

# Achieving Net Zero Energy with Plastic Piping Solutions

A presentation by the Plastics Pipe Institute  
for 2019 Solar Decathlon - Design Challenge

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# Who is the Plastics Pipe Institute?

**PPI was formed in 1950 to develop test methods for plastic pressure pipes**

- PPI's five divisions focus on piping solutions for multiple applications:
  - Drainage, Energy, Municipal & Industrial, Power & Communications, and the **Building & Construction Division (BCD)**
- BCD products include: CPVC, PEX, PE-RT, HDPE, and PP pressure pipes



- Applications for these materials include Plumbing, Fire Protection, Hydronic Heating & Cooling, Ground-source Geothermal Heating & Cooling systems.

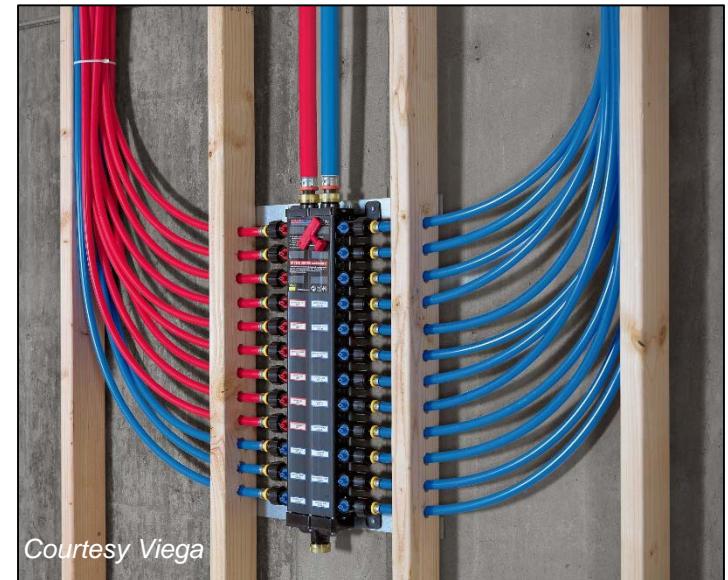
# Plastic Piping Solutions - Plumbing

## Hot- and Cold-Water Plumbing Distribution

- PEX, PE-RT and CPVC are used for residential plumbing supply pipes
- CPVC and PP are commonly used in commercial applications
- Some systems use both flexible (PEX, PE-RT) and rigid (CPVC, PP) pipes

## System Benefits:

- Optimized designs can save water
  - Hot-water recirculation reduces waste
- Plastic pipes are corrosion-resistant
- Pipes are quieter and transfer less heat
- Can provide benefits for **Operation, Comfort & Environmental Quality**



# Plastic Piping Solutions - Safety

## Fire Protection

- CPVC is used for residential fire protection applications built according to codes **NFPA 13D** and **13R**; PEX systems are used for **NFPA 13D** systems
- Each pipe must be tested and third-party certified for FP applications

## System Benefits:

- FP systems stop fires where they develop
  - Systems save lives and reduce property damage
- Often mandated by building codes
- Can provide benefits for **Innovation, Engineering, Operation, Market Appeal**



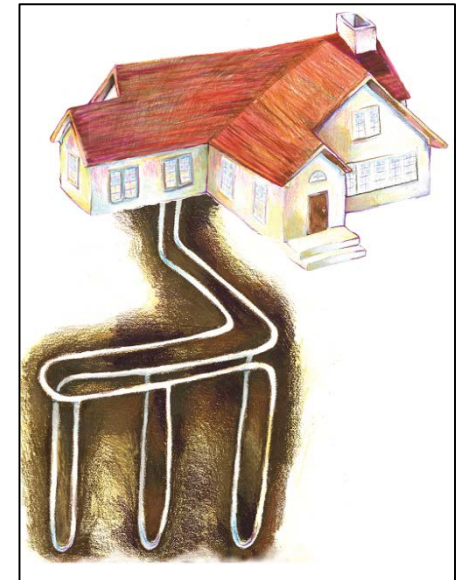
# Plastic Piping Solutions – Energy Source

## Ground Source Geothermal

- Ground source heat pumps are the most efficient source of heating and cooling energy for any type of building (vs. VRF, boilers, chillers, etc.)
- HDPE, PEX, PE-RT and PP piping materials are used for ground loop piping

## System Benefits:

- Geothermal heat pumps can have efficiencies (COP) greater than 450% when operating in heating mode
- Heat is rejected to the earth when cooling (high EER)
- Heat pumps are indoors, out of sight, no noise
- Can provide benefits for **Energy Performance, Engineering, Resilience, Financial Affordability**



# Plastic Piping Solutions – Heating & Cooling

## Radiant Heating, Radiant Heating & Cooling

- PEX or PE-RT tubing is embedded in floors, walls or ceilings
- Heated or chilled water is circulated through the tubing for energy transfer
- The most comfortable and efficient method to heat or cool any space

### System Benefits:

- Improved thermal comfort, silent
- Architectural freedom, invisible
- Energy flexibility, controllability
- Higher overall system efficiency
- Benefits for **Energy Performance, Comfort & Environmental Quality**



# Plastic Piping Solutions – Summary

**Many industry resources are available to assist with design**

- **RPA (Radiant Professionals Alliance):** Guides, Manuals @ [www.radiantpros.org](http://www.radiantpros.org)
- **HIA (Hydronics Industry Alliance):** Building Efficiency System Tool (BEST software) for commercial system HVAC design @ [www.radiantprofessionalsalliance.org/hia](http://www.radiantprofessionalsalliance.org/hia)
- **IGSHPA (International Ground Source Heat Pump Association):** Guides, manuals, videos, rebate information @ [www.igshpa.org](http://www.igshpa.org)
- **GEO (Geothermal Exchange Organization):** Consumer info @ [www.geoexchange.org](http://www.geoexchange.org)
- Start at [www.plasticpipe.org/building-construction](http://www.plasticpipe.org/building-construction) go to **Education** tab, click on **DOE Programs**, then open page for **2019 Solar Decathlon** – the best place to start!

**Thank you, and Good Luck!**