Quattlebaum, Grooms & Tull
A PROFESSIONAL LIMITED LIABILITY COMPANY
111 Center Street
Suite 1900
Little Rock, Arkansas 72201
(501) 379-1700 • (501) 379-1701 – Fax

January 2, 2015

William A.(Al) Eckert III
aeckert@qgtlaw.com

Direct Dial
501-379-1712
Direct Fax
501-379-3812

Mr. Mo Shafii
Arkansas Department of Environmental Quality
5301 Northshore Drive
North Little Rock, AR 72118-5317

RECEIVED
JAN 2 2015
By 1/2/15

RE: Waterford Septic Operations, LLC

Dear Mo:

Enclosed for your review are the no-discharge permit application and transfer forms for Waterford Septic Operations, LLC. The conveyance from Waterford Estates, LLC to Waterford Septic Operations, LLC is scheduled to close on or about January 12th. I will forward to you a copy of the deed when executed. Robert H. Holmes remains the principal party for Waterford Septic Operations, LLC.

I have enclosed the following:

1) ADEQ Disclosure Statement
2) ADEQ No-Discharge Section Permit Application
3) Permit Transfer Form
4) Waste Management Plan by Presley Consulting Engineers
5) Wastewater Plant Operations and Maintenance Manual by AquaTech Systems
6) Certificate of Good Standing - Arkansas Secretary of State
7) Special Warranty Deed to Waterford Estates, LLC (to be conveyed to Waterford Septic Operations, LLC).

Thanks for your assistance and please contact me if you have any questions or comments.

Sincerely,

QUATTLEBAUM, GROOMS & TULL, PLLC

Al Eckert

ARKANSAS DEPARTMENT OF ENVIRONMENTAL QUALITY
DISCLOSURE STATEMENT

Instructions for the Completion of this Document:

A. Individuals, firms or other legal entities with no changes to an ADEQ Disclosure Statement, complete items 1 through 5 and 18.

B. Individuals who never submitted an ADEQ Disclosure Statement, complete items 1 through 4, 6, 7, and 16 through 18.

C. Firms or other legal entities who never submitted an ADEQ Disclosure Statement, complete 1 through 4, and 6 through 18.

Mail to:
ADEQ
DISCLOSURE STATEMENT
[*List Proper Division(s)*]
5301 Northshore Drive
North Little Rock, AR 72118-5317

Hand Deliver to:
ADEQ
DISCLOSURE STATEMENT
[*List Proper Division (s)*]
5301 Northshore Drive
North Little Rock, AR 72118-5317

1. APPLICANT: (Full Name) Waterford Septic Operations, LLC

2. MAILING ADDRESS (Number and Street, P.O.Box Or Rural Route) : 3838 Oaklawn Avenue, Suite 920

3. CITY, STATE, AND ZIPCODE: Dallas, TX 75219

4. (check all that apply.)

☐ Individual ☒ Corporate or Other Entity

☒ Permit ☐ License ☐ Certification ☐ Operational Authority

☐ New Application ☐ Modification ☒ Renewal Application (If no changes from previous disclosure statement, complete number 5 and 18.)

☐ Air ☒ Water ☐ Hazardous Waste ☐ Regulated Storage Tank ☐ Mining ☐ Solid Waste

☐ Environmental Preservation and Technical Service

5. Declaration of No Changes:
The violation history, experience and credentials, involvement in current or pending environmental lawsuits, civil and criminal, have not changed since the last Disclosure Statement I filed with ADEQ on _____

_____

Signature of Individual or Authorized Representative of Firm or Legal Entity
(Also complete #18.)

6. Describe the experience and credentials of the Applicant, including the receipt of any past or present permits, licenses, certifications or operational authorization relating to environmental regulation. (Attach additional pages, if necessary.)

Tom Bartlett - site manager
On behalf of Applicant:
Charles Presley, P.E. & R.L.S.
111 Madison 7805
P. O. Box 607
Huntsville, AR 72740
See Attachment

7. List and explain all civil or criminal legal actions by government agencies involving environmental protection laws or regulations against the Applicant * in the last ten (10) years including:

1. **Administrative enforcement actions resulting in the imposition of sanctions;**
2. **Permit or license revocations or denials issued by any state or federal authority;**
3. **Actions that have resulted in a finding or a settlement of a violation; and**
4. **Pending actions.**

(Attach additional pages, if necessary.)

None.

*** Firms or other legal entities shall also include this information for all persons and legal entities identified in sections 8-16 of this Disclosure Statement.**

8. List all officers of the Applicant. (Add additional pages, if necessary.)

NAME: Robert H. Holmes, II TITLE: managing member
STREET: 3838 Oaklawn Avenue, Suite 920
CITY, STATE, ZIP: Dallas, TX 75219

NAME: Michael E. Montgomery TITLE: managing member
STREET: 4925 Greenville Ave., Suite 911
CITY, STATE, ZIP: Dallas, TX 75219

NAME: TITLE:
STREET:
CITY, STATE, ZIP:

9. List all directors of the Applicant. (Add additional pages, if necessary.)

NAME: Robert H. Holmes, II TITLE: managing member
STREET: 3838 Oaklawn Avenue, Suite 920
CITY, STATE, ZIP: Dallas, TX 75219

NAME: Michael E. Montgomery TITLE: managing member
STREET: 4925 Greenville Ave., Suite 911
CITY, STATE, ZIP: Dallas, TX 75219

NAME: TITLE:
STREET:
CITY, STATE, ZIP:

10. List all partners of the Applicant. (Add additional pages, if necessary.)

NAME: n/a TITLE:
STREET:
CITY, STATE, ZIP:

NAME: TITLE:
STREET:
CITY, STATE, ZIP:

NAME: TITLE:
STREET:
CITY, STATE, ZIP:

11. List all persons employed by the Applicant in a supervisory capacity or with authority over operations of the facility subject to this application.

NAME: Tom Bartlett TITLE: site manager
STREET:
CITY, STATE, ZIP:

NAME: TITLE:
STREET:
CITY, STATE, ZIP:

NAME: TITLE:
STREET:
CITY, STATE, ZIP:

12. List all persons or legal entities, who own or control more than five percent (5%) of the Applicant's debt or equity.

NAME: Robert H. Holmes II TITLE: managing member
STREET: 3838 Oaklawn Avenue, Suite 920
CITY, STATE, ZIP: Dallas, TX 75219

NAME: Michael E. Montgomery TITLE: managing member
STREET: 4925 Greenville Avenue, Suite 911
CITY, STATE, ZIP: Dallas, TX 75219

NAME: _____ TITLE: _____
STREET: _____
CITY, STATE, ZIP: _____

13. List all legal entities, in which the Applicant holds a debt or equity interest of more than five percent (5%).

NAME: n/a TITLE: _____
STREET: _____
CITY, STATE, ZIP: _____

NAME: _____ TITLE: _____
STREET: _____
CITY, STATE, ZIP: _____

NAME: _____ TITLE: _____
STREET: _____
CITY, STATE, ZIP: _____

14. List any parent company of the Applicant. Describe the parent company's ongoing organizational relationship with the Applicant.

NAME: n/a
STREET: _____
CITY, STATE, ZIP: _____

Organizational Relationship:

15. List any subsidiary of the Applicant. Describe the subsidiary's ongoing organizational relationship with the Applicant.

NAME: n/a
STREET: _____
CITY, STATE, ZIP: _____

Organizational Relationship:

18. VERIFICATION AND ACKNOWLEDGEMENT

The Applicant agrees to provide any other information the director of the Arkansas Department of Environmental Quality may require at any time to comply with the provisions of the Disclosure Law and any regulations promulgated thereto. The Applicant further agrees to provide the Arkansas Department of Environmental Quality with any changes, modifications, deletions, additions or amendments to any part of this Disclosure Statement as they occur by filing an amended Disclosure Statement.

DELIBERATE FALSIFICATION OR OMISSION OF RELEVANT INFORMATION FROM DISCLOSURE STATEMENTS SHALL BE GROUNDS FOR CIVIL OR CRIMINAL ENFORCEMENT ACTION OR ADMINISTRATIVE DENIAL OF A PERMIT, LICENSE, CERTIFICATION OR OPERATIONAL AUTHORIZATION.

State of TEXAS

County of DALLAS

I, Robert H. Holmes, II **, swear and affirm that the information contained in this Disclosure Statement is true and correct to the best of my knowledge, information and belief.**

APPLICANT SIGNATURE: Robert H Holmes

COMPANY TITLE: Waterford Septic Operations, LLC

DATE: December 31, 2014

SUBSCRIBED AND SWORN TO BEFORE ME THIS 31 **DAY OF** December **20** 14

Vicki L Miller

NOTARY PUBLIC

MY COMMISSION EXPIRES:

VICKI LYNN MILLER
Notary Public, State of Texas
My Commission Expires
May 31, 2016

Northwest Arkansas Utility Services currently has ownership and or contractual operations and maintenance agreements with 5 wastewater treatment facility in Washington and Benton County. Beginning in 2006, each facility has been managed, operated and maintained by at least one person that is certified in a class equal to or higher than the class of the facility, and has full and active responsibility for the daily on-site operation of the facility. All wastewater operating experience includes time spent performing the hands-on operational duties of each of the various a wastewater treatment plants and the necessary reporting requirements of each of the facilities required by the ADEQ. Currently NWA Utility Services operator holds a Class II certification with the Arkansas Department of Environmental Quality. All operators' responsibilities include:

- direct hands-on physical operation of wastewater treatment equipment and/or wastewater treatment processes,
- direct active field supervision of wastewater treatment equipment and/or wastewater treatment processes
- direct and active involvement in process control decisions for wastewater treatment processes
- coordination with labs for all necessary reporting requirements as defined by the individual permit

Arkansas Department of Environmental Quality
No-Discharge Section Permit Application
Subsurface Disposal System

Permit No.:	AFIN:	SIC Code:	NAICS Code:
(Office Use Only)	(Office Use Only)		

1. Permit Action and Type *(Please check one of the following)*:

Operator Type: ☐ Corporation (State of Incorporation: _____) ☒ Limited Liability Company (State of LLC: AR)
☐ Partnership ☐ Sole Proprietorship/Private ☐ Public Entity (Type: _____)

☐ New Permit ☒ Renewal ☒ Modification of Permit, Describe: owner name change

☐ Carwash/Truck Wash ☐ Domestic Septic System ☒ Drip Irrigation System ☐ Laundromat
☐ Slaughter House ☐ Other _____

2. Permittee Legal Name and Mailing Address: *(Must Match Arkansas's Secretary of State)*

Owner Name: Waterford Septic Operations, LLC			
Address: 3838 Oaklawn Drive, Suite 920		Phone Number: 479-601-2153	
City: Dallas	State: TX	Zip Code: 75219	
Contact Person: *(Mr. / Mrs. / Ms.) Robert H. Holmes, II*		Email: Robert@hhhfundi.com	
Title: Managing member	Phone Number:	Cell Number: 479-601-2153	

3. Facility Location *(physical address is required; NO P.O. BOX)*:

Facility Name: Waterford Estates			
Address *(911 Address)*: 2323 W. Bowen Blvd.		Phone Number: 479-601-2153	
City: Goshen	State: AR	Zip Code: 72735	
1/4 Sec.: Section:	Township:	Range:	
Latitude: 36 Deg 6 Min 0 Sec.	Longitude 94 Deg 2 Min 2 Sec.	Source Datum: NAD83	
County: Washington	Nearest Town: Goshen, AR		
Nearest Stream: unnamed _____ of White River	Distance: 990 (ft)	Stream Segment: 4K	

4. Consultant Information:

Name: Charles L. Presley	Consulting Firm: Presley, Brannan & Associates, Inc.	
Email:	Phone Number: 479-738-6630	
Address: 111 Madison 7805	Cell Number:	
City: Huntsville	State: AR	Zip Code: 72740

Please read the following carefully and sign below.

I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, which may include fines and/or imprisonment.

SIGNATORY REQUIREMENTS:

The information contained in this form must be certified by a **responsible official** as defined below:

Corporation: principal officer at least the level of vice president (must be an officer or register agent with the secretary of state)
Partnership: a general partner
Sole Proprietorship: the proprietor/owner
Municipal, state, federal, or other public facility: principal executive officer, or ranking elected official

Responsible Official: Robert H. Holmes, II Title managing member

Responsible Telephone: 214-613-0506 Email: Robert@hhhfundi.com

Responsible Signature: _____ Date: December 31, 2014

Cognizant Official is an individual that is given signature authority from the Responsible Official

Cognizant Official: _____ Title: _____

Cognizant Telephone: _____ Email: _____

Cognizant Signature: _____ Date: _____

PERMIT REQUIREMENT VERIFICATION (Please check the following to verify the completion of permit requirements.)

Yes	No	
☒	☐	Submittal of Complete Application Does the Owner name match the Secretary of State (Corporation or Limited Liability Company)? Does the Responsible Official match the Secretary of State?
☒	☐	Submittal of Waste Management Plan Stamped & Signed by an Arkansas Registered PE/ ADH Designated Representative Are maps and site description included?
☒	☐	Submittal of Operation/Maintenance Plan (nonmunicipal wastewater treatment systems) Is the cost estimate included?
☒	☐	Submittal of Disclosure Statement (completed and executed) Not required for public entity
☒	☐	Submittal of Land use Contract/Deed/Lease
☐	☒	Arkansas Department of Health notification letter (letter transmitting documents to ADH) (New permits or modified permits)
☒	☐	Provide Certificate of Good Standings with the Arkansas Secretary of State (If foreign corporation, provide Certificate of Good Standings from the state of Origin)

PERMIT TRANSFER FORM

Please select one of the following options:

A. Permittee (legal name) change B. Facility name change C. Responsible official name change

☐ A ☐ B ☐ C ☐ A & B ☒ A & C ☐ B & C ☐ A & B & C

PERMIT NUMBER: 4815-WR-1

I. CURRENT PERMITTEE INFORMATION

Permittee (legal name): Waterford Estates at Hissom Ranch Property Owners Association, Inc.

Facility Name: Waterford Estates

Responsible Official Name (see Section IV below): Harvey Williams

Is the permittee identified above, the owner of the facility? ☒ Yes ☐ No

If you mark No, please list the name of the owner:

II. NEW PERMITTEE INFORMATION

Permittee (legal name): Waterford Septic Operations, LLC

Facility Name (if different from Permittee Name): Waterford Estates

Is the permittee identified above, the owner of the facility? ☒ Yes ☐ No

If you mark No, please list the name of the owner:

Responsible Official Name (see Section IV below): Robert H. Holmes II

Official Title of Responsible Officer: Managing Member

E-mail: robert@hhhfundi.com

Permittee Address: 3838 Oaklawn Avenue, Suite 920

Permittee City: Dallas

Permittee State: TX Zip: 75219

Permittee Telephone No.: 214-613-0506

Owner Type:

☐ STATE ☐ PARTNERSHIP

☐ FEDERAL ☒ CORPORATION*

☐ SOLE PROPRIETORSHIP

Is the new permittee registered with the Arkansas Secretary of State? ☒ Yes ☐ No

If yes, please provide the full name of corporation if different than the legal permittee name listed above.

Facility Mailing Address: 2323 W. Bowen Blvd. Facility City: Goshen

Facility State: AR Zip: 72735

Facility Contact Person Name: Robert H. Holmes, II Contact Person Title: managing member

Telephone Number: 214-613-0506 Fax Number: E-mail: robert@hhhfundi.com

Invoice Contact Person: Robert H. Holmes, II City: Dallas

Invoice Mailing Address: 3838 Oaklawn Avenue, Suite 920 State: TX Zip: 75219

Invoice Mailing Address: Telephone: 214-613-0506

Cognizant Official Name: Robert H. Holmes, II Cognizant Official Title: managing member

Telephone Number: 214-613-0506 Fax Number: 214-520-1705 E-mail: robert@hhhfundi.com

PERMIT TRANSFER FORM

III. OWNERSHIP CHANGE AGREEMENT

Please note you must complete this Section (III.) only if the permit has a new owner or a new ownership.

Please specify the closing date for this transaction: _____

Current Permittee (Seller): Waterford Estates at Hissom Ranch Property Owners Association, Inc.

Signature of Responsible Corporate Officer: _____
Title of Responsible Corporate Officer: _____
Printed Name of Responsible Corporate Officer: Robert H. Holmes, II
Date: _____

New Permittee (Buyer): Waterford Septic Operations, LLC

Signature of Responsible Corporate Officer: _____
Title of Responsible Corporate Officer: managing member
Printed Name of Responsible Corporate Officer: Robert H. Holmes, II
Date: _____

Disclosure Statement:
Disclosure Statement must be submitted for new permittee. **Disclosure Statement is not required for Stormwater Permits.**

Is Disclosure Statement enclosed: ☒ Yes ☐ No

Financial Assurance:
Please note that if Financial Assurance is required for the current permittee then the new permittee may have to provide new Financial Assurance before the permit maybe transferred..

Land Use Contract:
For **land application permits** you must submit a new land use contracts for all the sites permitted under the current permit for land application. The new land use contract must be signed by the new permittee and land owner.

IV. CERTIFICATION OF NEW PERMITTEE

"I certify that the cognizant official designated in this Permit Transfer Form (Section II) is qualified to act as a duly authorized representative under the provisions of 40 CFR Part 122.22(b). If no cognizant official has been designated, I understand that the Department will accept reports signed by the applicant. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

In addition, I certify that there will be no operational changes that warrant a permit modification. (Please note that if there are changes that warrant a permit modification, then you must submit a complete application, updated plans, design calculations and specifications, and the permit modification fee along with this Ownership Change Form. The transfer may be made effective prior to permit modification.)

Typed or Printed Name: Robert H. Holmes, II Title: managing member
Signature: _____ Date: 12/21/17

PERMIT TRANSFER FORM

Please select one of the following options:

A. Permittee (legal name) change B. Facility name change C. Responsible official name change

☐ A ☐ B ☐ C ☐ A & B ☒ A & C ☐ B & C ☐ A & B & C

PERMIT NUMBER: 4815-WR-1

I. CURRENT PERMITTEE INFORMATION

Permittee (legal name): Waterford Estates at Hissom Ranch Property Owners Association, Inc.

Facility Name: Waterford Estates

Responsible Official Name (see Section IV below): Harvey Williams

Is the permittee identified above, the owner of the facility? ☒ Yes ☐ No

If you mark No, please list the name of the owner:

II. NEW PERMITTEE INFORMATION

Permittee (legal name): Waterford Septic Operations, LLC

Facility Name (if different from Permittee Name): Waterford Estates

Is the permittee identified above, the owner of the facility? ☒ Yes ☐ No

If you mark No, please list the name of the owner:

Responsible Official Name (see Section IV below): Robert H. Holmes II

Official Title of Responsible Officer: Managing Member

E-mail: robert@hhhfundi.com

Permittee Address: 3838 Oaklawn Avenue, Suite 920

Permittee City: Dallas

Permittee State: TX Zip: 75219

Permittee Telephone No.: 214-613-0506

Owner Type:

☐ STATE ☐ PARTNERSHIP

☐ FEDERAL ☒ CORPORATION*

☐ SOLE PROPRIETORSHIP

Is the new permittee registered with the Arkansas Secretary of State? ☒ Yes ☐ No

If yes, please provide the full name of corporation if different than the legal permittee name listed above.

Facility Mailing Address: 2323 W. Bowen Blvd. Facility City: Goshen

Facility State: AR Zip: 72735

Facility Contact Person Name: Robert H. Holmes, II Contact Person Title: managing member

Telephone Number: 214-613-0506 Fax Number: E-mail: robert@hhhfundi.com

Invoice Contact Person: Robert H. Holmes, II City: Dallas

Invoice Mailing Address: 3838 Oaklawn Avenue, Suite 920 State: TX Zip: 75219

Invoice Mailing Address: Telephone: 214-613-0506

Cognizant Official Name: Robert H. Holmes, II Cognizant Official Title: managing member

Telephone Number: 214-613-0506 Fax Number: 214-520-1705 E-mail: robert@hhhfundi.com

PERMIT TRANSFER FORM

III. OWNERSHIP CHANGE AGREEMENT

Please note you must complete this Section (III.) only if the permit has a new owner or a new ownership.

Please specify the closing date for this transaction: January 12, 2015

Current Permittee (Seller): Waterford Estates at Hissom Ranch Property Owners Association, Inc.

Signature of Responsible Corporate Officer:

Title of Responsible Corporate Officer:

Printed Name of Responsible Corporate Officer: Robert H. Holmes, II

Date:

New Permittee (Buyer): Waterford Septic Operations, LLC

Signature of Responsible Corporate Officer:

Title of Responsible Corporate Officer: managing member

Printed Name of Responsible Corporate Officer: Robert H. Holmes, II

Date:

Disclosure Statement:
Disclosure Statement must be submitted for new permittee. **Disclosure Statement is not required for Stormwater Permits.**

Is Disclosure Statement enclosed: ☒ Yes ☐ No

Financial Assurance:
Please note that if Financial Assurance is required for the current permittee then the new permittee may have to provide new Financial Assurance before the permit maybe transferred..

Land Use Contract:
For **land application permits** you must submit a new land use contracts for all the sites permitted under the current permit for land application. The new land use contract must be signed by the new permittee and land owner.

IV. CERTIFICATION OF NEW PERMITTEE

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In addition, I certify that there will be no operational changes that warrant a permit modification. (Please note that if there are changes that warrant a permit modification, then you must submit a complete application, updated plans, design calculations and specifications, and the permit modification fee along with this Ownership Change Form. The transfer may be made effective prior to permit modification.)

Typed or Printed Name: Robert H. Holmes, II Title: managing member

Signature: Date: 12/31/14

Arkansas Secretary of State
Mark Martin

State Capitol Building ♦ Little Rock, Arkansas 72201-1094 ♦ 501-682-3409

Certificate of Good Standing

I, Mark Martin, Secretary of State of the State of Arkansas, and as such, keeper of the records of domestic and foreign corporations, do hereby certify that the records of this office show

WATERFORD SEPTIC OPERATIONS, LLC

authorized to transact business in the State of Arkansas as a Limited Liability Company, filed Articles of Organization in this office August 12, 2014.

Our records reflect that said entity, having complied with all statutory requirements in the State of Arkansas, is qualified to transact business in this State.

In Testimony Whereof, I have hereunto set my hand and affixed my official Seal. Done at my office in the City of Little Rock, this 30th day of December 2014.

Mark Martin

Mark Martin
Secretary of State

Online Certificate Authorization Code: e81ca6c1a33789a

To verify the Authorization Code, visit sos.arkansas.gov

Type: REAL ESTATE
Kind: WARRANTY DEED
Recorded: 6/28/2013 1:15:40 PM
Fee Amt: $40.00 Page 1 of 6
Washington County, AR
Kyle Sylvester Circuit Clerk

THIS INSTRUMENT PREPARED BY AND
AFTER RECORDING TO BE RETURNED TO:

Katie M. Papasan
MITCHELL, WILLIAMS, SELIG,
GATES & WOODYARD, P.L.L.C.
5414 Pinnacle Point Drive, Suite 500
Rogers, Arkansas 75758-8131
(479) 464-5650

File# 2013-00021850

SPECIAL WARRANTY DEED

KNOW ALL PERSONS BY THESE PRESENTS:

THAT BANK OF THE OZARKS, an Arkansas banking corporation ("**Grantor**"), for and in consideration of the sum of Ten and No/100 dollars ($10.00) and other valuable consideration, in hand paid by **WATERFORD ESTATES, LLC**, a Texas limited liability company ("**Grantee**"), the receipt of which is hereby acknowledged, does hereby grant, bargain, sell and convey unto Grantee, and unto its successors and assigns forever, the following lands and all improvements thereon lying in Washington County, Arkansas (the "**Property**"):

See Exhibit A attached.

Grantor is selling the Property "**AS IS, WHERE IS**". Except for the limited warranties of Grantor with respect to title as set forth in this Special Warranty Deed, Grantor has not made, does not and has not authorized anyone else to make representations or warranties as to any aspect of the Property, including, without limitation: (i) the existence or non-existence of access to or from the Property or any portion thereof; (ii) the location of the Property or any portion thereof within any flood plain, flood prone area, water shed or designation of any portion thereof as "wetlands"; (iii) the availability of water, sewer, electrical, gas or other utility services; (iv) the number of acres in the Property or square footage of any improvements; (v) the present or future physical condition or suitability of the Property for any purpose; (vi) the amount, type or volume of timber, if any, in and on the Property; and (vii) any other matter or thing affecting or relating to the Property.

TO HAVE AND TO HOLD the Property, together with all and singular the rights and appurtenances thereto in anywise belonging unto the said Grantee, its heirs and assigns forever; and Grantor does hereby bind itself, its successors and assigns, to warrant and forever defend, all and singular the Property unto Grantee, its heirs and assigns, against every person whomsoever lawfully claiming, or to claim the same, or any part thereof, by, through and under Grantor but not otherwise, and subject to the matters set forth herein.

Special Title Warranty. Grantor covenants with Grantee and its successors and assigns, that, except as otherwise provided herein, it will warrant and defend the title to the Property against the lawful claims and demands of all persons claiming by, through or under Grantor, but against none other, including but not limited to liens arising as a result of an after-acquired property clause in another instrument. No general or other warranties of title are provided by Grantor herein, or may otherwise be implied or inferred by Grantee. The covenants of this special title warranty of Grantor are hereby expressly limited to the acts of Grantor during the

2895816-1
WAS 06-043-13

time in which it has been the title-holder of record of the Property, and specifically exclude the Permitted Encumbrances listed on Exhibit B hereto.

IN WITNESS WHEREOF, the name of the Grantor is hereunto affixed by its President this 28th day of June, 2013.

GRANTOR:
BANK OF THE OZARKS, an Arkansas banking corporation

By: Dan Thomas
Name: Dan Thomas
Title: President, Real Estate Specialties Group

STATE OF Texas)
)SS. **ACKNOWLEDGMENT**
COUNTY OF Dallas)

On this day, personally appeared before the undersigned, a Notary Public duly qualified, commissioned and acting, Dan Thomas, to me well known, or satisfactorily proven who acknowledged that he was the President, Real Estate Specialties Group, of Bank of the Ozarks, an Arkansas banking corporation, and that he, as such officer, being authorized so to do, had executed the foregoing instrument for the purposes therein contained, by signing the name of Bank of the Ozarks by himself as such officer.

WITNESS my hand and official seal this 27th day of June, 2013.

My Commission Expires:

11-12-2014

Anne M. Carrillo
Notary Public

(SEAL) ANNE M. CARRILLO NOTARY PUBLIC STATE OF TEXAS EXPIRES 11-12-2014

2895816-1

The undersigned hereby certifies under penalty of false swearing that the legally correct amount of documentary stamps has been placed on this instrument. Exempt or no consideration paid if none shown.

[GRANTEE or GRANTEE's Agent]

GRANTEE's Address: 4925 Greenville
Ste 915
Dallas, Tx 75206

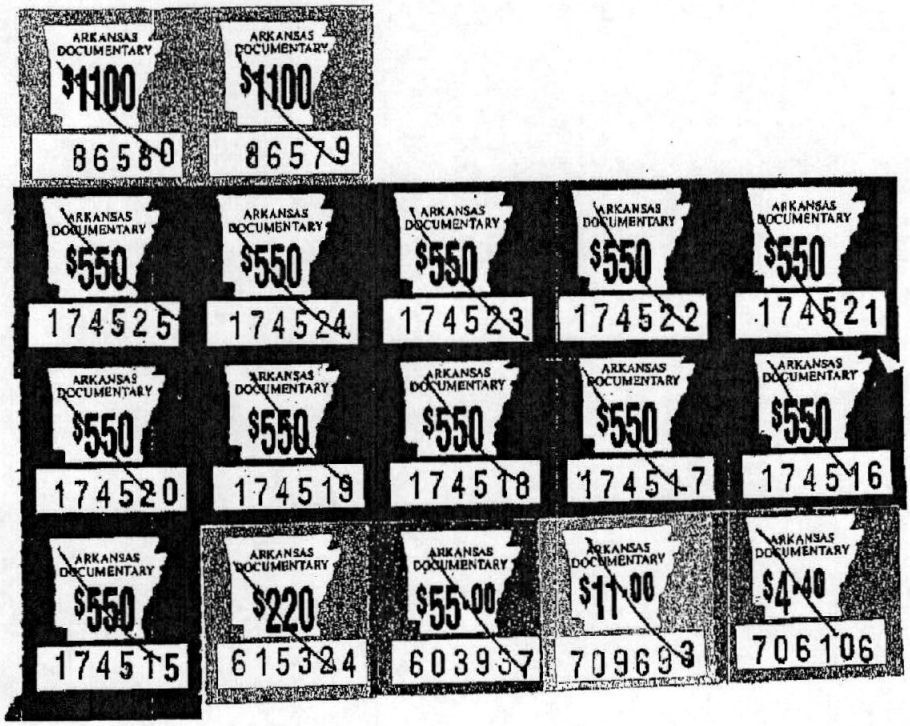


EXHIBIT A
To Warranty Deed

Legal Description

Lots 2, 3, 5, 12, 13, 19, 20, 21, 23, 25, 26, 27, 28, 29, 30, 31, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 46, 53, 56, 57, 58, 61, 71, 72, 73, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 88, 90, 91, 92, 94, 98, 100, 101, 102, 103, 106, 107, 108, 109, 112, 113, 114, 115, 116, 117, 118, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 153, 154, 155, 156, 158, 159, 160, 161, 182, 185, 186, 188, 191, and 00B, of Waterford Estates at Hissom Ranch to the City of Goshen, Arkansas, as per the final plat recorded in Plat Book 23A at Page 174 in the Office of the Circuit Clerk and Ex-Officio Recorder of Washington County, Arkansas.

2895816-1

EXHIBIT B
To Warranty Deed

Permitted Encumbrances

1. Any encroachment, encumbrance, violation, variation, or adverse circumstance affecting the title, including discrepancies, conflicts in boundary lines, shortages in area, or any other facts that would be disclosed by an accurate and complete land survey of the land, and that are not shown in the public records.

2. Loss arising from Oil, Gas or Minerals, conveyed, retained, assigned or any other activity caused by the sub-surface rights of ownership, including but not limited to the right of ingress and egress for said sub-surface purposes.

3. Taxes for the year 2013 and thereafter, which are not yet due and payable.

4. Assessments which may be assessed or levied by the Waterford Estates at Hissom Ranch Property Owners' Association, which may become liens upon the subject property, subordinate to first mortgage.

5. Future assessments levied by the Goshen Municipal Property Owners' Improvement District No. 2 – Waterford Estates at Hissom Ranch pursuant to Ordinance No. 59, recorded as Instrument No. 2005-32046, records of Washington County, Arkansas.

6. Restrictions, conditions and reservations contained in the Declaration of Covenants, Conditions, Restrictions and Easements of Waterford Estates at Hissom Ranch recorded as Instrument No. 2005-36656; First Amendment recorded as Instrument No. 2006-9778; Second Amendment recorded as Instrument No. 2006-9902; Third Amendment recorded as Instrument No. 2007-5273; Fourth Amendment recorded as Instrument No. 2007-12202; Fifth Amendment recorded as Instrument No. 2007-29741; Assignment to Successor Developer recorded as Instrument No. 2009-20824; Sixth Amendment recorded as Instrument No. 2009-38342; First Amendment to Sixth Amendment recorded as Instrument No. 2010-14493; Second Amendment to Sixth Amendment recorded as Instrument No. 2010-23821; and Third Amendment to Sixth Amendment recorded as Instrument No. 2010-35489; and Declaration of Roadway and Access Easement recorded as Instrument No. 2009-30261, records of Washington County, Arkansas.

7. Building setback lines, utility easements, conditions, reservations, dedications and all other matters as set out on the Plat of Waterford Estates at Hissom Ranch recorded in Plat Record Book 23A at Page 174, records of Washington County, Arkansas.

8. Any title or rights asserted by anyone including, but not limited to, persons, corporations, governments or other entities to lands comprising the shores or bottom of navigable streams, lakes, bays, or lands beyond the line of the harbor or bulkhead lines established or changed by the United States Government or riparian rights, if any, including but not limited to the 1148 foot contour line and easement granted to the United States of

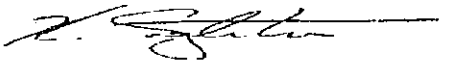
America, Corp of Engineers for Beaver Lake, and the property that lies within the White River boundaries.

