ICS XXX
XX

SZDB/Z

SZDB/Z XXX—XXXX

Technical Regulation of Retrofitting In-use Diesel Vehicle and Non-road Mobile Machinery with Particulate Filter

2017－XX－XX 发布　　XXXX－XX－XX 实施

深圳市市场监督管理局 发布

Content

FOREWORD

This regulation is drafted in accordance with GB/T1.1-2009, proposed and managed by Shenzhen Habitat Environment Committee.

In this regulation, Appendix A, C, D and E are informative appendix. Appendix B and F are normative appendix.

Drafted: Shenzhen Habitat Environment Committee and the Ministry of Environmental Protection Vehicle Sewage Monitoring Center.

Major drafters: Wang Yanjun, Ji Zhe, Teng Qi, Tang Yi, Lu Xuyang, Gao Jun, Chen Yuanqing, Xie Shuxia, Fu Yunfang.

This regulation is first released.

INTRODUCTION

This regulation is drafted based on the practical situation in Shenzhen, as required by the need of scientific evaluation and usage of particle traps on diesel vehicles and various types of non-road mobile machinery equipped with diesel engines (hereinafter referred to as "diesel vehicles / machines"), in order to prevent the exhaust particulates of diesel vehicles / machines from polluting the ambient air and harming citizens, according to Environmental Protection Law of The People's Republic of China and People's Republic of China Law on Air Pollution Prevention and Control.

This regulation stipulates the methods and techniques that diesel vehicles / machines installed in Shenzhen should follow when retrofitted with particle filters, including the general conditions to be met when using particle filters, the principles and methods for evaluation of environmental management effects, the principle of matching diesel vehicles / machines and particle traps, the batch installation testing procedure and the responsibility of the product supplier / consumer during operation and maintenance.

Technical Regulation of Retrofitting In-use Diesel Vehicle and Non-road Mobile Machinery with Particulate Filter

1 General Provisions

This regulation stipulates the principles and methods on particle filters selection, vehicle selection, matching, road demonstration test, mass installation and operation and maintenance when in-use diesel vehicles and various types of non-road mobile machinery equipped with diesel engines (hereinafter referred to as "diesel vehicles / machines") are retrofitted for exhaust gas treatment.

This regulation applies to the particulate matter control on diesel vehicles that meet the CHINA Ⅲ and above and non-road mobile machinery that meet the CHINA Ⅱ and above in Shenzhen. This regulation can also be used for reference of particulate emission control on all kinds of non-road machinery equipped with diesel engines and vehicles with second diesel engine in Shenzhen (except for those separately stipulated by the Country or Shenzhen).

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this regulation. For dated references, only the dated version applies to this regulation. For undated references, the latest version of this document applies to this regulation.

GB 1495	Limits and Measurement Methods for Noise Emitted by Accelerating Motor Vehicles
GB 3847	Limits and Measurement Methods for Exhaust Smoke from C.I.E. (Compression Ignition Engine) and Vehicle Equipped with C.I.E.
GB 17691	Limits and Measurement Methods for Exhaust Pollutants from Compression Ignition and Gas Fueled Positive Ignition Engines of Vehicles (III IV V)
GB 18352.6	Limits and Measurement Methods for Emissions from Light-Duty Vehicles (CHINA Ⅵ)
GB 19147	Automobile Diesel Fuels (Ⅳ)
GB 20891	Limits and Measurement Methods for Exhaust Pollutants from Diesel Engines of Non-road Mobile Machinery (CHINA Ⅲ, Ⅳ)
HJ/T 400	Determination of Volatile Organic Compounds and Carbonyl Compounds in Cabin of Vehicles
HJ 451-2008	Technical Requirement for Environmental Protection Product After-treatment Devices for Diesel Vehicle Exhaust
HJ 689-2014	Limits and Measurement Methods for Exhaust Pollutants from Diesel Engines of Urban Vehicles (WHTC)
HJ 732	Emission from stationary sources-Sampling of volatile organic compounds-Bags method

HJ 734	Stationary Source Emission -Determination of volatile organic compounds -Sorbent adsorption and thermal desorption gas chromatography mass spectrometry method
QC/T 900-1997	Quality Inspection and Evaluation Methods of Automobile Vehicle Product
DB 44/593	Limits and Measurement Methods for Exhaust Smoke from In-use Vehicle Equipped with Compression Ignition Engine (LUGDOWN)
SZJG 49-2015	Limits and Measurement Methods for Exhaust Smoke from In-use Diesel Engines of Non-road Mobile Machinery

3 Terminologies and Definitions

The following terms and definitions apply to this regulation.

3.1 Diesel Vehicle

Vehicles equipped with a diesel engine that provides driving power with diesel-based fuel.

3.2 Non-road Mobile Machinery

Various types of non-road machinery specified in GB 20891.

3.3 Emission Pollutants

Refers to the carbon monoxide (CO), hydrocarbons (HC), nitrogen oxides (NOX) and particulates discharged from the exhaust pipe of a diesel engine, and the nitrogen oxides are expressed as nitrogen dioxide (NO_2) equivalents.

