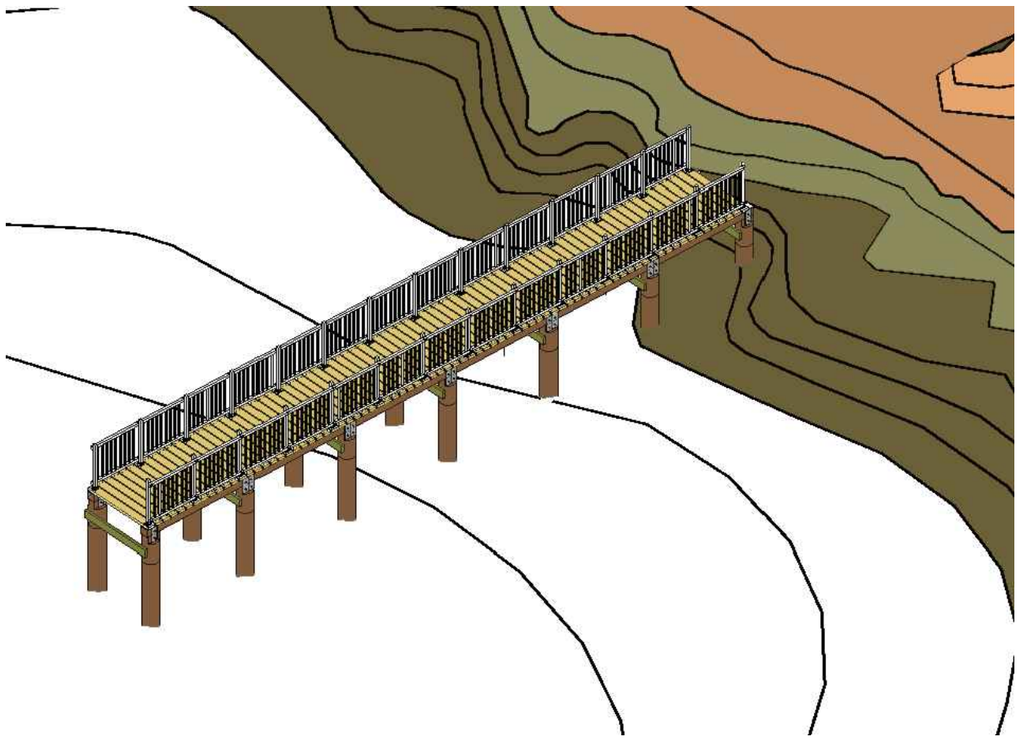
WORCESTER POLYTECHNIC INSTITUTE

BATIPA BOARDWALK PROJECT

SPONSORED BY OTEIMA TECHNOLOGICAL UNIVERSITY

A Major Qualifying Project (MQP) submitted to the Faculty of Worcester Polytechnic Institute
in partial fulfillment of the requirements for the Degree of Bachelor of Science



Universidad Tecnológica Oteima

BATIPA FIELD INSTITUTE

SUBMITTED OCTOBER 13, 2023

WPI

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NOTES

DESIGN & CONSTRUCTION

1. THIS DESIGN WAS DEVELOPED BY A TEAM OF CIVIL AND ENVIRONMENTAL ENGINEERING STUDENTS FROM WORCESTER POLYTECHNIC INSTITUTE WITHOUT REVIEW FROM A PROFESSIONAL ENGINEER. PRIOR TO CONSTRUCTION, THIS DESIGN SHOULD BE REVIEWED AND STAMPED BY A PROFESSIONAL ENGINEER.

2. PRIOR TO BEGINNING CONSTRUCTION, SURVEYING AND SOIL TESTING SHOULD BE CONDUCTED BY TRAINED PROFESSIONALS AND MODIFICATIONS TO THE DESIGN SHOULD BE MADE.

3. IT IS RECOMMENDED THAT MATERIALS WITH WATER RESISTANT ATTRIBUTES BE USED. USE OF PRESSURE TREATED PLANKS AND LOGS, OR WOOD HARVESTED FROM TREES THAT ARE OLD ENOUGH TO HAVE A NATURALLY OCCURRING WATER-RESISTANT OIL ARE RECOMMENDED.

4. ALTERNATIVES TO SOME OF THE MATERIALS INCLUDED IN THIS DESIGN ARE AVAILABLE. SOME OF THESE INSTANCES ARE NOTED IN THIS DRAWING SET. HOWEVER, THE MATERIAL PROPERTIES SHOULD BE REVIEWED PRIOR TO MAKING ANY SUBSTITUTIONS.

5. THE BOARDWALK DESIGN CONSISTS OF MULTIPLE REPEATING UNITS, AS WILL BE DEMONSTRATED IN THIS PLAN SET. DUE TO THE MOVEMENT OF WATER INTO AND OUT OF THE MANGROVE SWAMP DUE TO TIDES, IT IS RECOMMENDED THAT THE BOARDWALK BE BUILT IN SECTIONS TO ALLOW FOR DRIVING OF COLUMNS INTO THE GROUND DURING LOW TIDE AND WORK ON DECKING COMPONENTS DURING HIGH TIDE.

ENVIRONMENT & SAFETY

6. THE BOARDWALK IS DESIGNED TO BE CONSTRUCTED IN A SENSITIVE MANGROVE ECOSYSTEM. EXTRA PRECAUTIONS SHOULD BE TAKEN TO AVOID UNNECESSARY DISTURBANCE TO THE ENVIRONMENT.

7. THE PROPOSED CONSTRUCTION SITE POSES SEVERAL ENVIRONMENT-RELATED RISKS TO INDIVIDUALS WHO MAY PARTICIPATE IN CONSTRUCTION. THESE RISKS INCLUDE FLUCTUATION OF WATER LEVELS DUE TO TIDAL MOVEMENTS, UNEVEN SOIL, PRESENCE OF DANGEROUS WILDLIFE, AND POTENTIAL FOR SERIOUS MOSQUITO-BORNE ILLNESSES. A SAFETY CHECKLIST OR SET OF PROCEDURES TO ENSURE WORKER SAFETY SHOULD BE DEVELOPED PRIOR TO CONSTRUCTION.

WPI PROJECT TEAM: Deidra Anderson (CE), Lenny Fils-Aime (CE), Luke Barckholtz (CE), Sarah Hull (EVE), Tim Ryan (CE)

OTEIMA LIASON: Professor Edmundo Gonzalez, UTO

PROJECT ADVISOR: Professor Aaron Sakulich, WPI

LIST OF MATERIALS

QUANTITY	MATERIAL	DIMENSIONS	USAGE	NOTES
MATERIAL MEMBERS				
14	TEAK WOOD LOG	10' X Ø1'	COLUMNS	WILL BE EXPOSED TO SALT WATER AND DAMP SOIL. PROPER PREPARATION OF WOOD WITH WATER RESISTANT OILS OR OTHER METHODS STRONGLY ENCOURAGED TO PROLONG LIFE SPAN.
12		7'6" X 6" X 6"	GIRDERS	GIRDER CUT FROM TEAK WOOD LOG TO HAVE SQUARE CROSS-SECTION
85	TEAK WOOD PLANKS	5' X 6" X 2"	DECKING AND STRINGERS	
28		3' X 2" X 2"	RAILING POSTS	SECURED USING RAILING BASE (SEE BELOW)
52		3'7" X 2" X 2"	HORIZONTAL RAILS	INCLUDES RAILING HANDRAIL AND RAIL SUPPORTING SPINDLES
117		2'1" X 1" X 1"	RAILING SPINDLES	
CONNECTORS				
4	PRE-FABRICATED GALVANIZED STEEL PLATES	12" X 6" X 0.5"	SINGLE (END) PLATES	USE OF GALVANIZED STEEL REQUIRES PLATES TO BE PRE-CUT/PRE-FABRICATED AS ALTERATION DURING CONSTRUCTION WILL REMOVE PROTECTIVE COATING. TO REDUCE COSTS, TEAK WOOD CAN BE USED AS A SUBSTITUTE, BUT NO DIMENSIONS ARE PROVIDED IN THIS PLAN SET. PROTOTYPE 3 CAN BE USED AS A BASIS FOR SUCH A CHANGE
10		12" X 12" X 0.5"	DOUBLE (TYP) PLATES	
48	GALVANIZED STEEL THREADED ROD	Ø0.5" X 7"	THREADED ROD	DEVIATIONS IN DIAMETER OF GIRDERS AND COLUMNS REQUIRE A TOLERANCE OF +/- 0.5 INCHES OF MATERIAL
28	RAILING BASE	3.7" X 3.7"	RAILING BASE	RAILING BASE CAN BE ACQUIRED TO THE DETAILED DIMENSIONS FROM HARDWARE STORE. METAL RECOMMENDED, THOUGH PLASTIC AND WOOD CAN BE USED AS ALTERNATIVES.
140	GALVANIZED WOOD SCREWS	3" LENGTH	WOOD SCREWS (DECKING AND RAILING)	
7		1.5 " LENGTH	RAILING SCREWS	

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Mangrove Boardwalk Project

October 13, 2023	LOCUS Map	V-001
Sheet 4 of 22		

Designed for Universidad Technológica Oteima
Batipa Field Institute
David, Panama

A Major Qualifying Project (MQP) submitted to the Faculty of Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science

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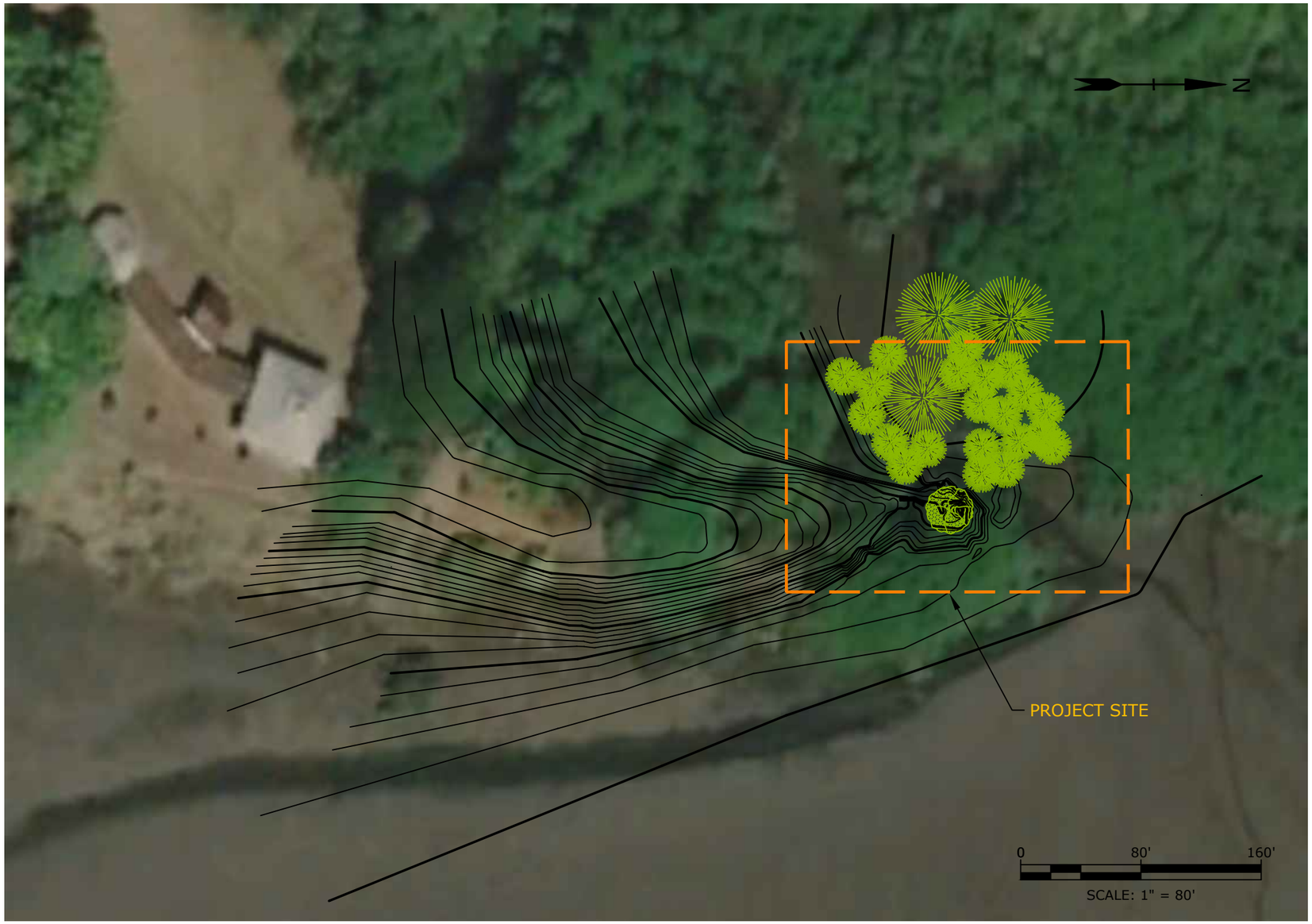

NOTES

1. PROPOSED SITE LOCATED AT 8.3317°N, 82.2368°W, BASED ON GPS DATA FROM GOOGLE MAPS.

2. DUE TO LIMITED SURVEYING EQUIPMENT, THE TOPOGRAPHY MAP AND OTHER SURVEYING DATA ARE APPROXIMATED AND SHOULD NOT BE USED FOR CONSTRUCTION DRAWINGS. THIS SITE MAP SHOULD ONLY BE USED FOR THE PRELIMINARY DESIGN SUBMISSION TO THE PROJECT SPONSOR.

