RIT MSD I PRELIMINARY DESIGN REVIEW

Estar Wide Format Shipping Container

RIT MSD Team:

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PRESENTATION OUTLINE

- Project Summary
- Key Requirements
- Engineering Specifications
- Functional Decomposition
- Workflow and container concept development
- Workflow and container concept selection
- System Architecture
- Present container concepts
- Detailed design schedule & team concerns

PROJECT SUMMARY

- Primary Task:

  Standardize pack to ship process for “new business” Estar products via:

- Proprietary shipping container
- Waste reduction in current pack to ship workflows

- Secondary Tasks:

- Provide ergonomic optimization
- Quantify savings and future performance

KEY REQUIREMENTS

- Container must be compatible with current core and varying roll diameters and widths.
- Unit cost ≤ $120
- Container must last for at least 5 uses.
- Must protect roll structurally (vibration and impact) as well as from contaminates (dirt and oil).
- Throughput at windup ≤ 5 minutes
- Total pack to throughput ≤ 10 minutes

KEY REQUIREMENTS

- Must conform to all international shipping standards.
- Container must meet or surpass current shipping capacity → dimensions and stackable.
- Enable 4 way access for fork truck.
- Container must be quick and easy to assemble/disassemble → safe and ergonomic.

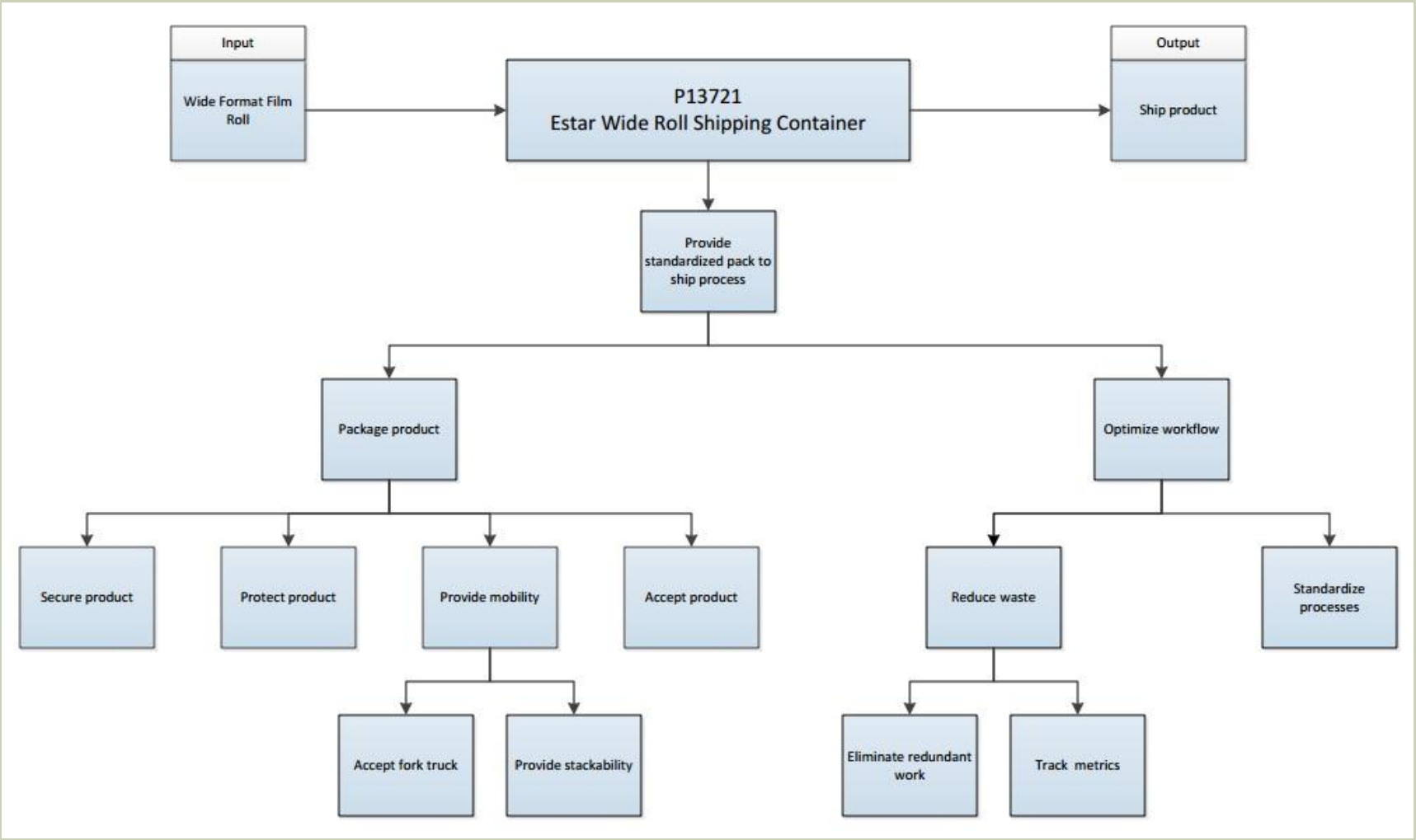
ENGINEERING SPECIFICATIONS

Description	Required Values	Units	Possible Additional Considerations
Core Outer Diameter	7	Inches	9" for Dryview
Core Length	58	Inches	
Roll Diameter	12 - 27.5	Inches	One roll has 32" dia
Roll Width	47 - 56	Inches	
Roll Weight	500 - 1900	Pounds	Roll weighs 2600 lb.
Overall Container Width	29.5	Inches	
Overall Container Length	64	Inches	

ENGINEERING SPECIFICATIONS

Description	Required Values	Units	Possible Additional Considerations
Overall Container Height	35	Inches	
Container Re-Useability	> 5	Uses	
Container Impact Resistance	10	G	
Container Stack Height	1 - 2	Containers	
Container Cost	120	Dollars	
Container Component Lead Time	< 4	Weeks	
Packing Time in Windup Area	<5	Minutes	
Total Packaging Time	< 10	Minutes	
# of Operators Needed to Package	2	Operators	

FUNCTIONAL DECOMPOSITION



CONCEPT DEVELOPMENT PROCESS

The Pack to Ship process must be considered before addressing the physical deliverable, much like design for manufacturing.

This enables the MSD team to:

- Ensure adequate waste reduction in current processes
- Optimize the current manufacturing area layout & resources
- Maximize the likelihood of the container and its assembly integrating well with existing resources in bldg. 317 and 318
- Meeting throughput requirements

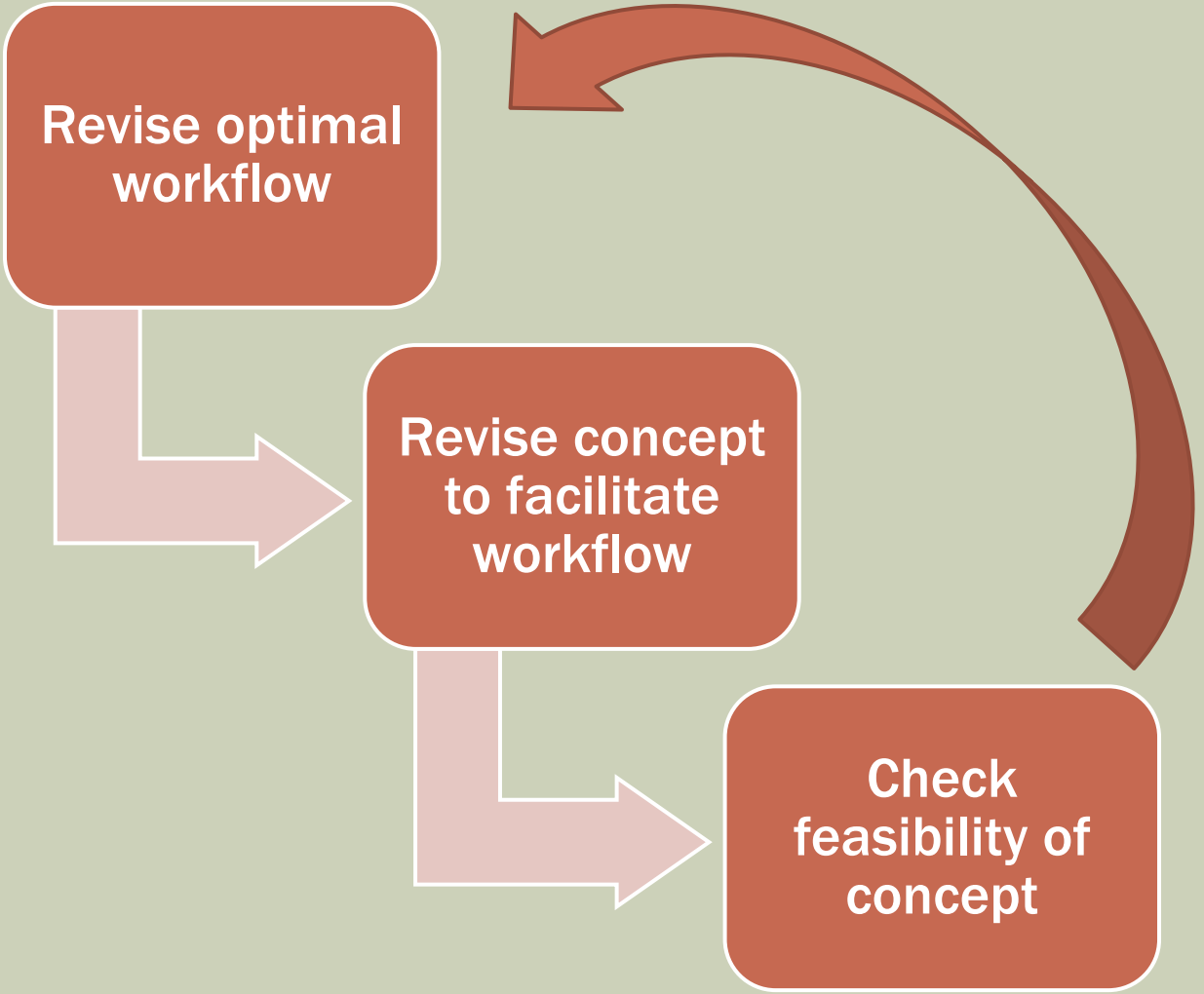
WORKFLOW CONCEPT DEVELOPMENT

- Pack to Ship workflow conceptualization
- Score and rank workflows
- Select optimal workflows to pursue
- Revise workflows per market constraints

