Guidelines for Assessing the Flushability of Disposable Nonwoven Products

A Process for Assessing the Compatibility of Disposable Nonwoven Products with Plumbing and Wastewater Infrastructure

Third Edition

June 2013

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Preface

Since the launch of the first edition of this Guideline in 2008, collaborations among INDA, EDANA and Wastewater agencies in the US and Europe identified the need for a more straight-forward and transparent means for differentiating flushable from non-flushable products as well as the benefits of a uniform labeling approach for non-flushable products to guide proper disposal following use.

As with previous editions, this edition should be considered a living document that will evolve over time to reflect advances in environmental science and nonwoven technologies as well as changes in consumer practices and wastewater infrastructure. INDA/EDANA will commence a review of this document no later than December 31st, 2015.

Continuous improvement in the performance of flushable products and consistent labeling of non-flushable products remains the goal of INDA/EDANA members.

This document provides a unified INDA/EDANA Labeling Code of Practice with clear guidance regarding the use of a standardized "Do Not Flush" symbol. It also contains an explicit decision tree to identify non-flushable products that have a significant risk of being mistakenly or inappropriately disposed via the toilet and need to be labeled. Moreover, this edition includes a radically simplified and linear assessment approach, consisting of seven tests including a municipal pump compatibility test, all of which a product must pass to be considered flushable.

INDA and EDANA acknowledge and are grateful for the invaluable input of all member and nonmember companies, as well as wastewater agencies in the European Union (EU) and United States (US) who have been involved in the dialogue that shaped these new editions of the Guidelines and Code of Practice.

Finally, we are all indebted to Adrian Bridge whose vision started this journey back in 2009, but who sadly passed away before its conclusion.

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Background to the New Edition

Flushability has attracted growing interest over the past decade, as an increasing array of personal hygiene and cleansing products have been introduced to the market which either incorrectly claim to be flushable, or which consumers think are flushable.

The success of many of these products is testimony to the value consumers place on improved standards of personal hygiene, and their appreciation of increased variety in the products that offer those better standards. These products can however cause challenges for both property owners and the wastewater industry if in fact they are not 'flushable', because they may cause clogging, blockages or equipment failure in the wastewater conveyance and treatment systems.

Since 2004 fiber suppliers, roll goods suppliers, converters and marketers of disposable nonwoven products have been working together through their industry associations, INDA in the US and EDANA in Europe, to collaborate with relevant wastewater agencies to advance the shared objective of ensuring that the only nonwoven products that are flushed are those that are compatible with wastewater systems. The challenge is three-fold and involves ensuring that:

> Any product that is marketed as 'flushable' can be flushed down the wastewater system without adversely impacting plumbing or wastewater infrastructure and operations;
> The general public is made aware of the importance of using the wastewater system to dispose only toilet paper and nonwoven products which have been established to be flushable through the INDA/EDANA Flushability Guidelines Assessment process; and
> Products which do not meet the criteria in these guidelines are appropriately labeled in accordance with the INDA/EDANA Code of Practice[1].

June 2008 saw the publication of the first edition of the INDA/EDANA "Guidance Document for Assessing the Flushability of Nonwoven Consumer Products". This document provided an industry-accepted definition of flushability, greater clarity on when flushing should be considered an appropriate means of disposal, and a specified approach for assessing the flushability of consumer products. At the time of its publication, the industry recognized that it was a work in progress. Since then, the nonwovens industry has continued to work in partnership with wastewater industries in Europe and the United States to evolve our approach. Specifically we have strived to:

> Understand better, with the help of the wastewater industry, the underlying causes and the extent of the problems associated with products being mistakenly or inappropriately disposed via the toilet;
> Evolve our flushability assessment to provide a simpler framework with greater rigor for addressing wastewater industry concerns; and
> Create more specific labeling recommendations for our member companies so that non-flushable products that have a significant potential for being mistakenly or inappropriately disposed to the toilet are clearly and consistently labeled with a "Do Not Flush" symbol.

This current document is the latest output of the industry's collaborative work. In addition to making changes based on our experiences using the approach and methods contained in our earlier editions, changes have been made based upon input from wastewater agencies in Europe and North America. As with previous editions, this version should be considered a living document that will evolve over time to reflect advances in environmental science and nonwoven technologies, as well as changes in consumer practices and wastewater infrastructure. It represents a consensus of INDA/EDANA members' views as to what

[1] Code of Practice: Communicating Disposal Pathways for Disposable Nonwoven Products to Protect Wastewater Systems (See Appendix 2 of this document).

represents a technically sound and practical approach for evaluating the flushability of nonwoven products. Use of this guideline to support a flushable claim is voluntary. INDA/EDANA will commence a review of this document no later than the 31st December, 2015.

This third edition departs significantly from the tiered testing approach in earlier editions. Instead, we have adopted a straight line approach to the assessment. While the tiered testing approach is commonly used in risk assessments, it can be complex and difficult to understand. This straight line approach requires a yes/no answer to each of the technical questions which need to be answered in the affirmative to establish flushability. It eliminates some of the ambiguity in previous editions, is much easier to follow, and now directly addresses an additional wastewater infrastructure concern with the inclusion of a municipal sewage pump test.

The heritage of earlier editions is preserved by retaining the existing tests that are most appropriate to the real world, simplifying loading protocols where possible and improving methods to reduce variability as necessary. As such, this third edition is much easier for users to follow and implement, while at the same time providing an appropriate assessment. Its use is expected to become more widespread throughout our industry amongst members and non-members alike.

The Flushability Assessment is an integral part of the nonwoven industry's commitment to prevent problems for the wastewater industry, but it is not the only contribution.

Since the publication of previous Guidelines, we have worked collaboratively with the wastewater industry in parts of Europe and the US to better understand the challenges associated with inappropriate disposal of a variety of items to the sewer system. By analyzing the products contributing to actual blockages and clogs[2] in sewers, it has become increasingly apparent that the majority of these products (including some types of disposable nonwoven products) were not designed for disposal via this route.

