Example of IceCube Upgrade design document

Sensors Packing & Shipping
Design Status and Notes (DSN)

Instructions for DSN Document

- *The DSN is an "active document" that is added to and revised throughout an item's design and design verification phases.*
- *The DSN represents an item's design and prototyping status at any given time and consolidates all design references in one place.*
- *The DSN should incorporate all item-specific design information needed for project-level design reviews.*
- *Use stable links in the DSN (e.g. copy design-related drawings or slideshows into "shared documents" library).*
- *A linked file can be updated in SharePoint by overwriting it with same filename- previous versions are archived automatically.*
- *Links to useful datasheets and web pages should be included when they are discovered during research and development.*
- *All CMS docs and linked production drawings are reviewed, approved, and timestamped prior to final design review & procurement*

Key Requirements

- Operating (Shipping & Storage) Environment:
  - ISPM-15 stamp required for all wood packaging greater than 6 mm
  - Pallets need to fit on an air force pallet
  - Waterproofing (Most likely)

- Main Functions:
  - Number of sensors / air force pallet should be maximized
  - Number of air force pallet/string should be minimized
  - Allow for safe transport of sensors from production to South Pole
  - Allow for sensor testing prior to unpacking and prior to un-palletization

- External Interfaces:
  - Max cargo dimensions that can be loaded onto an air force pallet
  - Penetrator cable reach
  - Orientation of boxes onto pallets guarantees access to penetrator holes while sensors are on the pallet on a sensor sled
  - Lift'n buddy minimum height < pallet height

- Basic Performance Specifications:
  - Main functions are satisfied

General concept

- Outlined in “sensor handling DSN”

Reference to Design Document for handling of sensors at the South Pole from receiving to installation

- Summary:
  - Each sensor in one dedicated box
  - Multiple sensors on 4-way pallets
  - Multiple pallets can be loaded on one air force pallets to maximize volume usage
  - Strings defined as combinations of multiple air force pallets
  - Scheme designed taking into account sensor movement and testing at Pole

- For every point of departure identify best transportation method:
  - Cost effective
  - Reduce travel time, touchpoints and handling
  - Special Handling Requirements

Key Component: Air force pallet

463L Air Force Pallet

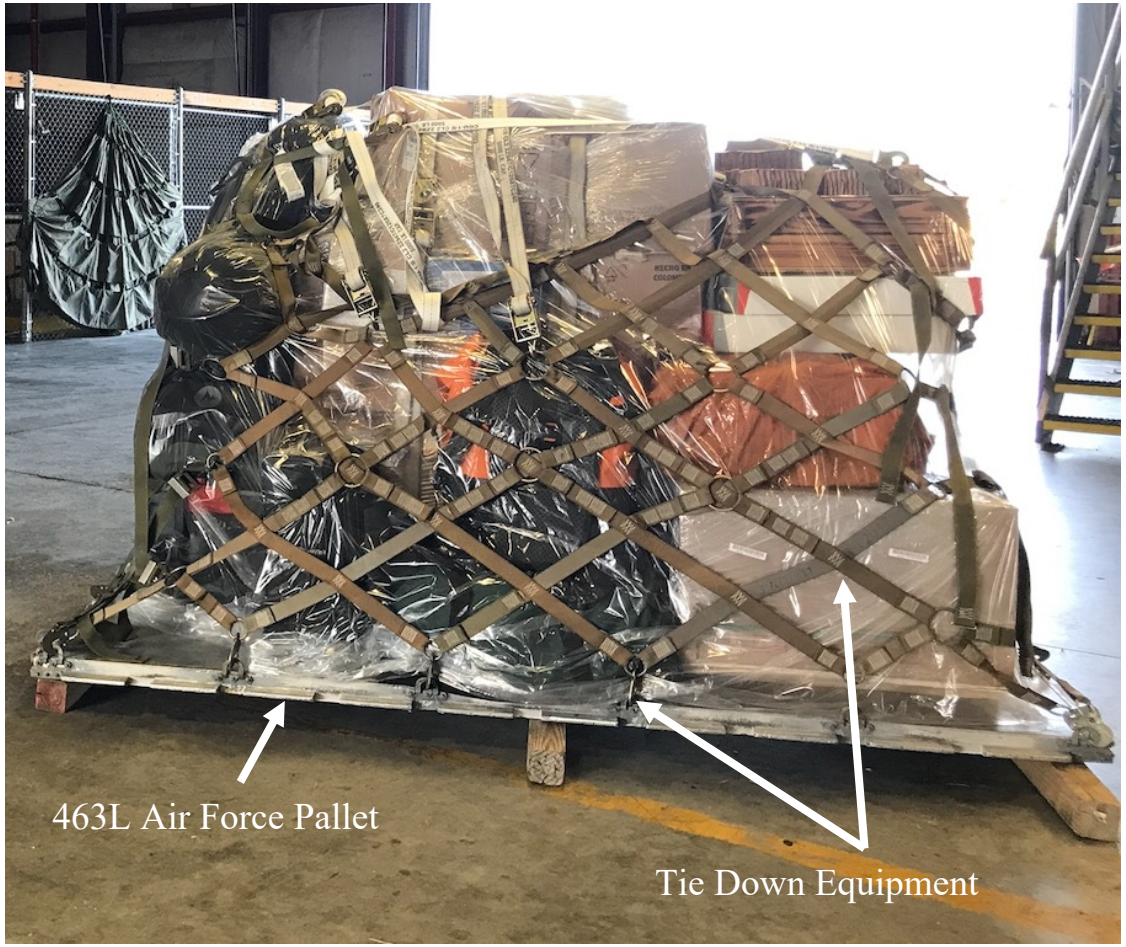
- External dimensions are: 108"W X 88"L X 2.25”H
- Pallet weight: 300 lbs
- Max load capacity 9700 lbs (including Tie Down Equipment “TDE”)

463L pallets can be linked together into pallet trains up to 5 pallets long (LC-130) - requires special handling so it should be avoided if possible

- Max usable footprint (T1 pallet)*: 102” W x 88” L
- Max usable footprint (T2 pallet)*: 102” W x 176” L

*includes 6-inch walkway on W dimension (108”→ 102")

- Max height of 102” H (96” is preferred for loading ease)
- The dimensions above INCLUDE user provided wood/plastic pallet



HTTPS://WWW.AARCORP.COM/463L-HCU-6/E-PALLET/

Instrumentation & baseline plan

- Each string has
  - mDOMs
  - D-Eggs
  - Calibration devices
  - Special devices

See Design Baseline Document: Upgrade Strings CMD for geometry

String	87	88	89	90	91	92	93		TOTAL
mDOMs	59	57	57	53	60	58	58		402
D-Eggs	39	41	40	38	40	39	40		277
Calibration Devices	6	6	8	7	6	6	8		47
Special Devices	9	10	8	16	13	12	9		77
Total	113	114	113	114	119	115	115		803

- Main sensors (mDOMs, D-Eggs) logistics is the most important piece given they make most of the volume, weight, number of items
- Instrumentation for first two strings to be stored at Pole to reduce risk on start of drilling operations

String	87-88	89-93	TOTAL
mDOMs	116	286	402
D-Eggs	80	197	277
Calibration Devices	12	35	47
Special Devices	19	58	77
Total	227	576	803

mDOMs

Plans for packing & shipping all the mDOMs from their points of origin

mDOM: counts & box

- Counts:
  - Strings 87-88:
    - 128 mDOMs from DESY (includes spares)
  - Strings 89-93:
    - 96 mDOMs from DESY
    - 200 mDOMs from MSU (includes spares)

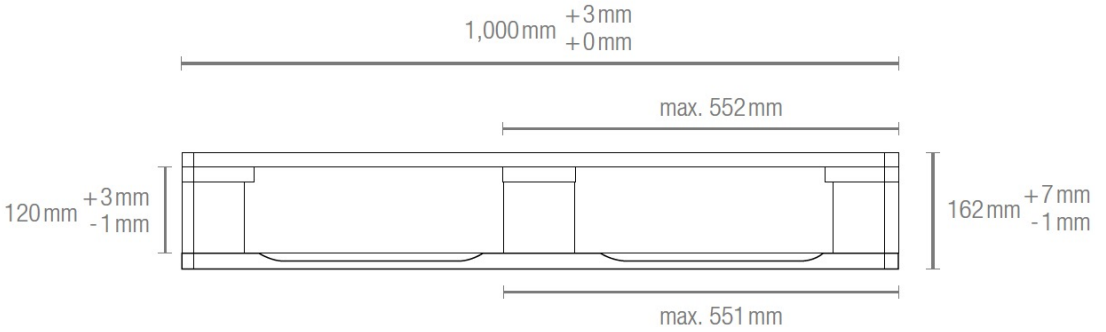
- Each mDOM in one box with foam inserts (similar to Gen1)
  - carton for single mDOM (flat projection)
    - Internal dimensions: 463 x 463 x 494 mm^3
    - External dimensions: 470 x 470 x 510 mm^3

