.75	5.19	9.63	6.44	8.19	7.56	1.43	8.50	N/A	N/A	N/A	23.01	33.50	37.26
H10-BL	9.75	5.19	9.63	9.25	8.19	7.56	1.43	8.50	N/A	N/A	N/A	23.01	36.31	40.07
J10	9.63	5.19	9.75	6.31	8.19	7.56	1.56	8.50	N/A	N/A	N/A	23.13	33.62	37.25
E10	9.75	5.19	9.63	6.50	8.19	9.44	1.43	10.62	N/A	N/A	N/A	23.01	33.56	37.32
J11-SC	11.13	6.81	9.88	8.44	10.00	9.44	1.56	10.75	N/A	N/A	N/A	26.69	35.88	41.13
J11-BL	11.13	6.81	9.88	9.69	N/A	N/A	1.56	10.75	10.06	7.25	3.75	N/A	37.13	42.38
M12-SC	12.13	6.94	11.31	9.92	11.38	8.72	1.56	8.00	N/A	N/A	N/A	29.63	38.79	44.17
M12-BL	12.13	6.94	11.31	9.56	N/A	N/A	1.56	8.00	10.06	7.25	3.75	N/A	38.43	43.81
E12	11.62	4.56	10.50	9.56	10.88	9.44	1.56	8.25	10.06	7.25	3.50	25.94	37.62	40.62
K12-SC	11.50	6.06	10.50	9.92	10.88	9.44	1.31	8.25	N/A	N/A	N/A	27.44	37.73	42.48
K12-BL	11.50	6.06	10.50	9.56	N/A	N/A	1.31	8.25	10.06	7.25	3.50	N/A	37.37	42.12
H12	11.63	6.06	12.50	10.94	12.50	11.25	1.31	13.50	N/A	N/A	N/A	31.06	40.75	45.50
J12	11.75	5.81	12.38	8.12	10.00	11.25	1.63	N/A	N/A	N/A	N/A	28.44	38.13	42.31
M14	14.13	5.44	13.25	8.12	10.00	11.25	0.56 [8]	7.25	12.06	6.88	2.75	28.69	37.93	42.81
H14	14.13	6.44	14.13	9.12	12.25	11.25	0.56 [8]	8.75	12.06	7.38	2.81	32.82	39.81	45.69
H16	15.63	6.44	14.69	11.00	N/A	N/A	1.81	12.00	15.97	9.97	2.26	N/A	CF	CF
E18	17.50	6.44	15.00	11.25	N/A	N/A	0.81	11.25	14.13	10.25	2.50	N/A	43.06	48.69
K20	19.25	6.44	18.25	11.75	N/A	N/A	1.81	11.25	13.88	10.50	3.25	N/A	47.81	52.44
H24	23.25	10.50	21.75	15.00	N/A	N/A	0.81	11.75	15.25	11.75	5.63	N/A	53.56	63.25

NOTES
1. 7" & 16" REPRESENTS National Pump standard stick-up.
2. Threaded suction/strainer engagement per ASA B2.1 (L1+L2)
3. All dimensions are rounded off to a 2 place decimal.
4. B.S. Lgth. (Bowl Shaft Length) given is for single stage pumps only. For each additional stage, add one "C" dimensions.
5. Use discharge case dimension for oil lube pumps (O.L.). Use column adapter dimensions for product lube pumps (P.L.).
6. Dimension shown for threaded bowl, flanged bowl has a dimension of 7.00.
7. Dimension shown for 5" suction/discharge case, 6" suction/discharge case has a dimension of 7.25.
8. Dimension shown for 10" discharge, 12" discharge has a dimension of 1.81.
9. Refer to the suction strainer dimension page for information on the suction strainer diameter. The diameter of the strainer is typcially larger than the dimension "A" listed above.

BOWL ASSEMBLY

PRODUCT LUBRICATED

OPEN LINESHAFT, FLANGED CONSTRUCTION



STANDARD MATERIALS OF CONSTRUCTION: Cast iron enameled bowls, bronze impellers, steel collets, 416 stainless steel bowl shaft, bronze bearings.

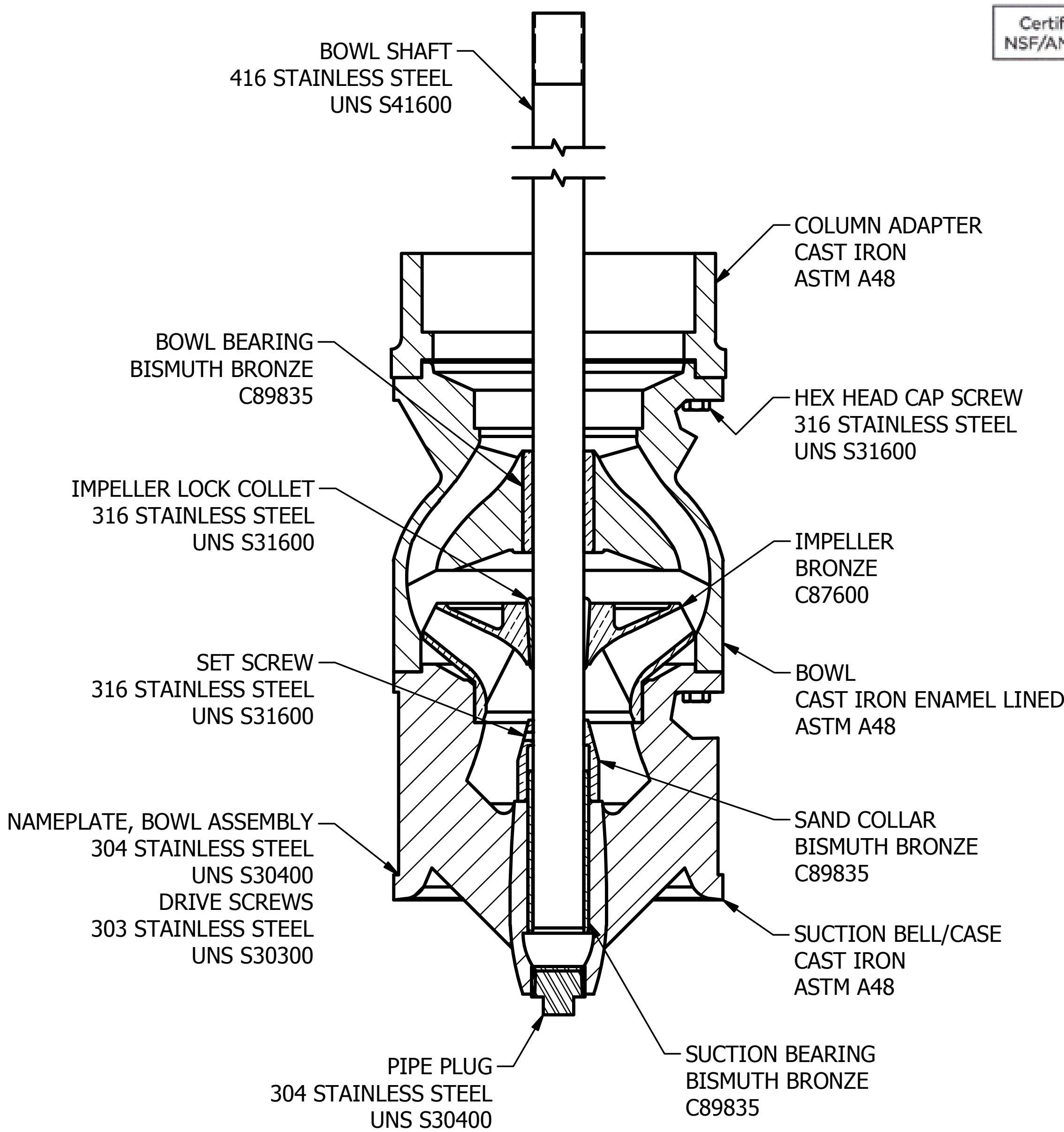
ALTERNATE MATERIALS AVAILABLE

BOWL ASSEMBLY

NSF61 CERTIFIED - PRODUCT LUBRICATED

OPEN LINESHAFT, FLANGED CONSTRUCTION

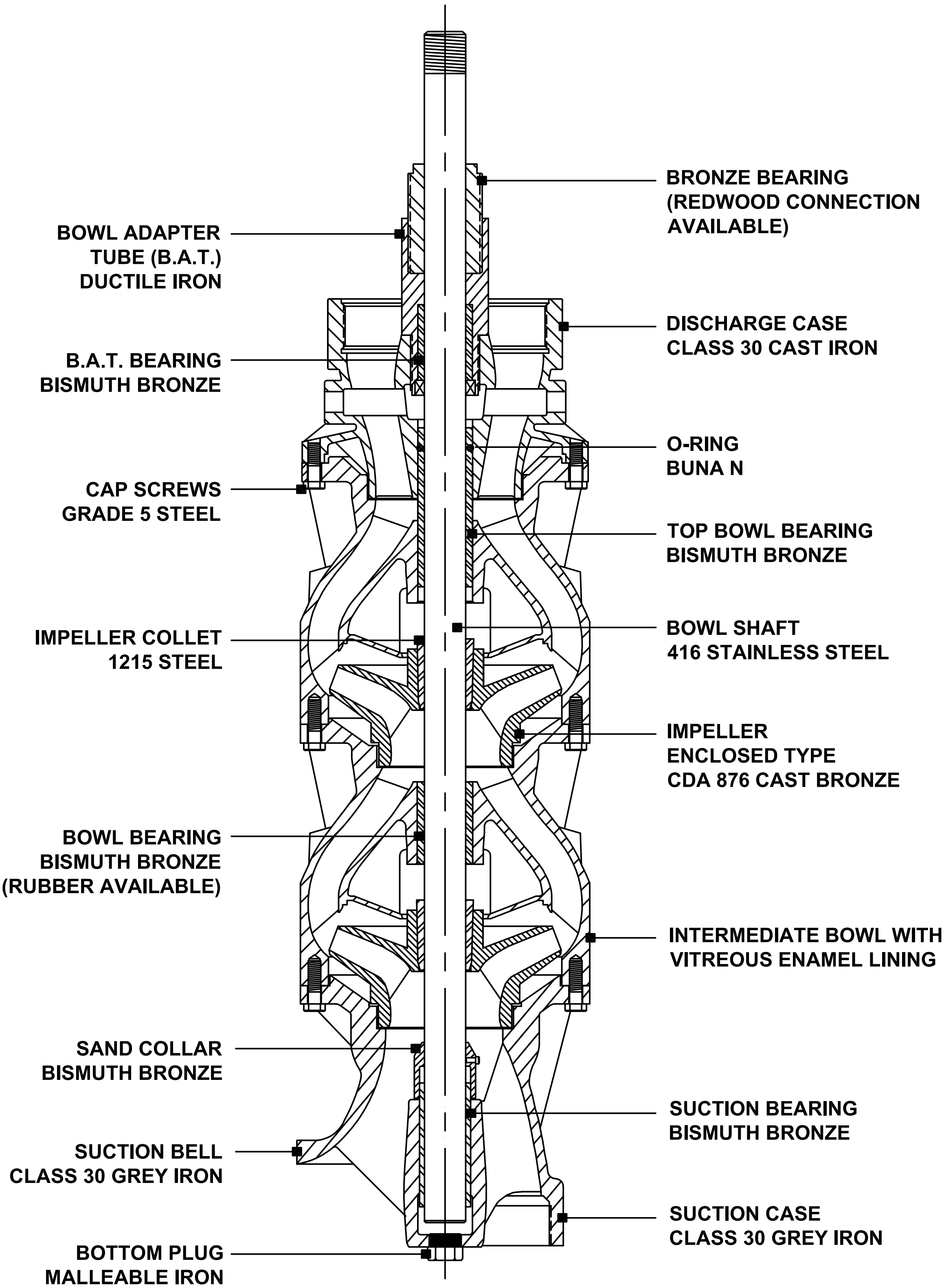
Certified to NSF/ANSI 61-G



NSF 61 LISTING INFORMAITON:
PRODUCT TYPE: SUBMERSIBLE PUMP - PUMP ENDS
TRADE DESIGNATION: SUBMERSIBLE BOWL ASSEMBLY (W)(XX)(Y)(Z)
- W: HYDRAULIC DESIGN (M, K, J, E, H)
- XX: SIZE, IN INCHES (6, 8, 9, 10, 11, 12, 14, 16, 18, 20, 24, 30)
- Y: DROP-IN BEARING RETAINERS & BEARINGS (4, 6, 8, 10, 12) - COLUMN SIZE
- Z: COATING OPTIONS (C, U)

ALTERNATE MATERIALS NOT AVAILABLE

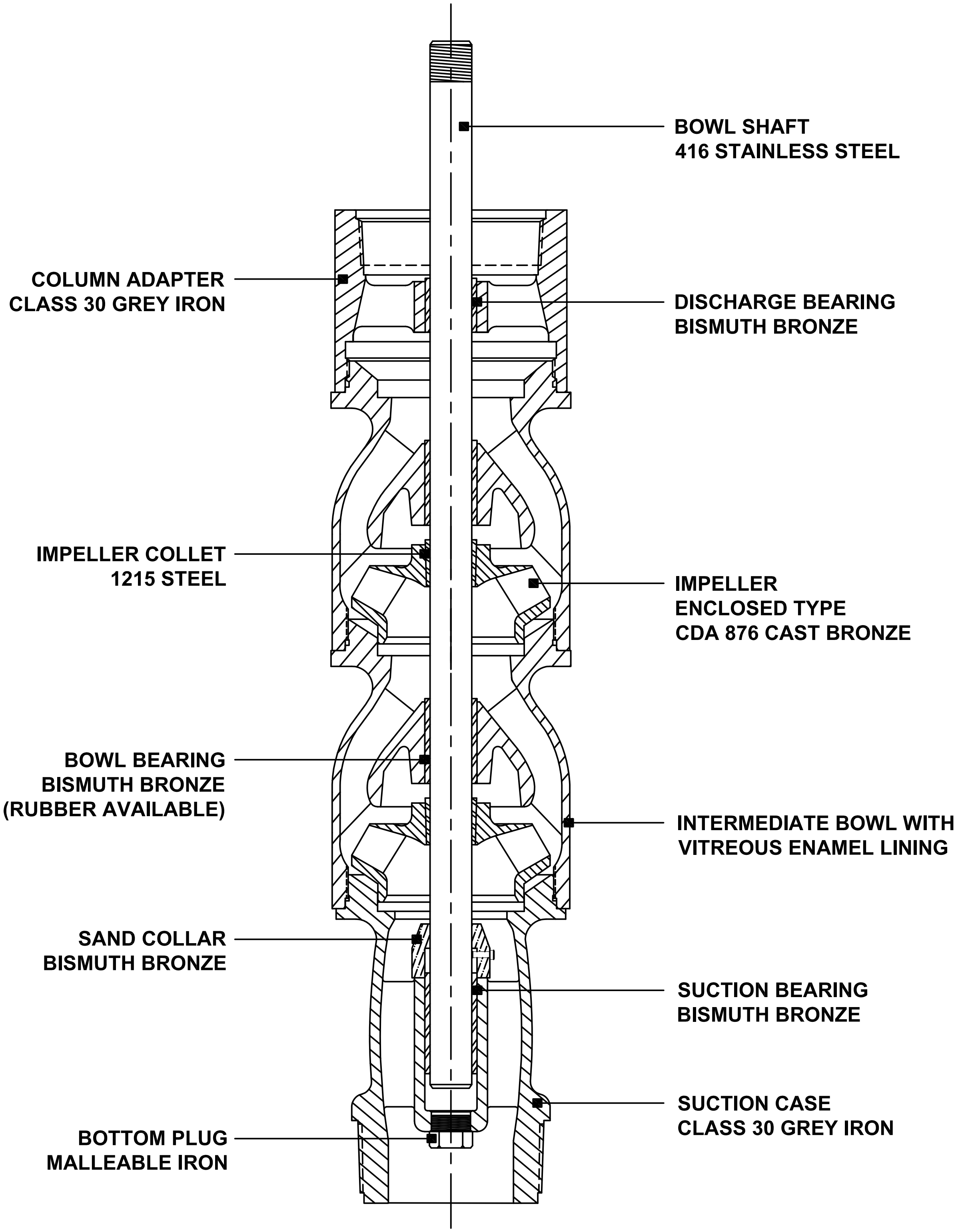
BOWL ASSEMBLY
OIL LUBRICATED
ENCLOSED LINESHAFT, FLANGED CONSTRUCTION



STANDARD MATERIALS OF CONSTRUCTION: Cast iron enameled bowls, bronze impellers, steel collets, 416 stainless steel bowl shaft, bronze bearings.

ALTERNATE MATERIALS NOT AVAILABLE

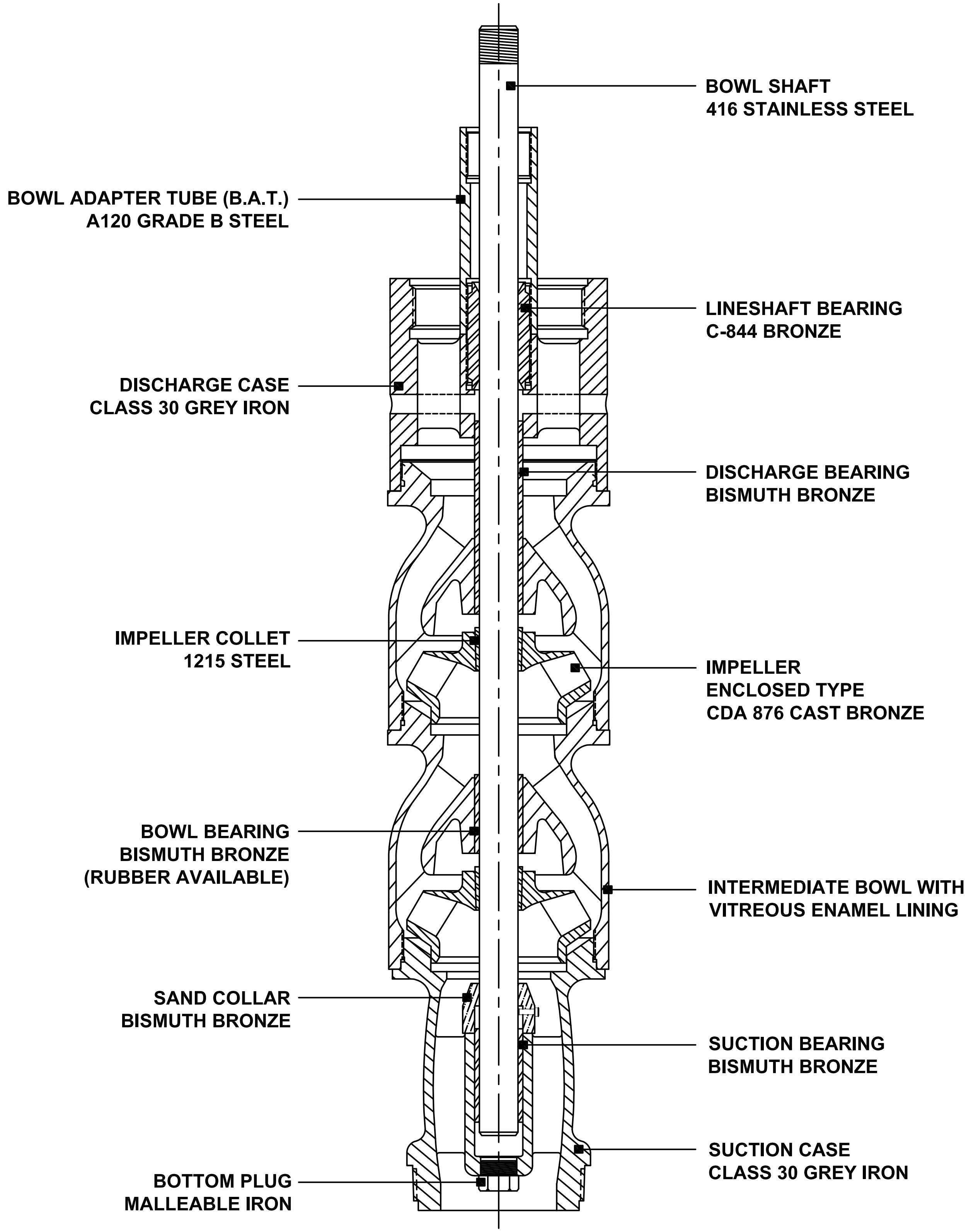
BOWL ASSEMBLY
PRODUCT LUBRICATED
OPEN LINESHAFT, THREADED CONSTRUCTION



STANDARD MATERIALS OF CONSTRUCTION: Cast iron enameled bowls, bronze impellers, steel collets, 416 stainless steel bowl shaft, bronze bearings.

ALTERNATE MATERIALS AVAILABLE

BOWL ASSEMBLY
OIL LUBRICATED
ENCLOSED LINESHAFT, THREADED CONSTRUCTION



BOWL ASSEMBLY

STANDARD MATERIALS OF CONSTRUCTION: Cast iron enameled bowls, bronze impellers, steel collets, 416 stainless steel bowl shaft, bronze bearings.

ALTERNATE MATERIALS AVAILABLE

SPECIAL BOWL ASSEMBLY MATERIALS

STANDARD CLASSIFICATION	MATERIALS						
	BOWL	IMPELLER	BOWL SHAFT	COLLET	BEARING	B.S. CPLG.	BOLTING (1)
STD. BRONZE FITTED	CL. 30 C.I.E.	CDA876 BRONZE	416 S.S.	STEEL	BISMUTH BRONZE	STEEL	STEEL
ALL IRON	CL. 30 C.I.E.	CL. 30 C.I.	416 S.S.	STEEL	C.I.	STEEL	STEEL
IRON-316 S.S. TRIM	CL. 30 C.I.E.	CL. 30 C.I.	316 S.S.	316 S.S.	C.I.	316 S.S.	316 S.S.
CLASS 45 C.I.-BRONZE FITTED	CL. 45 C.I.	CDA876 BRONZE	416 S.S.	STEEL	BISMUTH BRONZE	STEEL	STEEL
DUCTILE IRON-BRONZE FITTED	DUCTILE IRON	CDA876 BRONZE	416 S.S.	STEEL	BISMUTH BRONZE	STEEL	STEEL
STEEL-BRONZE FITTED	STEEL	CDA876 BRONZE	416 S.S.	STEEL	BISMUTH BRONZE	STEEL	STEEL
CDA876 BRONZE	CDA876 BRONZE	CDA876 BRONZE	416 S.S.	416 S.S.	BISMUTH BRONZE	416 S.S.	303 S.S.
SAE 63 ZINCLESS BRONZE	SAE 63 BRONZE	SAE 63 BRONZE	316 S.S.	316 S.S.	BISMUTH BRONZE	316 S.S.	316 S.S.
TYPE II NI-RESIST	NI-RESIST	NI-RESIST	316 S.S.	316 S.S.	BISMUTH BRONZE	316 S.S.	316 S.S.
316 S.S.	316 S.S.	316 S.S.	316 S.S.	316 S.S.	CARBON GRAPHITE	316 S.S.	316 S.S.
#20 S.S.	#20 S.S.	#20 S.S.	#20 S.S.	#20 S.S.	CARBON GRAPHITE	#20 S.S.	#20 S.S.

1. M6, E6 and J8 bowls are threaded construction only for standard construction. NOTE: E6 and J8 bowl assemblies are available in standard threaded construction. M6 bowl assembly is available in threaded and flanged construction (Flange Diameter is 7.25”).
2. When pressure exceeds standards listed on Bowl Assy., Page 34, double bolting will be required. Also, “O” ring construction is recommended when pressure exceeds 250 P.S.I. or lower for certain materials. Contact factory.
3. When special materials are used, see Special Material Pressure Ratings on Page 35.
4. Special materials change performance. Refer to correction factor chart, Page 109.
5. Bowl shaft material and/or diameter may have to be changed to obtain adequate H.P. carrying capacity. Contact factory.
6. Contact factory for all special material requirements.

PERFORMANCE MULTIPLIERS FOR SPECIAL BOWL ASSEMBLY MATERIALS

MODEL	BOWLS ONLY			IMPELLERS ONLY (1)		
	C.I. NO ENAMEL	ANY BRONZE	STEEL NI-RESIST ST. STEEL	C.I. ENAMEL HEAD & GPM ONLY (2)	C.I. NO ENAMEL	STEEL NI-RESIST ST. STEEL
L6LC	.95	.97	.95	.91	.91	.90
M6LC	.95	.97	.95	.91	.91	.90
M6MC-M6HC-E6XHC	.96	.97	.95	.93	.95	.91
H7XLC-H7HC	.96	.97	.96	.93	.94	.93
H7LC-M8XLC-K8LC-K8HC	.97	.98	.97	.93	.96	.95
M8MC-M8HC	.97	.98	.97	.93	.97	.95
H7XHC-M8XHC-J8XHC	.98	.98	.98	.94	.97	.97
M10LC-M10HC-M9MC	.98	.98	.98	.94	.97	.96
H10MC-H10HC-J10HC	.98	.99	.98	.94	.98	.97
M11LC-M11MC M11HC-J11LC-J11MC-J11HC	.98	.99	.98	.95	.98	.98
M12LC-M12MC M12HC-E12LC-E12XMC-E12MC-E12HC	.98	.99	.98	.95	.98	.97
E10HC-H12MC H12HC-J12XHC-K12HC	.99	.99	.99	.96	.98	.98
M14MC-M14HC M14XHC-M14XXHC	.99	.99	.98	.97	.99	.97
H14MC-H14XHC-E18LC-E18HC	.99	.99	.99	.97	.99	.98
K20LC-K20MC-K20HC	.99	.98	.99	1.00	1.00	.98
H24LC-H24MC-H24XHC	1.00	.99	.99	1.00	1.00	.98

1. No change in performance with any type bronze impeller.
2. No efficiency change with cast iron enameled impeller.

Example: Peak bowl performance of M12MC - 1770 RPM - full diameter impeller in standard materials is 925 GPM - 73 feet head - 82% - 1.0 specific gravity.

To correct for stainless steel bowl and impeller:

925 x .98 x .97 = 879 S.S. GPM
73’ x .98 x .97 = 69.4 S.S. Head
82% x .98 x .97 = 77.9 S.S. Eff. (minus staging deduct)

LINESHAFT AND SUBMERSIBLE PERFORMANCE TEST & SERVICES

1. Performance tests are performed with customer's bowl assembly (provided pump shaft has National standard shaft threads and projection). Test will cover normal operating range utilizing laboratory short column, laboratory discharge head and laboratory driver (motor - 3 phase, 60 hertz and 230/460). The test will be in accordance with Hydraulic Institute or API standards and (AWWA E103).

2. Pump test set-up and duration longer than one hour may be possible.

3. Witness test by customer permitted. Witness test by independent witness or impartial witness also permitted.

4. Included are five copies of the test results. Additional copies available.

5. Additional tests that can be performed (refer to factory for full details): (A) Test with job motor, (1000 HP capacity); (B) Test bowl assembly with shaft threads and projection different than National standard; (C) Test complete pump unit; (D) Test NPSH; (E) Test mechanical run; (F) Test vibration.

6. Factory start-up or installation supervision available.

TEST FACILITIES LIMITATIONS
MAXIMUM HORSEPOWER AVAILABLE WITH LABORATORY TEST MOTORS

RPM	3600	1800	900
HORSEPOWER	100	350	450

RPM	3600
HORSEPOWER/SUBMERSIBLE	100

7. Pumps sold at 50 hertz speed will be tested at 60 hertz and test data converted to job speed.

MAXIMUM RATE OF FLOW (Capacity) AND HEAD

Rate of Flow U.S.G.P.M.	13,000
Head in Feet	1,664

8. Rate of flows shown are maximum for flow meters.

ELECTRICAL POWER

Voltage - Phase (∅)	230 - 3	460 - 3	4160 - 3
Maximum Horsepower	75	600	1000

SUPPORT EQUIPMENT

Overhead crane........................ 7 ton capacity and 21 foot hook lift above the floor.
Test sump .... Concrete pit 18 feet x 45 feet x 16 feet deep.
Two deep wells......................... Two - 60" dia. x 35' deep wells

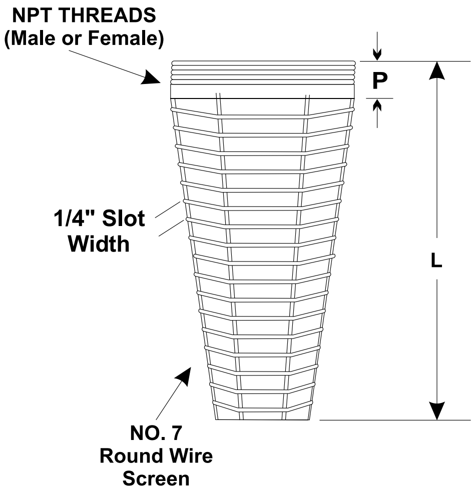
MEASUREMENT EQUIPMENT

Head .... Bourdon tube type gauges - dead weight calibration.
Rate of Flow (capacity).............. Magnetic flow meters.
Speed .... Electronic counter.
Power .... Calibrated factory test motors.

9. When the horsepower, rate of flow, or pressure exceed test facility limits, a test at reduced speed or reduced number stages will be performed.

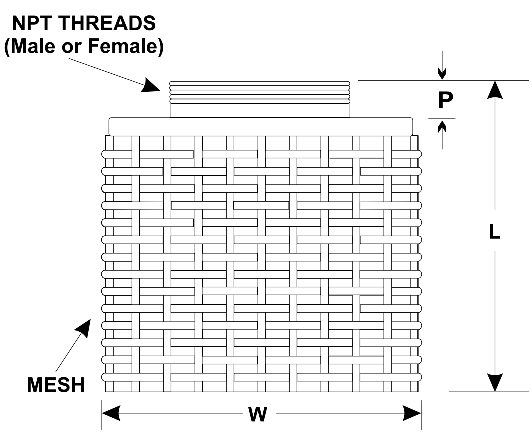
10. Special consideration must be given to pumps sold on services with LESS than 1.0 specific gravity when tested with water at 1.0 specific gravity.

DIMENSIONS
SUCTION STRAINERS



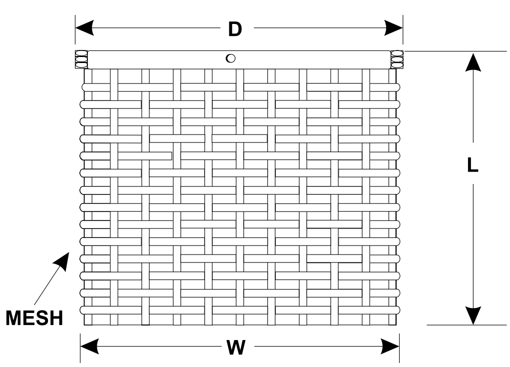
CONE TYPE STRAINER

PIPE SIZE	LENGTH L	NIPPLE OR COUPLING P	APPROX. NET OPENING AREA	WT. LBS.
2-1/2	11-1/4	1-1/2	20 Sq. In.	4
3	11-1/4	1-1/2	30 Sq. In.	4
4	11-1/2	1-3/4	50 Sq. In.	5-1/2
5	12-3/4	2	80 Sq. In.	10
6	15-3/4	2	115 Sq. In.	14
8	22-1/4	2-1/4	200 Sq. In.	26
10	30	3	315 Sq. In.	45
12	32-1/2	3	455 Sq. In.	50
14	41-1/2	3	720 Sq. In.	70



THREADED BASKET TYPE STRAINER

PIPE SIZE	LENGTH L	NIPPLE OR COUPLING P	OUTSIDE DIA. W	APPROX. NET OPENING AREA	WT. LBS.
2-1/2	6	3	6	104 Sq. In.	4-3/4
3	6	3	6	104 Sq. In.	5
4	7	3	8	178 Sq. In.	7-1/2
5	8	3	10	277 Sq. In.	12-1/2
6	9	3	10	307 Sq. In.	13
8	11	3	12	468 Sq. In.	21-1/2
10	13	3	18	959 Sq. In.	42
12	16	4	18	1017 Sq. In.	50
14	16	4	20	1234 Sq. In.	63



MATERIALS AVAILABLE:
Galvanized, 304 S.S., 316 S.S., Brass and Zincless Bronze

BOLT-ON BASKET TYPE STRAINER USED WITH SUCTION BELL

BOWL	LENGTH L	OUTSIDE DIA. W	D ACROSS CAP SCREWS	APPROX. NET OPENING AREA	WT. LBS.
L6	PLEASE CONSULT FACTORY				
K8, M8 - M9	6	8-3/4	9-3/4	210 Sq. In.	8-1/2
M10, H10	8	10-3/4	11-3/4	345 Sq. In.	10
J11, M11	10	11-5/8	12-5/8	370 Sq. In.	10-3/4
M12, E12, K12	10	13-1/8	14-1/8	515 Sq. In.	17
H14 & M14	12	14-3/4	15-3/4	710 Sq. In.	21
E18 & K20	14	18-1/8	21-1/2	1270 Sq. In.	40
H24	16	26	27	1420 Sq. In.	45

MESH SIZE AVAILABLE

Mesh - Inches	1/4	3/8	1/2	3/4	1	1-1/2
Gauge of Wire	14	14	14	13	10	10

NOTE: “Mesh” is the term used to describe the distance from the center of one wire to the center of the next.
ALL DIMENSIONS ARE IN INCHES. DO NOT USE FOR CONSTRUCTION UNLESS CERTIFIED.

TRIMMING IMPELLERS
LINESHAFT TURBINE PUMP

It is sometimes necessary to trim impellers to meet design conditions. This is usually not required with the smaller units since the head developed per stage is not high, and it is usually possible to choose a number of stages that will approximately equal or exceed the design conditions. However, the larger pumps have higher heads per stage so it is sometimes necessary, or desirable to modify the impellers by trimming to reduce the head or horsepower developed by each stage.

The exact trim diameters for new units should always be provided by the factory engineering department, who will have available tests of units with similarly trimmed impellers. The following is presented as general information and will provide good results for field trimming, if necessary, providing the amount of trim does not exceed those listed on the published curve. The factory will need design head, capacity, and driver horsepower along with any limitations or special requirements to provide units with impellers properly trimmed (if required).

In general, at a given speed, the capacity pumped by a specific impeller is dependent principally on the width of the blades, or vanes, while the Head generated depends upon the outer diameter of the impeller. It is not practical to alter the width, but, within reasonable limits, the diameter may be trimmed to reduce the head generated.

The effect of changing the outer diameter is to decrease the peripheral speed of the impeller, and that has exactly the same effect as reducing the rotative speed without altering the diameter; the effect is to change the head generated in proportion to the square of the speed, or the square of the diameter, according to the fundamental formula:

$$V^2 = 2GH$$

G = gravity = 32.2 feet per second
H = the head generated, in feet

However, when the peripheral speed is changed, the velocity of the fluid flowing through the impeller is also changed, in direct proportion, and that changes the quantity of fluid delivered, so both changes must be considered when trimming an impeller.

There is still a third factor to be considered. Assuming there is not a major change in the speed, with the capacity in direct proportion to the diameter, and the head in proportion to the square of the diameter, the work done, which is the power required, will be the product of the two, which is in proportion to the cube of the diameter.

EXAMPLE

An impeller of 11.563 diameter is rated to deliver 1600 GPM at 100 foot head, and requires 48 BHP to drive it. (Data taken from catalog curve). What will be the effect of changing the diameter to 11.000 inches?

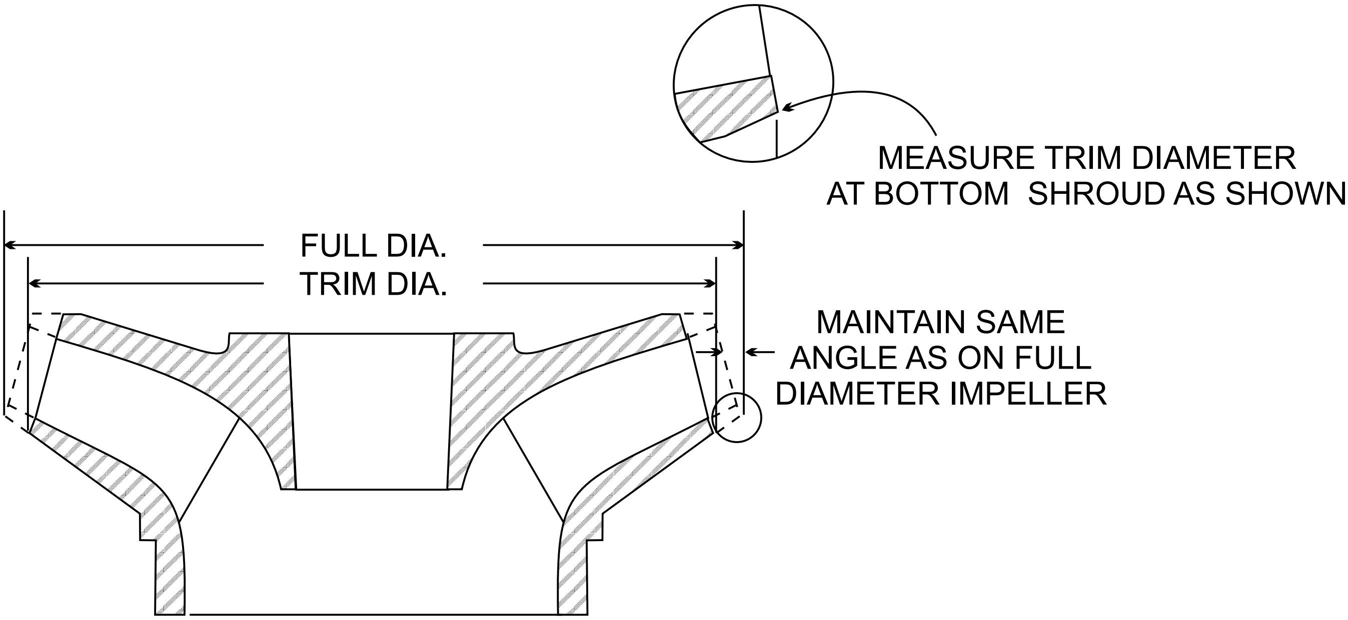
MODEL M14MC

The direct ratio of diameters will be:	$\frac{11.000}{11.563}$	=	.951
The trimmed capacity will be:	.951 x 1600	=	1522 GPM
The square of the ratio will be:	.951 x .951	=	.904
The trimmed head will be:	.904 x 100	=	90 feet
The cube of the ratio will be:	.951 x .951 x .951	=	.860
Trimmmed power will be:	.860 x 48	=	41 BHP

The efficiency is still another factor to be considered, but it is not seriously altered for small changes in diameter.

On multistage units it is necessary to figure one impeller only, then multiply its new head by the number of stages, for the entire pump. The capacity, and efficiency, however will be as calculated for the single impeller (corrected for number of stages as indicated on catalog curve) as all will perform the same in series.

The procedure applies in the same way to semi-open and enclosed impellers.



HOW PUMP PERFORMANCE IS AFFECTED BY IMPELLER TRIMMING AND VANE TIP FILING

When the head and capacity of a pump are to be reduced, the usual procedure is to reduce the impeller diameter. This is commonly called trimming or cutting the impeller. The performance of a trimmed impeller can be approximated by the affinity laws. These laws state: (a) capacity varies as the diameter ratio; (b) developed head varies as the diameter ratio squared; (c) brake horsepower varies as the cube of the diameter ratio; and (d) efficiency remains approximately constant, though BEP (Best Efficiency Point) moves in position approximately as capacity changes.

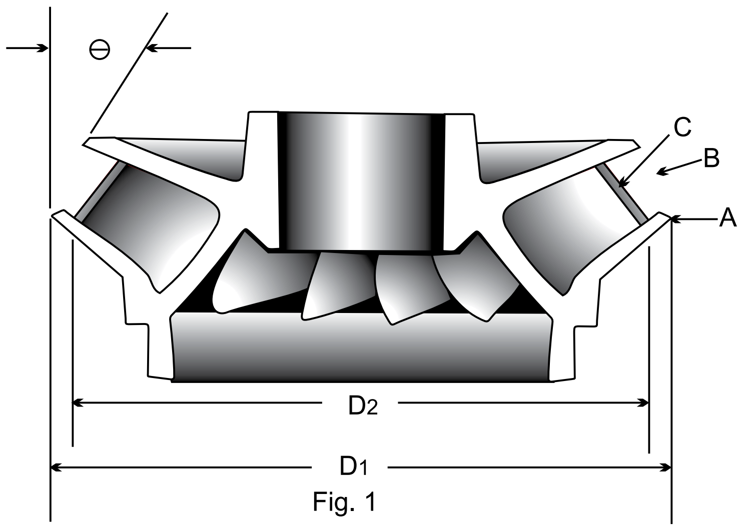


Fig. 1

In Fig. 1, D_1 represents a full diameter impeller and D_2 the diameter of a trim, thus the ratio of the diameters is $\frac{D_2}{D_1}$. Since capacity varies as the diameter ratio, the new capacity Q2 = Q1 $\left(\frac{D_2}{D_1}\right)$

The new head, $H_2 = H_1 \left(\frac{D_2}{D_1}\right)^2$; and $HP_2 = HP_1 \left(\frac{D_2}{D_1}\right)^3$

For smaller diameter reductions, the efficiency will remain nearly constant. For greater trims, a reduction in efficiency will result. This is caused by several factors. (1) Generally the impeller vane tapers in cross-section toward its outer tip. As the impeller is cut, blunt vane tips result which cause greater turbulence as the fluid leaves the discharge openings. This condition can be largely eliminated by proper filing of the vane tips as will be discussed later. (2) A trimmed impeller leaves a longer path for the fluid to travel between the impeller vane and the bowl vane. This also results in greater turbulence which means loss of power and consequently lower efficiency. (3) Another reduction in efficiency results from mechanical losses. The bearing and packing box losses remain the same while power output is reduced as the cube of the diameter ratio.

While the affinity laws closely approximate "trimmed" performance certain factors are present which account for the deviation. For impeller types as show in Fig. 1 the diameter is measured at the lower shroud, point A. The effective diameter could be said to be between the upper and lower shrouds, on point B. Using this theory, the affinity laws would be based on the diameters at points B & C. This method would not be recommended however, as obviously it would be difficult to measure, especially with impellers having an odd number of vanes.

It should be brought out that the machine angle O (Fig. 1) of the impeller discharge will affect pump performance. An increase in this angle will produce results similar to a trim even though the diameter D1 is held constant. At the factory this angle is usually held constant as the diameter is reduced.

Another factor which also accounts for inaccuracy is the reduction of vane overlap (also called solidity) with trimming. As the diameter is reduced, the sweep angle of the vane is reduced. This effectively reduces the water guidance as it travels through the impeller resulting in reduced performance.

In summary, small impellers do not trim as far proportionally as do the larger ones. However, since most small pumps are multistaged, it is seldom necessary to trim these impellers severely. Also all impeller types do not trim similarly. Only by a series of tests in a closely controlled laboratory test with successive trims can reliable information be accumulated. It is from such data as this used for a reference, that proper selections are made on each other as it reaches the factory.

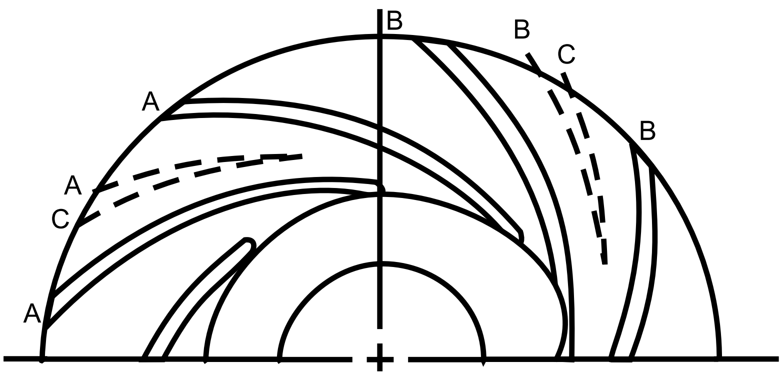


Fig. 2

Pump performance is also affected by the filing at the tip of the vane. For any pump type, high capacity impellers will usually have more vanes than low capacity impellers, and since the former had a lesser sweep angle, the relative path C (Fig. 2) will be more nearly radial. In (Fig. 2) A represents "under-filing" when B represents "top-filing". The effect of underfiling is to move the relative path toward A' or to increase the head. Under-filing in general will tend to increase the efficiency or to minimize the efficiency reduction resulting from trimming.

Top-filing of the vane acts to move the relative path toward B and to depress the head. This type of filing is not used too frequently, and should be done with extreme caution as performance is unpredictable if not based on laboratory performance tests.

Examining new impellers will more clearly show the physical features of underfiling. Again it should be emphasized that the true performance from diameter reductions and vane tip filing can only be accurately obtained in a test laboratory.

SPEED CHANGES

Pumps are quite often driven by devices which operate at speeds other than those of the published catalog curves or are capable of operating at different speeds. Variable speed electric motors, engines and turbines are examples. Catalog performance curves are usually published at standard electric motor operating speeds and therefore it is sometimes necessary to calculate the performance of pumps at speeds other than published.

The effect of trimming impellers (reducing the outside diameter of the impeller) and the effect of reducing (or increasing) the operating speed (RPM) is the same. Therefore, the following rules outline the change in performance when the operating speed is changed:

1. The capacity varies in direct proportion to the speed.
2. The head varies in direct proportion to the square of the speed.
3. The horsepower required varies in direct proportion to the cube of the speed.

EXAMPLE:

An impeller operating at 1760 RPM is rated to deliver 1600 GPM at 100 foot head, and requires 48 BHP to drive it (Data taken from catalog curve Model M14MC). What will be the effect of changing the speed to 1160?

The direct ratio of speeds will be:	$\frac{1160}{1760}$	=	.659
1160 RPM capacity will be:	.659 x 1600	=	1057 GPM
The square of the ratio will be:	.659 x .659	=	.434
1160 RPM head will be:	.434 x 100	=	43.4 feet
The cube of the ratio will be:	.659 x .659 x .659	=	.286
1160 RPM power will be:	.286 x 48	=	13.7 BHP

The efficiency is still another factor to be considered, but it is not seriously altered for small changes in speed. If the above pump had an efficiency of 84% at 1600 GPM when operating at 1760 RPM, the efficiency would still be approximately 84% at 1055 GPM when operating at 1160 RPM.

NOTES

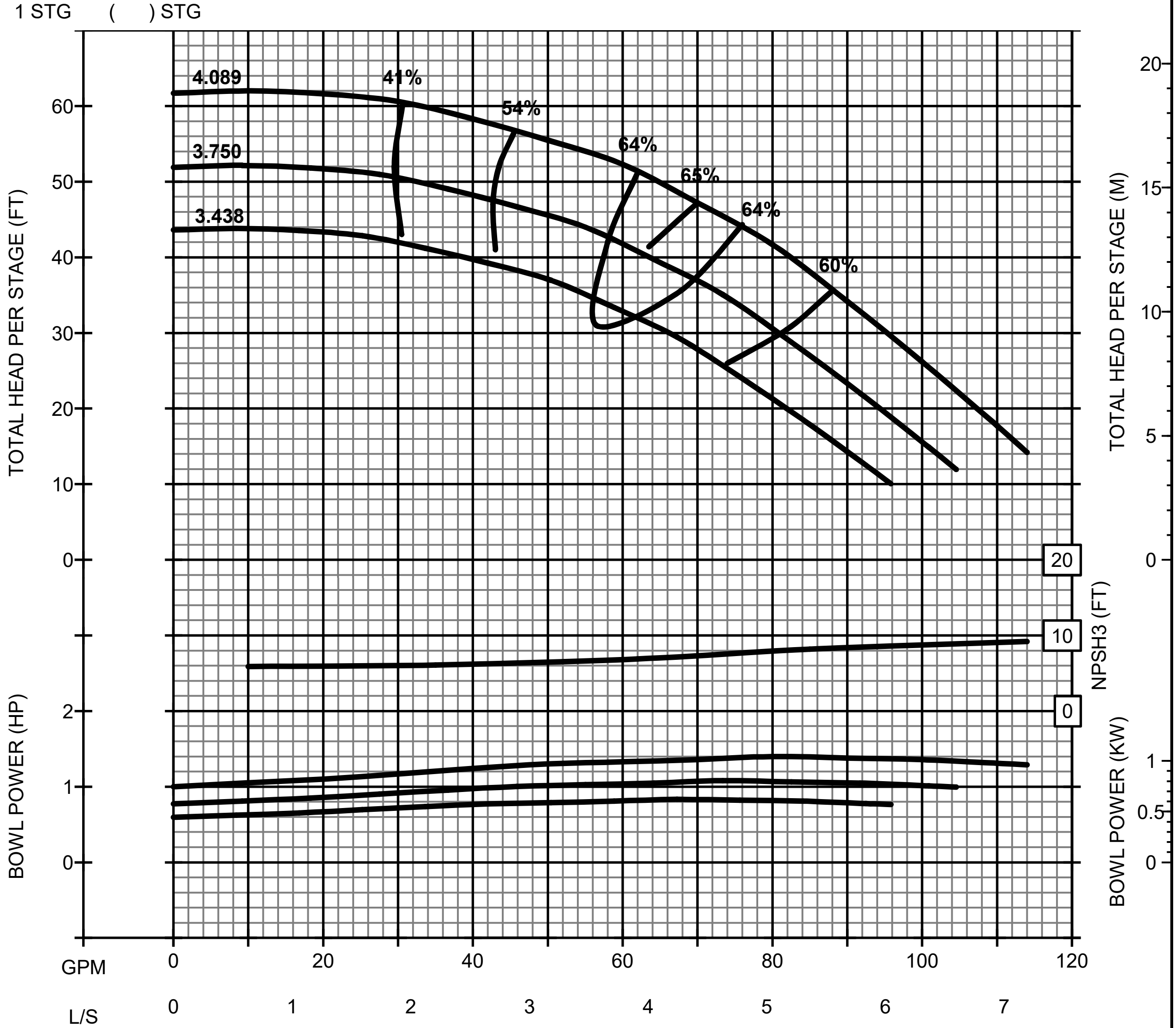
BOWL ASSEMBLY

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	L6LC 3540 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	3	4	
	NUMBER OF POINTS	-2	-1	0	

DESIGN	GPM	TDH	HP	EFF

1 STG ( ) STG

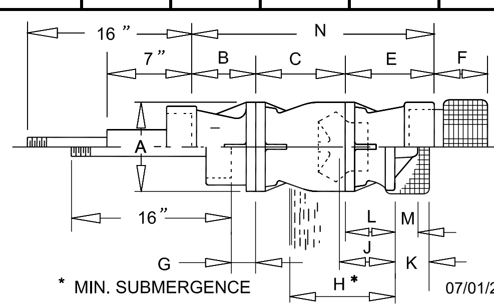


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	5.50	N/A	3.75	N/A	N/A	2.69	8.00	3.19	N/A	3.00	3.38	12.81

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	4"
THRUST CONSTANT:	1.20	SUCTION SIZE:	BELL
LATERAL (STD):	0.19	STD. TUBE:	N/A
EYE AREA IN^2:	5.38	WR^2 LB-FT^2:	0.14
SHAFT DIA:	1.0	1ST STG WT LB: 46	ADD STG WT LB: 16

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVL6LC2P6CY

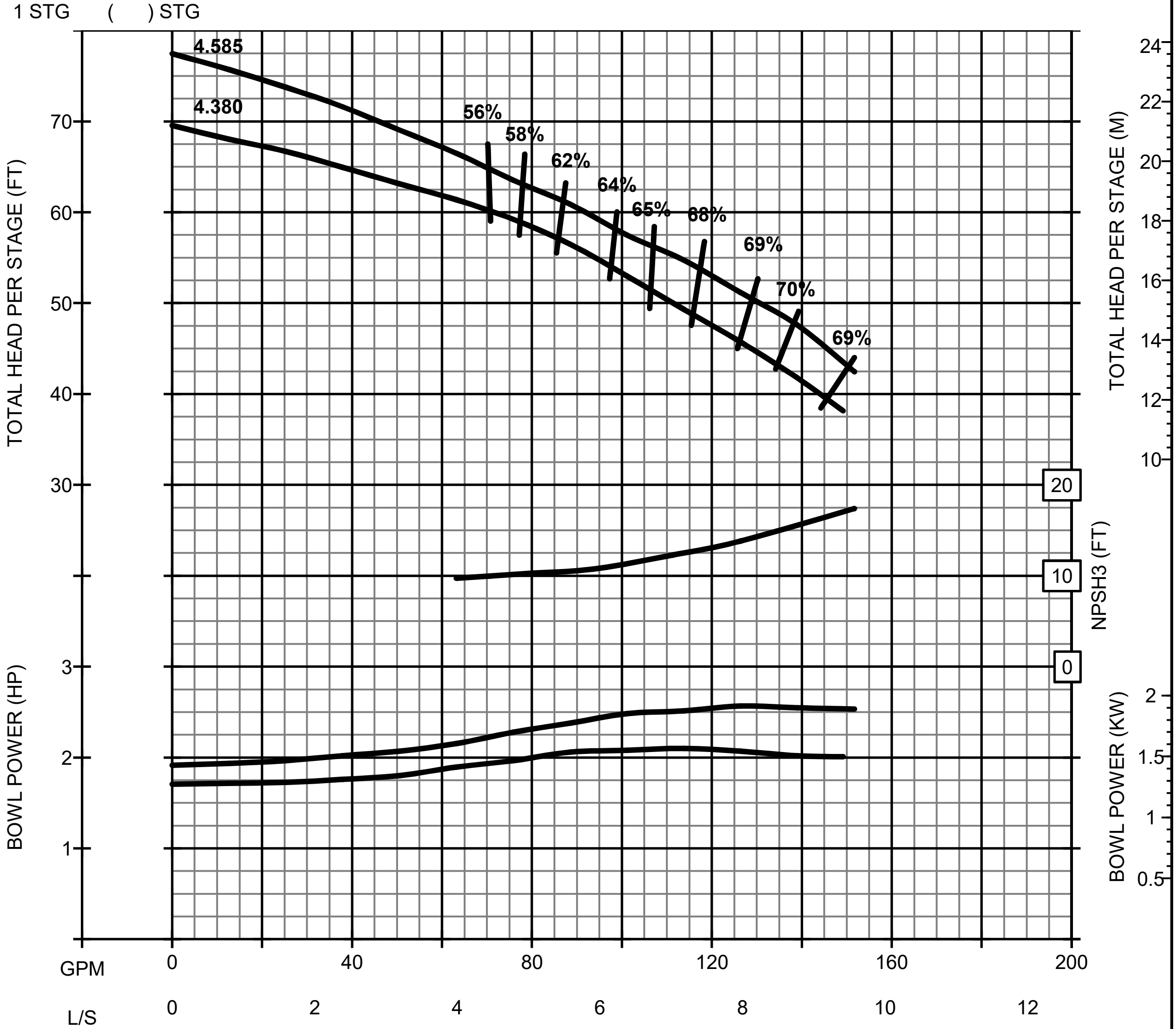
CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	# M6LC 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	3	4						
	NUMBER OF POINTS	-2	-1	0						

1 STG ( ) STG

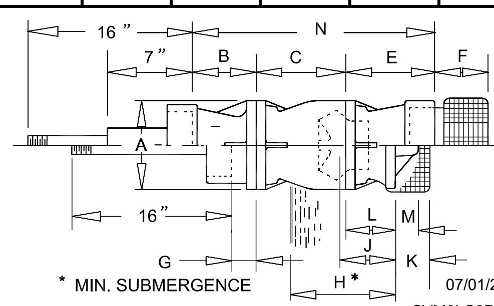


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	5.50	3.94	4.00	7.06	6.00	2.19	12.00	N/A	N/A	N/A	N/A	15.00

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	THREADED
NO. OF VANES:	5	DISCHARGE SIZE:	4"
THRUST CONSTANT:	2.3	SUCTION SIZE:	4"
LATERAL (STD):	0.19	STD. TUBE:	1.5"
EYE AREA IN²:	3.82	WR² LB-FT²:	0.14
SHAFT DIA:	1.00	1ST STG WT LB: 46	ADD STG WT LB: 16

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

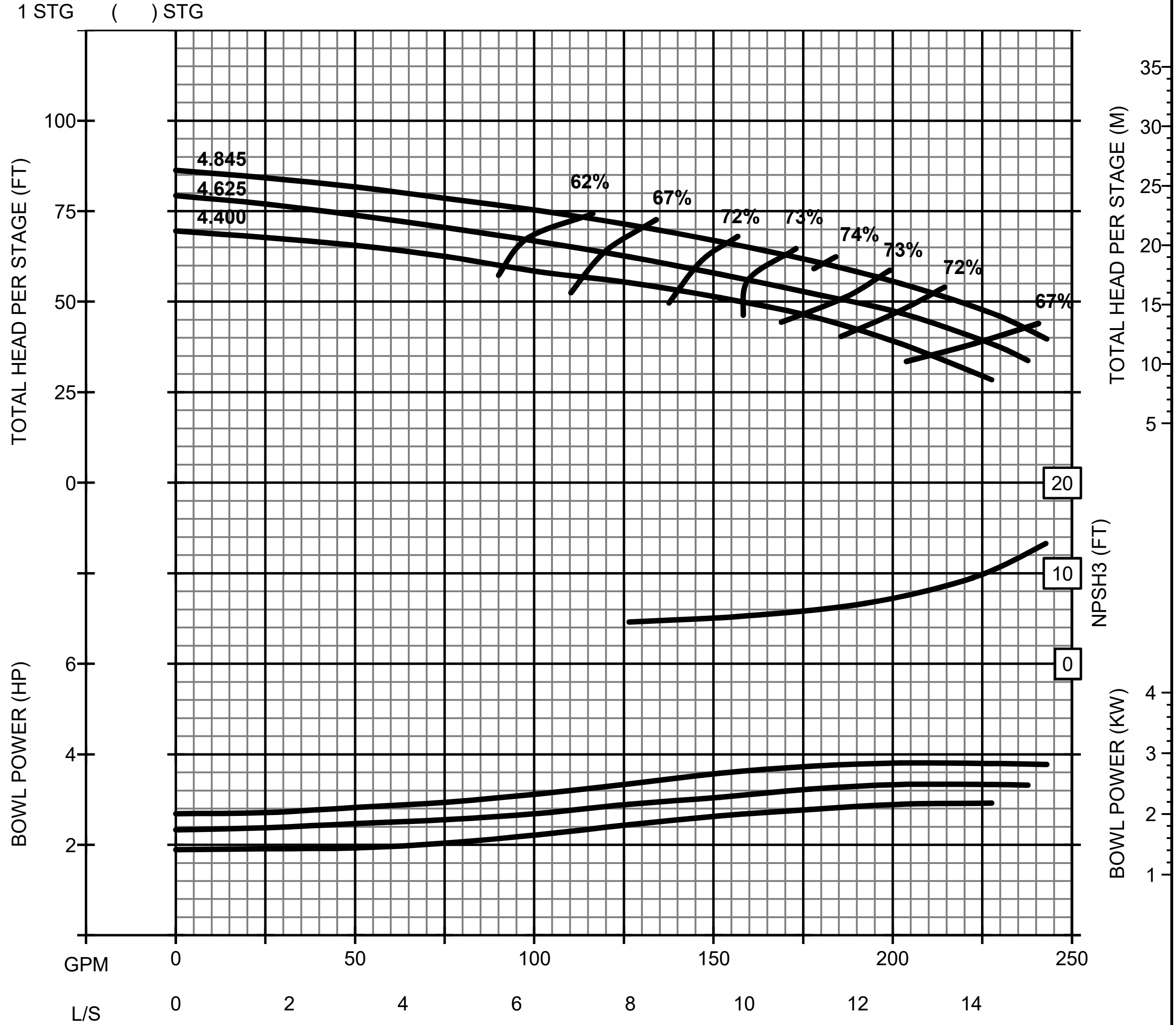
07/01/2012
CVM6LC2P6CY

CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP® COMPANY A GORMAN-RUPP COMPANY	M6MC 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	4		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

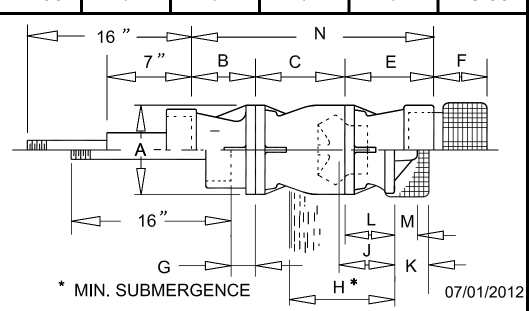


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	5.50	3.94	4.00	7.06	6.00	2.69	12.00	N/A	N/A	N/A	N/A	15.00

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	THREADED
NO. OF VANES:	6	DISCHARGE SIZE:	4"
THRUST CONSTANT:	2.3	SUCTION SIZE:	4"
LATERAL (STD):	0.19	STD. TUBE:	1.5"
EYE AREA IN²:	3.82	WR² LB-FT²:	0.14
SHAFT DIA:	1.00	1ST STG WT LB: 46	ADD STG WT LB: 16

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

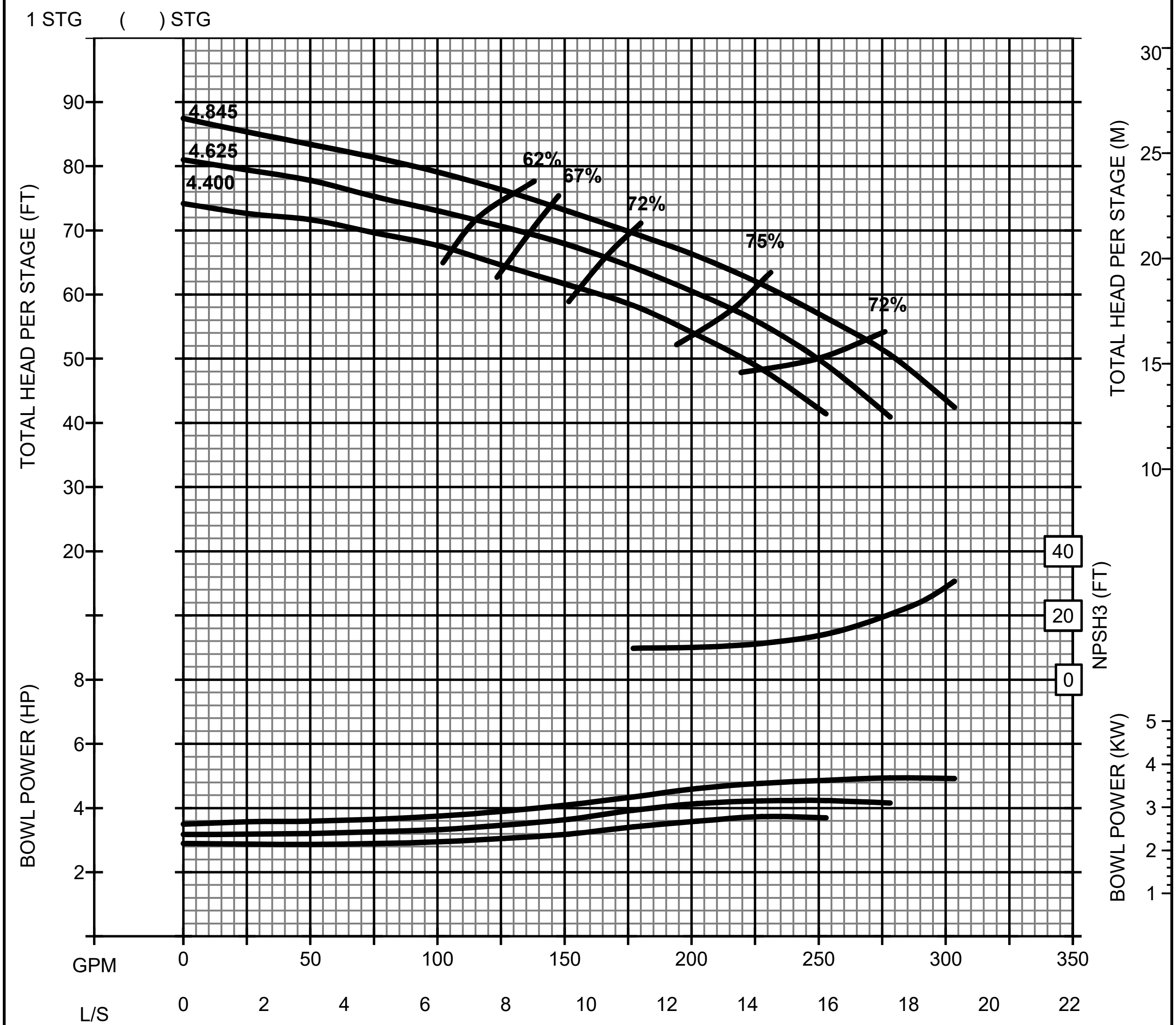
07/01/2012
CVM6MC2P6CY

CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	M6HC 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	4		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

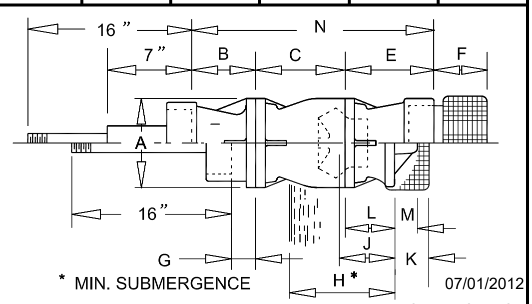


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	5.50	3.94	4.00	7.06	6.00	2.69	12.00	N/A	N/A	N/A	N/A	15.00

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	THREADED
NO. OF VANES:	7	DISCHARGE SIZE:	4"
THRUST CONSTANT:	2.3	SUCTION SIZE:	4"
LATERAL (STD):	0.19	STD. TUBE:	1.5"
EYE AREA IN²:	4.89	WR² LB-FT²:	0.14
SHAFT DIA:	1.00	1ST STG WT LB: 46	ADD STG WT LB: 16

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVM6HC2P6CY

CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

NATIONAL PUMP COMPANY®
A GORMAN-RUPP COMPANY

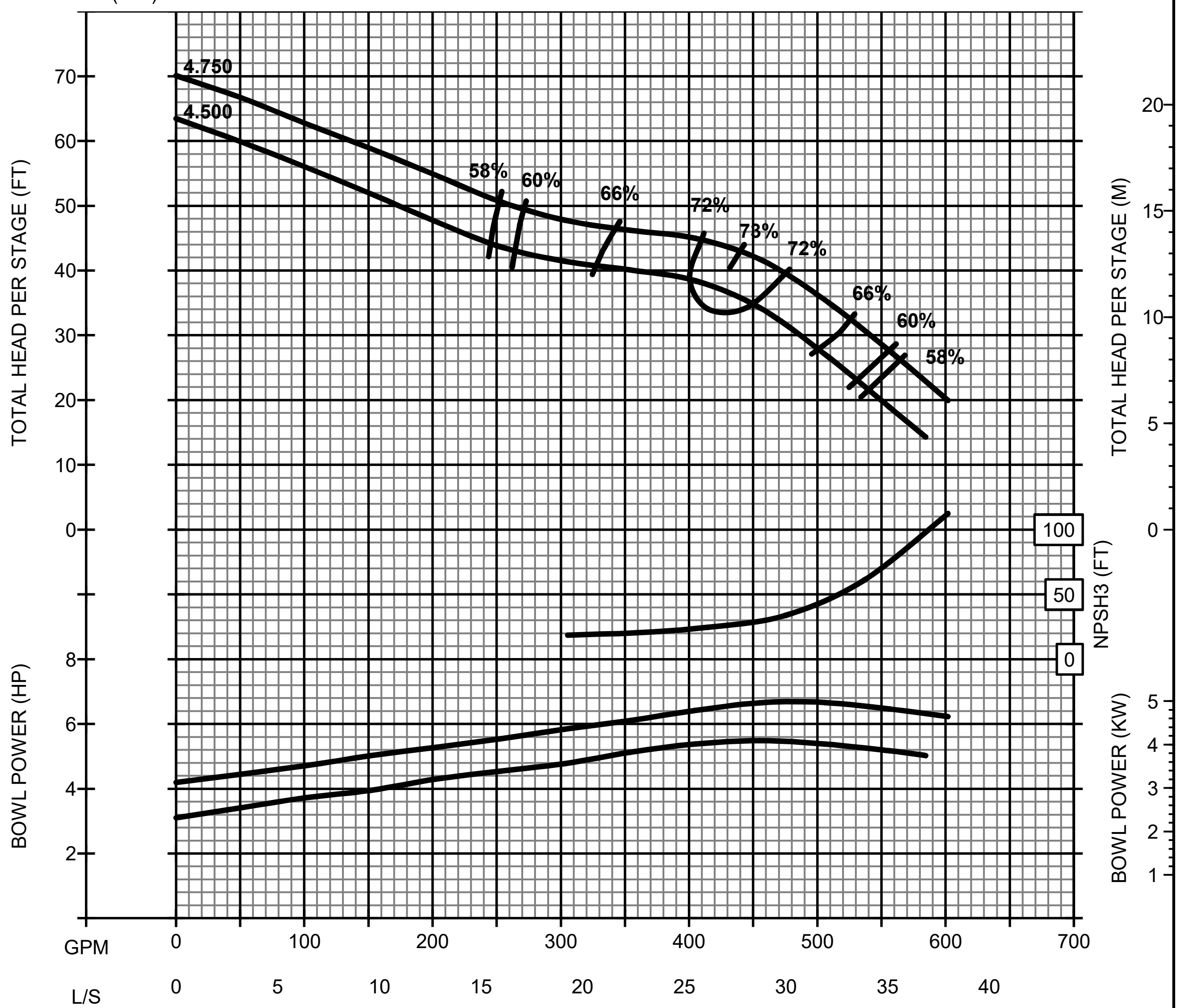
E6XHC

3550 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	4	
	NUMBER OF POINTS	-2	-1	0	

DESIGN	GPM	TDH	HP	EFF

1 STG ( ) STG

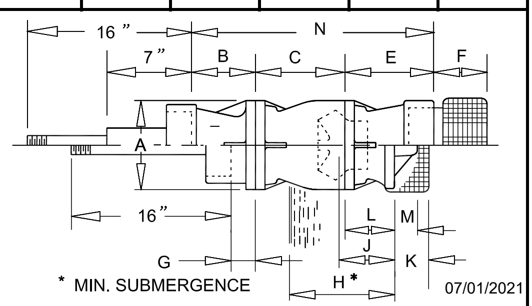


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	5.62	3.94	6.19	7.06	6.00	2.69	12.00	N/A	N/A	N/A	N/A	18.75

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	THREADED
NO. OF VANES:	8	DISCHARGE SIZE:	4"
THRUST CONSTANT:	2.90	SUCTION SIZE:	4"
LATERAL (STD):	0.188	STD. TUBE:	1.5"
EYE AREA IN²:	7.12	WR² LB-FT²:	0.14
SHAFT DIA:	1.00	1ST STG WT LB: 60	ADD STG WT LB: 25

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

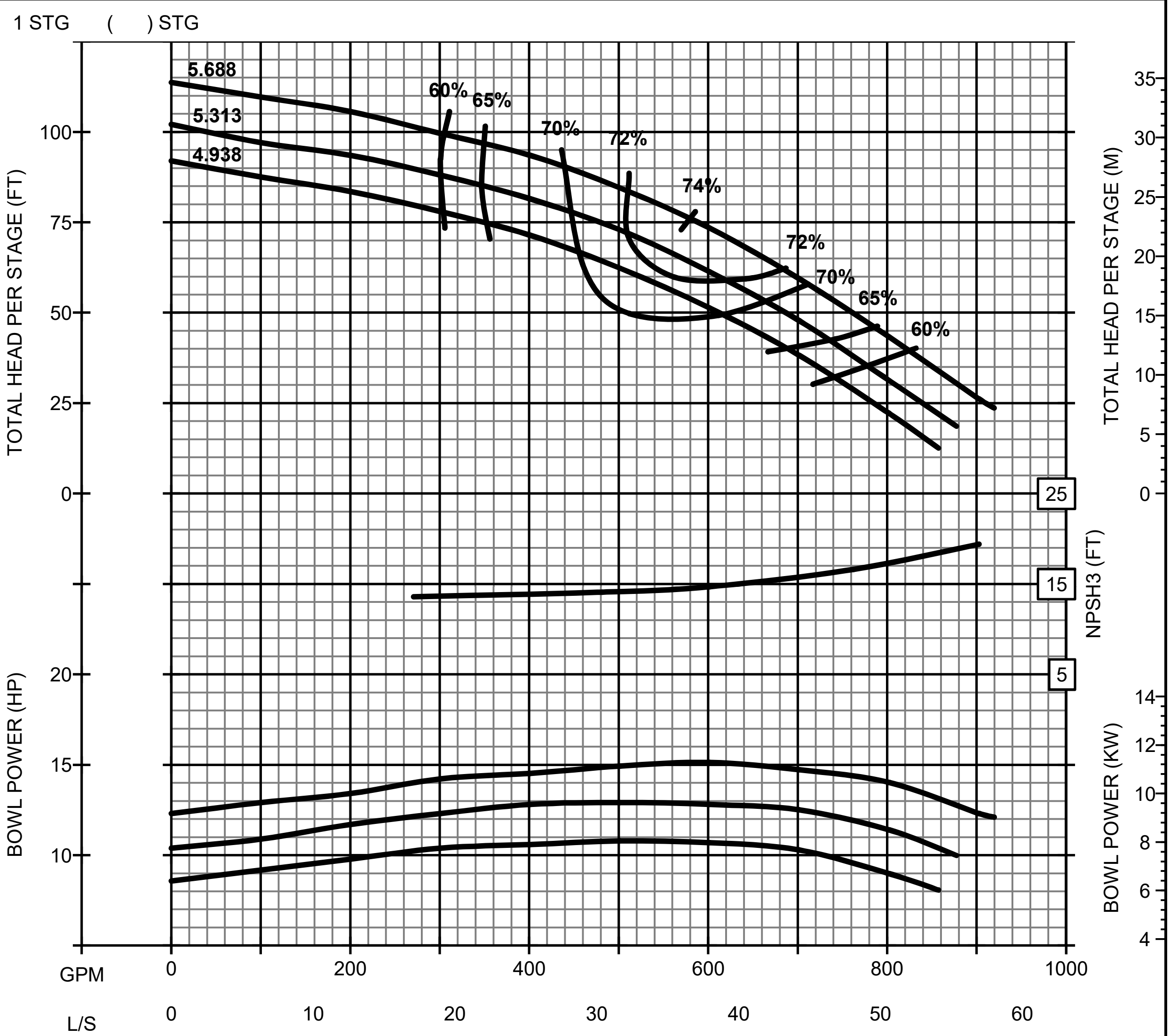
07/01/2021
CVE6XHC2P6CY

CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	H7LC 3550 RPM

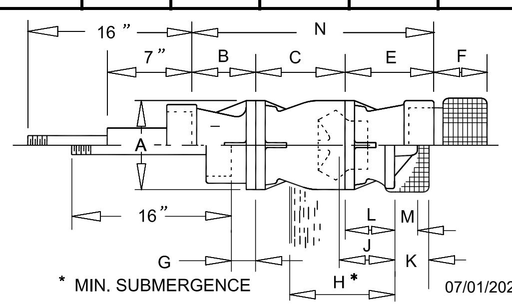
CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						



DIMENSIONS IN INCHES	A**	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	7.00	5.50	6.75	8.25	6.56	1.12	16.50	8.75	N/A	N/A	N/A	20.50

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	5", 6"
THRUST CONSTANT:	4.2	SUCTION SIZE:	5", 6"
LATERAL (STD):	0.75	STD. TUBE:	2"
EYE AREA IN^2:	9.07	WR^2 LB-FT^2:	0.25
SHAFT DIA:	1.25	1ST STG WT LB: 95	ADD STG WT LB: 35



* MIN. SUBMERGENCE

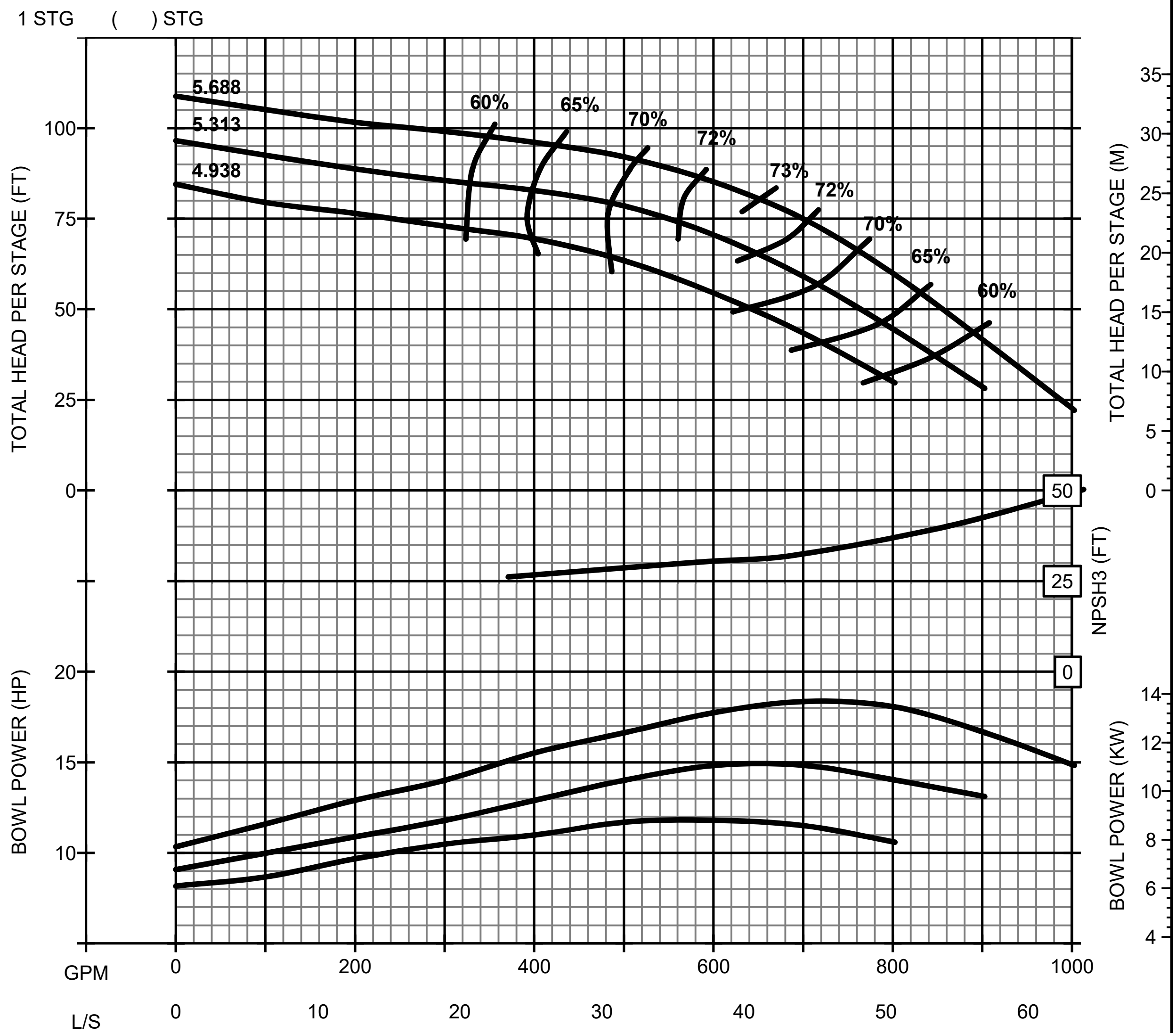
*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.
**IF 6" DISCHARGE CASE OR 6" SUCTION CASE IS USED THIS DIMENSION IS 7.25"

07/01/2021
CVH7LC2P6CY

CURVE TEMPLATE 08.05.2011

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	H7HC 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						



DIMENSIONS IN INCHES	A**	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	7.00	5.50	6.75	8.25	6.56	1.12	16.50	8.75	N/A	N/A	N/A	20.50

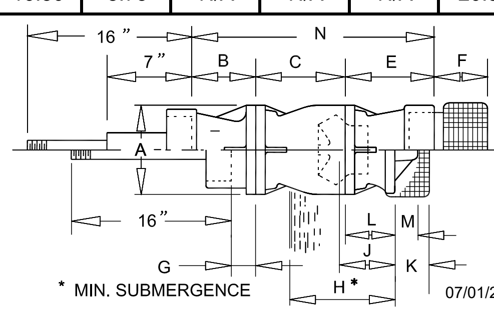
PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	5", 6"
THRUST CONSTANT:	4.2	SUCTION SIZE:	5", 6"
LATERAL (STD):	0.75	STD. TUBE:	2"
EYE AREA IN^2:	9.09	WR^2 LB-FT^2:	0.25
SHAFT DIA:	1.25	1ST STG WT LB: 95	ADD STG WT LB: 35

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.

**IF 6" DISCHARGE CASE OR 6" SUCTION CASE IS USED THIS DIMENSION IS 7.25"



07/01/2012

CVH7HC2P6CY

CURVE TEMPLATE 08.05.2011

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

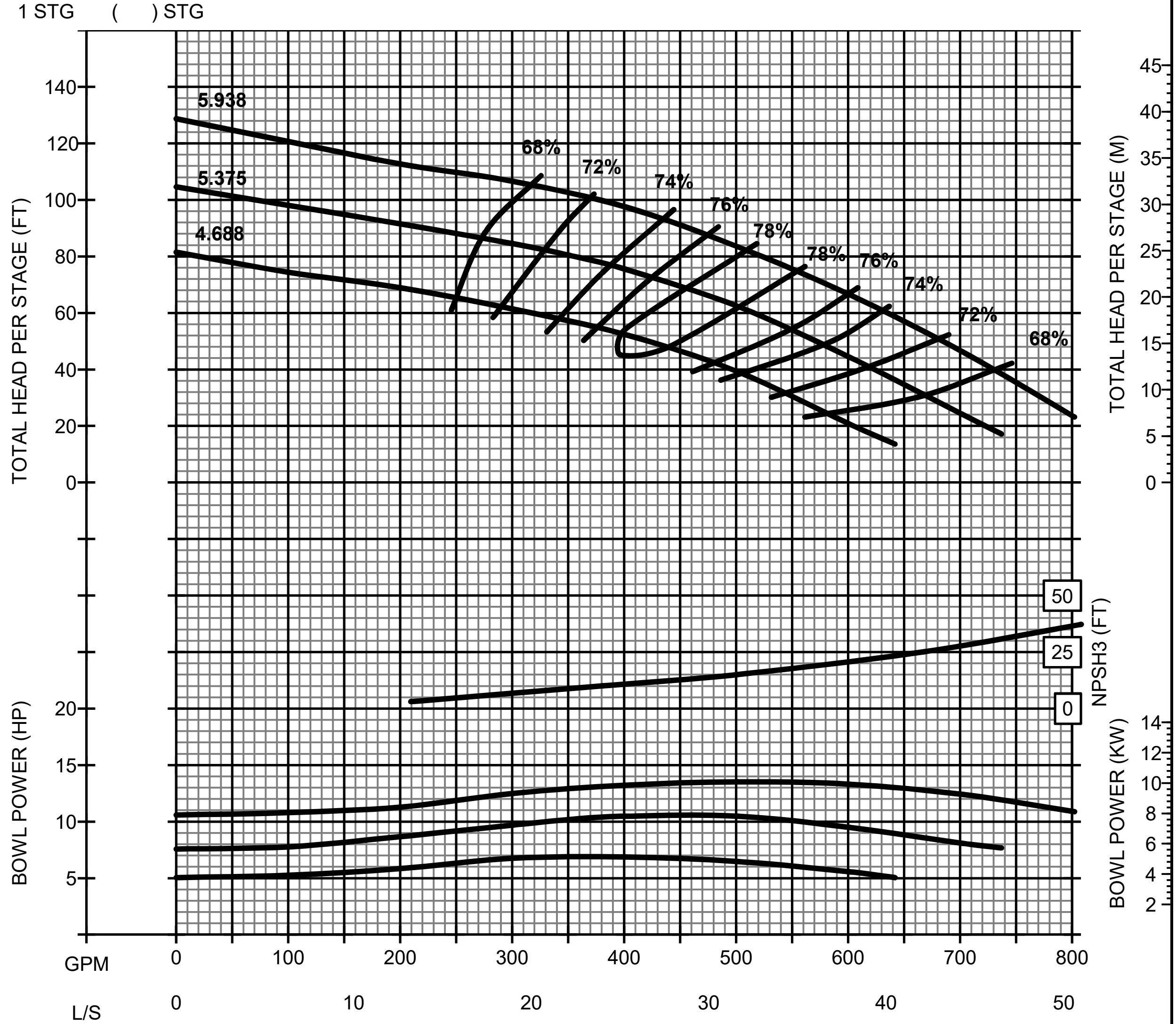
NATIONAL PUMP COMPANY®
A GORMAN-RUPP COMPANY

K8LC

3550 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	4	
	NUMBER OF POINTS	-2	-1	0	

DESIGN	GPM	TDH	HP	EFF

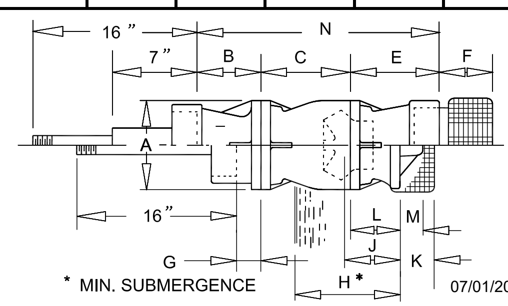


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	7.63	5.53	6.50	8.38	6.56	1.12	14.50	6.00	6.12	5.52	2.50	20.13

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	5", 6"
THRUST CONSTANT:	4.73	SUCTION SIZE:	5"
LATERAL (STD):	0.688	STD. TUBE:	2"
EYE AREA IN²:	7.742	WR² LB-FT²:	0.32
SHAFT DIA:	1.25	1ST STG WT LB: 85	ADD STG WT LB: 36

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

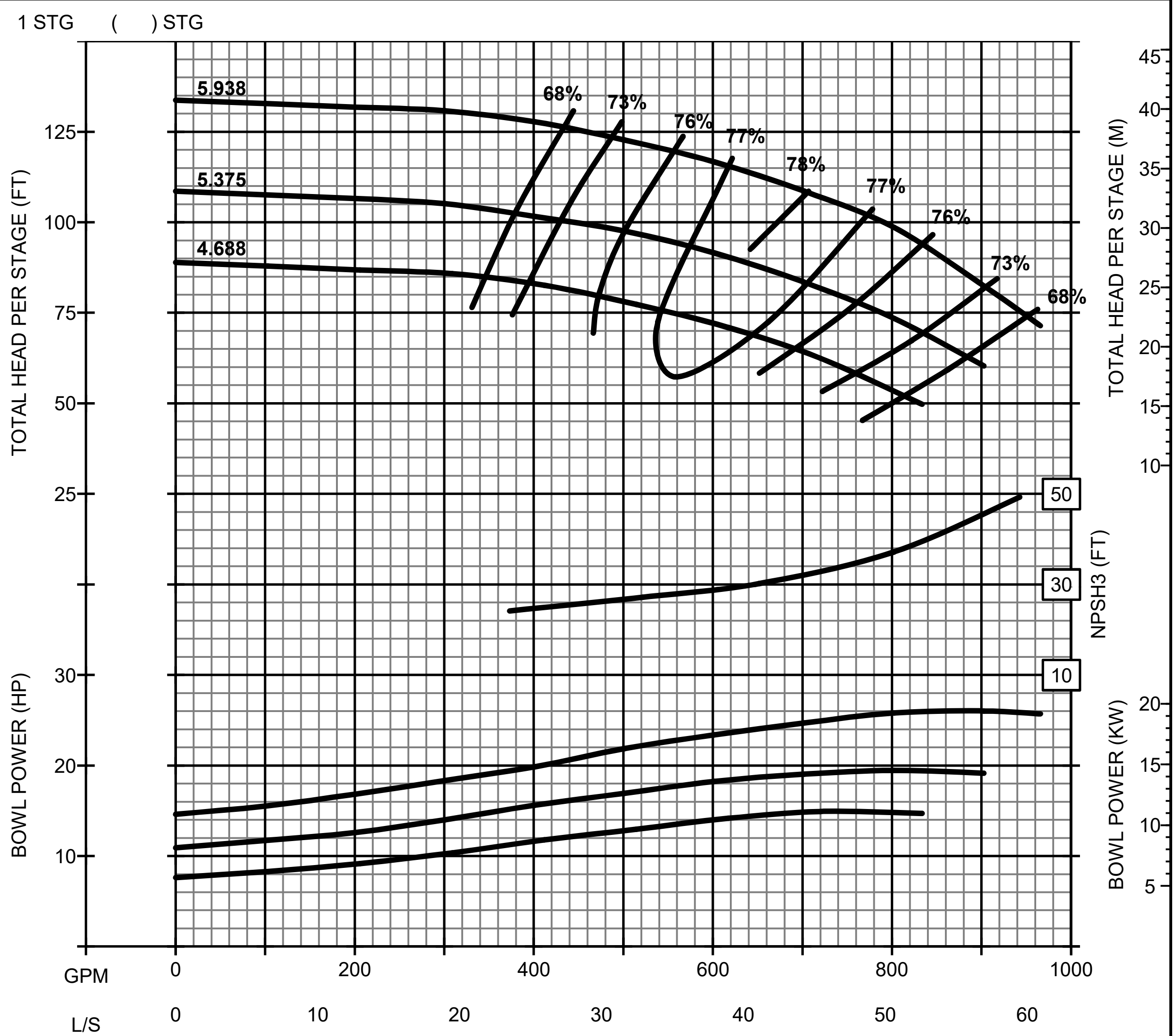
07/01/2012
CVK8LC2P6CY

CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	K8HC 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	4		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						



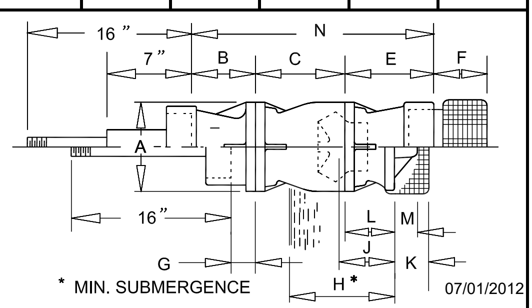
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	7.63	5.53	6.50	8.38	6.56	1.12	14.50	6.00	6.12	5.52	2.50	20.13

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	5", 6"
THRUST CONSTANT:	4.73	SUCTION SIZE:	5"
LATERAL (STD):	0.688	STD. TUBE:	2"
EYE AREA IN^2:	7.742	WR^2 LB-FT^2:	0.32
SHAFT DIA:	1.25	1ST STG WT LB: 85	ADD STG WT LB: 36

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

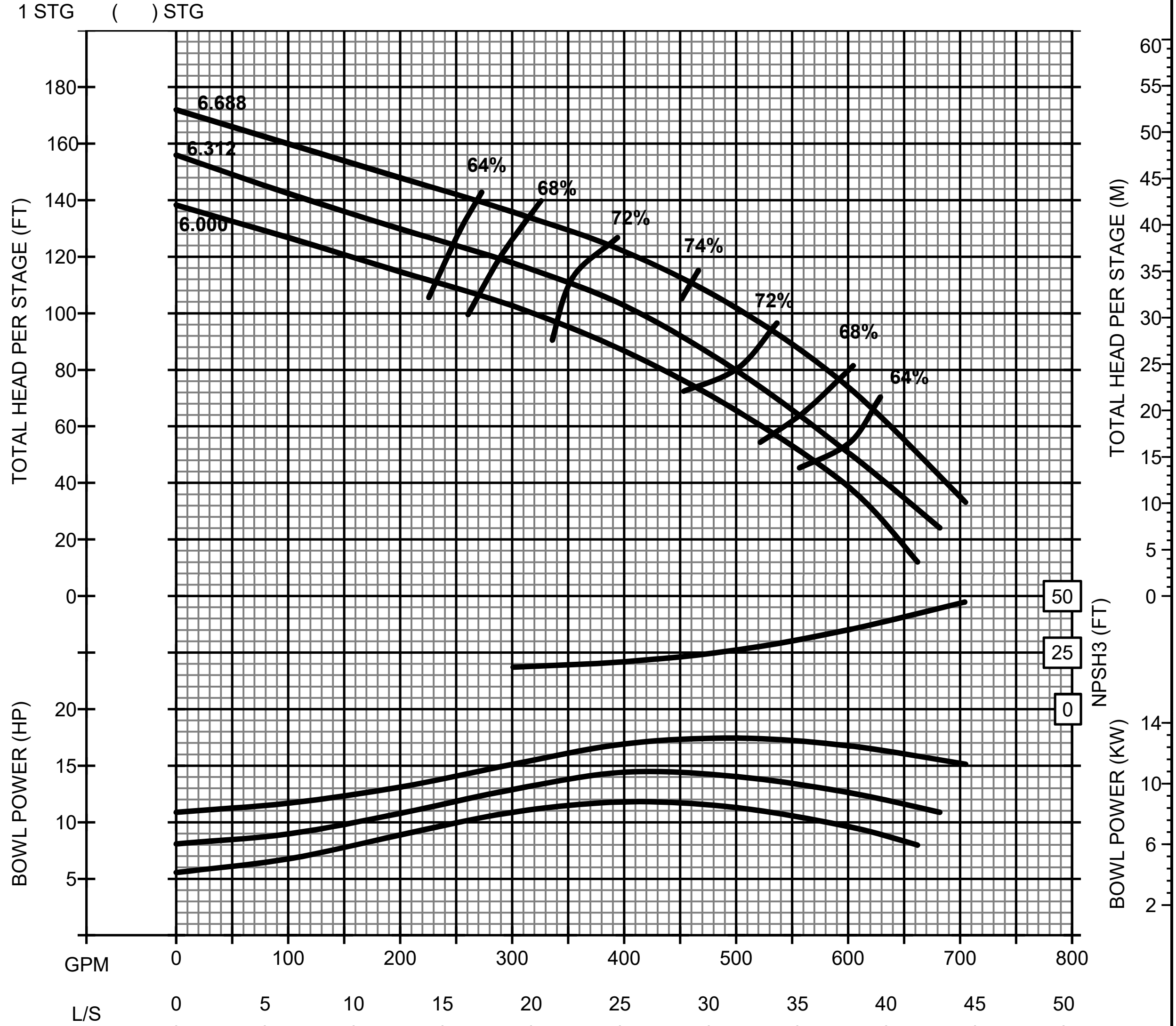
CVK8HC2P6CY

CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	M8XLC 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	3	5						
	NUMBER OF POINTS	-2	-1	0						

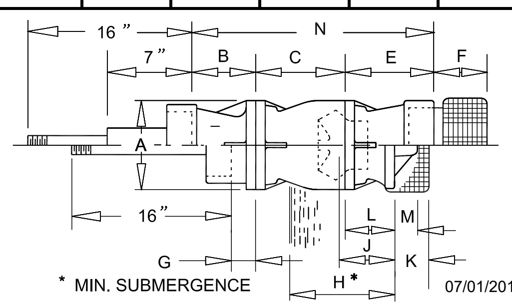


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	8.12	5.53	7.25	8.38	6.56	1.13	14.50	6.50	6.12	5.63	2.50	21.13

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	4	DISCHARGE SIZE:	5", 6"
THRUST CONSTANT:	4.0	SUCTION SIZE:	5", 6"
LATERAL (STD):	0.75	STD. TUBE:	2"
EYE AREA IN²:	7.72	WR² LB-FT²:	0.32
SHAFT DIA:	1.25	1ST STG WT LB: 102	ADD STG WT LB: 40

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

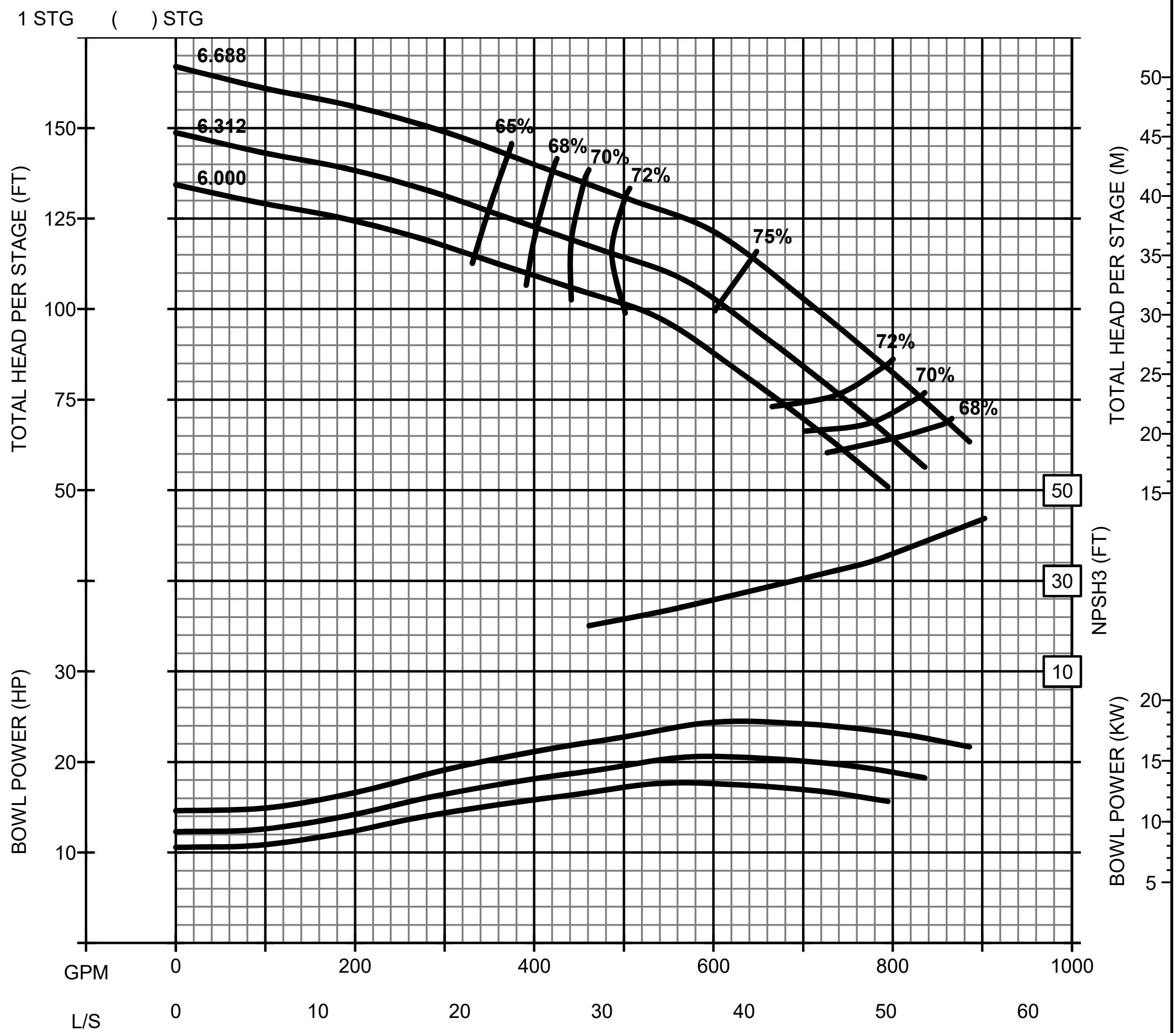
07/01/2012
CVM8XLC2P6CY

CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	M8MC 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

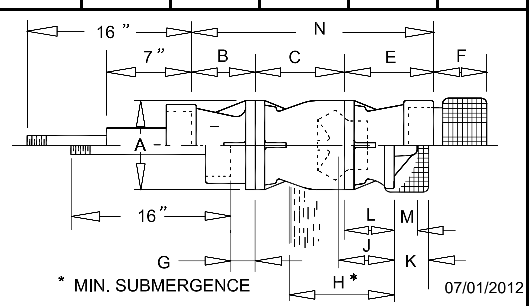


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	8.12	5.53	7.25	8.38	6.56	1.13	14.50	6.50	6.12	5.63	2.50	21.13

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	5", 6"
THRUST CONSTANT:	4.0	SUCTION SIZE:	5", 6"
LATERAL (STD):	0.75	STD. TUBE:	2"
EYE AREA IN²:	8.74	WR² LB-FT²:	0.32
SHAFT DIA:	1.25	1ST STG WT LB: 102	ADD STG WT LB: 40

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



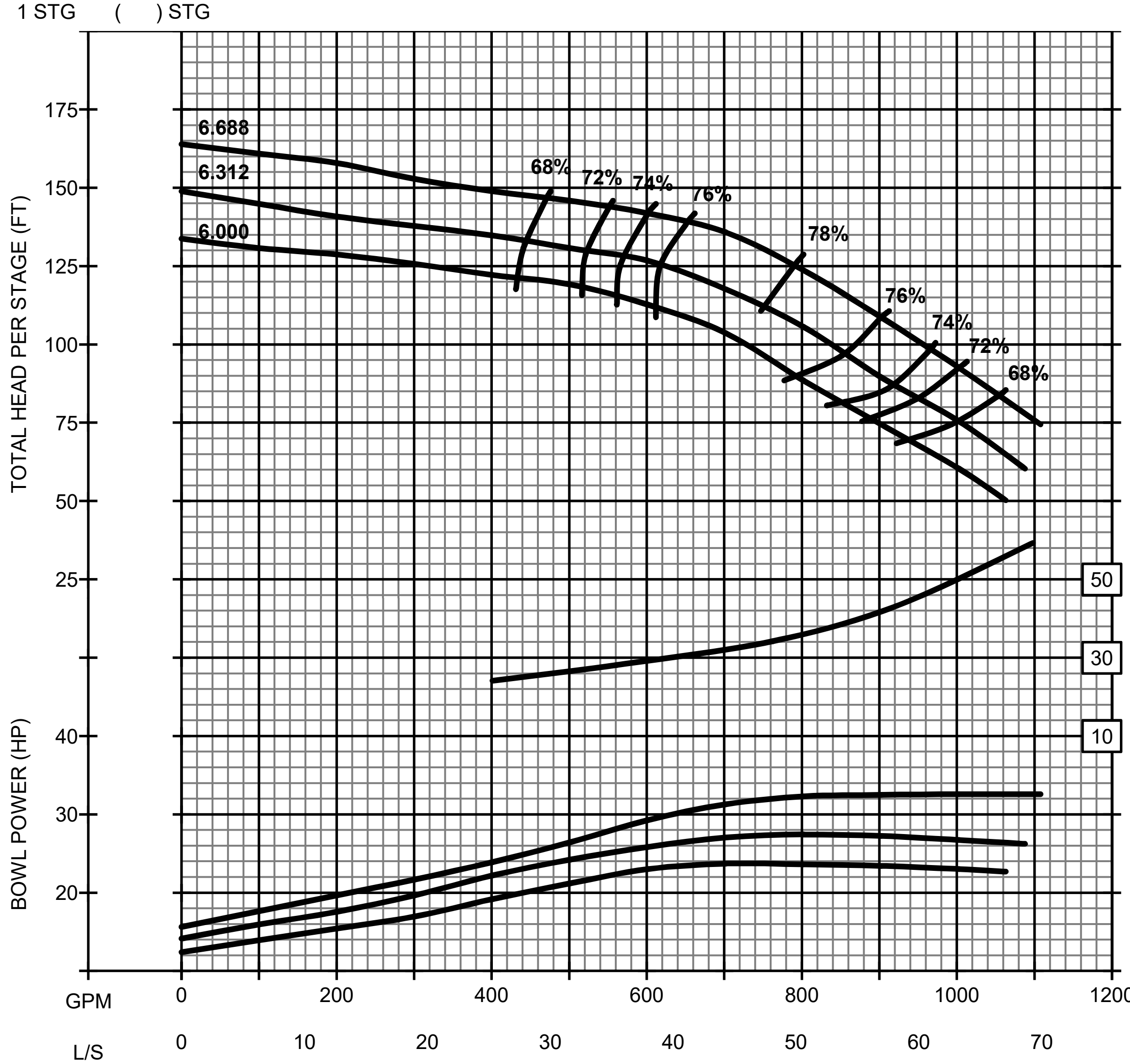
07/01/2012
CVM8MC2P6CY

CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	**M8HC** 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

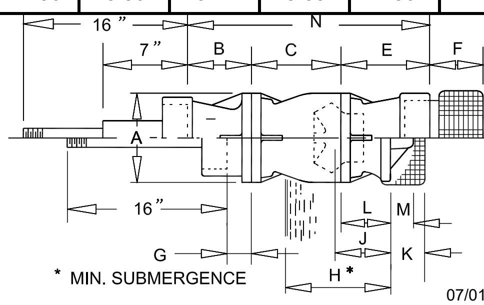


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	8.12	5.53	7.25	8.38	6.56	1.13	14.50	6.50	6.12	5.63	2.50	21.13

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	5", 6"
THRUST CONSTANT:	4.0	SUCTION SIZE:	5", 6"
LATERAL (STD):	0.75	STD. TUBE:	2"
EYE AREA IN²:	8.74	WR² LB-FT²:	0.23
SHAFT DIA:	1.25	1ST STG WT LB: 102	ADD STG WT LB: 40

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVM8HC2P6CY

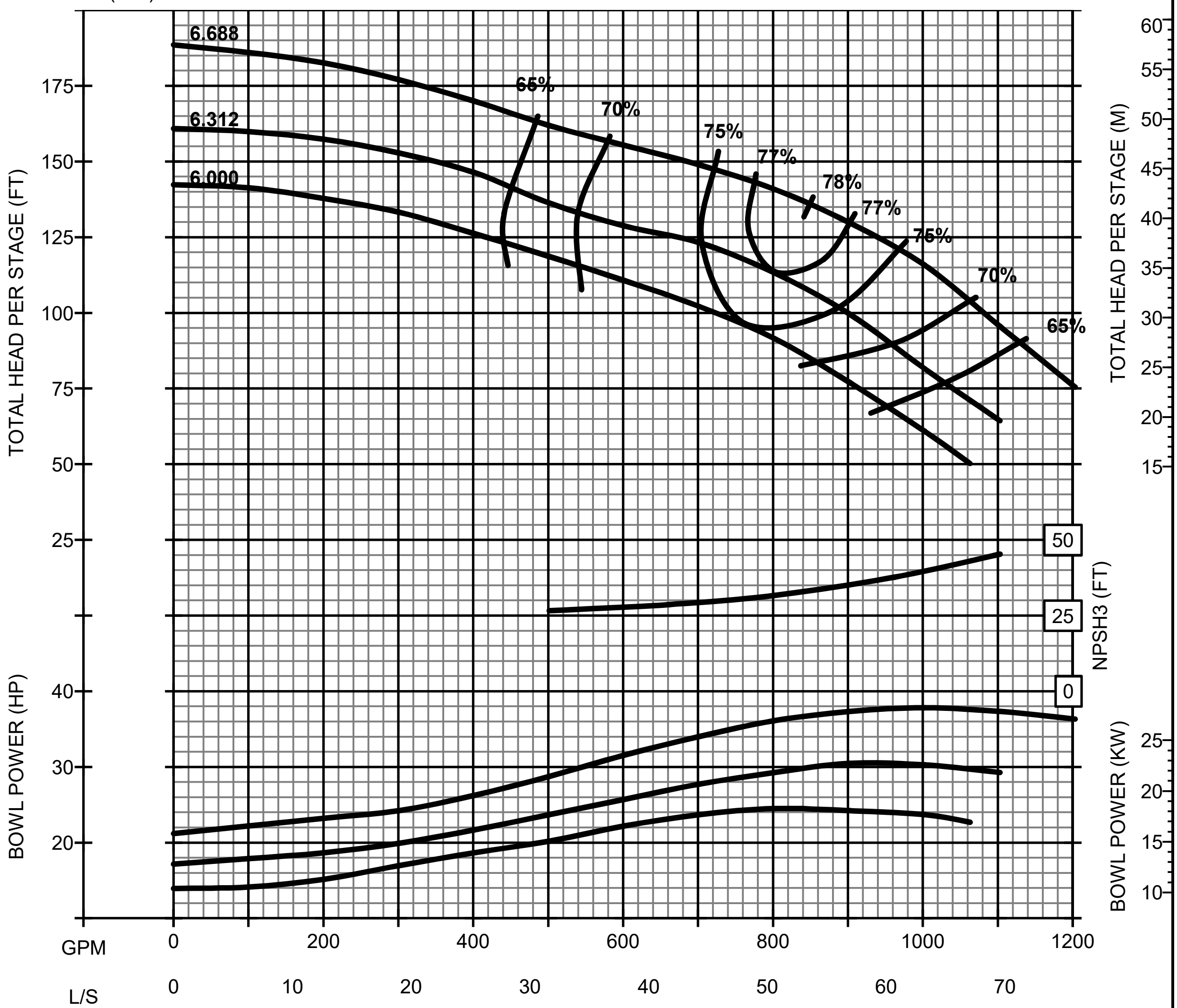
CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY			M8XHC 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	3	5						
	NUMBER OF POINTS	-2	-1	0						

1 STG ( ) STG

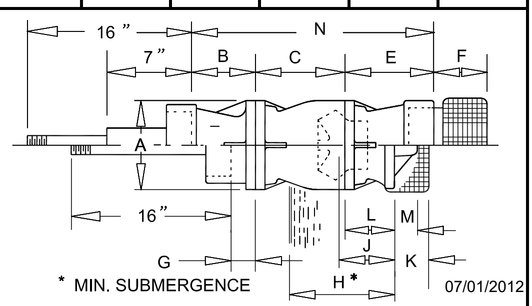


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	8.12	5.53	7.25	8.38	6.56	1.13	14.50	6.50	6.12	5.63	2.50	21.13

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	5", 6"
THRUST CONSTANT:	4.9	SUCTION SIZE:	5", 6"
LATERAL (STD):	0.62	STD. TUBE:	2"
EYE AREA IN^2:	10.7	WR^2 LB-FT^2:	0.32
SHAFT DIA:	1.25	1ST STG WT LB: 102	ADD STG WT LB: 40

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.

