BSL-PodAtrium

Introductory Graphical Workbook

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BSL-PodAtrium

A primary type of PodAtrium for scientific, medical, and environmental special applications

Designed for biomaterial handling and analysis, with capabilities for other "CBRN" tasks, by human and/or robotic operators

Designed for multiple missions in extreme physical/social operating environments and conditions

Highly modular and mobile, with each fundamental nPod component interchangeable with others, and capable of rapid assembly, disassembly, transport by diverse means (truck, rail, boat, barge, helicopter, airplane)

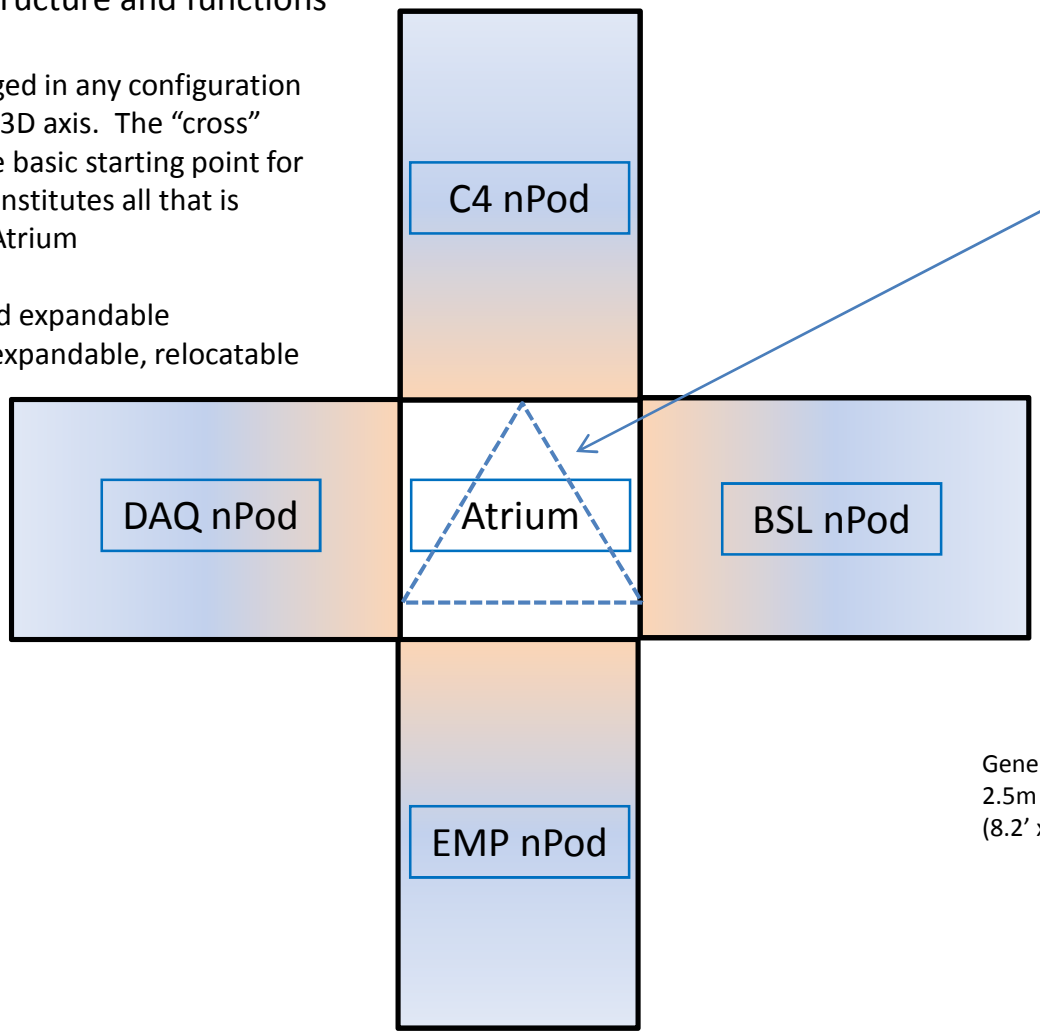
Designed for terrestrial applications (urban, rural, remote) and for conversion and extension to undersea and space-based operations

BSL-PodAtrium

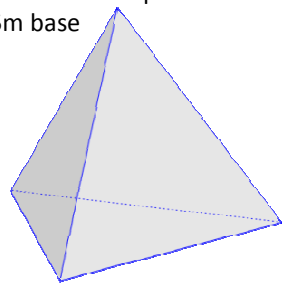
Illustrating generic structure and functions

nPod units can be arranged in any configuration and extended along any 3D axis. The "cross" design shown here is the basic starting point for most PodAtriums and constitutes all that is needed for the BSL-PodAtrium

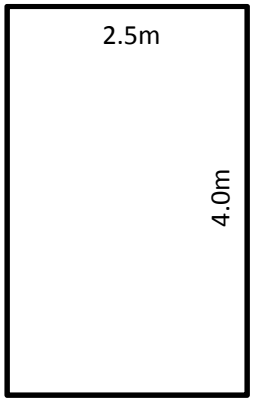
Atrium is flexible-use and expandable
Atrium-Cap is optional, expandable, relocatable



Generic tetrahedron atrium-cap
2.5m x 2.5m x 2.5m base
(8.2' x 8.2' x 8.2')



Generic nRec (rectangular nPod)
2.5m x 4.0m x 2.5m
(8.2' x 13.125' x 8.2')

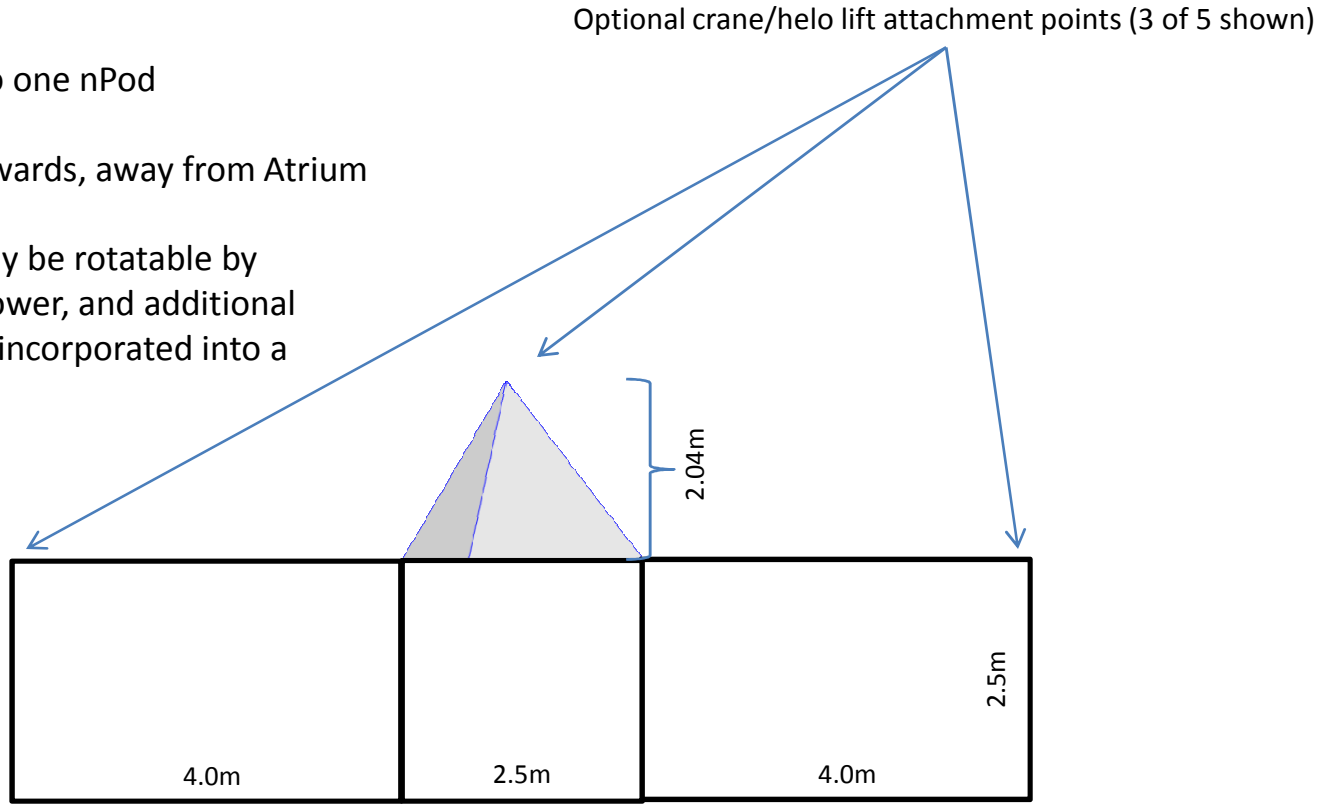


BSL-PodAtrium

Lateral view, head-on into one nPod

Extension is typically outwards, away from Atrium

Atrium-Cap may optionally be rotatable by mechanized or manual power, and additional Atrium-Cap units may be incorporated into a given BSL-PodAtrium



Structural assembly and disassembly is typically from/to the level of nPod structure elements (explained below →) but an entire BSL-PodAtrium may be transported intact (whole) in certain situations by helicopter or barge. Attachment points for lifting by crane or helo are at the midpoints of the end-faces of each nPod (two shown above) and at the apex of the tetrahedron atrium-cap

Foundation may be of several types depending upon applications and specifically upon plans for mobility as well as future expansion. These can range from a traditional concrete pad to an array of permanent footings or intentionally temporary pads (concrete, steel, wood, stone).

BSL-PodAtrium

Four principal application classes for diversified application-instances (missions, tasks, use-cases)

Each application utilizes the four nPods, the central Atrium and the central tetrahedron Atrium-Cap

PHES – Public Health and Environmental Safety

CERS – Community Emergency Resilience and Sustainability

CEED – Community Environmental EDucation

FRES – Field REsearch Station

Consult other documents for explanation of the individual application areas and how these all are intentionally interdependent and symbiotic in their functions and standard operations. The foundational thinking and architecture of the BSL-PodAtrium is governed by the objective of closely linking community-centric, public-access, "open" education, health services, emergency response, and specific basic and applied biomedical research, in a manner that supports, enhances, and deepens the quality for engagement at all appropriate levels by different members of the extended community. This philosophy and its practice as embodied in the BSL-PodAtrium and in other nPod and PodAtrium based systems is seen as a major transformational step toward addressing successfully many issues pertaining to STEMA (science-technology-engineering-mathematics-arts) education and professional development , public awareness and self-managed care for health and wellness (including disease management), food and water quality, environmental health and safety, animal and plant care, and sociopsychological balance.

BSL-PodAtrium

Component-nPod functions

Each BSL-PodAtrium consists of four connected nPods
with a central Atrium and an Atrium-Cap assembly

DAQ – Data Acquisition (Sampling input/entry; human/animal/foods/air-liq-sol)

C4 – Command, Control, Communications and Computing

BSL – Bio-Study Lab (BSL-2/3; wet lab, assay prep, diagnostics, testing)

EMP – Electro-Mechanical and Power Systems (energy generation/storage, tools)

Atrium (central cube-space) – Common or custom-assigned work area; optional secure-airlock area

Atrium-Cap (roof-level tetrahedron) – Solar panels (Si and Poly), HVAC, wireless transceivers)

BSL-PodAtrium

Component-nPod structural elements ("SE") – All face-elements (sides, floors, roofs) adhere to nPod standards and are constructed from several base-element ("BE") types according to standard SE designs (alpha, beta, gamma and delta) (explained below →)

Base-Element ("BE") Composition

Uni-Purpose (Structural Engineering)

SS - Steel tubing (square, hollow)
SR - Steel tubing (round, hollow)

CR – Carbon composite (round)

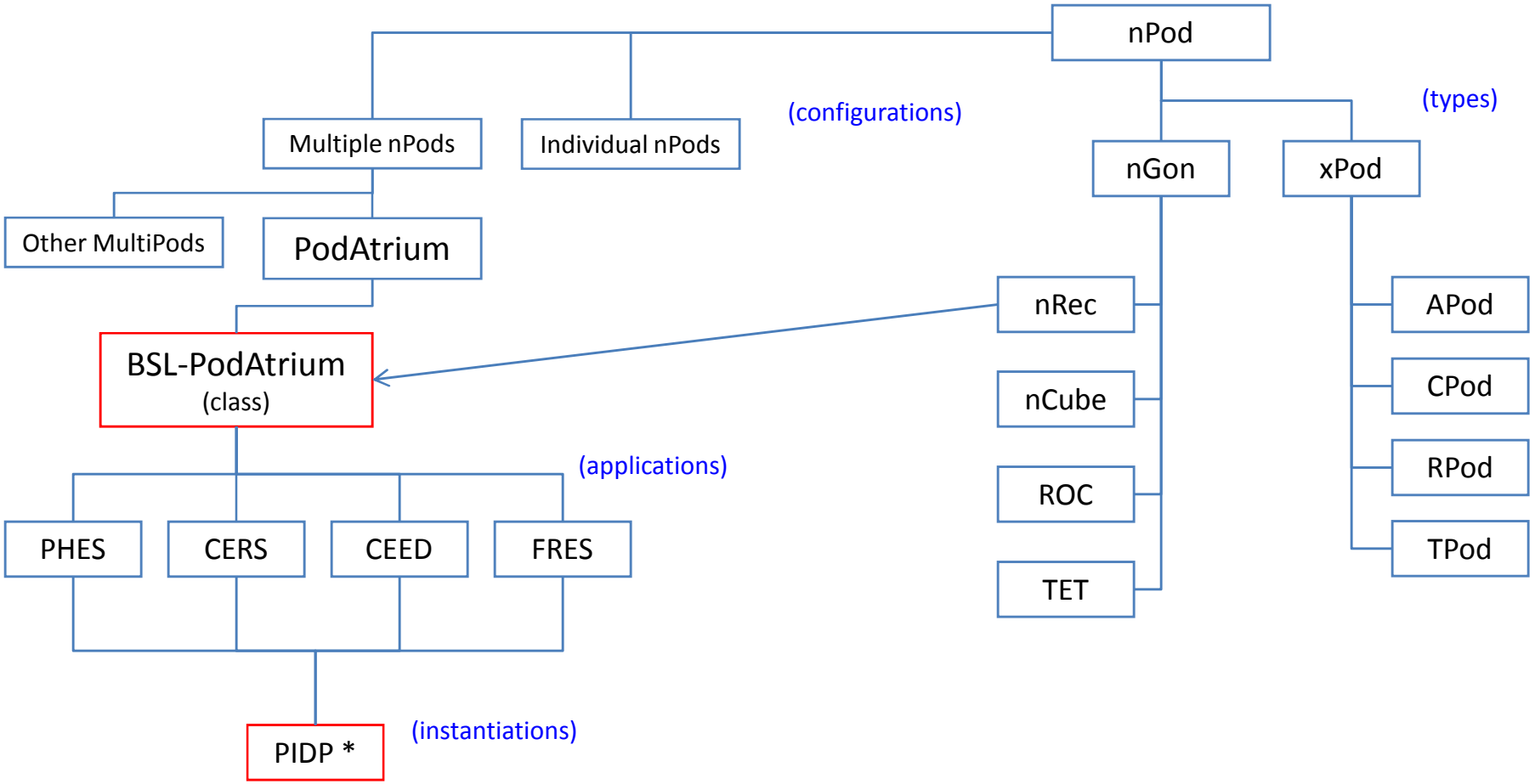
BD – Biodegradable PLA tubing (round, solid)

Dual-Purpose (Structural Engineering + Energy Functions)

MH – AB5-type alloy metal hydride storage cylinders for hydrogen (round)
FC – Fuel-cell component cylinders (round)
BT – Battery component cylinders (round)
CU – Custom applications for structural-element interior chambers (multi-geom.)

