
# PLUMBING HANDBOOK

# 2015-2016

# CONTENTS

**SOURCES OF INFORMATION**

# A MESSAGE FROM THE PRESIDENT

The Cleveland Chapter of the American Society of Plumbing Engineers is proud to present the Eighth Edition of the ASPE Plumbing Handbook for your use.

This Handbook has once again been completely updated and includes a list of National and Cleveland Chapter Board Members including our Local Chapter Members. These lists include the latest mailing addresses, phone numbers, fax numbers and email addresses.

We have once again included numerous Plumbing Details in the Handbook for your use. Please feel free to use any of these details, but they should be used with caution and modified to comply with your particular project needs.

The Sources of Information, Local Code Officials, Plumbing Contractor and Sprinkler Contractor sections have been updated. These sections include the latest information possible and will help you in your day to day responsibilities.

As in previous editions of the Handbook, we could not provide the information within this book without the help and support of our Advertisers. I would like to thank them once again and ask that you support those who helped make this reference book a success.

I would also like to thank Dan Evans and Mike Drab for spending many hours of their free time putting together this latest edition. A lot of work goes into putting together a reference book of this magnitude and we could not have done it without their help.

In addition to this handbook, you can visit the Society website at www.aspe.org and the Cleveland Chapter website at www.clevelandaspe.org for additional information. These web sites are updated on a regular basis and will give you the latest news and information regarding our Society. Please give Mike Drab your ongoing support for a job well done in managing our web site and newsletter.

In closing, I hope that you find this Handbook useful and a valuable resource that will help you in your daily routines. Please be generous and share this reference book with your colleagues, they too will benefit from it. This publication is one more reason to be e member of ASPE and why keeping involved is so important for networking and for this organization.

Keith Bush, CPD, CSI
President

# AMERICAN SOCIETY OF PLUMBING ENGINEERS

**2980 S. River Road • Des Plaines, IL 60018-4203**
**Telephone: (847) 296-0002 • Fax: (847) 296-2963**
**E-mail: info@aspe.org**
**Web Site: www.aspe.org**

## SOCIETY BOARD OF DIRECTORS

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## REGIONAL DIRECTORS

### *Region 1 (Northeast)*

*Region 1 Director*
**Paul Silvestre**
(215) 639-3600
E:Mail: asper1director@aspe.org

| | |
|---|---|
| Baltimore | New York City |
| Boston | Quebec City |
| Capital Region NY | Ottawa |
| Central New York | Philadelphia |
| Montreal | Richmond |
| New Jersey | Washington, D.C. |
| Virginia Blue Ridge | Connecticut |

### *Region 2 (Great Lakes)*

*Region 2 Director*
**Chris L. Graham, CPD**
(724) 477-1254
E:Mail: asper2director@aspe.org

| | |
|---|---|
| Central Indiana | Pittsburgh |
| Central Ohio | Rochester, NY |
| Cleveland | Southwestern Ohio |
| Eastern Michigan | Buffalo-Niagara |
| Johnstown | Western Michigan |
| Kentucky | |

### *Region 3 (Southeast)*

*Region 3 Director*
**David H. Anelli**
(470) 992-6320
E:Mail: asper3director@aspe.org

| | |
|---|---|
| Alabama | Nashville |
| Atlanta | New Orleans |
| Central Florida | North Florida |
| Memphis | Greenville |
| Miami | West Coast Florida |
| Raleigh | East Tennessee |
| Columbia | Charlotte |

### *Region 4 (Western)*

*Region 4 Director*
**Chris W. Scott**
(503) 382-2686
E:Mail: asper4director@aspe.org

| | |
|---|---|
| British Columbia | Phoenix |
| Denver | Portland |
| Intermountain | San Diego |
| Los Angeles | San Francisco |
| Northern California | Southern Nevada |
| Orange County | |

### *Region 5 (Midwest)*

*Region 5 Director*
**Kelvin H. Kennedy**
(972) 789-2639
E:Mail: asper5director@aspe.org

| | |
|---|---|
| Central Illinois | Kansas City |
| Central Texas | Minnesota |
| Chicago | Omaha |
| Dallas/Fort Worth | St. Louis |
| Houston | Wisconsin |
| High Plains | Tulsa |

# CERTIFIED IN PLUMBING DESIGN

The American Society of Plumbing Engineers sponsors the Certified in Plumbing Design (CPD) program – The international certification program for engineers and designers of plumbing systems. Completion of the CPD program and examination confers upon the successful candidate the designation CPD "Certified in Plumbing Design". The certification program provides the profession, the plumbing industry, and the general public with a single, comprehensive qualification of professional competence for engineers and designers of plumbing systems.

The CPD is the only international credential program in the plumbing engineering field. It sets the standards for leadership within the industry and provides formal recognition of outstanding professionals with advanced skills in the design and specification of plumbing systems. The CPD designation is designed to:

- Establish specific standards for professional competence in the field.
- Identify and recognize those individuals who successfully demonstrate their acquired knowledge and abilities.
- Encourage plumbing engineers to participate in a continuing program of professional development.
- Provide a standard for educational programs in plumbing engineering.
- Enhance the status of plumbing engineering as a unique discipline.

The CPD designation is achieved through successful completion of the comprehensive CPD examination and maintained through a biennial recertification program. The examination is typically held in the month of April of even-numbered years and eligibility requires a minimum of eight years experience (or equivalent). Created to provide a single, uniform national credential in the field of engineered plumbing systems, the CPD program is not in any way connected to any state-regulated Professional Engineer (P.E.) registration.

# ASPE RESEARCH FOUNDATION

The Research Foundation of the American Society of Plumbing Engineers was established in 1976 to foster a continuing program of technical research in the field of plumbing design and engineering. With this research, it is hoped to significantly expand the body of scientific knowledge in the field, to the benefit of the profession and the general public.

## FOCUS OF THE FOUNDATION

The Foundation is an organization that is not equipped to undertake major definitive research involving huge financial obligations and years of coordinated effort from geographically and professionally dispersed participants to the end that published results have no direct, timely or even foreseeable returns to individual ASPE members or Foundation coffers. However, the Foundation is equipped to take on basic research. All major definitive research has its basis in basic research conducted for the purpose of stimulating interest and obtaining funding for a specific topic of interest to the profession. Typically, basic research references existing literature and illustrates questions, contradictions and inconsistencies in a particular topic with the purpose of focusing further on resolving these issues by definitive research. Your ASPE Research Foundation is ideally suited to the generation of such basic research and subsequent funding pursuits. Expenditures for basic research with the purpose of generating larger externally funded research, then become a proportional investment in future royalties rather than a recurring unrecoverable expense.

Two basic research papers have recently been developed with future topics being reviewed. The two papers, which will be available to members for downloading from the Research Foundation's website in the near future, are:

- Scalding Temperatures Relative to Age and Physical Condition of a Person
- Emergency Eyewash and Shower Equipment: A Comprehensive Literature Review and Comparison

## FINANCIAL SUPPORT

Like all non-profit organizations, the ASPE Research Foundation, Inc. depends on voluntary contributions for the conduct of the research it supports. It receives contributions from ASPE members, chapters and regions as well as industry related organizations. The Foundation's Board of Directors is very appreciative of all the contributions that are received from these sources. When definitive external research is

conducted on the basic research topics developed by the Foundation, the organization will experience royalties to assist in future basic research projects.

Because of its non-profit status, all donations to the ASPE Research Foundation, Inc. are fully tax deductible – private, individual contributions as well as corporate gifts.

## CONTACT THE FOUNDATION

If anyone has any questions, comments or requests for information, they may contact the Foundation at their email address: asperf@aspe.org.

# AIMS OF ASPE

The objects of the Society are:

- To further the interest of the members through the development of their technical expertise, and to enable them to better perform the responsibilities of their positions.

- To improve the profession of plumbing engineering and thereby benefit the general public.

- To assist in solving professional problems among the engineering community as such problems affect the profession and the general public.

- To promote research in the field of plumbing engineering, and to extend the body of professional knowledge and expertise.

- To facilitate the exchange of information throughout the professional practices and responsibility, statistical research, governmental regulations, standards and/or certifications, standardized methods of keeping book and records, and related topics of interest to others.

- To advance the general scientific interest and education of the plumbing engineering profession, to inculcate the desire for scientific advancement in the field among members of this Society, and to provide appropriate recognition of significant accomplishments in this area.

- To foster greater cooperation and understanding between the members of the Society and the plumbing officials and other related professionals with whom they interact.

- To encourage participation by members on such public interest bodies as Code Committees and Standards Committees.

- To establish, register and gain public acceptance of a Society certification mark indicating a specific degree of professional expertise.

- To sponsor an engineering course of study.

# HOW ASPE SERVES ITS MEMBERS

ASPE is serving its members and the plumbing engineering profession in many important ways:

- TECHNICAL DATA on plumbing engineering and the presentation of technical reports.
- OPPORTUNITY TO SHARE information and experience with others in their field.
- PLUMBING ENGINEERING DESIGN HANDBOOKS - the only handbook of plumbing design of its kind.
- ADVANCED RESEARCH, sponsored and conducted through the ASPE Research Foundation, and the publication of advanced technical materials in the ASPE Journal.
- DEVELOPMENT OF CODES and standards, through involvement with national organizations.
- CHAPTER-SPONSORED COURSES in plumbing design for those in, and entering, the profession.
- REPRESENTATION OF THE PLUMBING ENGINEER through involvement with other organizations and creation of better communication within the construction industry.
- FELLOWSHIP among plumbing engineers and members of the plumbing industry.

# MEMBERSHIP

## MEMBERSHIP AND APPLICATION PROCEDURES

Today, more than 7000 members around the world are part of the ASPE family.

All members belong to ASPE nationally and, in those areas throughout the United States and Canada where local chapters exist, to those as well. There are currently (62) chapters.

Membership in ASPE is designed primarily for engineers and designers involved in the design and specification of plumbing systems. There are also categories for manufacturers and representatives, code officials and municipal inspectors, contractors, educators and students, and virtually all others who are interested in the plumbing industry.

Membership Categories:

1. **FULL MEMBER**: Eight (8) years of experience in plumbing engineering, a minimum of four (4) years of which must have been in a position of responsibility for the design of plumbing systems.

   A maximum of four (4) years of experience may be waived by the Society Vice President Membership for:

   a. Education: One half (½) year for each completed year in a curriculum related to plumbing engineering;
   b Engineering Registration: Four (4) years for Professional Engineering registration in a field that includes plumbing engineering; and
   c. CPD Certification: Two (2) years.

2. **ASSOCIATE MEMBER**: Any individual involved in the design of plumbing systems or in plumbing engineering and not meeting the requirements for Full membership.

3. **AFFILIATE MEMBER**: Any individual involved in producing or marketing a plumbing product who does not meet the qualifications or requirements of membership in any other grade.

4. **PRESIDENTIAL MEMBER**: The outgoing President of the Society shall become a Presidential Member upon installation of a successor and shall retain all rights, privileges and responsibilities of a Full Member.

5. **GOVERNMENTAL MEMBER**: Anyone employed by municipal, state of federal government for one of the following reasons: (a) the checking and/or inspection of plumbing plans and installations; (b) the formulation of codes, rules requirements and regulations pertaining to the planning, designing and installation of plumbing systems, or any portion of a plumbing system; (c) the research and developing of plumbing systems and design criteria.

   Exception: Persons employed by municipal, state or federal government for the purpose of designing and/or specifying plumbing systems shall be eligible for membership as Full Members or Associate Members, provided they have fulfilled the experience requirement as outlined for each respective classification.

6. **SPECIAL MEMBER**: Anyone employed by or doing business as a contractor or having a special interest in plumbing design, who does not meet any of the qualifications for membership in any other grade.

   Exception: Persons employed by contractors or separate division of contractor for the exclusive purpose of designing and/or specifying plumbing systems shall be eligible for membership as Full Members or Associate Members, provided they have fulfilled the experience required as outlined for each respective classification.

7. **STUDENT MEMBER**: Any individual attending a recognized University or College full time (12 credit hours per term minimum) in curriculum related to plumbing design.

8. **RETIRED MEMBER**: Any retired member with ten (10) years of continuous membership in the Society who has reached the age of sixty (60) years and is no longer active in the profession.

9. **HONORARY MEMBER**: The Society's board of Directors may recommend, upon its own initiative or when so requested by the two-thirds (2/3) majority vote of a chapter's membership, Honorary Membership for anyone deemed worthy by action or contribution to the Society or the plumbing profession. Such recommendations shall be ratified by a two-thirds (2/3) majority vote of delegates at the Society's convention. Proposed recommendations shall be presented to the delegates forty-five (45) days prior to the Society's convention.

10. **LIFE MEMBER**: The Society's board of Directors, after nomination by a Chapter Board of Directors, may grant upon verification of retirement, Life Membership status to any retired person who has been a Member in good standing continuously during the past ten (10) years and has demonstrated significant contributions to the Chapter and the Society. The Life Member shall also have reached the age of sixty (60) years and no longer be active in the profession.

# MEMBERSHIP BENEFITS

Chapter meetings are held monthly, providing members with an opportunity to hear and question authorities within the plumbing engineering field.

The Plumbing Engineering Design Handbooks published by ASPE, incorporates design sections which are constantly being updated and revised, reflecting current advances in the science of Plumbing Engineering.

ASPE holds an Engineering Plumbing Exposition concurrently with its biennial Convention. This exposition brings together the leading manufacturers to enable them to display their new or improved products. Also, many new design concepts are displayed or presented at the many technical seminars.

Members receive “Plumbing Systems and Design Magazine”, the Society’s journal which is an authoritative periodical on engineering, research, development design and news in the field of plumbing.

# ASPE PROJECTS

**TECHNICAL**

ASPE technical committees review plumbing engineering data and present technical reports. By sharing experience and knowledge and publishing the Plumbing Engineering Design Handbooks, ASPE assists its members in improving design methods.

**CODES AND STANDARDS**

ASPE is actively participating in the development of codes and standards.

Through membership on code and standard groups, ASPE works for improvement and uniformity of national codes and standards.

**EDUCATION**

ASPE sponsors courses of instruction in plumbing design. Courses are taught by experts and specialists in the field. Each course is under the auspices of the local ASPE Chapter.

**INDUSTRY RELATION**

ASPE has organized committees toward a better understanding among members of the construction industry in the solution of their common problems.

# ASPE PLUMBING ENGINEERING DESIGN HANDBOOKS

**ASPE Data Book Volumes**:

Volume 1 Fundamentals of Plumbing Engineering (2009-2010)
Volume 2 Plumbing Systems (2011)
Volume 3 Special Plumbing Systems (2006-2007)
Volume 4 Plumbing Components and Equipment (2008)

Please Visit the ASPE website @ www.aspe.org for additional publications.

# CLEVELAND CHAPTER
# AMERICAN SOCIETY OF PLUMBING ENGINEERS

**P.O. Box 5962**
**Cleveland, Ohio 44101-0962**

## CLEVELAND CHAPTER BOARD OF DIRECTORS

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**KEITH BUSH, CPD, CSI**

*V.P. Technical*
**JOHN VARGA**

*Administrative Secretary*
**TIM HOLLO**

*V.P. Legislative*
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*Corresponding Secretary*
**CRAIG McDOWELL**

*V.P. Membership*
**GREG TROMBOLD**

*Treasurer*
**KEVIN NOBLE, P.E., LEED AP**

### Past Presidents

| | |
|---|---|
| Murray Herzog* | April 1974 - May 1977 |
| John Nagle* | May 1977 - May 1978 |
| Joseph Zaffuto | May 1978 - May 1980 |
| Murray Herzog* | May 1980 - May 1981 |
| Joseph Zaffuto | May 1981 - May 1983 |
| Richard Uszko* | May 1983 - May 1985 |
| Paul Sheridan | May 1985 - May 1987 |
| Andrew Kovesdi | May 1987 - May 1989 |
| Salvatore Traina* | May 1989 - May 1991 |
| Edward F. Liggett | May 1991 - May 1993 |
| John A. Serwatka | May 1993 - May 1995 |
| Ronald C. Hegadore | May 1995 - May 1997 |
| John A. Serwatka | May 1997 - May 1999 |
| Ronald C. Hegadore | May 1999 - May 2000 |
| Keith Bush | May 2000 - May 2002 |
| Mitch Clemente | May 2002 - May 2007 |
| Michael D. Drab | May 2007 - May 2010 |
| Keith Bush | May 2010 - Present |

*Deceased

# ASPE CLEVELAND CHAPTER GOALS FOR 2010-2012

1. Teach plumbing engineering to Engineers, Contractors and Representatives.

2. Increase the practical knowledge of plumbing selection, design and installation to the plumbing community.

3. Maintain interest in the American Society of Plumbing Engineers with our peer group.

4. As always, learn a little each day and have fun doing so.

## AMERICAN SOCIETY OF PLUMBING ENGINEERS (ASPE)

ASPE was incorporated in 1964 as a non-profit organization, devoted exclusively to the interests and concerns of the plumbing engineer. Its membership includes Plumbing Engineers, Designers, Cad Operators, Specifiers, Governmental Authorities and Contractors.

ASPE members today enjoy the most extensive organization through which they can exchange data, knowledge and experience with others in their field.

## HISTORY OF THE CLEVELAND CHAPTER

Interest in forming a chapter in Cleveland began in early 1973. Eventual interim officers and charter members met to plan the chapter.

A letter of intent to organize was sent to Marianna Frankel, Administrative Secretary of ASPE National. Her acknowledgment of that letter dated July 5, 1973 was received by a chief organizer, Murray Herzog.

On July 15, 1973, Donald Sampler, then National 3rd Vice President, sent a letter to organizers describing procedures and requirements needed to form a chapter. The key requirement was twenty people who qualified as full or associate members. Through the dedication and hard work of the future interim officers and charter members, success was achieved in March, 1974.

April 3, 1974 was selected as the date of the initial Chapter meeting. George Runkle, Jr. the President of ASPE National at that time was present and officiated. During this first meeting, interim officers were elected to head the new Cleveland Chapter.

The newly elected interim officers developed plans for funding the chapter and selected a meeting site, The Cleveland Engineering and Scientific Center on Chester Avenue. It was also decided that the Chapter meetings were to be held on the third Wednesday of each month. A loan was then provided by ASPE National on April 17, 1974 in the amount of one hundred dollars to help get the Chapter started.

ASPE bylaws also required a prospective Chapter to hold three meetings prior to petitioning for its charter. On May 15, 1974, a formal petition was sent to Marianna Frankel. On May 22, 1974 the first formal Chapter meeting took place during which election of the next years officers took place. The original organizers and interim officers were all elected to the permanent posts.

July 20, 1974 was chosen for celebrating the inception of the new Cleveland Chapter of the American Society of Plumbing Engineers. Dr. Alfred Steel, then treasurer of ASPE National made the presentation to the Chapter.

The Cleveland Chapter had the honor of hosting the 1995 ASPE symposium. Chapter President Ron Hegadore hosted the event that was held at the Marriott Hotel at Key Tower in downtown Cleveland. The event was well attended and included numerous seminars and a product show. In fact, it was the first time continuing education units were offered to those attending the seminars.

ASPE also offered tours of Jacobs Field, home of the Cleveland Indians, the Rock-n-Roll Hall of Fame, Moen headquarters and the Inventors Hall of Fame in Akron.

The first formal Cleveland Chapter meeting was held on May 22, 1974. On May 12, 2004 the Chapter celebrated its 30th Anniversary at the monthly meeting. The celebration was held at Harry's Steakhouse in Independence and inaugural Board Members Craig McDowell, Joe Zaffuto and Region Two Chairman Dave Hudson were in attendance. Dave presented Chapter President Mitch Clemente with a plaque and emblem recognizing the milestone.

The 2004 National Plumbing Engineering Exposition and Convention was held in Cleveland and hosted by the Chapter. The Convention took place from October 23rd through October 27th and was held at Cleveland Public Hall. The Marriott Hotel at Key Tower served as the host hotel.

Convention Chairman and Chapter President Mitch Clemente along with Committee Members Kevin Noble, Greg Trombold, Keith Bush, Tom Porter, Matt Davis and a host of volunteers welcomed Society, Delegates and guests to the event. Besides all of the seminars, shows and meetings, Society also celebrated their 40th Anniversary in Cleveland and gave away a brand new red pick-up truck to a lucky attendee from Minnesota.

## INITIAL CLEVELAND CHAPTER OFFICERS

### MAY 1974 - MAY 1975

MURRAY HERZOG - PRESIDENT
FRED EHRENBEIT - TREASURER
THOMAS KING - FIRST VICE PRESIDENT
JOHN NAGLE - SECOND VICE PRESIDENT
RICHARD USZKO - THIRD VICE PRESIDENT
JOE ZAFFUTO - ADMINISTRATIVE SECRETARY
CRAIG MCDOWELL - CORRESPONDING SECRETARY

### CHARTER MEMBERS

Robert Allison
William Billik
David Brese
James Browning
Michael Cheatham
Leslie Duguid
Fred Ehrenbeit
Ralph C. Frey
Albert Graser
Murray Herzog
Robert W. Hoste
Don Jirik
Thomas King
Marcus Kittelsrud
James Konwinski
Craig McDowell
William McNally
John Nagle
Fred Peschke
John Pidwell
Charles W. Pressler
Ron Rupert
Ken Sauvain
D.E. Sheldon
Paul Sheridan
Edward Sloan
William Story
Russel J. Subjinski
Richard Uszko
William Walker
Joseph Zaffuto
Juris Zikmanis

### PROGRAM OF EVENTS

### CHARTER DINNER COMMITTEE

John Nagle - Chairman
Craig McDowell

### CHARTER PRESENTATION PROGRAM

Opening Remarks .....John Nagle, Chairman Dinner Committee
Second Vice President
Introduction of Chapter President
Address of Welcome ..... Murray Herzog, President
Introduction of Officers of Cleveland Chapter
Introduction of Invited Guests
Introduction of National Society Treasurer, Dr. Alfred Steele

### CHARTER PRESENTATION CEREMONY

Presentation .....Dr Alfred Steele
Acceptance and Acknowledgment .....Murray Herzog, President
Closing Address .....Murray Herzog
Dancing Until 12:30 a.m. .....Hal Lynn Orchestra

## INITIAL CHARTER SPONSORS

The Cleveland Chapter of the American Society of Plumbing Engineers expresses its sincere gratitude for the financial participation by the following firms that helped sponsor the Chapter:

Allied Equipment Company
Allied Pipe Products
American Standard
The Austin Company
J.A. Bastl & Associates, Inc.
Borosh Associates, Inc.
BWA Company
Paul Colton & Associates
DeMarco Inc. Mechanical Contractors
Denk-Kish and Associates
A.E. Ehrke & Company
Ralph C. Frey & Associates, Inc.
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Equipment & Sales Co.
Kahn Plumbing & Heating Co.
Lochinvar Water Heater Corp.
Mack Industries, Inc.
Paul C. Menster & Associates
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Ohio Hydronics Company
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The Osborn Engineering Co.
Consulting Engineers
The Paley Plumbing & Heating Co.
Pfitzenmaier & Jablonski
Pressler & Associates
Reliance Mechanical Contractors
J.M. Roessler & Associates
The Royal Brass Mfg. Co.
Sloan Valve Co.,
represented by Robert J. Wolf
A.O. Smith Corporation
The Smith & Oby Company
The Spohn Corporation
Story Equipment Sales
Structural Fibers, Inc.
Tomlinson Co., Inc.
Trombold Equipment Co.
Trygve Hoff & Associates
Woodhill Nipple & Supply, Inc.
Yager Plumbing Co., Inc.
Youngstown Steel,
Producers of Yoloy Pipe

## MEMBERSHIP INFORMATION

| MEMBERSHIP STATUS | DUES (1974 – 1975) |
|---|---|
| Full Members | $30.00 Annually |
| Associate Members | $25.00 Annually |
| Junior Member | $10.00 Annually |
| Governmental Member | $25.00 Annually |
| Special Member | $35.00 Annually |
| Student Member | $10.00 Annually |
| Affiliate Members | $85.00 Annually for each membership card |

Membership applications are available upon request of any officer.

On January 15, 1975, our chapter voted to co-sponsor with the American Society of Sanitary Engineering a manufacturers' mini-show.

Our first roster was published in May, 1975. Enrollment had increased since then.

BOARD OF DIRECTORS

| | 1975-1976 | 1976-1977 | 1977-1978 |
|---|---|---|---|
| President | Murray Herzog | Murray Herzog | John Nagle |
| 1st Vice President | Thomas King | Thomas King | Joseph Zaffuto |
| 2nd Vice President | John Nagle | John Nagle | Thomas Kamis |
| 3rd Vice President | Richard Uszko | Richard Uszko | Paul Sheridan |
| Treasurer | Edward Sloan | Marcus Kittelsrud | M. Kittelsrud |
| Administrative Sec. | Joseph Zaffuto | Joseph Zaffuto | Murray Herzog |
| Corresponding Sec. | Robert Hoste | Craig McDowell | Craig McDowell |

Membership has grown to 48.

A class in Plumbing Engineering is formed at Cuyahoga Community College. The instructor for the class is Murray Herzog.

On June 21, 1978, our chapter president, John Nagle, passed away. The 1979 roster is dedicated to John Nagle.

BOARD OF DIRECTORS

| | 1978-1979 | 1979-1980 | 1980-1981 |
|---|---|---|---|
| President | Joseph Zaffuto | Joseph Zaffuto | Murray Herzog |
| 1st Vice President | Richard Uszko | Richard Uszko | Richard Uszko |
| 2nd Vice President | Thomas Kamis | Thomas Kamis | Joseph Zaffuto |
| 3rd Vice President | Ralph Frey | James Porter | Geza Garnai |
| Treasurer | M. Kittelsrud | M. Kittelsrud | M. Kittelsrud |
| Administrative Sec. | Murray Herzog | Murray Herzog | Donald Jirik |
| Corresponding Sec. | Andrew Borosh | Andrew Borosh | Andrew Borosh |

Membership is at 80.
Titles of board members change.