EUR-2 ISPM-15 PALLET

https://www.epal.org.pl/download/56

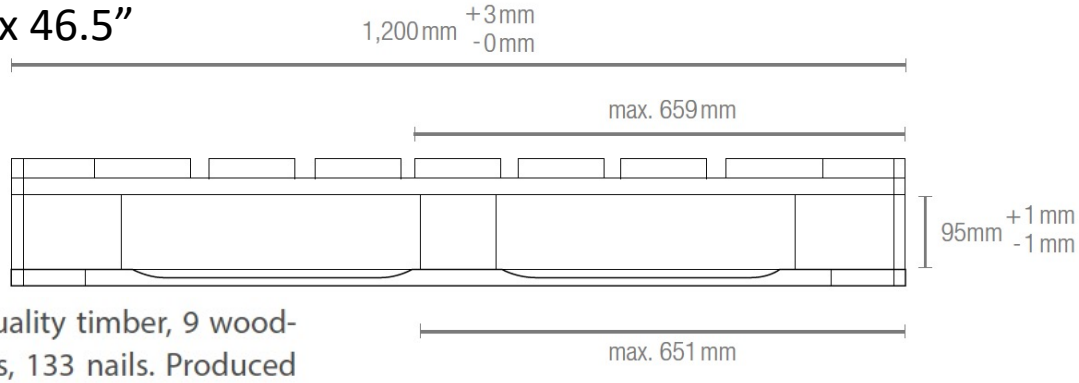
EUR 2 pallet
Dimensions: 1000 x 1200 x 162 mm^3
Max. load: 1250 kg
Typ. weight: 35 kg

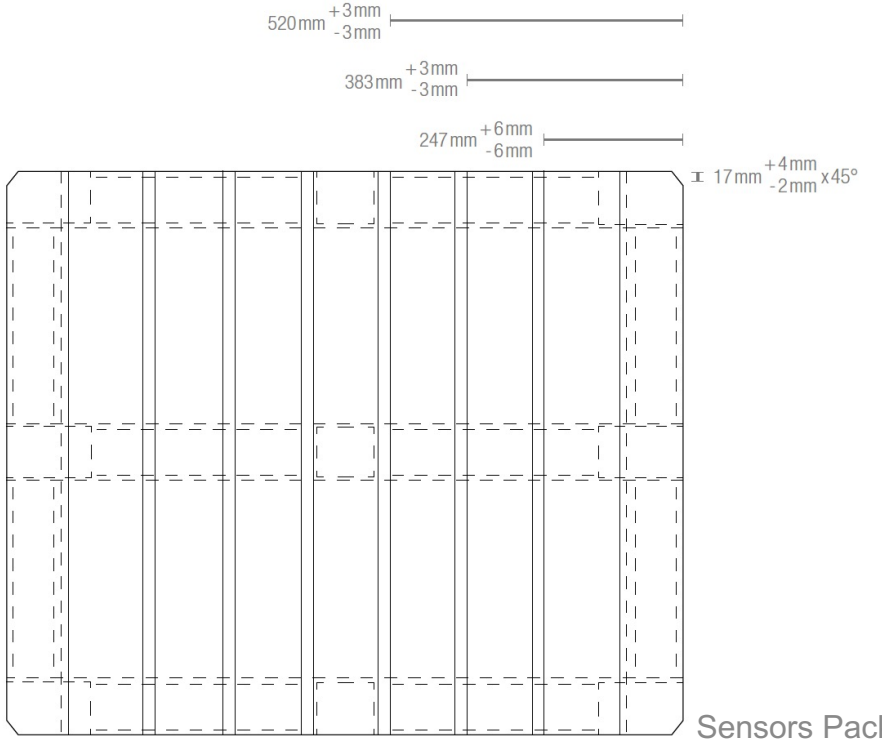
(~ US standard 40”x 48”x 5.5”)



8 (=2x2x2) mDOMs fit on a EUR 2 pallet

Dimensions:	1000mm x 120mm x 1182 mm =	39.4” x 47.2” x 46.5”
Volume:	1.42 m^3 =	50 cu ft
Weight:	8 x (25+3) kg + 35 kg = 259 kg =	570 lbs





Materials: 17 boards of quality timber, 9 wood-chip or solid wood blocks, 133 nails. Produced according to the EPAL Technical Regulations.

Length	1,200 mm
Width	1,000 mm
Height	162 mm
Weight	Approx. 35 kg
Safe working load	1,250 kg

When stacking laden pallets on a solid, even surface, the bottommost pallet must not exceed a load of max. 4,250 kg.

ISPM 15

IPPC

Compliance with the ISPM 15 standard is the most essential condition for the unrestricted use of load carriers in the international movement of goods. All EPAL load carriers are therefore produced according to the stringent specifications of the IPPC and can thus be deployed around the globe. Local plant protection agencies will provide information on the countries that recognise the IPPC standard.

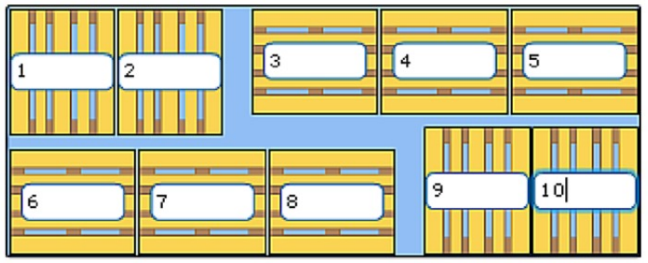
mDOM packaging proposed solution

Use a 20’ **High Cube** Single Door container for commercial travel on vessel to CHC

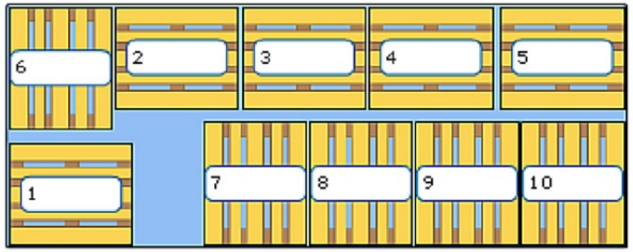
20ft Container Load Planning for Standard Pallets

20ft Container width and length:
2350mmx5900mm
Standard pallet width and length :
1000mmx1200mm

Layout 1 : 10 pcs of standard pallets fit in a 20ft container



Layout 2: 10 pcs of standard pallets fit in a 20ft container



	20' DRY CONTAINER			HI-CUBE 20' DRY CONTAINER			
Internal length	**Internal width**	**Door opening width**	**Internal height**	**Door opening height**	**Internal height**	**Door opening height**	**units**
5.898	2.352	2.34	2.39	2.28	2.698	2.585	m
19.4	7.7	7.7	7.9	7.5	8.9	8.5	ft
232.8	92.4	92.4	94.8	90	106.8	102	in

Each pallet has H =162mm
→ total height occupied is:
2*(480*2+162)= 2.24 m
→ 34.5cm clearance to door **OK**

3 containers will carry 480 mDOMs

20' DRY CONTAINER			HI-CUBE 20' DRY CONTAINER		
Tare weight	**Payload capacity**	**Cubic capacity**	**Tare weight**	**Payload capacity**	**Cubic capacity**
2250 kg	28230 kg	33.08 m^3	2300 kg	28,180 kg	37.23 m^3
4960.40 lbs	62236.49 lbs	1168.26 cu ft	5,071.5 lbs	67196.9 lbs	1,314.9 cu ft

2 layers x8 mDOMs/pallet x10 pallets mDOMs = 160mDOMs x 28 kg/mDOM → 4480 kg
20 pallets (only pallet weight) → 20x35 kg = 700 kg
Total weight: 5180 kg **OK**

Route for mDOMs from DESY to CHC

Recommended Route by DESY Logistics (June 2021)

Sent: Monday, June 7, 2021 10:17 AM

To: 'Dereschkewitz, Dana' <dana.dereschkewitz@desy.de>

Da es sich um Transporte handelt, die erst in weiter Zukunft stattfinden,

gebe ich Ihnen nachfolgend nur einmal ein paar Referenzpreise.

Ich hoffe, das ist bei Ihrer Entscheidungsfindung hilfreich.

SEEFRACHT:

Route: Hamburg – Singapore/ Port Klang - Auckland

Transitzeit ca. 50-60 Tage Hafen - Hafen

20'DC = ca. USD 3500 (nur die reine Seefracht)

40'DC = ca. USD 5600 (nur die reine Seefracht)

Bei dieser Menge empfehlen wir auf jeden Fall einen Versand im Container und nicht als Stückgut.

Die Kosten, speziell bei Ankunft in Neuseeland, wären enorm bei Stückgut.

Die Paletten werden nur in einen 20' DC passen, wenn Sie diese stapeln können.

Alternativ habe ich Ihnen auch den Preis für den 40'DC aufgegeben.

[…]

AIRCOM:* *Air freight was estimated to be 8.50 to 12 EUR per kilogram
I.e. ~2000 EUR per 8-mDOM palette

Sent: Monday June 7, 2021 10:17 AM To: 'Dereschkewitz, Dana' <dana.dereschkewitz@desy.de>

Since these are transports that will only take place in the distant future, I will only give you a few reference prices below. I hope this is helpful in your decision making.

SEA FREIGHT:
Route: Hamburg - Singapore / Port Klang - Auckland
Transit time approx. 50-60 days port - port
20'DC = approx USD 3500 (only pure sea freight)
40'DC = approx USD 5600 (only pure sea freight)

With this amount, we definitely recommend shipping in a container and not as general cargo. The costs, especially when arriving in New Zealand, would be enormous for general cargo.

The pallets will only fit in a 20 'DC if you can stack them. Alternatively, I have also given you the price for the 40'DC.

