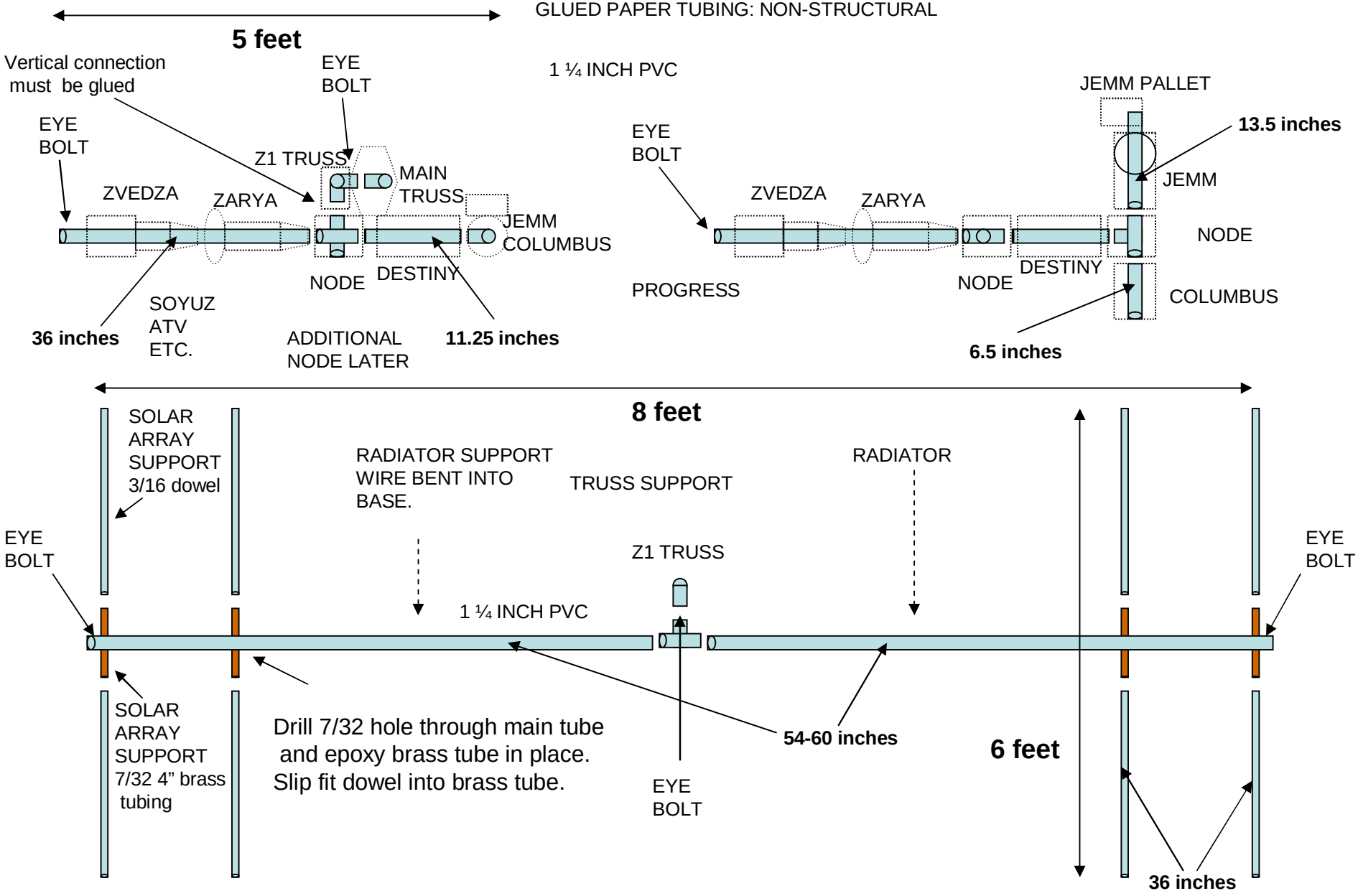
ISS – 4.5” 1:40 scale

- Building this model requires a moderate level of modeling skill and an intimate familiarity with the International Space Station structure – see http://www.nasa.gov/mission_pages/station/main/index.html

- Model is approximately 1:40 scale; sized to use 2 liter soda bottles to shape the modules. The finished model will be 6 feet high across the main solar arrays, just over 8 feet wide across the main truss, and about five feet long along the main spine where the modules mount.
- Most sections consist of a cylinder using a bottle as a form and two end caps. More complex shapes are formed from cones and boxes. Sections are assembled with 1 ¼ inch PVC tubing running though the part and connectors where needed. Most conics are formed by cutting on the solid radial lines, then forming and overlapping to the dotted line.
  - Non-structural connections are made with either a paper tube rolled to the same outside diameter as the tubing (1.68 inch/43mm) or with slip-fit cylinders. These connections include the cupola, airlock, JEM small experiment module, the PIRS docking compartment and Soyuz spacecraft.
  - To make a slip-fit docking connection, first close the open ends of the modules to be joined with a circular piece of card. Using a mandrel (cylindrical form), roll and glue a cylinder at least 1 inch long from card stock. When dry, roll a second cylinder over the first, wrapping tightly. When gluing the second cylinder, make sure you don’t glue it to the first (inner) piece. Cut a ½ inch (1 cm) section from both cylinders and glue one piece to each of the parts to be joined. When dry, the two cylinders should slip over each other for a friction fit. Secure with glue for a permanent display.
- The truss is assembled from hexagonal and rectangular box sections. Each section is capped and that end cap has a hole to allow the 1 ¼ inch PVC support tubing to pass through. The tubing runs off-center to accommodate the shape of the S1 and P1 truss sections.
- The main solar arrays are made from plain paper segments (to save weight) supported by a 3/16 inch dowel glued up the center of each array. The arrays are mounted to the truss using a 7/32 inch brass tube secured in a hole drilled through the main truss PVC support tube. The solar array dowels then slip into the tubing.
- The radiators for the solar arrays are suspended from a dowel attached to the main truss and attached to the outer end of the radiator.
- The main thermal radiators are suspended from a stiff wire that runs up the center of the mount, then bends 90 degrees and extends out to connect with the end of the top radiator panel. All three panels are tied together at the outer end with a strip of card to hold them up.
- The finished model should be suspended from (or supported at) at least four points: both ends of the truss, the center of the truss, and the back end (Progress/Zvezda) of the central spine.

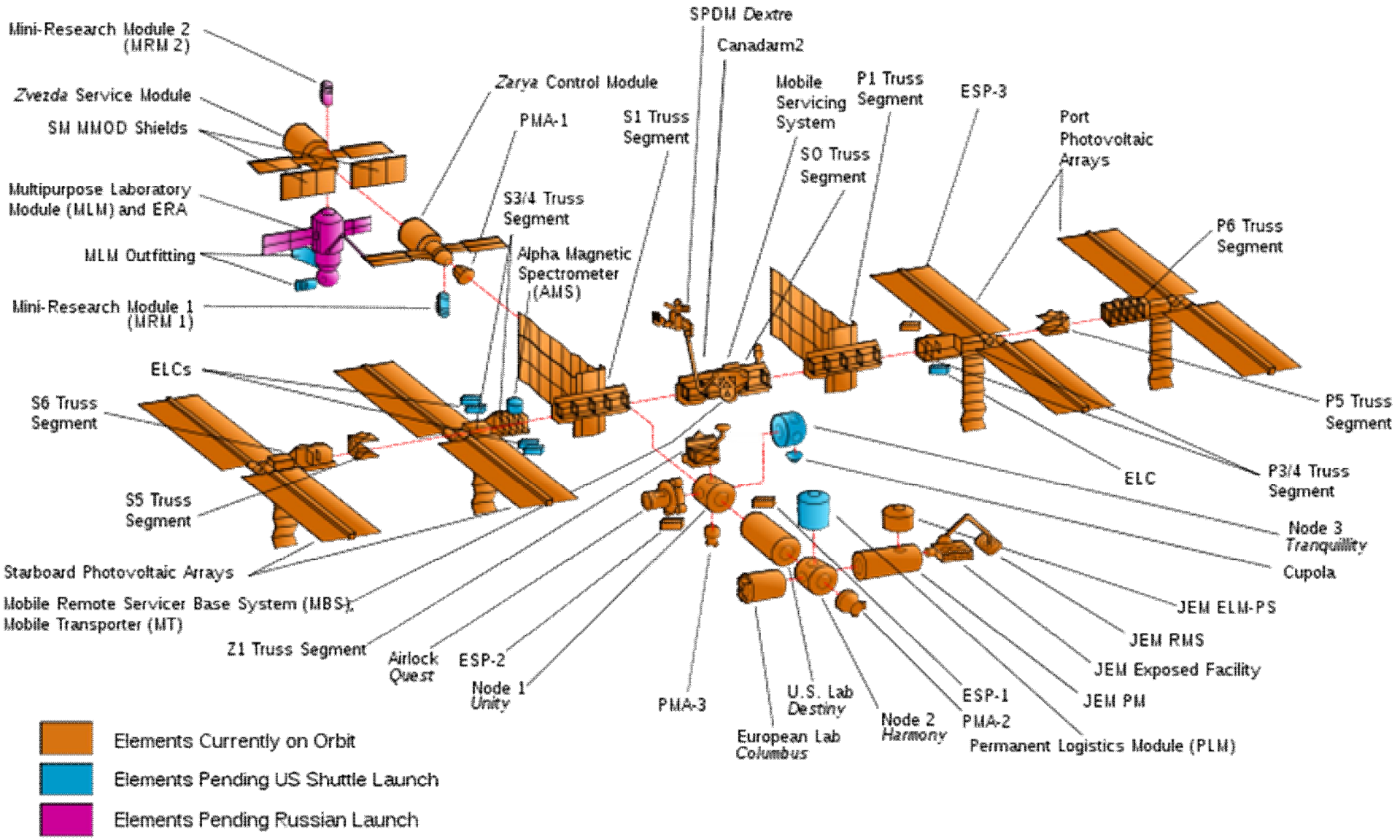
STRUCTURAL SUPPORT
CEILING HANGER DISPLAY

ADDITIONAL STRUCTURE (NODE, LS MODULES, CREW VEHICLES) ATTACHED WITH GLUED PAPER TUBING: NON-STRUCTURAL

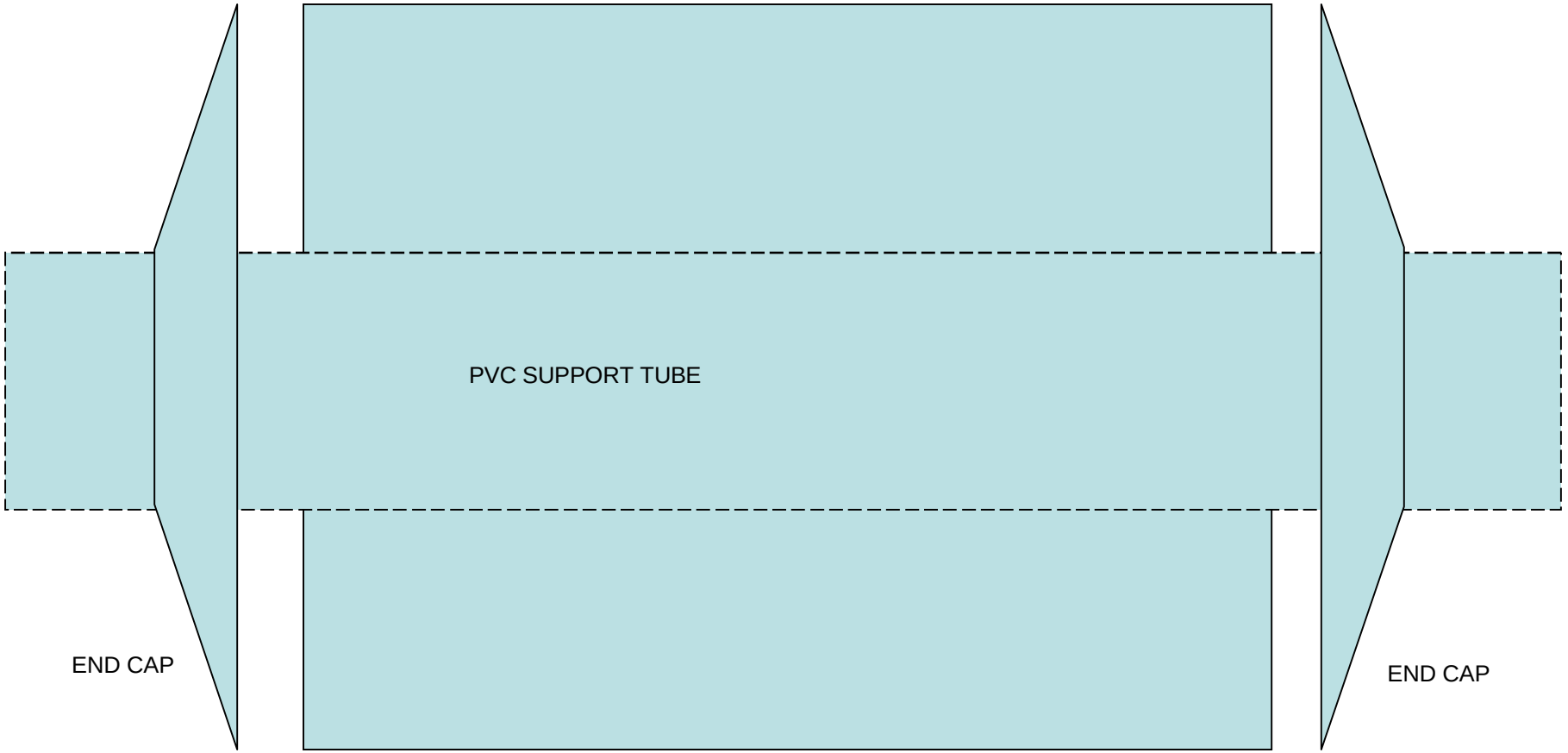


ISS Configuration

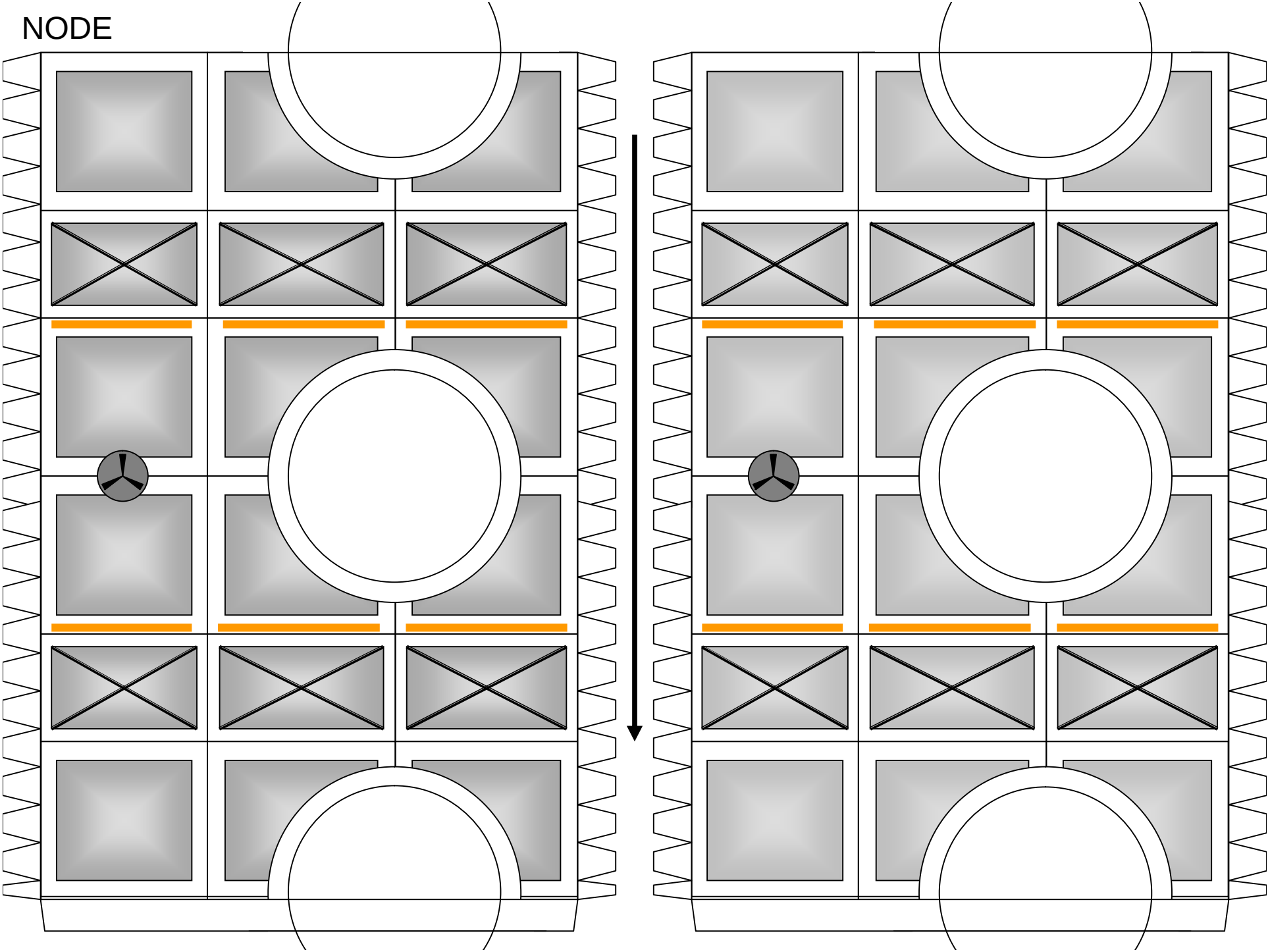
As of July 2009 (2J/A)



