Innovative Water Management Solutions

Advancing quality of life through sustainable solutions to water management challenges.

Capture ➔ Conveyance ➔ Storage ➔ Treatment

Precipitation ➔ River

Pipe Products Portfolio
- HP Storm
- N-12®
- Mega Green™
- StormTech®
- StormEdge™
- Single Wall
- Inlet Tires®
- Triple Wall
- PolyFlex™

Allied Products Portfolio
- StormTech®
- Nylodren®
- Water Quality
- Inlet Filters
- Inserts Tee®
- Duraslot®
- Geosynthetics
- Fittings
- Duraslot®
**Benefits of Polypropylene Pipe**

- **Polypropylene Plastic Resin**
  - Virgin Resin
  - Opaque in Color
  - Grey in Color
  - Added to Enhance Post Installation Inspection

- **Titanium Dioxide**
  - Gray in Color
  - Protects against UV degradation

- **20 Feet Lengths**

- **Durability**
  - High Abrasion Resistance
  - Impact Resistance
  - Superior Chemical & Corrosion Resistance

- **Joint Performance**
  - Joint Integrity
  - Sanitary Grade Joints

- **Elongated In-Line Bell & Spigot Design**
- **Sanitary Sewer Grade Joint**
- **Gasketed Water-Tight Joints**

**Polypropylene Resin**

Polypropylene is a completely different resin than HDPE.
Standard 20 Feet Lengths

Durability
Superior durability when compared to competition.

Joint Performance

Bell Holes
HP Pipe Inline Bell
RCP & PVC Oversized Bell
Joint Integrity

Polypropylene Approvals/Specifications

HP Storm Timeline
HP Storm has evolved significantly since its introduction in 2009

- Over 35 State DOT Approvals
- Under Interstate Highways
- Florida and Pennsylvania DOT issued 100-year DSL
- Nationally Recognized Organizations

Polypropylene Pipe National Approvals
**LRFD Design Methodology**

Polypropylene Pipe utilizes AASHTO Bridge Design Specifications

AASHTO LRFD Section 12.12
- Minimum Strength and Rigidity Requirements
- Deflection Requirements

Project Specific Calculations
- Live Load Deflection
- Project Specific Requirements

Multiple Live Loads
- AASHTO HS20, HS25, HL-93 Highway Loads
- Aircraft Loading
- Rail Loading
- Custom Loading

**LRFD Design Methodology**

\[ P_F = \eta_{EV} \left( \gamma_{EV} \cdot K_2 \cdot VAF \cdot P_{SP} + \gamma_{WL} \cdot P_W \right) + \eta_{LL} \cdot \gamma_{LL} \cdot C_L \cdot P_L \]

- Earth Load
- Hydrostatic Load
- Live Load
- Dead Load

- Design Methodology

- Polypropylene Pipe

- AASHTO M330

- ASTM F2881

- Watertight Joint (lab) ASTM D3212
- Watertight joint (field) ASTM F1417
- Installation ASTM D2321
- Stiffness ASTM D2412
- Gasket ASTM F477
- Resin ASTM D4101
Structural Integrity

Calculation Factors

Load Factors: Resistance Factors:

- Earth fill factor, \(T_{EF}\): 1.3
- Tensile resistance factor, \(\phi_T\): 1
- Installation factor, \(K_{IP}\): 1.5
- Buckling resistance factor, \(\phi_B\): 0.7
- Overall Earth fill factor, \(K_{EF}\): 1.35
- Flexure resistance factor, \(\phi_F\): 1
- Hydrostatic pressure factor, \(K_{HWP}\): 1.5
- Soil stiffness factor, \(\phi_S\): 0.9
- Line Load Factor, \(T_{LL}\): 1.75

Evaluation Results

- Stored Compressive Strain: Strain is within Acceptable Limits
  Evaluate to determine if strain due to thrust exceeds material's factored strain limit
- Buckling Strain: Strain is within Acceptable Limits
  Evaluate to determine if strain due to general buckling exceeds the material's factored strain capacity for buckling
- Combined Tension Strain: Strain is within Acceptable Limits
  Evaluate to determine if strain due to tension exceeds the material's factored strain capacity for tension

Pipe Installation

Delivery & Handling

ADS has a full fleet of trucks in Texas that make delivery easier on contractors. More linear footage of Polypropylene Pipe can be stored on one truckload than competitors.
Spigot Preparation & Field Cuts
Both Spigot Preparation and Field Cuts are quick and easy.

Joint Assembly
Multiple options are available for aligning and homing pipe.

Instructions
- Remove Wrap from Gasket
- Clean Bell & Spigot
- Apply Lube to Bell & Spigot
- Align Pipe and Push Home

Installation Direction
Pipe should be installed in the downstream direction, with the bells facing upstream.

Standard & Custom Fittings
Standard Fittings include Tees, Wyes, Reducers and End Caps. Custom Fittings can be made for specific project applications.

Dissimilar Material Connections
Polypropylene Pipe Adapters, Connections and Fittings are available for virtually any pipe type.
Splice & Repair Couplings

Mission Rubber, Nyloplast Slip Couplers and Fernco Couplers Test to Sanitary Grade Connection.

Manhole Connections

Non-Shrink Grout or Concrete Collar Connections are Common.

