

**REGULATION 6.40 Standards of Performance for Gasoline Transfer to Motor Vehicles
(Stage II Vapor Recovery and Control Systems)**

**Louisville Metro Air Pollution Control District
Jefferson County, Kentucky**

Relates To: KRS Chapter 77 Air Pollution Control

Pursuant To: KRS Chapter 77 Air Pollution Control

Necessity and Function: KRS 77.180 provides that the Air Pollution Control Board may make and enforce all needful orders, rules, and regulations necessary or proper to accomplish the purposes of KRS Chapter 77. This regulation provides for the control of emissions from motor vehicle refueling at gasoline dispensing facilities and decommissioning of existing Stage II controls at gasoline dispensing facilities that are no longer environmentally beneficial.

SECTION 1 Definitions

Terms used in this regulation that are not defined in this section shall have the meaning given to them in Regulation 1.02.

- 1.1 "Air-to-Liquid Ratio Test" means a test used to determine the collection efficiency of a vacuum assist system as measured by the air-to-liquid ratio. The test procedure is found in TP-201.5 in the Guidance.
- 1.2 "Aspirator assist system" means a vapor recovery system that uses a vacuum created by a jet pump by which liquid gasoline is sprayed into the vapor return line in order to draw vapor from the fuel tank of the motor vehicle being refueled.
- 1.3 "Assist system" means a vapor recovery system that uses a vacuum to draw vapor from the fuel tank of the motor vehicle being refueled into the recovery system. An aspirator assist system and a vacuum assist system are both assist systems.
- 1.4 "Balanced assist system" means a group of interacting components using a vacuum-creating device at a gasoline dispenser to assist in the capture of vapor from a motor vehicle fuel tank during refueling, and a balance system for the return of vapor to a storage tank.
- 1.5 "Balance system" means a group of interacting components using the pressure created in a motor vehicle fuel tank to force vapor through a sealed vapor return line connected to a storage tank.
- 1.6 "Boot" means an accordion-like tubular cover used over the spout of a gasoline nozzle to provide a return path for vapor displaced during refueling.
- 1.7 "CARB" means California Air Resources Board.
- 1.8 "Centralized assist system" means a group of interacting components using a single, remote vacuum-generating device to create a vacuum at a gasoline dispenser for drawing vapor from a motor vehicle fuel tank to a storage tank.
- 1.9 "Check valve" means a valve in the nozzle or in the vapor recovery line between the nozzle and the storage tank that prevents vapor back-flow.
- 1.10 "Construction" means fabrication, erection, installation, or modification of a gasoline dispensing facility. Construction shall include installation of vapor recovery and control equipment, laying of underground pipe and dispenser pipe work, building of permanent storage structures, and other construction activities related to the gasoline dispensing facility.

