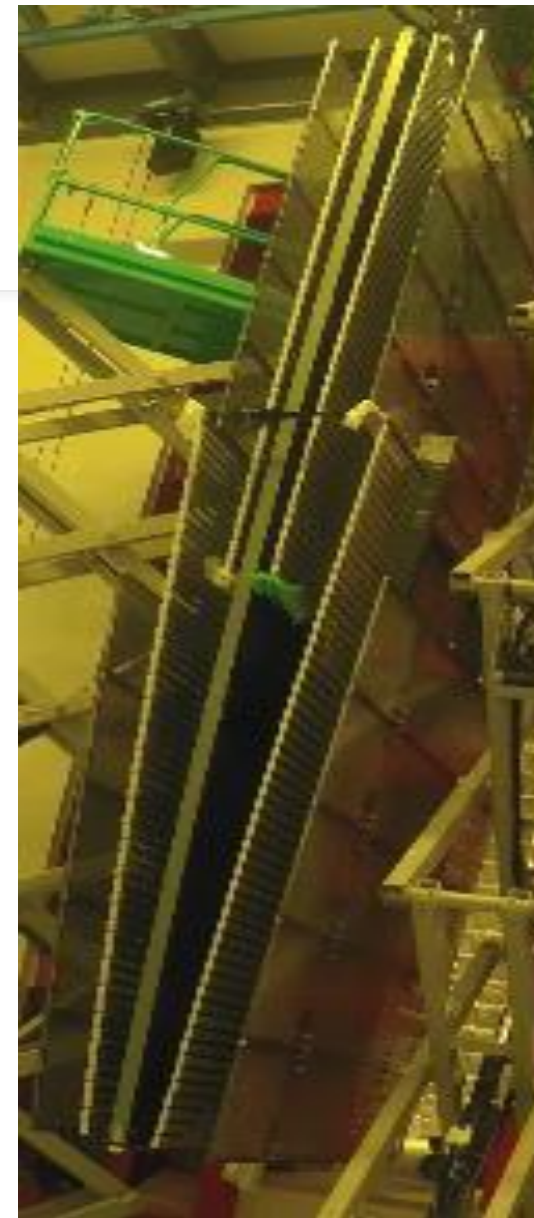
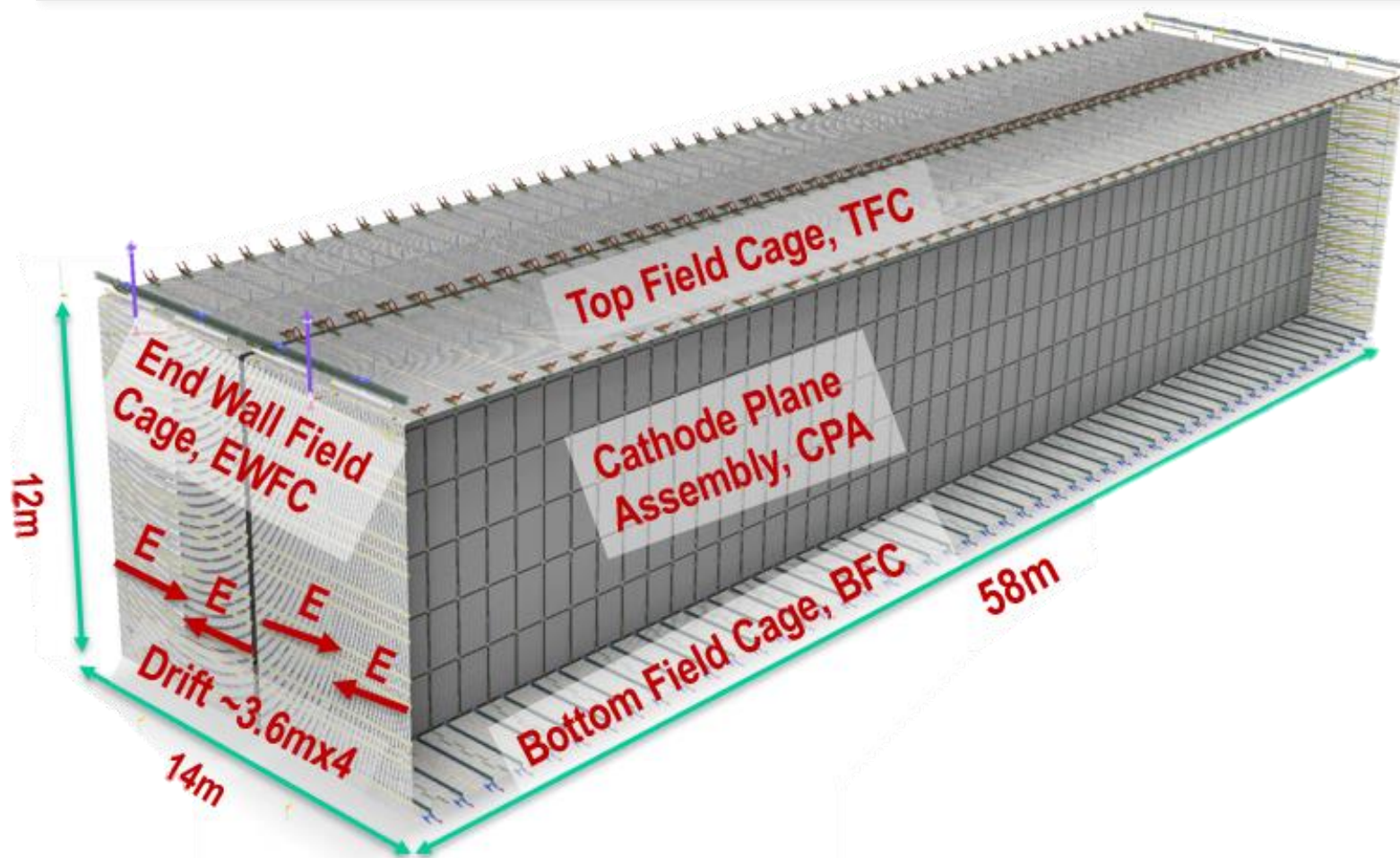


FD1-HD and FD2-VD Engineering Drawings

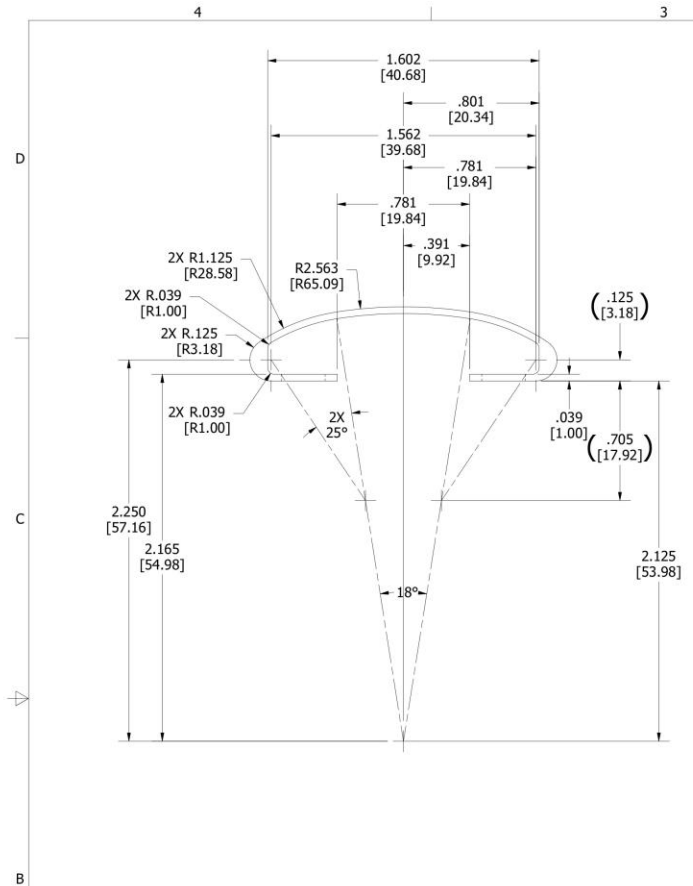
Nelda Hernandez

FD1-HD TPC



Parts

- We need to process 100 bottom field cage (BFC) modules with 10% spare for each component
- Parts for each BFC module
 - 2 FRP I-Beams
 - 2 FRP Latch Beams
 - 4 G10 Reinforcement Plates
 - 1 Lifting Bar
 - 57 Aluminum Profiles
- 2 FC assembly tables

