

P1 - Internship at Tractors and Farm Equipment Limited



IDC
IIT Bombay

R . S . Mahesh
176390009
(2017-2019)

Contents

S.No	Topic	Page No
1	About TAFE	1
2	Declaration	2
3	Acknowledgment	3
4	Internship Certificate	4
5	Upgradation of AM series tractor	5
6	Side guard LH / RH and binnacle bottom cover	6
7	LH and RH Console	10
8	Floor mat pattern	13
9	EHH console orchard series	16



TAFE – Tractors and Farm Equipment Limited, is an Indian tractor major incorporated in 1960 at Chennai, with an annual turnover of INR 93 billion (2014-15). The third-largest tractor manufacturer in the world and the second largest in India by volumes, TAFE wields about 25% market share of the Indian tractor industry with a sale of over 150,000 tractors (domestic and international) annually.

TAFE's partnership with AGCO Corporation and the Massey Ferguson brand for over 58 years is a stellar example of its commitment to building long-term relationships with its stakeholders, through fair and ethical business practices. TAFE is also a significant shareholder in AGCO Corporation, USA – a US \$8.3 billion tractor and agricultural equipment manufacturer.

TAFE has earned the trust of customers through its range of products that are widely acclaimed for quality and low cost of operation. A strong distribution network of over 1000 dealers effectively backs TAFE's four iconic tractor brands – Massey Ferguson, TAFE, Eicher and the recently acquired Serbian tractor and agricultural equipment brand IMT – Industrija Mašina i Traktora. TAFE exports tractors, both in partnership with AGCO and independently, powering farms in over 100 countries which include developed countries in Europe and the Americas.

Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any Violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited of from whom proper permission has not been taken when needed.

R.S.Mahesh
176390009
Mobility & Vehicle Design

Acknowledgement

I would like to sincerely thank Mr. S. Sriraman, Senior Vice President R&D, for giving the opportunity to work for TAFE during my internship and thank Mrs. Thangamalar, Manager FVPA team for coordinating with vehicle team. Thanks to all the employees at TAFE who supported me during my internship.

Certificate



Tractors and Farm Equipment Limited
Huzur Gardens, Sembiam
Chennai - 600 011, Tamil Nadu, India
T: + 91 44 6692 3500
F: + 91 44 2537 5865
E: corporate@tafe.com
CIN No: U29129TN1960PLC004337
tafe.com

Registered Office:
861, Anna Salai, Chennai - 600 002
T: +91 44 2841 5441/ 2858 4918

03rd July 2018

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr Mahesh R S**, student of M Des Mobility and Vehicle Design program IIT Bombay, has successfully completed his project internship with our Research & Development department, between 14th May 2018 and 30th June 2018.

During his tenure, he was found to be sincere and industrious.

We wish him the best in his future assignments.

For Tractors and Farm Equipment Limited

A handwritten signature in blue ink, appearing to read "Anitha N".

Anitha N
Deputy Manager – HR



Upgradation of AM series open field tractor for Tractors And Farm Equipment

AM series open tractor is a 4WD platform tractor. TAFE is upgrading this tractor with modified side guards, additional consoles with additional features.



Parts to be upgraded

1. Side guard LH and RH matching with binnacle bottom cover
2. EHH (Electronic hydraulic hitch) Console with inclined combi switch
3. Handbrake lever console
4. Floor mat pattern
5. EHH console for AM orchard series

