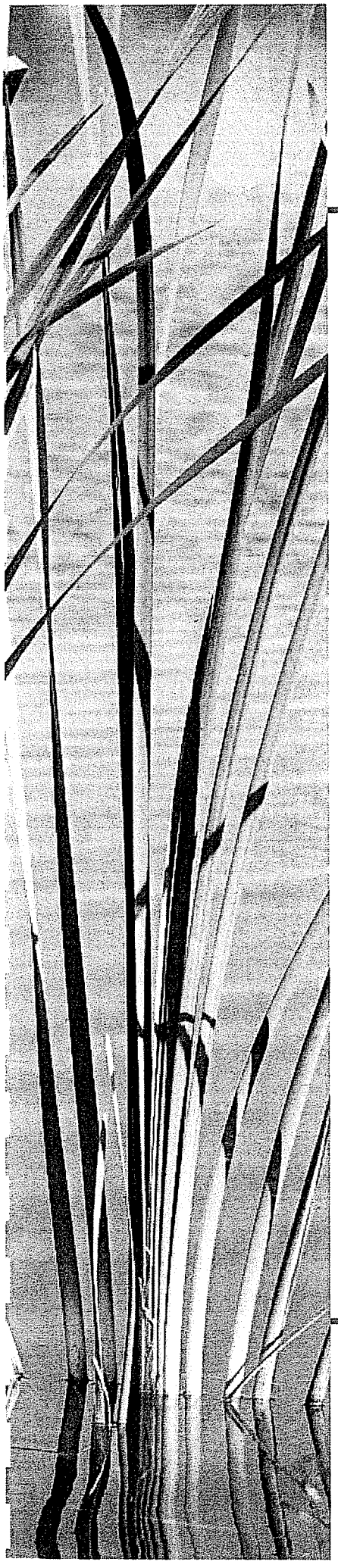


Preliminary Engineering Report

Hickory Nut Crossing
Water Line Extension and Pump Stations

Western Pulaski County Water District

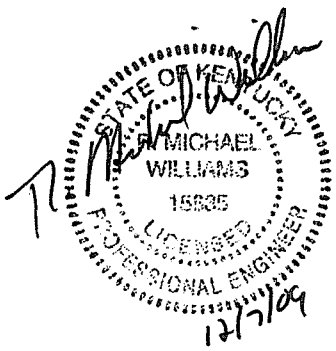
December 2006

bell engineering

Preliminary Engineering Report

Hickory Nut Crossing
Water Line Extension and Pump Stations

Index to Report



Preliminary Engineering Report

Hickory Nut Crossing
Water Line Extension and Pump Stations

I. Introduction

The Western Pulaski County Water District (WPCWD) desires to provide more reliable service to the western end of the service area. The WPCWD currently has only one water main across the fishing creek tributary of Lake Cumberland, and this project will add backup supply to the western end of the service area. The project consists of 6 and 8 inch water mains and associated pump stations .The project will also provide water service to 6 areas which have no public water supply.

II. Planning Area

The WPCWD service area is in South Western Pulaski County as shown on the attached Map #1. The project area is spread over the north and west portions of the service area, an area that is generally north and west of the Louie B. Nunn Parkway. System schematics, shown on the service area map, were developed from information received from the Cumberland Valley Area Development District and further refined from discussions with the WPCWD staff.

III. Existing Facilities

The Western Pulaski service area is comprise of approximately 350 miles of 3 inch (155 miles), 4 inch (53 miles), 6 inch (121 miles), 8 inch (18 miles), and 10 inch (less than 1 mile) water lines. The WPCWD has five pump stations and six water storage tanks. The system is served from the City of Somerset through four master meters supplied from both the Somerset high and low level pressure zones. The system provides water service to approximately 8,500 customers.

The distribution system is shown on Map #2. The WPCWD is generally in good repair; however, some components installed when the system was much smaller are in need of upgrading while others are showing signs of wear because of many years of use.

The WPCWD is currently in compliance with all Federal and State Regulations regarding the sanitary features of the distribution system. In addition the WPCWD is governed by the Public Service Commission, and they have no current violations of PSC regulations.