BOARD OF DIRECTORS

| | 1981-1982 | 1982-1983 | 1983-1984 |
|---|---|---|---|
| President | Joseph Zaffuto | Joseph Zaffuto | Richard Uszko |
| V.P. Technical | Richard Uszko | Richard Uszko | William Billik |
| V.P. Legislative | William Billik | Thomas Kamis | Thomas Kamis |
| V.P. Membership | Geza Garnai | Geza Garnai | Ed Liggett |
| Treasurer | M. Kittelsrud | M. Kittelsrud | Andrew Kovesdi |
| Administrative Sec. | Donald Jirik | Robert Gisewhite | Robert Gisewhite |
| Corresponding Sec. | Andrew Borosh | Andrew Borosh | Andrew Borosh |

BOARD OF DIRECTORS

| | 1984-1985 | 1985-1986 | 1986-1987 |
|---|---|---|---|
| President | Richard Uszko | Paul Sheridan | Paul Sheridan |
| V.P. Technical | Paul Sheridan | Ed Liggett | Ed Liggett |
| V.P. Legislative | Thomas Kamis | Thomas Kamis | Thomas Kamis |
| V.P. Membership | Ed Liggett | Ralph Frey, Jr | Ralph Frey, Jr |
| Treasurer | Andrew Kovesdi | Joseph Zaffuto | Joseph Zaffuto |
| Administrative Sec. | Terry Barrow | Richard Uszko | Richard Uszko |
| Corresponding Sec. | Andrew Borosh | Andrew Borosh | Andrew Borosh |

BOARD OF DIRECTORS

| | 1987-1988 | 1988-1989 | 1989-1990 |
|---|---|---|---|
| President | Andrew Kovesdi | Andrew Kovesdi | Salvatore Traina |
| V.P. Technical | Ed Liggett | Ed Liggett | Ed Liggett |
| V.P. Legislative | James Wickert | James Wickert | James Wickert |
| V.P. Membership | Ralph Frey, Jr | Craig McDowell | Craig McDowell |
| Treasurer | Joseph Zaffuto | Joseph Zaffuto | Joseph Zaffuto |
| Administrative Sec. | Judy Cefaratti | Judy Cefaratti | Judy Cefaratti |
| Corresponding Sec. | Andrew Borosh | Carolyn Hager | Carolyn Hager |

BOARD OF DIRECTORS

| | 1990-1991 | 1991-1992 | 1992-1993 |
|---|---|---|---|
| President | Salvatore Traina | Ed Liggett | Ed Liggett |
| V.P. Technical | Ed Liggett | Salvatore Traina | John Serwatka |
| V.P. Legislative | James Wickert | Ronald Hegadore | Ronald Hegadore |
| V.P. Membership | Craig McDowell | Craig McDowell | Craig McDowell |
| Treasurer | Joseph Zaffuto | Joseph Zaffuto | Joseph Zaffuto |
| Administrative Sec. | Judy Cefaratti | Judy Cefaratti | Chris Homola |
| Corresponding Sec. | Carolyn Hager | Carolyn Hager | Robert Wolf, Jr |

BOARD OF DIRECTORS

| | 1993-1994 | 1994-1995 | 1995-1996 |
|---|---|---|---|
| President | John Serwatka | John Serwatka | Ronald Hegadore |
| V.P. Technical | Robert Bukovec | Ronald Hegadore | John Serwatka |
| V.P. Legislative | Ronald Hegadore | Joseph Zaffuto | Don Shelden |
| V.P. Membership | Craig McDowell | Craig McDowell | Craig McDowell |
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## CHAPTER MEMBERSHIP STANDING

As of September, 2010

| | |
|---|---|
| FULL | 55 |
| ASSOCIATE | 10 |
| AFFILIATE | 28 |
| GOVERNMENTAL | 0 |
| SPECIAL | 6 |
| STUDENT | 0 |
| LIFE | 3 |
| RETIRED | 4 |
| TOTAL | 106 |

| | |
|---|---|
| CPD Registration | 10 |
| CPD and P.E.Registration | 2 |
| PE Registration | 25 |

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# THE HISTORY OF PLUMBING

*· Learning From Past Experiences*

We all learn from our mistakes and there have been plenty of events to learn from over the course of the history of plumbing systems. History provides us with knowledge and informative records of past plumbing performance and adverse experiences. Recognition of our past mistakes and learning from them provides us with the knowledge to move on and develop plumbing systems that will prevent illnesses and protect the health of the public. Society tends to react to plagues and epidemics by first asking why did this happen and what could have been done to prevent it from occurring again. The American Society of Sanitary Engineering carries this thought forward in their motto “Prevention Rather Than Cure”. We can learn from the past and prevent outbreaks and illnesses rather than cure the ill effects experienced by persons exposed to unsanitary or outdated plumbing systems.

## Ancient Plumbing

*· 4000-3000 BC: Indus River Valley, India*

Plumbing has been around for a long time. The first known evidence of ancient plumbing was when Archaeologists unearthed copper water pipes in the Palace Ruins in the Indus River Valley. The water pipe was estimated to be 5,500 years old. The Palace site was excavated and found to have individual apartments. Each bedroom apparently had been provided with a bathroom with elaborate plumbing systems for the time. This establishes the earliest known plumbing systems almost 6,000 years ago.

*· 2400-2150 BC: Babylon Between the Tigris and Euphrates Rivers*

Greek writers wrote of ancient Babylonia where the science of hydraulic engineering seemed to have had it’s beginning. A network of canals, all skillfully planned and regulated, covered the area. They had large brick drainage sewers with access holes similar to today’s manholes.

*· The First Building Code*

The first reported building code came from Babylonia. It was called the Hammurabi Code, written by King Shulgi of the Ur Dynasty. This compilation of laws included special provisions for construction and maintenance of the canals that were very important to that desert region. One of the clauses in this code deals with construction of a building. The clause struck terror in the heart of unethical contractors. The clause said “Woe to the builder whose house falls and kills someone. That builder shall be sentenced to death.”

*· 1000 BC: The Island of Crete*

On the island of Crete, the remains of a plumbing system at least 3000 years old were unearthed in excavations on the site of an ancient palace of Knossos. Evidence was found of plumbing fixtures, a water supply system, a sanitary drainage system, and a heating system. One of the fixtures was a bathtub made of hard pottery and 5 feet in length. It was a floor standing model with an integral base, resembling in shape the cast iron bathtub on base widely installed in America in the latter part of the nineteenth century. Another fixture was a water closet, also of hard pottery. It showed evidence of having been equipped with a water closet seat and a flushing device. Found intact were long sections of clay drain pipe of the bell and spigot type. Pipe lengths were short, and branch fittings were provided with T and Y connections adjacent to the bells or hubs.

*· 500 BC - 455 AD: The Roman Empire*

Of all the ancient peoples, the Romans carried sanitation to the highest and broadest degree of development. From their language, Latin, have come such words as sanitation and plumber, the latter being derived from *artifex plumbarius*, meaning a worker in lead. Roman aqueducts still grace the Italian countryside and rank among the world's engineering triumphs. Extensive underground sewer systems, public and private baths, lead and bronze water piping systems, and marble fixtures with gold and silver fittings have come to be symbolic of the civilization of Ancient Rome. An especially significant feature of progress may be cited by the fact that much of the underground public water supply system was constructed of standardized cast lead sections. It is interesting to note that the lead pipes that were so convenient to work with at the time made vast improvements in sanitary conditions. Today we are moving away from lead in piping systems for health reasons. One more lesson learned from our experiences.

*· 500 BC - 455 AD: The Roman Baths*

Public bathing colonies dotted the Roman Empire. One of them, the baths of Diocletian, reportedly accommodated 3200 bathers. Baths and bathing pools were lined with ceramic glazed tile. In residences, bathtubs often occupied an entire room and were supplied with both hot and cold water. Hot water was provided by means of lead or bronze piping which conveyed water across open fires. Bathtubs often were carved from solid marble or lined with ceramic glazed tile and equipped with gold or silver fittings.

*·455 AD - 1200 AD: The Dark Ages*

After almost a thousand years of world rule, the empire of ancient Rome crumbled. In the fifth century, it was subjected to successive invasions by Goths and Vandals, barbaric tribes from the north of Europe. In 455, Vandals swept south through Rome, sacked it of all things of value including any metals that could be removed, and destroyed its public works. With the destruction of Rome, its civilization rapidly decayed, and sanitary standards regressed almost to the vanishing point. Surprisingly several major urban areas today are going through similar experiences on a smaller scale.

The following 10 centuries have been historically termed the Dark Ages. For many centuries, people in general paid little attention to personal cleanliness and other domestic sanitary needs involving the use of water. Bathing was frowned upon by persons of influence and not taken seriously even by members of the ruling class, many of whom preferred to use perfume. Plumbing fixtures fell into disuse, including water closets which had been developed and widely used during the fourth and fifth centuries in Rome. They were not used again until about the twelfth century, and even then their use was extremely limited.

*· 1300 - 1400 AD: Plagues and Epidemics*

During the fourteenth century, Europe was ravaged by disease. Bubonic plague swept the continent and England reportedly killing 25 million people. To improve sanitary conditions in Paris in 1395, the authorities ordered a stop to the practice of throwing sewage out of building windows and dumping sewage waste pots onto the streets below. But this was a common practice that continued unabated in other cities.

As late as the early part of the eighteenth century, European cities had not been equipped with sanitary sewage disposal facilities. The mortality rate in many cities exceeded the birth rate. When building owners were ordered to install domestic sewage vaults, considerable opposition was raised. It was not until the latter part of the eighteenth and early part of the nineteenth centuries that European cities started to provide public sewer systems beneath city streets. Slowly people began to use the convenient public sewer facilities for the disposal of sewage from buildings and to develop progressively higher sanitary standards.

## Early American Sanitation Standards

*· 1600: Early Settlements*

Although America has become a symbol of high standards in plumbing and sanitation, these evolved from very primitive and rude beginnings. Along the Atlantic Coast, firmly established settlements developed local industries and conducted trade with Europe. Among the numerous early settlements were several which later became major port cities, such as Boston, New York, Philadelphia, and Baltimore. Each faced the same general sanitation problems and progressed in developing sanitary standards almost simultaneously. The following is an account of the historical records of early American plumbing history.

*· 1626: New York Port Area Living Conditions*

Available reports of the progressive development of sanitary standards in New York may be cited as typical. Following settlement of the port area in 1626, houses were built. None had within them any water supply or sewage disposal facilities. Drinking water was used sparingly as it had to be carried from springs or wells, or purchased by the bucket from water peddlers who traveled through the streets selling water from wooden barrels on horse drawn trucks. Outdoor earth pit privies were used as toilet facilities. Wastes from dish washing, clothes washing, and bathing were disposed of outdoors by dumping them onto the ground adjacent to buildings. Rainwater from roofs also was disposed of onto the ground. As the population of the settlement increased with the arrival of new immigrants, conditions deteriorated. Shallow wells became polluted by seepage from earth pit privies, areas around homes became excessively fouled from sewage and refuse dumped onto the ground, and streets were quagmires of mud long after rainstorms ended.

*· 1675: New York Appoints The First Health Official in America*

Health conditions became intolerable in time and forced organization of a Common Council in 1675. The council appointed a health officer in charge of sewage and refuse disposal and other health matters. Water tight privy vaults began to be installed instead of earth pit privies as toilet facilities. Scavenging regulations governing the disposal of privy vault wastes were put into effect in 1676. The scavengers lifted the wastes with buckets and hauled it away in barrels on carts pulled by horses or oxen. Scavengers were the predecessors to today's modern septic tank pumping services.

*· 1677: New York Builds the First Public Water Wells*

The cities first public water wells were projected in 1677 and completed in 1686. People could draw water from these wells that were located in the populated areas. Later horse drawn carts would deliver water to the doorstep for a small fee.

*· 1687: Muddy Streets Called for Gutters in New York City*

Streets were paved and gutters were installed in built up areas in 1687, and homeowners were ordered to pave sidewalks. This was all the result of storm water runoff causing muddy streets and sidewalks. Once again we learn from the past.

*· 1700: New York Adopts a Sanitary Waste Ordinance*

In 1700, a sanitary ordinance was adopted prohibiting the dumping of scavengers' barrels of vault wastes into the street gutters. They were required to go far beyond the city to dump their smelly cargo.

*· 1703: New York Builds Sewage Canals*

An open ditch public sewer or sewage canal was constructed, and city surveyors were appointed to establish street and sewer grades.

*· 1717: Open Sewers Drain Into New York Bay*

Complaints arose about the unsanitary conditions created by the open ditch public sewer, and in 1717 the sewer was extended to empty into New York Bay.

*· 1728: New York Installs the First Underground Sewer*

The public began to complain about the smell of the open sewers and the health officials responded by installing the first sewer under the streets of New York.

*· 1776: The First Water Reservoir Constructed for New York*

The first water supply reservoir was constructed in 1776. It collected water from wells and ponds and distributed water through a supply system consisting of hollow wooden logs laid under principal streets.

*· 1794 - 1797: Epidemics Caused Formation of More Health Boards*

Epidemics of waterborne diseases occurred in New York, Philadelphia, Baltimore, and other population centers along the Atlantic Coast. Public pressure developed as complaints to authorities mounted regarding the unsanitary disposal of sewage and the lack of an adequate, available supply of safe drinking water. To improve conditions, boards of health were established in Philadelphia in 1794 and Boston in 1797. At this time they were not chlorinating the water to kill bacteria. Later we learned this simple process would save millions of lives from bacteria in the water.

*· 1800s: The First Catch Basins*

As a health protection measure, communities began to install all public sewers underground and to extend them to buildings, although many people considered the sewers merely as a means of eliminating unsightly conditions. These early underground sewers were constructed with flat stone tops and bottoms and brick masonry sidewalls. They were intended to serve just for storm water drainage from streets and buildings. But they soon became foul and odorous from sewage and garbage dumped into street gutters. In 1831, catch basin traps were installed in street gutters to intercept solids conveyed

by storm water draining into the public sewer. Later they would learn round or egg shaped sewers would carry away solids much more efficiently.

*· 1830: First Water Mains Installed Under New York Streets*

In 1830, after numerous fires had demonstrated the need for an adequate, available supply of water for fire fighting, New York City installed its first public waterworks. This consisted of a large above ground water storage tank into which water was pumped from shallow wells, and from which water was supplied through two 12 inch cast iron water mains to fire hydrants installed along several of the main streets where business buildings were located. But this system proved to be totally inadequate when a severe fire broke out on December 16, 1835. A total of 530 buildings were destroyed overnight.

*· 1835: The New York Fire*

The disastrous fire of 1835 in New York City stirred the people into action and led to developments of great significance and benefit. People became aware of the necessity for having an adequate pressurized water supply system readily and constantly available for fire fighting in built up areas. They also realized there was a great need, both as a sanitary measure and as a laborsaving convenience, for having an adequate pressurized water supply system from which safe drinking water could be piped directly to buildings. Soon after the fire, plans were projected for providing a large public water supply system which would satisfy both of these needs. The 1835 New York City fire taught us a lesson about sizing water mains that civil engineers still refer to today.

*· 1842: New Yorks Aqueduct Placed in Service*

In 1842 the original Croton Aqueduct System was placed in operation. In this system, water from the Croton River was collected in Croton Reservoir, 40 miles north of the city, and supplied from there through an underground piping system to two reservoirs in the city, one at 42nd Street and another in Central Park. From these reservoirs, water was distributed through a system of cast iron water mains installed underground in city streets, and fire hydrants were installed in sidewalks at appropriate locations along the curb. Building owners were permitted to have water service connections made to the public main, and water service piping extended from the main to supply faucets or hydrants in building cellars or yards. At that time the population of the city of New York was about 300,000.

## Plumbing Systems Inside Buildings in America - "Indoor Plumbing"

*· 1842: New York City Installs Water Piping to Buildings*

Upon completion of the Croton Aqueduct System and pressurized water services into building cellars and yards in New York City in 1842, a radical change in building construction took place — the installation of plumbing systems in buildings. Pressurized water supply systems made it possible to satisfy, at the turn of a faucet, the needs of building occupants for a safe and abundant supply of water for all domestic purposes and to eliminate the drudgery, labor and inconvenience of having to carry water from the source. No plumbing fixtures had been installed in buildings prior to this time, except for a few crude sink installations reportedly installed in kitchens that were provided with water supply by means of an adjacent hand pump that drew water from a shallow well.

*· 1845 - 1850: Drainage Piping Installed in Buildings*

As late as 1845, records indicate that buildings were not provided with interior drainage piping systems. Most buildings were equipped with exterior leaders which conveyed storm water from roofs to pavements and sidewalks from which the water ran into the street gutters. In some cases where branches had been installed from the public sewer to buildings, the exterior leaders discharged directly into such branches or building sewers. Before fixtures could be installed with water supply and drainage piping systems, building sewers had to be installed first so as to convey sewage away from the buildings to a suitable disposal terminal, such as a public sewer system. In 1845 New York City permitted sanitary building sewers to be connected to the existing public sewer system which had originally been provided for just storm water disposal. These building sewers, and the main drains installed underground in buildings at the time were constructed with flat stone tops and brick masonry bottoms and brick masonry sidewalls. They still had flat bottomed sewers. And when they allowed the connection of sanitary sewers to the storm sewers many solids started to settle out in the bottoms of the sewers.

*· 1845 - 1850: Plumbing Fixtures Installed in NYC Buildings*

By 1850, plumbing fixtures had been installed in a number of New York City homes. These were principally private residences owned by wealthy people who could afford to alter their buildings to accommodate such facilities. Provision had to be made to protect the fixtures and piping against frost damage by means of heating equipment, insulation or both. Earliest installations consisted of wooden and sheet metal sinks in kitchens, wooden washtubs in kitchens, cellars or basement laundry rooms, and sheet metal bathtubs in special bathrooms or closets.

For these early installations, water supply and drainage piping were attached to building walls and either left exposed in rooms or concealed in boxwork. A handmade trap was installed in the drain of each individual fixture to prevent escape of obnoxious odors and sewer gases from fixture waste outlets. However, these traps often lost their water seals because of siphonage and back pressure conditions in the drainage system, and this caused fouling of the atmosphere of rooms in which fixtures were placed. Check valves and many specially designed traps were installed in efforts to prevent the loss of trap seal, but such devices were found to be totally ineffective. At that time, the principle of venting fixture drains to protect trap seals was unknown.

*· 1845 - 1850: Development of the Toilet Room in America*

Nevertheless, progress was made in the installation of plumbing systems in buildings . Fixtures were placed in locations where they would not be too objectionable. Sinks and washtubs were put in kitchens and basements. Lavatories and bathtubs were located on various floors and connected to separate stacks. Long hopper water closets, so named because of their funnel or long hopper shape, were installed in toilet rooms or compartments accessible only from outdoors, because it was considered hazardous to health for rooms which housed such odorous fixtures to be directly accessible from the interior of buildings. The hopper type water closet was installed so as to be relatively frost proof by placing the trap and water supply valve below the floor level. There was little or no consideration for backflow or cross connections in the early installations.

In the late 1850s, people became more and more aware of the need for improving sanitary standards in and adjacent to buildings. Recognition was given to the fact that plumbing systems in buildings could provide adequate safe water for drinking, cooking, bathing, and for flushing fixtures, and also could safely and efficiently dispose of sewage and other wastes from buildings. Extensions were built on many homes specifically to provide bathrooms at the upper stories of existing buildings. Lavatories, bathtubs, and water closets were installed in these extension bathrooms, many of which were also provided with heating equipment. Double doors were placed in passageways between extension bathrooms and the main building in order to prevent bathroom odors and sewer gases from entering the living quarters.

*· 1860s: The First Multifamily Housing Built in East Coast Cities*

Directly following the Civil War, immigration swelled the populations of industrial cities in the eastern part of the country. In many cities, rows of attached three and four tenement houses were built to take care of the additional population. These buildings were provided just with yard hydrants for drinking water supply, while toilet facilities consisted of rows of privies built above watertight privy vaults located in the backyards of the buildings. Extremely objectionable unsanitary conditions soon developed under such circumstances. Health authorities had to take stringent action to halt the spread of disease. To protect the health of building occupants, the public was alerted to the necessity of equipping buildings with adequate means for supplying safe drinking water for domestic purposes and with adequate facilities for sanitary disposal of sewage. Health authorities advocated the installation of plumbing systems in buildings, and as a result this became a subject of regulation in sanitary codes.

*· 1870s: The First Water Heaters*

In the early 1870s, water supplied kitchen sinks came into general use in private homes and other small buildings. Fireboxes of coal fired kitchen ranges were equipped with water jacketed backs and water jacketed fronts, and circulation piping was installed between these water heating units and hot water storage tanks so as to make pressurized hot water available in volume at fixtures. The use of outdoor privies and privy vaults for private homes was discontinued gradually as indoor water closets, directly connected to building drains, were installed in toilet rooms accessible from backyards.

*· 1874: The Venting Theory Was Proven*

A major stymie to more rapid introduction of plumbing systems in buildings was the fact that, as late as 1874, no method was known for preventing fixture trap seals from being lost because of siphonage and back pressure conditions in the drainage system. Where fixture trap seals were lost, objectionable odors and sewer gases escaped from the system at fixture outlets and fouled the atmosphere of rooms in buildings. A significant instance of this occurred when a plumbing system was installed in a large new private dwelling in New York City in 1874. Soon after occupying the building, the owner complained to the plumbing contractor that the stench of sewer gas from fixtures in the building was unbearable. After receiving this complaint, the plumbing contractor discussed it at a conference with other New York City master and journeymen plumbers. At this conference in 1874, the theory was that air pressure in the drain at the outlet of a fixture trap had to be in relatively exact balance with the atmospheric pressure at the inlet of the trap, and this balance could be maintained by means of a vent pipe connected to the drain at the trap outlet and extended to atmospheric pressure outdoors so that air could flow freely into or out of the drain in response to pressure variations in the drain.

This theory was tested by contractors and journeymen in the field on numerous installations, and it was proved to be correct. However, numerous details of vent piping installation and sizing had to be determined by further testing and field experience before continuous, satisfactory performance of vent piping was assured. Nevertheless, the principle of venting sanitary drainage systems by means of attendant vent pipes, to protect fixture trap seals against loss by siphonage and back pressure, was established. The way had been found to prevent objectionable odors and sewer gases from escaping at fixture waste outlets and fouling the atmosphere in buildings. To me this is one of the most important advances in modern plumbing history. Now, there could be “indoor plumbing”.

*· The Venting Principle is Publicized*

News of the development of the principle of venting sanitary drainage systems spread rapidly to all parts of the country. Detailed information on vent piping installation, test reports, and experience with systems in service were carried in trade publications, association reports, and newspapers at the time. A major breakthrough had been achieved in knowledge of the design of plumbing systems in buildings which made it possible to locate plumbing fixtures inside without fouling the atmosphere. Objections to installing plumbing systems in buildings rapidly vanished, and plumbing installation proceeded at a greatly accelerated rate.

Within a few years, kitchen sinks were installed in each dwelling unit in tenement houses. Owners of private homes began to have kitchen sinks put in, followed soon after by laundry trays, then bathtubs, and later lavatories placed in appropriate locations for convenient use. About 1880, the use of privies and privy vaults in the backyards of tenement houses was discontinued. In their place batteries of hopper type water closets, directly connected to building drains, were installed in either backyards or cellars. Similarly, at schools privies and privy vaults were removed . They were replaced by installation of trough type water closets, known as school sinks, directly connected to building drains. There fixtures were provided in separate schoolyard toilet buildings.

*· 1881: Building Sewers Improve Living Conditions*

By 1881, the health protection benefits of sanitary plumbing systems in buildings were clearly recognized by health officials in cities. Prior to this time, in New York City, 90 percent of all human wastes had to be disposed of by removing such wastes from privy vaults and transporting them through buildings, along city streets to docks, and then out to sea where they were dumped. This method of sewage disposal was a severe health hazard and had to be eliminated for this reason. Sanitary plumbing systems in buildings were the answer. People in cities knew this from hard experience. They began to rely upon plumbing facilities for improved sanitary conditions, and to reduce their daily work and increase their enjoyment of living.

For economy in installation, sinks and laundry trays were grouped together in kitchens and water closets, bathtubs, and lavatories were grouped together in bathrooms. This was possible to do in cities with public water supply and sewage disposal systems. But in rural areas, having no such public systems available for building connection, homes had no plumbing facilities. The only sanitary provisions for building occupants in such areas were an outdoor earth pit privy. Portable washtubs and bathtubs were used either indoors or under an outdoor shed in most areas.

*· 1890s: The First Washdown Water Closet and Cast Iron Bathtub*

In the 1890s, two important fixture developments, combined with newly available gas and electric public utility systems laid under city streets, aided in further expanding the use of plumbing systems in buildings. The first water closet design considered to be really sanitary was introduced about 1890 with the development of the washdown water closet. Almost simultaneously, the freestanding, white enameled cast iron bathtub appeared. They were hailed as important new sanitary advances, as they were reasonably priced, mass produced fixtures which home owners desired. The smooth surfaces of these fixtures did not harbor bacteria and were easy to clean. These new smooth finishes on these fixtures helped to reduce odors, spread of diseases and they improved sanitary conditions.

*· 1890: The Manning Formula*

In 1890, Robert Manning proposed a formula to calculate the flow in sloping drains. The Manning Formula is now the popular formula for determining flow in sloping drains.

*· 1890s: New Gas Mains Allowed Installation of Gas Fired Water Heaters*

Doctors and health authorities advocated the expanded use of hot water as a sanitary measure and proclaimed the health benefits of bathing. The ready availability of public utility gas supply systems, which had been newly laid under city streets, aided in expanding the use of hot water supply systems in buildings and the installation of gas fired water heaters. The availability of public utility systems for supplying electricity for light and power in buildings made possible the installation of efficient electric pumps for pumping water to plumbing fixtures at any height. It was at this time that skyscraper type office buildings were first erected in New York City, Chicago, Philadelphia and other major cities. These buildings were equipped with plumbing systems that performed satisfactorily and were unobjectionable, and suitable kinds and numbers of fixtures were provided in convenient locations for building occupants.

*· l900s: Minimum Requirements for Number of Fixtures*

At the start of the twentieth century, laws had already been enacted in many areas of the country requiring the installation of plumbing systems in buildings and the provision of suitable kinds and numbers of fixtures in convenient locations for the use of building occupants. In general, such areas were large municipalities where public water supply and public sewer systems were available for building connections. In areas beyond the limits of public systems, it was deemed unreasonable to require installations of plumbing systems and fixtures. Nevertheless, people desired sanitary plumbing facilities and sought to equip their buildings with appropriate systems.