- 1.11 "Certified Stage II system" or "CARB-certified system" means a Stage II system certified by CARB. To be CARB-certified, a system shall have been:
- 1.11.1 Previously tested and approved by CARB,
 - 1.11.2 Assigned an executive order, and
 - 1.11.3 Found to have achieved a vapor recovery or removal efficiency of at least 95% by weight of vapor displaced during the dispensing of gasoline.
- 1.12 "Decommission" means to render inoperable a Stage II system in accordance with this Regulation. Decommissioning shall not be considered a modification pursuant to Section 6 of this Regulation.
- 1.13 "Dynamic Back Pressure Test" means a test used to determine the pressure drop (flow resistance) through vapor balance recovery and Hirt vacuum assist systems (including nozzles, vapor hoses, swivels, dispenser piping, and underground piping) at prescribed flow rates, during which all nozzles that may operate simultaneously on one dispenser are tested simultaneously to determine whether the under-dispenser plumbing and the vapor recovery kit were installed correctly. The test procedure is found in Bay Area Source Test Procedure ST-27 in the Guidance.
- 1.14 "Executive order" means an order established by CARB consisting of a list of equipment, special conditions, and configurations identifying the specific balance or assist system that has been tested and demonstrated to be at least 95% efficient by weight.
- 1.15 "Existing gasoline dispensing facility" means any gasoline dispensing facility that has installed a Stage II system as of May 18, 2016.
- 1.16 "Faceplate" means a soft, donut-shaped device attached to the boot of a nozzle that forms a tight seal with a motor vehicle fill pipe during refueling.
- 1.17 "Gasoline" means any petroleum distillate having a Reid Vapor Pressure of four pounds per square inch or greater. Gasoline shall also include gasoline oxygenate blends (gasoline blended with minor amounts of alcohols such as methanol, ethanol, and tertiary butanol or ethers such as methyl-tertiary butyl ether), but shall exclude E85.
- 1.18 "Gasoline dispensing facility" means a stationary source where gasoline is dispensed into motor vehicle fuel tanks or portable containers from a storage tank with a capacity greater than 250 gallons, and shall include storage tanks and associated piping (including co-vault above-ground systems), dispensers (including vapor hoses, swivel nozzles, and piping), and all on-site equipment connecting them.
- 1.19 "Guidance" means EPA 450/3-91-022b *Technical Guidance - Stage II Vapor Recovery Systems for Control of Vehicle Refueling Emissions at Gasoline Dispensing Facilities* (11-91).
- 1.20 "Independent small business marketer of gasoline" means a person engaged in the marketing of gasoline who:
- 1.20.1 Is not a refiner, or a person who controls, is controlled by, or is under common control with, a refiner, or otherwise directly or indirectly affiliated with a refiner or with a person who controls, is controlled by, or is under a common control with a refiner (unless the sole affiliation is by means of a supply contract or an agreement or contract to use a trademark, trade name, service mark, or other identifying symbol or name owned by such refiner or any such person),
 - 1.20.2 Owns only one gasoline dispensing facility, and
 - 1.20.3 Has annually averaged non-gasoline business sales (Consumer Price Index-adjusted 1993 dollars) of less than \$25,000 dollars per month.

- 1.21 "Leak Test" means a test used to quantify the vapor tightness of a Stage II system, conducted once all equipment has been connected. The test procedure is found in the Bay Area Source Test Procedure ST-30 in the Guidance.
- 1.22 "Liquid Blockage Test" means a test used to determine if the piping configuration is correct and to detect low points in the piping where the accumulation of liquid condensate may cause a blockage that may restrict the flow of vapor and decrease a Stage II system's vapor collection efficiency. The test procedure is found in San Diego Air Pollution Control District Test Procedure TP-91-2 in the Guidance.
- 1.23 "Liquid Removal Device Test" means a test used to quantify the removal of liquid gasoline from the vapor passage of coaxial hoses and underground piping equipped with a liquid removal device. The test procedure is found in the Bay Area Source Test Procedure ST-37 in the Guidance.
- 1.24 "Modification" or "modify" means a physical change to a Stage II system, including replacement or correction of underground piping between a gasoline dispenser and a storage tank, but excludes:
- 1.24.1 Replacement of a hose, breakaway, or nozzle,
 - 1.24.2 Replacement of up to 25% of the total number of gasoline dispensers if the underground piping is not modified,
 - 1.24.3 Extension of a drop fill tube or replacement of a float valve,
 - 1.24.4 Replacement of an underground storage tank cap, collar, seal, adapter, or pressure/vacuum valve,
 - 1.24.5 Replacement of plumbing or components inside a gasoline dispenser,
 - 1.24.6 Replacement of manhole or access port components,
 - 1.24.7 Replacement of a fillport adapter, or
 - 1.24.8 Installation or replacement of an isolation valve or check valve.
- 1.25 "Motor vehicle" means a vehicle, machine, or mechanical contrivance propelled by an internal combustion engine and operated upon the public highways, and any trailer or semi-trailer attached to or having its front end supported by a motor vehicle.
- 1.26 "New gasoline dispensing facility" means any gasoline dispensing facility that has not installed a Stage II system as of May 18, 2016.
- 1.27 "Onboard refueling vapor recovery equipment" means a system on a motor vehicle that captures vapor from the vehicle's fuel tank during refueling.
- 1.28 "Owner or operator" means a person who owns, leases, operates, manages, supervises, or controls (directly or indirectly) a gasoline dispensing facility.
- 1.29 "Processor" or "vapor processor" means a thermal oxidizer system that transports hydrocarbon vapor from an underground storage tank to a destruction device or afterburner.
- 1.30 "Refiner" means a person engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants, or other products through distillation of petroleum or through the redistillation, cracking, or reforming of unfinished petroleum derivatives, and whose total refinery capacity is 65,000 barrels per day or greater. In determining the total refinery capacity, the capacity of the refineries of any persons who control, are controlled by, or are under common control with the refiner shall be included with the capacity of the refiner.
- 1.31 "Representative" or "facility representative" means a person who has been trained to serve at a gasoline dispensing facility as prescribed in Section 4.