Route for mDOMs from MSU to CHC

- mDOMs from MSU sums up to 200 (25 pallets) in drilling year
- Planning on MSU → PTH by truck, then PTH → CHC by ComSur
- Note in shipping master sheet to use 2 x 20'HC containers, probably enough stuff to fill in the second (Field Hubs, BCAs).
- Containers could be owned by MSU and loaded in MSU - less risk more cost – each container is O(3k)
- Alternatively, containers could be loaned from ASC in PTH. MSU equipment would need to travel on a 53 ft semi truck – more touchpoints

mDOMs on 463L Air Force Palette

- For travel on USAP airlift we need to pack things on air force pallets: https://www.aarcorp.com/463l-hcu-6/e-pallet/
  - Dimensions: 2743 x 2235 x 57 mm^3 = 108” x 88” x 2.25”
  - Max. load: 4400 kg = 9700 lbs
  - Typ. weight: 136 kg = 300 lbs

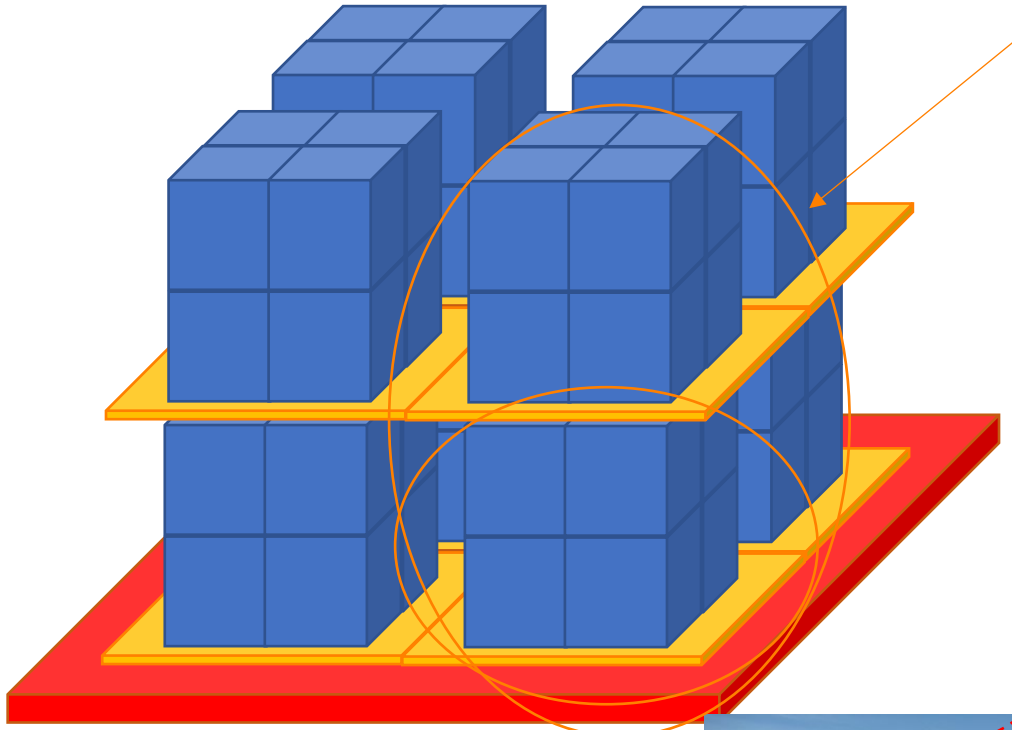
- 8 (2x2x2) EUR 2 pallets (64 mDOMs) per 463L pallet
  - Used space on 463L pallet: 2200 x 2200 x 2364 mm3 = 86.6” x 86.6” x 93”
  - Weight: 8 x 259 kg + 136 kg = 2208 kg = 4868 lbs

mDOMs on USAP airlift

CHC→ NPX

This assembly is done in CHC for C-17/C-130 transport

The single pallet is prepared at shipping location



Assumptions:

Box size is 456x456x480 mm → ~18”x18”x19”

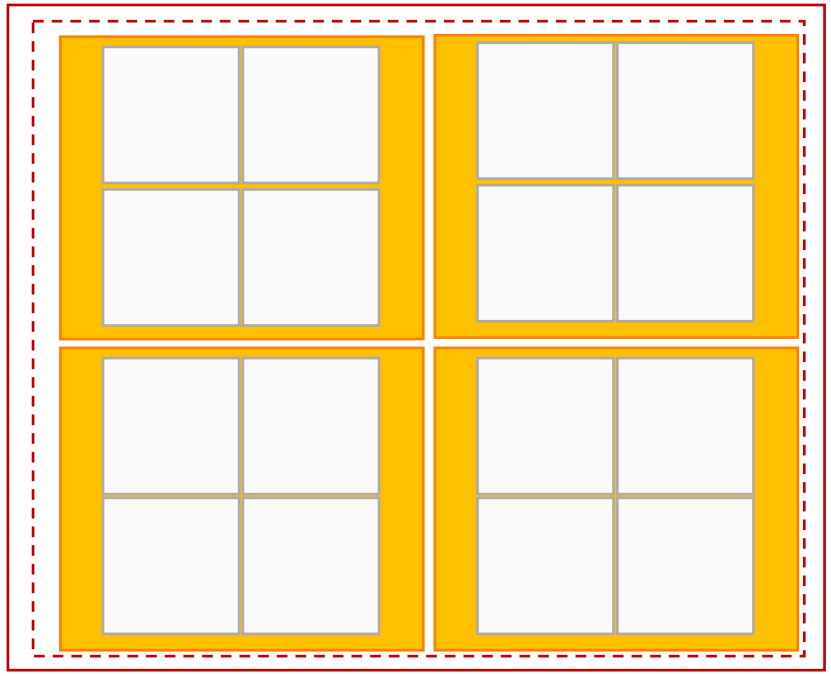
Max air cargo is 102”x 84” x 102” (H)

number of mDOMs/string is 57-60

mDOM weight: 25 kg

64 mDOMs/one pallet (spares included)

Penetrator hole side vs pallet side: TBD



All standard pallets 40”x48”
or EUR2 (1000mmx1200mm),
4-way
ISPM-15: heat treated for export

Looking scaring?
Just like in Gen1

mDOM Shipping Plan Summary

08 / 2023 <u>128 mDOMs from DESY to CHC</u>

= 116 to be deployed + 12 spares
= 16 EUR-2 pallets (8 mDOMs/pallet)

Travel to CHC in dedicated container
will be assembled to (2) 463L pallets in CHC

08 / 2024 <u>96 mDOMs from DESY to CHC</u>

= 12 EUR-2 pallets (8 mDOMs/pallet)

will be assembled to (1.5) 463L pallets in CHC

<u>200 mDOMs from MSU to PTH</u>

= 190 to be deployed + 10 spares

= 25 EUR-2 pallets (8 mDOMs/pallet)

will be assembled to (3) 463L pallets + 1 add. EUR-2 pallets

D-Eggs

Plans for packing & shipping all the D-Eggs from their points of origin

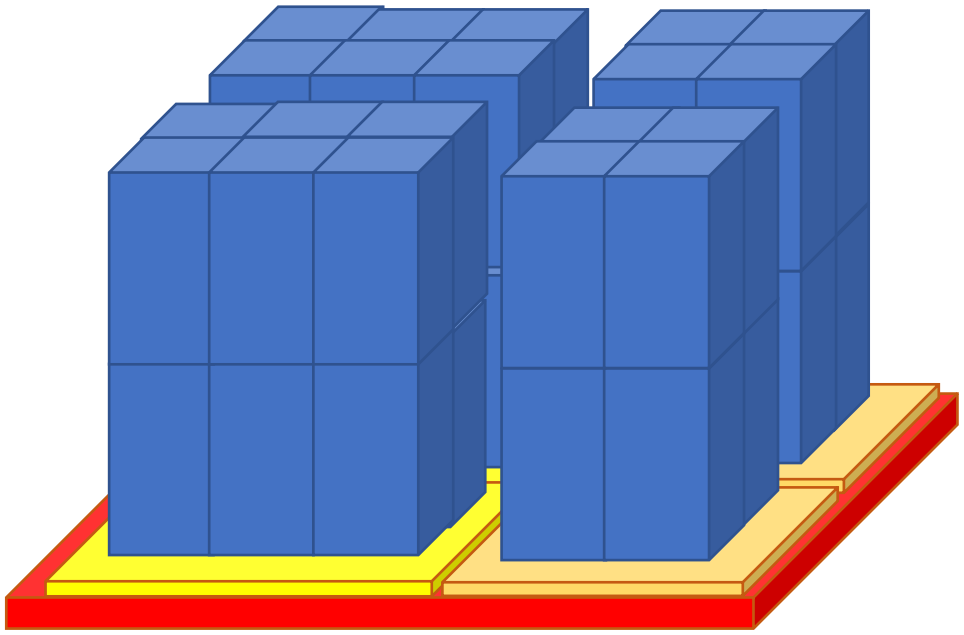
D-Eggs: counts & box

- Counts (all from Chiba):
  - Strings 87-88:
    - 80 D-Eggs (+ spares TBD)
  - Strings 89-93:
    - 200 D-Eggs (+ spares TBD)

- Each D-Egg in one box with foam inserts (similar to Gen1)
  - D-Egg Packaging
  - Internal dimensions: 456 x 456 x 740 mm^3
  - External dimensions: 510 x 470 x 750 mm^3

D-Egg packaging proposed solution

CHC→ NPX



D3: 37” to 42" (=84"/2)
D4: 55.5” to 102”-D2

D1: 37”-42” (=84"/2)
D2: 37”-46.5”

Height of pallet needs to be 5-1/4” – 6”

Assumptions:

