

**SYSTEM & PROCEDURE FOR
COMPLIANCE TO EMISSION and NOISE LIMITS FOR**

Genset run on dedicated Natural Gas (NG) or Liquefied Petroleum Gas (LPG);
Petrol or Natural Gas (NG)/Liquefied Petroleum Gas (LPG); and Dual Fuel - Diesel and
Natural Gas (NG) or Diesel and Liquefied Petroleum Gas (LPG).



CENTRAL POLLUTION CONTROL BOARD

(Ministry of Environment, Forests & Climate Change)

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Acknowledgement

Notification for these standards issued vide GSR 281(E) on 7th March 2016 by Ministry of Environment, Forests & Climate change. There was really insufficient time for preparing this document to implement the standards by July 2016. UPCD division of CPCB interacted with Power Train Engineering (PTE) Division of ARAI for preparing this document. Most of the technical portion is prepared by certification agency Automotive Research Association of India (ARAI), Pune. 15th Standing committee has recommended implementation of the standard for emission compliance as per this document. 22nd National committee has also recommended to go ahead with the existing Diesel System and procedure for diesel compatible Genset in addition to dedicated LPG/CNG fuel and Petrol System and Procedure for Petrol compatible Gensets for Noise compliance. Since time is scanty it is proposed to adopt this system and procedure for one COP year and modify the document; if needed.

ARAI has helped in preparation of this document considering its responsibility to the nation. CPCB appreciates the contribution of PTE Division of ARAI headed by Sh. N. V. Marathe, Sr. Director in preparation of this document

OVERALL REQUIREMENTS

1.0 SCOPE

This document lays down the applicability and requirements; System and Procedure for compliance the rules vide notification no. GSR 281 (e) DATED 7th March 2016 at serial no. 95A, 95B and 95C issued by the Ministry of Environment, Forests and Climate Change, Government of India. The details are covered as under:

Part I : Mass emission limits as notified

- A) Emission and Noise Limits, Applicability and Other Requirements for Genset (up to 800 kW) run on Dedicated Natural Gas (NG) or Liquid Petroleum Gas (LPG)
- B) Emission and Noise Limits, Applicability and Other Requirements for Genset (upto 19 kW) powered by SI engine (upto 400 cc displacement) run on Petrol and Natural Gas (NG) or Petrol and Liquid Petroleum Gas (LPG)
- C) Emission and Noise Limits, Applicability and Other Requirements for Genset (up to 800 kW) run on Dual Fuel - Diesel and Natural Gas (NG) or Diesel and Liquefied Petroleum Gas (LPG)

Part II: System procedure

- A) Certification System and Procedures for Genset (up to 800 kW) run on Dedicated Natural Gas (NG) or Liquid Petroleum Gas (LPG)
- B) Certification System and Procedures for Genset (upto 19 kW) powered by SI engine (upto 400 cc displacement) run on Petrol and Natural Gas (NG) or Petrol and Liquid Petroleum Gas (LPG)
- C) Certification System and Procedures for Genset (up to 800 kW) run on Dual Fuel - Diesel and Natural Gas (NG) or Diesel and Liquefied Petroleum Gas (LPG)

Part III: Test Equipment and procedure

- A) Test Equipment and Procedures for Genset (up to 800 kW) run on Dedicated Natural Gas (NG) or Liquid Petroleum Gas (LPG)
- B) Test Equipment and Procedures for Genset (upto 19 kW) powered by SI engine (upto 400 cc displacement) run on Petrol and Natural Gas (NG) or Petrol and Liquid Petroleum Gas (LPG)
- C) Test Equipment and Procedures for Genset (up to 800 kW) run on Dual Fuel - Diesel and Natural Gas (NG) or Diesel and Liquefied Petroleum Gas (LPG)

Part IV: Annexure and duty cycle

- A) Annexure & Duty Cycle for Genset (up to 800 kW) run on Dedicated Natural Gas (NG) or Liquid Petroleum Gas (LPG)
- B) Annexure & Duty Cycle for Genset (upto 19 kW) powered by SI engine (upto 400 cc displacement) run on Petrol and Natural Gas (NG) or Petrol and Liquid Petroleum Gas (LPG)
- C) Annexure & Duty Cycle for Genset (up to 800 kW) run on Dual Fuel - Diesel and Natural Gas (NG) or Diesel and Liquefied Petroleum Gas (LPG)

List of documents are given below for compliance:

- 1) Annexure 1 (NOTARISED AFFIDAVIT ON NON-JUDICIAL STAMP PAPER OF Rs.10/-[To be submitted to the Nodal Agency by a manufacturer approaching for the first time for TA]
- 2) Annexure-2 (APPLICATION TO TEST AGENCY FOR TYPE APPROVAL)
- 3) SPECIMEN COPY Type Approval Certificate
- 4) SPECIMEN COPY Conformity of Production
- 5) Test Cycle for Emission testing of Portable Genset
- 6) Annexure 3 : Fuel Specification (Petrol, CNG, LPG and Diesel) (Needs to be added)

2.0 DEFINITION & ABBREVIATIONS

For the purposes of this document following definitions shall apply

- a. Approval of an engine (engine family) means the approval of an engine type with regard to the level of the emission of gaseous, particulate and smoke pollutants.
- b. Auxiliary emission control strategy means any element of design that senses temperature, engine RPM, or any other parameter for the purpose of activating,

modulating, delaying, or deactivating the operation of any part of the emission control system

- c. Base emission control strategy is active throughout the speed and load operating range of engine unless Auxiliary emission control is activated, but not limited to engine timing map, EGR map, SCR catalyst reagent dosing map
- d. Combined de NOx- particulate filter means an exhaust after treatment system designed to reduce emissions of oxides of nitrogen (NOx) and particulate pollutants.
- e. Continuous regeneration means the regeneration process of an exhaust after treatment system that occurs either permanently or at least once; such a process will not require a special test procedure.
- f. Declared power (kW) means rated gross mechanical power declared by manufacturer for type approval.
- 2.7.1 Dedicated NG or LPG genset engine shall mean a mono-fuel engine starting and operating with only one fuel, i.e., NG or LPG.
- 2.7.2 A bi-fuel Genset means a Genset powered by an SI engine started and operating either on any one type of fuel at a time i.e. Petrol or NG/LPG
- 2.7.3 Dual fuel engine operation shall mean a two – fuel system having diesel as a primary combustion fuel and NG or LPG as supplementary fuel, both in some proportion, throughout the engine operating zone. Such dual fuel genset engine may operate on diesel stand-alone mode in absence of gaseous fuel i.e. NG or LPG.
- g. Emissions-related defect means a deviation from normal production tolerances in design, materials, system or assembly that affects any parameter, specification or component belonging to the emission control system. A missing component may be considered to be an emission-related defect.
- h. Emission control system means the exhaust after treatment system, the electronic management controllers of the engine system and any emission related component of the engine system in the exhaust which supplies an input to or receives an output from these controllers and when applicable the communication interface between the engine system electronic control unit (ECU) and any other power train with respect to emissions management.
- i. Engine system means the engine, the emission control system and the communication interface (hardware and messages) between the engine system electronic control unit (ECU) and any other power train.
- j. Engine family for Dedicated, Bi-fuel and Dual Fuel operation means a manufacturers grouping of engine systems which, through their design have

similar exhaust emission characteristics, all members of the family must comply with the applicable emission limit values. Refer ISO 8178-7.

- k. Parent engine means an engine selected from an engine family in such a way that its emissions characteristics will be representative for that engine family. Refer also ISO 8178-7.
- l. Engine type means a category of engines, which do not differ in such essential respects as engine characteristics.
- m. Exhaust after treatment system means 'a catalyst (oxidation or 3-way), particulate filter, deNOx system, combined deNOx particulate filter or any other emission-reducing device that is installed downstream of the engine. This definition excludes exhaust gas recirculation, which, where fitted is considered an integral part of the engine system'.
- n. High idle speed means 'the speed achieved by the engine under the specified test conditions at full throttle condition with no external load applied on the engine flywheel'
- o. Periodic regeneration means the regeneration process of an emission control device that occurs periodically in less than 100 hours of normal engine operation. During cycles where regeneration occurs, emission standards may be exceeded (in which case cycle may need repetition).
- p. Power generating set means any equipment which is used for electric power generation
- q. A generator set engine means "An engine used primarily to operate an electrical generator or alternator to produce electric power for other applications"
- r. Gaseous pollutants means carbon monoxide, methane/non methane hydrocarbons or THC and oxides of nitrogen (expressed in nitrogen dioxide (NO₂) equivalent).
- s. Opacity meter means an instrument used to measure the opacity of smoke particles by means of the light absorption principle.
- t. Particulate after treatment device means an exhaust after treatment system designed to reduce emissions of particulate pollutants through a mechanical, aerodynamic, diffusion or inertial separation.

- u. Particulate pollutants means any material collected on a specified filter medium after diluting exhaust gases with clean, filtered air to a temperature of greater than 315 K (42 °C) and less than or equal to 325 K (52°C), as measured at a point immediately upstream of the primary filter.
- v. Percent load means the fraction of available torque at a rated engine speed. Also refer ISO 8178-4.
- w. Smoke means particles suspended in the exhaust stream of a diesel engine which absorb, reflect, or refract light. Also refer ISO 8178-3.
- x. Test Cycle means a sequence of test points each with a defined speed and torque to be followed by the engine under steady state operating conditions. Also refer ISO 8178-4.
- y. For Domestic products, Date of Manufacture means the date on which the engine is invoiced.
- z. For Imported products, Date of Import means the date of payment of custom duties applicable to the engine / genset.
- aa. Manufacturer means engine/ genset manufacturer, importer or, assembler (as noted in notification).

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PART I

NOTIFICATION/ APPLICABILITY AND REQUIREMENTS

1.0 NOTIFICATION

Emission and Noise Limit for Generator Sets run with

- A. Genset run on dedicated Natural Gas (NG) or Liquid Petroleum Gas (LPG);
- B. Genset run on bi-fuel Petrol and Natural Gas (NG) or bi-fuel Petrol and Liquid Petroleum Gas (LPG)
- C. Genset run on dual-fuel Diesel and Natural Gas (NG) or dual-fuel Diesel and Liquid Petroleum Gas (LPG).

have been notified vide GSR 281 (E) dated 7th March 2016 at serial no.95 under the **Environment (Protection) Third Amendment Rules, 2016**. The notification is reproduced as such.

Compliance to Safety :

All Genset run on dedicated Natural Gas (NG) or Liquid Petroleum Gas (LPG), Petrol and Natural Gas (NG) or Petrol and Liquid Petroleum Gas (LPG), Diesel and Natural Gas (NG) or Diesel and Liquid Petroleum Gas (LPG) shall meet Safety requirements prescribed in the SAFETY CODE PRACTICE published by CPCB.

