

CVSA–FHWA-ISWIM WIM Webinar

Thursday November 14th, 2024

IMPLEMENTATION OF WIM SYSTEMS
FOR DIRECT ENFORCEMENT OF LEGAL WEIGHT LIMITS
ON THE BQE CONCRETE CANTILEVER STRUCTURES



TANVI PANDYA, P.E., DBIA (NYCDOT)

AGENDA



- Team Introduction
- BQE Project Background
- From Data Collection to Direct Enforcement
- Implementation of Direct Enforcement
- Closing Remarks

TEAM INTRODUCTION



Tanvi Pandya, Executive Director, BQE, Design Build & Emergency Contracts

Dawn Harrison, Director, Design & Planning , BQE, Design-Build & Emergency Contracts

Shane Trotman, Civil Design Lead, BQE/, Design-Build & Emergency Contracts



Hani Nassif, Professor & Director of RIME Group and Associate Director of C2SMART

Kaan Ozbay, Professor and Director of C2SMART



Chaekuk Na, Senior Research Associate

Peng Lou, Research Associate, and Senior Str. Engineer



JT Kirkpatrick, Head of Sales, Infrastructure Kistler Instrument Corp.

BQE PROJECT BACKGROUND

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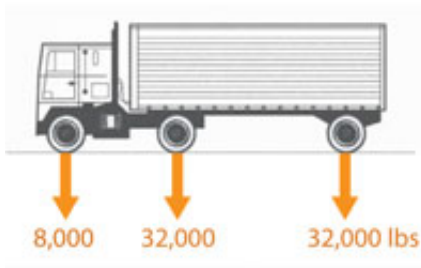
The BQE is one of the most heavily traveled roadways in New York City, and beyond, with an average daily volume of **130,000 vehicles**, including up to 13,000 trucks:



Key freight route: peak volume of up to 1,100 trucks per hour (500-600 per direction) during weekday mornings.

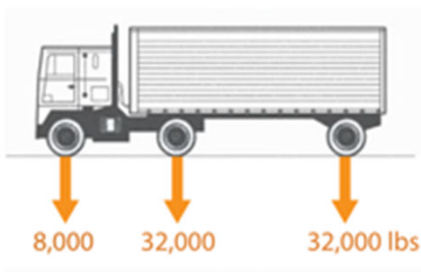
Comparison of Load Factors

- In Bridge design, the standard HL-93 truck load is typically used for analysis, amplified by a **load factor**: (a statistically-determined factor of safety).



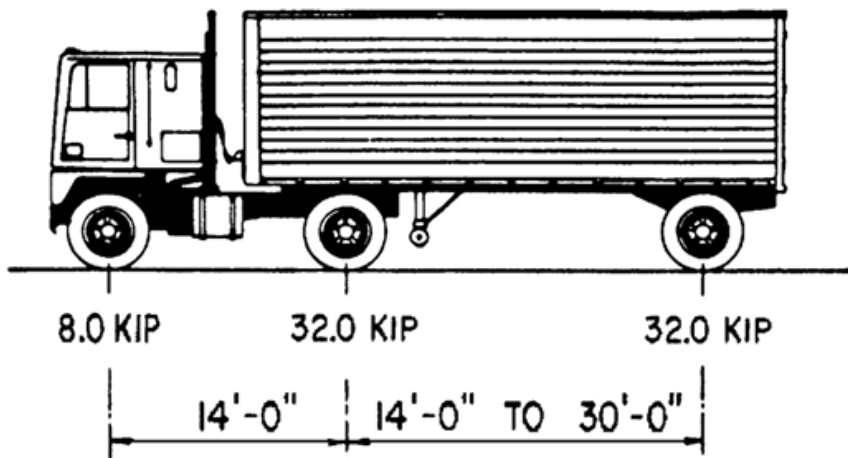
X Load Factor_{standard}

- When site-specific loads are calculated using WIM, the standard HL-93 truck load is amplified further to account for the new variation in loads.