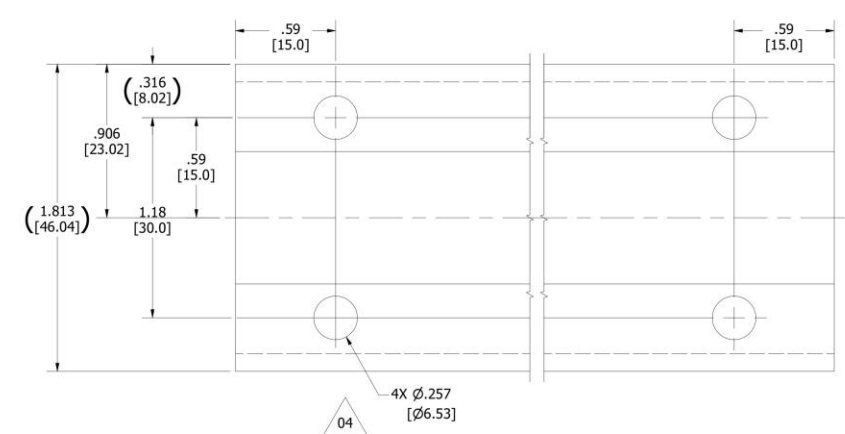
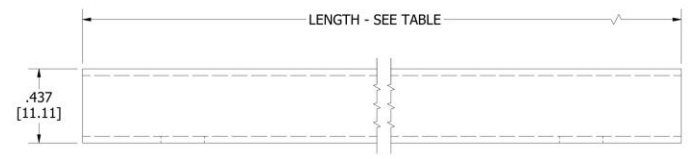


PROFILE TABLE		PROFILE TABLE	
Part Number	LENGTH	Part Number	LENGTH
DUNE-7-7-1	2287 mm	DFD-21-2212_682	682 mm
DUNE-7-7-1_19_62	19.62 in	DUNE_5_05	5.05 in
DFD-20-140_503	503 mm	DUNE-7-7-1_75_86	75.86 in
DFD-20-140_476	476 mm	DUNE-7-7-1-47_98	47.98 in
DUNE-7-7-1_138_3	138.3 mm	DUNE-7-7-1_75_11	75.11 in
DUNE-7-7-1_1166	1166 mm	DUNE-7-7-1_71_44	71.44 in
DUNE-7-7-1-1138	1138 mm	DUNE-7-7-1-73_63	73.63 in
DUNE-7-7-1_1810	1810 mm	DFD-21-2221_1849	1849.0mm
DFD-20-140_2028	2028 mm	DFD-21-2221_250	250.0 mm
DFD-20-140-1873	1873 mm	DUNE-7-7-1_1911	1911.0 mm
DUNE-7-7-1_45_47	45.00 in	PD2-21-2124	945.0 mm
DUNE-7-7-1_1979	1979 mm	PD2-21-2125	1051.0 mm
DFD-21-2124_2208	2208 mm	PD2-20-1120	1900.0 mm
DFD-21-2104_2311	2311 mm		
DUNE-7-7-1_20_62	20.62 in		
DUNE-7-7-1_21_03	21.03 in		
DUNE-7-7-1-22_51	22.51 in		
DUNE-7-7-1-1814	1814.6 mm		
DFD-21-2231_2145	2145 mm		
DFD-21-2211_1417	1417 mm		

04

NOTE:
1 - ALL DIMENSIONS IN inches [mm]

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	04	Ø.257 was .245, ADD TABLE	4/27/17	RTK
	03	Ø.245 was .22	4/21/17	RTK



RELEASED SEPT 29 2022

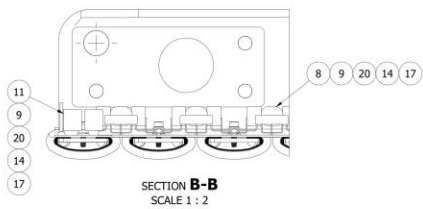
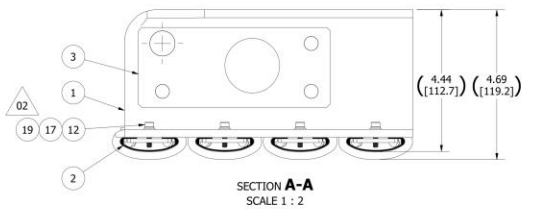
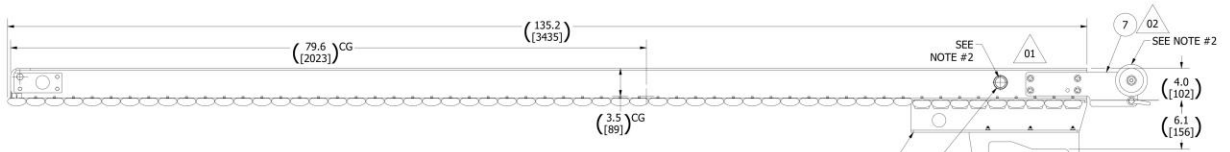
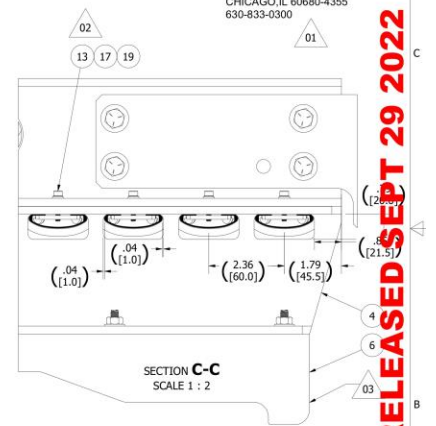
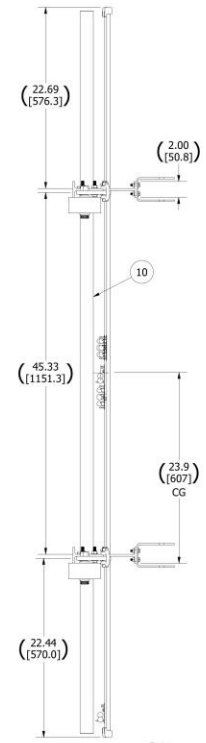
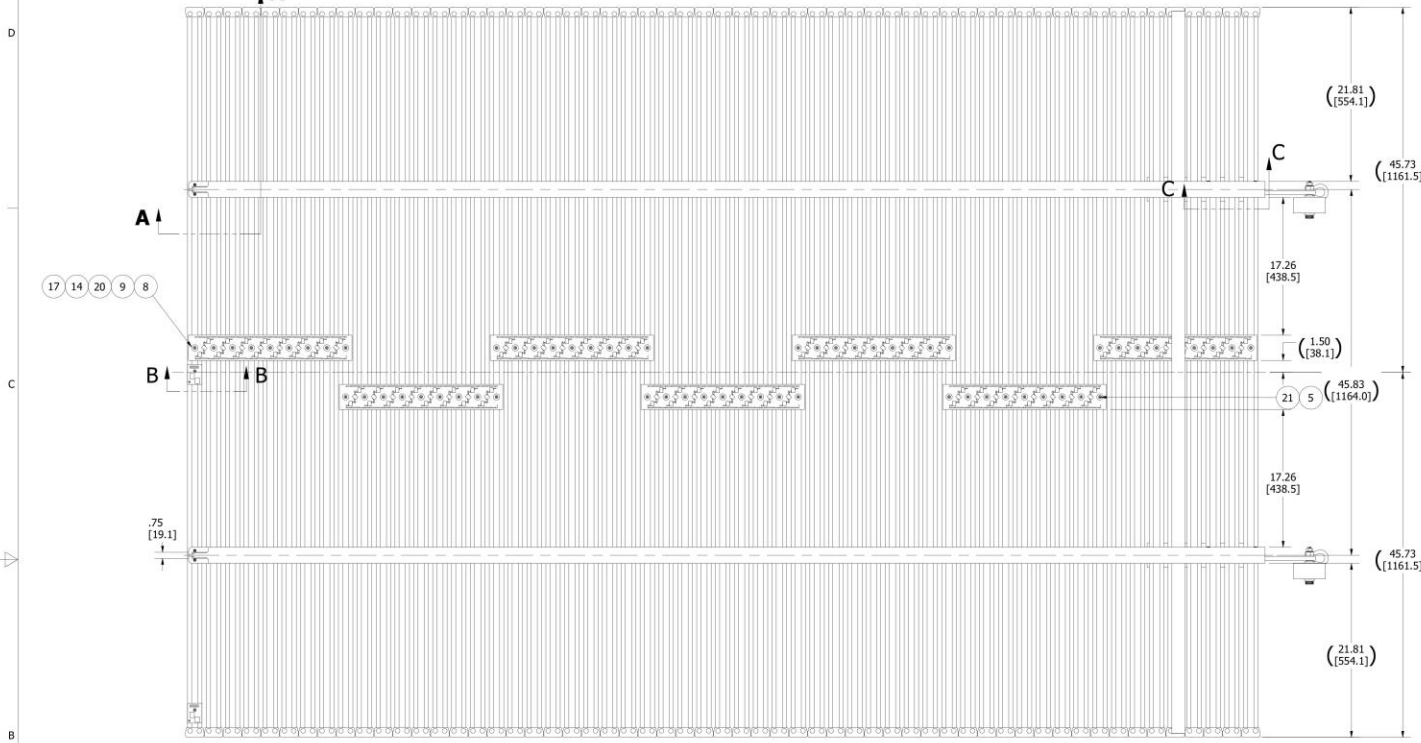
<small>UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE -XX = .01 XXX = .005 ANGULAR TOL ± 1/2° FRACTIONAL TOL ± 1/64 THIRD ANGLE PROJECTION</small>	RELEASED DRAWN BY: RTKMAK DATE: 10/3/2018 CHECKED BY: DATE: PROJECT MGR: DATE:		DO NOT SCALE DRAWING GROUP LEADER: DATE:		Argonne NATIONAL LABORATORY PROJECT: DUNE PART NUMBER: DUNE-7-7-1 PROJECT NUMBER: 82596-80-137	NEXT ASSEMBLY: DUNE-7-7	QTY. REQD .	
	RESPONSIBLE ENGINEER: V GUARINO DATE:		APVD/RELEASED: DATE:			PROFILE	REV 04	
	MATERIAL: ALUMINUM, 6061-T6		SCALE: 3:1	SHEET: 1 OF 1		SHEET SIZE: C	DUNE-7-7-1	
							04	