2.0 EMISSION STANDARDS

“95A. Genset run on dedicated Natural Gas (NG) or Liquefied Petroleum Gas (LPG):-

Emission Limits.- The emission limits for dedicated NG or LPG driven engine for genset application or genset (above 400cc & upto 800 kW) shall be effective from 1st July, 2016 as specified in the Table below subject to the general conditions contained therein, namely:-

TABLE 1

Power Category	Emission Limits (g/kW-hr)	
	NO _x + NMHC Or NO _x + RHC	CO
Upto 19 kW	≤ 7.5	≤ 3.5
More than 19 kW upto 75 kW	≤ 4.7	≤ 3.5
More than 75 kW upto 800 kW	≤ 4.0	≤ 3.5

95B. Genset run on Bi Fuel Petrol or Natural Gas (NG)/Liquefied Petroleum Gas (LPG) :-

Emission Limits.- The emission limits for Bi Fuel Petrol or Natural Gas (NG)/Liquefied Petroleum Gas (LPG) (upto 19 kW) powered by SI engine (upto 400 cc displacement) (hereinafter referred to as Genset) shall be effective from the 1st August, 2016 as specified in the following Table:-

TABLE 2

Class	Engine Displacement (cc)	CO (g/kWh)	NO _x + THC/ NO _x + NMHC / NO _x + RHC (g/kWh)
1	Upto 99	≤ 250	≤ 12
2.	>99 and upto 225	≤ 250	≤ 10
3.	≥ 225 ≤ 400	≤ 250	≤ 8

95C. Genset run on Dual Fuel - Diesel and Natural Gas (NG) or Diesel and Liquefied Petroleum Gas (LPG):-

Emission Limits.-

The emission limits for Dual Fuel - Diesel and NG or Diesel and LPG driven engine (upto 800 kW) for generator set (hereinafter referred to as Genset) application shall be effective from the 1st July, 2016 as specified in the

Table below, subject to the general conditions specified therein, namely:-

TABLE 1

Power Category	Emission Limits (g/kW-hr)			Smoke Limit (light absorption coefficient, m-1)
	NO _x + THC Or NO _x + NMHC or RHC	CO	PM	
Upto 19 kW	≤ 7.5	≤ 3.5	≤ 0.3	≤ 0.7
More than 19 kW upto 75 kW	≤ 4.7	≤ 3.5	≤ 0.3	≤ 0.7
More than 75 kW upto 800 kW	≤ 4.0	≤ 3.5	≤ 0.2	≤ 0.7

Notes.- The abbreviations used in the Table shall mean as under:

1. NO_x - Oxides of Nitrogen; CO – Carbon Monoxide; PM – Particulate Matter; NMHC – Non-Methane Hydrocarbon; THC – Total Hydrocarbon and RHC – Reactive Hydrocarbon.
2. Dedicated NG or LPG genset engine shall mean a mono-fuel engine starting and operating with only one fuel, i.e., NG or LPG.
3. A bi-fuel (Petrol and NG) genset means a genset powered by an SI engine started and operating either on any one type of fuel at a time i.e. Petrol or NG

4. Portable genset means an SI engine (upto 19 kW mechanical power and engine displacement upto 400 cc) coupled with an alternator and housed in a canopy.
5. Dual fuel engine operation shall mean a two – fuel system having diesel as a primary combustion fuel and NG or LPG as supplementary fuel, both in a certain proportion, throughout the engine operating zone. Such dual fuel genset engine may operate on diesel stand-alone mode in absence of gaseous fuel i.e. NG or LPG.
6. NO_x + NMHC or NO_x + RHC shall be measured in case of dedicated NG or LPG genset engine. NMHC shall be equal to 0.3×Total Hydrocarbon (THC) in case of NG, and RHC is equal to 0.5×THC in case of LPG.
7. NO_x + THC shall be measured as emission while diesel alone is used as fuel. NO_x + NMHC or NO_x + RHC shall be measured in case of diesel and NG or diesel and LPG dual fuel operation respectively. NMHC shall be equal to 0.3 × THC in case of NG and RHC as 0.5 × THC in case of LPG.
8. These norms shall be applicable to Original Equipment Manufacturer (OEM) built dedicated NG or LPG genset engines. Conversion or retro fitment of the existing diesel engines to run on dual fuel- diesel and NG or diesel and LPG shall not be permitted.
9. The above mentioned emission limits shall be applicable for Type Approval and Conformity of Production (COP) carried out by authorised agencies. For Type Approval and COP for dual fuel - diesel and NG or diesel and LPG dual fuel operation engines, the emission and smoke limits prescribed in above Table shall be met in diesel alone or diesel and NG or diesel and LPG dual fuel mode separately.
10. Stack height (in metres), for genset shall be governed as per Central Pollution Control Board (CPCB) guidelines NO_x + THC shall be measured as emissions from diesel alone in bi-fuel fuel mode of operation. NO_x + NMHC or NO_x +RHC shall be measured in case of petrol and NG or petrol and LPG fuel mode of operation, respectively.
11. The emission standards for smoke and particulate matter shall be applicable, when diesel is used as fuel. Smoke limit prescribed in above Table shall not exceed throughout the operating load points of the test cycle.

3.0 CERTIFICATION AGENCIES :

Any of the following institutions shall undertake Type Approval and for verification of Conformity of Production for emission standards for engine products and to issue such certificates on compliance of the prescribed norms, namely:-

- (a) The Automotive Research Association of India, Pune (Maharashtra);
- (b) The International Centre for Automotive Technology, Manesar (Haryana);
- (c) The Indian Oil Corporation, Research and Development Centre, Faridabad (Haryana);
- (d) The Indian Institute of Petroleum, Dehradun (Uttarakhand); and
- (e) The Vehicle Research Development Establishment, Ahmednagar (Maharashtra).

4.0 NOISE LIMITS:

- 4.1 The maximum permissible sound pressure level for genset (Dedicated or dual fuel operated), with rated capacity upto 800 kW shall be 75 dB (A) at 1 metre from the enclosure surface. Gensets should be provided with integral acoustic enclosure at the manufacturing stage itself. The noise norms shall be effective from the 1st January, 2017.

- 4.2 The noise limit for gensets (upto 19 kW) powered by an SI engine (upto 400 cc displacement) run on Dedicated NG or Dedicated LPG shall be effective from the 1st September, 2016 as specified in the following table :-

Table

Noise Parameter	Noise Limits
Sound Power Level	86 dB(A)

- 4.3 Noise limit for gensets not covered under paragraph (1.1) shall be as follows:-
- (a) Noise from gensets shall be controlled by providing an acoustic enclosure or by treating the room acoustically, at the users end.
 - (b) The acoustic enclosure shall be designed for minimum 25 dB(A) insertion loss or for complying with the ambient noise standards, whichever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure or acoustic treatment. Under such circumstances the performance may be checked for noise reduction upto actual ambient noise level, preferably, in the night time between 10.00 pm-6.00 am). The measurement for insertion loss may be done at different points at 0.5m from the acoustic enclosure or room, and then averaged.
 - (c) The genset shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB(A).
 - (d) These limits shall be regulated by the State Pollution Control Boards and the State Pollution Control Committees.
 - (e) The manufacturer shall offer to the user a standard acoustic enclosure of 25 dB(A) insertion loss and also a suitable exhaust muffler with insertion loss of 25 dB(A).
 - (f) The user shall make efforts to bring down the noise levels due to the genset, outside his premises, within the ambient noise requirements by proper siting and control measures.
 - (g) Installation of a genset shall be strictly in compliance with the recommendation of the genset manufacturer.
 - (h) A proper routine and preventive maintenance procedure for the genset shall be set and followed in consultation with the genset manufacturer.
- 4.4 Any of the following institutions shall undertake Type Approval and for verification of Conformity of Production for noise norms for dedicated NG or LPG gensets and issue such certificates on compliance of the prescribed norms, namely :-
- (a) The Automotive Research Association of India, Pune (Maharashtra);
 - (b) The International Centre for Automotive Technology, Manesar (Haryana);
 - (c) The Fluid Control Research Institute, Palghat (Kerala);
 - (d) The National Test House, Ghaziabad (Uttar Pradesh);
 - (e) The National Aerospace Laboratory, Bangaluru (Karnataka); and
 - (f) The Naval Science and Technology Laboratory, Visakhapatnam (Andhra Pradesh).

5.0 GENERAL CONDITIONS

- 5.1 Every manufacturer, importer or assembler (hereinafter referred to as the 'manufacturer') of the dedicated NG or LPG engine, Bi fuel Petrol or CNG/LPG and Dual fuel- Diesel and CNG or Diesel and LPG (hereinafter referred to as 'engine') for genset application manufactured or imported into India or dedicated NG or LPG engine, Bi fuel Petrol or CNG/LPG and Dual fuel- Diesel and CNG or Diesel and LPG (hereinafter referred to as 'product'), assembled or imported into India shall obtain Type Approval and comply with the COP of their products for the emission limits which shall be valid for the next COP year or, the date of implementation of the norms specified above, whichever is earlier. Thereafter, the manufacturer shall obtain COP approval every COP year. Petrol and NG or LPG kit shall also have independent Type Approval and shall independently comply with COP requirement, as and when notified.
- 5.2 These conditions shall apply to all new engines for genset application and products manufactured, assembled or imported into India, as the case may be:
Provided that these rules, shall not apply to, -
- (a) any engine or, product, assembled or manufactured or imported, as the case may be, for the purpose of export outside India; or
 - (b) any engine or product intended for the purpose of sample limited to four in number and to be exported back within three months, and not for sale in India.
- 5.3 Every manufacturer of engine or product, as the case may be, shall have valid certificates of Type Approval and COP for each COP year, for all engine models being manufactured or, for all engine or product models being imported, after the effective date of the emission limits, as specified above and CPCB shall develop system and procedure to monitor the norms and COP year.
- 5.4 Every manufacturer shall submit its engine or products, as the case may be, for the verification for conformity of production for emission and noise, by any of the institutions, as applicable, every COP year.
- 5.5 No person shall manufacture, sell, import or use an engine for genset application or any product which is not having a valid Type Approval certificate and certificate of COP referred to in sub - paragraph (5.3) above, as applicable.
- 5.6 All the engines, individually or as part of the product shall be clearly engraved as NG genset Engine or LPG genset engine or diesel and NG genset Engine or diesel and LPG genset engine on the cylinder block, as the case may be.
- 5.7 The engine or the product shall be affixed with a conformance label meeting the following requirements, namely:-
- (a) the label shall be durable and legible;

(b) the label shall be affixed on a part necessary for normal operation of the engine or the product and not normally requiring replacement during the life of the engine or the product.

5.8 The conformance label (genset upto 800 kW) shall contain the following information, namely:-

- (a) Name and address of the manufacturer of engine or product, as the case may be;
- (b) Statement that the engine or product conforms to the Environment (Protection) Rules, 1986;
- (c) Type Approval Certificate number;
- (d) Date of manufacture of engine and the product or in case of import, the date of import of the engine and the product; and
- (e) Rated speed and corresponding gross power in kW.

5.9 (a) The Central Pollution Control Board shall be the nodal agency for implementation of these rules.

(b) In case of any dispute or difficulty in implementation of these rules, the matter shall be referred to the nodal agency.