CONTAINER CONCEPT DEVELOPMENT

- Subassembly conceptualization
- Score and rank complete concepts
- Select container concepts to begin design

SUBASSEMBLY DEVELOPMENT PROCESS



PACK TO SHIP WORKFLOW CONCEPTUALIZATION

Concept								
A	Windup	Place roll in base	Place lid	Ship				
B	Windup	Place roll in base	Lock down	Place lid	Ship			
C	Windup	Place roll in base	Stage	Lift with C-hook	Wrap entire roll	Lock Down	Place lid	Ship
D	Windup	Place roll in base	Stage	Lift with C-hook	Wrap circumf.	Place end caps	Place lid	Ship
E	Windup	Place roll in base	Stage	Lock down	Place lid	Ship		
F	Windup	Wrap circumf.	Place end caps	Place roll in base	Stage	Place lid	Ship	
G	Windup	Wrap circumf.	Place end caps	Place roll in base	Stage	Lock Down	Place lid	Ship
H	Windup	Wrap circumf.	Place roll in base	Stage	Place end caps	Lock down	Place lid	Ship
I	Windup	Wrap circumf.	Place roll in base	Stage	Place end caps	Place lid	Ship	
J	Windup	Wrap circumf.	Place roll in base	Lock down	Place lid	Ship		
K	Windup	Wrap circumf.	Place roll in base	Place lid	Ship			

WORKFLOW SCORING VIA PUGH MATRIX

	Concepts										
Selection Criteria	A	B	C Reference	D	E	F	G	H	I	J	K
Ease of Packaging	+	+	0	-	+	+	+	+	+	+	+
Packaging Cycle Time	+	+	0	-	+	+	+	+	+	+	+
Container Simplicity	-	-	0	0	-	-	0	0	-	-	-
Number of Parts	+	+	0	-	+	-	-	-	-	+	+
Material Weight	-	-	0	0	-	0	0	0	0	-	-
Adherence to lean critera	+	+	0	-	-	+	+	+	+	+	+
Simple Product Protection	-	-	0	-	-	-	0	0	-	-	-
Aesthetics	+	+	0	0	+	0	0	0	0	0	+
Adjustability	-	0	0	0	0	-	0	0	-	0	-
Cost	-	-	0	-	-	-	-	-	-	-	-
Sum + 's	5	5	0	0	4	3	3	3	3	4	5
Sum 0's	0	1	10	4	1	2	5	5	2	2	0
Sum -'s	5	4	0	6	5	5	2	2	5	4	5
Net Score	0	1	0	-6	-1	-2	1	1	-2	0	0
Rank											
Continue?											

REFINED WORKFLOW SCORING

Step #1 Screening (Refined)

	Concepts										
Selection Criteria	**A**	**B**	**C** Ref	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**
Ease of Packaging	+	+	0	-	+	+	+	+	+	+	+
Packaging Cycle Time	+	+	0	-	+	+	+	+	+	+	+
Container Simplicity	-	-	0	0	-	-	0	0	-	-	-
Number of Parts	+	+	0	-	+	-	-	-	-	+	+
Adherence to lean critera	+	+	0	-	-	+	+	+	+	+	+
Simple Product Protection	-	-	0	-	-	-	0	0	-	-	-
Adjustability	-	0	0	0	0	-	0	0	-	0	-
Sum + 's	4	4	0	0	3	3	3	3	3	4	4
Sum 0's	0	1	7	2	1	0	3	3	0	1	0
Sum -'s	3	2	0	5	3	4	1	1	4	2	3
Net Score	1	2	0	-5	0	-1	2	2	-1	2	1
Rank											
Continue?	N	Y	Y	N	Y	N	Y	Y	N	Y	N

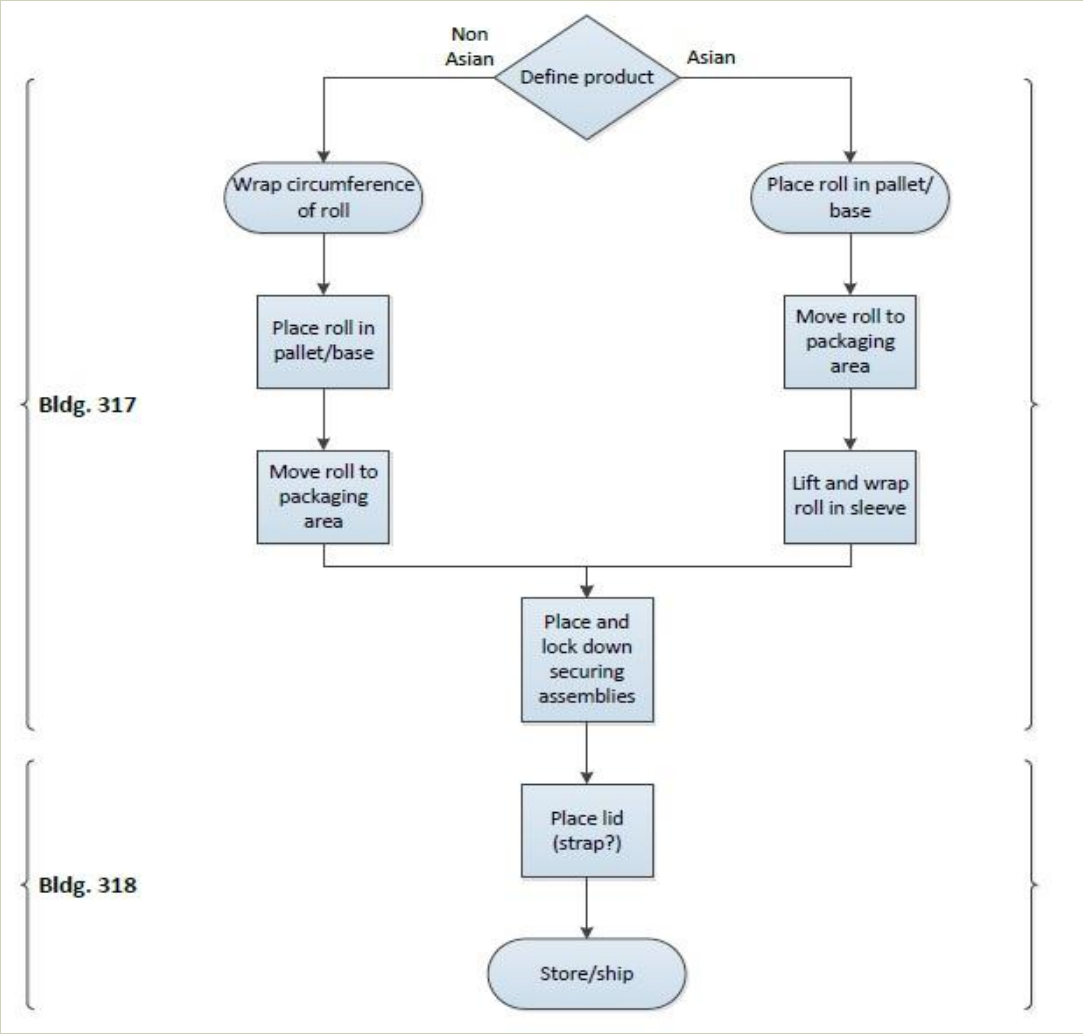
WEIGHTED RANKING & SELECTION

		Concepts											
		B		C (ref)		E		G		H		J	
Selection Criteria	%	R	W	R	W	R	W	R	W	R	W	R	W
Ease of Packaging	10%	5	0.5	3	0.3	5	0.5	2	0.2	2	0.2	3	0.3
Packaging Cycle Time	25%	5	1.25	3	0.75	5	1.25	4	1	4	1	5	1.25
Number of Parts	5%	5	0.25	3	0.15	3	0.15	2	0.1	2	0.1	3	0.15
Material Weight	5%	1	0.05	3	0.15	2	0.1	3	0.15	3	0.15	3	0.15
Adherence to lean critera	25%	5	1.25	3	0.75	4	1	4	1	4	1	5	1.25
Simple Product Protection	10%	1	0.1	3	0.3	2	0.2	1	0.1	1	0.1	2	0.2
Adjustability	20%	2	0.4	3	0.6	3	0.6	3	0.6	3	0.6	2	0.4
Wrap @ Windup?		1		1		1		5		5		5	
Total Score		3.80		3.00		3.80		3.15		3.15		3.70	
Rank		1				1		3		3		2	
Continue?		Y		N		Y		M		M		Y	
Weighted Total	100%												

B: Windup, Place roll in base, Lock down, Lid, Ship

G: Windup, Wrap circumf, Place end caps, Place roll in base, Stage, Lock Down, Lid, Ship

