Project 1 Report: Summer Internship at

Outdoor Play-Space : Design & Phase I Implementation

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DECLARATION:

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

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APPROVAL FORM:

The project titled "Sishu Vihar Outdoor Play Space: Design & Phase I Imlpementation" by Paulanothony George & Gourab Saha is approved for the partial fulfillment of the requirement for the degree of Master of Design in Product Design.

Guide:

Internal examiner:

Date:

ACKNOWLEDGMENTS

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To Industrial Design Centre for giving us this opportunity.

Most of all we thank the children of Sishu Vihar and Prof Purba Joshi, our guide for inspiring us and helping us find our inner child.

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Overview of Sishu Vihar Outdoor PlaySpace Design
(Part of PDII Course - Prelude to Project I)

1.1 Introduction

Young children bear many gifts which are pure and unadulterated. Between the ages of 4 and 10 years, before being pushed into class rooms and other sterile environments, they love the opportunity to run in open spaces and be a part of nature.

It is the age that they begin to exercise their imagination and bodies simultaneously, hence the spaces and scenarios that they are in have to be easy to manipulate.

Our concepts and ideas for the play space in Sishu Vihar, IIT Bombay, is keeping in mind the distinct ecosystem that is IIT Bombay and within other constraints that have strengthened rather than limit the outcome of the project.

1.2 Sishu Vihar - An Overview

The Sishu Vihar building is a bungalow amongst a series of bungalows situated in the IIT Bombay, Powai campus.

As a foundation it is a crèche and a day care unit formed as a decision by the IIT Staff Club in 2001.

Currently there are close to 100 children and 20 caretakers excluding 3 administrators in an indoor space meant for a family of six.

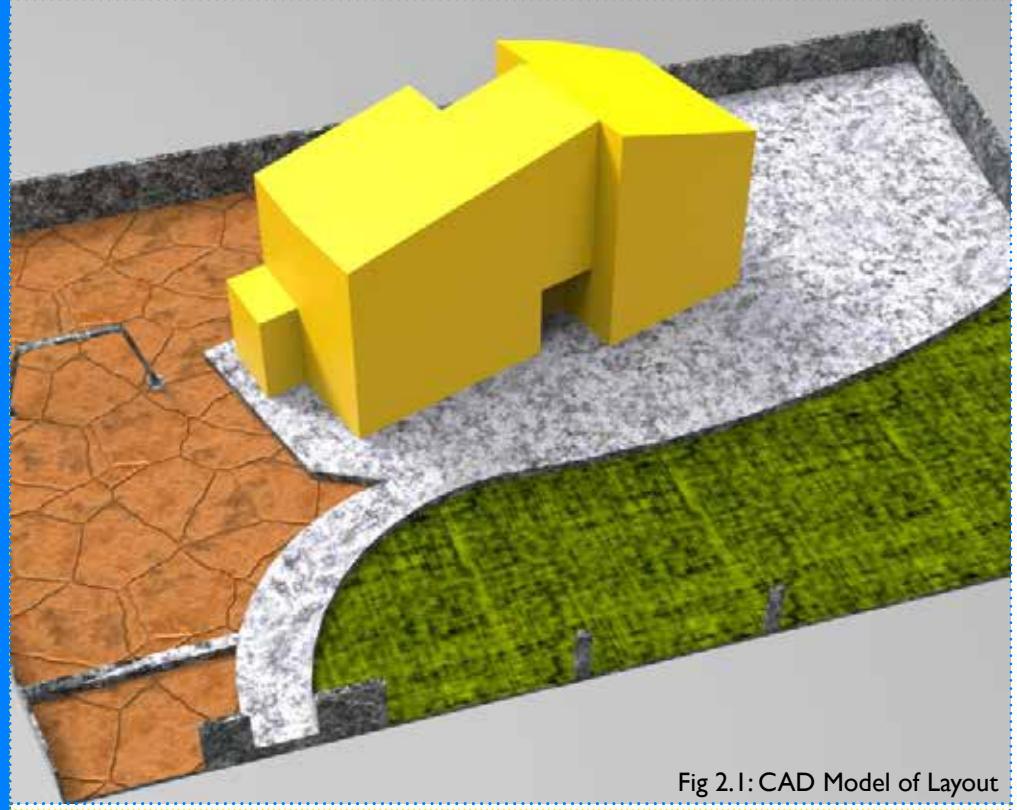


Fig 2.1: CAD Model of Layout

Time	Activity
8:15 to 9:15	Sishu Vihar opens
9:30 to 10:15	Assembly and prayers
10:15 to 10:30	Morning fruits and snacks
10:30 to 10:55	Batch1 outdoor playtime/ Indoor
11:00 to 11:30	Batch2 outside playtime/ Activities
11:30 to 12:00	Batch3 outside playtime/ Class
12:00 to 12:40	Kiddies lunch/ Caretakers lunch in shifts
1:00 to 2:00	Caretakers lunch in shifts
2:00 to 4:00	Nap time for some/ Self time/Reading
4:00 to 4:30	Evening snacks + Milk
4:30 to 6:00	Arts and crafts, dance class, Music class

Fig 2.2: A Day in the Life

2.0 Field Study - The Current Scenario

Sishu Vihar does not have a proper signage that advertises it exists in the vicinity, the first thing one notices about the place which is distinct are the barbed wire fences and the overall unkemptness of the plot.

The outdoor spaces can be divided into four areas; to the right side upon entering is a patch of land that has grass growing on it, which is currently the only area that has carpet grass growing. It is being used by the children to play cricket. Adjacent to this area is a patch of land with a concrete surface. It is here that the children run and play most of their games. To the left at the entry is a section of land which has a bird bath hidden by tall plants. The land is barren and uneven; the connecting section to the left and the back of the building is one where there are a lot of trees growing on cracked earth.

The children are given a pre-fabricated plastic slide set and mini scooters, which can be pulled back in when not in use. When kept outside for play in the morning to pre-noon time, these get sufficiently hot to do some damage just by the hot surfaces. Also the slides don't have a proper base, so one of the caretakers generally puts a mat underneath the slide.

he wall opposite the house consists of stones cemented together and is devoid of any colour other than grey. Due to lack of sand and other material that they can manipulate during play time, some of the children are observed to break and dig up the concrete.

The left side of the house is seldom used and children are also not encouraged to play on this side due presence of snakes and other insects. According to the current scenario, the space inside is congested during lunch time as children of all age groups are brought together. The children are grouped into 3 age groups viz. 2-4 year olds, 5-7 year olds and 8-10 year olds. But to contain the energy levels of all age groups under one roof all at the same time is a strenuous effort on the part of the supervisors. They have to constantly make sure the children are quite and not invading another child's personal space which can result in conflicts. The back side of the house is used for activities with clay, here the children assemble outside and roll the clay on concrete slabs used to cover the gutter below.

The basic schedule of Sishu Vihar as understood during the study is tabulated alongside.

Fig 2.3 Sishu Vihar : Front View

Fig 2.4 Sishu Vihar : Rear View

3.0 DESIGN OBJECTIVE & DESIGN BRIEF

Design Objective

To design an outdoor play space for the children of Sishu Vihar, IIT –Bombay.

Design Brief

To design an outdoor play space for the children of Sishu Vihar, IIT –Bombay that adheres to the check points:

- ☐ Have spaces and scenarios that are not injurious to playing children.
- ☐ Is conducive to learning by playing and exploring.
- ☐ Is easy to supervise.
- ☐ Attracts children to playing outdoors.

Fig 4.1 Key Spatial Elements

Fig 4.2 Layout Design

4.1 Identifying Key Spatial Elements

After clustering our ideas into close-affinity groups , we identified the basic elements that should constitute the layout of Sishu Vihar's outdoor play-space :

I. Spaces for Tactile Play

II. Spaces for Creative Play

III. Spaces for Role Playing

IV. Spaces for Experiential Learning

V. Open Spaces -

These basic spaces are shown along with typical examples alongside.

4.2 Layout Design Considerations

The layout of the various elements in the play space were logically positioned as per architectural guidelines for design layout of play-lots. The following points reflect upon how these guidelines were implemented into the layout design for Sishu Vihar's outdoor play-space.

1) The Tree-Den & Sandpit Area are positioned near the entrance ,children will tend to move more slowly towards equipment that limits participation & requires taking turns [eg. Swing set], thereby modifying the load factor & reducing conflicts. The space is surrounded by a low enclosure [tree stump lining] to discourage intrusion by animals, prevent thoroughfare & provide adequate visibility for supervision.

2) The sand area is located away from swings and slides for safety and to promote a creative atmosphere.) The 3 trees that run through the tree-den provide natural shade to the toddlers as they play & limit heating of the structure. The sand pit is also canopied to provide shade and prevent flooding.

3) Defined play-areas like the experiential learning space , role playing space are bounded by hedges with spaces for safe and orderly movement across the play space. The main play spaces are defined so as to promote smaller, more manageable playgroups that are easier to supervise. The experiential learning space is positioned away from the central play space to cater for a quieter atmosphere.

Fig 5.1 Tree Den Area

Fig 5.2 Scale Model

5.1 Tree Den - Design Details

The tree den is a climbing structure that accommodates children at 3 different heights (under lower deck , lower deck and upper deck). It is primarily designed as a structure that promotes tactile development of the child, such as balance , eye-limb coordination.

Railings are provided around the periphery of both decks with openings for orderly entrance and exit in single file. The tree den is accessible via fixed ladders with double railings inclined at about 45 degrees to the horizontal.

Railings have been provided at 2 different heights in order to accommodate for both the 5th Percentile (2 yr old) and 95th (10 yr old) percentile. The formal language of the railings and deck are reminiscent of a cruise ship / watch tower to encourage imaginative role-playing .

The lower deck is placed 1m above ground level (95th percentile , sitting erect height + Clearance) so that children may crawl and sit beneath the deck. 3 existing trees have been integrated into the tree den structure (not as structural members) in order to provide natural shade to the playing children and limit heating of equipment.

The structural members are made from pultruded FRP tubes , which are practically weather proof and can be impregnated with colour (no paint flaking).

The slightly higher initial cost in comparison to GI pipes may be justified in terms of minimal maintenance cost in the long run.

Wood and Aluminium composites have been considered as decking materials. Architectural standards suggest a minimum thickness of 25mm and maximum width of 6 inches must be maintained for decking in wood.

The tree den is positioned within the sand area as a safety measure to prevent injury. Dynamic equipment such as slides and swings have been omitted in the tree-den area to prevent collisions and maintain a creative atmosphere in the adjacent sand area.

Fig 5.3 Sand Pit

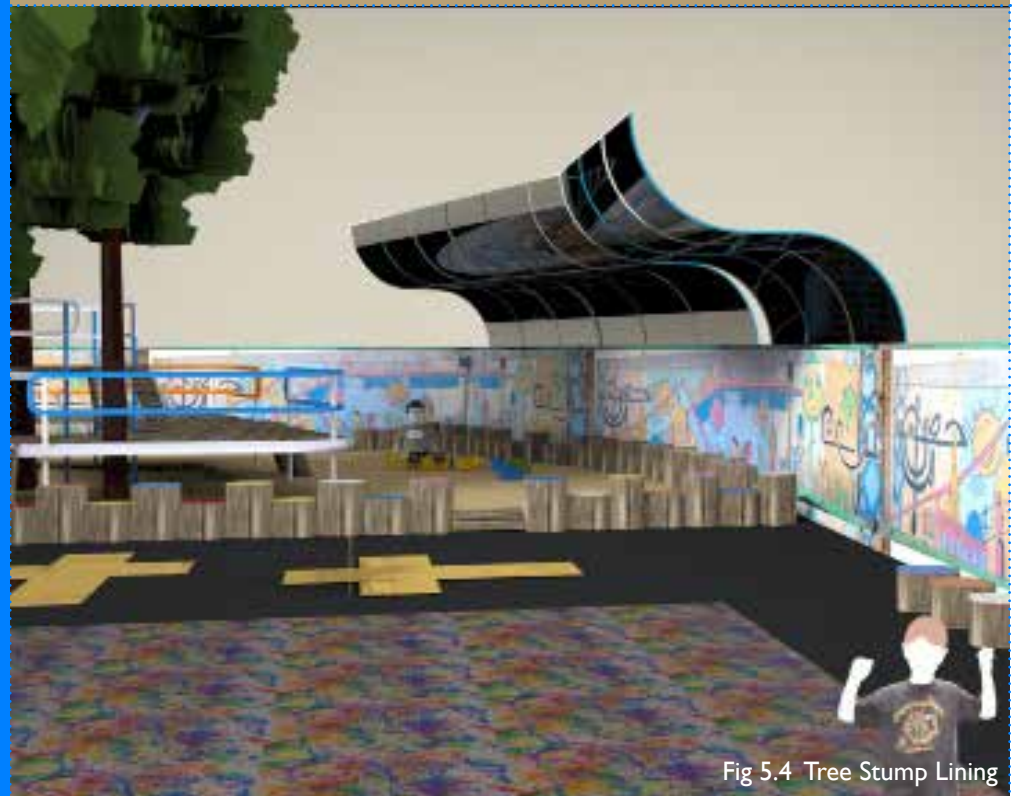


Fig 5.4 Tree Stump Lining

5.2 Sand Area

Sand-pits are amongst the most favoured play elements for pre-school children. Mouldable medium such as sand allows them to develop their creativity as well as develop their motor skills through the use of simple tools such as plastic spades and buckets.

The sand pit is bounded by tree stumps of varying diameters and sizes [approx. 1ft height & dia]. Adjacent sides of the tree stumps may be cemented in order to prevent erosion of sand from the pit.

The tree-stumps surrounding the sand pit are stationary and may serve as stools during an outdoor story telling session or as balancing platforms during play time.

The tree-stumps required for the periphery of the sand pit may be procured from within the IIT-B campus , and must be treated to prevent rot & weathering before it can be used. The top face of the tree stumps are filleted and painted to provide a safe and aesthetic surface.

Canopies are provided to prevent flooding of the sand pit during monsoons and to shield children from the glaring sun during summers.

Adequate drainage must be provided in the sand pit for water to escape. It is suggested that the sand-pit should be covered when not in use to prevent intrusion by animals.

Fig 5.5 Role Playing Area

Fig 5.6 Scale Model

5.31 Vehicles

Open space with grass has been planned for the majority of this area for playing outdoor sports like cricket. The area is bounded by hedges of 1m height to create a defined contour for easy supervision and preventing traffic flow to the concrete picking up area.

An auto-rickshaw body and a bajaj chetak scooter body placed in this area must have their interior surfaces child-proofed and painted with weather resistant paint in blue , white and orange.

These vehicles will serve as role playing elements for the children to engage in unsupervised. FRP paint from Chemtreat has been suggested for use to weather proof the vehicles against Mumbai's extreme climate.

5.32 Tube Tunnel

Originally inspired from tyre tunnels , the tube tunnel is made of a series of lifebuoys that are wrapped in cargo netting to provide a swinging sort of motion when the children climb through the tunnel.

Lifebouys are used instead of tyres as they pose no threat of snakes / rodents hiding inside, are weather resistant and large enough to fit even the older children through their inner diameter
(24 in.)

Fig 5.7 Birdbath

Fig 5.8 Experential Area

5.4 FINAL CONCEPT DETAILS - ACTIVITY AREA IV

5.41 Bird Bath & Bird Houses

We believe a healthy interaction with the natural surrounding is one of the key elements a 21st century child misses out upon growing up. This quieter area of the play space, away from the noise of the main play area aims to promote this type of experiential learning for the children at Sishu Vihar.