Some terminology and taxonomy (1)

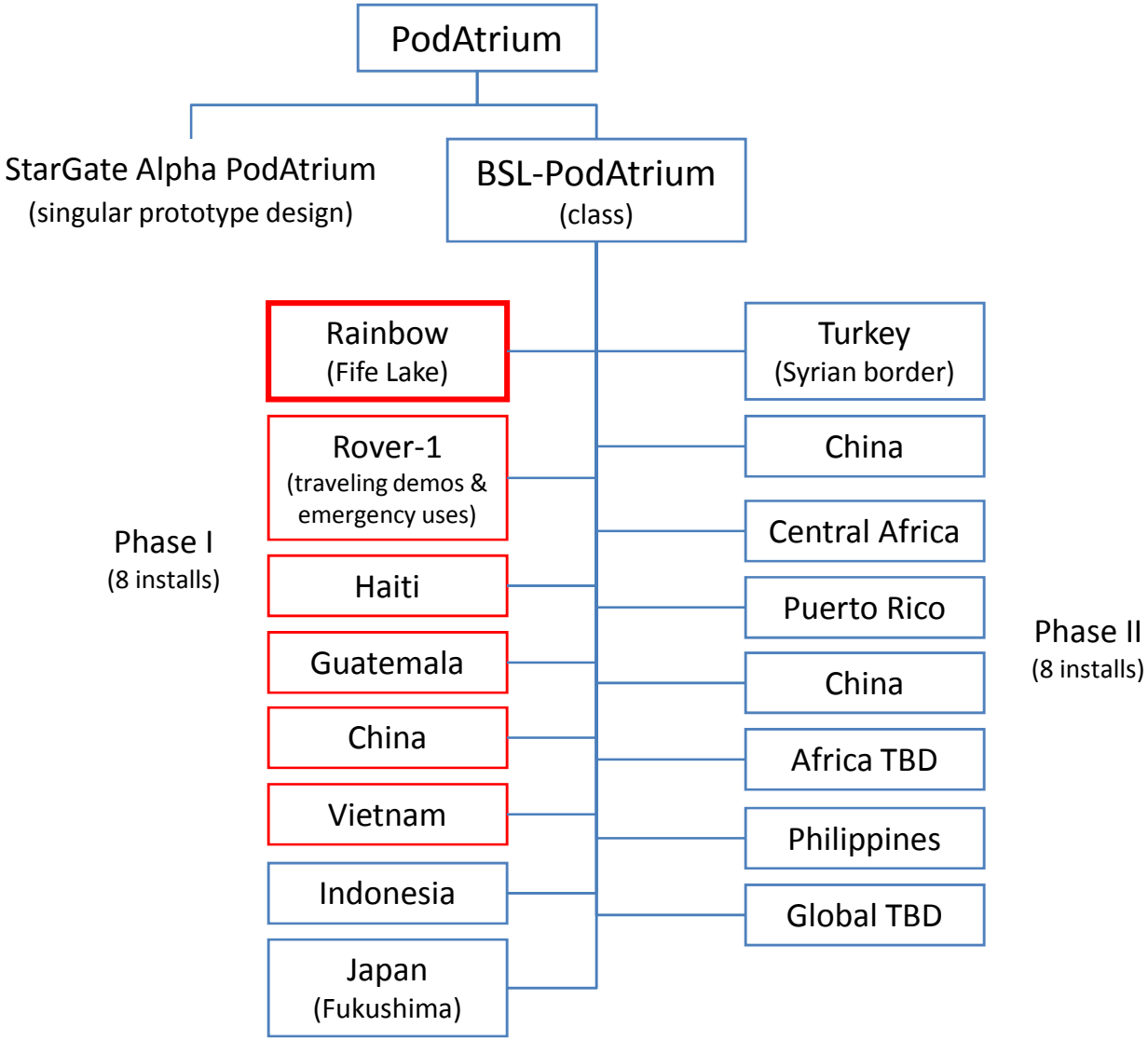
For more complete explanations, consult other documents, particularly those in the "EIET-masterplan" series, those on the SGA (StarGate Alpha) PodAtrium design and specs, and related ones that go into more detail on the structural engineering and the functional instruments and equipment for different major applications (e.g., medical, agricultural, emergency, fab-lab).



* (Public health, Infectious Diseases and Pandemic prevention)
Focus:
- Influenza and Foodborne Pathogens
- CRAIDO public testing and monitoring services (cf. "CRAIDO")
- MADIT (mutation and anomaly detection) basic research program

Some terminology and taxonomy (2)

Specific BSL-PodAtriums are planned in order to accommodate primarily PHES and FRES requirements in the areas of (1) pandemic and epidemic prevention as well as (2) rapid real-time detection and tracking microbial mutation and resistance, and (3) social stability, resilience and sustainability.



BSL-PodAtrium "Rainbow" will be the first and one of the most visible with its use for all four basic applications – PHES, CEED, CERS and FRES, and an emphasis on providing a base for the development and field trials of the BioTetrad diagnostic sensing technology, the communications hub for the NomadEyes civilian health and security alert system, and a program of monitoring for wild and domestic poultry.

"The "Rainbow" system is a PIDP type of BSL-PodAtrium.(Public health, Infectious Diseases and Pandemic prevention). It focus encompasses:

- Influenza and Foodborne Pathogens
- CRAIDO public testing and monitoring services (cf. "CRAIDO")
- MADIT (mutation and anomaly detection) basic research program

The "Rainbow" BSL-PodAtrium will be a central and high-visibility component of a non-profit public facility known as The EcOasis, near the banks of the Manistee River and highly accessible to visitor traffic.

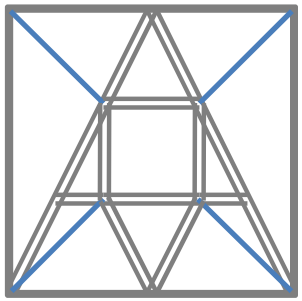
This BSL-PodAtrium will be the hands-on testing platform for all other PodAtriums.

BSL-PodAtrium

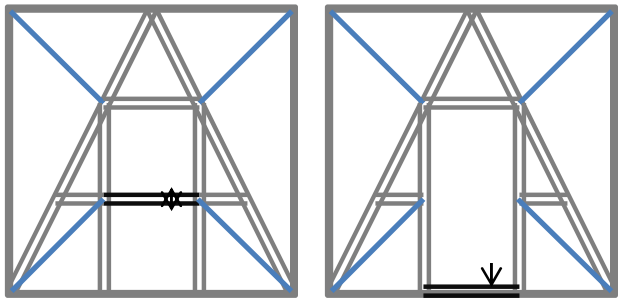
Standard nPod structural elements used within most-common nGons (nRecs and nCubes)

(Note: all square structural element ("SE") types shown here and in detail views on the following slides but only a few rectangular types)

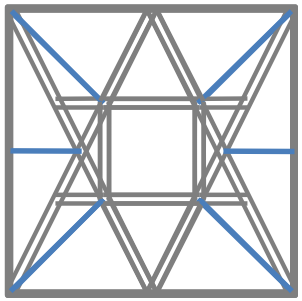
α



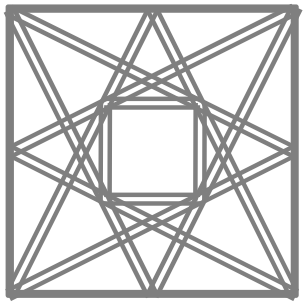
β

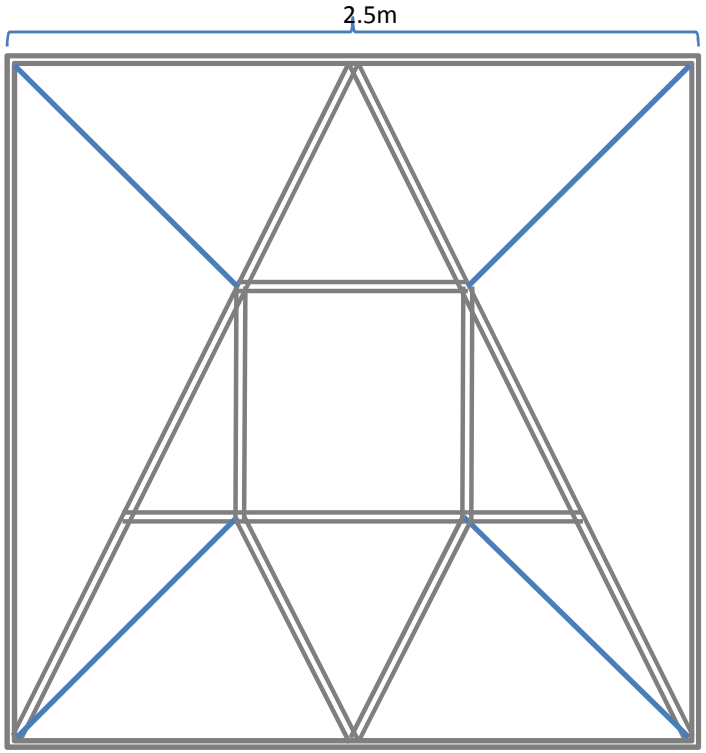


γ



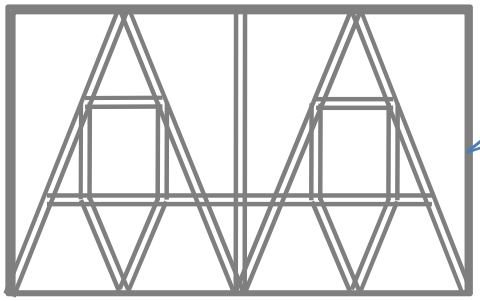
δ

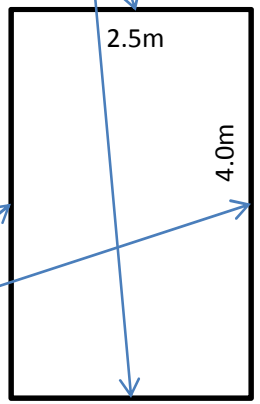




Generic nRec rectangular nPod
2.5m x 4.0m x 2.5m
(8.2' x 13.125' x 8.2')

α





These notes apply to all nRec face-panels and in general to all nGon face-panels.

Tubes are of a uniform type in all panels:
Galvanized steel, hollow, square, m x m (cm) x n (mm - thickness). Default: m=5, n=5
Galvanized steel, hollow, round, m (cm) diameter (OD) x n (mm - thickness). Default: m=5, n=5
{future fabrication}
Carbon composite, similar to steel in dimensions
PLA composite, similar to steel in dimensions but with greater thickness

Cables (shown here in blue) are composed of n strands, woven, stainless steel. approx. 1cm diameter.

Assembly:
Method 1: Welding (least desirable – only for initial prototypes)
Method 2: Welding + clamp fasteners and bolts
Method 3: (preferred) Joiner-elements - clamp fasteners and bolts, entirely – no welding or brazing, no power-tools necessary for component assembly or disassembly (i.e., not absolutely req'd, although preferential in most cases)

BSL-PodAtrium and all PodAtriums adhere to the formalism of nPod Design and Layout Schema (nDLS) and nPod Programming Language (nPL)

nPODs are described by a logical schema that identifies specific coordinate locations for all elements and for all equipment that is positioned on nPOD component faces including floors and ceilings. By referencing a specific nDLS identification code, one can know where any specific piece of equipment or structural part is or belongs. This section presents an introduction to the nDLS and contains some technical terminology.

