

PLASTIC PIPE: *Is It Practical* for... **PANEL**



PLASTIC PIPE IS somewhat of a paradox in the plumbing and heating industry.

Many industry authorities now accept plastic pipe of the type recommended for potable water supply systems as suitable for almost any cold water plumbing job. As reported in last month's article (p. 94), research conducted by the National Sanitation Foundation for the Society of the Plastics Industry has shown approved pipe to be nontoxic, with no objectionable tastes or odors present. The article covered many other previously unanswered questions about plastic pipe.

But when it comes to hot water service for either domestic or space heating purposes, the industry is divided into opposite camps.

For example, many claim that plastic pipe should not be used for any hot water heating sys-

tem; yet it is being used for panel heating, apparently successfully, in many sections of the country.

This raises the question, then, of whether plastic pipe is practical for panel heating.

However, before analyzing representative installations and the results, let's see what industry authorities have to say about plastic pipe for panel heating.

■ Among the manufacturers either favoring the use of plastic pipe for panel heating under controlled conditions, or studying experimental installations like the Crane Co. is doing, are Triangle Conduit & Cable Co., Inc., New Brunswick, N. J.; Franklin Plastics, Inc., Franklin, Pa.; Yardley Plastics Co., Columbus, O.; Carlon Products Corp., Cleveland, and American Molding Co., San Leandro, Calif.

Several of these have reported

their experience to DOMESTIC ENGINEERING, while others have merely indicated radiant panel heating as one application for their product.

On the other hand, some manufacturers do not feel that plastic pipe is suitable for panel heating. One of the nation's largest steel producers, which also makes a line of plastic pipe, writes: "While we have sold a considerable amount of flexible polyethylene pipe for use in radiant panel installations, we are not in any position to take a firm stand on promotion of the pipe for such a purpose. We do not like to see the pipe used where there is any possibility of the water temperature exceeding 110F."

■ The plastics industry itself feels that while polyethylene pipe has been used for radiant heating installations, it is perhaps a borderline application. The reason for this opinion was summed up by an industry spokesman: "If the hot water circulatory system should back up and approach the boiling point, it would have a definite softening effect on the plastic pipe."

It should be pointed out that most of the reservations regarding the use of plastic pipe for panel heating revolve around these factors: its resistance to water temperatures, physical strength, expansion and contraction, and joining to plastics or

HEATING?

Some authorities say plastic pipe should not be used with water temperatures over 120F. Others say 150F. Who's right?

HEATING CONTRACTOR Otto Vogt, Chicago (standing), and **Otto Nerad**, architect, check panel heating job using plastic pipe installed by Vogt. In Vogt's opinion, plastic pipe is suitable for panel heating if water temperatures are strictly controlled.



other pipefitting materials.

Robert H. Emerick, a prominent consulting mechanical engineer of North Charleston, S. C., offered the following opinion when queried by DE editors:

"At present, I consider plastic pipe to be unproved for uniformly satisfactory service in radiant panel installations. I do not specify it for this use, although I have authorized installations on compressed air, cold water and some chemical lines, and have a high regard for its value. My personal rejection of plastics in heating is for these reasons:

"1—There is no warranty (for heating) by the manufacturer. The purchaser takes plastics at his own risk.

"2—There is always a chance that circulating water temperatures will exceed the safe limit, simply as a matter of accident. Automatic controls, like human

beings, are subject to occasional aberrations, in my opinion.

"3—At temperatures below freezing, many plastics, with perhaps the notable exception of polyethylene, become brittle. Unfortunately, during winter months, construction must go forward frequently at temperatures below 32F. Even for an installed job, a breakdown of the system might permit the panel temperature to fall below freezing, with piping fractures following a period of vibration or physical shock.

"4—While expansion is greater than for metal tubing, the problem on this point is a nuisance rather than serious.