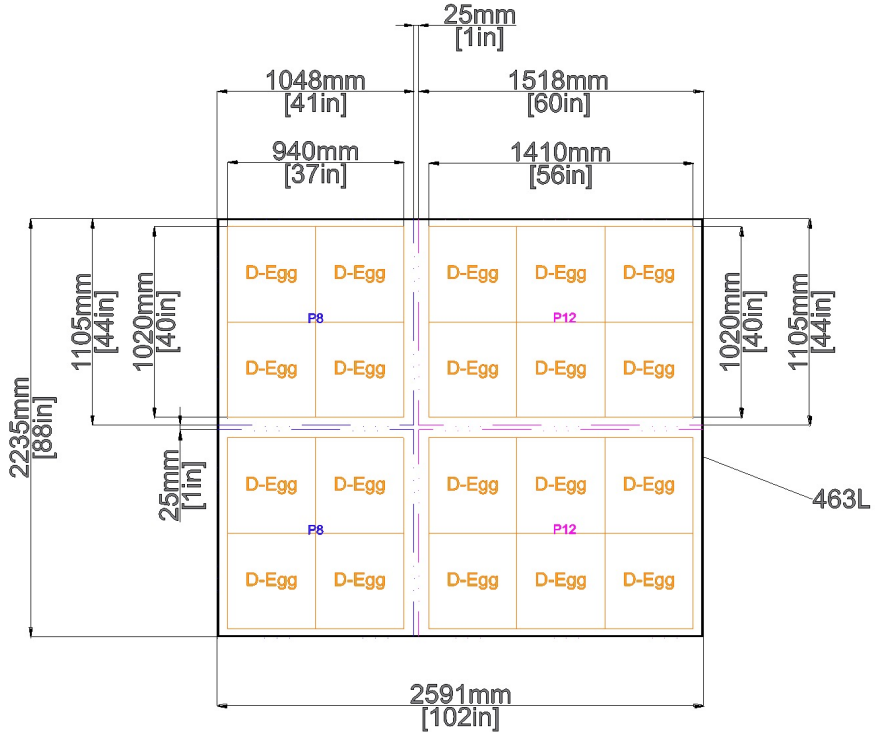
Box size is 18.5”x18.5”x30”

Max air cargo is 102”x 88” x 102” (H)

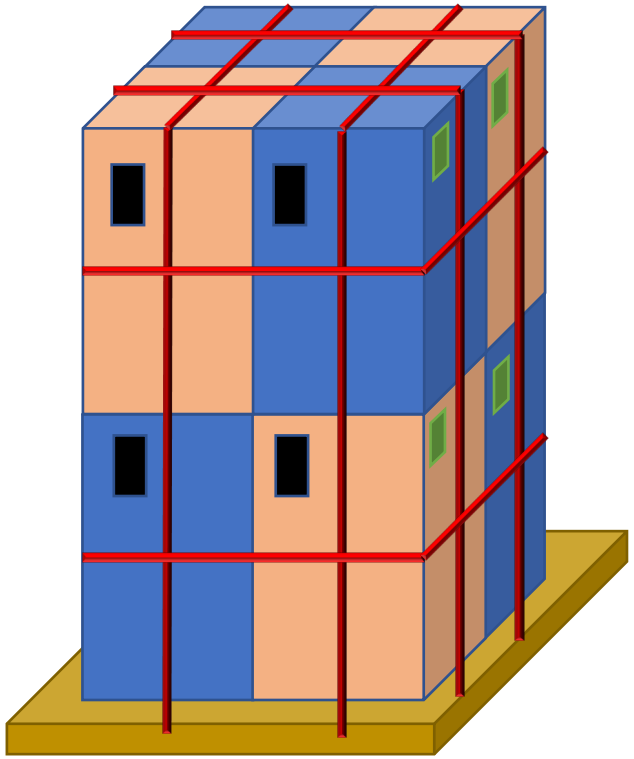
number of D-Eggs/string is 38-41

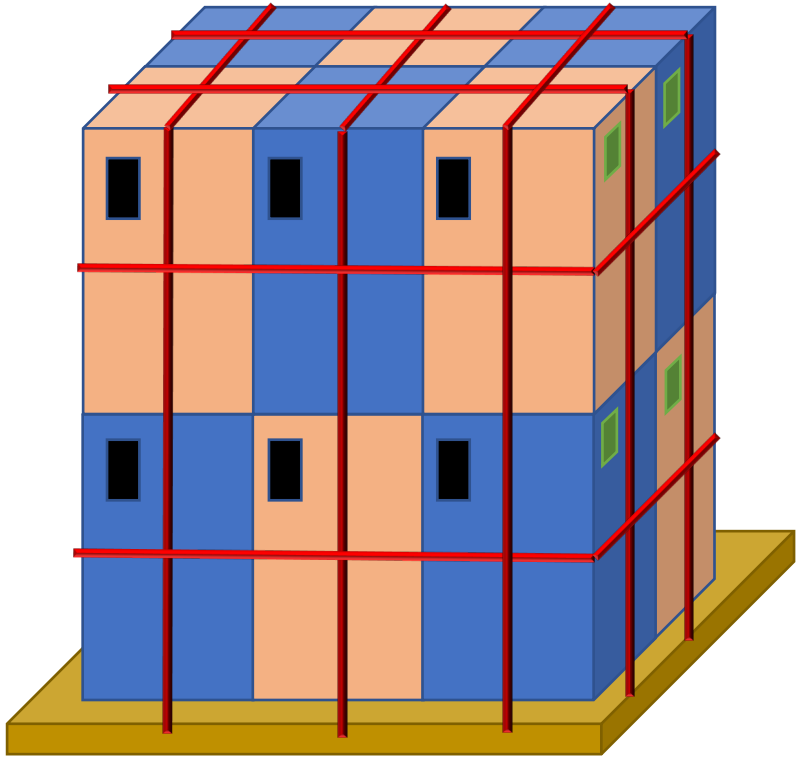
40 D-Eggs/one pallet (spares shipping TBD)

~ All the D-Eggs of one string will fit on ONE air force pallet.



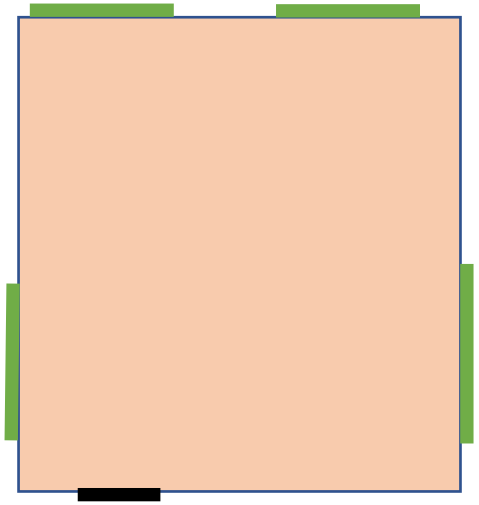
D-Egg packing option A





Pallets need to be forkable 4-way

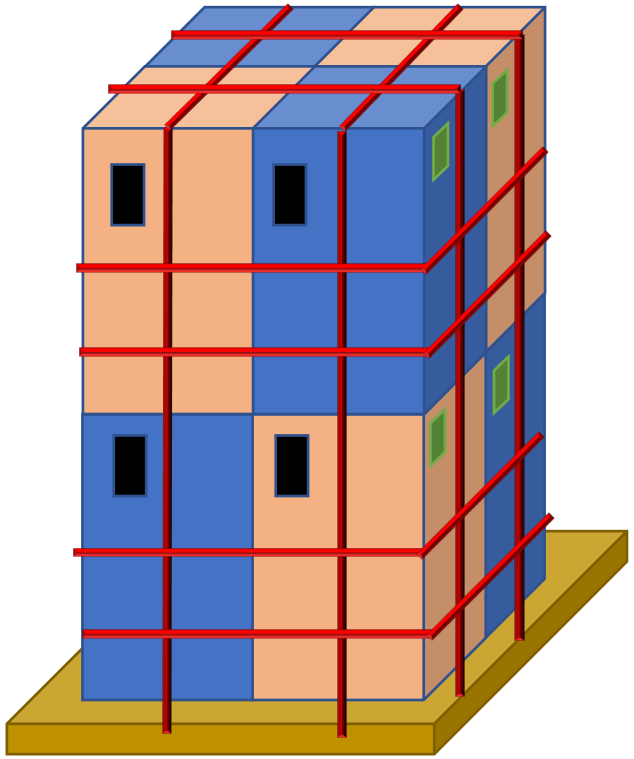
Handle holes, do NOT need to be accessed before straps are removed