IIT Bombay is rich with a variety of birds available on campus throughout the year. The existing front porch on the left of the entry gate has bird-bath that can be restored to a useable condition by landscaping the area.

Bird seeds & water in the bird bath will encourage birds to stop by in this area of Sishu on a regular basis. Birdhouses can also be procured and mounted on a few of the many existing trees in Sishu Vihar .

5.42 Veggie Patch & Flower Garden

A vegetable patch and flower garden has also been planned in the experiential learning area so that children can plant , learn about and watch plants and vegetables grow physically.

Choice of flower and vegetable species that are relatively fast–growing are advisable to spur continuing interest in the children.

The vegetable patch and flower garden should be pretty simple to set-up with the help of an experienced gardener. Additional plastic tools such as spades may have to be provided in the area so children can get involved.

Fig 5.9 Landscaping Elements

Fig 5.10 Fencing

5.5 FINAL CONCEPT DETAILS : MISCELLANEOUS ELEMENTS

5.51 Picket Fencing

Picket fencing that are contoured to the shape of colour pencils have been planned on the front periphery of Sishu Vihar.

The fencing would be approximately 1.3 m in height and would be coloured / stained in white , blue , yellow , orange and red.

Using bright colours for fencing creates a playful visual that children respond to, as well as caution drivers that an children's area exists.

5.52 Gate

A sliding gate that may be locked at different positions has been planned to allow for only pedestrian entry during working hours.

The gate may also be slid along the rail underneath to allow access to a construction trucks for example.

5.53 Hedges

The use of hedges as supplementary planting creates contours for defined areas in the play space and hence results in a more organised traffic flow through gaps.

Additionally the hedges act as a boundary against the hard concrete area that may cause injury to falling children.

5.54 Landscaping

The large area behind the Sishu Vihar building has been deemed unsafe for children to play in due to the abundance of snake and rat holes , hard jagged surfaces , poor visibility etc. .

Major landscaping activity must occur in this area before it can safely be used by playing children.

Design Validation

We presented our final concept to a panel of Professors as part of our end of semester coursework. The following feedback was noted for further refinement:

"The play-space design lacks the feel of an integrated concept , visually the various elements come across as ***patchy.*** *The overall visual language of the play-space lacks harmony amongst the various elements."*

"Children are attracted to playful ,wacky , emphasized play elements , the current design lacks the ***"wow" factor*** *children are attracted to."*

"One must carefully consider the ***socio-cultural aspects*** *of integrating vehicles like an auto-rickshaw into the play-space , the auto generally has 1 driver and 3 passengers. We must avoid creating situations that may be misinterpreted in terms of social hierarchy amongst the users."*

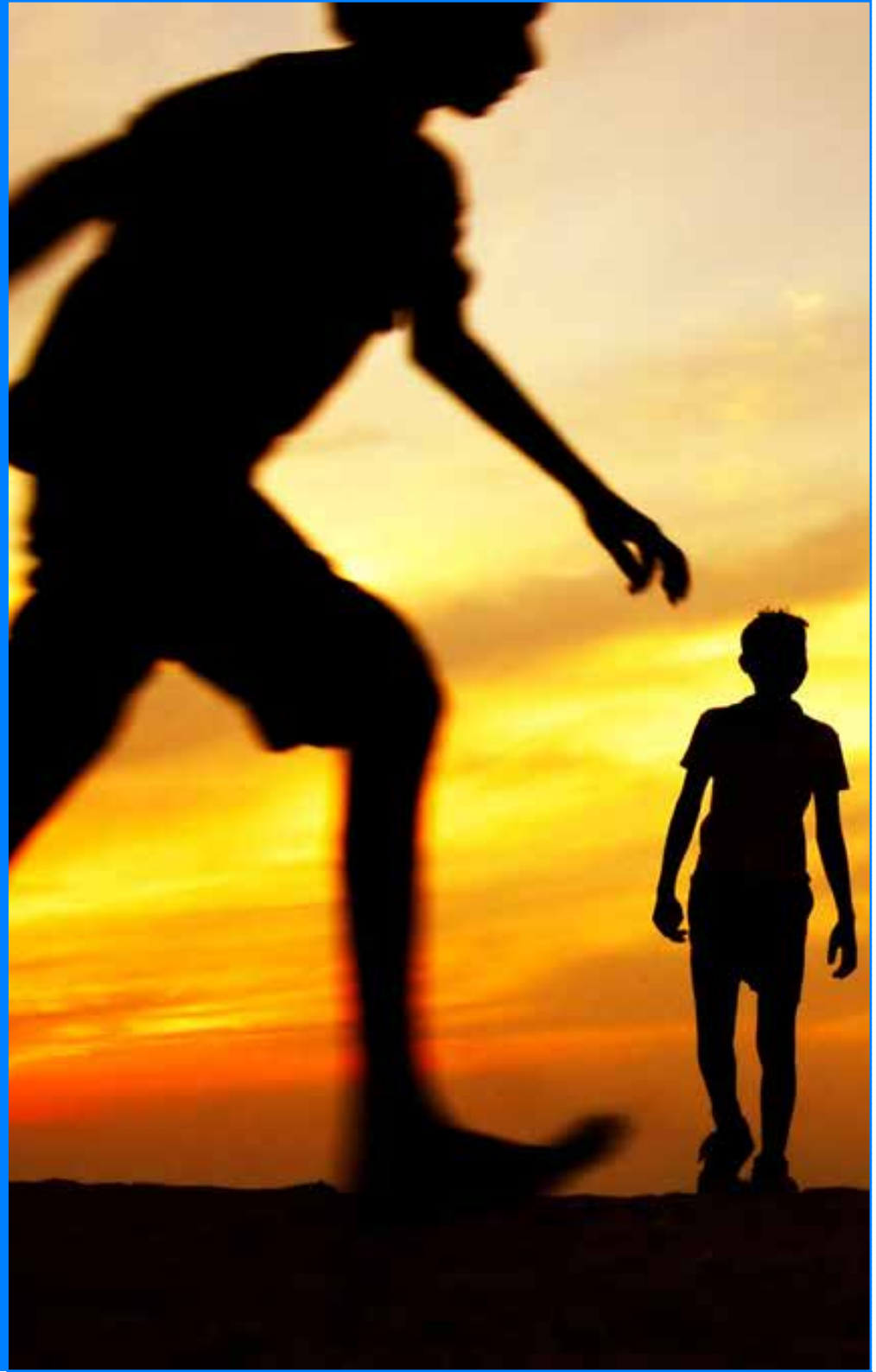
"Children love ***music*** *,the current design has missed an opportunity to incorporate elements that cater to their musical tendencies."*

"The overall design comes across as very safe , ***novelty*** *seems to be missing*

Stake-Holder Feedback : Sishu Vihar Commiittee

"There is some space for improvement , however overall I'm impressed with the play-space design and am optimistic to initiate an initial phase of implementation of the design at Sishu Vihar."

Project I Report:
Outdoor Play-Space Design & Phase I Implementation



7.0 P1: REVISED PROJECT BRIEF

Project Objective

To implement an initial phase of the outdoor play-space design at Sishu Vihar , IIT Bombay in a period of 6 weeks. (5th May - 15th June).

Project Brief

For phase 1 implementation of the outdoor play-space design ,the following deliverables were agreed upon by the stake-holders (Sishu Vihar committee) to be executed within a period of 6 weeks:

- ☐ Design refinement, detailing and execution of the tree-den & sand-pit area.
- ☐ Procurement, refurbishing & installation of role-playing elements: vehicles.
- ☐ Design refinement, detailing & implementation of fencing for Sishu Vihar.

Space	Task /Activity	Execution	Design Details
Tree Dome	Prototyping	Gourab & Paul	Using Below Details
	Procuring GI Tubes	GI Tube Vendor	Length ,Dia , Wall Thickness
	Bending Structural Members	Bending Vendor	Bending Radii , Arc Length
	Painting / Post-Treatment	Post-Treatment Vendor	Coatings , Colour Scheme
	Procuring Structural Pipe Fasteners + Flanges	Structural Fittings Vendor	Vendor Finalisation
	Assembly & Installation @ Site	Installation Vendor /IITB	Assy. ,Fastening & Grouting
	Procuring Nets	Net Vendor	Material , Mesh Size ,Dimensions
	Net-Frame Fastening	Net Fastener Vendor	Component , Process
Sand Area	Procuring Tree Stumps & SAND	Baikar / Lumbar Vendor	Height , Dia , No. required
	Transportation of Stumps into SV	Truck/Tractor Hiring	Truck / Tempo Hiring facility
	Finishing & Treatment of Stumps	Woodwork Team	Process Sequence
	Procurement of Stump Fastening Components	Powai Market Vendors	Dimensions ,Fasteners
	Fastening Stumps on site /Proto	Installation Vendor/IITB	Installation Vendor
Wall Painting Area	Cleaning & White-Washing	Mr. Unithan's Team	Finalising Painters.
	Procuring Non-Toxic Paint for Children	Paul & Gourab	Background Research
Open-Turfed Area	Procuring Outdoor Mats , Vendor Finalisation	Matting Vendor	Area Estimation
Vehicle RPG Area	Scooter Procurement Follow-up	IITB / Garage	IIT Security Office
	Auto Procurement	IITB / Garage	2nd Hand Cheapest Quote
	Child -Proofing	Mech. Fab. Vendor	Vendor Identification
	Paint Job	Paint Vendor	Painter Identification
	Ground Fastening of Mount	Installation Vendor/IIT-B	Mounting Technique
Experiential Area	Cleaning , Levelling & Soil Treatment	Baikar -Estate Maintenance	Estimation of Amounts
	Revamping Birdbath	Paul & Gourab	-
	Gardener Identification - for 1st batch	Baikar	
Miscellaneous Elements	Procurement of Fencing	Fencing Vendor	Vendor finalisation
	Grouting & Installation of Fencing	Installation Vendor	Vendor finalisation
	Painting of Fencing	Paint Vendor	Colour Scheme + Paint
	Removal of Barbed Wire	Mr. Unithan's Team	-
	Awning Vendor Finalisation	Prof. Sunthar , P & G	Dimensions ,3 Quotations
	Awning Installation	Awning Vendor	-
	Area Prepn . For Pre-Ordered Equipment	Baikar's Team	-
	Landsc aping ,Shrubs , Flowers Selection	P & G , Baikar	-

8.0:TIMELINE

	Priority	17th-24th May	24th-31st May	31st May-7th June	7th June- 14th June
	HIGH				
	HIGH				
	HIGH				
	HIGH				
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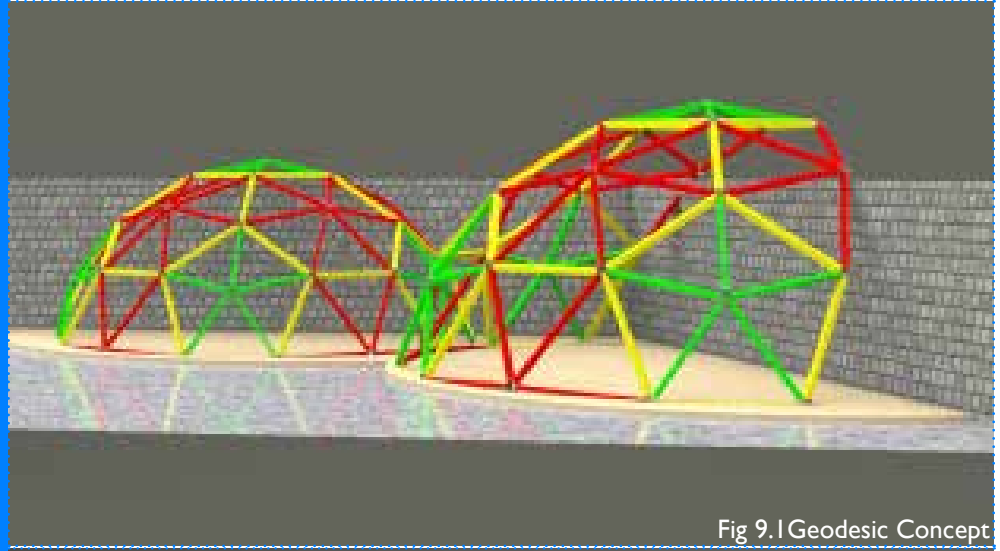


Fig 9.1 Geodesic Concept

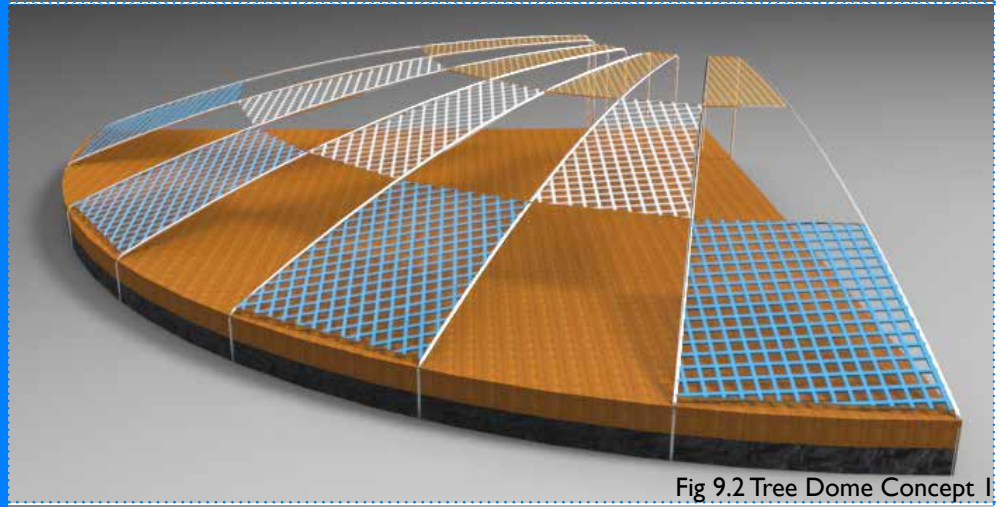


Fig 9.2 Tree Dome Concept 1

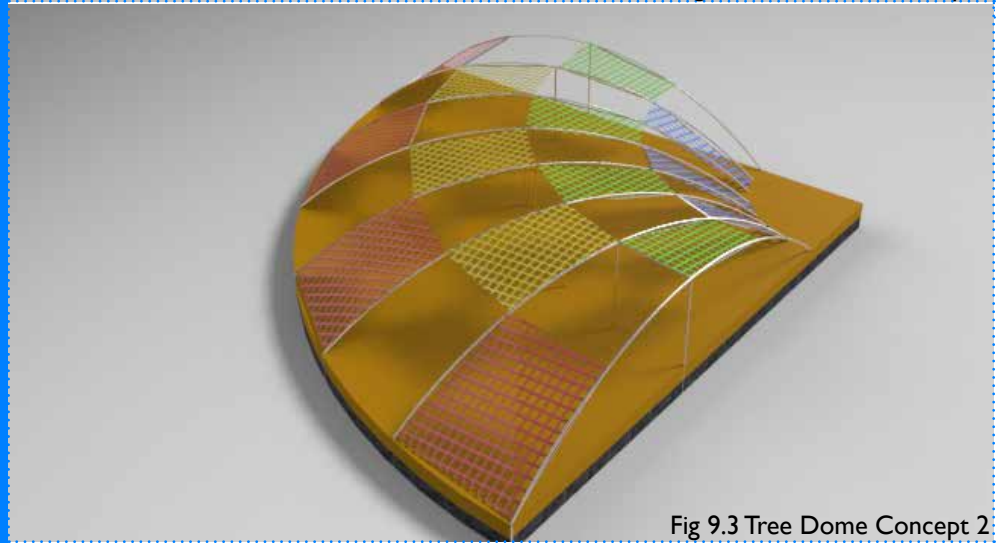


Fig 9.3 Tree Dome Concept 2

Tree Dome Refinement & Evolution

Budget constraints led us to revise the initial concept to something more feasible without compromising on the safety. Inspired by the weaver bird's nest and tensegrity structures like the geodesic dome we ideated on different structures.