REVISED WORKFLOWS PER MARKET



CONCEPT FUNCTIONS & COMPONENTS

Concept Component	Function	Comments
Existing Pallet		Use an unmodified existing E or A pack pallet, build off of it
Custom	Allow Double Stacking	
	Doesn't Allow Double Stacking	
		In order to accommodate the different windups and the angle the core
Half-Board Base		is lowered into the saddle, a half-board saddle is the best option
Adjustable Main Saddle		Uses the existing roll support as the means to prevent telescoping. Requires adjustable roll support!
Extra Piece	Integrated Into Base	Uses an additional piece (end board) that is adjustable independent of the roll support
	Not Integrated Into Base	
Hard Lid	Has Supports	
	No Supports	
Soft Lid	Has Supports	
	No Supports	
Lid With Supports		Requires the roll covering to have some sort of sturdy supports
End boards as Supports		Requires the end boards to be tall enough to support a second roll

CONTAINER CONCEPT SELECTION

	Concepts				
Function	**A**	**B**	**C**	**D**	**E**
Base	Pallet	Pallet	Pallet	Pallet	Custom
Prevent Telescoping	Adj main saddle	Adj main saddle	Piece in base	Piece not in base	Adj main saddle
Cover Roll	soft lid w/ support	w/o support	hard w/ support	hard w/ support	soft lid w/ support
Allow double stacking	lid support	end board	lid support	end board	lid support

	F	**G**	**H**
Base	Custom	Custom	Custom
Prevent Telescoping	Adj main saddle	Piece in base	Piece not in base
Cover Roll	w/o support	hard w/ support	hard w/ support
Allow double stacking	end board	lid support	end board

Conclusions:

Concept D is recommended based on the Pugh criteria

If an adjustable main saddle is desirable, a custom base should be designed

Concept Rank

D

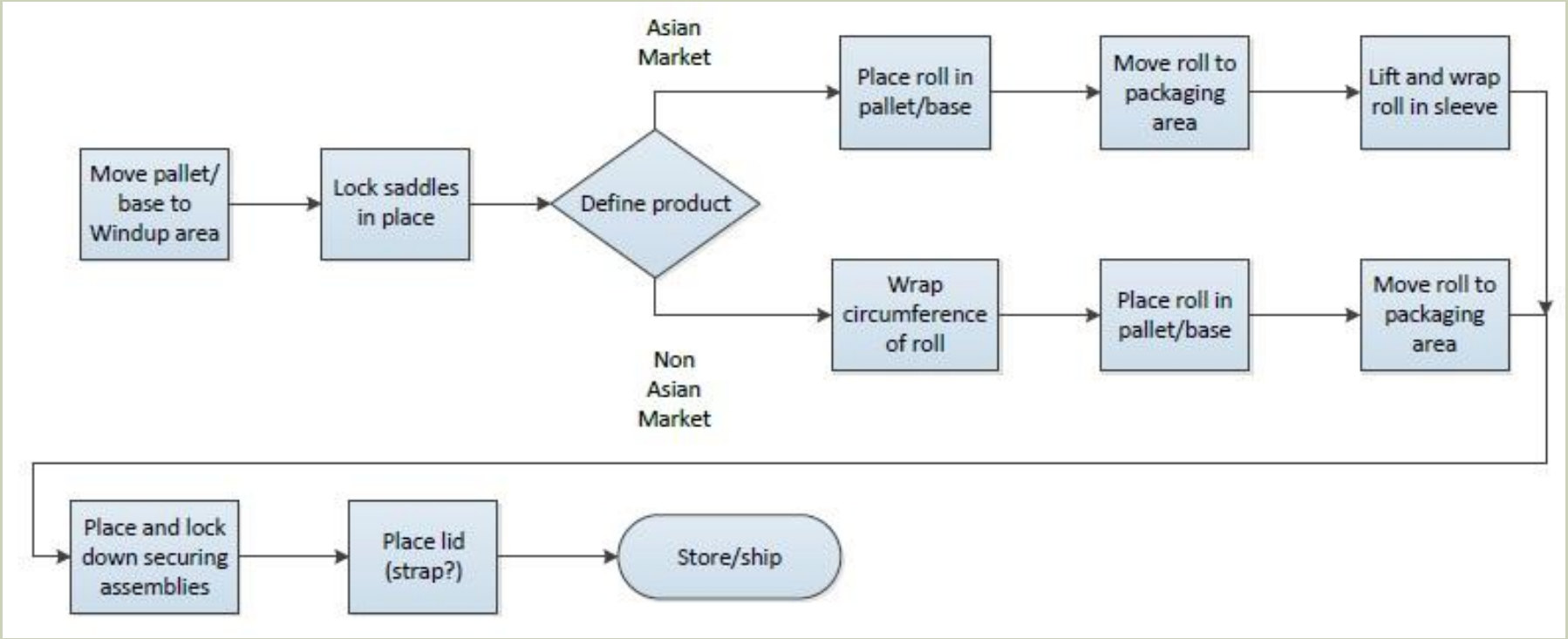
C

G

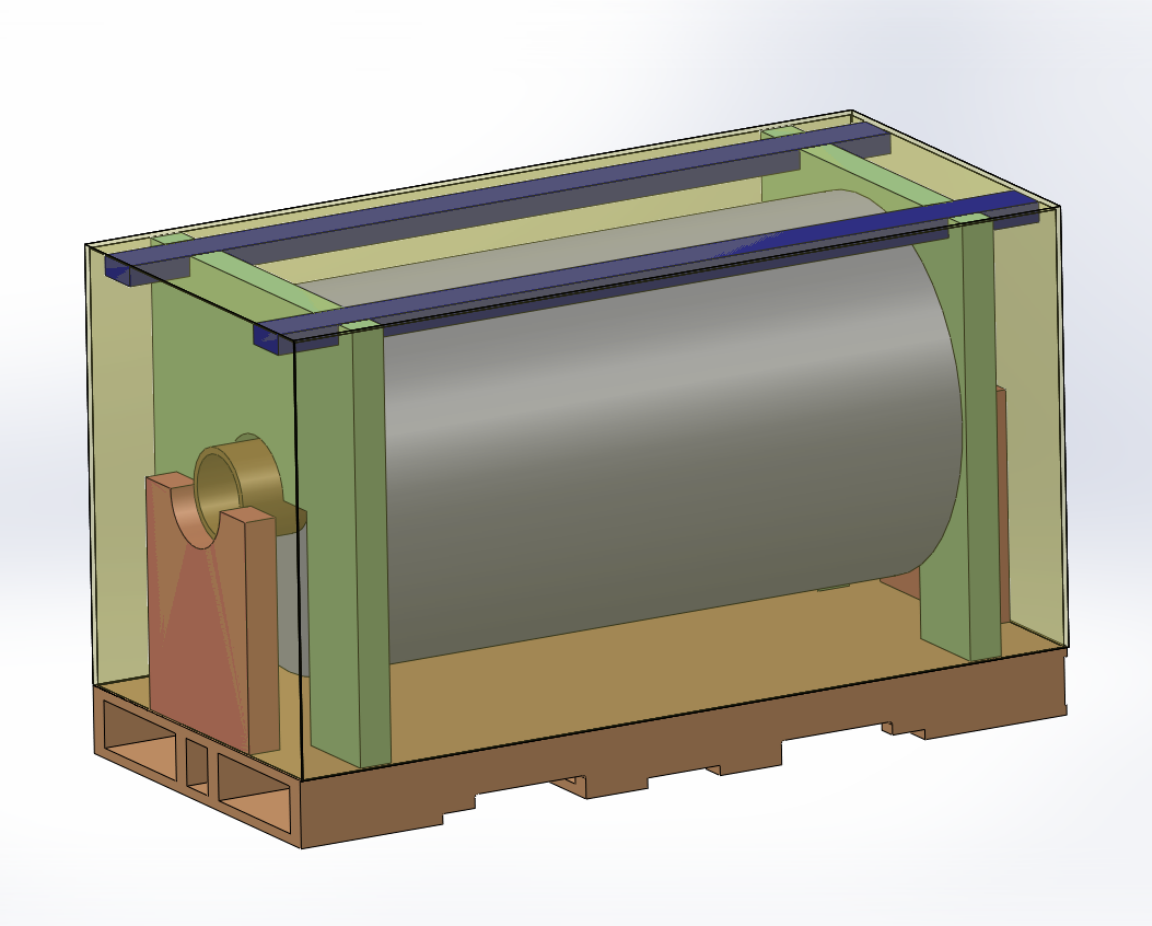
CONTAINER CONCEPT SCORING

	Step #1 Screening							
	Concepts							
Selection Criteria	**A**	**B**	**C**	**D** Ref	**E**	**F**	**G**	**H**
Adjustability (Implement)	-	-	-		-	-	-	0
Cost	-	-	-		-	-	-	-
Packaging Time	+	+	+		+	+	+	+
Support (Implement)	-	-	-		+	+	+	+
Complexity	-	-	-		-	-	-	-
Collapsability	-	-	0		-	-	0	-
Weight	0	0	0		-	-	-	-
Ability to Prevent Telescoping	0	0	+		0	0	+	0
Sum + 's	1	1	2	0	2	2	3	2
Sum 0's	2	2	2	0	1	1	1	2
Sum -'s	5	5	4	0	5	5	4	4
Net Score	-4	-4	-2	0	-3	-3	-1	-2
Rank								
Continue?			Y	Y			Y	

