WV-0136 #198

17394

UNION CARBIDE CORPORATION

ENGINEERING AND HYDROCARBONS DIVISION

CENTRAL ENGINEERING

SOUTH CHARLESTON, WEST VIRGINIA

MATERIALS
ENGINEERING
CENTRAL FILE

MEMORANDUM

July 18, 1984

TO: J. A. Fey, 514
A. E. Wood, 514

CC: P. D. Black, 511
D. J. Hart, 514
R. H. Johnson, 511
J. E. Kidd, 514
J. E. Kidd, Jr., 514
D. T. Nguyen, 514
J. O. Silvey, 514
J. N. Wickert, 514
MOC

FROM: H. G. Clem

SUBJECT: INSPECTION OF TRANSITE PIPING SECTION OF WASTEWATER COLLECTION SYSTEM, SOUTH CHARLESTON PLANT

At your request, a further investigation into concerns with the subject piping system was conducted with particular emphasis on apparent deflection of joints due to improper support, repair procedures, and general integrity of the system. The major problems, as noted in your recent report(1) are a series of failures or leaks in the area of transition between polyethylene piping and the transite which are due mainly to thermal expansion and improper support of the piping system. The transite was reportedly not found to be severely deteriorated or embrittled. Our findings are outlined below. Reference material was obtained from obsolete UCC Piping Specifications and the "Transite Ring-Tite Pressure Pipe Installation Guide" which is available from the J-M A/C Pipe Corporation:

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(1) Jr., Kidd, J. E., Silvey, J. O., Wickert, J. N., Wood, A. E., Inspection of the Wastewater Collection System, South Charleston Plant, November 16, 1983, File No.: 17149.

PLAINTIFF'S EXHIBIT
UC-2413

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● Deflection of Transite Pipe Joints:

The piping system is designed to operate under pressure with 3 to 5 degrees deflection per coupling depending upon pipe diameter. In our recent field inspection, none of the transite pipe joints appeared to be deflected more than 3 degrees. This condition could change if ground movement or land slides in the area cause a further deterioration of support for the piping, but the degree of deflection, in itself, is not a major concern at this time. Details on this topic from Pages 14-15 of the installation guide are attached for reference.

● Repair of Transite Piping:

The existing repairs on the transition section of the transite piping are in accordance with J-M A/C Pipe Corp. recommendations as shown in the attached excerpts, Pages 98-101, from the installation guide. Repair clamps are normally used for this work.

Joint repairs while the system is in operation are best handled with mechanical couplings. If the leak is relatively minor, the joint may be repaired with epoxy grout reinforced with a fiberglass overwrap. These repair procedures will restrict the flexibility of the original joint but should be satisfactory for emergency situations.

● General Integrity of the Transite Piping System:

Although our existing transite piping is apparently in good condition aside from mechanical damage from thermal expansion in the transition area near the polyethylene piping, transite is losing popularity due to poor structural strength and environmental concerns related to asbestos (see attached UGP-5 newsletter). Mr. Tom Mullen, area representative of J-m A/C Pipe Corporation, stated that their transite piping product line may be phased out within the year because of declining markets.

If this is the case, we should consider stocking additional transite fittings, adaptors, and piping in the appropriate diameters and lengths to replace any sections of existing installed pipe that may be damaged beyond repair in the future. As mentioned in your report, the transite piping system should be monitored for failure areas, dates and costs.

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Since the service life of the system is unknown, a replacement plan should also be developed using an alternative piping system like fiberglass reinforced resin pipe.

In conclusion, current repair procedures and the degree of deflection of existing pipe joints are satisfactory. Since there are concerns about the service life of the system and future availability of the piping, a contingency plan for eventual replacement should be considered.

If there are additional comments or questions on this subject, please call.

H. G. Clem

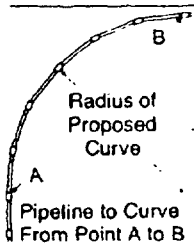
HGC:es

Attachments

17394 INDEX: R, 6, 7, 17, 23, 32, 112, 114, 141, 154, 180, 294, 301, 318, 351

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Table B
Minimum Radius of Curvature for Pipe on Curves



Radius of Proposed Curve	Minimum Radius of Curve (feet) Length of Pipe (Feet) 3'3"	6½'	13'	Deflection per Coupling (Degrees)	Offset per 13' Length (Inches)
	186.8	373.5	747	1°	2.7
	92.8	185.5	371	2°	5.4
	62.0	124.0	249	3°	8.1
	46.6	93.1	186	4°	10.9
	37.2	74.3	149	5°	13.6

Pipe in sizes 4"-12" may be deflected up to 5°; pipes 14" and 16" up to 4°; 18" thru 24" up to 3½°, and 30"-36" up to 3°. These deflections apply to couplings belled on the job site. For factory-belled couplings, use one-half of the above deflections or offsets.