Hence, there is a need for much better consumer information and education hopefully leading to more thoughtful and environmentally responsible behavior, relating to flushing practices. One aspect is the need for more effective product labeling. In March 2009 EDANA and INDA produced *a "Manufacturers' Code of Practice on Communicating Disposal Pathways for Personal Hygiene Wet Wipes"*. This code covered moist toilet tissue as well as baby, toddler, feminine hygiene, and incontinence wipes. It encouraged member companies to not only follow the guidelines for assessing flushability before marketing products as flushable, but also to label non-flushable products with a distinctive "Do Not Flush" symbol. Based upon usage experience and feedback from our stakeholders, we have revised the Code to facilitate clearer, more consistent communication to consumers. Furthermore, the associations have converged on individual "Do Not Flush" and "Dispose via the Solid Waste Stream" (Tidy Man) symbols shown below in Figure 1 for use on European and US packaging. The revised code is included in full as Appendix 2 to these Flushability Guidelines.

Figure 1: The "Do Not Flush" (left) and "Tidy Man" (right) symbols to be used on the packaging of products not designed to be flushed.

[2] See: "The Moraga Pumping Station Study" http://www.inda.org/issues-advocacy/flushability/ and Appendix 3 of the UKWIR Test Protocol to Determine the Flushability of Disposable Products. Report Reference 12/WM/07/16 http://www.ukwir.org/site/web/content/home#

Principles for Assessing Flushability

The toilet and the wastewater system should not be used as a receptacle for general waste. In their original design, sewage systems were intended to handle human waste, wastewater and latterly, toilet paper. More recently, toilets have been increasingly used for the disposal of a variety of products; many of which are not designed or intended to be flushed, and which can create operational issues for property owners and the operators of wastewater treatment systems.

For public health and hygiene reasons, there are products for which flushing represents not only an acceptable but also the most appropriate means of product disposal; providing they can be disposed via the wastewater system without causing harm.

The flushability of a disposable nonwoven product depends upon the physical and chemical attributes of both the product itself and of the wastewater and treatment systems through which it is disposed. Wastewater disposal and treatment systems differ by country and region, but commonly involve disposal via the toilet, conveyance via drainage pipes and physical, biological and chemical treatment processes.

Flushability is determined by a product's fate, behavior and effects during the various stages of toilet disposal and wastewater conveyance and treatment.

For a product to be deemed flushable there must be evidence indicating that it:

- Clears toilets and properly maintained drainage pipe systems when the suppliers recommended usage instructions are correctly followed;
- Passes through wastewater conveyance systems and is compatible with wastewater treatment, reuse and disposal systems without causing system blockage, clogging or other operational problems; and
- Is unrecognizable in effluent leaving onsite and municipal wastewater treatment systems and in digested sludge from wastewater treatment plants that are applied to soil.

The Technical Assessment is designed to evaluate the ability of a product to conform to each of these above criteria. Consequently, when a product fulfills the requirements in this assessment, it is considered flushable and can be labeled as such in accordance with the INDA/EDANA Code of Practice.

One change from the previous Guidelines is the use of the term 'disintegration', in place of 'dispersibility'. While both terms refer to the breakdown of a product, disintegration is a more inclusive term that refers to the process in which a product weakens, loses its integrity and breaks into smaller parts due to both a physical and chemical or biological breakdown of a product, whereas dispersibility refers simply to the physical separation of the product into smaller pieces. As a result, we have updated the terminology to more accurately reflect the changes that happen to nonwoven products after they have entered the wastewater system.[3]

Before undertaking a Flushability Assessment, manufacturers are expected to have verified the human and environmental safety of all components of their finished products and complied with all relevant legislation and regulations in bringing a product to market. In this way, not only wastewater infrastructure is protected, but also public health and the broader environment.

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[3] Regarding the INDA/EDANA approach taken to the processes of dispersibilty and disintegration, we recognize that both relate to how a product breaks apart over time. However, dispersibility is only one mechanism of disintegration. It relates to the process in which a product physically breaks into finer particles that separate from each other and distribute themselves relatively evenly in water. Disintegration includes other processes including dissolution of soluble components and the chemical or biological degradation of constituents in the product. Both disintegration and dispersibility can be determined in the tests associated with these Guidelines, by estimating the mass of a product that passes through sieves following exposure to a set of environmental conditions. This third edition of the Guidelines recognizes the importance of having a physical disintegration metric that prevents permanent wet-strength materials from becoming approved "flushable" products under this process, and has included a Slosh Box Test with pass/fail criteria to capture this concept.

The Scope of the Flushability Assessment

This Flushability Assessment has been designed principally for disposable nonwoven wipes, which due to their purpose and use, are frequently disposed of via the toilet into the waste water system. The technical assessment outlined in this document assesses compatibility with plumbing fixtures and drain lines, on-site treatment, municipal wastewater conveyance and treatment systems.

Four questions need to be answered in the affirmative for a disposable nonwoven product to come under the scope of this Flushability Assessment and the Code of Practice. These questions are:

Is the product constructed from nonwoven sheet(s)?
Is the product designed for, marketed for, or commonly used in a bathroom setting or for toileting purposes?
In normal use could the product become contaminated with feces, menses, urine and germs typically associated with these wastes?
Is the product designed and marketed to be flushed?

If the answer is affirmative in every case and the product passes the technical assessment, it is deemed as flushable and a "Flushable Claim" is appropriate.

If these answers are affirmative but the product is not designed to be flushed or it fails the technical assessment, the product should be disposed to the solid waste stream and the packaging should include a 'Do Not Flush' symbol in accordance with the Decision Tree contained in Figure 2 below and the "INDA/EDANA Code of Practice: Communicating appropriate Disposal Pathways for Disposable Nonwoven Products to Protect Wastewater Systems".