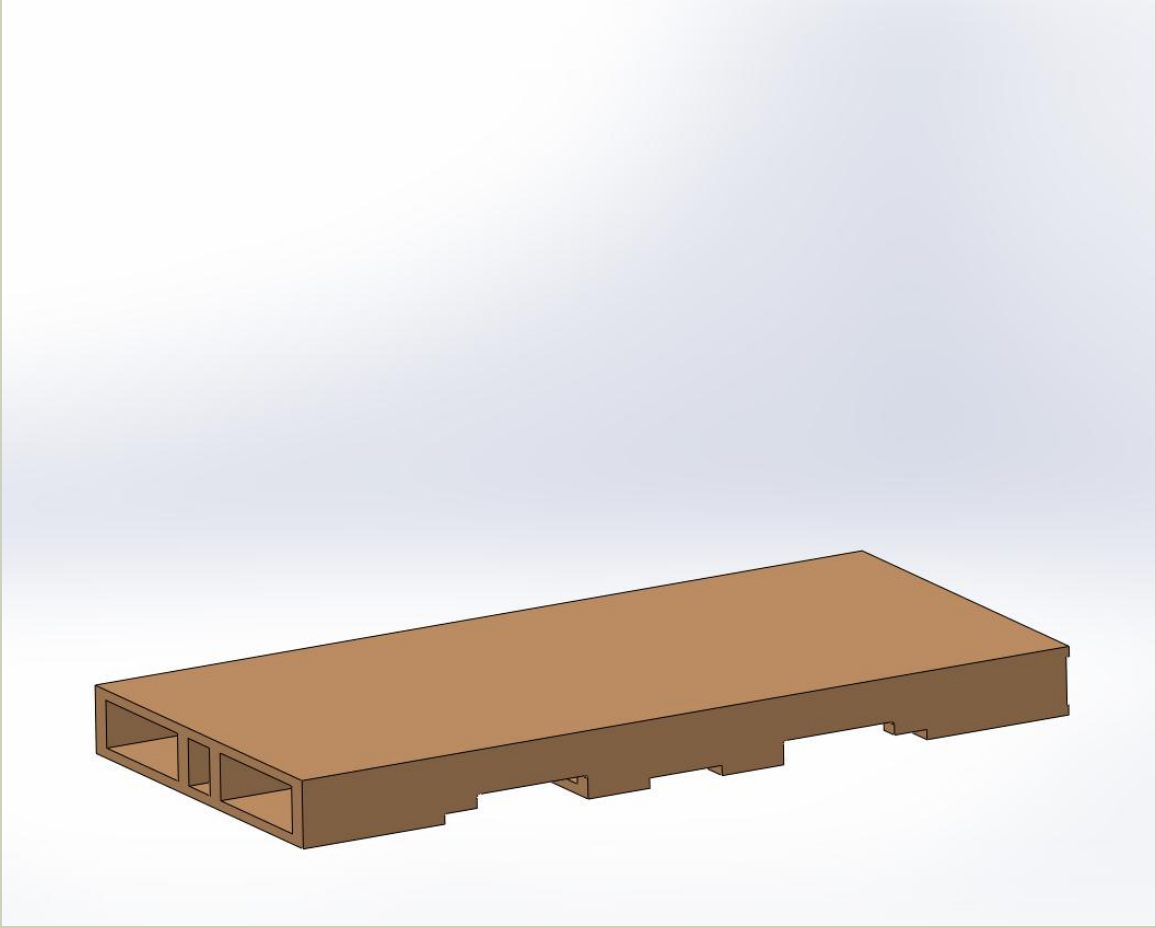
SYSTEM ARCHITECTURE



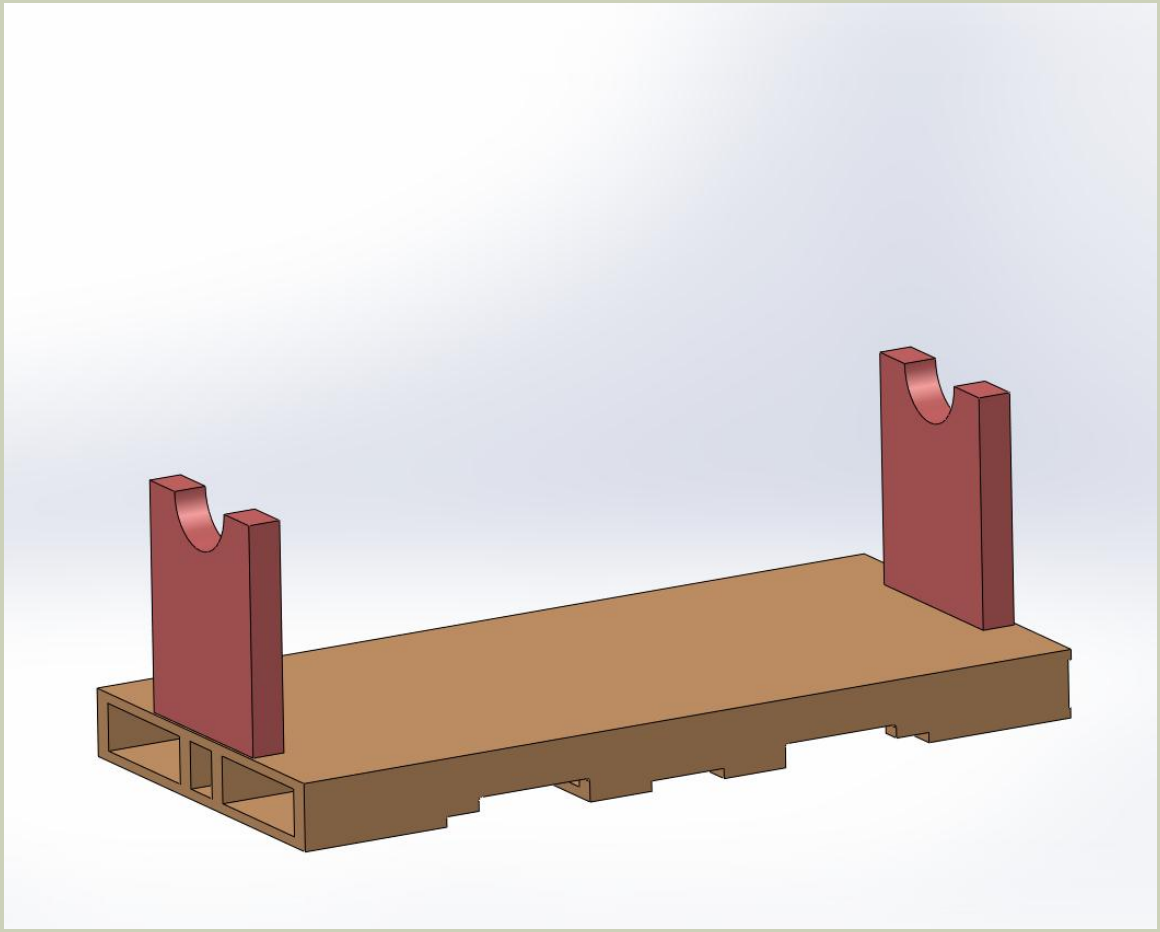
CONCEPT ‘D’