3.4 Particulate Number (Referred to as PN)

The amount of particulate matter discharged from the exhaust pipe of a diesel engine.

3.5 Unregulated Pollutants

Volatile organic compounds (such as benzene, toluene, ethylbenzene, styrene and xylene) and aldehydes and ketones (such as formaldehyde, acetaldehyde and acrolein) emitted from diesel vehicles / engines.

3.6 Free Loading Smoke

The light absorption coefficient of a mechanical exhaust are continuously measured with Opacimeters during continuous normal operation of non-road mobile machinery (for example, the whole process from shoveling to loading). Take the maximum reading of the opacimeter during the measurement as the smoke value.

3.7 Diesel Particle Filter (Referred to as DPF)

Specifically refers to the diesel engine exhaust all through the carrier wall and the particulate matter filtration system, including sensors, electronic control system, attached heater or oxidation-type catalytic converters (DOC) for regeneration, and other ancillary units.

3.8 Substrate

Components in DPF for supporting the catalyst coating and filtering particulate matter in the exhaust.

3.9 Catalyst

Substance that promotes or accelerates a chemical reaction, while its quality and chemical properties remain unchanged before and after the chemical reaction.

3.10 Exhaust Backpressure

Resistance pressure of diesel engine exhaust, in kPa.

3.11 Regeneration

Remove the particles collected in DPF to ensure its stable and reliable operation. It can be divided into active regeneration and passive regeneration.

3.12 Active Regeneration

The regeneration of the DPF is achieved by increasing the temperature of the exhaust gas with the addition of energy or added matter to raise the temperature inside the DPF to the oxidation combustion temperature of the particulate matter.

3.13 Passive Regeneration

The regeneration of the DPF is achieved by low-temperature oxidation (generally less than 450 °C) of collected particles under the action of the catalyst with the energy of exhaust gas of diesel engine.

3.14 Particulate Filtration Efficiency

The ratio of the difference between PN measured at DPF inlet and outlet to PN measured at the DPF inlet. It is calculated as follows:

$$F = \frac{PN_I - PN_F}{PN_I} \times 100\% \quad (1)$$

F：Particulate filtration efficiency

PN_I：Particle number measured at the DPF inlet in Units/kWh,（#/kW•h）

PN_F：Particle number measured at the DPF outlet in Units/kWh,（#/kW•h）

3.15 Pollutant Reduction Efficiency

The ratio of the difference between the gaseous pollutants (CO, HC and NOx, etc.) measured at the DPF inlet and outlet to the gaseous pollutants measured at the DPF inlet. It is calculated as follows:

$$R = \frac{L_I - L_F}{L_I} \times 100\% \quad (2)$$

R：Pollutant reduction efficiency

L_I：Gaseous pollutants (CO, HC and NOx, etc.) measured at the DPF inlet in Units/kWh,（#/kW•h）

L_F：Gaseous pollutants (CO, HC and NOx, etc.) measured at the DPF outlet in Units/kWh,（#/kW•h）

3.16 DPF Monitoring System

A hardware and software system that monitors the working environment and provides the working status of the DPF. Generally include sensors (such as exhaust back pressure sensor / differential pressure sensor, exhaust temperature sensor, etc.), DPF working status display device, electronic control unit and processing software.

4 Technical Principles for Products

4.1 General Requirements

4.1.1. Design, manufacture and installation of this product should make it under reasonable control that corrosion, oxidation and other phenomena that would happen in normal conditions.

4.1.2. Insulation protection shall be necessary but shall not affect the vehicle's braking performance, and circuit modification shall not affect safety of the system.

4.1.3. Design of destroying the wall-flow filtration system is forbidden, and usage the bypass device is prohibited under normal circumstance.

4.1.4. Products with active regenerative have the ability of forcibly canceling active regeneration in some places / periods involving potential safety hazards.

4.1.5. Product description, labeling, packaging and storage should meet the requirements of Appendix A.

4.2 Mechanical requirements

4.2.1. Product mechanical properties and performance should meet the requirements of HJ 451-2008

4.3 Emission requirements

4.3.1. Products shall be tested in accordance with the requirements of Appendix B, and the filtration efficiency shall not be less than 97% during the non-regeneration period.

4.3.2. Products shall be tested in accordance with the requirements of Appendix B, and emissions of CO, HC, NO_x shall not increase.

4.3.3. Products shall be tested in accordance with the requirements of Appendix B, and the increase of CO_2 emission shall not exceed 3%.

4.3.4. Products shall be tested in accordance with the requirements of Appendix B.2.2, and the increase of NO_2 content in NO_x (NO_2 / NO_x ratio) after installation of PDF shall not exceed 0.2 compared with situation before the DPF is installed.