- 1.32 "Stage II vapor recovery and control system" or "Stage II system" means a vapor-gathering system equipped to be capable of collecting at least 95% of the hydrocarbon vapor discharged during motor vehicle refueling and a vapor disposal system capable of processing the hydrocarbon vapor so as to prevent emissions into the atmosphere.
- 1.33 "Vacuum assist system" means a balanced assist system or centralized assist system.
- 1.34 "Vapor Space Tie Test" means a test used to determine whether a storage tank is properly manifolded into a Stage II system. The test procedure is found in San Diego Air Pollution Control District Procedure TP-91-2 in the Guidance.

SECTION 2 Applicability

- 2.1 This regulation applies to the refueling of motor vehicles at gasoline dispensing facilities, except:
 - 2.1.1 The initial fueling of new motor vehicles at a motor vehicle assembly facility,
 - 2.1.2 A gasoline dispensing facility that is exempt under Section 2.2, or
 - 2.1.3 A new gasoline dispensing facility.
- 2.2 The following gasoline dispensing facilities are exempt:
 - 2.2.1 A gasoline dispensing facility whose average monthly throughput does not exceed 10,000 gallons of gasoline,
 - 2.2.2 A gasoline dispensing facility owned or operated by an independent small business marketer whose average monthly throughput does not exceed 25,000 gallons of gasoline,
 - 2.2.3 A motor vehicle rental facility that previously decommissioned its existing Stage II system in accordance with this regulation, or
- 2.3 Beginning May 18, 2016, any gasoline dispensing facility with a Stage II system that is decommissioned in accordance with Section 3 shall not be subject to this Regulation.

SECTION 3 Decommissioning

- 3.1 The owner operator of an existing gasoline dispensing facility with a Stage II system shall decommission the Stage II system in accordance Chapter 14 of the Petroleum Equipment Institutes Recommended Practices for Installation and Testing of Vapor Recovery Systems at Vehicle Refueling Sites, PEI/RP300-09.
- 3.2 The decommissioning procedure shall include the following:
 - 3.2.1 Initiating safety procedures;
 - 3.2.2 Relieving pressure in the tank ullage;
 - 3.2.3 Draining all liquid collection points;
 - 3.2.4 Protecting against electrical hazards by disconnecting all Stage II electrical components;
 - 3.2.5 Reprogramming the electronics in the dispenser to indicate that the Stage II vapor recovery is not in service;
 - 3.2.6 Sealing off vapor piping located below grade and below the level of the dispenser base in a secure manner;
 - 3.2.7 Sealing off vapor piping located below grade at the end of the tank end, if reasonably accessible, in a secure manner;
 - 3.2.8 Sealing of vapor piping located inside the dispenser cabinet in a secure manner;

- 3.2.9 Replacing Stage II vapor recovery-type hanging hardware with conventional-type hanging hardware;
- 3.2.10 Installing pressure and vacuum vent valves as appropriate;
- 3.2.11 Removing all Stage II instructions from all dispenser cabinets;
- 3.2.12 Conducting appropriate testing, including pressure decay and tie-tank tests;
- 3.2.13 Verifying that all visible storage system components will not release any vapors or liquids; and
- 3.2.14 Restoring the gasoline dispensing facility back to operational status.
- 3.3 The owner or operator of an existing gasoline dispensing facility with a Stage II system shall submit to the District:
 - 3.3.1 A completed Form APG-D at least 30 days prior to commencing any decommissioning activity. If a change occurs to the submitted plan, a revision shall be submitted at least 10 calendar days prior to commencing any decommissioning activities; and
 - 3.3.2 A completed Form APG-E within 10 days of completing the decommissioning.
- 3.4 Decommissioning, including all required testing, shall be completed within 60 days of commencement of decommissioning.
 - 3.4.1 If decommissioning, including all required testing, is not completed within 60 days of commencing decommissioning, lock-outs and “Out of Service” tags shall be installed on all gasoline dispensers that have not been decommissioned until decommissioning is completed.
 - 3.4.2 Testing required to complete decommissioning shall be in accordance with the requirements of sections 5.2 to 5.5.
- 3.5 All Stage II systems shall be decommissioned in accordance with this section by December 31, 2018.