IV. Need for the Project

The development of this project is not directly related to the health and safety of the customers in the project area. The project is related to capacity and reliability as such has an indirect effect on the health and safety of the customer base. This project is designed to add additional distribution system capacity to the north western end of the WPCWD service area. The area is currently supplied by the southern portion of the distribution system through multiple pump stations that has only one water main that crosses the fishing creek tributary of Lake Cumberland. This project will add a backup emergency water supply to the western end of the service area. The project is not designed to provide for a complete backup in the event of a complete failure of the water main across Fishing Creek at Lees' Ford.

This project will service 17 unserved customers and improve service to approximately 4,000 existing customers. More importantly, the project will provide increased reliability to the Northwest pressure zone. Map # 2 shows the location of the WPCWD pressure Zones. Currently the entire western end of the distribution system is served by one water line that crosses Fishing Creek a tributary of Lake Cumberland. If either the pump station or the 10 inch water line at Lee's Ford is out of service for an extended period approximately 4,000 customers will be out of water service

V. Alternatives

Design Criteria:

1. Provide increased water supply to the Northwest pressure Zone.
2. Provide an alternate route across Fishing Creek.
3. Provide emergency supply to all the western end of the service area.

Alternative 1: Provide a new water line to the Northwestern section of the service area with associated pumping stations. This alternative meets all the above design criteria.

Alternate 2: Increase the size of the existing pump station that currently supplies the Northwestern section of the service area. This alternative does not meet design criteria #2 and #3.

VI. Proposed Project

The chosen alternative is to provide a new water line to the Northwestern section of the service area with associated pumping stations. The project provides the following:

1. A new water line that services the Northwest section of the service area.
2. Additional pump capacity to the Northwest section of the service area.
3. Adds service to unserved area.
4. Fills and makes use of an existing 500,000 water storage tank.

The design includes additions water lines where none exist and upgrading other lines to larger sizes where system hydraulic dictates. This main follows Ringgold to Clifty Creek, then along an unnamed road to Fishing Creek and then to Hickory Nut road. The new line terminates at a 6 inch water lines in the existing system. The new water main ultimately feed the Hickory Nut water tank. There are 5,125 feet of 6 inch and 15,000 feet of 8 inch water line in this part of the project.

Two new pump stations are included in the project. The Hickory Nut pump station will supply the Northwestern pressure zone that was previously supplied from the Southeast pressure zone by a small (125 gpm) station. The Denham knob pump station will supply the Denham knob tank, and will create a new pressure zone from sections of the Northeast pressure zone, the Somerset High Level pressure zone and the Southeast pressure zone. Currently, the Denham knob tank will not fill from its current source. The pump curves and the hydraulics are demonstrated in the hydraulic analysis located in Appendix B. The characteristics of the pump stations are listed in the table below and also Appendix B.

Name	Head (Ft.)	Flow (GPM)	Horsepower
Hickory Nut	355	255	30
Denham	94.8	347	15

This project will service 17 unserved customers and improve service to approximately 4,000 existing customers. More importantly, the project will provide increased reliability to the Northwest pressure zone. Map # 2 shows the location of the WPCWD pressure Zones. Currently the entire western end of the distribution system is served by one water line that crosses Fishing Creek a tributary of Lake Cumberland. If either the pump station or the 10 inch water line at Lee's Ford is out of service for an extended period approximately 4,000 customers will be out of water service.

Additional water lines extensions included in this project provide service to new customers located on the following roads. The road names with customer count line size and length ate listed in Table 1. Map #3 shows the location of all projects areas.

Table 1

Road Name	Length (feet)	PIPE Size	Number Customers
Anderson	2,000	3 inch	2
Leo Muncey	5,450	4 inch	5
Ezra Hall	4,000	3 inch	2
Rock Lick	1,400	3 inch	2
Greenway	3,000	3 inch	2
Roy	2,900	3 inch	4
Von	1,000	6 inch	None

Environmental Impacts

Environmental impacts are related to the Fishing Creek and Clifty Creek Crossing. The two streams are branches of Lake Cumberland and are subject to U. S. Army Corps of Engineers permitting process, and the permit has been applied for. The project was also been submitted to the Kentucky clearing house, which is designated as the single point of contact pursuant to Presidential Executive Order 12372 . The clearinghouse letter (SAI# KY20080103-0004) is included in Appendix A.

Land Requirements

The project will be constructed on both private land and state highway right of way except through the Corps property. Land for pump stations must be purchased.

Construction problems

Construction problems are not anticipated for either the pump station or the water lines.

