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APPROVED
Date: 2-8-83

Submitted by: Chairman of the Assembly at the request of the Mayor
Prepared by: Department of Public Works
For Reading: January 25, 1983

ANCHORAGE, ALASKA
AO No. 83-9

AN ORDINANCE PROVIDING FOR THE REPEAL AND REENACTMENT OF CHAPTER 23.25 OF THE ANCHORAGE MUNICIPAL CODE PERTAINING TO THE UNIFORM PLUMBING CODE AND AMENDING SECTION 23.05.010(C)

THE ANCHORAGE ASSEMBLY ORDAINS:

Section 1. That Chapter 23.25 of the Anchorage Municipal Code is hereby repealed and reenacted to read as follows:

Chapter 23.25

LOCAL AMENDMENTS TO THE UNIFORM PLUMBING CODE, 1982 EDITION

Sections:

AM101-83

APPROVED
Date: 6-21-83

Submitted by: Chairman of the Assembly at the request of the Mayor
Prepared by: Department of Public Works
For Reading: June 7, 1983

ANCHORAGE, ALASKA
AO No. 83-92

AN ORDINANCE AMENDING AMC 23.25.1.5, RTAINING TO PERMIT TIME LIMITATIONS

THE ANCHORAGE ASSEMBLY ORDAIN

Section 1. That the fourth paragraph of AMC 23.25.1.5, Violations and Penalties, is hereby amended to read as follows:

23.25.1.5 Violations and penalties.

Every permit issued by the administrative authority under the provisions of this code shall expire by limitation and become null and void, if the work authorized by such permit is not commenced within [180] 360 days from the date of such permit, or if the work authorized by such permit is suspended or abandoned at any time after the work is commenced for a period of [180] 360 days. Before such work can be recommenced a new permit shall be first obtained to do so, and the fee therefor shall be one-half the amount required for a new permit for such work, provided no changes have been made, or will be made in the original plans and specifications for such work, and provided further that such suspension or abandonment has not exceeded [one year] 18 months. (CAC 14.32.060-1.7, am AO 78-105, am AO 80-1, AO 82-5, AO 83-9).

Section 2. This ordinance shall take effect immediately upon passage by the Anchorage Municipal Assembly.

PASSED AND APPROVED by the Anchorage Municipal Assembly this 21st day of June, 1983.

Chairman

ATTEST:

Deputy Municipal Clerk

AO 83-92

23.25.010 Local amendments to the Uniform Plumbing Code (1982 Edition).

Amendments to the 1982 Uniform Plumbing Code and appendices thereto are listed hereafter by section. The last digits after the title and chapter digits of the section number are the section number of the Uniform Plumbing Code to which the amendment refers, i.e., 23.20.409(a) refers to Section 409(a) of the Uniform Plumbing Code. (new, am AO 78-105, AO 80-1, AO 82-5).

23.25.015 Administration.

Part I, Administration, is amended by deleting sections 10.1 through 20.8 and substitution of the following sections 23.25.1.0 through 23.25.2.10. (AO 78-105, am AO 80-1, AO 82-5).

23.25.1.0 Application and scope.

The provisions of this code shall apply to all new construction, relocated buildings and to any alterations, repairs or reconstruction, except as provided for otherwise in this code. (AO 78-105, am AO 80-1, AO 82-5).

23.25.1.1 Administrative authority and assistants.

Whenever the term "administrative authority" is used in this code, it shall be construed to mean the building official or his authorized representative. (CAC 14.32.030-1.1, am AO 78-105, AO 80-1, AO 82-5).

23.25.1.2 Duties of the administrative authority.

The administrative authority shall maintain public office hours necessary to efficiently administer the provisions of this code and amendments thereto and shall perform the following duties:

A. Require submission of, examine and check plans and specifications, drawings, descriptions, and/or diagrams necessary to show clearly the character, kind and extent of work covered by applications for a permit and upon approval thereof shall issue the permit for which application is made.

B. Keep a permanent, accurate account of all fees for permits issued and other moneys collected and received as provided by this code, the names of the persons upon whose account the same were paid, the date and amount thereof, together with the location or premises to which they relate.

C. Administer and enforce the provisions of this code in a manner consistent with the intent thereof and shall inspect all plumbing and drainage work authorized by any permit to assure compliance with provisions of this code or amendments thereto, approving or condemning the work in whole or in part as conditions require.

D. Issue upon request a certificate of approval for any work approved by him.

E. Condemn and reject all work done or being done or materials used or being used which do not in all respects comply with the provisions of this code and amendments thereto.

F. Order changes in workmanship and/or materials essential to obtain compliance with all provisions of this code.

G. Investigate any construction or work regulated by this code and issue such notices and orders as provided in Section 23.25.1.6.

H. Keep a complete record of all the essential transactions of his office.

I. Transfer all fees collected by him to the proper authority provided by law to receive such funds.

J. Maintain an official register of all persons, firms or corporations lawfully entitled to carry on or engage in the business of plumbing or to labor at the trade of plumbing to whom a plumber's certificate of qualification has been issued in accordance with provisions of Sections 23.25.2.1 through 23.25.2.10 of this code. (AO 78-105, am AO 80-1, AO 82-5).

23.25.1.3 Right of entry.

The administrative authority and assistants shall carry proper credentials of their respective office, upon exhibition of which they shall have the right of entry, during usual business hours, to inspect any and all buildings and premises in the performance of their duties. (AO 78-105, am AO 80-1, AO 82-5).

23.25.1.4 Dangerous and unsanitary construction.

A. Any portion of a plumbing system found by the administrative authority to be unsanitary as defined herein is hereby declared to be a nuisance.

B. Whenever brought to the attention of the department having jurisdiction that any unsanitary conditions exist or that any construction or work regulated by this code is dangerous, unsafe, unsanitary, a nuisance or a menace to life, health or property or otherwise in violation of this code, said department may request an investigation by the administrative authority who, upon determining such information to be fact, shall order any person, firm or corporation using or maintaining any such condition or responsible for the use or maintenance thereof to discontinue the use or maintenance thereof or to repair, alter, change, remove or demolish same, as he may consider necessary for the proper protection of life, health or property, and in the case of any gas piping or gas appliance may order any person, firm or corporation supplying gas to such piping or appliance to discontinue supplying gas thereto until such piping or appliance is made safe to life, health or property.

Every such order shall be in writing, addressed to the owner, agent or person responsible for the premises in which such condition exists and shall specify the date or time for compliance with such order.

C. Refusal, failure or neglect to comply with any such notice or order shall be considered a violation of this code.

D. When any plumbing system is maintained in violation of this code and in violation of any notice issued pursuant to the provisions of this section, or where a nuisance exists in any building or on a lot on which a building is situated, the administrative authority, through the municipal Legal Department, shall institute any appropriate action or proceeding in any court of competent jurisdiction to prevent, restrain, enjoin, correct or abate the violation or nuisance. (AO 78-105, am AO 80-1, AO 82-5).

23.25.1.5 Violations and penalties.

Any person, firm or corporation violating any provision of this code shall be deemed guilty of a misdemeanor and shall be subject to the penalties and remedies provided in Section 23.10.025 of this title.

The issuance or granting of a permit or approval of plans and specifications shall not be deemed or construed to be a permit for, or an approval of, any violation of any of the provisions of this code. No permit presuming to give authority to violate or cancel the provisions of this code shall be valid, except insofar as the work or use which it authorizes is lawful.

The issuance or granting of a permit or approval of plans shall not prevent the administrative authority from thereafter requiring the correction of errors in said plans and specifications or from preventing construction operations being carried on thereunder when in violation of this code or of any other ordinance or from revoking any certificate of approval when issued in error.

Every permit issued by the administrative authority under the provisions of this code shall expire by limitation and become null and void, if the work authorized by such permit is not commenced within 180 days from the date of such permit, or if the work authorized by such permit is suspended or abandoned at any time after the work is commenced for a period of 180 days. Before such work can be recommenced a new permit shall be first obtained to do so, and the fee therefor shall be one-half the amount required for a new permit for such work, provided no changes have been made, or will be made in the original plans and specifications for such work, and provided further that such suspension or abandonment has not exceeded one year. (CAC 14.32.060-1.7, am AO 78-105, am AO 80-1, AO 82-5).

23.25.1.6 Permit required.

A. It shall be unlawful for any person to install, remove, alter, repair or replace or cause to be installed, removed, altered, repaired or replaced any plumbing, gas or drainage piping work or any fixture or water heating or treating equipment in a building or premises without first obtaining a permit to do such work from the administrative authority.

B. A separate permit shall be obtained for each building or structure.

C. No person shall allow any other person to do or cause to be done any work under a permit secured by a permittee except persons in his employ. (AO 78-105, am AO 80-1, AO 82-5).

23.25.1.7 Work not requiring permit.

No permit shall be required in the case of any repair work as follows: the stopping of leaks in drains, soil, waste or vent pipe, provided, however, that should any trap, drainpipe, soil, waste or vent pipe be or become defective and it becomes necessary to remove and replace the same with new material in any part or parts, the same shall be considered as such new work and a permit shall be procured and inspection made as hereinbefore provided. No permit shall be required for the clearing of

stoppages or the repairing of leaks in pipes, valves or fixtures, when such repairs do not involve or require the replacement or rearrangement of valves, pipes or fixtures. (AO 78-105, am AO 80-1, AO 82-5).

23.25.1.8 To whom permits may be issued.

A. No permit shall be issued to any person to do or cause to be done any work regulated by this code, except to a person holding a valid unexpired and unrevoked plumbing contractor's certificate of qualification or registration as required by Section 23.25.2.2, except when and as otherwise hereinafter provided in this section.

B. A permit may be issued to a properly licensed person not acting in violation of any current contractor licensing law.

C. Any permit required by this code may be issued to any person to do any work regulated by this code in a single-family dwelling used exclusively for living purposes, including the usual accessory buildings and quarters in connection with such buildings in the event that any such person is the legal owner of any such dwelling and accessory buildings and quarters, and that the same are occupied by said owner, provided that said owner shall personally perform all labor in connection therewith. (GAAB 22.20.010-1.10(d)1 and 2, am AO 78-105, AO 80-1, AO 82-5).

23.25.1.9 Application for permit.

Any person legally entitled to apply for and receive a permit shall make such application on forms provided for that purpose. He shall give a description of the character of the work proposed to be done, and the location, ownership, occupancy and use of the premises in connection therewith. The administrative authority may require plans, specifications or drawings and such other information as he may deem necessary.

If the administrative authority determines that the plans, specifications, drawings, descriptions or information furnished by the applicant are in compliance with this code, he shall issue the permit applied for upon payment of the required fee as hereinafter fixed. (AO 78-105, am AO 80-1, AO 82-5).

23.25.1.10 Cost of permit--Schedule of fees.

Every applicant for a permit to do work regulated by this code shall state in writing on the application form provided for that purpose the character of work proposed to be done and the amount and kind in connection therewith, together with such information pertinent thereto as may be required.

Such applicant shall pay for each permit issued, at the time of issuance, a fee in accordance with the following schedule, and at the rate provided for each classification shown herein.

Any person who shall commence any work for which a permit is required by this code without first having obtained a permit therefor shall, if subsequently permitted to obtain a permit, pay double the permit fee fixed by this section for such work, provided however, that this provision shall not apply to emergency work when it shall be proved to the satisfaction of the administrative authority that such work was urgently necessary and that it was not practical to obtain a permit therefor before the commencement of the work. In all such cases a permit must be obtained as soon as it is practical to do so, and if there be an unreasonable delay in obtaining such permit, a double fee as herein provided shall be charged.

For the purpose of this section a sanitary plumbing outlet on or to which a plumbing fixture or appliance may be set or attached shall be construed to be a fixture. Fees for reconnection and retest of existing plumbing systems in relocated buildings shall be based on the number of plumbing fixtures, gas systems, water heaters, etc., involved.

When interceptor traps or house trailer site traps are installed at the same time as a building sewer on any lot, no sewer permit shall be required for the connection of any such trap to an appropriate inlet fitting provided in the building sewer by the permittee constructing such sewer.

When a permit has been obtained to connect an existing building or existing work to the public sewer or to connect to a new private disposal facility, backfilling of private sewage disposal facilities abandoned consequent to such connection is included in the building sewer permit.

SCHEDULE OF FEES

Permit fee for all plumbing work:

A.	For the issuance of each permit	$ 10.00
B.	For each plumbing fixture	3.00
C.	For each gas outlet	3.00
D.	For each water heater per 1,000 B.T.U.	0.15
E.	For plumbing alteration work per outlet	3.00

F. For automatic sprinkler systems per head 1.00

G. Re-inspection fee 35.00

H. Inspection outside normal business hours, per hour, 4 hours minimum 35.00
(GAAB 22.20.010-1.12, am AO 78-105, AO 80-1, AO 82-5).

23.25.1.11 All work to be inspected.

All plumbing and drainage systems shall be inspected by the administrative authority to ensure compliance with all requirements of this code. (AO 78-105, am AO 80-1, AO 82-5).

23.25.1.12 Notification.

It shall be the duty of the person doing the work authorized by the permit to notify the administrative authority orally or in writing that said work is ready for inspection. Such notification shall be given not less than 24 hours before the work is to be inspected.

It shall be the duty of the person doing the work authorized by the permit to make sure that the work will stand the tests prescribed elsewhere in this code before giving the above notification. (AO 78-105, am AO 80-1, AO 82-5).

23.25.2.1 Definitions of plumbers and contractors.

A. A plumbing contractor certificate holder can obtain permits, install or repair plumbing, gas piping and mechanical equipment.

B. A sewer or sewage disposal contractor is a person who may conduct, carry on or engage in the business of installing, altering or repairing sewers and private sewage disposal systems.

C. A journeyman plumber is a person who labors at the trade of plumbing as an employee. A journeyman plumber certificate holder can install plumbing, gas piping and mechanical equipment.

D. An apprentice plumber is a person other than a contractor or journeyman plumber who labors at the trade of plumbing as an employee. The apprentice plumber shall be under the direct supervision and in the immediate presence of a plumbing contractor or journeyman plumber. The apprentice plumber shall be a certificate holder of a valid Municipality of Anchorage apprentice card.

E. A gas certificate holder can install gas piping and gas equipment. He may also service said equipment. He will not be issued permits.

F. A gas piping contractor certificate holder can install and repair gas piping, install and repair mechanical equipment and obtain permits for such work.

G. Any other specialty contractors doing work covered by code shall be required to be tested and licensed and to obtain permits for such work, i.e., mobile home installer. Specialty contracting shall include, but not be limited to, work such as trailer hook-ups and duct work. (AO 78-105, am AO 80-1, AO 82-5).

23.25.2.2 General provisions.

A. It shall be unlawful for any person to conduct, carry on or engage in the business of plumbing or act in the capacity of a plumbing contractor without first having been issued a valid plumbing contractor's certificate of qualification or registration by the Board of Plumber Examiners.

B. It shall be unlawful for any person to labor at the trade of plumbing in the capacity of a journeyman plumber without first having been issued a valid journeyman plumber's certificate of qualification or registration by the Board of Plumber Examiners.

C. No person, firm or corporation except duly certified and licensed gas fitters or persons working under the immediate supervision and control of a licensee hereunder shall install, alter or repair any gas piping for illuminating or fuel gas or install, alter, repair or service any gas-burning devices connected thereto in or for any building or structure in the municipality without having a license acceptable to the building official authorizing said person, firm or corporation to do so.

D. Any other specialty contractors doing work covered by code shall be required to be tested and licensed.

E. It shall be unlawful for any person to labor at the trade of plumbing while learning the trade of plumbing, without first having been issued a valid apprentice plumber certificate of registration by the Board of Plumber Examiners. (AO 78-105, am AO 80-1, AO 82-5).

F. Applicants for an apprentice plumber license need no prior experience.

G. Applicants for a gas piping contractor's certificate shall prove that they have at least four years of previous practical experience.

H. Applicants for a specialty contractor's certificate shall prove that they have had at least four years of previous practical experience in the field for which they are applying. (GAAB 22.20.010-2.3, am AO 78-105. AO 80-1, AO 82-5).

23.25.2.4 Board of Plumber Examiners.

A. The Board of Mechanical Examiners and Appeals as established under Section 23.10.015 of this title shall also be the Board of Plumber Examiners. The building official or his deputy shall be the executive secretary to the Board of Plumber Examiners, and shall have no vote on any matter to be decided by the board.

B. Appeals shall be made in writing on an application obtained from the board secretary and shall be submitted with a $50.00 processing fee. Appeals shall be heard not later than 30 days after receipt of the application. The appellant may appear in person before the board, or may be represented by an attorney, and may introduce evidence to support his claims. The appellant shall cause to be made at his own expense any tests or research required by the board to substantiate his claims. (Adapted from GAAB 22.20.010-2.4, am AO 78-105, AO 80-1, AO 82-5).

23.25.2.5 Application and testing fee.

Every person applying for a plumber's certificate of qualification or registration shall pay to the secretary of the Board of Building Regulation Examiners and Appeals at the time he makes such application for examination the following fees:

A.	Mechanical and plumbing contractor's certificate of examination	$ 25.00
B.	Journeyman plumber's certificate of examination	15.00
C.	Journeyman gas fitter's certificate of examination	15.00
D.	Gas piping contractor's certificate of examination	15.00

E. Specialty contractor's certificate of examination 15.00
(GAAB 22.20.010-2.6, am AO 78-105, AO 80-1, AO 82-5).

23.25.2.6 Issuance of certificate of qualification or registration.

The Board of Plumber Examiners shall issue certificates of qualification or registration pursuant to the following provisions:

A. A plumbing contractor's certificate of qualification or registration shall be issued to every person who makes application for such certificate, pays the required fee, proves required experience and training and successfully passes the examination conducted by the Board of Plumber Examiners.

B. A journeyman plumber's certificate of qualification or registration shall be issued to every person who makes application for such certificate, pays the required fee, proves required experience and training and successfully passes the examination conducted by the Board of Plumber Examiners.

C. A journeyman gas fitter's certificate of qualification or registration shall be issued to every person who makes application for such certificate, pays the required fee, proves required experience and training and successfully passes the examination conducted by the Board of Plumber Examiners.

D. An apprentice plumber certificate of registration shall be issued to every person who makes application for such certificate and pays the required fee.

E. A gas piping contractor's certificate of qualification or registration shall be issued to every person who makes application for such certificate, pays the required fee, proves required experience and training and successfully passes the examination conducted by the Board of Plumber Examiners.

F. A specialty contractor's certificate of qualification or registration shall be issued to every person who makes application for such certificate, pays the required fee, proves required experience and training and successfully passes the examination conducted by the Board of Plumber Examiners. (GAAB 22.20.010-2.7, am AO 78-105, AO 80-1, AO 82-5).

23.25.2.7 Reexaminations.

A. Any person who fails to pass the examination as prescribed by the Board of Plumber Examiners may apply for reexamination after the expiration of 30 days. Should such person fail the second time, the board may refuse a third application until after the expiration of six months.

B. Fees for reexamination will be the same as initial examination fees. (GAAB 22.20.010-2.8, am AO 78-105, AO 80-1, AO 82-5).

23.25.2.8 Expiration of certificates of qualification or registration.

Every certificate of qualification or registration shall remain in force and effect until its expiration date, unless cancelled or revoked. All certificates expire December 31 of each year. (GAAB 22.20.010-2.9, am AO 78-105, AO 80-1, AO 82-5).

23.25.2.9 Fees for issuance or renewal of certificates of qualification or registration.

The fees for issuance or renewal of certificates of qualification or registration are as follows:

A. Journeyman plumber's certificate of qualification shall be $35.00.

B. Plumbing contractor's certificate of qualification shall be $100.00.

C. Gas fitter's certificate of qualification shall be $35.00.

D. Gas contractor's certificate of qualification shall be $100.00.

E. Specialty contractor's certificate of qualification shall be $100.00.

F. Apprentice registration shall be $25.00.

G. All contractors' certificates of qualification, except certificates that have been cancelled or revoked, may be renewed from year to year upon request and payment of the required annual fee. If a renewal of a certificate is requested and the required fee paid more than 30 days but less than 90 days after the expiration date of such certificate, the renewal fee shall be $125.00. No certificate may be renewed more than 90 days after the expiration date of such certificate except by appeal to the board. Retesting shall be required after three years' expiration.

H. For journeymen, if a renewal request is submitted and the required fee paid within 30 days of the expiration date of such certificate, the renewal fee shall be $35.00. If such renewal is requested and the required fee paid more than 30 days but less than 90 days after the expiration date of such certificate, the renewal fee shall be $45.00. No certificate may be renewed more than 90 days after the expiration date of such certificate except by appeal to the board. Retesting shall be required after three years' expiration. The apprentice plumber late fee will be $10.00. (GAAB 22.20.010-2.6, 2.10, am AO 78-105, AO 80-1, AO 82-5).

23.25.2.10 Revocation of certificates of qualification or registration.

A. The Board of Plumber Examiners may cancel or revoke any certificate of qualification or registration issued by it to any person, if such person later shows incompetency or lack of knowledge in matters relevant to such certificate or if such certificate was obtained by fraud. If the certificate of qualification or registration of any person be so cancelled or revoked, another such certificate shall not be granted to such person within 12 months after the date of cancellation or revocation.

B. Certificates of qualification or registration are not transferable from one person to another, and the lending of any certificate or the obtaining of permits thereunder for any other person shall be deemed cause for revocation. (AO 78-105, am AO 80-1, AO 82-5).

23.25.20.14 Board of appeals.

Delete this section in its entirety.

23.25.203(d) Use of copper tubing.

Amend to delete the words "or underground outside of structures." (CAC 14.32.150-203(d), am AO 78-105, AO 80-1, AO 82-5).

