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UNIDO BICYCLE PROJECT IN INDIA PHASE II:
Improving Quality, Productivity and Innovation for Enhanced Competitiveness of the Indian Bicycle and Bicycle Parts Industry

INVESTMENT PLAN

for Safety Standards Testing Equipment for Bicycle and Bicycle Parts at RDCBSM, Ludhiana, India

Project number: ID 200297

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Table of Contents

1. Objective of the Investment Plan 4
2. Strategic Context 4
2.1 UNIDO 4
2.2 RDCBSM 5
3. Market Analysis 9
4. Capacity Utilization of the Existing Facilities set up 11
5. Market Plan 13
6. Investment plan 14
6.1 Testing equipment required for current bicycle models including existing load and future load 14
6.2 Testing equipment required for future bicycle models 15
6.3 Profit and Loss Statement, Balance Sheet and Statement of Cash Flow and envisaged investments and associated costs 16
6.4 Capital Expenditure (CAPEX): 17
6.5 Operational Expenditure (OPEX): 17
6.6 Financial Ratios 18
6.7 Revenue Forecast 20
6.8 Break-even Analysis and Future proposition for stable cash flow 20
7. Conclusions, Way Forward and Recommendations 22
Annexure I 25
Annexure II 27
Annexure III 28

1. Objective of the Investment Plan

Prepare market-based investment plan to establish techno-economic feasibility of the quality and safety testing equipment to be procured for submission and approval by the Project Steering Committee

2. Strategic Context

2.1 UNIDO

The United Nations Industrial Development Organization (UNIDO) is the specialized agency of the United Nations that promotes industrial development for poverty reduction, inclusive globalization and environmental sustainability. The mission of UNIDO is to promote and accelerate inclusive and sustainable industrial development (ISID) in its Member States. The relevance of ISID as an integrated approach to all three pillars of sustainable development is recognized by the 2030 Agenda for Sustainable Development and the related Sustainable Development Goals (SDGs). UNIDO's mandate is fully recognized in SDG-9, which calls to "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation". The Organization's programmatic focus is structured in four strategic priorities: Creating shared prosperity; Advancing economic competitiveness; Safeguarding the environment; and Strengthening knowledge and institutions.

UNIDO supports Governments and the private sector to set up and improve processing and value addition technologies within a value chain context contributing to inclusive and sustainable industrial development. UNIDO has unique capacities in the design and implementation of technical support projects for value chain and cluster development, partnerships promotion to enhance productive integration as well as technology upgrading for adding value and trade facilitation to enhance competitiveness and market access. Furthermore, this experience includes enhancing productivity and international competitiveness of manufacturing MSMEs, along with ensuring the up-scaling and sustainability of these activities through building up an appropriate infrastructure of technical expertise and institutional capacities for technical and business support to local producers.

UNIDO is currently implementing a project titled, 'Improving quality, productivity and innovation for enhanced competitiveness of the Indian bicycle and bicycle parts industry', with support from the Department for Promotion of Industry and Internal Trade (DPIIT). The project aims to to contribute to enhancing the growth and competitive position of the Indian bicycle industry, globally and domestically. This is foreseen to be achieved by improving performance of industry units, especially MSMEs, regarding quality, productivity, design and innovation, and their adherence to product and performance standards for bicycles and bicycle parts in India.

One of the issues being addressed by the project is updating the quality and testing infrastructure of the Indian bicycle sector, in line with safety performance requirements for bicycles sold in the country. Over the last few years, the Indian bicycle market had witnessed a considerable growth in the sale of non-certified cycles by the unorganized or informal sector (primarily traders, dealers etc.). The 29 standards formulated to govern bicycle/parts' specifications remain '*voluntary*' in nature, i.e., these are not mandated by the law and thus the sale of substandard products takes place, oftentimes at a large scale. Internationally only safety standards of Bicycles are made mandatory. ISO 4210 :2015 Cycles Safety requirements for bicycles is the umbrella safety standard, which defines in part 1 that "The scope has been limited to safety considerations and has specifically

avoided standardization of components". Industry cannot make parts standards mandatory as innovation in material and other specification are dynamic and ever evolving and parts with varied design and engineering choices, earns IPR and brings value addition. More so, respective testing of that part of Bicycle safety stands covered in the corresponding safety standard of Bicycles – categories like adult, kids, BMX or Electric. For example: Testing of Rim and Chain is already covered in Bicycle standards. Therefore, only safety standard of Bicycles needs to made mandatory and not the parts standards. There it is thus an urgent requirement for the current safety standards to be updated in line with global best practices and national requirements, and subsequently be made mandatory especially for the following safety standards:

- Cycles Safety Requirements for Bicycles (IS 10613: 2023)
- Cycles Safety requirements for bicycles for young children (IS 15533: 2018/ISO 8098)
- BMX bicycles safety requirements and test methods (New standard under consideration)
- E- Bicycles (New standard under formulation)[1].

and correspondingly, adequate testing facilities be set-up such that manufacturers can avail the testing and associated services required to confirm their conformance with the mandatory safety standards. The updating of standards towards the issuance of a Quality Control Order (for this Compulsory Registration Scheme) is being pursued by the recently constituted Bicycle Development Council (BDC) under the Chairmanship of Secretary, DPIIT. The UNIDO project, in parallel, focuses on upgrading the facilities available at the Research and Development Centre for Bicycle and Sewing Machine (RDCBSM), the nodal technical institute for the Indian bicycle sector, in line with the scope and scale of testing requirements envisaged under the safety standards to be prescribed. The UNIDO project therefore focuses on investments in testing equipment as per the safety standards, as well as introduction of improved service and business models for cost efficient and self-sustaining delivery of testing and associated services to the industry. This investment plan serves as a basis for the operationalization of these testing facilities.

2.2 RDCBSM

RDCBSM is the main nodal technical institute that provides testing, training and tool room-related services to the Indian bicycle industry. It therefore has a key role to play in providing critical support services and technology adoption support, especially to MSMEs, in keeping with the latest developments in the global bicycle industry.

The RDCBSM's testing and calibration facilities are one of the key services provided to the industry. The testing and calibration facilities of the RDCBSM are duly accredited by the National Accreditation Board for Testing and Calibration Labs (NABL; ISO/IEC-17025:2005) and the Bureau of Indian Standards (BIS). As per the NABL accreditation, the RDCBSM labs carry out mechanical testing of metals and alloys, chemical analysis (Fe, Cu and Al, base metals and alloys), calibration of measuring instruments and gauges and the testing of bicycles/bicycle parts as per ISO:4210 (parts 1-9) and ISO 8098. Under the BIS certification, the RDCBSM provides testing for bicycles and bicycle parts (IS 10613), household and industrial sewing machines (IS:1610 and IS:12109 respectively), zigzag sewing machines (IS:15449) and complete testing of steel as per IS:1875. In addition, the test labs at the R&D centre provide testing facilities for spectroscopic analysis of metals and alloys and mechanical testing of tor steels, structural steels, tubular products, cold and hot rolled steels, fasteners, fixtures and assemblies. The mechanical test labs, the standards room and the coordinate measuring machine also cater to the needs of automotive and other

[1] Source: AICMA

engineering industries, as is the case with the chemical/spectro analysis-based testing, where clients from the other industries outnumber bicycle/parts manufacturers.

The government plays a crucial role in funding the RDCBSM. It provides financial support through various mechanisms and schemes, covering operational expenses, funding research and development projects, supporting capacity building and training, facilitating infrastructure development, and promoting collaboration and partnerships. The government's funding is essential for the RDCBSM to fulfil its mandate of supporting industry development, promoting innovation, and enhancing the competitiveness of the bicycle and sewing machine industry. It is prudent on the part of Government as well as bicycle associations AICMA and UCPMA that RDCBSM becomes a self-sustaining entity and develops into an international centre for Bicycle testing in Ludhiana with knowledge base extending networking with international organizations to the benefit of the industry.

A judicious mix of the required equipment has been planned by UNIDO in consultation with RDCBSM, AICMA, UCPMA, DPIIT and the bicycle industry. However, RDCBSM needs to prepare for future requirement of equipment through self-generated retained earnings and achieve an independent self-sustaining entity enlarging its scope of services into advanced research and development activities to support the industry.

Corporate Objectives for funding the testing equipment, related technical support, services and hands on training to RDCBSM:

I) To meet the increased demand of safety standards testing with the advent of mandatory testing standards to be soon launched by DPIIT in collaboration with BIS and AICMA.

This investment plan will focus on the mechanical testing subset of RDCBSM's testing portfolio, i.e., focusing on testing as per the Indian Bicycle Safety Standard IS 10613, as well as requirements of International Bicycle Safety Standards ISO 4210 Part 1 to 9 and ISO 8098 for exports to various countries including Europe and USA, due to the alignment in the substantive focus areas of the standards.

The bicycles supplied for the government tender-based orders (for steel bicycles and components) must be certified by a third party as per IS standards (i.e. IS 10613), a function that the RDCBSM fulfils for the industry. Thus, the IS testing facility is a common resource for the OEMs catering to these tenders adhering to IS standards. The IS standards comprise a wide range of tests for general-purpose bicycles, most of which are aligned with the corresponding ISO tests. From this list, the R&D centre is certified to execute tests such as those for: bicycle tube valves; frames; rims; handlebars; seat pillars; pedal assembly; hub assembly; spokes; axles; cranks and chainwheels; front forks; cycle/rickshaw pneumatic tyres; steering head assembly; mudguards; reflectors; specification for padlocks; luggage carriers; steel balls and chains. The R&D centre's bicycle test labs are accredited to perform parts 1-9 of ISO 4210 tests for bicycles. These tests largely cover safety requirements for city/trekking bicycles, young adult bicycles, and mountain and racing bicycles, and test methods for braking, steering, frames and forks, wheels and rims, pedal and drive systems and saddle and seat posts.