"There is no doubt that many plastic installations have been satisfactory," Emerick concludes. "However, I personally see no advantage to the designing en-

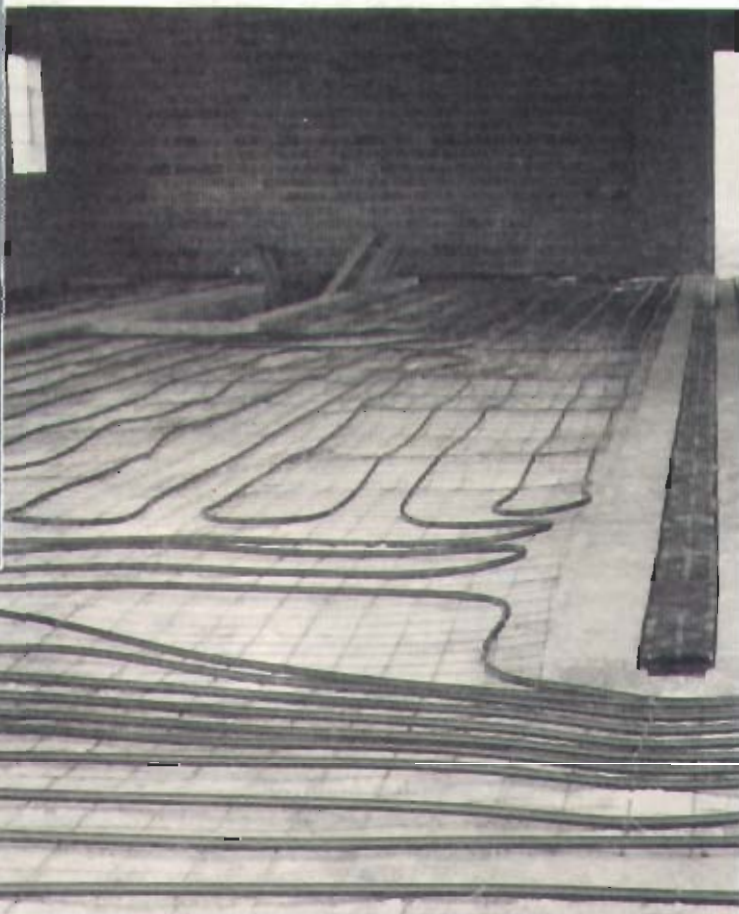
gineer or to the installing contractor in taking an unnecessary chance. When this chance is taken, I believe the owner should be informed of the reasons for using plastic, and furthermore, should agree to hold the engineer and contractor blameless in the event trouble develops at a later time."

This then is the opinion of an engineer with a wide range of experience in the industry.

In its research on this subject DE also called on William Carlisle, training and education manager for Bell & Gossett Co., Morton Grove, Ill., manufacturer of heating specialties, for his opinion.

Carlisle said: "We have had this question come up at many of our training schools from wholesaler representatives who know of contractor-customers who have
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Picture Story Shows Plastic Pipe for



FOUR-INCH concrete floor is laid over plastic pipe and gravel bed. As an extra safeguard, air pressure was kept in pipe lines while the concrete was poured. At right is the completed pipe layout for the system. Note in foreground that plastic pipe loops were laid closer together at large front doors of the garage to concentrate heat.

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made panel installations with plastic pipe. However, we do not feel we are in a position to offer much comment at this time. We like to think of hot water heating systems as a lifetime installation—say 40 to 60 years—and naturally do not feel that we can reach any definite conclusions on the basis of two, three or even five years of service. We know from experience that even if a system fails after 20 years, someone, a manufacturer, a contractor, or an engineer is blamed.”

Carlisle mentioned also that his company has a snow melting system using plastic pipe in-

stalled at the Morton Grove plant, but that, again, the research department is not in a position to reach definite conclusions regarding the installation at this time.

Thus, we have a representative selection of what some experts are saying about the use of plastic pipe for radiant panel heating. It is obvious that there is no unanimity of opinion; in fact, some authorities, including a number of manufacturers, had no opinion and therefore did not reply to DOMESTIC ENGINEERING'S query on the subject.

With the question still unresolved, DOMESTIC ENGINEERING

next went directly to contractors who have made radiant panel installations using plastic pipe.