(c) The nodal agency shall constitute a Standing Committee for emission related issues and a National Committee for noise related issues, respectively, to advise it on all matters related to the implementation of these rules including disputes, if any.

5.10 (a) All genset engines operating on dedicated NG or LPG or BI fuel- petrol and NG/LPG or Dual fuel -diesel and NG or Diesel and LPG shall be tested for Type Approval and COP of emission and noise limits compliance as per system and procedure published from time to time by the Central Pollution Control Board.

(b) The Central Pollution Control Board may develop or as the case may be, revise the compliance and testing procedure allowing a time of six months for all concern.

(c) The institutes referred in clause no 4.4 above shall submit the testing and certification details in respect of emission and, or, noise, as applicable, to the Central Pollution Control Board, annually and the Central Pollution Control Board shall be free to depute its officials to oversee the testing.

5.11 All genset engines operating on dedicated NG or LPG or BI fuel- petrol and NG/LPG or Dual fuel -diesel and NG or Diesel and LPG shall comply safety requirements.

5.12 The specification of commercial fuel applicable for Petrol, NG, LPG and Diesel shall be applicable as per CMVR document in the area where product shall be operated, from time to time, as per policy of Government of India.

5.13 All the details of engine components or part responsible for the emission performance shall be clearly marked in English language.

6.1 **Applicability.**- The stipulations in respect of emissions and noise as mentioned above shall apply to all new generator sets using petrol, dedicated NG or LPG engine, Bi fuel

Petrol or CNG/LPG and Dual fuel- Diesel and CNG or Diesel and LPG as fuel, manufactured in or, imported into India. .

Provided that this provision shall not apply to,-

- (a) Genset manufactured or, imported for the purpose of exports outside India; or,
- (b) Gensets intended for the purpose of Research and Development and not for sale or, captive use in India.

6.2 Requirement of certification.- Every manufacturer or importer (hereinafter referred to as manufacturer) of genset (hereinafter referred to as product) to which these conditions apply shall have a separate valid certificate of type approval for all the product models for emission as well as noise norms being manufactured or imported.

6.3 Verification of conformity of production.- Every manufacturer shall submit its products to the verification for conformity of production for emission and noise, by any of the institutions, as applicable, every conformity of production year.

6.4 Sale of generator sets not complying with these conditions.- The sale of product model, not having valid type approval certificate, or not complying with the emission or noise norms, as determined by the verification for conformity of production, shall continue to be prohibited in India.\

6.5 Requirement of conformance labelling for genset (upto 19 kW mechanical power and engine displacement upto 400 cc)

(1) The manufacturer of the product shall affix a conformance label on the product containing the following requirements, namely:-

- i) The label shall be durable and legible;
- ii) The label shall be affixed on a part necessary for normal operation of the product and not normally requiring replacement during the product life.

(2) The conformance label must contain the following information, namely:-

- (i) Name and address of the manufacturer (even, if the address is described in the owner's manual);
- (ii) Statement that this product conforms to the Environment (Protection) Rules, 1986; and
- (iii) Type approval certificate number and time phase of the regulation (namely from the August 2016 or the August 2017 OR as applicable notification).
- (iv) Date of manufacture of engine and the product or in case of import, the date of import of the engine and the product.
- (v) Rated & Maximum output of the genset in KVA (for upto 400cc engines)
- (vi) Rated speed and corresponding gross power in kW. (for other engines)

7.0 COMPLIANCE AND TESTING PROCEDURE

- 7.1 The compliance and testing procedure as published from time to time, if reviewed by Central Pollution Control Board shall be followed.
- 7.2 The Central Pollution Control Board may revise the compliance and testing procedure.
- 7.3 The institutes referred in this document shall submit the testing and certification details in respect of emission or, noise, as applicable to the Central Pollution Control Board, annually and the Central Pollution Control Board shall be free to depute its official(s) to oversee the testing.

PART II

CERTIFICATION SYSTEM & PROCEDURE

8.0 MODEL FAMILY

- 8.1 For the purpose of type approval certification and verification of conformity of production, the manufacturer's product range will be divided into model families, consisting of basic models and its variant.
- 8.2 The determination of an engine/genset family and the decision regarding parent engine/genset shall be taken according to the guidelines given in ISO 8178 –7 (Reciprocating internal combustion engines – exhaust emission measurement – part 7: engine/genset family determination). However, the decision of selection of parent engine/genset and family classification by the authorized agency shall be final.
- 8.3 For the purpose of identification, the manufacturer shall designate the families as F1, F2, F3 Fn.

9.0 APPLICATION FOR TYPE APPROVAL

- 9.1 The manufacturer for the first time shall apply to Nodal Agency as per Annexure –1 and on written acceptance of the application by the nodal agency; the Certification Agency will process the application for Type Approval. For each product model, the manufacturer must submit an application to one selected Certification Agency only for all of its product models.
- 9.2 If any manufacturer wants to change the Certification Agency, he shall apply to the Nodal Agency well in advance with justification(s). The Nodal Agency, after consultation with the existing Certification Agency may approve the change, if found justified. If approved, the nodal agency shall inform to all the concerned parties.
- 9.3 On receipt of information for change in Certification Agency, from the Nodal Agency, the previous Certification Agency shall authenticate all the relevant documents of the models (Type Approvals as well as COP verification) and forward the same to the new Certification Agency. The new Certification Agency shall be responsible for carrying out the Type Approval testing and COP verification for the manufacturer, in future.
- 9.4 Till the Nodal Agency gives approval for change in the Certification Agency, the previous Certification Agency will continue to carry out Type Approval and COP tests for the said manufacturer.
- 9.5 The application to Certification Agency shall be made in the format prescribed in Annexure 2 and must be completed in all respect. Test result, if any, of the emission

test done in accordance with the requirement of this document may also be submitted along with the application.

10.0 TYPE APPROVAL

10.1 The concerned certification agency shall review the application for the model which belongs to a family already certified.

10.1.1 Whether the model belongs to a family of model(s) already certified and even if so, whether specific testing of the model is necessary prior to certification.

10.1.2 Whether the emission test data supplied with the application is adequate and reasonable for granting certification (by certified test agencies).

10.2 The manufacturer shall submit the details of the parent model and its variants for considering them as a family, with justification, to the Certification Agency.

10.3 The application must be signed by the authorized representative of the manufacturer.

10.4 If the model does not belong to a family already certified, the Certification Agency shall proceed with the testing of the model for Type Approval

10.5 If the model belongs to a family already certified, the Certification Agency shall decide whether the specific testing of the model is required. In case the specific testing of the model is not required, the Type Approval certificate for the family may be extended to include the model; if the emission test data supplied with the application is adequate and reasonable for granting certification.

10.6 The certification agency shall intimate its decision to the applicant within one month of receipt of the application, indicating need and plan (schedule) of testing for type approval, if necessary for certification, with a copy marked to the nodal agency (It should be ensured by the applicant to provide correct and adequate data to the agency in prescribed format)

10.7 The manufacturer shall submit a product sample for testing, as intimated by the certification body. A prototype can be submitted; however it must be completely built and conforming to the design to be productionized.

10.8 The testing shall be done as per the procedure and specifications given in Part III of this document.

10.9 The product sample / prototype shall be deemed to have passed the test if the emission levels of all the species are within their respective limits. However, if the product sample / prototype fail to complete the test or meet the acceptance criteria, as above, the manufacturer has the option to repair / modify or

replace the same. If the design modifications reflect changes in the specifications given in the application, a revised application shall be submitted.

If the manufacturer is unable to repair / modify / replace the product sample / prototype within a reasonable time (upto a maximum of 3 months duration), the application for certification shall be deemed as withdrawn and a fresh application shall have to be submitted.

10.10 After verification / testing for type approval, the certification agency shall submit a type approval report to the manufacturer within one month from the date of testing indicating acceptance or rejection decision and reasons thereof.

10.11 The manufacturer is under the obligation to ensure the production strictly as per approved technical specifications, declared at the time of submission of application for type approval.

11.0 CERTIFICATE OF TYPE APPROVAL

11.1 Subsequent to type approval, the certification body shall issue the certificate of type approval for the model as per format prescribed in Annexure 3. Copy of the Certificate shall also be forwarded to the nodal agency.

11.2 The certificate shall be deemed to be valid for the model included therein; unless explicitly withdrawn through a separate written order by the nodal agency.

11.3 After the issue of the Type Approval certificate of a family, the same shall be valid till:

11.3.1 the engine specifications change as mentioned in Annexure-2; and

11.3.2 further amendments to the notification.

11.3.3 COP is missed- certification agency is to refer the industry to Nodal Agency

11.4 All the Type Approval tests shall be conducted in the test agency laboratory. In case, the required test facilities are accredited by the test agency, the Type Approval / COP tests can be carried out at manufacturer's laboratory also if reasons call for. In case the test is to be carried out in any overseas test facilities, the same shall be informed to the Nodal Agency by the Certification agency. The Certification Agency will submit a copy of the accreditation letter highlighting the details of test facilities available in the manufacturers' laboratory.

11.5 In case the manufacturer approaches the test agency for the first time, such manufacturers should complete the COP tests within three months from the commencement of commercial production or importation of 100 units, whichever is earlier.

12.0 VERIFICATION OF CONFORMITY OF PRODUCTION (COP)

- 12.1 Each manufacturer shall subject its product range to the verification for Cop ,every year. For this, the year shall mean the period from 1st August of a calendar year to 31st July of the succeeding calendar year for engines up to 19 kW & for engines up to 400 CC as applicable and 1st July of a calendar year to 30th June for engines upto 800kW
- 12.2 The same Certification Agency will be responsible for COP as selected at the time of Type Approval.
- 12.3 In case of domestic manufacturer, the verification of COP shall be done as per the following plan: **(for engines up to 19 kW & for engines up to 400 CC as applicable)**

Total no. of Families of the Domestic Manufacturer	No. of Families to be Tested per Year
1~3	1
4~7	2
8~11	3
12~15	4

- 12.4 Domestically manufactured engines of more than 19 kW rated output and imported engines of all ratings (above 400cc) shall be subjected to the verification of COP, once for every 1000 units or once in a year, whichever is earlier.
- 12.5 In case of importer, for engines up to 400cc, the verification of COP shall be done for each family once in a COP year or for every 250 units imported, whichever is more. The importer should give import schedule to test agency in advance.
- 12.6 Testing shall be done on sample(s) randomly selected by the certification agency, from production / import units of model for each family to be tested as above.
- 12.6 If the importer is not of Indian origin, the importer should establish a base office in India, which is to be declared in the initial application submitted to Nodal Agency in Annexure-1. This base office will be responsible for quality assurance.
- 12.7 The certification agency shall intimate to the manufacturer the schedule for sampling / testing. In case of imports, the importer will confirm to the certification agency the schedule for imports and the certification agency shall intimate the schedule for sampling / testing. The copy of schedule shall be forwarded to the nodal agency by the certification body.
- 12.8 For domestic manufacturer a minimum quantity of 10 nos. (up to 19kW & up to 400 CC) or one day's average production of the engine model selected by certification

agency, whichever is more, should be available for random sampling selection. This limit shall be minimum 10 units in case of imports.