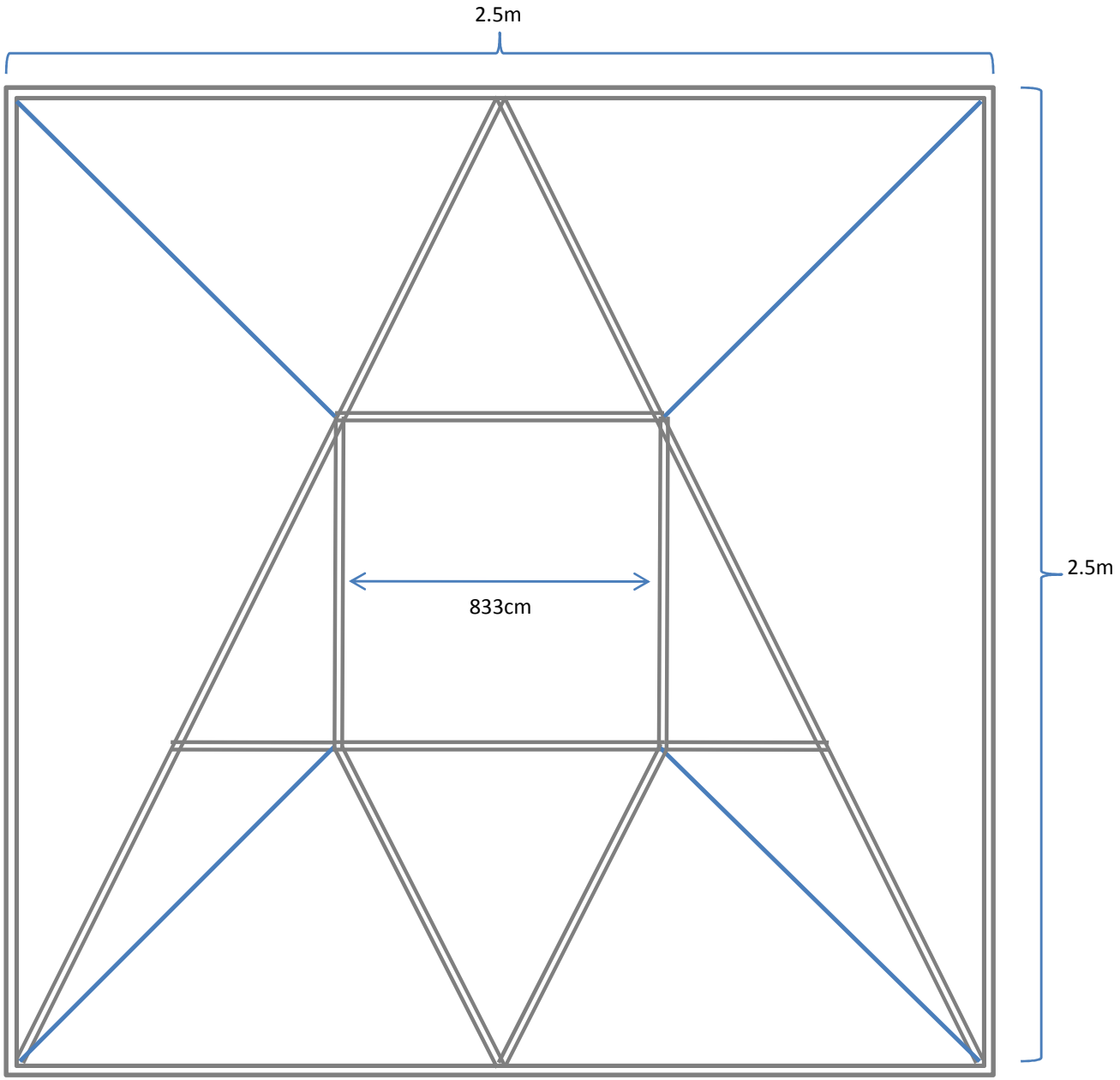
The full abstract nDLS for a given nPOD object is:
[nPOD identifier].[nPOD component identifier].[nPOD sequence location].[nPOD component type].
[Face identifier].[Entity-coordinate-location set]. [Position-orientation set].
[Specification-attribute set].[Constraint-discriminator set]

nPods and PodAtriums are designed, assembled, managed, disassembled, and transported by use of the nDLS, with nPL programming, in the nPOD Design and Operations Control System Information Management (nDOCSIM). The nDOCSIM is a web-based, mobile-accessible database and expert system for use in specifying, designing, ordering and organizing parts for, shipping and transporting, and operating an nPOD Each of these informatic elements is described in detail in other nPod and PodAtrium documents. Note that not all of these descriptive identifiers are required and the latter three are most likely to not be employed in many nDLS specifications.

The nDLS specification formalism is employed for describing all structural features and included equipment and provisions within a given nPOD. This is critical for design, planning and logistics with respect to devices and materials that are used in fabricating and outfitting any nPOD. The above nDLS formalism allows designers to indicate exactly what object x is used or will be located at any given location within an nPOD.

Alpha-square panel

positive (+)
alignment
(0°)



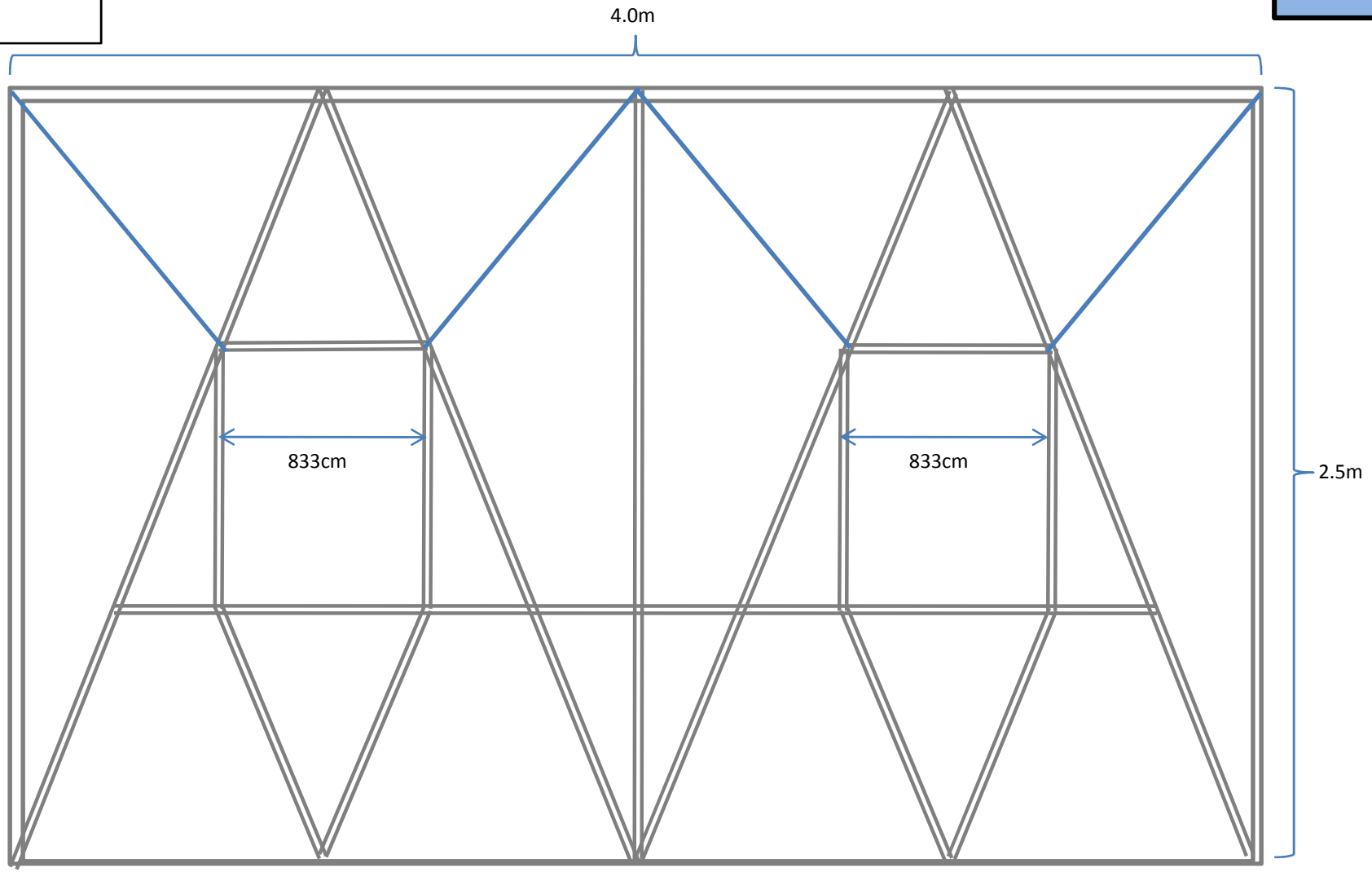
2.0a

Scale: 1” = 416.66cm

Alpha-rect panel

positive (+)
alignment
(0°)

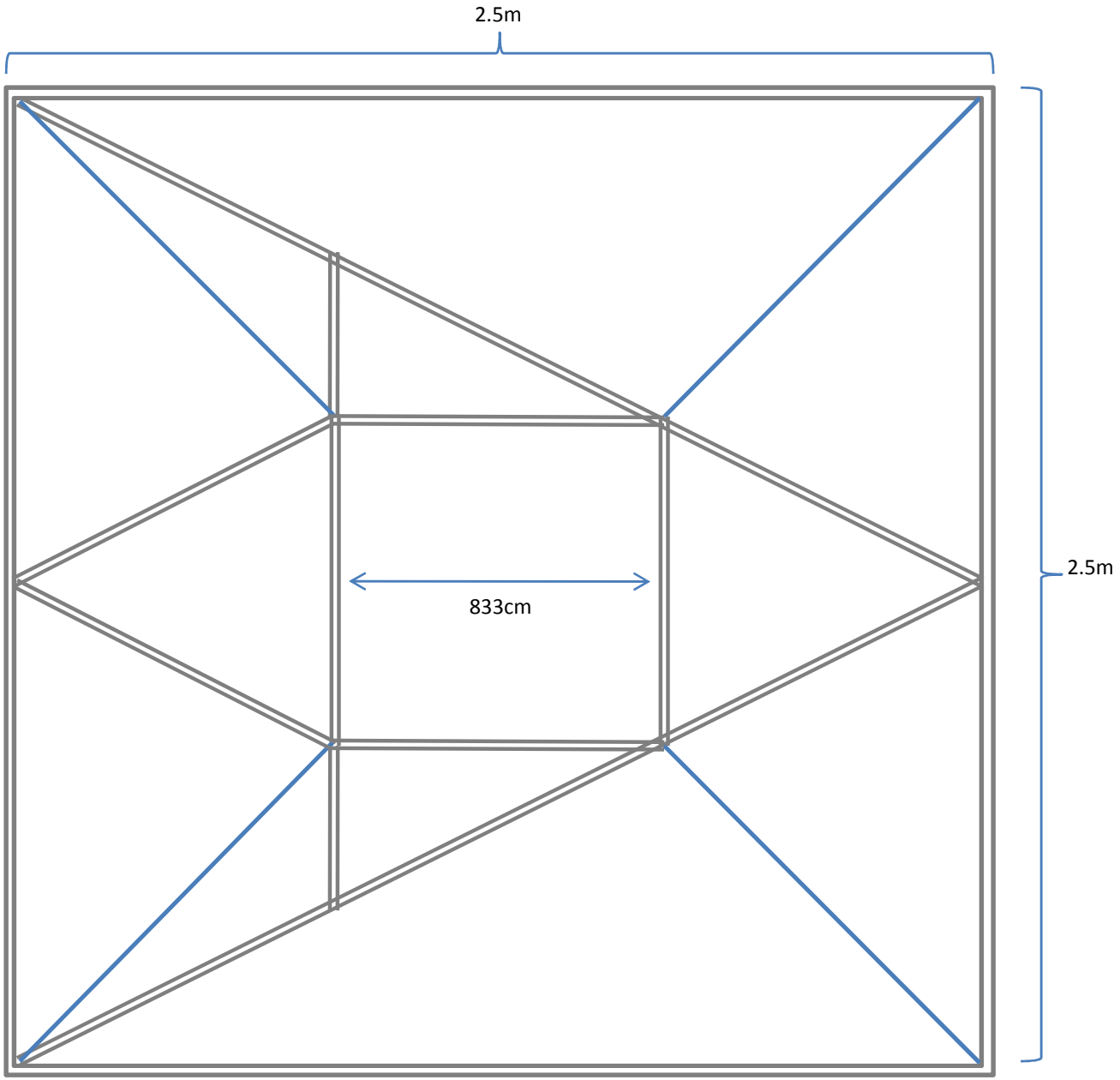
2.4



Scale: 1” = 416.66cm

Alpha-square panel

positive-right
alignment
(90°)

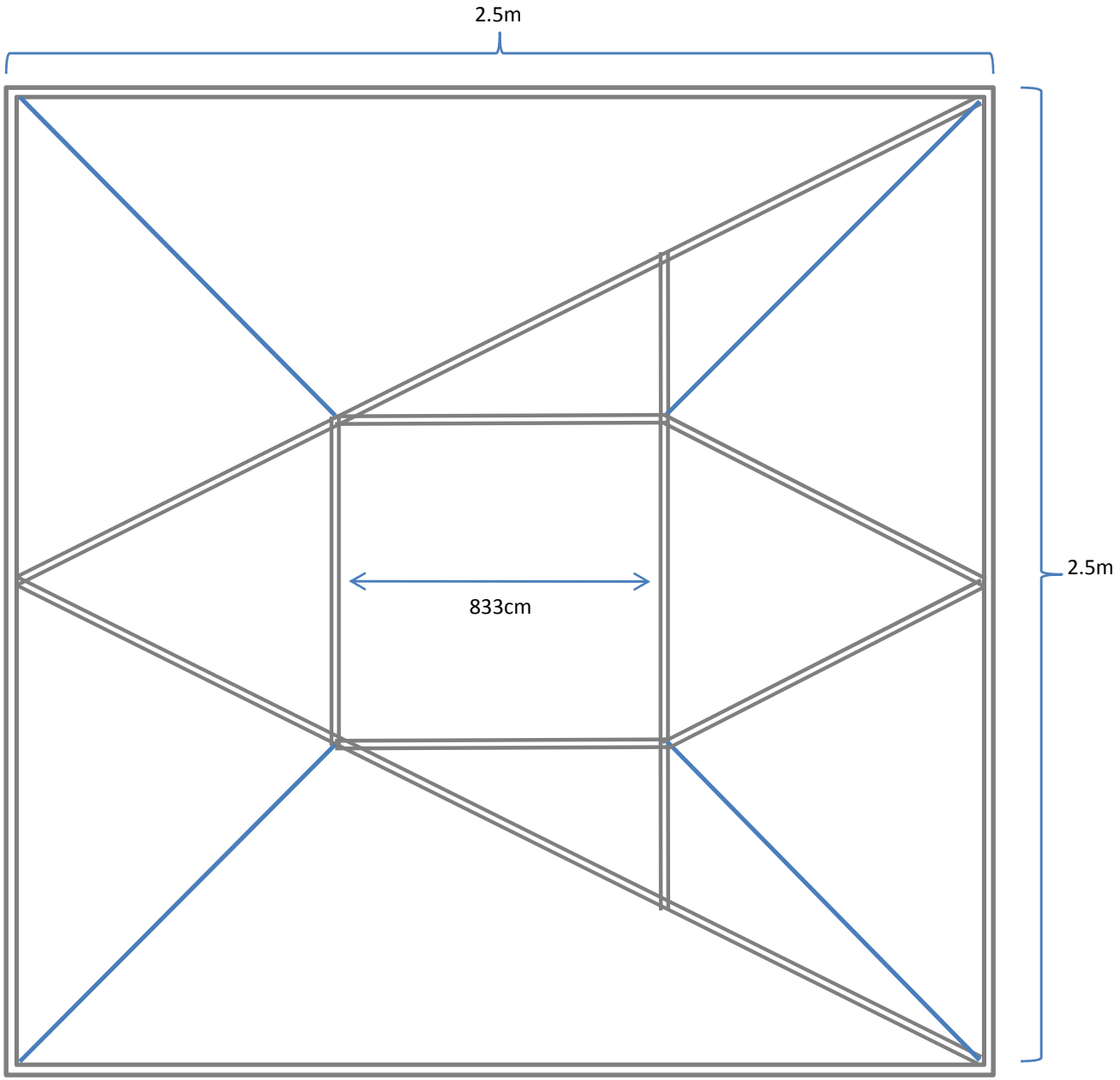


2.0b

Scale: 1” = 416.66cm

Alpha-square panel

positive-left
alignment
(270°)