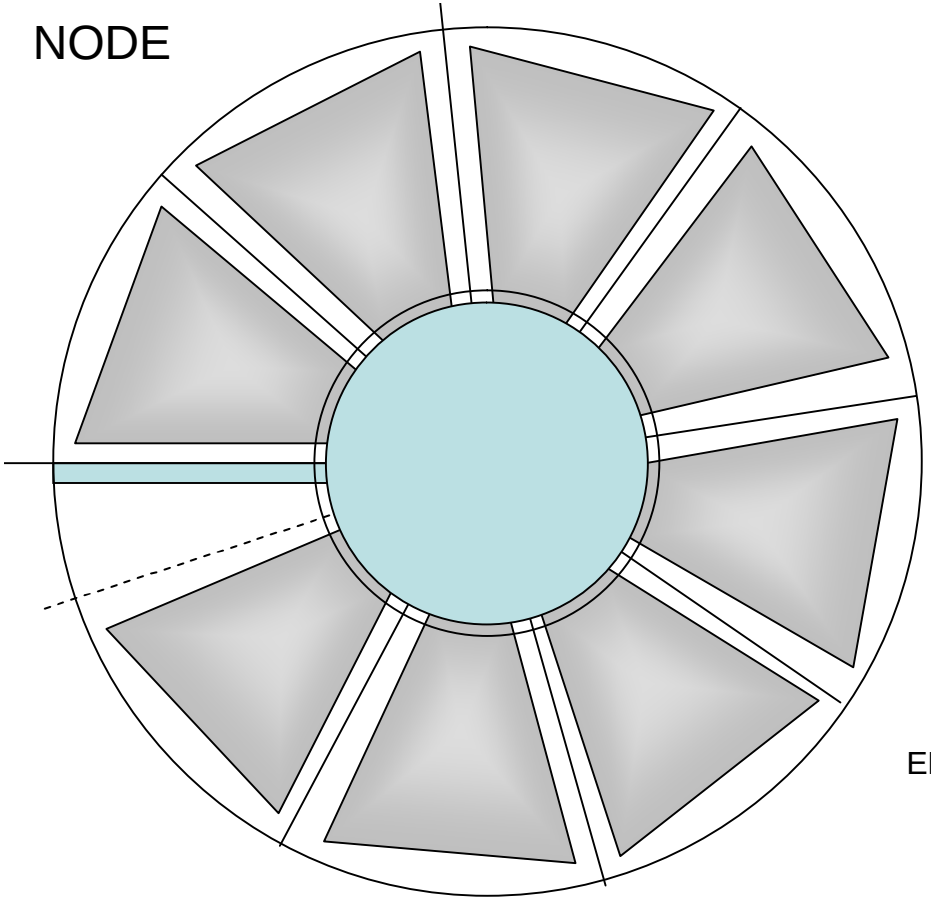
Modules

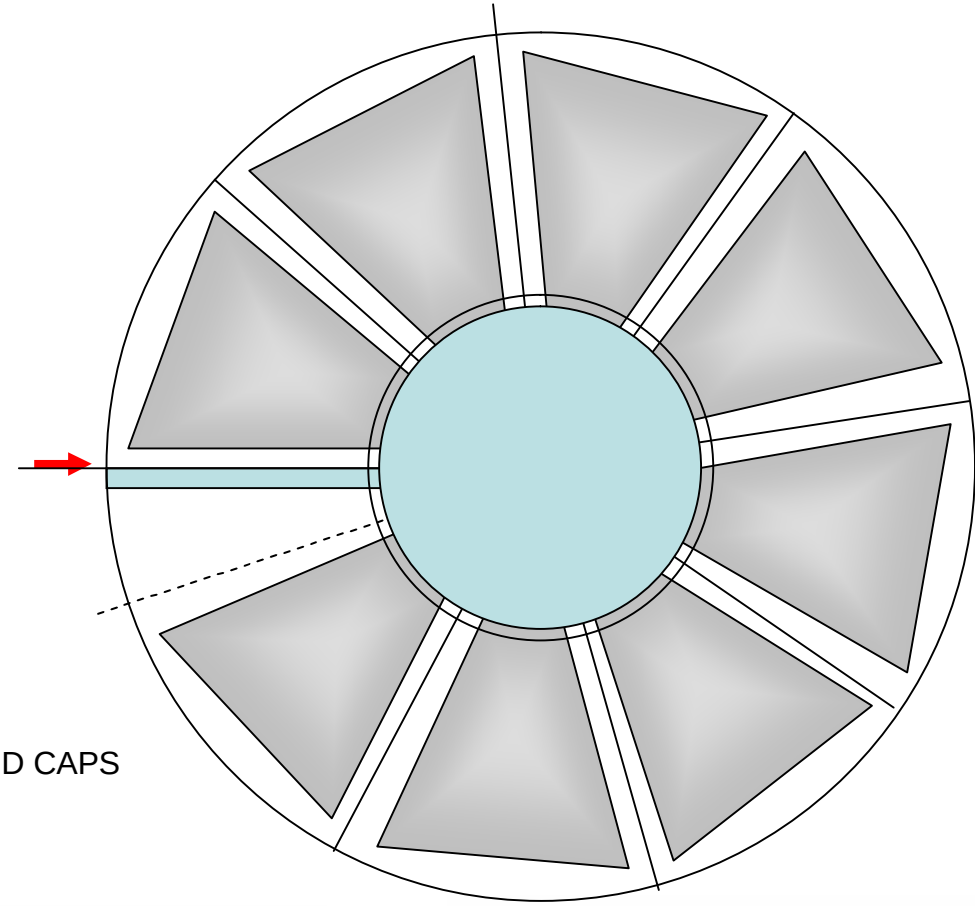


NODE

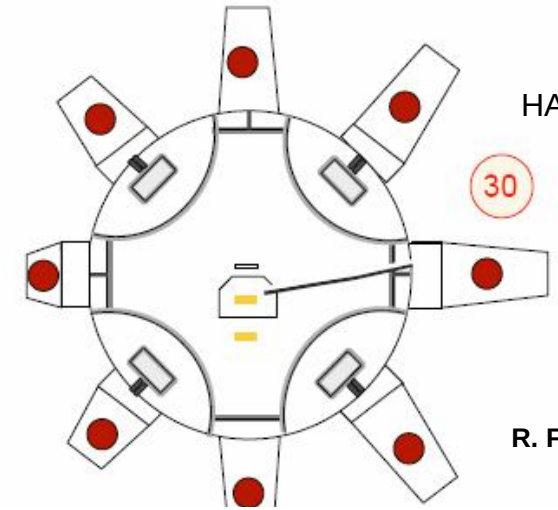


NODE

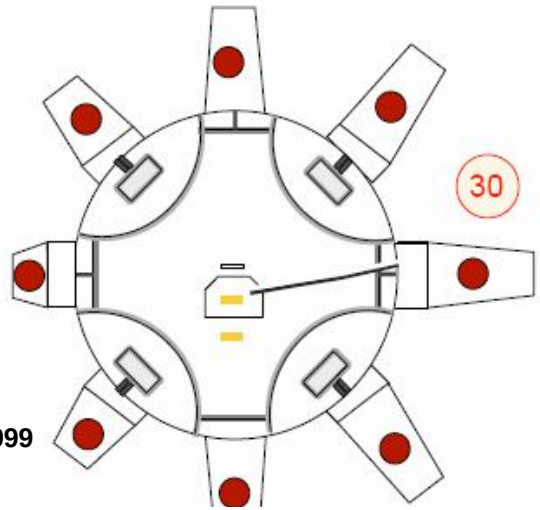


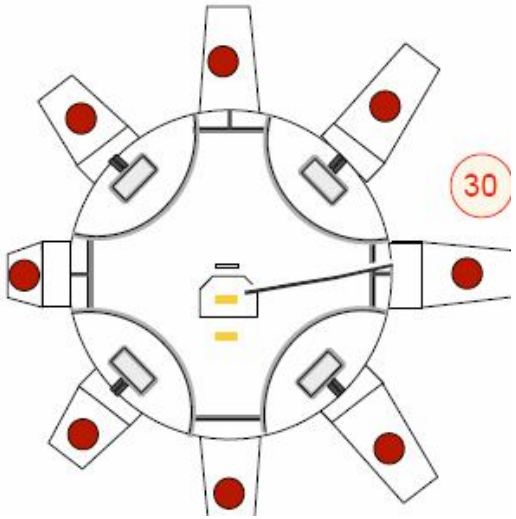


END CAPS



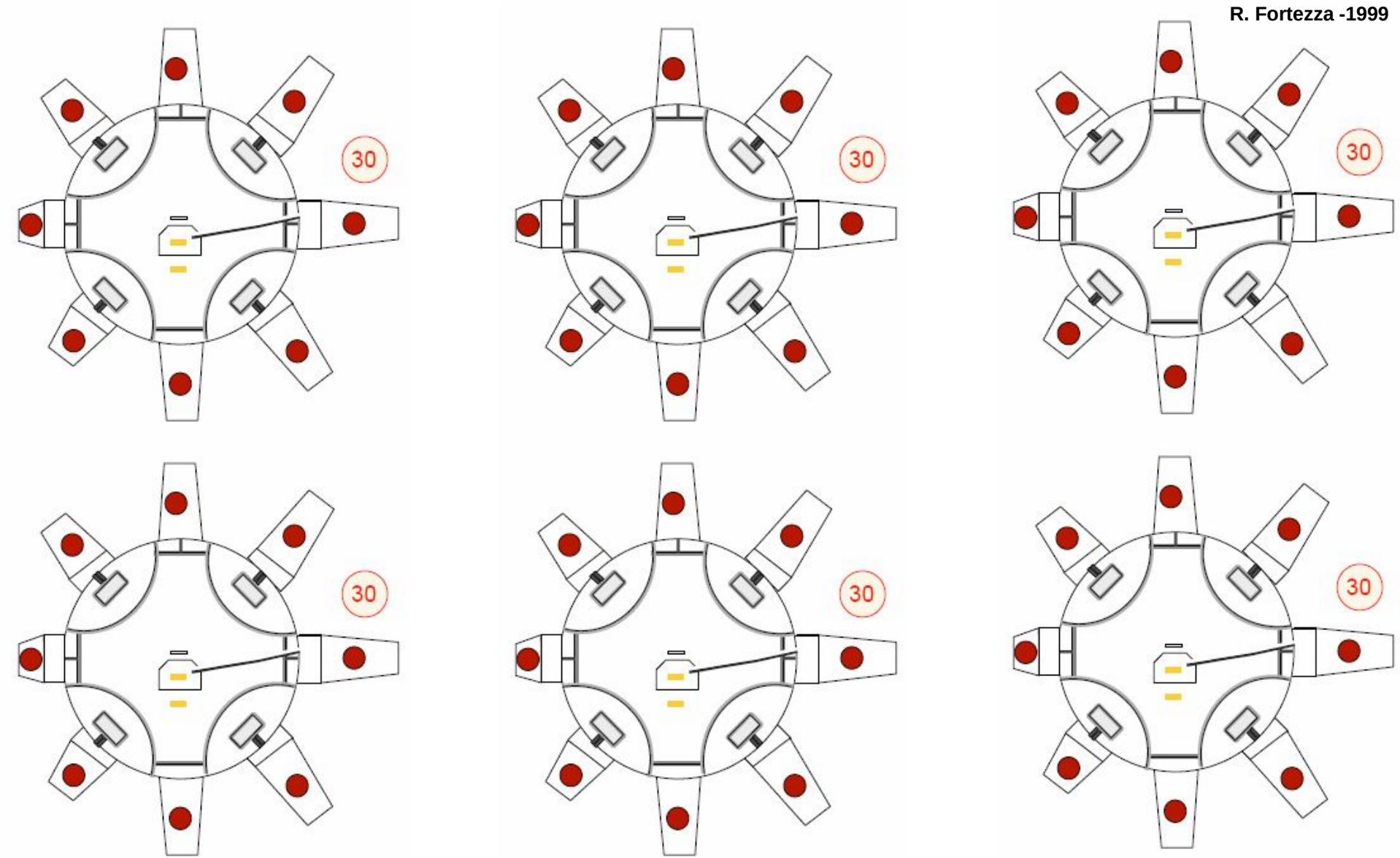
HATCHES



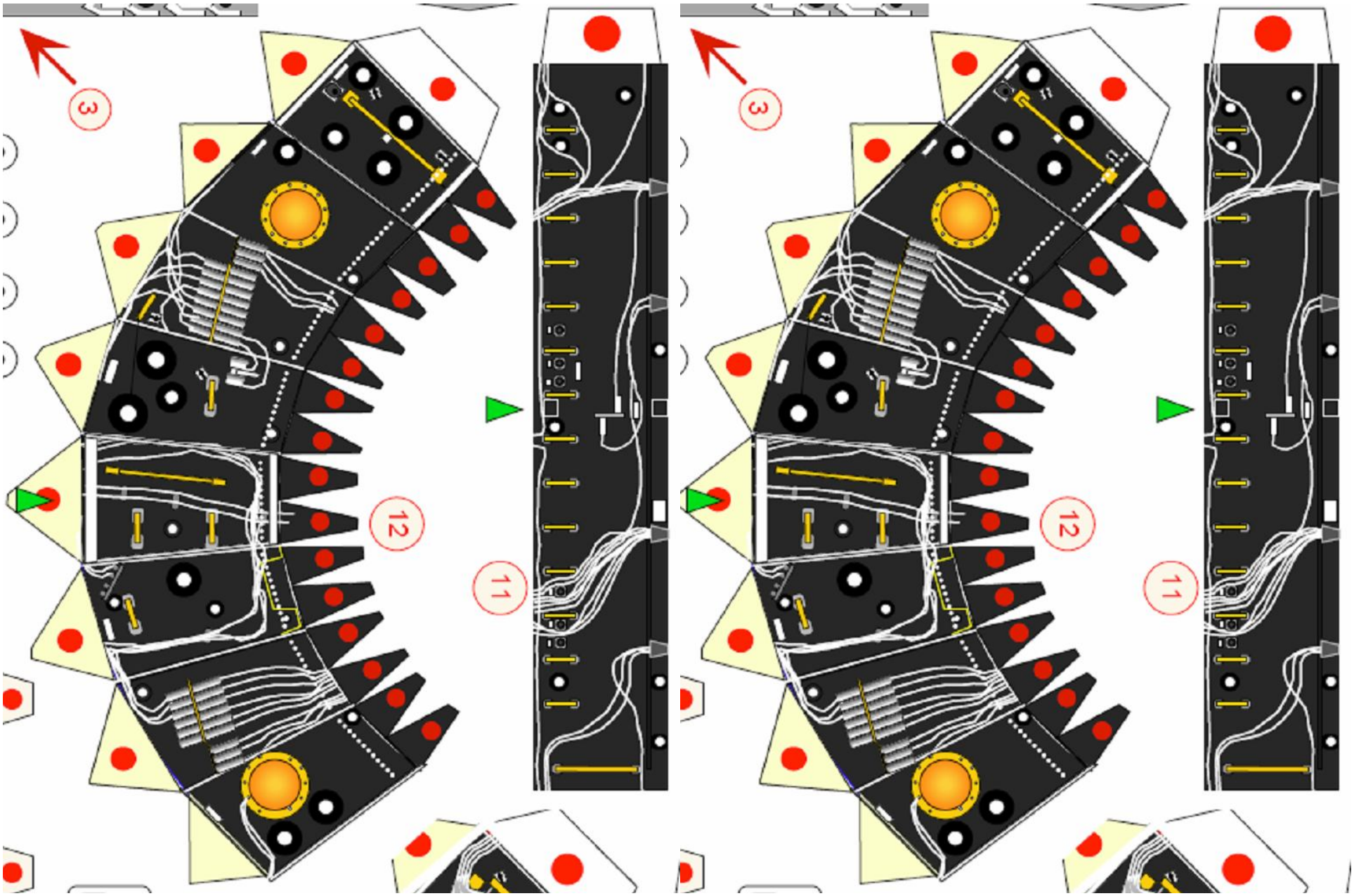


R. Fortezza -1999

R. Fortezza -1999

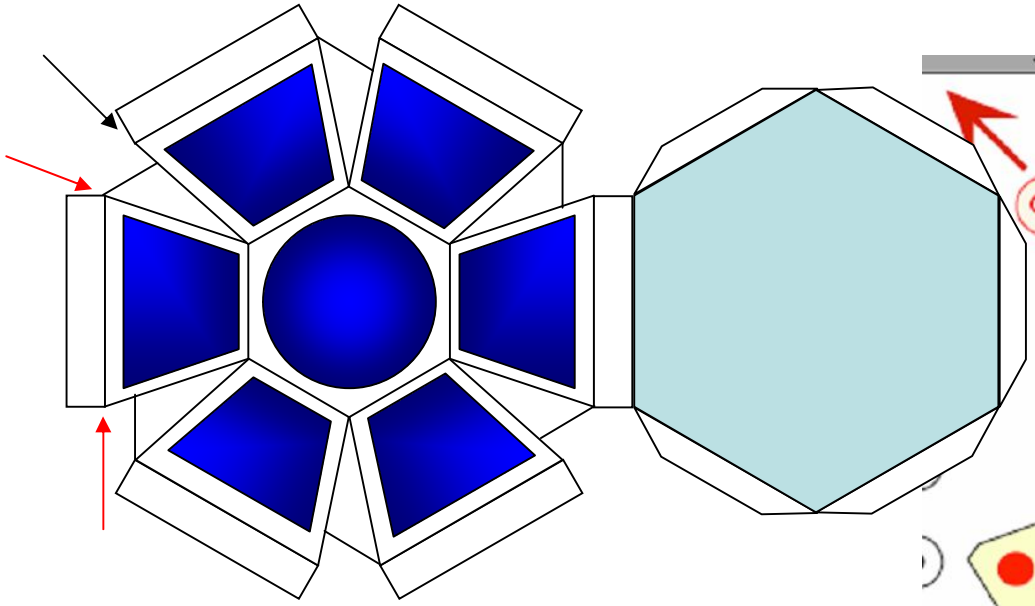


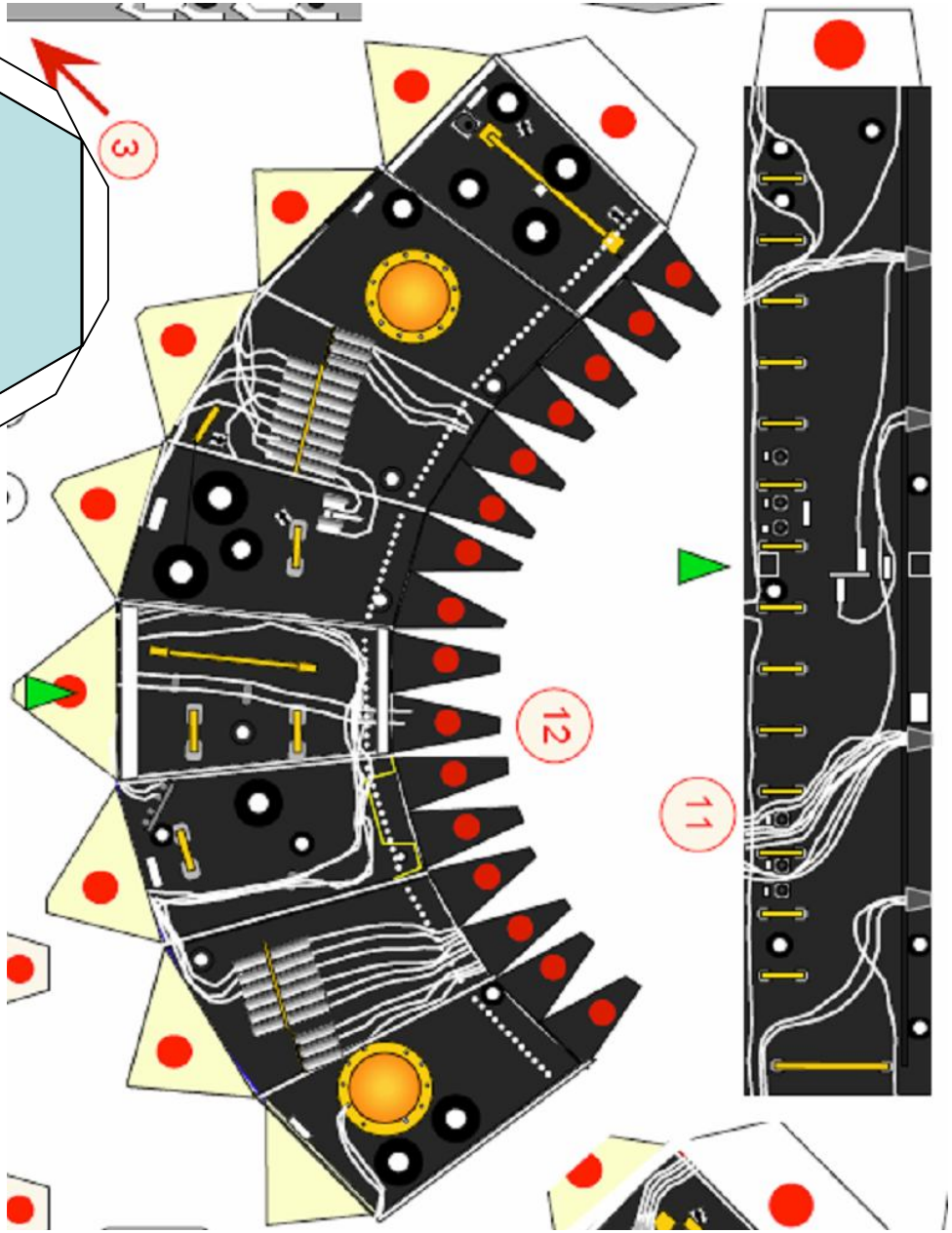
NODE – docking adapter



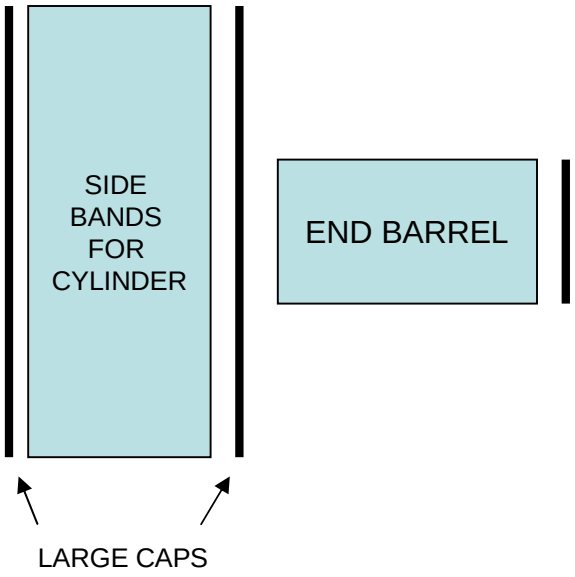
NODE – cupola

R. Fortezza -1999



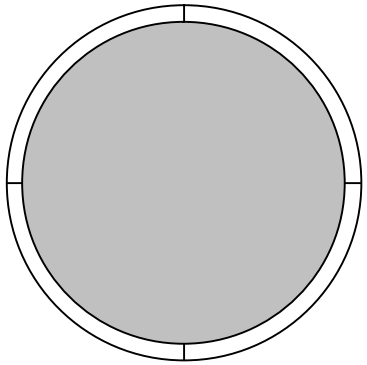


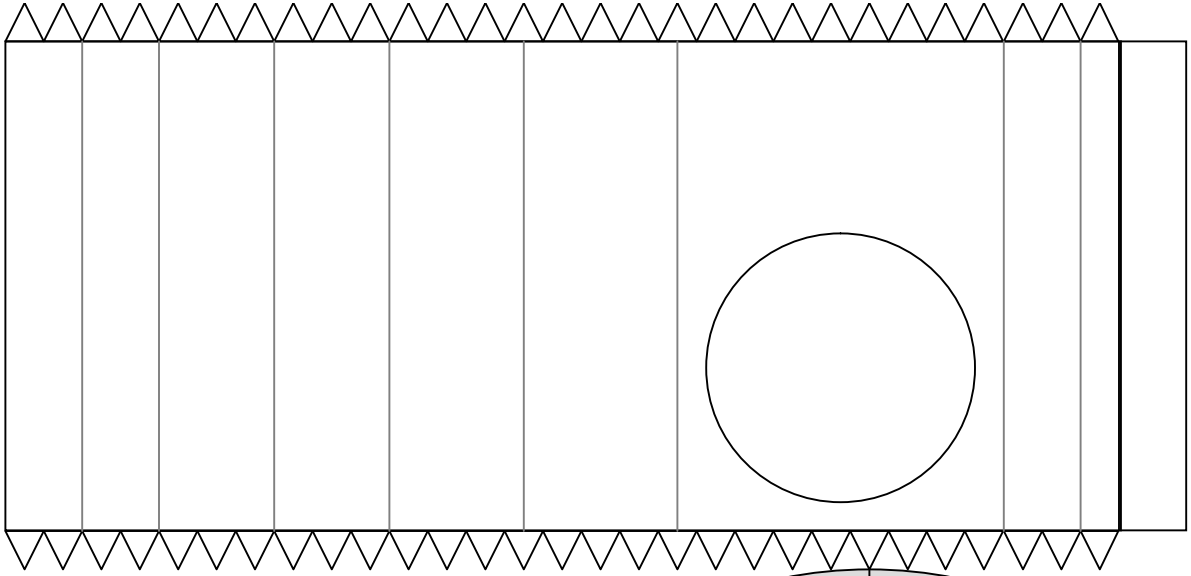
NODE - AIRLOCK



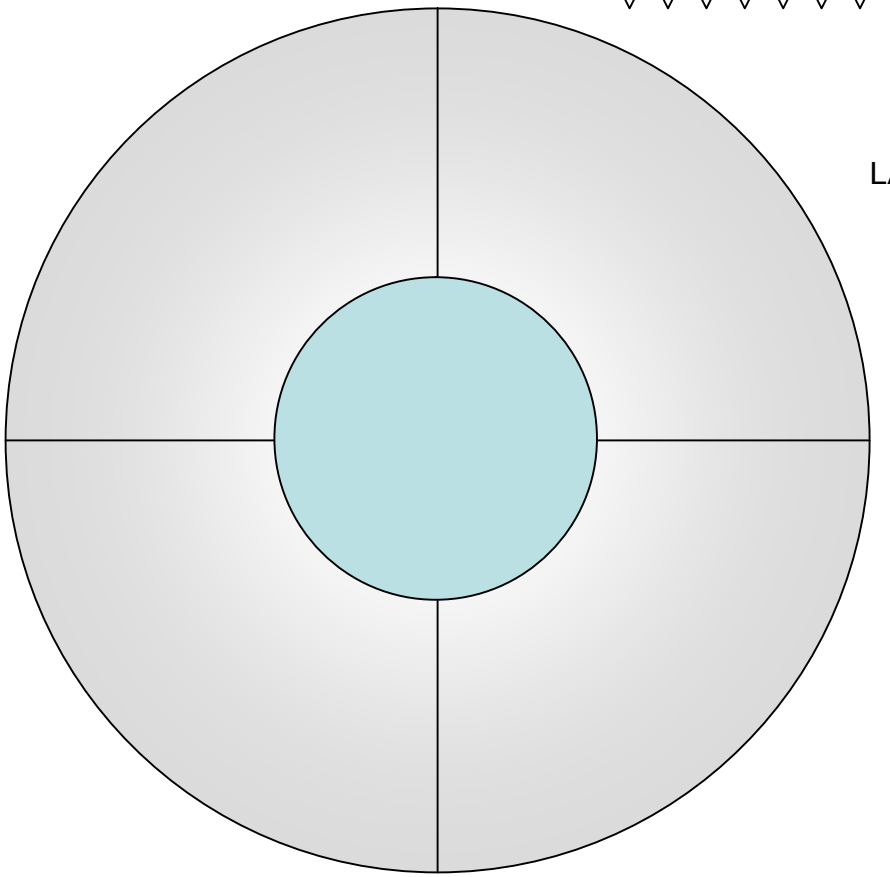
NODE – airlock

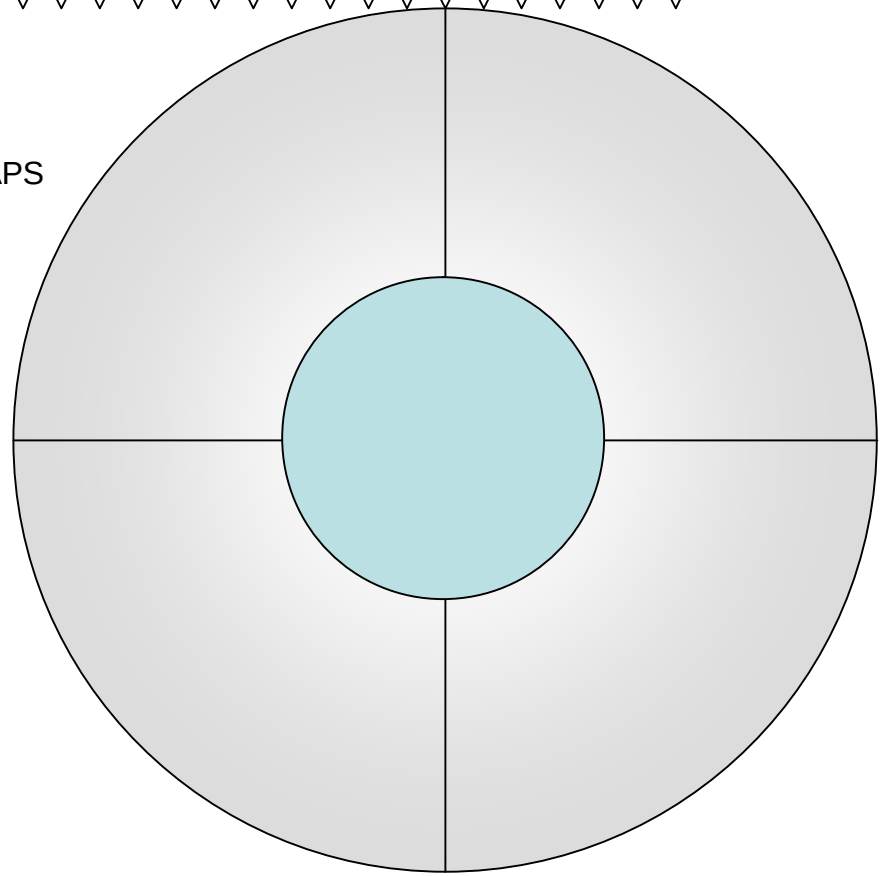
END BARREL





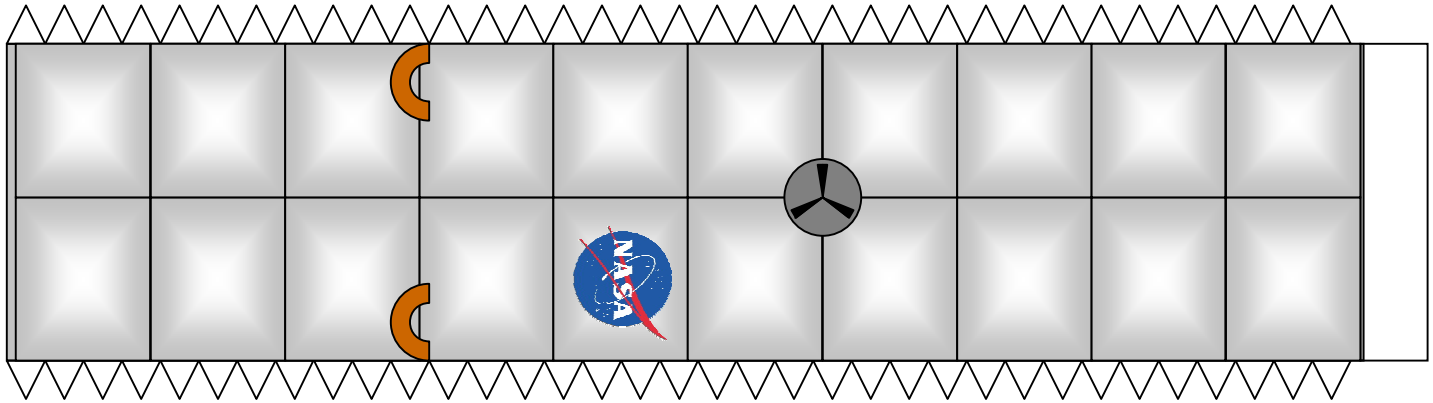
LARGE CAPS

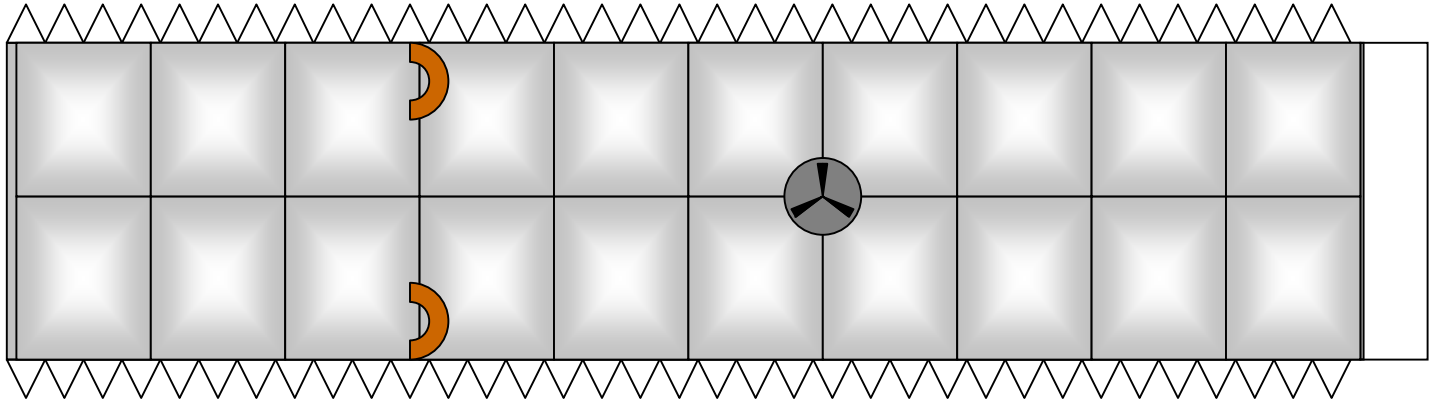


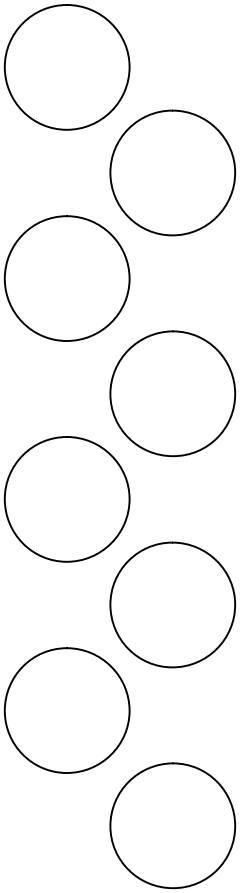


NODE – airlock

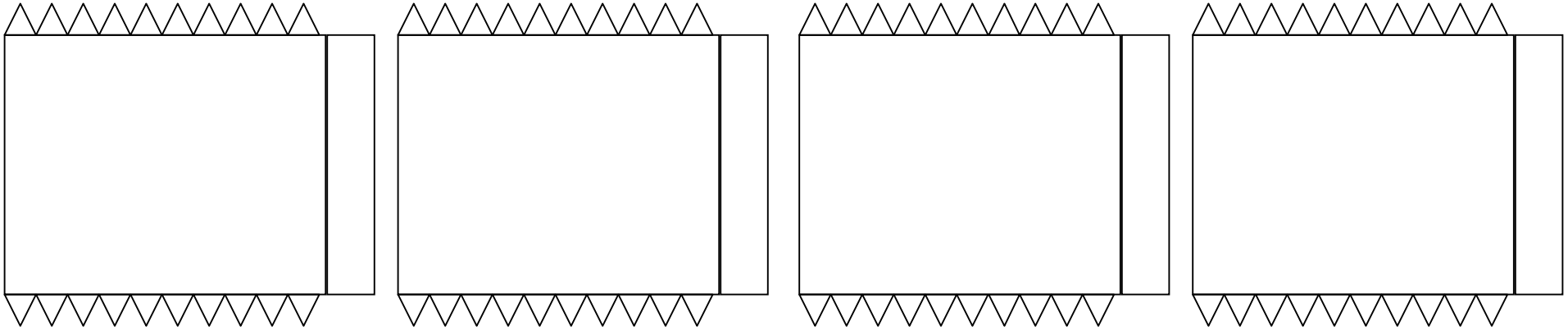
SIDE BAND



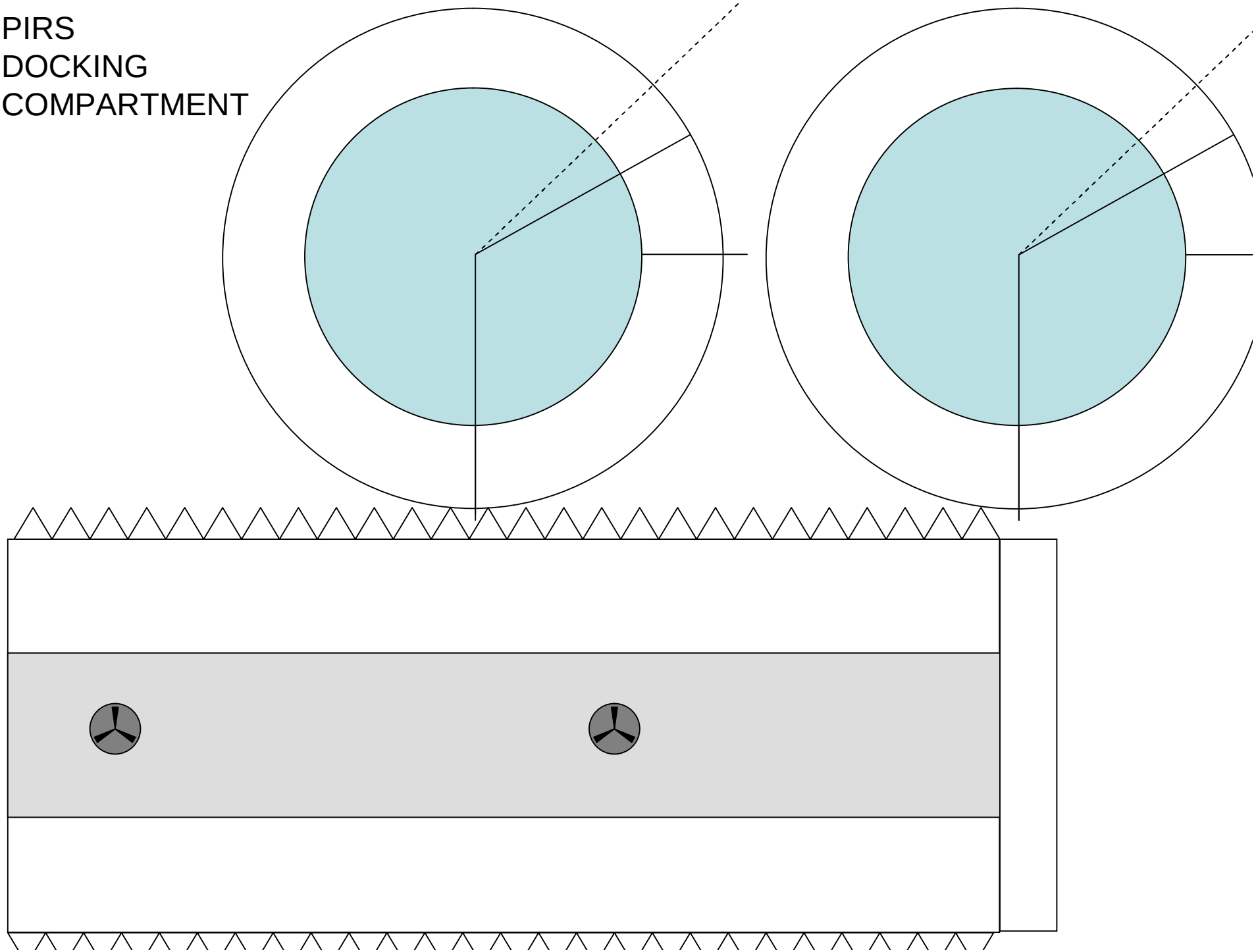




GAS CANNISTERS (4)

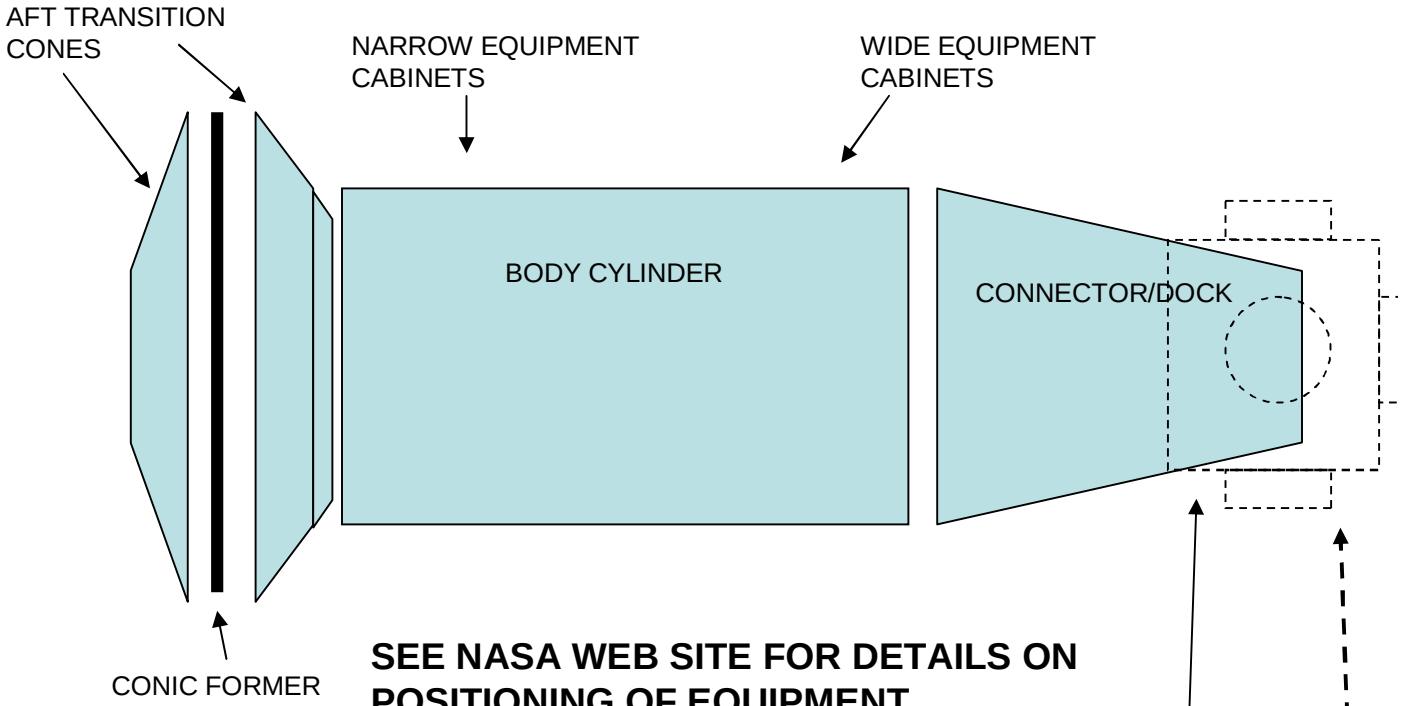


PIRS
DOCKING
COMPARTMENT



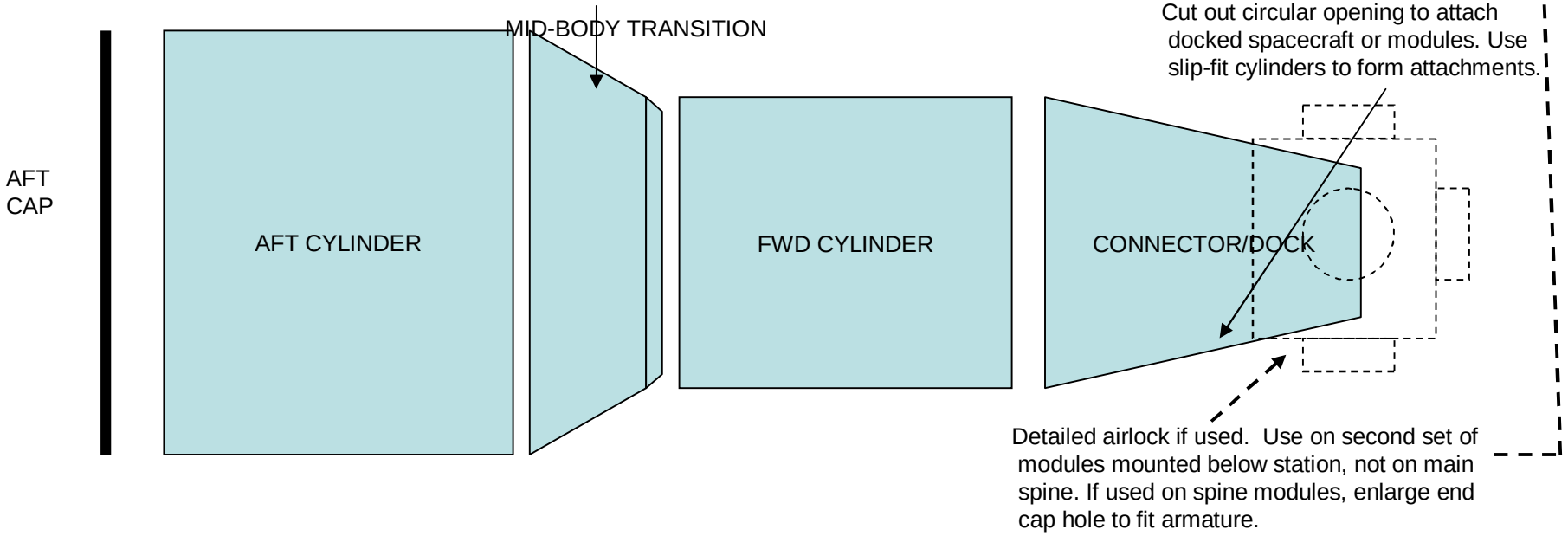
FGB/UDM
Zarya (use radiator array)
Research Module

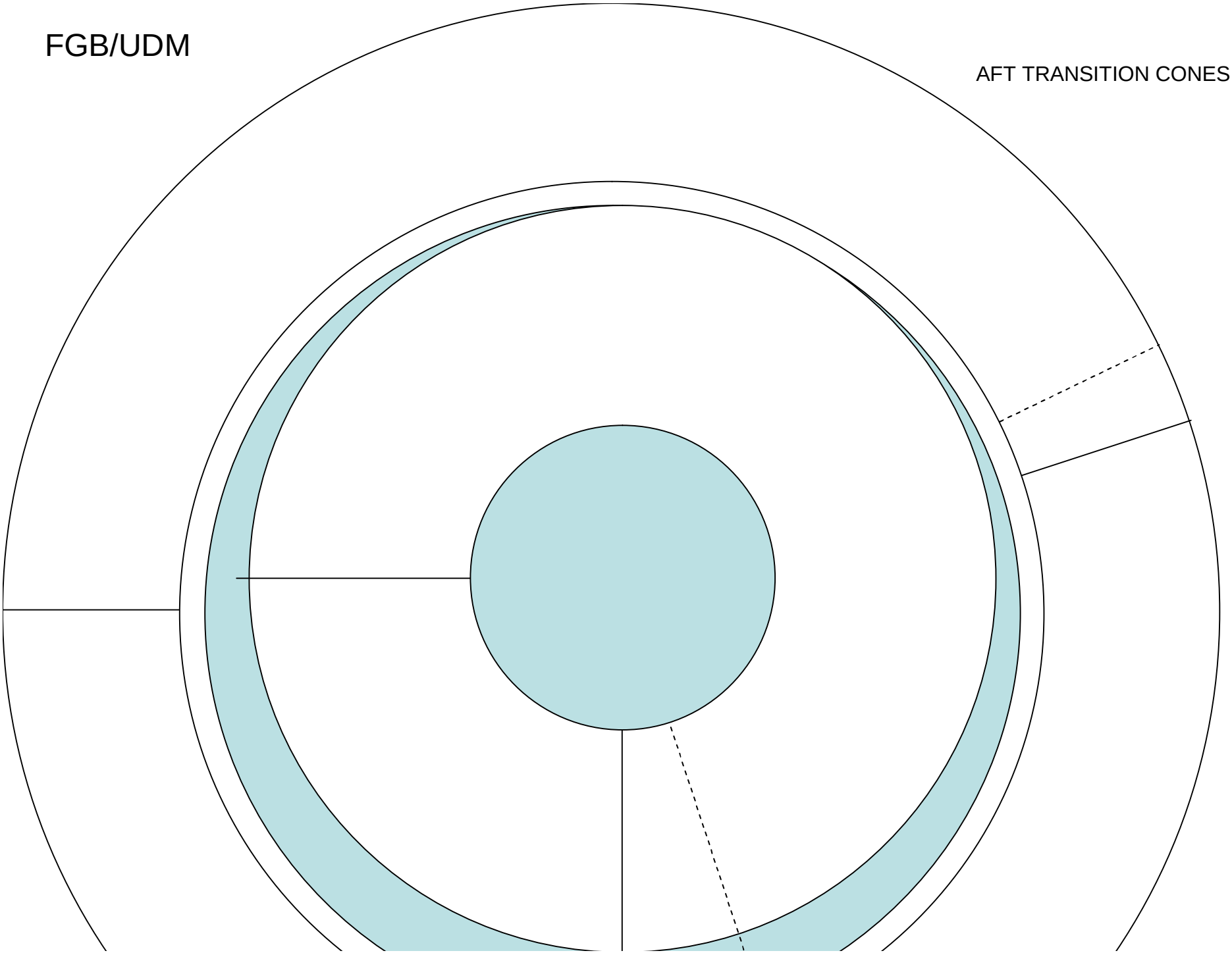
(RM has two solar arrays set at 90 degree angle, no radiator, only aft set of narrow equipment boxes)



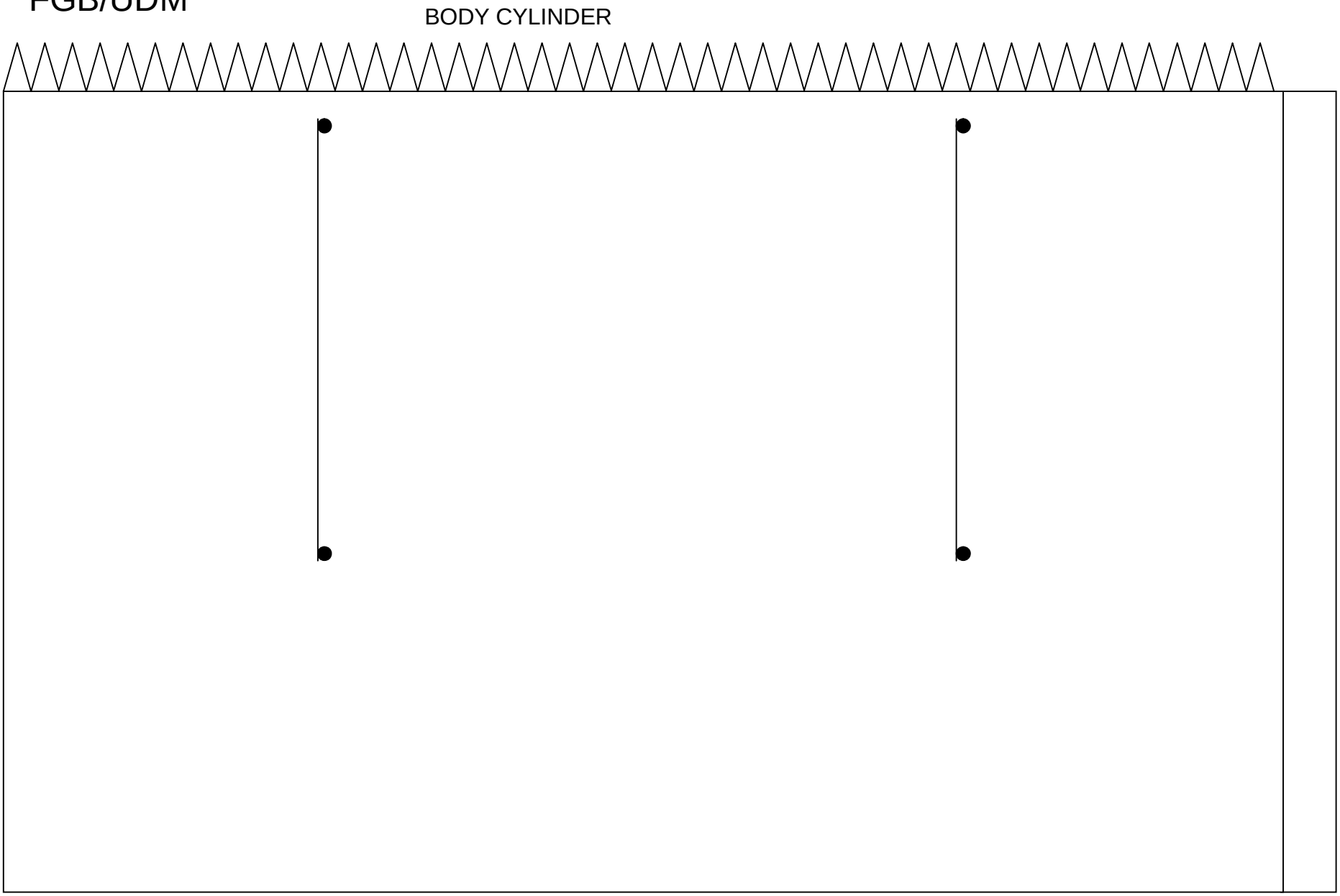
SERVICE MODULE
Zvezda
Multipurpose Lab Module

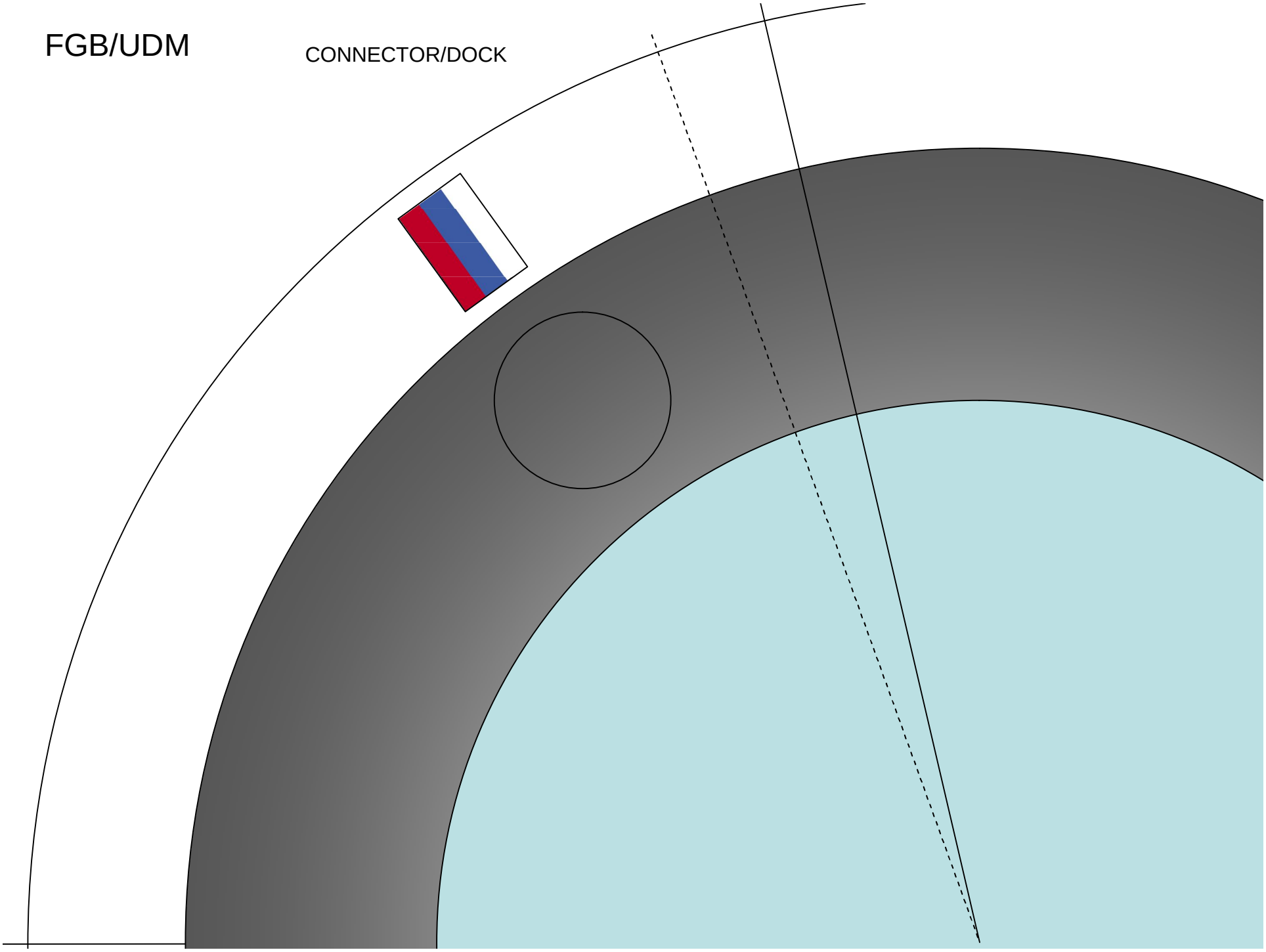
SEE NASA WEB SITE FOR DETAILS ON POSITIONING OF EQUIPMENT BOXES, RADIATOR, AND SOLAR PANELS.



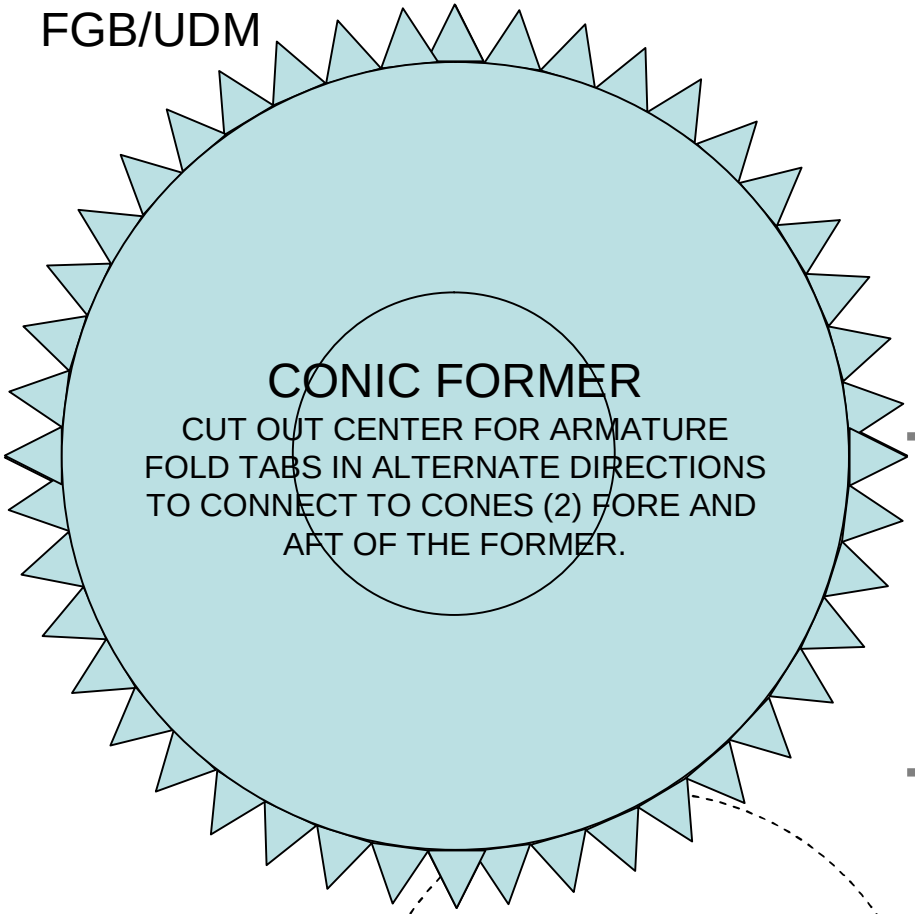

FGB/UDM
AFT TRANSITION CONES

FGB/UDM




FGB/UDM
CONNECTOR/DOCK

FGB/UDM

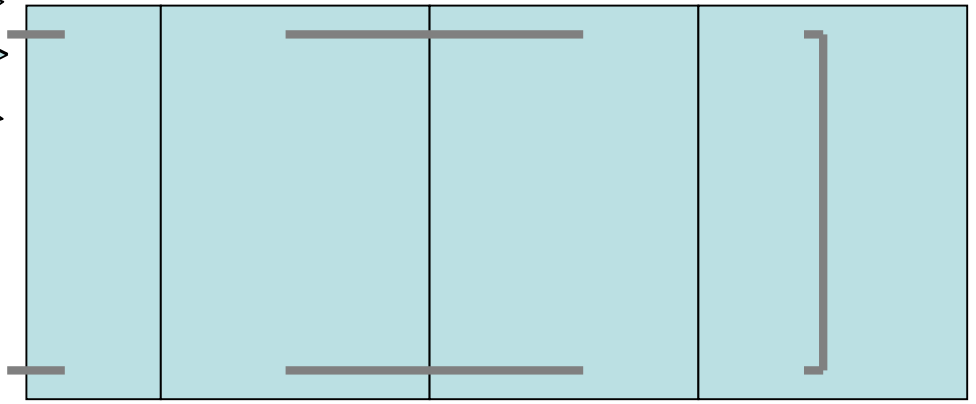


CONIC FORMER

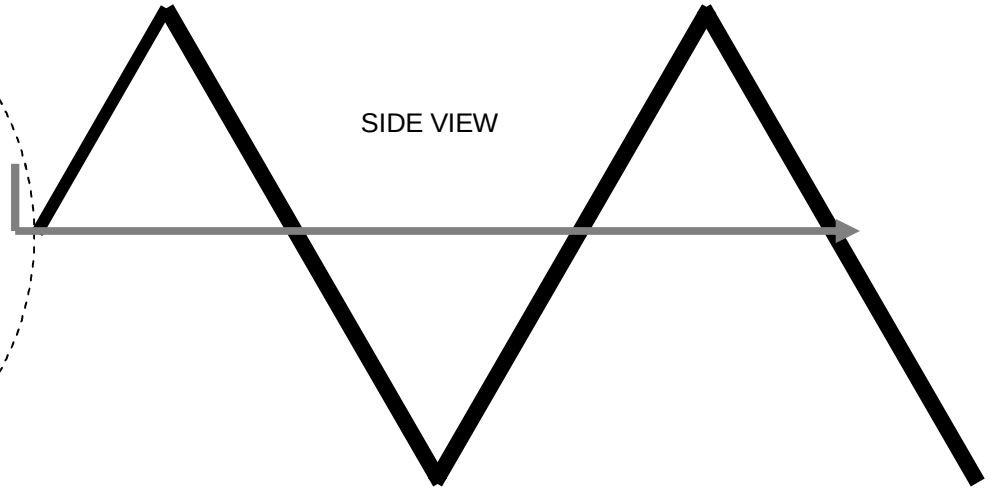
CUT OUT CENTER FOR ARMATURE
FOLD TABS IN ALTERNATE DIRECTIONS TO CONNECT TO CONES (2) FORE AND AFT OF THE FORMER.

RUN U-SHAPED COAT HANGER WIRE FOR SUPPORT. BEND UP INNER ENDS TO HOLD ALIGNMENT.

TOP VIEW

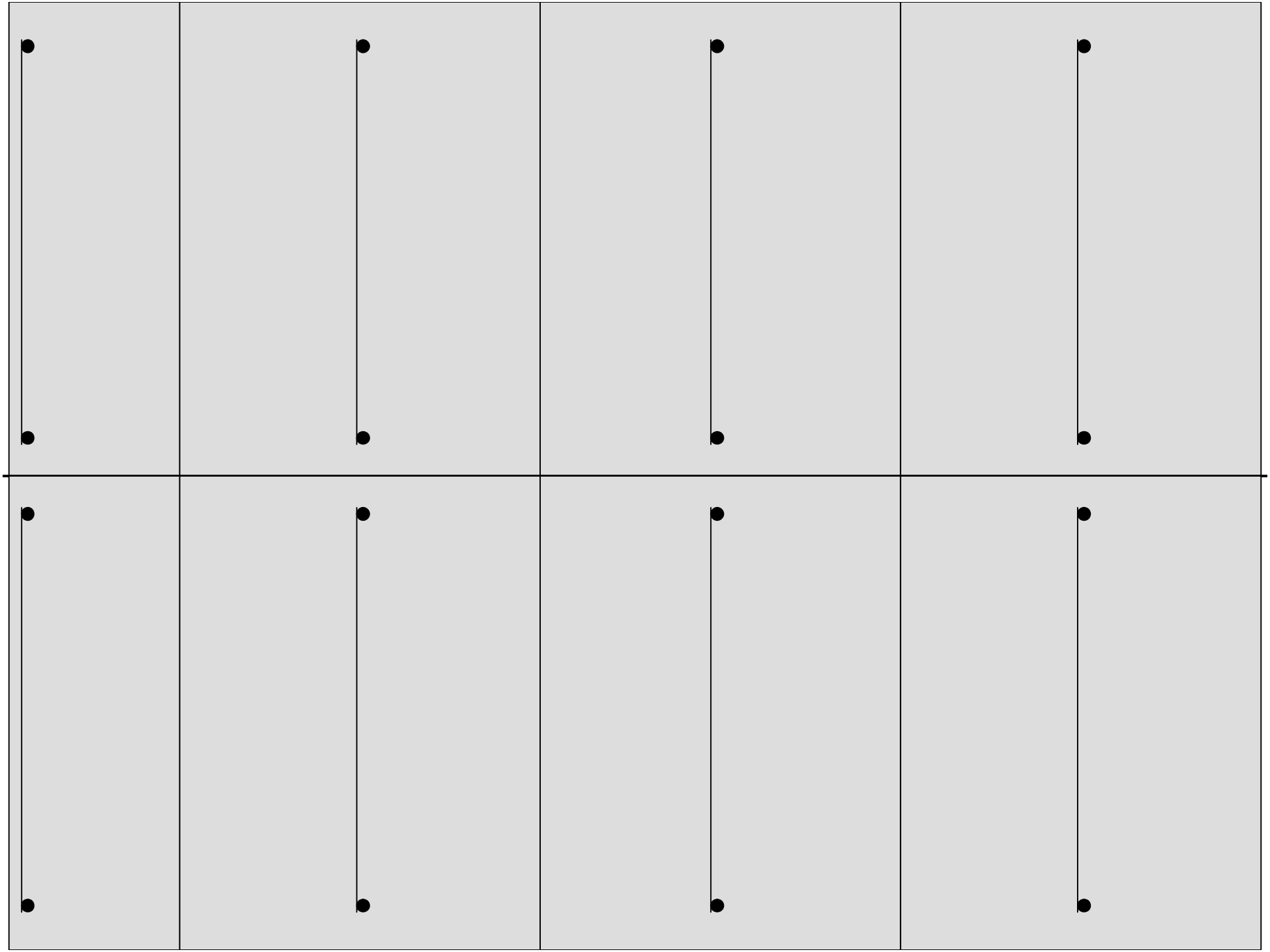


SIDE VIEW

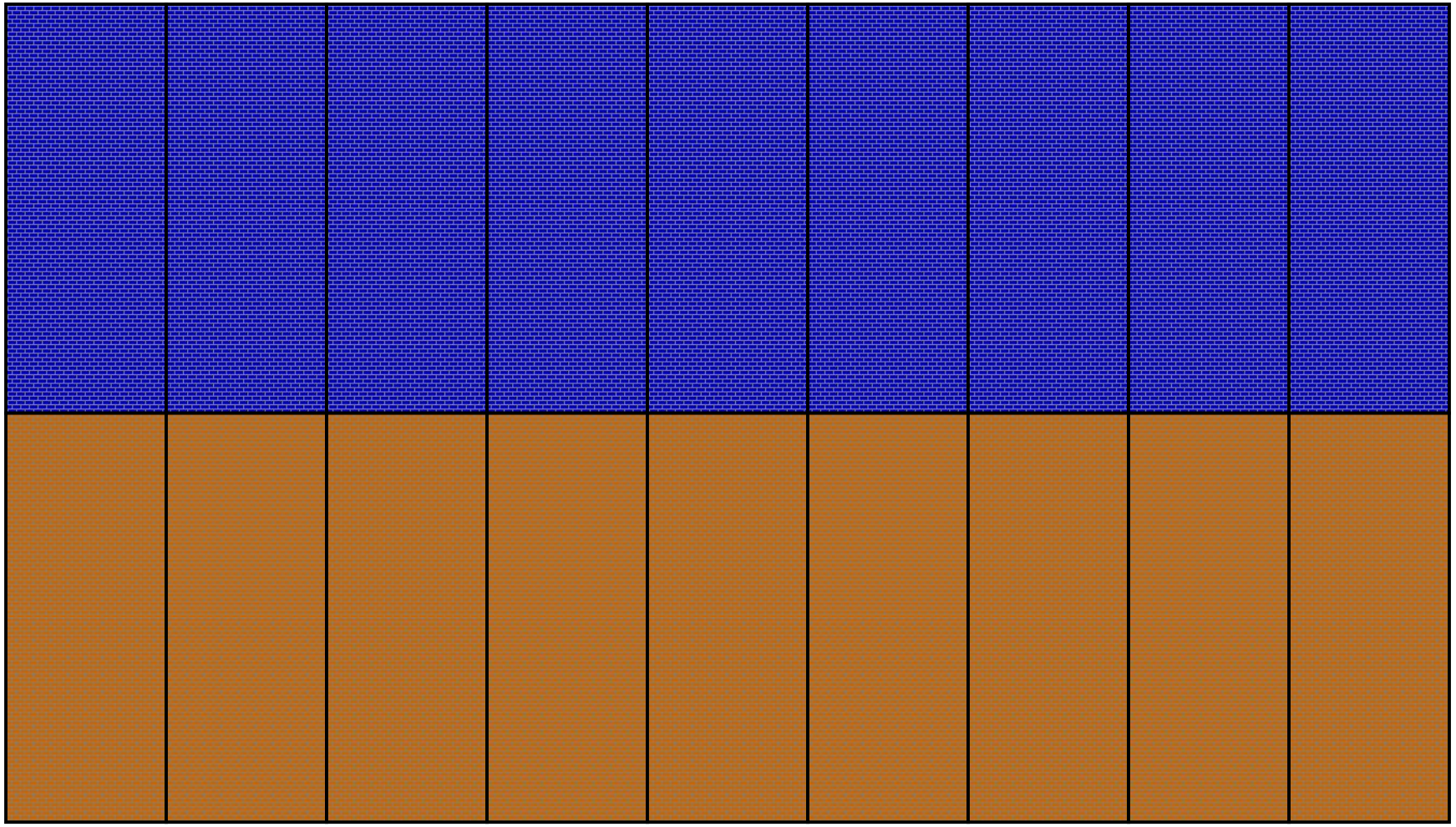


RADIATOR PANELS NEXT PAGE

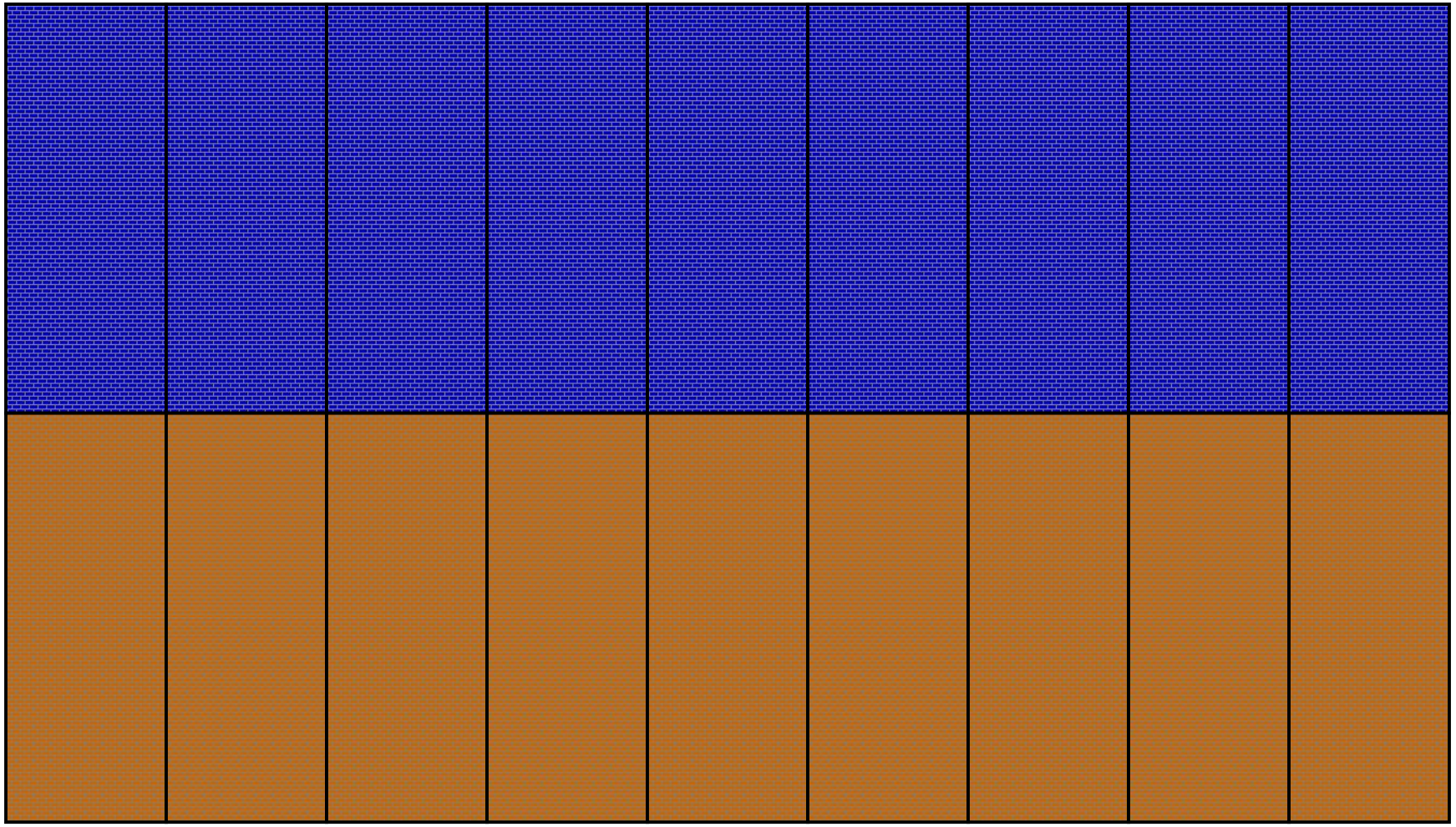
Two panels, cut long center line, fold on short verticals, pierce dots for support wire.