Hydraulic Calculations

A KYPIPE 2000 model was developed from system schematics and discussions with system operators. Demand data was developed from meter books and their associated routes. Tank overflow elevations and pump station data was provided by the WPCWD. Hydraulic grades at master meters were established from an extensive hydraulic model developed by Bell Engineering for the City of Somerset. The hydraulic analysis is included in Appendix B.

Opinions of probable costs

Opinions of probable costs are provided in the Table 2 below.

Table 2

Hickory Nut and Fishing Creek
Plus Small Roads

Opinion of Probable Costs	
Total Project	
Administration	$29,107
Legal	$19,404
Land, Appraisals, Easements	$20,000
Planning--PER	$25,000
Engineering Fees-Design and Construction	$86,253*
Engineering Fees-Inspection	$54,914*
Construction	$970,220
Subtotal	$1,204,898
Contingencies	$97,022
Total	$1,301,920

*Calculated from RD Design and Inspection Fees

Annual Operating Budget

The annual operating budget will be included in the Summary Addendum.

VII. Conclusion and Recommendations

The western end of the county has no backup water supply and this project adds an additional water line across a tributary of Lake Cumberland. In addition to providing backup supply to the service area, the new pump station will supply needed pumping capacity to the western end of the county. The project will supply water service to unservered customers in the service area.

This project is needed to supply additional distribution system capacity to the North West portion of the WPCWD service area. Because the western end of the district is only supplied by one water main across the Cumberland Lake at Lees Ford, this project will supply needed backup to the area.

Map #1, Western Pulaski County Water District Service Area

Map #2, Western Pulaski County Water District Distribution System

Map #3, Hickory Nut Crossing Project Map

Appendix A: Kentucky State Clearinghouse Letter

REC'D FEB 15 2008

STEVEN L. BESHEAR
GOVERNOR

GOVERNOR'S OFFICE FOR LOCAL DEVELOPMENT
OFFICE OF THE GOVERNOR
1024 CAPITAL CENTER DRIVE, SUITE 340
FRANKFORT, KENTUCKY 40601-8204
PHONE (502) 573-2382 FAX (502) 573-2939
TOLL FREE (800) 346-5606
www.kentucky.gov

February 13, 2008

Mr. Michael Williams
Bell Engineering
354 Waller Ave.
Lexington, Kentucky 40504

RE: WPCWD – Hickory Nut Crossing and Various Water Line Extension
WX21199076
SAI# KY20080103-0004

Dear Mr. Williams:

The Kentucky State Clearinghouse, which has been officially designated as the Commonwealth's Single Point of Contact (SPOC) pursuant to Presidential Executive Order 12372, has completed its evaluation of your proposal. The clearinghouse review of this proposal indicates there are no identifiable conflicts with any state or local plan, goal, or objective. Therefore, the State Clearinghouse recommends this project be approved for assistance by the cognizant federal agency.

Although the primary function of the State Single Point of Contact is to coordinate the state and local evaluation of your proposal, the Kentucky State Clearinghouse also utilizes this process to apprise the applicant of statutory and regulatory requirements or other types of information which could prove to be useful in the event the project is approved for assistance. Information of this nature, if any, concerning this particular proposal will be attached to this correspondence.

You should now continue with the application process prescribed by the appropriate funding agency. This process may include a detailed review by state agencies that have authority over specific types of projects.

This letter signifies only that the project has been processed through the State Single Point of Contact. It is neither a commitment of funds from this agency or any other state of federal agency.

The results of this review are valid for one year from the date of this letter. Continuation or renewal applications must be submitted to the State Clearinghouse annually. An application not submitted to the funding agency, or not approved within one year after completion of this review, must be re-submitted to receive a valid intergovernmental review.

If you have any questions regarding this letter, please feel free to contact my office at 502-573-2382.

Sincerely,

Lee Nalley
Kentucky State Clearinghouse

Attachments
Cc: Lake Cumberland ADD
KIA

The Natural Resources has made the following advisory comment pertaining to State Application Identifier Number KY200801030004

This review was based upon the information that was provided by the applicant through the Clearinghouse for this project. An endorsement of this project does not satisfy, or imply, the acceptance or issuance of any permits, certifications or approvals that may be required from this agency under Kentucky Revised Statutes or Kentucky Administrative Regulations. Such endorsement means this agency has found no major concerns from the review of the proposed project as presented other than those stated as conditions or comments.