23.25.Table A Table A--Plumbing material standards.

Delete from Table A, page 23, the following:

"Homogenous bituminized fiber drain and sewer pipe." (CAC 14.32.160-Table A, am AO 78-105, AO 80-1, AO 82-5).

~~23.25.~~401(a) Materials.

Amend paragraph (a) as follows:

(a) Drainage piping shall be cast iron, galvanized steel, galvanized wrought iron, lead, copper, brass, ABS, PVC, or other approved materials having a smooth and uniform bore, except that:

Delete exceptions (1) and (2) and substitute the following:

1. No galvanized wrought iron or galvanized steel pipe or ABS or PVC pipe shall be used underground, but all such pipe shall be kept at least six inches above ground, except as specified in Section 23.25.612(i).

2. ABS or PVC installations shall be limited to Type VN residential construction, not over 35 feet in stack height. ABS and PVC pipe shall not be less than schedule 40 (IPS) standard steel pipe thickness.

Delete exception (3) in its entirety. (GAAB 22.20.010-401(a), am AO 78-105, AO 80-1, AO 82-5).

23.25.401(b) Materials.

Amend paragraph (b) to read as follows:

(b) Drainage fittings shall be of cast iron, malleable iron, lead, brass, copper, ABS, PVC, or other approved materials having a smooth interior waterway of the same diameter as the piping served and all such fittings shall conform to the type of pipe used.

23.25.503(a)(2) Materials.

Delete paragraph (a)(2) in its entirety and substitute the following:

(2) ABS or PVC installations shall be limited to Type VN residential construction, not over 35 feet in stack height. ABS and PVC pipe shall not be less than schedule 40 (IPS) standard steel pipe thickness. (GAAB 22.20.010-401(a), am AO 78-105, AO 80-1, AO 82-5).

23.25.506(b) Vent termination.

Amend paragraph (b) to read as follows:

(b) Each vent shall terminate not less than ten (10) feet (3 m) from or at least three (3) feet (.9 m) above any window, door, opening, air intake or vent shaft, nor less than three (3) feet (.9 m) in every direction from any lot line; alley, street and zero-lot line properties excepted.

23.25.506(f) Vent termination.

Amend paragraph (f) as follows:

(f) Change three (3) inches to two (2) inches in first sentence. (GAAB 22.20.010-506(f), am AO 78-105, AO 80-1, AO 82-5).

23.25.612(h) Chemical wastes.

Amend paragraph (h) by adding a clause to the last sentence as follows:

. . . . except that copper material for drainage shall be prohibited to the point of dilution. (CAC 14.32.190-612(h) and GAAB 22.20.010-612(h), am AO 78-105, AO 80-1, AO 82-5).

23.25.612 Chemical wastes.

Add paragraph (i) as follows:

(i) Vacuum dental systems may be installed with schedule 40 PVC pipe and fittings, above and below grade. Piping and fittings above grade shall have a flame spread not to exceed 25. Protection of this piping shall conform to the Anchorage Municipal Code. (AO 78-105, am AO 80-1, AO 82-5).

23.25.613 Vertical wet venting.

Amend by deleting this section in its entirety and substituting the following:

A. Vertical wet venting is limited to sections of vertical drainage piping serving not more than two fixtures set on the same floor level in private living quarters (residential uses only) and having a discharge rating of not more than two units each.

B. In each such installation the vertical drain shall be one pipe size larger than the upper fixture inlet, but in no case smaller than the lower fixture inlet, whichever is the larger, and the developed length between any two such inlets shall at no time be greater than five times the diameter of the intervening wet vented section. Identical fixtures installed back to back shall have their fixture inlets at the same level.

C. The unit load on the common vent serving the two fixtures shall be the sum of the unit values of such fixtures.

D. Fixtures that rough in above the floor shall not be combined with fixtures that rough in below the floor. (CAC 14.32.200-613 and GAAB 22.20.613, am AO 78-105, AO 80-1, AO 82-5).

23.25.615(f) Combination waste and vent system.

Amend by deleting the following sentence: An accessible cleanout shall be installed in each vent for the combination waste and vent system. (AO 82-5).

23.25.Table 7-1 Horizontal distance of trap arms.

Add * after Horizontal Distance of Trap Arms and add below Table 7-1 the following:

*Residential floor drain trap arm to be extended where it passes under the nearest wall. Residential garage floor drains with a three-inch minimum trap size and drain arm and two-inch minimum floor drain size need not be vented. (AO 78-105, am AO 80-1, AO 82-5).

23.25.1003(i) Fixture inlets and outlets with hose attachments.

Amend by deleting the following sentence: Hose bibbs other than above and lawn hydrants shall be protected by an approved non-removable type backflow prevention device. (AO 82-5).

23.25.1003(k) Water cooled compressors, degreasers or any other water cooled equipment.

Amend by adding a third paragraph before the Exception to read as follows:

Installation, operation or use of air conditioning or cooling units employing water or other fluid as a cooling agent without a recovery and recirculation unit is prohibited. (GAAB 22.20.010-1003(k), am AO 78-105, AO 80-1, AO 82-5).

23.25.1004(a) Materials.

Amend by deleting the second and third sentences. (CAC 14.32.210-1004(a) and GAAB 22.20.1004(a), am AO 78-105, AO 80-1, AO 82-5).

23.25.1004(e) Materials.

Delete paragraph (e) and Exception.

23.25.1004(c) Water pressure, pressure regulators and pressure relief valves.

Delete paragraph (c) in its entirety. (AO 78-105, am AO 80-1, AO 82-5).

23.25.1007(e) Water pressure, pressure regulators and pressure relief valves.

Delete paragraph (e) and substitute as follows:

(e) Relief valves shall be provided with a full-size drain of galvanized steel or hard drawn copper piping fittings with the end of the pipe terminating at a floor drain or other approved location inside the building. No part of such drain pipe shall be trapped, and the terminal end shall not be threaded. Each drain shall be piped independently of all other drains. Trap primers shall be required as per Section 707. (CAC 14.32.220-1007(e), am AO 78-105, AO 80-1, AO 82-5).

23.25.1010 Air chambers.

Amend Chapter 10 by adding Section 1010 to read as follows:

Section 1010 - Air Chambers

Air chambers a minimum of 12 inches in length shall be installed at all fixtures, or other approved mechanical devices shall be provided to reduce water hammer or line noises to such an extent that no pressure hazard to the piping system will exist. (GAAB 22.20.010-1010, am AO 78-105, AO 80-1, AO 82-5).

23.25.1011 Indoor water meter setter.

Amend Chapter 10 by adding Section 1011 to read as follows:

All newly constructed single-family, duplex and tri-plex residences shall install an approved indoor water meter setter with meter idler or a removable section of pipe to facilitate the future installation of water meters in a horizontal position. It shall be located in the vicinity of the main supply full-way valve, ahead of any branch lines and shall also be valved on the outlet side. An easily accessible frost-proof area with adequate clearances shall be provided for meter installation, maintenance or removal. "Easily accessible" shall be considered an open area which is not concealed by an appliance, furnace, water heater or standard building material.

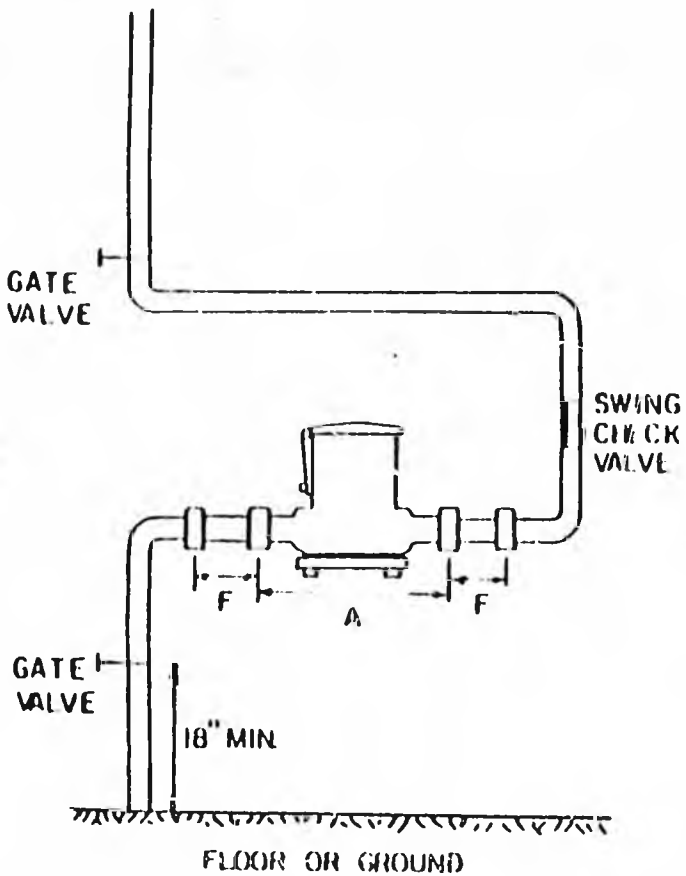
An approved indoor meter setter shall be constructed of all copper brass with all smooth water passages and shall provide permanent support for the water meter and shall be sized to accommodate a water meter in accordance with Table 10-2.

A removable section of pipe used in lieu of the indoor meter setter shall be the same length as the appropriate water meter, including meter couplings, according to the following Table of Standard Meter Dimensions and installed with appropriate fittings to allow its easy removal. The piping shall be supported to provide a permanent support for the water meter when installed.

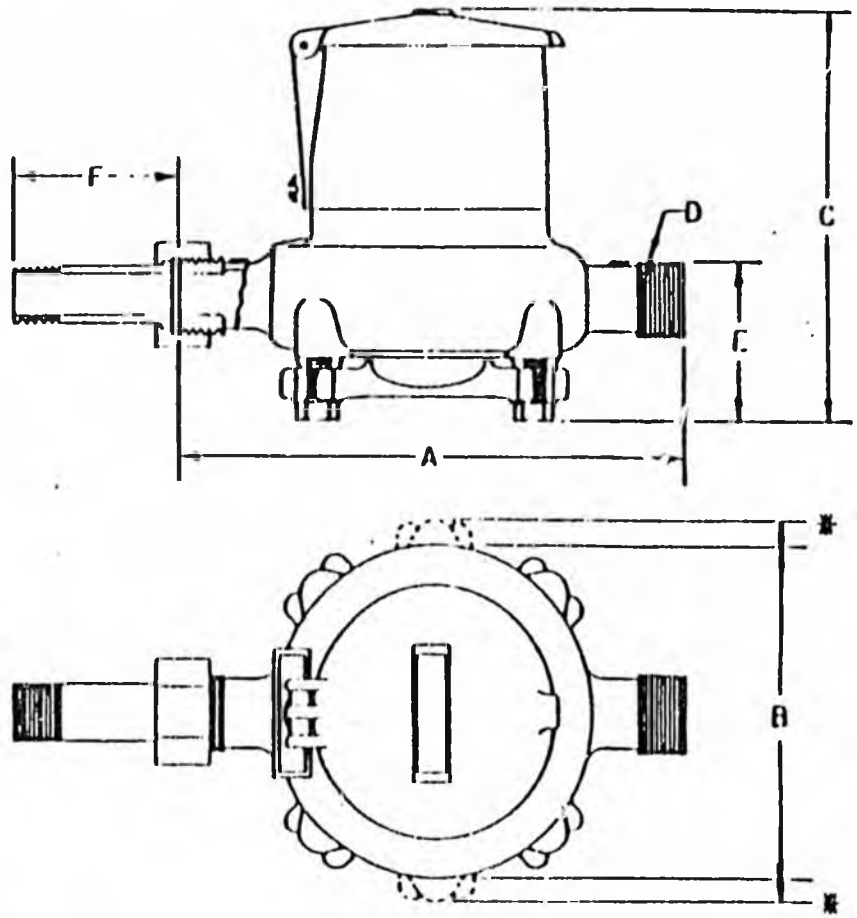
When the water tariff is revised to allow the metering of these residences the utility will furnish the meters and remote feed-outs at its expense and its crews will install remote read-out meters at the time of actual meter installation.

TABLE OF STANDARD METER DIMENSIONS

TYPICAL SMALL
METER INSTALLATION
(MUST BE HORIZONTAL)



SMALL WATER METER
STANDARD DIMENSIONS



METER SIZE	A	B	C		D		E	F	APPROX WEIGHT LBS
			STD	ARB/PUL	THD'S PER IN	OD			
5/8 x 3/4	7-1/2	4-5/8	5-3/4	5-3/4	11-1/2	1.290	1-3/4	2-5/8	6
3/4	9	5-3/8	6	6	11-1/2	1.232	1-7/8	2-5/8	7-1/4
1	10-3/4	6-1/8	7	7	11-1/2	1.626	2	2-3/4	13-1/2

23.25.1107 Cleanouts.

Delete first paragraph of subsection (a) and substitute the following:

(a) Cleanouts shall be placed at the end of building drains, two feet outside building and shall be of same material as building drain. (AO 78-105, am AO 80-1, AO 82-5).

23.25.1212(a) Material for gas piping.

Amend paragraph (a) by deleting the last sentence and substituting the following:

.Approved type L soft copper or high carbon PE pipe may be used in exterior buried piping systems and will be buried at least 18 inches deep. (AO 78-105, am AO 80-1, AO 82-5).

23.25.1212 Material for gas piping.

Add the following paragraphs:

(e) At all points where fuel gas piping enters or leaves the ground there shall be installed, above ground, a connection capable of absorbing relative motion due to frost heave action. Such connectors shall be of a type approved by the building official. Three-quarter inch kink-proof wire, with a braided flexible connection with woven jacket and oil-proof synthetic tube and cover and neoprene liner may be used. Supporting wire shall run the full length of hose. Hose-to-pipe connectors are to be of the removable metal compression type. Temperature range shall be -40° F. to +250° F. (Aeroquip #1503 medium-pressure single-wire braid hose equipped with non-swivel male pipe fittings is an example of a suitable connector.)

(f) Three-quarter inch coated flex connector may be used between meter and house main, no more than 18 inches in length. No flex connector may pass through any wall, partition, panel or other barrier. Solid fittings shall be used on each end.

(g) At points where copper tubing type systems enter or leave the ground, they shall be protected from frost heave action by the incorporation of suitable above ground 6-inch radius bends or approved flex connection of equal size. (AO 80-1, am AO 82-5).

23.25.1213(a) Installation of gas piping.

Add the following to paragraph (a):

Swing joints using threaded fittings will not be allowed before or after the gas meter as flex connections. (AO 80-1, am AO 82-5).

23.25.1213(b) Installation of gas piping.

Add the following to paragraph (b):

All building fuel gas piping entrances and exits shall be located above grade or in an approved vented vault. (AO 80-1, am AO 82-5).

23.25.1213(o) Installation of gas piping.

Delete paragraph (o) and substitute the following:

(o) Any size gas pipe that goes under a driveway or right-of-way must be welded. (AO 80-1, am AO 82-5).

23.25.1213 Installation of gas piping.

Add the following new paragraphs (p) and (q):

(p) All underground joints made with rigid pipe of 1-1/4 inch or larger shall be welded.

(q) Pounds to inches water column regulators in copper tubing type systems shall be installed in locations outside and not under the mobile home. Preferably the regulator should be attached directly to the mobile home inlet connection. An approved gas valve shall be installed immediately preceding the regulator. (AO 80-1, am AO 82-5).

23.25.1214(a)(2) Appliance connectors.

Delete paragraph (a)(2) and substitute the following:

(a)(2) No part of such connector shall be concealed within or extended through any wall, floor, partition, furnace jacket or boiler jacket. (AO 80-1, am AO 82-5).

23.25.1220 Medium pressure gas piping systems.

Add the following paragraphs:

(i) Medium pressure (2-lb.) systems. The use of type L semi-rigid 3/8-inch O.D. copper tubing shall be permitted but limited to 2-lb. underground fuel gas systems designed to convey fuel gas from a meter set assembly to a mobile home.

(j) (1) All joints in the underground portions of medium pressure systems utilizing rigid pipe shall be welded.

(2) All joints in special medium (2-lb.) pressure copper systems shall be of the flared type and shall use the short cast flare nut. No underground joints shall be permitted unless the underground length of run exceeds 60 feet. All pipe to tubing transitions shall be made above ground. (AO 80-1, am AO 82-5).

23.25.1307(d) Louvers and grilles.

Amend paragraph (d) by deleting 1/4" mesh and adding 1/2" mesh. (AO 82-5).

23.25.1326 Check valves.

Amend Chapter 13 by adding Section 1326 to read as follows:

Check valves shall not be installed on any domestic water heater installation on the cold water supply branch, unless approved by the administrative authority. (GAAB 22.20.010-1326, am AO 78-105, AO 80-1, AO 82-5).

23.25.App. C Minimum plumbing facilities.

Amend Appendix C, Minimum Plumbing Facilities, by deleting the sections pertaining to theaters, auditoriums; dormitories; office or public buildings; manufacturing, warehouses, workshops, loft buildings, foundries and similar establishments; restaurants; and dwelling or apartment houses and adding the following sections:

APPENDIX C
MINIMUM PLUMBING FACILITIES[1, 12]

Type of building or occupancy[2]	Water closets		Urinals[8]	Lavatories[10]	Bathtubs or showers	Drinking Fountains[3]
	Males	Females	Fixtures/Males	Fixtures/Persons	Fixtures/Persons	Persons
Theaters, auditoriums, other places of public assembly	1 - 1-200 2 -201-400 3 -401-600 1 for each additional 500 males and 1 for each additional 300 females	1 - 1-100 2 -101-200 3 -201-400 1 for each addi- 500 additional	1 - 1-200 2 -201-400 3 -401-600 1 for each additional 300 males	1 - 1-200 2 -201-400 3 -401-750 1 for each additional 500 persons	- - -	1 - 1-100 2 -101-500 1 for each additional 1,000
Food service establishments, taverns, cocktail bars, restaurants[11]	1 - 1- 60 1 for each additional 60	1 - 1- 30 1 for each additional 30	1 - 1- 30 2 - 31- 90 1 for each additional 60	1 per 60 females 1 per 60 males	- - -	- - -
	Fixtures	Employees				
Office buildings stores, and similar establishments[9]	1 2 3 4 5 6 1 for each additional 50	1 - 15 16 - 35 36 - 55 56 - 80 81 - 100 101 - 150	***	1 - 1- 15 2 - 16- 35 3 - 36- 55 4 - 56- 80 5 - 81-100 6 -101-150 1 for each additional 50	- - -	1 per 75
Manufacturing, warehouses, workshops, loft buildings, foundries and similar establishments[5, 9]	1 2 3 4 5 1 for each additional 30	1 - 9 10 - 24 25 - 49 50 - 74 75 - 100		Up to 100 1 per 10 Over 100 1 per 15[6, 7]	1 shower for each 15 persons exposed to excessive heat or to skin contamination with poisonous, infectious or irritating materials	1 per 75
Dwelling or apartment houses[4]	1 for each dwelling unit		- - -	1 for each dwelling unit	1 for each dwelling unit	- - -

AO 83-9

*** Whenever urinals are provided, one water closet less than the number specified may be provided for each urinal installed, except the number of water closets in such cases shall not be reduced to less than two-thirds of the minimum specified.

1. The figures shown are based upon one fixture being the minimum required for the number of persons indicated or any fraction thereof. In applying this schedule of facilities, consideration shall be given to the accessibility of the fixtures. Conformity purely on a numerical basis may not result in an installation suited to the need of the individual establishment. For example, schools should be provided with toilet facilities on each floor having classrooms. The director of public health may approve variances from this schedule when its literal application is impracticable.

2. Minimum plumbing facilities for buildings or occupancies not shown in this table shall be as required by the building official. Facilities for the physically handicapped shall be as required by ANSI 117.1, 1980 and 1982 Uniform Building Code, as amended.

3. Drinking fountains shall not be installed in toilet rooms or on janitor services sinks or within 12 inches of any sink faucet.

4. Kitchen sinks - one for each dwelling unit.

5 As required by the American Standard Safety Code for Industrial Sanitation in Manufacturing Establishments (ASA Z4.1--1942).

6. Where there is exposure to skin contamination with poisonous, infectious or irritating materials, provide one lavatory for each five persons.

7. Twenty-four lineal inches of wash sink or 18 inches of a circular basin, when provided with water outlets for such space, shall be considered equivalent to one lavatory.

8. (a) Floor-type urinals: Floor-type trough urinals are prohibited.

   (b) Wall-type trough urinals shall be acid-resistant and each such urinal shall be not less than 6 inches deep and shall be furnished with one-piece backs and have strainers with outlets at least 1-1/2 inches in diameter.

The washdown pipe shall be perforated so as to flush with an even curtain of water against the back of the urinal. Urinal tanks shall have a flushing capacity of not less than 1-1/2 gallons of water for each 2 feet of urinal length.

(c) Equivalent length--Trough urinals shall be figured on the basis of one urinal for each 18 inches of length, provided that:

Length of urinal.....	24"	36"	48"	60"	72"
Equivalent number of urinals.....	1	2	2	3	4

(d) Surround materials--Wall and floor space to a point 1 foot in front of urinal lip and 4 feet above the floor, and at least 1 foot to each side of the urinal shall be lined with non-absorbent material.

9. (a) Toilet facilities shall be provided in separate rooms for each sex if there are more than four persons of mixed sex employed.

(b) Hand-washing basins supplied with hot and cold water shall be provided in commercial food-handling establishments for the use of employees convenient to their work area. The basin shall be equipped with an approved hot and cold water mixing faucet.