RESEARCH MODULE VARIANT – SOLAR ARRAYS

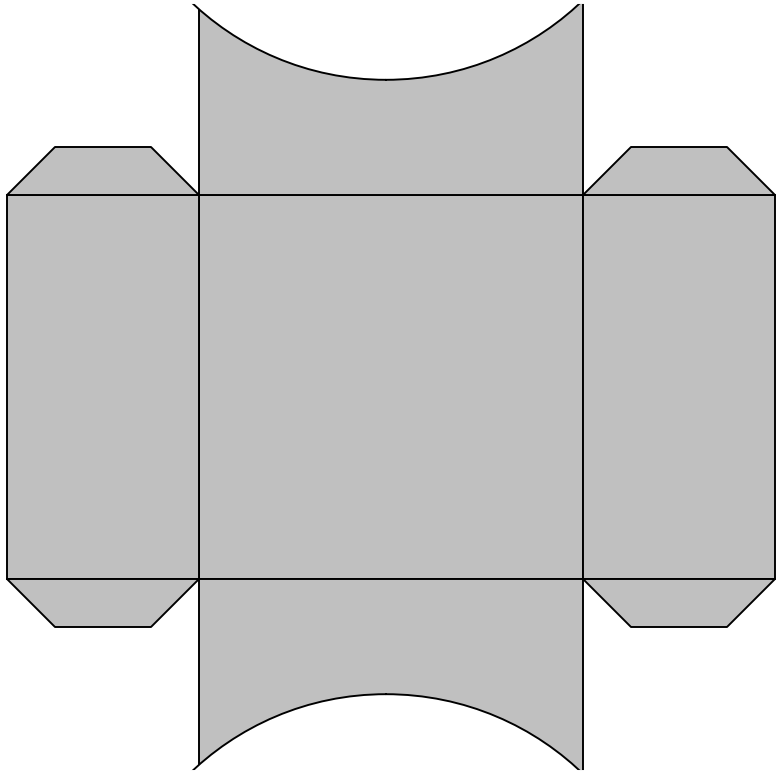


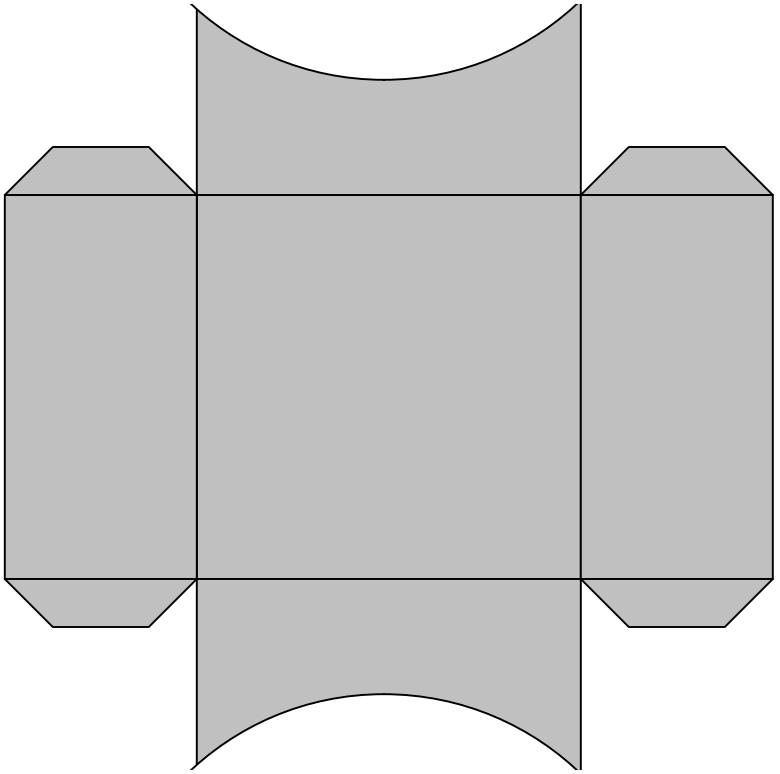
RESEARCH MODULE VARIANT – SOLAR ARRAYS



FGB/UDM

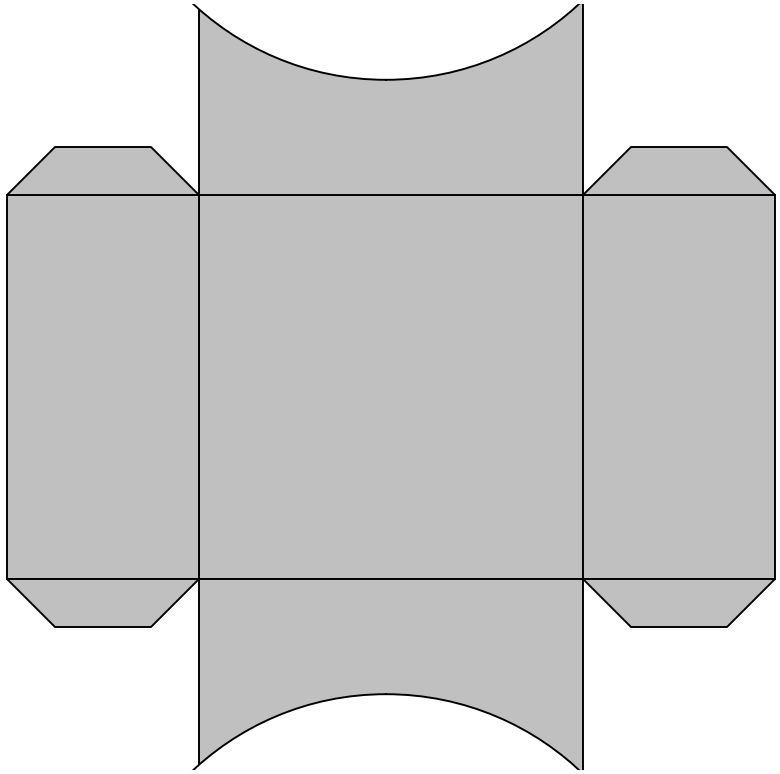
EQUIPMENT CABINETS

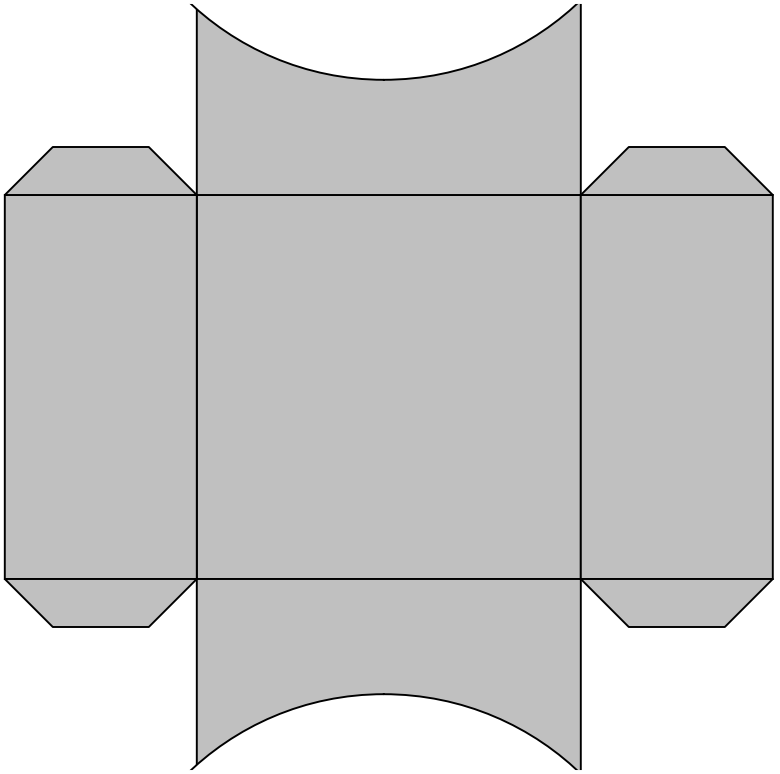




FGB/UDM

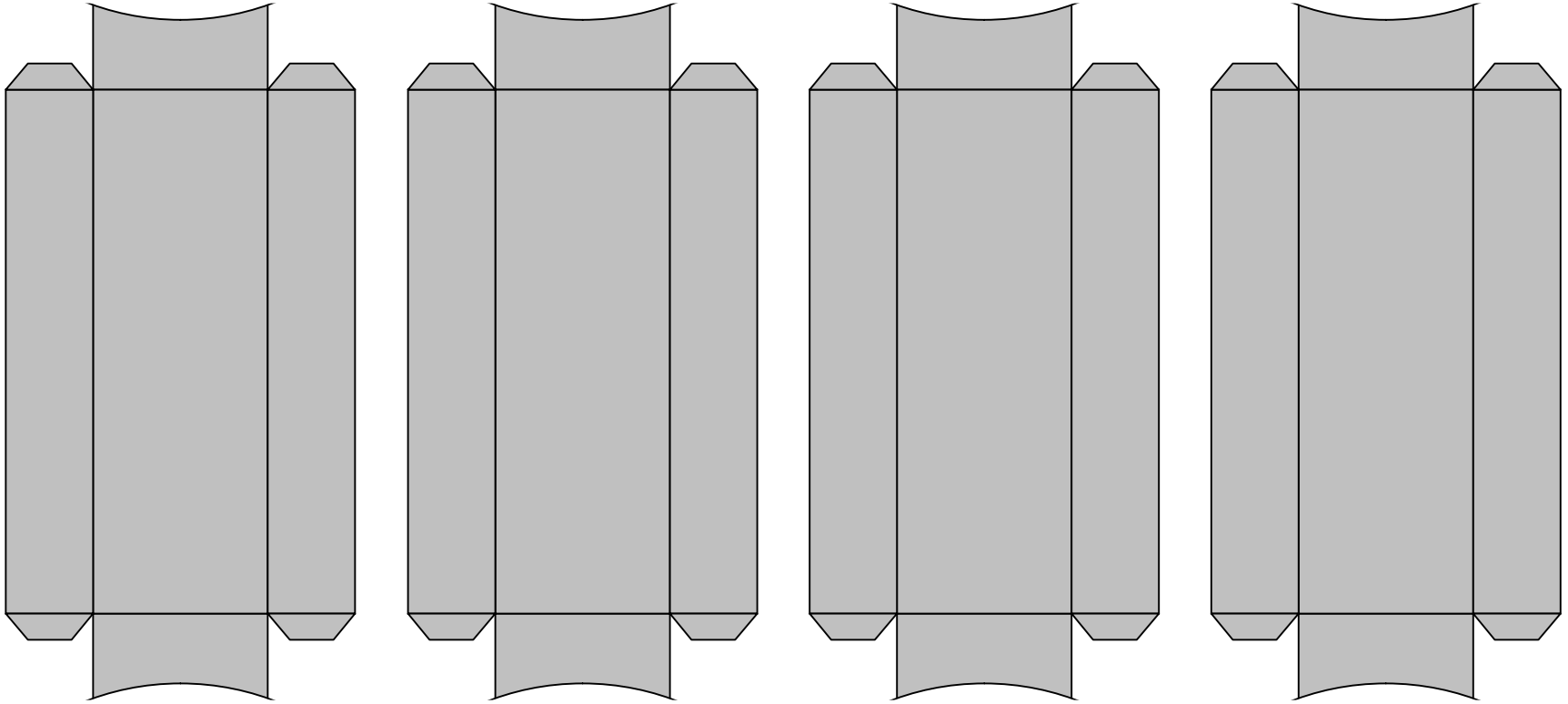
EQUIPMENT CABINETS



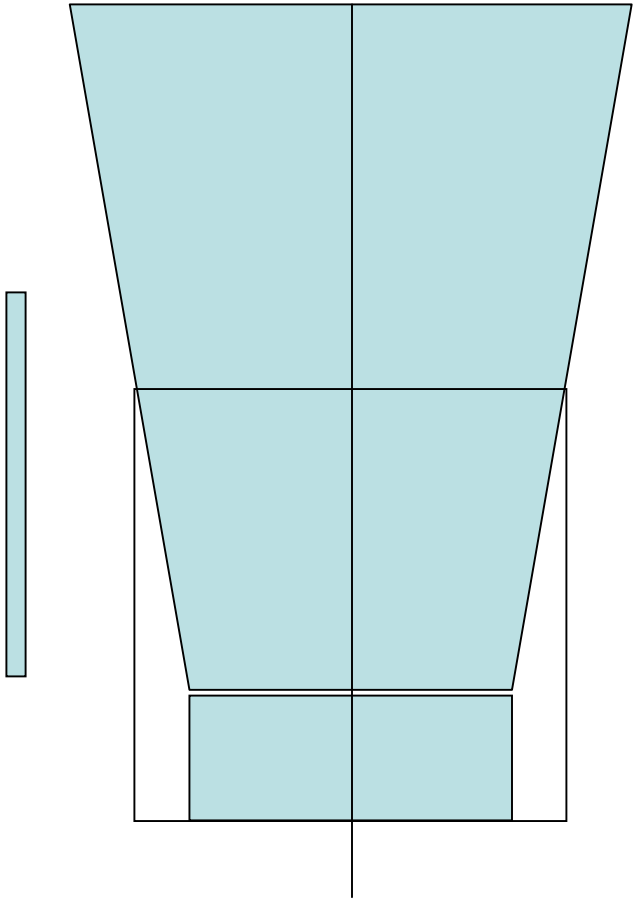


EQUIPMENT CABINETS

FGB/UDM

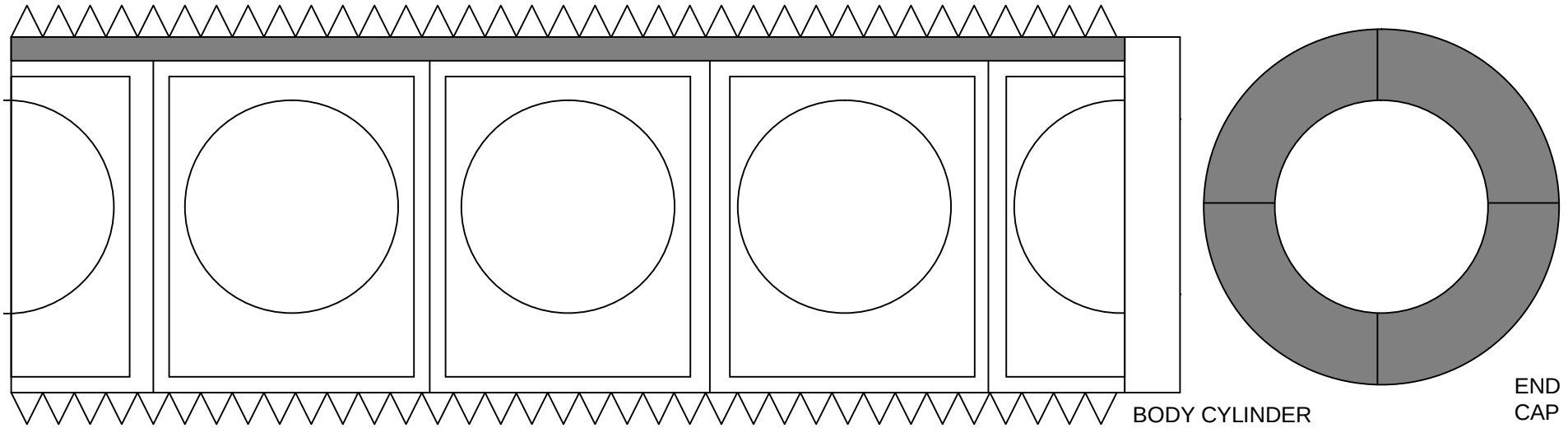


DETAILED AIRLOCK SECTION
FOR FGB/UDM OR SM



DETAILED AIRLOCK SECTION FOR FGB/UDM OR SM

ROLL SLIP CYLINDERS (see page 1) – CUT APART ALONG LINES AFTER ROLLING



BODY CYLINDER

END CAP

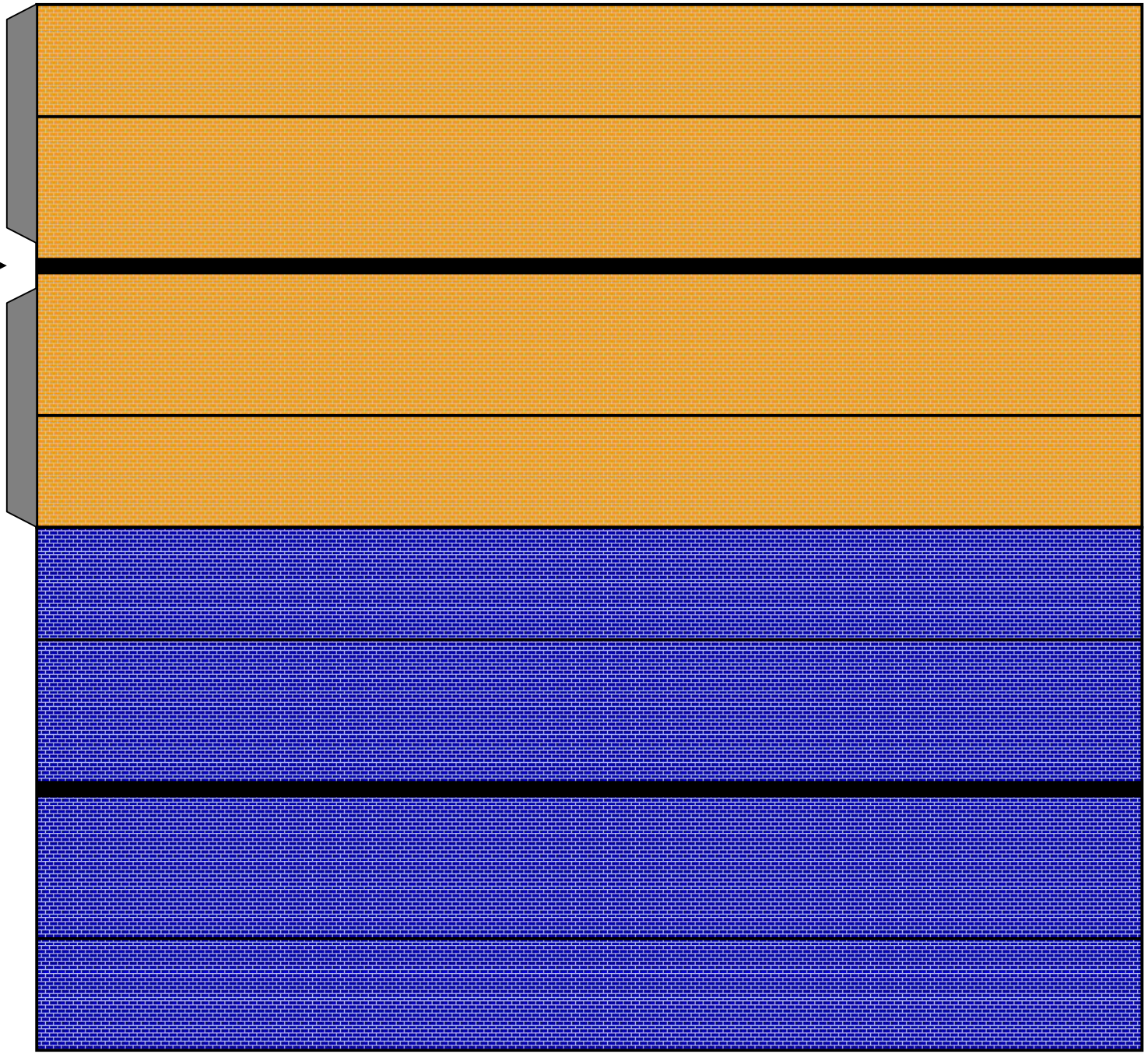
SERVICE MODULE

PRINT ON PLAIN PAPER

INNER SOLAR PANEL

INSERT
COATHANGER WIRE
FOR SUPPORT.
RUN FULL LENGTH
OF INNER AND
OUTER PANELS.

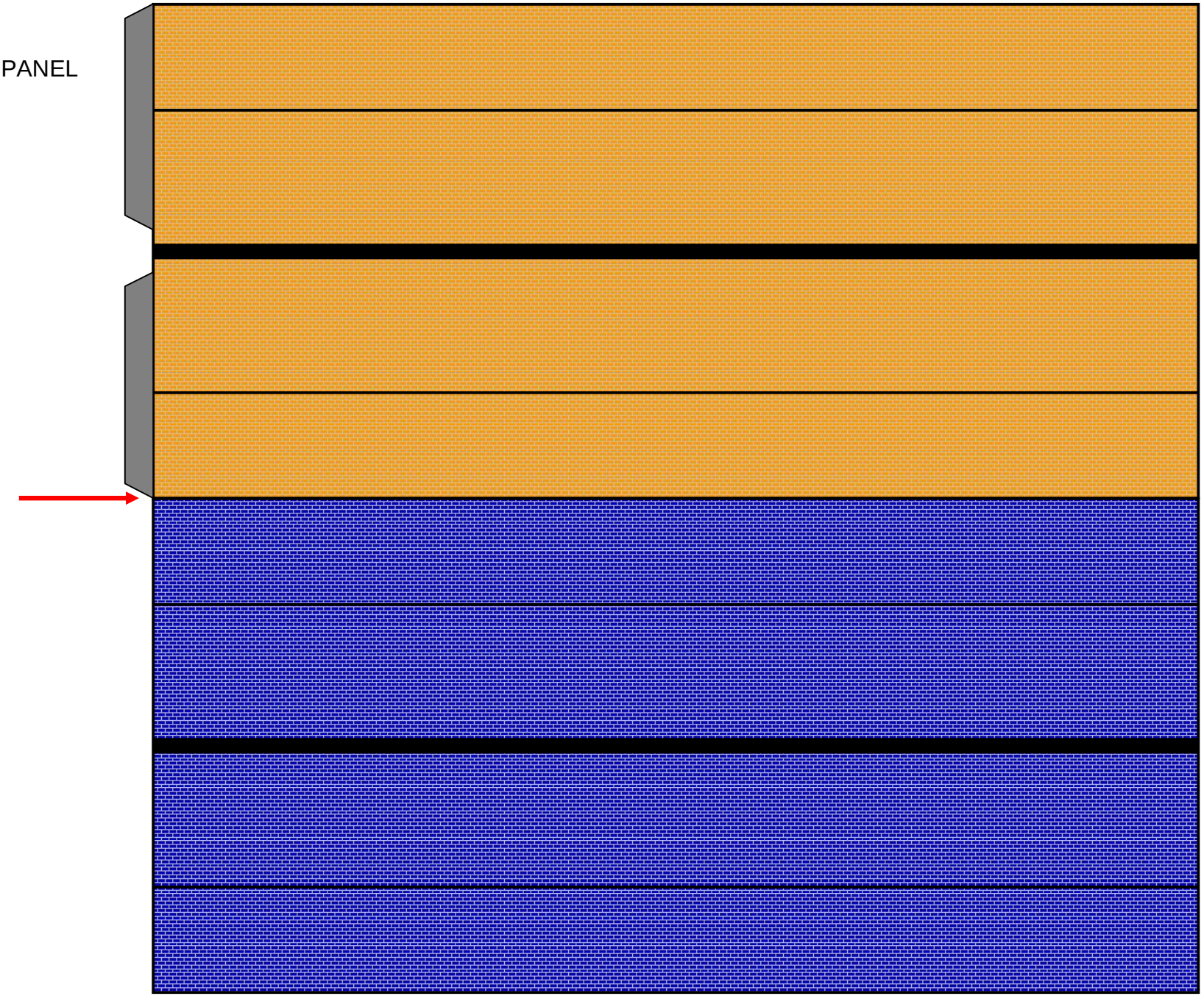
FOLD AND GLUE.
INSERT TABS
BETWEEN LAYERS
OF OUTER PANELS.



