



ADS

HP Storm – Polypropylene Pipe

September 14, 2023

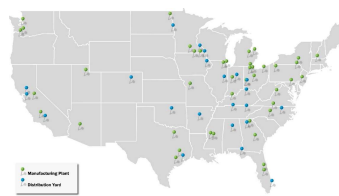
Riley O'Brien, P.E.
Regional Engineer

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ADS: Our reason is water.™

- \$3.1+ billion**
PY 2023 Revenue
- 12+ billion**
Feet of ADS pipe in service around the world today
- 500+ million**
Pounds of plastic recycled annually by ADS
- 1st**
In Corrugated Plastic Pipe
- 350+**
Total Number of Product Solutions
- 5500+**
Solutions Providers

Expansive Footprint
ADS' scale and footprint enables us to meet your specific needs, wherever you are



- ~70**
Domestic & International Manufacturing Plants
- 38+**
Distribution Centers Across US, Canada, Europe, Middle East
- 80+**
International Countries Served
- 700 Trucks & 1,300 Trailers**
Company-Owned Fleet

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Innovative Water Management Solutions
Advancing quality of life through sustainable solutions to water management challenges.



Precipitation → **Capture** → **Conveyance** → **Storage** → **Treatment**

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Innovative Water Management Solutions

Pipe Products Portfolio

- HP Storm
- N-12®
- Mega Green™
- Single Wall
- SaniTite® HP
- AdvanEDGE®
- Triple Wall
- PolyFlex™

Allied Products Portfolio

- StormTech®
- Nyloplast®
- Water Quality
- Inlet Filters
- Inserta Tee®
- Arc Chamber
- Geosynthetics
- Fittings
- Duraslot®

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Benefits of Polypropylene Pipe

- Polypropylene Plastic Resin**
 Impact Modified Copolymer
 Twice as Stiff as HDPE
 Titanium Dioxide
 Grey in Color
- 20 Feet Lengths**
 3x Faster Installation
 Reduced Number of Joints
 Lightweight
 Safer
- Durability**
 High Abrasion Resistance
 Impact Resistance
 Superior Chemical & Corrosion Resistance
- Joint Performance**
 Elongated In-Line Bell & Spigot Design
 Sanitary Sewer Grade Joint
 Gasketed Water-Tight Joints

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Polypropylene Resin

Polypropylene is a completely different resin than HDPE.

<p>Virgin Resin Crisper in Color</p>	<p>Grey Color Added to Enhance Post Installation Inspection</p>	<p>Titanium Dioxide Protects against UV degradation</p>	<p>Joint Integrity Sanitary Grade Joints</p>
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Standard 20 Foot Lengths

FEWER JOINTS
FASTER INSTALLATION

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Durability

Superior durability when compared to competition.

Material	% Invert Loss
PP	~5
PVC	~15
CSP	~10
CAP	~8
CON	~55

Abrasion Resistance
Superior invert durability in highly abrasive environments

Impact Resistance
Resistance to Effects During Construction

Chemical & Corrosion Resistance
Inert Material, not affected by gas, hydrogen sulfide or sulfuric acid

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Joint Performance

BELL WRAP
ASTM F477 GASKET (TYP)
OUTSIDE DIAMETER
INSIDE DIAMETER
JOINT #1 ORIENTATION

CEMENT/POLYMER COMPOSITE
IN-LINE BELL O.D. ELIMINATES NEED FOR BELL HOLE IN TRENCH
FLARED BELL SPRING UP TO TWO GASKETS
PATENTED WATERPOOF GASKET INCREASES SEALING FORCE AND MEETS ASTM F 477
TAPERED SPIGOT MAKES INSTALLATION EASY

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Bell Holes

HP Pipe Inline Bell
RCP & PVC Oversized Bell

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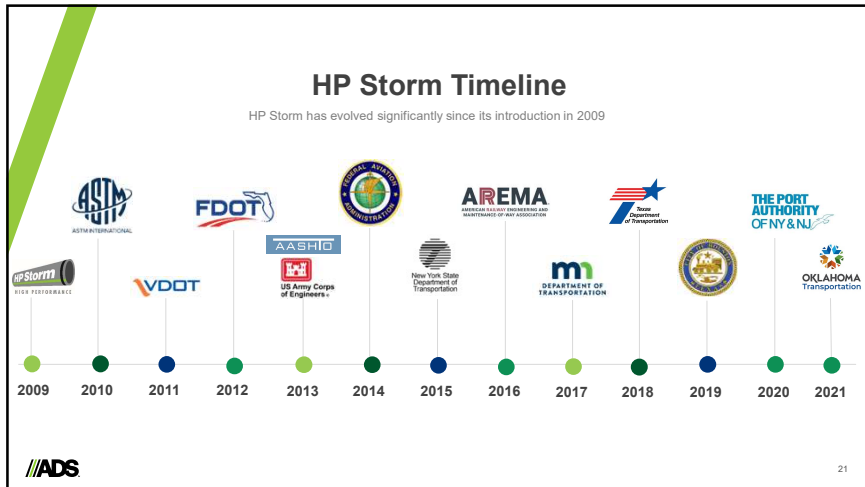
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Polypropylene Pipe National Approvals