X Load Factor_{WIM}

The Truth About Truck Loads



Standard HL-93 AASHTO Design Truck Load



Actual Site-Specific loads

Comparison of Load Factors

Comparing the **standard load factors** with the **load factors calculated to account for site-specific loads** gives a quantitative measure of the effect of site-specific WIM loads on design

LRFD Rating	HL-93 (standard)	Site-Specific (WIM)	% Increase
Staten-Island Bound	1.75	2.13	22%
Queens-bound	1.75	2.31	32%

FROM DATA COLLECTION TO DIRECT ENFORCEMENT

Paving the Way & Breaking Ground

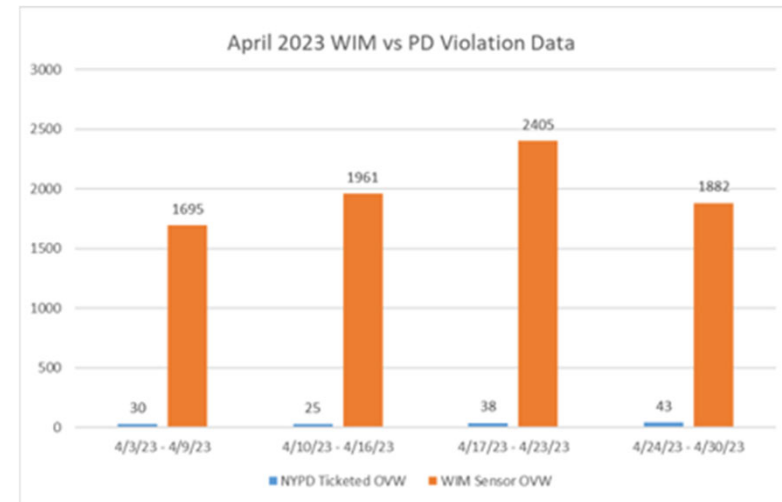
STEPPED UP TRADITIONAL ENFORCEMENT



BQE Truck Weight Limits Enforcement-Traditional Methods

- **Enforcement:** Executive Order 51 issued in January 2020 to provide for strict enforcement of existing weight restrictions on BQE
- **Following the Executive Order, the following notification was sent to all permit holders**

"To all who currently have a valid NYC DOT Annual Overweight Load and or Annual Special Hauling / Crane permit, Vehicles with NYC DOT Annual Overweight Load and or Annual Special Hauling / Crane permits **are NOT permitted** to travel on the BQE / I-278 from Sands St. to Atlantic Avenue in both directions until further notice."
- New York City's highway network presents operational challenges to law enforcement personnel with limited available space to safely conduct truck stops.



Only **14.6% of overweight trucks** identified along the BQE corridor by NYPD using portable scales

Steps to Direct Enforcement

LEGISLATION



CALIBRATION & CERTIFICATION



IMPLEMENTATION

NYS Legislation Overview

Amended in 2023: S6246/A6225

Dec 23, 2021	APPROVAL MEMO.151	Approved.
Dec 22, 2021	SIGNED CHAP.773	
Dec 10, 2021	DELIVERED TO GOVERNOR	
Jun 08, 2021	Returned To Senate Passed Assembly Home Rule Request Ordered To Third Reading Rules Cal.536 Substituted For A2316a	
Jun 03, 2021	Referred To Codes DELIVERED TO ASSEMBLY PASSED SENATE HOME RULE REQUEST	
May 24, 2021	AMENDED ON THIRD READING 2740B	
Apr 26, 2021	ADVANCED TO THIRD READING	
Apr 21, 2021	2ND REPORT CAL	
Apr 20, 2021	1ST REPORT CAL.707	
Apr 08, 2021	PRINT NUMBER 2740A	
Apr 08, 2021	AMEND AND RECOMMIT TO TRANSPORTATION	
Jan 25, 2021	REFERRED TO TRANSPORTATION	Introduced.