SECTION 4 Standards for Gasoline Dispensing Facilities

- 4.1 Subject to the applicability in Section 2, no owner or operator of an existing gasoline dispensing facility shall install, permit the use of, or allow the transfer of gasoline from a gasoline dispensing unit to a motor vehicle fuel tank or container, unless the facility is equipped with a CARB-certified system complying with this regulation.
- 4.2 A Stage II system shall be maintained in good working order in accordance with the manufacturer's plans, specifications, maintenance requirements, and CARB certification.
- 4.3 No elements or components of a Stage II system shall be modified, removed, replaced, or otherwise rendered inoperative in a manner that would prevent the system from performing in accordance with the requirements of the applicable CARB executive order, unless approved by the District. The District may approve a change to a Stage II system if a needed component is not obtainable and the component will be replaced with one providing equivalent emission reductions.
- 4.4 Equipment used in a Stage II system shall:
 - 4.4.1 Be manufactured by the original manufacturer or rebuilt by a rebuilder certified by CARB,
 - 4.4.2 Have the name of the certified manufacturer or certified rebuilder permanently affixed to it,
 - 4.4.3 Have only coaxial nozzles and hoses on balance systems used to dispense gasoline and recover vapor,

- 4.4.4 Have vapor risers, for balance systems and balanced assist systems, of one inch inside diameter galvanized pipe or larger if two or more nozzles feed into them,
- 4.4.5 If equipped with rubber hosed vapor connectors (riser-to-dispenser), have UL approval for gasoline transmission,
- 4.4.6 Have an assist system using a processing unit that is located in a safe and accessible location for compliance inspections,
- 4.4.7 Not have a remote vapor check valve or associated equipment for operating equipment on any vapor balance recovery or Hirt vacuum assist system,
- 4.4.8 Be operated and maintained so as to be leak-free, vapor tight, and in good working order,
- 4.4.9 Be free of the following defects:
 - 4.4.9.1 Absence or disconnection of a component required by the CARB certification,
 - 4.4.9.2 A vapor hose:
 - 4.4.9.2.1 Crimped or flattened in a manner that will constrict the flow of vapor in the vapor return line,
 - 4.4.9.2.2 With a cut, tear, leak, kink, more than six inches of hose resting on the dispenser island or ground when in the hang-up position, or disconnection of an inner spring from a hose end fitting, or
 - 4.4.9.2.3 With a pressure drop through the hose exceeding by a factor of two or more the value specified for that certified system,
 - 4.4.9.3 A nozzle:
 - 4.4.9.3.1 With a boot that is cut, torn, or damaged,
 - 4.4.9.3.2 With a boot or faceplate that cannot achieve a seal,
 - 4.4.9.3.3 With a malfunctioning nozzle shut-off mechanism, or
 - 4.4.9.3.4 With a leak, a bent or loose spout, or a clogged vapor port on the spout,
 - 4.4.9.4 A vapor return line, including components such as swivels, anti-recirculation valves and underground piping, that malfunctions or is blocked, cracked, crimped, trapped, or restricted,
 - 4.4.9.5 An inoperative or malfunctioning vapor-processing device,
 - 4.4.9.6 An inoperative or malfunctioning vacuum-producing device,
 - 4.4.9.7 An inoperative or malfunctioning pressure/vacuum relief valve, vapor check valve, or dry break, or
 - 4.4.9.8 A defect substantially impairing the effectiveness of the system in reducing the emission of air contaminants.
- 4.5 Tagged equipment:
 - 4.5.1 Upon identification of a defect described in Section 4.4.9, the owner or operator of a gasoline dispensing facility shall ensure that all gasoline dispensing equipment for which vapor recovery has been impaired is tagged "Out of Service." The tagged equipment shall be rendered inoperable and the tags shall not be removed until the defective equipment has been repaired, replaced, or adjusted to permit proper operation.
 - 4.5.2 In the case of a defect identified by the District, tagged equipment shall be rendered inoperable and the tags shall not be removed until:
 - 4.5.2.1 The District has been notified of the repairs, and
 - 4.5.2.2 The tagged equipment either has been reinspected, or the District has authorized its use pending reinspection.