- 12.9 In case of domestically manufactured engines of more than 19 kW power rating, a minimum quantity of one day's average production of each model shall be made available for random selection subject to minimum of 3. This limit shall not be applicable in case of imports of all ratings.
- 12.10 If a manufacturer wishes to discontinue a particular model in a COP year, the manufacturer should inform the test agency with copy to Nodal Agency immediately so as to update the models /families record for the COP year.
- 12.11 The testing shall be done as per the procedure and specification given in Part III of this document.
- 12.12 During the testing, if a sample fails to complete the test or is found to be defective for reasons other than emission result, the results of the sample shall be discarded and another sample shall be selected. If max power is not met on first sample, two samples are required for verification of power and emission test to be done in any one of two.
- 12.13 COP verification shall be carried out for each plant of the indigenous manufacturer. For imported Gensets, the COP testing shall be carried out for each genset family manufactured in each country of origin and plant wise.
- 12.14 The manufacturer shall complete all the COP activities (such as random selection, initial running-in, emission testing, & documentation/certification) as per specified schedule. The COP certificate shall not be issued in case of non-adherence of the specified schedule.
- 12.15 Following table gives the deadline for the respective COP year for the COP activities. However manufacturer can take early action on each activity.

Sr. No	Activity	Last date(*)
1	Submission of Production/Import Details to test Agency	3 months before the end of COP year
2	Random Selection and Initial Running in	2 months before the end of COP year
3	Submission of engines, Technical details & Emission testing (Including extended COP if any)	1 month before the end of COP year
4	Completion of Certification/Document preparation	Before last date of COP year

- 12.16 It is the responsibility of the Genset /Engine manufacturer for the completion of the COP activities for the Gensets/engines models produced/imported from the beginning of the COP year. In such situations engine manufacturer shall intimate test Agency regarding the tentative production/import plan before three months of end of COP year.
- 12.17 The manufacturer shall inform the certification agency regarding the stoppage of production of a specific model. In case this has not been anticipated at the start of the COP period, this should be intimated at least three months before the end of COP year so that selection of Genset for COP can be completed by the certification agency before stoppage of production. The manufacturer shall provide all the assistance required by the Certification Agency for completing the tests. This information should also be communicated to Nodal Agency.
- 12.18 The latest updated technical specifications, procedure of pre-delivery inspection (PDI), running – in and servicing of the Gensets, shall also be submitted before the selection of genset, if there has been revisions after the previous COP/Type Approval.
- 12.19 Pre-delivery inspection, as per owners’ instruction manual / service manual, will be carried out by the manufacturer as per the procedure declared at the time of Type Approval, and as amended and intimated to the concerned Certification Agency from time to time, on the selected genset(s) model, under the control of the Certification Agency.
- 12.20 The running-in of the Gensets shall be carried out as per the manufacturer’s recommendation submitted during the type approval and as amended and intimated to the concerned certification agency from time to time, under the control of the certification agency. The running-in may also be carried in Genset manufacturer / manufacturers place under the control of test agency. After this, the manufacturer will be permitted by the Certification Agency to carry out all the adjustments recommended in his user’s / service manual and as amended and intimated to the concerned Certification Agency from time to time, under the control of the certification agency.
- 12.21 In case of failure of any major component during the running-in or testing, the Certification Agency may permit to replace the component, only once, which has failed and which do not affect the performance and the emission of engine. In case of failure of components affecting the performance and emissions of the engine, random selection and testing should be done once again. If the randomly selected Gensets or replaced component fails again, it shall be reported to the nodal agency by the concerned certification agency and the agency shall await instructions from the nodal agency for further action

12.22 The supplier shall submit the randomly selected gensets to test agency within 4 weeks (8 weeks in case of import subject to last date as mentioned in clause 12.15) in clause of completion of running in/selection for the emission compliance tests. The test agency should endeavor to complete the further testing of selected sample within 4 weeks after the submission of gensets-

12.23 The testing shall be done as per the procedure and specifications given in Part III of this document.

12.23.1 Exemption from COP :

In the following case, the Gensets shall be exempted from COP for the prevailing COP year.

12.23.2 If Type approval obtained in the last quarter of the COP year. This clause is not applicable to the manufacturers as mentioned in clause no. 11.5

12.23.3 In case of No production/import, the manufacturer shall submit a declaration to test agency and Nodal Agency for no production/import of a particular family models for every COP year.

The COP test shall be conducted by test agency for the next COP year, upon receipt of declaration by the manufacturer that there was no production/import during previous COP year.

Declaration in this regard should be submitted before the end of 2nd quarter of the COP year.

12.23.4 Any genset engine manufactured/imported for purpose of export outside India.

12.23.5 Any domestically manufactured genset engine intended for the purpose of sample (Max number of 4 units of each family) only and not for sale in India.

12.23.6 Any genset engine imported for the purpose of sample testing, bench marking, or intended not for any commercial sale (Max number of 4 units per year).

12.23.7 Any genset engine imported for the round robin/Lab co-relation tests. Such engines shall be exported back within 3 months (refer General Conditions) from date of import.

12.23.8 For obtaining the exemption for Sr. no. 12.23.4, 12.23.5; and 12.23.6 the manufacturer shall obtain approval from Nodal Agency.

13.0 SAMPLE SIZE & DECISION CRITERIA FOR VERIFICATION OF COP

Sampling plan – I is applicable to domestically manufactured engines upto 19 kW rated output whereas sampling plan – II is applicable to domestically manufactured engines of rating above 19 kW as well as for imported engines of all ratings (imported as engine or as genset).

Sampling plan I

- 13.1 The number of samples to be tested shall be minimum as necessary to arrive at a decision on whether the production units comply with the emission limits.
- 13.2 A sample is said to have failed for particular specie if the test result of the sample for the specie exceeds the applicable emission limits.
- 13.3 The production / import units of all models in the family shall be deemed to comply with the emission limits if the number of failed samples as defined in 13.2 above for each specie is less than or equal to the pass decision no., appropriate to the cumulative no. of samples tested for that specie, as given in the following Table.

Cumulative Samples	Pass No. (No. of failures)	Fail No. (No. of failures)	Cumulative Samples	Pass No. (No. of failures)	Fail No. (No. of failures)
1	(¹)	(²)	16	6	11
2	(¹)	(²)	17	7	12
3	(¹)	(²)	18	7	12
4	0	(²)	19	8	13
5	0	(²)	20	8	13
6	1	6	21	9	14
7	1	7	22	10	14
8	2	7	23	10	15
9	2	8	24	11	15
10	3	8	25	11	16
11	3	8	26	12	16
12	4	9	27	12	17
13	5	10	28	13	17
14	5	10	29	14	17
15	6	11	30	16	17

(¹): Series not able to pass at this stage

(²): Series not able to fail at this stage

- 13.4 Once a compliance or non-compliance decision is made for particular specie, the result of testing of subsequent samples for that specie shall not influence the decision.

Sampling plan II

- 13.5 One engine sample, selected randomly, shall be tested as per part – III of this document.
- 13.6 If the engine sample, as tested above, fails to comply with the emission limits, the manufacturer may ask for measures to be performed on a sample of engines taken from the series and including the engine originally taken. The manufacturer shall specify the size n of the sample subject to 'n' being minimum 2 and maximum 10, including the engine originally taken.
- 13.7 The production/import units of all models in the family shall be deemed to comply with the emission limits if the following condition is met, for each specie (except smoke limit):

$$\bar{x} + k. S < L$$

Where

\bar{x} = arithmetic mean of the results of the tests conducted on n no. of samples, for a particular specie

S = Standard deviation of the results of the tests conducted on n no. of samples, for the specie = $[\sum (x - \bar{x})^2 / (n - 1)]^{1/2}$

x = results of the tests conducted on n no. of samples, for the specie.

L = the emission limit for the specie

k = a statistical factor dependent on n and as given in below table.

TABLE

Values of statistical factor (k) w.r.t. n

N	2	3	4	5	6	7	8	9	10
K	0.973	0.613	0.489	0.421	0.376	0.342	0.317	0.296	0.279

14.0 TECHNICAL SPECIFICATION TO BE CHECKED AFTER COP TESTS:

- 14.1 Description of the Engine- Make/ type/working principle/Cylinder capacity/cooling system.
- 14.2 Air filter Make /type :
- 14.3 Anti-pollution device description:
- 14.4 Carburettor/feed pump Make/Type/ID/Main Jet Size/Pilot Jet size/Venturi Size
- 14.5 Gaseous fuel Stepper motor/Injector make/type
- 14.6 LPG Vaporiser make/type
- 14.7 CNG regulator make/type
- 14.8 Diesel Fuel injection and governing system make/type
- 14.9 EGR Make/Type

14.10 Ignition System Make/type:

14.11 Spark plug Make/Type:

14.12 After completion of all tests for verification of COP, the certification body shall prepare and submit a verification of COP report to the nodal agency giving the families and models selected and the decision. Copy of the report shall also be given to the manufacturer.

14.13 LPG/CNG KIT COMPONENT SPECIFICATIONS AS PER ANNEXURE :-

15.0 ANALYSIS & CORRECTIVE ACTIONS FOR NON-COMPLIANCE

15.1 If the verification of COP report of the certification body for a model family indicates non-compliance, the manufacturer must analyze the reasons for non-compliance, plan and take corrective actions in design, production line and units already produced, if possible and submit a report to the nodal agency with a copy to the concerned certification body, within 4 weeks of the verification of COP report.

15.2 If the manufacturer is unable to diagnose the reasons for non-compliance within stipulated time and / or feels that the problem is not relevant to any or all other models in the family, this shall be clearly stated in the report.

16.0 CONSEQUENCES OF NON-COMPLIANCE

16.1 If the COP verification report of the certification agency for a model family indicates non-compliance, he must stop the manufacturing /dispatch of imported models belonging to that family.

16.2 Further, the manufacturer must analyse the reasons for non-compliance, plan to take corrective actions in design, production line and units already produced and submit a report to the nodal agency with a Copy to the concerned certification agency, within four weeks of the receipt of the COP verification report.

16.3 If the manufacturer is unable to diagnose the reasons for non-compliance within the stipulated time, this shall be clearly stated in the report.

16.4 Based on the diagnosis and corrective action plan submitted by the manufacturer, the nodal agency, in consultation with the standing committee, may take any of the following actions:

16.4.1 Allow continuation of production / import of all models in the family if it is satisfied with the corrective actions planned / taken by the manufacturer with or without additional verification of COP in due course.

16.4.2 Allow continuation of production / import of some or all other models of the family if it determines that the reasons for non-compliance of the tested model are not relevant to these models, with or without additional verification of COP in due course.

- 16.4.3 Stop production / import of any or all the models in the family till compliance is demonstrated by the manufacturer, through a re-verification of COP.
- 16.5 The manufacturer shall be given an opportunity to explain its views before taking a final decision.
- 16.6 It is the responsibility of the manufacturer to ensure at his cost that the modifications / modified components are carried out / retrofitted, within a period specified by the nodal agency, on all the products produced / dispatched in the period between the dates from which the COP became due and re-verification of COP or as decided by the nodal agency, in consultation with the standing committee.
- 16.7 **Penalty (Bank Guaranty) for non-compliance.**

CPCB has apprised satisfactory implementation of Bank Guaranty provision to the 15th Standing Committee held on 23rd August 2016 and on recommendation of the committee following procedure is to be adopted.