- Establishes a weigh-in-motion (WIM) demonstration program on I-278 in Kings County (Brooklyn, NY), imposing monetary liability for failure of an operator to comply with gross vehicle weight and/or axle weight restrictions; and
- The installation and operation of up to (16) sixteen weigh-in-motion violation monitoring systems within the vicinity of the Atlantic Ave. interchange to Sands St.
- Calibration & Certification of Calibration Required every 6 months
- **Violations**
 - GVW **10%** above gross vehicle weight restrictions
 - FHWA GVW Limit = 80 kips or Federal Bridge Formula
 - Axle/Tandem weights **20%** overweight restrictions
 - At least two independent weight measurements obtained by the WIM monitoring system

Calibration & Certification – Code Update Considerations

State Department of Agriculture typically certifies all commercial as well as enforcement equipment using NIST Handbook 44 Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices

- Existing NIST Handbook 44 currently has a tentative code for screening of vehicles
- ASTM 1318:
 - Type IV system potentially for automated enforcement for speeds of 2 – 10 mph.
 - The Type 3 system is defined as a system to be used for screening for weight violations only
- OIML R134-1: A comprehensive existing standard available for reference

NIST HB44 Section 2.26

NIST Handbook 44 Update for Direct Enforcement Certification

Aspect	Section 2.26	OIML R134-1
Accuracy	Class 10 (Similar to OIML F10) 10% GVW, 20% Single, 15% Group Class 5 5% GVW, 10% Axle, 8% Group	F10 10% GVW, 16% Single; 8% Group E5 5% GVW, 8% Axle/Group
Tolerance	Aligned with OIML	Interval 50-1000d @ d=200kg; min 50d
Influence Factor	Aligned with OIML	Temp range; voltage variation
Technical Requirement	Covering all aspects in Scale Code + Equivalent to OIML	Zero-setting, zero-tracking, operating speed, marking, vehicle recognition, etc.
Test Vehicle	3 vehicles Class 8-9/Class 6-7/Class 5 with full/partially full load per decision from Demo	3 vehicles Class 8-9/Class 6-7/Class 5 with full/empty load
Add'l vehicle	Aligned with OIML	If system is expected to weigh vehicle w/shifting weights, must include in tests
Speed Meas.	Aligned with OIML/Scale Code	Addressed
Position Test	Excluded per decision at Demo	Addressed

Calibration/Certification Progress

- NIST Handbook update effort
 - NCWM Interim Meeting in January 2025 formal designation as voting item
 - NCWM Annual Meeting in July 2025 Voting on the update
- ASTM Code update is also currently in progress

In the meantime:

- NYCDOT entered a MOA with NYS Dept of Agriculture to certify the system as a pilot.
- They have the authority to test/certify equipment outside of the handbook guidelines.
- Until the handbook is updated, they will use the most recent version of the proposed standard under consideration with national weights and measure for handbook update

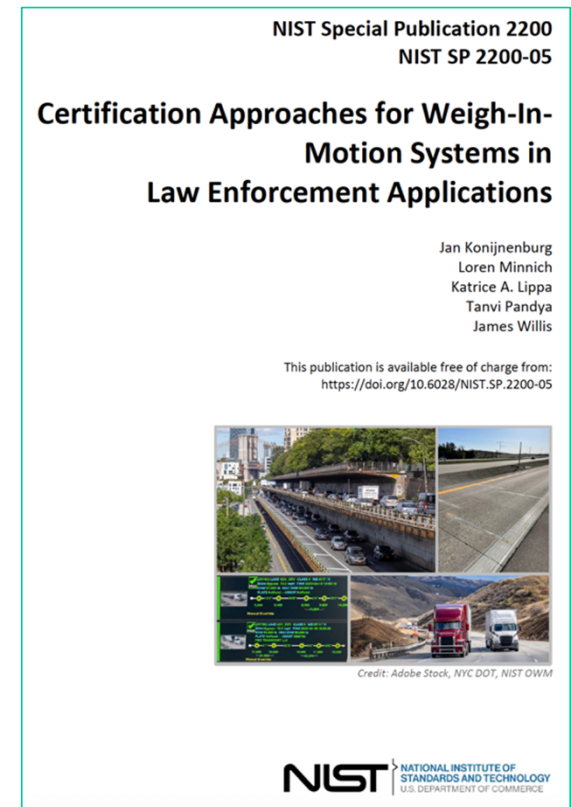
NIST PUBLICATION

Certification Approaches for Weigh-In-Motion Systems in Law Enforcement Applications

- The main characteristics of WIM systems and applicability for direct enforcement , as well as NYCDOT implementation and the certification of the WIM system to begin issuing citations to overweight vehicles in an effort to protect the BQE.



