



Transmittal



March 29, 2021

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HydrEra Energy Services
Attn: Dan Kubek, US Operations Manager
#250, 325 Manning Rd NE
Calgary, Alberta T2E 2P5

RE: H15P – Harpoon Frac Tank

Dan:

Attached you will find the following sealed submissions:

- H15P – Harpoon Frac Tank Design Basis & Fabrication drawings signed/sealed by a Professional Engineer licensed in Colorado
- H15P – Harpoon Frac Tank Design Basis & Fabrication drawings signed/sealed by a Professional Engineer licensed in Ohio
- H15P – Harpoon Frac Tank Design Basis & Fabrication drawings signed/sealed by a Professional Engineer licensed in Texas

If you have any questions, please feel free to contact me. Thank you.

Sincerely,

Jake A. Althouse, PE
Project Engineer

201 Lincolnway W, Ste 200
Mishawaka, Indiana 46544

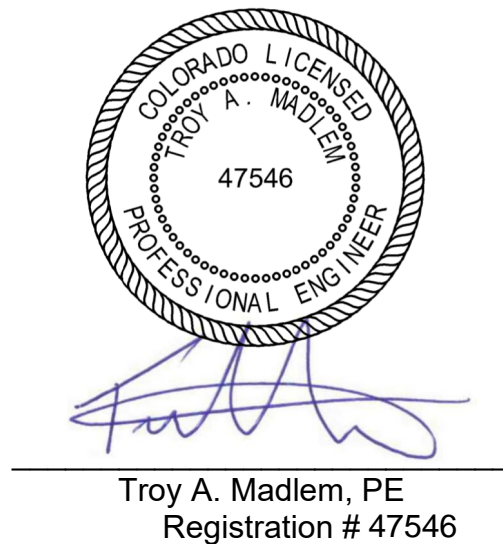
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HydrEra Energy Services

H15P – Harpoon Frac Tank Design Basis

March 2021

The following individual has developed the attached structural calculations



Troy A. Madlem, PE
Registration # 47546

All inquiries of the findings within may be directed to:

Frost Engineering & Consulting Company
201 Lincolnway West, Suite 200
Mishawaka, Indiana 46544

Office: (574) 344-5900

Email: jalthouse@Frosteng.net

Design Data – Harpoon Frac Tank

1. Design Standards & References:
 - a. API 650*
 - b. ASCE 7-16
 - c. AISC 360-16
 - d. USGS Unified Hazards Tool 2020
2. Service Life 25 years
3. Gravity Loads:
 - a. Self weight of tank components
 - b. Various fluid depths with specific gravity (S.G.) = 1.00 – 1.25
4. Risk Category I
5. Wind Load (Mean recurrence interval = 50 years):
 - a. Basic Wind Speed
 - i. NM, WY, OK, ND, WV 81.3 mph (3-second gust)
 - ii. CO 86.0 mph (3-second gust)
 - iii. TX, LA 116.2 mph (3-second gust)
 - b. Exposure Category C
 - c. Directionality Factor 0.85
 - d. Topographic Factor 1.00
 - e. Elevation Factor 1.00 (At sea level)
 - f. Exposure Coefficient 1.04
6. Seismic Loads (Mean recurrence interval = 50 years)**:
 - a. Soil Site Class D (Default)
 - b. Seismic Use Group (SUG) I
 - c. S_{DS}
 - i. TX, PN, ND, LA, WV 0.10g
 - ii. NM, CO, OK 0.28g
 - iii. WY 0.39g
 - d. S_{D1}
 - i. TX, PN, ND, LA, WV 0.04g
 - ii. NM, CO, OK 0.13g
 - iii. WY 0.20g
 - e. R_{wi} (Impulsive response modification factor) 3.5
 - f. R_{wc} (Convective response modification factor) 2.0

*API 650 represents the relevant industry standard for tank construction

**Seismic design is defined as a Purchaser's option per API 650.

Minimum Safety Factor				
Fluid Height (ft)	36	35	34	32.73
Free Board (ft)	0	1	2	3.27
Specific Gravity				
1.00	2.29	2.38	2.46	2.57
1.05	2.19	2.28	2.36	2.46
1.10	2.10	2.18	2.26	2.36
1.15	2.02	2.09	2.16	2.26
1.20	1.94	2.01	2.08	2.17
1.25	1.87	1.94	2.00	2.09

Notes:

1. Safety factor represents the nominal capacity to demand ratio for the governing limit state and load scenario
2. The Owner targeted minimum safety factor for in-service conditions is 2.0