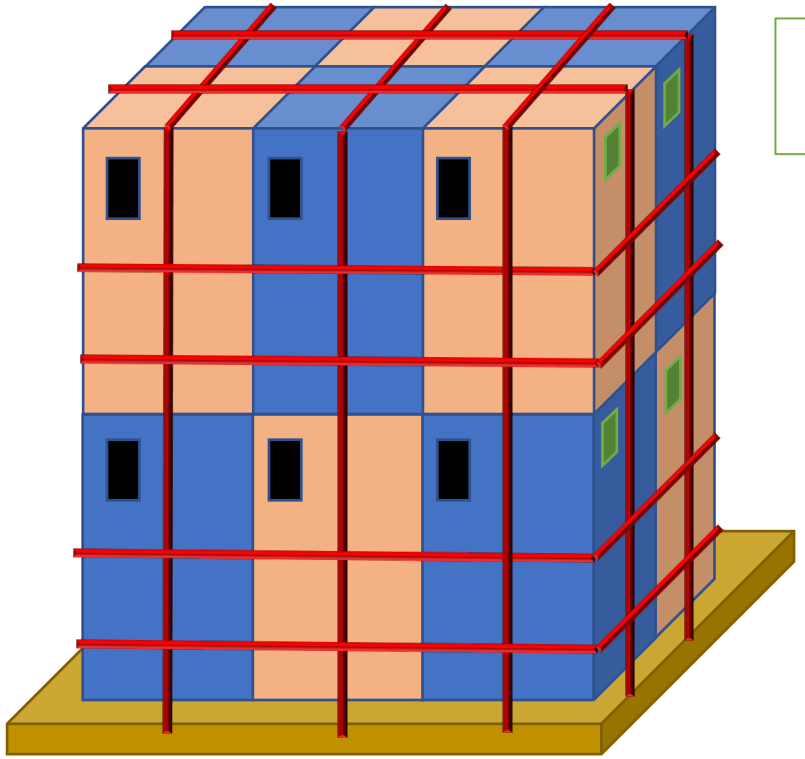


Penetrator hole, needs to be accessed with straps on

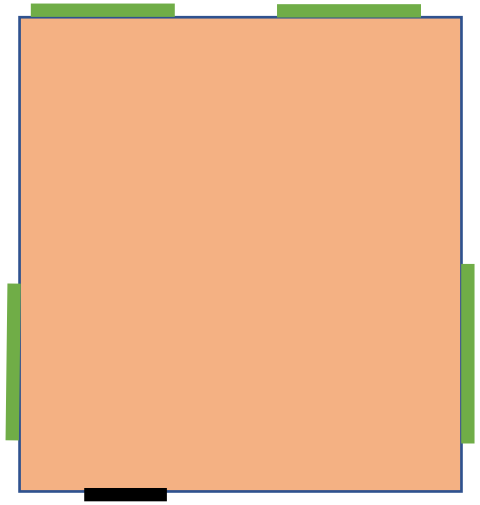
Edge protectors on the sides not shown (see later)

D-Egg packing option B





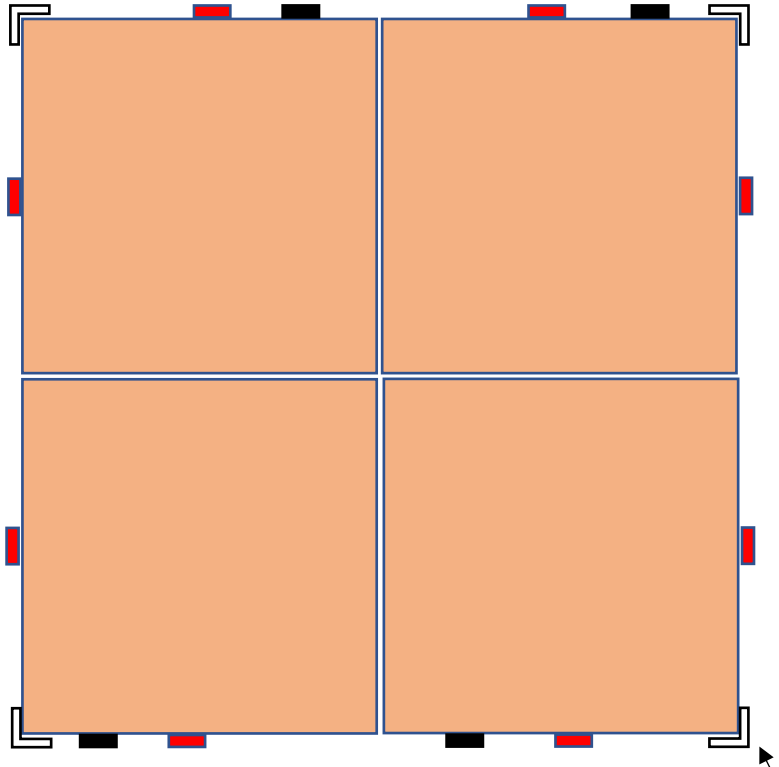
Handle holes, do NOT need to be accessed before straps are removed



Penetrator hole, needs to be accessed with straps on

Edge protectors on the sides not shown (see later)

Proposed position of penetrator hole



¾” strap

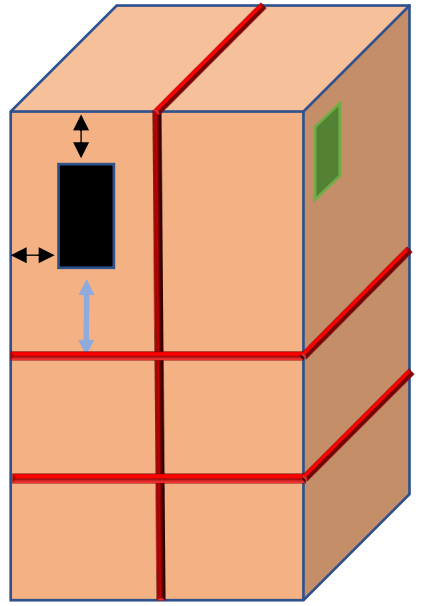
2x2 inches edge protectors

Penetrator hole

2x2 inches edge protectors

>2.5”
0.5” (?) for clearance if push in pre-perforated hole

Height from center: as high as possible, to allocate room for two straps, but penetrator need to be extracted and connected



One D-Egg box

D-Egg selected packing solution

センコーフォワーディング株式会社　御中

件名：　千葉大学様　D-Eggs

PROFORMA PACKING LIST

単位 (F/T)

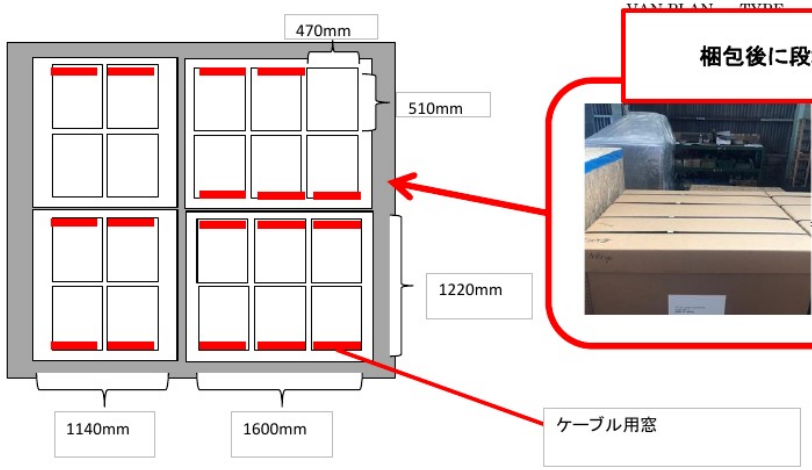
DATE OF ISSUE : 2021/9/22

B.CASE	CASE	B.CRATE	CRATE	B.SKID	SKID	TOTAL NOS. OF PACKAGE	4	P'KG
					11.364	TOTAL NET WEIGHT	1,200	KGS
S.B.CASE	S.CASE	S.B.CRATE	S.CRATE	S.B.SKID	S.SKID	TOTAL GROSS WEIGHT	1,780	KGS
						TOTAL MEASUREMENT	11.364	M3
						TOTAL F/T	11.364	F/T

NO.	DESCRIPTION	入り数	NOS. OF P'KG	PACKING STYLE	NET WEIGHT (KGS)		GROSS WEIGHT (KGS)		DIMENSION (CM)			MESUREMENT (M3)		VAN PLAN
					PER P'KG	TOTAL	PER P'KG	TOTAL	L	W	H	PER P'KG	TOTAL	
1	510x470x750mm	8	1	SKID	240	240	360	360	114	122	170	2.364	2.364	1
2	510x470x750mm	8	1	SKID	240	240	360	360	114	122	170	2.364	2.364	1
3	510x470x750mm	12	1	SKID	360	360	530	530	160	122	170	3.318	3.318	1
4	510x470x750mm	12	1	SKID	360	360	530	530	160	122	170	3.318	3.318	1

＊米空軍カルゴ　259x275x223cm
＊角当て(L字紙管)つける

＊上下固定材
＊内箱　取っ手付き・ケーブル用穴開き
＊外箱　取っ手付き・ケーブル用窓あり



Pallets sizes under revision

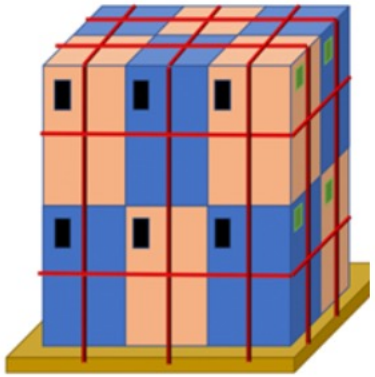
D-Egg box:
510x470x750mm
20”x18.5”x29.5”

8xD-Eggs pallets:
114x122x170 cm
= 45” x 47” x67”
Occupied volume:
94 x102x150cm=
37”x 40” x59”