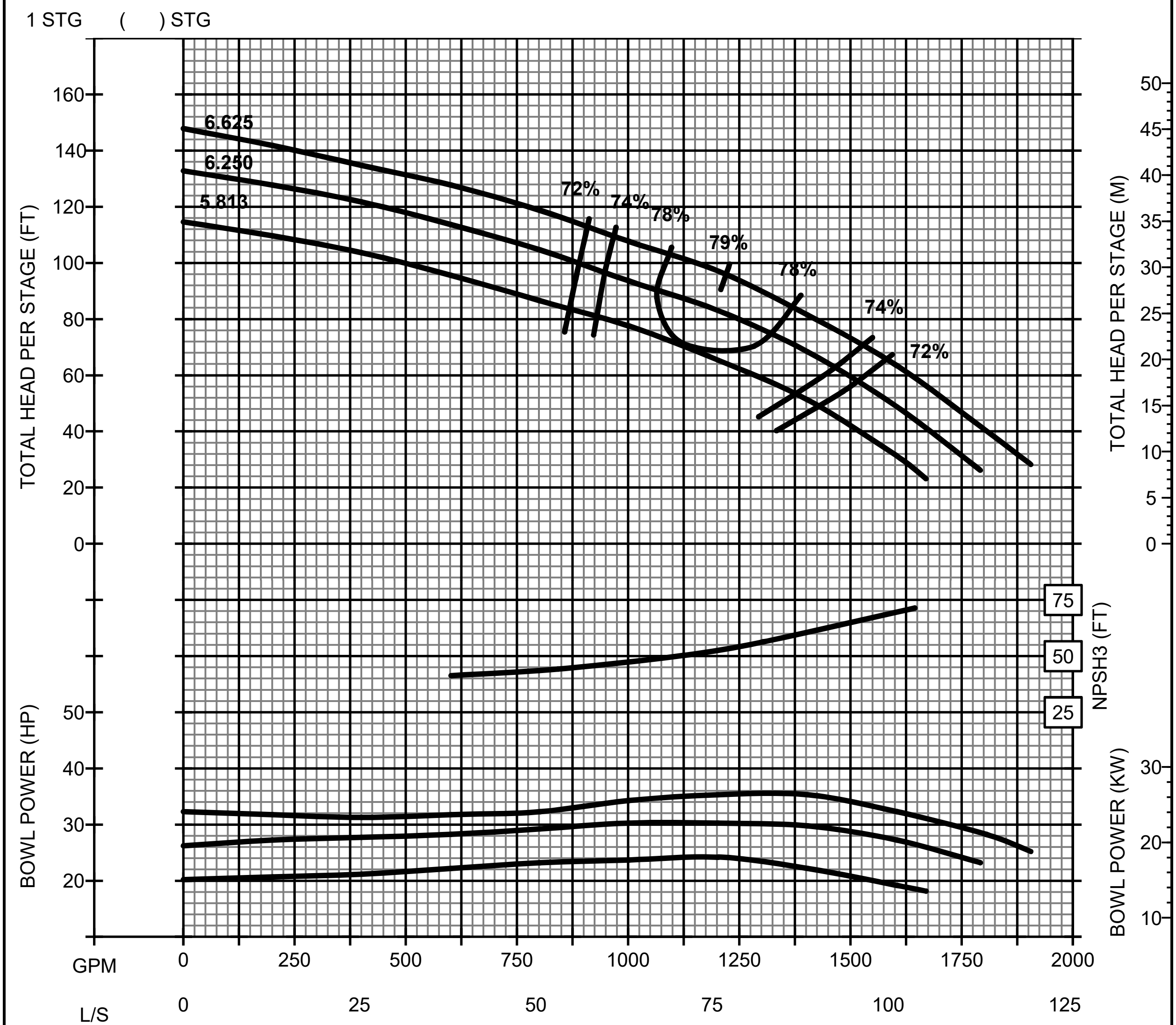


07/01/2012
CVM8XHC2P6CY

CURVE TEMPLATE 08.05.2011

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	J8XHC 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2	3	5	DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-3	-2	-1	0					

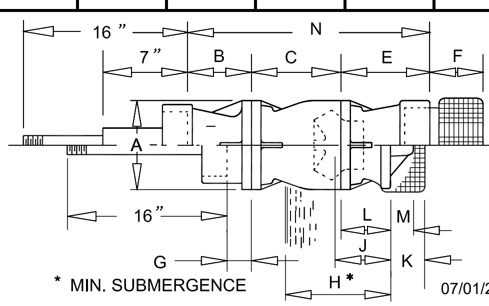


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	7.75	8.50	8.88	9.25	6.63	1.12	14.00	N/A	N/A	N/A	N/A	26.63

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	THREADED
NO. OF VANES:	6	DISCHARGE SIZE:	6"
THRUST CONSTANT:	5.4	SUCTION SIZE:	6"
LATERAL (STD):	1.38	STD. TUBE:	2"
EYE AREA IN^2:	12.81	WR^2 $LB\text{-}FT^2$:	0.36
SHAFT DIA:	1.25	1ST STG WT LB: 140	ADD STG WT LB: 62

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



07/01/2012
CVJ8XHC2P6CY

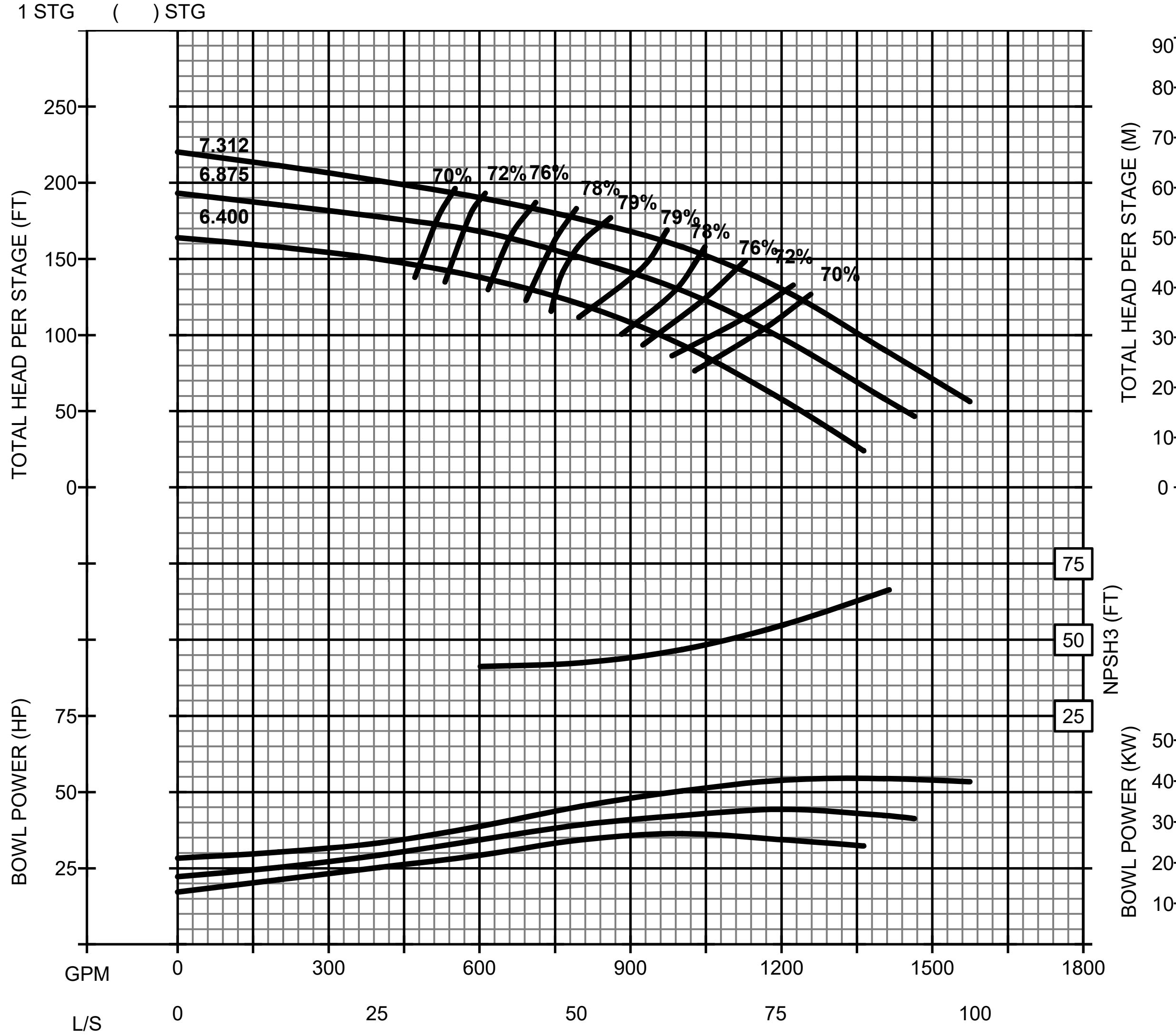
CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	# M9MC 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	4	6						
	NUMBER OF POINTS	-3	-2	0						

1 STG ( ) STG

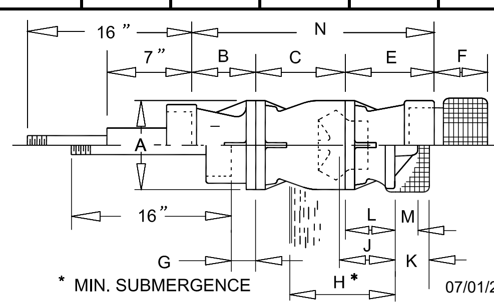


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.00	5.53	8.00	8.38	2.94	7.47	14.50	6.50	6.13	5.62	2.50	21.91

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	5", 6"
THRUST CONSTANT:	5.1	SUCTION SIZE:	6"
LATERAL (STD):	0.625	STD. TUBE:	2"
EYE AREA IN^2:	9.69	WR^2 LB-FT^2:	0.47
SHAFT DIA:	1.25	1ST STG WT LB: 138	ADD STG WT LB: 56

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVM9MC2P6CY

CURVE TEMPLATE 08.05.2011

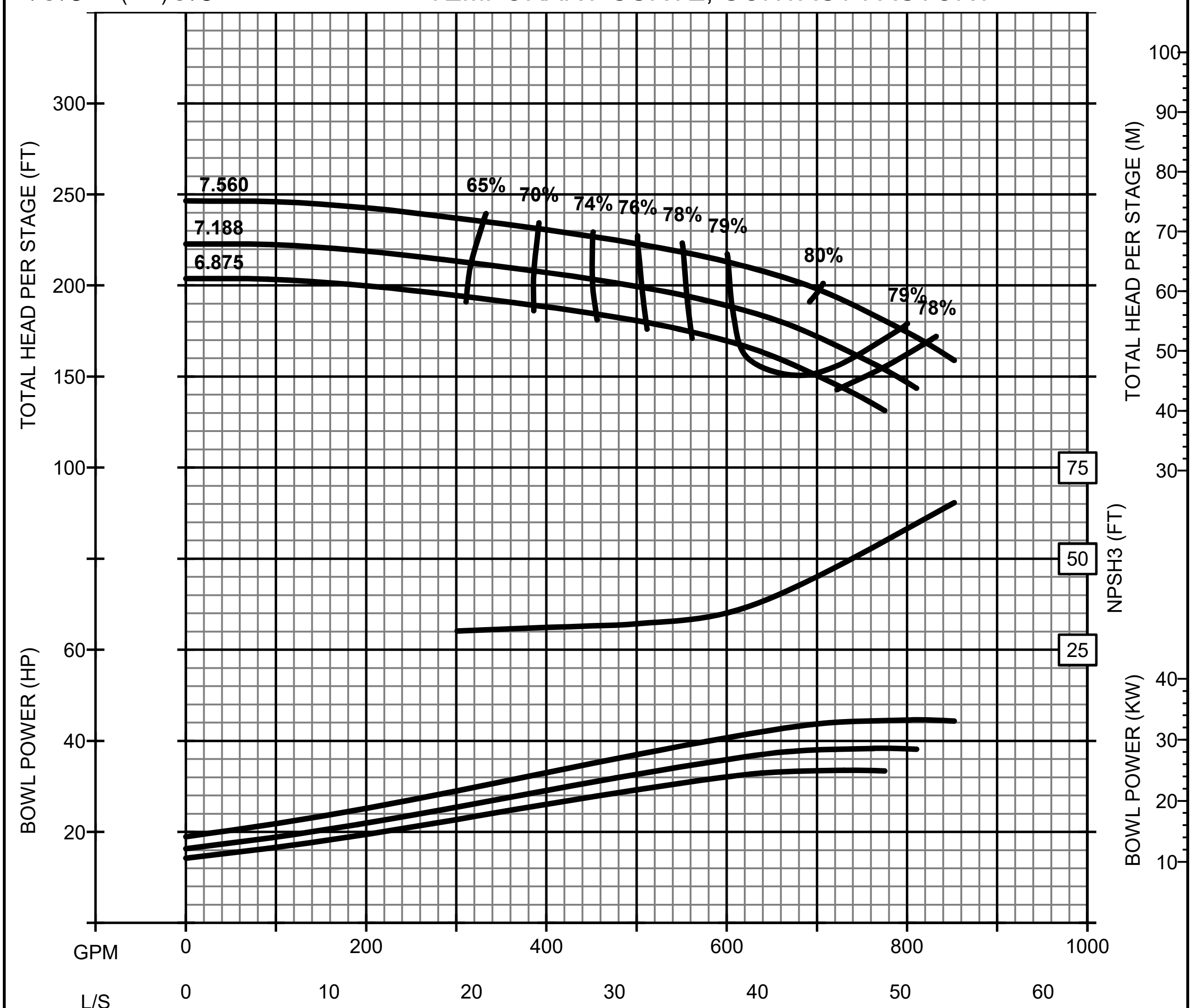
3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	L10HC 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2	3						
	NUMBER OF POINTS	-3	-2	0						

1 STG ( ) STG

TEMPORARY CURVE, CONTACT FACTORY

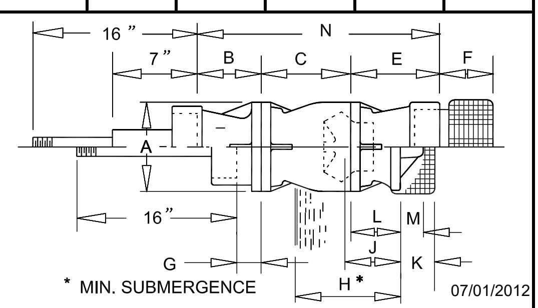


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.83	5.18	6.50	N/A	N/A	1.43	16.00	4.00		4.13	3.75	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	6"
THRUST CONSTANT:	4.60	SUCTION SIZE:	N/A
LATERAL (STD):	0.50	STD. TUBE:	2.5"
EYE AREA IN²:	8.53	WR² LB-FT²:	0.44
SHAFT DIA:	1.50	1ST STG WT LB: 175	ADD STG WT LB: 75

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVL10HC2P6CY

CURVE TEMPLATE 08.05.2011

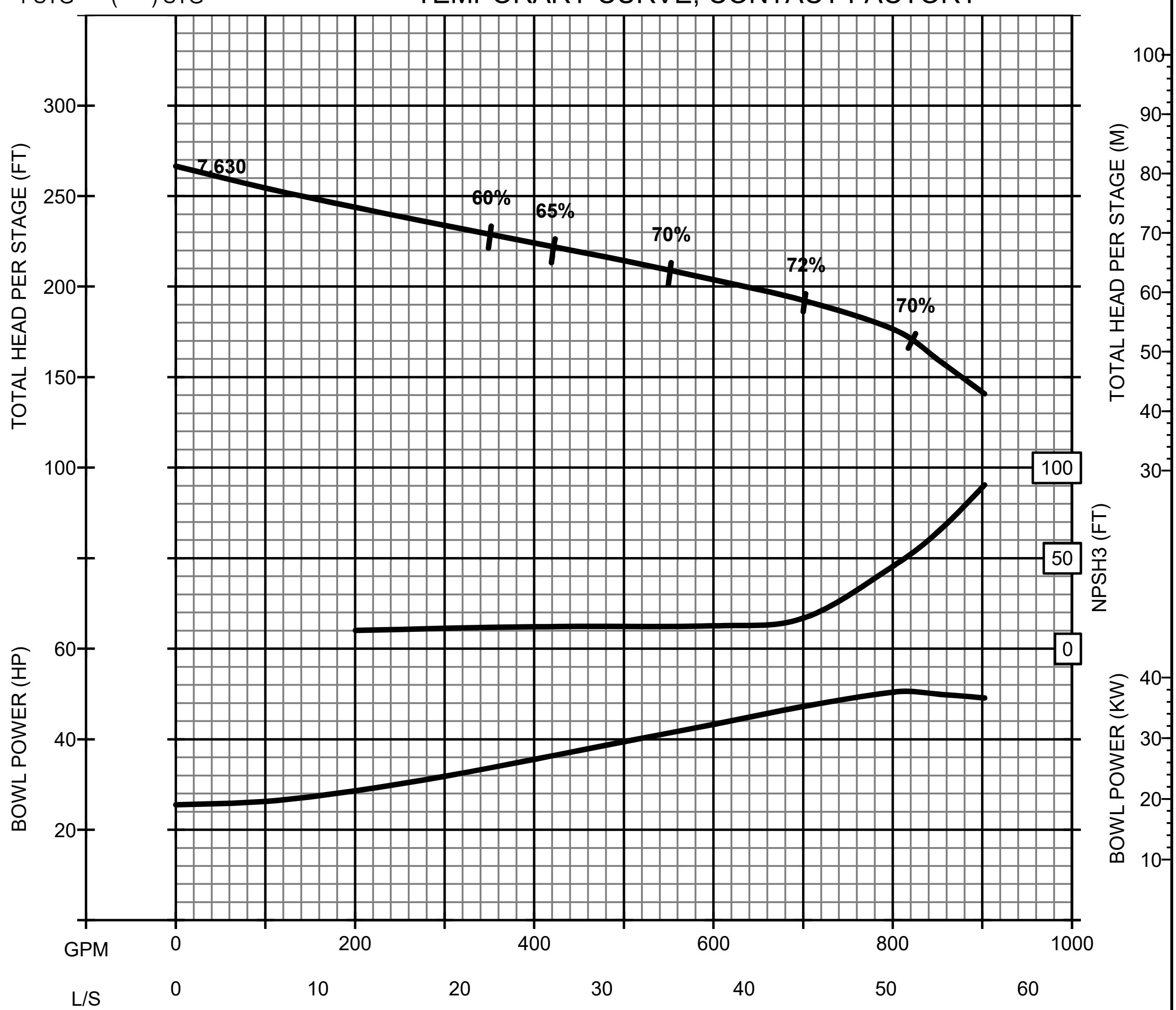
3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	L10HC-S 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	-	-	-	-					
	NUMBER OF POINTS	-	-	-	-					

1 STG ( ) STG

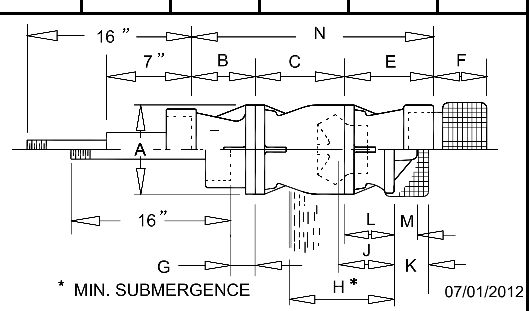
TEMPORARY CURVE, CONTACT FACTORY



DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.83	5.18	6.50	N/A	N/A	1.43	16.00	4.00		4.13	3.75	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	6"
THRUST CONSTANT:	8.80	SUCTION SIZE:	N/A
LATERAL (STD):	0.50	STD. TUBE:	2.5"
EYE AREA IN²:	18.66	WR² LB-FT²:	0.44
SHAFT DIA:	1.50	1ST STG WT LB: 175	ADD STG WT LB: 75



* MIN. SUBMERGENCE

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.
LOW NPSH IMPELLER FOR 1ST STAGE ONLY

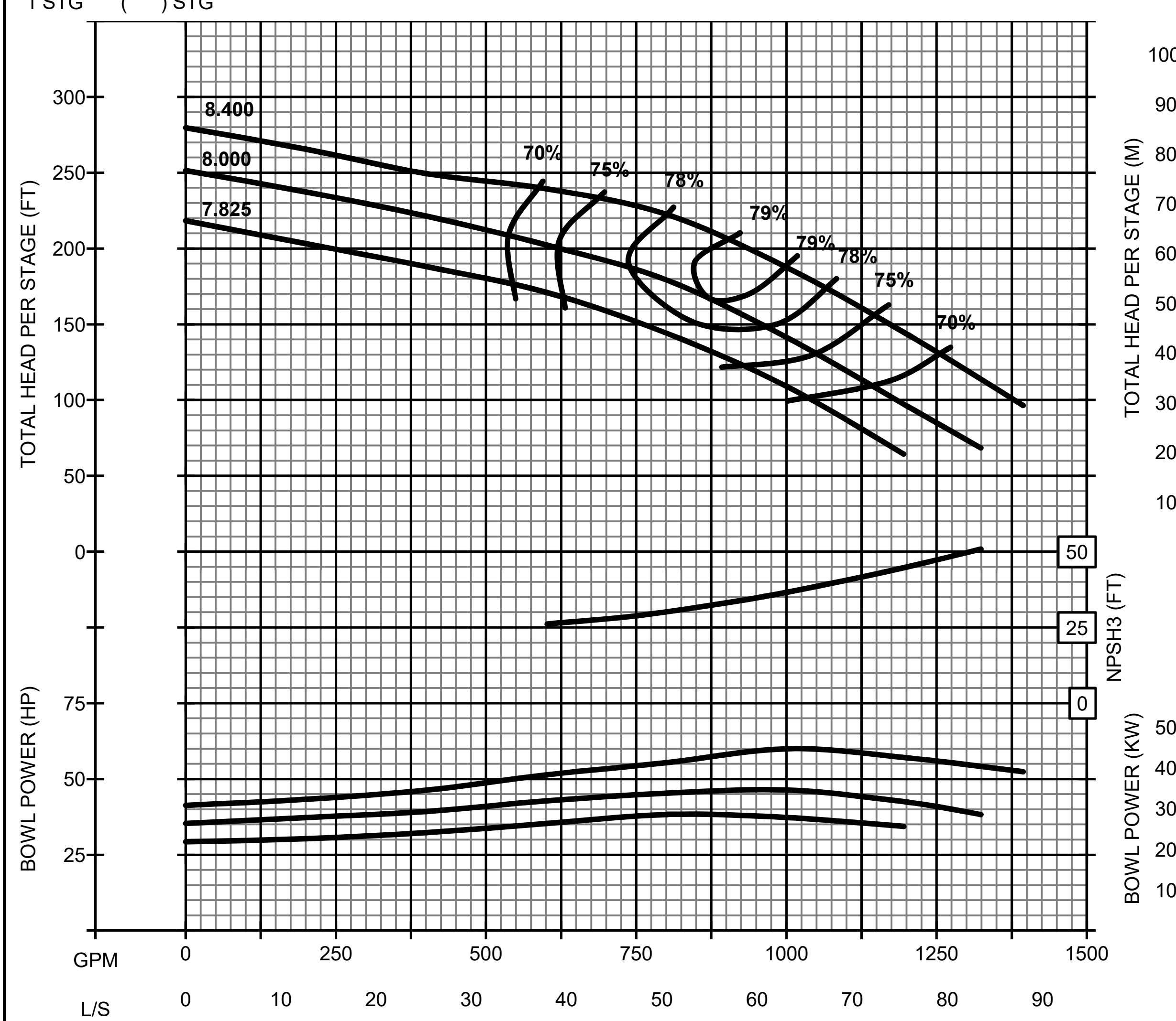
07/01/2012
CVL10HC-S2P6CY

CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	M10LC 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

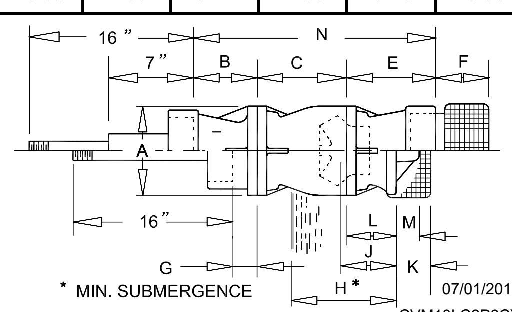


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	10.12	5.19	9.62	10.69	7.56	1.43	10.50	7.50	8.12	7.00	3.19	25.50

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	6", 8"
THRUST CONSTANT:	5.3	SUCTION SIZE:	6"
LATERAL (STD):	1.0	STD. TUBE:	2.5"
EYE AREA IN^2:	13.25	WR^2 LB-FT^2:	0.78
SHAFT DIA:	1.50	1ST STG WT LB: 175	ADD STG WT LB: 75

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVM10LC2P6CY

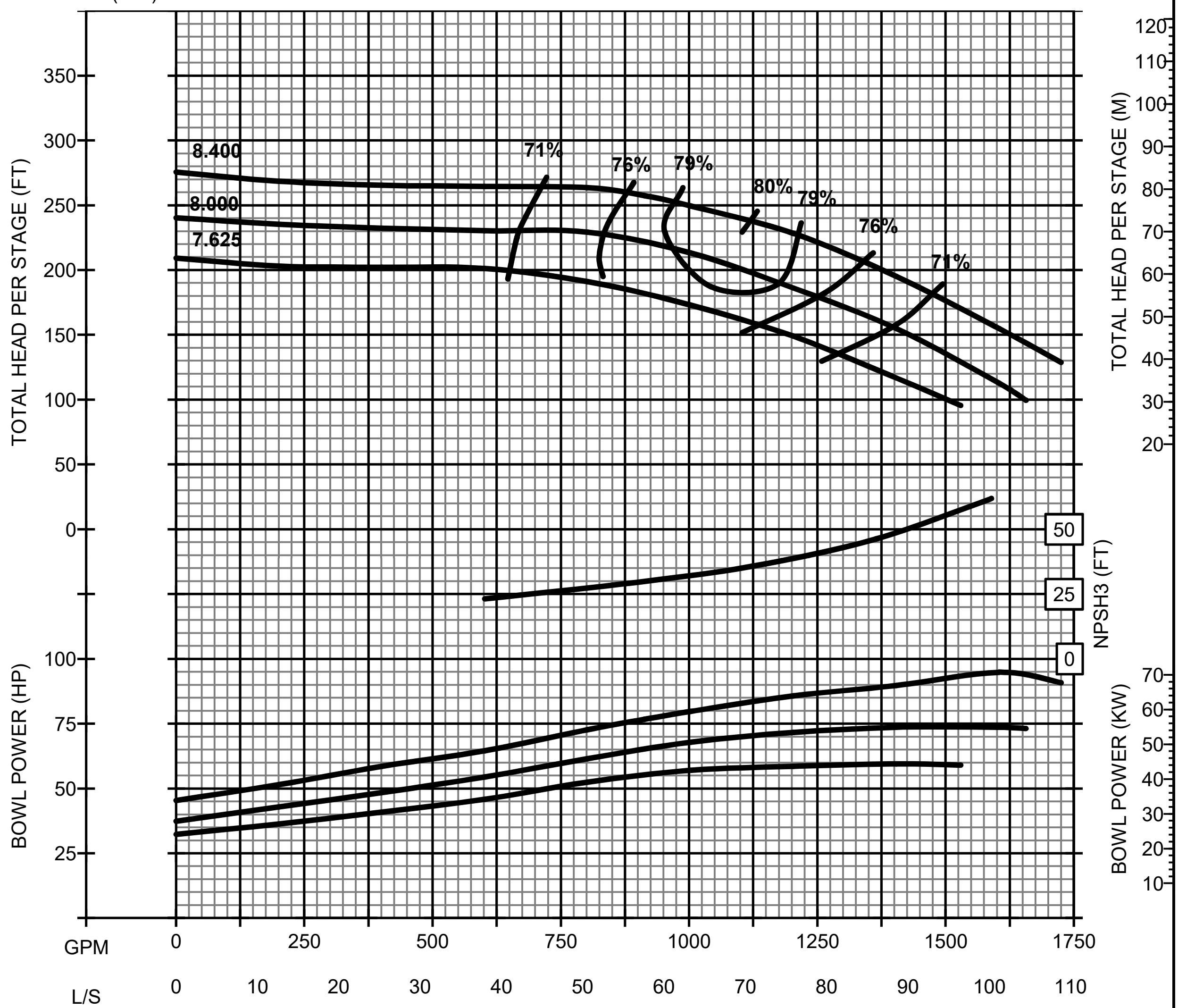
CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	M10HC 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

1 STG ( ) STG

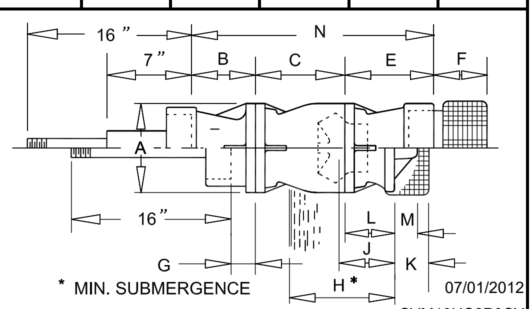


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	10.12	5.31	9.62	10.69	7.58	1.43	10.50	7.50	8.12	7.00	3.12	25.62

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	6", 8"
THRUST CONSTANT:	5.4	SUCTION SIZE:	6"
LATERAL (STD):	1.0	STD. TUBE:	2.5"
EYE AREA IN²:	13.25	WR² LB-FT²:	0.78
SHAFT DIA:	1.50	1ST STG WT LB: 175	ADD STG WT LB: 75

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



07/01/2012
CVM10HC2P6CY

CURVE TEMPLATE 08.05.2011

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

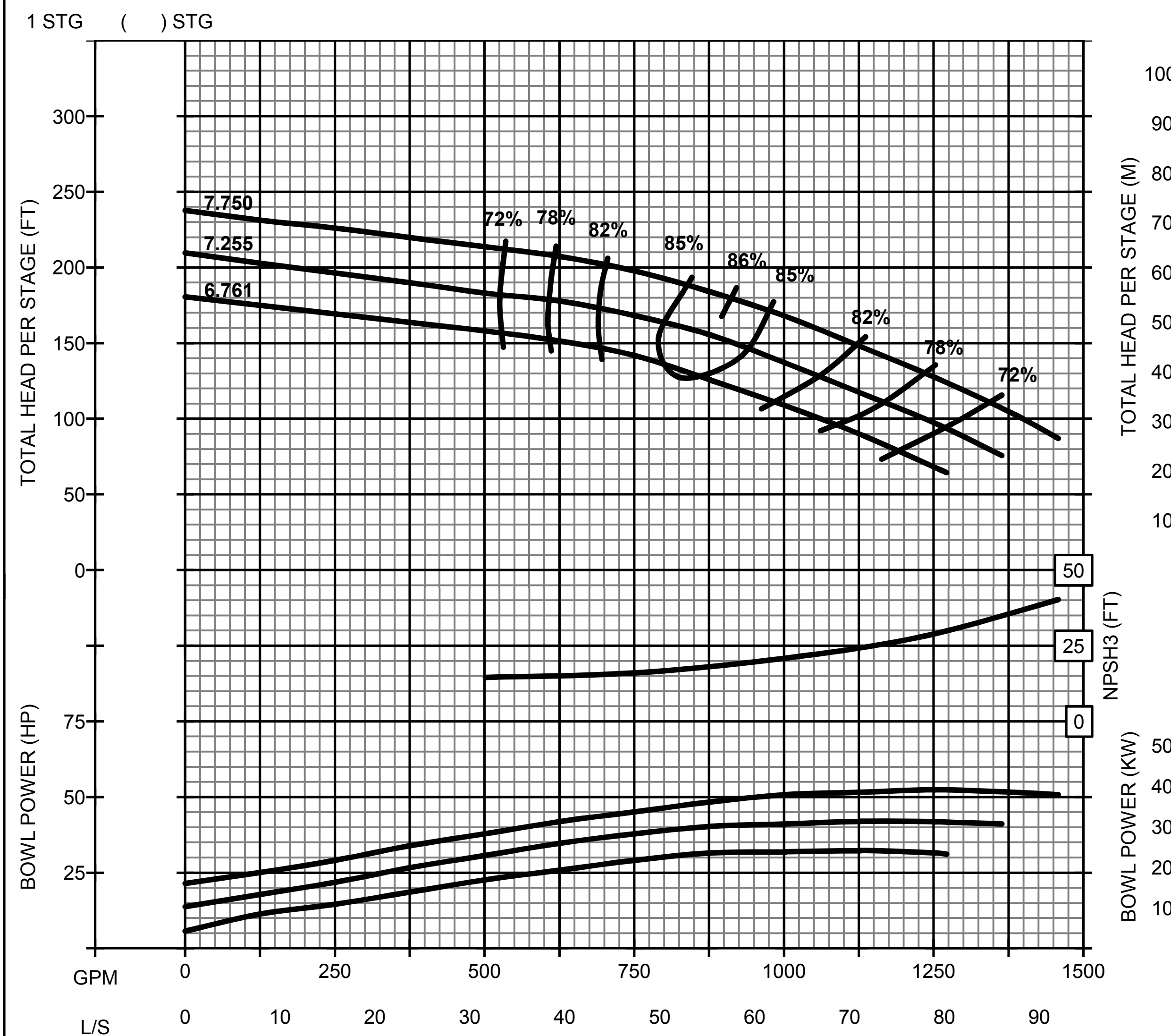
NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

K10LC

3550 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	4	
	NUMBER OF POINTS	-4	-1	0	

DESIGN	GPM	TDH	HP	EFF

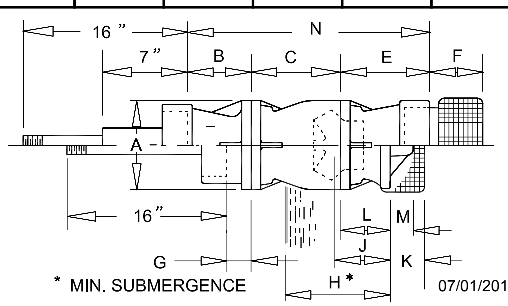


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.75	5.19	8.88	8.19	7.56	1.43	12.50	8.50	8.12	7.00	3.121	22.25

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	6"
THRUST CONSTANT:	6.8	SUCTION SIZE:	6"
LATERAL (STD):	1.0	STD. TUBE:	2.5"
EYE AREA IN²:	13.8	WR² LB-FT²:	0.78
SHAFT DIA:	1.50	1ST STG WT LB: 170	ADD STG WT LB: 68

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVK10LC2P6CY

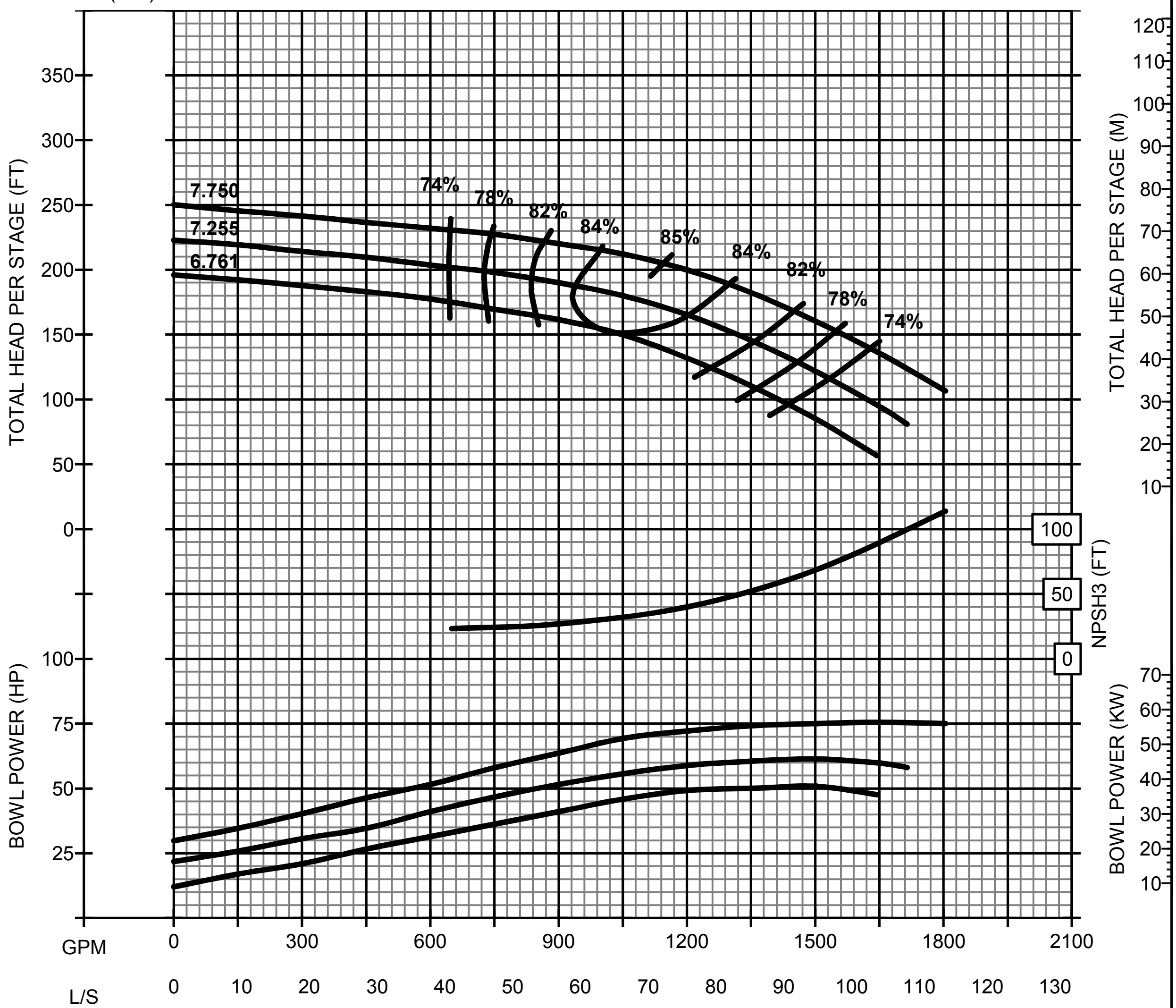
CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	K10MC 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	4		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-4	-1	0						

1 STG ( ) STG

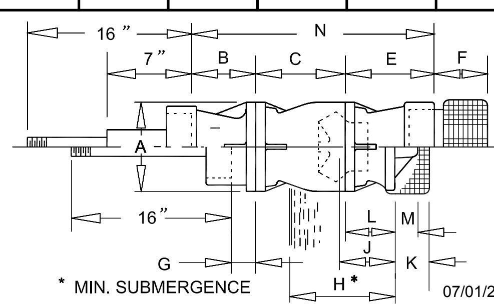


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.75	5.19	8.88	8.19	7.56	1.43	12.50	8.50	8.12	7.00	3.121	22.25

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	6"
THRUST CONSTANT:	6.8	SUCTION SIZE:	6"
LATERAL (STD):	1.0	STD. TUBE:	2.5"
EYE AREA IN²:	13.8	WR² LB-FT²:	0.78
SHAFT DIA:	1.50	1ST STG WT LB: 170	ADD STG WT LB: 68

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



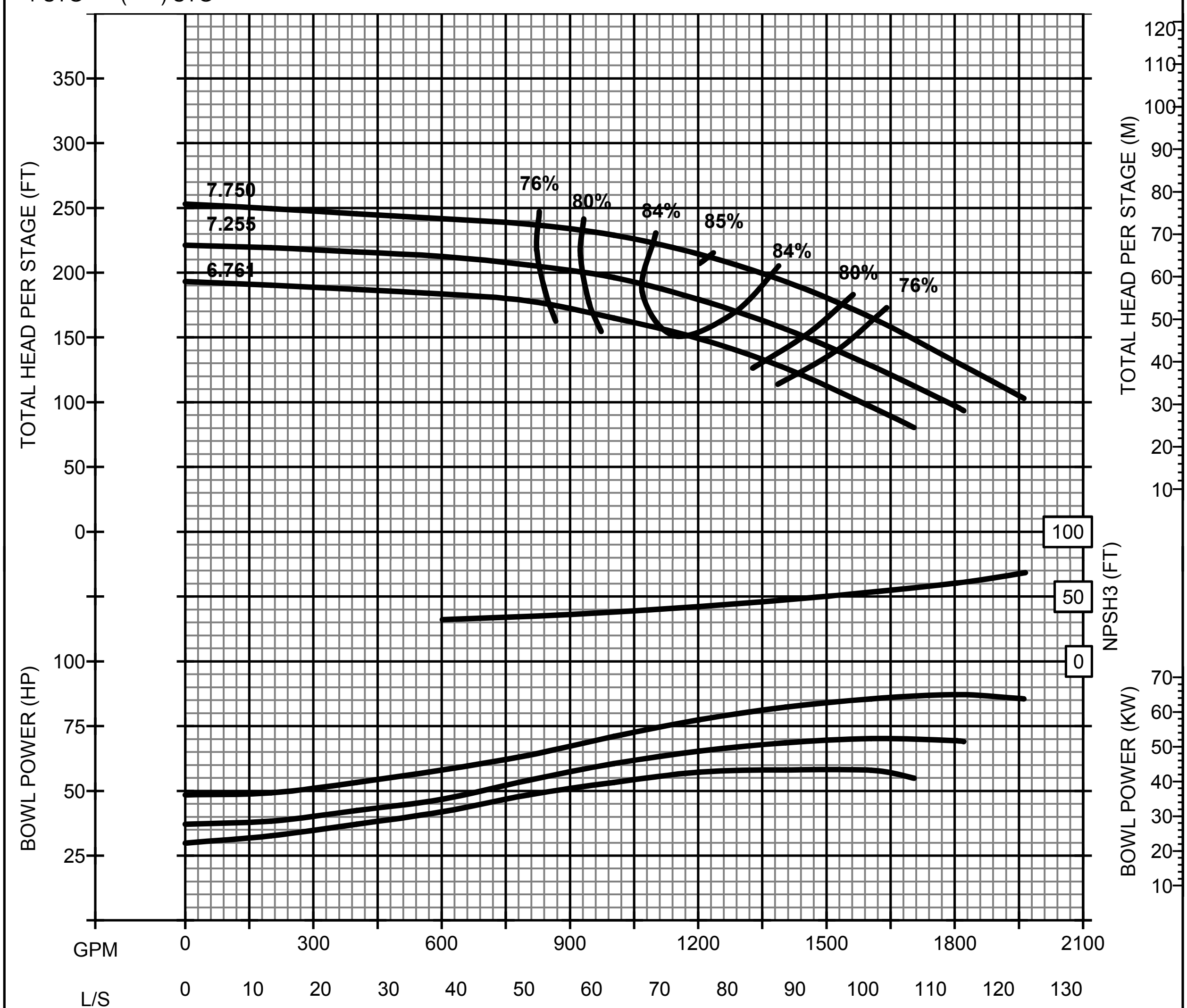
07/01/2012
CVK10MC2P6CY

CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	K10HC 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	3	4						
	NUMBER OF POINTS	-4	-1	0						

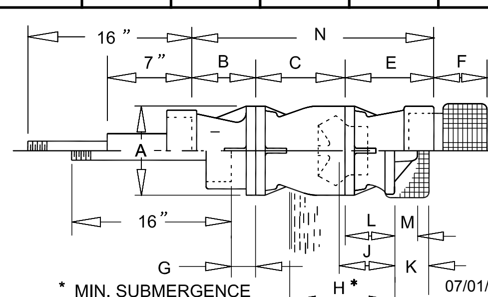


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.75	5.19	8.88	8.19	7.56	1.43	12.50	8.50	8.12	7.00	3.121	22.25

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	6"
THRUST CONSTANT:	6.8	SUCTION SIZE:	6"
LATERAL (STD):	1.0	STD. TUBE:	2.5"
EYE AREA IN²:	13.8	WR² LB-FT²:	0.78
SHAFT DIA:	1.50	1ST STG WT LB: 170	ADD STG WT LB: 68

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

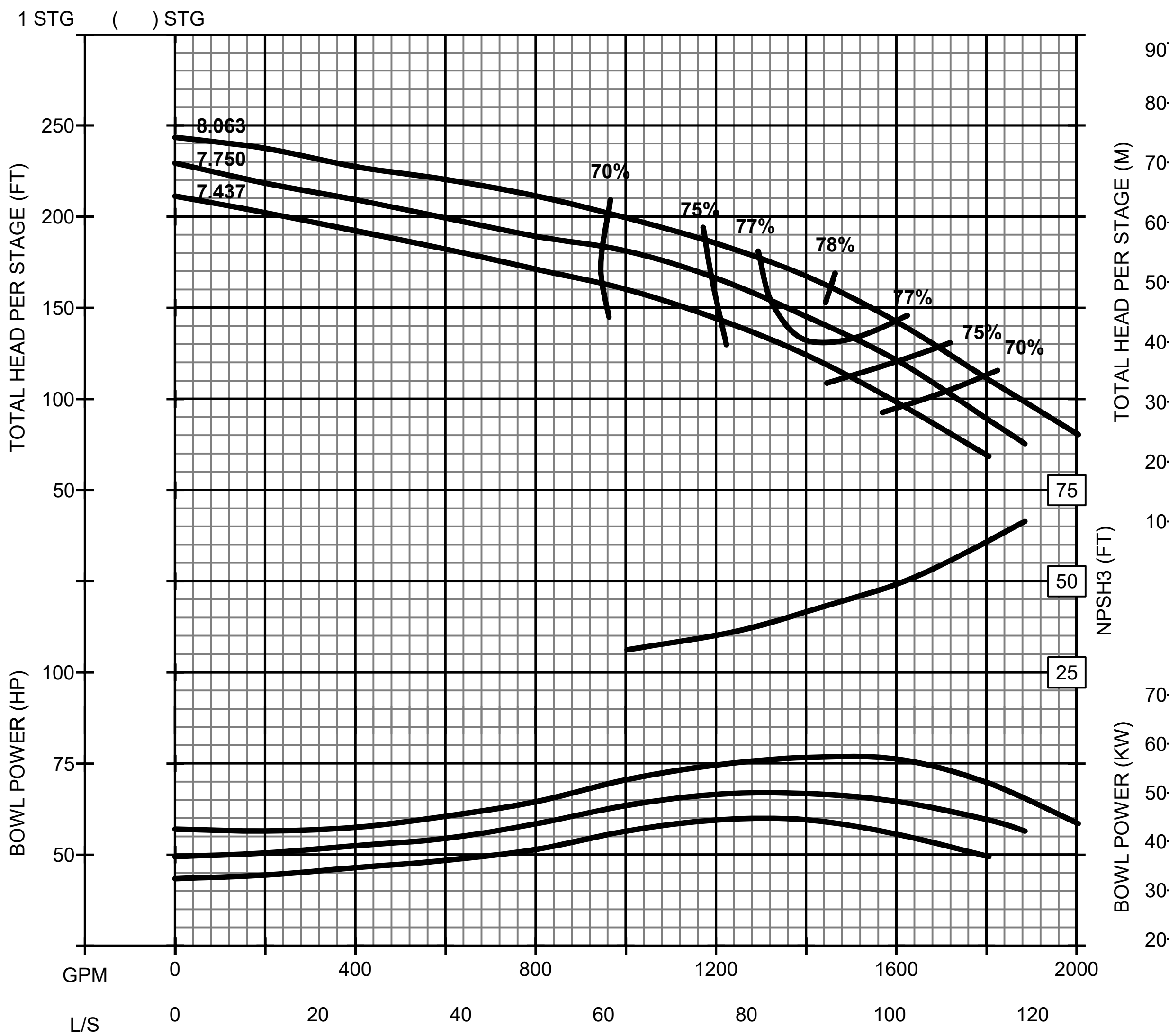
07/01/2012
CVK10HC2P6CY

CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	H10HC 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	3	5						
	NUMBER OF POINTS	-2	-1	0						

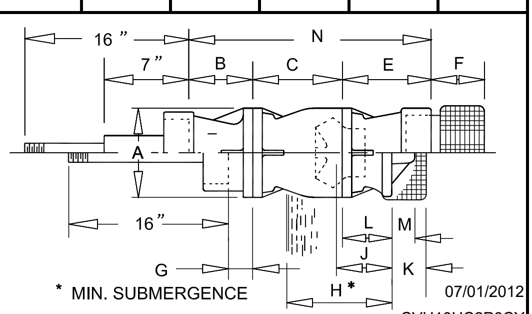


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.75	5.31	9.62	8.19	7.56	1.43	12.50	8.50	8.13	7.00	3.19	23.12

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	6", 8"
THRUST CONSTANT:	6.9	SUCTION SIZE:	6"
LATERAL (STD):	1.25	STD. TUBE:	2.5"
EYE AREA IN^2:	16.89	WR^2 LB-FT^2:	0.75
SHAFT DIA:	1.50	1ST STG WT LB: 210	ADD STG WT LB: 80

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



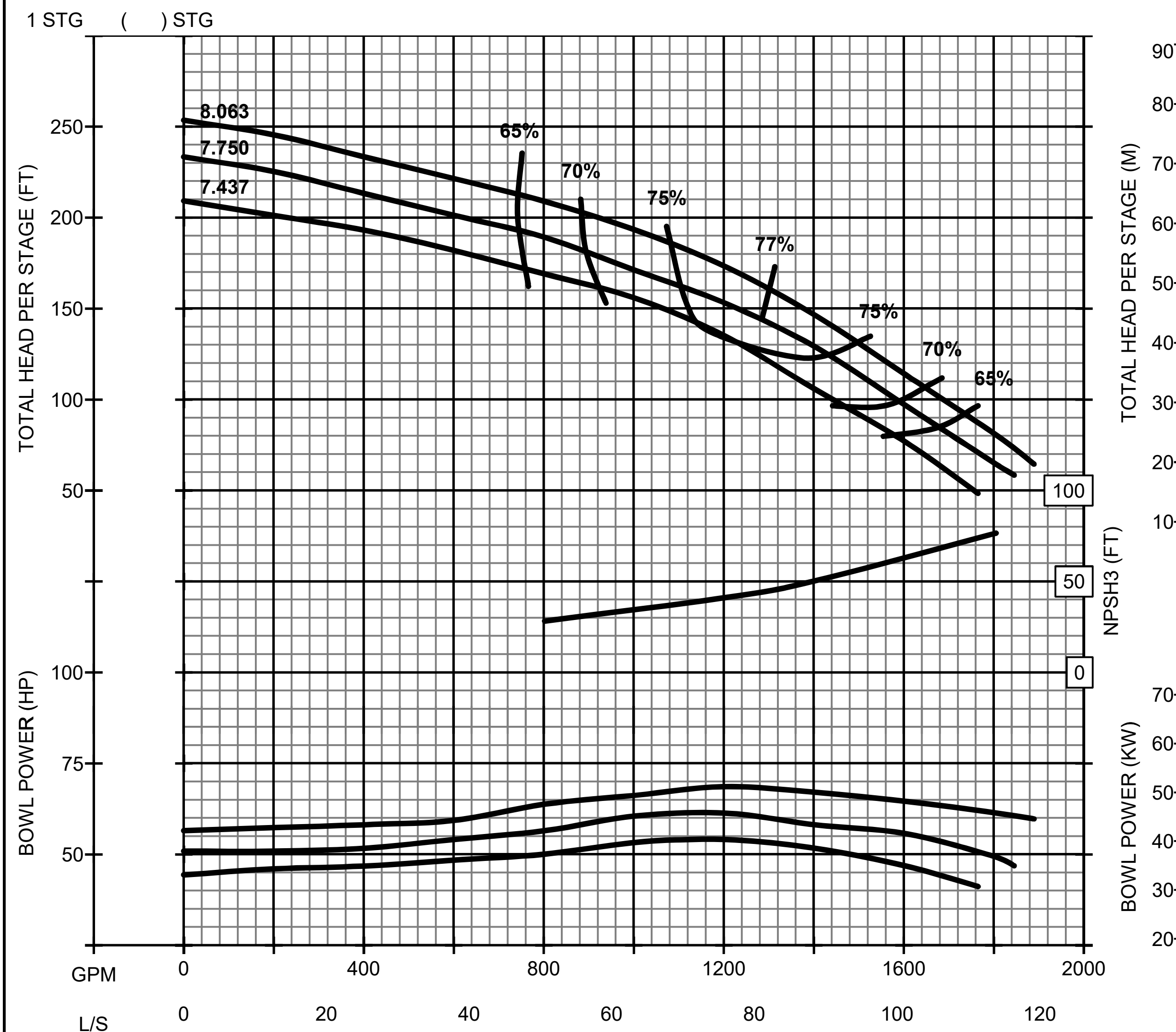
07/01/2012
CVH10HC2P6CY

CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	H10MC 3550 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						



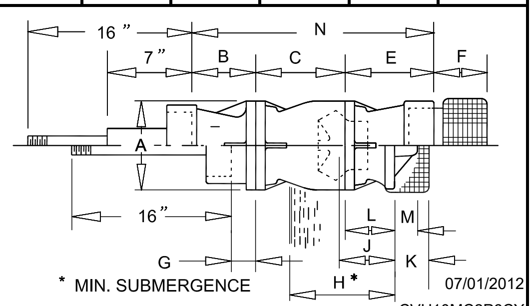
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.75	5.31	9.62	8.19	7.56	1.43	12.50	8.50	8.13	7.00	3.19	23.12

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	6", 8"
THRUST CONSTANT:	6.9	SUCTION SIZE:	6"
LATERAL (STD):	1.25	STD. TUBE:	2.5"
EYE AREA IN²:	16.89	WR² LB-FT²:	0.75
SHAFT DIA:	1.50	1ST STG WT LB: 210	ADD STG WT LB: 80

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

CVH10MC2P6CY

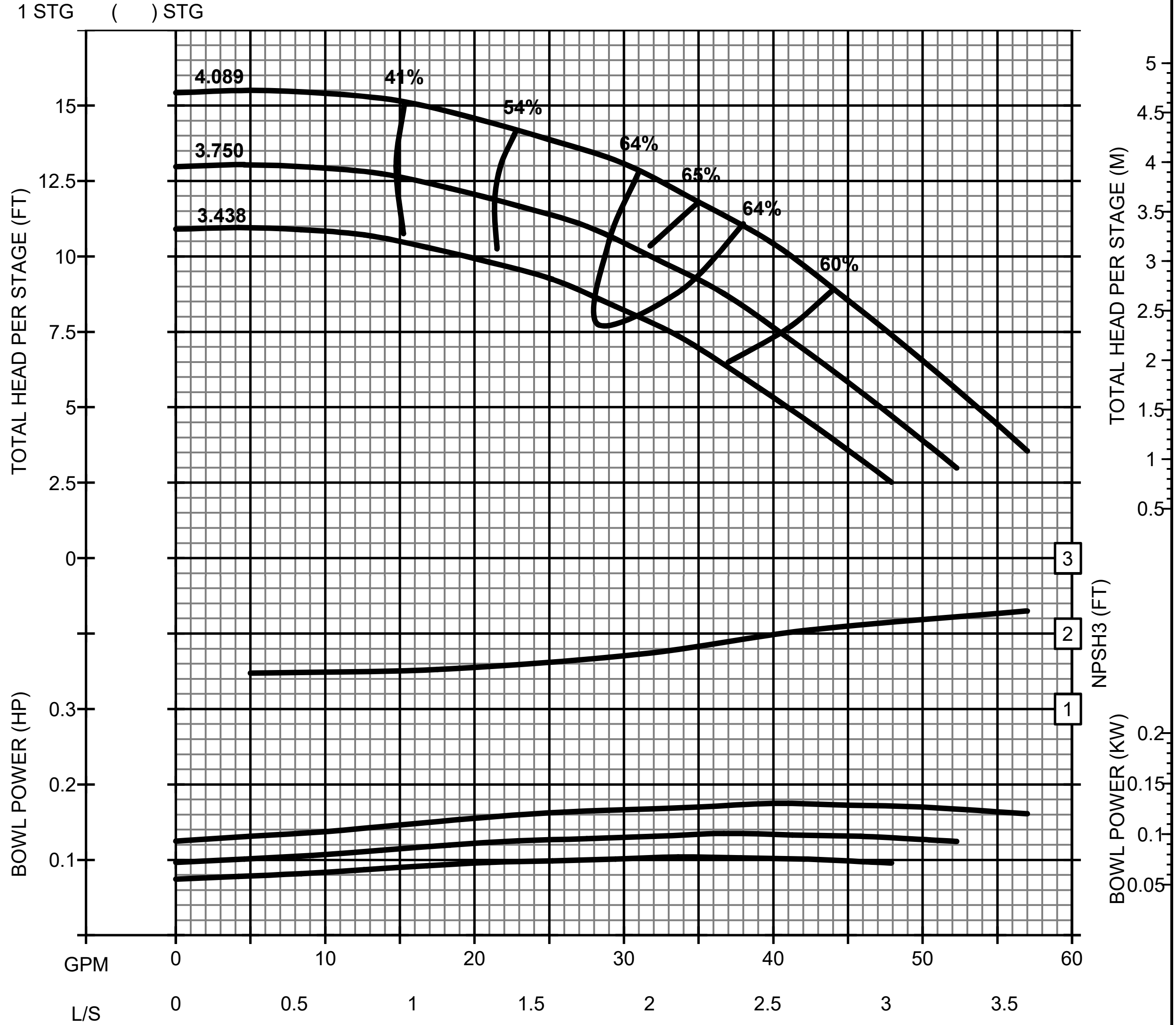
CURVE TEMPLATE 08.05.2011

3500 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP® COMPANY A GORMAN-RUPP COMPANY	L6LC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	3	4						
	NUMBER OF POINTS	-2	-1	0						

1 STG ( ) STG



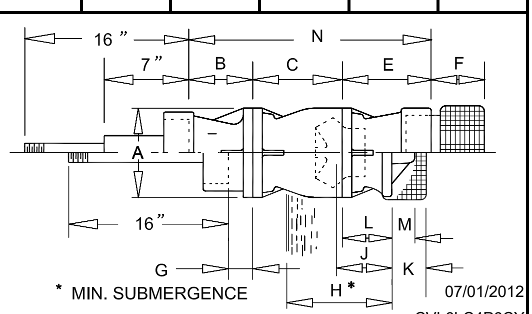
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	5.50	N/A	3.75	N/A	N/A	2.69	8.00	3.19	N/A	3.00	3.38	12.81

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	4"
THRUST CONSTANT:	1.20	SUCTION SIZE:	BELL
LATERAL (STD):	0.19	STD. TUBE:	N/A
EYE AREA IN^2:	5.38	WR^2 LB-FT^2:	0.14
SHAFT DIA:	1.0	1ST STG WT LB: 46	ADD STG WT LB: 16

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

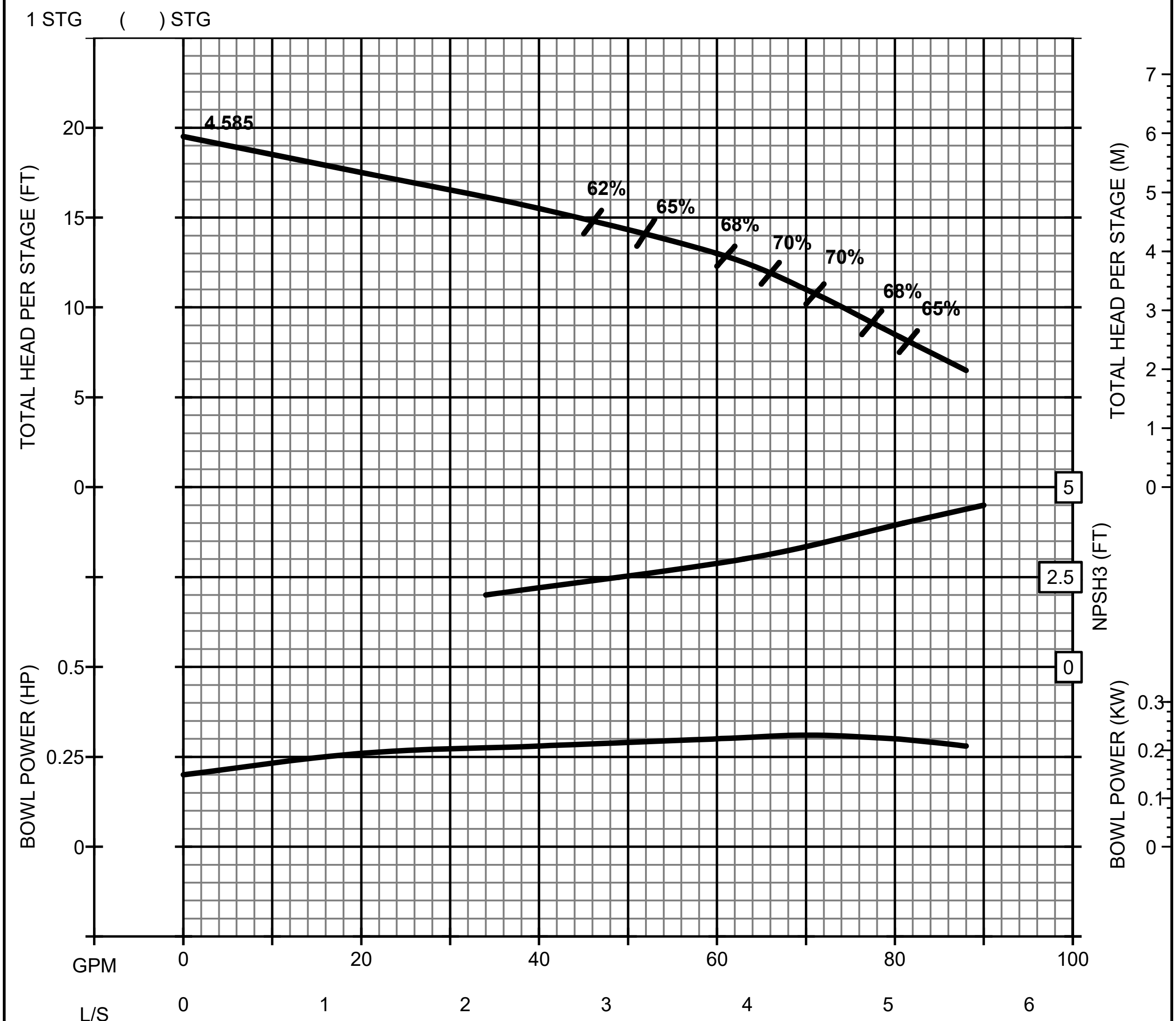
CVL6LC4P6CY

CURVE TEMPLATE 08.05.2011

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	M6LC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	3	4	
	NUMBER OF POINTS	-2	-1	0	

DESIGN	GPM	TDH	HP	EFF



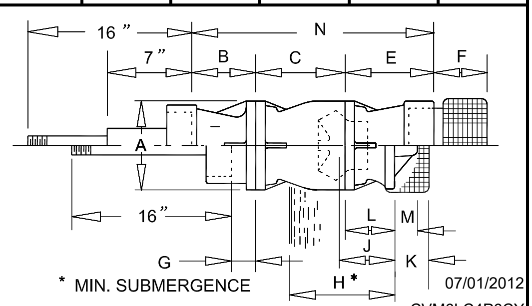
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	5.50	3.94	4.00	7.06	6.00	2.69	12.00	N/A	N/A	N/A	N/A	15.00

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	THREADED
NO. OF VANES:	5	DISCHARGE SIZE:	4"
THRUST CONSTANT:	2.3	SUCTION SIZE:	4"
LATERAL (STD):	0.19	STD. TUBE:	1.5"
EYE AREA IN²:	3.82	WR^2 LB-FT²:	0.14
SHAFT DIA:	1.00	1ST STG WT LB: 46	ADD STG WT LB: 16

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

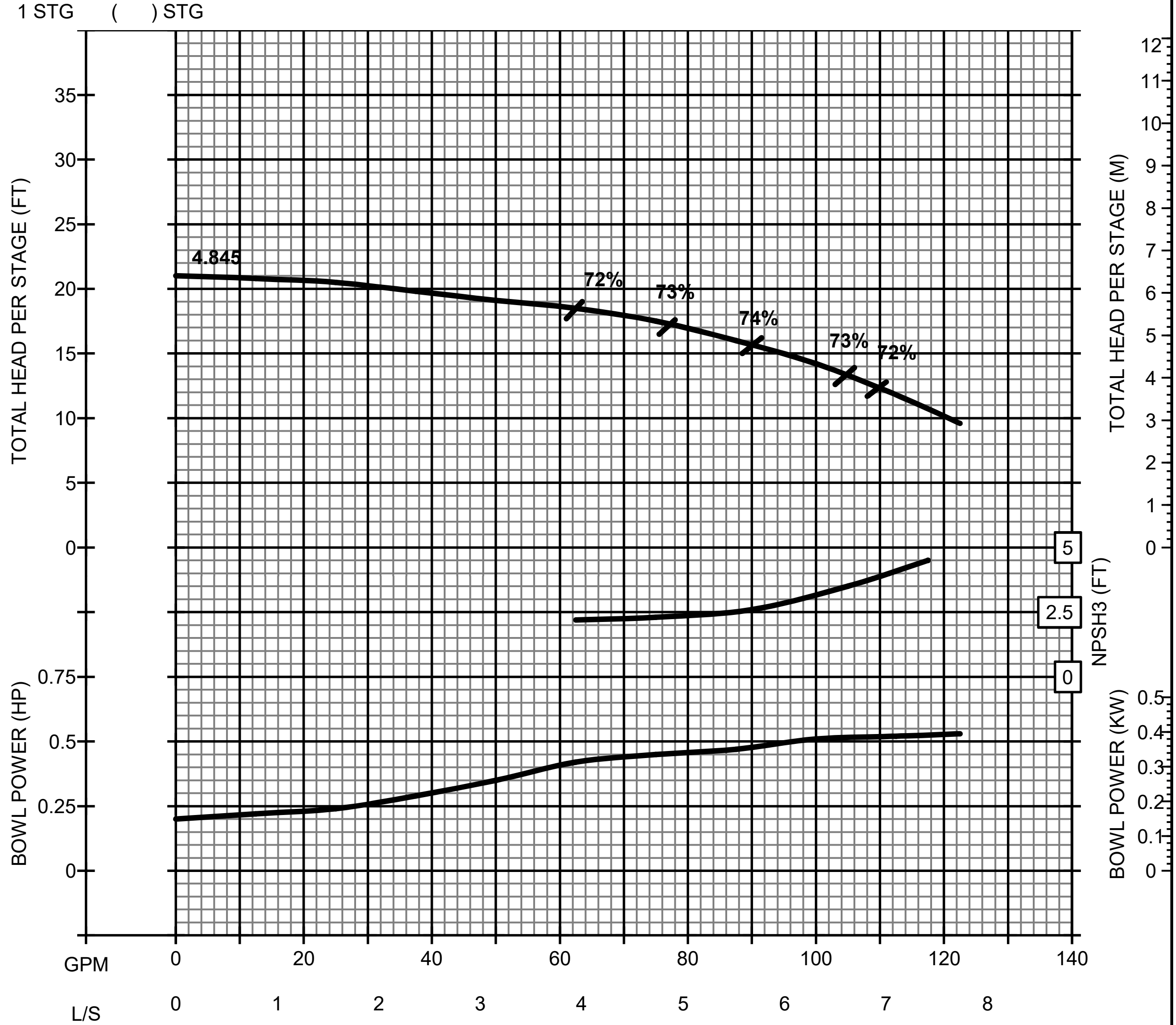
07/01/2012

CVM6LC4P6CY

CURVE TEMPLATE 08.05.2011

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	M6MC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	3	4						
	NUMBER OF POINTS	-2	-1	0						

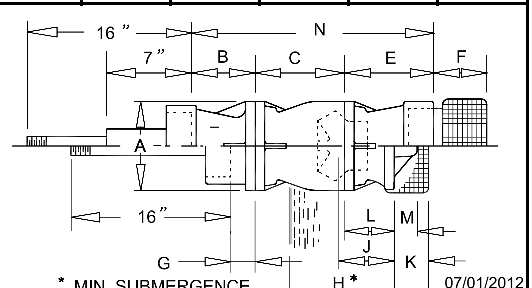


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	5.50	3.94	4.00	7.06	6.00	2.69	12.00	N/A	N/A	N/A	N/A	15.00

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	THREADED
NO. OF VANES:	6	DISCHARGE SIZE:	4"
THRUST CONSTANT:	2.3	SUCTION SIZE:	4"
LATERAL (STD):	0.19	STD. TUBE:	1.5"
EYE AREA IN^2:	3.82	WR^2 LB-FT^2:	0.14
SHAFT DIA:	1.00	1ST STG WT LB: 46	ADD STG WT LB: 16

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

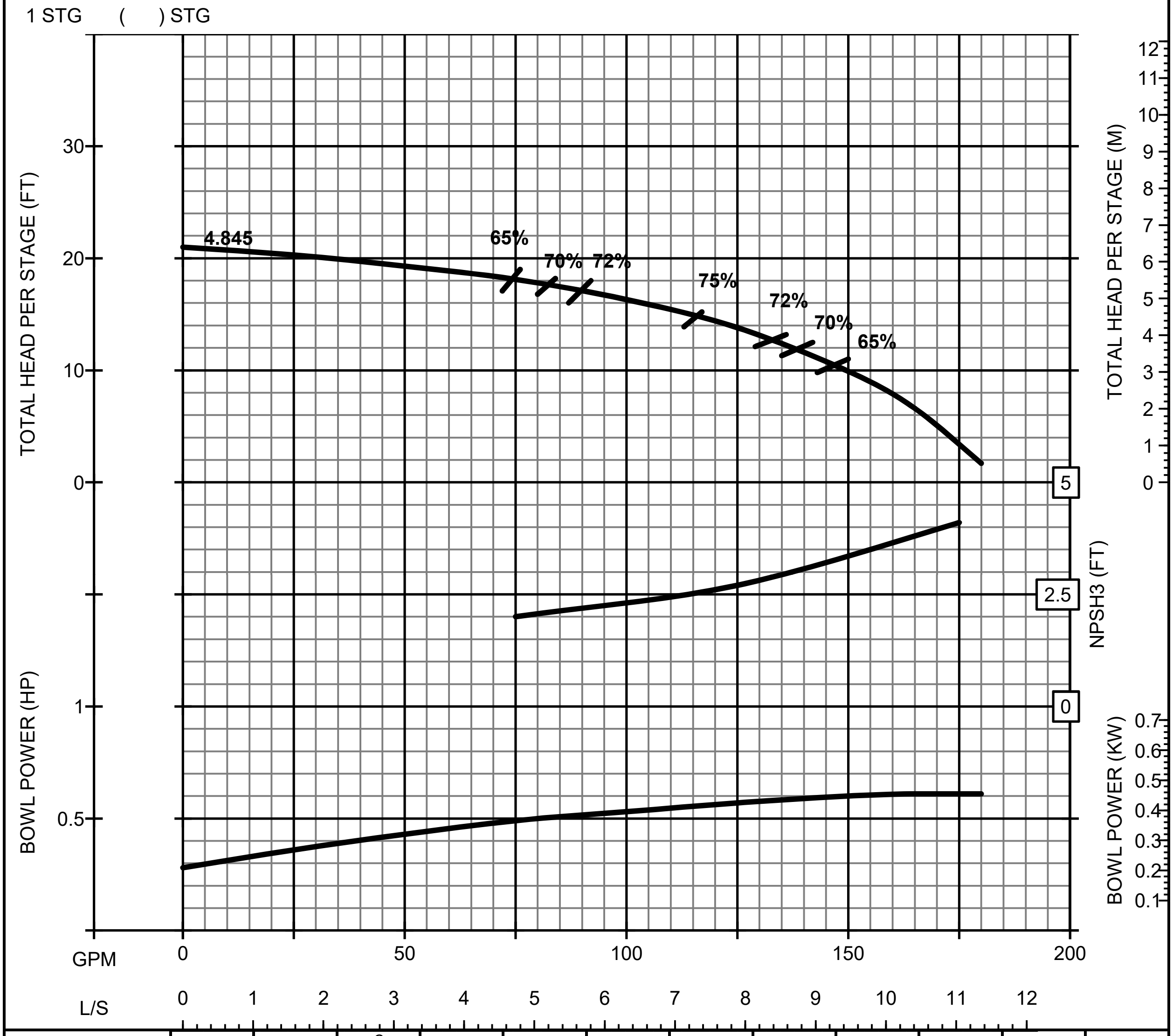
07/01/2012
CVM6MC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	M6HC 1770 RPM

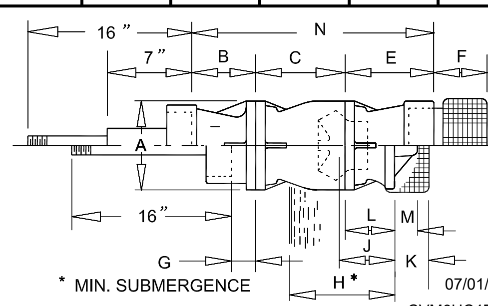
CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	4		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						



DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	5.50	3.94	4.00	7.06	6.00	2.69	12.00	N/A	N/A	N/A	N/A	15.00

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	THREADED
NO. OF VANES:	7	DISCHARGE SIZE:	4"
THRUST CONSTANT:	2.3	SUCTION SIZE:	4"
LATERAL (STD):	0.19	STD. TUBE:	1.5"
EYE AREA IN^2:	3.82	WR^2 LB-FT^2:	0.14
SHAFT DIA:	1.00	1ST STG WT LB: 46	ADD STG WT LB: 16



*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.

* MIN. SUBMERGENCE

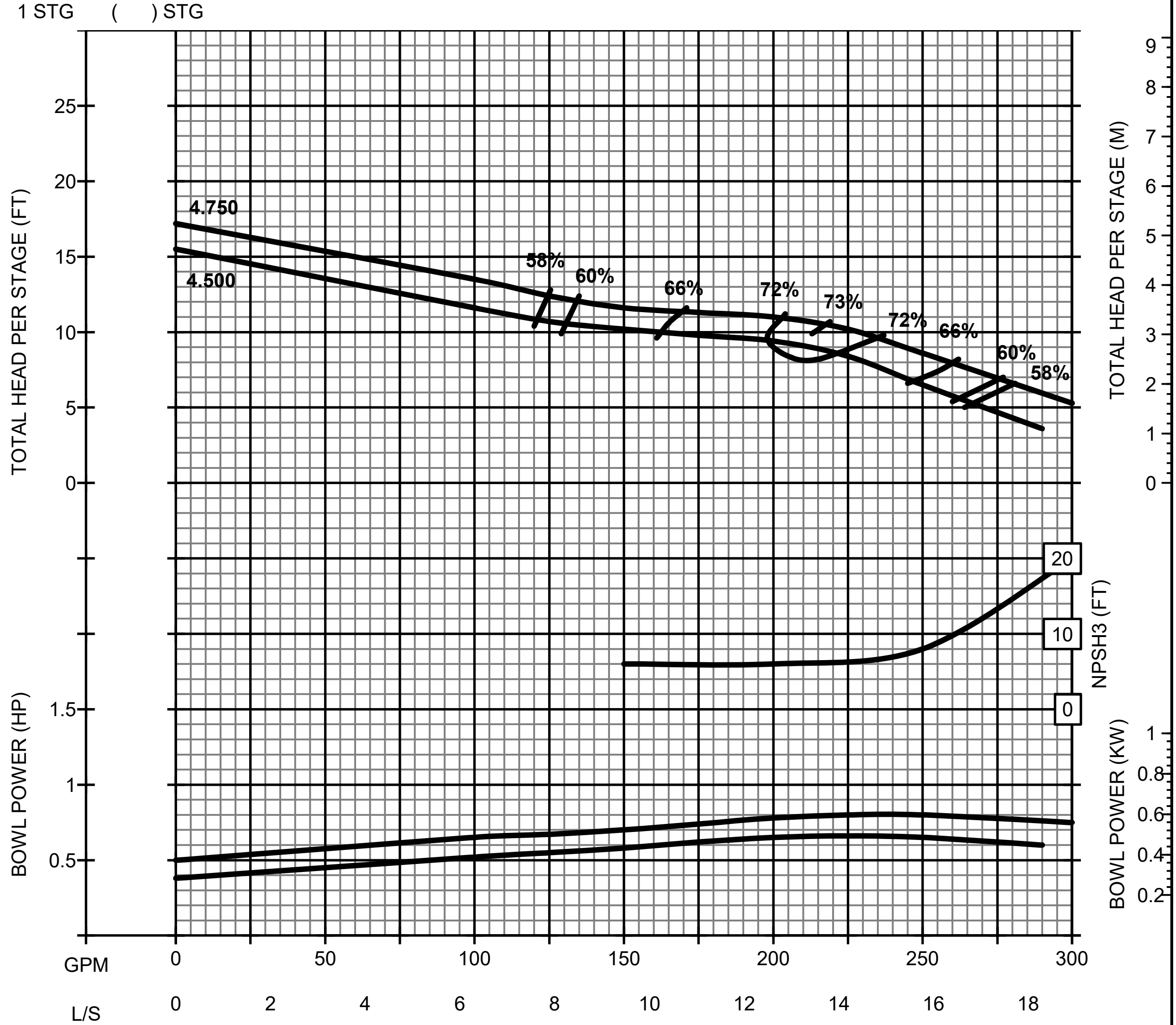
07/01/2012
CVM6HC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	E6XHC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	4		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

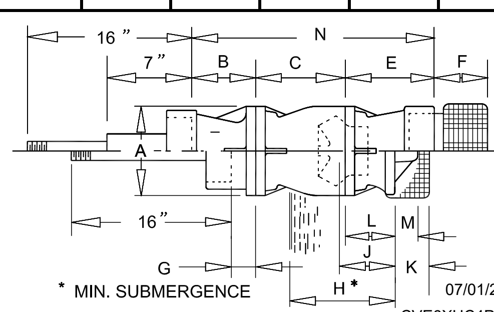


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	5.62	3.94	6.19	7.06	6.00	2.69	12.00	N/A	N/A	N/A	N/A	18.75

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	THREADED
NO. OF VANES:	8	DISCHARGE SIZE:	4"
THRUST CONSTANT:	2.90	SUCTION SIZE:	4"
LATERAL (STD):	0.188	STD. TUBE:	1.5"
EYE AREA IN²:	7.12	WR² LB-FT²:	0.14
SHAFT DIA:	1.00	1ST STG WT LB: 60	ADD STG WT LB: 25

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVE6XHC4P6CY

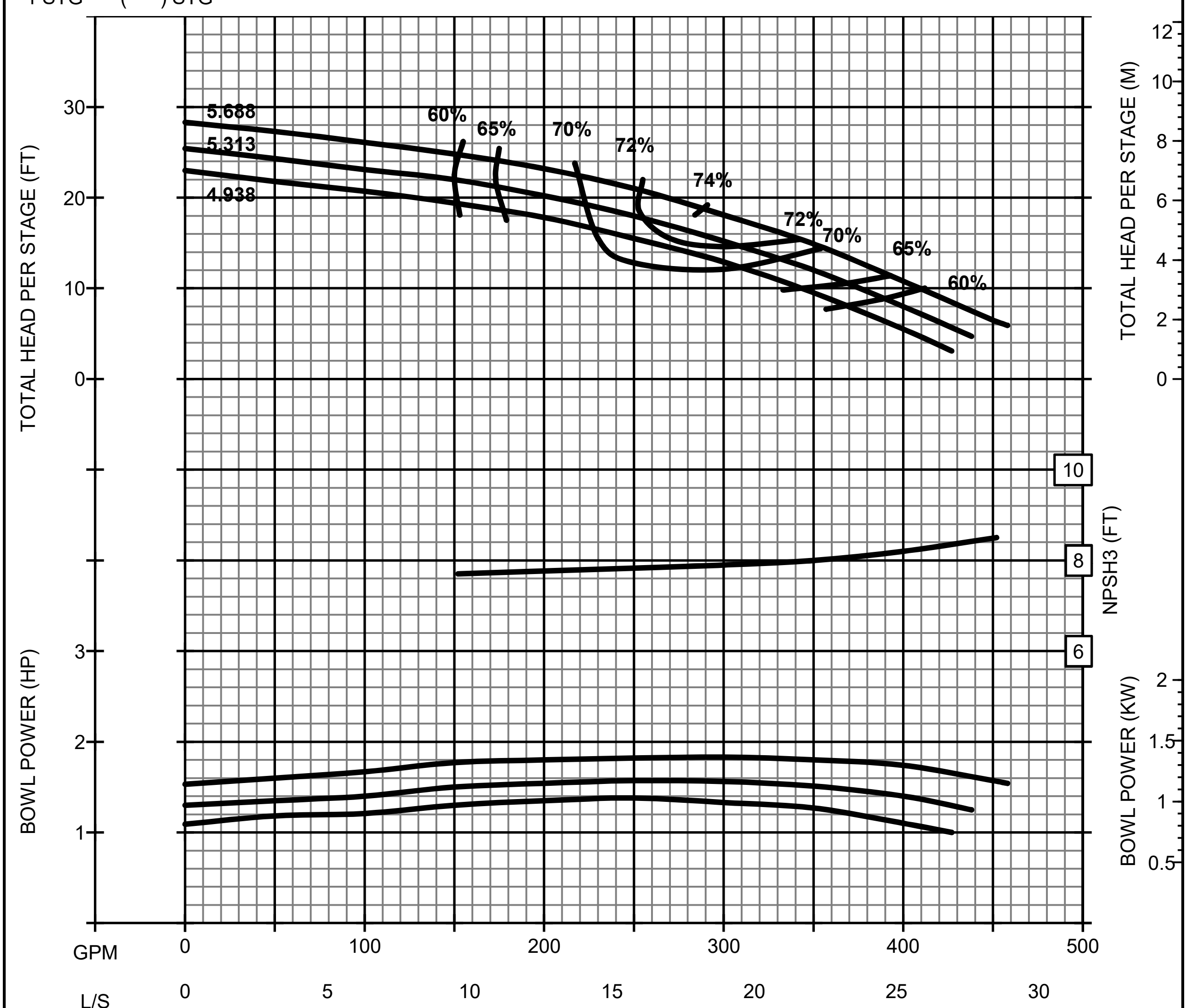
CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	H7LC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	3	5						
	NUMBER OF POINTS	-2	-1	0						

1 STG ( ) STG



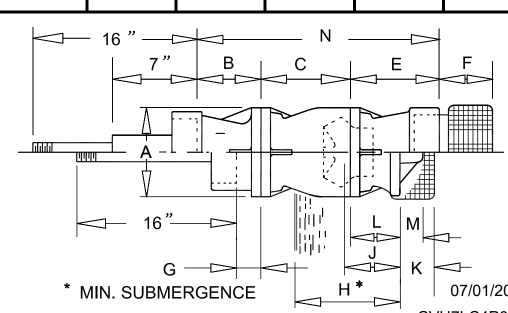
1770 CURVES

DIMENSIONS IN INCHES	A**	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	7.0	5.5	6.75	8.25	6.56	1.12	16.5	8.75	N/A	N/A	N/A	20.5

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	5", 6"
THRUST CONSTANT:	4.2	SUCTION SIZE:	5", 6"
LATERAL (STD):	0.75	STD. TUBE:	2"
EYE AREA IN²:	9.07	WR² LB-FT²:	0.25
SHAFT DIA:	1.25	1ST STG WT LB: 95	ADD STG WT LB: 35

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.
** IF 6" DISCHARGE CASE OR 6" SUCTION CASE IS USED, THIS DIMENSION IS 7.25"



* MIN. SUBMERGENCE

07/01/2012
CVH7LC4P6CY

CURVE TEMPLATE 08.05.2011

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

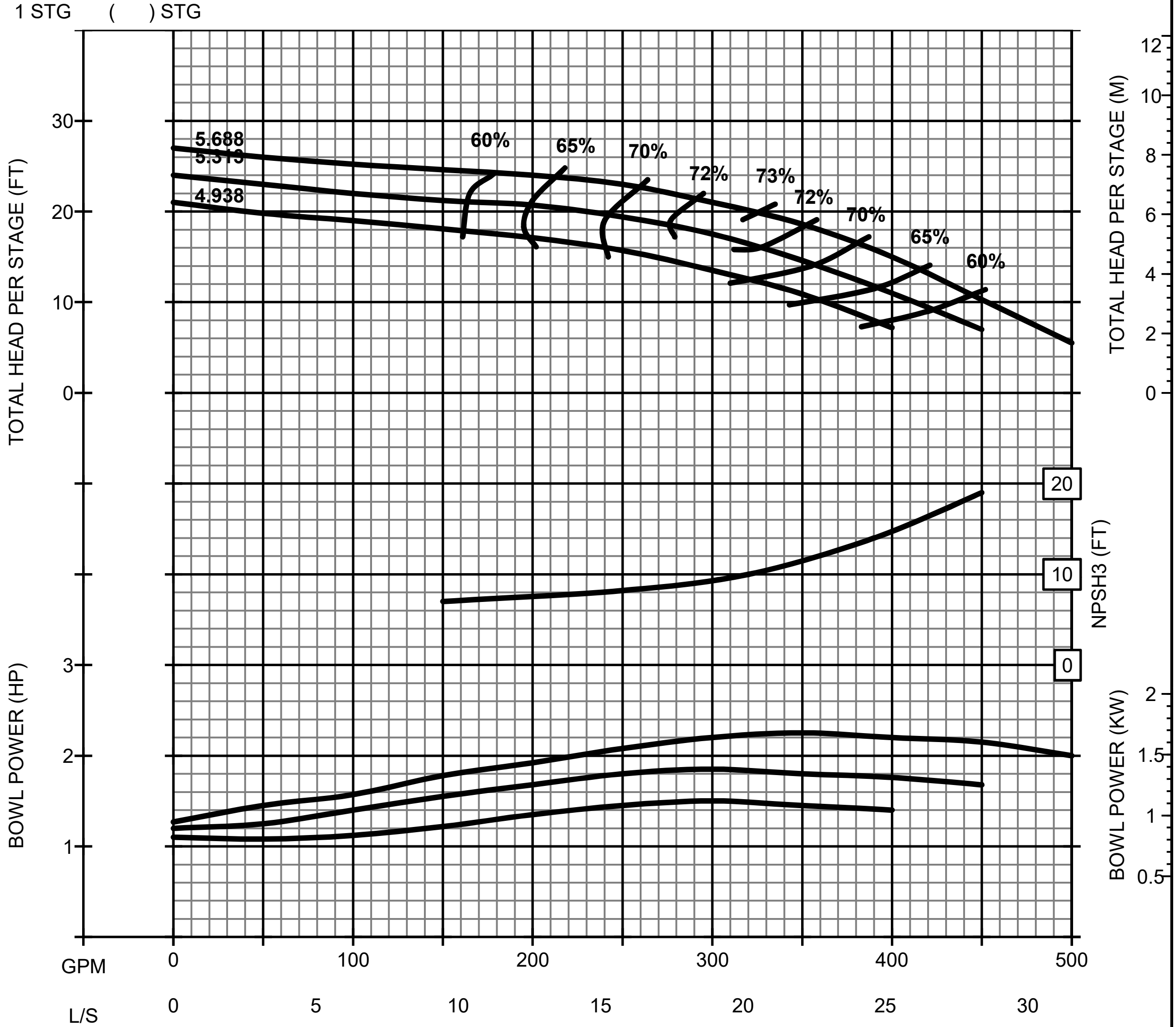
NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

H7HC

1770 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	3	5	
	NUMBER OF POINTS	-2	-1	0	

DESIGN	GPM	TDH	HP	EFF



DIMENSIONS IN INCHES	A**	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	7.0	5.5	6.75	8.25	6.56	1.12	16.5	8.75	N/A	N/A	N/A	20.5

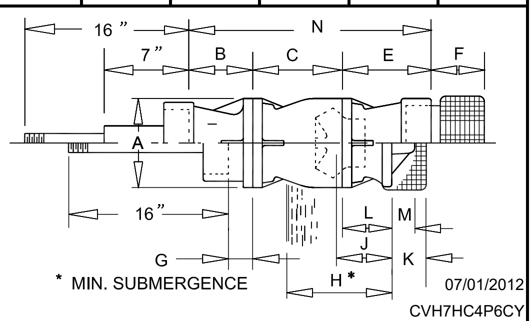
PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	5", 6"
THRUST CONSTANT:	4.2	SUCTION SIZE:	5", 6"
LATERAL (STD):	0.75	STD. TUBE:	2"
EYE AREA IN^2:	9.09	WR^2 LB-FT^2:	0.25
SHAFT DIA:	1.25	1ST STG WT LB: 95	ADD STG WT LB: 35

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.

** IF 6" DISCHARGE CASE OR 6" SUCTION CASE IS USED, THIS DIMENSION IS 7.25"



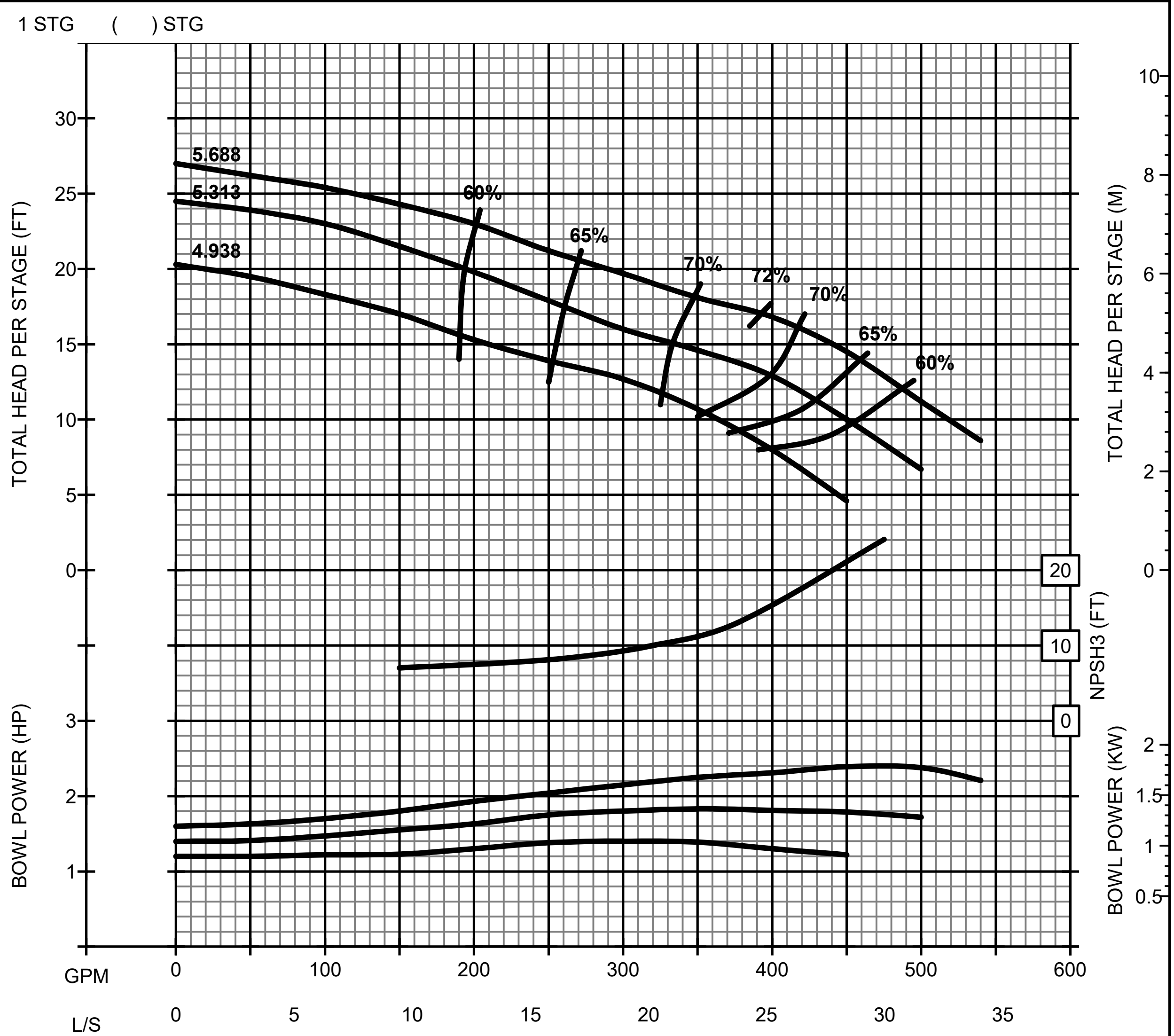
07/01/2012
CVH7HC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	H7XHC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	3	5						
	NUMBER OF POINTS	-2	-1	0						



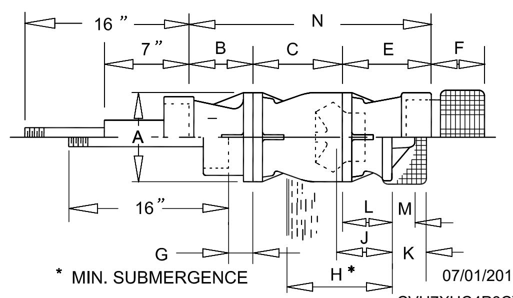
DIMENSIONS IN INCHES	A**	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	7.0	5.5	6.75	8.25	6.56	1.12	16.5	8.75	N/A	N/A	N/A	20.5

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	5", 6"
THRUST CONSTANT:	4.2	SUCTION SIZE:	5", 6"
LATERAL (STD):	0.75	STD. TUBE:	2"
EYE AREA IN²:	10.7	WR² LB-FT²:	0.25
SHAFT DIA:	1.25	1ST STG WT LB: 95	ADD STG WT LB: 35

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

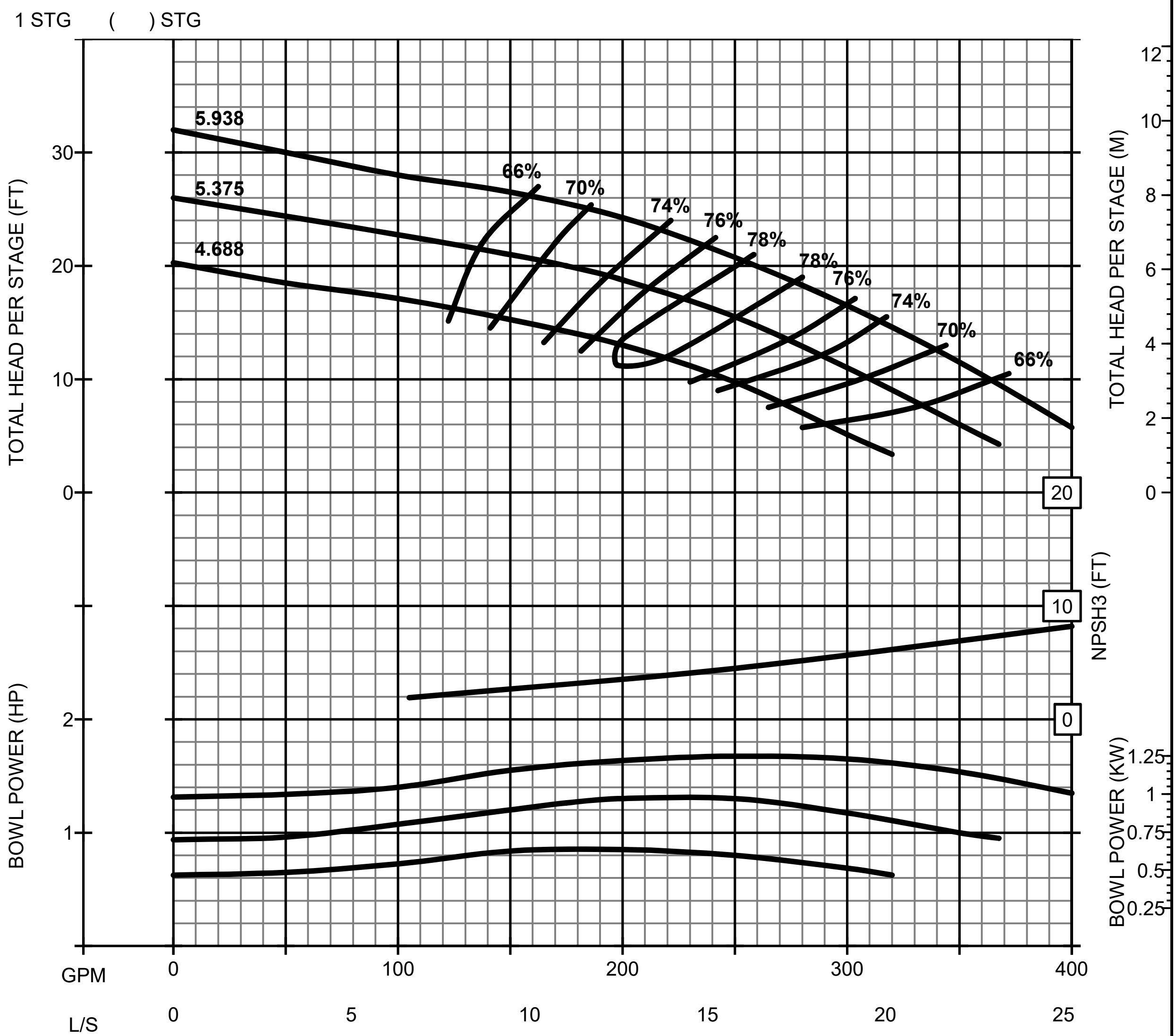
07/01/2012
CVH7XHC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	K8LC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	3	4						
	NUMBER OF POINTS	-2	-1	0						

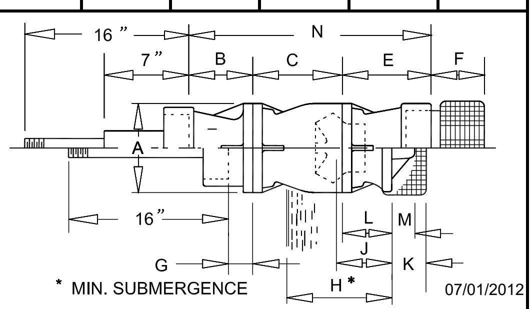


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	7.63	5.53	6.50	8.38	6.56	1.12	14.50	6.00	6.12	5.52	2.50	20.13

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	5", 6"
THRUST CONSTANT:	4.73	SUCTION SIZE:	5"
LATERAL (STD):	0.688	STD. TUBE:	2"
EYE AREA IN²:	7.742	WR² LB-FT²:	0.32
SHAFT DIA:	1.25	1ST STG WT LB: 85	ADD STG WT LB: 36

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



07/01/2012
CVK8LC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

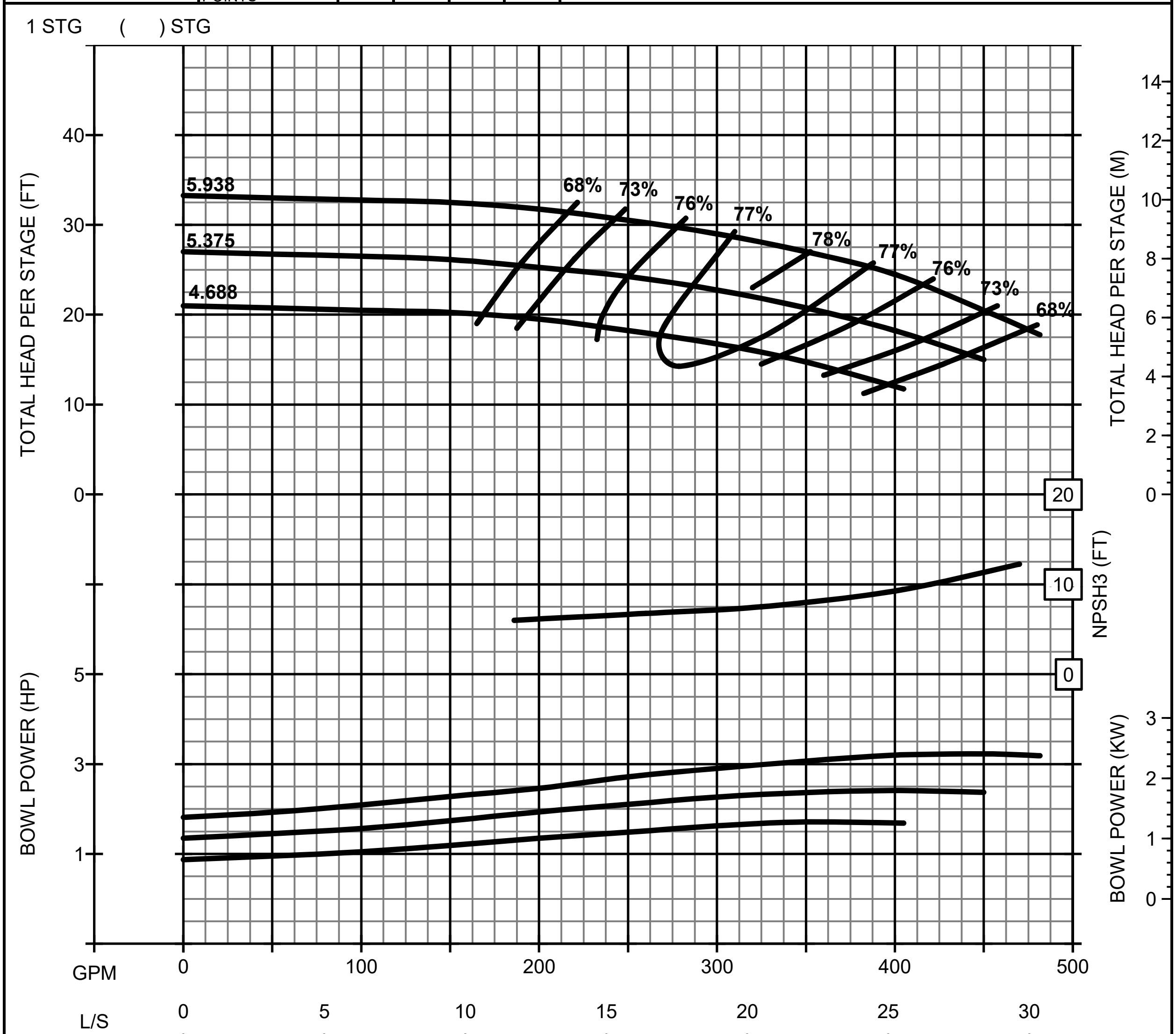
PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY

K8HC

1770 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	3	4	
	NUMBER OF POINTS	-2	-1	0	

DESIGN	GPM	TDH	HP	EFF



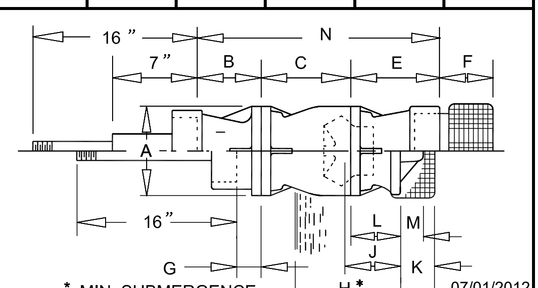
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	7.63	5.53	6.50	8.38	6.56	1.12	14.50	6.00	6.12	5.52	2.50	20.13

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	5", 6"
THRUST CONSTANT:	4.73	SUCTION SIZE:	5"
LATERAL (STD):	0.688	STD. TUBE:	2"
EYE AREA IN²:	7.742	WR² LB-FT²:	0.32
SHAFT DIA:	1.25	1ST STG WT LB: 85	ADD STG WT LB: 36

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

CVK8HC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

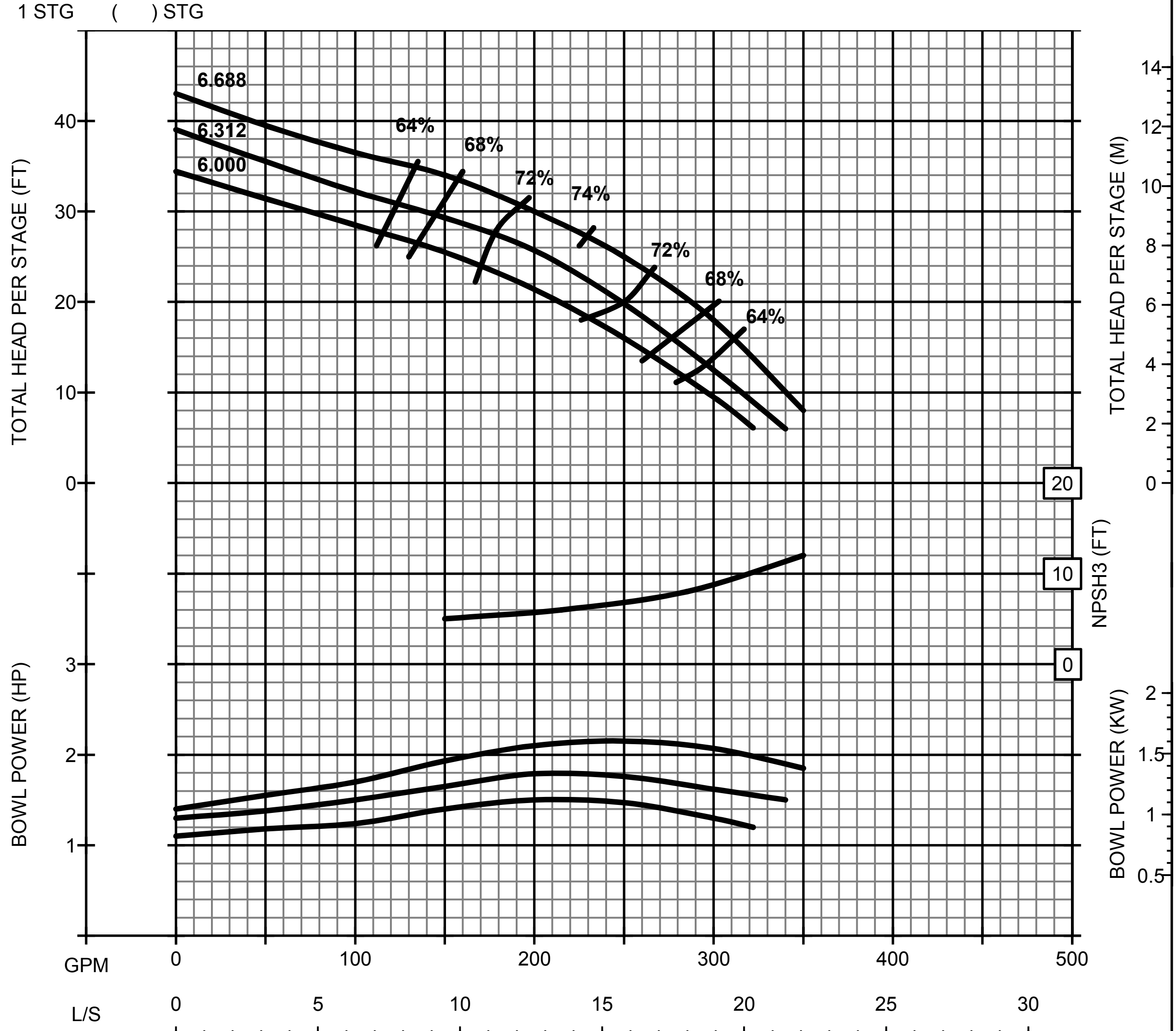
NATIONAL PUMP COMPANY®
A GORMAN-RUPP COMPANY

M8XLC

1770 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	3	5	
	NUMBER OF POINTS	-2	-1	0	

DESIGN	GPM	TDH	HP	EFF

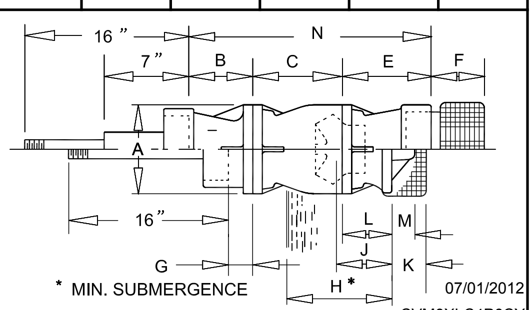


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	8.12	5.53	7.25	8.38	6.56	1.13	14.50	6.50	6.12	5.63	2.50	21.13

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED		
NO. OF VANES:	4	DISCHARGE SIZE:	4", 6"		
THRUST CONSTANT:	4.0	SUCTION SIZE:	5", 6"		
LATERAL (STD):	0.75	STD. TUBE:	2"		
EYE AREA IN²:	7.72	WR² LB-FT²:	0.32		
SHAFT DIA:	1.25	1ST STG WT LB:	102	ADD STG WT LB:	40

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

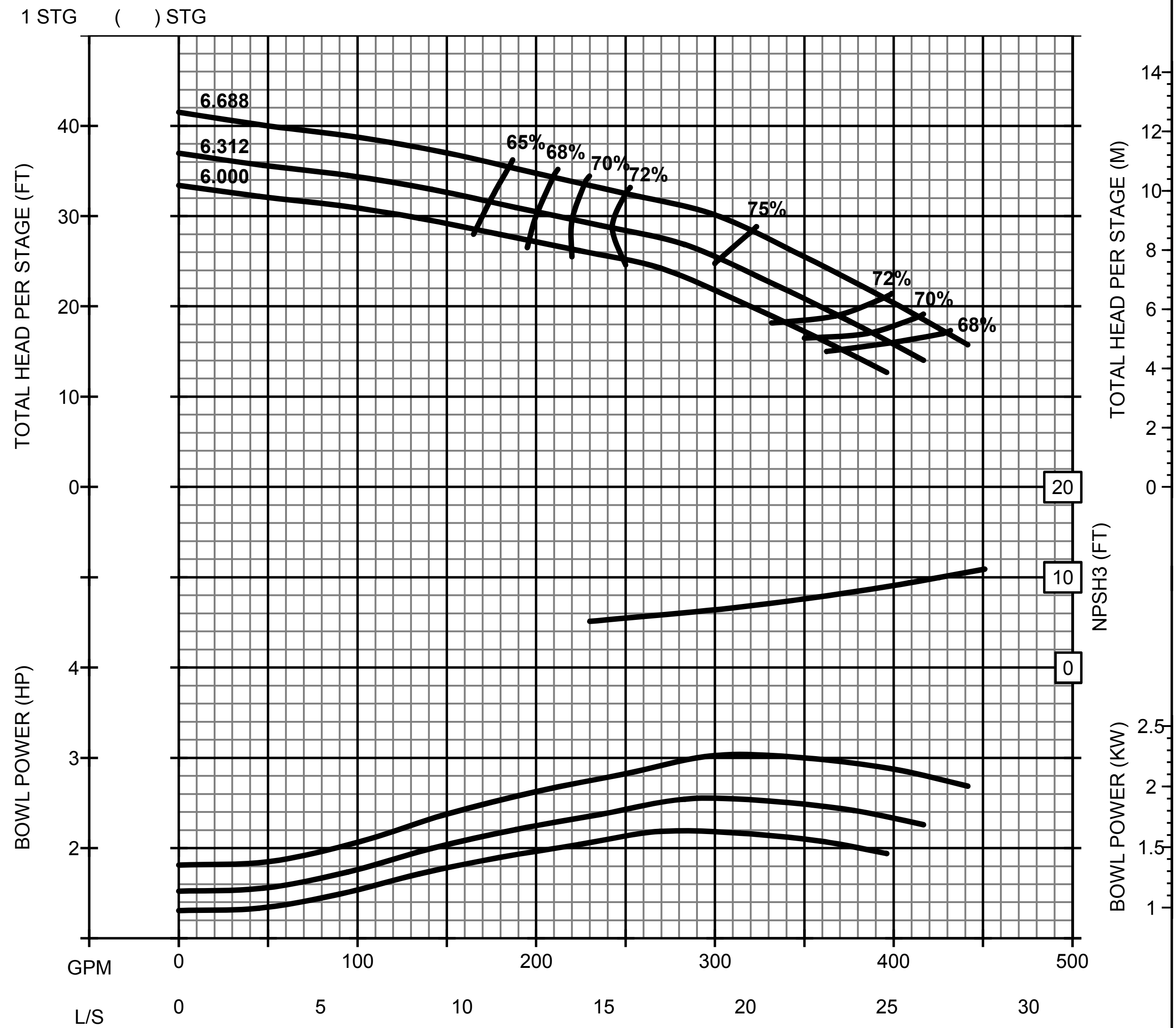
07/01/2012
CVM8XLC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	M8MC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	3	5						
	NUMBER OF POINTS	-2	-1	0						

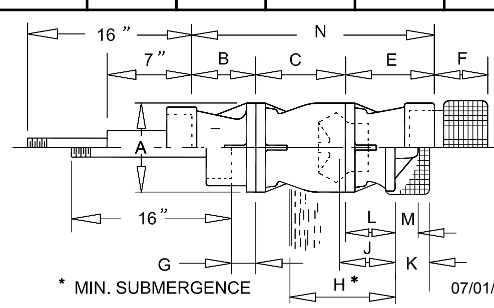


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	8.12	5.53	7.25	8.38	6.56	1.13	14.50	6.50	6.12	5.63	2.50	21.13

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	4", 6"
THRUST CONSTANT:	4.0	SUCTION SIZE:	5", 6"
LATERAL (STD):	0.75	STD. TUBE:	2"
EYE AREA IN²:	8.74	WR² LB-FT²:	0.32
SHAFT DIA:	1.25	1ST STG WT LB: 102	ADD STG WT LB: 40

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVM8MC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

NATIONAL PUMP COMPANY®
A GORMAN-RUPP COMPANY

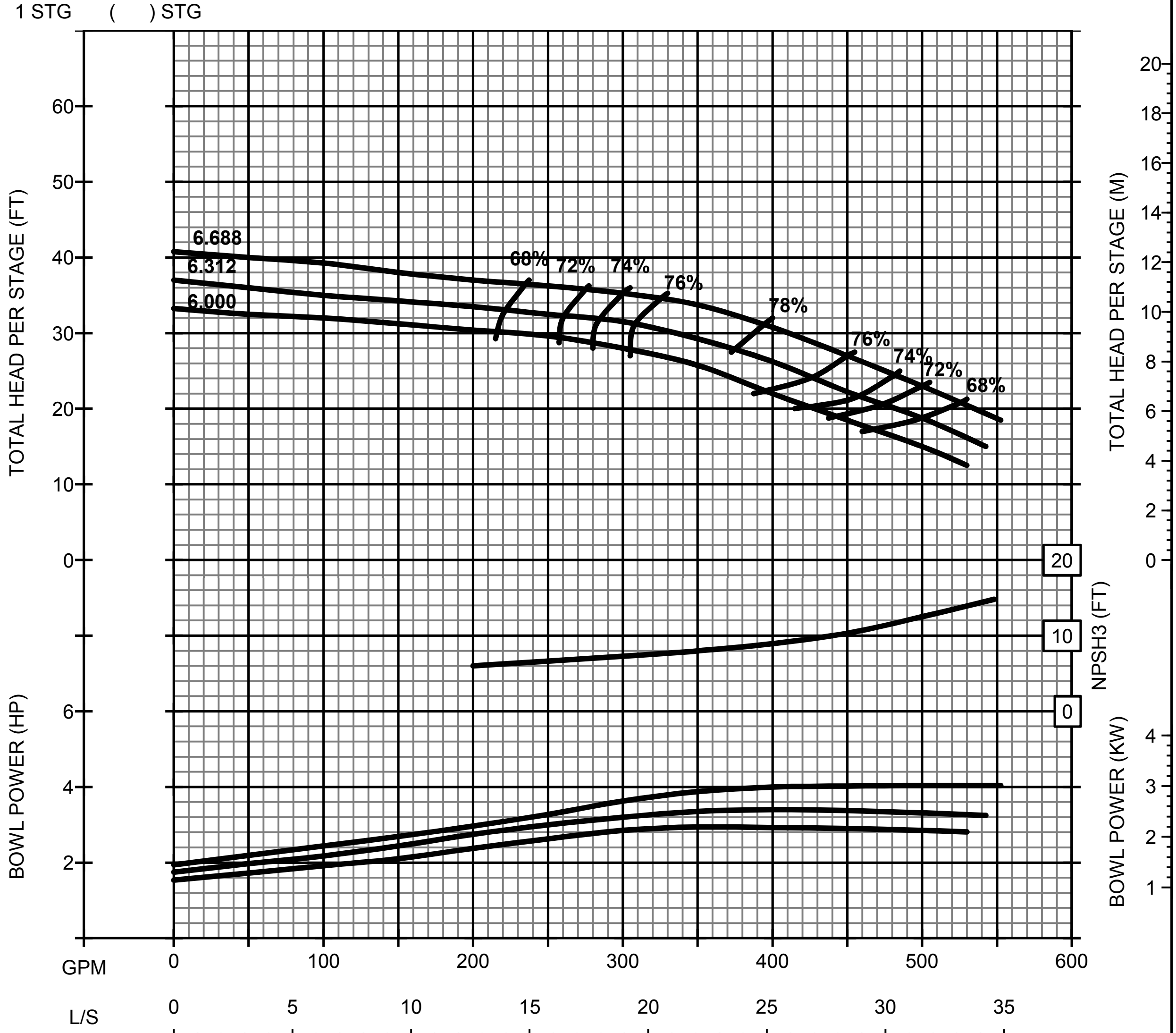
M8HC

1770 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	3	5	
	NUMBER OF POINTS	-2	-1	0	

DESIGN	GPM	TDH	HP	EFF

1 STG ( ) STG

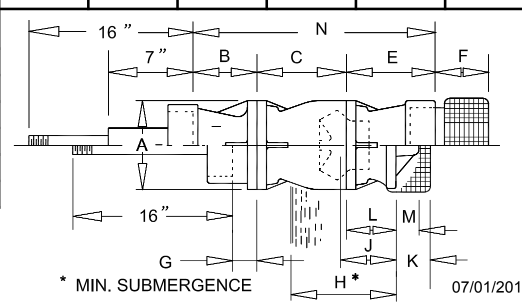


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	8.12	5.53	7.25	8.38	6.56	1.13	14.50	6.50	6.12	5.63	2.50	21.13

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	4", 6"
THRUST CONSTANT:	4.0	SUCTION SIZE:	5", 6"
LATERAL (STD):	0.75	STD. TUBE:	2"
EYE AREA IN²:	8.74	WR² LB-FT²:	0.32
SHAFT DIA:	1.25	1ST STG WT LB: 102	ADD STG WT LB: 40

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

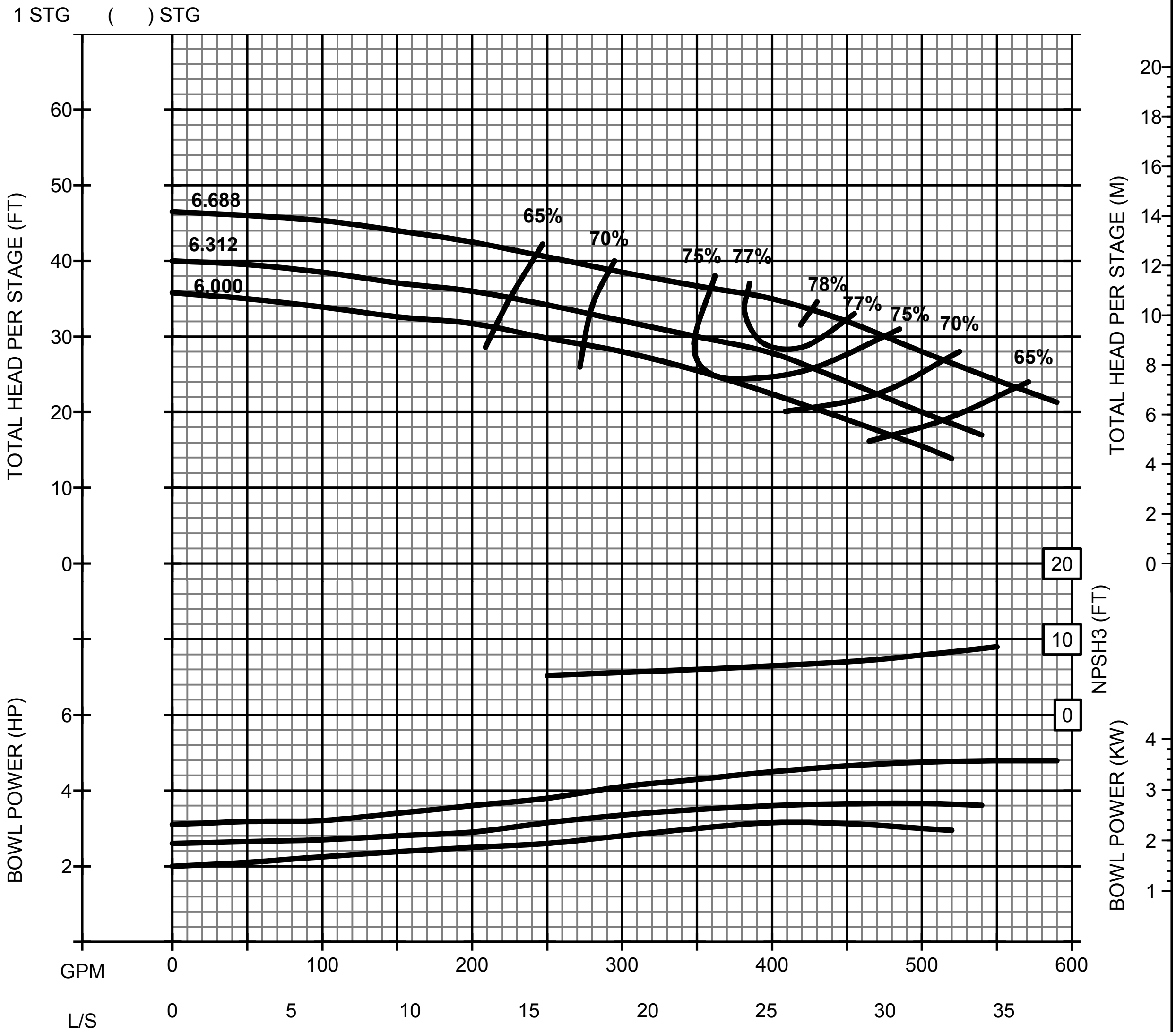
07/01/2012
CVM8HC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	M8XHC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

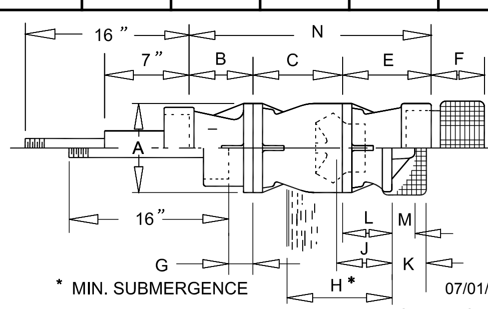


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	8.12	5.53	7.25	8.38	6.56	1.13	14.50	6.50	6.12	5.63	2.50	21.13

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	4", 6"
THRUST CONSTANT:	4.9	SUCTION SIZE:	5", 6"
LATERAL (STD):	0.62	STD. TUBE:	2"
EYE AREA IN^2:	10.7	WR^2 LB-FT^2:	0.32
SHAFT DIA:	1.25	1ST STG WT LB: 102	ADD STG WT LB: 40

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

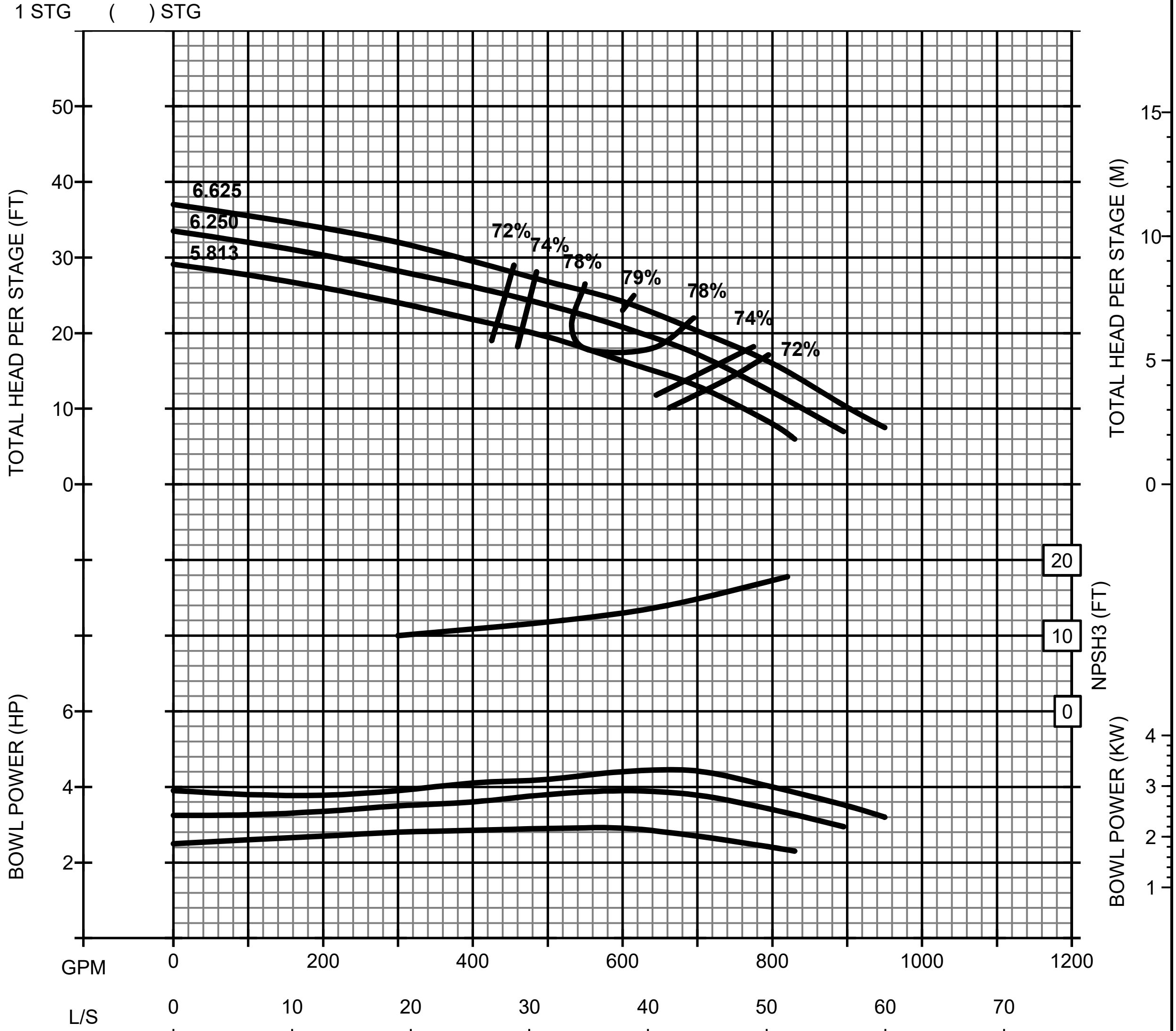
07/01/2012
CVM8XHC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	J8XHC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2	3	5					
	NUMBER OF POINTS	-3	-2	-1	0					