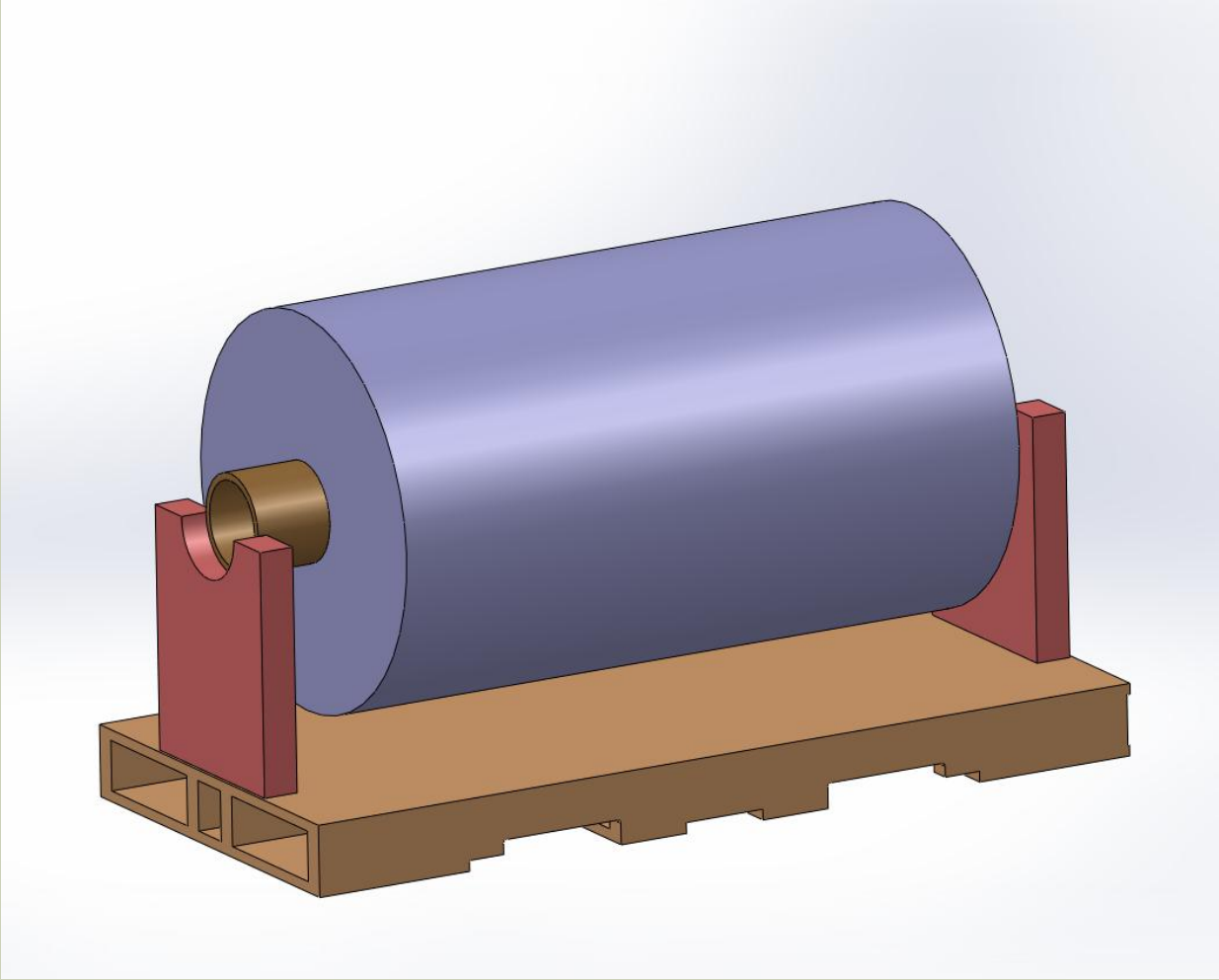
CONCEPT ‘D’ - BASE



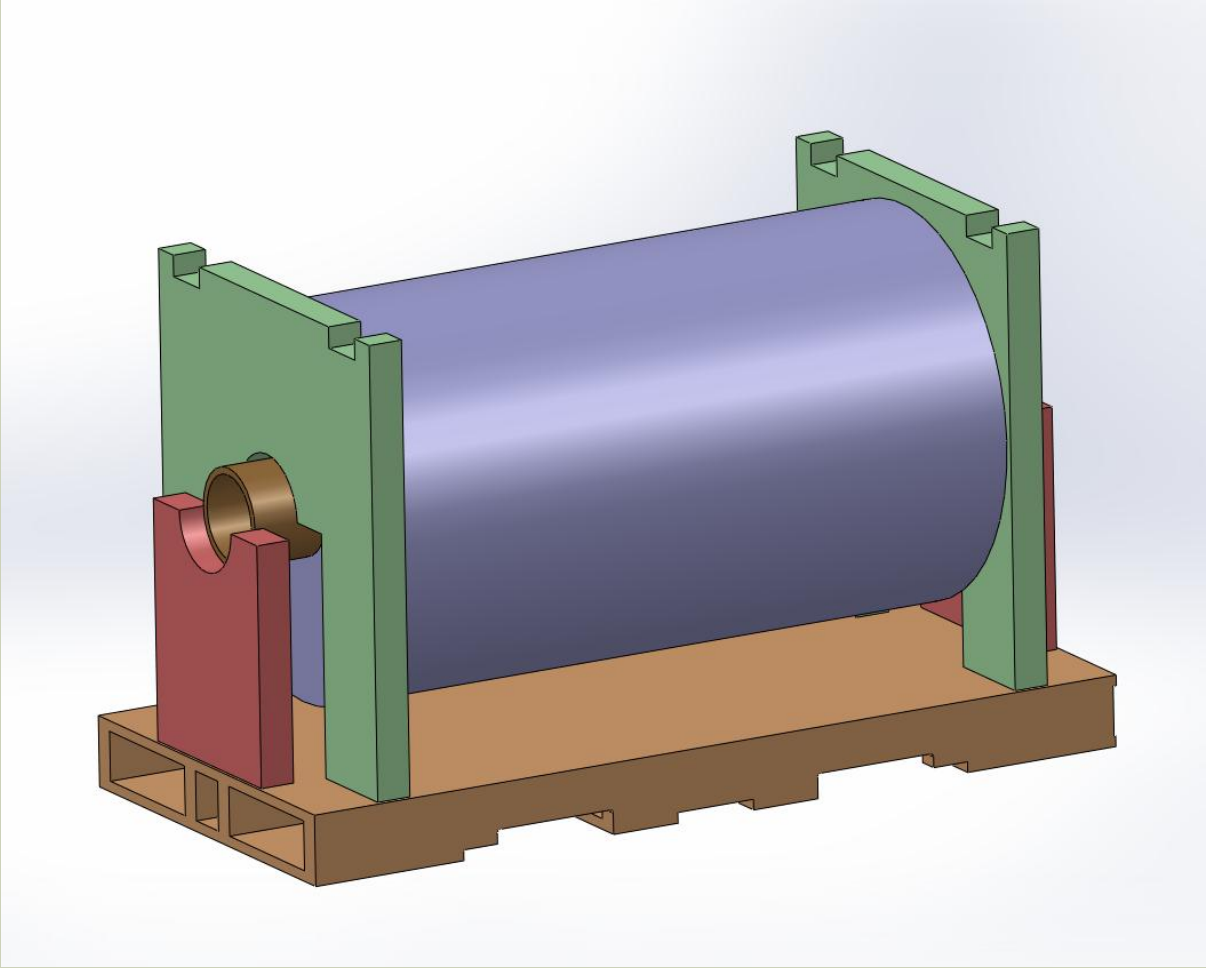
CONCEPT ‘D’ - SADDLES



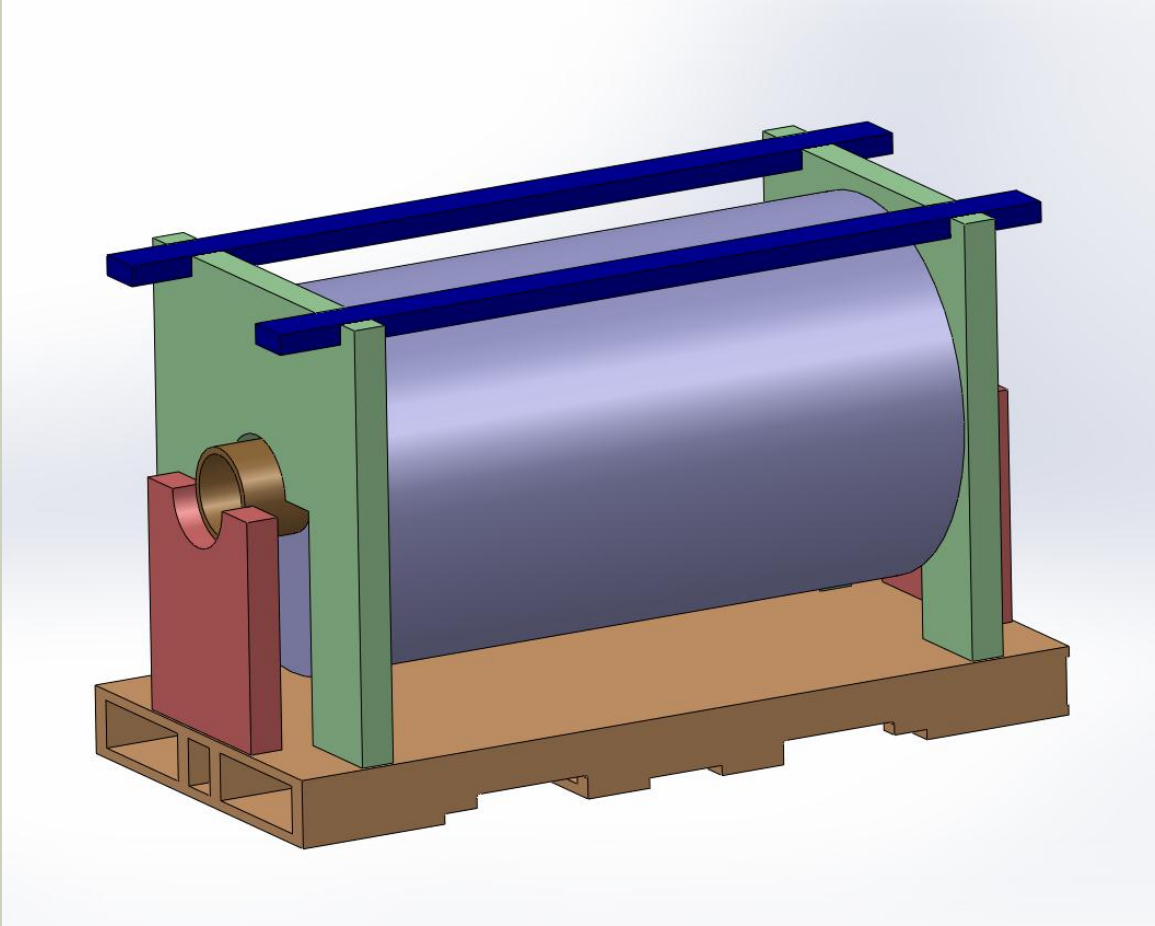
CONCEPT ‘D’ - ROLL



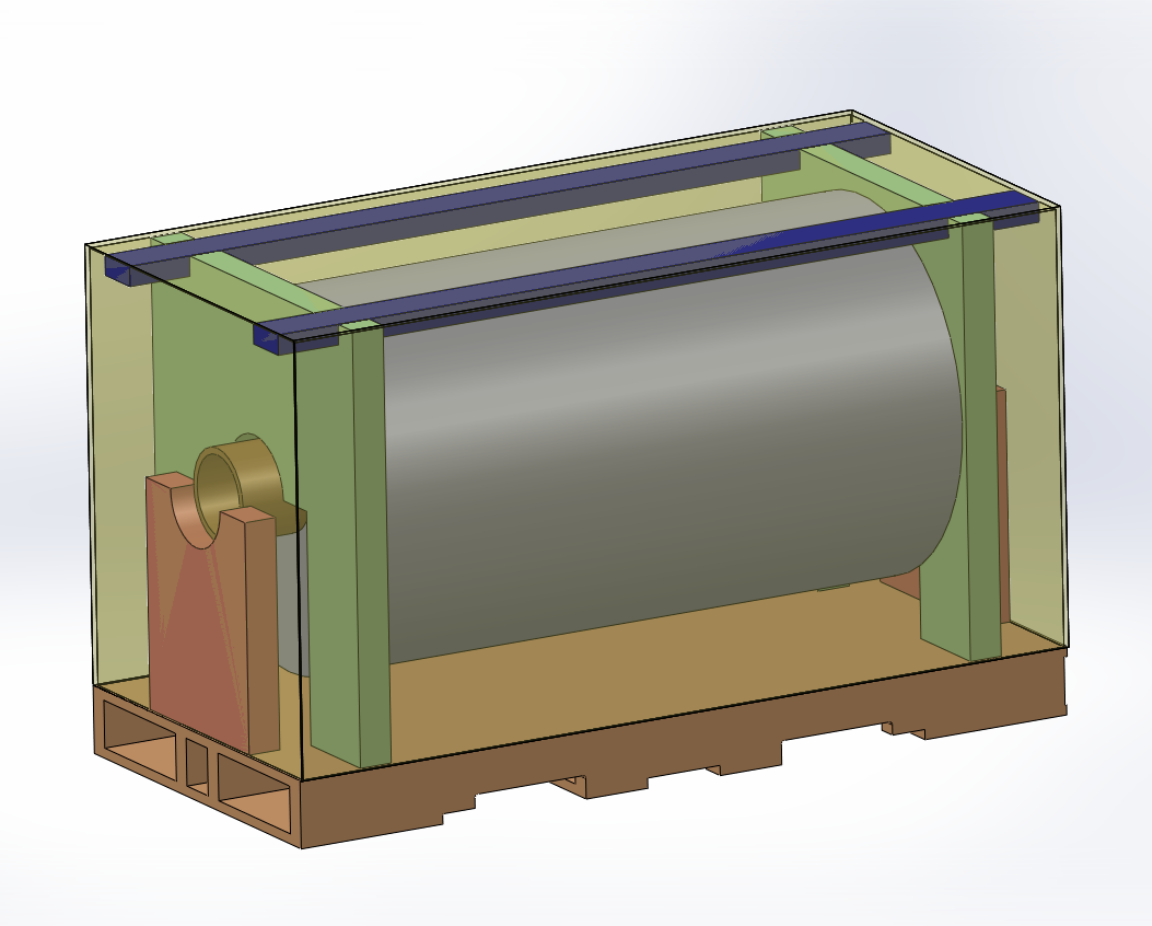
CONCEPT ‘D’ - END BOARDS



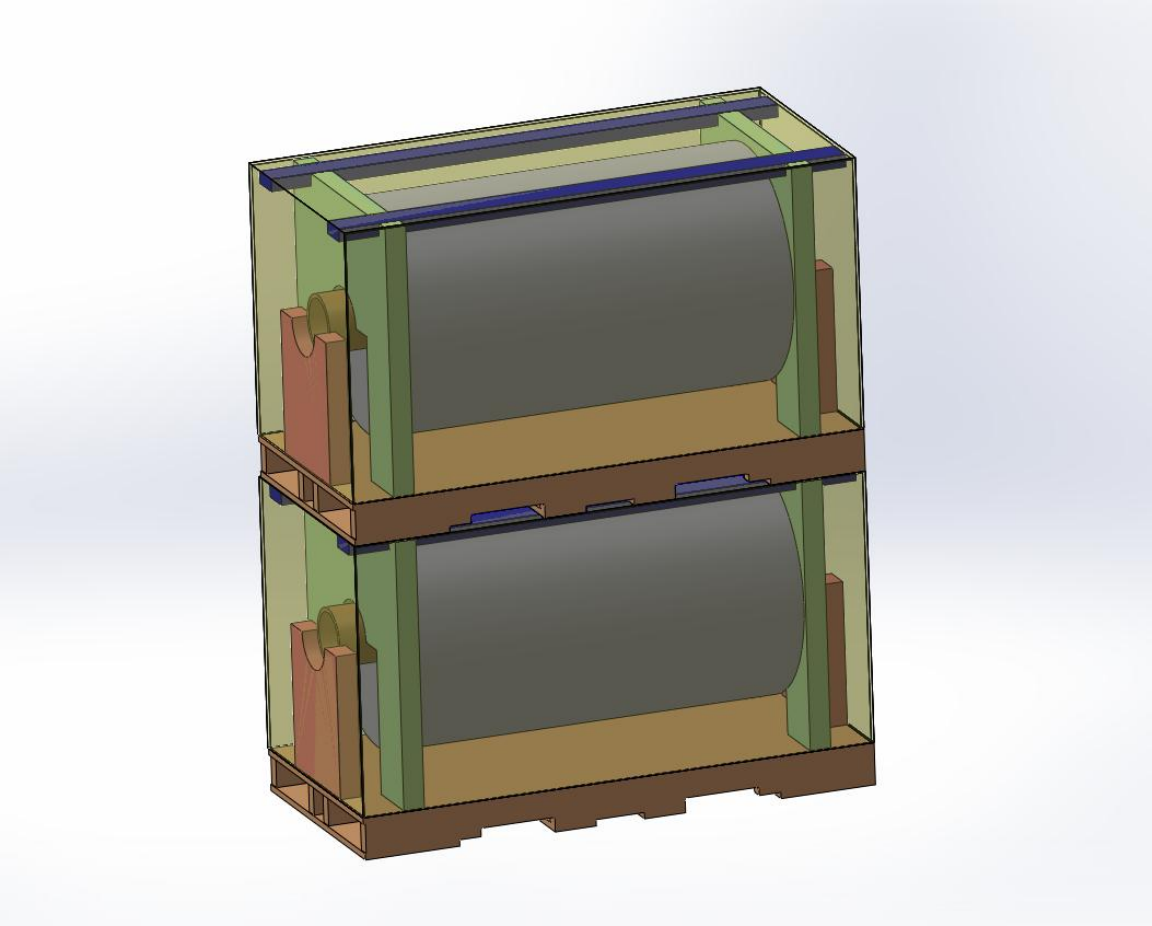