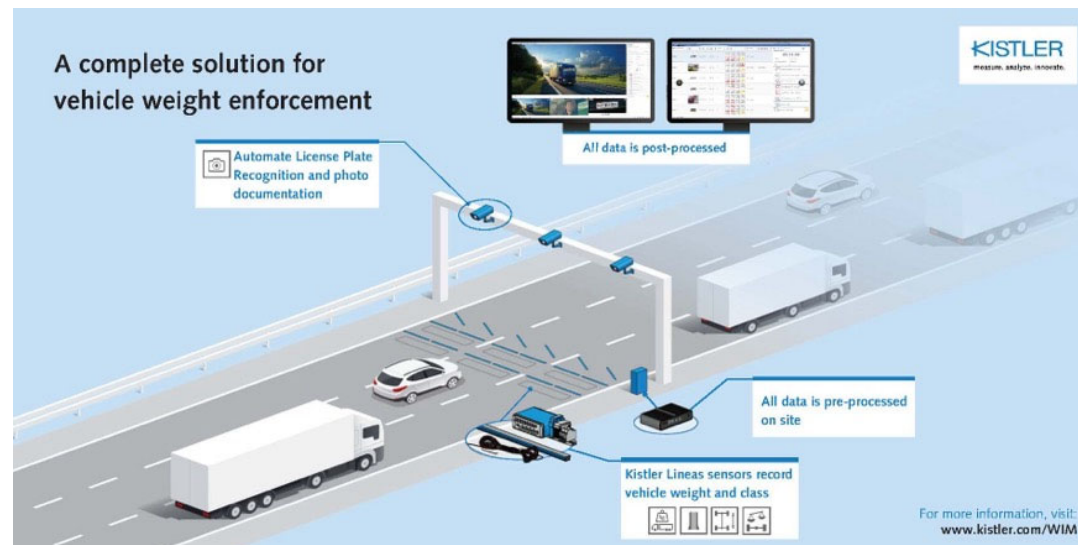
Scan Me!



DIRECT ENFORCEMENT - IMPLEMENTATION

DIRECT ENFORCEMENT IMPLEMENTATION

QB WIM System Installation: November 2022
Calibration: December 2022
System Validation & Back Office Configuration
: January ~ July 2023



CERTIFICATION TESTING



Load Condition	Speed
Half Load (10 runs)	High Speed Vmax (5 runs)
	Low Speed Vmin (5 runs)
Full Load (20 runs)	High Speed Vmax (10 runs)
	Low Speed Vmin (10 runs)
Total 30 runs per Test Vehicle	

- Testing consisted of field visit, witnessing of reference scale weighment, measurement of axle spacing of each truck
- Test runs were viewed from multiple cameras along with direct feed from the data logger
- Test completed over 2 nights with assistance from NYCDOT attenuator trucks for traffic management
- Concurrent logging of data by inspectors into their verification tabulation