9. Reservation of one-fourth of all oil, gas and minerals under the land described on a Warranty Deed recorded in Book 310 at Page 230, records of Washington County, Arkansas, along with full right of ingress and egress for the purposes of exploring for and obtaining same.

10. Loss arising from security interest evidenced by Financing Statements filed of record, as of the effective date hereof, under the Arkansas Uniform Commercial Judgment Liens or other liens of record in any United States District Court or Bankruptcy Court, in the State of Arkansas, as of the effective date hereof.

Washington County, AR
I certify this instrument was filed on
6/28/2013 1:15:40 PM
and recorded in REAL ESTATE

File# 2013-00021850
Kyle Sylvester - Circuit Clerk



2895816-1

WASTE MANAGEMENT PLAN

WATERFORD ESTATES AT HISSOM RANCH

WASHINGTON COUNTY, ARKANSAS

PRESLEY CONSULTING ENGINEERS

CHARLES PRESLEY, P.E., P.L.S.

PO BOX 607

HUNTSVILLE AR 72740

WATERFORD ESTATES AT HISSOM RANCH

DECENTRALIZED WASTEWATER TREATMENT SYSTEM

PROJECT DESCRIPTION

The Waterford Estates at Hissom Ranch subdivision is located in Washington County, AR and consists of 200 single family home lots, a community clubhouse and guard shack. The wastewater treatment plant which was installed, commissioned and started up in is designed to accommodate a design flow of 95,000 GPD. The current design flow for the facility is 52,520 gallons/day. The design flow is based on the following calculations:

202 lots X 260 GPD/lot which accounts for the flow from the single family homes, the clubhouse and the guard shack.

This facility is located 0.75 miles West of Goshen, on the South side of Highway 45 in Section 35, Township 17 North, Range 29 West, in Washington County Arkansas

The facility is located 990 feet from an unnamed tributary of the White River in Stream Segment 4K of the White River Basin

WASTE CHARACTERIZATION

The treatment technology is a fixed film, or attached growth process which can typically provide treatment when the system is hydraulically and organically under loaded. The wastewater system consists of Septic Tank Effluent Pump tanks for collection, and therefore is designed with the following influent and designed to meet or exceed the effluent qualities listed.

Permit Condition	Settled Influent (MG/L)	Effluent (MG/L)
PH	6.5 – 8.5	
CBOD 5	$\leq$ 200	15 mg/l
TSS	$\leq$ 200	15 mg/l
TKN	45	
Fecal Coliform		2000 col/100ml

WASTEWATER TREATMENT COMPONENTS

The treatment system consists of individual septic tank effluent pump (STEP) interceptor tanks located at each home to provide primary treatment and settling. The STEP tank effluent is pumped by individual turbine pumps to a 35,000 gallon Equalization tank. The wastewater in the Equalization tank is pumped in small doses in 15 minute intervals to

the Lotus Reactor for secondary treatment. Treated effluent from the Lotus Reactor is pumped to the Drip Irrigation System. A 20,000 gallon Sludge Holding tank is installed next to the equalization tank for storage of waste activated sludge from the Lotus Reactor unit.

PRIMARY CLARIFICATION

The treatment system primary clarification consists of 1250 Gallon individual STEP (septic tank effluent pump) tanks at each of the homes in the subdivision to provide primary treatment and settling. The STEP tank effluent is pumped by turbine pumps to the flow equalization tank in the treatment system train. Each turbine STEP vault includes a filter pack with a handle and a pump chamber. The filter pack utilizes the deep pleated filter designed effluent filter, providing 928 linear feet of filtration area to screen solids.

FLOW EQUALIZATION and PRIMARY TREATMENT

Clarified effluent flows from the STEP tanks into a buried Xerxes single compartment (35K gallon) single wall fiberglass reinforced flow equalization tank. Effluent is pumped into the Lotus Reactor by Dual Barnes SE 2" spherical solids handling pumps to distribute the flow to the treatment system over an optimal 18 hour period. This equates to a sewage feed rate of 2918 GPH or 49 GPM.

Prior to entering the Lotus aeration tank, the wastewater passes through a 3 millimeter stainless steel mechanical screen. The screen has an automatic raking device to clear the slots of debris and direct them to the holding container. The screen will remove approximately 15-20% of the influent TSS. This equates to the removal of 50 mg/l or approximately 17.5 lbs./day of dry screenings with a bulk density of 40 lb./ft3 As a result there will be a BOD5 reduction associated with the volatile solids that are removed with the screenings.

The wastewater flows thru the screen and into the grit chamber. The grit chamber has a surface area of 5.1 ft2, which translates to a settling area of 97 ft2/MGAL. The hydraulic detention time is not less than one minute at peak flow.

LOTUS REACTOR TREATMENT PROCESS

The biological reactor utilizes a fixed-film process in which microorganisms attach themselves to a high specific surface area media that is submerged in wastewater. This allows the absorption of organic as well as inorganic matter into the bio-film layer where treatment is realized. The treatment reactor is partitioned into 4 aerobic treatment compartments using stainless steel baffles. Each aeration chamber in the aeration reactor contains a highly permeable submerged

polyethylene media on which microorganisms attach to form a diverse and highly specialized biofilm consisting of heterotrophic and autotrophic bacteria, protozoa and carnivores. This design feature provides an environment in which the excess biomass is digested and mineralized by the higher level microorganisms in the treatment plant. The byproducts of the digested and mineralized sludge are carbon dioxide, water and inorganic elements. This sequence of biochemical reactions drastically minimizes the biological sludge yield.

As the wastewater flows through the Lotus treatment reactor, the biofilm attached to the media absorbs the organic and inorganic pollutants and oxidizes the carbonaceous and nitrogenous biochemical oxygen demand (BOD5) As the microorganisms proliferate and the biological film thickens, diffused oxygen is consumed prior to penetrating the full depth of the slime layer. Anoxic conditions develop within the biofilm which enhance nitrogen removal through denitrification.

The filter media consists of a combination of randomly packed dynamic media and block type fixed polyethylene media. The media is UV resistant and resistant to a wide range of aqueous solutions, acids, alkali's, oxidizing agents, oils, fats and alcohols.

HYDRAULIC FLOW REGIME

The influent feed pumps transfer the wastewater to the mechanical screen. The flow proceeds by gravity to the grit chamber and into the Lotus reactor. The first section of the treatment plant contains polyethylene random packed dynamic media with an effective surface area of 320 m2/m3. The media is submerged and the aeration pattern is adequate to mobilize the media. The media in sections 2, 3 and 4 of the reactor are fixed submerged media with an effective surface area of 200 m2/m3. The wastewater flows to each compartment by gravity through a stainless steel baffle and eventually to an overflow weir that is connected to the effluent pipe.

As flow enters each aerobic compartment, dissolved oxygen is transferred to the wastewater via a compressor and fine pore membrane air diffuser system. The diffuser system allows for vertical mixing so that the hydraulic flow regime through the plant can be characterized as plug flow. It is this flow regime that develops optimum conditions for effective mass exchange between the wastewater pollutants and the fixed biofilm. Each compartment has an independent and fully adjustable air regulation valve to adjust the dissolved oxygen concentrations and mixing intensity. It is the mixing intensity that maintains and effective and healthy biofilm on the polyethylene media. The aeration assembly is designed to completely mix each compartment and insure consistent treatment by preventing the short circuiting of wastewater and solids deposition. Each disc membrane diffuser shall contain a non-clog air seal to prevent the flow of wastewater into the air header assembly.

OXYGEN AND MIXING REQUIREMENTS

Two, 2 stage regenerative blowers and (64) 10.5" diameter, fine pore disc membrane air diffusers are utilized to transfer dissolved oxygen to the wastewater and provide mixing in the aeration tank. Each aerobic treatment section contains (16) diffusers to ensure proper mixing. Based on the design criteria of this project, approximately 19 lbs. of oxygen/hour (456 lbs. /day) are required for efficient treatment of the wastewater during the summer and winter seasons, this includes the oxygen required to achieve nitrification. This oxygen requirement is derived using standard oxygen requirement (SOR) calculations for wastewater treatment based on the fact that 1.25 lbs. and 4.6 lbs. of oxygen are required to oxidize each pound of BOD5 and ammonia respectively.

SECONDARY CLARIFICATION

The secondary clarifiers have a rectangular surface area of approximately 67 ft2 and a sludge hopper that is conical with 60-degree sloping sides to aid in the settling of secondary sludge. Each secondary clarifier contains inclined plates to increase the settling efficiency. The inclined plates provide surface area that decreases sludge settling distance and increases the settling velocity. The clarified effluent passes over a V notch weir and into the effluent dosing tank and system.

CONTROL PANEL

The control components for the Lotus treatment plant are housed in an insulated building attached to the treatment plant. The compressor and all critical mechanical components are connected to audio and visual alarms to alert the operator in case of failure. The control panel contains dry contacts for a remote common external alarm.

DRIP IRRIGATION

DOSING SYSTEM AND FILTERS

After exiting the final settling chamber, the treated effluent flows into the dosing chamber of the pump tank. There it is pumped through a Zoeller effluent filtered turbine pump vault, Model 5041-0026 to deliver the treated effluent to the drip disposal field. The pumps operate as a duplex system, alternating pumping cycles. Each set of zones is served by a pump package in the dosing tank. If one pump fails to start the other will kick in and an alarm will be triggered.

Pumped effluent will pass through 2" API spin clean filters with 200 mesh (80 micron) screens, model #12140029, to filter out any remaining particles before the effluent reaches the disposal area. Backwash from the self-cleaning filters will be returned to the head of the final clarifier chamber of the tank.

DRIPFIELD

The area requirements for the drip zones were determined by having a soils evaluation for subsurface wastewater disposal by Richard S Murphree, RS, PSCT Mr. Murphree determined the soil loading rates for drip irrigation in each of the areas, and his loading rates for the original areas set aside by the developers were submitted to the Arkansas Department of Health for confirmation. There is 262,600 sq. ft. of drip irrigation line installed in an area of 7.72 acres for the existing drip irrigation system with 2.67 acres set aside as reserve area. The existing disposal area is divided into different zones with the appropriate application rates. Application rates were determined by soils analysis performed by Mr. Murphree. Drip application is through Geoflow Wasteflow PC subsurface tubing with pressure compensating emitters spaced at a minimum of 24" on center. The tubing is installed on contour as neatly as possible with no more than one foot of elevation difference between the beginning and the end of each run. The laterals are sized for a 3 inch PVC in order to minimize the friction head loss. Each zone is served by a supply lateral and a return lateral having sufficient diameters to provide the pressure and flushing based upon the manufacturers sizing guidelines. A flow meter is installed outside the southwest corner of the treatment plant. There are 12 field lysimeters and 4 monitoring wells located within and around the drip irrigation field.

DISPOSAL FIELD CONTROL PANEL

The controls for the dosing tank, drip irrigation head control box and displays for the mag meters will be enclosed in a separate enclosure meeting minimum requirements of NEMA 3R. The control panel monitors the pump dosing cycle, the field flushing cycles, and the filter flushing cycles. The control panel contains a programmable logic controller with motor starters, relays, timers, audio/visual alarms, and displays to provide the following functions:

A. Operate all dosing pumps in a duplex alternating mode with 2 pumps normally running simultaneously. The programmable logic controller is programmed so that the dosing times and frequency are set for each of the duplex systems independently

B. Designed with an audio/visual a high water level alarm

ALARMS

The system is equipped with Audio Visual alarms for the following functions:

- High water alarm
- Pump out of service alarm
- High water alarm

- Pump out of service alarm
- High/Low pressure

FACILITY OPERATIONS AND MAINTENANCE

The plant has been operated, maintained and managed by the same wastewater operators since 2009, originally under the name of Greenfield Capital Development and currently under the name of Waterford Utility LLC, a Northwest Arkansas Utility Service Company. All MMR reports of the facility have been submitted in a timely manner and copies of all records have been retained by the operator. This facility has been compliant and has met or exceeded permit requirements consistently since 2009.

JTE Wastewater Systems
P.O. Box 867
Farmington, AR 72730
479-790-6715

May 12, 2004

Presley Engineering, Inc.
2218 Worth Lane Suite A
Springdale, AR 72764

Re: Soils Evaluations for Subsurface Wastewater Disposal
Waterford Estates- Proposed Subdivision
Owner: Ronny Hissom
Developer: Basic Construction, Inc
Washington County

Dear Charlee and Steve,

On May 10, 2004, a total of 16 additional soils pits were evaluated in the proposed leach field location to determine the suitability of the soils for subsurface drip disposal. The soils were evaluated based on the most current suitability guidelines made available by the Arkansas Department of Health (ADH) and the University of Arkansas.

The soils observed are considered suitable for drip irrigation disposal with an average daily loading rate of **0.2 gal/sq.ft.**

The pits were numbered and marked with flags. The pit locations should be shown on the plat submitted to the ADH for review.

Please let me know if you have any questions.

Sincerely,

Richard S. Murphree, RS, PSCT

Seasonal Water Table Data						
Waterford Estates						
						Drip Loading
					Adjusted	Rate
Pit #	Type	BSWT	MSWT	LSWT	SWT	gal/sq.ft
1	A	0"	20"	n/a	B-0"	n/a
2	A	12"	24"	n/a	M-20"	0.137
3	A	18"	29"	n/a	M-25"	0.171
4	A	8"	24"	n/a	M-19"	0.13
5	B	28"	38"	n/a	M-35"	0.239
6	D	0"	12"	22"	B-0"	n/a
7	D	11"	31"	n/a	M-24"	0.164
8	D	16"	23"	n/a	M-21"	0.144
9	D	0"	16"	n/a	B-0"	n/a
10	A	0"	12"	n/a	B-0"	n/a
11	D	0"	0"	14"	B-0"	n/a
12	B	23"	36"	n/a	M-32"	0.219
13	A	26"	32"	n/a	M-30"	0.205
14	A	0"	15"	21"	M-19"	0.13
15	A	10"	20"	n/a	M-17"	0.116
16	B	22"	40"	n/a	M-34"	0.232
17	C	17"	34"	n/a	M-28"	0.191
18	C	17"	29"	n/a	M-25"	0.171
19	A	0"	9"	18"	B-0"	n/a
20	B	20"	32"	n/a	M-28"	0.191
21	B	24"	38"	n/a	M-33"	0.226
22	B	22"	31"	n/a	M-28"	0.191
23	A	14"	19"	28"	L-22"	0.075
New pits observed on May 10, 2004						
25	C	17"	31"	n/a	M-26"	0.176
26	C	24"	33"	n/a	M-30"	0.205
27	C	22"	35"	n/a	M-31"	0.212
28	C	25"	35"	n/a	M-32"	0.219
29	B	25"	36"	n/a	M-32"	0.219
30	C	19"	28"	n/a	M-25"	0.171
31	C	20"	32"	n/a	M-28"	0.191
32	C	22"	30"	n/a	M-27"	0.185
33	B	21"	33"	n/a	M-29"	0.198
34	C	27"	35"	n/a	M-32"	0.219
35	B	24"	35"	n/a	M-31"	0.212
36	C	26"	48"	n/a	M-41"	0.28
37	C	20"	33"	n/a	M-29"	0.198
38	D	27"	40"	n/a	M-36"	0.246
39	D	30"	41"	n/a	M-37"	0.253
40	D	29"	36"	n/a	M-34"	0.232

Soil Type Descriptions
Waterford Estates

Soil Type A

Ap 00-08" Yellowish brown (10YR 5/4) silt loam; common fine Fe stains; weak fine sub-angular blocky structure; clear smooth boundary.

E 08-20" Brownish yellow (10YR 6/6) silt loam; common medium 10YR 6/4 depletions; common fine Fe stains; weak medium sub-angular blocky structure; clear wavy boundary.

Bt 20-30" Yellowish brown (10YR 5/6) silt loam; many medium 10YR 7/2 depletions; common coarse Fe/Mn masses; moderate coarse sub-angular blocky structure; common distinct clay films; <2% sub-rounded sandstone gravel; clear wavy boundary.

Btx 30-42" Yellowish brown (10YR 5/6) silty clay loam (34%); many medium 10YR 6/2 depletions; many coarse Mn/Fe concretions; moderate medium sub-angular blocky structure; brittle; common distinct clay films; <2% sub-rounded sandstone gravel.

Soil Type B

Ap 00-09" Brown (7.5YR 4/4) loam; weak medium sub-angular blocky structure; 2% sub-rounded sand stone gravel; clear smooth boundary.

Bt1 09-22" Strong brown (7.5YR 4/6) loam; few fine sharp Mn nodules; moderate medium sub-angular blocky structure; few distinct clay films; common medium organic stains; 2% sub-rounded sandstone gravel; gradual smooth boundary.

Bt2 22-40" Yellowish brown (7.5YR 5/6) clay loam (33%); few medium 10YR 5/6 depletions; common medium Fe stains; moderate medium sub-angular blocky structure; common distinct clay films; 2% sub-rounded sandstone gravel; gradual smooth boundary.

Btx 40-50" Yellowish brown (7.5YR 5/6) clay loam (34%); many coarse 2.5YR 4/8 accumulations; few fine 7.5YR 7/2 depletions; moderate coarse sub-angular blocky structure; slightly brittle; many distinct clay films; 2% sub-rounded sandstone gravel.

Soil Type C

Ap 00-08" Brown (7.5YR 4/4) loam; weak fine sub-angular blocky structure; 5% sub-rounded sandstone gravel; clear smooth boundary.

Bt1 08-22" Yellowish red (5YR 4/6) loam; common fine sharp Mn nodules; moderate medium sub-angular blocky structure; common distinct clay films; 5% sub-rounded sandstone gravel; clear smooth boundary;

Bt2 22-38" Yellowish red (5YR 4/6) clay loam (37%); few fine 7.5YR 5/6 depletions; common fine Fe stains; moderate medium sub-angular blocky structure; common distinct clay films; 5% sub-rounded sandstone gravel; clear wavy boundary.

Bt3 38-48" Yellowish red (5YR 4/6) clay loam (38%); many medium Fe masses; few medium 7.5YR 6/2 depletions; moderate coarse sub-angular blocky structure; many prominent clay films; 10% sub-rounded sandstone gravel.

Soil Type D

Ap 00-11" Dark yellowish brown (10YR 4/4) loam; moderate coarse sub-angular blocky structure; common medium pockets of 10YR 5/3 material; 2% sub-rounded sandstone gravel; clear smooth boundary.

Ab 11-21" Brown (10YR 4/3) loam; common medium 10YR 5/4 depletions; few medium Fe stains and soft masses; moderate fine sub-angular blocky structure; 2% sub-rounded sandstone gravel; clear wavy boundary.

Bt 21-31" Yellowish brown (10YR 5/6) loam; common medium Mn/Fe stains; moderate medium sub-angular blocky structure; common distinct clay films; 2% sub-rounded sandstone gravel; irregular boundary

Btx 31-46" Yellowish red (5YR 5/8) silty clay loam (36%); many coarse 10YR 6/4 depletions; common coarse 10YR 5/6 depletions; few fine 10YR 7/1 depletions; moderate medium sub-angular blocky structure; brittle; common distinct clay films; 10% sub-rounded sandstone gravel.

JTE Wastewater Systems
P.O. Box 867
Farmington, AR 72730
479-790-6715

August 13, 2004

Presley Engineering, Inc.
2218 Worth Lane Suite A
Springdale, AR 72764

Re: Soils Evaluations for Subsurface Wastewater Disposal
Waterford Estates- Proposed Subdivision
Owner: Ronny Hissom
Developer: Basic Construction, Inc
Washington County

Dear Charlee,

A total of 6 additional soil pits were located within the proposed leach field location for the above referenced proposed development. A revised soil pit data sheet is provided.

The overall soil loading rate for drip irrigation including the new pits is 0.206 gal/sq.ft.

Please let me know if you have any questions.

Sincerely,

Richard S. Murphree, RS, PSCT
JTE Wastewater Systems

CC: Melissa Wonnacott, RS

08/25/04

Seasonal Water Table Data						
Waterford Estates						
Revised August 13, 2004						
						Drip Loading
					Adjusted	Rate
Pit #	Type	BSWT	MSWT	LSWT	SWT	gal/sq.ft
New pits observed on August 10, 2004						
45	D	21"	27"	n/a	M-25"	0.171
46	C	22"	29"	36"	L-31"	0.106
47	C	24"	28"	n/a	M-27"	0.185
48	C	21"	27"	n/a	M-25"	0.171
49	B	26"	30"	n/a	M-29"	0.198
50	C	27"	36"	n/a	M-33"	0.226
51	C	18"	25"	n/a	M-23"	0.157
52	C	19"	33"	n/a	M-28"	0.191
Note- Pits 45 and 46 are not within the disposal field area.						

AquaTechSystems
DECENTRALIZED WASTEWATER SYSTEMS

WATERFORD ESTATES AT HISSOM RANCH

WASTEWATER PLANT
OPERATIONS AND MAINTENANCE MANUAL

Permitted Facility

Operation and Maintenance (O&M) Expense Estimate

Permit No. 4815-WR-2

Date: December 19, 2014

By: Presley Consulting Engineers, Charlee Presley, PE

O & M Expense Categories	Units/Year	Unit Cost	Annual Cost	5-Year Cost *1
Operating Expenses				
Operating Labor * 2	12	900	10,800	57,240
Electricity *3	61,536	.1169	7,193	38,122
Supplies & Chemicals	12	85	850	4,505
Analytical Testing	12	175	2,100	11,130
Generator Fuel				
Maintenance Expenses				
Maintenance Labor	8	400	3200	16,960
Parts & Supplies				8,000
Building Materials				
Administrative Expenses				
Administrative Labor				
Customer Fee Collection				
Insurance & Bonding	1	1200	1200	6360
Consulting & Legal Fees	1			1200
Interest Expense				
Property Taxes				
Permit Fees	1		500	2500
Other Miscellaneous Expenses				
TOTAL			25,843	146,017

Notes:

*1 Assuming no inflation data are available, assume an inflation rate of 3% in years two through Five and multiply the annual cost by 5.3 to estimate the five-year cost

*2 Labor costs must include fringe benefits and payroll taxes.

*3 For existing facilities, show the electricity consumption calculations in kilowatt hours (kWh)

CONTENT

LIST OF COMPLETE SET

of municipal wastewater biological treatment station (phase 1)

N1-CM2S-960-953.N

according to Invoice No. 61 dated 17.07.2003.

No.	Description	Designation	Quantity
1.	Municipal wastewater biological treatment station:	N1-CM2S-960-953.N	1 set
	1.1 Mechanical treatment block:		1 set
	• mechanical screen	RSM8*	1 set
	• hydraulic press	RP-15	1 set
	• grit chamber	S-03	1 set
	• grit dewatering unit	SA-01	1 set
	• technical container	TK-041	1 set
	1.2 Block of tanks:		
	• aeration tank	ND.1.10	2 sets
	• secondary sedimentation tank	C-19	1 set
2.	Flowmeter	S-25*	1 set
3.	Biopreparation for 1 year	Bacti-Bio 9500	3 kg
4.	Biopreparation for 1 year	BICHEM DC 1008 SF	4 kg
5.	Biopreparation for 1 year	BICHEM DC 2000 Biosock GL	8 kg

* - equipment is equivalent to the mechanical screen M-04.M1 and the flowmeter S-25-100 by technical and technological requirements accordantly.

APPLICATION TERMS

Application terms of the station are determined by hydraulic and organic loadings. The first phase of the station corresponds to hydraulic loading of 355 m^3/day. Determination of hydraulic and organic loadings is made by the below given table No. 1.

Table No. 1

Application values

No.	Parameter	Meas. units	Value		Permitted value deviations	
			calculated	*permitted	daily	hourly
1.	Wastewater temperature	°C	13÷17	10÷25	±2°C	±2÷3°C
2.	pH		7	6.5÷7.5	±0.1÷0.2	±0.3
3.	Hydraulic loading	m^3/day				
	· daily	m^3/day	100%	30÷100%	-	-
	· hourly	m^3/hour	19.7	39.4	-	-
4.	BOD_5 - biological oxygen demand	mg/l	250	100÷250	±10%	±20%
5.	COD – chemical oxygen demand	mg/l	440	200÷500	±10%	±20%
6.	SS – suspended solids	mg/l	250	50÷250	±10%	±20%
7.	N – nitrogen (TNK):	mg/l	72	-	-	-
	· $NO_3 \rightarrow N$	mg/l	27	5÷27	±10%	±20%
	· $NH_4 \rightarrow N$ ammonia	mg/l	45	8÷45	±10%	±20%
8.	P – phosphorus, including:	mg/l	8	1÷8	±10%	±20%
	· organic	mg/l	3	1÷3	±10%	±20%
	· inorganic	mg/l	5	1÷5	±10%	±20%
9.	Chlorides	mg/l	50	30÷300	±10%	±20%
10.	Detergents (oxydizable)	mg/l	12.5	0÷12.5	±10%	±20%
11.	Sulphates	mg/l	30	0÷50	±10%	±20%
12.	Alkalinity	mg/l	100	50÷100	±10%	±20%
13.	Greases and fats	mg/l	50	0÷50	±10%	±20%
14.	Coli– index	pcs/l	10^6	10^6÷10^7	±10%	±20%
15.	Mineralization degree	mg/l	1000	500÷2000	±10%	±20%

Notes:

- For normal regeneration of biocenosis the content of nutrients should be:
  BOD_{total} : N : P = 100: 5: 1;
- *Permitted deviations of wastewater parameters towards larger values are acceptable only if flow temperature is not less than **12°C**,
- Sizing of the plant is made under the condition that all wastewater parameters should be less or equal to the calculated values.

In case of meeting the above-mentioned conditions, it is possible:

1. Formation of biocenosis within 40 days during start-up works;
2. Achievement of 90% treatment effect by all parameters from required (within 40 days from a beginning of start-up works).

100 % efficiency of treatment by all parameters at 95% daily analyses is achieved within one year. This time is necessary for completely adapted to particular wastewater biocenosis formation.

REQUIREMENTS FOR STATION TIE-IN

General requirements

The municipal wastewater biological treatment station of technological series "9" corresponds to the general technical requirements of the Methodological Instruction MI 028-05.02-97 and working technical documentation.

The station is intended for municipal wastewater biological treatment.

Applying the station of technological series "9" for municipal wastewater biological treatment, it is necessary to solve following questions:

- wastewater mechanical treatment from big wastes;
- obligatory grit removal from wastewater;
- primary sedimentation;
- wastewater feeding into the station;
- sediment processing;
- foundation under the station;
- discharge of effluent;
- connection of communications.

If necessary:

- greases removal from wastewater;
- wastewater equalization;
- wastewater feeding equalization.

Tie-in of the municipal wastewater biological treatment station should be carried out according to the figures 1, 2, 3, 3.1, 4 and 4.1.

1. Greases and fats (oils and oil products) removal

Amount of incoming greases (oil products) to the station should not exceed 50 mg/l.
If greases amount exceeds 50 mg/l, then it is necessary to provide of:
at concentration

- 50÷100 mg/l – application of a biopreparation;
- 100÷200 mg/l – grease chambers;
- > 200 mg/l – flotation units.

2. Flow equalization

2.1. Parameters equalization

Biocenosis of microorganisms that treat wastewater have limited adaptation rates (see Application terms – Table No. 1) to wastewater parameters fluctuations:

- physical;
- chemical;
- microbiological;
- concentrations;
- composition;
- balance proportions, -

not resulting in deterioration of treatment efficiency.
According to concrete conditions of wastewater composition during a day and the above mentioned limited rates of microorganisms adaptation, volume of an equalization tank is calculated.

2.2. Hydraulic equalization

The station is calculated for optimal hydraulic load according to organic matters oxidation technological time that is 18 hour/day.

For example, if daily flowrate is Q (m^3/day), then optimal hourly flowrate is:

$$G_{hour}^{opt} = Q/18 \ (m^3/hour).$$

The sedimentation tank in standard complete set is calculated for short-term hydraulic peak load not more than 1.75 x G_{hour}^{opt}. For example,

$$G_{hour}^{max} = G_{hour}^{opt} \times 1.75 \ (m^3/hour).$$

Usually peak loads compose 3-7 % of daily flowrate.

If hydraulic volume of sewerage discharge systems is big enough, than G_{hour}^{opt} can be accepted as calculated flowrate at choosing feeding pumps.

Shot-term system flooding does not result in deterioration of operation conditions.

If hydraulic volume of the system is not big, than:

- using one pump, it is necessary to accept G_{hr}^{max} as calculated flowrate. In this case automatic scheme should provide wastewater feeding adjusted by a frequency converter. At maximal feeding mode the feeding pump switches on directly without the frequency converter;
- using two pumps, it is necessary to accept G_{hr}^{max} / 2 as calculated flowrate. The pumps switch on alternately by cross scheme. At maximal feeding mode the feeding pumps switch on simultaneously.

If actual hourly flowrate does not exceed $G_{hr} > G_{hr}^{max}$, then according to hourly flowrate curve, a volume of the equalization tank is calculated.

In case of the equalization tank calculation both by parameters and hydraulics accept the largest value of volume for design.

3. Debris removal

It is necessary to provide feeding pumps protection from debris, which can be in wastewater. For this purpose it is necessary to install a hand cleaned screen with slotted openings of 12÷16 mm in a well before a pumping station. ***"REŠETILOVS UN CO" IK*** offers a stainless steel hand cleaned screen.

4. Grit removal

Wastewater always contains certain amount of grit and other mineral substances. For grit removal before wastewater feeding into the station a grit chamber, i.e. well with recessed bottom, can be used.

5. Primary sedimentation

Amount of suspended solids (SS) introduced to biological treatment should not exceed 150 mg/l. Usually wastewater contains suspended solids > 150 mg/l. Following constructions and equipment can be used for SS removal:

No.	Description	Capacity, m^3/day	Efficiency by SS removal
1.	Septic tanks	≤ 50	50÷60%
2.	Imhoff tanks	50÷1000	60÷70%
3.	Primary sedimentation tanks	50÷1000	70%
4.	Primary sedimentation tanks ***"REŠETILOVS UN CO" IK***	20÷1000	70%
5.	Mechanical screens with	100÷1000	18÷29%

	slotted openings of 1÷2.5 mm		
6.	Mechanical screens with a kept up filtering layer of screenings with slotted openings of 1÷3 mm	100÷10000	30÷60%

The constructions of positions 1÷3 are usually chosen and calculated by a design company carrying out a station's tie-in, and they are construction objects on site.

The equipment of positions 4÷6 is offered by ***"REŠETILOVS UN CO" IK***.

6. Wastewater feeding into the station

Conditions for feeding pumps selection are following:

1. Capacity of feeding pump (pumps) should provide the conditions listed in p. 2.2.
2. Surplus hermetic height should be not less, than:
   + 1 m above a board of the aeration tank without mechanical treatment;
   + 2 m above a board of the aeration tank with mechanical treatment;
   + 3÷4 m additionally when flowmeters are used.

"REŠETILOVS UN CO" IK offers pumping station's equipment.

7. Sediment processing

The sediment accumulated in filtration sack on the sediment dewatering unit should be removed by means of trolley into a platform for containers (see Fig. 2).

8. General layout

8.1. Sanitary zone

Noise level produced by the equipment does not exceed 45 Db.

Concentration level of contaminants at normally loaded and working stations:

Parameter	Formula	Concentration, mg/m^3	Permitted limited concentration (The Russian norm)
		Measurements above aeration tank	
Nitrogen dioxide	NO_2	5.5	9
Sulphur dioxide	SO_2	1.6	10
Ammonia	NH_3	5.5	20
Hydrogen sulphide	H_2S	1.1	10

The above mentioned data shows, that the treatment station can be placed on territories of residential and public areas.

8.2. Site

The passport contains the scheme of buildings location on site. At development of real design it is necessary to provide of sediment draw off by special auto transport from the grit chamber, the sedimentation tank and the tank for sediment.

8.3. Communications

The passport contains schemes of necessary communications connection, their parameters and tie-in of connection points with ***"REŠETILOVS UN CO" IK*** equipment.

8.4. Foundations

Foundations for the plant are designed by "Task for foundation design" according to concrete hydro-geological conditions. Task for foundation design is enclosed.