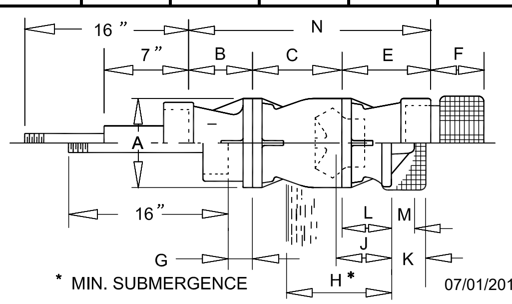


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	7.75	8.50	8.88	9.25	6.63	1.12	14.00	N/A	N/A	N/A	N/A	26.63

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	THREADED
NO. OF VANES:	6	DISCHARGE SIZE:	6"
THRUST CONSTANT:	5.4	SUCTION SIZE:	6"
LATERAL (STD):	1.38	STD. TUBE:	2"
EYE AREA IN²:	12.81	WR² LB-FT²:	0.36
SHAFT DIA:	1.25	1ST STG WT LB: 140	ADD STG WT LB: 62

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVJ8XHC4P6CY

CURVE TEMPLATE 08.05.2011

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

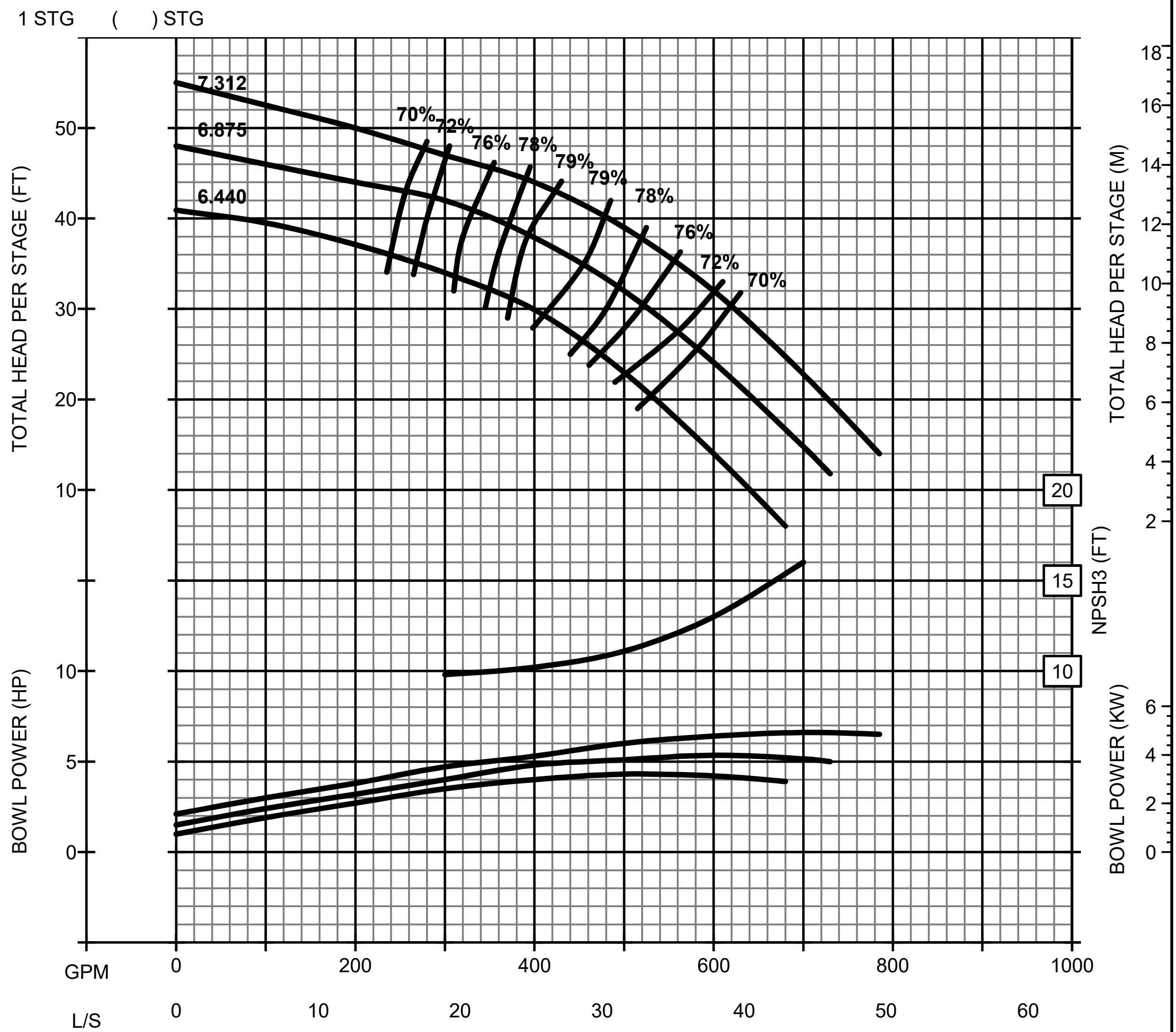
NATIONAL PUMP COMPANY®
A GORMAN-RUPP COMPANY

M9MC

1770 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	4	6	
	NUMBER OF POINTS	-3	-2	0	

DESIGN	GPM	TDH	HP	EFF



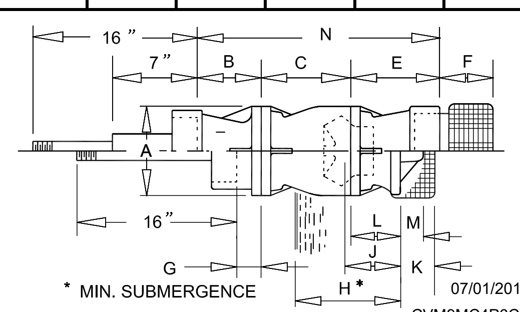
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.00	5.53	8.00	8.38	2.94	7.47	14.50	6.50	6.13	5.62	2.50	21.91

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	5", 6"
THRUST CONSTANT:	5.1	SUCTION SIZE:	6"
LATERAL (STD):	0.625	STD. TUBE:	2"
EYE AREA IN²:	9.69	WR² LB-FT²:	0.47
SHAFT DIA:	1.25	1ST STG WT LB: 138	ADD STG WT LB: 56

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

CVM9MC4P6CY

CURVE TEMPLATE 08.05.2011

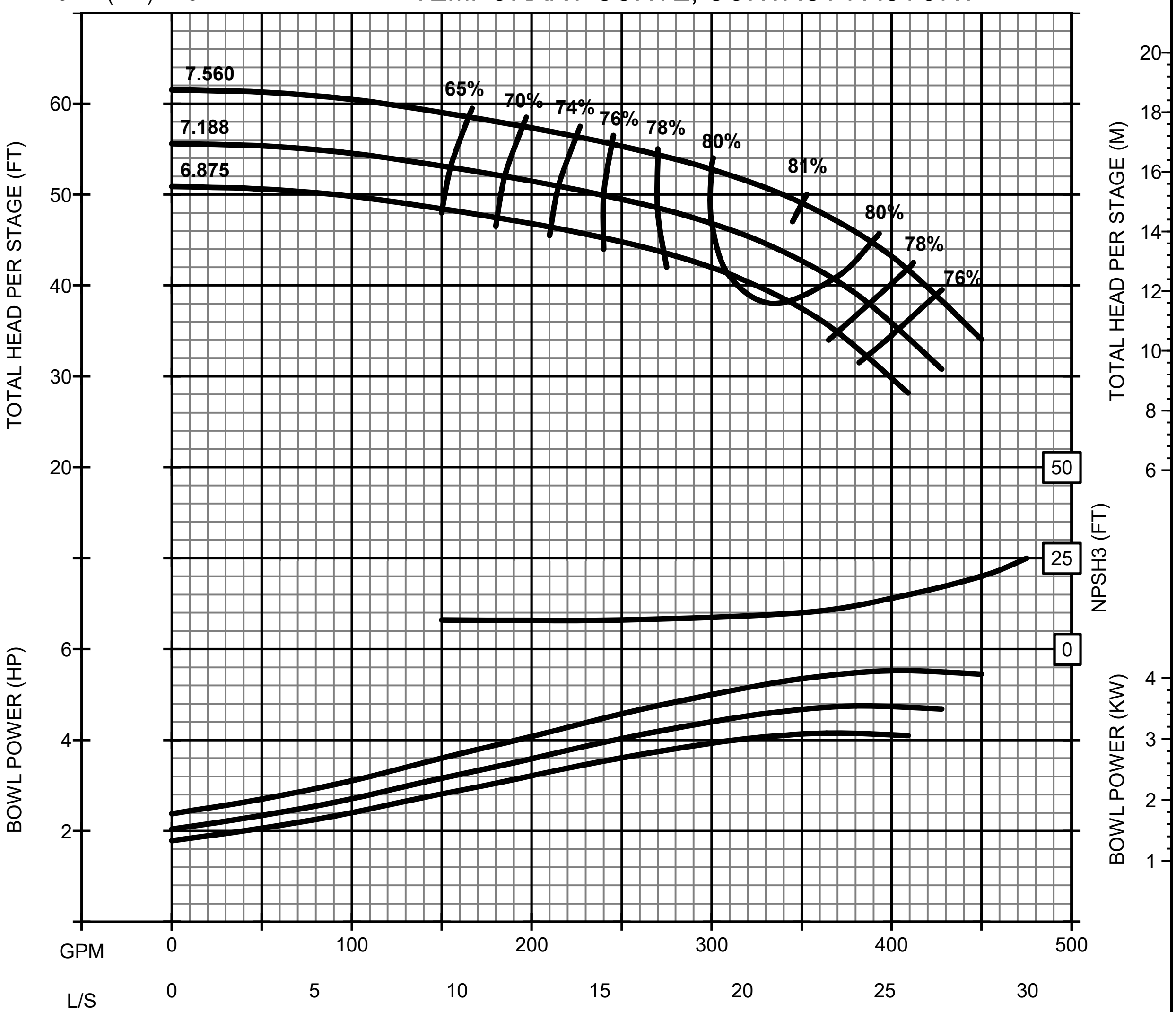
1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	L10HC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2	3		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-3	-2	0						

1 STG ( ) STG

TEMPORARY CURVE, CONTACT FACTORY

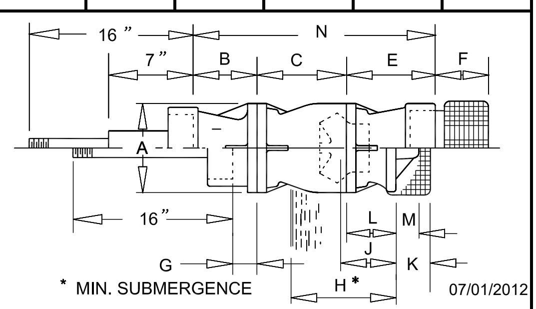


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.83	5.18	6.50	N/A	N/A	1.43	16.00	4.00		4.13	3.75	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	6"
THRUST CONSTANT:	4.60	SUCTION SIZE:	N/A
LATERAL (STD):	0.50	STD. TUBE:	2.5"
EYE AREA IN²:	8.53	WR² LB-FT²:	0.44
SHAFT DIA:	1.50	1ST STG WT LB: 175	ADD STG WT LB: 75

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVL10HC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

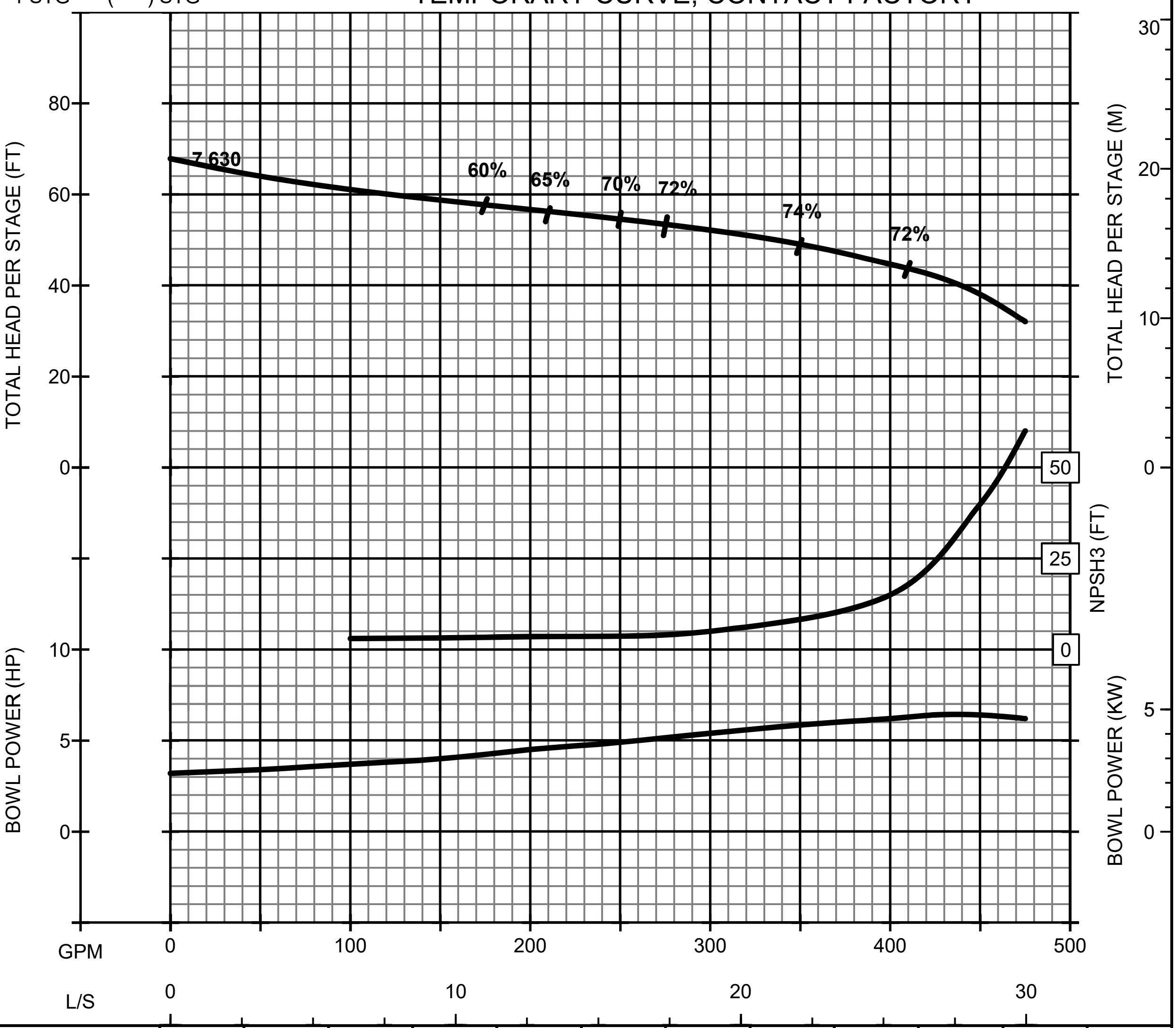
L10HC-S

1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	-	-	-	-	DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-	-	-	-					

1 STG ( ) STG

TEMPORARY CURVE, CONTACT FACTORY

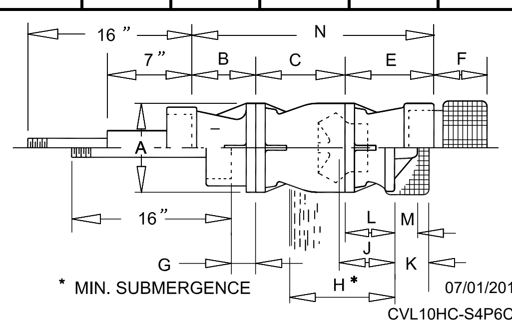


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.83	5.18	6.50	N/A	N/A	1.43	16.00	4.00		4.13	3.75	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	6"
THRUST CONSTANT:	8.80	SUCTION SIZE:	N/A
LATERAL (STD):	0.50	STD. TUBE:	2.5"
EYE AREA IN²:	18.66	WR² LB-FT²:	0.44
SHAFT DIA:	1.50	1ST STG WT LB: 175	ADD STG WT LB: 75

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.
LOW NPSH IMPELLER FOR 1ST STAGE ONLY



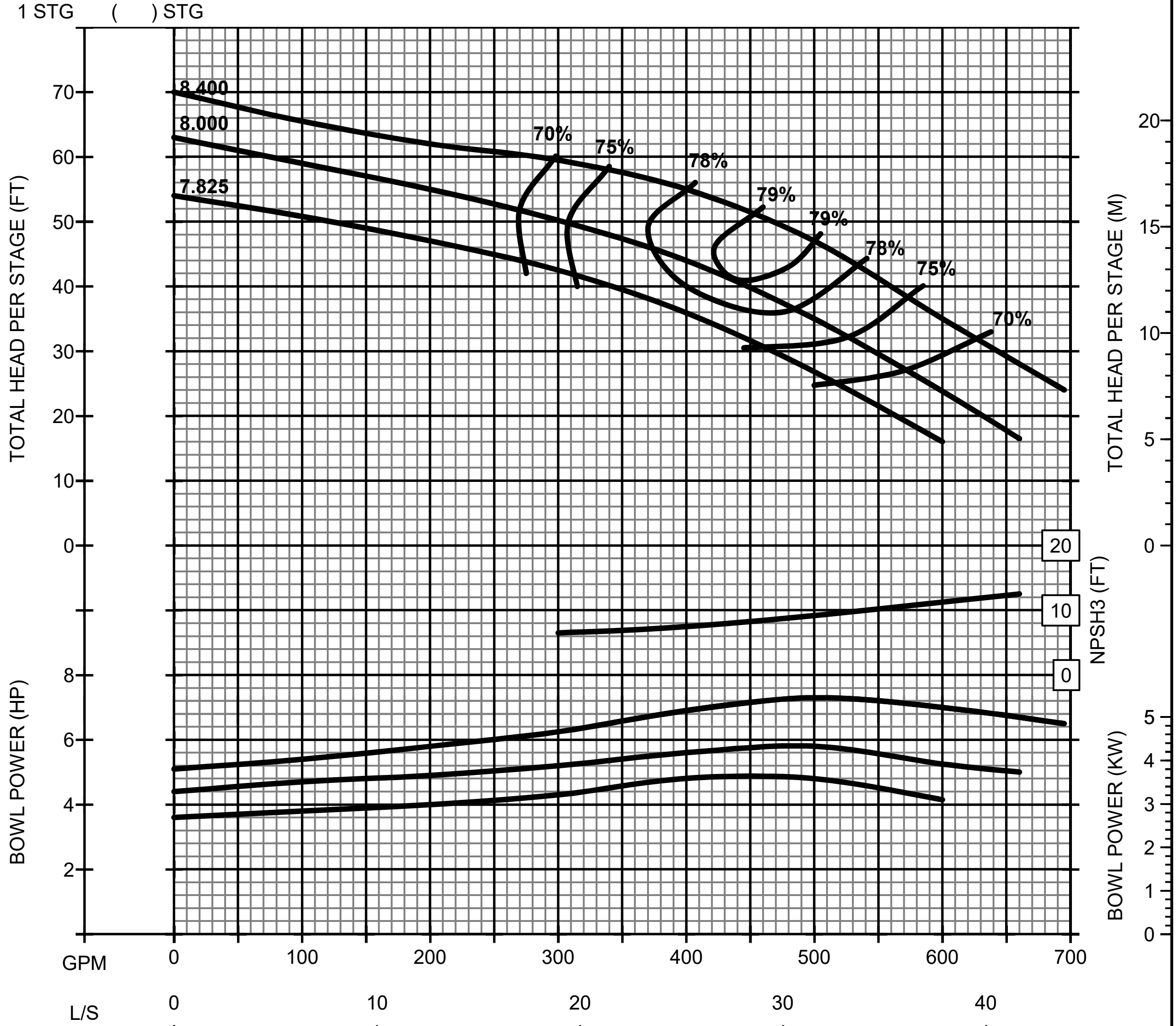
* MIN. SUBMERGENCE

07/01/2012
CVL10HC-S4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED		NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY							M10LC 1770 RPM
CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP / EFF
	NUMBER OF POINTS	-2	-1	0					

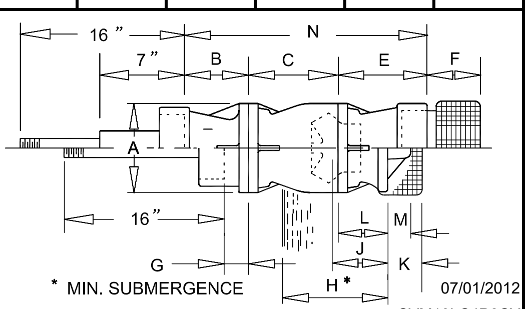


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	10.12	5.19	9.62	10.69	7.56	1.43	10.50	7.50	8.12	7.00	3.19	25.50

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	6", 8"
THRUST CONSTANT:	5.3	SUCTION SIZE:	6"
LATERAL (STD):	1.0	STD. TUBE:	2.5"
EYE AREA IN²:	13.25	WR² LB-FT²:	0.78
SHAFT DIA:	1.50	1ST STG WT LB: 175	ADD STG WT LB: 75

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

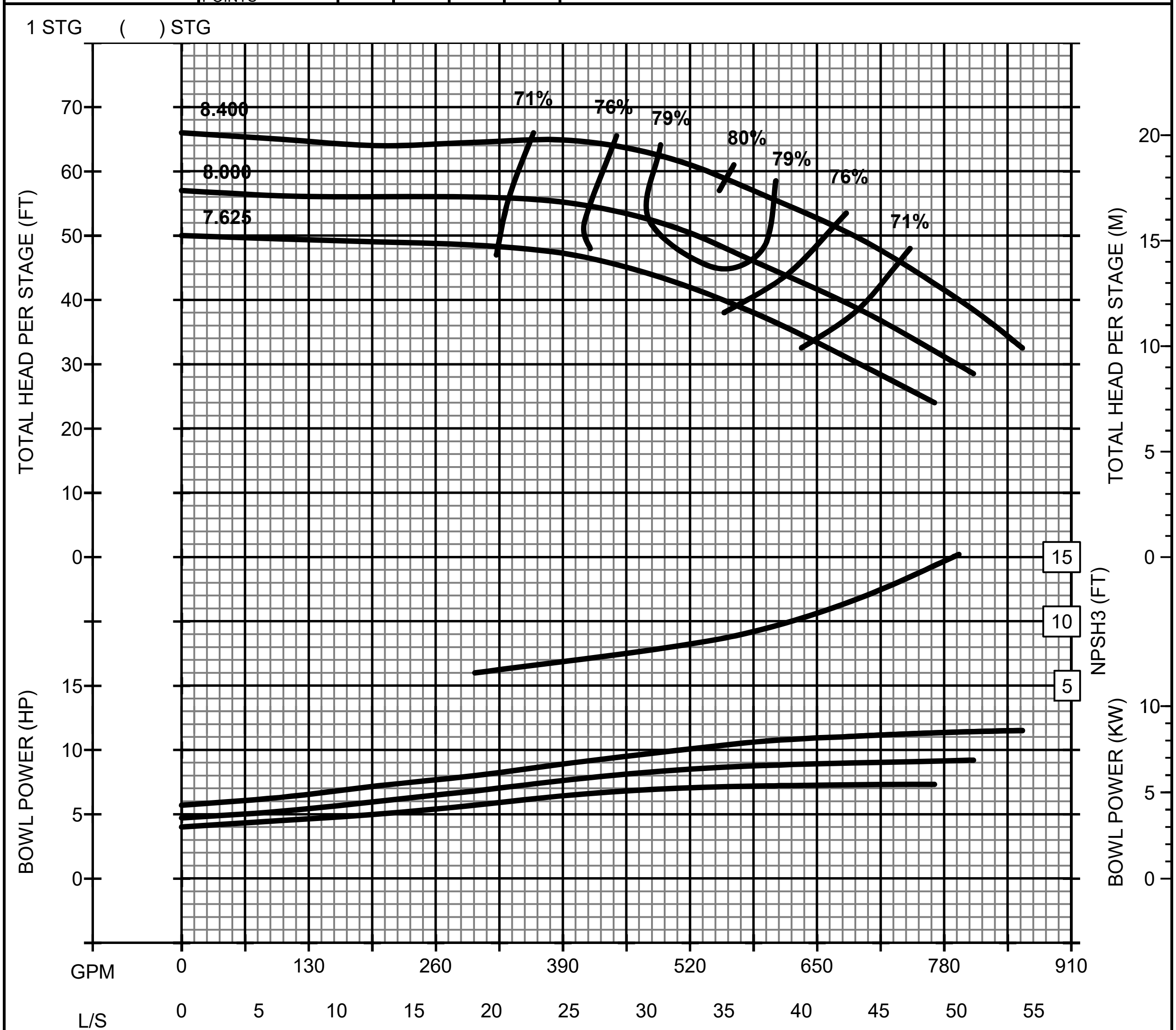
07/01/2012
CVM10LC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	M10HC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

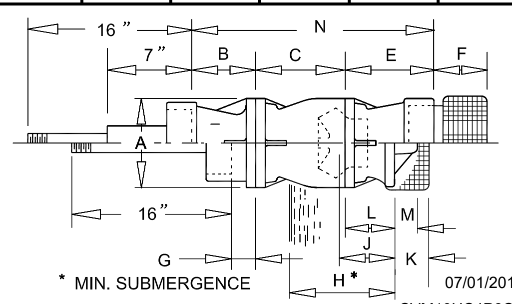


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	10.12	5.31	9.62	10.69	7.58	1.43	10.50	7.50	8.12	7.00	3.12	25.62

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	6", 8"
THRUST CONSTANT:	5.4	SUCTION SIZE:	6"
LATERAL (STD):	1.0	STD. TUBE:	2.5"
EYE AREA IN^2:	13.25	WR^2 LB-FT^2:	0.78
SHAFT DIA:	1.50	1ST STG WT LB: 175	ADD STG WT LB: 75

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVM10HC4P6CY

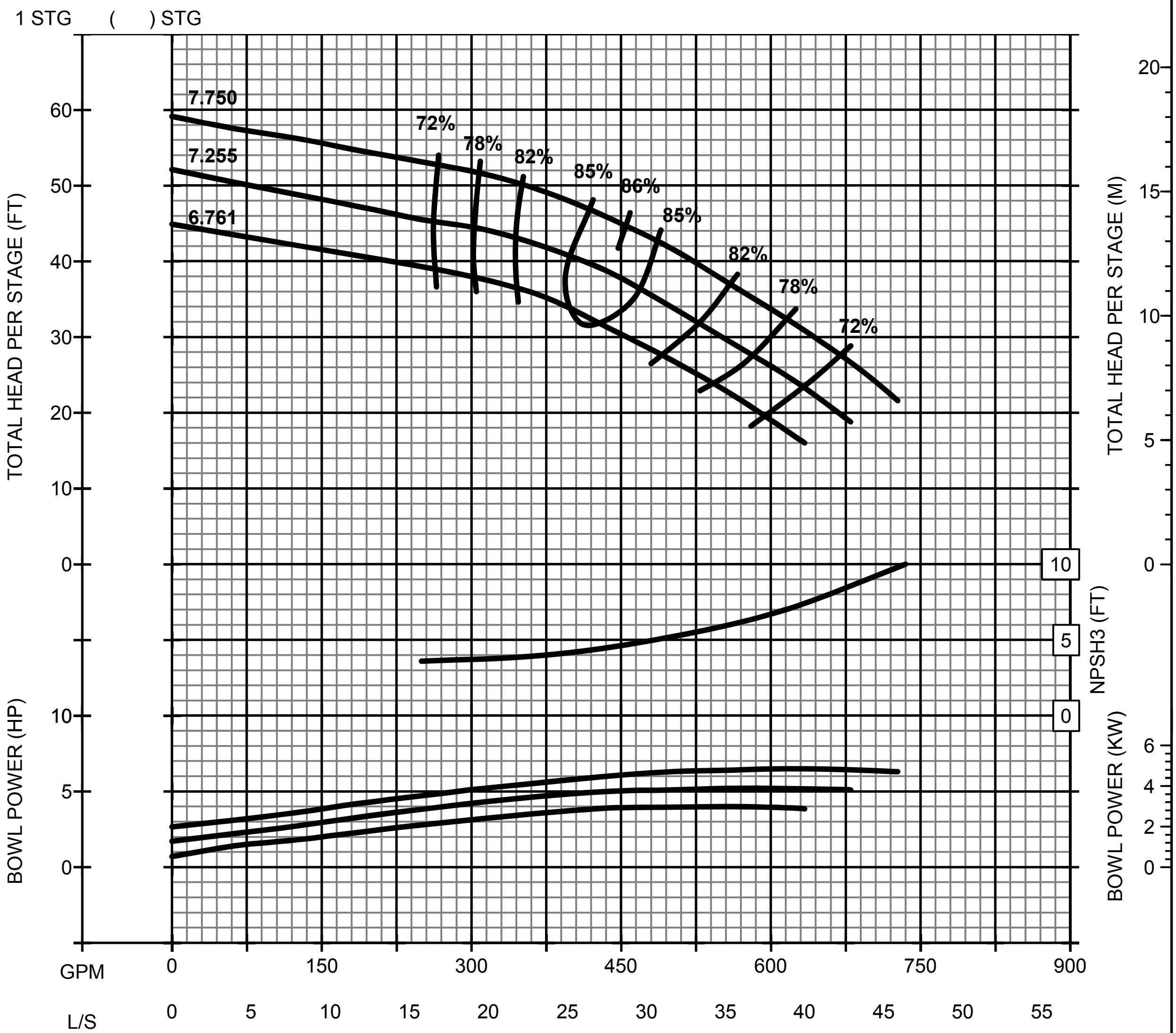
CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP® COMPANY A GORMAN-RUPP COMPANY	# K10LC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	4		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-4	-1	0						

1 STG ( ) STG

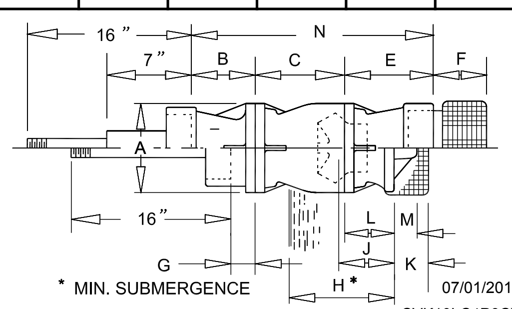


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.75	5.19	8.88	8.19	7.56	1.43	12.50	8.50	8.12	7.00	3.121	22.25

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	6"
THRUST CONSTANT:	6.8	SUCTION SIZE:	6"
LATERAL (STD):	1.0	STD. TUBE:	2.5"
EYE AREA IN²:	13.8	WR² LB-FT²:	0.78
SHAFT DIA:	1.50	1ST STG WT LB: 170	ADD STG WT LB: 68

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

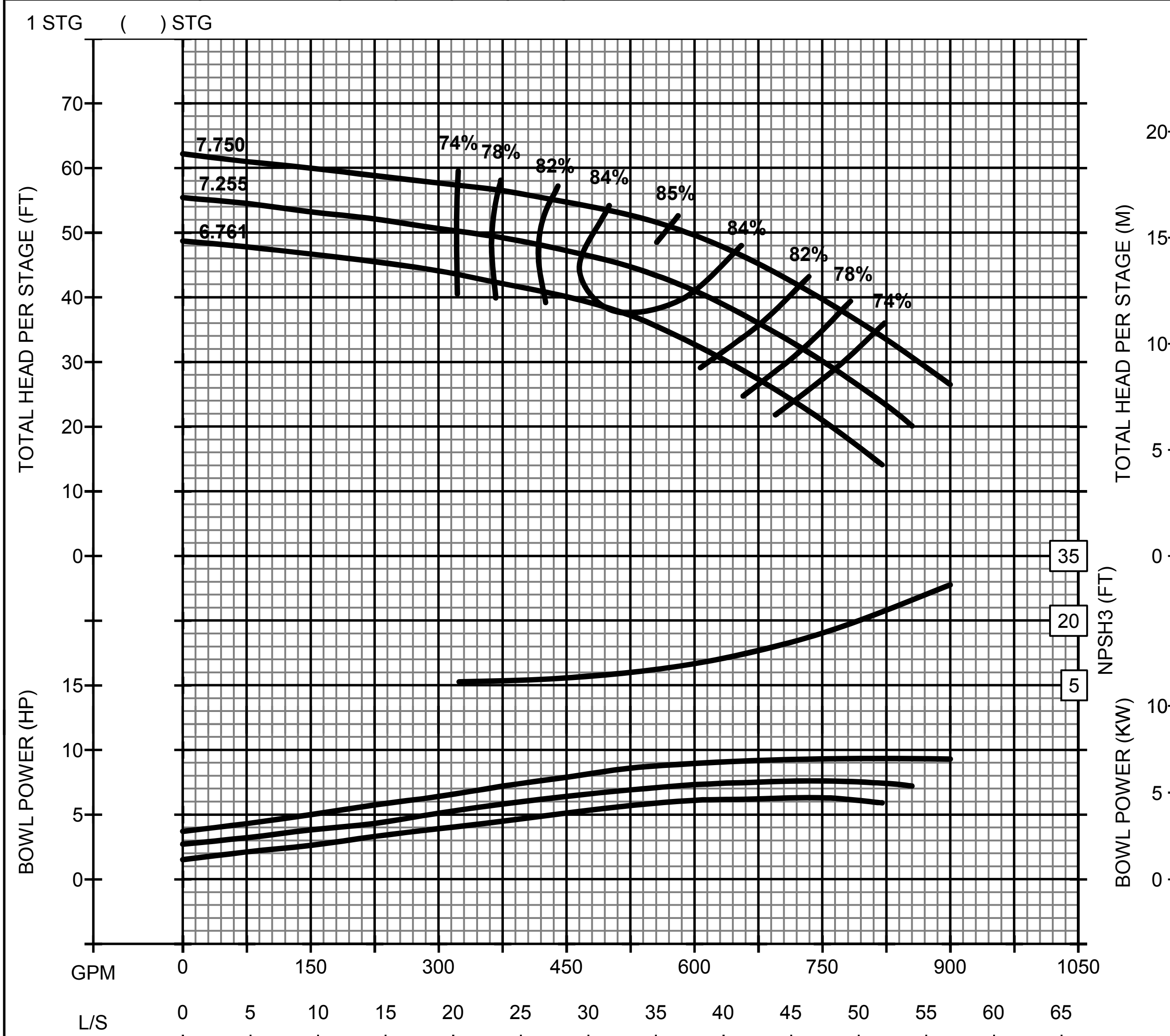
07/01/2012
CVK10LC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	K10MC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	4		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-4	-1	0						

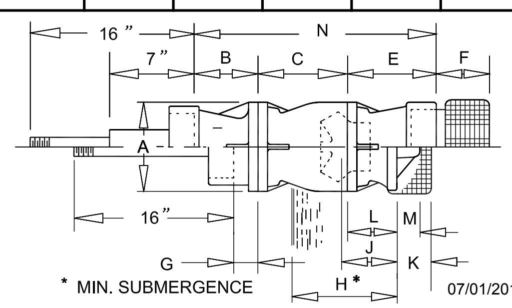


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.75	5.19	8.88	8.19	7.56	1.43	12.50	8.50	8.12	7.00	3.121	22.25

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	6"
THRUST CONSTANT:	6.8	SUCTION SIZE:	6"
LATERAL (STD):	1.0	STD. TUBE:	2.5"
EYE AREA IN^2:	13.8	WR^2 LB-FT^2:	0.78
SHAFT DIA:	1.50	1ST STG WT LB: 170	ADD STG WT LB: 68

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVK10MC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

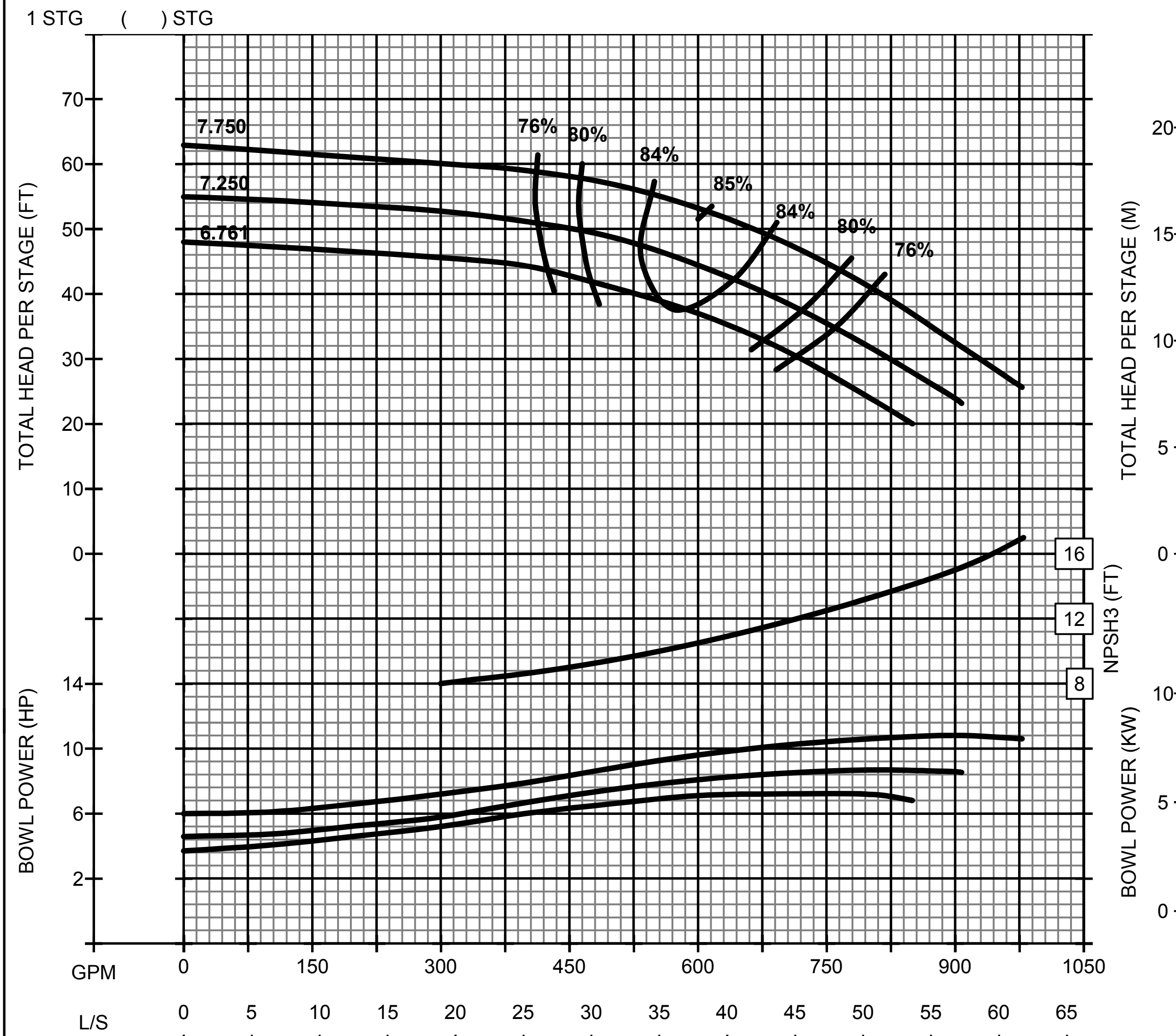
NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

K10HC

1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	4	
	NUMBER OF POINTS	-4	-1	0	

DESIGN	GPM	TDH	HP	EFF

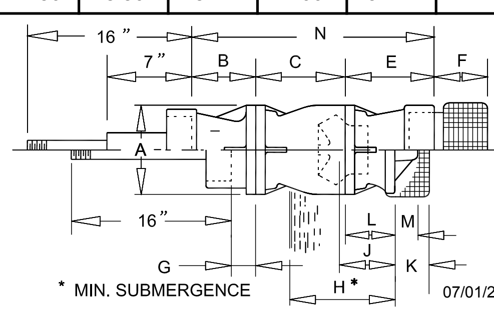


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.75	5.19	8.88	8.19	7.56	1.43	12.50	8.50	8.12	7.00	3.121	22.25

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	6"
THRUST CONSTANT:	6.8	SUCTION SIZE:	6"
LATERAL (STD):	1.0	STD. TUBE:	2.5"
EYE AREA IN²:	13.8	WR² LB-FT²:	0.78
SHAFT DIA:	1.50	1ST STG WT LB: 170	ADD STG WT LB: 68

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVK10HC4P6CY

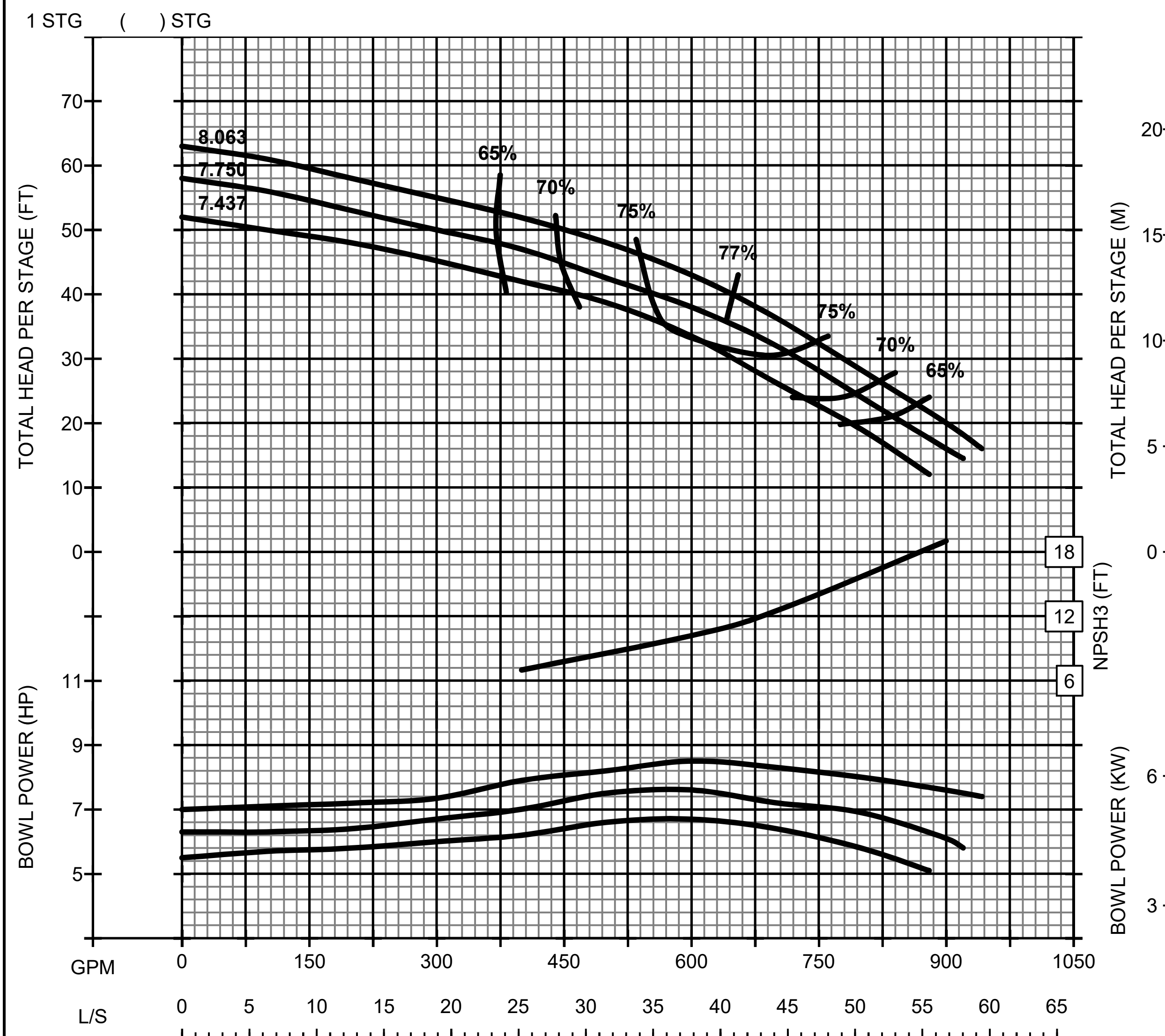
CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	H10MC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	3	5	
	NUMBER OF POINTS	-2	-1	0	

DESIGN	GPM	TDH	HP	EFF

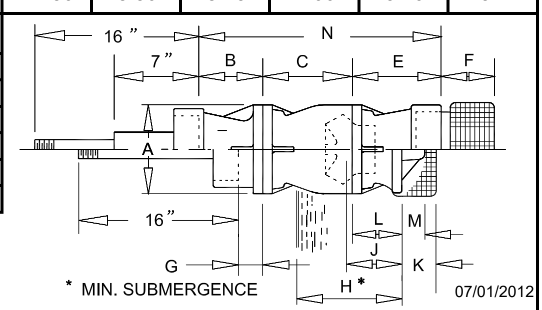


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.75	5.31	9.62	8.19	7.56	1.43	12.50	8.50	8.13	7.00	3.19	23.12

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	6", 8"
THRUST CONSTANT:	6.9	SUCTION SIZE:	6"
LATERAL (STD):	1.25	STD. TUBE:	2.5"
EYE AREA IN²:	16.89	WR² LB-FT²:	0.75
SHAFT DIA:	1.50	1ST STG WT LB: 210	ADD STG WT LB: 80

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

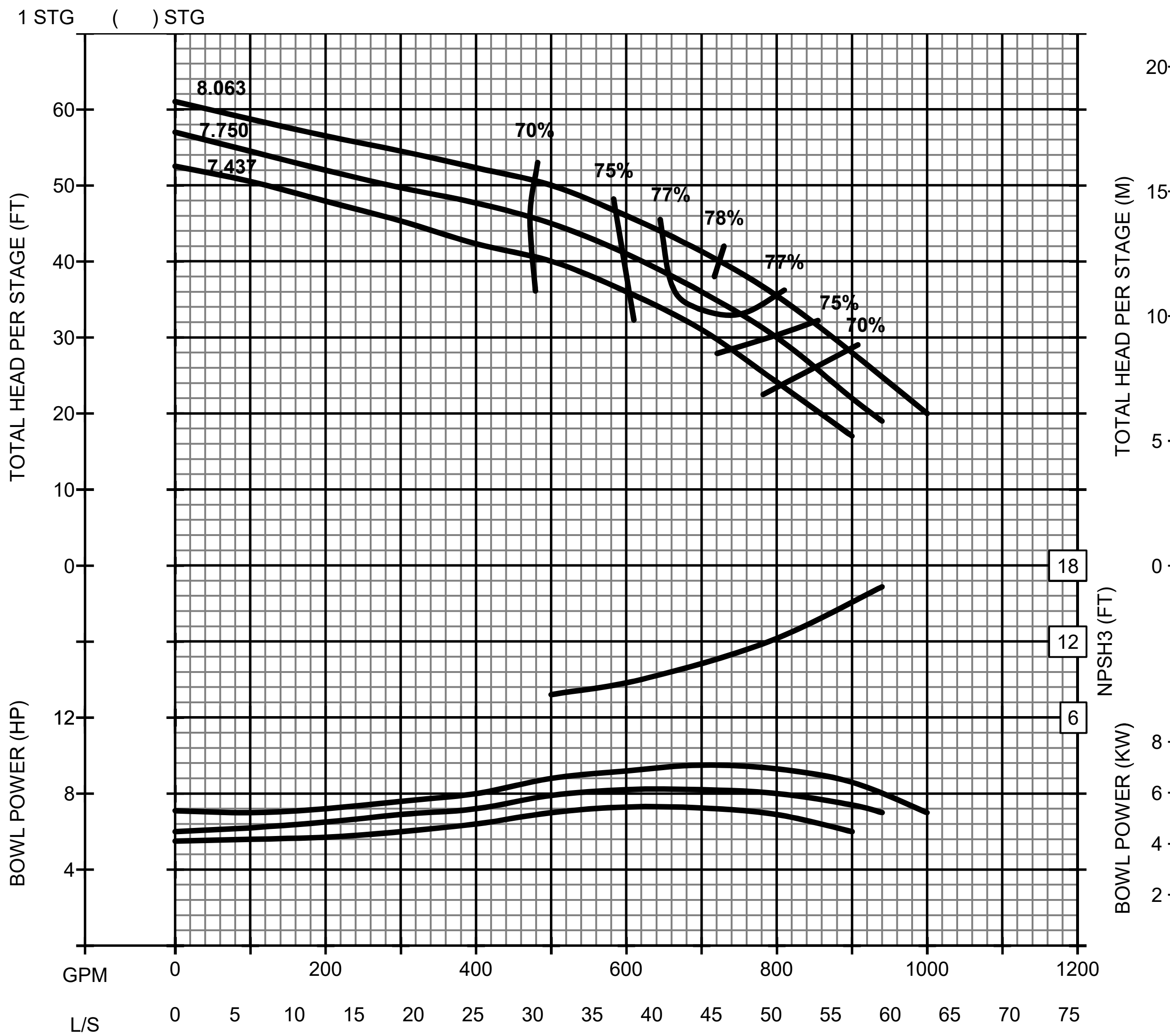
07/01/2012
CVH10MC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	H10HC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

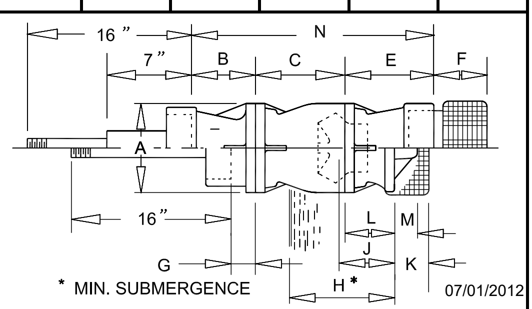


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.75	5.31	9.62	8.19	7.56	1.43	12.50	8.50	8.13	7.00	3.19	23.12

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	6", 8"
THRUST CONSTANT:	6.9	SUCTION SIZE:	6"
LATERAL (STD):	1.25	STD. TUBE:	2.5"
EYE AREA IN²:	16.89	WR² LB-FT²:	0.75
SHAFT DIA:	1.50	1ST STG WT LB: 210	ADD STG WT LB: 80

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



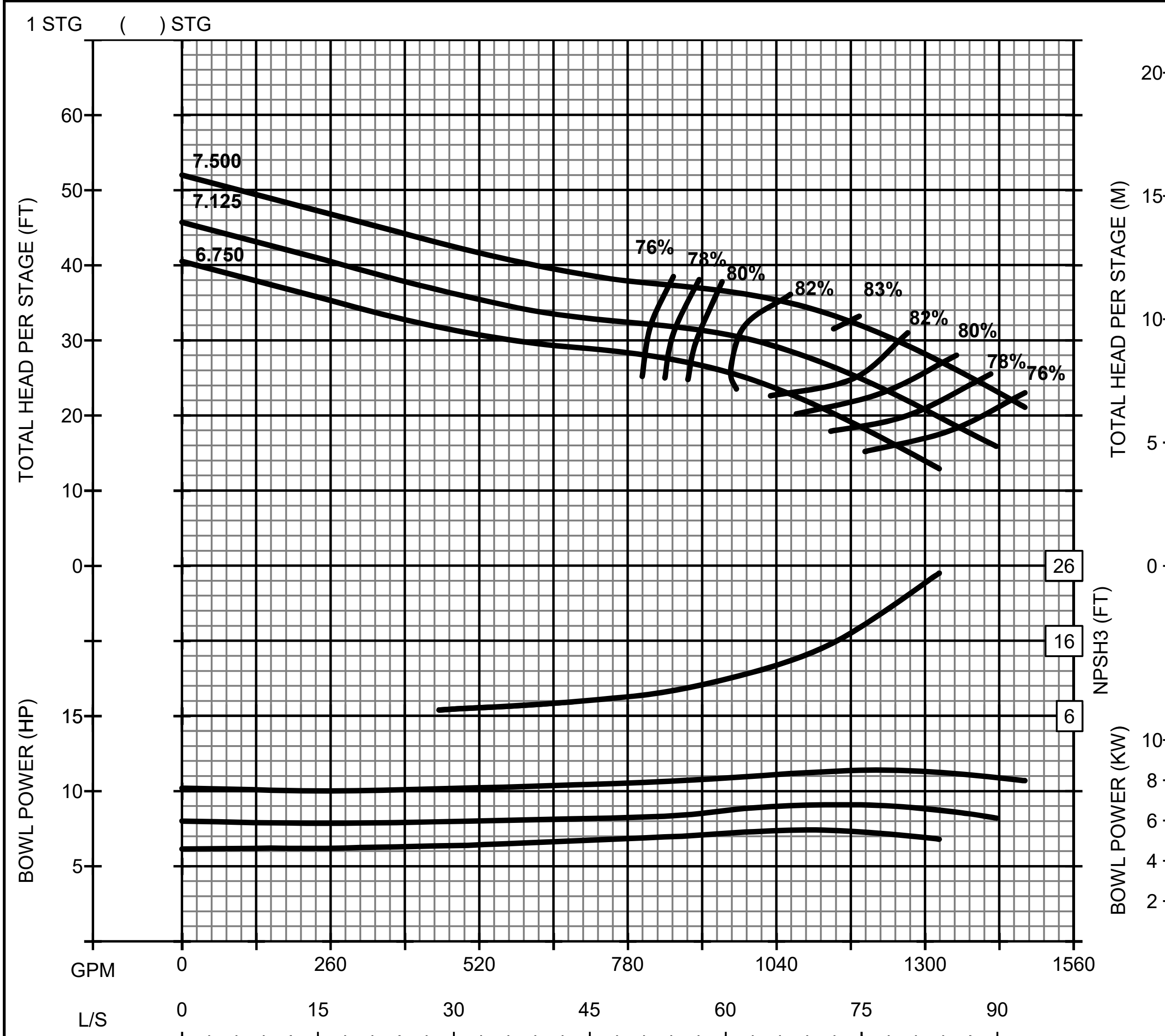
07/01/2012
CVH10HC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	J10HC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2	3						
	NUMBER OF POINTS	-1.5	-1	0						



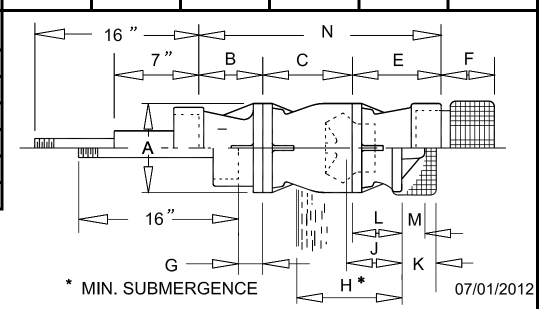
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.63	5.31	9.75	8.19	7.56	1.43	20.00	8.50	N/A	N/A	N/A	23.25

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	8"
THRUST CONSTANT:	8.2	SUCTION SIZE:	8"
LATERAL (STD):	0.750	STD. TUBE:	2.5", 3.0"
EYE AREA IN^2:	21.8	WR^2 LB-FT^2:	0.69
SHAFT DIA:	1.50	1ST STG WT LB: 175	ADD STG WT LB: 70

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

CVJ10HC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

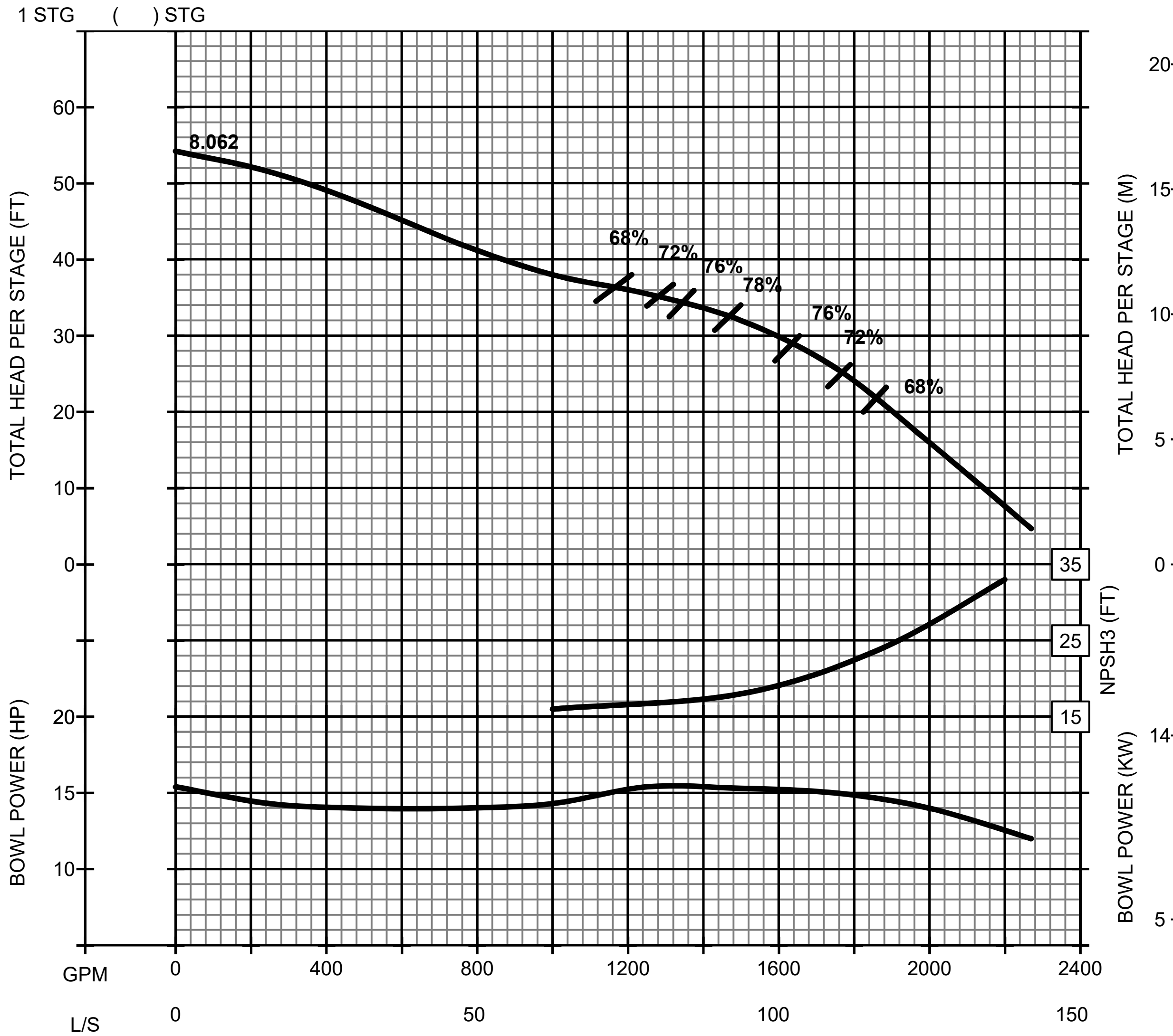
PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

NATIONAL PUMP COMPANY®
A GORMAN-RUPP COMPANY

E10HC

1770 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	2	3	4	5					
	NUMBER OF POINTS	-3	-2	-1	0					

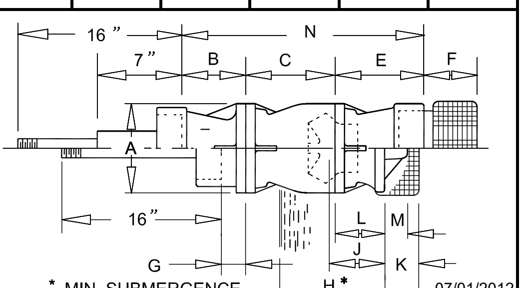


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.75	6.50	9.62	8.19	9.44	1.43	22.00	10.62	N/A	N/A	N/A	24.31

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	8"
THRUST CONSTANT:	10.7	SUCTION SIZE:	8"
LATERAL (STD):	0.75	STD. TUBE:	2.50"
EYE AREA IN²:	26.50	WR² LB-FT²:	0.59
SHAFT DIA:	1.50	1ST STG WT LB: 175	ADD STG WT LB: 70

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

CVE10HC4P6CY

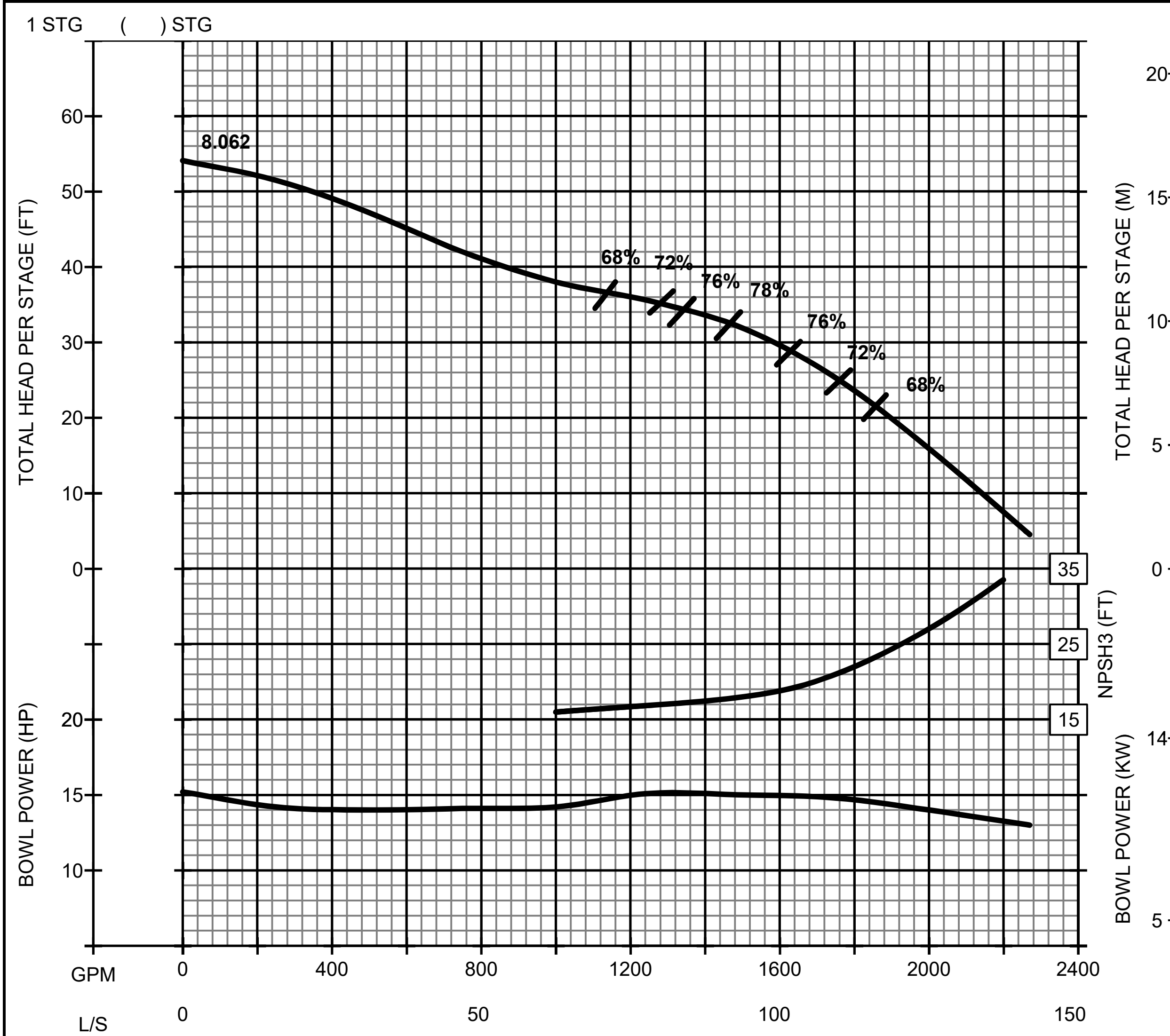
CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	E10HO 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	2	3	4	5
	NUMBER OF POINTS	-3	-2	-1	0

DESIGN	GPM	TDH	HP	EFF

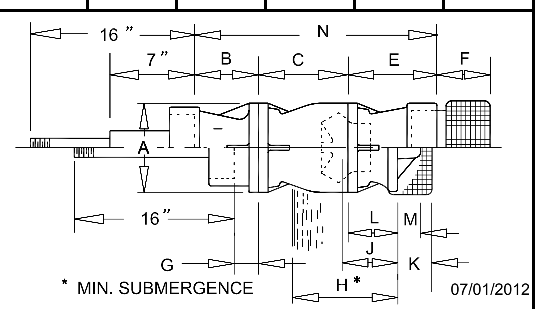


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	9.75	6.50	9.62	8.19	9.44	1.43	22.00	10.62	N/A	N/A	N/A	24.31

PUMP DATA

IMPELLER:	SEMI-OPEN	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	8"
THRUST CONSTANT:	10.7	SUCTION SIZE:	8"
LATERAL (STD):	0.75	STD. TUBE:	2.50"
EYE AREA IN²:	26.50	WR² LB-FT²:	0.59
SHAFT DIA:	1.50	1ST STG WT LB: 175	ADD STG WT LB: 70

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



07/01/2012
CVE10HO4P6CY

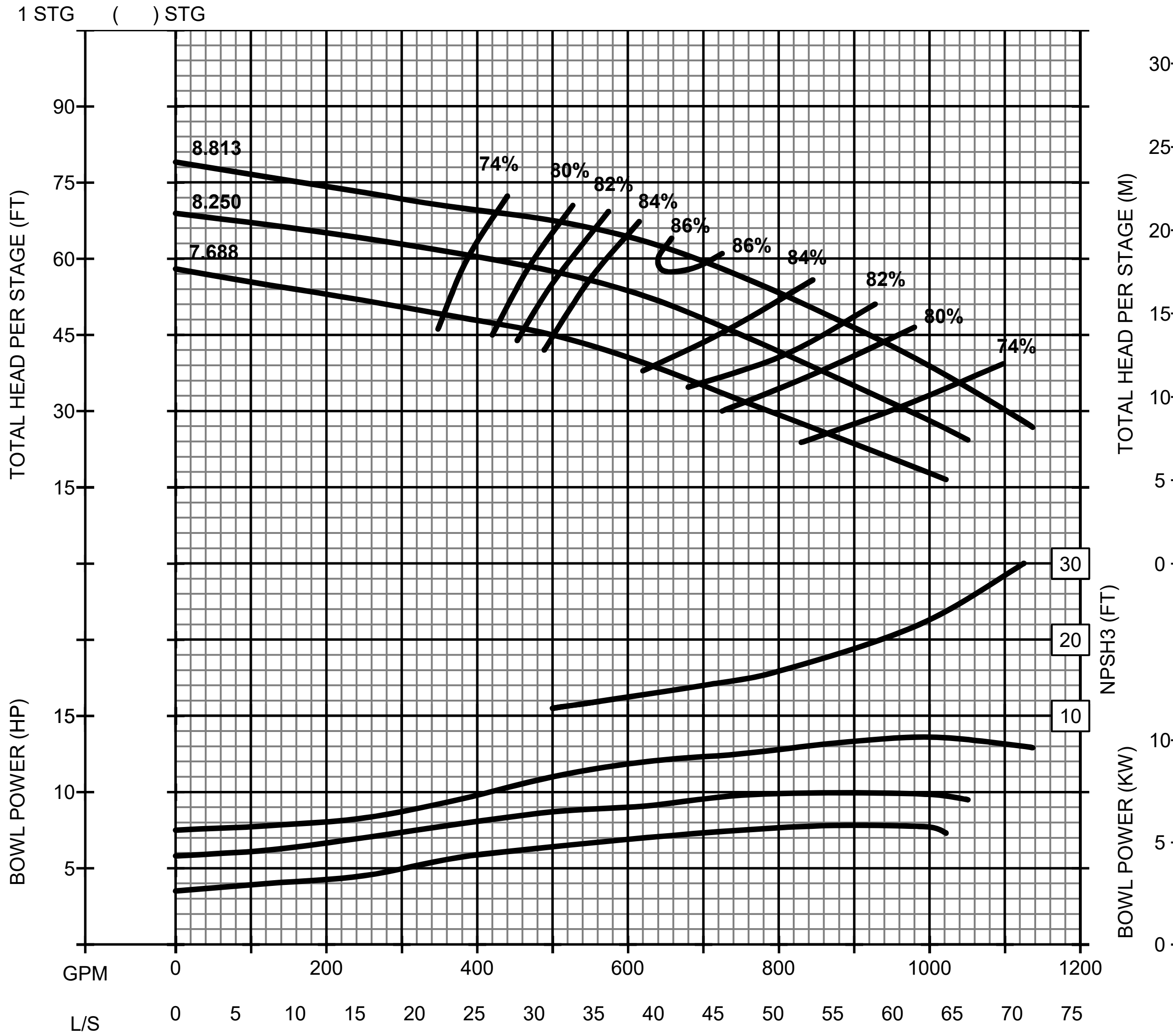
CURVE TEMPLATE 08.05.2011

1770 CURVES

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	J11LC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	4		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-4	-1	0						

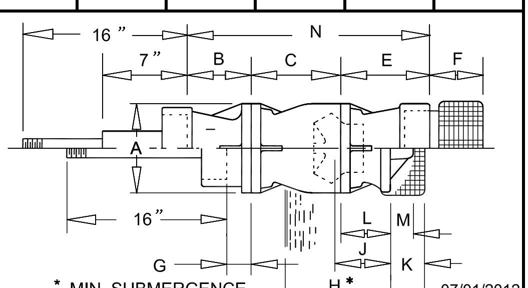


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.13	6.81	9.88	10.00	9.44	1.56	24"	10.75	10.06	7.25	3.75	26.69

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	8"
THRUST CONSTANT:	7.8	SUCTION SIZE:	8"
LATERAL (STD):	1.00	STD. TUBE:	2.5", 3.0"
EYE AREA IN^2:	15.9	WR^2 LB-FT^2:	1.02
SHAFT DIA:	1.6875	1ST STG WT LB: 183	ADD STG WT LB: 91

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.

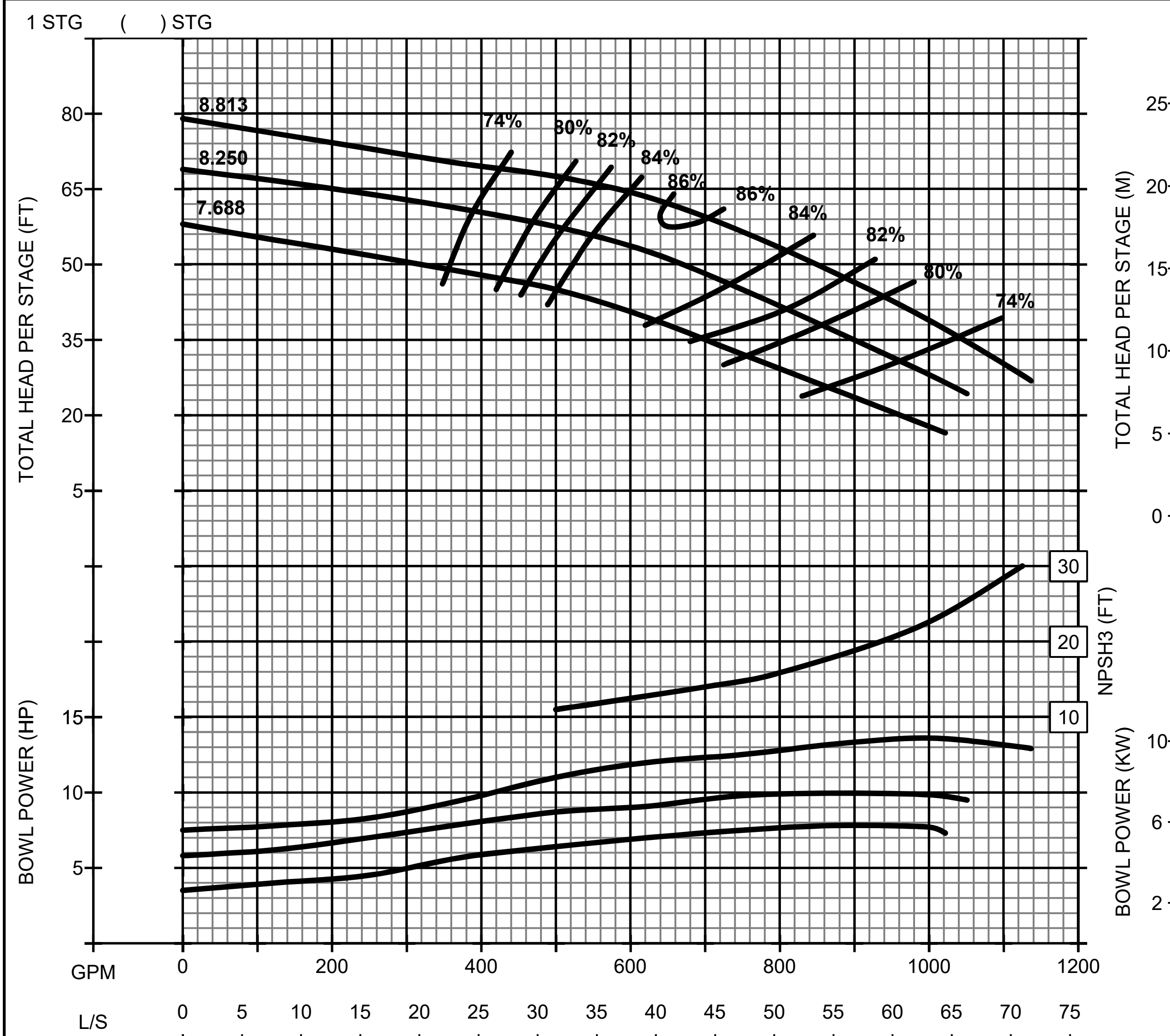


07/01/2012
CVJ11LC4P6CY

CURVE TEMPLATE 08.05.2011

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	J11LO 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	4		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-4	-1	0						



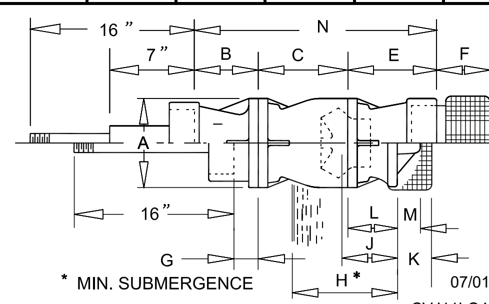
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.13	6.81	9.88	10.00	9.44	1.56	24"	10.75	N/A	N/A	N/A	26.69

PUMP DATA

IMPELLER:	SEMI-OPEN	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	8"
THRUST CONSTANT:	7.8	SUCTION SIZE:	8"
LATERAL (STD):	1.00	STD. TUBE:	2.5", 3.0"
EYE AREA IN²:	15.9	WR² LB-FT²:	1.02
SHAFT DIA:	1.6875	1ST STG WT LB: 183	ADD STG WT LB: 91

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

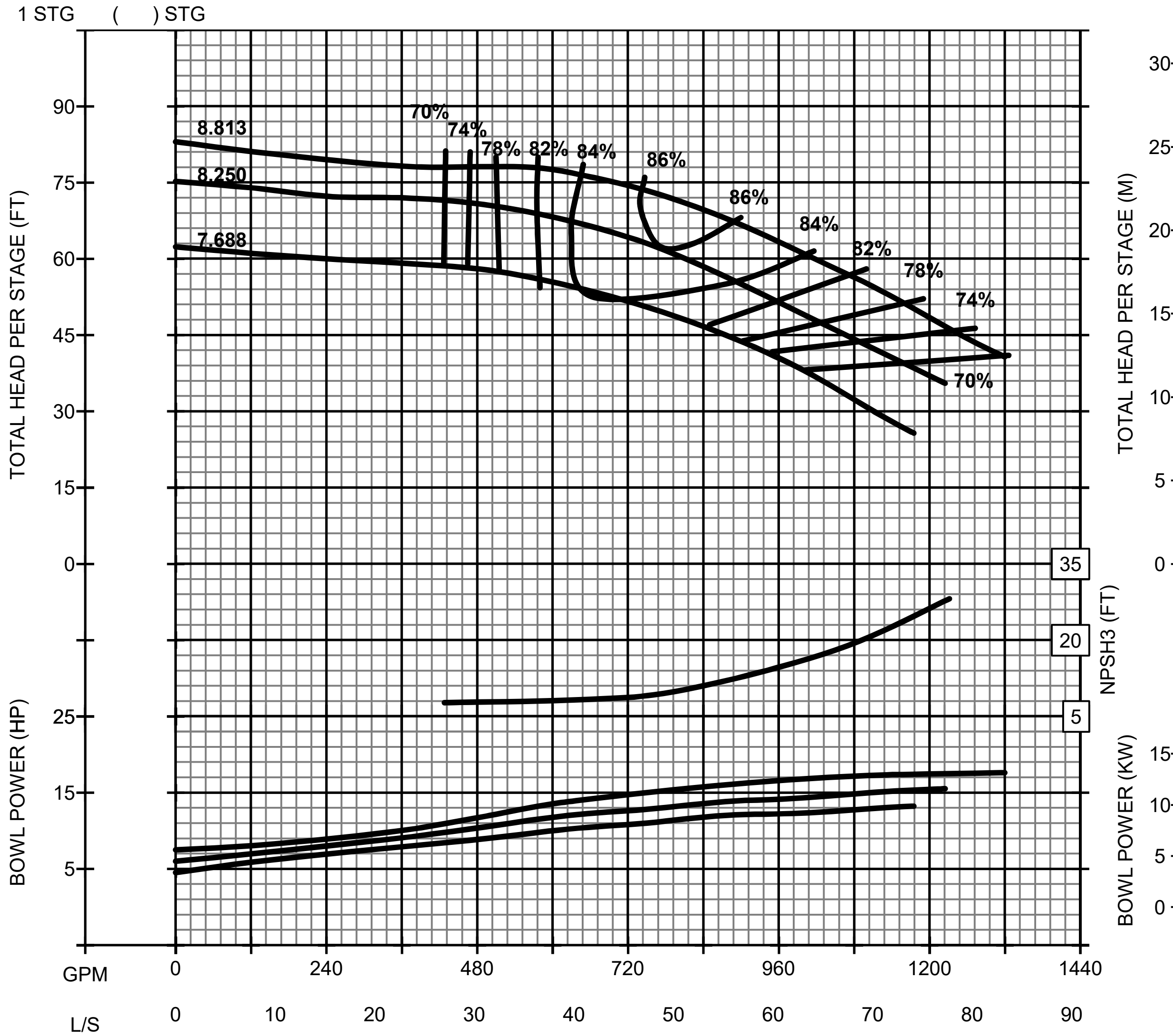
CVJ11LO4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	J11MC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	3	4						
	NUMBER OF POINTS	-4	-1	0						

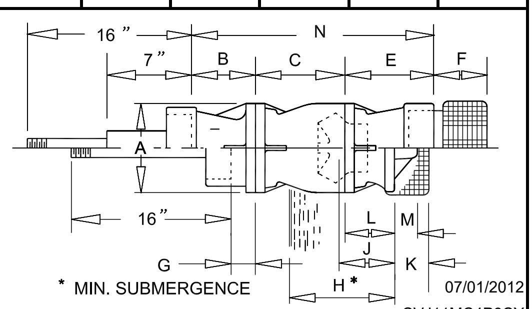


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.13	6.81	9.88	10.00	9.44	1.56	24"	10.75	10.06	7.25	3.75	26.69

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	8"
THRUST CONSTANT:	7.8	SUCTION SIZE:	8"
LATERAL (STD):	1.00	STD. TUBE:	2.5", 3.0"
EYE AREA IN^2:	15.9	WR^2 LB-FT^2:	1.02
SHAFT DIA:	1.6875	1ST STG WT LB: 183	ADD STG WT LB: 91

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVJ11MC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

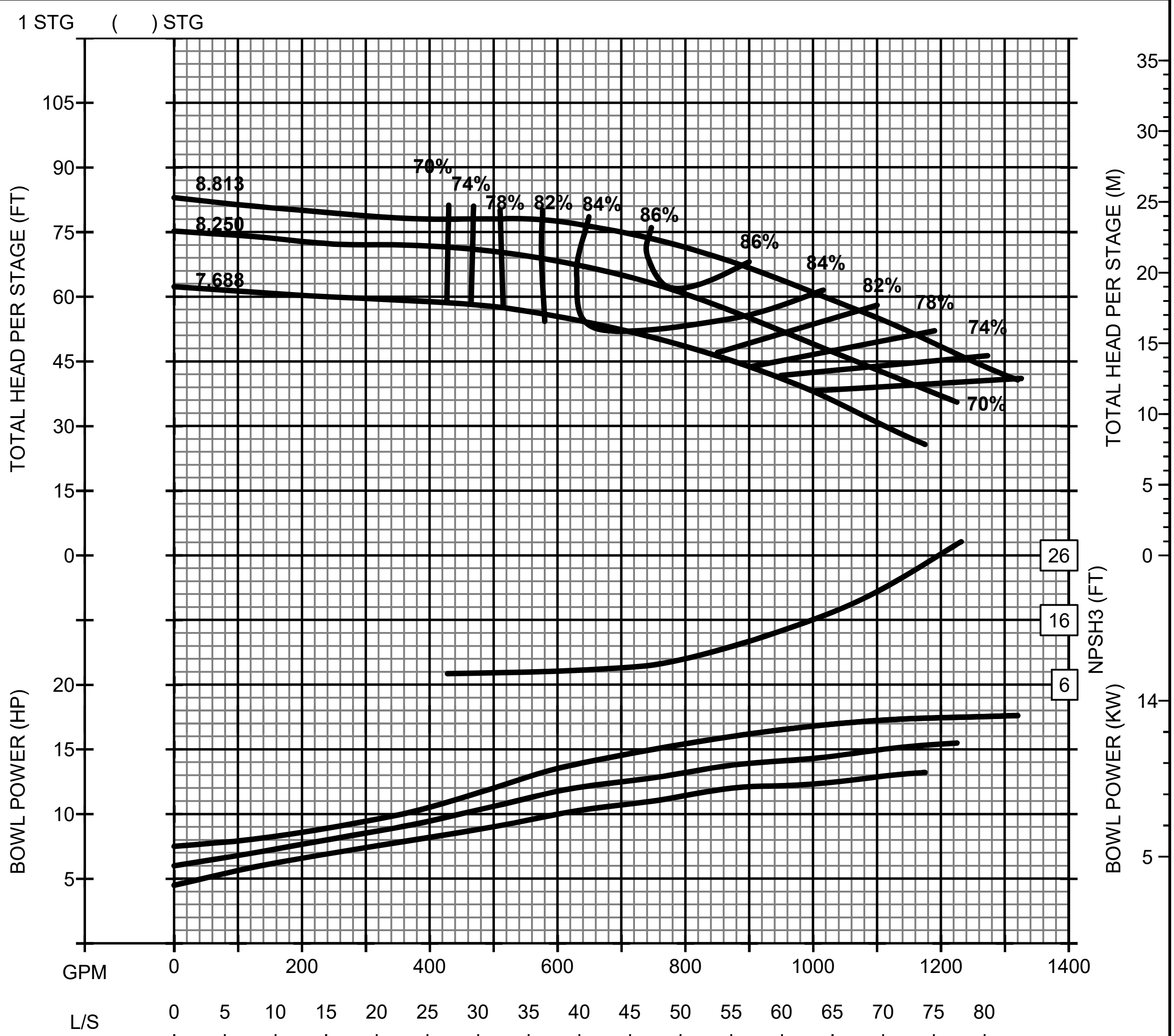
PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

J11MO

1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	4		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-4	-1	0						

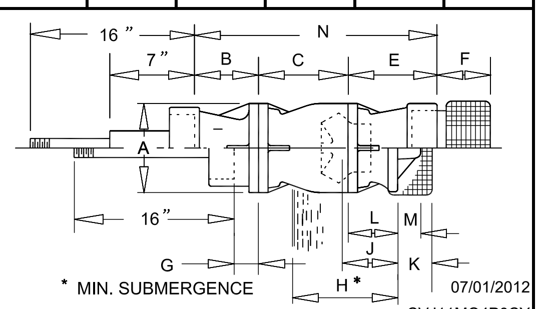


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.13	6.81	9.88	10.00	9.44	1.56	24"	10.75	N/A	N/A	N/A	26.69

PUMP DATA

IMPELLER:	SEMI-OPEN	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	8"
THRUST CONSTANT:	7.8	SUCTION SIZE:	8"
LATERAL (STD):	1.00	STD. TUBE:	2.5", 3.0"
EYE AREA IN²:	15.9	WR² LB-FT²:	1.02
SHAFT DIA:	1.6875	1ST STG WT LB: 183	ADD STG WT LB: 91

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

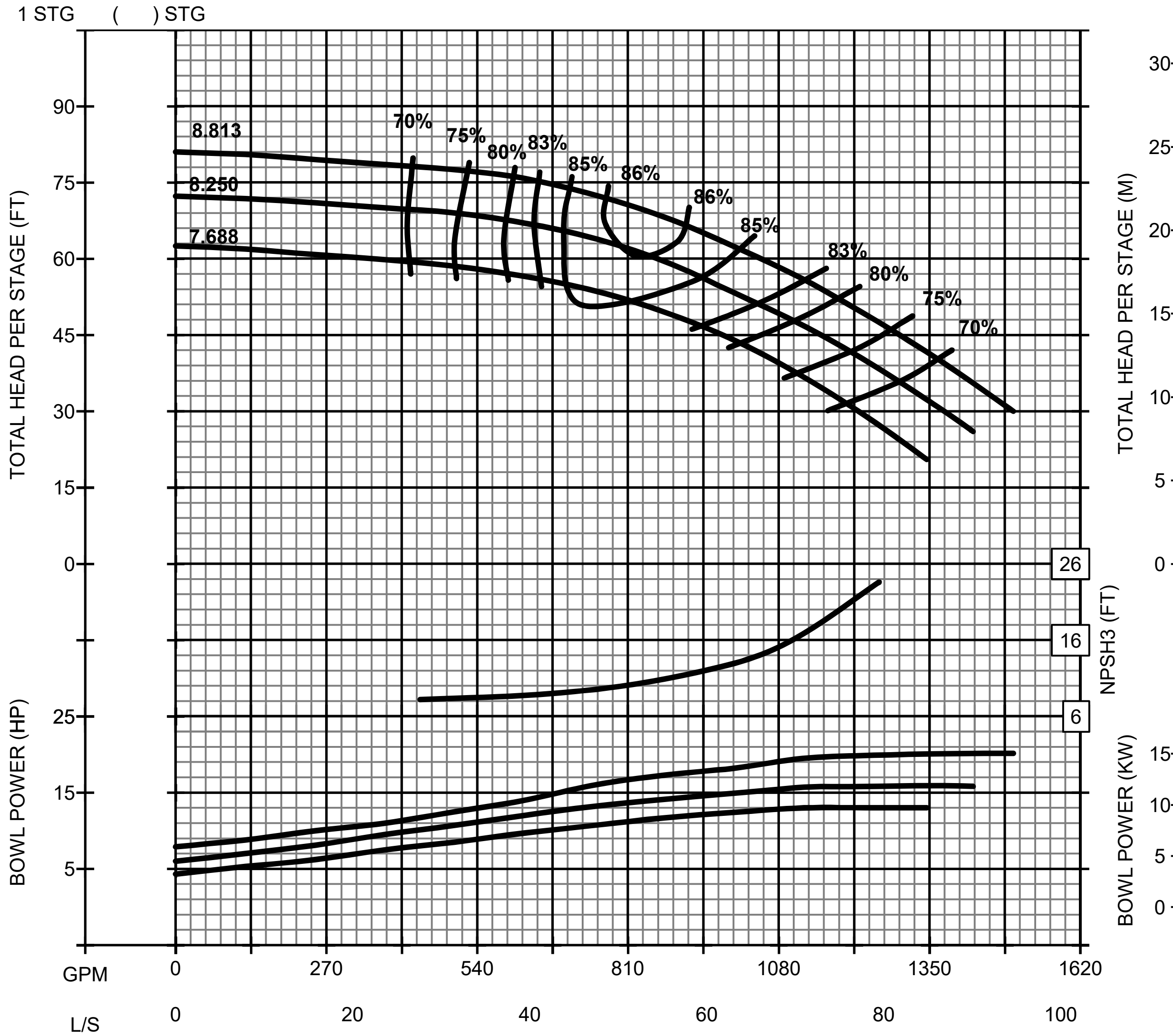
07/01/2012
CVJ11MO4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	J11HC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	3	4						
	NUMBER OF POINTS	-4	-1	0						

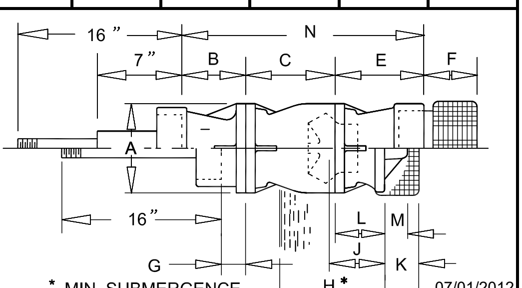


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.13	6.81	9.88	10.00	9.44	1.56	24"	10.75	10.06	7.25	3.75	26.69

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	8"
THRUST CONSTANT:	7.8	SUCTION SIZE:	8"
LATERAL (STD):	1.00	STD. TUBE:	2.5", 3.0"
EYE AREA IN^2:	15.9	WR^2 LB-FT^2:	1.02
SHAFT DIA:	1.6875	1ST STG WT LB: 183	ADD STG WT LB: 91

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

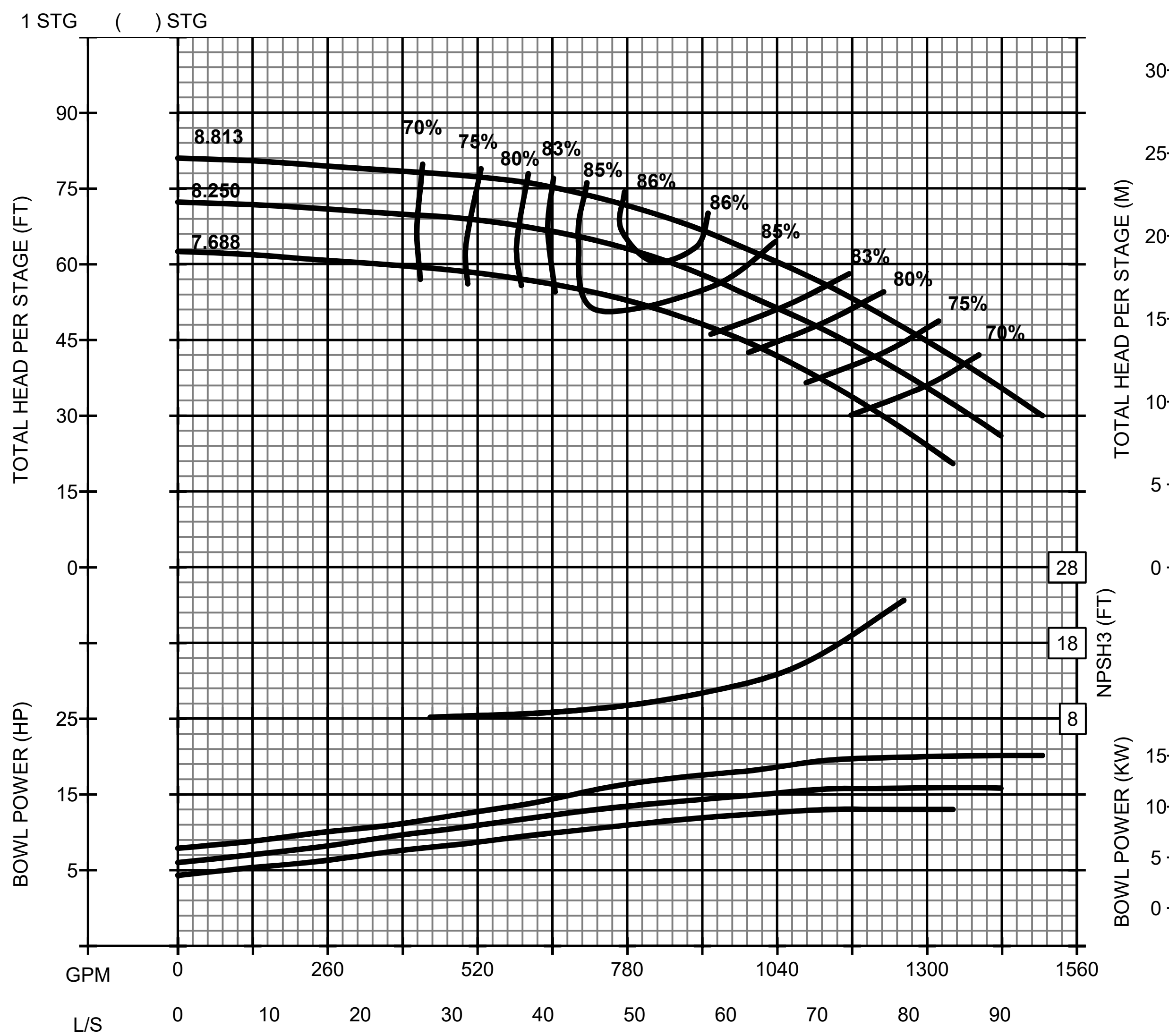
07/01/2012
CVJ11HC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP® COMPANY A GORMAN-RUPP COMPANY	J11HO 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	4		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-4	-1	0						

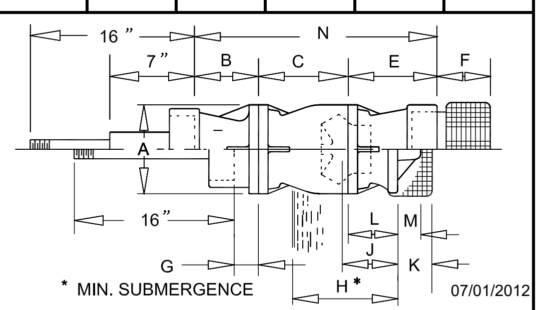


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.13	6.81	9.88	10.00	9.44	1.56	24"	10.75	N/A	N/A	N/A	26.69

PUMP DATA

IMPELLER:	SEMI-OPEN	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	8"
THRUST CONSTANT:	7.8	SUCTION SIZE:	8"
LATERAL (STD):	1.00	STD. TUBE:	2.5", 3.0"
EYE AREA IN²:	15.9	WR² LB-FT²:	1.02
SHAFT DIA:	1.6875	1ST STG WT LB: 183	ADD STG WT LB: 91

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



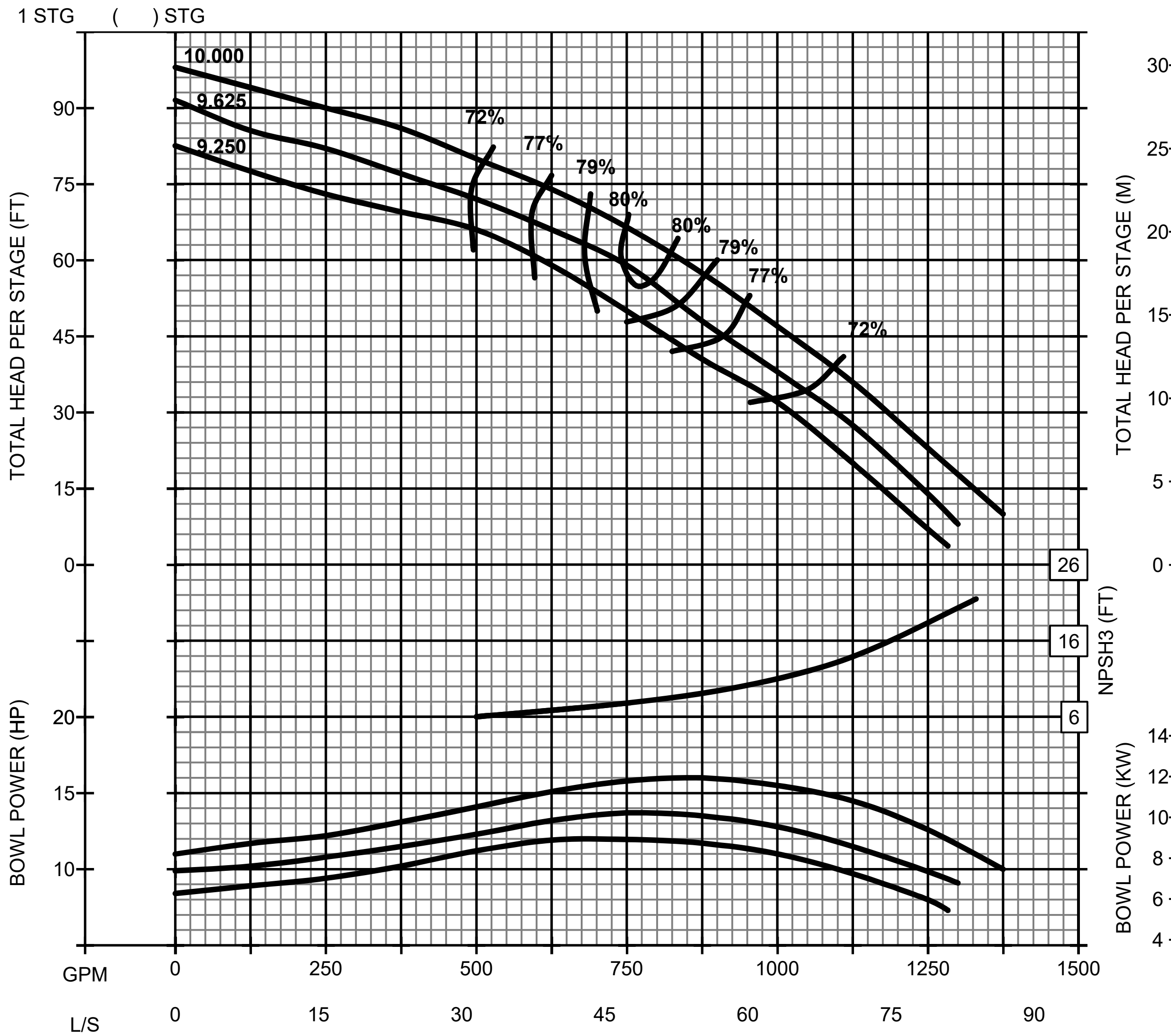
07/01/2012
CVJ11HO4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	M12LC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	3	5						
	NUMBER OF POINTS	-2	-1	0						

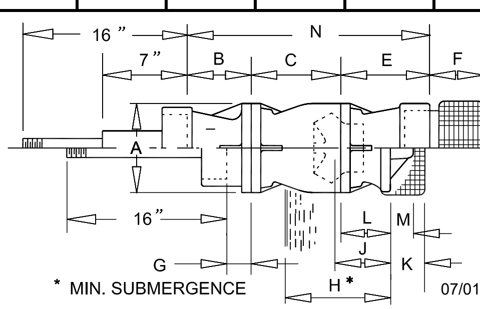


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	12.12	6.94	11.31	11.38	9.44	1.56	21.00	8.00	10.06	7.25	3.75	29.63

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	8", 10"
THRUST CONSTANT:	7.9	SUCTION SIZE:	8"
LATERAL (STD):	1"	STD. TUBE:	2.50",3.00"
EYE AREA IN²:	18.39	WR² LB-FT²:	1.51
SHAFT DIA:	1.687	1ST STG WT LB: 315	ADD STG WT LB: 125

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



07/01/2012
CVM12LC4P6CY

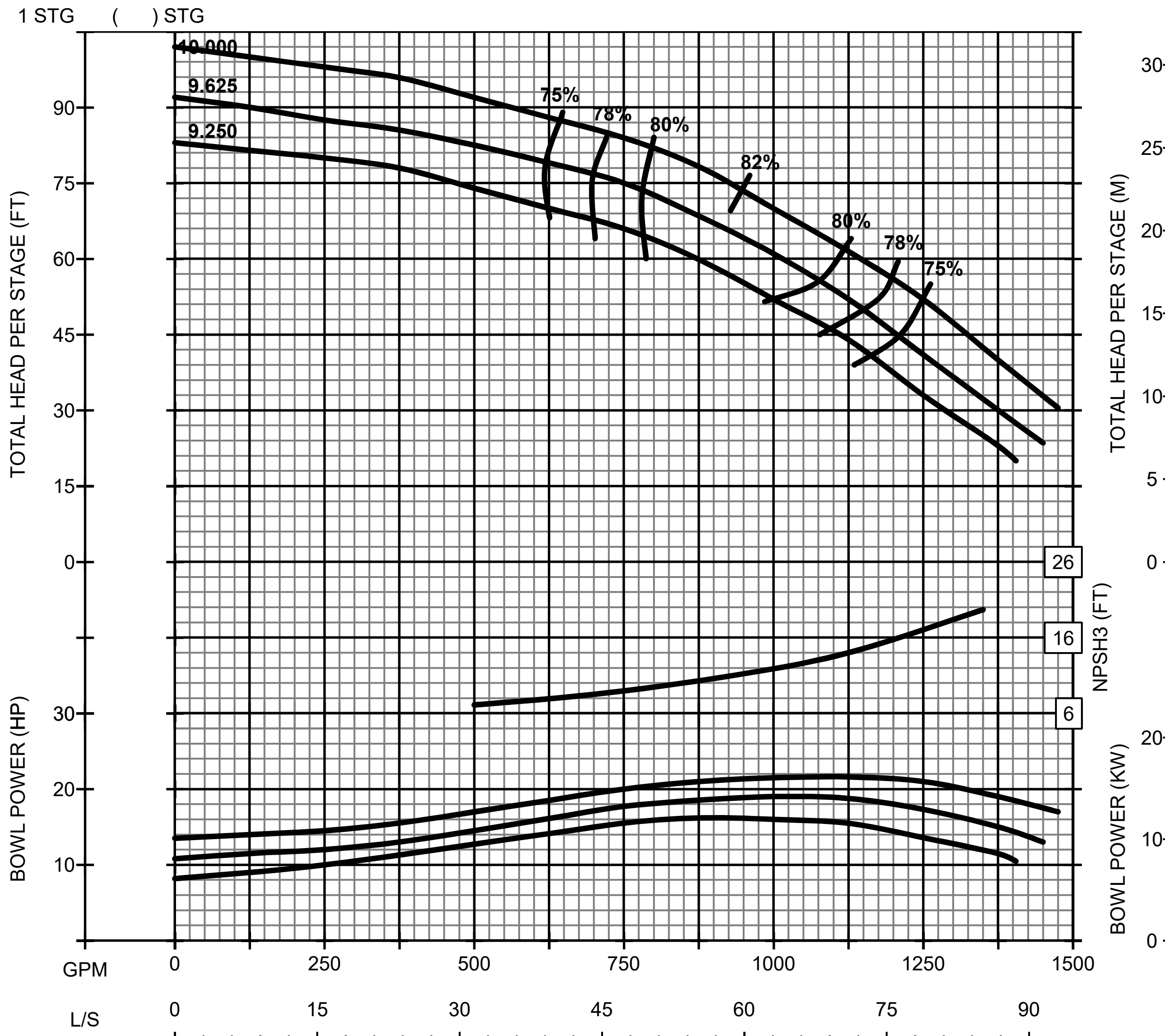
CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	M12MC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	3	5	
	NUMBER OF POINTS	-2	-1	0	

DESIGN	GPM	TDH	HP	EFF



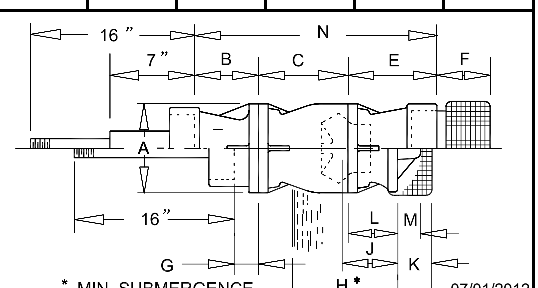
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	12.12	6.94	11.31	11.38	9.44	1.56	21.00	8.00	10.06	7.25	3.75	29.63

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	8", 10"
THRUST CONSTANT:	7.9	SUCTION SIZE:	8"
LATERAL (STD):	1"	STD. TUBE:	2.50",3.00"
EYE AREA IN^2:	18.39	WR^2 LB-FT^2:	1.51
SHAFT DIA:	1.687	1ST STG WT LB: 315	ADD STG WT LB: 125

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

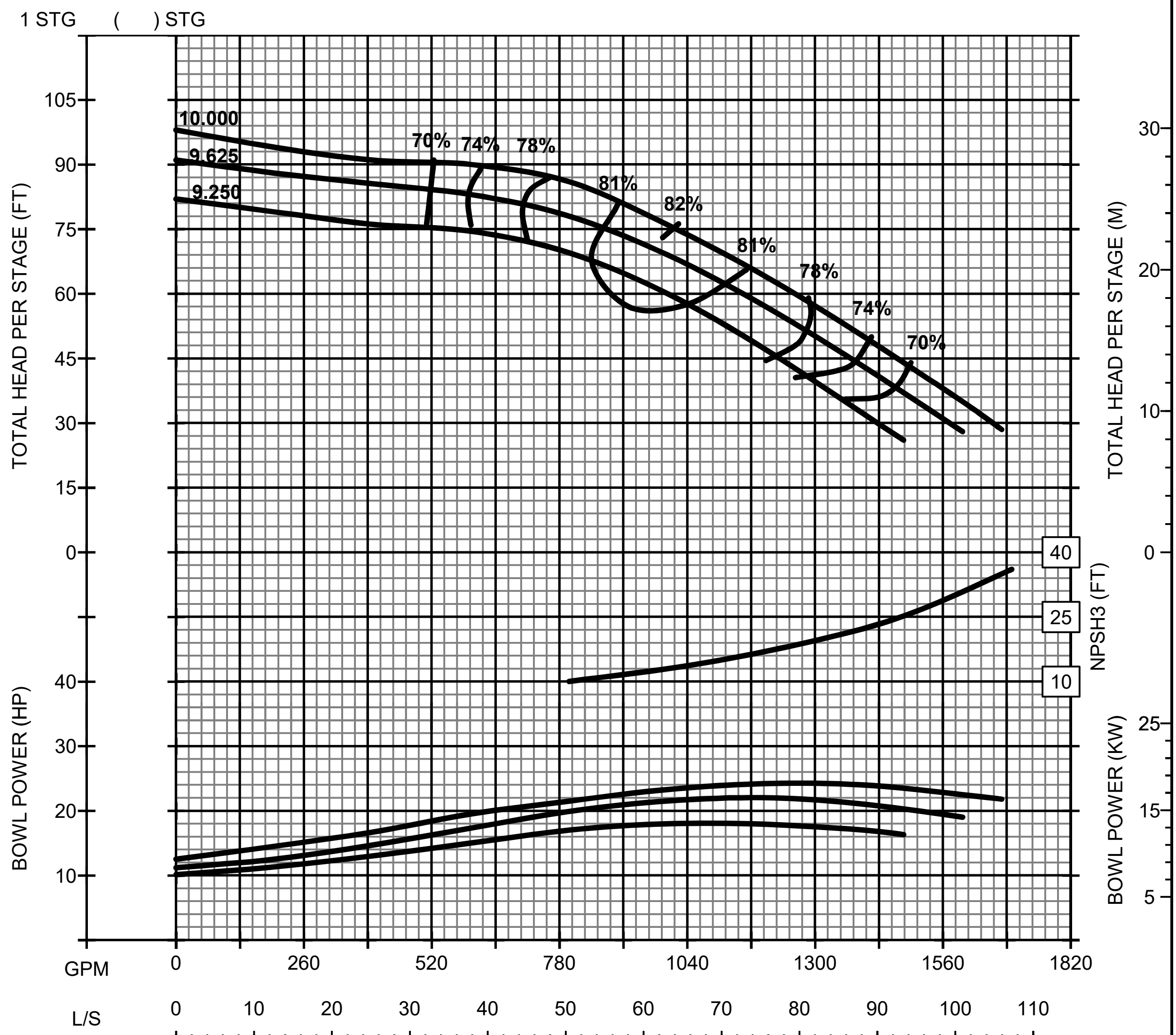
07/01/2012

CVM12MC4P6CY

CURVE TEMPLATE 08.05.2011

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	M12HC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						



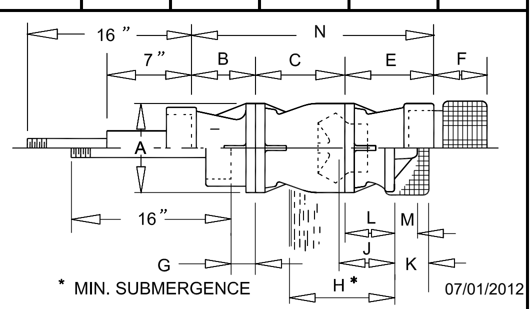
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	12.12	6.94	11.31	11.38	9.44	1.56	21.00	8.00	10.06	7.25	3.75	29.63

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	8", 10"
THRUST CONSTANT:	7.9	SUCTION SIZE:	8"
LATERAL (STD):	1"	STD. TUBE:	2.5", 3"
EYE AREA IN²:	18.39	WR² LB-FT²:	1.51
SHAFT DIA:	1.687	1ST STG WT LB: 315	ADD STG WT LB: 125

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

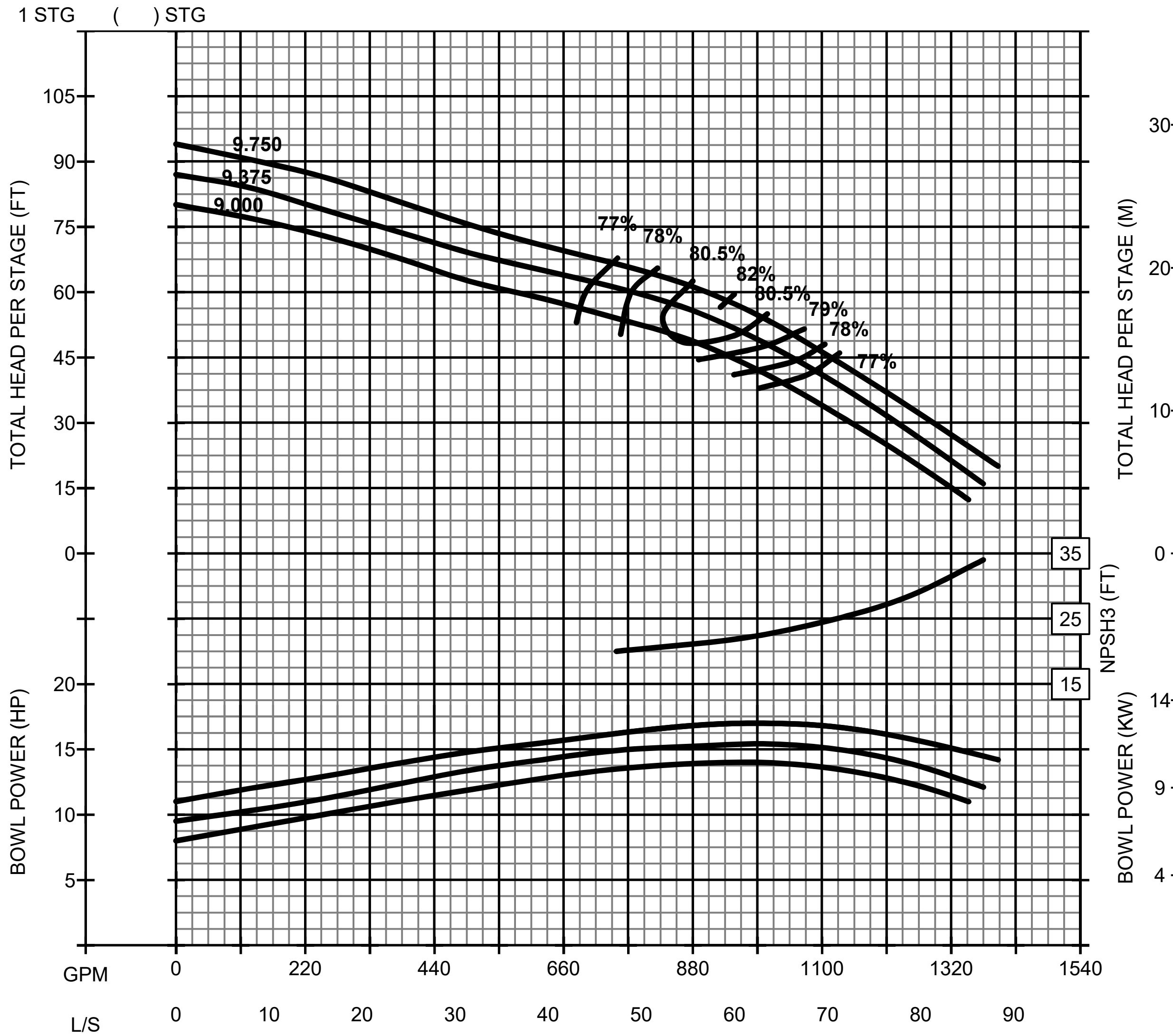
CVM12HC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	E12LC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

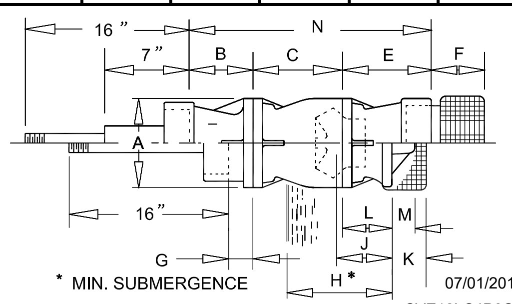


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.62	4.56	10.50	10.88	9.44	1.56	26.00	8.25	10.06	7.25	3.50	25.94

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	4	DISCHARGE SIZE:	8"
THRUST CONSTANT:	7.3	SUCTION SIZE:	8"
LATERAL (STD):	1.0"	STD. TUBE:	2.5", 3.0"
EYE AREA IN²:	14.07	WR² LB-FT²:	1.2
SHAFT DIA:	1.687	1ST STG WT LB: 197	ADD STG WT LB: 98

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

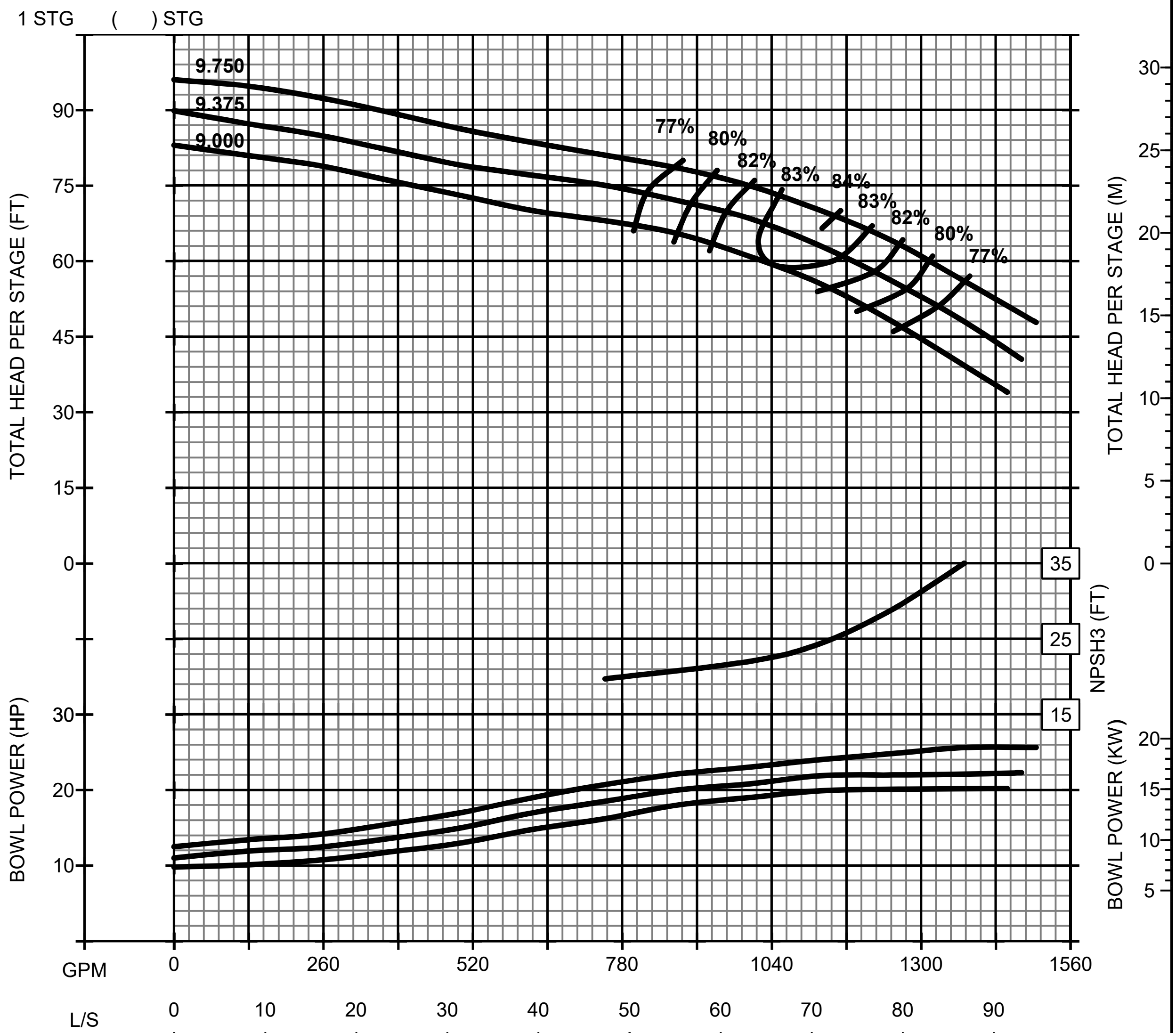
07/01/2012
CVE12LC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	E12MC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

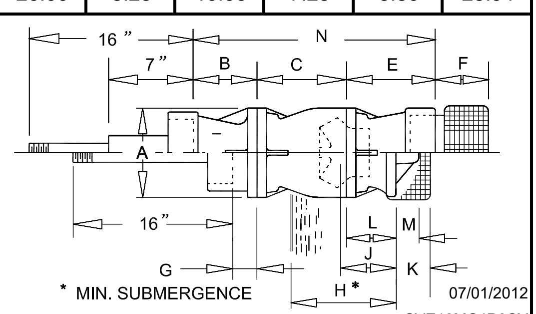


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.62	4.56	10.50	10.88	9.44	1.56	26.00	8.25	10.06	7.25	3.50	25.94