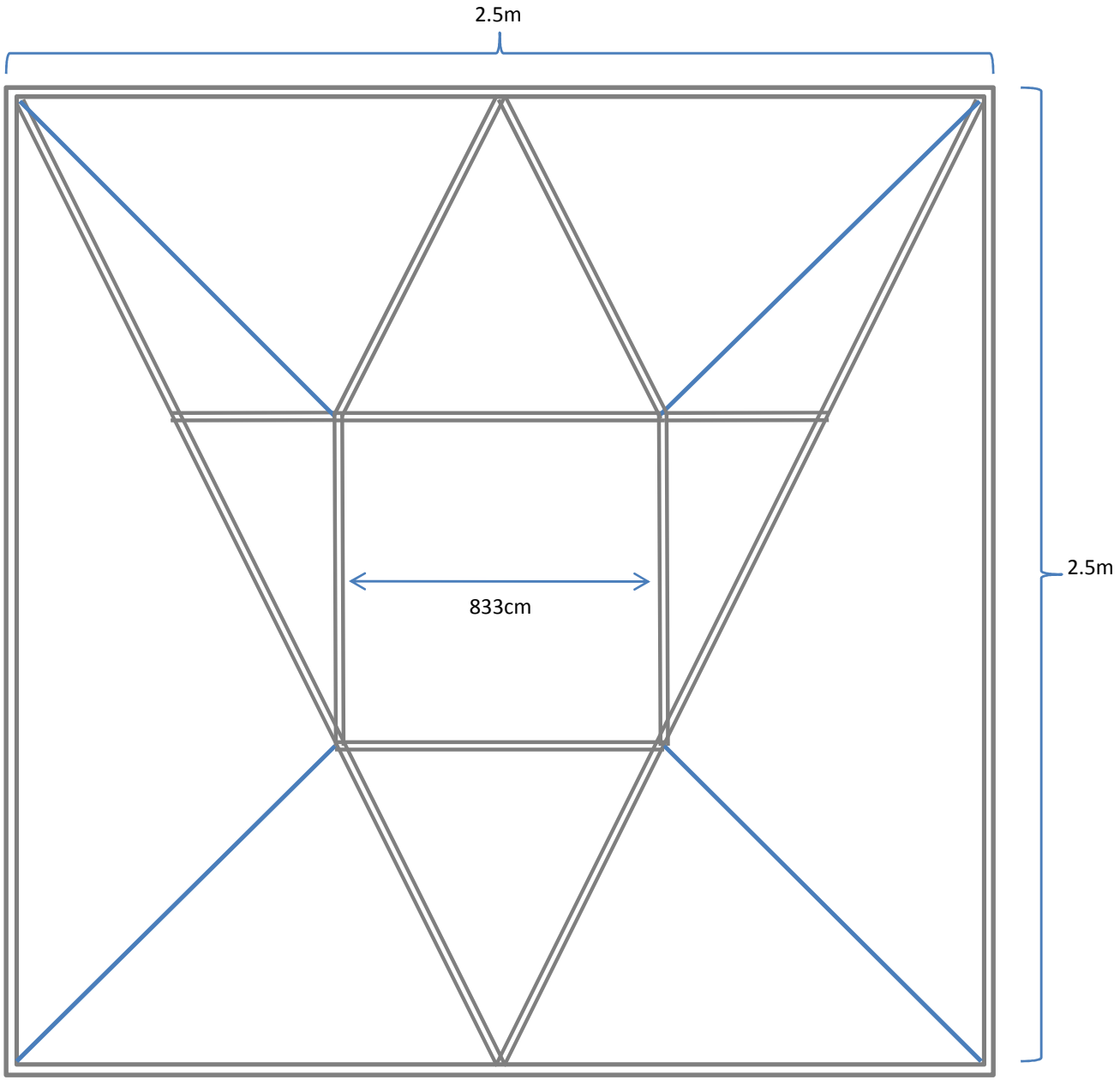


2.0c

Scale: 1” = 416.66cm

Alpha-square panel

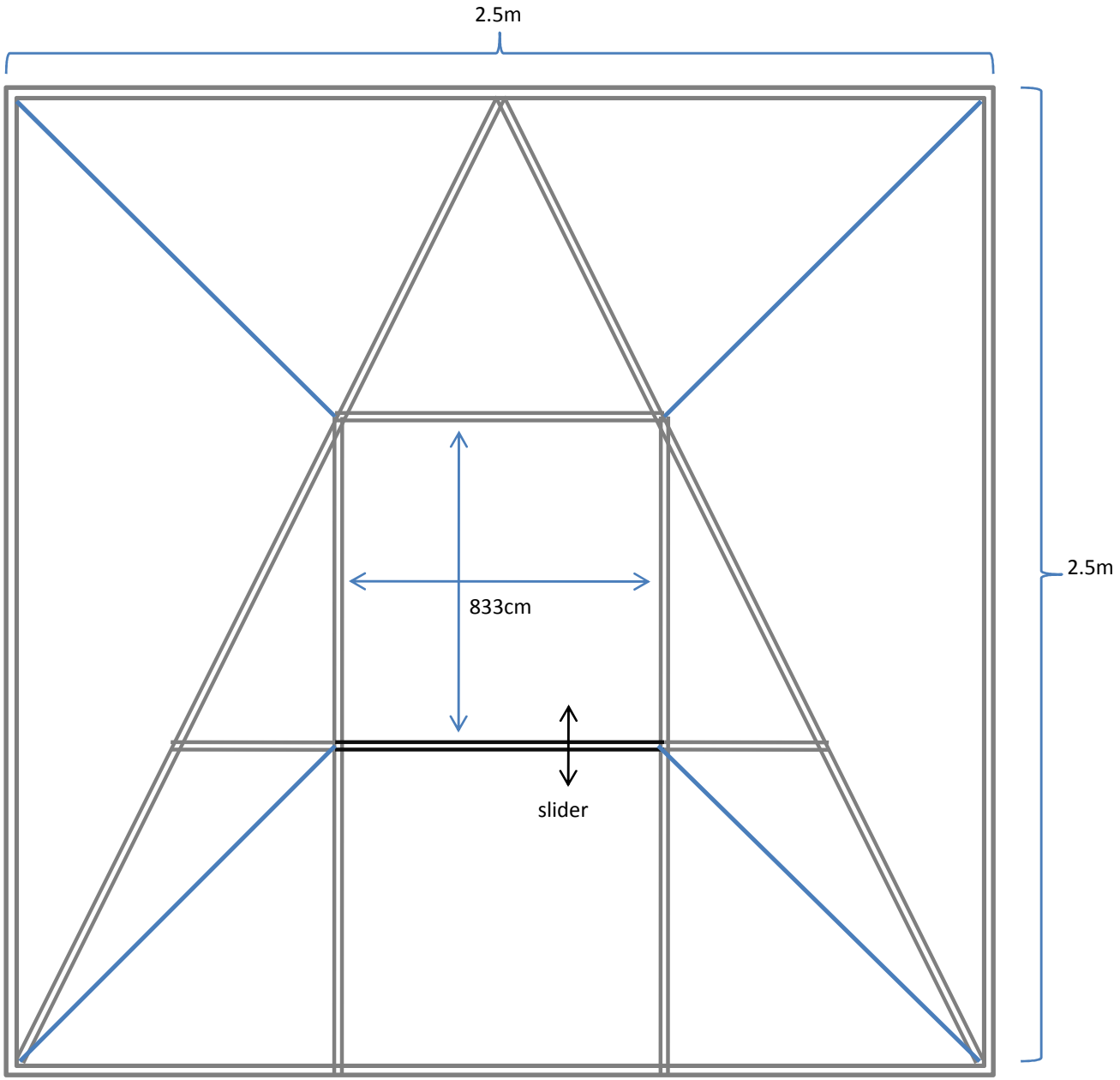
negative (-)
alignment
(180°)



2.0d

Scale: 1” = 416.66cm

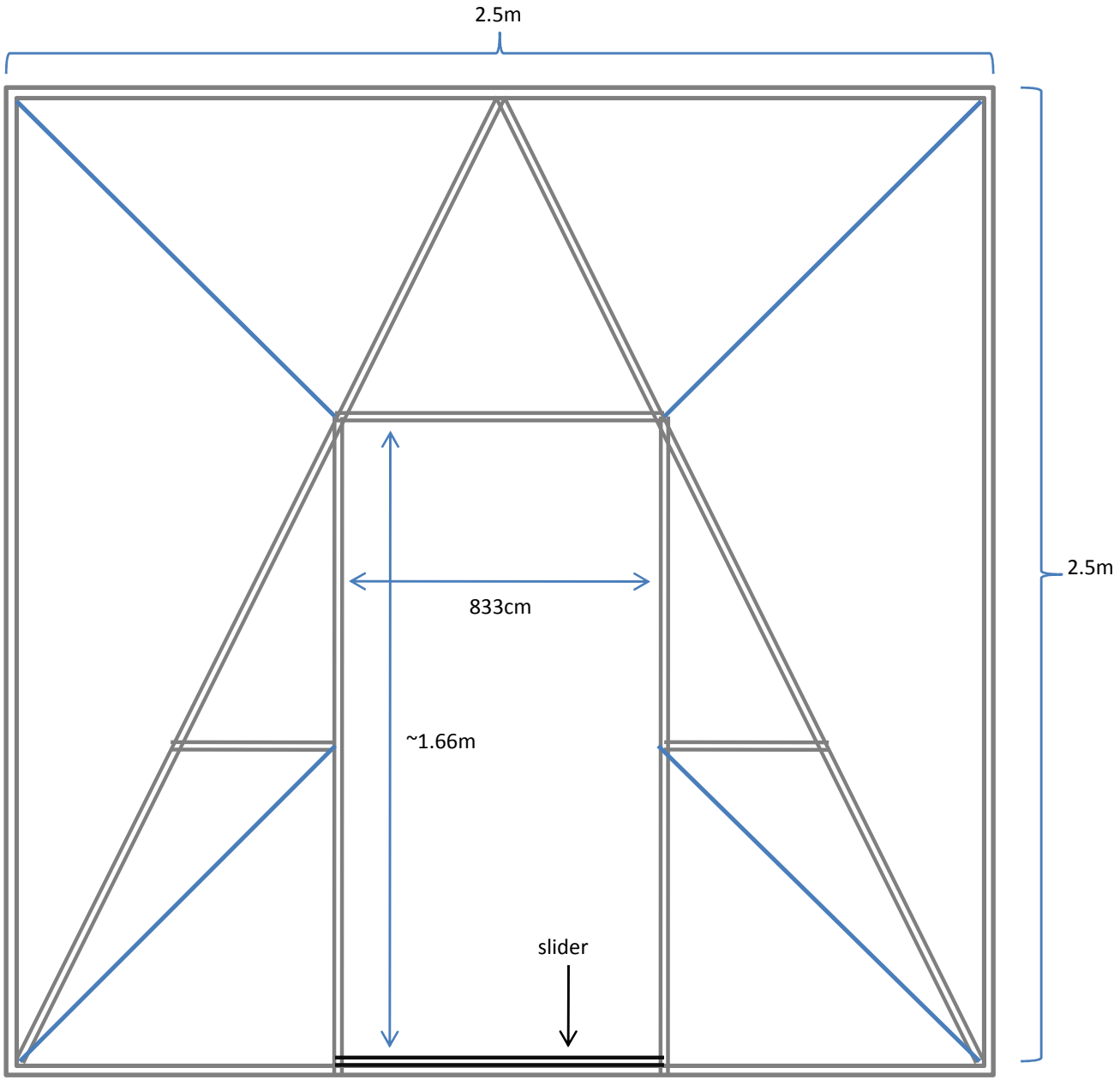
Beta-square panel
[set for window or channel]
positive (+) alignment
(0°)



