

# N-12<sup>®</sup> Pipe



THE MOST **ADVANCED** NAME IN WATER MANAGEMENT SOLUTIONS™



# THE NEW STANDARD IN DRAINAGE PIPE

Every day for over 50 years, Advanced Drainage Systems corrugated high-density polyethylene (HDPE) pipe has been building its reputation for economy, durability, and superior performance in gravity-flow drainage applications. During the 1970s and 1980s, ADS singlewall pipe became the preferred product for agricultural, mining, turf/recreation, and residential drainage markets.

The hydraulic capabilities of N-12, which is available in diameters 4"-60" (100-1500 mm), were significantly improved in 1987 when ADS introduced the first HDPE drainage pipe to combine an annular corrugated exterior for strength with a smooth interior wall for maximum flow capacity. Named for its excellent Manning's "n" rating of 0.012, N-12 pipe was designed specifically for storm sewers, highways, airports, and other engineered construction. Through extensive field and university testing, ADS engineers were able to refine the corrugated wall design for larger diameters without compromising the pipe's excellent strength-to-weight ratio. Its performance and economy have led to rapid acceptance by contractors and engineers, and official approval by state and municipal agencies. Over the years, the N-12 family of products has expanded to reflect the needs of our end-users. The N-12 family now includes N-12 (per ASTM F2648), N-12 MEGA GREEN® and N-12 (per AASHTO).

## REVOLUTIONARY JOINING TECHNOLOGY

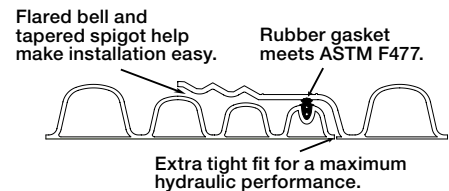
Years of research and testing have produced soil-tight and watertight systems providing unsurpassed joint integrity, with built-in bell joints and fast push-together installation.

**SOIL-TIGHT JOINT:** N-12 ST IB pipe, delivered with an integral bell and spigot joint, meets the most stringent soil-tight requirements. The bell resists distortion, chipping, cracking, and exceeds ASTM F2306. The in-line bell design eliminates the need to dig bell holes in the trench. Joints are sealed by a factory-installed rubber gasket that meets all requirements of ASTM F477.

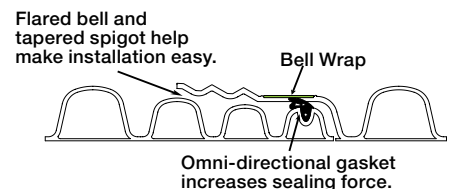
**WATERTIGHT JOINT:** The design is based on the flared bell and tapered spigot of N-12 ST IB pipe, with important differences. A gasket meeting ASTM F477 is factory installed into the spigot, increasing its sealing force as hydrostatic pressure increases. An exterior bell wrap provides a quick visual indicator to customers and inspectors that a watertight product is being used. The design meets or exceeds ASTM D3212 lab test and ASTM F2487 watertight field test requirements, and fills an essential role in complying with the stricter demands of EPA water quality guidelines.

## APPLICATIONS

The products in the N-12 family meet a variety of specifications. This product can be specified for culverts, cross drains, storm sewers, landfills, and other public and private construction. For more information on the N-12 products or to discuss a specific application, contact your local ADS representative.



**N-12 ST IB**



**N-12 WT IB**

# TECHNOLOGY CREATES A SUPERIOR PIPE MATERIAL

Gone are the days when plastic pipe was specified only for cost reasons. Advances in polymer science and structural design have created a product that has actually outperformed and outlasted concrete and metal pipe while maintaining its cost advantage. By any measure, ADS N-12 pipe compares favorably to conventional materials.

## STRUCTURAL STRENGTH

As a flexible conduit, HDPE pipe withstands vertical pressure by transferring most of the load to the surrounding soil. N-12 pipe will support H-25 or HL-93 live loads with 12" (300 mm) minimum cover, while 54" & 60" (1375 & 1500 mm) pipe requires 2' (600 mm) of cover for H-25 or HL-93 loads. (fill height tables are available in the ADS Water Management Drainage Handbook-Tech Note 2.01 and 2.02). Field research done in Ohio and Pennsylvania has placed HDPE pipe under 40 and even 100 feet of fill. Even under some harsh backfill conditions, N-12 pipe has continued to provide outstanding performance.

## DURABILITY

High-density polyethylene is an extremely tough material that can easily withstand the normal impacts involved in shipping and installation. It is highly resistant to chemical attack and is unaffected by soils or effluents with pH ranges from 1.5 to 14. HDPE's ductility and molecular structure result in excellent resistance to abrasion. Polyethylene pipe shows less than 20% of the material loss of concrete pipe in abrasive environments, and is often specified for harsh mine slurries and as a slip liner for deteriorated culverts.