(c) Service sinks used for mopping and other similar cleaning operations shall be provided in food markets, taverns and restaurants. Office building occupancies having 10,000 or more square feet of area per floor shall have at least one service sink on each floor of the building. Office occupancy buildings having over 2,000 square feet per floor but less than 10,000 square feet per floor shall have at least one service sink on every third floor, provided such sink is available for use to the floor directly below and the floor directly above.

10. All places where hand-washing facilities are required shall have hot and cold water. Such fixtures shall be provided with approved mixing valves.

11. Includes only those food service establishments serving food or drink for consumption on the premises.

12. Table 33-A of the Uniform Building Code should not be applied in determining occupants for Appendix C. A realistic actual population count, subject to the approval of the building official, should be used. (AO 80-1, am AO 82-5).

23.25.App.D.1(a) Rainwater systems.

Amend Appendix D, Part A, D1.0, Materials, paragraph (a) by deleting paragraph (a) and substituting as follows:

(a) Drainage piping shall be cast iron, galvanized steel, galvanized wrought iron, lead, copper, brass, ABS, PVC, or other approved materials having a smooth and uniform bore.

23.25.App.D.1(c) Rainwater systems.

Amend Appendix D, Part A, D1.0, Materials, paragraph (c) by deleting paragraph (c) and substituting as follows:

(c) Rainwater piping located underground within a building shall be of service weight cast iron soil pipe, type DVW copper tube, or other approved materials. (AO 80-1, am AO 82-5).

Section 2. That Section 23.05.010(C) of the Anchorage Code is hereby amended to read as follows:

C. Uniform Plumbing Code, 1982 [1979] Edition (including the appendices thereto);

Section 3. This ordinance shall take effect immediately upon passage by the Anchorage Municipal Assembly.

PASSED AND APPROVED by the Anchorage Municipal Assembly this 8th day of February, 1983.

Chairman

ATTEST:

Municipal Clerk

Allied TUBE & CONDUIT CORPORATION
16100 South Lathrop
Harvey, Illinois 60426
(312) 339-1610
NEWS

POLYVINYL CHLORIDE FUMES CAUSE LONG-TERM HEALTH PROBLEMS FOR FIRE SURVIVORS, STUDY SHOWS

Long-term health effects of exposure to polyvinyl chloride fumes from electrical fires can include permanent damage to lungs, heart, vocal cords and other organs, a study of fire survivors discloses in the November, 1981 issue of Journal of Combustion Toxicology.

The study covers survivors of the 1977 fire that claimed 161 lives in the Beverly Hills Supper Club near Cincinnati and the 1975 New York Telephone Company fire, in which 239 fireman required medical attention for toxic gas inhalation. The fires are described as two of the largest polyvinyl chloride electrical fires in the 1970's.

Deborah N. Wallace, president, Public Interest Scientific Consulting Service, reports in the study that four Beverly Hills Supper Club survivors died of severe respiratory impairments several weeks to several months after the fire. Autopsies also revealed kidney damage in three of the four victims, Dr. Wallace reports.

In-depth interviews of eight other survivors showed a consistent picture... of severe damage to both upper and lower respiratory tract and secondary subsequent infections," Dr. Wallace notes. "Long-term diminuation of respiratory disease resistance, headaches, sleep problems, and inability to work constitute present secondary impacts of the respiratory damage....Several interviewees

experienced one or more of the following: irregular heart beat, skin problems, and visual perception impairment. Psychological effects included frequent nightmares, memory lapses, and heavy guilt characteristic of survivor syndrome."

A survey of 113 of the firefighters treated at the scene of the New York Telephone Company blaze covered the first sign of aftereffect injury and symptoms before later medical attention. "By far, the most frequent first symptoms were sore throat, irritated eyes ('burning'), dizziness, aching nostrils, and confusion. Other moderately frequent first symptoms included nausea, chest pains, chest congestion, and headache."

Nearly two-thirds of the firemen complained of persistent or permanent effects, Dr. Wallace reports. "Many men complained of being hoarse from the time of the fire to the present," she adds. "This condition became progressively worse in two men who...were found to have vocal cord lesions...The high prevalence of hoarseness indicates that the vocal cords of many of the men should be watched for growths."

Polyvinyl chloride (PVC) fumes were clearly identified in the Wallace study as the primary cause of death and injury in the two fires. She points out that in the Beverly Hills Supper Club fire, "A total of 161 people died that night without any direct involvement with the flames and long before the carbon monoxide had reached a concentration which affected the rescuers, most of whom wore no respiratory masks, and before any wood was burning in or near the...room."

During the New York Telephone Company fire, "...firefighters were collapsing or running out to the medical vans," Dr. Wallace reports. "Some men in the building depleted their airpacks and had to breathe the undiluted hot, acidic smoke. Some of the men on the outside also suffered from airpack depletion and breathed the dense downwash of smoke from the building."

Both fires have been traced to electrical origin. An estimated "minimum of 4,000 and a maximum of 8,000 feet of Romex-jacketed cabling containing several PVC-insulated wires in the plenum of the Cabaret Room alone..." where most of the Beverly Hills Supper Club fatalities occurred. "Although the fire was discovered in the Zebra Room about 8:40-8:45 pm, it had been building in the wall undiscovered for about one-two hours. By this time, the process of thermal decomposition which is the initial stage of a polyvinyl chloride fire had already spread through the wiring to the Cabaret Room."

The New York Telephone Company fire began in the main Manhattan switching center cables entering the basement vault. The 490 cables there were clad either in polyethylene plastic or lead sheathing. "The fire remained confined to these apparently, for some time because the heat had to reach about 600° C to ignite the PVC cables leading from the vault to the upper floors," Dr. Wallace recounts. "By the time the alarm was turned on, much thermal decomposition had occurred and the PVC cables were burning.

"The initial fire was extinguished only about 3¼ hours after the alarm was sounded. However, the gases from the decomposition of the PVC cables

accumulated in the vault and burst into flames on contacting the hot wires. The second fire spread rapidly along the cables to the upper floor, and all the burning cables were of the type with each individual wire coated in PVC .... According to the New York fire department and NYS Public Service Commision inventories of what burned and was available to burn, PVC cable insulation and jacketing constituted over 80% of the fuel....No other cable insulation or jacketing was used in the building itself, and only very small quantities of wood were present on the distribution frames."

The combination of PVC electrical insulation and its ready access to combustion-supporting air thus appear to have magnified the intensity of the two fires. The Beverly Hills Supper Club wiring used reinforced plastic-jacketed wires individually insulated in PVC, and the New York Telephone Company building contained large amounts of PVC-clad wire in open distribution channels. Neither installation had the protection of metal conduit capable of both resisting high heat and blocking access of combustion air that supported the fires.

The Journal of Combustion Toxicology article notes that "by the early-to-mid 1970's, PVC had become a common electric wire insulation and cable jacket because if its electrical properties flexibility, and high ignition temperature (600° C). Combustion toxicological research of the late 1960's-early 1970's had, however, uncovered a problem with PVC and several other halogenated plastics, namely that the combustion products were extremely toxic compared to those of most natural materials.

"Further research on PVC in the early-to-mid 1970's revealed a special pattern of thermal decomposition, characterized by evolution of anhydrous hydrogen chloride and traces of benzene and toluene from the surface of the plastic at temperatures as low as 100° C. When temperatures reach 250-300° C, the reaction accelerates to the point that significant quantities of HCl are generated. Long before actual ignition temperatures are reached, long before the presence of visible fire, and long before quantities of carbon monoxide become significant, both gaseous and soot-absorbed HCl are generated in high concentrations."

The article also notes that the pattern of decomposition of PVC into HCl varies with a number of factors, including "configuration of many wires vs few; and whether the wire is in metal conduit, PVC conduit, or no conduit."

Dr. Wallace also points out that in addition to combining with water in tissue of the upper respiratory tract (to form hydrochloric acid), "another effect of PVC decomposition products is that they impair perception and behavior. The smoke is extremely dense and drastically reduces visibility, and its irritation of the eyes, skin, respiratory tract, and possibly nervous system provokes disoriented movement, blind groping and incapacitation. The potential for escape from PVC decomposition products is low compared to that of the initial stages of a fire with natural products as fuel."

She urges that "because the decreased potential for escape appears to have contributed to increasing the number of people subjected to relatively lengthy exposure to high concentrations of PVC decomposition and combustion products,

monitoring survivors of wire insulation fires for long-term health effects would be an important contribution to both the field of combustion toxicology and to the body of data on which fire safety decisions are based."

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STATE OF CALIFORNIA—STATE AND CONSUMER SERVICES AGENCY GEORGE DEUKMEJIAN, Governor

DEPARTMENT OF Consumer Affairs

(916) 445-4465

1020 N STREET, SACRAMENTO, CALIFORNIA 95814

December 20, 1984

Mr. Thomas Higham
Executive Director
International Association
of Plumbing and Mechanical
Officials
5032 Alhambra Avenue
Los Angeles, CA 90032

Dear Mr. Higham:

As you know, this department actively participated in litigation concerning IAPMO last year. While our formal role in that matter has ceased, we remain abreast of current developments and are involved, in conjunction with HCD, in the ongoing environmental impact report.

I recently learned that IAPMO voluntarily has elected to include the notice concerning the use of plastic pipe in your upcoming edition of the Uniform Plumbing Code. It is also my understanding that the language to be used is identical to that which appeared in the last publication.

I applaud your decision. This action on the part of IAPMO carries forward the spirit of the trial court decision and allows all interested parties to focus their attention upon other critical problems.

While I trust that the information which I have received is correct, please don't hesitate to contact me if I have misstated your decision.

Sincerely,

Marie Shibuya-Snell

MARIE SHIBUYA-SNELL
Director

cc: Shirley Chilton
Secretary
State & Consumer
Services Agency

bcc: Mitch Wilk
Julie Nauman (HCD)
Tom Cecil

INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIA
5032 ALHAMBRA AVENUE, LOS ANGELES, CALIFORNIA 90032-3400 • (213) 223-1471

January 14, 1985

Marie Shibuya-Snell, Director
Department of Consumer Affairs
1020 N Street
Sacramento, CA 95814

Dear Ms. Shibuya-Snell:

cc: Frankel

This is in response to your letter of December 20, 1984, regarding the insertion of the notice on the status of plastic pipe in California in the 1985 edition of the Uniform Plumbing Code.

At its recently held meeting, the IAPMO Board of Directors determined that IAPMO will voluntarily continue to insert the notice in copies of the Uniform Plumbing Code sold in California. The wording of the notice will be substantially the same as at present. We are, however, contemplating deleting the portion in parenthesis which refers to the "pending litigation". Since the litigation is no longer pending, there is no reason to continue to refer to it.

Very shortly I will be forwarding a copy of the proofs of the 1985 edition of the Uniform Plumbing Code to John Worsley so the Building Standards Commission can proceed with its adoption in a timely fashion.

Thank you for your letter and your interest. I hope we can continue to work closely together for the mutual benefit of the citizens of California.

Cordially,

Tom Higham

TOM HIGHAM
EXECUTIVE DIRECTOR

INTERNATIONAL ASSOCIATION OF
PLUMBING AND MECHANICAL OFFICIALS

TH:jg

cc: Jack McKenna

JAN 16 1985

9

LEGISLATIVE ACTIVITIES OF INTEREST REGARDING ELECTRICAL NON-METALLIC TUBING AND OTHER PLASTIC CONSTRUCTION MATERIALS

CONFERENCE OF INSURANCE LEGISLATORS

The Conference of Insurance Legislators is an organization of influential state legislators whose legislative duties include or have included state insurance codes. As an organization, COIL and a number of its members have been very active in fire safety. On November 1, 1981, the Resolutions Committee of COIL and members of the Missouri Legislature held a public hearing aimed at finding legislative responses to the fires at MGM Grand and Stouffers' Inn, among other tragedies. As a result of that public hearing, COIL adopted Resolution No. 6. Of particular interest to this Committee is the following finding by COIL:

> "Whereas, there are several avenues which state legislatures can take to marshall the power of state and local governments to bring about greater safety in hotels and other facilities of public accommodation, such as the enactment of laws which:
> --improve structural and fire safety codes to include among others, recently obtained data on toxicology . . ." (emphasis added)

To further refine that finding of fact and its ultimate resolution, COIL created a Task Force on Hotel Fire and Structural Safety. That Task Force is chaired by the Honorable Charles Butts, Senator of the State of Ohio. Senator Butts addressed the Symposium on Combustion Toxicology recently held at the NFPA's Annual Meeting. During his address, Senator Butts said:

"One of the things that I think is important to say and why I am grateful for the opportunity to speak to you is that when you have the fire storms in the media as we have had with the hotel fires particularly, but some of the other things; supper clubs and others, that there will be legislative reactions good or bad, and we will enact laws. We will enact into the statutes, code changes!"

Sen. Charles Butts,
NFPA Symposium on Toxicity
May 17, 1982

Senator Butts' observations were not only prophetic in terms of future legislation but he was relating some of the reactions that law makers and public officials across the country have already had when the issue of fire-gas toxicity and codes, such as the electrical code came before them.

STATE OF NEW MEXICO

In late July, 1981, the Electrical Bureau Chief of the Construction Industries Division of the Commerce and Industry Department of the State of New Mexico added Article 331 to the 1979 National Electrical Code under which the state was then operating. Upon learning of the development, Allied brought the facts regarding the potential hazards of PVC in a fire situation to the attention of the Construction Industries Committee, a group appointed by the Governor to oversee the adoption of codes throughout the State of New Mexico. Although the state's approval of proposed Article 331 was quickly withdrawn by the Electrical Bureau, the Committee, on the basis of the evidence presented by both Allied and the proponents of combustible, toxic electrical conduit decided there was sufficient evidence to warrant holding a full evidentiary hearing on the use of toxic building

materials. The Construction Industries Division held that hearing, which was chaired by Richard W. Lisle, Director of the Division on April 15, 1982. The purpose of the hearing was to gather information on the various kinds of plastic materials used in New Mexico.

The New Mexico statute, under which all minimum codes are adopted for the entire state, requires that the Division begin with model codes such as the National Electrical Code and amend those only so as to increase the standards. Prompted by the abortive attempt to gain approval for proposed Article 331, and by the facts regarding fire-gas toxicity, the state is now considering the question of whether PVC, along with other synthetics commonly used in construction materials, ought to be prohibited from use in the state.

Richard W. Lisle has now released a report recommending cutbacks on the use of synthetic building materials. His report cited growing evidence of injuries and often lethal effects of synthetic products when they decompose in a fire. New Mexico is the first state to study the issue and recommend that PVC conduit no longer be permitted in high-rise buildings or non-fire-rated high density occupancy structures.

CITY OF CHICAGO

The City of Chicago is one of the largest cities which does not authorize the use of combustible, toxic electrical wiring methods or water, drain, waste or vent systems in any of its codes. In October, 1981, the Major of Chicago proposed wide-sweeping revisions to the City's electrical, plumbing and building codes so as to promote the rehabilitation of existing but dilapidated housing in Chicago. There were several extensive hearings before the Committee on Buildings and Zoning of the City Council of the City

of Chicago. At those hearings, both the opponents and the proponents of combustible, toxic building materials had a full opportunity to present their view of the facts to the Committee. The result of those hearings was that, while extensive changes were made to Chicago's codes, the Committee and later the full City Council, voted to retain the City's ban on the use of plastic wiring and plumbing methods. The Chairman of the Building and Zoning Committee, Alderman Edward R. Vrdolyak, was quoted as saying:

> "There are too many questions the experts can't answer. I certainly am not a chemist or a toxicologist . . . but there are safety questions. We're going to take a good look until most, if not all, of the evidence is in."
>
> Chicago Tribune
> February 27, 1982

STATE OF NEW YORK

Chicago is not the only major city to protect its citizens from the unrestricted loading of its buildings with combustible, toxic materials. New York City has, for many years, prohibited the use of building materials which, in a fire, produce smoke more toxic or denser than that produced by wood. The City of New York has been requiring toxicity testing of building materials using several commercial testing laboratories for several years.

Until the unfortunate tragedy of the Stouffers' Inn fire, however, the State of New York did not have a uniform, state-wide code. Following that fire, the Governor of New York appointed a special fire safety Task Force chaired by the Honorable Basil A. Paterson, Secretary of State of New York. A key conclusion of that Task Force report, which was issued to the Governor of New York on February 19, 1981, was:

"Most fire deaths are caused by smoke inhalation with an apparent increase of involvement of petrochemical based and other synthetic materials."

Special Fire Safety Task Force Report, p. 3

The Task Force recommended that a Uniform Fire Prevention and Building Code to take effect on January 1, 1984, be adopted. That Act, which provides for mandatory and uniform state-wide construction and material requirements for public and private buildings, based on performance standards, was passed in 1981. To facilitate the work of the Council which is required to formulate this state-wide code, State Senator Dunne and Assemblyman Branca introduced legislation in March, 1982. This legislation contains very important legislative findings. It says:

"The legislature hereby finds that there is a growing concern regarding injuries and deaths related to the toxic behavior of certain building and furnishing materials when exposed to fire or high temperatures. The legislature further finds that model test methods exist for rating the toxicity of combustion products, but that no adequate program exists to improve upon and integrate such tests into the state uniform fire prevention and building code established pursuant to article eighteen of the executive law."

On May 6, 1982, the Fire Safety Subcommittee of the Senate Finance Committee held a public hearing to consider toxicity and fire safety. Several of the statements made during the course of that hearing are particularly important to note:

"Neither building codes nor fire regulations seem to have taken much account of the dangerous aspects of plastics. Such codes and

regulations are inadequate. Many buildings were made to withstand fire rather than smoke, but some flame retardants minimize burning and maximize smoke. Those codes and regulations, based on heat generated by fires, may not be sufficient for smoldering plastic."

Hon. Basil A. Paterson, p. 12
Secretary of State of New York

"We think it (N.Y. Senate Bill S8988, Attachment 3,) is a milestone piece of legislation, something that should be done on a national level. I don't foresee it at a national level, so I feel fortunate to live in the State of New York where we are assured that we will have some further study done in the area of toxic materials and the effects that it not only has on firefighters but the effects it's having on civilians.

We know it's killing people. We know it is coming from gases. If this study will help prevent some of these materials from being used in the buildings in the state, then it's a major step forward. Particularly, as I cited before, plastic pipes and plumbing should be outlawed, some of the other plastic materials that are being used in building construction."

Mr. Robert Gollnick, President
New York State Professional
Firefighters Association, p. 51

"From my experience, many thermoplastics, such as styrofoam, polyethylene, polyvinyl chloride, to name a few, used as building materials make the difficult job of firefighting more difficult. They, by virtue of their high fuel values, their ability to generate toxic thick smoke, and their thermoplastic melt-flow nature at fire

ground temperatures too often deprive firefighting forces from reaching their objective to seat the fire."

Officer Scott Kirchhofer,
Ladder Company No. 40
New York City Fire Department
p. 106

"Polyvinyl Chloride (PVC), polychlorinated biphenyl (PCB) are only a few of the compounds that can produce immediate or delayed injuries or death when involved in fire. State and federal legislation is needed to control the composition of materials used in furnishings and building construction so that the public may be properly safeguarded in the case of fire."

Chief Joseph C. Hess,
Chief of Fire Prevention
New York City Fire Department
p. 218

This testimony and the clear and cogent testimony of toxicologists experienced in fire-gas toxicity such as Dr. Merritt Birky formerly of the National Bureau of Standards, Center for Fire Research and now of the Foundation for Fire Safety and Dr. Yves C. Alarie, Chairman, Department of Respiratory Physiology and Toxicology, Graduate School of Public Health, University of Pittsburgh that it was feasible to rate the toxicity of materials resulted in Senate Bill 8988 being unanimously passed in the New York State Senate. On July 3, 1982, despite enormous budgetary pressures, this legislation was passed 140 to 1 by the New York State Assembly and was signed by the Governor on July 20.

At the same time as the New York legislature was considering this landmark toxicity legislation, a dispute arose regarding PVC electrical conduit installed in the New York City subway system. As in the other

instances where the facts on fire-gas toxicity were brought to the attention of responsible lawmakers charged with the duty to protect the safety of their constituency, there was quick governmental action. The New York Subway Authority discontinued the use of PVC electrical conduit based upon their concerns about the toxic hydrogen chloride gases emitted by the PVC electrical conduit in a fire. The controversy did not end, however, with discontinuance of the use of such material. On June 2, 1982, Carol Bellamy, President of the New York City Council called for the removal of all of the PVC tubing in use in the New York subway system. Answering the standard assertion that combustible, toxic PVC conduit presents no imminent hazard, Ms. Bellamy was quoted as saying:

> "The system-wide use of PVC tubing indoors poses a clear and present danger to millions of subway passengers and transit workers, as well as to firefighters responsible for controlling fires in the system. Our first concern must be safety. Using PVC tubing is perilous economy."(emphasis added)
>
> Journal of Commerce Daily
> June 2, 1982

Finally, on June 25, 1982, the New York City Council appropriated $2,000,000 to remove PVC electrical conduit from the subway system.

TULSA, OKLAHOMA

The recent action of the Board of Commissioners of the City of Tulsa is another example of the overwhelming response of lawmakers to the facts on fire-gas toxicity. In Tulsa's case, when asked to permit the use of flexible non-metallic conduit, the Mayor and Board of Commissioners referred the matter to the Fire Marshal. His conclusion was to reject the material and said, "The danger of PVC, particularly under fire conditions,

are well known because of the hazardous, death-dealing products of combustion."

STATE OF CALIFORNIA

The Supreme Court of California recently enjoined the publication in California of a model plumbing code which would have expanded the use of plastic pipe in California. The Court decided that unless the public was adequately informed about the health hazards of such pipe, that that model code could not be sold in California until a complete environmental impact report, currently about to begin, was completed. How that report would deal with the problem and solution to the problem of combustible, toxic building materials was not clear enough for members of the California Assembly. As a result, on June 29, 1982, Assemblywoman Maxine Waters, a member of the majority leadership, introduced Assembly Concurrent Resolution No. 146 which would direct the development of a standard toxicity test method by the state and require the environmental impact report to include the toxicity of all building materials included in the electrical, plumbing, structural, or any other building code of the state.