Concept 1 :Geodesic-Domes

Concept 2 :Tree Dome 1

Concept 3 :Tree Dome 2

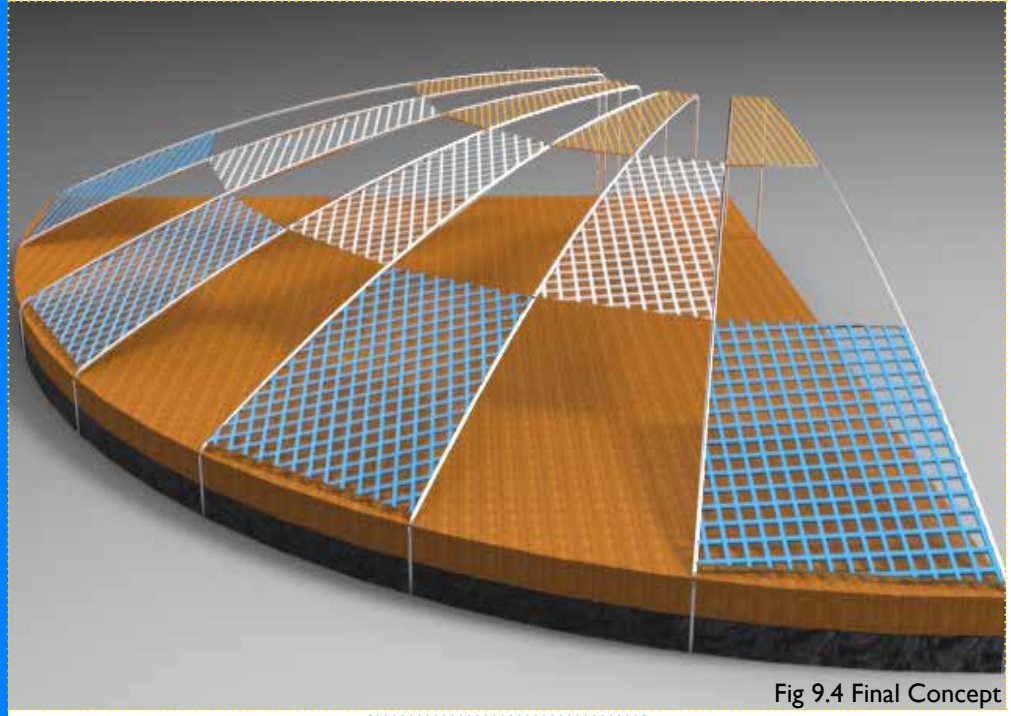


Fig 9.4 Final Concept

We finalised on a structure that consisted of arches grouped radially. This area is to cater to the tactile growth of children in the same way as the Tree Den.

Final Concept : Tree-Dome

This structure serves multiple purposes:

1) A climbing structure for the children

2) With roll-able covers it serves as a canopy for children playing in the sand area.

3) It serves as a sitting area for children and supervisors for story telling sessions.

The structure is proposed to be constructed out of GI pipes based on the budget constraints.

Implementing The Structure

The main challenges that we faced are trying to get hold of a vendor who would bend the pipes with a large radius of curvature and the pipe connectors as well as the grouting of the supporting vertical members.

We were able to contact and discuss the design details of the structure with Kee Safety, is a global supplier of handrail, guardrail and height safety equipment. They had agreed to do it as a turnkey solution; however we were notified within 4 weeks of the project that this aspect of the project would have to be put on hold as the budget constraints would prevent implementation of the other elements.

We took the tree dome from ideation to concept, did rig testing and strength evaluation using CAD. The vendor details have been attached as part of the annexure along with the results from the strength analysis.

Fig 9.6 Kee Klamp Flange

Fig 9.7 Adjustable Side Outlet Tee

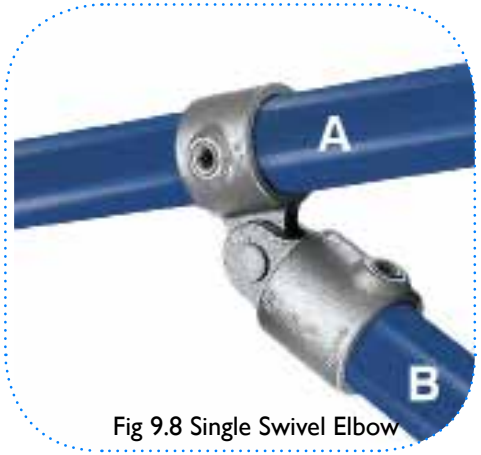


Fig 9.8 Single Swivel Elbow

Contributions Gourab: Ideation, 3D modelling and renders, design detailing
Paul: Design detailing, strength analysis, vendor devpt.

**Image Ref: Kee Klamp: Safety Components Guide 2008*

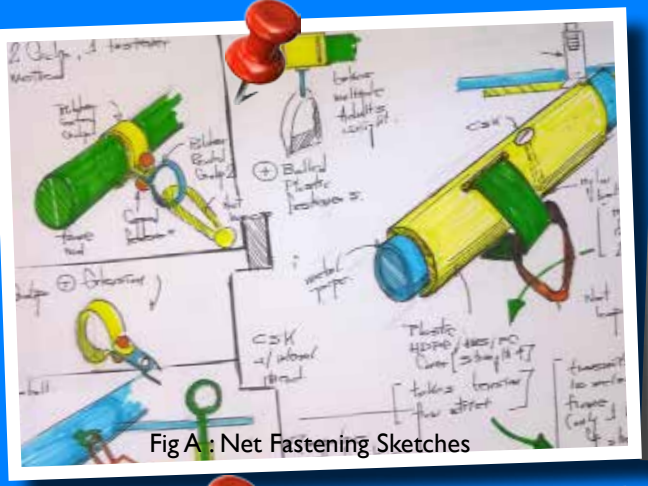


Fig A : Net Fastening Sketches

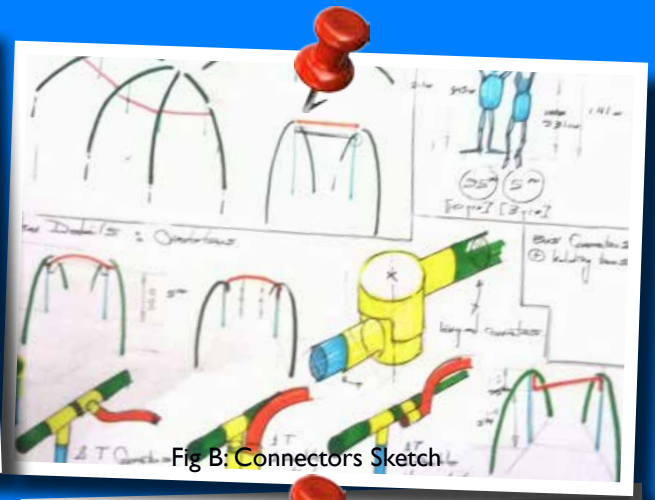


Fig B: Connectors Sketch

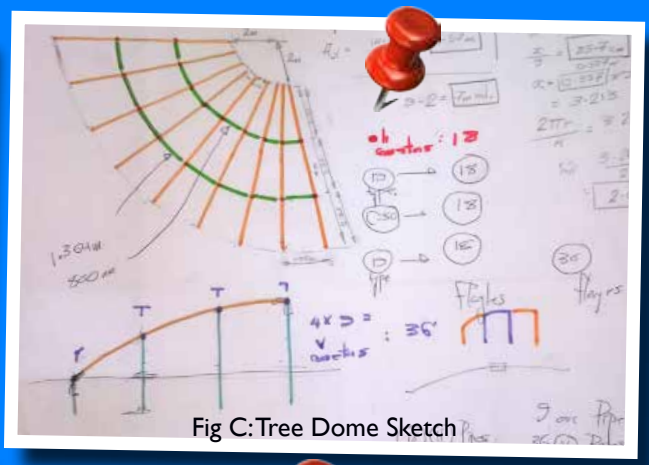


Fig C: Tree Dome Sketch

Fig D : Geodesic Dome Mockup

Fig E: Joint Prototype

Fig F: Net Fungal Test

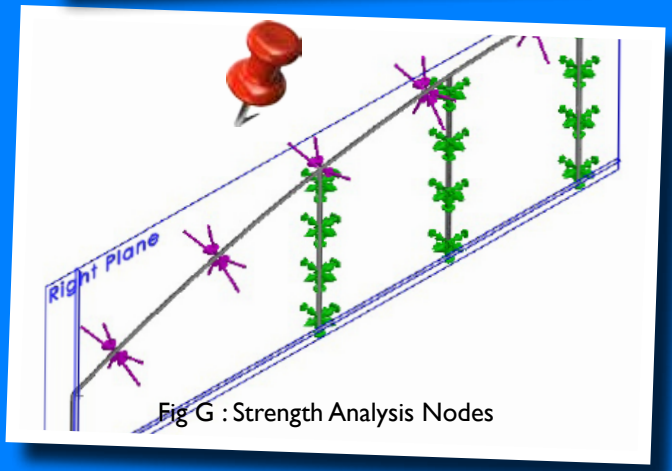


Fig G : Strength Analysis Nodes

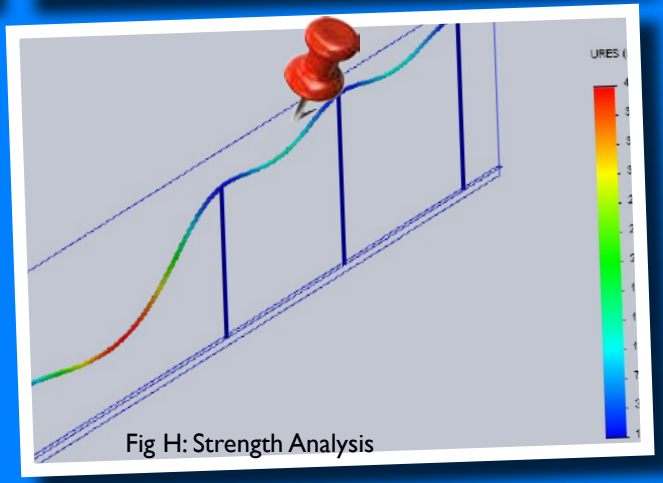


Fig H: Strength Analysis

Fig I: Rig Testing

Fig 10.1 Sand Pit Area

Fig 10.2 Procured Tree Stumps

Sand-Pit Area

Sand-pits are amongst the most favoured play elements for pre-school children. Mouldable medium such as sand allows them to develop their creativity as well as develop their motor skills through the use of simple tools such as plastic spades and buckets.

The sand pit is bounded by tree stumps of varying diameters and sizes [approx.1ft height & dia]. Adjacent sides of the tree stumps may be cemented in order to prevent erosion of sand from the pit.

The tree-stumps surrounding the sand pit are stationary and may serve as stools during an outdoor storytelling session or as balancing platforms during play time.

Tree stumps:

The tree-stumps required for the periphery of the sand pit was procured from within the IIT-B campus, they belong to two different varieties viz. Palm tree (Arecaceae) and Coconut tree.

The stumps were cut by the IIT nursery team during clearance activity and with their help transported to Sishu Vihar. The logs are near cylindrical and have a fibrous bark which was removed and treated to prevent rot & weathering before use.

The top face of the tree stumps are filleted and stained before applying a clear coat of lacquer, to provide a safe and aesthetic surface.

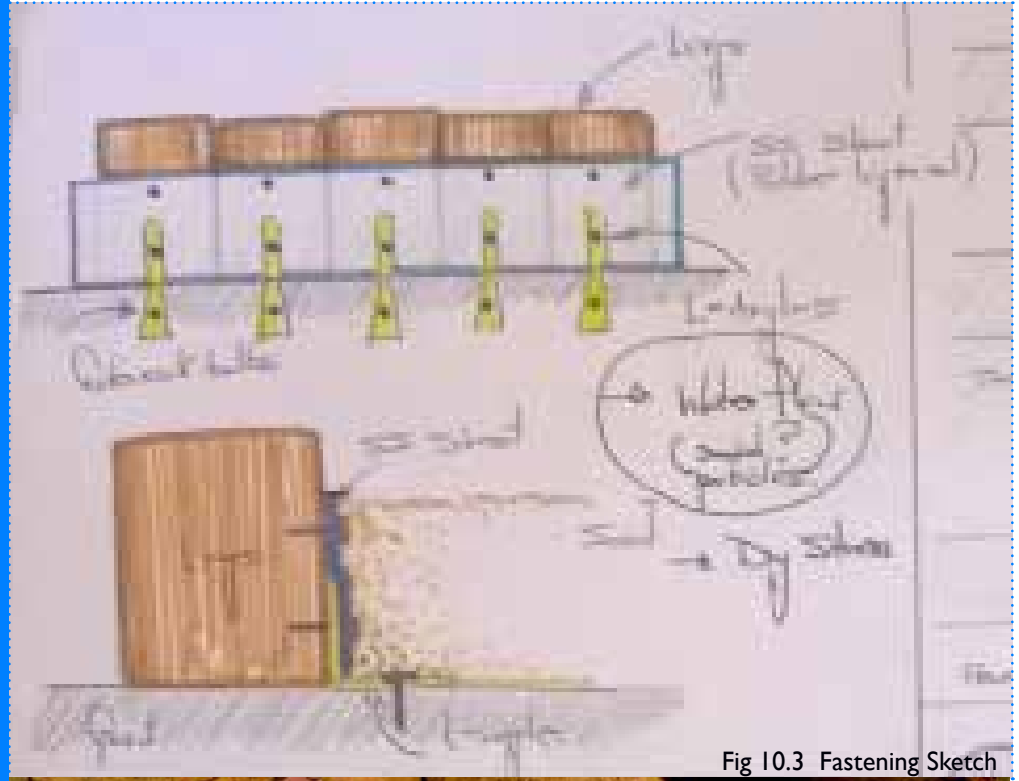


Fig 10.3 Fastening Sketch

Fig 10.4 Stumps

10.1 STUMP FASTENING TECHNIQUE : SAND PIT

Stump Fastening Technique

The stumps need to be safely secured to the ground so that children can sit and run on top of the logs without the danger of them toppling. Another important detail that we put our mind to was the prevention of soil eroding away with enough clearance to let water either wash through or evaporate.
We initially made two prototypes considering soil erosion as a major problem. One which consisted of SS sheets being screwed to the logs directly. Due to the ductility of the material the sheet keep coming off and the number of screws to fasten the sheet to just three logs proved that this concept was futile. We tried winding the sheet in an 'S', which did not garner any fruitful results.

The other concept was to use thick industrial grade PP ropes and weave the logs together.
We prototyped using Nylon ropes to test the concept, this method of keeping the logs standing seemed to work without having the secondary anchor to the ground, in terms of soil erosion, we were confident that a thicker grade of rope would hold in the sand and let the water seep through.

The disadvantage with this concept was that it would be costly to obtain the required length of rope, as there are 50 logs. Also this work of weaving the rope would require a lot of supervision and was highly labour intensive.