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Mangrove Boardwalk Project

October 13, 2023	Batipa Boardwalk Site Location and Survey Data	V-002
Sheet 5 of 22		

Designed for Universidad Technológica Oteima
Batipa Field Institute
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Universidad Tecnológica Oteima

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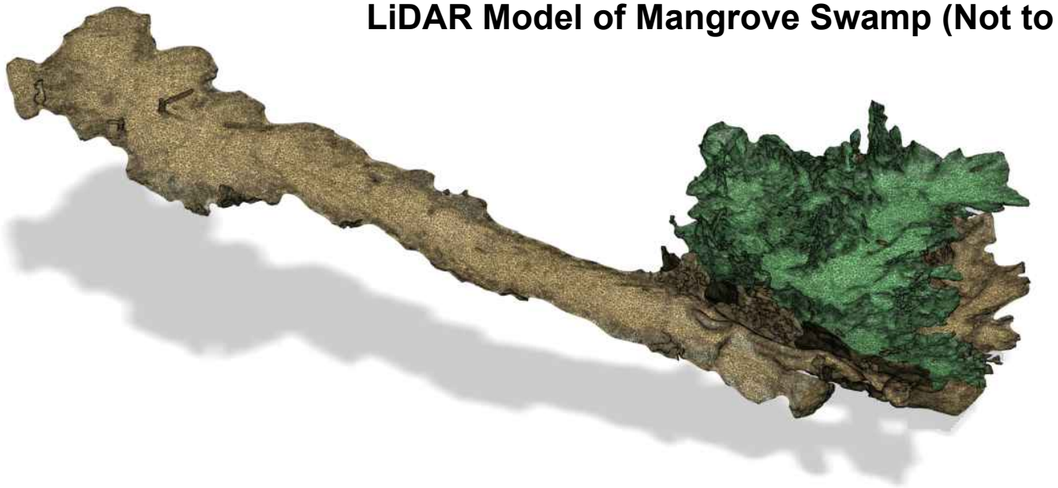
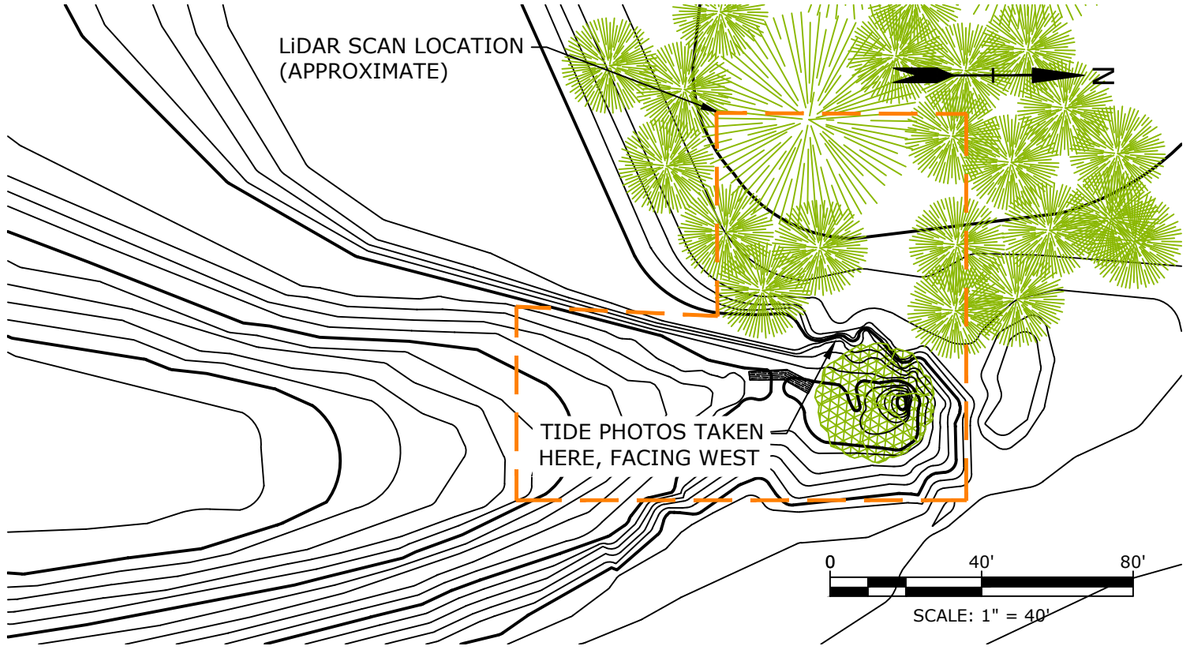
LiDAR Model of Mangrove Swamp (Not to Scale)





Mangrove Swamp at High Tide

Mangrove Swamp at Low Tide

Mangrove Boardwalk Project

October 13, 2023	LIDAR Scan Model and Site Pictures	V-003
Sheet 6 of 22		

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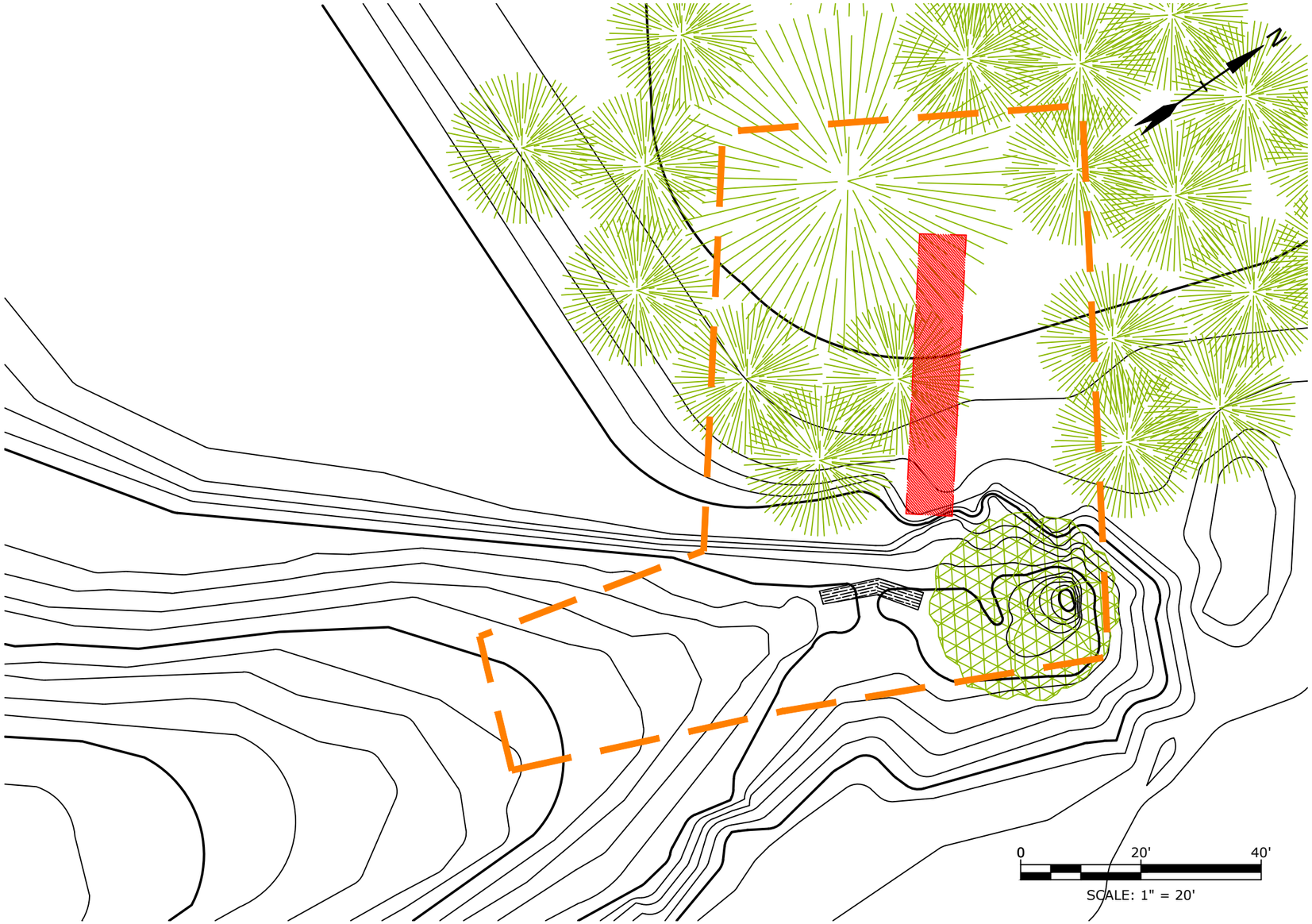

NOTES & LEGEND

1. DUE TO LIMITED SURVEYING EQUIPMENT, ALL CONTOURS, OBJECTS, AND OTHER MAP DETAILS ARE APPROXIMATED. THIS SITE MAP SHOULD ONLY BE USED IN PRELIMINARY DESIGNS AND NOT FINAL CONSTRUCTION DRAWINGS.

2. FOR 3D RENDERINGS, GO TO SHEET C-204 AND C-205.

	Proposed Boardwalk Location
	Site Limits/Area of Disturbance
	Mangrove Tree
	Deciduous Tree
	Large Tree Root (Above Surface)

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Mangrove Boardwalk Project

October 13, 2023

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Project Boundaries

C-101

Designed for Universidad Technológica Oteima
Batipa Field Institute
David, Panama

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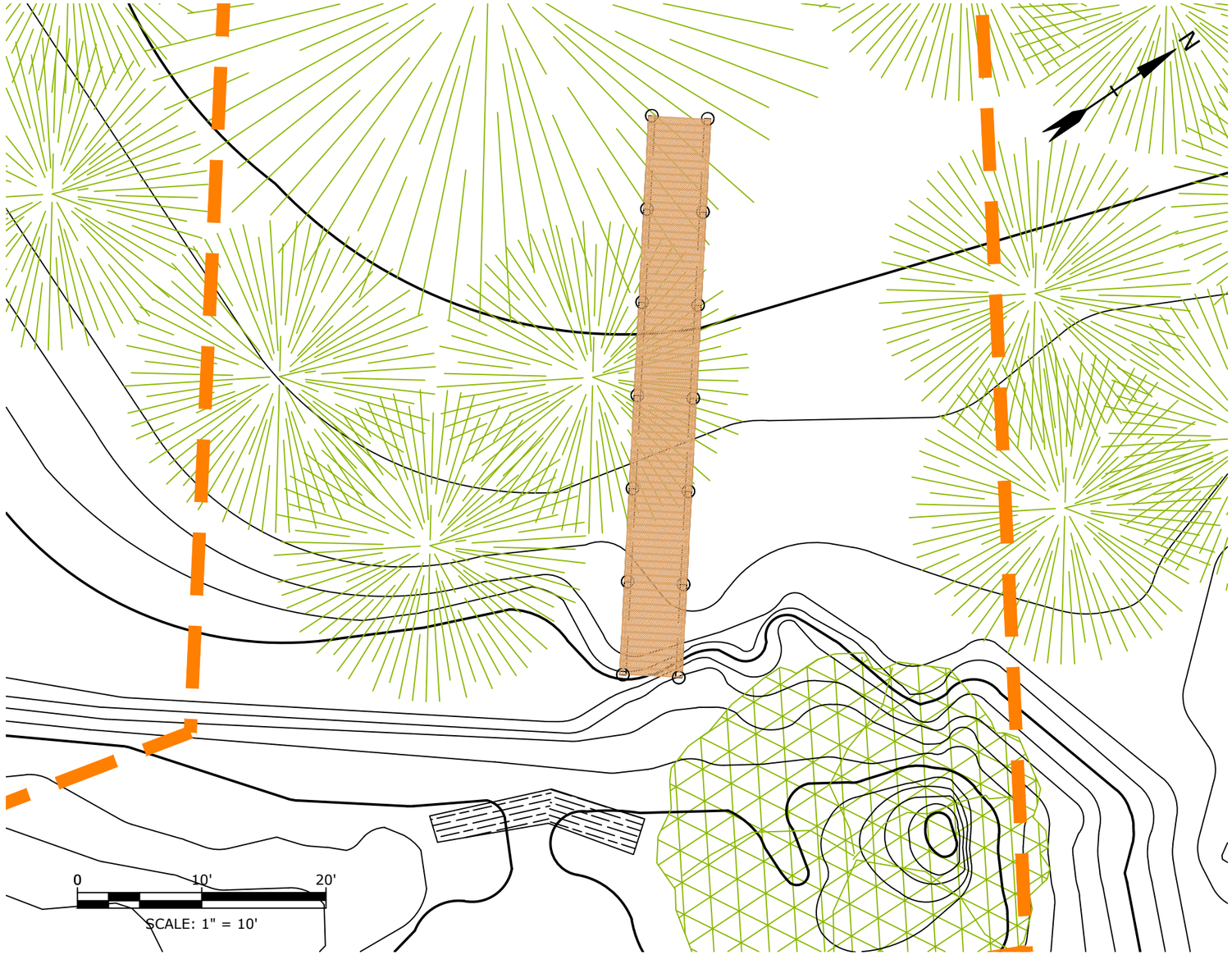
NOTES

1. BOARDWALK DESIGN TO BE CONSTRUCTED IN 7'-6" SECTIONS, KEEPING IN MIND THE IMPACT OF TIDES ON ABILITY TO DRIVE PILES INTO THE SOIL.

2. VARIATIONS TO THE DESIGN TO THE RIGHT WILL EXIST DUE TO PLANT LIFE, SOIL CONDITIONS, AND OTHER FACTORS THAT COULD NOT BE IDENTIFIED WITHOUT PROPER SOIL TESTING AND SURVEYING. DESIGN CROSSES UNEVEN TERRAIN.