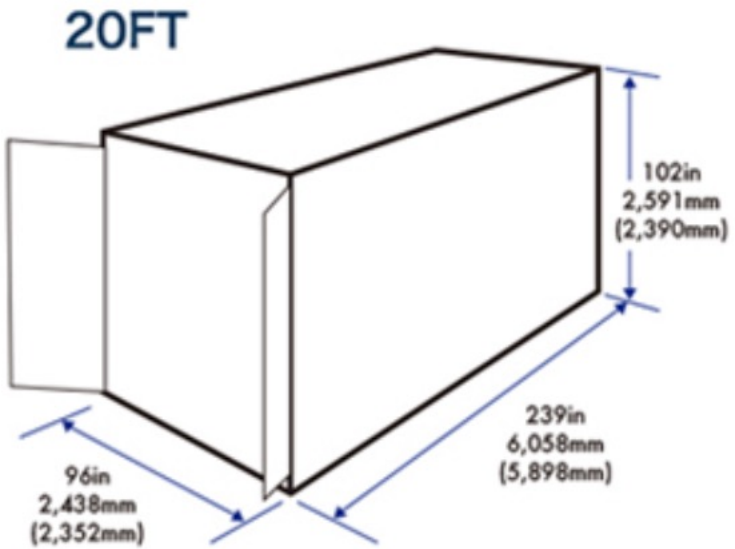
12xD-Eggs pallets:
160x122x170cm
63”x 47” x67”
Occupied volume:
145x102x150 cm=
55.5”x 40” x 59”

D-Eggs shipping

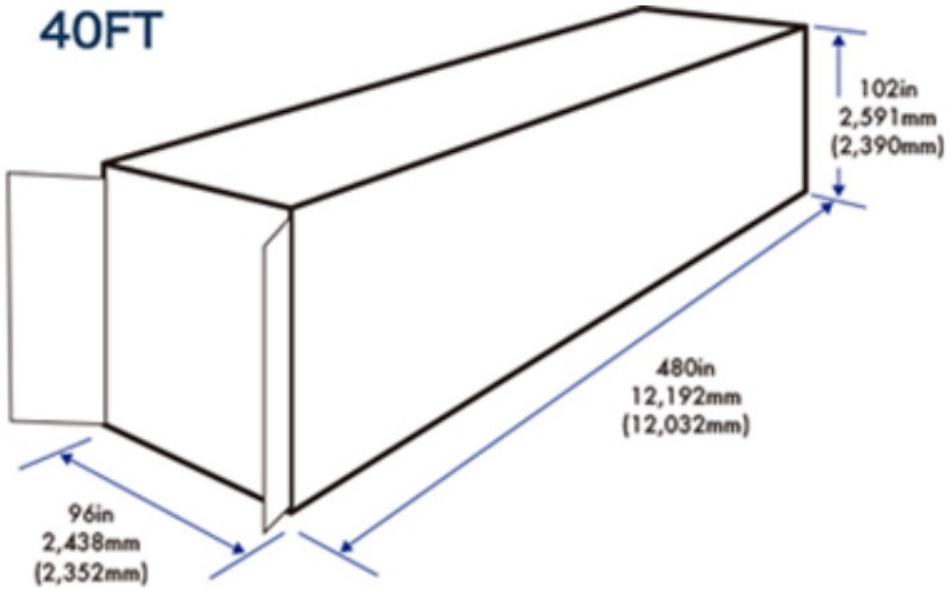
CHIBA → CHC



A container for exclusively use



7 palet (84 D-Eggs)



15 palet (180 D-Eggs)

Most efficient way to transport D-Eggs to CHC

- **Chiba to Chistchurch**:
  Chiba University to Yokohama Port, Japan -- 7 business days
  Yokohama Port to Lyttelton Port, NZ -- 31 days
  Custom clearance, Lyttelton Port to Christchurch. -- probably 6 business days
  In total, 44+ days
- DUTY FREE with USAP code
- All D-Eggs need to be shipped by March 2024 (funding agency constraint) – storage in CHC TBD

Materials

- https://www.uline.com/Product/Detail/S-2442/Edge-Protectors/Light-Duty-Edge-Protectors-120-thick-2-x-2-x-36
- https://www.uline.com/Product/Detail/S-8482/Edge-Protectors/Light-Duty-Edge-Protectors-120-thick-2-x-2-x-60
- https://www.uline.com/Product/Detail/S-8482/Edge-Protectors/Light-Duty-Edge-Protectors-120-thick-2-x-2-x-60 (to be cut)
- https://www.uline.com/BL_2804/Heavy-Duty-Poly-Cord-Strapping
  - https://www.uline.com/Product/Detail/S-21351/Poly-Cord-Strapping/Heavy-Duty-Polyester-Cord-Strapping-3-4-x-2100

Waterproofing?

- Possibility to add waterproofing/protecting layer with boat shrink wrap (https://www.youtube.com/watch?v=vm3OQEI8GQg)
- This needs to be heated for application, so whoever applies it should be skilled
- Custom plastic bags also possible

Firn drill in McMurdo Feb 2020

Special Devices

Plans for packing & shipping all the mDOMs from their points of origin

Special & calibration devices: count

Counts from Upgrade Strings CMD (Configuration Management Document)

	nominal		spares		nominal + spares (NTOT)		Units Shipped (NTOT except where overwritten - indicated by thick border)	
	2 strings	5 strings	2 strings	5 strings	2 strings	5 strings	2 strings	5 strings
SDs from Europe								
WOM	8	6	0	0	8	6	8	6
AH	0	2	0	1	0	3	0	3
								3
CDs from Europe								
POCAM	4	17	2	2	6	19	6	19
AM	3	7	1	1	4	8	4	8
SWE	2	3	1	1	3	4	3	4
SD from US								
RP	1	3	1		2	3	1	0
RR	1	2	1	1	2	3	2	3
LOM	1	11	1	1	2	12	2	12
FTS	0	12	0	1	0	13	0	13
FOM	3	4	1	1	4	5	4	5
							1	
pDOM	2	12	1	1	3	13	3	13
Seismometer (*)	0	1	0	0	0	1	0	1
DM ice	1	1	-1	1	0	2	0	1
							0	0
CDs from US							0	0
PB	3	8	1	1	4	9	4	9
PS	2	5	1	1	3	6	3	6
SUM Special devices and Calibration devices -->	31	94	10	13	41	107		
Logging								
Blue DL		1				1		1
Green DL		1				1		1
Pink Box		1				1		1
Gray Box		1				1		1
(*) currently not in CMD								

Additional pieces for Dust Logging

Shipping units: sometimes the number of shipped boxes does not match nominal + spares
Examples:

- 2 DM-ice modules will be shipped in one single crate
- the Radio Pulsers will be all shipped in one single crate

Special & calibration devices: size & weight

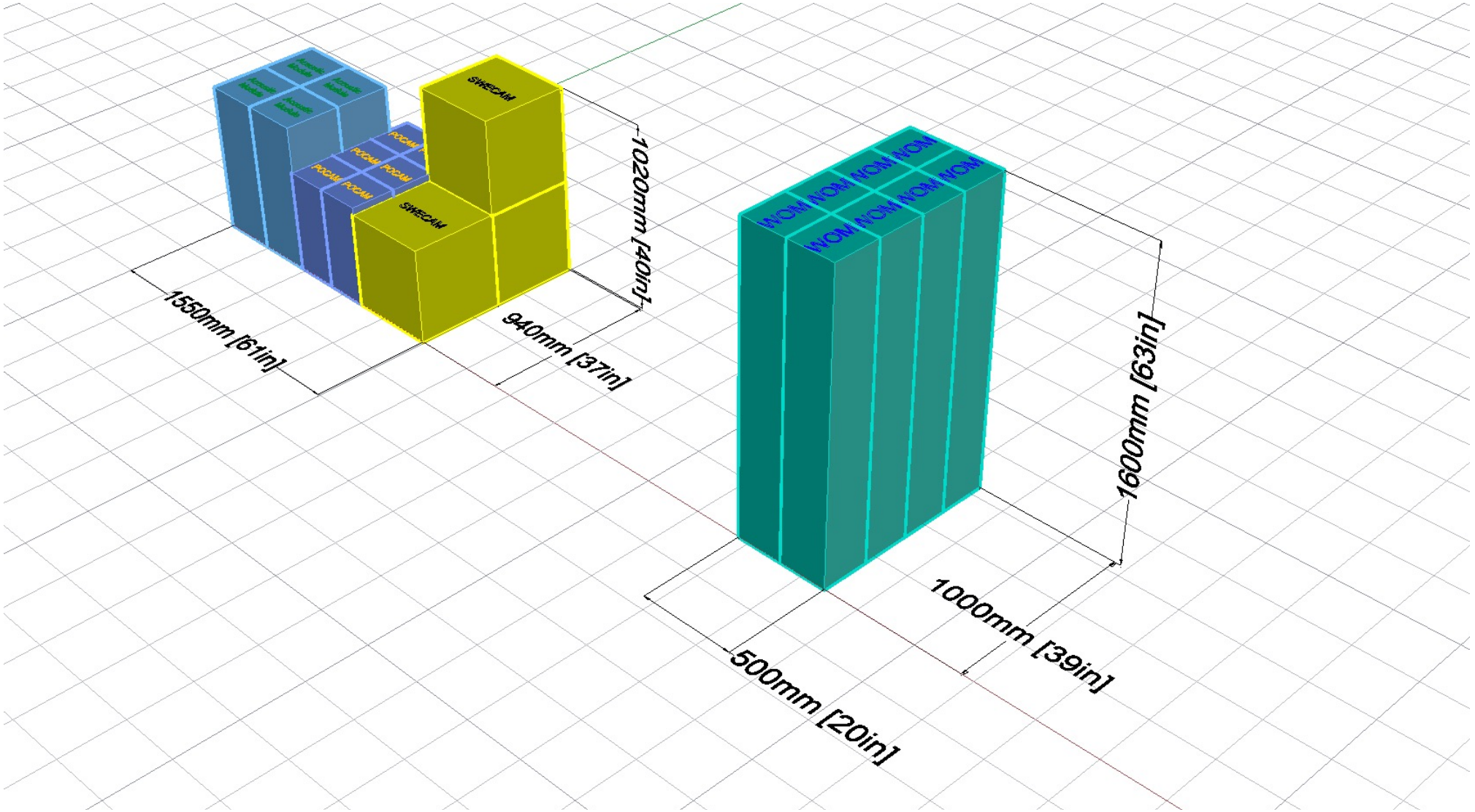
	Unit dimensions (in box)				Unit weights		
	W [mm]	L [mm]	H [mm]	unit volume [m3]	device weight [kg]	box weight [kg]	unit weight [kg]
WOM	250	250	1600	0.10	30	3	33
AH	2235	300	300	0.20	30	3	33
AH/WOM trap light sensor	470	470	510	0.11	30	3	33
POCAM	240	240	550	0.03	15	3	18
AM	300	300	800	0.07	25	3	28
SWE	470	470	510	0.11	25	3	28
RP	250	1000	1000	0.25	40	10	50
RR	470	470	510	0.11	25	3	28
LOM	510	470	750	0.18	30	0	30
FTS							
FOM	470	470	510	0.11	25	3	28
FOM LC	610	1220	610	0.45	7	3	10
pDOM	470	470	510	0.11	25	3	28
Seismometer (*)	1500	432	430	0.28	50	50	100
DM ice	1220	1220	1220	1.82	600	0	600
PB	470	470	510	0.11	25	3	28
PS	Small, shipped separately						
148	<--TOTAL						
Blue DL	1219.2	431.8	177.8	0.09			27
Green DL	1219.2	431.8	177.8	0.09			23
Pink Box	660.4	609.6	609.6	0.25			53
Gray Box	533.4	584.2	508	0.16			23
(*) currently not in CMD							