*· 1900s: Key Developments in Water Heating*

Hot water supply was especially desired as manufacturers publicized their new developments in water heater equipment. Coal and gas fired sidearm water heaters appeared on the scene. Automatic controls to eliminate the dangers associated with manual operation of water heaters were introduced, and range boiler manufacturers introduced tanks made of several different materials with greater durability.

*· 1900's: Unsanitary Conditions Caused Building Codes to be Updated*

Many new tenements were erected in large industrial cities to house the swelling populations. These buildings had sinks and laundry trays in each dwelling unit, but water closets were provided in toilet compartments accessible from the public hallways on each floor. In many cases, more than one family used the toilet facilities. It was soon apparent that such arrangements were inadequate and objectionable and fostered unsanitary conditions. Health authorities put new regulations into effect requiring that water closets be installed in toilet rooms or bathrooms in each dwelling unit, and strenuous efforts were made to bring existing buildings up to existing standards.

*· 1906: American Society of Sanitary Engineering Organized*

The American Society of Sanitary Engineering grew out of a meeting held in Washington D.C. on January 29-31, 1906. Henry B. Davis, chief Plumbing Inspector for the District of Columbia, believed it was vital that the plumbing practice in the United States be standardized. Mr. Davis invited 25 inspectors from other American cities to organize an association of plumbing inspectors and sanitary engineers. The Fundamental Principle they decided to follow was "Prevention Rather Than Cure". This principle still guides the society today. ASSE's activities and programs were designed to educate the industry and the public on the importance of safe and correct plumbing installations.

*· 1920s: Post WW I Building Boom*

Following World War I and continuing through the early 1920s, the large industrial cities expanded tremendously. New housing developments were built on the fringes of cities, and public water supply, sewer, and utility systems were extended to serve the new buildings. All these were equipped with the most modern plumbing systems and fixtures of the day. Complete bathroom installations, consisting of a water closet, lavatory, and bathtub with an overhead shower were provided in each dwelling unit along with modern kitchen sinks and laundry trays. The growing importance of sanitary plumbing systems in buildings was shown by large scale plumbing installations in hotels, office buildings, factories, food processing plants, and dairy buildings. Most buildings were provided with more plumbing equipment than was required by law. Multistory residential buildings in great numbers were erected in the central parts of cities where land values were very high. They too were fully equipped with complete bathroom, kitchen, and laundry fixtures of modern and sanitary design. Many were equipped with colored plumbing fixtures which were introduced in the middle 1920s. But this tremendous new building construction wave reached its peak in 1929 and came to a sudden halt in 1930 when the severe business depression occurred.

*· 1926: IAPM0 Began as the Plumbing Inspectors Association of Southern California.*

In 1926 forty-two plumbing inspectors banded together to bring about an improvement in the application of common sense codification and application of ordinances based on scientific knowledge. In 1932 they published the Standard Plumbing Code. The organization still writes codes, they publish the Uniform Plumbing Code and the Uniform Mechanical Code. Today they are known as the International Association of Plumbing and Mechanical Officials.

*· 1930s: The Depression - Inadequate Systems Corrected*

During the 1930s relatively few new buildings were erected until the latter part of the decade. This period was devoted principally to the correction and modernization of plumbing systems and equipment in existing buildings. Important corrections were made to the potable water supply systems of buildings to eliminate all water supply piping connections and fixture supply piping connections and fixture supply connections which were recognized as potential sources of contamination. This drive for correction of systems was led by health officials, water supply officials and building officials to avoid the repetition of the amoebic dysentery epidemic which occurred in the city of Chicago during it's world fair in 1933. Other important improvements were made in the hot water supply systems in existing buildings. Many were equipped with modern automatically controlled hot water heaters designed for use with gas, oil, or electricity as a source of heat.

*· 1935 - 1940: Electricity Extended to Rural Areas*

During this period, the public utility systems around the country extended their electric supply lines into a great portion of the rural area. This provided a source of power for pumping water from wells and for supplying plumbing systems with all the water needed to maintain the sanitary standards that were enjoyed in the cities. Private sewage disposal systems were provided by means of underground septic tank and leaching field installations in appropriate locations. In this way, modern sanitary plumbing systems and fixtures became available even in the remote regions of the country.

*· 1940s: ASSE and the Plumbing Industry Search for Cause of Polio*

In the 1940s the American Society of Sanitary Engineering (ASSE) and the plumbing industry took on an extensive effort to prove that polio was a water borne disease. ASSE and the plumbing industry contended the viral disease was spread through polluted potable water. The theory was that many cases were caused by faulty plumbing practices such as cross connections which led to back siphonage and backflow. The ASSE campaign was of major importance in developing a greater consciousness of proper plumbing practices. Since that time the American Society of Sanitary Engineering has developed many Standards for Products that are components of plumbing systems. The standards have a heavy emphasis on backflow prevention and are being adopted by model codes throughout the country.

*· 1944: The National Sanitation Foundation was Formed*

The National Sanitation Foundation Was formed by Walter Snyder, Henry Vaughan and Nathan Sinai. The Agency was devoted to scientific research in sanitation. They kept in contact with national, state and local governments for the purposes of promoting sound improvements in sanitation. NSF International develops standards for food & beverage equipment, components used in drinking water systems and plastic pipe and fittings.

*· 1946 - 1970s: Post WW II Building Boom*

In the latter 1940s, following World War II, and continuing through the 1950s, 1960s, and into the 1970s, there was a tremendous expansion of housing developments and industrial plant construction outside the central areas of cities in the United States. New buildings were erected along new principle highways, and public water, sewer, gas, and electric systems were provided for building service needs in most areas. Private systems were utilized in many areas where public systems were not available. All of the buildings built during these years were equipped with modern plumbing systems conforming to sanitary standards elevated to a higher level than ever before.

In the central areas of cities many old buildings were removed and in their places large skyscraper office buildings and apartment buildings were erected. They too were equipped with modern plumbing systems designed in accordance with the highest sanitary standards in history in order to serve the greatest occupancy loads of all time.

*· 1950s: N.B.S. Published Report on Estimating Loads*

In the 1950s, the National Bureau of Standards published report BMS 65, "Methods of Estimating Loads in Plumbing Systems," prepared by Dr. Roy B. Hunter. The report gave tables of load producing characteristics (fixture unit weights) of commonly used fixtures along with probability curves which made it easy to apply to actual design problems. The curves are known as "Hunters Curves."

*· 1950s - 1960s: Skyscraper Construction Brings Changes in Design*

Tower building construction accelerated in the late 1950s and early 1960s, and necessitated changes in design to meet changing conditions. Increased building heights and increased water usage, including water for air conditioning, required water supply tanks so large that they caused significant space problems and were uneconomical. To meet the changing conditions, design was changed to provide tankless, automatic constant pressure booster pump systems which required a minimum of valuable building space and which also provided a sealed in supply of potable water from the source of supply to the plumbing fixture outlet.

*· 1966: The Development of Plastic Piping*

In 1966, a critical shortage of copper occurred in the United States because of stoppage of shipments from foreign sources of supply. Inventories of copper drainage waste and vent (DWV) tube and fittings were rapidly exhausted. Large developments of single family residences were halted for most of 1966 because of the unavailability of copper DWV piping which originally had been planned to be installed. This urgent need was soon filled by nonmetallic, plastic DWV pipe and fittings, which were then introduced into use for building plumbing systems under carefully prescribed installation conditions.

*· 1961 - 1992: Development of Plumbing for the Disabled*

A most significant change in the design of buildings used by the public began in 1961. The object of the change was to make all buildings and facilities, including plumbing, used by the public accessible to, and functional for, the physically handicapped, without loss of function, space, or facility where the general public is concerned. The changes were originally set forth in the American National Standards Institute (ANSI) standard, "Specification for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People", originally issued as A117.1-1961.

Updates were made in 1971 and 1980, and in 1992 government regulations went into affect known as the Americans with Disabilities Act (ADA). These regulations were enacted and mandated the necessary building design changes including many related to plumbing systems in buildings.

*· 1974: Energy Efficiency in Plumbing Design*

Since 1974, when the supply of foreign oil to the United States was interrupted and oil prices rose sharply, ways to conserve energy have been a constant concern. Some important conservation measures related to plumbing were: elimination of water waste, limitation of water use to a reasonable minimum, limitation of hot water supply temperature and rate of flow reductions for hot water faucets, insulation of water heater tanks and piping, and use of heat reclaiming systems and solar heating systems. These are just some of the conservation methods that have been applied to plumbing systems. Today water saving faucets and fixtures are becoming mandated by many municipalities from coast to coast due to water shortages in many water districts around the country.

*· 1994 - 1996: New Legislation to Further Restrict Water Usage*

Legislation was adopted as part of the Energy Efficiency Act in the 1980s to restrict the water flow rates in various plumbing fixtures. Later it was amended with the Energy Policy Act of 1992 to further reduce water usage in plumbing fixtures. As part of the Energy Policy Act of 1992 legislators determined 1.6 gallons per minute would be the maximum consumption allowed for water closets without any testing or research. Manufacturers have spent millions of dollars to redesign fixtures to flush with the lower flow rates and the jury is still out on this one. Can we learn a lesson from this? I think we have. Before legislation of this type is introduced in the future, there should be research done by an independent organization to conclude that the fixtures will work properly at a given flow rate.

*· Conclusion*

As you can see, there are a lot of significant events recorded in the history of plumbing. Each time something did not work properly, or someone became ill, there was an investigation of some scale to determine the cause of the failure or occurrence. We need to respect the things we have learned from history and continue teaching them to young engineers and apprentices. The code book may tell you not to do something but history tells you why you should not do something.

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From an article by Ronald L. George, CIPE, which appeared in the July - September, 1997 issue of ASSE’s *Plumbing Standards* magazine.

# THE EVOLUTION OF PLUMBING CODES

The plumbing industry in the United States has long held a fascination with the history of plumbing codes. Trivia experts debate who has the oldest plumbing code, but the age and beginning of plumbing codes are not as important as how plumbing codes have evolved.

The evolution of plumbing codes in the United States parallels the evolution of the country itself. The true emergence of this country came about in the years following the Civil War. Before the Civil War, the United States was a nation of loosely joined states. While the country had a strong resolve, it was, in fact, a weak union. In the early 1800s, nobody would have considered the United States a superpower, nor would they ever have guessed that they would accomplish such stature.

It was Abraham Lincoln that defined this country as one nation. When the Civil War was fought between 1861 and 1865, the fighting forces came from all of the different state militias. Even the great generals of the South fought because they always had a higher calling for their state (and home), not the federal government. Still, Lincoln's plan took hold as states worked together to achieve a common goal.

When the troops from the different states fought side-by-side, they also conversed with one another. It was one of the first times in the history of this country that direct communication took place among common people of the different states. This was normally left to politicians and wealthy business owners.

The camaraderie that developed among the soldiers continued for a lifetime. They put their association to use after the war, trying to solve the many problems of the country. Many of these soldiers were future plumbers and sanitarians.

The Civil War era also highlighted the deplorable sanitary conditions in the country. With all of the troops in Washington, the Potomac River smelled of sewage and water quality was terrible. Most soldiers lost their lives in the Civil War not from wounds, but from poor sanitation and unclean water. Historians report that it was contaminated water in the White House that caused the death of Lincoln's only son, Willy. Hence, Lincoln was directly affected by the poor quality of the water system and the unsanitary conditions of the time.

## The Birth of Associations

Early plumbers and sanitarians started associations following the Civil War to collaborate in solving the problems of the poor sanitation. These associations started writing down precepts to prevent

contamination of drinking water. These precepts were passed around to different areas of the United States.

In the 1880s a national plumbing organization was formed to continue these efforts to share ideas and information. That association, originally the National Association of Master Plumbers, is the National Association of Plumbing, Heating, and Cooling Contractors.

The intention of these early plumbing association members was very noble. It was through their efforts that they were going to protect the health of the nation. They had figured out simple ways of protecting potable water from contamination. They also recognized the need to isolate waste from water source.

These recommended practices were gradually adopted by major cities, usually after some major outbreak of disease or other health crisis. The adopted rules became known as the Code of Practice for the plumbing industry. Unfortunately, there was no consistency in the code from one city to the next. The political leaders always thought that their problems were unique when compared to other cities, so they would tinker with the code of practice. Competition as to who had the better code for protecting sanitation began early among the different jurisdictions.

In 1906, a group of sanitary professionals got together under the direction of Henry Davis and formed an organization called The American Society of Sanitary Engineering. Davis envisioned a group that could exchange ideas and try to standardize the different sanitary codes throughout the country. Recognizing that codes, to date, had all been reactionary, ASSE developed a motto of “Prevention Rather Than Cure”. This philosophy was based upon predicting what would occur if certain conditions persisted. The plumbing profession was better equipped to solve a problem before the problem occurred, as opposed to having the medical profession cure the illness.

Building regulations were also being implemented throughout the country in response to major conflagrations. However, the building professionals and the sanitary professionals were not comparing notes. The first group to consider fire protection concerns was the National Fire Protection Association, which was formed in 1896. In 1915, a group of building inspectors got together in New York City to develop the Building Officials Conference of America (BOCA). This was the first group to concentrate on coordinating building code regulations on a national level. Two other major code organizations would follow: Southern Building Code Congress in the South and International Conference of Building Officials on the West Coast. The need for separate organizations was dictated by a lack of adequate transportation and immediate communication. A trip from New York to Los Angeles took from three to five days.

## The Hoover Legacy

In 1921, President Warren Harding appointed prominent engineer Herbert Hoover to the position of Secretary of Commerce. Hoover, as an engineer, saw the United States as a vast land where proper planning could change the course of the nation. Remember that the 1920s were a time of prosperity in the United States. Hoover believed that with the emergence from World War I and with the wealth of the nation coming into prominence, the country could improve its quality of life by applying better engineering concepts.

Hoover wanted electricity and indoor plumbing in every home. At the time Hoover was Secretary of Commerce, less than one percent of the homes in the United States had indoor plumbing. In 1921, Hoover started the Building Material and Structures Division of the National Bureau of Standards. The person to head the plumbing section was Dr Roy B. Hunter. Hunter dedicated his talents to the research of plumbing in an effort to standardize regulations in the United States.

The work at the National Standards was a cornerstone in Hoover's efforts to bring engineering to the forefront in the United States. Hoover believed that the Commerce Department should control the standardization effort since this would improve the ability for entrepreneurs to have easy access to the marketplace. It was only a few years earlier that Henry Ford promoted the idea of interchangeable parts.

Standards for products were emerging at the same time as plumbing codes. The Civil War also had an impact on the development of standards. Prior to the war, manufacturers were producing products to their own specifications. However, one manufacturer's pipe could not be joined to another manufacturer's pipe. It was during the war that the manufacturers developed one set of specifications so that their products could be used together. Hoover's observation in regard to this effort was that it would help spur competition and lower prices for all Americans.

Hoover was a beloved man in our country because of his efforts as Secretary of Commerce. When the first plumbing code was developed in 1928, through the efforts of the National Bureau of Standards, it was nicknamed the Hoover Code. Not because of any effort put forth by Hoover, more to pay tribute to a man who saw the need to develop such a document.

## Recognizing Building Demands

The Hoover Code of 1928 was revised in 1932, Hunter continued his research in the 1930s, developing new methods for estimating demands on a plumbing system. His work culminated in the publication of the BMS 66 Plumbing Manual in 1940. These three documents served as the basis for every up-to-date plumbing code of that time. The federal government did not see it as their job to mandate the national plumbing code. They offered it as a suggested document for jurisdictions to adopt. During this period, the federal government was still of the opinion that construction should be regulated at the local level. The plumbing code was only mandated for federal projects.

While the basic emphasis of the Hoover Code and BMS 66 was sanitation, the codes also made a concerted effort to emphasize low cost housing. In Hunter's paper, BMS 65, 1940, he wrote, "The purpose of this series of papers is to collect, in an organized form, the mass of information obtained by the author over a number of years, beginning with the investigation in 1921 of plumbing of small dwellings, and including the current research (1937-1940) on plumbing for low cost housing, together with the results of intervening experiments related to plumbing requirements, and to interpret the results of these investigations in a form suitable for direct and practical application. It is hoped that this series of papers will supply the logical answer to many of the controversial questions pertaining to pipe sizes and design of plumbing construction."

BMS 66 followed a similar theme, writing, "In order to have good and economical plumbing, it is necessary that there should be some agreement on the rules governing its design and installation Particular emphasis is placed upon its usefulness in connection with low cost housing, where there is special need to take advantage of all legitimate economies. The field of the manual, however, is not restricted to housing, since the same fundamental principles apply in any structure."

The BMS 66 manual also stated that many innovations were added to the document to allow engineers to design, and builders to build based on the actual demands of the building. Users of the plumbing code were encouraged to offer comments on the content of the manual. There was an acknowledgment that the document would need to undergo changes to keep it abreast of new technology. However, the document did state that there are certain concepts in plumbing that would never change, only ways to achieve the goals of these concepts.

## The Proliferation of Codes

During this time, other organizations were publishing plumbing codes to be adopted by local jurisdictions. The American Standards Association (ASA), later known as ANSI, developed an A40 Committee to prepare a national standard on plumbing. The National Association of Master Plumbers (later known as NAPHCC) published a code, and the Western Plumbing Officials (later known as IAPMO) published a code. All these documents used the work of the National Bureau of Standards as their basis.

The United States' entry into World War II changed the way plumbing codes were viewed. The National Association of Plumbing Contractors (later NAPHCC) and the United Association (plumbers' union) collaborated with various government agencies to develop the Emergency Plumbing Standard. This was the first nationally enacted plumbing code since it was made law as an emergency measure during the war.

Since the Emergency Plumbing Standard was considered successful, the National Association of Plumbing Contractors and the UA again joined with government agencies to establish a peacetime code. They first developed a plumbing code for housing in 1949. This was further developed into a plumbing code for all structures. The document, with many sponsoring organizations, was submitted to the American Standards Association for consideration as a National Standard. In 1955, the document was published as the ASA A40.8 National Plumbing Code. Included in the code was a list of basic principles for the development of the National Plumbing Code. (This list of basic principles was published in last month's newsletter. - ed.)

The beauty of the Basic Principles was that they provided engineering guidelines regarding the intent of the plumbing code. In developing any newer technology or innovative method of plumbing, one only had to reference the intent of the Basic Principles to establish a protocol to follow.

Another feature of the code was the alternate material and methods requirements. This section established a means for the consideration of new or innovative materials or methods. A procedure was provided for gaining immediate acceptance.

The A40.8 was one of the most widely used plumbing codes in the United States. It was adopted by many states and local jurisdictions. The BOCA Basic Building Code referenced the A40.8 as the plumbing code.

ASA required all standards to be periodically updated. It was recognized that the A40.8 would need to be revised to stay current. Unfortunately, the revision committee was unable to achieve a consensus for updating the standard. The committee had many battles that could not be settled. ASA (ANSI) removed their accreditation of the A40.8 in 1963. Two of the member organizations of the revision committee decided to take the draft of the revised A40.8 and develop their own plumbing code. What emerged in 1967 was the first edition of the BOCA Basic Plumbing Code, and in 1971, the first edition of the NAPHCC National Standard Plumbing Code.

## The Demise of the Code

What was the controversy that caused the demise of the A40.8? It was all based on recognition of plastic pipe for plumbing systems. The majority of the committee favored adding PVC and ABS plastic pipe as acceptable materials for drainage, waste, and vent systems. However, competing material interests saw plastic as a threat to their industry. The opponents were able to manipulate the consensus process to prevent the recognition of plastic pipe.

BOCA's response to this dilemma was to prevent material interests from voting on any code matters. The only ones permitted to vote on changes to the BOCA Code would be inspectors that attended the annual meeting. NAPHCC solved the problem by putting the code in the hands of a committee appointed by the president of the association (which would not include material interests).

Not only did material interests use the consensus process to foster their positions, they also used the legal system. When BOCA published their first edition of the Basic Plumbing Code, the cast iron soil pipe industry immediately filed suit against BOCA. Of course, the problem was that the BOCA Code permitted use of plastic pipe for drainage, waste and vent systems. Some believe that NAPHCC waited to publish their version of the code until after the BOCA lawsuit was settled. The cast iron industry lost the lawsuit, but it did delay the adoption (by jurisdictions) of the code.

The demise of the A40.8 brought an end to the pure concepts of plumbing codes in the United States. Organizations and manufacturers recognized that plumbing codes could be used as legal tools to control the marketplace. Politicking, lobbying, and manipulation of the facts could be used to delay, or even restrict, the acceptance of new materials and methods.

There was a tremendous outgrowth of the special interests in the plumbing code profession. A new profession was started – code consultants.

The codes that remained a force were the BOCA Code, the NAPHCC Code, the SBCCI Standard Plumbing Code, and the IAPMO Uniform Plumbing Code. Each of these regional model code organizations knew that the special interests wanted to manage the code for their own benefit. Each organization established policies to prevent the special interests from controlling the free exchange of ideas and the recognition of new technology.

The model code groups developed slogans to guide them in promulgating their codes. The basic expression, still used today, is "The code provides the minimum level of protection against public health, safety and welfare." Lost in these slogans was the concern for low cost housing. Also lost was a guideline for recognizing new technology. The model code organizations soon developed a policy of cost is not an object when it comes to protection of the public. In 1991, IAPMO dropped the expression of minimum requirements. It was considered inadequate just to have minimum requirements.

What has evolved are plumbing codes filled with niceties. Many changes were made in recent years because someone thought it was a good idea, or because that is how we do it in our part of the country. When technical data is required, it is not uncommon to find data manipulated to achieve the user's end objective. Opinions garner more support than does pure science. When reports are issued by esteemed research facilities, including the National Bureau of Standards (now known as NIST), those opposed to the new concepts simply raise the red flag of "This may be good in the laboratory, but it does not duplicate what occurs in the field." When that doesn't work, the other red flag goes up, "This is good information, but is only a start. Additional testing is necessary." Any time an opponent wants to stop progress, they merely have to say that more testing is required, when in fact, there will never be enough testing to satisfy them.

While the model code organizations have attempted to remain pure, they too have fallen into using the plumbing code for their own economic gains. The copyright of each code is protected so that only the model code group can generate revenues from the sale of the plumbing code. The plumbing codes also specify requirements for the listing of plumbing products. Some codes require every plumbing product to be listed by a third party agency. Conveniently, the model code organizations have listing services in order to list the plumbing products to meet these requirements in the code. These listings cost manufacturers millions of dollars each year and result in financial gains for the listing agencies. One only has to ask oneself, "Does a hose clamp really need to be listed?"

## Consolidating Codes

The last evolution has been a consolidation of codes in the United States. BOCA, ICBO, and SBCCI have joined forces to promulgate the new International Plumbing Code. IAPMO, NAPHCC, and MCAA (Mechanical Contractors Association of America) have joined together to promulgate the A$) National Plumbing Code.

After 33 years, a new edition of the A40 was published in 1993. However, the Secretariat recognized that the document was out of date the day it was published. The IAPMO, NAPHCC, MCAA group intends to update the document to compete against the International Plumbing Code.

The International Plumbing Code had its first edition published in 1995. This joint effort by the code groups is intended to produce the most technically accurate plumbing code in the country. However, there are no rigid guidelines for determining technical accuracy. As a result, the code is still based largely upon opinions of committee members overseeing its development.

While the direction of plumbing codes may not appear to be very promising in the United States, in fact, the current state of plumbing codes is very good. The United States has always been known to adjust their methods to correct what is wrong. Other nations can learn from the wealth of experience the United States has in the area of plumbing codes. The points that other nations should follow in developing a good national plumbing code are as follows:

- Establish minimum performance guidelines.
- Consider the cost impact of any code regulation.
- Have the code specify minimum requirements.
- Establish guidelines for evaluating technical data.
- Permit direct input from any interested party.
- Have open proceedings for all code activity.
- Have an annual review of the code.
- Require all parties to disclose their biases.
- Expose all hidden agendas.
- Have voting rights on code matters established to be fair.
- Provide a quick and impartial appeals mechanism.
- Permit a legal challenge of all code regulations.

There are also things to avoid in promulgating a national plumbing code. They would be as follows:

- Don’t permit the copyright to be retained by one entity.
- Don’t permit the code writing organization to serve as a product listing agency.
- Don’t permit manufacturers to use the code to restrict progress.
- Don’t permit manufacturers or trade organizations to control the voting.

· Don't permit unsubstantiated, biased (non-technical) data to be considered.
· Don't permit personal opinions to override credible technical data.

It is most important for a plumbing code to remain a flexible document that allows for innovations and advances in technology. The engineering mind never stops trying to solve problems in slightly better ways.

Plumbing codes cam be defined as good or bad. A plumbing code that is restrictive, takes years to evaluate new technology, and is not open to immediate change can easily be defined as a bad code. A good plumbing code is one that is open, fair, established on the latest available technology, and based on common sense. This is what the plumbing industry worldwide should be striving for — good plumbing codes.

From an article by Julius Ballanco, PE, which appeared in the November, 1996 issue of *PM Engineer* magazine.

## BASIC PRINCIPLES OF A40.8

The A40.8 has been considered by many in this profession to be the last pure and innocent plumbing code in the United States. While it was neither pure nor innocent, the document followed the philosophy of the National Bureau of Standards. It had requirements based on the latest available technology, was concerned about low cost housing and provided the necessary protection of public health.

Included in the A40.8 was a list of Basic Principles. The Basic Principles were intended to be guidelines for the development of the National Plumbing Code. The Basic Principles from the 1955 edition of the ASA A40.8 National Plumbing Code were as follows:

*Principle No. 1:* All premises intended for human habitation, occupancy or use shall be provided with a supply of pure and wholesome water, neither connected with unsafe water supplies nor subject to the hazards of backflow or back siphonage.

*Principle No. 2:* Plumbing fixtures, devices and appurtenances shall be supplied with water in sufficient volume and at pressures adequate to enable them to function satisfactorily and without undue noise under all normal conditions of use.

*Principle No. 3:* Plumbing shall be designed and adjusted to use the minimum quantity of water consistent with proper performance and cleaning.

*Principle No. 4:* Devices for heating and storing water shall be so designed and installed as to prevent dangers from explosion through overheating.

