



**Jessica R. Baker**  
The Montgomery County  
Conference Center and Hotel  
(MCCCH), Rockville, MD

**Appendix F: Ice Storage Central Chilling  
Plant - Mechanical Equipment**



Issue Date: 2/05  
 Project: Project  
 Engineer: Sales Eng  
 Customer: customer

Program: LTC  
 Rev: v1\_43.idd  
 Date: 03/14/05  
 Page: 1 of 2

MODEL	YRVDVDT1-46C	(MOTOR SELECTED BY USER)	
REFRIGERANT	134A	MAX CAPACITY (TR)	182
RATED CAPACITY (TR)	182	SPECIFIED CAPACITY (TR)	300
INPUT POWER (KW)	176	MAX MOTOR LOAD (KW)	264
VOLTAGE / HZ	460 / 60		
ORIFICE (VARY)	VALVE:2		
RLA	252	LRA	1488
MIN CIR. AMPS.	314	MAX C.B.	500
INRUSH (AMPS)	670		
SSS SIZE	7LK-46		
FULL LOAD (kW/TR)	0.969	NPLV	0.669

#### STARTER TYPE (1) SOLID STATE STARTER - 3 LEAD

	Evaporator	Condenser
FLUID	ETHYLENE GLYCOL*	WATER*
% BY WEIGHT	30.0*	0.0*
TUBE MTI NO.	281*	260*
PASSES	2*	2*
FOUL FACTOR (hr.ft <sup>2</sup> .°F/BTU)	0.00010*	0.00025*
FLUID ENT TEMP (°F)	28.65	85.00*
FLUID LVG TEMP (°F)	22.00*	91.20
FLUID FLOW (gpm)	720.0*	900.0*
FLUID PRDROP (ft)	29.2	26.8

(\*) Designates Specified Input

#### IPLV / NPLV CALCULATION:

$$\text{IPLV OR NPLV} = \frac{1}{\frac{0.01}{A} + \frac{0.42}{B} + \frac{0.45}{C} + \frac{0.12}{D}} \quad \text{NPLV} = \frac{1}{1.4954} = 0.669$$

A = kW / TR AT 100% CAPACITY

B = kW / TR AT 75% CAPACITY

C = kW / TR AT 50% CAPACITY

D = kW / TR AT 25% CAPACITY

% Load	CAPACITY (TR)	ECWT (°F)	kW / TR	WEIGHT	WEIGHTED TR / kW
100	181.6	85.000	0.969	0.01	0.0103
75	136.2	75.000	0.734	0.42	0.5720
50	90.8	65.000	0.606	0.45	0.7429

25	45.4	65.000	0.705	0.12	0.1702
----	------	--------	-------	------	--------

Ratings outside the scope of ARI STD 550/590.  
Compliant with ASHRAE 90.1

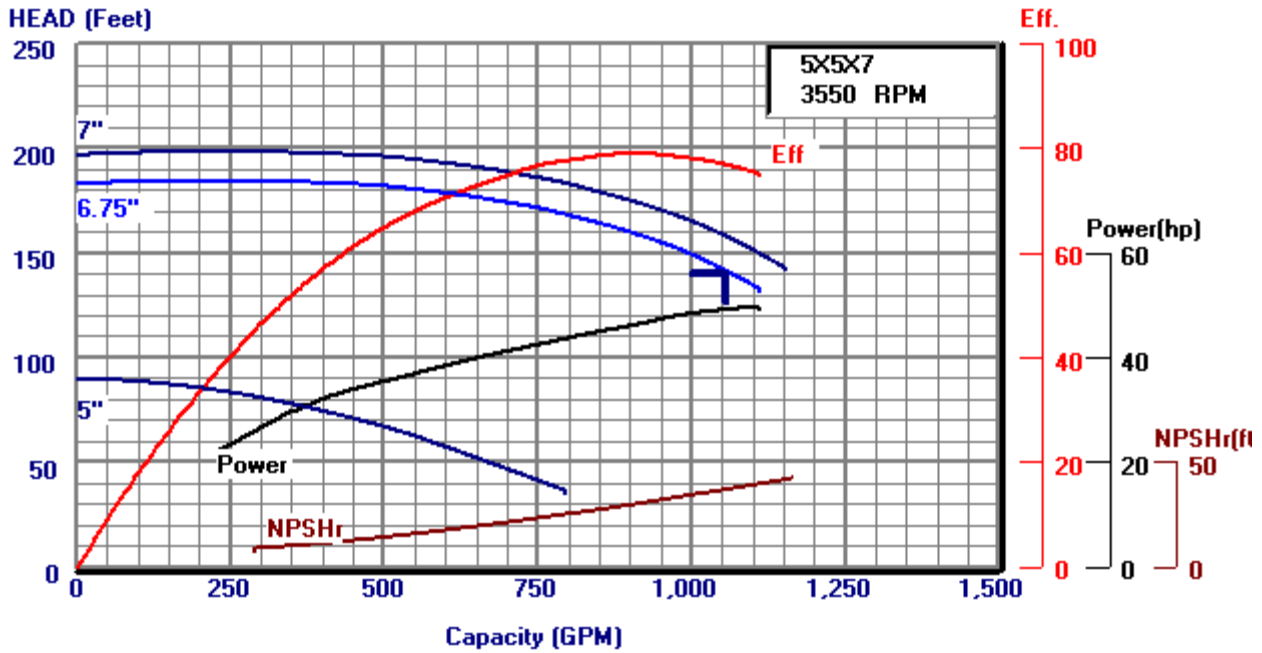
Materials and construction per mechanical specifications - Form 160.81-EG1.

Note: Special pricing required and extended delivery may apply.

Any application having an evaporator leaving fluid temperature below 36F/2.22C will require factory review before using output data. Contact packaged centrifugal chiller product department.