SYSTEM CERTIFIED

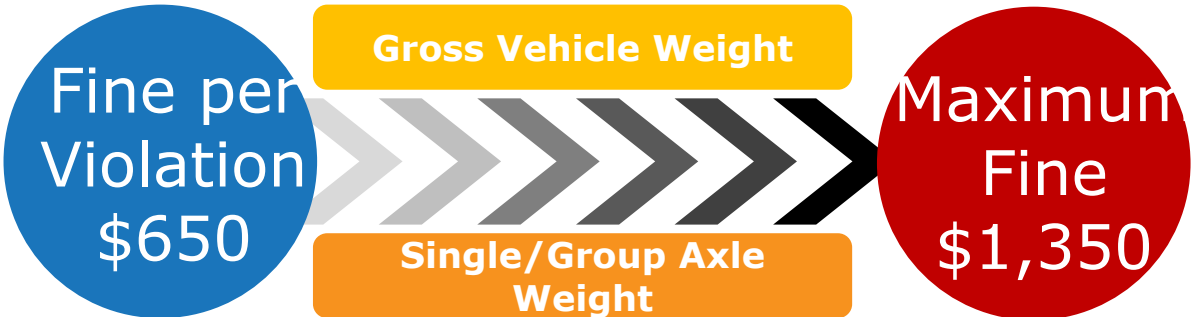
Certification by NYS Dept. of Ag.: October 2023
& April 2024

Table T.2.3: Maintenance Tolerances for Accuracy		Test Result
Load Description at 100% Compliance	Tolerance	
Axle Load	$\pm 20 \%$	✓
Axle Group Load (including bridge formula)	$\pm 15 \%$	✓
Gross Vehicle Weight	$\pm 10 \%$	✓



DIRECT ENFORCEMENT INITIATION

Direct OW Enforcement at BQE
Since Nov. 14, 2023



System calculates based on federal bridge formula the maximum GVW for truck configuration and differentiates between tandem and single axle

New York City Department of Finance
Weigh-In-Motion Enforcement Program
PO Box 3641 Church Street Station
New York, NY 10008-3641

NOTICE OF LIABILITY / CERTIFICATE
CHARGING THE LIABILITY



View your records online at
www.wimviolations.nyc.gov

NOTICE #: 4500000215

PIN: 8839

#BWCFGHJ
#45000002158#



ISSUE DATE: 11/14/2023 DUE DATE: 12/14/2023

VIOLATION DATE	VIOLATION TIME	FINE AMOUNT
11/13/2023	01:36:06 AM	\$650.00

LOCATION
EB BQE (I-278) MP 2.9 Lane 2; Interstate route 278 specifically from the vicinity of Atlantic Avenue to the vicinity of Sands Street in Kings County, NY

Axle Weights Measured (lbs.)	Maximum Axle Weight (lbs.)
Sensor Set 1: Tandem - 47,960 lbs	Single Axle: 22,400 lbs; Tandem-Axle: 36,000 lbs;
Sensor Set 2: Tandem - 49,460 lbs	

PLEASE TAKE NOTE:
In accordance with New York State Vehicle and Traffic Law section 365-a, the photographed vehicle has been detected by the NYCDOT Weigh-in-Motion (WIM) violation monitoring system located on that portion of Interstate route 278 (also known as Brooklyn-Queens Expressway) specifically from the vicinity of Atlantic Avenue to the vicinity of Sands Street in Kings County (Brooklyn), NY traveling: at least 20% above the axle weight limit (22,400 lbs. for a Single Axle and 36,000 lbs. for a Tandem-Axle) at the stated date and time.

You are liable to pay a monetary penalty for the amount shown. This amount is due within 30 days of the date of this Notice. Photographs evidencing the plate and violation are shown. Please see the additional pages of this Notice for further instructions.

There are no points associated with this Notice.



USDOT #



Make your check or money order payable to the NYC Department of Finance

Detach and mail this coupon with your payment

DO NOT MAIL CASH
Write on the front of your payment:
1) The 10-digit Notice Number
2) Your Plate Number
3) Your State of Registration
4) Your Plate Type

Insert this tear off coupon in the enclosed envelope

NYC DEPARTMENT OF FINANCE
Weigh-In-Motion
Enforcement Program
PO BOX 3641
CHURCH STREET STATION
NEW YORK, NEW YORK 10008-3641



NAME		AMOUNT DUE	
[Redacted]		\$650.00	
NOTICE NUMBER	VERSION	ISSUED	DUE DATE
4500000215	1	11/14/2023	12/14/2023
PLATE NUMBER	STATE	TYPE	WIM SYSTEM ID
[Redacted]	US-NY	COMMERCIAL	870501

