



Flushmate Drainline Carry

Understanding the Science of
Superior Flushing Performance

FLUSHMATE®



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Introduction: The Hidden Dynamics of Plumbing



When a toilet flushes, waste disappearing from the bowl is only the beginning of the journey. For building owners, facility managers, and plumbing engineers, the critical metric isn't just a clean bowl—it's how effectively that waste travels through the building's infrastructure. This concept is known as drainline carry.

Drainline carry is defined as the distance that solid waste travels through a building's drainage pipes after a single flush. While often overlooked, it is a critical factor in preventing chronic plumbing issues.

The mechanics are simple but unforgiving. Physics dictates that moving mass requires energy. A flush must generate enough velocity, volume, and momentum to transport

waste from the fixture, through the trap way, and down the lateral lines to the main sewer connection. Without sufficient momentum, waste may settle in the pipe instead of clearing it. Over time, repeated buildup increases the risk of blockages.

This eBook explores the mechanics of drainline carry, the rigorous American Society of Mechanical Engineers (ASME) standards that govern it, and how Flushmate pressure-assist technology provides the superior performance necessary to maintain healthy building infrastructure. The eBook also highlights how Flushmate's cutting-edge solutions align with the industry's push toward sustainability and smart technology, setting a new benchmark for performance and efficiency.

Case Study: Luxor Hotel

Challenge: The Luxor Hotel faced chronic drainline stoppages in their guest rooms, leading to expensive maintenance calls and frustrated guests.

Solution: By retrofitting their systems with Flushmate pressure-assist units, the hotel leveraged the power of momentum to ensure waste cleared the drainline every time.

Result: Stoppages were virtually eliminated, maintenance costs plummeted, and guest satisfaction scores improved.

LUXOR
LAS VEGAS

CHAPTER 1

The Importance of Efficient Drainage Systems

The consequences of poor drainline carry extend far beyond a simple clog. In commercial and hospitality settings, the plumbing system is the circulatory health of the building. When it fails, the symptoms are immediate and costly.



The Consequences of Failure

When a toilet lacks the power to push waste the necessary distance, there may be several adverse effects:

- **Maintenance Headaches Skyrocket:** Facilities teams will spend a significant amount of time snaking drains rather than performing preventive maintenance.
- **Property Damage Risks:** Backups can cause overflow, which damages flooring, subfloors, and ceilings in multi-story buildings.
- **Health and Safety:** Stagnant waste and recurring backups may create unsanitary conditions and persistent odors.
- **User Experience:** A clogged toilet is a memorable negative experience that reflects poorly on a facility's management. For instance, in a high-traffic hotel, a single clogged toilet may lead to multiple guest complaints, tarnishing the brand's reputation.

The Challenge of Gravity Toilets

The plumbing industry faces a complex engineering paradox: mandates for water conservation are stricter than ever, yet the physical requirement to move waste remains unchanged.