4.3.5. Products shall be tested for unconventional pollutant discharge in accordance with the requirements of Appendix B.2.3, and the concentration of volatile organic compounds (benzene, toluene, xylene, ethylbenzene, styrene, etc.) and aldehydes and ketones (formaldehyde, acetaldehyde, acrolein, etc.) shall not increase.

4.4 Functional requirements

4.4.1. Products should have a monitoring system, with real-time online diagnostic capabilities that can diagnose, warn of alarm in face of failures and extreme conditions such as blockage, damage, sensor failure, power supply equipment failure, exhaust temperature exceeding the limit, and removal of the product. Products with active regenerative have the ability of forcibly canceling active regeneration in some places / periods involving potential safety hazards.

4.4.2. Products should have visual / audible alarm function, with lights or display, to remind users of blockage, failure or need to regenerate.

4.4.3. Products should have a remote data transmission system capable of transmitting data (including at least the geographical location of the product, the DPF access point Temperature, pressure, DPF system running alarm signal, etc.) wirelessly to the environmental supervision department of Shenzhen, at a frequency of not less than 0.02 Hz in a non-regenerative state and at a frequency of not less than 1 Hz in a regenerative state in accordance with the relevant transmission protocol (the protocol is stipulated by relevant departments).

4.4.4. Product monitoring system should be tamper-proof with its own storage system for backup when the network is sluggish. The local storage frequency should not be less than 1Hz and meet the data requirement of recording at least 1 year.

4.4.5. Product monitoring system should be scalable with the ability to monitor the emissions of NO_x, PN and other pollutants of diesel vehicles / machines when the technology is mature.

5 Technical Requirements of To-be-retrofitted Diesel Vehicles/Machines

5.1. Components and performance of to-be-retrofitted diesel vehicles / machines shall be within normal indicators, such as cylinder pressure, injection timing, the cylinder uniformity of work, turbocharger control valve opening pressure, injector opening pressure and the status of the fuel atomization, fuel injection pump characteristics, governor characteristics, oil consumption, oil limiter, oil pump rack limit screw, air filter, EGR working condition (if any), and exhaust line.

5.2. It is suggested that diesel vehicles for retrofit should meet the requirements of local standard DB44/593 of Guangdong Province, and those that can not be tested under DB44/593 should meet the requirements of national standard GB3847; if necessary, the actual emission measurement can be carried out in accordance with relevant laws and regulations. It is recommended to measure the emission of particulate matter at the same time if PN detection is capable.

5.3. It is recommended that non-road mobile mechanical diesel engines for retrofit shall not emit visible smoke (no more than Ringelman Emittance Class Ⅰ), or the smoke value under free loading (actual operating conditions) measured by Opacimeters should less than $1.61m^{-1}$. It is recommended to measure the emission of particulate matter at the same time if PN detection is capable.

5.4. For those which original emission does not meet our requirements, or which suppliers suggest not suitable for installation, repair should be firstly introduced. Installation should not be forced on those that still do not meet our requirements after repairmen. It is suggested to evaluate the NO_x emission of retrofitted diesel vehicles / machines, and to repair first diesel vehicles / machines with seriously excessive NO_x emission.

6 Matching and Installation Requirements between Products and Diesel Vehicles/Machines

6.1. Prior to the installation of diesel vehicles / machines and DPFs, select vehicle / machine with typical operating conditions from the to-be team, and equip them with monitors to record at least two weeks of exhaust temperature, working conditions and other information, in order to guide suppliers to match suitable products.

6.2. Install products in proper place based on the product inlet temperature and temperature distribution of diesel vehicle / engine exhaust, to ensure that the DPFs would maintain high filtration efficiency within exhaust temperature range.

6.3. The supplier shall determine the substrate volume of the product based on information such as vehicle engine displacement, original emission level, exhaust flow rate and exhaust temperature. The volume of substrate for filtering the particulate matter is generally 2 times the displacement of the engine, and in principle, it should not be less than 1.5 times.

6.4. Product installation shall meet the constraints of chassis space in diesel vehicles / machines, and shall not reduce the vehicle traffic ability. Without affecting the filtration efficiency, structural optimization of the larger DPF is allowed to reduce the impact on the driving performance.

6.5. All operating parameters (including operating parameters related to emission components) of the diesel vehicles / machines shall not be modified. The on board diagnostics system (OBD) and NO_x control system of the original engine should not be affected by the DPF installation.

6.6. No modification of the upstream components of the NO_x reduction system of the original diesel engine is allowed without the written permission of the original engine manufacturer.

6.7. In the process of operation after retrofitting, the difference between DPF inlet and outlet pressure should not exceed 20kPa, and should not exceed 30kPa at the high speed and high load and at conditions of unstart active regeneration in presence of safety risks.

6.8. For those who need to replace the original car muffler, tests after installation in accordance with GB1495 should be carried out and exterior noise of accelerating test vehicles should not be higher than the original car noise.

6.9. No leakage or bypass on the diesel vehicles / machines exhaust pipe after installation.

6.10. Site and process of installation should meet the safety regulations of the vehicle, and repair shops with class A maintenance qualification are recommended for modification and installation.