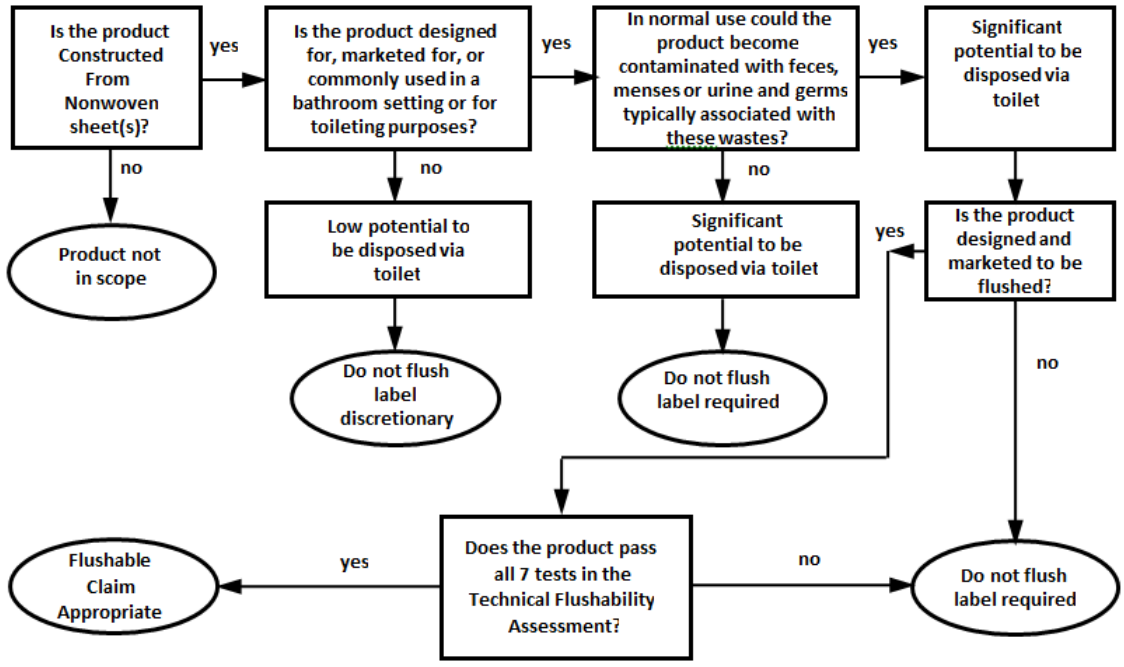


Figure 2: Illustrates the decision-making process for determining whether a product is within the scope of this Flushability Assessment and the labeling requirements specified by the INDA/EDANA Code of Practice.

The Boundaries of the Flushability Assessment

The test method development and the validation for this technical assessment have been based primarily on disposable nonwoven wipes. Using this assessment approach for unrelated product types requires further development and validation not contained in this document.

This assessment has been developed and evaluated within Europe and the United States by INDA and EDANA and their member companies who produce the vast majority of the total volume of nonwovens used in nonwoven disposable products on the market in North America, Europe, the Middle East and Africa. The principles of these guidelines and the test methods could be adapted for other countries, but would first need to account for local habits/practices and wastewater infrastructure in the regions concerned. This is not covered in this document.

These guidelines and tests are only relevant for plumbing in permanent building structures and may not be appropriate for sanitary systems found in temporary rest rooms (e.g. Porta-John, Port-O-Let, Port-a-Loo), motor homes, recreational vehicles, and boats, etc.

Overview of the Technical Flushability Assessment

When a product is disposed of via the wastewater system first it is flushed down the toilet, then it is conveyed via drainage pipes in order to be treated either in an on-site treatment system or in municipal treatment systems as depicted in Figure 3. For a product to be flushable it is necessary to establish that it can pass through all these processes without causing problems, and that is will not do harm in the receiving environments at the end of these processes. The assessment therefore contains the following evaluations, all of which must be addressed:

Toilet, Drainline and Ejector Pump Evaluation. Here it is necessary to establish that the product will not cause the toilet to block, that it does not clog the household drain lines, and that it does not accumulate in or clog household sewage ejector pumps that are sometimes used in buildings to assist in the movement of waste. Macerator Toilets are not covered in this document.

On-Site Treatment Evaluation. This relates to septic tanks, cesspits or aerobic treatment systems. Here it is necessary to establish that the product will sink with the rest of the solids and will then break down sufficiently under aerobic or anaerobic conditions, that it does not contribute to clogging of the septic tank system or create mechanical problems.

Sewer System Evaluation. This relates to conveyance in the sewer system beyond the property and the processing of the waste in municipal wastewater treatment plants. Here it is necessary to establish that the product will pass through the sewer pipes without causing clogs, that it will not blind the screens used at various stages in the system, that it will not cause problems in municipal pump stations, that it will settle and that it will break down under aerobic and anaerobic conditions.

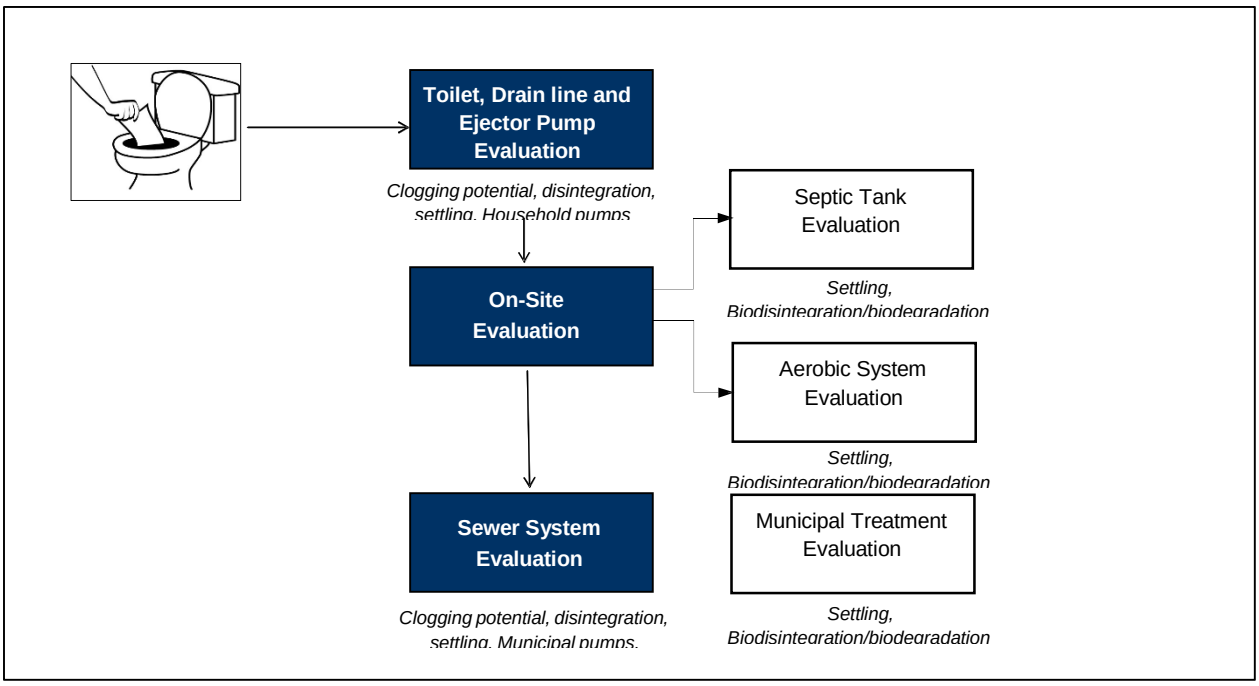


Figure 3: The disposal routes for products flushed down the toilet.