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	8"
THRUST CONSTANT:	7.3	SUCTION SIZE:	8"
LATERAL (STD):	0.94	STD. TUBE:	2.5", 3.0"
EYE AREA IN^2:	14.07	WR^2 LB-FT^2:	1.2
SHAFT DIA:	1.687	1ST STG WT LB: 197	ADD STG WT LB: 98

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



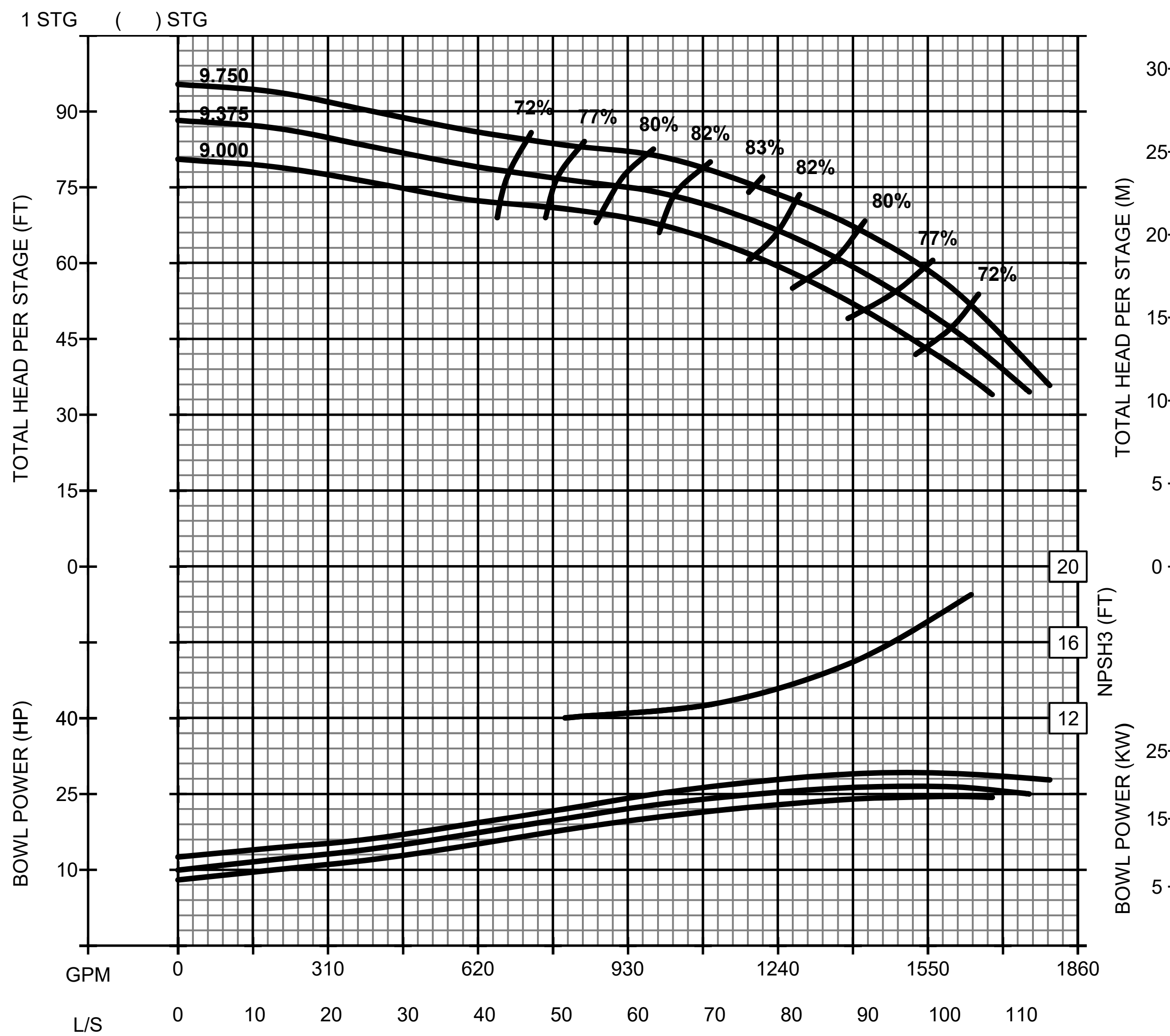
07/01/2012
CVE12MC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	E12HC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	3	5						
	NUMBER OF POINTS	-2	-1	0						

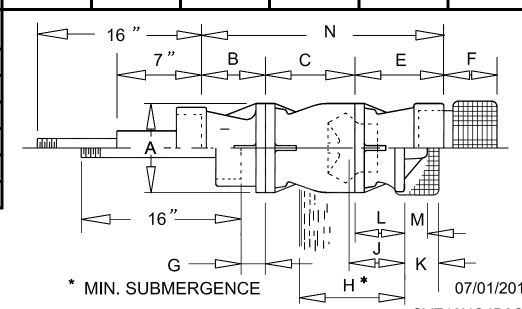


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.62	4.56	10.50	10.88	9.44	1.56	26.00	8.25	10.06	7.25	3.50	25.94

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	8"
THRUST CONSTANT:	7.3	SUCTION SIZE:	8"
LATERAL (STD):	0.94	STD. TUBE:	2.5", 3.0"
EYE AREA IN^2:	14.07	WR^2 LB-FT^2:	1.2
SHAFT DIA:	1.687	1ST STG WT LB: 197	ADD STG WT LB: 98

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

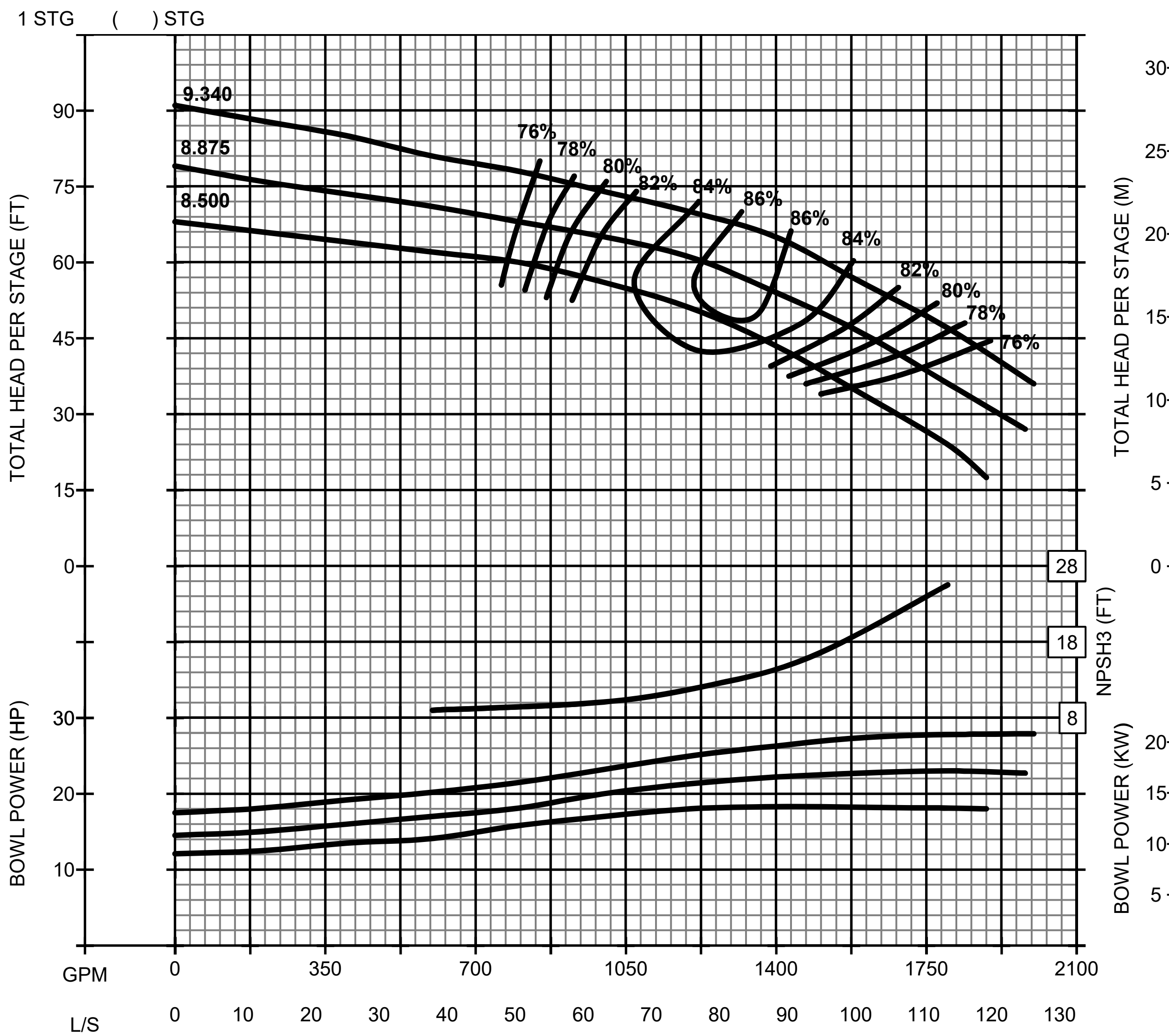
07/01/2012
CVE12HC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	K12HC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

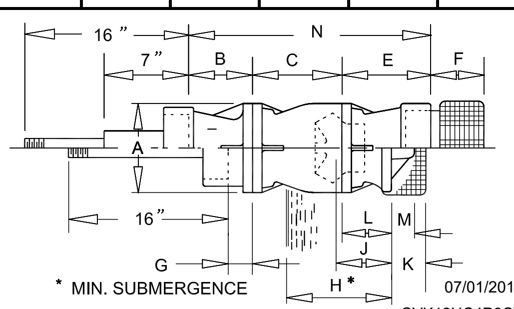


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.63	6.06	10.50	10.88	9.44	1.56	26.00	8.25	10.06	7.25	3.50	26.00

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	8"
THRUST CONSTANT:	11.20	SUCTION SIZE:	8"
LATERAL (STD):	0.87	STD. TUBE:	2.5", 3.0"
EYE AREA IN²:	21.5	WR² LB-FT²:	1.2
SHAFT DIA:	1.6875	1ST STG WT LB: 197	ADD STG WT LB: 98

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



07/01/2012
CVK12HC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

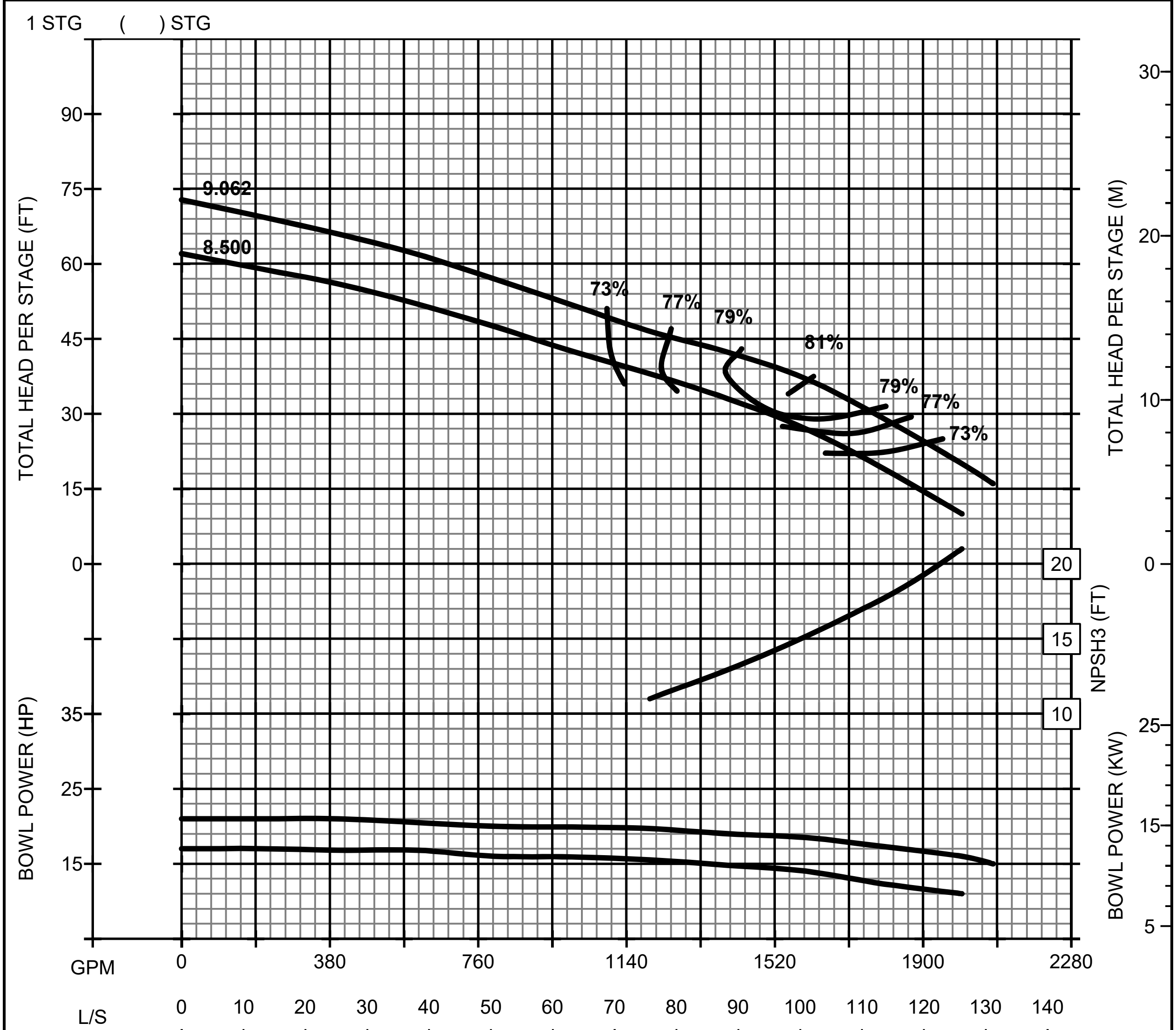
NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

H12MC

1770 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	2	3	4	5
	NUMBER OF POINTS	-3	-2	-1	0

DESIGN	GPM	TDH	HP	EFF

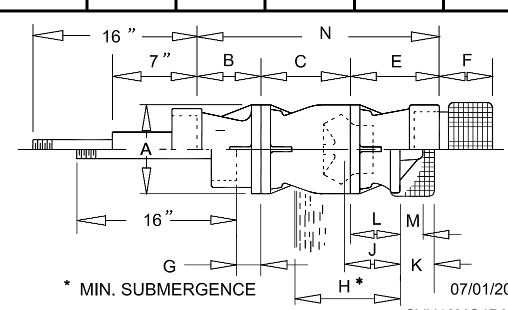


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.62	6.06	12.50	12.50	11.25	1.31	28.00	13.50	N/A	N/A	N/A	31.06

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	8", 10"
THRUST CONSTANT:	15.4	SUCTION SIZE:	10"
LATERAL (STD):	1.0"	STD. TUBE:	2.5", 3"
EYE AREA IN^2:	33.4	WR^2 LB-FT^2:	2.32
SHAFT DIA:	1.687	1ST STG WT LB: 375	ADD STG WT LB: 150

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVH12MC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

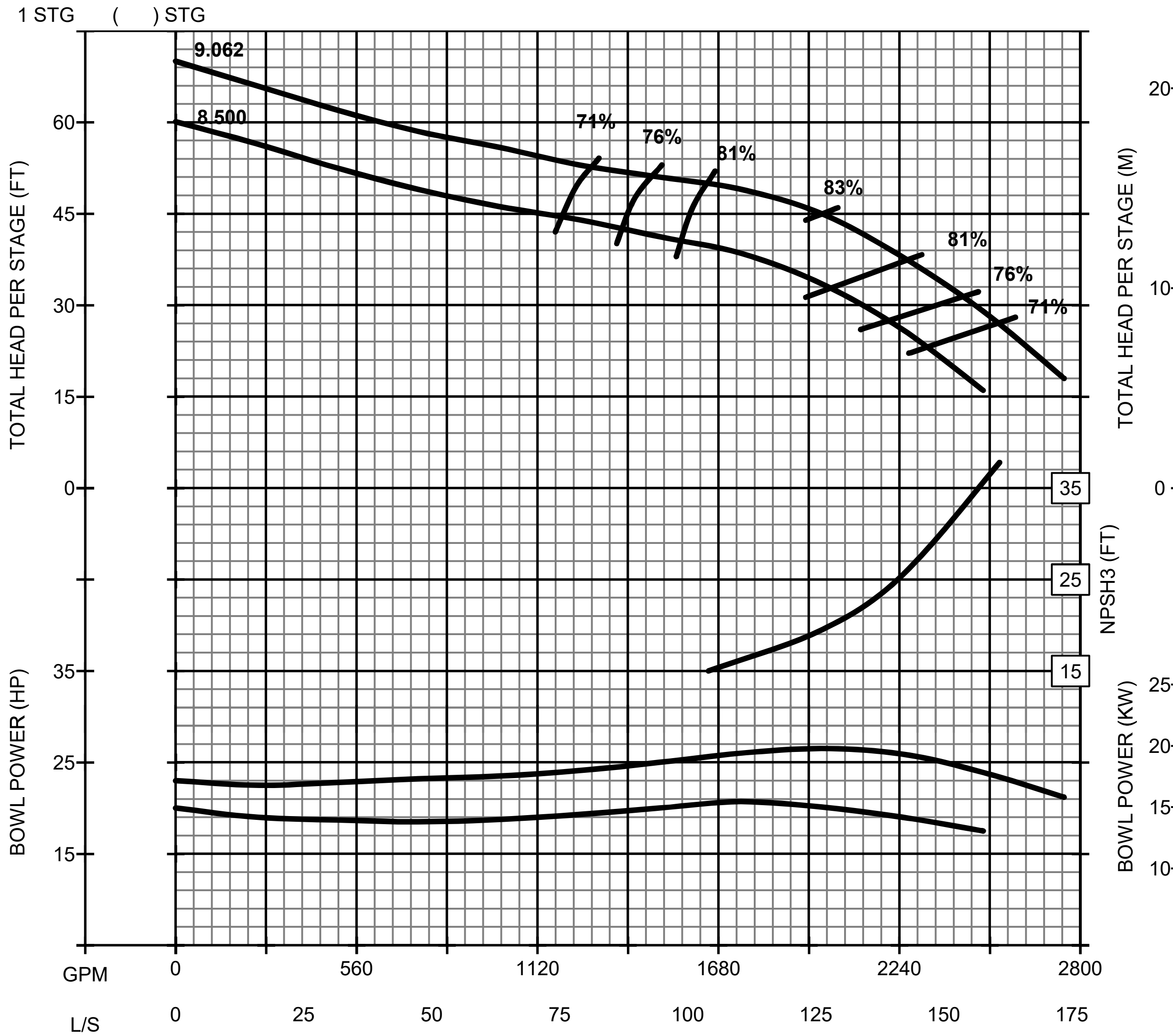
PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

NATIONAL PUMP COMPANY®
A GORMAN-RUPP COMPANY

H12HC

1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	2	3	4	5	DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-3	-2	-1	0					

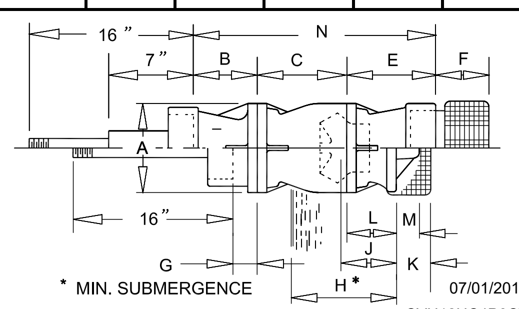


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.62	6.06	12.50	12.50	11.25	1.31	28.00	13.50	N/A	N/A	N/A	31.06

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	8", 10"
THRUST CONSTANT:	15.4	SUCTION SIZE:	10"
LATERAL (STD):	1"	STD. TUBE:	2.5", 3"
EYE AREA IN²:	33.4	WR² LB-FT²:	2.32
SHAFT DIA:	1.687	1ST STG WT LB: 375	ADD STG WT LB: 150

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVH12HC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

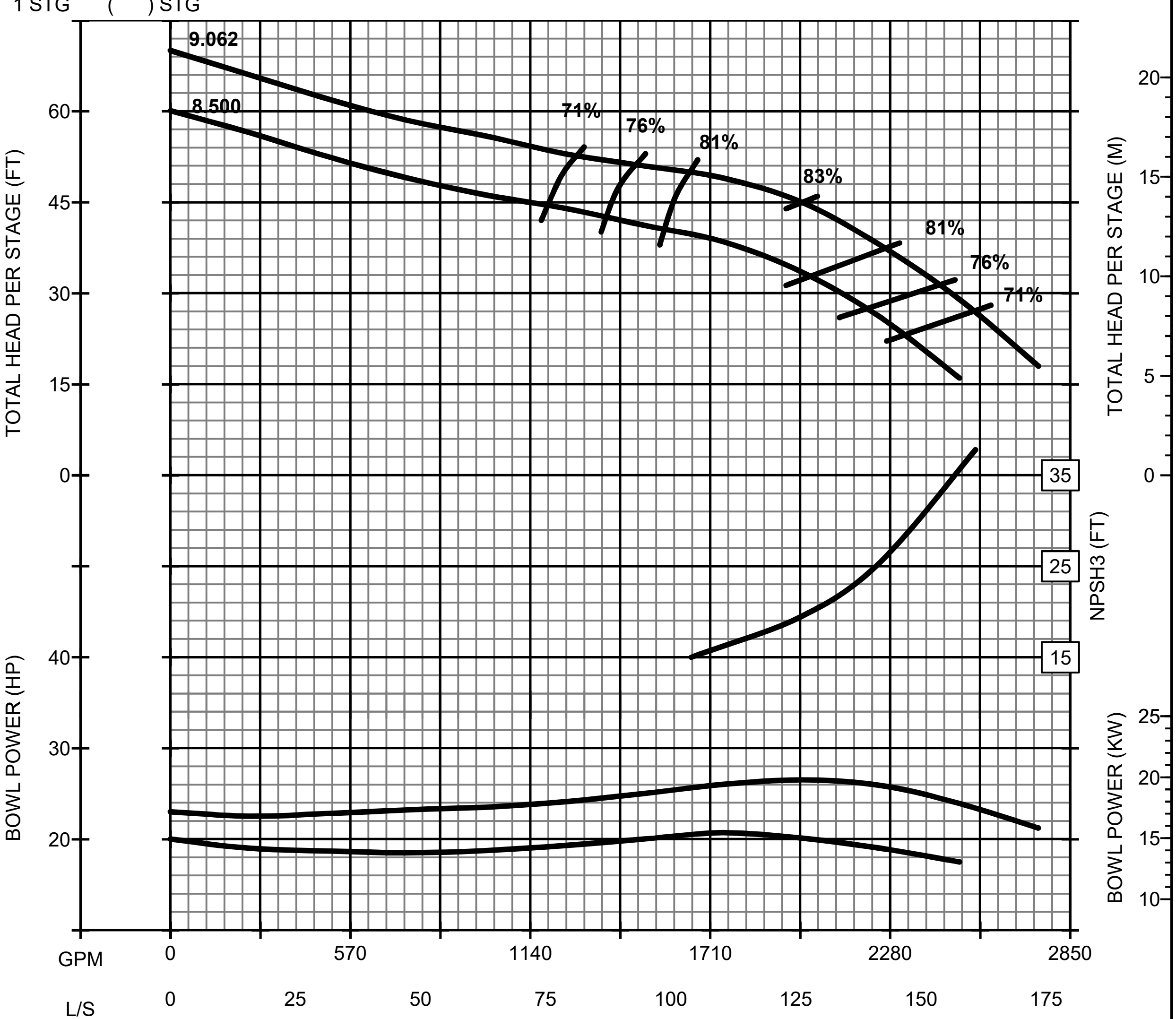
PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

H12HO

1770 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	2	3	4	5					
	NUMBER OF POINTS	-3	-2	-1	0					

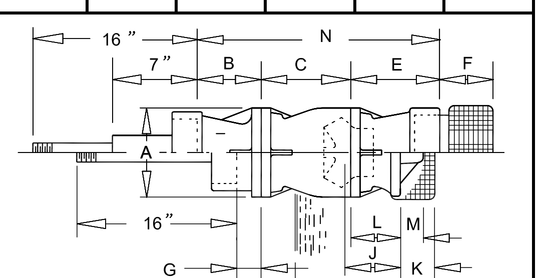


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.62	6.06	12.50	12.50	11.25	1.31	28.00	13.50	N/A	N/A	N/A	31.06

PUMP DATA

IMPELLER:	SEMI-OPEN	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	8", 10"
THRUST CONSTANT:	15.4	SUCTION SIZE:	10"
LATERAL (STD):	1"	STD. TUBE:	2.5", 3"
EYE AREA IN²:	33.4	WR² LB-FT²:	2.32
SHAFT DIA:	1.687	1ST STG WT LB: 375	ADD STG WT LB: 150

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

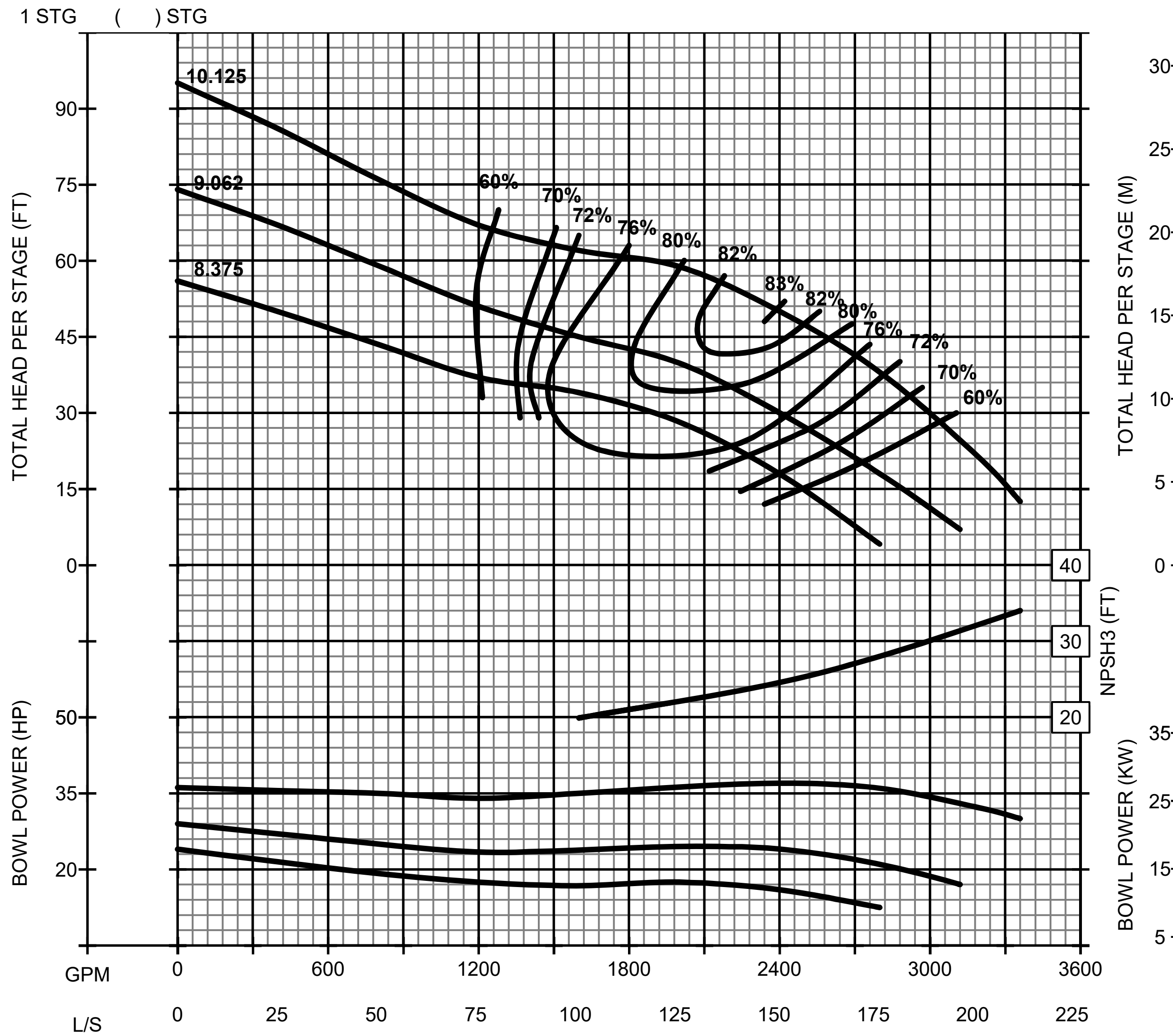
07/01/2012
CVH12HO4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	J12XHO 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2	3	5	DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-3	-2	-1	0					

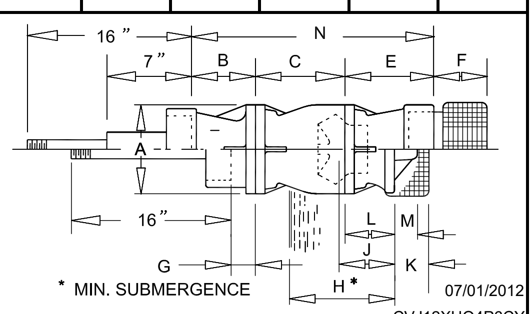


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.75	5.81	12.38	10.00	11.25	1.62	24.00	N/A	N/A	N/A	N/A	28.19

PUMP DATA

IMPELLER:	SEMI-OPEN	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	10"
THRUST CONSTANT:	15.6	SUCTION SIZE:	10"
LATERAL (STD):	1.375	STD. TUBE:	3"
EYE AREA IN²:	36.2	WR² LB-FT²:	2.71
SHAFT DIA:	1.9375	1ST STG WT LB: 395	ADD STG WT LB: 170

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



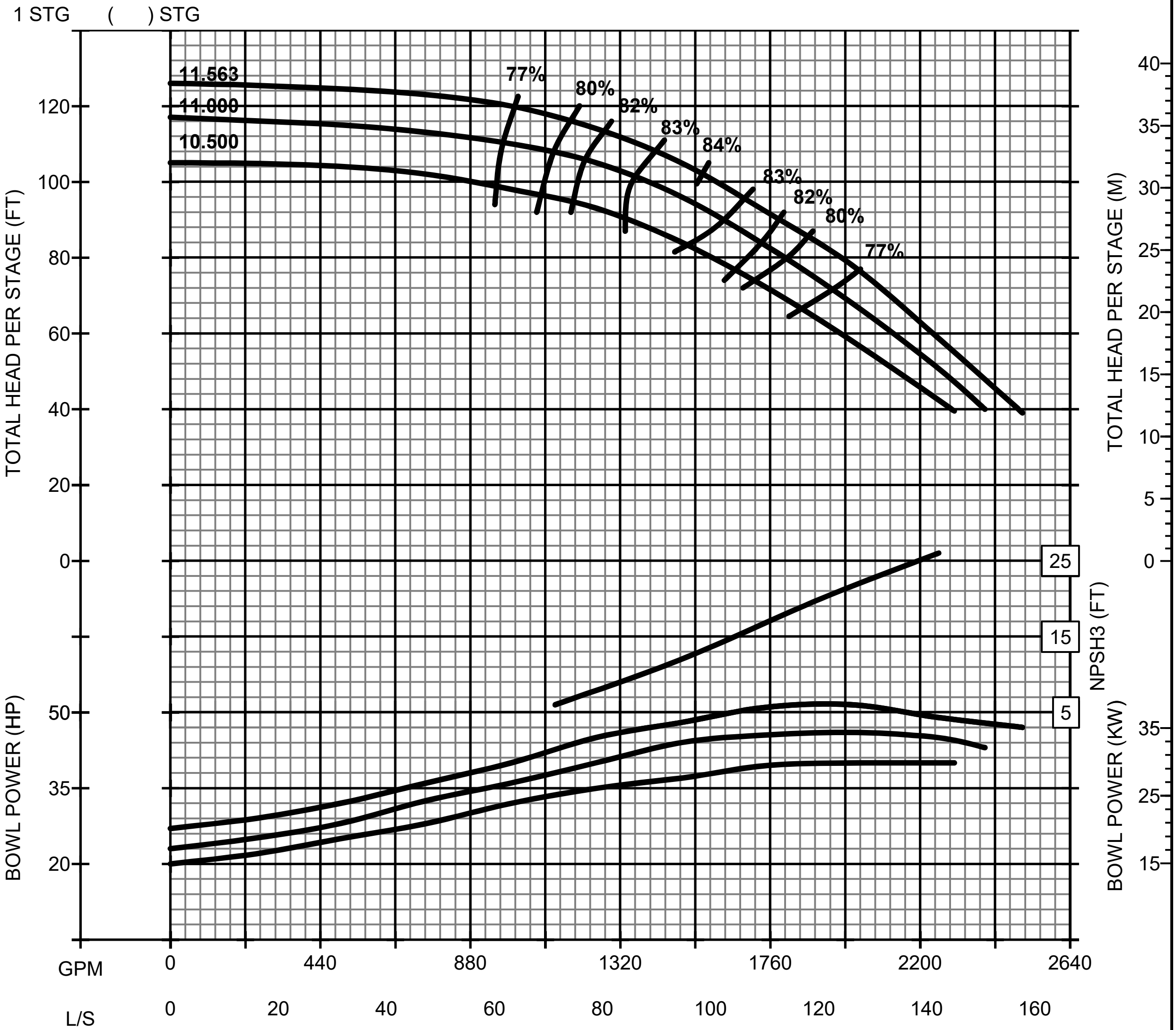
07/01/2012
CVJ12XHO4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	M14MC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2	3		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

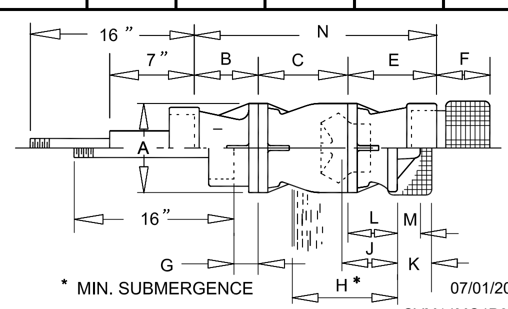


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	14.13	5.44	13.25	10.00	11.25	0.56	22.50	7.25	12.06	6.88	2.75	28.69

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	10", 12"
THRUST CONSTANT:	12.5	SUCTION SIZE:	10"
LATERAL (STD):	1.12	STD. TUBE:	3"
EYE AREA IN²:	25.32	WR² LB-FT²:	3.62
SHAFT DIA:	1.937	1ST STG WT LB: 420	ADD STG WT LB: 170

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

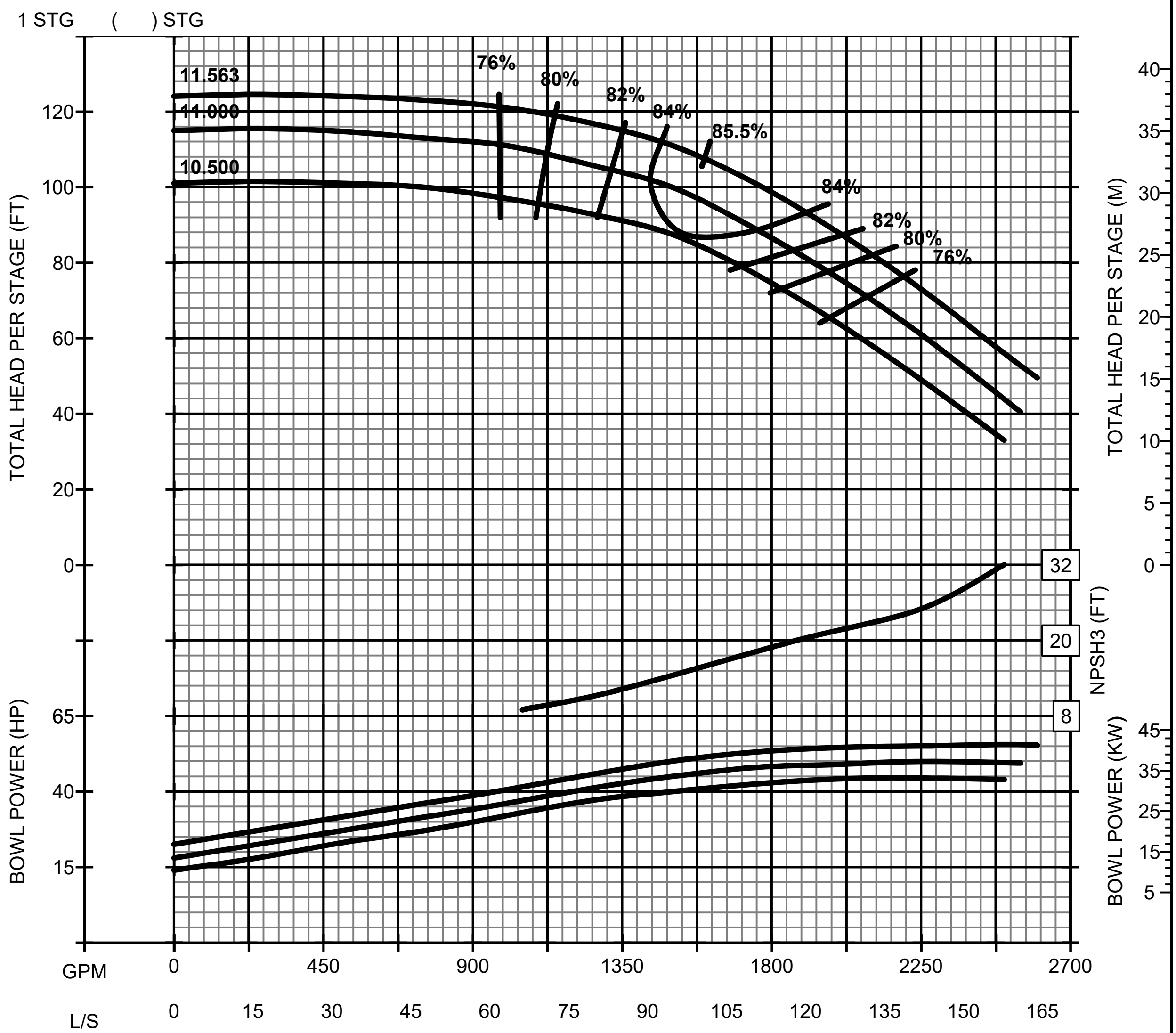
07/01/2012
CVM14MC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	M14HC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2	3		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

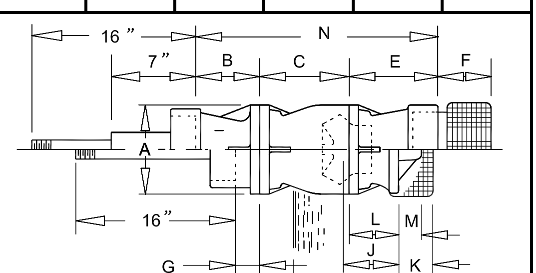


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	14.13	5.44	13.25	10.00	11.25	0.56	22.50	7.25	12.06	6.88	2.75	28.69

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	10", 12"
THRUST CONSTANT:	12.5	SUCTION SIZE:	10"
LATERAL (STD):	1.12	STD. TUBE:	3"
EYE AREA IN²:	25.32	WR² LB-FT²:	3.62
SHAFT DIA:	1.9375	1ST STG WT LB: 420	ADD STG WT LB: 170

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

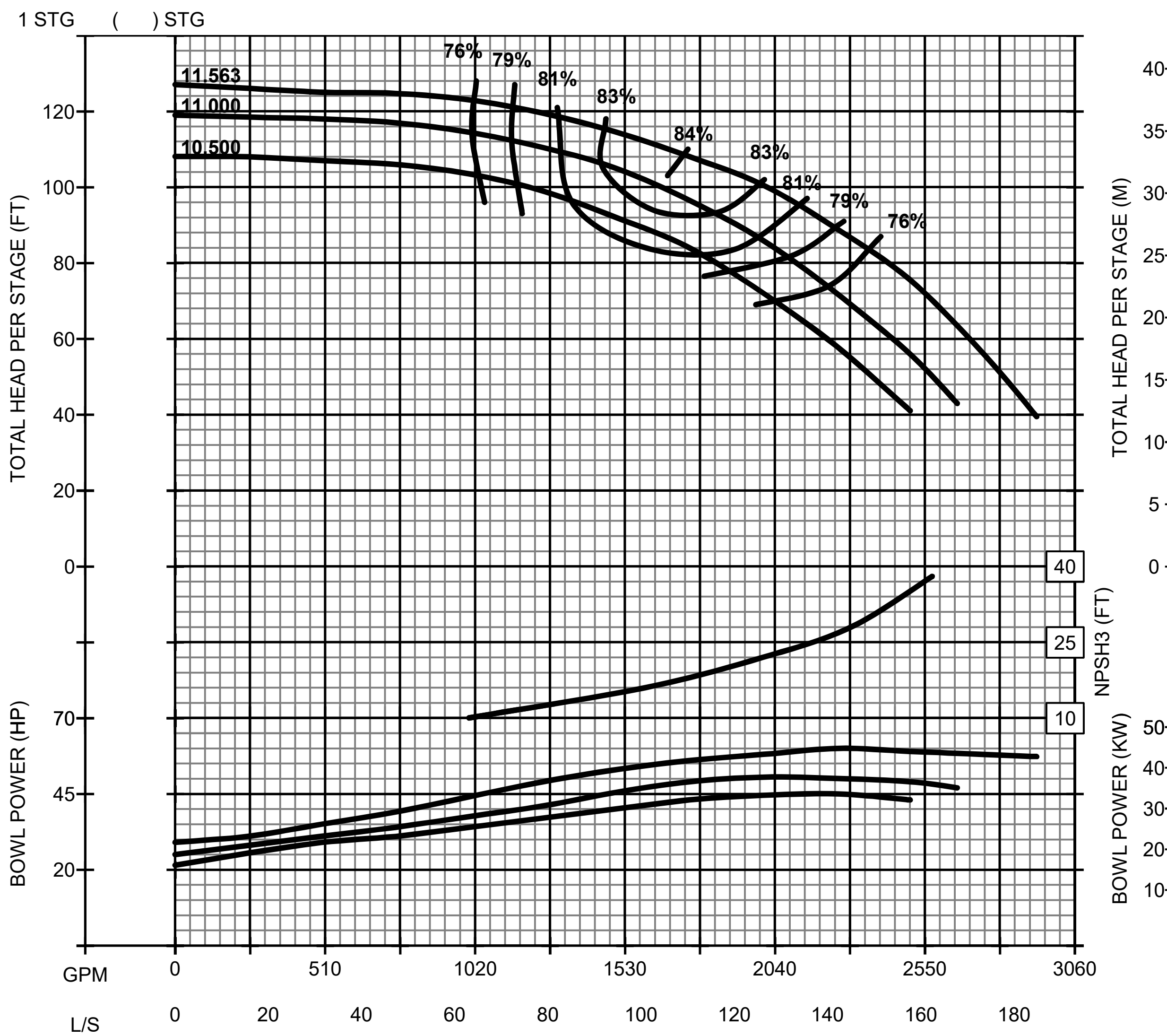
07/01/2012
CVM14HC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	**M14XHC** 1770 RPM	

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2	3						
	NUMBER OF POINTS	-2	-1	0						

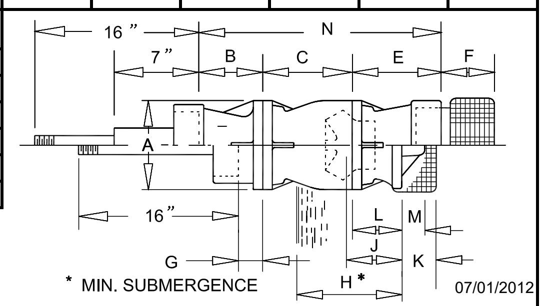


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	14.13	5.44	13.25	10.00	11.25	0.56	22.50	7.25	12.06	6.88	2.75	28.69

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	10", 12"
THRUST CONSTANT:	12.5	SUCTION SIZE:	10"
LATERAL (STD):	0.88"	STD. TUBE:	3"
EYE AREA IN^2:	25.32	WR^2 LB-FT^2:	3.62
SHAFT DIA:	1.937	1ST STG WT LB: 420	ADD STG WT LB: 170

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVM14XHC4P6CY

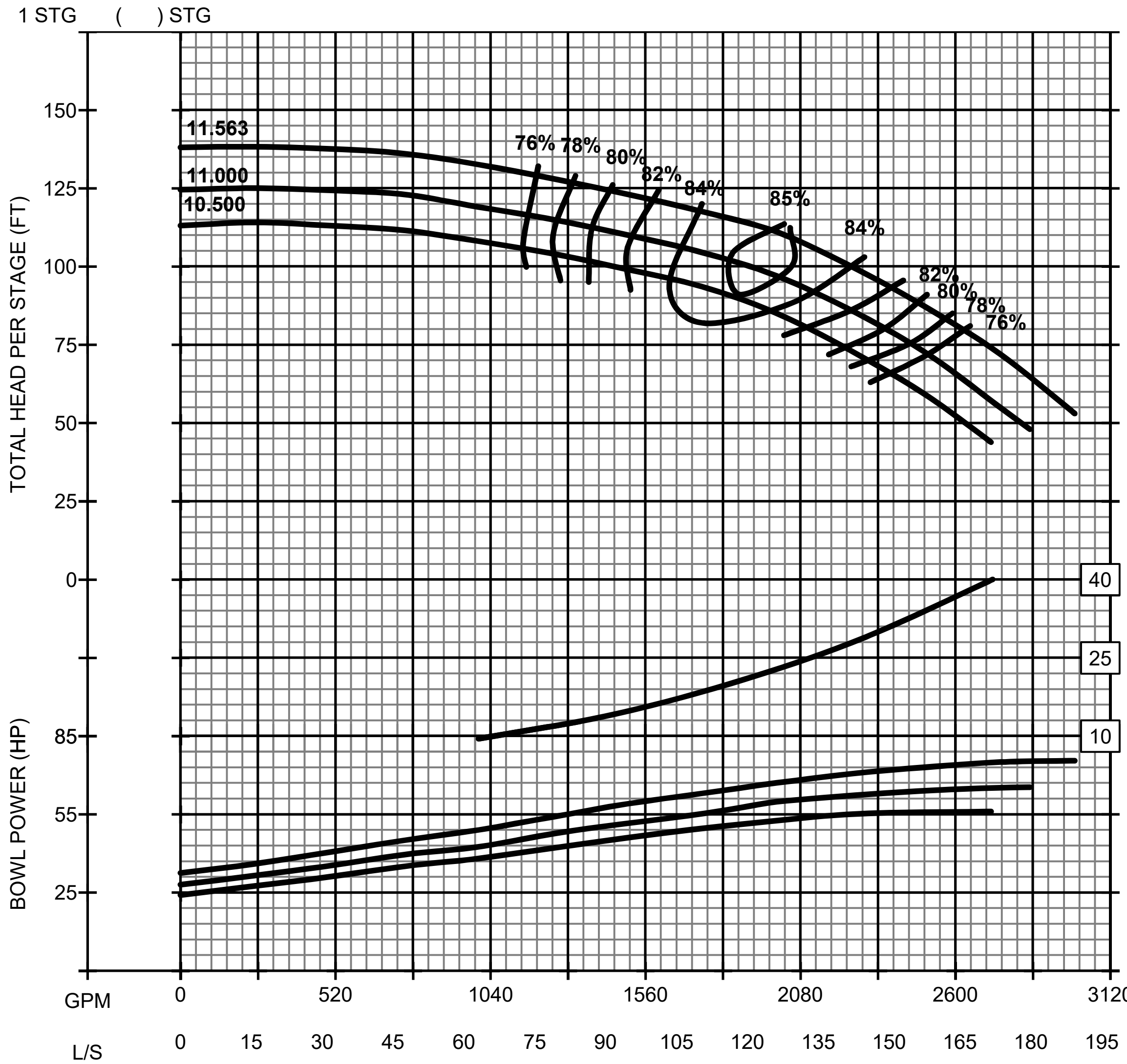
CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP® COMPANY A GORMAN-RUPP COMPANY	M14XXHC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	2	3	
	NUMBER OF POINTS	-2	-1	0	

DESIGN	GPM	TDH	HP	EFF

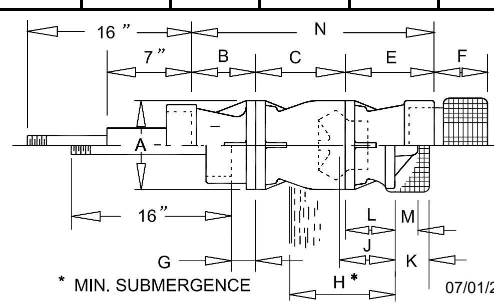


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	14.13	5.44	13.25	10.00	11.25	0.56	22.50	7.25	12.06	6.88	2.75	28.69

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	10", 12"
THRUST CONSTANT:	12.5	SUCTION SIZE:	10"
LATERAL (STD):	0.88"	STD. TUBE:	3"
EYE AREA IN^2:	25.32	WR^2 LB-FT^2:	3.62
SHAFT DIA:	1.937	1ST STG WT LB: 420	ADD STG WT LB: 170

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVM14XXHC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

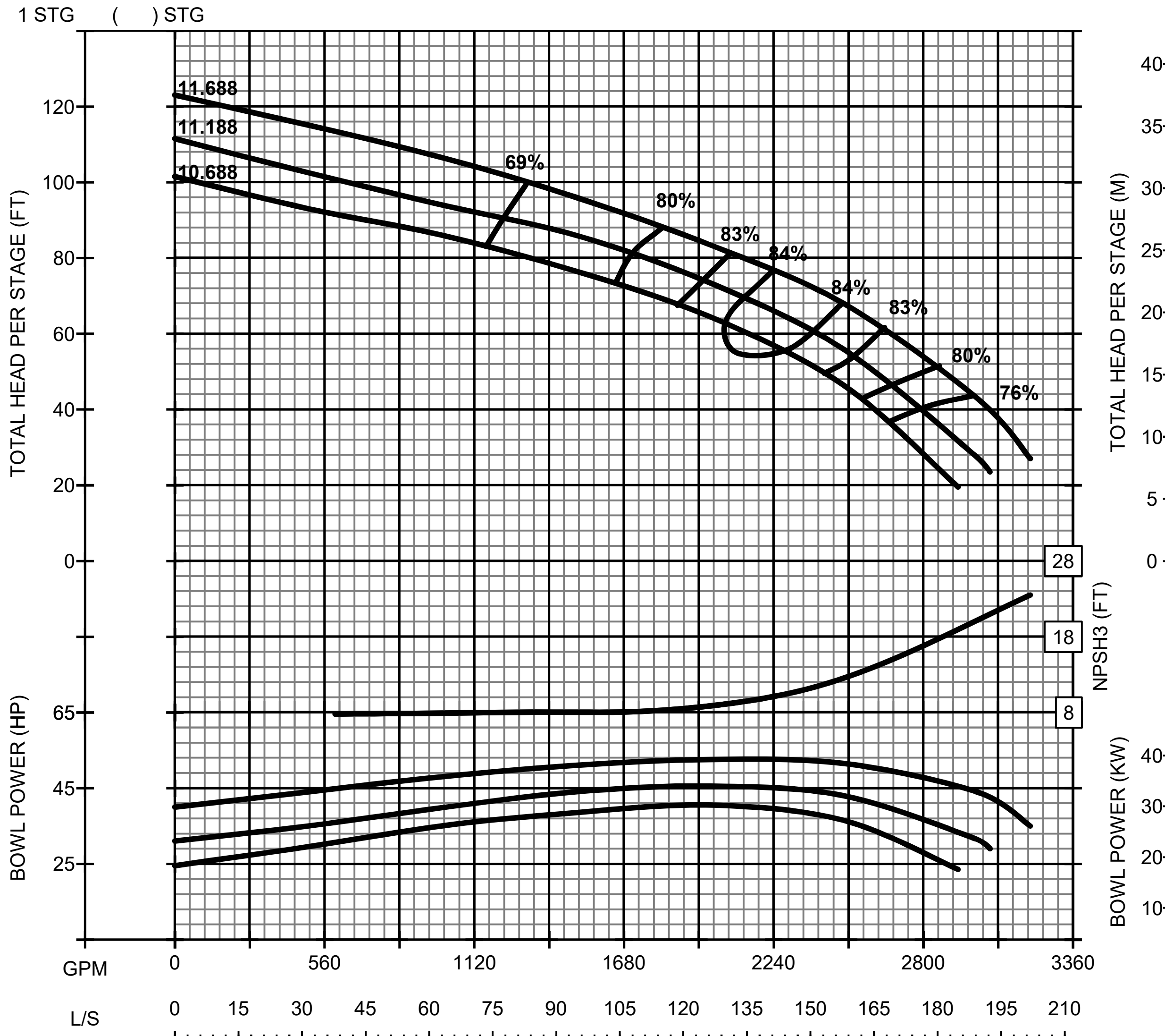
NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

H14LC

1770 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	2	3	
	NUMBER OF POINTS	-4	-2	0	

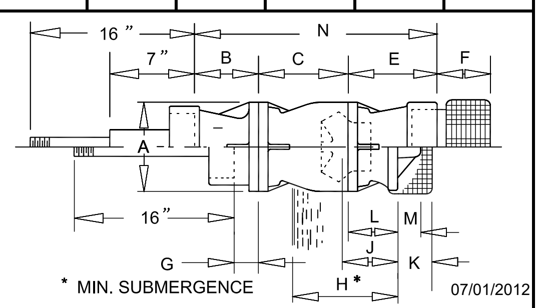
DESIGN	GPM	TDH	HP	EFF



DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G**	H*	J	K	L	M	N
	14.12	6.44	14.12	12.25	11.25	0.56	25.00	8.75	12.06	7.38	2.81	32.81

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	10", 12"
THRUST CONSTANT:	20.3	SUCTION SIZE:	10"
LATERAL (STD):	1.25	STD. TUBE:	3.5"
EYE AREA IN^2:	39.0	WR^2 $LB\text{-}FT^2$:	4.15
SHAFT DIA:	2.187	1ST STG WT LB: 540	ADD STG WT LB: 200



*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.
**1.81 WITH 12" DISCHARGE

* MIN. SUBMERGENCE

07/01/2012
CVH14LC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

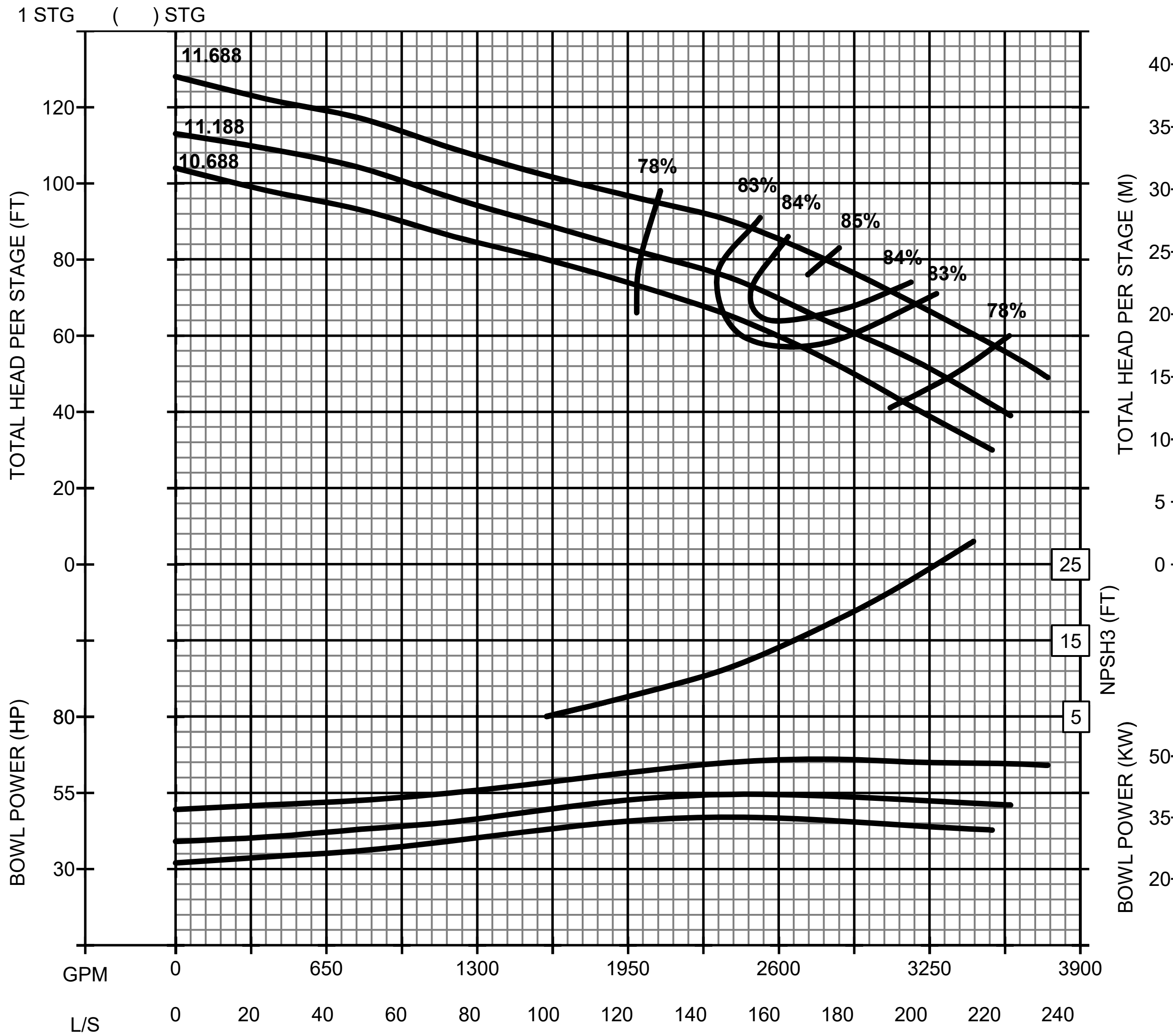
PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

H14MC

1770 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2	3						
	NUMBER OF POINTS	-4	-2	0						

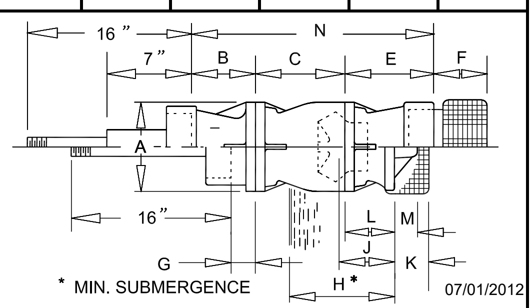


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G**	H*	J	K	L	M	N
	14.12	6.44	14.12	12.25	11.25	0.56	25.00	8.75	12.06	7.38	2.81	32.81

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	10", 12"
THRUST CONSTANT:	20.3	SUCTION SIZE:	10"
LATERAL (STD):	1.25	STD. TUBE:	3.5"
EYE AREA IN^2:	38.96	WR^2 LB-FT^2:	4.15
SHAFT DIA:	2.187	1ST STG WT LB: 540	ADD STG WT LB: 200

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.
**1.81 WITH 12" DISCHARGE



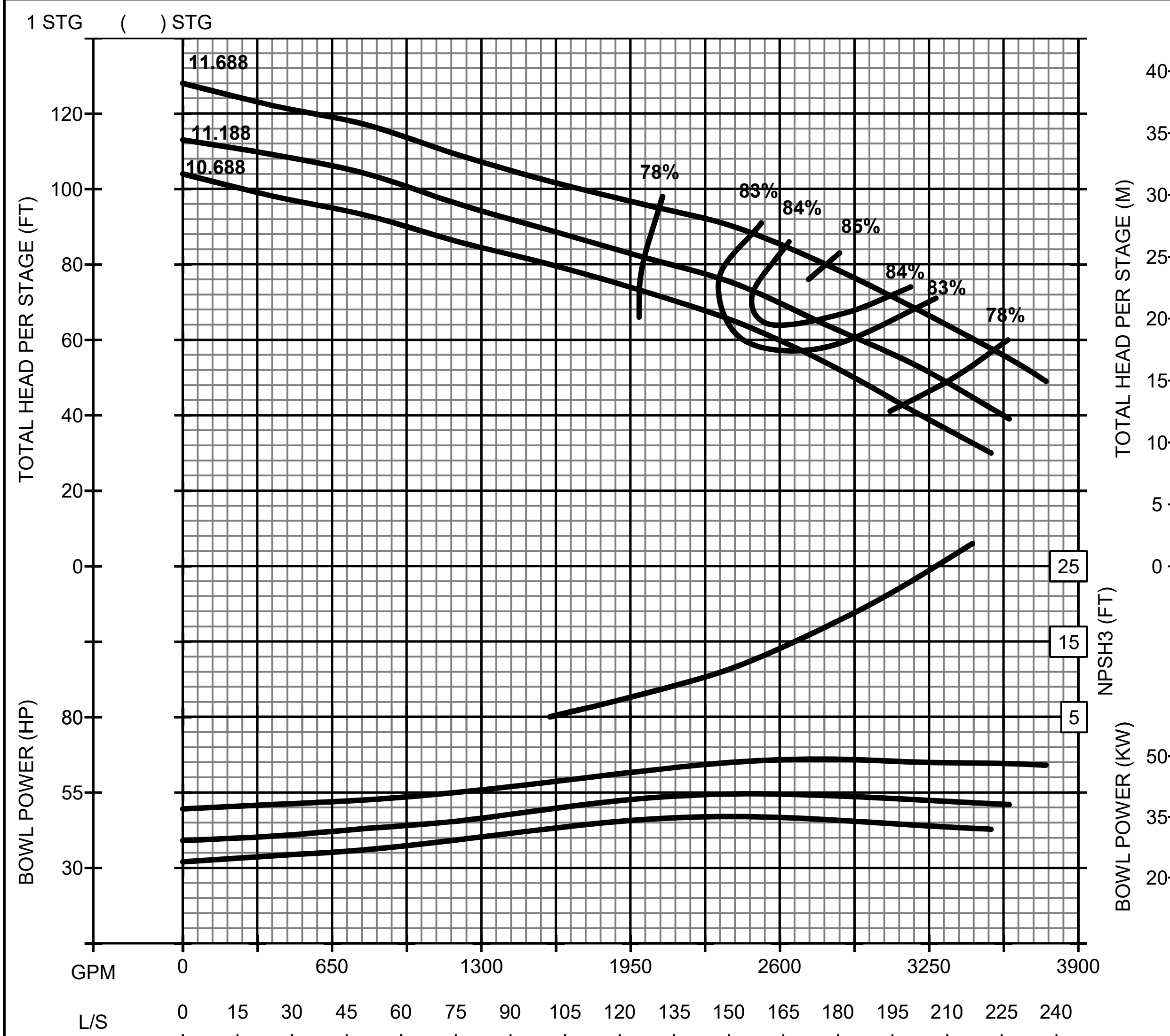
07/01/2012
CVH14MC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	H14MO 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2	3		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-4	-2	0						

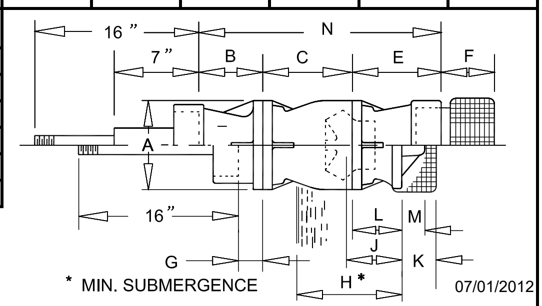


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G**	H*	J	K	L	M	N
	14.12	6.44	14.12	12.25	11.25	0.56	25.00	8.75	N/A	N/A	N/A	32.81

PUMP DATA

IMPELLER:	SEMI-OPEN	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	10", 12"
THRUST CONSTANT:	20.3	SUCTION SIZE:	10"
LATERAL (STD):	1.25	STD. TUBE:	3.5"
EYE AREA IN²:	38.96	WR² LB-FT²:	4.15
SHAFT DIA:	2.187	1ST STG WT LB: 540	ADD STG WT LB: 200

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.
**1.81 WITH 12" DISCHARGE



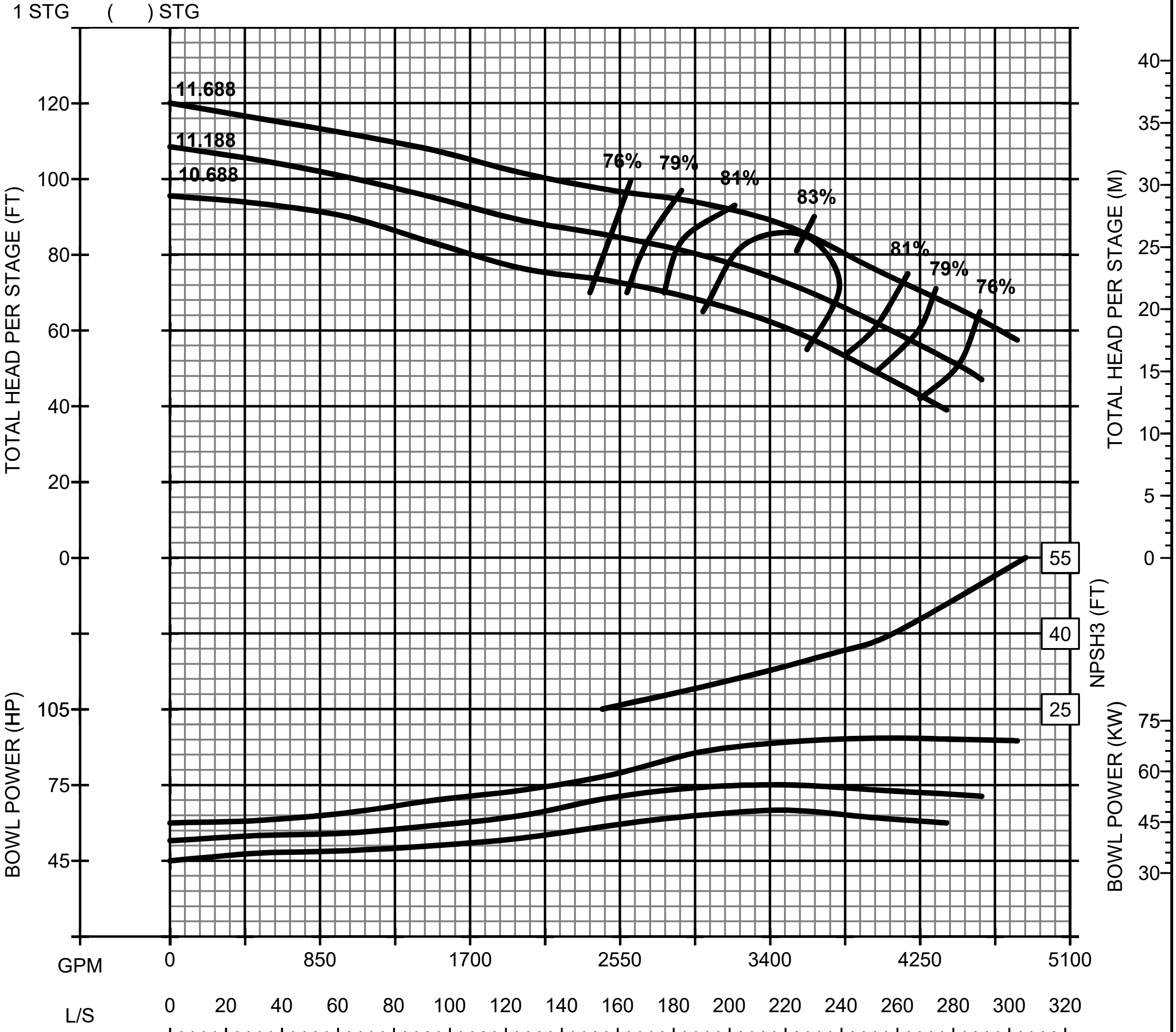
07/01/2012
CVH14MO4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	H14XHC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2	3						
	NUMBER OF POINTS	-4	-2	0						

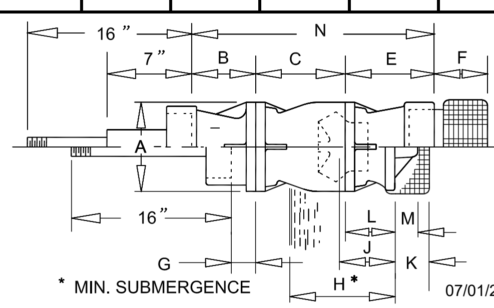


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G**	H*	J	K	L	M	N
	14.12	6.44	14.12	12.25	11.25	0.56	25.00	8.75	12.06	7.38	2.81	32.81

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	10", 12"
THRUST CONSTANT:	20.3	SUCTION SIZE:	10"
LATERAL (STD):	1.12"	STD. TUBE:	3.5"
EYE AREA IN²:	38.96	WR² LB-FT²:	4.52
SHAFT DIA:	2.187	1ST STG WT LB: 540	ADD STG WT LB: 200

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.
**1.81 WITH 12" DISCHARGE



* MIN. SUBMERGENCE

07/01/2012
CVH14XHC4P6CY

CURVE TEMPLATE 08.05.2011

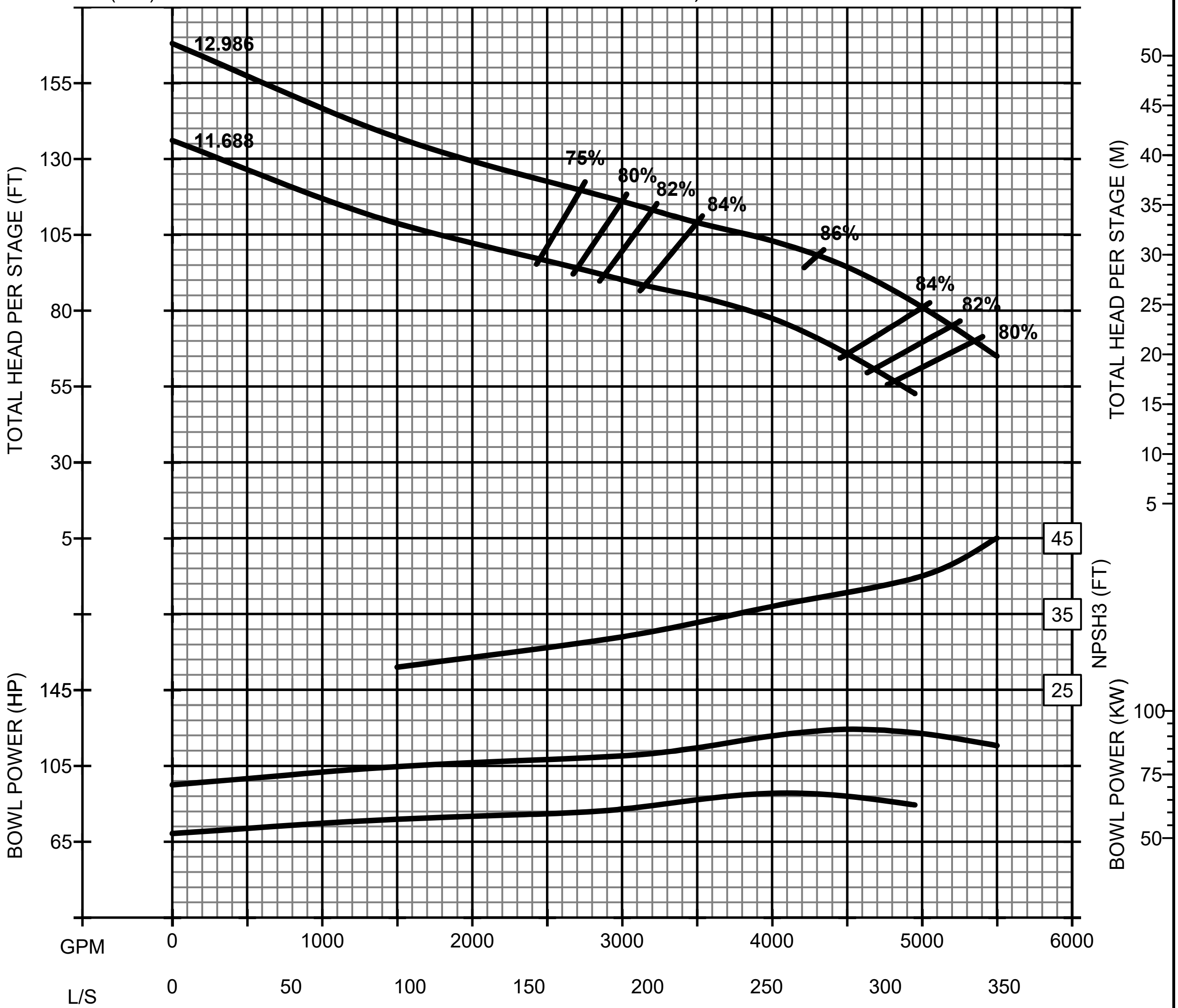
1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	H16MC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2	3		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-4	-2	0						

1 STG ( ) STG

TEMPORARY CURVE, CONTACT FACTORY

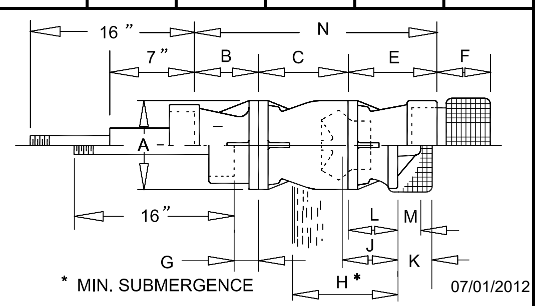


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	15.63	6.44	14.69	N/A	9.97	1.81	48.00	12.00	16.00	9.97	2.26	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	12"
THRUST CONSTANT:	27.80	SUCTION SIZE:	BELL
LATERAL (STD):	0.94	STD. TUBE:	3.5"
EYE AREA IN²:	58.7	WR² LB-FT²:	9.15
SHAFT DIA:	2.19	1ST STG WT LB: 540	ADD STG WT LB: 200

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVH16MC4P6CY

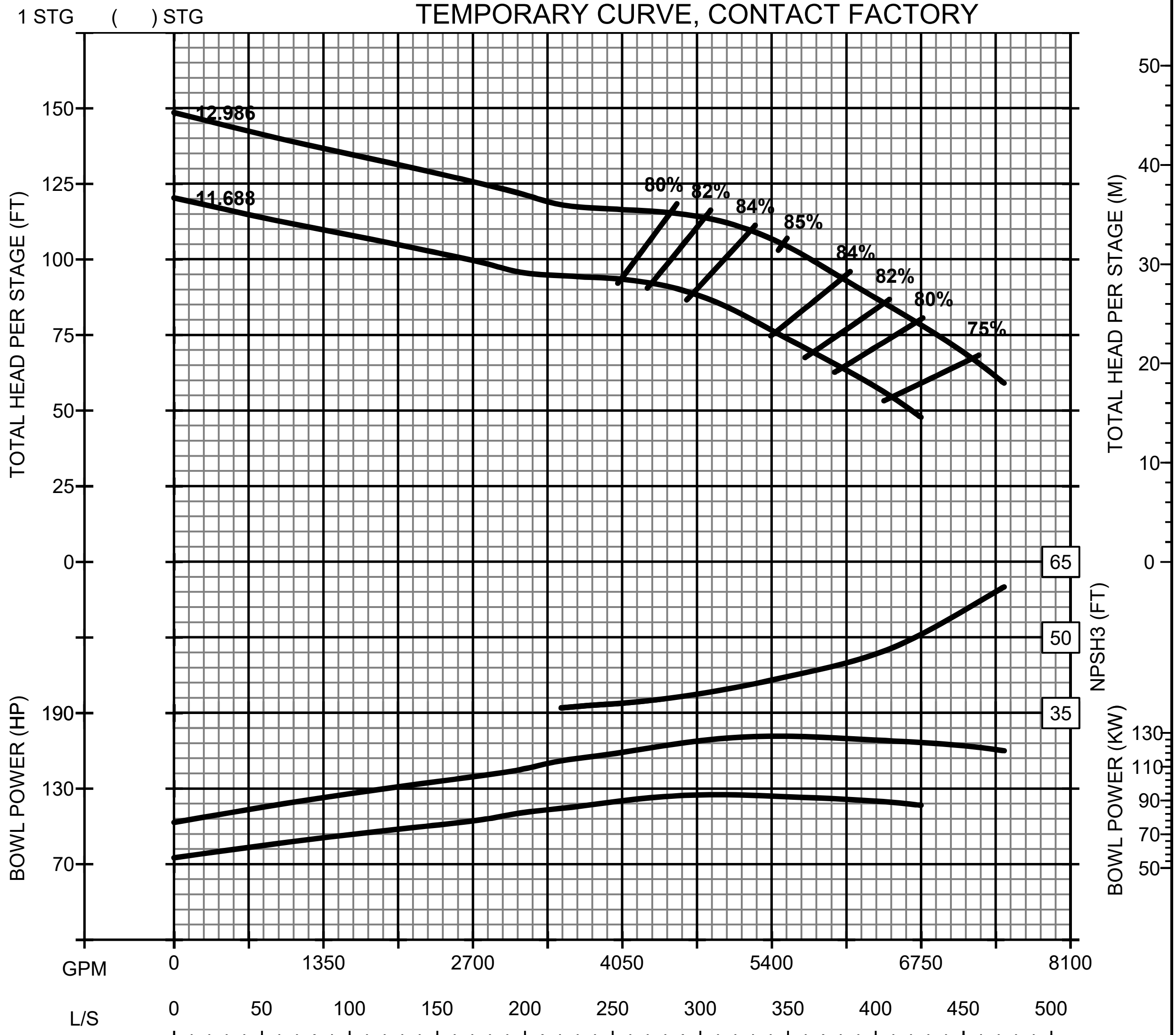
CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	H16XHC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2	3		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-4	-2	0						

TEMPORARY CURVE, CONTACT FACTORY

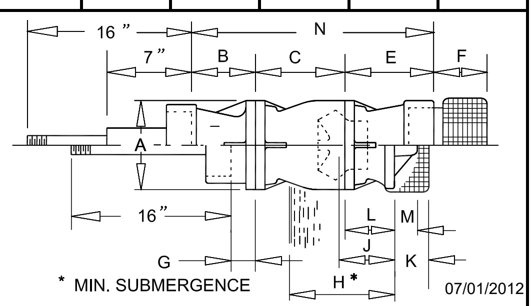


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	15.63	6.44	14.69	N/A	9.97	1.81	48.00	12.00	16.00	9.97	2.26	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	12"
THRUST CONSTANT:	27.80	SUCTION SIZE:	BELL
LATERAL (STD):	0.94	STD. TUBE:	3.5"
EYE AREA IN²:	58.7	WR² LB-FT²:	9.15
SHAFT DIA:	2.19	1ST STG WT LB: 540	ADD STG WT LB: 200

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVH16XHC4P6CY

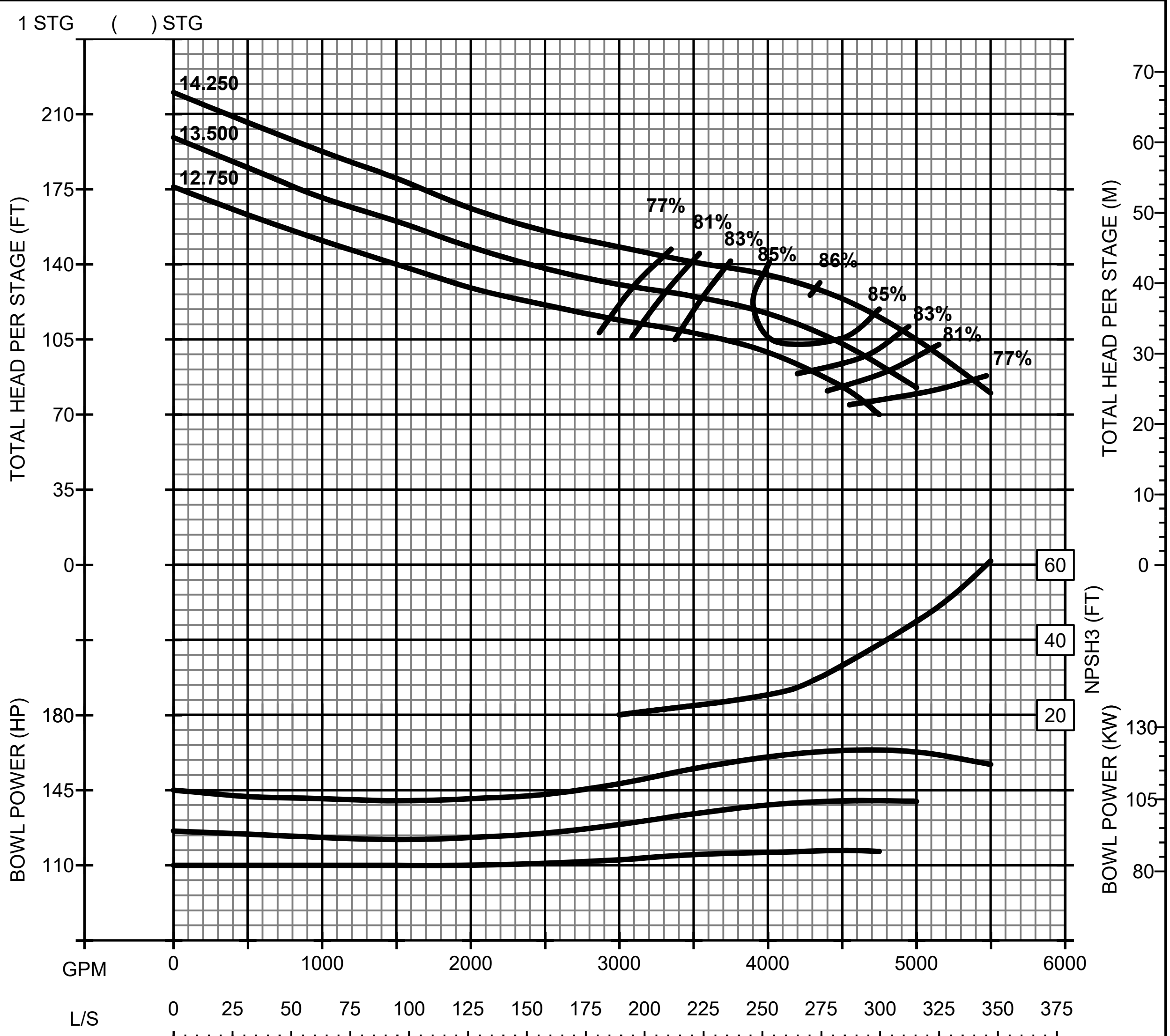
CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	E18LC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	2	3	
	NUMBER OF POINTS	-2	-1	0	

DESIGN	GPM	TDH	HP	EFF



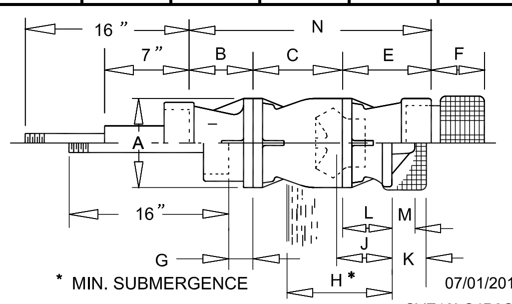
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	17.50	6.44	15.00	N/A	N/A	0.81	48.00	11.25	13.88	10.50	2.50	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	12"
THRUST CONSTANT:	26.5	SUCTION SIZE:	BELL
LATERAL (STD):	0.62"	STD. TUBE:	3.5"
EYE AREA IN^2:	63.88	WR^2 LB-FT^2:	9.01
SHAFT DIA:	2.187	1ST STG WT LB: 492	ADD STG WT LB: 315

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

CVE18LC4P6CY

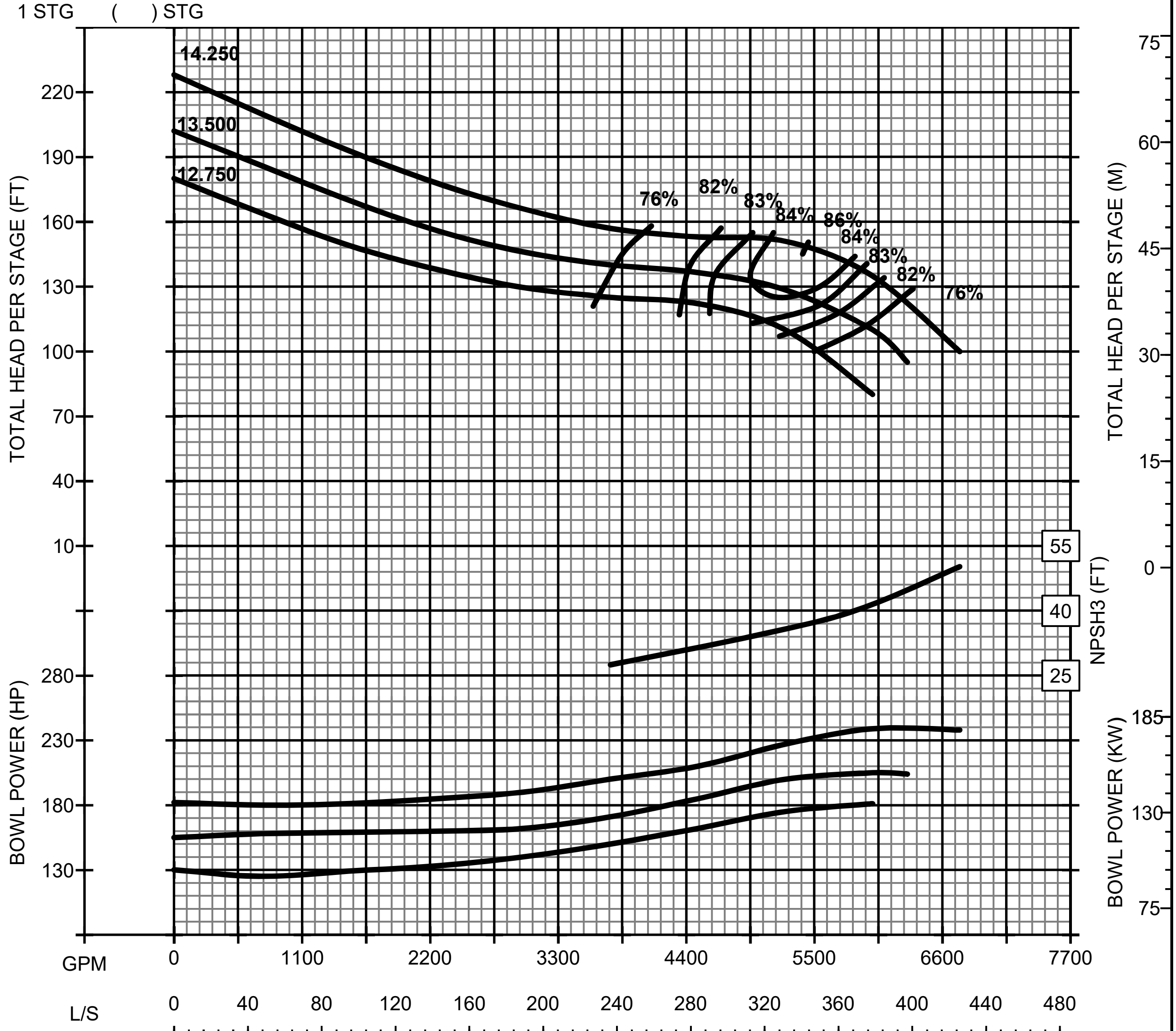
CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	E18HC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2	3		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

1 STG ( ) STG

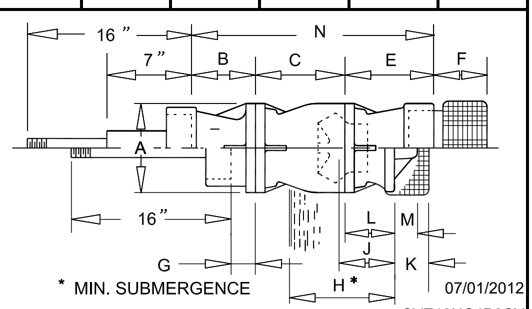


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	17.50	6.44	15.00	N/A	N/A	0.81	48.00	11.25	13.88	10.50	2.50	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED		
NO. OF VANES:	7	DISCHARGE SIZE:	12"		
THRUST CONSTANT:	26.5	SUCTION SIZE:	BELL		
LATERAL (STD):	0.62"	STD. TUBE:	3.5"		
EYE AREA IN²:	63.88	WR² LB-FT²:	9.26		
SHAFT DIA:	2.187	1ST STG WT LB:	492	ADD STG WT LB:	315

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

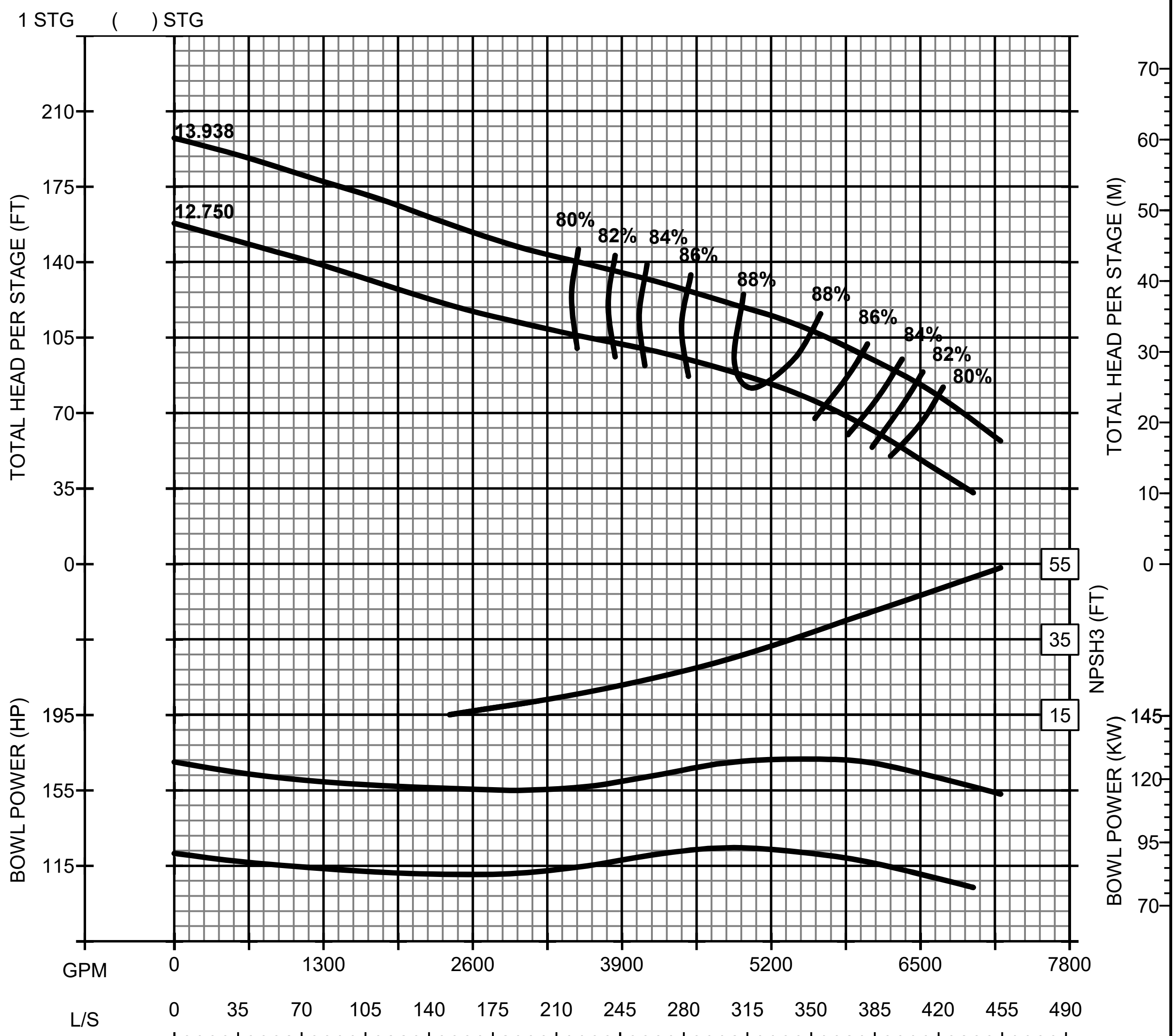
07/01/2012
CVE18HC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	K20LC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2			DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	0							

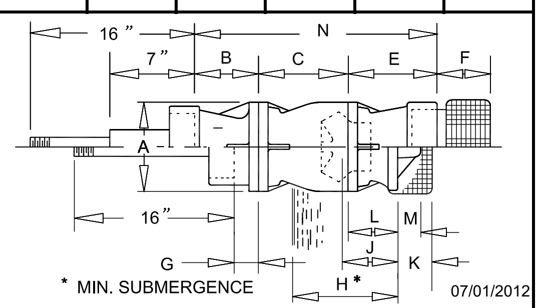


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	19.25	6.44	18.25	N/A	N/A	1.81	48.00	11.25	13.88	10.50	5.125	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	12", 14"
THRUST CONSTANT:	33.0	SUCTION SIZE:	BELL
LATERAL (STD):	1.00	STD. TUBE:	N/A
EYE AREA IN^2:	72.6	WR^2 LB-FT^2:	20.26
SHAFT DIA:	2.438	1ST STG WT LB: 730	ADD STG WT LB: 510

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

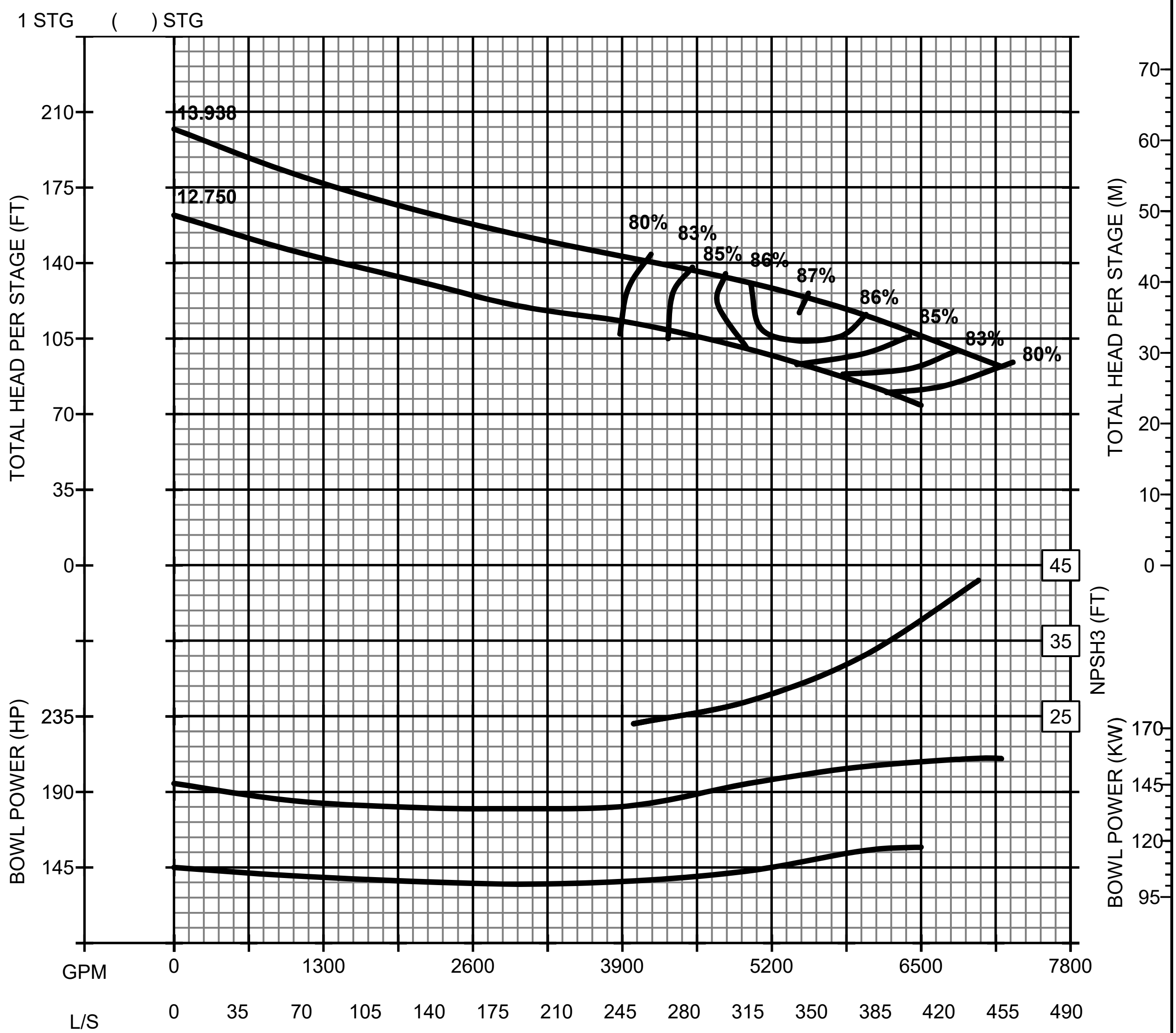
07/01/2012
CVK20LC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	K20MC 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2			DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	0							

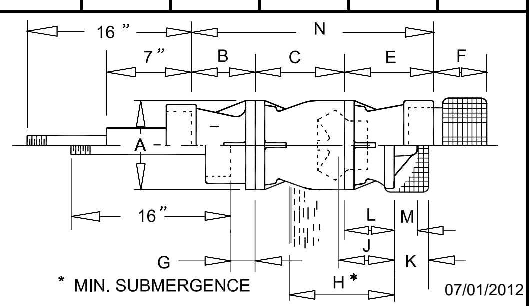


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	19.25	N/A	18.25	N/A	N/A	1.81	48.00	11.25	13.88	10.50	5.13	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	12", 14"
THRUST CONSTANT:	33.0	SUCTION SIZE:	BELL
LATERAL (STD):	1.00	STD. TUBE:	N/A
EYE AREA IN²:	72.6	WR² LB-FT²:	20.26
SHAFT DIA:	2.438	1ST STG WT LB: 730	ADD STG WT LB: 510

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVK20MC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

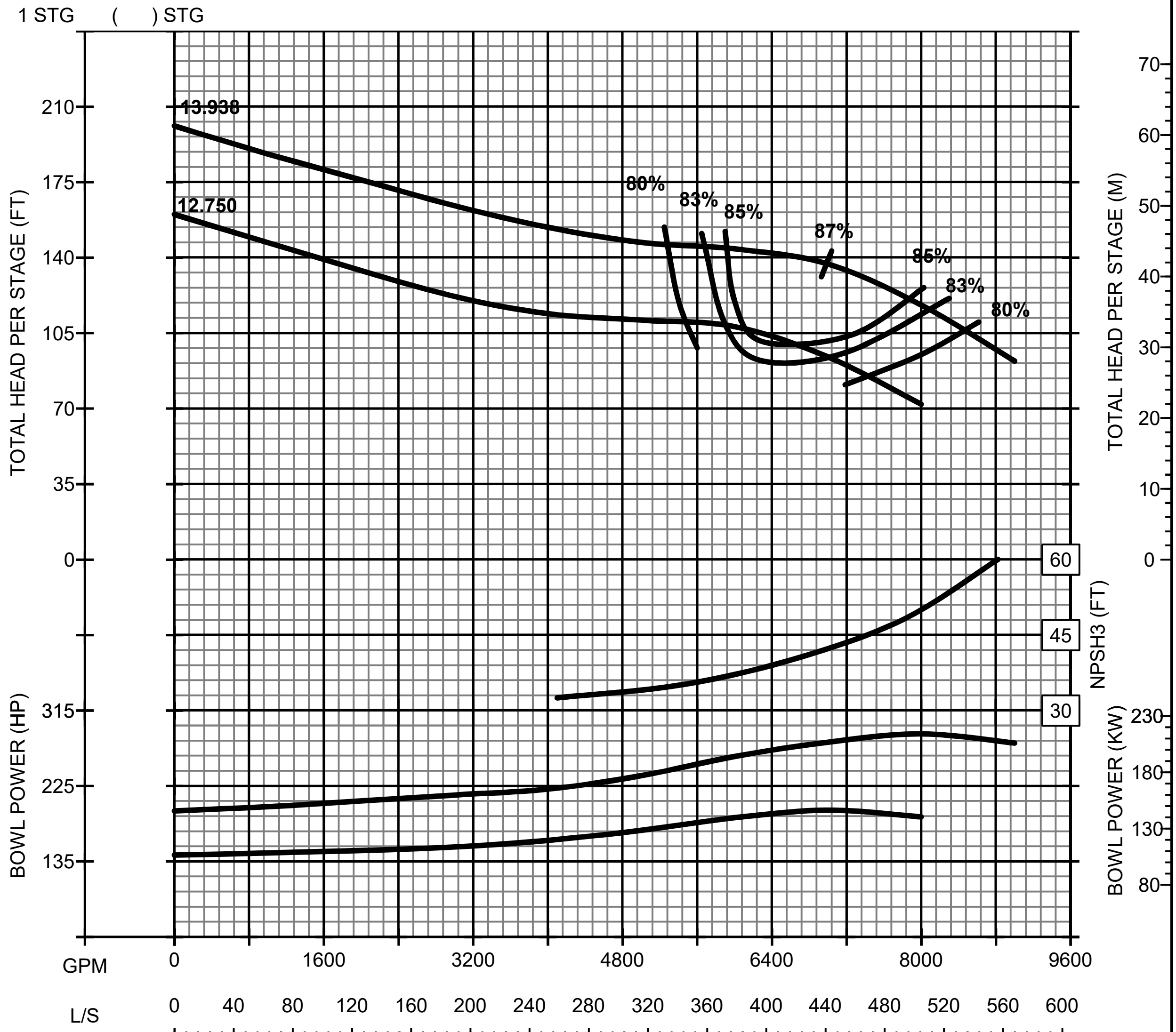
NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

K20HC

1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2		
	NUMBER OF POINTS	-2	0		

DESIGN	GPM	TDH	HP	EFF



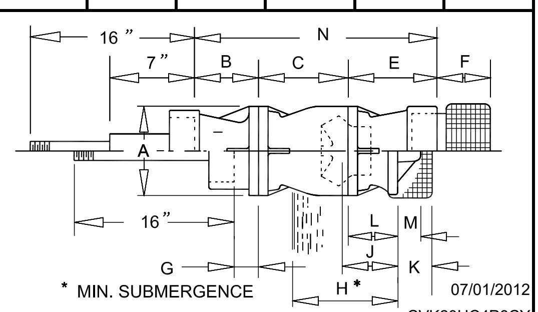
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	19.25	N/A	18.25	N/A	N/A	1.81	48.00	11.25	13.88	10.50	5.13	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	12", 14"
THRUST CONSTANT:	33.0	SUCTION SIZE:	BELL
LATERAL (STD):	1.00	STD. TUBE:	N/A
EYE AREA IN²:	72.6	WR² LB-FT²:	20.26
SHAFT DIA:	2.438	1ST STG WT LB: 730	ADD STG WT LB: 510

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

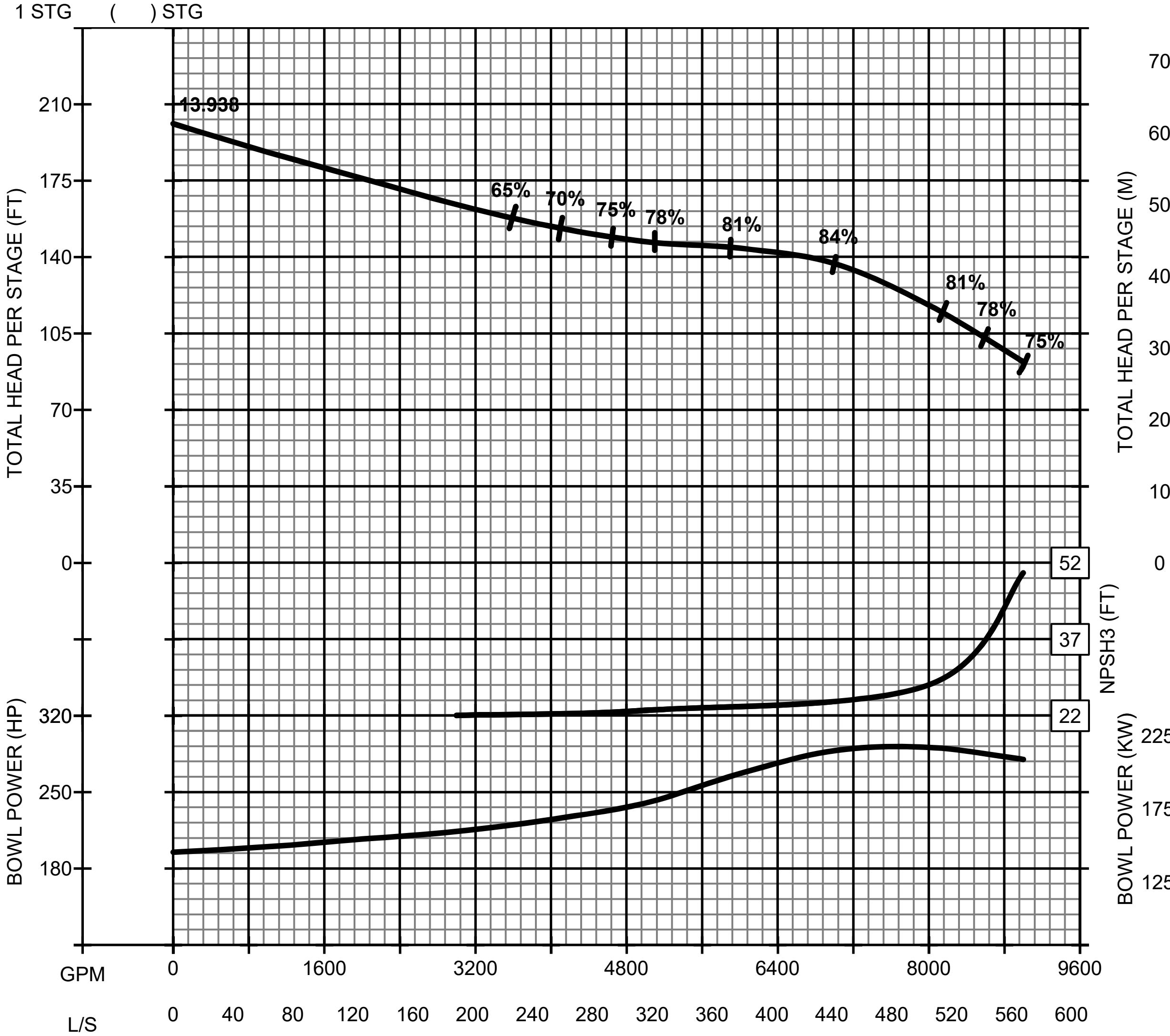
CVK20HC4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	K20HC-S 1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	-	-	-	-	DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-	-	-	-					

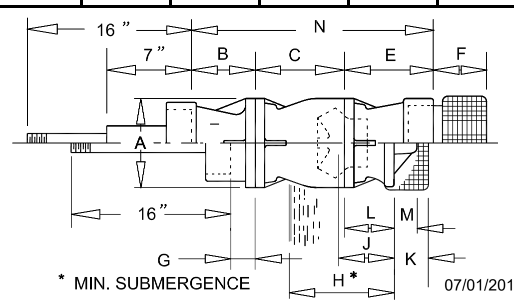


DIMENSIONS IN INCHES	A**	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	19.25	N/A	18.25	N/A	N/A	1.81	48.00	11.25	13.88	10.50	5.13	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	12", 14"
THRUST CONSTANT:	35.2	SUCTION SIZE:	BELL
LATERAL (STD):	1.00	STD. TUBE:	N/A
EYE AREA IN²:	83.91	WR² LB-FT²:	20.26
SHAFT DIA:	2.438	1ST STG WT LB: 730	ADD STG WT LB: 510

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.
BELL DIAMETER IS 20.65 ***LOW NPSH IMPELLER FOR 1ST STG ONLY*



* MIN. SUBMERGENCE

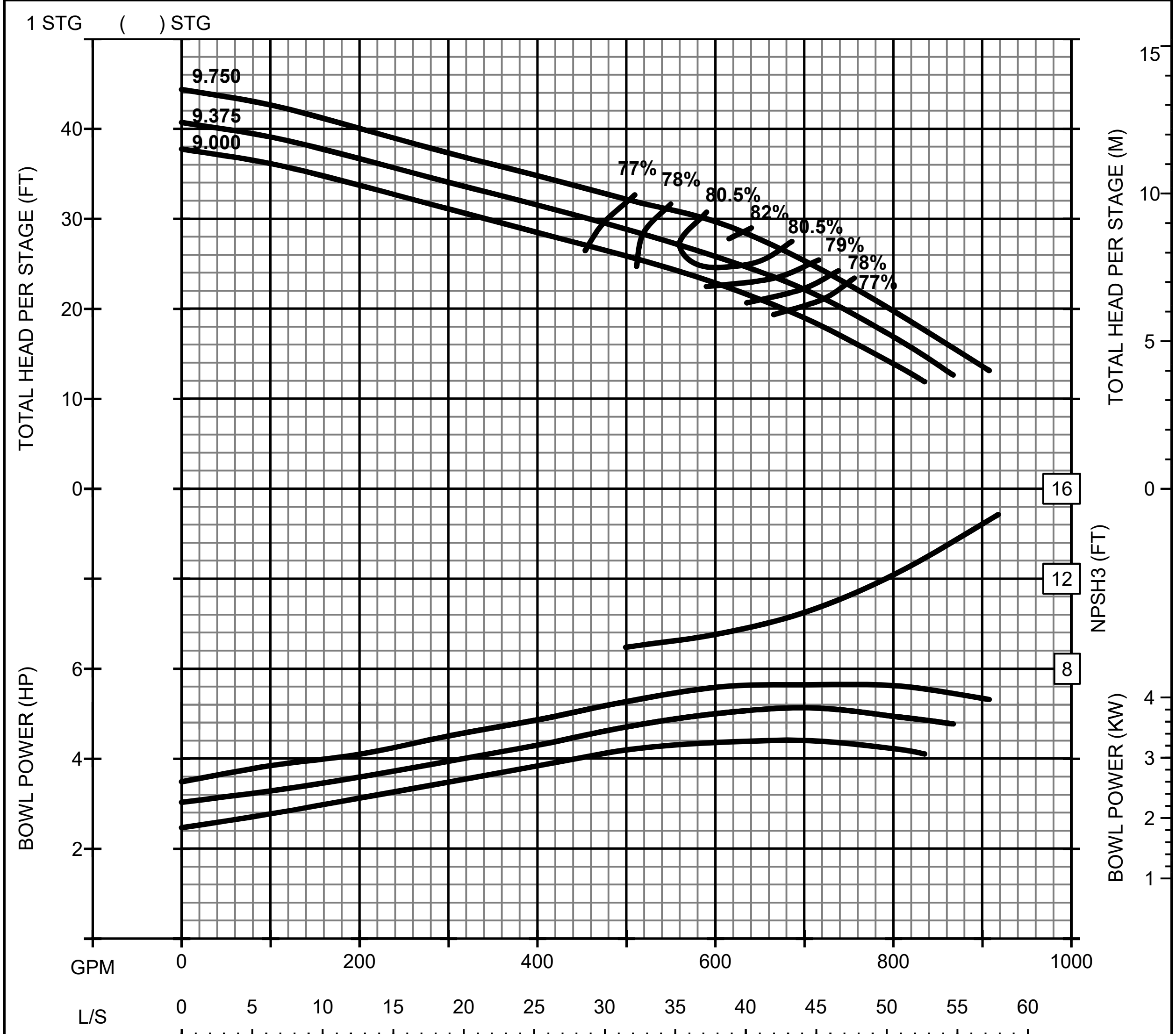
07/01/2012
CVK20HC-S4P6CY

CURVE TEMPLATE 08.05.2011

1770 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	E12LC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						



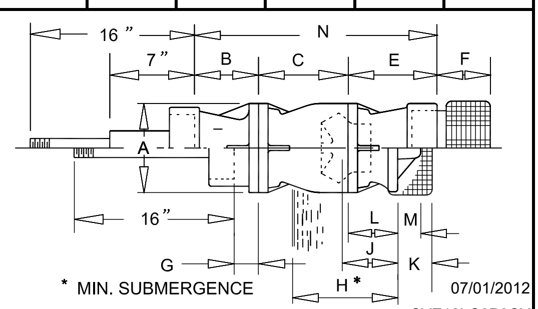
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.62	4.56	10.50	10.88	9.44	1.56	26.00	8.25	10.06	7.25	3.50	25.94

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	4	DISCHARGE SIZE:	8"
THRUST CONSTANT:	7.3	SUCTION SIZE:	8"
LATERAL (STD):	1.0"	STD. TUBE:	2.5", 3.0"
EYE AREA IN^2:	14.07	WR^2 LB-FT^2:	1.2
SHAFT DIA:	1.687	1ST STG WT LB: 197	ADD STG WT LB: 98

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



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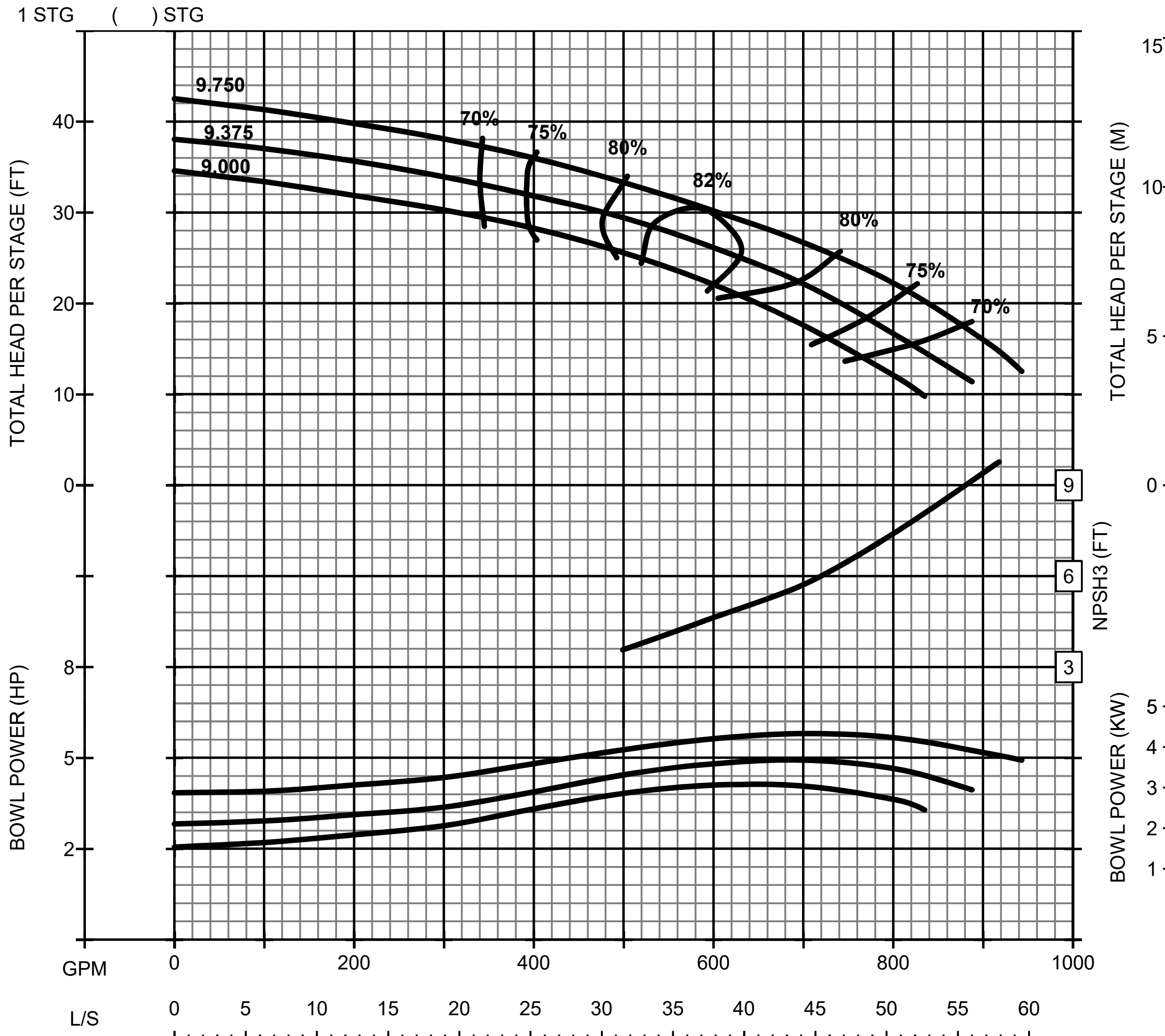
CVE12LC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	E12XMC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	3	5						
	NUMBER OF POINTS	-2	-1	0						

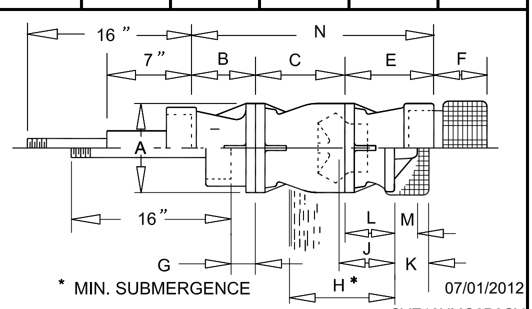


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.62	4.56	10.50	10.88	9.44	1.56	26.00	8.25	10.06	7.25	3.50	25.94

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	8"
THRUST CONSTANT:	7.9	SUCTION SIZE:	8"
LATERAL (STD):	1.0"	STD. TUBE:	2.5", 3.0"
EYE AREA IN^2:	14.07	WR^2 $LB\text{-}FT^2$:	1.2
SHAFT DIA:	1.687	1ST STG WT LB: 197	ADD STG WT LB: 98