NOTICE REQUIREMENTS



Gross Vehicle Weight Violations

- Date and time of violation
- License plate photograph
- GW Measured per sensor set
- Allowable maximum Weight per bridge formula
- Link to website for view record online
- NOL issued to Owner / Responsible Party (Rental)

Each violation reviewed by NYCDOT personnel to ensure integrity of package

Axle Weight Violations

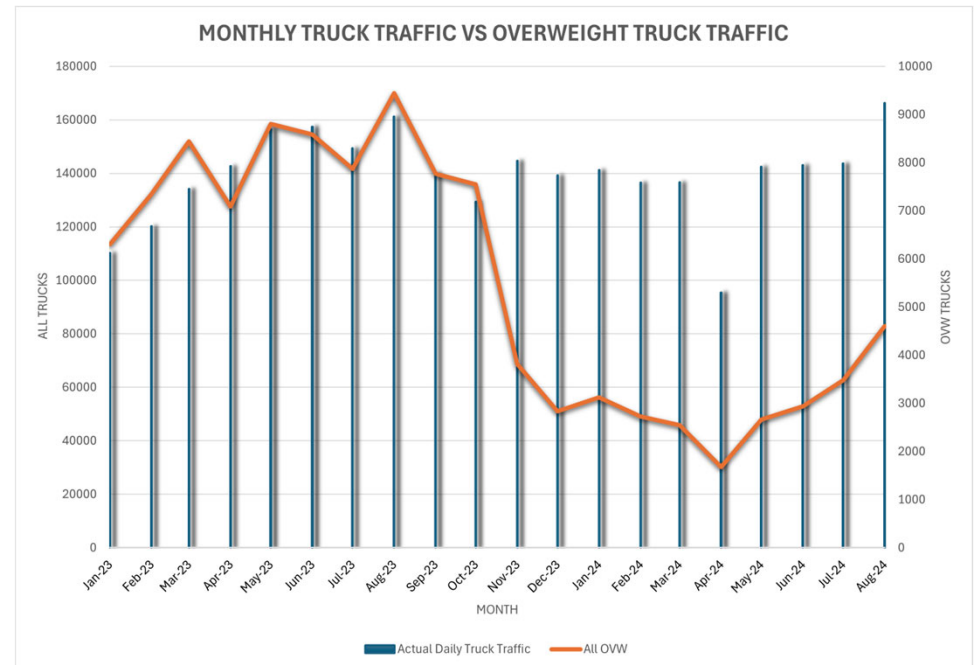
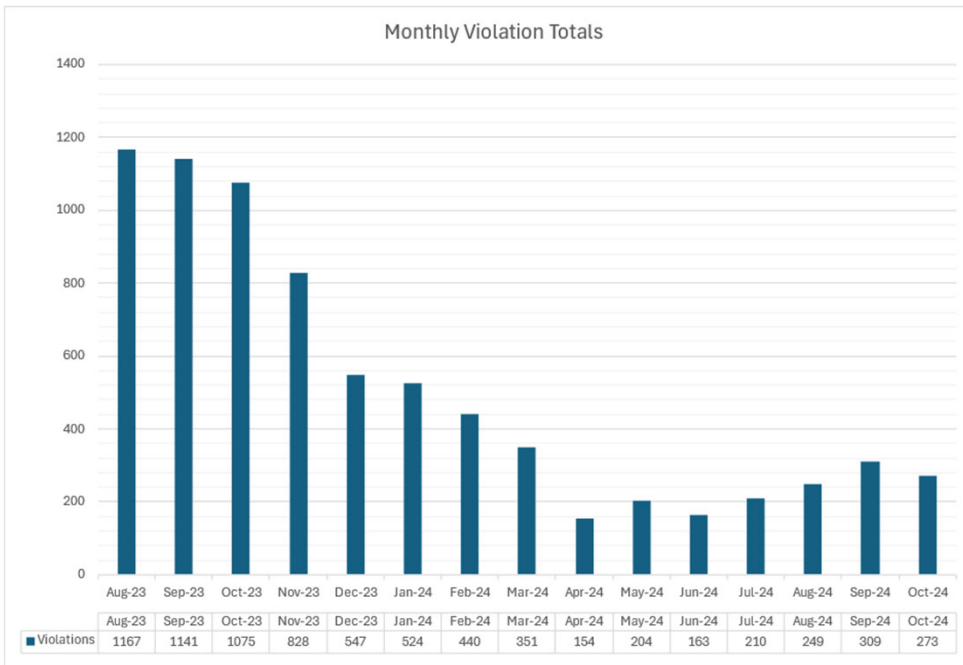
- Date and time of violation
- License plate photograph
- Each Axle Weight Measured per sensor set
- Allowable maximum for the axle in violation per bridge formula
- Additional tabulation of axle spacing and weights for identification of axle in question, e.g., tandem
- Link to website for view record online
- NOL issued to Owner / Responsible Party (Rental)