Outlined on the following flow chart (Figure 4) are the key questions that need to be answered for a product to be considered flushable. The first set of questions relate to the applicability of the product to this assessment; the remaining questions comprise the technical assessment and cover each of the routes the product could follow in the wastewater conveyance and treatment process.

The questions in the technical assessment are answered by conducting the test which is referenced in the box below each question. These tests are summarized in Figure 5 and a brief summary of each test method with acceptance criteria is then provided.

The acceptance criteria for a specific test demonstrate either compatibility with the disposal system or that the product cannot be considered to be flushable. All questions must be answered in the affirmative for a flushable claim to be made.

The full test methods and supplementary guidance documents for use in laboratories are available for download at the INDA/EDANA websites:

www.edana.org/industry-initiatives/flushability
www.inda.org/issues-advocacy/flushability

Product Eligibility

Is the product constructed from nonwoven sheet(s)?

Yes → Is the product designed for, marketed for, or commonly used in a bathroom setting or for toileting purposes?

Yes → In normal use could the product become contaminated with feces, menses or urine and germs typically associated with these wastes?

Yes → Is the product designed and marketed to be flushed?

Yes → Proceed to Technical Assessment

No → Product not in scope

No → Do not flush label Discretionary

No → Not Flushable 'Do Not Flush' Label Required

No → Not Flushable 'Do Not Flush' Label Required

Toilet, Drainline and Ejector Pump Evaluation

1.1 Does the product clear the toilet and the building's lateral drainline? — FG501

Yes → 1.2 Does the product have the potential to disintegrate? — FG502

Yes → 1.3 Is the product compatible with household sewage ejector pumps? — FG503

No → Not Flushable 'Do Not Flush' Label Required

No → Not Flushable 'Do Not Flush' Label Required

No → Not Flushable 'Do Not Flush' Label Required

On-site Treatment

2.1 Will the product sink? — FG504

Yes → 1.2 Does the product have the potential to biodisintegrate/ biodegrade under aerobic conditions? — FG505

Yes → 1.3 Does the product have the potential to biodisintegrate/ biodegrade under anaerobic conditions? — FG506

No → Not Flushable 'Do Not Flush' Label Required

No → Not Flushable 'Do Not Flush' Label Required

No → Not Flushable 'Do Not Flush' Label Required

Sewer System Evaluation

3.1 Does the product transport through the sewer pipe? — FG501

Yes → 3.2 Does the product have the potential to disintegrate in the sewer? — FG502

Yes → 3.3 Will the product sink? — FG504

Yes → 3.4 Is the product compatible with a Municipal Sewer Pump? — FG507

Yes → 3.5 Does the product have the potential to biodisintegrate/ biodegrade under aerobic conditions? — FG505

Yes → 3.6 Does the product have the potential to biodisintegrate/ biodegrade under anaerobic conditions? — FG506

Yes → Flushable Claim Appropriate

No

No

No

No

No

No

Figure 4: Key questions that need to be answered in the affirmative for a product to be considered flushable.

Test		Assessment and action
Toilet and Drainline ClearanceTest FG501	Fail	Not Flushable. "Do not Flush" label required
Pass		
Slosh Box Disintegration Test FG502	Fail	Not Flushable. "Do not Flush" label required
Pass		
Household Pump Test FG503	Fail	Not Flushable. "Do not Flush" label required
Pass		
Settling Test FG504	Fail	Not Flushable. "Do not Flush" label required
Pass		
Aerobic Biodisintegration/Biodegradation Test FG505	Fail	Not Flushable. "Do not Flush" label required
Pass		
Anaerobic Biodisintegration/Biodegradation Test FG506	Fail	Not Flushable. "Do not Flush" label required
Pass		
Municipal Sewage Pump Test FG507	Fail	Not Flushable. "Do not Flush" label required
Pass		
Flushable Claim Appropriate		

Figure 5: The tests which need to be passed in order to make a flushable claim.

Summary of Test Methods and Acceptance Criteria

Copies of the full test methods are available for download at the INDA/EDANA websites.
EDANA website: www.edana.org/industry-initiatives/flushability
INDA website: www.inda.org/issues-advocacy/flushability

FG501: Toilet and Drainline Clearance Test

Purpose	To determine the likelihood that a product will successfully clear toilet and building drainage lines.
Principles	The test system consists of a toilet and drain line. Four different toilet and drain line combinations are contained in the full test methods that cover typical configurations in US, EU (including UK) regions. The ultimate choice of toilet(s) and drain line configuration(s) should be based upon the region where a product is marketed. The test itself simulates 2 days of normal toilet use by a family of four and is repeated at least 3 times. The test system consists of a toilet and drain line. In the case of nonwoven hygienic wipes, a test consists of 35 toilet flushes using a specified loading sequence of product based on the habits and practices of a family of four. This sequence includes flushes with water only, flushes with product and toilet tissue, and flushes with product, simulated fecal matter and toilet tissue. For products other than hygienic wipes, the loading sequence should be amended to reflect specific habits/practices for that product. For each flush, observations are made regarding whether the product clears the toilet bowl and trap. In addition, the travel distance is measured for all flushed materials in the drain line following each flush. The latter information is used to calculate the location of the center of mass of all materials within the drain line relative to the toilet. Prior to conducting a study, a 35 flush sequence excluding test product is used to establish a baseline for each specific toilet and drain line configuration to ensure correct operation of the system.
Validity Criteria for the Test System	In the baseline evaluation: In the absence of product, no clogs should occur that require use of a plunger to clear toilet tissue and excess water from the bowl and trap. The travel distance of the Centre of Mass of the toilet tissue must not consistently decrease over the course of 5 consecutive flushes.
Pass/Fail Criteria	To be acceptable: Toilet Clearance: No more than 5% of the flushes containing product (3 flushes for hygienic wipes) should be associated with clogs that require use of a plunger to clear product and excess water from the bowl and trap. Drain line Clearance: The travel distance of the Centre of Mass of the flushed material in the drain line does not consistently decrease over the course of 5 consecutive flushes.