# PUMP DETAILS

<b>80 5X5X7</b>			
Flow Rate (GPM)	1055	Pump Head (Feet)	140
Speed (RPM)	3550	NPSHr (Feet)	36.8
Weight (lbs)	**	Cost Index	**
Suction Size (in.)	5	Suction Velocity (fps)	16.9
Discharge Size (in.)	5	Discharge Velocity (fps)	16.9
Impeller Size (in.)	6.75	Pump Efficiency (%)	76.33
Max. Flow (GPM)	1142	Duty Flow/Max Flow (%)	92.4
Flow @ BEP (GPM)	941	Min. Rec. Flow (GPM)	235.1
Selected Motor Size (HP)	50	Selected Motor Size (kw)	37.29
Duty-Point Power (BHP)	48.76	Duty-Point Power (kw)	36.36
Maximum Power (BHP)	49.46	Maximum Power (kw)	36.89
Est. Full Load Amps	**	Est. Full Load Efficiency (%)	**
Frame Size	**	Est. Full Load Power Factor (%)	**
<input checked="" type="radio"/> <a href="#">Generate Pump Curve</a> <a href="#">Calculate Operating Costs</a> <a href="#">Generate Submittal</a>		<a href="#">Print Friendly Format</a> <a href="#">eMail This Pump Selection</a> <a href="#">Add This Pump To My Project</a>	
<input type="button" value="Select Feature"/>			

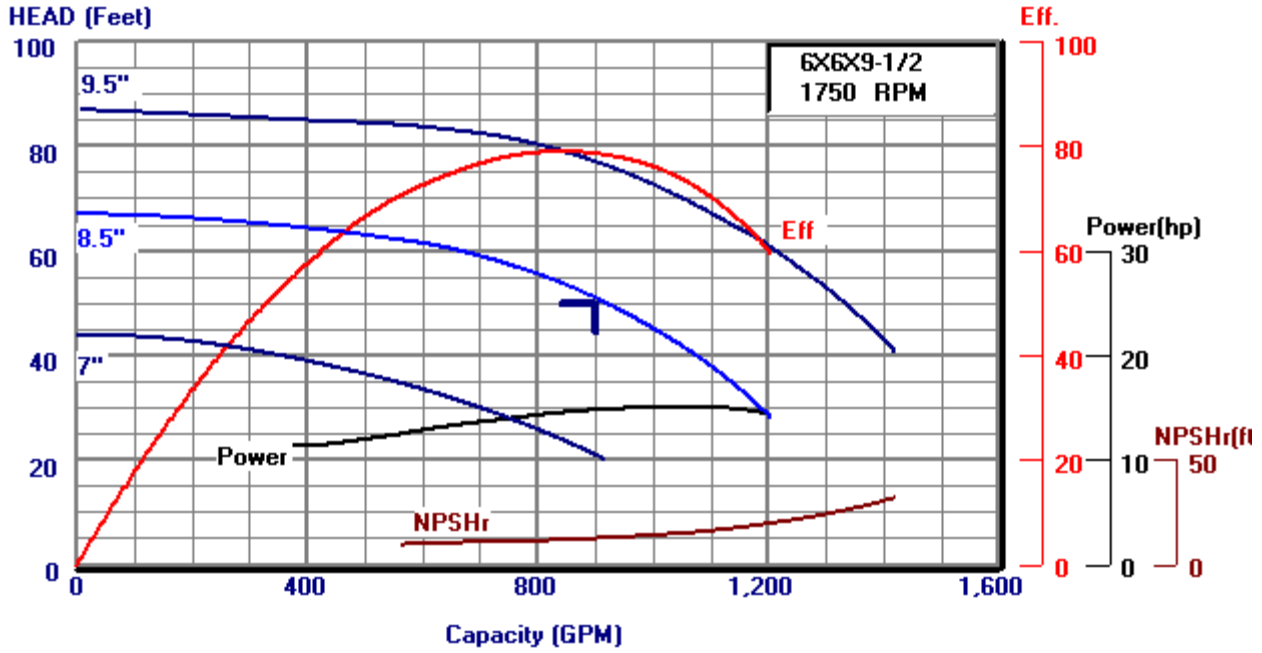


Pump Series: 80	Min Imp Dia = 5 "	Design Capacity = 1055.0	ITT Bell & Gossett
Suction Size = 5 "	Max Imp Dia = 7 "	Design Head = 140.0	8200 N. Austin
Discharge Size = 5 "	Cut Dia = 6.75 "	Motor Size = 50 HP	Morton Grove, IL 60053

The Power and Eff. curves shown are for the cut dia. impeller.

# PUMP DETAILS

<b>80 6X6X9-1/2</b>			
Flow Rate (GPM)	900	Pump Head (Feet)	50
Speed (RPM)	1750	NPSHr (Feet)	12.5
Weight (lbs)	**	Cost Index	**
Suction Size (in.)	6	Suction Velocity (fps)	10.0
Discharge Size (in.)	6	Discharge Velocity (fps)	10.0
Impeller Size (in.)	8.5	Pump Efficiency (%)	78.28
Max. Flow (GPM)	1203	Duty Flow/Max Flow (%)	74.8
Flow @ BEP (GPM)	841	Min. Rec. Flow (GPM)	210.4
Selected Motor Size (HP)	15	Selected Motor Size (kw)	11.19
Duty-Point Power (BHP)	14.59	Duty-Point Power (kw)	10.88
Maximum Power (BHP)	15.03	Maximum Power (kw)	11.21
Est. Full Load Amps	**	Est. Full Load Efficiency (%)	**
Frame Size	**	Est. Full Load Power Factor (%)	**
<a href="#">View Published Pump Curve</a>		<a href="#">Download CAD Drawing</a>	
<input checked="" type="radio"/> <a href="#">Generate Pump Curve</a>		<a href="#">Print Friendly Format</a>	
<a href="#">Calculate Operating Costs</a>		<a href="#">eMail This Pump Selection</a>	
<a href="#">Generate Submittal</a>		<a href="#">Add This Pump To My Project</a>	
<input type="button" value="Select Feature"/>			

