

MECHANICAL ENGINEERING:

Triodyne Inc.

(Est. 1969)

Officers

Ralph L. Barnett
Dolores Gidlin
S. Carl Uzgrins, Ph.D.

Mechanical Engineering

Ralph L. Barnett
Dennis B. Brickman
Michael A. Dilich
Christopher W. Farnoria
Suzanne A. Glowick
John M. Goebelbecker
Crepin Hales, Ph.D.
Dor Kopernik
Michael S. McCain
Woodrow Nelson
Peter J. Poczynok
Audrone M. Staka, Ph.D.
William G. Switalski
George J. Trezik, Ph.D.
S. Carl Uzgrins, Ph.D.
James R. Wingfield, Ph.D.

Library Services

Maria S. Sanders
Betty Bellows
Cathy Friedman
Donna Klock
John Kristell
Florence Lasky
Jackie Schwartz

Information Products

Expert Transcript

Center (ETC)

Maria S. Sanders
Cathy Friedman

Graphic Communications

Robert Koutny
Charles D'Eccliss

Training and Editorial Services

Paula L. Barnett

Vehicle Laboratory

Charles Sinkovits
Matthew J. Ulmanzine

Model Laboratory

2721 Allison Lane
Wilmette, IL 60091-2101
Bill Brown

Photographic Laboratory

7903 Beckwith Road
Morton Grove, IL 60053
Larry Good

Business Systems

Chris Ann Gonatas
Jennifer Bliton
Cheryl Black
Sandie Christiansen
Rita Curtis
Sandra Prieto

Facilities Management

Peter Warner
Neil Miller
Jose Rivera

FIRE AND EXPLOSION:

Triodyne Fire & Explosion Engineers, Inc.

(Est. 1987)

2907 Butterfield Road
Suite 120
Oak Brook, IL 60523-1176
(630) 573-7707
FAX: (630) 573-7731

Officers/Directors

John A. Campbell
Ralph L. Barnett
S. Carl Uzgrins, Ph.D.

Engineering

John A. Campbell
Scott M. Howell
Kim R. Mniszewski
Norbert R. Orszula

SAFETY RESEARCH:

Institute for Advanced Safety Studies

(Est. 1984)

5950 West Touhy Avenue
Niles, IL 60714-4610
(847) 647-1101

Chairman

Ralph L. Barnett
Director of Operations
Paula L. Barnett
Information Services
Maria S. Sanders
Senior Science Advisor
Theodore Liber, Ph.D.

ENVIRONMENTAL:

Triodyne Environmental Engineering, Inc.

(Est. 1989)

5950 West Touhy Avenue
Niles, IL 60714-4610
(847) 677-4730
FAX: (847) 647-2047

Officers

Ralph L. Barnett
S. Carl Uzgrins, Ph.D.