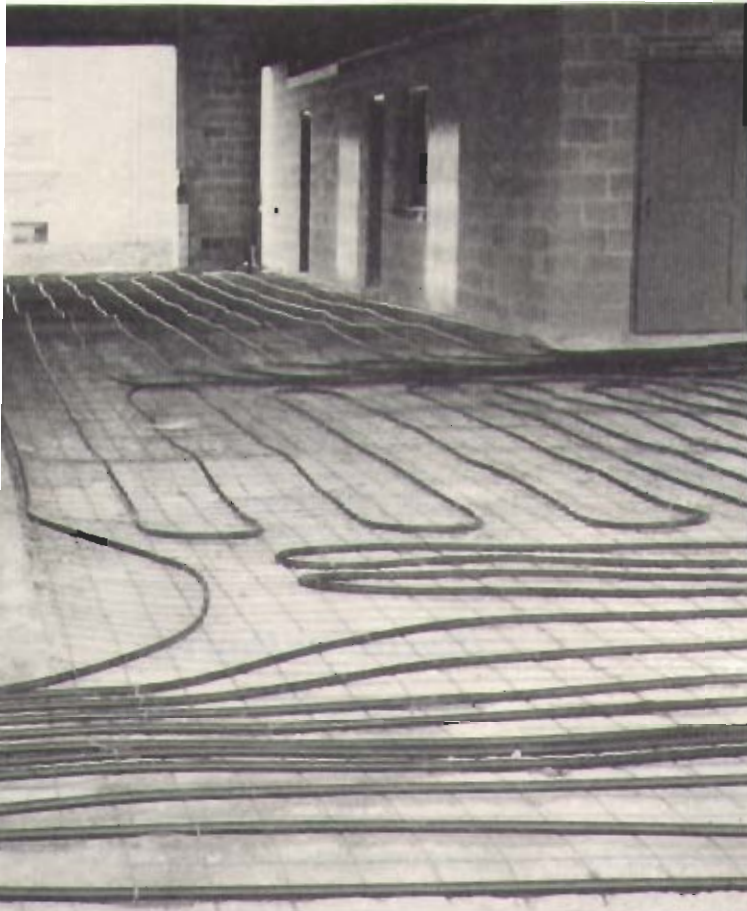
Among them is Otto Vogt, a Forest Park, Ill., heating contractor who is reputed to have made more panel installations, mostly copper and steel, than any other Illinois contractor.

His opinion: Plastic pipe is suitable for radiant panel heating under *limited conditions* insofar as water temperatures are concerned.

The installation illustrated on these pages is typical of what Vogt considers a satisfactory system using plastic pipe.

The site is a garage in La

Application of Radiant Heating . . .



PLASTIC PIPE installation was checked under 125 lbs air pressure before concrete was poured. The pipe was attached to the headers with polystyrene plastic adapters. Note that headers are installed above the concrete for easy access. Vogt feels that it is not desirable to bury the header connections in plastic pipe installations.

Grange, Ill., a suburb of Chicago, which houses the La Grange Cab Co. and La Grange Transit Co.

Vogt designed the system to keep the maintenance and storage areas of the garage at 55F and an enclosed office area at 65F. He used 6,000 ft of 3/4-in. plastic pipe on 18-in. centers in the parking area, 3/4-in. pipe on 12-in. centers in the work areas and 1/2-in. pipe on 6-in. centers in the office area.

The pipe was rolled out and wired over a gravel base and wire mesh by a two-man crew, then covered by a 4-in. concrete slab floor. Polystyrene insert-type adapters were used to tie

the plastic pipe into the headers, which are located above the concrete. Vogt feels it is not desirable to bury the connections.

Although Vogt designed the system to maintain a 55F temperature in the garage, it has been operating at 70 to 75F. Vogt discovered this on a routine call-back and installed two high-limit controls in series to keep water temperatures below 120F.

The system is now in its second heating season and operating satisfactorily, Vogt says.

Vogt believes the product definitely has a future in radiant heating applications.

"I wouldn't say that I'm ac-

tively promoting plastic pipe for panel heating, but I will continue to design systems where it seems appropriate. I think there is a market for it, particularly in larger buildings where heated areas do not require high temperatures. Unit heaters could be installed to provide for extra heat during periods of excessive cold," Vogt said.

During his investigation of systems using plastic pipe in the Chicago area, a DE reporter chose a subzero day (-5F) and located an installation involving five heating zones in a 13,000 square foot building housing a soft drink

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MASTER CONTROL on radiant panel heating system is checked by J. M. Wyllie, president of the transit company using the garage. Vogt installed two high-limit controls in series to keep the water temperatures below a maximum of 120F at all times, confirming his belief that plastic pipe panel jobs are all right if temperatures are controlled.