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

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AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

AASHTO
THE VOICE OF TRANSPORTATION

AASHTO M330
Standard Specification for Polypropylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter

Section 30: Thermoplastic Culverts

Materials
Assembly
Installation
Inspection



ASTM F2881
Standard Specification for 12 to 60 in. [300 to 1500 mm] Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications

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

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Design Methodology



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LRFD Design Methodology
Polypropylene Pipe utilizes AASHTO Bridge Design Specifications



-  **AASHTO LRFD Section 12.12**
Structural Design of Polypropylene Pipe
Outlines Strain Limits
Deflection Requirements
-  **Project Specific Calculations**
Specific Traffic Loads
Multiple Pipe Sizes
Cover and Backfill Requirements
-  **Multiple Live Loads**
AASHTO HS20, HS25, HL-93 Highway Loads
Aircraft Loading
Rail Loading
Custom Loading

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LRFD Design Methodology

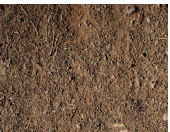


$$P_F = \eta_{EV} (\gamma_{EV} \cdot K_2 \cdot K_{\gamma E} \cdot VAF \cdot P_{SP} + \gamma_{WA} \cdot P_W) + \eta_{LL} \cdot \gamma_{LL} \cdot C_L \cdot P_L$$

Earth Load

Hydrostatic Load

Live Load

Dead Load

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Calculation Factors

Only Strength Limit I factors are summarized because Strength Limit I will always govern for HDPE or PP plastic pipe design.

Load Factors:	Resistance Factors:
Earth fill factor, γ_{EV} : 1.3	Thrust resistance factor, ϕ_{T} : 1
Installation factor, K_{REV} : 1.5	Buckling resistance factor, ϕ_{B} : 0.7
Overall Earth fill factor, $K_{EV} \gamma_{EV}$: 1.95	Flexure resistance factor, ϕ_{F} : 1
Hydrostatic pressure factor, $K_{WA} \gamma_{WA}$: 1.3	Soil stiffness factor, ϕ_{S} : 0.9
Live Load factor, γ_{LL} : 1.75	

Evaluation Results

Only Strength Limit I factors are summarized because Strength Limit I will always govern for HDPE or PP plastic pipe design.

- ✔ **Factored 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

Deflection Variable	Equation	Value
Total deflection	$\Delta_s = \frac{K_B(D_1 P_{sp}) D_s}{\left(\frac{E_p I_p}{R_s^3}\right) + 0.061 M_s} + \frac{K_B(C_1 P_s) D_s}{\left(\frac{E_p I_p}{R_s^3}\right) + 0.061 M_s} + (e_{sp}(K_{sa})) D = 4.99 \text{ in}$	$\Delta_t = 0.501 \text{ in}$
Percent deflection		$\Delta_p = 1.32\%$
Deflection check	DefCheck = "OK" if $\Delta_s < \Delta_A$ "NG" otherwise	DefCheck = OK

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Structural Integrity



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Pipe Installation




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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.



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Spigot Preparation & Field Cuts

Both Spigot Preparation and Field Cuts are quick and easy.

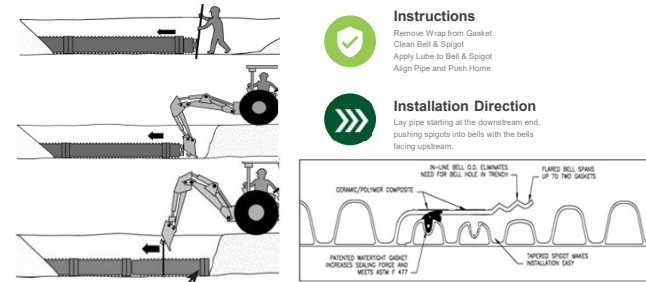


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Joint Assembly

Multiple options are available for aligning and homing pipe.