2.1a

Scale: 1” = 416.66cm

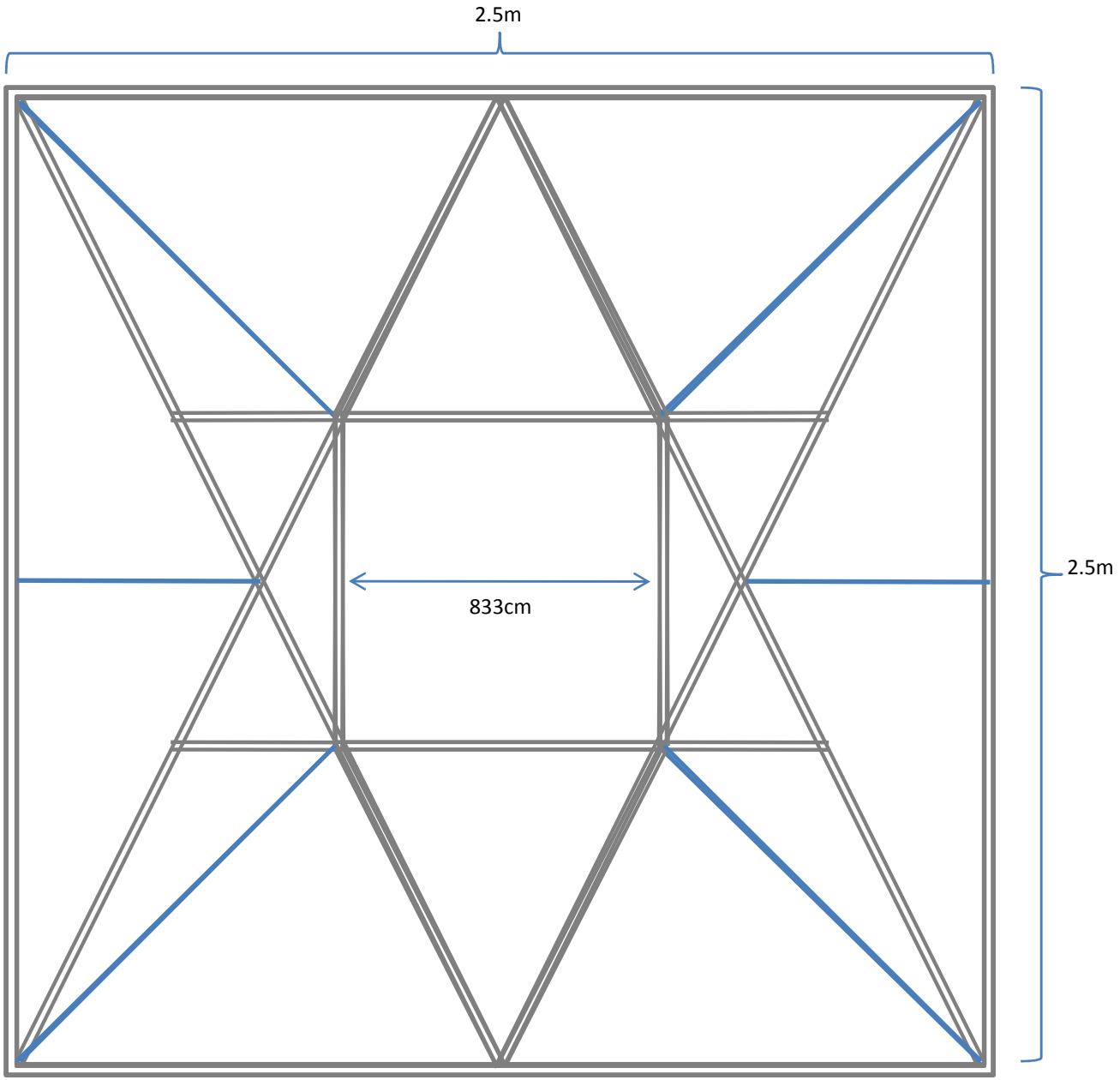
Beta-square panel
[set for door]
positive (+)
alignment
(0°)



2.1b

Scale: 1” = 416.66cm

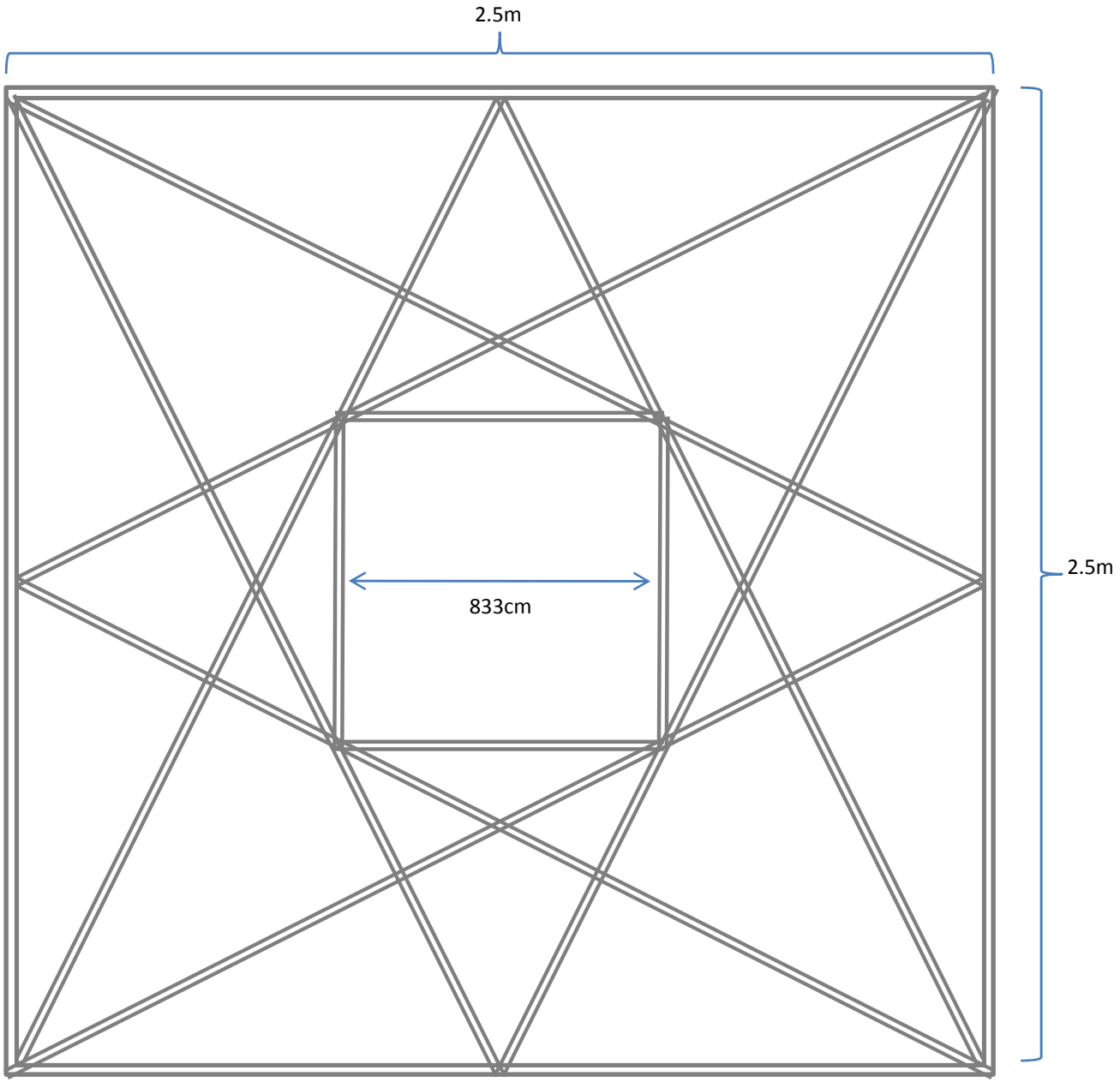
Gamma-square panel for floor, ceiling or wall (essentially this is made from two Alpha panels joined as an overlay for a stronger configuration) [positive (+) alignment (0°), and one negative (-) alignment (180°)]



2.2

Scale: 1” = 416.66cm

Delta-square panel (may be used for any face but usually for floor or ceiling of multi-level nCube constructions)



2.3

Scale: 1” = 416.66cm

When nCubes are used singly, then most typically there are six faces used, but in some cases, the application may call for variations with fewer faces:
-- no floor or no ceiling
-- omission of one or two walls

When nCubes are combined, then many variations can occur:
-- Between two nCubes, have no face on their join, only a total open space (e.g., clear open volume, the full length of the rectangular prism – for standard nCubes, this will be a box 2.5m wide, 2.5m high, 5.0m long)
-- For reinforcement or functional separation, use one face or even two

This applies to both horizontal and vertical combinations; one can create an open shaft from several stacked nCubes that do not have any intervening faces, only their exterior-wall faces.

When basic nRecs are used, the same applies as above, except that one is now dealing with units that are individually 2.5m wide, 2.5m high, and 4.0m long.

Important point about multi-nGon structures:
Many combinations can be made in 3D assemblies of nCubes and nRecs, and also, the central square openings can be used for not only windows but for vertical spiral stairs and ladder shafts, and for channels which are typically for different equipment, piping, conduits, cables, etc.

Interchangeability:
Virtually any structural element can be changed and moved to serve another function for another nPod.

System Connectivity Panels (SCP) with power-utility-comms modules can be located and affixed along any face of any nGon.

There is, in effect, no top, bottom, front, back, left, right, for most structural elements used in nGon-type nPods. Theoretically, an nPod could be rotated on its long-axis at 90, 180, or 270 degrees and all interior attachments could be realigned and re-attached in such a manner as to restore the nGon to its original configuration or a suitable "mirror" arrangement of equipment and functions

Interior and Exterior Surfaces ("walls, floors, ceilings" of nGon components):
These can be of virtually any material that can be manufactured to fit the fundamental specifications. Thus: fiberglass, metal, plastic, glass, wood, canvas, carbon composite. These are panels of different sizes, thicknesses, and features such as openings for windows, SCP and other utility connections, and also thermal/electricity generation. They follow the nDLS specifications.

Attachments between elements:
Although welding and other forms of permanent and material-changing bonding can be used, all of these traditional methods are considered to be second-choice and non-optimal.

The preferred method is with joiner-elements ("JE"; insert-fitting sleeves) made of steel, aluminium, composites, plastics, or other materials consistent with the specifications for the particular nPod and optional PodAtrium design.

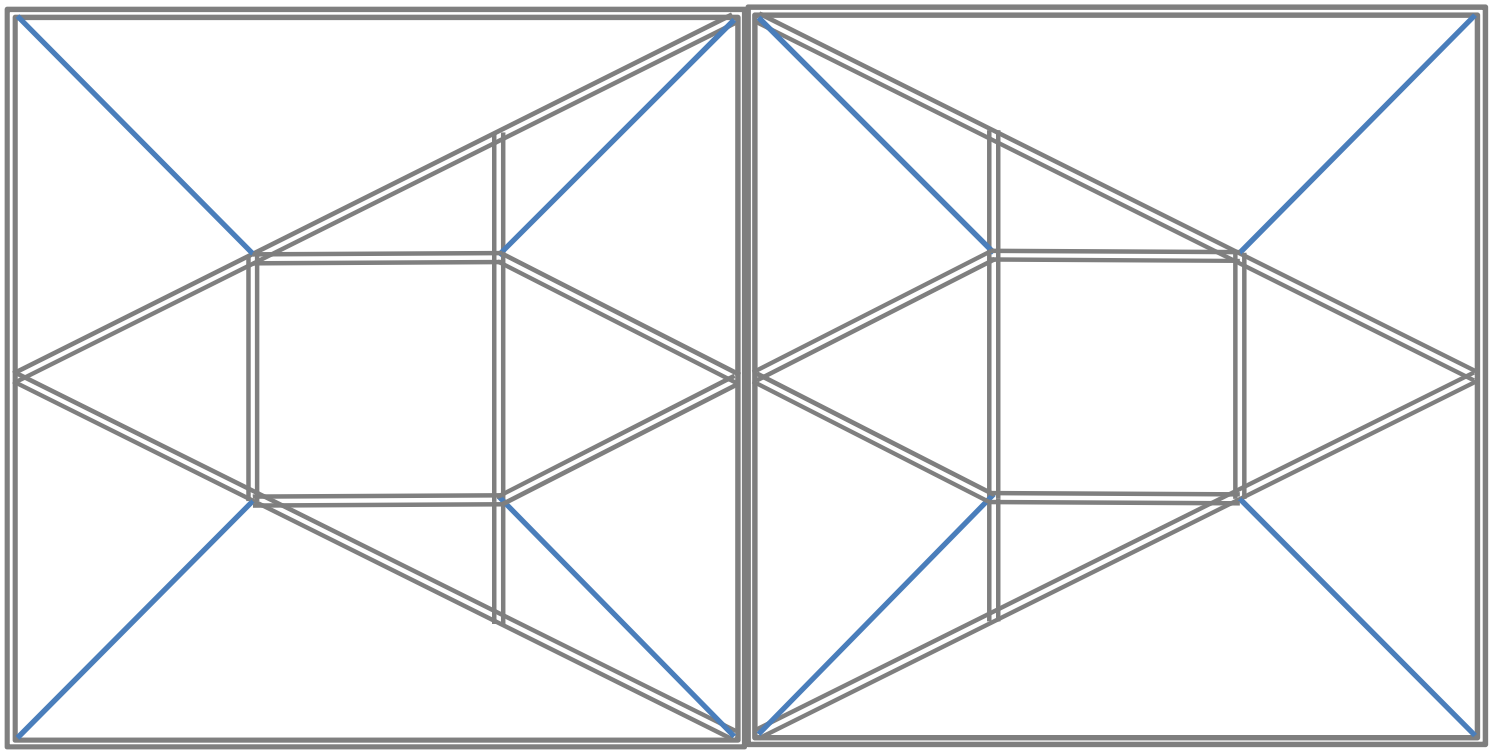
These "JE" fittings are in several varieties based upon the number of base-elements ("BE") used in the structural element ("SE") being assembled and the angles among those BE.

Thus there are fittings for 2, 3, 4 and more BE joining at angles that may range typically as among the set {30, 45, 60, ~70, 90, ~102, 180}. Joiners are described by a syntax based upon the number of BE being joined and the angles among the different BE. (Refer to other specification documents for more details.)

BE are joined with the JE to other BE by using both bolts and screws.