3. DIMENSIONS FOR BOARDWALK CAN BE FOUND IN SECTIONS C-201, C-202, AND C-203.



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Mangrove Boardwalk Project

October 13, 2023

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Proposed Site Conditions and Construction

C-102

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Batipa Field Institute
David, Panama

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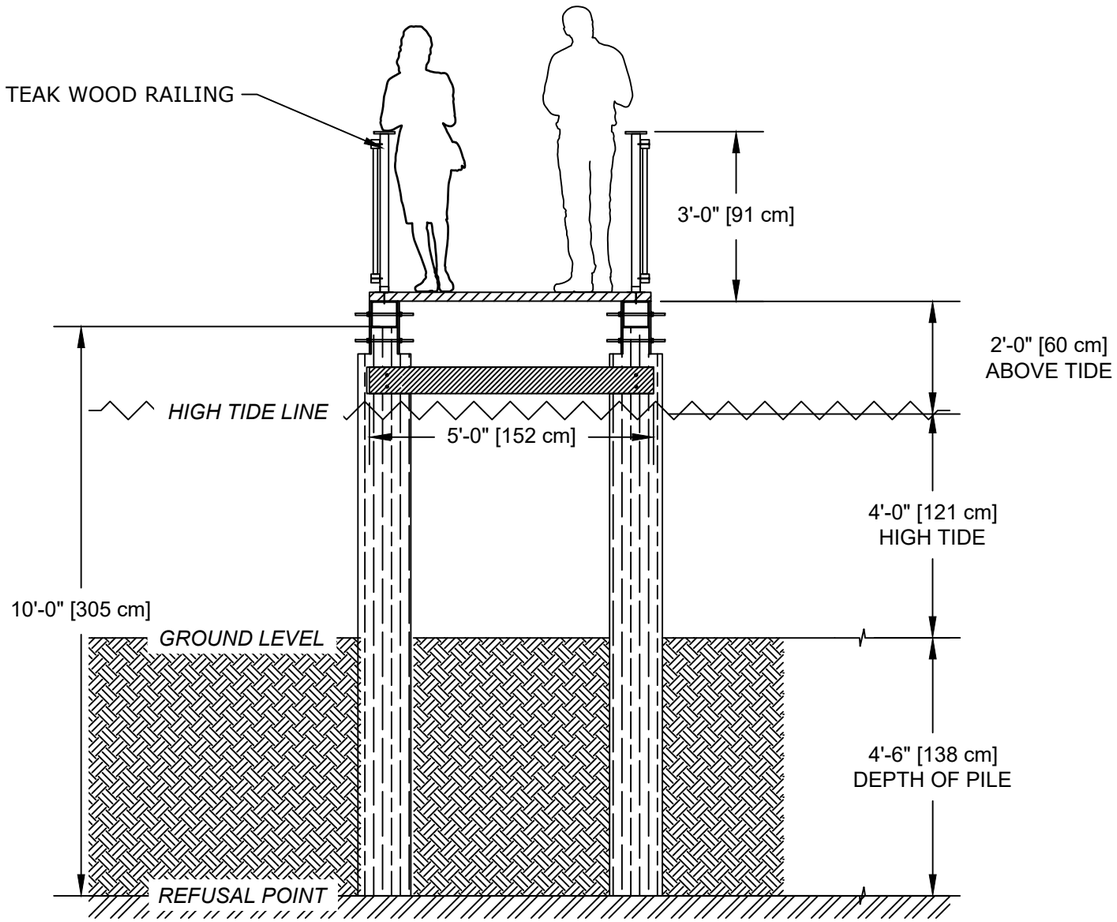
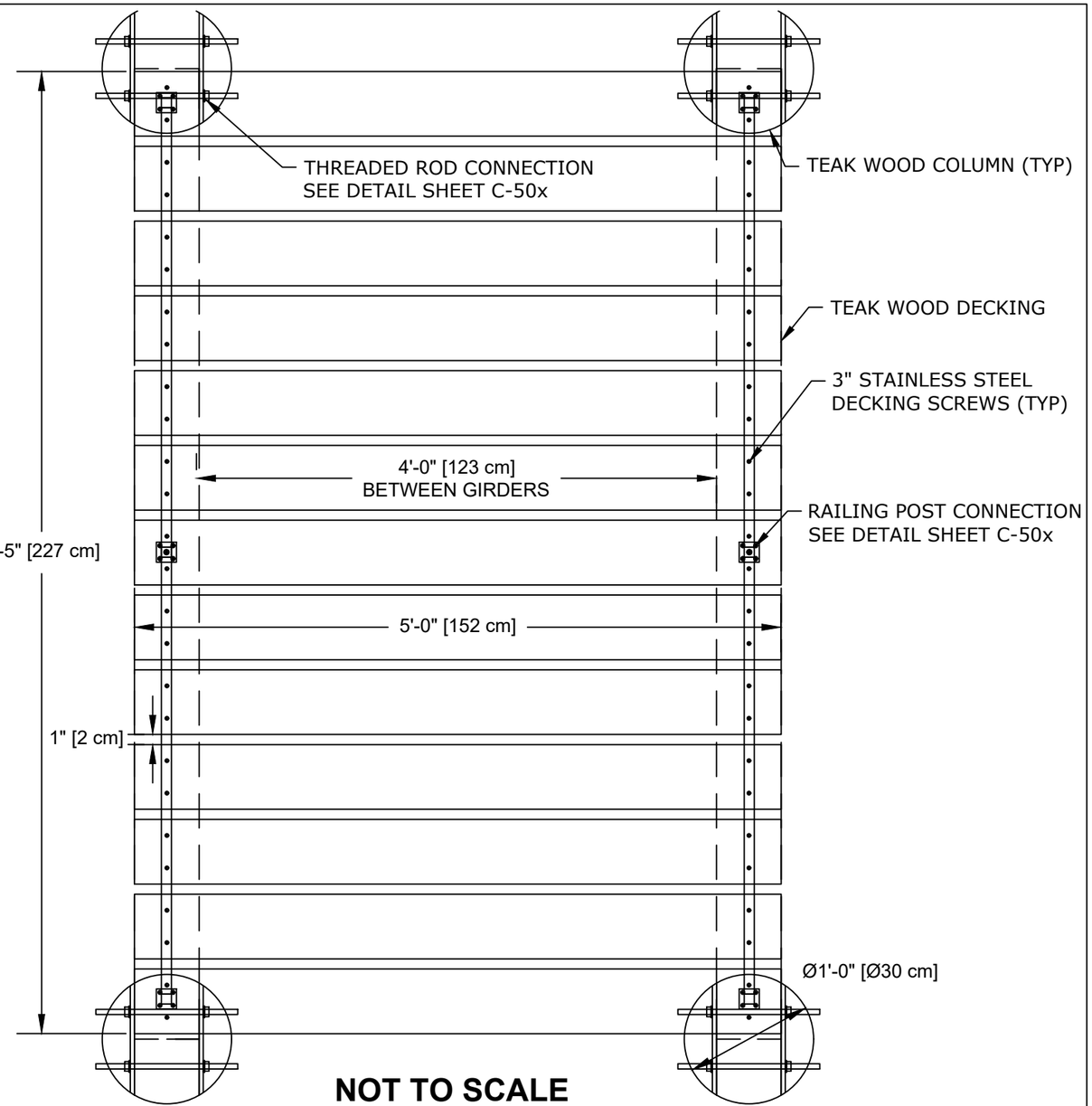
NOTES

1. TEAK WOOD MEMBER DIMENSIONS DEFINED ON SHEET C-203.
2. COLUMN LENGTHS, HIGH TIDE LEVELS, AND OTHER MEASUREMENTS VARY DUE TO CONSTRUCTION SURFACE VARYING IN HEIGHT. VARIATIONS WILL BE DETAILED IN THE 3D MODEL ON SHEET _.





NOT TO SCALE

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Mangrove Boardwalk Project

October 13, 2023	Final Design Front and Top View	C-201
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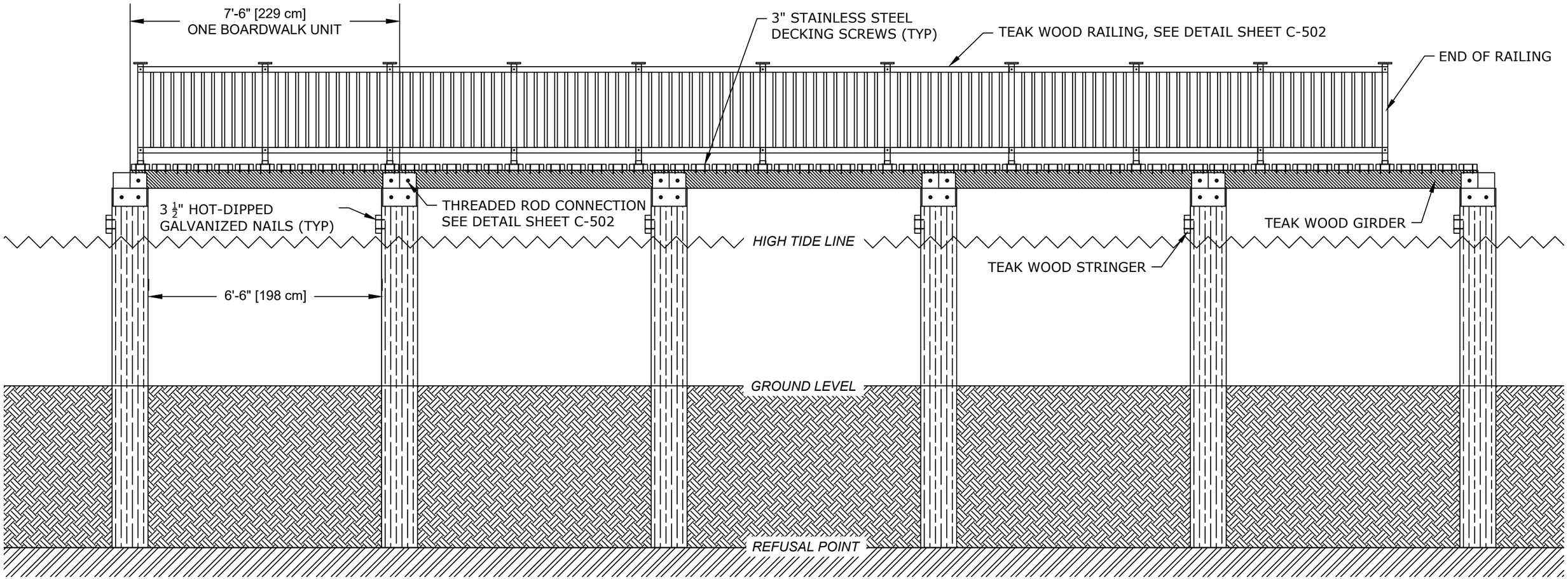
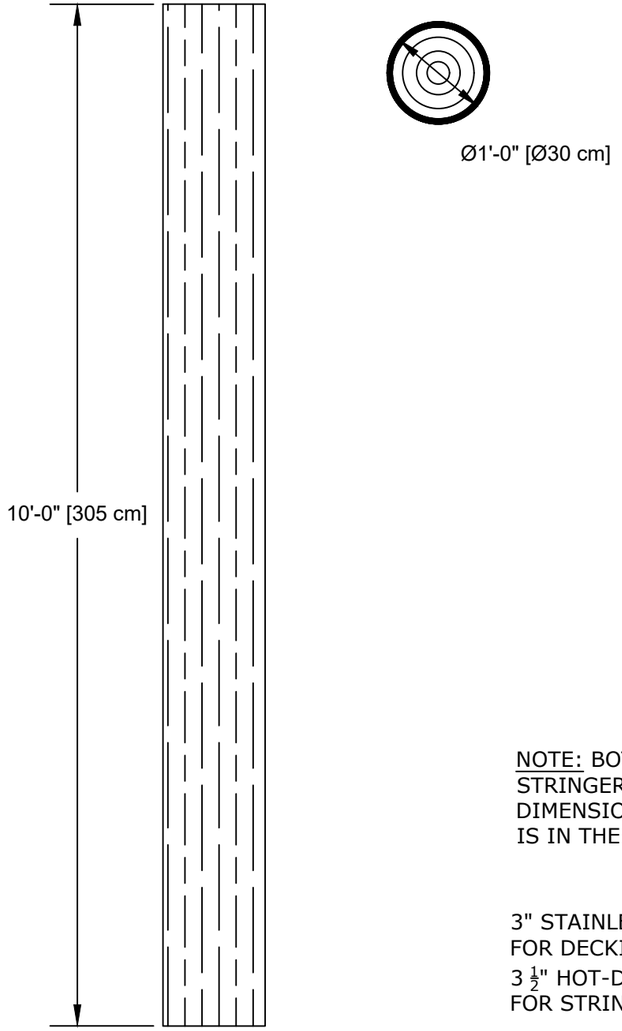
NOTES

1. TEAK WOOD MEMBER DIMENSIONS DEFINED ON SHEET C-203. DIMENSIONS VARY BASED ON AVAILABILITY OF WOOD. BELOW IS NOT A FULL LENGTH MODEL.
2. SOIL DEPTHS, WATER DEPTHS, AND RELATED MEASUREMENTS SHOWN ON PREVIOUS SHEET, C-201. ACTUAL TOPOGRAPHY SHOWN ON SURVEY DRAWINGS V-002, V-003, AND C-101.
3. BOARDWALK DESIGN TO BE BUILT IN 7'-6" SECTIONS, DEFINED AS "UNITS", SPANNING THE CENTER OF ONE COLUMN TO THE CENTER OF THE FOLLOWING COLUMN.
4. DUE TO THE SPACING BETWEEN RAILING POSTS AND DESIGN CONSIDERATIONS, THE RAILING ENDS BEFORE THE END OF THE BOARDWALK TO ALLOW CLOSE OBSERVATION AND EQUIPMENT ACCESS TO MANGROVES.