CONCEPT ‘D’ - END BOARD SUPPORTS



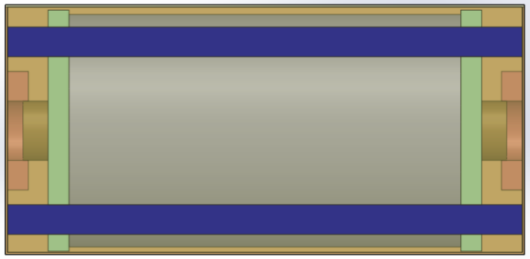
CONCEPT ‘D’ - LID

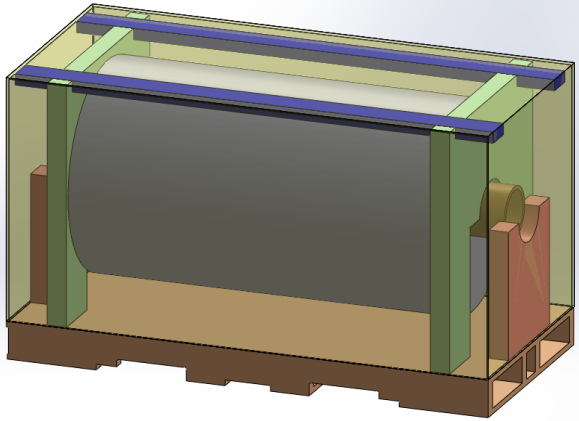


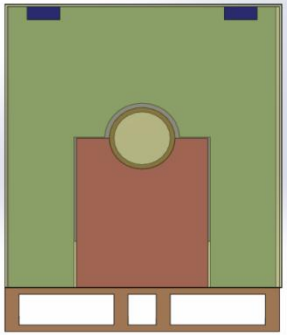
CONCEPT ‘D’ – DOUBLE STACK



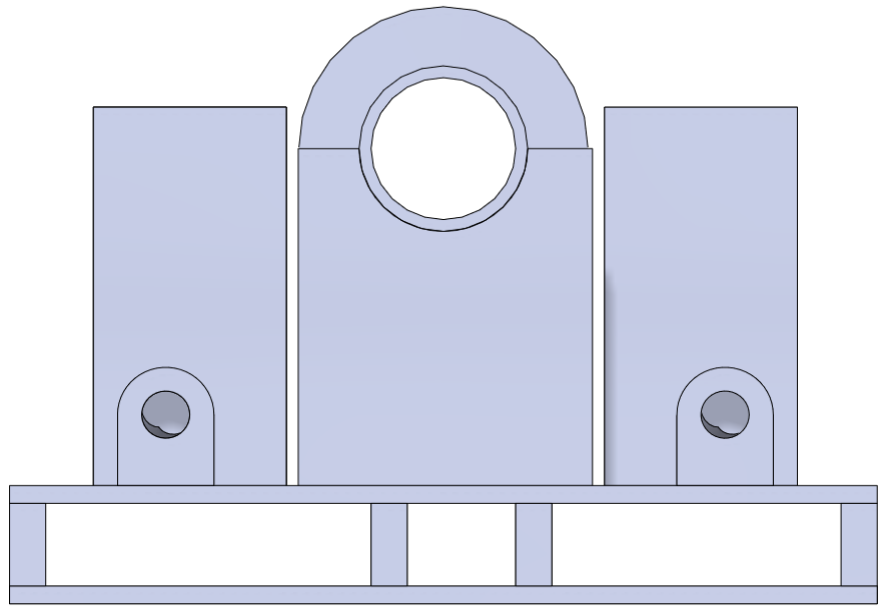
CONCEPT ‘D’ – OPTIMAL CONCEPT