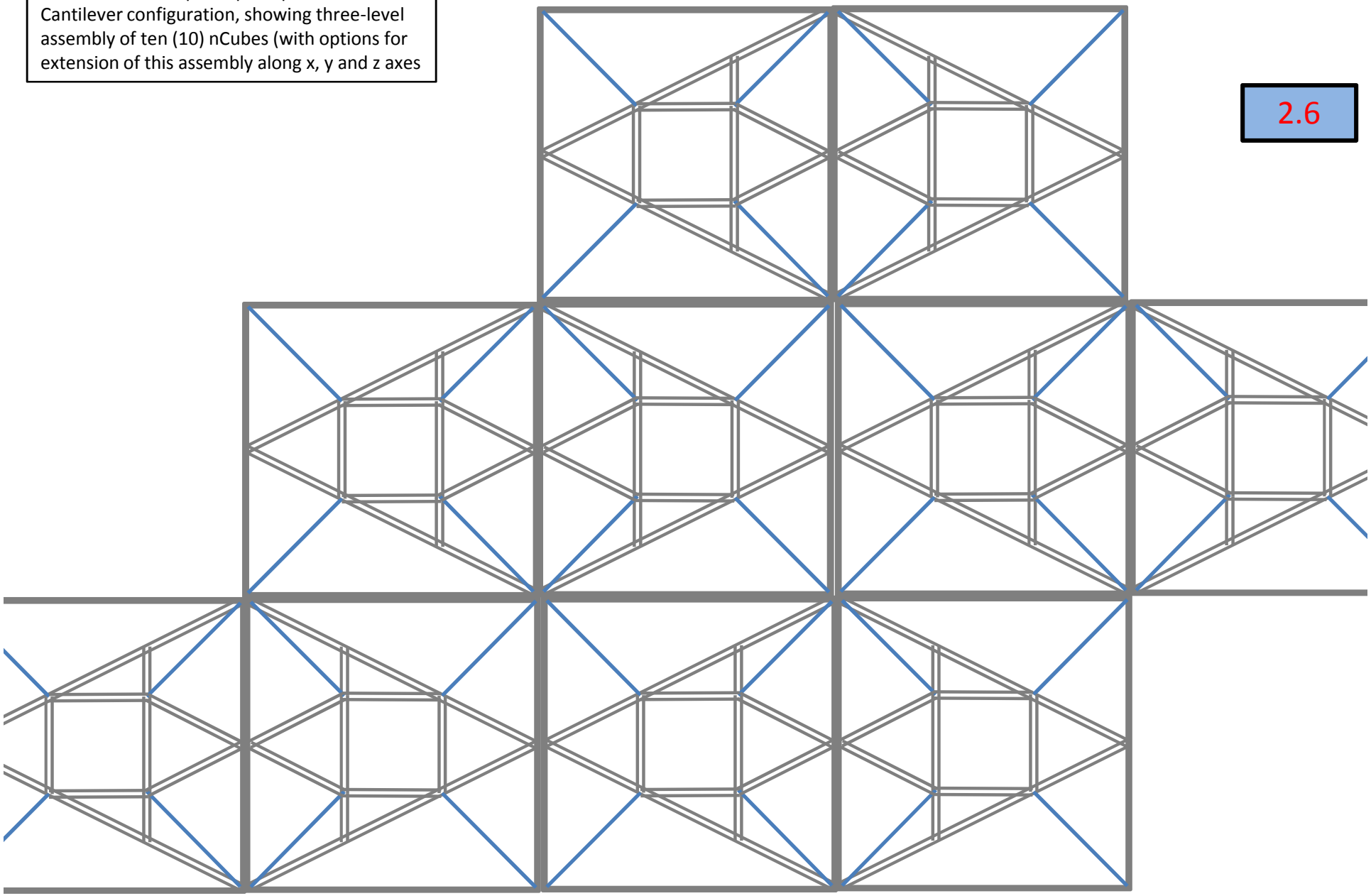
Cantilever configuration element (double-sized multi-panel element) made from two Alpha-square panels, affording major structural support for an upper level or some heavy equipment on the roof.

2.5



Combination of Alpha-square panels in Cantilever configuration, showing three-level assembly of ten (10) nCubes (with options for extension of this assembly along x, y and z axes

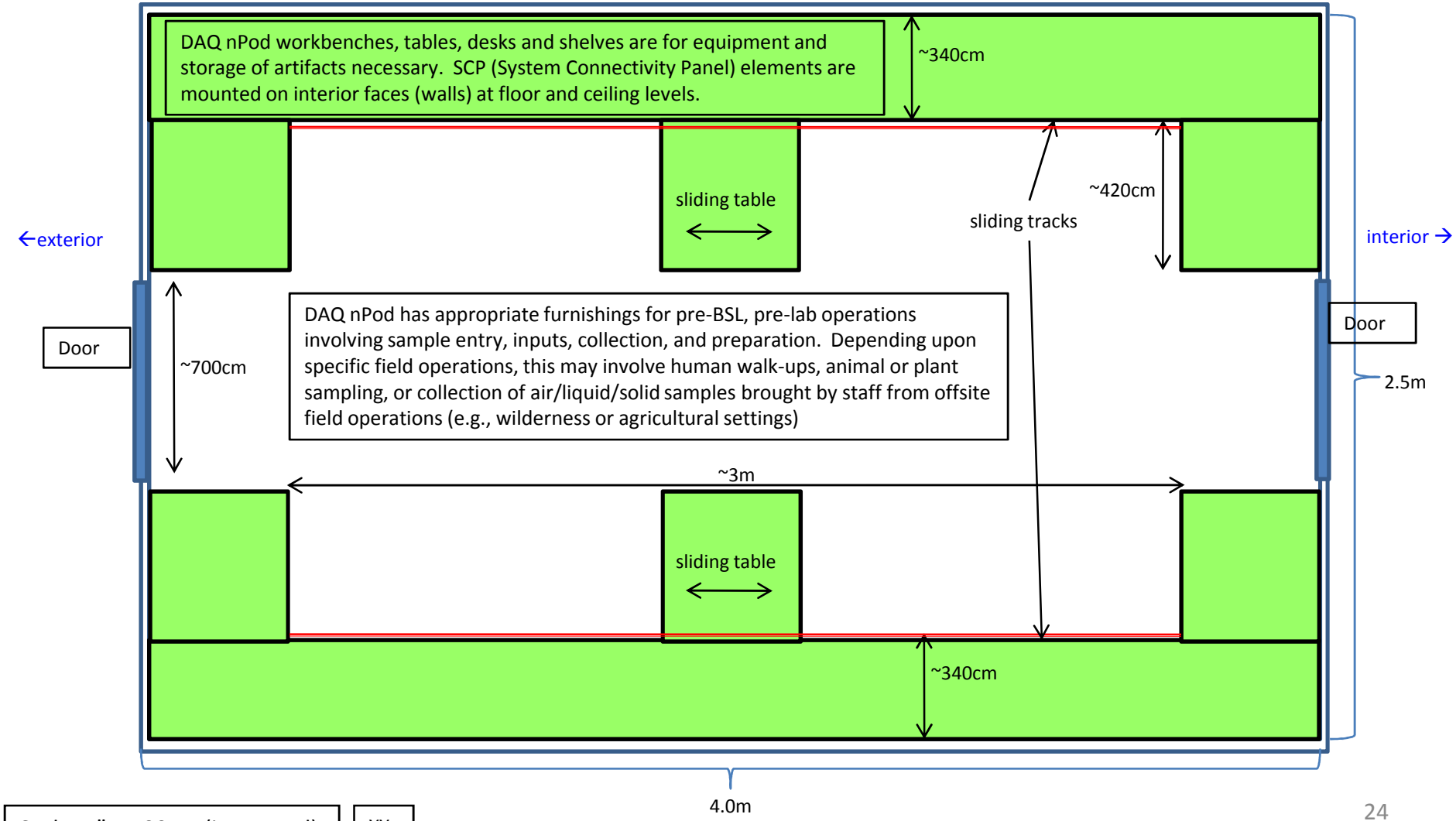
2.6



Representative **DAQ** nPod in the BSL-PodAtrium

DAQ nPod receives power and other utilities from the EMP nPod and main communications I/O is handled through the C4 nPod. DAQ may be converted into a CBR-secure space including employment of negative-pressure HVAC by appropriate changes to the Atrium or by addition of another nPod or similar chamber to the (typically) exterior entrance opposite the Atrium.

Detailed specifications for a given DAQ nPod are developed for each instance (e.g., for a specific BSL-PodAtrium such as the PIDP-1 ("Rainbow") @ Fife Lake, MI) and provided in formal nDLS specifications

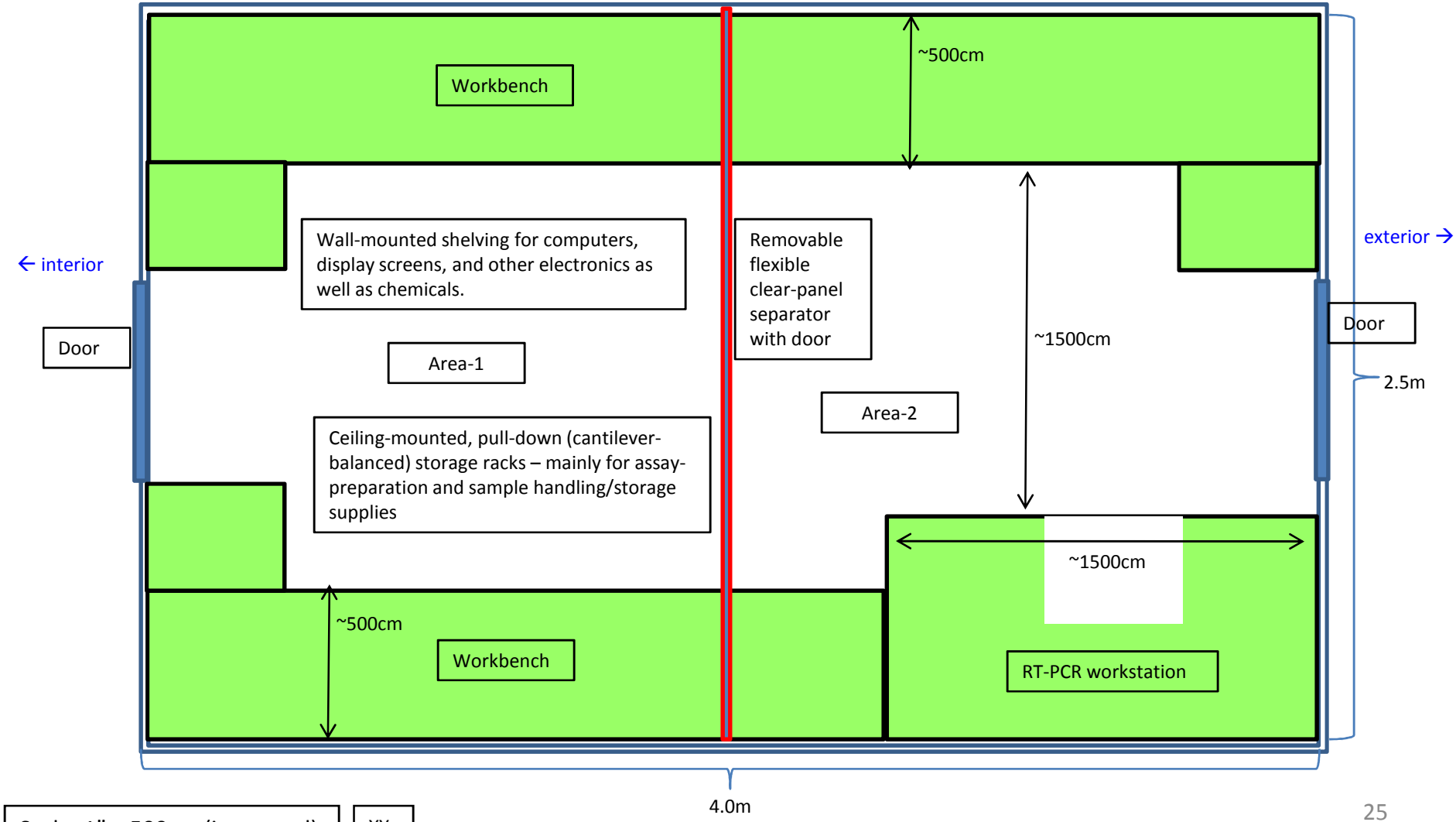


Scale: 1" = 500cm (in general)

XY

Representative **BSL** nPod in the BSL-PodAtrium

BSL nPod is the hub for all onsite, in-Pod biological and chemical laboratory work. Hoods may be set up in either Area-1 or Area-2. BSL may be converted into a CBR-secure space including employment of negative-pressure HVAC by appropriate changes to the Atrium or by addition of another nPod or similar chamber to the (typically) exterior entrance opposite the Atrium. Note that there is a basic commonality between BSL and C4 nPods allowing for expansion, if so desired, of the BSL to being two (2) nPods within a BSL-PodAtrium, and thereby moving the C4 functions to another nPod or to an extended fifth nPod.