Based on the conclusions of the two prototypes we finalised on a solution that would be easy to replicate by low-skilled labour. We used a cast iron L bracket and with the help of 4" long cement screws fastened the standing log to the ground. To prevent sand from eroding we placed an EPDM rubber sheet of 4mm thickness.

A mock-up of this construction is at the site, along with the details of contractors who can fasten the logs according to the design layout. This arrangement is by far the easier one to replicate and is a low cost solution.

The Sishu Vihar committee has agreed on implementing this as soon as the design details are provided to them.

Contributions: Gourab: Stump fastening concept, prototyping, vendor development.
Paul: Stump procurement, people managment, prototpying.


Fig A : Cut Tree Stump


Fig B: Stump Procurement


Fig C: Stump Debarking


Fig D : Stump Post Filling & Sanding


Fig E: Fastening Proto


Fig F: Fastening Proto I


Fig G : Fastening Proto2

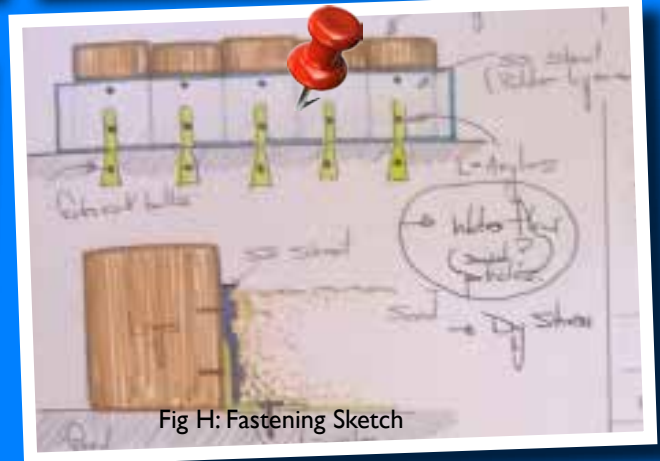


Fig H: Fastening Sketch


Fig I: Rope Fastening Proto

Fig A : Stump Lining Rig

Fig B: Stump Lining Rig

Fig C: Finished Stumps

Fig D : Finished Stumps


el
ters
Embossing

Fig 11.1 :Refurbished M80 Major Moped

Vehicle Role playing area

Open space with grass has been planned for the majority of this area for playing outdoor sports like cricket. We proposed and implemented an M-80 moped and a Bajaj Chetak scooter body, with their interior surfaces childproofed and painted. These vehicles will serve as role playing elements for the children to engage in unsupervised.

The two vehicles were obtained with the help of the IIT-Security; these vehicles were in their custody as they had been left unclaimed within the campus. It was shifted to IDC, where with the help of mechanics we disassembled both vehicles making use of only the essential elements of the vehicles and discarding elements like the engines, the exhaust pipe and the electrical cables.

Once dismantled, with the help of IDC staff we grinded each surface to remove the paint, rust and other elements like burrs and splinters which might hurt the children. The rust had eaten away at certain joints where the front panel met the base; these were fillet using aluminium sheets

Bondite which acted as a supporting structure for polymer putty filling.

Since the intended target area were children we decided to go with an unconventional paint scheme as compared to the basic dual tone for panels. In our approach we realised that kids would love to have a fun element like paint splatters and blobs. After a few trials in this respect we reached a conclusion that for clean and vibrant appearance we would need to mask the panels and the body after giving it a White base coat, the stencils here would be in the shape of paint blobs of different colours. Applying primer and then the base coat along with the masking took a total of 5 days.

With the help of the mechanics we assembled both vehicles and transported them to Sishu Vihar. With the help of masons we finished the fixing of the vehicles. The vehicles are oriented near the corner front of the plot on the grassy patch, so that it does not obstruct the children from playing bigger games like cricket. They are positioned in a 'V' shape to encourage healthy competition; also the space between them prevents crowding and fights resulting there in.

Contributions: Gourab: Colour scheme and stencils, prototyping, process.
Paul: Colour scheme and stencils, prototyping, process.


Fig A : Initial Condition


Fig B: Paint Job Ideation


Fig C: Patching of Cavities


Fig D : Putty Work & Sanding


Fig E: Zinc Primer Spraying


Fig F: Base Paint Mixing


Fig G : White Base Spraying


Fig H: Stencils & Masking


Fig I: PaintJob Completion

Fig A : Drying

Fig B: Scooter Re-assembly

Fig C: Transfer to Sishu Vihar

Fig D : Cement

Fig E: Initial User Testing

Fig F: Initial User Testing

Fig G : Initial User Testing

Fig H: User Testing

Fig I: PaintJob Completion

Fig A : Initial User Testing

Fig B: Initial User Test

Fig C:Initial Iser Test

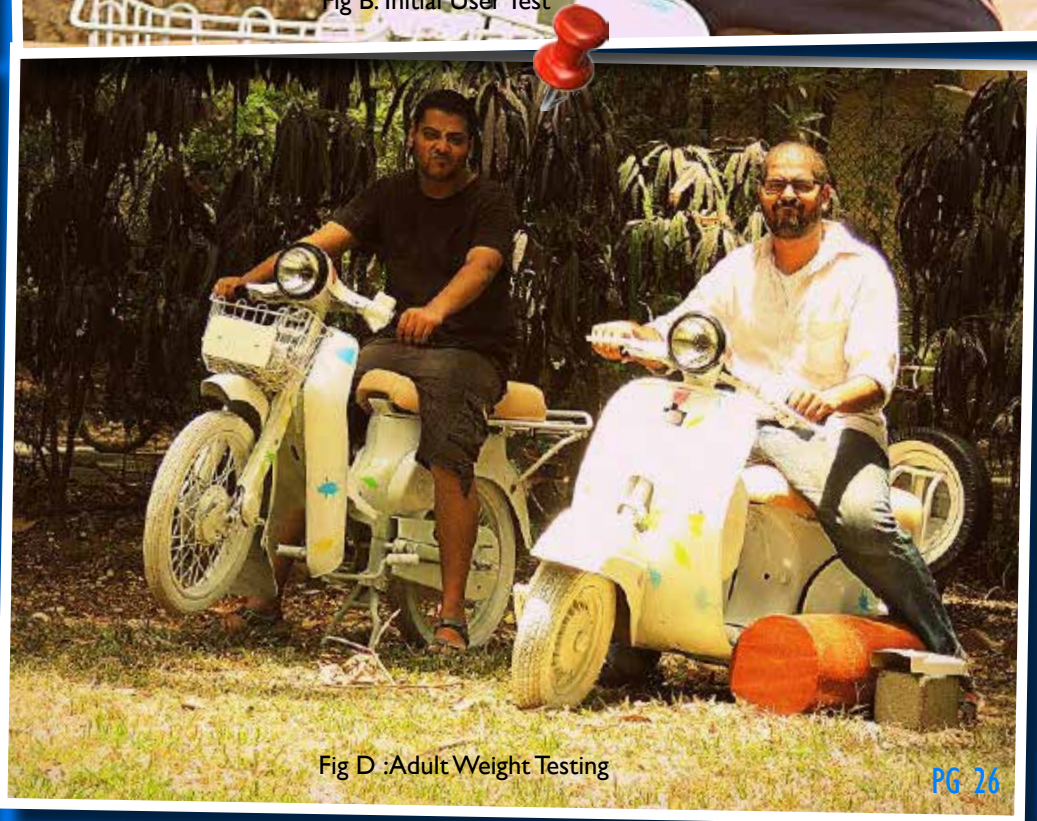


Fig D :Adult Weight Testing

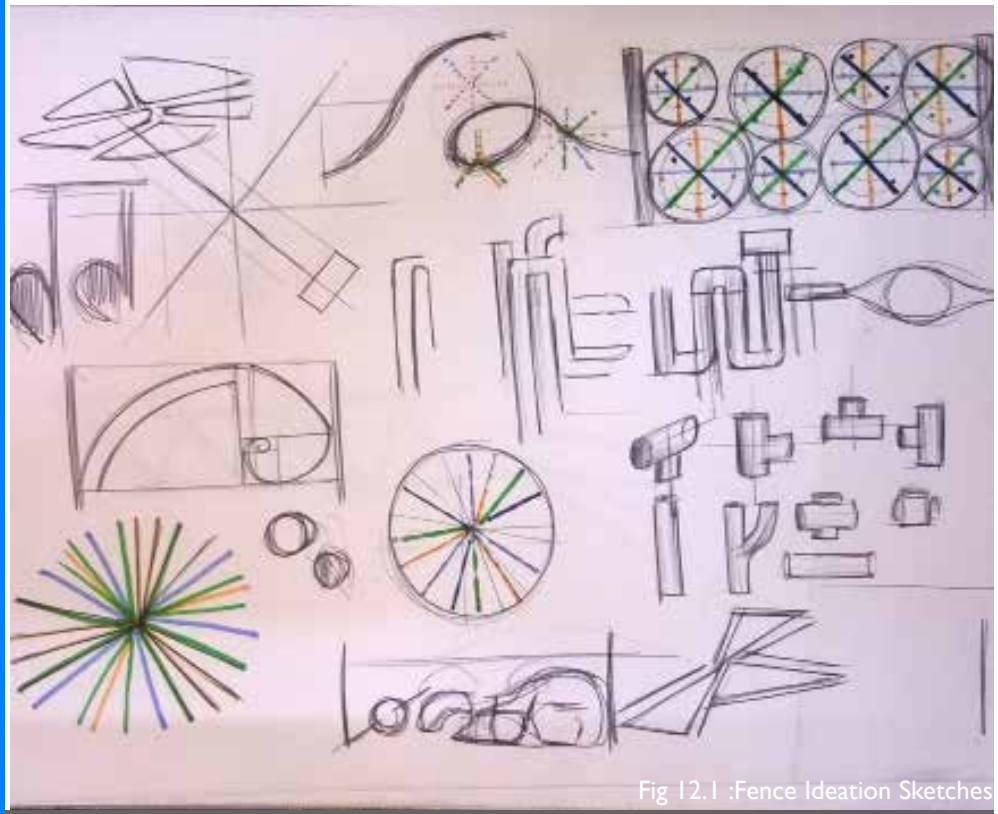


Fig 12.1 :Fence Ideation Sketches

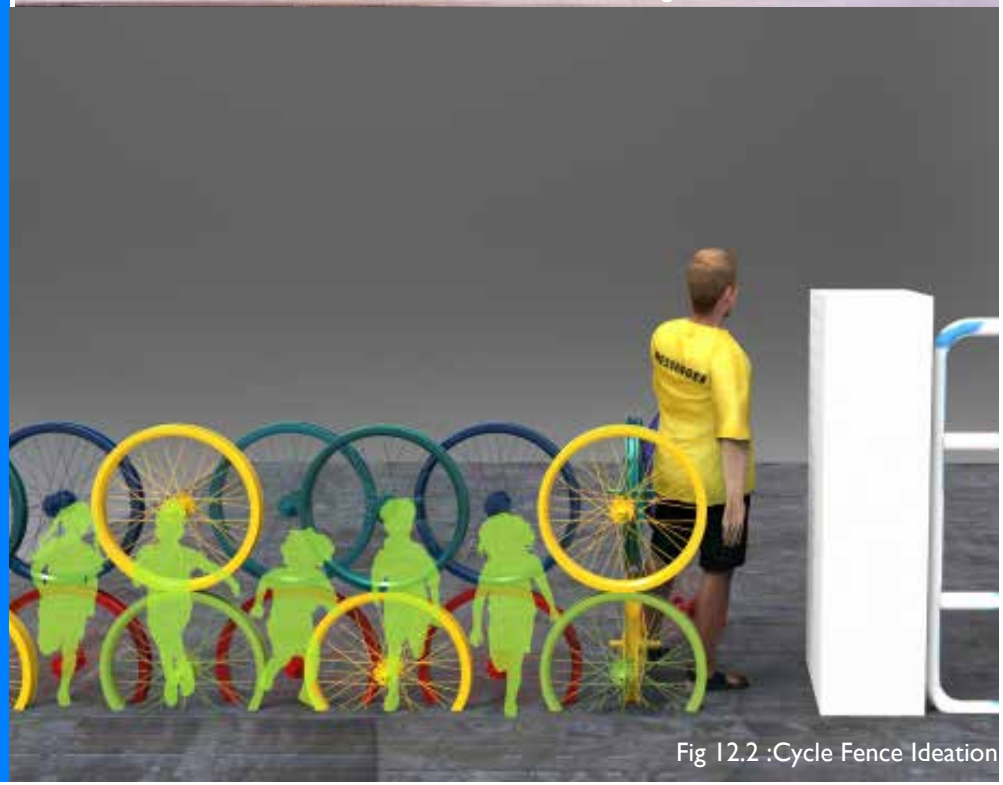


Fig 12.2 :Cycle Fence Ideation

FENCING:

Existing area of Sishu Vihar consists of barbed wire fencing, which are injurious to children inside Sishu Vihar as well as pedestrians walking by. The area is subject to parents, faculty members and other passers-by, as such there is no indication that a day care centre is in the vicinity.

We thought of using the traditional picket fencing that are contoured to the shape of colour. According to architectural standards and preferences of Sishu Vihar the fencing should be

We considered many different materials for making the picket fences:

1) Traditional wood- material wise durability is low, the amount of pre-treatment is high and hence the cost increases

2) Using FRP panels-material wise durability is high, these can be modified as per graphics required. The cost however for the panels and grouting is exorbitant.

3) We experimented with concrete, casting it in cylindrical blocks to get actual 3D colour pencils, but to cast this with the perfection and quantity that was expected turned out to be costly investment.

4) Our final concept was re-use of cycle wheels. Here differently coloured cycle wheels would be stacked in a floral module linearly to form the fence.

CONTRIBUTIONS: Gourab: Washer ideation, colour schemes, prototyping,
Paul: Prototyping, vendor development, procurement, colour scheme.

Fig 12.3 :Ideating with Washers

Fig 12.4 :Ideating with Washers

Fig 12.5 :Ideating with Washers

Fig 12.6 :Ideating withWashers

Fig 12.7 : Cycle Fence Proto

Fig 12.8 : Cycle Fence Welding

Execution of the Floral Cycle Wheel Fence:

With the help of washers we were able to ideate as to what kind of patterns would be interesting visually once it occupies 3D space. We also had to think of the feasibility of constructing such a structure in terms of quantity of cycle wheels and where to procure them and how to join and fix them to the ground.
After consulting with the Prof Purba from IDC and Prof Sunthar from the Sishu Vihar committee we decided that the fence installation and procurement of wheels will be on one half of the site, due to constraints in terms of number of wheels and time available for implementation.

The wheels were procured with the help of the Security office and the cycle repair shop within the campus. For one half, we were able to manage 80 wheels, as these were rusted and greasy we decided to powder coat as opposed to hand painting

The wheels were joined together by electrode welding; we concluded that for the rest of the wheels it would be better to do CO2 welding as this would be better in terms of finish and time taken. The major drawback with electrode welding is that it has to eat away at the powder coating before the joint is formed.

Post powder coating, the wheels were taken to the site; due to lack of time and manpower constraints the committee decided that a proof of concept for the fence would be enough. With the help of masons we grouted one modular unit of the fence. The remainder of wheels are on the site and will be erected by the contractor once the Sishu Vihar committee contacts them.

Contributions: Gourab: Colour schemes, prototyping, masonry work.
Paul: Colour scheme, prototyping, masonry work.