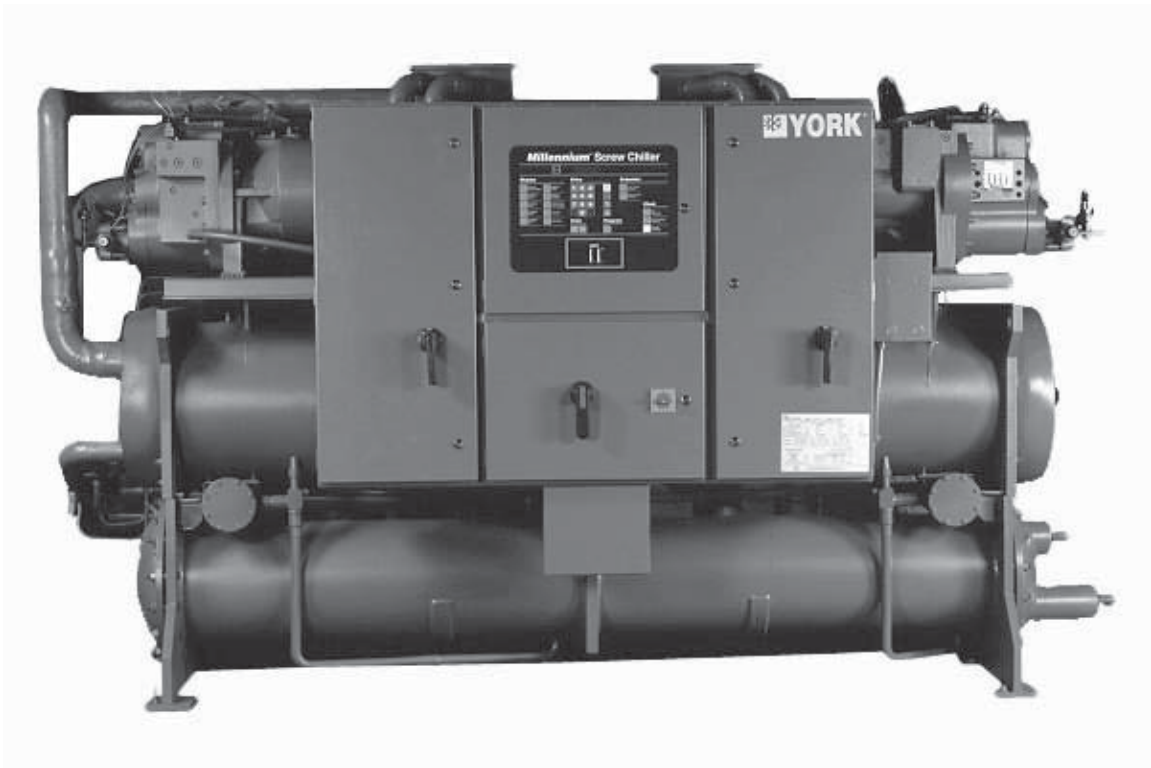


Pump Series: 80	Min Imp Dia = 7 "	Design Capacity = 900.0	ITT Bell & Gossett 8200 N. Austin Morton Grove, IL 60053
Suction Size = 6 "	Max Imp Dia = 9.5 "	Design Head = 50.0	
Discharge Size = 6 "	Cut Dia = 8.5 "	Motor Size = 15 HP	

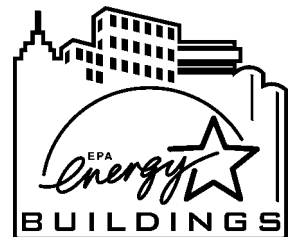
The Power and Eff. curves shown are for the cut dia. impeller.