On August 31, 1982, the legislature of the state of California passed the resolution with amendments requiring the establishment of tests to determine the fire-gas toxicity and combustibility of materials used in buildings. The measure calls for the Department of Industrial Relations and the State Fire Marshal to review combustion toxicology test methods and to "adopt or adapt the most appropriate existing test method to rate the relative toxicity of all materials intended for use in or as part of high-density occupancy buildings."

####

(b) In case of complaints by a contractor, builder or installer charging arbitrary actions or incompetence on the part of an inspector, the commissioner, after reviewing written presentation of the dispute, may require reinspection by a new inspector who has no connection with either disputant. (§ 1 ch 15 SLA 1972)

Sec. 18.60.730. Penalty for violations. A person who violates a provision of the code, and who, after receiving the notification required by AS 18.60.725, refuses to correct the violation, after proof of the violation, is subject to a fine of not more than $1,000. (§ 1 ch 15 SLA 1972)

Sec. 18.60.735. Borough or city regulation. AS 18.60.705 — 18.60.740 do not affect the authority of any municipality to prescribe by ordinance, rule or order, standards for their respective areas of jurisdiction no less stringent than those established under AS 18.60.705. This chapter is not intended to duplicate or preempt code administration or enforcement by municipalities. Any organized municipality or unorganized village having less than 2,500 population is exempt from the provisions of this Act. (§ 1 ch 15 SLA 1972)

Sec. 18.60.740. Definitions. In AS 18.60.705 — 18.60.740

(1) "code" means the Uniform Plumbing Code, 1979 edition, adopted at the 49th Annual Conference, September 1978, International Association of Plumbing and Mechanical Officials;

(2) "commissioner" means the commissioner of labor;

(3) "department" means the Department of Labor;

(4) "inspector" means a qualified inspector employed by, designated by, or under contract to the Department of Labor. (§ 1 ch 15 SLA 1972; am § 3 ch 88 SLA 1980)

Effect of amendments. — The 1980 amendment, in paragraph (1), substituted "1979" for "1970" preceding "edition" near the beginning of the paragraph, substituted "49th" for "40th" preceding "Annual Conference" near the middle of the paragraph, and substituted "1978" for "1969" following "September" near the middle of the paragraph.

Article 9. Safety Glazing.

established under this chapter only for inspections requested by the owner of a structure.

(e) The department shall maintain a record of all plumbing inspections performed by it and of all inspection fees and permit fees collected by it. (§ 1 ch 15 SLA 1972; am § 2 ch 88 SLA 1980)

Effect of amendments. — The 1980 amendment added subsections (d) and (e).

Sec. 18.60.720. Cost of permits. (a) If the department by regulation requires permits for plumbing work, fees may not exceed the following:

(1) for issuing each permit	$2.00
(2) a permit for each	
(A) plumbing fixture or trap or set of fixtures on one trap, including water, drainage piping and backflow protection	1.50
(B) building sewer or trailer park sewer	5.00
(C) drain in rainwater system	2.00
(D) cesspool	5.00
(E) private sewage disposal system	10.00
(F) water heater and/or vent	1.50
(G) gas piping system of one to five outlets	1.50
(H) gas piping system of six or more outlets, per outlet	.30
(I) industrial waste pretreatment interceptor, including its trap and vent, but excluding kitchen type grease interceptors functioning as fixture traps	1.00
(J) installation, alteration or repair of water piping or water treating equipment	1.50
(K) repair or alteration of drainage or vent piping	1.50
(L) lawn sprinkler system or any one meter which includes backflow protection devices	2.00
(3) for vacuum breakers or backflow protective devices on tanks, vats, or for installation on unprotected plumbing fixtures including necessary water piping	
(A) one to five	2.00
(B) over five, each	.30

(b) The department shall keep a record of all fees collected and all inspections performed. (§ 1 ch 15 SLA 1972)

Sec. 18.60.725. Enforcement of compliance. (a) A department inspector shall give written notice to the owner of a constructed premise or the contractor of a premise under construction of each violation of the code. The notice of violation shall accurately describe the violation and give specific reference to the section and paragraph of the code. In addition, the notice shall prescribe the necessary changes so that the work will comply with the code.

Collateral references. 13 Am. Jur. 2d, Buildings, § 29.

39A C.J.S., Health and Environment, §§ 28-32.

Sec. 18.60.705. Plumbing code. The Department of Labor shall adopt, as the official minimum plumbing code for the state, the Uniform Plumbing Code, 1979 edition, adopted at the 49th Annual Conference, September, 1978, International Association of Plumbing and Mechanical Officials, chs. 1 — 13 and appendices, but excluding Part I, Administration, pages 1a — 6a, and subject to AS 18.60.710 — 18.60.740. (§ 1 ch 15 SLA 1972; am § 1 ch 88 SLA 1980)

Effect of amendments. — The 1980 amendment substituted "1979" for "1970" preceding "addition" near the middle of the section, substituted "49th" for "40th" preceding "Annual Conference" near the middle of the section, substituted "1978" for "1969" following "September" near the middle of the section, deleted "Part II and" preceding "chs. 1 — 13" near the middle of the section, and substituted "1a — 6a" for "1a — 7a" near the end of the section.

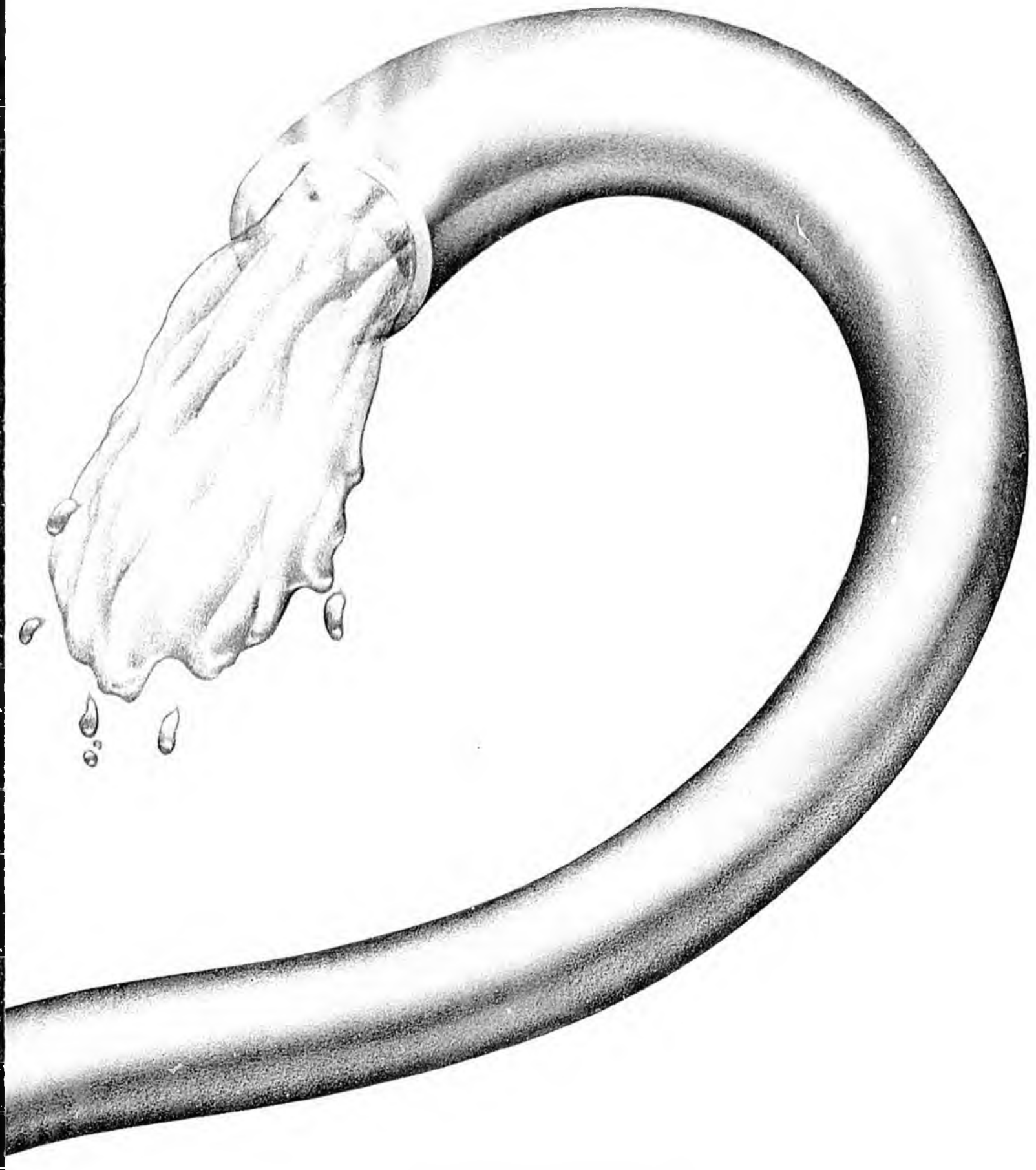
Sec. 18.60.710. Duties of the department. The department is responsible for the administration of the code. The department may promulgate regulations designed for maximum practical implementation of the code, and may grant exceptions from specific code provisions, where distance or other factors make implementation impractical. Specific consideration shall be given to outlying villages and sparsely populated areas to ensure that AS 18.60.705 — 18.60.740 will not impose an undue financial burden. The department may by regulation designate appropriate inspection to a public or private utility company. A company so designated may refuse utility connections if an installation does not meet the requirements of this code. (§ 1 ch 15 SLA 1972)

Sec. 18.60.715. Administration. (a) The code applies to all new construction, all new work in relocated buildings and to any alteration, repairs or reconstruction of buildings except as provided otherwise under AS 18.60.705 — 18.60.740.

(b) The department may inspect work installed, removed, altered, or replaced on any plumbing, gas or drainage piping, plumbing fixture, water heater or water treating equipment in a building or other location. No permit or inspection is required for the following work: the stopping of leaks in drains, soil, waste or vent pipes, the clearing of stoppages in or repairing of leaks in pipe valves or fixtures, repairs or alterations not of a substantive nature which can be reasonably exempted from inspection.

(c) Nothing in AS 18.60.705 — 18.60.740 prohibits a person from performing plumbing work on his own property.

(d) The department may adopt regulations establishing fees for inspections conducted under AS 18.60.705 — 18.60.740. Fees may be



HOT AND COLD WATER
PLUMBING PIPE

The Toughest Pipe at the Lowest Cost.

Pipe made with Duraflex* polybutylene resin from Shell Chemical Company is the toughest *and* the most economical plumbing you can buy.

When you match polybutylene pipe against copper, galvanized, CPVC or any other plumbing material used for hot and cold water service, you'll see there's no comparison. You won't find a better pipe for homes, townhouses and apartment buildings at any price.

Polybutylene pipe is tough — tougher than any other plumbing pipe. It resists corrosion, rust, scale and freezing. It can be used for water systems with pressures up to 200 psi at 73°F (cold water pipe) and up to 100 psi at 180°F (hot water pipe).

And polybutylene pipe is less expensive than other types of plumbing pipe. Material costs will be significantly less than copper. In addition, its price is more stable than the cost of copper, allowing contractors to bid jobs more accurately. Polybutylene pipe is less expensive than CPVC and also saves on installation time.

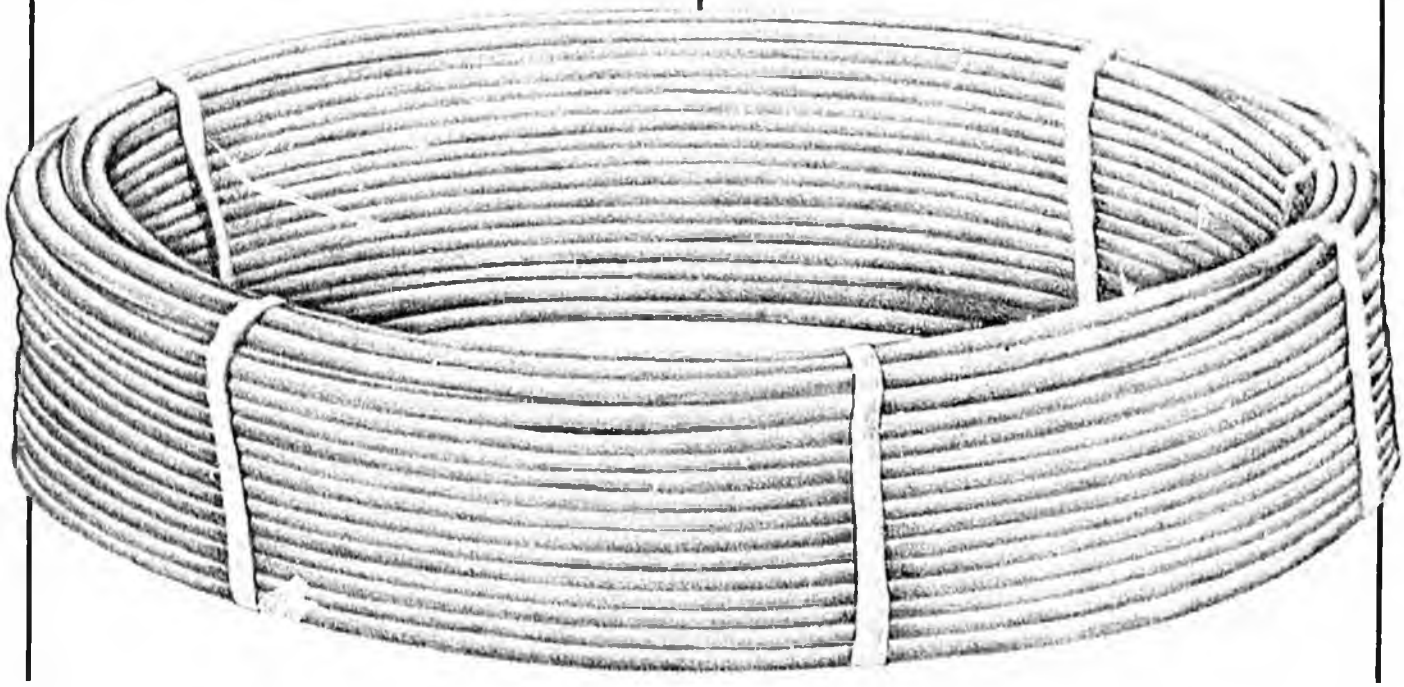
Flexibility Simplifies Installation.

Polybutylene pipe is lightweight and flexible, which means it's easy to install.

Because it weighs about one-ninth as much as copper, polybutylene pipe can be handled by one person. It bends easily, so elbows aren't needed every time you turn a corner. You can pull it through wall studs in tight spaces, simplifying retrofit jobs. You also can curve it to meet fixtures, reducing the number of costly and time-consuming fittings required.

Polybutylene pipe offers other savings. You have less waste with polybutylene pipe compared to other plumbing because it comes in coils up to 1,000 feet in length. You can cut the amount you need and save the rest. It also is available in straight lengths for areas where aesthetics are important.

**Duraflex™ is a trademark of Shell Chemical Company for its polybutylene resins. Shell Chemical does not manufacture pipe.*



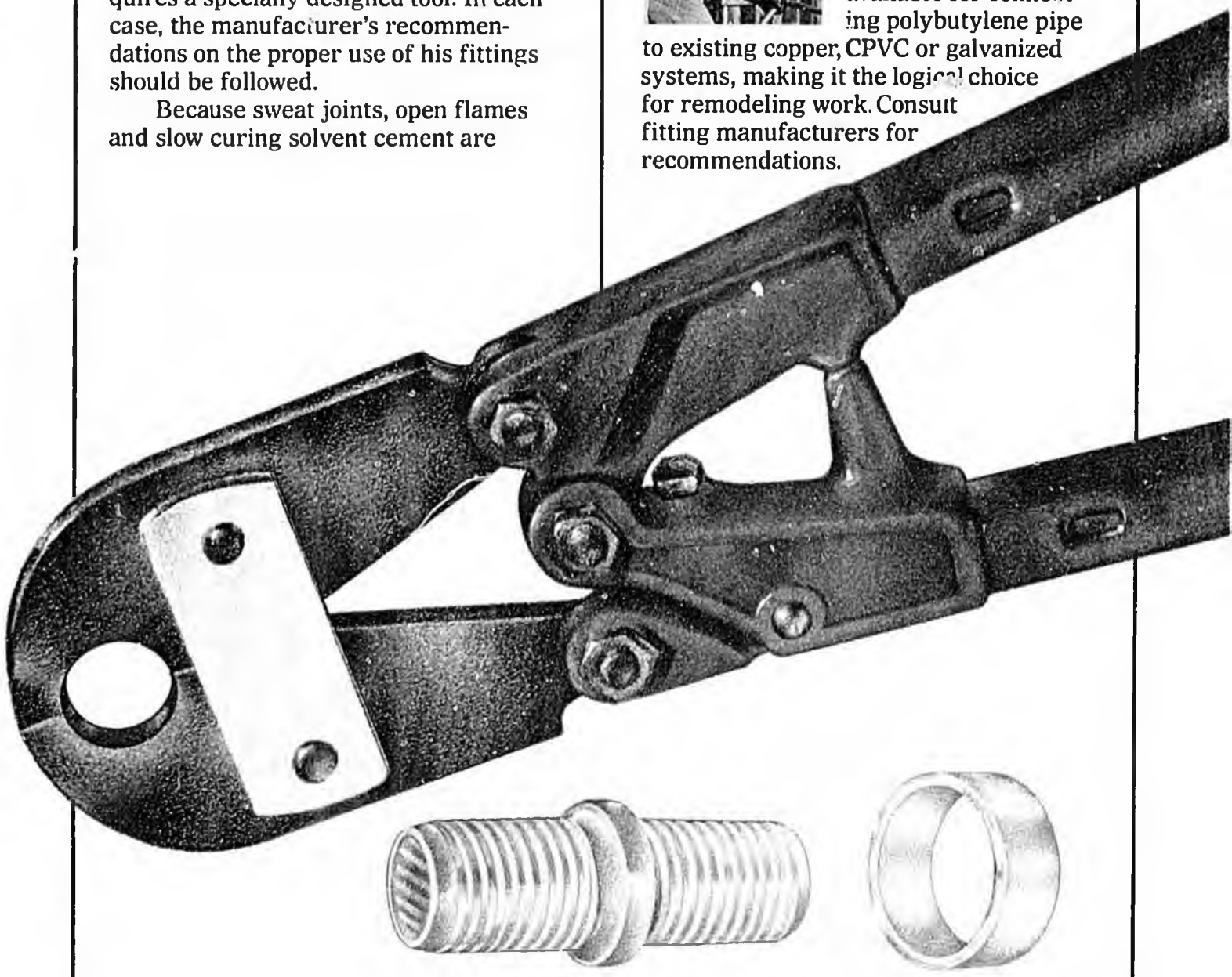
A Choice of Fitting Methods.

Polybutylene pipe can be joined using one of three common methods. (Shell does not endorse or recommend any joining method. They are listed merely for completeness of information.)

A tubing cutter and a wrench are required if you use *compression fittings*. Low-cost tools are readily available for *crimp-type fittings*. And heat fusion that uses polybutylene *pipe and fittings* requires a specially designed tool. In each case, the manufacturer's recommendations on the proper use of his fittings should be followed.

Because sweat joints, open flames and slow curing solvent cement are eliminated, the safety of your operation is improved. You don't have to wait for joints to cure before making pressure checks. Water can be turned on when the last pipe connection is completed. Pressure check at 200 psi to expose any possible bad joints.

Adapters are available for connecting polybutylene pipe to existing copper, CPVC or galvanized systems, making it the logical choice for remodeling work. Consult fitting manufacturers for recommendations.



Freeze Tolerance Can Protect Homes. Plumbing systems should always be designed to avoid freezing. However, homes, townhouses and apartments with polybutylene plumbing pipe have an extra degree of protection against damage that might occur when pipes burst during freezing weather.

When water freezes, it expands, causing ordinary copper plumbing to crack and eventually burst. But polybutylene pipe can expand to accommodate frozen water and then regains its original shape after the water thaws, providing a greater margin of safety than any other plumbing material.

Polybutylene pipe won't split or crack under subfreezing conditions. However, when short lengths of polybutylene pipe are connected to rigid fittings or pipe, the pipe may not be able to expand sufficiently to protect the whole system. In such cases, it is essential to protect against freezing.

Corrosion, Rust and Scale Resistant. Pipe made with Duraflex polybutylene resin offers added protection because it won't corrode, rust or rot. Duraflex resin is inert, so it resists the corrosive elements in water that can eventually eat holes in metallic pipe.

