

Methodology, Results, and Recommendations of the 2022 NCWM-NIST National Survey on 20 lb LPG (Propane) Cylinders

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- **Why a National Survey?**
- **Background and Scope of Survey**
- **Results**
- **Recommendations**

Role of NIST OWM

NIST

- The NIST Office of Weights & Measures (OWM) cooperates with other Federal agencies, states, other countries, standards development organizations, business and industry and the National Conference on Weights and Measures (NCWM) to develop uniform laws and regulations related to legal metrology.
- NIST supports commercial measurement systems by providing traceability, uniform laws, regulations, training, technical and other assistance to administrators, metrologists and field enforcement officials as well as to business and industry.



Learn more about OWM here: www.nist.gov/owm

Role of NIST OWM

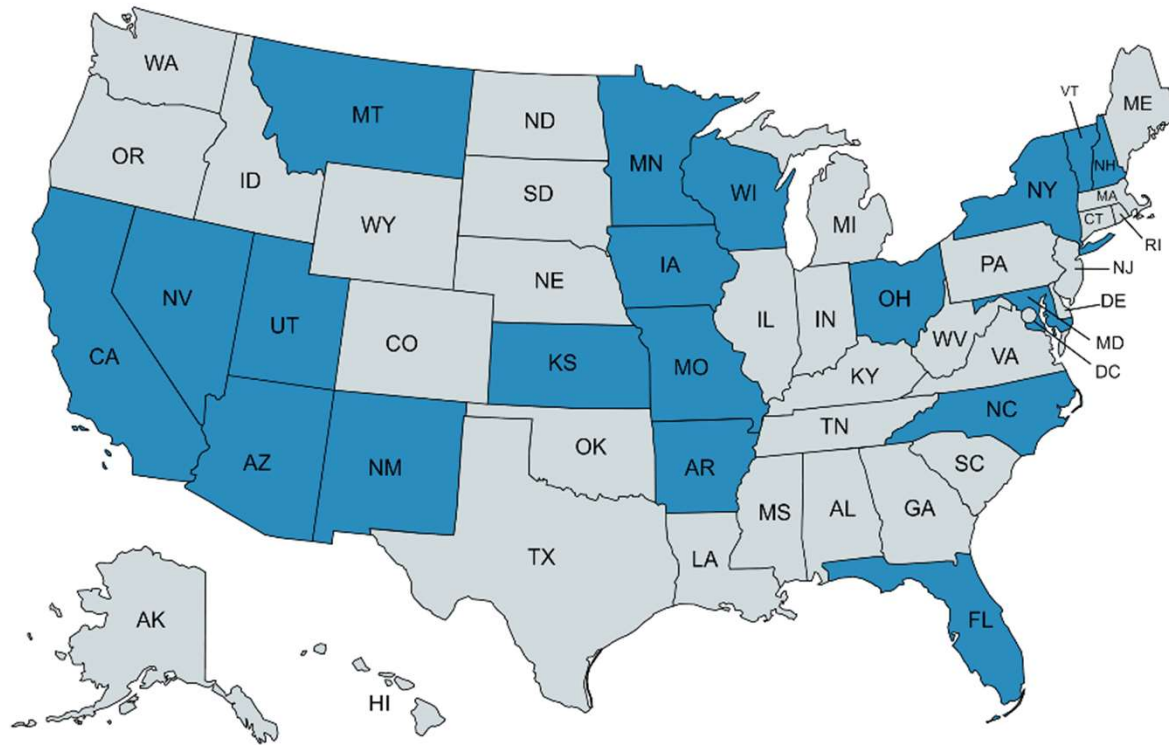
NIST

- The National Institute of Standards and Technology (NIST) is non-regulatory agency of DOC
- NIST has **statutory responsibility** to promote “cooperation with the states in securing uniformity in weights and measures laws and methods of inspection”
- NIST has a duty under the Fair Packaging and Labeling Act (FPLA):
Sec. 1458. Cooperation with State Authorities; Transmittal of Regulations to States



Learn more about OWM here: www.nist.gov/owm

Participating States



Participating Counties (and City)



California

Alameda
El Dorado
Lassen
Lake, Mendocino
Napa, Orange
Sacramento
San Luis Obispo
San Bernadino
San Mateo
San Diego
Santa Barbara
Santa Cruz
Sonoma
Tulare
Ventura
Yolo

New York

Otsego
Westchester
Putnam

Ohio

Fayette
Lucas
Huron
Licking
Franklin
Columbus (City)
Cuyahoga
Wayne
Homes
Mahoning

Why Conduct a National Survey?

NIST

NCWM Chairman Ivan Hankin's vision:

- Systematic problems in the marketplace
- Promotion of Equity
- Role of W&M in marketplace
- DOT Final Rule



Why Conduct a National Survey?