DRAWING LIST	
SHEET	DESCRIPTION
1 of 14	TITLE PAGE
2 of 14	GENERAL ARRANGEMENT
3 of 14	MANWAY PANEL ASSEMBLY
4 of 14	PANEL ASSEMBLY
5 of 14	RETURN PIPING PANEL ASSEMBLY
6 of 14	PANEL ASSEMBLY - PART DETAILS
7 of 14	REPAD/CONNECTOR PLATE - LEFT SIDE
8 of 14	REPAD/CONNECTOR PLATE - RIGHT SIDE
9 of 14	EYE PAD CONNECTOR
10 of 14	OVAL MANWAY ASSEMBLY
11 of 14	4" NPS STAMP PIPE
12 of 14	4" NPS FILL NECK
13 of 14	TRANSPORT STAND
14 of 14	TOMCAT LEVEL GAUGE BRACKET

HYDRERA ENERGY SERVICES

H15P - HARPOON FRAC TANK

RedFox Project No: RF21046A

PO: HAR-008



03/29/2021

REVISIONS					
REV.	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
A	3/17/21	ISSUED FOR APPROVAL	Dan Griffiths		
0	3/25/21	ISSUED FOR CONSTRUCTION	Dan Griffiths		

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Drawn By:
Dan Griffiths

Date:
March-17-2021

Checked By:
-

Approved By:
-

Customer Project No:
HAR-008

RedFox Project No:
RF21046A

GENERAL NOTES

1. THE ABOVE GROUND STORAGE TANK HAS BEEN DESIGNED IN ACCORDANCE WITH THE AMERICAN PETROLEUM INSTITUTE STANARD 650.
2. ALL STRUCTURAL STEEL MEMBERS DESIGNED IN ACCORDANCE WITH ANSI/AISC 360-16 SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS.
3. ALL STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING MINIMUM MATERIALS PROPERTIES:

MATERIAL SPECIFICATIONS			Minimum Yield Stress (ksi)	Minimum Rupture Stress (ksi)
SHAPE	CANADA	USA (ASTM)		
HSS	G40.21 50W	A500 Gr. C	50	62
PLATE	G40.21 50W	A572	50	65
PLATE	G40.21 44W	A572	44	65
PLATE	QT-100	A514	100	110
BAR	AISI 1020	A36	36	58

4. FABRICATION SHALL CONFORM TO ANSI/AISC 360-16.
5. ALL WELDING SHALL BE IN ACCORDANCE WITH AWS D1.1 USING E70XX ELECTRODES. WELDING SHALL BE PERFORMED BY WELDERS CERTIFIED FOR THE WELD TYPE AND POSITIONS INVOLVED ACCORDING TO THE CURRENT EDITION OF AWS D1.1.
6. UNLESS OTHERWISE NOTED ALL CONNECTIONS ARE TO BE 3/16" CONTINUOUS FILLET WELDS.
7. MINIMUM FABRICATED THICKNESS OF ALL 10 GAUGE ELEMENTS SHALL BE 0.1345".