**YCWS  
WATER COOLED LIQUID CHILLER**



**91 THROUGH 216 TONS  
320kW THROUGH 760 kW  
60Hz  
STYLE A**



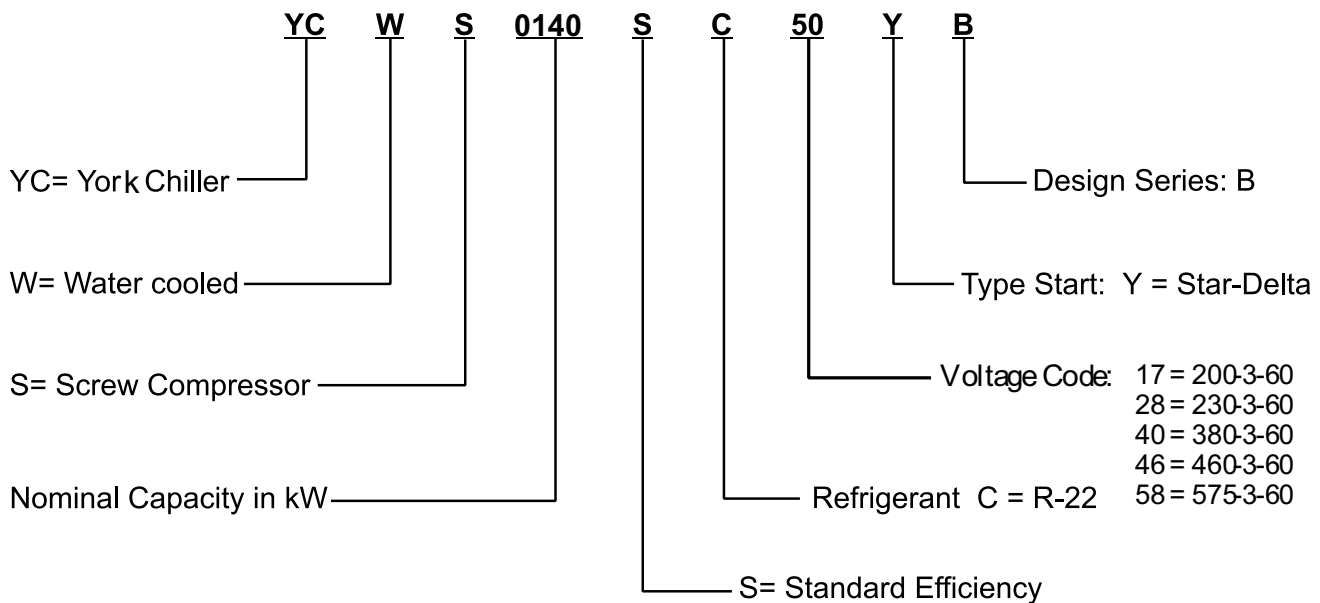
ALLY



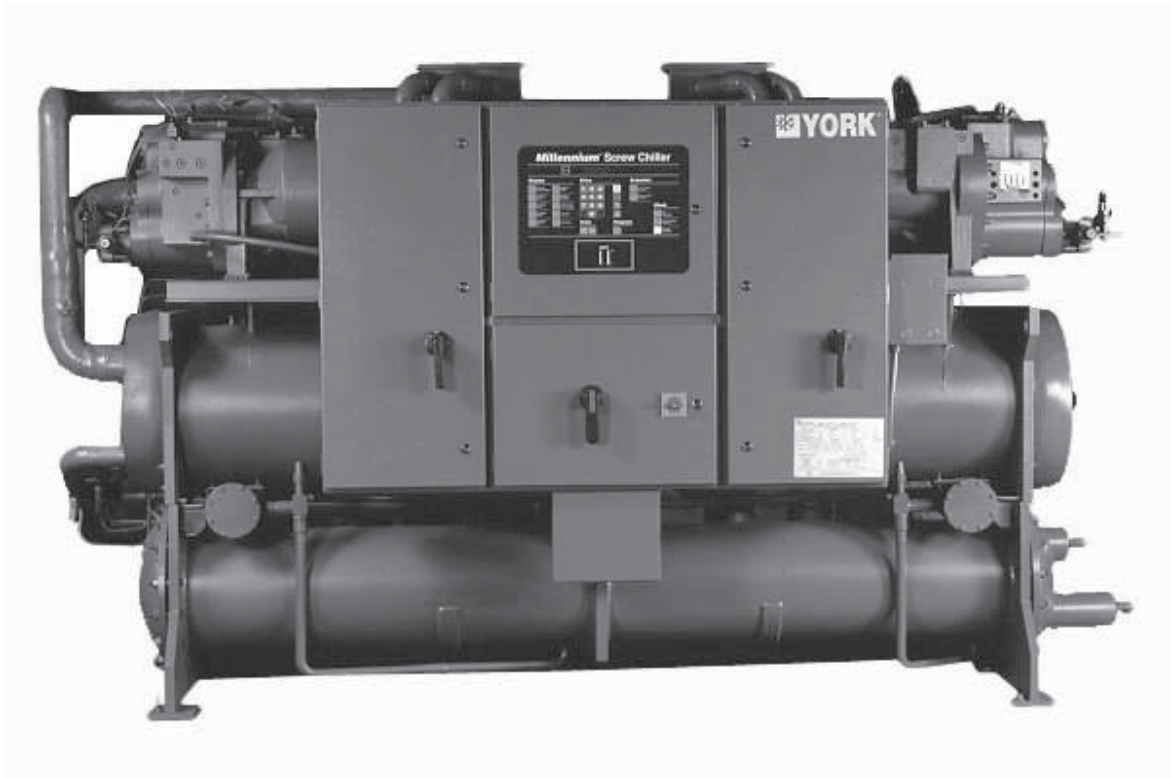
# Table of Contents

Introduction.....3  
 Specifications .....4  
 Accessories & Options .....7  
 Design Parameters.....8  
 Pressure Drops .....9  
 Selection Data .....10  
 Ratings (R-22) .....12  
 Ratings- Brine (30 % Ethylene Glycol) (R-22) .....14  
 Ratings- Brine (30 % Propylene Glycol) (R-22).....16  
 Brine Correction Factors .....18  
 Physical Data .....20  
 Isolator Selection Data .....21  
 Isolator Details.....22  
 Sound Data .....23  
 Dimensions.....24  
 Electrical Data .....26  
 Customer Wiring Data .....30  
 Typical Control Panel Wiring .....32  
 Application Data .....34  
 Guide Specifications.....35

## Nomenclature



## York YCWS Water Cooled Screw Chillers



*YORK YCWS Water-Cooled models provide chilled water for all air conditioning applications that use central station air handling or terminal units. They are completely self-contained and are designed for indoor (new or retrofit) installation. Each unit includes accessible semi-hermetic screw compressors, a liquid cooler, water cooled condenser, and a user-friendly, diagnostic Microcomputer Control Center all mounted on a rugged steel base. The units are produced at an ISO 9001 registered facility. The YCWS chillers are rated in accordance with ARI Standard 550/590.*

# Specifications

## GENERAL

The Liquid Chiller will be completely assembled with all interconnecting refrigerant piping and internal wiring, ready for field installation.

The unit will be pressure-tested, evacuated, and charged with Refrigerant-22, and York 'L' (POE) synthetic oil. There will be an operational test, with water flowing through the cooler, to check that each control device operates correctly.

The unit can be covered with an optional coat of Caribbean Blue enamel. Units are designed in accordance with NFPA 70 (National Electric Code), ASHRAE/ANSI 15 Safety Code for Mechanical Refrigeration. All units are produced at an ISO 9001 registered facility. All YORK chillers are rated in accordance with ARI Standard 550/590 at ARI conditions.

## SEMI-HERMETIC YORK SCREW COMPRESSORS

- An ideal synergy of expertise, sister division FRICK™ Industrial Refrigeration Compressor Engineers as integral members on YORK™'s Chiller Design Team, has resulted in a world class compressor with unequalled performance.
- Continuous function, microprocessor controlled, 3-way proportional Capacity Control Valve provides regulated output pressure independent of valve input pressure for a stable, smooth, and precise match of compressor capacity to cooling load to 10% of chiller capacity.
- Automatic spring return of capacity control valve to minimum load position ensures compressor starting at minimum motor load. Internal discharge check to prevent rotor backspin upon shutdown.
- Acoustically tuned, internal discharge gas path eliminates objectionable noise at the source, while optimizing flow for maximum performance.
- Reliable suction gas cooled, high efficiency, accessible hermetic motor with APT2000 type magnet wire and redundant overload protection using both thermistor and current overload protection.
- Suction gas screen and serviceable, 0.5 micron full flow oil filter within the compressor housing.
- Cast iron compressor housing precisely machined for optimal clearances and superb efficiency. Entire

compressor, from suction to discharge has a Design Working Pressure of 450psig (31 bar).

- 350W compressor body cartridge heater.
- Each compressor will be mounted on isolator pads to reduce transmission of vibration to the rest of the unit.

## COOLER

The dual-circuit cooler will be the direct-expansion type, with refrigerant in the tubes and chilled liquid flowing through the baffled shell. The design working pressure of the shell (liquid) side will be 150 PSIG (10.3 bar), and 300 PSIG (26.7 bar) for the tube (refrigerant) side.

The cooler will be constructed and tested in accordance with the applicable sections of the ASME Pressure Vessel Code, Section VIII, Division (1). The water side will be exempt per paragraph U-1, (c)(6).

The water baffles will be constructed of galvanized steel to resist corrosion. The removable heads will allow access to the internally enhanced, seamless, copper tubes. Vent and drain connections will be included.

The cooler will be covered with 3/4" (19.1 mm) flexible, closed-cell, foam insulation (K = 0.25).

## CONDENSER

The condenser is a cleanable thru-tube type with steel shell, copper tubes, removable water heads, and includes integral subcooling. Refer to PHYSICAL DATA for design working pressures. The shell will be constructed and tested in accordance with section VII, division 1 of the ASME pressure-vessel code. The water side is exempt per paragraph U-1 (c) of section VIII, division 1 of the ASME pressure-vessel code. The condenser is equipped with relief valves and will hold the full refrigerant charge for pumpdown.