## HYDRAULIC EFFICIENCY

The smooth interior of N-12 pipe provides superior flow characteristics. The chart to the right indicates that the values for N-12 pipe are basically the same as those yielded on previous tests of reinforced concrete pipe. On the other hand, the "n" ratings for corrugated metal pipe are considerably higher, and are predicated on the pipe running full to develop the spiral flow.

## LIGHT WEIGHT

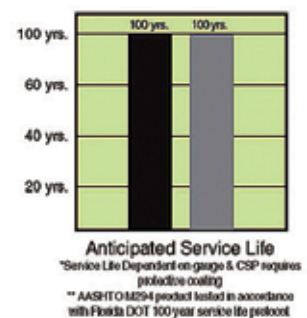
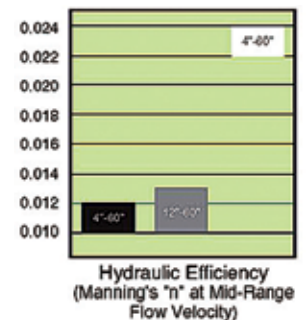
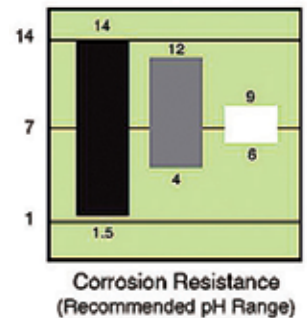
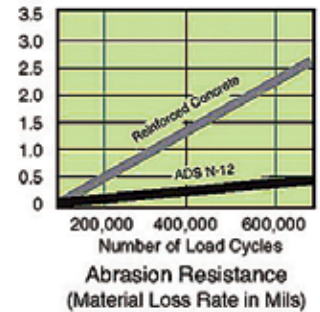
HDPE pipe is up to 30 times lighter than concrete pipe, making it far easier to transport and handle. On-site labor and equipment requirements are reduced, with a corresponding reduction in the potential risk of injury.

## FAST INSTALLATION

Long 20' (6 m) lengths mean fewer joints. (N-12 pipe is also available in 13' (4 m) lengths for shorter trench boxes.) Soil-tight or watertight connections are quick and easy with integral gasketed bell and spigot joints. The pipe cuts easily and does not need to be beveled for joining. In typical trench depths of 6' to 10' (2 to 3 m), contractors report installation rates ranging from 1,200' (365 m) per day of 15"-24" (375-600 mm) pipe to more than 400' (122 m) per day of 60" (1500 mm) pipe.

## HOW HDPE STACKS UP AGAINST THE COMPETITION

- N-12
- Reinforced Concrete
- Corrugated Steel



Anticipated Service Life  
\*Service Life Dependent on gauge & CSP requires protective coating  
\*\* AASHTO M254 product tested in accordance with Florida DOT 100 year service life protocol

## THE LOWEST INSTALLED COST OF ANY DRAINAGE PIPE

The material cost of HDPE is extremely competitive with concrete and corrugated metal. When installation costs are factored in, the savings start to multiply.

- Polyethylene's light weight cuts shipping charges. More lengths of pipe per truck means fewer delivery loads.
- Fewer people are needed for on-site unloading and handling.
- Heavy equipment requirements are reduced.
- Long lengths are easy to handle and require fewer joints.

A recent survey of state Departments of Transportation revealed that reductions in installed cost for HDPE pipe were 12 to 38 percent compared to concrete, and 5 to 28 percent vs. corrugated steel.

### A CHOICE OF JOINING SYSTEMS

1. Integral bell-and-spigot joints. Standard soil-tight and watertight joints (see page 2) are engineered for fast installation of long straight sewer lines that require soil-tight or watertight joint performance.
2. Hinged split couplers and fabricated fittings provide cost effective connections for normal drainage installations. ADS can fabricate virtually any fitting as long as it meets engineering standards.
3. Injection molded HDPE couplers are available on fittings and repair couplers to meet specific joint performance requirements and provide installation savings. Just align the pipe or fitting sections, lubricate the bell and spigot, and push together.
4. Small diameter injection molded fittings. A complete line of fittings including tees, wyes, elbows, couplers and reducers are available in 4"-12" (100-300 mm) diameters for both soil tight and watertight applications.
5. Series 35<sup>®</sup> thermo-molded PVC sanitary fittings meet the 10.8 psi (74.5 kPa) pressure testing requirements of ASTM D3212. Selection includes couplers, tees, wyes, elbows, caps and adaptors, each fitted with a rubber gasket. The fittings connect not only to corrugated HDPE pipe, but can adapt to PVC, concrete and other materials.