To support such testing, the testing equipment currently available at RDCBSM includes one set of bicycles testing machines, comprising of the following equipment:

1. Complete Bicycle Road/Brake Performance testing machine (#01): for brake performance test (dry/ wet condition); back pedal brake performance test; hand-operated brakes performance test; brake thermal resistance test; and complete bicycle fatigue test.

2. Dynamic/Fatigue Testing Machine (#01): for handlebar to stem assembly fatigue test; frame fatigue test with pedalling forces; frame fatigue test with vertical forces; frame fatigue test with horizontal forces; front fork bending fatigue test; fork for hub/ disc brake – repeated brake torque test; chain wheel crank assembly fatigue test; saddle and seat pillar clamp fatigue test; and seat-post – fatigue test.

3. Impact Test Machine (#01): for front fork rearward impact test; frame and front fork assembly - impact test (falling mass); frame and front fork assembly - impact test (falling frame); pedal - spindle impact test; handlebar/stem assembly impact test; wheel/tyre assembly – Impact test; and plastic pedal impact test.

4. Static and Torque Test Machine (#01): for handle – stem assembly lateral bending test; handle – stem forward bending test; handlebar to handlebar stem torsional security test; handlebar stem to fork stem torsional security test; aerodynamic extensions to handlebar – torsional security test; handlebar – stem lateral bending test; bar – end to handlebar torsional security test; front fork static bending test; fork for hub/ disc brake – static brake torque test; tensile test for non – welded fork; wheel/ tyre assembly static strength test; drive system static strength test; pedal/ pedal – spindle assembly - static strength test; saddle - static strength test; saddle/ seat pillar security test; suspension frames - tyre clearance test; wheels — front/rear wheel retention devices secured; wheels — front/rear wheel retention devices unsecured; seat post — static strength test; and seat-pillar clamp - static test.

II) Management and technical manpower development and training:

UNIDO plans to hold series of hands-on experience training in technical, innovation, productivity, quality and management of the resources to meet the new testing load and projecting the testing agency as a premier third-party testing agency for safety standards testing and certification to crucially meet the industry demand in exports and mandatory safety standards compliance in the domestic market.

III) Make the Bicycle Industry globally competitive:

Bicycle Industry Association – AICMA had taken an initiative for subsequent migration to mandatory safety requirements with an aim to develop structured manufacturing, fair trade and safer cyclists' eco-system. This apart, to safeguard the Indian bicycle market from becoming a dumping ground for cheaper/substandard bicycles and to make exports globally competitive.

Safety standard IS:10613 was revised in 2023 and following significant changes have been made:

a) Three more categories of bicycles are included namely, Young Adult Bicycles, Mountain Bicycles and Racing Bicycles.
b) Fatigue, static and impact tests for various bicycle and parts like frame, fork, handle, saddle and pedal etc. incorporated; and
c) Higher load and a greater number of test cycles for high end or fancy bicycles.

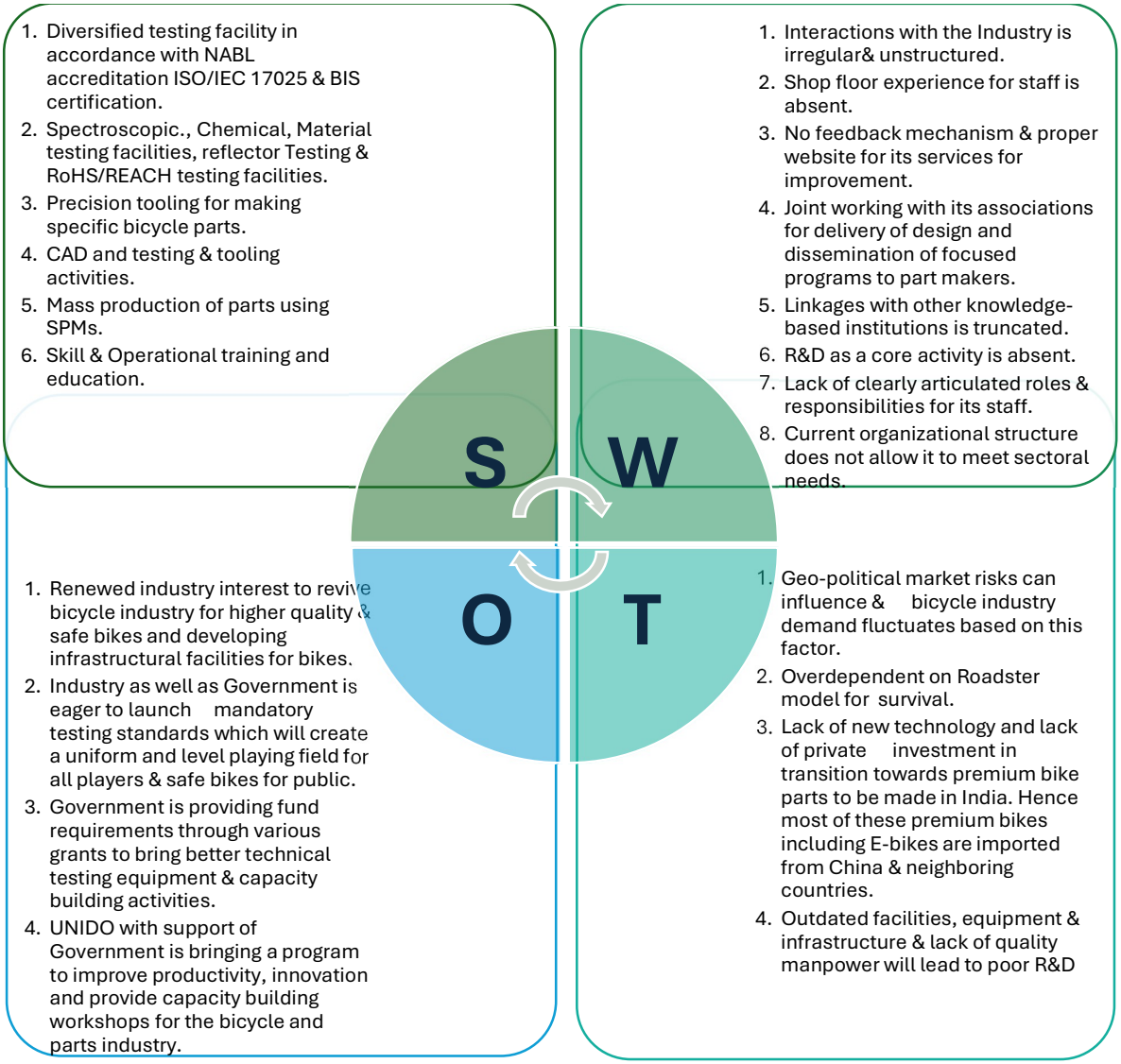
It is expected that compliance of this standard shall ensure that bicycles manufactured will be as safe as is practically possible. The tests have been designed to ensure the strength and durability of individual parts as well as of the bicycle as a whole, demanding high quality throughout and consideration of safety aspects from the design stage onwards.

IV) Efficient utilisation of resources:

With the foreseen migration to mandatory safety testing standards, all manufacturers of bicycles and/or parts looking to sell in the Indian market, must obtain third-party certification as per the safety test IS 10613. Thus, the demand for third party testing is certainly going to increase

exponentially, for which commensurate testing facilities must be available. The safety testing infrastructure available to the industry would need to be expanded to meet this increased demand before a Quality Control Order for these mandatory safety standards can be issued. Given that RDCBSM is a bicycle industry-focused testing facility and given that RDCBSM is the only dedicated testing lab for the bicycle industry and is already providing testing services as per IS 10613, ISO 4210 and ISO 8098, it is well-positioned to be upgraded for this function. It is envisaged that safety standards testing load from the industry under mandatory safety standards will increase the turnaround time (TAT) for each firm pertaining to its requirement of testing no of models. Therefore, RDCBSM require effective resource allocation and management. This includes allocating financial, human, and technological resources to support the innovation process and ensuring that resources are used efficiently and effectively like preparing an efficient layout of the testing equipment for faster turnaround time per test utilizing combination of various testing machines and skilled manpower deployment.

SWOT Analysis of RDCBSM(Brief)



3. Market Analysis

An analysis was carried out to estimate the foreseen surge in demand for safety testing services at RDCBSM in response to mandatory safety standards, factoring in

i. The number of current models sold in the Indian market, that would need to be (re)certified upon migration to a mandatory safety standards system; and
ii. The approximate number of new models reasonably estimated to be launched by manufacturers on an annual basis, to estimate approximate annual testing demand for the foreseeable future.

Global Bicycle Market trends[2]:

① Global Bicycle market is projected to grow from USD 81.50 billion in 2022 to USD 128.73 billion by 2030.

② Structural change in Cycling trends post pandemic: increasing ridership and rising penetration of e-bikes has led to a "global cycle boom'.

③ E-bikes are transforming mobility, they are expected to be sharing a market size of approx.40% of total market followed by premium all terrain bikes around 30%.

④ Production shift to use of higher generation materials – Aluminium alloy, carbon fibre and titanium.