## REFRIGERANT CIRCUIT

Two independent refrigerant circuits will be furnished on each unit. All piping will be ACR copper with brazed joints. The liquid line will include: a shutoff valve with charging port; sightglass with moisture indicator; thermal expansion valve; solenoid valve; and high-absorption removable-core filter drier. The entire suction line and the liquid line between the expansion valve and the cooler will be insulated with flexible, closed-cell, foam insulation.

## POWER AND CONTROL PANELS

All controls and motor starting equipment necessary for unit operation shall be factory wired and function tested. The panel enclosures shall be designed to IP32 (NEMA 1) and manufactured from powder-painted galvanized steel.

The Power and Control Panel shall be divided into a power section for each electrical system, a common input section and a control section.

Each power panel shall contain:

Compressor starting contactors, control circuit serving compressor capacity control, compressor contactor coils and compressor motor overloads. The compressor motor overloads contain current transformers which sense each phase, as an input to the microprocessor, to protect the compressors from damage due to: low input current, high input current, unbalanced current, single phasing, phase reversal, and compressor locked rotor.

The common input section shall contain:

The control supply transformer providing 115V, customer relay board and control circuit switch disconnect/emergency stop device.

The control section shall contain:

On/Off rocker switch, microcomputer keypad and display, microprocessor board, I/O expansion board, relay boards, and 24V fused power supply board.

## MICROPROCESSOR CONTROLS

**Fuzzy Logic** control will be incorporated in the YCWS range of chillers. Fuzzy Logic allows the control system to monitor several key variables to provide tighter, more stable chilled water temperature control. The control system monitors the leaving chilled water temperature to track where it has been, where it is now, how fast it is moving, and accurately adjusts the chiller operation in anticipation of expected performance to minimize hunting and save energy.

The microprocessor shall have the following functions and displays:

- A liquid crystal 40 character display with text provided on two lines and light emitting diode backlighting for outdoor viewing.
- A color-coded, 35 button, sealed keypad with sections for Display, Entry, Setpoints, Clock, Print, Program, and Unit On/Off Switch.

The standard controls shall include: brine chilling or thermal storage, automatic pumpdown, run signal contacts, demand load limit from external building automation system input, remote reset liquid temperature reset input, unit alarm contacts, chilled liquid pump control, automatic reset after power failure, automatic system optimization to match operating conditions, software stored in nonvolatile memory (EPROM) to eliminate chiller failure due to AC power failure.

The microprocessor can be directly connected to a YORK ISN Building Automation System via the standard onboard RS485 communications port. This option also provides open system compatibility with other communications networks.

Programmed Setpoints shall be retained in a lithium battery backed RTC with a memory of five years.

**Display** - In Metric (°C and Bars) or English (°F and PSIG) units, and for each circuit:

- Return and leaving chilled liquid
- Day, date and time. Daily start/stop times. Holiday and Manual Override status.
- Compressor operating hours and starts. Automatic or manual lead/lag. Lead compressor identification.
- Run permissive status. No cooling load condition. Compressor run status.
- Anti-recycle timer and anti-coincident start timer status per compressor.
- Suction (and suction superheat), discharge, and oil pressures and temperatures per System.
- Percent full load compressor motor current per phase and average per phase. Compressor capacity control valve input steps.
- Cutout status and setpoints for: supply fluid temperature, low suction pressure, high discharge pressure and temperature, high oil temperature, low and high current, phase rotation safety, and low leaving liquid temperature.
- Unloading limit setpoints for high discharge pressure and compressor motor current.
- Liquid pull-down rate sensitivity (0.3°C to 3.0°C [0.5°F to 5°F]/minute in 0.05°C [0.1°F] increments).
- Status of: evaporator heater, load and unload timers, chilled water pump.
- Out of range message.
- Up to 6 fault shut down conditions.
- Standard Display Language is English, with an Option for Spanish.

**Entry** - Enter set point changes, cancel inputs, advance day, change AM/PM.

# Specifications (Continued)

---

**Set Points** - Chilled liquid temperature, chilled liquid range, remote reset temperature range.

**Clock** - Time, daily or holiday start/stop schedule, manual override for servicing.

**Print** - Operating data or system fault shutdown history for last six faults. Printouts through an RS-232 port via a separate printer (by others).

**Program** -

- Low leaving liquid temperature cutout, 300 to 600 second anti-recycle timer, lag compressor start time delay, and average motor current unload point. Liquid temperature setpoint reset signal from **YORK ISN** or building automation system (by others) via:
- Pulse width modulated (PWM) input for up to 40°F(22°C) total reset as standard.
- Optional Building Automation System interface input card for up to 11.1°C ( 20°F) reset using a: 4 to 20 mA, 0 to 10 Vdc input, or discrete reset input.  
NOTE: The Standard MicroPanel can be directly connected to a YORK ISN Building Automation System via the standard onboard RS485 communication port. This Option also provides open system compatibility with other communications

networks (BACnet™ & LONMARK™ via interface through standard onboard 485 or 232 port and an external YorkTalk Translator.

- Additional functions (password protected) for programming by a qualified service technician:

Cutouts for low suction pressure, high discharge pressure, high oil temperature.

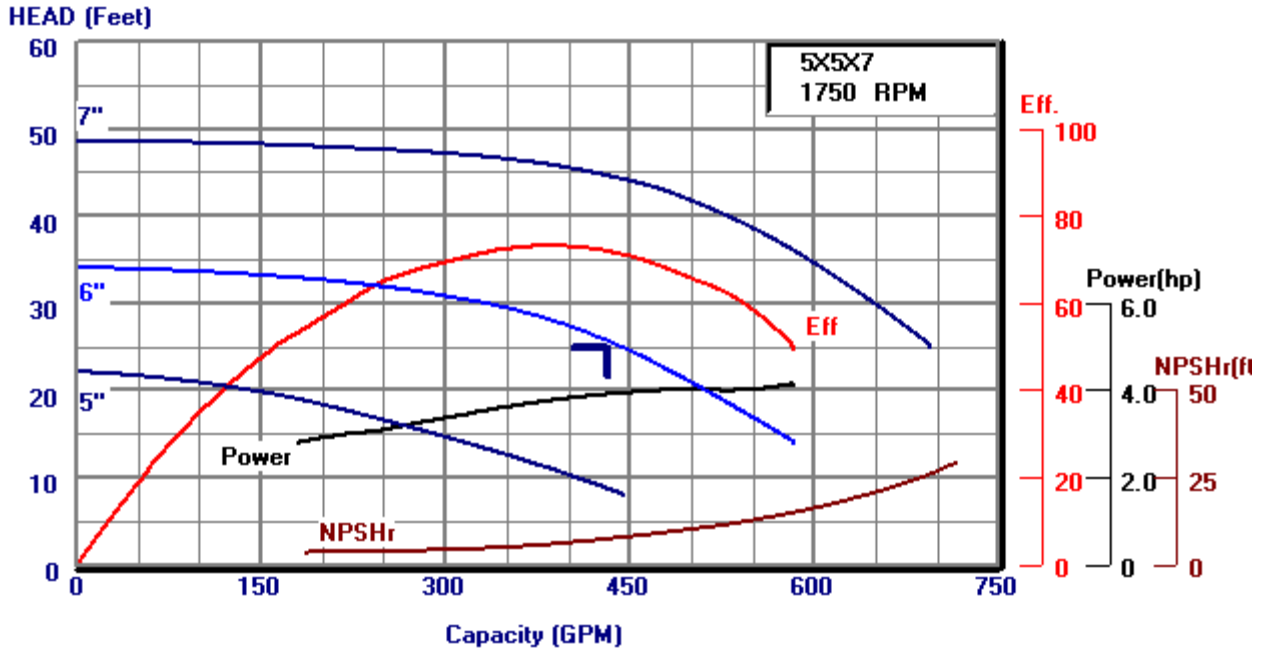
Refrigerant type.