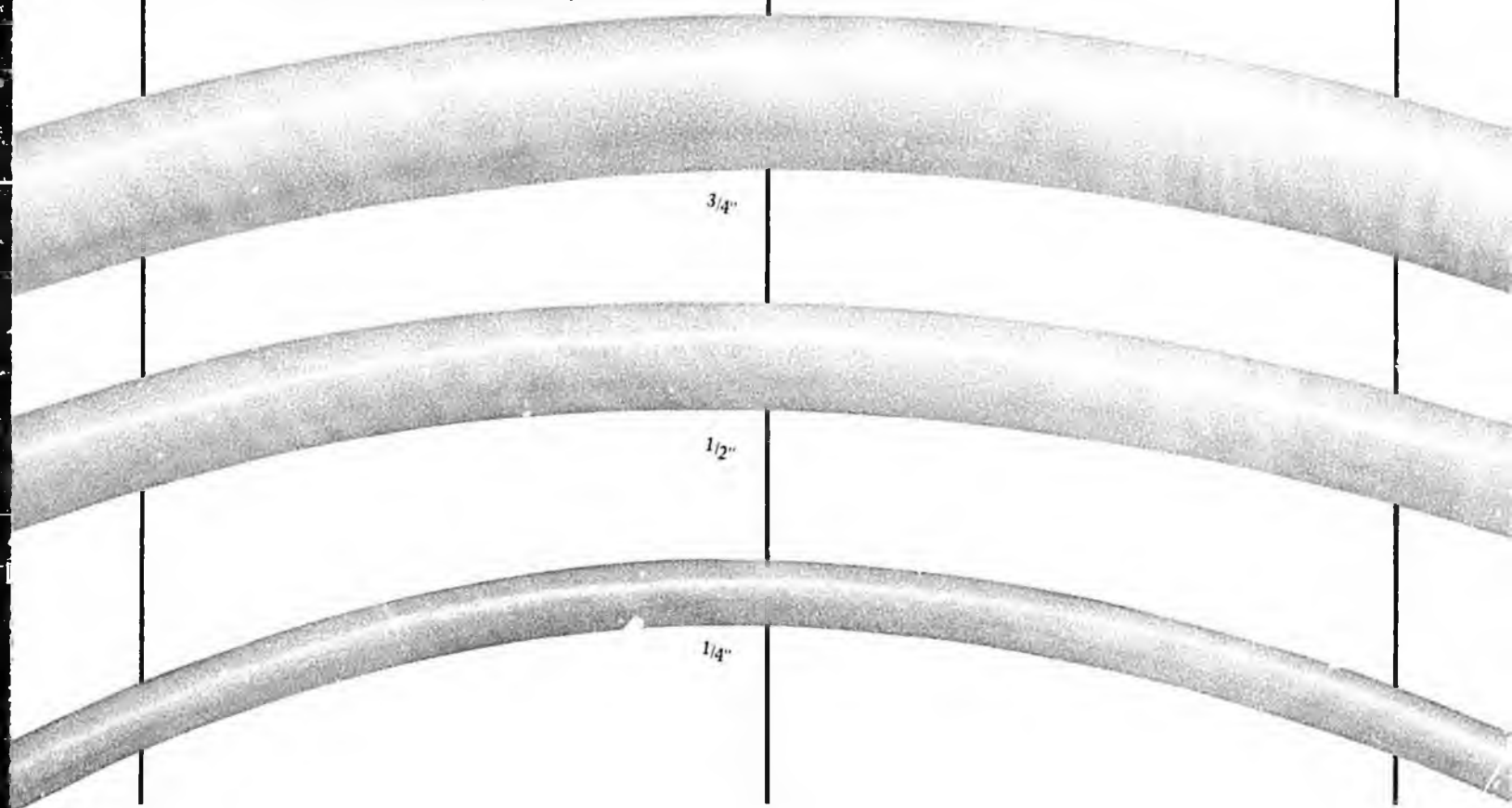
Polybutylene pipe also is totally unaffected by acid soil conditions or electrolysis. And it resists scale buildup from hard water that can block other plumbing systems.

The Seal of Approval.

Plumbing pipe for hot water service made with polybutylene resin meets the following codes, standards and regulations:

- National Sanitation Foundation (NSF)
- Plastics Pipe Institute (PPI)
- National Standard Plumbing Code (NSPC)
- Southern Building Code Congress (SBCC)
- Building Officials and Code Administrators (BOCA)
- International Congress of Building Officials (ICBO)
- International Association of Plumbing and Mechanical Officials (IAPMO)
- Federal Housing Administration (FHA) UM-68
- HUD Mobile Home Construction and Safety Standard
- Canadian Standards Association (CSA)
- Manufactured Housing Institute (MHI)
- American Society for Testing and Materials (ASTM)
- American National Standards Institute (ANSI) A119,2/NFPA 501.C
- Most State and Local Codes.

Polybutylene pipe for both hot and cold water service is available from manufacturers in sizes ranging from ¼ inch to 4 inches in diameter.



TECHNICAL DATA

Applications

Since it was first commercially produced in 1967, polybutylene pipe has been used for a large variety of hot and cold water applications, including:

Plumbing and Heating

- Domestic Hot Water Supply
- Hydronic Heating
- Slab Radiant Heating
- Solar Heating and Cooling
- Commercial Hot Water
- Fire Sprinkler Piping
- District Heating
- Snow Melting
- Agricultural Soil Heating

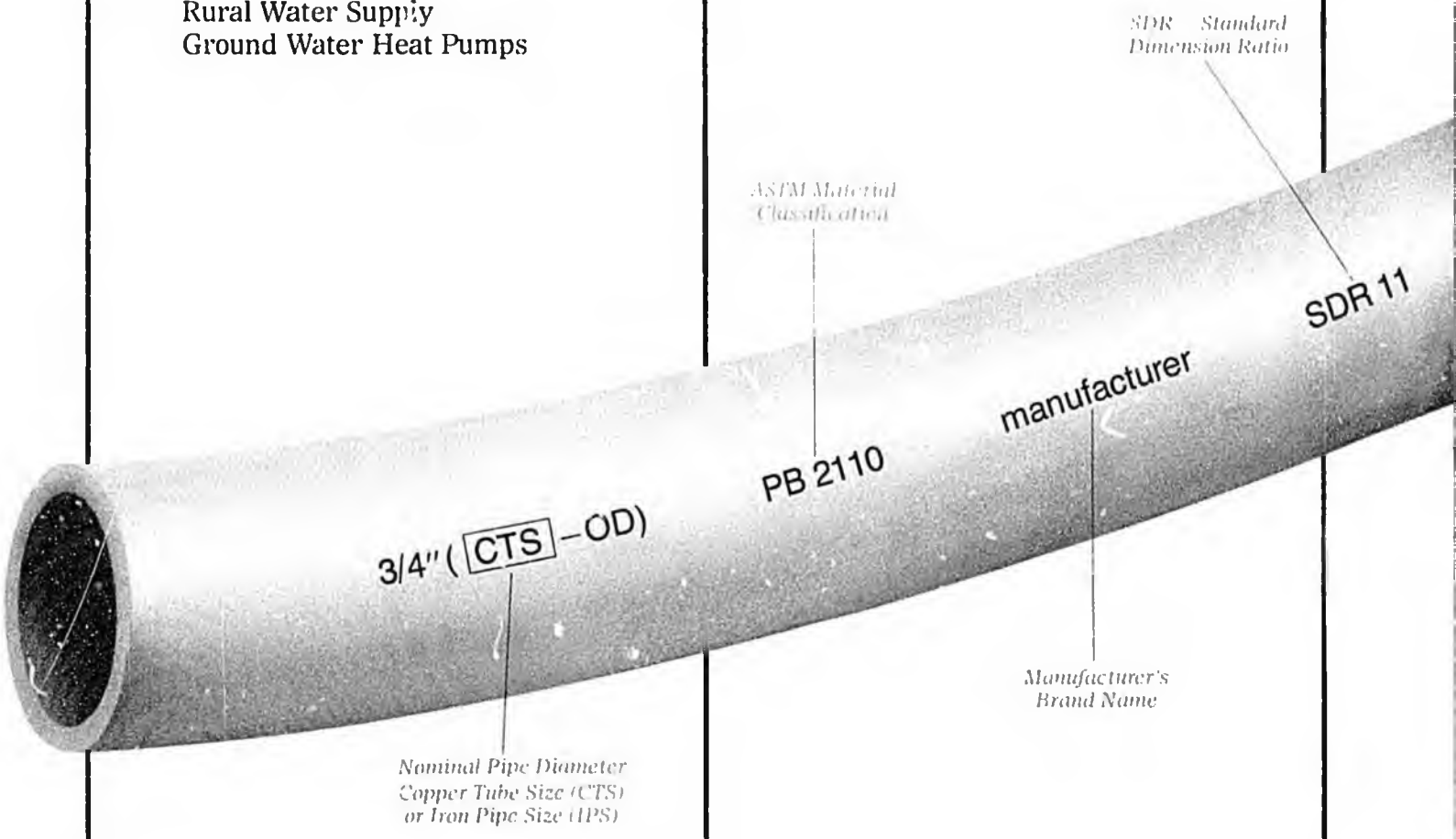
Water Supply

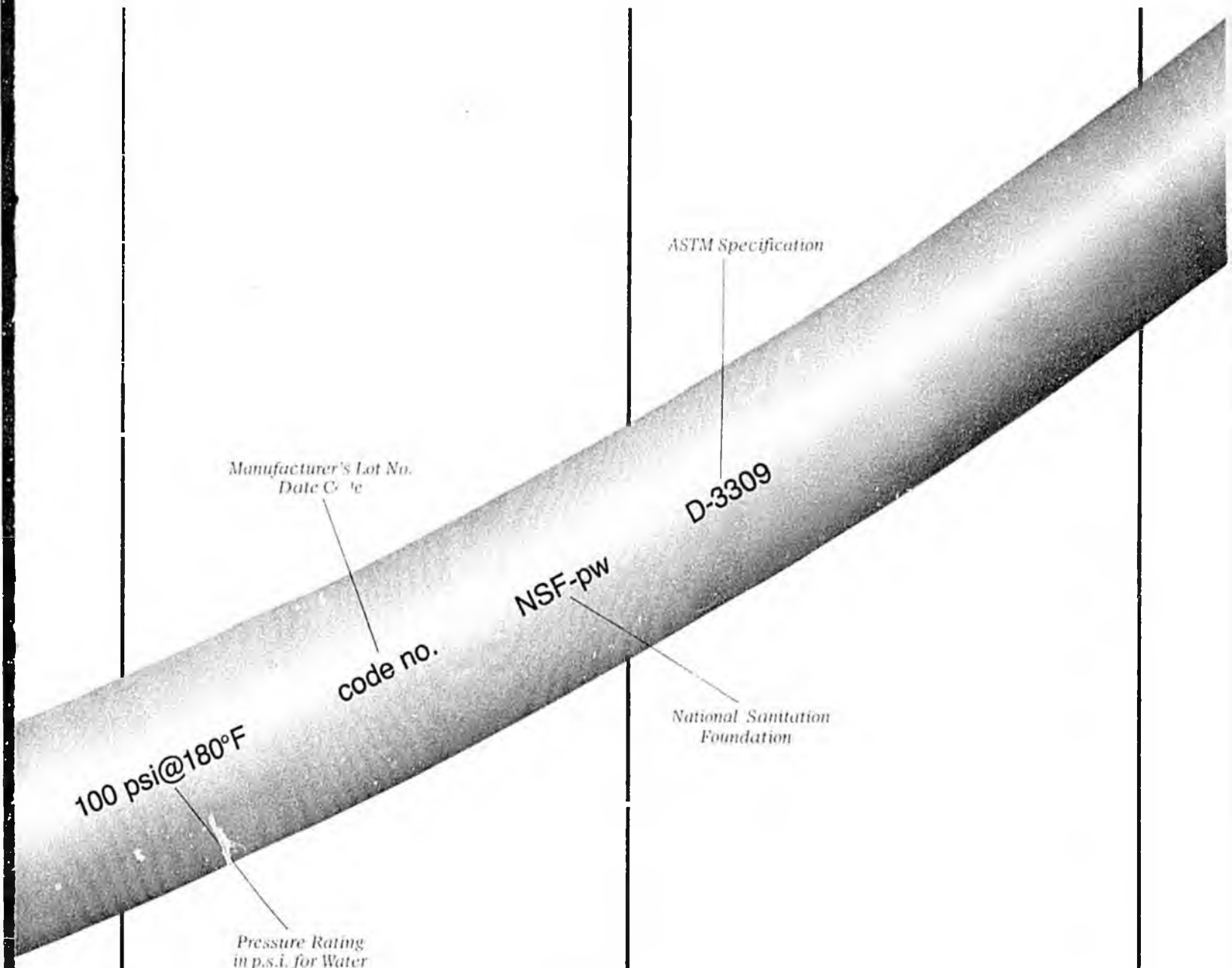
- Municipal Water Service Systems
- Yard Piping
- Deep Well Submersible Pumps
- Drip Irrigation
- Ditch Irrigation
- Rural Water Supply
- Ground Water Heat Pumps

Pipe Indentification

The following identifications are usually found at 3-ft intervals on every piece of polybutylene tubing:

1. Pipe size
2. Material designation
3. Manufacturer's name
4. Dimensional data
5. Pressure rating
6. Manufacturer's code
7. Code recognition
8. Appropriate standard to which pipe has been manufactured.




ASTM Specification
Manufacturer's Lot No.
Date Code
D-3309
code no.
NSF-pw
National Sanitation Foundation
100 psi@180°F
Pressure Rating in p.s.i. for Water

Pipe Storage

Thermoplastic materials such as Duraflex polybutylene resin are susceptible to ultraviolet attack as a result of continued outdoor exposure. The amount of ultraviolet damage will depend on the material, formulation, exposure time, geographic latitude, climate conditions, etc. Black grades of Duraflex polybutylene resin (4101 and 4121) are formulated for continuous exposure and can be stored outside. The other grades (4103, blue; 4127, and 4137, gray; 4128, beige; and 4129, brown) are not formulated for continuous outdoor exposure and should be stored under cover. Outdoor exposure of these grades should be limited to reasonable construction and installation periods.

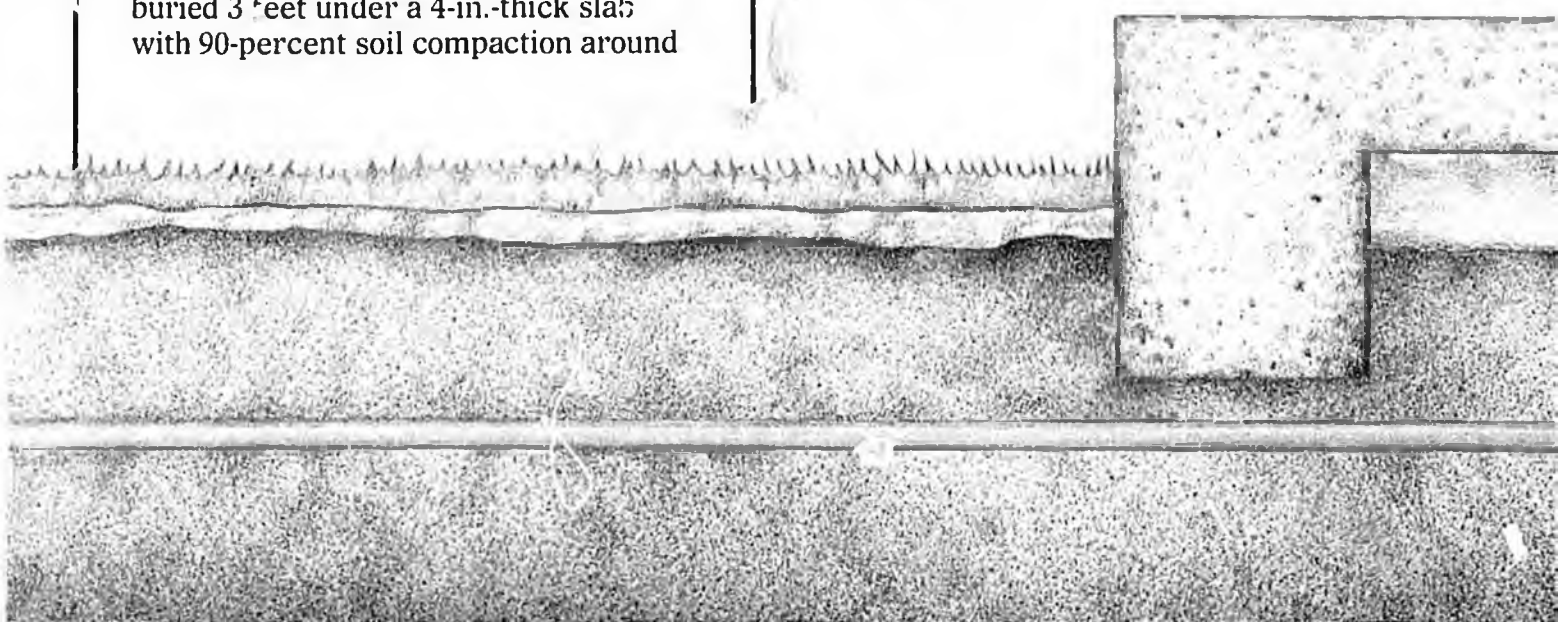
Buried Pipe

Running polybutylene pipe under a slab does not significantly affect its properties.

Polybutylene pipe buried under a slab is compressed by earth and slab loadings. The amount of compression depends on the temperature of the water in the pipe, the compaction of soil around the pipe, and the weight of both soil and slab bearing down on the pipe.

Under typical conditions (pipe buried 3 feet under a 4-in.-thick slab with 90-percent soil compaction around the pipe), the pipe is compressed by 1 percent at room temperature and 2 percent at 180°F. Both of these values are well within the design limit of 5-percent deflection. Because of its chemical resistance, Duraflex resin is inert to any chemical interaction with concrete and thus can be used safely within and through a slab. In addition, because it is immune to electrolysis it also can be placed in contact with supporting steel mesh. As a matter of good installation practice, fittings should never be used in or under a slab.

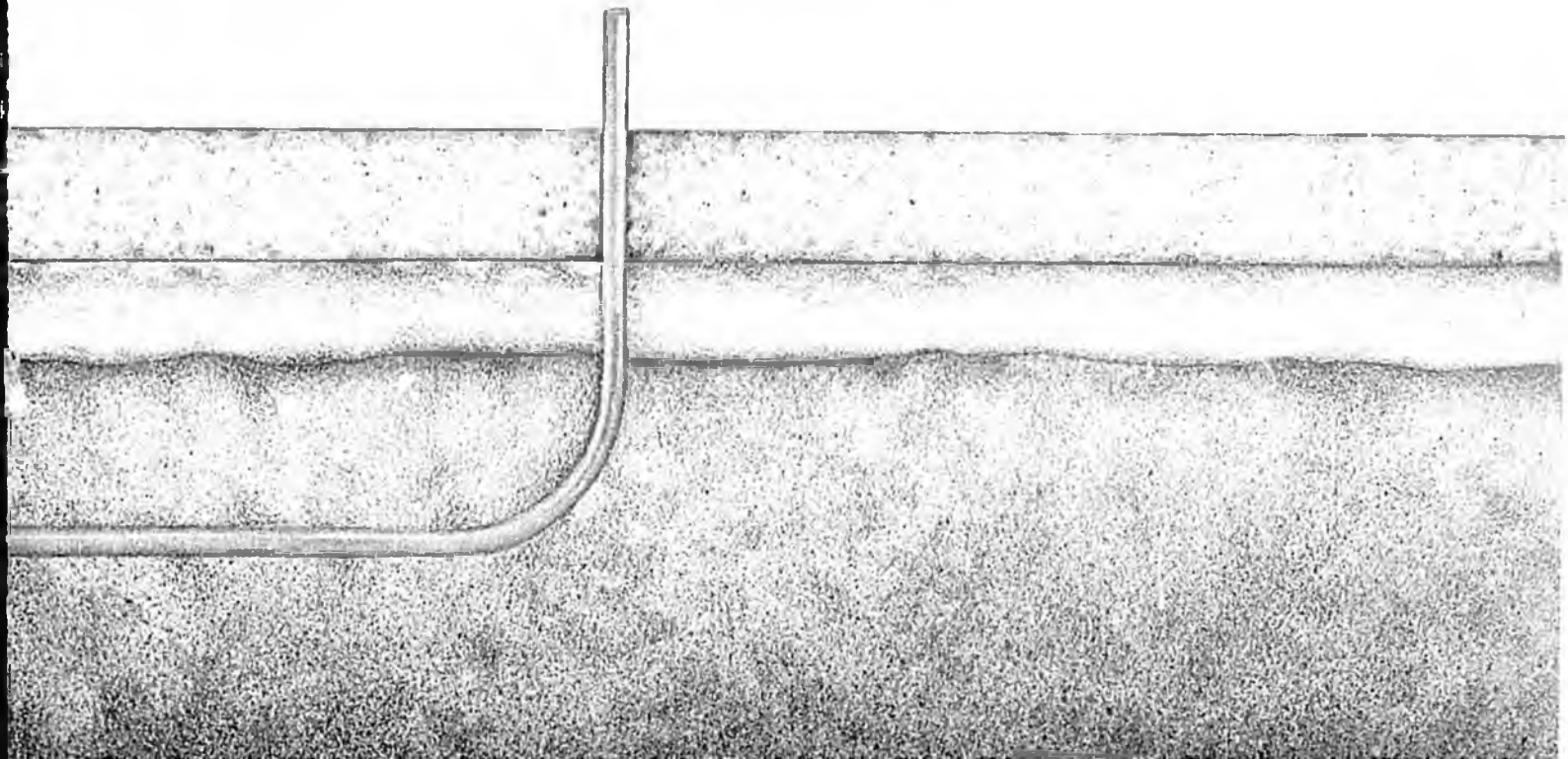
Underground use of polybutylene pipe in areas of known soil contamination or where there is high risk for potential chemical spills is not recommended. Polybutylene pipe should not be used under the slab or come in contact with soil in areas which are known to be contaminated by, for example, organic solvents or petroleum distillates. It should also not come in contact with soil near hazardous waste disposal sites or underground chemical or petroleum storage tanks. Overhead use in such circumstances is a safe alternative.