Fig A : Ideation Sketches


Fig B:Cement Casted Proto


Fig C:Washer Ideation


Fig D :De-Wheeling Cycles


Fig E: Rig Testing


Fig F: Powder Coated Wheels


Fig G :Welding of Wheels


Fig H: Cement Grouting Prep


Fig I: Final Fence Pilot

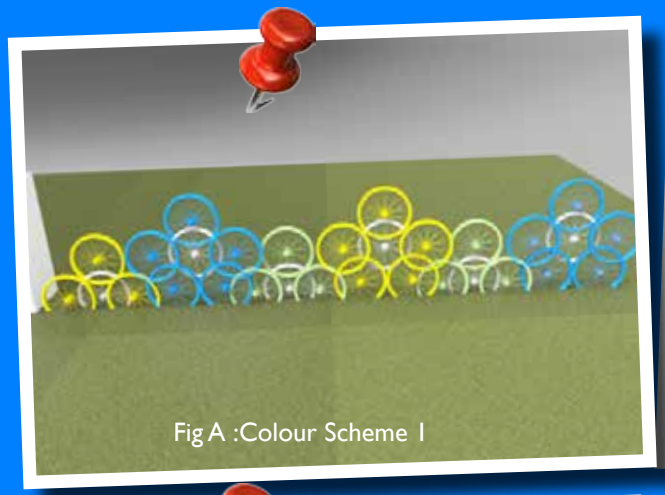


Fig A :Colour Scheme 1

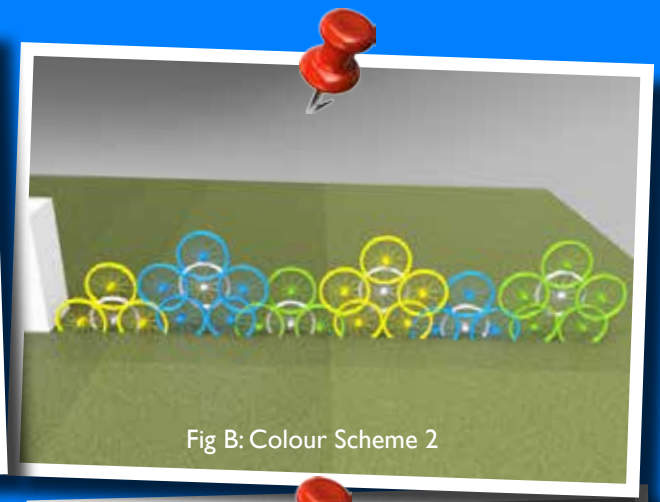


Fig B: Colour Scheme 2

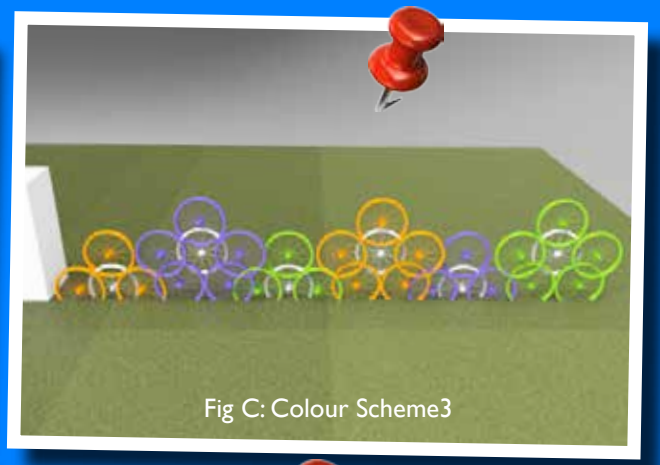


Fig C: Colour Scheme3


Fig D : Colour Scheme 4


Fig E: Colour Scheme 5


Fig F: Colour Scheme 6


Fig G : Colour Scheme 7


Fig H: Colour Scheme 8

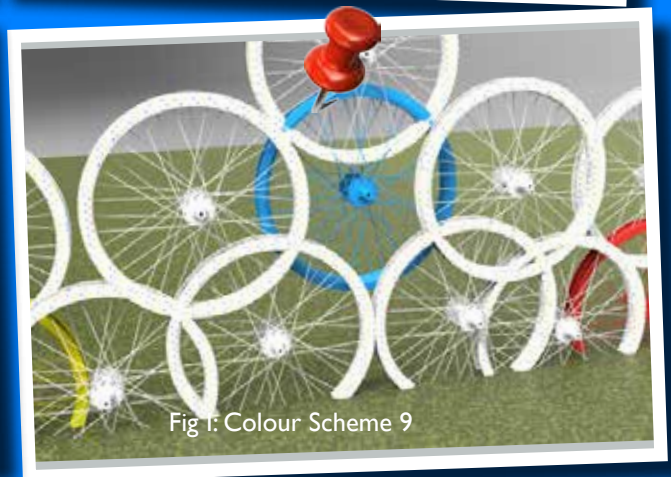
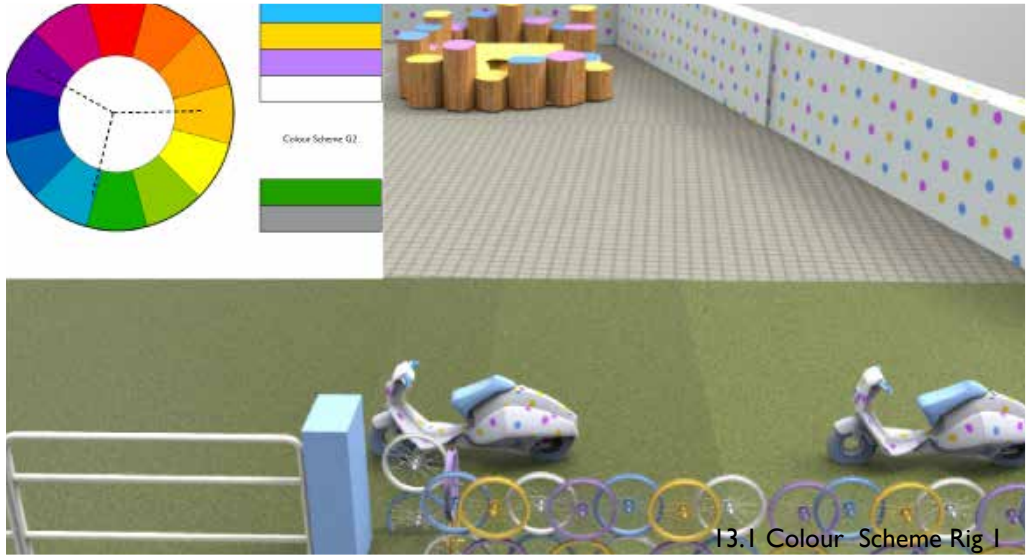
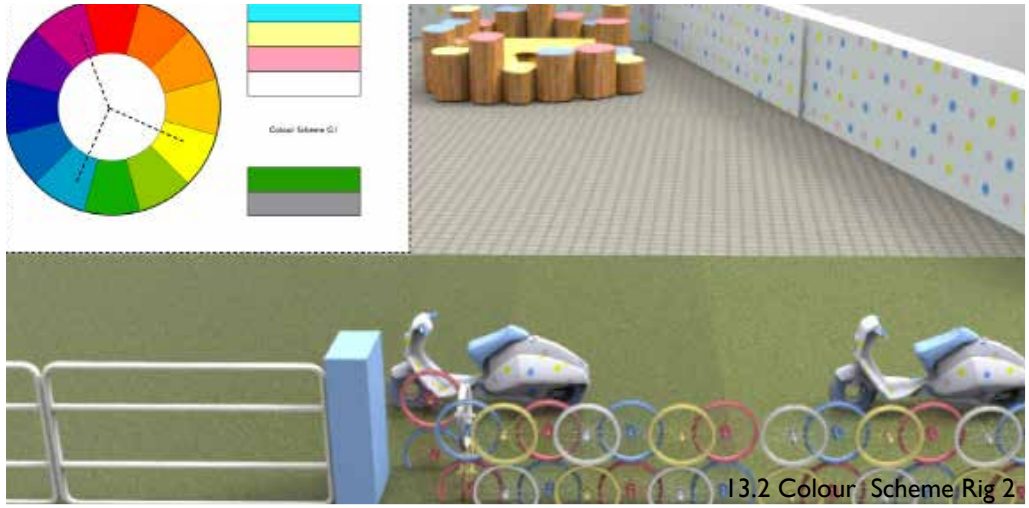


Fig I: Colour Scheme 9

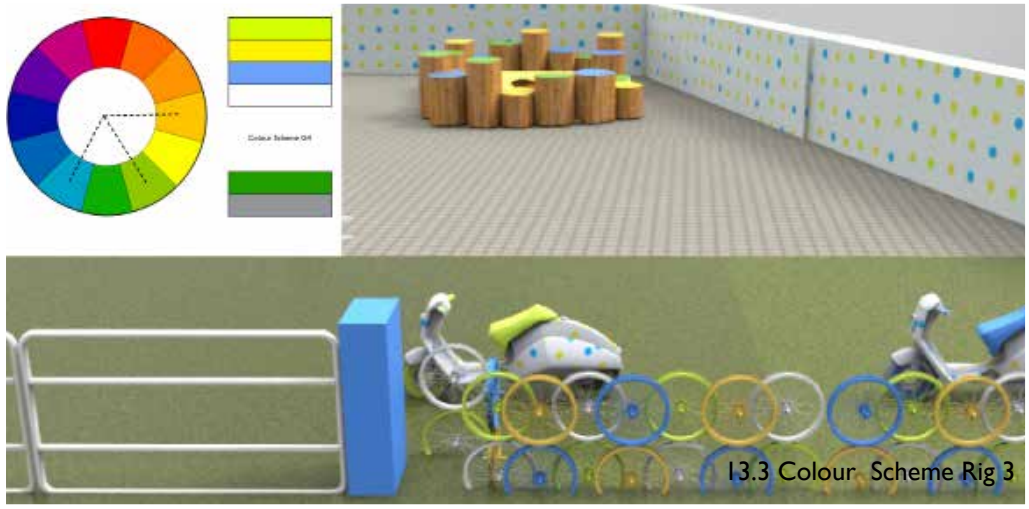
Fig 12.9 : Final Pilot



13.1 Colour Scheme Rig 1



13.2 Colour Scheme Rig 2



13.3 Colour Scheme Rig 3

Colour Schemes:

Working on one of the main critique that was given to us was that there was no connection between elements. Once we were able to get a connection in terms of form, we wanted a colour scheme that reflected what it meant to be child like. We also were told not to make a colour scheme that would be very flashy.

Our color schemes are along the lines of pastel shades which are often called as "baby shades". Our selections were through intuition and later using basic concepts of analogous,triadic and complementary colour schemes.

The original colour scheme for the floral cycle wheel fence had to be changed. Even though it felt like it would go with the rest of the elements. Taking into account the scale of the fence, these colours felt too flashy, hence we chose to go with a more simpler and more economical colour pallet which would have the petals in white and the centres in primary colours. This same colour scheme was then later applied to the vehicle installations as well.

The primary colour scheme is also seen as the basis for staining the tree stump tops.

Contributions: Gourab: Colour schemes,rig.
Paul: Colour scheme, render.

Fig 13.4: Final Colour Scheme

14.0 FINAL CONCEPT RENDERS

Fig 14.1: Entry into Sishu Vihar

14.0 FINAL CONCEPT RENDERS

Fig 14.2: Front View Sishu Vihar

Fig 14.4 Sishu Vihar from Distance

Fig 14.5 Sishu Vihar Front

Fig 14.6: Bird's Eye View

Fig 14.67 Corner View

Fig 14.6: Sand Pit Area

LEARNINGS

1) Relooking at what a child needs and wants and what parents want for their children.

2) Architectural standards for child safety in play areas.

3) People management and vendor development. A huge part of this project involved us in finding the right person for the right job in the shortest time and the least expensive vendor.
And getting them to deliver results within the tight time constraints.

4) Cheap and dirty prototyping, to help give us a sense of what our concepts might manifest into in a tangible sense.

5) Rig testing of the Tree Dome gave us a sense of what the entire scale of the structure would be in the Sishu Vihar plot. We modified our basic dome structure four to five times because of concerns of safety in terms of whether the child could climb up and down the structure, whether children could play underneath the structure in the sandpit without getting hurt. As well as visual appeal.

6) We were able to gather a lot of contacts in terms of powder coaters, tempo services and mechanics. These proved to be really valuable for last minute fix ups, transportation and painting.

7) Time management was the backbone of this project, from the start of this project till the end, it was a mad dash in terms of time and money. We had to deal with upsets in the timeline when it started deviating from the ground reality.

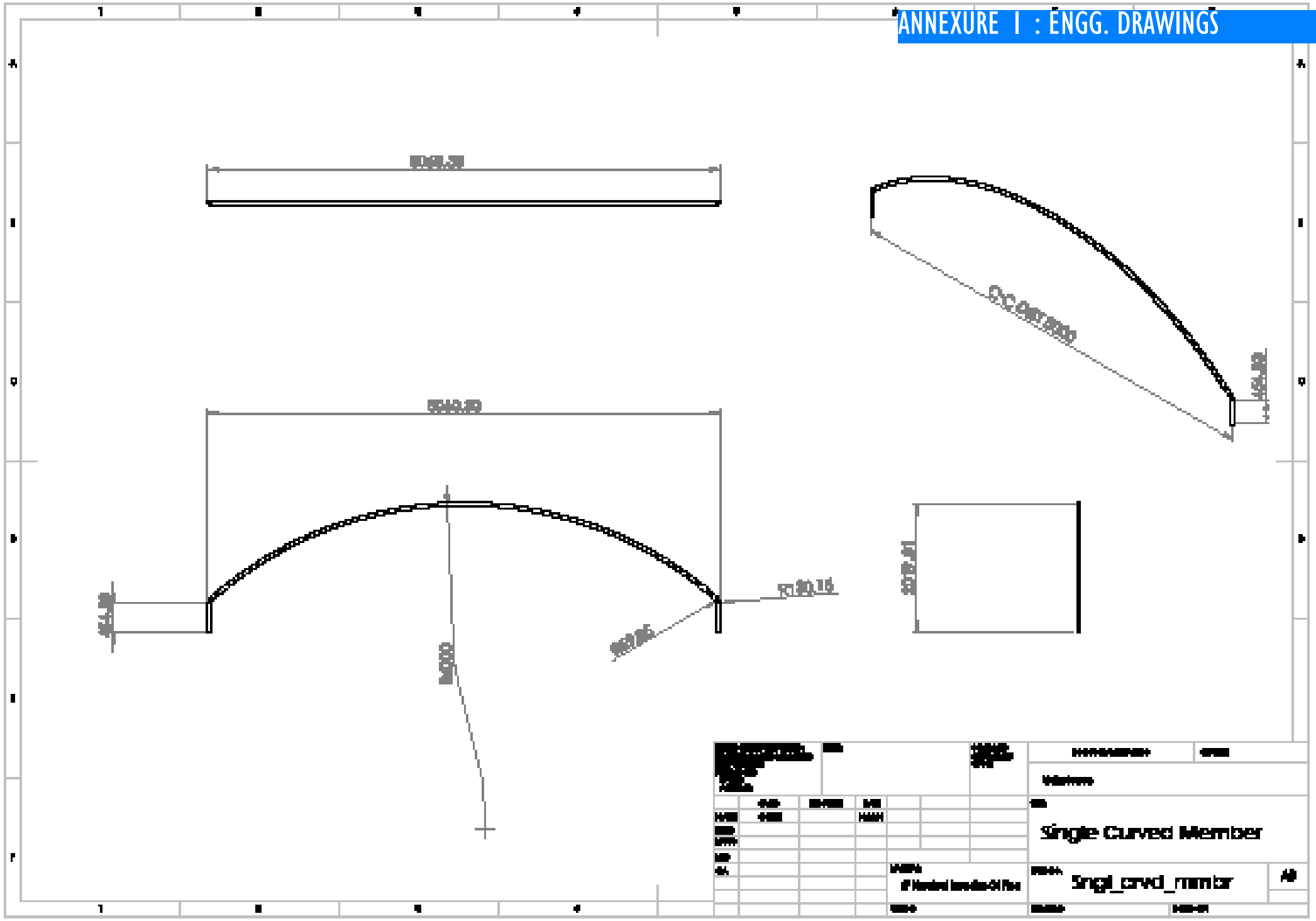
8) Biggest learning was to achieve an ability to gauge when to call whom and for what, as the project had reached a stage where it could all end up as only concepts or with enough push could reach implementation.