High discharge pressure unload setpoint.

Compressor motor current percent limit.

# PUMP DETAILS

<b>80 5X5X7</b>			
Flow Rate (GPM)	432	Pump Head (Feet)	25
Speed (RPM)	1750	NPSHr (Feet)	7.4
Weight (lbs)	**	Cost Index	**
Suction Size (in.)	5	Suction Velocity (fps)	6.9
Discharge Size (in.)	5	Discharge Velocity (fps)	6.9
Impeller Size (in.)	6.0	Pump Efficiency (%)	70.93
Max. Flow (GPM)	584	Duty Flow/Max Flow (%)	74.0
Flow @ BEP (GPM)	385	Min. Rec. Flow (GPM)	96.2
Selected Motor Size (HP)	5	Selected Motor Size (kw)	3.73
Duty-Point Power (BHP)	3.86	Duty-Point Power (kw)	2.88
Maximum Power (BHP)	4.16	Maximum Power (kw)	3.10
Est. Full Load Amps	**	Est. Full Load Efficiency (%)	**
Frame Size	**	Est. Full Load Power Factor (%)	**
<a href="#">View Published Pump Curve</a>		<a href="#">Download CAD Drawing</a>	
<input checked="" type="radio"/> <a href="#">Generate Pump Curve</a>		<a href="#">Print Friendly Format</a>	
<a href="#">Calculate Operating Costs</a>		<a href="#">eMail This Pump Selection</a>	
<a href="#">Generate Submittal</a>		<a href="#">Add This Pump To My Project</a>	
<input type="button" value="Select Feature"/>			



Pump Series: 80	Min Imp Dia = 5 "	Design Capacity = 432.0	ITT Bell & Gossett 8200 N. Austin Morton Grove, IL 60053
Suction Size = 5 "	Max Imp Dia = 7 "	Design Head = 25.0	
Discharge Size = 5 "	Cut Dia = 6 "	Motor Size = 5 HP	

The Power and Eff. curves shown are for the cut dia. impeller.

**Job Information**

MCCCH  
 JB  
 Rockville, MD

**Selected By**

Penn State  
 104 Engineering Unit A  
 University Park, PA  
 wpb5@psu.edu  
 PSUAE  
 Tel 814-863-2076

**Marley Contact**

H & H Associates, Inc.  
 4510 Westport Drive  
 Mechanicsburg, PA 17055  
 frank@hassociates.com  
 Tel 717-796-2401  
 Fax 717-796-9717

**Cooling Tower Definition**

Manufacturer	Marley Cooling Technologies	Fan Motor Speed	1800 rpm
Product	NC Class	Fan Motor Capacity per cell	7.500 BHP
Model	NC8302D1	Fan Motor Output per cell	7.500 BHP
Cells	1	Fan Motor Output total	7.500 BHP
CTI Certified	Yes	Air Flow per cell	61870 cfm
Fan	7.000 ft, 5 Blades	Air Flow total	61870 cfm
Fan Speed	330 rpm, 7257.1 fpm	ASHRAE 90.1 Performance	90.6 gpm/Hp
Fans per cell	1		

Sound Pressure Level 75 dBA/Cell, 5.000 ft from Air Inlet Face. See sound report for details.

**Conditions**

Tower Water Flow	540.0 gpm	Air Density In	0.07094 lb/ft <sup>3</sup>
Hot Water Temperature	95.00 °F	Air Density Out	0.07129 lb/ft <sup>3</sup>
Range	10.00 °F	Humidity Ratio In	0.01712
Cold Water Temperature	85.00 °F	Humidity Ratio Out	0.02864
Approach	7.00 °F	Wet-Bulb Temp. Out	87.42 °F
Wet-Bulb Temperature	78.00 °F	Estimated Evaporation	5.9 gpm
Relative Humidity	50 %		

- This selection meets your design conditions.

**Weights & Dimensions**

	Per Cell	Total
Shipping Weight	5260 lb	5260 lb
Max Operating Weight	11520 lb	11520 lb
Width	15.500 ft	15.500 ft
Length	7.896 ft	7.896 ft
Height	10.198 ft	
Static Lift	9.411 ft	

**Minimum Enclosure Clearance**

Clearance required on air inlet sides of tower without altering performance. Assumes no air from below tower.

Solid Wall	4.574 ft
50 % Open Wall	3.307 ft

Weights and dimensions do not include options; refer to sales drawings. For CAD layouts refer to file NC8302.dxf

**Cold Weather Operation**

**Heater Sizing** (Minimum ambient temperature to maintain collection basin water at 40 °F)

Heater kW/Cell	12.0	9.0	7.5	6.0	4.5	3.0
Ambient Temperature °F	-21.75	-5.25	3.00	11.25	19.50	27.75