The proposed project is subject to Division of Water (DOW) jurisdiction because the following are or appear to be involved: water lines and appurtenances. Prior approval must be obtained from the DOW before construction can begin. The applicant must cite the State Application Identifier (SAI #KY200801030004) when submitting plans and specifications.

This project is consistent with the Pulaski County Water Management Plan. It is approved for water management planning. It is approved for water withdrawal by the Water Quantity Management Section of DOW. From the application data, DOW ascertains that a stream construction permit application will need to be submitted to our office for further review of this project.

The proposed project is a distribution system upgrade realized by adding a new water line along Hickory Nut Road and across Lake Cumberland at Fishing Creek. The project will improve service to the western end of the Western Pulaski County Water District service area. Currently, there are no connection water lines north of the parkway that serve the western end of the water district. This project includes a pump station that will supplement the pump stations south of the parkway. Other short extensions are included to provide water service to areas that are out of water due to drought condition. The primary benefits are improved operations, reliable water service to existing and new residents, and increase potential for new business in the western end of the water district. Completion of this project will provide improved water service to 4,000 households. There is no objection to the proposed project. However, final plans and specifications are subject to review by the Division of Water, based on sanitary features of the design.

If the construction area disturbed is equal to or greater than 1 acre, the applicant will need to apply for a Kentucky Pollutant Discharge Elimination System (KPDES) storm water discharge permit.

Utility line projects that cross a stream will require a Section 404 permit from the US Army Corps of Engineers and a 401 Water Quality Certification from DOW.

The Transportation has made the following advisory comment pertaining to State Application Identifier Number KY200801030004
no commenst

The Heritage Council has made the following advisory comment pertaining to State Application Identifier Number KY200801030004

The applicant must ensure compliance with the Advisory Council on Historic Preservation's Rules and Regulations for the Protection of Historic and Cultural Properties (36CFR, Part 800) pursuant to the National Historic Preservation Act of 1966, the National Environmental Policy Act of 1969, and Executive Order 11593.

Those water lines in the existing right-of-way do not require an archaeological survey, however, the lines not in the right-of-way must be surveyed by a professional archaeologist to determine if sites eligible for listing in the National Register of Historic Places will be affected by the undertaking. Where a given project area or portions thereof have been disturbed by prior construction, the applicant may file documentation of that disturbance with the State Historic Preservation Officer and may request an opinion concerning the need of an archaeological survey. The State Historic Preservation Officer must review and approve the survey report.

The Health and Family Services has made the following advisory comment pertaining to State Application Identifier Number KY200801030004
No Comment

The Fish & Wildlife has made the following advisory comment pertaining to State Application Identifier Number KY200801030004

To minimize impacts to the aquatic environment the Kentucky Dept. of Fish & Wildlife Resources recommends that erosion control measures be developed and implemented prior to construction to reduce siltation into waterways located within the project area. Such erosion control measures may include, but are not limited to silt fences, staked straw bales, brush barriers, sediment basins, and diversion ditches. Erosion control measures will need to be installed prior to construction and should be inspected and repaired regularly as needed.

Additionally, KDFWR recommends the following for the portions of the project that crosses intermittent or perennial streams: Development/excavation in streams should be done during low flow periods to minimize disturbances. When crossing a stream, the pipe should be laid perpendicular to the stream bank to minimize the direct impacts to the streambed. We recommend that all instream disturbances be returned to a stable condition upon completion of stream pipeline crossing.

The Lake Cumberland ADD has made the following advisory comment pertaining to State Application Identifier Number KY200801030004
no comments

The Labor Cabinet has made the following advisory comment pertaining to State Application Identifier Number KY200801030004

Prevailing Wage Rates are applicable please contact the Kentucky Department of Labor at 502-564-3070 to obtain the proper rates

The Office of State Budget Director has made the following advisory comment pertaining to State Application Identifier Number KY200801030004

Endorsed by Vicki Goins 2/8/08

The Kentucky Housing Corporation has made the following advisory comment pertaining to State Ipplication Identifier Number KY200801030004
no comments

The Housing, Building, Construction has made the following advisory comment pertaining to State Application Identifier Number KY200801030004
no comment

Appendix B: Hydraulic Analysis

The following hydraulic analysis does not include the computer printout from the KYPIPE hydraulic model. The printout and associated schematics are the same as those that are included in the analysis submitted to the Kentucky Division of water for approval. The entire analysis will be provided on request.