WPI	**Mangrove Boardwalk Project**		**Designed for Universidad Technológica Oteima** **Batipa Field Institute** **David, Panama** A Major Qualifying Project (MQP) submitted to the Faculty of Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science Universidad Tecnológica Oteima · BATIPA FIELD INSTITUTE	WPI PROJECT TEAM: Deidra Anderson (CE), Lenny Fils-Aime (CE), Luke Barckholtz (CE), Sarah Hull (EVE), Tim Ryan (CE)
	October 13, 2023	Final Design Full Elevation View		OTEIMA LIASON: Professor Edmundo Gonzalez, UTO
	Sheet 10 of 22	C-202		PROJECT ADVISOR: Professor Aaron Sakulich, WPI

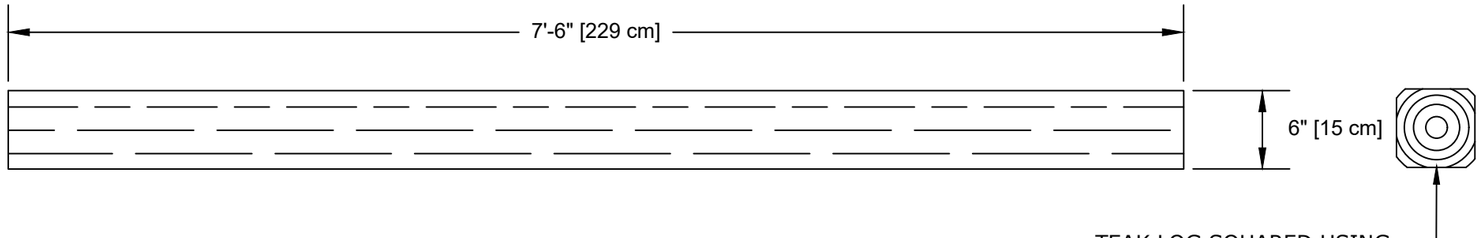
LOG COLUMNS



NOTES

1. TEAK WOOD MEMBER DIMENSIONS BELOW ARE TYPICAL DIMENSIONS AND VARY BASED ON TOPOGRAPHY, AVAILABLE MATERIAL, AND OTHER FACTORS.
2. METAL COMPONENTS SHOULD BE GALVANIZED STEEL.
3. EXACT CONNECTION, SAWCUT, AND RAILING DETAILS CAN BE FOUND ON SHEET C-503.

TEAK WOOD GIRDERS

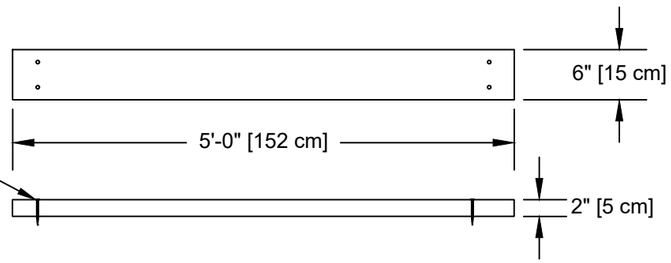


NOTE: BOTH THE DECKING AND THE SUPPORTING STRINGERS USE WOODEN PLANKS OF THE SAME DIMENSIONS. AS NOTED, THE ONLY DIFFERENCE IS IN THE FASTENER

3" STAINLESS STEEL DECKING SCREWS (TYP) FOR DECKING

3 ½" HOT-DIPPED GALVANIZED NAILS (TYP) FOR STRINGERS

PLANK DECKING & GIRDERS



WPI	**Mangrove Boardwalk Project**	
October 13, 2023	Final Design Wood Dimensions	C-203
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Designed for Universidad Technológica Oteima
Batipa Field Institute
David, Panama

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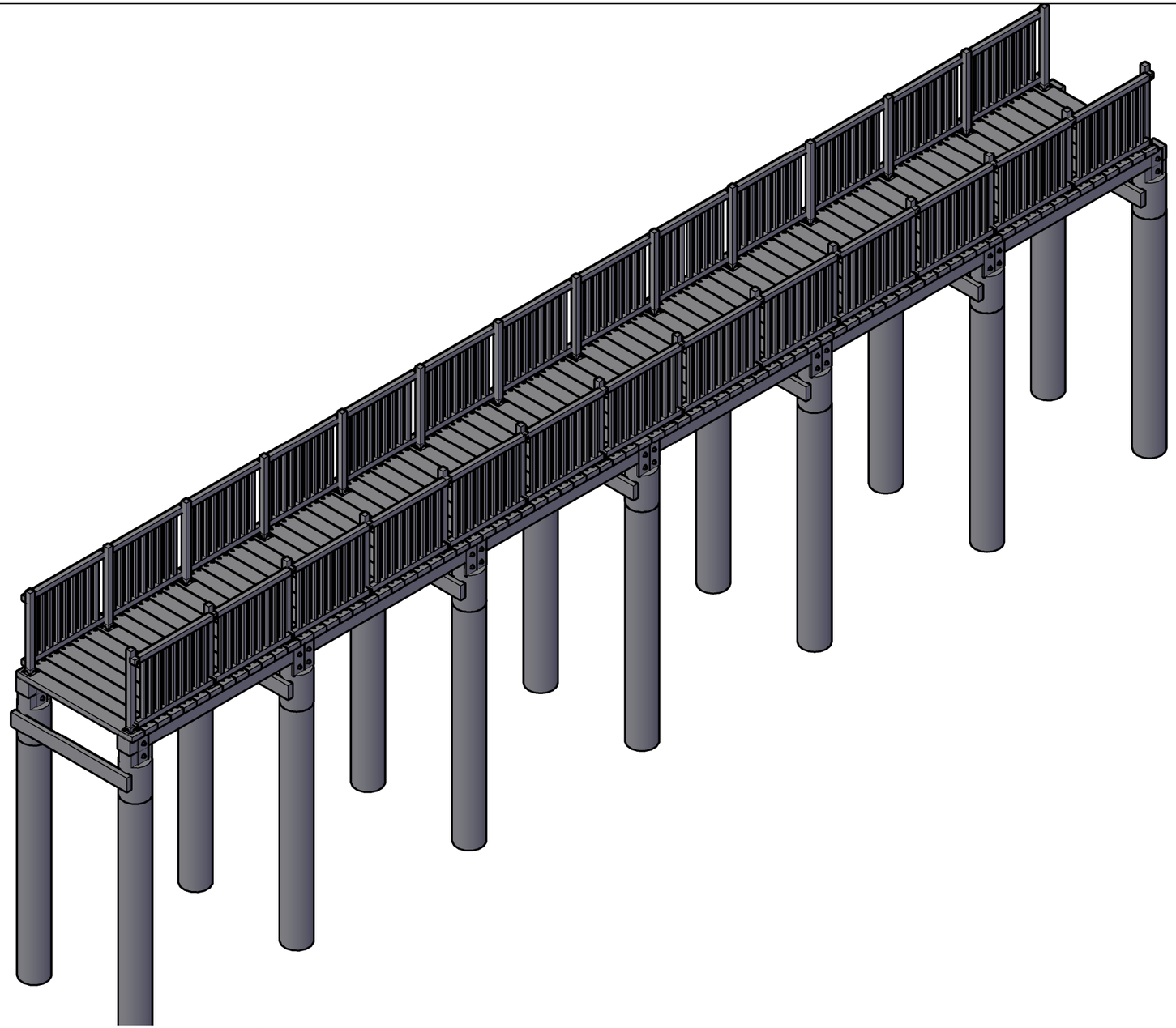
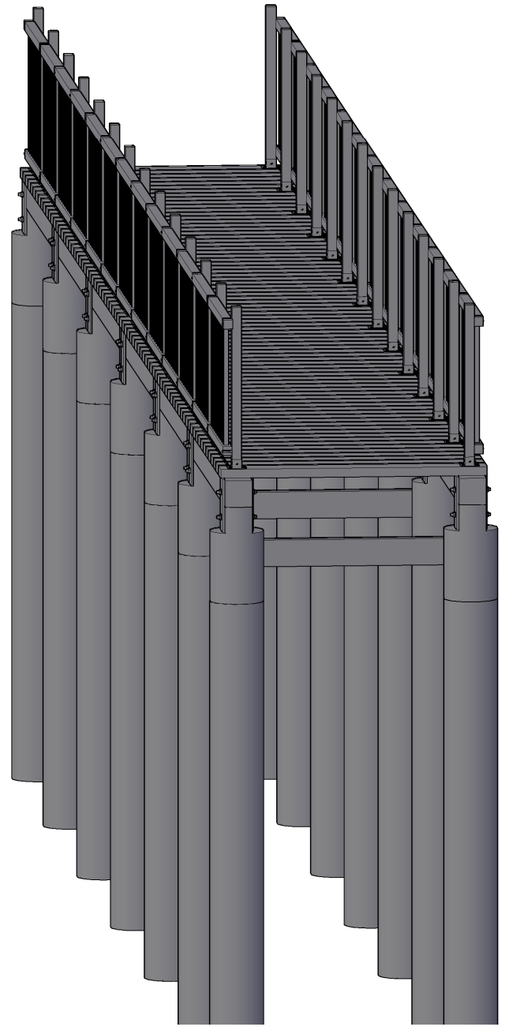


NOTES

1. FOR DIMENSIONS, REFER TO SHEETS C-201, C-202, AND C-203.
2. MODELS ARE NOT TO SCALE. TO SEE 3D MODELS IN PROPOSED CONSTRUCTION ENVIRONMENT, SEE C-902 AND C-903.



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Mangrove Boardwalk Project

October 13, 2023

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3D AutoCAD Model

C-204

Designed for Universidad Technológica Oteima
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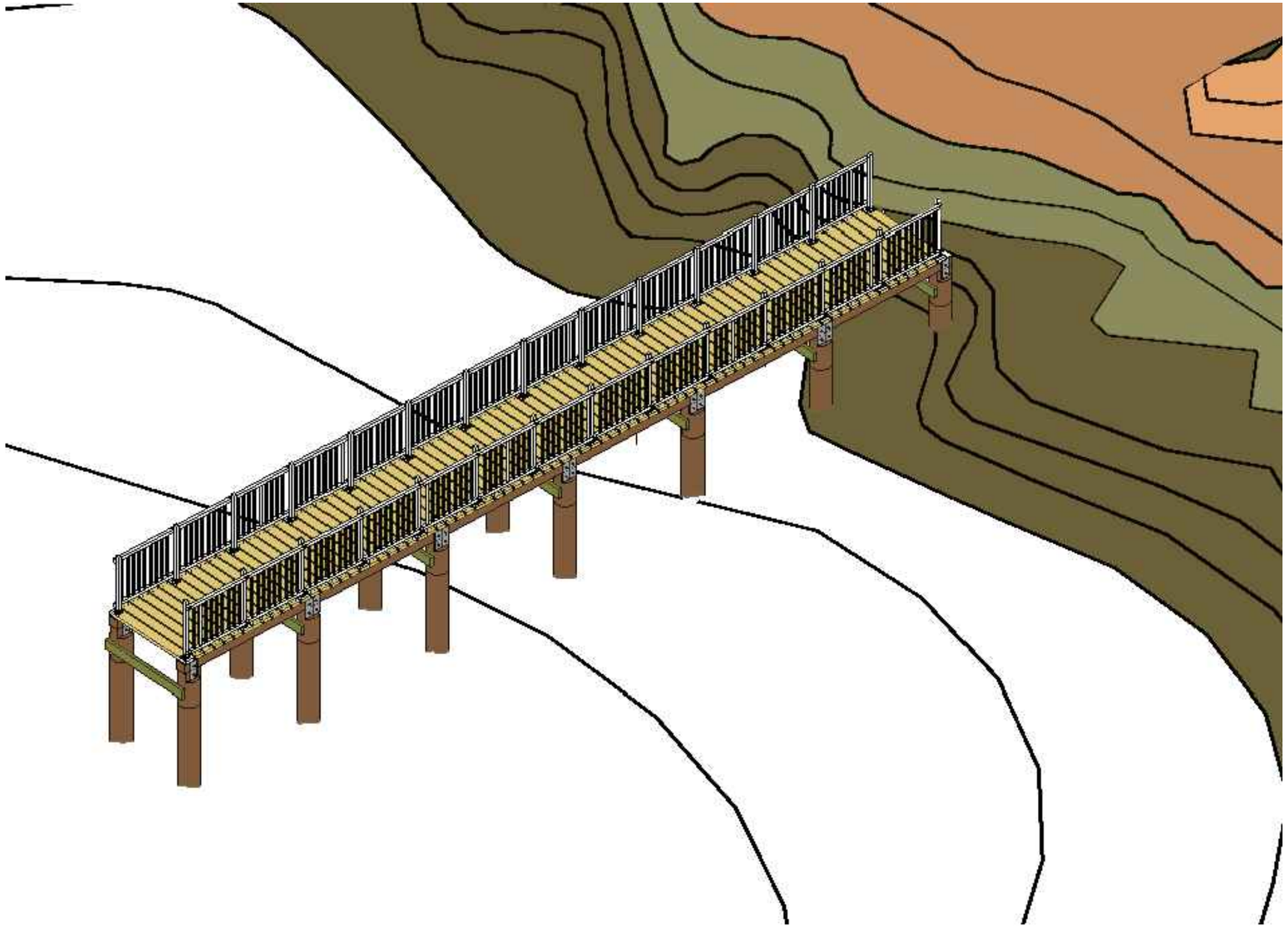

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Mangrove Boardwalk Project

October 13, 2023

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3D Artistic Rendering

C-205

Designed for Universidad Technológica Oteima
Batipa Field Institute
David, Panama

The Batipa Boardwalk was designed by a team of senior students at Worcester Polytechnic Institute (WPI) as part of their Major Qualifying Project (MQP), a requirement for graduation