- 4.5.3 If a District inspector determines that a component is not in good working order, but does not contain a defect listed in Section 4.4.9, the District shall provide the owner or operator with a notice specifying the basis on which the component is not in good working order. If within 15 days the owner or operator provides the District with adequate evidence that the component is in good working order, the owner or operator shall not be considered in violation of Section 4.
- 4.6 Facility representative:
- 4.6.1 The owner or operator of a gasoline dispensing facility shall ensure that at least one person, designated as facility representative, receives adequate training and instruction on the operation and maintenance of the Stage II system, including how to comply with this regulation. Training and instruction shall include:
- 4.6.1.1 How the installed system operates and what it is designed to do,
- 4.6.1.2 How to conduct daily start-up and shut-down of the system, including how to conduct daily inspections of the system equipment,
- 4.6.1.3 How to avoid causing the defects described in Section 4.4.9,
- 4.6.1.4 How to recognize when faulty equipment should be repaired or replaced, including the need to prevent voiding an equipment warranty, and
- 4.6.1.5 When equipment must be tagged as required by Section 4.5.
- 4.6.2 The owner or operator of a gasoline dispensing facility shall post the name of the current facility representative on a sign where it is clearly visible, readily accessible to the facility's employees, and kept in good repair.
- 4.6.3 The owner or operator of a gasoline dispensing facility shall prepare a training certificate for each person trained as a facility representative.
- 4.7 Daily inspections: An owner or operator of a gasoline dispensing facility shall ensure that at least once during every 24 hour period for which the system was in operation during that day a facility representative visually inspects the equipment for defects. An inspection report shall be made every 24 hours recording deficiencies, repairs, or maintenance on the system. The inspection reports shall be recorded in a non-falsifiable format that can be verified by the District.
- 4.8 Operating instructions and contact information:
- 4.8.1 The owner or operator of a gasoline dispensing facility shall post operating instructions on the front of each gasoline dispenser connected to the system. The instructions shall be clearly visible to the public at any normal refueling position and kept in good repair. The instructions shall describe clearly how to refuel vehicles correctly with the vapor recovery nozzles and include a warning not to attempt continued refueling after automatic shut-off of the nozzle (an indication that the vehicle fuel tank is full).
- 4.8.2 The owner or operator of a gasoline dispensing facility shall post a toll-free telephone number for the facility, so that the public may report any problems experienced with the Stage II system.

SECTION 5 Testing Requirements

- 5.1 The owner or operator of a gasoline dispensing facility shall test the Stage II system as required by this section in order to demonstrate compliance with this regulation.
- 5.2 The owner or operator of a gasoline dispensing facility shall notify the District in writing of a scheduled test at least 5 business days before the testing date, identifying each test to

- be conducted, the date and time of each test, and the name of the company that will conduct each test. The District may require a test to be rescheduled if a District representative cannot be available for the scheduled date or time.
- 5.3 The District may require a test to be aborted if the duration of the test is greater than 2 hours, improper test procedures are used, or sufficient tools, reference materials, test equipment, or repair parts or equipment are not available at the facility.
- 5.4 If the Stage II system or any of its components fails the test, the system shall be tagged as provided by Section 4.5 and shall not be used for refueling until it is repaired or replaced and passes the test.
- 5.5 No later than 15 days after passing a test, the person conducting the test shall certify the results to the District in a written record that includes the date of the test and the results.
- 5.6 Preliminary test:
- 5.6.1 The owner or operator of a gasoline dispensing facility constructing or modifying a Stage II system shall arrange for a Leak Test to be conducted after installing all underground piping but before installing any above-ground components.
- 5.6.2 If the underground components of the Stage II system pass the Leak Test, then the underground components may be covered and sealed.
- 5.7 Initial compliance test:
- 5.7.1 The owner or operator of a gasoline dispensing facility shall arrange for an initial compliance test to be conducted no later than 30 days after the first date gasoline is delivered to the facility after a Stage II system has been installed (including all underground and above-ground components and associated piping).
- 5.7.2 The tests to be conducted during the initial compliance test shall be based on the type of Stage II system installed. Unless the District approves eliminating a test, the initial compliance test shall include a Leak Test of the entire Stage II system, an Air-to-Liquid Ratio Test (including the 10-Gallon per Minute Limitation Procedure), a Dynamic Back Pressure Test, a Vapor Space Tie Test, a Liquid Removal Device Test, and a Liquid Blockage Test.
- 5.8 Annual CARB test:
- 5.8.1 The owner or operator of a gasoline dispensing facility shall arrange for a CARB test to be conducted every twelve months.
- 5.8.2 The tests to be conducted during the annual CARB test shall be based on the type of Stage II system installed. Unless the District approves eliminating a test, the annual CARB test shall include a Leak Test, an Air-to-Liquid Ratio Test (including the 10-Gallon per Minute Limitation Procedure), and a Liquid Removal Device Test. The District may also require a Dynamic Back Pressure Test, a Vapor Space Tie Test, and a Liquid Blockage Test.
- 5.9 Recertification test:
- 5.9.1 The owner or operator of a gasoline dispensing facility shall arrange for a recertification test to be conducted every 5 years.
- 5.9.2 The tests to be conducted during the recertification test shall be based on the type of Stage II system installed. Unless the District approves eliminating a test, the recertification test shall include the same tests conducted during the initial compliance test.