FG502: Slosh Box Disintegration Test

Purpose	To assess the potential for a product to disintegrate when subjected to mechanical agitation in water or wastewater (optional).
Principles	The test system consists of an oscillating box containing 2.0 liters of tap water or wastewater (optional), in which a single article (e.g. individual hygienic wipe) is incubated for 3 hours. Subsequently, the contents of the box are transferred to and then rinsed through a 12.5 mm perforated plate sieve. The materials retained on the sieve are recovered and analyzed gravimetrically. This measurement is used to calculate the percent of the article's initial dry mass passing through the sieve, based on difference. At a minimum, this test is repeated with 6 replicate articles.
Pass/Fail Criteria	To be acceptable: Greater than 25% of an article's initial dry mass must pass through the sieve, and this condition must be met for 80% or more of the replicate articles tested.

FG503: Household Pump Test

Purpose	To assess the compatibility of a product with household sewage ejector pump systems to ensure that the product does not clog, accumulate within or otherwise interfere with normal system operation under high usage conditions.
Principles	For hygienic wipes, an accelerated 6 day loading protocol is used to verify that the wipes do not clog, accumulate within or otherwise interfere with normal operation of a sewage ejector pump system under high usage conditions. The test system includes a toilet and drainline, connected to a household sewage ejector pump assembly, consisting of a basin and submersible pump. Upon activation, the pump discharges the basin contents upward through a check valve and into an 8-10 ft section of vertical pipe connected by elbow to another section of pipe with a 2 degree downward slope connected by elbow to another section of vertical pipe draining through a screen to a drain. Test articles are flushed down the toilet. The loading protocol consists of 2 loading sequences each day with each sequence consisting of a total of 12 flushes with 6 including product. After each flush, the basin is inspected to determine if the product is interfering with the float device activating the pump. In addition during each pump run, the system is observed to determine if the pump shuts off before fully emptying the basin and if the pump is effectively pumping water from the basin. At the end of each day, the number of articles in the basin is determined. On completion of the final loading sequence, the toilet is flushed as needed to trigger the pump one final time. Subsequently, all articles in the basin are removed and counted. The numbers of articles observed in the basin at the end of days 2 through 6 are averaged, and this value is compared to the number of articles loaded each day. For products which are buoyant in tap water, 150g of Simulated Fecal Matter can be included in two of the flushes within a sequence to simulate the normal presence of fecal solids. For products other than hygienic wipes, the loading sequence and daily quantification of product in the basin should be amended to reflect specific habits/practices for that product.
Pass/Fail Criteria	To be acceptable: The product must not cause the system to stop functioning at any point during the test. AND The average number of articles remaining in the basin at the end of days 2 through 6 must not exceed the number of articles loaded on a daily basis.

FG504: Settling Test

Purpose	To assess whether a product settles in sumps, septic tanks, onsite aerobic systems and settling chambers that are associated with pump stations and municipal wastewater treatment plants.
Principles	The test system consists of an approximately 20cm diameter clear plastic column containing tap water which allows the settling behavior of a product to be observed. The column has graduations that are used for determining the time needed for an article to descend a pre-determined distance in the column. Individual test articles are rinsed in water or flushed through a test drainline. In addition, they can be swirled gently in wastewater for 30 seconds to allow the adsorption of solids (optional). Each article is then placed in a beaker containing tap water, which is poured into the top of the column. The settling rate is calculated from the product's travel time in the column. This process is repeated for 10 separate articles and the average settling velocity is calculated. The settled articles are then left in the column for 24 hours to verify that they do not become buoyant and float. In the event that articles fail to settle or become buoyant, this process can be repeated with 10 additional articles.
Pass/Fail Criteria	To be acceptable: The average settling velocity for the articles that settle must exceed 0.1cm/sec and at least 95% of the total articles tested must settle. AND At least 95% of the articles tested must not become sufficiently buoyant to rise more than 30cm from the bottom within 24 hrs.

FG505: Aerobic Biodisintegration/Biodegradation Tests

Purpose	Either of these tests can be used to assess the potential for a product to biologically degrade under aerobic conditions typically found in sewers as well as onsite and municipal wastewater treatment systems.
Principles	BIODISINTEGRATION TEST This test measures the total mass of a product retained on a 1mm sieve after being incubated with activated sludge for 14 days at ambient laboratory temperature. Samples of product are placed in triplicate 2.8 liter baffled flasks containing 1 liter of activated sludge, which has been pre-screened through a 1mm wire mesh sieve. In addition, identically prepared treatments with USP cotton serve as a positive control. These systems are agitated on a rotary shaker table at 75rpm to provide continuous aeration of the sludge throughout the test. After 14 days, the contents of each flask are passed through a 1mm wire mesh sieve and the material retained on the sieve is recovered, dried and analyzed gravimetrically. The percent of the initial product mass passing through the sieve is calculated based upon difference. The average is calculated for the three replicates. BIODEGRADATION TEST The OECD 301B is a standardized biodegradation test that measures the evolution of carbon dioxide resulting from the mineralization of the organic constituents in the product. Samples should be rinsed prior to testing.
Pass/Fail Criteria	BIODISINTEGRATION TEST To be acceptable: The average percent of initial dry mass passing through the 1mm sieve after 14 days should exceed 95%. BIODEGRADATION TEST To be acceptable: The average percent of theoretical carbon dioxide produced after 28 days must exceed 60%. Any remaining fraction of the test substance is assumed to be incorporated into biomass or present as products of biosynthesis.
Additional information	The OECD 301B test method can be downloaded from the OECD website: http://www.oecd-ilibrary.org/