Freeze-Thaw Resistance

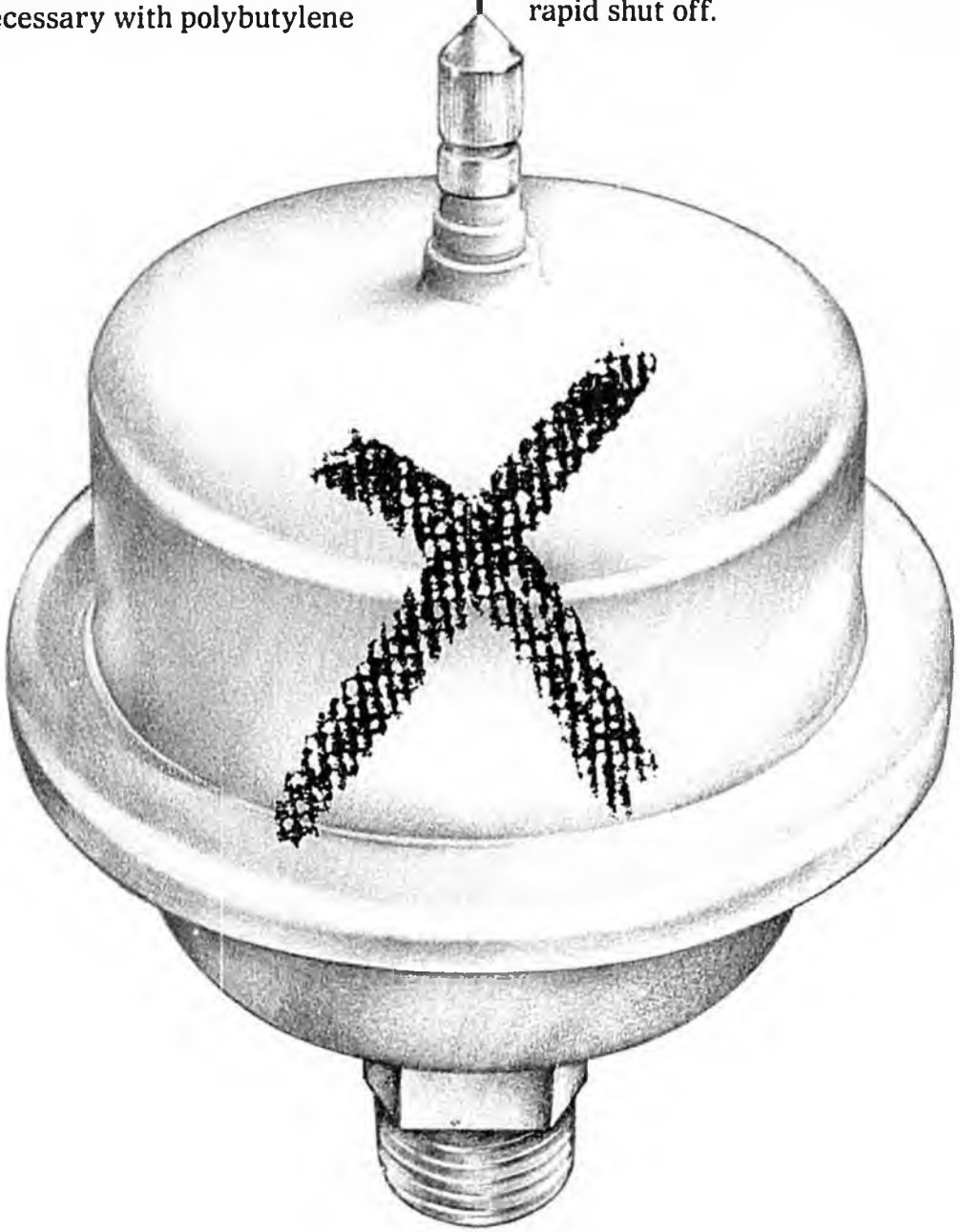
Properly extruded polybutylene pipe has sufficient elasticity and ductility to withstand the expansion of frozen water. To demonstrate this, three samples of ¾-in. CTS Duraflex pipe were frozen overnight and thawed daily for a six-day period. After six days, all of the samples were still intact and quick-burst tests showed no apparent loss of strength. Although polybutylene pipe cannot survive an infinite number of freeze-thaw cycles, it provides a far greater margin of safety against freeze breakage than any other plumbing pipe material. Even with polybutylene, good plumbing practices dictate that all plumbing systems should be protected against freezing.

Control Not Subject to Freeze-Thaw Cycle	Frozen Under 50 PSI Internal Pressure	Frozen Under 100 PSI Internal Pressure
Burst Pressure (psi)	Burst Pressure (psi)	Burst Pressure (psi)
490	485	490
495	480	485
505	490	495
497 *Average*	485 *Average*	490 *Average*



Water Hammer

Because polybutylene pipe is more flexible than either CPVC or copper, it is less affected by water hammer caused by rapid shut off. Water hammer arrestors are unnecessary with polybutylene pipe, although some local code authorities may still require their installation. The chart below shows the calculated pressure surge (psi) for polybutylene, CPVC, copper and galvanized pipe in a rapid shut off.



Velocity (fps)	Pressure Surge (psi) 2	4	8
Polybutylene pipe	14	30	59
CPVC	45	90	180
Copper	106	212	422
Galvanized Iron	110	225	464

Pipe Support

Being flexible, polybutylene pipe must be supported. For ½ and ¾ inch plumbing pipe, support intervals of 32 inches can be used. Longer support intervals can be used with larger pipe. If the pipe is passing through studs, the pipe should be sleeved at the beginning and end of straight runs and at significant changes of direction (plastic sleeves are available for this purpose).

Bending Radius

A minimum bending radius (ratio of the bend radius to the diameter of the pipe) of 10 is recommended. Bending more tightly can lead to kinking. If a kink occurs, it must be cut out of the system and replaced.

Hot Water Heater Considerations

Polybutylene tubing is easily capable of withstanding the malfunction of a water heater. It is made in accordance with ASTM D3309 and is designed to operate continuously at 180°F, 100 psi. This is within the expectations of any normal household plumbing system.

In the event of a hot water heater malfunction, polybutylene pipe may be exposed to a higher temperature and pressure for a short period. (Temperature/pressure relief valves normally are designed to release at 210°F and 150 psi). Tests conducted under the auspices of the National Sanitation Foundation have shown that at 210°F, polybutylene plumbing tubing has average burst values of over 275 psi and can sustain a pressure of 150 psi continuously for over 20 months without failure.

As a general precaution, polybutylene pipe should not be installed within 18 inches of a burner or direct source of heat.

Fire Potential

The smoke hazard from polybutylene plumbing is minimal, and the incremental contribution to a residential fire from polybutylene plumbing is *infinitesimal.*

The average three-bedroom house would require an estimated 15 pounds of polybutylene pipe for its total plumbing service. This same house would also contain *several thousand pounds* of other combustible products such as rugs, furniture, bedding, draperies, etc. In addition, the same house would contain *tens of thousands of pounds* of combustible construction materials such as wooden beams and flooring, shingles, weather stripping, etc.

Duraflex resin is a saturated organic polymer composed of carbon and hydrogen; therefore, with adequate air, it burns slowly and cleanly in a manner similar to a candle. Its combustion products are similar to those derived from burning other organic materials such as paper, cotton and wood, and less onerous than those obtained from burning wool, leather, or other complex materials.

Disclaimer

The information contained in this guide is based on data obtained by Shell research and is considered accurate. However, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF. This information is furnished upon the condition that the person receiving it shall make his own tests to determine the suitability thereof for this particular purpose.

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Houston, Texas 77002

Shell Chemical Company

DURAFLEX™ POLYBUTYLENE

PERFORMANCE REPORT

SHELL CHEMICAL COMPANY

Comparison tests confirmed: Installed cost of polybutylene plumbing was 44% less than that of copper.

DURAFLEX™ POLYBUTYLENE

PERFORMANCE REPORT

SHELL CHEMICAL COMPANY

Recent quantitative comparison tests have concluded that the total labor and material costs to install a plumbing system with Duraflex™ polybutylene pipe were 44% less than those of copper in virtually identical installations.

The tests were conducted in the Pleasant Valley subdivision located west of Fairfax, Virginia and Washington, D.C., by the National Association of Homebuilders Research Foundation, Inc., an independent research firm. Homes in the subdivision range from modest to luxury offering a variety of handsome energy efficient designs.

For the tests, plumbing installations in two similar, 2½ bath, single family homes were compared. One home had a full basement and was plumbed with copper plumbing using the traditional cut, fit and solder installation method. The other home had a crawl space and was plumbed with Duraflex* polybutylene plumbing pipe, using insert fittings and aluminum crimp ring connections. The houses were plumbed by a plumber who was experienced in copper installation and who had previously installed five plumbing systems using Duraflex polybutylene.

The polybutylene plumbed house had more cramped working conditions in one area and required slightly more pipe than the copper house because the crawl space limited direct routing. This meant a slight advantage for the copper installation. The only other difference in the two houses was the location of the water heater and the water meter.

Duraflex™ is a trademark of Shell Chemical Company for its polybutylene resins. Shell Chemical does not manufacture pipe.

Objective and fair testing yields relevant results

The 44% cost savings realized in the polybutylene plumbed house are based on the material and time savings. Total installed material and labor costs for the polybutylene plumbed house were $138 less than the copper installation. It took 7 hours and 39½ minutes to plumb the copper house, but only 5 hours and 55½ minutes to plumb the polybutylene house. Material costs included all indoor supply piping and fittings running from the meter yokes to the fixture connections, but did not include valves.

Armed with a stop watch, a specially ruled recording book, a camera and a pen, Hila Anderson, Senior Industrial Engineer with NAHB Research Foundation, Inc., observed, measured, counted and recorded the work performed, actions made, and materials used by the plumber.

To ensure objective, comparable and applicable results, Anderson used several established sampling and factoring methods common in gathering and compiling this type of research data. These included an averaging of the plumber's efforts and conditions with other plumbers in general. Thus, the results are applicable for an adequately trained plumber to perform the installation with an acceptable amount of personal time and breaks.

NAHB Research Foundation, Rockville, Maryland, a wholly-owned subsidiary of the National Association of Home Builders which operates separately as an autonomous unit, conducted the study. Over 80% of their work is for clients other than the NAHB and its members. Anderson said, "We're interested in anything that helps the building industry, verifying a new product or technique, and telling the industry about it."

Strength and flexibility set Duraflex pipe apart.

The real difference between polybutylene pipe and other plastic pipe is the Duraflex polybutylene resin. Duraflex

Hila Anderson observed and recorded the plumber's actions and materials used.

is a durable, tough plastic. But unlike many other plastics, polybutylene is flexible rather than stiff or brittle. As a result, the pipe made from Duraflex resin can easily withstand household water pressures at elevated temperatures and its flexibility and light weight allow plumbers to curve it around obstacles and bends with fewer connections. Because it is chemically inert, there will be no problems with corrosion, electrolysis, or scale buildup.

Connections and fittings can be made by one of several mechanical methods which are easily learned and performed. Gary Peed, the plumbing contractor for the test houses, said, "The first time I put the pipe (polybutylene) in was slow, but you pick up how to work with it pretty easily. My time is much better now." Each of the installation methods takes advantage of the flexible nature of polybutylene to make quick, strong, and permanent connections. As Gary Peed puts it, "You don't have to solder anything or use any glue. There's less time, energy and equipment involved."

A durable pipe full of advantages.

How does Peed feel about polybutylene pipe in general? "I like it better than copper. It's easier, faster and it's lower in cost. I use it for almost all of my work now."

Other advantages to polybutylene pipe, both builders and plumbers cite: corrosion and scale resistance; self-insulating, thus energy efficient for hot water lines; and if water freezes in it, the pipe won't break.

Those were the reasons Don Crosen, Superintendent for R.J.L. Associates' Pleasant Valley subdivision, selected polybutylene pipe. Crosen has realized the cost savings which the NAHB Research Foundation tests revealed, stating: "We're saving on the average of about $150 to $200 per house." Another big advantage Crosen cited..."is customer satisfaction. That's very important to us. We want our owners to be happy with the house they buy. This polybutylene pipe helps us supply that satisfaction."

Comparison Tests—Results:

Materials	Copper System	Polybutylene System
Pipe	$156.93	$64.84
Solder & Flux	$ 20.73	negligible
Fittings	$ 21.79	$19.12
Suspension Clamps	$ 1.98	$ 4.81
TOTALS	$201.43	$88.77
Labor at $15/hr		
Cut & install pipe & fittings	(176.0 min.) $ 44.00	(146.5 min.) $36.63
Connect pipes & fittings	(162.5 min.) $ 40.62	(88.0 min.) $22.00
Misc.	(51.5 min.) $ 12.88	(53.5 min.) $13.37
Mounting Blocks	(41.5 min.) $ 10.37	(39.5 min.) $ 9.87
Set-up & Layout job	(28.0 min.) $ 7.00	(28.0 min.) $ 7.00
TOTALS	(459.5 minutes) $114.87	(355.5 minutes) $88.87

	Copper System	Polybutylene System
Total Costs Material & Labor for supply piping installation	$316.30	$177.64
Polybutylene Savings		
Time		104.0 minutes less to install than copper
Money (includes labor costs savings)		$138.66

Note: For each $1.00 wage rate differential increase above the $15/hour figure used in the comparison, polybutylene's advantage increases $1.73 in savings.

Test homes' subdivision superintendent, Don Crosen, cited customer satisfaction as a polybutylene pipe advantage.

Polybutylene pipe supplies customer satisfaction.

"One of the biggest complaints in a new house is noise in the plumbing," Crosen continued. "This pipe is quiet, no hammer, no vibration. You don't even hear water running. So polybutylene eliminates that source of complaints, and satisfies our customers."

Another problem solved by polybutylene pipe involves hanging the sheet rock. According to Crosen, occasionally a rigid pipe will get bumped hard enough during sheet rock installation to cause it to break, crack and leak. "Often that leak won't show up until after the construction is completed, or worse... after the owner moves in. That's an expensive repair. But because this polybutylene pipe is so flexible, it doesn't break if it gets bumped or knocked. So once again, customer satisfaction," he said.

Satisfaction for builders, too.

Crosen has found satisfaction with polybutylene pipe in many ways, summing up, "It's less expensive. Better for customers. Easier to install, repair and add extra fixtures to later. It won't corrode and minerals won't adhere to it. We get less call-backs for repairs because of polybutylene pipe. It's another way to please our customers."

Crosen added, "It's good for builders and supervisors, too. Supervisors have to deal with the problems. They're less problems with polybutylene pipe."

Come to Shell for answers

Warranty

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February, 1983

SC: 550-81
Printed in U.S.A. 2/83 50M

DURAFLEX™ POLYBUTYLENE

PERFORMANCE REPORT

SHELL CHEMICAL COMPANY

Duraflex polybutylene pipe used for advanced industrial slab heating application.

DURAFLEX™ POLYBUTYLENE

PERFORMANCE REPORT

SHELL CHEMICAL COMPANY

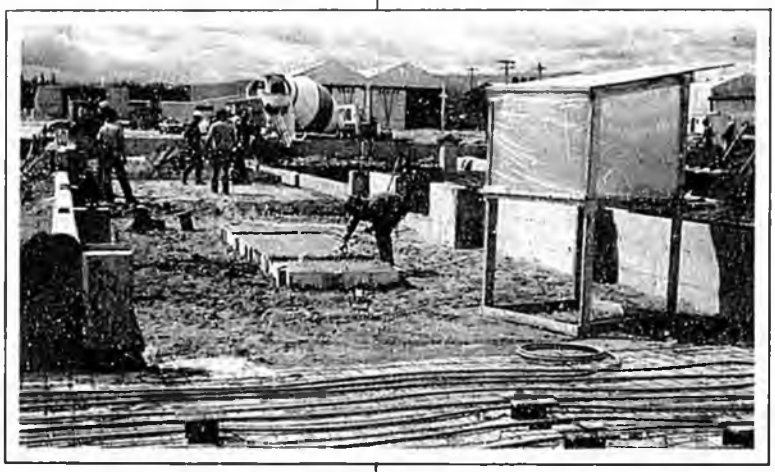
Pipe of Duraflex polybutylene resin was the key element in an advanced type of radiant hot water heating system installed in a British Columbia planer mill. The system is designed to provide comfortable temperatures even on extremely cold days.

Left to right, Smith, Swaykoski, Crooks

More than 26,000 feet of pipe was used for the system in the new $5-million, 27,000-square-foot planer mill at Finlay Forest Industries in MacKenzie, B.C. The planer mill will produce one-half million board feet daily from the spruce, fir and pine forests that cover the area. The same radiant heating system employed in the Finlay Forest building would work equally as well in equipment maintenance shops, warehouses, churches and other public buildings.

At the Finlay mill, the Duraflex pipe* will be used to circulate a 50-50 mixture of ethylene glycol and water that is heated and pumped through the coils in the slab. An indoor/outdoor thermostat will control the temperature of the 1,320 gallons of liquid in the system. The thermostat offers a one-to-one ratio so that when the outside temperature is at freezing, the circulating fluid is at 100°F. Each time the ambient temperature drops one degree, the three-million BTU gas-fired boiler in the system automatically increases the temperature of the liquid by one degree.

The ethylene glycol/water solution is circulated at a rate of up to 250 gallons per minute by a 7½-hp, 480-v, 3 phase 60-cycle pump. A recovery unit that burns wood shavings will replace the gas-fired boiler later, according to Blain Crooks, development manager for Finlay Forest.



The radiant heating system using pipe made from Duraflex polybutylene was incorporated into the building's design because a conventional forced air system would have aggravated the problem of swirling sawdust in the mill. Consulting engineer George Nixon of Carroll, Hatch & Associates, Ltd. pointed out that the wood dust not only collects on and clogs filters, coils and fan-driven heaters, but also increases the risk of fire due to dust settling on a hot line.

The mechanical contractor for the project was Vic Swaykoski, owner of Doug's Heating (Northern) Ltd. of Prince George. His employees installed the pipe system, which is similar to eight other installations he has supervised in British Columbia saw mills.

"Slab heating and circulating warm-air systems might cost about the same to start with," Swaykoski said, "but six months down the road you'll be having to pay a premium for

*Duraflex™ is a trademark of Shell Chemical Company for its polybutylene resins. Shell Chemical does not manufacture pipe.

maintenance, to say nothing of the nuisance and hazards of circulating fine saw dust if you install a forced air system."

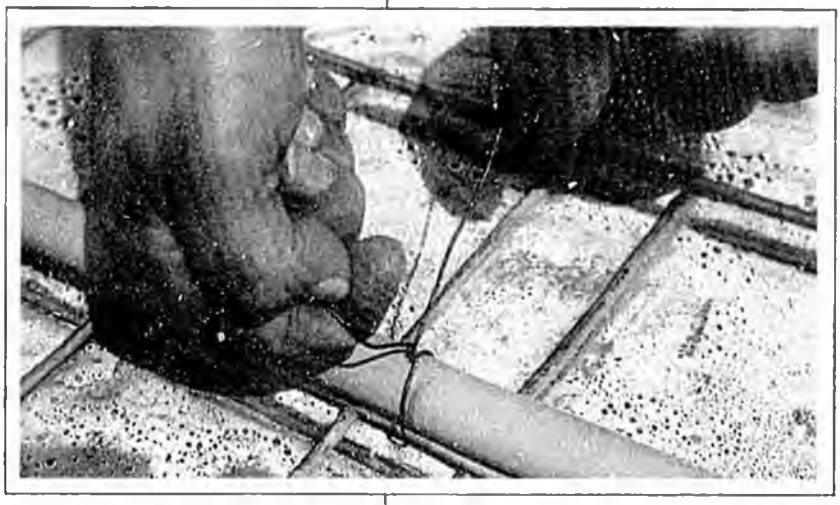
Swaykoski explained that the temperatures frequently reach 40 degrees below zero in MacKenzie, and occasionally drop to minus 60 degrees. "The heating system will go on about the first of October and

will operate continually until May," he said.

"Pipe made of polybutylene is the tube we use. It's the only plastic tube that will stand the hot water temperatures necessary to bring the floor heat up to at least 50 degrees," he said.

Smith, left, Swaykoski

Ease of pipe installation was cited by Swaykoski as an advantage for radiant heating systems. He said a two-man crew could lay 2,000 feet of the lightweight, flexible pipe in a single shift. He pointed out that the pipe can be curved in tight loops without kinking, thus eliminating the need for elbows and connections in the slab as required with copper or other rigid plastic materials. He added that polybutylene pipe is corrosion resistant and resists scale and sediment buildup inside the pipe, which could arrest the fluid flow. In addition, the pipe costs less than copper and it virtually eliminates hot spots in the floor because it transmits heat at a slower rate than copper.



Engineer Nixon claimed a system using polybutylene pipe could handle water with a temperature of 160°F or higher, but that the safe limit for polyethylene pipe was only 120°F.

Larry Smith, manager of Westburn Industrial Enterprises, who handled the distribution of the pipe to the contractor, said that, in his experience with polyethylene pipe in slab installations, the tubing tended to become brittle with the high temperatures of the antifreeze/water solution. "The heat carrying capability of polybutylene is much better than polyethylene for industrial applications," he explained.

During installation of the Finlay mill system, a concrete base of varying depths was poured first, with the depth depending upon the weight of the operating equipment planned for the area. After stringing the pipe of Duraflex polybutylene from 500-foot coils, installers tied the tubing to reinforcing steel wire mesh with twist ties.

The lines were connected to a series of four-inch manifolds before a second layer of concrete was poured. The mesh was held so that the pipe was two inches to two-and-one-half inches from the top regardless of the overall depth of the concrete. Swaykoski said if colder conditions had warranted it, the pipe could have been strung closer together to provide extra radiant heating through the slab.