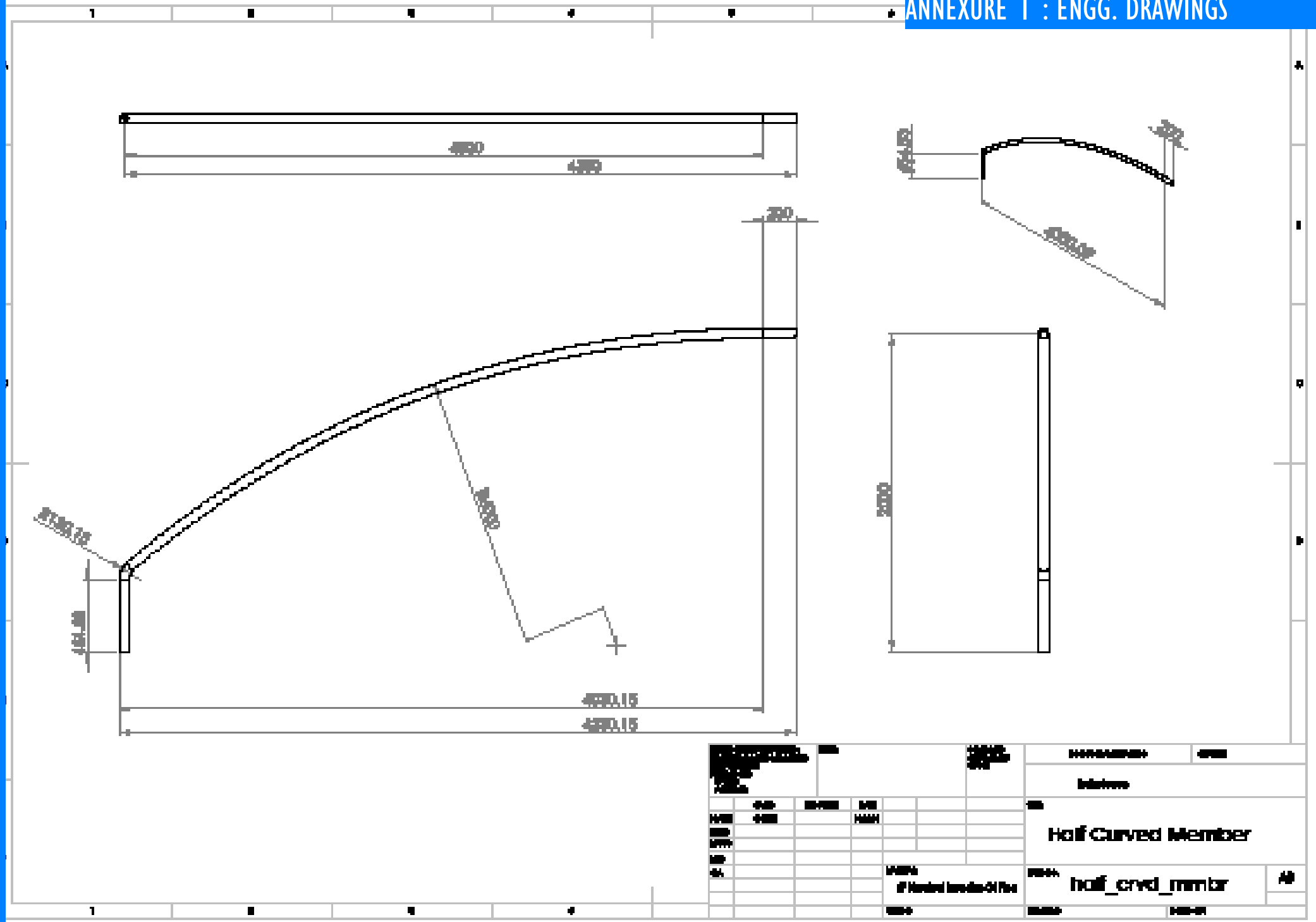
9) We learnt how to be really critical with each others ideas and concepts, if there was something that we or the guides felt that would not work, we did not hesitate to throw it out of the window and start from scratch.

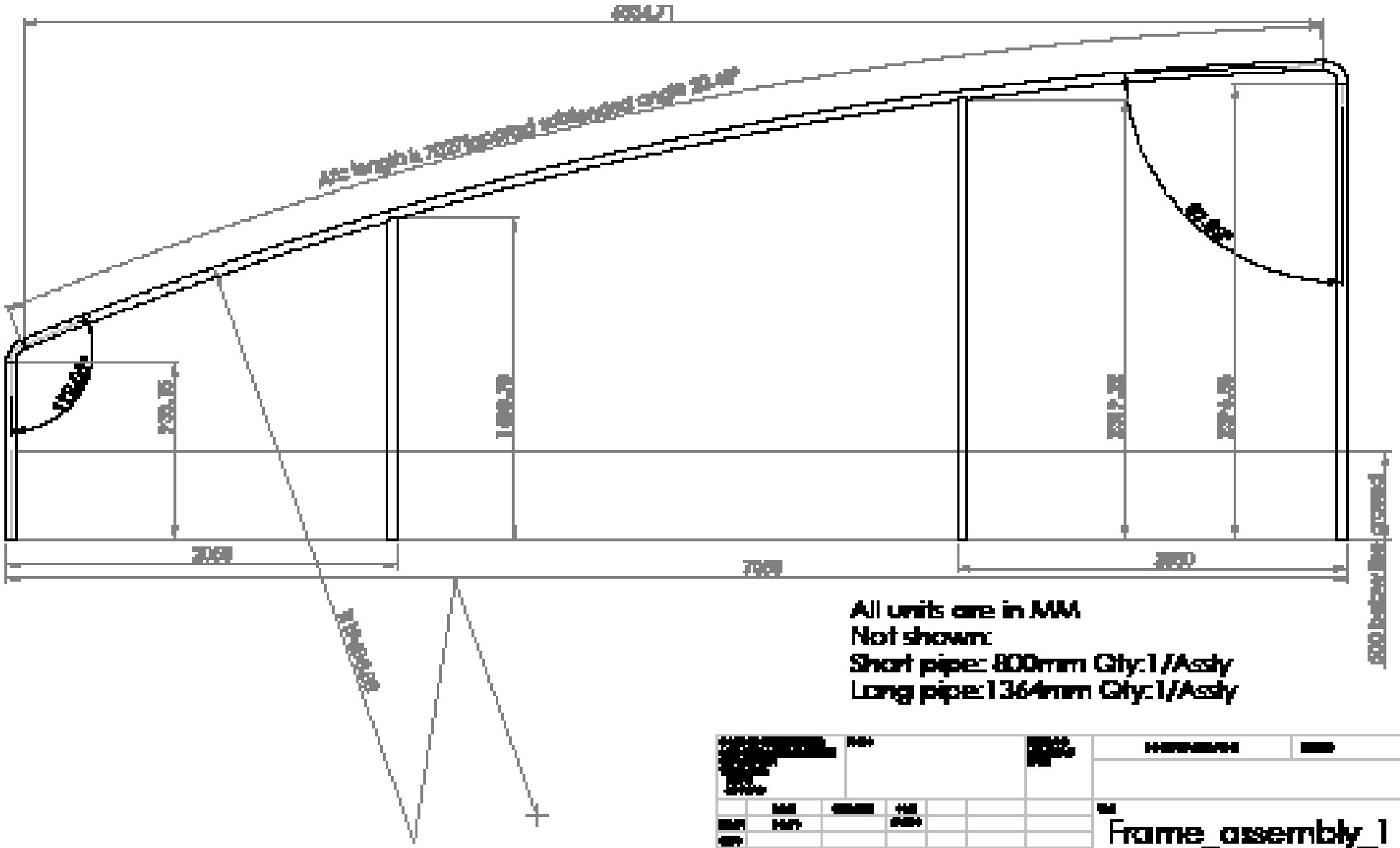
10) We worked from day 1 (May 5th) 9am till end date (June 13th) 12am, and we thoroughly enjoyed

ANNEXURES

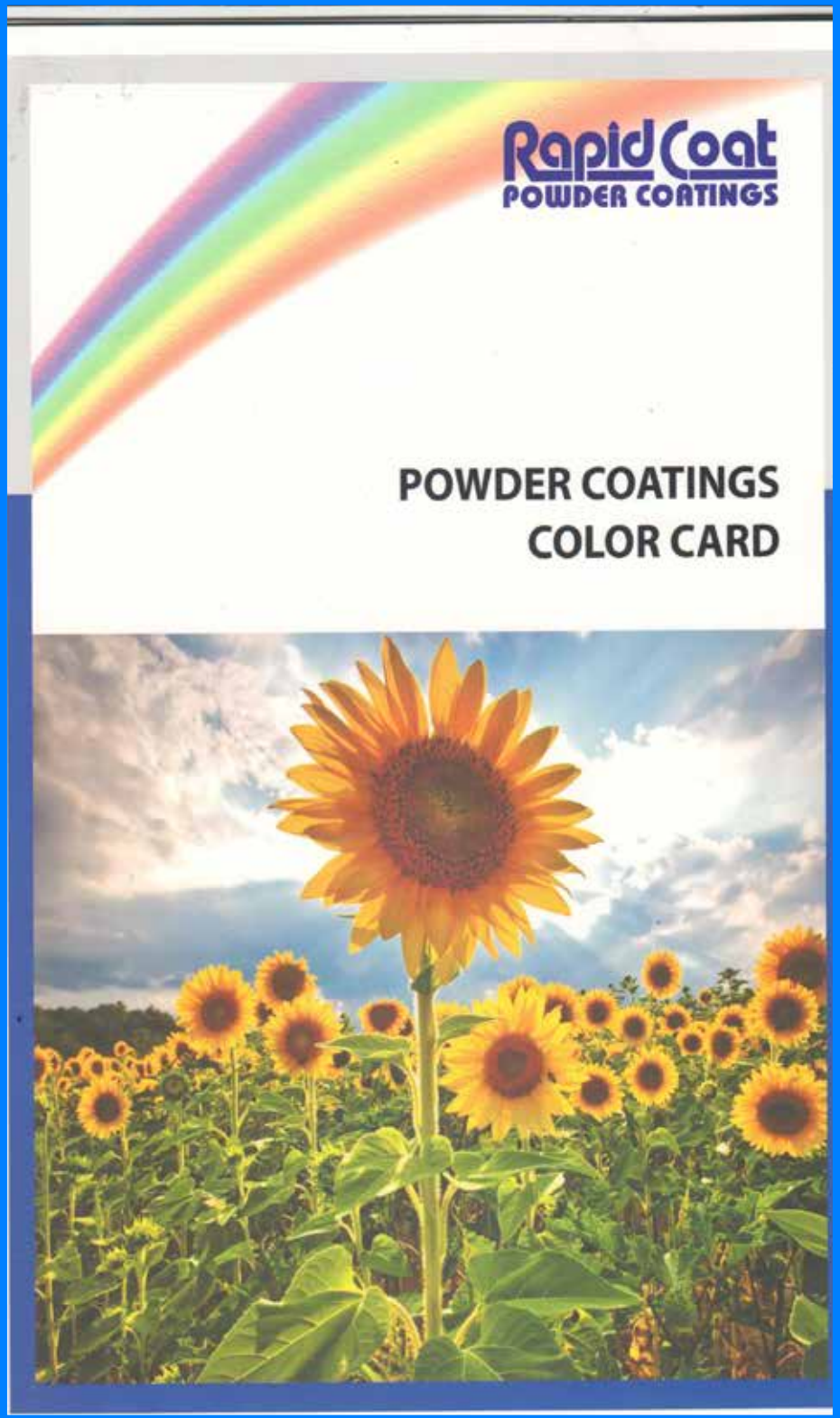
ANNEXURE I : ENGINEERING DRAWINGS
ANNEXURE 2 SHADE CARD
ANNEXURE 3: STRENGTH ANALYSIS
ANNEXURE 4: VENDOR DETAILS
ANNEXURE 5: COSTING DETAILS
ANNEXURE 6: OFFICIAL DOCUMENTS


Single Curved Member
Singl_crvd_rmmbr

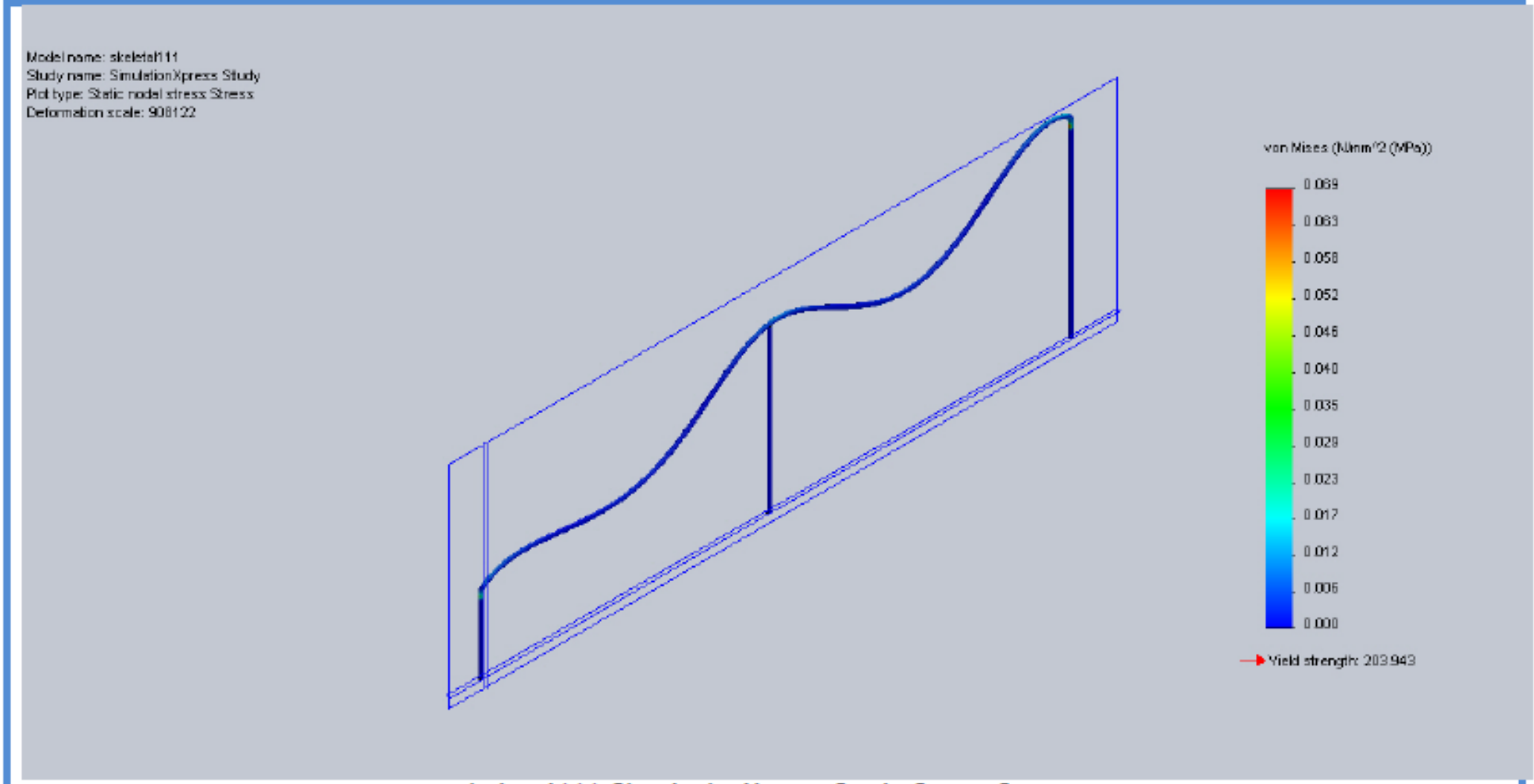

Half Curved Member
half_crvd_mmbr


All units are in MM
Not shown:
Short pipe: 800mm Qty:1/Assly
Long pipe:1364mm Qty:1/Assly
Frame_assembly_1
Frame_assly_1