How to Use

1. Find the radius of the proposed curve by actual measurement or by making a sketch to scale. (See diagram above.)

2. Check the table to make sure the radius is not too small. For example: Assume the radius will be 188 ft. and that 8" pipe in 13 ft. lengths will be used.

   Under the 13 ft. column the figure nearest 188 ft. is 186 ft. — checking to the right we find this is equal to 4 degrees of deflection at each coupling. (Referring to Table B shows that 4 degrees is satisfactory for 8" pipe.)

3. Then, by checking the offset column above, we find that the required curve can be made by offsetting each 13 ft. length 10.9".

Note: If the radius had been shorter, say 125 ft., the deflection at couplings would be too great and the curve should be eased up or short lengths used if they were available. The table (see second column) shows that 6½' lengths on a curve of 125 ft. radius would give 3 degrees deflection per coupling.

If the offset exceeds the maximum recommended deflection the curve is too sharp to allow the use of full lengths. When short lengths are used, the maximum deflection at each coupling cannot be any greater than for the full length — but, since there will be more couplings in the same length of line, a sharper curve can be made. (See Fig. 12)

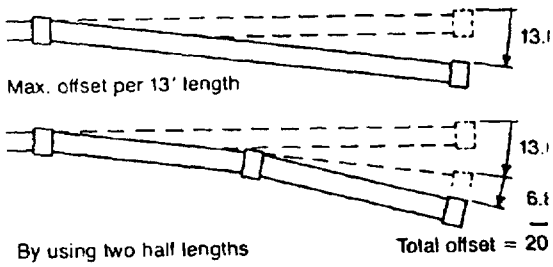


Fig. 12 Short lengths allow sharper curves.

Width of trench

Sometimes a wide trench will be necessary. In other cases the soil will be such that a narrow cut could be made. Whatever width may be used at the *top* of the trench, be sure that, for pipe sizes above 16", at the pipe-level, it is kep between the maximum and minimum widths given in the Transmission Pipe Handbook TR639. There are two reaso for this:

1. **Loads on pipe.** The wider the trench at the top level of t pipe, the greater the earth load on the pipe will be up to t transition width. To determine the exact loads on pipe, consult the engineer. It is desirable to keep earth loads o pipe lines at a minimum. As Figure 13 shows, no additio earth load will result from wide, sloping trenches so lon as the extra width is kept above the pipe. It's the width a the top level of the pipe that determines the extra earth load.



UCC 015711

Repairs to Damaged Pipe

When pipe has been damaged and repair is required, all damaged material may be replaced in kind or the pipe may be repaired using a repair clamp or other methods authorized by the engineer.

1. Bruises are caused by heavy impact against such things as timber and iron edges, rocks, other pipes and fittings. This can result in a breakdown by crushing of the pipe-wall under the bruise. The weakened spot may blow out under high pressure or may cause seepage through the pipe and a blow-out at some future time. This condition is usually indicated by bulging and broken structure on the inside surface of the pipe or by cracks.

2. Whether the blow results in a bruise or in a hole through the pipe-wall, some or all of the pipe will still be useable. As shown in Fig. 67, bruises and punctures can be repaired with repair clamps.

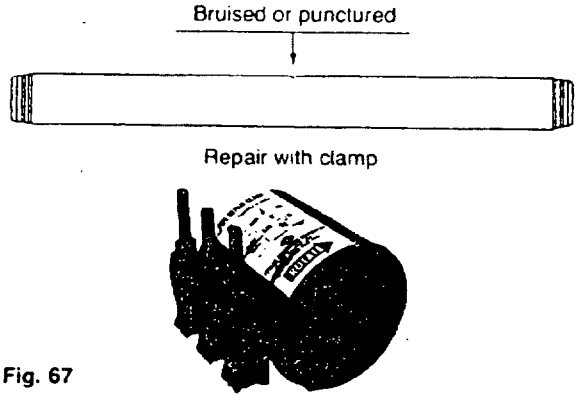


Fig. 67

If a repair clamp is to be used the full circle type with opposed bolt-line flanges is recommended and should be installed in accordance with the manufacturer's instructions. When using a repair clamp the area on the pipe barrel around which clamp will be placed should first be cleaned with a wire brush. Apply Ring-Tite lubricant to the cleaned area — (to help seat the rubber lining smoothly during final adjustments). The clamp is then put around the pipe with the nut position on top for easy access. After the nuts have been tightened lightly the clamp should be rotated slightly in the same direction as the overlap of the rubber lining to assure its smoothness. The nuts are then tightened so as to distribute the pull evenly on all the bolts and the repair is completed. Either clamp shown in Fig. 67 or 68 is suitable for either repair.