⑤ Dockless bicycle sharing systems are gaining popularity, particularly Asian nations such as India and China. As per IMARC, the global bike sharing market size has reached USD 3.7 Billion in 2023 and expected to reach USD 5.4 Billion with a CAGR of 4.4% during 2024-2032.

⑥ Power assist systems (PAS) are the most important component of e-bikes and is usually manufactured in Japan, China and Europe.

⑦ Manufacturers looking to build market share need to ensure their e-bikes conform to safety, quality and performance requirements relating to bicycles and electrically power assisted cycles (EPAC). EPAC are designed for use on public roads and must meet the following requirements:

- Maximum continuous rated power of 0.25 kW, Electric motor – less than 750 watts (US).
- Maximum speed not exceeding 25Km/h (EU) or 32Km/h (US).
- Rated voltage up to and including 48 V DC or integrated battery charger with a nominal 230 V AC input Maximum saddle height – at least 635 mm.

⑧ World bicycle market is dominated by China (90 mln units/year) followed by India (22 mln per year). Export markets are usually European nations ($17 billion market size) followed by USA ($7 billion market size). European nations like Belgium, Denmark, France and Italy are aggressively rolling out infrastructure to support and encourage bicycle commutation.

Indian Trends:

Following above mentioned global trends; Indian trends also closely imitate similar opportunities except on much smaller level compared to globally:

[2] Source: KPMG report

① Based on KPMG estimates, potential to increase the bicycle market size by three times in the next 10 years and grow it to around USD 5.21 billion in 2030 from USD 1.3 billion in 2020.

② Market Segmentation in 2030 is expected to be dominated by premium and e-bikes to almost 72% of the market size as per AICMA projections.

③ E-bikes are expected to display maximum growth in especially EPAC models.

④ Premium bike segment closely following e-bikes in growth and includes racing, mountain, leisure types are predominant and there is an increasing awareness towards fitness and health concerns.

⑤ Dockless sharing stations are gaining great preference for use by the millennial and Z groups for especially last mile mobility in Metro cities and for fun and leisure with emphasis on health and fitness. It is getting noticed in India due to:

- Urbanization: Rising urbanization is increasing demand for convenient and eco-friendly transportation options.
- Technological advancements: GPS and mobile apps make it easier for users to locate and unlock bikes.
- Investments: Increased investments in urban mobility solutions are driving the growth of the market. Some of the players are MYBYK, Yulu etc.

As per Statista projections, the Bike-sharing market in in India is projected to grow by 9.75% (2024-2029) resulting in a market volume of US$2.15bn in 2029.

Above mentioned trends are demanding increasing investments in following new products and premium and e-bikes in India:

① Transition towards Mandatory safety standards for better, safer and reliable bikes preventing accidents and lives. Migration to uniform BIS standard for multiple suppliers and it thus reduces multiplicity and improves cost and quality uniformly along the supply chain.

② Improve the testing capacity and enhance the capability of testing and research at RDCBSM to meet the demand from industry.

③ Improve the productivity, quality and innovation at MSMEs which are part of entire supply chain to produce quality bicycles in India. Vendors and OEMs need to invest to introduce new production processes, follow digitalization processes, improve workplace management, production planning and preventive measures to reduce wastage and include more greener measures to reduce emissions.

Accordingly, UNIDO is recognising the trends globally as well as in the Indian context and are oriented towards improving the facilities at RDCBSM and increasing their testing capacity and capability by introducing latest technically superior machines and processes.

4. Capacity Utilization of the Existing Facilities set up

Presently, R&D Centre has only one setup of Bicycle/Parts testing machines (Mechanical testing/Performance) for Mandatory testing as per International Bicycle Safety Standards ISO 4210 Part 1 to 9.

S. No.	Type of Test	No. of M/cs	Utilization	Remarks
1.	Dynamic/Fatigue Testing	01	80 – 90%	When IS:10613 Indian Bicycle Safety Standard shall be made mandatory by DPIIT, R&D Centre shall urgently require additional Bicycle/Parts testing equipment to meet enhanced testing load.
2.	Static/Torque Testing	01	40 – 50%	
3.	Impact Testing	01	40 – 50%	
4.	Complete Bicycle Endurance/Brake Performance Test Machine	01	70 – 80%	

Source: RDCBSM

When Bicycle Safety Standard IS10613 is made mandatory, Bulk/Volume of Bicycle/Parts testing is expected to increase multifold and with the present limited testing capacity set-up with only one set of machines, it takes about 15-20 days for testing/certification of a single Bicycle and with the Augmented Testing/Certification facility, with procurement of 02 Bicycle Fatigue/Dynamic Test machines, the turnaround time(TAT) for Testing/Certification of a Bicycle shall be significantly reduced i.e. up to 4 - 5 days based on 8 hrs/day working. To cater to the increased testing work load under mandatory regime, the testing facility shall be provided with extended hours upto 16 hrs/day which shall result in Testing/Certification of a Bicycle in 2 Days. This shall result in Testing/Certification of 400 models of Bicycles per year (organized plus unorganized sector)i.e. under flexible hours working schedule, 200-250 Bicycle models can be tested/certified as per mandatory/International Bicycle Safety Standards on regular recurring load basis.Data was collected with valuable support from the All-India Cycle Manufacturers' Association (AICMA), whose member companies represent a majority (80-90%) of the Indian bicycle production. This data was combined with estimations for the unorganised sector, combined with extrapolations for the attendant component production for the estimated number of bicycle models.

Table 1: Number of models per year (i.e. Current and Future) for all bicycle categories[3]

Sr. No.	Bicycle category	No. of Models/Year				
		Organized sector		Unorganized sector		TOTAL
		Current	Future	Current	Future	
1	**ROADSTER**	85	17	9	2	**113**
2	**MTB/CITY and TREKKING/YOUNG ADULT/RACING/BMX/EPAC**	279	135	228	88	**730**
3	**YOUNG CHILDREN**	140	109	153	101	**503**
4	**TOTAL**	**504**	**261**	**390**	**191**	**1346**

Source: RDCBSM in consultation with industry

[3] Data compiled by RDCBSM and AICMA; Annexure II attached for reference on no of current and future models forecasted by RDCBSM in consultation with industry

Based on this estimation of future demand, testing load at RDCBSM was estimated based on the following assumptions:

- Total no. of current plus future models to be tested on complete Bicycle Road/Brake performance Testing machine excluding cycle category of Young Children = 1346-503 = 843.
- Total no. of current plus future models to be tested on dynamic fatigue testing machine = 1346
- Total no. of current plus future models to be tested on static and torque testing machine = 1346
- Total no. of current plus future models to be tested on Impact Testing machine = 1346

While the 'current' models would contribute to one-time testing loads, the 'future' models would be indicative of recurring testing requirements. The estimated number of future models is based on current estimates but is expected to stabilise based on more accurate market demand forecasts from industry on a regular basis to RDCBSM. RDCBSM has to undertake an initiative to set up frequent interaction and regular meetings with industry to estimate more accurately the forecast and determine the testing load for an efficient and reliable services utilising its machines to the fullest capacity and look for expansion in future depending upon the industry feedback. This would have a bearing on RDCBSM's planning of equipment to be procured and operationalized, i.e., a reasonable estimate of annual testing demand, beyond the initial surge of demand following the issuance of the QCO related to mandatory safety standards to be met by manufacturers.

5. Market Plan

All the concerned staff and managers of RDCBSM must know the actions that they are responsible for and then how the physical and financial resources so available are allocated for securing success in each service market segment envisaged in the plan.

Revised Indian Bicycle Safety Standard IS: 10613-2023 has been published by BIS besides this IS15533-2018 has also been amended as per International mandatory testing requirements. Most of progressive Bicycle/Parts manufacturers/exporters (mostly AICMA members) were actively involved in revision/amendments of Bicycle Safety Standards. These Bicycle Sectional Committee members are well aware of the International mandatory testing requirements and anticipated Indian Bicycle Safety Standard IS:10613 (revised) and IS: 15533 (amended) likely to be made mandatory by DPIIT.

The industry is currently in transition from Roadster to Premium Segment Bicycles Testing and Certification as per International Standards ISO 4210 (Part 1 to 9), ISO 8098 has increased as per export growth of Bicycle abroad.

Development and prioritization of important marketing activities, sub activities and tactics suggested for RDCBSM to Carry out in future:

i. Various awareness seminars can be conducted for UCPMA members (Bicycle Association) representing 4000 Bicycle Parts and Small Component Manufacturers, mostly located in mega cluster at Ludhiana to make them aware of the International/National Bicycle Safety requirements.

ii. R&D Centre should utilize digital marketing platform for doing extensive marketing for National/International networking and contact regarding the augmented Testing/Certification-

   - Website updating about augmented Testing/Certification facilities
   - Newsletters for wide circulation
   - Contact and network with the international inspection agencies for 3rd party testing/certification of Bicycle/Parts
   - Collect data from prospective Bicycle manufacturers about No. of Models being/shall be developed/year to plan the execution of testing/Certification of Different Models of Bicycles as per International Mandatory Standards ISO 4210 (1-9)/ISO 8098, EN 14764, EN-14765, EN 14766

iii. Should mobilize personnel and approach to Industry based on following targets for marketing based on present estimates by industry and RDCBSM

   - 220 Models in roadster/Premium segments per year
   - 200 Models in young children segment per year

iv. Extend contact and promote the services to the primary beneficiaries of the project who are micro, small and medium-sized enterprises of the Indian bicycle industry producing bicycles as well as bicycle parts and components. Bicycle/Parts testing facility as per National/International Standards shall be provided to the 12-15 Large Manufacturers and more than 4000 MSME engaged in manufacturing of Bicycle Parts/Small Components. More than 2300 Parts manufacturers are also availing the testing facilities at R&D Centre.