### INSTALLATION RECOMMENDATIONS

Proper installation is necessary for the long-term performance of any drainage pipe. The basic procedures and precautions for corrugated polyethylene pipe are quite similar to those for concrete and metal pipe.

N-12 pipe is a flexible conduit. As is the nature of flexible conduits live and dead loads are transferred to the surrounding soil. It is important to properly place and use backfill material that will produce a pipe-soil interaction system capable of withstanding the applied loads. Class I, II, or III soils may be used for backfill material, and should be compacted to at least 90% Standard Proctor Density or as otherwise specified by the engineer.

Instructions for underground installation of plastic drainage pipe are contained in ASTM D2321. Specific instructions for N-12 pipe may be found in the Installation Section of the ADS Water Management Drainage Handbook.



FABRICATED FITTINGS



INJECTION MOLDED FITTINGS

# SPECIFICATIONS

## APPLICABLE STANDARDS

**ASTM F2306**, Standard Specification for 12" to 60" (300 to 1500 mm) Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications

**ASTM D2321**, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications

**ASTM F477**, Standard Specifications for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

**ASTM D3212**, Standard Specification for Joints for Drain and Sewer Plastic Pipe Using Flexible Elastomeric Joints

**ASTM F2487**, Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Corrugated High Density Polyethylene Pipelines

**ASTM F2648/F2648M-07**, Standard Specification for 2" to 60" (50 to 1500 mm) Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications

**ASTM F1417**, Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air

**ASTM F2510**, Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Corrugated High Density Polyethylene Drainage Pipes

**AASHTO M252**, Standard Specifications for Corrugated Polyethylene Pipe, 3" to 10" (75 to 250 mm)

**AASHTO M294**, Standard Specification for Corrugated Polyethylene Pipe, 12" to 60" (300 to 1500 mm)

**AASHTO LRFD Bridge Design Specification, Section 12: Buried Structures & Tunnel Liners**

**AASHTO Section 30**, Construction Standard, Thermoplastic Pipe

**CSA B182.8**, Storm Sewer and Drainage Pipe and Fittings Polyethylene

### Recommended Manning's "n" for Design

Diameter (mm)	N-12	Reinforced Concrete	Corrugated Steel
4"-10" (100-250)	.012	N/A	.024
12"-15" (300-375)	.012	.012	.024
18"-36" (450-900)	.012	.012	.024
42"-60" (1050-1500)	.012	.013	.024

### Pipe Stiffness

Diameter (mm)	N-12
4"-12" (100-300)	50
15" (375)	42
18" (450)	40
24" (600)	34
30" (750)	28
36" (900)	22
42" (1050)	20
48" (1200)	18
60" (1500)	14

### Weight Comparison (Pounds per Foot)

Diameter (mm)	N-12	Reinforced Concrete <sup>1</sup>	Corrugated Steel <sup>2</sup>
4" (100)	0.44	N/A	N/A
6" (150)	0.85	N/A	6
8" (200)	1.5	N/A	7
10" (250)	2.3	50	9
12" (300)	3.3	79	11
15" (375)	4.6	103	13
18" (450)	6.4	131	16
24" (600)	11.0	264	19
30" (750)	15.4	384	24
36" (900)	19.8	524	29
42" (1050)	26.4	686	34
48" (1200)	31.3	867	38
60" (1500)	45.2	1295	60

<sup>1</sup> Class B Pipe

<sup>2</sup> 16 Gauge Steel

# SOLVING DRAINAGE PROBLEMS ACROSS THE NATION

## PENNDOT DEEP BURIAL STUDY

In 1987, the Pennsylvania Department of Transportation initiated what is believed to be the most ambitious research project ever attempted by the plastic pipe industry. A total of 576' (175 m) of 24" (600 mm) corrugated HDPE pipe (both standard singlewall and N-12 pipe) were buried at depths exceeding 100' (30 m) in an embankment under Interstate 279 near Pittsburgh. Researchers from the University of Massachusetts administered the test, which sought to determine the performance limits of HDPE pipe under extreme loads.

Electronic and hydraulic systems have been monitoring many aspects of pipe performance, including wall strain, deflection, soil pressure and soil strain. The results to date are impressive. Despite the tremendous soil load, the total of pipe deflection and circumferential Shortening is just 4.3%, and has remained constant since the second year of the test. In 2002, 15 years after the initial installation, a full inspection was conducted. The pipe was unchanged from the last inspection completed in 1997. PennDOT has provided the full report to the FHA for their distribution and use.

PennDOT officials view the pipe's performance under these severe soil pressures as very positive, particularly since a sample of concrete pipe failed rather quickly under 65' (20 m) in the same embankment. The study results have led PennDOT and other state transportation agencies to conclude that existing maximum fill height requirements for HDPE pipe are conservative and may be increased under certain project conditions.