SERVICE MODULE

PRINT ON PLAIN PAPER

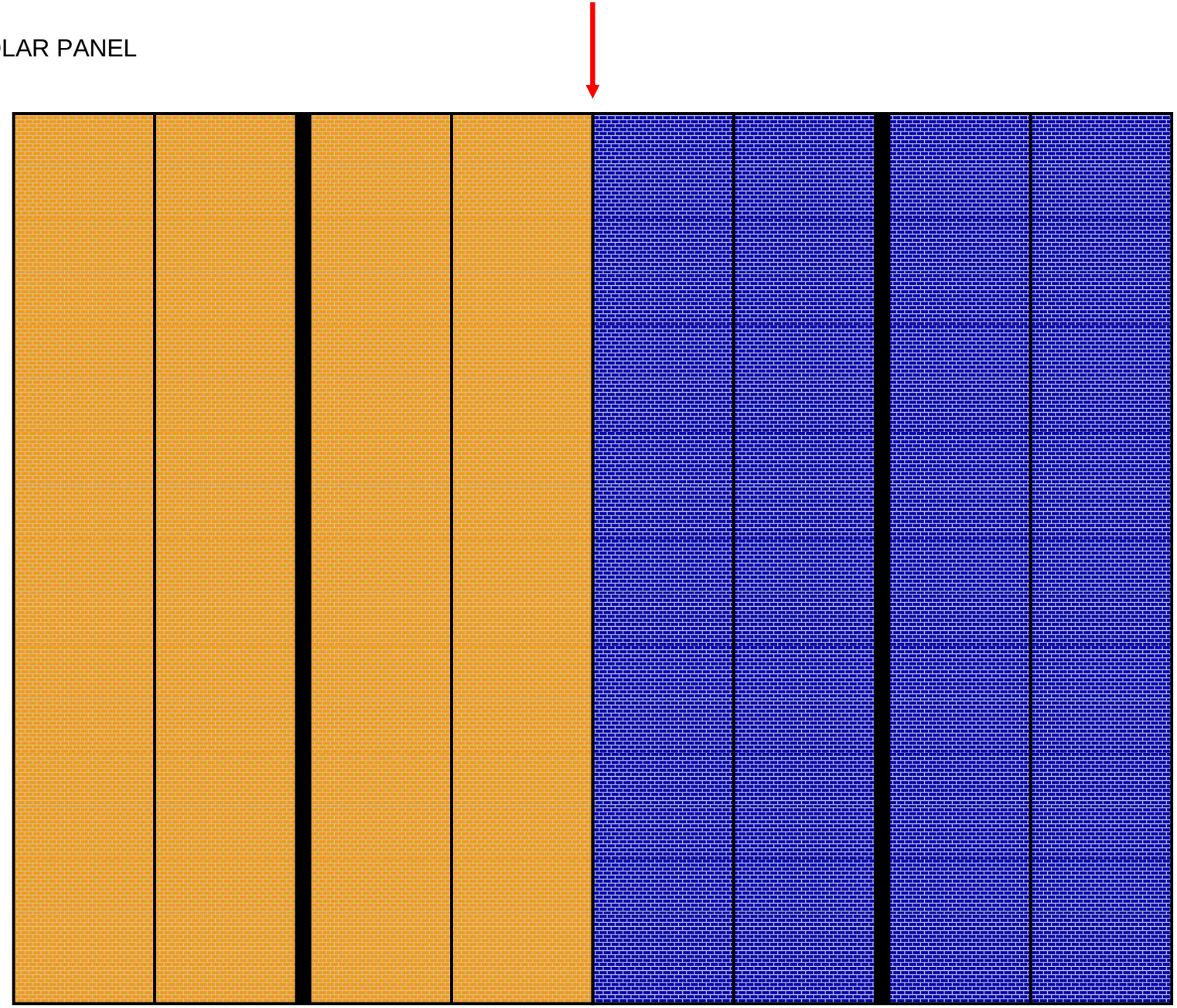
INNER SOLAR PANEL



SERVICE MODULE

PRINT ON PLAIN PAPER

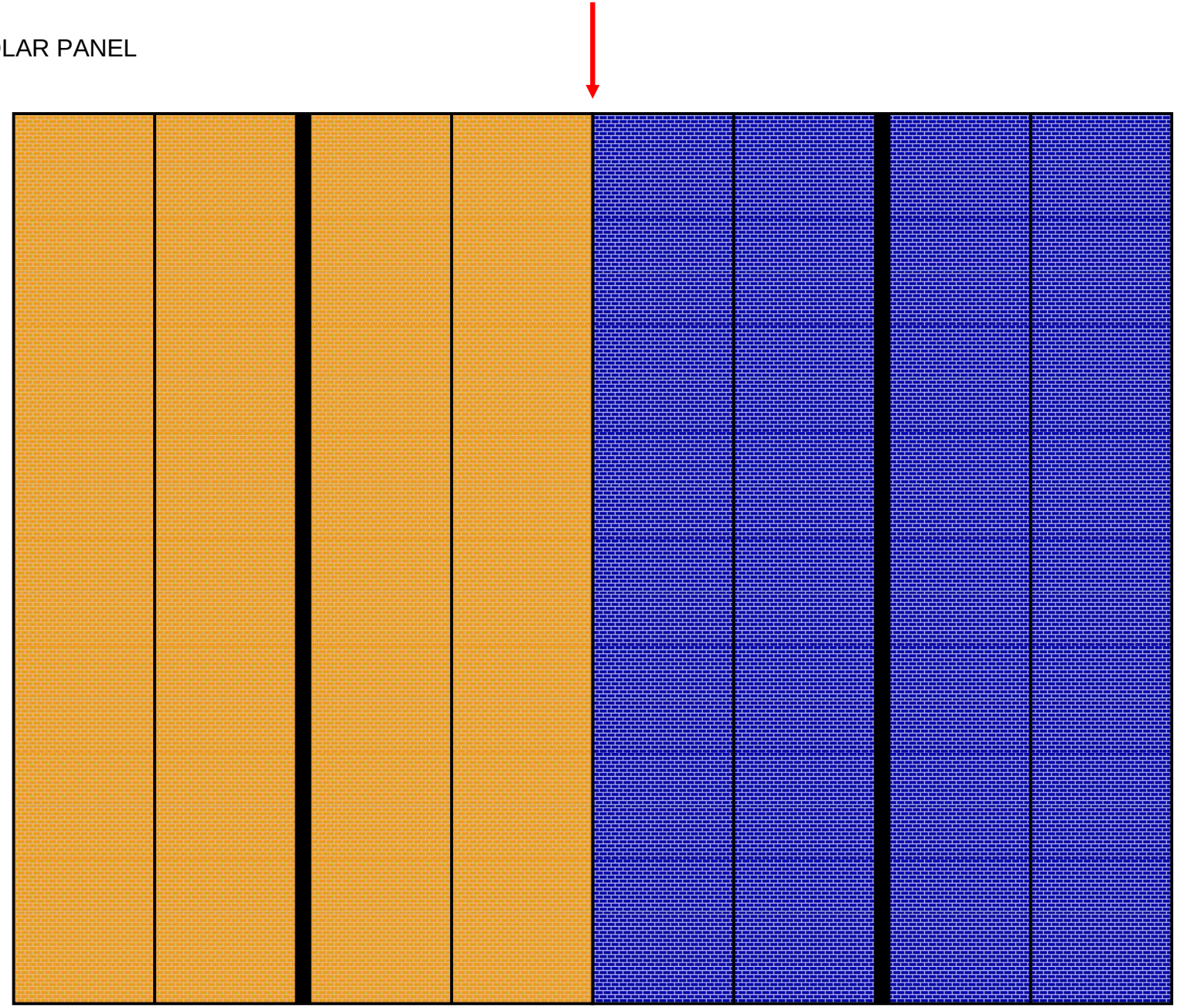
OUTER SOLAR PANEL



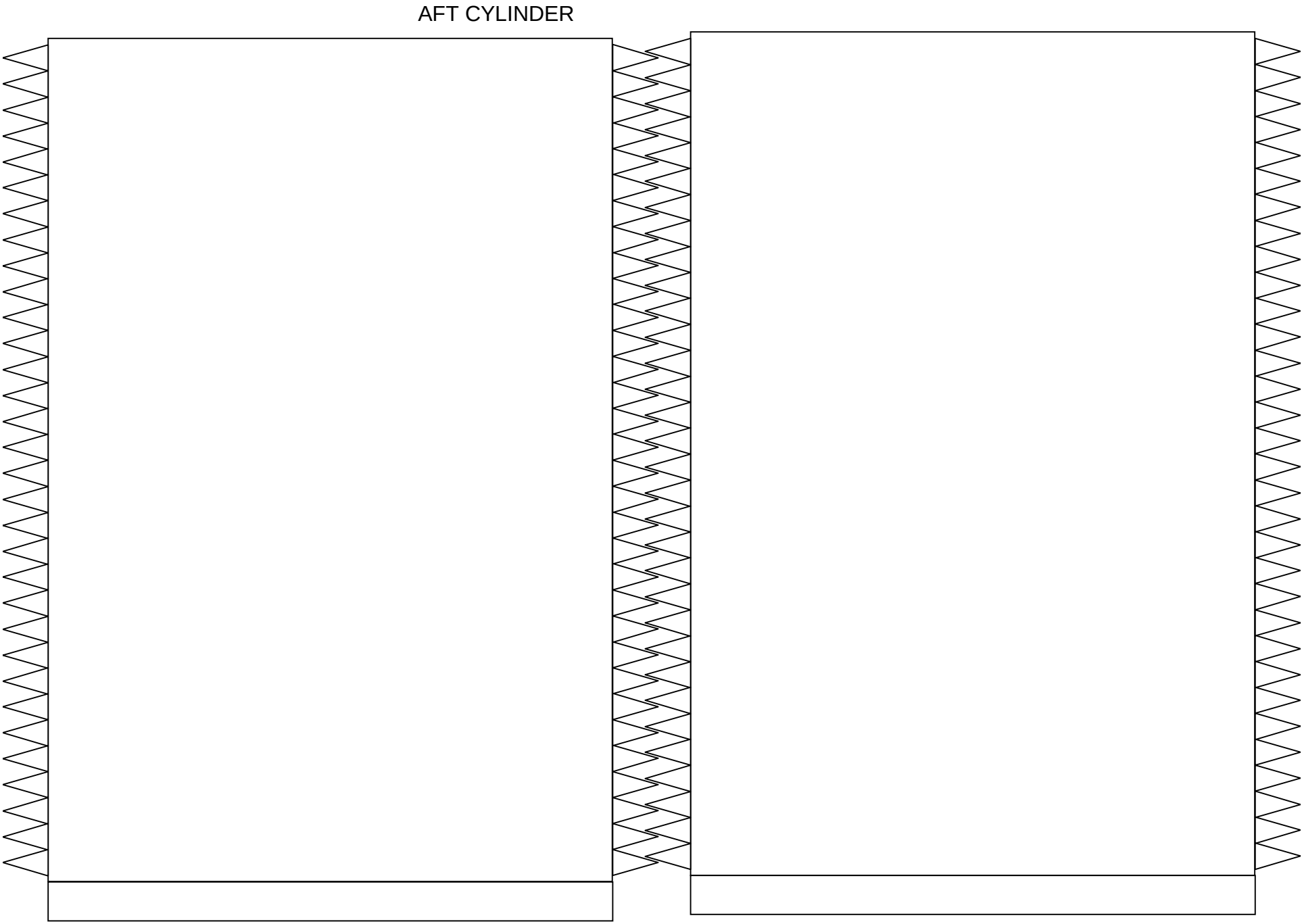
SERVICE MODULE

PRINT ON PLAIN PAPER

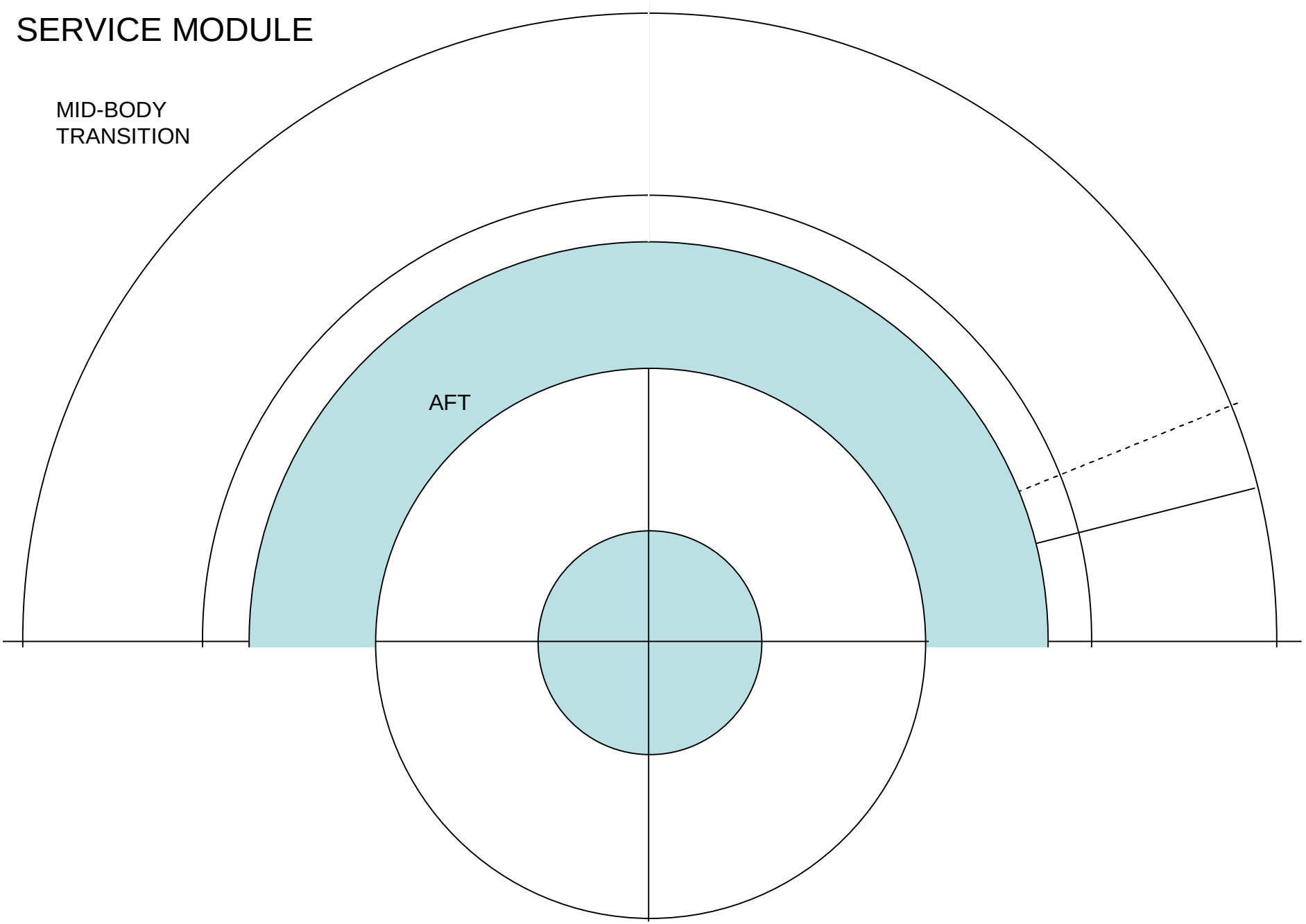
OUTER SOLAR PANEL



SERVICE MODULE

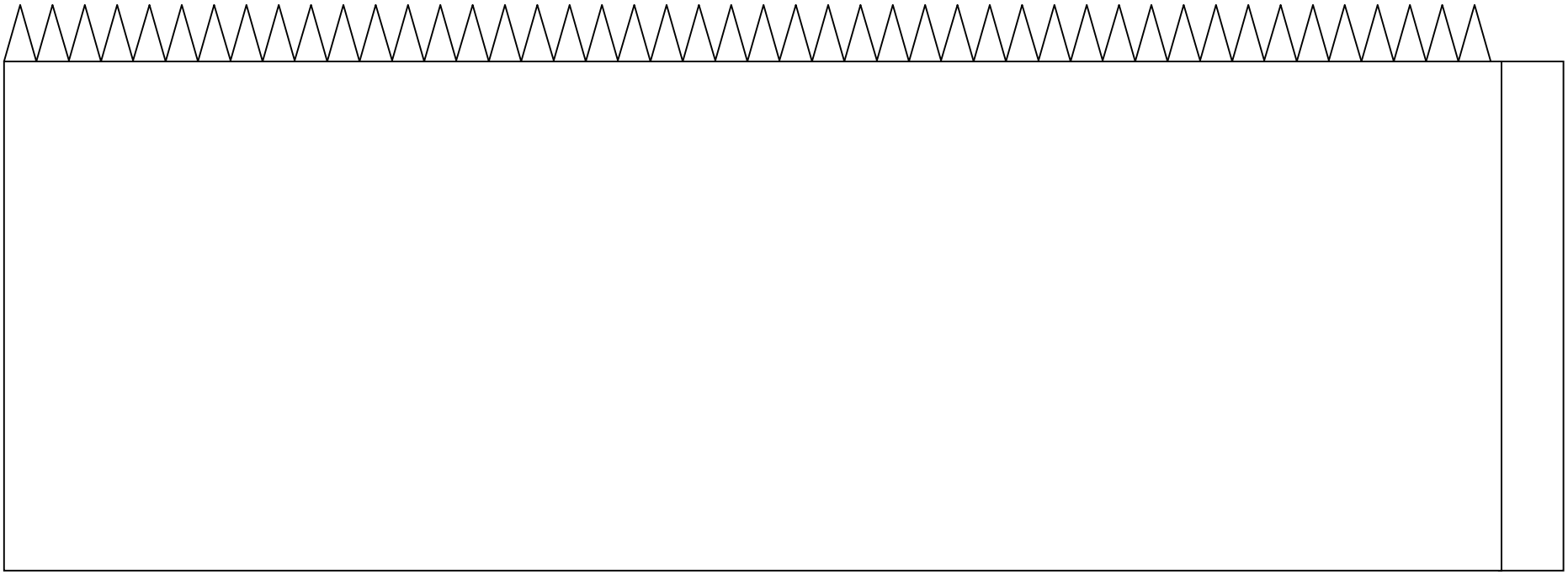


SERVICE MODULE

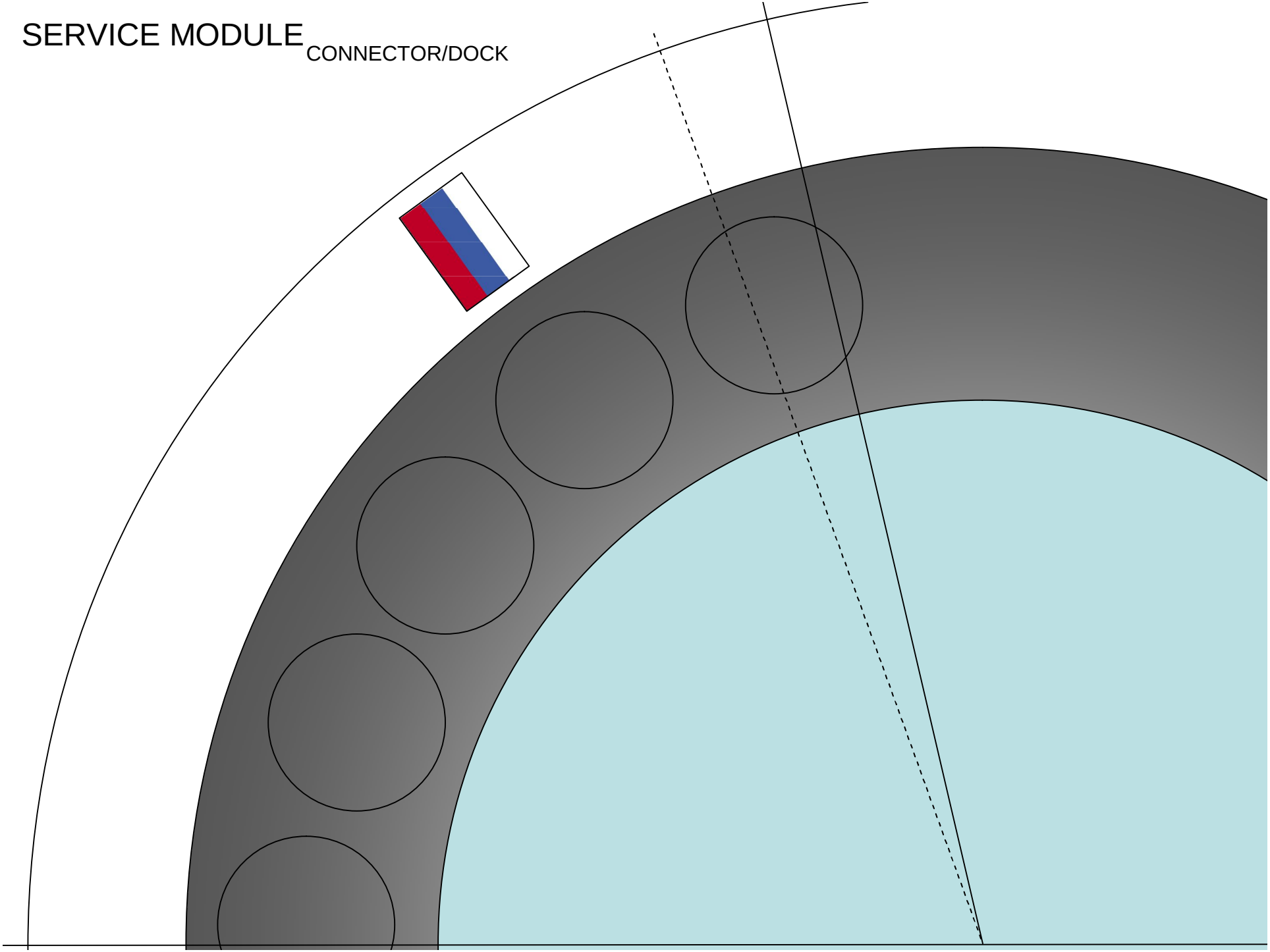


SERVICE MODULE

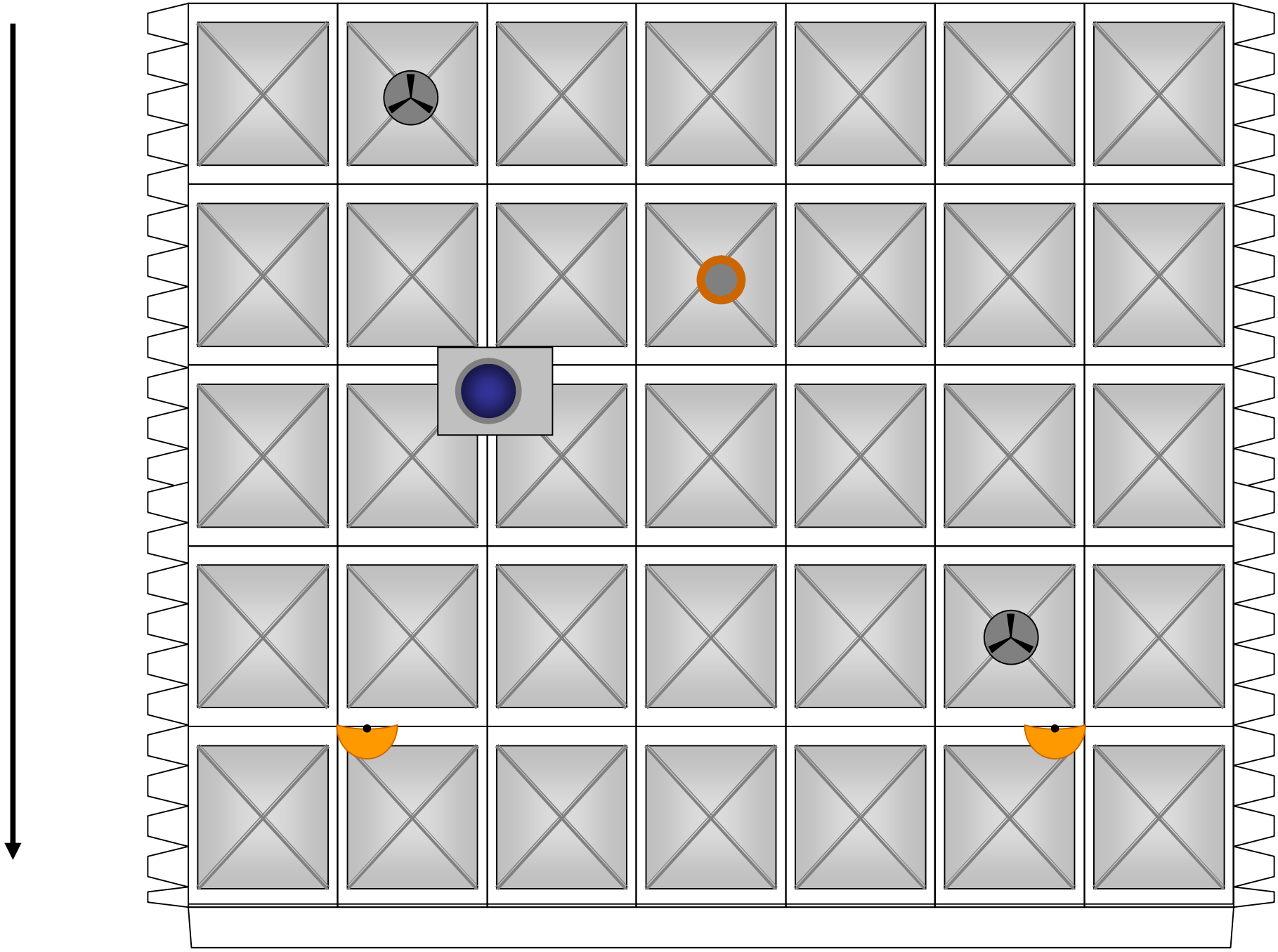
FORWARD CYLINDER



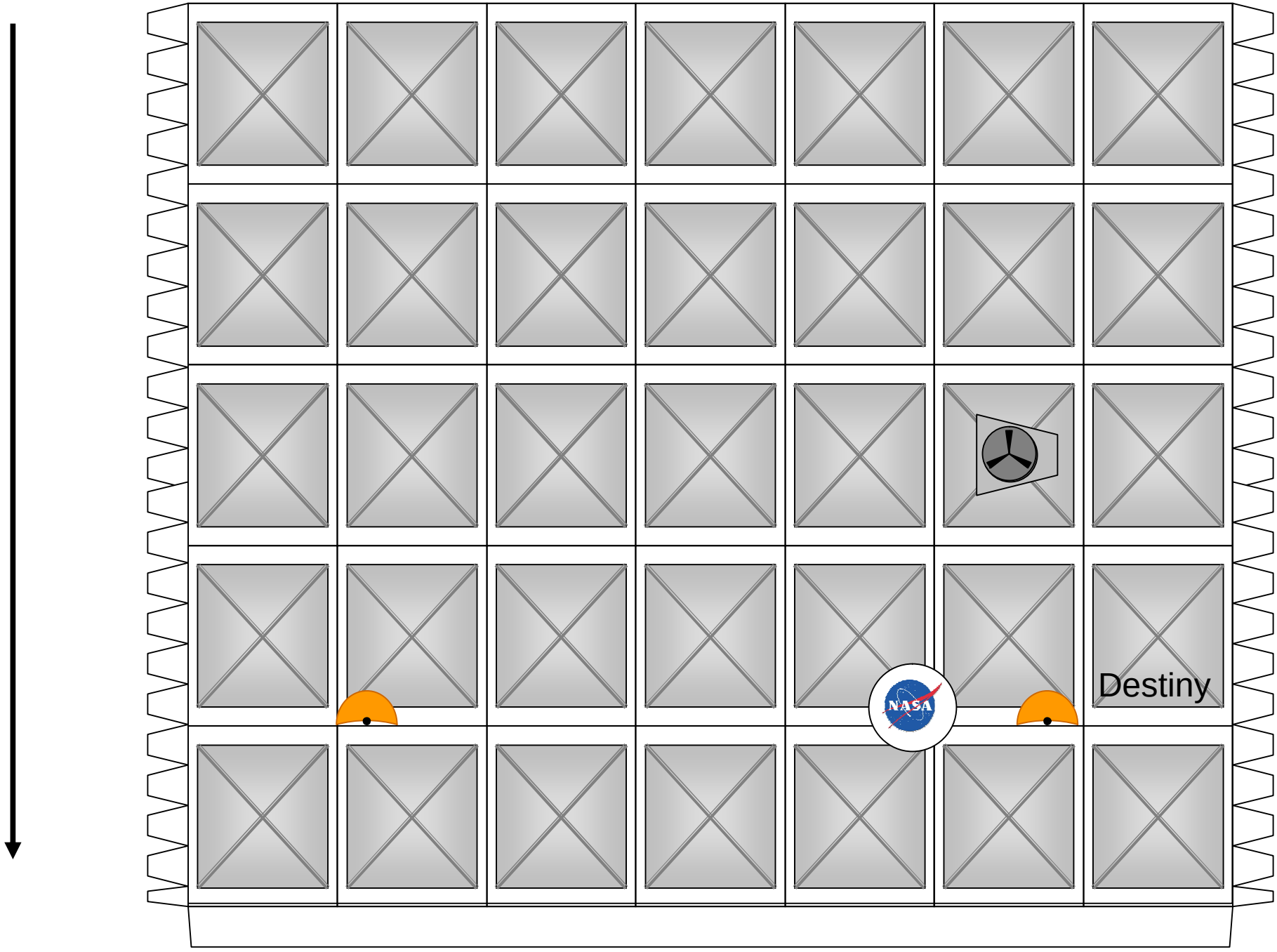
SERVICE MODULE CONNECTOR/DOCK



DESTINY LAB

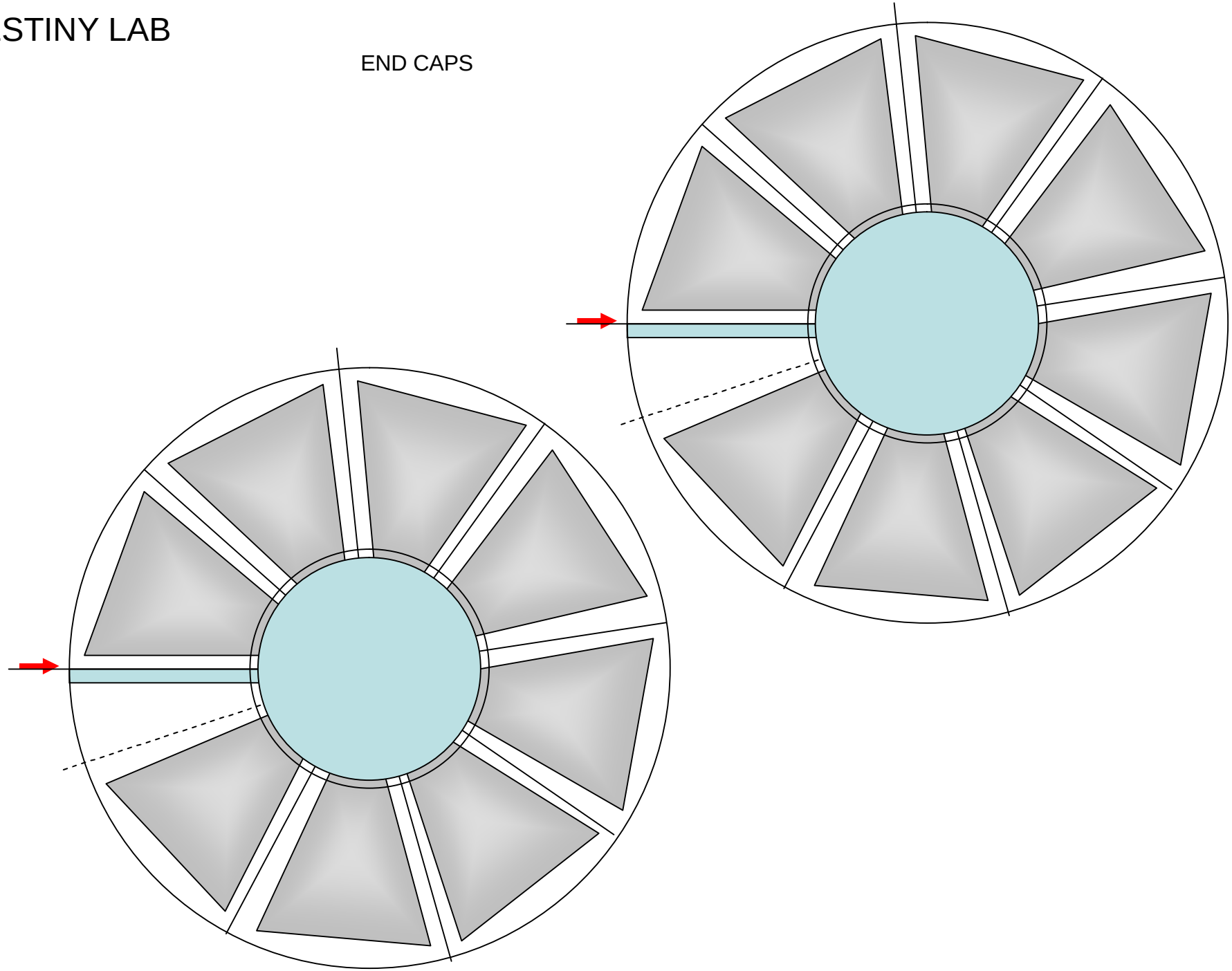


DESTINY LAB

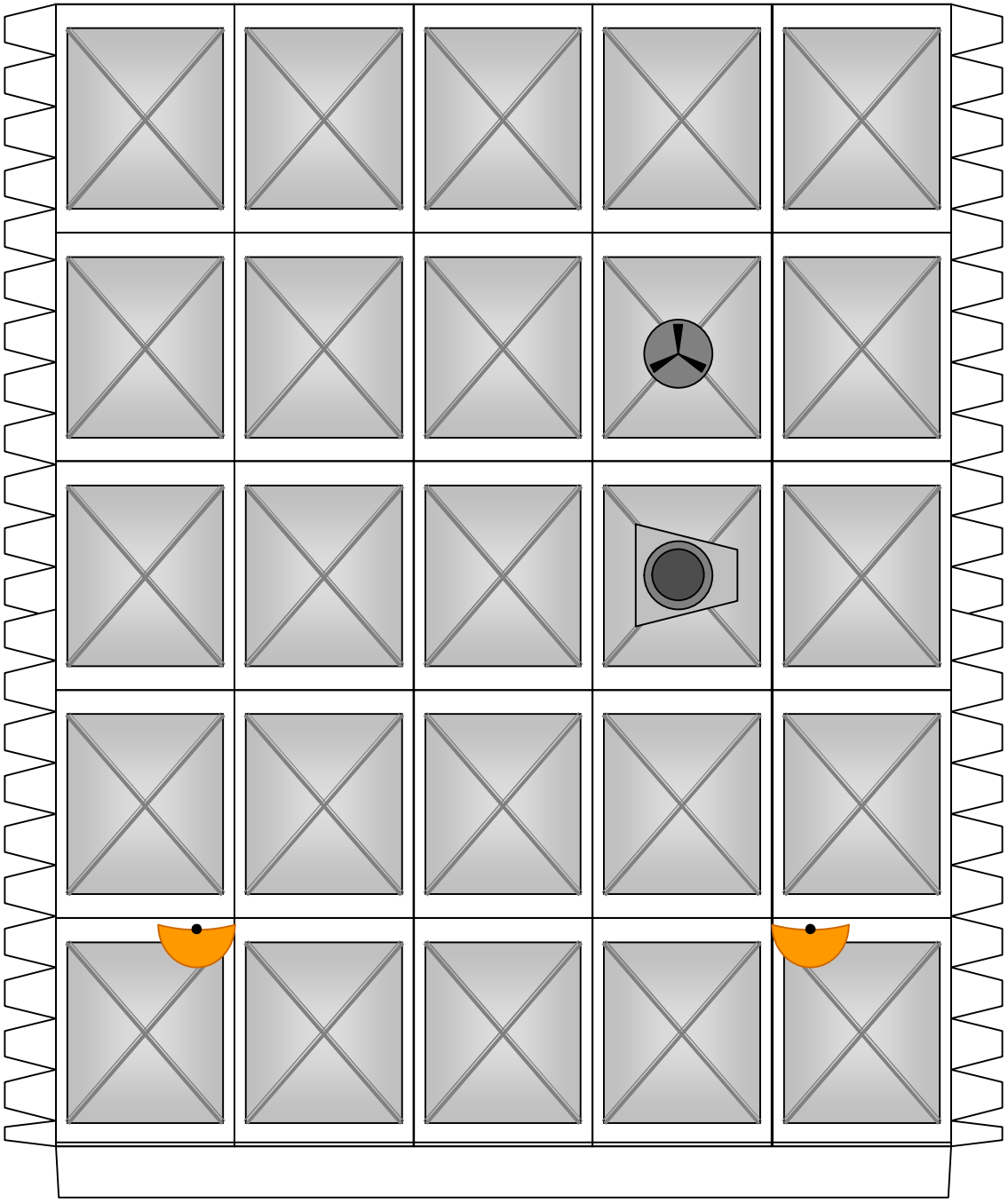


DESTINY LAB

END CAPS

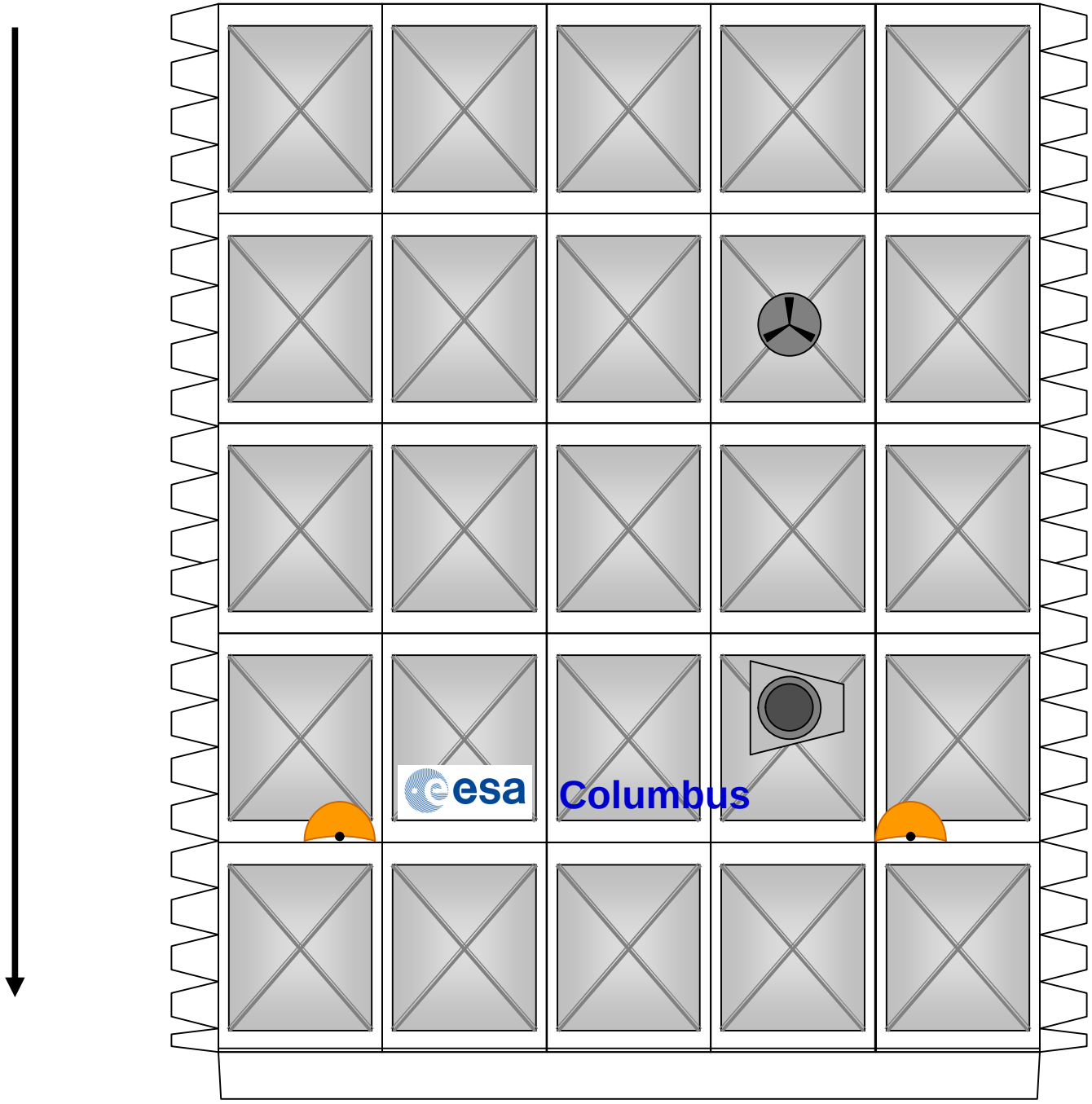


COLUMBUS LAB



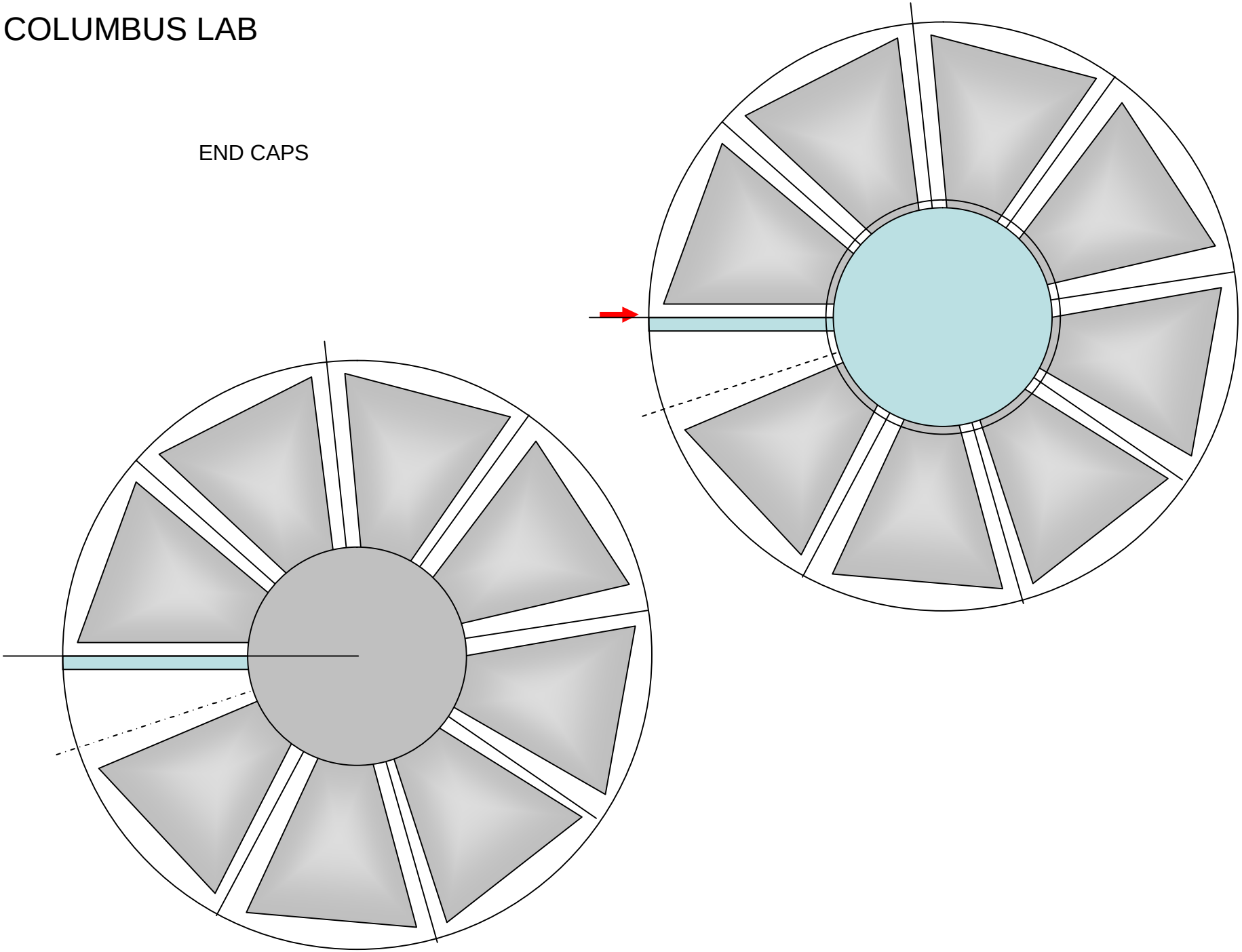
Columbus lab is also logistics module, typically dismounted after loading/ unloading and lands with Shuttle.