Engineering Calculations
for
Hickory Nut Crossing
Waterline and Pump station Project
April 23, 2008
Prepared by
Bell Engineering

These calculations are prepared in support of the waterline extension to Hickory Nut Ridge and various water small water line extensions to unserved customers. The new water main to Hickory Nut Ridge provides additional capcity to the Northwest portion of the Western Pulaski County Water District (WPCWD) distribution system. The entire western end of the WPCWD system is currently supplied by a single water main that crosses the back waters of Cumberland lake at the KY 80 bridge that crosses Fishing Creek. The new water main, which will also cross Fishing Creek, will provide a backup to the existing water main.

A KYPIPE 2000 model was developed from system schematics and discussions with system operators. Demand data was developed from meter books and their associated routes. Tank overflow elevations and pump station data was provided by the WPCWD. Hydraulic grades at master meters were established from an extensive hydraulic model developed by Bell Engineering for the City of Somerset.

A simulation was performed on the system for normal demands, peak demands, and flushing demands. Results are labeled normal demand, peak demand, and flushing report on the KYPIPE 2000 printout.

For normal demands, data from Western Pulaski County Water District provided a total number of 1831 customers in the Southern Pressure zone for a total of 1865 when the new customers are added For peak flow analysis, the formula $D=10\sqrt{N}$ was used to determine a peak demand for the affected areas. Therefore, a global demand factor of 2.3 was applied to the entire pressure zone. A simulated demand of 55 gpm and 98 gpm was imposed at the end of the new 3-inch and 4 inch water lines respectively in order to achieve the required 2.5 fps flushing velocity though the lines. System pressures remain above 20 psi during the simulated flushing. The flushing hydrant arrangement is shown in the following Table. A KYPIPE 2000 computer output is attached along with the system schematic. The new lines are highlighted on the printout and schematic.

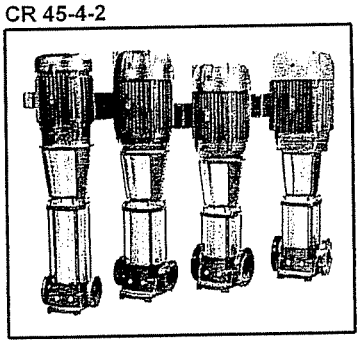
Western Pulaski County Water District provided a total number of 512 customers in the Northwest pressure zone considered in this model. For peak flow analysis, the formula $D=10\sqrt{N}$ was used to determine a peak demand of 226 gpm for the affected areas. Therefore, a global demand factor of 4.5 was applied to the pressure zones system. A simulated demand of 220 gpm and 400 gpm was imposed at the end of the new 6-inch and 8 inch water lines respectively in order to achieve the required 2.5 fps flushing velocity though the lines. System pressures remain above 20 psi during the simulated flushing. The flushing hydrant arrangement is shown in the following Table.

A new pump stations are included in the project. The Hickory Nut pump station will supply the Northwestern pressure zone that was previously supplied from the Southeast pressure zone by a small (125 gpm) station. The pump curves are attached and the hydraulics are demonstrated in the KYPIPE output below, Normal demand run for the Northwest pressure Zone.

Road Name	Plan Sheet Number	PIPE Number	Flush Node
Anderson	13	P-92	J-69
Roy	10	P-95	J-70
Greenway	9	P-22	J-20
Leo Muncey	11	P-90	J-66
Ezra Hall	8	P-26	J-25
Rock Lick	12	P-28	J-27
Von	14	P-1260	J-26
Hickory Nut	2,3,4,5	P-8, P-29, P-46	J-26
Ringgold	5,6,7	P-18, P-1131	J-26

HICKORY NUT CROSSING

Position	Qty.	Description	Single Price
	1	CR 45-4-2	Price on request



Note! Product picture may differ from actual product

Product No.: 96419142
Vertical, non-self-priming, multistage, in-line, centrifugal pump for installation in pipe systems and mounting on a foundation.

The pump has the following characteristics:

- Impellers and intermediate chambers are made of Stainless steel DIN W.-Nr. 1.4301 DIN W.-Nr..
- Pump head and base are made of Cast iron.
- The shaft seal has assembly length according to EN 12756.
- Power transmission is via cast iron split coupling.
- Pipework connection is via ANSI flanges.

The motor is a 3-phase AC motor.