9. Calculated and technological parameters

After questionnaire receipt with wastewater parameters and hydraulic characteristics ***"REŠETILOVS UN CO" IK*** provides of station's design, technological and operation parameters.

10. Some features of the station operation

Technology "9" has been developed for using of fixed microorganisms (biofilm) formed on the special plastic carrier. Aeration tank's biocenoses possess characteristics usual to organized biological system. The biocenosis themselves keep up the dynamic balance of both biomass and qualitative composition in accordance with wastewater parameters fluctuations (within limits of optimum adaptation rates and permissible values of calculated loads). Thus treatment process is highly stable due to self-regulation.

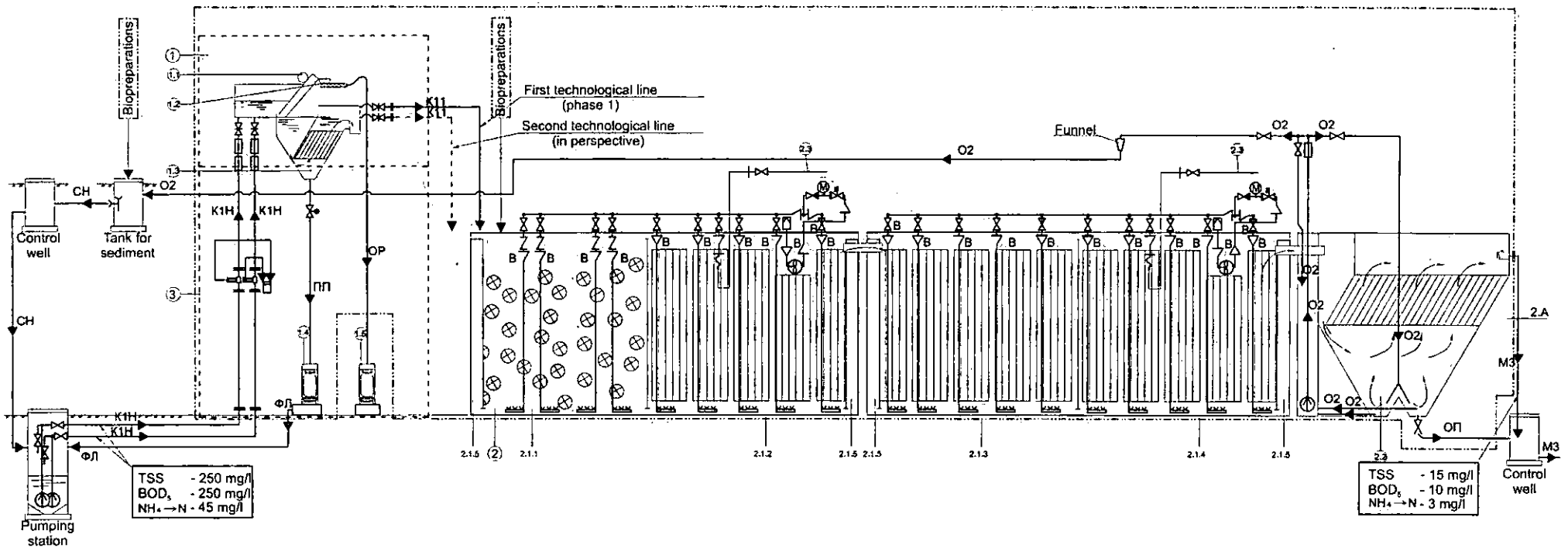
At change of following conditions as:

- temperature, mineralization degree;
- concentration and nutrients balance in wastewater, -

the biocenosis independently change qualitative and quantitative structure under the new conditions.

At short time shock loads the system regenerates by itself.

In case of constant operation in conditions when parameters are over design limits balance of the system has to be kept by means of biopreparations.



EXPLICATION:

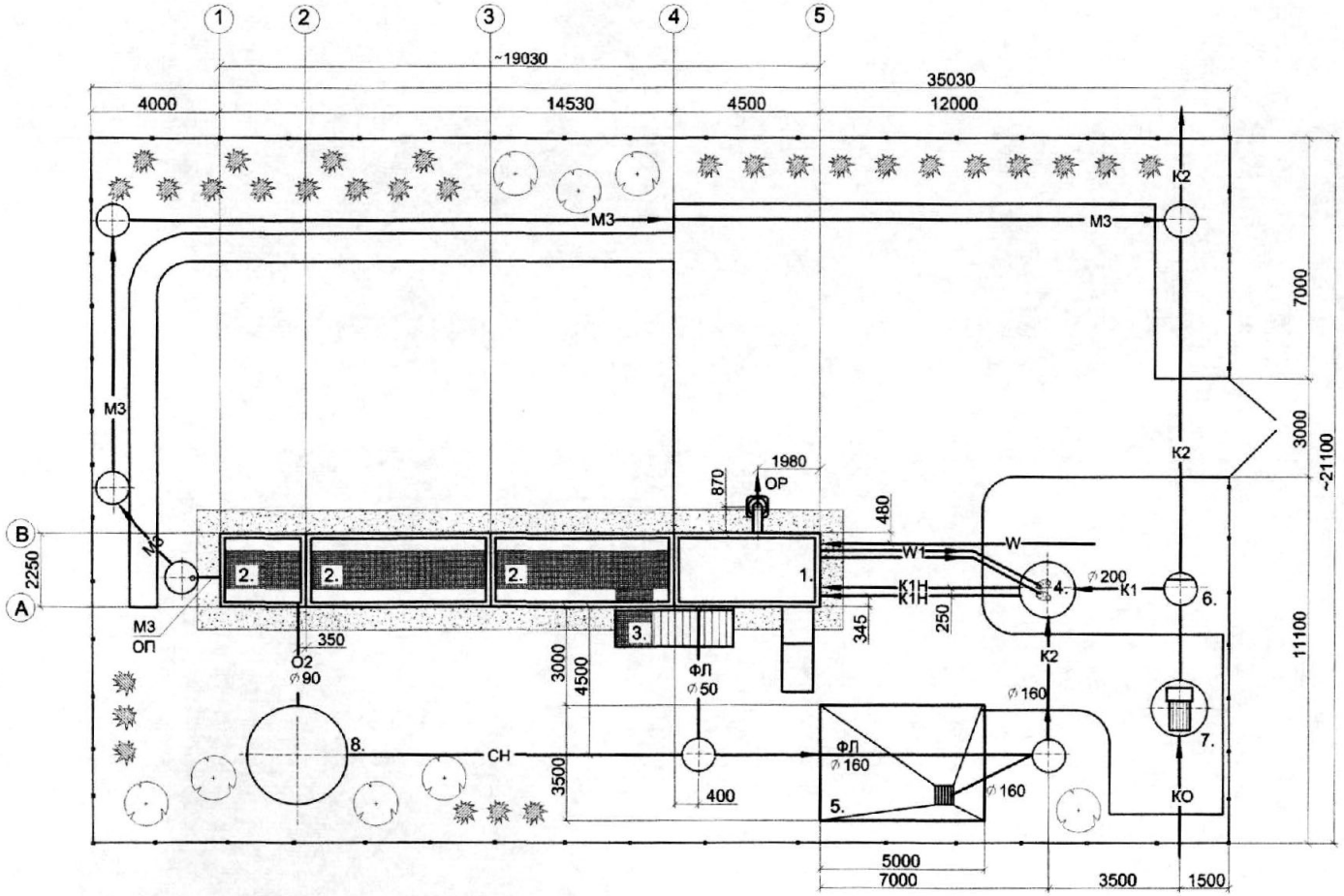
1. Mechanical treatment block
1.1 Mechanical screen
1.2 Hydraulic press of screenings
1.3 Grit chamber
1.4 Grit pulp dewatering unit
1.5 Screenings accumulation unit
2. Block of tanks
2.A First technological line (phase 1)
2.1 Multi-chamber aeration tank
2.1.1 hydrolisis - fermentation tank
2.1.2 heterotrophic nitri-denitrification tank
2.1.3 hetero/autotrophic nitri-denitrification tank
2.1.4 autotrophic nitrification tank
2.1.5 servicing shafts
2.2 Secondary sedimentation tank
2.3 Block media air scouring lance
3. Technical container

K1H - municipal pressure sewerage
K11 - municipal gravity sewerage mechanically treated
M3 - treated effluent
O2 - secondary sediment
OP - screenings
ПП - grit pulp
B - compressed air
CH - supernatant
ФЛ - filtrate
ОП - drainage

LEGENDS:

- parts division border
- delivery set border
- compressor
- pump
- block media
- moving media
- thin-film module
- fine bubble aeration
- valve
- slide valve
- membrane valve
- magnetizer
- branch pipe with supersonic sensor
- electronic block (flowmeter)
- t-piece with two sockets
- flange connection
- pipe-lines connection
- pipe-lines crossing (without connection)
- water flow direct (liquid)
- air flow direct (gas)

Fig. 1 Technological scheme



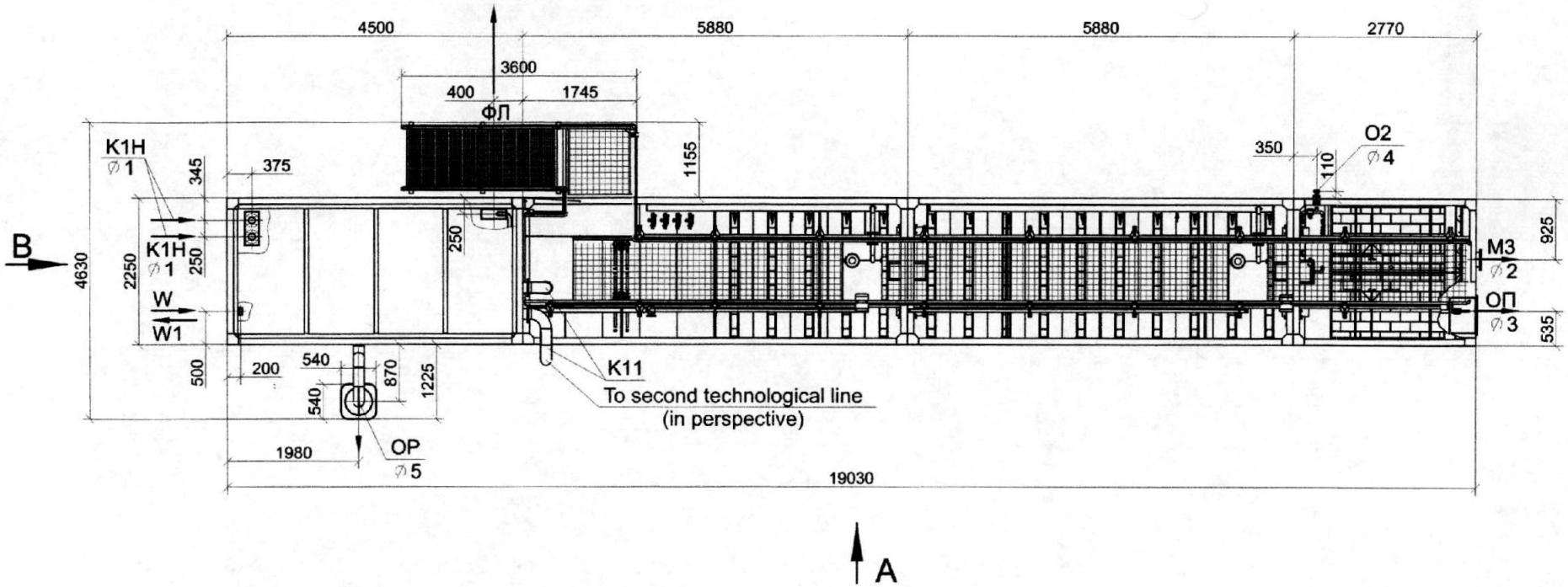
EXPLICATION OF BUILDINGS AND CONSTRUCTIONS:

1. Mechanical treatment block
2. Block of tanks
3. Stairs
4. Pumping station
5. Platform for containers
6. Distribution well
7. Well with hand cleaned screen
8. Tank for sediment

LEGENDS:

K1 - municipal gravity sewerage
K2 - rain gravity sewerage
K1H - municipal pressure sewerage
KO - municipal plus rain sewerage
M3 - treated effluent
OP - screenings
ФЛ - filtrate
CH - supernatant
W - electrical cable of station
W1 - electrical cable of pumping station
ОП - drainage

Fig. 2 Task for general layout design

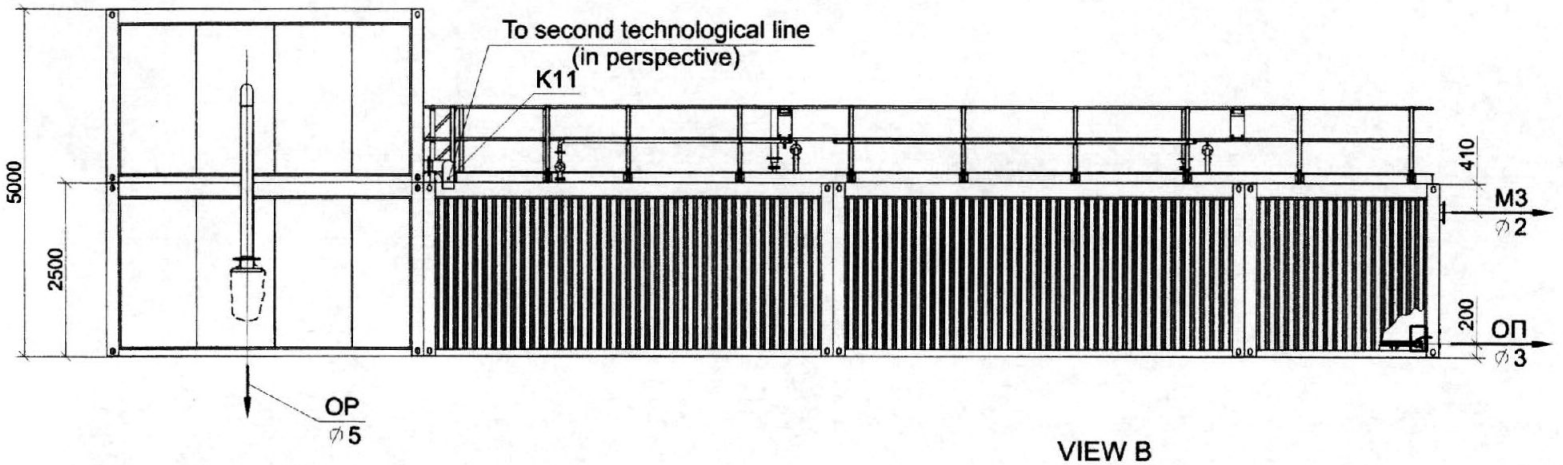


Ø 1	Stainl. steel pipeØ 114,3x2 with flange DIN 2641
Ø 2	Stainl. steel pipeØ 219,1x2 with flange DIN 2641
Ø 3	Threaded valve G 1 1/2"
Ø 4	Pipe PVC Ø 50
Ø 5	Stainl. steel pipe Ø 168,3x2

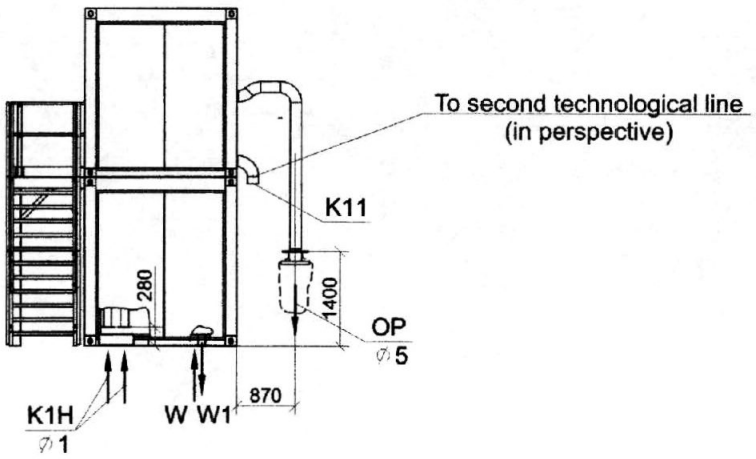
LEGENDS:
K1H - municipal pressure sewerage
K11 - municipal gravity sewerage mechanically treated
M3 - treated effluent
W - electrical cable of station
W1 - electrical cable of pumping station
O2 - secondary sediment
OP - screenings
ФЛ - filtrate
ОП - drainage

Fig. 3 Station connection scheme (upper view)

VIEW A



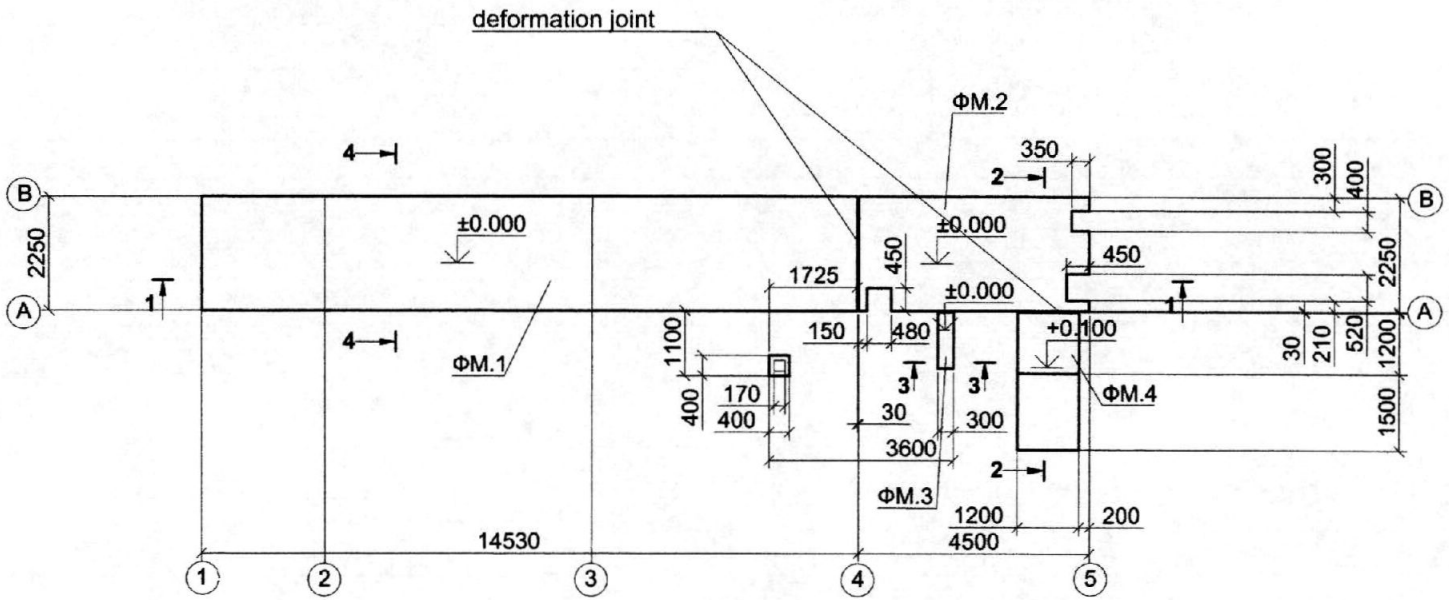
VIEW B



LEGENDS:
K1H - municipal pressure sewerage
K11 - municipal gravity sewerage mechanically treated
M3 - treated effluent
OP - screenings
ОП - drainage
W - electrical cable of station
W1 - electrical cable of pumping station

Ø 1	Stainl. steel pipeØ 114,3x2 with flange DIN 2641
Ø 2	Stainl. steel pipeØ 219,1x2 with flange DIN 2641
Ø 3	Threaded valve G 1 1/2"
Ø 5	Stainl. steel pipe Ø 168,3x2

Fig. 3.1 Station connection scheme (view A, view B)



Mark	Descrip-tion	Q-ty	Load from equipment in working condition	q,ton/m²
ФМ.1	plate	1	Block of tanks	2.9
ФМ.2	plate	1	Mechanical treatment block	0.8
ФМ.3	plate	1	Stairs	0.5
ФМ.4	plate	1	Ramp	0.3

NOTES:
1. Sizes are given in mm, height marks in m.
2. Foundations' construction is designed according to concrete hydrogeological conditions.
3. During concrete works provide deformation joints at the places appointed.

LOAD SCHEME

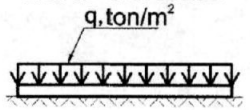
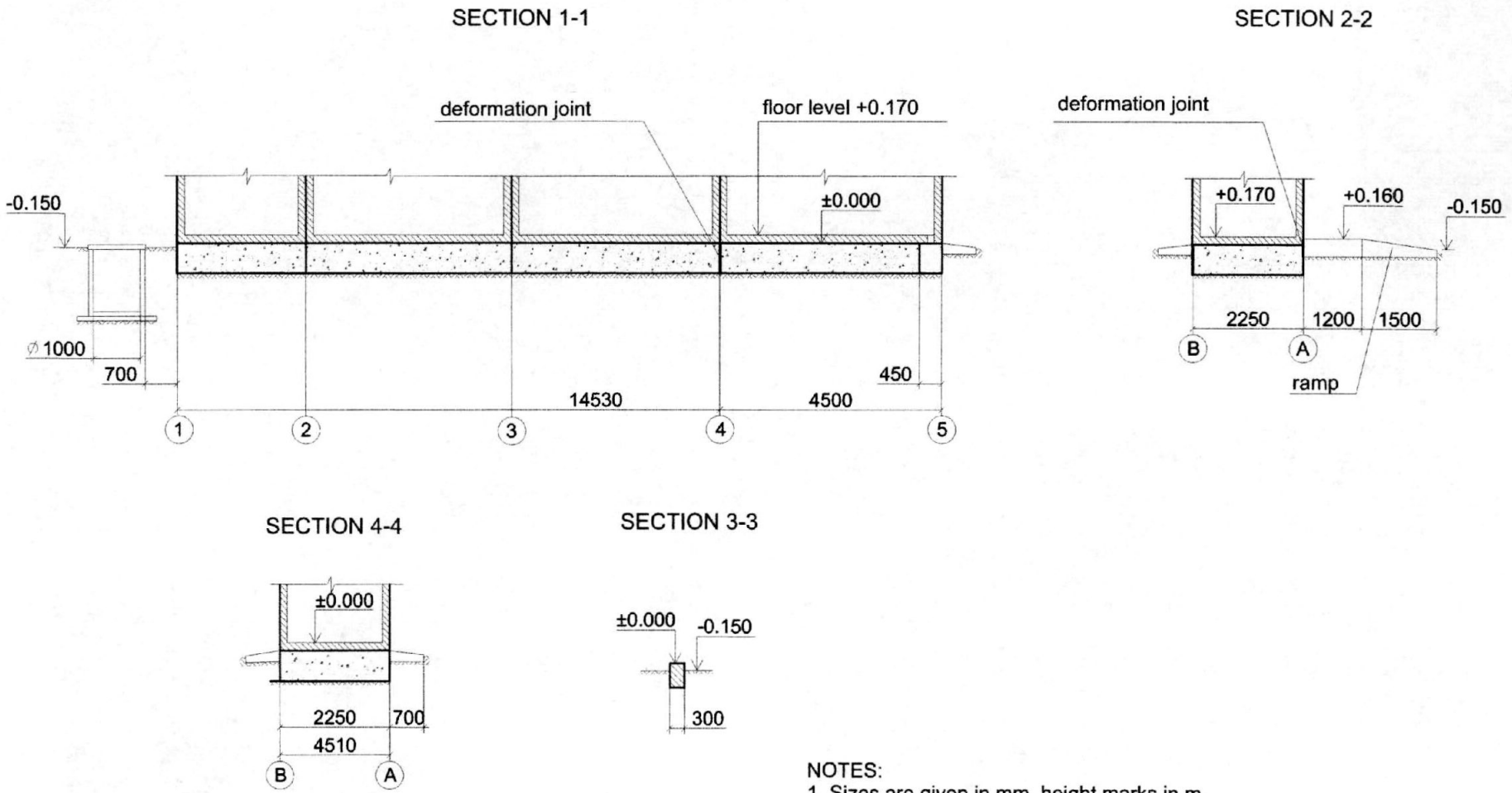


Fig. 4 Task for foundations design



NOTES:
1. Sizes are given in mm, height marks in m.
2. Foundations' construction is designed according to concrete hydrogeological conditions.
3. During concrete works provide deformation joints at the places appointed.

Fig. 4.1 Task for foundations design (sections)

STATION DESCRIPTION

TECHNICAL PARAMETERS:

Capacity:		
- biological treatment block	355	m^3/day
- mechanical treatment block	710	m^3/day
Person equivalent	1,480	person
Wastewater type		municipal
Occupied area	88.1	m^2
Consumed power	3.06	kW
Servicing staff (labor input)	1	person
Station normative servicing time	5	hour/day
Type		container
Dry station weight	15.43	ton
Station overall dimensions L×B×H	19030 x 4630 x 5000	mm
Fencing, distribution troughs and tanks		stainless steel
Flooring		zinc coated steel

EQUIPMENT

1. Complete set

Municipal wastewater biological treatment station N1-CM2S-960-953.N consists of container type separate modules. The modules are functionally divided into:

- technical container (2 floors);
- mechanical treatment block;
- block of tanks;
- secondary sedimentation tank;
- stairs with technological platform.

On the site the modules are mounted on before prepared foundation. Communications are installed and connected.

1.1. Technical container

Construction

A frame is made of stainless steel and painted. Ceiling and walls are from multi-layer panels with with insulation from foam plastic. A roof is from stainless steel sheet. A floor is from bakelized plywood covered by linoleum with warm-keeping mineral cotton wool. A door is plastic. Windows are plastic with glass packets.

Equipment

In the technical container (on the first floor) following equipment is mounted:

- grit pulp dewatering unit;
- switchboard for electrical power supply of lighting, ventilation and heating systems;
- wastewater pipe-line with equipment for flowrate metering;
- stairs into the second floor with technological platform.

On the second floor following equipment is installed:

- mechanical treatment block;
- electrical power supply and control panel of mechanical treatment block, compressors.

Heating and ventilation

Heating is electrical, by a wall convector equipped with mechanical thermostats to keep set temperature. The temperature should not drop below +15÷17°C in the technical container on winter period.

Ventilation is influx-exhaust compulsory.

The influx system is installed on the first floor of the technical container. The influx ventilation system consists of an intake screen, an electrical channel air heater and a channel ventilator. On winter period automatic air heating up to indoor temperature is carried out by means of an electronic thermal regulator of the influx ventilation system. The channel ventilator is equipped with a thyristor rate regulator.
Exhaust ventilation is installed on the second floor of the technical container.
The exhaust wall ventilator is equipped with a temperature controller for temperature adjustment and a thyristor rate regulator.
Switching of the influx and exhaust systems' ventilators and their adjustment can be made manually.

Electric equipment

The technical container is equipped with indoor and outdoor lighting; completed with electrical power supply and control panels, and electrical outside network.

1.2. Mechanical treatment block

Construction

The mechanical treatment block equipment is made from stainless steel.

Equipment

The mechanical treatment block's equipment consists of:

- feeding pressure pipe-lines with magnetizers;
- chamber with mechanical screen;
- grit chamber;
- grit pulp dewatering unit;
- hydraulic press;
- pipe-line for dewatered wastes removal;
- exhaust ventilation system.

1.3. Block of tanks

Construction

The block of tanks consists of rectangular metal reservoirs from stainless steel divided inside by baffles, forming (see Fig. 1 Technological scheme):

- multichamber aeration tank (4 chambers – 2 modules);
- servicing shafts.

By tanks' perimeter is made a frame for insulation fastening of mineral cotton and covering of steel zinc coated lining plate with polymeric covering. The zinc-coated steel servicing bridges with flooring are provided for the station servicing.

Equipment

The aeration tank's chambers are equipped with block or moving plastic media, disc membrane aerators or perforated pipe aerators, submersible compressors with air pipelines and constructions for equipment fastening.
The servicing shafts are placed by ends of the block of tanks (the aeration tank).

Mounting

The block of tanks is mounted on a concrete foundation.

Attention! Check and drain water (liquid) out of the block of tanks before the station lifting. It is necessary to drain or pump out water in avoidance of construction elements deformation.

Connection

Feeding and discharge pipelines are connected to the block of tanks. The block of tanks is connected by communications to the mechanical treatment block and the secondary sedimentation tank. The station is connected to contour of outside grounding.

1.4. Secondary sedimentation tank

Construction

The secondary sedimentation tank represents a rectangular reservoir with a hopper bottom manufactured of stainless steel and equipped with:

- thin-film modules;
- hopper bottom for sediment thickening;
- accumulation trough with adjustable rod;
- sediment loosening device;
- secondary sediment pumping station.

By the secondary sedimentation tank's perimeter is made a frame for insulation fastening of mineral cotton and covering of steel zinc coated lining plate with polymeric covering.
The zinc-coated steel servicing bridges with flooring are provided for the station servicing.

Equipment

The secondary sediment pumping station is equipped with a submersible pump with fittings for sediment removal and mixing, and also a pipe-line for sediment draw off (through a funnel into a tank for sediment).

Mounting

The secondary sedimentation tank is mounted on a concrete foundation.

Attention! Check and drain water (liquid) out of the tank before the secondary sedimentation tank lifting. It is necessary to drain or pump out water in avoidance of construction elements deformation.

Connection

Feeding and discharge pipelines are connected to the secondary sedimentation tank. The secondary sedimentation tank is connected by communications to the block of tanks.

1.5. Wastewater flowrate control

Wastewater flowrate is recorded by supersonic correlation flowmeter's sensors. The flowmeter's supersonic sensors are installed on the pressure pipelines.
The electronic block of supersonic correlation flowmeter is installed in the technical container on the wall. The flowmeter allows to give information about immediately flowrate, and also about flowrate per every hour at last 32 days. The data through the standard interface RS232 can be displayed on the computer or transferred to telephone modem.

TECHNOLOGY OF MUNICIPAL WASTEWATER BIOLOGICAL TREATMENT STATION

1. Mechanical treatment

Application:

- fine wastes removal;
- grit removal;
- decrease of suspended solids amount;
- BOD decrease;
- grit dewatering;
- wastes thickening.

Complete set

Mechanical treatment consists of the following equipment set:

- block: mechanical screen – grit chamber;
- grit pulp dewatering unit;
- hydraulic press for screenings dewatering.

1.1. Mechanical screen

Application:

- fine wastes removal;
- decrease of suspended solids amount;
- BOD decrease.

Construction

A screen is installed in a stainless steel trough. The trough is placed above the grit chamber's hopper bottom and equipped with wastewater feeding pipe-lines with pressure relief chambers, a funnel for screening supply on the hydraulic press.

On the body of the grit chamber is a branch-pipe for the exhaust ventilation connection. The exhaust ventilation represents a stainless steel pipe-line connected with a wall ventilator. The exhaust wall ventilator is equipped with a thyristor rate regulator. The exhaust system's ventilator switching and its adjustment can be made manually.

Technological process

By the pressure pipelines wastewater comes into a trough of the mechanical screen. The pipe-lines are ended by flanges and are connected through floor by branches.

On the pressure pipe-lines magnetizers are installed, which by effect of magnetic fields provide wastewater processing that passes perpendicularly to magnetic power lines.

In the result of the processing physicochemical properties of wastewater change as follows:

- increase of buffer properties, that improves enzymatic activity and efficiency;
- interfacial water tension reduction, that increases velocity of organic matters sorption;
- increase of oxygen solubility, that augments velocity of biochemical oxidation;
- without fermentation many of not easily degradable compounds are decomposed.

Screenings are moved by mobile plates step by step upper to draw off line. In the result of wastewater treatment through the screen is formed a layer from pollutions that works as additional filter.

Screenings are constantly removed through an intake funnel into the intake chamber of a hydraulic press.

1.2. Grit chamber

Application:

- insoluble mineral solids removal;
- grit thickening;
- grit dewatering;
- wastewater distribution.

Construction

The grit chamber represents a rectangular chamber with a hopper bottom manufactured from stainless steel and equipped with:

- half-submersed baffle;
- thin-film modules block;
- water discharge rod;
- chamber of wastewater proportionally distribution;
- grit pulp pipe-line;
- slide valve;
- grit pulp dewatering unit.