Universidad Tecnológica oteima

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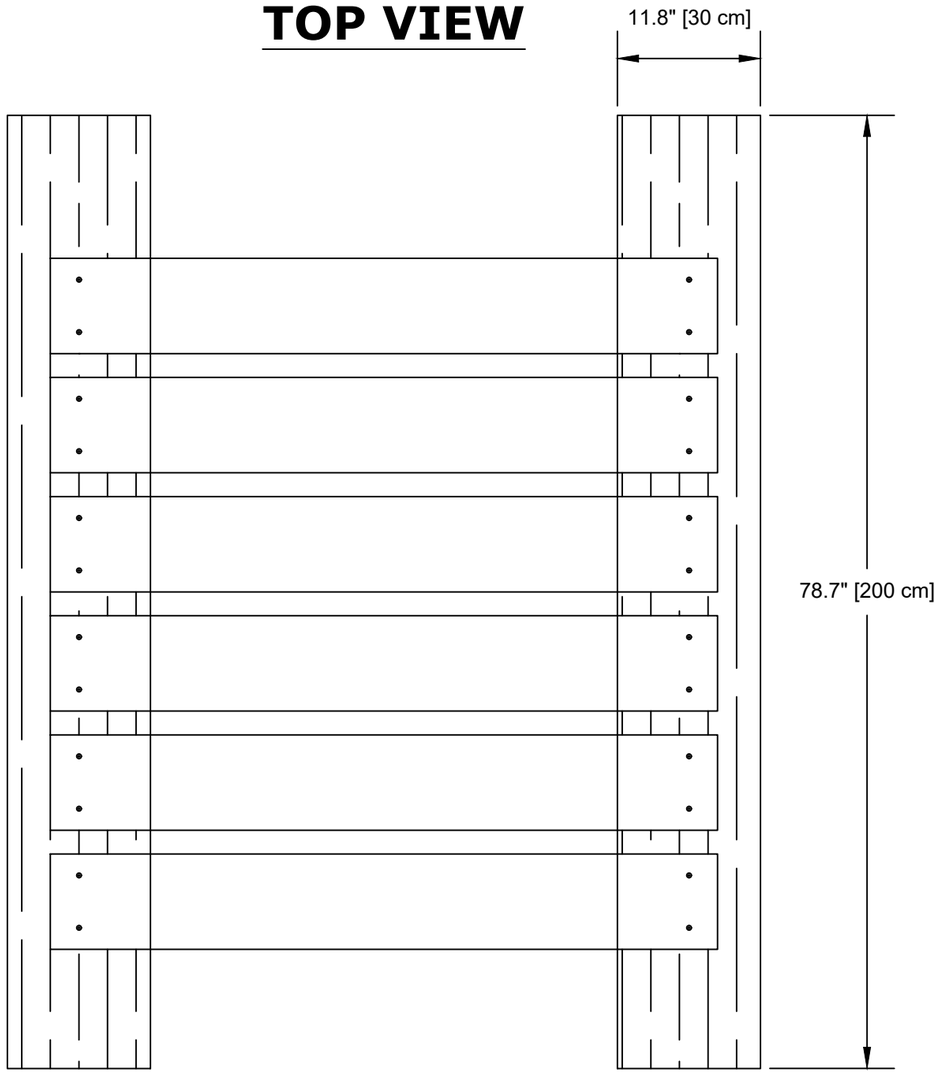
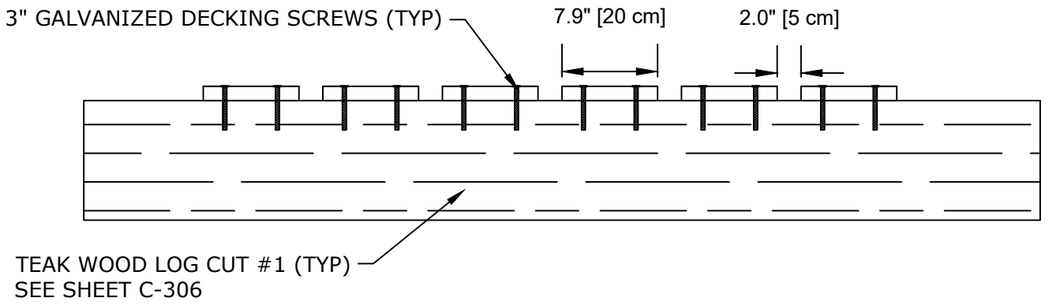
TOP VIEW



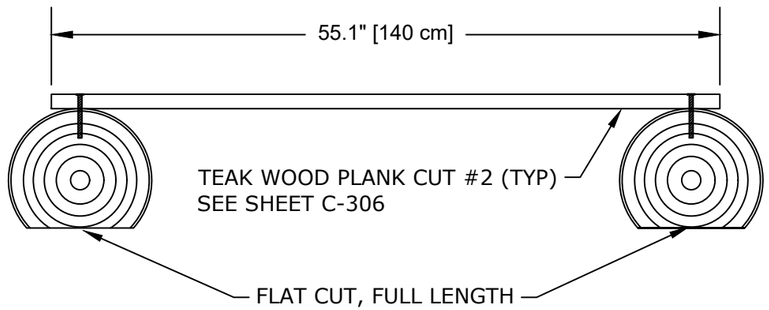
NOTES

1. PROTOTYPE CONSTRUCTED AT BATIPA FIELD STATION ON SEPTEMBER 11, 2023. DEFLECTION TESTING OF PLANKS CONDUCTED ON SEPTEMBER 13, 2023
2. PLANKED DECKING AND LOG GIRDERS SHALL BE MADE OF TEAKWOOD TO DIMENSIONS DETAILED IN SHEET C-406. BASE OF GIRDERS SHALL BE CUT FLAT AS DETAILED TO EQUAL HEIGHT FROM BASE TO TOP OF LOG.
3. MATERIAL DIMENSIONS, INCLUDING PLANK WIDTH, VARY BETWEEN BOARDS WITH TOLERANCE OF +/- 1" [2.5 cm] DUE TO METHOD OF CUTTING AND OBTAINING WOOD.
4. CONNECTIONS DETAILED IN SHEET C-501.

SIDE VIEW



FRONT VIEW



DRAWINGS NOT TO SCALE

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Mangrove Boardwalk Project

October 13, 2023

Sheet 14 of 22

Prototype 1

C-301

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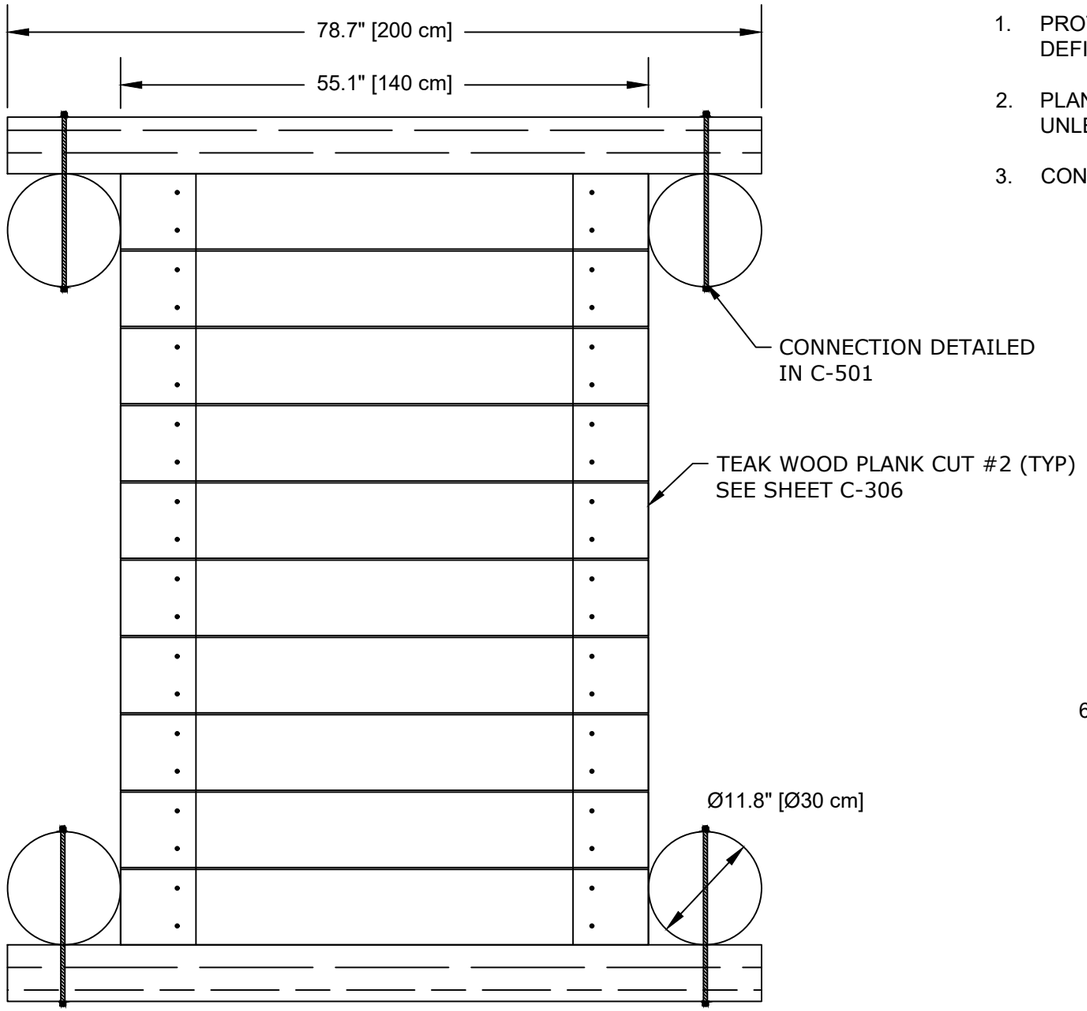
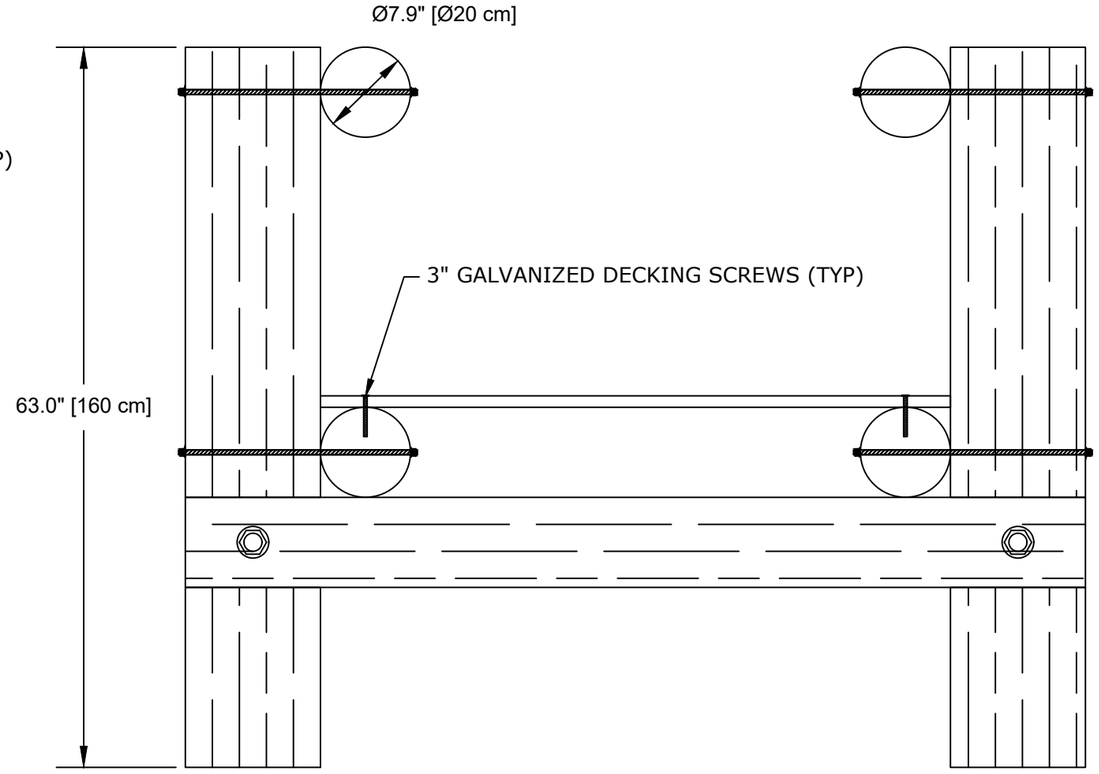
TOP VIEW



NOTES

1. PROTOTYPE DESIGN IS THEORETICAL AND WAS NOT BUILT DURING FIELD TESTING AT BATIPA FIELD STATION DUE TO DEFICIENCIES FOUND PRIOR TO CONSTRUCTION.
2. PLANKED DECKING AND LOG GIRDERS SHALL BE MADE OF TEAK WOOD. DIMENSIONS NOT DETAILED IN PAGE C-306 UNLESS SPECIFIED AS CUTS WERE NOT MADE FOR CONSTRUCTION.
3. CONNECTIONS DETAILED IN C-501.