CLOSING REMARKS

So what's the impact?

ENFORCEMENT DATA

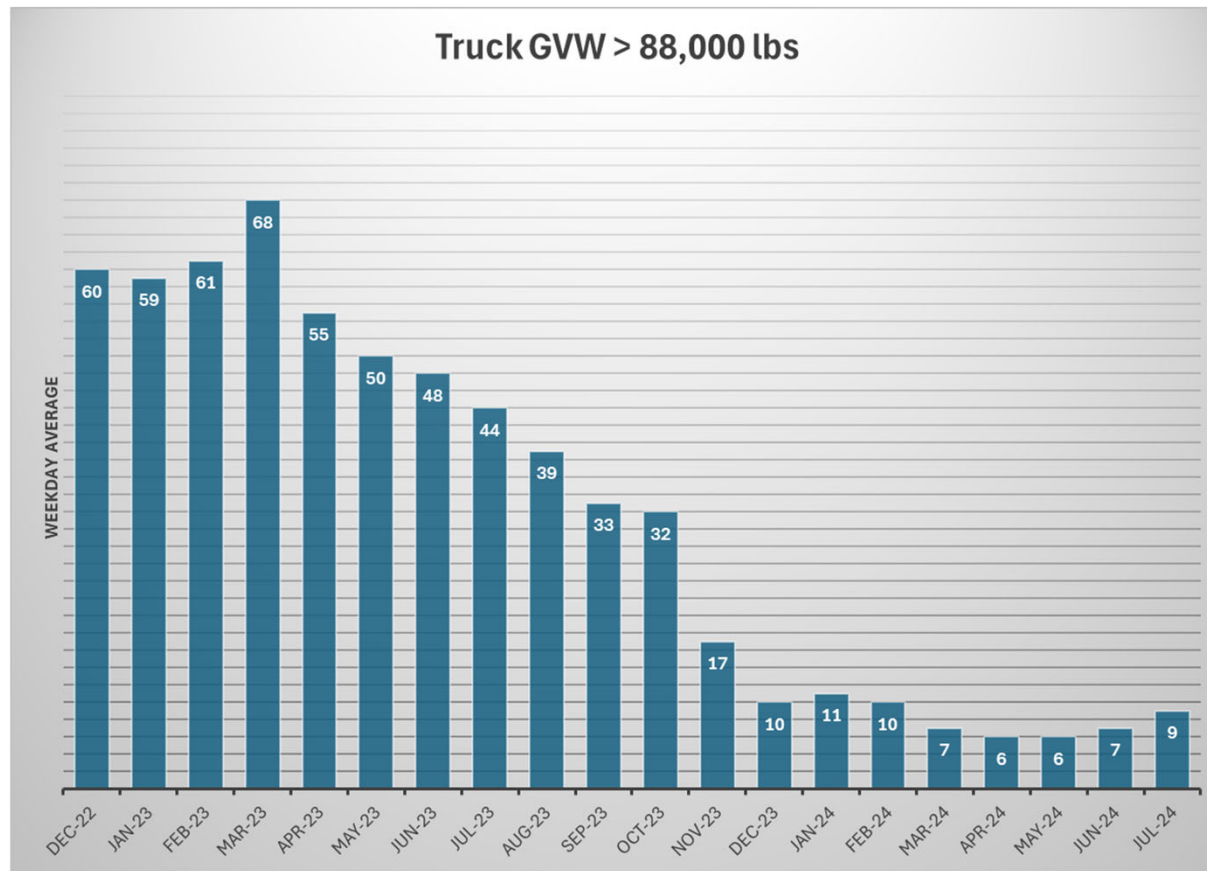
- Over 2000 violations issued to date
- Very limited adjudicated dismissal