Liquid:

Liquid temperature range:	32 .. 248 °F

Technical:

Speed for pump data:	3541 rpm
Rated flow:	220.1 US GPM
Resulting flow of the pump:	255 US GPM
Rated head:	355 ft
Resulting head of the pump:	323 ft
Type of shaft seal:	KUBE
Approvals on motor nameplate:	UL Recognized Component, CSA
Curve tolerance:	ISO 9906 Annex A

Materials:

Material, pump housing:	Cast iron EN-JS1050 DIN W.-Nr. 80-55-06 ASTM
Material, impeller:	Stainless steel 1.4301 DIN W.-Nr. 304 AISI

Installation:

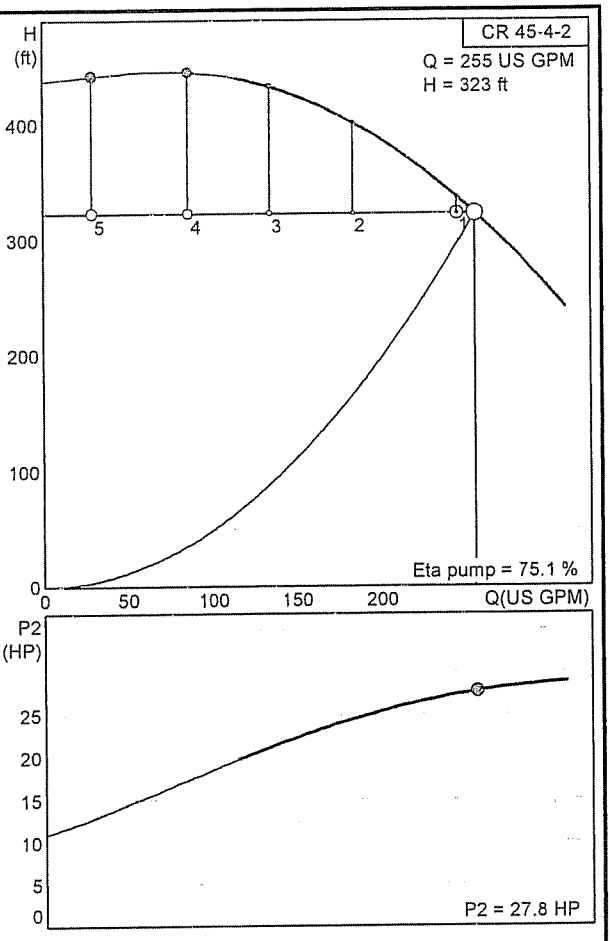
Maximum ambient temperature:	104 °F
System pressure:	232 psi
Max pressure at stated temp:	232 / 250 psi / °F
Min inlet pressure:	-7.8 psi
Minimum pre-charge pressure:	0 psi
Standard, pipe connection:	ANSI
Size, pipe connection:	3"
Pressure stage, pipe connec.:	125 Lb.
Flange size for motor:	284TC

Electrical data:

Motor type:	Baldor, TEFC
P2 :	30 HP
Mains frequency:	60 Hz
Rated voltage:	3 x 230 / 460 V
Service factor:	1,15

Position	Qty.	Description		Single Price
		Rated current:	66 / 33 A	
		Starting current:	448 / 224 A	
		Cos phi - power factor:	0,91	
		Rated speed:	3525 rpm	
		Full load motor efficiency:	91,7 %	
		Insulation class (IEC 85):	F	
		Others:		
		Gross weight:	809 lb	
		Shipping volume:	32.8 ft³	

Description	Value
Product name:	CR 45-4-2 A-G-A-E KUBE
Product No:	96419142
EAN number:	5700390748401
Technical:	
Speed for pump data:	3541 rpm
Rated flow:	220.1 US GPM
Resulting flow of the pump:	255 US GPM
Rated head:	355 ft
Resulting head of the pump:	323 ft
Impellers:	4
Impeller reduc.:	2
Type of shaft seal:	KUBE
Approvals on motor nameplate:	UL Recognized Component, CSA
Curve tolerance:	ISO 9906 Annex A
Stages:	4
Pump version:	A
Model:	A
Materials:	
Material, pump housing:	Cast iron EN-JS1050 DIN W.-Nr. 80-55-06 ASTM
Material, impeller:	Stainless steel 1.4301 DIN W.-Nr. 304 AISI
Material code:	A
Code for rubber:	E
Installation:	
Maximum ambient temperature:	104 °F
System pressure:	232 psi
Max pressure at stated temp:	232 / 250 psi / °F
Min inlet pressure:	-7.8 psi
Minimum pre-charge pressure:	0 psi
Standard, pipe connection:	ANSI
Connect code:	G
Size, pipe connection:	3"
Pressure stage, pipe connec.:	125 Lb.
Flange size for motor:	284TC
Liquid:	
Liquid temperature range:	32 .. 248 °F
Electrical data:	
Motor type:	Baldor, TEFC
P2:	30 HP
KVA code:	G
Mains frequency:	60 Hz
Rated voltage:	3 x 230 / 460 V
Service factor:	1,15
Rated current:	66 / 33 A
Starting current:	448 / 224 A
Load current:	77.2 / 38.6 A
Cos phi - power factor:	0,91
Rated speed:	3525 rpm
Full load motor efficiency:	91,7 %
Insulation class (IEC 85):	F
Motor protec:	None
Motor No:	85600027
Others:	
Gross weight:	809 lb
Shipping volume:	32.8 ft³
Sales region:	namreg