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
B	02	add wash & LW, longer screws; part revisions	2/20/2020	RTK
B	03	New latch hook	12/9/2020	RTK
	03			

PARTS LIST				
ITEM	QTY	PART NUMBER	REV	DESCRIPTION
1	2	DFD-21-2101	02	MAIN BEAM
2	57	DFD-21-2104	00	PROFILE ASSY [91.5"]
3	4	DFD-21-2107	02	REINFORCEMENT PLATE
4	2	DFD-21-2111	01	LATCH BEAM
5	1	DFD-21-2112	00	PCB SPACER
6	2	DFD-21-2117	02	LATCH RECEIVER, LOWER
7	2	DFD-21-2170	01	LIFT / ROLLER ASSY
8	7	DFD-21-A009		PC BOARD
9	65	DFD-21-A012	01	PROFILE NUT, Type 1B
10	1	DFD-21-A017	01	LIFT BAR
11	2			2FC PCB
12	192	91292A118		SHCS; M4 x 0.7 x 16mm LG.
13	36	91292A121		SHCS; M4x.7 x 20mm LG
14	65	91635A210		FLAT WASHER; M4 (BRASS)
15	12	91845A029		HEX NUT; 1/4-20UNC
16	24	92141A029		WASHER, FLAT; 01/4 NOM
17	293	92148A160		WASHER, LOCK; M4
18	12	92240A542		HHCS; 1/4-20UNC x 1.0 LG
19	228	93475A230		WASHER, FLAT; M4
20	65	96741A220		PAN HD SCR; M4x.7 x 10mm (BRASS)
21	1	96741A226		PHSCS; M4 x 0.7 mm x 16 mm Lg

SOURCE OR EQUIVALENT:
McMASTER-CARR
P.O. BOX 4355
CHICAGO, IL 60680-4355
630-833-0300

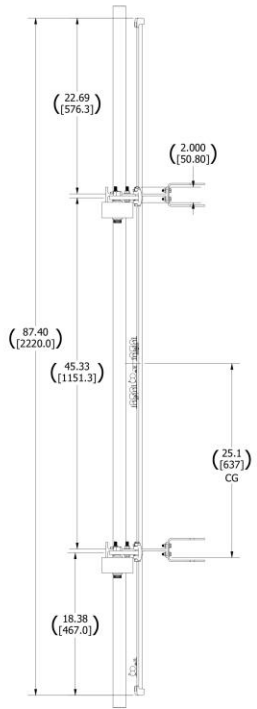
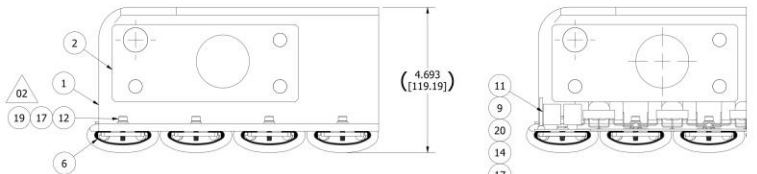
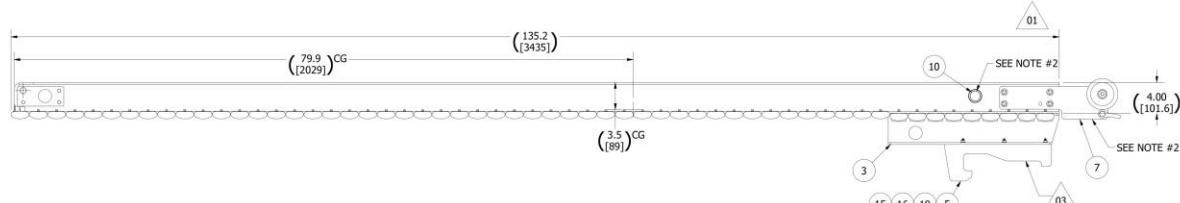
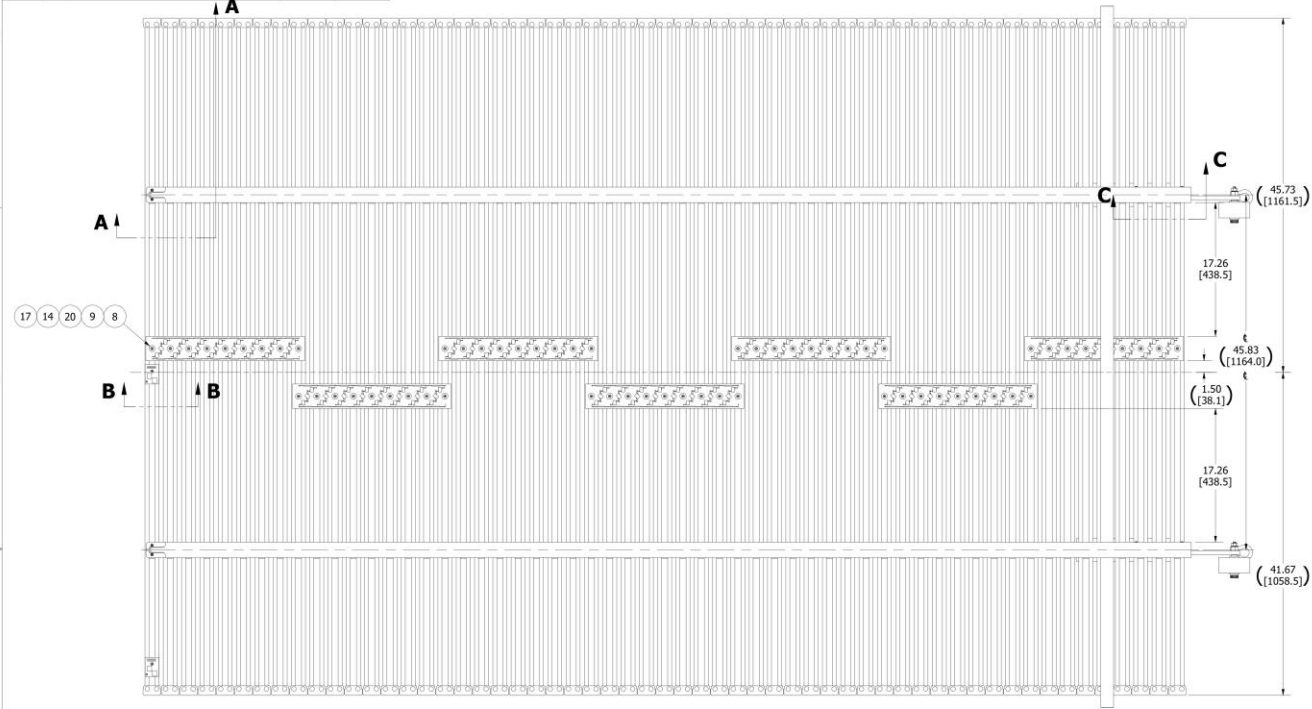
RELEASED SEPT 29 2022



NOTES:
1 - ALL DIMENSIONS IN INCHES (mm).
2 - THESE PARTS ARE USED FOR TRANSPORTATION AND INSTALLATION OF FIELD CAGES, REMOVE AFTER DEPLOYING FC.
3 - EST WEIGHT: 170 LB