COLUMBUS LAB

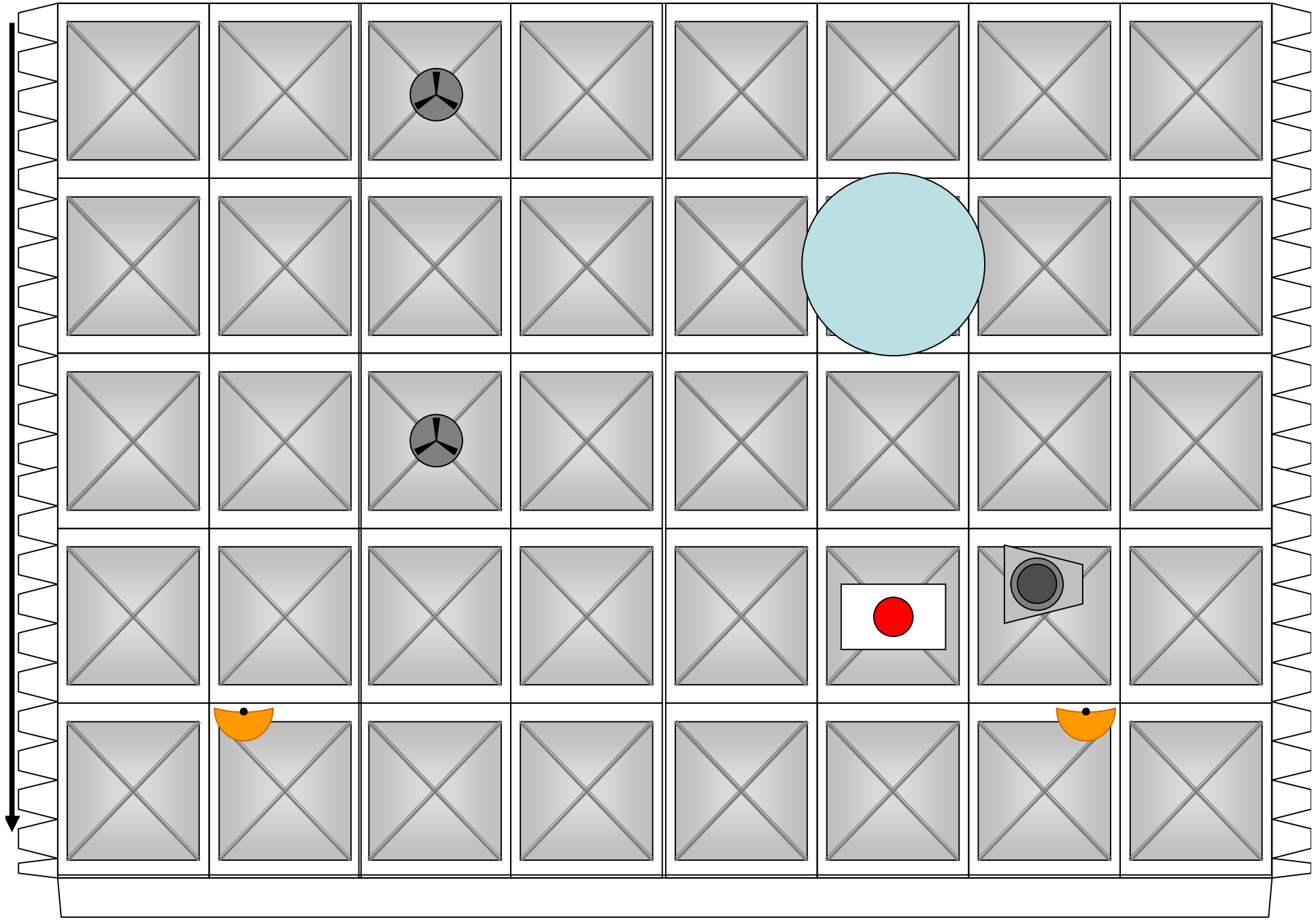


COLUMBUS LAB

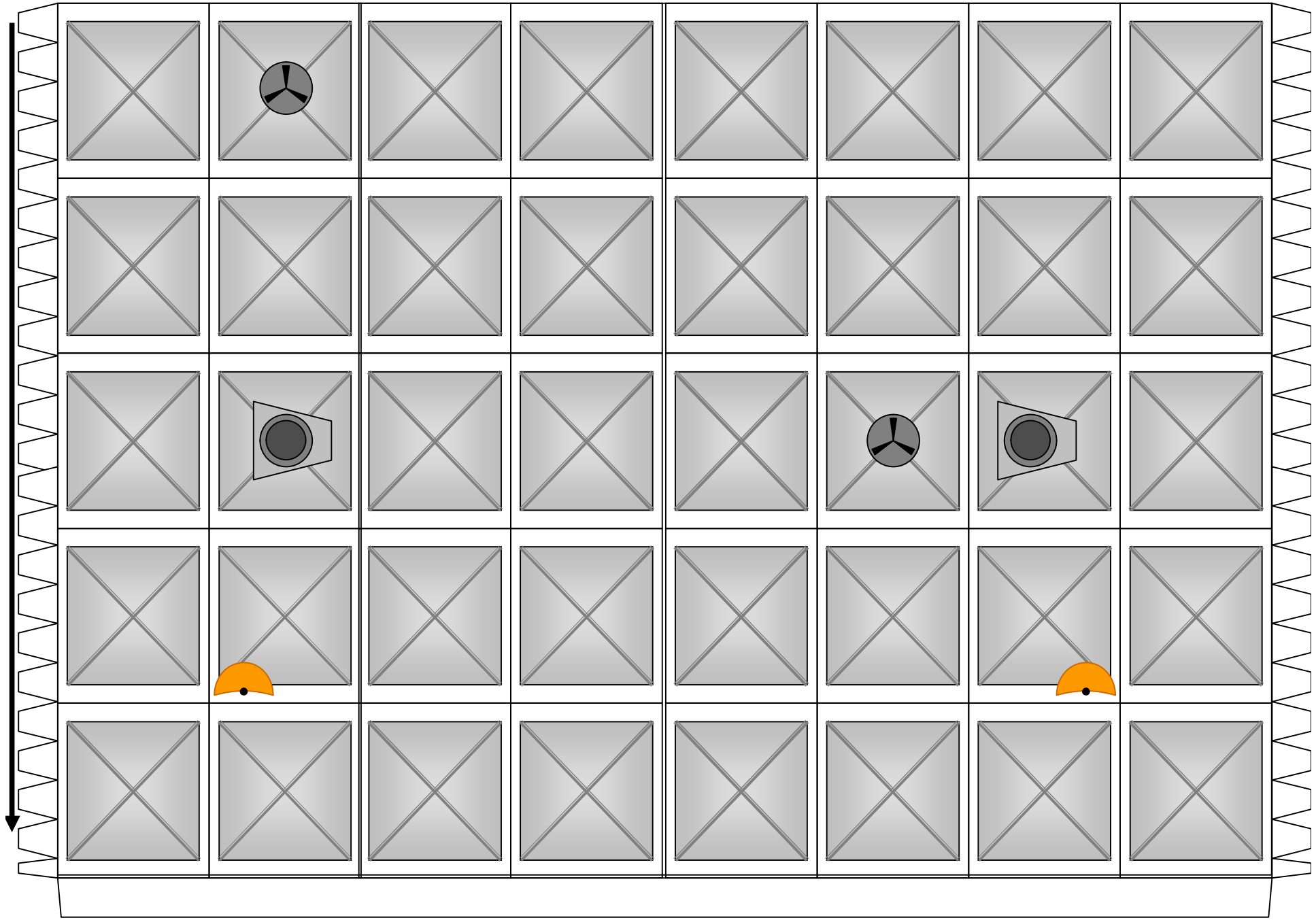
END CAPS



JEM LAB

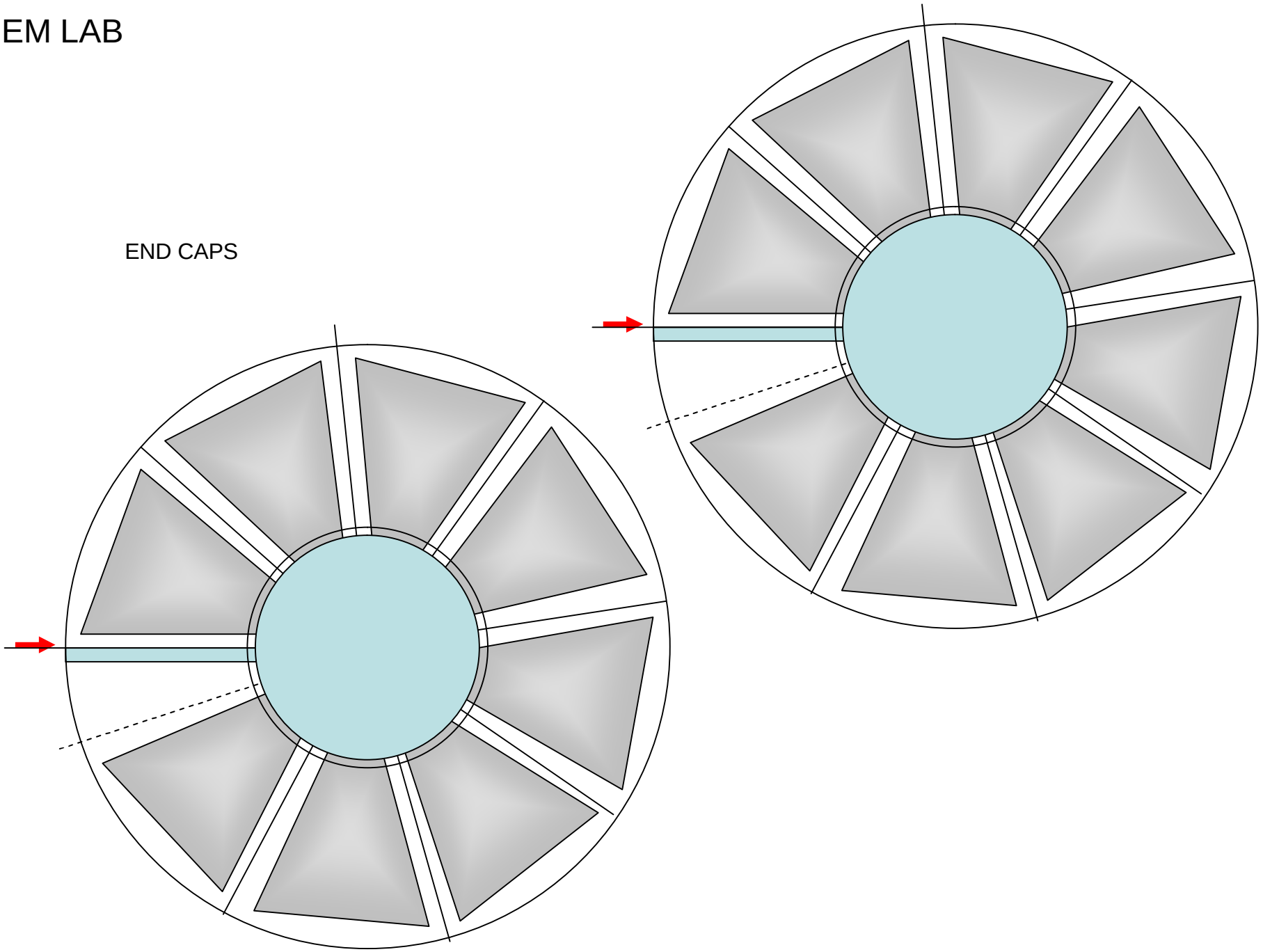


JEM LAB

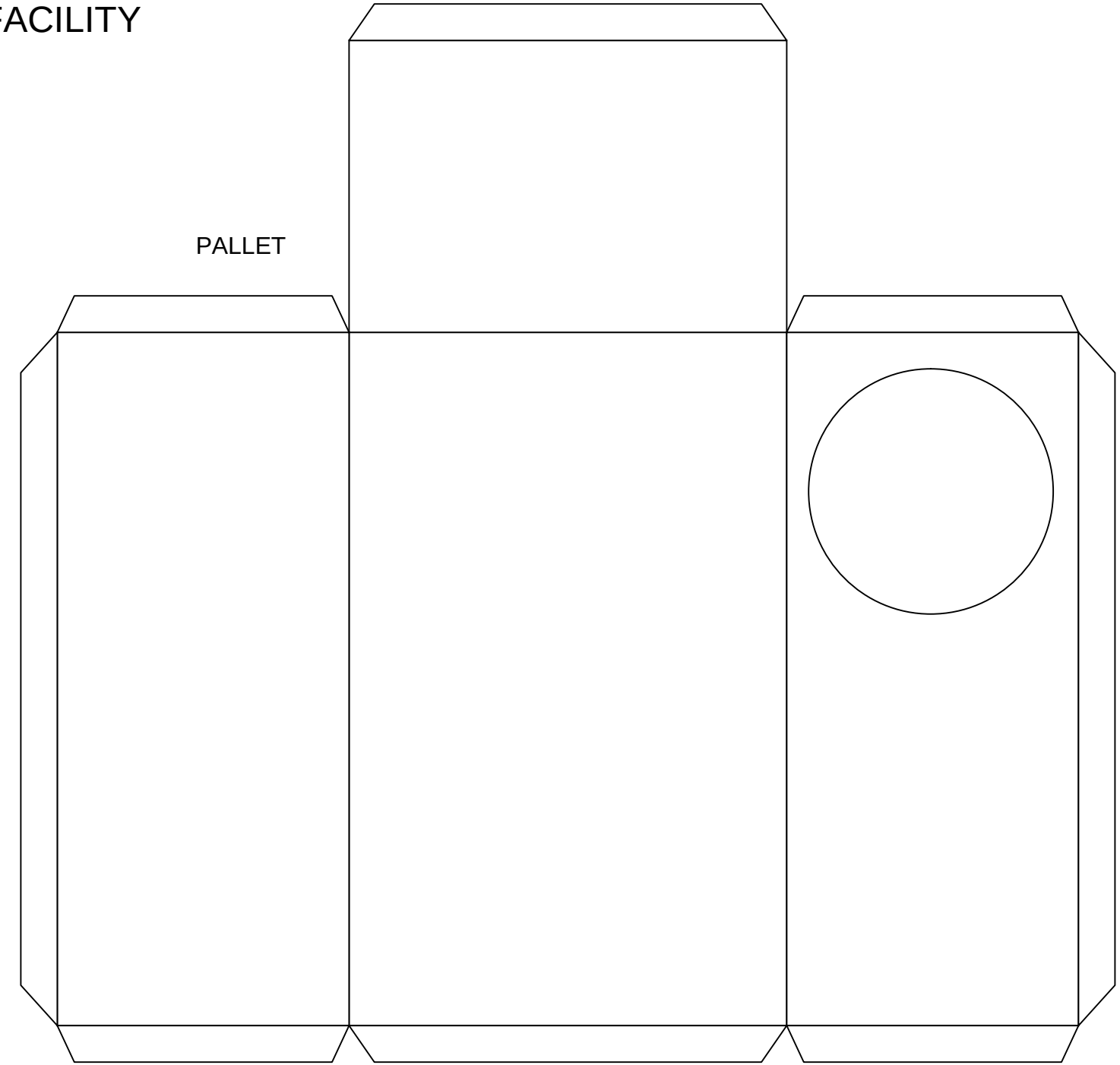


JEM LAB

END CAPS

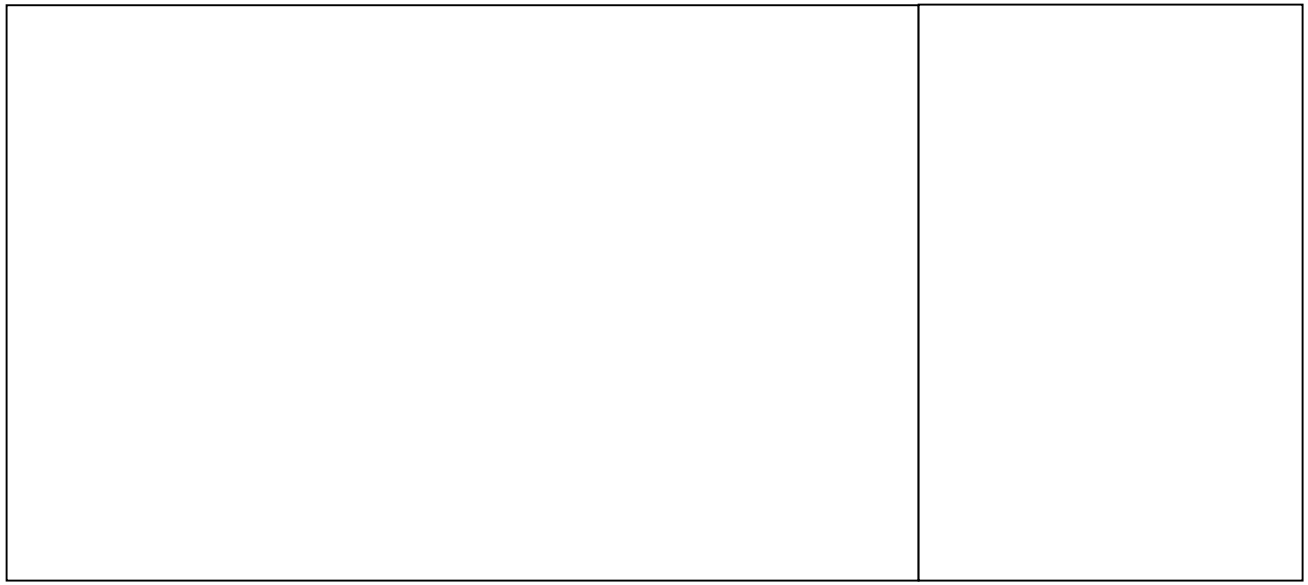


JEM EXPOSURE FACILITY

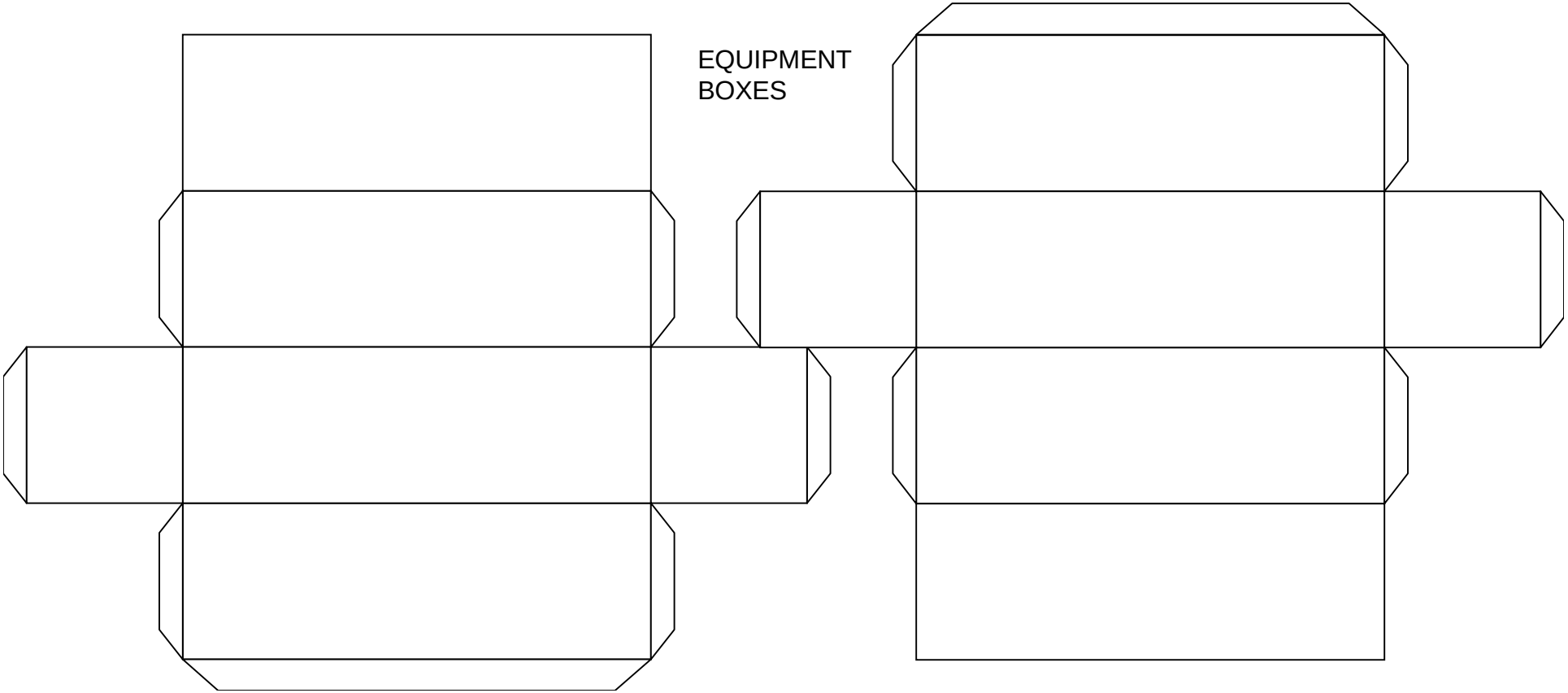


JEM EXPOSURE FACILITY

PALLET

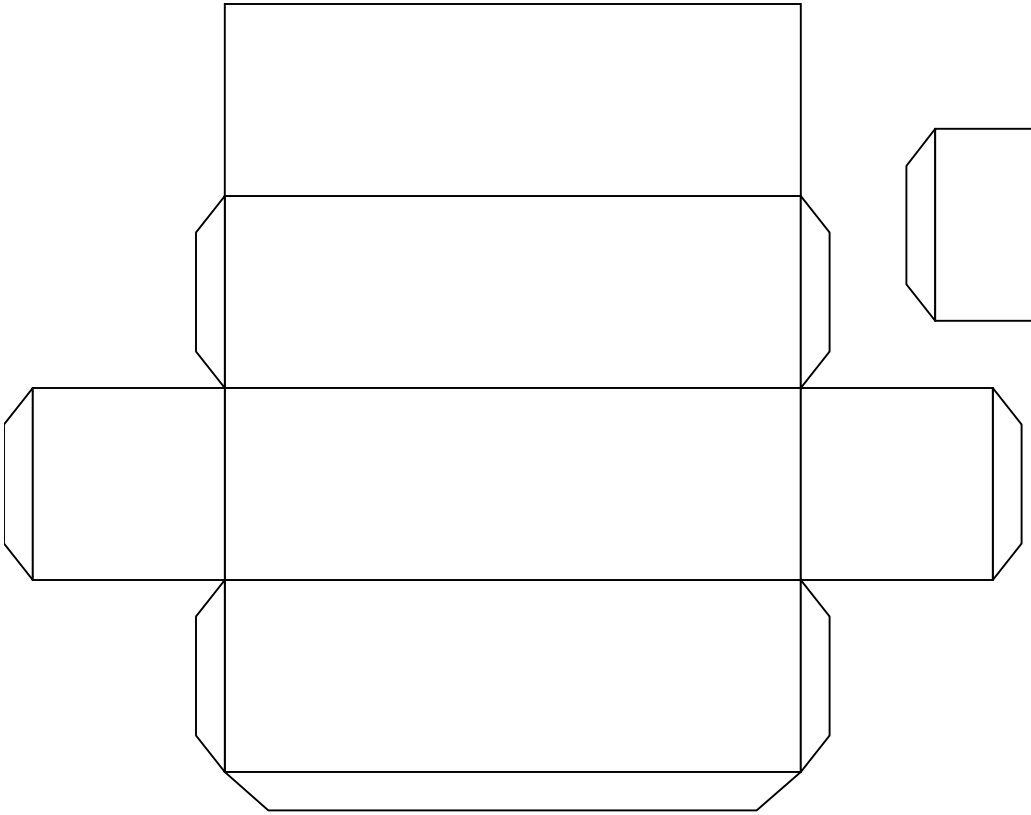


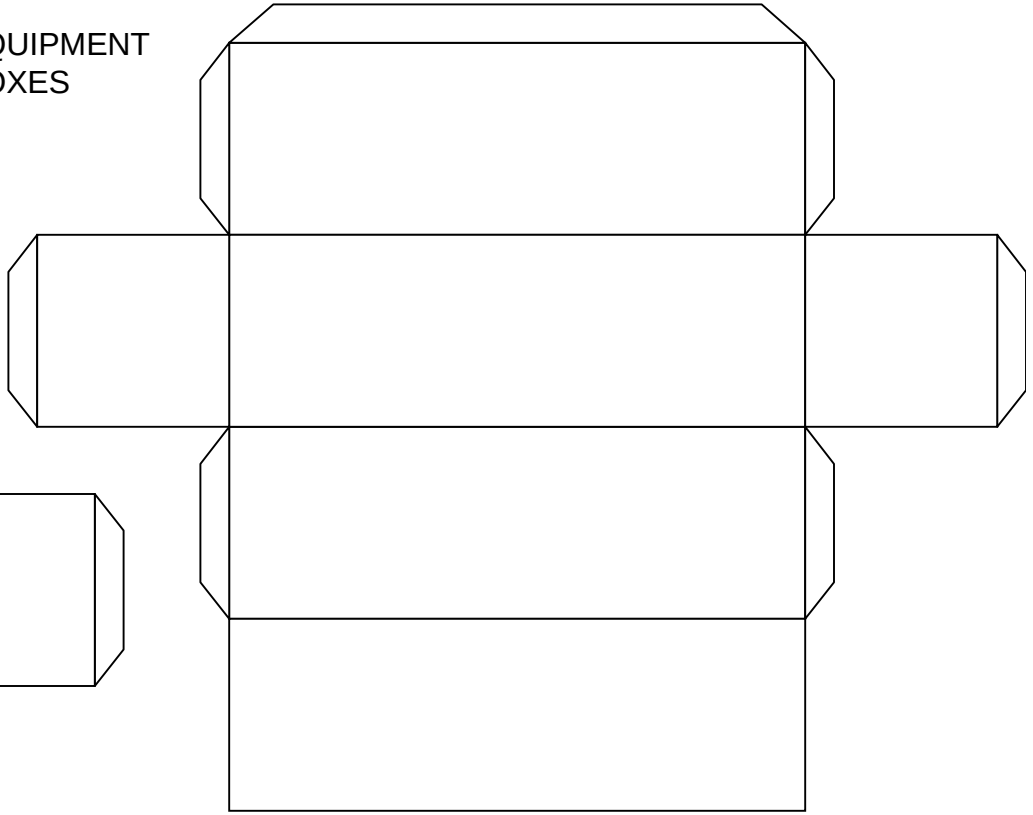
EQUIPMENT BOXES



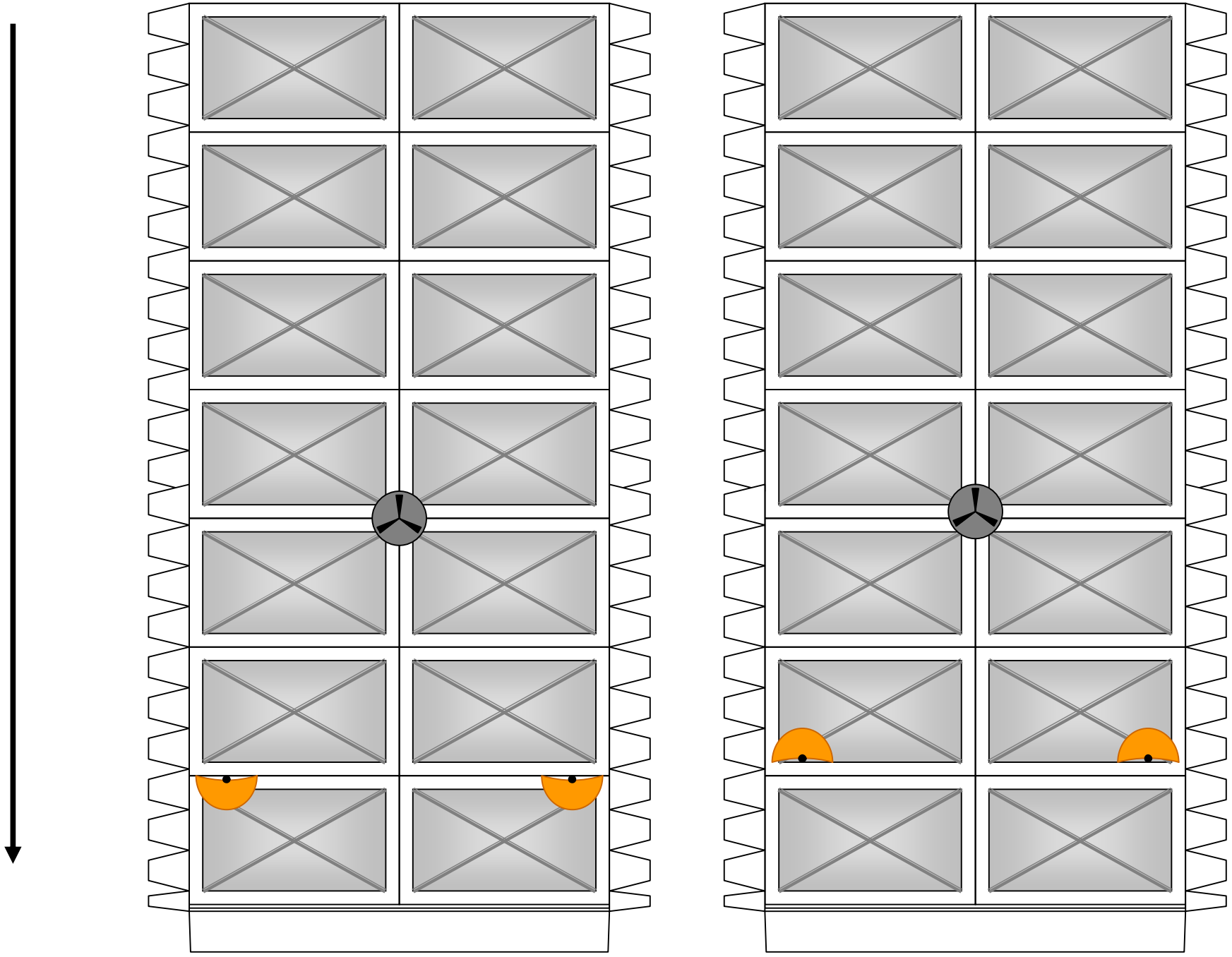
JEM EXPOSURE
FACILITY

EQUIPMENT
BOXES



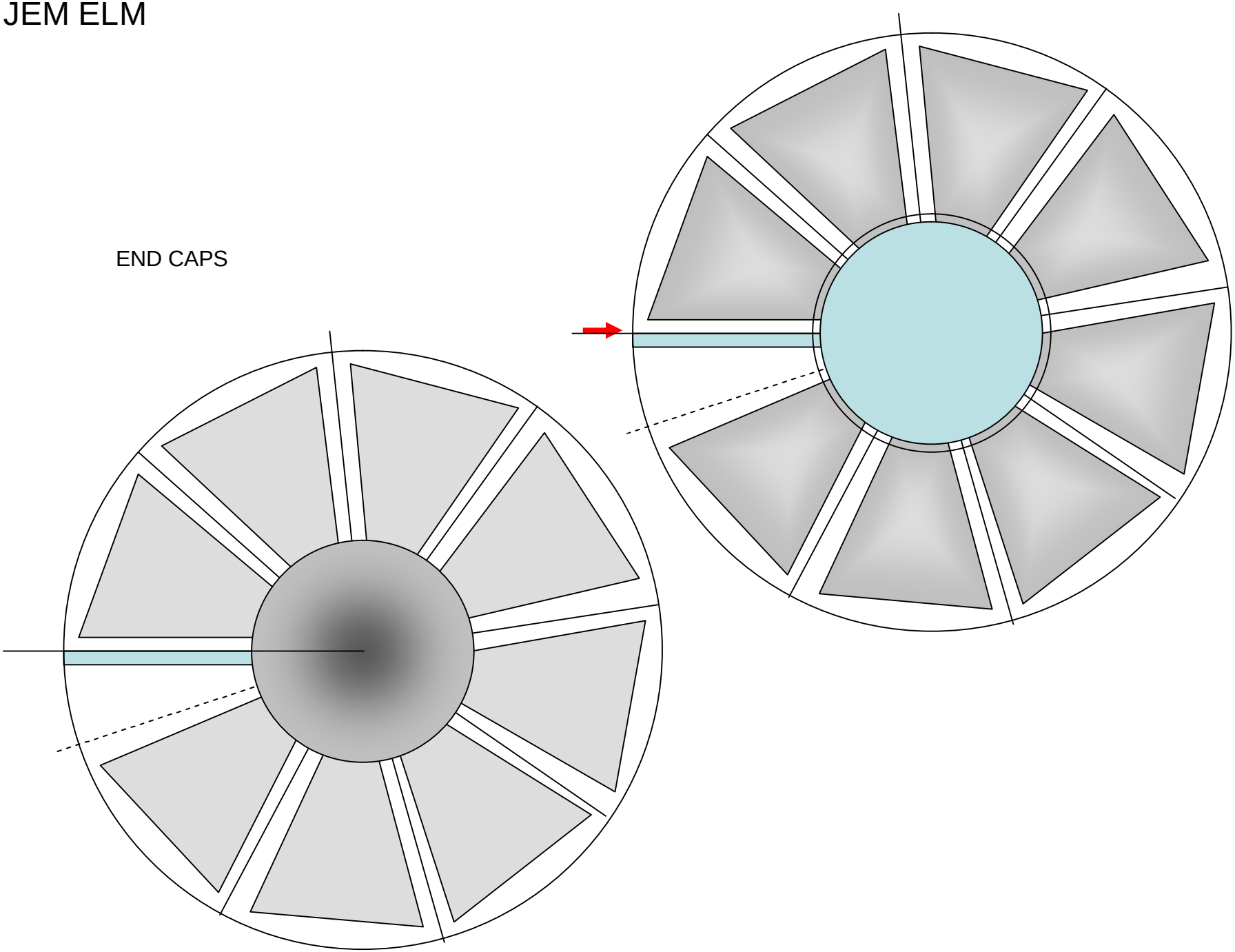


JEM ELM

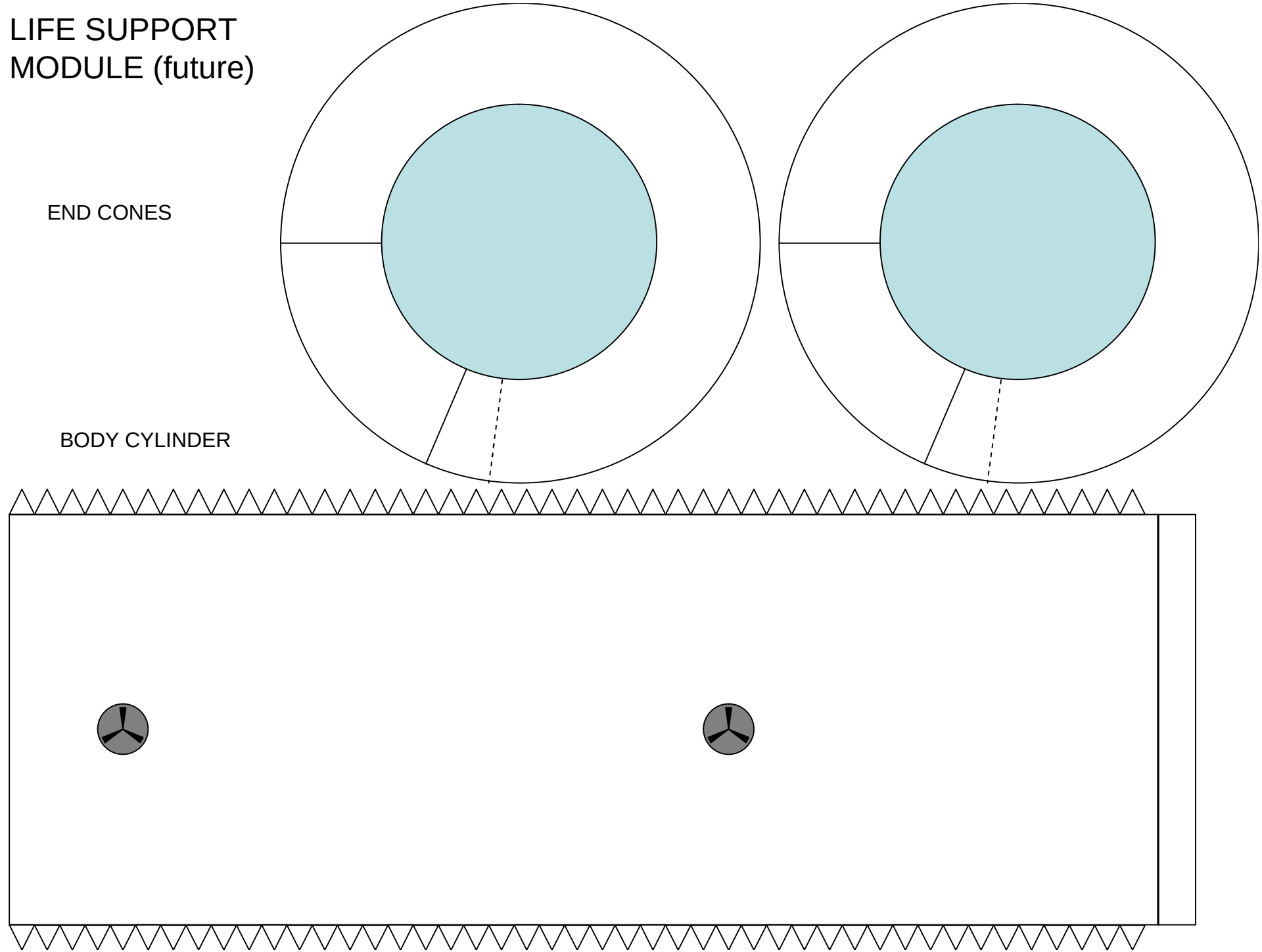


JEM ELM

END CAPS

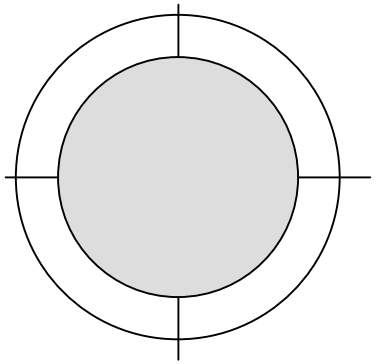


LIFE SUPPORT
MODULE (future)

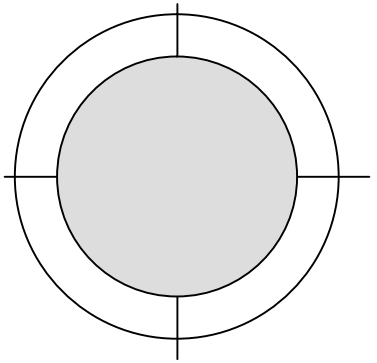


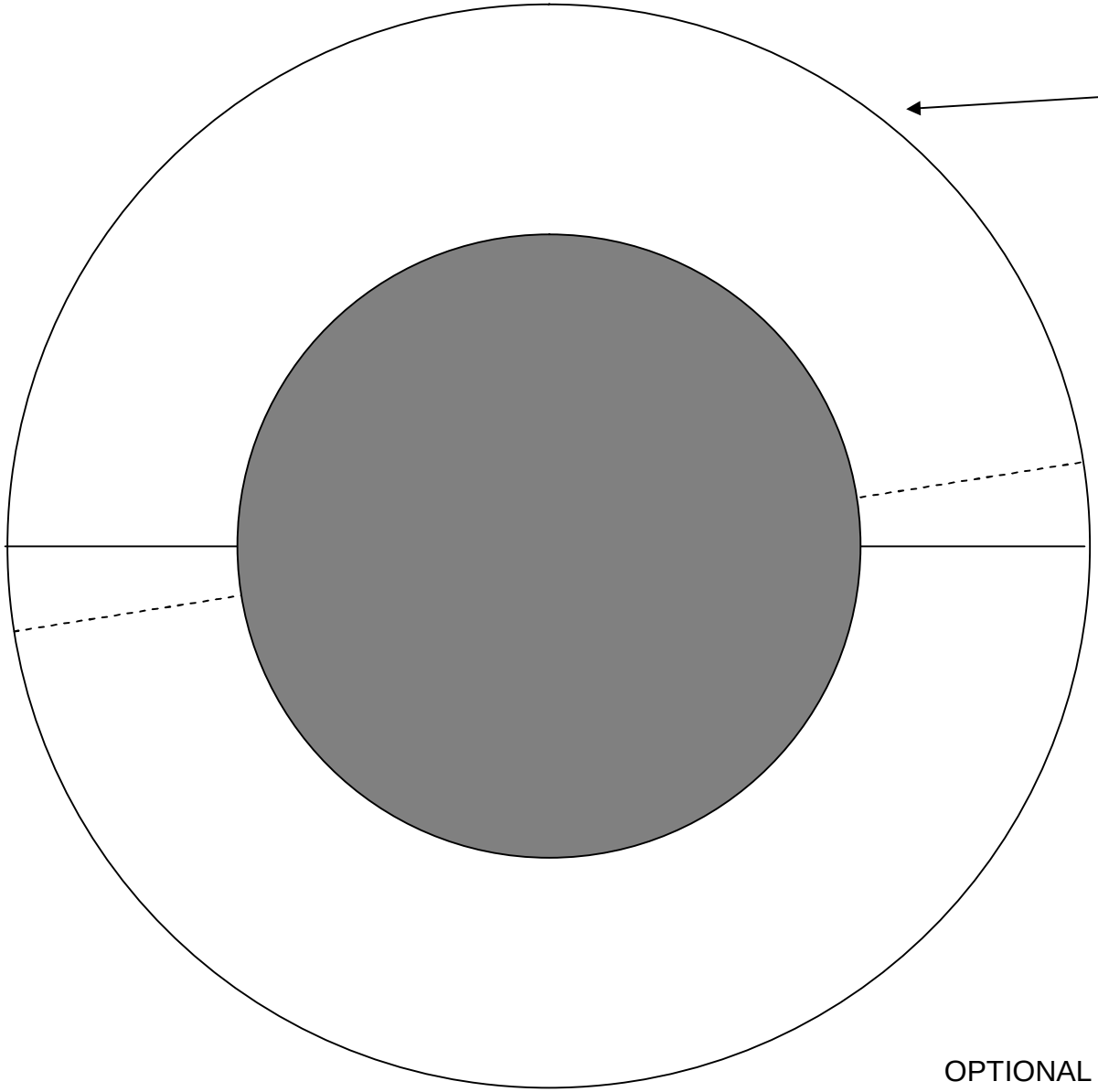
RESEARCH MODULE
DOCKING/STORAGE
MODULE (future)

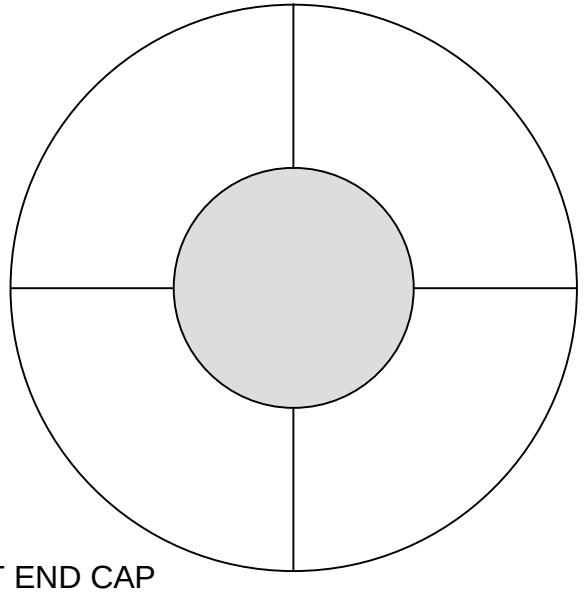
END CAP FOR CONIC
IF NEEDED – COVER
WITH HATCH IF EXPOSED



END CONES



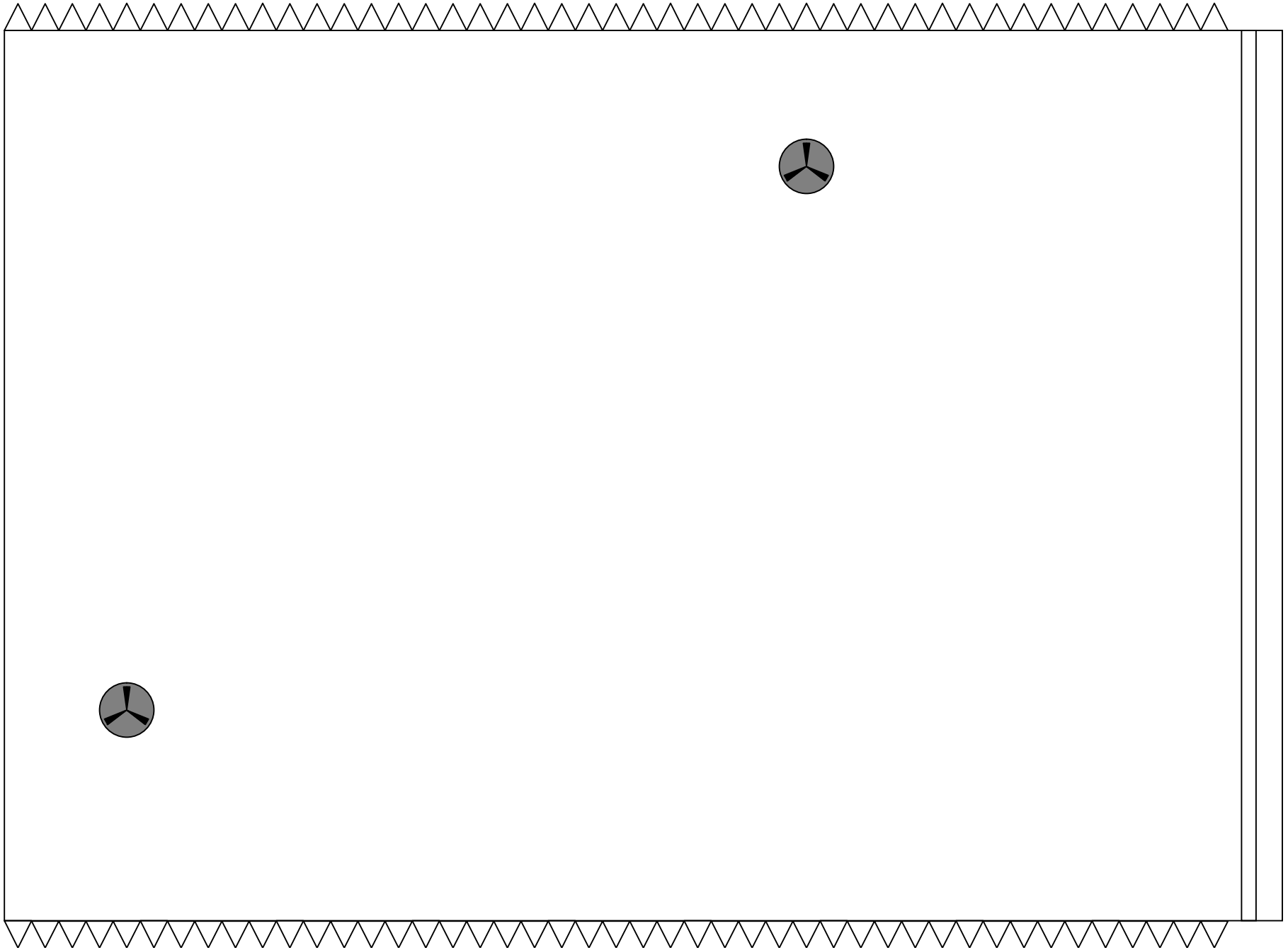




OPTIONAL FLAT END CAP

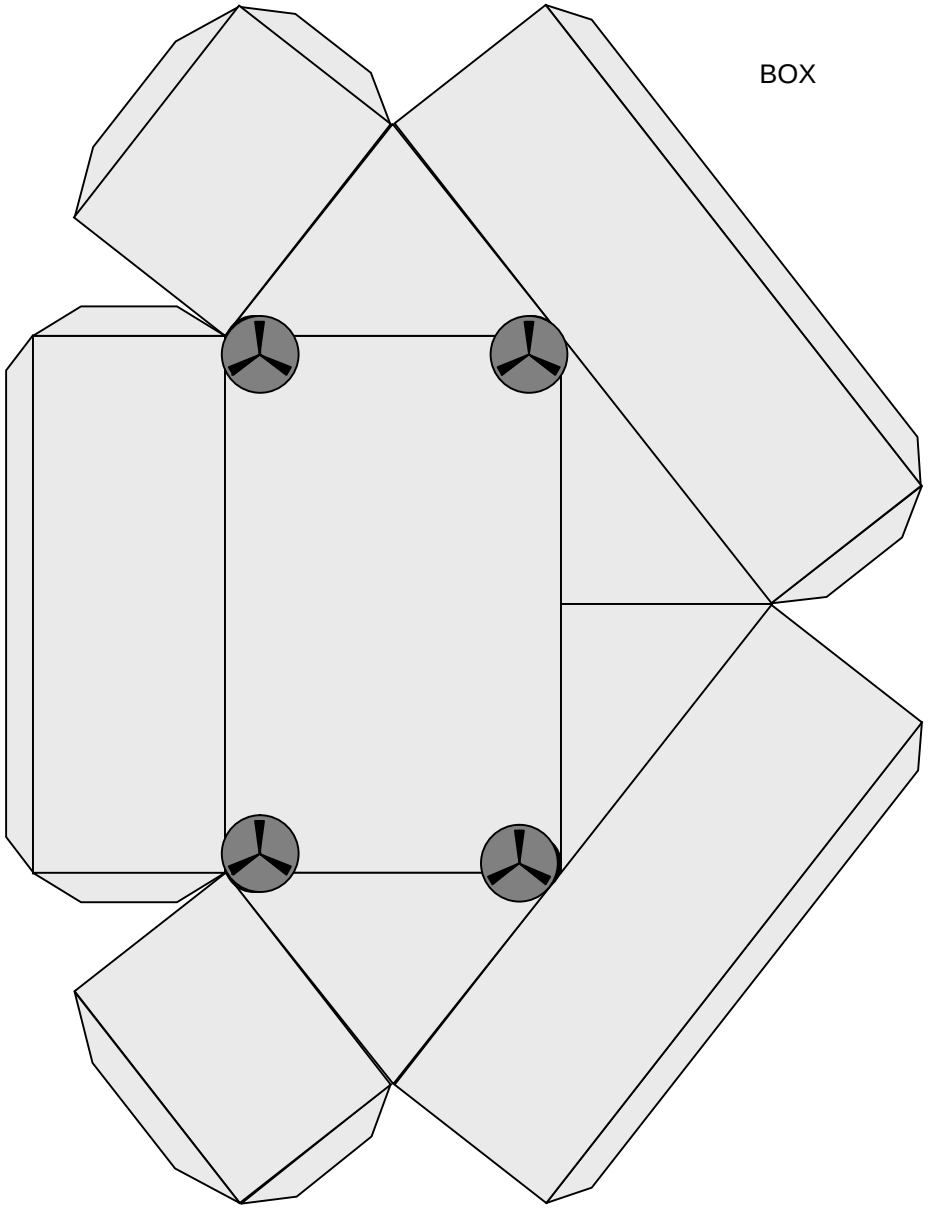
RESEARCH MODULE, DOCKING/STORAGE MODULE (future)

BODY CYLINDER

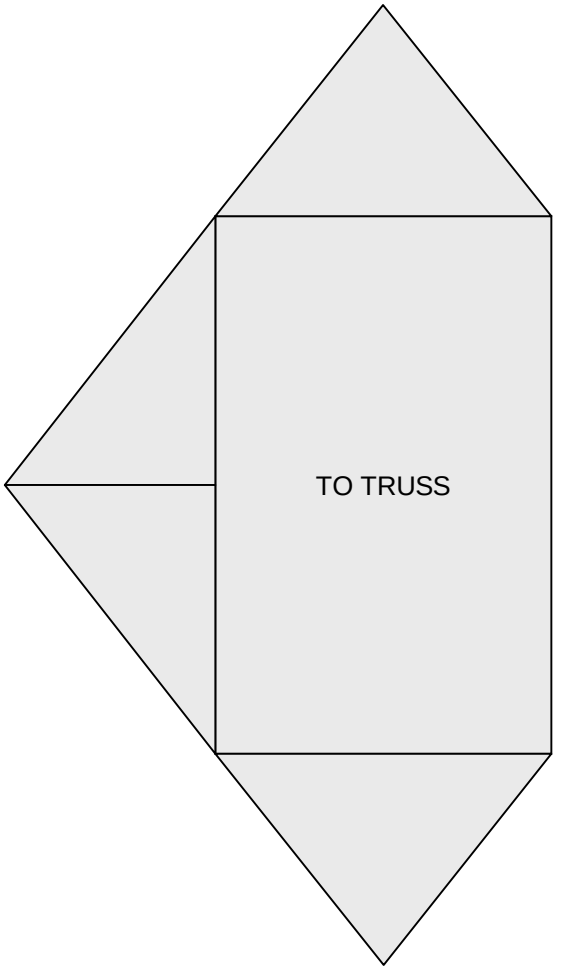


MOBILE TRANSPORTER/BASE

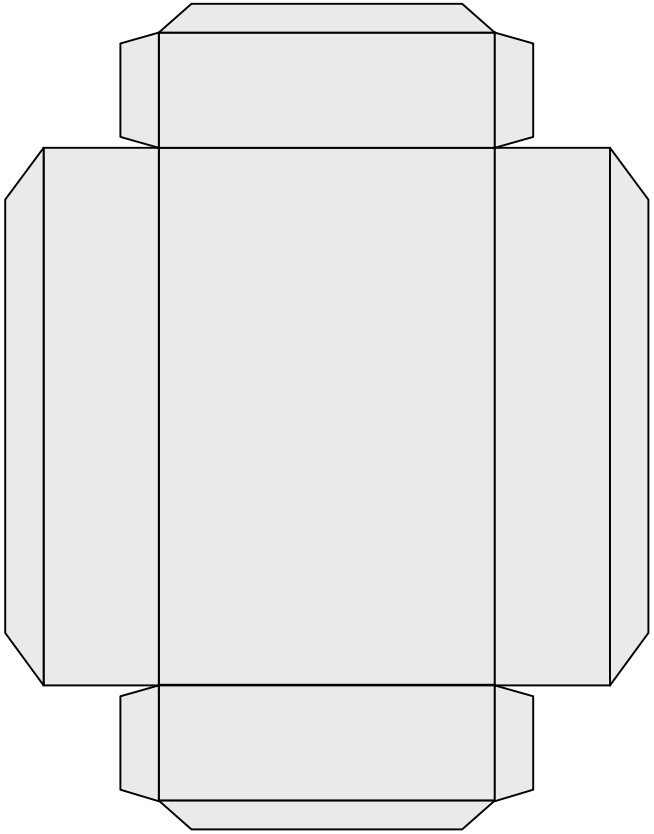
BOX



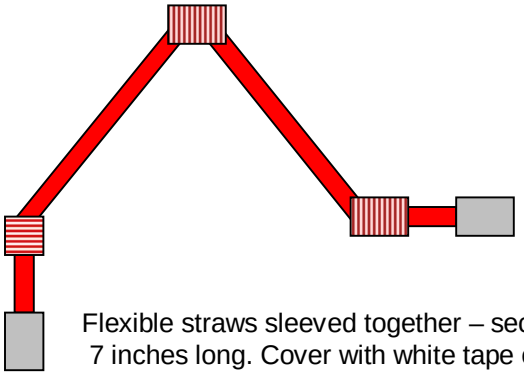
BOX BOTTOM



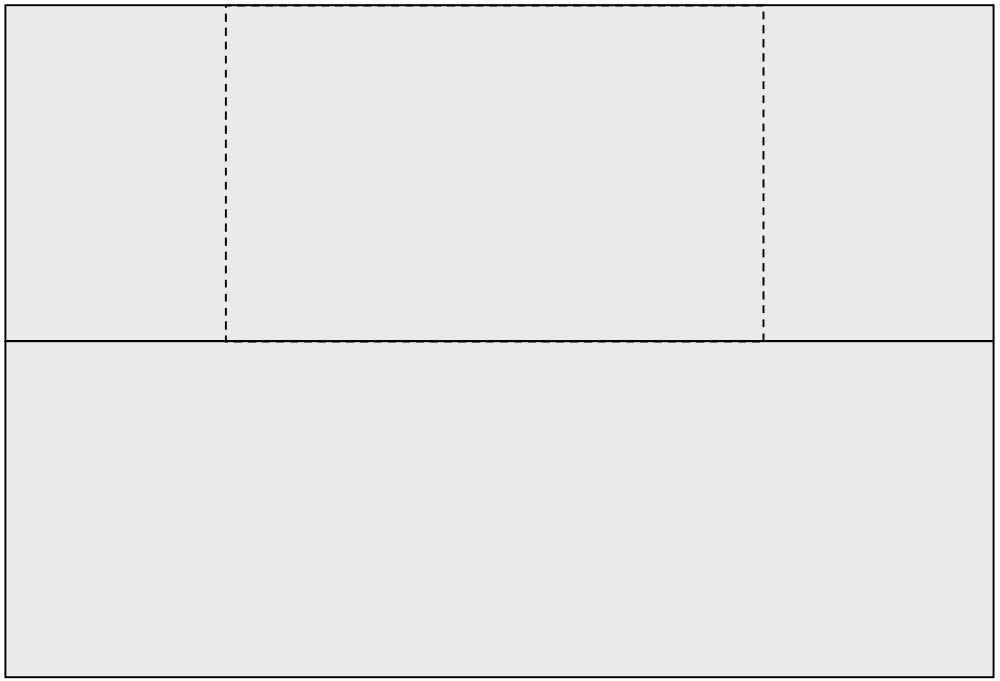
MOBILE TRANSPORTER/BASE



BOX – MOUNT ON BOX BOTTOM

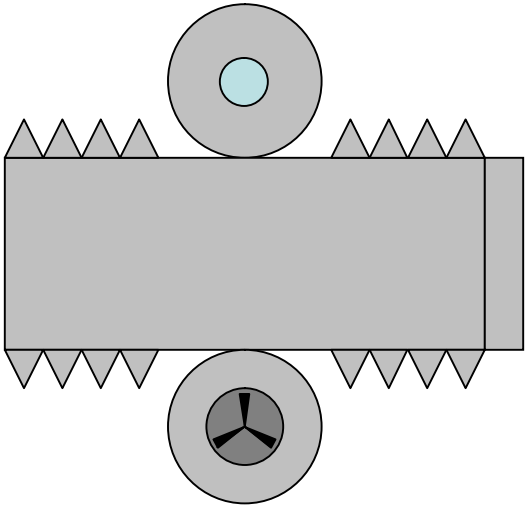


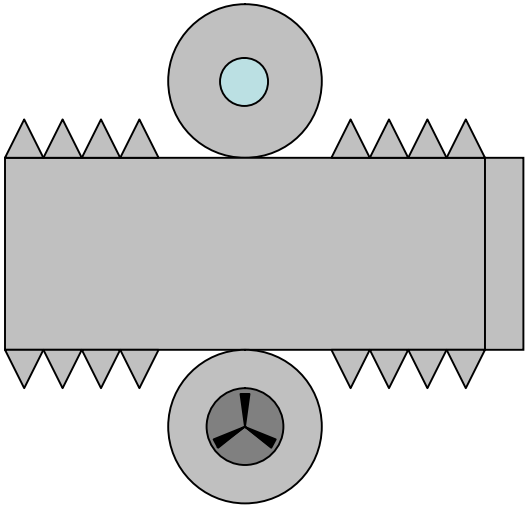
Flexible straws sleeved together – sections about 7 inches long. Cover with white tape or paint.