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bottling plant, a machine shop and office areas. At the time of the reporter's call, the aquastat on the boiler was set at 150F and room temperatures were between 75 and 80F.

Occupants expressed satisfaction with the heating system, now in its first season. The heating contractor was out of the city and not available for comment on the aquastat setting of 150F. The builder, however, thought the system was designed for 120F water temperature and was going to check the contractor on that point.

To get the picture in a different part of the country, DOMESTIC ENGINEERING contacted two contractors in California. Robert Bruen, of Oakland, a pioneer in the design and installation of panel heating systems, had this to say:

"For several years we have

considered using plastic pipe in concrete floor installations. However, to date something has always come up to prevent our following through. In some instances the financing agencies have protested; in others, we have run into difficulties with county building inspectors and we also have had a cool reception of plastics for heating from builders and owners.

"Our primary concern in using plastic pipe has been its relatively low softening point. Also, we have had reliable reports of plastic pipe installations in Southern California that have failed in a very short period of time."

Bruen added, however, that the failures were due to "inferior" plastic pipe that had been turned out by "fly-by-night" extruders, rather than improper installation or failure of a quality product.

Bruen said that he is planning

to use plastic pipe in the future. "I feel that the product definitely has a future in radiant panel heating as I have no doubt that eventually the temperature difficulties will be solved and a complete line of fittings designed for its use. I feel, too, that competitive conditions will be a factor in the growing use of plastic pipe for radiant heating," Bruen concluded.

Another California contractor, Tom Boothe, Boothe Radiant Heat, Inc., Lafayette (also near Oakland), told DE that he has installed more than 1,000,000 feet of plastic pipe in more than 500 panel heating jobs during the past five years. He made his first installation six years ago and has since handled about 200 residential jobs, with the balance being

Plastic authority on suitability of

The evidence was in. Industry authorities on plastic pipe—the manufacturers, the designers, the installers—had given their views on the suitability of plastic pipe for radiant panel heating.

One thing was clear: They were sharply divided.

To clarify the essential points of difference for contractors who are wondering if plastic pipe panel heating jobs are in their future, DE went to H. L. Halvorsen, ranking sales engineer on plastics for the Crane Co., Chicago, for his opinion based on the DE study. His conclusions follow:

■ Within recommended pressure and temperature limitations, plastic pipe may have application for radiant panel heating.

■ Where certain types of anti-freeze additives are used in snow melting systems, the use of plas-

commercial jobs with a scattering of industrial plants and swimming pools.

Boothe said he believes he is the only heating contractor in the country who offers an unconditional five-year guarantee on all radiant panel heating jobs using plastic pipe. So far he has experienced "no difficulty" with any of the installations he's made.

Most of his systems operate at an average water temperature of 120-130F, with 150F being considered the maximum. Residential jobs are installed on 12-in. centers, while commercial jobs are installed on both 12 and 18-in. centers. Boothe advocates no plastic pipe above slab level and uses copper from the slab to headers. Copper-to-plastic fit-

tings are used with stainless steel clamps and buried in the concrete. He uses the same depth of bury for plastic as for other materials.

At present, plastic pipe jobs constitute about 25 percent of his radiant heat volume, with most of the rest copper and steel.

Boothe insists on pure, virgin polyethylene for his installations. "It is important that you know your supplier and get a quality product. Polyethylene must be extruded at the proper temperature and in the right way."

Boothe says that commercial installations are easier to sell because of the financing factor. Like Bruen, he has found that lending agencies are reluctant to finance a residential job.

Commercial builders and own-

ers, on the other hand, can either finance the job themselves or have ways of getting the money, Boothe says.

Both Bruen and Boothe are fully aware of the divided opinion of the industry regarding the use of plastic pipe for radiant panel heating. "It is only natural that the situation should be what it is," Boothe says. "With a relatively new product, neither manufacturers nor engineers can go too far out on a limb in making claims for the product. They have to provide a safety factor that is practical.

"For my part, I don't look at radiant panel heating as a hot water heating job in the strictest sense of the word, but rather as a 'lukewarm' or 'limited' hot wa-

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analyzes DE's research; gives his opinion plastic pipe for panel heating installations

tic pipe is not recommended.