**Side guard LH / RH
and
Binnacle bottom cover**

Existing

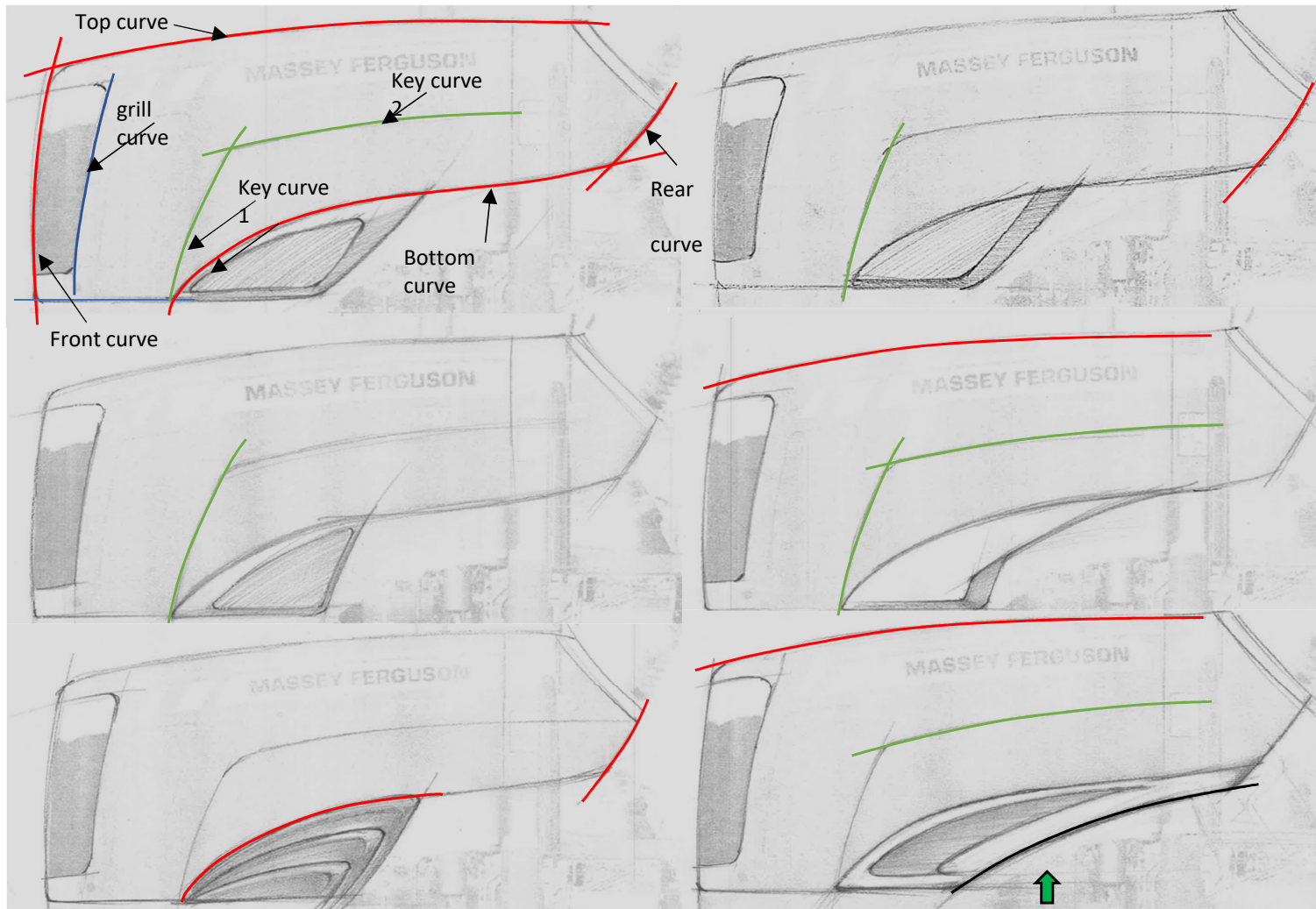
Design Requirements - Side guards and Binnacle bottom cover

P.No	A	B	C	D	E	F
	Current issue	Aesthetic Requirement	Functional Requirement	Manufacturing Requirement	Assembly and service Requirement	Limitation
1	Styling to be improved	Side Guard design Should follow the existing hood style	Should cover the descent amount of chassis	Guards and binnacle cover parts will be Injection moulded	Should be multiple piece construction for the ease of service points	Cant modify hood and binnacle design
2	Guard design and binnacle bottom cover design not blending with each other	Guard design and binnacle bottom cover should blend with each other	Grill should be provided for non Europe market for better cooling efficiency	Avoid negative surface for tool ejection		DOC position cant be modified in RH side, hence the new guard should have hump to clear the DOC
3	DOC hump not looking good	Avoid mountings on styling surfaces	Non Grill version also to be designed as a variant for Europe market (Noise compliance)	Consider the split lines		Fuel filter position cant be modified in LH side, hence the new guard should have hump to clear the filter
4	Filter hump on the guard not looking good		Cut out to be provided for pendent pedals			
5			Sufficient clearance should be provided between pedal pads and binnacle bottom cover			
6			Battery Isolator should be provided in LH guard area			