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

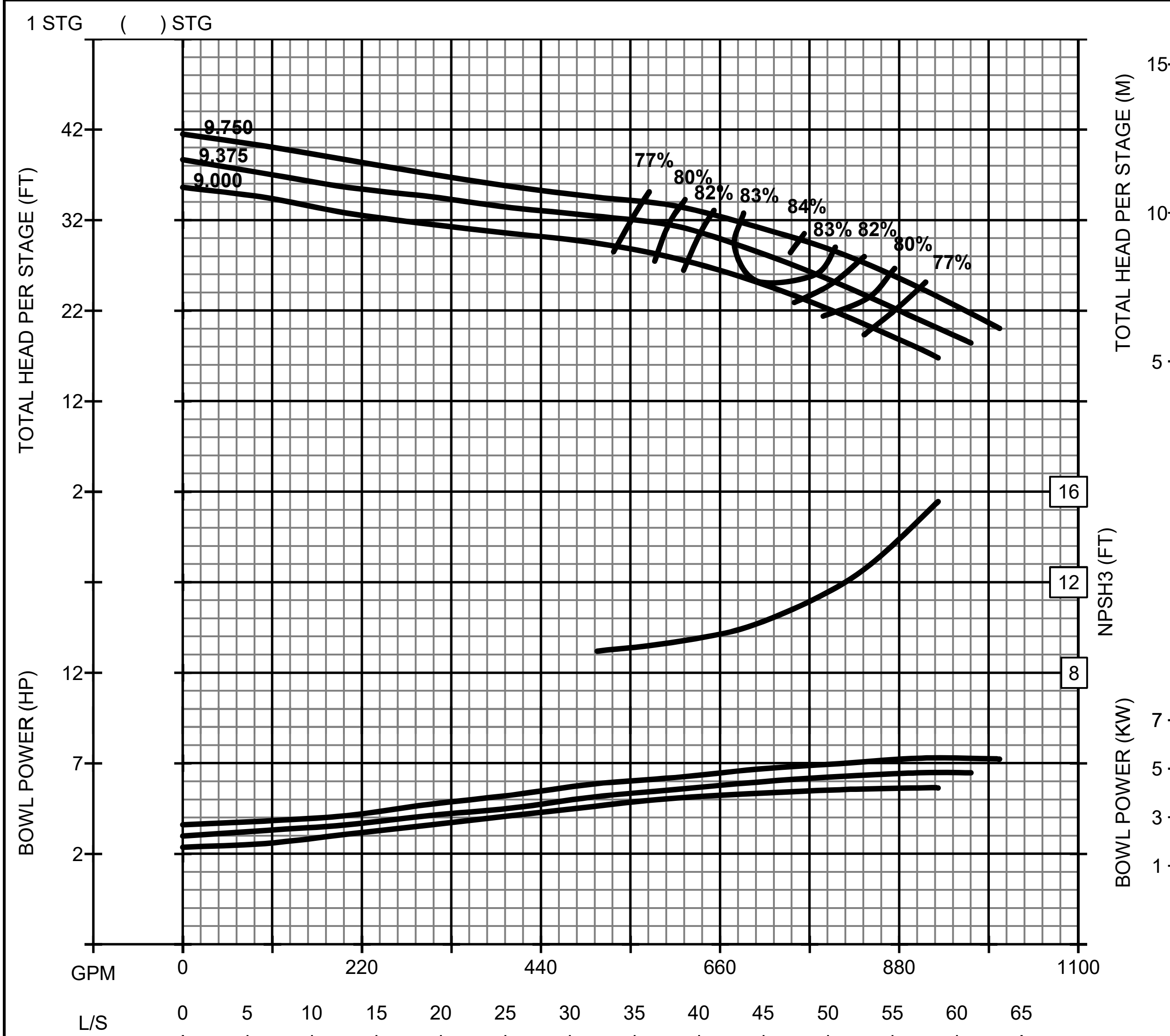
07/01/2012
CVE12XMC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	E12MC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						



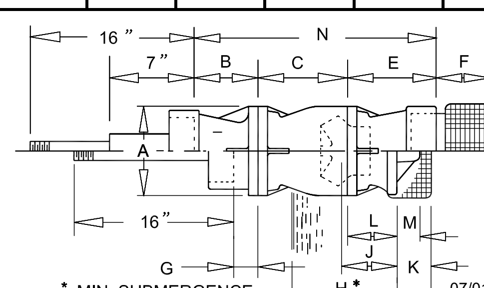
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.62	4.56	10.50	10.88	9.44	1.56	26.00	8.25	10.06	7.25	3.50	25.94

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	8"
THRUST CONSTANT:	7.3	SUCTION SIZE:	8"
LATERAL (STD):	0.94	STD. TUBE:	2.5", 3.0"
EYE AREA IN²:	14.07	WR² LB-FT²:	1.2
SHAFT DIA:	1.687	1ST STG WT LB: 197	ADD STG WT LB: 98

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

CVE12MC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

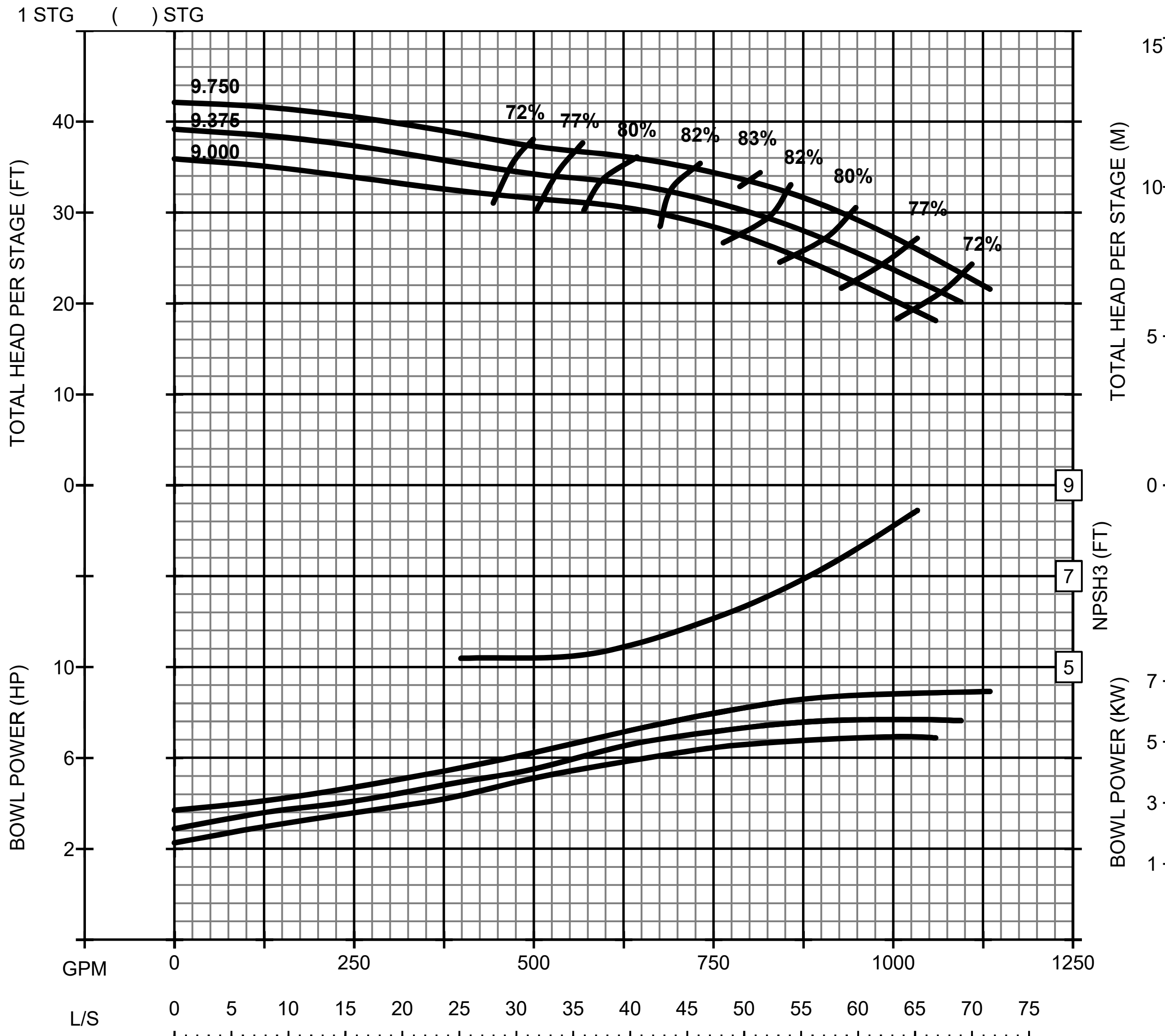
PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

NATIONAL PUMP COMPANY®
A GORMAN-RUPP COMPANY

E12HC

1180 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

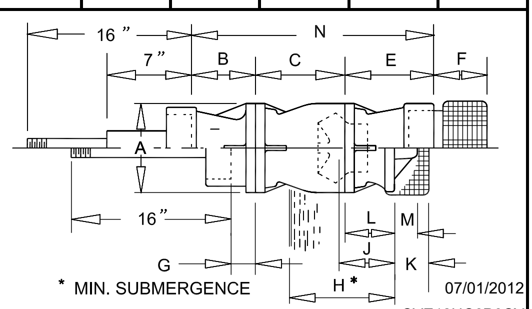


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.62	4.56	10.50	10.88	9.44	1.56	26.00	8.25	10.06	7.25	3.50	25.94

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	8"
THRUST CONSTANT:	7.3	SUCTION SIZE:	8"
LATERAL (STD):	1.0"	STD. TUBE:	2.5", 3.0"
EYE AREA IN^2:	14.07	WR^2 $LB\text{-}FT^2$:	1.2
SHAFT DIA:	1.687	1ST STG WT LB: 197	ADD STG WT LB: 98

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

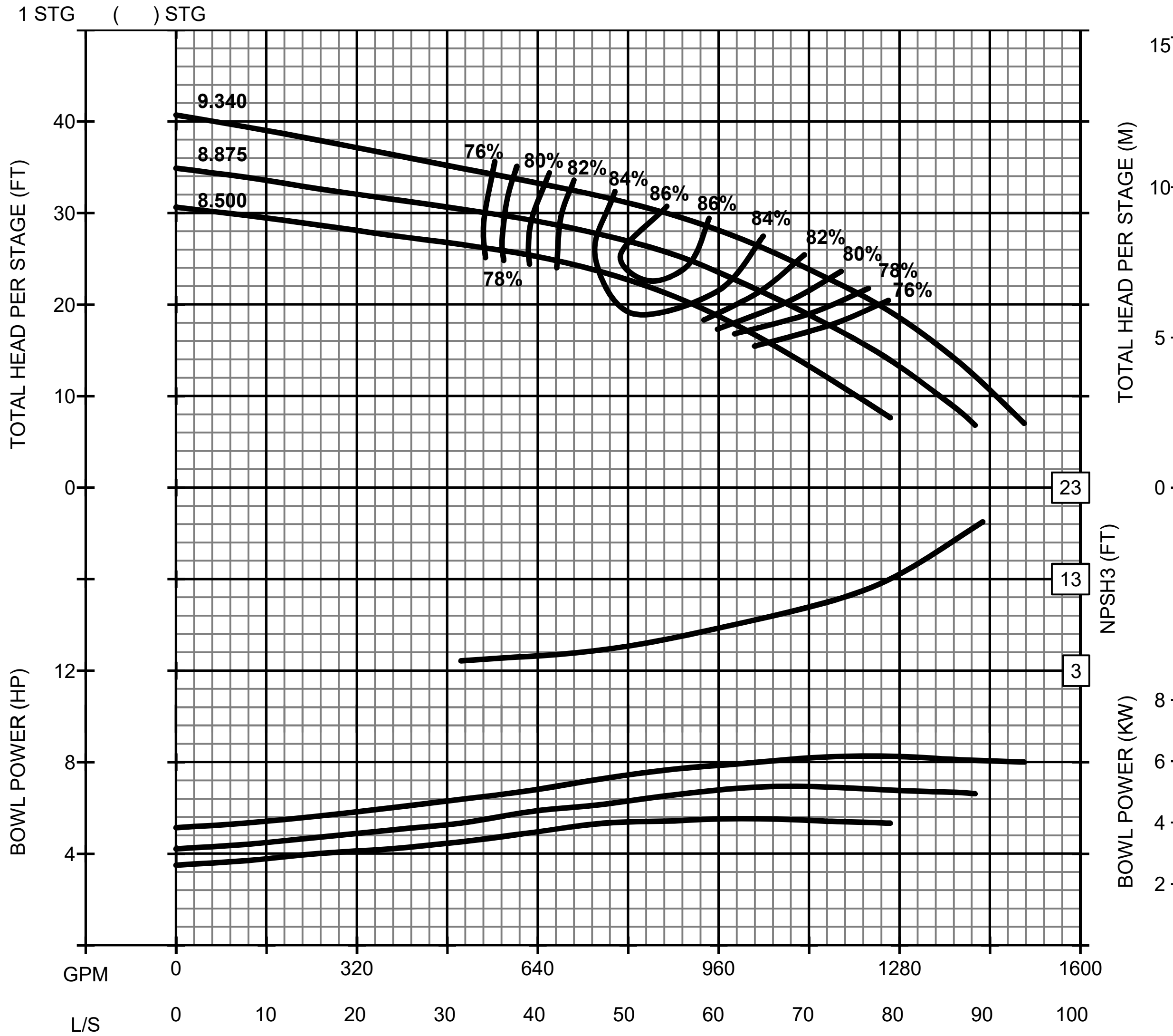
07/01/2012
CVE12HC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	K12HC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	3	5		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

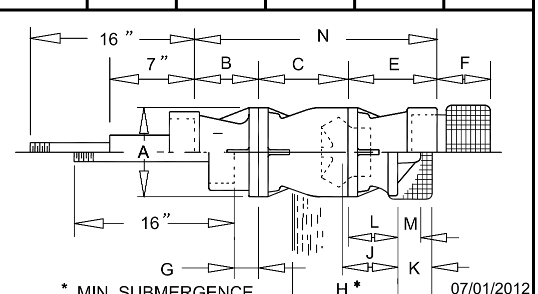


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.62	6.06	10.50	10.88	9.44	1.56	26.00	8.25	10.06	7.25	3.50	25.94

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	8"
THRUST CONSTANT:	11.20	SUCTION SIZE:	8"
LATERAL (STD):	0.87	STD. TUBE:	2.5", 3.0"
EYE AREA IN²:	21.5	WR² LB-FT²:	1.2
SHAFT DIA:	1.6875	1ST STG WT LB: 197	ADD STG WT LB: 98

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVK12HC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

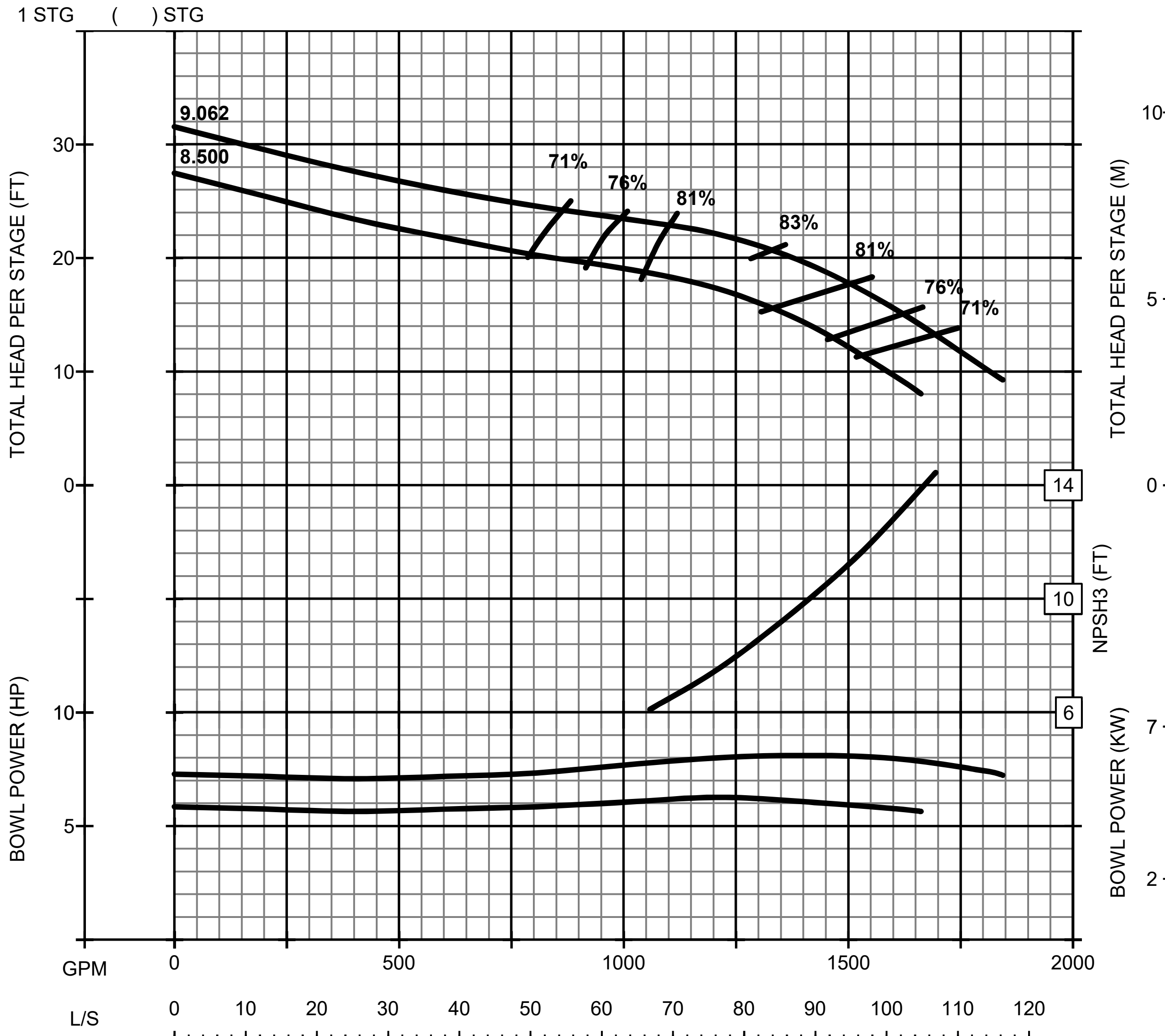
NATIONAL PUMP COMPANY®
A GORMAN-RUPP COMPANY

H12HC

1180 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	2	3	4	5
	NUMBER OF POINTS	-3	-2	-1	0

DESIGN	GPM	TDH	HP	EFF

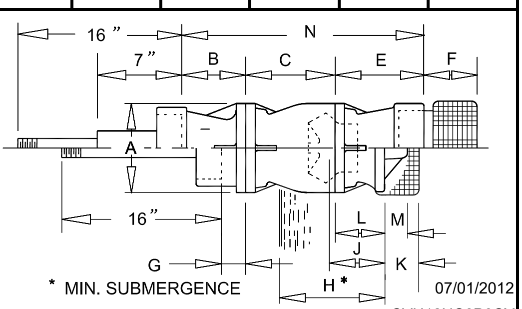


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.62	6.06	12.50	12.50	11.25	1.31	28.00	13.50	N/A	N/A	N/A	31.06

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	8", 10"
THRUST CONSTANT:	15.4	SUCTION SIZE:	10"
LATERAL (STD):	1.0"	STD. TUBE:	2.5", 3.0"
EYE AREA IN^2:	33.4	WR^2 LB-FT^2:	2.32
SHAFT DIA:	1.687	1ST STG WT LB: 375	ADD STG WT LB: 150

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

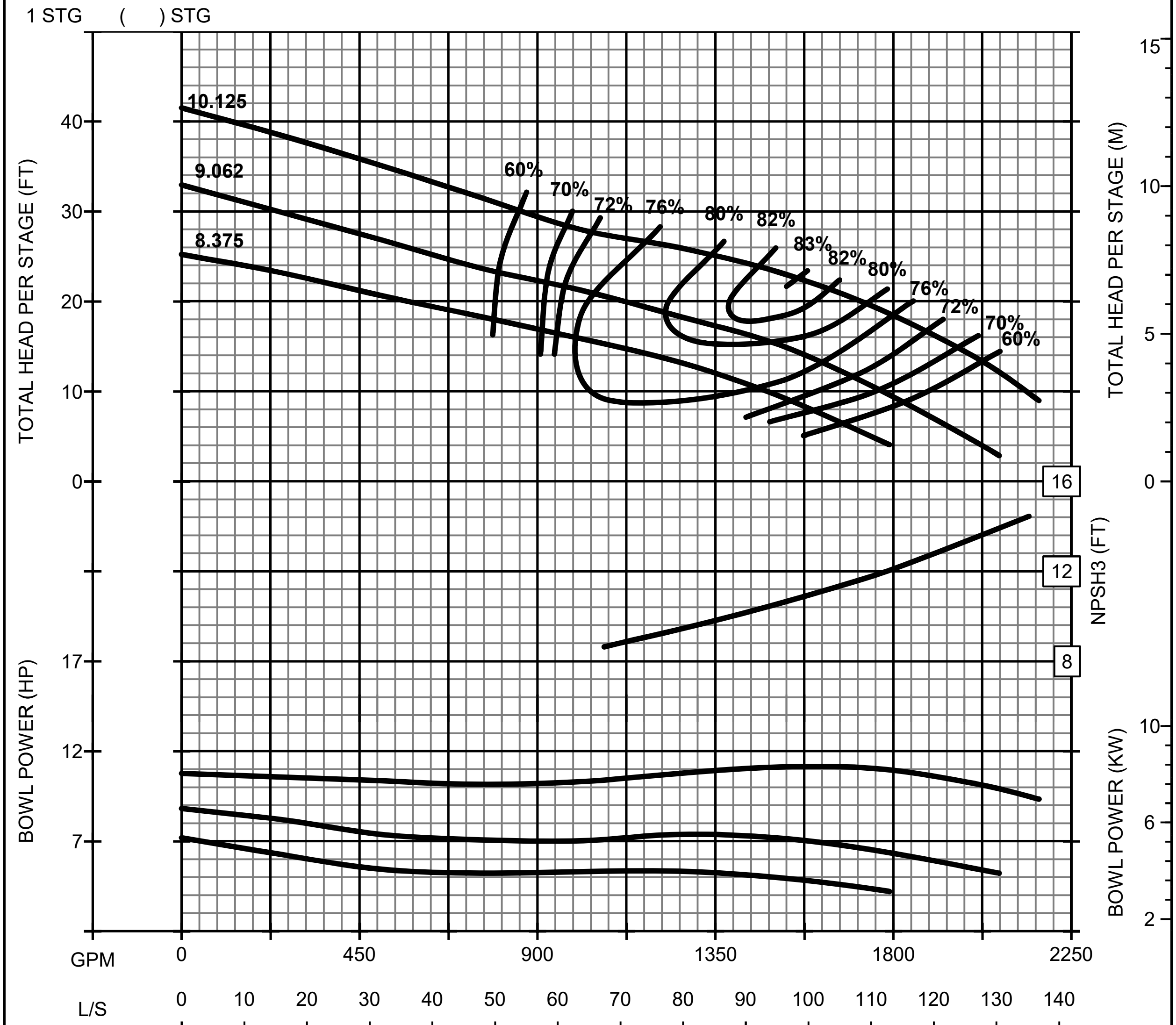
07/01/2012
CVH12HC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	J12XHC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2	3	5	DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-3	-2	-1	0					



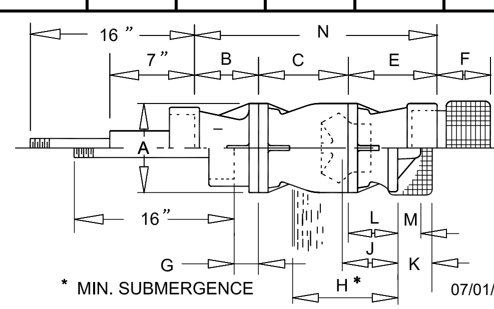
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	11.75	5.81	12.38	10.00	11.25	1.62	24.00	N/A	N/A	N/A	N/A	28.19

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	10"
THRUST CONSTANT:	15.6	SUCTION SIZE:	10"
LATERAL (STD):	1.375	STD. TUBE:	3"
EYE AREA IN^2:	36.2	WR^2 LB-FT^2:	2.71
SHAFT DIA:	1.9375	1ST STG WT LB: 395	ADD STG WT LB: 170

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

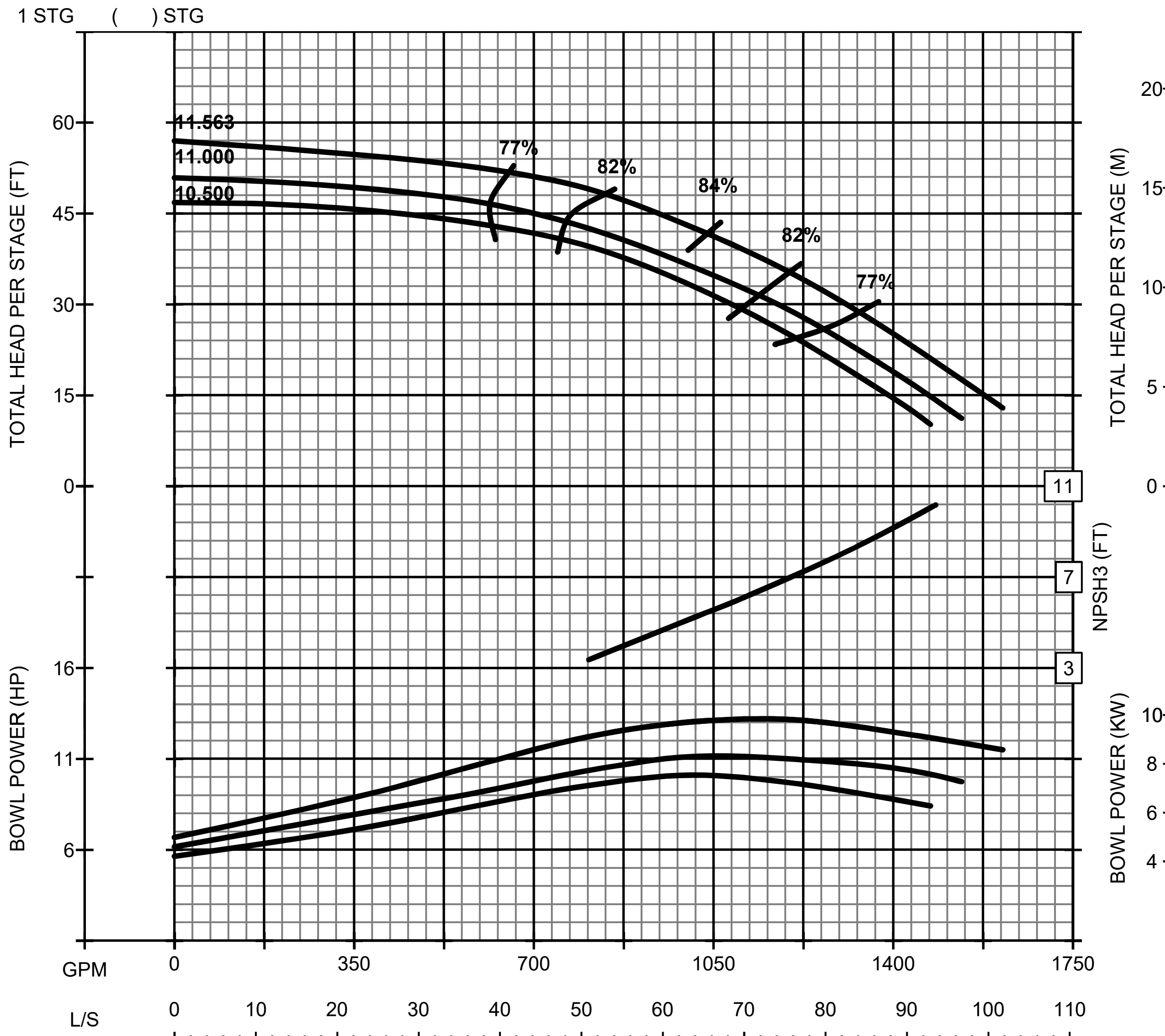
CVJ12XHC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	**M14MC** 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2	3						
	NUMBER OF POINTS	-2	-1	0						

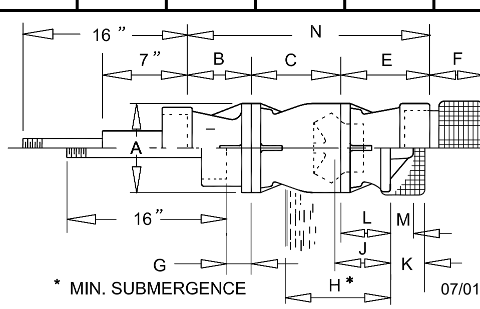


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	14.13	5.44	13.25	10.00	11.25	0.56	22.50	7.25	12.06	6.88	2.75	28.69

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	10", 12"
THRUST CONSTANT:	12.5	SUCTION SIZE:	10"
LATERAL (STD):	1.12	STD. TUBE:	3"
EYE AREA IN^2:	25.32	WR^2 LB-FT^2:	3.62
SHAFT DIA:	1.937	1ST STG WT LB: 420	ADD STG WT LB: 170

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



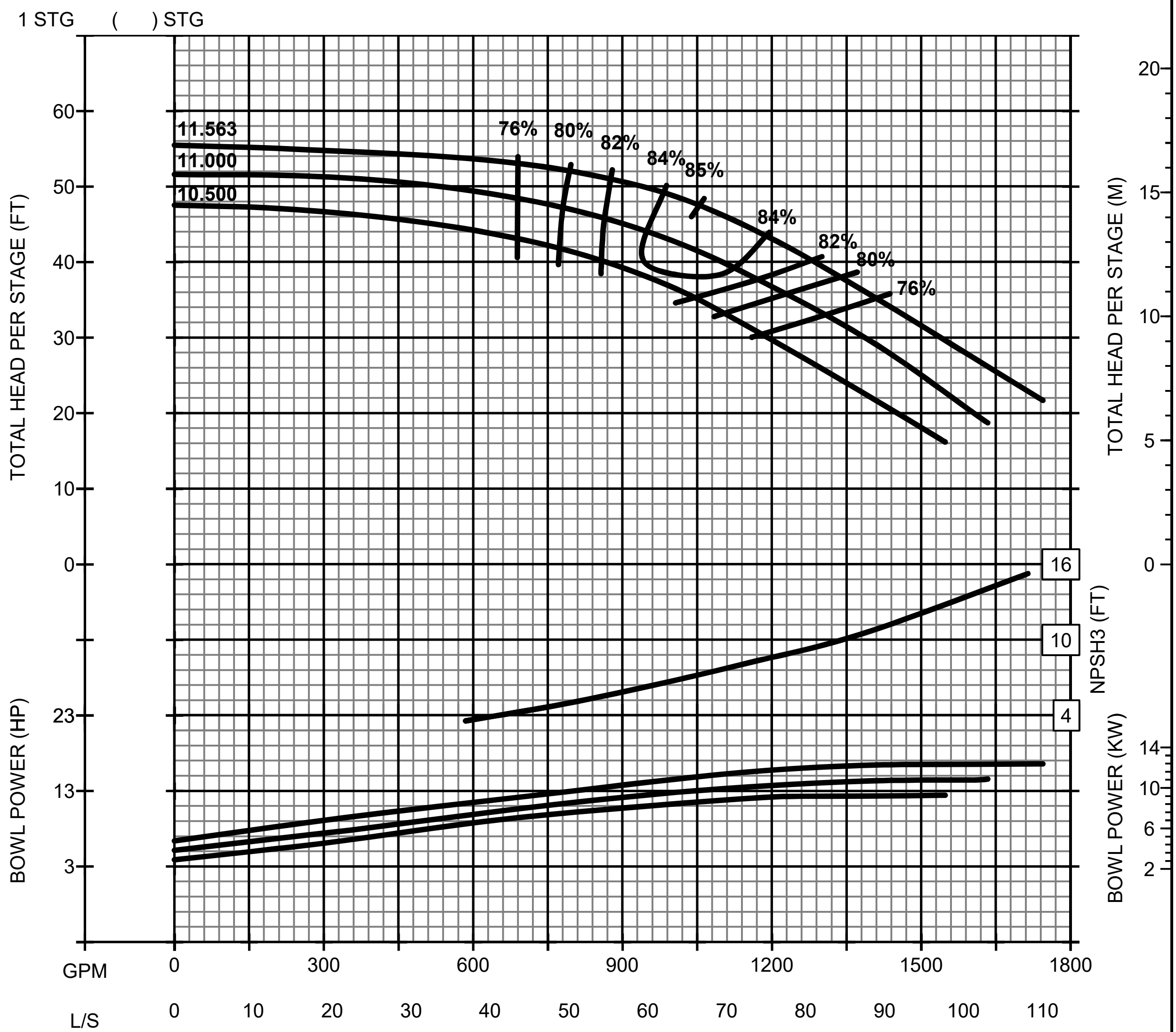
07/01/2012
CVM14MC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP® COMPANY A GORMAN-RUPP COMPANY	M14HC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2	3						
	NUMBER OF POINTS	-2	-1	0						



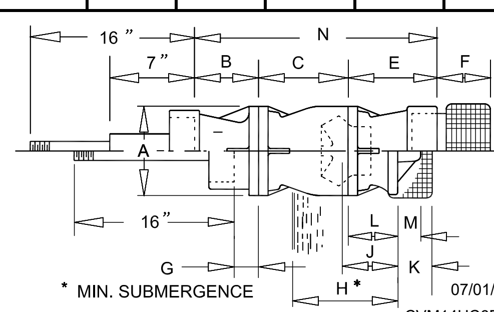
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	14.13	5.44	13.25	10.00	11.25	0.56	22.50	7.25	12.06	6.88	2.75	28.69

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	10", 12"
THRUST CONSTANT:	12.5	SUCTION SIZE:	10"
LATERAL (STD):	1.12	STD. TUBE:	3"
EYE AREA IN^2:	25.32	WR^2 LB-FT^2:	3.62
SHAFT DIA:	1.937	1ST STG WT LB: 420	ADD STG WT LB: 170

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

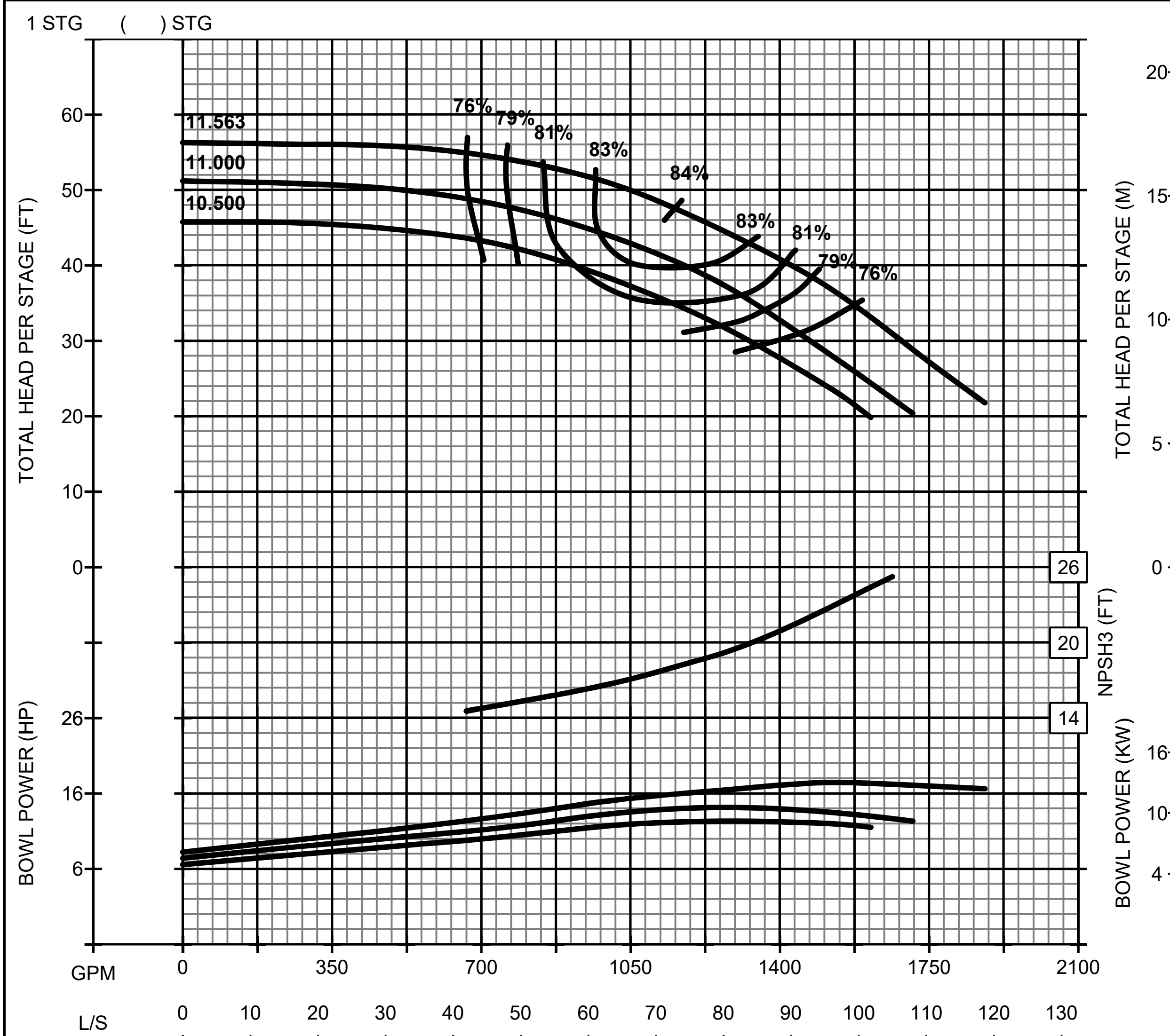
CVM14HC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	M14XHC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2	3						
	NUMBER OF POINTS	-2	-1	0						

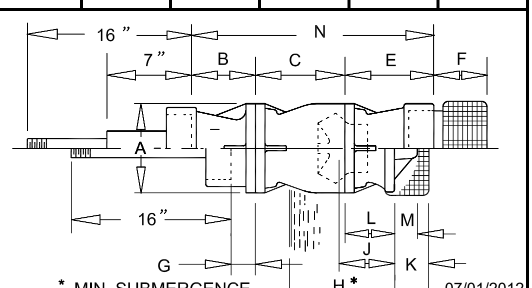


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	14.13	5.44	13.25	10.00	11.25	0.56	24.00	9.25	12.08	6.88	2.75	28.69

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	10", 12"
THRUST CONSTANT:	12.5	SUCTION SIZE:	10"
LATERAL (STD):	0.88"	STD. TUBE:	3"
EYE AREA IN²:	25.32	WR² LB-FT²:	3.62
SHAFT DIA:	1.937	1ST STG WT LB: 420	ADD STG WT LB: 170

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVM14XHC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

NATIONAL PUMP COMPANY®
A GORMAN-RUPP COMPANY

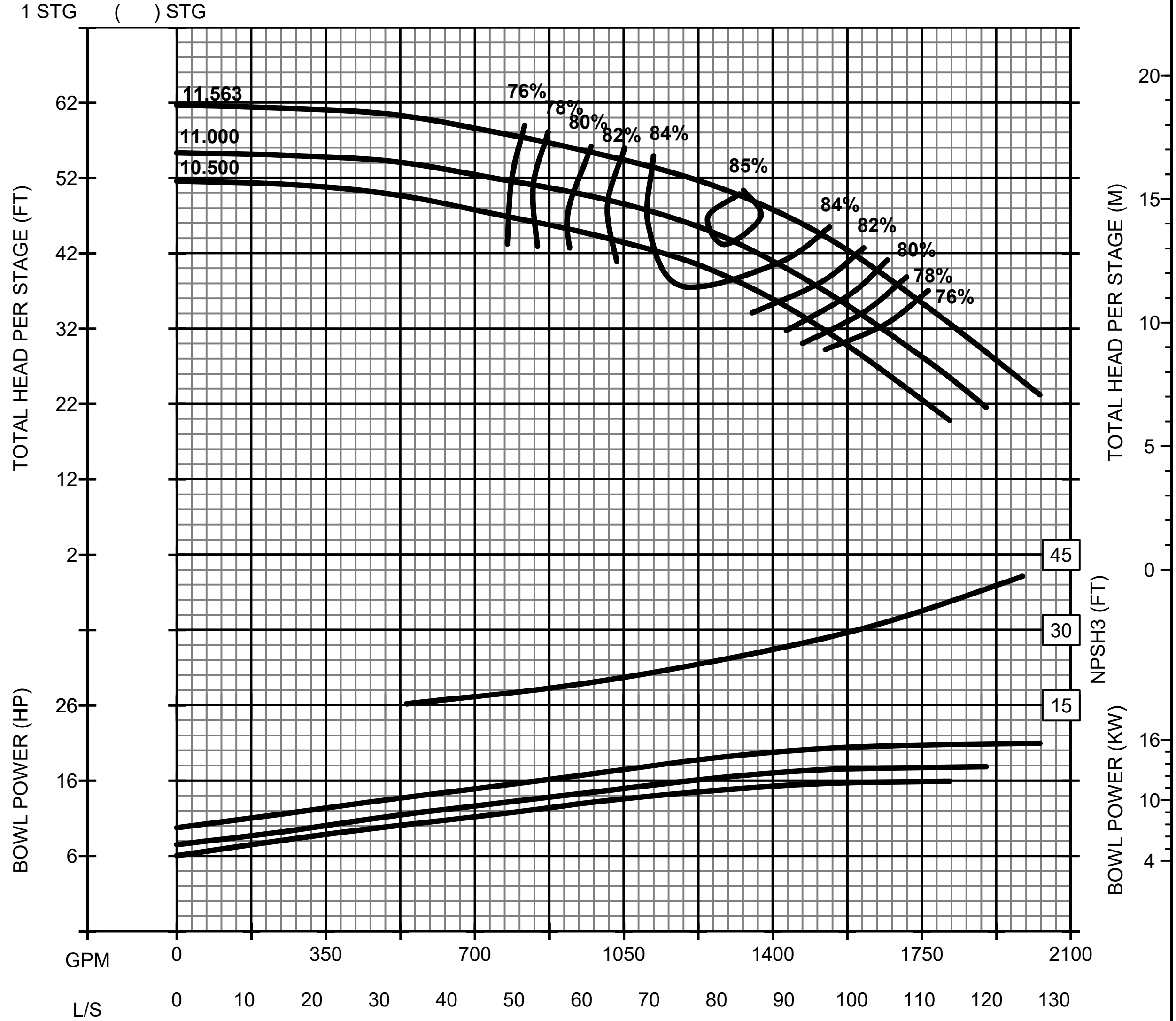
M14XXHC

1180 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2	3	
	NUMBER OF POINTS	-2	-1	0	

DESIGN	GPM	TDH	HP	EFF

1 STG ( ) STG

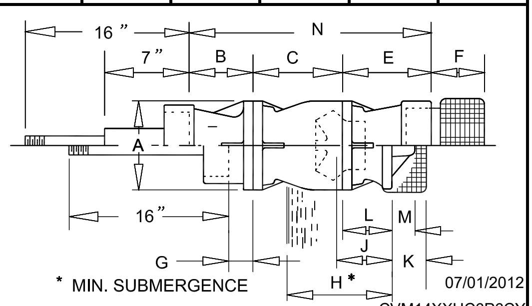


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	14.13	5.44	13.25	10.00	11.25	0.56	22.50	7.25	12.06	6.88	2.75	28.69

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	10", 12"
THRUST CONSTANT:	12.5	SUCTION SIZE:	10"
LATERAL (STD):	0.88"	STD. TUBE:	3"
EYE AREA IN²:	25.32	WR² LB-FT²:	3.62
SHAFT DIA:	1.937	1ST STG WT LB: 420	ADD STG WT LB: 170

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

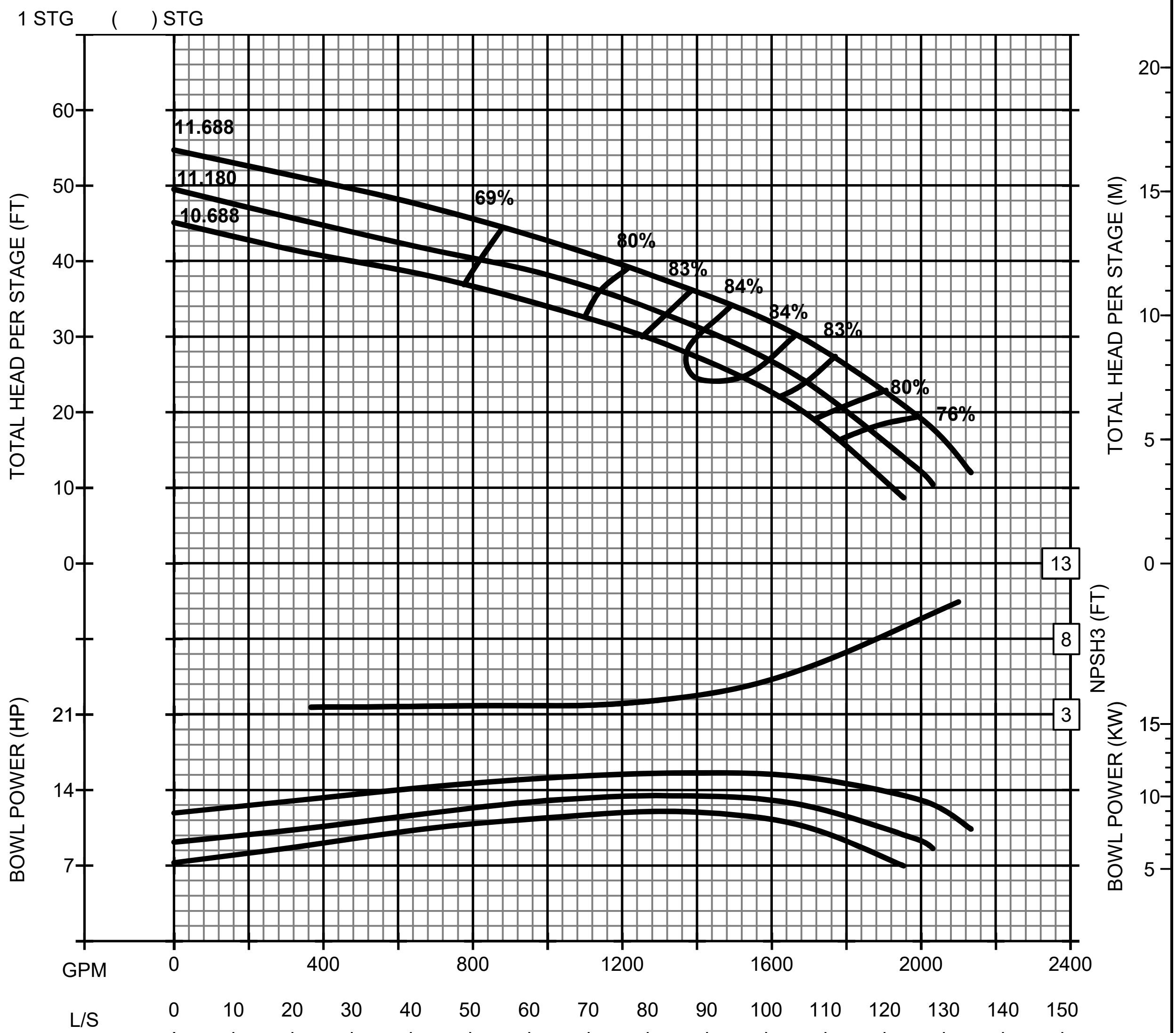
07/01/2012
CVM14XXHC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	H14LC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2	3						
	NUMBER OF POINTS	-4	-2	0						

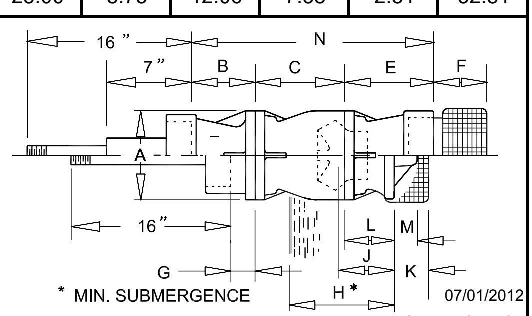


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G**	H*	J	K	L	M	N
	14.12	6.44	14.12	12.25	11.25	0.56	25.00	8.75	12.06	7.38	2.81	32.81

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	10", 12"
THRUST CONSTANT:	20.3	SUCTION SIZE:	10"
LATERAL (STD):	1.25	STD. TUBE:	3.5"
EYE AREA IN^2:	39.0	WR^2 LB-FT^2:	4.15
SHAFT DIA:	2.187	1ST STG WT LB: 540	ADD STG WT LB: 200

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.
**1.81 WITH 12" DISCHARGE



* MIN. SUBMERGENCE

07/01/2012
CVH14LC6P6CY

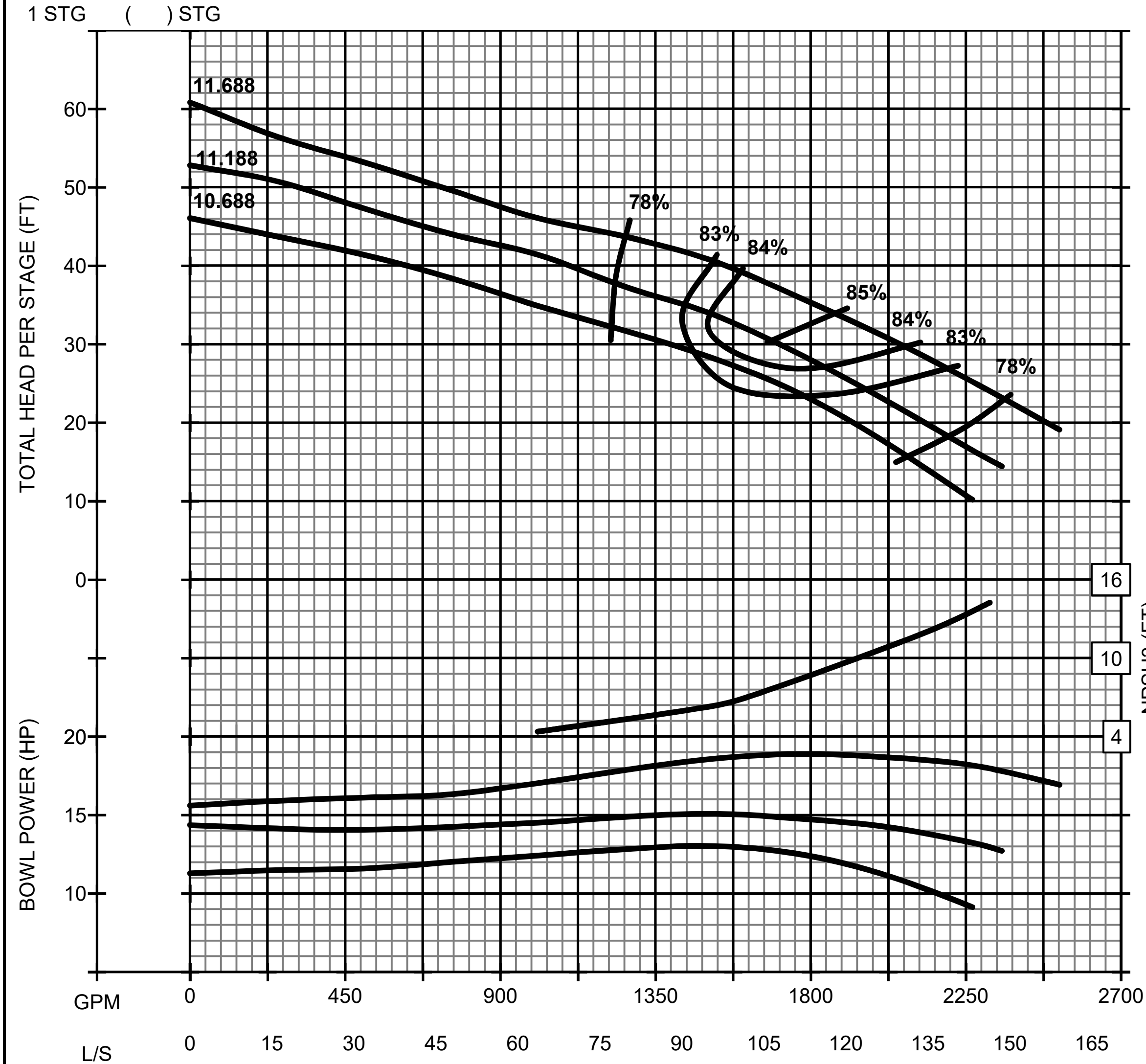
CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	H14MC 1180 RPM	

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	2	3	
	NUMBER OF POINTS	-2	-1	0	

DESIGN	GPM	TDH	HP	EFF

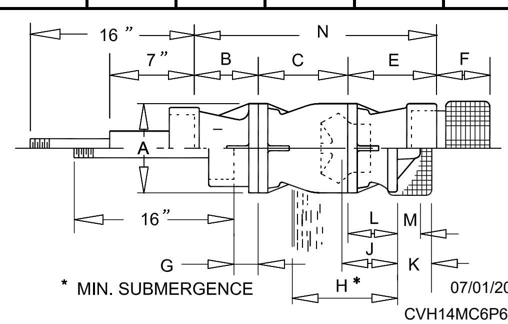


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G**	H*	J	K	L	M	N
	14.13	6.44	14.12	12.25	11.25	0.56	25.00	8.75	12.06	7.38	2.81	32.81

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	10", 12"
THRUST CONSTANT:	20.3	SUCTION SIZE:	10"
LATERAL (STD):	1.25	STD. TUBE:	3.5"
EYE AREA IN²:	38.96	WR² LB-FT²:	4.15
SHAFT DIA:	2.1875	1ST STG WT LB: 540	ADD STG WT LB: 200

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.
**1.81 WITH 12" DISCHARGE



* MIN. SUBMERGENCE

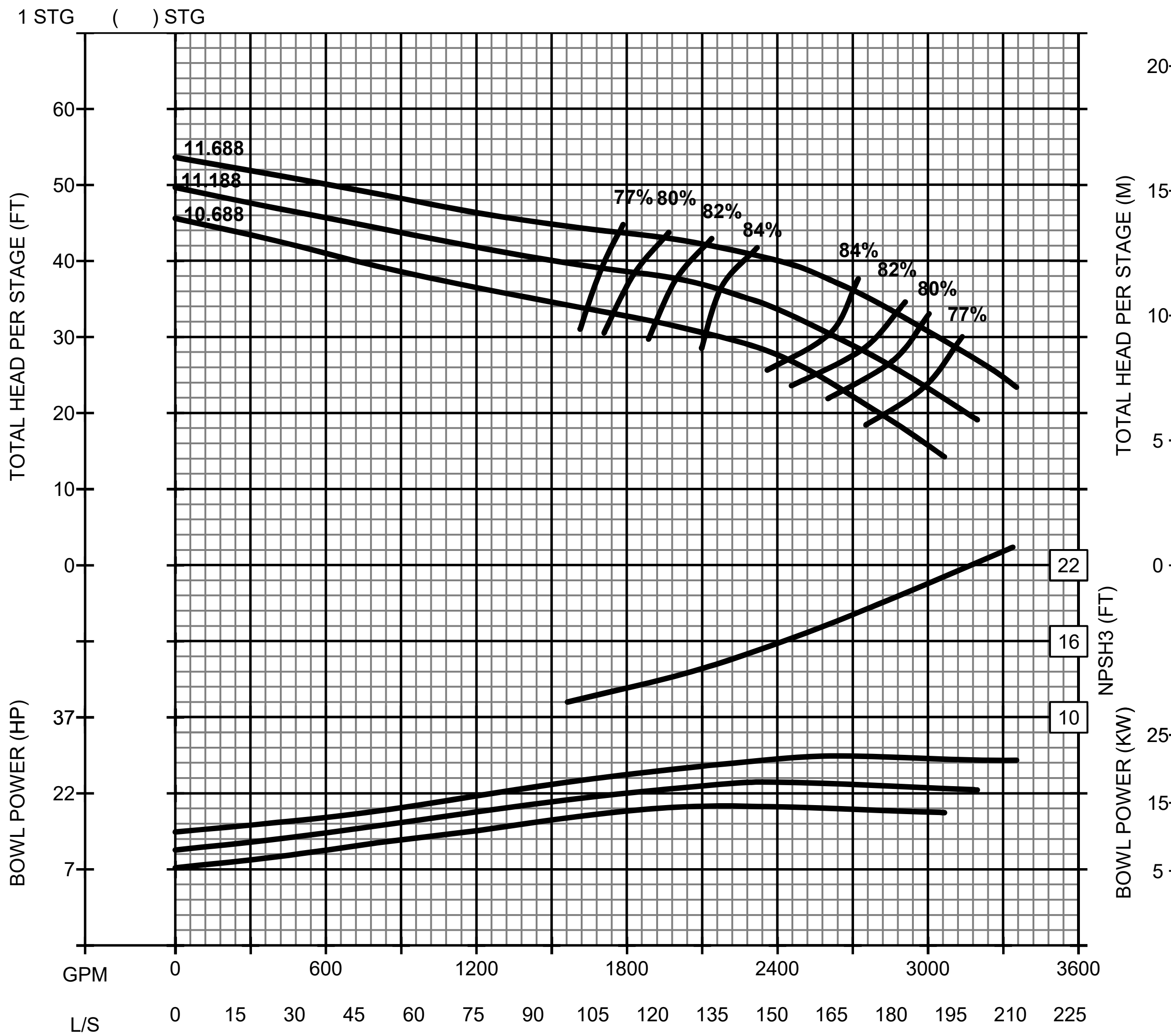
07/01/2012
CVH14MC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	H14XHC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2	3						
	NUMBER OF POINTS	-2	-1	0						

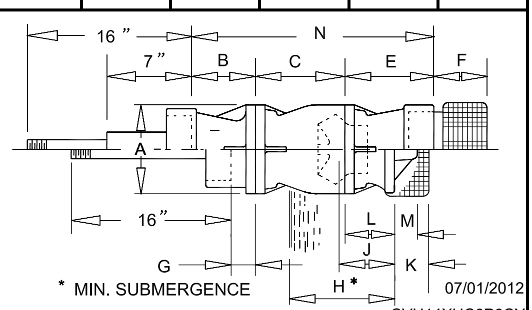


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G**	H*	J	K	L	M	N
	14.13	6.44	14.12	12.25	11.25	0.56	25.00	8.75	12.06	7.38	2.81	32.81

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	10", 12"
THRUST CONSTANT:	20.3	SUCTION SIZE:	10"
LATERAL (STD):	1.25	STD. TUBE:	3.5"
EYE AREA IN^2:	38.96	WR^2 LB-FT^2:	4.15
SHAFT DIA:	2.1875	1ST STG WT LB: 540	ADD STG WT LB: 200

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.
**1.81 WITH 12" DISCHARGE



* MIN. SUBMERGENCE

07/01/2012
CVH14XHC6P6CY

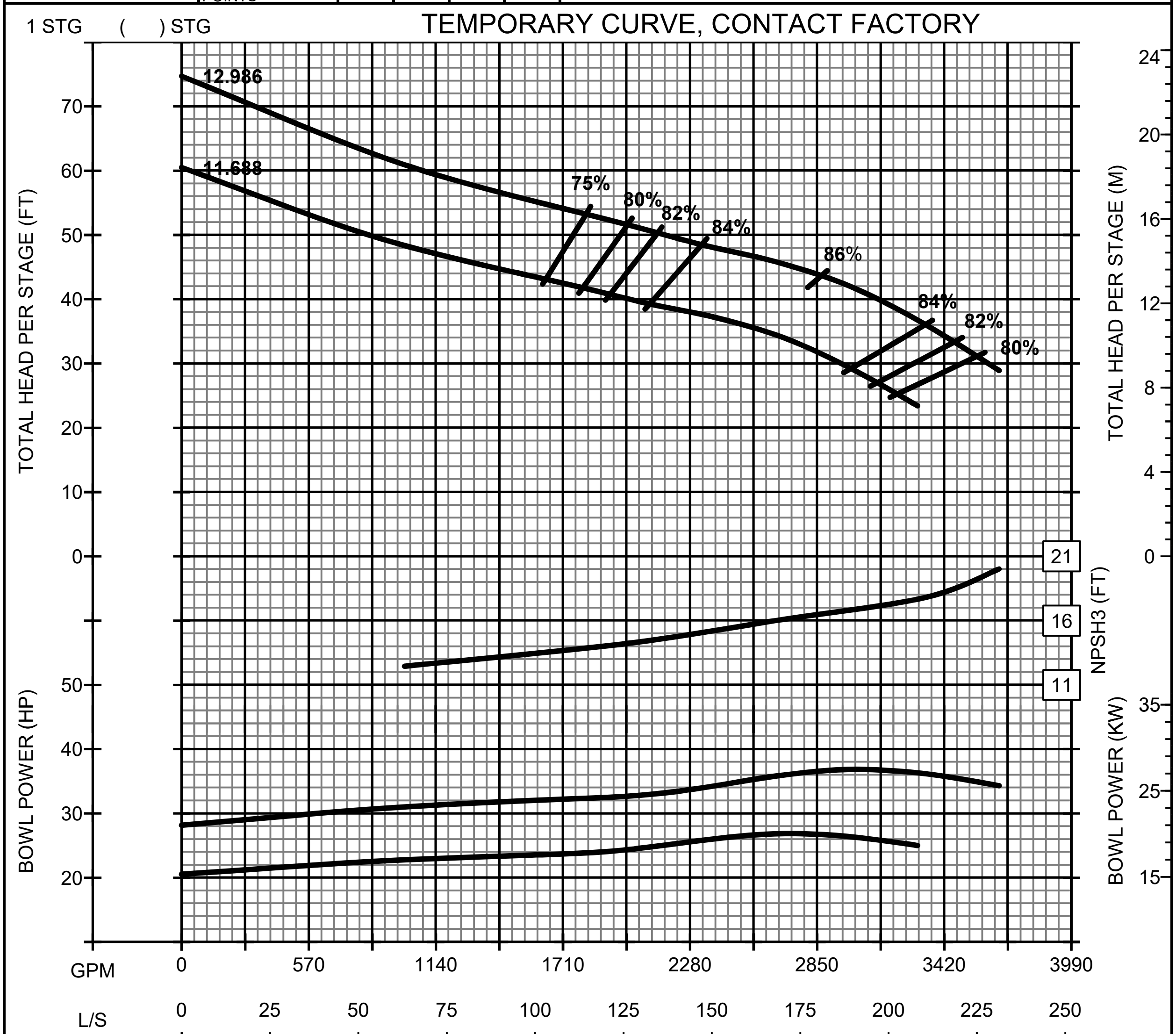
CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP® COMPANY A GORMAN-RUPP COMPANY	H16MC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	2	3	
	NUMBER OF POINTS	-4	-2	0	

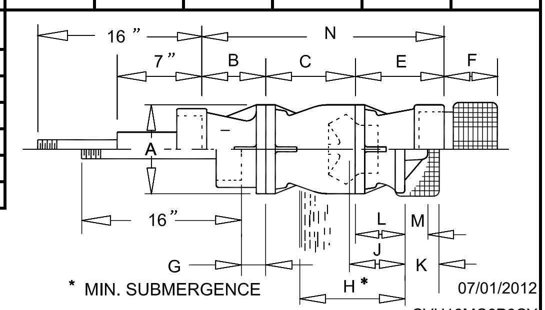
DESIGN	GPM	TDH	HP	EFF



DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	15.63	6.44	14.69	N/A	9.97	1.81	48.00	12.00	16.00	9.97	2.26	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	12"
THRUST CONSTANT:	27.80	SUCTION SIZE:	BELL
LATERAL (STD):	0.94	STD. TUBE:	3.5"
EYE AREA IN²:	58.7	WR² LB-FT²:	9.15
SHAFT DIA:	2.19	1ST STG WT LB: 540	ADD STG WT LB: 200



*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.

07/01/2012
CVH16MC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

NATIONAL PUMP® COMPANY
A GORMAN-RUPP COMPANY

H16XHC

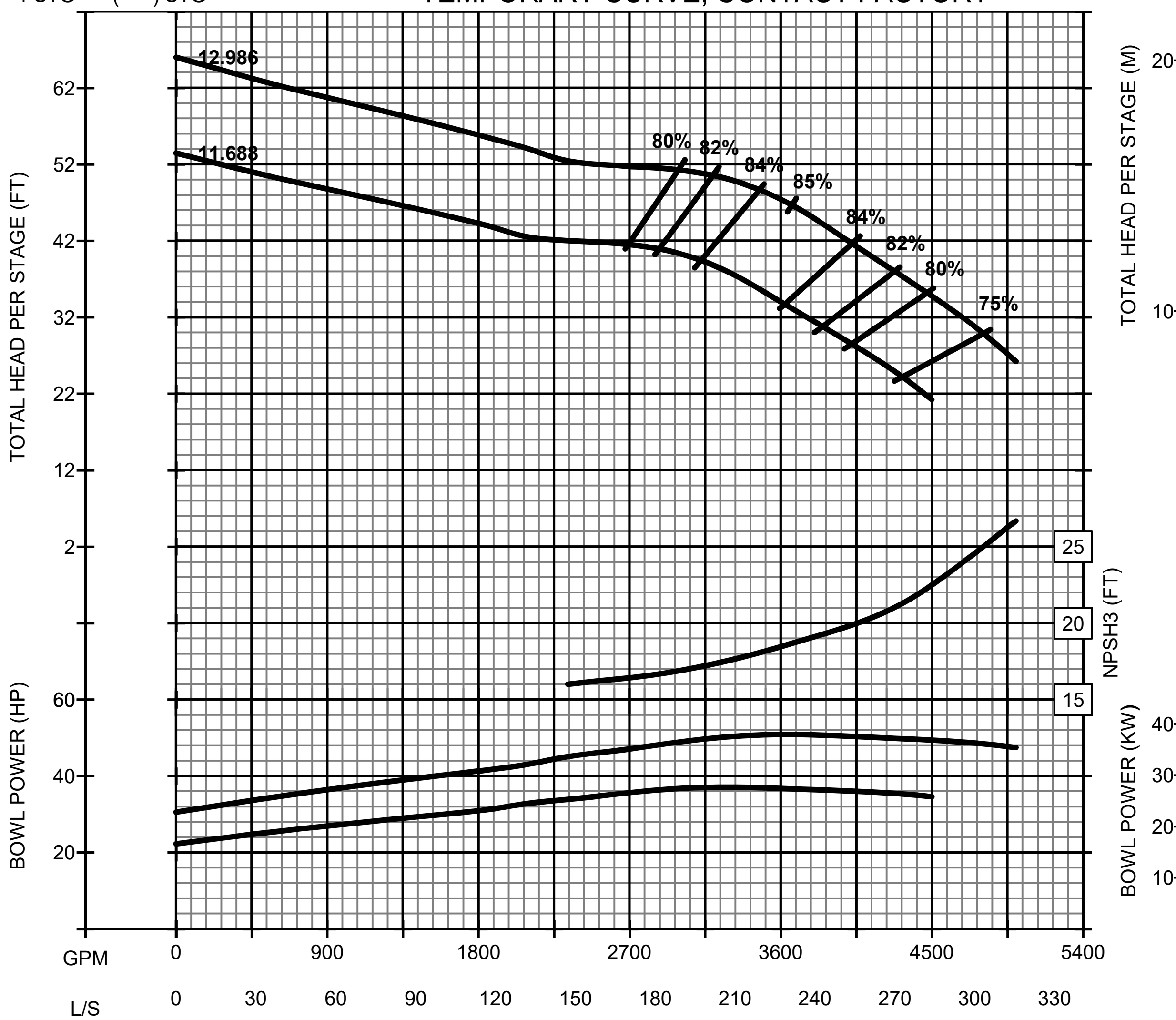
1180 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	2	3	
	NUMBER OF POINTS	-4	-2	0	

DESIGN	GPM	TDH	HP	EFF

1 STG ( ) STG

TEMPORARY CURVE, CONTACT FACTORY

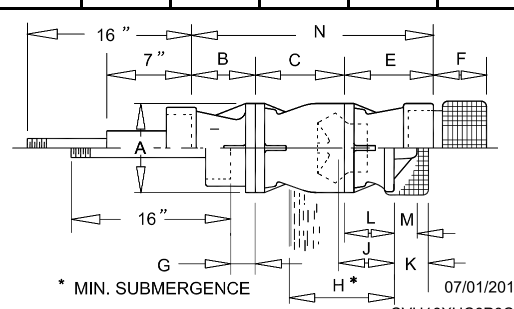


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	15.63	6.44	14.69	N/A	9.97	1.81	48.00	12.00	16.00	9.97	2.26	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	12"
THRUST CONSTANT:	27.80	SUCTION SIZE:	BELL
LATERAL (STD):	0.94	STD. TUBE:	3.5"
EYE AREA IN²:	58.7	WR² LB-FT²:	9.15
SHAFT DIA:	2.19	1ST STG WT LB: 540	ADD STG WT LB: 200

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVH16XHC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

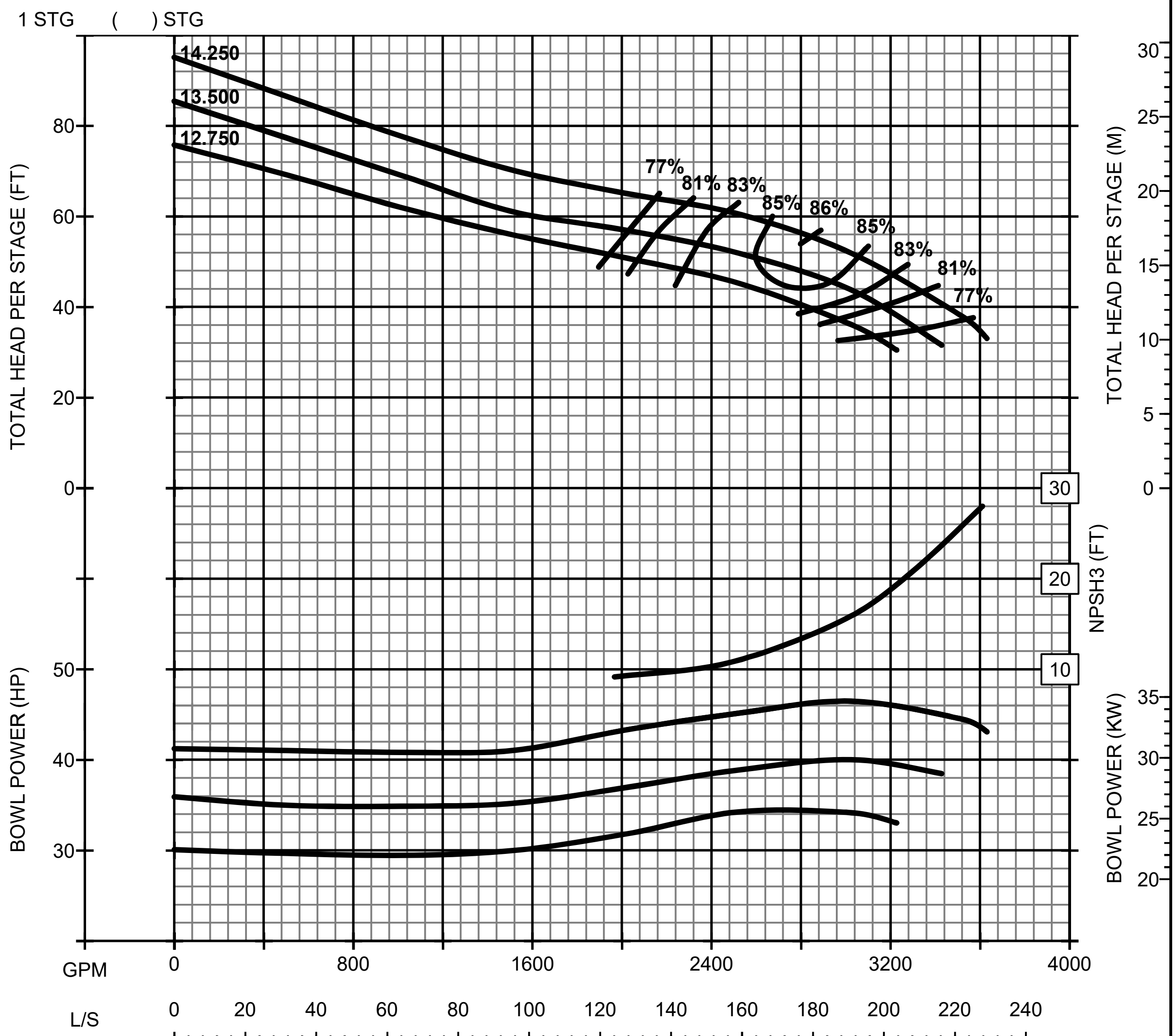
NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

E18LC

1180 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	2	3	
	NUMBER OF POINTS	-2	-1	0	

DESIGN	GPM	TDH	HP	EFF



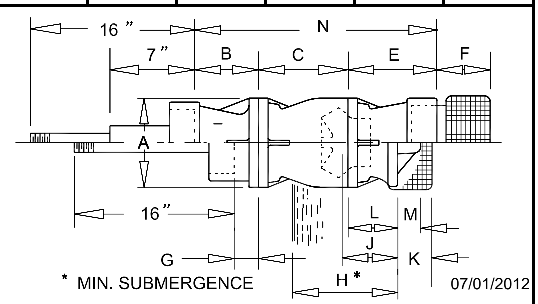
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	17.50	6.44	15.00	N/A	N/A	0.81	48.00	11.25	13.88	10.50	2.50	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	12"
THRUST CONSTANT:	26.5	SUCTION SIZE:	BELL
LATERAL (STD):	0.62"	STD. TUBE:	3.5"
EYE AREA IN^2:	63.88	WR^2 LB-FT^2:	9.01
SHAFT DIA:	2.187	1ST STG WT LB: 492	ADD STG WT LB: 315

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

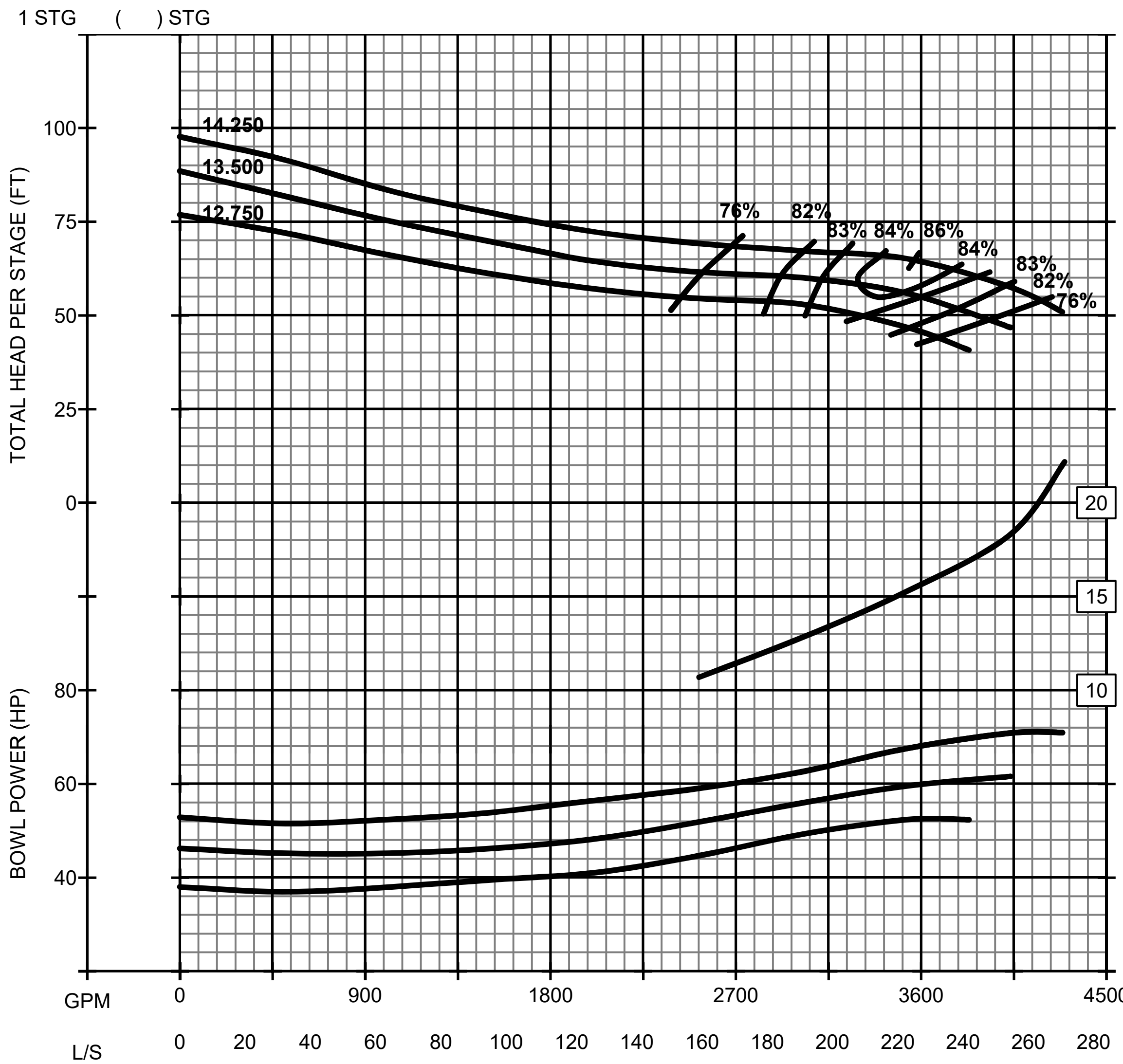
CVE18LC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY					E18HC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2	3		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

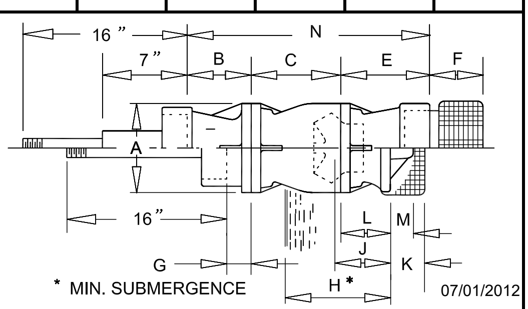


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	17.50	6.44	15.00	N/A	N/A	0.81	48.00	11.25	13.88	10.50	2.50	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	12"
THRUST CONSTANT:	26.5	SUCTION SIZE:	BELL
LATERAL (STD):	0.62"	STD. TUBE:	3.5"
EYE AREA IN²:	63.88	WR² LB-FT²:	9.26
SHAFT DIA:	2.187	1ST STG WT LB: 492	ADD STG WT LB: 315

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



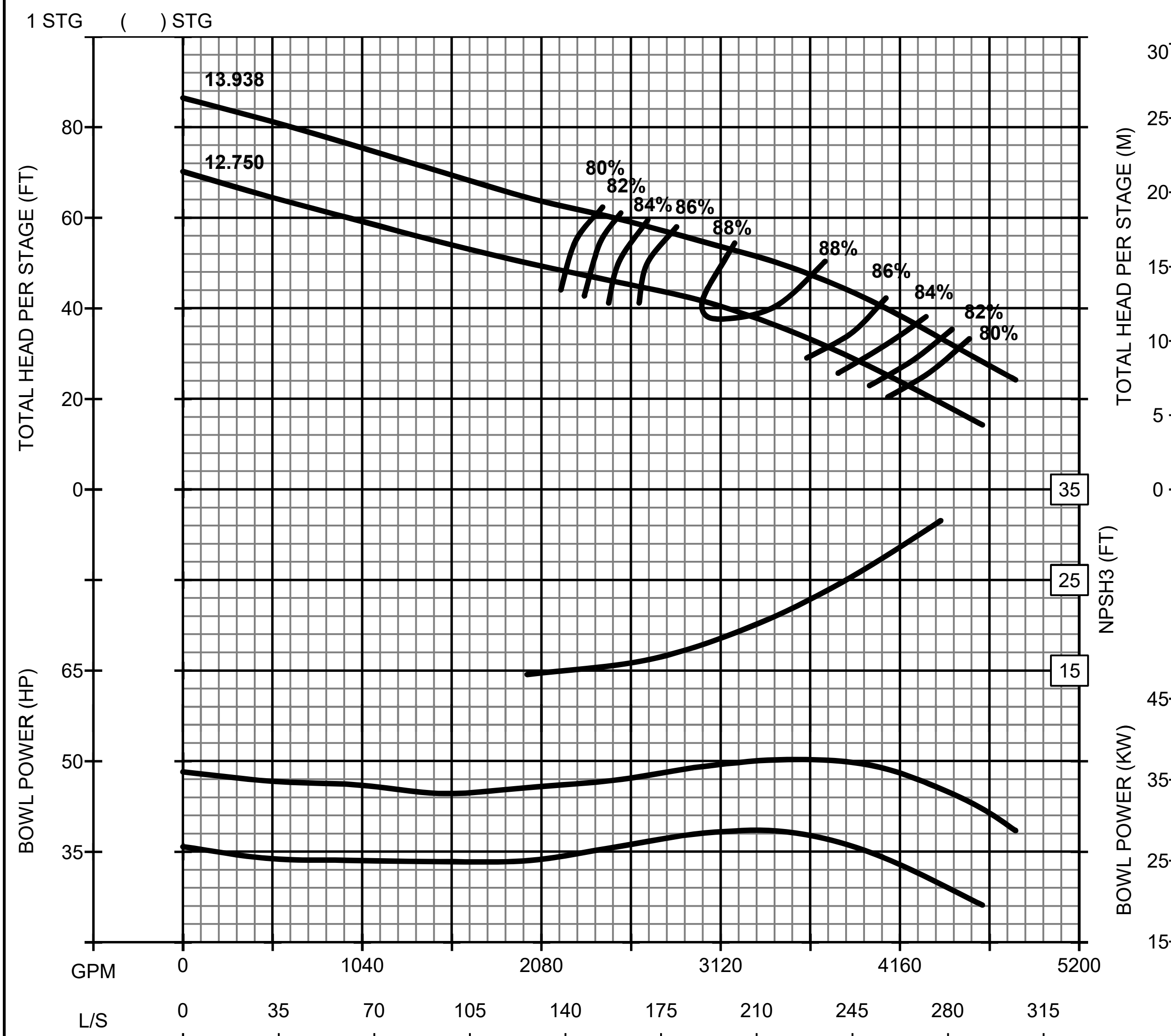
07/01/2012
CVE18HC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	K20LC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2							
	NUMBER OF POINTS	-2	0							



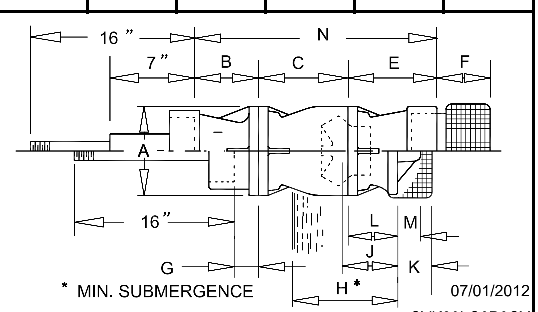
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	19.25	6.44	18.25	N/A	N/A	1.81	48.00	11.25	13.88	10.50	5.125	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	12", 14"
THRUST CONSTANT:	33.0	SUCTION SIZE:	BELL
LATERAL (STD):	1.00	STD. TUBE:	N/A
EYE AREA IN²:	72.6	WR² LB-FT²:	20.26
SHAFT DIA:	2.438	1ST STG WT LB: 730	ADD STG WT LB: 510

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

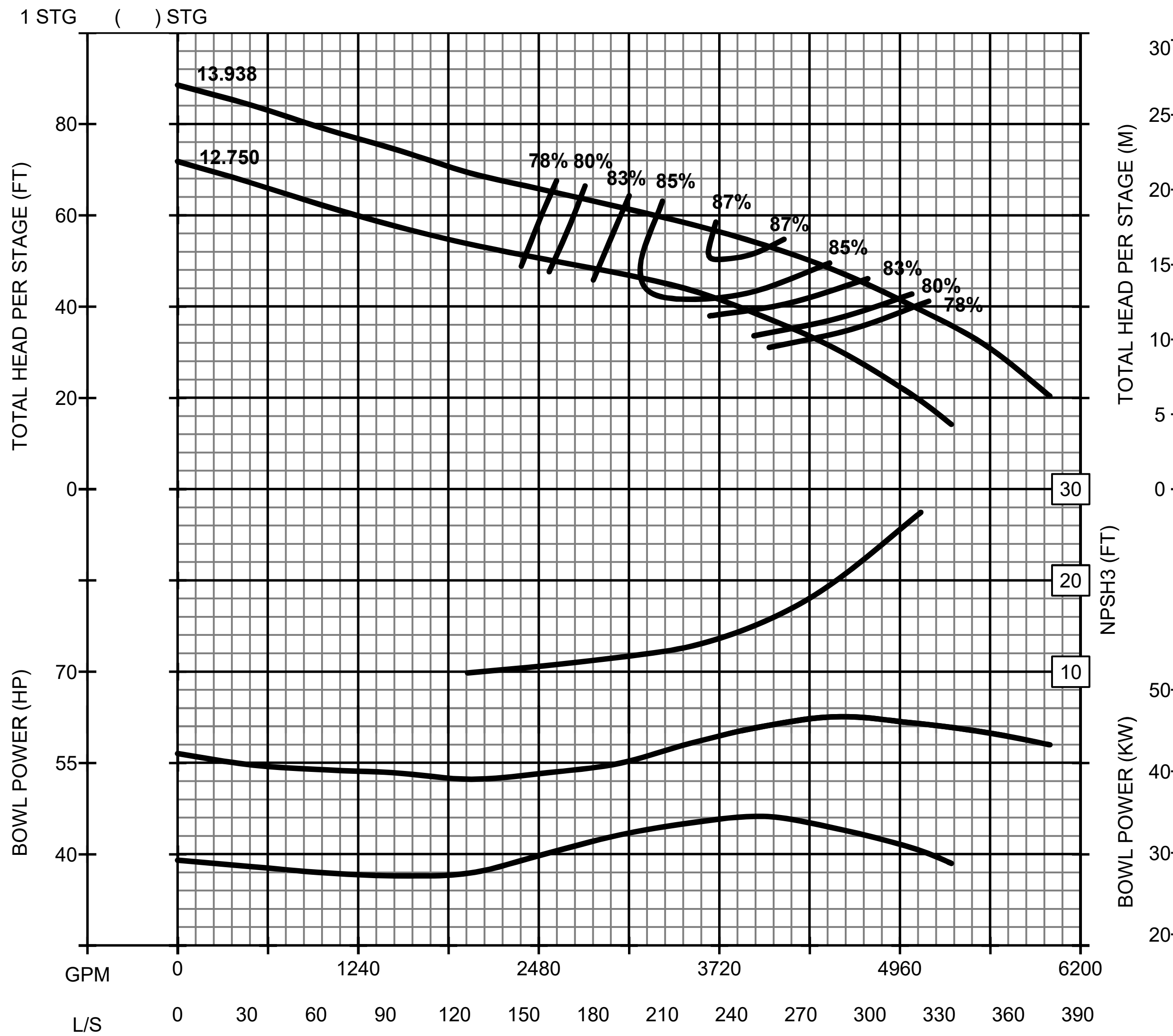
CVK20LC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NPC® NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	K20MC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2							
	NUMBER OF POINTS	-2	0							

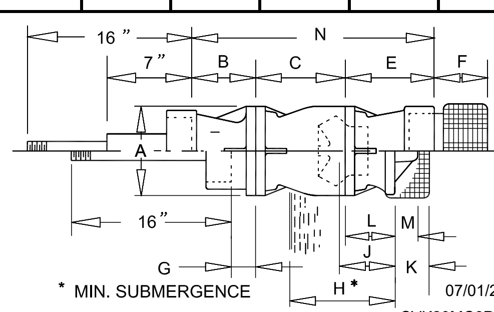


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	19.25	6.44	18.25	N/A	N/A	1.81	48.00	11.25	13.88	10.50	5.125	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	12", 14"
THRUST CONSTANT:	33.0	SUCTION SIZE:	BELL
LATERAL (STD):	1.00	STD. TUBE:	4"
EYE AREA IN²:	72.6	WR² LB-FT²:	20.26
SHAFT DIA:	2.438	1ST STG WT LB: 730	ADD STG WT LB: 510

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVK20MC6P6CY

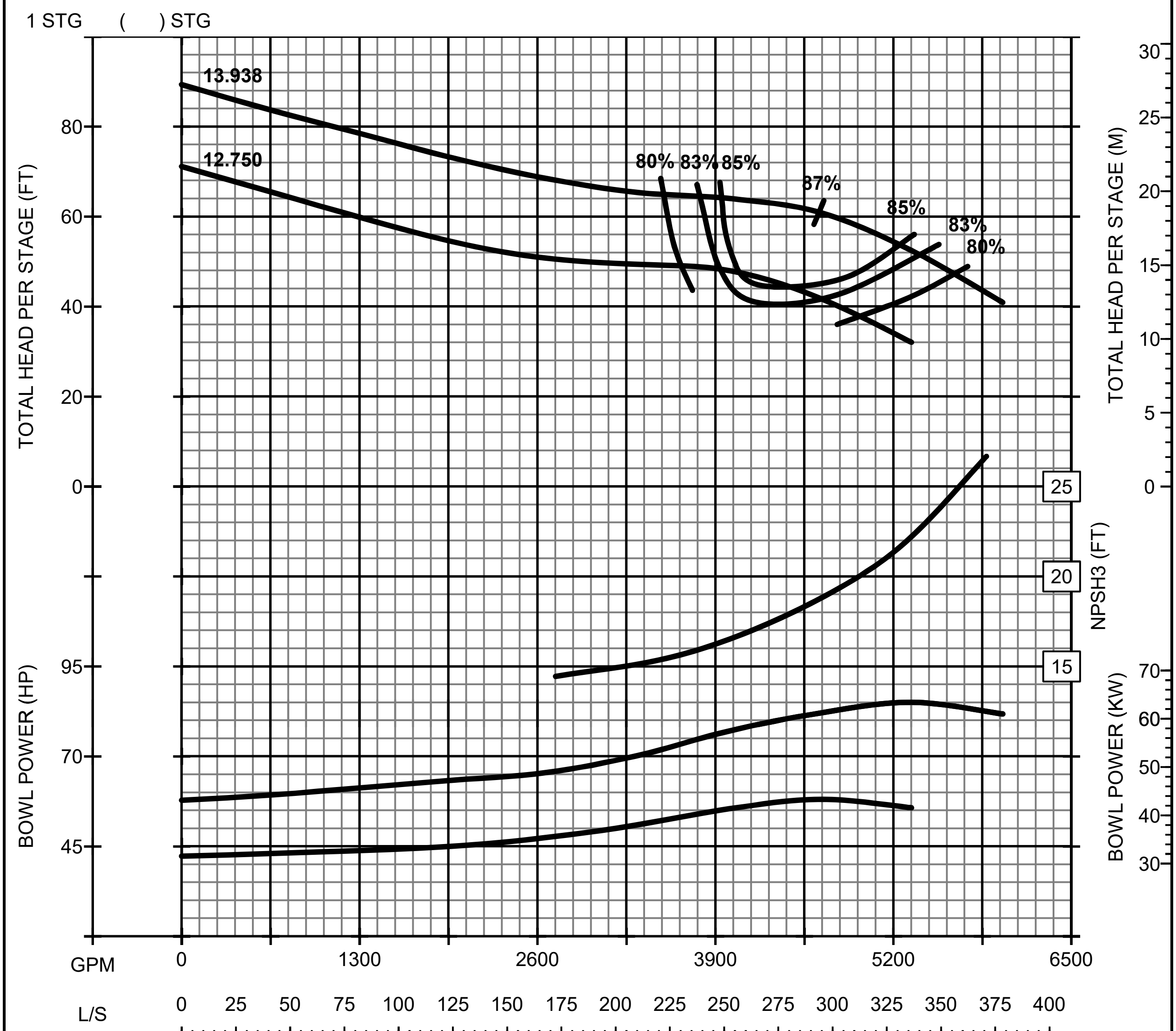
CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	K20HC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	2		
	NUMBER OF POINTS	-2	0		

DESIGN	GPM	TDH	HP	EFF

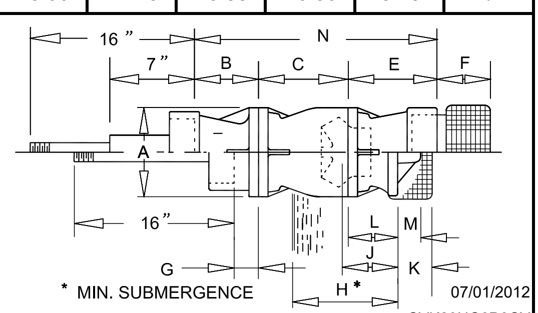


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	19.25	N/A	18.25	N/A	N/A	1.81	48.00	11.25	13.88	10.50	5.13	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	12", 14"
THRUST CONSTANT:	33.0	SUCTION SIZE:	BELL
LATERAL (STD):	1.00	STD. TUBE:	N/A
EYE AREA IN²:	72.6	WR² LB-FT²:	20.26
SHAFT DIA:	2.438	1ST STG WT LB: 730	ADD STG WT LB: 510

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

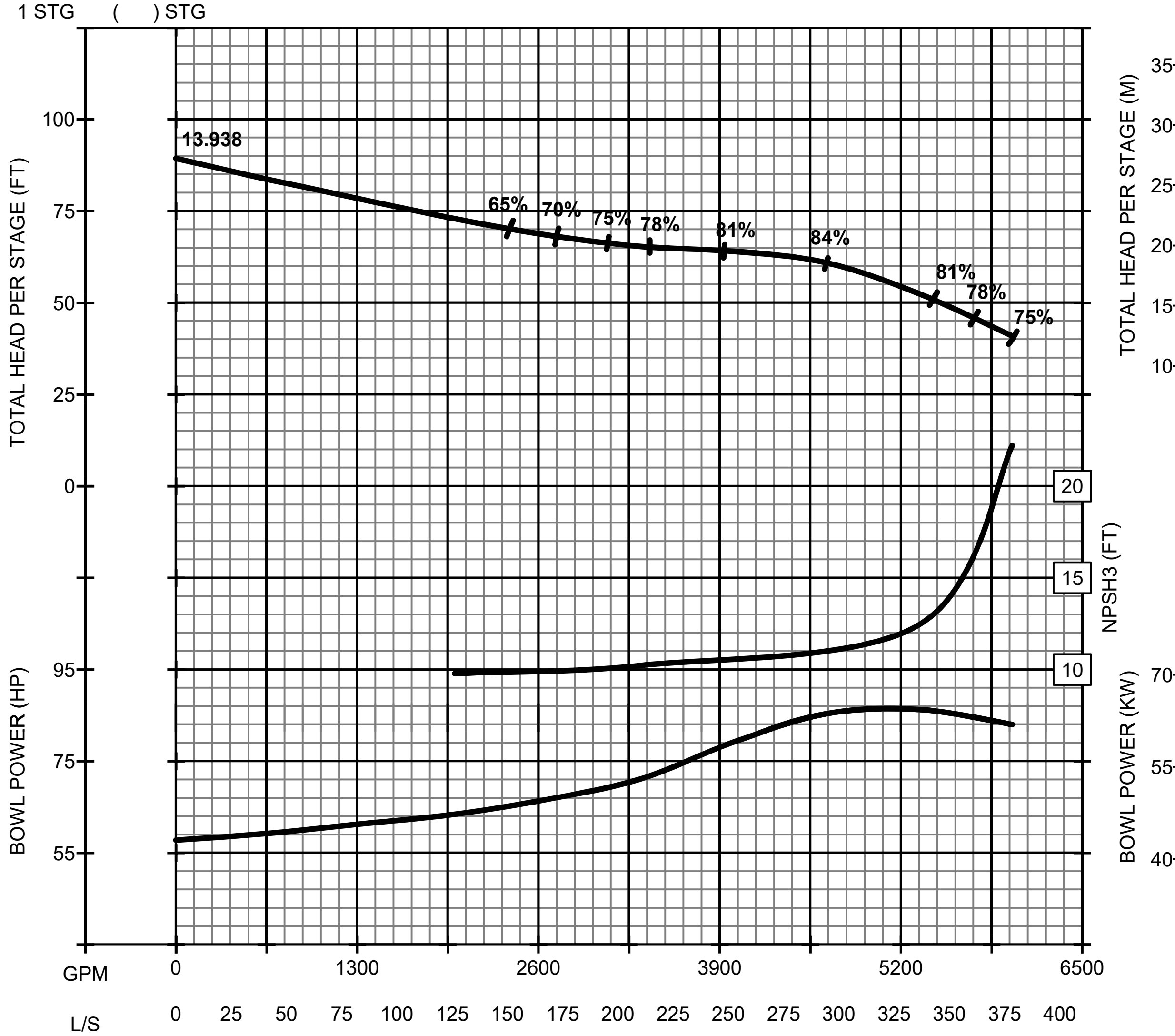
07/01/2012
CVK20HC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	K20HC-S 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	-	-	-	-	DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-	-	-	-					

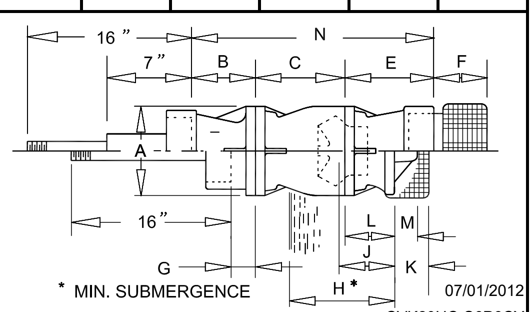


DIMENSIONS IN INCHES	A**	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	19.25	N/A	18.25	N/A	N/A	1.81	48.00	11.25	13.88	10.50	5.13	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	12", 14"
THRUST CONSTANT:	35.2	SUCTION SIZE:	BELL
LATERAL (STD):	1.00	STD. TUBE:	N/A
EYE AREA IN²:	83.91	WR² LB-FT²:	20.26
SHAFT DIA:	2.438	1ST STG WT LB: 730	ADD STG WT LB: 510

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.
BELL DIAMETER IS 20.65 ***LOW NPSH IMPELLER FOR 1ST STG ONLY*



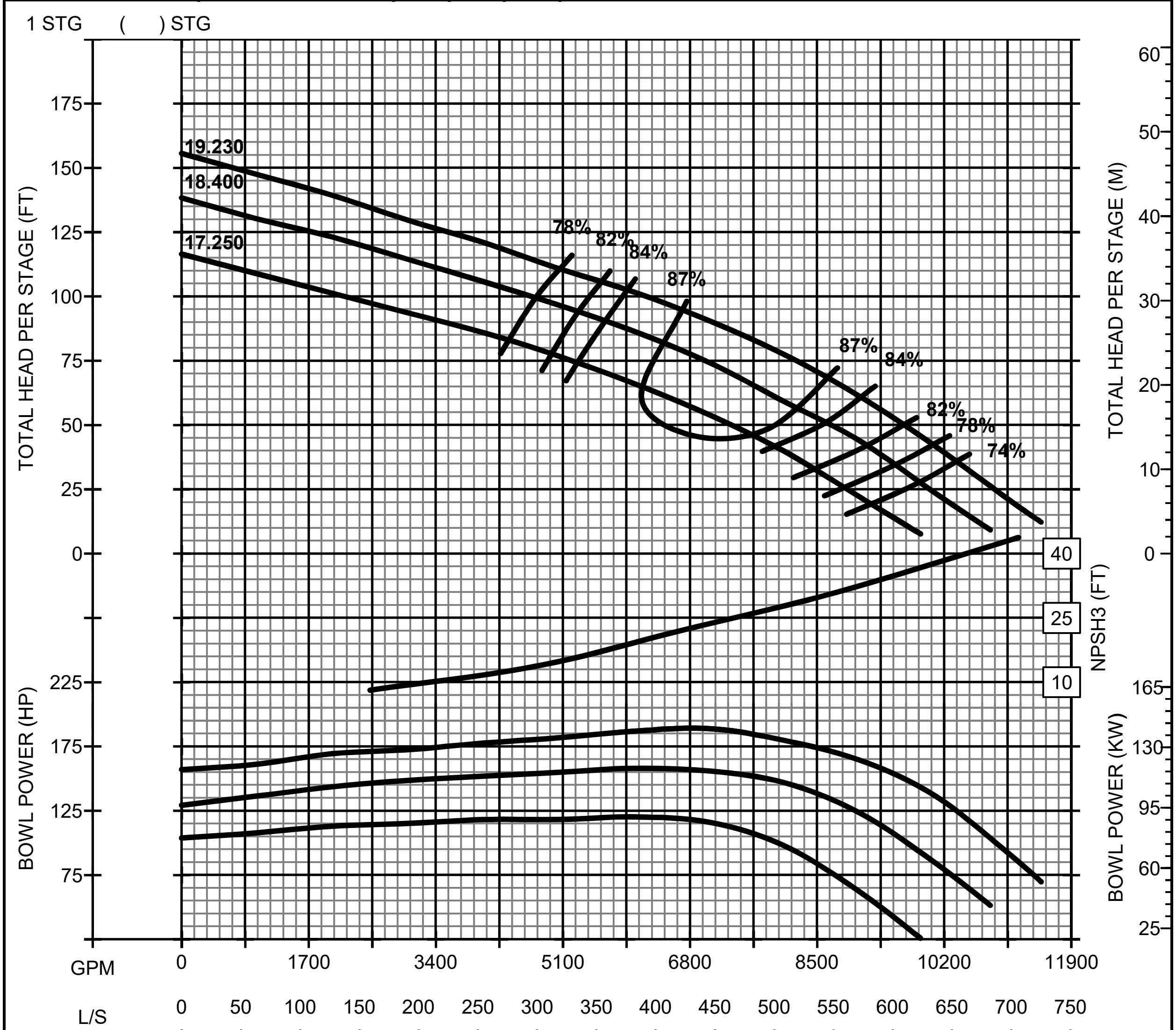
07/01/2012
CVK20HC-S6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	H24LC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2			DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-1	0							



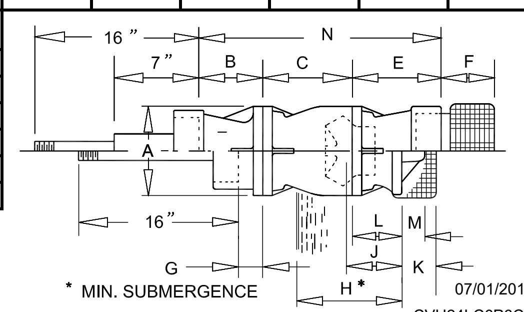
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	23.25	N/A	21.75	N/A	N/A	N/A	48.00	11.75	16.00	11.50	5.63	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	FLANGED
THRUST CONSTANT:	53.0	SUCTION SIZE:	BELL
LATERAL (STD):	1.25	STD. TUBE:	N/A
EYE AREA IN²:	128.00	WR² LB-FT²:	51.1
SHAFT DIA:	2.688	1ST STG WT LB: 762	ADD STG WT LB: 541

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

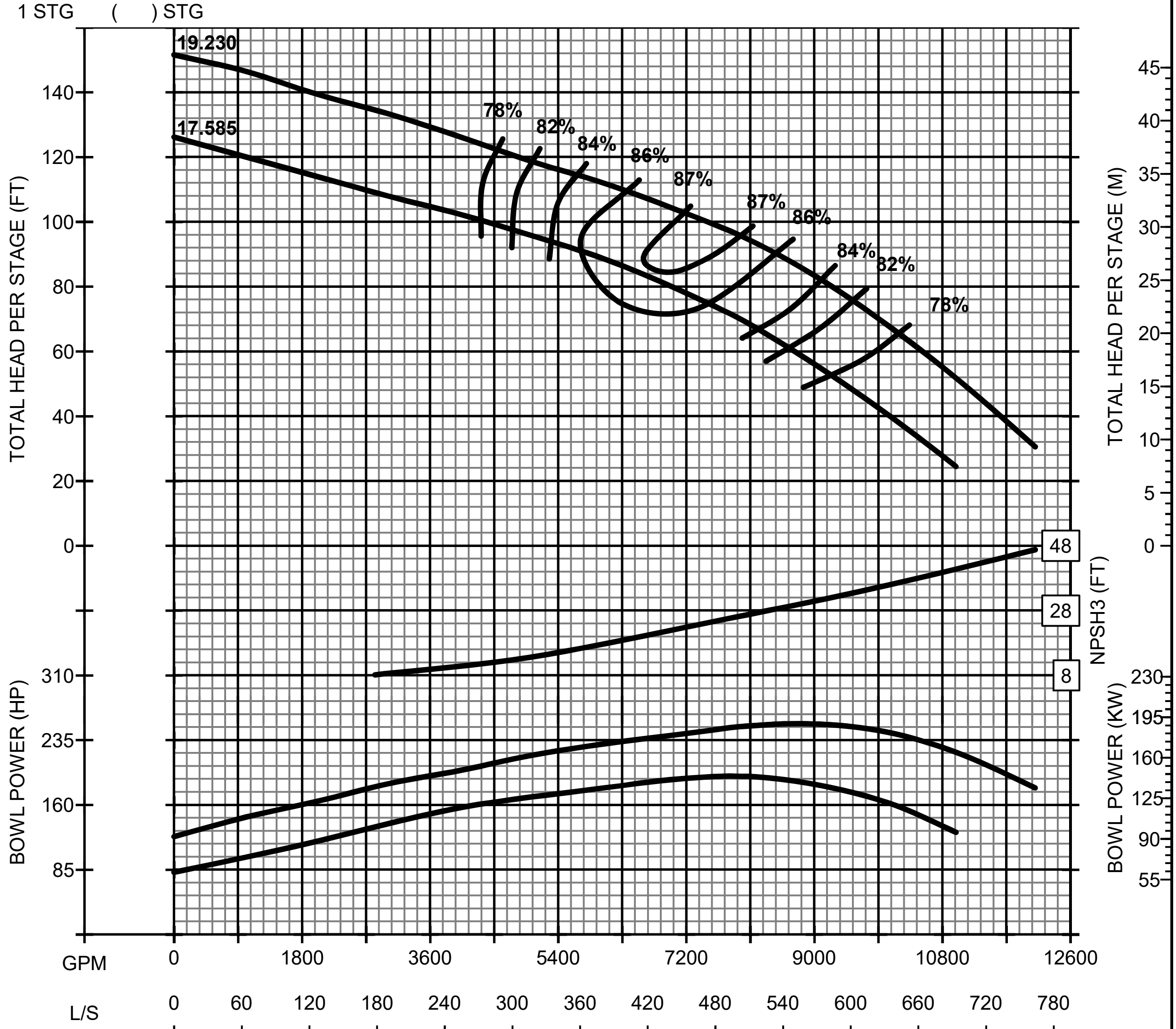
CVH24LC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	H24MC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2							
	NUMBER OF POINTS	-1	0							

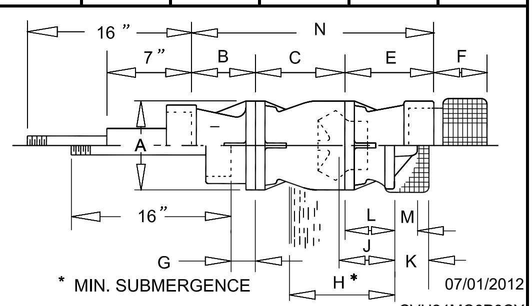


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	23.25	N/A	21.75	N/A	N/A	N/A	48.00	11.75	16.00	11.50	5.63	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	FLANGED
THRUST CONSTANT:	53.0	SUCTION SIZE:	BELL
LATERAL (STD):	1.25	STD. TUBE:	N/A
EYE AREA IN^2:	128.00	WR^2 LB-FT^2:	51.1
SHAFT DIA:	2.688	1ST STG WT LB: 762	ADD STG WT LB: 541

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

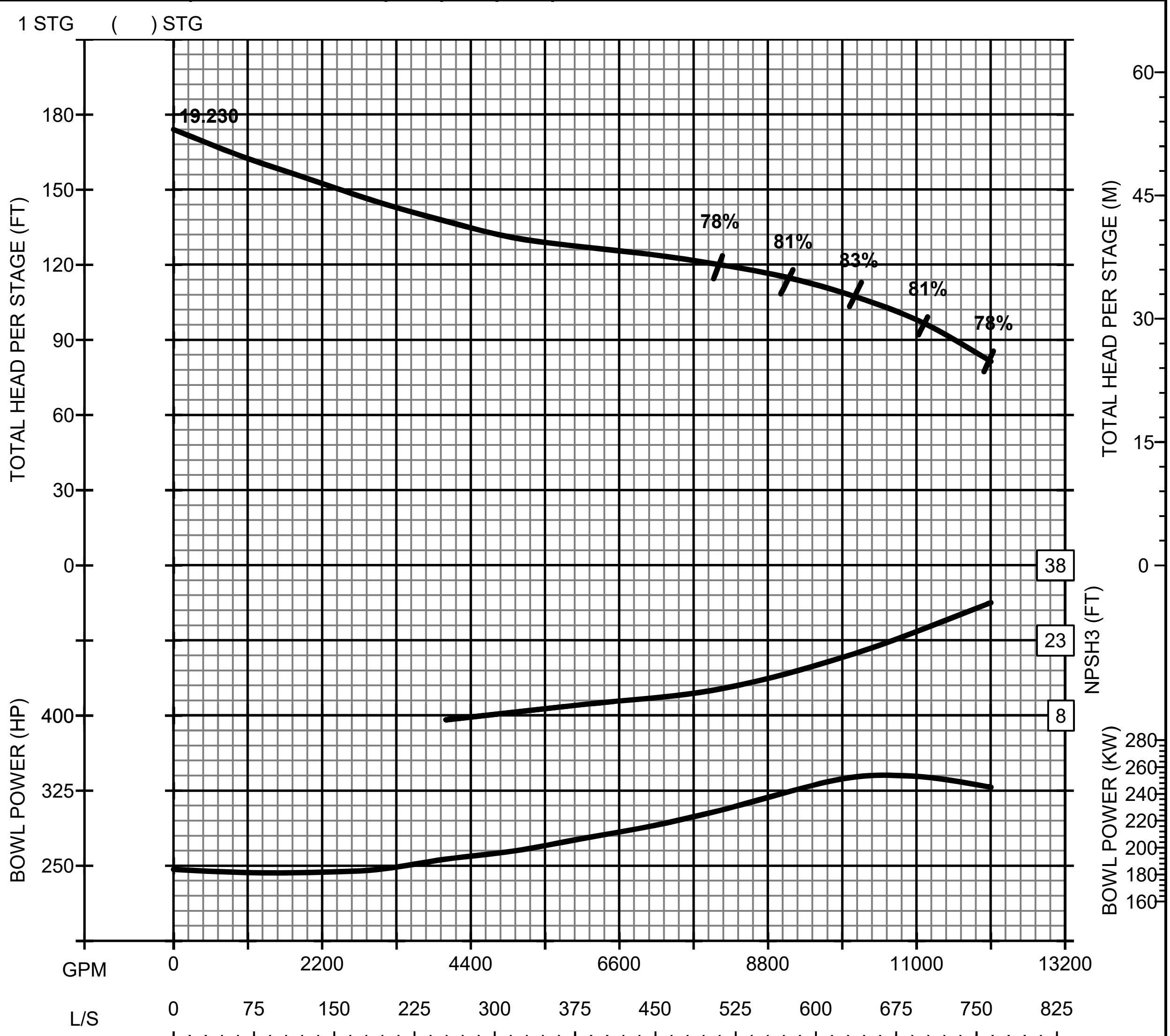
07/01/2012
CVH24MC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	**H24MC-S** 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	—	—	—	—					
	NUMBER OF POINTS	—	—	—	—					



DIMENSIONS IN INCHES	A**	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	23.25	N/A	21.75	N/A	N/A	N/A	48.00	11.75	16.00	11.50	5.63	N/A

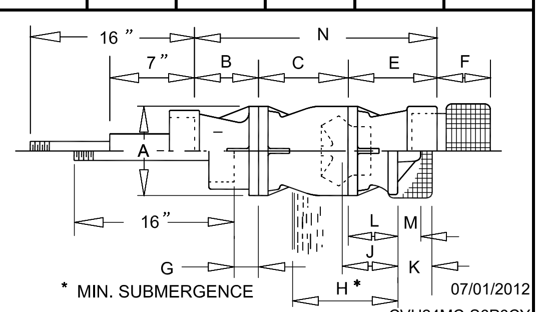
PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	FLANGED
THRUST CONSTANT:	78.1	SUCTION SIZE:	BELL
LATERAL (STD):	1.25	STD. TUBE:	N/A
EYE AREA IN^2:	146.50	WR^2 $LB\text{-}FT^2$:	51.1
SHAFT DIA:	2.688	1ST STG WT LB: 762	ADD STG WT LB: N/A

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.