ASSEMBLY NOTES

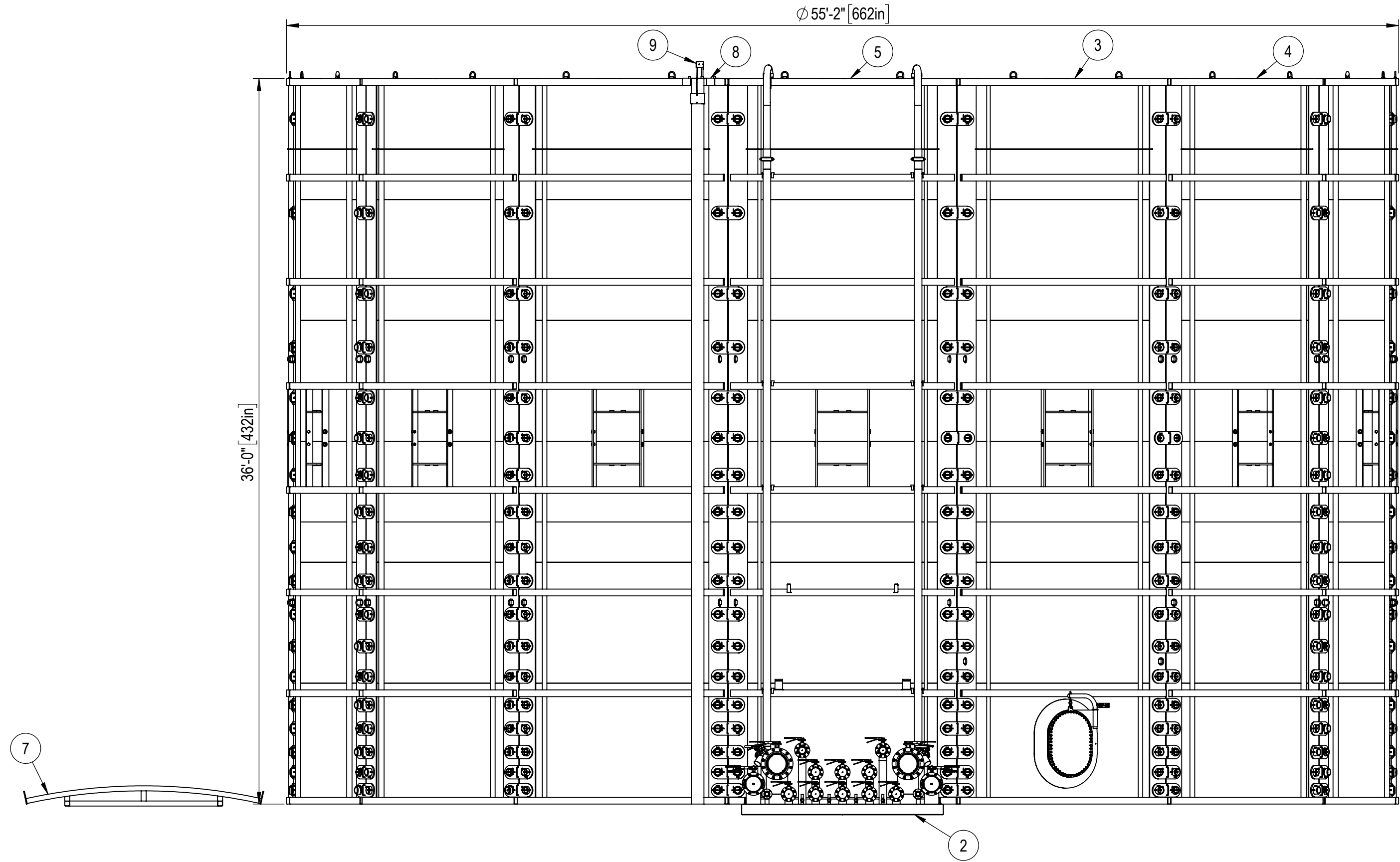
1. ERECTOR SHALL PROVIDE ALL MATERIAL, EQUIPMENT AND LABOR THAT IS REQUIRED FOR TEMPORARY STABILITY OF THE TANK DURING ERECTION.
2. THE STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER THE BUILDING IS COMPLETE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE ERECTION PROCEDURES AND SEQUENCES TO INSURE SAFETY OF THE BUILDING AND ITS COMPONENTS DURING ERECTION. THIS INCLUDES, BUT IS NOT LIMITED TO, THE ADDITION OF NECESSARY SHORING, SHEETING, TEMPORARY BRACING, GUYS, TIE DOWNS, ETC.
3. TANK AND SUMP ARE TO BE SUPPORTED BY LEVEL FOUNDATION, DESIGNED BY OTHERS.
4. TANK IS TO BE USED IN COMPLIANCE WITH LOCAL & FEDERAL JURISDICTION.

SPECIFICATIONS

1. ABOVE GROUND STORAGE TANK IS RATED FOR 15 PANEL ASSEMBLY FOR FLUIDS UP TO 1.15 SPECIFIC GRAVITY.
2. MINIMUM REQUIRED SOIL BEARING CAPACITY AT 1.15 S.G.= 3000 lbs/ft² (145 kPa).
3. TANK VOLUMES (ZERO FREEBOARD):
 - 14950 US BBL
 - 2378.5 m³
 - 83982 ft³