Considering all design requirement, concept sketches are made

Concept sketches

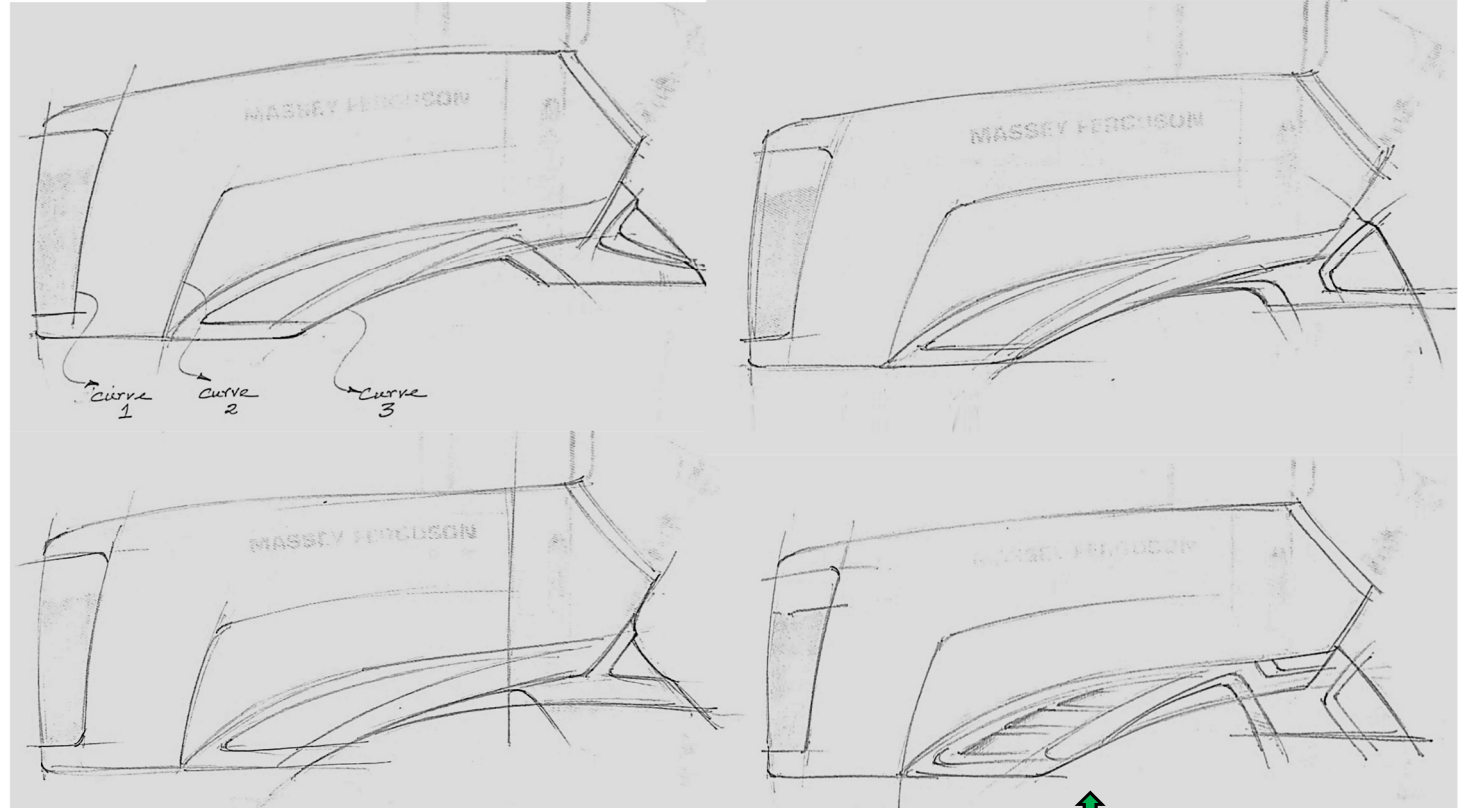
Following the hood form and curves



- The whole silhouette looks voluminous and complete
- The feature inside follows the hood form direction and curves