6. Investment plan

The above demand projections were then mapped against the testing requirements and durations of applicable tests, as per the stipulations under the standards.

For each of the requisite machines, the required machine hours per bicycle model were recorded, and multiplied with foreseen annual demand (i.e., number of bicycle models) to establish required machine hours per annum. This was then divided by available working hours of the testing facilities per day (12 hours, assuming two shifts of 8 hours each, with 75% active operating time), to arrive at an overall number of machines required to meet envisaged testing demand over the next few years. The figures used for this calculation are attached under Annex 1.

The plan for expansion of RDCBSM's safety testing facilities comprises a combination of funding sources/ grants via which the requisite testing equipment would be purchased. As on date, it is foreseen that equipment for safety testing would be procured through two sources: the UNIDO phase II project, with support from DPIIT; and from the Ministry of Heavy Industries (MHI). The investment planning for RDCBSM in this document would therefore take into account machines being made available through both these channels, to determine a viable business model for the overall operation of RDCBSM 'safety testing facility'.

In order to gain short-term and longer-term insights for facility planning at RDCBSM, the estimation of testing machinery requirements was first done separately for:

(i) Number of current bicycle models, which would need to undergo testing immediately upon the issuance of the quality control order. This would provide an indication of the immediate surge in demand expected in the short term, as well as an indication of reasonable timelines within which RDCBSM would be able to support current manufacturers' compliance with the QCO.
(ii) Number of future bicycle models per annum, that would constitute recurring demand for testing services at RDCBSM.

6.1 Testing equipment required for current bicycle models including existing load and future load

Equipment	Required as per no. of current models	Available at RDCBSM	To be procured under UNIDO phase II project	To be procured with MHII support	Remaining requirement[4] without considering available machines at RDCBSM
Complete Bicycle Road/Brake Performance testing machine	02	01	01	01	-
Dynamic/Fatigue Testing Machine	06	01	01	02	03
Impact Test Machine	01	01	01	-	-

Static and Torque Test Machine	04	01	01	-	03

An analysis of equipment required for meeting the current (one-time) demand shows that RDCBSM would need to mobilize resources to procure additional units of three machines for meeting required testing machines (namely, dynamic/fatigue testing machine and three for meeting static and torque testing machine).

Time required to complete one-time testing of current bicycle models:

> It will depend upon the grace period with respect to effective date of QCO allowed by DPIIT for existing models like 6 months or more which may considerably reduce the testing requirement of the existing models. In such a case then only, older existing models may require re-testing and re-certification under the revised new QCO.

6.2 Testing equipment required for future bicycle models

Equipment	**Required as per no. of future models**	**Available at RDCBSM**	**To be procured under UNIDO phase II project**	**To be procured with MHII support**	**Remaining requirement[5] without considering available machines at RDCBSM**
Complete Bicycle Road/Brake Performance testing machine	01	01	01	01	-
Dynamic/Fatigue Testing Machine	03	01	01	02	-
Impact Test Machine	01	01	01	-	-
Static and Torque Test Machine	02	01	01	-	01

An analysis of equipment required for meeting the future (recurring) demand shows that RDCBSM would need to mobilize resources to procure additional units of one machine for meeting required testing machines (namely, static and torque testing machine).

Even after addition of machines from UNIDO and MHI there will be shortfall for testing entire projected testing load (current plus future) assuming that existing older machines will be fully utilised by RDCBSM:

S. No.	Type of Test	No of models to be tested (current plus future) after declaration of mandatory testing	Present no. of M/cs at RDCBSM	M/c to be added by UNIDO	*Max. Number of Models that can be tested after addition of machines by UNIDO	M/c to be added by MHI	Max. Number of Models can be tested after addition of machines by MHI and UNIDO	Percentage of models that can be tested after addition of MHI & UNIDO machines
1	**Dynamic / FatigueTesting	1346	1	1	288	2	576	43%
2	**Static / Torque Testing	1346	1	1	450	0	450	33%
3	Impact Testing	1346	1	1	1346	0	1346	100%
4	Complete Bicycle Endurance / Brake Performance Test Machine	843	1	1	480	1	720	85%
	* Revenue has been calculated based on this model distribution							
	**Critical testing is for fatigue testing & Static/torque testing as the number of tests and their duration is longer compared to other test types							

6.3 Profit and Loss Statement, Balance Sheet and Statement of Cash Flow and envisaged investments and associated costs

Assumptions in making the financial statements:

1. Revenue has been calculated on the basis of present testing charges as applicable in FY 2023-24.

2. Annual calibration expenditure is required to be incurred to test machine accuracy.

3. Revenue for the FY 2024-25 will increase by 76% over FY 2023-24 due to increase in testing load from the industry once the standards are made mandatory. Thereafter revenue growth of 10% has been considered over the previous years.

4. FY 2023-24 data considered is provisional.

5. For the sake of simplicity, gross fixed assets have been taken to comprise of physical assets and corresponding reserves. It is to be noted that fresh purchase of safety equipment by UNIDO will be transferred to RDCBSM after installation and commissioning of the equipment. Therefore, once the equipment is transferred in the name of RDCBSM these will show up as assets on the balance sheet of RDCBSM and will account for depreciation expenses (non-cash expenses) every year contributing towards the free cash flow.

6. Due to unavailability of standalone data of RBCBSM, no working capital cycle has been taken in previous year's calculations.

7. Centre has no debt (either from bank or any other financial institution) hence only equity has been considered in the preparation of the statement.

8. New Machinery to be procured out of grant is assumed to be Rs.650.00 Lacs (Tentative) based upon the project document for phase-II from UNIDO.

9. For the sake of investment contribution from RDCBSM for the installation and commissioning of the new safety testing equipment, an investment of Rs.25.00 Lacs for laying down the infrastructure facilities and land provision at Rs.30.00 Lacs based on deemed cost of Land has been considered for the purpose of usage of equipment(as per UNIDO phase-II report).

10. Depreciation has been calculated on the basis of WDV method at 15% annually on the tentative estimate of the capital expenditures and same has been considered in the operational expenditures in the financial statements. These costs are preliminary estimates, and to be confirmed based on actuals at the time of procurement and operationalization, respectively.

6.4 Capital Expenditure (CAPEX):

- **Equipment and Instruments**: Cost breakdown for purchasing testing equipment, calibration devices, etc.
  - **Approx**. 650.00 lakhs as per the project document for phase-II of the UNIDO.
- **Facility**: Building or leasing costs, renovations, lab setup from RDCBSM.
  - **Approx**. 55.00 lakhs has been considered (deemed value of land plus infrastructural facilities).

6.5 Operational Expenditure (OPEX):

Assumption for considering Salaries of key personnel (scientists, engineers, technicians).

Direct Expenses

All Values in INR

	Description	No of Employee	Salary(monthly)	Total Salary (monthly)	Annual Expenditure
1	Lab Officer(Design) Graduate Mech. Engineer	1	50,000	50,000	6,00,000
2	Lab Officer (science graduate)	2	45,000	90,000	10,80,000
3	Lab Officer (Graduate Mech. Engineer)	2	45,000	90,000	10,80,000
4	Lab Officer (Diploma in Mechanical)	2	40,000	80,000	9,60,000
5	Lab Officer (Engineer- Photometry)	1	40,000	40,000	4,80,000
6	Lab Technician (Diploma/ITI)	6	30,000	1,80,000	21,60,000
7	Front Line Officer (Diploma/Graduate in Mechanical)	2	30,000	60,000	7,20,000
8	Front Line Officer (Diploma/Graduate in Marketing)	1	30,000	30,000	3,60,000
9	Technician-Electrical (ITI/Certificate course)	1	30,000	30,000	3,60,000
10	Technician-Electronics (ITI/Certificate course)	1	30,000	30,000	3,60,000
	TOTAL	19		6,80,000	81,60,000

Indirect Expenses (SUPPORT STAFF)	
SGA (Selling , General and Administrative expenses)	
(Includes staff from Administration dept., Marketing dept., Sample receipt dept., Accounts, Purchase ,Maintenance and Secutiy)	
Consider monthly salary for all these staff inclusive	7,00,000
Safety standards Testing team accounts for 80% of the expenditure	5,60,000
Annual Expenditure for the entire support staff	67,20,000
Monthly salary for the entire team for Safety standards testing room	1,50,000
Annual Expenditure for the entire tool room staff	18,00,000

Fixed cost considered includes following:

1. Salaries and other allowances (Including Support Staff)
2. Building maintenance expenses Supplies and materials for testing.
3. Calibration Exp (Including AMC)
4. Machinery repair and Maintenance
5. Insurance premium
6. Depreciation and Amortization expenses
7. Standard Specifications (National/International)
8. Quality Management System (BIS/ISO/NABL)
9. Addition in Machinery (in future years) with effect from 2026-27 onwards

Variable cost considered includes following:

1. Electricity, water expenses
2. Testing expenses and consumables
3. Other SGA (Selling, General and Administrative cost):
    - Books and periodicals
    - Travel expenses
    - Legal expenses
    - Telecommunication expenses
    - Vehicle running and maintenance
    - Business promotion expenses
    - Other expenses (Including Printing and Stationery)

Working Capital:

It includes cash required for day-to-day operations, accounts receivable, and emergency funds. RDCBSM is able to generate enough cash flow to account for its working capital requirements based on the revenue generated on increased testing load.