FINISHING DETAILS

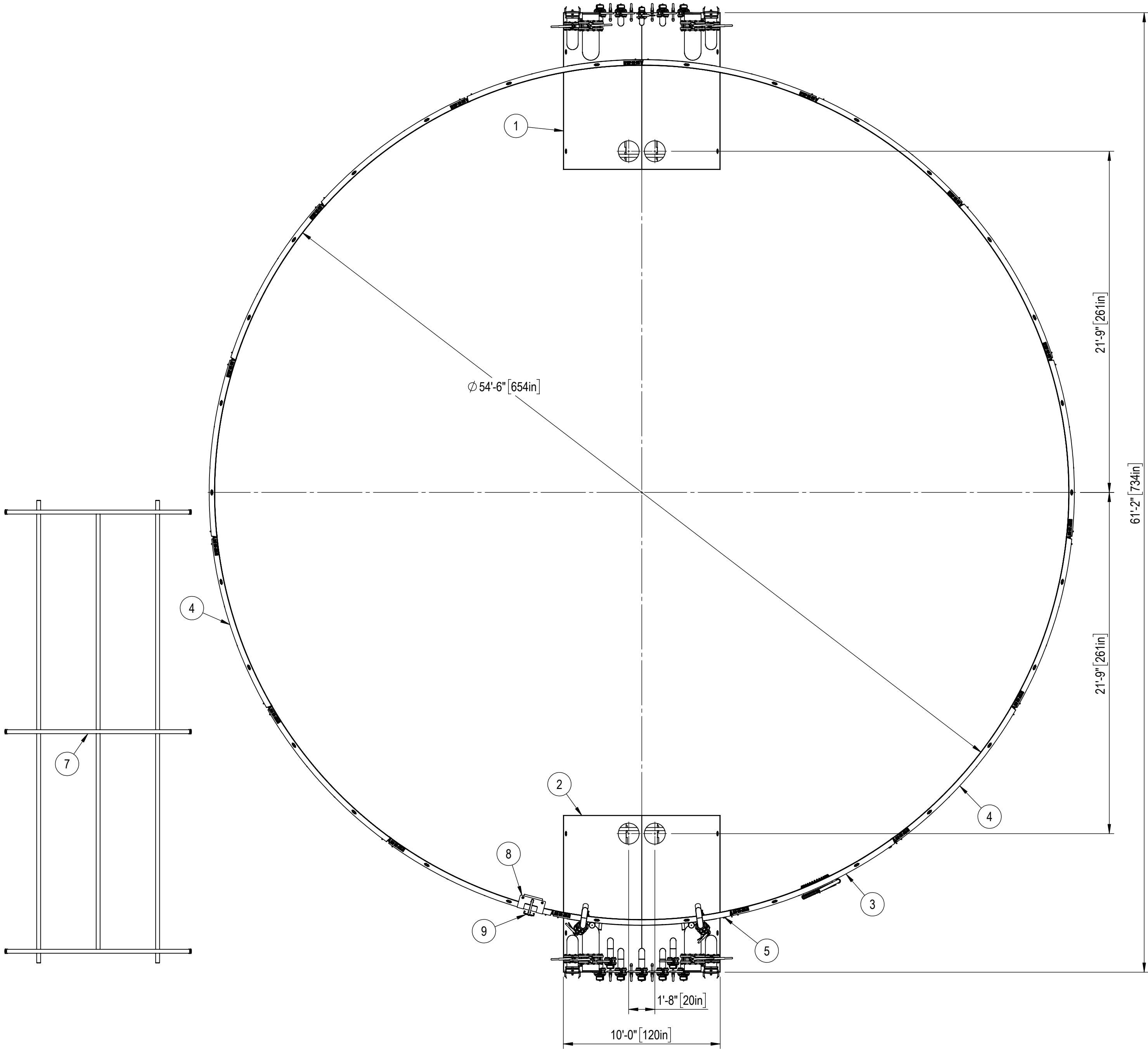
1. PANELS : ENDURA EXCEL D2M (SIGNAL BLUE CLR33994)
2. PANEL CONNECTOR: ENDURA EXCEL D2M (GREEN CLR42186)
3. HYDRERA DECAL CENTERED VERTICALLY ON EVERY SECOND PANEL 72" ABOVE GRADE.
4. STENCIL "MADE IN USA" SHALL BE PLACED ON BOTTOM RIGHT OF EACH PANEL. LOCATED 12" FROM BOTTOM OF PANEL TO THE CENTER OF THE STENCIL.




BILL OF MATERIALS

ITEM	PART NUMBER	QTY	DESCRIPTION	WEIGHT (lbs)
1	H15P-1001	1	FILL MANIFOLD ASSEMBLY	3377
2	H15P-1002	1	SUMP MANIFOLD ASSEMBLY	3776
3	H15P-1003	1	MANWAY PANEL ASSEMBLY	7537
4	H15P-1004	13	PANEL ASSEMBLY	6970
5	H15P-1005	1	RETURN PIPING PANEL ASSEMBLY	7746
6	H15P-1006	2	4" NPS FILL NECK	32
7	H15P-1007	3	PANEL TRANSPORT STAND	1028
8	H15P-1008	1	TOMCAT LEVEL GAUGE BRACKET	23
9	H15P-1009	1	TOMCAT GAUGE BOARD ASSEMBLY (36'-0" GUIDED) c/w MAGNETS AND WEIGHTS	
10	H15P-1010	1	BLADDER ASSEMBLY	2406

TOTAL WEIGHT: 114329 lbs



<div>RedFox Design & Drafting Inc 151 Vancouver Crescent Red Deer, AB T4R 0P2 PH: (403) 877-9859 E: dan@redfox-design.ca www.redfox-design.ca</div> <div></div>	Drawn By: Dan Griffiths	H15P - HARPOON FRAC TANK			
	Date: March-17-2021	H15P - HARPOON TANK ASSEMBLY GENERAL ARRANGEMENT			
	Checked By: -				
	Approved By: -	Customer Project No: HAR-008	RedFox Project No: RF21046A	Drawing Number: RF21046A-2	Sheet: 2 of 14 Rev: 0