Proposal

Bottom binnacle cover – Form of protrusion



- The bottom cover shape looks like new protruding form popping out from hood form
- As a whole the design gives more stability feel
- The binnacle bottom cover simple features follows the hood binnacle curves also provide clearance for pendant pedals

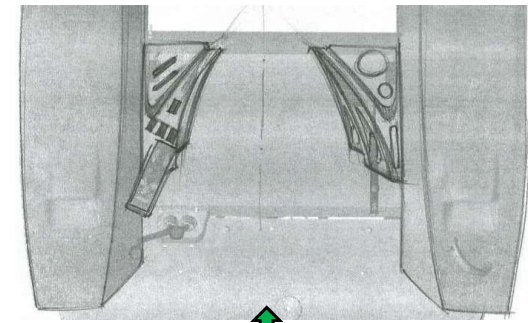
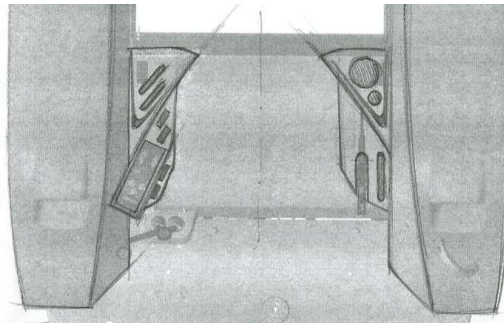
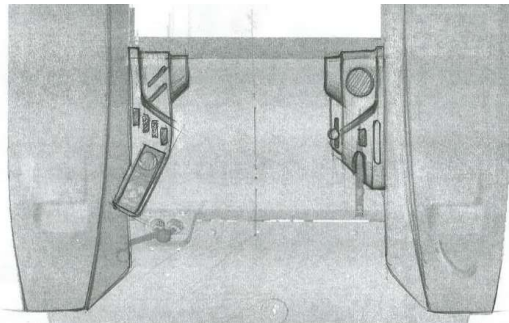
**EHH console (LH side)
and
Hand brake lever console (RH side)**