Default	Default cases	BG amount
1 st time	Missed COP including non-compliance of Clause no 7.3 regarding additional COP on achieving production limit of 1000 units and thereafter for every additional 1000 units of Genset engines >19kW.	BG for <u>units</u> :: Rs 10,00,000 per family on production equal or greater than 1000 units for genset engines > 19kW during any of the last three CoP years ELSE Rs 6,00,000 per family Validity of BG – three years
2 nd time	Second time defaulters after observation period are required to submit a BG of Rs 20, 00, 000.00 with observation period of three years.	Rs 20, 00, 000.00 Validity of BG – three years
Recall of non-complaint units	Fail in CoP	BG of Rs 50, 00,000.00 as security for total recall. Validity : subject to CPCB's review on case basis

Note: Manufacturer includes assemblers and importers also. This procedure to be adopted uniformly for both noise and emissions across Gensets of all fuel types.

PART III

TEST EQUIPMENT & PROCEDURES

17.0 OVERVIEW

17.1 The test facility to be used shall be of the certification agencies or any other facility approved by these certification agencies. The tests shall be carried out under the control of the certification agencies.

17.2 Test equipment, setup, procedure, calculation method and other relevant technical details to be used shall be as per following standards, except where it is mentioned, specifically, in this document.

- ISO 8178 – 1 : 2006
“Reciprocating internal combustion engines-exhaust emission measurement”

Part I: Test bed measurement of gaseous and particulate exhaust emissions

- ISO 8178 – 3 : 1994
“Reciprocating internal combustion engines – Exhaust emission measurement”

Part –3 : Definitions & methods of measurement of exhaust gas smoke under steady state conditions.

The smoke shall be measured at all specified mode points of the test cycle, wherever applicable.

17.3 EMISSION TESTING USING ENGINE DYNAMOMETER :

17.3.1 The testing shall be done on engines for Genset (up to 800 kW) run on Dual Fuel - Diesel and Natural Gas (NG) or dual-fuel Diesel and Liquefied Petroleum Gas (LPG) with the engine dynamometer. In case of import of complete genset, the engine shall be decoupled to test the engine with the engine dynamometer. The testing shall be done as per the following 5-mode cycle.

Mode No.	Engine speed	% Load	Weighting Factor
1	Rated speed	100	0.05
2	Rated speed	75	0.25
3	Rated speed	50	0.30
4	Rated speed	25	0.30
5	Rated speed	10	0.10

17.3.2 The testing shall be done on engines for Genset (up to 800 kW) run on dedicated Natural Gas (NG) or dedicated Liquefied Petroleum Gas (LPG) with the engine dynamometer. In case of import of complete genset, the engine shall be decoupled to test the engine with the engine dynamometer. The testing shall be done as per the following 3-mode cycle.

Mode No.	Engine speed	% Load	Weighting Factor
1	Rated speed	100	0.3
2	Rated speed	75	0.5
3	Rated speed	50	0.2

17.3.3 Notes

100% of load shall correspond to full throttle output of the engine.

In case of dual fuel engines, diesel engine Testing shall be done with commercial diesel fuel as per the specification given in **annexure I**. In case of engine having gaseous fuel system, testing shall be done with commercial CNG/LPG fuel as notified in CMVR 115B/115C. The fuel (diesel) inlet temperature shall be maintained at 38±5 Deg C throughout the test.

Single & two cylinder engines shall be tested with the engine air intake system. All the other engines shall be tested with either air intake system or applying maximum declared air intake depression.

Running in of the engine, for COP, shall be as per clause 7.13 of part II of this document.

Gross observed power shall be the criteria for adjusting dynamometer load as well as calculating specific emission values.

The declared rated gross power shall be verified and corrected as mentioned below.

17.3.4 Power Corrections Factors:

Definition: The power correction factor is the coefficient by which the measured power must be multiplied to determine the engine power under the reference atmospheric conditions specified as below

$$P_o = \alpha P$$

Where:

Po is the corrected power (i.e. power under reference atmospheric conditions);

α is the correction factor (α_a being the correction factor for spark ignition engines)

P is the measured (observed) power (test power)

Reference atmospheric conditions:

Temperature (T): 298K

Dry pressure (Pso): 99kPa

Note: The dry pressure is based on a total pressure of 100 kPa and water Vapour pressure of 1kPa.

Test atmospheric conditions:

The atmospheric conditions during the test shall be the following

Temperature (T) : Between 283 K and 313

Pressure (P) : Between 80 kPa and 110 kPa

Determination of correction factor:

(The tests may be carried out in air -conditioned tests rooms where the atmospheric conditions may be controlled.)

The power correction factor α_a for Positive Ignition Engines (Naturally aspirated or supercharged) obtained by applying the formula:

The correction Factor (α_a) is obtained by applying the formula:

$$\alpha_a = (99 / P_s)^{1.2} (T/298)^{0.6}$$

Where,

P_s= the dry atmospheric pressure in kPa, that is the total barometric pressure minus water vapour pressure and

T= the absolute temperature in Kelvin (K) at the engine air inlet

The formula applies to carburetted engines and to other engines where the management system is designed to maintain relatively constant fuel / air ratio as ambient conditions change.

(The references for Power correction factor are taken from IS 14599:1999 clause 6.4.1)

The power correction factor α for compression ignition engines at constant fuel delivery is obtained by applying the formula :

$$\alpha = f_a^{f_m}$$

where

f_a – the atmospheric factor

f_m - the characteristic parameter for each type of engine and adjustment

Atmospheric factor (f_a)

This factor indicates effect of environmental conditions (pressure, temperature and humidity) on the air drawn in by the engine. The atmospheric factor differs according to the type of the engines.

Naturally aspirated and mechanically pressure charged engines:

$$f_a = (99/P_s) * (T/298)^{0.7}$$

Turbocharged engines with or without cooling of charge air :

$$f_a = (99/P_s)^{0.7} * (T/298)^{1.5}$$

Engine Factor (f_m)

f_m is a function of Q_c (fuel flow corrected) as follows:

$$f_m = 0.036 Q_c - 1.14$$

where

$Q_c = Q/r$ and

Q – the fuel delivery in milligrams/cycle per liter of engine swept volume (mg/1.cycle)

r is the pressure ratio of compressor outlet and compressor inlet ($r = 1$ for naturally aspirated engines)

This formula is valid when Q_c is $40 \leq Q_c \leq 65$

For Q_c values lower than 40, a constant value of f_m equal to 0.3 ($f_m=0.3$) will be taken.

For Qc values higher than 65, a constant value of fm equal to 1.2 (fm=1.2) will be taken.

The gross declared corrected power of the engine (above 400cc, needs to be confirm the applicability for below 400cc) shall be measured on a test bench at rated speed of the engine. The measured power and speed may differ from the power and speed specified by the supplier as specified below:

17.3.5 Declared rated corrected Power

(i) For Type Approval:

- For single cylinder engines, $\pm 5\%$ at the rated power point
- For all other engines, $\pm 4\%$ at the rated power point

(ii) For Conformity of Production:

- For single cylinder engines, at rated power point, $\pm 6\%$ of the type approved figure
- For all other engines, at rated power point, $\pm 5\%$ of the type approved figure

17.3.6 Declared rated Speed at rated power point shall vary within $\pm 1\%$

For verifying the conformity of production, if the selected engine does not meet the smoke limits as applicable, another 2 engines will be taken from the series at random and shall be tested as per this part. The selected two engines should meet the limit values specified.

For verifying the conformity of production, for the selected engine, if the gross power and rated speed does not meet the limits as mentioned above, two more engines shall be tested for the rated gross power and rated speed.

The two selected engines shall meet the limits for the rated gross power and speed, out of the two engines, one engine shall be subjected to the emission test for the conformance of production as mentioned in this part.

The engine shall be tested with the maximum exhaust back pressure values declared by the manufacturer.

In case of engines fitted with exhaust after treatment devices and external EGR system, the supplier shall declare exhaust back pressure values at all five test points. The engine will be tested with the declared exhaust back pressure values set at laboratory conditions with a tolerance of $\pm 10\%$ at rated load. At part load points the tolerance shall be as low as possible in the test laboratory conditions.

The no load speed or high idle speed shall be verified and documented against value specified by the supplier

18.0 EMISSION TESTING USING RESISTIVE LOAD BANK :

Emissions from the gensets (upto 19 kW) running on Bi Fuel Petrol or Natural Gas (NG) and bi-fuel Petrol or Liquefied Petroleum Gas (LPG) powered by SI engine (upto 400 cc displacement) shall be tested using Resistive Load Bank as per following 3-mode test cycle.

Mode No.	LOAD CURRENT	Frequency	Weighting Factor
1	Maximum output declared by the manufacturer of the genset (tolerance $\pm 5\%$)	50 ± 1 Hz	0.3
2	75% of Mode 1	50 ± 1 Hz	0.5
3	50% of Mode 1	50 ± 1 Hz	0.2

18.1 SPECIFICATION OF TEST EQUIPMENT AND SETUP

- 18.1.1 The equipment and setup necessary for testing of exhaust emissions of genset/ engine as per method prescribed herein, consists of:
- 18.1.2 Resistive load bank for electrical loading of the genset, equipped with voltmeter, ammeter and frequency meter for measurement of the load. (Required only if the testing has to be done on genset).
- 18.1.3 Engine dynamometer, in case the testing has to be performed on the engine alone.
- 18.1.4 Exhaust gas analyzers for measurement of molar concentrations of CO, CO₂, HC, NO_x and O₂.
- 18.1.5 Arrangement for sampling raw or dilution (CVS) exhaust gases, their conditioning for and transfer to analyzers.
- 18.1.6 Apparatus for measurement of fuel consumption rate.
- 18.1.7 Instruments for measurement of:
 - Ambient air pressure and humidity

- Engines inlet air and other temperatures
- Temperatures of exhaust sample

18.2 Resistive Load Bank (for upto 400cc engine)

- a) The load bank shall be a single phase (for single phase Gensets only) or 3 phase load circuit, with each phase consisting of:
- A combination of stable resistive elements of appropriate rating, wired such that the total load current is adjustable to any value up to 125% of max. full throttle current per phase of the genset under test with accuracy of ± 0.1 Amp.
 - I. The resistive elements shall be capable of withstanding continuous energisation at 150% of the rated voltage of the genset without overheating.
 - II. The ratings of other circuit elements such as switches, cords etc., shall be consistent with the highest current / voltage to which they may be subjected to in actual operation.
 - A voltmeter, frequency meter and ammeter for measuring the output voltage and frequency of the genset and the total load current respectively.
 - I. Voltmeter and ammeter shall be AC RMS meters, direct acting analogue I digital type conforming to IS 1248 (part 2), accuracy class 0.5. The range and rating shall be appropriate for the genset output to be measured.
 - II. Frequency meter shall be direct acting analogue (pointer)/ digital type conforming to IS 1248 (part 4), accuracy class 1. The range of frequency meter shall be 45 - 65 Hz.
 - III. The meters should be calibrated once in a year. The calibration must be traceable to within the specified accuracy with respect to NPL/International standard.
- b) The entire circuit shall be housed in a suitable enclosure for safety and convenience of operation. The configuration shall ensure that under normal conditions:
- I. Accidental touches to live/ hot parts are not possible.
 - II. There shall be no possibility of short-circuiting. The insulation resistance between each independent conducting path and between

conducting path and body of the enclosure shall be 10 $\mu\Omega$ min. Further, the insulation system shall withstand 1500 V AC for 1 minute without breakdown and shall be consistent with the maximum temperature to which it may be subjected in operation.