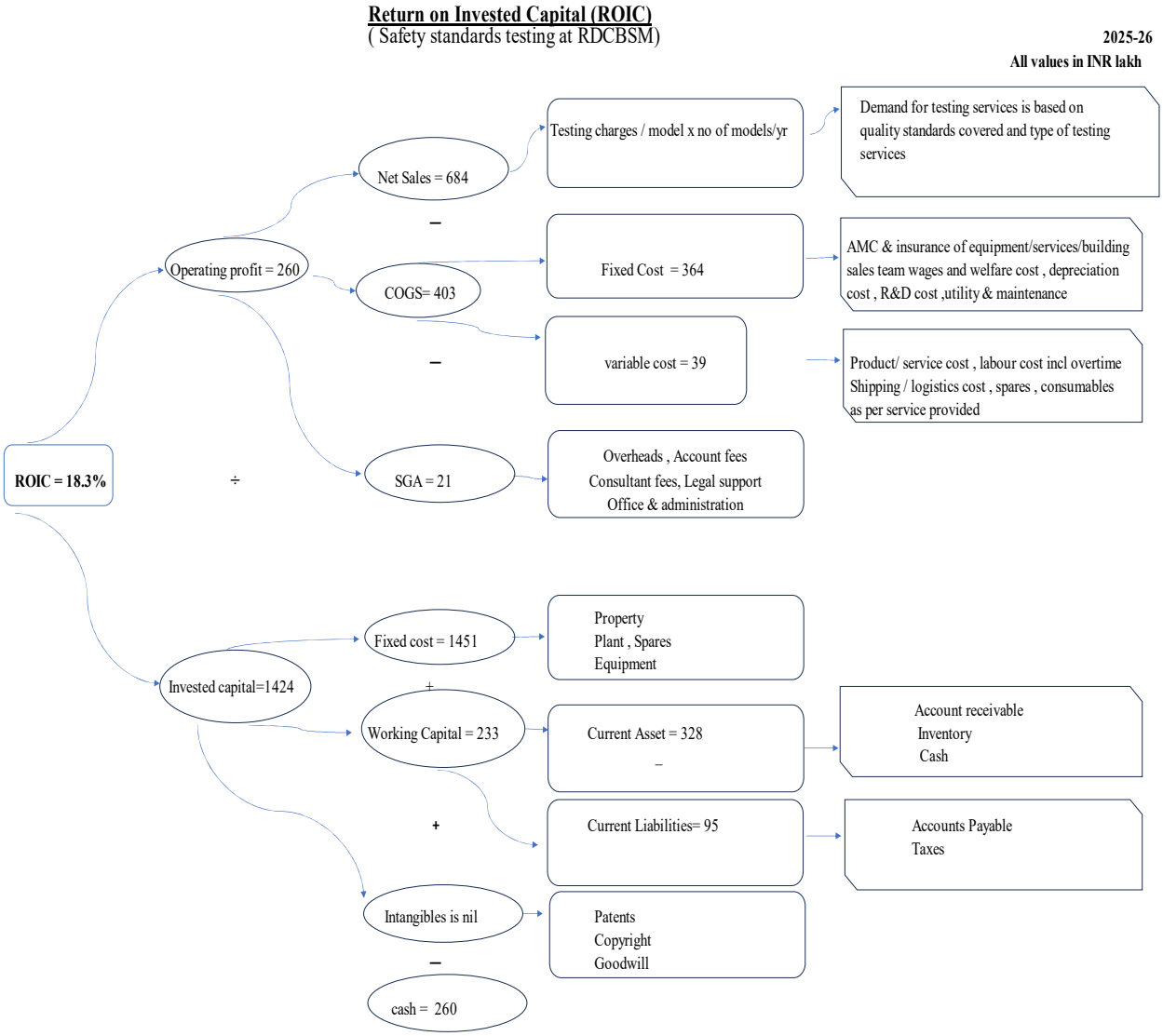
6.6 Financial Ratios

Calculation of IRR and NPV please see the following reference cash flow table:

														Values in INR lakhs	
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Amount(INR lakh)	-705.00	259.92	375.29	398.51	436.17	479.78	527.76	580.54	638.59	702.45	772.70	849.96	934.96	1028.46	1131.30

ROIC	18.30%	(PAT/ invested capital) for 2025-26. Investment by RDCSM is 55 lakh in infrastructure etc. and grant for safety testing equipment considered is approx.INR 650.00 lakhs from UNIDO/DPIIT.
IRR	51.68%	Project is assumed to generate cash flows over period of 10 years.It is also the return on investment(ROI) for the project.
NPV(INR Lakhs)	188.44	At discount rate of 9% over 10 year cash flows.
WACC	18.30%	same as ROIC since there is no debt leverage.

At projected testing load:



- Given the above-mentioned capital and operational expenditures involved in setting up and expanding RDCBSM's safety testing facility, the next step was to establish a pricing strategy, and therefore revenue targets that would contribute to a viable business model for the centre. The pricing strategy would aim to ensure that RDCBSM is able to achieve a return on investments (albeit through external public grants). This document aims to establish the basis for competitive pricing scenarios, reflective of the facility's high-quality services and cognizant of industry standards for similar services. This would ensure RDCBSM's ability to meet operational/recurring costs during the operation of its facility, as well as contribute to further expansion of its facility in the future.

6.7 Revenue Forecast

- It has been assumed that new safety equipment will be installed and commissioned by beginning of the FY 2025-26. Growth has been considered on a conservative basis of 10% for 2026-27 over previous year assuming that mandatory safety testing has been completely implemented over the entire industry and the backlog of testing for existing model testing is over and now RDCBSM is only getting testing load from the introduction of new models by the industry.

6.8 Break-even Analysis and Future proposition for stable cash flow

- We assume that at present consideration of maintaining the current testing charges will still make RDCBSM profitable due to the high testing load expected from the industry after making safety standard testing mandatory at a ROIC (return on invested capital) of 18.30%. It is provided that the revenue and expenses so projected remain achievable and there is no undue change in the testing load and expenses.

- As a simple sensitivity analysis, if RDCBSM is able to achieve a testing load of only 75% of the proposed testing load projections then also following healthy picture is emerging at no increase in prices of testing keeping the expenses unchanged:

IRR	NPV(INR Lakhs)	ROIC
24.35%	56.49	6.00%

And at 60% of the proposed testing load the following table is achievable near to a breakeven level:

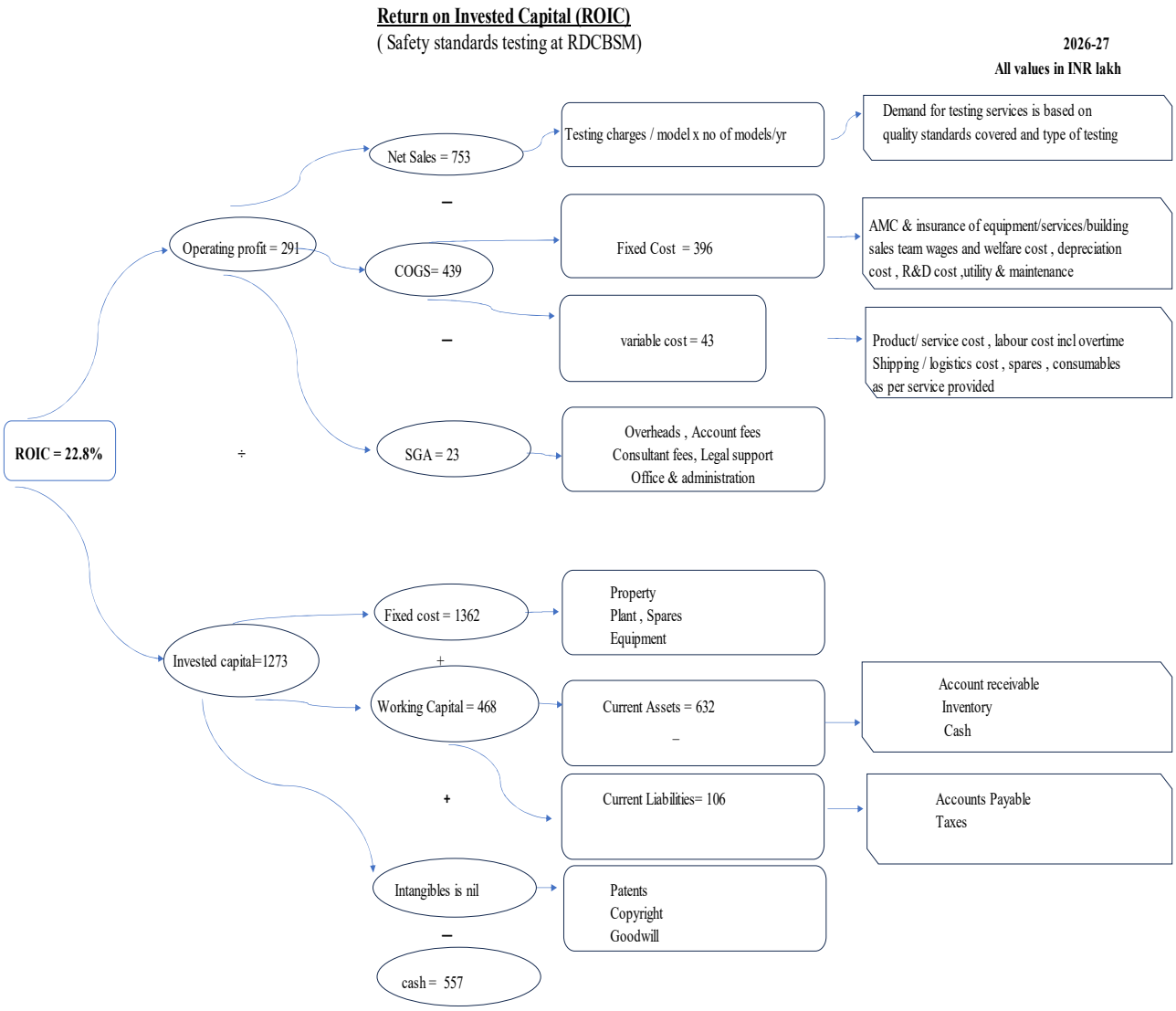
IRR	NPV(INR lakhs)	ROIC
0.84%	-22.68	-0.80%

The scenario of 60% may be possible when the existing model testing load gets fulfilled by RDCBSM and only future models will continue for testing load.