3. If the pipe has been broken cleanly into two pieces the ends can be joined together with a repair clamp.

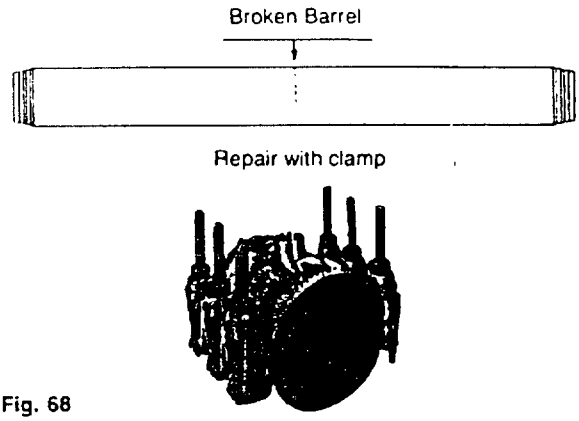
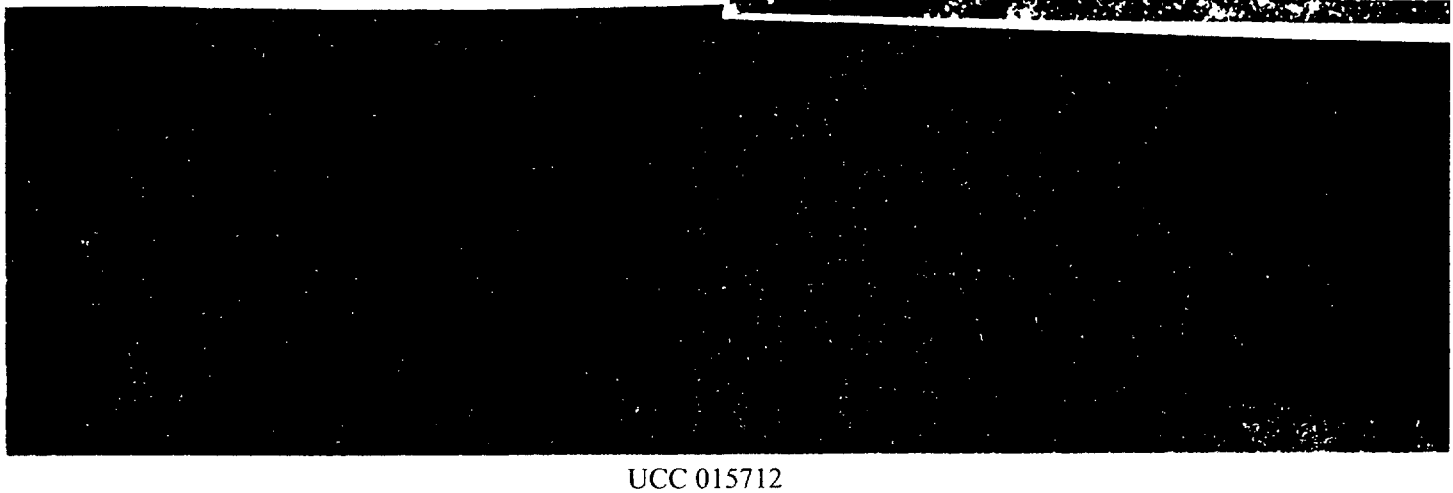


Fig. 68

4. Chips that extend more than ½" in as shown in Fig. 69 should be trimmed off and the end re-machined with a field machining tool as described on page 42. Test with a knife point to make certain that pipe is sound beyond the chip—or wet the area with water and, as the pipe dries, a crack will become visible because it remains wet longer. It is advisable, before field-machining, to trim an extra inch off to be certain of reaching undamaged material.

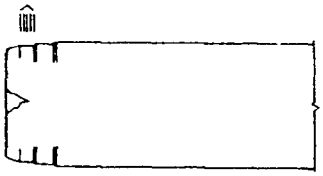


UCC 015712

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Chipped End

Ring Area



Trim off to sound pipe and re-machine.