Design Requirements - EHH console

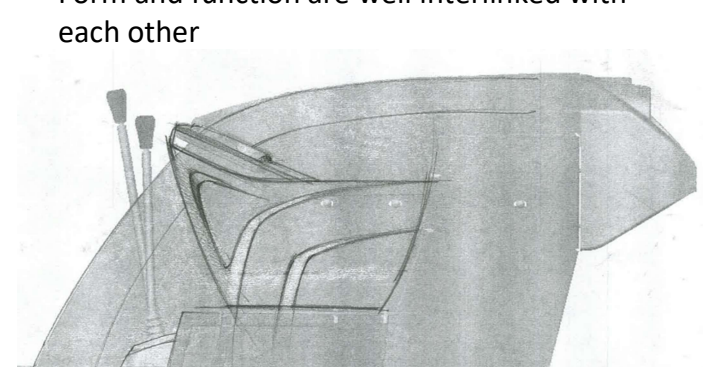
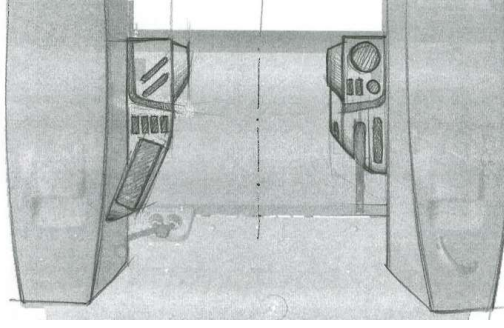
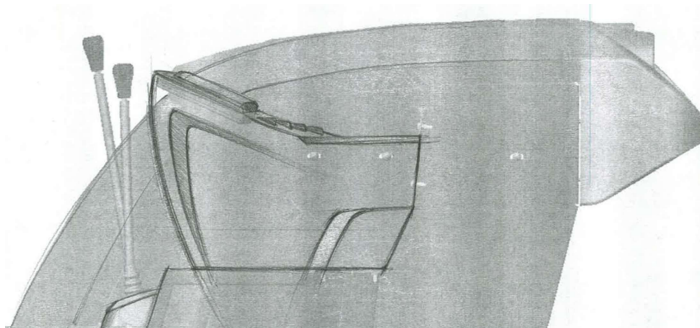
P.No	A	B	C	D	E	F
	Current issue	Aesthetic Requirement	Functional Requirement	Manufacturing Requirement	Assembly and service Requirement	Limitation
1	EHH console looks very mechanical and simple	LH and RH console should have same design language	5 rectangular switch to be provided	Console will be Injection moulded	Easy to remove the console (fasteners should be reachable)	Seat deck cannot be modified
2	There is no Console for hand brake lever	Avoid mountings on styling surfaces	1 EHH combi switch to be positioned in inclined manner for better ergonomics	Avoid negative surface for tool ejection	Dust should not get collected over the consoles	EHH combi switch position cannot be relocated as the current location is for better ergonomics
3	PTO lever has no console		2 slots to be provided for spool valve actuation levers	Consider the split lines		Hand brake lever, PTO lever cannot be modified
4	No mobile charging port and mobile holder in current design		Provide features like mobile charging port, mobile holder, cigar lighter, ash tray, cup holder, etc..			Fender to fender inside dimension cannot be increased
5			Lift arm pocket in rear shield to be moved to consoles to simplify the rear shield design			Fender cannot be modified
6			Charging port and Cigar lighter port should have rubber cap to avoid water entry			

Considering all design requirement, concept sketches are made

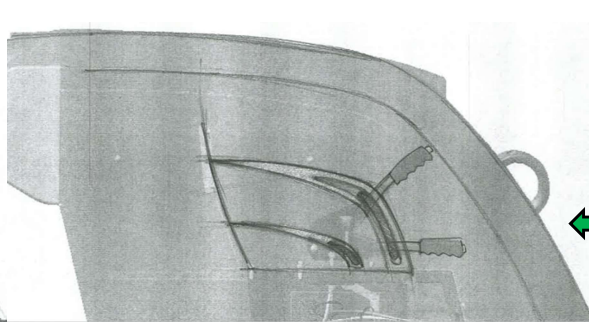
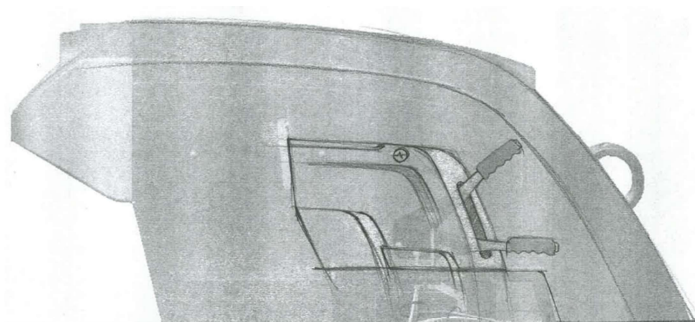
Concept sketches



- Form and function are well interlinked with each other



- The console outer profile follows the fender outer profile and it has the design feature like wider chamfer at the root and gradually decreases at the tail