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Standard & Custom Fittings

Standard Fittings include Tees, Wyes, Reducers and End Caps.
Custom Fittings can be made for Specific Project Applications.



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Dissimilar Material Connections

Polypropylene Pipe Adapters, Connections and Fittings are available for virtually any pipe type.



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Splice & Repair Couplings

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



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Manhole Connections

Non-Shrink Grout or Concrete Collar Connections are Common.



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Trench Installation Detail

HP STORM TRENCH INSTALLATION DETAIL

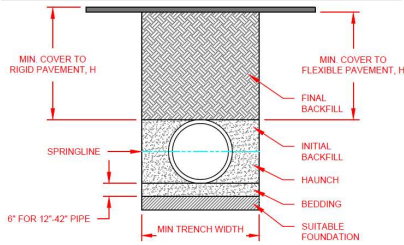


Table 2
Minimum Trench Width

Nominal Pipe Diameter (in.)	Minimum Trench Width (in.)
18	39
24	48
30	57
36	66
42	75

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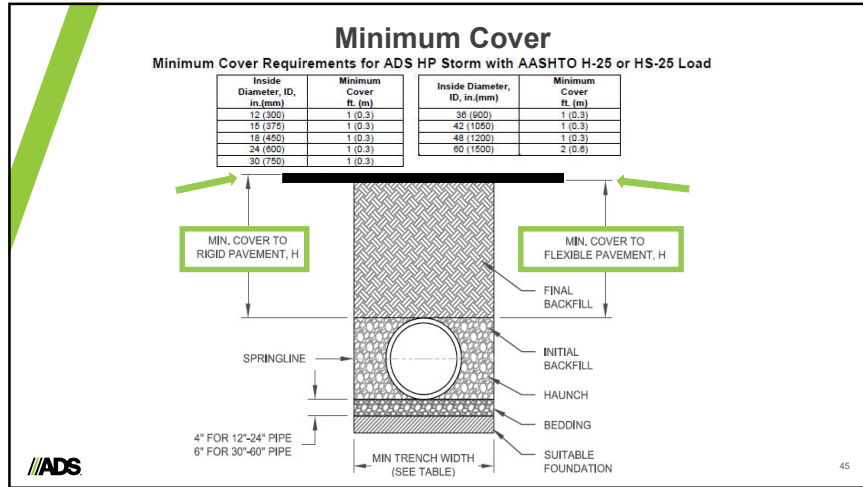
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Maximum Cover

PIPE DIA	Crushed Rock		GW, GP, SW, SP, GW-GC, SP-SM			GM, GC, SM, SC, ML, CL		ML, CL
	COMPACTED	DUMPED	95%	90%	85%	95%	90%	
12" (300mm)	41 (12.5m)	21 (6.4m)	28 (8.5m)	21 (6.4m)	16 (4.9m)	20 (6.1m)	16 (4.9m)	16 (4.9m)
15" (375mm)	42 (12.8m)	21 (6.4m)	29 (8.8m)	21 (6.4m)	16 (4.9m)	21 (6.4m)	16 (4.9m)	16 (4.9m)
18" (450mm)	44 (13.4m)	21 (6.4m)	30 (9.1m)	21 (6.4m)	16 (4.9m)	18 (5.5m)	14 (4.3m)	14 (4.3m)
24" (600mm)	30 (9.1m)	15 (4.6m)	21 (6.4m)	15 (4.6m)	11 (3.4m)	16 (4.9m)	11 (3.4m)	11 (3.4m)
30" (750mm)	39 (11.9m)	19 (5.8m)	27 (8.2m)	19 (5.8m)	14 (4.3m)	19 (5.8m)	15 (4.6m)	14 (4.3m)
36" (900mm)	28 (8.5m)	28 (8.5m)	20 (6.1m)	14 (4.3m)	10 (3.0m)	14 (4.3m)	11 (3.4m)	10 (3.0m)
42" (1050mm)	30 (9.1m)	14 (4.3m)	21 (6.4m)	14 (4.3m)	10 (3.0m)	15 (4.6m)	11 (3.4m)	10 (3.0m)
48" (1200mm)	29 (8.8m)	14 (4.3m)	20 (6.1m)	14 (4.3m)	9 (2.7m)	14 (4.3m)	10 (3.0m)	9 (2.7m)
60" (1500mm)	29 (8.8m)	14 (4.3m)	20 (6.1m)	14 (4.3m)	9 (2.7m)	14 (4.3m)	10 (3.0m)	9 (2.7m)