6.11. It is suggested that the supplier put forward the requirements for lubricants usage after installation or indicate the applicability of the original lubricants.

6.12. If the vehicle / machine owner or regulatory authorities consider that small-scale demonstration tests of the products should be carried out before large-scale retrofitting, it should meet the requirements of Appendix C.

7 Acceptance Requirements

7.1 Document Review

7.1.1. Diesel car / machine owners shall check and accept each product in accordance with the commercial and technical contracts they signed with suppliers. Acceptance record can refer to Appendix D.

7.1.2. The contents of the document review shall at least meet the requirements of Appendix A, including but not limited to: sketch map of product installation (including gas circuit diagram and mechanical connection diagram), installation technical requirements, operation manual and maintenance instructions. The submitted documents for review should be complete and effective.

7.2 Vehicle Inspection

7.2.1. During the appearance inspection, the installation of post-processing products must comply with the requirements of the installation drawings and operation instructions, such as the installation and layout of the pipes, wires, components being reasonable, safe and standardized, no reducing the traffic ability of original vehicle, and the exhaust system tightness being intact.

7.2.2. During the emission inspection, diesel vehicles after retrofitting tested under DB44/593 should have opacity smoke value under $0.5m^{-1}$, and those can not be tested under DB44/593 should be tested by free acceleration method in GB3847 and should have opacity smoke value under $0.3m^{-1}$. Non-road mobile machinery after retrofitting should meet the requirements of SZJG49-2015 in Shenzhen. It is recommended to measure the emission of particulate matter at the same time if PN detection is capable. The PN filtration efficiency under non-regenerative condition should not be less than 97% when using the international commercially available and mature portable PN testing equipment to evaluate the actual diesel vehicles / machines emission reduction.

7.2.3. After installation, the product should have the hardware and software measures to protect the safety performance of the original diesel vehicle / machine. The DPF product suppliers shall carry out the necessary property loss or personal safety insurance for the retrofitted diesel vehicles / machines with the warranty period equal to or more than the warranty period.

7.2.4. Product remote monitoring system should upload data to the designated authorities monitoring platform which receives the relevant operating parameters.

7.3 After-Sales Service

7.3.1. The suppliers shall ensure that DPFs meet requirements for service life in relevant laws when using and maintaining DPFs in accordance with the supplier's instructions, and promise free maintenance period of no less than 200,000 km or 4 years for retrofitted vehicles, and no less than 5000 working hours or 4 years for retrofitted machines (whichever comes first).

7.3.2. The suppliers shall set up an office for after-sales and maintenance in Shenzhen or sign a maintenance and cooperation agreement with the Shenzhen Automobile Maintenance Organization to promptly repair or replace the product if it involves quality problems or problems users can not solve, including key components replacement and additive filling.

7.3.3. After installation, the suppliers shall set up an emergency response mechanism after the alarm of the remote monitoring platform, and establish a quick communication mechanism with the users and the supervisors to ensure that the problem can be dealt with promptly after alarms.

7.3.4. The supplier shall ensure that the products outside of the warranty period will still function normally in life cycle and that suppliers will provide related maintenance and other services. The required parts, working hours should be clearly marked, and the price shall not significantly deviate from its value. Basis of price calculation should be clarified in demand of users.

7.3.5. Outside the warranty period suppliers shall ensure that the routine maintenance and replacement of regular consumables as proposed by the users are fulfilled and that all consumables and accessories must be original consumables and accessories of the original manufacturer.

7.3.6. The supplier shall carry out the necessary product operation and maintenance training on record for owner and operator of the retrofitted vehicles / machines, and both sign the agreement on the maintenance of the product and the diesel vehicles / machines (refer to Appendix E).

8 Implementation and Supervision

8.1. Product suppliers shall conduct the production conformity check on the batches used in Shenzhen. The inspection methods and judgments are shown in Appendix F.1 and F.5.

8.2. Product suppliers shall conduct the compliance check on in-use batches in Shenzhen. The inspection methods and judgments are shown in Appendix F.2 and F.5.

8.3. Relevant department of Shenzhen conduct spot checks of production conformity on the DPF batches. The inspection methods and judgments are shown in Appendix F.3 and F.5.

8.4. Relevant department of Shenzhen conduct spot checks of compliance on in-use DPF batches. The inspection methods and judgments are shown in Appendix F.4 and F.5.

8.5. For those who can not meet our requirements after installation, suppliers should submit rectification report and recall the same batch of products for repair. Rectified products should meet the relevant requirements before they back on sale.

Appendix A (Informative) Description and Package Requirement of DPFs

A.1 Product Manual

A.1.1. Products should be attached with quality inspection certificate, manufacturer's product manual (including information like product number, date of manufacture, etc.), product installation documentation, maintenance instructions, and information of manufacturer and service provider such as name, address, postcode, telephone number and emergency contact number.