*Principle No. 5:* Every building having plumbing fixtures installed and intended for human habitation, occupancy or use on premises abutting on a street, alley or easement in which there is a public sewer shall have a connection with the sewer.

*Principle No. 6:* Each family dwelling unit on premises abutting on a sewer or with a private sewage disposal system shall have at least one water closet and one kitchen type sink. It is further recommended that a lavatory and bathtub or shower be installed to meet the basic requirements of sanitation and personal hygiene.

All other structures for human occupancy or use on premises abutting on a sewer or with a private sewage disposal system shall have adequate sanitary facilities, but in no case less than one water closet and one other fixture for cleaning purposes.

*Principle No. 7:* Plumbing fixtures shall be made of smooth nonabsorbent material, shall be free from concealed fouling surfaces and shall be located in ventilated enclosures.

*Principle No. 8:* The drainage system shall be designed, constructed and maintained so as to guard against fouling, deposit of solids and clogging, and with adequate cleanouts so arranged that the pipes may be readily cleaned.

*Principle No. 9:* The piping of the plumbing system shall be of durable material, free from defective workmanship and so designed and constructed as to give satisfactory service for its reasonable expected life.

*Principle No. 10:* Each fixture directly connected to the drainage system shall be equipped with a water seal trap.

*Principle No. 11:* The drainage system shall be designed to provide an adequate circulation of air in all pipes with no danger of siphonage, aspiration or forcing of trap seals under conditions of ordinary use.

*Principle No. 12:* Each vent terminal shall extend to the outer air and be so installed as to minimize the possibilities of clogging and the return of foul air to the building.

*Principle No. 13:* The plumbing system shall be subjected to such tests as will effectively disclose all leaks and defects in the work.

*Principle No. 14:* No substance which will clog the pipes, produce explosive mixtures, destroy the pipes or their joints, or interfere unduly with the sewage disposal process shall be allowed to enter the building drainage system.

*Principle No. 15:* Proper protection shall be provided to prevent contamination of food, water, sterile goods and similar materials by backflow of sewage. When necessary, the fixture, device or appliance shall be connected indirectly with the building drainage system.

*Principle No. 16:* No water closet shall be located in a room or compartment which is not properly lighted and vented.

*Principle No. 17:* If water closets or other plumbing fixtures are installed in buildings where there is no sewer within a reasonable distance, suitable provision shall be made for disposing of the building sewage by some accepted method of sewage treatment and disposal.

*Principle No. 18:* Where a plumbing drainage system may be subjected to backflow of sewage, suitable provision shall be made to prevent its overflow into the building.

*Principle No. 19:* Plumbing systems shall be maintained in a sanitary and serviceable condition.

*Principle No. 20:* All plumbing fixtures shall be so installed with regard to spacing as to be reasonably accessible for their intended use.

*Principle No. 21:* Plumbing shall be installed with due regard to preservation of the strength of structural members and prevention of damage to walls and other surfaces through fixture usage.

*Principle No. 22:* Sewage or other waste from a plumbing system which may be deleterious to surface or subsurface waters shall not be discharged into the ground or into any waterway unless it has first been rendered innocuous through subjection to some acceptable form of treatment.

From an article by Julius Ballanco, PE, which appeared in the November, 1996 issue of *PM Engineer* magazine.

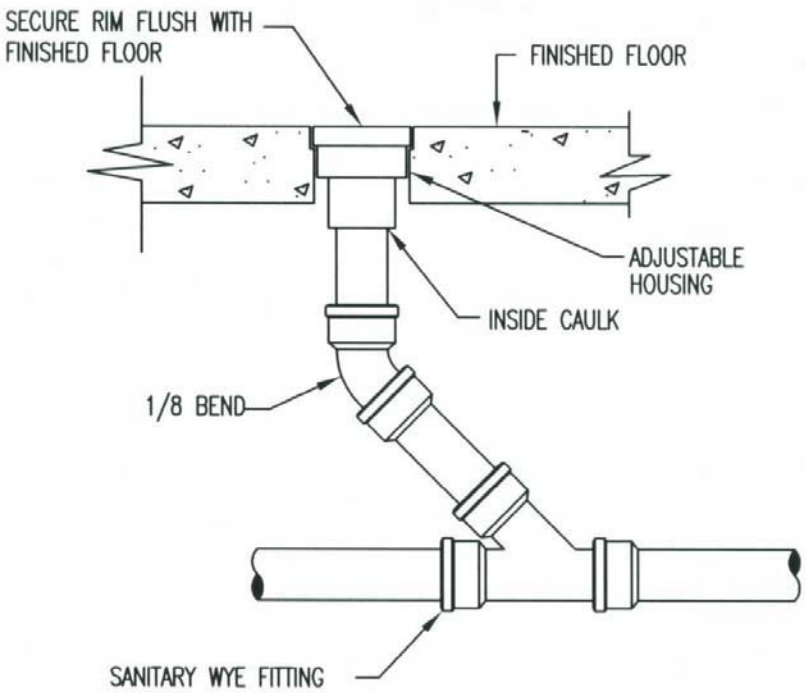
## WATER FACTS

- One gallon of fresh water weighs 8.333 pounds.
- One cubic foot of water contains 7.48 gallons.
- One cubic foot of water weighs 62.428 pounds.
- One gallon of water occupies 231 cubic inches.
- The capacity of a cylinder in gallons is equal to the length in inches multiplied by the square of the diameter in inches x 0.0034.
- A water column 1 foot high exerts a pressure of 0.4333 pounds per square inch.
- Doubling the diameter of a pipe increases its capacity four times.
- Water expands 4.34% when heated from 40°F to 212°F.

## CONVERSION FACTORS

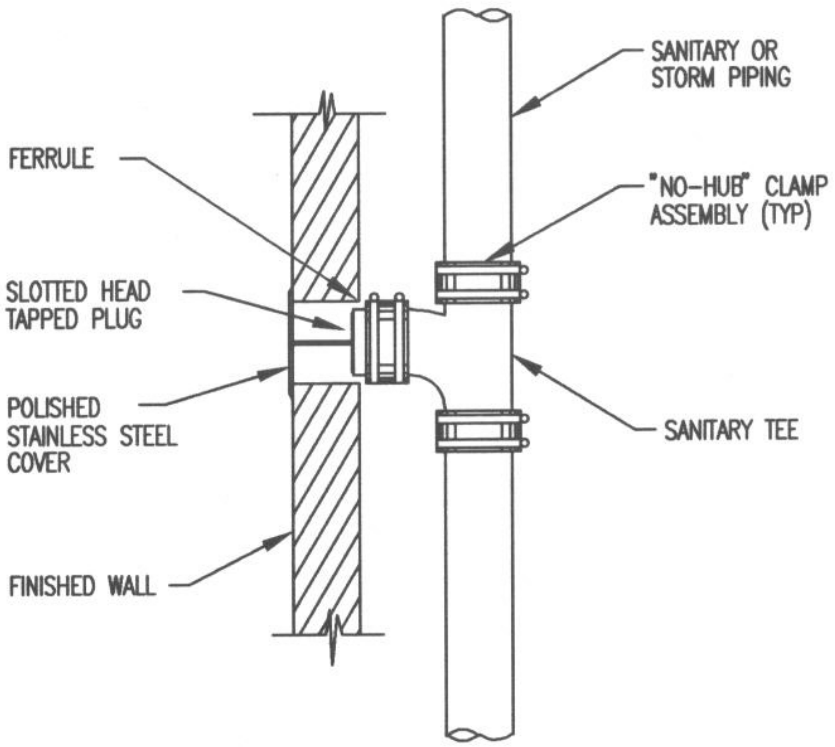
| MULTIPLY | BY | TO OBTAIN |
|---|---|---|
| Acres | 43,560 | Square Feet |
| Acres | 4840 | Square Yards |
| Acre Feet | 1613.3 | Cubic Yards |
| Atmospheres | 14.7 | Psi |
| Atmospheres | 33.9 | Feet of Water |
| Acceleration Gravity | 32.2 | Feet/second$^2$ |
| Barrels | 31.5 | Gallons |
| BTU | 777.5 | Foot-Pounds |
| BTU/min | 0.02356 | Horsepower |
| BTU/min | 17.57 | Watts |
| Cubic Feet | 28.32 | Liter |
| Cubic Feet | 7.48052 | Gallons |
| Cubic Feet | 0.03704 | Cubic Yards |
| Cubic Feet/Min | 0.1247 | Gallons/Sec |
| Cubic Feet/Min | 62.43 | Lbs Water/Min |
| Cubic Feet/Sec | 0.646317 | Million Gal/Day |
| Cubic Feet/Sec | 448.831 | Gallons/Min |
| Cubic Feet/Sec | 28.32 | Liter/Sec |
| Cubic Feet/Sec | 0.02832 | Cubic Meters/Sec |
| Degrees Celsius | 1.8 | Degrees Fahrenheit |
| Degrees Fahrenheit | 0.5556 | Degrees Celsius |
| Feet of Water | 0.4335 | Lbs/Sq. In. |
| Feet of Water | 62.43 | Lbs/Sq. Ft. |
| Gallons | 0.1337 | Cubic Feet |
| Gallons | 231 | Cubic Inches |
| Gallons | 0.00379 | Cubic Meter |
| Gallons | 3.785 | Liters |
| Gallons Water | 3.78625 | Kilogram |
| Gallons Water | 8.3453 | Lbs Water |
| Gallons/Min | 0.00144 | Million Gals/Day |
| Gallons/Min | 8.0208 | Cubic Feet/Hr |
| Gallons/Min | 0.00228 | Cubic Feet/Sec |
| Gallons/Min | 0.06308 | Liter/Sec |
| Gallons/Min | 0.00006 | Cubic Meter/Sec |
| Horsepower | 42.44 | BTU/min |
| Horsepower | 745.7 | Watts |

| MULTIPLY | BY | TO OBTAIN |
|---|---|---|
| Inch of Water | 0.03613 | Lbs/Sq In |
| Inch of Hg | 0.49116 | Lbs/Sq In |
| Kilograms | 2.2046 | Pounds |
| Kilometers | 3280.83 | Feet |
| Kilometers | 0.62137 | Miles |
| Kilowatts | 59.92 | BTU/Min |
| Kilowatts | 1.341 | Horsepower |
| Kilowatt-Hours | 3415 | BTU |
| Liters | 0.2642 | Gallons |
| Liters | 0.03531 | Cubic Foot |
| Meters | 3.2808 | Feet |
| Meters | 39.37 | Inches |
| Miles | 5280 | Feet |
| Miles | 1.60935 | Kilometers |
| Miles | 1760 | Yards |
| Miles/hour | 88 | Feet/min |
| Miles/hour | 1.467 | Feet/sec |
| Million Gallons/Day | 694.44 | Gallons/Min |
| Million Gallons/Day | 1.55 | Cubic Feet/Sec |
| Million Gallons/Day | 0.04167 | Cubic Meters/Sec |
| Ounce/Sq In | 0.0625 | Lbs/Sq In |
| Pounds Water | 0.01602 | Cubic Feet |
| Pounds Water | 27.68 | Cubic Inches |
| Pounds Water | 0.01198 | Gallons |
| Pounds/Sq Ft | 0.0069 | Lbs/Sq In |
| Pounds/Sq Ft | 0.01602 | Feet of Water |
| Pounds/Sq In | 2.307 | Feet of Water |
| Pounds/Sq In | 0.06803 | Atmosphere |
| Pounds/Sq In | 2.036 | Inch of Hg |
| Pounds/Sq In | 144 | Lbs/Sq Ft |
| Square Feet | 0.00002296 | Acres |
| Square Feet | 144 | Square Inches |
| Square Miles | 640 | Acres |
| Square Yards | 9 | Square Feet |
| Watts | 0.05692 | BTU/Min |
| Watt Hours | 3.415 | BTU |
| Pounds/Water | 0.01602 | Cubic Feet |
| Pounds/Water | 0.1198 | Gallon |
| Pounds/Square Inch | 2.307 | Feet/Water |
| Square Miles | 640 | Acres |
| Square Miles | 2.59 | Square Kilometers |
| Yards | 0.9144 | Meters |




**FLOOR CLEANOUT DETAIL**

SCALE: NONE




## WALL CLEANOUT DETAIL

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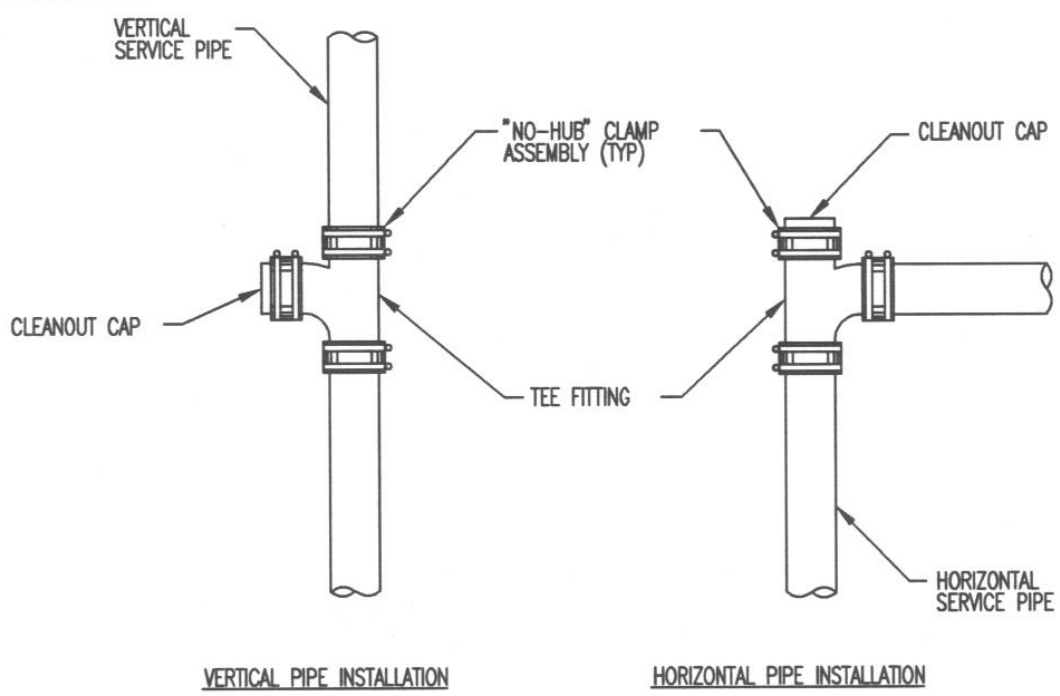



## EXPOSED CLEANOUT DETAIL

SCALE: NONE

# KITCHEN GREASE INTERCEPTOR SIZING GUIDE

1. Determine the cubic content of all fixtures being drained.

   Example: A wash sink is 48" long x 24" wide x 12" deep.

   48"x24"x12"=13,824 cubic inches

2. Convert cubic inches into gallons by dividing by 231.

   Example: 13,824 cubic inches ÷ 231 = 59.8 gallons

3. Determine the **Actual Drainage Load**

   A fixture is usually filled to about 75% of capacity with waste water. The items being washed displace the remaining 25% of the fixture content.

   Example: Actual drainage load= 59.8 gallons x 75% = 44.9 Gallons

4. Determine the **Flow Rate** and the **Drainage Period.**

   Good practice dictates a (1) minute drainage period, however where conditions permit, a (2) minute drainage period may be used.

   The drainage period is the actual time required to completely drain the fixture.

   $$\text{Flow Rate} = \frac{\text{Actual Drainage Load}}{\text{Drainage Period}}$$

   Example: $\frac{44.9 \text{ gallons}}{1 \text{ minute}}$ = 44.9 gallons per minute

5. Plumbing and Drainage Institute G-101, (Certification Standard Flow rates and Grease Retention Capacity Ratings for Grease Interceptors) states that an interceptor must retain not less than 2.25 pounds of grease for each gallon per minute of average flow rate.

6. A cubic foot of grease at 100 degrees F weighs 56.5 pounds.

7. The fixture used in this example would require an interceptor that retains 101 pounds of grease as determined below:

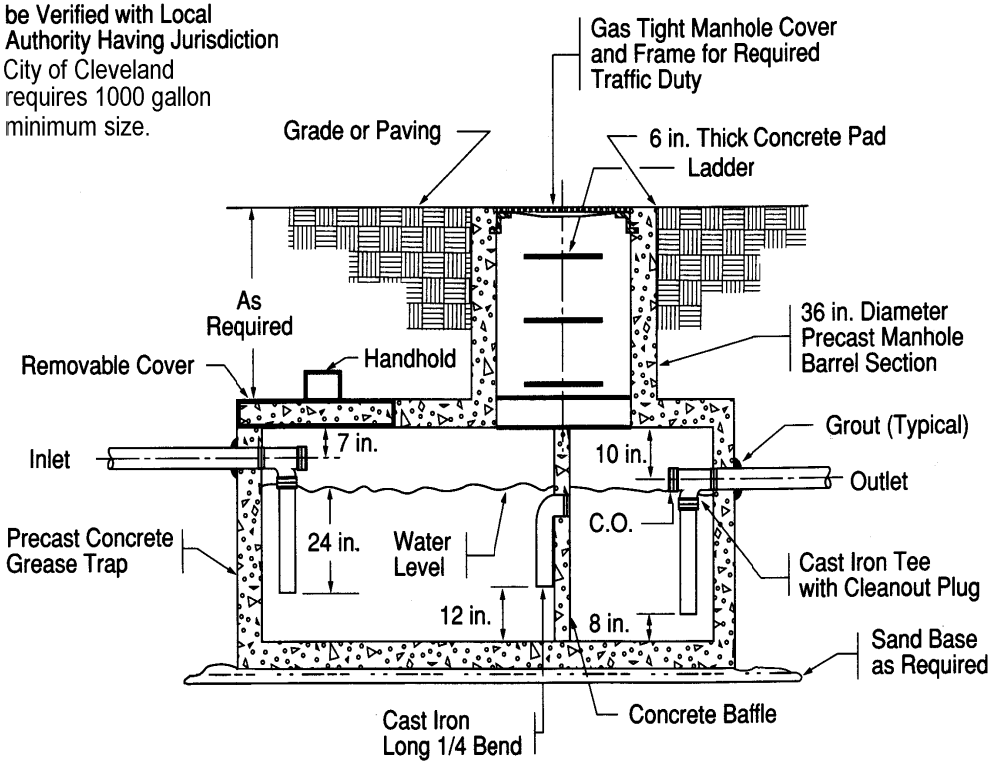
   Example: 44.9 GPM x 2.25 pounds of grease per GPM – 101.03 pounds.

   Or, if you wish to use volume rather than pounds:

   101.03 pounds of grease ÷ 56.5 pounds per cubic foot = 1.788 cubic feet capacity required.

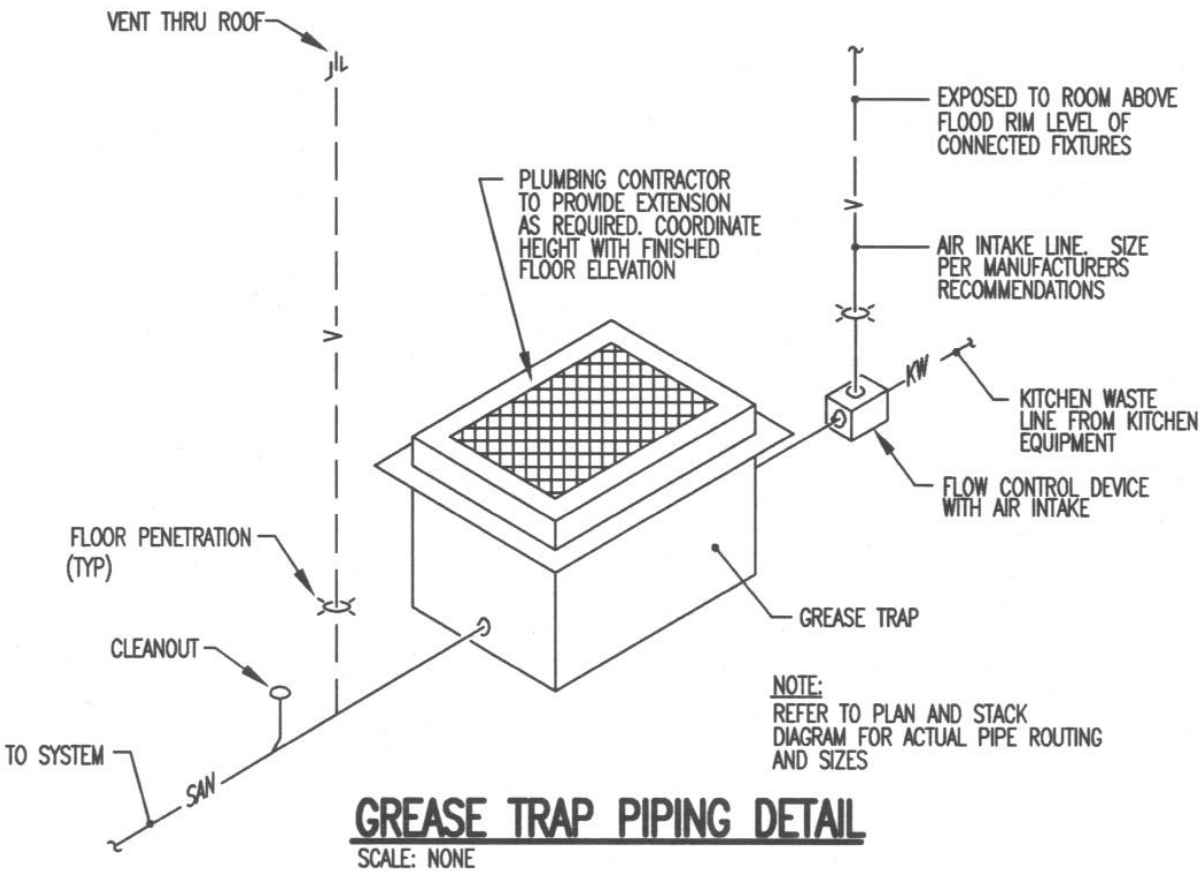
Note:

1. All Dimensions Shown shall be Verified with Local Authority Having Jurisdiction
2. City of Cleveland requires 1000 gallon minimum size.