Floor Mat Pattern

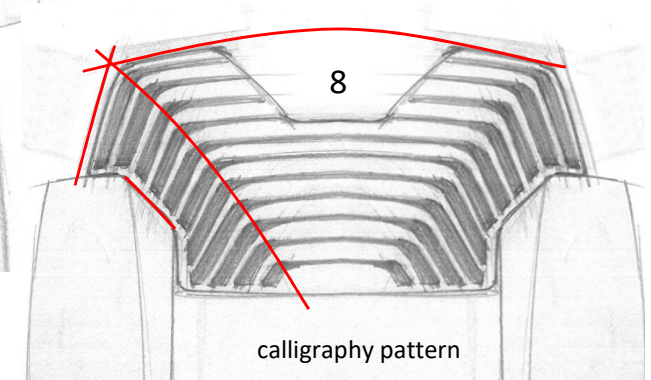
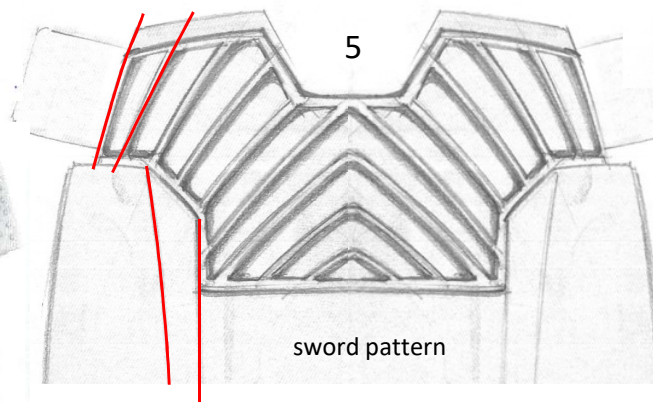
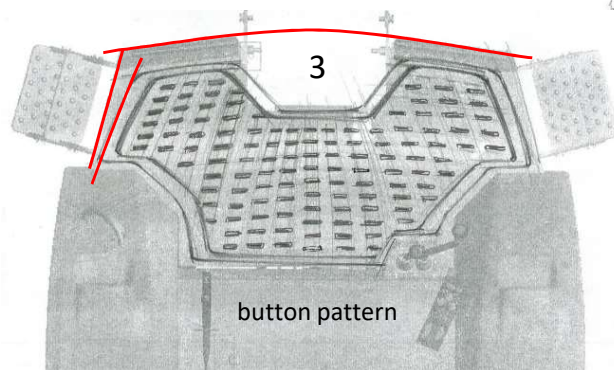
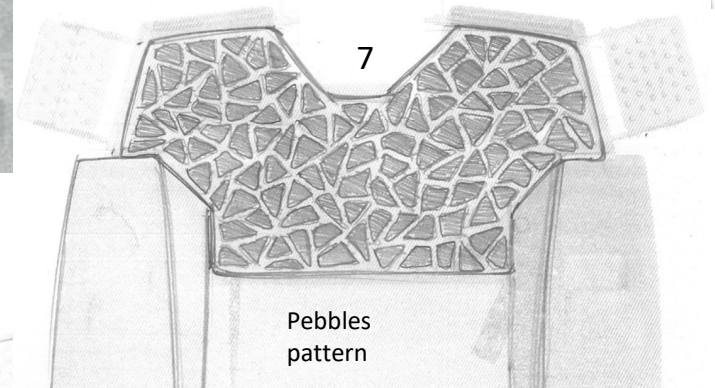