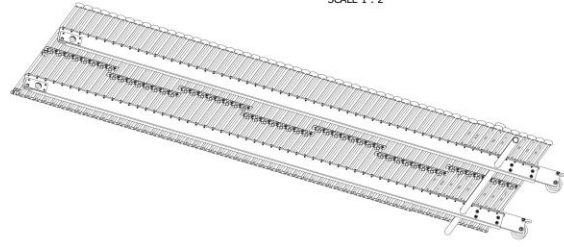
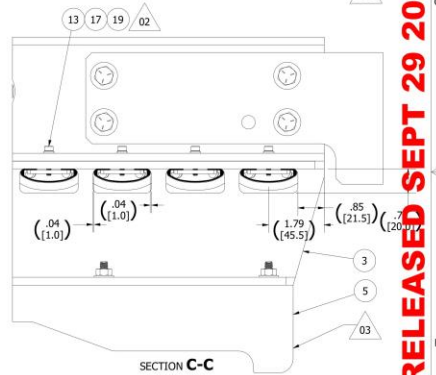
UNLESS OTHERWISE NOTED	STATUS: RELEASED	DO NOT SCALE DRAWING	ARGONNE NATIONAL LABORATORY	PROJECT NUMBER: P4303042	REV: 03
ALL DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE: XX .XX XXX .XXX FRACTIONS: TO .1 TO .01 TO .005	DRAWN BY: RTKMAK CHECKED BY: APPROVED BY: V GUARINO	DATE: 12/12/2019 PROJECT HSR: APPROVAL DATE:	GROUP LEADER: DATE: DATE:	DESCRIPTION: FIELD CAGE ASSEMBLY - TYPE D (LOWER)	REV: 03
THIS DRAWING IS UNLESS SHOWN OTHERWISE TO BE IN ACCORDANCE WITH THE FOLLOWING STANDARDS: ASME Y14.5-2018 ASME Y14.7-2015	PROJECT: DUNE-FAR DETECTOR	SCALE: 1:8	SHEET: 1 OF 1	PART NUMBER: DFD-21-2140	REV: 03

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	02	add wash & LW, longer screws; part revisions	2/20/2020	RTK
B 1	03	New latch hook	12/9/2020	RTK
	03			



PARTS LIST				
ITEM	QTY	PART NUMBER	REV	DESCRIPTION
1	2	DFD-21-2101	02	MAIN BEAM
2	4	DFD-21-2107	02	REINFORCEMENT PLATE
3	2	DFD-21-2111	01	LATCH BEAM
4	1	DFD-21-2112	00	PCB SPACER
5	2	DFD-21-2117	02	LATCH RECEIVER, LOWER
6	57	DFD-21-2124	00	PROFILE ASSY (87.4")
7	2	DFD-21-2170	01	LIFT / ROLLER ASSY
8	7	DFD-21-A009		PC BOARD
9	65	DFD-21-A012	01	PROFILE NUT, Type 1B
10	1	DFD-21-A017	01	LIFT BAR
11	2			2PC PCB
12	192	91292A118		SHCS; M4 x 0.7 x 16mm LG.
13	36	91292A121		SHCS; M4x.7 x 20mm LG
14	65	91635A210		FLAT WASHER; M4 (BRASS)
15	12	91845A029		HEX NUT; 1/4-20UNC
16	24	92141A029		WASHER, FLAT; Ø1/4 NOM
17	293	92148A160		WASHER, LOCK; M4
18	12	92240A542		HHCS; 1/4-20UNC x 1.0 LG
19	228	93475A230		WASHER, FLAT; M4
20	65	96741A220		PAH HD SCR; M4x.7 x 10mm (BRASS)
21	1	96741A226		PHSCS; M4 x 0.7 mm x 16 mm Lg

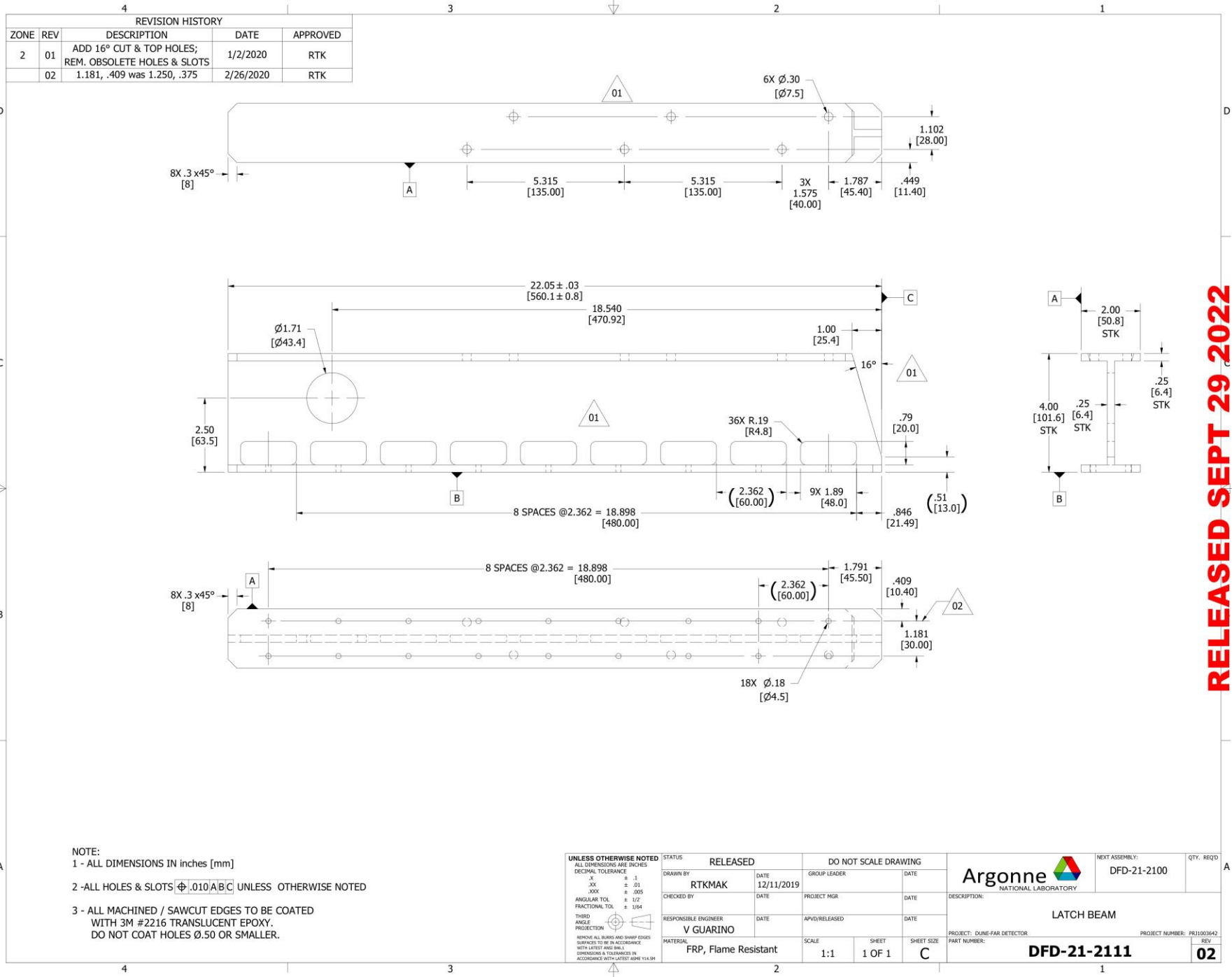
SOURCE OR EQUIVALENT:
McMASTER-CARR
P. O. BOX 4355
CHICAGO, IL 60680-4355
630-833-0300



NOTES:
1 - ALL DIMENSIONS IN INCHES [mm].
2 - THESE PARTS ARE USED FOR TRANSPORTATION AND INSTALLATION OF FIELD CAGES, REMOVE AFTER DEPLOYING FC.
3 - EST WEIGHT: 170 LB