Duraflex polybutylene is a resin manufactured by Shell Chemical Company. The one-half-inch and three-quarter-inch pipe used at the Finlay mill meets the requirements of the Canadian Standard Association (B 137.8) as well as most major codes and standards within the United States. The SDR 11 pipe has a 200-psi pressure rating at 73.4°F and a 100-psi rating at 180°F.

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June 1981

Come to
Shell for answers

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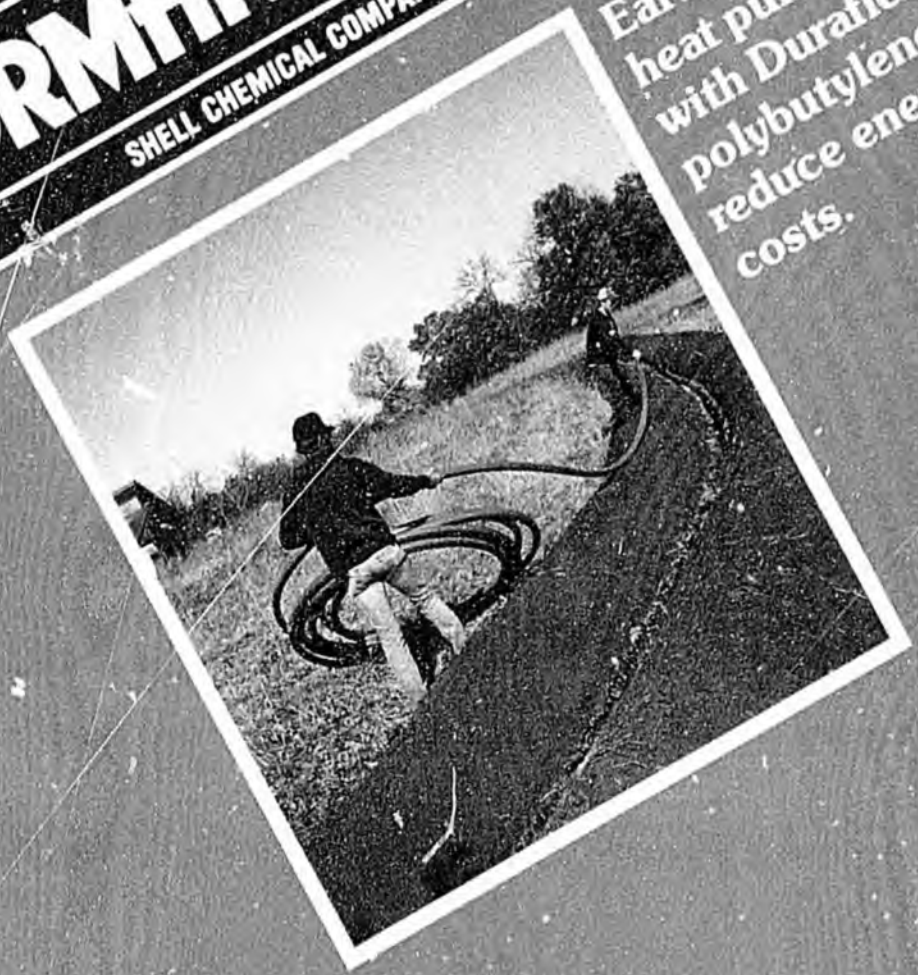
DURAFLEX™ POLYBUTYLENE

PERFORMANCE REPORT

SHELL CHEMICAL COMPANY



Earth-coupled heat pump systems with Duraflex™ polybutylene pipe reduce energy costs.

DURAFLEX™ POLYBUTYLENE

PERFORMANCE REPORT

SHELL CHEMICAL COMPANY

A new generation of energy efficient earth-coupled heat pump systems has enabled several hundred Central Oklahoma families to slash their annual electric bills.

These systems extract heat directly from a few feet below the ground for heating or discharge heat into the ground for cooling. Exchanging heat with this milder and more stable natural heat source rather than with outside air enables the heat pump to provide more efficient heating and cooling than is possible with conventional heating systems or air-to-air heat pumps.

Whereas electric resistance heat has a typical coefficient of performance (COP) of only 1 and air-to-air heat pumps have a more efficient rating of 1.7, the earth-coupled systems have a COP of 3 or more. (The COP is the heating/cooling output divided by the energy input.)

The new closed-loop, earth-coupled systems require virtually no water because they recirculate the initial charge of water.

In contrast, the more widely used water source heat pump systems are open systems, using thousands of gallons of fresh well water daily.

There are two types of closed-loop systems. The horizontal type uses pipe buried 4 to 5 feet below ground in a trench. A low-wattage pump circulates water from the heat pump through the earth coil to exchange heat with the earth and then back to the heat pump.

The vertical closed-loop system uses pipe in a well as a vertical heat exchanger. Water is pumped from the heat pump through the pipe to the bottom of the well and back to the heat pump, exchanging heat with the earth. A key component of either system is the earth coil of flexible, lightweight Duraflex* polybutylene pipe.

Rigid PVC plastic pipe had been used in some of the first installations. This pipe, however, was found to be too brittle, cumbersome and expensive. Contractors then switched to flexible plastic pipe.

A long run of 2-inch Duraflex polybutylene square pipe lays flat alongside a trench with virtually no tendency to recoil.

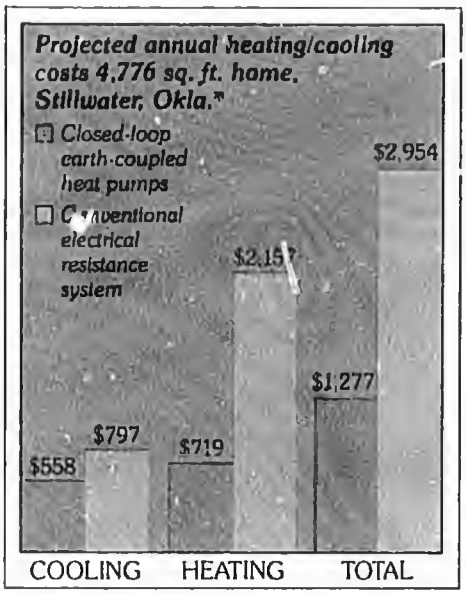
The closed-loop, earth-coupled heat pump systems have been pioneered by Geosystems, Inc., a manufacturer and distributor of geothermal heat pumps and accessories in Stillwater, Oklahoma. Jim Partin and Carl Ledbetter are co-partners. Geosystems has installed thousands of closed loop systems in the United States and Canada for residential and commercial applications ranging from one ton to 60 tons.

The company recommends polybutylene pipe for all earth couplings on the basis of a combination of cost effectiveness, ease of installation, and long life. Polybutylene pipe can be quickly installed from 500-foot coils, minimizing the number of joints and speeding the installation. Where temperatures warrant, glycol antifreeze or brine solutions also can be circulated through polybutylene pipe with no loss in performance. Duraflex pipe is inert and so resists corrosion, rust and scale build-up. In addition, it has exceptional resistance to environmental stress cracking.

A brass barbed fitting is inserted into the end of a coil of pipe and tightly secured with two stainless steel clamps.

"These systems use less electricity than an air-to-air heat pump and they don't take water from the ground it's a closed system. It needs only that one filling of water," Partin said.

The savings in electric power were confirmed by Bill Blair, Member Services Advisor, Central Rural Electric Cooperative. His records showed dramatic drops in power consumption when existing centrally air conditioned homes were converted to earth-coupled heat pump systems



*Projected by installing contractor, A C Service Co

For example, consumption in one Stillwater home for a July-August period totaled 7,405 KWH with a central air conditioning system. A year after the switch to an earth-coupled heat pump system only 4,438 KWH were required for the same period. Excellent results also have been achieved when such systems are used in conjunction with solar collectors.

Late in 1982, a unique forming process was developed for polybutylene pipe which produced a lighter, "square" configuration which further simplifies installation.

"Shell came up with the idea of a square pipe with its decreased wall thickness which is the first pipe I know of that was specifically developed with the earth-coupled heat pump installer in mind," commented Ledbetter.

According to him, the new configuration "is much easier to install. It's lighter so it's easier to handle and it rolls out evenly in the ditch."

"You can install polybutylene pipe in an earth-coupled system in about as cold a weather as a man can stand to work in. But you can't do that with polyethylene. The colder it gets the harder polyethylene is to work with and the longer it takes to get the job done. Unrolling a coil of polyethylene can be a real problem," he said.

The unique chemical structure of the polybutylene resin makes it possible to post form pipe into a square configuration. This shape not only makes it easier for the installer to lay the pipe in the trench but it also reduces any tendency of the pipe to recoil. Compared to polyethylene pipe, the square polybutylene pipe is at least four times easier to handle. This is due to a combination of its better flexibility as well as thinner wall, i.e. less material is required than with the same outside diameter pipe made of stiffer polyethylene.

The square polybutylene pipe was used initially for a new 4,776 square-foot home in Stillwater. Two men easily fed the coil of pipe from the bed of a truck into the trench despite 15-20 mph winds and temperatures in the low 40s. (See front cover.)

A series of three separate heat pump systems was designed for the house. For each of the three, a trench six inches wide by six feet deep was dug behind the house to accommodate 1,000 feet of pipe. Five hundred feet of pipe were placed in the bottom of each trench and the trench was then back filled with two feet of soil. The remaining 500 feet of the continuous loop of pipe was buried at the 4-foot level.

The coils of square 2-inch pipe were joined by brass barbed insert fittings secured by two stainless steel clamps on each side of the fitting (the excellent flexibility of polybutylene allows it to reround to accommodate the fitting.) The three separate loops were connected to individual 2½-ton Geosystem Heat Pumps to generate 40,000 BTUs per unit for heating and 30,000 BTUs for cooling.

Ledbetter's calculations indicated the house would require 3,700 heating degree days and 1,600 cooling hours of operation a year. The numbers were based on design temperatures of 0°F minimum

The key component of a closed-loop, earth-coupled heat pump system is polybutylene pipe shown here just before being covered in the bottom of a 6-foot trench.

in the winter and a 100°F maximum in the summer with an indoor temperature of 75°F.

To maintain this temperature 58,187 BTUs would be needed for cooling and 103,640 BTUs for heating. With electricity at 6 cents per KWH in 1982, the estimated

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cooling costs would be $797 and the heating costs $2,157 if a conventional electrical resistance system had been installed. Instead, with the earth-coupled heat pumps, the projected costs were only $558 for cooling and $719 for heating — an annual savings of $1,667.

Even before the development of the square polybutylene pipe and its significant contribution to simplified installation, a wide variety of successful earth-coupled heat pump systems using polybutylene pipe had been installed. These systems used both barb insert fittings and socket heat fusion fittings.

In one 1,100 square-foot house in Stillwater, a solar-assisted earth-coupled 2½-ton heat pump system was installed. In this system 288 square feet of unglazed solar collectors were mounted on the roof and coupled to a 250-foot deep geothermal well. The solar collectors and earth coil were filled with propylene glycol solution. The back-up heating system consists of an electric-ignition natural gas furnace. The system has a domestic hot water pre-heater with backup heat for hot water supplied by natural gas. In spite of numerous nighttime temperature readings below zero, the electric bill during one winter month was $40 and the cost for gas was only $12.

At a facility on the campus of Oklahoma State University, a 1,000-foot earth coil was used with a 3-ton heat pump, a 1,000-gallon insulated storage tank and integral solar collectors. On a summer day when the outside temperature was 106°F, the interior temperature was maintained at 72°F while the compressor required only 1.3 kilowatts of power, a fraction of that required with typical air conditioning systems.

Similar systems were used by the Stillwater Housing Authority in a housing project built for senior citizens. About 6,000 feet of polybutylene pipe were used in connecting a series of 250-foot vertical earth-coupled wells.

Before its initial use in closed-loop earth-coupled heat pump systems, the advantages of Duraflex pipe over other plastic and metallic materials already had been well established in cold water service, hot and cold water plumbing, industrial piping, and radiant slab heating. Now with its improved ease of handling in addition to its other advantages discussed above, the pipe has become even better suited for earth-coupled heat pump systems.

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July 1983

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DURAFLEX™ POLYBUTYLENE

PERFORMANCE REPORT

SHELL CHEMICAL COMPANY

Georgia water system switches from polyethylene pipe to 250 psi Duraflex polybutylene.

DURAFLEX™ POLYBUTYLENE

PERFORMANCE REPORT

SHELL CHEMICAL COMPANY

Tough, 250 psi rated water service pipe made from Duraflex™ polybutylene resins is now the only pipe specified by a Georgia county water department for all connections and replacements of existing metallic or 160 psi rated UHMW polyethylene pipe.

Water pressure surges in hilly Gwinnett County contribute to cracks in polyethylene pipe and replacement with copper would be too expensive, explained Dan Pirkle, Distribution Superintendent for the county. The fast growing county, whose terrain rises from river bottoms to a peak elevation of about 1100 feet, is northeast of Atlanta.

The sheer force of gravity combined with the pressure of a new water system proved to be too much strain for the polyethylene pipe which had been installed since the late 1960s.

"Polyethylene started to be a problem four or five years ago. It became brittle, split under the combination of gravity flow and increased pump pressure running on the line. It'd break just like glass," Pirkle said.

He also said crews had to go back into some areas and replace polyethlylene sections as many as three or four times.

Pirkle began switching to Duraflex* pipe in the fall of 1980 and expected to have nearly 40 miles of the tubing in use within the first year.

In the early 1970s, average daily water consumption was about 3 million gallons a day (MGD). The department built a 60-mile loop of 48-inch main around the county and added 6 to 36-inch lines to accommodate the new Lake Lanier Water Treatment Plant which went on stream in 1977.

Two lines for separate homes spiral from double strap saddles.

For the last few years, new water meters were being installed at a rate of 400 a month and the plant and pumping station are now able to handle 45 MGD with a future capability of 240 MGD.

"The water system here was organized in 1959. They put in galvanized and now its 20-year life span is gone. We started using polyethlyene pipe about 1968 or 1969, but the 160 psi pressure is too low," said Pirkle, who has run the department for the last 10 years.

In 1980, Pirkle was presented information on 250 psi, SDR 9 Duraflex pipe that eventually convinced him that the tougher polyolefin material would handle the pressure without failure.

Gwinnett County's rolling terrain influences water pressure.

**Duraflex is a trademark of Shell Chemical Company for its polybutylene resins. Shell Chemical does not manufacture pipe.*

"So far we've put in 100,000 to 150,000 feet and we haven't had a problem yet. The crews claim it's easier to work with than polyethylene, is lighter, not as stiff and doesn't crimp," Pirkle said in the spring of 1981.

There are seven subcontractors who have crews working for the Gwinnett County Water System. They are required to use a double strap service saddle, usually 6" x ¾", on every tie in to the water main.

The materials for the mains range from cast iron to asbestos cement and prestressed concrete. Because 250 psi Duraflex pipe has the same wall thickness as 160 psi polyethylene, standard corporation stops can be used.

Duraflex pipe is bought on a low bid basis in lots of 50,000 feet in 500-foot coils. Out of 200,000 feet contracted for by the spring of 1981, about 15,000 feet is 1-inch pipe for connections in homes with 3 to 4 bathrooms and/or a swimming pool. The rest is ¾" pipe.

In a typical installation, the Duraflex polybutylene tubing is laid in a 3-foot trench from the main to the individual meter. (The frost line can go as deep as two feet in the county.) The pipe's flexibility minimizes the need for elbows and other fittings since the service line can match ground contours or be run around obstacles.

Plastic meter boxes with cast iron lids are set 18-20 inches from the surface. Installations usually are completed rapidly. The superintendent said 96 meters were installed by one 3-man crew in two weeks, including 20 in a single day when the main was on the same side of the street as the houses.

While this was abnormally high, another crew was observed recently to make three installations in about an hour's time. The ¾" lines were then tested at 40 gallons a minute even though a pressure reducing valve will limit the flow through the home meters to a maximum of 30 gpm.

Dan Pirkle stands by a stack of Duraflex pipe coils in the water department's warehouse.

When placement requires installation on the "long side," air and water pressure are used to bore through the red clay beneath the road bed before inserting the pipe. Casing is required only when boring under a state highway.

A fitting is tightened just prior to a pressure test at 40 gpm. Water service lines of Duraflex polybutylene pipe are blue coded for easy visual identification in common trenches.

Pirkle anticipates a heavy demand for all water service related activities for the county during the 1980s. The current capacity of the water treatment plant, pumping station and reservoir enable the county to be a major water wholesaler to surrounding districts. As the current 170,000 county population grows to 300,000 by the end of this decade, this excess capacity will diminish. Already the county is No. 1 in building permits in the 7-county Atlanta metroplex.

Gwinnett County is one of the newest to be added to the list of more than 250 water utility districts and cities putting Duraflex polybutylene pipe to work.

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September 1981

Come to
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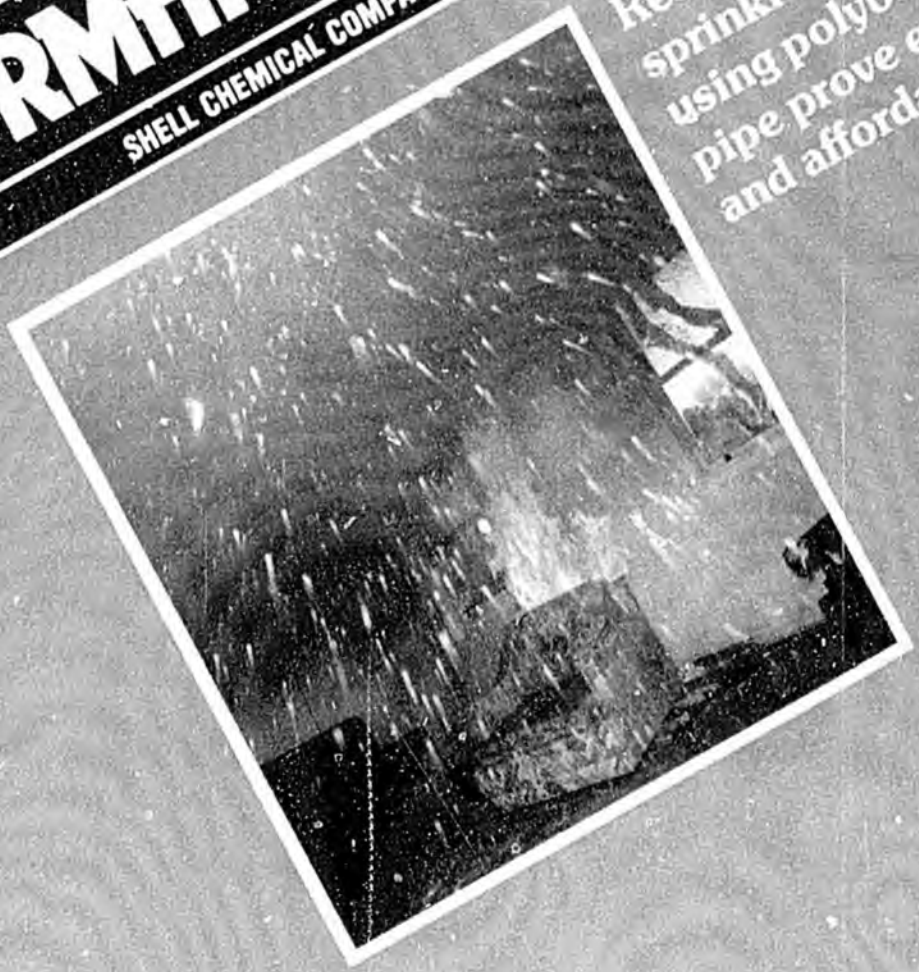
DURAFLEX™ POLYBUTYLENE

PERFORMANCE REPORT

SHELL CHEMICAL COMPANY

Residential fire sprinkler systems using polybutylene pipe prove effective and affordable.



DURAFLEX™ POLYBUTYLENE

PERFORMANCE REPORT

SHELL CHEMICAL COMPANY

A revolutionary new fire sprinkler system combining fast response sprinkler heads and polybutylene pipe has repeatedly demonstrated that a significantly improved level of fire safety is now available at an affordable price.

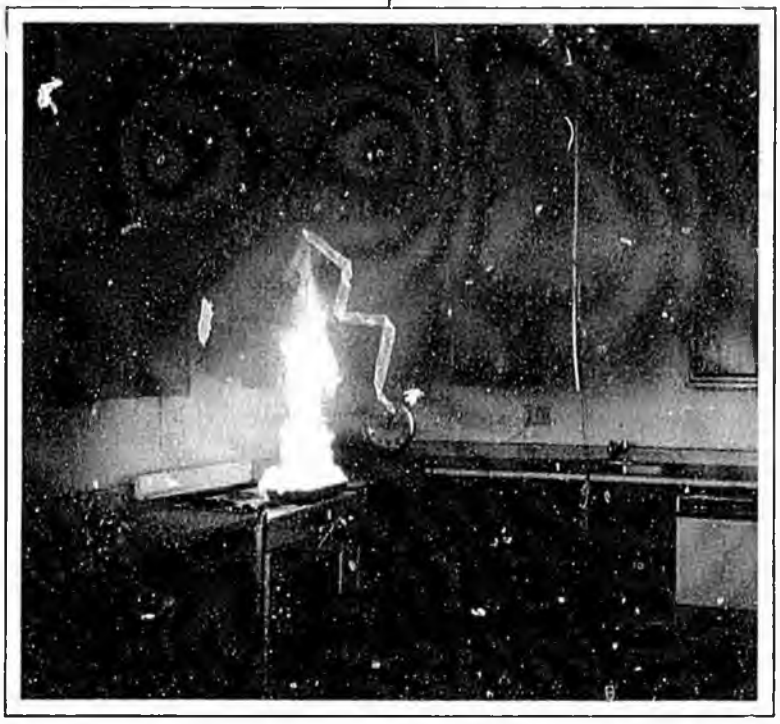
The vast majority of fire deaths in the United States occur in the home. Residential fires injure someone every 12 minutes and kill someone every 80 minutes. In addition, residential fires also cause five billion dollars in property damage annually, the worst record in the industrialized world.