Technological process

Wastewater after the mechanical screen comes into the grit chamber by the trough. The grit chamber is equipped with thin-film modules that allow to separate grit in intensive mode with high treatment efficiency. In the thin-film modules is carried out intensive separation of mineral solids, which settle on to the inclined plates, thicken and slip into the hopper bottom of the grit chamber. From the hopper bottom of the grit chamber a grit pulp

is periodically removed into the grit pulp dewatering unit.

1.2.1. Flow distribution

After thin-film modules wastewater comes into the wastewater proportional distribution chamber. Wastewater distribution is carried out through the baffle – adjustable overflow rod. The slide valves are installed on the discharge pipe-lines.

1.2.2. Grit pulp dewatering unit

Application

Grit dewatering from the grit chamber.

Construction

The grit pulp dewatering unit consists of:

- special branch pipe with quickly detachable clamp for filtration sack fixing;
- filtration sack;
- mobile trolley for dewatered grit removal;
- crate for filtrate accumulation and removal.

Technological process

Grit is thickened in the hopper bottom and is periodically removed by the stand-pipe into the grit pulp dewatering unit by means of a slide valve, and then in a filtration sack. Dewatering is carried out in the special filtration sacks by means of gravitation. The sack installed in a mobile trolley is fixed with a detachable clamp and is periodically removed to a storage platform then the sack is full with dewatered grit.

Filtrate from the sacks is removed into the crate and then comes into outside system.

1.3. Hydraulic press

Application

Screenings dewatering.

Construction

The press consists of a piston in a cylindrical pipe. The piston works from a hydro driver.

The press is completed with:

- refuse chute;
- sack's fixative element;
- packing sack;
- vehicle for wastes transportation (not included in delivery set).

Technological process

Dewatering process occurs in the hydraulic press. Screenings from the mechanical screen fall free into an intake chamber of the press. The press dewaters wastes in the pressing zone. Filtrate drainages through a sieve metallic sheet installed on the front of the press's cylindrical pipe and flows into the grit chamber. At straight moment of the piston dewatered wastes are pressed with each cylinder's step and moved by the refuse chute to the special fixative element with a packing sack. The sack is installed in a mobile trolley. Filled sack is disconnected and removed on the mobile trolley for utilization.

2. Technology of the block of tanks

Wastewater biological treatment is realized in the block of tanks, which consists of:

2.1. multichamber aeration tank divided into 4 chambers:

- hydrolysis – fermentation tank (1st module);
- heterotrophic nitri-denitrification tank (1st module);
- hetero/autotrophic nitri-denitrification tank (2nd module);
- autotrophic nitrification tank (2nd module);

2.2. secondary sedimentation tank;
2.3. servicing shafts.

The treatment technology provides use of:
- fixed film developed on the special plastic media;
- alternation of reduction and oxidation processes;
- fine-bubble aeration;
- biofiltration;
- thin-film sediment separation;
- automatic control of the mechanical equipment.

All this allows to provide of stable high-quality wastewater treatment.

2.1. Nitrification – denitrification tank

Application
- organic and inorganic solids oxidation;
- organic solids mineralization;
- nitrification;
- denitrification;
- wastewater clarification;
- biological disinfection.

Construction

The modules are connected among themselves by overflow pipes. The aeration tanks' chambers are connected among themselves by bottom passages.

Each chamber is equipped with:
- plastic media;
- fine-bubble aeration system;
- pipelines and fittings of air supply.

Hydraulics

From the pipe-line mechanically treated municipal wastewater enters into the first chamber of the nitri – denitrification tank by gravity. Due to aeration (vertical mixing) and multistage arrangement, the mode of the nitri – denitrification tank is characterized as the ideal plug-flow mixing tank. The vertical mixing and contact with the media form optimal requirements of effective mass transfer between pollutants of the wastewater and fixed sludge.

Hydrobiology and biochemistry of the process

The entering organic solids in the polluted water are successfully mineralized by isolated biocenoses of fixed microorganisms on plastic media retained within each chamber. The media is submerged in water. Oxygen supply is carried out by aeration. Mixing by aeration, too.

Owing to change of oxidation rate at each stage from high on the first stages up to low – on the last ones, loads on biocenoses and water saprobity vary from high up to low accordingly.

The first stage of process runs in reduction environment promoting development of anaerobic organisms, which use alternative ways of respiration. They ensure hydrolysis and fermentation of organic matters.

The following stage runs in oxidation-reduction environment. In these conditions biocenoses of microorganisms with the high content of the 1-st trophic level representatives and some species of the 2-nd trophic level of detritic food chain are formed.

Alongside with it, it is necessary to mark high efficiency of heterotrophic nitrification and denitrification, which appear simultaneously, due to specific conditions originating in biofilm layer and metabiotic relations of microorganisms.

The last stage of the process runs in oxidation-reduction (closer to oxidative) environment. In these conditions biocenoses with dominance of the 2-nd trophic level organisms, and also presence of the 1-st and the 3-rd trophic levels representatives are formed.
At this stage the basic amount of ammonia is oxidized and reduced nitrogen, due to simultaneous heterotrophic and autotrophic nitrification and denitrification in biofilm layer.
At the last stage of the process the level of dissolved oxygen is close to a complete saturation. In these conditions biocenosis with dominance of the 2-nd trophic level representatives and great variety of multicellular predators - representatives of the 3-rd and the 4-th trophic levels is formed. The nitrification is completed.
The conditions, which are formed by a construction of the nitrification – denitrification unit, allow to generate biocenoses in a dynamic regime without external interference.
The large variety of protozoan, especially representatives of *Peritricha* (ciliated infusorians), in biocenoses provide of high efficiency of clarification and removal of *E. coli* and other bacterial forms dangerous for human health.

2.2. Secondary sedimentation tank

Application

- additional clarification;
- sediment thickening;
- sediment removal.

Construction

The secondary sedimentation tank represents a rectangular chamber with a hopper bottom made of stainless steel and equipped with:

- thin-film modules;
- hopper bottom for sediment thickening;
- accumulation trough with a dentate adjustable rod;
- device for sediment loosening;
- secondary sediment pumping station.

Hydraulics

Wastewater enters into the secondary sedimentation tank through the overflow pipe-lines from the second module of the aeration tank. The clarification occurs in a thin laminated layer of water. The thin-film separation is carried out by means of the special plastic plates (thin-film modules) installed with the step of 50 mm and with the angle of 60°. The sediment settles on inclined plates, on which it thickens and slips downwards by gravity. The sediment is collected and condensed in the hopper bottom. The thickened sediment is removed to the secondary sediment pumping station by the pipeline. Periodically the sediment is mixed and pumped by means of a pressure head jet from the feeding pump. Clarified wastewater above the block of thin-film modules is collected by the water accumulation trough and is removed from the secondary sedimentation tank. The accumulation trough is equipped with a rod with triangular shaped apertures for uniform distribution of discharge along the trough. Before the rod an impingement baffle is installed for prevention of the sediment cakes inlet onto the discharge rod.

2.3. Secondary sediment pumping station

Application

- sediment draw off from the hopper bottom of the secondary sedimentation tank;
- sediment loosening in the hopper bottom;
- sediment stabilization.

Construction

The secondary sediment pumping station represents a hermetic rectangular standpipe with a pipeline in a bottom part connected with the sedimentation tank's hopper bottom. The submersible pump is installed in the stand-pipe. Fittings of the pipelines ensure:

- sediment draw off into the tank for sediment;
- sediment pumping for loosening in the sedimentation tank's hopper bottom;
- bypass for capacity adjustment.

On the pipe-line of the secondary sediment pump a magnetizer is installed.

Hydraulics

The pump works in manual mode (feeding into the tank for sediment and feeding for sediment mixing into the secondary sedimentation tank's hopper bottom) and in automatic mode (basically for sediment mixing in the secondary sedimentation tank's hopper bottom).

In automatic mode the pump is:

- powered up after switch off of the feeding pump,
- turned off by the timer on expiration of the time set at regulation works.

The sediment discharge into the tank for sediment and sediment loosening are carried out simultaneously.

The magnetizer installed on the pipe-line of the secondary sediment pump allows to remove gases off the sediment. Sediment loosening and the gases removal prevent flotation of the sediment.

2.4. Servicing shafts

Application

- accumulated sediment draw off and the block of tanks drainage by a pump or special auto transport.

Construction

The servicing shafts are placed in ends of the aeration tanks' modules and represent rectangular standpipes with holes in the bottom part (see Fig. 1).

During servicing it is possible to drain the block of tanks putting the pump in the shaft.

Hydraulics

The sediment drawn off from the block of tanks by the servicing pump is discharged into the tank for sediment.

The servicing pump works in manual mode.

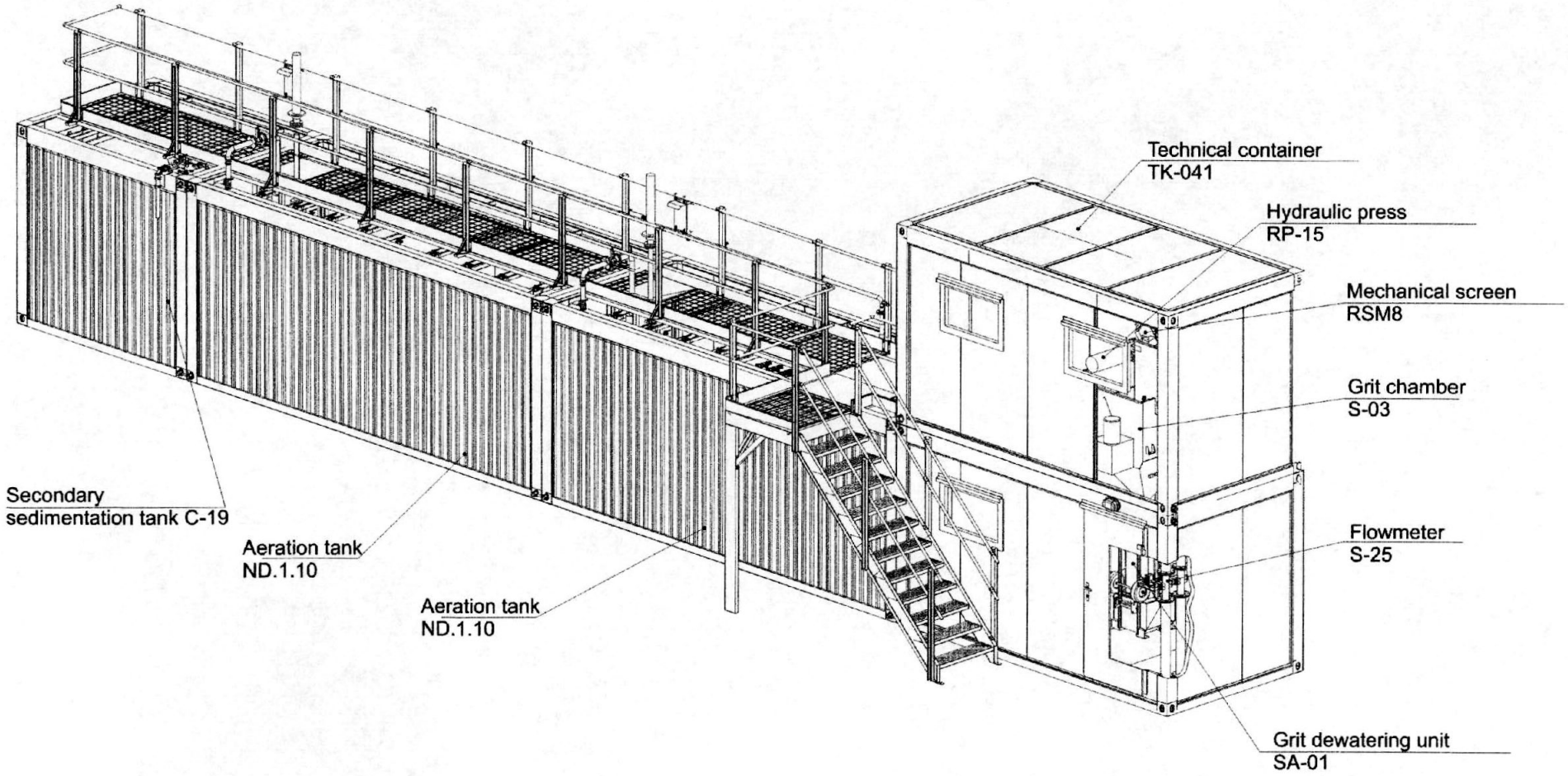
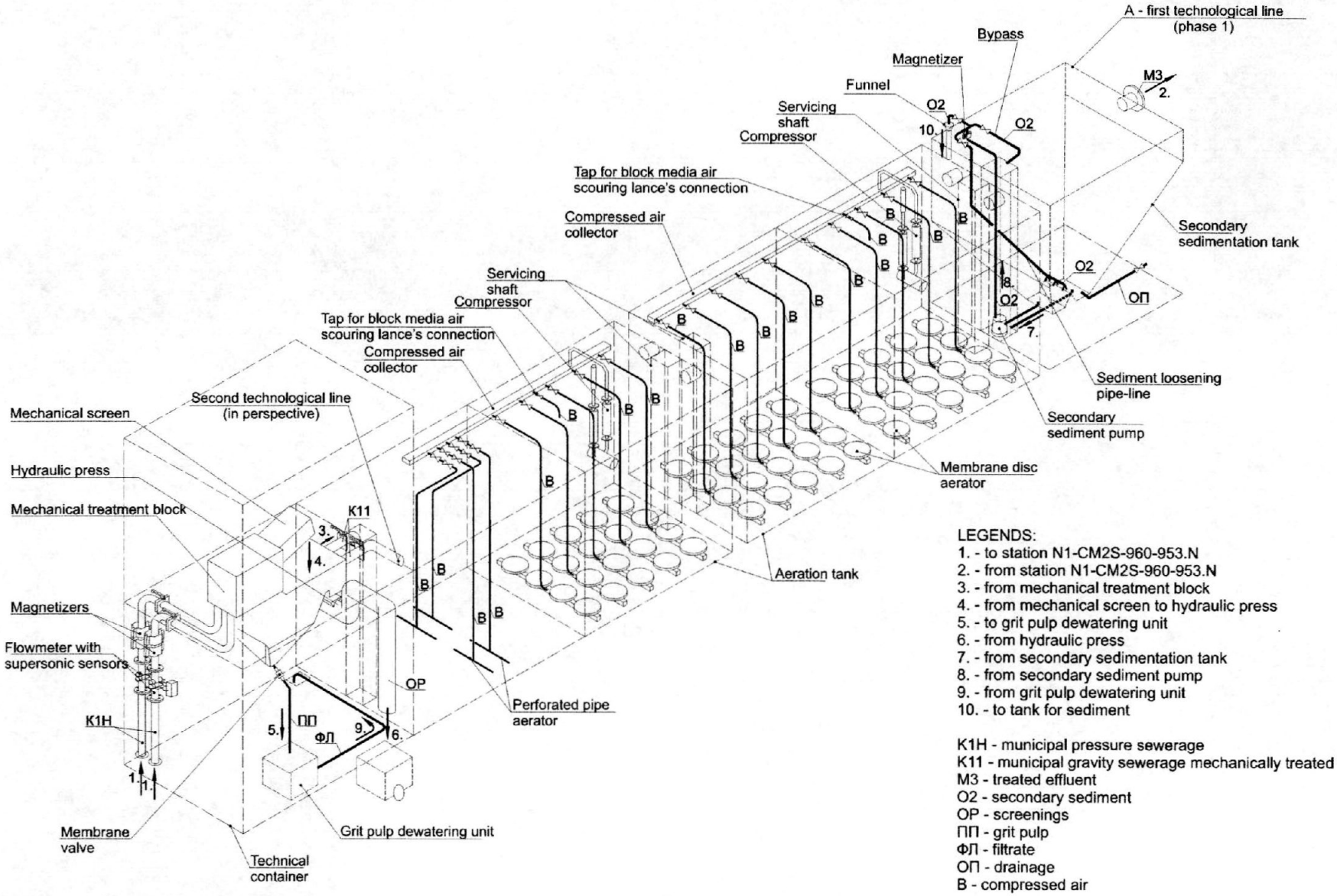


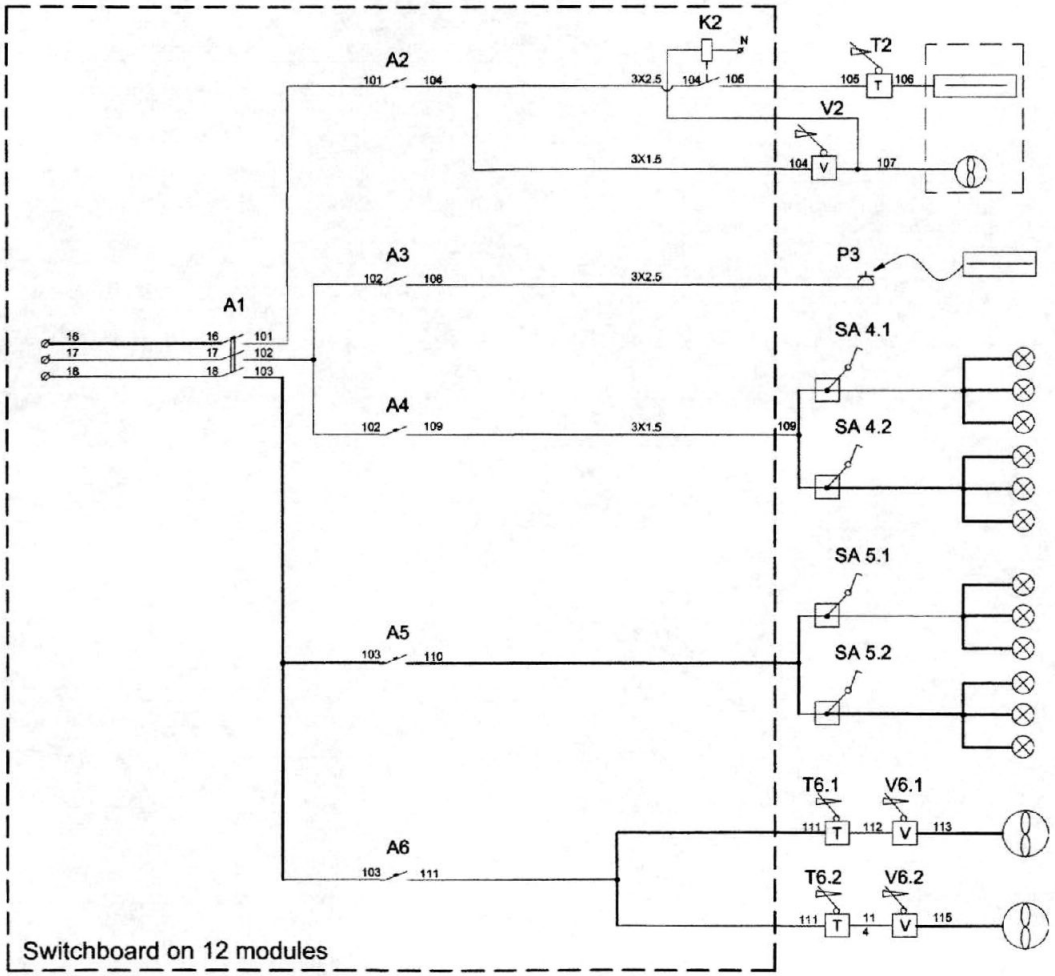
Fig. 5 Station general view



LEGENDS:
1. - to station N1-CM2S-960-953.N
2. - from station N1-CM2S-960-953.N
3. - from mechanical treatment block
4. - from mechanical screen to hydraulic press
5. - to grit pulp dewatering unit
6. - from hydraulic press
7. - from secondary sedimentation tank
8. - from secondary sediment pump
9. - from grit pulp dewatering unit
10. - to tank for sediment

K1H - municipal pressure sewerage
K11 - municipal gravity sewerage mechanically treated
M3 - treated effluent
O2 - secondary sediment
OP - screenings
ПП - grit pulp
ФЛ - filtrate
ОП - drainage
B - compressed air

Fig. 6 Principal technological piping scheme



$\frac{2}{1.3}$ Input air heating unit

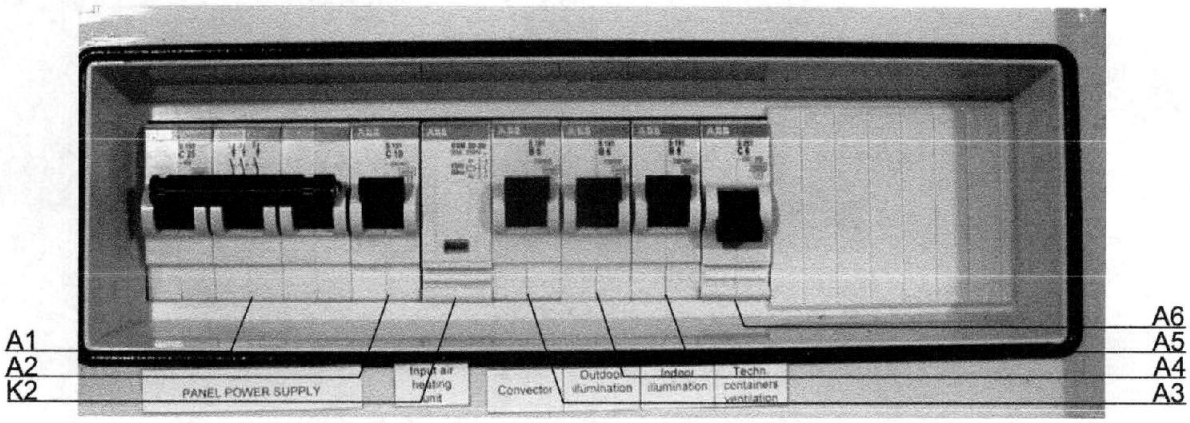
$\frac{3}{0.75}$ Panel heater

$\frac{4}{0.27}$ Outdoor lighting

$\frac{5}{0.6}$ Indoor lighting

$\frac{6}{0.14}$ Technical container ventilation

Fig. 7 Circuit diagram



Pos.	Designation	Type	Application
A1	Circuit breaker	C 25	Panel electrical power supply
A2	Circuit breaker	C 10	Input air heating unit
K2	Contactor	2N/O	Input air heating unit
A3	Circuit breaker	B 6	Technical container heating
A4	Circuit breaker	B 6	Outdoor lighting
A5	Circuit breaker	B 6	Indoor lighting
A6	Circuit breaker	C 6	Technical container ventilation

Fig. 7.1. Electrical power supply and control panel's equipment location of lighting, ventilation and heating systems

Heating, ventilation, lighting				
No.	Pos.	Designation	Type	Notes
1	A1	Circuit breaker	C 25	S263 ABB
2	A2	Circuit breaker	B 10	S261 ABB
3	A3	Circuit breaker	B 6	S261 ABB
4	A4	Circuit breaker	B 6	S261 ABB
5	A5	Circuit breaker	B 6	S261 ABB
6	A6	Circuit breaker	C 6	S261 ABB
7	K2	Contactor	2N/O 230 V AC	ESB20-20 ABB
8	T2	Thermoregulator	RTR-E 6705	Eberle
9	V2	Regulator of ventilation rotation rate	MTY-1A	Systemair
10	T6.1	Thermoregulator	RTR-E 6705	Eberle
11	V6.1	Regulator of ventilation rotation rate	MTY-1A	Systemair
12	T6.2	Thermoregulator	RTR-E 6705	Eberle
13	V6.2	Regulator of ventilation rotation rate	MTY-1A	Systemair
14	P3	Socket with earthing	16 A, 230 V	ELIO
15	SA4.1, SA4.2, SA5.1, SA5.2	Switches	10 A, 230 V	ELIO
16	S-5	Panel for 12 modules		ABB

Explication of circuit diagram

GENERAL TECHNICAL REQUIREMENTS FOR NORMAL OPERATION OF THE STATION N1-CM2S-960-953.N

1. Operation of the station begins after putting the station into operation.
2. Provide of qualified operation and maintenance of the station.
3. Perform the station and the mechanical equipment maintenance in accordance with manuals issued by the manufacturer.
4. All maintenance tasks and actions of the station and mechanical equipment should be entered into a technical log.
5. It is categorically forbidden to supply into the treatment station:

- septic sediments;
- regeneration water from drinking water treatment equipment;
- water from pools due to replacement or preventive works;
- storm water from roofs and territory;
- excrements of animals.

6. Ensure uninterrupted wastewater feeding, which parameters should meet designed values.
7. Ensure uninterrupted electrical power supply.
8. Switch on mechanical equipment only after filling the station with water.
9. Use biodegradable detergents only.
10. Control application of disinfectants.

OPERATION AND MAINTENANCE MANUAL OF MUNICIPAL WASTEWATER BIOLOGICAL TREATMENT STATION N1-CM2S-960-953.N

Start operation of the station after putting the station into operation.
An owner of the station nominates an operator responsible for the station's operation and maintenance according to internal regulations.
The operator is obliged to:

- carry out the station and equipment operation and maintenance in accordance with this manual;
- register all regular and extraordinary works in a technical log;
- control treatment process by chemical and hydrobiological parameters and register them in the log.

Attention!
Only qualified personnel is permitted to operate the electrical equipment!

I. STATION START-UP

1. Tanks filling with water

1.1. Check tightness of connection fittings;
1.2. Check if pipe aerators are in horizontal position;
1.3. Check block media holes alignment using the block media air scouring lance. If alignment disturbed, rebuild blocks according to the block media mounting scheme (see Appendix No. 16);
1.4. Check fixation of the block media (see Appendix No. 17). Fixative elements of the block media should be firmly fastened;
1.5. Lift up the sacks with floating media out of the first chamber before the aeration tank filling with water;
1.6. Fill the block of tanks and the secondary sedimentation tank with clean water.
1.7. Check up serviceability of the station's equipment according to operational manuals:

- submersible compressors (see Appendix No. 4);
- secondary sediment pump (see Appendix No. 5);
- mechanical screen (see Appendix No. 6);
- hydraulic press (see Appendix No. 7);
- flowmeter (see Appendix No. 12).

2. Aeration system adjustment

2.1. Open valves on the air collectors completely, except the valves for the air scouring lance connection (see fig. 6);
2.2. Switch on the compressors;
2.3. Fill in the first chamber of the aeration tank with moving media according to p. 3.;
2.4. Adjust sufficient air feeding into the first chamber for complete mixing of the moving media;
2.5. Adjust air feeding to achieve even aeration intensity.

3. Filling of the first chamber of the aeration tank with moving media

3.1. Moving plastic media is getting wet slowly and does not sink, as it's specific weight is less than water's.
The block of tanks should be completely filled with water and aeration should be switched on.
Sequence of filling:

- fill the first chamber of the block of tanks with 50% of moving plastic media total quantity;
- after some time, when the plastic media in the first chamber of the aeration tank will get wet and start to mix evenly, it is necessary to add the next 25% of the media;
- wait until moving media starts to mix evenly in the tank and add the rest;
- moving plastic media will be in working conditions after some days, when it will get completely wet and will mix evenly in the tank;
- aeration intensity should be sufficient to prevent formation of non-mixed areas.

3.2. The station should work some days at switched on aeration with clean water to get completely wet moving plastic media.

4. Wastewater feeding into the station

4.1. Hydraulic loading

It is necessary to adjust wastewater feeding according to wastewater calculated hourly flowrate.

The adjustment is carried out by means of the flowmeter S-25 (see fig. 1, 6). Calculated flowrate for each working line is determined by formula:

$$G_p \leq \frac{Q}{18 \times 3.6} \text{ l/sec} = \frac{355}{18 \times 3.6} = 5.48 \text{ l/sec}$$

where:

G_p – wastewater calculated flowrate of one technological line, l/sec;

Q – daily flowrate by passport, m^3/day.

Maximally permitted wastewater flowrate for the station is G_{max} = 11 l/sec.

4.2. Wastewater parameters checking

4.2.1 Determine daily average parameters of wastewater (pH, temperature t°C, concentrations of SS, BOD, COD, N and P):

- take samples each hour and collect them in a tank or use an automatic sampler;
- during sampling measure temperature and pH;
- for one day take average daily analysis;
- period of taking analyses should be not less than one week.

4.2.2 Check up conformity of the determined parameters of wastewater with the municipal wastewater biological treatment station application terms (See Application terms – Table No. 1).

4.2.3 Draw up the act on parameters of wastewater, comparing them with the tie-in design and the permitted values by the passport.

II. STATION OPERATION

5. Aeration

5.1. Compressors

For air feeding to aeration the rotor type submersible compressors are used that are installed under water in the aeration tanks. The compressors are fastened on special frames. Base points of the compressors are completed with vibroisolators.

The standard complete set of each compressor consists of:

- lifting chain;
- cable for the compressor's electrical connection;
- intake silencer No. 1 with filter;
- intake silencer No. 2;
- pressure silencer;
- check valve;
- safety valve;

- compensation connection;
- pressure gauge;
- vibroinsulated coupling.

Water absorbs noise of the compressors and simultaneously cools them. The optimal temperature mode increases working time of bearings and drive gears.
The submersible compressors are ideal for application under water for requirements of increased volume of air feeding and general insulation.

5.2. Adjustment of aeration

Each chamber of the aeration tank has its own aeration system. The intensity of aeration is set sufficient for keeping optimum below-mentioned concentration of dissolved oxygen. The minimal value of O_2 at design loading by BOD in the four-chamber aeration tank:

1	2	3	4
O_2 = 1÷2 mg/l	O_2 = 2÷3 mg/l	O_2 = 4÷5 mg/l	O_2 > 7 mg/l

The minimal intensity of aeration, which can be adjusted, should ensure mixing, sufficient for prevention of sediment accumulation. The quantity of oxygen in last chamber at the maximal loading always should be **not less than 7 mg/l**! The quantity of oxygen in the penultimate chamber at the maximal loading should be **not less than 4 mg/l**!
Breaks in the compressor operation longer than for 2 hours disturb balance between bacteria and *Protozoa* amounts that leads to sludge growth increase.

6. Beginning of treatment process

6.1. Beginning of the station operation is characterized with increased foaming (up to 7 days). **In this period it is categorically forbidden to switch off compressors!** To reduce foaming and to improve biological treatment it is required to add in the aeration tank the biopreparation ***BICHEM DC 1008 SF***.
After foaming stops it is necessary to wash the station (walls, lids, pipelines).
6.2. Formation of biomass usually occurs within 14÷40 days to provide wastewater biological treatment. Within 30÷90 days is formed biocenosis that includes *Protozoa* and *Metazoa*, ensuring lack of surplus sludge.
At optimum conditions the formation of fixed film occurs spontaneously – without any additional efforts of the servicing personnel. Accordingly output on required parameters occurs automatically by the process of biocenosis formation and adaptation.

7. Biopreparations application

Methodology of the biopreparations adding see in p. 10.1.11.
7.1. After two weeks of the station operation add the biopreparation ***Bacti-Bio 9500*** in the tank for sediment to improve sediment digestion process and apply further not less than twice per month, and in the first chamber of the aeration tank at odour presence (see Appendix No. 1).
7.2. To reduce foaming and to improve biological treatment it is required to add the biopreparation ***BICHEM DC 1008 SF*** in the aeration tank (see Appendix No. 2).
7.3. For fats and greases removal in the septic tank and in the first chamber of the aeration tank use the biopreparation ***BICHEM DC 2000 Biosock GL*** (see Appendix No. 3).

8. Station and equipment operation control and monitoring

8.1. Control of the mechanical screen and the hydraulic press operation

Control of the mechanical screen operation (fig. 1, pos. 1.1) see in operation manual (Appendix No. 6).

Control of the hydraulic press operation (fig. 1, pos. 1.2) see in operation manual (Appendix No. 7).

8.2. Control of the secondary sediment pump operation (for each technological line)

For operation optimization of the secondary sedimentation tank it is necessary to connect wastewater feeding cycle and cycle of the sediment draw off from the sedimentation tank.

The sediment draw off from the secondary sedimentation tank is made by means of the secondary sediment pump, which works in two modes:

- Automatic, when the secondary sediment pump switches on automatically after some retention time T1=1-2 minutes after wastewater feeding stoppage into the station. In this mode the pump works some time T2=1-3 minutes. The time T2 is established experimentally according to concrete operation conditions to provide of complete sediment draw of from the secondary sedimentation tank's hopper bottom in one cycle of the secondary sediment pump work.
- Manual, when the secondary sediment pump can be started, irrespectively of wastewater feeding into the station.