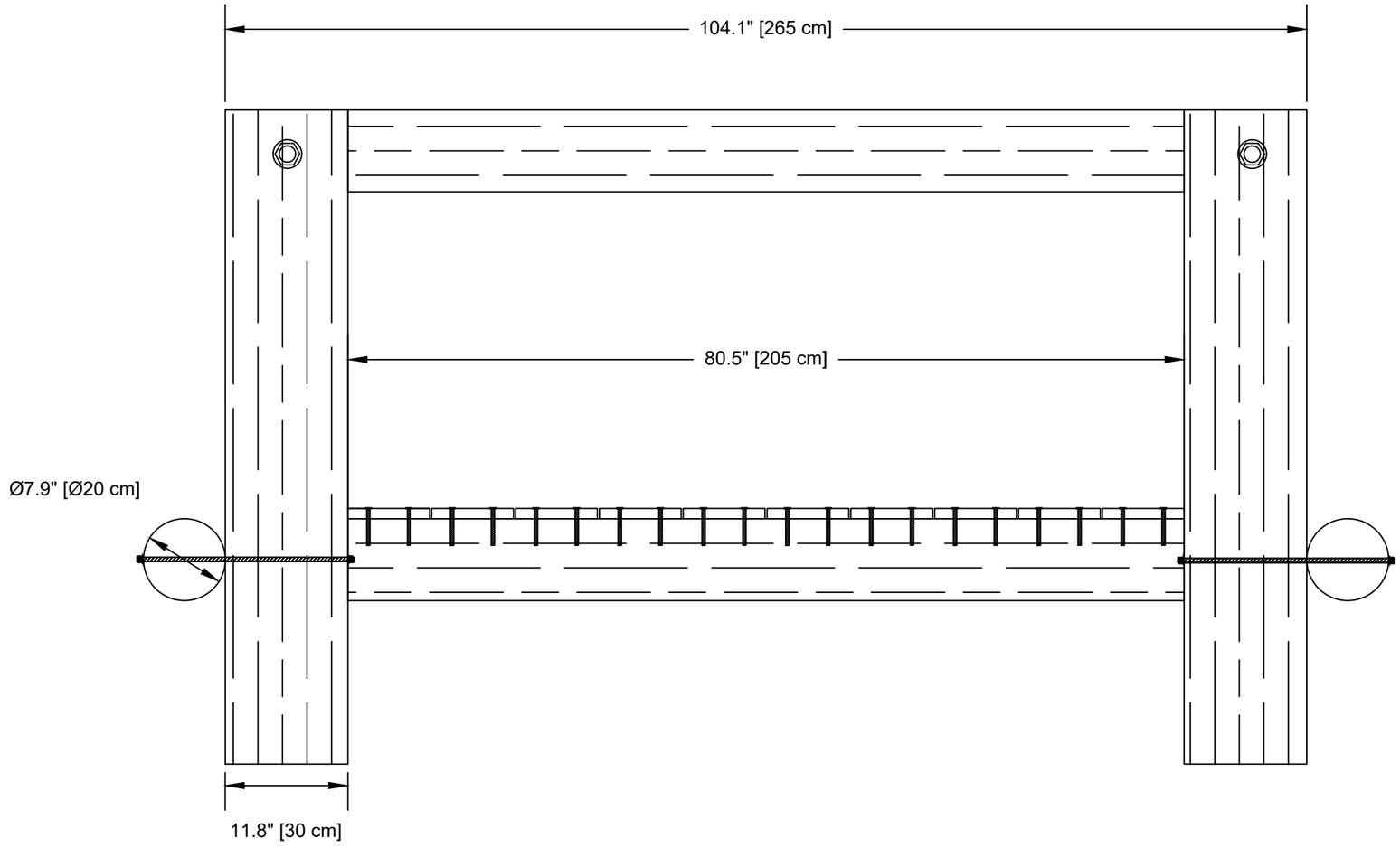
FRONT VIEW



DRAWINGS NOT TO SCALE

WPI	**Mangrove Boardwalk Project**		**Designed for Universidad Technológica Oteima Batipa Field Institute David, Panama** A Major Qualifying Project (MQP) submitted to the Faculty of Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science Universidad Tecnológica Oteima · BATIPA FIELD INSTITUTE	WPI PROJECT TEAM: Deidra Anderson (CE), Lenny Fils-Aime (CE), Luke Barckholtz (CE), Sarah Hull (EVE), Tim Ryan (CE)
	October 13, 2023	Prototype 2 - Top and Front View		OTEIMA LIASON: Professor Edmundo Gonzalez, UTO
	Sheet 15 of 22		C-302	PROJECT ADVISOR: Professor Aaron Sakulich, WPI

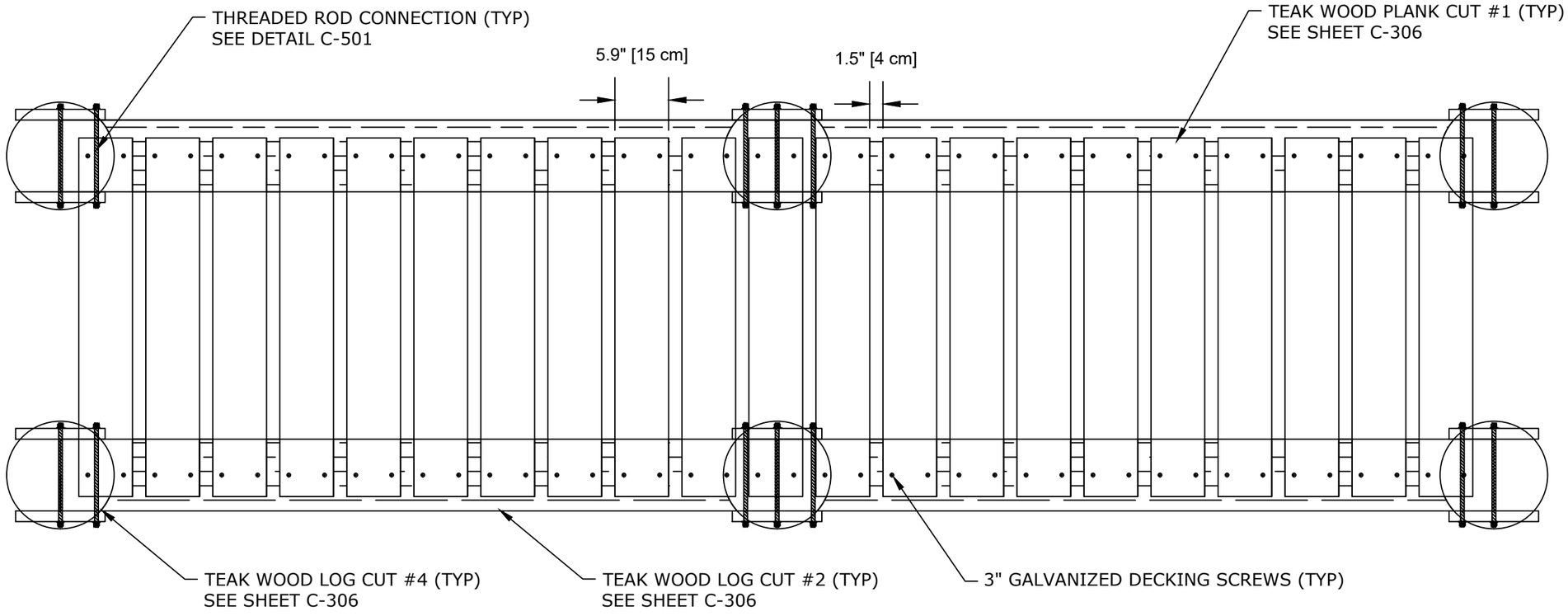
SIDE VIEW



DRAWINGS NOT TO SCALE

WPI	**Mangrove Boardwalk Project**		**Designed for Universidad Technológica Oteima** **Batipa Field Institute** **David, Panama** A Major Qualifying Project (MQP) submitted to the Faculty of Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science Universidad Tecnológica Oteima — BATIPA FIELD INSTITUTE	WPI PROJECT TEAM: Deidra Anderson (CE), Lenny Fils-Aime (CE), Luke Barckholtz (CE), Sarah Hull (EVE), Tim Ryan (CE)
	October 13, 2023	Prototype 2 - Side View		OTEIMA LIASON: Professor Edmundo Gonzalez, UTO
	Sheet 16 of 22	C-303		PROJECT ADVISOR: Professor Aaron Sakulich, WPI

TOP VIEW



DRAWINGS NOT TO SCALE

WPI

Mangrove Boardwalk Project

October 13, 2023

Sheet 17 of 22

Prototype 3 -
Top View

C-304

Designed for Universidad Technológica Oteima
Batipa Field Institute
David, Panama

A Major Qualifying Project (MQP) submitted to the Faculty of Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science

Universidad Tecnológica Oteima

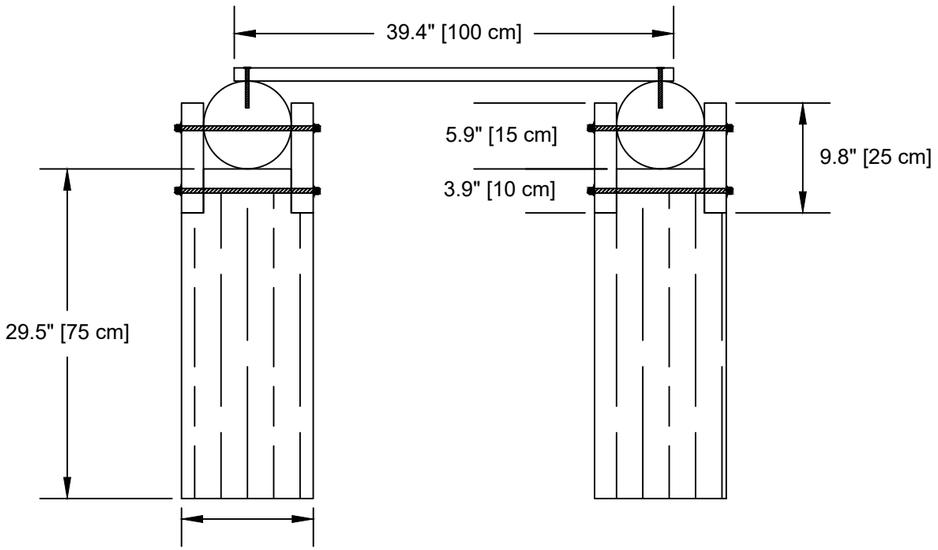
BATIPA FIELD INSTITUTE

WPI PROJECT TEAM: Deidra Anderson (CE), Lenny Fils-Aime (CE), Luke Barckholtz (CE), Sarah Hull (EVE), Tim Ryan (CE)

OTEIMA LIASON: Professor Edmundo Gonzalez, UTO

PROJECT ADVISOR: Professor Aaron Sakulich, WPI

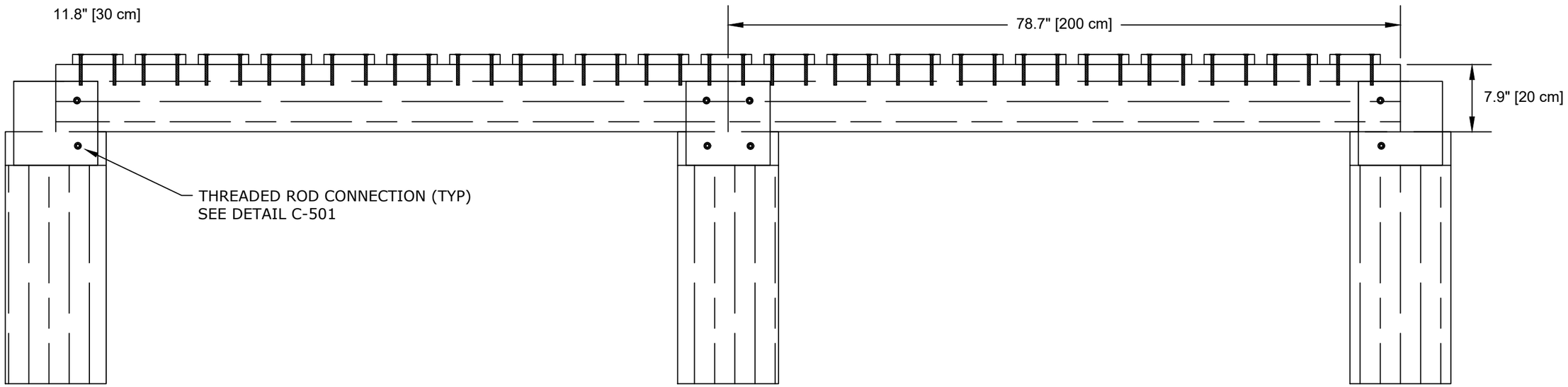
FRONT VIEW



NOTES

1. PROTOTYPE CONSTRUCTED AT BATIPA FIELD STATION FROM SEPTEMBER 12, 2023 TO SEPTEMBER 14, 2023. TESTING OF STRUCTURE CONDUCTED ON SEPTEMBER 14, 2023.
2. PLANKED DECKING AND LOG GIRDERS SHALL BE MADE OF TEAKWOOD TO DIMENSIONS DETAILED IN SHEET C-306.
3. MATERIAL DIMENSIONS, INCLUDING PLANK WIDTH, VARY BETWEEN BOARDS WITH TOLERANCE OF +/- 1" [2.5cm] DUE TO METHOD OF CUTTING AND OBTAINING WOOD.
4. CONNECTIONS DETAILED IN SHEET C-501.