SAFETY BULLETIN

January 2000

Volume 9, No. 1

**Triodyne Inc.**

Consulting Engineers & Scientists - Safety Philosophy & Technology

5950 West Touhy Avenue Niles, IL 60714-4610 (847) 677-4730

FAX: (847) 647-2047

e-mail: info@triodyne.com

GENERAL SAFETY

The Washing Machine Flood

By William G. Switalski, P.E.*

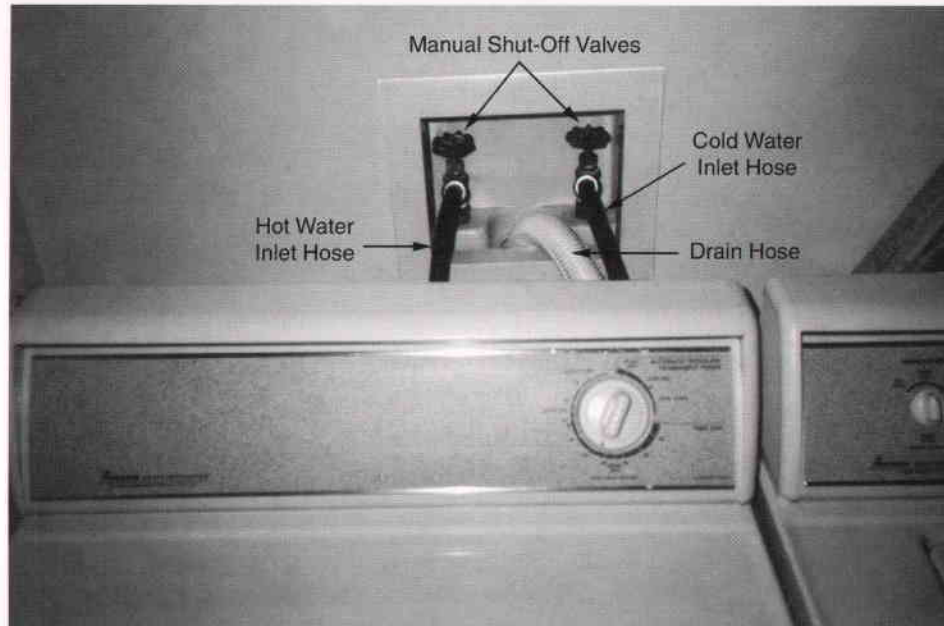


Figure 1 - Washing Machine / Valve Locations

Traditionally, the weekly laundry chore took place in the basement where the washer and dryer were located. Occasionally, a stream of water was found emanating from beneath the washing machine and trickling across the floor to the basement floor drain. No damage resulted since the basement floor was made of concrete and sloped toward a floor drain where the water was guided harmlessly away. Indeed, the old-fashioned wringer washer our mothers and grandmothers once had was intentionally emptied by lowering the drain hose to the basement floor drain.

Modern homes, townhomes, apartments and condominiums now feature the convenience of a laundry room on the main living level or even at the upstairs bedroom level. Hot and cold water spigots are plumbed in to a location where the washer and dryer are intended to be located in the home. However, current building codes have not given consideration to the eventuality of the washing machine flood.

There are three primary sources of a washing machine flood:

1. a malfunctioning float switch which fails to shut off the inlet water when the washer tub is full;
2. a clog in the discharge drain or standpipe which allows drain water to back up out of the drain; or
3. a hot or cold water inlet hose which bursts.

* Senior Mechanical Engineer, Triodyne Inc., Niles, IL.

SAFETY PRODUCTS:

Triodyne Safety Systems, L.L.C.

(Est. 1998)

5950 West Touhy Avenue
Niles, IL 60714-4610
(847) 677-4730
FAX: (847) 647-2047

Officers/Directors

Ralph L. Barnett
Paula L. Barnett
Joel I. Barnett

Senior Science Advisor

Theodore Liber, Ph.D.

Mechanical Engineering

Ralph L. Barnett
Peter J. Poczynok

MANUFACTURING:

Alliance Tool & Manufacturing Inc.

(Est. 1945)

91 East Wilcox Street
Maywood, IL 60153-2397
(773) 281-1712
(708) 345-5444
FAX: (708) 345-4004

Officers

S. Carl Uzgrins, Ph.D.
Ralph L. Barnett

General Manager

Ramesh Gandhi

Plant Manager

Bruno Stachon

Founders/Consultants

Joseph Gansacz
Albert Kanikula

CONSTRUCTION:

Triodyne-Wangler Construction Company Inc.

(Est. 1993)

5950 West Touhy Avenue
Niles, IL 60714-4610
(847) 647-8866
FAX: (847) 647-0785

Officers/Directors/Managers

Joel I. Barnett
William A. Wangler
Joseph Wangler
Ralph L. Barnett
S. Carl Uzgrins, Ph.D.

CONSTRUCTION PRODUCTS:

Triodyne-Wangler Construction**Specialties, L.L.C.**

(Est. 1999)

5950 West Touhy Avenue
Niles, IL 60714-4610
(847) 647-8866
FAX: (847) 647-0785

Officers

Joel I. Barnett
William A. Wangler
Joseph Wangler
Ralph L. Barnett
S. Carl Uzgrins, Ph.D.