Some values are guessed to be close to mDOM values or Deggs (based on similarity of pressure vessel for example)

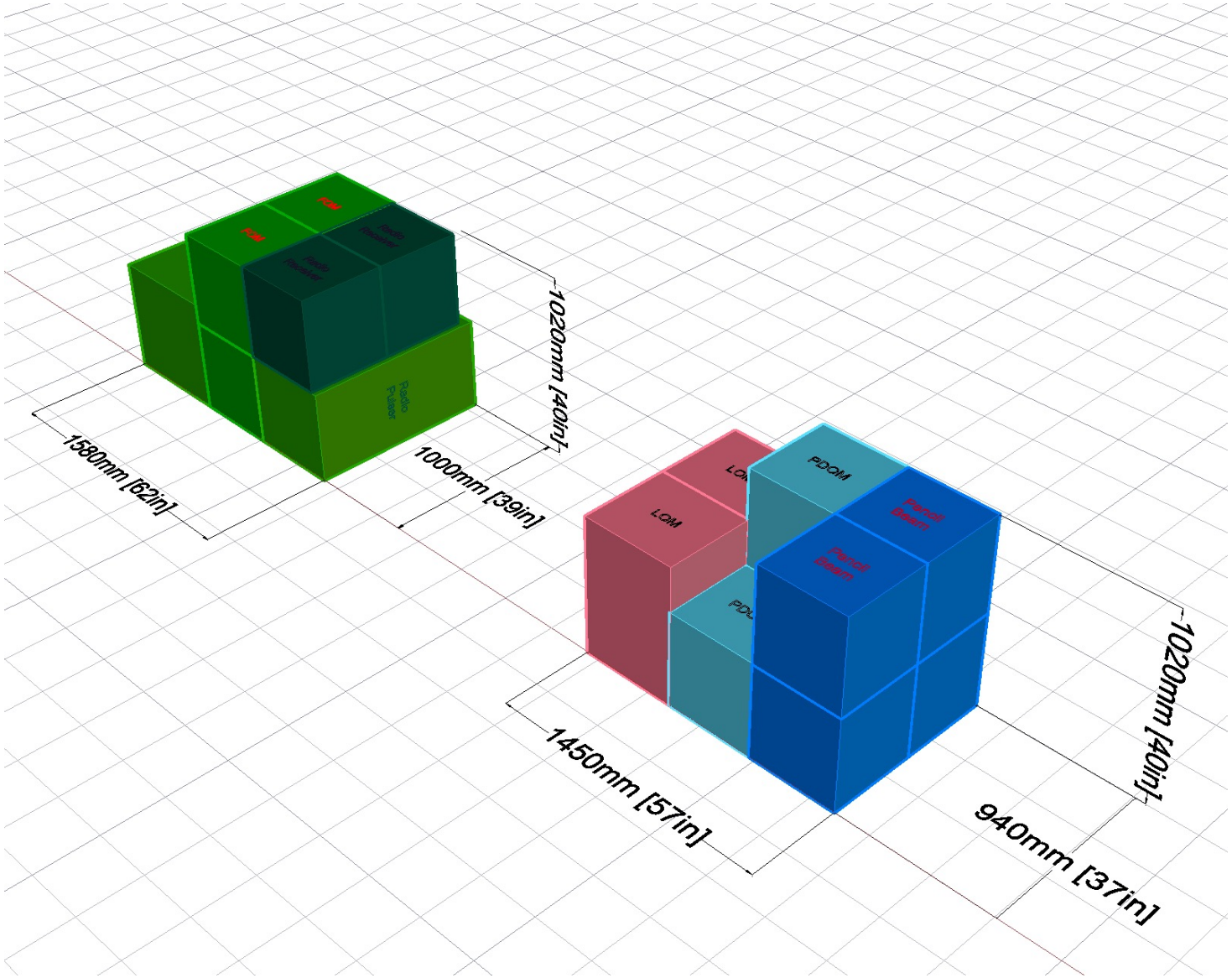
Calculation of totals by CAD

- Creating virtual boxes in CAD, group by shipment
  - Shift boxes to consolidate shipments and minimize waste of volume
- Assume ½" plywood around the volume, 4" height (4x4+½"plywood)
  - That defines the shipment volume
- Estimate crate weight (0.5”plywood sheets plus a few 4”x4”)
- Calculate total weight and volume of each crate