ANNEXURE 2 : SHADE CARD

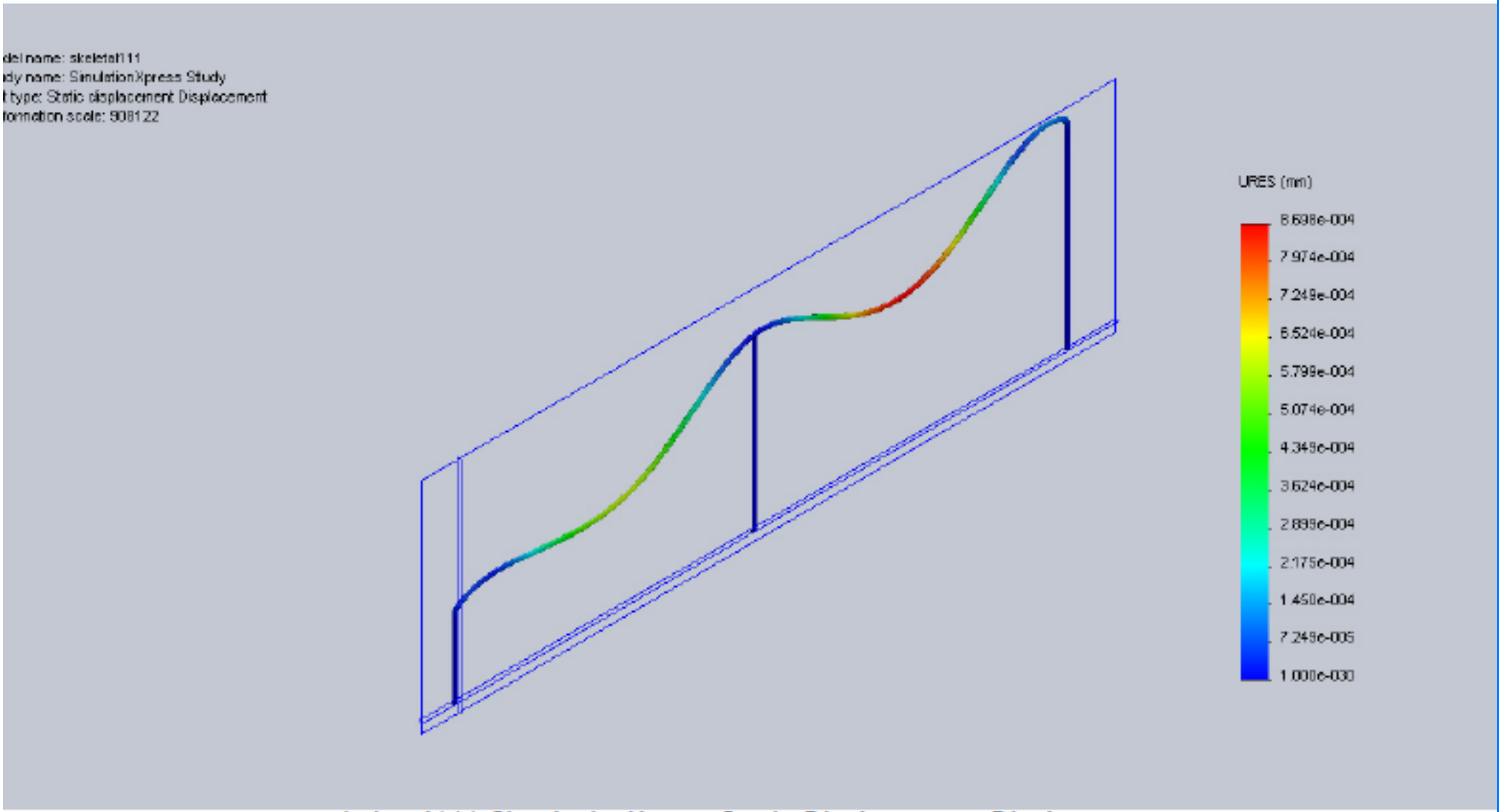


Name	Type	Min	Max
Stress	VON: von Mises Stress	0 N/mm^2 (MPa) Node: 1671	0.0691767 N/mm^2 (MPa) Node: 12449



skeletal111-SimulationXpress Study-Stress-Stress

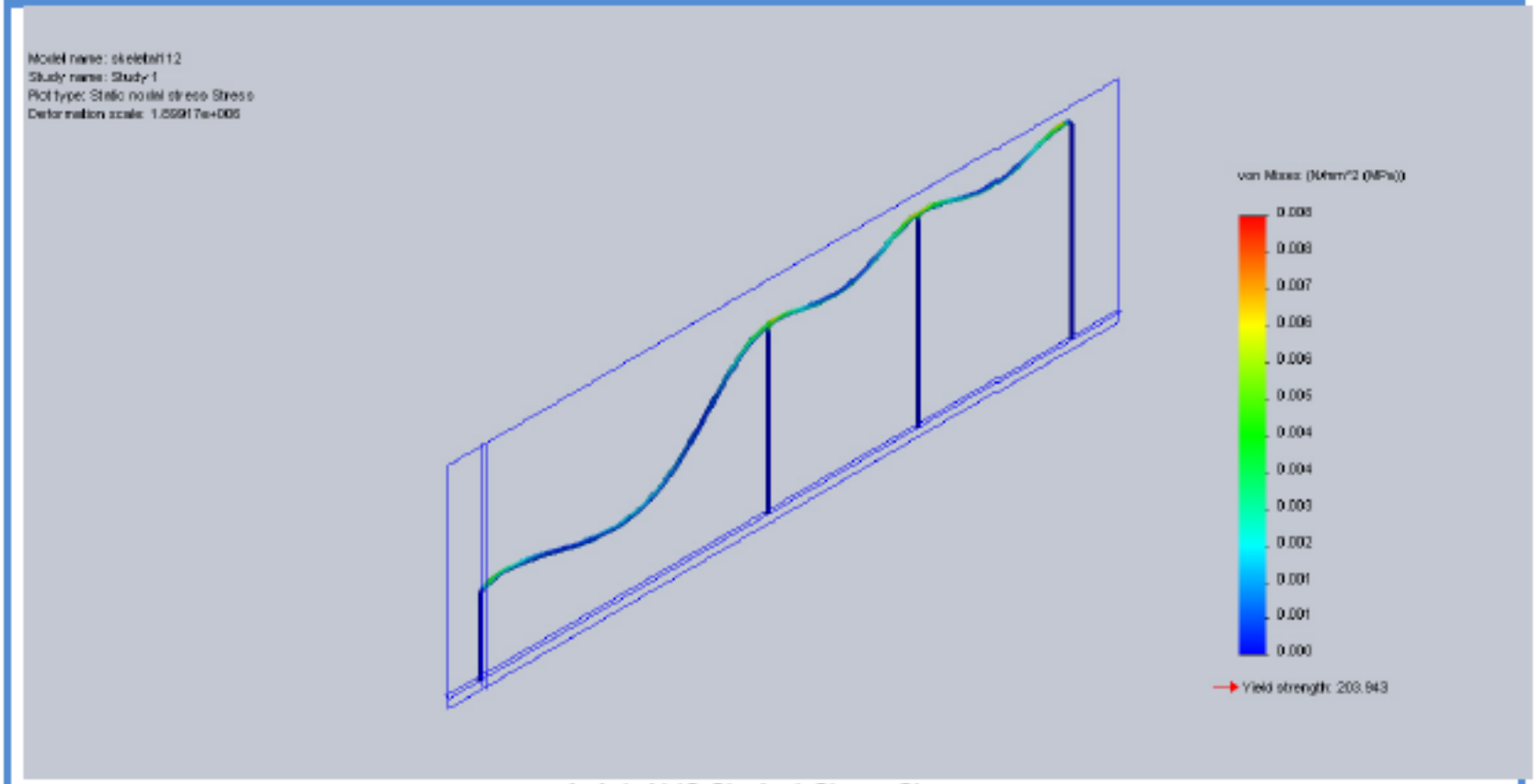
Name	Type	Min	Max
Displacement	URES: Resultant Displacement	0 mm Node: 1	0.000869837 mm Node: 19510



skeletal111-SimulationXpress Study-Displacement-Displacement

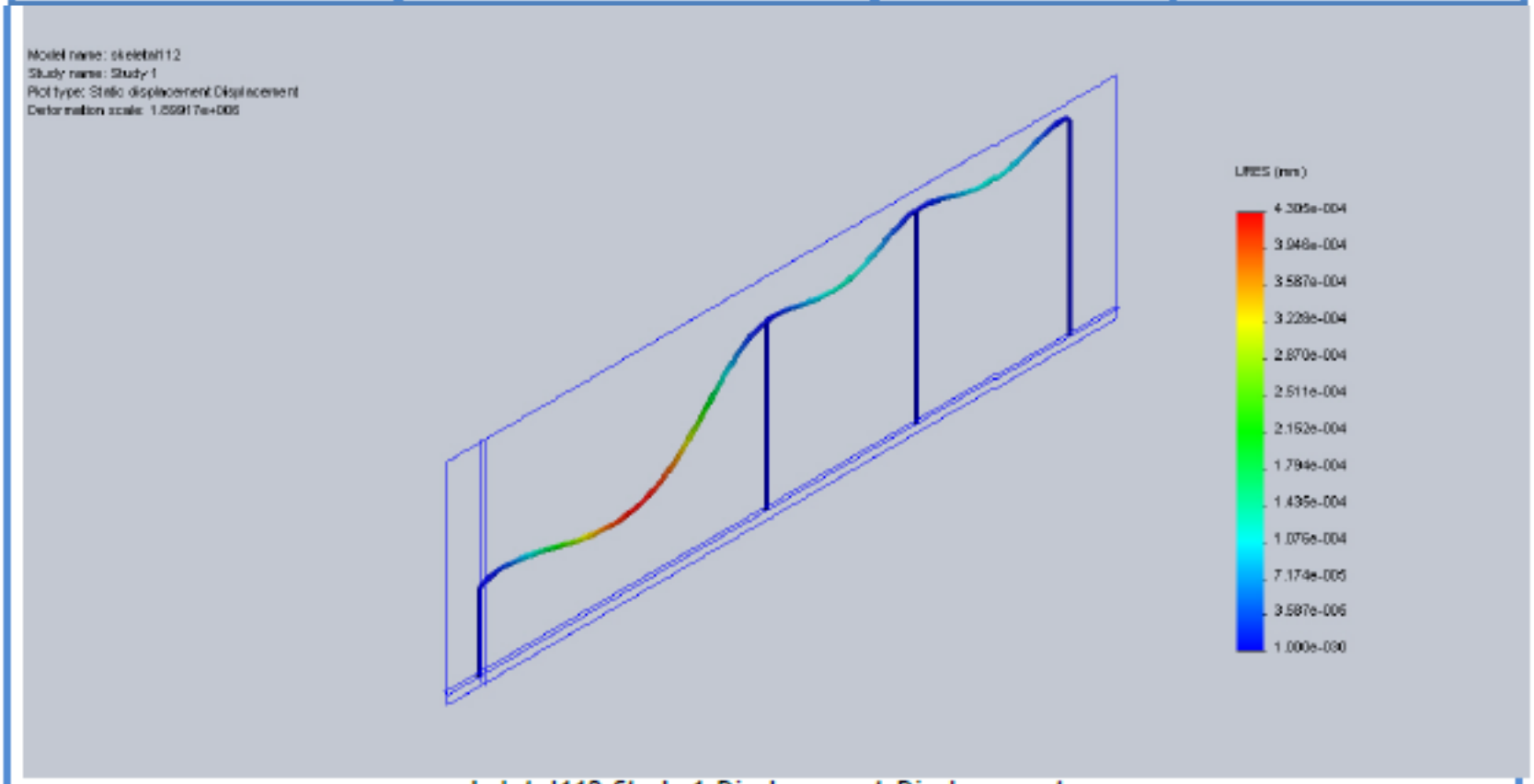
Study Results

Name	Type	Min	Max
Stress	VON: von Mises Stress	0 N/mm^2 (MPa) Node: 1347	0.00842256 N/mm^2 (MPa) Node: 1897



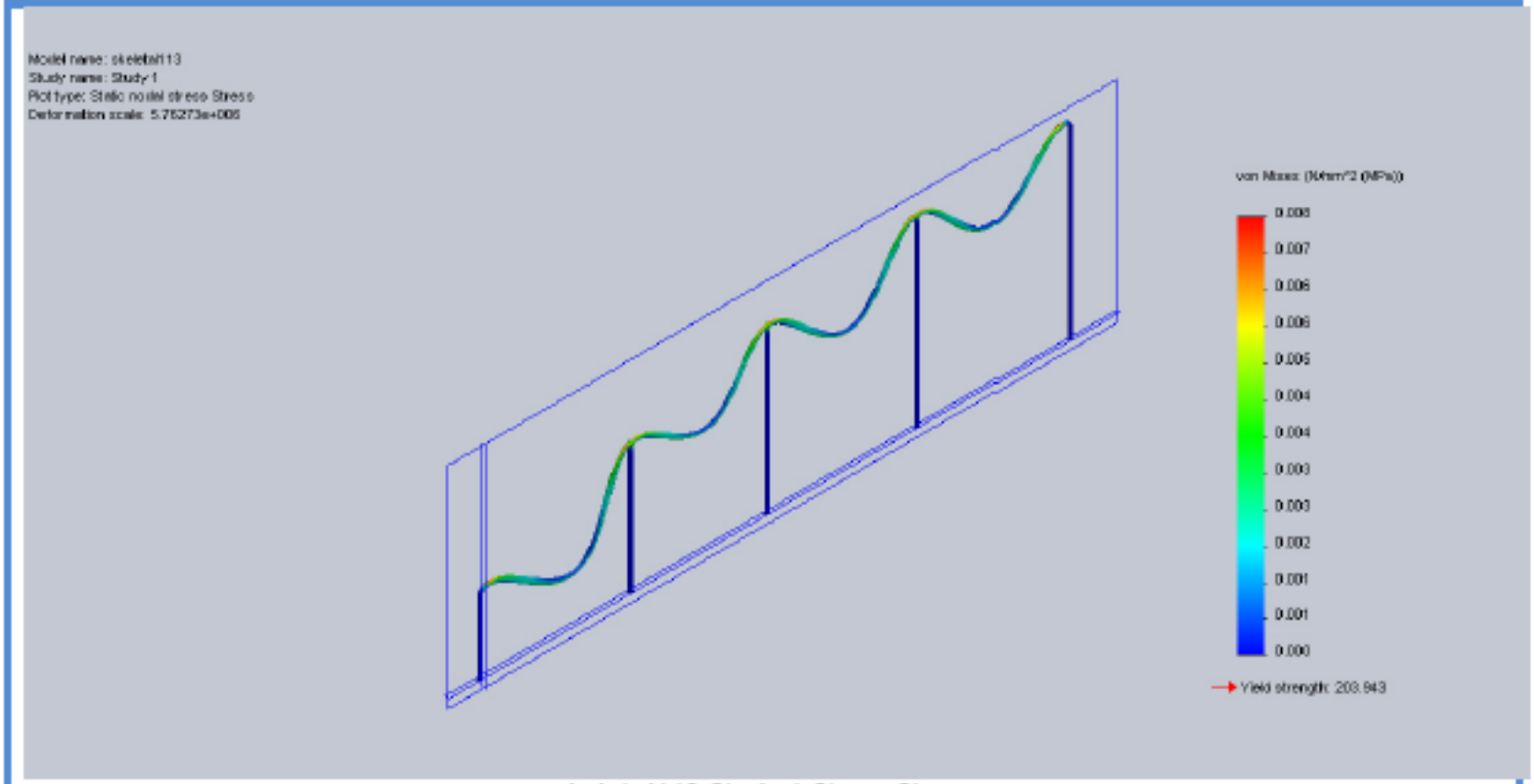
skeletal112-Study 1-Stress-Stress

Name	Type	Min	Max
Displacement	URES: Resultant Displacement	0 mm Node: 1	0.000430464 mm Node: 12855