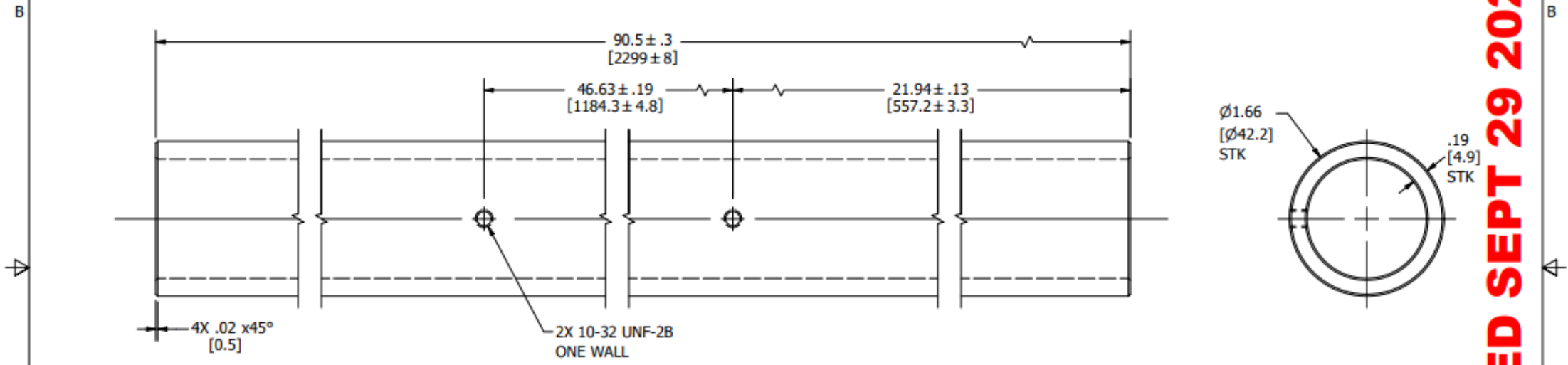
UNLESS OTHERWISE NOTED: ALL DIMENSIONS ARE DECIMAL DECIMAL TOLERANCE ± .01 ANGULAR TOL. ± .04 FRACTIONAL TOL. ± 1/32 HOLE ALL DIMENSIONS UNLESS SPECIFIED DIMENSIONS TO DIMENSION LINES DIMENSIONS TO DIMENSION LINES UNLESS OTHERWISE SPECIFIED DIMENSIONS TO DIMENSION LINES UNLESS OTHERWISE SPECIFIED	STATUS: RELEASED	DO NOT SCALE DRAWING	NEXT ASSEMBLY: DFD-13-6100, -6300
	DRAWN BY: RTKMAK	DATE: 12/16/2019	GROUP LEADER: DATE:
	CHECKED BY: DATE:	PROJECT MGR: DATE:	DESCRIPTION: FIELD CAGE ASSEMBLY - TYPE E (LOWER)
	RESPONSIBLE ENGINEER: V GUARINO	DATE: DATE:	PROJECT: DATE: DATE:
PARTIAL:	SCALE: 1:8	SHEET: 1 OF 1	SHEET SIZE: D
			PROJECT NUMBER: DFD-21-2150
			PROJECT NUMBER: 9338042

RELEASED SEPT 29 2022



RELEASED SEPT 29 2022

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	01	DELETE #8 TAP; REVISED TOLERANCES	2/7/2020	RTK




NOTE:
1 - ALL DIMENSIONS IN inches [mm]

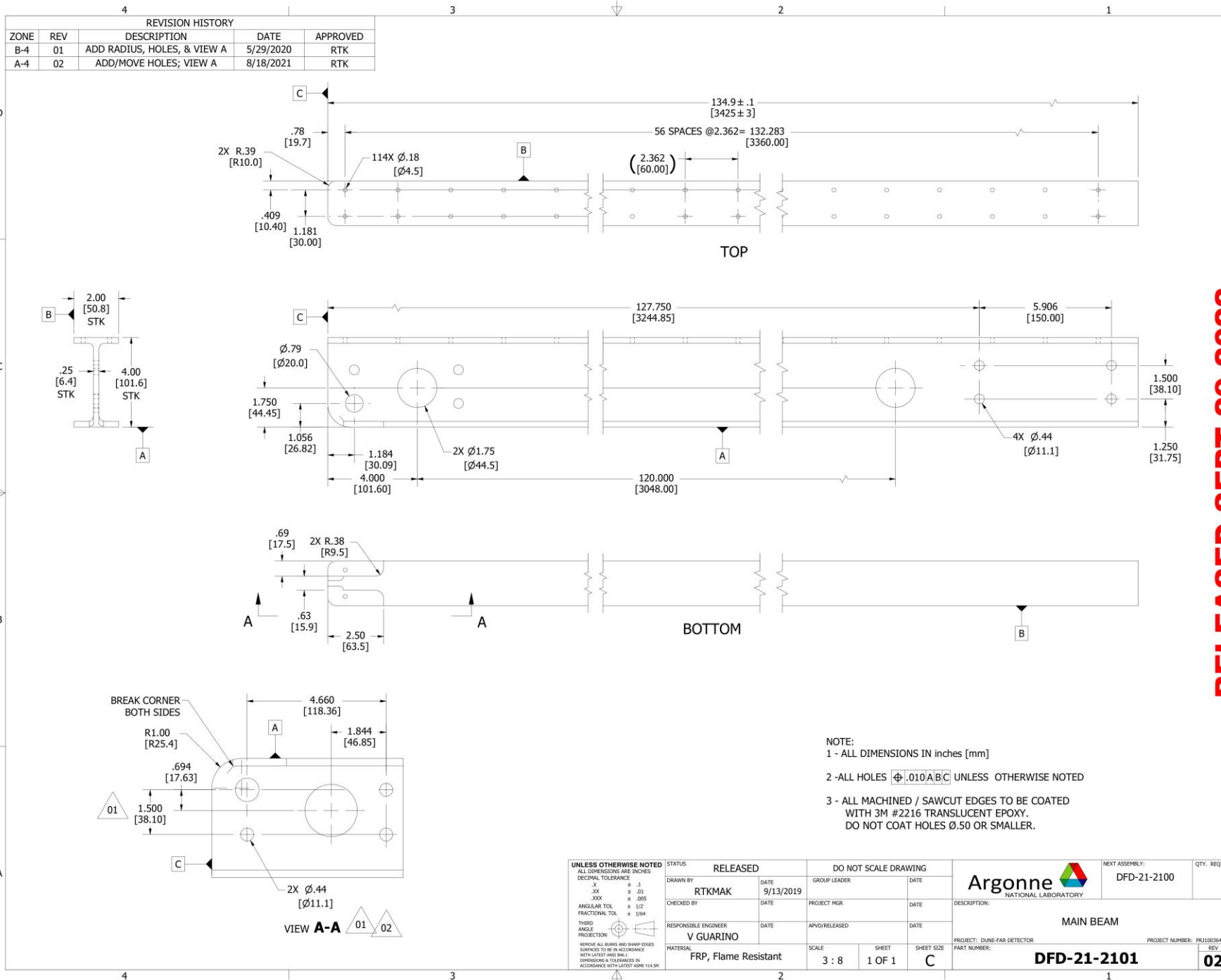
TOLERANCES:
.X ± .1
.XX ± .01
.XXX ± .005

UNLESS OTHERWISE NOTED
ALL DIMENSIONS ARE INCHES
DECIMAL TOLERANCE
X ± .1
XX ± .01
XXX ± .005
ANGULAR TOL ± 1/2°
FRACTIONAL TOL ± 1/64
REMOVE ALL BURRS AND SHARP EDGES SURFACES TO BE IN ACCORDANCE WITH LATEST ASME B46.1 DIMENSIONS & TOLERANCES IN ACCORDANCE WITH LATEST ASME Y14.5M

STATUS		RELEASED		DO NOT SCALE DRAWING	
DRAWN BY	DATE	GP LEADER	DATE		
RTKMAK	2/23/2019				
CHECKED	DATE	PROJECT MGR	DATE		
RESPONSIBLE ENGINEER	DATE	APVD/RELEASED	DATE		
V GUARINO					
MATERIAL	SCALE	SHEET	SHEET SIZE		
1-1/4" SCH 80 304 SST PIPE	1:1	1 OF 1	B		

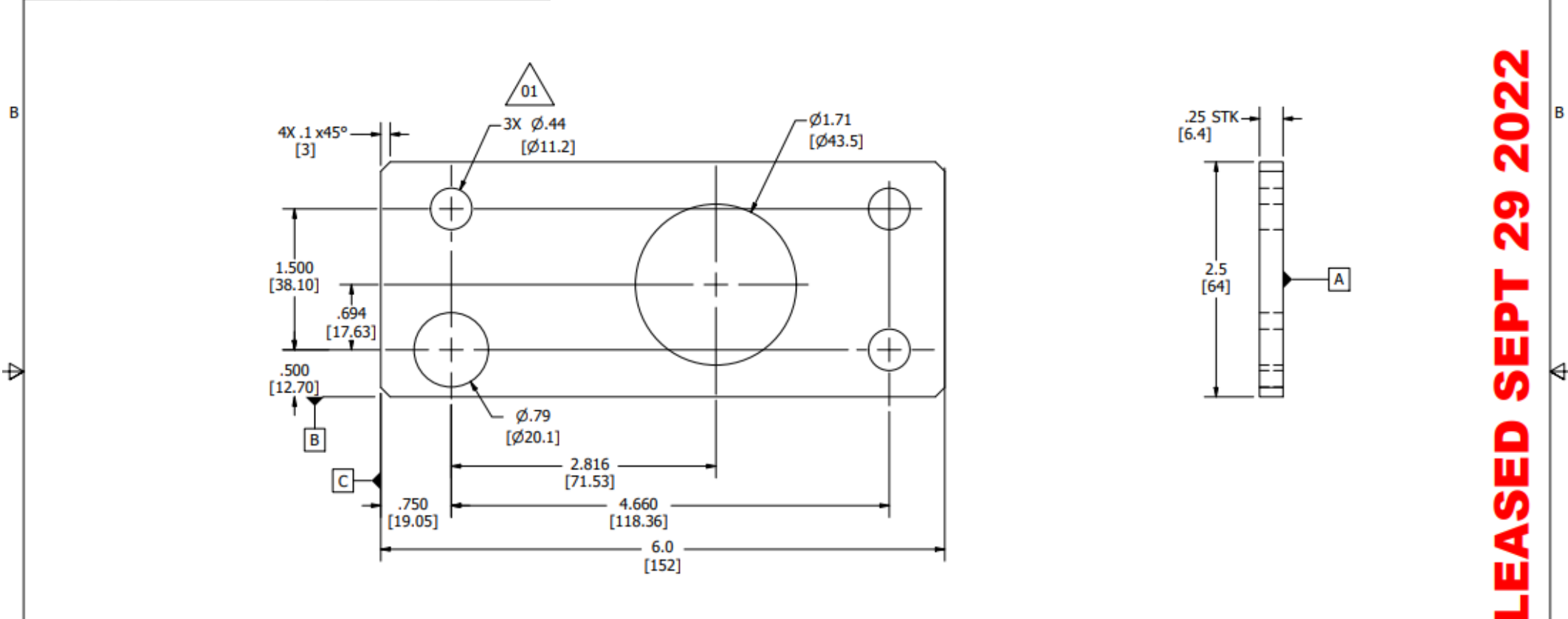
ITEM NO.	NEXT ASSEMBLY	QTY
	DFD-21-2110; MULTI	
 THIS DRAWING IS THE PROPERTY OF: Argonne National Laboratory Experimental Operations & Facilities		
DESCRIPTION:		
LIFT BAR		
PROJECT: DUNE-FAR DETECTOR	PROJECT NO: IPJ1003542	
PART NUMBER:	REV	
DFD-21-A017	01	