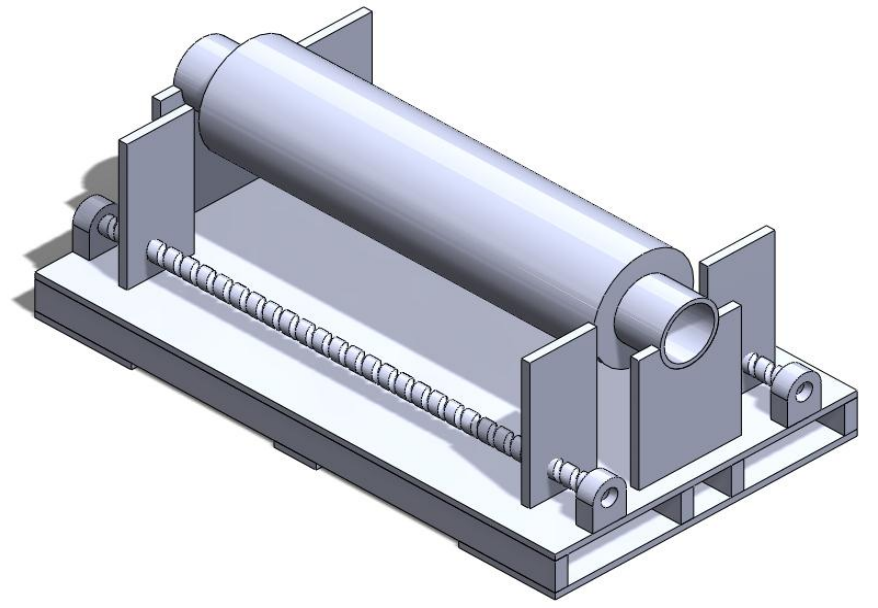






CONCEPT “C-G” VARIANT





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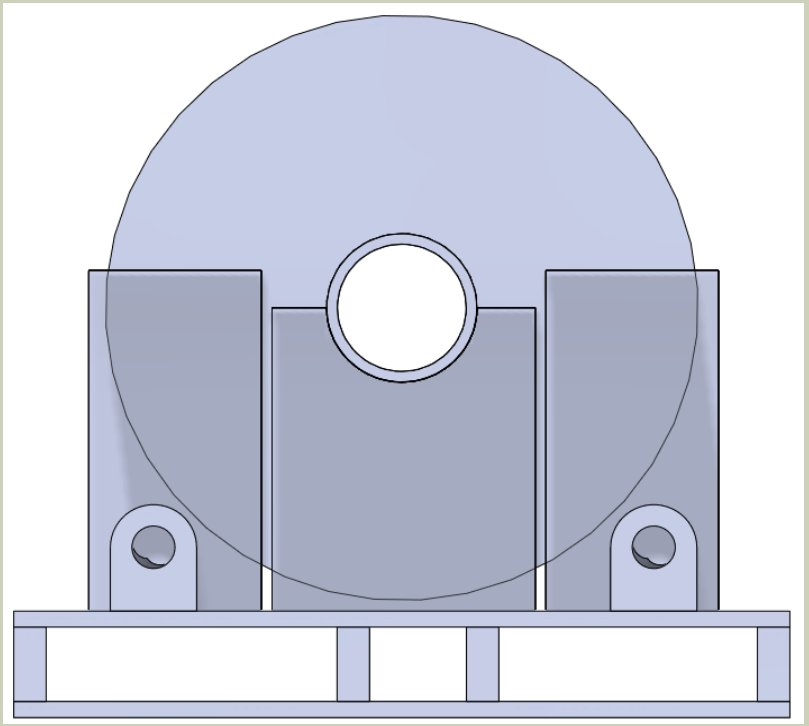
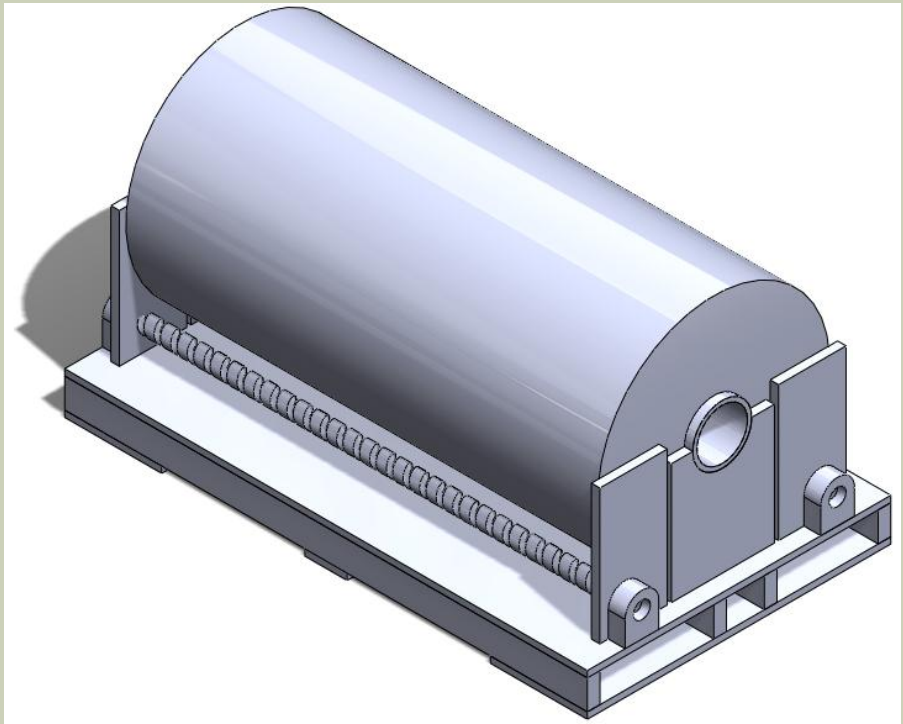
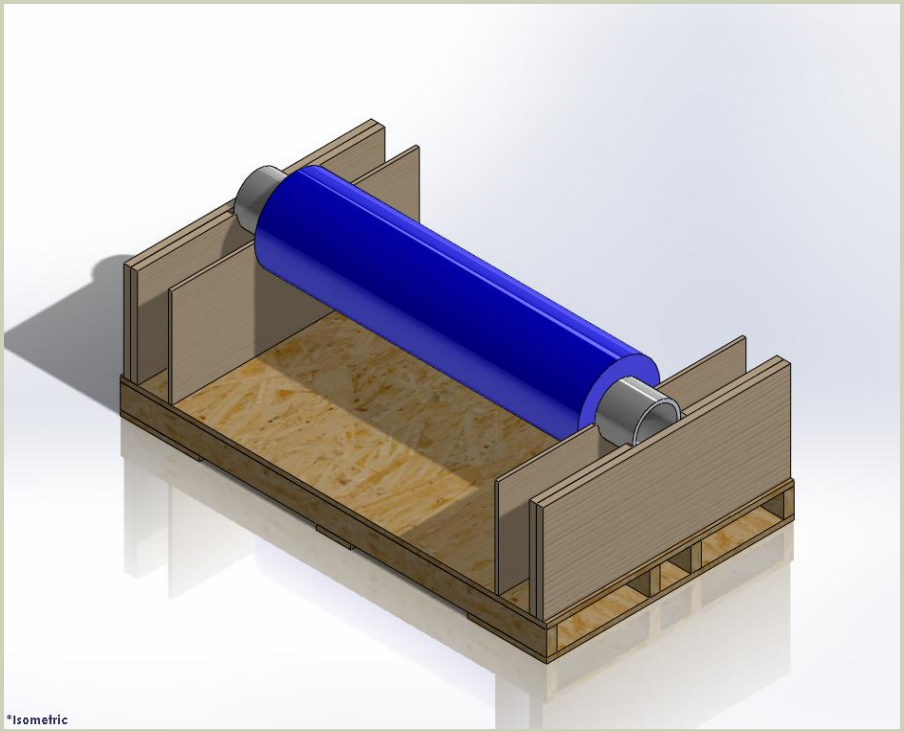
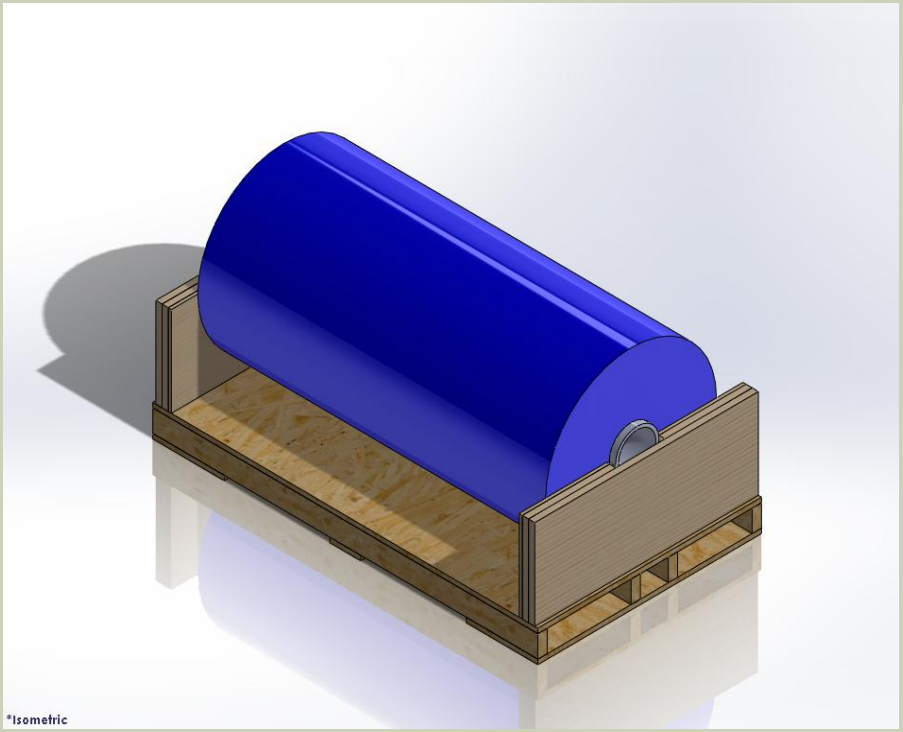