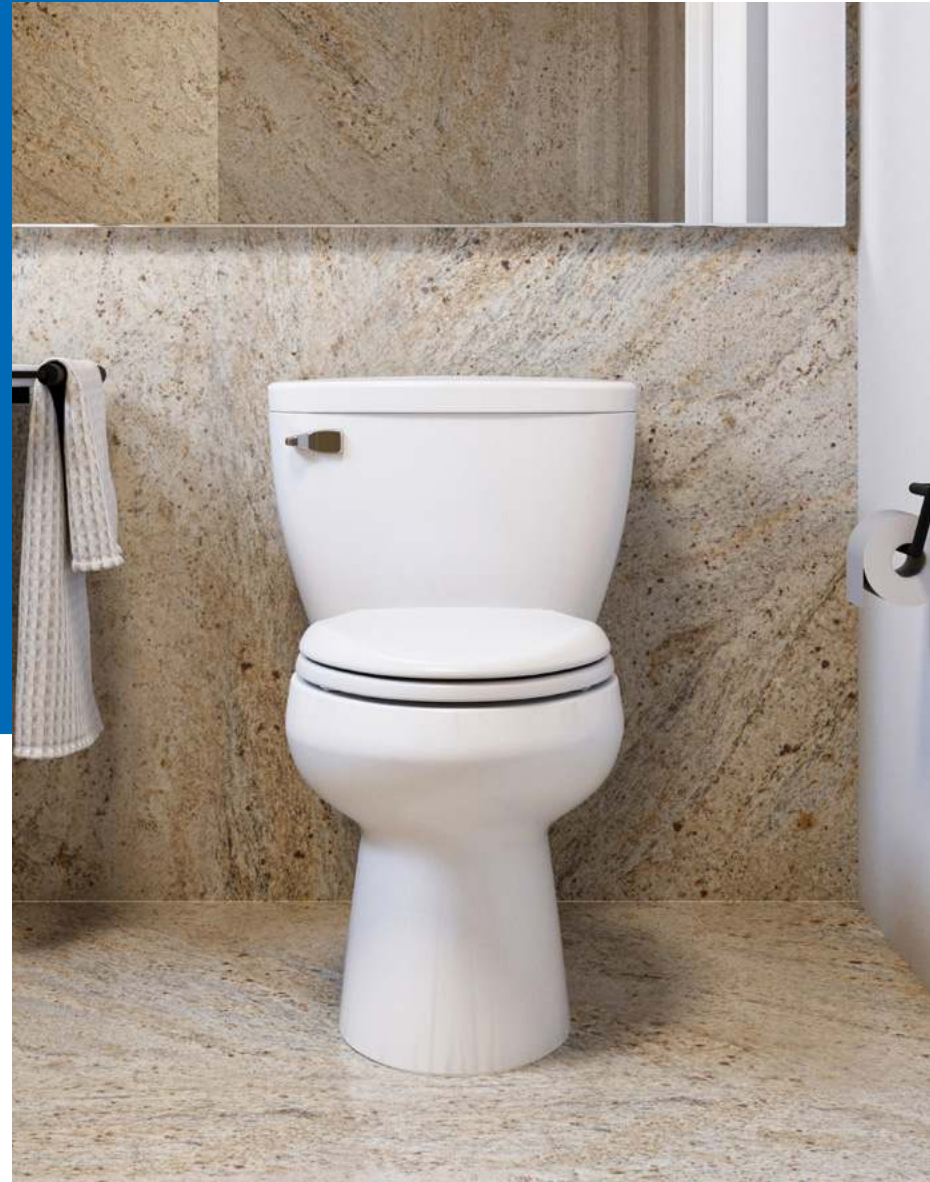
As regulations pushed flush volumes down from 3.5 gallons per flush (gpf) to 1.6 gpf and now to 1.28 gpf or lower, gravity-fed systems have struggled. A standard gravity toilet relies on the weight and height of water to create a siphon. With less water, that siphon becomes weaker, often failing to generate the momentum needed to clear the drainline effectively. This has led to the phenomenon of "double flushing," which negates water savings entirely.



CHAPTER 2

Key ASME Standards Explained

To ensure plumbing fixtures perform safely and effectively, the industry relies on standards set by the American Society of Mechanical Engineers (ASME). These standardized tests provide a baseline for performance, ensuring that a toilet can do its job before it is installed.



TEST

Drainline Transport Characterization

This is the industry benchmark for measuring drainline carry.

Purpose	To strictly quantify how far a toilet can move solid waste down a drainline.
Test Media	The test utilizes 100 polypropylene balls, which simulate solid waste mass without decomposing.
Procedure	As detailed in Clause 7.7.4 of the ASME standard, these balls are placed in the bowl. The unit is flushed, and the distance the balls travel down an 18-meter (approx. 60-foot) pipe with a specific slope (2%) is recorded.
The Standard	To pass, the average carry distance must be at least 12.2 meters (approximately 40 feet).

TEST

Waste Extraction

Before waste can travel down the line, it must effectively leave the bowl.

Purpose	To verify a toilet's ability to clear solid and paper waste in a single flush.
Test Media	As outlined in Clause 7.5.1, the Granule and ball test uses 2,500 high-density polyethylene (HDPE) granules and 100 nylon balls to assess flushing performance. MaP testing also measures the maximum amount of solid waste (soybean paste and toilet paper, in grams) a toilet can completely remove in a single flush.
Performance Requirement	The toilet must completely flush all media in at least four out of five test runs, ensuring that the trap seal is fully restored after each flush.
Flushmate Performance	Internal Flushmate testing has shown that pressure-assisted toilets equipped with Flushmate® 503 and 503H Series systems deliver up to 45% higher MaP test performance, providing a powerful, reliable flush that helps clear the bowl completely the first time, every time.