III. The resistive elements and the enclosure do not overheat. If necessary, a cooling fan of adequate capacity shall be provided.

18.3 The Exhaust sampling arrangement shall consist of an extension pipe fitted with an exhaust sample probe connected with the outlet of the normal exhaust system supplied with the product (genset) has shown in fig. 1.

19.0 TEST CONDITIONS

19.1.1 The ambient temperature throughout the test shall be within 20 ~40°C.

19.1.2 The absolute ambient temperature (designated as T & expressed in Kelvin) and dry atmospheric pressure (designated as Ps & expressed in kPa) must meet the following condition:

$$0.93 < F_a = (99/P_s) \times (T / 298)^{0.7} < 1.07$$

19.2 Power Corrections Factors:

Definition: The power correction factor is the coefficient by which the measured power must be multiplied to determine the engine power under the reference atmospheric conditions specified as below

$$P_o = \alpha P$$

Where:

P_o is the corrected power (i.e. power under reference atmospheric conditions);

α is the correction factor (α_a being the correction factor for spark ignition engines)

P is the measured (observed) power (test power)

Reference atmospheric conditions:

Temperature (T): 298K

Dry pressure (P_{so}): 99kPa

Note: The dry pressure is based on a total pressure of 100 kPa and water Vapour pressure of 1kPa.

Test atmospheric conditions:

The atmospheric conditions during the test shall be the following

Temperature (T) : Between 283 K and 313

Pressure (P) : Between 80 kPa and 110 kPa

Determination of correction factor:

(The tests may be carried out in air -conditioned tests rooms where the atmospheric conditions may be controlled.)

The power correction factor α_a for Positive Ignition Engines (Naturally aspirated or supercharged) obtained by applying the formula:

The correction Factor (α_a) is obtained by applying the formula:

$$\alpha_a = (99 / P_s)^{1.2} (T/298)^{0.6}$$

Where,

P_s = the dry atmospheric pressure in kPa, that is the total barometric pressure minus water vapour pressure and

T = the absolute temperature in Kelvin (K) at the engine air inlet

The formula applies to carburetted engines and to other engines where the management system is designed to maintain relatively constant fuel / air ratio as ambient conditions change.

(The references for Power correction factor are taken from IS 14599:1999 clause 6.4.1)

20 TEST PROCEDURE

20.1 Preparations and Pre-Checks

20.1.1 Check and confirm that the equipment and test setup conforms to the specifications given in 18.0

20.1.2 Carry out the pre-test calibration and other checks as specified in 18.0

20.1.3 If the test has to be carried out on the engine alone, as recommended by the manufacturer:

Make proper arrangement for mounting and coupling of the engine on the dynamometer. If any modifications are necessary in the mounting of essential engine parts, these shall be done such that they do not affect the performance of the engine

Calibrate the dynamometer as specified in 18.2.2

20.1.4 Install thermocouples or other suitable temperature measuring devices to monitor the temperatures, which constitute criteria of thermal stability as specified by the manufacturer.

20.1.5 Subject the Genset to running in, as per the manufacturer's recommendation, to stabilize its emission characteristics. During and after running-in normal maintenance, as specified by the manufacturer, shall be carried out.

20.1.6 Run the Genset at mode 1 of test cycle as specified in fig.1 and fig.2 below and note the corresponding maximum output and fuel consumption. Repeat the check after installation of exhaust sampling set up. If the drop in maximum output or increase in fuel consumption rate, due to installation of exhaust sampling system is greater than 5%, modify the exhaust sampling arrangement keeping in mind the essential requirements specified in 18.2.5.

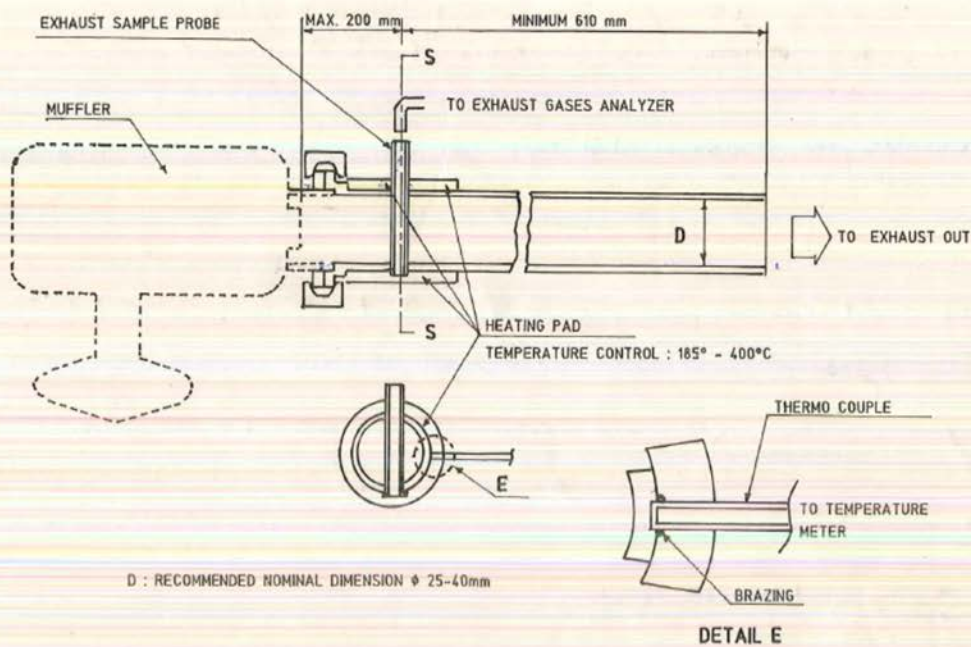


FIG. 1 EXHAUST GAS SAMPLING ARRANGEMENT

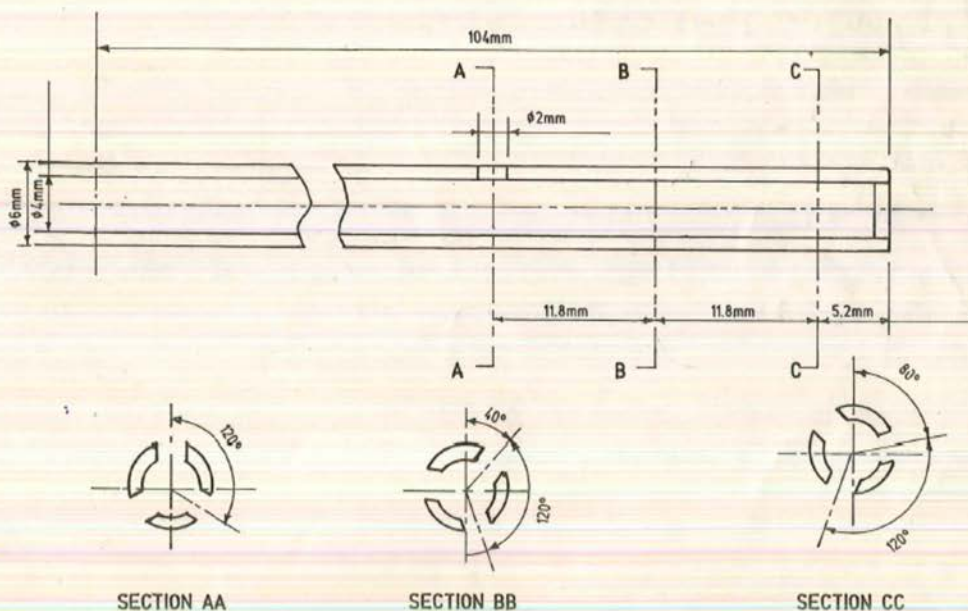


FIG. 2 RECOMMENDED DETAILS OF EXHAUST SAMPLE PROBE

20.2 Emission Test for engine displacement upto 400 cc

20.2.1 Run the genset and adjust the load, engine speed and throttle as per mode 1 of test cycle specified in Annexure 5. Run the genset for a sufficient period of time to achieve thermal stability (Engine temperature to remain within a band of 10 °C for 10 minutes).

20.2.2 After achieving thermal stability, initiate the measurement of fuel consumption rate, air flow rate (optional) and emissions:

- A minimum of 3 readings of fuel consumption rate shall be taken and the duration of each measurement must be minimum 30 seconds. Average of the 3 readings shall be reported.
- Emission values of each specie shall be monitored / recorded for a continuous period of 2 minutes. Average value of the period shall be reported.
- Record the appropriate load data

20.2.3 Repeat 20.1 and 20.2.2 for modes 2 & 3.

20.2.4 The following guidelines must be strictly observed during the testing:

- Modes shall be performed in the numerical order specified in the test cycle
- In case of doubt in any mode, may be repeated before switching over to the next mode.
- The load and the engine speed must be maintained as per the test cycle during the period of measurement of emissions, fuel consumption and load. If this requirement is not met, the mode is void and must be completely repeated.
- If a delay of more than one hour occurs between the end of one mode and the beginning of another mode, the test is void and must be completely repeated.
- If at any time, during a mode the test equipment malfunctions or the specifications cannot be met, the test is void and must be aborted. Corrective action should be taken and the test restarted.

21 CALCULATION OF WEIGHTED AVERAGE SPECIFIC EMISSION for CNG/LPG Genset engine testing:-

21.1 Conversion of molar concentration in dry exhaust to wet exhaust

Species concentration, wet = K * Species concentration, dry

Where:

$$K = \frac{1}{1 + 0.005 * (CO\%_d + CO_2\%_d) * y - 0.01 * H_2\%_d}$$

$$H_2\%_d = \frac{0.5 * y * CO\%_d * (CO\%_d + CO_2\%_d)}{CO\%_d + 3 * CO_2\%_d}$$

y = H/C atomic ratio of test fuel; ref CMVR Tap document

21.2 Conversion of molar concentration of species to mass emission in gms/hr

21.2.1 Carbon Balance Method

$$W_{HC} = \frac{MHC_{exh}}{MF} * \frac{G_F}{TC} * \frac{HC_{ppm,w}}{10000}$$

$$W_{CO} = \frac{MCO}{MF} * \frac{G_F}{TC} * CO\%, w$$

$$W_{\text{Nox}} = \frac{M_{\text{Nox}}}{MF} * \frac{G_F}{TC} * \frac{\text{NOx,ppm,w}}{10000}$$

Where:

W_{HC} = Mass emission rate of HC in exhaust in gms/hr

W_{CO} = Mass emission rate of CO in exhaust in gms/hr

W_{Nox} = Mass emission rate of NOx in exhaust in gms/hr

G_F = Mass flow rate of fuel in gms/hr

TC = CO% wet + CO₂ % wet + HC% wet

M_{HCexh} = MF (This assumes that the exhaust hydrocarbons are identical to unburnt fuel)

MF = Molecular weight of fuel per carbon = 12.011 + 1.008 * y + 15.999 * z

M_{CO} = Molecular weight of CO = 28.01

M_{NOx} = Molecular weight of NO₂ (NO_x) = 46.01

y = H/C atomic ratio of the fuel ,ref CMVR TAP document

z = O/C atomic ratio of the fuel , ref CMVR TAP document

*For CNG AND LPG COMMERCIALY AVAILABLE :-

* H/C AND O/C RATIO TO BE taken from CMVR TAP document.