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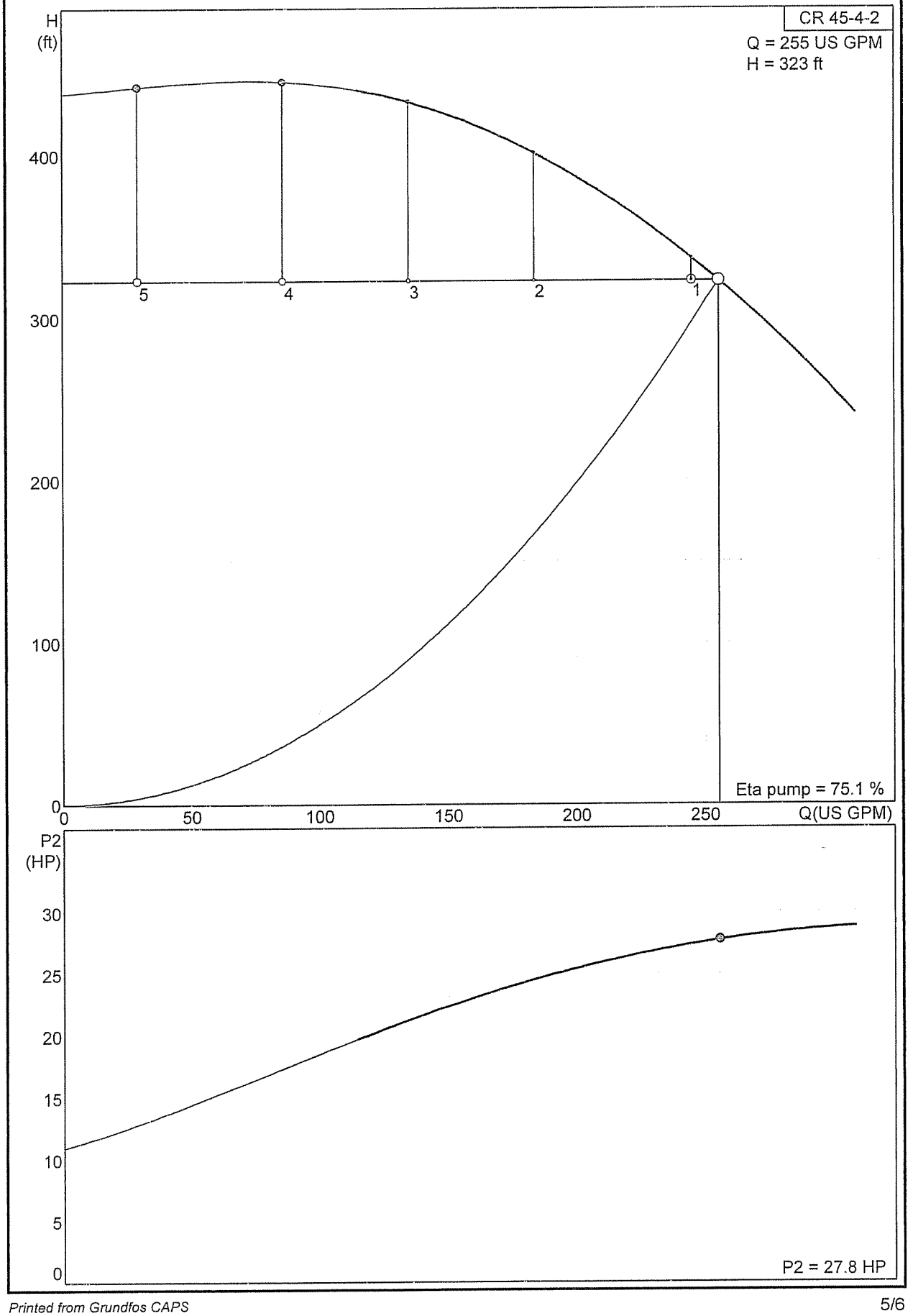