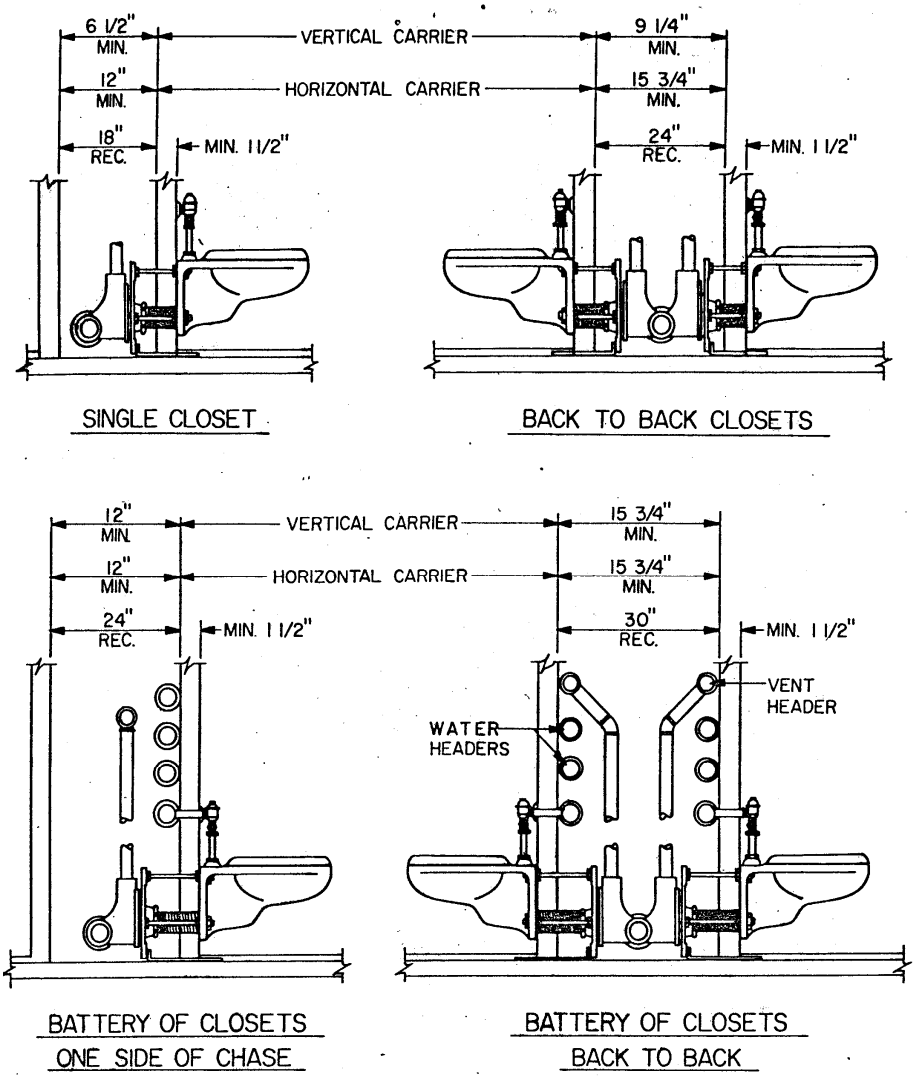

## GREASE INTERCEPTOR DETAIL

SCALE: NONE

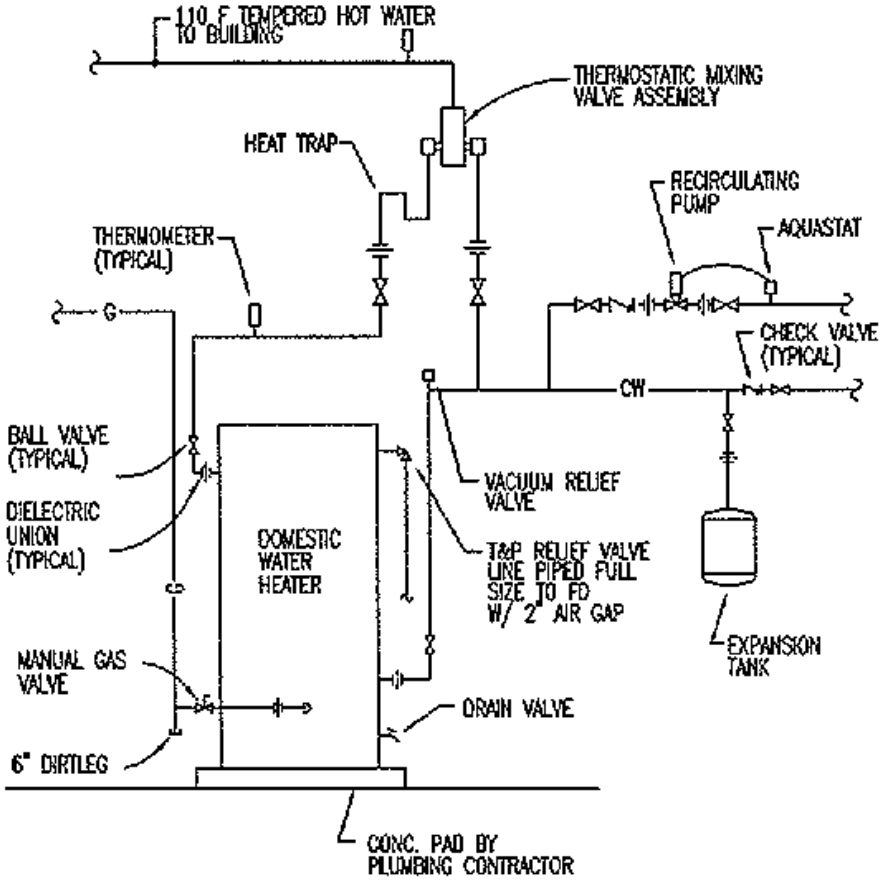



## GREASE TRAP PIPING DETAIL

SCALE: NONE




# PIPE CHASE CLEARANCES FOR WALL HUNG CARRIER CLOSETS

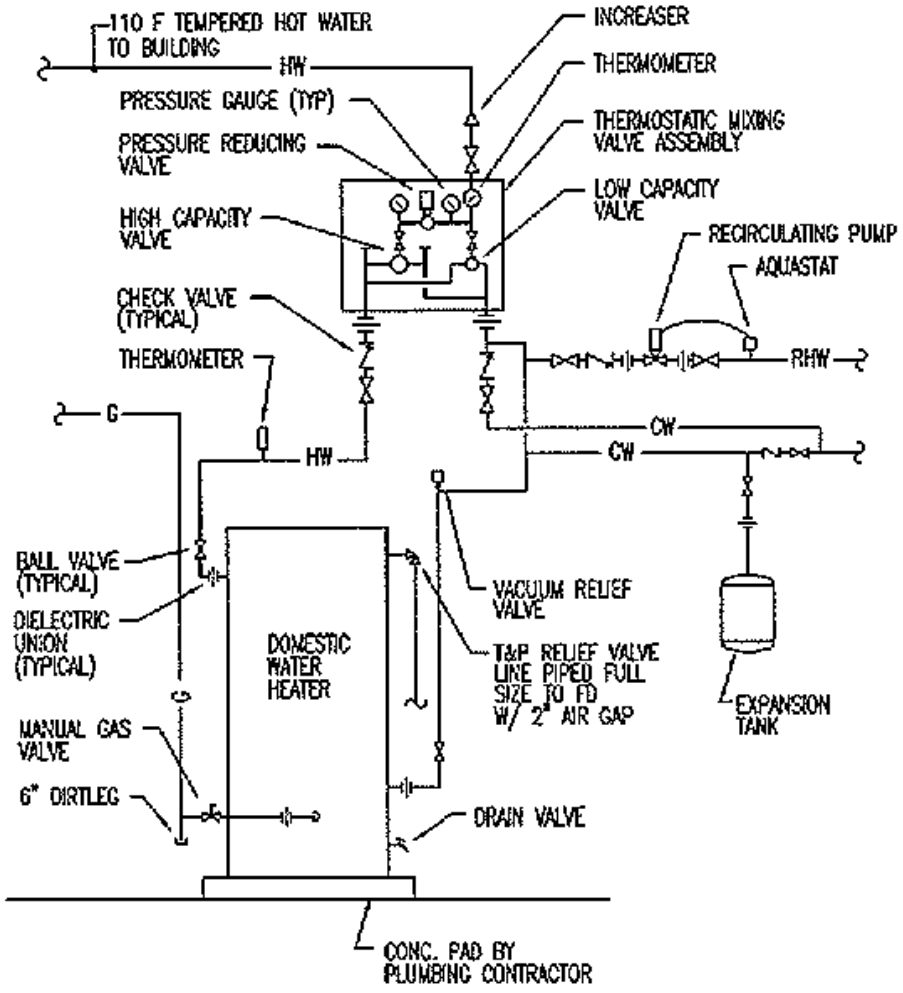



GENERAL NOTES:

1. CONTRACTOR SHALL VERIFY EXACT THERMOSTATIC MIXING VALVE PIPING ARRANGEMENT WITH MANUFACTURER.
2. PROVIDE VACUUM RELIEF VALVE ON BOTTOM FED TANK ONLY.

## WATER HEATER PIPING DIAGRAM

NO SCALE

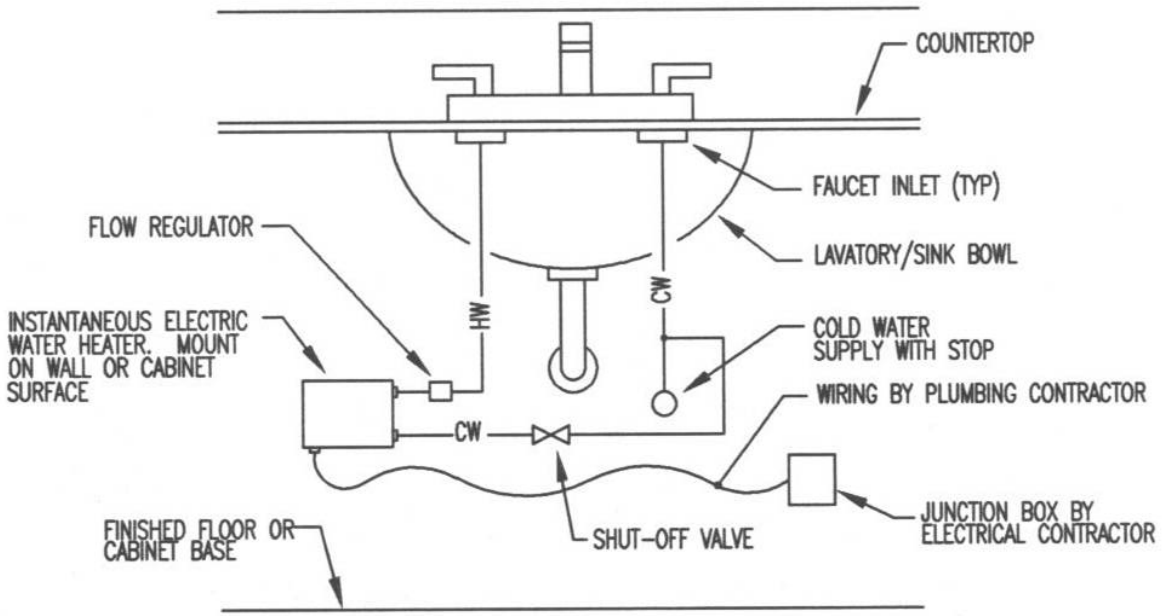



GENERAL NOTES:

1. CONTRACTOR SHALL VERIFY EXACT THERMOSTATIC MIXING VALVE PIPING ARRANGEMENT WITH MANUFACTURER.
2. PROVIDE VACUUM RELIEF VALVE ON BOTTOM FED TANKS ONLY.