CONCEPT “C-G” VARIANT





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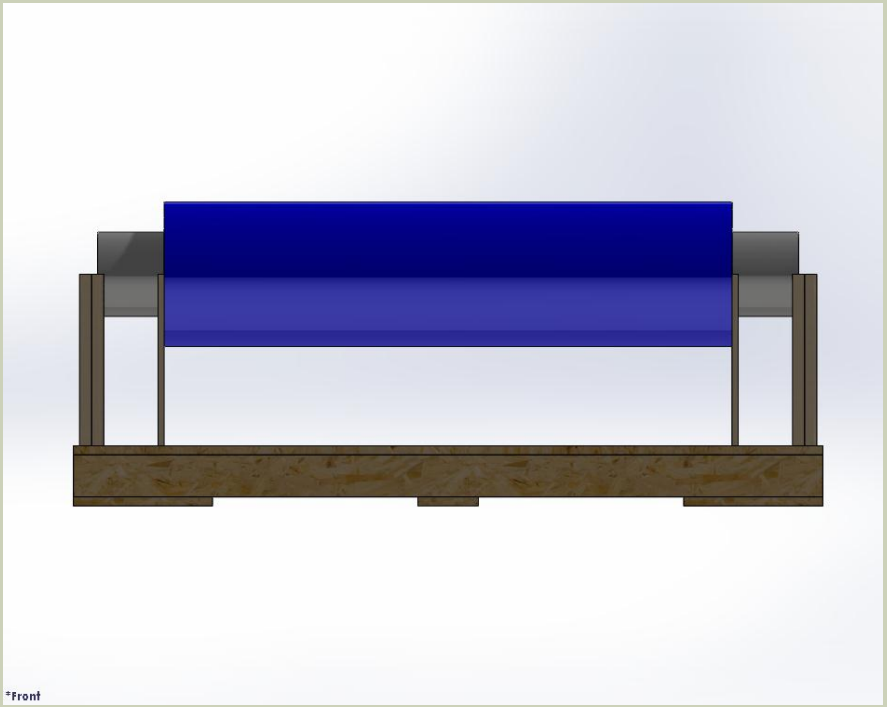

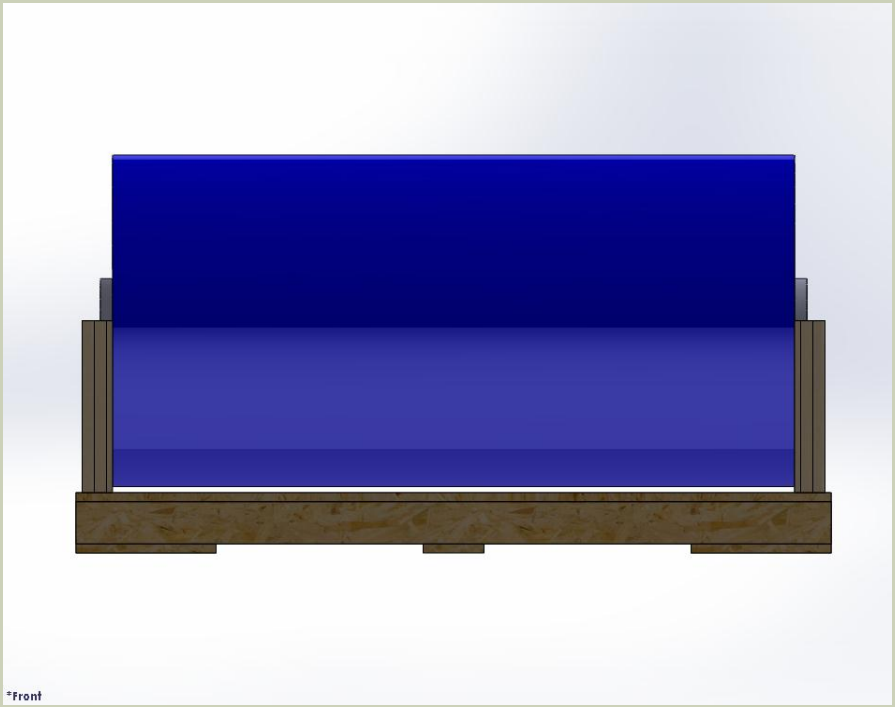

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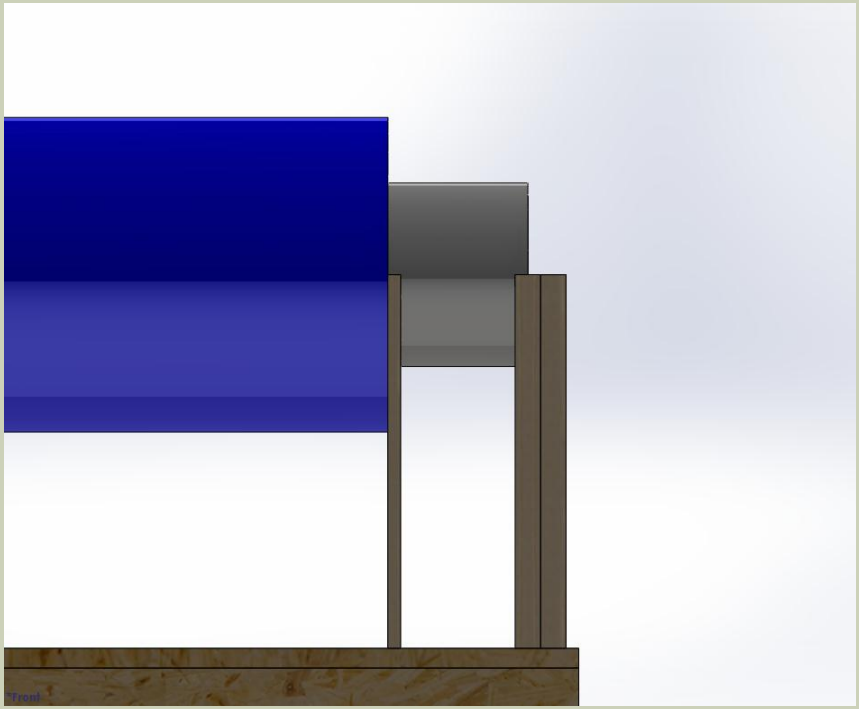

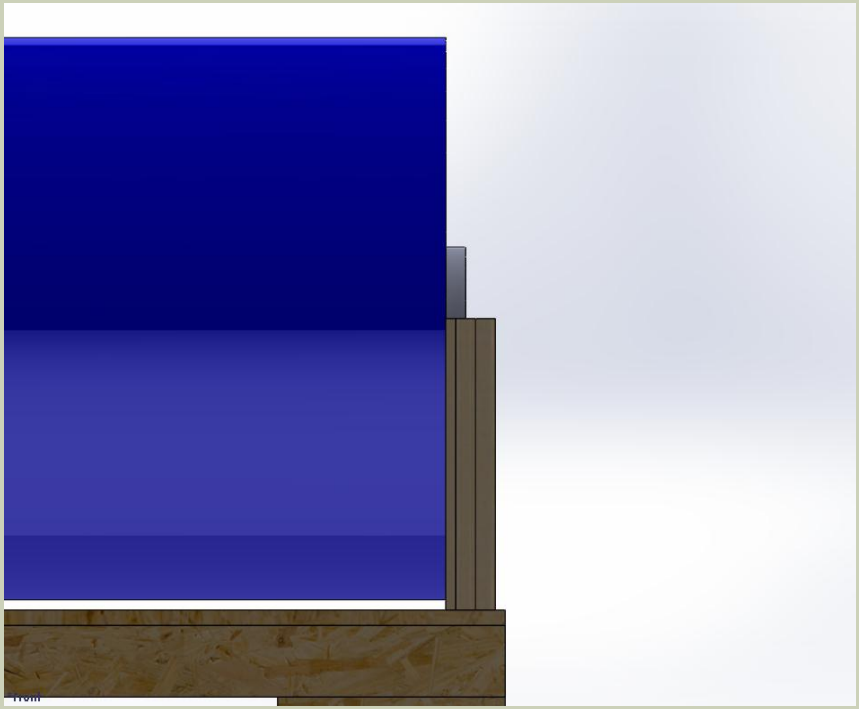

DETAILED DESIGN SCHEDULE

Task Name	Duration	Start	Finish
Choose concept for detailed design	1 day	Fri 1/18/13	Fri 1/18/13
Finalize concept assembly	5 days	Mon 1/21/13	Fri 1/25/13
Determine hardware and materials	5 days	Mon 1/28/13	Fri 2/1/13
Engineering Analysis	5 days	Mon 1/28/13	Fri 2/1/13
Finalize detailed concepts	5 days	Mon 2/4/13	Fri 2/8/13
Draft test plan	5 days	Mon 2/4/13	Fri 2/8/13
Prepare for prototyping	5 days	Mon 2/11/13	Fri 2/15/13
Detailed design review	1 day	Fri 2/15/13	Fri 2/15/13

TEAM CONCERNS

- Straps?
- Total prototype and testing budget?
- Wood shop lead time and cost?
- Packaging lab rules (scheduling, cost)
- Customer approval issues, wrapping procedures, etc. who has final approval power?
- Need to video current process
- Throughput data at windup and for packaging, approximate annual overtime in 318 (hours, # rolls, and cost)
- Safety and ergonomic concerns? Areas to focus on?