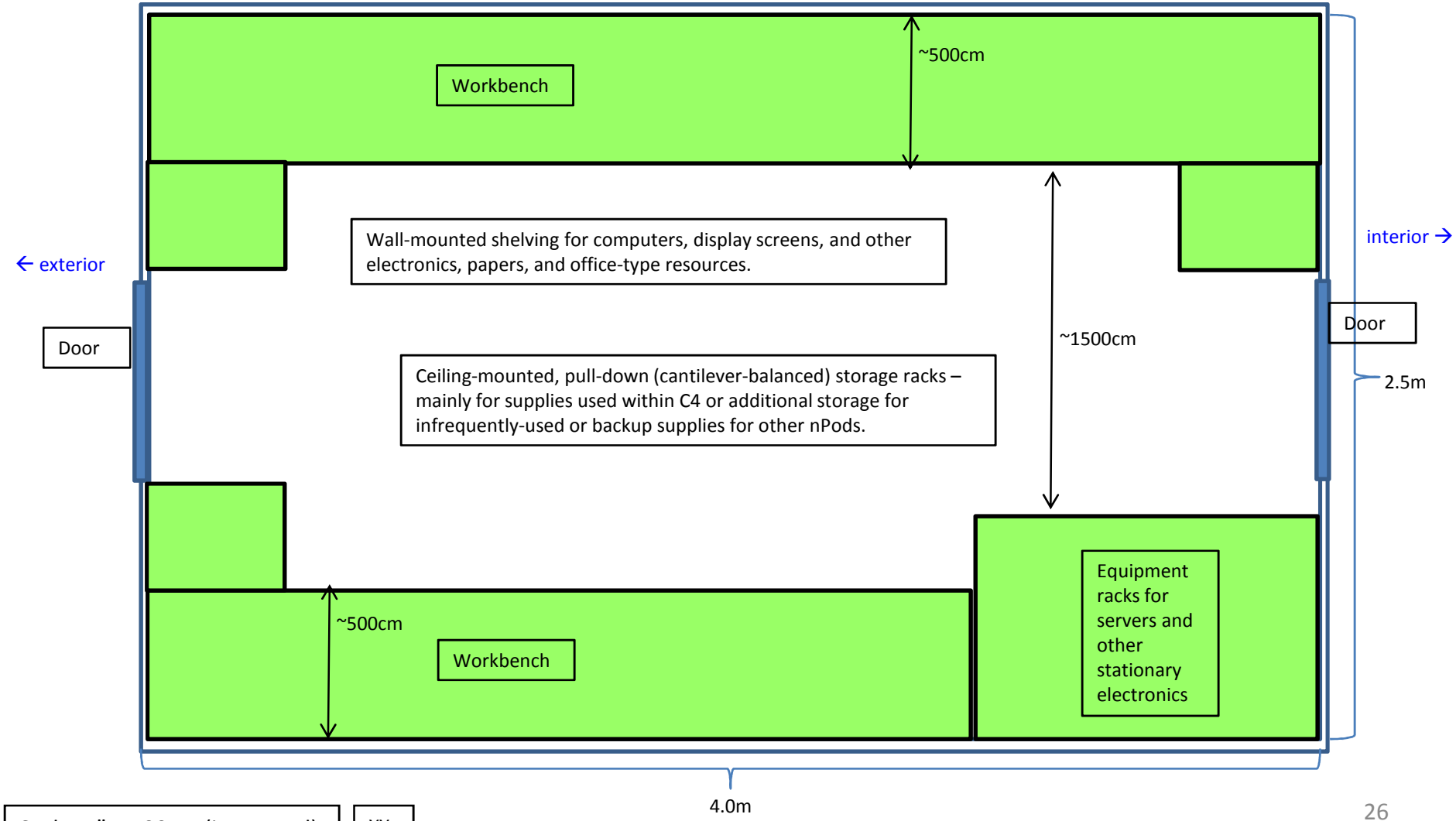


Scale: 1” = 500cm (in general)

XY

Representative **C4** nPod in the BSL-PodAtrium

C4 nPod is the hub for all communications and computing used within other nPods, and the center for computer-based work by staff. C4 is used for any indoor teleconferencing including videoconference meetings. C4 receives power and other utilities from the EMP nPod. C4 may be converted into a CBR-secure space including employment of negative-pressure HVAC by appropriate changes to the Atrium or by addition of another nPod or similar chamber to the (typically) exterior entrance opposite the Atrium.

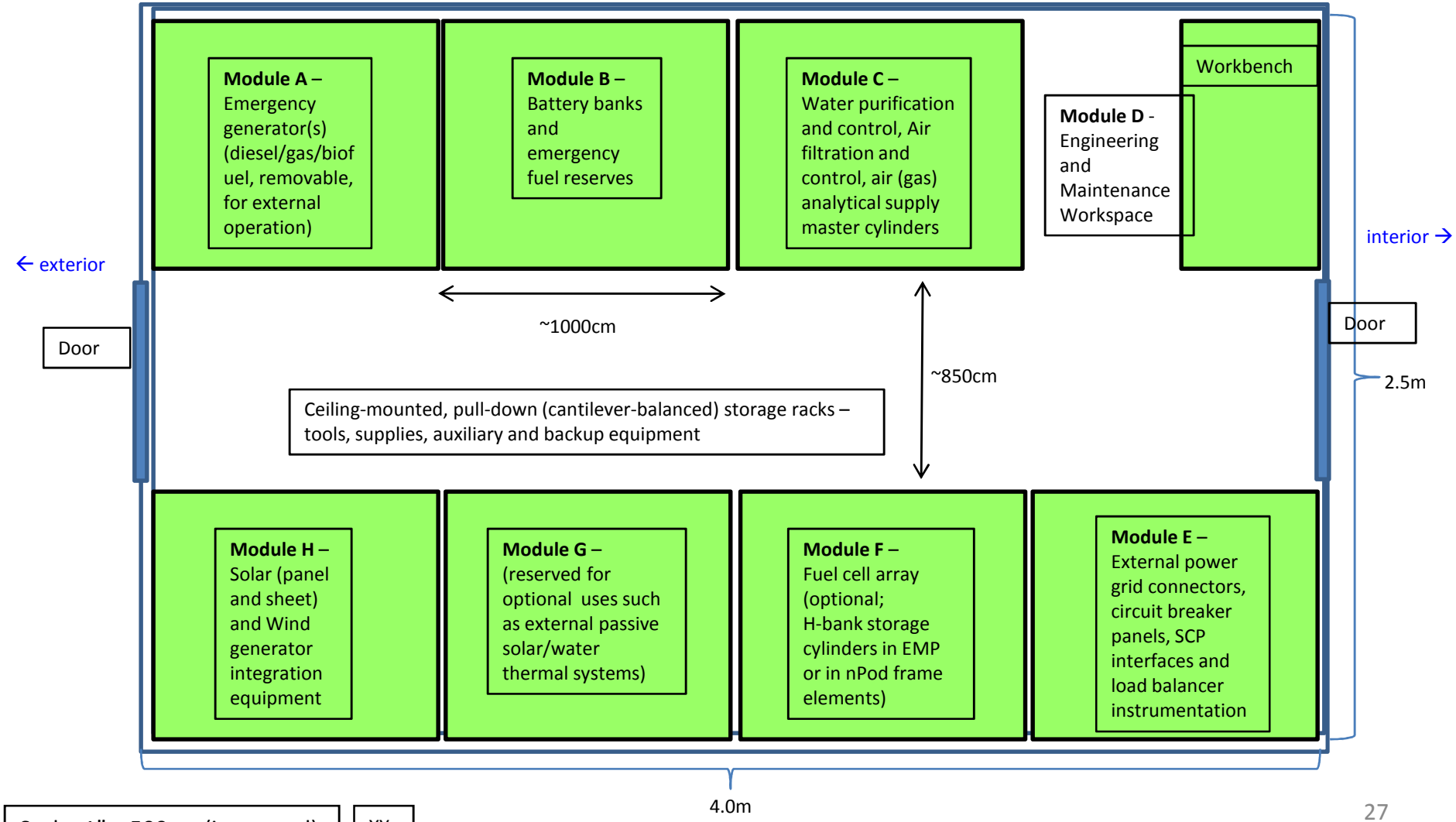


Scale: 1” = 500cm (in general)

XY

Representative **EMP** nPod in the BSL-PodAtrium

EMP nPod is the nexus and coordination center for all power and other utilities used by different nPods. EMP is the hub for all SCP units. Main communications I/O is handled through the C4 nPod. EMP may be converted into a CBR-secure space including employment of negative-pressure HVAC by appropriate changes to the Atrium or by addition of another nPod or similar chamber to the (typically) exterior entrance opposite the Atrium.



Scale: 1” = 500cm (in general)

XY

Six Primary Application Areas for PodAtriums

FabLabAtrium
(Workshop-Training)

MedAtrium
(PublicHealth)

EnergAtrium
(Energy/Power)

EducAtrium
(Education)

AgriAtrium
(Hydroponics)

DormAtrium
(Residence)

ECOADUNA ARCOLOGY

1.0

Expansion of a BSL-PodAtrium over time

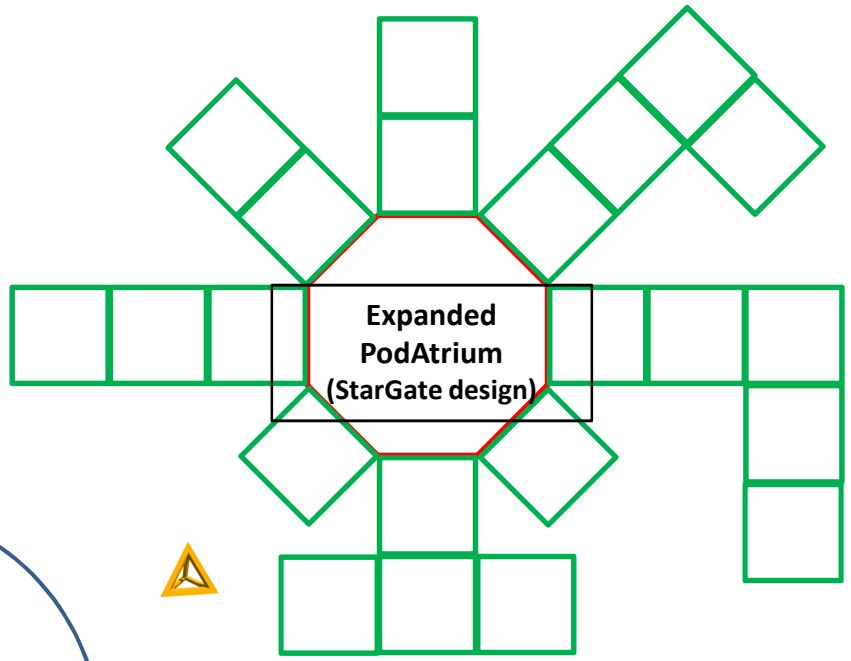
This is one hypothetical expansion which can accommodate different nPod components and multiple functions over and beyond the core purposes of the generic BSL-PodAtrium.

Other structures shown here are part of the overall operation but are not part of the PodAtrium structure.

Entire property that is not developed with structures or gardens (including areas for vehicular or human traffic) is either forest, field, or planted with alfalfa, clover, wildflowers, other fauna.

Apiary –
The Hives

Outdoor Vegetable Garden and
Fruit Orchard Area



Gravel
parking lot

Gravel drive

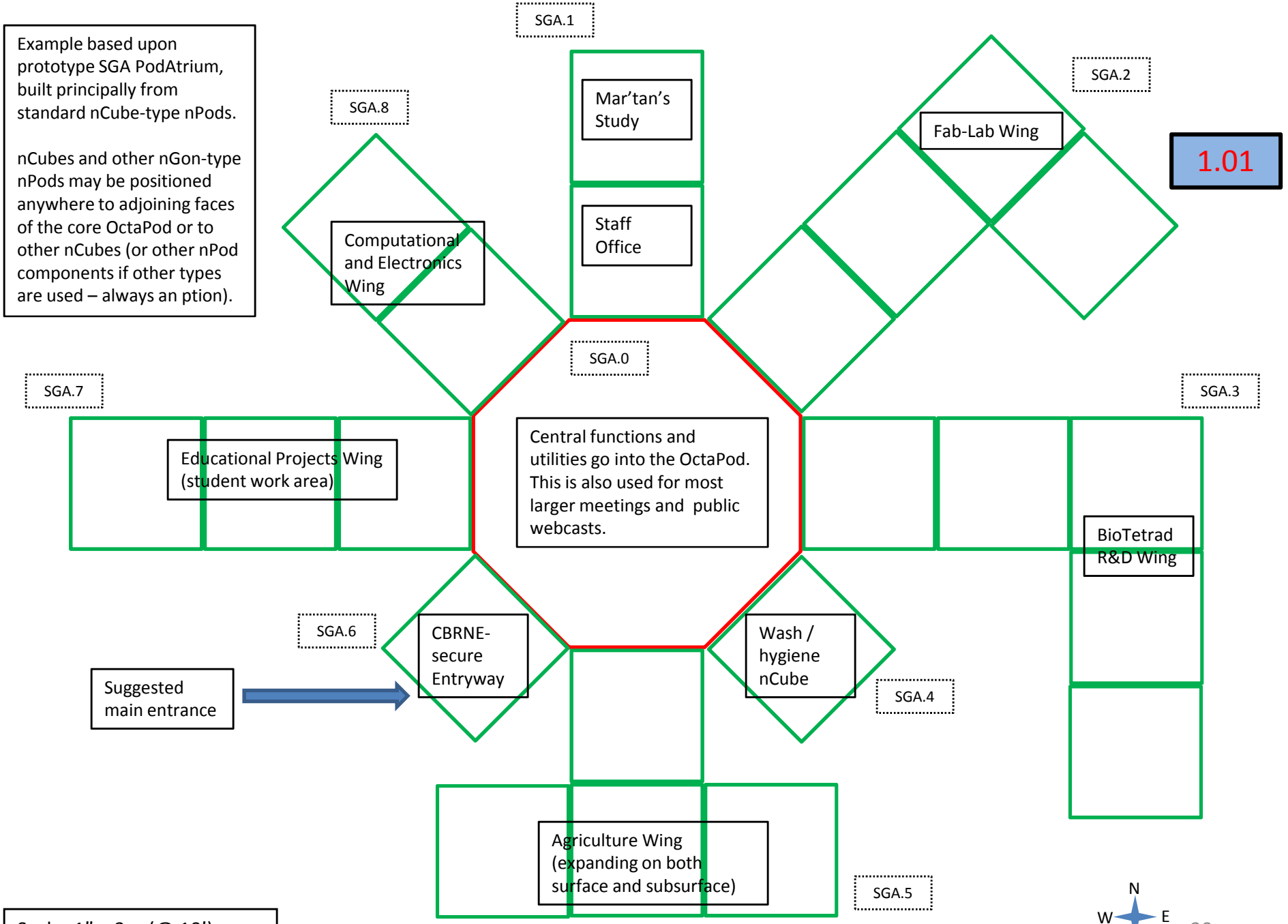
Greenhouses, Coops, Pens,
and auxiliary support structures

N
W E
S

Scale: 1” = 6m (@ 19.5’)