Therefore, it can be seen that whenever testing load as proposed in the statement falls below 75% limit and is approaching around 60% level then, RDCBSM must consider increasing their testing charges in consultation with its management and industry and with support of All India cycle associations to overcome negative profitability and avoid depletion of resources preventing it from sustaining their services on long term to the industry. 60% testing load

corresponds to approx. 800 models for testing on an annual basis from the industry compared full load of 1346 in first year of operation after installation and commissioning of UNIDO machines and implementation of mandatory safety standards.

- For future years especially from 2026-27, it is expected that testing load from the industry will continue to increase by 10% over previous year. This will ensure to achieve enough profits and cash flow for future investments for bringing in new equipment and managing the annual increases in expenses especially to cover Annual Maintenance of equipment and their personnel expenses. In such case the proposed ROIC calculation looks like the following in year 2026-27 without increasing their current testing charges:



ROIC has improved to 22.8% compared to 18.3% in FY 2025-26 due to better testing load in FY 2026-27.

Therefore, it is expected that RDCBSM will continue to improve over the years based on better revenue on higher demand for testing load from the industry when the mandatory testing compliance settles all over the industry. This is after assuming that revenue is purely increasing after 2025-26 based on modest increase of 10% in the demand for testing load from the industry.

7. Conclusions, Way Forward and Recommendations

RDCBSM must continuously invest in the following to enhance its competitiveness and usefulness to the industry:

A) RDCBSM has to ensure that its staff is adequately equipped through upskilling and reskilling and then hire new people when necessary. Upskilling means that employees learn new skills to help them in their current positions as the skills they need evolve. Reskilling is the real challenge: workers are retrained with new skills that will enable them to fill different positions within RDCBSM. The end-to-end skill transformation can be covered through three phases:

- Scout: analyse the skills required to achieve RDCBSM's ambitions;
- Shape: identify talent gaps that must be addressed and design the program infrastructure to address it; and then
- Shift: develop and implement content and delivery mechanisms to train the staff at scale.

B) RDCBSM must refurbish the existing machines to fully utilise to meet the increased testing load from existing and future models and generate enough funds to secure new machines to replace the existing old machines. However, till they are able to secure more new machines, they may have to depend on old existing machines to avoid shortfall in testing load from the industry.

C) RDCBSM will have to operate extended shifts for 16 hr in order to meet the increased testing load till the existing models testing load gets covered from the industry.

D) Creating and maintaining robust internal processes and documentation. This will showcase an international outlook for setting up a centre of excellence in the field of testing and research.

E) Well trained technicians and professionals to build trust in its tests with respect to accuracy, reliability and repeatability of tests. There is a need for an advanced tool room to meet requirements for production tooling, design and engineering of mould/dies and jigs/fixtures for making different parts.

F) Efficient layout of its equipment for better turnaround time (TAT) for the tests.

E) Create a testing standard manual with required standard operating methods.

G) Portfolio of testing charges with required testing parameters as per IS 10613 and 8098, etc.

H) Carry out analysis of its present organisation chart and make it industry compliant and useful to meet the demand for research and support and continuous upgradation of knowledge and facilities based on trends and industry requirements.

Based on present financial statements of cash flow and profit and loss, it can be seen that RDCBSM is able to sustain growth based on projected testing load at current prices of testing. It is dependent on following risks:

- Testing demand so forecasted by the industry for future models is achieved.
- Expenses forecasted by RDCBSM hold and not affected by sudden contingencies not yet estimated.
- Presently RDCBSM is debt free but if in future to meet their working capital or CAPEX requirements, it may have to borrow. In such case the statements could change for the principal and interest burden for the loan affecting the profitability and the cash flow.

I) Pricing strategy:

Whenever testing load falls to 60% level corresponding to 800 models for testing in a year then the profitability turns negative and therefore it must increase its prices of testing to sustain long term support to industry.

Therefore, the revenue forecasted at the moment may not be enough for a sustainable future wherein it has to continuously invest in its infrastructure and procure more equipment and professionally train its staff for knowledge and keep up with the latest trends in new products and testing requirements. They must discuss with the industry players and respective cycle associations for a more improved pricing structure for the testing so that it could build a sustainable future and support the industry on a long run.

They must constantly monitor and review the testing requirement of the industry based on introduction of future models and prepare themselves to serve the industry in a better and efficient manner.

In the current scenario of the projected testing demand they must plan for procurement of more equipment and instruments and tools to meet the projected demand. They are particularly short for testing by dynamic fatigue machine after considering existing machines at RDCBSM and sourcing from UNIDO and MHI.

J) Diversifying the services:

They will need more funds in future for such a purpose and will have to therefore plan for diversifying their services for improving their revenue and thus accumulate their retained earnings to satisfy the future CAPEX as it is possible that Government may not provide frequent funds requirements for operational efficiency and would like RDCBSM to become self-reliant.

An example for another avenue for future funds opportunity, it could diversify its services and could strive in getting accredited for performing all tests as per various International Standards like JIS (Japan), EN (Europe), ASTM (USA), DIN (Germany), etc. This will qualify RDCBSM to enter certification for exports with special focus on European and US markets. This will enhance RDCBSM's utility for local component and bicycle manufacturers. They may need following steps with more funds at their disposal:

- Purchase of country specific standard documents.
- Submission of applications for achieving accreditations.
- Cross comparison of requirements across each of the standards (effective guidance to manufacturers).
- For complete testing of electrically power assisted cycles (EPACs), RDCBSM needs to be equipped with equipment, professional technicians and managers.
- Diversify the testing portfolio to provide specialized testing for certain accessories for example bicycle helmets for which regulatory standards (as per PPE directive 89/686.EEC) exist in USA, Europe. etc.
- RDCBSM personnel require expertise for specific component testing as well as for RoHS/REACH compliance testing. The test lab personnel may require undergoing training at international test labs to observe such component specific tests (e.g. cranks, handles and handlebars) as well as components made from different materials required in export worthy bicycles. Besides these training is also required in calibration of equipment, maintaining reliability of test results and avoiding common mistakes in testing.
- RDCBSM may like to venture out in diversifying its services in non-destructive testing (Ultrasonic testing, magnetic particle inspection, dye penetration test (DPT), radiography, fractography etc.). It needs funds for expert guidance and procurement of necessary equipment.

RDCBSM could consider going beyond safety testing and move into various important aspects of export worthy bicycle designs and engineering involving durability, functionality, precision or comfort which are not measured by safety tests. Therefore, while safety tests provide solid foundation for future expansion, final product quality must be measured factoring in bike's intended use. This could allow RDCBSM to benchmark top quality bicycles and components for reference to Indian manufacturers. Among such tests could be tyre rolling resistance, seat and handle compliance, chain friction, shifter repeatability etc.

- Global e bike standards and testing needs to be developed inside RDCBSM: state-of-the-art testing facilities and industry experts are required to ensure their e-bikes conform to national and international regulations, including US 16 CFR 1512 for bicycles, EU Machinery Directive 2006/42/EC and EU Electromagnetic Compatibility Directive 2014/30/EU. To test against a wide range of standards, including:

  European Union:
  - EN 15194 - Cycles - Electrically power assisted cycles, incl. electromagnetic capability (EMC), safety and mechanical strength;
  - Charger EMC: EN 55014, EN 61000-6, EN61000-3 ;
  - Charger safety: IEC/EN 60335-2-29;
  - Battery safety: EN 62133 or EN 50604-1;
  - Functional safety: EN ISO 13849;
  - Risk assessment: EN ISO 12100.

  Unites States of America:
  - UL 2849 - Standard for Electrical Systems for e-Bikes;
  - Charger: UL/CSA 60950-1, UL/CSA 62368-1, UL 1310 or UL 1012;
  - Batteries: UL 1642 or UL 2271;
  - Rotating Electrical Machines: UL 1004;
  - Radio Frequency Devices: 47 CFR 15;
  - Requirements for Bicycles: 16 CFR 1512.

