HDPE or PVC

ONE DESIGNERS PERSPECTIVE

Where <u>should</u> you use HDPE?

• Shifting soils (landfills/slopes/sand)

TRUMP LINKS – FERRY POINT



- Shifting soils (landfills/slopes)
- Corrosive soils (DI fittings?)



- Shifting soils (landfills/slopes)
- Corrosive soils (DI fittings?)
- Challenging terrain



HDPE – WHERE, WHY, AND WHY NOT

- Shifting soils (landfills/slopes)
- Corrosive soils (DI fittings?)
- Challenging terrain
- Directional boring



Where should you <u>not</u> use HDPE?

Certain bridge crossings

338' FROM END TO END



- Certain bridge crossings
- Cost is a significant concern



AS MUCH AS \$250,000 PREMIUM

- HDPE = 0.80 0.82 /lb
- PVC = 0.78 0.80 / lb
- 12" DR11 4710 HDPE = 18.5 lb/ft=\$15.17/ft
- 12" CL200 PVC = 15.8 lb/ft=\$12.32/ft
- 14"DR11 4710 HDPE = 22.3 lb/ft = \$18.29/ft

- Certain bridge crossings
- Cost is a significant concern
- Where large temp swings occur

- Thermal Expansion of HDPE
- Pressure de-rate with temperature increase



- Certain bridge crossings
- Cost is a significant concern
- Where large temp swings occur
- Water with high chlorine content



VERY STRONG OXIDIZING AGENT!

Las Vegas, NV; HDPE Service Line Failures:

Las Vegas Valley Water District (LVVWD) delivers water to over 1 million people in the Las Vegas Valley. Beginning in the early 1970's LVVWD began using polyethylene (HDPE) service laterals to deliver water from the mains to homes. In 1980, large numbers of HDPE service lines began to fail. Of the 80,000 HDPE service lines originally installed, about 56,000 are still in service, but the District is experiencing about 1500 failures per year.¹ One of the key causes of the failures as determined by LVVWD is oxidation of the HDPE service line which leads to brittle failure and cracking.²



HYBRID SYSTEMS? ABSOLUTELY!

- PVC MAINLINE/ HDPE LATERAL
 - FEWER 2" FITTING LEAKS OVER TIME
- HDPE MAINLINE / PVC LATERAL
 - EASIER LATERAL REPAIRS/CHANGES

HDPE STANDARDS STILL A MOVING TARGET!

Working on standards that everyone can agree on

PPI and manufacturers = no de-rating for unknown surge ASABE (ANSI/ASAE S376.2) revised 2015 = De-rate same as other thermoplastic material (ie 72-78% of PR)

HDPE – WHERE, WHY, AND WHY NOT Thermal expansion

- HDPE: 1.2" / 10 deg F / 100 ft
- PVC: 0.33" / 10 deg F/ 100 ft
- Ductile Iron: 0.07" / 10 deg F / 100 ft

Example: 300' bridge in Las Vegas July: High temp = 115, Low temp = 80 HDPE: $1.2 \times 3.5 \times 3 = 12.6$ " PVC: .33 x 3.5 x 3 = 3.46" DI: .07 x 3.5 x 3 = 0.74"

FITTING PRESSURE RATING IS NOT ALWAYS THE SAME AS THE PIPE PRESSURE RATING!

- 4710 DR11 <u>PIPE</u> = 202 psi
- DR9 <u>MOLDED FITTING</u> = 250 psi
- DR11 <u>MOLDED FITTING</u> = 200 psi
- DR17 <u>MOLDED FITTING</u> = 125 psi

WHAT ABOUT A FABRICATED FITTING ?

WHAT ABOUT A FABRICATED FITTING ?? VARIES BY MANUFACTURER!

2" THROUGH 12"

- MOLDED 90
- 5-SEGMENT 90
- 3-SEGMENT 90

- = 200 psi
- = 161 psi (80%)
- = 126 psi (63%)

• 14" – ANY GUESSES?

YOU CAN'T GET 14" (or larger) FITTINGS MOLDED

- DR11 5-SEGMENT 90 = 161 psi
- DR11 3-SEGMENT 90 = 126 psi
- DR9 5-SEGMENT 90 =202 psi
- DR9 3-SEGMENT 90 =164 psi
- TO KEEP THE 200 PSI RATING, YOU NEED TO GO TO <u>5-</u> <u>SEGMENT DR9</u> FITTINGS FOR <u>DR11</u> PIPE FOR THIS MANUFACTURER.

WHAT HAVE WE LEARNED ??

- MATCH WALL OF PIPE AND FITTING OR NOT MORE THAN 1 DR DIFFERENCE (MACHINE TO MATCH)
- BEWARE OF PRESSURE DERATING
- USE MOLDED FITTINGS UNLESS YOU HAVE NO OPTION (14" +)
- EVERY WELD IS A POSSIBLE LEAK

WHAT HAVE WE LEARNED ??

REMEMBER THERMAL EXPANSION?

- DERATE FOR TEMPERATURE (per PPI)
 - </=80 DEGREES = 1.0
 - 100 DEGREES = 0.78
 - 120 DEGREES = 0.73

Example: 6" DR11 HDPE, 4710 material In Las Vegas @ 120 degrees? 200 psi x .73 temp = 146 psi (x .72 SURGE = 105 psi)

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WHAT HAVE WE LEARNED ??

- Size for size, PVC v HDPE:
 - 12" CL200 PVC: 5 fps = 1650 gpm (0.26/100')
 - 12" DR11 HDPE: 5 fps = 1298 gpm (0.29/100')

- 6" CL200 PVC: 5 fps = 450 gpm (0.57/100')
- 6" DR11 HDPE: 5 fps = 351 gpm (0.62/100')





6000 GPM @ 125 PSI

(Internet Photo)