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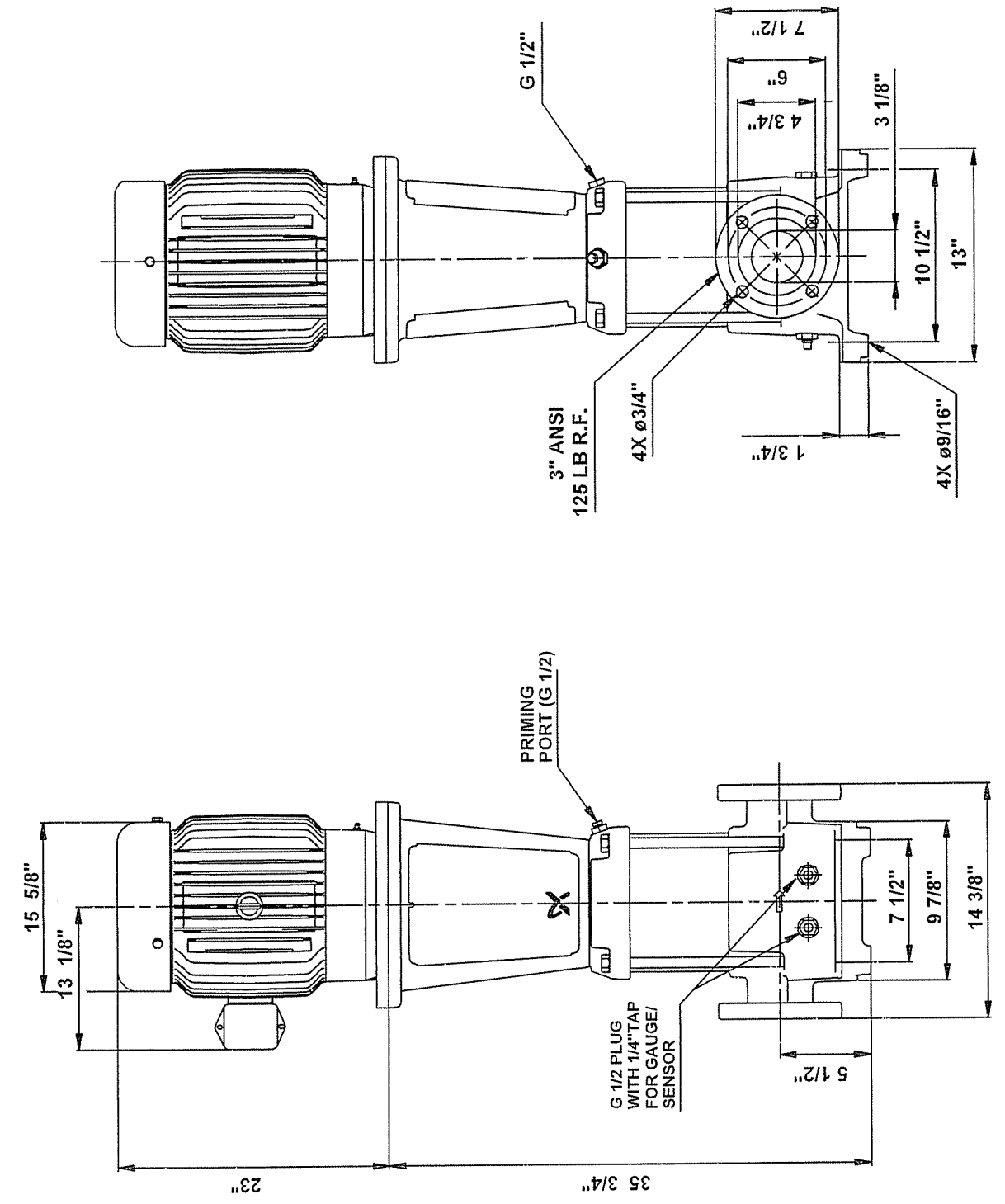

Note! All units are in [mm] unless others are stated