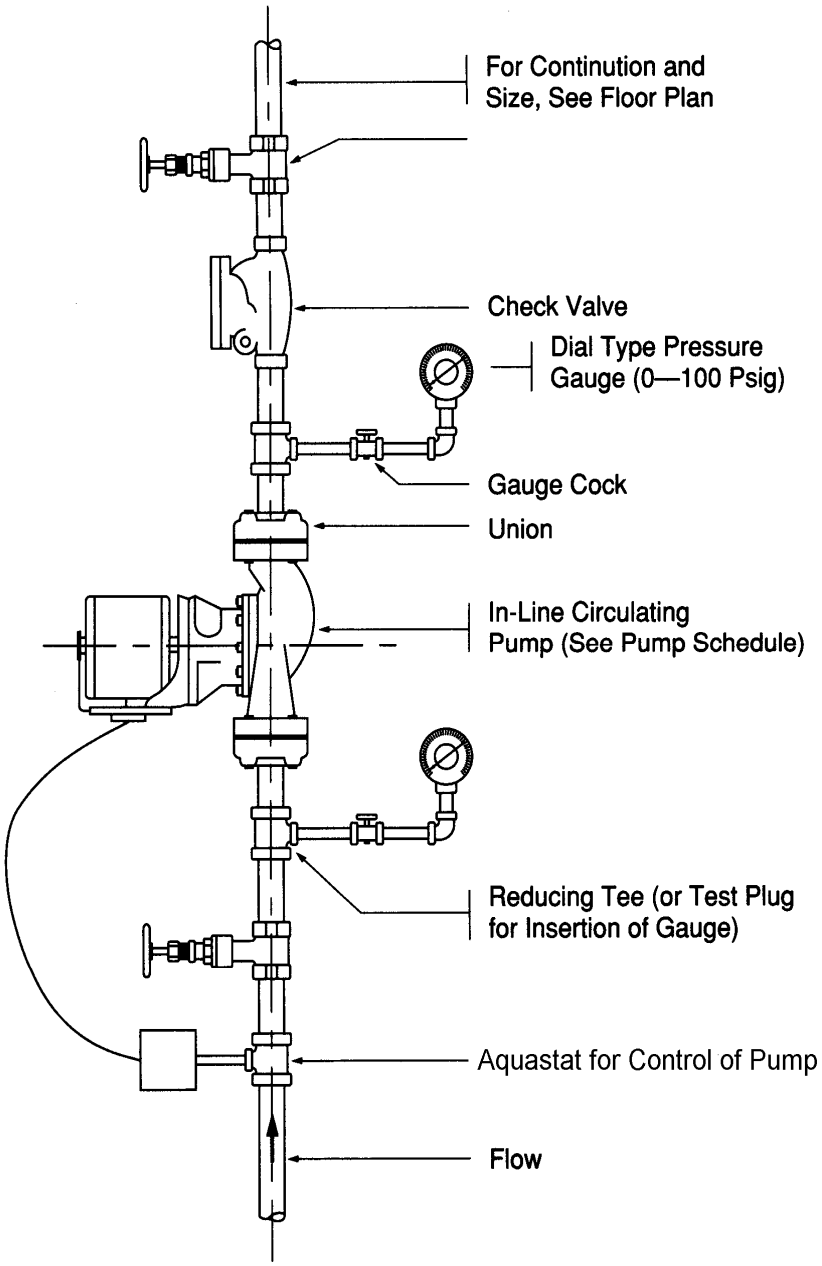
## WATER HEATER PIPING DIAGRAM

NO SCALE



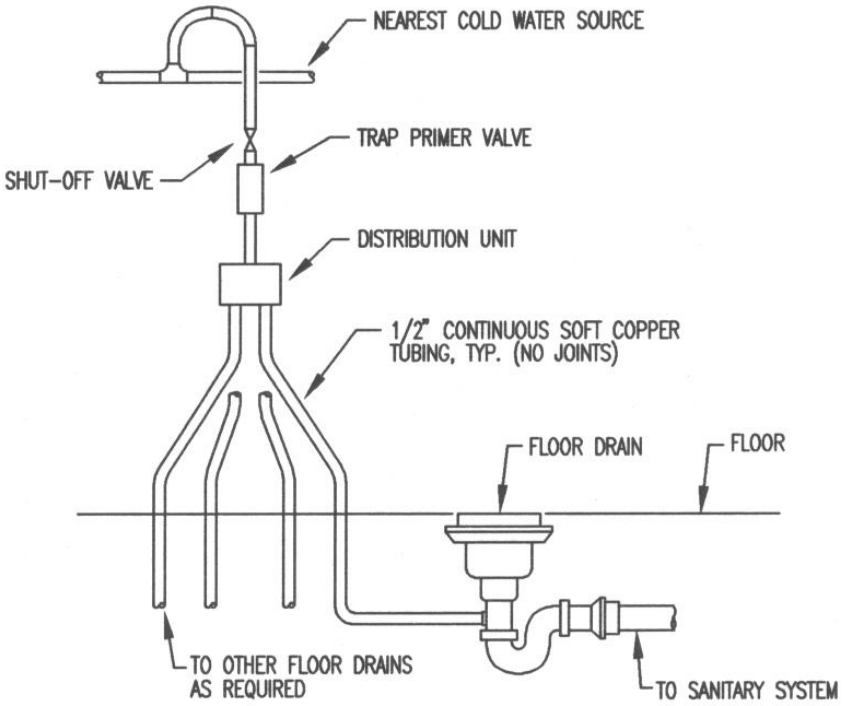

## INSTANTANEOUS ELECTRIC WATER HEATER DETAIL

SCALE: NONE



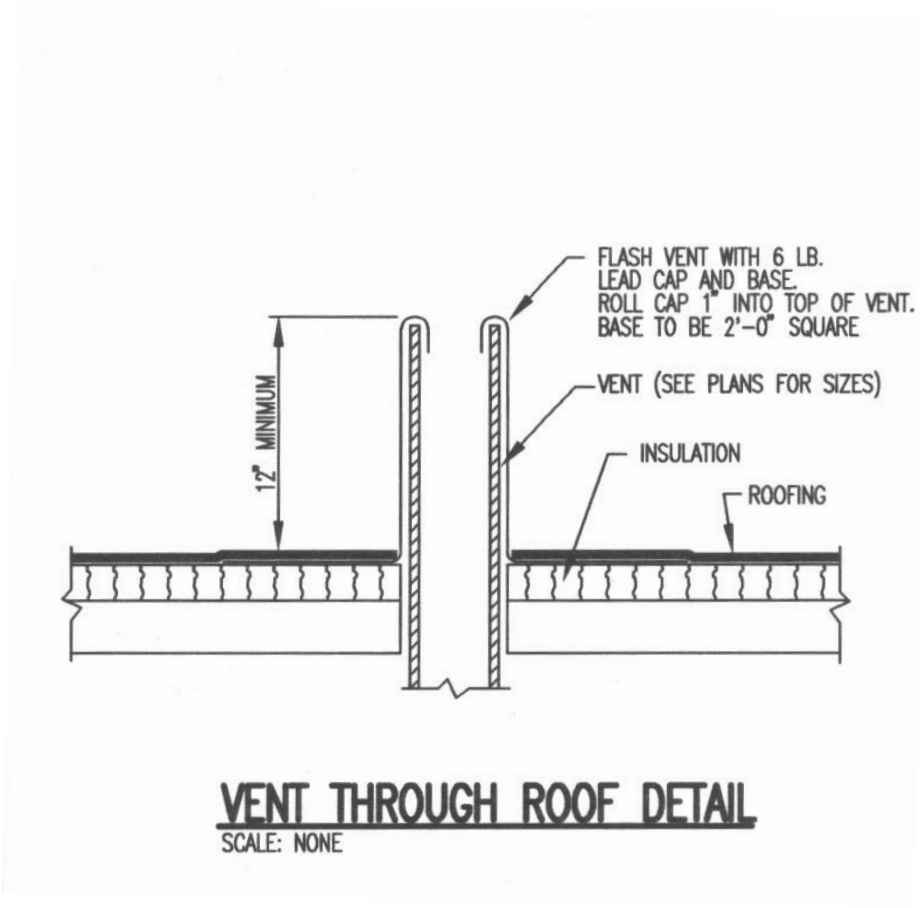

CIRCULATING PUMP

SCALE: NONE



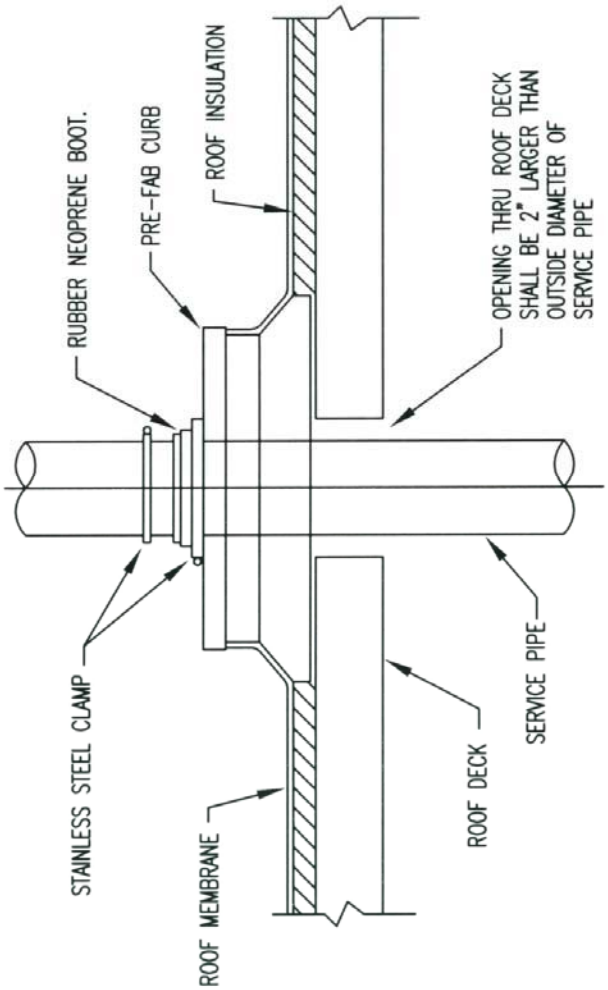

## TRAP PRIMER DETAIL

SCALE: NONE



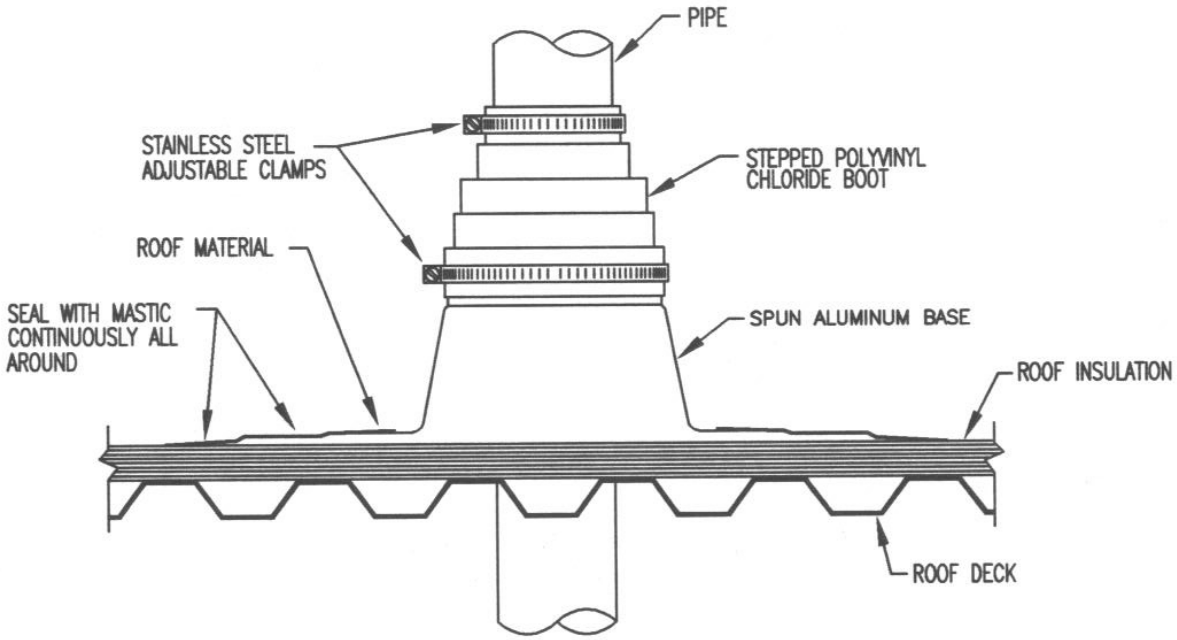

VENT THROUGH ROOF DETAIL

SCALE: NONE



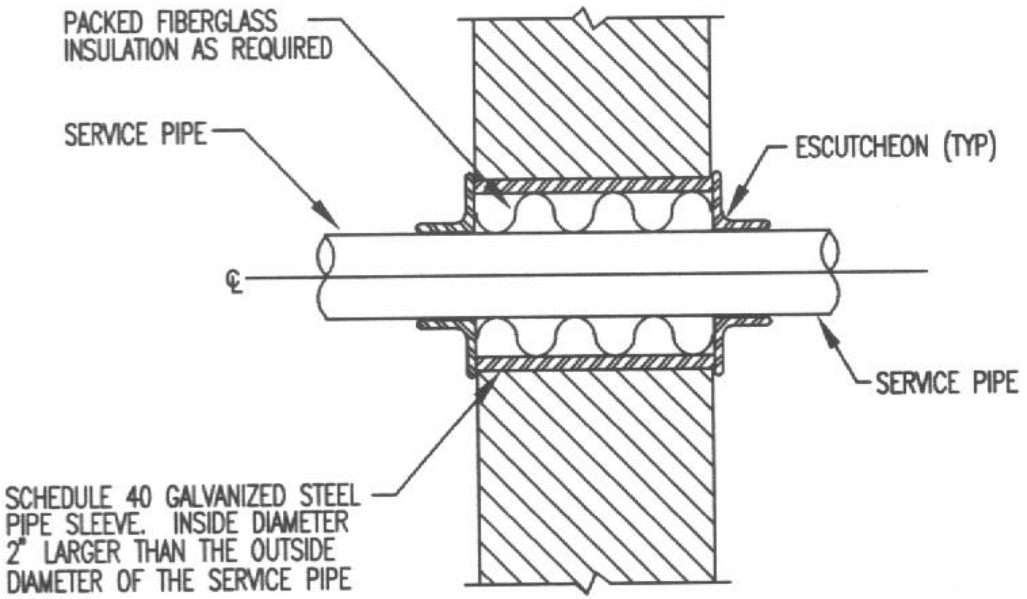

**ROOF CURB (PIPE) DETAIL**

SCALE: NONE



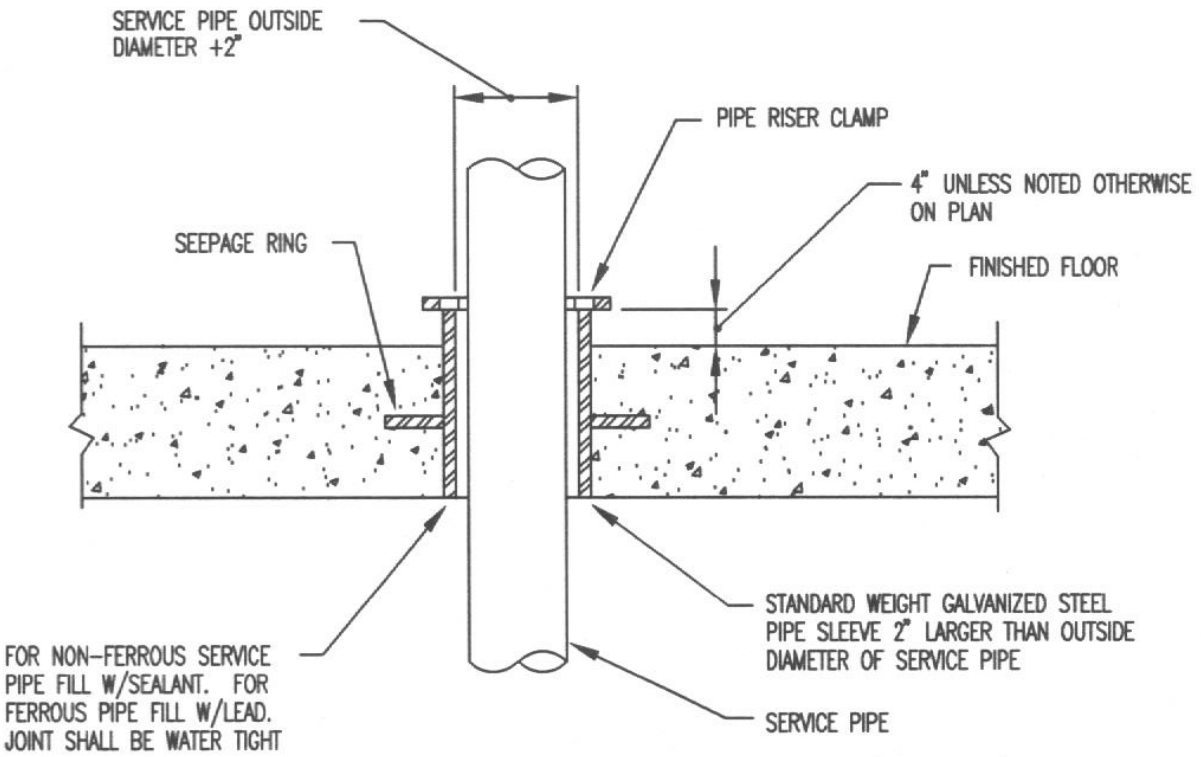

**PIPE PENETRATION THRU ROOF**

SCALE: NONE



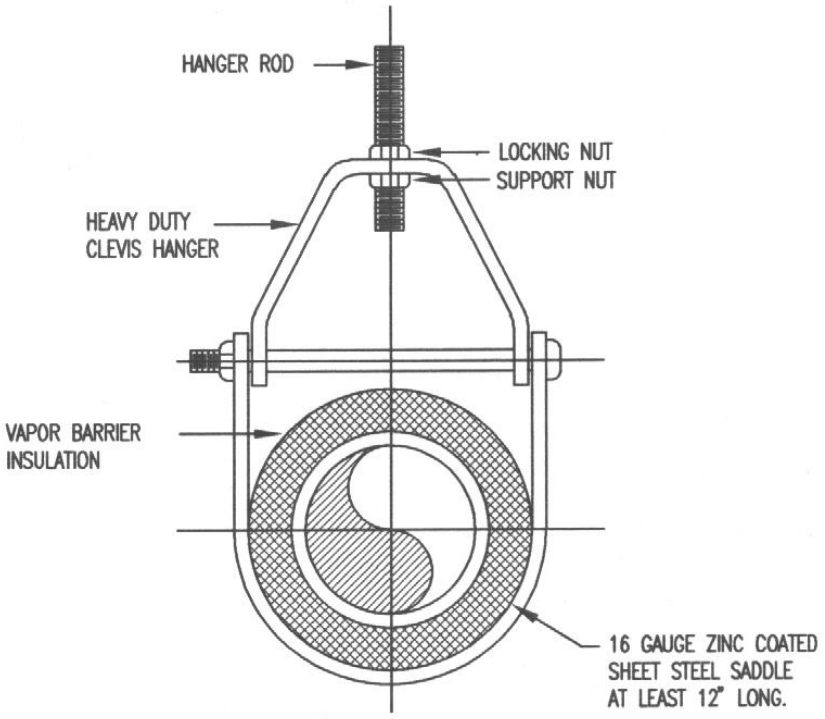

## PIPE PENETRATION THROUGH INTERIOR WALL

SCALE: NONE




**FLOOR SLEEVE**

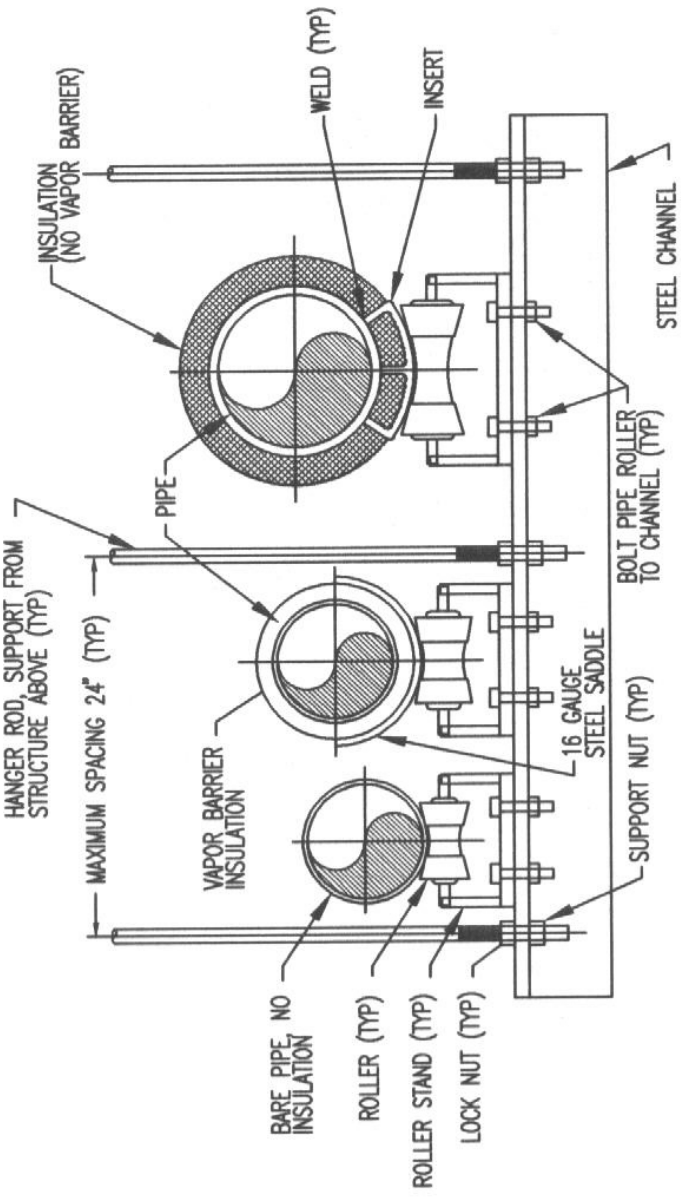
SCALE: NONE




SINGLE HORIZONTAL RUNS WITH
VAPOR BARRIER INSULATION

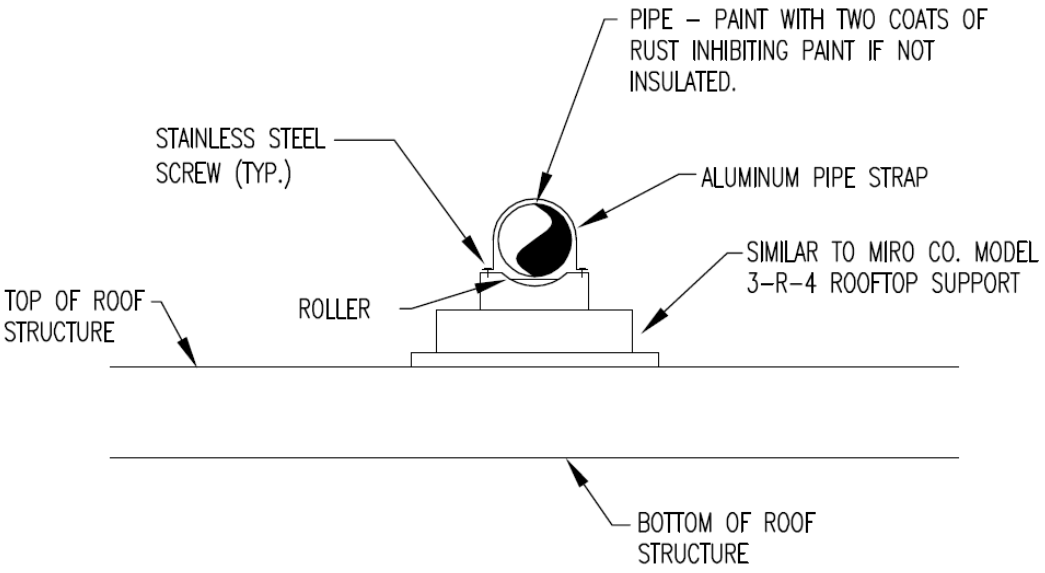
## CLEVIS HANGER

SCALE: NONE



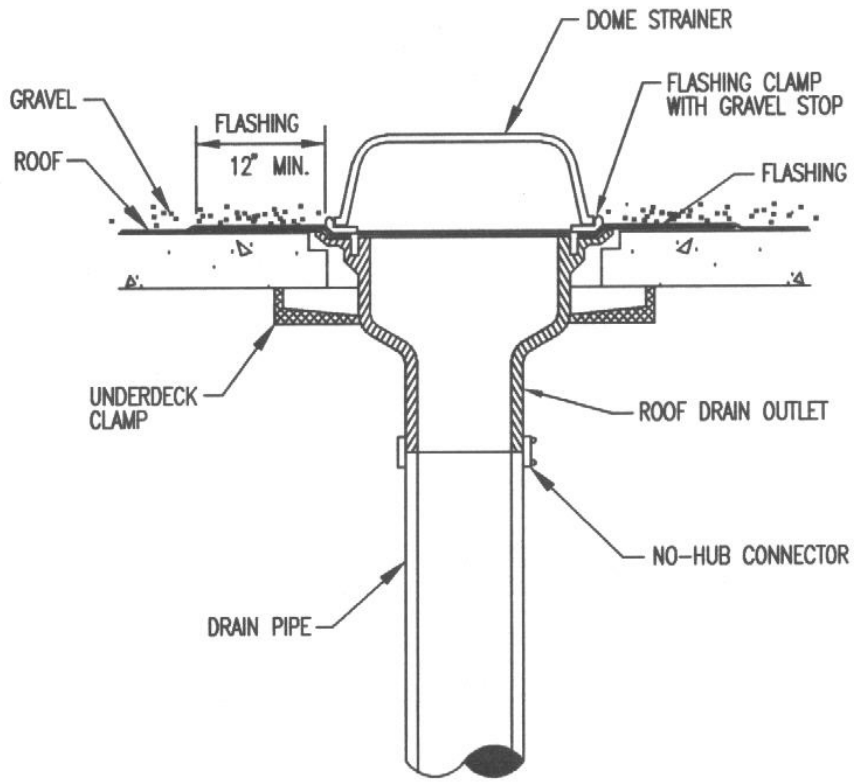

**TRAPEZE HANGER DETAIL**

SCALE: NONE



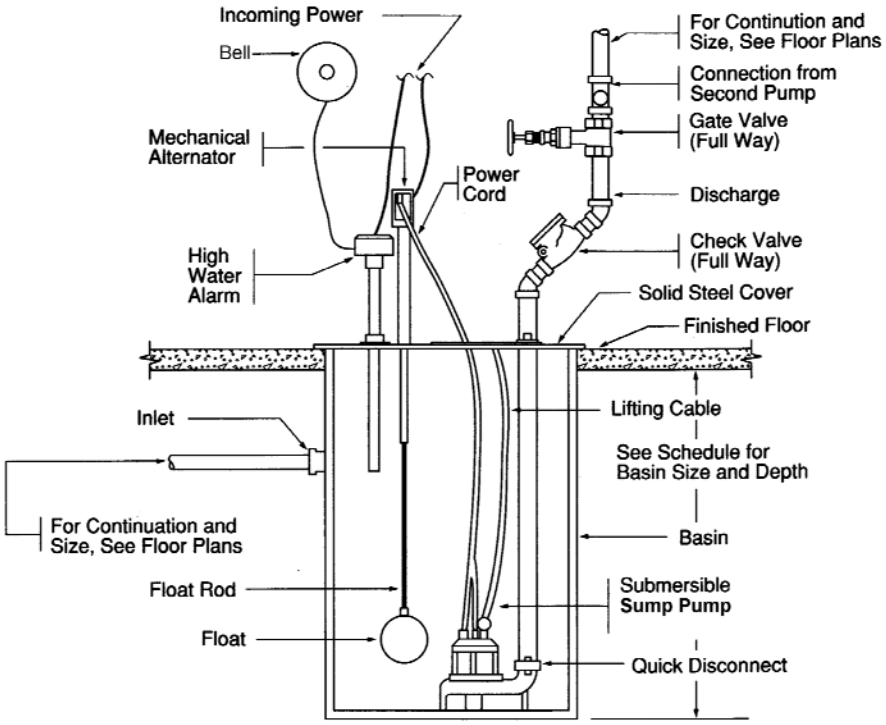

## GAS PIPE ROOF SUPPORT DETAIL

SCALE: NONE




**ROOF DRAIN DETAIL**

SCALE: NONE




**SUMP PUMP**

SCALE: NONE

## Sump Pump Design Notes

Use Submersible when:

- Outdoors
- Indoors with Limited Headroom above Sump
- Sumps over 10'-0"
- Limited Maintenance
- Where Abrasives occur, i.e. Sand

Use Shaft type when:

- Desire to have motor above floor
- Long life of motor (20-30 years) with proper maintenance
- Explosion proof motor capability
- Economical up to 8 feet deep basin

Basin

- Minimum width of 48” — 60” for heavy flows
- 4'-0” minimum between inlet and bottom of basin

Power

- Alarms require 110 volt connection
- Power shall be 3 phase for pumps and control circuit

Selection Example

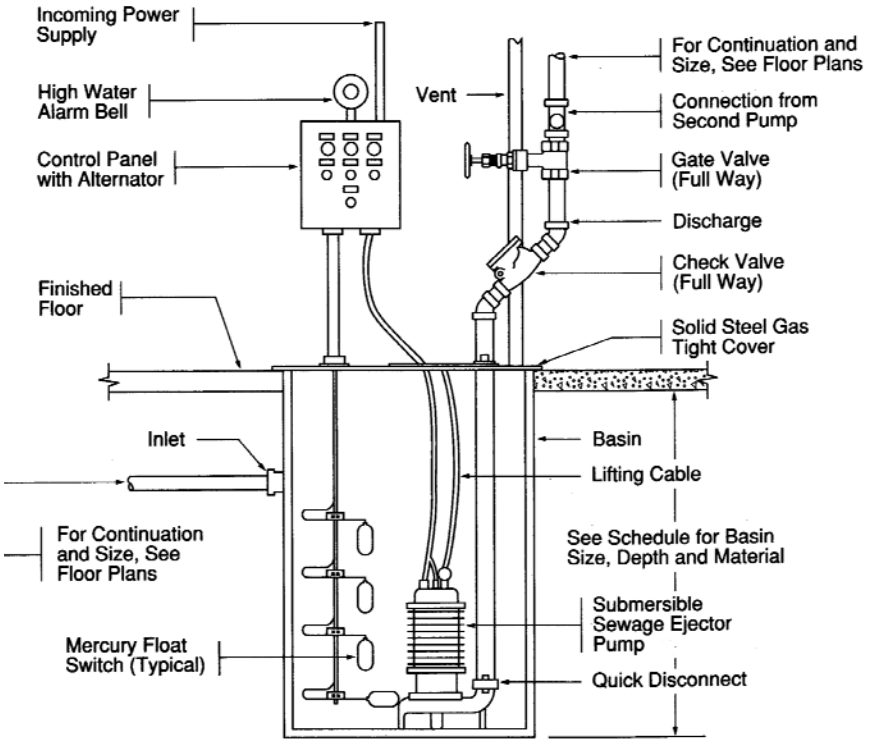
100 ft. x 100 ft. = 10,000 sq. ft.
10,000 sq. ft. X ¼ft. / hr. rainfall rate = 2500 cu. ft. / hour
2500 cu. ft. X 7.5 = 18,750 gal. / hour
18,750 gph ÷ 60 = 320 gpm.

Head Calculation Example

| | Gravity | Force Main |
|---|---|---|
| Basin Depth | 6 ft. | 6 ft. |
| Static Head | 12 ft. | 6 ft. |
| Friction Head | - | 3.5 ft. (ft. / 100 ft.) |
| Fittings | 2 ft. | 2 ft. |
| Total | 20 ft. | 20 ft. |

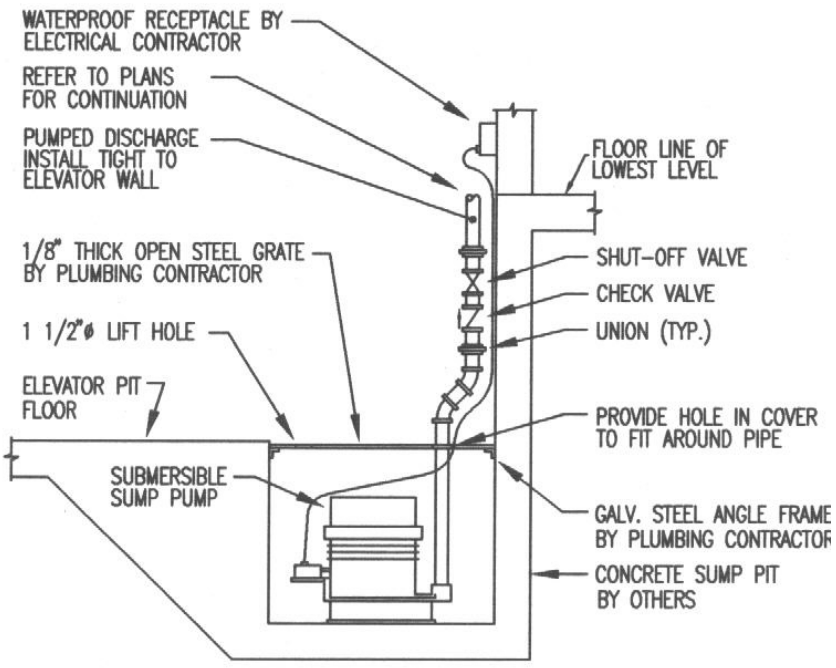
Pump Selection

Select non-overloading motor
Normal rpm 1150



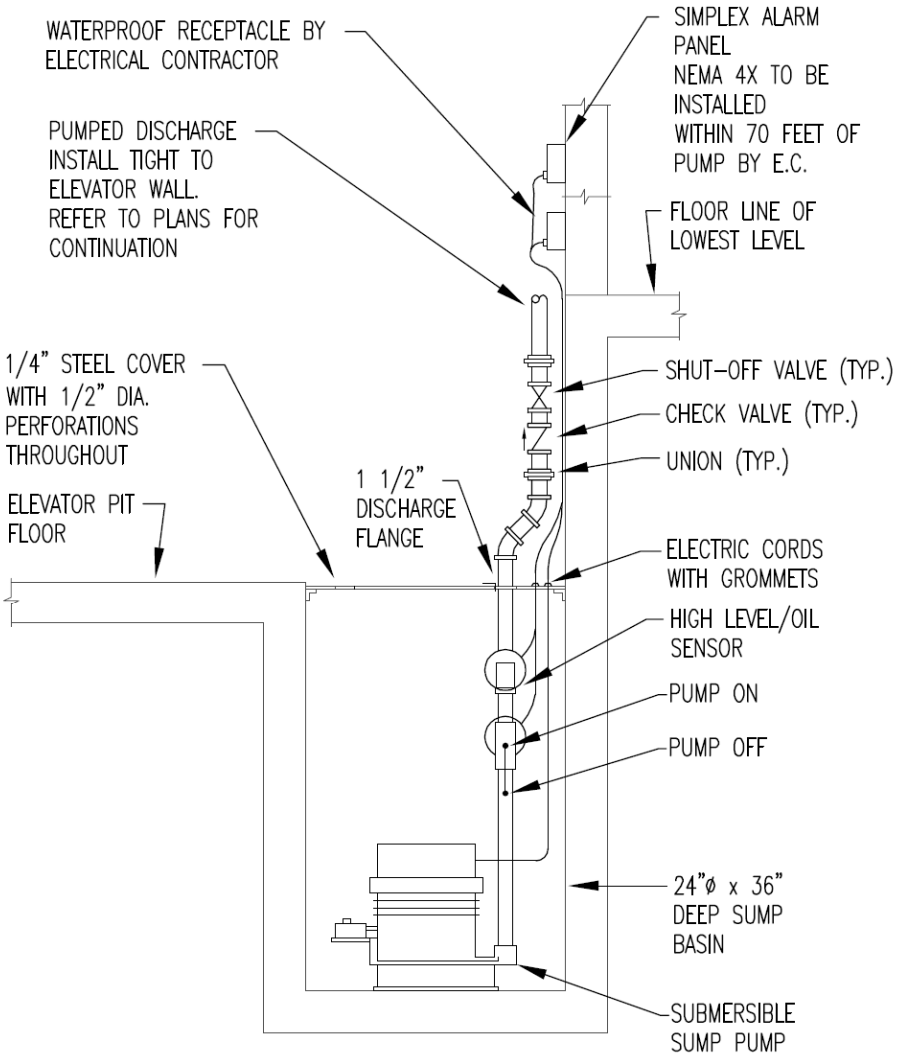

**SEWAGE EJECTOR**

SCALE: NONE



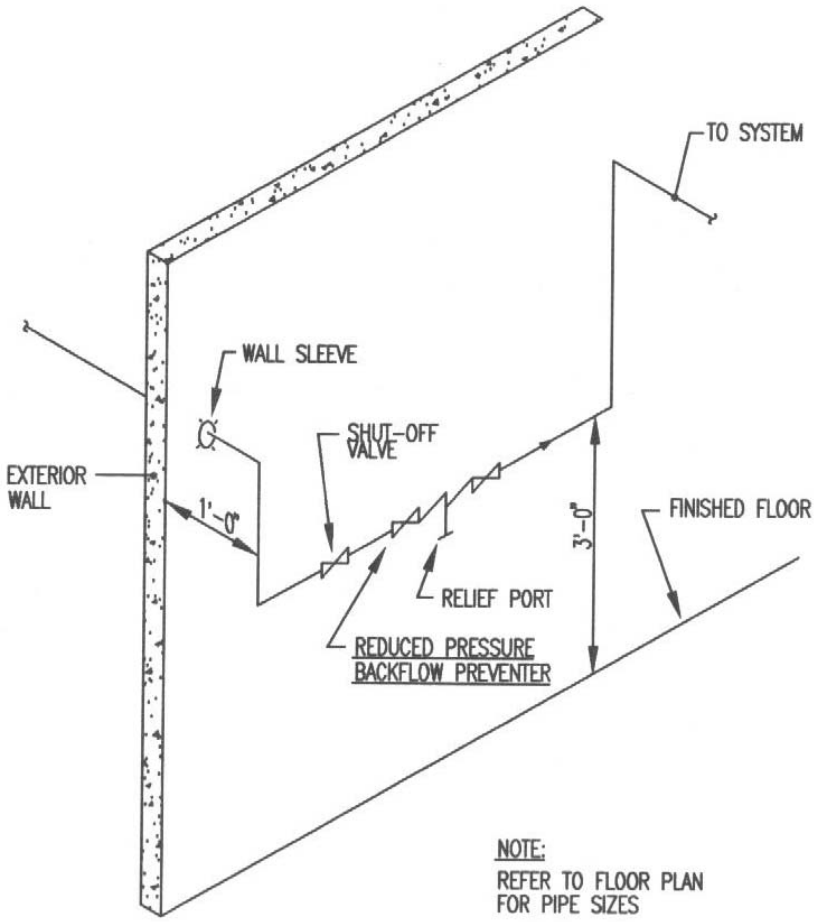

## ELEVATOR PIT SUMP PUMP DETAIL

SCALE: NONE




## HYDRAULIC ELEVATOR SUMP PUMP DETAIL

SCALE: NONE



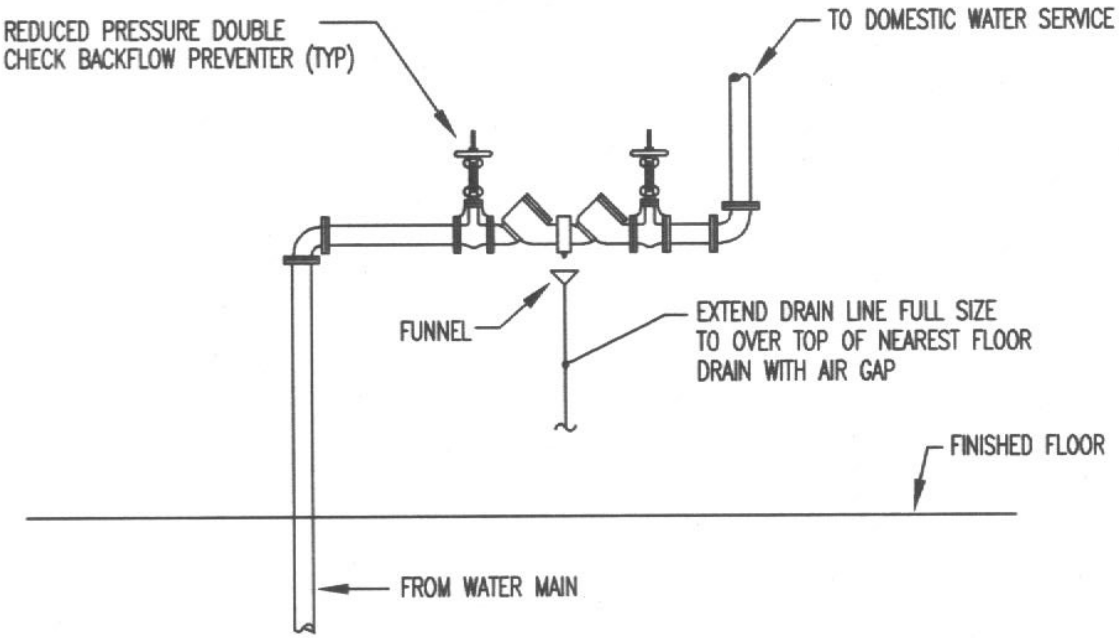

## CITY OF AKRON
## DOMESTIC WATER PIPING ISOMETRIC

SCALE: NONE

# REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY PER CITY OF AKRON PUBLIC UTILITIES BUREAU

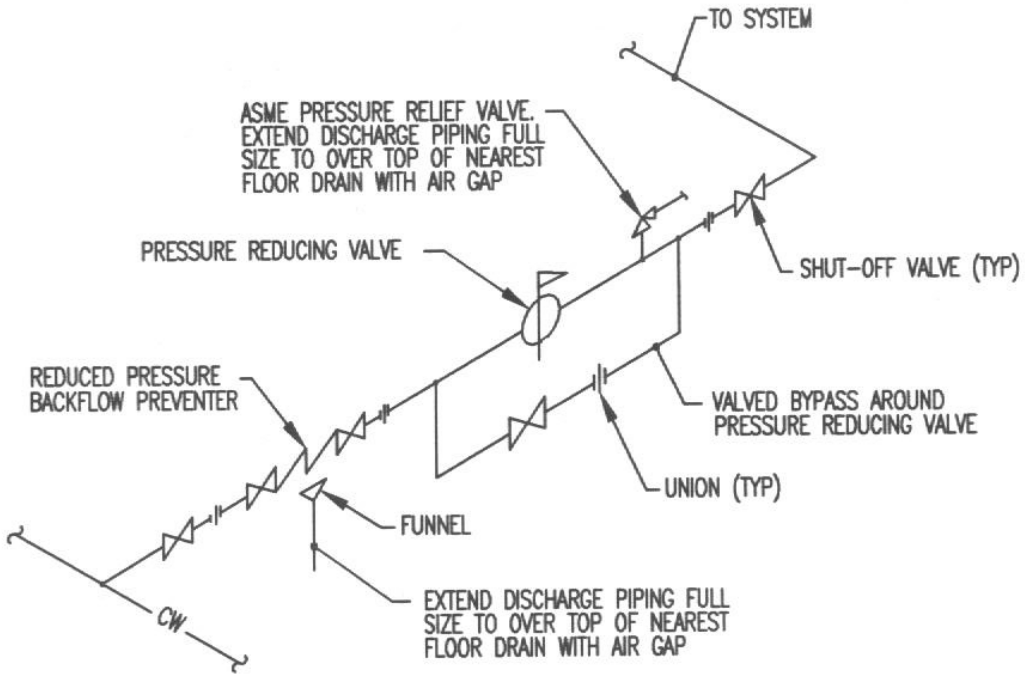
1. ALL PIPING TO CONFORM TO AKRON WATER WORKS STANDARD CONSTRUCTION DRAWINGS AND SPECIFICATIONS.
2. BYPASSING OF THIS ASSEMBLY IS SPECIFICALLY PROHIBITED.
3. INSTALLATION OF THIS ASSEMBLY IN VAULT IS SPECIFICALLY PROHIBITED.
4. UNIONS PRIOR TO BACKFLOW PREVENTION ASSEMBLIES ARE PROHIBITED.
5. INSTALLED DIRECTLY AFTER THE METER SETTING AHEAD OF ANY OUTLETS.
6. INSTALLED SO AS TO BE READILY ACCESSIBLE FOR INSPECTION, TESTING AND MAINTENANCE.
7. PROVIDED WITH ADEQUATE SPACE FOR INSPECTION, TESTING, MAINTENANCE AND DISASSEMBLY.
8. PROTECTED FROM FREEZING BY INSTALLATION WITHIN A HEATED BUILDING.
9. MOUNTED IN A HORIZONTAL POSITION WITH ABUTTING SHUT-OFF VALVE, AS SUPPLIED WITH THE ASSEMBLY, THREE FEET ABOVE FINISHED FLOOR.
10. PROVIDED WITH ADEQUATE DRAINAGE.
11. INSTALLED SO THAT THERE IS A VISIBLE FREE DISCHARGE FROM THE RELIEF PORT WITH NO EXTENSION PIPING.
12. INSTALLED AS PER MANUFACTURER'S SPECIFICATIONS. WHERE MANUFACTURER'S SPECIFICATIONS CONFLICT WITH THESE GUIDELINES, THESE GUIDELINES SHALL GOVERN.
13. BECAUSE OF THEIR DESIGN, BACKFLOW PREVENTION ASSEMBLIES CREATE A CLOSED SYSTEM AND A DETECTABLE PRESSURE LOSS. BECAUSE OF THESE FACTS, THE INSTALLATION MAY ALTER THE HYDRAULICS OF THE INTERNAL PLUMBING SYSTEM. THE OWNER SHOULD CONTACT A MECHANICAL DESIGNER PRIOR TO INSTALLATION.
14. UPON INSTALLATION, ASSEMBLIES MUST BE TESTED BY A BACKFLOW PREVENTION ASSEMBLY TESTER, CERTIFIED BY THE OHIO DEPARTMENT OF COMMERCE. THE ASSEMBLY MUST BE DISMANTLED, INSPECTED INTERNALLY, CLEANED, AND REPAIRED, IF NECESSARY.