FG506: Anaerobic Biodisintegration/Biodegradation Tests

Purpose	Either of these tests can be used to assess the potential for a product to biologically degrade under anaerobic conditions typically found in sewers as well as onsite and municipal wastewater treatment systems.
Principles	BIODISINTEGRATION TEST This test measures the total mass of a product retained on a 1mm sieve after being incubated in anaerobic sludge for 28 days at 35 ± 2°C. Samples of product are incubated in 2 liter vessels containing 1.5 liter of anaerobic digester sludge, which has been prescreened through a 1mm sieve. In addition, identically prepared treatments with USP cotton serve as a positive control. The flasks are incubated statically and in a way that prevents oxygen from entering the test vessels. After 28 days, the contents of each flask are passed through a 1mm wire mesh sieve and the material retained on the sieve is recovered, dried and analyzed gravimetrically. The percent of the initial product mass passing through the sieve is calculated based upon difference. The average is calculated for the three replicates. BIODEGRADATION TEST The OECD 311 biodegradation test measures the evolution of gas (carbon dioxide and methane) resulting from the mineralization of the organic constituents in the product.
	BIODISINTEGRATION TEST To be acceptable: The average percent of initial dry mass passing through the 1mm sieve after 28 days should exceed 95% BIODEGRADATION TEST To be acceptable: The average percent of theoretical gas produced after 56 days must exceed 70%. Any remaining fraction is assumed to be incorporated into biomass or present as products of biosynthesis.
Additional information	The OECD 311 test method can be downloaded from the OECD website: http://www.oecd-ilibrary.org/

FG507: Municipal Sewage Pump Test

Purpose	To assess the compatibility of products with small municipal sewage pump systems.
Principles	Individual articles (e.g. hygienic wipes) are positioned near the intake of an operating municipal pump while monitoring power consumption at 1 second intervals relative to a baseline. The test system consists of a ITT Flygt pump; model C-3085.183, operating at a flow rate corresponding its 100% efficiency point (21.2 liters/second or 336 gallons/minute). The pump is allowed to reach steady state and no adjustments to flow, gate valve positioning, or pump adjustments are made after establishing the baseline flow rate. The pump is allowed to run for 5 minutes at this condition to determine a steady state / baseline for power consumption prior to introducing products. Subsequently, an article is introduced every ten seconds for ten minutes (total of 60 pieces) at the pump intake. At the end of the sample introduction the system is allowed to run for an additional five minutes. The pump power consumption and flow rate on the outlet are continuously monitored and recorded. The test consists of 5 separate runs as described above, each of which involving the use of 60 articles. For each of the 5 runs the percent power increase over the baseline is determined for every data point. In addition, the areas under the power curves for the baseline and test periods during the run are integrated and then used to calculate the percent power increase over baseline. For products other than hygienic wipes, the loading sequence may need to be amended to reflect specific habits/practices for that product.
Pass/Fail Criteria	To be acceptable in the Netherlands: No more than 10% of the individual data points recorded during the 5 runs can exceed a 10% power increase over the baseline. To be acceptable outside the Netherlands: Based upon integration of the power curves, the average percent power increase over baseline for the 5 runs must not exceed 15%.

Appendices

Appendix 1: Glossary of Terms.

There is much ambiguity surrounding the term 'flushable', and historically there has been no consistently accepted definition. Moreover, flushable is often confused with biodegradable and/or dispersible. For the purpose of these Guidelines, the following definition of flushable has been developed.

For a product to be flushable it should:

- Clear toilets and properly maintained drainage pipe systems when the supplier's recommended usage instructions are correctly followed;
- Passes through wastewater conveyance systems and is compatible with wastewater treatment, reuse and disposal systems without causing system blockage, clogging or other operational problems; and
- Is unrecognizable in effluent leaving onsite and municipal wastewater treatment systems and in digested sludge from wastewater treatment plants that are applied to soil.

The Technical Assessment is designed to evaluate the ability of a product to conform with each of these above criteria. Consequently, when a product meets the requirements in the Assessment, it is operationally defined as flushable.

There are many terms used in discussions about flushability. For the ease of use of readers, we have listed below the most commonly used terms in this document together with a brief description of the meaning applied to it in these Guidelines.

Aerobic Process: A biochemical or biologically mediated process occurring in the presence of and typically requiring molecular oxygen.

Anaerobic Process: A biochemical or biologically mediated process which occurs in the absence of molecular oxygen. Such processes are typically divided into facultative anaerobic processes that occur both in the presence and absence of oxygen and obligate anaerobic processes that occur only when oxygen is absent.

Biodegradation: The chemical breakdown of materials by living organisms into simpler molecules, It is catalyzed by naturally occurring microorganisms, typically bacteria and fungi, which use the material as a source of energy and carbon. Mineralization is one process occurring during biodegradation, whereby the material is completely mineralized to simple inorganic molecules (e.g. carbon dioxide, methane, nitrate, ammonia). Another process is incorporation of some of the molecular constituents into new microbial biomass. Consequentially, for a material to be considered completely biodegradable, the parent material must disappear, substantial amounts of carbon dioxide (aerobic conditions) and/or methane (anaerobic conditions) must be produced and there should be no persistent constituents remaining or persistent metabolites produced.

Biodisintegration: Disintegration that involves biodegradation (see Disintegration).

Clarifier: A unit at a wastewater treatment plant used for separating suspended solids from the wastewater via settling and consolidation.

Clog: A restriction or blockage in a toilet, pump, pipe or other conduit that limits the free flow of water that can result from the presence of an object or an accumulation of materials.

Degradation: The breakdown of a material into simpler molecules as a result of biological or chemical processes.

Digested Sludge: The settled wastewater solids which have been degraded and stabilized under either aerobic or anaerobic conditions – also known as biosolids.

Disintegration: The process, in which a product weakens, loses its integrity and breaks into smaller parts. It is operationally defined by measuring mass loss of the product or estimating the mass of the product that passes through sieves after exposure to specific environmental conditions. Disintegration can be the result of dissolution of soluble components, chemical or biological degradation of constituents in the product, physical forces that break the product into smaller particles or a combination of the above.

Dispersion: A disintegration process that is characterized by a material breaking into fine particles that separate from each other and distribute themselves more or less evenly in water. It is operationally defined by measuring mass loss of the product or estimating the mass of the product that passes through sieves after exposure to specific environmental conditions.

Disposable product: A product designed for single use rather than for medium to long term durability. Such products may be termed consumables.