ENFORCEMENT DATA

Direct Enforcement – Impact

More decrease of the extreme heavy trucks (GVW > 88,000 lbs)



ON-GOING EFFORTS



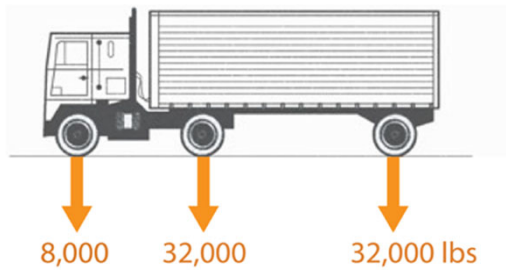
- NYCDOT is the first agency in the nation to implement WIM for direct enforcement
- Installation for SIB direction expected to be completed this year. A 90-day warning period will begin in early 2025 followed by violations being issued.
- Discussions with local partner agencies to pursue wider implementation
- Outreach with Freight partners to foster a culture of regulatory compliance and even the playing field
- NYCDOT is actively working with authorizing entities, including, FHWA, to educate and inform the industry on the WIM installation, calibration, and enforcement process.

This is Only the Beginning !

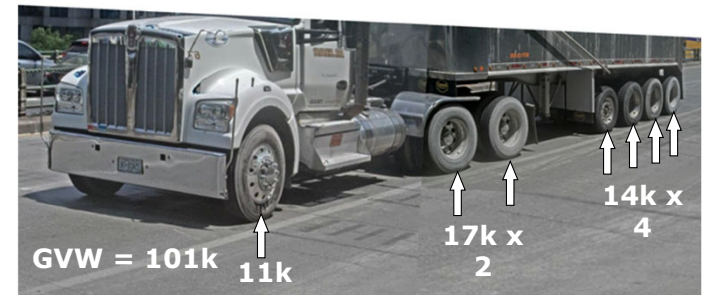
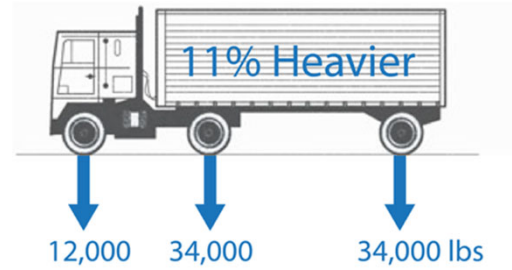
TRUCK LOADS

Legal load has been increased significantly, and the actual load is higher than structure's designed load.

Standard HL-93 AASHTO Design Truck Load



NYS Legal Load



What do we do about it?

CLOSING REMARKS



- Protecting our infrastructure and safer highways requires efficient means to enforce truck weight limits along with other related enforcement
- There is a gap in communications in achieving this goal
 - For instance –
 - DOT needs to protect bridges from overweight vehicles, may or may not be involved in weight enforcement must consider actual loads in their assessment
 - Highway Safety Personnel need to ensure vehicles are following safety standards but may not be aware of the infrastructure implications
 - Department of Agriculture reviews Handbook 44 which would set the standards for technology but are not involved in safety or infrastructure needs
 - Technology/Theoretical discussions don't always connect with decision makers

Who steps up to connect these seemingly disconnected aspects to achieve the goal?