A.1.2. Product manual should provide the following information, including but not limited to:

a) Product model and technical parameters, including at least substrate, catalyst, filter material, specification and manufacturer.

b) Product packaging and packaging manufacturers.

c) Regeneration methods, such as passive regeneration and active regeneration, shall specify the form and strategy of regeneration for active regeneration.

d) Scope of adaptation, including the engine displacement range, emission levels, and installation space.

e) Liner of each part and its manufacturer, model and so on.

f) Functions and manufacturers of monitoring system and alarm system.

A.2 Installation Document

A.2.1. Product suppliers should provide installation instructions for DPFs to ensure normal work when DPFs are mounted on a vehicle or non-road machine with the necessary mechanical parts. Documentation should include the necessary, detailed requirements of software, hardware and communication technology.

A.2.2. Installation documents should provide a detailed written description of the operating characteristics of the diagnostic system and its components.

A.2.3. Installation documents should indicate normal working conditions of DPFs such as temperature range and environmental conditions.

A.3 Maintenance Document

A.3.1. Installation documents should include written instructions for proper operation of DPF system and relevant maintenance requirements such as how to properly use consumable reagents.

A.3.2. This document should clarify that if DPF system is not working properly, the operating diagnostic system will notify the driver or operator in time, and omitting the fault signal may result in the vehicle or construction machinery not working properly or causing the product malfunction.

A.3.3. This document should specifically notify the reagent consumption rate and the time interval for refilling the reagent, if, during normal maintenance, the operator and the operator of the construction machinery need to re-add the reagent.

A.4 Label

A.4.1. Information shall be marked on notable location of enclosure with a permanent marking that can not be altered that includes the manufacturer's name or brand, the model of the device, the names of the major components and its manufacturer, precious metal coating plant (if any), product serial number, date of manufacture and exhaust incoming and outgoing flow identification.

A.5 Packaging

A.5.1. The product should be well packaged to prevent bump, distortion or rusting during normal shipping and storage.

Appendix B (Normative) Emission Test Procedure

B.1 Description

The agencies that have obtained the qualification of testing by the relevant state departments shall evaluate the performance of the products and carry out the relevant tests required by this regulation on the engine performance evaluation test bench and issue qualified test reports.

B.2 Method

B.2.1. The particle number and conventional pollutants concentrations are measured under transient WHTC conditions (as shown in Figure B.1) in accordance with the "Limits and Measurement Methods for Exhaust Pollutants from Diesel Engines of Urban Vehicles (WHTC)" (HJ 689-2014).

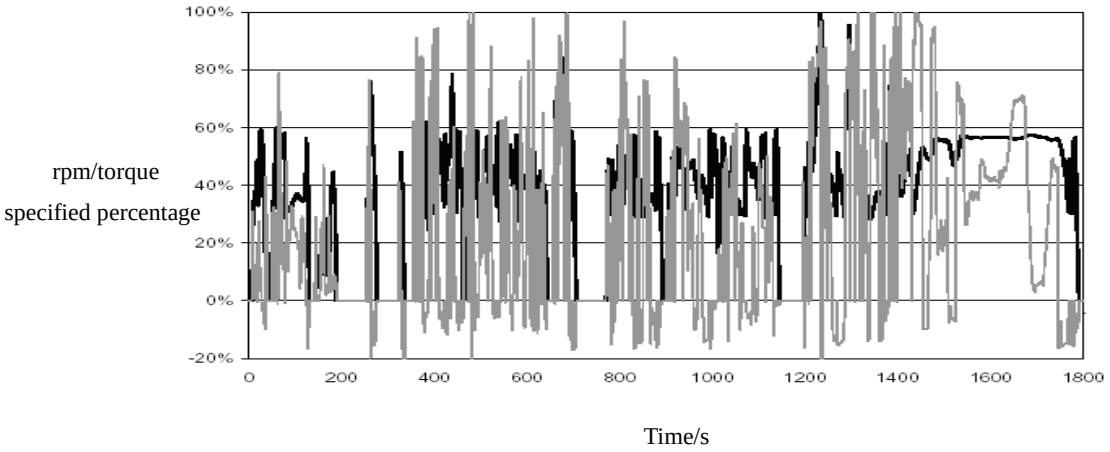

Figure B.1 WHTC conditions in HJ689-2014

B.2.2. The particle number and conventional pollutants concentrations are measured under steady-state conditions (as shown in Table B.1) in accordance with "Limits and Measurement Methods for Exhaust Pollutants from Diesel Engines of Non-road Mobile Machinery (CHINA Ⅲ, Ⅳ)" (GB20891-2014).