NIST

In 2020, nearly 9.5 BILLION gallons of LPG were sold in the U.S.



- Included the sale of over 40 MILLION 20 lb cylinders of LPG

Effect of New DOT Regulation



2.16. Method of Sale Regulation

(NIST Handbook 130 “Uniform Laws and Regulations”)

Allowable Difference.

$\pm 1/2$ % for tare weights of 9 kg (20 lb) or less; or

Average Requirement. – When used to determine the net contents of cylinders, the stamped or stenciled tare weights of cylinders at a single place of business found to be in error predominantly in a direction favorable to the seller and near the allowable difference limit shall be considered to be not in conformance with these requirements.

$\pm 1/4$ % for tare weights of more than 9 kg (20 lb)

DOT Federal Regulation - Dec 28, 2022

Tolerance.

Minus 3 % or plus 1 % for a cylinder that weighs (25 lb) or less.

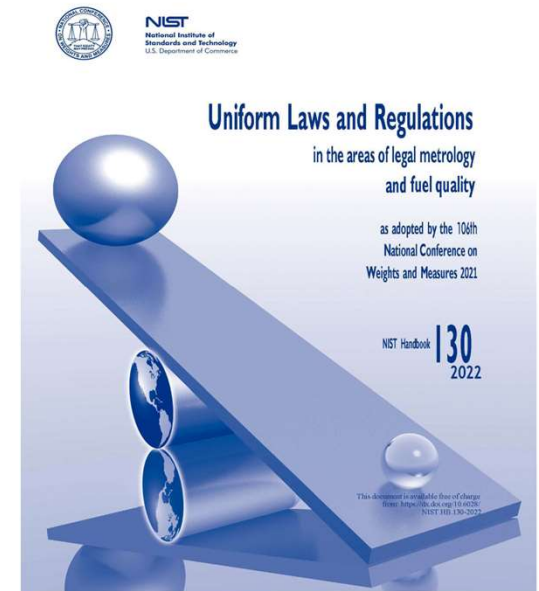
Does Not Include an Average Requirement

Minus 2 % or plus 1 % for a cylinder that weighs greater than 25 lb.

Background: 1990 NCWM Adoption of Tare Weight Requirements for Compressed Gas Cylinders



- Purpose to ensure equity in the marketplace
- Existing requirements in place for over 30 years
- States unanimously adopted ± 0.5 % allowable difference



New Federal Requirements for MINUS Errors Effective December 2022



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Potential Loss of Over **\$30 Million** to Industry

Steel

	Tare Weight	Allowable Difference	Calculation	Allowable Difference in lb
HB 130	16.6 lb	½ %	$0.005 \times 16.6 =$	- 0.083 lb
DOT 22	16.6 lb	3.0 %	$0.03 \times 16.6 =$	- 0.498 lb

Steel

	Tare Weight	Allowable Difference	Calculation	Allowable Difference in lb
HB 130	18 lb	½ %	$0.005 \times 18 =$	- 0.09 lb
DOT 22	18 lb	3.0 %	$0.03 \times 18 =$	- 0.36 lb

New Federal Requirements for PLUS Errors Effective December 2022



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Potential Loss of Over **\$10 Million** to Consumers

Steel

	Tare Weight	Allowable Difference	Calculation	Allowable Difference in lb
HB 130	16.6 lb	½ %	$0.005 \times 16.6 =$	+ 0.083 lb
DOT 22	16.6 lb	1.0 %	$0.01 \times 16.6 =$	+ 0.166 lb

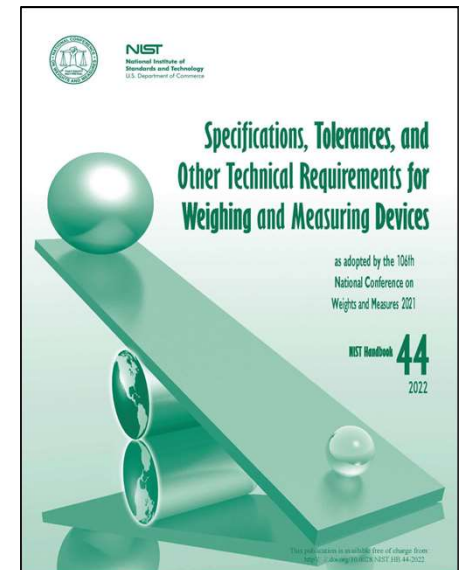
Steel

	Tare Weight	Allowable Difference	Calculation	Allowable Difference in lb
HB 130	18 lb	½ %	$0.005 \times 18 =$	+ 0.09 lb
DOT 22	18 lb	1.0 %	$0.01 \times 18 =$	+ 0.18 lb