Because of this tragic record, the Federal Emergency Management Agency—U.S. Fire Administration (FEMA-USFA) was empowered in 1974 to increase public awareness of the problem and to develop improved technology to reduce these appalling losses. Working in conjunction with private industry, studies were made which showed that conventional sprinklers would not work effectively in a residential environment. A new sprinkler head was needed that would respond to fires at least five times faster than the previously available sprinkler heads and spray water higher on the walls to combat the perimeter flames characteristic of residential fires. Due to the cooperative effort of FEMA-USFA and private industry, the fast response sprinkler head is now a reality.

Recognizing that the new sprinkler heads would not be widely used if their installation cost were too high, the USFA began looking for ways to reduce costs without compromising performance. In a report published in 1977, the need for a flexible high performance plastic pipe was identified as a primary means to reduce these costs. Since polybutylene was the only flexible hot water plastic pipe available, attention soon focused on it as the possible answer to USFA's need. Since that time, systems combining fast response sprinkler heads with polybutylene pipe have been tested and approved for residential use at Factory Mutual Research Corporation. Their effectiveness has also been demonstrated in over 100 burn tests held at various locations across the United States.

Tests prove system effectiveness

Quickly realizing the benefits that these systems offer, several far sighted communities



Eight fire tests at Scottsdale produced evidence that damages can be cut by an average of 85% when effective sprinkler systems have been installed.

life of a house or mobile home, this reduction in insurance rates can offset the cost of installing a sprinkler system constructed with polybutylene pipe.

Tax Savings. The State of Alaska has passed a law that reduces the taxable value of a sprinklered residence by 2% up to a maximum of $2,000.

Construction and Access Trade-Offs. Recognizing the value of the fast response sprinkler systems, local governments in some areas of the country are providing incentives for their installation. A leader in this area is Cobb County, Georgia which made several important changes in its building codes to encourage the acceptance of the new systems. These construction and access trade-offs provide additional incentives for builders to install the systems.

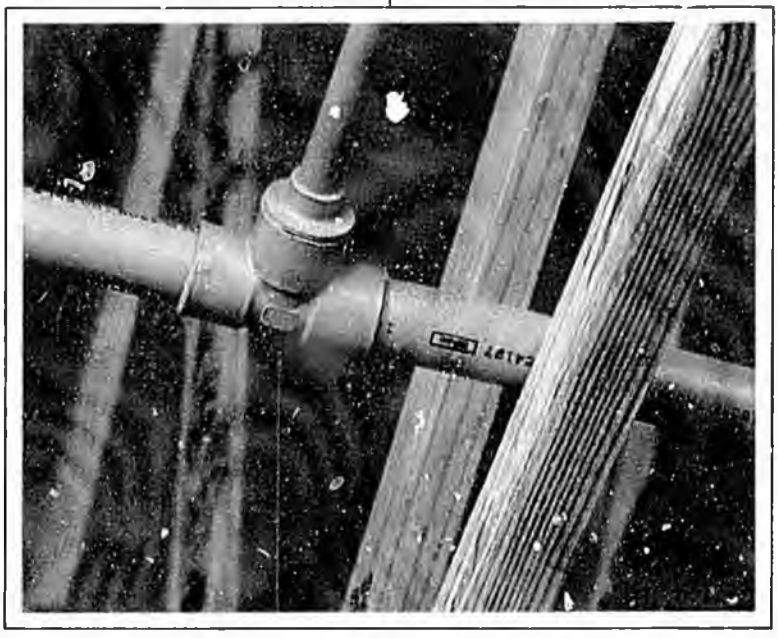
One example of construction trade-offs is the waiving of requirements for one-hour rated fire walls and fire doors in favor of normal gypsum board and doors. Savings are estimated at $23 per 1,000 square feet of walls and $111 for each door.

Cobb County's access trade-offs include the waiving of the requirement for a fire lane in certain instances where it would otherwise have been required. This allows developers to use land more effectively and profitably.

The economies realized through these trade-offs and the use of polybutylene pipe can reduce the net costs of the sprinkler system to zero. As a result, 90% of the new multi-family construction in Cobb County is now being sprinklered.

Installation recommendations

- Design residential sprinkler systems to conform to the NFPA 13D standard
- Install the system to minimize the possibility of freezing, e.g. install the pipe in inside walls or, if it is in the attic, directly on the dry wall under the insulation
- Use only high temperature rated pipe for residential sprinkler systems
- Use straight lengths of pipe rather than coils
- Follow manufacturer instructions on joining techniques
- Anchor pipe next to the sprinkler heads



The heat fusion method provides quick, dependable pipe fittings.

Miller of Miller Mechanical Co., has installed over 200 fire sprinkler systems with polybutylene pipe in new low-rise multi-family housing at a cost ranging as low as 45 cents per square foot. These costs will vary depending on the type of structure and sprinkler head spacing (14 foot spacing is standard in Cobb County).

In retrofit applications, even greater savings can be obtained. Grantham Fire Protection, Inc. of Phoenix, Arizona compared the overall costs of retrofitting black iron and polybutylene piped fire sprinkler systems into the same $70,000 homes. Material costs were roughly equal but installation time was reduced sharply. "Two men were able to retrofit the house with polybutylene in three days and it took four and a half days and three men to complete the black iron system," said Terry Glenn of Grantham.

Quickly assembled connections can be made with this specially designed heat fusion tool. This pipe joining technique results in significant savings in installation time and cost for sprinkler systems in both new and existing homes.

In San Clemente, a difficult retrofit in a wood frame house with tight attic clearances (8-30 inches) took two men less than a day to complete at a total cost of less than $1,000. Because of polybutylene's flexibility, Orvin Engineering was able to do 90% of the joints outside the structure, then curl the pipe into place. Jack Shaughnessy, Orvin executive vice president, commented that polybutylene pipe "proved worthy and relatively simple to install."

Sections of lightweight polybutylene pipe were connected outside, then easily fed through an attic opening, greatly reducing the time required to install a sprinkler system for the Scottsdale tests.

Safe, dependable, long-lasting systems

Polybutylene pipe is the only flexible plastic pipe approved for hot water plumbing by every major plumbing code in the United States and Canada. It is also the only flexible thermoplastic pipe that carries a 200°F pressure rating. As such, it can easily tolerate the high attic temperatures that can occur in the summer or the high temperatures to which it could be exposed during a fire.

At the other extreme of temperature, polybutylene's flexibility allows it to tolerate numerous freeze-thaw cycles without breaking. Although all sprinkler systems should be designed to avoid freezing (this would deactivate the system), freeze problems can occur. In such situations, polybutylene pipe will provide a margin of safety that rigid piping does not have.

Since polybutylene is plastic it resists the corrosion, scaling, and electrolysis that can affect metal pipe and because of its smooth inner walls, polybutylene pipe offers a high flow factor (C = 150) which it will maintain over its life.

Incentives for installing sprinkler systems

Insurance Savings. The Insurance Service Organization (ISO), the nation's largest advisory service for insurance rates, has recommended a 15% reduction in total insurance premiums for homeowners whose houses are protected by fire sprinkler systems. Filings to allow insurance companies to offer these reductions have already been made in over 38 states.

Over the average useful

across the country initiated demonstrations to gain local support for the new residential fire sprinkler systems.

One of the first tests conducted was in Cobb County, Georgia in 1981. A house in Smyrna was the site for a series of 15 separate test fires. The FEMA-USFA, Factory Mutual Research Corporation and the Cobb County Fire Department monitored the fires and the performance of the sprinkler systems in extinguishing them. Polybutylene pipe was used to connect the fast response sprinkler heads. The effectiveness of the system convinced local officials that such systems could successfully handle residential fires.

Building codes subsequently were amended authorizing the use of polybutylene pipe and NFPA 13D designs in sprinkler systems in multi-family dwellings. Several months later, the first such system in the United States was installed in a 2-story multi-family building. Fire Chief David Hilton of Cobb County estimated the cost of a conventional metal pipe fire sprinkler system would have been two to three times higher than the system installed.

Another series of tests was organized by the Rural-Metro Fire Department in Scottsdale, Arizona. The tests were conducted in typical $70,000 subdivision homes and simulated fire scenarios ranging from waste basket fires to fires as severe as a kitchen grease fire and a burning (dry) Christmas tree. Each of the fires was quickly extinguished, reducing damage by an average of 85% relative to the losses expected if no sprinkler system had been present.

The performance of the system prompted Scottsdale Administrative Fire Chief Bob Edwards to call the fast response, low cost residential fire sprinkler system "the most important fire protection breakthrough of the century."

Another series of tests in San Clemente, California culminated in a severe test of polybutylene pipe's ability to withstand high temperatures.

Before & After. In another series of tests, a wastebasket fire set in the corner of a room was quickly extinguished resulting in only minor damage.

In the test, the fire sprinkler system was drained of water and a fire was allowed to burn freely in the room below for 15 minutes. The pipe installed above the ceiling sustained no damage. Fire Chief Ron Coleman supervised the test series which he described as an "unqualified success."

Other successful tests of the fast response sprinkler/polybutylene pipe system have been made in Carmichael, California; Springdale, Arkansas; Fort Lauderdale, Florida; and St. Petersburg, Florida. Tests were also conducted by Factory Mutual Research Corporation which resulted in the approval of polybutylene pipe for residential fire sprinkler systems. This action also provides a nationwide approval for one and two family homes and mobile homes under the National Fire Protection Association standard 13D (1980).

How polybutylene pipe reduces costs

The light weight, flexibility, and ease of joining polybutylene pipe result in significant savings in installation time and cost for the sprinkler installer, particularly in retrofit applications. Compare the steps required to install a fire sprinkler system with black iron pipe or copper to that with polybutylene.

With black iron, the installation must be painstakingly designed to make sure all pipes are cut to the exact length; all wall or stud penetrations must be perfectly aligned and all threaded pipes scrupulously labeled so that the system can be properly assembled on-site. In addition, accommodations must be made to put black iron pipes in wall cavity areas. Although copper systems do not have all these requirements, they do require that care be taken to avoid the fire hazard associated with soldering.

By contrast, flexible polybutylene pipe is a more forgiving system that can normally be cut and assembled on-site at ground level and then snaked through structural members into place. In addition, the light weight of polybutylene pipe (one inch diameter pipe weighs less than ⅛ as much as black iron and less than ½ as much as copper) makes it even easier to transport and assemble.

In Cobb County, Herb

Warranty

Polybutylene pipe is manufactured from a material produced by Shell Chemical Company. All products purchased from Shell are subject to the terms and conditions set out in the contract, order acknowledgement and/or bill of lading. Shell warrants only that its product will meet those specifications designated as such therein or in other publications. All other information supplied by Shell is considered accurate but is furnished upon the express condition that the customer shall make its own assessment to determine the product's suitability for a particular purpose. **No warranty is expressed or implied regarding such other information, the data upon which it is based, or the results to be obtained from the use thereof; any product's merchantability or fitness for any particular purpose, or that the use of such other information or product will not infringe any patent.**

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DURAFLEX™ POLYBUTYLENE

PIPER

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The 42-story Marriott Hotel was the first commercial high rise building in New Orleans to install a fire sprinkler system using polybutylene pipe.

New Orleans Marriott retrofits sprinkler system with polybutylene pipe

During the 7-month period from June, 1983, to January, 1984 a life-protection fire sprinkler system was quietly added to the 42-floor New Orleans Marriott Hotel with no interruption of room occupancy or complaints from guests. More than 3,000 sprinkler heads and five miles of polybutylene pipe were used by Grinnell Fire Protection Systems to retrofit the 1,300 sleeping rooms and hallways.

The Marriott Hotel was the first commercial high rise fire sprinkler installation in the New Orleans area to use polybutylene pipe. A variance in the local building codes was obtained to allow the flexible, high performance plastic pipe to be used.

The major hotel chain first became aware of polybutylene pipe about two years ago. By early 1984, 14 of their hotels already had polybutylene pipe in the sprinkler systems serving guest rooms. A spokesman for the hotel said the "Marriott plans to continue to use polybutylene pipe in its retrofit programs."

Sonny Scarff, a former fire officer

(continued on page 2)

Polybutylene pipe approved for sprinklers in Dallas

The installation of life safety fire sprinkler systems using polybutylene pipe is expected to expand greatly in Dallas. Public awareness of the need for sprinkler systems began to grow when on February 3, 1981, the Dallas Fire Department reported they could not extinguish fires in buildings larger than 7,500 square feet.

As a result of this report, a landmark study of the Dallas building code was launched later that year by Schirmer Engineering Corporation. The study eventually recommended more than 50 code changes to the Dallas City Council, most of which were intended to offset the increased construction costs resulting from mandatory sprinklering.

Referring to the Schirmer report, Dallas Fire Marshal Jerry Lambert commented, "The package as a whole provides the source of the funds necessary to pay for sprinkler systems by identifying building costs that can be eliminated when sprinklers are put in." The Dallas Fire Marshal is a strong advocate of the installation of sprinkler systems, which he called the "best possible protection" for controlling fires quickly.

The major code change proposed was a requirement for sprinklering all structures over 7,500 up to 35,000 square feet, depending on the type and occupancy of the building. To help offset the additional cost for installing sprinkler systems, a number of concessions were granted. Some of the major provisions included a reduction in the required fire protection rating of walls, reduction in smoke detector requirements for high rise buildings and atrium buildings, and reduction in the number of exits per floor in a building. In addition, polybutylene pipe also was

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*Duraflex™ is a trademark of Shell Chemical Company for its polybutylene resins. Shell Chemical does not manufacture pipe.

"New Orleans Marriott" continued from cover

who has been the Director of Fire Protection for Marriott for the past nine years, organized and staged the September, 1982 sprinkler tests in Fort Lauderdale, Fla. that helped prove the worth of polybutylene pipe.

"When we started talking about retrofitting we felt we could take advantage of the new polybutylene pipe so we ran a series of fire tests," Scarff said, adding that the pipe "gives us the ability to install sprinkler systems the most cost-effective way because we can keep the

A heat fusion tool is used to connect the feeder pipe in the hall to the line extending to the sprinklers in each room.

hotel from being down. Secondly, the initial cost is 20-30 percent less. It's faster to use polybutylene pipe than conventional metal pipe."

Doc Adams, Director of Engineering for the hotel, believes the fact that the hotel was able to maintain room occupancy without interruption during the installation period probably saved a considerable amount in potentially lost revenues. "There was no interruption of room occupancy and we received no complaints while the system was under construction," Adams said. While the project took quite a bit of long range planning and coordinating with the installers from Grinnell, the job "was 95% complete in 10 months," he added.

Satisfaction with the project also was voiced by Charles Martin, Grinnell's Branch Manager. "We had Grinnell people come in from Florida and Colorado who had worked on similar installations in Marriott hotels in their areas. They helped train our crews and gave them excellent advice."

Martin said Grinnell designed a system that required only two pipe sizes, 1½-inch lines feeding a loop down both sides of the corridor with 1-inch pipe running to the sprinkler heads in the rooms.

"We were able to pre-fab most of the systems for the rooms on two small tables in a cramped area in the basement," he explained. "Therefore, less time was required on the floors. Because of the pipe's flexibility, the prefabbed pieces were transported easily to each floor in service elevators. Room installations required only three small holes to be drilled—one high on the hallway wall into the room, one in the hallway outside the bathroom and the third on the wall overlooking the sleeping area."

In a typical situation, installers would transport the materials to a selected floor between 8 a.m. and 9 a.m. As the guests left their rooms, the crews moved in to cut holes and shoot studs for the pipe hangers. Two ceiling panels were removed from the drop ceiling above the bathroom. A prefabricated pipe then was snaked in and curved around electrical installations and plumbing above the bathroom ceiling. Two sidewall fast-response sprinkler heads were installed in each room, one in the entry and one in the room itself. The tail end of the pipe section connected to the sprinklers stuck out into the hallway. It was trimmed to the proper length in a matter of seconds and heat fused to the prefabbed feeder pipes in the hallway. All of the pipe was connected and hung and the crew was clearing the floor by the time the guests began returning to their rooms late that afternoon.

With no need for any pipe dope, cutting oils, solder flux or torches, cleanup operations were minimal. Carpets and furnishings did not have to be covered. "Even when polybutylene pipe was exposed in the ceiling of the hallways, as it was for a period of time, it looked clean and neat and there was nothing threatening about it. I can't see anyone going into black iron again for installations such as this."

Matt Morgan, Grinnell's general foreman for the job, said he and his crews previously had worked only with metal pipe. But, he added, it took only about a week "to get adjusted to the polybutylene pipe and get up to speed." He added that he hopes to get other polybutylene jobs in the New Orleans area—"its light weight requires less muscle and energy to put in place."

"Where we really gained on this job is that usually, with black iron pipe, about 15 percent of the work is outside fabrication and about the same percent is engineering before you even get to installation. But with polybutylene pipe, the installers were able to do most of the pre-fab work. There was no need for engineering to go in and meticulously measure everything because we could cut to fit as we installed, and even curve and bend the pipe around obstacles when necessary," he explained.

A spokesman for the Marriott Corporation said that "we expected the pipe to live up to its advertised capabilities and it has done so. In testing, we use 250 psi for two hours. In fact, we've had fewer leaking problems after installations of polybutylene pipe than we have with black iron."

Sonny Scarff said the company saved "in the area of $300,000 to $400,000 in New Orleans because we were doing the rooms so much more quickly." An additional savings of $500,000 was obtained because of the reduced downtime. He said it took 14 days to retrofit a floor of 30 rooms in the Chicago Marriott in 1980 when black iron was used "while the same 30 rooms were done in four days in New Orleans" using polybutylene. Scarff figured current costs to retrofit the Chicago Marriott would be about $1,550 a room with black iron compared to an average cost of $800 a room with polybutylene pipe for the sprinkler system.

Pre-fab operations were set up in a small utility area of the hotel.

Polybutylene pipe chosen for fire sprinklers in desert resort's guest rooms

In the clean, dry air of the Sonora country desert foothills northeast of Phoenix, Arizona, a luxurious $200 million desert resort is being built. To help protect guests and property, fire sprinkler systems using polybutylene pipe were installed in all of the 120 casitas.

Any one of the four sprinkler heads installed in each casita is designed to confine, control and extinguish a fire quickly and to minimize the risk of a major conflagration that might spread throughout the complex. In a fire condition, one of the sprinkler heads would operate, releasing water in a wide spray pattern at a rate of 18 gpm. Only if the first sprinkler head could not control the fire would additional heads operate.

A 6-inch water line from Scottsdale serves the casitas, while the resort's golf course lake provides the water source for sprinkler systems in the restaurant, clubhouse and both tennis and golf pro shops.

"If they hadn't decided to put in a sprinkler system they would have needed a much larger water system," said Bob Edwards, Fire Chief of the Rural/Metro Fire Department in Scottsdale. In addition, without the sprinklers, fire lanes would have been required, which would detract significantly from the rugged beauty of the resort, aptly called "The Boulders", a Rockresort, Carefree, Arizona. The fire sprinkler system for The Boulders was designed and installed by "Automatic" Sprinkler Corporation of America, one of the largest contractors in the country.

Approximately 60 feet of sprinkler pipe is used in each casita. A portion of each system is heat-fused at the company's Scottsdale office and transported to the site. All the pipe sections required for one casita can be carried easily by one man to the installation site on the roof.

The 1¼-inch polybutylene pipe is placed on the flat roof (there are no attics) and fused to the 1-inch pipe segments below. In this joining method, a hot tool melts a thin layer of polymer on the inside of the fitting and on the outside of the pipe. The joint is formed when the pipe is pushed into the fitting. The joint that is formed *is* stronger than the pipe itself. The process takes about a minute.

After the sprinkler system has been installed, "Automatic" Sprinkler increases the water pressure to 200 psi and holds it for 24 hours, in order to check for any leaks. Any that are found can be repaired quickly. Later, an expandable foam insulation would be applied on the roof of the casita to cover the exposed pipe.

"Polybutylene's flexibility is the biggest thing going for it. You've got the advantage of going to a job site with a prefabricated section; then, if you find the building situation has changed somewhat, you can cut the pipe and make the adjustments easily. You don't have to worry about threading the pipe. Polybutylene saves you time and money and it is reliable," summarized "Automatic" Sprinkler Vice President Fred Benn III, of San Francisco.

The sprinkler installation at The Boulders is representative of a growing nationwide trend in construction, where life-safety protection can be provided at minimum additional cost because of construction tradeoffs.

Benn pointed to a condominium project in the Phoenix area where the decision to install sprinklers using polybutylene pipe "cost the developer less money to put up 220 condos with sprinklers than it would without them." According to Fire Chief Edwards, concessions at the project amounted to a savings of $275,000 and the system cost only $170,000. As he put it, "tradeoffs are the road to success" in increasing the number of sprinkler installations.

Edwards, who two years ago helped sponsor a major fire test demonstration involving polybutylene pipe in Scottsdale, said he felt the pipe was superior to other materials in ease of installation and durability. He cited the pipe's flexibility, fast fusion-joining method, resistance to cold and hot temperatures, and reduced labor costs for both new and retrofit installations. Following the Scottsdale fire tests, Edwards commented that the performance of the fast-response, low-cost system was "the most important fire protection breakthrough of the century."

Edwards is a strong advocate of sprinkler systems for saving lives, including those of firefighters, and property; but he also wants to reduce the taxpayers' burdens. In Scottsdale, when commercial and residential properties are sprinklered, insurance rates are

(continued on page 4)