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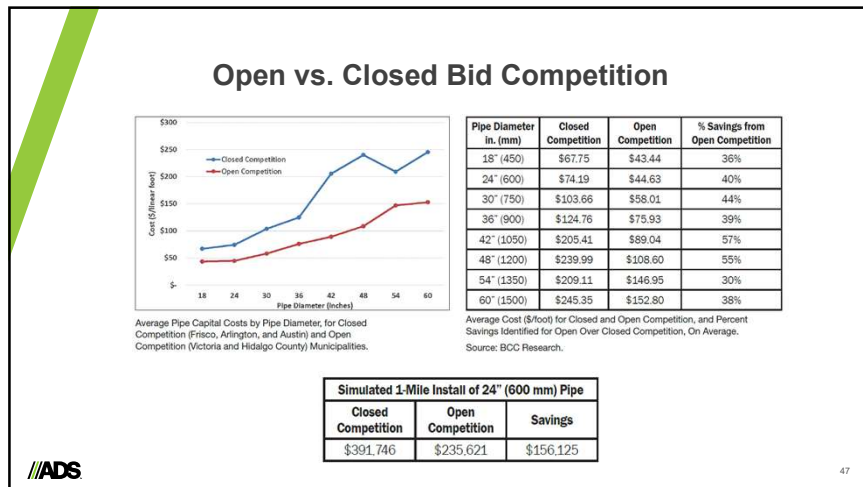
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www.PipeValueTool.com

See How the ADS Pipe Value Tool Works

Welcome to the Pipe Value Tool

Quickly review total installed cost of ADS pipe vs. RCP or CMP.

New User | Returning User

Use Tool As Guest


English | Français

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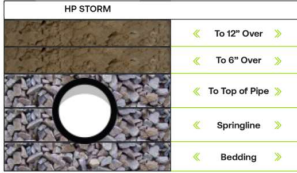
CITY OF MONTGOMERY

Sample Project

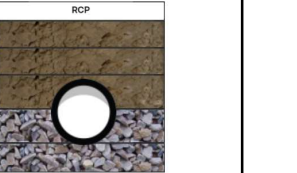


Company	Advanced Drainage Systems
State	Alabama
Area/City	Montgomery
Design Engineer	Perfect Plans, LLC
Site Contractor	Per The Plans Contracting, Inc.
Report Author	Riley OBrien
Phone	4079221846
Email	RileyOBrien@adspipe.com
Units	Imperial

HP STORM



RCP



57, 67 Stone \$85.00/ton Native Soil \$10.00/ton

Project Overview

Pipe Size	Total Length (ft)	Pipe Cost (\$/FT)		Installation Rates (ft/day)		Total Installation Cost/FT	
		HP Storm	RCP	HP Storm	RCP	HP Storm	RCP
18"	240	\$21.08	\$22.89	220	132	\$62	\$79
24"	450	\$35.55	\$38.04	200	100	\$88	\$112
36"	390	\$60.59	\$67.25	160	72	\$143	\$175

HP Storm - Delivery And Stringing		RCP - Delivery And Stringing		Crew Cost (Labor & Equip)	
Minutes/Truck	Cost/hr	Minutes/Truck	Cost/hr	HP Storm	RCP
30 Minutes	\$100.00	45 Minutes	\$150.00	\$800.00/hr	\$700.00/hr

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Cost Comparison Summary

Cost Comparison


Pipe Cost	\$44,687	<div style="width: 80%;"></div>	\$41,152
	\$48,840	<div style="width: 100%;"></div>	Cost Savings 9% Reduction
Crew Cost (Labor + Equipment)	\$27,737	<div style="width: 60%;"></div>	\$37,979
	\$85,716	<div style="width: 100%;"></div>	Cost Savings 58% Reduction
Unloading + Stringing	\$200	<div style="width: 10%;"></div>	\$925
	\$1,125	<div style="width: 100%;"></div>	Cost Savings 82% Reduction
Backfill + Spoils Cost	\$37,185	<div style="width: 90%;"></div>	\$(15,920)
	\$21,245	<div style="width: 25%;"></div>	Cost Savings
Total Installed Cost	\$109,789	<div style="width: 80%;"></div>	\$27,137
	\$136,926	<div style="width: 100%;"></div>	Cost Savings 20% Reduction

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Jobsite & Installation Metrics

Number of Installation Days




HP Storm
8 Days

RCP
13 Days

38% Reduction
5 Fewer Days

Number of Truckloads




HP Storm
4 Truckloads

RCP
10 Truckloads

60% Reduction
6 Fewer Truckloads

Number of Joints



HP Storm
55 Joints

RCP
136 Joints

60% Reduction
81 Fewer Joints

51

51



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