Scale Accuracy

49 CFR states that “an accurate scale must be used to check the weight of liquified gas filled in the cylinder”

- NIST HB 44 Specifications, Tolerances and Other Technical Requirements is the “standard” for all states and USDA.
- The recommendation would be for DOT to place the same requirement (NIST HB 44) as part of its regulations



SCOPE:

1. To collect data comparing the actual tare weight of new and used cylinders to the stamped tare weight
2. To evaluate the **Methods of Sale, Price Posting and Fill Procedures** used at Direct Sale Refilling Locations
3. To determine net content compliance at exchange locations

PHASE 1: Actual vs stamped tare weight of NEW and USED cylinders

- Data collected at the Plant
 - New cylinders also tested at retail
- All cylinders verified to be empty (evacuated)
- Conducted in February 2022

NCWM – NIST National Survey on LPG 20 lb Cylinders

PHASE 1: Actual vs stamped tare weight of NEW and USED cylinders

- 9,482 NEW cylinders tested
 - 702 lots
- 1,535 USED cylinders tested
 - 71 lots



Summary of Percentage of New and Used Cylinders within Specified Tolerances



Range of Tolerance (%)	New Cylinders (n = 9,482) ^a		Used Cylinders (n = 1,535) ^a	
	NIST HB 130 ^b	DOT ^c	NIST HB 130 ^b	DOT ^c
(- 0.5 to 0) %	29.7 %	----	16.1 %	----
(0 to + 0.5) %	14.6 %	----	15.9 %	----
(- 3 to 0) %	----	78.5 %	----	33.7 %
(0 to + 1) %	----	19.9 %	----	32.0 %
TOTAL	44.3 %	98.4 %	32.0 %	65.7 %

PHASE 2: Direct Sale Refilling Locations

1,559 Locations Tested

- Method of Sale
- Fill Procedures
- Price Posting



PHASE 2: Direct Sale Refilling Locations

Method of Sale

- Weight?
- Volume?
- Flat Fee?



PHASE 2: Direct Sale Refilling Locations

Method of Sale (1,559 locations)	Percentage
Weight Only	11.0 %
Volume Only	53.6 %
Weight and Volume	2.2 %
Flat Fee Only	24.7 %
Combination of Weight and/or Volume, with a Flat Fee	8.5 %

PHASE 2: Direct Sale Refilling Locations

Fill Procedures

Only 2 Verification Methods Allowed:

1. By weight
2. By using “bleeder valve”

Verification by Overflow Protection Device (alone) is not permitted



PHASE 2: Direct Sale Refilling Locations

Fill Level Verification Methods

Fill Level Verification Method	Percentage
Weight Only	26.2 %
Bleeder Valve only	33.0 %
OPD Only	10.0 %
Combination of Weight, Bleeder Valve, and or OPD	30.8 %

PHASE 2: Direct Sale Refilling Locations

Price Posting at the 1,559 locations

- Only 6 of the 18 (1/3) states participating require price posting
- In 6 states that require price posting, only 68% posted prices
- In 12 states that do not require price posting, only 30% posted a price

PHASE 3: Exchange Locations

- Net Content Verification
- Product Left Behind



PHASE 3: Exchange Locations

Net Content Verification

- 959 lots tested
- 10,456 cylinders inspected

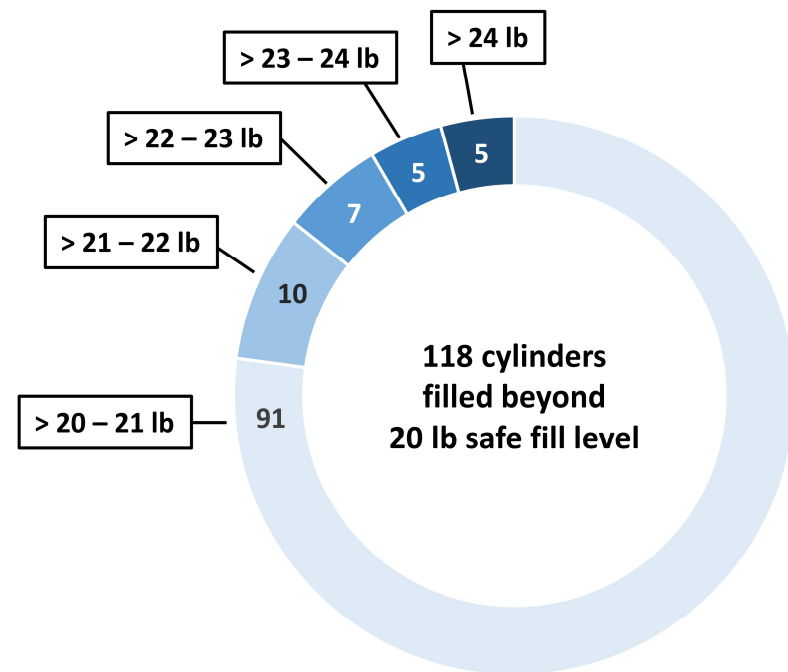
PHASE 3: Exchange Locations

Net Content Verification

- 959 lots tested – 74.2% passed (25.8% or 1 of 4 failed)
- of the 25.8% that failed:
 - 66 % (2 of 3) failed on the MAV alone
 - 5 % failed on the Average Requirement alone
 - 29 % failed on both the MAV and Average