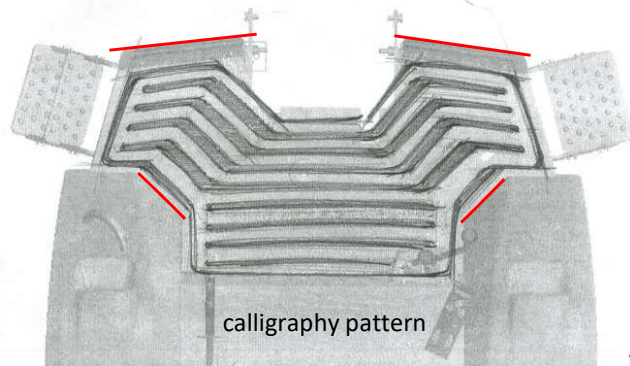
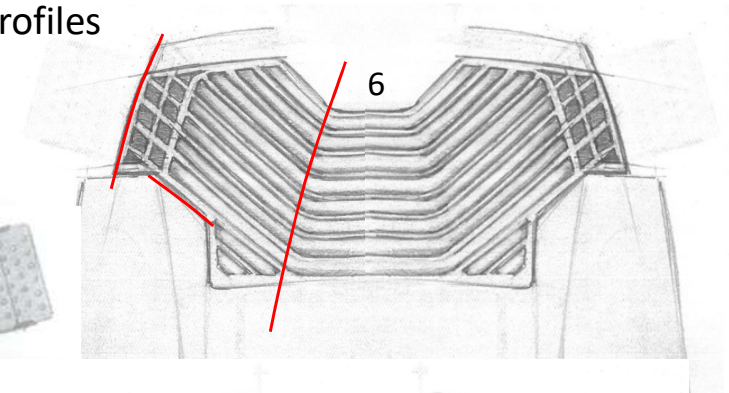
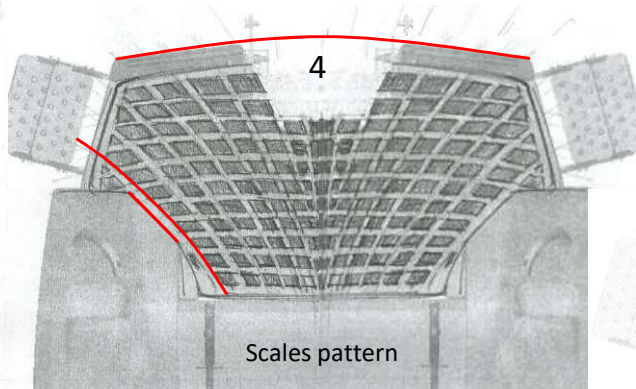
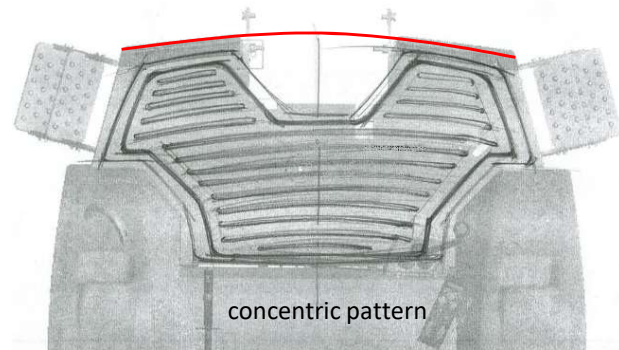
Design Requirements - Floor mat