RELEASED SEPT 29 2022



RELEASED SEPT 29 2022

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	01	ADDED HOLES	5/29/2020	RTK
	02	REVISED HOLE LOCATIONS	8/18/2021	RTK



- NOTE:
- 1 - ALL DIMENSIONS IN inches [mm]
 - 2 - ALL HOLES $\text{H}\text{Ø}\text{.010}\text{A}\text{B}\text{C}$ UNLESS OTHERWISE NOTED
 - 3 - ALL MACHINED / SAWCUT EDGES TO BE COATED WITH 3M #2216 TRANSLUCENT EPOXY. DO NOT COAT HOLES Ø.50 OR SMALLER.

UNLESS OTHERWISE NOTED
ALL DIMENSIONS ARE INCHES
DECIMAL TOLERANCE
X ± .1
XX ± .01
XXX ± .005
ANGULAR TOL ± 1/2
FRACTIONAL TOL ± 1/64
THIRD ANGLE PROJECTION
REMOVE ALL BURRS AND SHARP EDGES SURFACES TO BE IN ACCORDANCE WITH LATEST ANSI B46.1 DIMENSIONS & TOLERANCES IN ACCORDANCE WITH LATEST ASME Y14.5M

STATUS RELEASED		DO NOT SCALE DRAWING	
DRAWN BY RTKMAK	DATE 9/17/2019	GROUP LEADER	DATE
CHECKED BY	DATE	PROJECT MGR	DATE
RESPONSIBLE ENGINEER V GUARINO	DATE	APVD/RELEASED	DATE
MATERIAL FRP, Flame Resistant	SCALE 1 : 1	SHEET 1 OF 1	SHEET SIZE B