Annexure I

Financial Statements

	Profit & Loss Statement							Value:	INR Lakh
			2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29
	INCOME								
1	Revenue from Testing		360.02	435.79	457.58	807.44	888.19	977.01	1,074.71
2	Less : GST paid		54.92	66.48	69.80	123.17	135.49	149.03	163.94
3	Net Revenue(minus GST)		305.10	369.31	387.78	684.27	752.70	827.97	910.77
4	Interest income		-	-	-	-	-	-	-
5	Misc. Income		-	-	-	-	-	-	-
	Total Revenue receipts		305.10	369.31	387.78	684.27	752.70	827.97	910.77
	Revenue growth			21%	5%	76%	10%	10%	10%
	EXPENDITURE								
1	Salaries and other allowances(Including Support Staff)		159.25	187.32	196.68	166.80	175.14	192.65	211.92
2	Building maintenance expenses		0.31	7.59	7.97	8.50	9.35	10.29	11.31
3	Electricity,water expenses		12.64	16.18	16.99	21.00	23.10	25.41	27.95
4	Testing expenses & consumables		11.63	10.02	10.52	18.00	19.80	21.78	23.96
5	Caliberation Exp (Including AMC)		6.33	4.93	5.18	50.00	55.00	60.50	66.55
6	Machinery repair and Maintenance		1.86	0.76	0.79	9.00	9.90	10.89	11.98
7	Books and periodicals					0.72	0.79	0.87	0.96
8	Travel expenses					1.20	1.32	1.45	1.60
9	Legal expenses		0.74	0.60	0.63	1.00	1.10	1.21	1.33
10	Telecommunication expenses		0.65	1.76	1.85	2.00	2.20	2.42	2.66
11	Insurance premium		0.22			2.00	2.20	2.42	2.66
12	Vehicle running and maintenance		4.16	2.80	2.94	4.00	4.40	4.84	5.32
13	Business promotion expenses		1.41	1.97	2.07	9.00	9.90	10.89	11.98
14	Depreciation & Amortization expenses					105.75	89.89	76.40	64.94
15	Standard Specifications (National/International)					12.00	13.20	14.52	15.97
16	Quality Management System (BIS/ISO/NABL)					10.00	11.00	12.10	13.31
17	Addition in Machinery (in future years)						30.00	48.00	55.00
18	Other expenses(Including Printing & Stationery)		2.69	3.48	3.66	3.00	3.30	3.63	3.99
	Total		201.88	237.41	249.28	423.97	461.59	500.28	533.40
	Operating Profit		103.22	131.90	138.50	260.30	291.11	327.69	377.37
	EBIT % of revenue		28.67	30.27	30.27	32.24	32.78	33.54	35.11
	Other expenses								
	Interest on loan		-	-	-	-	-	-	-
	Profit before tax		103.22	131.90	138.50	260.30	291.11	327.69	377.37
	Tax to be paid		30.97	39.57	41.55	78.09	87.33	98.31	113.21
	Profit after tax(PAT)		72.25	92.33	96.95	182.21	203.78	229.39	264.16
	PAT % of revenue		20.07	21.19	21.19	22.57	22.94	23.48	24.58
	Balance Sheet					-	-	-	-
	Total Asset		851.46	851.46	851.46	1,778.91	1,992.95	2,235.13	2,516.19
	Current Asset					328.20	632.13	950.71	1,296.71
	Inventories					1.00	1.00	1.00	1.00
	Cash					259.92	557.12	868.30	1,206.16
	Accounts receivables					67.29	74.02	81.42	89.56
	Others								
	Fixed Asset		851.46	851.46	851.46	1,450.71	1,360.82	1,284.42	1,219.47
	Building								
	Preoperating expenses								
	BTL Machinery & LMS		851.46	851.46	851.46	1,450.71	1,360.82	1,284.42	1,219.47
	Liability and retained earnings		851.46	851.46	851.46	1,778.91	1,992.95	2,235.13	2,516.19
	Current liability		-	-	-	95.24	105.50	118.30	135.20
	Account payable					17.15	18.17	19.99	21.99
	Any short term loan								
	Tax payable					78.09	87.33	98.31	113.21
	others								
	Non current liability		851.46	851.46	851.46	1,683.67	1,887.45	2,116.84	2,380.99
	long term loan								
	Retained earnings		851.46	851.46	851.46	1,683.67	1,887.45	2,116.84	2,380.99

	Cash Flow Statement								
	Operating cash flow								
	PBT		103.22	131.90	138.50	260.30	291.11	327.69	377.37
	plus Amortization/depreciation		-	-	-	105.75	89.89	76.40	64.94
	Change in account receivable (+/-)		-	-	-	- 68.29	- 6.73	- 7.40	- 8.14
	Change in account payable (+/-)		-	-		17.15	1.02	1.82	2.00
	Tax Payment		30.97	39.57		78.09	87.33	98.31	113.21
	Cash from operatng activities		134.19	171.47	138.50	393.01	462.62	496.82	549.38
	Investing cash flow								
	Investment in property and equipment		-	-		- 705.00			
	Cash from Investing activities					- 705.00			
	Financing cash flow					-			
	issuance(repayment) of debt								
	Cash from financing activities					650.00			
	Net cash flow		134.19	171.47	138.50	338.01	462.62	496.82	549.38
	Free cash Flow(FCF)								
	PBT		103.22	131.90	138.50	260.30	291.11	327.69	377.37
	Amortization / depreciation		-	-	-	105.75	89.89	76.40	64.94
	Interest					-			
	Investment (net)					- 55.00	-	-	-
	Change in working capital					- 51.14	- 5.71	- 5.58	- 6.14
	FCF		103.22	131.90	138.50	259.92	375.29	398.51	436.17

Source of above financial statements: RDCBSM

Annexure II

Detail of No. of Model per year (i.e. Current & Future) Industry-wise for all types of bicycle categories.																			
Sr. No. (I)	**Categories of Bicycles (II)**	**No. of Models / Year**																	
		AICMA INDUSTRIES																**Unorganized sector (X) (See Annex-IV)**	**TOTAL (XI)**
		HERO (III)		AVON (IV)			SK BIKE (V)		HERO ECOTECH (VI)		VISHAL CYCLE (VII)		Seth Industrial Co. (VIII)		TI Cycles of India (IX)				
		Current	**Future**	**Current**	**Future**	**Imported**	**Current**	**Future**	**Current**	**Future**	**Current**	**Future**	**Current**	**Future**	**Current**	**Future**	**Current**	**Future**	
1	**ROADSTER**	23	4	6	6	2	9	1	11	0	10	0	9	1	17	3	9	2	**113**
2	**MTB/CITY & TREKKING / YOUNG ADULT / RACING / BMX / EPAC**	41	17	34	41	27	34	4	83	19	20	9	34	4	33	14	228	88	**730**
3	**YOUNG CHILDREN**	17	10	23	15	16	15	2	51	53	6	3	15	2	13	8	153	101	**503**
4	**TOTAL**	**81**	**31**	**63**	**62**	**45**	**58**	**7**	**145**	**72**	**36**	**12**	**58**	**7**	**63**	**25**	**390**	**191**	**1346**

Note	
A	Total no. of current models to be tested on complete Bicycle Testing machine excluding cycle category of Young Children (i.e. 211; defind in Column XI at Sr. No. 3) = 1346-503 = 843
B	Total no. of current models to be tested on Dynamic fatigue Testing machine = 1346 (see column no. XI at Sr. no. 4)
(B^1)	Total no. of current models to be tested on Static & torque Testing machine = 1346 (see column no. XI at Sr. no. 4)
(B^2)	Total no. of current models to be tested on Impact Testing machine = 1346 (see column no. XI at Sr. no. 4)

Source: RDCBSM

Annexure III

	Annexure-III													Source: RDCBSM			
Detail of Machinery Required for Bulk Testing of Complete Bicycles and Bicycle Components as per ISO:4210/IS:10613-2023 and IS:15533/ISO:8098 (Current and Future Requirements) for AICMA and UNORGANISED SECTOR																	
Part - A	Total Number of Models for all categories of Bicycles to be get tested on complete Bicycle Road/Brake Performance testing machine per year. (See Annexure-I, Note "A" for quantity/nos. of bicycles detail)											**843**					
Sl. No.	**Type of machines to be used**	**Test name**	**Item/Component**	**Number of tests**	**Test duration (Hr)**	**Young Adult/Adult (IS 10613)**	**Young Children (ISO 8089)**	**EPAC Bicycles (Draft)**	**BMX Bicycles (Draft)**	**Required test Hrs per M/C per model testing (incl. loading/unloading time)**	**Total test hours required per M/C per year (VII x A)**	**Available working hours on machine per day in two shift (75% efficiency)**	**Total available machine hours per Year (IX * 300 days)**	**Total No. of machines required (excluding existing M/c of R&D Centre) VIII/X**	**Number of machines required (Round off Colum no. XI)**	**Presently available machines at R&D Centre** (See Note **"C")**	**Machines planed under MHI Project**	**Machines planned under UNIDO Project**	**Balance Machines except available at RDCBSM**
	II	**III**	**IV**	**V**	**VI**					**VII**	**VIII**	**IX**	**X**	**XI**		**XII**	**XIII**	**XIV**	**XV**
1	Complete Bicycle Road/Brake Performance testing machine	Brake performance test (dry/ wet Condition)	Complete Bicycle	5	1.5	4.4.13		4.3.5.9	4.8.7.2	15	12645	12	3600	3.5125	4	1	1	1	2
2		Back pedal brake performance test			1.5	4.4.11	4.7.8.3												
3		Hand-Operated Brakes performance test			1.5	4.4.10	4.7.8.1		4.8.7.3										
4		Brake thermal resistance test			1.5	4.4.13.8		4.3.5.10											
5		Complete bicycle fatigue test			6	ANNEX - M													