# PUMP DETAILS

<b>80 4X4X9-1/2</b>			
Flow Rate (GPM)	540	Pump Head (Feet)	50
Speed (RPM)	1750	NPSHr (Feet)	16.8
Weight (lbs)	**	Cost Index	**
Suction Size (in.)	4	Suction Velocity (fps)	13.6
Discharge Size (in.)	4	Discharge Velocity (fps)	13.6
Impeller Size (in.)	8.875	Pump Efficiency (%)	69.89
Max. Flow (GPM)	640	Duty Flow/Max Flow (%)	84.4
Flow @ BEP (GPM)	448	Min. Rec. Flow (GPM)	112.0
Selected Motor Size (HP)	10	Selected Motor Size (kw)	7.46
Duty-Point Power (BHP)	9.82	Duty-Point Power (kw)	7.32
Maximum Power (BHP)	10.19	Maximum Power (kw)	7.60
Est. Full Load Amps	**	Est. Full Load Efficiency (%)	**
Frame Size	**	Est. Full Load Power Factor (%)	**

[Generate Pump Curve](#)

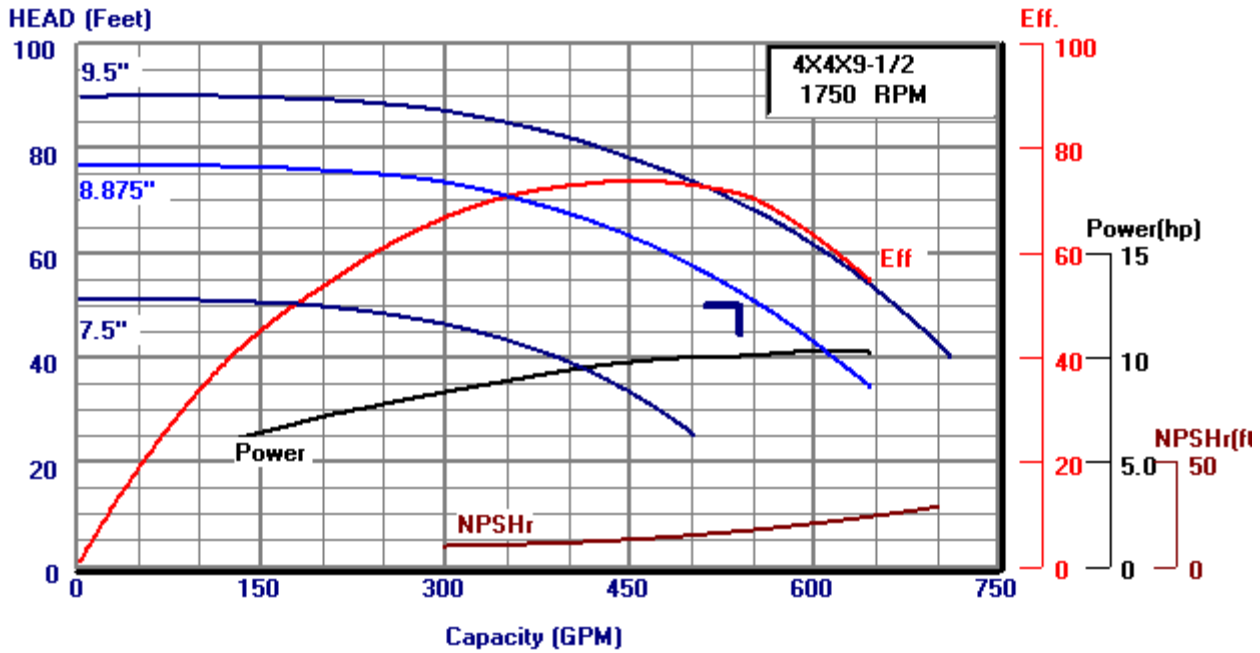
[Calculate Operating Costs](#)

[Generate Submittal](#)

[Print Friendly Format](#)

[eMail This Pump Selection](#)

[Add This Pump To My Project](#)



Pump Series: 80  
Suction Size = 4 "  
Discharge Size = 4 "

Min Imp Dia = 7.5 "  
Max Imp Dia = 9.5 "  
Cut Dia = 8.875 "

Design Capacity = 540.0  
Design Head = 50.0  
Motor Size = 10 HP

ITT Bell & Gossett  
8200 N. Austin  
Morton Grove, IL 60053

The Power and Eff. curves shown are for the cut dia. impeller.

**This is NOT the quotation form**

<b>INQUIRY NO. 86066-01.01</b>	MEDIUM HOT/COLD	Water	30% Ethylene Glycol	
	VOLUME FLOW RATE	1008.0	1055.0	GPM
<b>PLATE</b>	MASS FLOW RATE	504541.3	552482.7	LB/HR
TYPE: 120MH	TEMPERATURE IN	54.0	40.0	F
NUMBER/FRAME: 254	TEMPERATURE OUT	44.0	50.7	F
PASSES H/C: 1/1				
SPACES H/C: 126/ 127	PRESSURE DROP TOTAL	6.6	8.7	PSI
MATERIAL: 0.4 MM 304 S/S	PRESSURE DROP ALLOW	10.0	10.0	PSI
GASKET MAT.: NBR	HEAT EXCHANGE/HR	5052747	BTU/H	
	Heat Transfer Area (All Frames)	3245.7	FT2	
	LMTD CORRECTED/CALC	3.7/ 3.7	F	
	U-VALUE REQUIRED	426	BTU/FT2 H F	

<b>FRAME</b>							
TYPE	B-20		CONNECTIONS	TYPE	MATERIAL	SIZE	POSITION
NO. PARALLEL	1		HOT IN	Studded	NBR	6.00	1F
DESIGN PRESS.	100	PSI G	OUT	Studded	NBR	6.00	4F
DESIGN TEMP.	150	°F	COLD IN	Studded	NBR	6.00	3F
TEST PRESS.	130	PSI G	OUT	Studded	NBR	6.00	2F
LENGTH	85.89	Inch					
WIDTH	36.25	Inch					
HEIGHT	104.50	Inch					
WT. EMPTY/EA	7141	LB					

\*\*NOTE\*\* ALUMINUM SHROUD OMITTED

\*\*NOTE\*\* FRAME IS DESIGNED PER ASME SECTION VIII, DIV.1

## MUELLER ACCU-THERM PLATE HEAT EXCHANGER SPECIFICATION SHEET

PMC Spec. No.: 86066-01.01  
Ref. No.:

Sales Manager: /RN  
Date: 26 March, 2005

<u>Design Data</u>	<u>Hot-Side</u>	<u>Cold-Side</u>	
Heat Transfer Media:	Water	30% Ethylene Glycol	
Volume Flow Rate:	1008.0	1055.0	GPM
Mass Flow Rate:	504541.3	552482.7	LB/HR
Inlet Temperature:	54.0	40.0	°F
Outlet Temperature:	44.0	50.7	°F
Density:	8.35	8.73	LB/GAL
Specific Heat:	1.002	0.857	BTU/LB F
Viscosity:	1.32	3.24	CPS
Thermal Conductivity:	0.333	0.271	BTU/FT H F
Pressure Drop:	6.6	8.7	PSI
Operating Pressure:	50	50	PSI G
Heat Transfer Rate:		5052747	BTU/H
Log Mean Temp Diff:		3.7	°F
Operating U-Value:		426	BTU/FT <sup>2</sup> H F
Heat Transfer Area (All Frames):		3245.7	FT <sup>2</sup>