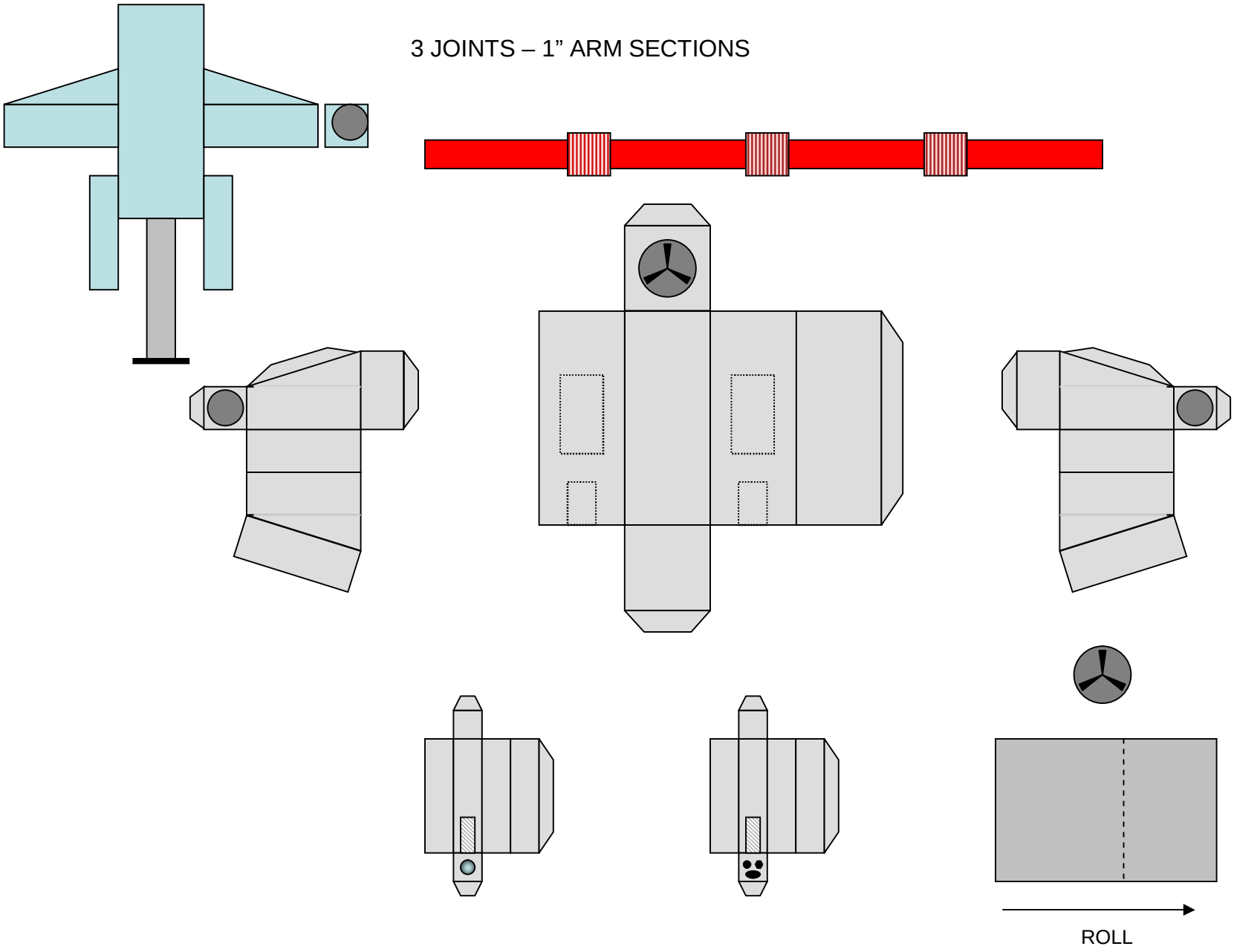
MOUNTING PLATFORM – GLUE TO BOX, THEN ATTACH TO TRUSS

ROBOT (CANADARM) ARM END FITTINGS

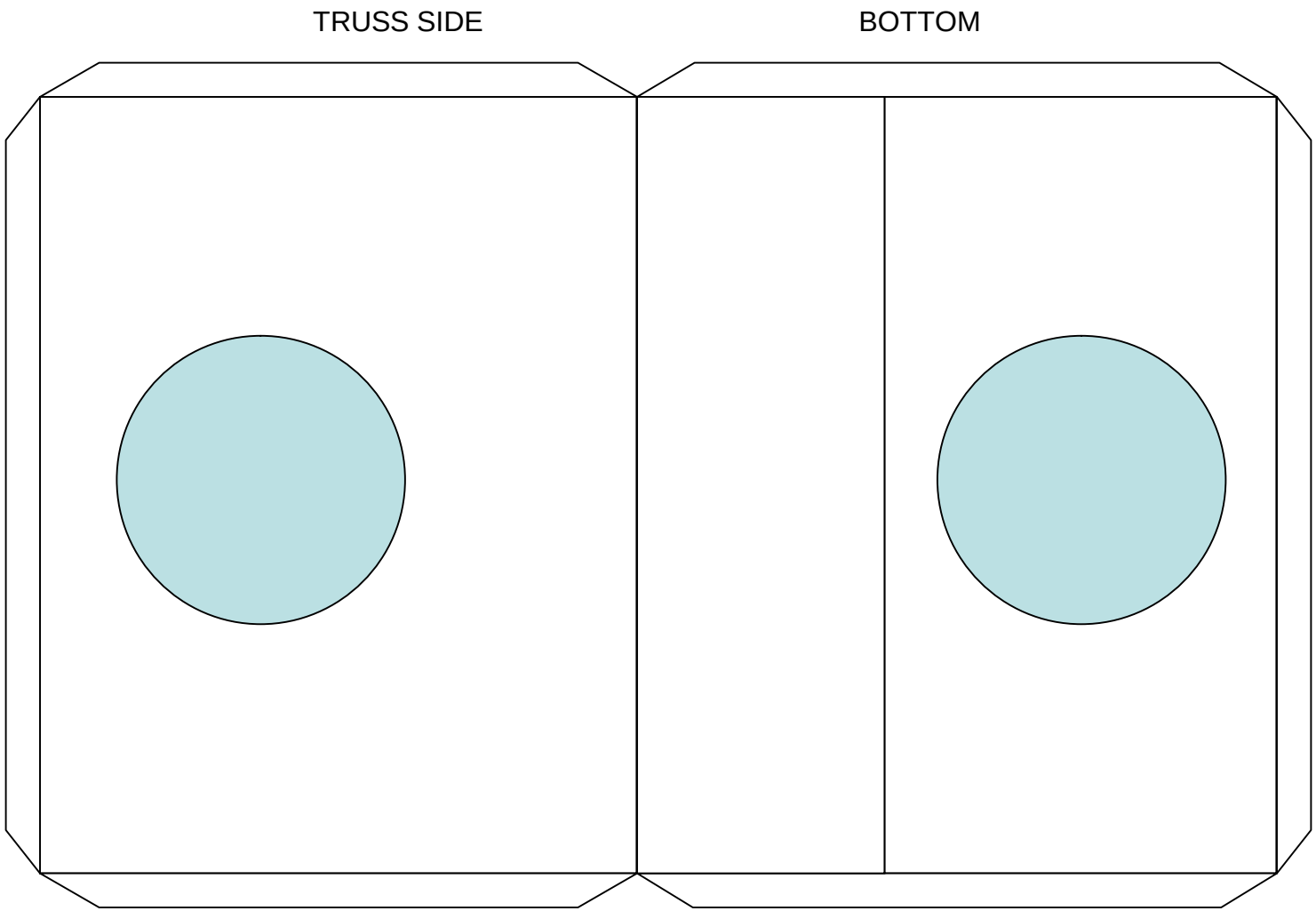




CANADARM DEXTRE

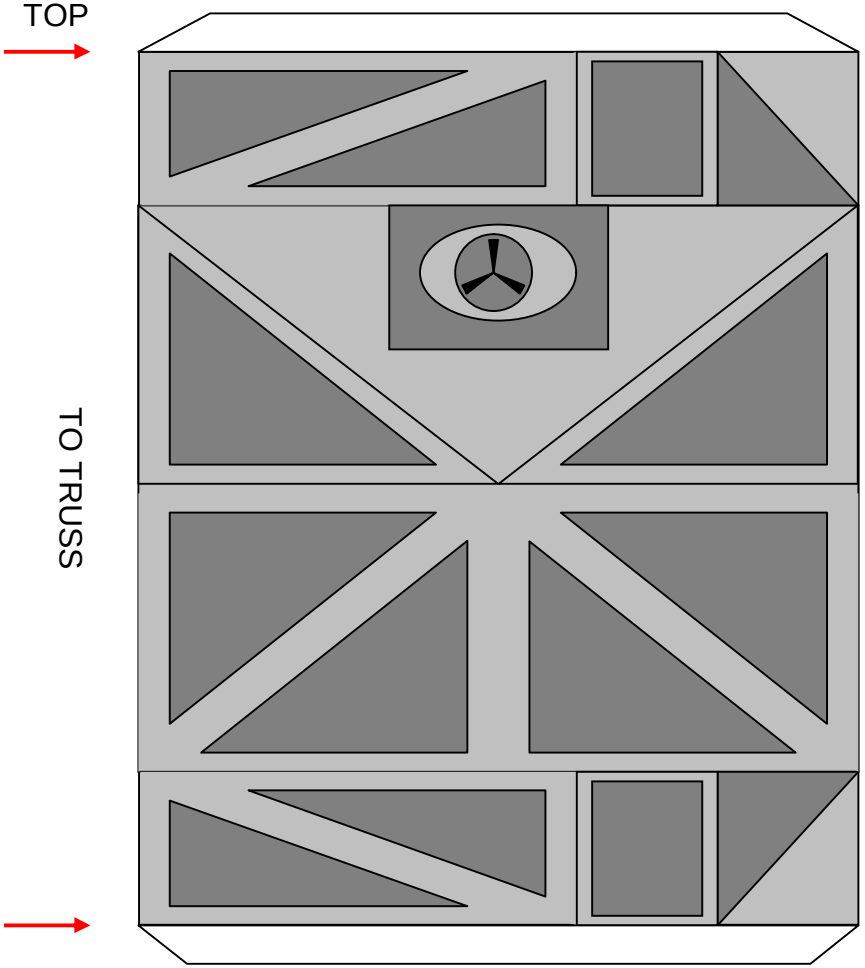


Z1 TRUSS - enlarged

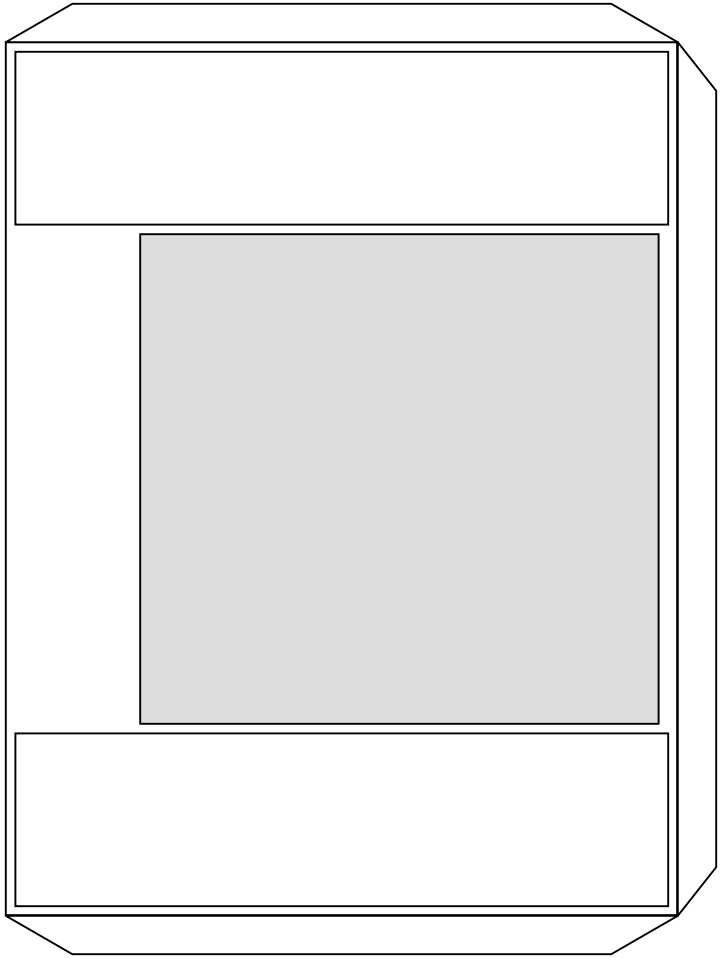


Z1 TRUSS -enlarged

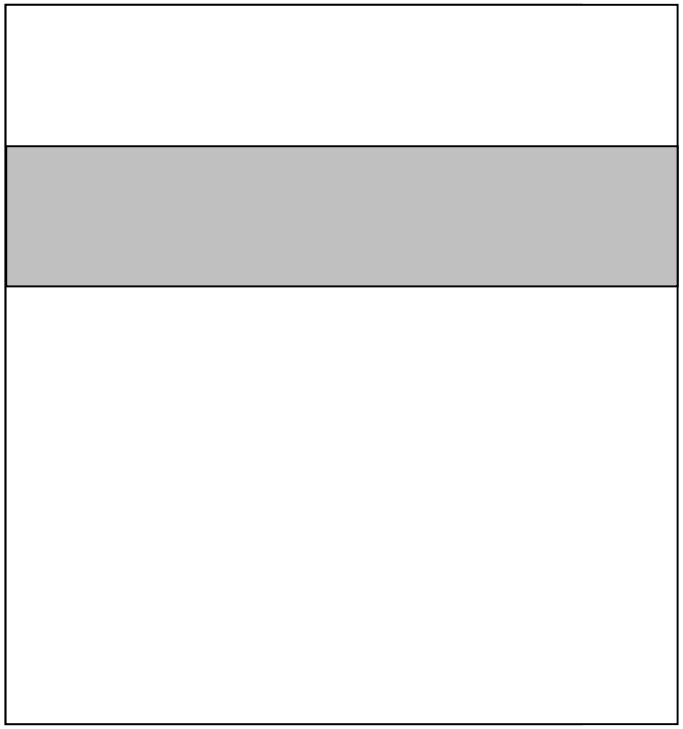
TOP



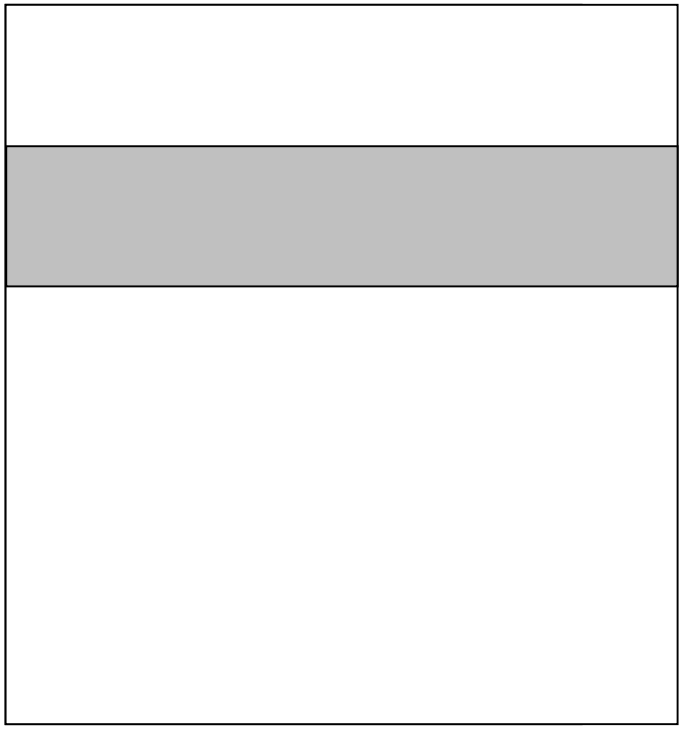
BACK – AWAY FROM TRUSS

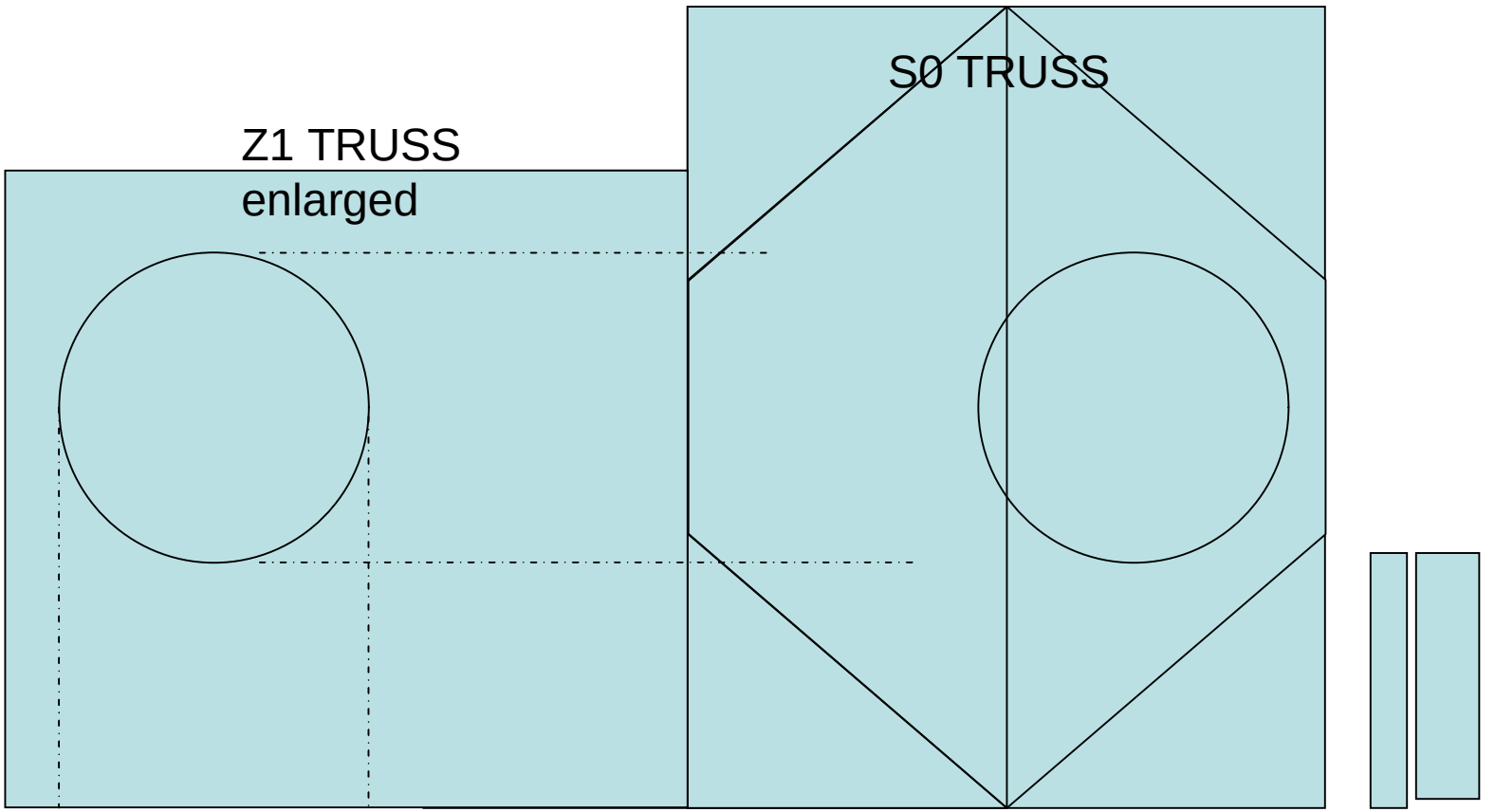


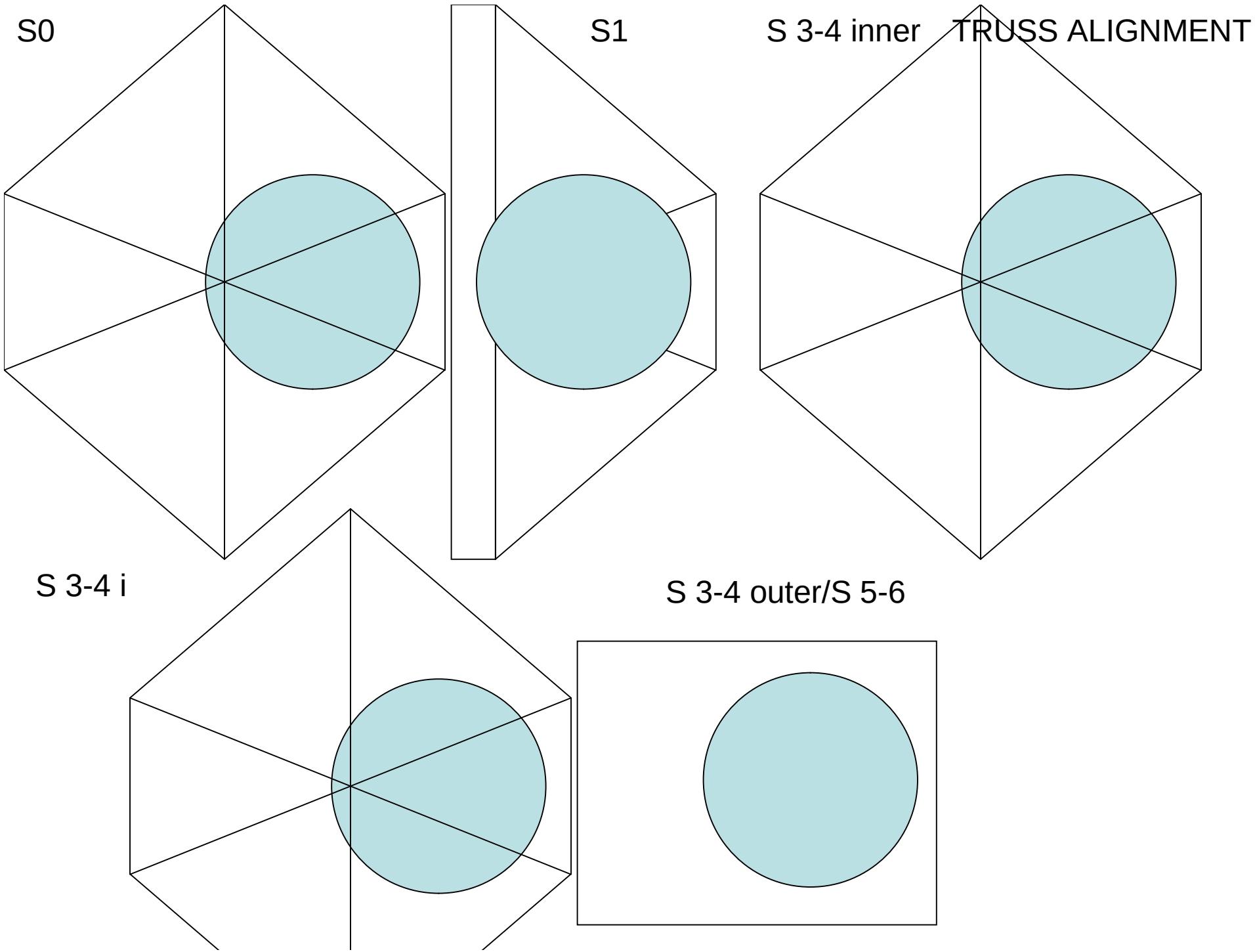
Z1 TRUSS
enlarged



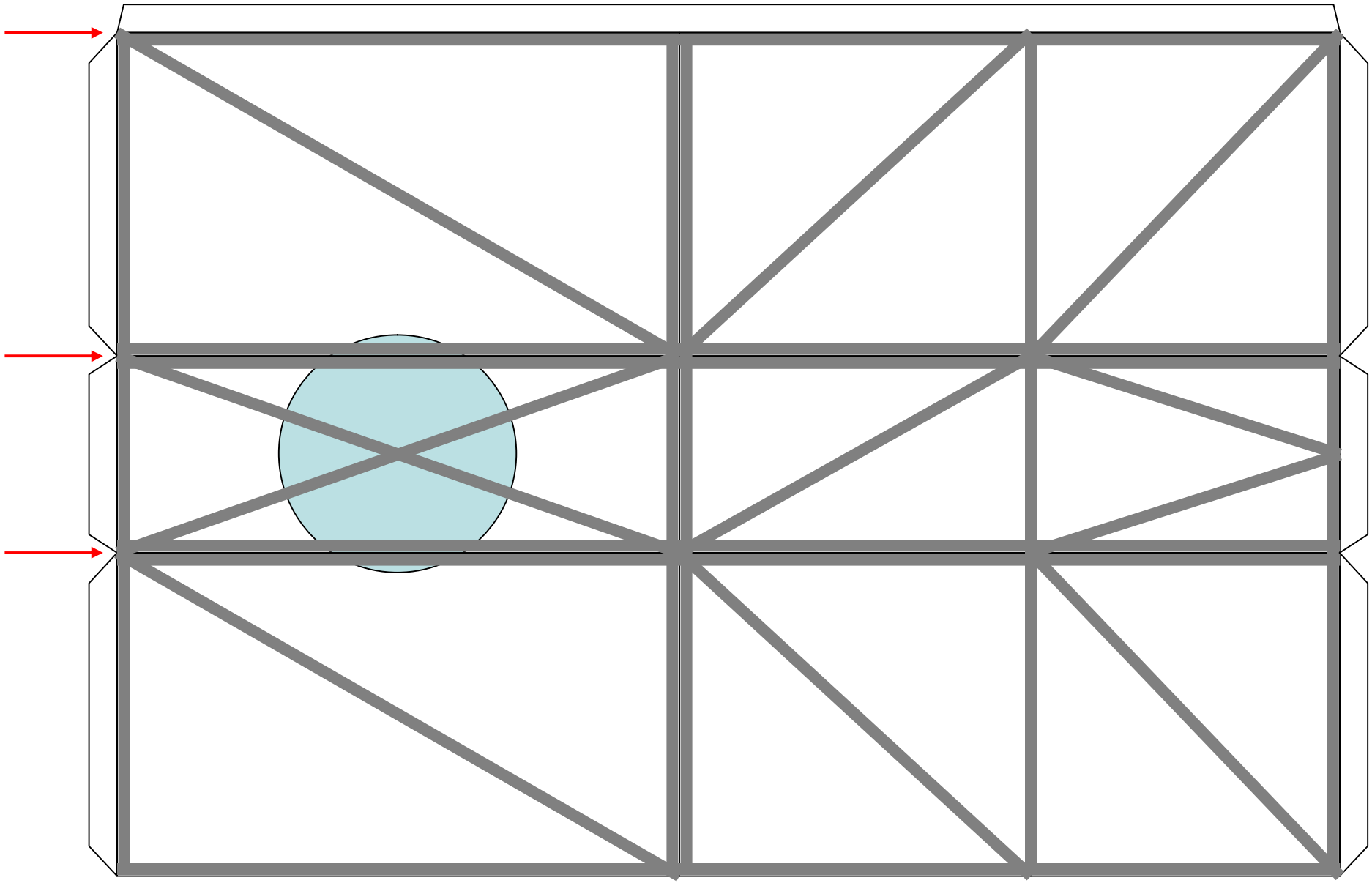
SIDES



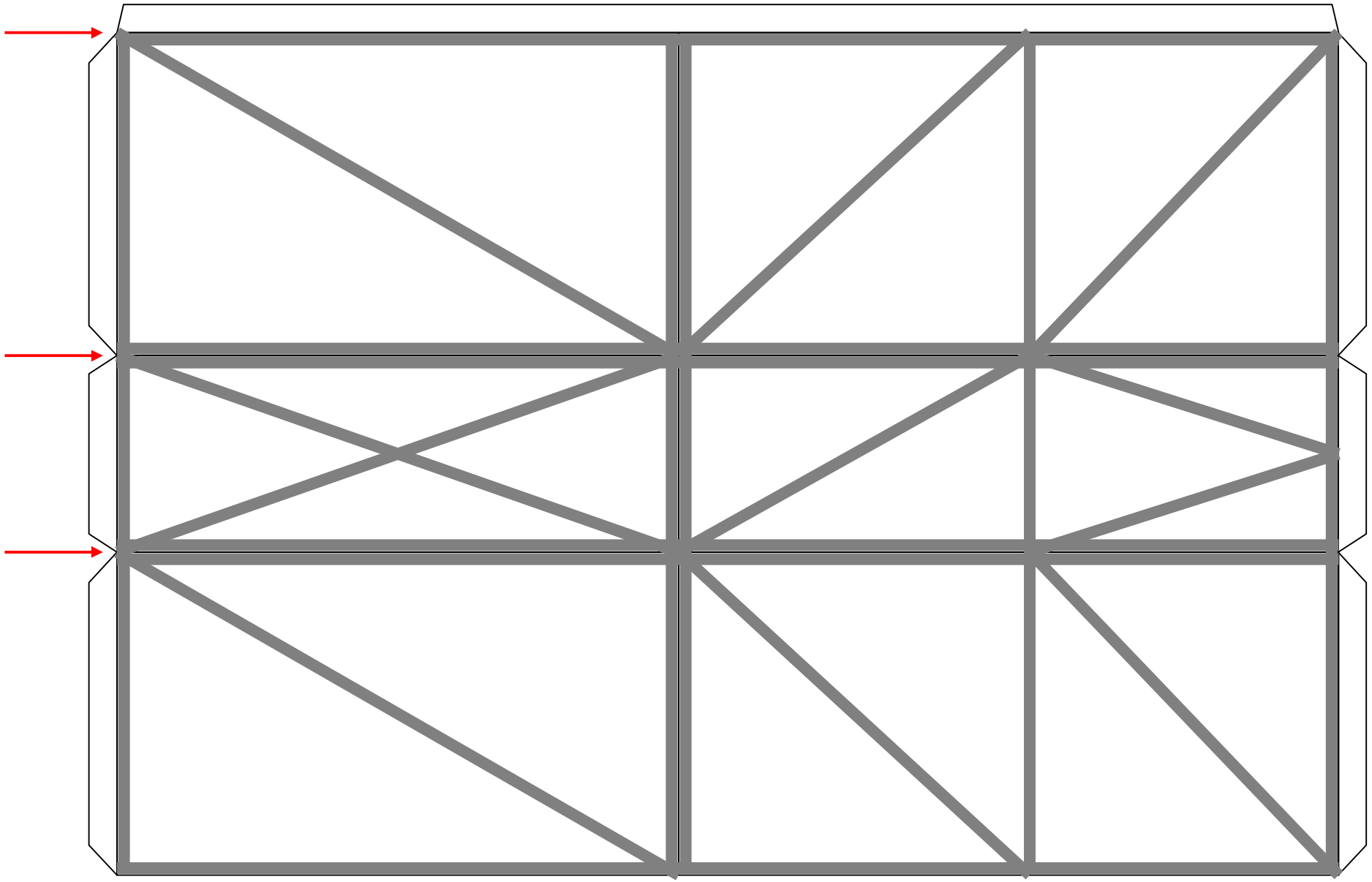

S0 TRUSS
Z1 TRUSS
enlarged


S0
S1
S 3-4 inner
TRUSS ALIGNMENT
S 3-4 i
S 3-4 outer/S 5-6

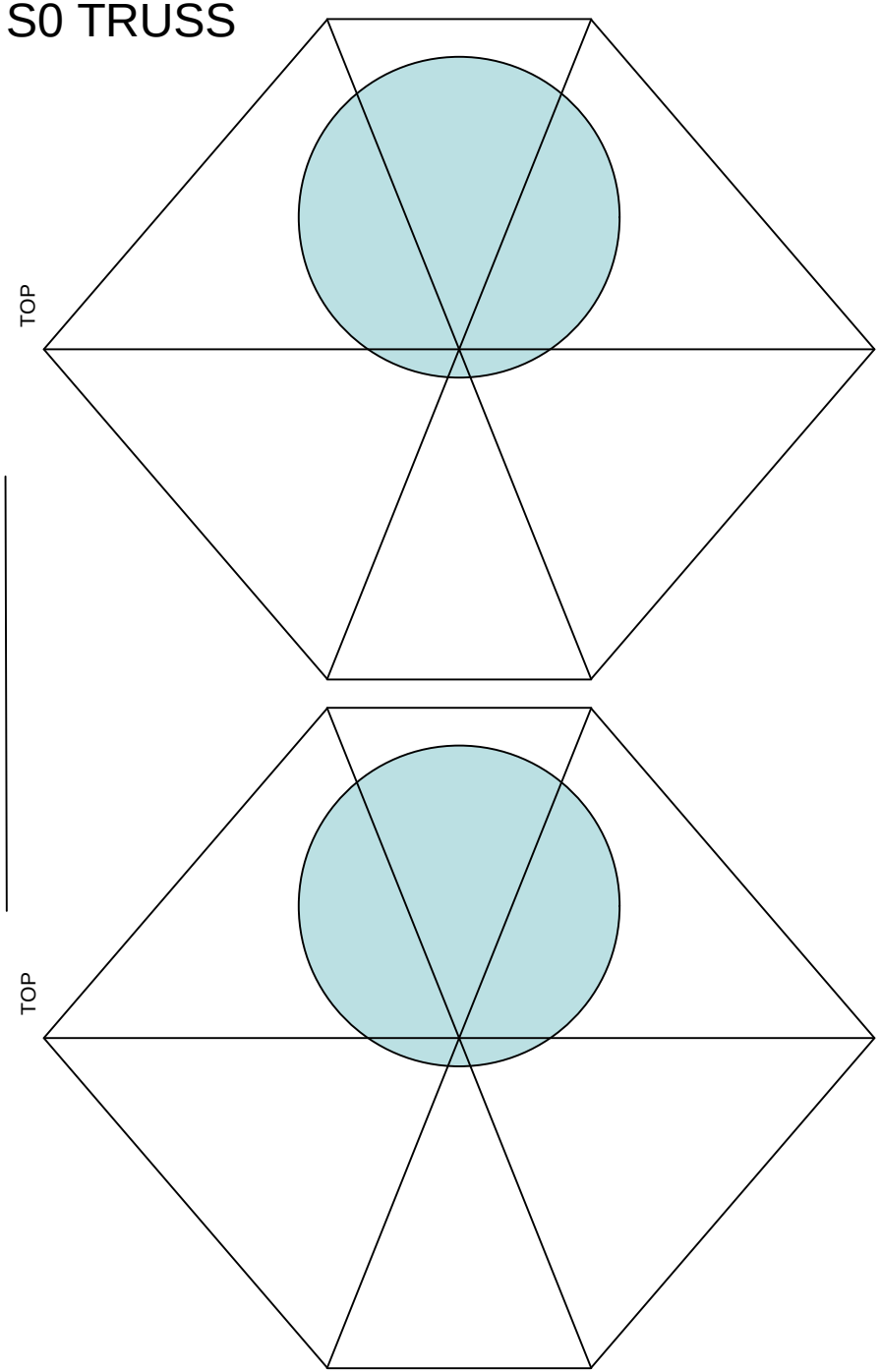
S0 TRUSS
JEMM SIDE

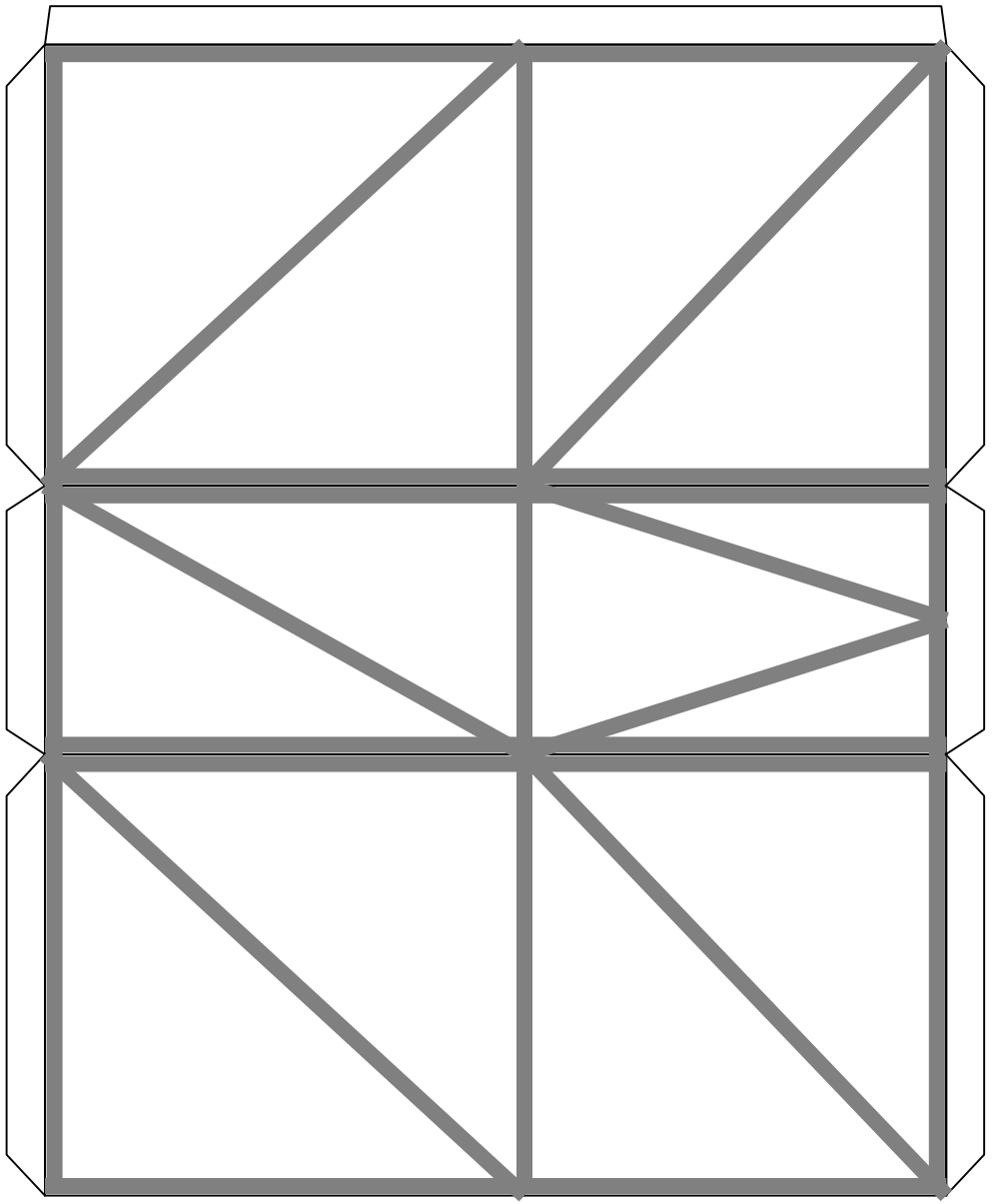


S0 TRUSS
JEMM SIDE

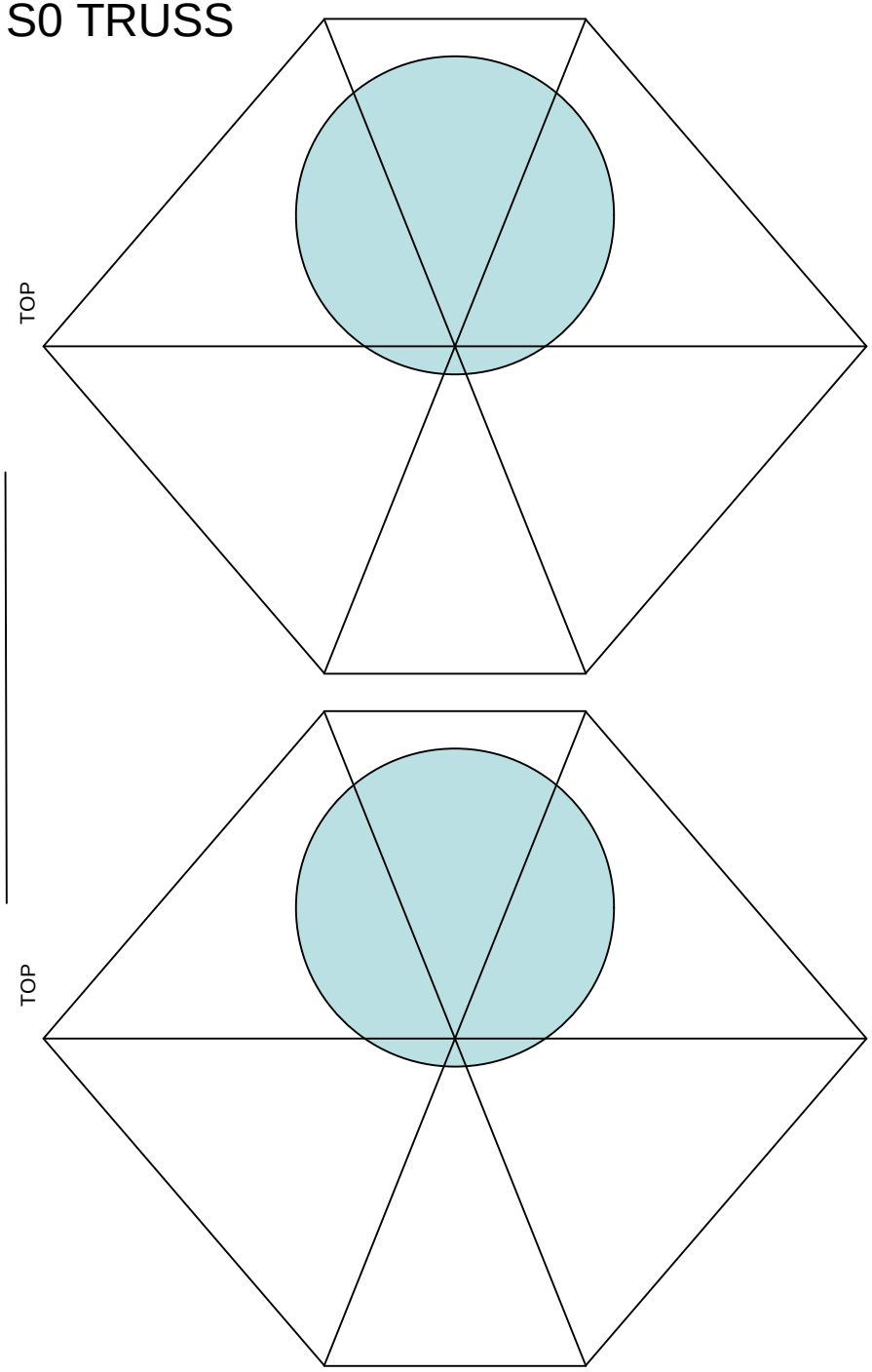


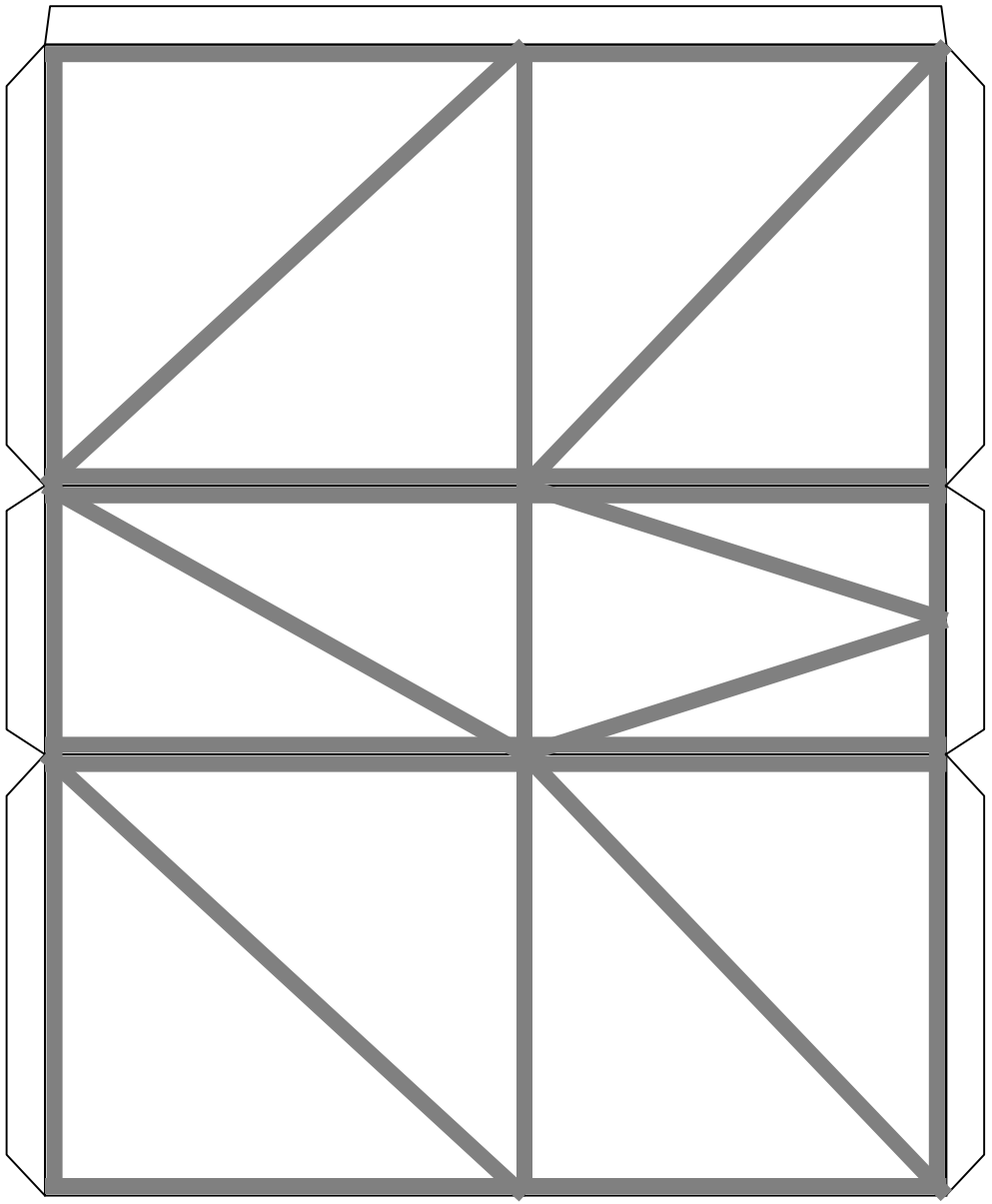
S0 TRUSS



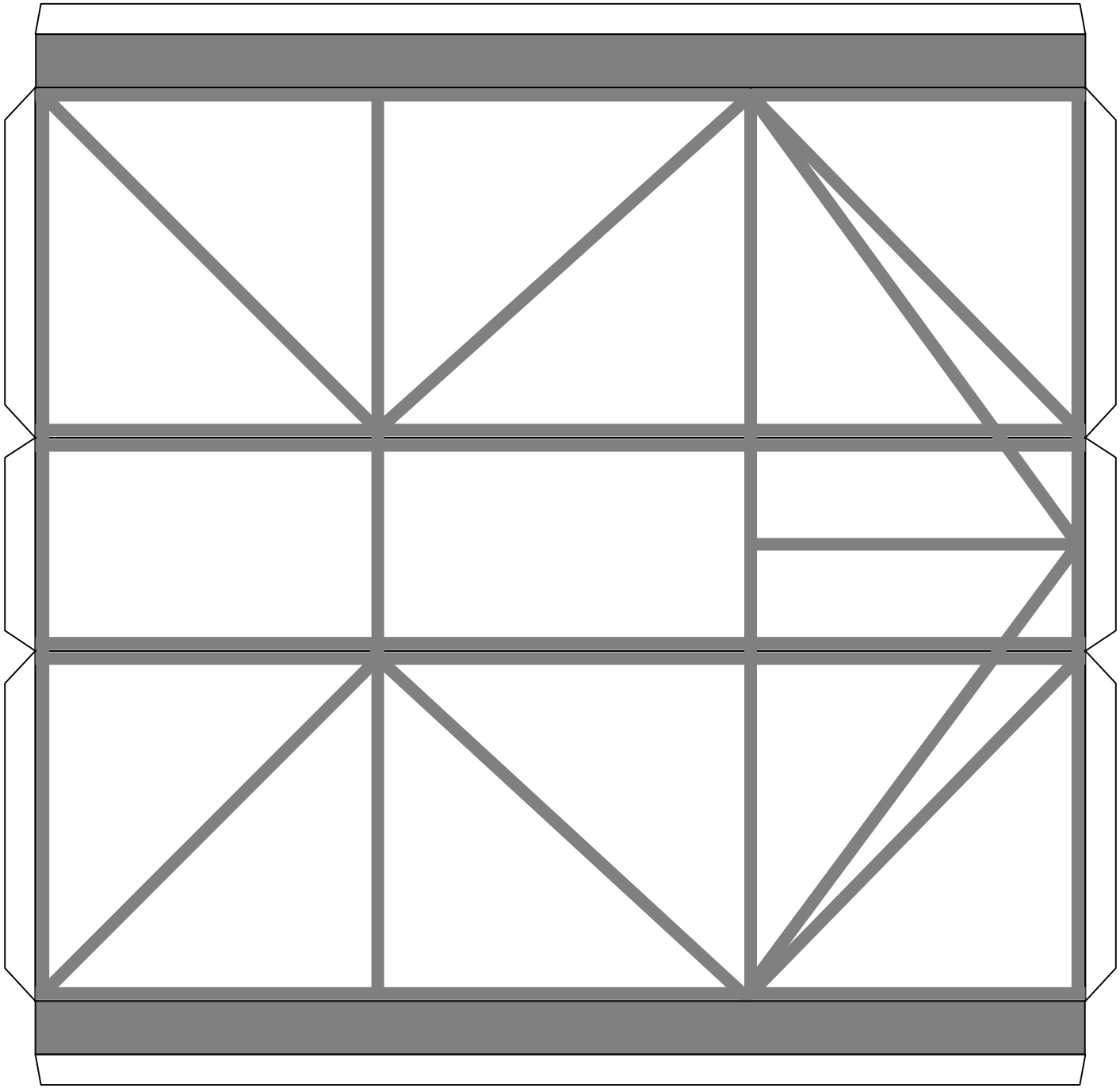


S0 TRUSS

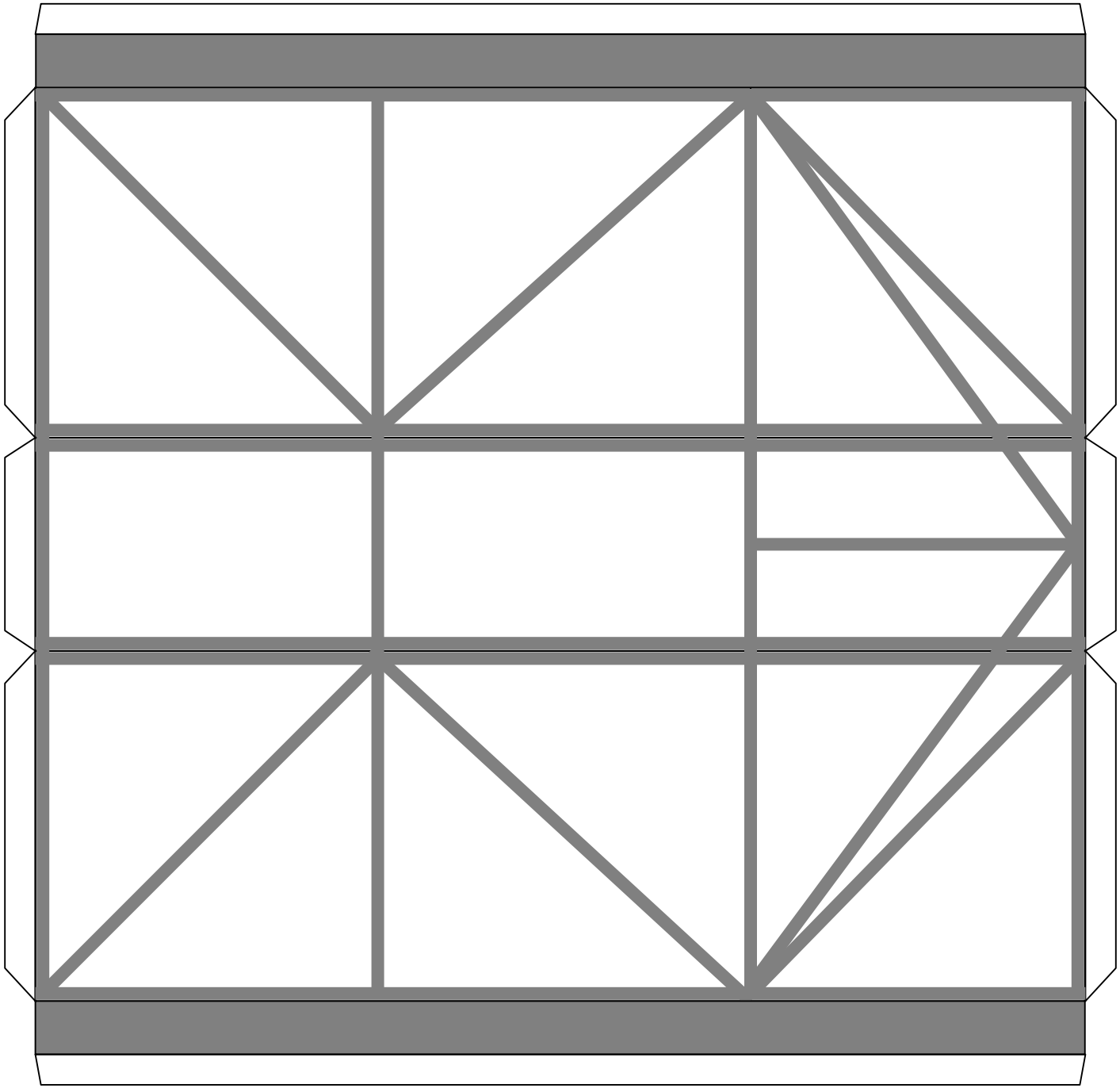