The secondary sedimentation tank operation should be optimized as within start-up works as during further operation due to possible changes of the equipment operation conditions.

Optimal operation conditions of the secondary sedimentation tank are achieved by means of adjustment of following parameters:

- switching on retention time of the secondary sediment pump T1;
- operation duration of the secondary sediment pump T2;
- sediment draw off (position of a valve for sediment draw off);
- loosening (position of a valve for sediment loosening);
- bypass (position of a bypass valve).

Attention! The main condition of the secondary sedimentation tank normal operation is to ensure of the sediment complete draw off from the sedimentation tank's hopper bottom within one cycle of the secondary sediment pump operation.

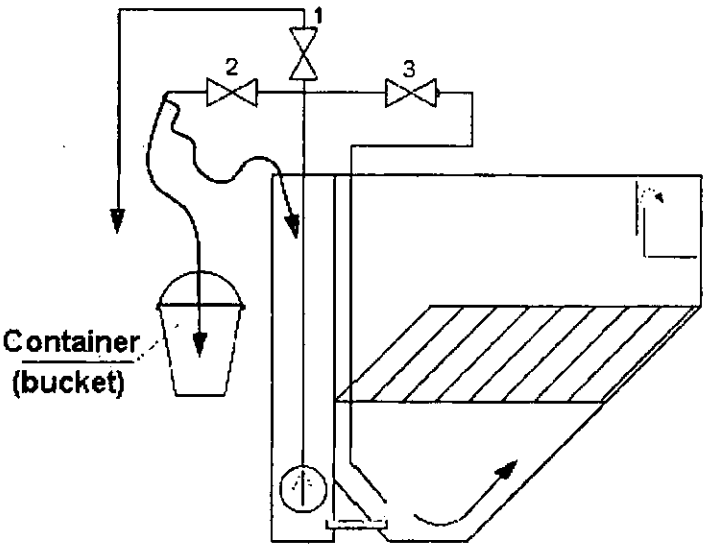
Precise adjustment of the above mentioned parameters is carried out as follows (see Typical scheme of the secondary sedimentation tank's piping):

- set the time T1 and T2 as described above;
- open completely the sediment draw off valve and open slightly the loosening valve and the bypass valve;
- put down a bypass pipe-line in a container;
- wait for wastewater feeding into the station (or initiate it);
- after wastewater feeding stoppage the system automatically stand set retention time T1;
- the secondary sediment pump works (operation time T2);
- after the secondary sediment pump switching off ensure that the sediment is completely drawn off from the sedimentation tank's hopper bottom (water drained

- from the bypass pipe-line should not contain settled solids when the secondary sediment pump finishes to work). In other case it is necessary to continue adjustment of the time T2, the positions of the sediment draw off valve, the sediment loosening valve and the bypass valve.

In automatic mode provide sediment draw off approximately in following proportions according to the time T2:

- 80% of the time T2 – sediment draw off (water with settled solids flows out of the bypass pipe-line);
- 20% of the time T2 – pumping of water without sediment (water without settled solids flows out of the bypass pipe-line).



DESIGNATIONS:
1. Sediment removal pipeline
2. By-pass pipeline
3. Sediment loosening pipeline

Typical scheme of the secondary sedimentation tank's piping

8.3. Control of the compressors operation

The compressors start-up is carried out manually.

Attention! The compressors should work constantly!

8.4. Control of the filtering sack of the grit pulp dewatering unit (see fig. 1, pos. 1.4):

- operator should follow after replacement of the filtering sack;
- dewatering effect of the grit pulp is supervised visually by intensity of free water extraction from the filtering sack;
- remove the full sack from the grit pulp dewatering unit (prior that close the valve before the grit pulp dewatering unit) and take out on a storage platform;
- fix a new sack;
- open the valve before the grit pulp dewatering unit.

8.5. Control of the packing sack of the mechanical treatment block's screenings accumulation unit (see fig. 1, pos. 1.5):

- operator should follow after replacement of the packing sack;
- remove the full sack from the screenings accumulation unit and take out for utilization;
- fix a new sack.

Table "A"

OPERATION PERIODICITY

No.	Works	Periodicity				Note
		Day	Week	Month	Year	
1	2	3	4	5	6	7
1.	Visual inspection of the pumping station	1				See explanations
2.	Visual inspection of the mechanical treatment block	1				See explanations
3.	Visual inspection of the station	1				See explanations
4.	Biopreparations application			2		See explanations
5.	Check of filling of the grit pulp dewatering unit's filtering sack	1				See explanations
6.	Check of filling of the screenings accumulation unit's packing sack	1				See explanations
7.	Cleaning of the block of tanks' walls and troughs		1			See explanations
8.	Check and adjustment of aeration	1				According to service manual p. 5 See explanations
9.	Sediment accumulation control in the secondary sedimentation tank		1			See explanations
10.	Sediment draw off from the block of tanks				1	See explanations
11.	Block media scouring with air scouring lance			2		See explanations
12.	Electrical equipment maintenance					According to the operation manuals; See explanations
13.	Monitoring of chemical and hydrobiological parameters:					The recommended form of the parameters registration – Table "B". Control flowrate constantly.
	• temperature of influent t_{in} and effluent t_{out}			1		
	• pH*	1				
	• O_2*	1				
	• flowrate					
	• BOD			1		
	• N*			1		
	• P			1		
	• SS			1		
	• greases and fats			1		
	• parameters of quality and quantity of fixed film		1			
14.	Care of the territory					If it is necessary

*- measurements are made if portable equipment is available.

3) open the free tap of the air collector;
4) adjust the valve on the air scouring lance;
5) begin air scouring from the first chamber of the aeration tank;
6) gradually introduce the air scouring lance in pipe of the aeration tank block media;
7) to avoid disc membrane aerators damage, descend the air scouring lance carefully up to stop.

After air scouring it is recommended to add dosage of the biopreparations ***Bacti-Bio 9500, BICHEM DC 1008 SF***.

12. Electrical equipment maintenance.

Attention! At scheduled maintenance tasks electrical power of the equipment should be disconnected.

– Perform scheduled maintenance tasks of the secondary sediment submersible pump (see Appendix No. 5).

– Perform scheduled maintenance tasks of the submersible compressors (see Appendix No. 4).

Attention! Pay attention to the compressors operation!

Time of the compressor operation is controlled by the counter.

– Perform scheduled maintenance tasks of the mechanical screen (see Appendix No. 6).

– Perform scheduled maintenance tasks of the hydraulic press (see Appendix No. 7).

– Monitor of the supersonic correlation flowmeter S-25 operation according to manual (see Appendix No. 12).

Make marks about performed scheduled maintenance tasks and unexpected malfunctions in electromechanical equipment operation in the technical log.

13. Timely monitor to control situation. Register parameters in the technical log. The recommended form of registration – see Table "B".

GEOFLOW

Design and Installation Manual

Subsurface Drip for Onsite Wastewater Reuse and Disposal

INTRODUCTION

Geoflow's WASTEFLOW® drip system disposes of effluent below the ground surface through ½" pressurized pipes. It is designed using the grid concept with supply and flush manifolds at each end creating a closed loop system. The result of the grid design is a complete subsurface wetted area.

The objective with effluent disposal is usually to dispose of the effluent using the minimum area as quickly and safely as possible at an approximately uniform rate throughout the year. If the main purpose of the Geoflow system is to irrigate, then please use the standard irrigation manual for landscape available from Geoflow, Inc.

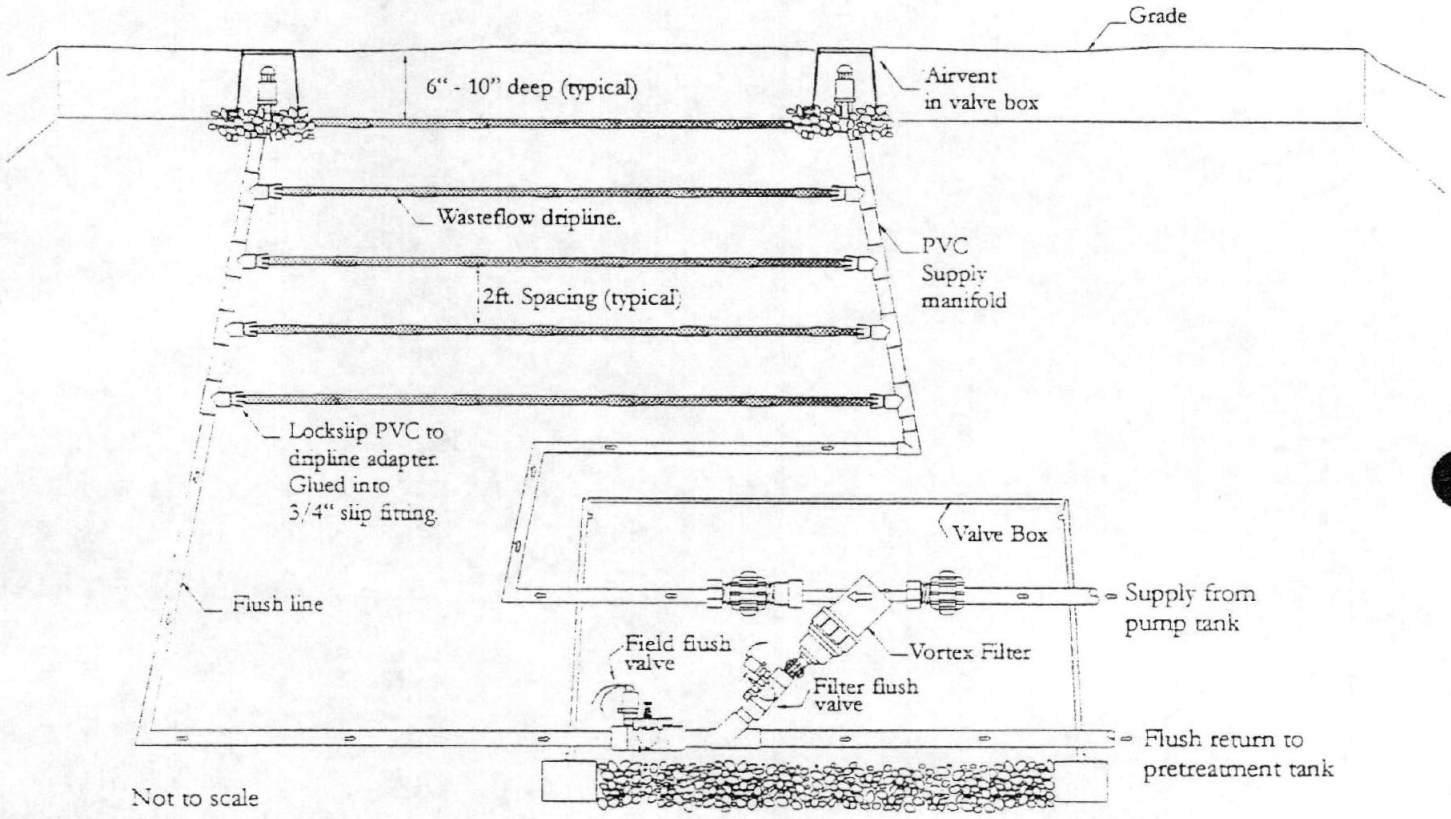
Subsurface drip is the most efficient method to dispose of effluent. Small, precise amounts of water are uniformly applied under the soil surface from multiple points.

The main advantages of Geoflow's subsurface irrigation for effluent disposal are:

- Human and animal contact with effluent is minimized, reducing health risks.
- Correctly designed systems will not cause puddling or runoff.
- It can be used under difficult circumstances of high water tables, tight soils, rocky terrain, steep slopes, around existing buildings, trees or other vegetation, and on windy sites.
- Disposal of water is maximized by means of evapotranspiration.
- The system requires no gravel. It is easy to install directly into indigenous soils and the natural landscape can be maintained.
- Minimizes deep percolation.
- Consumption of nitrates by the plant material is increased.
- Invisible and vandal proof installations.
- Ten-year warranty for root intrusion, workmanship and materials. Systems are durable with a long expected life.
- Non intrusive. It allows use of the space while operating.
- Easily automated.
- Effluent can be re-used for irrigation.

WASTEFLOW® is a registered trademark of A.I.Innovations

DIAGRAM 1: TYPICAL DRIP FIELD LAYOUT



SYSTEM COMPONENTS:

See Diagram 1 on page 3.

A typical drip system installation will consist of the elements listed below:

1. WASTEFLOW® DRIPLINE

(See Appendix 1 on page 21 for product specification)

WASTEFLOW lines carry the water into the disposal/reuse area. WASTEFLOW lines are connected to the supply and return with Compression or Lockslip fittings. Standard spacing between lines and emitters is 24" on center. The pipe has no joints that may pull apart during installation and is ideal for tractor mounted burying machines. It is sold in 500-ft rolls. For export 400-m rolls are available. Rolls of alternative lengths may be special ordered.

WASTEFLOW dripline features:

a) ROOTGUARD®
The risk of root intrusion with an emitter slowly releasing nutrient rich effluent directly into the soil is well known to anyone who has observed a leaking sewer pipe. Geoflow has an exclusive license for ROOTGUARD, to protect emitters from root intrusion. ROOTGUARD carries a 10 year warranty against root intrusion.

b) Turbulent flow path
Wasteflow drip emitters are pre-inserted in the tube 6", 12" or 24" apart with 24" being the most popular. Angles in the emitter flow path are designed to cause turbulence in order to equalize flow between emitters and keep the emitters clean. Geoflow emitters boast large flow paths, which, coupled with turbulent flow, have proven over the years to be extremely reliable and dependable.

c) Bactericide
Geoflow's WASTEFLOW has an inner lining impregnated with a bactericide, Ultra Fresh DM-50, to inhibit bacterial growth on the walls of the tube and in the emitter.

d) WASTEFLOW Classic and WASTEFLOW PC Dripline
For WASTEFLOW Classic the flow rate delivered by the emitter is a function of the pressure at the emitter. WASTEFLOW PC will have a constant flow rate at all pressures from 7 to 60 psi - to ensure a long life the recommended operating range is 10 to 45 psi.
We recommend that WASTEFLOW PC be used when the advantages are of substantial economic value.

i) Wasteflow PC can be run longer distances than WASTEFLOW Classic.

ii) Steep slopes. Systems should be designed for the dripline lateral to follow the contour. When this is practical, the extra cost of installing pressure regulators required for WASTEFLOW Classic would likely be less than the incremental cost of WASTEFLOW PC.

iii) Rolling terrain. If the difference in height from trough to peak exceeds six feet then WASTEFLOW PC should be used. Vacuum relief valves must be placed at the top of each rise.

ROOTGUARD® is a registered trademark of A.I.Innovations.

2. Controllers

(See Appendix 3 on page 27 for product specifications)

Controllers are used for time dosing and time flushing of the filter and dripfields. GEO controllers include a programmable logic control interface for field modifications. They can be used on systems ranging in size from one to four zones at the time this manual was printed. All controllers include a surge arrestor, elapsed time meter and counter. For larger systems please inquire about our Wasteflow Manager controller which has monitoring and telemetry capabilities.

3. Pumps

WASTEFLOW dripfields depend on pumps to supply effluent and pressure to the field. These must be sized according to flow and pressure requirements. Look for submersible effluent pumps from a dependable source. Geoflow does not endorse a single manufacturer, but does advocate you use a pump that is readily serviced in your area.

4. Filters

(See Appendix 2 on page 24 for product specifications)

Geoflow systems use a self-cleaning Vortex Filter with a stainless screen 150 mesh / or 100 micron filter element. The self-cleaning action is efficient over a range of flow rates depending on the filter size. The clean-out port is at the base and can be opened or closed manually or automatically. If using a manual flush valve, please keep the valve cracked open slightly at all times for continuous flushing. The controller will fully open automatic flush valves.

5. Supply Manifold

This carries the water from the dosing tank to the disposal area. Rigid PVC is usually used and must be designed to slope back to the pump tank in freezing conditions. The velocity in the manifold should be between 2 feet per second and 5 feet per second (fps). Refer to PVC pipe sizing chart in the appendix to determine the best diameter for your application.

6. Return Manifold

In order to help clean the system, the ends of the drip lines are connected together into a common return line, most often made of rigid PVC. This line will help equalize pressures in the system. Flushing should be done frequently during the installation period. Periodic flushing under full system pressure will guarantee a long system life. The return manifold should be installed to drain the line back to the pretreatment tank in freezing climates.

7. Pressure Regulator

(See Appendix 6 on page 32 for product specification)

Pressure regulators fix the inlet pressure at a given rate and are required with WASTEFLOW Classic. Under normal operating conditions, pressure in the drip lines should be:

10 psi to 45 psi for WASTEFLOW Classic and

7 psi to 60 psi for WASTEFLOW PC

8. Air Vacuum Breaker

(See Appendix 5 on page 31 for product specification)

Air vacuum breakers are installed at the high points to keep soil from being sucked into the emitters due to back siphoning or backpressure. This is an absolute necessity with underground drip systems. They are also used for proper draining of the supply and return manifolds in freezing conditions. Use one on the high end of the supply manifold and one on the high point of the return manifold. Maximum flow per vacuum breaker is 50 gpm. Freezing conditions require the air vacuum breaker be protected with insulation.

9. Filter Flush Valves

(See Appendix 4 on page 29 for product specifications)

Used to flush debris from the filter cleanout port back to the pretreatment tank, this can be an electronically activated solenoid valve or a manual ball valve. If manual, it should be opened for a full flushing at least every six months and left cracked open slightly to flush continuously. Cracking open a manual valve may be used to increase flow through the system to be within the efficient flow rate of the filter and/or pump, if necessary. Certain States may require automated electronic flushing. Please refer to your State codes.

10. Field Flush valves.

(See Appendix 4 on page 29 for product specifications)

Used to flush out fine particles which have passed through the filter and accumulate on the bottom of the tube at the end of each lateral. The field flush valve can be manual or electronic. If manual, it should be opened for full flushing at least every six months and left cracked open slightly to flush continuously and provide for drainage of the flush line in freezing conditions. Cracking open a manual valve can also be used to increase the flow through the system to be within the efficient flow rate of the filter and/or pump if necessary. Certain States do require automated electronic flushing. Please refer to your State codes.

11. WASTEFLOW HEADWORKS

(See Appendix 7 on page 33 for product specifications)

WASTEFLOW Headworks is a pre-assembled unit including the filter, valves and pressure gauge in a jumbo box. It is installed between the pump and the field. Be sure to insulate the box in freezing climates.

SYSTEM MAINTENANCE

The best way to assure years of trouble free life from your system is to continuously monitor the system and to perform regular maintenance functions. For large systems or systems with a BOD > 30 mg/l automation of maintenance is essential. For smaller systems with a BOD < 30 mg/l inspection and maintenance should be performed every six months.

Routine and Preventative Maintenance

1) Clean the filter cartridge. This may be done with a pressure hose. The screen filter cartridge should be cleaned from the outside inwards, while the discs in the disc filter cartridge should be separated and then cleaned. If bacteria buildup is a problem, we advise first trying lye, and if the problem persists, soak the filter cartridge in a chlorine bath - a mixture of 50% bleach and 50% water.
2) Open the field flush valve and flush the field for 3-5 minutes by activating the pump in "manual" position. Close the flush valve. On automatic solenoid valves the manual bleed lever should always be in the closed position and the dial on top should be free spinning. This allows it to open when pulsed electrically. Clockwise rotation closes valve.
3) With the pump in the "manual" position, check the pressure in the drip field by using a pressure gauge on the schrader valve located on the air vents and by reading the pressure gauge located in the Wasteflow Headworks box. The pressure should be the same as shown on the initial installation records. On systems with manual flush valves, close the field flush valve completely and then open the valve slightly until there is a 1-2 psi drop or design pressure is reached. This will allow the field to drain after each dose to prevent the manifold lines from freezing.
4) Remove the lids on the vacuum breaker and check for proper operation. If water is seen leaking from the top of the vacuum breaker, remove the cap of the vacuum breaker and press down on the ball to allow any debris to be flushed out. Be careful not to come in contact with the effluent.
5) Turn off the pump and reset the controller for auto mode.
6) Periodically remove and clean the air vents, field flush and filter flush valves.
7) Visually check and report the condition of the drip field, including any noticeable wetness.
8) Treatment and distribution tanks are to be inspected routinely and maintained when necessary in accordance with their approvals.
9) Record the elapsed time meter, pump counter, override counter, high-level alarm and power failures. This information can be obtained from the controller.

TROUBLE SHOOTING GUIDE:

Symptom: High water alarm activates periodically (1-2 times/week). During other times the water level in the pump chamber is at a normal level.

Possible cause: Peak water usage (frequently laundry day) is causing a temporary high water condition to occur.

Remedy: Set timer to activate the pump more frequently. Be sure to not exceed the total design flow. To avoid this, reduce the duration of each dose.

Remedy: Provide a larger pump tank to accommodate the peak flow periods.

Symptom: High water alarm activates during or shortly after periods of heavy rainfall.

Possible cause: Infiltration of ground/surface water into system.

Remedy: Identify sources of infiltration, such as tank seams, pipe connections, risers, etc. Repair as required.

Symptom: High water alarm activates intermittently, including times when it is not raining or when laundry is not being done.

Possible cause: A toilet or other plumbing fixture may be leaking sporadically but not continuously. Check water meter readings for 1-2 weeks to determine if water usage is unusually high for the number of occupants and their lifestyle. Also determine if water usage is within design range.

Remedy: Identify and repair fixture.

Symptom: High water alarm activates continuously on a new installation (less than 3 months of operation). Inspection of the filter indicates it is plugged with a gray colored growth. Water usage is normal. being done.

Possible cause: Slow start-up of treatment plant resulting in the presence of nutrient in the effluent sufficient to cause a biological growth on the filter. This is typical of lightly loaded treatment plants that receive a high percentage of gray water (i.e., from showers and laundry),

Remedy: Remove and clean filter cartridge in a bleach solution. Add a gallon of household bleach to pump tank to oxidize organics. Contact treatment plant manufacturer for advice on speeding up the treatment process possibly by "seeding" the plant with fresh activated sludge from another treatment plant.

Symptom: Water surfaces continuously at one or more isolated spots, each one foot or more in diameter.

Possible cause: Damaged drip line or a loose connection is allowing water be discharged under pressure and therefore at a much greater volume than intended.

Remedy: Dig up drip line. Activate pump and locate leak. Repair as required.

Possible cause: If water is at base of slope, can be caused by low-head drainage.

Remedy: Install check valves and airvents in the manifolds to redistribute water in the system after pump is turned off. This is not advised for freezing climates where manifold drainage is required.

Symptom: A portion of the drip field closest to the feed manifold is saturated while the rest of the field is dry.

Possible cause: Insufficient pump pressure. A pressure check at the return manifold indicates pressure of less than 10 psi.

Remedy: Check filter and pump intake to insure they are not plugged. If they are, clean as require.

Remedy: Leaks in the system may be resulting in loss of pressure. Check for water leaks in connections and fittings or wet spots in the field. Also check air vents to insure they are closing properly. Repair as necessary.

Remedy: Pump is worn or improperly sized. Pressure at feed manifold in less than 15 psi. Verify pressure requirements of system and provide a new or larger pump. As an alternate approach, the drip field may need to be divided into two or more zones.

Possible cause: The duration of each dose is of insufficient length to allow the drip field to become pressurized before the pump shuts off (or runs for only a brief time before turning off).

Remedy: Increase the pump run time and decrease the frequency of doses. Always calculate (or observe during field operation) how long the system takes to fully pressurize and add this time to the design dosing duration.

Symptom: High water alarm begins to activate continuously after a long period (1-2 years) of normal operation. Inspection of the filter indicates it is plugged with a heavy accumulation of sludge.

Possible cause: A buildup of solids in the pump tank due to carryover from the treatment plant.

Remedy: Replace the filter cartridge with a clean cartridge. Check the pump tank and if an accumulation of solids is noted, pump the solids out of the pump tank. Also, check the operation of the treatment plant to insure it is operating properly.

Symptom: Water surfaces at several spots in drip field during dosing periods. Installation is recent, less than 6 months of usage and the soil is a moderate to heavy clay. Possibly, the installation was completed using a non-vibratory plow.

Possible cause: Smearing of the soil may have occurred during installation of drip line. Also, the "cut" resulting from the installation allows an easy path for the water to surface during dosing.

Remedy: In most cases the sod will compact naturally around the drip line and the surfacing will diminish and ultimately cease. To help, reduce the duration of each dose and increase the number of doses/day. Also, it will help to seed the area to encourage the development of a good root zone.

Symptom: Entire area of drip field is wet, soft and spongy. It appears to be totally saturated with water. Situation occurs during dry season when there is little rainfall.

Possible cause: Water being discharged to drip field exceeds design. Excess water may be a result of infiltration, plumbing leaks or excessive water usage.

Remedy: Check water meter, elapsed time meter, pump counter, override counter or high level alarm counter to determine if water usage is in excess of design. Check for leaks or infiltration. Repair leaks as required. Reduce water usage by installing water saving fixture.

Remedy: If water usage cannot be reduced, enlarge drip field as required.

Possible cause: Area of drip field was inadequately sized and is too small.

Remedy: Provide additional soil analysis to verify sizing and enlarge as required.

Valve Troubleshooting

Symptom: Valve will not open manually

Check water supply and any possible master or gate valves to insure they are open.
Check that the valve is installed with the arrow pointing in the downstream direction
Check that the flow control is fully open, counterclockwise.
Turn off the water supply. Remove the solenoid and check for debris blocking the exhaust port.
Turn off the water supply. Remove the cover. Inspect the diaphragm for damage and replace if necessary.

Symptom: Valve will not open electrically

Check voltage at controller for 24 VAC station.
Check voltage across the solenoid lead wires for minimum 21 VAC.
Make sure handle on top of valve is free spinning. Not all the way open or all the way closed.
If the valve still does not operate, electrically replace the solenoid.

Symptom: Valve will not close

Insure the manual bleed lever is in the closed position.
Check for leaks around the flow control, solenoid or between valve cover and body.
Turn off the water supply. Remove the solenoid and check for debris or damage to the exhaust port.
Turn off the water supply. Remove valve cover and inspect for debris under diaphragm or debris in diaphragm ports.

Symptom: Slow leak

Check for dirt or gravel embedded in the diaphragm seat.
Check actuator and exhaust fitting for proper seating.

AQUA TECH SYSTEMS

LOTUS AND EQUALIZATION TANK ELECTRICAL SPECIFICATIONS AND WIRING INSTRUCTIONS FOR WATERFORD ESTATES

CONTENTS

WATERFORD ESTATES

LIST OF COMPLETE SET

of municipal wastewater biological treatment station (phase 1)

N1-CM2S-960-953.N

according to Invoice No. 61 dated 17.07.2003.

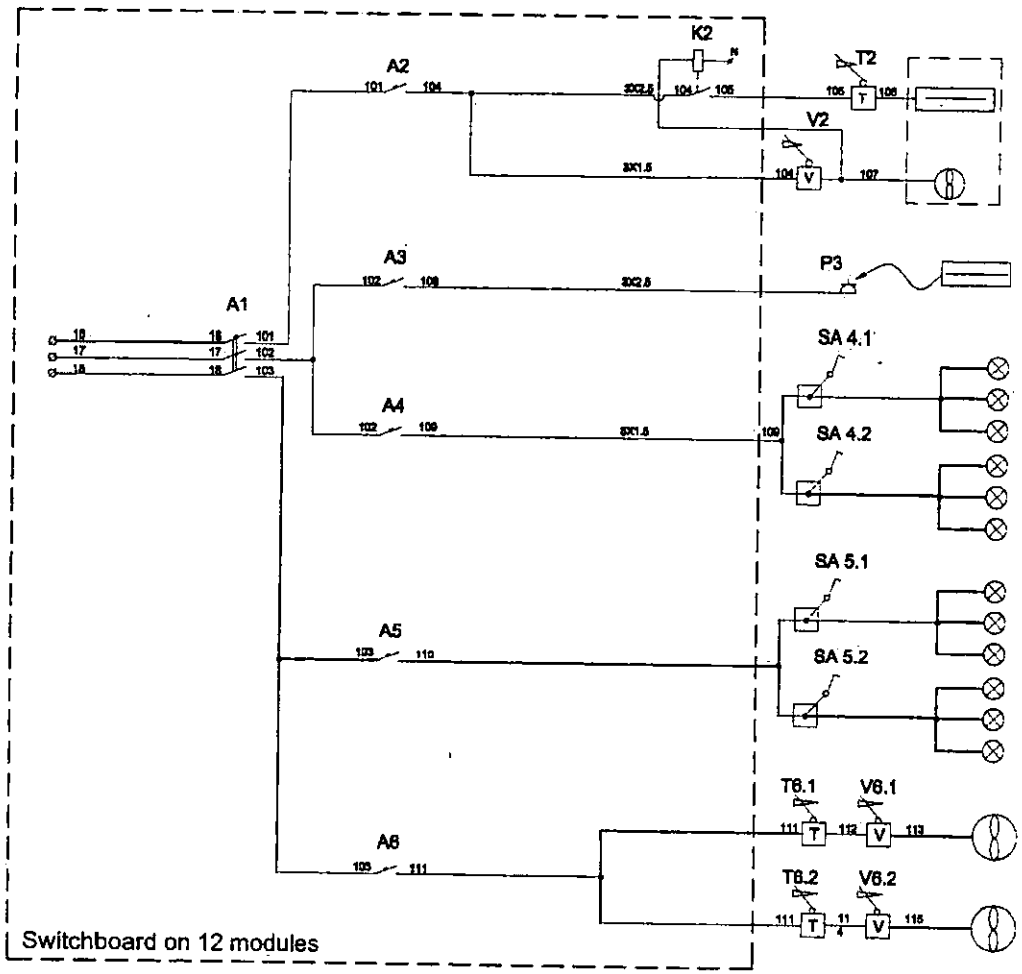
No.	Description	Designation	Quantity
1.	Municipal wastewater biological treatment station:	N1-CM2S-960-953.N	1 set
	1.1 Mechanical treatment block:		1 set
	• mechanical screen (380 V)*	RSM8*	1 set
	• hydraulic press (380V)*	RP-15	1 set
	• grit chamber	S-03	1 set
	• grit dewatering unit	SA-01	1 set
	• technical container	TK-041	1 set
	1.2 Block of tanks:		
	• aeration tank	ND.1.10	2 sets
	• secondary sedimentation tank	C-19	1 set
2.	Flowmeter (230V)	S-25*	1 set
3.	Biopreparation for 1 year	Bacti-Bio 9500	3 kg
4.	Biopreparation for 1 year	BICHEM DC 1008 SF	4 kg
5.	Biopreparation for 1 year	BICHEM DC 2000 Biosock GL	8 kg

* - equipment is equivalent to the mechanical screen M-04.M1 and the flowmeter S-25-100 by technical and technological requirements accordantly.

* MUST BE WIRED FROM THE AQUAPOINT SUPPLIED TRANSFORMER.

THIS ALSO INCLUDES THE SUBMERSIBLE COMPRESSOR CONTROL PANEL.