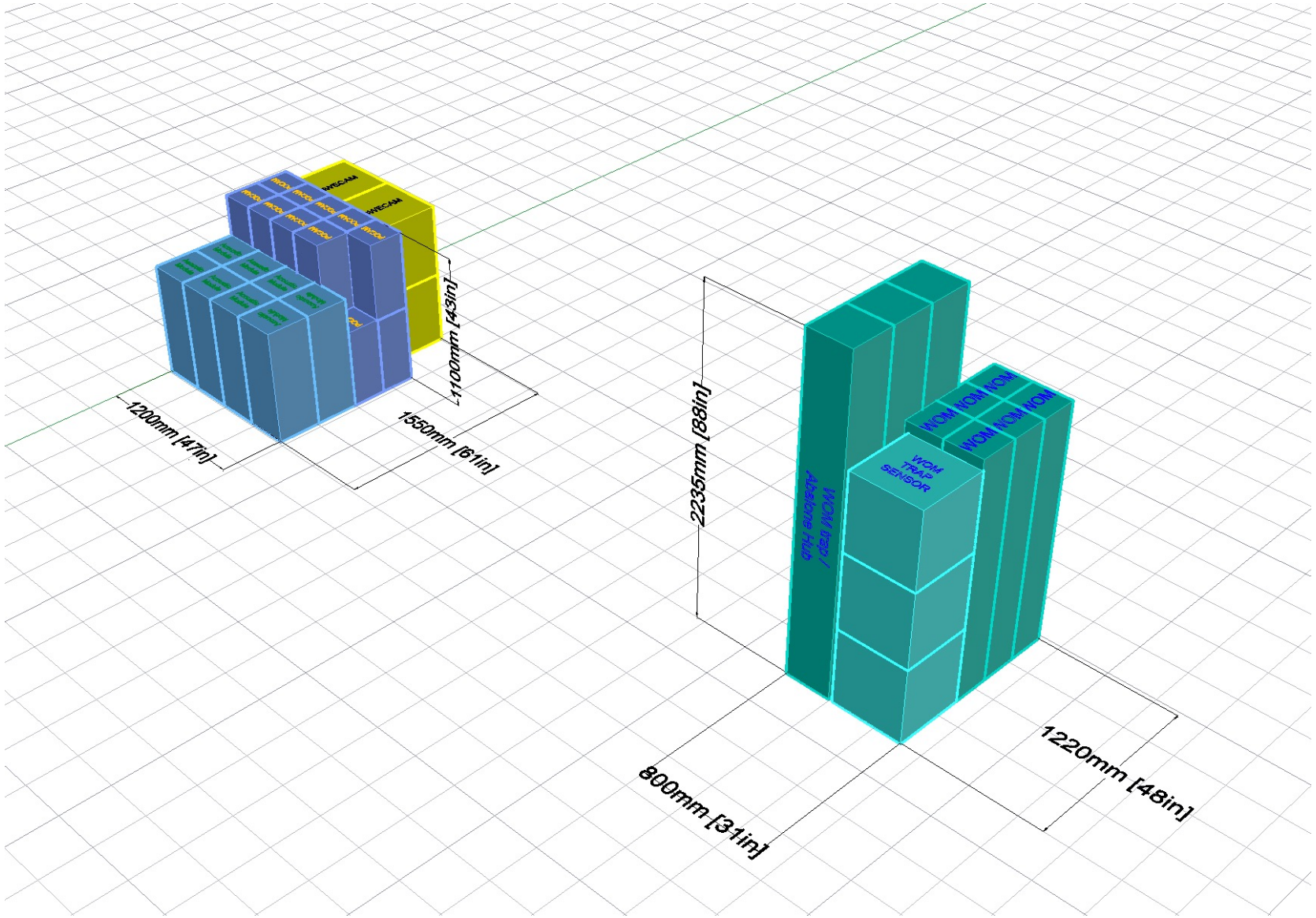
SDs + CDs from Europe Strings 87-88



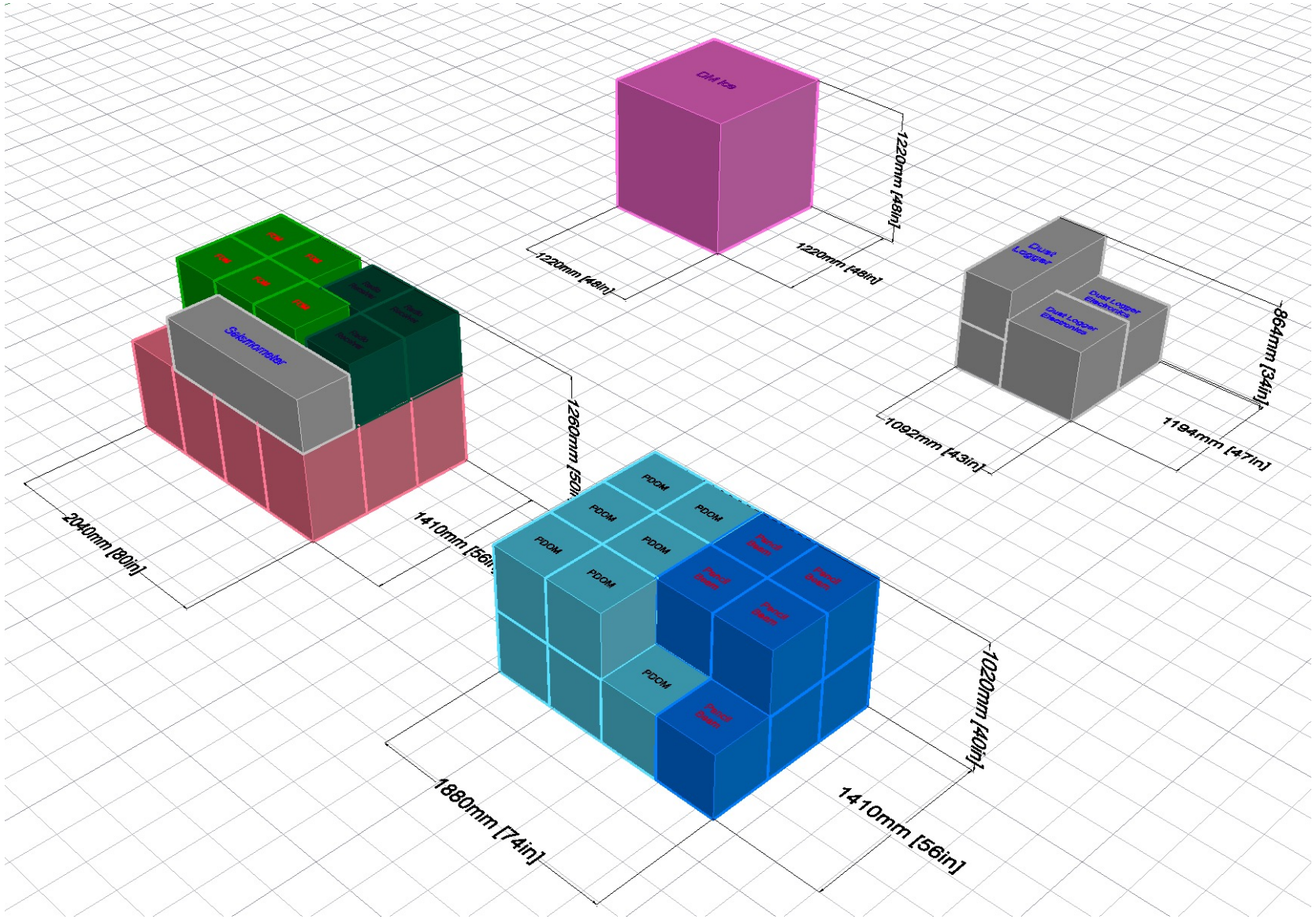
SDs + CDs from USA Strings 87-88



SDs + CDs from Europe Strings 89-93



SDs + CDs from USA Strings 89-93



Calculation of totals by CAD

	Content (from CAD)	2 strings crate inside dimensions (from CAD)			Outside dimensions			Volume		Approx. Crate Weight		Instrumentation Weight		Total weight	
CRATE ID		L [mm]	W [mm]	H [mm]	L [mm]	W [mm]	H [mm]	[m3]	[cuft]	kg	lbs	kg	lbs	kg	lbs
EUROPE-1	8 WOMS	1000	500	1600	1025	525	1629	0.877	30.96	54	119	264	582	318	701
EUROPE-2	4 AM + 6 POCAM + 3 SWE	1550	940	1020	1575	965	1049	1.594	56.30	75	166	304	670	379	836
USA-1	4 FOM + FOM BOX + 1 RP box (5 RP in it) + 2 RR	1580	1000	1020	1605	1025	1049	1.726	60.94	79	174	228	503	307	677
USA-2	3 PDOMs + 2 LOMS + 4 PB	1450	940	1020	1475	965	1049	1.493	52.73	72	158	256	564	328	722
Total									**200.9**		**617**		**2319**		**2936**
	Content (from CAD)	5 strings crate inside dimensions (from CAD)			Outside dimensions			Volume		Approx. Crate Weight		Instrumentation Weight		Total weight	
CRATE ID		L [mm]	W [mm]	H [mm]	L [mm]	W [mm]	H [mm]	[m3]	[cuft]	kg	lbs	kg	lbs	kg	lbs
EUROPE-3	6 WOMs + 3 HA/WOM trap + 3 WOM sensors	800	750	2235	825	775	2264	1.448	51.12	73	162	396	873	469	1035
EUROPE-4	8 AM + 19 POCAM + 4 SWE	1550	1200	1100	1575	1225	1129	2.178	76.92	91	200	678	1495	769	1694
USA-4	Seismometer + 12 LOM + 5 FOM + 3 RR	2040	1410	1260	2065	1435	1289	3.820	134.89	131	289	684	1508	815	1797
USA-5	13 pDOMS + 9 PBs	1880	1410	1020	1905	1435	1049	2.868	101.27	111	244	616	1358	727	1602
DM-ICE					1220	1220	1220	1.816	64.13	79	175	600	1323	679	1498
Dust logger	Blue				1219.2	431.8	177.8	0.094	3.31				60		60
	Green				1219.2	431.8	177.8	0.094	3.31				51		51
	Pink				660.4	609.6	609.6	0.245	8.67				116		116
	Gray				533.4	584.2	508	0.158	5.59				50		50
									449.2		**1069**		**6834**		**7902**

Information entered on master shipping spreadsheet

Cross check for completeness

CRATE ID	Content (from CAD)	2 strings crate inside dimensions (from CAD) L [mm]	W [mm]	H [mm]	Outside dimensions L [mm]	W [mm]	H [mm]	Volume [m3]	[cuft]	Approx. Crate Weight kg	lbs	Instrumentation Weight kg	lbs	Total weight kg	lbs
EUROPE-1	8 WOMS	1000	500	1600	1025	525	1629	0.877	30.96	54	119	264	582	318	701
EUROPE-2	4 AM + 6 POCAM + 3 SWE	1550	940	1020	1575	965	1049	1.594	56.30	75	166	304	670	379	836
USA-1	4 FOM + FOM BOX + 1 RP box (5 RP in it) + 2 RR	1580	1000	1020	1605	1025	1049	1.726	60.94	79	174	228	503	307	677
USA-2												256	564	328	722
Total													**2319**		**2936**

	volume (2 strings) [cu ft]	volume (5 strings) [cu ft]	weight (2 strings) [lbs]	weight (5 strings) [lbs]
Special Devices, Germany	28.3	54.4	582.0	873.0
Calibration Devices, Germany	28.8	57.5	670.2	1494.7
Special Devices, US	73.4	169.6	820.1	2310.4
Calibration Devices, US	15.9	35.8	246.9	555.6
DM ice	0.0	64.1	0.0	1322.8
Logging	0.0	20.9	0.0	277.0
Total	**146.3**	**402.3**	**2319.3**	**6833.5**

CRATE ID	Content (from CAD)	2 strings crate inside dimensions (from CAD) L [mm]	W [mm]	H [mm]	Outside dimensions L [mm]	W [mm]	H [mm]	Volume [m3]	[cuft]	Approx. Crate Weight kg	lbs	Instrumentation Weight kg	lbs	Total weight kg	lbs
EUROPE-3												396	873	469	1035
EUROPE-4												678	1495	769	1694
USA-4	RR	2040	1410	1260	2065	1435	1289	3.820	134.89	131	289	684	1508	815	1797
USA-5	13 pDOMS + 9 PBs	1880	1410	1020	1905	1435	1049	2.868	101.27	111	244	616	1358	727	1602
DM-ICE					1220	1220	1220	1.816	64.13	79	175	600	1323	679	1498
Dust logger	Blue				1219.2	431.8	177.8	0.094	3.31				60		60
	Green				1219.2	431.8	177.8	0.094	3.31				51		51
	Pink				660.4	609.6	609.6	0.245	8.67				116		116
	Gray				533.4	584.2	508	0.158	5.59				50		50
									449.2		**1069**		**6834**		**7902**