Disposal Pathways: Various routes by which a product may be disposed. In the case of a flushable product, this pathway would include the building's toilet and drain line system and the wastewater conveyance system (e.g. sewer). Depending upon the system, it could also include pump stations, and a wastewater treatment plant.

Drain line: The pipe system that transports wastewater from the toilet, through the building to the onsite wastewater treatment system or to the municipal sewer collection system.

Durable product: A product that yields utility overtime and is not consumed in one use.

EDANA: EDANA is the international association serving the nonwovens and related industries.
Address: Avenue Herrmann-Debroux 46, 1160 Brussels. Belgium.
Tel: +32 27349310
Web: www.edana.org/industry-initiatives/flushability

Ejector Pump: Equipment typically used within a building to lift wastewater when gravity flow cannot be maintained. In a residential setting these systems are usually found in basements and typically consist of a basin connected to the toilet containing a submersible centrifuge type pump with an open impeller design that can pass solids less than 5cm in size.

Hygienic Wipe: A nonwoven sheet, pre-moistened with water or a lotion, used to clean the urogenital and/or anal areas.

INDA: INDA is the "Association of the nonwovens fabrics industry" (previously International Nonwovens and Disposables Association).
Address: 1100 Crescent Green, Suite 115 Cary. NC 27518.
Tel: +1 919-233-1210
Web: www.inda.org/issues-advocacy/flushability

Lift Station or Pumping Stations: Wastewater pumping facility that lifts wastewater from lower to higher elevation. Lift stations is the terminology most commonly used in the United States; pumping stations is the terminology used in Europe.

Moist Toilet Paper: A pre-moistened hygienic wipe.

Municipal Pump: A pump used in a sewer lift station or within a sewage treatment plant that is used to move wastewater.

Nonwoven: A fabric made directly from a web of fibers or continuous filaments without the yarn preparation necessary for weaving or knitting.

Physical Disintegration: The process, in which a product weakens, loses its integrity or breaks into smaller parts as a result of physical forces. In some cases, physical disintegration occurs only after a product has been weakened by other processes such as for example biodegradation.

Product Flush: Term used in the test methods to describe the process of placing a product in the toilet bowl and activating the flow of water into the bowl.

Properly Maintained Drain lines: Are equivalent to "Fit for Purpose" sewer pipes in this document.

Re-usable Product: A conventional re-usable product is a product that can potentially be used again for the same function after it has been used once.

Settling: The downward movement of an article or suspended solids in a water column as a result of gravitational forces.

Septage: The contents (liquid and solid fractions) pumped from a building's septic or holding tank. Depending on the location, this raw or untreated sewage is treated at a municipal wastewater treatment plant, treated in a separate treatment facility or land applied.

Sewer Collection System: System of conduits used to remove and transport human waste and waste waters. They typically begin with connecting pipes from buildings to one or more levels of larger underground horizontal mains, which terminate at wastewater treatment plants. Flow in sewer pipes is generally by gravity, though pumps may be used if necessary.

Simulated Fecal Matter (SFM): A material that is used to simulate the presence of feces in a flushability test. It consists of a material that replicates the physical properties and consistency of human adult feces.

Slosh Box: Test equipment used to assess the potential for a product to disintegrate when it is subjected to mechanical agitation in water or wastewater.

Solids Retention Time (SRT): Term used to describe the average time that sludge remains in a treatment process, such as an activated sludge basin or digester. In the case of activated sludge processes, SRT can also be referred to as Sludge Age (SA) or Mean Cell Retention Time (MCRT).

Toilet Flush: Term used in the test methods to describe the process of activating the flow of water into the bowl of a toilet.

UKWIR: UK Water Industry Research. http://www.ukwir.org

Wastewater Solids Disposal System: Term to describe the processes used to manage sludge solids leaving a wastewater treatment plant. Various forms of disposition include land filling, incineration and beneficial use as a soil amendment.

Appendix 2: Code of Practice.

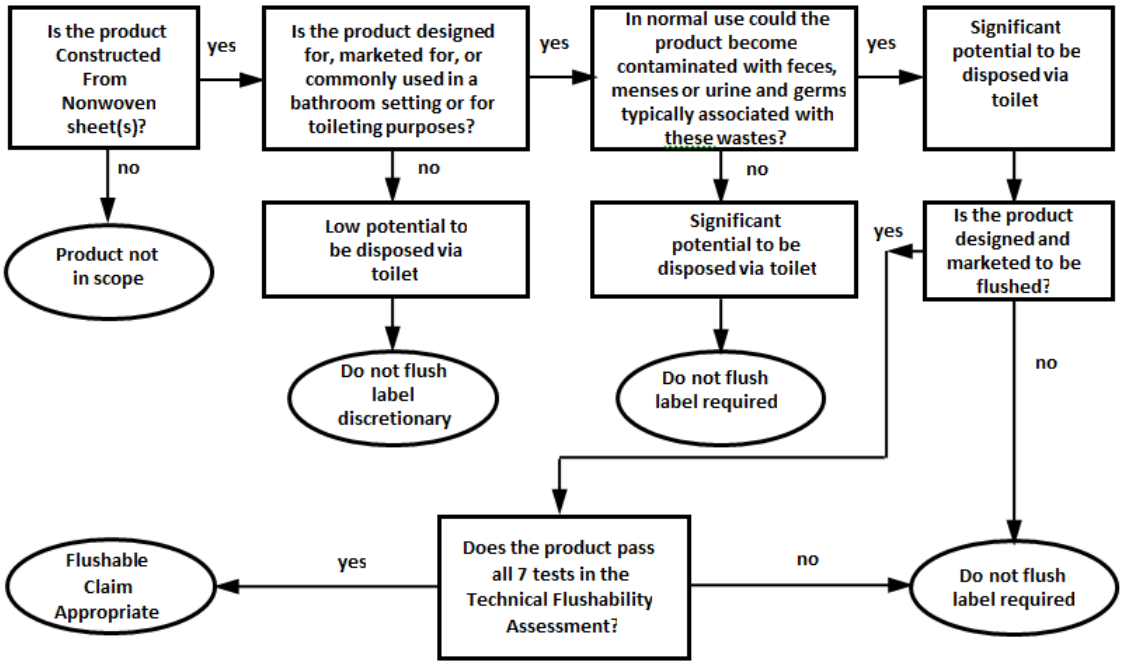
Code of Practice: Communicating Appropriate Disposal Pathways for Disposable Nonwoven Products to Protect Wastewater Systems

INTRODUCTION

INDA & EDANA members represent the vast majority of nonwovens supplied to the market today in North America and EMEA respectively (including Western Central Europe, Eastern Europe, Turkey, C.I.S and the Middle East and Africa). The suppliers of consumer products constructed from nonwoven sheets, represented by EDANA and INDA (the Associations), are committed to communicating to consumers when the toilet is an appropriate disposal route for finished products in the marketplace. The industry will help ensure that only those products compatible with the wastewater system are disposed of by this route.