**BELL DIAMETER IS 28.75. ***LOW NPSH IMPELLER FOR 1ST STAGE ONLY.



07/01/2012

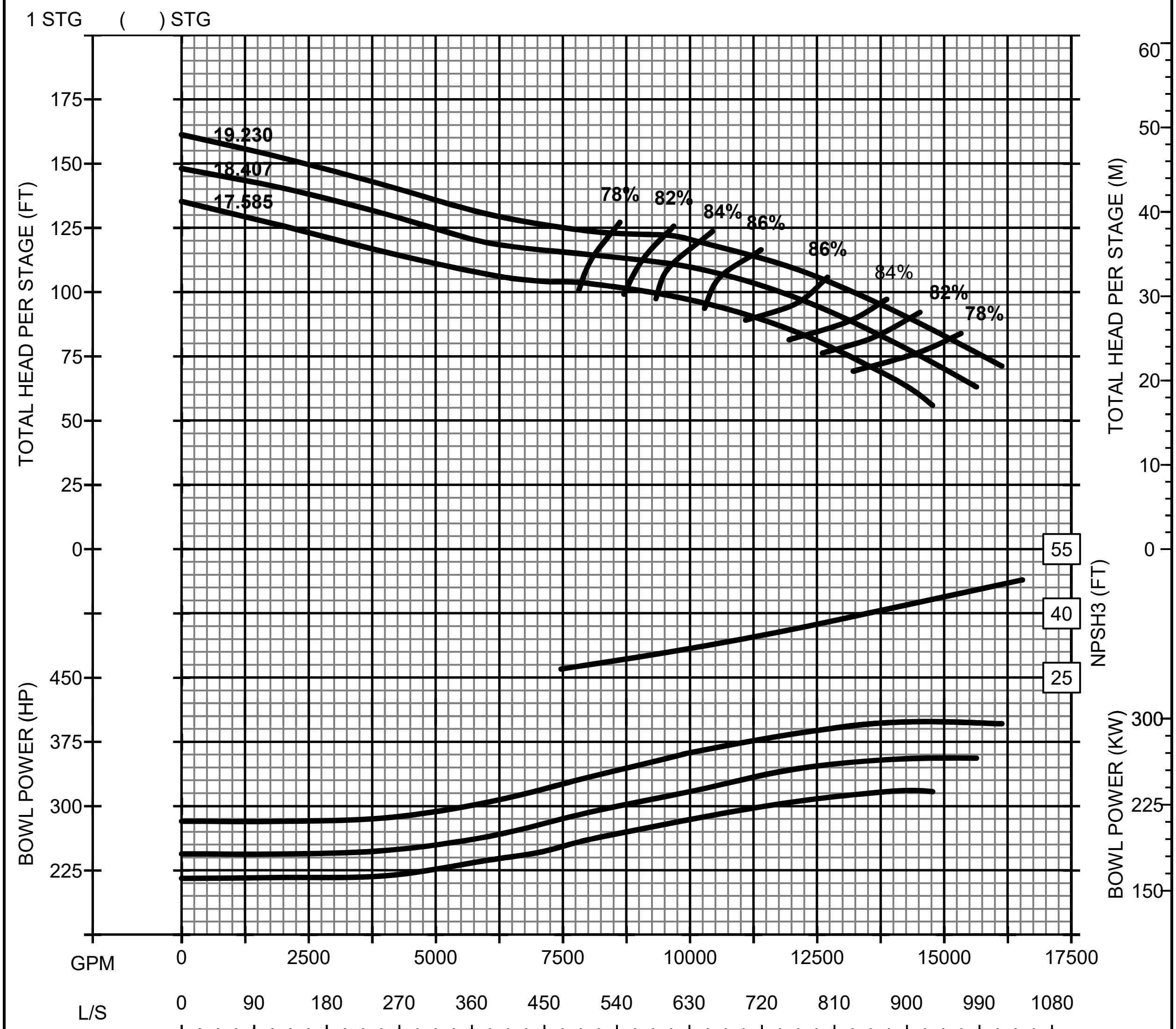
CVH24MC-S6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP® COMPANY A GORMAN-RUPP COMPANY	H24XHC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2							
	NUMBER OF POINTS	-1	0							



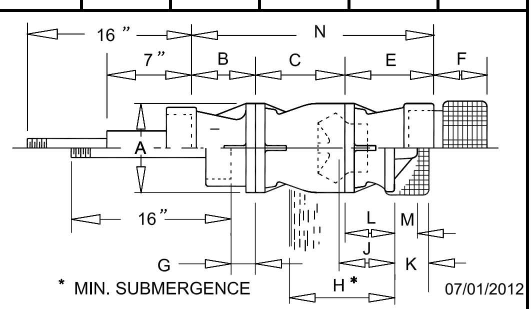
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	23.25	N/A	21.75	N/A	N/A	N/A	48.00	11.75	16.00	11.50	5.63	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	FLANGED
THRUST CONSTANT:	53.0	SUCTION SIZE:	BELL
LATERAL (STD):	1.25	STD. TUBE:	N/A
EYE AREA IN^2:	128.00	WR^2 LB-FT^2:	51.1
SHAFT DIA:	2.688	1ST STG WT LB: 762	ADD STG WT LB: 541

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

CVH24XHC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

H30LC

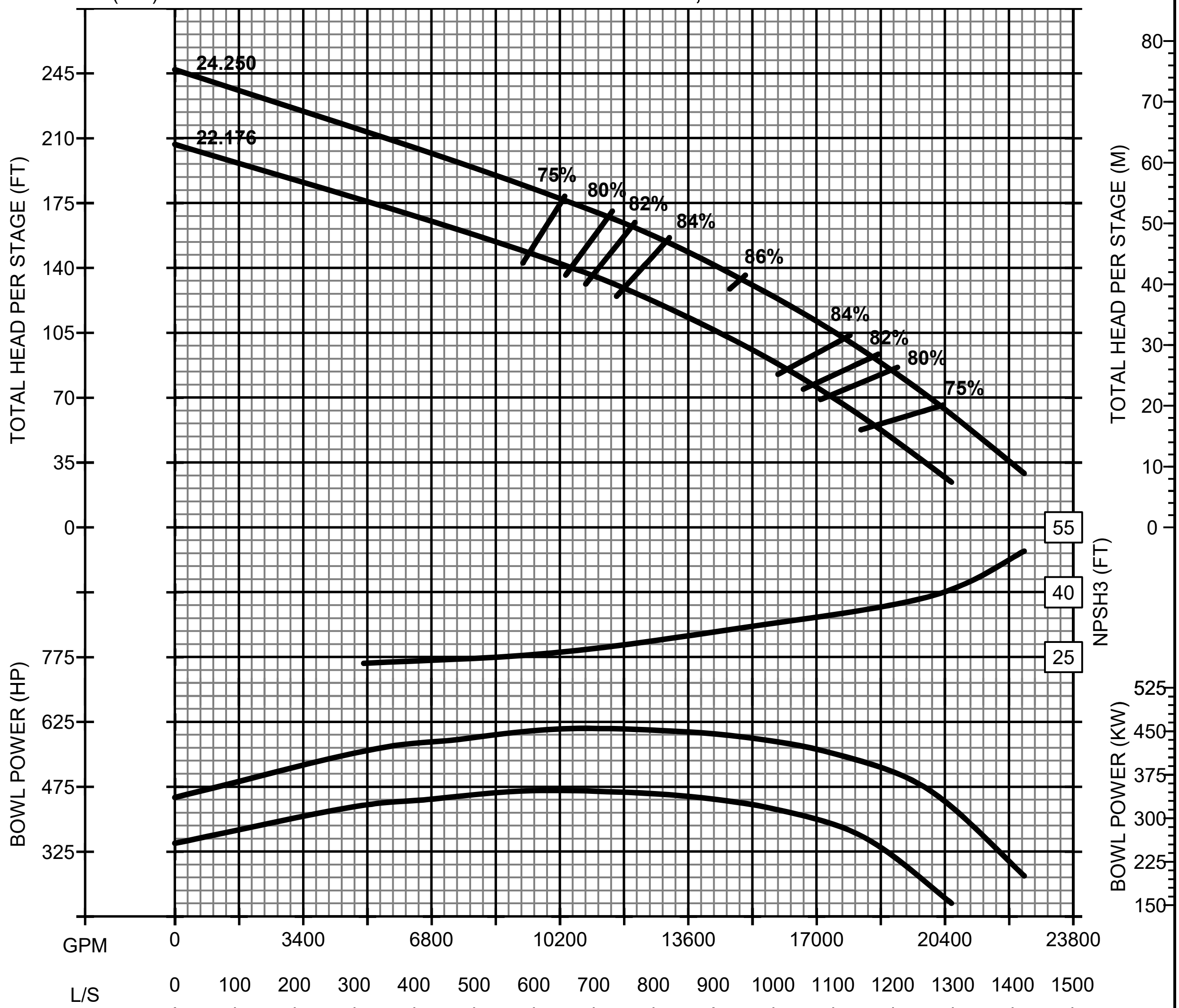
1180 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2		
	NUMBER OF POINTS	-1	0		

DESIGN	GPM	TDH	HP	EFF

1 STG ( ) STG

TEMPORARY CURVE, CONTACT FACTORY



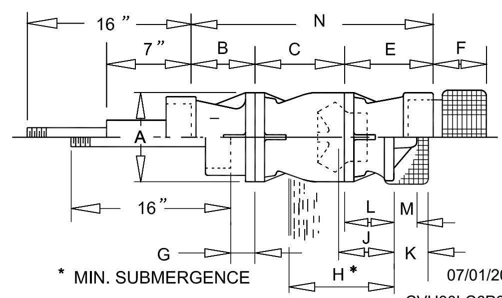
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	29.10	N/A	21.75	N/A	N/A	N/A	60.00	14.00	18.00	14.50	7.00	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	N/A
THRUST CONSTANT:	85.0	SUCTION SIZE:	N/A
LATERAL (STD):	1.50	STD. TUBE:	N/A
EYE AREA IN^2:	187.0	WR^2 $LB\text{-}FT^2$:	101
SHAFT DIA:	3.50	1ST STG WT LB: 2020	ADD STG WT LB: 1472

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

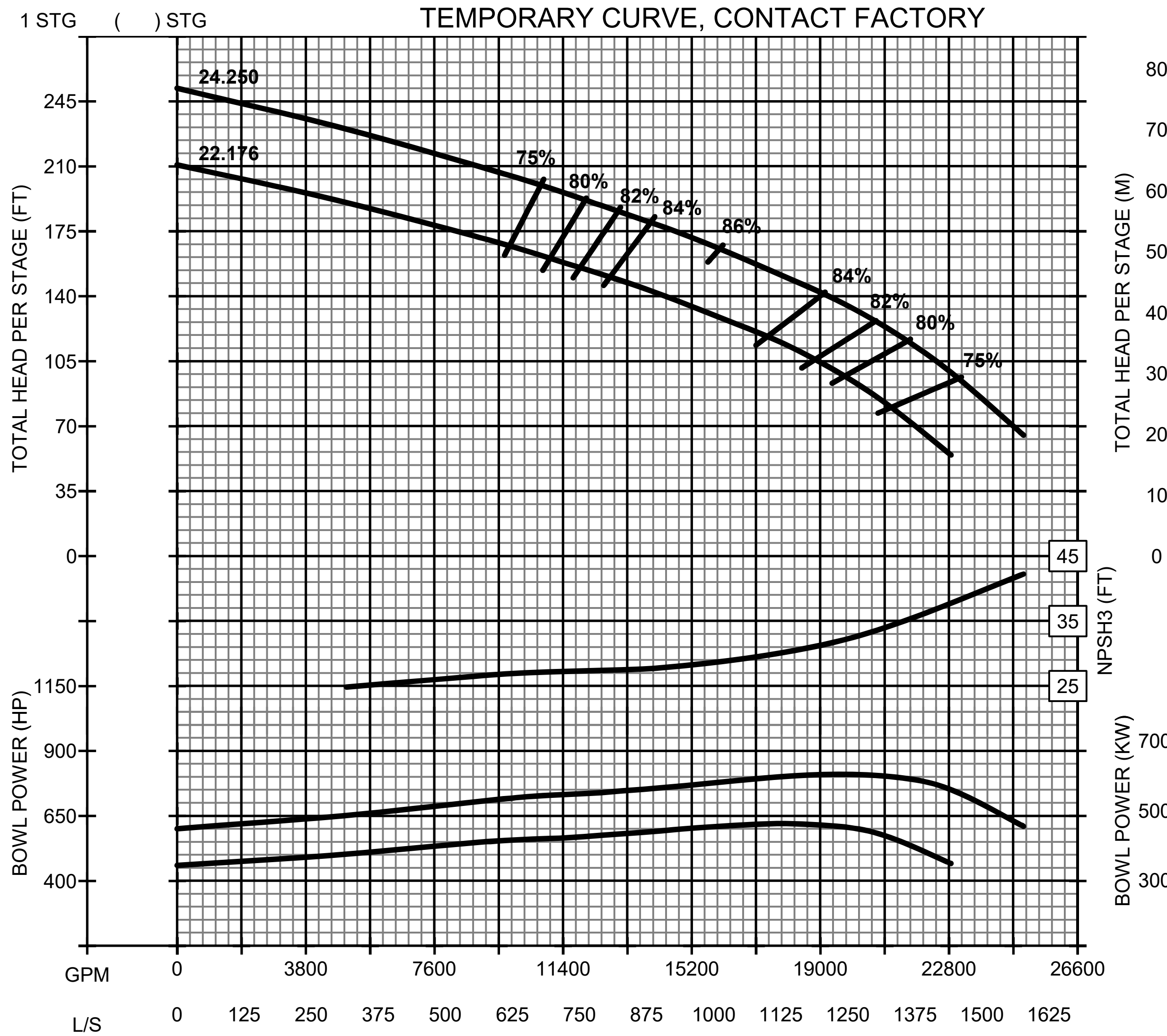
CVH30LC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP® COMPANY A GORMAN-RUPP COMPANY	H30MC 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2							
	NUMBER OF POINTS	-1	0							

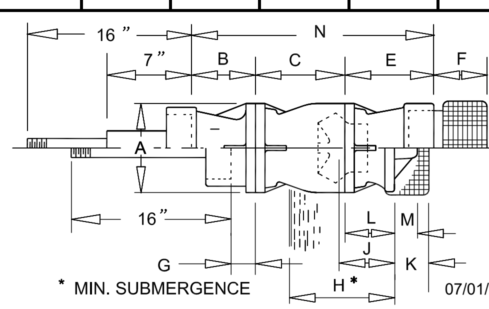


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	29.10	N/A	21.75	N/A	N/A	N/A	60.00	14.00	18.00	14.50	7.00	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	N/A
THRUST CONSTANT:	85.0	SUCTION SIZE:	N/A
LATERAL (STD):	1.50	STD. TUBE:	N/A
EYE AREA IN²:	187.0	WR² LB-FT²:	101
SHAFT DIA:	3.50	1ST STG WT LB: 2020	ADD STG WT LB: 1472

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVH30MC6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

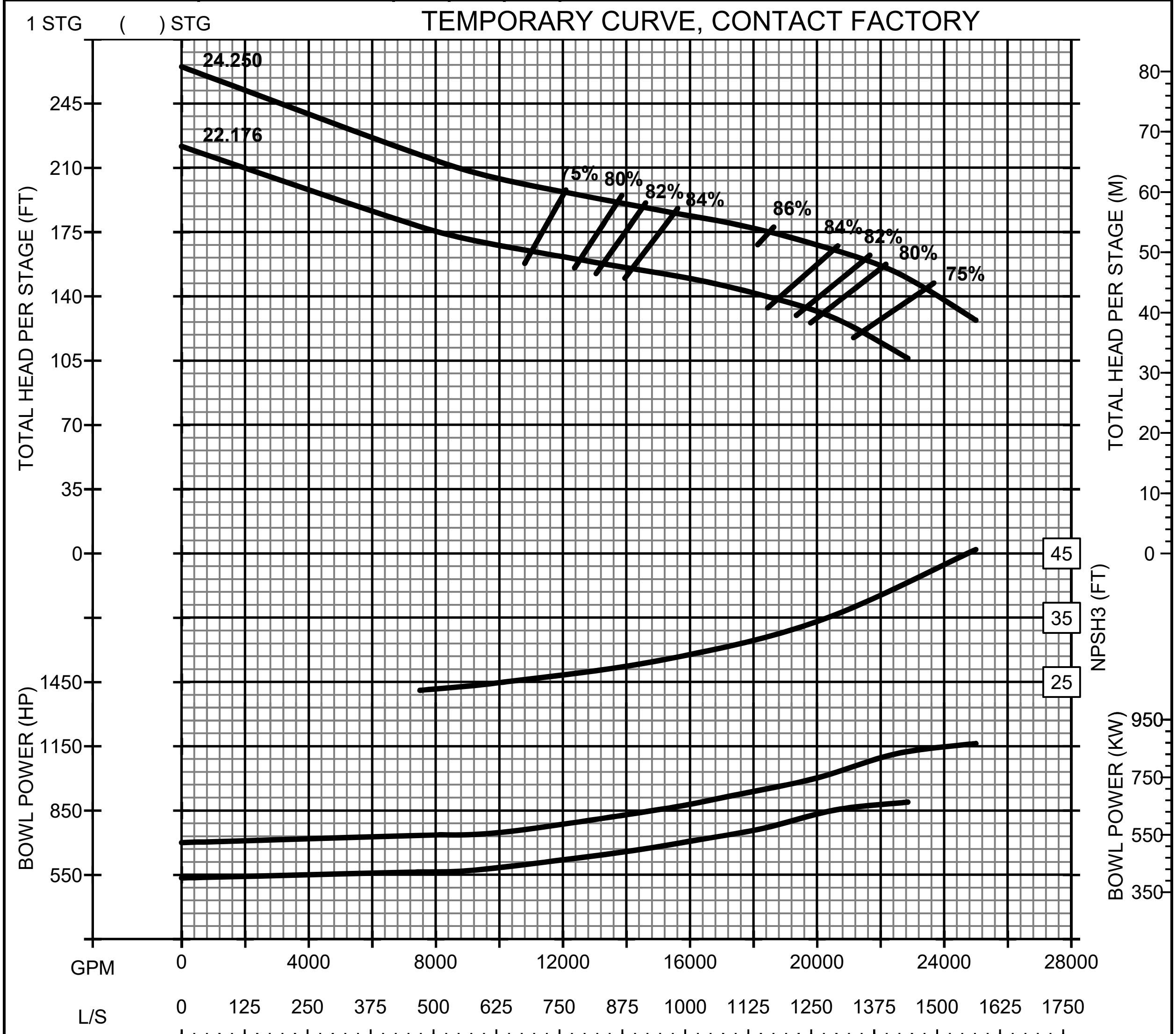
NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

H30HC

1180 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2		
	NUMBER OF POINTS	-1	0		

DESIGN	GPM	TDH	HP	EFF



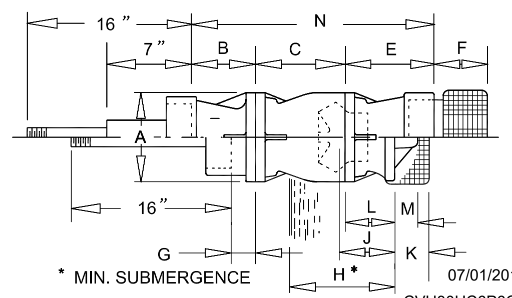
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	29.10	N/A	21.75	N/A	N/A	N/A	60.00	14.00	18.00	14.50	7.00	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	N/A
THRUST CONSTANT:	85.0	SUCTION SIZE:	N/A
LATERAL (STD):	1.50	STD. TUBE:	N/A
EYE AREA IN²:	187.0	WR² LB-FT²:	101
SHAFT DIA:	3.50	1ST STG WT LB: 2020	ADD STG WT LB: 1472

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVH30HC6P6CY

CURVE TEMPLATE 08.05.2011

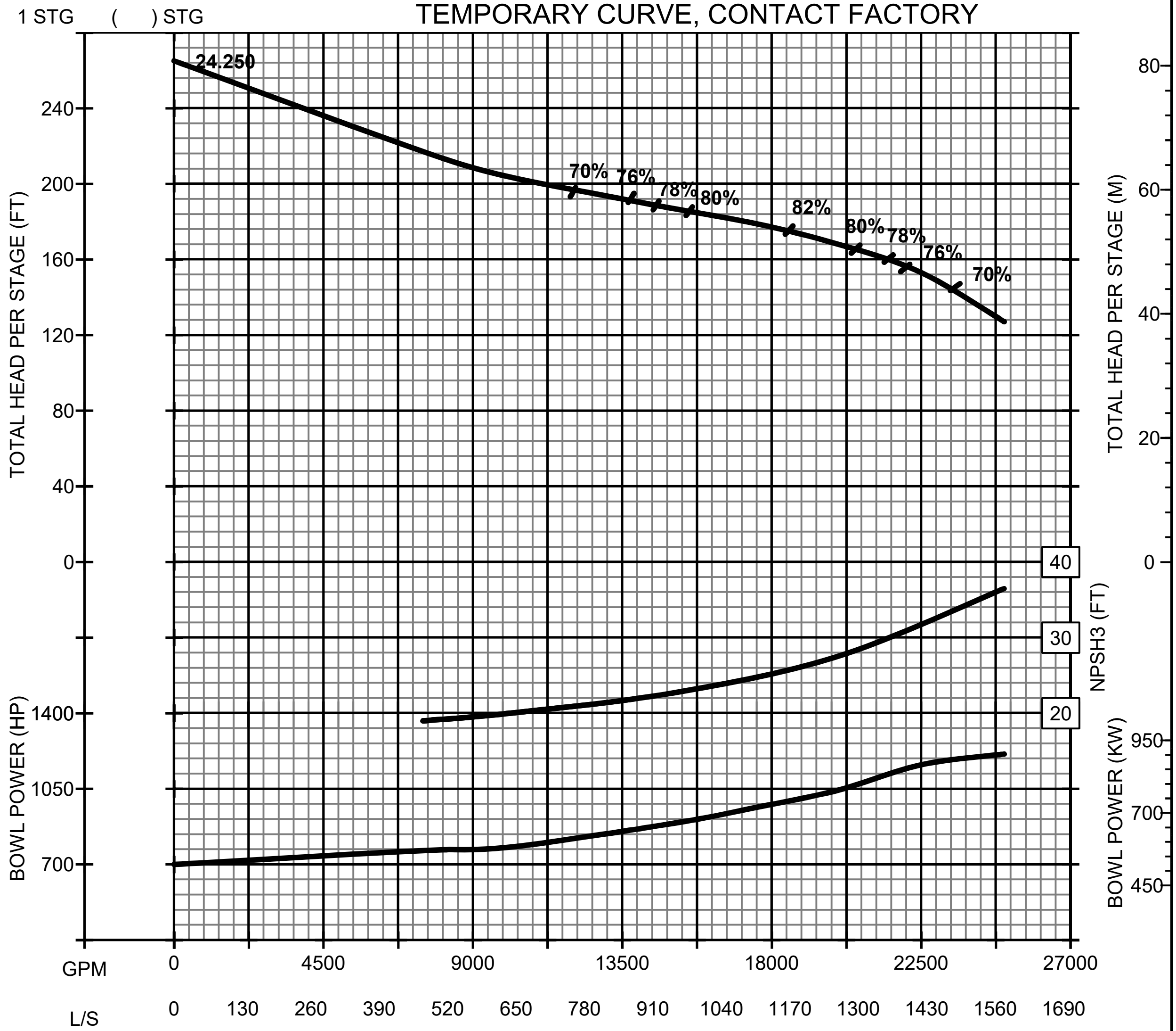
1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	H30HC-S 1180 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2							
	NUMBER OF POINTS	-1	0							

1 STG ( ) STG

TEMPORARY CURVE, CONTACT FACTORY

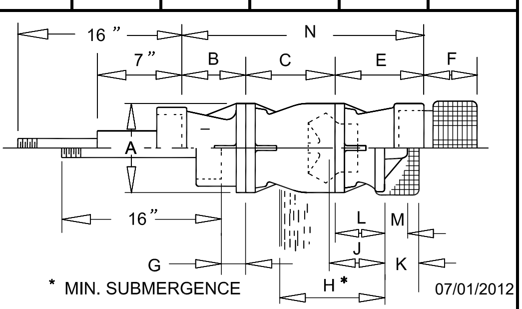


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	29.10	N/A	21.75	N/A	N/A	N/A	60.00	14.00	18.00	14.50	7.00	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	N/A
THRUST CONSTANT:	85.0	SUCTION SIZE:	N/A
LATERAL (STD):	1.50	STD. TUBE:	N/A
EYE AREA IN^2:	187.0	WR^2 LB-FT^2:	101
SHAFT DIA:	3.50	1ST STG WT LB: 2020	ADD STG WT LB: 1472

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.
LOW NPSH IMPELLER FOR 1ST ONLY



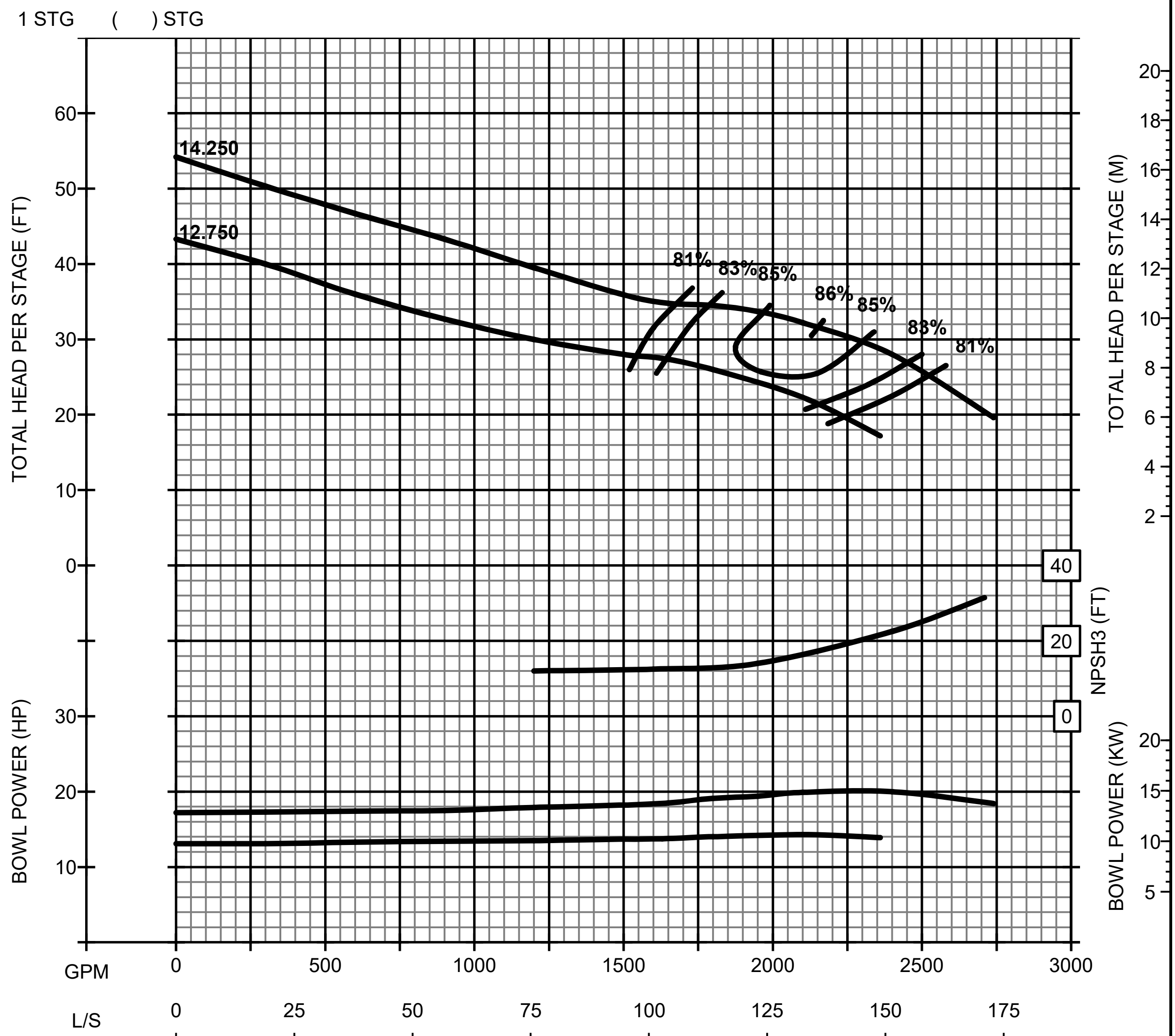
07/01/2012
CVH30HC-S6P6CY

CURVE TEMPLATE 08.05.2011

1180 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY		# E18LC 880 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2	3		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

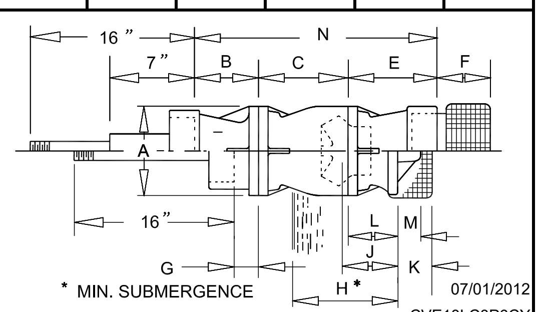


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	17.50	6.44	15.00	N/A	N/A	0.81	48.00	11.25	13.88	10.50	2.50	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	12"
THRUST CONSTANT:	26.5	SUCTION SIZE:	BELL
LATERAL (STD):	0.62"	STD. TUBE:	3.5"
EYE AREA IN²:	63.88	WR² LB-FT²:	9.01
SHAFT DIA:	2.187	1ST STG WT LB: 492	ADD STG WT LB: 315

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

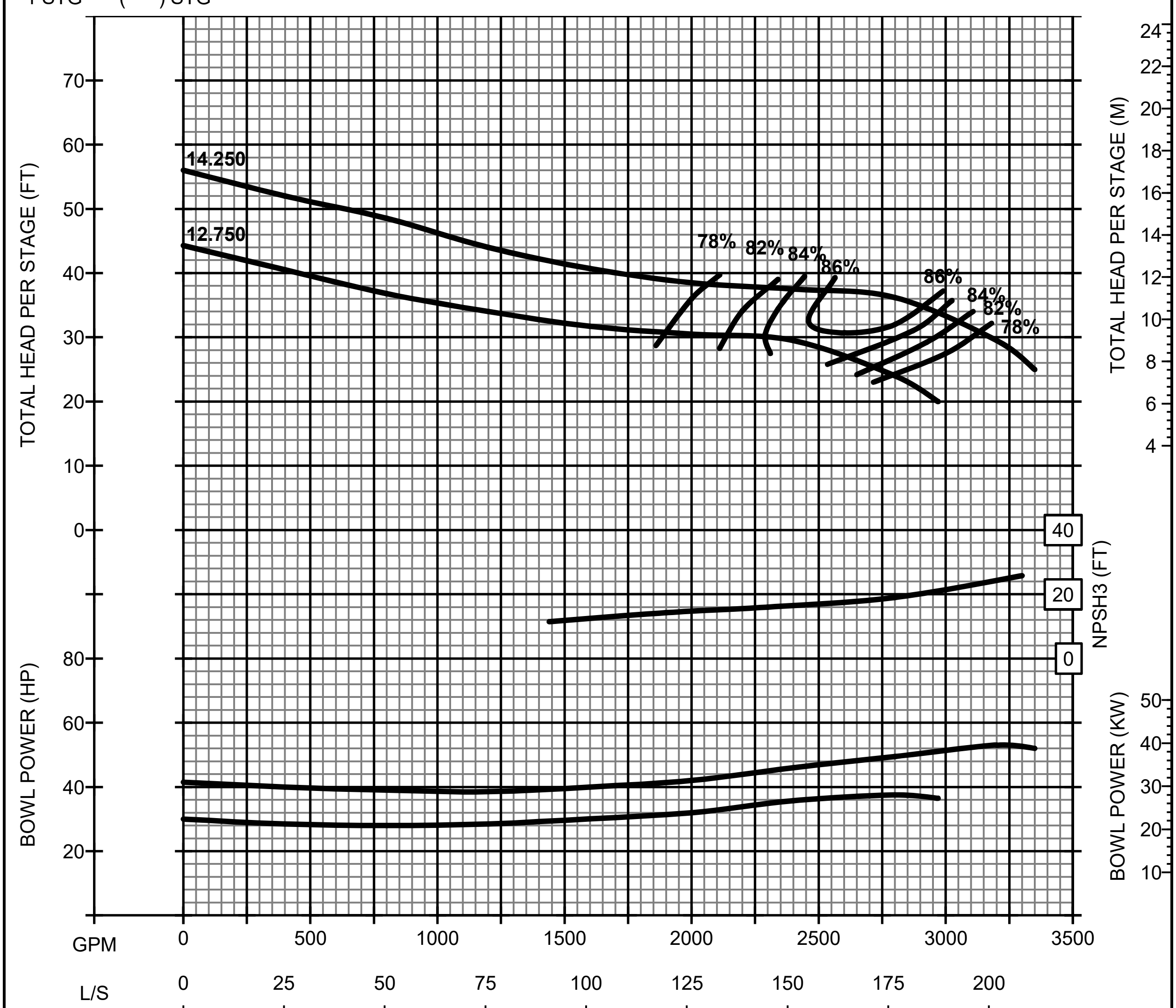
07/01/2012
CVE18LC8P6CY

CURVE TEMPLATE 08.05.2011

880 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	E18HC 880 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2	3		DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	-1	0						

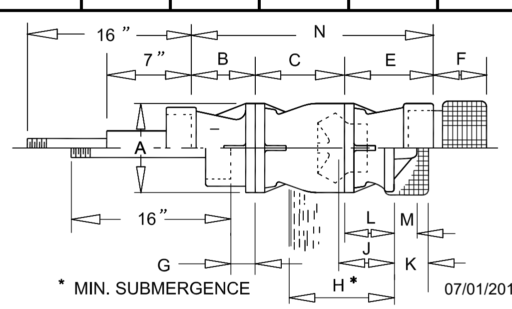


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	17.50	6.44	15.00	N/A	N/A	0.81	48.00	11.25	13.88	10.50	2.50	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	7	DISCHARGE SIZE:	12"
THRUST CONSTANT:	26.5	SUCTION SIZE:	BELL
LATERAL (STD):	0.62"	STD. TUBE:	3.5"
EYE AREA IN^2:	63.88	WR^2 LB-FT^2:	9.26
SHAFT DIA:	2.187	1ST STG WT LB: 492	ADD STG WT LB: 315

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

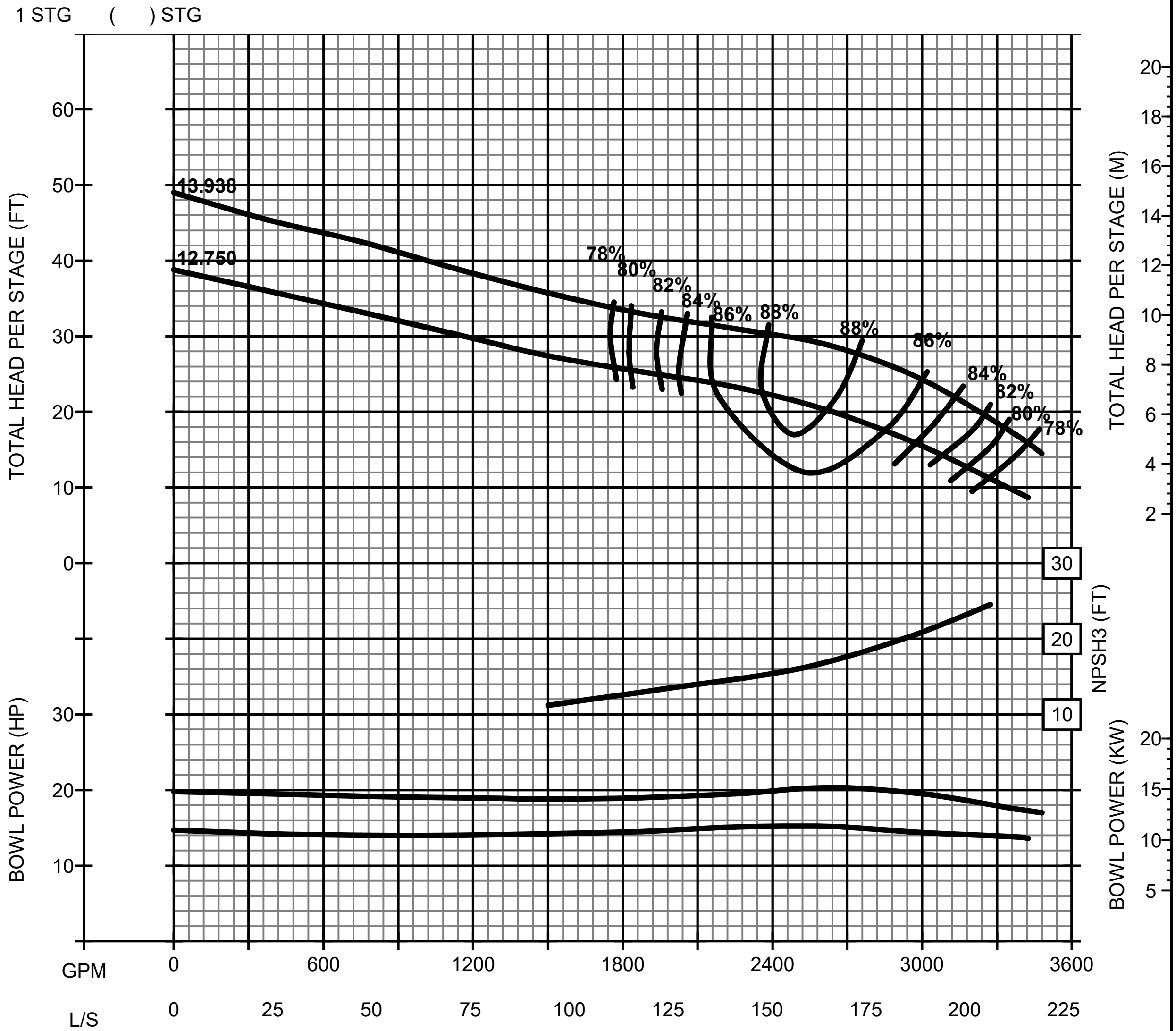
CVE18HC8P6CY

CURVE TEMPLATE 08.05.2011

880 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY		# K20LC 880 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2			DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	0							



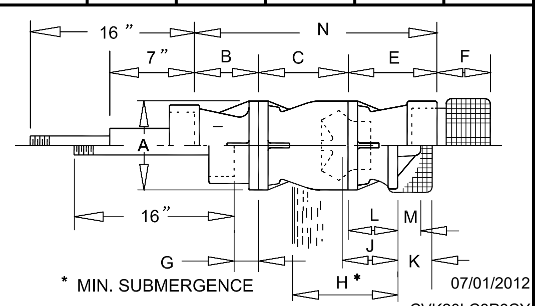
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	19.25	6.44	18.25	N/A	N/A	1.81	48.00	11.25	13.88	10.50	5.125	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	12", 14"
THRUST CONSTANT:	33.0	SUCTION SIZE:	BELL
LATERAL (STD):	1.00	STD. TUBE:	N/A
EYE AREA IN²:	72.6	WR² LB-FT²:	20.26
SHAFT DIA:	2.438	1ST STG WT LB: 730	ADD STG WT LB: 510

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

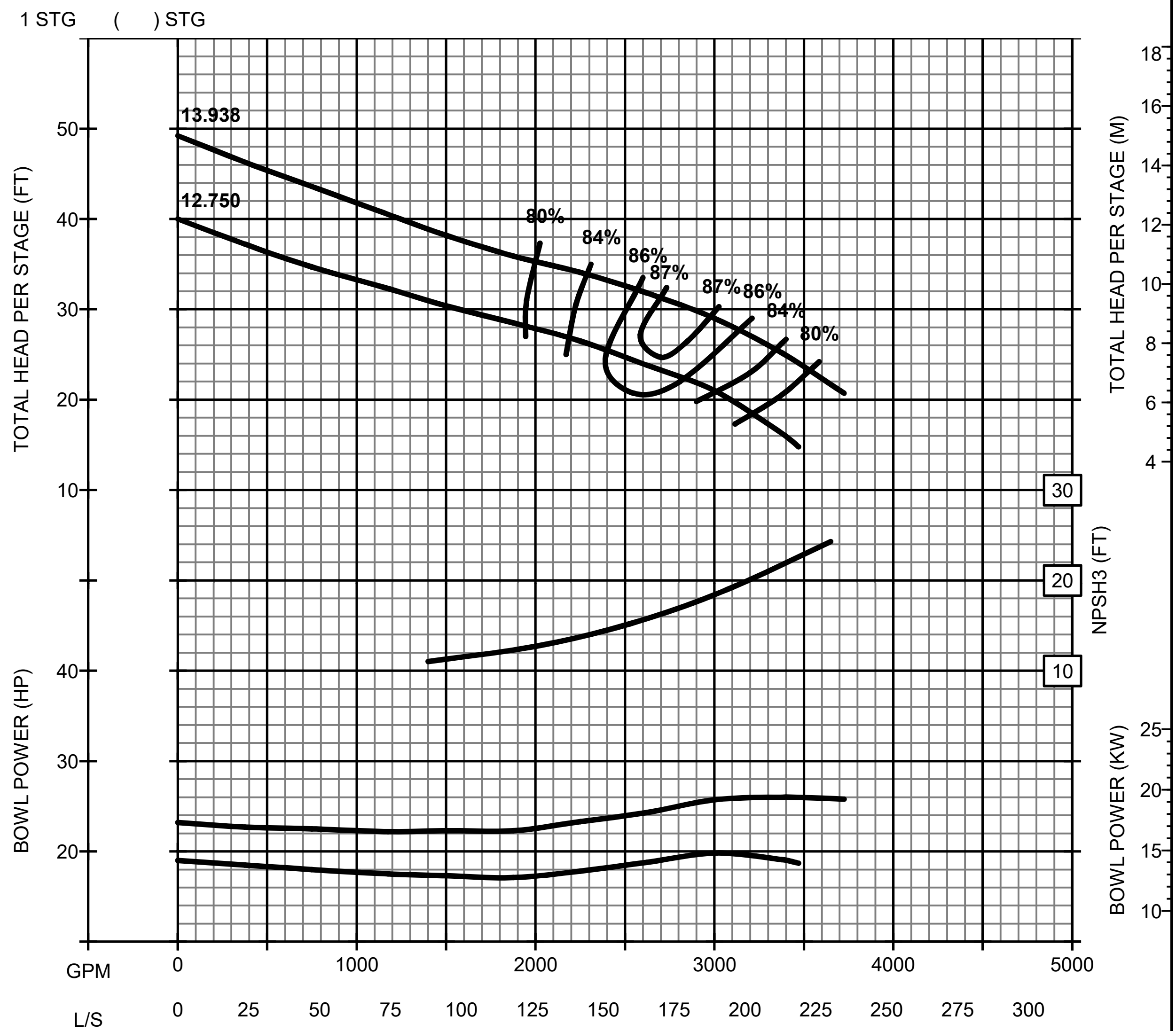
CVK20LC8P6CY

CURVE TEMPLATE 08.05.2011

880 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	K20MC 880 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2			DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-2	0							

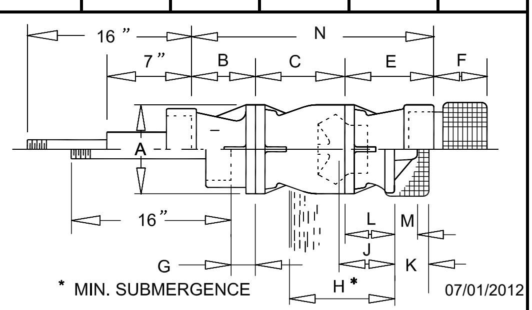


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	19.25	6.44	18.25	N/A	N/A	1.81	48.00	11.25	13.88	10.50	5.125	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	12", 14"
THRUST CONSTANT:	33.0	SUCTION SIZE:	BELL
LATERAL (STD):	1.00	STD. TUBE:	N/A
EYE AREA IN^2:	72.6	WR^2 LB-FT^2:	20.26
SHAFT DIA:	2.438	1ST STG WT LB: 730	ADD STG WT LB: 510

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVK20MC8P6CY

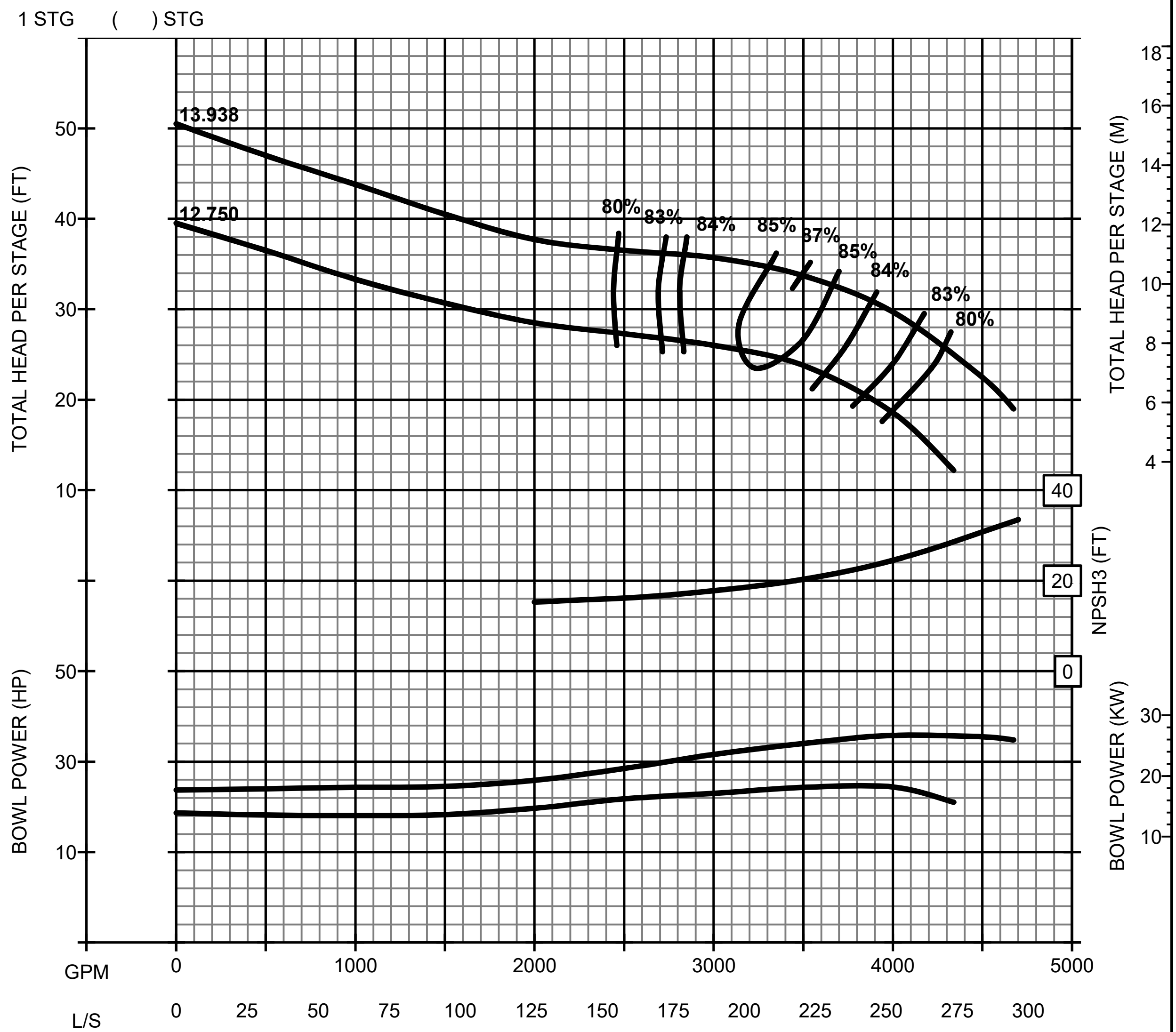
CURVE TEMPLATE 08.05.2011

880 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	K20HC 880 RPM

CHANGE EFFICIENCY AS FOLLOWS					
NUMBER OF STAGES	1	2			
NUMBER OF POINTS	-2	0			

DESIGN	GPM	TDH	HP	EFF



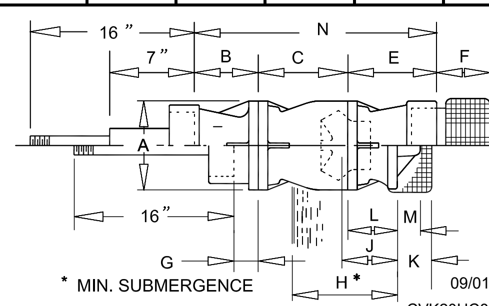
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	19.25	6.44	18.25	N/A	N/A	1.81	48.00	11.25	13.88	10.50	5.125	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	12", 14"
THRUST CONSTANT:	33.0	SUCTION SIZE:	BELL
LATERAL (STD):	1.00	STD. TUBE:	N/A
EYE AREA IN^2:	72.6	WR^2 LB-FT^2:	20.26
SHAFT DIA:	2.438	1ST STG WT LB: 730	ADD STG WT LB: 510

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

09/01/2011

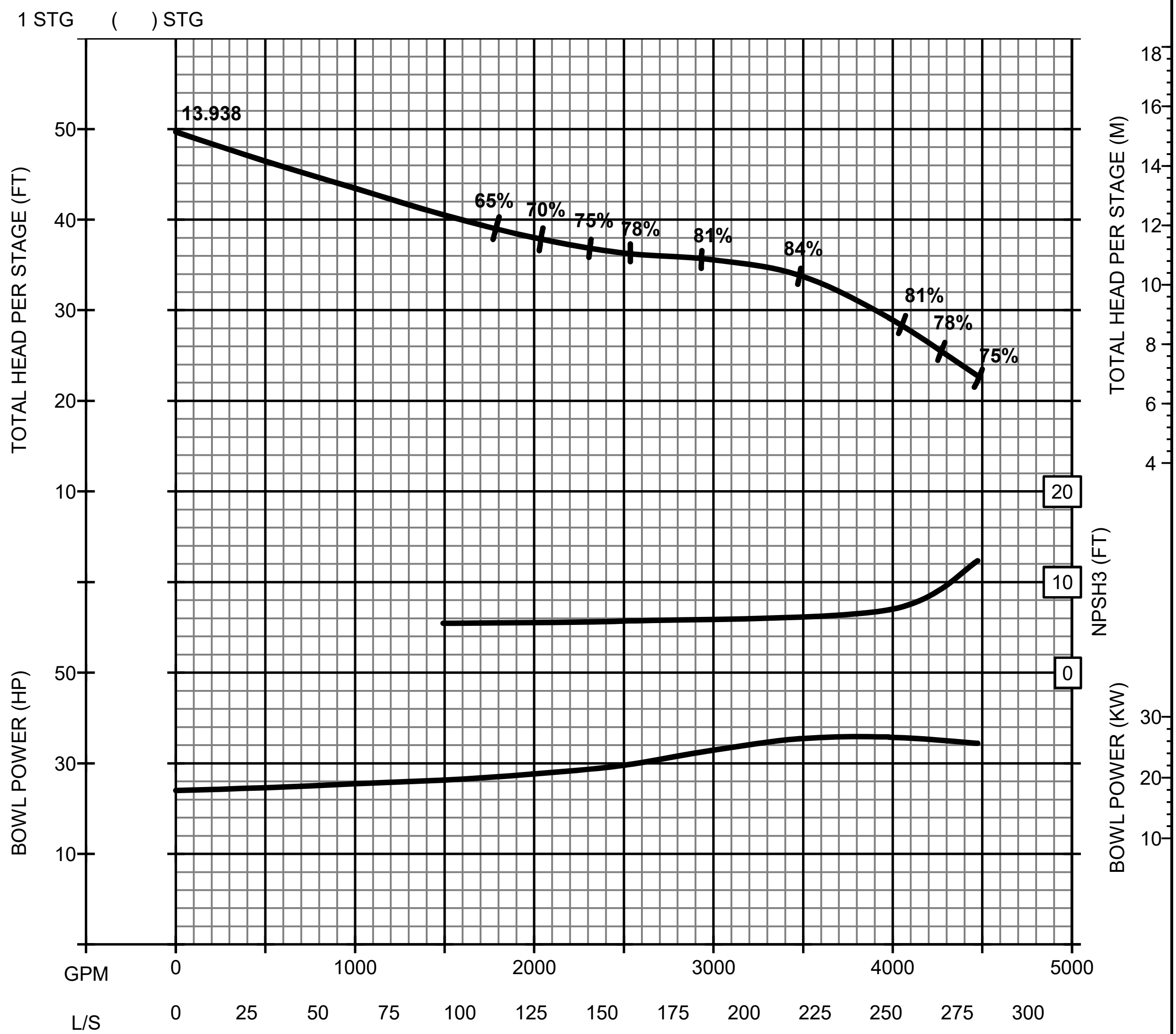
CVK20HC8P5CY

CURVE TEMPLATE 08.05.2011

880 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	K20HC-S 880 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	-	-	-	-	DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-	-	-	-					

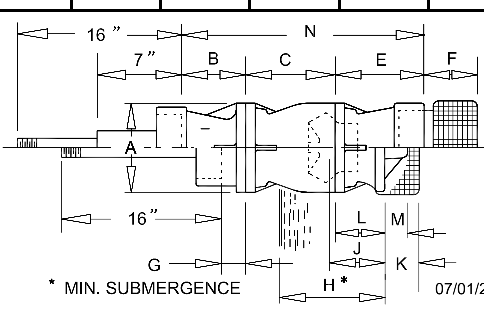


DIMENSIONS IN INCHES	A**	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	19.25	N/A	18.25	N/A	N/A	1.81	48.00	11.25	13.88	10.50	5.13	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	12", 14"
THRUST CONSTANT:	35.2	SUCTION SIZE:	BELL
LATERAL (STD):	1.00	STD. TUBE:	N/A
EYE AREA IN²:	83.91	WR² LB-FT²:	20.26
SHAFT DIA:	2.438	1ST STG WT LB: 730	ADD STG WT LB: 510

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.
BELL DIAMETER IS 20.65 ***LOW NPSH IMPELLER FOR 1ST STG ONLY*



* MIN. SUBMERGENCE

07/01/2012
CVK20HC-S8P6CY

CURVE TEMPLATE 08.05.2011

880 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED

NATIONAL PUMP COMPANY

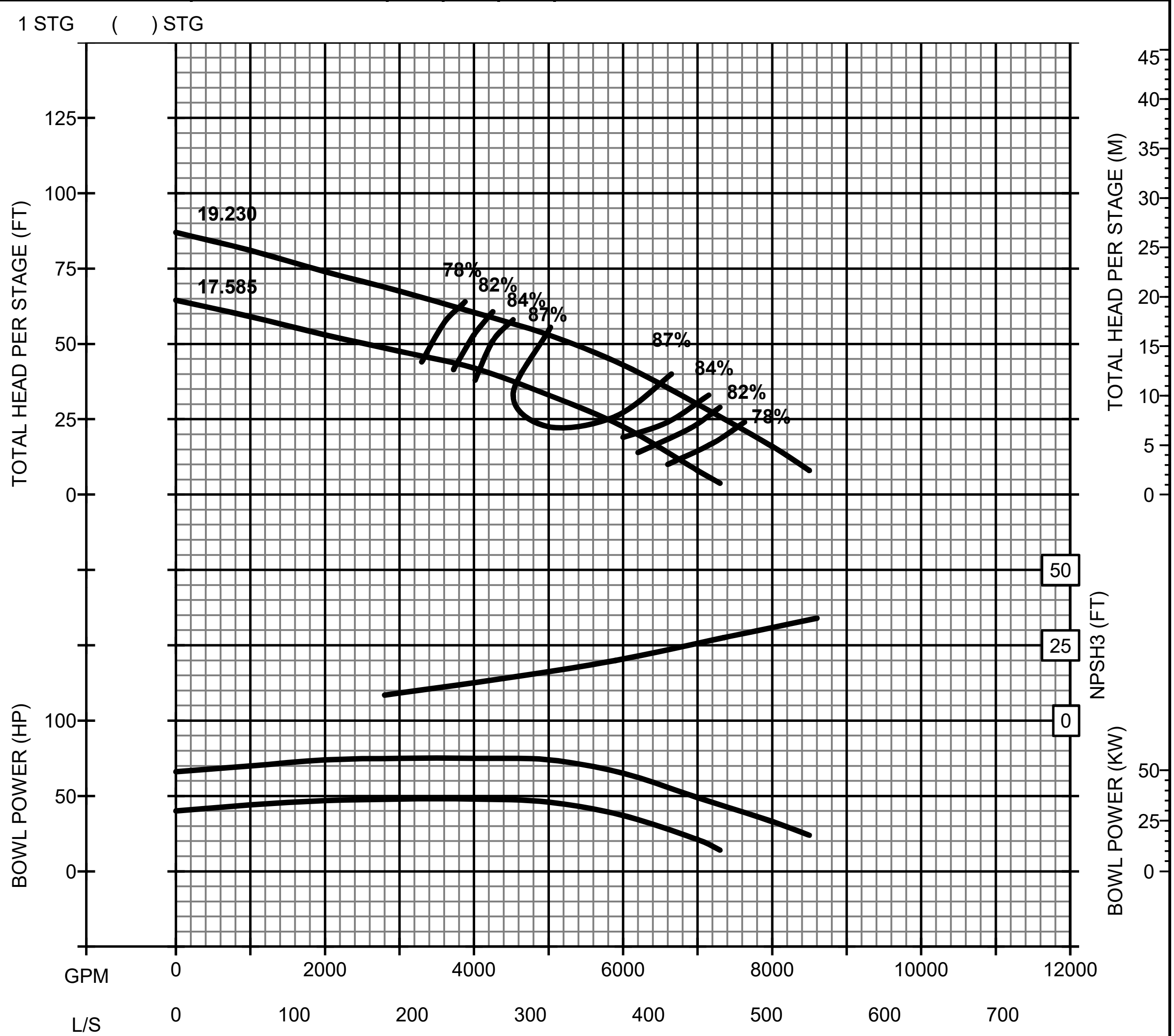
A GORMAN-RUPP COMPANY

H24LC

880 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2		
	NUMBER OF POINTS	-1	0		

DESIGN	GPM	TDH	HP	EFF



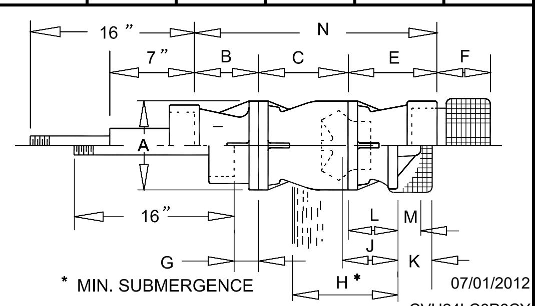
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	23.25	N/A	21.75	N/A	N/A	N/A	48.00	11.75	16.00	11.50	5.63	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	FLANGED
THRUST CONSTANT:	53.0	SUCTION SIZE:	BELL
LATERAL (STD):	1.25	STD. TUBE:	N/A
EYE AREA IN²:	128.00	WR² LB-FT²:	51.1
SHAFT DIA:	2.688	1ST STG WT LB: 762	ADD STG WT LB: 541

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

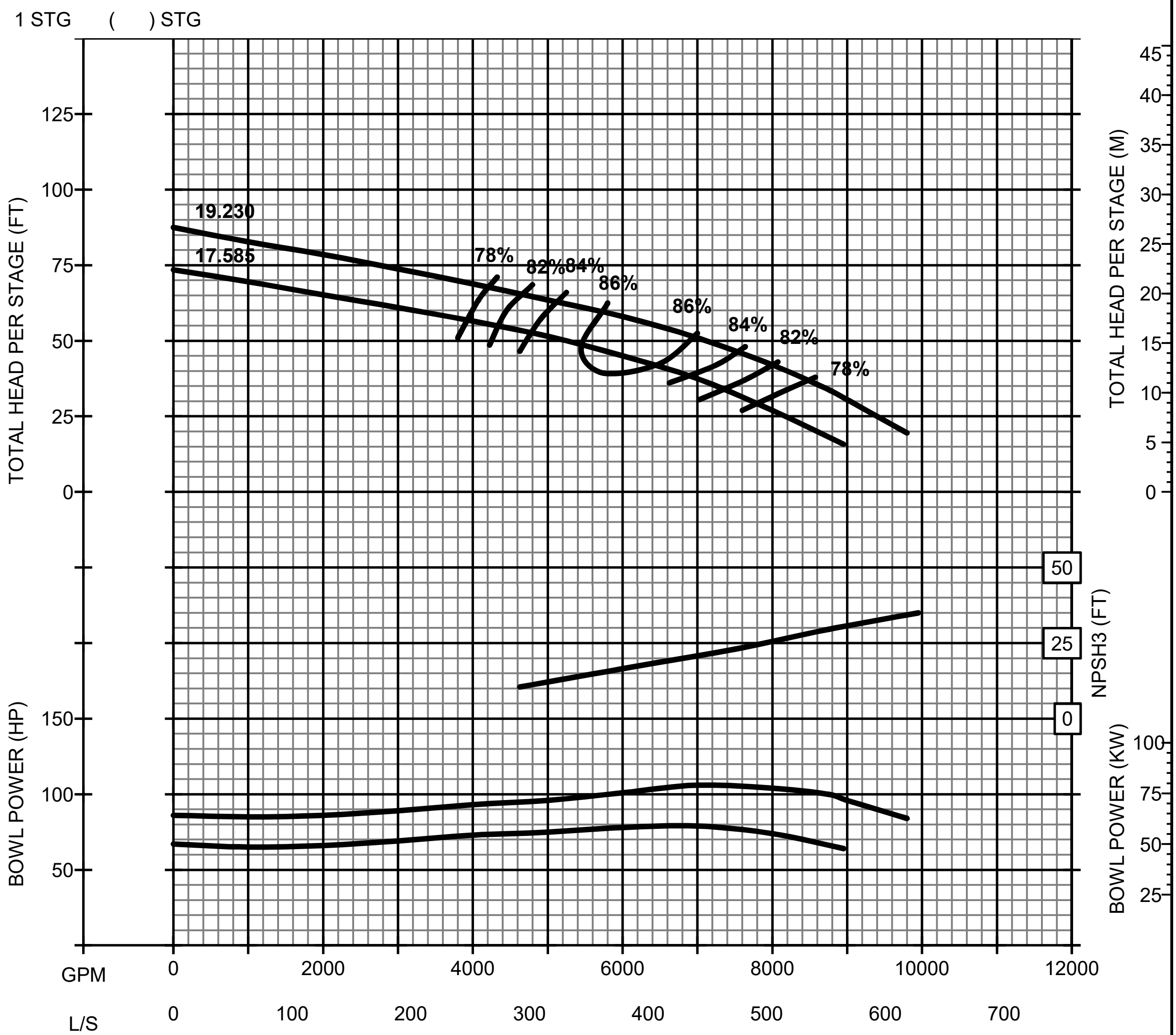
CVH24LC8P6CY

CURVE TEMPLATE 08.05.2011

880 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	H24MC 880 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2			DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-1	0							

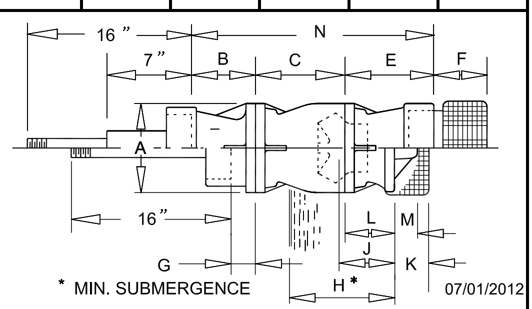


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	23.25	N/A	21.75	N/A	N/A	N/A	48.00	11.75	16.00	11.50	5.63	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	FLANGED
THRUST CONSTANT:	53.0	SUCTION SIZE:	BELL
LATERAL (STD):	1.25	STD. TUBE:	N/A
EYE AREA IN²:	128.00	WR² LB-FT²:	51.1
SHAFT DIA:	2.688	1ST STG WT LB: 762	ADD STG WT LB: 541

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

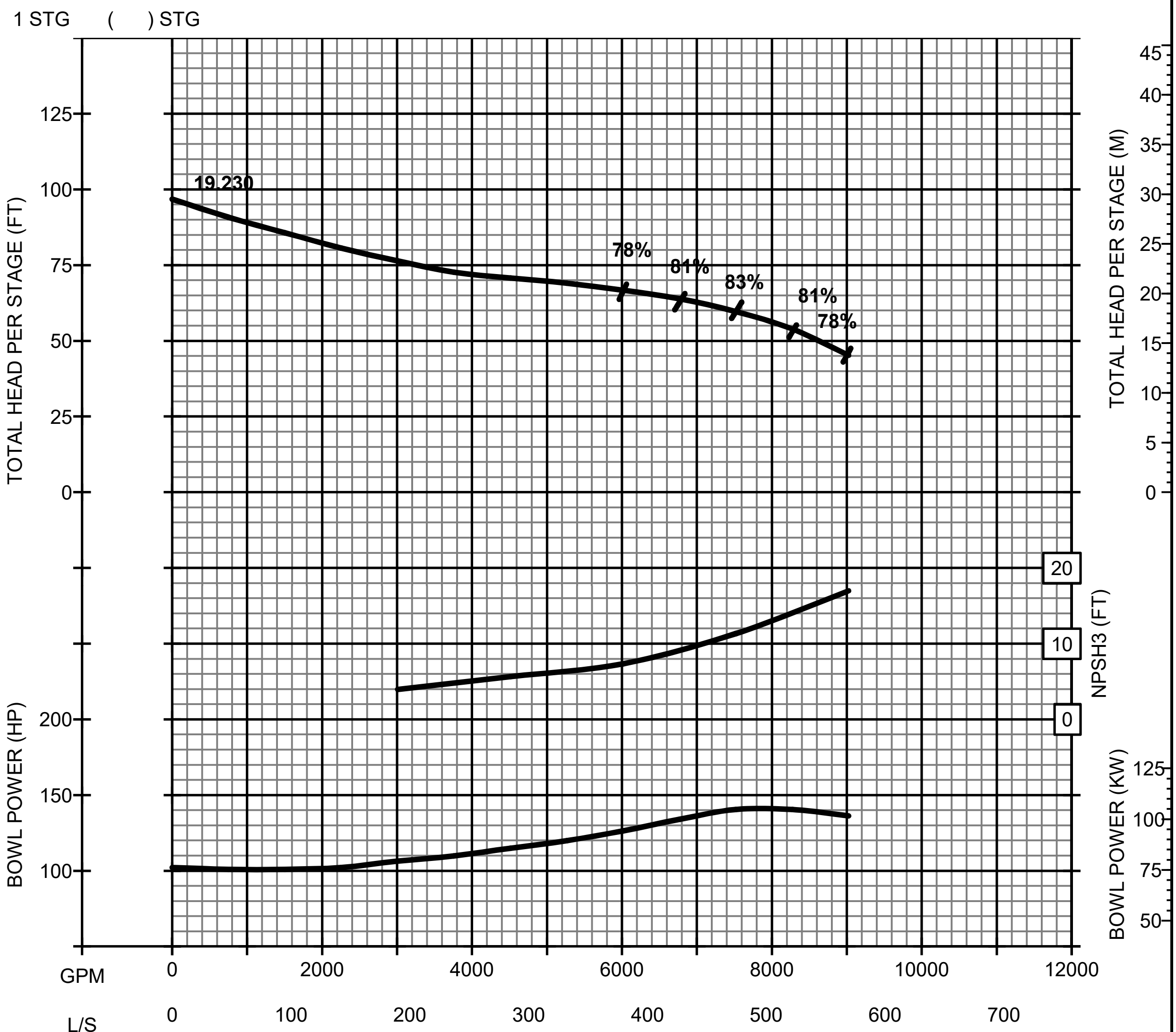
07/01/2012
CVH24MC8P6CY

CURVE TEMPLATE 08.05.2011

880 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	H24MC-S 880 RPM

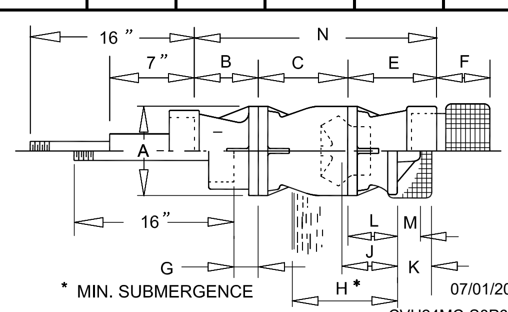
CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	—	—	—	—	DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	—	—	—	—					



DIMENSIONS IN INCHES	A**	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	23.25	N/A	21.75	N/A	N/A	N/A	48.00	11.75	16.00	11.50	5.63	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	6	DISCHARGE SIZE:	FLANGED
THRUST CONSTANT:	78.1	SUCTION SIZE:	BELL
LATERAL (STD):	1.25	STD. TUBE:	N/A
EYE AREA IN^2:	146.50	WR^2 LB-FT^2:	51.1
SHAFT DIA:	2.688	1ST STG WT LB: 762	ADD STG WT LB: N/A



*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.
**BELL DIAMETER IS 28.75. ***LOW NPSH IMPELLER FOR 1ST STAGE ONLY.

* MIN. SUBMERGENCE

07/01/2012
CVH24MC-S8P6CY

CURVE TEMPLATE 08.05.2011

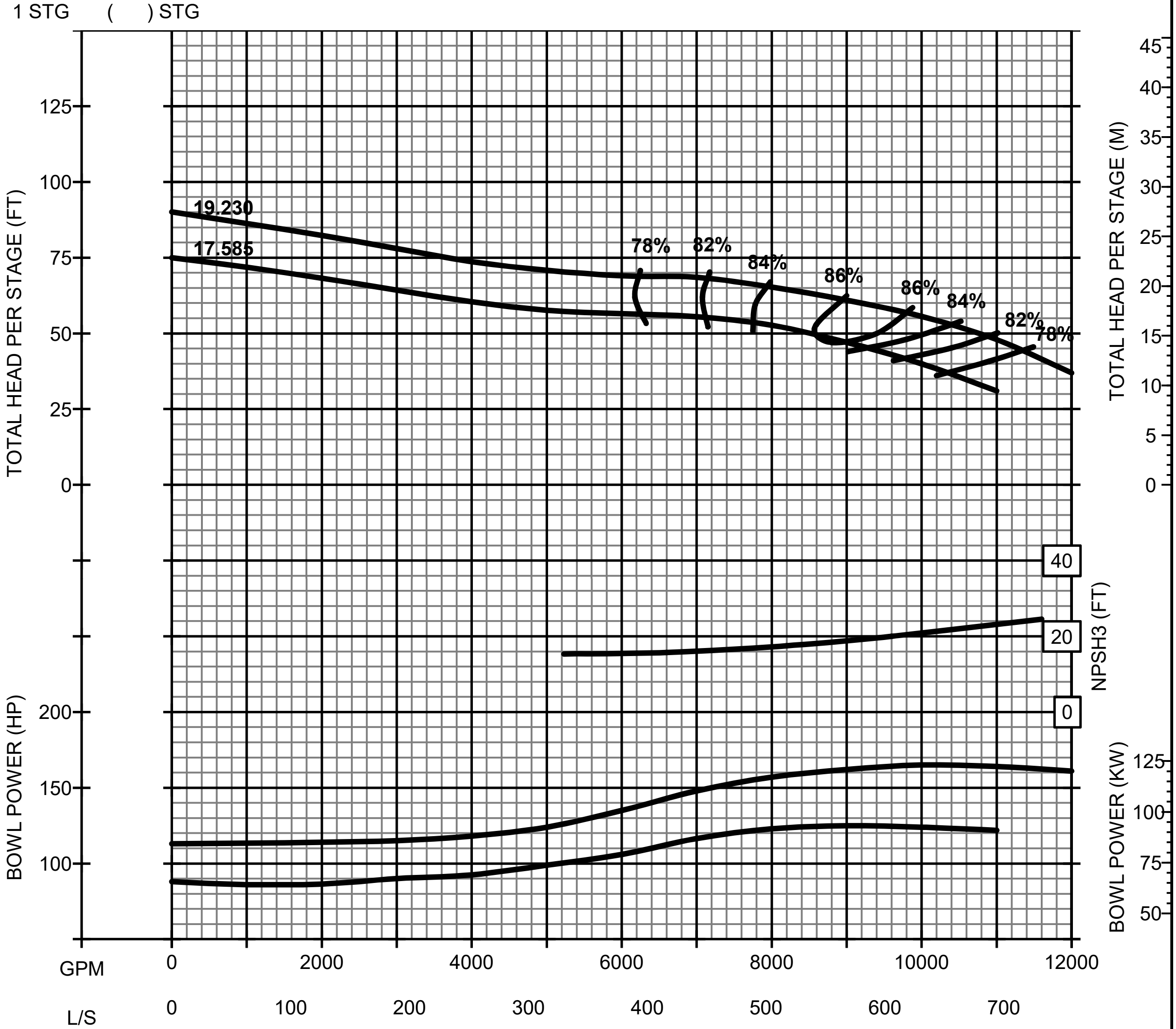
880 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	H24XHC 880 RPM

CHANGE EFFICIENCY AS FOLLOWS					
	NUMBER OF STAGES	1	2		
	NUMBER OF POINTS	-1	0		

DESIGN	GPM	TDH	HP	EFF

1 STG ( ) STG



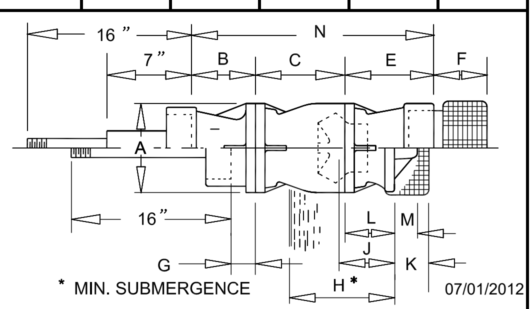
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	23.25	N/A	21.75	N/A	N/A	N/A	48.00	11.75	16.00	11.50	5.63	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	FLANGED
THRUST CONSTANT:	57.80	SUCTION SIZE:	BELL
LATERAL (STD):	1.25	STD. TUBE:	N/A
EYE AREA IN^2:	128.00	WR^2 LB-FT^2:	51.1
SHAFT DIA:	2.688	1ST STG WT LB: 762	ADD STG WT LB: 541

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

CVH24XHC8P6CY

CURVE TEMPLATE 08.05.2011

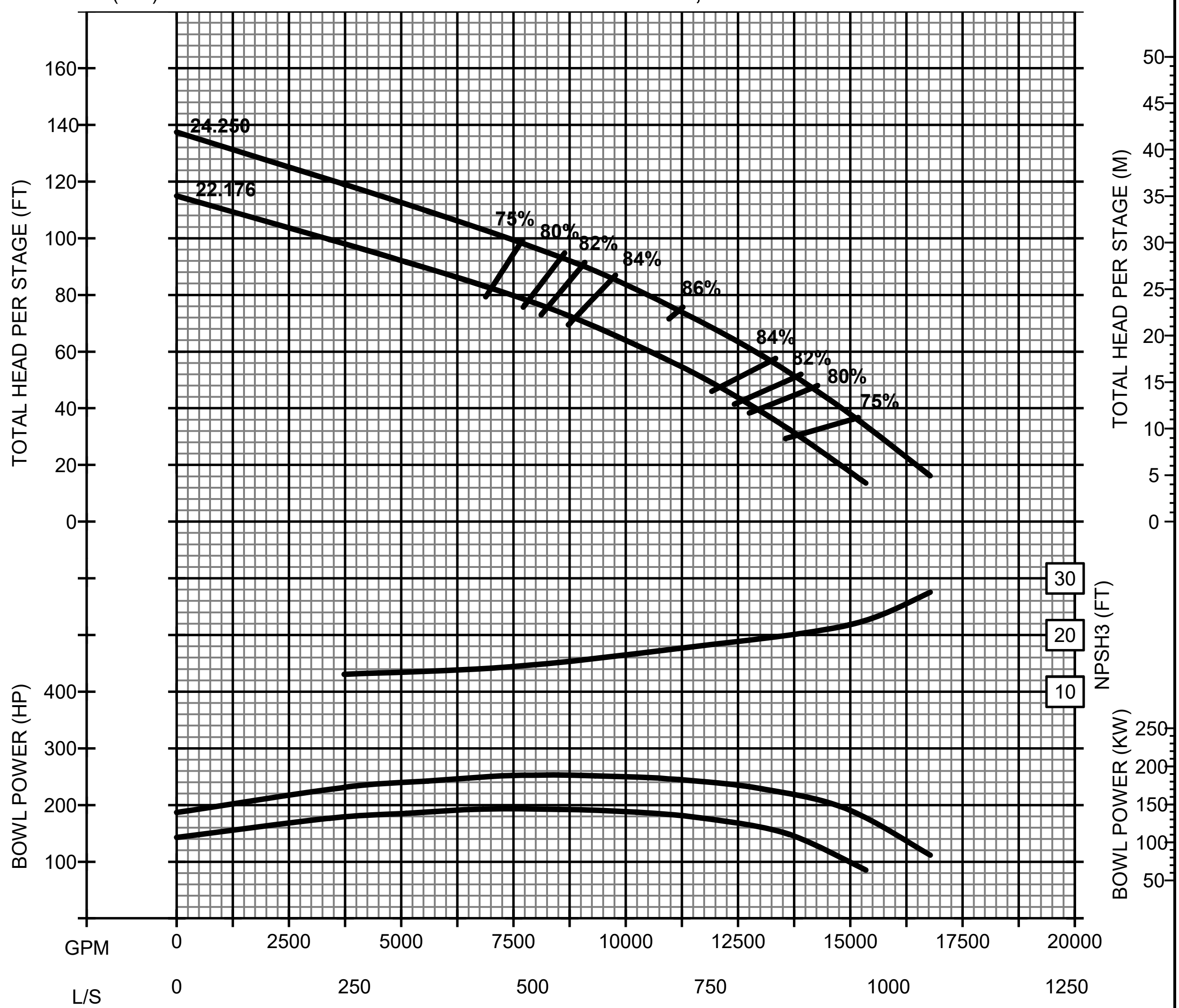
880 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	H30LC 880 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2							
	NUMBER OF POINTS	-1	0							

1 STG ( ) STG

TEMPORARY CURVE, CONTACT FACTORY



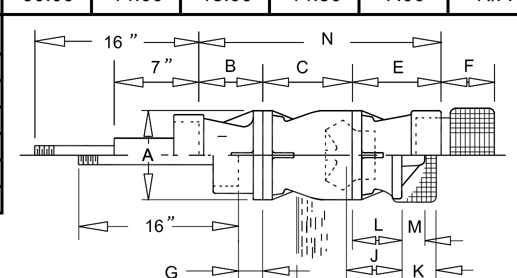
DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	29.10	N/A	21.75	N/A	N/A	N/A	60.00	14.00	18.00	14.50	7.00	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	N/A
THRUST CONSTANT:	85.0	SUCTION SIZE:	N/A
LATERAL (STD):	1.50	STD. TUBE:	N/A
EYE AREA IN²:	187.0	WR² LB-FT²:	101
SHAFT DIA:	3.50	1ST STG WT LB: 2020	ADD STG WT LB: 1472

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.

PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012

CVH30LC8P6CY

CURVE TEMPLATE 08.05.2011

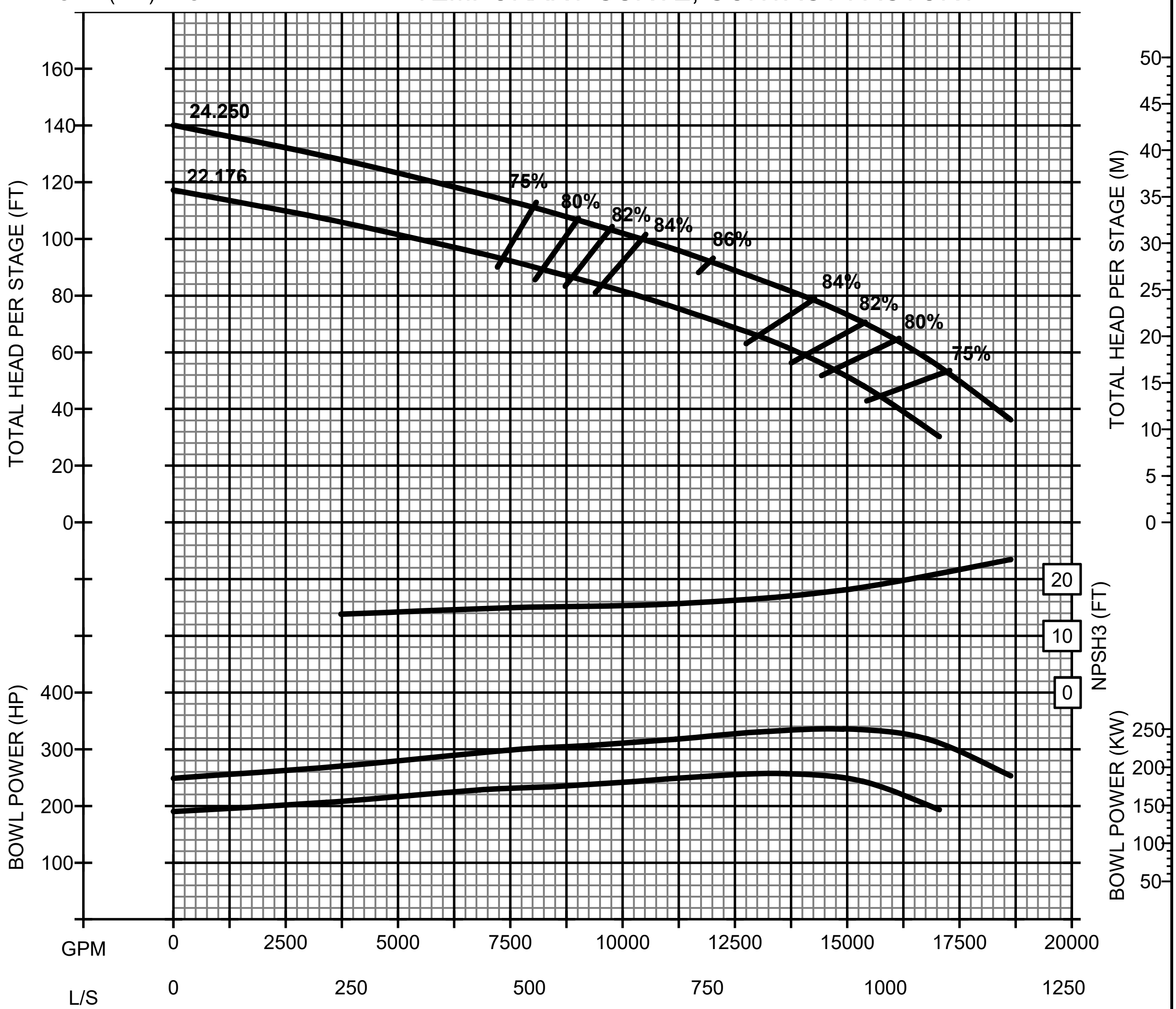
880 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	H30MC 880 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2							
	NUMBER OF POINTS	-1	0							

1 STG ( ) STG

TEMPORARY CURVE, CONTACT FACTORY

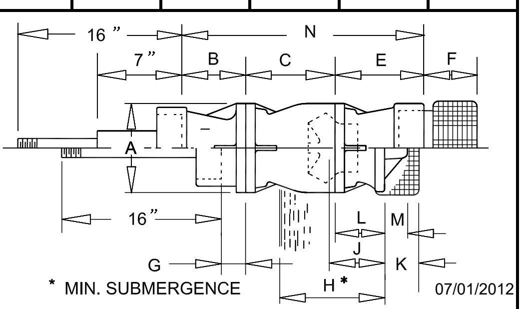


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	29.10	N/A	21.75	N/A	N/A	N/A	60.00	14.00	18.00	14.50	7.00	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	5	DISCHARGE SIZE:	N/A
THRUST CONSTANT:	85.0	SUCTION SIZE:	N/A
LATERAL (STD):	1.50	STD. TUBE:	N/A
EYE AREA IN^2:	187.0	WR^2 LB-FT^2:	101
SHAFT DIA:	3.50	1ST STG WT LB: 2020	ADD STG WT LB: 1472

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVH30MC8P6CY

CURVE TEMPLATE 08.05.2011

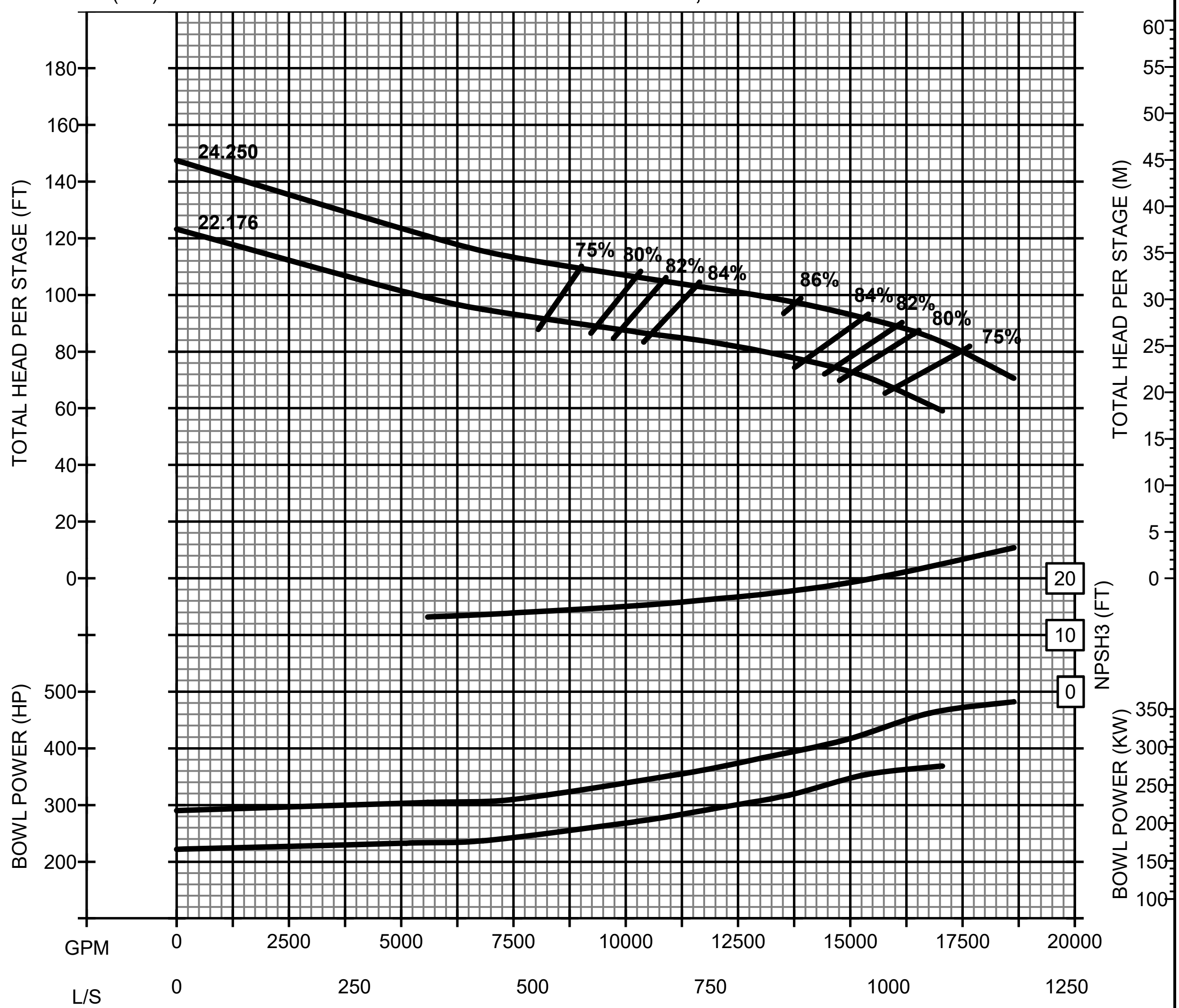
880 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP COMPANY A GORMAN-RUPP COMPANY	# H30HC 880 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2			DESIGN	GPM	TDH	HP	EFF
	NUMBER OF POINTS	-1	0							

1 STG ( ) STG

TEMPORARY CURVE, CONTACT FACTORY

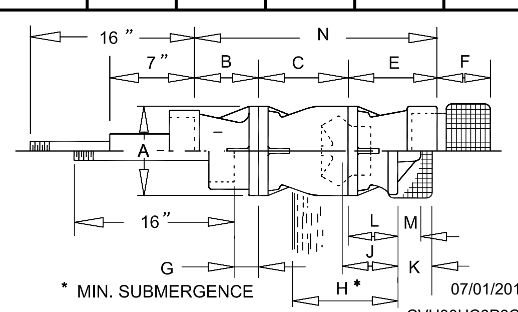


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	29.10	N/A	21.75	N/A	N/A	N/A	60.00	14.00	18.00	14.50	7.00	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	N/A
THRUST CONSTANT:	85.0	SUCTION SIZE:	N/A
LATERAL (STD):	1.50	STD. TUBE:	N/A
EYE AREA IN^2:	187.0	WR^2 LB-FT^2:	101
SHAFT DIA:	3.50	1ST STG WT LB: 2020	ADD STG WT LB: 1472

*THIS DIMENISION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.



* MIN. SUBMERGENCE

07/01/2012
CVH30HC8P6CY

CURVE TEMPLATE 08.05.2011

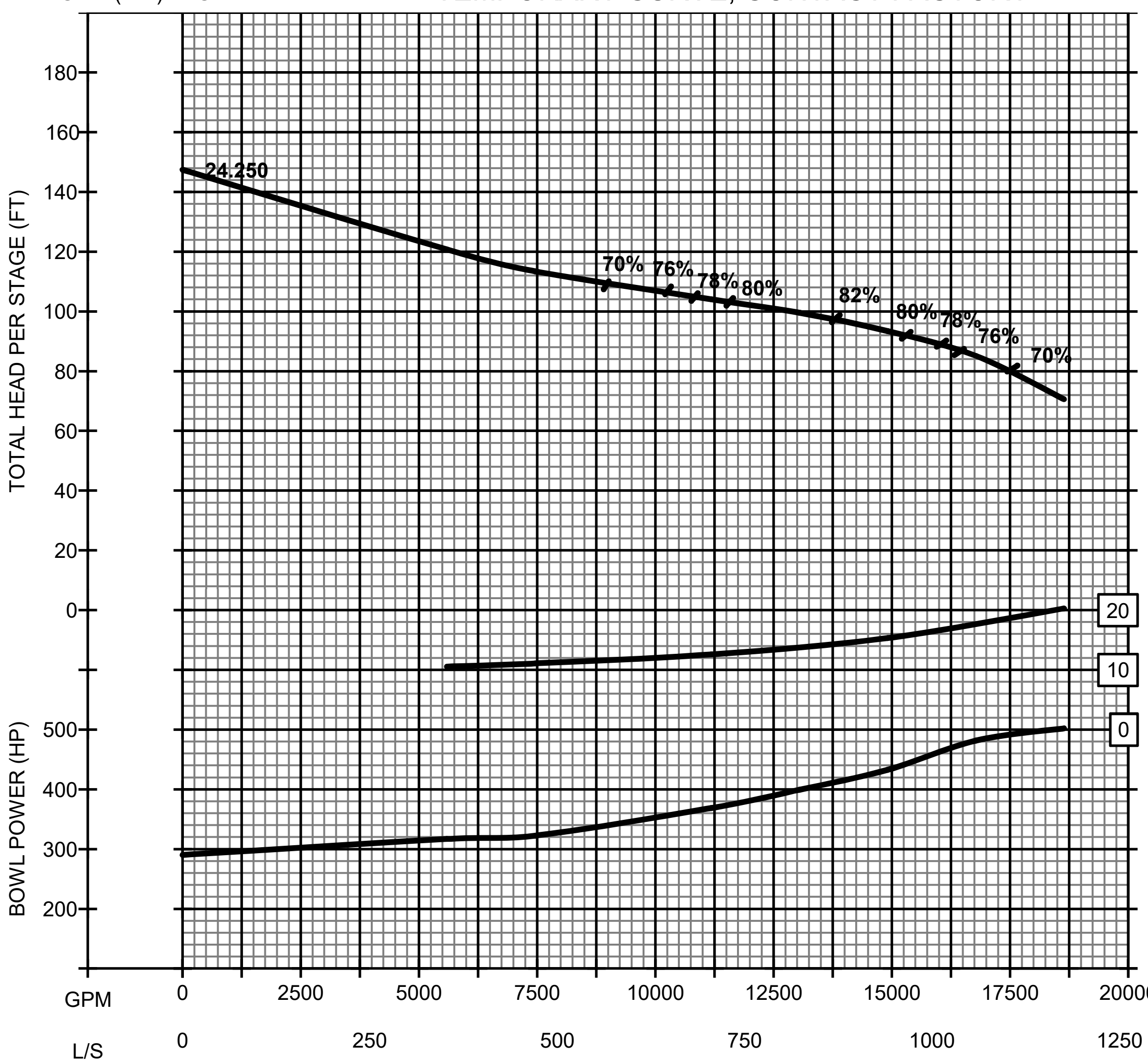
880 CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON-AERATED WATER AT 85° F MAXIMUM UNLESS OTHERWISE SPECIFIED	NATIONAL PUMP® COMPANY A GORMAN-RUPP COMPANY	H30HC-S 880 RPM

CHANGE EFFICIENCY AS FOLLOWS						DESIGN	GPM	TDH	HP	EFF
	NUMBER OF STAGES	1	2							
	NUMBER OF POINTS	-1	0							

1 STG ( ) STG

TEMPORARY CURVE, CONTACT FACTORY

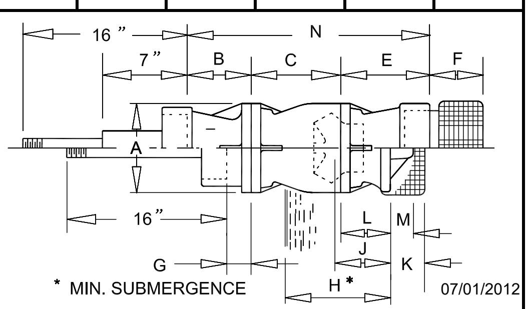


DIMENSIONS IN INCHES	A	B	C ADD/STG	E	F	G	H*	J	K	L	M	N
	29.10	N/A	21.75	N/A	N/A	N/A	60.00	14.00	18.00	14.50	7.00	N/A

PUMP DATA

IMPELLER:	ENCLOSED	BOWL CONNECTION:	FLANGED
NO. OF VANES:	8	DISCHARGE SIZE:	N/A
THRUST CONSTANT:	85.0	SUCTION SIZE:	N/A
LATERAL (STD):	1.50	STD. TUBE:	N/A
EYE AREA IN²:	187.0	WR² LB-FT²:	101
SHAFT DIA:	3.50	1ST STG WT LB: 2020	ADD STG WT LB: 1472

*THIS DIMENSION TO BE USED WITH NPSH3. PUMP INSTALLATION AND SYSTEM MUST SATISY BOTH VALUES.
PERFORMANCE BASED ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLER UNLESS OTHERWISE SPECIFIED.
LOW NPSH IMPELLER FOR 1ST ONLY



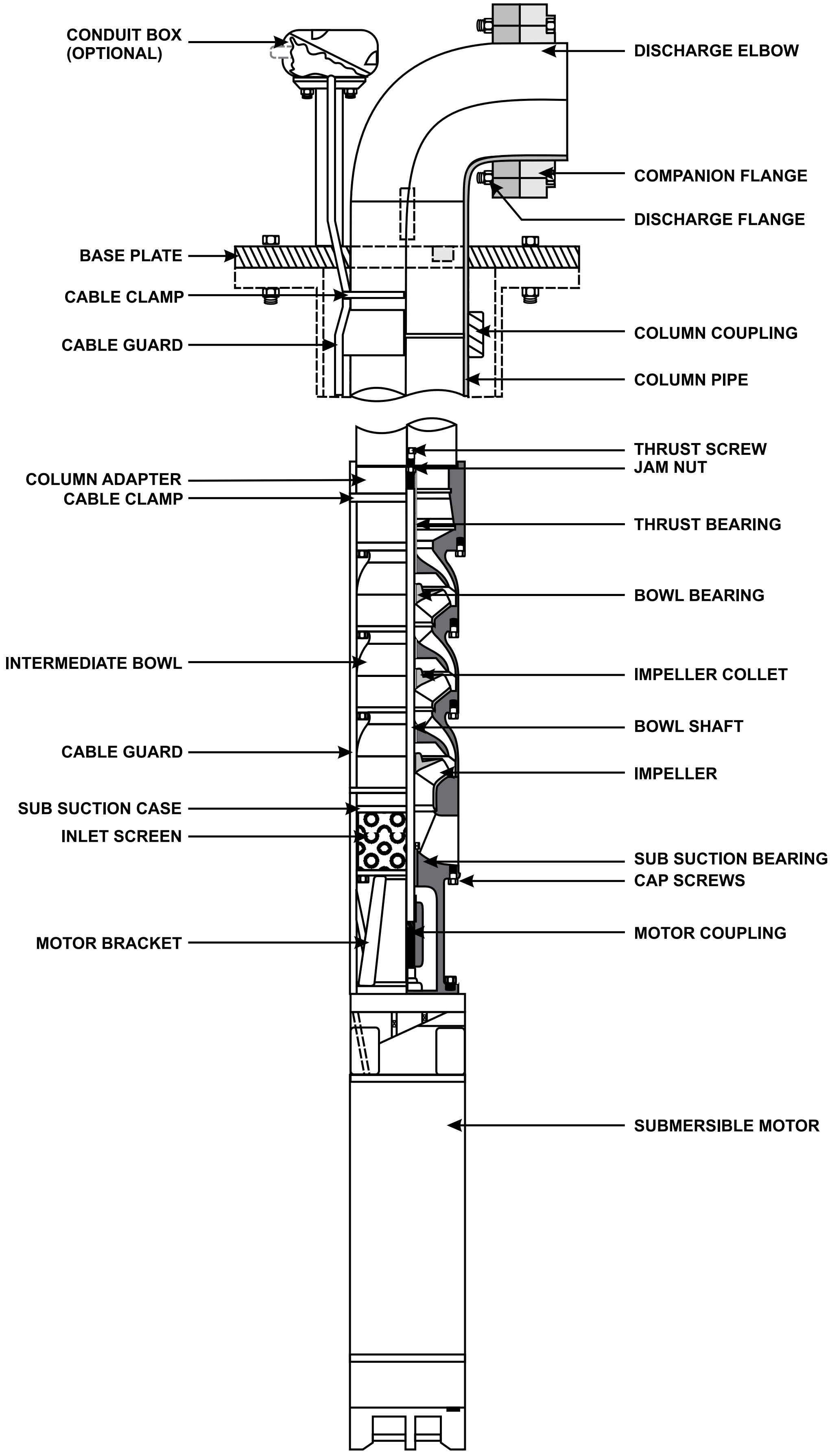
* MIN. SUBMERGENCE

07/01/2012
CVH30HC-S8P6CY

CURVE TEMPLATE 08.05.2011

880 CURVES

SUBMERSIBLE PUMP



SUBMERSIBLES

SUB SAMPLE SPECIFICATIONS

GENERAL

The contractor shall furnish, completely installed, including connection to the motor starter, one (1) NATIONAL vertical turbine submersible pump, Model No. __________ and appurtenances to meet the requirements herein or as shown on the drawings or approved equal. Concrete foundations, piping beyond the pump discharge, and wiring beyond the motor starter will be provided by others. The pump is to deliver a capacity of ____________ GPM against a total head (not including pump inlet, drop pipe, and discharge elbow losses) of ____________ feet. The setting from the bottom of the surface plate to the top of the bowl section shall be not less than ____________ feet. Pump RPM shall not exceed ____________. The pump will be installed in a ____________" diameter well having a total depth of ____________ feet with static water level ____________ feet below surface and pumping water level ____________ feet below surface when pumping design capacity. Water temperature will not exceed ____________º F.

INFORMATION REQUIRED IN THE PROPOSAL

1. Data Sheet completely filled in.
2. Performance curve showing accepted performance at design point. Curve will show head, capacity, efficiency, and horsepower based on bowl performance and shall cover the complete operation range of the pump from zero capacity to the maximum capacity.
3. Drawings of the proposed equipment giving general dimensions sufficient to determine how the equipment is to be supported and if it will fit within the space available.
4. Any additional information such as descriptive literature, manufacturer's specifications, and other data to demonstrate compliance with these specifications.

DETAILED REQUIREMENTS

PUMP BOWLS

Intermediate bowls and discharge bowls shall be of cast iron enameled, free of foundry imperfection, and other detrimental defects. Bowls may be either flanged or threaded type.

IMPELLERS

The impellers shall be of bronze of the enclosed type and statically balanced. They shall be securely fastened to the impeller shaft with tapered split collets.

IMPELLER SHAFT

Impeller shaft shall be of 416 stainless steel. Shaft shall be of ample size for the horsepower required and shall be supported by bronze bearings on each side of each impeller.

SUCTION CASE

Suction case shall be of cast iron and be provided with a bearing to stabilize shaft, insure accurate alignment between pump shaft and motor shaft and to avoid radial thrust on motor bearing. Suction case shall also incorporate suction screen having minimum open area of 4 times the eye area of the impeller. Flange for connection of the motor must provide accurate rabbet fit to insure positive alignment of pump and motor.

DROP PIPE

Pipe size shall be such that friction loss shall not exceed 5' per 100' of drop pipe and velocity shall not be less than 3.5 ft./sec. based on rated capacity of the pump. The pipe may be furnished in random lengths of approximately 20' per length. Pipe shall be coupled with threaded sleeve type couplings. Pipe and couplings must be 3/4 NPT type threads.

SURFACE PLATE

The surface discharge assembly shall be of fabricated steel. It shall be of ample strength to support the motor, bowl assembly, drop pipe, cable, and column of water. The surface discharge plate shall incorporate suitable watertight openings to accommodate the cable, well vent connection, and water level measuring device. Cable entry shall terminate in watertight conduit box located approximately 12" above the top of the surface plate. Discharge shall be provided with a (flanged elbow) (female thread elbow).

SUB SAMPLE SPECIFICATIONS (CONT.)

CABLE

The cable shall consist of three or more separate conductors (or) a single jacketed three conductor cable assembly. Each conductor shall be insulated with synthetic rubber or plastic suitable for continuous immersion in the liquid being pumped. The cable must be protected by a suitable shield or guard when it passes the bowl section to prevent damage in installation or operation. Cable size shall be such that voltage drop will not exceed 5% under rated operating conditions.

CHECK VALVE

When total head exceeds 200’, a drop pipe check valve is to be used and installed approximately 20’ above bowl section. For settings over 600’, two drop pipe check valves are to be used and the first valve installed approximately 100’ above bowl section and the second valve installed approximately 60% of the distance between the first valve and the surface plate. Valves are to act as surge valves and permit the water in the drop pipe to drain slowly.

MOTOR

The motor shall be designed for operation, completely submerged. The motor shall not be loaded in excess of 115% of name plate rating under any operating condition.

Motor will operate on 3-phase, 60-cycle, ________-volt electric current and shall be suitable for operation with this power supply.

Motor thrust bearing rating must be ample to carry the thrust load imposed by the pump when operating under the maximum anticipated pumping head. With the motor in the “shaft up” position, direction of thrust shall be downward. Motor thrust bearing must be capable of operating with rotation in either direction, and thrust capacity, when operated in reverse rotation, shall not be less than 75% of rated thrust capacity.

An expansion chamber diaphragm shall be provided to relieve thermal expansion of internal motor fluid due to temperature variation and shall provide motor internal and external pressure balance under all conditions of temperature and pressure.

Shaft shall be Type 416 stainless steel or equivalent corrosion resistant material. Outer shell shall be of material to resist corrosion.

DATA REQUIRED

The following data must be filled in and included with the proposal:

PUMP DATA

Design Capacity	____________GPM
Design Head	____________FT. T.D.H.
Pump Efficiency - Field	____________%
Pump Horsepower - Field	____________HP
Total Pump Downthrust	____________LBS.
Impeller Shaft Diameter	____________IN.
Drop Pipe Diameter (nominal)	____________IN.
Drop Pipe Weight	____________LBS./FT.
Length of Drop Pipe	____________FT.
Size of Discharge (nominal)	____________IN.
Cable Size	____________AWG#

MOTOR DATA

Manufacturer	____________
Motor Rating	____________HP
Full Load Speed	____________RPM
Full Load Amperes	____________AMPS
Thrust Bearing Rating	____________LBS.
Electric Characteristics	____________PHASE
	____________CYCLE
	____________VOLTS
Weight of Pump and Motor	____________LBS.

SUBMERSIBLES

SUBMERSIBLE PUMP APPLICATION

The submersible pump is a type of construction in which the driving motor is coupled directly to the turbine bowl assembly and is designed to be submerged in the fluid pumped. Power is supplied to the motor by means of waterproof electrical cable running from the motor to the power source.

Submersible pumps are suitable for most applications.

Since the complete unit is either enclosed or below the surface of the ground, there are several applications where the submersible pump has many advantages. Some of the more important are: (1) extremely deep wells which may present problems with shafting, especially if the well is crooked, (2) installation subjected to surface flooding which may be damaging to electric motors, (3) applications such as booster pumps that are in locations that require quiet operation, (4) installations where there is little or no floor space to install the unit, such as under a street or sidewalk, (5) horizontal pipe line booster pumps placed directly in the pipe line, and (6) agriculture installations where time consuming maintenance operations offers a great savings and security from ever rising vandalism of irrigation pumping units.

OPERATION
These pumps may be operated and controlled in the same manner as any other type of turbine pump in similar applications. No special consideration peculiar to the submersible is generally necessary, with the exception of the motor starting equipment. This is due to the fact that the motor, being installed in the pumped fluid, may not be subjected to the same ambient temperature as the overload relays in the starter. Overload protection is a must for submersibles. Unless the correct overload protection is used on all three motor legs, the motor warranty is void. Why? For two reasons: (1) for running protection and (2) if the motor stalls, power must be cut within 10 seconds or you may damage the motor windings. In three-phase submersible motors, use ambient compensated, quick trip heaters.

CONSIDERATIONS
Submersible pumps can be built in sizes up to several hundred horsepower for most applications where this type of construction is practical. However, there are some uses that do not lend themselves too well to this pump. Among these are high fluid temperatures, unusually corrosive applications, or a large amount of abrasives.

SUB MOTOR COOLING
It is important that the motor have an adequate flow of water passing it to maintain proper operating temperature and avoid premature failure. If the well casing is “oversize” or the motor is installed in a “pit” or “pond”, or the inflow from the well is above the pump, a closed top shroud of the proper size must be installed above the pump suction inlet to force the liquid to pass the motor before entering the pump. Since recommendations vary between motor manufacturers and temperature of liquid and installation configurations, it is important that the application be reviewed with the particular motor manufacturer involved for proper sizing of the motor shroud.

CROOKED WELLS
A submersible pump will give better service in a crooked well than a lineshaft type pump since the length of the rotating parts are much shorter. Where the well is known to be crooked, a gage of the same length and diameter of the motor and bowl section assembly should be lowered into the well on at least 40 feet of pipe of the size to be installed on the unit. If the gage with pipe can be lowered to the depth at which the pump will be set, a submersible pump can be installed. Never install a pump in a well known to be crooked without gaging the well.

BOOSTERS
The submersible pump has been designed for pipe line booster service for industry, municipal water systems, petroleum products pipe lines, and other booster applications. The unique design enables the submersible, ordinarily operated in a vertical setting, to be suspended horizontally within the pipe line, and furnish a powerful booster to the liquid being carried by the line. The many advantages of noiseless operation, close-coupled motor and bowl assembly, totally enclosed motor operating completely immersed in the line liquid, economy of operation, and completely new ease of access to the pump and motor all combine to make this new concept of submersible booster operation the engineered answer to pipe line booster problems. Costly pump houses to maintain and keep clean, additional property to purchase, motor damage from heat, dust and moisture, possibility of vandalism, stuffing boxes and packing gland maintenance are completely eliminated. The submersible installation makes all of these obsolete.

The horizontal application enables the submersible unit to be fitted into a special section of the pipe line. This section is flanged at each end and becomes an integral part of the line. Within this section, the motor is centered and firmly held by special spiders. The line liquid is drawn past the motor and into the bowl assembly which passes it along at a greatly increased pressure. The submersible power cable is clamped firmly to the bowl assembly and leads to a terminal box mounted on the outside of the special section and from there to a control box.

The vertical application enables the submersible unit to be fitted into a canister used as a booster in many places.

SUBMERSIBLE PUMP SELECTION

A submersible pump consists of the following basic elements:

< Bowl Assembly
< Motor
< Cable
< Drop Pipe
< Surface Plate (with)(without) discharge elbow

DATA REQUIRED FOR SELECTION

< Capacity in GPM
< Static and Pumping Levels in Well
< Setting Required (drop pipe)
< Well I.D. Diameter
< Electric Characteristics

DETERMINATION OF TOTAL HEAD

Total head = H + P + F where:

H = Distance from surface to water level when pumping
P = Pressure (head) at pump discharge
F = Drop pipe friction (+) check valve(s) loss

BOWL ASSEMBLY SELECTION

Select impeller in exactly the same manner as for lineshaft type pump. Note comments under WELL SIZE.

DROP PIPE SELECTION

Size of drop pipe is selected based on the capacity to be pumped. Submersible pumps frequently require smaller drop pipe than do line shaft pumps since the full area of the pipe is used to deliver water to the surface.

Minimum velocity in drop pipe should not be less than 3.5Ft./Sec.

We recommend drop pipe size be selected to limit the maximum friction loss to 5' per 100' of pipe. Selection table is based upon this limitation. Smaller size drop pipe may be used when bowl assembly and motor are adequate for operation with the increased head and horsepower.

Pipe furnished by others must be standard pipe with 3/4 taper NPT threading throughout and to connect to the bowl assembly and surface plate.

CHECK VALVES

Where total head exceeds 200', the use of a drop pipe check valve is recommended. Check valve should be located approximately 20' above the bowl assembly. For settings over 600', the use of two check valves are recommended, with the first valve approximately 100' above bowl unit and the second located approximately 60% of the distance between the first valve and the surface plate.

SUBMERSIBLE PUMP SELECTION (CONT.)

CABLE SELECTION
Select a drop cable designed for use in water. The insulation on the conductors should be RW, RUW, TW, or their equivalent. DO NOT compromise on drop cable quality. Paying a little more will save you money in the long run. Cable selection chart is based on horsepower, voltage, and length of cable required. Cable sizes and lengths are maximum allowable. Higher operating efficiency will be obtained by using the next larger cable size when lengths approach listed limits. All size and cable lengths shown are for copper wire only.

NOTE: Use of smaller cable than recommended will void warranty.

Select cable length equal to length of setting plus an additional 10' or more to connect to starter at the surface, plus 1 additional foot for each 50' of length in the well to compensate for unavoidable slack in the installation.

SURFACE PLATE
Surface place consists of flat steel plate with connection for drop pipe, hole for entrance of cable, vent hole, hole for air line or water level gauge. Surface plate is supplied (with)(without) elbow. If elbow is furnished, it can be flanged or female thread. Surface plate is selected to match drop pipe size.

MOTOR SELECTION
Motor selection is based upon horsepower required, pump RPM, thrust load, well diameter, and power supply. Also, see comments under WELL SIZE and WATER TEMPERATURE.

STARTING EQUIPMENT
Selecting the proper overload protection is one of the most important factors in obtaining a successful submersible installation. Submersible motor starters should provide the following:

< Positive motor protection against single phasing.
< Positive motor protection against sustained overload in excess of 115% of motor rating.
< Motor protection if rotor is stalled.
< Tripping timers independent of ambient temperature; (Ambient Compensated Quick Trip Heaters).

NOTE: Failure to provide quick trip overload heaters will void warranty.

Also, note that under certain conditions of maximum load on the motor (use of the 1.15 service factor), a starter one size larger may be required.

LIGHTNING PROTECTION
Lightning and power surge damage are major causes of submersible motor failures, so a three-phase lightning arrestor is a must. The arrestor is mounted in the pump panel and grounded to both ground terminals onto pump panel and well head. If you use plastic pipe, the ground wire should also be connected to a stud on the motor to obtain good grounding and maximum benefit from the arrestor.

WARNING: Failure to ground this unit may result in serious electrical shock. A faulty motor or wiring can be a serious electrical shock hazard if it is accessible to human contact. To avoid this danger, connect the motor frame to the power supply grounding terminal with copper conductor no smaller than the circuit conductors. In all installations, connect above ground metal plumbing to the power supply ground per National Article 250-80 to prevent shock hazard.

SELECTION PROCEDURE EXAMPLE

REQUIREMENTS:

Capacity..850 GPM
Head...140 Feet
Pumping Level...................................200 Feet
Well Diameter....................................12” Inside Diameter
Power Supply......................................3 Ph. / 60 Hertz / 480 Volts
Pumping Liquid..................................Fresh Water

1. DETERMINE TOTAL DYNAMIC HEAD: (TDH) = pumping level + head required + drop pipe friction loss + check valve(s) friction

TDH = a. Pumping level..200 Feet
b. Head required..140 Feet
c . 8” drop pipe friction head for 850 GPM is 2.2 feet per 100 feet.
200 feet of new 8” drop pipe has a total loss of 2.2 x 2.0 =..........4.4 Feet
d. Friction head loss in one 8” check valve =......................................2.2 Feet

TOTAL Dynamic Head (TDH)... 346.6 Feet

2. IMPELLER SELECTION:

Since no speed was specified, use 3450 RPM. The S9XHC shows 76% efficiency, full diameter.

a. Number of stages required =

$$\text{No. Stg.} = \frac{\text{TDH}}{\text{Head/Stage}} = \frac{346.6}{125} = 2.78 \text{ USE 3 stages, 75.5\%}$$

b. Total Pump Thrust = TDH x Impeller Thrust Factor x Sp. Gr. + (Rotor weight per stage x number of stages)
(349.55 x 4.9 x 1) + (10.6 x 3) = 1744.6

c. Bowl Horsepower $= \frac{\text{GPM x TDH x Sp. Gr.}}{\text{3960 x Bowl Eff.}} = \frac{850 \times 346.6 \times 1}{3960 \times 75.5\%} = 98.54$ BHP

d. Pump Efficiency $= \frac{\text{GPM x TDH x Sp. Gr.}}{\text{3960 x Bowl H.P.}} = \frac{850 \times 346.6 \times 1}{3960 \times 98.54} = 75.5\%$

SUBMERSIBLES

SELECTION PROCEDURE EXAMPLE (CONT.)

3. MOTOR SELECTION:
   a. Bowl Horsepower = 98.54
   b. Pump Operating Speed = 3450 RPM
   c. Total Pump Thrust = 1744.6
   d. 3 Phase, 60 Hertz, 460 Volts (nameplate)
   e. Thrust Bearing Loss = $\frac{.10 \times \text{Total Pump Thrust}}{1000} = \frac{.10 \times 1744.6}{1000} = .17$ H.P.
   f. Horsepower Loss in Cable:
      Total Cable Length = 200 feet + 10 + 4 = 214 feet
      Select #00 cable from Selection Chart
      100 H.P. motor current = 130 amps full load
      Horsepower loss in #00 cable = $\frac{\text{H.P. loss per 100' x Total Cable Length}}{100} = \frac{.65 \times 214}{100} = 1.39$HP
   g. Total Horsepower: = Bowl horsepower + Thrust HP loss + Cable horsepower loss = 98.54 + 1.39 + .17
      = 100.10 H.P. (100 H.P. motor OK to use.)

4. CABLE SELECTION:
   a. Determine total cable length.
      Total Cable Length = Pumping Level + Surface Length + Slack = 200 + 10 + 4 = 214 feet
   b. Per Cable Selection Chart @ 460 volts horsepower, use #00 cable.

5. SURFACE PLATE:
   Use 8” surface plate.

6. CHECK VALVE:
   One 8” check valve required.

7. CALCULATION OF FIELD PERFORMANCE:
   To determine field head and overall pump efficiency:
   a. Field Head = laboratory head minus total friction loss.
      (1) Total friction loss = loss in drop pipe + check valve(s)
   b. Overall Pump Efficiency = $\frac{\text{Water HP x (motor eff. \% - cable loss \%)}}{\text{Laboratory H.P.}}$
   c. Water Horsepower = $\frac{\text{GPM x Head}}{3960}$
   d. Laboratory Horsepower = $\frac{\text{GPM x Head x Sp. Gr.}}{3960 \times \text{Pump Eff.}}$

Calculations for other values of power consumption can be carried out per equations noted below:

   e. Wire to Water Efficiency - same as Overall Efficiency.
   f. Input Horsepower = $\frac{\text{Pump Brake Horsepower}}{\text{Motor Efficiency - Cable Loss}}$
   g. Wire to Water Horsepower = Same as Input Horsepower
   h. Kilowatt Hours per 100 Gallons = $\frac{\text{Field head x .00314}}{\text{Overall Efficiency}}$
   i. Kilowatts Input = Input Horsepower x 0.746
   j. Gallons per Kilowatt Hour = $\frac{\text{Overall Efficiency x 1000}}{\text{Field Head x .00314}}$

DETERMINATION OF FIELD PERFORMANCE

GENERAL INSTRUCTIONS

1. Select drop pipe size from selection chart.
   (NOTE: 5' per 100' friction loss is maximum; 3.5'/Sec. velocity is minimum.)

   a. Calculate drop pipe friction loss

      $$\text{Friction per 100 feet} \times \frac{\text{drop pipe length}}{100} + \text{check valve friction loss}$$

   b. Calculate Total Dynamic Head (TDH)

      TDH = Pumping level + discharge head required at surface + check valve friction loss + drop pipe friction loss

2. Impeller Selection: From performance curves with known capacity and speed, select the bowl assembly that has its peak efficiency as close as possible to desired capacity. Well I.D. must be larger than bowl diameter. If speed is unknown, the speed should be as high as possible for a given capacity.

   a. Number of stages required $= \frac{\text{TDH}}{\text{Head/stage}} =$ Number of stages

   b. Total Pump Thrust = (TDH x Impeller Thrust Factor x Sp. Gr.) + (rotor weight per stage x number of stages)

   c. Bowl Horsepower $= \frac{\text{GPM x TDH x Sp. Gr.}}{\text{3960 x Bowl Eff.}}$

   d. Pump Efficiency $= \frac{\text{GPM x TDH x Sp. Gr.}}{\text{3960 x Bowl H.P.}}$

SUBMERSIBLES

DETERMINATION OF FIELD PERFORMANCE (CONT.)

3. MOTOR SELECTION:

   Select the proper electric motor from the following:

   a. Bowl Horsepower
   b. Pump Operating Speed
   c. Total Pump Thrust
   d. Electric Power Supply Available
   e. Thrust Bearing Loss in H.P.
      Horsepower loss per 1000# thrust (given by manufacturer is approx. .09 per 1000# thrust; use .10 H.P. per 1000#) =

$$\frac{.10 \times \text{total pump thrust \#}}{1000\#}$$

   f. Horsepower loss in cable (from Cable Loss Chart) to determine horsepower loss per 100 feet.

$$\text{Total horsepower loss in cable} = \text{horsepower loss per 100'} \times \frac{\text{Total Cable Length}}{100}$$

      NOTE: Total cable length = pumping level + distance from well at surface to starter panel + allowance for slack.

   g. Total Horsepower:

      Total H.P. = bowl horsepower + thrust horsepower loss + cable horsepower loss

4. Cable Selection:

   a. Determine total cable length.

      Total cable length = pumping level + surface distance to starter panel + allowance for slack

      NOTE: (1) Slack cable, allow 2 feet per 100 feet

      (2) 10 foot minimum for surface cable to starter

   b. From cable selection chart under proper voltage, select cable under motor full load amps for length of cable used.

      NOTE: If full load amps fall between amps on chart, go to next larger size.

5. SURFACE PLATE: Select the same size as drop pipe diameter.

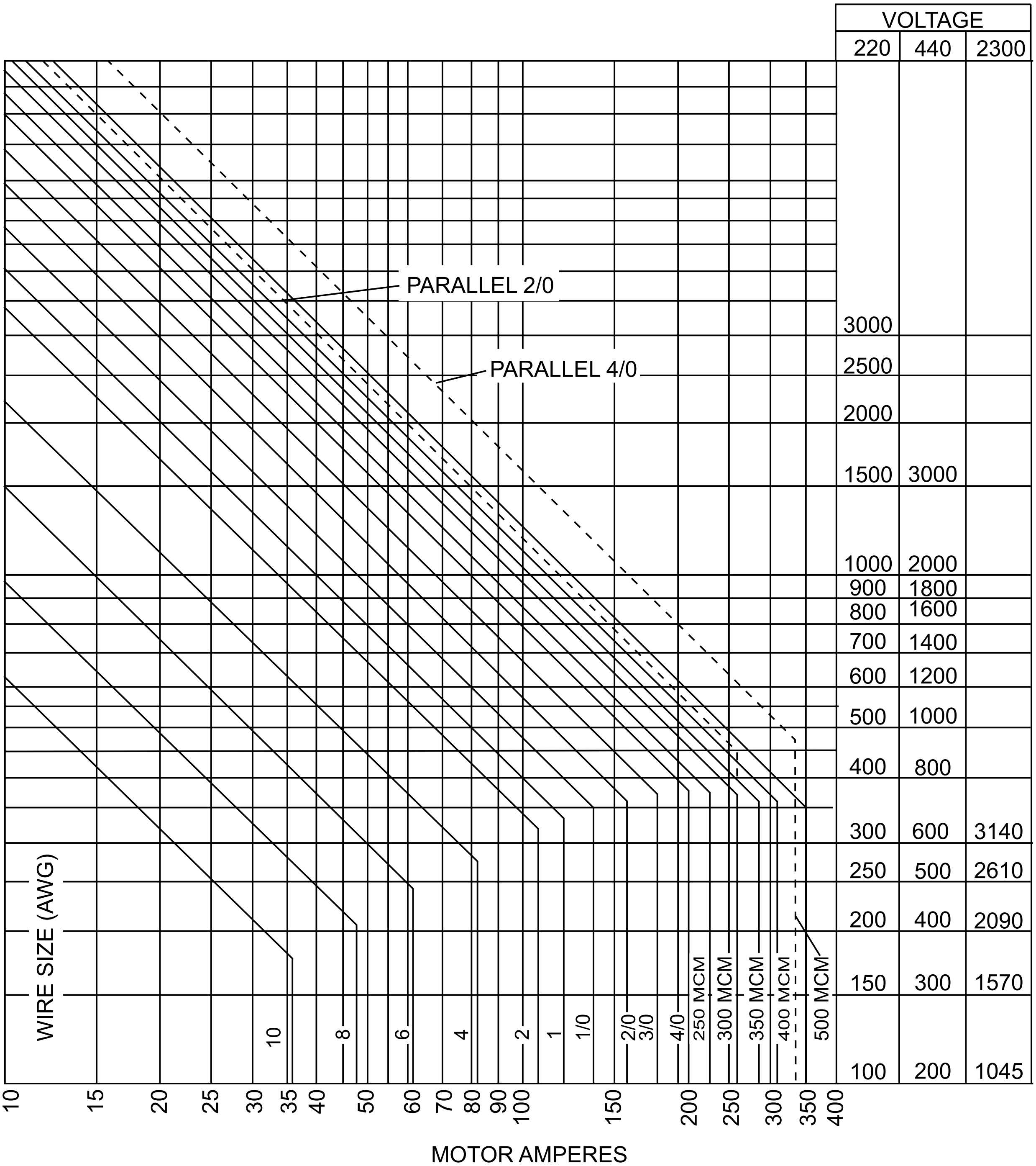
6. CHECK VALVE: Select the same size as drop pipe diameter (if required by Technical Data).