■ In areas where mean temperatures require operating water temperatures in excess of 120F, the use of plastic pipe would not be considered good practice. *(Editor's Note: There is no unanimity of opinion on maximum water temperatures permissible with plastic pipe. As pointed out in the article, some contractors are installing systems that apparently operate successfully at temperatures up to 150F. These systems have been in use five to six years, but many authorities prefer to withhold endorsement of these higher operating temperatures until it can be shown that plastic pipe will withstand the higher temperatures for a period of 10 to 15 years. It can be assumed, of course, that the lower water temperature provides a greater margin of safety.)*

■ While there is no warranty for plastics for heating by manufacturers at this time, it is felt that plastic pipe may be established as an accepted medium for radiant panel heating.

When and if manufacturers do establish warranties, they will render opinions for its specific application to panel heating.

■ At present, most installations (of flexible polyethylene) are in radiant floor panels and have not been applied to ceiling or wall installations. *(Editor's Note: the thermal expansion of plastic pipe is not considered to be too great a factor in floor panel installations since the concrete holds the plastic steady. There is some question at this time, however, whether plaster in ceiling and wall panels would be strong enough to withstand the expansion factor. As pointed out in*



H. L. Halvorsen
Crane Co., Chicago

last month's article, the factor of thermal expansion in plastic pipe is currently under study.)

■ Above all, make sure you are using a quality product (most commonly used is polyethylene). Some plastic pipe is extruded from scrap material and may contain impurities that could cause imperfections. Therefore, deal only with reputable firms that are in business to stay.

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ter system. With the excellent safety controls we have today, the chance of failure or accident is so remote that I don't consider it a serious factor."

Bruen agrees that manufactur-

ers and engineers have to be cautious in their recommendations for plastic pipe for heating purposes. "As in the case of other new products, it is frequently the contractor himself, the man on the job, who does a considerable

amount of experimenting. I think that is the phase we are in now."

Based on this particular study, what conclusions can be drawn regarding radiant panel heating systems using plastic pipe? See pages 104 and 105. END



PLASTIC PIPE for panel heating? Yes, under limited water temperature conditions, said some contractors like Otto Vogt, who is shown being interviewed by Ed Howard, a DE editor. Others felt it was not suitable for any heating application.



MANUFACTURERS also were asked whether plastic pipe is practical for panel heating jobs. Finding no unanimity of opinion, DE asked H. L. Halvorsen, sales engineer for Crane Co., for his conclusions. He's shown above talking it over with a DE editor.

The Story Behind the Story on Plastic Pipe

THIS STORY began over a year ago when a contractor asked DE editors this question: Is plastic pipe practical for radiant panel heating? We didn't know, but said we'd try to find out. Shortly thereafter at an industry meeting we put the question to two manufacturers. One said he thought it could be used under limited temperature conditions; the other believed it was not suitable for any hot water heating application.

So we had an answer, or rather two answers. We began querying other manufacturers. We wrote and talked with engineers and other authorities in the field. This took several months, but we came up with a lot of answers; the only trouble was that the answers were about equally divided between "yes" and "no" with a scattering of "maybe" thrown in. So we went next to the man on the job, the plumbing and heating contractor. Here again there was no unanimity of opinion: "Not suitable; I wouldn't use it," said some; others said: "I believe plastic pipe is practical for panel heating because I'm using it right along and it works." So we had some more answers to work with.

Finally, we took all the results of our study

to H. L. Halvorsen, sales engineer on plastics for Crane Co., Chicago, and said: "We've been doing some research on the use of plastic pipe for radiant panel heating and here's what we've found out. What's your opinion?" His conclusions are given on p.105.

And that, briefly, is the "story" of this story.

But the Story Isn't Ended Yet . . .

Although we covered a lot of ground in our study of plastic pipe for radiant panel heating, we naturally could not talk to all contractors, manufacturers, engineers and other authorities in the field.

Thus, we rather suspect that the story will have a sequel . . . and it will come from *you*, the readers of **DOMESTIC ENGINEERING**, particularly those we didn't have an opportunity to talk to.

What is *your* opinion?

Is plastic pipe practical for panel heating? Do you know of any installations? Have you made any installations? What are the results to date? In short, DE would like to have your opinions. Address all letters to the Editor, 1801 Prairie Ave., Chicago 16. END