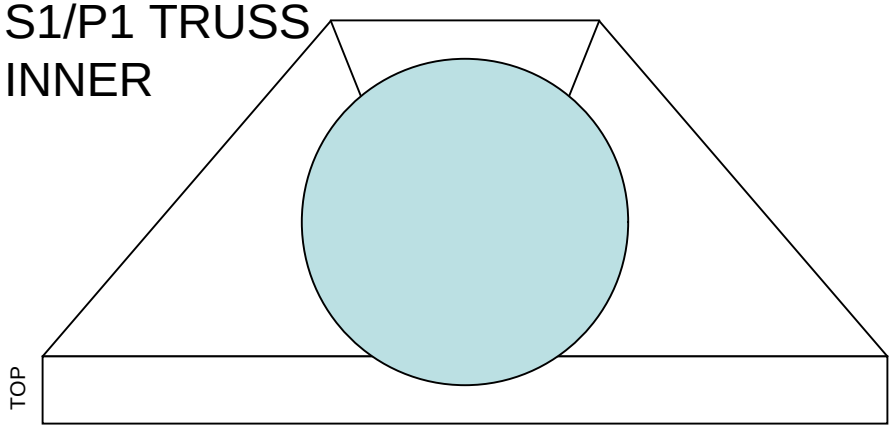
S1/P1 TRUSS
INNER

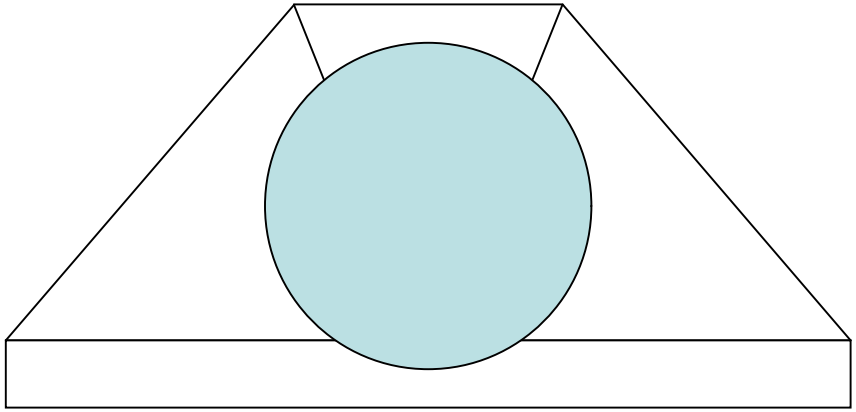


S1/P1 TRUSS
INNER

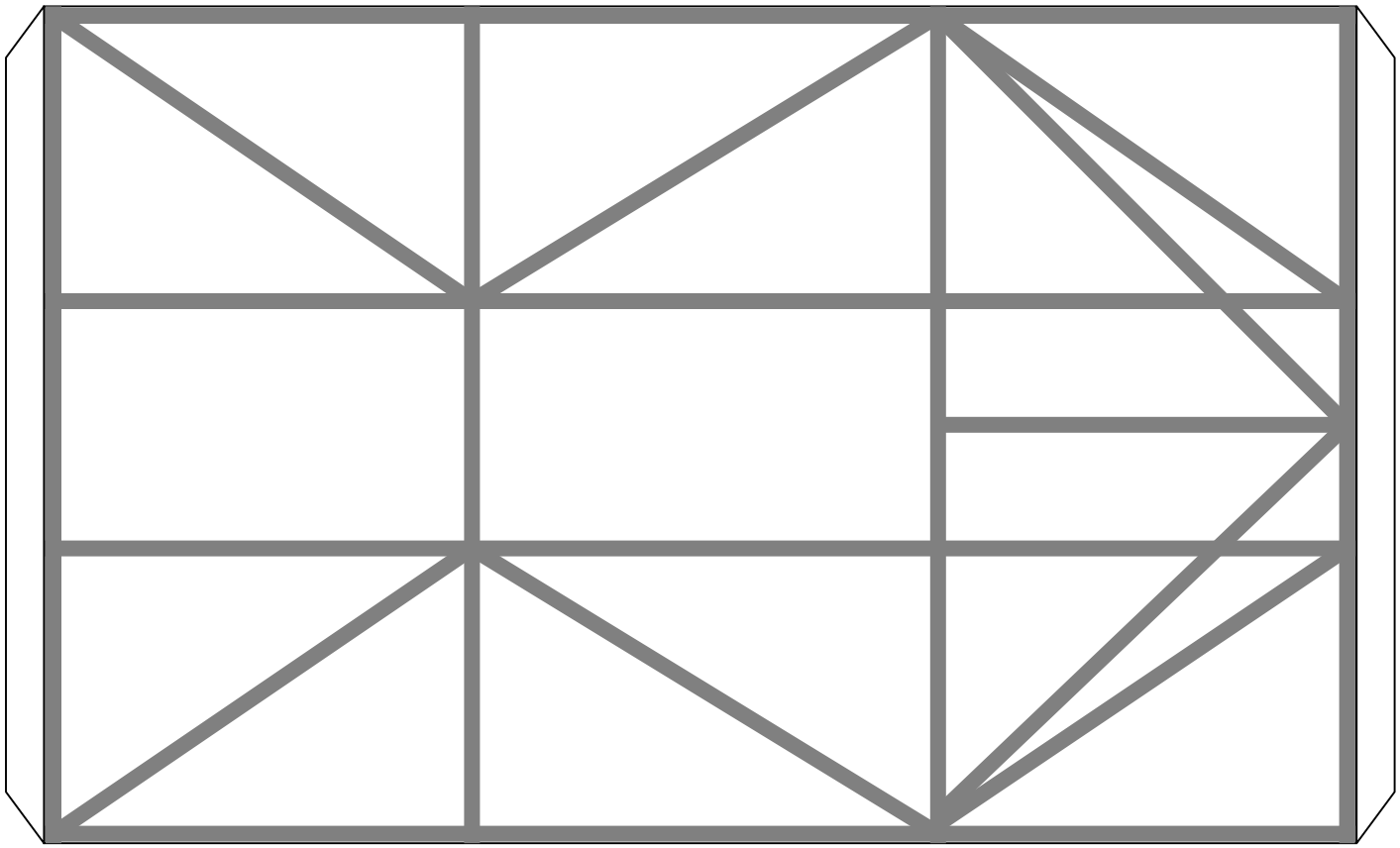


S1/P1 TRUSS
INNER

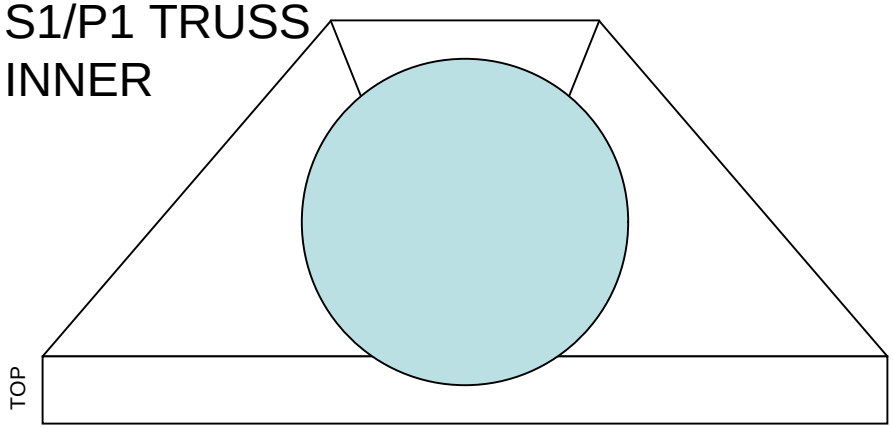


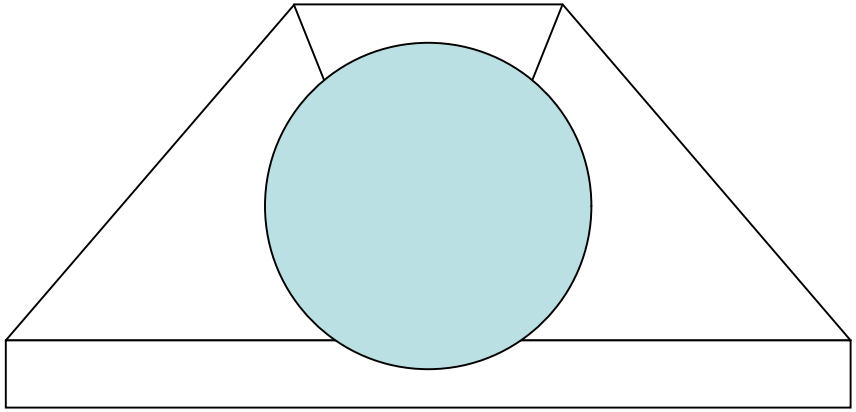


BACK

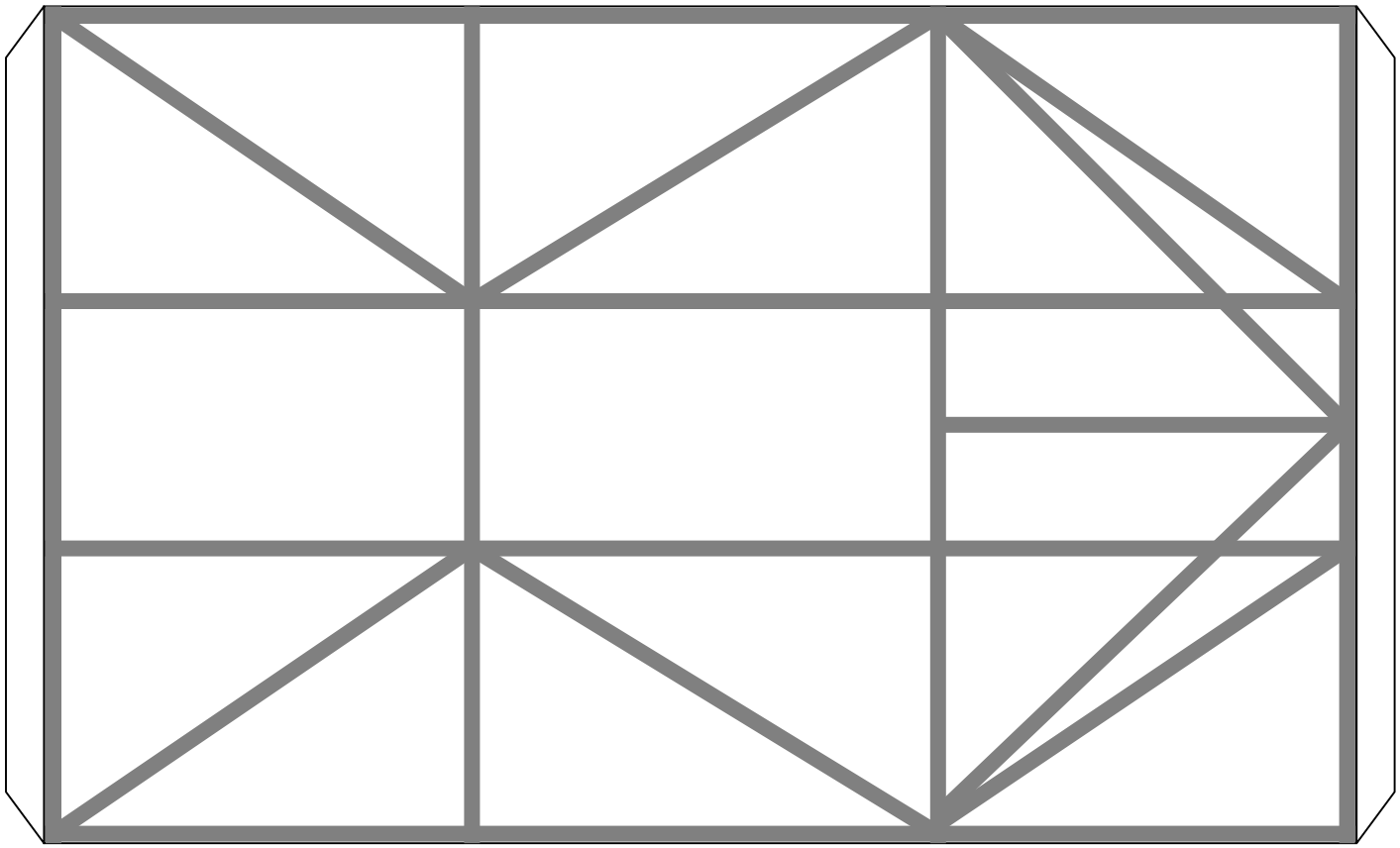


S1/P1 TRUSS
INNER

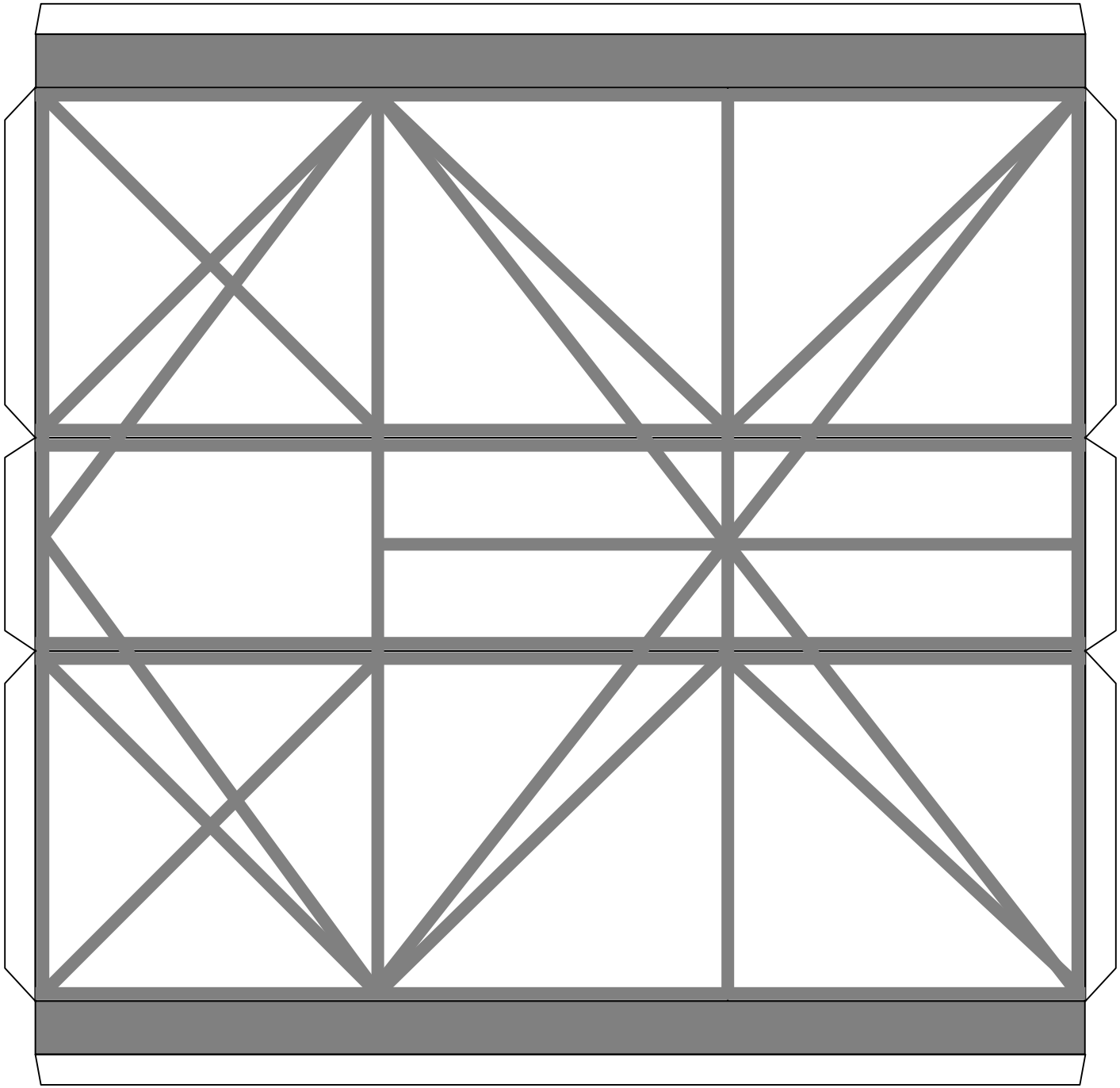




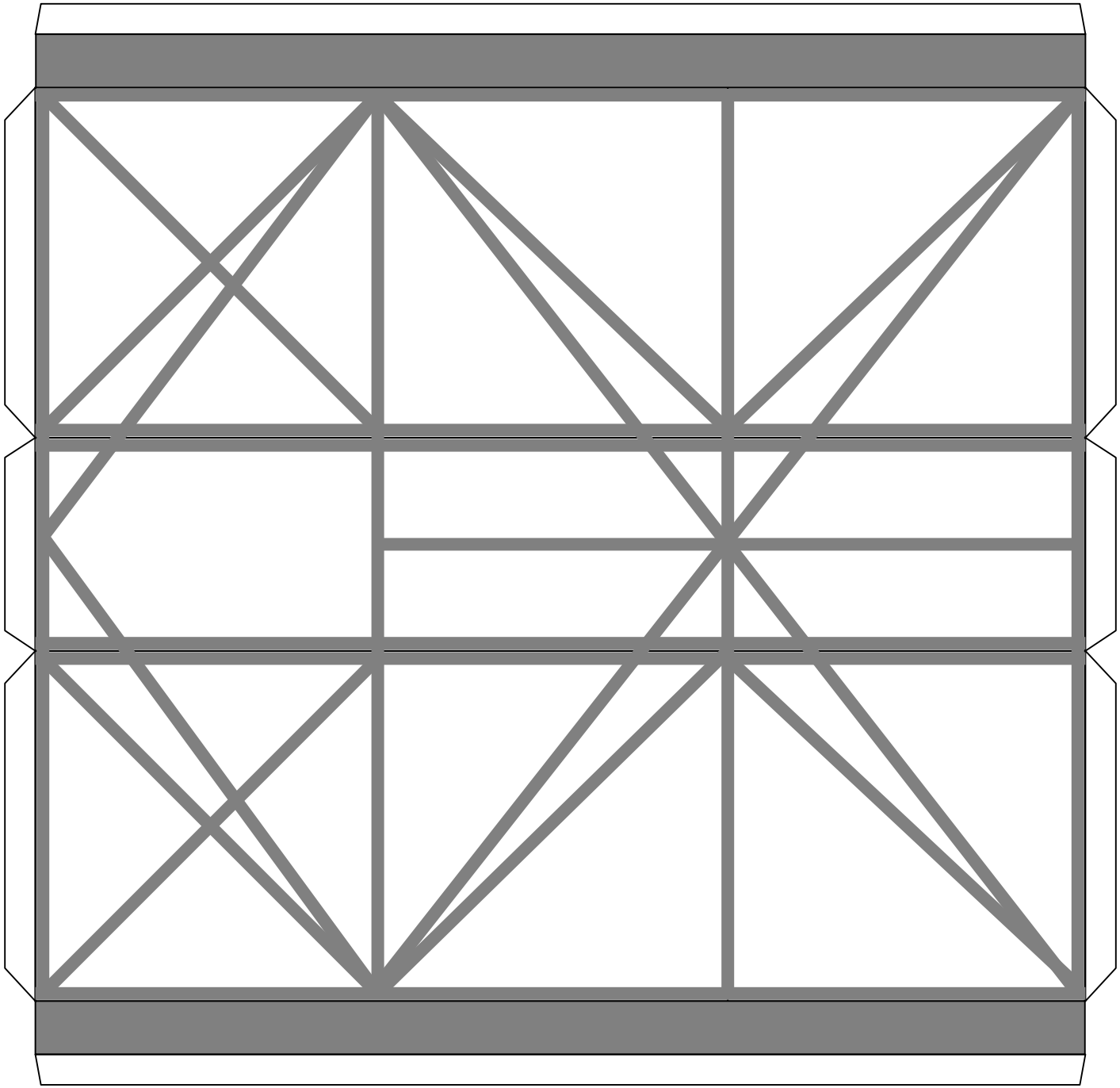
BACK



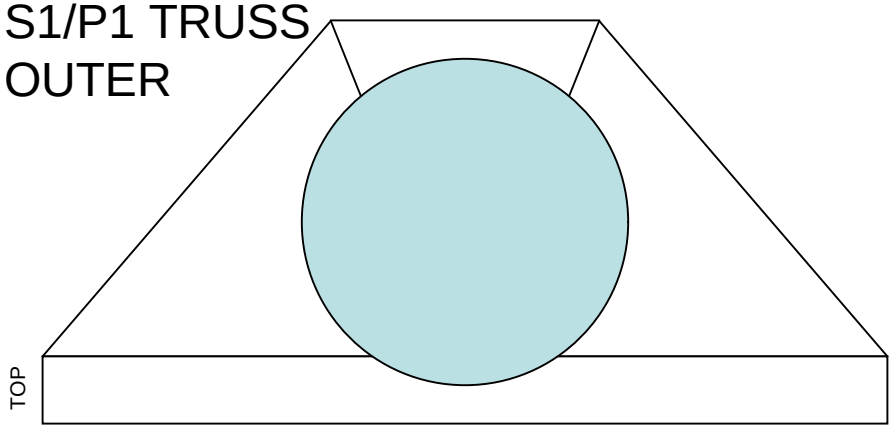
S1/P1 TRUSS
OUTER

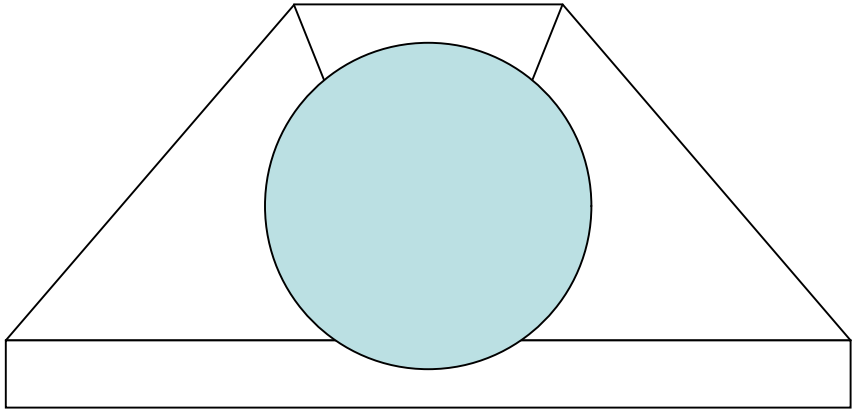


S1/P1 TRUSS
OUTER

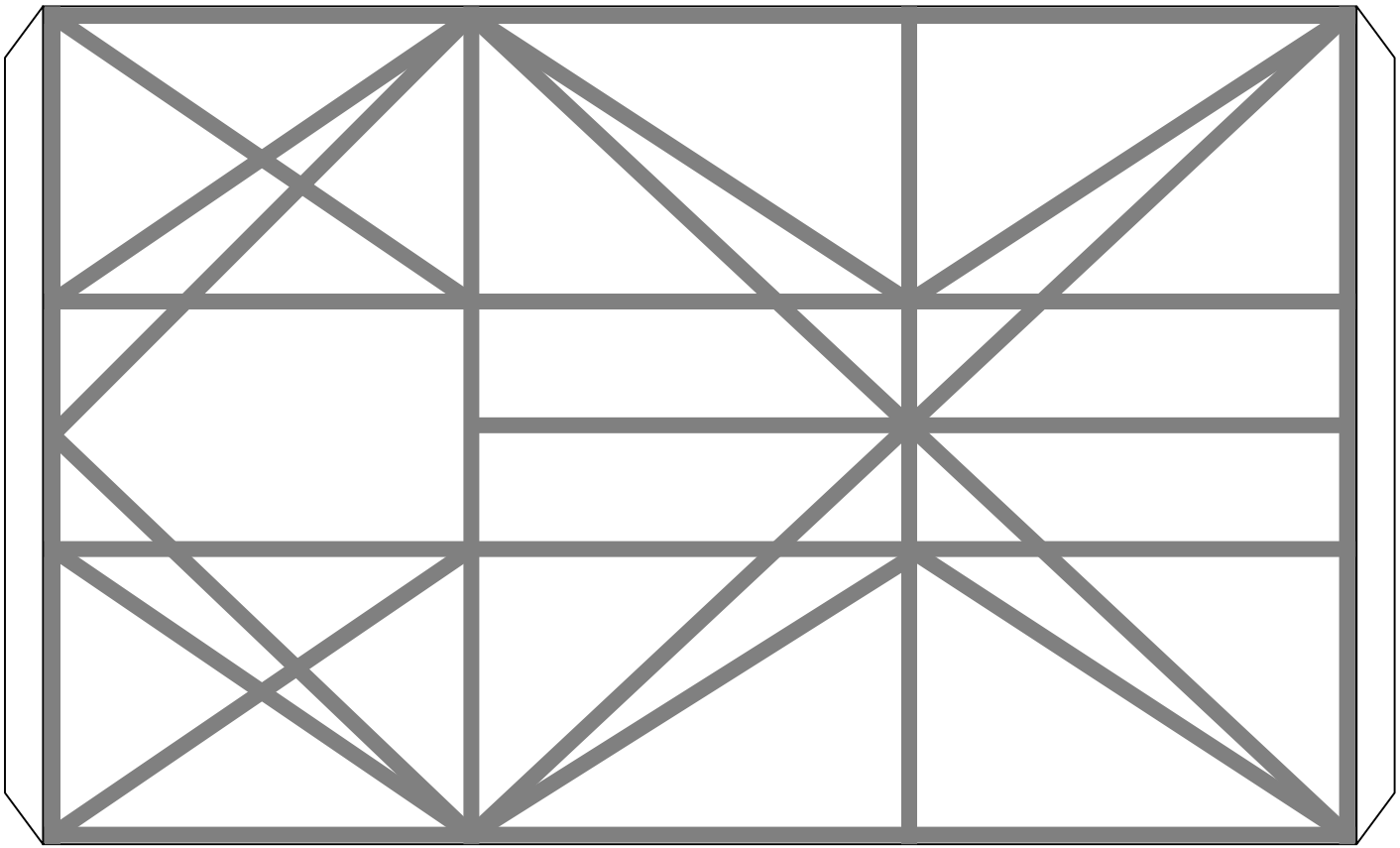


S1/P1 TRUSS
OUTER

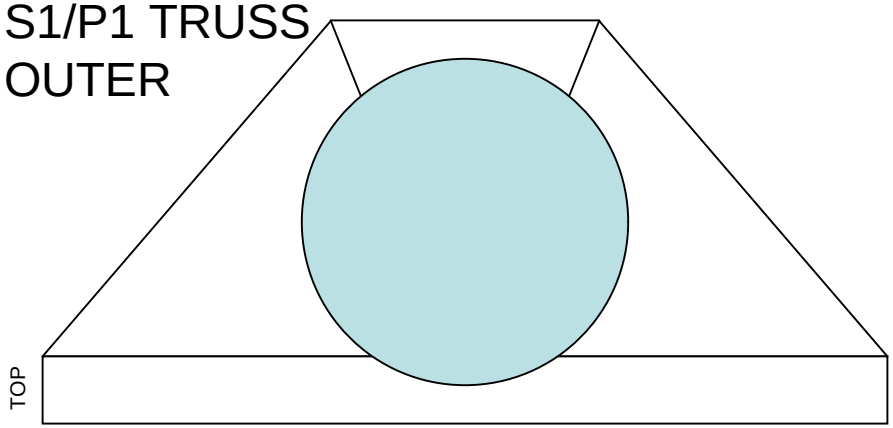


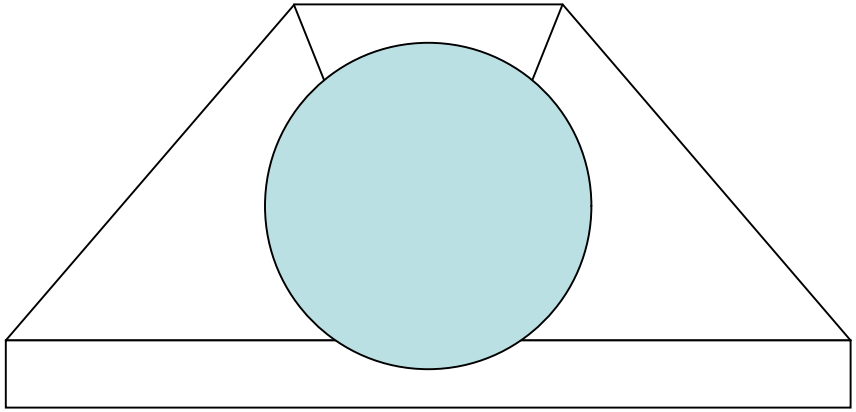


BACK

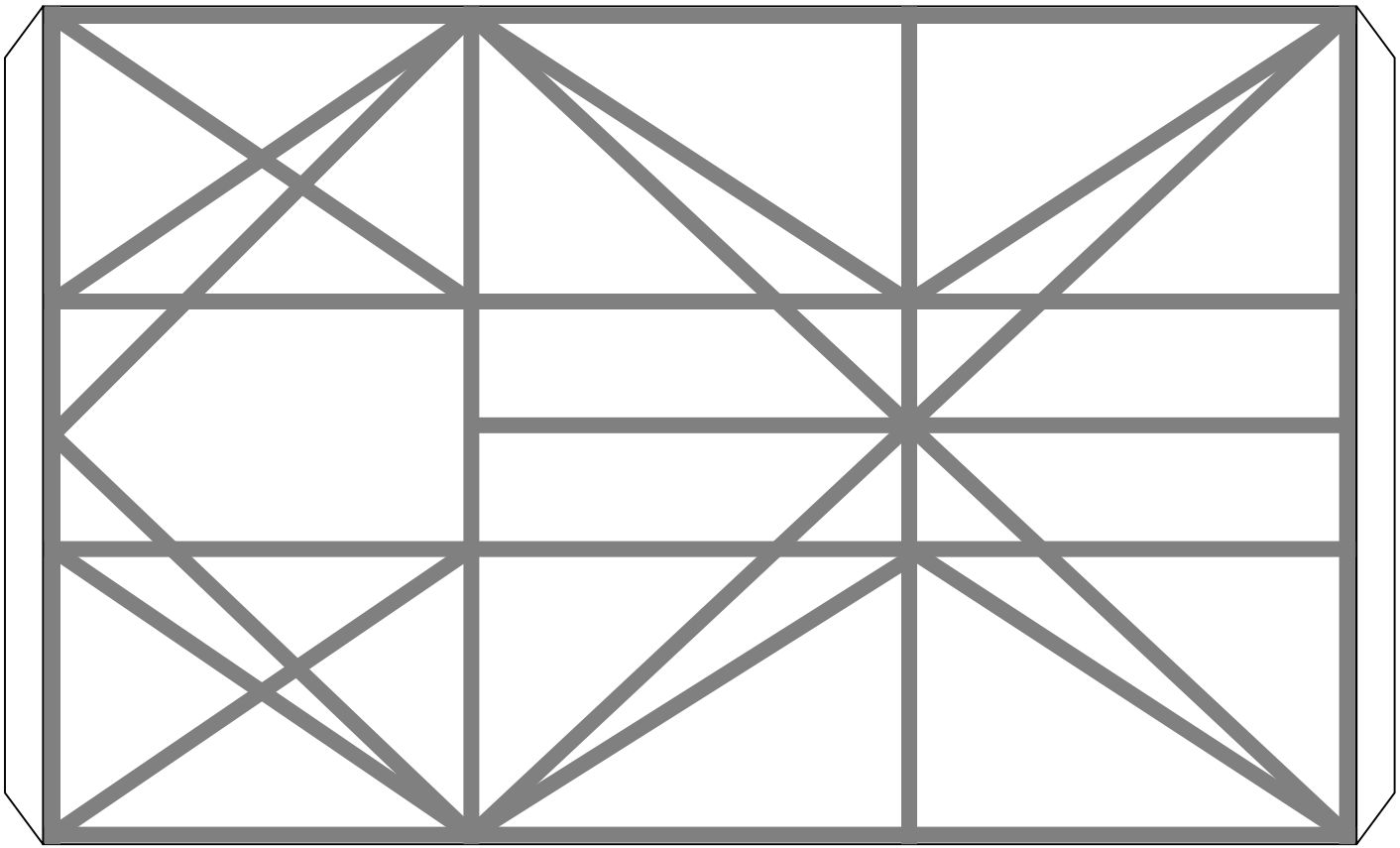


S1/P1 TRUSS
OUTER

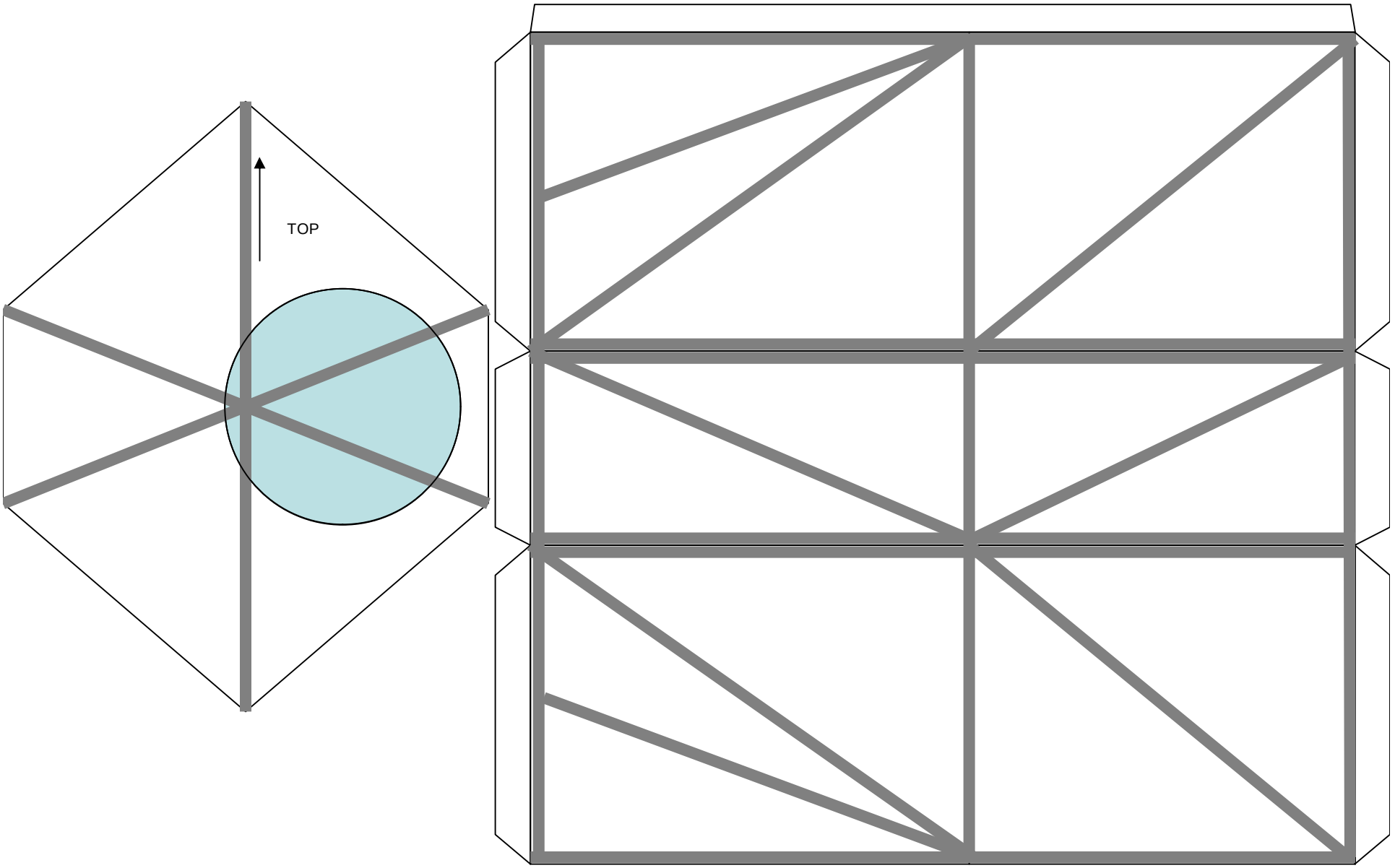




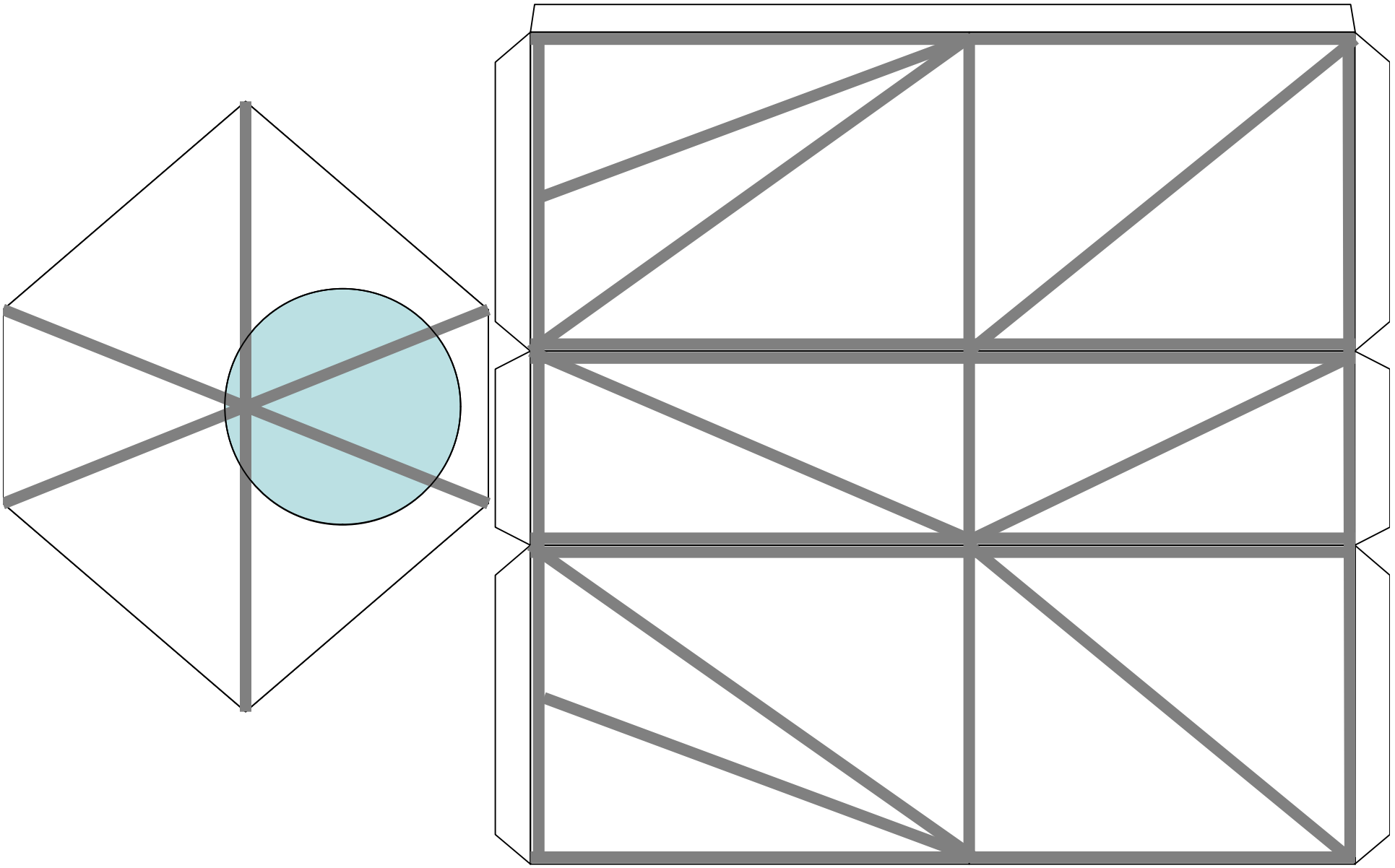
BACK



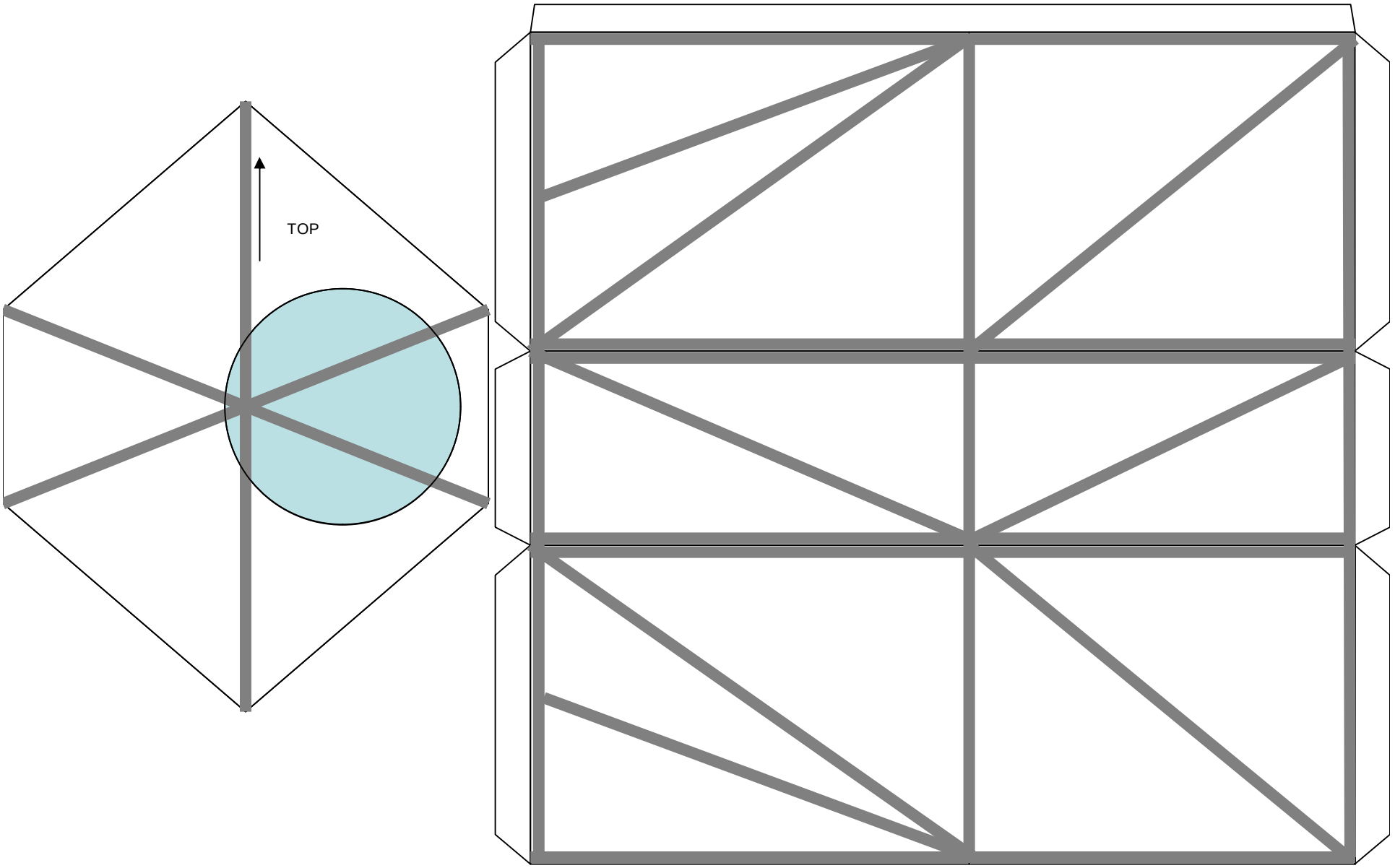
S/P 3-4 TRUSS
INNER



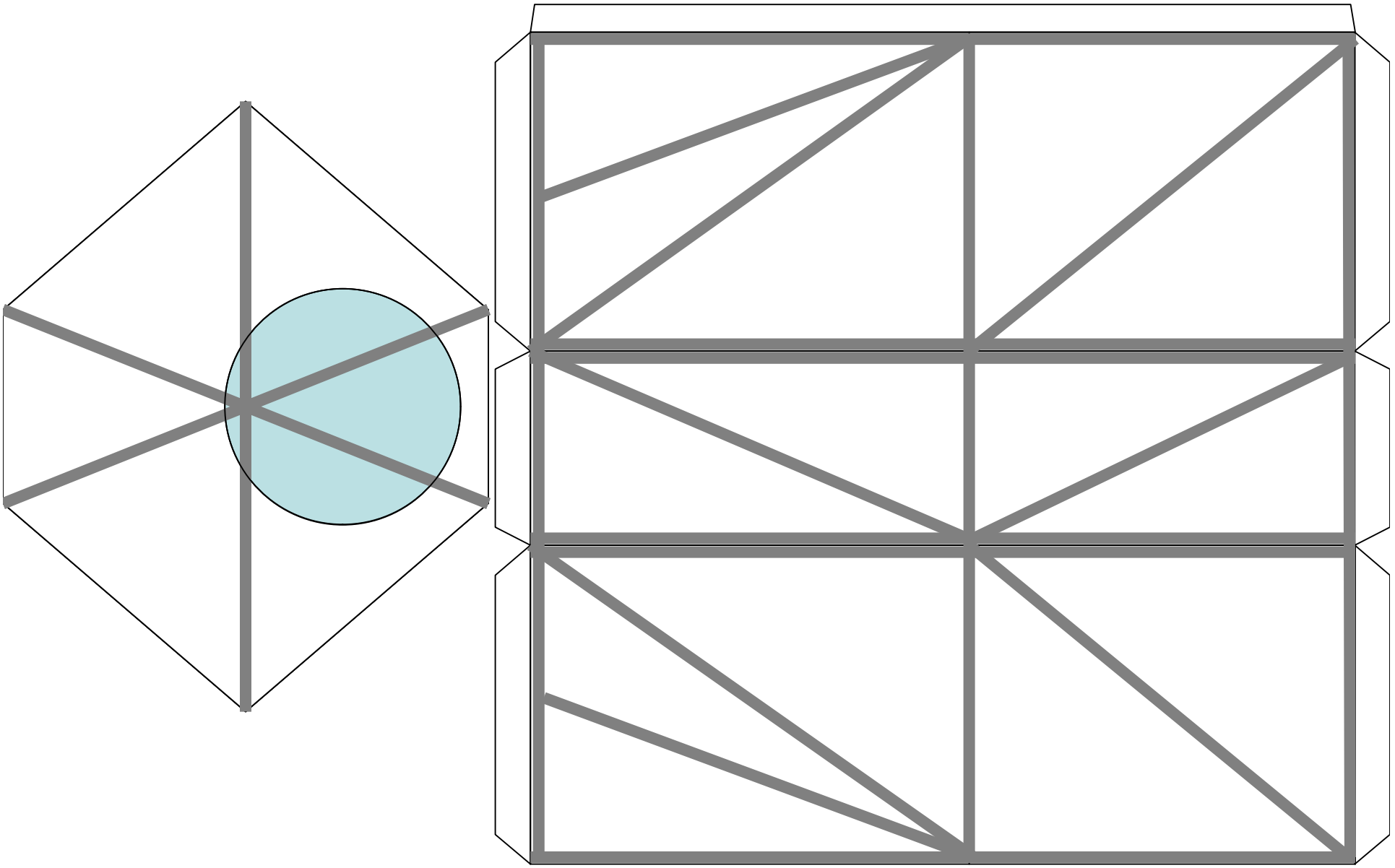
S/P 3-4 TRUSS
INNER



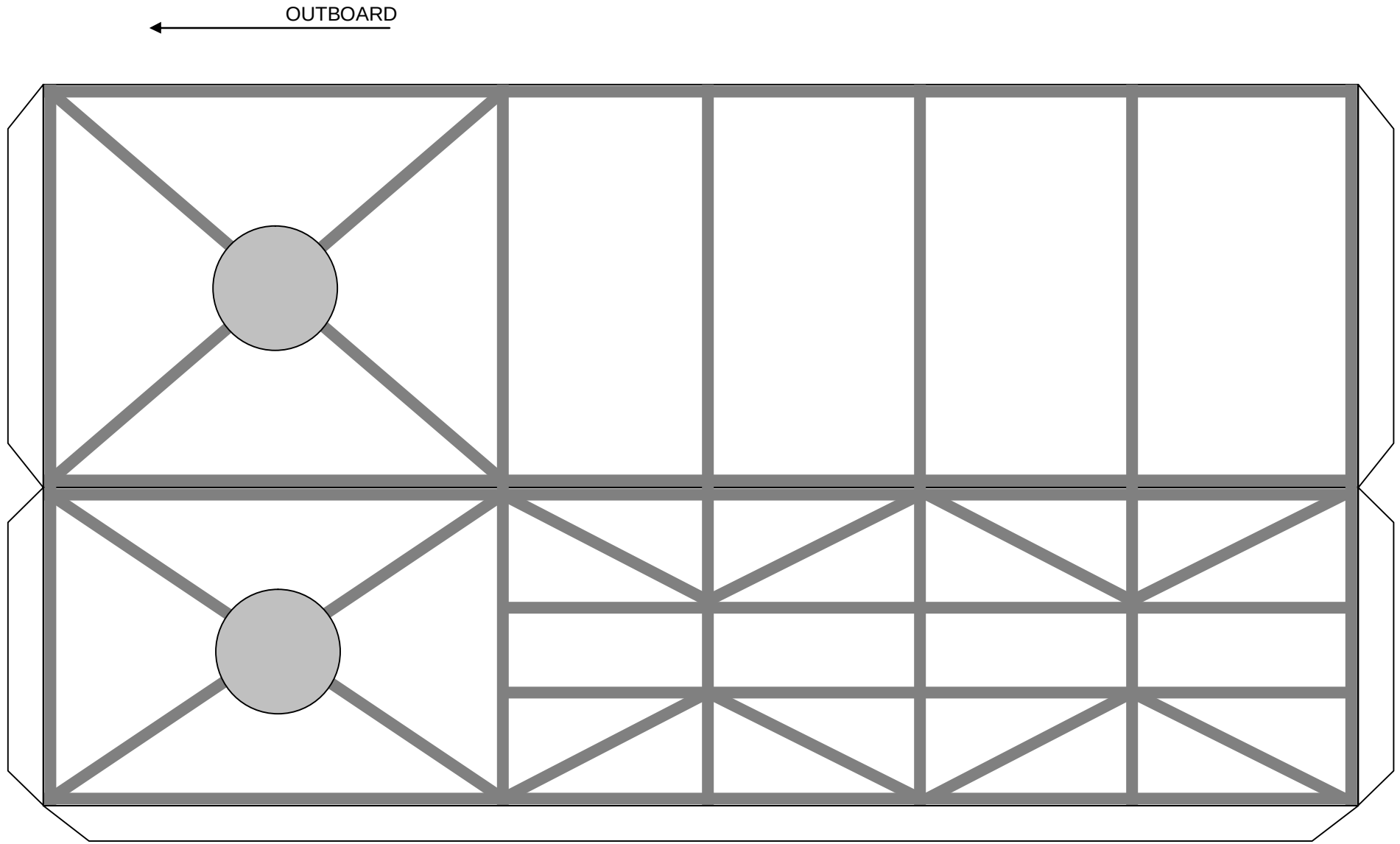