LOTUS TECHNICAL CONTAINER ELECTRICAL REQ.
(SHEET 1 of 3)



$\frac{2}{1.3}$ Input air heating unit

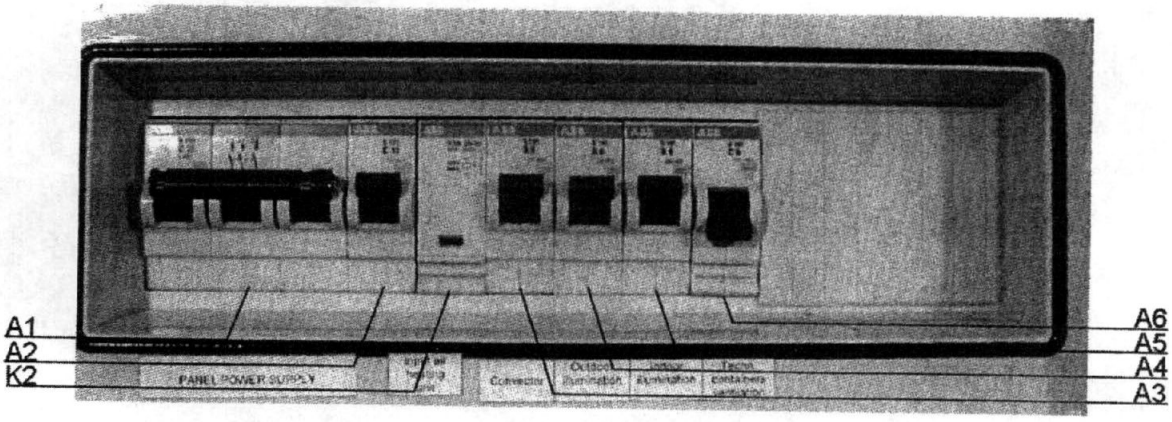
$\frac{3}{0.75}$ Panel heater

$\frac{4}{0.27}$ Outdoor lighting

$\frac{5}{0.6}$ Indoor lighting

$\frac{6}{0.14}$ Technical container ventilation

Fig. 7 Circuit diagram



Pos.	Designation	Type	Application
A1	Circuit breaker	C 25	Panel electrical power supply
A2	Circuit breaker	C 10	Input air heating unit
K2	Contactor	2N/O	Input air heating unit
A3	Circuit breaker	B 6	Technical container heating
A4	Circuit breaker	B 6	Outdoor lighting
A5	Circuit breaker	B 6	Indoor lighting
A6	Circuit breaker	C 6	Technical container ventilation

Fig. 7.1. Electrical power supply and control panel's equipment location of lighting, ventilation and heating systems

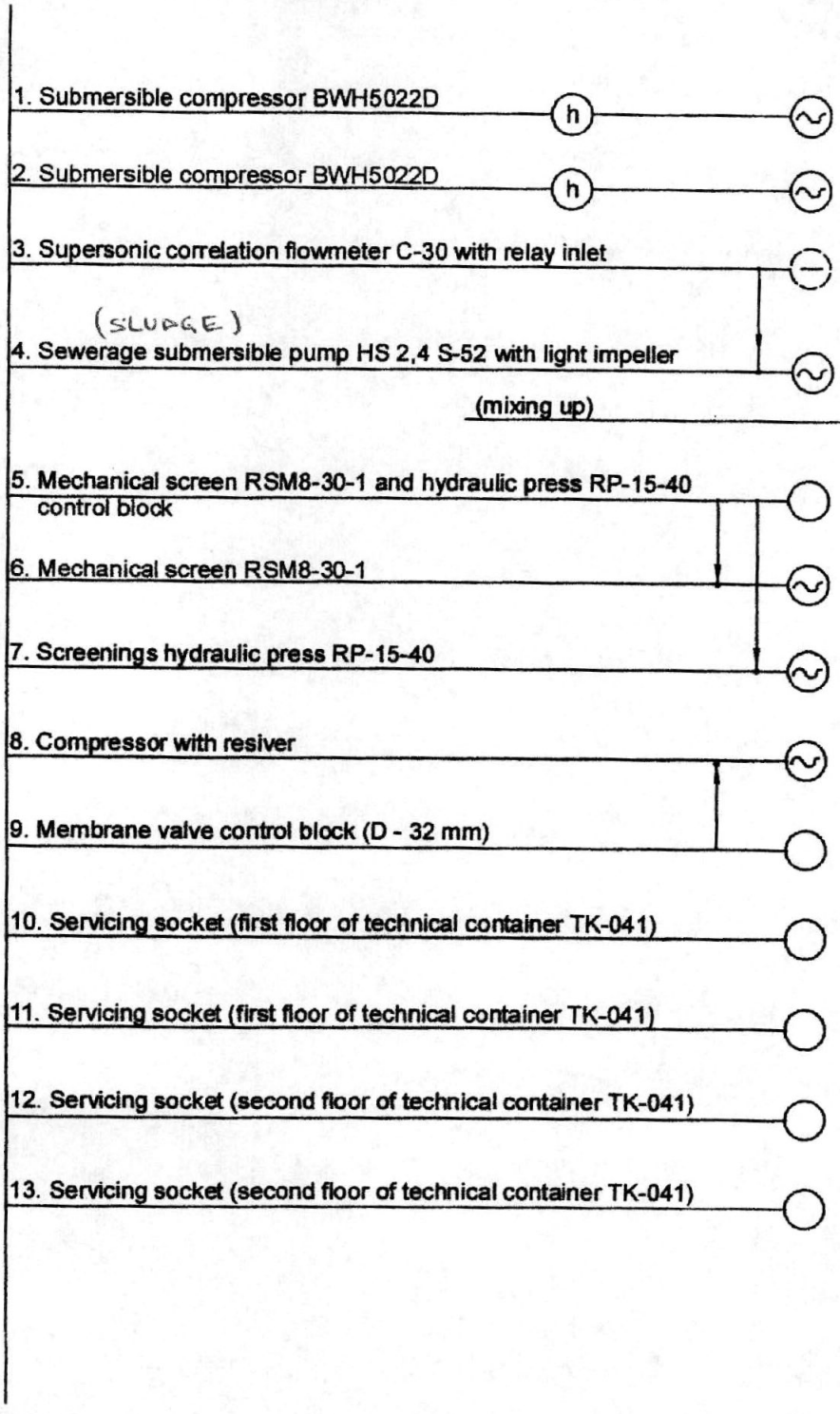
LOTUS TECHNICAL CONTAINER
(SHEET 3 of 3)

Heating, ventilation, lighting				
No.	Pos.	Designation	Type	Notes
1	A1	Circuit breaker	C 25	S263 ABB
2	A2	Circuit breaker	B 10	S261 ABB
3	A3	Circuit breaker	B 6	S261 ABB
4	A4	Circuit breaker	B 6	S261 ABB
5	A5	Circuit breaker	B 6	S261 ABB
6	A6	Circuit breaker	C 6	S261 ABB
7	K2	Contactor	2N/O 230 V AC	ESB20-20 ABB
8	T2	Thermoregulator	RTR-E 6705	Eberle
9	V2	Regulator of ventilation rotation rate	MTY-1A	Systemair
10	T6.1	Thermoregulator	RTR-E 6705	Eberle
11	V6.1	Regulator of ventilation rotation rate	MTY-1A	Systemair
12	T6.2	Thermoregulator	RTR-E 6705	Eberle
13	V6.2	Regulator of ventilation rotation rate	MTY-1A	Systemair
14	P3	Socket with earthing	16 A, 230 V	ELIO
15	SA4.1, SA4.2, SA5.1, SA5.2	Switches	10 A, 230 V	ELIO
16	S-5	Panel for 12 modules		ABB

Explication of circuit diagram

Customer: Aquapoint Inc., USA
Project:

TASK OF ELECTRICAL SCHEME DESIGN
FOR MUNICIPAL WASTEWATER BIOLOGICAL TREATMENT STATION N1-CM2S-960-953.N
Phase 1



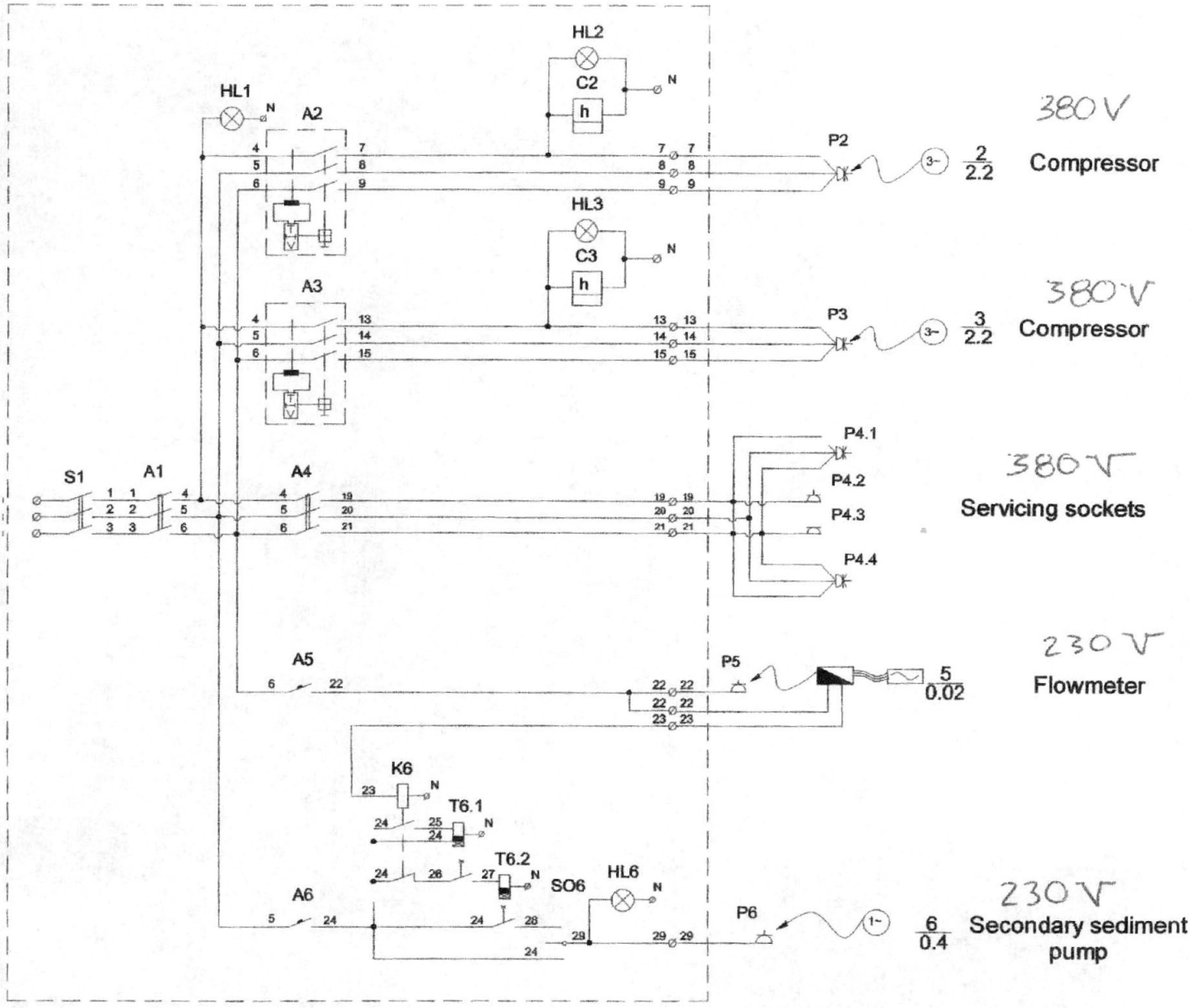
		Switch on	Switch off
1. Submersible compressor BWH5022D (h)	Ny-2.2 kW U-380 V, 60 Hz	P	P
2. Submersible compressor BWH5022D (h)	Ny-2.2 kW U-380 V, 60 Hz	P	P
3. Supersonic correlation flowmeter C-30 with relay inlet	Ny-0.015 kW U-230 V, 60 Hz	starts to count at wastewater feeding	stops to count when wastewater feeding stops
4. Sewerage submersible pump HS 2,4 S-52 with light impeller (SLUDGE) (mixing up)	Ny-0.40 kW U-230 V, 50 Hz	A.3 after wastewater feeding stops P	A-T1, T2 P
5. Mechanical screen RSM8-30-1 and hydraulic press RP-15-40 control block			
6. Mechanical screen RSM8-30-1	Ny-0.37 kW U-380 V, 60 Hz	A.5 P	A.5 P
7. Screenings hydraulic press RP-15-40	Ny-1.5 kW U-380 V, 60 Hz	A.5 P	A.5 P
8. Compressor with resiver	Ny-1.2 kW U-230 V, 60 Hz	A.9 P	A.9 P
9. Membrane valve control block (D - 32 mm)			
10. Servicing socket (first floor of technical container TK-041)	Ny≤2.0 kW U-380 V, 60 Hz	P	P
11. Servicing socket (first floor of technical container TK-041)	Ny≤2.0 kW U-230 V, 60 Hz	P	P
12. Servicing socket (second floor of technical container TK-041)	Ny≤2.0 kW U-380 V, 60 Hz	P	P
13. Servicing socket (second floor of technical container TK-041)	Ny≤2.0 kW U-230 V, 60 Hz	P	P

LEGEND
P - manual switch on/off
A - automatic switch on/off
A.3 - automatic switch on/off from position "3"
(h) - motor-hours counter

A - T1, T2 - automatic switch on/off from timers T1, T2
T1, T2 - timers (after wastewater feeding stops pump switches on with delay t_1=1-5 min on work time t_2=1-5 min)

Customer:
Order: Invoice No. 61 dated 17.07.2003.
Object: N1-CM2S-960-953.N

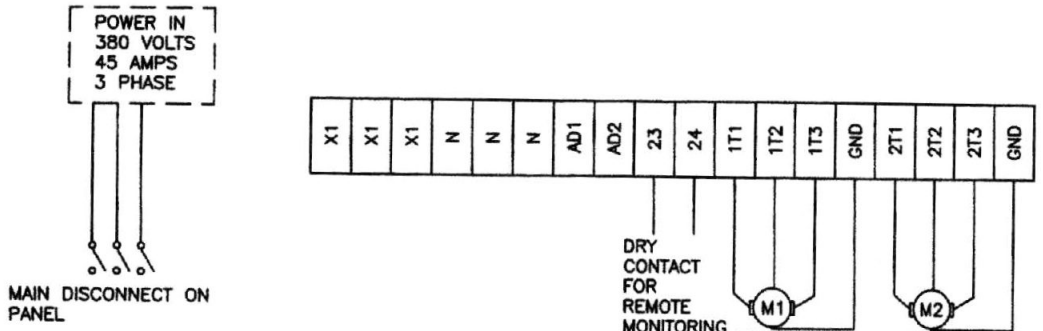
LOTUS PLANT EQUIPMENT



Circuit diagram

* LOTUS COMPRESSORS (5 SHEETS)

* FEED FROM TRANSFORMER (SUPPLIED BY AQUAPOINT) 460V to 380V



* MUST BE WIRED FROM SOCKETS ON PLANT TO CONTROL PANEL.

CONTRACTOR EXTERNAL WIRING

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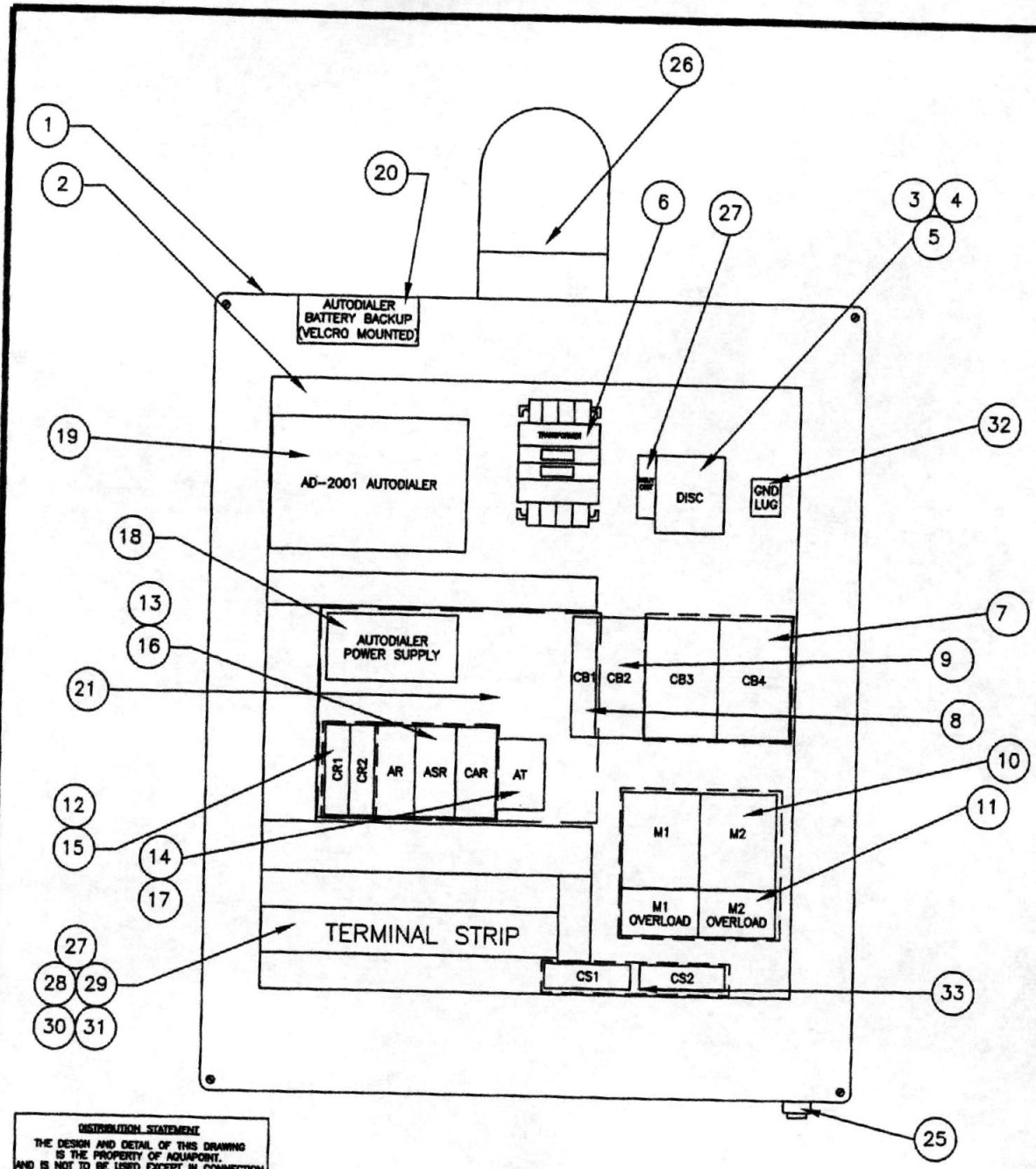
AquaPoint
241 DUCHAINE BLVD., NEW BEDFORD, MA 02745
(508) 998-7577 FAX (508) 998-7177

DATE	3-23-99
TITLE	Submersible Control Panel
DRAWING NO.	AWT3110
SIZE	B
REV	A
SHEET	1 OF 5



ITEM NO.	QTY	MANUFACTURE	DESCRIPTION	PART NO.
33	2	IDEC	2 POSITION SELECTORS	ASW210
33	2	DIVERSIFIED	CURRENT SENSORS	CMG100-020
32	1	ILSCO	GROUND LUG	TA1
31	6	ENTRELEC	TERMINAL END BLOCKS	10300206
30	3	ENTRELEC	TERMINAL BARRIERS	11831618
29	2	ENTRELEC	GROUND TERMINALS	15611316
28	10	ENTRELEC	30A TERMINALS	11511607
27	6	ENTRELEC	50A TERMINALS	11511811
26	1	PATLITE	120V BEACON/ALARMS	RHB120AUL-R
25	1	IDEC	BLACK PUSHBUTTONS NO	ABW110
24	1	IDEC	3 POSITION SELECTORS	ASW320
23	3	IDEC	GREEN PILOT LIGHTS	APW199G120
22	2	ENM	120V ELAPSED TIME METERS	T5102
21	1	MCKINSTRY	OPERATOR CONTROL PANEL	42/108
20	1	UNITED SECURITY	AUTODIALER BATTERY BACKUP	PP1
19	1	UNITED SECURITY	AUTODIALER	AD2001
18	1	IDEC	DIN MTD 12VDC PWR SUPPLY	PS5R-A12
17	1	IDEC	8 PIN SOCKET	SR2P-06
16	3	IDEC	2 POLE SOCKETS	SH2B-05
15	2	IDEC	1 POLE SOCKETS	SH1B-05
14	1	IDEC	8 PIN ON DELAY TIMER	RTEP1AF20
13	3	IDEC	2 POLE 120V RELAYS	RH2BULAC120
12	2	IDEC	1 POLE 120V RELAYS	RH1BUAC120
11	2	SPRECHER & SCHUH	3.7-12A OVERLOAD RELAYS	CEP7-M32-12-10
10	1	SPRECHER & SCHUH	CONTACTORS	CA7-12-10-120
9	1	ABB	4A 2 POLE CIRCUIT BREAKER	S272K4A
8	1	ABB	3A 1 POLE CIRCUIT BREAKER	S271K3
7	2	ABB	15A 3 POLE CIRCUIT BREAKERS	S273K15
6	1	ACME	380/115 TRANSFORMER	TA2-32405
5	1	ABB	SHAFT	OX5SX180
4	1	ABB	SELECTOR TYPE HANDLE	OHB2AJ1
3	1	ABB	45A 3 POLE DISCONNECT SWITCH	OT45E3
2	1	MCKINSTRY	SUBPANEL	42/2420
1	1	ROBROY	24 X 20 X 8 BOX	N24208HWT

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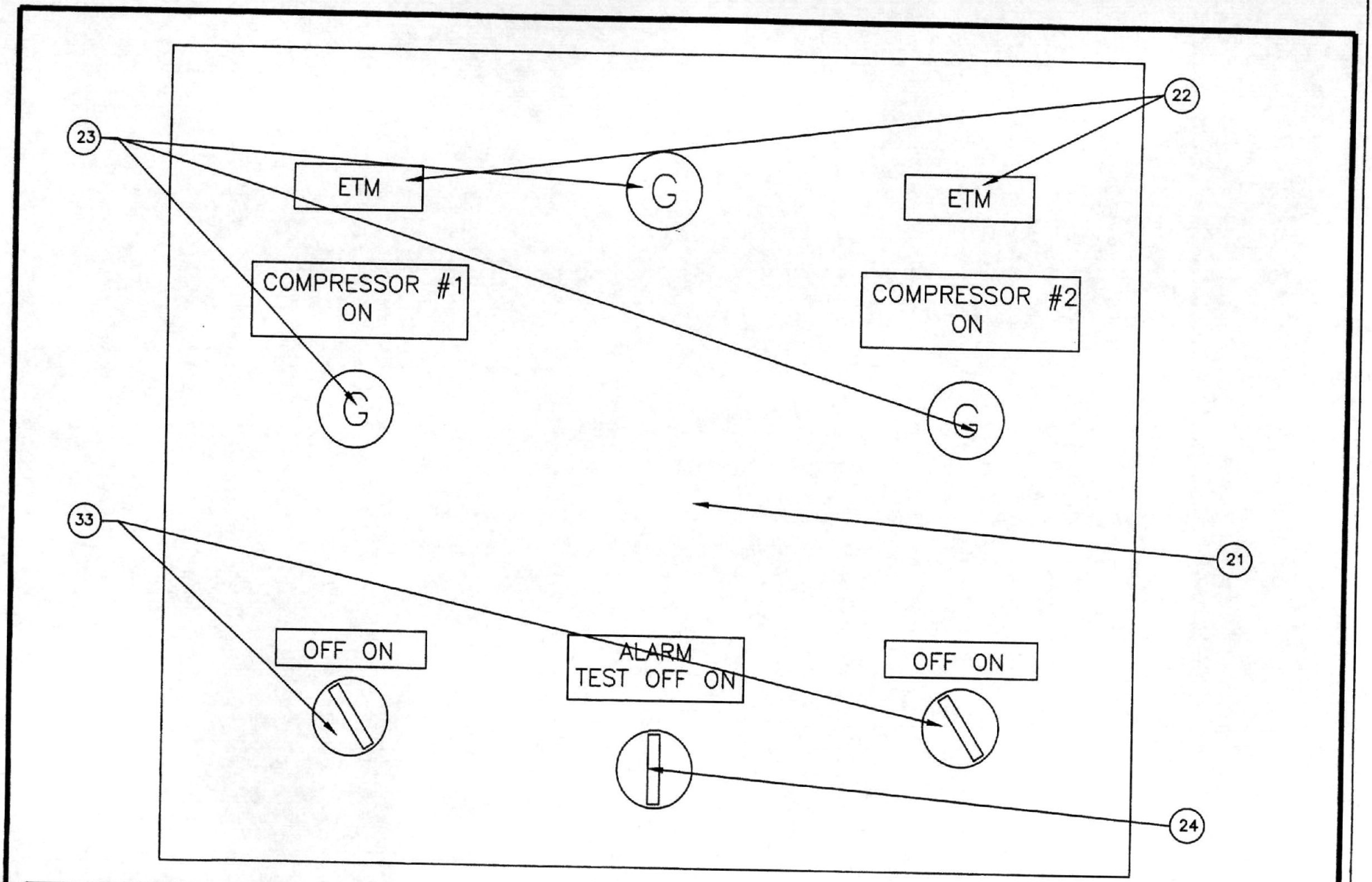
Submersible Control Panel
SIZE B | REVISION A | DRAWING NO. AWT3110
SCALE 1=1 | AWT3110_2.prt | SHEET 2 OF 5



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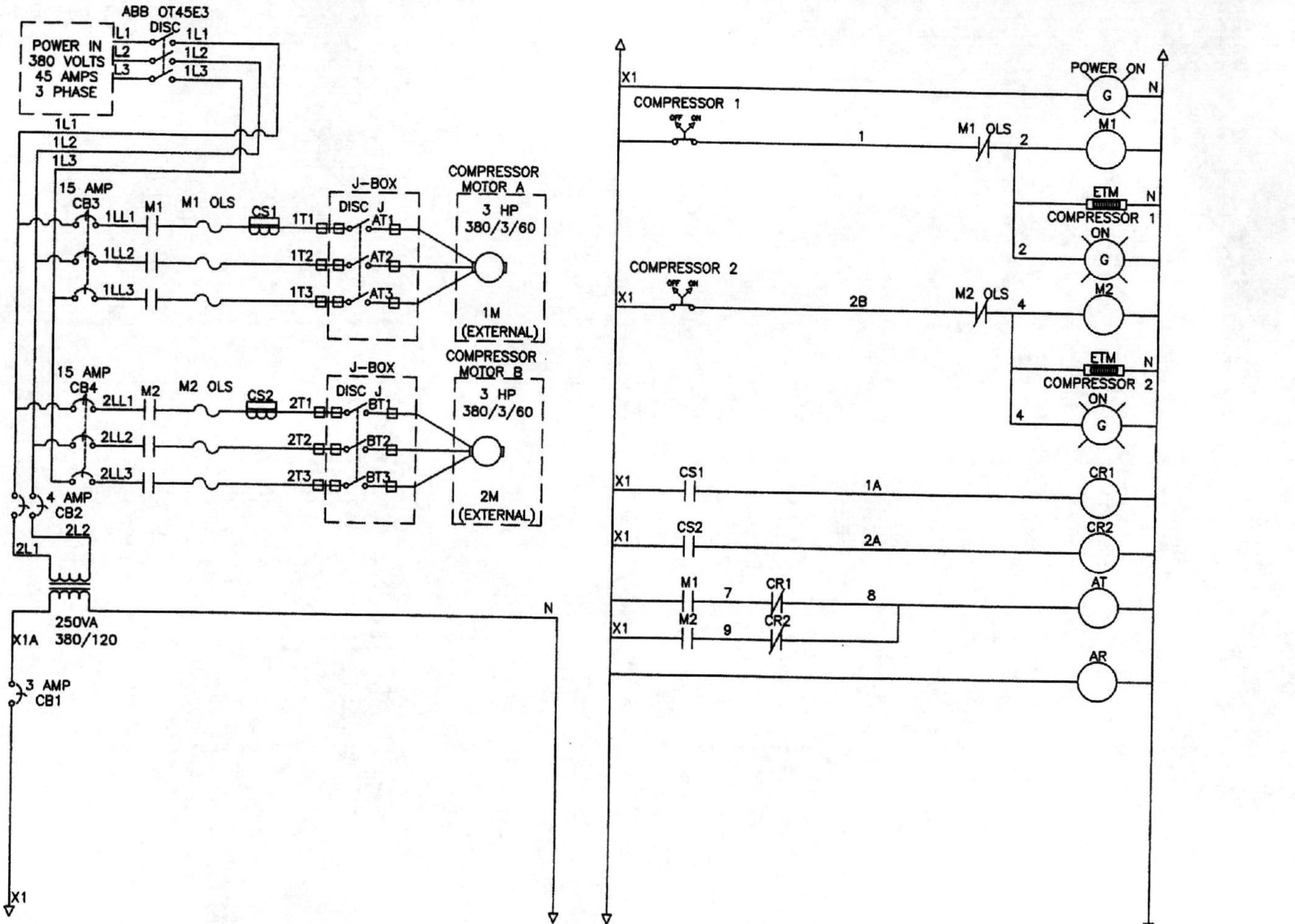
Submersible Control Panel
SIZE B | REVISION A | DRAWING NO. AWT3110
SCALE 3/4 | AWT3110_X.prel | SHEET 6 OF 8



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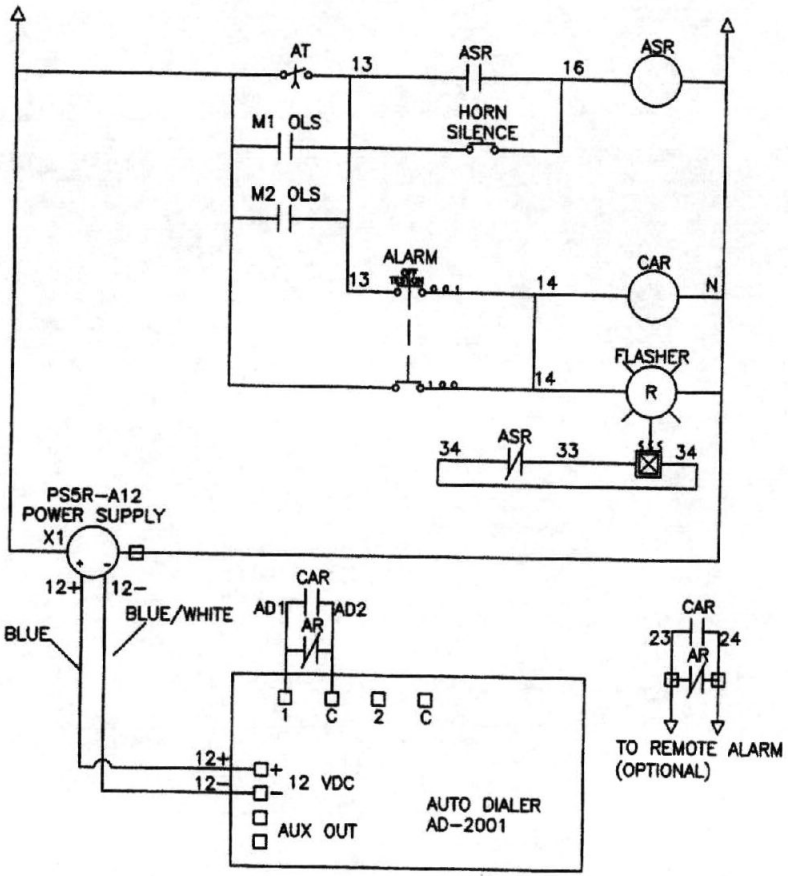
TITLE: Submersible Control Panel		
B	REVISION: A	DRAWING NO.: AWT3110
SCALE: NONE	3110_4_revA	SHEET # 4 OF 5



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Submersible Control Panel

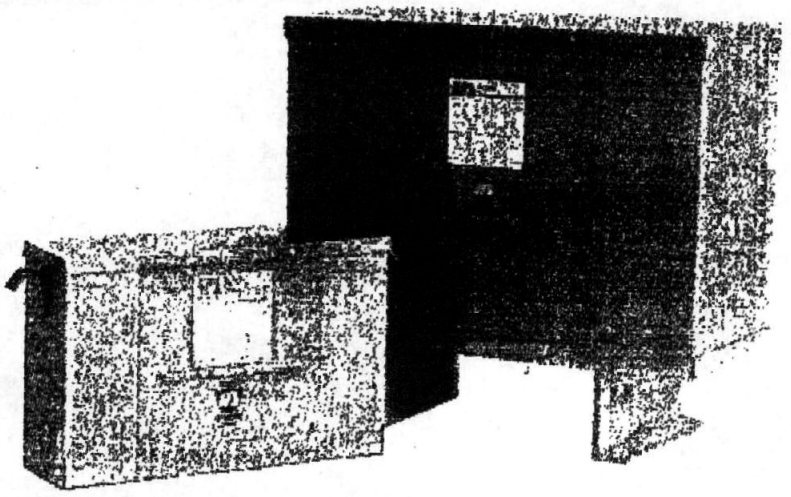
AWT3110

Shielded Power in Many Design Styles

THREE PHASE 3 to 75 KVA

Features

- **UL listed, CSA certified and UL-3R enclosure** meets or exceeds all listing criteria including NEMA, ANSI and OSHA standards.
- **UL Class** 180°C insulation system. 115°C rise.
- **Extra** large front access wiring compartment through 9 KVA; top access through 75 KVA for easier installation and cooler case temperatures.
- **Completely enclosed** — suitable for indoor/outdoor service. Consult selection charts for details. Excellent for dust or lint laden atmosphere.
- **Encapsulated** — electrical grade silica and resin compound completely encloses the core and coil. Encapsulation seals out all moisture and air, eliminating corrosion and insulation deterioration.
- **High efficiency** and excellent regulation.