21.2.2 Air and Fuel Flow Method

If both air and fuel mass flow rates are measured, use the following equations.

$$W_{\text{Hc}} = \frac{M_{\text{HCexh}}}{M_{\text{EXH}}} * (G_{\text{AD}} + G_F) * \text{HC,ppm,w} * 10^{-6}$$

$$W_{\text{CO}} = \frac{M_{\text{CO}}}{M_{\text{EXH}}} * (G_{\text{AD}} + G_F) * \text{CO\%,w} * 10^{-2}$$

$$W_{\text{Nox}} = \frac{M_{\text{NOx}}}{M_{\text{EXH}}} * (G_{\text{AD}} + G_F) * \text{NOx,ppm,w} * 10^{-6}$$

Where:

M_{EXH} = Molecular weight of total exhaust

$$\begin{aligned}
&= \frac{\text{MHCexh} * \text{HCppm.w}}{10^6} \\
&+ \frac{28.01 * \text{CO}\%,\text{w}}{10^2} + \frac{44.01 * \text{CO}_2\%,\text{w}}{10^2} \\
&+ \frac{46.01 * \text{NOxppm.w}}{10^6} + \frac{32.00 * \text{O}_2\%,\text{w}}{10^2} \\
&+ \frac{2.016 * \text{H}_2\%,\text{w}}{10^2} + 18.01(1-K) \\
&+ 28.01 * [100 - \frac{\text{HCppm.w}}{10^4} - \text{CO}\%,\text{w} \\
&- \text{CO}_2\%,\text{w} - \frac{\text{Nox ppm.w}}{10^4} - \text{O}_2\%,\text{w} - \text{H}_2\% \\
&\text{w} \\
&- \frac{100(1-K) * 10^{-2}}{10^4}
\end{aligned}$$

G_{AD} = Intake air mass flow rate on dry basis in gms/Hr.

21.2.3 Calculation of Weighted Average Specific Emissions

$$A_{WM} = \frac{\sum (W_i * WF_i)}{\sum (P_i * WF_i)}$$

Where:

A_{WM} = Weighted average specific emission of a particular specie (HC, CO, NOx) in gms/kw-hr

W_i = Mass emission rate of the particular specie during Mode i in gms/hr

WF_i = Weighting factor for mode i (refer Annexure 5)

P_i = Gross average engine power generated during mode i

$$= \frac{2\pi}{60,000} * \text{speed in rpm} * \text{torque in N.m}$$

60,000

(If the testing is done one engine)

$$= \frac{\text{Genset output voltage in volts} * \text{Load Current in Amps}}{60,000}$$

$$1000 * \eta$$

(If the testing is done on genset)

η = alternator efficiency, as declared by the supplier

21.3 Humidity Correction Factor

The NOx emissions for small engines (upto 400 CC) are low and the humidity correction factor approaches one in a laboratory test environment.

Accordingly, the humidity correction factor has been ignored for the calculation of NOx in the equations given above.

22.0 General Conditions

22.1 The engine lubricating oil used shall be as per the manufacturer's recommendations

22.2 The commercially available fuel as prescribed by Govt. of India in CMVR document, petrol or NG or LPG or diesel as applicable shall be used for testing. As specified in this document no other fuel, other than stipulated by CPCB, shall be used to start and run the genset without consent from CPCB

22.3 Genset component or Parts identification:

All the details of the genset components or parts responsible for emission Performance shall be clearly marked in the English language. All engineering drawings shall be in the English language & appropriately in dimensions in mm.

22.4 The nodal agency shall investigate the adequacy and suitability of specifications of ambient temperature and pressure and fuel as laid down in 19.1, 19.2 and 20.2 of this part respectively to ensure accuracy and reproducibility of the results

22.5 All other specifications shall also be subject to review as and when necessary based on the experience gained in implementation of emission testing as prescribed in this document.

PART IV

ANNEXURE – 1

Part - 1A

NOTARISED AFFIDAVIT ON NON-JUDICIAL STAMP PAPER OF Rs.10/-

[To be submitted to the Nodal Agency by a manufacturer approaching for the first time for TA]

I,, Chairman / President / Managing Director / Partner / CEO / Proprietor of M/s, having Registered Office at engaged in manufacturing / import of dedicated LPG and/or CNG, bi-fuel Petrol / Kerosene with LPG / CNG, dual fuel diesel with LPG / CNG driven Gensets / Genset engines with manufacturing facilities / ware house (in case of importer) at:

- i).....
- ii).....

am authorized to swear this affidavit for and on behalf of the above named Company. I do hereby solemnly affirm and declare as under:

1. That the deponent is well conversant with the facts and competent to swear this affidavit.
2. That the deponent declares that M/s are manufacturer / importer of Genset engines driven by dedicated LPG and/or CNG, bi-fuel Petrol / Kerosene with LPG / CNG, dual fuel diesel with LPG / CNG driven Gensets / Genset engines in the brand name
 - i)
 - ii)(Strike out if not applicable)
2. That the deponent declares that M/s are importer of dedicated LPG and/or CNG, bi-fuel Petrol / Kerosene with LPG / CNG, dual fuel diesel with LPG / CNG driven Gensets / Genset engines from

M/s (ii) M/s
(Complete address) (Strike out if not applicable)

4. That the deponent declares that M/s will obtain Type Approval / Conformity of Production verification only from (Name of the Certification Agency)..... and will not approach any other Certification Agency for Type Approval / Conformity of Production verification for any of their dedicated NG or

LPG or BI fuel- petrol and NG/LPG or Dual fuel -diesel and NG or Diesel and LPG driven Gensets / Genset engine models, without prior permission from the nodal agency.

Continued.....

5. That the deponent declares that none of the Chairman, Managing Director, Partner, Director, Proprietor, Board Member in M/s has been involved with a Company / Firm which has manufactured and sold non-compliant dedicated LPG and/or CNG, bi-fuel Petrol / Kerosene with LPG / CNG, dual fuel diesel with LPG / CNG driven Gensets / Genset engines .

6. That the deponent declares that M/s will manufacture / import and sell only..... make compliant Genset engines driven by dedicated LPG and/or CNG, bi-fuel Petrol / Kerosene with LPG / CNG, dual fuel diesel with LPG / CNG driven Gensets / Genset engines .

(Name & signature with Co. stamp)
(DEPONENT)

VERIFICATION

Verified aton thisof,200.. that the contents of the above affidavit are true and correct to the best of my knowledge and belief and nothing has been concealed therein.

Place:.....

Date:.....

(Name & Signature with Co. Seal)
(DEPONENT)

PART IV

ANNEXURE – 1

Part - 1B

FORMAT FOR SUBMISSION OF PROFILE AND DETAILS OF THE MANUFACTURER

A. COMPANY DETAILS

- Name of the Company
- Type of Company: Proprietor / Partnership / Private Ltd / Public Ltd
- Name of the Proprietor / Partners / Directors (submit relevant documents)
- Importer / manufacturer
- Registered Office Address with phone number
- Contact Address with phone number, fax number, email etc.
- Name and designation of the authorized person for submission of documents and to deal with the certification agency
- Plant addresses and contact details, in case of manufacturer
- Ware house address, in case of importer

(This cannot be changed without prior intimation to Nodal Agency and Certification Agency)

- Name of the company from whom to import and its contact details , in case of importer
- Plant details, from where to import
- Authenticated copies of following documents to be submitted
 - i) Manufacturing License from Directorate of Industries / Department of Industry (in case of Manufacturer), IEC Code (in case of importer)
 - ii) VAT and CST/GST Registration
 - iii) Excise Registration, in case of manufacturer
 - ii) Consent to establish / operate from respective SPCB /PCC
- No. of employees
- Engineers (if any)
- Last year Turn-over
- Any other business

B. Details of Genset engine (Proposed) manufactured / assembled / imported

Model Names	Nos. produced /imported in current year	Nos. expected to be produced / imported in the next year
-------------	--	---

- a)
- b)
- c)
- d)

PART IV

ANNEXURE -2

APPLICATION TO TEST AGENCY FOR TYPE APPROVAL

For dedicated NG or LPG or bi-fuel petrol and NG/LPG or Dual fuel diesel and NG or dual fuel Diesel and LPG run engine / generator Sets for all ratings

1.0	NAME & ADDRESS OF THE ENGINE / GENSET MANUFACTURER	
2.0	NAME & ADDRESS OF THE ENGINE / GENSET MANUFACTURER	
2.1	ENGINE / GENSET CATEGORY – Indigenous or Imported	
2.2	ADDRESS OF THE MANUFACTURING PLANT/S	
3.0	PRODUCT CATEGORY	
4.0	MODEL NAME / BRAND NAME	
5.0	GENSET CANOPY TYPE: HALF /FULL	
6.0	CLASS OF THE ENGINE AS SPECIFIED IN THE REGULATION	
7.0	MODEL FAMILY DESIGNATION ASSIGNED TO THE MODEL:-	
8.0	GENSET OUTPUT SPECIFICATIONS	
8.1	No. of phases	
8.2	Rated voltage (V)	
8.3	Rated current (A)	
8.4	Rated frequency (Hz)	
8.5	Overall efficiency of the alternator %	
8.6	Max. output declared by manufacturer with tolerance (VA)	
9.0	Alternator Make:	
9.1	No. of Poles used	
10.0	PRODUCTION / IMPORT PLAN (SCHEDULE) AND ESTIMATED VOLUME PER ANNUM	
11.0	DESCRIPTION OF THE ENGINE	
11.1	Make	
11.2	Type	
11.3	Working principle, Four stroke / Two stroke	
11.4	Bore (mm)	
11.5	Stroke (mm)	