Table B.1 8 testing point in GB20891-2014

8 TESTING POINT	RATED SPEED				INTERMEDIATE SPEED			IDILING
TESTING STAGE	1	2	3	4	5	6	7	8
RELATIVE TORQUE M[%]	100	75	50	10	100	75	50	0
RUN TIME [MIN]	15	15	15	10	10	10	10	15

B.3 Tests of Unregulated Pollutants

B.3.1. Gaseous emissions and PN under the WHTC operating conditions of the original engine without DPF product are measured on engine test bed in accordance with HJ 689-2014, and the amount of volatile organic compounds (benzene, toluene, ethylbenzene, styrene, xylene) and aldehydes and

ketones (formaldehyde, Acetaldehyde, acrolein) are measured in accordance with HJ/T400, HJ732 and HJ734 after taking exhaust gas samples from CVS airbags.

B.3.2. Install DPF product that need to be test in the engine exhaust system (after pretreatment), measure the amount of gaseous pollutants and PN after passing through the DPF under the same WHTC conditions, sample from the CVS airbags (from both cold-start and hot-start airbags, respectively) and measure volatile organic compounds and aldehydes and ketones using the same method to evaluate how much unconventional pollutants emissions increase under both conditions.

Appendix C (Informative) Pilot Test Procedure

C.1 Principle of Pilot Test

C.1.1. Vehicles / machine owners along with product suppliers and the relevant regulatory authorities (if any) should jointly determine the method, duration and expectations of conducting the pilot test.

C.1.2. Pilot test shall test at least three products at the same time for the same type of DPF. Three products shall be installed respectively on the same type of three diesel vehicles / machines at the same time for pilot tests.

C.1.3. In addition to meeting the requirements of Section 5 of this regulation, diesel vehicles / machines used for pilot tests shall, in principle, be those with the largest engine displacement and the lowest emission levels in the scope of DPF application.

C.1.4. Diesel vehicles for pilot tests shall be no less than 5,000 km or 3 months of operation and non-road mobile machinery shall be no less than 400 hours or 3 months of operation.

C.1.5. Product performance evaluation test can be conducted after the initial installation of DPF, or in the process or at the end of pilot test and the demonstration test, which shall in principle be carried out by a third party that has relevant qualification.

C.2 Pilot Test Procedure

C.2.1 Diesel vehicles / machines owners and product suppliers shall sign a contract for installation and pilot test, and clarify the responsibilities of both parties, test methods, expectations, vehicles / machines for pilot project and products used. Drivers of diesel vehicles / machines shall receive necessary operation and maintenance training.

C.2.2 Diesel vehicles / machines owners and product suppliers shall jointly examine those vehicles / machines used in pilot project, the quality of the oil used, and if necessary, the emissions.

C.2.3 Product suppliers should install the DPF for demonstration ("Demo sample") with the help of the diesel vehicles / machines owners. Demo samples should be in accordance with the installation instructions, and tightness of vehicles / machines exhaust system should meet the requirements. When necessary, demo samples and relevant vehicles / machines parts would be sealed for further examination.

C.2.4 Diesel vehicles / machines owners and product suppliers shall carry out tests in accordance with the agreement, including pollutant conversion efficiency and filtration efficiency after DPF installation, and those who meet the requirements of the contract will move on to procedure C.2.5, while those who fail should be marked as unqualified product.

C.3 Pilot Operation of Diesel Vehicles/Machines

C.3.1 Except for the actual operation mode of some vehicles (such as the bus should follow the route and normal operation), vehicles are allowed to be tested on fast driving mode. During the test, the loading of the vehicle should follow its actual operating conditions. If the vehicle during test is a non-operating vehicle (such as fast driving mode), the test vehicle shall be fitted with more than 50%

of its rated load. The loading of non-road mobile machinery is determined according to the actual working conditions, and the running time should be in accordance with mechanical continuous working process (idle, walking and homework).

C.3.2 During the operation of diesel vehicles / machines, the attached remote monitoring system should record data of back pressure and the temperature of the exhaust gas, and if there is product adopting active regeneration, record the regeneration status.

C.3.3 Driving status of the vehicles / machines should be promptly or regularly checked, including driving routes, driving mileage, back pressure and temperature changes of exhaust, operating mileage / time when a demo sample fails along with fault description and treatment, maintenance and repair.

C.3.4 The demo samples or any part of them shall not be replaced, repaired or modified during the whole pilot project. But normal maintenance of the vehicle is allowed (such as change of lubricant, fuel filter and air filter, cooling system maintenance, idle speed adjustment, speed controller adjustment, engine bolt tightening torque check, valve clearance adjustment, injector clearance adjustment, timing and drive belt tension adjustment). For situations like blockage of non-demonstration samples caused by theirs own quality problem or exhaust back pressure of demonstration vehicles / machines exceeding the preset value, maintenance in accordance with the instructions are allowed.

C.3.5 When failure of demonstration vehicle / machine has caused a shutdown, after confirming the cause of the shutdown has nothing to do with the sample itself and the sample is not damaged, it is allowed to replace the sample with another vehicle / machine of same type to continue the test, and the operation mileage / time of original vehicle / machine can be included in the total mileage / time, on the other hand, if the sample is damaged, the operation mileage / time should be recalculated after the replacement of products and vehicles / machines of same type.