BUILDING MAINTENANCE:

Alliance Building Maintenance Corporation

(Est. 1999)

5950 West Touhy Avenue
Niles, IL 60714-4610
(847) 647-1379
FAX: (847) 647-0785

Officers

William A. Wangler
Joseph Wangler
David J. Smith
Joel I. Barnett
Ralph L. Barnett

CONSULTANTS:

Richard M. Blot, Ph.D.
Electromagnetic Compatibility
Claudine P. Giesse Myers
Biomechanics
Richard Gullikson
Industrial Hygiene/Safety/Chemistry
Beth A. Hamilton
Information Science
David W. Lavinson, Ph.D.
Senior Metallurgical Advisor
Steven R. Schmid, Ph.D.
Food Processing Equipment
Dane Moshman
Chemical/Environmental Engineering
Harry Smith
Electrical Engineering

Any of the above causes will result in water damage to floors, ceilings below the floors, walls, furniture and personal contents. Apartment, townhome and condominium occupants can be held liable for damage to "the common elements" of their buildings as well as to the property of their neighbors living below. One major homeowners insurance carrier has reported that the problem has grown to 13,500 property damage claims per year at an average of \$3500 in damages per claim.¹

The malfunctioning float switch and the clogged discharge drain are causes of water damage which are typically less severe since the homeowner is normally at home when the washing machine is in use. The only time these malfunctions can occur is when the washing machine cycle is in progress. With a clogged drain, the maximum amount of water spilled is limited by the capacity of the washer.

On the other hand, the hot and cold water inlet hoses are always pressurized. Hence, the water inlet hoses can burst under pressure whether or not the washer is in use. This can occur when the home is unoccupied so that the water will continue to pour in until the problem is discovered and the incoming water supply turned off. Thousands of gallons can be spilled and the resulting damage can be catastrophic.

To cope with the water inlet hose burst hazard, washing machine manufacturers advise the consumer to turn off the water inlet valve when the washer is not in use. This is the best protection against a washing machine flood. Turning off the water valves does not extend the life of the water inlet hoses or reduce the chance of a hose burst. However, this precaution limits the amount of water that can be spilled to the volume contained within the length of the hose.

Although engineering standards exist for both laundry equipment plumbing² and water inlet hose³, there is no guidance given to appliance manufacturers or consumers regarding hose life expectancy or suggested replacement intervals. The water inlet hose standard of 1986 requires that a generous safety factor be met by the design of the new hose. Domestic water supply pressures typically range from 10 to 40 psi (pounds per square inch), whereas the hose design is required to withstand five applications of 580 psi without bursting. Nevertheless, the factor of safety diminishes with the age of the hose, and every hose will eventually wear out, leak and/or burst. In the absence of engineering standards, some replacement inlet hose manufacturers have come up with their own recommendations. Advice on periodic hose replacement ranges from 2 to 5 years, depending upon the manufacturer. Any physical damage to the outer hose jacket, bulging, brittleness or softness, especially at the end connections and where

the hose is routed around a corner, are sufficient grounds for replacement. Used water inlet hose should be discarded and never reused when a washing machine is relocated or replaced.

Hose inspection and replacement is not likely to be carried out by many consumers due to inconvenience, lack of skill, inaccessibility of the hoses and inaccessibility of the shut-off valves. Furthermore, hose replacement is no guarantee against a water inlet hose burst. A better solution is the installation of a floor drain in the laundry room. Unfortunately, building codes do not typically require the installation of a drain at this location. Perhaps the entities who are at greatest financial risk for water damage losses, i.e. homeowners, renters, and homeowners insurance carriers, can unite to lobby for changes in building codes that include laundry room floor drains. Until the problem is given legislative attention, owners are advised to consider specifying their own floor drains when building.

¹ NBC News; Dateline NBC; Feeling the Pressure; aired 12-21-98.

² American National Standard Plumbing Requirements for Home Laundry Equipment, ANSI/ASSE 1007/AHAM HLW-2PR-1992.

³ Standard Consumer Product Specification for Household Laundry and Dishwasher Water Inlet Hose, ASTM D3571-198671-1986.