P.No	A	B	C	D	E	F
	Current issue	Aesthetic Requirement	Functional Requirement	Manufacturing Requirement	Assembly and service Requirement	Limitation
1	Existing pattern has very straight line patterns	Exclusive pattern to be designed	At the entry the grip pattern should be more effective to avoid slipping off while stepping in and out	mat will be made by compression moulding	Easy to remove the mat for cleaning (fasteners should be reachable)	foot step, fender cant be modified
2	longitudinal straight line are slippery for the user	Avoid mountings on styling surfaces	While operating the pedals the pattern should be cross against longitudinal direction	provide checked ribs under the mat for cushion effect	while water wash the mud should easily flow thru the pattern gap	throttle pedal slot cant be relocated
3			Pattern should not have closed pockets to avoid dust collection and water clogging	Consider the split lines		
4			Pattern depth should be deep enough for better gripping	should be single piece		
5			wide gap should be provided between pattern to avoid mud accumulation			
6			No sharp edges to avoid edge breakage			

Considering all design requirement, concept sketches are made

Concept sketches

Following the fender and foot step profiles



Electrical Hydraulic Hitch console for orchard series

Existing

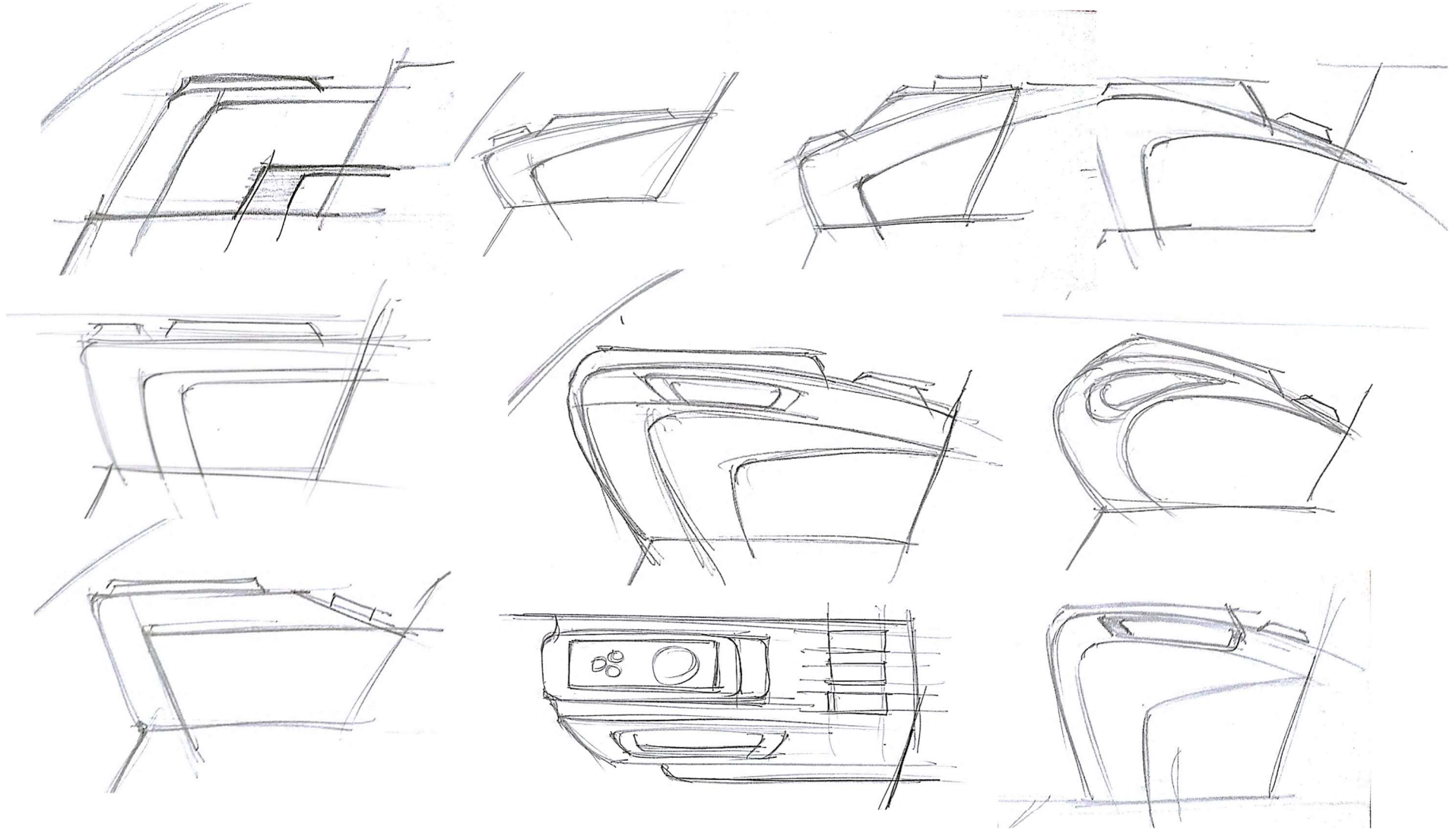
Design Requirements - AM orchard series EHH console

P.No	A	B	C	D	E	F
	Current issue	Aesthetic Requirement	Functional Requirement	Manufacturing Requirement	Assembly and service Requirement	Limitation
1	EHH console looks very mechanical and simple	Should look modern. In future the same console will be commonised across all basic EHH tractors	Should satisfy the ergonomic requirement	console will be injection moulded	Eassy to remove the console (fastners should be reachable)	Seat deck cannot be modified
2	EHH combi switch to be moved forward and the individual switch to be moved rear for better ergonomics	Avoid mountings on styling surfaces	1 EHH combi switch to be accomodated in horizontal position	Avoid negative surface for tool ejection	Dust should not get collected over the consoles	EHH combi switch position cannot be relocated as the current location is for better ergonomics
3			5 individual switch to be protected	Consider the split lines		

Considering all design requirement, concept sketches are made

Concept sketches

Considering all the basic EHH console requirement and commonisation





Thank You