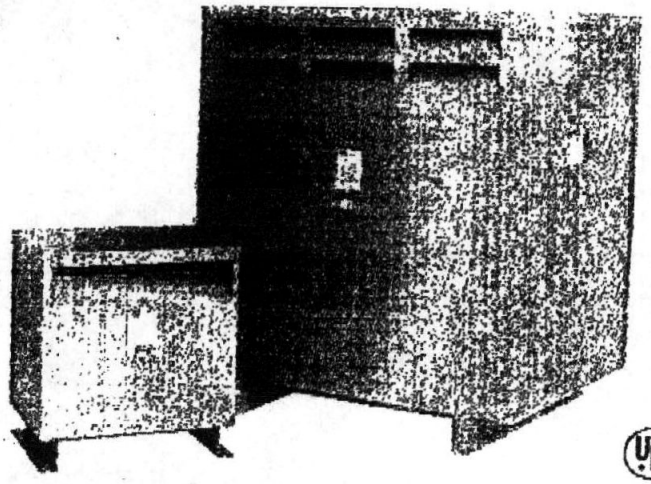


- Sound levels below NEMA standards.
- Keyhole mounting slots permit installation of mounting bolts prior to hanging transformer and are accessible from the front. Lifting ears for easy installation.
- Wiring connections can be made outside of wiring compartment due to the use of flexible leads.
- 3-9 KVA provided with dual size knockouts in sides and bottom of wiring compartment.
- Termination — copper lead wire.
- Electrostatic shielding provided on all 60 Hz isolation transformers.

SINGLE PHASE 37.5 to 250 KVA
THREE PHASE 25 to 1000 KVA

Features

- **With weather shield, UL Type 3R enclosure** type 2 enclosure without weather shield. UL listed and CSA certified.
- **UL Class 220°C** insulation system. 150°C rise.
- **Extra large wiring** compartment for easier installation and cooler case temperatures.
- **NEMA standard bus bar terminals** no special tools needed to make clearly marked connections. Tap changing easily accomplished with jumpers.
- **Aluminum windings** for increased insulation life, cooler operation, lower losses.
- Noise and vibration isolating pads standard to assure **quiet** operation.
- Large permanently legible nameplates on front.



- Single phase units can be banked for 3 phase service.
- All units have ground studs for use with non-metallic conduit.
- Suitable for wall or "trapeze" mounting. Wall brackets are available for units up to 50 KVA single and 75 KVA three phase.
- Other models are available with class 220°C insulation and either 115°C or 80°C rise operating temperature. Refer to Opti-Miser™ Section.
- Termination — single phase 37.5 to 100 KVA, copper bus; 167 to 250 KVA, aluminum bus. Three phase 27 to 225 KVA, copper bus; 275 to 1000 KVA, aluminum bus.
- Electrostatic shielding provided on all 60 Hz isolation transformers.

GROUP U

440 DELTA PRIMARY VOLTS — 220Y/127 SECONDARY VOLTS — 3Ø, 50/60 Hz

KVA	CATALOG NO.	APPROX. DIMENSIONS Inches (Cm.) HEIGHT	WIDTH	DEPTH	APPROX. SHIP WEIGHT Lbs. (Kg.)	TYPE MTG. W – Wall F – Floor	KNOCKOUTS	WEATHER SHIELD P/N	Electrical Connections and Design Figures Begin on Page 54
10.0	TF-22010-5S	18.90 (48.0)	20.30 (51.6)	9.00 (22.9)	245 (111.1)	F	NA	NA	73–I
15.0	TF-22015-5S	25.50 (64.8)	24.40 (62.0)	19.40 (49.3)	291 (130.0)	F	NA	WS-A-1	73–E
25.0	TF-22025-5S	25.50 (64.8)	24.40 (62.0)	19.40 (49.3)	375 (170.1)	F	NA	WS-A-1	73–E
50.0	TF-22050-5S	29.90 (75.9)	28.20 (71.6)	22.40 (56.9)	437 (198.2)	F	NA	WS-A-2	73–E
100.0	TF-220100-5S	41.50 (105.4)	32.90 (83.6)	29.90 (75.9)	725 (328.9)	F	NA	WS-A-4	73–E
200.0	TF-220200-5S	45.60 (115.8)	39.50 (100.3)	35.50 (90.2)	1025 (464.9)	F	NA	WS-A-5	73–E
250.0	TF-220250-5S	45.60 (115.8)	39.50 (100.3)	35.50 (90.2)	1600 (725.8)	F	NA	WS-A-5	73–E
300.0	TF-220300-5S	57.84 (146.9)	45.50 (115.6)	41.50 (105.4)	1700 (771.12)	F	NA	WS-A-7	73–G
500.0	TF-220500-5S	62.80 (159.5)	54.00 (137.2)	41.50 (105.4)	2418 (1096.8)	F	NA	WS-A-6	73–G

AUTO-TRANSFORMERS ②

600 PRIMARY VOLTS — 480 SECONDARY VOLTS — 3Ø, 60 Hz

480 PRIMARY VOLTS — 380 SECONDARY VOLTS — 3Ø, 50/60 Hz ALTERNATE RATING

KVA 600V Pri. 480V Sec.	KVA 480 Pri. 380 Sec.	CATALOG NO.	APPROX. DIMENSIONS Inches (Cm.) HEIGHT	WIDTH	DEPTH	APPROX. SHIP WEIGHT Lbs. (Kg.)	TYPE MTG. W – Wall F – Floor	KNOCKOUTS	WEATHER SHIELD P/N	Electrical Connections and Design Figures Begin on Page 54
15.0	12.0	T-2-52703-1③	15.21 (38.6)	19.25 (48.9)	7.37 (18.7)	104 (47.2)	W	NA	NA	56–F
30.0	24.0	T-2-52705-1③	15.21 (38.6)	19.25 (48.9)	7.37 (18.7)	152 (68.9)	W	NA	NA	56–F
45.0	36.0	T-2-52707-1③	15.21 (38.6)	19.25 (48.9)	7.37 (18.7)	156 (70.8)	W	NA	NA	56–F
75.0	60.0	T-3-52710-1③	18.86 (47.9)	20.30 (51.6)	9.03 (22.9)	300 (136.1)	F ①	NA	NA	56–I
112.5	90.0	T-2A-52712-1④	25.50 (64.8)	24.40 (62.0)	19.40 (49.3)	325 (147.0)	F ⑤	NA	WS-A-1	57–E
150.0	120.0	T-2A-52713-1④	25.50 (64.8)	24.40 (62.0)	19.40 (49.3)	350 (158.8)	F ⑤	NA	WS-A-1	57–E
225.0	180.0	T-2A-52715-1④	29.90 (75.9)	28.20 (71.6)	22.40 (56.9)	600 (272.0)	F ⑤	NA	WS-A-2	57–E
300.0	240.0	T-2A-52717-1④	29.90 (75.9)	28.20 (71.6)	22.40 (56.9)	650 (294.8)	F ⑤	NA	WS-A-2	57–E
450.0	360.0	T-2A-52718-1④	35.90 (91.2)	31.90 (81.0)	26.90 (68.3)	750 (340.0)	F	NA	WS-A-3	57–E
500.0	400.0	T-2A-52719-1④	35.90 (91.2)	31.90 (81.0)	26.90 (68.3)	790 (358.3)	F	NA	WS-A-3	57–E

460V INTO TRANSFORMER

* 380V INTO COMPRESSOR CONTROL PANEL, 380 V FOR SCREEN AND HYDRAULIC PRESS.

① Wall mounting brackets use PL-79911.

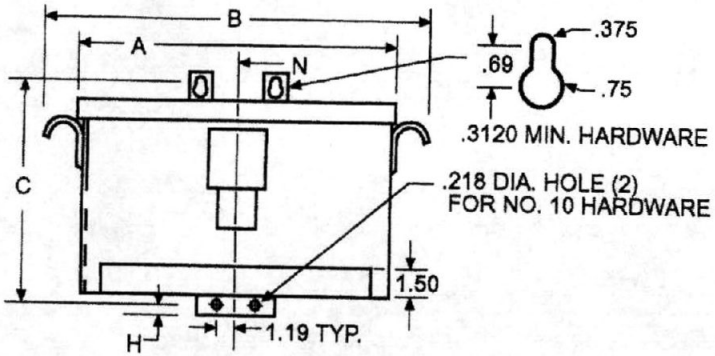
② If used on unbalanced loads, these units should only be used on a 4 wire system with the supply neutral connected to the transformer. If used on balanced loads, such as motor loads, then they may be used on a 3 wire system without a neutral or 4th wire.

③ These units are encapsulated with a 115° C temperature rise.

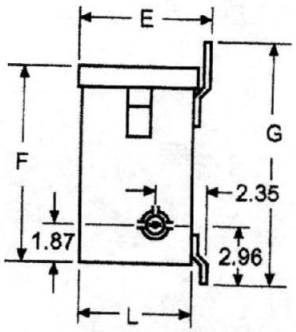
④ These units are ventilated with 150° C temperature rise.

⑤ Wall mounting brackets use PL-79912.

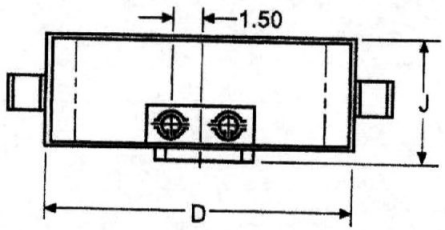
FRONT



SIDE



BOTTOM



CERTIFIED DIMENSIONS

THREE PHASE

TOTALLY ENCLOSED

DRIVE ISOLATION TRANSFORMERS

AND AUTOTRANSFORMERS

KVA	A	B	C	D	E	F	G	H	J	L	N	WT. LBS.
5.0 KVA	16.87	19.25	14.46	16.72	7.37	13.06	15.21	.38	7.31	6.87	3.25	180
7.5 KVA												
15 KVA AUTO												
30 KVA AUTO	16.87	19.25	14.46	16.72	7.37	13.06	15.21	.38	7.31	6.87	3.25	180
45 KVA AUTO												

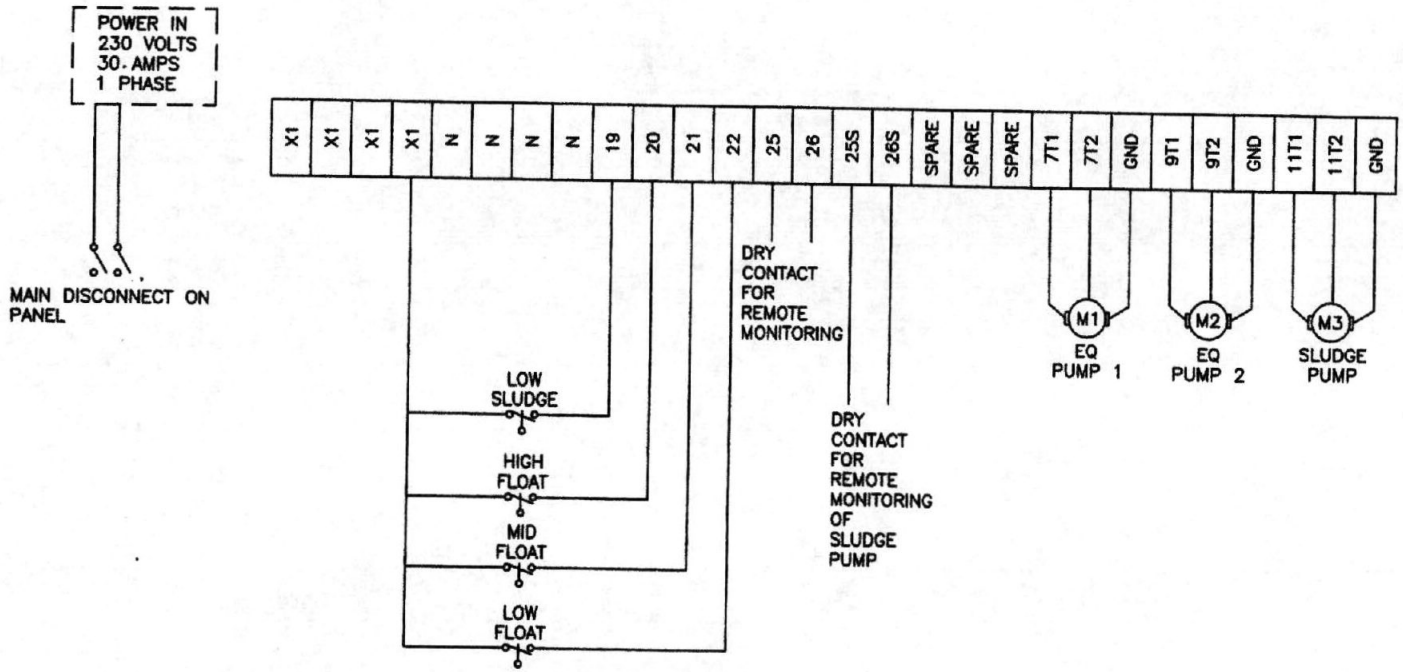
Acme Electric Corporation

Power Distribution Products Division

4815 West Fifth Street
Lumberton, NC 28358
910-738-1121 Inside NC
800-334-5214 Outside NC
910-739-0024 Fax
www.acmepowerdist.com

A-700982

* EQUALIZATION AND SLUDGE PUMP (5 SHEETS)



CONTRACTOR EXTERNAL WIRING

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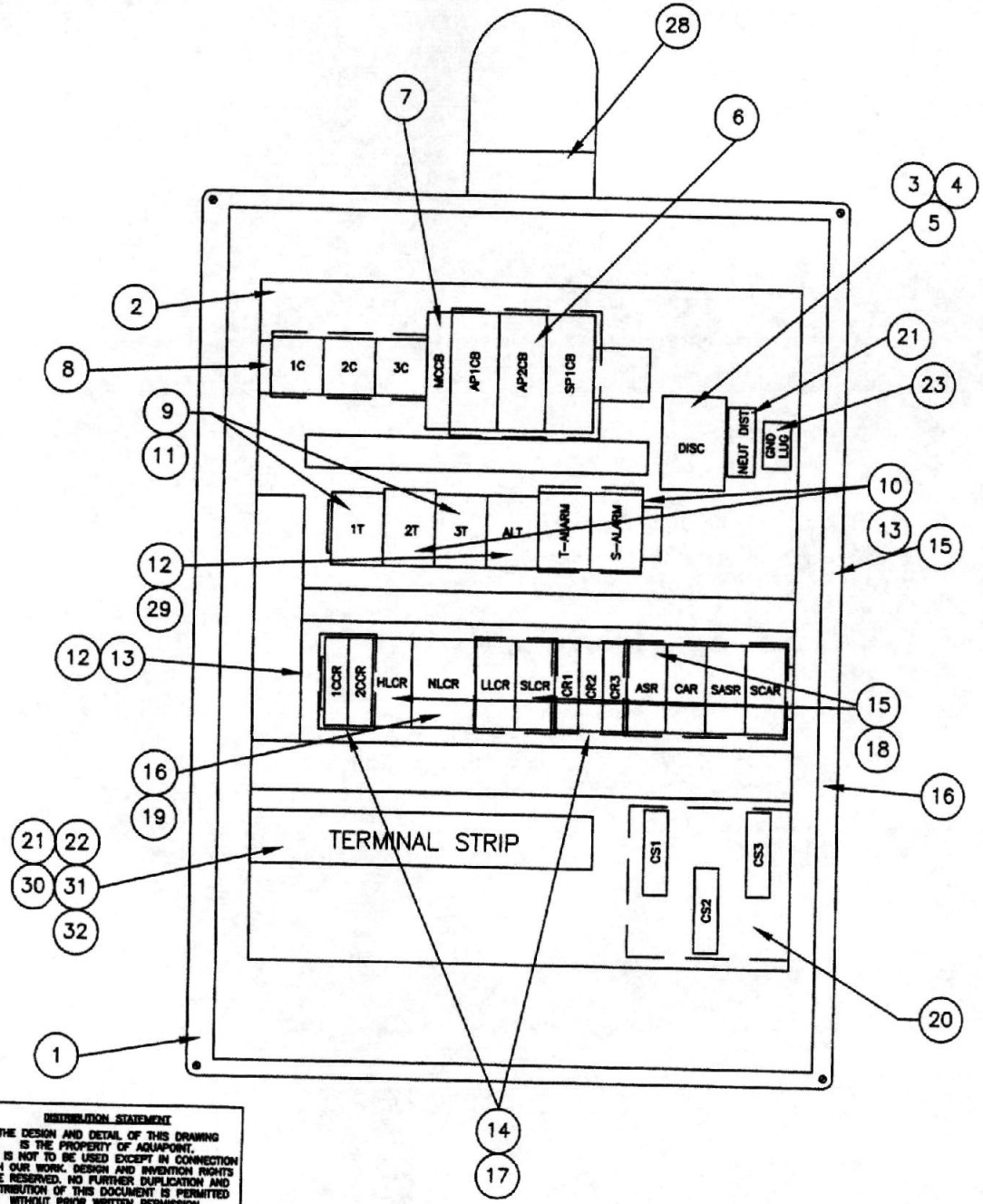
AquaPoint
241 DUCHAINE BLVD., NEW BEDFORD, MA 02745
(508) 998-7577 FAX (508) 998-7577

Equalization With Sludge Pump

AWT3079

51



ITEM NO.	QTY	MANUFACTURE	DESCRIPTION	PART NO.
32	6	ENTRELEC	TERMINAL END BLOCKS	10300206
31	4	ENTRELEC	TERMINAL BARRIERS	11831618
30	3	ENTRELEC	GROUND TERMINAL	15611316
29	1	TIMEMARK	ALTERNATOR	261D120
28	2	PATLITE	120V BEACON/ALARMS	RHB120AUL-R
27	2	IDEC	BLACK PUSHBUTTONS NO	ABW110
26	5	IDEC	3 POSITION SELECTORS	ASW320
25	4	IDEC	GREEN PILOT LIGHTS	APW199G120
24	1	OMRON	NO VOLTAGE COUNTER MID LEVEL	H7EC-N-B
23	1	ILSCO	GROUND LUG	TA1
22	13	ENTRELEC	30A TB'S	11511607
21	7	ENTRELEC	50A TB'S	11511811
20	3	DIVERSIFIED	CURRENT SENSORS	CMG100-020
19	1	IDEC	4 POLE RELAY SOCKET	SH4B-05
18	7	IDEC	2 POLE RELAY SOCKETS	SH2B-05
17	5	IDEC	1 POLE RELAY SOCKETS	SH1B-05
16	1	IDEC	4 POLE RELAY	RH4BULAC120
15	7	IDEC	2 POLE RELAYS	RH2BULAC120
14	5	IDEC	1 POLE RELAY	RH1BUAC120
13	3	IDEC	8 PIN SOCKET	SH2P-06
12	1	IDEC	11 PIN SOCKETS FOR ALTS	SR3P-06
11	2	IDEC	11 PIN SOCKETS FOR 1T, 3T	SR3P-05
10	3	IDEC	ON DELAY TIMERS 8 PIN	RH1BUAC120
9	2	CROUZET	REPEATCYCLE TIMERS	PL2R1
8	3	AEG	CONTACTORS	LS07.10A0
7	1	ABB	1 POLE 3A CIRCUIT BREAKER	S271S3A
6	3	ABB	2 POLE 13A CIRCUIT BREAKERS	S272K13A
5	1	ABB	SHAFT	OX5SX180
4	1	ABB	SELECTOR TYPE HANDLE	OHB2AJ1
3	1	ABB	45A 3 POLE DISCONNECT SWITCH	OT45E3
2	1	MCKINSTRY	SUBPANEL	42/2420
1	1	ROBROY	24 X 20 X 8 N4X BOX W/ INNER DOOR	N24208DFHWT

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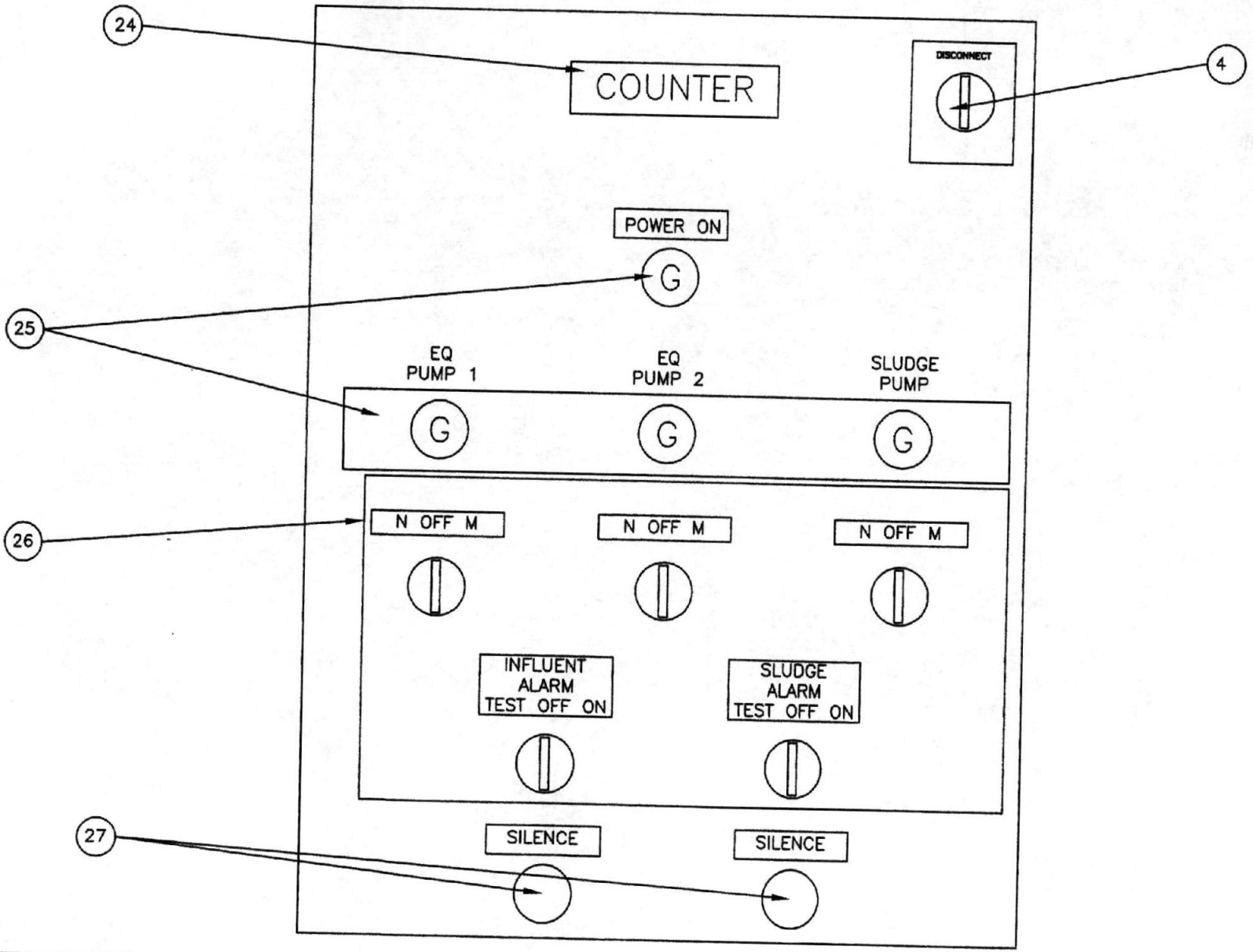
Equalization With Sludge Pump
REVISION A
DRAWING NO. AWT3079
SCALE: 1:8
SHEET 6 OF 6



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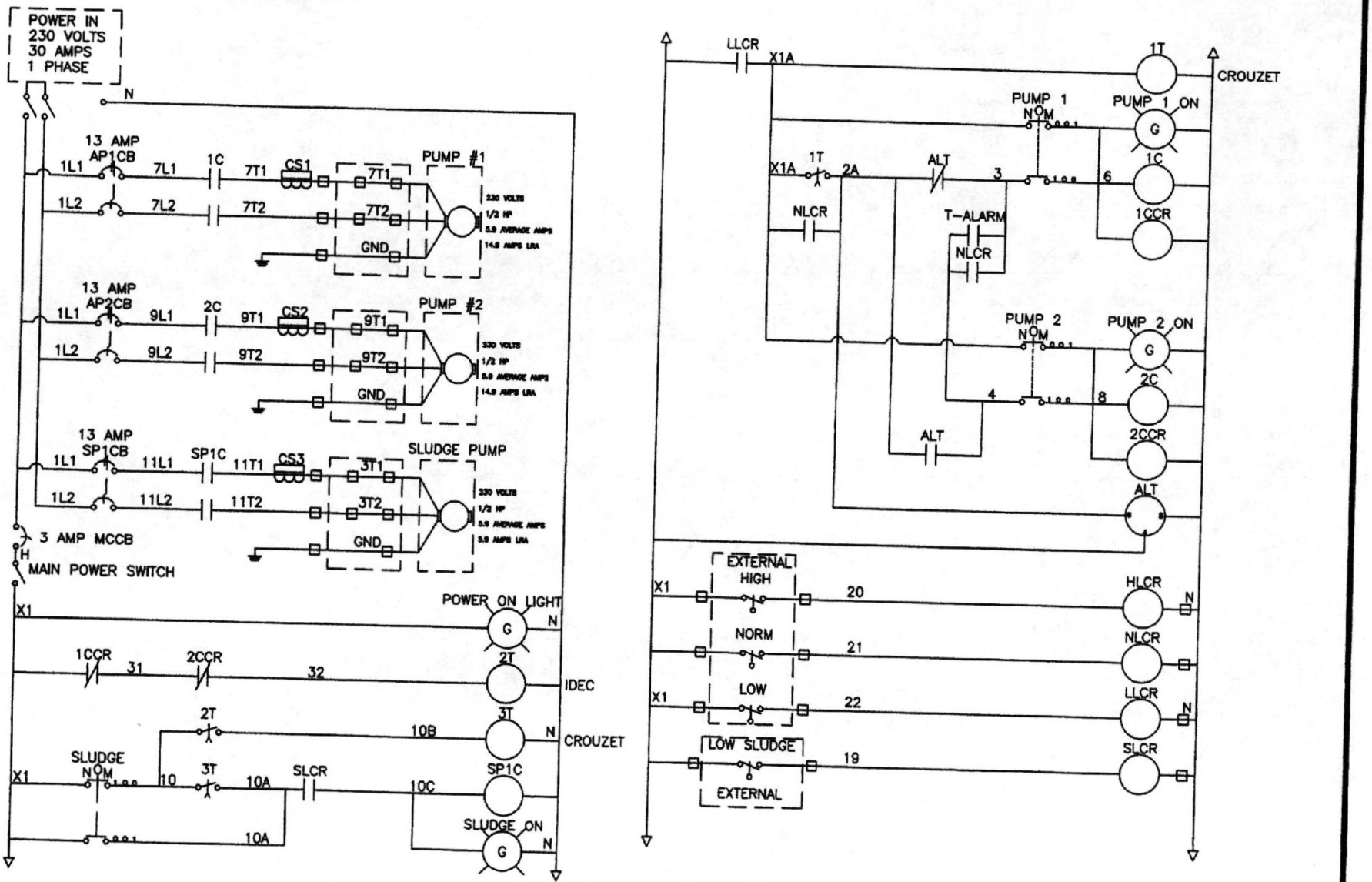
Equalization With Sludge Pump

SIZE B | REVISION B | DRAWING NO. AWT3079

SCALE 3/4 | FILE 3079_3_1.mdl | SHEET # 3 OF 5



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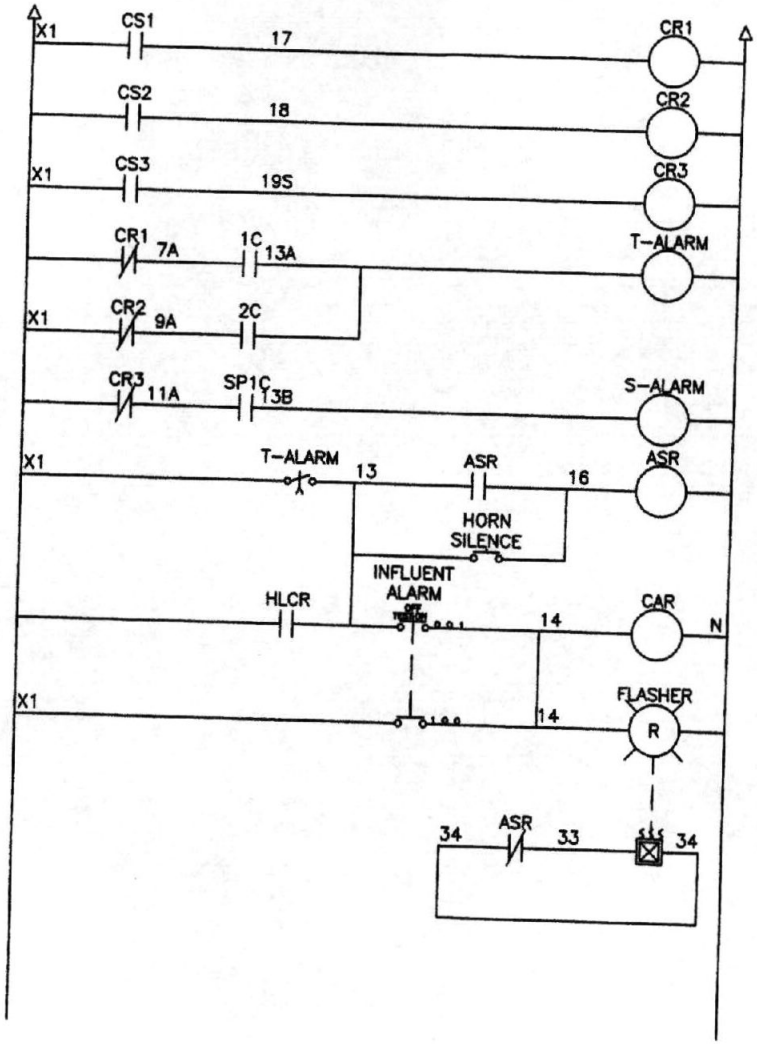
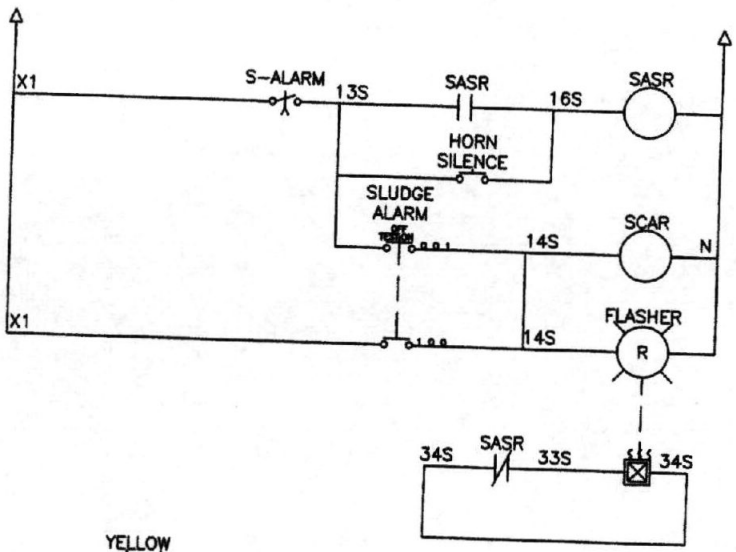
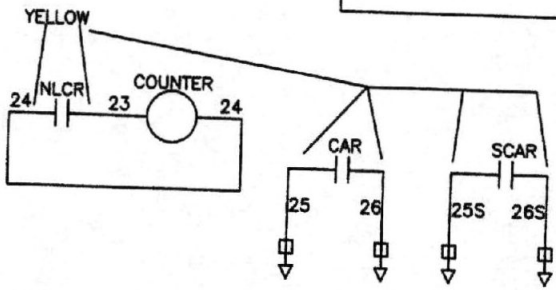
Equalization With Sludge Pump