Argonne NATIONAL LABORATORY

PROJECT: DUNE-FAR DETECTOR

PROJECT NUMBER: PRJ1003642

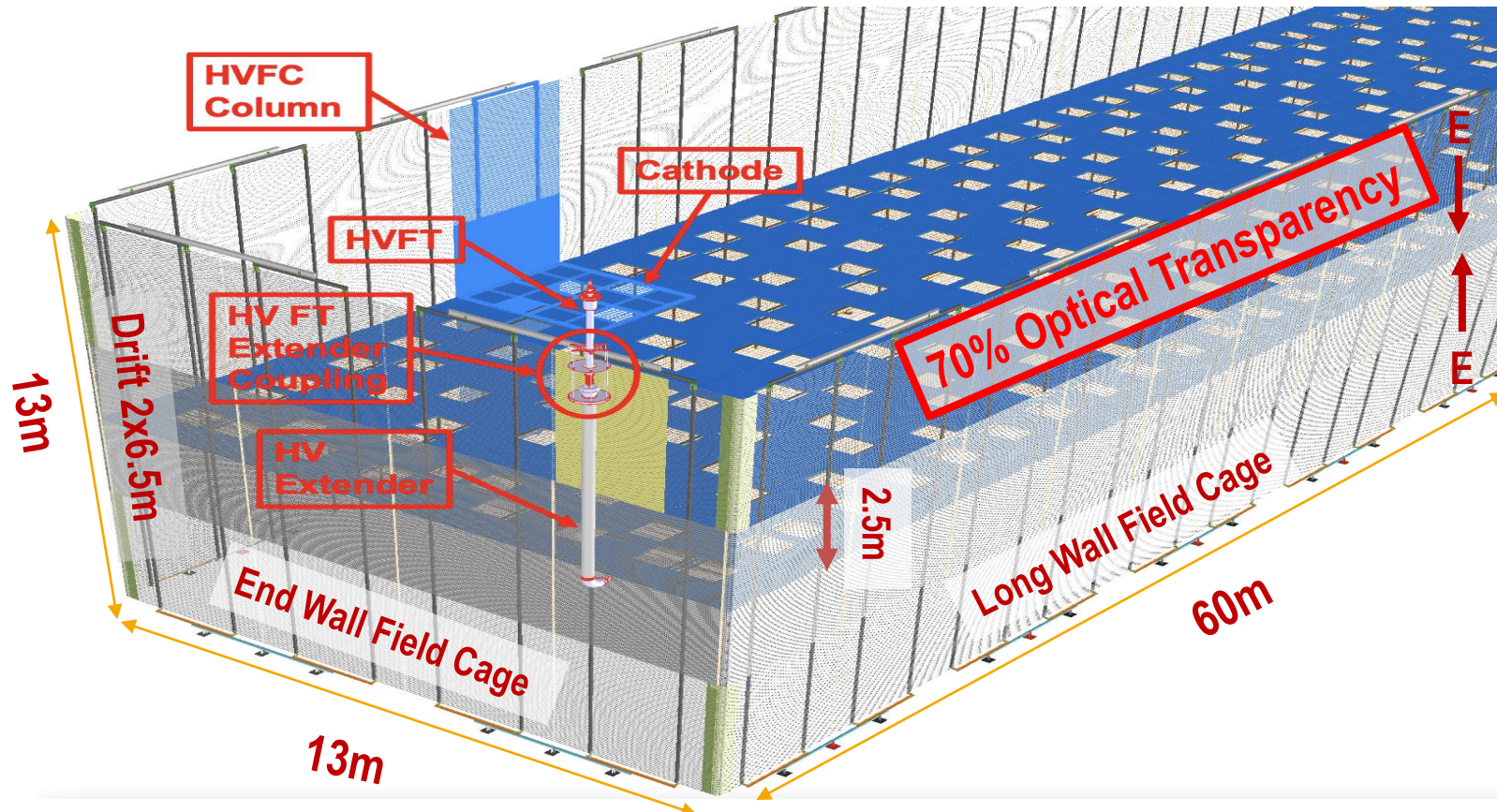
REINFORCEMENT PLATE

PART NUMBER: **DFD-21-2107**

REV: **02**

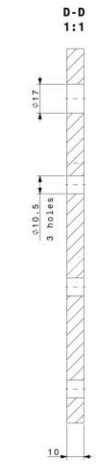
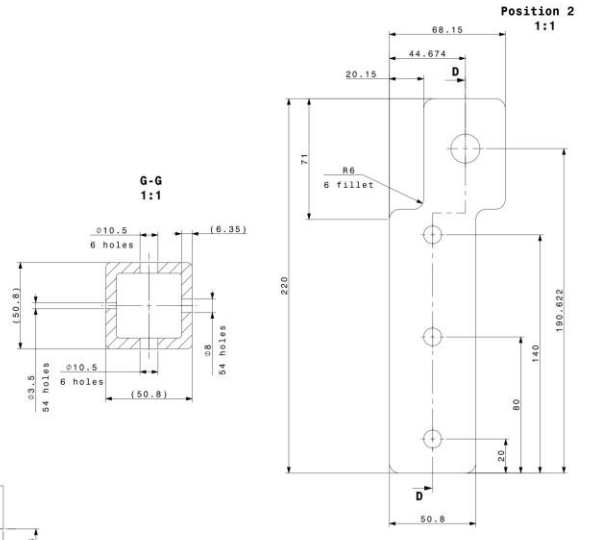
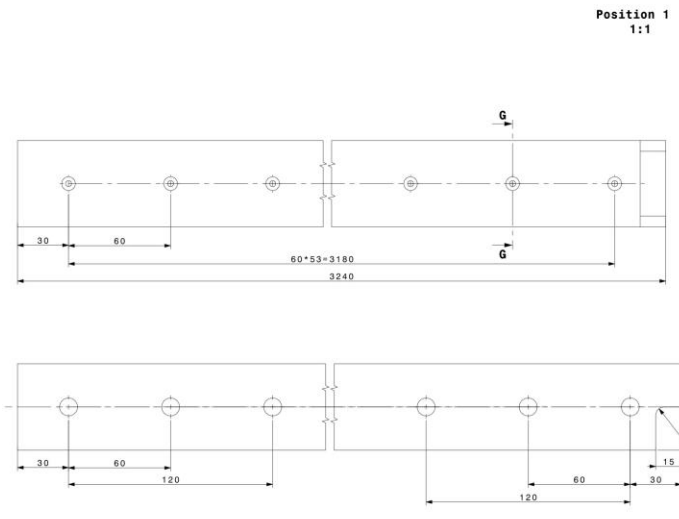
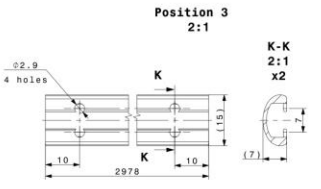
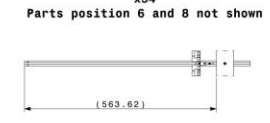
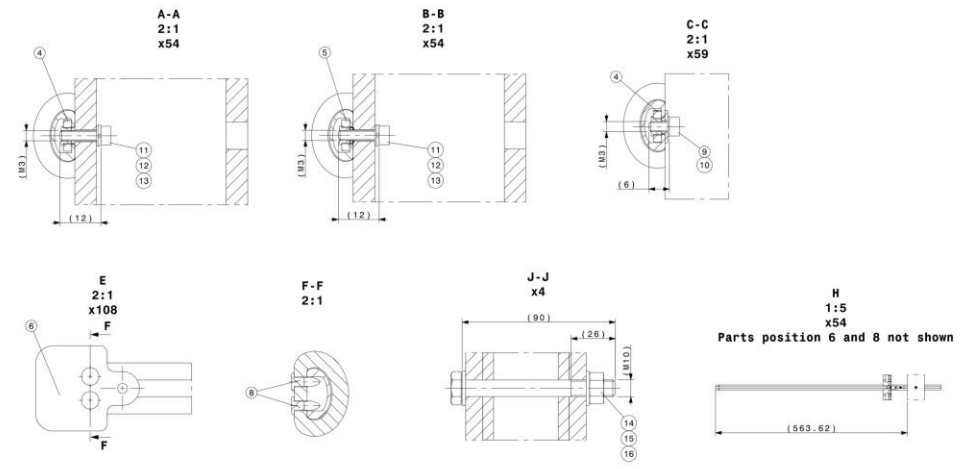
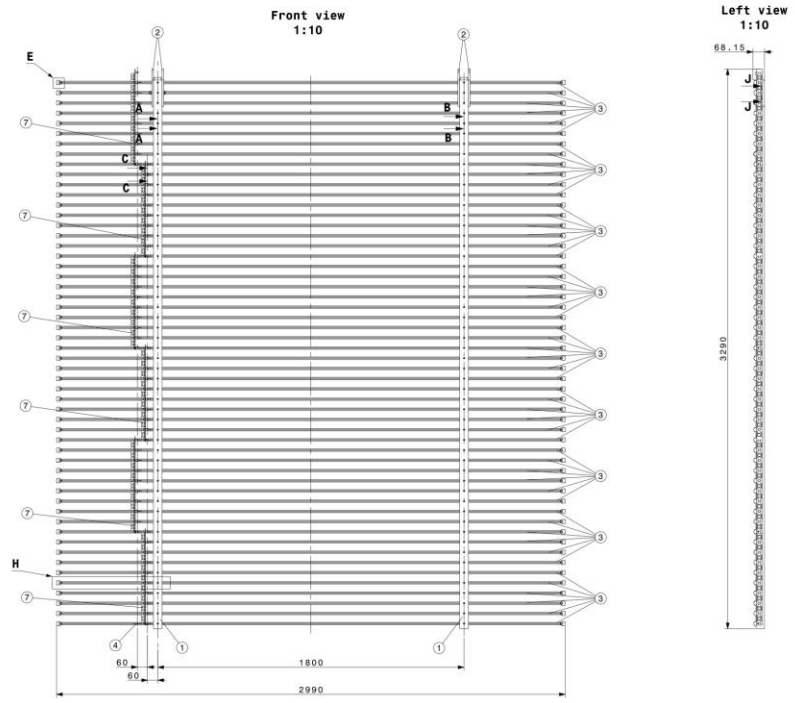
RELEASED SEPT 29 2022