SECTION 6 Permitting of Gasoline Dispensing Facilities

6.1 Construction permits:

- 6.1.1 The owner or operator of a gasoline dispensing facility shall obtain a construction permit from the District before constructing or modifying the facility. A construction permit issued by the District shall remain in effect until it expires, or until an operating permit is issued or denied.
- 6.1.2 The owner or operator of the facility shall notify the District no later than 30 days prior to the construction or modification of a Stage II system, by submitting a construction permit application on a form provided by the District. The application shall include:
 - 6.1.2.1 The name, address, and phone number of the facility and the contractor installing or modifying the Stage II system,
 - 6.1.2.2 The CARB executive order number and exhibit for the Stage II system to be installed, along with a construction blueprint (consisting of underground vapor recovery piping size, manifolding pipes between dispenser banks, and underground storage tanks) and a copy of the system's operating instructions,
 - 6.1.2.3 The number of nozzles (excluding diesel and kerosene), the nozzle model number and manufacturer, and the dispenser model and manufacturer,
 - 6.1.2.4 The average monthly throughput of gasoline, and
 - 6.1.2.5 The scheduled dates of installation and completion of the Stage II system. Completion of installation includes successfully passing the preliminary test and the initial compliance test.

6.2 Operating permits:

- 6.2.1 The owner or operator of a gasoline dispensing facility shall demonstrate compliance with this regulation before the District issues an operating permit for the facility. A compliance demonstration shall include:
 - 6.2.1.1 Passing the preliminary test and the initial compliance test, and
 - 6.2.1.2 Passing the District's initial inspection.
- 6.2.2 An operating permit will be renewed if the gasoline dispensing facility is operating in compliance with this regulation.

SECTION 7 Recordkeeping

- 7.1 The owner or operator of a gasoline dispensing facility shall maintain the following records at the facility, and provide them to the District at the time of the District's request:
 - 7.1.1 All executive orders for the Stage II system,
 - 7.1.2 Training certificates for all facility representatives,
 - 7.1.3 Maintenance and repair records for the Stage II system for the last 2 years, including type and duration of any system failures, dates of repairs and replacements, identity of parts repaired or replaced, and locations of parts repaired or replaced, and
 - 7.1.4 Daily inspection reports for the last 2 years.
- 7.2 The owner or operator of a gasoline dispensing facility shall maintain the following records at the facility or off-site, and provide them to the District within three business days of the District's request:
 - 7.2.1 Names, addresses, and telephone numbers of companies installing Stage II system equipment, the identity of the equipment installed, and the dates of installation,

- 7.2.2 Results of preliminary tests and compliance tests, including test dates and the names, addresses, and telephone numbers of the persons conducting the tests,
- 7.2.3 Maintenance and repair records for the Stage II system for the last 3-5 years, including type and duration of any system failures, dates of repairs and replacements, identity of parts repaired or replaced, and locations of parts repaired or replaced,
- 7.2.4 Daily inspection reports for the last 3-5 years, and
- 7.2.5 Monthly throughput reports.

Adopted v1/12-16-92; effective 12-16-92; amended v2/8-18-93; v3/10-15-08; v4/5-18-16.