### Mechanical Description

#### Frame

Type	B-20 Carbon Steel
Design Code	ASME Section VIII, DIV. 1
Design Pressure	100 PSI G
Design Temp. Max/Min	150 °F / 32°F
Test Pressure	130 PSI G
Frames In Parallel/Series/Total	1/ 1/ 1
A-Dim. Min./Max.	35.04/ 37.50 Inch
Overall Length	85.89 Inch
Overall Width	36.25 Inch
Overall Height	104.50 Inch
Guide Bar Length	84.00 Inch
Compression Bolt Length	60.00 Inch
Weight Operating/Empty	9402/7141 LB

#### Plates

Type	120M H
Plate Material	0.4 MM 304 S/S
Plates/Frame	254
Passes-H/C	1/1
Channels-H/C	126/127
Gasket Material	NBR

<u>Connections</u>		<u>Location</u>
Hot In	6.00 Inch NBR Studded	1F
Out	6.00 Inch NBR Studded	4F
Cold In	6.00 Inch NBR Studded	3F
Out	6.00 Inch NBR Studded	2F

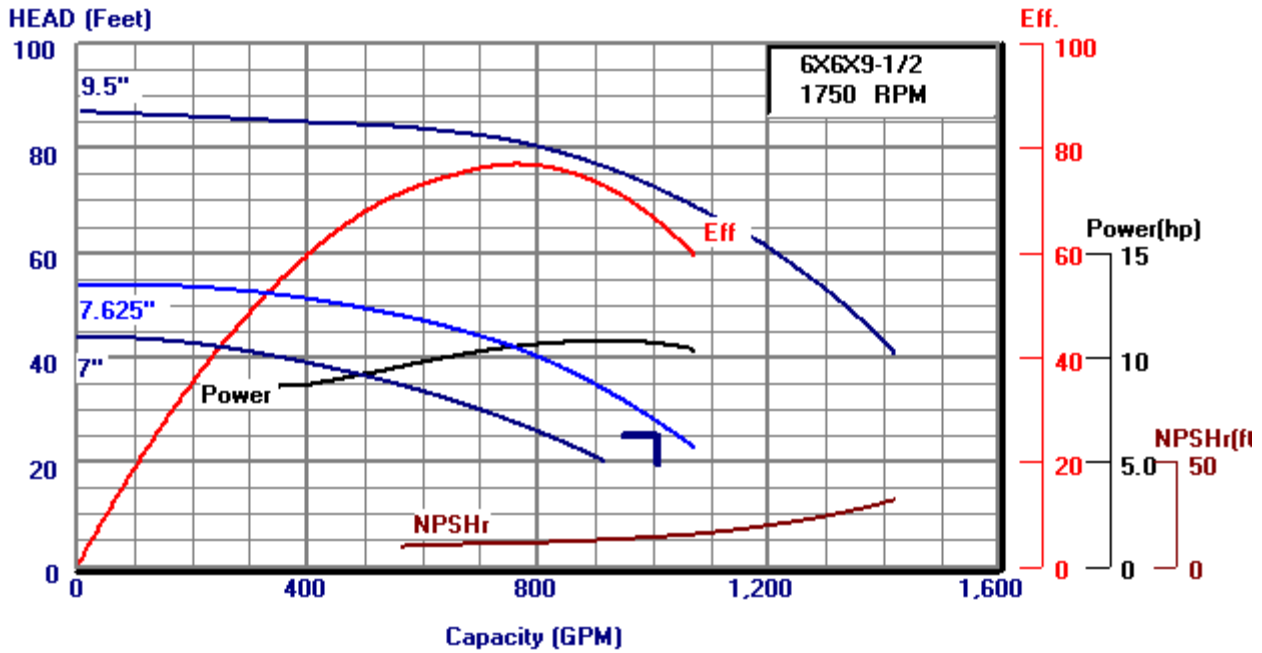
#### **Notes:**

Aluminum shroud omitted

The purchaser of the equipment bears total responsibility for suitability of use of all materials in this application. We may have assumed some design values. If they differ from your requirements, a new design may be necessary.

# PUMP DETAILS

<b>80 6X6X9-1/2</b>			
Flow Rate (GPM)	1008	Pump Head (Feet)	25
Speed (RPM)	1750	NPSHr (Feet)	14.2
Weight (lbs)	**	Cost Index	**
Suction Size (in.)	6	Suction Velocity (fps)	11.2
Discharge Size (in.)	6	Discharge Velocity (fps)	11.2
Impeller Size (in.)	7.625	Pump Efficiency (%)	62.65
Max. Flow (GPM)	1053	Duty Flow/Max Flow (%)	95.7
Flow @ BEP (GPM)	728	Min. Rec. Flow (GPM)	182.1
Selected Motor Size (HP)	15	Selected Motor Size (kw)	11.19
Duty-Point Power (BHP)	10.26	Duty-Point Power (kw)	7.65
Maximum Power (BHP)	10.58	Maximum Power (kw)	7.89
Est. Full Load Amps	**	Est. Full Load Efficiency (%)	**
Frame Size	**	Est. Full Load Power Factor (%)	**
<a href="#">View Published Pump Curve</a>		<a href="#">Download CAD Drawing</a>	
<input checked="" type="radio"/> <a href="#">Generate Pump Curve</a>		<a href="#">Print Friendly Format</a>	
<a href="#">Calculate Operating Costs</a>		<a href="#">eMail This Pump Selection</a>	
<a href="#">Generate Submittal</a>		<a href="#">Add This Pump To My Project</a>	
<input type="button" value="Select Feature"/>			



Pump Series: 80	Min Imp Dia = 7 "	Design Capacity = 1008.0	ITT Bell & Gossett 8200 N. Austin Morton Grove, IL 60053
Suction Size = 6 "	Max Imp Dia = 9.5 "	Design Head = 25.0	
Discharge Size = 6 "	Cut Dia = 7.625 "	Motor Size = 15 HP	

The Power and Eff. curves shown are for the cut dia. impeller.