7. ACCESSORIES:

   a. Pump Panel
   b. Air Line and Gauge
   c. Banding Tools
   d. Banding Supplies
   e. Cable

SUBMERSIBLE CABLE SELECTION CHART

CABLE LENGTH VERSUS MOTOR AMPERES

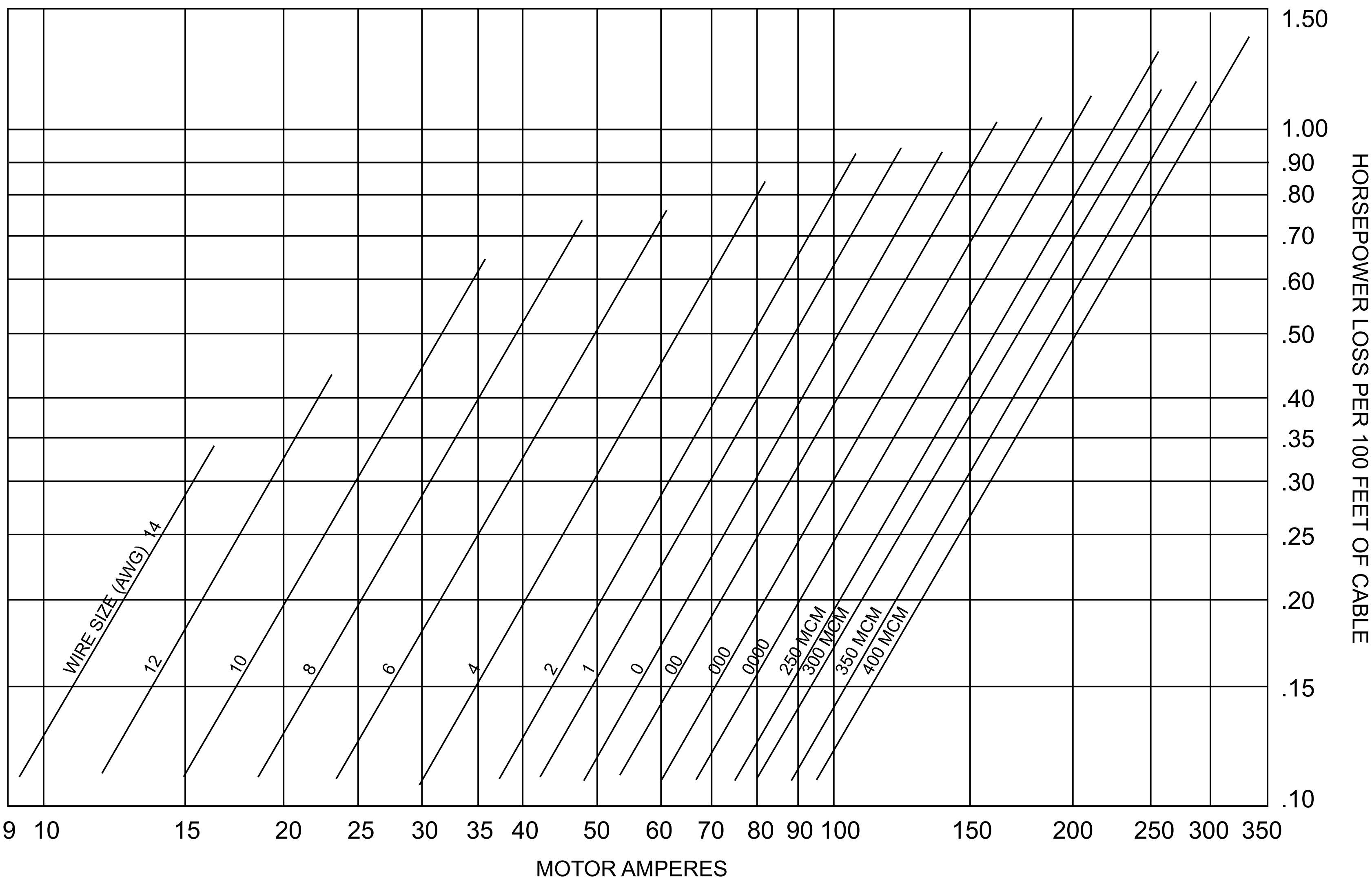


Based on 5% voltage drop - 60° C. copper temperature and 30° C. ambient temperature.
Maximum ampere value for each cable size must be reduced if ambient temperature exceeds 30° C.

SUBMERSIBLES

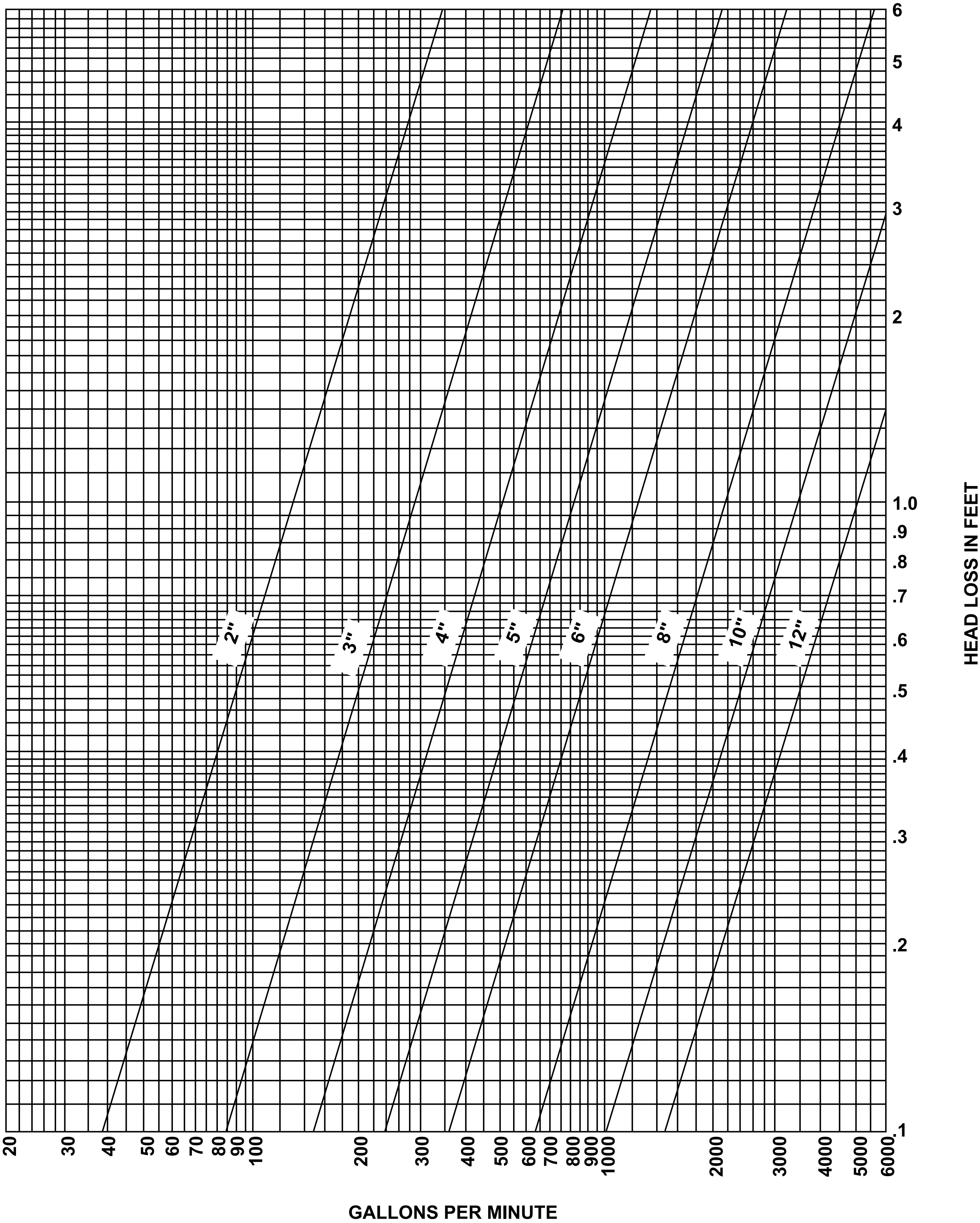
SUBMERSIBLE CABLE LOSS CHART

To use selection chart find intersection of motor amperes and cable length - use any cable to RIGHT of this point. Example: 150 HP, 440 volt G.E. motor operating at full lad will draw 200 amperes; checking selection chart we find that 0000 is the minimum recommended cable size for any setting up to 800 feet. For deeper settings, larger cable must be used. A 900 foot setting on the above motor would require a minimum cable size of 300 MCM.



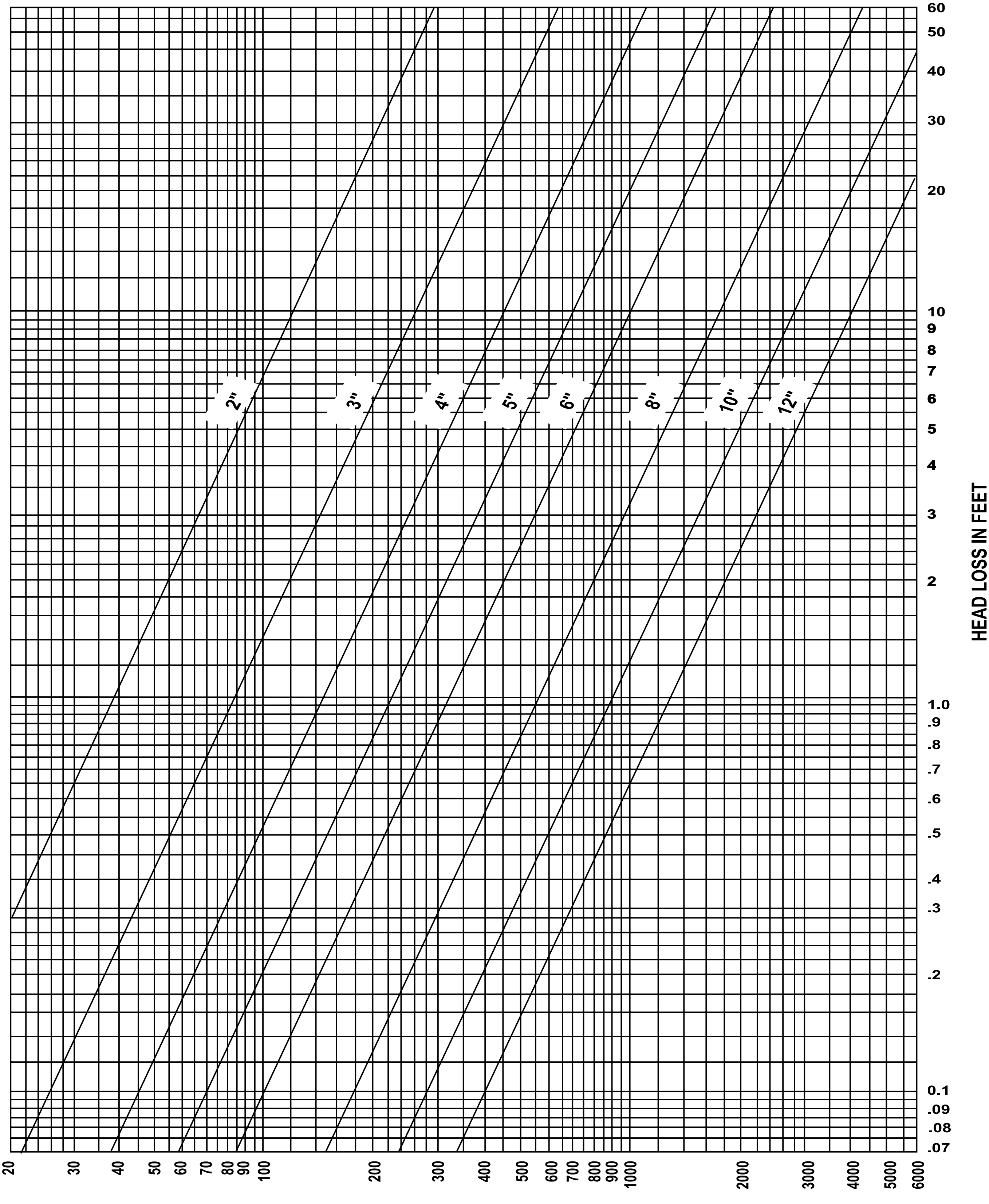
The above chart indicates the power loss (in horsepower) for each 100 feet of submersible cable. This loss must be considered in overall plant efficiency calculations. Long range cost evaluation may dictate the use of a larger than normal size cable.

FRICTION LOSS CHART FOR SUBMERSIBLE SURFACE PLATE ELBOWS



SUBMERSIBLES

FRICTION LOSS CHART FOR SUBMERSIBLE DROP PIPE CHECK VALVES



SUBMERSIBLES

WEIGHT OF WATER IN FOOT LENGTHS OF PIPE OF DIFFERENT INSIDE DIAMETERS

(62.35 POUNDS PER CUBIC FOOT)

DIAMETER INCHES	WATER POUNDS	DIAMETER INCHES	WATER POUNDS	DIAMETER INCHES	WATER POUNDS	DIAMETER INCHES	WATER POUNDS
1/8	0.0053	3	3.0643	7-3/4	20.450	17	98.897
1/4	0.0213	3-1/8	3.3250	8	21.790	17-1/2	104.27
3/8	0.0479	3-1/4	3.5963	8-1/4	23.174	18	110.31
1/2	0.0851	3-3/8	3.8782	8-1/2	24.599	18-1/2	116.53
5/8	0.1330	3-1/2	4.1708	8-3/4	26.068	19	122.91
3/4	0.1915	3-5/8	4.4741	9	27.579	19-1/2	129.47
7/8	0.2607	3-3/4	4.7879	9-1/4	29.132	20	136.19
1	0.3405	3-7/8	5.1125	9-1/2	30.728	21	150.15
1-1/8	0.4309	4	5.4476	9-3/4	32.366	22	164.79
1-1/4	0.5320	4-1/4	6.1498	10	34.048	23	180.11
1-3/8	0.6437	4-1/2	6.8946	10-1/2	37.537	24	196.11
1-1/2	0.7661	4-3/4	7.6820	11	41.198	25	212.80
1-5/8	0.8991	5	8.5119	11-1/2	45.028	26	230.16
1-3/4	1.0427	5-1/4	9.3844	12	49.028	27	248.21
1-7/8	1.1970	5-1/2	10.299	12-1/2	53.199	28	266.93
2	1.3619	5-3/4	11.257	13	57.540	29	286.34
2-1/8	1.5375	6	12.257	13-1/2	62.052	30	306.43
2-1/4	1.7237	6-1/4	13.300	14	66.733	31	327.20
2-3/8	1.9205	6-1/2	14.385	14-1/2	71.585	32	348.65
2-1/2	2.1280	6-3/4	15.513	15	76.607	33	370.78
2-5/8	2.3461	7	16.683	15-1/2	81.799	34	393.59
2-3/4	2.5748	7-1/4	17.896	16	87.162	35	417.08
2-7/8	2.8142	7-1/2	19.152	16-1/2	92.694	36	441.26

Weights of water in cylinders of the same length are proportional to the squares of the diameters. Therefore, to get weight of cylinder of water one foot long and 60 inches diameter, take from above table weight of water of 30 inch pipe and multiply it by the square of 60 - 30, or the square of two; thus, 306.43 x 4 = 1226.72 = the weight of water in one foot length of a 60 inch pipe.

POWER CONSUMPTION

VARIOUS EFFICIENCIES PUMPING 1000 GALLONS OF CLEAR WATER AT ONE FOOT TOTAL HEAD

OVERALL EFFICIENCY PUMP UNIT	KWH PER 1000 GALLONS AT ONE FOOT TOTAL HEAD	OVERALL EFFICIENCY PUMP UNIT	KWH PER 1000 GALLONS AT ONE FOOT TOTAL HEAD	OVERALL EFFICIENCY PUMP UNIT	KWH PER 1000 GALLONS AT ONE FOOT TOTAL HEAD
32	.00980	51.5	.00609	71	.00442
32.5	.00958	52	.00603	71.5	.00439
33	.00951	52.5	.00597	72	.00435
33.5	.00937	53	.00592	72.5	.00432
34	.00922	53.5	.00586	73	.00430
34.5	.00909	54	.00581	73.5	.00427
35	.00896	54.5	.00575	74	.00424
35.5	.00884	55	.00570	74.5	.00421
36	.00871	55.5	.00565	75	.00418
36.5	.00860	56	.00560	75.5	.00415
37	.00848	56.5	.00555	76	.00413
37.5	.00837	57	.00550	76.5	.00410
38	.00826	57.5	.00545	77	.00407
38.5	.00815	58	.00541	77.5	.00405
39	.00804	58.5	.00536	78	.00402
39.5	.00794	59	.00532	78.5	.00399
40	.00784	59.5	.00527	79	.00397
40.5	.00775	60	.00523	79.5	.00394
41	.00765	60.5	.00518	80	.00392
41.5	.00756	61	.00514	80.5	.00389
42	.00747	61.5	.00510	81	.00387
42.5	.00738	62	.00506	81.5	.00385
43	.00730	62.5	.00502	82	.00382
43.5	.00721	63	.00498	82.5	.00380
44	.00713	63.5	.00494	83	.00378
44.5	.00705	64	.00490	83.5	.00375
45	.00697	64.5	.00486	84	.00373
45.5	.00689	65	.00482	84.5	.00371
46	.00682	65.5	.00479	85	.00369
46.5	.00675	66	.00475	85.5	.00367
47	.00667	66.5	.00472	86	.00365
47.5	.00660	67	.00468	86.5	.00362
48	.00653	67.5	.00465	87	.00360
48.5	.00647	68	.00461	87.5	.00358
49	.00640	68.5	.00458	88	.00356
49.5	.00634	69	.00454	88.5	.00354
50	.00627	69.5	.00451	89	.00352
50.5	.00621	70	.00448	89.5	.00350
51	.00615	70.5	.00445	90	.00348

KWH/100 GAL. = K*H

K = KWH/1000 GAL. AT ONE FT. HEAD H = TOTAL HEAD

SUBMERSIBLE PUMPS

GENERAL INFORMATION

The application of a submersible pump requires attention to certain conditions which do not exist with a lineshaft pump.

1. If there is inadequate or restricted circulation of water past the motor, the motor may overheat and burn out. Each motor manufacturer has different recommendations; but, in general, if water is continually flowing into the pump chamber and flow past the motor is unrestricted, the motor will operate satisfactorily. Consult the factory in doubtful cases. Use of a liquid level control or flow switch to prevent pump from breaking suction is recommended.
2. If the temperature of the water exceeds 86º F. (30º C), motor failure may result. Consult factory if water temperature exceeds this limitation.
3. The use of semi-open impellers with submersible motors may effect pump performance as the motor shaft expands when the motor is in operation and lifts the impellers away from the bowl seats, thus reducing head by 5 percent and efficiency by 3 percent.
4. Length of drop pipe must be sufficient to keep the bowl assembly and motor leads completely submerged at all times.
5. Motor controls should be equipped with quick-trip overload protection on all three legs. This is available at very little added cost when the starter or panel is furnished. This protection is required because submersible motors heat up much faster than a conventional motor due to their compact design.
6. When pricing cable, allow one extra foot for every 50 feet of drop pipe, plus 10 feet more to connect to surface wiring. If a conduit box is used at the well head (this is highly recommended), three feet extra will usually be adequate.
7. Voltage at the motor leads must be within plus or minus 10% of the nameplate voltage. If there is 5% voltage drop in the submersible pump cable, voltage at the surface must not be less than 95% of rated voltage.
8. Drop pipe should have 3/4" NPT taper threads with matching heavy duty couplings. 3", 4", and 5" are normally 21 foot random lengths; larger sizes are 20 foot. If butt thread drop pipe is used, it must be pinned at each joint to prevent unscrewing, as the motor torque tends to loosen butt threads.

SUB ASSEMBLY INSTRUCTIONS

MOTOR TO PUMP END

Step 1

Remove the motor and pump end from containers. At this time, check to make sure pump model horsepower matches motor horsepower rating. Also, check motor phase and voltage to make sure it matches power source.

Raise motor to vertical position, making sure motor is adequately supported. Pump and motor should never be assembled in horizontal position as damage to the pump shaft could occur.

Step 2

Raise pump to vertical position over motor, inspect flanges of pump and motor making sure all dust, paint, grease, and rust are removed from flange faces. Make sure no obstruction is in motor coupling.

Step 3

Lower pump slowly onto motor. Guide pump into proper alignment (never rest pump on motor shaft). Align cable recess on pump making sure you do not pinch motor leads. Coupling should slip freely into place to join pump and motor. Pump should be lowered to meet motor flange flush. Bolt pump end and motor together with stainless fasteners provided. NOTE: Should pump end not meet motor flange flush, see Step 4.

Step 4

The thrust assembly is pre-set at factory but could need final adjustment when pump and motor are coupled. The thrust assembly consists of either thrust bolt and jam nut or thrust plug. First, the thrust bolt should be screwed all the way down against the pump shaft. When the bolt bottoms, the bolt may be backed off two (2) turns. With a wrench as a backup, now screw the jam nut against the pump casting and jam lock nut and bolt.

With the thrust plug, screw all the way down against the pump shaft, then back off one and a half (1-1/2) turns. This will allow for ample momentary upthrust.

The thrust assembly, if set too closely, could prevent you from bolting pump and motor or even locking shaft rotation. Make sure you have ample clearance for pump to fit flush with motor.

Consult factory or local sales office should questions arise.

CABLE SPLICING INSTRUCTIONS

There are several good methods of attaching the drop cable to the motor leads. Any method used must have high insulation value, be corrosion resistant, and most of all, must be waterproof under pressure.

As every 2.31 feet of water represents one pound of pressure, the total pressure at the splice depends on the submergence. This is why testing a finished splice in a bucket of water, as is sometimes done, is not an accurate test.

As pressure testing is not a practical operation, in most cases it becomes evident that great care should be used in the splicing operation. Generally, splicing is not a complicated job and if the necessary care and time is taken, there is no reason why the splice should not be successful.

TAPE SPLICING

A good waterproof electrical tape must be used. Never use ordinary friction tape. The tape recommended is the "Scotch" brand due to our personal experience with the product; however, any other brand of good waterproof electrical tape would serve the purpose.

The three types of "Scotch" tape used are as follows:

No. 23 - This is used for the first layer as it affords excellent insulation and, most importantly, it is of a thick pliable texture which is

be noted at this point that on some of the larger sizes of cable splices, it may be necessary to use several wraps of No. 23 to fill the gaps at the connection and smooth out the joint.

No. 33 - This is the tape generally used in tape splicing and is an excellent waterproofing electrical tape which is used for the final 4

tape at close to room temperatures or in some way keep it warm when using.

No. 88 - This tape, although a little more expensive than No. 33, has superior adhesive qualities in cold weather and is highly

firmly but not over-stretched as this tends to "thin the tape out."

TAPE SPLICE INSTRUCTIONS

Cut the cable so that connections will be staggered about 3" apart. (See Figure 1.) Taking care not to nick or cut the copper conductor, strip enough insulation from wire to fit well into connector. Shape the end of the insulation in the manner of sharpening a pencil. This makes it easy to fill the void between the insulation and connector. Carefully scrape or sand the copper wire clean. This step is very important if finished splice is to be a trouble free connection.

Following the cable color code, crimp the wires in the connectors. It is important that the proper crimping tool is used rather than ordinary pliers. If a crimping tool is not available, it is recommended that a good solder connection is made between the wire and the connector. Never use an acid core solder on electrical connections.

As most outer cable insulation has a wax type finish which makes a poor surface for the tape, use sandpaper or steel wool and clean the surface from 3" to 6" on each side of the connector, depending on the size splice to be made. (See Figure 2.)

Fill in around the connector and 1-1/2" to 2-1/2" along the cable with the No. 23 or No. 33 tape. Then, using No. 33 or No. 88 tape, wrap firmly and smoothly (without wrinkles) using an overlap of about half the width of the tape. Complete the splice with 4 of these finishing laps, taking each layer beyond the end of the layer underneath to make a tapered finish. (See Figure 3.) When finished, cut; do not tear the tape. To help insure good sealing, finish off with a coat of "Scotchkote" which is a fairly fast drying sealant and bonding agent. Some pump men prefer to use this sealant between each layer of tape, which is, of course, an added safety feature, but not absolutely necessary if the rest of the splice has been made with care.

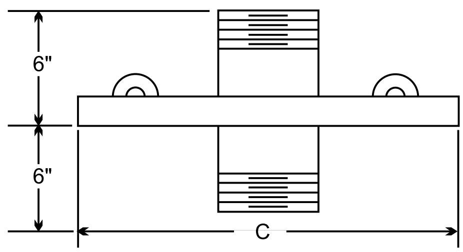
A very good splice can also be made using heat shrink tubing in combination with the aforementioned tapes. The shrink tubing contains a sealant which melts when treated, thus making a better seal between cable and tubing.

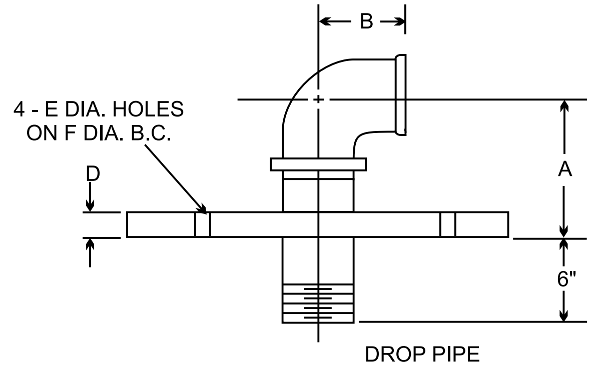
To use shrink tubing, prepare cables in the same way; slide tubing on cables and make connections. Fill in the gaps with No. 23 or No. 33 tape. Centralize tubing on connector; then, using a small heating torch, heat the tubing, working out from the center until the sealant flows from the ends of the tubing. CAUTION: Do not allow naked flame to contact the tubing or the cables.

Cover the tubing with 2 or 3 lap layers of No. 33 or No. 88 tape and coat with Scotchkote.

"LDS"
SUBMERSIBLE PUMP SURFACE PLATE

DIMENSIONS





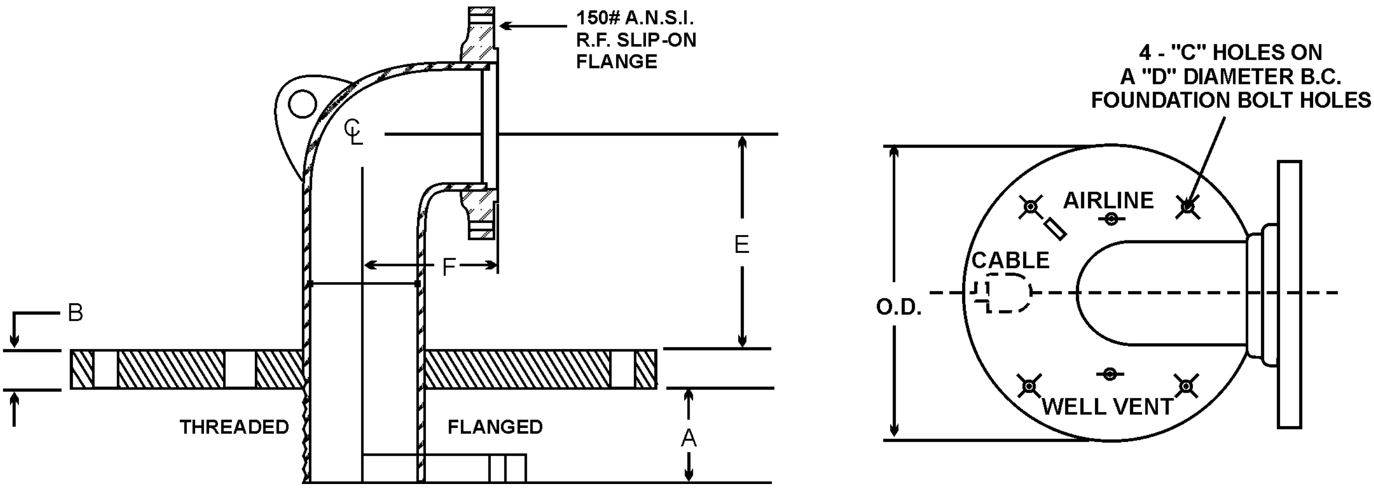
DROP PIPE SIZE	A	B	WELL I.D. (NOM.)	C	D	E	F
3	8-3/16	3-1/8	6	11	1	7/8	9-1/2
4	8-11.16	3-3/4	8	13-1/2	1	7/8	11-3/4
5	9-5/16	4-1/2	10	16	1-1/4	1	14-1/4
6	9-7/8	5-1/8	12	19	1-1/4	1	17
			14	21	1-1/4	1-1/8	18-3/4
			16	23-1/2	1-1/2	1-1/8	21-1/4
			18	25	1-1/2	1-1/4	22-3/4
			20	27-1/2	1-1/2	1-1/4	25

ALL DIMENSIONS ARE IN INCHES

1. Standard construction includes steel base plate (not machined) with threaded both ends pipe welded through the center; four foundation bolt holes; two lifting eyes, holes for cable, airline and vent; maximum setting is 600-feet. Contact factory for deeper setting.
2. Specify for machined bottom of baseplate and drilling additional holes to match 150# F.F. flange.
3. Specify for weather tight junction box, maximum 460 volts.

"HDS"
SUBMERSIBLE DISCHARGE HEAD

DIMENSIONS

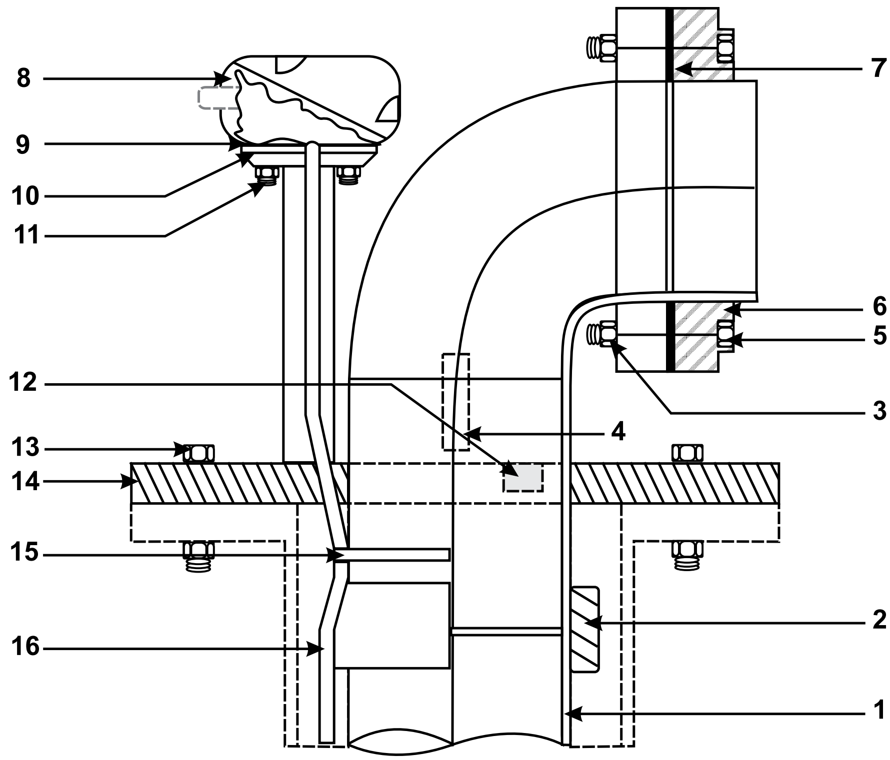


- ALL DIMENSIONS ARE IN INCHES -

DISCHARGE SIZE	CASING SIZE	O.D.	A	B	C	D	E	F	APPROX. WEIGHT
3"	6	11	6	1	7/8	9-1/2	8	5	50
	8	13-1/2	6	1	7/8	11-3/4	8	5	67
	10	16	6	1	1	14-1/4	8	5	90
4"	6	11	6	1	7/8	9-1/2	8	6-1/2	60
	8	13-1/2	6	1	7/8	11-3/4	8	6-1/2	77
	10	16	6	1	1	14-1/4	8	6-1/2	100
	12	19	6	1-1/8	1	17	8	6-1/2	122
5"	8	13-1/2	6	1	7/8	11-3/4	9	8-1/2	86
	10	16	6	1	1	14-1/4	9	8	106
	12	19	6	1-1/8	1	17	9	8	142
	14	21	6	1-1/4	1-1/8	18-3/4	9	8	178
6"	10	16	6	1	1	14-1/4	9	9-1/2	106
	12	19	6	1-1/8	1	17	9	9-1/2	154
	14	21	6	1-1/4	1-1/8	18-3/4	9	9-1/2	191
	16	23-1/2	6	1-1/4	1-1/8	21-1/4	9	9-1/2	202
	18	25	6	1-1/4	1-1/4	22-3/4	9	9-1/2	242
8"	12	19	6	1-1/8	1	17	12	12-1/2	190
	14	21	6	1-1/4	1-1/8	18-3/4	12	12-1/2	228
	16	23-1/2	6	1-1/4	1-1/8	21-1/4	12	12-1/2	238
	18	25	6	1-1/4	1-1/4	22-3/4	12	12-1/2	278
10"	14	21	6	1-1/4	1-1/8	18-3/4	15	15-1/2	269
	16	23-1/2	6	1-1/4	1-1/8	21-1/4	15	15-1/2	260
	18	25	6	1-1/4	1-1/4	22-3/4	15	15-1/2	320
	20	27-1/2	6	1-3/8	1-1/4	25	15	15-1/2	380
	24	32	6	1-1/2	1-3/8	29-1/2	15	15-1/2	490
12"	16	23-1/2	6	1-1/4	1-1/8	21-1/4	18	18-1/2	342
	18	25	6	1-1/4	1-1/4	22-3/4	18	18-1/2	382
	20	27-1/2	6	1-3/8	1-1/4	25	18	18-1/2	442
	24	32	6	1-1/2	1-3/8	29-1/2	18	18-1/2	552

Surface plates listed consist of a round steel plate machined one side with a flanged or threaded pipe welded through the center. Four foundation bolt holes, lifting lugs, and holes for cable, airline, and well vent are incorporated in the construction of the head. The discharge flange will be a 150 lb. raised face. (Companion flange, bolts, nuts, junction box, and gaskets are not supplied.) A square surface plate instead of a round surface plate is optional at no additional cost.

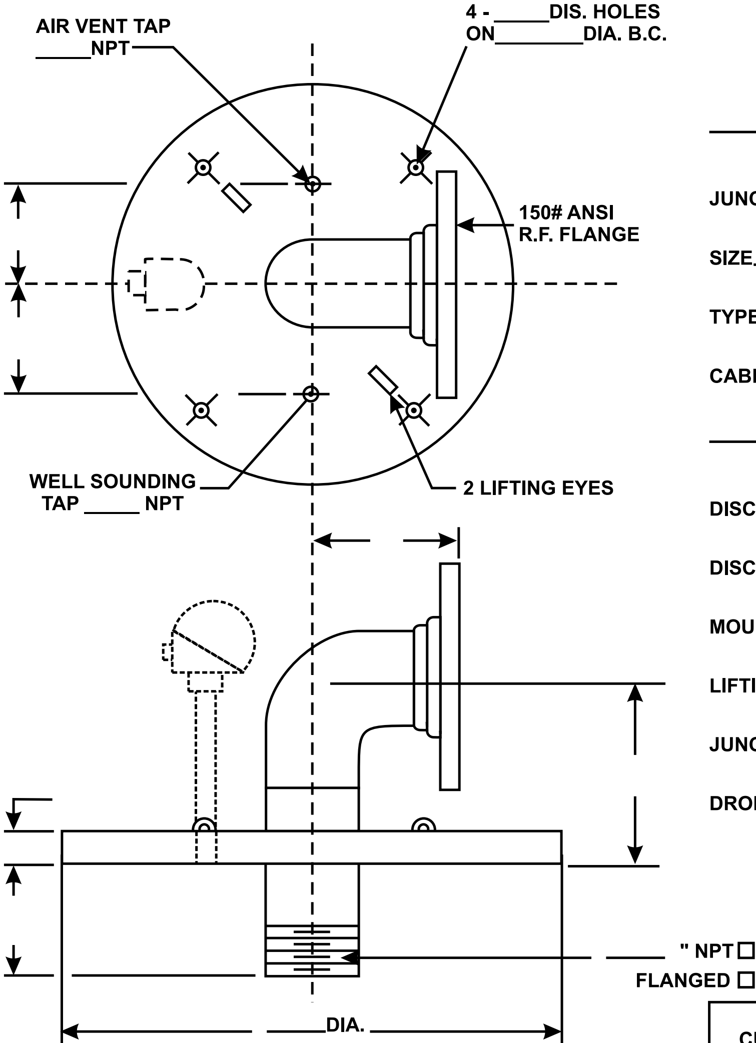
"HDS"
SUBMERSIBLE PUMP SURFACE PLATE



ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	DROP PIPE	9	STOVE BOLT, RND. HEAD (4)
2	PIPE COUPLING	10	CONDUIT BOX - GASKET
3	HEX NUT COMPANION FLANGE	11	SQUARE NUT
4	LIFTING LUGS	12	PIPE PLUG
5	HEX BOLT COMPANION FLANGE	13	CASING BOLTS
6	COMPANION FLANGE	14	SURFACE PLATE
7	GASKET, COMPANION FLANGE	15	CABLE CLAMP
8	CONDUIT BOX (OPTION)	16	POWER CABLE

Standard construction includes steel baseplate (not machined) with threaded one end pipe welded through the center and 90 degree elbow with 150# R.F. flanged discharge; four foundation bolt holes; threaded cable/conduit box connection; holes for airline and vent. All other item are optional features.

"HDS"
SUBMERSIBLE PUMP SURFACE PLATE



SURFACE PLATE

________" _________ # R.F. DISCHARGE FLANGE

JUNCTION BOX ☐ YES ☐ NO

SIZE____________________

TYPE ____________________

CABLE SIZE____________________

____

MATERIALS

DISCHARGE FLANGE____________________

DISCHARGE ELBOW ____________________

MOUNTING PLATE____________________

LIFTING EYES ____________________

JUNCTION BOX* ____________________

DROP PIPE MOUNTING FLANGE*____________________

* IF REQUIRED

CUSTOMER ____________________

____

____

FURNISHED BY____________________

____

____

____

P.O. NUMBER ____________________

____

PUMP SERIAL NUMBER: ____________________

____

NOT FOR CONSTRUCTION UNLESS CERTIFIED

REMARKS ____________________

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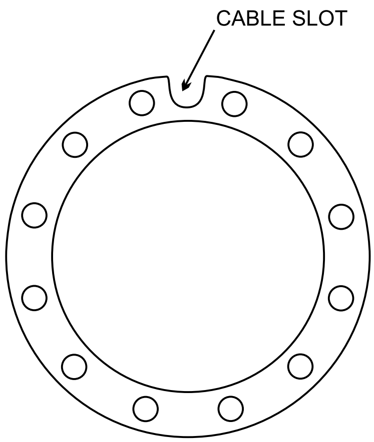
MFG. BY NATIONAL PUMP CO., GLENDALE, ARIZONA

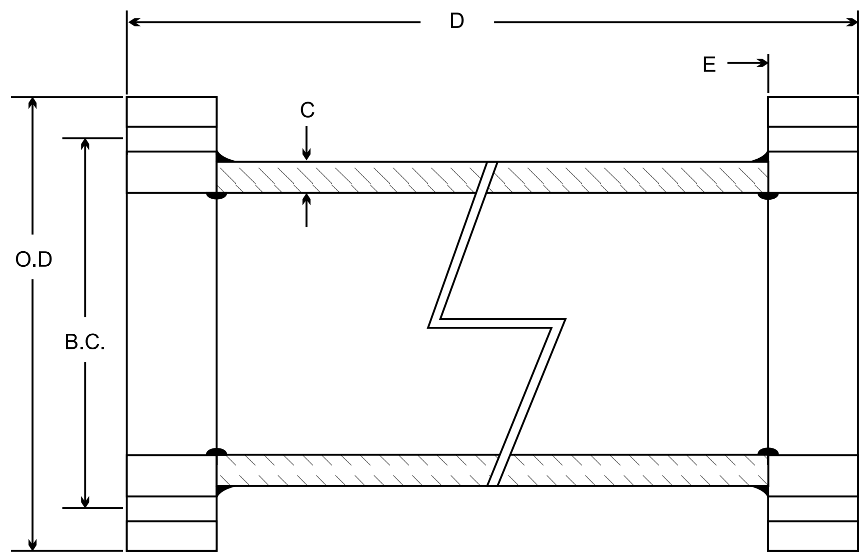
DRAWN BY ____________________ DATE____________________ DRAWING NO. ____________________

SUBMERSIBLES

SUBMERSIBLE FLANGED COLUMN PIPE

DIMENSIONS



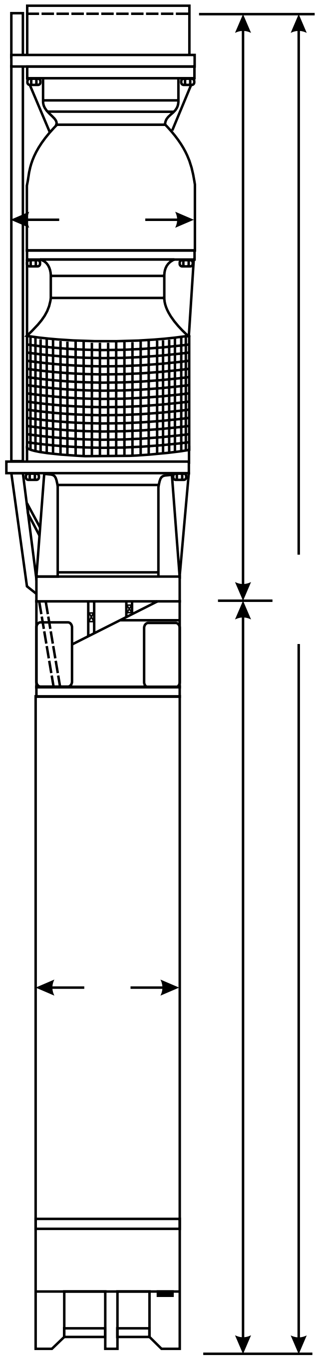


COLUMN PIPE SIZE	O.D.	B.C.	NO. OF HOLES	SIZE OF HOLES	C	D	E	SIZE & LENGTH OF BOLTS REQUIRED
3	6-1/2"	5.50	4	3/4"	.216	A.R.	3/4"	5/8" x 2-1/2"
4	7-1/2"	6.25	8	3/4"	.237	A.R.	3/4"	5/8" x 2-1/2"
5	10	8.62	8	7/8"	.258	A.R.	1"	3/4" x 3"
6	10	8.62	8	7/8"	.280	A.R.	1"	3/4" x 3"
8	12	10.62	8	7/8"	.322	A.R.	1"	3/4" x 3"
10	14-5/8"	13.00	12	1"	.365	A.R.	1-1/8"	7/8" x 3-1/2"
12	16-5/8"	15.00	12	1"	.375	A.R.	1-1/4"	7/8" x 3-1/2"
14	18-1/2"	16.75	12	1"	.375	A.R.	1-3/8"	7/8" x 4"
16	21-1/2"	18.75	12	1-1/8"	.375	A.R.	1-3/8"	1" x 4"
18	23"	21.00	12	1-1/4"	.375	A.R.	1-5/8"	1-1/8" x 4-1/2"
20	25"	23.00	16	1-1/4"	.375	A.R.	1-5/8"	1-1/8" x 4-1/2"

OTE: A.R. = As Required.

CUSTOMER'S SPECIFICATIONS							
PIPE SIZE	O.D.	B.C.	NO. OF	SIZE OF	C	D	E

SUBMERSIBLE PUMP AND MOTOR



MOTOR

H.P.______ PHASE______ HERTZ______ VOLTS______ AMP______
R.P.M.__________ MFG.______________________

CABLE

SIZE ______________ LENGTH ____________ TYPE ____________

DROP PIPE

SIZE ________________ LENGTH SECTIONS ____________
TYPE: ☐ FLANGED ☐ THREADED & COUPLED

PUMP

TYPE ______________________ STAGES ____________
__________ US GPM @ ______________________ FT. T.D.H.
AIR LINE ☐ YES ☐ NO LENGTH ____________
DEPTH GAUGE ☐ YES ☐ NO

CONTROL PANEL

PANEL MANUFACTURER ______________________
SHORT CIRCUIT DEVICE:
☐ CIRCUIT BREAKER: RATING______ SETTING ______
☐ FUSES: RATING______ TYPE ______
☐ STANDARD ☐ DELAY

STARTER MANUFACTURER: ______________________
STARTER SIZE ______________________
TYPE OF STARTER
☐ FULL VOLTAGE ☐ AUTOTRANSFORMER
☐ OTHER ____________ FULL VOLTAGE IN ________ SEC.

HEATERS MANUFACTURER: ______________________
NUMBER __________ ADJUSTABLE SET AT ________ AMPS
SUBTROL-PLUS: ☐ NO ☐ YES: REGISTRATION #: ____________
IF YES OVERLOAD SET? ☐ NO ☐ YES SET AT ________ AMPS
UNDERLOAD SET? ☐ NO ☐ YES SET AT ________ AMPS

MATERIALS

DROP PIPE ____________	INTAKE SCREEN ____________
AIR LINE ____________	INTAKE BRKT. ____________
BOWLS ____________	MOTOR CPLG. ____________
IMPELLERS ____________	DISC. ADAPT. ____________
BOWL SHAFT ____________	CABLE GUARD ____________
BOWL BRGS. ____________	BOLTING ____________

REMARKS:

____
____
____
____
____
____

NOT FOR CONSTRUCTION
UNLESS CERTIFIED

MFG. BY NATIONAL PUMP COMPANY GLENDALE, AZ

CUSTOMER ______________________

FURNISHED BY ______________________

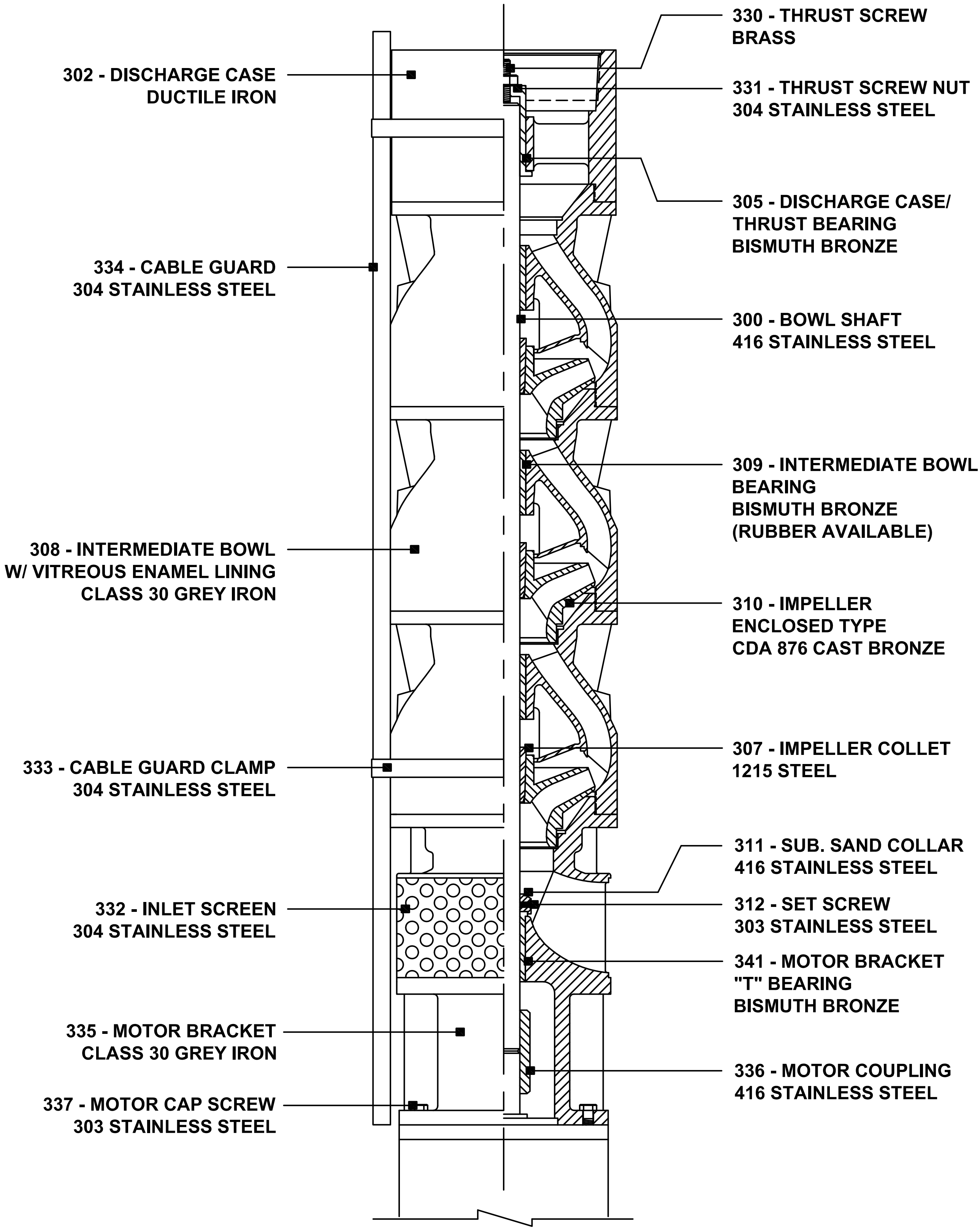
P.O. NO. ______________________

PUMP SERIAL NO. ______________________

DRAWN BY: ______________ DATE: ______________ DRAWING NO. ______________

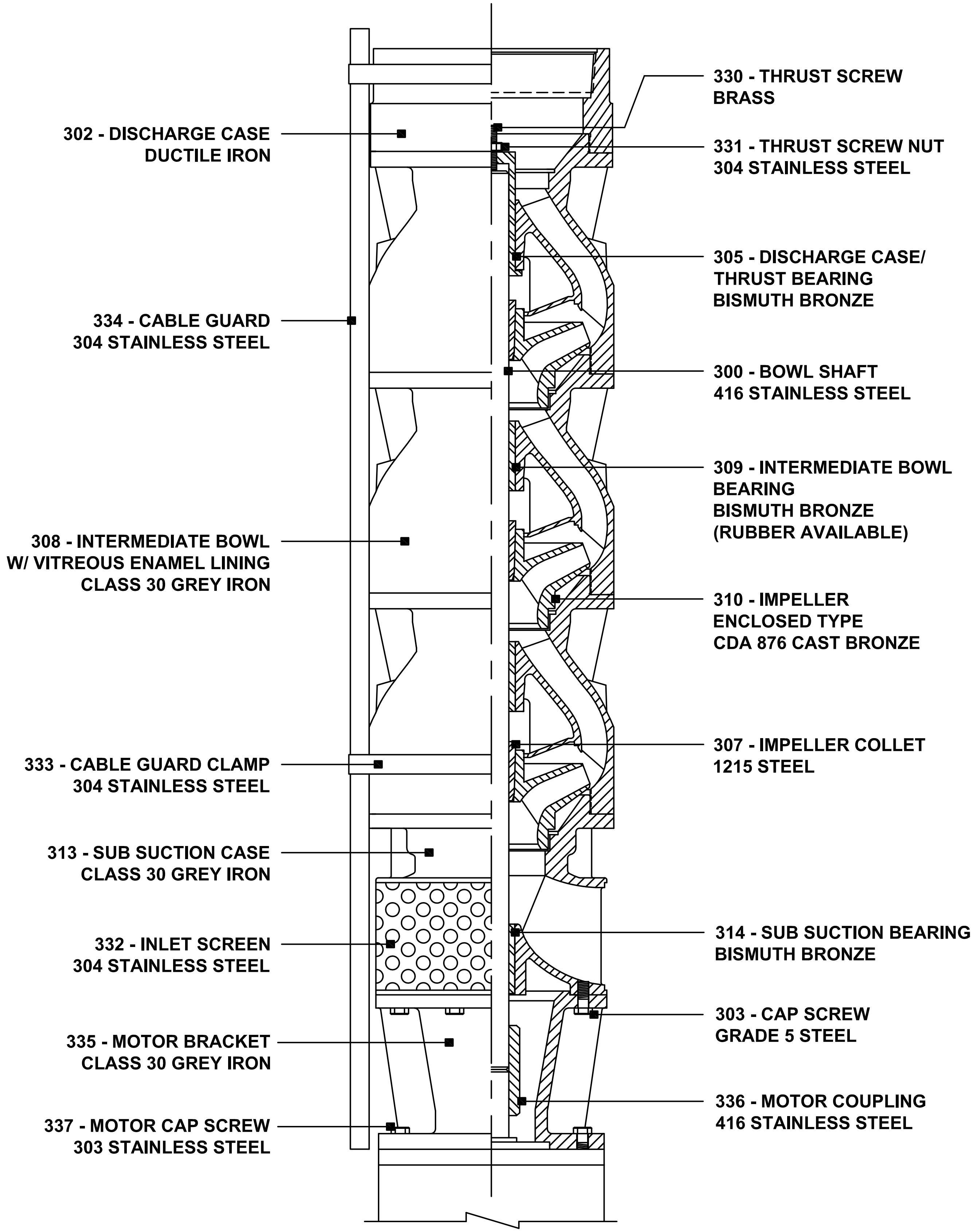
SUBMERSIBLES

SUBMERSIBLE PUMP ASSEMBLY
THREADED S6 - SE6 MODELS



ALTERNATE MATERIAL AVAILABLE UPON REQUEST

SUBMERSIBLE PUMP ASSEMBLY
THREADED SJ8 MODEL

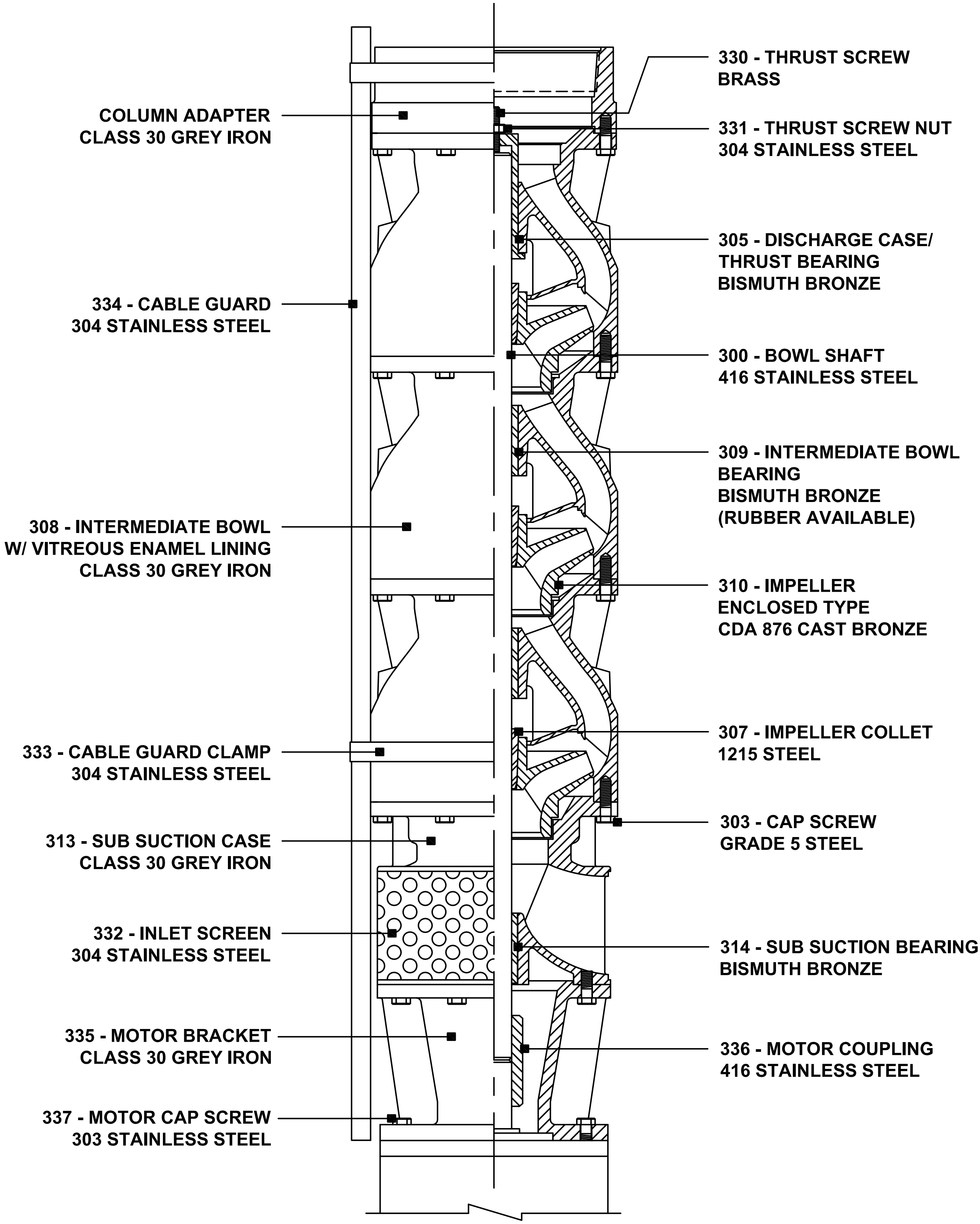


ALTERNATE MATERIAL AVAILABLE UPON REQUEST

SUBMERSIBLE PUMP ASSEMBLY

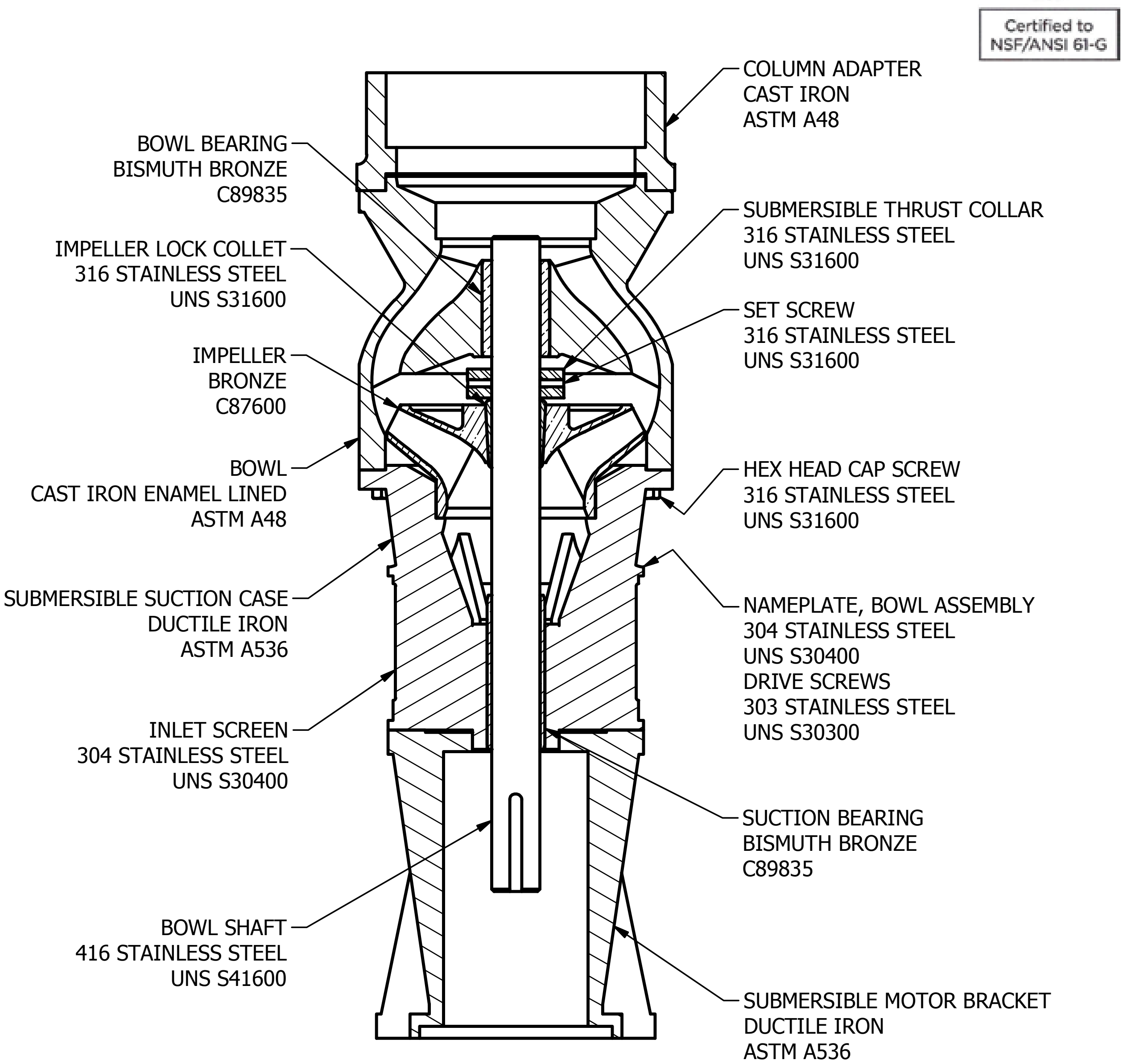
SK8 - S8 - S9 - S10 - SH10 - SJ10 - SM10 - SJ11 MODELS

FOR 6", 8" AND 10" MOTORS



ALTERNATE MATERIAL AVAILABLE UPON REQUEST

BOWL ASSEMBLY
NSF61 CERTIFIED - SUBMERSIBLE
FLANGED CONSTRUCTION

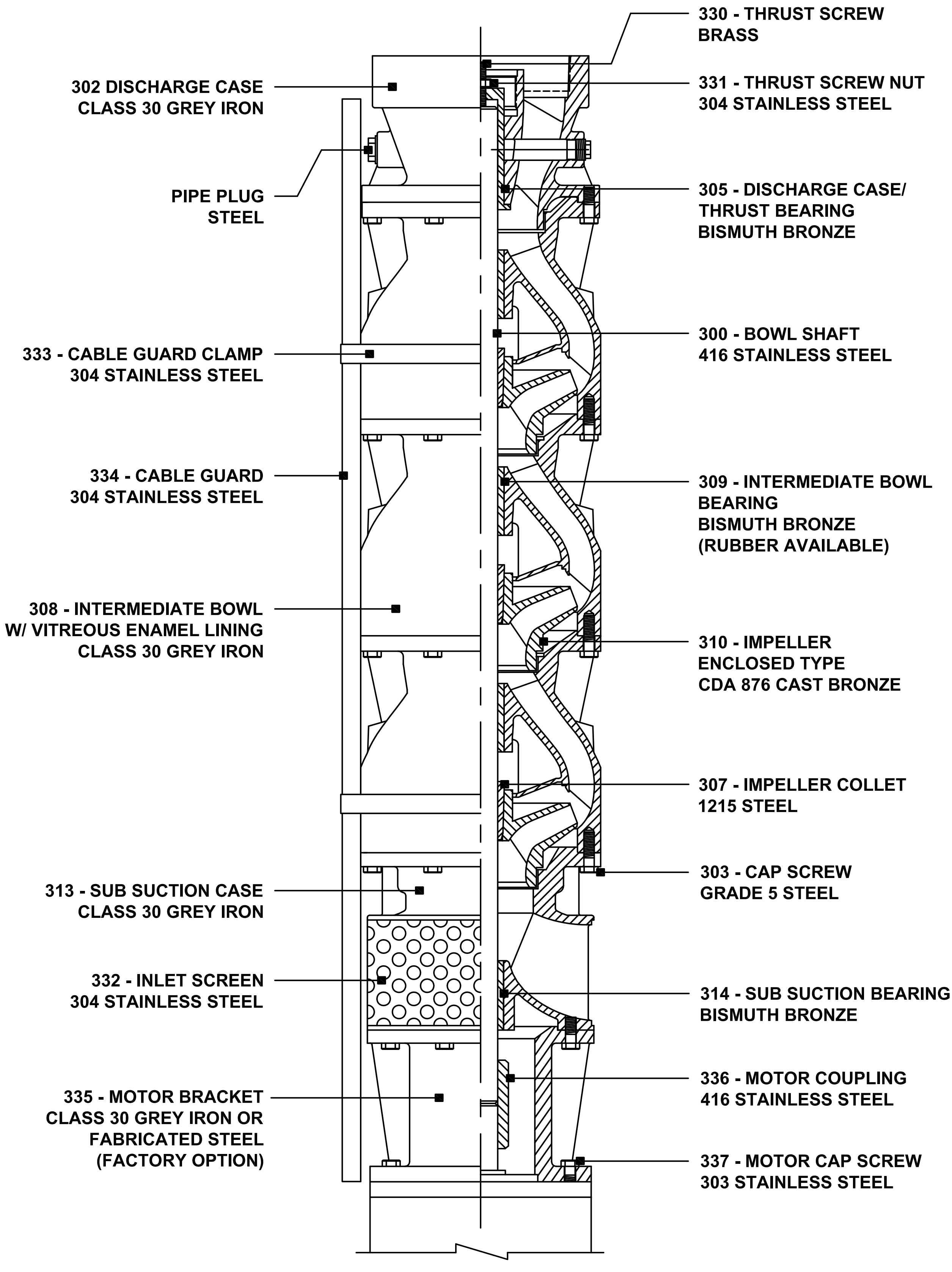


NSF 61 LISTING INFORMAITON:
PRODUCT TYPE: SUBMERSIBLE PUMP - PUMP ENDS
TRADE DESIGNATION: SUBMERSIBLE BOWL ASSEMBLY (W)(XX)(Y)(Z)
- W: HYDRAULIC DESIGN (M, K, J, E, H)
- XX: SIZE, IN INCHES (6, 8, 9, 10, 11, 12, 14, 16, 18, 20, 24, 30)
- Y: DROP-IN BEARING RETAINERS & BEARINGS (4, 6, 8, 10, 12) - COLUMN SIZE
- Z: COATING OPTIONS (C, U)

BowlAssy,NSF61,Submersible (2013.04.22)

ALTERNATE MATERIALS NOT AVAILABLE

SUBMERSIBLE PUMP ASSEMBLY
LARGE MODELS



ALTERNATE MATERIAL AVAILABLE UPON REQUEST

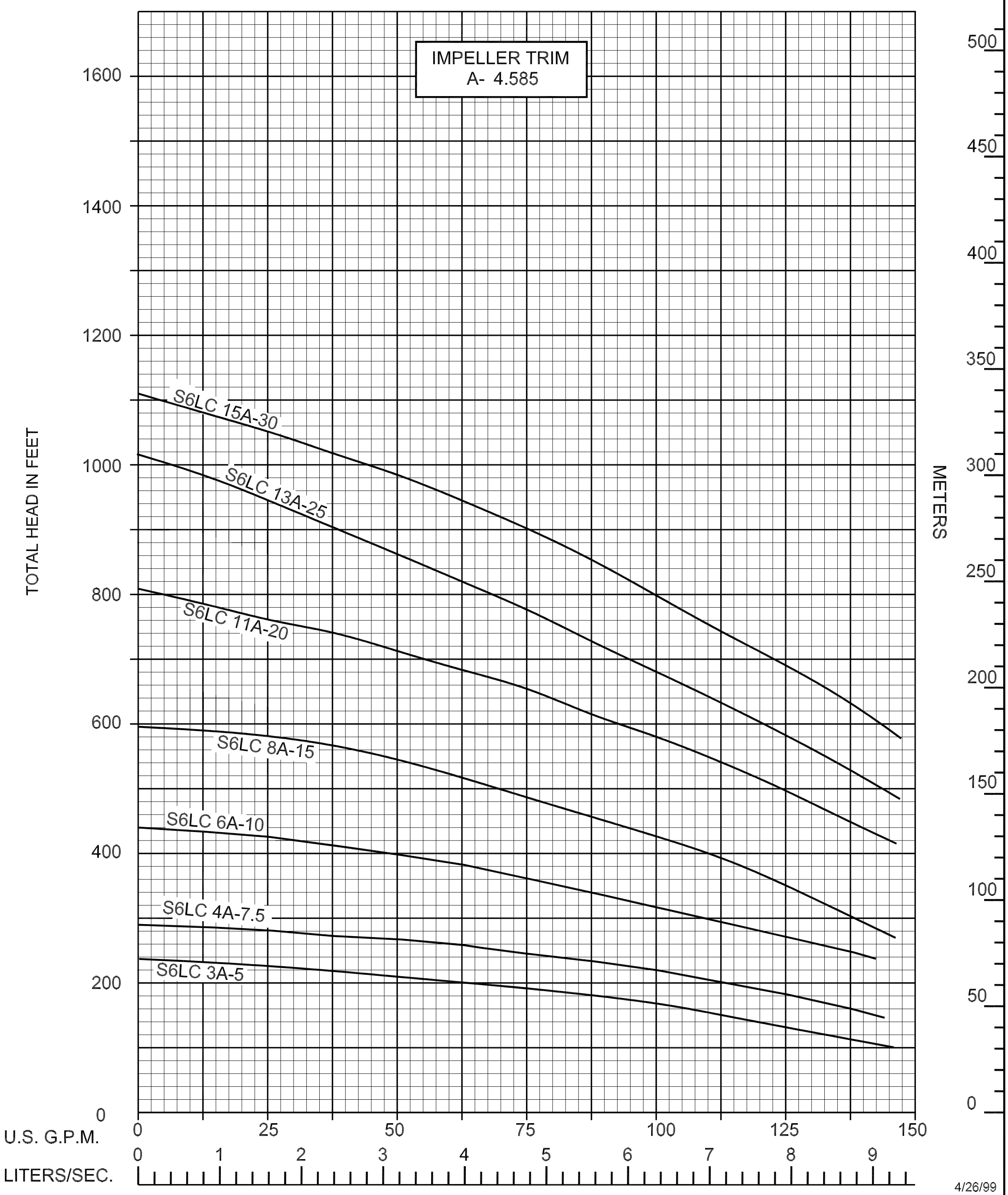
NOTES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON- AERATED WATER AT 85° F. MAXIMUM.

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

S6LC
3450 RPM

SUBMERSIBLE PUMP PERFORMANCE



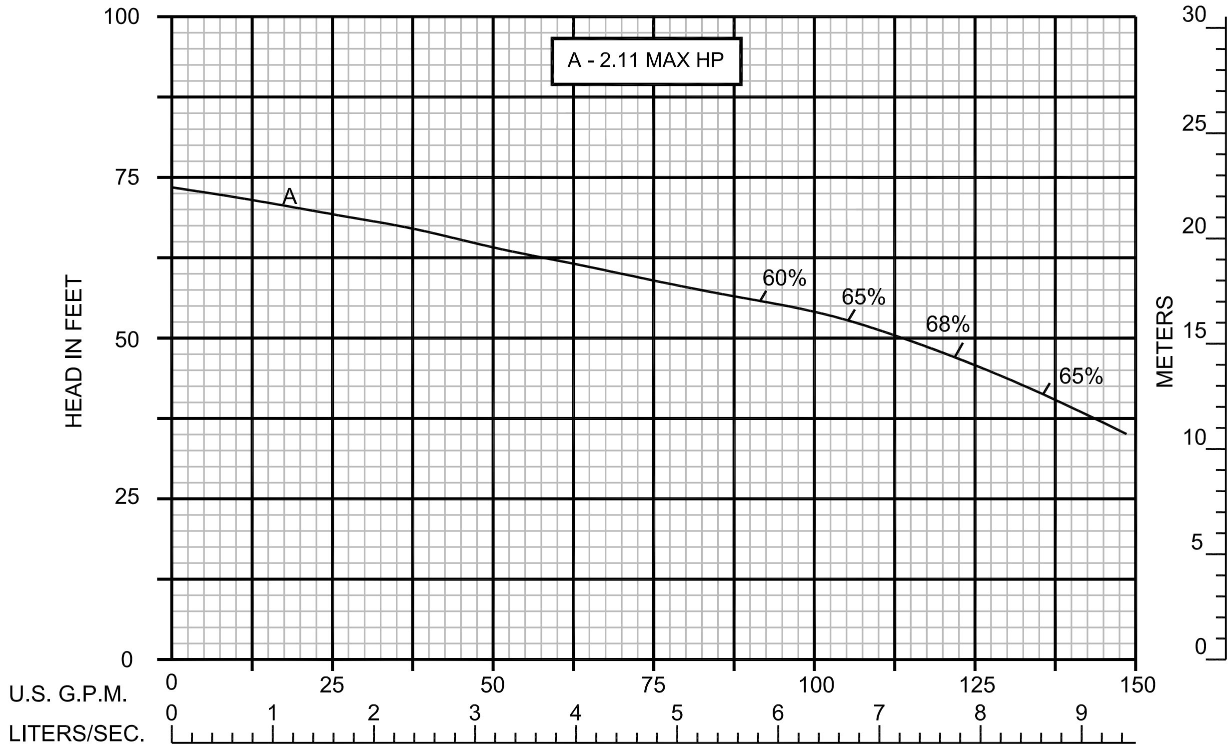
4/26/99
CVS6L2P6CY

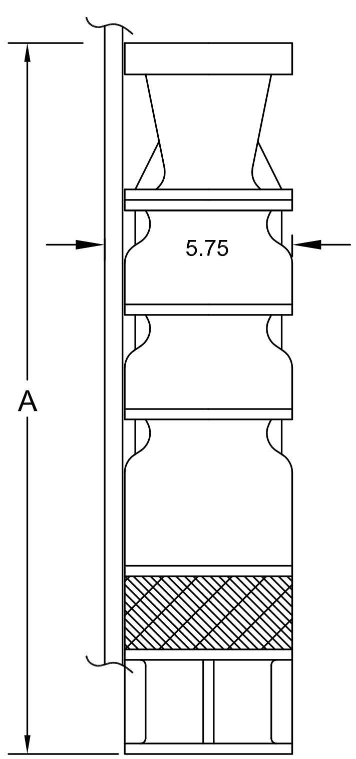
SUBMERSIBLE CURVES

S6LC

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	HP.	"A" LENGTH IN INCHES	APPROXIMATE SHIPPING WGT. LBS
S6LC 3A-5	3	5	25.25	74
S6LC 4A-7.5	4	7.5	29.25	88
S6LC 6A-10	6	10	37.25	116
S6LC 8A-15	8	15	45.25	144
S6LC 11A-20	11	20	57.25	186
S6LC 13A-25	13	25	65.25	214
S6LC 15A-30	15	25	73.25	242

MATERIALS OF CONSTRUCTION

DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

6/29/09
CVS6L2P6CYBP

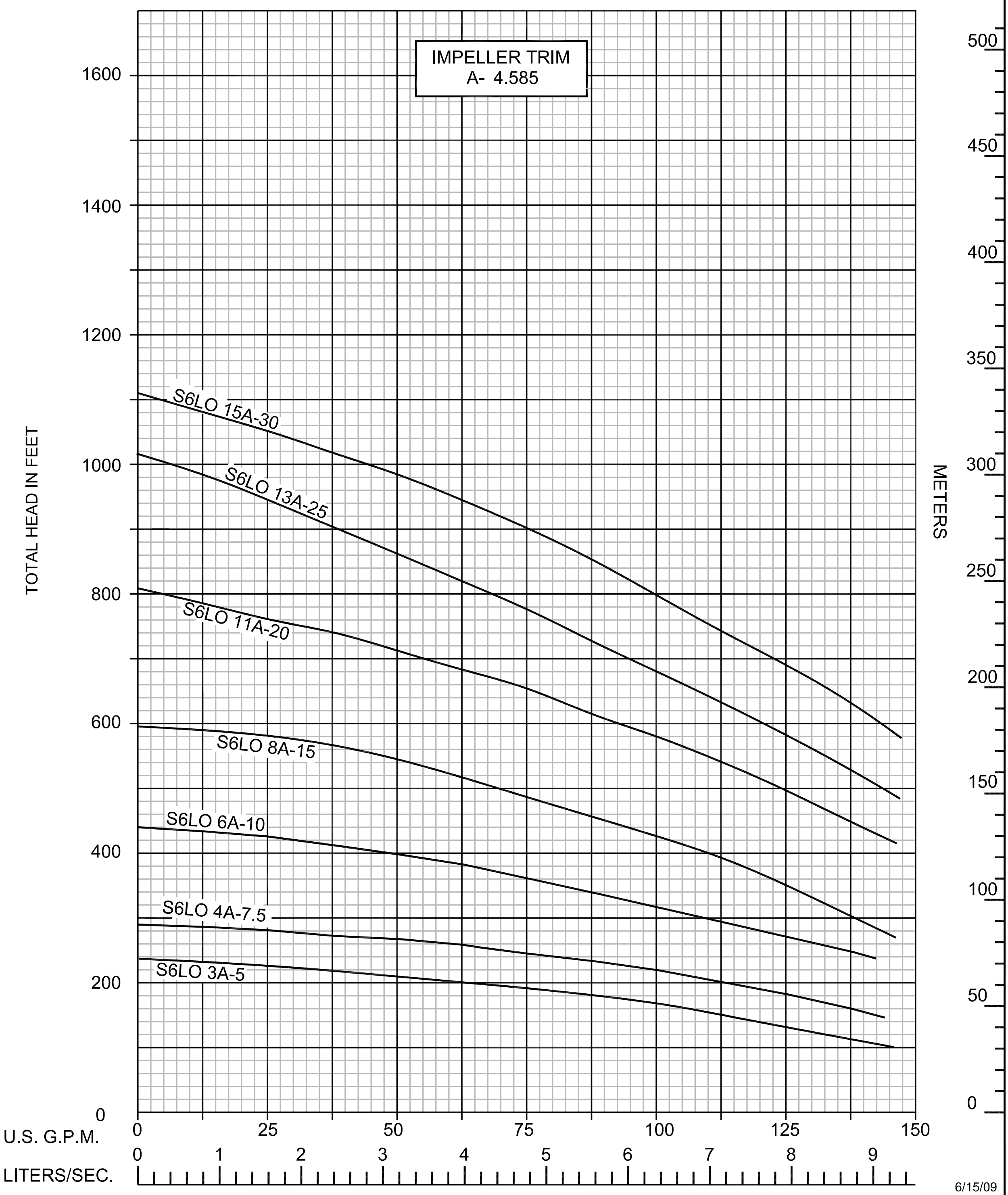
PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON- AERATED WATER AT 85° F. MAXIMUM.

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

S6LO
3450 RPM

TEMPORARY CURVE, CONTACT FACTORY

SUBMERSIBLE PUMP PERFORMANCE



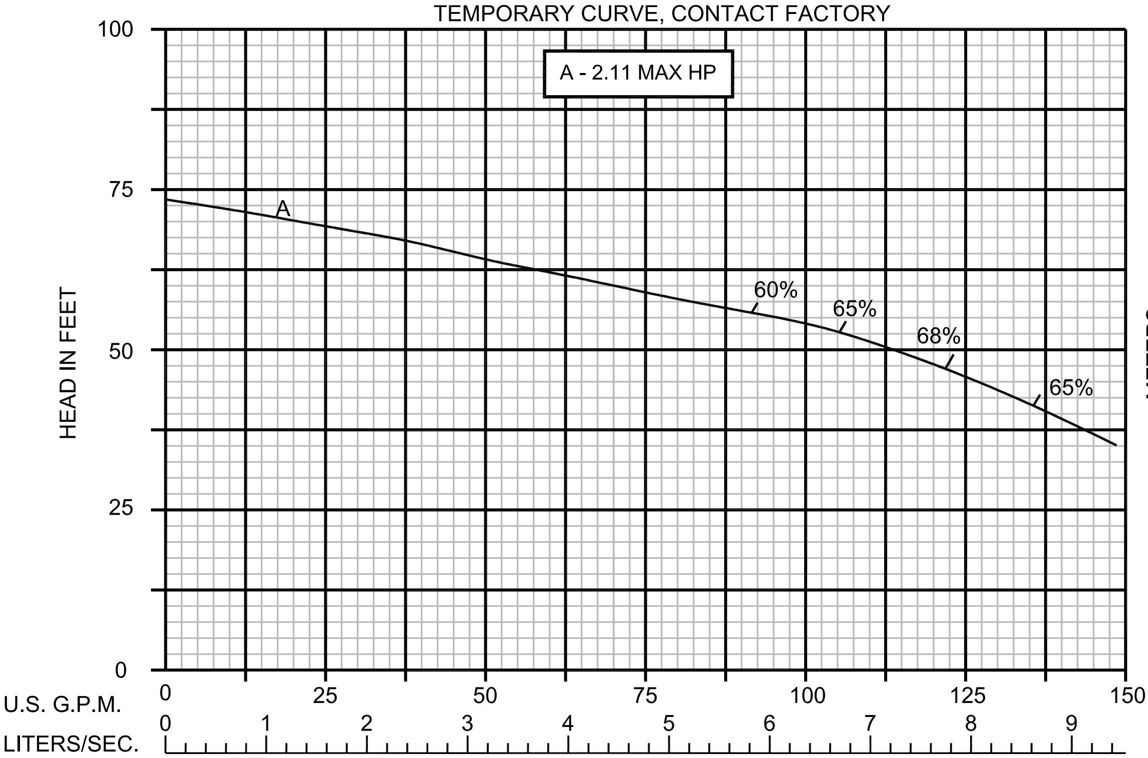
6/15/09
CVS6LO2P6CY

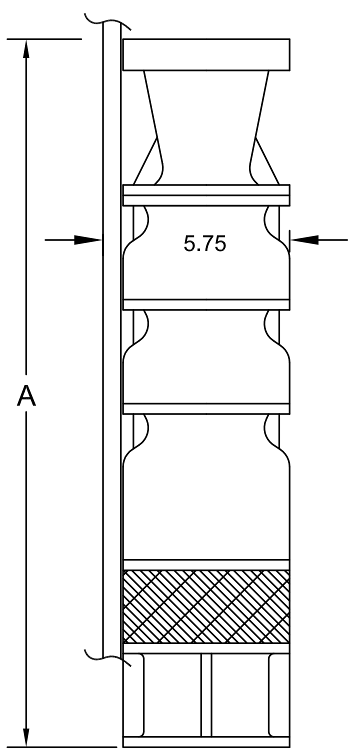
SUBMERSIBLE CURVES

S6LO

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER		STAGES	HP.	"A" LENGTH IN INCHES	APPROXIMATE SHIPPING WGT. LBS
S6LO	3A-5	3	5	25.25	74
S6LO	4A-7.5	4	7.5	29.25	88
S6LO	6A-10	6	10	37.25	116
S6LO	8A-15	8	15	45.25	144
S6LO	11A-20	11	20	57.25	186
S6LO	13A-25	13	25	65.25	214
S6LO	15A-30	15	25	73.25	242

MATERIALS OF CONSTRUCTION

DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

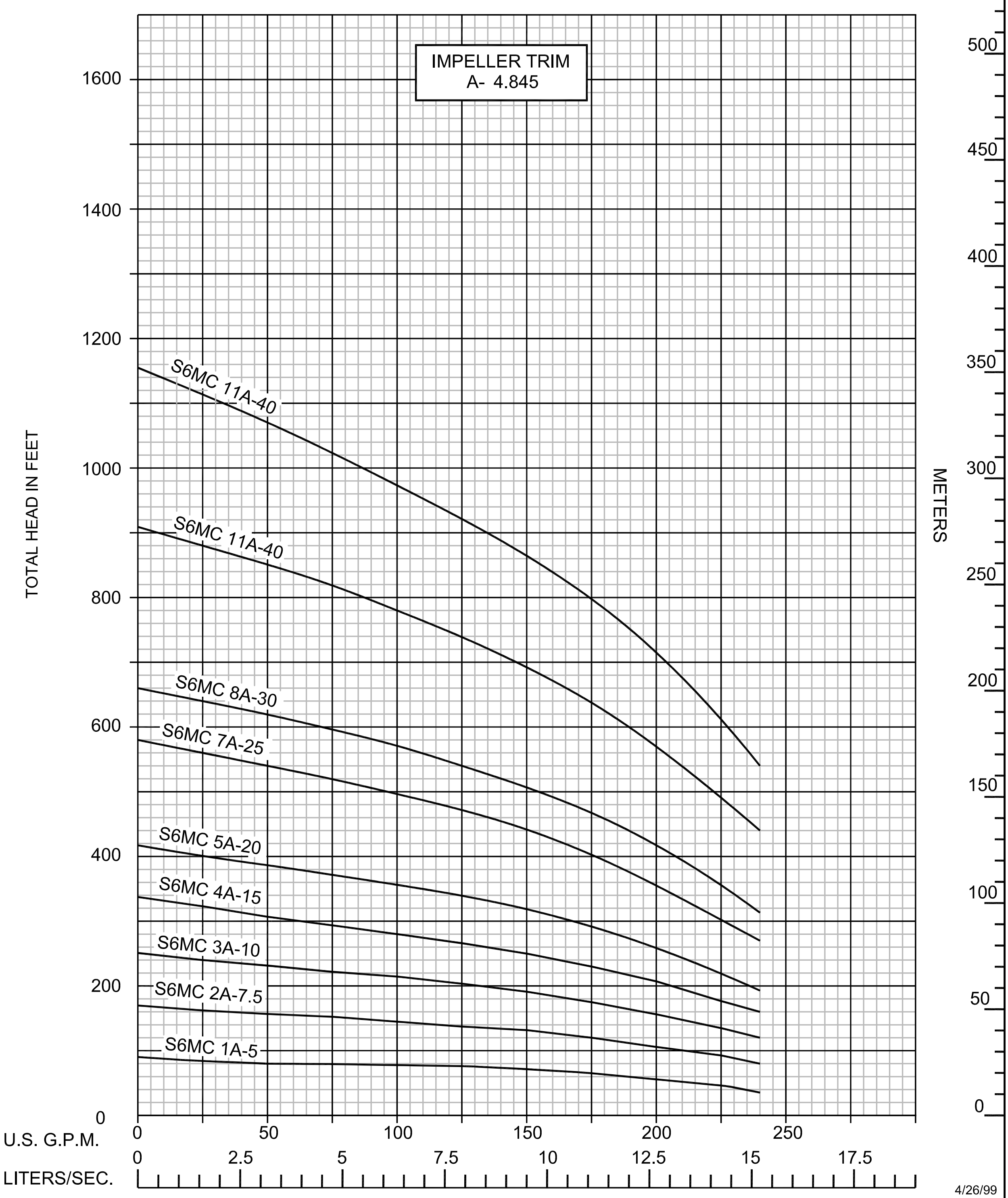
6/15/09
CVS6LO2P6CYBP

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON- AERATED WATER AT 85° F. MAXIMUM.

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

S6MC
3450 RPM

SUBMERSIBLE PUMP PERFORMANCE



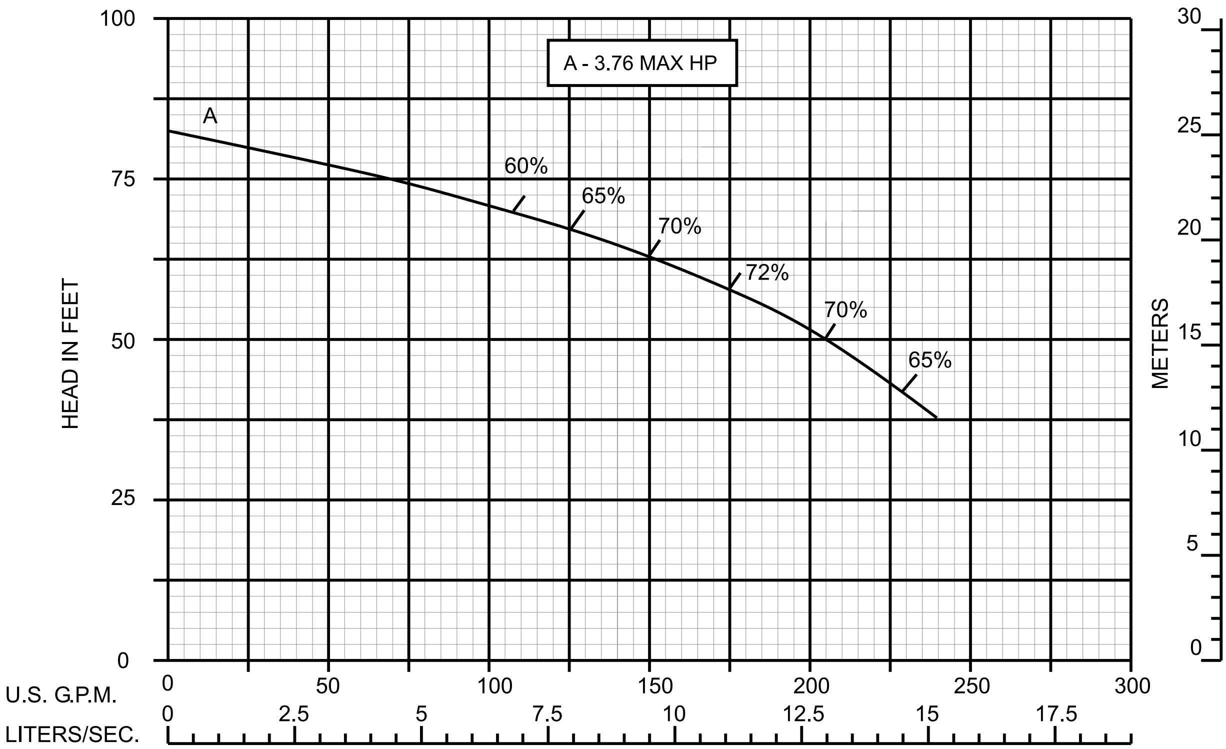
4/26/99
CVS6M2P6CY

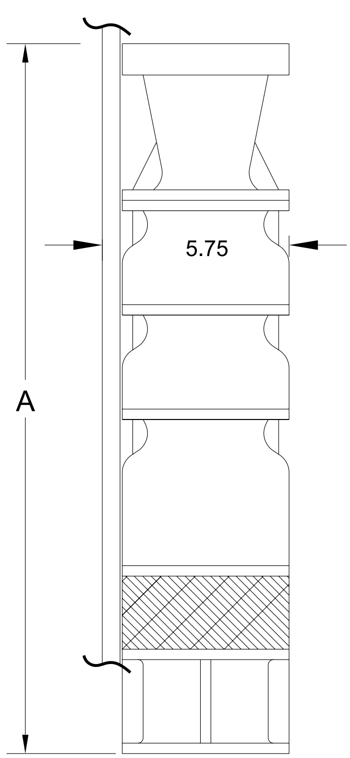
SUBMERSIBLE CURVES

S6MC

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	HP.	"A" LENGTH IN INCHES	APPROXIMATE SHIPPING WGT. LBS
S6MC 1A-5	1	5	17.25	46
S6MC 2A-7.5	2	7.5	21.25	60
S6MC 3A-10	3	10	25.25	74
S6MC 4A-15	4	15	29.25	88
S6MC 5A-20	5	20	33.25	102
S6MC 7A-25	7	25	41.25	130
S6MC 8A-30	8	30	45.25	144
S6MC 11A-40	11	40	57.25	186
S6MC 14A-50	14	50	69.25	228

MATERIALS OF CONSTRUCTION

DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

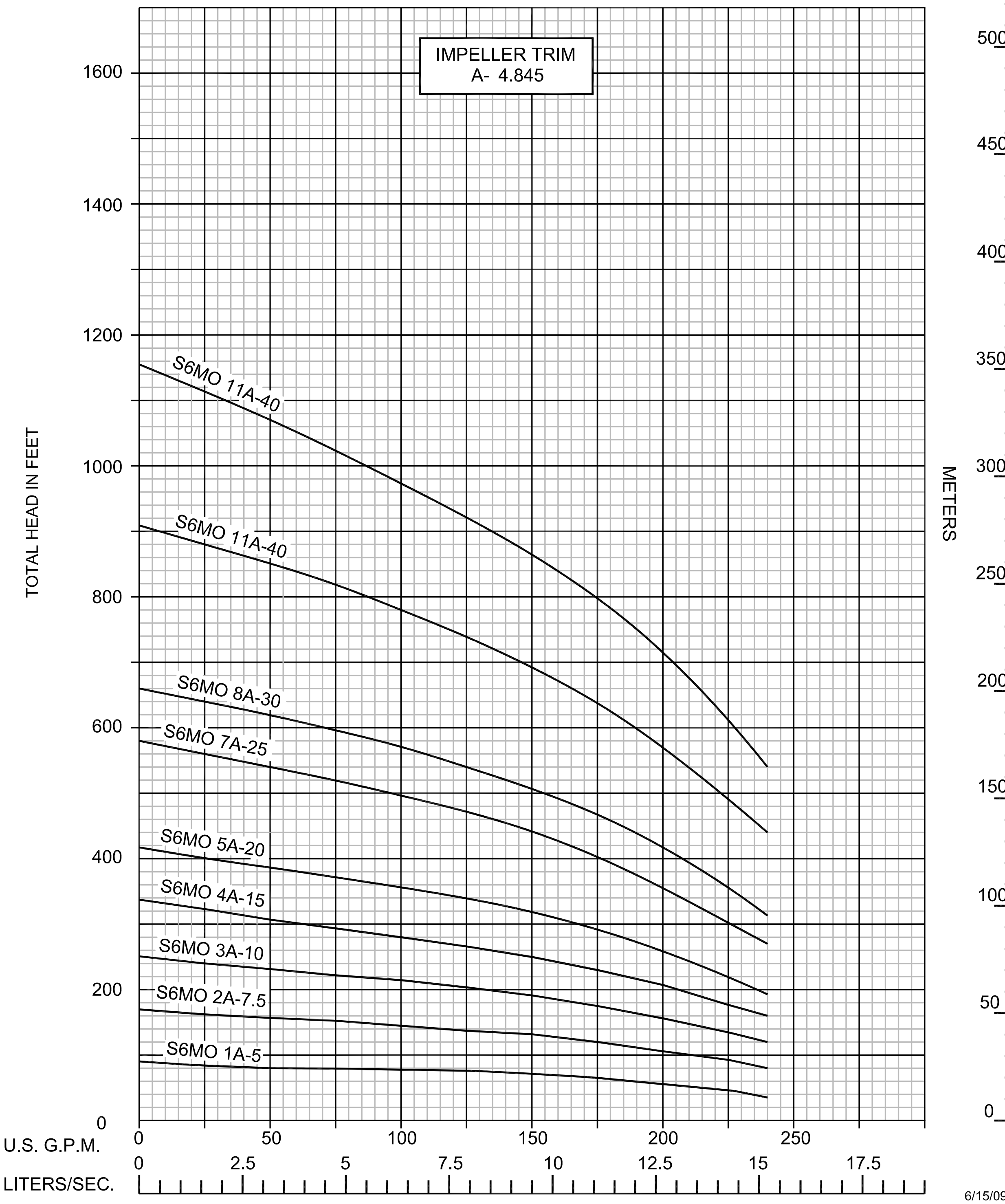
8/17/00
CVS6M2P6CYBP

SUBMERSIBLE CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON- AERATED WATER AT 85° F. MAXIMUM.	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	S6MO 3450 RPM

TEMPORARY CURVE, CONTACT FACTORY

SUBMERSIBLE PUMP PERFORMANCE



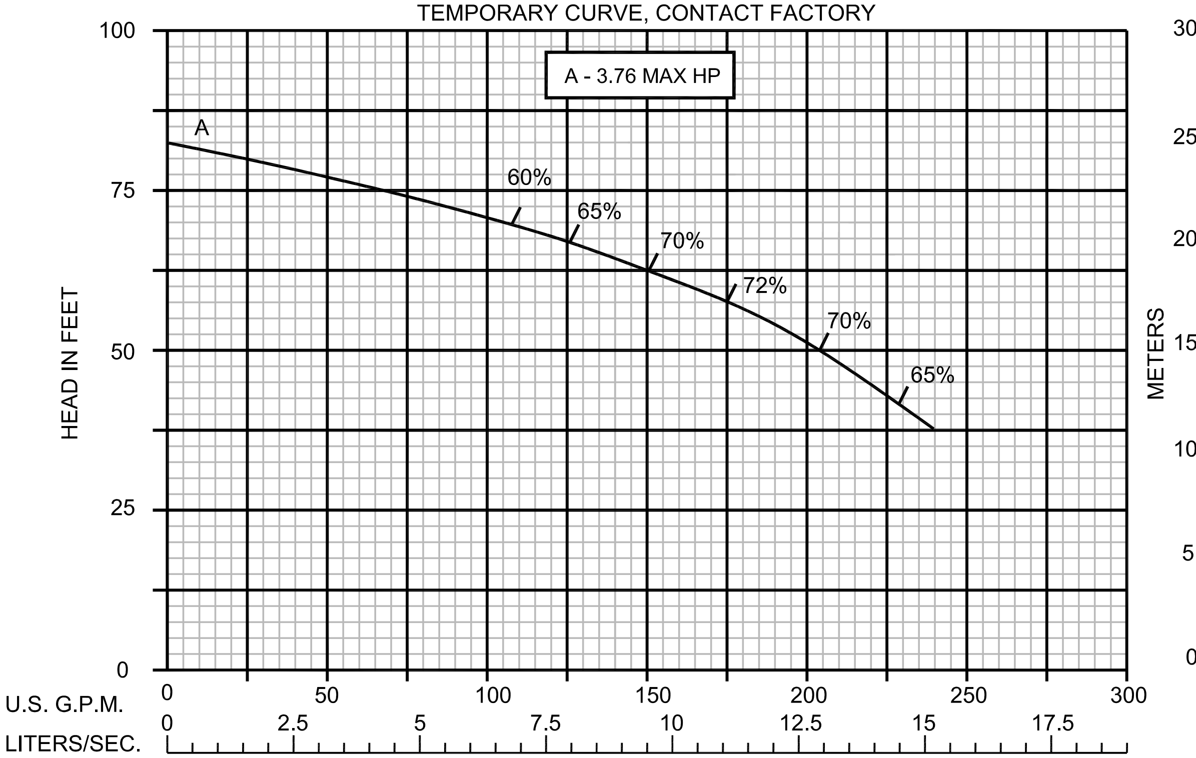
6/15/09
CVS6MO2P6CY

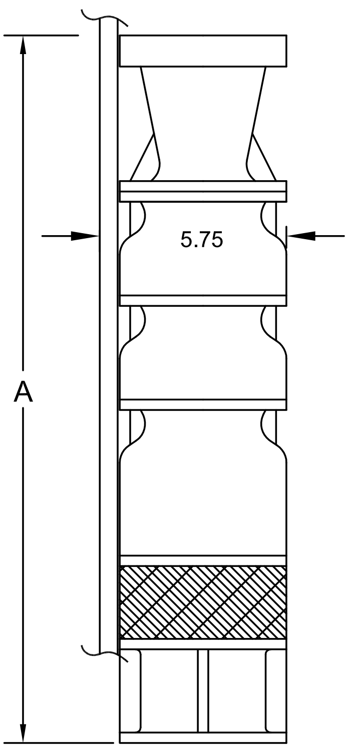
SUBMERSIBLE CURVES

S6MO

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	HP.	"A" LENGTH IN INCHES	APPROXIMATE SHIPPING WGT. LBS
S6MO 1A-5	1	5	17.25	46
S6MO 2A-7.5	2	7.5	21.25	60
S6MO 3A-10	3	10	25.25	74
S6MO 4A-15	4	15	29.25	88
S6MO 5A-20	5	20	33.25	102
S6MO 7A-25	7	25	41.25	130
S6MO 8A-30	8	30	45.25	144
S6MO 11A-40	11	40	57.25	186
S6MO 14A-50	14	50	69.25	228

MATERIALS OF CONSTRUCTION

DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

6/15/09
CVS6MO2P6CYBP

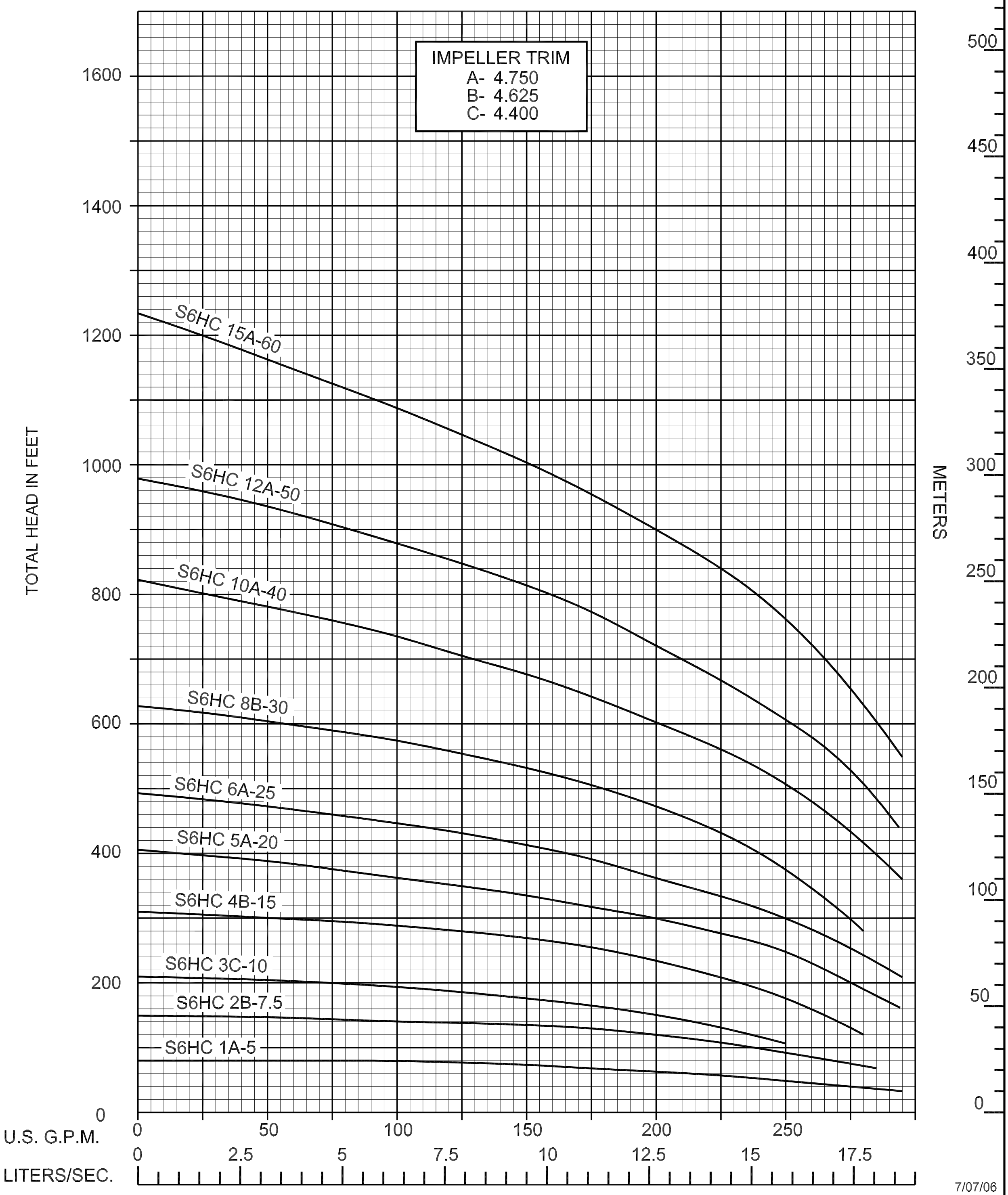
SUBMERSIBLE CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON- AERATED WATER AT 85° F. MAXIMUM.

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

S6HC
3450 RPM

SUBMERSIBLE PUMP PERFORMANCE



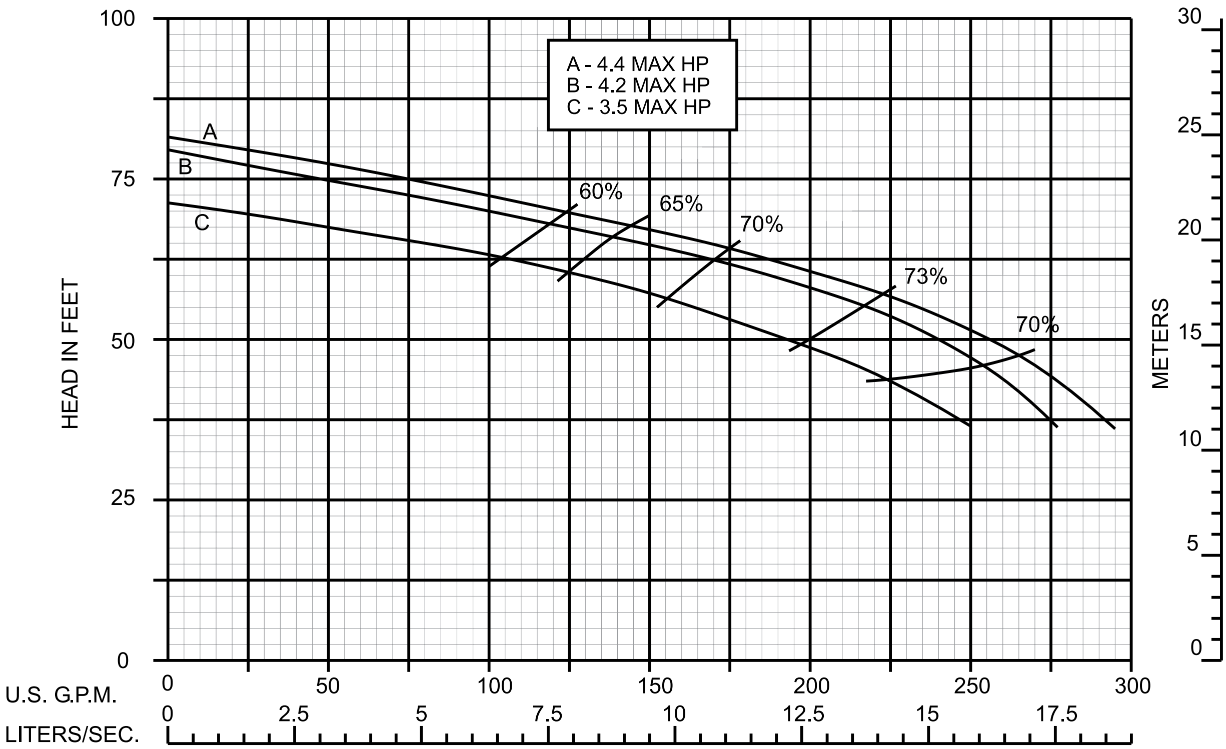
7/07/06
CVS6H2P6CY

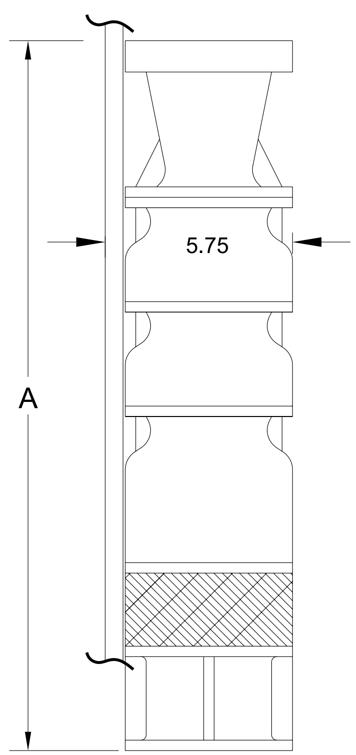
SUBMERSIBLE CURVES

S6HC

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	HP.	"A" LENGTH IN INCHES	APPROXIMATE SHIPPING WGT. LBS
S6HC 1A-5	1	5	17.25	46
S6HC 2B-7.5	2	7.5	21.25	60
S6HC 3C-10	3	10	25.25	74
S6HC 4B-15	4	15	29.25	88
S6HC 5A-20	5	20	33.25	102
S6HC 6A-25	6	25	37.25	116
S6HC 8B-30	8	30	45.25	144
S6HC 10A-40	10	40	53.25	172
S6HC 12A-50	12	50	61.25	200
S6HC 15A-60	15	60	73.25	242

MATERIALS OF CONSTRUCTION

DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

5/5/99
CVS6H2P6CYBP

SUBMERSIBLE CURVES

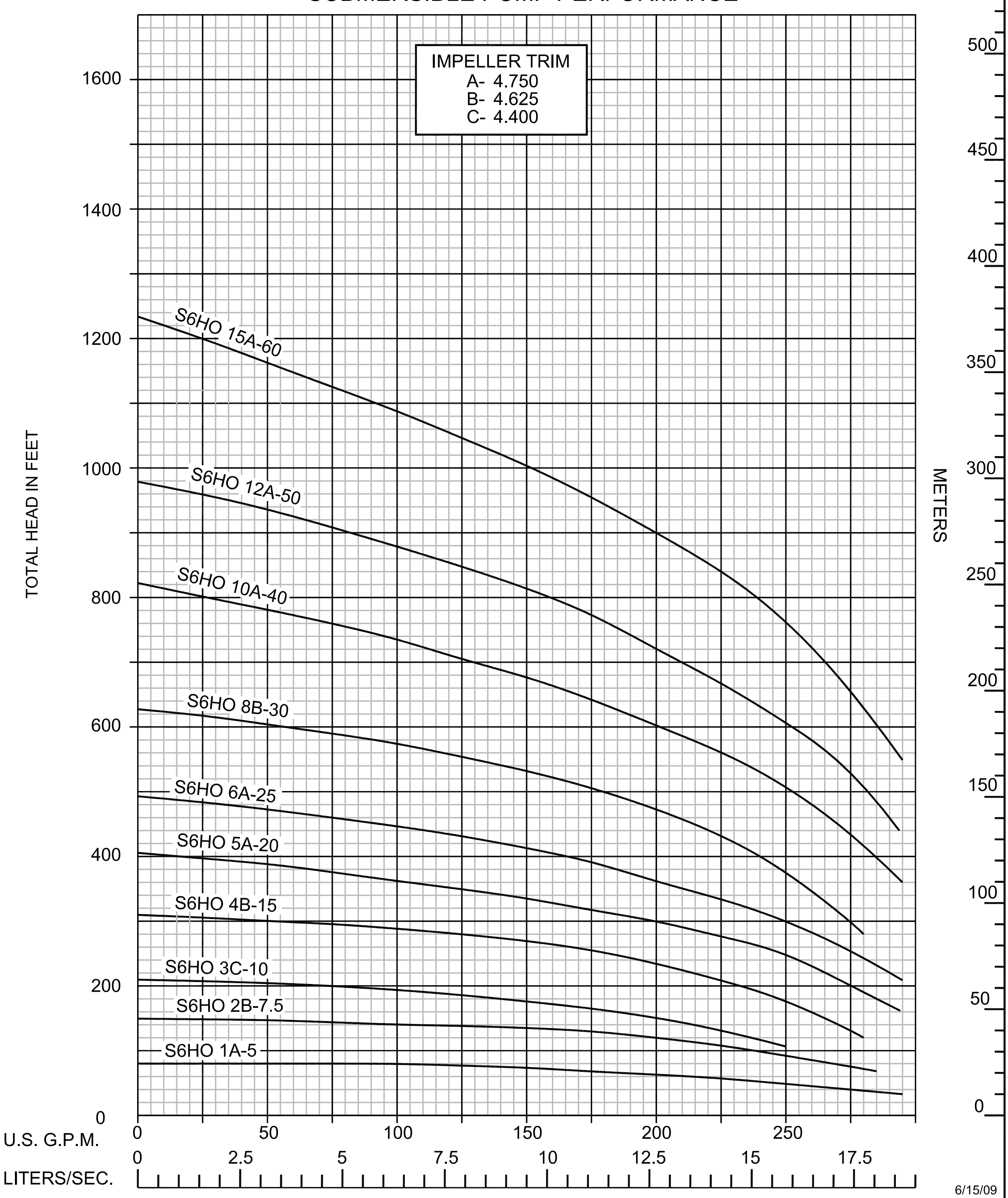
PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON- AERATED WATER AT 85° F. MAXIMUM.