AWT3079







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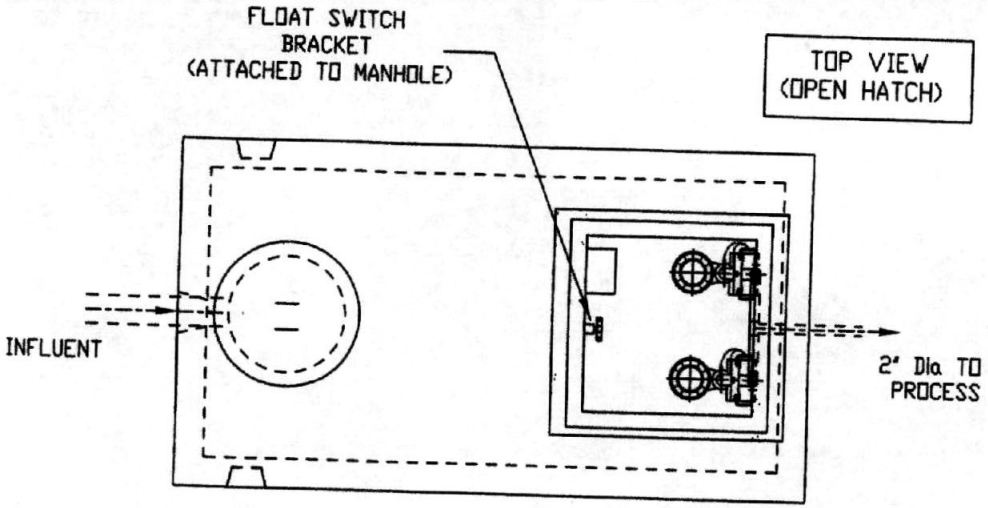
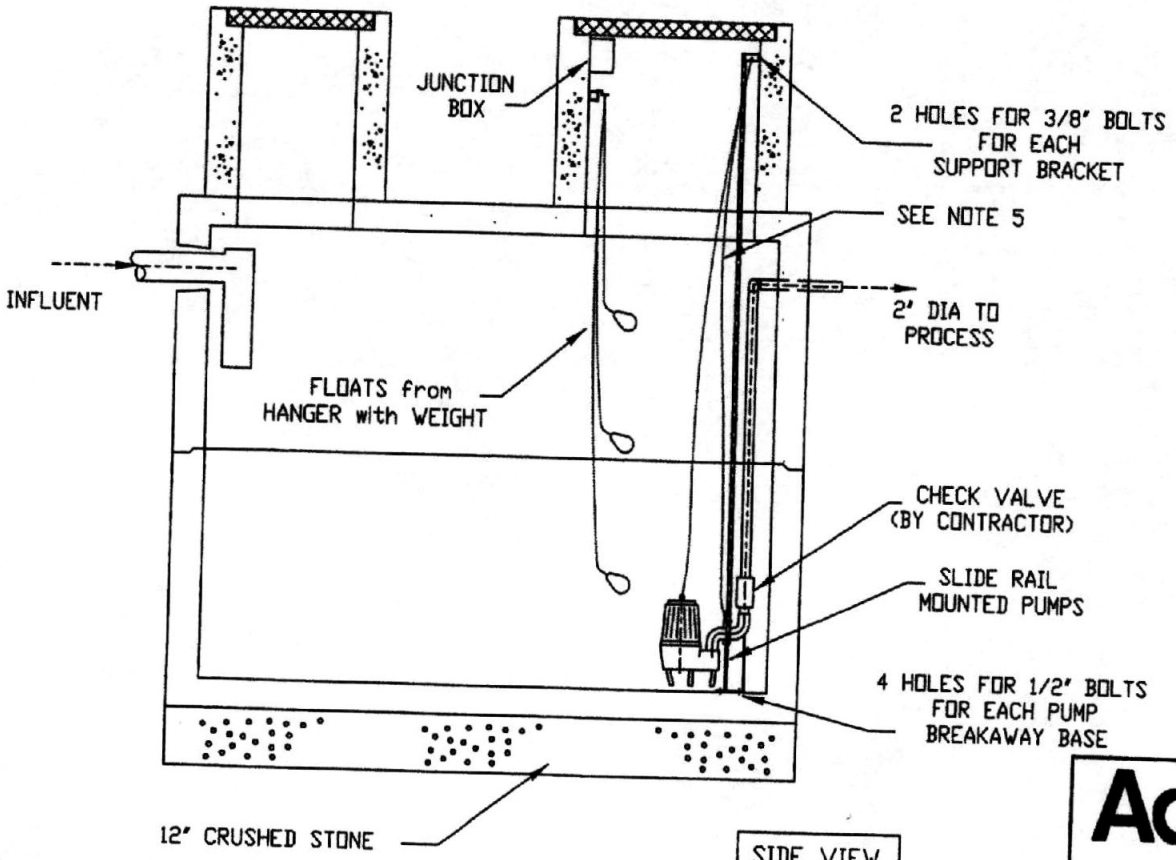
Equalization With Sludge Pump
AWT.3079



TOP VIEW
(OPEN HATCH)

NOTES FOR CONTRACTOR:

1. PUMPS, FLOATS, SLIDE RAIL ASSEMBLIES AND CONTROLS BY AQUAPOINT, HARDWARE BY CONTRACTOR.
2. TO BE INSTALLED BY GENERAL CONTRACTOR.
3. PROVIDE 3' x 3' (min) ALUMINIUM HATCH OVER PUMP ASSEMBLIES.
4. INSTALL JUNCTION BOX AND FLOAT HANGER AT TOP OF CONCRETE RISER.



SIDE VIEW

FLOAT SWITCH ELEVATION SETTINGS
1) LOW FLOAT SWITCH (OPEN):
3 TO 6 INCHES ABOVE TOP OF FEED PUMPS,
2) MID LEVEL FLOAT SWITCH (CLOSED) :
12 INCHES BELOW INLET TEE INVERT,
3) HIGH LEVEL FLOAT SWITCH (CLOSED):
6 INCHES BELOW INLET TEE INVERT.
(UNLESS SPECIFIED ON THE SITE PLANS)

Equalization Feed Assembly

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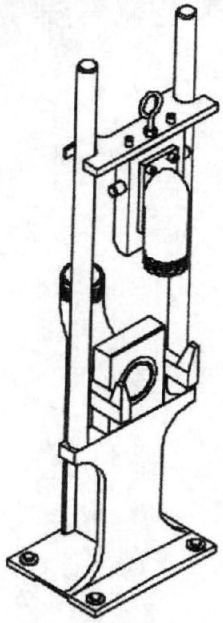
Making Waves in Water Resource Technology
241 DUCHAINE BLVD.
P.O. BOX 50120
NEW BEDFORD, MA 02745
(508) 998-7577 FAX (508) 998-7177

TITLE:	Equalization Feed with slide rail pumps.
DRAWING NO:	1256-18
REVISION:	G
DATE:	11/01/00
DWN BY:	P.WILLEY
SCALE:	1 : 40
SIZE:	A / A4
SHEET #:	1 of 1

BARNES®

1.25"- 3" BREAK AWAY FITTING
With or Without Check Valve.

SECTION	B
PAGE	15
DATE	11/02
REPLACES	3/02



Models: Without Check Valve

BAFEZ-1.25x2*

BAFEZ-2x2

BAFEZ-2x3

BAFEZ-3x3

Models: With Check Valve

BAFEZCV-1.25x2

BAFEZCV-2x2

Description:

THE BREAK AWAY FITTING IS DESIGNED TO ALLOW THE SUBMERSIBLE PUMP TO BE INSTALLED OR REMOVED WITHOUT REQUIRING PERSONNEL TO ENTER THE WET WELL.

Specifications:

Each BAFEZ break away fitting consists of a cast iron base elbow which is bolted to the floor of the wet well, lower guide rail supports, cast iron movable elbow (the BAFEZCV's include ball check valve and clean-out cap), which is free to ride up and down the guide rails, A sealing plate with o-ring seat and galvanized guide plate, and a stainless steel upper rail support.

The guide rails (supplied separately) are attached to the base elbow at one end and to a stainless steel Upper Rail support , which is attached to the underside of the wet well cover at the other end.
The guide rails serve only to guide, they carry none of the pump weight. 3/4" (19mm) schedule 40 pipe should be used for guide rails.

An optional intermediate guide pipe bracket should be used for depths of 13 feet (4M) or more. See page 31.

The BAFEZ's 1.25" and 2" are for pumps up to 200lbs. which do not generate in excess of 150 ft. of Head.

The BAFEZCV's (with Check Valve), 1.25" and 2" are for pumps up to 200lbs and are recommended for a velocity of 3 Ft. to 5 Ft. per sec. max.

The BAFEZ 3" is for pumps up to 200lbs which do not generate in excess of 150ft. of Head.

Quantity of One (1) each for Simplex and Two (2) for Duplex.
Assemblies **DO NOT** include Pump, Discharge piping, Guide Rails, Lifting Chain, nor Gate Valve with Handle.
* The 1.25 x 2 is supplied with an ultra close adapter.
Can be used with Basin Cover 101186 in Section C

CRANE
PUMPS & SYSTEMS
A Crane Co. Company

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Mansfield, Ohio 44907-2674
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Fax: (419) 774-1530
www.barnespumps.com

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Canada L6T 2J6
Ph: (905) 457-6223
Fax: (905) 457-2650

SECTION	B
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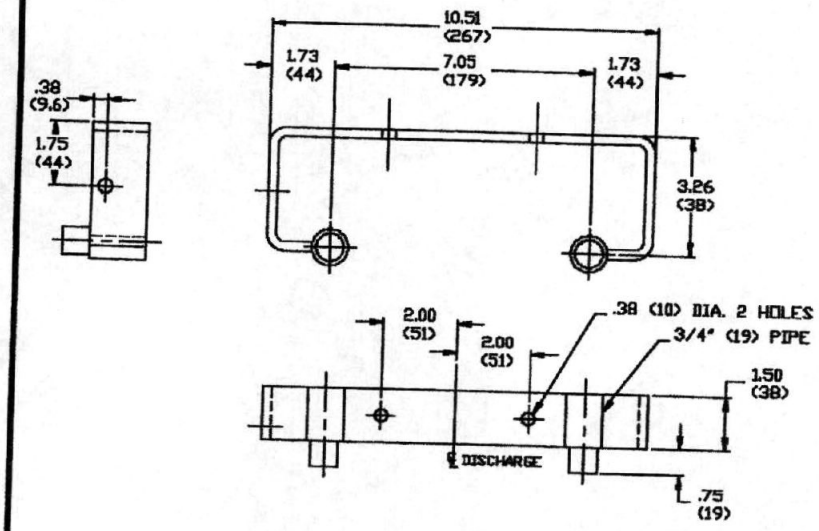
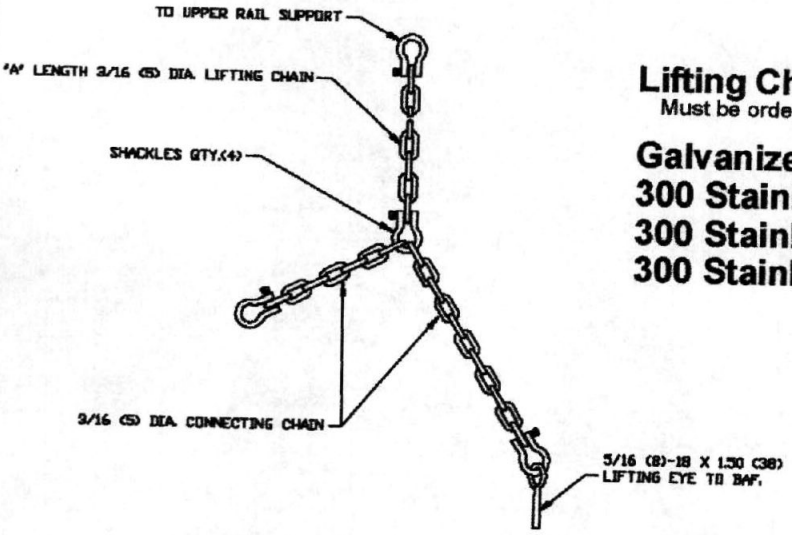
1.25"- 3" BREAK AWAY FITTING
Upper Guide Bracket & Lifting Chain.

inches (mm)



Stainless Steel Upper Rail Support, for BAFEZ's (Supplied with BAFEZ's)



Lifting Chain Assembly:
Must be ordered separately.

Galvanized Steel 10' (3M) P/N:	100564
300 Stainless 10' (3M) P/N:	100563
300 Stainless 15' (4.6M) P/N:	101312
300 Stainless 20' (6.1M) P/N:	101313

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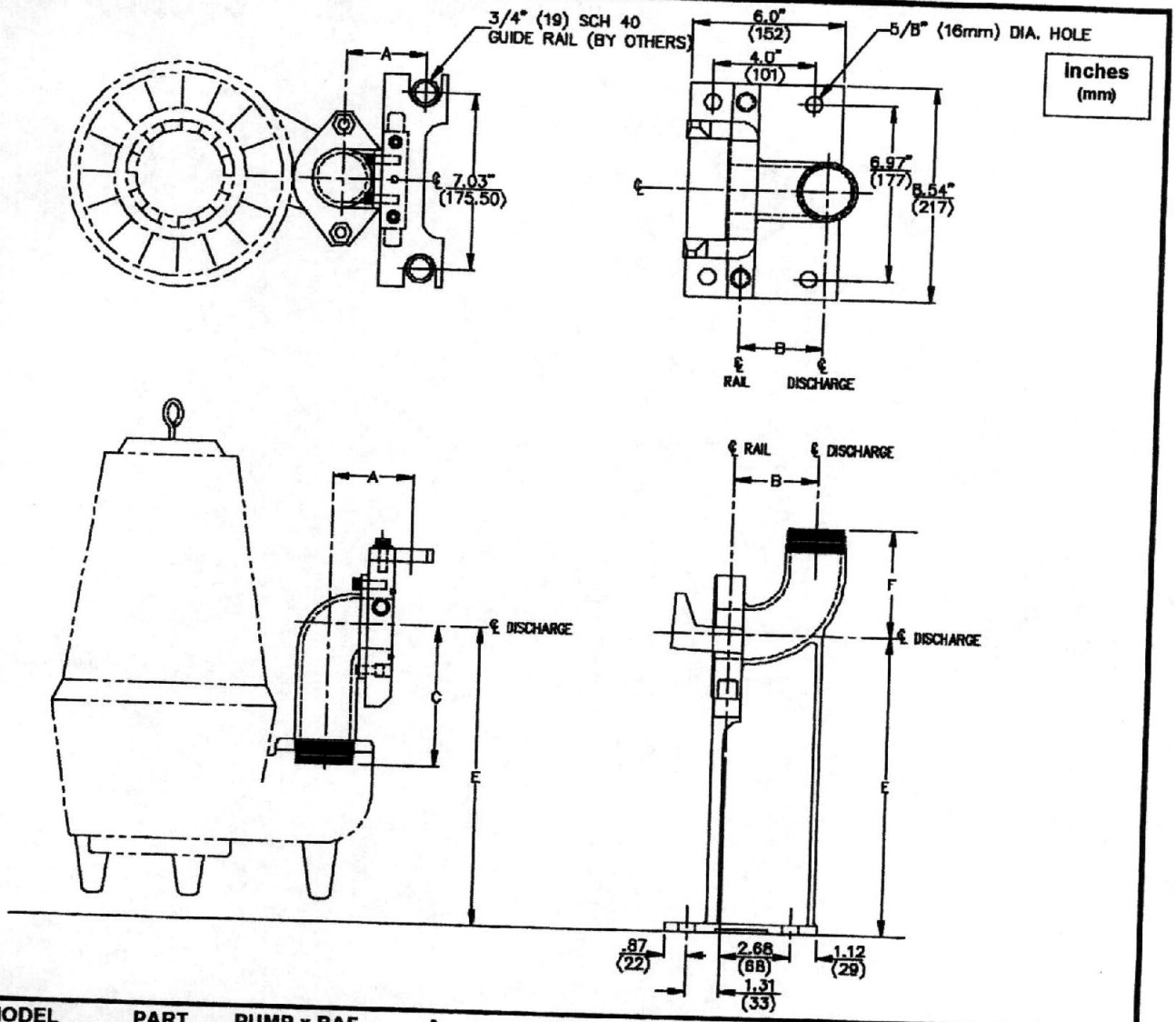
SECTION	B
PAGE	18
DATE	11/02
REPLACES	3/02

1.25", 2" & 3" BREAK AWAY FITTING
Without Check Valve



MODEL NO.	PART NO.	PUMP x BAF Disch. x Disch.	A	B	C	D	E	F
BAFEZ-1.25x2*	114030	1.25" x 2"	2.87 (73)	3.31 (84)	4.75 (121)	7.52 (191)	12.07 (307)	4.33 (110)
BAFEZ-2x2	114031	2" x 2"	3.20 (81)	3.31 (84)	5.32 (135)	6.75 (171)	12.07 (307)	4.33 (110)
BAFEZ-2x3	114032	2" x 3"	3.20 (81)	4.68 (119)	5.32 (135)	10.27 (261)	15.59 (396)	6.50 (165)
BAFEZ-3x3	114033	3" x 3"	3.97 (101)	4.68 (119)	5.64 (143)	9.95 (253)	15.59 (396)	6.50 (165)

* The 1.25 x 2 is supplied with an ultra close adapter.
See page 39 for OPTIONAL Intermediate Supports.
NOTE: Lifting Chain Sold Separately.

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Fax: (905) 457-2650

BARNES® - EQUALIZATION PUMPS

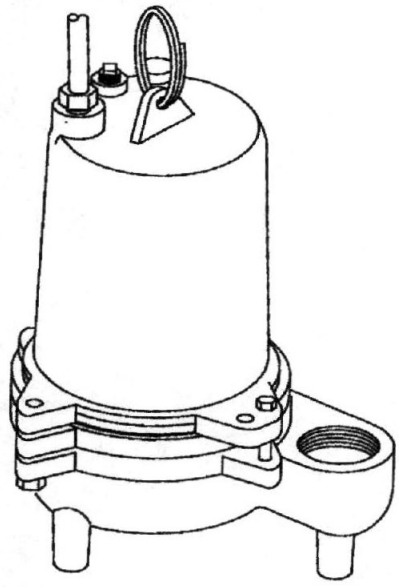
www.cranepumps.com

Series SE & SEV

2" Spherical Solids Handling
Manual & Automatic

1½", 2" & 3" Discharge

DISCHARGE	2" NPT, Female, Vertical
LIQUID TEMPERATURE	104°F (40°C) Continuous
VOLUTE	Cast Iron ASTM A-48, Class 30
MOTOR HOUSING	Cast Iron ASTM A-48, Class 30
SEAL PLATE	Cast Iron ASTM A-48, Class 30
IMPELLER: *Design*	**SE** - 2 Vane, Open. **SEV** - 12 Vane, Vortex. with pump out vanes on back side. Dynamically Balanced, ISO G6.3
Material	**SE** - Cast Iron ASTM A-48, Class 30 **SEV** - 81-3-7-9 Bronze
SHAFT	416 Stainless Steel
SQUARE RINGS	Buna-N
HARDWARE	300 Series Stainless Steel
PAINT	Air Dry Enamel
SEAL: *Design*	Single Mechanical, Oil Filled Reservoir, Secondary Exclusion Seal
Material	Carbon/Ceramic/Buna-N Hardware -300 Series Stainless
CORD ENTRY	15 ft. (5m) Quick Disconnect Cord with plug On 115 Volt, Pressure Grommet for sealing and strain relief
SPEED	1750 RPM (Nominal)
UPPER BEARING	Single Row, Ball, Oil Lubricated
Load	Radial
LOWER BEARING	Single Row, Ball, Oil Lubricated
Load	Radial & Thrust
MOTOR: *Design*	NEMA L Torque Curve, Oil Filled, Squirrel Cage Induction
Insulation	Class B
SINGLE PHASE	Permanent Split Capacitor (PSC) Includes Overload Protection in Motor
LEVEL CONTROL	**"A"** - Wide Angle, PVC, Mechanical, 15 ft (5m) cord with Piggy-Back Plug, N/O **"AU"**- Wide Angle, Polypropylene, Mechanical, N/O, Integral to pump. ON and OFF Points are adjustable **"VF"** - Vertical Float, PVC, Snap Action, 15 ft (5m) cord, with Piggy-Back plug. OFF point ONLY is adjustable
OPTIONAL EQUIPMENT	Seal Material, Additional Cord



Series:
SE .5HP, 1750RPM, 60Hz
SEV .5HP, 1750RPM, 60Hz

SWPA MEMBER

c SA® US
CSA 108
UL 778
LR16567

Sample Specifications: Section 1 Page 3.

DESCRIPTION:

SUBMERSIBLE NON-CLOG SEWAGE PUMP DESIGNED FOR TYPICAL RAW SEWAGE APPLICATIONS

* EQUALIZATION PUMPS

Series SE & SEV

2" Spherical Solids Handling
Manual & Automatic

BARNES®

www.cranepumps.com

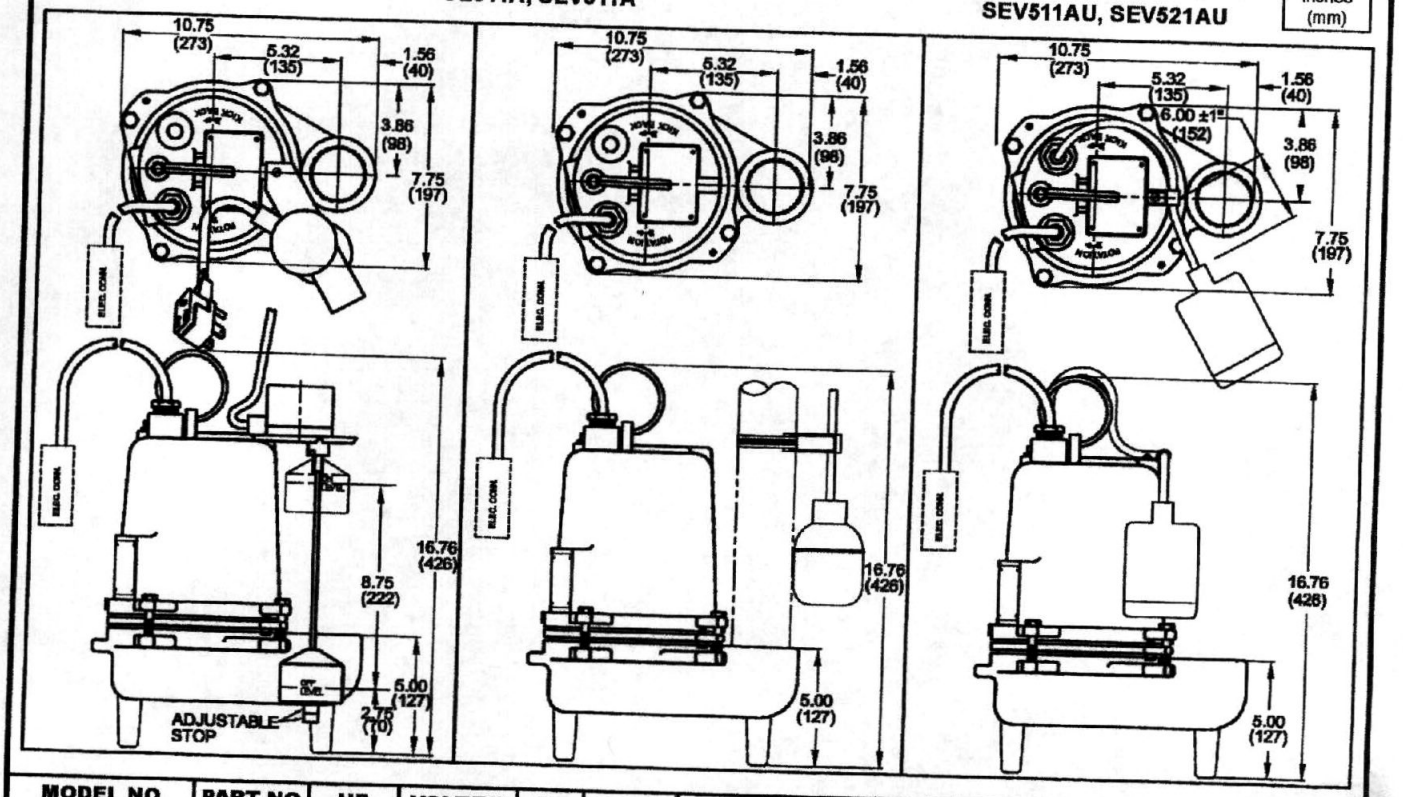
1½", 2" & 3" Discharge

SE511VF
SEV511VF

SE511, SE521, SEV511, SEV521 (Less Float)
SE511A, SEV511A

SE511AU, SE521AU,
SEV511AU, SEV521AU

inches (mm)



MODEL NO	PART NO	HP	VOLT/PH	Hz	RPM (Nom)	NEMA START CODE	FULL LOAD AMPS	LOCKED ROTOR AMPS	CORD SIZE	CORD TYPE	CORD O.D Inch (mm)
SE511	096752	0.5	115/1	60	1750	A	12.0	26.0	14/3	SJTOW	0.375 (9.5)
SE511A	096753	0.5	115/1	60	1750	A	12.0	26.0	14/3	SJTOW	0.375 (9.5)
SE511AU	096754	0.5	115/1	60	1750	A	12.0	26.0	14/3	SJTOW	0.375 (9.5)
SE511VF	100837	0.5	115/1	60	1750	A	12.0	26.0	14/3	SJTOW	0.375 (9.5)
SE521	096755	0.5	230/1	60	1750	A	6.2	13.0	14/3	SJTOW	0.375 (9.5)
SE521AU	096756	0.5	230/1	60	1750	A	6.2	13.0	14/3	SJTOW	0.375 (9.5)
SEV511	096757	0.5	115/1	60	1750	A	12.0	26.0	14/3	SJTOW	0.375 (9.5)
SEV511A	096758	0.5	115/1	60	1750	A	12.0	26.0	14/3	SJTOW	0.375 (9.5)
SEV511AU	096759	0.5	115/1	60	1750	A	12.0	26.0	14/3	SJTOW	0.375 (9.5)
SEV511VF	100838	0.5	115/1	60	1750	A	12.0	26.0	14/3	SJTOW	0.375 (9.5)
SEV521	096760	0.5	230/1	60	1750	A	6.2	13.0	14/3	SJTOW	0.375 (9.5)
SEV521AU	096761	0.5	230/1	60	1750	A	6.2	13.0	14/3	SJTOW	0.375 (9.5)

Mechanical Switch on SE-A, cord 16/2, SJOW, Piggy-Back Plug
Mechanical Switch on SE-AU, cord 14/2, SJOW, 0.370 (9.4mm) O.D.
Vertical Switch on SE-VF, cord 16/2, SJOW, 0.320 (8.1mm) O.D. Piggy-Back Plug

IMPORTANT !

1.) PUMP MAY BE OPERATED "DRY" FOR EXTENDED PERIODS WITHOUT DAMAGE TO MOTOR AND/OR SEALS.
2.) THIS PUMP IS APPROPRIATE FOR THOSE APPLICATIONS SPECIFIED AS CLASS I DIVISION II HAZARDOUS LOCATIONS.
3.) THIS PUMP IS NOT APPROPRIATE FOR THOSE APPLICATIONS SPECIFIED AS CLASS I DIVISION I HAZARDOUS LOCATIONS.
4.) INSTALLATIONS SUCH AS DECORATIVE FOUNTAINS OR WATER FEATURES PROVIDED FOR VISUAL ENJOYMENT MUST BE INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE ANSI/NFPA 70 AND/OR THE AUTHORITY HAVING JURISDICTION. THIS PUMP IS NOT INTENDED FOR USE IN SWIMMING POOLS, RECREATIONAL WATER PARKS, OR INSTALLATIONS IN WHICH HUMAN CONTACT WITH PUMPED MEDIA IS A COMMON OCCURRENCE.

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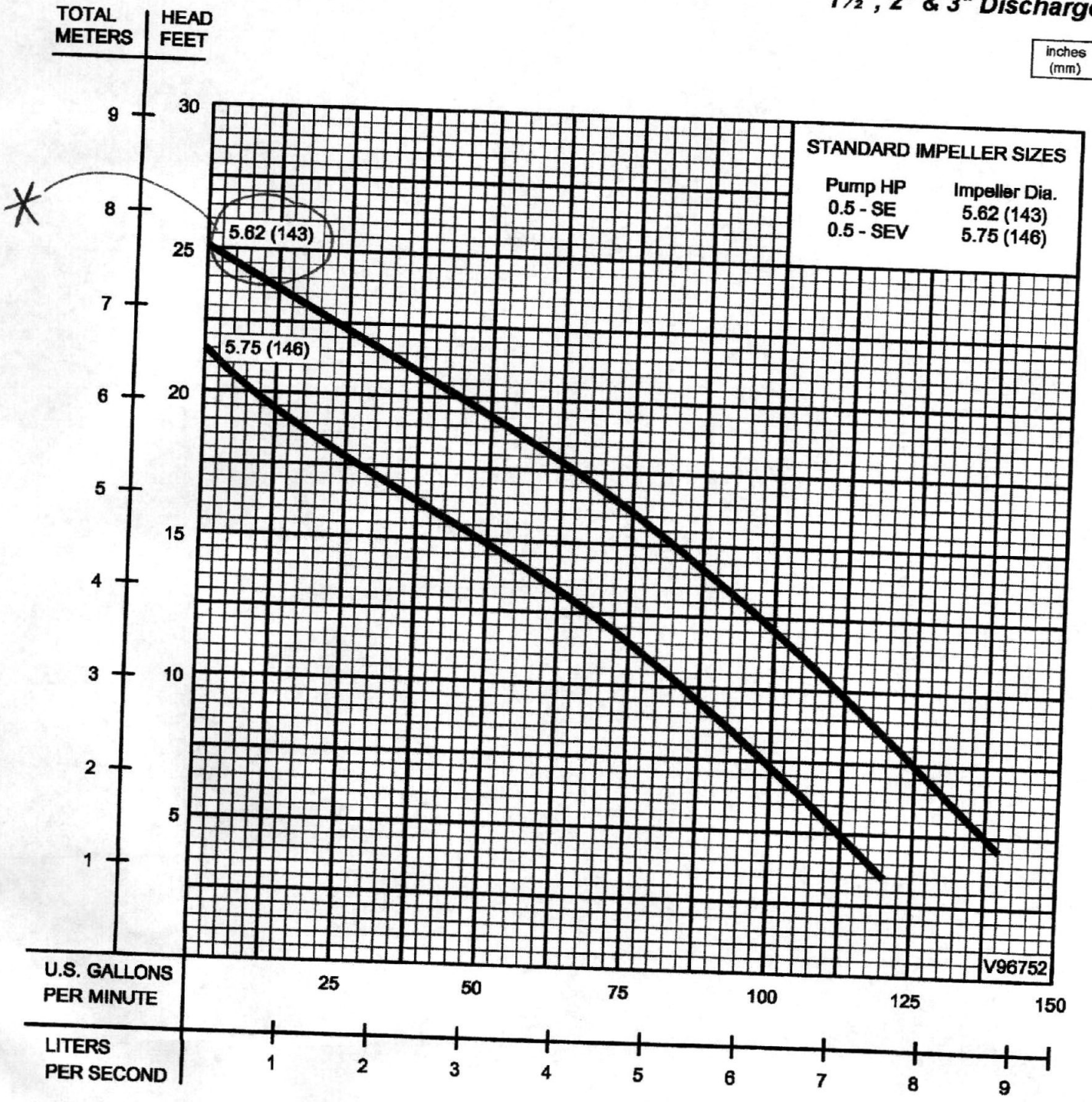
Series SE & SEV

Performance Curve
.5HP, 1750RPM, 60Hz

1½", 2" & 3" Discharge

inches (mm)



Testing is performed with water, specific gravity 1.0 @ 68° F @ (20°C), other fluids may vary performance