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Spec No: DRDO-ARDE-CQB-SPC-014-2022

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Specification for Development and Manufacture of 5.56x45 mm Carbine



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ARMAMENT RESEARCH AND DEVELOPMENT ESTABLISHMENT
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Title: "Specification for Development and Manufacture of 5.56x45 mm Carbine"
(Spec No: DRDO-ARDE-CQB-SPC-014-2022)

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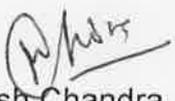
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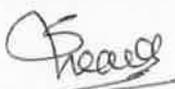

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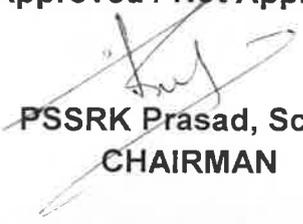

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- 1. Aim of the Specification:** The aim of this specification is to convey the requirements for the development, manufacturing, testing and acceptance of 5.56x45 mm Carbine to **Industrial Partner**.

The Industrial Partner can use their own ingenuity and expertise to improve the system mainly with respect to DFM and also develop the QA & QC tools i.e gauges or any other modern equipment/techniques for ensuring overall quality of the components/ sub-assemblies.

Development is an iterative activity. Industrial Partner selected through this contract needs to submit the samples of weapons till the final parameters are achieved. The number of iterations can be 5 Nos or less. Industrial Partner need to properly cost these development efforts.

- 2. Qualification requirements: Industrial Partner/ Parent Firm of Industrial Partner** must meet following qualification requirements.

- a. The Industrial Partner/ Parent Firm of Industrial Partner should either have valid licence issued by competent authority of govt. of India or applied for the same for manufacturing small arms and components. Copy of license/ application as applicable to be shared with ARDE for release of Supply Order.
- b. The Industrial Partner/ Parent Firm of Industrial Partner should have the capacity to develop and manufacture the carbine class of weapons in **5.56 mm** calibre.(Relevant document to be submitted before release of SO from ARDE)
- c. The Industrial Partner/ Parent Firm of Industrial Partner should have in house manufacturing facility, quality vendor base and sound quality management systems for himself and sub vendors. (Relevant document to be submitted)
- d. The Industrial Partner/ Parent Firm of Industrial Partner should have manufactured & supplied at least Rs 50 Lakhs worth of weapons in 5.56 mm calibre to any agency of MOD / MHA serving under Govt of India (SO copy to be shared).
- e. The Industrial Partner/ Parent Firm of Industrial Partner should have annual turnover of minimum Rs 100Cr (a copy of account statement duly vetted by a CA to be shared).



3. **Introduction :** A carbine is a select fire, automatic and portable firearm, usually designed to fire bullets in quick succession from a magazine, typically at a rate of several hundred rounds per minute. Carbines are primarily weapons used for CI/CT operations by Army, CAPFs and state police forces. ARDE is seeking active participation of a development partner to develop state of the art 5.56x45 mm carbine for Indian Armed Forces, CAPF and Counter Terrorist Units.



Fig 1: 5.56x45 mm Carbine with its sub-assemblies (Representative figure)

4. **Brief description:** A Brief description and functional requirement of various sub assy of 5.56x45 mm Carbine are given as following. Details of the components features, Materials, Heat treatment and Qty are provided with solid model and drawings and other related paper particulars as and when needed.

S/N	Components	Purposes
1.	Barrel Assembly	Consists of the Barrel, Gas Block and Flash eliminator Assy . It houses the cartridge for firing and directs the projectile. Barrel is a pressure bearing component.
2.	Upper Body Assy	It consist a high strength alloy steel (EN24 or equivalent) housing for holding barrel assembly, piece guide. Rear Sight Assy and mounting rail is welded on this. It is the parent housing meant for assembling various sub-assemblies viz breach block, Piston Extension and recoil assy. It has complex machining features and HTs mentioned in drawings. This is a pressure bearing component.
3.	Breach Block and	It consist of Breach block assy (Breach Block, Pin

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	Piston Extension Assembly	Firing extractor their pins and springs) and Piston Extension assy (Piston and Piston Extension) It is the heart of the gun system and is meant for feeding, stripping, chambering, firing, extracting, and ejection of cartridges. It is an high strength alloy steel (EN24 or equivalent) and It has complex machining features and HTs mentioned in drawings. This is a pressure bearing component. Mfg through MIM to be done for extractor, pin firing and related pins components.
4.	Recoil assembly.	It is the recoil mechanism consisting of telescopic recoil rods assy and a helical compression spring. A polyurethane buffer is attached to the recoil assembly to absorb the recoil impact.
5.	Cocking handle assembly	Pulls the moving parts rearward compressing the recoil spring for loading the first round in the chamber. Mfg through MIM to be done for suitable components.
6.	Lower Body Assy	This is a high strength alloy steel (EN24 or equivalent) housing for trigger mechanism and magazine assy. Butt Assy is also connected to it at the rear.
7.	Trigger mechanism assembly	Controls the firing of the 5.56x45 mm Carbine. Contains trigger and safety components and their springs like hammer, safety sear trigger and lug sear. Mfg through MIM to be done for suitable components.
8.	Rear and Fore Sight Assy	These are high precision components/assy required for aiming the target. Mfg through MIM to be done for extractor, pin firing and related pins components.
9.	Upper and Lower hand guard assy	These are GF nylon / Polyvinyl based molded components used to avoid firer hand touching the heated barrel and gas cylinder.
10.	Butt assembly	GF nylon based molded butt stock provides shoulder support during firing. In unfold condition it is locked by spring loaded latch & in folded condition it is locked by a locking mechanism provided in the Butt with lower body.
11.	Pistol Grip assy	This is GF nylon based molded components used to grip the weapon while operation. The ergonomics and texture of grip is of important considerations in design.
12.	Magazine	This is a metal inserted polymer assy used to fill

Assembly	30 rds and attached to carbine lower body to load the rounds. This consist of a special spring to support the platform to ensure movement of rounds to upward direction during feeding.
NOTE: *marked components/assemblies in this table will be provided as Free Issue material (FIMs) for integration as mention in para6 of this document	

5. Technical Specification: 5.56x45 mm Carbine should meet following technical specification without any deviation.

S/N	Parameters	Specification/Requirements
1.	Caliber.	5.56x45 mm
2.	Length: a) Butt Extended b) Butt Folded	Not more than 800 mm Not more than 650 mm
3.	Butt Stock	Side folding
4.	Effective Range	Minimum 200 m on 3.5 mm MS plate. 70 % rds should hit and penetrate
5.	Muzzle Velocity.	More than or equal to 700 m/s
6.	Cyclic Rate of Fire.	More than or equal to 600 RPM
7.	Life of Barrel.	More than or equal to 15000 rds
8.	Metal Inserted Polymer Magazine: a) Capacity b) Colour	30 rounds Black, Matt finish
9.	Weight	Not more than 3.3 kg (without Magazine)
10.	Ammunition Used	5.56x45 mm In service and NATO
11.	Safety Mechanism /Mode of Firing	a) Should have Safe, Single & Auto mode b) Applied safety by change lever or selector switch & in built mechanical safety
12.	Picatinny Rails complying with MIL Std 1913	a) At 12 o'clock position running continuously for mounting optical sights b) Additionally at 3,6 & 9 o'clock for mounting accessories viz. tactical torch, fore hand grip etc

	i. Class-I Stoppage.	Not more than 03 stoppages In 2000 Rds cycle
	ii. Class-II Stoppage.	
	iii. Class-III Stoppage.	Not allowed
14.	Accuracy at 100m range from Fixed stand: Zeroing will be at 50 m.	
	i. Accuracy (Single Shot mode)	9/10 shots within 15 cm (H) X 15 (V) cm
	ii. Automatic Fire	18/ 30 rds within 24 cm x 24 cm with 2- 3 rds burst
15.	Accessories	<ul style="list-style-type: none"> ▪ Magazine ▪ Sling ▪ Bayonet
16.	Sighting System	Flip up/rotating front & rear iron sights
17.	Colour	Black color with non-reflecting matt finish
18.	Operational & Environmental Standards	
	i. Environmental and Durability Tests.	As per JSS 1005 - 15: 2015
	ii. Operating Temperature	-20 to +50 Deg C
19.	Packaging	Suitable packing is required to store weapons at ARDE
20.	Life:	
	a) Shelf Life	More than or equal to 10 years
	b) Barrel Life	More than or equal to 10000 Rds

6. Inputs from ARDE: Following will be provided from ARDE:

- a) Preliminary design (in form of Solid model) and drawings of 5.56x45 Carbine along with Quality assurance plans.
- b) **Free Issue Materials (FIMs): 25 Nos of Barrels** 5.56x45 mm will be provided as **FIM** for breeching and integration with carbines to Industrial Partner.
- c) **5.56x45 mm Ammunition, Magazines** available with ARDE and Range facilities for conduct of trial and evaluation.

7. Scope of Work : The scope of work for Industrial Partner is as follows-

- a) Design refinement (from mfg aspects) in design provided by ARDE.
- b) Preparation of mfg drawings in ARDE drawing format (ARDE will give approval for the manufacturing based on these drawings)
- c) Preparation of QAPs as per ARDE format and Identification of control

dimensions along with ARDE.

- d) Design and mfg of inspection tools, gauges and jigs-fixtures for components mfg and assembly (barrel assy, breeching etc)
- e) Development of components & assemblies of 1st and 2nd Batch weapons
- f) Inspection and testing of 5.56x45 mm (other than firing test) of Carbine Components as per finalized QAPs/ATPs. ARDE team shall witness the inspection and testing.
- g) Setting up of assembly line at Industrial Partner premises to ensure smooth assembly for carbine sub assy
- h) Integration of components and Assembly of 5.56x45 mm Carbine with **FIMs (barrel) provided** under by ARDE.
- i) Testing and evaluation of 5.56x45 mm Carbines at ARDE or place authorised by ARDE as per the test plan prepared based on Table 1 of this document.
- j) Incorporation of design modification emerged in 5.56x45 mm Carbine during Assy, dry functioning test and conduct of Firing trials
- k) Preparation of Test report of materials, Mechanical testing, Heat treatment and surface treatment involved and Environmental test reports
- l) Supply of Integrated Weapon in proper packaging and all documents to ARDE

8. Development, Test and Acceptance Plan:

The development of **25 Nos** of 5.56x45 mm Carbines along with accessories will happen in **two batches** as per following details.

Table 2.0: Weapons Development Batch			
Batch No	1 st	2 nd	Total Qty (Sets)
Qty (Sets)	10	15	25

Director ARDE or any rep authorised by him will be approving authority based on inspection and test reports. Industrial Partner need to submit all original inspection and test report to ARDE.

Evaluation of the weapon will be as per the table 1 and table 3. The critical tests being reliability test and environmental test. Reliability test will be carried as per TOP 3-2-045 and All Environmental and durability test will be based on JSS 1005 - 15: 2015. Detailed test plan will be issued during execution of contract. Table 3.0 will be applicable for testing and acceptance of each Weapon mfg and integrated through this contract.

Table 3.0 : Test and Acceptance Plan	
Stage 1: Component Level	<ul style="list-style-type: none"> ▪ Raw Material inspection and approval by ARDE prior to start of mfg for all components as per QAPs ▪ Dimensional inspection of 100% dimensions of all components as per Drgs and QAPs ▪ Safety and strength proof of pressure bearing components as per ARDE specifications ▪ Functional Test on finished components viz. springs etc (as mentioned in QAPs)
Stage 2: Assy Level	<ul style="list-style-type: none"> ▪ Dimensional inspection as per finalized Control point inspection document/Assy QAPs. ▪ Dry functioning test on sub-assembly level as per ARDE specs/ Assy QAPs. ▪ Test on finished assembly as per QAPs / ARDE Specifications.
Stage 3: Physical ,functional evaluation and Firing test of Integrated weapon	<ul style="list-style-type: none"> ▪ All weapon of Batch 1st and Batch 2nd will be subjected for Physical Parameters, fit for firing certification test ,safety and strength proof test, functional firing test, zeroing and accuracy test as per table 1. ▪ After passing these test, sample of weapons from both batches 1st & 2nd will be subject to the test from table 1 as decided by ARDE. ▪ Environmental and durability test as per JSS 1005-15 – 2015 will be carried out for Batch 1 and Batch 2 Weapons as decided by ARDE during execution of contract. ▪ Reliability test will be carried out on any 02 Weapons for the batch No 1st and 2nd submitted as per table 2.0. ▪ Service Life on 01 Weapon from the batch 1st and 2nd submitted as per table 2.0.
NOTE:	
1. All components, Assy and weapon will be accepted on successful compliance of all stage wise test and acceptance plan.	
2. Go ahead for next stage test will be accorded only after successful compliance on prior stage.	
3. Any ambiguity at any stage will be cleared/finalized by Director ARDE/ rep of Director ARDE	

9. **Deliverables:** Total items will be delivered during the execution development contract as per table 4.0. Delivery batches 1st and 2nd details are given in table 2.0

Table 4.0: Deliverables		
S/N	Item	Qty
1.	5.56x45 mm Carbine as per ARDE specification no. DRDO-ARDE-CQB-SPC-014-2022	25 sets
	a) 5.56x45 mm Carbines	25 Nos

	b)	3 Point Sling	25 Nos	
	c)	Armourer gauges	7 sets	
2.	Finalized Solid models, Mfg Drawing and QAPs (hard copy & soft copy as applicable) of components and assemblies			1set each
3.	Raw Material test certificates of all material used, Surface treatment/ Coatings and Heat treatment specifications and process details and test/ inspection results.			1set each
4.	Inspection and test reports of components, sub-assemblies and final assemblies for all 25 Nos of weapons			1set each
5.	Assembly, packaging and dispatch procedures			1 set

10. Execution Plan: Following plan will be strictly followed for execution of contract.

Table 3 : Execution Plan (D0 = Date of Placement of contract)		
Sr. No.	Milestones	Duration (weeks)
1.	Design refinements for mfg and approval of same from ARDE	D0+3
2.	Refinements of mfg drgs and QAPs (ARDE Format) and submission for approval	D0+6
3.	Raw material inspection, submission of test reports as per stage 1 (table 3.0) for mfg of 1 st Batch weapon components	D0+10
4.	Manufacturing of 1st Batch components as per approved drgs and QAPs	D0+22
5.	Inspection of components and Assy as per Stage 1 and 2 (table 3.0) of 1st Batch and submission of reports	D0+26
6.	Integration of 1st Batch at ARDE and submission of Weapon for stage 3 test	D0+28
7.	Conduct of Stage 3 Physical and Firing trials of Weapon and acceptance of 1st Batch	D0+32
8.	Delivery of 1st Batch Weapons (10Sets) with accessories and related QA QC reports and documents	D0+32
9.	Incorporation of design modification and approval of drgs and QAPs from ARDE based on test and acceptance of 1 st Batch	D0+34
10.	Raw material inspection, submission of test reports as per stage 1(table 3.0) for mfg of 2 nd Batch weapon components	D0+36
11.	Manufacturing of 2nd Batch components as per approved drgs and QAPs after Incorporation of design modification of 1 st batch	D0+46

12.	Inspection of components and assy as per Stage 1 and 2 (table 3.0) of 2 nd Batch and submission of reports	D0+48
13.	Integration of 2 nd Batch at ARDE and submission of Weapon assy at ARDE for stage 3 test	D0+50
14.	Conduct of Stage 3 (table 3.0) Physical and Firing trials of Weapon and acceptance of 2 nd Batch	D0+52
15.	Delivery of 2 nd Batch Weapons (15 sets) with accessories and related QA QC documents	D0+52

11. General Terms & Conditions: Following conditions will be applicable throughout this development contract.

- a) **Non Disclosure agreement will be signed before the award of contract ARDE and Industrial Partner**
- b) **Industrial Partner to ensure signing NDA between all sub-contractors before giving SO from their end. A copy of same to be shared with ARDE before placing orders.**
- c) **Intellectual Property Rights (IPR) for the current design and any other future variants (upgrades) of the same will be with DRDO.**
- d) **Industrial Partner** will not make any alteration in the design of the product and sell the product without prior permission of Director ARDE.
- e) Any alteration in design of 5.56x45 mm Carbine towards betterment will be undertaken with prior approval from ARDE.
- f) **Industrial Partner** should have in-house infrastructure & expertise to manufacture components and assy of 5.56x45 mm Carbine.
- g) All the components should be manufactured in strict compliance with drawings, QAPs/ATP approved by ARDE.
- h) Final inspecting and accepting authority is Director ARDE or rep appointed by him.
- i) Material testing and Inspections shall be witnessed by Rep ARDE if required.
- j) All materials test reports, inspection reports, qualification test report of 5.56x45 mm Carbine as laid down in acceptance criteria should be submitted in ARDE format for approval.
- k) Solid models and drawings generated during dev contract will not be shared or exploited in any format and will be returned back after completion of project/ as per the guidelines of Director ARDE.

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- l) Payment will be on pro-rata basis.
- m) Development cost will be released after Batch No 1st delivery (refer Table 2.0) or till the design is sealed by ARDE whichever is later.
- n) Director ARDE holds the right to short close the development if need arise.
- o) Drgs and model can be shown at ARDE premises at mutually agreeable time for budgeting, planning and understanding the complexities of machining will not be shared prior award of contract.

12. Requirements for Development cum Production Partner (DcPP): Industrial Partner may be declared DcPP after successful completion of the Order (25 Nos of weapons) as per this specification. Industrial partner should also fulfil requirement for declaring DcPP as per DRDO guidelines.

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