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

S6HO
3450 RPM

TEMPORARY CURVE, CONTACT FACTORY

SUBMERSIBLE PUMP PERFORMANCE



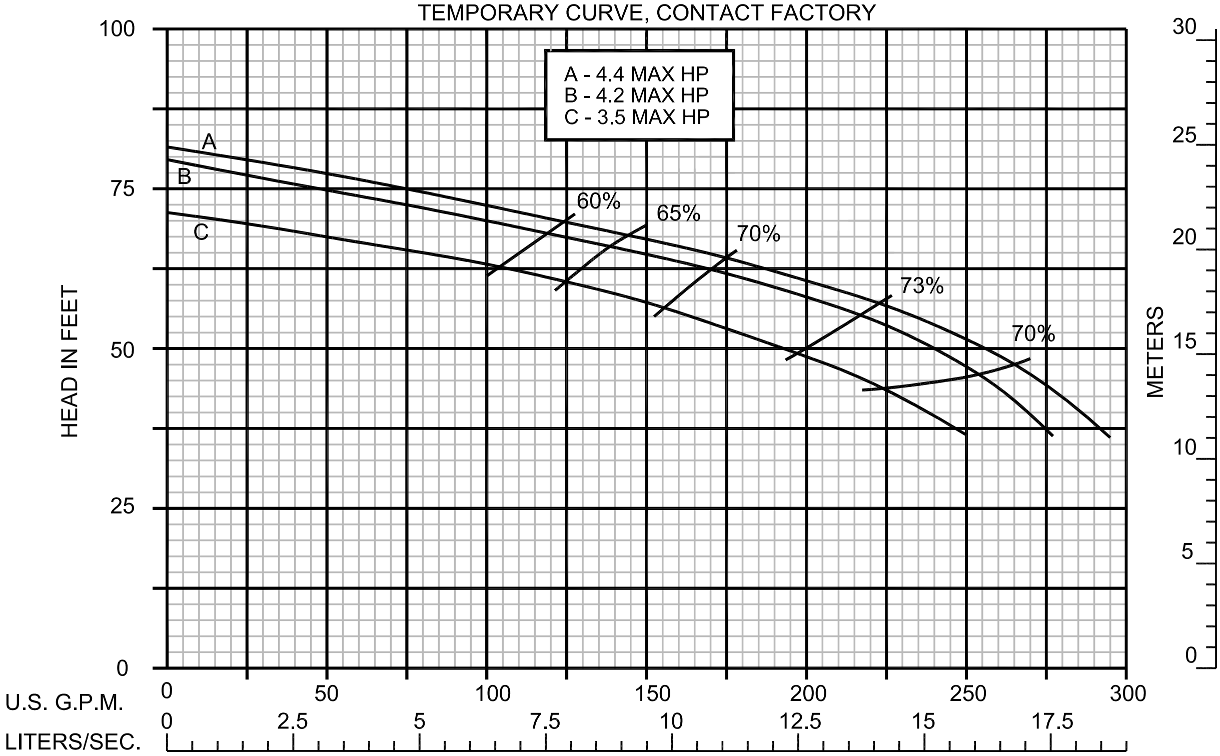
6/15/09
CVS6HO2P6CY

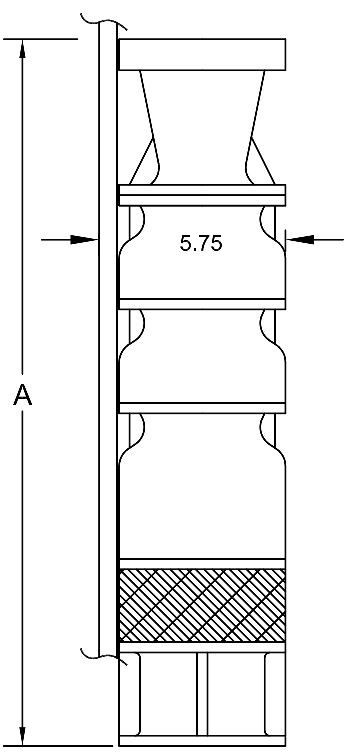
SUBMERSIBLE CURVES

S6HO

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	HP.	"A" LENGTH IN INCHES	APPROXIMATE SHIPPING WGT. LBS
S6HO 1A-5	1	5	17.25	46
S6HO 2B-7.5	2	7.5	21.25	60
S6HO 3C-10	3	10	25.25	74
S6HO 4B-15	4	15	29.25	88
S6HO 5A-20	5	20	33.25	102
S6HO 6A-25	6	25	37.25	116
S6HO 8B-30	8	30	45.25	144
S6HO 10A-40	10	40	53.25	172
S6HO 12A-50	12	50	61.25	200
S6HC 15A-60	15	60	73.25	242

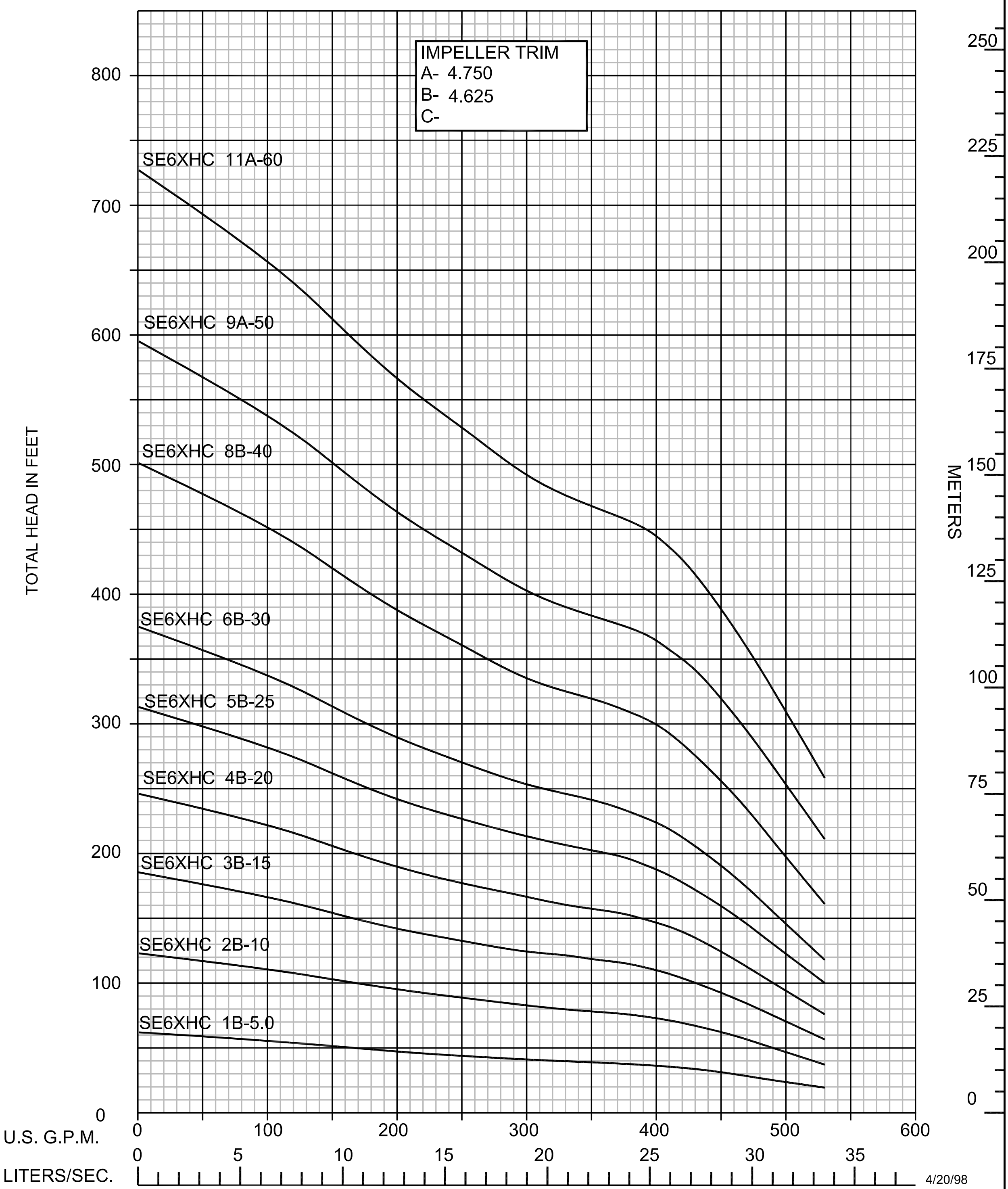
MATERIALS OF CONSTRUCTION

DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

6/15/09
CVS6HO2P6CYBP

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON- AERATED WATER AT 85° F. MAXIMUM.	NATIONAL PUMP COMPANY® A GORMAN-RUPP COMPANY	SE6XHC 3450 RPM

SUBMERSIBLE PUMP PERFORMANCE

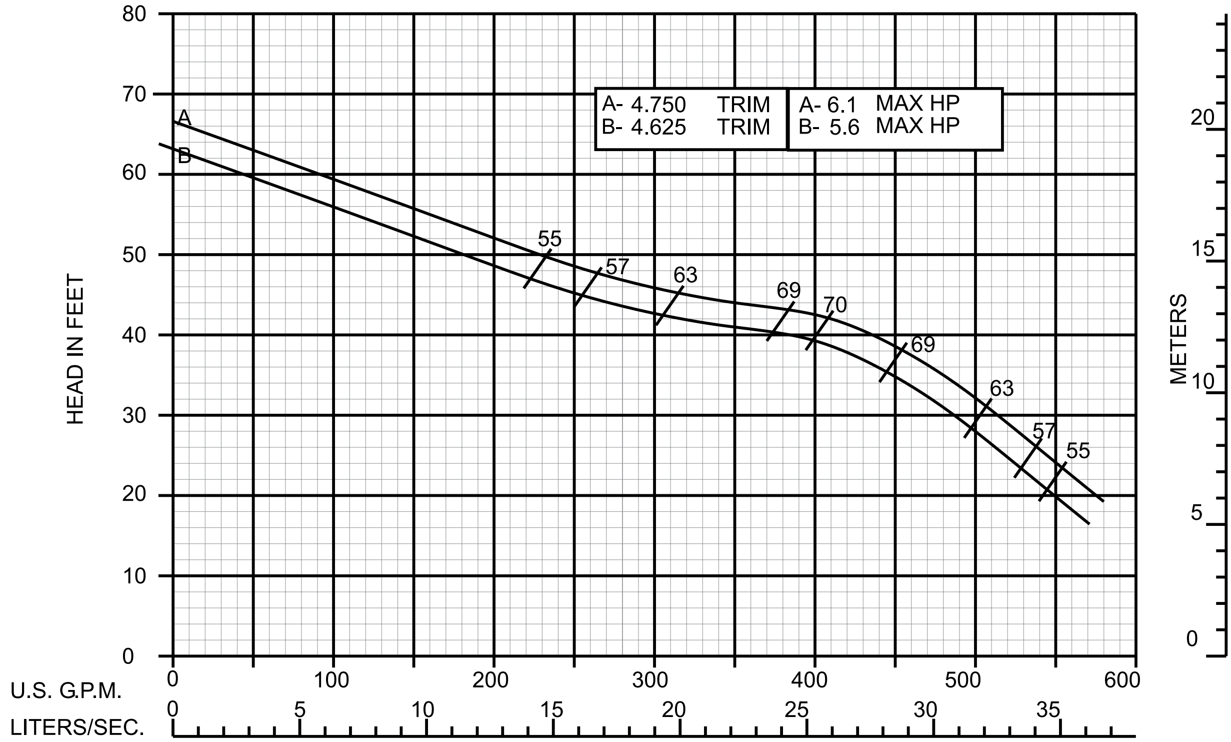


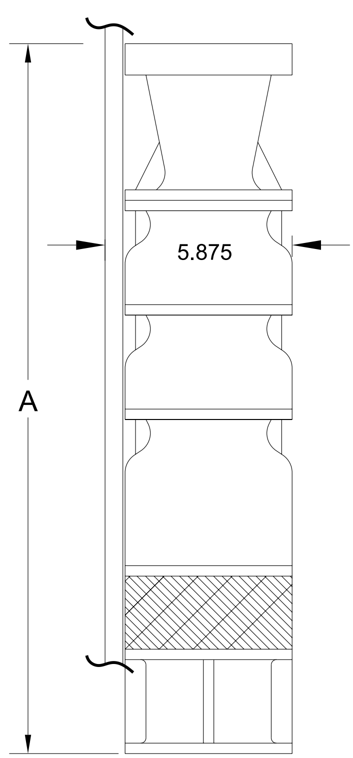
SUBMERSIBLE CURVES

SE6XHC

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	HP.	"A" LENGTH IN INCHES	APPROXIMATE SHIPPING WGT. LBS
SE6XHC 1B-5.0	1	5.0	14.813	60
SE6XHC 2B-10	2	10	21.000	85
SE6XHC 3B15	3	15	27.188	110
SE6XHC 4B-20	4	20	33.375	135
SE6XHC 5B-25	5	25	39.563	160
SE6XHC 6B-30	6	30	45.750	185
SE6XHC 8B-40	8	40	58.125	235
SE6XHC 9A-50	9	50	64.312	260
SE6XHC 11A-60	11	60	76.688	310

MATERIALS OF CONSTRUCTION

DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

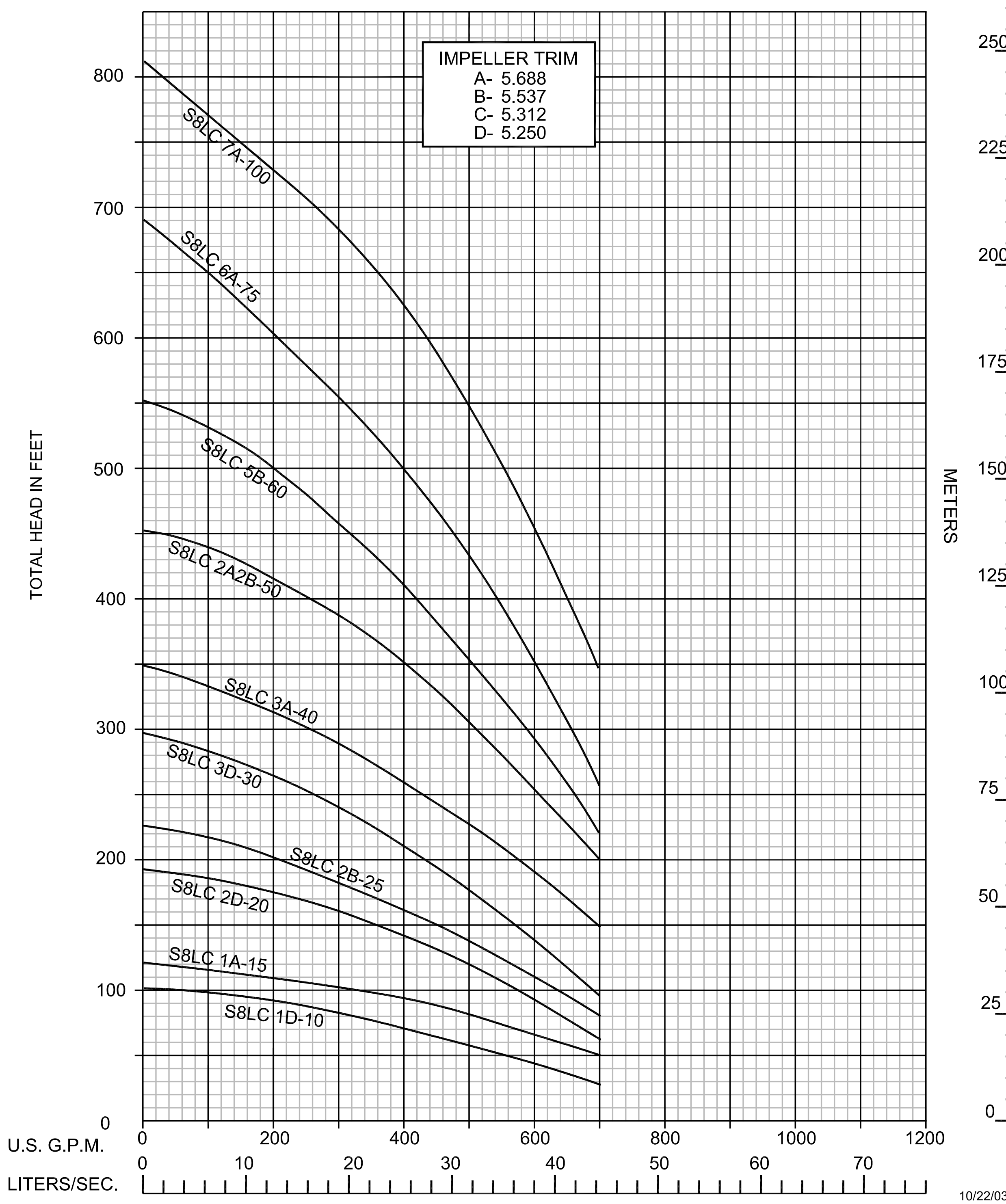
3/29/01
CVSE6XH2PSGL

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON- AERATED WATER AT 85° F. MAXIMUM.

NATIONAL PUMP COMPANY®
A GORMAN-RUPP COMPANY

S8LC
3450 RPM

SUBMERSIBLE PUMP PERFORMANCE



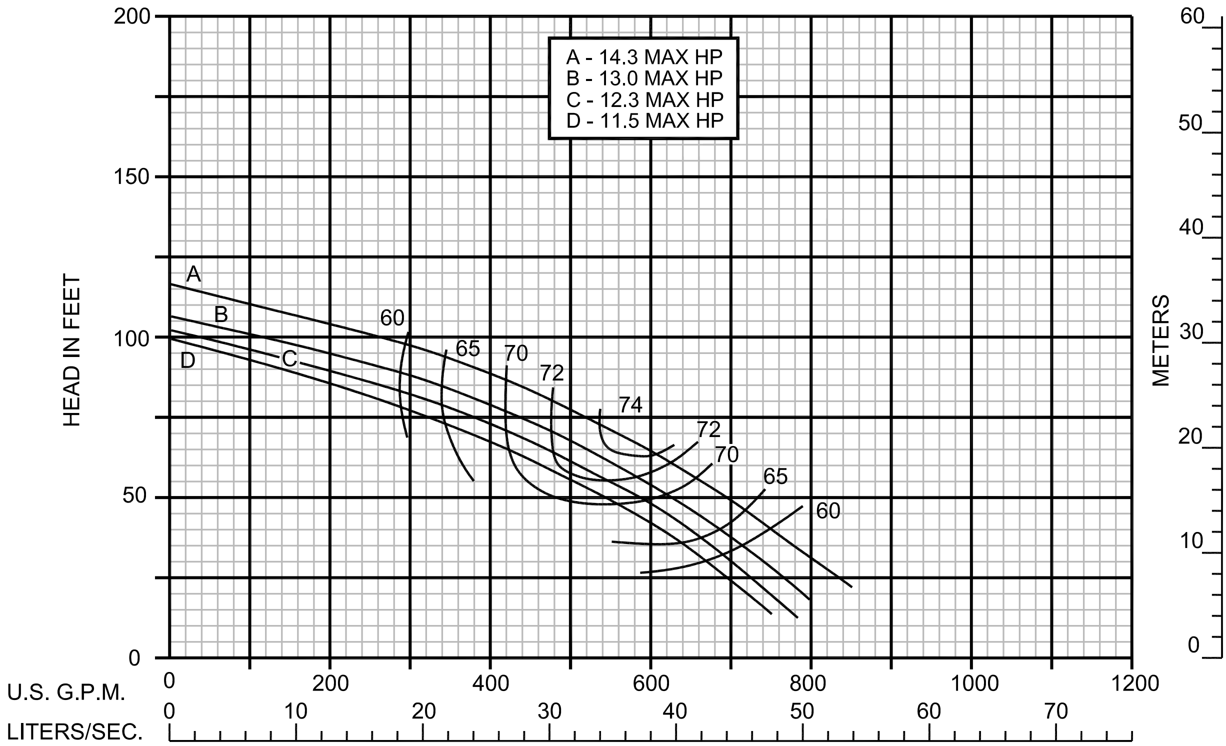
10/22/03
CVS8L2P6CY

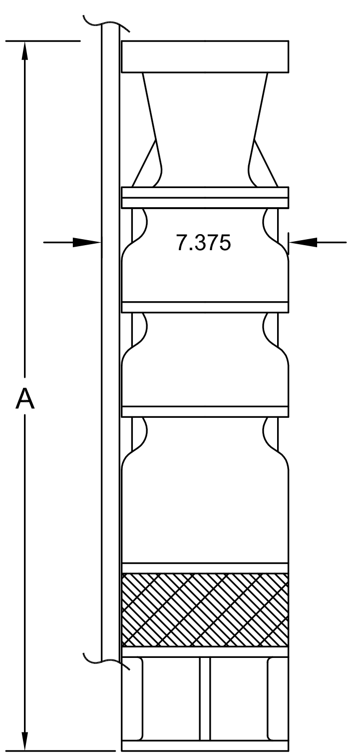
SUBMERSIBLE CURVES

S8LC

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	HP.	"A" LENGTH IN INCHES	APPROXIMATE SHIPPING WGT. LBS
S8LC 1D-10	1	10	27.75	115
S8LC 1A-15	1	15	27.75	115
S8LC 2D-20	2	20	34.50	150
S8LC 2B-25	2	25	34.50	150
S8LC 3D-30	3	30	41.25	185
S8LC 3A-40	3	40	41.25	185
S8LC 2A2B-50	4	50	48.00	220
S8LC 5B-60	5	60	54.75	255
S8LC 6A-75	6	75	61.50	290
S8LC 7A-100	7	100	68.25	325

MATERIALS OF CONSTRUCTION			
DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

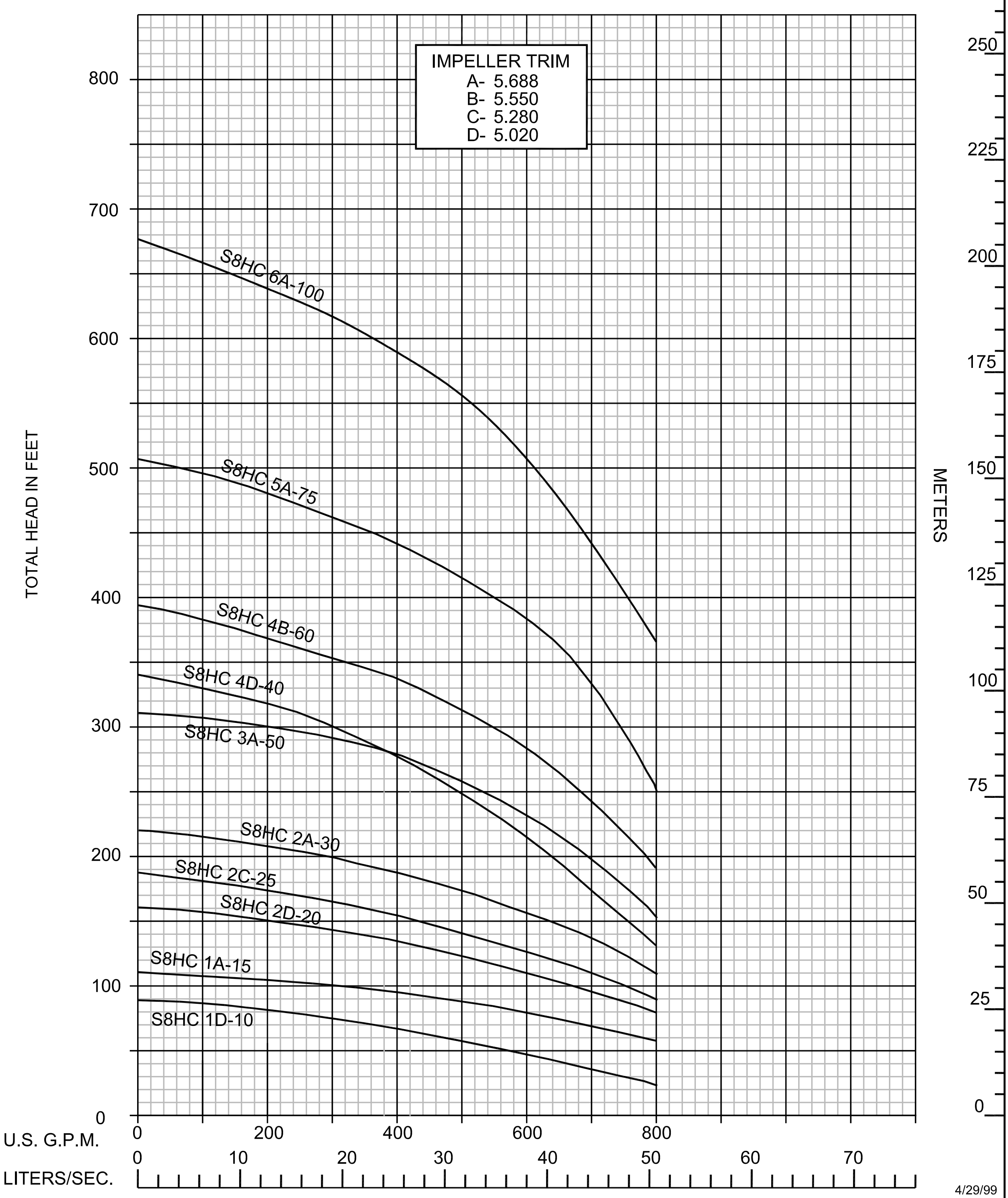
09/10/09
CVS8L2P6CYBP

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON- AERATED WATER AT 85° F. MAXIMUM.

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

S8HC
3450 RPM

SUBMERSIBLE PUMP PERFORMANCE



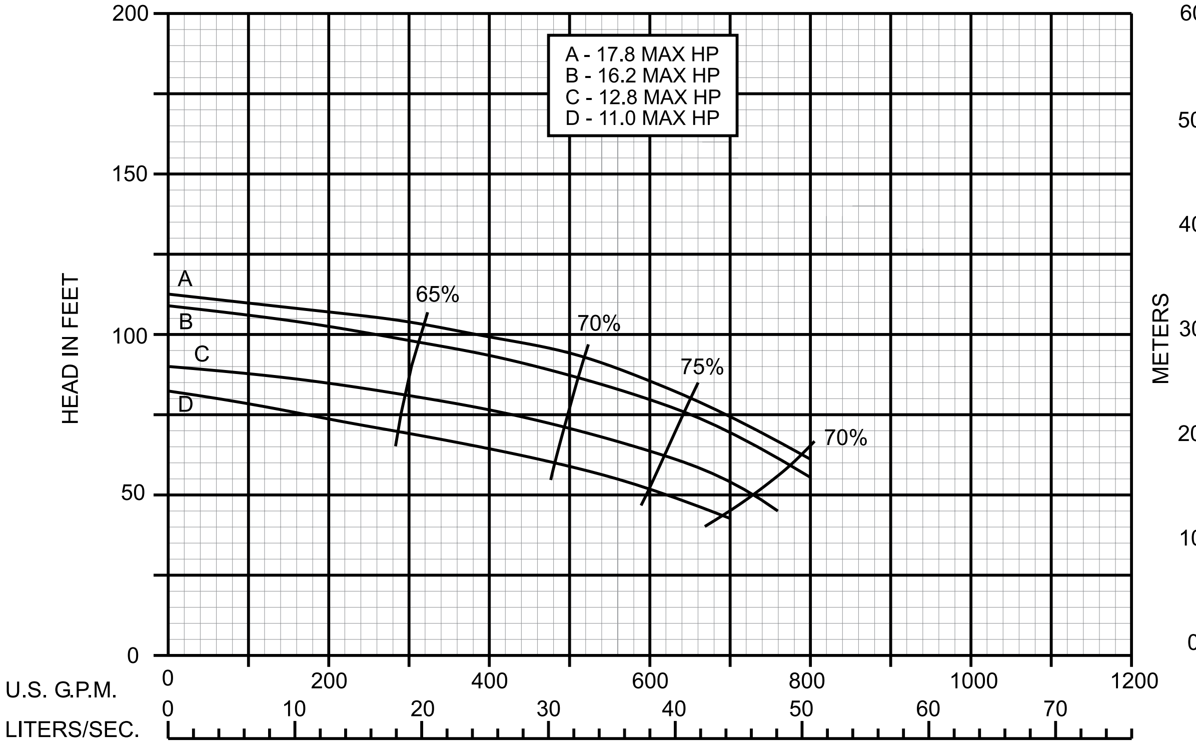
4/29/99
CVS8H2P6CY

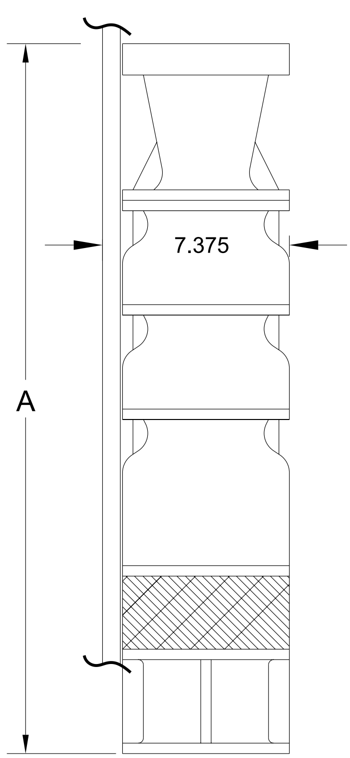
SUBMERSIBLE CURVES

S8HC

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	HP.	"A" LENGTH IN INCHES	APPROXIMATE SHIPPING WGT. LBS
S8HC 1D-10	1	10	27.75	115
S8HC 1A-15	1	15	27.75	115
S8HC 2D-20	2	20	34.50	150
S8HC 2C-25	2	25	34.50	150
S8HC 2A-30	2	30	34.50	150
S8HC 4D-40	4	40	48.00	220
S8HC 3A-50	3	50	41.25	185
S8HC 4B-60	4	60	48.00	220
S8HC 5A-75	5	75	54.75	255
S8HC 6A-100	6	100	61.50	290

MATERIALS OF CONSTRUCTION			
DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

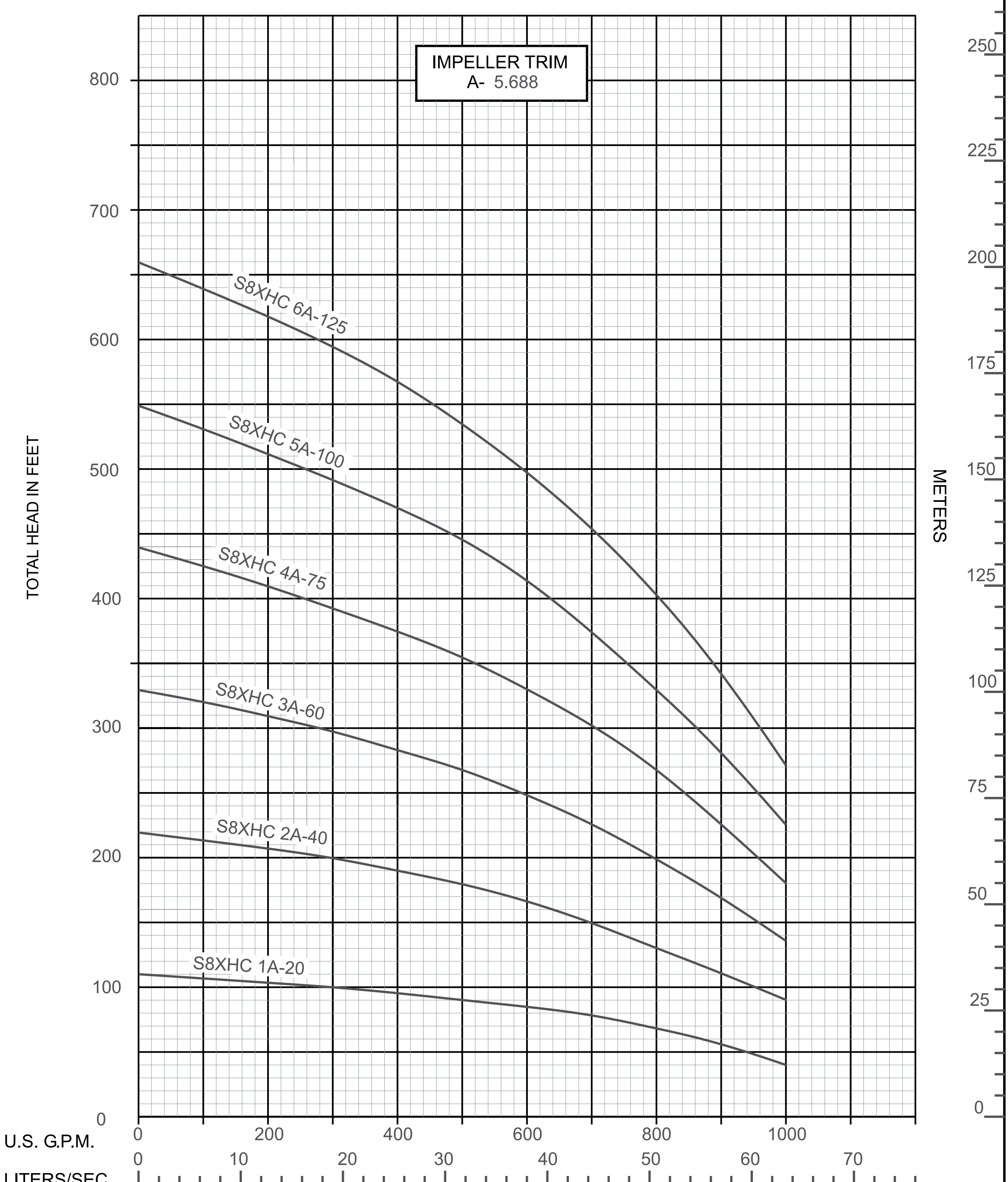
5/5/99
CVS8H2P6CYBP

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON- AERATED WATER AT 85° F. MAXIMUM.

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

S8XHC
3450 RPM

SUBMERSIBLE PUMP PERFORMANCE



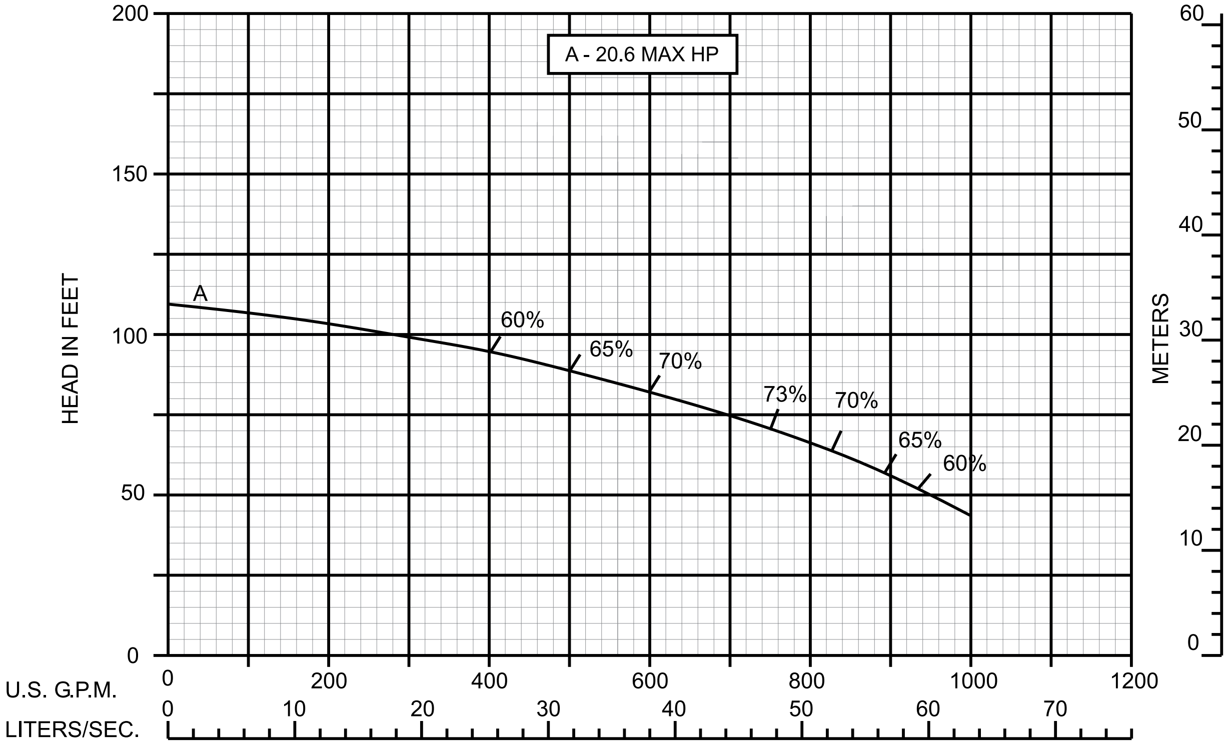
5/20/99
CVS8X2P6CY

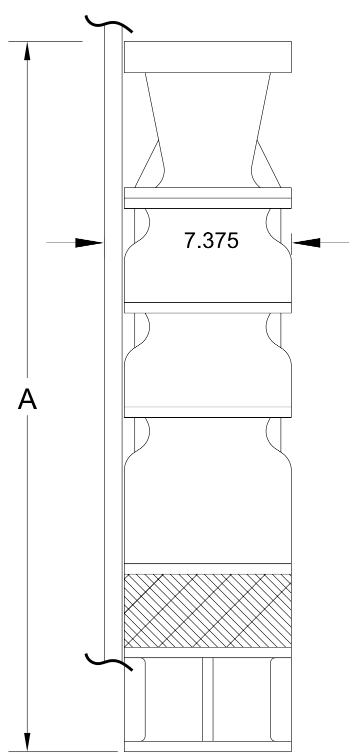
SUBMERSIBLE CURVES

S8XHC

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	HP.	"A" LENGTH IN INCHES	APPROXIMATE SHIPPING WGT. LBS
S8XHC 1A-20	1	20	27.75	115
S8XHC 2A-40	2	40	34.50	150
S8XHC 3A-60	3	60	41.25	185
S8XHC 4A-75	4	75	48.00	220
S8XHC 5A-100	5	100	54.75	255
S8XHC 6A-125	6	125	61.50	290

MATERIALS OF CONSTRUCTION

DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

5/5/99
CVS8X2P6CYBP

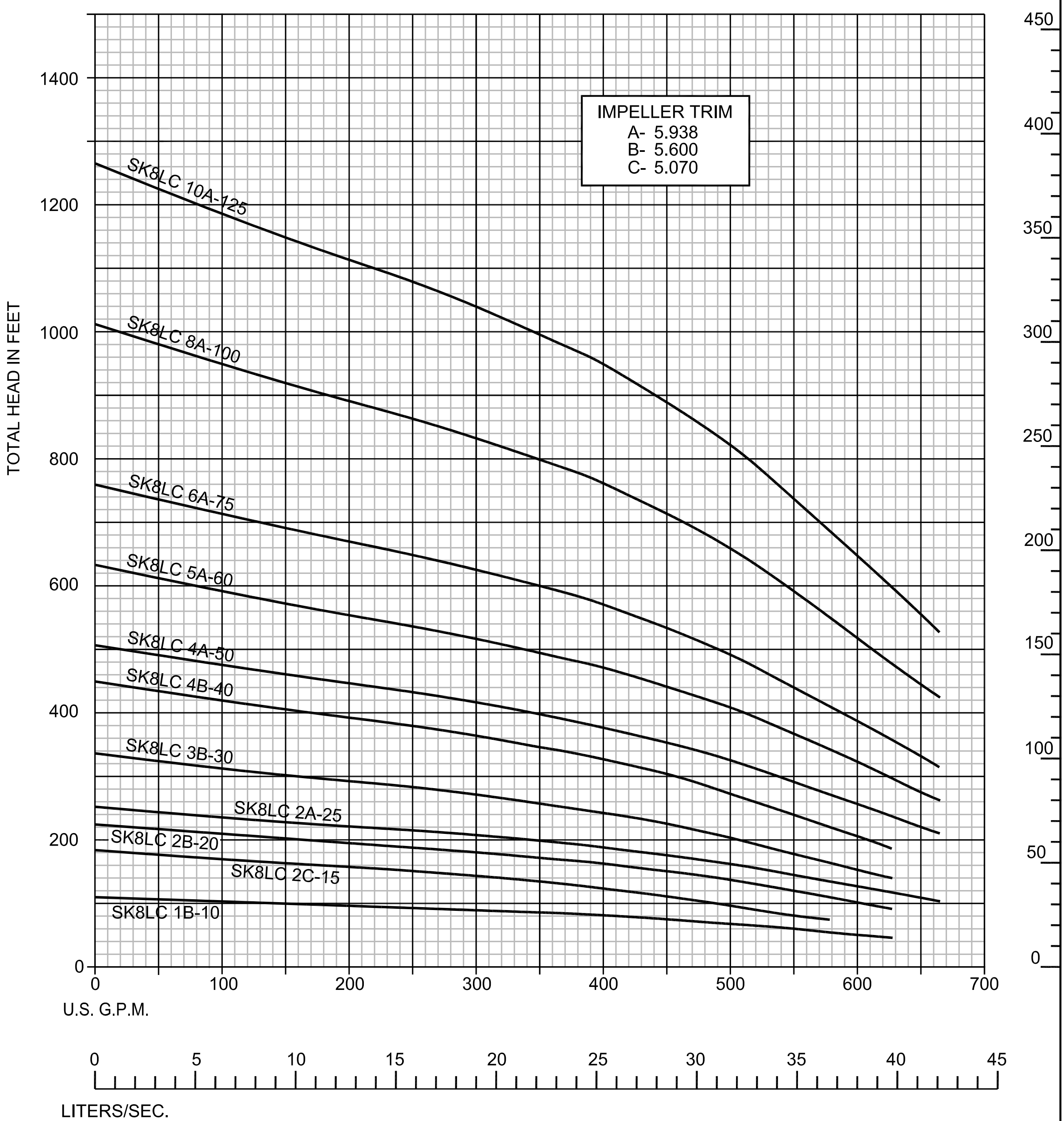
PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON- AERATED WATER AT 85° F. MAXIMUM.

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

SK8LC

3450 RPM

SUBMERSIBLE PUMP PERFORMANCE



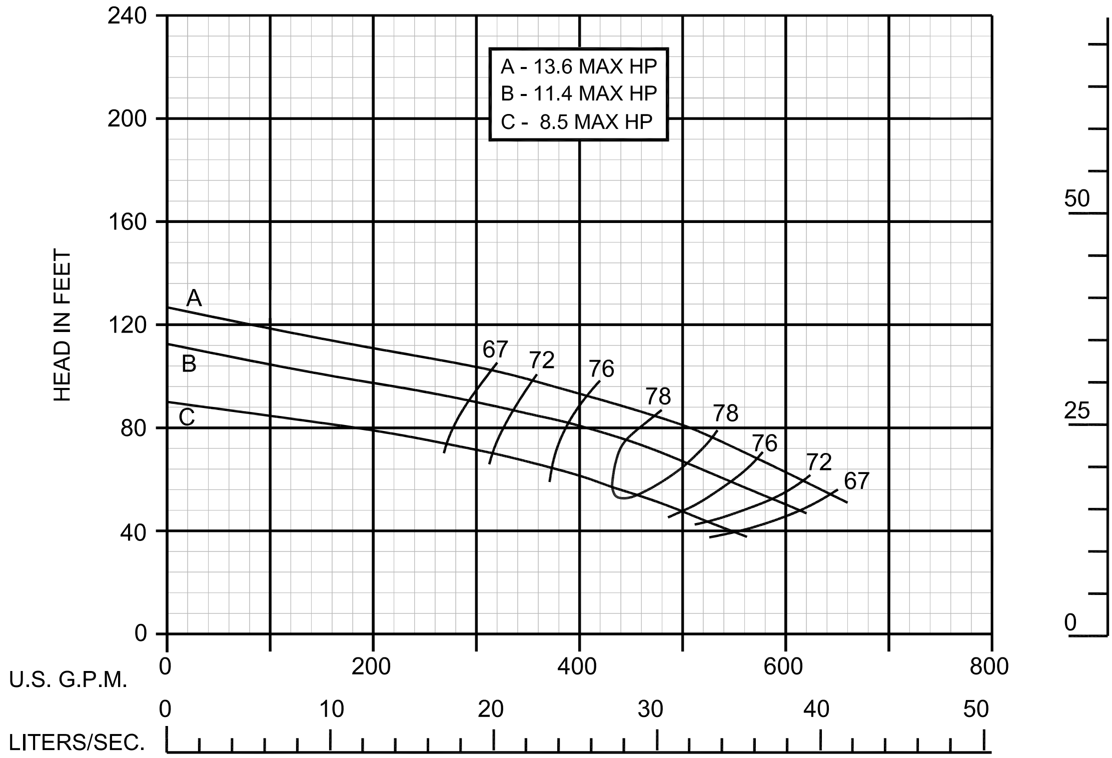
8/26/09
CVSK8L2P6CY

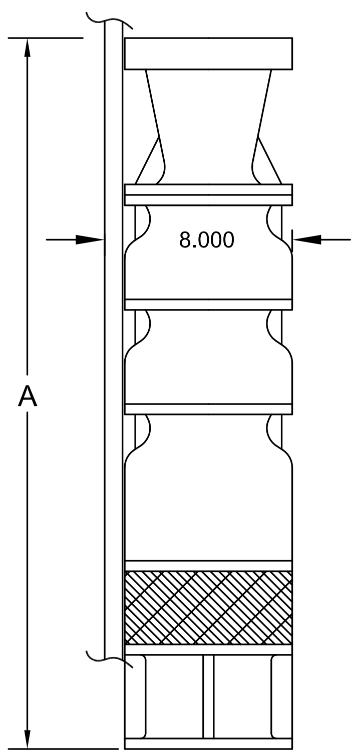
SUBMERSIBLE CURVES

SK8LC

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	HP.	"A" LENGTH IN INCHES	APPROXIMATE SHIPPING WGT. LBS
SK8LC 1B-10	1	10	22.63	85
SK8LC 2C-15	2	15	29.13	121
SK8LC 2B-20	2	20	29.13	121
SK8LC 2A-25	2	25	29.13	121
SK8LC 3B-30	3	30	35.63	157
SK8LC 4B-40	4	40	42.13	193
SK8LC 4A-50	4	50	42.13	193
SK8LC 5A-60	5	60	48.63	229
SK8LC 6A-75	6	75	55.13	265
SK8LC 8A-100	8	100	68.13	337
SK8LC 10A-125	10	125	81.13	409

MATERIALS OF CONSTRUCTION

DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

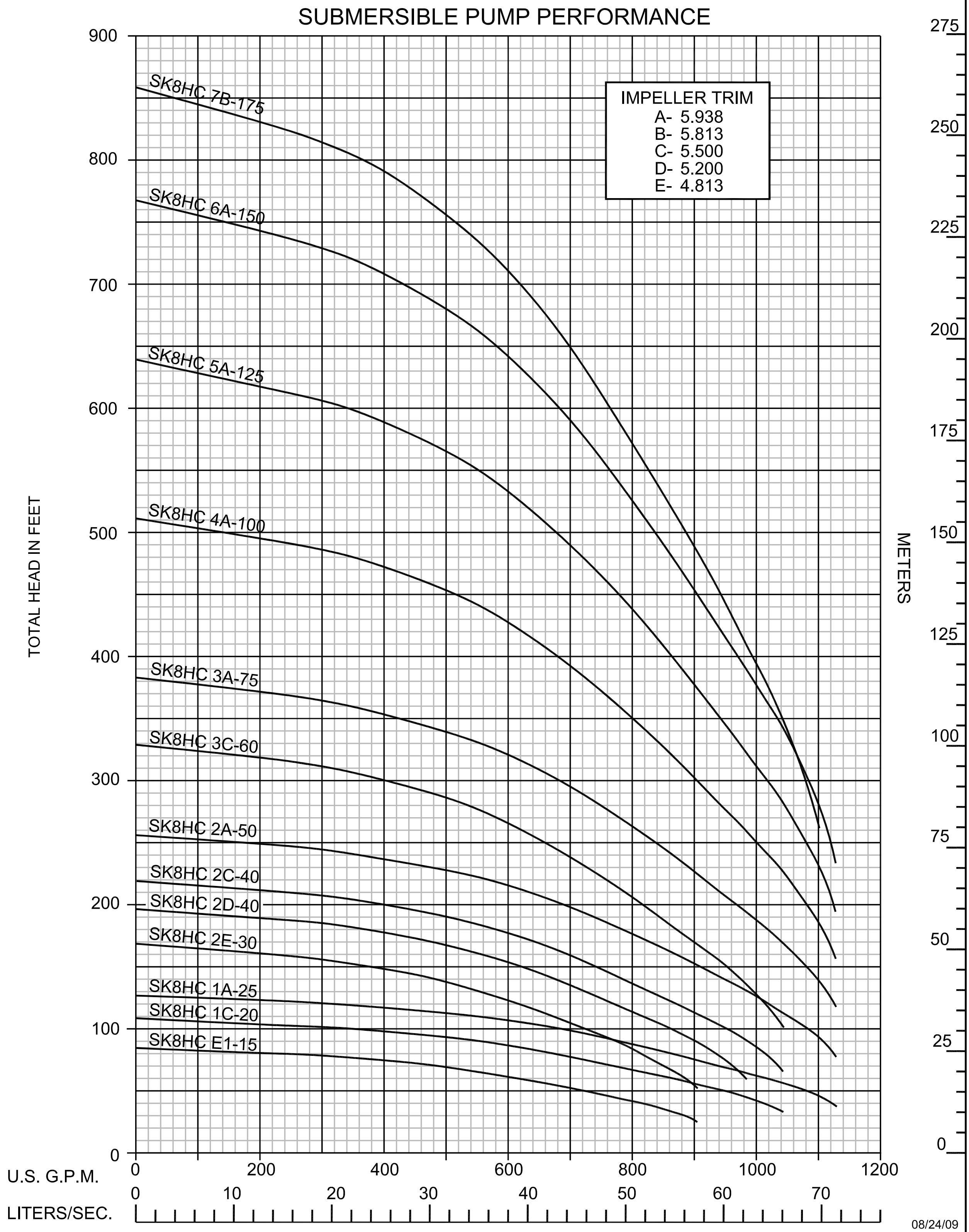
8/26/09
CVSK8L2P6CYBP

SUBMERSIBLE CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON- AERATED WATER AT 85° F. MAXIMUM.

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

SK8HC
3450 RPM

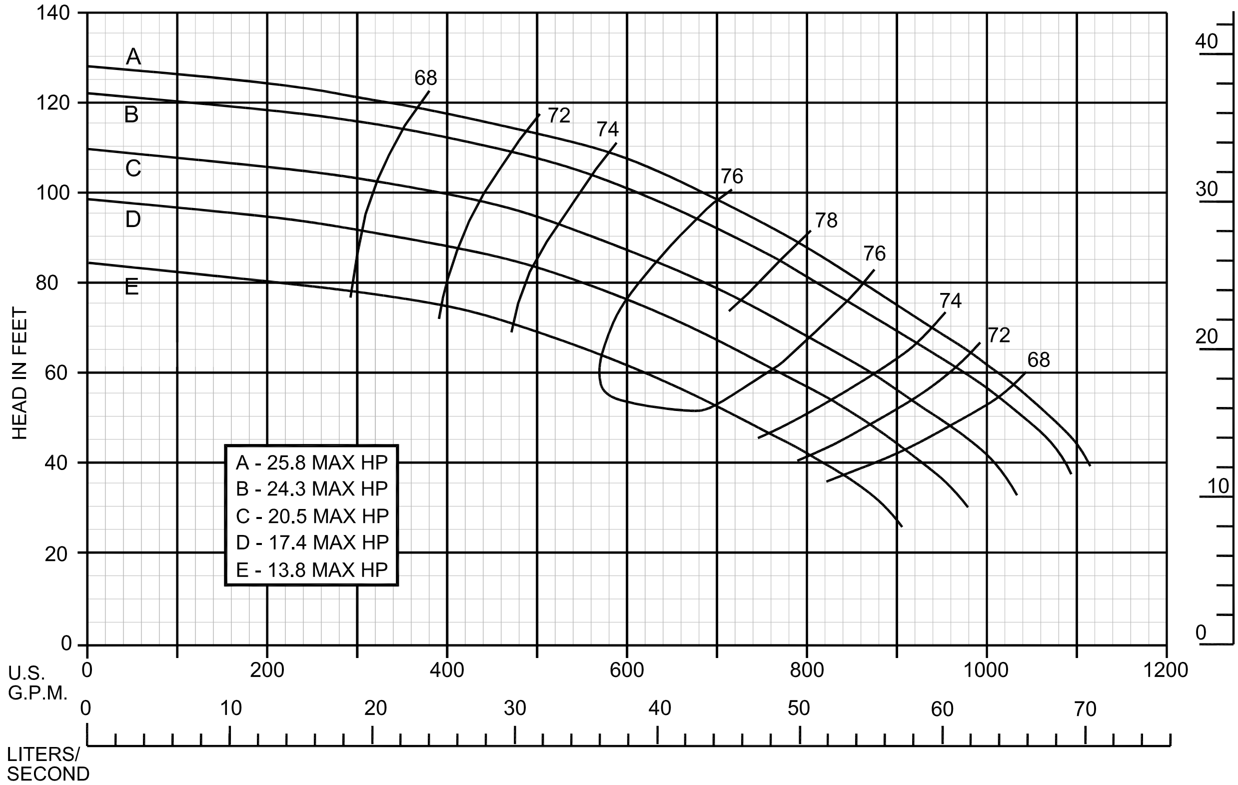


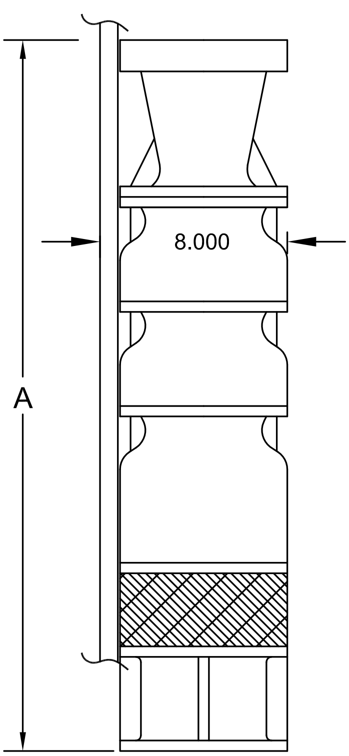
SUBMERSIBLE CURVES

SK8HC

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	HP.	"A" LENGTH IN INCHES	APPROXIMATE SHIPPING WGT. LBS
SK8HC 1E-15	1	15	22.63	85
SK8HC 1C-20	1	20	22.63	85
SK8HC 1A-25	1	25	22.63	85
SK8HC 2E-30	2	30	29.13	121
SK8HC 2D-40	2	40	29.13	121
SK8HC 2C-40	2	40	29.13	121
SK8HC 2A-50	2	50	29.13	121
SK8HC 3C-60	3	60	35.63	157
SK8HC 3A-75	3	75	35.63	157
SK8HC 4A-100	4	100	42.13	193
SK8HC 5A-125	5	125	48.63	229
SK8HC 6A-150	6	150	55.13	265
SK8HC 7B-175	7	175	61.63	301

MATERIALS OF CONSTRUCTION

DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

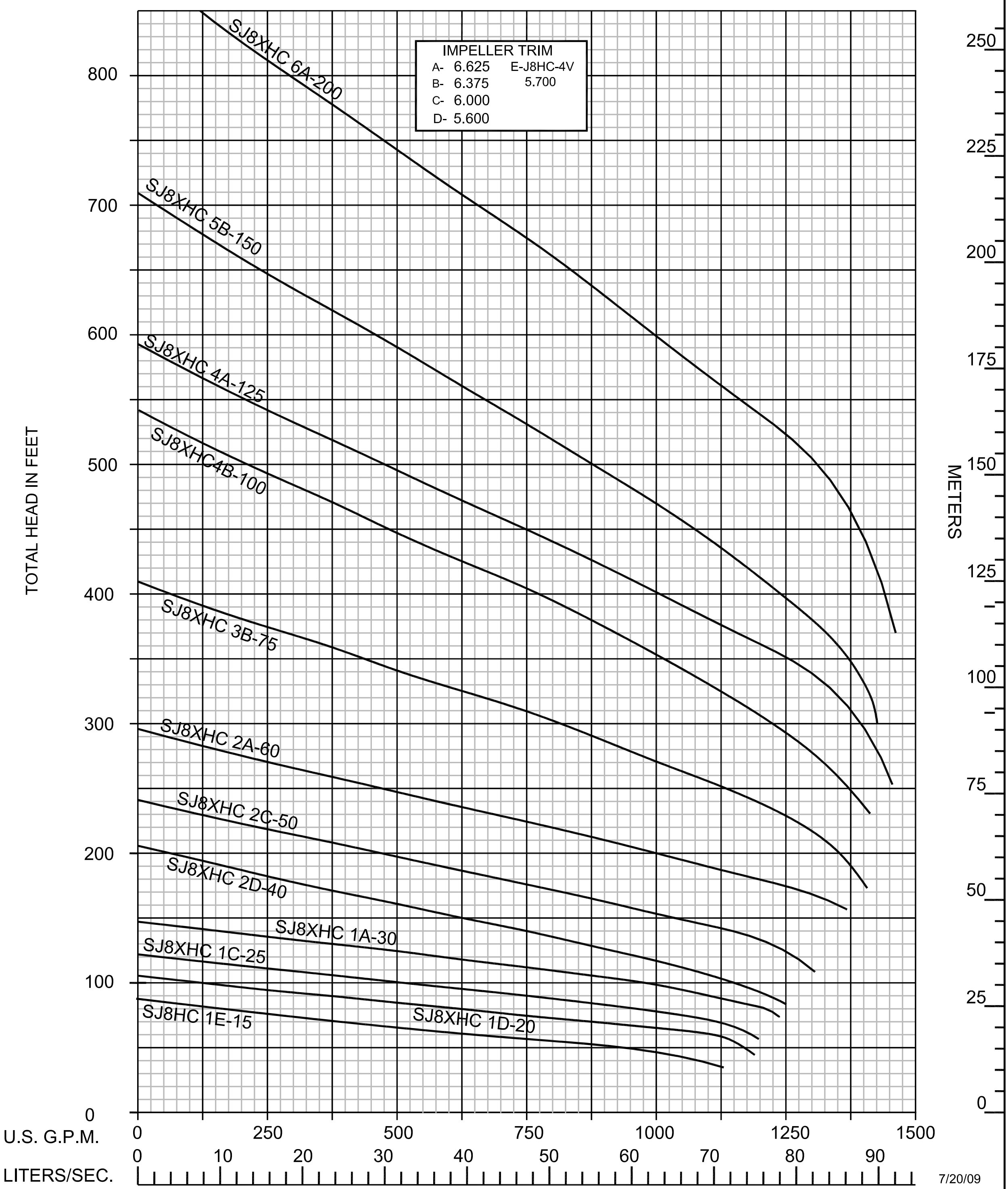
8/26/09
CVSK8H2P6CYBP

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON- AERATED WATER AT 85° F. MAXIMUM.

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

SJ8XHC
3450 RPM

SUBMERSIBLE PUMP PERFORMANCE



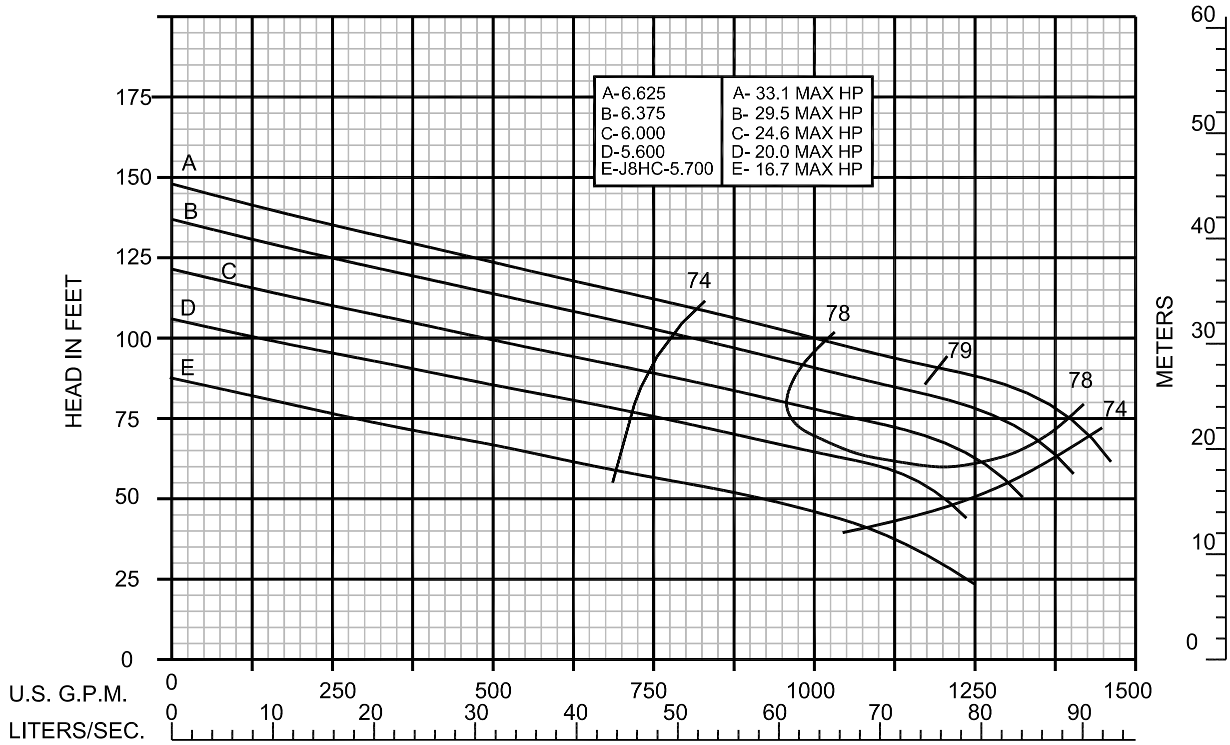
7/20/09
CVSJ8XH2P6CY

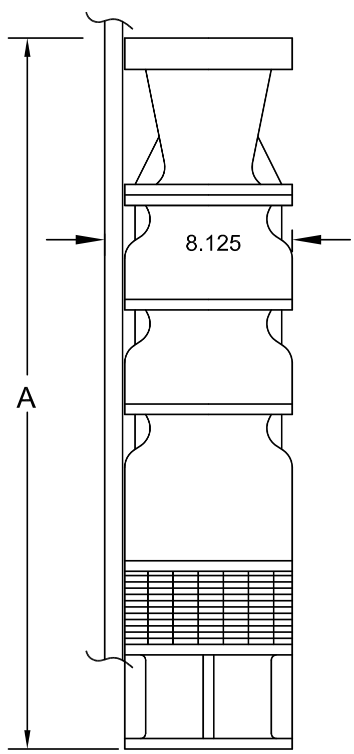
SUBMERSIBLE CURVES

SJ8XHC

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	HP.	"A" LENGTH IN INCHES	APPROXIMATE SHIPPING WGT. LBS
SJ8HC 1E-15	1	15	24.000	85
SJ8XHC 1D-20	1	20	24.000	85
SJ8XHC 1C-25	1	25	24.000	85
SJ8XHC 1A-30	1	30	24.000	85
SJ8XHC 2D-40	2	40	32.880	130
SJ8XHC 2C-50	2	50	37.000 *	130
SJ8XHC 2A-60	2	60	37.000 *	130
SJ8XHC 3B-75	3	75	45.880 *	175
SJ8XHC 4B-100	4	100	54.750 *	220
SJ8XHC 4A-125	4	125	54.750 *	220
SJ8XHC 5B-150	5	150	63.630 *	265
SJ8XHC 6A-200	6	200	72.500 *	310

* LENGTH FOR 2 PIECE SUB. SUCTION/MOTOR BRACKET

MATERIALS OF CONSTRUCTION

DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	DUCTILE IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

4/24/09
CVSJ8XH2P6CY SGL

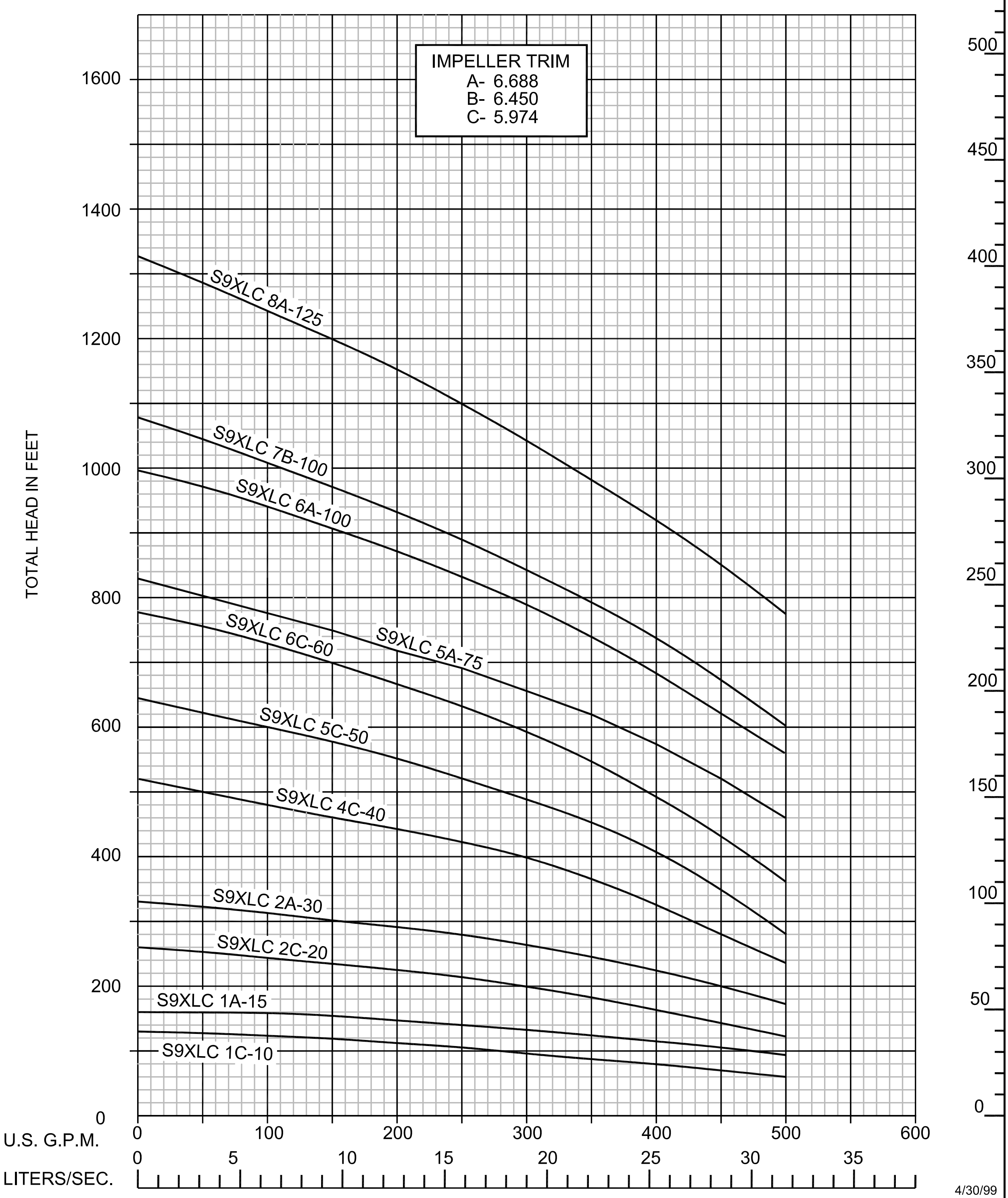
SUBMERSIBLE CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON- AERATED WATER AT 85° F. MAXIMUM.

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

S9XLC
3450 RPM

SUBMERSIBLE PUMP PERFORMANCE



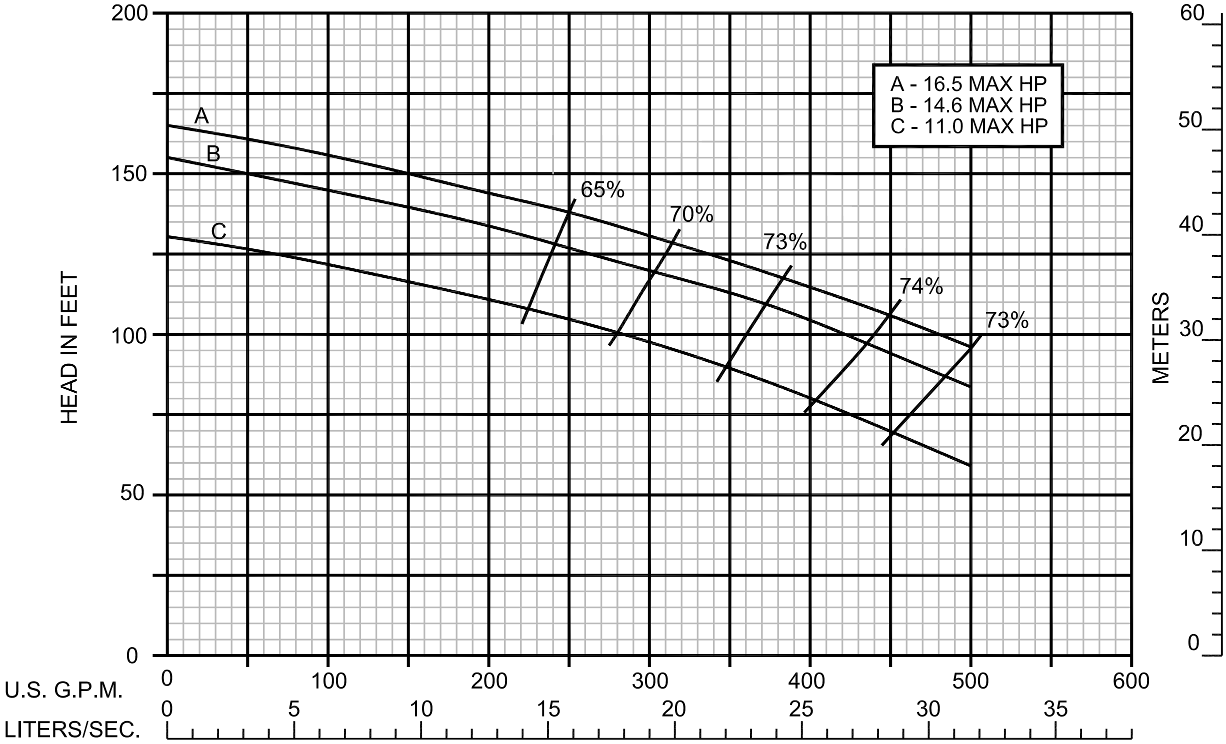
4/30/99
CVS9XL2P6CY

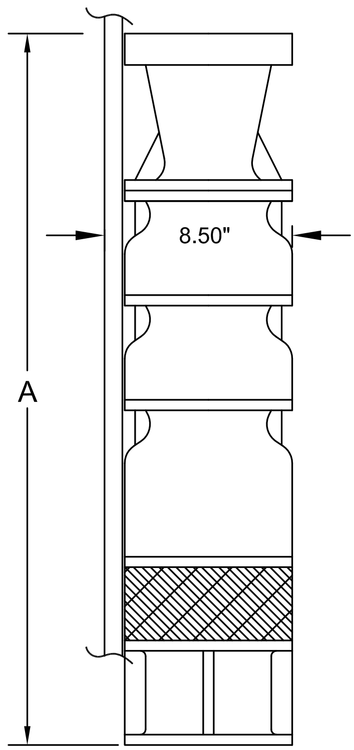
SUBMERSIBLE CURVES

S9XLC

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	HP.	"A" LENGTH IN INCHES	APPROXIMATE SHIPPING WGT. LBS
S9XLC 1C-10	1	10	27.50	130
S9XLC 1A-15	1	15	27.50	130
S9XLC 2C-20	2	20	34.75	170
S9XLC 2A-30	2	30	34.75	170
S9XLC 4C-40	4	40	49.25	250
S9XLC 5C-50	5	50	56.50	290
S9XLC 6C-60	6	60	63.75	330
S9XLC 5A-75	5	75	56.50	290
S9XLC 6A-100	6	100	63.75	330
S9XLC 7B-100	7	100	71.00	370
S9XLC 8A-125	8	125	78.25	410

MATERIALS OF CONSTRUCTION

DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

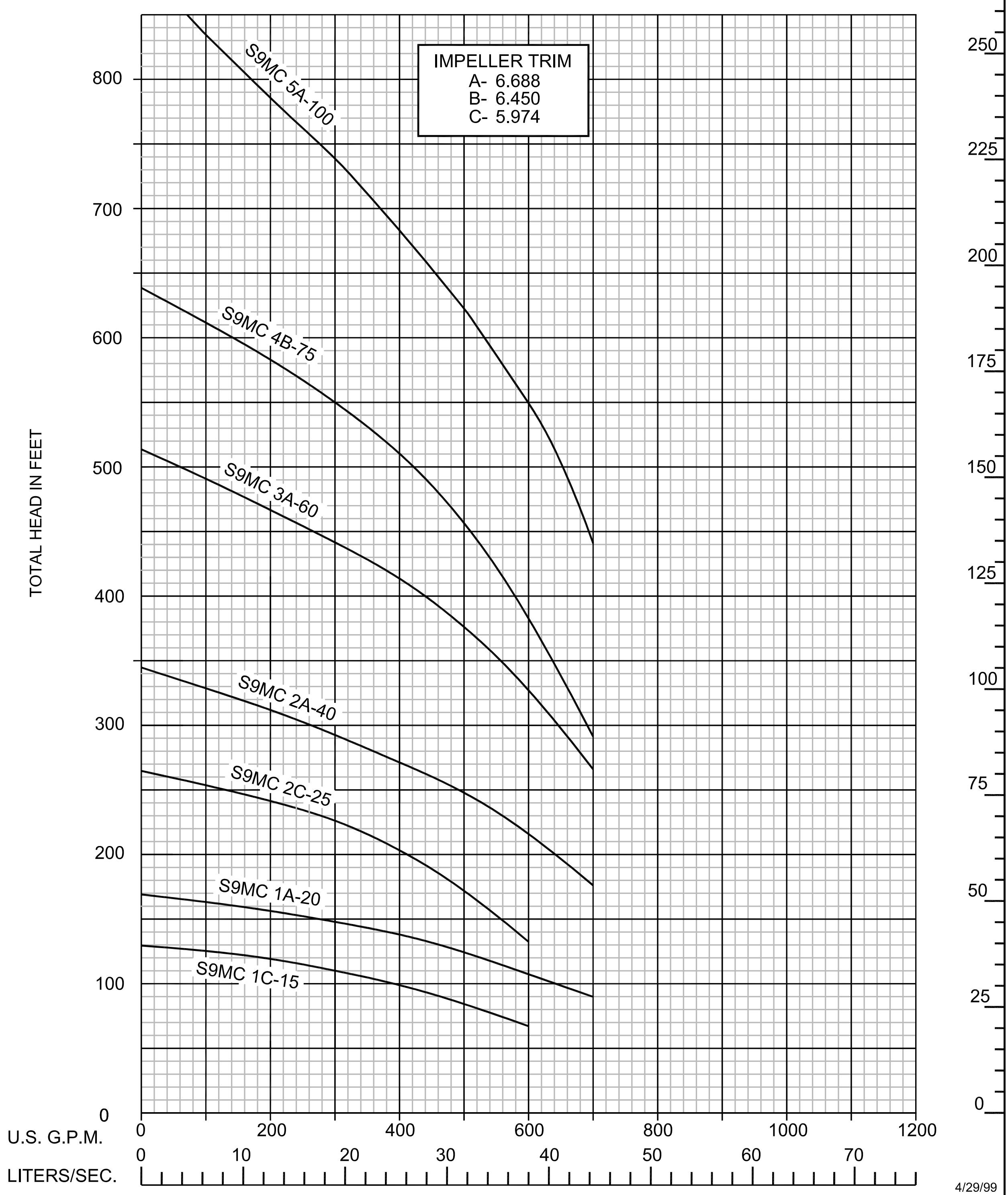
5/11/99
CVS9XL2P6CYBP

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON- AERATED WATER AT 85° F. MAXIMUM.

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

S9MC
3450 RPM

SUBMERSIBLE PUMP PERFORMANCE



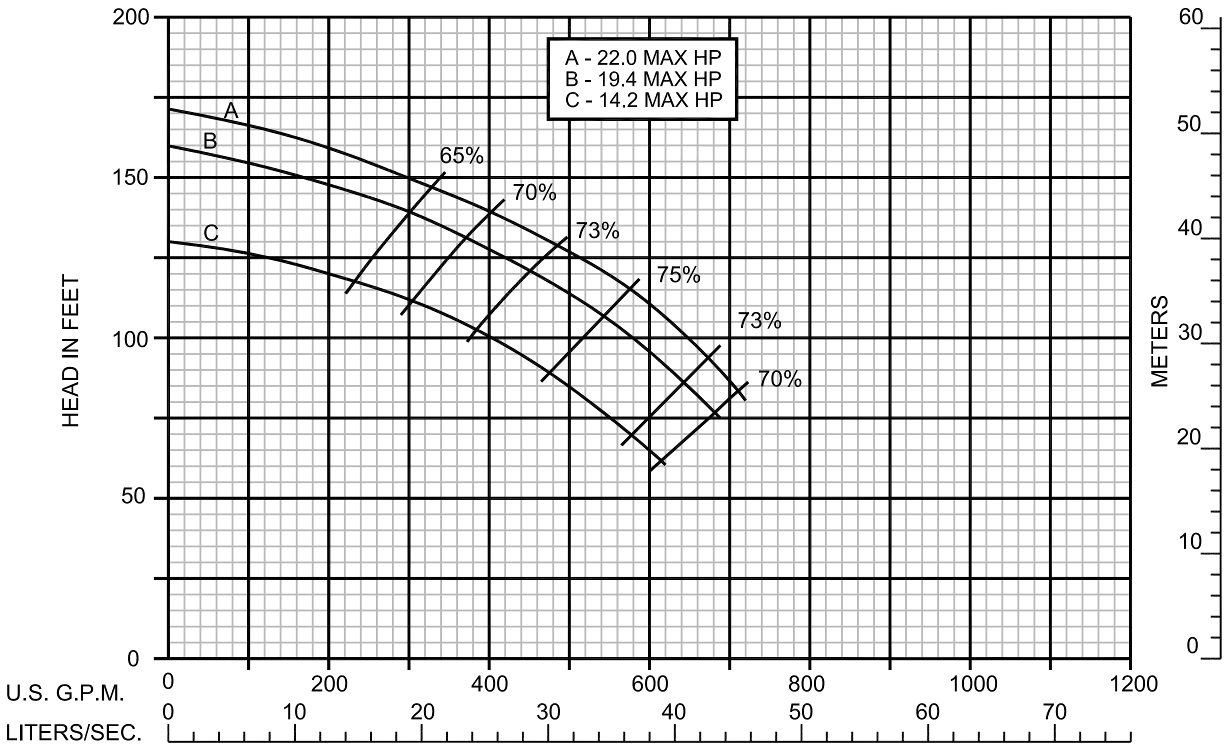
4/29/99
CVS9M2P6CY

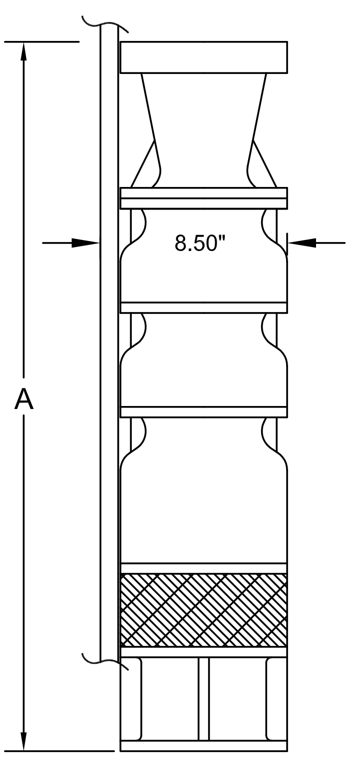
SUBMERSIBLE CURVES

S9MC

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	HP.	"A" LENGTH IN INCHES	APPROXIMATE SHIPPING WGT. LBS
S9MC 1C-15	1	15	27.50	130
S9MC 1A-20	1	20	27.50	130
S9MC 2C-25	2	25	34.75	170
S9MC 2A-40	2	40	34.75	170
S9MC 3A-60	3	60	42.00	210
S9MC 4B-75	4	75	49.25	250
S9MC 5A-100	5	100	56.50	290

MATERIALS OF CONSTRUCTION

DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

5/11/99
CVS9M2P6CYBP

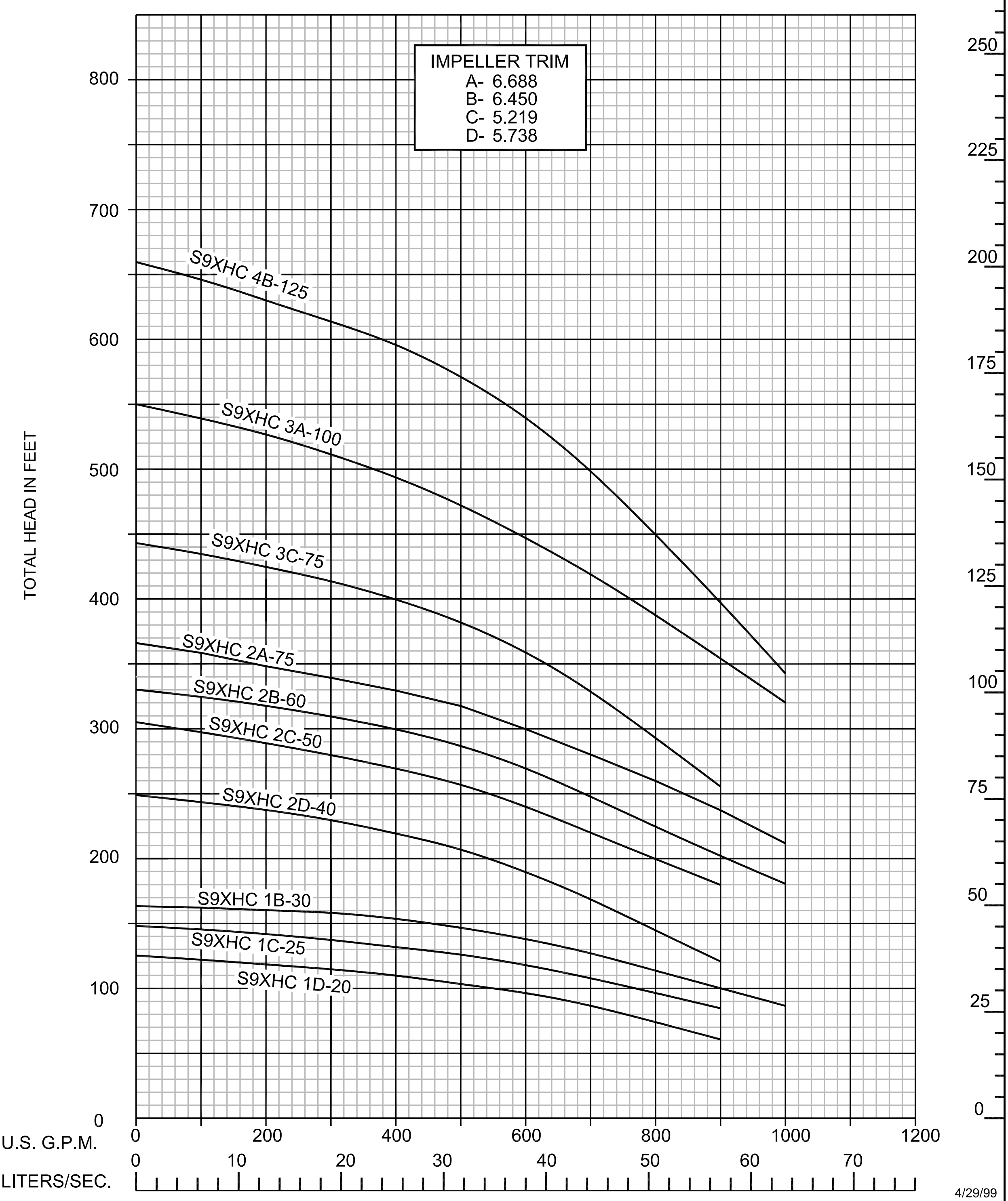
SUBMERSIBLE CURVES

PERFORMANCE BASED ON PUMPING CLEAR, FRESH NON- AERATED WATER AT 85° F. MAXIMUM.

NATIONAL PUMP COMPANY
A GORMAN-RUPP COMPANY

S9XHC
3450 RPM

SUBMERSIBLE PUMP PERFORMANCE



4/29/99
CVS9XH2P6CY

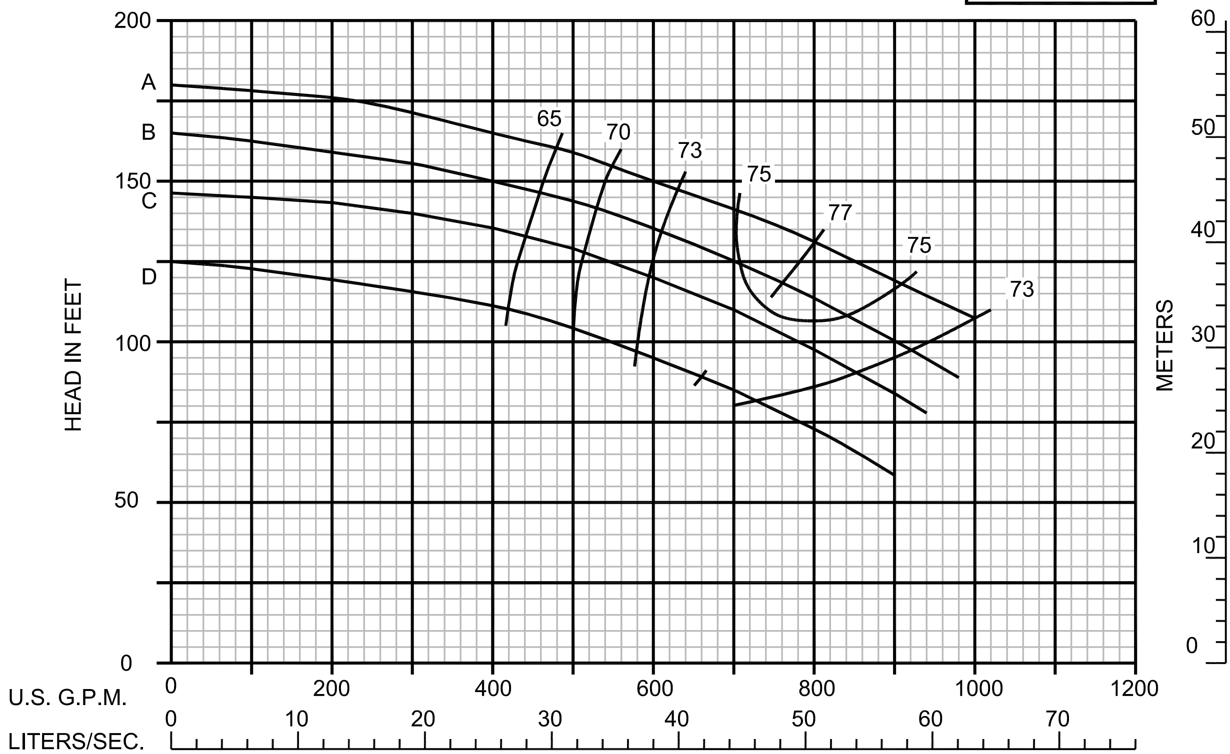
SUBMERSIBLE CURVES

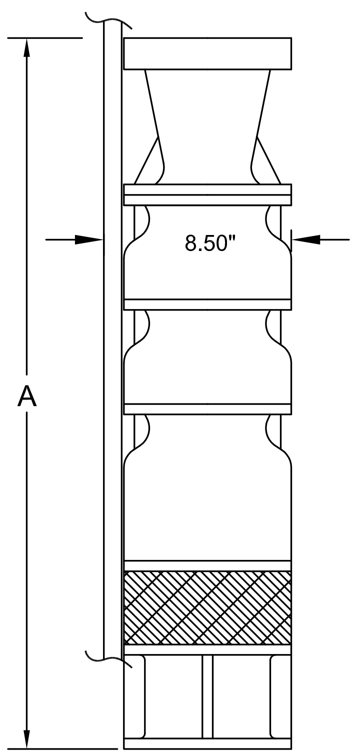
S9XHC

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE

A - 37.3 MAX HP
B - 32.0 MAX HP
C - 27.0 MAX HP
D - 21.7 MAX HP





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	HP.	"A" LENGTH IN INCHES	APPROXIMATE SHIPPING WGT. LBS
S9XHC 1D-20	1	20	27.50	130
S9XHC 1C-25	1	25	27.50	130
S9XHC 1B-30	1	30	27.50	130
S9XHC 2D-40	2	40	34.75	170
S9XHC 2C-50	2	50	34.75	170
S9XHC 2B-60	2	60	34.75	170
S9XHC 2A-75	2	75	34.75	170
S9XHC 3C-75	3	75	42.00	210
S9XHC 3A-100	3	100	42.00	210
S9XHC 4B-125	4	125	49.25	250

MATERIALS OF CONSTRUCTION

DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

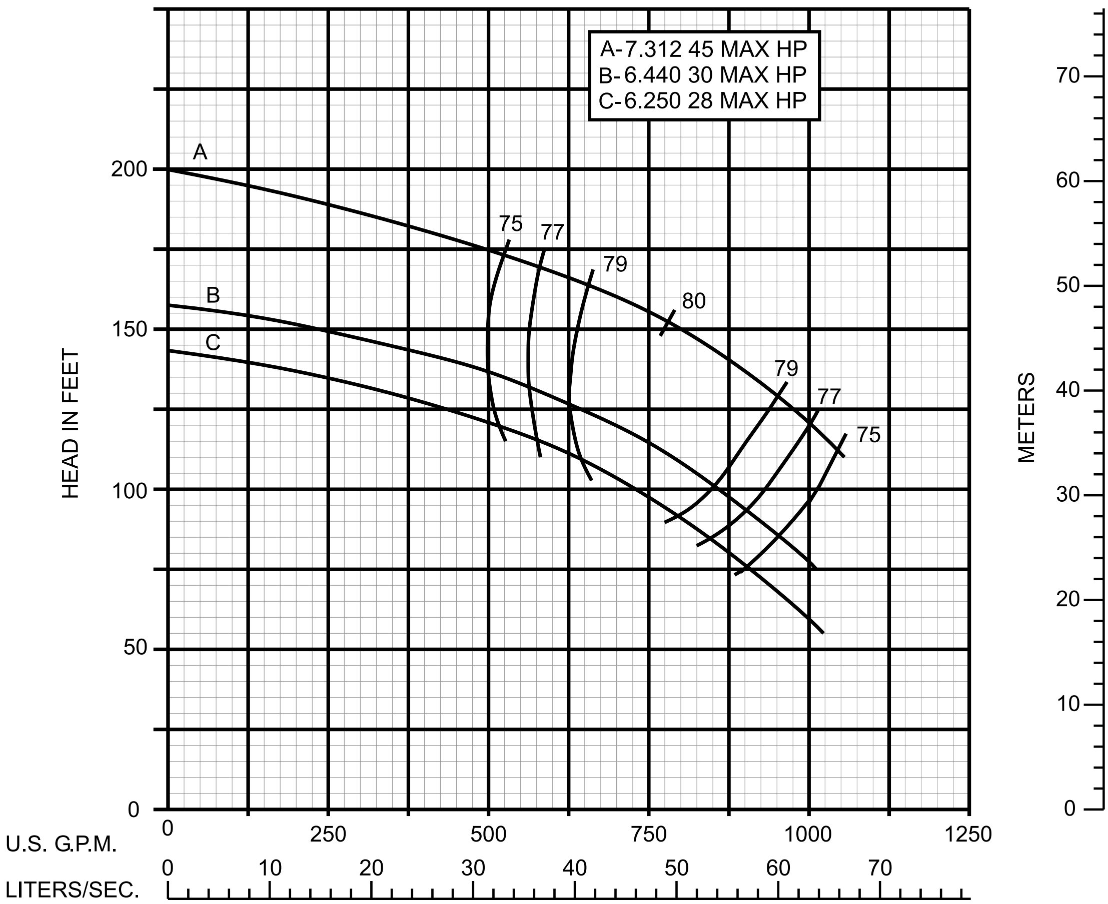
09/10/09
CVS9XH2P6CYBP

SUBMERSIBLE CURVES

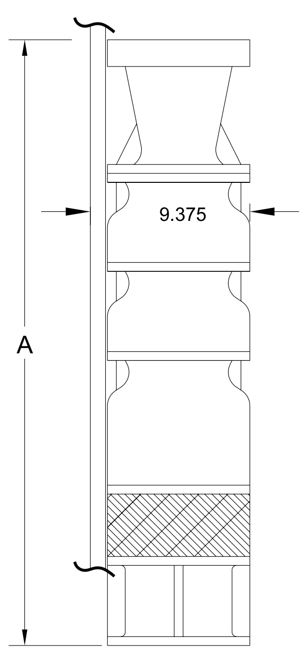
S10MC

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE



DIMENSIONS & SPECIFICATIONS



MODEL NUMBER	STAGES	"A" LENGTH 6" MOTOR	8" MOTOR	APPROXIMATE SHIPPING WGT. LBS.
	1	28.00	30.00	150
	2	36.00	38.00	210
	3	44.00	46.00	270
	4	52.00	54.00	330
	5	60.00	62.00	390
	6	68.00	70.00	450
	Add Stg.	8.00	8.00	60

MATERIALS OF CONSTRUCTION			
DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

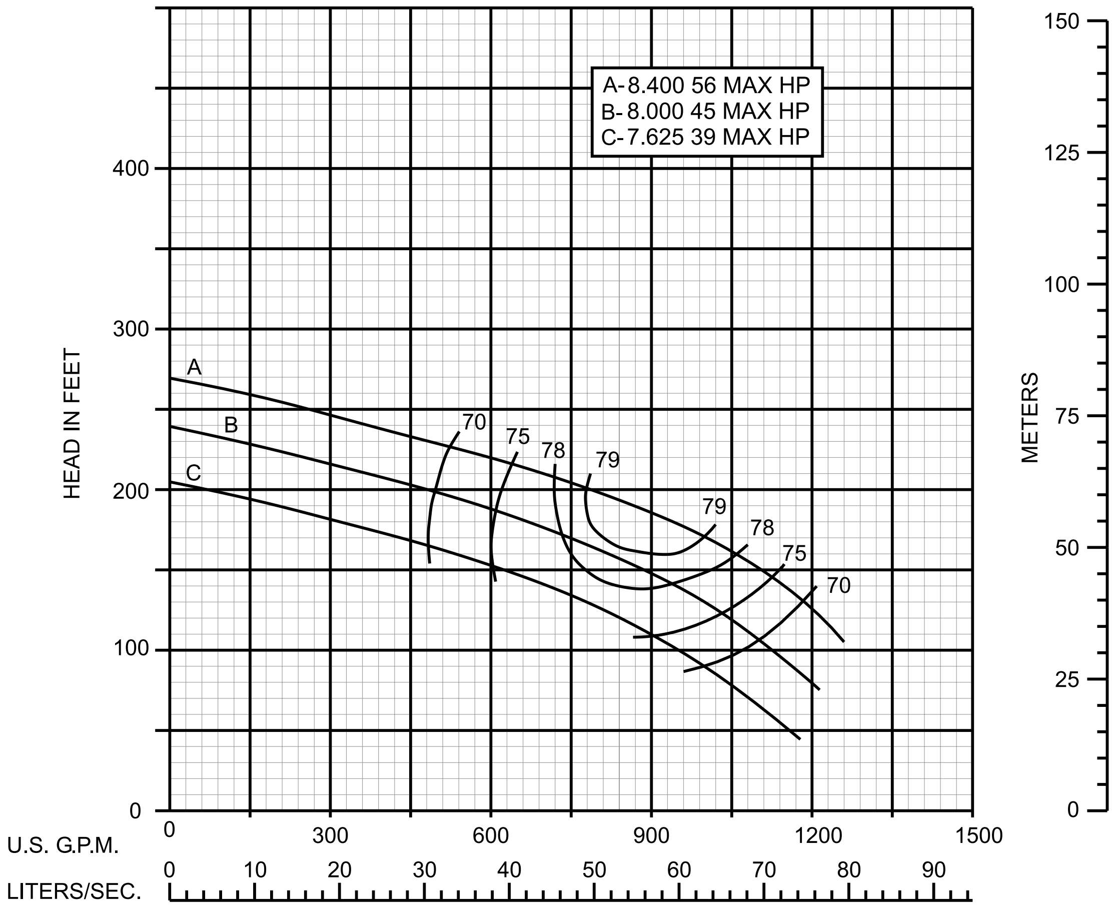
5/19/99
CVS10M2P6CYBP

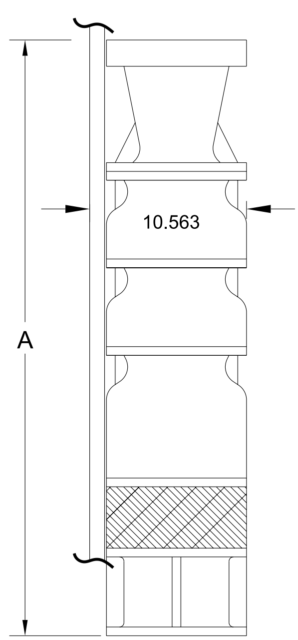
SUBMERSIBLE CURVES

SM10LC

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	"A" LENGTH 6" MOTOR	"A" LENGTH 8" MOTOR	APPROXIMATE SHIPPING WGT. LBS.
	1	27.37	29.37	205
	2	36.99	38.99	277
	3	48.61	48.61	349
	4	56.23	58.23	421
	5	65.85	67.85	493
	6	75.47	77.47	565
	Add Stg.	9.62	9.62	72

MATERIALS OF CONSTRUCTION

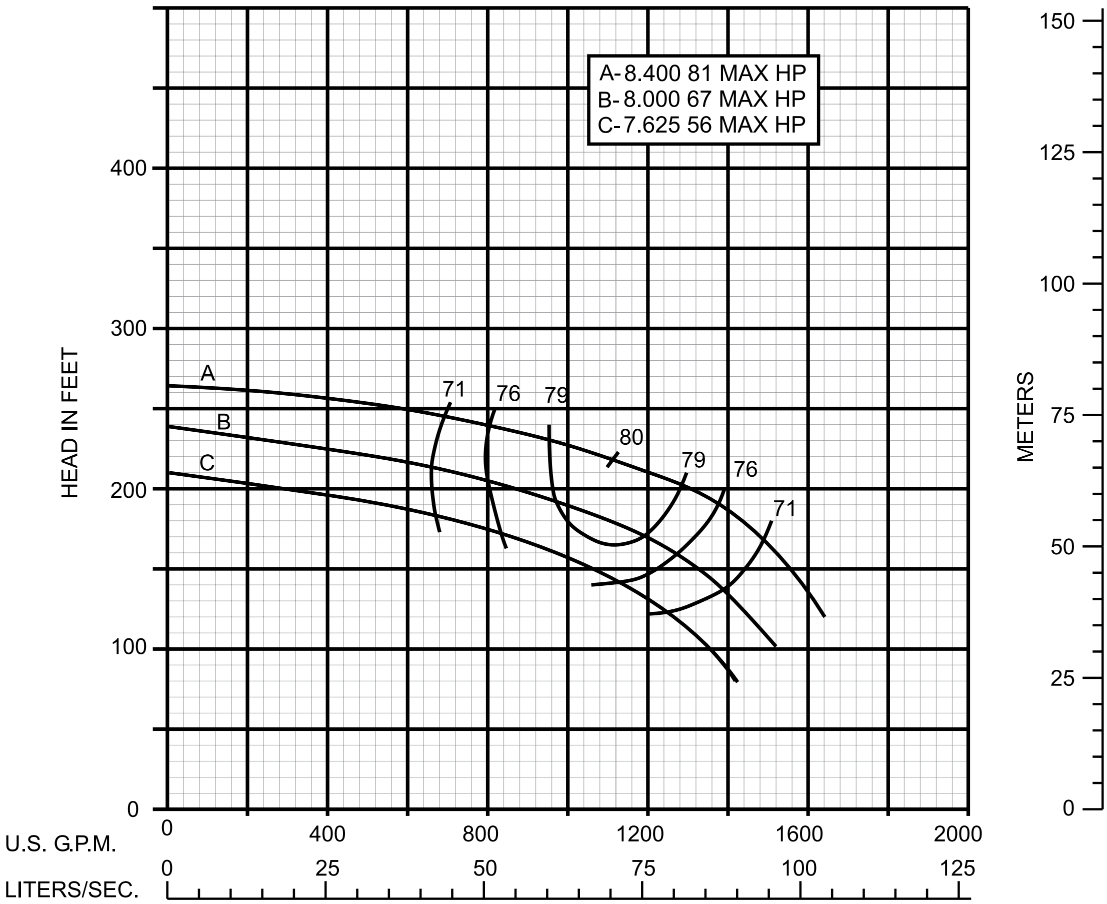
DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

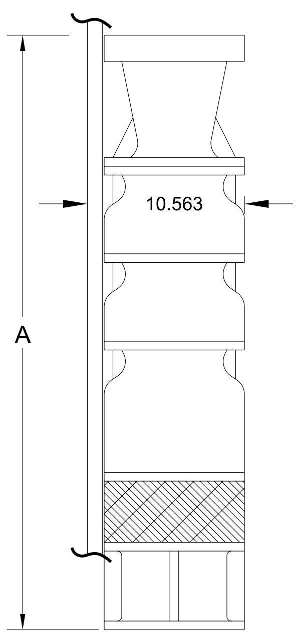
5/19/99
CVSM10L2P6CYBP

SM10HC

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	"A" LENGTH 6" MOTOR	"A" LENGTH 8" MOTOR	APPROXIMATE SHIPPING WGT. LBS.
	1	27.37	29.37	205
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MATERIALS OF CONSTRUCTION

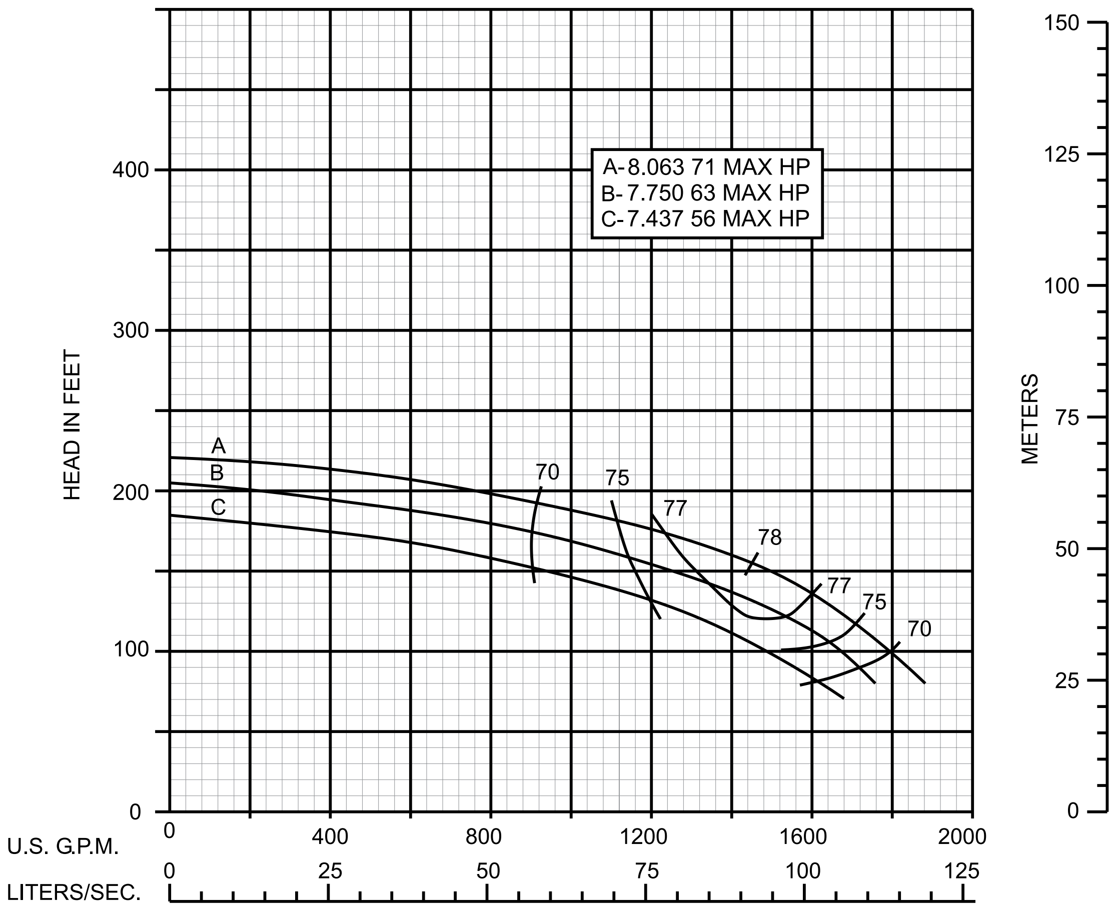
DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

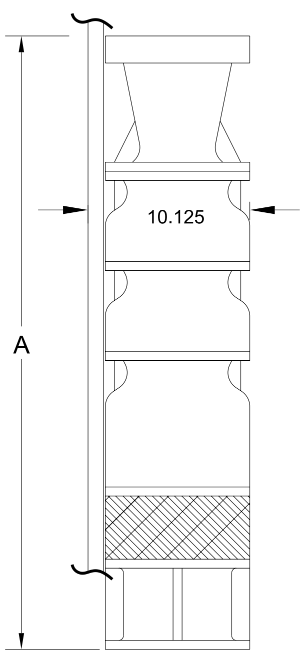
5/19/99
CVSM10H2P6CYBP

SH10HC

3450 RPM

ONE STAGE SUBMERSIBLE PUMP PERFORMANCE





DIMENSIONS & SPECIFICATIONS

MODEL NUMBER	STAGES	"A" LENGTH 6" MOTOR	"A" LENGTH 8" MOTOR	APPROXIMATE SHIPPING WGT. LBS.
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	2	36.99	38.99	277
	3	48.61	48.61	349
	4	56.23	58.23	421
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	Add Stg.	9.62	9.62	72

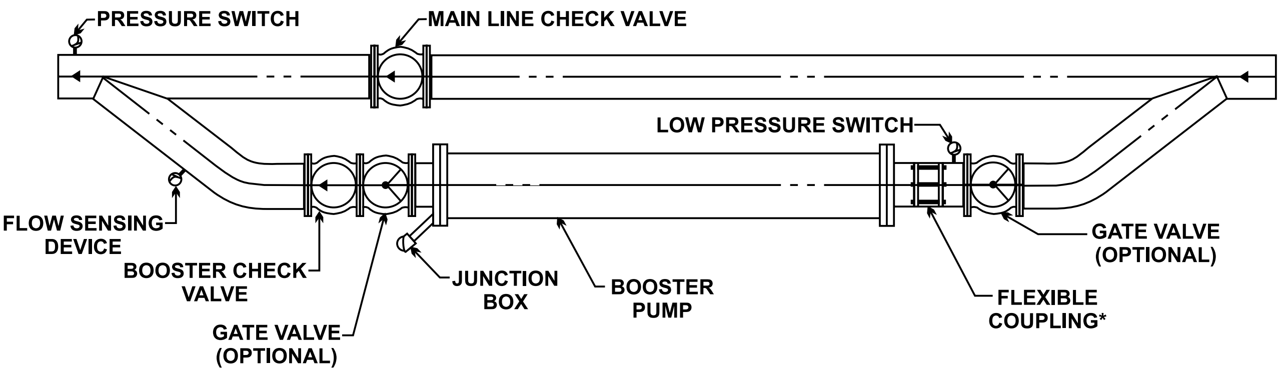
MATERIALS OF CONSTRUCTION

DESCRIPTION	MATERIAL	DESCRIPTION	MATERIAL
BOWL	CAST IRON	THRUST ASSY.	BRONZE
IMPELLER	BRONZE	BOLTS	GRADE 5 STEEL
SHAFT	STAINLESS STL.	SCREEN	STAINLESS STL.
BEARING	BRONZE	CABLE GUARD	STAINLESS STL.

5/19/99
CVSH10H2P6CYBP

NOTES

BOOSTER INSTALLATION PLAN, OPERATION & DESIGN



INSTALLATION PLAN

IN-LINE SUBMERSIBLE BOOSTER

*Flexible coupling recommended to facilitate installation and maintenance.

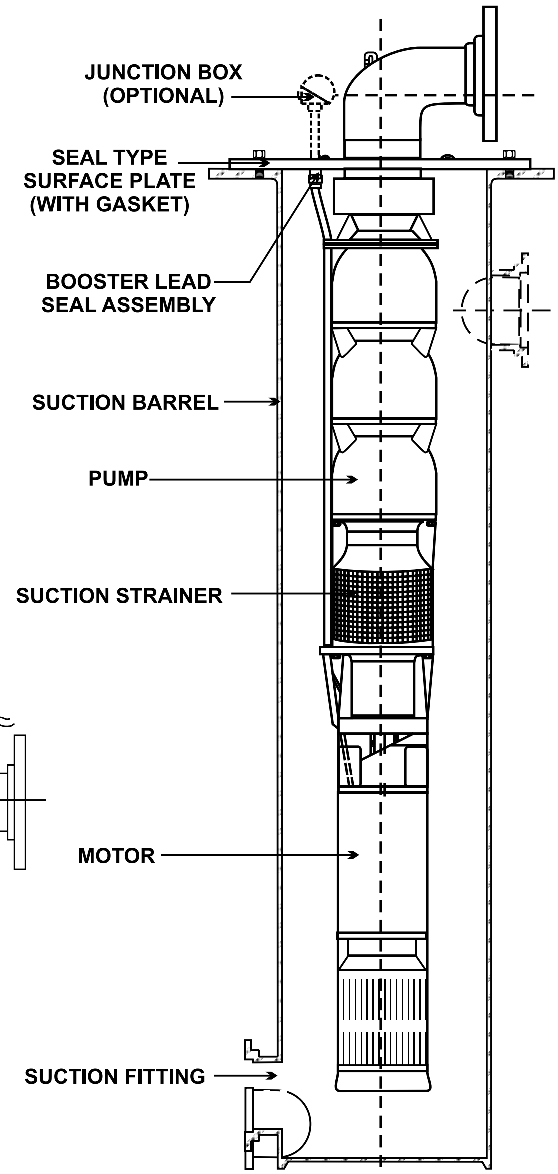
OPERATION

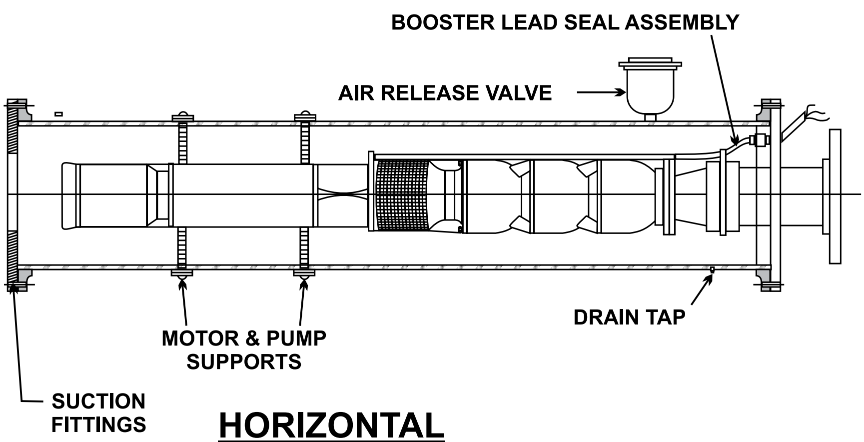
The pressure switch is pre-set to start the booster pump when line pressure drops below limits and stops the pump on high pressure. On start-up, differential pressure closes the main line check valve, preventing reverse flow.

The flow sensing device is connected to a time delay relay to stop the pump after a short time if flow through the booster ceases at any time.

The low pressure (vacuum) switch protects the pump if the suction pressure drops below a safe level.

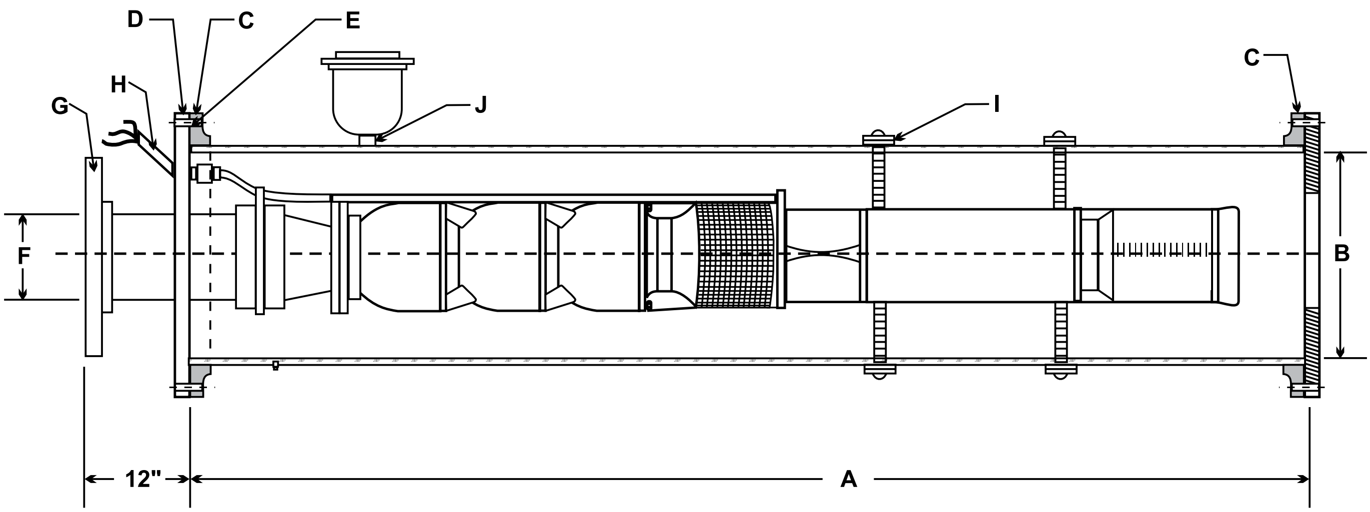
When system flow ceases check valves maintain upstream pressure. Gate valves allow installation and service of the unit without interrupting system service. Gate valves should be locked open when in service.





HORIZONTAL

SUB HORIZONTAL BOOSTER ASSEMBLY



PUMP	____________	MOTOR	____________	PUMP UNIT	____________
LENGTH	____________ (Inches)	LENGTH	____________ (Inches)	TOTAL LENGTH	____________ (Inches)

BOOSTER BARREL DATA **INCHES**

A. LENGTH SUCTION BARREL ____________________

B. DIA. SUCTION BARREL ____________________

C. SIZE & DIA. FLANGES ____________________

D. DIA. OF HEAD PLATE ____________________

E. BOLT CIRCLE & SIZE OF BOLT ____________________

F. DIA. DISCHARGE PIPE ____________________

G. SIZE DISCHARGE FLANGE ____________________

H. TYPE OF CABLE GLAND ____________________

I. NO. OF STABILIZERS ____________________

J. SIZE OF AIR RELEASE VALVE NIPPLE ____________________

CAPACITY

________________________ GPM

DISCHARGE HEAD

________________________ FT.

STANDARD CONSTRUCTION:

PIPE: A53 GRADE B STEEL

FLANGES & HEAD PLATE:

SIZE 150# STANDARD
SIZE 300# HEAVY DUTY

SUB VERTICAL BOOSTER ASSEMBLY

PUMP ______________________ MOTOR ______________________ PUMP UNIT __________________

LENGTH______________ Inches LENGTH ______________Inches LENGTH______________ Inches

BOOSTER BARREL DATA

INCHES

A. LENGTH SUCTION BARREL ____________

B. DIA. SUCTION BARREL ____________

C. SIZE & DIA. FLANGES ____________

D. DIA. OF HEAD PLATE ____________

E. BOLT CIRCLE & SIZE OF BOLT ____________

F. DIA. DISCHARGE PIPE ____________

G. SIZE DISCHARGE FLANGE ____________

H. SIZE SUCTION FLANGE ____________

J. SIZE OF CABLE JUNCTION ____________

K. SIZE OF AIR RELEASE VALVE NIPPLE ____________

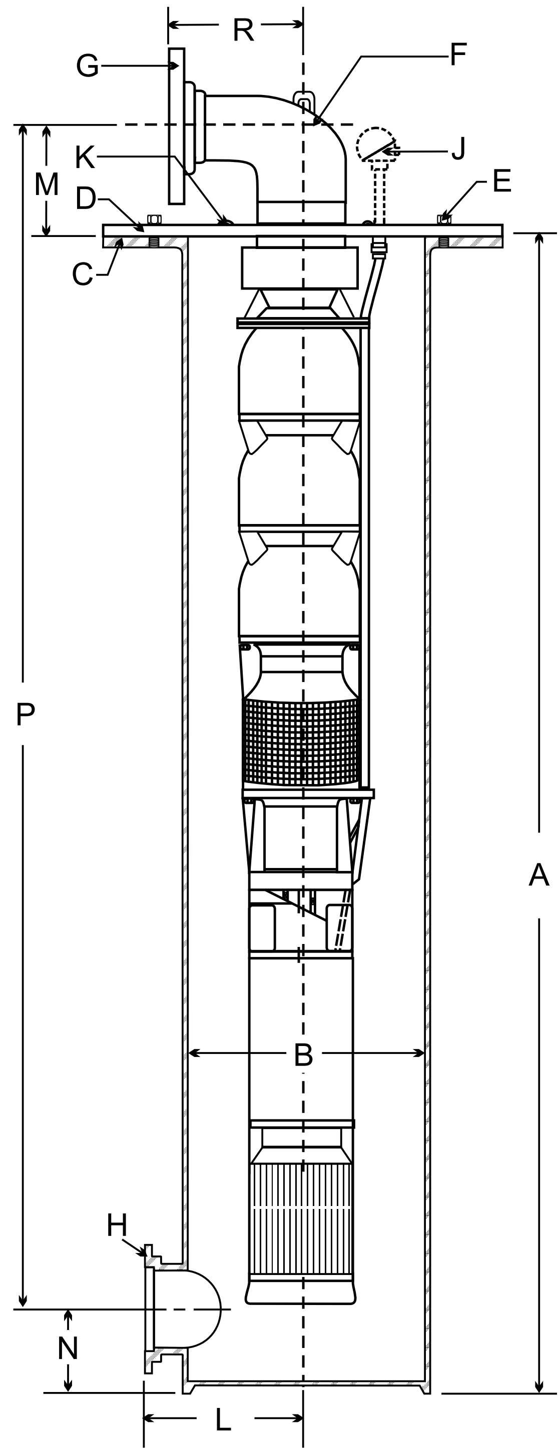
L. CENTER LINE TO FACE DIMENSION ____________

M. CENTER LINE TO BARREL DIMENSION ____________

N. CENTER LINE SUCTION TO BOTTOM ____________

P. DISCHARGE TO SUCTION ____________

R. CENTER LINE TO FACE ____________



CAPACITY

____ GPM

DISCHARGE HEAD

____ GPM

STANDARD CONSTRUCTION:

SCHEDULE 40 STEEL

FLANGES & HEAD PLATE:

SIZE 150# STANDARD
SIZE 300# HEAVY DUTY

OPTIONS:

TEMPERATURE PROBE ____________

JUNCTION BOX ____________

IN-LINE BOOSTER DATA

The complete Booster Barrel Assembly consists of three basic sub assemblies: Barrel Assembly, Head Plate Assembly, and Pumping Unit. The pumping unit is secured to the head plate assembly and is centered in the barrel by means of brackets or stabilizers. Generally, two brackets are necessary and are positioned at top and bottom end of the submersible motor. However, in the case of an installation requiring a long pump end, it may be necessary to have a third bracket positioned around the pump at the halfway mark; i.e., between the pump outlet and the pump inlet. As the number of bowls in a given length differ, depending on the model of pump end use, it is suggested that you consult the factory when considering six (6) stages or over. The support brackets are necessary on both the Horizontal and the Vertical applications. However, on a Vertical Installation, the brackets can be eliminated if the pumping unit is installed in the barrel at the site. The main reason for support brackets in a Vertical Booster would be to support the pumping unit in transit. The dimensions of the Barrel and the Head Plate Assemblies are governed by the size of the Pump Assembly; and, in turn, the Pump Assembly is sized according to GPM and Head (psi) required.

The Pumping Unit installed in a booster barrel will operate satisfactorily if given the same basic care as a proper deep well installation. The following three rules, however, are of extreme importance. Otherwise, the end result will be the overheating of the motor windings without the necessary amperage draw to activate the circuit breakers in the pump control.

1. The barrel must be vented of all air on start-up.
2. There must be a larger flow (GPM) at the intake than the demand at the pump inlet at all times. This will ensure that the barrel is completely full and the pumping unit is operating under submerged conditions.
3. At no time should the pump be permitted to operate against a closed valve condition or against a pressure high enough to approach its closed valve condition as the proper cooling of the motor depends on a constant flow of liquid past its outer casing. The higher the H.P., the larger the flow necessary. The minimum flow for safe operation is generally considered to be one gallon per minute per H.P. of motor.

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REVISED OCTOBER 2022

NATIONAL PUMP COMPANY'S CAPABILITIES

SALES AND SERVICE:

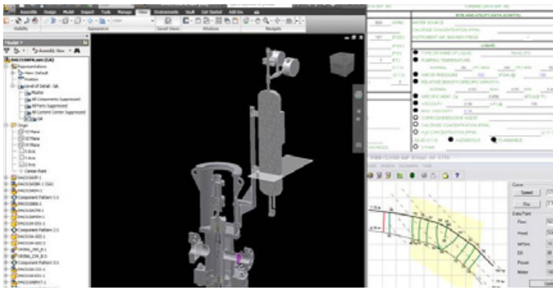
Putting the "customer first" is at the center of everything we do at National Pump. Our experienced sales, marketing, application engineers and branch managers offer many years of pump experience and are prepared to satisfy customer product and service needs. Challenge the National Pump team on your next API, agricultural, industrial and municipal application and discover how we can add value to your business.

PRODUCT & MANUFACTURING:

National Pump Company manufactures a complete line of vertical turbine pumps and pump systems from an extensive inventory located in six (6) USA build centers. Pump capabilities range from 50 through 20,000 GPM. NPC also manufactures and stocks a complete line of VTP accessories, including: column, tube and shaft, standard and custom discharge heads, gear drives and VHS motors, and offers custom pump design, fabrication work, sandblasting and powder coating capabilities.

ENGINEERING & TECHNOLOGY:

National Pump Company's Engineering Department is staffed with extremely experienced engineers and technicians. The team utilizes the latest technology for the design and application of pump products, which includes (CAD) computer aided design, 3D modeling, and realistic engineering programs. This technology and experience ensures that the final product is properly designed for optimum performance.



QUALITY CONTROL:

National Pump strives to deliver the highest quality products for complete customer satisfaction through continuous quality improvement initiatives. NPC is ISO 9001 Certified which integrates all facets of the business including: engineering, procurement, assembly, testing, shipping, receiving, and supplier inspections. Every employee at NPC understands they are responsible for the quality objectives of the organization but most importantly to our customers.

TESTING:

NPC offers full HYDRAULIC INSTITUTE certified pump testing, along with UL 508A electrical certification and custom panel building for our complete line of pumps and custom pump stations.

PRODUCT AVAILABILITY AND SUPPLY CHAIN:

National Pump markets it pumps and components in the USA and in over 40 countries globally. We operate six (6) Build and Service Centers in the USA in which we stock and utilize the best quality domestic and international components to insure a quality and reliable pump installation. Our forecasting tools and distribution system maintains thousands of pump parts to help achieve the best customer satisfaction with timely customer deliveries.

MEETING CUSTOMER NEEDS

NATIONAL PUMP COMPANY®

A GORMAN-RUPP COMPANY

Delivering Vertical Turbine Pump Reliability, Quality and Service Since 1969

Creating Quality Pump Systems and Satisfied Customers

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(800) 745-5393

109 North Richey • Pasadena, TX 77506
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