TEST

Surface Wash

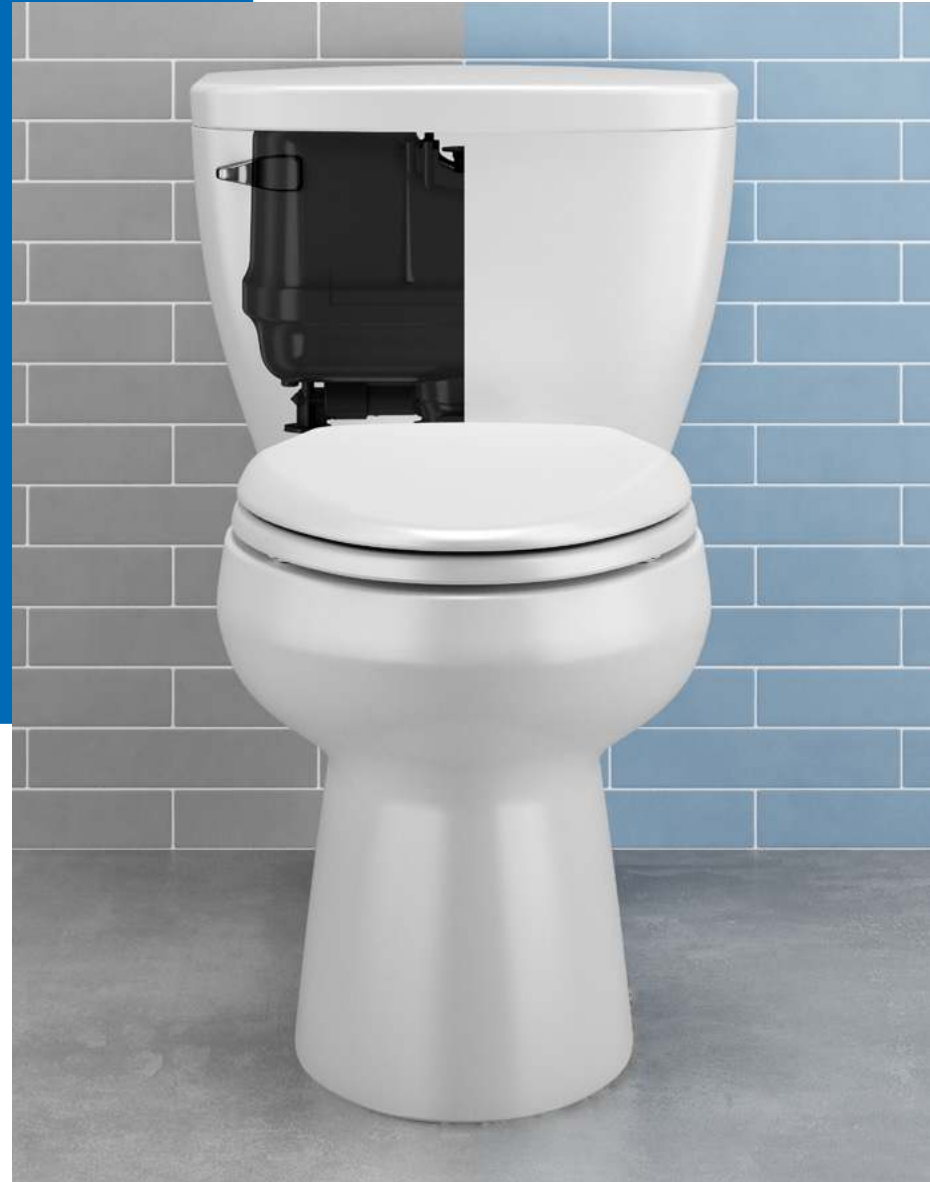
Cleanliness is also a function of surface coverage.

Purpose	To measure how effectively water rinses the interior surface of a urinal.
Test Media	A wet-erase transparency marker is used to draw a line on the urinal surface.
Procedure	The marked urinal is flushed, and inspectors measure any remaining ink segments.
The Standard	The required total length of the ink line segment remaining on the flush surface after each flush shall not exceed 2.0" (51 mm) when averaged over three test runs. No individual segment shall be longer than 0.5" (13 mm).

CHAPTER 3

How Flushmate Technology Enhances Performance

While gravity toilets struggle to adapt to low-flow requirements, Flushmate technology is engineered specifically to maximize the energy of every drop of water.



The Mechanics of Pressure-assist

The difference lies in how energy is stored and released.

1. **Supply:** As water enters the Flushmate vessel, it traps air inside.
2. **Compression:** The incoming water pressure compresses this trapped air, turning the vessel into a stored energy device.
3. **Release:** When flushed, this stored energy is released instantly.

Pushing vs. Siphoning

Gravity toilets pull waste out via a siphon. Flushmate pushes waste out, and it also initiates siphoning faster than gravity toilets. The compressed air drives water into the bowl at a peak flow rate of 70 gallons per minute. This high-velocity jet action creates a “push” that mechanically forces waste through the trapway and deep into the drainline.

Superior Drainline Carry Performance

The data confirms the physics.