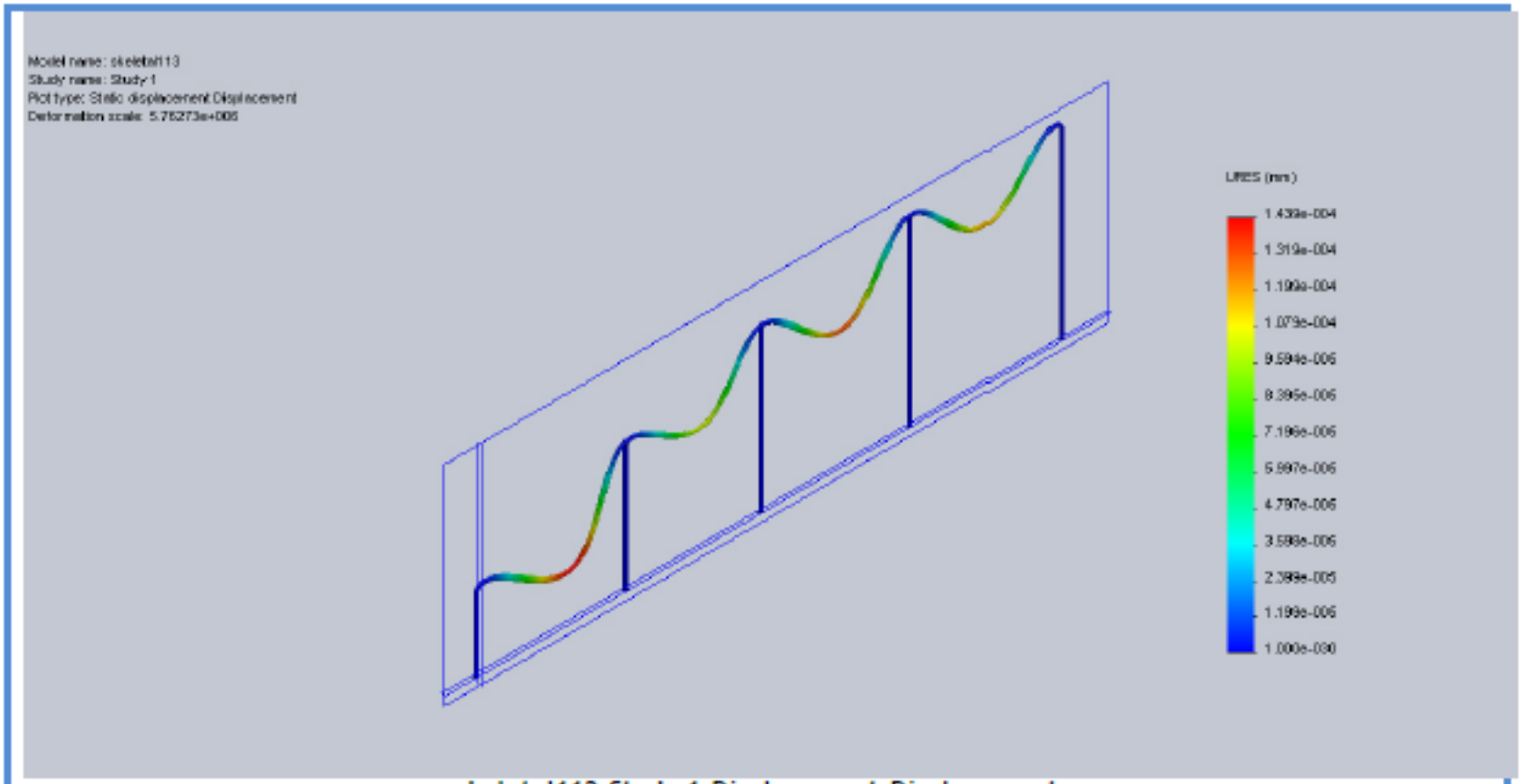
skeletal112-Study 1-Displacement-Displacement

Name	Type	Min	Max
Stress	VON: von Mises Stress	0 N/mm^2 (MPa) Node: 1295	0.00756922 N/mm^2 (MPa) Node: 14881



skeletal113-Study 1-Stress-Stress

Name	Type	Min	Max
Displacement	URES: Resultant Displacement	0 mm Node: 1	0.000143917 mm Node: 16345



skeletal113-Study 1-Displacement-Displacement

ANNEXURE 4 : VENDOR DETAILS

Vendor Area		Vendor Name		Contact
Contractor for wood stump polishing		Md. Khalid		9224477900
Tree stump fastening contractors		Sanjay Kumble Ashok Yadav		9821992988 8689873038
Cycle wheel fence welding contractors		Sanjay Kumble Ashok Yadav Saleem		9821992988 8689873038 9821233790
Masonry material		Md. Irshad_Citihomes		9224118703
Vehicle mechanic		Bharat		9869715450
Powder coating		Nimesh Shah_JK Industries		9324520784
Tempo		Rohit		9594457423
L brackets		Gajanan		9869457301
Rubber lining for tree stumps		Ronak		9819333790
Al-ain Awnings		Tarique Moin		9892998920
Ree Safety railings_tree dome		Pinal Doshi		9833656524
Chemtreat_pultruded pipes and frp		Ankit Gupta		9920955399
IIT B Nursery		M Baikar		9833898436
IIT B Civil Works		Unnithan		25768088 9833898404
				25764030
Greenpro India_rubber turf		NA		61309200
FRP picket fences_Alpha fences		Vikram Singh		9975857460
KNT Creations_FRP wood stumps		Nihar Tumne		98228 48017

ANNEXURE 5 : COSTING DETAILS

Detail of costing		
Material	Paid amt	Remarks
Orange welding electrodes	300	
Extension box	160	
Brackets sandpit	2358	
Tempo for Powder coating	1200	No bill
Tree stumps transporting	950	No bill
Scooters transporting	800	No bill
Shinde cycle shop_40 wheels	2000	No bill
White spray cans for touchup	440	
1K Primer	600	
Scooter & M80 seat covers	600	
Prototyping bracket accessories	60	
Lifebuoy ring	1300	
SV Mockup material	1249	
Prototyping supplies Mangaldeep	502	
Prototyping supplies Jai Ambe	212	
Prototyping supplies Azhar auto garage	130	
Swastik_SS Sheets	274	
Additional paint supplies	328	
Stencil Stickers_Patel Printers	300	
Scooter+ Fence transport	300	No bill
Paint supplies_Balaji Traders	11868	
Prep material_vehicles	1960	
Ambika colours_polymer putty	170	
Zip Tags	500	No bill
Bondite	342	No bill
NC Putty	160	No bill
Cycle labour+ Vehicle labour	7275	
Mechanics spares	3575	
Brackets sandpit	2000	
IDC paint team	7500	
IDC vehicle refurb	5000	
Masonry material	1820	No bill
Masons	3000	No bill
IDC_Welding prototype	1500	No bill
Powder coating	13814	Cheque
Billed amounts	61975	
Unbilled amounts	12572	
Total	74547	

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IIT Bombay

1 May 2014

Gourab Saha & Paulanthony George
IDC, IIT Bombay

Dear Gourab and Paul,

This is to confirm your internship at Sishu Vihar, IIT Bombay, Powai, Mumbai from 5th May 2014 to 10th June 2014, under the following terms and conditions:

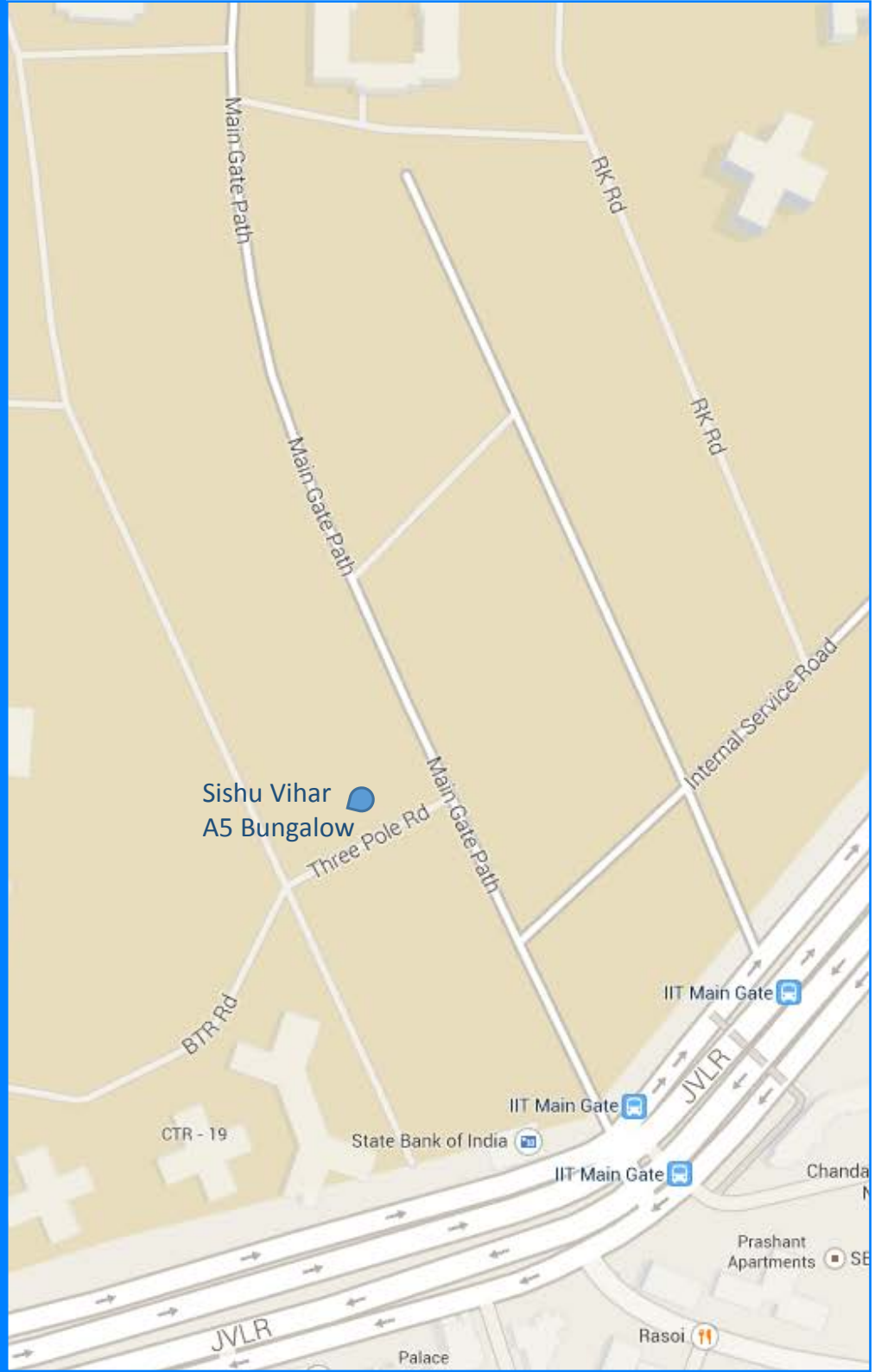
1. No stipend will be paid during the period of internship.
2. During the period of assignment you shall administratively report to Prof P. Sunthar and carry out all aspect of project assigned to you.
3. Information pertaining to the company's operations shall remain secret and safeguarded by you both during and after you tenure of assignment with us.
4. Breach of any of the above conditions will render you liable to termination of your assignment without notice.

We wish you all success in your assignment.

Best wishes,

P Sunthar
(on behalf of Sishu Vihar Management committee)

ANNEXURE 6 : DOCUMENTS



LOCATION AND CONTACT DETAILS:

Address:

Sishu Vihar – children's daycare centre located in the IIT Bombay campus, near Main Gate, A5 Bungalow.
Intercom – 4978
External- 022 2576 4978

Contact:

Ms Suthapa (Supervisor)
Prof P. Sunthar: +91 9833907229 (Commitee Member)

BIBLIOGRAPHY

As seen on 7th July 2014:

• Aileen Shackell, Nicola Butler, Phil Doyle and David Ball

• Design For Play: http://www.playengland.org.uk/resources/design-for-play.aspx

• Natural Spaces in the Lives of Our Children: https://www.youtube.com/watch?v=tz28319BavY

• Tour of Dinton Pastures Nature Play Space with landscape architect Davies White https://www.youtube.com/watch?v=IMFCmPStK7Y

• http://www.pinterest.com/pin/90775748713464992/

• http://www.wstcoast.org/playspaces/outsidecriteria/7Cs.pdf

• http://www.infiniteplaygrounds.co.uk/projects/

• flet on a tree: http://www.pinterest.com/pin/90775748712047177/

• Sandbox tyre: http://www.iheartnaptime.net/make-a-sandbox-with-a-tire/

• Wood playspaces: http://la-lashomedaycare.blogspot.in/2011/05/building-ournatural-play-area_18.html

• Twig and Toadstool: http://twigandtoadstool.blogspot.in/2010/05/its-gardening-weeklets-make-toadstools.html

• Fence with marbles:http://gardendrama.wordpress.com/2011/09/17/gardenart-on-the-cheap-diy-glass-marbles-in-your-fence/

• Natural Play Space: http://theenchantedtree.blogspot.in/2011/04/natural-play-space.html

• Foldable sandbox : http://www.mh-star.co.uk/wooden-sandpit-sand-box-withfolding-lidseats-498-p.asp http://ana-white.com/2011/10/plans/sand-box-builtseatt#b

• Wood treatment:http://www.doityourself.com/stry/how-to-properly-treatwood-for-your-log-furniture-project#b