(* ALL REQUIREMENTS MAY NOT APPLY TO THIS PROJECT)



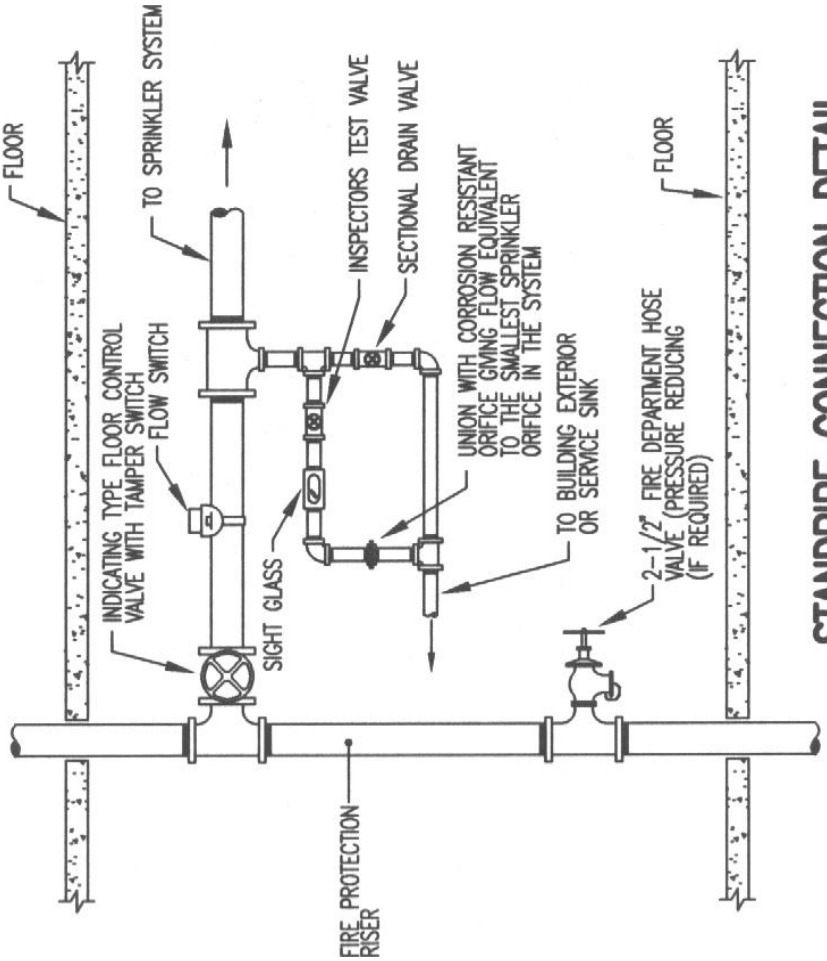

## REDUCED PRESSURE DOUBLE CHECK BACKFLOW PREVENTER DETAIL

SCALE: NONE



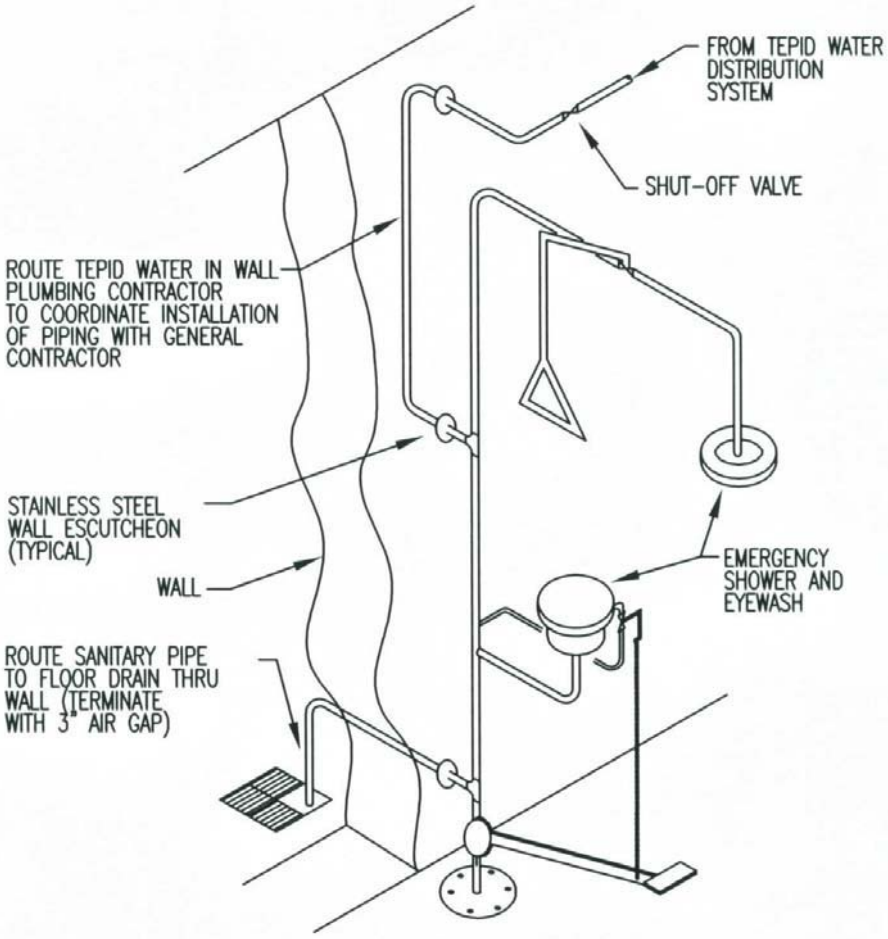

## MAKE-UP WATER STATION

SCALE: NONE



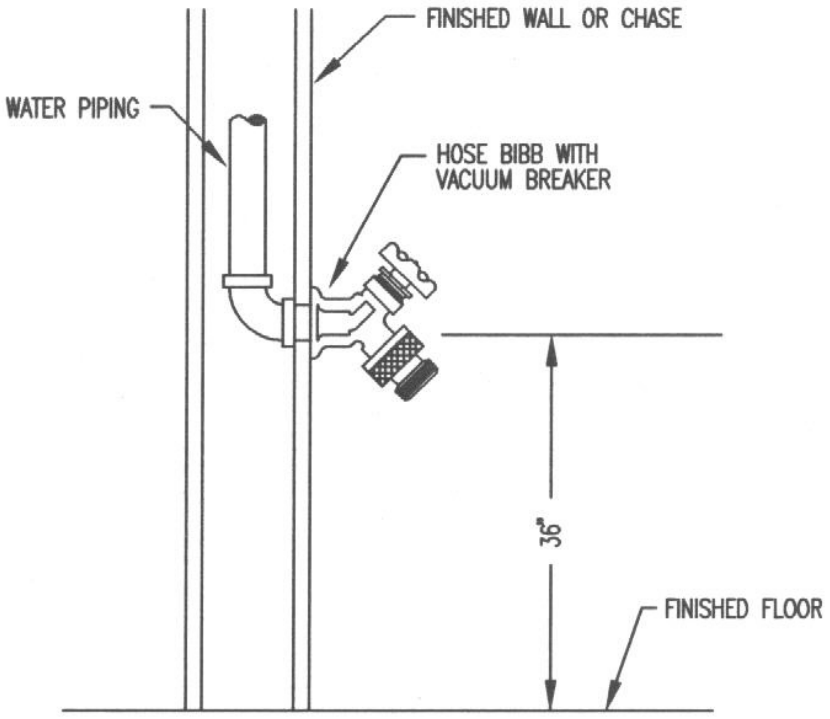

**STANDPIPE CONNECTION DETAIL**

SCALE: NONE



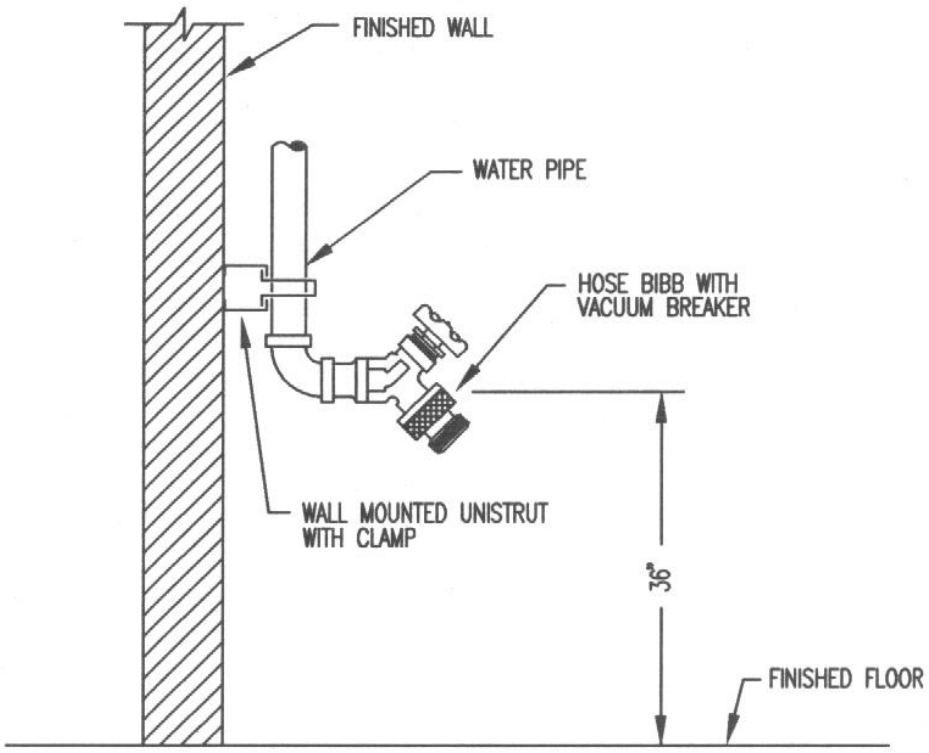

**EMERGENCY SHOWER / EYEWASH DETAIL**

SCALE: NONE



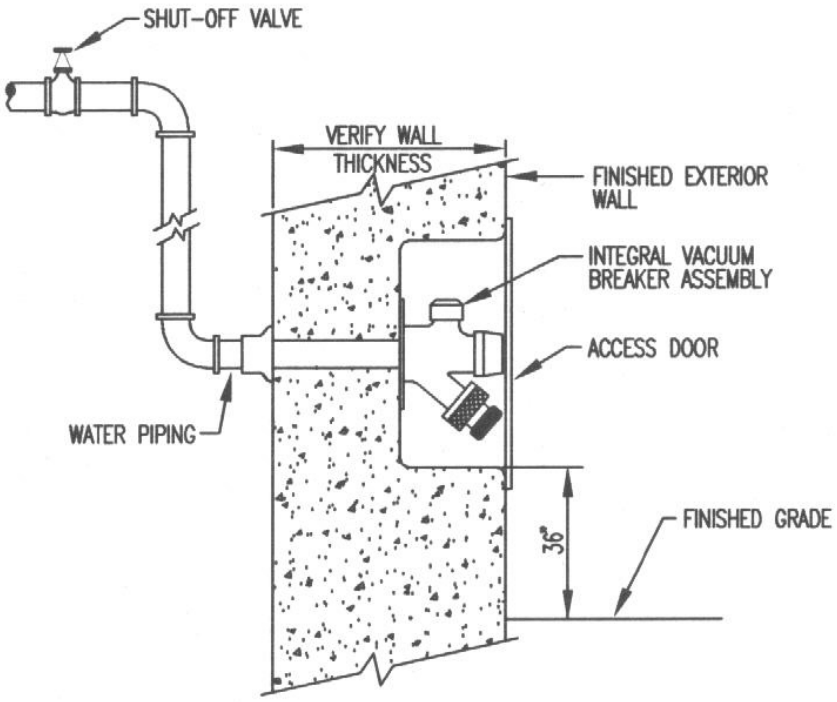

**HOSE BIBB DETAIL**

SCALE: NONE



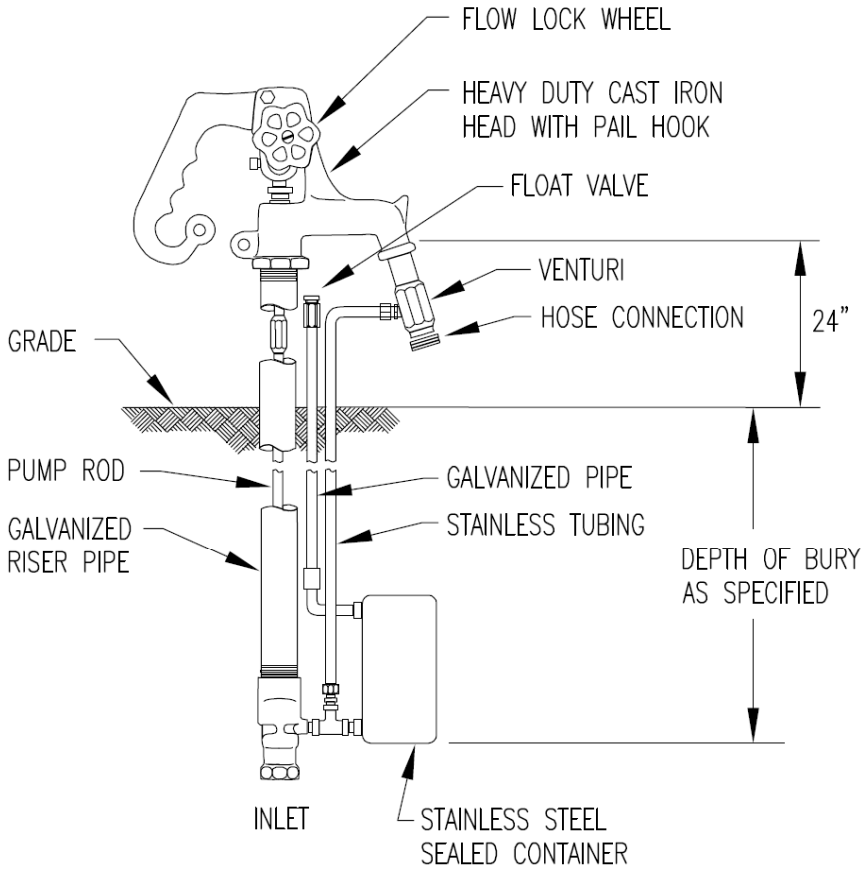

## WALL-MOUNTED HOSE BIBB DETAIL

SCALE: NONE




## FROSTPROOF HOSE BIBB DETAIL

SCALE: NONE




## FROSTPROOF YARD HYDRANT DETAIL

SCALE: NONE

# SOURCES OF INFORMATION

## City of Cleveland
## Distribution Systems Engineering Services
## Guy Singer-Supervisor
## (216)-664-2444 x5555

*Permit & Sales Unit*

Submittal and processing of permits for service connections, inspection of service connection installations on owner's side, hydrant permits, location of individual service lines.

Greg McClain, Supervisor (216) 664-2444 x5200
Address: 1201 Lakeside Avenue, Cleveland, OH 44114

*Plan Review Unit*

Review of connection sizing and meter sizing of service connections (eventual approval process for plans in 1998)

Tina Gosha (216) 664-2444 x5526
Address: 1201 Lakeside Avenue, Cleveland, OH 44114

*Backflow Unit*

Review of connections for backflow requirements, inspection and verification of backflow installations.

John Corsi, Sr. (216) 664-3944
Address: 1825 Lakeside Ave. Cleveland, OH 44114

Flow Test Information

Static and Residual pressure readings
Leondria Williams (216) 664-2444 x5505

*Mapping Unit*

Location of water mains and copies of maps.
Richard Smith (216) 664-2444 x5558

## Cleveland Water Pollution Control Department

*Deputy Commisioner* (216) 664-2754

## Contact for Sewer Drawings and Information

*Engineering*
Rashid Zoghaib (216) 664-3785
12303 Kirby Avenue, Cleveland, Ohio 44108

## City of Cleveland
## Division of Building and Housing (216) 664-2910

Building Code Consultation
Timothy R. Wolosz, Commissioner (216) 664-2298

Zoning Code Consultation
Richard Riccardi, Assistant Commissioner (216)664-3827

*Structural Plan Review*
Ramesh Patel, Chief Civil Engineer (216) 664-2923

*HVAC, Plumbing Plan Review*
Timothy Musser, Chief Mechanical Engineer (216) 664-2036

*Electrical Plan Review*
Kenneth Marriott, Electrical Engineer (216) 664-3635

*Contractor Registration*
Timothy Wolosz, Commissioner (216) 664-2298

*Building Inspections*
District 1 – Kevin Franklin (216) 664-4364
Chief Building Inspector
District 2 – George Lazarowski (216) 664-2032
Chief Building Inspector
District 3 – Pete Stewart (216) 664-2030
Chief Building Inspector
District 4 – Dwayne Ford (216) 664-4316
Chief Building Inspector

*Vacant Properties Unit*

| | |
|---|---|
| Tom Ardito, Chief Building Inspector | (216) 664-3669 |
| *Electrical Inspections* | |
| Charlie Stroud, Chief Elect. Inspector | (216) 664-2616 |
| *HVAC, Refrigeration Inspections* | |
| Bill Cagney, Acting Chief HVAC/ Refrigeration Inspector | (216) 664-2284 |
| *Plumbing Inspections* | |
| Bill Cagney, Chief Plumbing Inspector | (216) 664-2284 |
| *Elevator Inspections* | |
| Bill Cagney, Chief Elevator Inspector | (216) 664-2284 |

## OTHER IMPORTANT SOURCES OF INFORMATION

Officials

Building Officials and Code Administrators International (BOCA)
1245 Sunbury Rd., Suite 100
Westerville, OH 43081
Bruce Larcorb - Senior Service Coordinator, Mid-East Regional Office: (614) 890-1064 or (614) 890-9712

Americans with Disabilities Act (ADA) Title III, Public Law 101-636
U.S. Department of Justice
Washington, D.C. 20530
Barbara S. Drake, Deputy Assistant Attorney General
Stewart B. Oneglia, Chief Coordination and Review Section
John Wodatch, Director

| | |
|---|---|
| Information: | (202) 514-0301 (Voice) |
| | (202) 514-0381 (TDD) |
| | (202) 514-0383 (TDD) |
| Copies of Act: | (202) 514-0301 (Voice) |
| | (202) 514-0381 (TDD) |
| Electronic Bulletin Board: | (202) 514-6193 |

Cuyahoga County Sanitary Engineer
6100 West Canal
Valley View, Ohio 44125
Tom Atherton - Plan Review / County Grease Traps
(216) 443-8204

Cleveland Fire Prevention Bureau
1645 Superior Avenue
Cleveland, Ohio 44114-2984
Lt. Doug Veselsky - Sprinkler and Plan Review
(216) 664-6664

Cleveland Plumbing Industry Fund
981 Keynote Circle Suite #30
Brooklyn Hts.,Ohio 44131
Thomas J. Wanner, Executive Director
(216) 459-0770, Fax: 216-459-1342

Ohio Department of Health
Plumbing Inspection Unit
35 East Chestnut
P.O. Box 118
Columbus, Ohio 43266-0118
Gary Krebs, Chief Enforcement Official
Kit Llyod
(614) 752-1380 or 614-752-1383

Ohio Department of Natural Resources
Mineral Resources Management
2045 Morse Road, Building H2, H3
Columbus, Ohio 43229
(216) 371-8334

Environmental Protection Agency
Division of Surface Water
Sandy Cappatto
(330) 425-9171

Factory and Building Code Review
Bill Phillips (Plans Review)
(800) 643-4842

Aqua Ohio Water Company
Doug Brown
(440) 255-3421

## Utility Companies

Dominion East Ohio Gas Company
1201 East 55th Street
P.O. Box 5759
Cleveland, Ohio 44101-0759
(800) 362-7557

Columbia Gas Company
7080 Fry Road
Middleburg Heights, Ohio 44130
(800) 440-6111

The Illuminating Company
55 Public Square
P.O. Box 5000
Cleveland, Ohio 44101
Central Sales Region
(216) 622-9800

First Energy
6200 Oak Tree Boulevard
Independence, Ohio 44131
or
P.O. Box 94661
Cleveland, Ohio 44101-4661
(330) 315-6976

Cleveland Thermal Energy Resources
2274 Canal Road
Cleveland, Ohio 44113
(216) 241-3636

## Lake County Water Department

Plan Review and Questions
(440) 639-4825
Flow Test and Water Quality
(440) 951-8410

Societies

**Cleveland Engineering Society**
3100 Chester Avenue
Cleveland, Ohio 44114-4683
Debra Mitchell, Executive Director
(216) 361-3100

**Ohio Association of Consulting Engineers**
Don Mader, Executive Director
(614) 487-8844

**Cleveland ASHRAE**
Billy Kodosky, President
(330) 342-9400

**National Fire Protection Association**
(800) 344-3555

**American Society of Sanitary Engineering**
**Northern Ohio Chapter**
Jason Shank, President
(216) 459-2900

# LOCAL CODE OFFICIALS

**Bay Village**
350 Dover Center Road
Bay Village, Ohio 44140
(440) 899-3402
Fax: (440) 899-3418

**Beachwood**
2700 Richmond Road
Beachwood, Ohio 44122
(440) 292- 1914
Fax: (440) 292-1917

**Bedford**
65 Columbus
Bedford, Ohio 44146
(440) 232-1600
Fax: (440) 232-1558

**Bedford Heights**
5661 Perkins Road
Bedford Heights, Ohio 44146
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Fax: (440) 786-3277

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**Brecksville**
9069 Brecksville Road
Brecksville, Ohio 44141
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Fax: (440) 526-6322

**Broadview Heights**
9543 Broadview Road Bldg #7
Broadview Heights, Ohio 44147
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**Brooklyn**
7619 Memphis Avenue
Brooklyn, Ohio 44144
(216) 351-2133
Fax: (216) 351-7601

**Brooklyn Heights**
345 Tuxedo Avenue
Brooklyn Heights, Ohio 44131
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Fax: (216) 741-3753

**Brookpark**
6161 Engle Road
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Fax: (216)433-4117

**Chagrin Falls**
21 West Washington
Chagrin Falls, Ohio 44022
(216) 247-5050
Fax: (216) 247-1510

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470 Center Street Building 8
Chardon, Ohio 44024
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**Cleveland Heights**
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Cleveland Heights., Ohio 44118
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Fax: (216) 291-4421

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Cuyahoga Heights, Ohio 44125
(216) 524-6068
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**East Cleveland**
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East Cleveland, Ohio 44112
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Fax: (216) 681-2402

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Fax: (440) 777-5889

**North Randall**
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Fax: (216) 587-9280

**North Royalton**
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North Royalton, Ohio 44133
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Fax: (440) 582-3089

**Oakwood**
24800 Broadway
Oakwood, Ohio 44146
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Fax: (440) 232-5874

**Ohio Dept.of Commerce**
**Div. of Industrial Compliance**
**Bureau of Construction Compliance**
6606 Tusing Road
P.O. Box 4009
Reynoldsburg, Ohio 43068-9009
(614) 644-3153
Fax: (614) 644-3505

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Fax: (440) 885-8039

**Parma Heights**
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(440) 884-9607
Fax: (440) 884-1802

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Pepper Pike, Ohio 44124
216.831.8500
Fax: 216.831.6525

**Richmond Heights**
457 Richmond Road
Richmond Heights, Ohio 44143
(216) 383-6312
Fax: (216) 383-6320

**Rocky River**
21012 Hilliard Road
Rocky River, Ohio 44116
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Fax: (440) 331-1304

**Seven Hills**
7325 Summitview Drive
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**Shaker Heights**
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(216) 491-1461
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**Solon**
34200 Bainbridge Road
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(440) 349-6737
Fax: (440) 349-6322

**South Euclid**
1349 South Green Road
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Fax: (216) 291-4959

**Strongsville**
16099 Foltz Industrial Parkway
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(440) 238-5720
Fax: (440) 238-3001

**University Heights**
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University Heights, Ohio 44118
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Fax: (216) 932-5239

**Westlake**
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Fax: (440) 835-6447

**Wickliffe**
28730 Ridge Road
Wickliffe, Ohio 44092
(440) 943-7115
Fax: (440) 943-7162

**Willoughby**
One Public Square
Willoughby, Ohio 44094
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Willoughby Hills, Ohio 44094
(440) 975-3550
Fax: (440) 918-8749