C.3.6 After the operating mileage / time has reached the amount in contractual agreement, suppliers should analyze the operation of the diesel vehicles / machines referring to the QC/T900-1997 standard, classify and summarize the faults, and analyze the data of the DPF monitoring system.

C.4 Results and Evaluation

C.4.1 During the pilot test, if any one of the three diesel vehicles / machines had a fatal or serious failure due to sample installation, or more than 2 general failure, or more than 4 times minor failure, or the total amount of general and minor failure cumulatively exceeding 5 times, the performance stability test would be terminated, and the sample would be judged as unqualified. Judgement and classification of failure is referred to QC/T900-1997.

C.4.2 After the operation period of pilot test, both parties shall timely conduct the test about impact of the samples on pollutant emissions of diesel vehicles / machines according to the original contract.

C.4.3 After the pilot test is completed, the supplier shall evaluate the performance and the operating conditions of the products. All data during the operation shall be recorded in the technology assessment report.

C.4.4 After the pilot test, the demo sample should operate continuously to evaluate the deterioration effect and durability performance of the product. The supplier shall ensure that product performance meets the requirements of Section 4 in this regulation within the promised shelf life.

Appendix D (Informative) Installation Record of DPFs

D.1 Installation Record of DPFs in In-use Diesel Vehicles

Table D.1 Installation Record of DPFs in diesel vehicles

Vehicle Conditions					
License Plate		Manufacturer		Production Date	
Maximum total mass (kg)		Model		Engine Model	
Emission Stage		Displacement (L)		Power (kW)	
Injection Mode		Free Smoke Value		Subordinate Company	
PN before DPF installation	(It is recommended to measure the emission of particulate matter at the same time if PN detection is capable)				
Driving license (copy / photo):					
Post-processing Products and Installation					
DPF Serial Number		Product Model		Manufacturer	
Installation Date		Installation Site		Manager	
Remote Monitoring Serial Number		Brief Description of Regeneration Strategy			
Photo of vehicle after DPF installation:					
Inspection and Test Results after Installation					
Appearance		Tightness			
PN after DPF installation	(It is recommended to measure the emission of particulate matter at the same time if PN detection is capable)				
Particulate Filtration Efficiency after first installation		Data Transmission of Remote Monitoring			
Others:		Others：			
Owner’s Signature		Product Supplier (Signature)			

Date:

D.2 Installation Record of DPFs in Non-road Mobile Machinery

Table D.2 Installation Record of DPFs in non-road machinery

<table>
<tr><td colspan="6">Non-road Machinery Conditions</td></tr>
<tr><td>License Plate</td><td></td><td>Manufacturer</td><td></td><td>Production Date</td><td></td></tr>
<tr><td>Maximum total mass (kg)</td><td></td><td>Model</td><td></td><td>Engine Model</td><td></td></tr>
<tr><td>Emission Stage</td><td></td><td>Displacement (L)</td><td></td><td>Power (kW)</td><td></td></tr>
<tr><td>Injection Mode</td><td></td><td>Free Smoke Value</td><td></td><td>Subordinate Company</td><td></td></tr>
<tr><td>PN before DPF installation</td><td colspan="5">(It is recommended to measure the emission of particulate matter at the same time if PN detection is capable)</td></tr>
<tr><td colspan="6">Mechanical Features (copy / photo)：</td></tr>
<tr><td colspan="6">Post-processing Products and Installation</td></tr>
<tr><td>DPF Serial Number</td><td></td><td>Product Model</td><td></td><td>Manufacturer</td><td></td></tr>
<tr><td>Installation Date</td><td></td><td>Installation Site</td><td></td><td>Manager</td><td></td></tr>
<tr><td>Remote Monitoring Serial Number</td><td></td><td>Brief Description of Regeneration Strategy</td><td colspan="3"></td></tr>
<tr><td colspan="6">Photo of machine after DPF installation：</td></tr>
<tr><td colspan="6">Inspection and Test Results after Installation</td></tr>
<tr><td>Appearance</td><td colspan="2"></td><td>Tightness</td><td colspan="2"></td></tr>
<tr><td>PN after DPF installation</td><td colspan="4">(It is recommended to measure the emission of particulate matter at the same time if PN detection is capable)</td></tr>
<tr><td>Particulate Filtration Efficiency after first installation</td><td colspan="2"></td><td>Data Transmission of Remote Monitoring</td><td colspan="2"></td></tr>
<tr><td>Others</td><td colspan="5"></td></tr>
<tr><td colspan="2">Owner’s Signature</td><td colspan="4">Product Supplier (Signature)</td></tr>
</table>

Date:

Appendix E (Informative) Supervision of Maintenance and Repair of In-use Diesel Vehicles/Machines

E.1 Obligations of Post-processing Product Supplier

E.1.1 Ensure product performance and service life, and make a written commitment to product particle reduce, life expectancy and quality assurance.

E.1.2 Have a sound after-sale maintenance service system, and ensure the provision of comprehensive after-sales service according to the after-sales guarantee within the usage period of post-processing products.