11.6	Number of cylinders	
11.7	Engine Displacement (cc)	
11.8	Compression ratio (with the tolerance)	
11.9	Max. power of the Engine (kW) @ rpm	
11.10	Drawings of combustion chamber and piston crown	
11.11	Minimum cross-sectional area of inlet and outlet ports (mm ²)	
12.0	Cooling system : Liquefied / air cooling	
12.1	Liquefied cooling: Max. temp. at Engine Outlet	
12.2	Engine Lub oil Temperature: Minimum: Maximum:	
12.3	Characteristics of air-cooling system	
12.4	Blower : Characteristics of make(s) and type (s)	
12.5	Air ducting (standard production)	
12.6	Temperature regulating system	
12.7	Intake system	
12.8	Intake manifold description	
12.9	Air filter : make & type	
12.10	Device for recycling crank-case gases : Description and diagrams	
13.0	ADDITIONAL ANTI-POLLUTION DEVICES (IF ANY, AND IF NOT COVERED BY ANOTHER HEADING) (Description and diagrams)	
13.1	Catalytic Converter	
	a) Make:	
	b) Type:	
	c) I.D:	
	d) Substrate Dimension:	
	e) Loading:	
	f) CPSI:	
13.2	Secondary air Injection system details	
	a) Make:	
	b) Type:	
	c) I.D:	
	c) Quantity of valve	
14.0	Fuel feed system	

	a) Make:	
	b) Type:	
	c) I.D:	
14.1	Carburetor Air screw settings (specify the tolerance)	
14.2	Jets size : a) Main Jet: d) Pilot jet:	
14.3	Carburetor Venturi Diameter (mm)	
14.4	Float-chamber level	
14.5	Mass of float in gms.	
14.6	Float needle	
14.7	Dimensions mixture duct	
14.8	Manual / automatic choke, closure setting	
14.9	Fuel Feed (By fuel injection/Carburation) including details of NG/LPG kit and Cylinder details to be specified: Gas Air mixer Make /Type: Gas Air mixer diameter : No. of holes : System description Working principle : intake manifold / direct injection / injection pre-chamber / swirl chamber	
14.10	Fuel pump:	
	a) Make	
	b) Type	
	c) I.D.No.	
	d) Injection timing	
	e) Injection advance curve	
14.11	a) Injectors :	
	b) Make	
	c) Type	
	d) Opening pressure (specify tolerance)	
14.12	Governor /ECU/Controller	
	a) Make	
	b) Type, Mechanical /Electronic/Hydraulic	
	c) ID. No.:	
	d) Max. speed without load / min	
	e) Idle speed	
14.13	Exhaust Gas Recirculation (EGR) System	

	a) Make	
	b) Type (Internal/External/cooled/uncooled/progressive OON-OFF/Electrical/Vacuum based/Other)	
	c) ID No.	
14.14	Other Pollution Control Device (DeNOx/SCR/DPF) etc)	
	a) Make	
	b) Type (Give Complete Details of the system with necessary drawings)	
	c) ID No	
14.15	Cold start device	
	a) Make	
	b) Type	
	c) System description	
14.16	Starting aid	
	a) Make	
	b) Type	
	c) System description	
15.0	VALVE TIMING OR EQUIVALENT DATA	
	<ul style="list-style-type: none"> • Maximum lift of inlet valve,(mm) • Maximum lift of Exhaust Valve,(mm) • Angles of Valves (w.r.t. top dead centre):- • Inlet valve opening angle (IVO) • Inlet Valve Closing angle(IVC) • Exhaust valve opening angle (EVO) • Exhaust valve Closing angle (EVC) (Valve timing Diagram wrt top centre)	
16.0	Description of reed valves if any (with dimensional drawing)	
16.1	Description (with dimensional drawing) of inlet ports, scavenging and exhaust, with corresponding timing diagram	
17.0	IGNITION	
	a) Ignition system	
	b) Make	
	c) Type	
	d) Ignition timing (specify the tolerance)	
	e) Contact point gap and dwell-angle (specify the tolerance)	
18.0	EXHAUST SYSTEM	

	Description and diagrams	
	Specify the Back Pressure (kPa) at rated power (This data to be mentioned for the engines without EGR)	
19.0	Settings and limits declared by the Manufacturer	
	Max. Temperature of Engine Coolant Deg C	
	Lubricating Oil Temperatures Deg C Minimum Maximum	
	Max. Air Intake Depression kPa	
	Max. Intake Manifold Temperature in case of TCIC Deg C	
	Max. Exhaust Back Pressure kPa (This data is required for the engines with External EGR)	100% Load 75% Load 50% Load 25% Load 10% Load
19.0	LUBRICATION SYSTEM	
	a) Description of systems	
	b) Position of lubricant reservoir	
	c) Feed system (pump, injection into intake, mixing with fuel, etc.)	
	d) Lubricating pump	
	e) Make	
	f) Type	
	g) Lub oil mixed with fuel	
	h) Oil Percentage in fuel	
	i) Lubricant Used	
	j) Make	
	k) Type	
20.0	ADDITIONAL INFORMATION ON TEST CONDITIONS	
	a) Sparking plugs	
	b) Make	
	c) Type	
	d) Spark gap setting	
	e) Reference spark plug seat temperature at Max. output	
21.0	Ignition coil	
	a) Make	
	b) Type	

22.0	Ignition condenser	
	a) Make	
	b) Type	
23.0	Radio interference suppression equipment	
	a) Make	
	b) Type	
24.0	Details of LPG / CNG Kit	
24.1	a) Kit Manufacturer Name	
	b) Kit Manufacturer Address	
24.2	Cylinders	
	a) No. Of Cylinders	
	b) Type of Cylinders	
	c) Cylinder Sr.No	
	d) Make	
	e) Water Capacity (litres)	
	f) Working Pressure (kg/cm ²)	
	g) Approval reference of DOE	
24.3	Multifunctional valve	
	a) Make	
	b) ID	
	c) Sr.No	
24.4	Refilling Valve	
	a) Make	
	b) Type	
24.5	Fuel Line	
	a) High pressure pipe dia (ID/OD)	
	b) Low pressure pipe dia (ID/OD)	
24.6	Shut Off Valve (Solenoid Valves)	
	a) Make	
	b) Type	
	c) Operation Voltage	
24.7	Fuel selection switch	
	a) Make	
	b) Type	
24.8	Regulator	
	a) Make	

	b) Type	
	c) Sr. No.	
24.9	Gas-Air Mixer/Injector	
	a) Make	
	b) Type	
25.0	Attachments to be Enclosed	
25.1	Combustion Chamber (Piston Crown) Drawing	
25.2	Valve Timing Diagram	
25.3	Oxidation Catalyst Layout and drawing along with specifications	
25.4	Exhaust Gas Recirculation (EGR) Layout and drawing along with specifications	
25.5	Air Intake system layout (from air-filter to intake manifold)	

Note:-

- 1) Strike out whichever is not applicable
- 2) In addition to the names of the manufacturers of items mentioned above, the manufacturers shall inform the test agency that carries out the type approval, the names of new alternate manufacturers for these items as and when they are being introduced.

Test Agency :	Manufacturer	Document No. (indicating also revision status)
Signature	Signature	
Name	Name	
Designation	Designation	Revision date
Date	Date	Sheet No.

(While formatting above table to be included in each page of Annexure)

PART IV

ANNEXURE – 3

SPECIMEN COPY

Type Approval Certificate No:

Date:

Cert	Rep	Spec	Drg	Total

**CERTIFICATE OF TYPE APPROVAL
FOR**

COMPLIANCE TO MASS EMISSION NORMS

FOR

**Dedicated NG or LPG or BI fuel- petrol and NG/LPG or Dual fuel -diesel and NG or Diesel and LPG fuel RUN
GENERATOR SETS**

1. In order to establish compliance to the provisions of **mass emission limits**, applicable as on date, documental verification /necessary testing was carried out on the following Portable **Generator set model(s)**, submitted by the manufacture /manufacturer/ Assembler refereed below:

Portable Generator Set Supplier		Portable Generator Set Manufacturer	Test Report Reference
Generator Set Model(s)/Brand Name		Type	Category
Parent	Variant	Family	

2. *It is certified that the above mentioned Generator Set model(s) comply with the emission limits applicable for dedicated NG or LPG or BI fuel- petrol and NG/LPG or Dual fuel -diesel and NG or Diesel and LPG fuel run genset ,as prescribed under the following rules notified by **Ministry of Environment & Forest And Climate Change, Govt. of India:***

Notification	Date	Rule.No	Description	Date Of Compliance of Emission Norms
G.S.R. 281(E)	07 th March,2016	95 (A)/ 95 (B) / 95(C)	Mass Emission Norms for Dedicated NG or LPG or BI fuel- petrol and NG/LPG or Dual fuel - diesel and NG or Diesel and LPG fuel	01 st August,2016

3. **Validity of the Certificate:**

This Type Approval Certificate is valid till	1. Further amendment to notification No.GSR 281(E),dated:07 th March,2016
	2. No change in technical specification of the Generator Set specified
	3. Explicitly the Type Approval Certificate withdrawn by the Generator Set manufacturer/Supplier /Assembler/Importer

4. **Conformity of Production (CoP) requirements:**

COP test shall be carried out once in a year (between the period 1st August of Calendar year to 31st July of succeeding calendar year.

Note Refer overleaf for disclaimer.

(Head)

Certification Laboratory

Authorised Signatory,
(Head)

Certification Body

PART IV

(ANNEXURE 4)

SPECIMEN COPY

Certificate No.

Date:

CERTIFICATE

OF

CONFORMITY OF PRODUCTION (COP) FOR THE YEAR _____

FOR

COMPLIANCE TO MASS EMISSION NORMS

FOR

Dedicated NG or LPG or BI fuel- petrol and NG/LPG or Dual fuel -diesel and NG or Diesel and LPG fuel RUN GENERATOR SETS

Company Name

1. Based on the verification of documents and trials conducted on portable genset model _____ manufactured by _____ and randomly selected from their _____, it is certified that the portable genset model of families _____ complies with the provisions of Verification of the Conformity of Production (CoP) as per para 12.0 of CPCB procedure (System & Procedure for Compliance to Emission Limits for dedicated NG or LPG or BI fuel- petrol and NG/LPG or Dual fuel -diesel and NG or Diesel and LPG fuel and as per requirements of Rule 95(B) of Environment (Protection) of GSR 281(E), Dtd.07th March,2016 notified by Ministry of Environment, Forests and Climate Change Govt. of India.
2. This certificate covers the genset families and its models as listed in Annexure I, declared by the manufacturer to have been produced / planned to be produced , during the stipulated period from 1st August _____ to 31st July _____ .
3. Validity of Certificate:
 - a) This CoP certificate is valid upto 31st July _____. Validity of this certificate is subjected to completion of next CoP before 31st July _____ for the production of portable genset model/s during the period 1st August _____ to 31st July _____ once.
 - b) As confirmed by the supplier, this CoP certificate is issued for the planned production during the manufacturing period.
4. Disclaimer:

Authorized Signatory
(Head)

Certification Laboratory

Authorized Signatory
(Head)

Certification Body

ANNEXURE – I to Annexure-4

COP CERTIFICATE NO. -----

Sr. No.	<u>Family</u>	Model	Manufacturing Plant	Manufacturing Period	COP Year (August-July)	Type Approval certificate No.(for reference)

Authorized Signatory

(Head)
Certification Laboratory

(Head)
Certification Body

Ref.: Report Nos.
Place of issue: