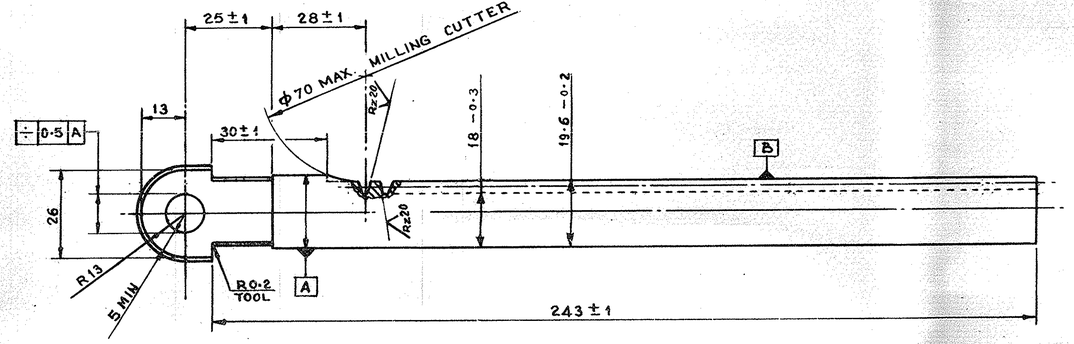
PART No/DS CAT No	DIMNS. ARE IN mm.
1015-003033	

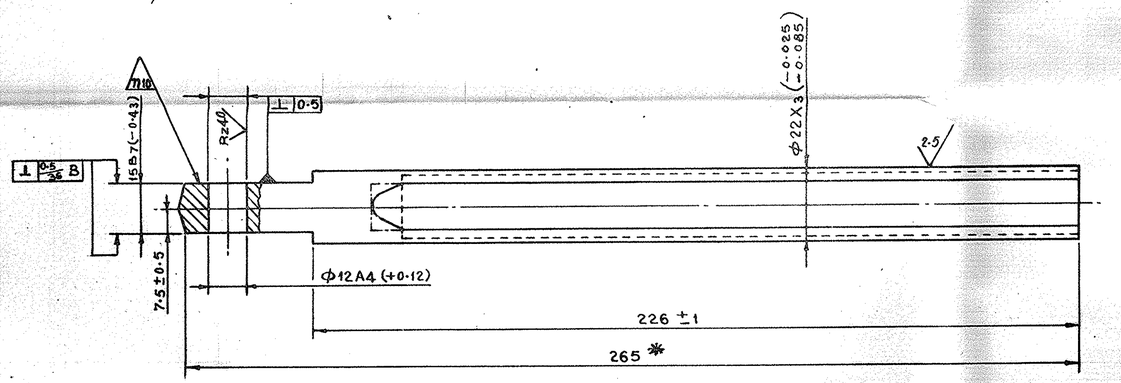
ALT MATL:- STEEL, 708 M 40, COND'T' OR 709 M 40 TO BS-970 PT 1:1983

COATING:- PHOSPHATING TO JSS-0465-01:1993, CLASS II/III, FINISH 13(B)

Rz80 $\sqrt{(\sqrt{})}$

MODULE	m	2
DEGREE OF ACCURACY AS PER GOST 10242-62	—	Cm 9-X
BASIC RACK	—	GOST 13755-68
TOOTH THICKNESS	S	3,14159
MEASUREMENT HEIGHT	h	—
PITCH	t	6,282
NUMBER OF TEETH	z	—
ADDENDUM MODIFICATION COEFFICIENT	ξ	0





NOTES:-

1. BHN 302-255 (DIA. OF INDENTATION 3.5-3.8) TO BE CHECKED IN BLANK.
2. EXTERNAL DRAFTS SHOULD BE UP TO 7°.
3. TOLERANCE ON ROUGH DIMENSIONS AS PER 2nd GROUP, GOST 7505-55.
4. MISMATCH OF DIES UP TO 1 mm.
5. UNDERCUT FLASH SHOULD BE UP TO 1 mm.
6. TECHNICAL REQUIREMENTS FOR NOT TO BE MACHINED SURFACES SHOULD BE IN COMPLIANCE WITH GOST 8479-70.
7. COATING: CHEMICAL OXIDIZING/PHOSPHATING, OIL FINISHING OR CHEMICAL OXIDIZING, OIL FINISHING.
8. MAY BE MACHINED AS SHOWN WITH CONVENTIONAL DOTTED LINE.
9. SHARP EDGES OF TOOTH ON END FACE OF RACES SHOULD BE CAREFULLY SLUNTED WITH COMING OUT ON EDGE OF FACE OF RACK OF LESS THAN HALF UNDERCUT TOOTH, LATTER SHOULD BE FILED FLUSH WITH TOOTHSPACE.
10. TO BE MARKED.
11. * DIMENSION FOR REFERENCE.

जारी गई सही प्रति
CERTIFIED CORRECT COPY OF
मुद्रित रेखांकित की
SEALED DRAWING AS ON
22/2/12
कृते नियंत्रक गुणता
FOR CONTROLLER OF QUALITY
आश्वासन (क वा आ) आवडि चेन्नै 54
ASSURANCE (AVA) AVADI CHENNAI 54

DATE	AUTHORITY	ZONE	NATURE	SIGN AHSP	SIGN D.O.
22-10-03	18814-W		HINDI NOMEN ROBED.		
11-3-94	17921-W		ALT MATL & COATING NOTE ADDED.		
4.7.91	17088-W		D.S CAT No ADDED		
10-6-89			RETRACED WITHOUT CHANGE		
			PREVIOUS D.C.(I)S No. 16469-W & 16751-W. DT. 25-3-89.		

AMENDMENTS

DRG. SEALED:- 16469-W 8-10-86 D.O.C.Q.A.(W).

DRN:- | CHD:- | ASSY. DRG.

TCD:- S.R. Jaulkar | CHD:- G.P. Shukla | DATE:-

C/D'MAN | D.O. | AHSP FOR CQA(W) | SCALE:- 1:1 | ESTD. MASS:- 0·75

MATL:- STEEL 38XC GOST 4543-71

PROTECTIVE FINISH:-

C.Q.A. (AVA) AVADI

DESIGN No.

PART No. 172-27-140

D.S. CAT. No. 1015-003033

RACK

120

F/25
70

RESTRICTED
(DRAFT/PROVISIONAL)
QUALITY ASSURANCE PLAN

FOR

(RACK)

DRG.NO. 172.27.140

(LF NO: 6206210129)

No.HVF/T-72C/QAP/27/RACK/240870-00

ISSUE No: 00 **DATE: JUNE – 2021**

QUALITY ASSURANCE (RIG–SUB ASSEMBLY)

HEAVY VEHICLES FACTORY

AVADI CHENNAI – 600 054

QUALITY ASSURANCE PLAN (QAP)

FOR

RACK

DRG. NO. 172.27.140

PREPARED BY

(C.NANDAKUMAR)
JWM/QA (RIG-SA)

REVIEWED BY

(G.HANUMANTHA RAO)
JWM/QA (RIG-SA /TA)

APPROVED BY

(NEERAJ KUMAR)
DGM/QA (RIG-SA)

ISSUED BY

QUALITY ASSURANCE (RIG- SUB ASSEMBLY)
HEAVY VEHICLES FACTORY
AVADI CHENNAI – 600 054

1.IMPORTANT NOTE

Note-1

This is only a provisional and will be amended from time to time according to the requirement. No addition, deletion and reproduction will be done without permission of The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 54.

Note –2

Any instruction contained in this does not prejudice the terms and conditions of the contract what so ever. In case of any contradiction between the contents of this QAP and the clause in the contract, the latter will prevail.

Note-3

The stores should be manufactured strictly only as per the drawings supplied by the Inspection Authority and not as per the samples, if any received by the manufacturer for guidance purpose.

Note-4

Any amendment issued by the Inspection Authority shall be incorporated in the QAP and the records for the amendments carried out should be maintained as per the Performa at Appendix-"A".

Note-5

In case of any contradiction between the contents of this QAP and drawings issued along with the contract, the latter will prevail.

2.INTRODUCTION

1. This quality plan lays down the inspection and testing procedure to be carried out on the component **RACK - 172.27.140** being procured indigenously. This is prepared, based on the acceptance standards and inspection parameters laid down in collaborators documents and on the inspection test standards followed in respect of similar indigenous items.

2. This QAP is the property of Government of India and is liable for amendments as and when required. The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 600 054, is the inspecting Authority for this assembly. Any query / clarification on the content of this QAP shall be referred to this Factory. Any departure from these instructions is allowed only after written approval from the above authority. Notwithstanding the tests indicated in this QAP, the inspecting Officer has the right to carry out any test to check conformance to

the paper particulars quoted in the Supply Order, which he may consider necessary to satisfy himself about the stores which he has to accept.

3.AIM

The QAP is aimed at standardizing the Inspection procedure and acceptance norm for **RACK - to Drg no. 172.27.140.**

It also aims at giving adequate information to the manufacturer on the quality requirements so that the required quality control methods are established. This is also meant to guide authorized Inspection Officer in his routine inspection and to set out main points to which his attention must be drawn to ensure that the accepted stores meet the stipulated standards.

4. SCOPE:

This QAP outlines in general terms, the checks and methods to be used during inspection of **RACK to Drg. no - 172.27.140** including the technical requirements of the drawings. The recommended Quality Plan stipulated herein is mandatory and should be strictly adhered to.

For inspection purpose, only the latest issue of this QAP will be made applicable and copies of this QAP can be obtained from the issuing authority i.e. The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai.

Note:

i. Tender enquiry (TE) and supply order (S.O) will be issued with QAP stating that inspection will be done as per QAP.
ii. In case of TE, It is responsibility of the vendor to obtain the copy of QAP and give the statement of compliance that vendor will abide by the QAP in case supply order is placed.
iii. In case of S.O, it is the responsible of the vendor to obtained copy of QAP and give the statement of compliance that the vendor will follow QAP. However, GM/HVF reserves the right to revise/update the QAP from time to time.

5. DOCUMENTS:

a) On placement of firm supply order, One set of relevant specification and technical instructions on the subject item can be obtained by the contractor from AHSP through DDO/HVF
b) Any clarification required on these documents should be obtained from the Inspecting Authority i.e. The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 600 054. Equivalents to the collaborators specifications and standards will be decided only by the Inspecting Authority and should not be unilaterally decided. For any change in the specifications, standards or written approval, any alterations in specification can be affected and not otherwise.
c) The process instruction sheets supplied by the collaborators are available with the Authority Holding Sealed Particulars, i.e. The Controllerate of Quality

Assurance (Heavy Vehicles), Avadi, Chennai for the reference. The relevant process sheets may be studied at the premises of the AHSP after obtaining necessary permission.

d) The supplier after scrutiny of the concerned process sheets and connected paper particulars should establish the necessary production and inspection facilities. Particularly the inspection test rigs, stands, fixtures, template, gauges etc should be provided as recommended in these process sheets. If process sheet / Process Book is not available the details particulars/parameters available in the drawings to be strictly adhered.

6. ITEM USED ON:

Refer the drawing.

7. LIST OF DRAWINGS:

Single (individual) item

Sl. NO.	DRG. NO	NOMENCLATURE	REMARKS
1	172.27.140	RACK	-

8. BILL OF MATERIALS:

Single (individual) item, details as below,

Sl. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.27.140	RACK	Steel 38XC To GOST 4543-71	1

Note: Vendor/Contractor may use approved alternate material as per drawing. Refer Para 13.

9. CONDITIONS OF USE/STORAGE INSTRUCTIONS

This assembly/item should be properly packed to protect from transit / handling damage and influence of atmospheric precipitations. In addition, the following parameters should be ensured:

(a) The threaded parts if any should be covered with suitable plastic caps to prevent damages.

(b) If the item consists of assemblies, each assembly should be packed separately.

(c) The stores are to be suitably covered for preventing ingress of dust and Dirt/entry of sunlight / moisture.

(d) The packaging slip shall contains

(i) Certificate of testing (NABL)
(ii) Guarantee/ Warranty Certificate
(iii) Service and maintenance instructions
(iv) Delivery Slip with Inspector's Acceptance Mark

(e) The stores are not permitted to be stored together with oils. Petrol, acids, alkaline and other substances to avoid damage to the metal / rubber components.

10. SAMPLING PLAN:

Sl. No.	Sampling Plan	Pilot*	Bulk
(i)	Visual Inspection	100%	100%
(ii)	Dimensional Inspection	100%	General Inspection level III, single sampling, Normal Inspection, AQL 2.5 of IS 2500 (Part-I)-2000
(iii)	Material Inspection	1 No	1 No. for each batch of raw material or heat treatment lot as required by specifications.
(iv)	Acceptance test	----	-------
(v)	Pressure testing	---.	-------
(vi)	Machining/Fitment/ Performance trial on higher assembly / Tank	1 No	1 No Per Batch of 100 Nos or less and 1 no. thereof for every 100 nos.
(vii)	Interchangeability Test	02 Nos.	02 Nos. per batch on randomly basis, except selective assembly.
(viii)	Test stand/Jigs/ Fixtures/Gauges/Mandrels/etc.	100%	100%
(ix)	Marking/Identification	100%	100%
(x)	Packing/ Preservation	100%	100%

Note:-

* This clause is applicable if mentioned in supply order or project sanction order.

A New (First time supplier of this item) supplier should obtain clearance from HVF for bulk production which will be issued only after inspection/evaluation of pilot samples by HVF.

11. VISUAL INSPECTION[Sampling plan as per Para- 10 (i)]

The stores are to be visually examined on 100 % of pilot /bulk and same should be free from any defects and all the finishing requirements shall satisfy as indicated in technical conditions of the assembly / component drawing.

The components shall be checked for the following and should be free from the defects:

- Defects in construction
- Cracks/Dents/Scratches
- Fitment of all components
- Presence of foreign particles
- Moisture and dust
- Corrosion of metal parts
- Mechanical imperfections & distortion
- Any form of deterioration of material and finishing.

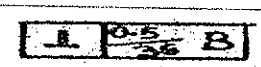
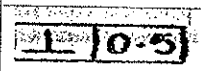
Packing and preservation should be ensured as per drawings/relevant TY specification (To be ensured on receipt at consignee end).

12. DIMENSIONAL CHECK[Sampling plan as per Para- 10(ii)]

The dimensions of individual component, sub assembly and major assembly shall be checked and ensured as per respective drawing. Dimensional check should be carried out as per sampling plan. However, the inspecting authority/rep. may at his discretion, tighten the inspection level and acceptance quality level on the critical items and adopt check point during manufacture.

12.1 RACK (172.27.140)

All dimensions shall be confirmed as per drawing/Specification.

Sl. No.	Drawing Dimensions
(i)	265* mm
(ii)	$226^{\pm1}$ mm
(iii)	$Ø12A4^{+0.12}$ mm
(iv)	$7.5^{\pm0.5}$ mm
(v)	
(vi)	$15B7^{-0.43}$ mm
(vii)	
(viii)	$Ø22X_3$ $^{(-0.0.25/-0.085)}$ mm
(ix)	$243^{\pm1}$ mm
(x)	R 0.2 by tool
(xi)	5 mm Min
(xii)	R13

(xiii)	26 mm
(xiv)	⌖ 0·5 A
(xv)	13 mm
(xvi)	$25^{\pm1}$ mm
(xvii)	$30^{\pm1}$ mm
(xviii)	$28^{\pm1}$ mm
(xix)	Ø70mm Max. Milling Cutter
(xx)	$18^{-0.3}$ mm
(xxi)	$19.6^{-0.2}$ mm
(xxii)	Surface Finish/ roughness should be confirmed as per the drawing / specification.

MODULE	m	2
DEGREE OF ACCURACY AS PER GOST 10242-62	—	Cm 9-X
BASIC RACK	—	GOST 13755-68
TOOTH THICKNESS	S	3,14159
MEASUREMENT HEIGHT	h	—
PITCH	t	6,282
NUMBER OF TEETH	Z	—
ADDENDUM MODIFICATION COEFFICIENT	ξ	0

For admissible alternate manufacture if any in dimensions/material, refer drawing/specification.

13) MATERIAL CHECKS [SAMPLING PLAN AS PARA – 10 (iii)]

Material specimen /test bars of the components shall be in conformity as per the material mentioned in the relevant documents/drawing. The material check will be carried out as per sampling plan. However, if the manufacturer proposes any alternative/equivalent material at the stage of tender enquiry, the same has to be approved and a written concurrence should be obtained from AHSP through DDO/HVF, before usage of such materials.

13.1 **RACK to Drg. No. 172.27.140**

a) The component should be manufactured from STEEL 38XC GOST 4543-71.

b) Chemical properties: As per STEEL 38XC GOST 4543-71.

CONTENT OF ELEMENTS %							
C	Si	Mn	Cr	Ni	S	P	Cu
				MAX			
0.34 to 0.42	1.00 to 1.40	0.30 to 0.60	1.30 to 1.60	0.30	0.035	0.035	0.30

Note: For mass fraction of other elements refer GOST4543-71

c) Mechanical properties: As per STEEL 38XC GOST4543-71

Yield point, N/mm2/kgf/mm2	Ultimate strength N/mm2 (kgf/mm2)	Elongation %	Relative reduction of area %	Impact strength KCU/ (Kgm/cm2)	Hardness(HB)
Not Less than					
735 (75)	930 (95)	12	50	-	255-302

For other details/parameters refer GOST 4543-71.

14) PERFORMANCES/ACCEPTANCE TEST: RACK 172.27.140.

The following technical requirements shall be confirmed for acceptance of the component.

NOTES:-

1. BHN 302-255 (DIA. OF INDENTATION 3.5-3.8) TO BE CHECKED IN BLANK.
2. EXTERNAL DRAFTS SHOULD BE UP TO 7°.
3. TOLERANCE ON ROUGH DIMENSIONS AS PER 2nd GROUP, GOST 7505-55.
4. MISMATCH OF DIES UP TO 1 mm.
5. UNDERCUT FLASH SHOULD BE UP TO 1 mm.
6. TECHNICAL REQUIREMENTS FOR NOT TO BE MACHINED SURFACES SHOULD BE IN COMPLIANCE WITH GOST 8479-70.
7. COATING : CHEMICAL OXIDIZING / PHOSPHATING, OIL FINISHING OR CHEMICAL OXIDIZING, OIL FINISHING.
8. MAY BE MACHINED AS SHOWN WITH CONVENTIONAL DOTTED LINE.
9. SHARP EDGES OF TOOTH ON END FACE OF RACES SHOULD BE CAREFULLY SLUNTED WITH COMING OUT ON EDGE OF FACE OF RACK OF LESS THAN HALF UNDERCUT TOOTH, LATTER SHOULD BE FILED FLUSH WITH TOOTHSPACE.
10. TO BE MARKED.
11. * DIMENSION FOR REFERENCE.

15) FITMENT AND PERFORMANCE TEST:

Pilot samples should be checked for fitment and Performance test to ascertain the efficacy of the system under different operating conditions by fitting in higher assembly and repeating it for functional checks, wherever required.

a. Items of Bulk supplies may be subjected to performance trial in tank in case of repeated failure/defects during exploitation.

16) INTERCHANGEABILITY:

The assemblies/component should be interchangeable component wise and assembly wise, except the Component are to be supplied as a set and to be assembled selectively as per sampling plan.

17) CALIBRATION CHECKS (TEST STANDS/JIGS/FIXTUERS/GAUGES/INSTRUMENTS):

i. The supplier / Contractor should have suitable Instruments, Test Stand, jigs, fixture, mandrels and gauges to carry out quality checks, to ensure conformance of components/assembly as per drawing and Specification /T.R points.

ii. The supplier/contractor should submit calibration reports/certificates for instruments/fixtures/gauges/mandrels etc., which are used during process of inspection activities.

18) MARKING/IDENTIFICATION

Marking of the items is to be carried out as called for in the relevant drawing, drawing/T.R points.

Inscription if any on the components is to be carried out as called for in the drawing/T.R points. Unless otherwise specified in the drawing/ specification, marking should not be carried out over the components.

For traceability, marking of part No., Manufacturer name, supply order No, Serial No/Qty, batch No. and manufacture date & year are to be carried out. Suitable method can be adopted, provided that the above parameters are legible and considering the parameters mentioned in the drawing and specification. (Refer Para 14(10).

19) PRESERVATION CHECK

a) Preservative coatings are to be strictly adhered to as called for in the drawing. However, equivalent BIS Standards can also be followed, subject to the thickness of the coating/preservative is maintained as per the drawing/specification.

b) Other preservations as necessary to prevent damages due to moisture and dust during process, storage and transit are to be carried out. Conventional Methods can also be resorted to.

20) PACKING CHECK

Components / Assemblies are to be packed separately to avoid damages during transit / handling of the same. Part No. and No. of sets are to be marked on the packing.

Packing and preservation should be ensured as per drawings/relevant TY specification (To be ensured on receipt at consignee end).

Finished products shall be wrapped / packed using black and opaque polyethylene sheet or bags.

21) DOCUMENTATION

i. Firm has to maintain all the documents as per QAP with respect to the Sl.No.to have traceability.

ii. Vendor has to submit Bill of materials, Material test reports, Class 'C' /Endurance test reports (wherever specified in drawing/TY specification/QAP) and Complete PIR (pre-inspection report)at the time of offering the item for inspection. HVF will commence inspection only after scrutiny of these documents.

iii. The testing/inspection responsibility to test all the parameters as per QAP and drawing specifications as mentioned in Annexure -A (enclosed).

iv. Pre inspection reports (PIR) of firm like, 1. Chemical analysis, 2.Mechanical properties, 3. Pre-forming process, 4. Coating certification (wherever applicable), 5. Calibration reports of instruments and 6. 100% Dimensional inspection reports. 7. Pressure test (leakage test) (wherever applicable) reports, etc,.

22) REFERENCE:

a) Drawing No: 172.27.140
b) Material specification Steel 38XC to GOST 4543-71
c) GOST 4543-71
d) GOST 7505-55
e) GOST 8479-70
f) Alternate material : Steel 708 M40, COND 'T' OR 709 M40 TO BS -970 Pt-1:1983
g) Coating - JSS-0465-01 : 1993
h) GOST 10242-62

RACK - 172.27.140

ANNEXURE-A

SL. NO.	CATEGORY	ASSEMBLY/SUB ASSEMBLY	TESTS/INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS
						Firm	HVF	DGQA	
1	RACK TO DRG. NO 172.27.140	**Pre inspection reports (PIR) of firm**	Firm has to produced all the document as per Para 21 (iv)	As per the relevant drawing and QAP.	Confirm to drawing and QAP as per bill of material	P	V	R	100% by firm/ vendor.
2		**Bill of material (BOM)**	Firm has to prepare the BOM as per QAP	Refer QAP Para no: 8 or item list.	Confirm to QAP.	P	V	R	100% by firm/ vendor.
3		**Dimensional checks**	Dimensions as per the specification	Refer Specifications & QAP Para no: 12.1	Conform to Specifications and QAP	P	W/P	R	100% by firm/ vendor SP followed by HVF.
4		**Material tests**	Chemical composition & Mechanical / Physical Properties	Refer GOST 4543-71	All the values to confirm with QAP (Para no:13.1 (a), (b), (c)	P	W/V	R	SP followed by HVF.
5		**Hardness Checks**	BHN 255-302	Refer QAP Para no: 14(1)	All the values to confirm with QAP (Para no: (1)	P	W/V	R	SP followed by HVF.
6		**Coating Checks**	Chemical oxidizing / Phospating, oil finishing	As per Para 14 (7)	All the values to confirm with QAP Para 14 (7)	P	W/V	R	SP followed by HVF.
7		**Marking / traceability**	Firm has to make marking / traceability records.	Refer QAP Para no: 18 and 14(10).	Confirm to QAP Para no:18 and 14(10).	P	V	R	100% by firm/ vendor.
8		**Preservation & packing**	Firm has to make Preservation & packing records	Refer QAP Para no: 19 & 20	Confirm to QAP Para no: 19 & 20	P	V	R	100% by firm/ vendor.

Note:
For conformity of the items (Chemical/Physical/Mechanical properties).
1. One sample per heat / batch shall be tested under NABL Lab/Govt. Approved lab by firm. In case of non-compliance to standards entire lot shall be rejected or not to use in production further.
2. For cross conformation of material, manufacturer has to submit test sample pieces for the items used / test slab and button for rubber items / HVF will draw samples from supplied lot for Witnessing (W) at HVF premises. In case of non-compliance to standards entire lot will be rejected.

P- Perform **W- Witness** **V-Verify** **R-Review** **SP - Sampling Plan**

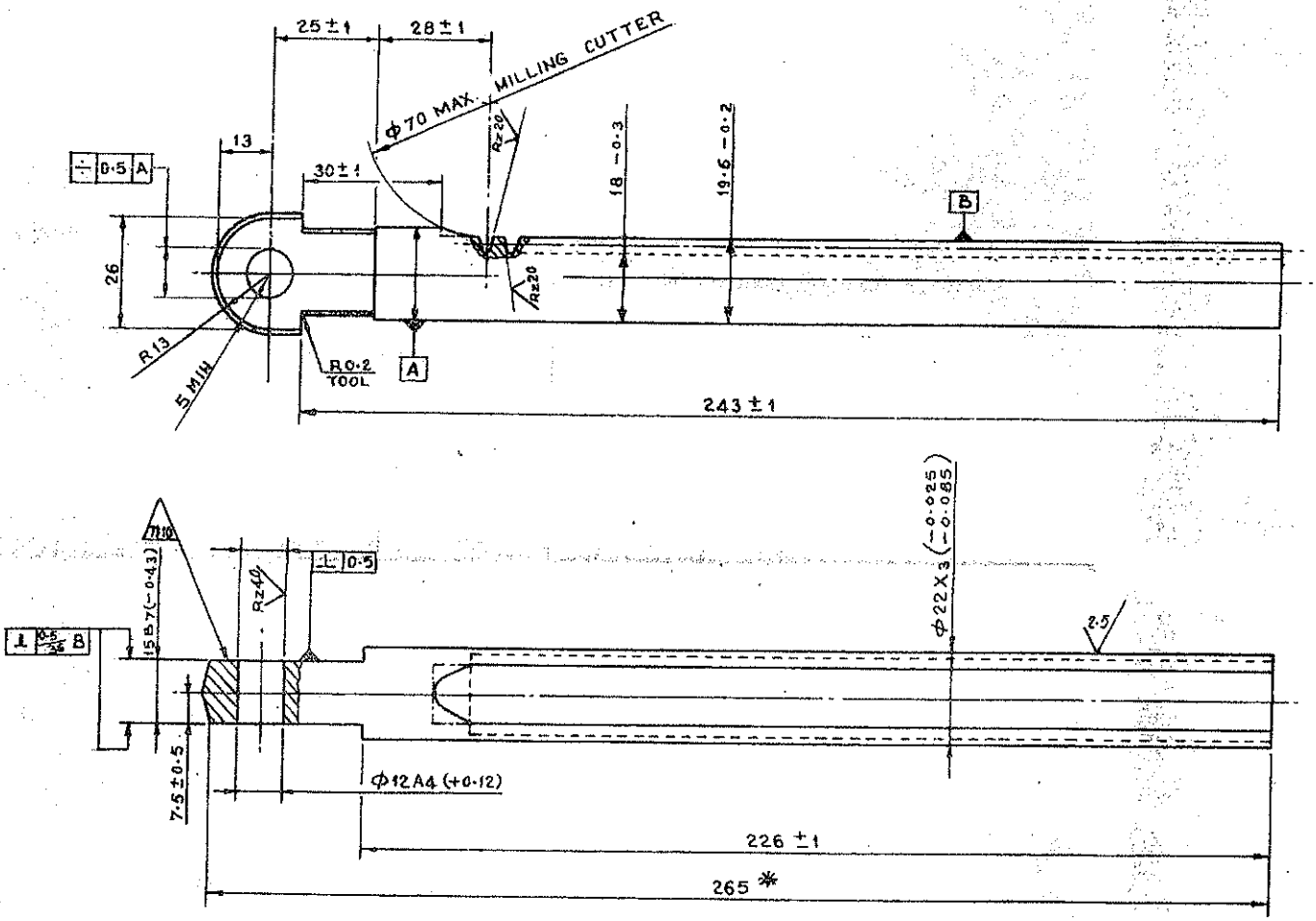


FIG: RACK TO DRG. NO 172.27.140

APPENDIX ' A'

RECORD OF AMENDMENTS

Sl. No	Amendment No. & date	Amended by	Date of Insertion	Initial

Sl no.	Nomenclature & drawing No.	Manufacturing technology & Testing / Inspection Facilities required to produce the item		Must be possessed by the vendor in his premises (P&M list and testing / inspection equipment list to be submitted)	May be possesed by the vendor in his premises or out sourced (Self declaration to be submitted)	FIRM Comp-liance (Y/N)	Remarks
1	RACK 172.27.140	TECHNOLOGY-I	Turning	CNC Turning machine suitable to accommodate component of dia 100mm diameter or more with 0.010mm accuracy			
			Milling & Drilling	HMC and/or VMC suitable to the component Milling, Drilling & Rack Milling with 0.010 accuracy			
			Grinding		External grinding machine as per component requirement with 0.010mm accuracy		
		TECHNOLOGY-2	Heat Treatment		Hardening & Tempering furnace with Oil quenching facility suitable to the component		
			Protection coating		Oxidising Plant suitable to the component		
		TECHNOLOGY-3	Raw material		Firm should be capable to arrange the raw material Bar material as per drawing specification and standard.		
		TEST / INSPECTION-1	3D CMM		3D CMM 300 x 300mm.		
			Surface Roughness Tester	Surface Roughness Tester for Ra &Rz values			
			Gauges	Standard Gauges for checking Holes and Rack suitable to the requirement of the component. Firm should submit the undertaking in this regard that they will create the facilities within 6 months from the date of receipt of order.			
			Measuring Instruments	Vernier Caliper, Gear Tooth Vernier, Radius gauge, Feeler Gauge etc. suitable to the requirement of the component			

Note : Justification for alternate facilities may be shared to prove that alternate facilities can be utilised to manufacture the item wherever the facilities are mentioned above are not available, but vendor has alternate facilities.

(LUXMAN SINGH)
WM/TRG, HT & EP

(D.GNANASAMBANDAN)
JWM/QA(OE -TRG)

(K.DURAIRAJ)
JWM/Trans

J P. SINGH
GM/OP-I