Part - B	Total No of Models of all categories of Bicycles to be get tested on Dynamic/Fatigue Testing Machine per year . (See Annexure-I, Note "B" for quantity/nos. of bicycles detail)										**1346**								
Sl. No.	**Type of machines to be used**	**Test name**	**Item/Component**	**Number of tests**	**Test duration (Hr) (See Note "D")**	**Young Adult/Adult (IS 10613)**	**Young Children (ISO 8089)**	**EPAC Bicycles (Draft)**	**BMX Bicycles (Draft)**	**Required test Hrs per M/C per model testing (incl. loading/unloading time) (See Note "E")**	**Total test hours required per M/C per year (VII xB)**	**Available working hours on machine per day in two shift (75% efficiency)**	**Total available machine hours per Year (IX * 300 days)**	**Total No. of machines required (excluding existing M/c of R&D Centre) VIII/X**	**Number of machines required (Round off Colum no. XI)**	**Presently available machines at R&D Centre** (See Note **"C")**	**Machines planed under MHI Project**	**Machines planned under UNIDO Project**	**Balance Machines**
	II	**III**	**IV**	**V**	**VI**					**VII**	**VIII**	**IX**	**X**	**XI**		**XII**	**XIII**	**XIV**	**XV**
6	Dynamic/Fatigue Testing Machine	Handlebar to stem assembly fatigue test	Handlebar	1	10 hours	4.5.7	4.8.6	4.3.6.7	4.9.8	25	33650	12	3600	9.347222222	9	1	2	1	6
7		Frame fatigue test with pedalling forces	Frame and fork Assembly	3	5 hours	4.6.4		4.3.7.4	4.10.4										
8		Frame fatigue test with vertical forces			5 hours	4.6.6		4.3.7.6											
9		Frame fatigue test with horizontal forces **(*)**			5 hours	4.6.5		4.3.7.5	4.10.5										
11		Front fork bending fatigue test	Fork	2	5 hours	4.7.6	4.10.2	4.3.8.6	4.11.4										
12		Fork for hub/ disc brake – repeated brake torque test			5 hours	4.7.7.3		4.3.8.7.4											
13		Chain wheel Crank assembly fatigue test	Chain wheel and crank	3	5 hours	4.10.9	4.12.6		4.14.7										
14		Saddle and seat pillar clamp fatigue test	Saddle and seat post		10 hours	4.9.5			4.15.6										
15		Seat-Post – Fatigue Test			5 hours	4.9.6.1	4.13.5												

Part - C	Total No of Models of all categories of Bicycles to be get tested on Impact Test Machine Testing Machine per year . (See Annexure-I, Note "B[1]" for quantity/nos. of bicycles detail)										**1346**								
Sl. No.	**Type of machines to be used**	**Test name**	**Item/Component**	**Number of tests**	**Test duration (Hr)**	**Young Adult/Adult (IS 10613)**	**Young Children (ISO 8089)**	**EPAC Bicycles (Draft)**	**BMX Bicycles (Draft)**	**Required test Hrs per M/C per model testing (incl. loading/unloading time)**	**Total test hours required per M/C per year (VII xB[1])**	**Available working hours on machine per day in two shift (75% efficiency)**	**Total available machine hours per Year (IX * 300 days)**	**Total No. of machines required (excluding existing M/c of R&D Centre) VIII/X**	**Number of machines required (Round off Colum no. XI)**	**Presently available machines at R&D Centre** (See Note **"C")**	**Machines planed under MHI Project**	**Machines planned under UNIDO Project**	**Balance Machines**
	II	**III**	**IV**	**V**	**VI**					**VII**	**VIII**	**IX**	**X**	**XI**		**XII**	**XIII**	**XIV**	**XV**
18	Impact Test Machine	Front fork rearward impact test	Fork	7	30 min	30 min	4.7.5		4.3.8.5	5	6730	12	3600	1.869444444	2	1	0	1	1
19		Frame and front fork assembly - impact test (falling mass)	Frame and fork		30 min	30 min	4.6.2	4.9.1	4.3.7.2										
20		Frame and front fork assembly - impact test (falling frame)			30 min	30 min	4.6.3	4.9.2	4.3.7.3										
21		Pedal - spindle impact test	Pedal		30 min	30 min	4.10.4	4.12.3											
22		Handlebar/stem assembly impact test	Handlebar		30 min	30 min													
23		Wheel/tyre assembly – Impact test	Wheel tyre assembly		30 min	30 min													
24		Plastic pedal impact test	Pedal		30 min	30 min													

Part - D	Total No of Models of all categories of Bicycles to be get tested on Static and Torque Testing Machine per year. (See Annexure-I, Note "B^2" for quantity/nos. of bicycles detail)												**1346**						
Sl. No.	**Type of machines to be used**	**Test name**	**Item/Component**	**Number of tests**	**Test duration (Hr)**	**Young Adult/Adult (IS 10613)**	**Young Children (ISO 8089)**	**EPAC Bicycles (Draft)**	**BMX Bicycles (Draft)**	**Required test Hrs per M/C per model testing (incl. loading/unloading time)**	**Total test hours required per M/C per year (VII xB^2)**	**Available working hours on machine per day in two shift (75% efficiency)**	**Total available machine hours per Year (IX * 300 days)**	**Total No. of machines required (excluding existing M/c of R&D Centre) VIII/X**	**Number of machines required (Round off Colum no. XI)**	**Presently available machines at R&D Centre** (See Note **"C")**	**Machines planed under MHI Project**	**Machines planned under UNIDO Project**	**Balance Machines**
	II	**III**	**IV**	**V**	**VI**					**VII**	**VIII**	**IX**	**X**	**XI**		**XII**	**XIII**	**XIV**	**XV**
25	Static and Torque Test Machine	Handle – stem assembly lateral bending test	Handlebar	20	30 min	30 min	4.5.6.2	4.8.5.1	4.3.6.6.1	16	21536	12	3600	5.982222222	6	1	0	1	5
26		Handle – stem forward bending test			40 min	40 min	4.5.6.3	4.8.5.2	4.3.6.6.3										
27		Handlebar to handlebar stem torsional security test			30 min	30 min	4.5.6.4	4.8.5.3	4.3.6.6.4										
28		Handlebar stem to fork stem torsional security test			30 min	30 min	4.5.6.5	4.8.5.4	4.3.6.6.5										
29		Aerodynamic extensions to Handlebar – Torsional Security Test			30 min	30 min	4.5.6.7		4.3.6.8										
30		Handlebar – stem lateral bending test			30 min	30 min	4.5.6.1		4.3.6.6.2										

31		Bar – end to handlebar torsional security test			30 min	30 min	4.5.6.6		4.3.6.6 .6											
32		Front fork static bending test	Fork		30 min	30 min	4.7.4		4.3.8.4											
33		Fork for hub/ disc brake – static brake torque test			30 min	30 min	4.7.7.2		4.3.8.7											
34		Tensile test for non – welded fork			30 min	30 min	4.7.8		4.3.8.8											
35		Wheel/ tyre assembly static strength test	Wheel tyre assembly		30 min	30 min	4.8.3	4.11.3	4.3.9.3											
36		Drive system static strength test	Complete Bicycle		40 min	40 min	4.10.6	4.12.5												
37		Pedal/ pedal – spindle assembly - static strength test	Pedal		30 min	30 min	4.10.3													
38		Saddle - static strength test	Saddle and seat post		30 min	30 min	4.9.4	4.13.4												
39		Saddle/ seat pillar security test			30 min	30 min	4.9.3													
40		Suspension Frames - Tyre Clearance test	Frame		30 min	30 min	ANNE X - F													
44		Wheels — Front/rear wheel retention	Wheel tyre assembly		30 min	30 min	4.8.4.3	4.11.4. 2/ 4.11.4. 3	4.3.9.5 .2											

		devices secured																	
45		Wheels — Front/rear wheel retention devices unsecured			30 min	30 min	4.8.4.4	4.11.4.4	4.3.9.5.3										
48		Seat Post — static strength test	Seat Post		30 min	30 min	4.9.6.5												
49		Seat-pillar clamp - Static test			30 min	30 min													
	Note:																		
	C	R&D Centre have above mentioned four machines for column-II mentioned test parameters of bicycle testing. These machines is in operation since 2017 (i.e. 07 years old). Therefore, considering age and condition of these machines; these machines will be kept exclusively for non-mandatory testing workload.																	
	(*)	Frame Fatigue test with Horizontal Forces test performed on separate station so, no need to add that hour in total																	
	D	Test hours calculated by taking test frequency 6Hrz.																	
	E	The value given at column VII i.e. 25 hours is calculated by taking in consideration two cylinders/stations working simultaneously at a time. So, testing hours reduced from 50 hours to 25 hours.																	
	Calculation Base:-	**Adult**								**Kids**									
	Test Name	Handlebar to stem assembly fatigue test	Frame fatigue test with pedalling forces	Frame fatigue test with vertical forces	Front fork bending fatigue test	Chain wheel Crank assembly fatigue test	Saddle and seat pillar clamp fatigue test	Seat-Post – Fatigue Test	Total Test Hours	Test Name	Handlebar to stem assembly fatigue test	Front fork bending fatigue test	Chain wheel Crank assembly fatigue test	Saddle and seat pillar clamp fatigue test					
	Test Hours	10	5	5	5	10	10	5	50	Test Hours	10	5	5	5					
	No Hr required for testing	843(Models) x 25(Hrs)= 21075 hrs								Total Test Hrs		25							
	Available hr and machines	16075(hrs)/ 3600 = 5.85								Available hrs		503 (models) x 12.5 hrs = 6,288							
	Total required Testing m/cs	5.85								Total required testing m/c		1.75							