Trench Installation Detail

HP STORM TRENCH INSTALLATION DETAIL

<table>
<thead>
<tr>
<th>MIN TRENCH WIDTH</th>
<th>MIN TRENCH DEPTH</th>
<th>MIN COVER TO FLEXIBLE FABRIC</th>
<th>MIN COVER TO REBAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>14&quot;</td>
<td>16&quot;</td>
<td>6'</td>
<td>4'</td>
</tr>
<tr>
<td>16&quot;</td>
<td>18&quot;</td>
<td>8'</td>
<td>6'</td>
</tr>
<tr>
<td>18&quot;</td>
<td>20&quot;</td>
<td>10'</td>
<td>8'</td>
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Table 3

<table>
<thead>
<tr>
<th>Diam (cm)</th>
<th>Crushed Rock</th>
<th>30% GC</th>
<th>40% GC</th>
<th>20% GC</th>
<th>30% CL</th>
<th>40% CL</th>
<th>20% CL</th>
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<tbody>
<tr>
<td>12&quot; (305mm)</td>
<td>41</td>
<td>21</td>
<td>28</td>
<td>21</td>
<td>18</td>
<td>20</td>
<td>16</td>
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<td>15&quot; (375mm)</td>
<td>42</td>
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<td>29</td>
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<td>18</td>
<td>21</td>
<td>18</td>
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<tr>
<td>18&quot; (457mm)</td>
<td>44</td>
<td>21</td>
<td>30</td>
<td>21</td>
<td>18</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>24&quot; (609mm)</td>
<td>50</td>
<td>21</td>
<td>31</td>
<td>21</td>
<td>18</td>
<td>16</td>
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<tr>
<td>30&quot; (762mm)</td>
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<td>32</td>
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Maximum Cover

<table>
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<tr>
<th>Crushed Rock</th>
<th>30% GC</th>
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<td>32</td>
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<td>18</td>
<td>16</td>
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</table>
Minimum Cover

Minimum Cover Requirements for ADS HP Storm with AASHTO H-25 or H-62 Load

<table>
<thead>
<tr>
<th>Inside Diameter (In.)</th>
<th>Minimum Cover</th>
<th>Minimum Cover</th>
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</thead>
<tbody>
<tr>
<td>12-3/8&quot;</td>
<td>1.0&quot;</td>
<td>1.0&quot;</td>
</tr>
<tr>
<td>14-1/2&quot;</td>
<td>1.3&quot;</td>
<td>1.3&quot;</td>
</tr>
<tr>
<td>16-3/8&quot;</td>
<td>1.5&quot;</td>
<td>1.5&quot;</td>
</tr>
<tr>
<td>20-3/8&quot;</td>
<td>1.6&quot;</td>
<td>1.6&quot;</td>
</tr>
<tr>
<td>24-1/8&quot;</td>
<td>1.9&quot;</td>
<td>1.9&quot;</td>
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</tbody>
</table>

Open Competition & Cost Analysis

Open vs. Closed Bid Competition

<table>
<thead>
<tr>
<th>Pipe Diameter (In.)</th>
<th>Closed Competition</th>
<th>Open Competition</th>
<th>% Savings from Open Competition</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>$140,750</td>
<td>$120,000</td>
<td>17%</td>
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<tr>
<td>36</td>
<td>$145,500</td>
<td>$122,500</td>
<td>16%</td>
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<tr>
<td>24</td>
<td>$182,000</td>
<td>$149,000</td>
<td>21%</td>
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<tr>
<td>18</td>
<td>$205,000</td>
<td>$156,000</td>
<td>24%</td>
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<tr>
<td>12</td>
<td>$224,000</td>
<td>$158,000</td>
<td>34%</td>
</tr>
</tbody>
</table>

Simulated 1 Mile Install at 24" & 6000 psi Pipe

<table>
<thead>
<tr>
<th></th>
<th>Closed Competition</th>
<th>Open Competition</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-1/2&quot;</td>
<td>$290,000</td>
<td>$220,000</td>
<td>$70,000</td>
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</tbody>
</table>

Pipe Value Tool

Welcome to the Pipe Value Tool

See How the ADS Pipe Value Tool Works

New User
Returning User

Use Tool As Guest
Sample Project

Project Overview

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Total Length (ft)</th>
<th>Pipe Cost ($)</th>
<th>Installation Rate (ft/hr)</th>
<th>Total Installation Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP Storm</td>
<td>18&quot;</td>
<td>$900</td>
<td>200</td>
<td>$700</td>
</tr>
<tr>
<td></td>
<td>24&quot;</td>
<td>$1,800</td>
<td>100</td>
<td>$1,800</td>
</tr>
</tbody>
</table>

HP Storm - Delivery & Stringing

Miles/Truck: 2500
Cost/Hr: 0.34

Jobsite & Installation Metrics

<table>
<thead>
<tr>
<th></th>
<th>HP Storm</th>
<th>HP Storm</th>
<th>HP Storm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Installation Days</td>
<td>8 Days</td>
<td>10 Truckloads</td>
<td>10 Days</td>
</tr>
<tr>
<td>Number of Truckloads</td>
<td>4 Truckloads</td>
<td>10 Truckloads</td>
<td>13 Truckloads</td>
</tr>
<tr>
<td>Number of Joints</td>
<td>13 Days</td>
<td>5 Joints</td>
<td>136 Joints</td>
</tr>
</tbody>
</table>

Cost Comparison Summary

<table>
<thead>
<tr>
<th></th>
<th>HP Storm</th>
<th>HP Storm</th>
<th>HP Storm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost ($000)</td>
<td>10,900</td>
<td>1,900</td>
<td>10,000</td>
</tr>
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QUESTIONS?