**Willowick**
31230 Vine Street
Willowick, Ohio 44095
(440) 516-3000
Fax: (440) 585-3776

# CLEVELAND AREA ENGINEERS

**Austin Company**
6095 Parkland Blvd.
Cleveland, OH 44124
(440) 544-2600

**Austrian and Associates**
2530 Superior Avenue
Cleveland, OH 44114
(216) 621-6631

**Bandwen, Williams, and Kindbom**
3475 Forest Lake Suite 300
Union town, OH 44685
(330) 899-9633

**Burgess & Niple, LTD.**
100 West Erie Street
Painesville, Ohio 44077
(440) 951-7050

**CEC Consultants**
11699 Brookpark Road
Cleveland, OH 44130
(216) 749-2992

**C.T. Consultants, Inc.**
35000 Kaiser Court
Willoughby, Ohio 44124
(440) 951-9000

**Denk Associates**
503 East 200th Street
Cleveland, Ohio 44119
(216) 531-8880

**Frederick Frederick and Heller**
672 East Royalton Road
Broadview Heights, Ohio 44147
(440) 546-9696

**H2L1 Engineering Inc.**
1785 East 45th Street
Cleveland, OH 44103
(216) 361-2911

**Hinkel Engineering**
1022 Heyl Road
P.O. Box 996
Wooster, OH 44691
(330) 262-0042

**Karpinski Engineering**
3135 Euclid Avenue
Cleveland, OH 44115
(216) 391-3700

**McHenry and Associates**
25001 Emery Road, Suite 200
Warrensville Heights, OH 44128-5621
(216) 292-4696

**Middough Associates**
1901 East 13th Street
Cleveland, OH 44114
(216) 367-6000

**Osborn Engineering**
1300 East 9th Street
Cleveland, OH 44114
(216) 861-2020

**Peters, Tschantz and Associates**
275 Springside Drive, Suite 300
Akron, OH 44333
(330) 666-3702

**Point One Design**
9941 York Theta Drive
North Royalton, OH 44133
(440) 230-1800

**Ralph Tyler Company**
1120 Chester Ave. Suite 200
Cleveland, OH 44115
(216) 623-0808

**RE Warner and Associates**
25777 Detroit Road, Suite 200
Westlake, OH 44145
(440) 835-9400

**Sandhu and Associates**
Park West Building, Suite 110
20545 Center Ridge Road
Rocky River, OH 44116
(440) 892-4470

**Scheeser Buckley Mayfield, Inc.**
1540 CORPORATE WOODS PKWY
Uniontown, OH 44685
(330) 896-4664

**TEC Inc.**
33851 Curtis Boulevard Suite 216
Eastlake, OH 44095
(440) 953-8760

**Thermal Environmental Systems**
25760 First Street, Suite 1
Westlake, OH 44145
(440) 871-2710

**THORSON BAKER and Associates, Inc.**
3030 West Streetsboro Rd.
Richfield, OH 44286
(330) 659-6688

**URS Consultants**
1375 Euclid Ave.
Cleveland, OH 44115
(216) 622-2400

**Washington International**
1500 West 3rd Street
Cleveland, OH 44113
(216) 523-5600

**Westlake Reed Leskosky**
925 Euclid Ave. Suite 1900
Cleveland, OH 44115
(216) 522-1350

# MANUFACTURER'S REPRESENTATIVES

| Manufacturer | Representative | Telephone | Web Site |
|---|---|---|---|
| A.O. SMITH | LIBB CO. INC. | 740-549-1516 | www.hotwater.com |
| ABT | REP SOURCE | 740-927-6880 | www.abtdrains.com |
| AC TECHNOLOGY CORP. | R.L. DEPPMANN COMPANY | 330-659-0200 | www.actechdrives.com |
| ACO TRENCH DRAINS | ADCO SALES INC. | 440-944-7500 | www.acousa.com |
| ACORN | ADCO SALES INC. | 440-944-7500 | www.acorneng.com |
| ACUDOR ACCESS DOORS | CAMPBELL EQUIPMENT CO. | 216-696-1155 | www.acudor.com |
| ADAMSON | ALLIED EQUIP. CO. | 330-686-1622 | www.adamsontank.com |
| ADVANCE TABCO | D.A. VAN DAM & ASSOCIATES | 330-759-0017 | www.advancetabco.com |
| ADVANCED FIRE TECHNOLOGY, INC | TROMBOLD EQUIP. CO. | 216-663-8700 | www.advancedfiretechnology.com |
| AERCO | R.L. DEPPMANN COMPANY | 330-659-0200 | www.aerco.com |
| AJAX BOILER | D.B. JOHNSEN COMPANY | 330-659-9295 | www.aboilerinc.com |
| ALSONS | LIBB CO. INC. | 740-549-1516 | www.alsons.com |
| AMERICAN FLOW CONTROL | AMERICAN FLOW CONTROL | 800-326-7082 | www.acipco.com/afc/ |
| AMERICAN PLUMBER | REP SOURCE | 740-927-6880 | www.americanplumber.com |
| AMERICAN STANDARD | MIDWEST SPEC | 419-756-0233 | www.americanstandard-us.com |
| AMES BACKFLOW | DISNEY-MCLANE & ASSOCIATES | 800-542-1682 | www.amesfirewater.com |
| AMICO CORPORATION | NORTHEAST MEDICAL CONSULTING | 330-534-9702 | www.amico.com |
| AMSCO (STERIS INTERNATIONAL) | STERIS INTERNATIONAL | 800-548-4873 | www.amsco.com |
| AMTROL | GREAT LAKES SALES | 216-356-9200 | www.amtrol.com |
| ANVIL INTERNATIONAL | MIDWEST SPEC | 800-298-0401 | www.anvilantl.com |
| APCO WILLAMETTE (VALVES) | MCSTAY & ASSOCIATES | 216-439-7208 | www.apcovalves.com |
| APOLLO VALVES | MIDWEST SPEC | 800-298-0401 | www.apollovalves.com |
| AQUA GLASS | REP SOURCE | 740-927-6880 | www.aquaglass.com |
| AQUA TECHNOLOGIES, INC. | REP SOURCE | 740-927-6880 | www.atwh.com |
| AQUARIUS | BWA SOUTH CO., INC. | 614-876-2477 | www.aquariusproducts.com |
| AQUASPEC | BWA CO. | 216-486-1010 | www.zurn.com |
| ARISTON | ARISTON | 800-642-3199 | www.aristonheating.com |
| ARMSTRONG PUMPS | STORY EQUIPMENT SALES | 440-786-8883 | www.armstrongpumps.com |
| AUMA ACTUATORS, INC. | MCSTAY & ASSOCIATES | 216-439-7208 | www.auma-usa.com |
| AURORA PUMP | FABER PUMP & EQUIP. | 216-331-2298 | www.aurorapump.com |
| BARNES & JONES, INC. | THE DAVIS SALES GROUP | 440-871-2827 | www.barnesandjones.com |
| BEACON / MORRIS CORPORATION | STORY EQUIPMENT SALES | 440-786-8883 | www.beacon-morris.com |
| BEACON MEDAES | CHT | 216-255-9607 | www.beaconmedical.com |

# MANUFACTURER'S REPRESENTATIVES

| | | | |
|---|---|---|---|
| BECKER PUMPS | BECKER PUMPS | 330-928-9966 | www.beckerpumps.com |
| BELVEDERE | BELVEDERE | 330-665-2244 | www.belvedereco.com |
| BEMIS | CURNAYN SALES, INC. | 440-846-1280 | www.bemismfg.com |
| BERMAD | REP SOURCE | 740-927-6880 | www.bermad.com |
| BIG DIPPER GREASE REMOVAL | BIG DIPPER | 800-663-4204 | www.big-dipper.com |
| BLAZE MASTER | LUBRIZOL | 216-447-5244 | www.lubrizol.com |
| BLUCHER DRAINAGE SYSTEMS | DISNEY-MCLANE & ASSOCIATES | 800-542-1682 | www.blucherdrains.com |
| BOCK WATER HEATERS | ROBERTS MECHANICAL | 216-587-0005 | www.bockwaterheaters.com |
| BOSCH PRO TANKLESS HEATERS | REP SOURCE | 740-927-6880 | www.protankless.com |
| BRADFORD WHITE WATER HEATERS | PREFERRED SALES INC. | 724-981-5500 | www.bradfordwhite.com |
| BRADLEY CORPORATION | REP SOURCE | 740-927-6880 | www.bradleycorp.com |
| BRIZO FAUCETS | LIBB CO. INC. | 740-549-1516 | www.brizo.com |
| BRYAN BOILERS | ROBERTS MECHANICAL | 216-587-0005 | www.bryanboilers.com |
| BURNHAM COPORATION | STORY EQUIPMENT SALES | 440-786-8883 | www.burnham.com |
| CAMBRIDGE BRASS | CAMBRIDGE BRASS | 716-609-3440 | www.cambridgebrass.com |
| CANARIIS | ALLIED EQUIP. CO. | 330-686-1622 | www.canariis.com |
| CASH ACME | OUTPUT SALES CORP. | 724-334-5600 | www.cashacme.com |
| CASHCO REGULATORS & VALVES | ROSS CONTROLS | 330-666-6654 | www.cashco.com |
| CECO CAST IRON FIXTURES | U.S. CONSOLIDATED, INC. | 330-655-9220 | www.cecosinks.com |
| CEMLINE CORP. | R.L. DEPPMANN COMPANY | 330-659-0200 | www.cemline.com |
| CENTOCO TOILET SEATS | BWA SOUTH CO., INC. | 614-876-2477 | www.centoco.com |
| CENTRAL BRASS | GREAT LAKES SALES | 216-356-9200 | www.centralbrass.com |
| CFM - CLARION | BWA CO. | 216-486-1010 | www.clarionbathware.com |
| CHAMPION | CHAMPION MACHINERY | 216-666-7500 | www.gardnerdenver.com |
| CHEMETRON FIRE SYSTEMS | CHEMETRON | 330-688-0859 | www.chemetron.com |
| CHICAGO FAUCETS | THE DAVIS SALES GROUP | 440-871-2827 | www.chicagofaucets.com |
| CHICAGO FAUCETS (SOUTHERN OH) | REP SOURCE | 740-927-6880 | www.chicagofaucets.com |
| CHROMALOX | OMAR MCDOWELL CO. | 440-808-2280 | www.chromalox.com |
| CHRONOMITE LABORATORIES | ADCO SALES INC. | 440-944-7500 | www.chronomite.com |
| CHURCH | CAMPBELL EQUIPMENT CO. | 216-696-1155 | www.churchseats.com |
| CLAMP ALL | OMAR MCDOWELL CO. | 440-808-2280 | www.clampall.com |
| CLARION BATHWARE | MIKE VERES | 330-225-8441 | www.clarionbathware.com |
| CLA-VAL | BC ENGINEERING COMPANY | 513-943-7900 | www.dezurikwater.com |
| COLLINS EQUIP. CORP. | COLLINS EQUIP. CORP. | 216-641-4300 | www.collinsequip.com |

## MANUFACTURER'S REPRESENTATIVES

| Manufacturer | Representative | Telephone | Web Site |
|---|---|---|---|
| COMFORT SEATS | PROMARC SALES INC. | 216-287-8679 | www.comfortseats.com |
| CONBRACO | MIDWEST SPEC | 800-298-0401 | www.apollovalves.com |
| CRANE PLUMBING | CRANE PLUMBING | 800-546-5476 | www.craneplumbing.com |
| CRANE VALVES | KERR MARKETING AGENCY | 330-659-7171 | www.cranevalve.com |
| CREATIVE INDUSTRIES | REP SOURCE | 740-927-6880 | www.creativeindustries.com |
| CROKER FIRE PROT. PRODUCTS | SVF SALES | 216-741-7000 | www.croker.com |
| CULLIGAN | CULLIGAN | 800-545-1035 | www.culligan.com |
| CUNO WATER FILTRATION | PREFERRED SALES INC. | 724-981-5500 | www.cuno.com |
| DANZE FAUCETS AND SHOWERS | CURNAYN SALES, INC. | 440-846-1280 | www.danze-online.com |
| DECOSHIELD SYSTEMS INC. | DECOSHIELD SYSTEMS INC. | 800-873-0894 | www.decoshield.com |
| DeDIETRICH | ALLIED EQUIP. CO. | 330-686-1622 | www.dedietrichboilers.com |
| DELANY | MIDWEST SPEC | 800-755-7732 | www.coynedelany.com |
| DELTA FAUCETS | LIBB CO. INC. | 740-549-1516 | www.deltafaucet.com |
| DELTATHERM | M.A.F. SALES & ENGINEERING | 216-432-6200 | www.delta-therm.com |
| DEZURIK (VALVES) | RAWDON MYERS, INC. | 513-965-5300 | www.dezurik.com |
| DFT INC. | ROSS CONTROLS | 330-666-6654 | www.ross-controls.com |
| DURIRON | BWA CO. | 216-486-1010 | www.flowserve.com |
| EAST JORDAN IRON WORKS | EAST JORDAN IRON WORKS | 800-692-3549 | www.ejiw.com |
| EEMAX | REP SOURCE | 740-927-6880 | www.eemaxinc.com |
| ELBI | ROBERTS MECHANICAL | 216-587-0005 | www.elbi.net |
| ELJER | ELJER | 630-582-8070 | www.eljer.com |
| ELKAY | BWA CO. | 216-486-1010 | www.elkay.com |
| ELKHART BRASS | ELKHART BRASS | 800-346-0250 | www.elkhartbrass.com |
| ELKHART PRODUCTS CORPORATION | SAPPCO SALES | 567-203-9484 | www.elkhartproducts.com |
| E-MON SUBMETERING PRODUCTS | ELECTRO SPECIALTIES | 216-447-3048 | www.emon.com |
| EMGLO COMPRESSORS | SVF SALES | 216-741-7000 | www.emglo.com |
| EMPIRE INDUSTRIES | KERR MARKETING AGENCY | 330-659-7171 | www.empireindustries.com |
| EMSE MEDICAL EQUIPMENT | L.W. WHITE & ASSOCIATES | 513-984-5961 | www.emse.com |
| ENCON | R.C. FREY & ASSOCS., INC. | 216-425-2555 | www.enconsafety.com |
| ERICO | ERICO | 440-542-3965 | www.erico.com |
| ETERNAL WATER HEATERS | BWA CO. | 216-486-1010 | www.eternalwaterheater.com |
| FACET INTERNATIONAL | FACET INTERNATIONAL | 216-243-2186 | www.facetinternational.net |
| FAIRBANKS MORSE | FAIRBANKS MORSE | 800-422-6505 | www.fairbanksmorse.com |
| FEBCO | KERR MARKETING AGENCY | 330-659-7171 | www.febcoonline.com |

## MANUFACTURER'S REPRESENTATIVES

| | | | |
|---|---|---|---|
| FERNCO | PROMARC SALES INC. | 216-518-2980 | www.fernco.com |
| FIAT | MIDWEST SPEC | 800-298-0401 | www.fiat.ca |
| FIKE CORPORATION | CONTINENTAL FIRE & SECURITY, INC | 216-749-5522 | www.fike.com |
| FILTRINE MFG. COMPANY | MC ENTERPRISES | 888-280-9960 | www.filtrinemfg.com |
| FIREFLEX SYSTEMS, INC. | FIREFLEX SYSTEMS, INC. | 450-437-3473 | www.fireflex.com |
| FLEX-HOSE CO., INC. | R.L. DEPPMANN COMPANY | 330-659-0200 | www.flexhose.com |
| FLEXCON INDUSTRIES | SVF SALES | 216-741-7000 | www.flexconind.com |
| FLO - CONTROL | FLO - CONTROL | 305-428-8703 | www.flocontrol.com |
| FLOMATIC | SVF SALES | 216-741-7000 | www.flomatic.com |
| FLO SAFE, INC. | KERR MARKETING AGENCY | 330-659-7171 | www.flosafe.com |
| FLO WAY PUMPS | TROMBOLD EQUIP. CO. | 216-663-8700 | www.weirminerals.com |
| FLORESTONE | LIBB CO. INC. | 740-549-1516 | www.florestone.com |
| FLUIDMASTER | U.S. CONSOLIDATED, INC. | 330-655-9220 | www.fluidmaster.com |
| FORD METER BOX COMPANY | FORD METER BOX COMPANY | 260-563-3171 | www.fordmeterbox.com |
| FREEDOM PLASTICS, INC. | PREFERRED SALES INC. | 724-981-5500 | www.freedomplastics.com |
| FREIJE (DESCALING SYSTEMS) | PHILLIP HOWARD | 330-526-0673 | www.freije.com |
| FROET INDUSTRIES, INC. | R.C. FREY & ASSOCS., INC. | 330-425-2555 | www.froetindustries.com |
| G & C ENCLOSURES | KERR MARKETING AGENCY | 330-659-7171 | www.gcenclosures.com |
| GAMCO WASHROOM ACCESSORIES | CAMPBELL EQUIPMENT CO. | 216-696-1155 | www.gamcousa.com |
| GASTITE FLEXIBLE GAS PIPING | PREFERRED SALES INC. | 724-981-5500 | www.gastite.com |
| GEBERIT | THE DAVIS SALES GROUP | 440-871-2827 | www.geberit.com |
| GERBER PLUMBING FIXTURES | CURNAYN SALES, INC. | 440-846-1440 | www.gerberonline.com |
| GOULDS PUMPS | TROMBOLD EQUIP. CO. | 216-663-8700 | www.goulds.com |
| GREASE TRAPS - USA | R.C. FREY & ASSOCS., INC. | 330-425-2555 | not available |
| GROHE | US CONSOLIDATED, INC. | 330-655-9220 | www.grohe.com |
| GUARDIAN | MIDWEST SPEC | 800-298-0401 | www.gesafety.com |
| HALFEN-DEHA PIPE SUPPORTS | HALFEN ANCHORING SYSTEMS | 800-323-6896 | www.halfenusa.com |
| HALSEY TAYLOR | THE DAVIS SALES GROUP | 440-871-2827 | www.halseytaylor.com |
| HANKISON | SYSTEM SALES INC. | 216-261-0304 | www.hankison.co.uk |
| HARRINGTON INDUSTRIAL PLASTICS | HARRINGTON INDUSTRIAL PLASTICS | 216-459-0447 | www.harringtonplastics.com |
| HAWS | PROMARC SALES INC. | 216-518-2980 | www.hawsco.com |
| HICO GROUP | SVF SALES | 216-741-7000 | www.hicogroup.com |
| HIGHLAND TANK GREASE REMOVAL | TROMBOLD EQUIP. CO. | 216-663-8700 | www.highlandtank.com |
| HILL-ROM | HILL - ROM | 812-934-7777 | www.hill-rom.com |
| HILTI | SUPERIOR INSULATION COMPANY | 216-252-9590 | www.us.hilti.com |

## MANUFACTURER'S REPRESENTATIVES

| | | | |
|---|---|---|---|
| HOBART | HOBART | 888-446-2278 | www.hobartcorp.com |
| HOLBY VALVE COMPANY | STORY EQUIPMENT SALES | 440-786-8883 | www.jmpco.com |
| HOMA PUMP | TROMBOLD EQUIP. CO. | 216-663-8700 | www.grinder-pumps.com |
| HONEYWELL | STORY EQUIPMENT SALES | 440-786-8883 | www.honeywell.ca |
| HOTBOX | MIDWEST SPEC | 800-298-0401 | www.hot-box.com |
| HOUZER | PREFERRED SALES INC. | 724-981-5500 | www.houzersink.com |
| HUSKY | KMR AGENCY | 614-296-7906 | www.anaco-husky.com |
| HYDRO SYSTEMS | HUME SALES | 216-449-2477 | www.hydrosystem.com |
| INGERSOL RAND | AIR POWER OF OHIO CO. | 216-447-9190 | www.irco.com |
| INSINK ERATOR | GREAT LAKES SALES | 440-356-9200 | www.insinkerator.com |
| INSUL-TECT | SVF SALES | 216-741-7000 | www.mvgmoldedproducts.com |
| INTERSAN | CAMPBELL EQUIPMENT CO. | 216-696-1155 | www.intersanus.com |
| IONPURE | IONPURE TECHNOLOGIES INC. | 978-614-7326 | www.ionpure.com |
| IPEX | MIDWEST SPEC | 800-298-0401 | www.ipexinc.com |
| IPS CORPORATION | PREFERRED SALES INC. | 724-981-5500 | www.ipscorp.com |
| ISIMET UTILITY CONTROLLERS | ADCO SALES INC. | 440-944-7500 | www.isimet.com |
| JENNY SPRINKLER AIR COMPRESSORS | SVF SALES | 216-741-7000 | www.steamjenny.com |
| J.R. SMITH | ADCO SALES INC. | 440-944-7500 | www.jrsmith.com/buzz |
| JADO / PORCHER | MIDWEST SPEC | 419-756-0233 | www.jadoporcher.com |
| JASON WHIRLPOOLS/TUBS | THE DAVIS SALES GROUP | 440-871-2827 | www.jasonint.com |
| JOHNSON CORPORATION | R.L. DEPPMANN COMPANY | 330-659-0200 | www.liquimover.com |
| JONES STEPHENS CORP. | PROMARC SALES INC. | 888-584-7468 | www.plumbest.com |
| JOSAM | SVF SALES | 216-741-7000 | www.josam.com |
| JOSAM (SOUTHERN OH) | REP SOURCE | 740-927-6880 | www.josam.com |
| JUST/EBC | R.C. FREY & ASSOCS., INC. | 330-425-2555 | www.justmfg.com |
| JUST/EBC (SOUTHERN OH) | REP SOURCE | 740-927-6880 | www.justmfg.com |
| KELTECH TANKLESS WATER HTR'S | KELTECH | 800-999-4320 | www.keltech-inc.com |
| KINDRED STAINLESS STEEL SINKS | NEW CENTURY SALES | 800-567-5045 | www.kindred-sinkware.com |
| KINETICO | CLEARWATER SYSTEMS | 330-296-3978 | www.kwater.com |
| KOHLER | WELKER MCKEE | 216-447-0050 | www.us.kohler.com |
| LAARS HEATING SYSTEMS | R.L. DEPPMANN COMPANY | 330-659-0200 | www.laars.com |
| LASCO BATHWARE | PREFERRED SALES INC. | 724-981-5500 | www.laskobathware.com |
| LAWLER | CAMPBELL EQUIPMENT CO. | 216-696-1155 | www.lawlervalve.com |

## MANUFACTURER'S REPRESENTATIVES

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|---|---|---|---|
| LEGEND VALVE | PROMARC SALES INC. | 888-584-7468 | www.legendvalve.com |
| LEONARD | BWA SOUTH CO., INC. | 614-876-2477 | www.leonardvalve.com |
| LIBERTY PUMPS | OUTPUT SALES CORP. | 724-334-5600 | www.libertypumps.com |
| LINDSAY CONCRETE PRODUCTS | LINDSAY CONCRETE PRODUCTS | 800-837-7788 | www.lindsayconcrete.com |
| LOCHINVAR | CAMPBELL EQUIPMENT CO. | 216-696-1155 | www.lochinvar.com |
| MAAX AKER SHOWER PRODUCTS | U.S. CONSOLIDATED, INC. | 330-655-9220 | www.maax.com |
| MACK INDUSTRIES, INC. | MACK INDUSTRIES INC. | 330-483-3111 | www.mackconcrete.com |
| MAJESTIC FIREPLACE HANDBOOK | THE MAJESTIC PRODUCTS CO. | 800-525-1898 | www.majesticgaslogs.com |
| MANSFIELD PLUMBING FIXTURES | LIBB CO. INC. | 740-549-1516 | www.mansfieldplumbing.com |
| MAPA PRODUCTS | ADCO SALES INC. | 440-944-7500 | www.mapaproducts.com |
| MARLO | REP SOURCE | 740-927-6880 | www.marlo-inc.com |
| MASON INDUSTRIES, INC. | MASON INDUSTRIES, INC. | 631-348-0292 | www.mason-ind.com |
| MCGUIRE MANUFACTURING | THE DAVIS SALES GROUP | 440-871-2827 | www.mcguiremfg.com |
| MEDAES | MEDAES | 412-431-8634 | www.medaes.com |
| METCRAFT | CAMPBELL EQUIPMENT CO. | 216-696-1155 | www.metcraft.com |
| MG CAST IRON COUPLINGS | MG CAST IRON COUPLINGS | 714-761-8055 | www.mgcoupling.com |
| MICROPHOR, INC. | GARRY CASE | 877-801-5621 | www.microphor.com |
| MIFAB | SVF SALES | 216-741-7000 | www.mifab.com |
| MILJOCO CORPORATION | MILJOCO CORPORATION | 888-888-1498 | www.miljoco.com |
| MILLIPORE | MILLIPORE | 800-460-9011 | www.labwater.com |
| MILWAUKEE VALVE | WMK & ASSOCIATES | 216-378-3801 | www.milwaukeevalve.com |
| MIRO INDUSTRIES | SVF SALES | 216-741-7000 | www.miroind.com |
| MISSION | SVF SALES | 216-741-7000 | www.missionrubber.com |
| MOEN | REP SOURCE | 740-927-6880 | www.moen.com |
| MUELLER COMPANY | MUELLER COMPANY | 800-423-1323 | www.muellercompany.com |
| MURDOCK | ADCO SALES INC. | 440-944-7500 | www.murdockfountains.com |
| MUSTEE | PREFERRED SALES INC. | 724-981-5500 | www.mustee.com |
| NATIONAL CHIMNEY LINER | SVF SALES | 216-741-7000 | not available |
| NAVIEN | CURNAYN SALES, INC. | 440-846-1440 | www.navienamerica.com |
| NEENAH FOUNDRY COMPANY | NEENAH FOUNDRY COMPANY | 614-397-8018 | www.nfco.com |
| NELSON | A.E. EHRKE & CO. | 440-248-9400 | www.nelsonheaters.com |
| NEPTUNE | ROBERT SHUPE, INC. | 216-656-3848 | www.showerandspashop.com |
| NEOPERL | LIBB CO. INC. | 740-549-1516 | www.neoperl.com |

## MANUFACTURER'S REPRESENTATIVES

| | | | |
|---|---|---|---|
| NEW YORKER BOILERS | STORY EQUIPMENT SALES | 440-786-8883 | www.newyorkboiler.com |
| NOMACO PIPE INSULATION | CURNAYN SALES, INC. | 440-846-1440 | www.nomaco.com |
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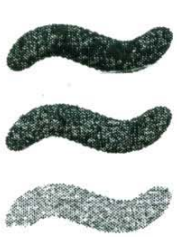

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