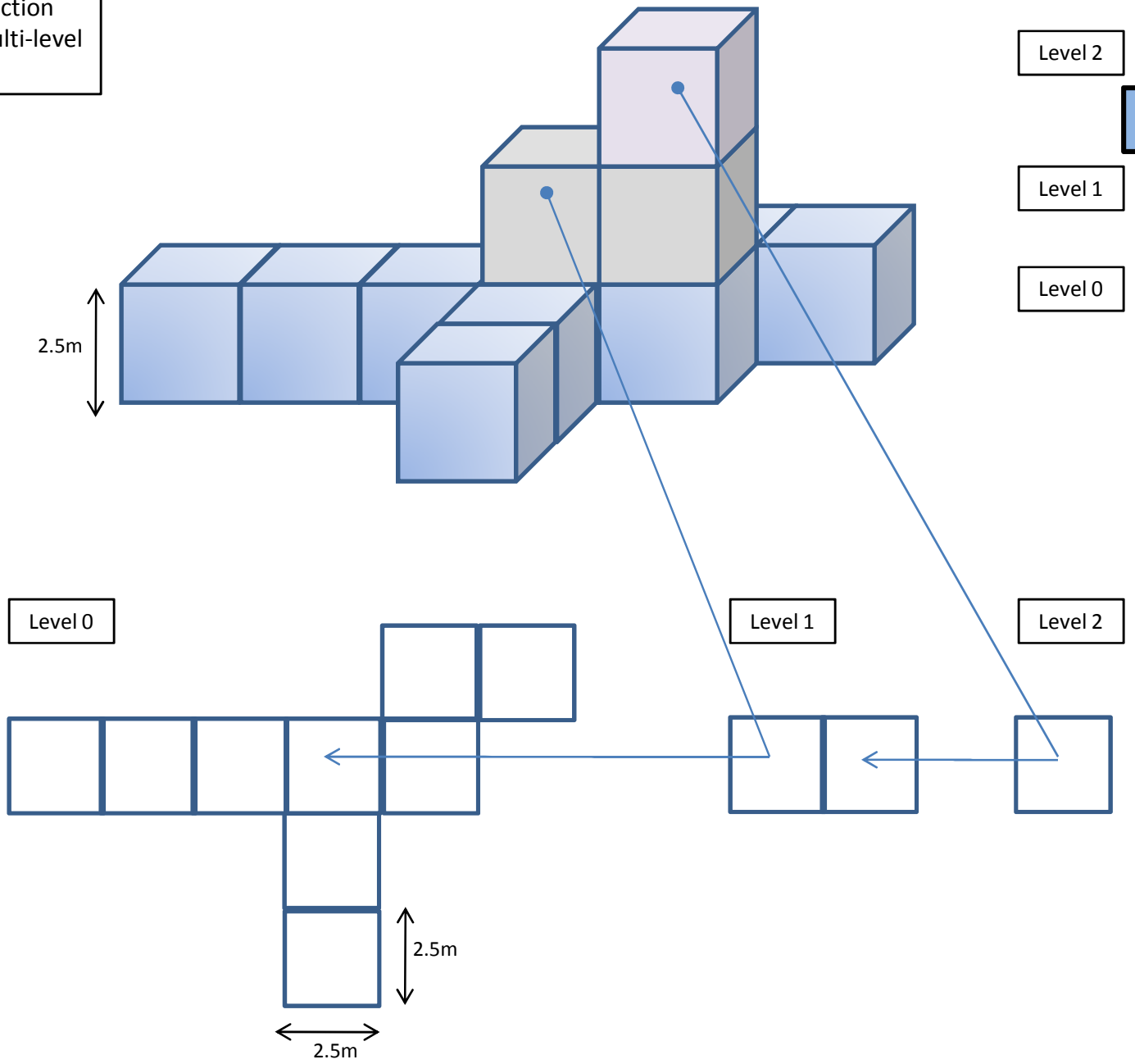
Example based upon prototype SGA PodAtrium, built principally from standard nCube-type nPods.

nCubes and other nGon-type nPods may be positioned anywhere to adjoining faces of the core OctaPod or to other nCubes (or other nPod components if other types are used – always an ption).

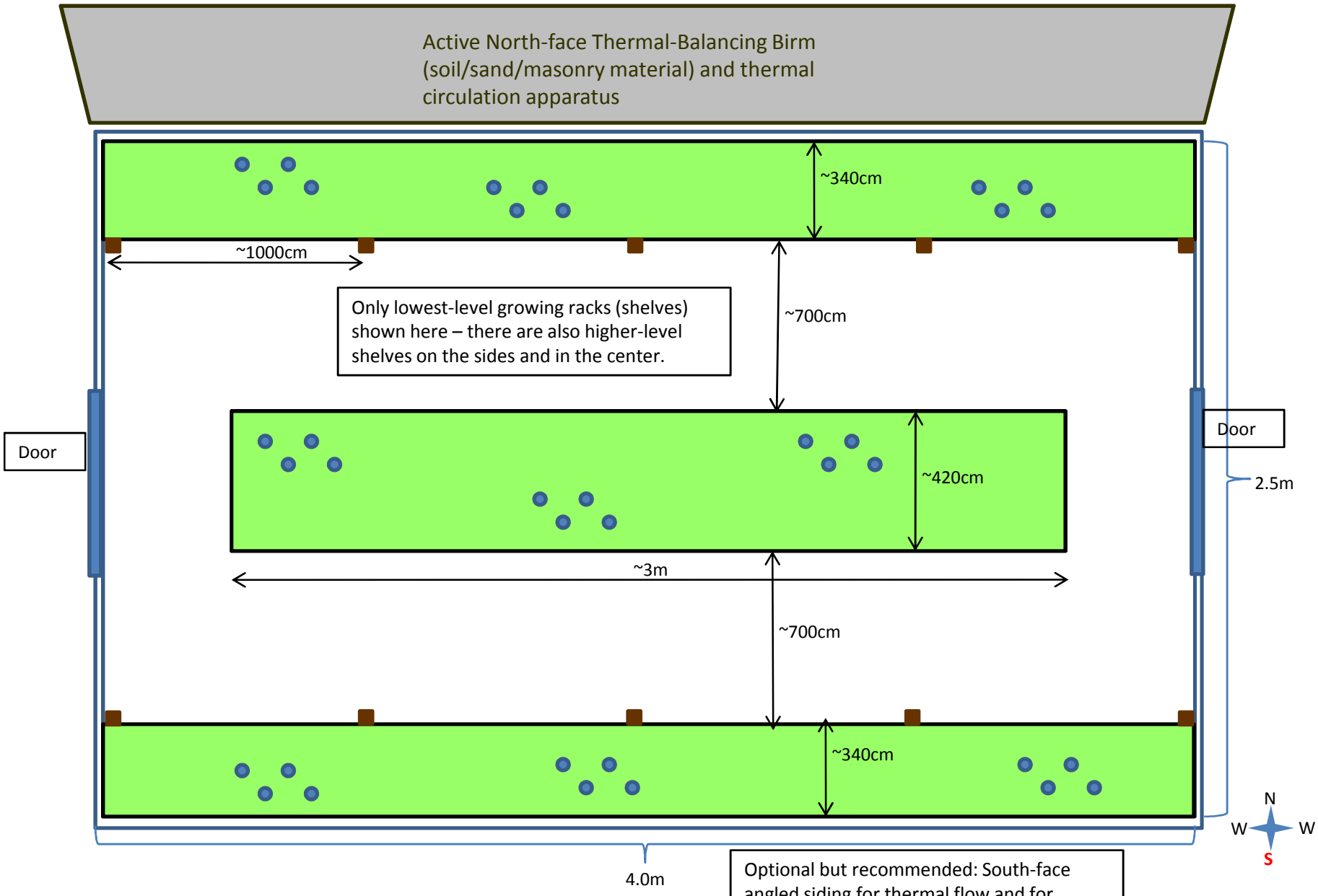


Scale: 1" = 3m (@ 10')

Sample nPod construction consisting of a 3D multi-level nCube array



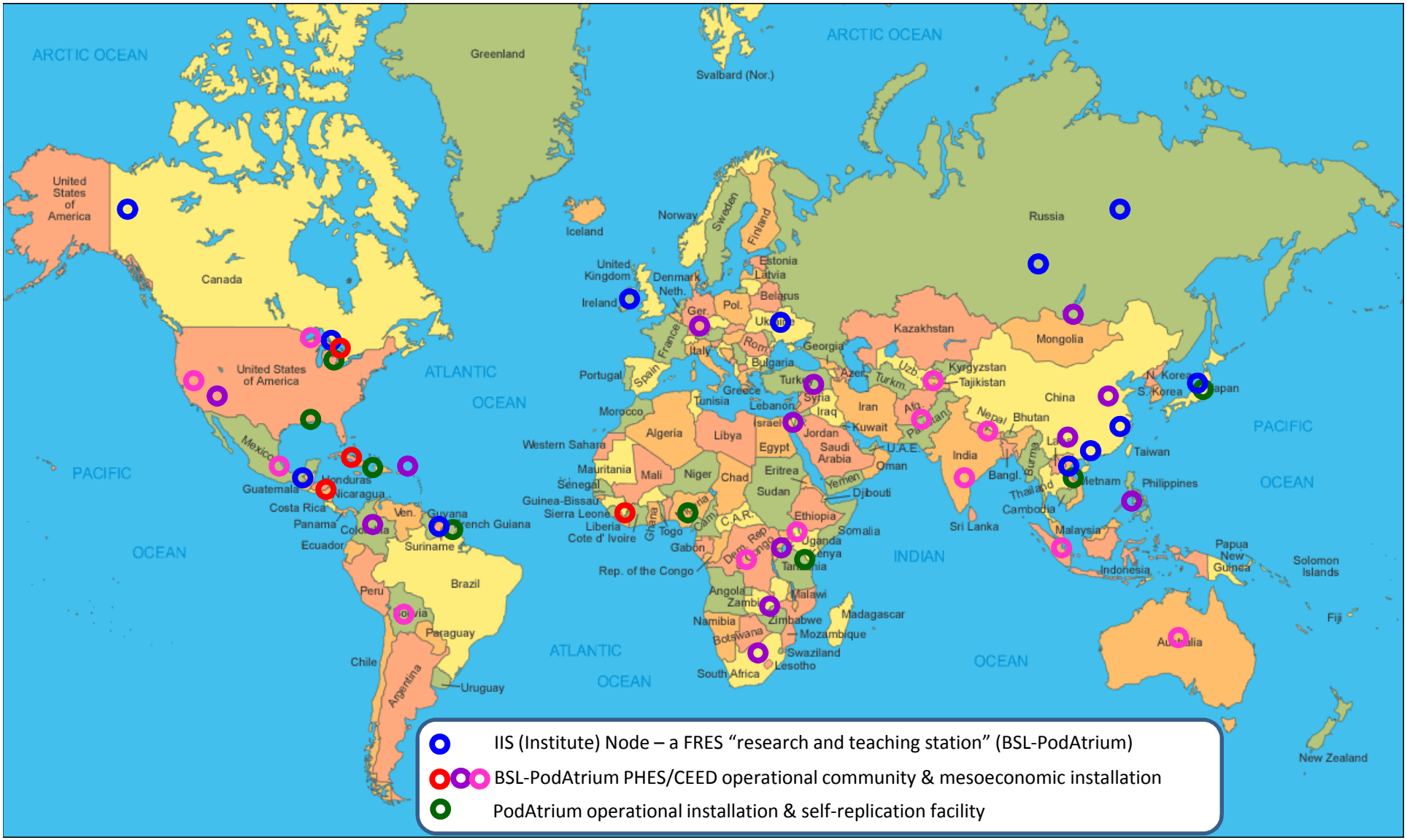
Example of an nRec-type nPod (in a BSL-PodAtrium, for instance) employed as a greenhouse (soil or hydroponic)



Scale: 1” = 500cm (in general)

XY

PFP (PODs For People) – Some sites with needs, targeted, underway



Global development through "organic-engineering" self-replication

OLDER PAGE - PFP (PODs For People) - Phases I through IV, 2012 – 2016 (projected)

IIS nodes are initially action-hubs formed by affiliations with specific persons, labs, centers at existing institutions. Primary (home node) in Europe {Sweden; Stockholm; KTH}. Additional nodes @ {Japan; Fukushima; Fukushima Univ.}, {Ukraine; Kiev; ITP}, and {USA; San Diego; SDSU}. Gradually, through later Phases, PodAtriums complement other physical workspace facilities. Active field research (ESB-EGIA program) conducted @ FDNPP and Chernobyl.

Primary PodAtriums for specific and multiple applications (see PodAtrium types – later pages) are set up in critical strategic locations. The first two are for the (1) Turkana region of NW Kenya as part of Atlas Challenge and MavenGroup, and (2) Shimogo Hydroponic Vegetable Plant project in Japan. Subsequent installations and operations are projected to evolve in accordance with the further developments from Atlas Challenge and other organizations and programs as well as changing needs, emergency/disaster/refugee situations, and many other factors that cannot be neatly predicted and planned long in advance. PODs and PodAtriums are by nature designed and used in highly dynamic environmental, socioeconomic and political situations.

Locations may change. That some region or country is not shown as having any PODs or PodAtrium configurations does not imply "no"; the order of projected implementation and installation dependent upon conditions, needs, and convergence of people and organizations.

Special "self-replication" ("SR") PodAtrium nodes are those that evolve into factories for production of PODs and PodAtriums along with other micro- and mesoeconomic business activities within the specific surrounding community. These produce PODs of all five basic types for both nearby and distant regions. Each of the four key SR or "factory" nodes are near seaports (Japan, Kenya, Pakistan, French Guiana)

"SR" nodes are also providing operational special services through functional PodAtriums. It is projected that there will be additional "SR" nodes in USA, Central and Latin America, Africa, Asia, and based mainly upon special needs that arise, elsewhere in the world. Space-focused POD developed (e.g., HALO, MOSES (see ETA) will mostlikely be mainly in Japan, USA, & French Guiana.

- IIS (Institute) Node – a "research and teaching station", Phases I-II
- PodAtrium operational community & mesoeconomic installation, Phases I-II
- PodAtrium operational installation & self-replication facility, Phases I-IV
- PodAtrium operational community & mesoeconomic installation, Phases III-IV

Contacts – http://ecoaduna.org ---- http://tetradyn.com

Additional Info –

BSL-PodAtrium, PodAtrium in general –
http://podlab.tetradyn.com
http://biotetrad.tetradyn.com

Biomedical R&D Program (PIDP, integrated) –
http://ecoaduna.org/pidp

Civilian Alert Communications Network (NomadEyes) –
http://nomadeyes.tetradyn.com

Independent Non-governmental Data Security Management (Kyberos) –
http://kyberos.tetradyn.com