The appeal of these products comes from the advantages they offer in effectiveness, convenience and ease of use. However, the context or location of their usage can inadvertently encourage flushing as the means for disposal which, in certain cases, is not the correct route.

Products are defined here at Fig. 2 from the Flushability Guidelines.



This Code of Practice outlines the commitments of the Associations and their member companies to:

- Use the Guidelines for Assessing the Flushability of Disposable Nonwoven Products[4] for evaluating flushability of products prior to making a flushable claim;
- Only identify products as flushable when they meet all criteria contained in the above guideline;
- Clearly label all products with the 'Do Not Flush' logo whenever they are not designed to be flushed or fail the Flushability assessment[1];
- Prominently and clearly display on these non-flushable products the recommended symbol, indicating that they should be disposed of via the solid waste system and not flushed into the wastewater system;
- Communicate appropriate disposal information for such products in relevant print literature and other communications channels (i.e. websites);
- For flushable products, clearly provide on the packaging explicit use and flushing instructions;
- Encourage companies who are not members of the Associations to comply with this Code of Practice;
- Encourage retailers to subscribe to this Code of Practice, particularly when sourcing private label products, and where possible reinforce proper disposal practices with their customers; and
- Where appropriate, support work at national and local levels to increase public awareness of proper disposal practices.

PRODUCT DISPOSAL

There are two primary disposal routes for disposable nonwoven products; via solid waste (trash or rubbish bin) and wastewater (toilet).

Only products which have been assessed as flushable according to the definition of flushability and the assessment approach outlined in the Guidelines for Assessing the Flushability of Disposable Nonwoven Products[1] should be disposed via the toilet. All other products should be disposed of via solid waste.

The Definition of Flushability[1]
For a product to be deemed flushable there must be evidence indicating that it:

- Clears toilets and properly maintained drainage pipe systems when the suppliers recommended usage instructions are correctly followed;
- Passes through wastewater conveyance systems and is compatible with wastewater treatment, reuse and disposal systems without causing system blockage, clogging or other operational problems; and
- Is unrecognizable in effluent leaving onsite and municipal wastewater treatment systems and in digested sludge from wastewater treatment plants that are applied to soil.

ON-PACK CONSUMER INFORMATION

[4] For information on how to obtain a copy of the Guidance Document or the print-quality logos, visit http://www.edana.org/industry-initiatives/flushability or www.inda.org/issues-advocacy/flushability

The packaging of all finished products which have high potential to be discarded via the toilet must clearly inform consumers whether or not the products are appropriate for disposal via the wastewater system.

Packaging for non-flushable products must clearly indicate that the product should not be disposed of via the toilet and display the 'Do Not Flush' (DNF) logo. Where space permits the additional use of the 'Dispose via the Solid Waste Stream' ('Tidy Man') logo to confirm disposal in solid waste is encouraged, where used, it is recommended to be same size as the DNF logo.

'Do Not Flush' logo

'Tidy Man' logo

Location: The symbol(s) must be prominent, clearly visible and legible on primary/secondary consumer packaging.
The logo should not be obscured by packaging seals.

Color: Logo artwork should be dark on white background.

Size: Diameter ≥1.1cm (0.45") for Primary packaging.[5]
Diameter ≥2.5cm (1") for Secondary consumer packaging e.g. On shelf club packs, display case, or bundles.

Wording: Use of instructions with the DNF logo is optional.
Any on-pack instruction for product disposal needs to be clear and explicit.

Timing: By January 1, 2015 any existing non-flushable products are to be assessed and labeling updated. Thereafter, all new non-flushable products are expected to follow the Guidelines relating to this Code of Practice.

[5] Exclusions:
Regulated products need to comply with size/placement requirements given by any relevant regulation or legislation.
Small packs: Diameter ≥0.635cm (0.25") as space allows.

RAISING PUBLIC AWARENESS OF RESPONSIBLE DISPOSAL PRACTICES

Responsible consumer behaviour is a key aspect in preventing non-flushable products from entering wastewater systems. The improper disposal of such products is one part of a much broader problem.

The Associations and their member companies will consider opportunities to support governments, municipalities and wastewater authorities in implementing awareness-raising activities designed to increase understanding of the appropriate disposal routes for flushable and non-flushable wipes.

PROMOTION OF THIS CODE OF PRACTICE

Although voluntary, the Associations will promote this Code of Practice to its membership and will encourage member companies to operate within the spirit of the Code.

The Associations will also seek to ensure that non-member companies are made aware of the Code and are encouraged to comply with it.

This document contains voluntary guidelines for flushability of disposable products constructed from nonwovens. The contents of this document and related code of practice are for general information purposes only. While INDA and EDANA have used reasonable care to ensure the accuracy and completeness of these Guidelines and the Code of Practice, the information contained therein does not constitute professional or legal advice and should not be relied upon as such. To the extent permitted by law, INDA and EDANA do not accept liability (whether pursuant to a claim for contribution or under statute, tort, contract or otherwise) for any loss which may arise from reliance on information contained in these Guidelines or the Code of Practice (including in relation to the certification of products). Always consult suitably qualified legal counsel on any specific problem or matter. Any and all information is subject to change without notice. Compliance with these Guidelines and Code of Practice is voluntary and the verification process remains the responsibility of individual companies, using their own technical resources and/or competent third party testing facilities/laboratories. INDA and EDANA do not certify compliance with these Guidelines or the Code of Practice nor do we condone any statement of certification credentials or capabilities or competencies of any laboratory testing entity. For avoidance of doubt, INDA and EDANA are not responsible for verifying any product claims of compliance or flushability on any package labeling. That is the separate responsibility of the party making that claim and fully subject to the applicable trade rules and regulations on advertising claims and labeling.