SIDE VIEW



DRAWINGS NOT TO SCALE

WPI

Mangrove Boardwalk Project

October 13, 2023

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Prototype 3 -
Front and Side Views

C-305

Designed for Universidad Technológica Oteima
Batipa Field Institute
David, Panama

A Major Qualifying Project (MQP) submitted to the Faculty of Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science

Universidad Tecnológica Oteima

BATIPA FIELD INSTITUTE

WPI PROJECT TEAM: Deidra Anderson (CE), Lenny Fils-Aime (CE), Luke Barckholtz (CE), Sarah Hull (EVE), Tim Ryan (CE)

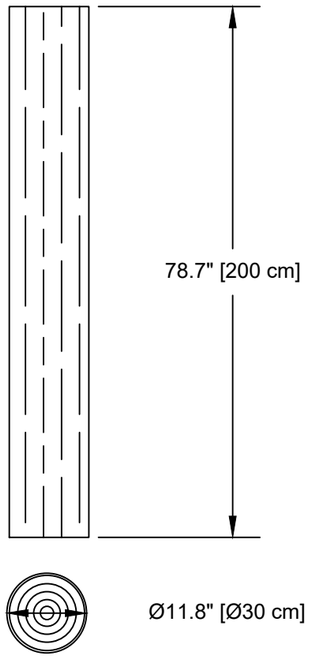
OTEIMA LIASON: Professor Edmundo Gonzalez, UTO

PROJECT ADVISOR: Professor Aaron Sakulich, WPI

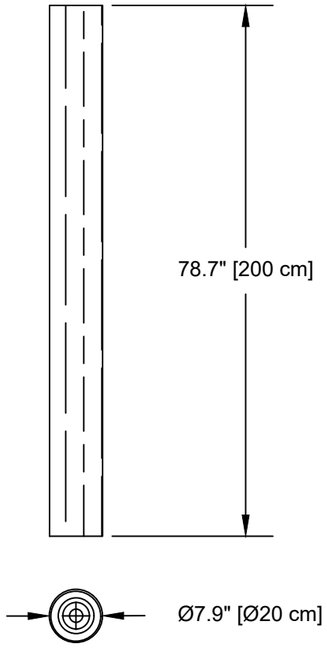
NOTES

1. ALL LOGS AND PLANKS USED IN PROTOTYPE CONSTRUCTION WERE CUT FROM 20 YEAR OLD (SHORT ROTATION) TEAK WOOD GROWN AT BATIPA HARVEST SITE.
2. ALL CUTS MADE WITH CHAINSAW AND MEASURED TO THE NEAREST CENTIMETER
3. PLANK WIDTHS AND HEIGHTS VARY DUE TO AVAILABILITY OF WOOD WITH THE FOLLOWING TOLERANCES: HEIGHT +/- 0.05cm LENGTH +/- 0.5cm WIDTH +/- 2.5cm
4. LOG DIMENSIONS VARY DUE TO USE OF UNPROCESSED, LOWER GRADE TEAK LOGS. TOLERANCES OF +/- 2 in [5 cm] CAN BE EXPECTED FROM LOGS.

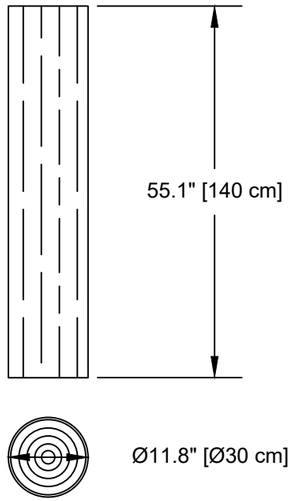
TEAK WOOD LOG CUT #1



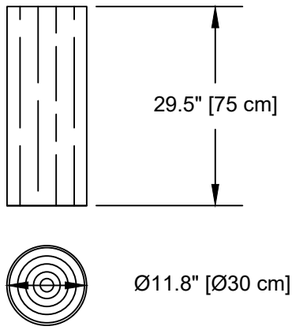
TEAK WOOD LOG CUT #2



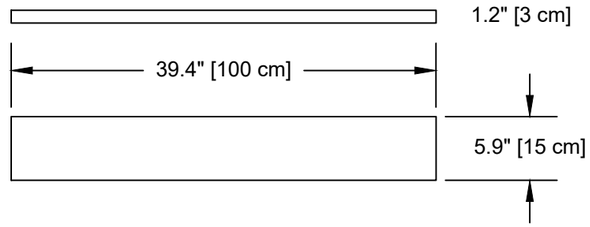
TEAK WOOD LOG CUT #3



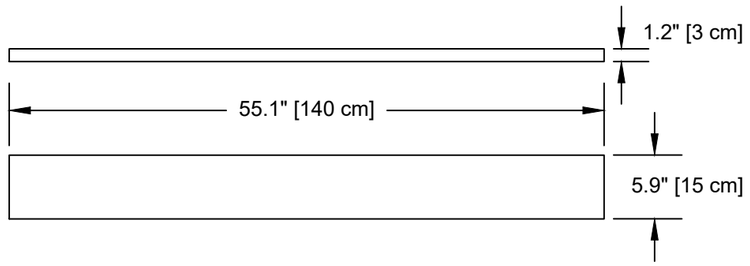
TEAK WOOD LOG CUT #4



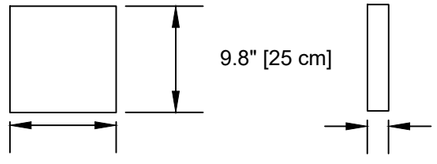
TEAK WOOD PLANK CUT #1



TEAK WOOD PLANK CUT #2

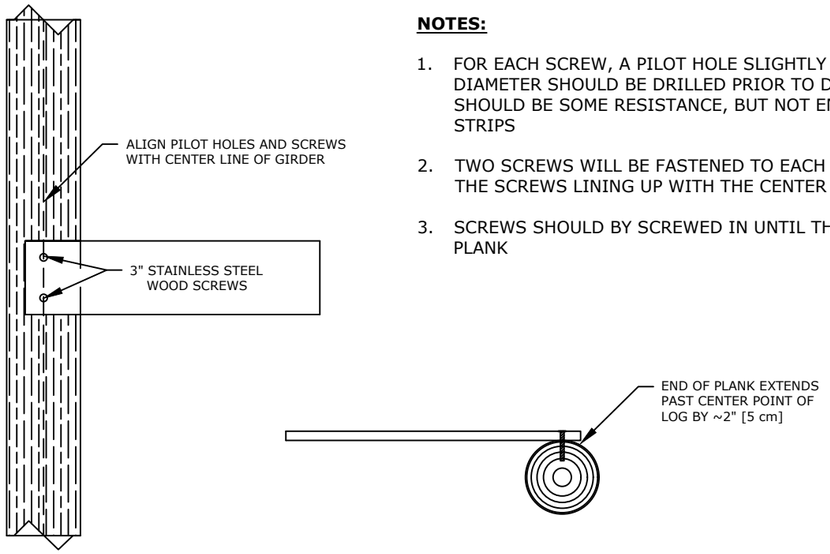


TEAK WOOD PLANT CUT #3



WPI	**Mangrove Boardwalk Project**		**Designed for Universidad Technológica Oteima** **Batipa Field Institute** **David, Panama** A Major Qualifying Project (MQP) submitted to the Faculty of Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science	WPI PROJECT TEAM: Deidra Anderson (CE), Lenny Fils-Aime (CE), Luke Barckholtz (CE), Sarah Hull (EVE), Tim Ryan (CE)
	October 13, 2023	Prototype Teak Wood Dimensions		OTEIMA LIASON: Professor Edmundo Gonzalez, UTO
	Sheet 19 of 22	C-306		PROJECT ADVISOR: Professor Aaron Sakulich, WPI

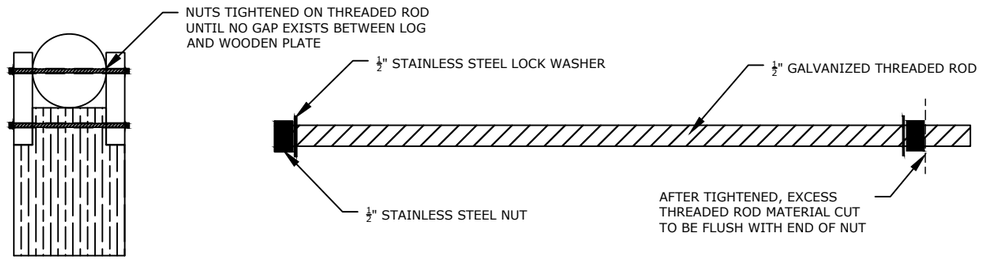
3" WOOD SCREW WOODEN PLANK CONNECTION



NOTES:

1. FOR EACH SCREW, A PILOT HOLE SLIGHTLY SMALLER THAN THE THREAD DIAMETER SHOULD BE DRILLED PRIOR TO DRIVING IN SCREW. THERE SHOULD BE SOME RESISTANCE, BUT NOT ENOUGH WHERE THE SCREW STRIPS
2. TWO SCREWS WILL BE FASTENED TO EACH END OF EACH PLANK, WITH THE SCREWS LINING UP WITH THE CENTER POINT OF THE GIRDER
3. SCREWS SHOULD BY SCREWED IN UNTIL THE TOP IS FLUSH WITH THE PLANK

1/2" THREADED ROD CONNECTION

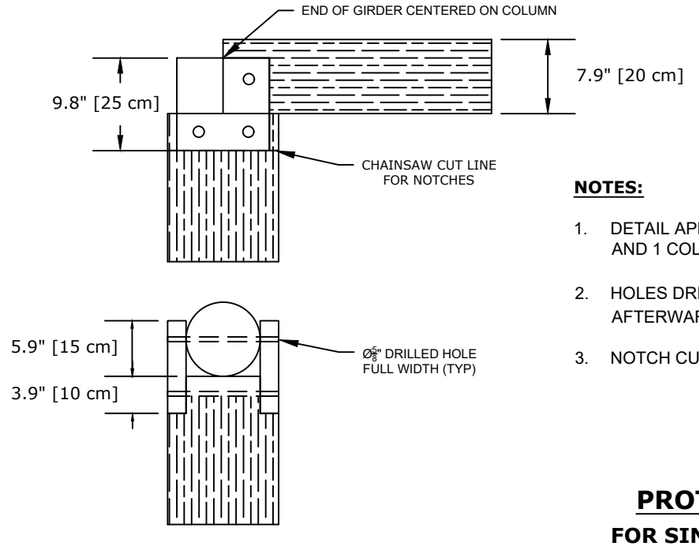


NOTES:

1. FOR HOLE DIMENSIONS, REFER TO DETAILS FOR *PROTOTYPE 3 DRILL HOLE #1* AND *#2*
2. THREADED ROD LENGTHS VARY DUE TO SLIGHT VARIATION IN WOOD DIAMETERS, SO RODS SHOULD BE CUT LONG
3. TIGHTEN NUTS UNTIL TIGHT AND UNTIL BOARDS ARE FIRMLY ATTACHED TO COLUMNS AND GIRDERS

PROTOTYPE 3 DRILL HOLE #1

FOR SINGLE COLUMN TO SINGLE GIRDER

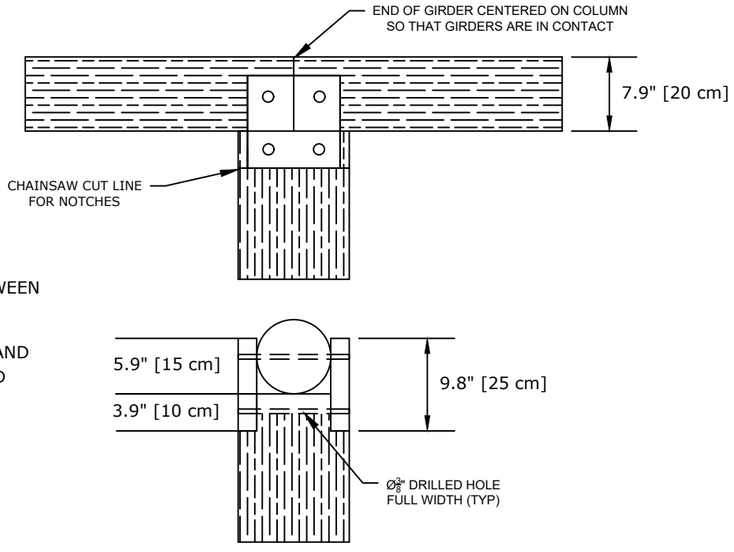


NOTES:

1. DETAIL APPLIES TO FOUR END CONNECTIONS BETWEEN 1 GIRDER AND 1 COLUMN
2. HOLES DRILLED USING 8" LONG, ½" THICK DRILL BIT AND WIDENED AFTERWARDS TO ⅝". BOARD HOLES DRILLED AFTER LOG HOLES
3. NOTCH CUTS MADE WITH CHAINSAW

PROTOTYPE 3 DRILL HOLE #2

FOR SINGLE COLUMN TO DOUBLE GIRDER



NOTES:

1. DETAIL APPLIES TO TWO MIDDLE CONNECTIONS BETWEEN WHERE COLUMN CONNECTS TWO GIRDERS
2. HOLES DRILLED USING 8" LONG, ½" THICK DRILL BIT AND WIDENED AFTERWARDS TO ⅝". BOARD HOLES DRILLED AFTER LOG HOLES
3. NOTCH CUTS MADE WITH CHAINSAW

WPI

Mangrove Boardwalk Project

October 13, 2023

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Prototype 3 Details

C-501

Designed for Universidad Technológica Oteima
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David, Panama

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Universidad Tecnológica oteima