## HDPE PIPE SPEEDS WORK ON OLYMPIC HIGHWAY

N-12 pipe played a key role in what was called the biggest design-build freeway project in North America. Early in 1998, Salt Lake City began the massive task of replacing and expanding 17 miles (27 km) of the I-15 highway in preparation for the 2002 Winter Olympic Games. Normally an 8-year project, the time frame was cut to 4½ years, placing a premium on time-saving methods and materials.

The project coordinator reported little difficulty in deciding on the drainage pipe material. "For the 33 miles (53 km) of 24" (600 mm) and 30" (750 mm) pipe, polyethylene was the hands down winner. It should save us at least 15 percent in material and installation costs compared to reinforced concrete pipe. An 80-ft. (24 m) run of PE requires three joints, while RCP needs ten. Two people can lay the 20' (6 m) sections in the trench and just 'pop' them together."

Designers selected ADS N-12 soil-tight pipe with its integral bell-and spigot joining system. The even profile of this pipe eliminates the need for separate "digouts" to accommodate the protruding bell on standard pipe. The pipe's toughness is another time saving factor, according to the coordinator. "We can drop PE pipe 100', (30 m) and nothing will happen to it. If the bell on a concrete pipe is hit, the joint is gone and we have to get a new section."

## SCHOOL INSTALLS COMPLEX BUT ECONOMICAL DRAINAGE SYSTEM

Small diameter N-12 pipe met all the requirements for an intricate drainage system to be installed at McArthy Teszler Elementary in Spartanburg, South Carolina, a school for physically handicapped children. The building consisted of many wings spaced 30 ft. (9 m) apart, with an exit door from each classroom leading to sidewalks between the wings. Because of the special needs of the children, no standing water was permitted to accumulate on these walkways.



This requirement, plus the limited space between wings, created the need for extensive roof drainage and numerous inlets and fittings in the underground pipe system. The designer specified 4" (100 mm) N-12 pipe for the roof drain connections, tying in to 6"-15" (150-375 mm) N-12 trunk lines and 12" or 15" (300-375 mm) watertight Nyloplast inline drains and drain basins.

After evaluating many products, the engineer determined that ADS "offered an extremely cost effective system . . . The smooth interior of N-12 pipe allowed us to use smaller pipe sizes around the building because of better hydraulics. The pipe is lightweight and since you don't have to bevel the ends to connect with fittings, it is easier to install and more cost effective than PVC."

## **UNDERGROUND LANDMAX® RETENTION/DETENTION SYSTEMS**

As real estate costs continue to escalate, developers and design engineers strive to maximize the potential of available land. Add to this the ever-increasing variables of government regulations, environmental impact and safety, one quickly recognizes the challenges that come with commercial and residential site development.

For over 25 years, ADS has been assisting landowners to increase the value of their investments by designing underground stormwater management systems as an economic alternative to retention ponds. No longer are designers limited to high-maintenance ponds along with their inherent aesthetic and safety issues. By creating subsurface retention or detention systems, previously unusable land can now be used for other applications such as parking lots, playing fields and green spaces. With minimal maintenance costs and productive use of the land, this investment pays significant dividends over its lifetime.

N-12 pipe plays a critical role in the design of a complete stormwater system. By connecting to surface drainage structures like our Nyloplast® drain basins, collected storm water feeds into a complete retention or detention system using N-12 pipe for distribution and storage. By taking advantage of N-12 pipe's superior abrasion and corrosion resistance, integral soil-tight or watertight joints, and its design flexibility for water quality structures, it is no wonder engineers and architects readily choose N-12 pipe for all their stormwater management needs.

## **NEIGHBORHOOD STORM SEWER PROJECT INSTALLS EASILY**

After 25 years of flooding, the residents of the Lakeview subdivision of Madison Township, Ohio, applied for state public improvement funds to install a modern storm drainage system. Of all the materials bid, only the HDPE system fell within the funding limit.

The installation included 5,000' (1520 m) of ADS N-12 pipe and was accomplished well within the deadline and the limited budget. Since then flooding complaints have been non-existent, despite a 100-year rain event in 1993.

Five years later, ADS cooperated in an internal inspection by an independent pipe cleaning company using a remotely controlled television camera. Three hours of video tape revealed no abnormalities within the 2,400' (730 m) of sewer line inspected - no damage, no misaligned joints, no changes in line and grade. Since the Lakeview installation, Madison Township has specified N-12 pipe on several other large drainage projects. Officials point to HDPE's ease of handling and believe that it performs as well or better than the concrete and metal pipe used previously.





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