E.1.3 Have emergency handling capabilities for product failures.

E.1.4 Ensure the durability of the product. If the retrofitted diesel vehicles / machines were randomly selected within the specified durability period and the tests were carried out according to the original agreed methods, the results should meet the requirements.

E.1.5 Periodic maintenance of the product.

E.1.6 Maintain the product in accordance with the specified product cycle and content. Ensure particle reduction and service life of the product. Maintenance should include routine maintenance, regular maintenance and monitoring data analysis.

E.1.7 Routine maintenance should include appearance inspection, tightness inspection of piping systems, connectivity checks of electrical system, and functional checks of each sensor. Timely repair or replace defective parts.

E.1.8 Periodically remove the ash and other particles that can not be removed by normal regeneration to ensure the normal operation of the product.

E.1.9 Periodically read the monitoring system data and analyze the workability of the post-processing product to determine if the vehicle or post-processing product needs maintenance.

E.1.10 Set clear instructions signs in the cab of the vehicle, which should include the product maintenance requirements, handling methods of monitoring system warning message and after-sales service contact information.

E.1.11 The owner of the vehicle must be technically trained on the use, maintenance and emergency measures of the post-process products.

E.2 Responsibility of Diesel Vehicle/Machine owner

E.2.1 Responsible for the routine maintenance of diesel vehicles / machines after retrofitting, ensure the normal operation of diesel vehicles / machines and post-processing products, and ensure the using diesel oil meeting the quality standards required by the local government in Shenzhen.

E.2.2 Process the failure warning promptly. When the monitoring system alerts for possible failure of the product, pay close attention to the warning signal and drive the vehicle to the nearest repair point to check and find out whether there is a failure (including DPFs and vehicles), and a fault (if any) must be ruled out to continue driving. When the monitoring system alerts the product for failure, owners should stop operation and inform the supplier as soon as possible to check and clear the fault.

E.2.3 Forcibly terminate the active regeneration process at a specific location (such as gas station and

places with flammable material).

E.2.4 No modification to the post-processing products of an in-using vehicle.

Appendix F (Normative) Supervision Requirements of DPFs Products

F.1 Production Consistency Check

For manufacturers whose products have been used in the mass retrofitting of diesel vehicles / machines in Shenzhen City, they should carry out production consistency self-check. The tests can be conducted in the internal laboratory of the enterprise in accordance with the requirements of its own quality control system documents.。

F.2 Production In-service Conformity Check

F.2.1 For the products that have been used in the Shenzhen diesel vehicles / machines retrofitting, the enterprise shall carry out the product in-service conformity self-check and tracking inspection for in-use post-processing products.

F.2.2 Select 3 vehicles in every 100 sets of post-processing products sold in Shenzhen for follow-up inspection.

F.2.3 One vehicle will be tested and inspected every 10,000 kilometers of mileage before it reaches the endurance guarantee mileage. Vehicles should not be changed at will and will be recorded for each fueling.

F.2.4 Use free acceleration (for diesel vehicles) or free-laden (for off-road machines) for smoke tests. It is recommended to measure the emission of particulate matter at the same time if PN detection is capable.

F.2.5 Do the tracking test, check the online monitoring system data at the same time, and analyze regeneration frequency and the status of the vehicle operation.

F.3 Production Consistency Spot Check by relevant Department

F.3.1 The selected product batch should be determined by the relevant departments of Shenzhen or third-party testing organization commissioned by them.

F.3.2 Relevant departments in Shenzhen would inform the manufacturers of the products to be tested and sent representatives of law enforcement officers or third-party testing agencies together with the product suppliers to stockroom to randomly select samples, 3 for each product type.

F.3.3 Product suppliers should cooperate with law enforcement officers on information confirming such as the technic status and test condition of selected products, and send sealed samples to designated laboratory in a specified way.

F.3.4 Supplier of the products shall also provide the factory certificate (copy) of the selected samples.

F.3.5 All samples should do appearance inspection first, and those visually without significant leakage will be tested for performance in accordance with the requirements of Section 4 in this specification.

F.3.6 Catalytic post-processing products can be spot-checked for precious metal content, by testing methods with reference to requirements of GB18352.6.

F.4 Production In-service Conformity Spot Check by relevant Department

F.4.1 The relevant department in Shenzhen or the commissioned third-party testing organization shall

determine the families of the selected products and select the retrofitted vehicles for spot check. It may include vehicles independently inspected by manufacturers, with no less than 3 sets per family.

F.4.2 The relevant department in Shenzhen or the commissioned third-party testing organization shall conduct the inspection in accordance with the requirements of Section 7 in this specification.

F.5 Judgment

F.5.1 In the production consistency test and in-service conformity test, if one of the three samples fails to meet relevant requirements of Section 4 or Section 7 in this regulation, it is determined that this batch are not qualified.

F.5.2 In the precious metal content test of post-processing product, difference of type of precious metal, content or ratio between samples and declare should be no more than ± 15%.