BATIPA FIELD INSTITUTE

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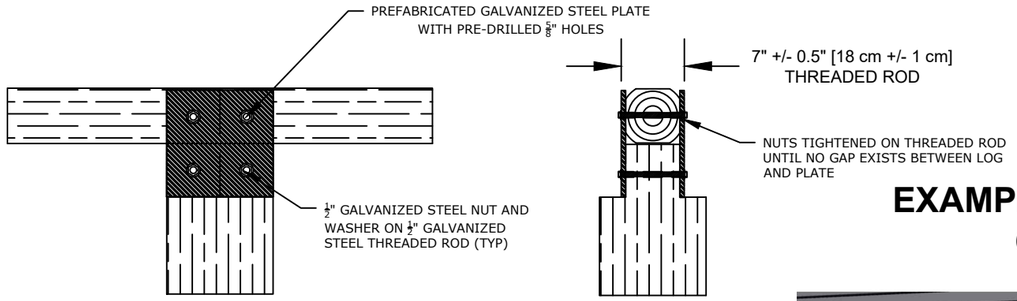
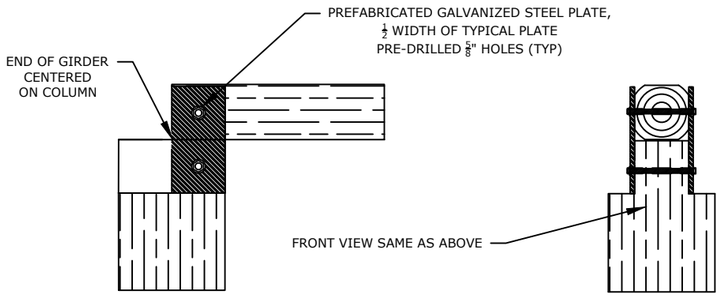
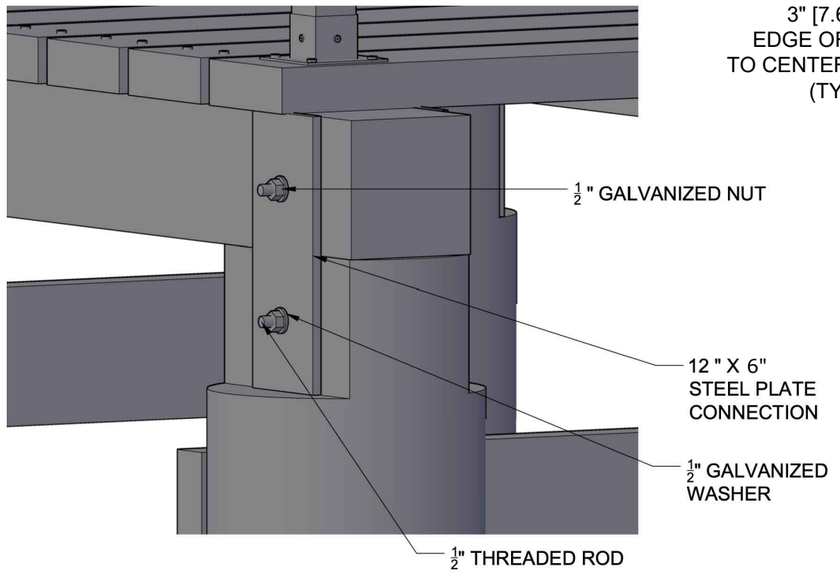
COLUMN TO GIRDER CONNECTION - TYPICAL



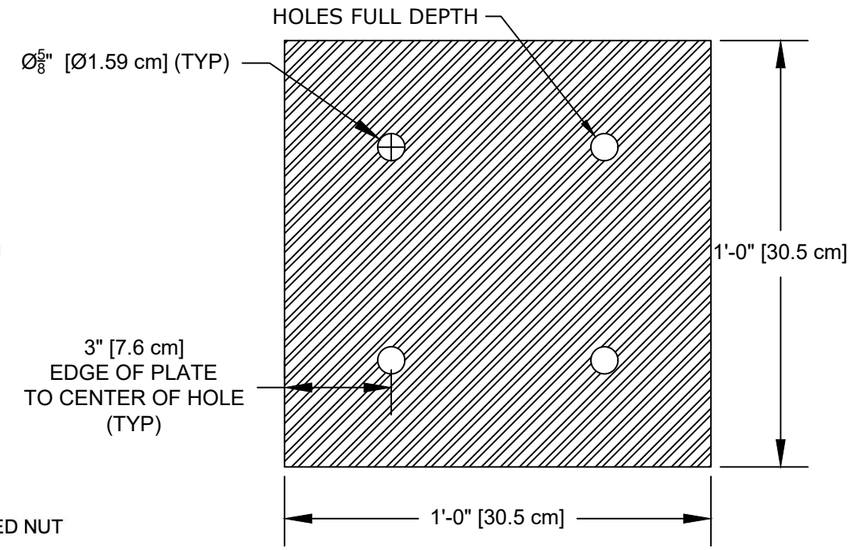
COLUMN TO GIRDER CONNECTION - ENDS

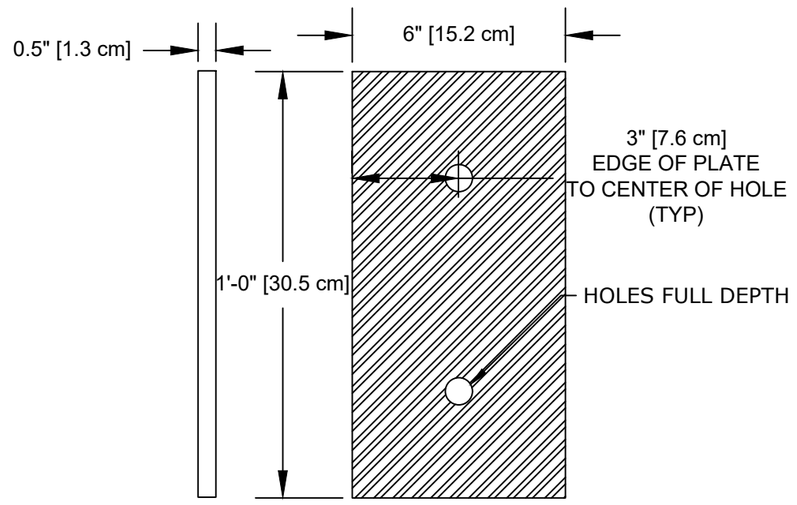


EXAMPLE 3D DIAGRAM OF ENDING COLUMN ASSEMBLY



PRE-FABRICATED GALVANIZED STEEL PLATES





NOTES:

1. SPECIFICATIONS FOR CONNECTIONS AT THE END COLUMNS AND FOR THE OTHER COLUMNS ARE SIMILAR, THOUGH THE END COLUMNS USE A 6" WIDE PLATE AND A PAIR OF THREADED RODS, AS DEMONSTRATED ABOVE.
2. STEEL PLATES SHOULD BE GALVANIZED STEEL. GALVANIZED STEEL COMPONENTS SHOULD BE PREFABRICATED, AS CUTS MADE AFTER FABRICATION WILL EXPOSE STEEL AND ALLOW FOR OXIDATION. A CHEAPER AND MORE AVAILABLE ALTERNATIVE TO STEEL IS USING WOOD, BUT DIMENSIONS FOR SUCH CONNECTION WERE NOT CALCULATED AS PART OF THIS DESIGN.
3. NOTCH CUTS MADE WITH CHAINSAW.
4. SEE BILL OF MATERIALS, SHEET G-002, FOR QUANTITIES.

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Mangrove Boardwalk Project

October 13, 2023

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Final Design Details - 1

C-502

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David, Panama

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Universidad Tecnológica Oteima

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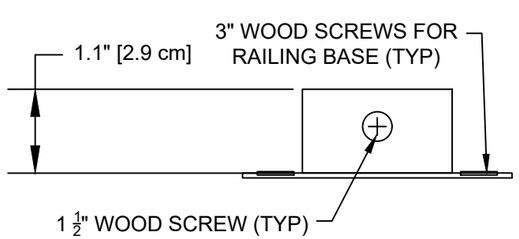
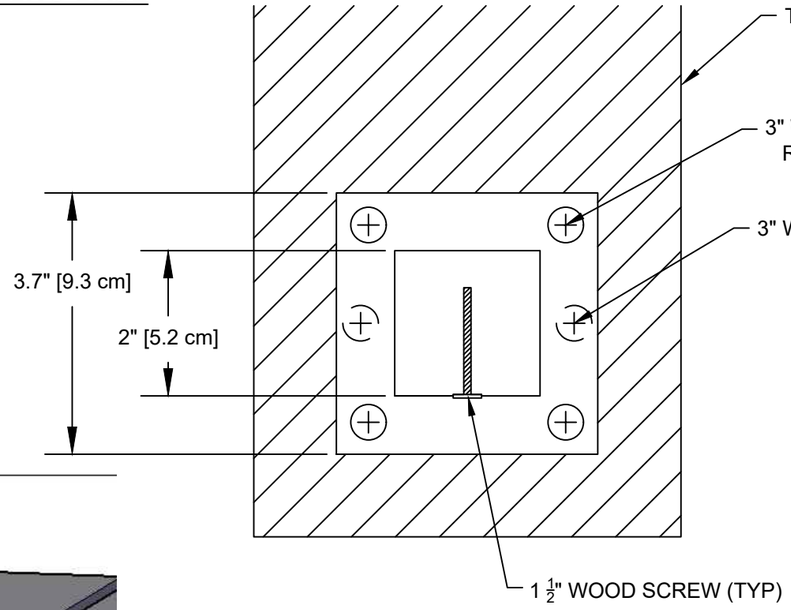
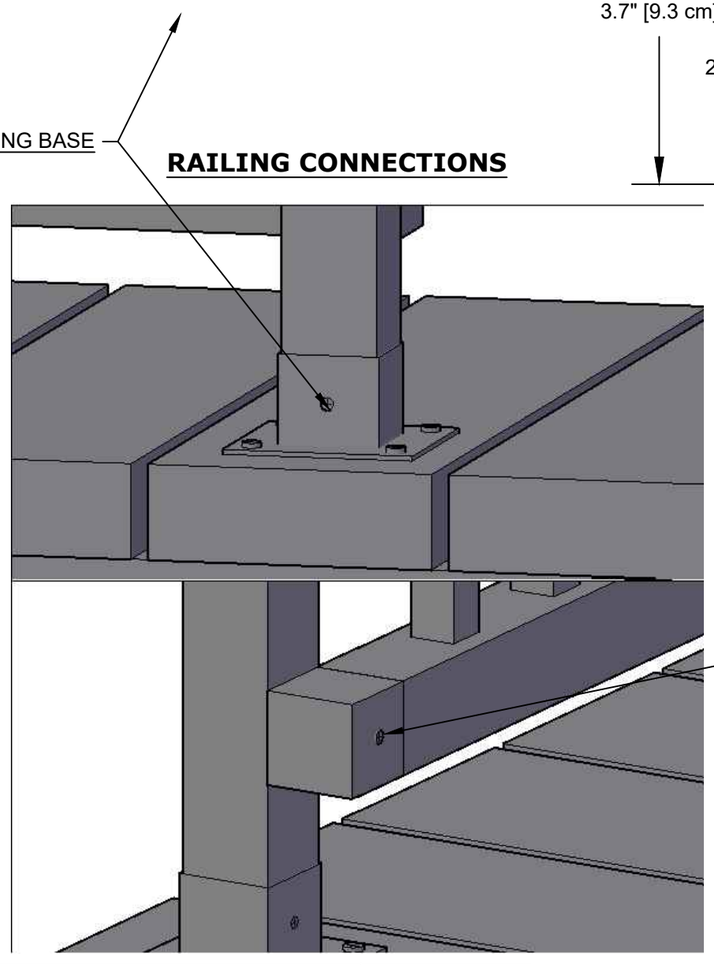
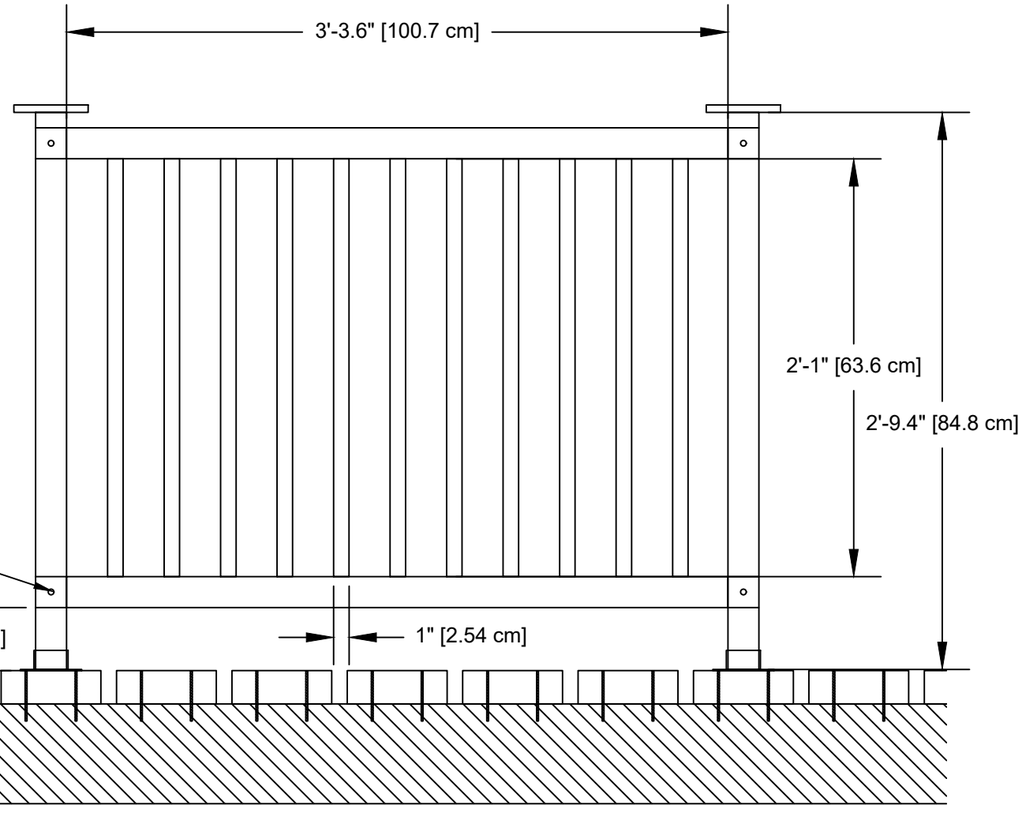
RAILING BASE





RAILING CONNECTIONS





WPI	**Mangrove Boardwalk Project**		**Designed for Universidad Technológica Oteima** **Batipa Field Institute** **David, Panama** A Major Qualifying Project (MQP) submitted to the Faculty of Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science Universidad Tecnológica Oteima — BATIPA FIELD INSTITUTE	WPI PROJECT TEAM: Deidra Anderson (CE), Lenny Fils-Aime (CE), Luke Barckholtz (CE), Sarah Hull (EVE), Tim Ryan (CE)
	October 13, 2023	Final Design Details - 2		OTEIMA LIASON: Professor Edmundo Gonzalez, UTO
	Sheet 22 of 22	C-503		PROJECT ADVISOR: Professor Aaron Sakulich, WPI