FD2-VD TPC



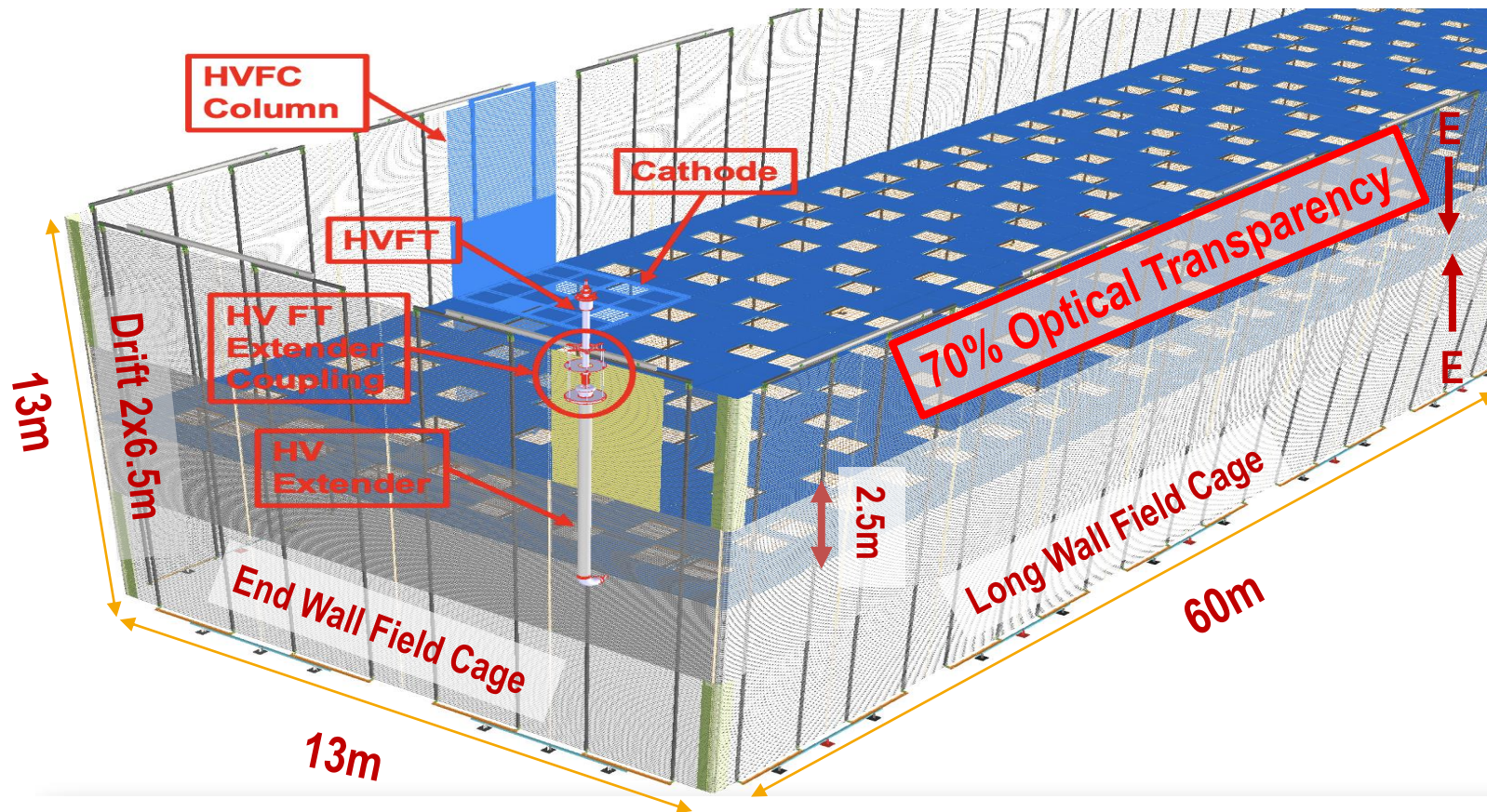
Parts

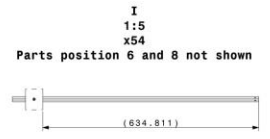
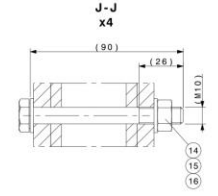
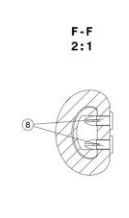
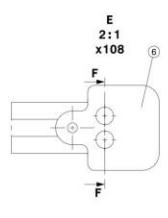
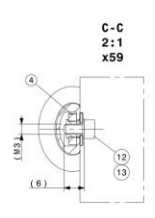
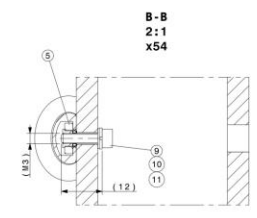
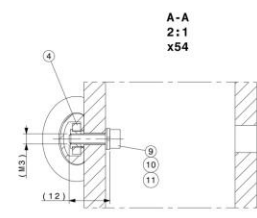
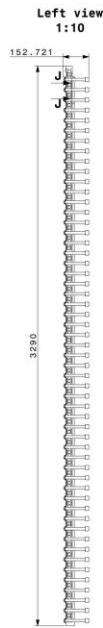
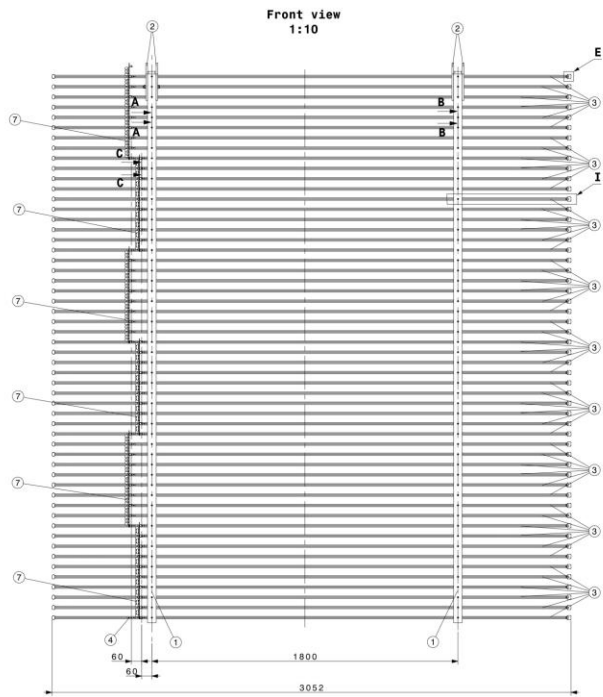
- 160 Long Wall Modules
- 32 End Wall Modules
- Parts for each FC module
 - 2 FRP Box-Beams
 - 2 FRP Box Beam Inserts
 - 108 End Caps
 - 2 Bottom Stabilizers
 - 2 Top Stabilizers
- Tooling
 - 1 Gantry Crane
 - 2 Profile Bending Tools
 - 3 FC Assembly Stands
 - 28 FC Storage Carts
 - 3 Scaffolding Structures
 - 4 Installation Tripods
 - 4 Module Installation Carts



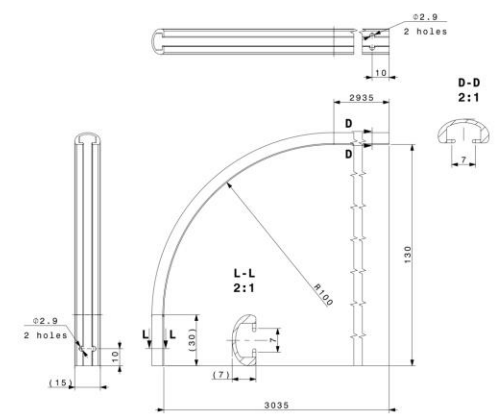
1. Mass: 33 kg.
2. Dimensions in brackets are for information.

BILL OF MATERIALS					
POS	QTY	DESCRIPTION	REFERENCE	UNIT	QTY
01	2	F02 FC Top part BG base 01	80 base 30 mm - L1000 00	VEITONET +	
02	4	F02 FC Top support plate 01	ST160719	Epoxy PR-A	
03	64	Aluminum beam A 01	Aluminum profile 100x100x10	Alu 6063 (TR)	
04	114	Slip Nut Narrow	ST160342		
05	54	Slip Nut Narrow Nonlocking	ST160348		
06	108	Cap 01 (for Aluminum beam A)	ST1602479	PE-UMW	
07	6	ROB	ST160348		
08	216	Push-In Rivets	ZPP170040	VLON + (PA)	
09	54	300 4762 HEX SKT M8 ROSEN 404 - 40	ST1602302	ST: Steel A4	
10	54	20x4x3-1 WADNER W046-AA	8068400 : 01 0	ST: Steel A4	
11	108	300 4762 HEX SKT M8 ROSEN 404 - 40	ST1602302	ST: Steel A4	
12	108	300 4762 HEX SKT M8 ROSEN 404 - 40	ST1602302	ST: Steel A4	
13	108	300 4762 HEX SKT M8 ROSEN 404 - 40	ST1602302	ST: Steel A4	
14	4	HEX HD screw M10x300	100 4014_M10x300-AA	ST: Steel A4	
15	4	HEX NUT STYLLET W046-AA	100 W046_M10-AA	ST: Steel A4	
16	8	WADNER PL WADNER W046-AA	100 W046_M10-AA	ST: Steel A4	

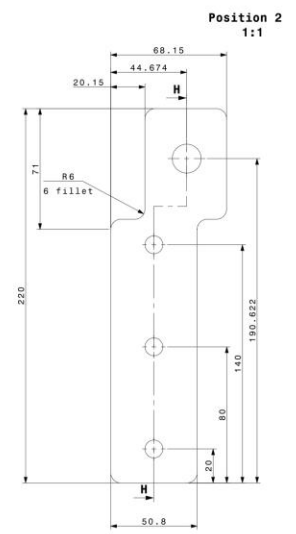
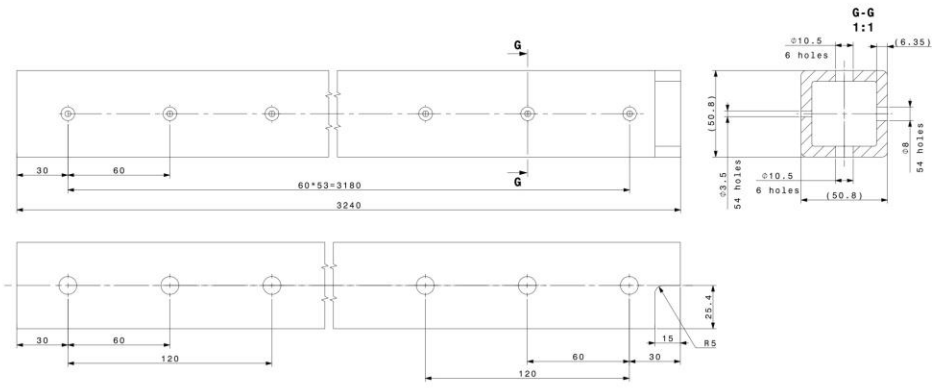




Position 3 1:1



Position 1 1:1



H-H 1:1

- Mass: 34 kg.
- Dimensions in brackets are for information.

BILL OF MATERIALS			
QTY	DESCRIPTION	REVISION	REVISION
01	2 F02 FC Top part 00 beam 01	NO BEAM 30 mm 1-1080 mm	VEHICOLI 1
02	4 F02 FC Top support plate 01	ST1680719	EP 40 200
03	54 Aluminum beam A 02	ST1680741	Epoxy PR-4
04	114 Slip Nut Narrow	Aluminum 6105 105 M	Alu 60 M-080 (TS)
05	54 Slip Nut Narrow Nonlocking	ST1683412	
06	108 Cap on (for Aluminum beam A)	ST1683043	
07	6 R08	ST1680240	
08	216 Push-In Rivets	216P10040	
09	108 4762 M6x10 M6 10808 M6x10 3.3x0.5	BOSSARD : M 610 102010	NYLON 6 (PA6)
10	108 Spring washers without nuts DIN 127B-A2 3	ST1680800	ST: 3046 A2
11	108 Washer without flange DIN 402-A2 3.3x0.5	ST1681945	ST: 3046 A2
12	108 4762 M6x10 M6 10808 M6x10 3.3x0.5	ST1681951	ST: 3046 A4
13	09 020403-1 WASHER WIDE AA	BOSSARD : M 6	ST: 3046 A4
14	4 W6x10 M6 screw W6x10x50 Via Tete hexa W6x10x50	ST1682302	ST: 3046 A4
15	4 HEX NUT STYLUS GRADE A W6x10x50	ISO 4014 W6x10x50 AA	ST: 3046 A4
16	8 NORMAL PL WASHER 10x20 W6x10x20 PLATE W6x10x20	ISO 7089 10x20-AA	ST: 3046 A4

DRAWING CODE: CENBNFV00003
 PART: F02 FC Extremity module 01 Top part
 DESIGNED: E. SILETTI
 CHECKED: AD
 RELEASED: 1.00
 APPROVED: 1.00
 REFERENCE: CENBNFV00014
 NET WEIGHT FOR DESIGN: 1/1