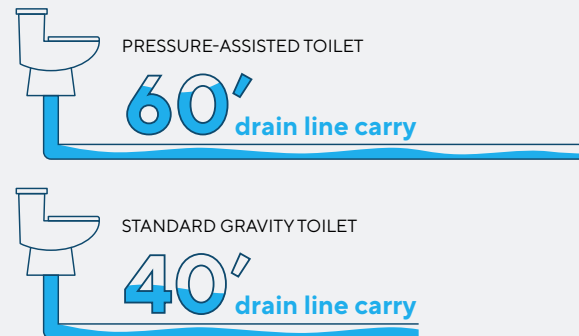
Exceeding Standards: While the ASME minimum requirement is 40 feet (12.2 meters), Flushmate systems consistently push waste up to 50% further.

Verified Results: In controlled testing, Flushmate-equipped toilets achieve an average drainline carry of 60 feet. This extra 20 feet of transport is the difference between a clear line and a mid-pipe blockage.

Operational Impact: This superior carry virtually eliminates clogs in the lateral lines, reducing the need for double flushing and ensuring complete waste removal from the building.



50% higher drain-line carry than gravity toilets³



Beyond the Carry: Additional Benefits

Water Conservation: By eliminating double flushing and utilizing pressure rather than volume, Flushmate models save up to 53% more water compared to standard 1.6 gpf gravity toilets.

Hygiene: The vigorous flush action—and up to 50% larger water surface area—helps minimize odors and keeps the bowl cleaner between scheduled cleanings.

Durability: Gravity toilets rely on flappers and chains. These components are prone to warping, leaking, and breaking. Flushmate uses a sealed vessel system designed to last, eliminating the common “running toilet” syndrome caused by leaky flappers. This durability not only reduces the frequency of repairs but also lowers long-term maintenance costs, making it a cost-effective choice for facility managers.

No Tank Sweating: Because the water is contained within the sealed vessel, it never touches the ceramic tank wall. This prevents exterior condensation (sweating) in humid environments, protecting floors from moisture damage.

**Toilets stay cleaner-looking longer
with pressurized flushing.**

No condensation



Water is contained
within the vessel
rather than the
toilet tank

Larger water surface



Powerful flushing
action keeps the
bowl cleaner





Case Studies: Aloft Hotel and Sleep Inn & Suites

Challenge: Both hospitality brands faced frequent plumbing performance issues, leading to guest complaints and increased demands on maintenance teams. These issues threatened their brand reputation and operational efficiency.

Solution: By specifying Flushmate pressure-assist technology, the hotels leveraged its superior flushing performance to address these challenges.

Result: Guest complaints regarding plumbing were reduced to near zero, significantly improving guest satisfaction. Additionally, the workload on maintenance teams was minimized, allowing them to focus on other priorities and reducing overall maintenance costs.



CHAPTER 4

Future Innovations in Drainline Technology

The plumbing industry is not standing still. As water becomes a more precious resource, the drive for efficiency continues to accelerate.



The Drive for Greater Efficiency

Today's market is trending toward Ultra-High-Efficiency Toilets (UHETs), utilizing sub-1.1 gpf volumes. Flushmate is at the forefront of this shift with the 0.75 gpf model. The engineering challenge here is immense: maintaining powerful drainline carry with less than a gallon of water. Flushmate's pressure-assist technology is uniquely positioned to solve this, as it relies on velocity rather than volume to move mass.

Flushmate remains committed to innovation and ensuring its solutions remain at the cutting edge of emerging trends and technologies.

Smart Toilet Technology

The future of commercial restrooms is intelligent.

Sensor-Driven Flushing: Technologies like Flushmate's I-Flush allow for touchless operation, improving hygiene. ►

Some advanced systems can now monitor water usage and detect leaks instantly, providing facility managers with actionable data to further reduce operating costs.

Commitment to Innovation

Customer feedback serves as a cornerstone for continuous improvement at Flushmate. By addressing the needs of facility managers, engineers, and end-users, Flushmate develops solutions that anticipate and solve challenges proactively. The company remains dedicated to advancing water conservation technologies while maintaining exceptional flushing power, ensuring that buildings operate efficiently, reliably, and sustainably.



Conclusion

Drainline carry is an often-overlooked metric that defines the success and longevity of plumbing systems. A deep understanding of waste transport mechanics, combined with adherence to rigorous ASME standards, empowers facility managers to make proactive decisions that minimize costly disruptions and ensure operational excellence.

Flushmate technology redefines what is possible in modern plumbing by seamlessly bridging the gap between water conservation and unmatched performance. By leveraging advanced pressure-assisted engineering, Flushmate consistently delivers the velocity and reliability needed to clear the line with every flush.

As a leader in the plumbing industry, Flushmate continues to set the standard for innovation, ensuring that its solutions not only meet but exceed the demands of modern facilities. For those seeking efficiency, hygiene, and sustainability, the solution is clear: specify the innovation and power of pressure.

FLUSHMATE®