Trim back beyond any crack that may exist.

(See page 99.)

FIG. 69

5. Cutting, or abrading the pipe is another type of abuse that may require repair. This takes the form of gouging, scratching, chipping and scraping actions which cut or wear away some part of the pipe surface. Such damage is caused by carelessly dragging pipe across sharp objects; by dragging heavy, rough objects across the pipe; or by constant friction against protruding bolt-heads, rubbing action of wires, etc.

6. On the machined end of the pipe (where water-tightness is attained by sealing with rubber rings) grooves and scratches that run lengthwise, and would be in the rubber ring area, will have to be repaired or trimmed off and re-machined. Refer to Fig. 70. Slight scratches (not over 1/16" deep and no wider than ¼") can be repaired by sanding the sharp edges so that the rubber rings will seat properly on the pipe. Wider or deeper scratches will prevent the ring from sealing properly and should be trimmed off.

7. Scratches that run around the pipe will not cause trouble if the rubber ring will fully cover the scratch (see Fig. 70) —but, if the ring will cross it at an angle, it would cause leakage and should be repaired or trimmed off as described above.

8 At other points along the barrel of the pipe (where the Ring-Tite Coupling and rubber rings are not used) a cut or abrasion that is larger than ⅛" deep, ½" wide and 2" long should be repaired with a clamp

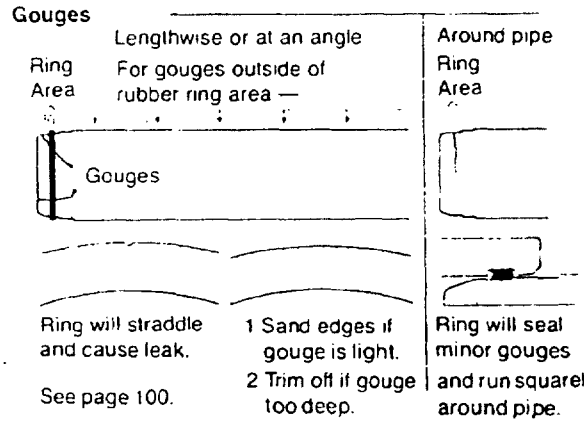


Fig. 70

UCC 015713

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UGP-5

UNDERGROUND PIPING NEWSLETTER

PVC

A UCC Chemicals/Plastics Standard Underground Valve and Piping Specification for Polyvinyl Chloride (PVC) or Chlorinated Polyvinyl Chloride (CPVC) piping does not exist. Three explosions of PVC pipe used for potable water supply have been reported in the State of Washington. One of these explosions destroyed about 600 feet of pipe. Apparently, the hypochlorite used for disinfecting potable water piping systems reacts with the pipe bonding solvents used by some manufacturers creating an inadvertent pipe bomb.

Potable water passing through PVC piping does pick up unpolymerized residuals of the material. Concentrations, however, are below the level now considered to have adverse effects on experimental animals. Recent studies verify the VC concentration by gas chromatography examination. The newest installations tested show a higher VC concentration than the older systems.

The temperature limitation for PVC piping is 120°F and for CPVC, 180°F. The temperature-pressure curve decreases rapidly as the temperature exceeds 73.4°F (20°C), e.g., the design pressure of PVC must be derated by 50% if the anticipated temperature is 110°F. (R)

Bell and spigot plastic piping joined with rubber O-rings must be restrained at intersections, changes of direction, and reductions in pipe size. Concrete thrust blocks are the only known method of restraint for plastic piping. Thrust blocks use valuable real estate, are usually oversized since accurate soil-bearing data is rarely available, and create local subsidence that could damage the pipe. The concrete block adds to material and labor costs and precludes extension of trunk headers and branches.

Some manufacturers are now promoting large thread joints to overcome restraint and solvent problems and are over wrapping the PVC with Reinforced Thermosetting Resin (FRP) to increase the structural strength of the piping and fittings.

AC

Asbestos cement (transite) piping systems are losing popularity due to poor structural strength, manufacturing problems with asbestos fibers, external erosion in low pH soils, and internal bacteriological attack. Studies are currently in progress to determine the concentration of asbestos fibers in potable water supply systems using AC piping. Thrust blocks are also required for this piping system.

A Standard Underground Valve and Piping Specification for AC piping does not exist.

L. A. Peggs
February 1978
Revised: November 1978

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