PHASE 3: Exchange Locations

Cylinders Exceeding the Safe Fill Level



PHASE 3: Exchange Locations

Product Left Behind

Based on 6,896 cylinders tested, an average of 25.4 % of consumers return more than 1 lb of propane remaining

- 58.8 % of cylinders contained up to 1 lb
- 10.6 % of cylinders contained between 1 lb to 3 lbs
- 5.6 % of cylinders contained between 3 lbs to 5 lbs
- 9.1 % of cylinders contained over 5 lbs
- 15.9 % of cylinders were either empty (0 lb) or had negative values (< 0 lb)

Where are we now?

Survey completed and published in October 2022

- Plans to revise the MOS based on study results
- Continue inspections to ensure compliance
- Address key recommendations from study
- Petition U.S. DOT



NIST Special Publication
NIST SP 2200-01

**2022 NCWM-NIST National Survey
on 20 lb LPG (Propane) Cylinders**

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Recommendations from Survey



- Industry Evaluate, Develop and Ensure Good Quantity Control Practices
- Industry must ensure that any weighing and measuring device meets the requirements of NIST Handbook 44
- That future DOT regulations include a requirement that scales must meet NIST Handbook 44
- DOT adopt the “Average Requirement” to tare regulations

Relevant to and underpinning Marketplace Equity:

- Manufacturing
- Safety
- Consumer Protection
- Consumer Education

Improving Manufacturing Processes:

- CGA and NPGA to establish new practices to ensure tare weight for new and used cylinders are within established tolerances throughout the cylinder's life in the supply chain
- PERC to develop Good Quantity Control Practices for the industry and provide training to members
- CGA and NPGA add requirements for meeting the “Average Requirement” and “Maximum Allowable Variation” as part of their best practices for Good Quantity Control

Improving Safety:

- NPGA working with their members to eliminate overfilling beyond the safe fill level
- NPGA working with Direct Sale Refilling Locations to ensure proper training takes place to ensure the correct procedure is used to determine the safe fill level

Informing and Educating Consumers:

- PERC to educate consumers on product remaining in cylinders when performing an exchange or returns
- NCWM to engage states that allow 20 lb cylinders of LPG to be sold by flat fee sales. Develop protections for consumers to receive credit for product returned in tank, which may require pricing and unit pricing.
- NCWM consider developing price posting requirements at the Direct Sale Refilling Location

Ensuring Marketplace Equity:

- The focus of this survey was on 20 lb cylinders but there may be similar issues and concerns for other types of compressed gasses (acetylene, oxygen, argon, nitrogen, helium and hydrogen)
- All States to perform more routines inspections and enforcement beyond the 20 lb cylinders. Typical sizes of portable LPG cylinders in the marketplace can range from 1 lb to 100 lb.
- States should develop a program to ensure the accuracy of scales being used at the plant and at direct sale refilling locations

Ensuring Marketplace Equity (cont'd):

- Industry and their trade associations should consider conducting a “root cause analysis” to determine any underlying processes or procedures that may be contributing to non-compliance
- DOT to review and reconsider its tolerances which are based on safety, to recognize and include economic protection

NCWM Petition to DOT Pipeline and Hazardous Materials Safety Administration (PHMSA) in 2023

1. Re-evaluate the allowable differences to take into account:
 - Existing state law (NIST Handbook 130, $\pm 0.5\%$ allowable difference)
 - Consider the data provided based on a National Survey
 - Clarify the stamped tare weight must be accurate for the life of the cylinder

NCWM Petition to DOT Pipeline and Hazardous Materials Safety Administration (PHMSA) in 2023

2. Consider citing and adopting NIST Handbook 44 as the DOT accuracy standard for scales used to weigh LPG cylinders
3. Consider adding an “Average Requirement” to improve measurement accuracy and production controls and to ensure a business is not using the allowable difference to gain a competitive advantage

Summary

“We believe narrower tolerances than currently specified in 49 CFR 178.35 are achievable and will provide safe handling and safe filling of cylinders, while helping to ensure equity for buyers and sellers in commercial transaction.”