S/P 3-4 TRUSS
INNER



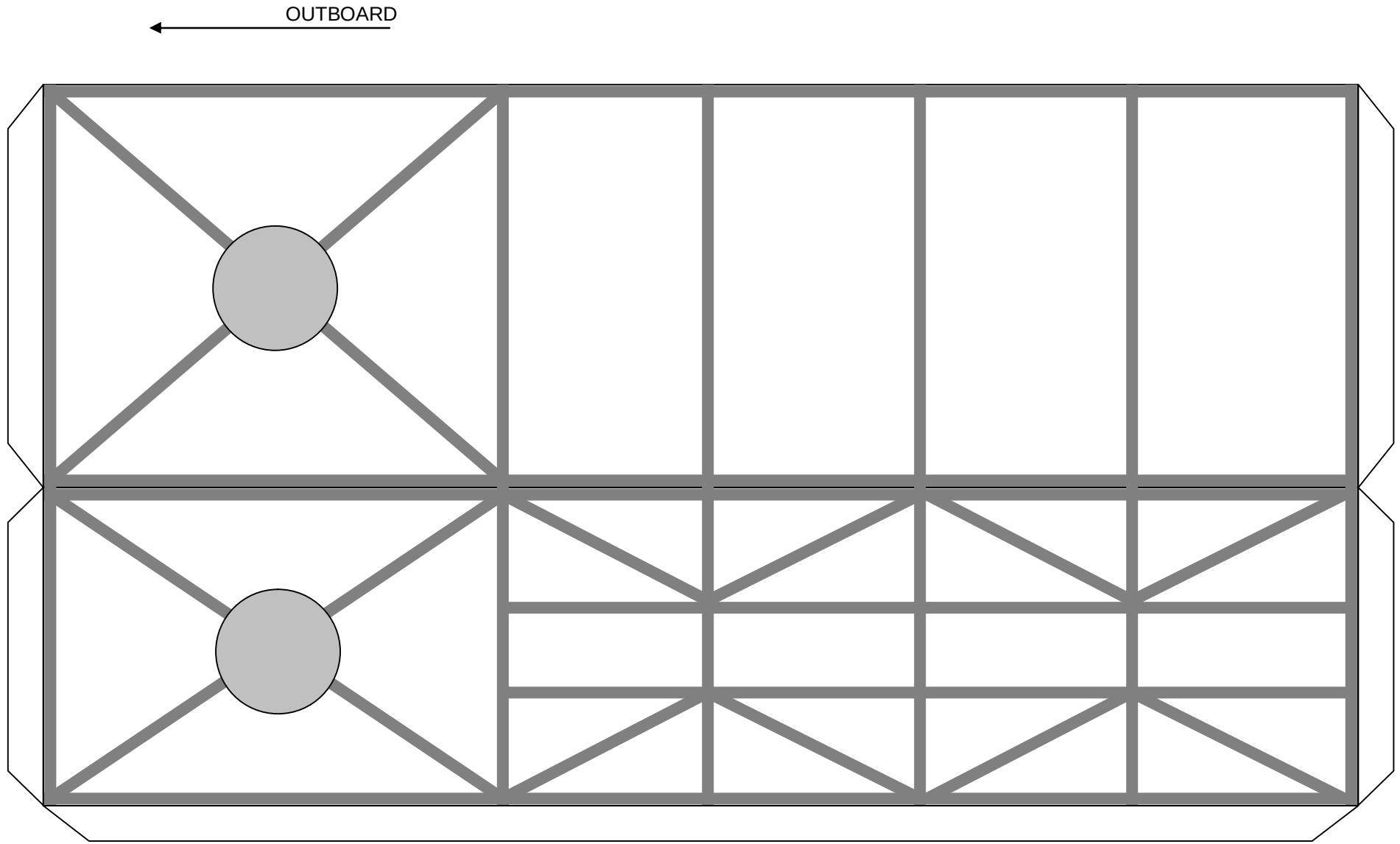
S/P 3-4 TRUSS
INNER



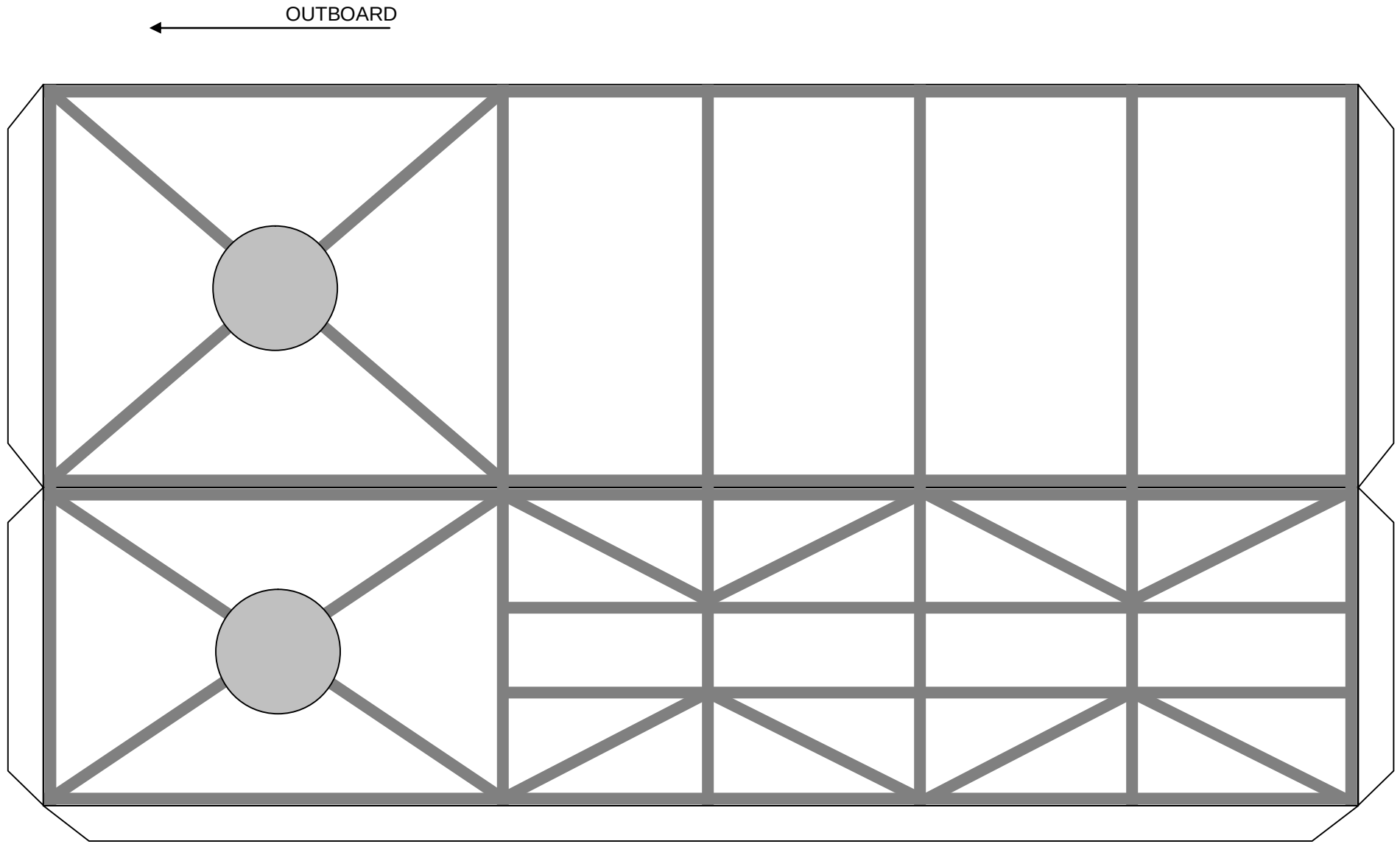
S/P 3-4 TRUSS
OUTER



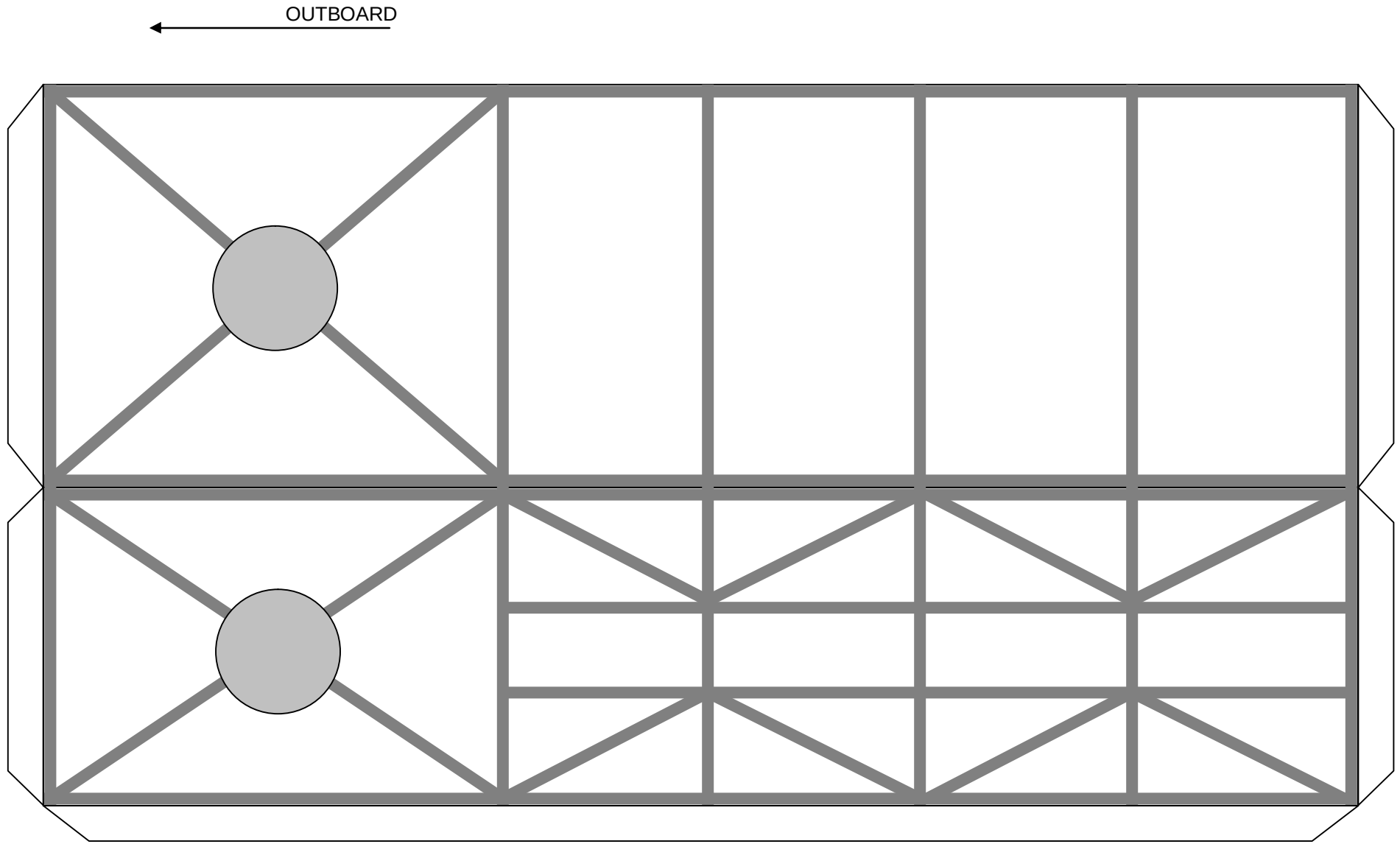
S/P 3-4 TRUSS
OUTER



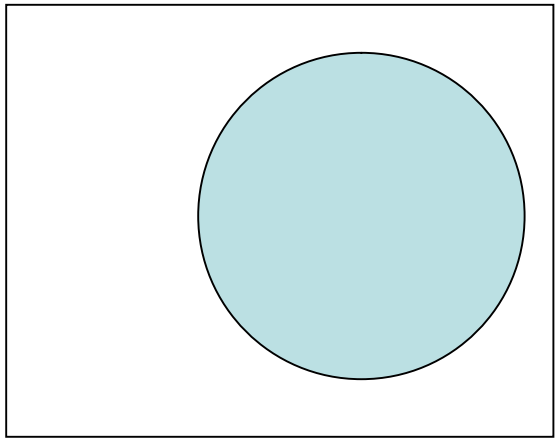
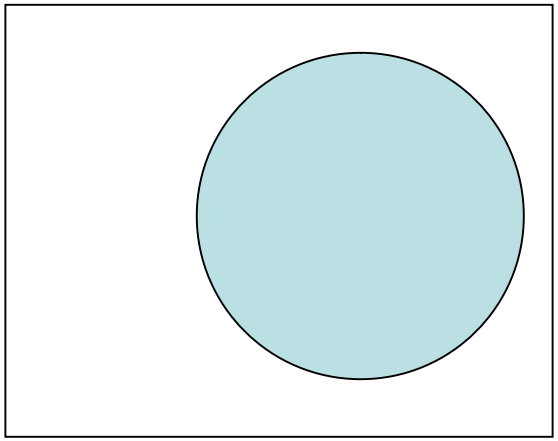
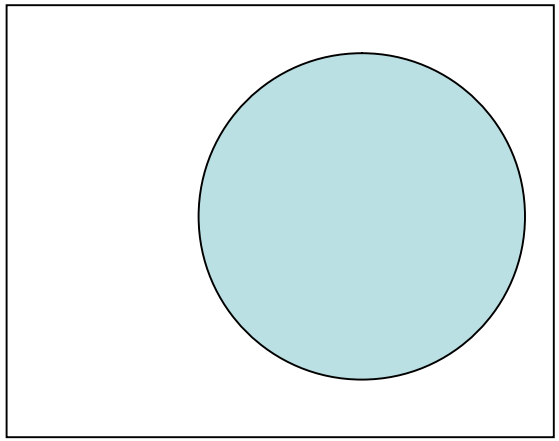
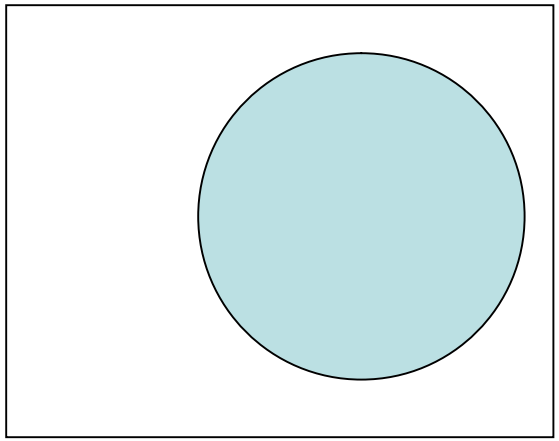
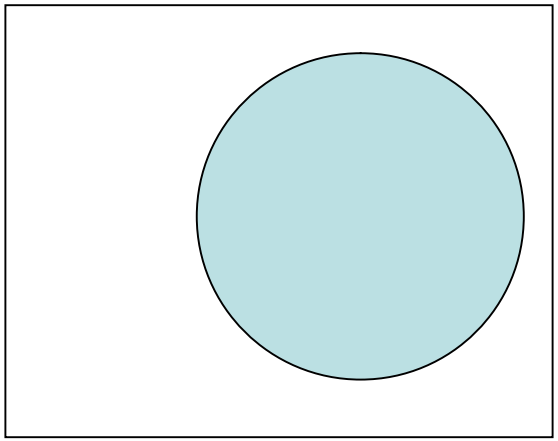
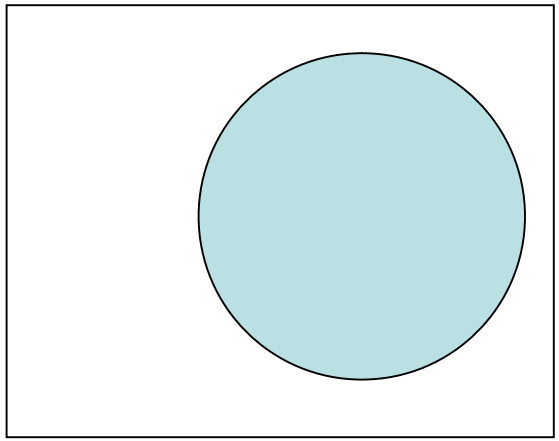
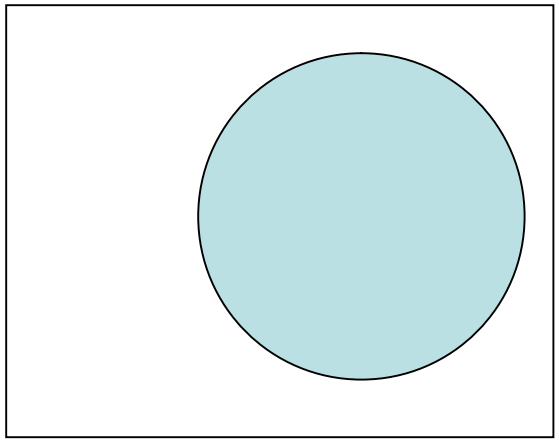
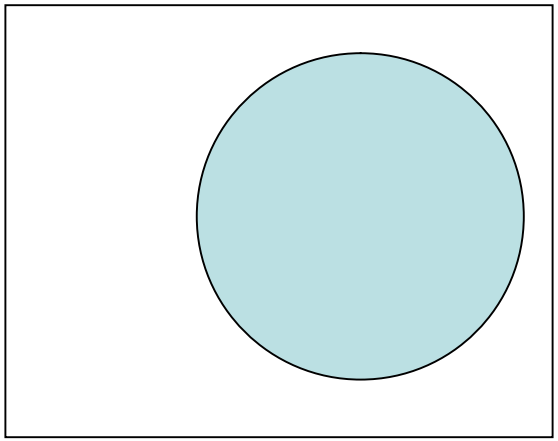
S/P 3-4 TRUSS
OUTER



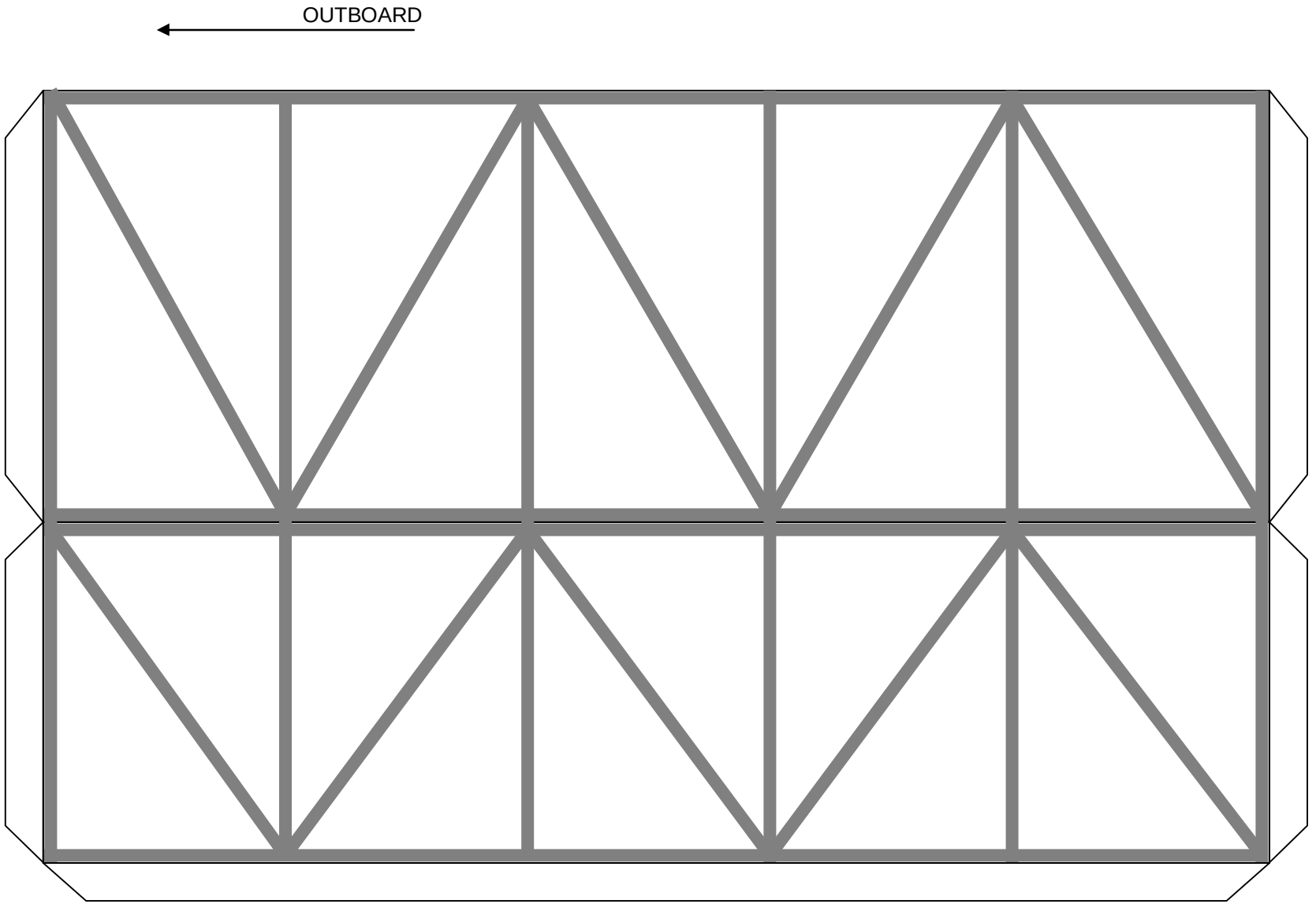
S/P 3-4 TRUSS
OUTER



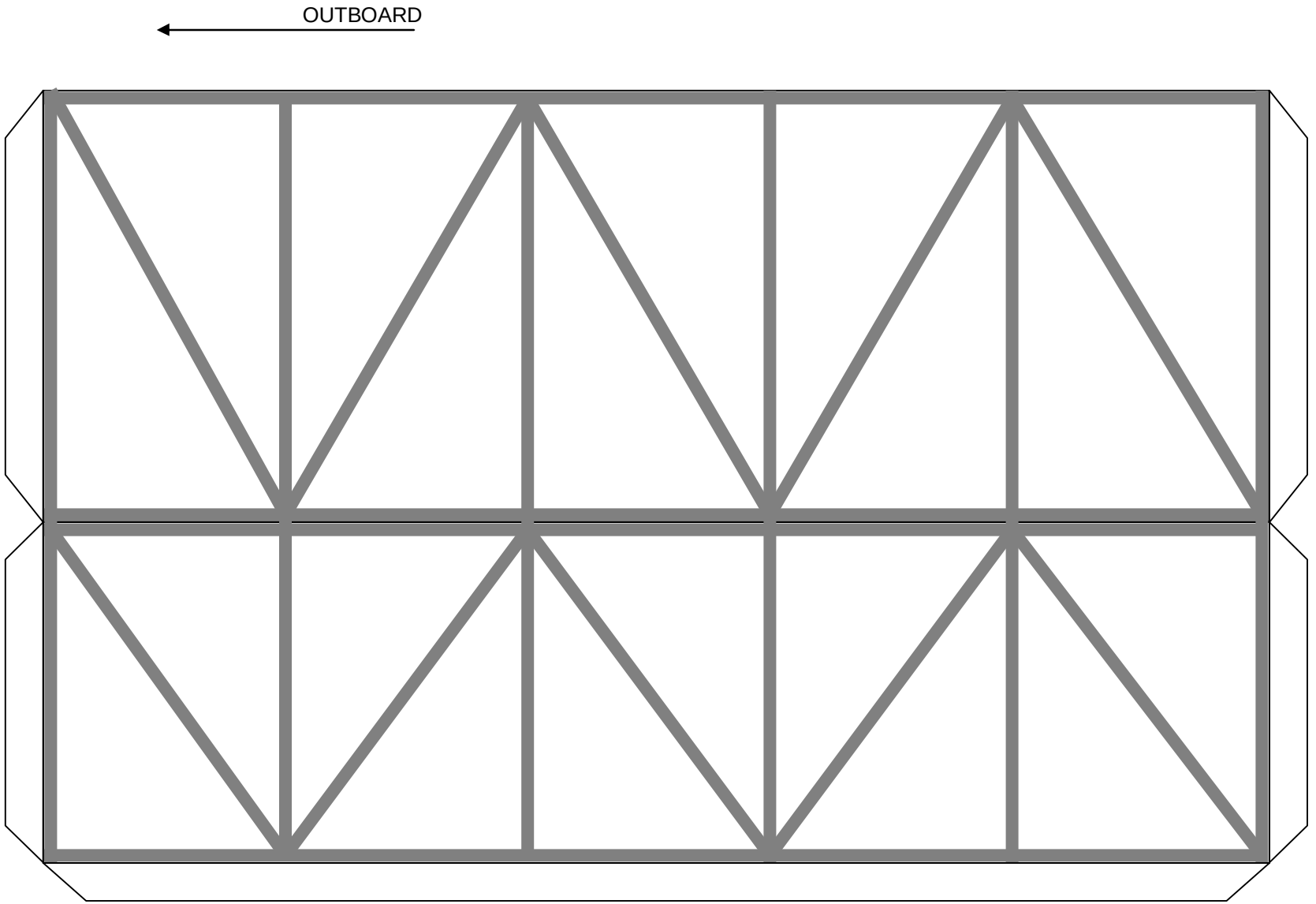
S/P 3-4 TRUSS
OUTER

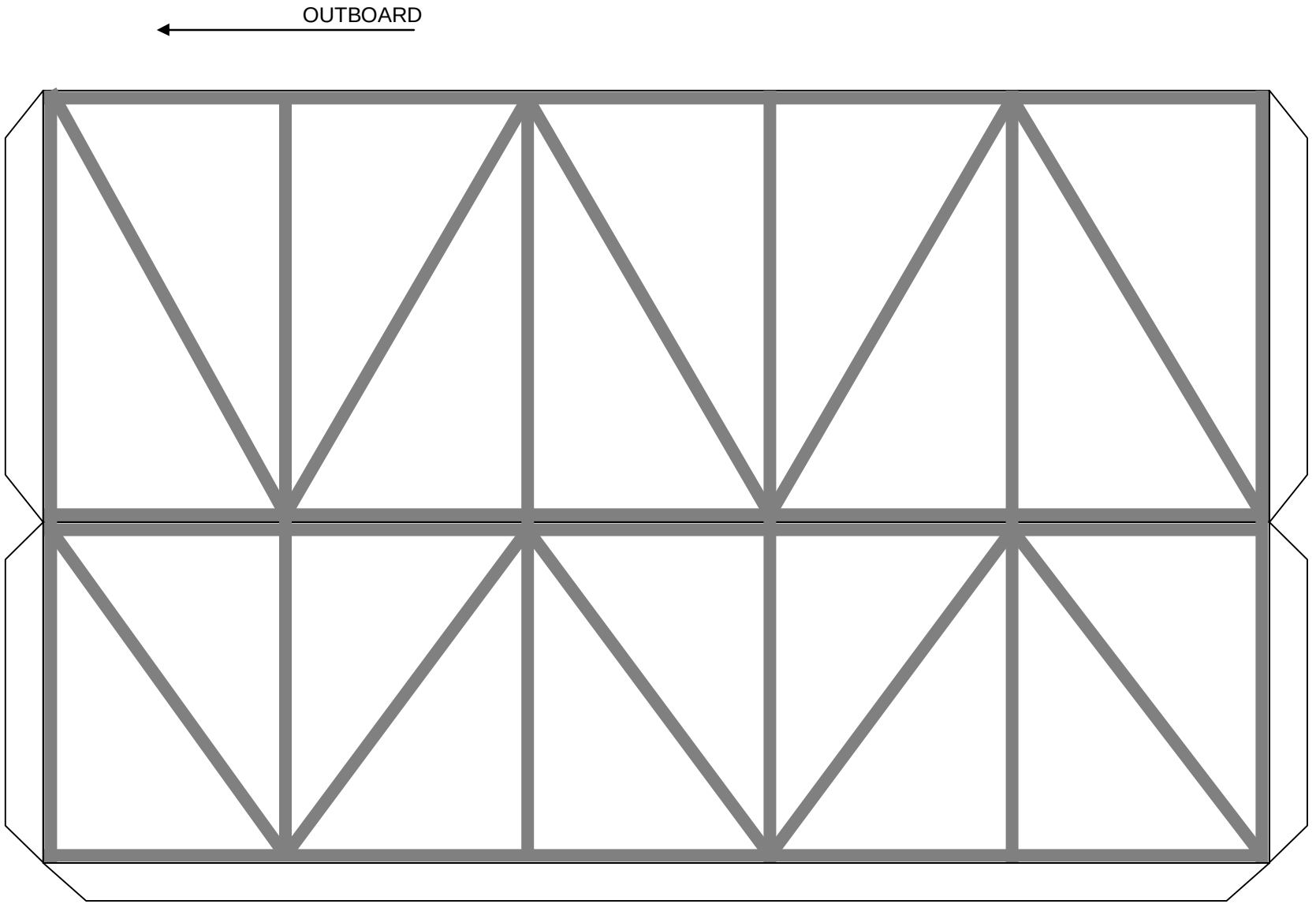
S/P 5-6 TRUSS
INNER



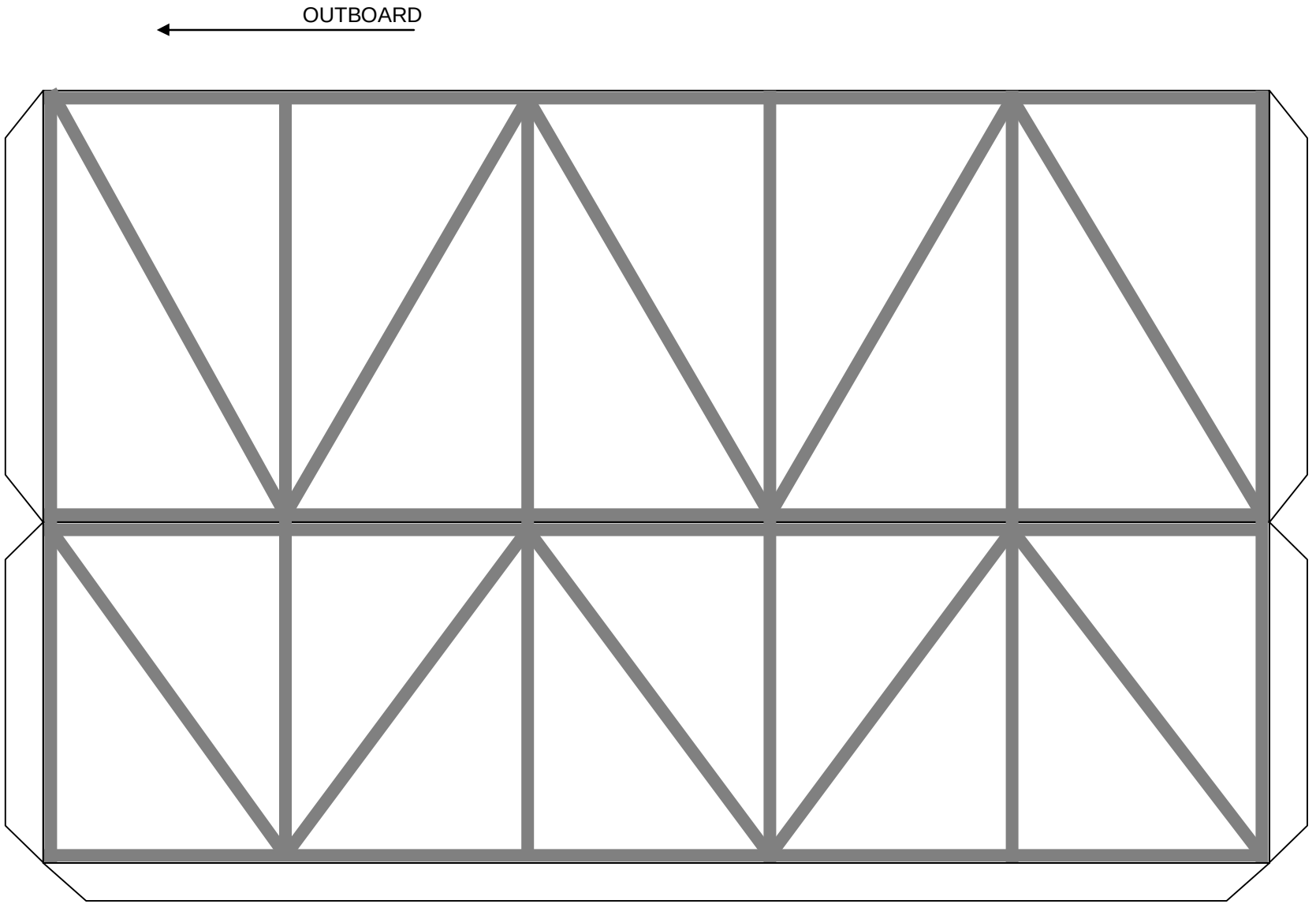
S/P 5-6 TRUSS
INNER



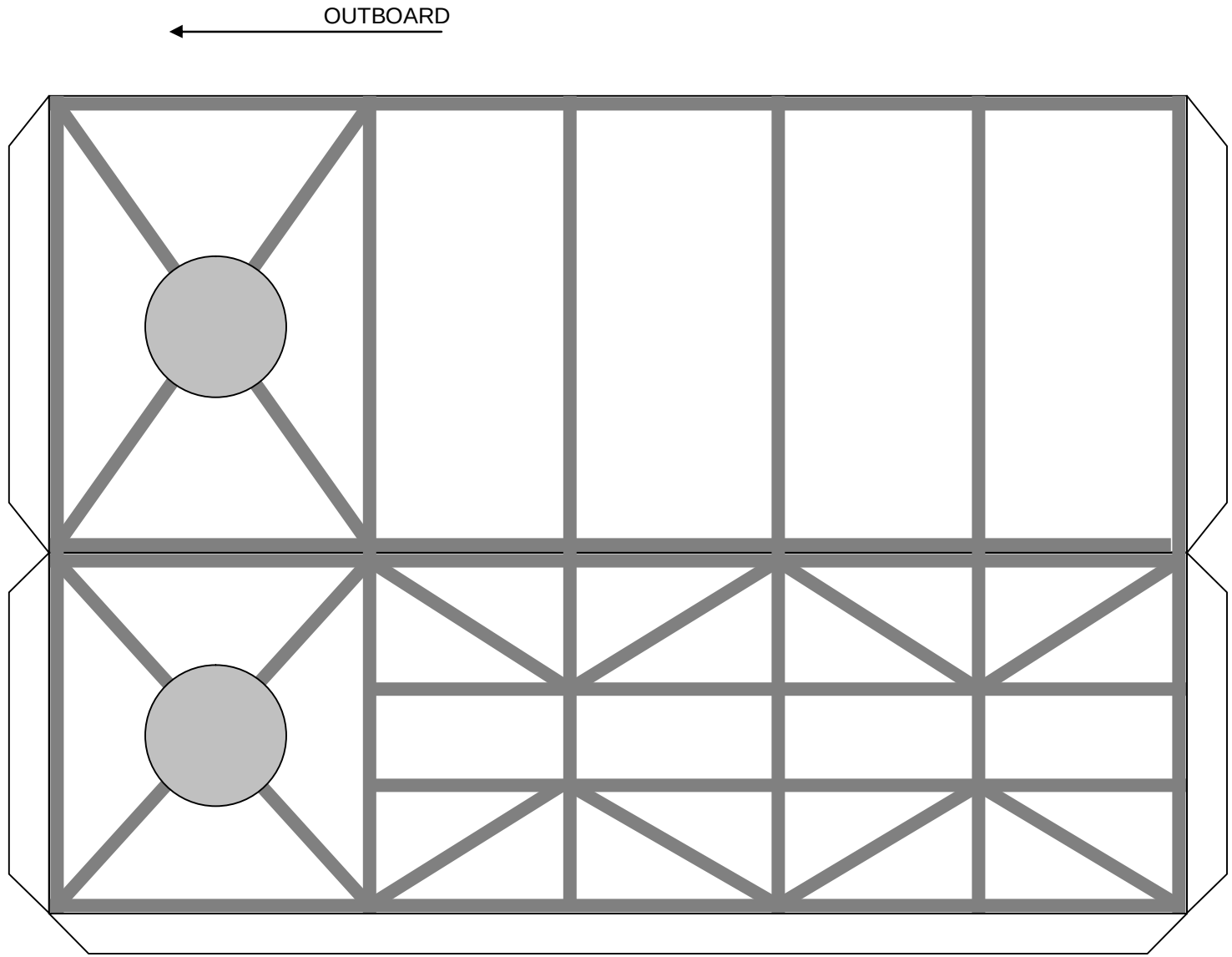
S/P 5-6 TRUSS
INNER



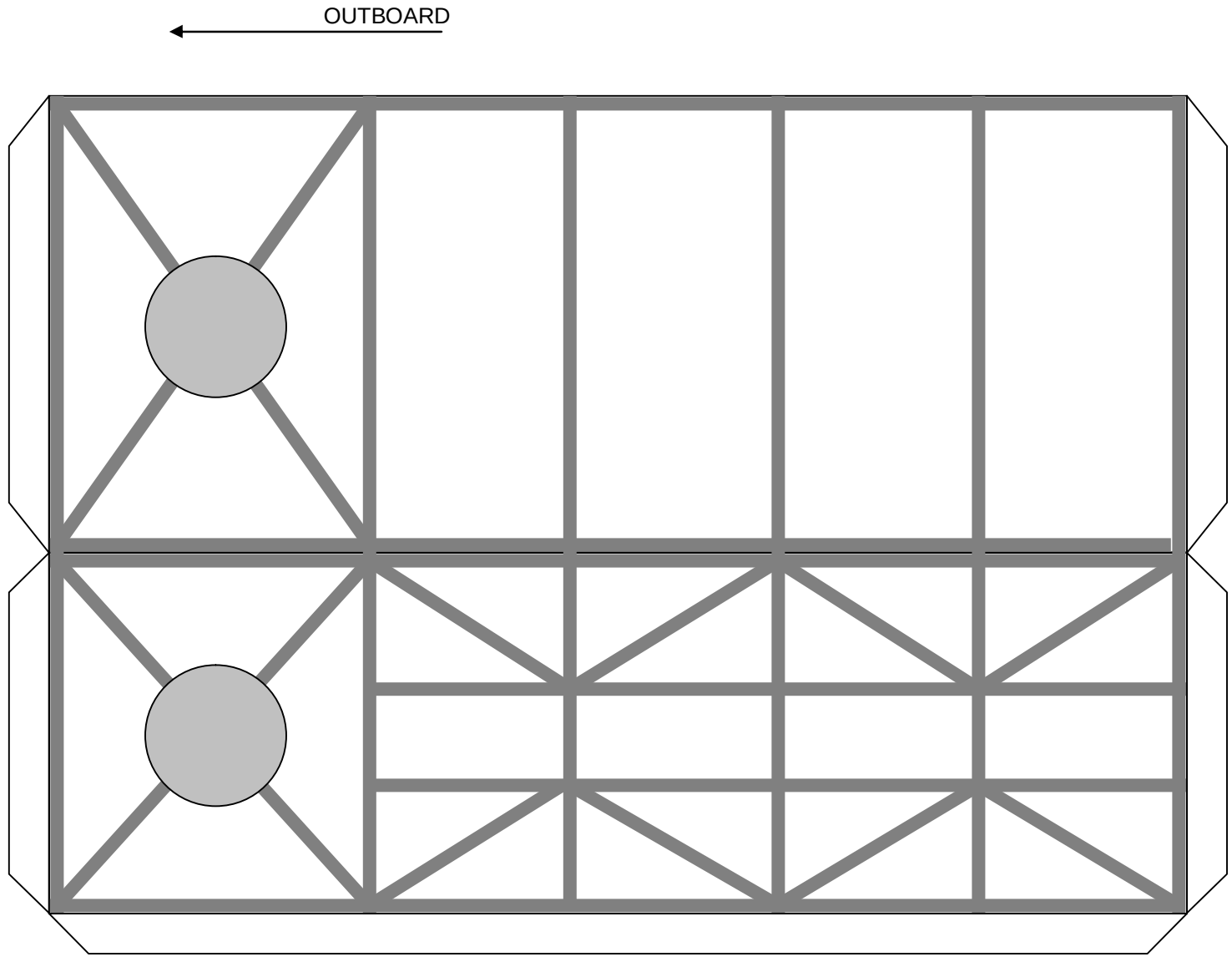
S/P 5-6 TRUSS
INNER



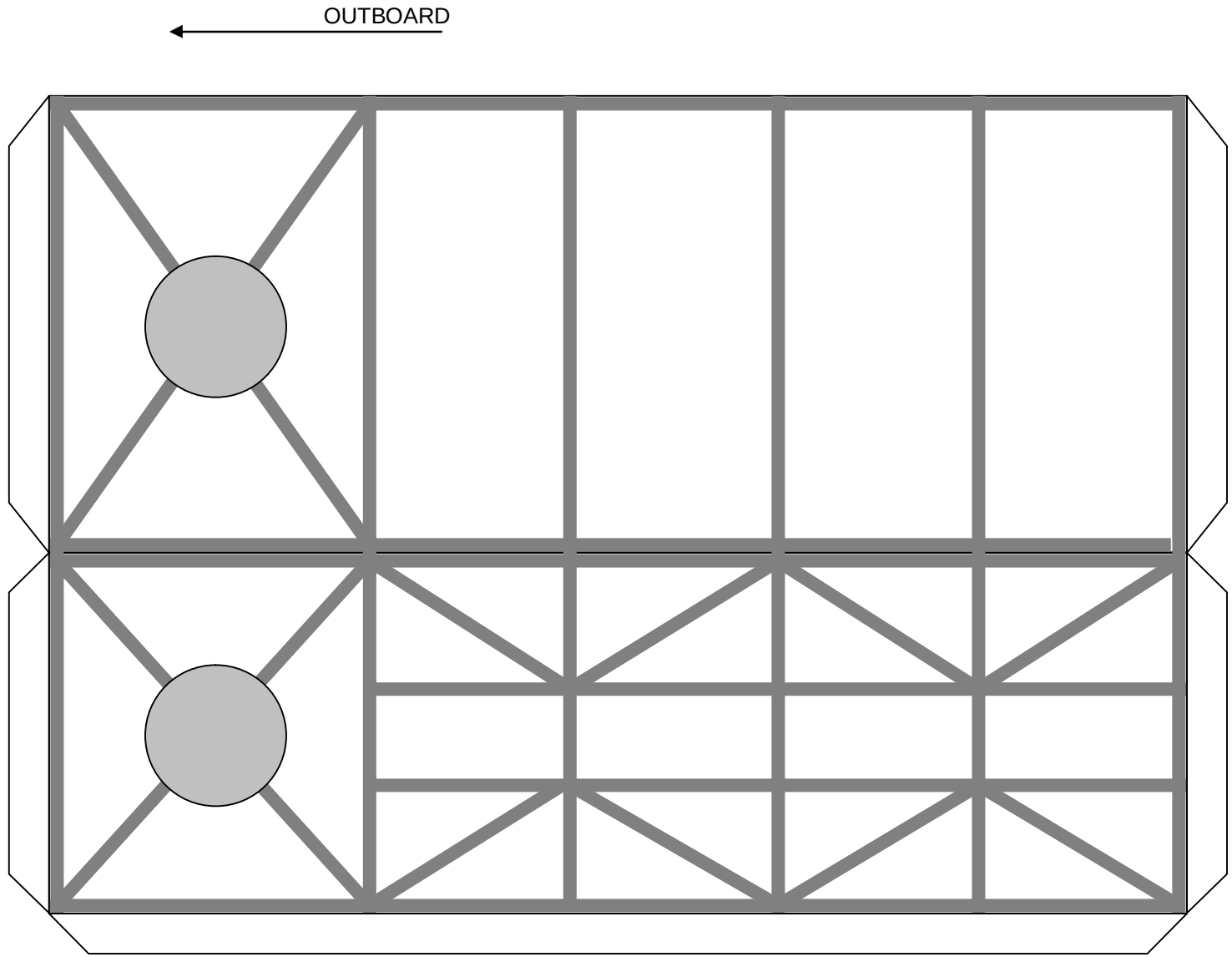
S/P 5-6 TRUSS
OUTER



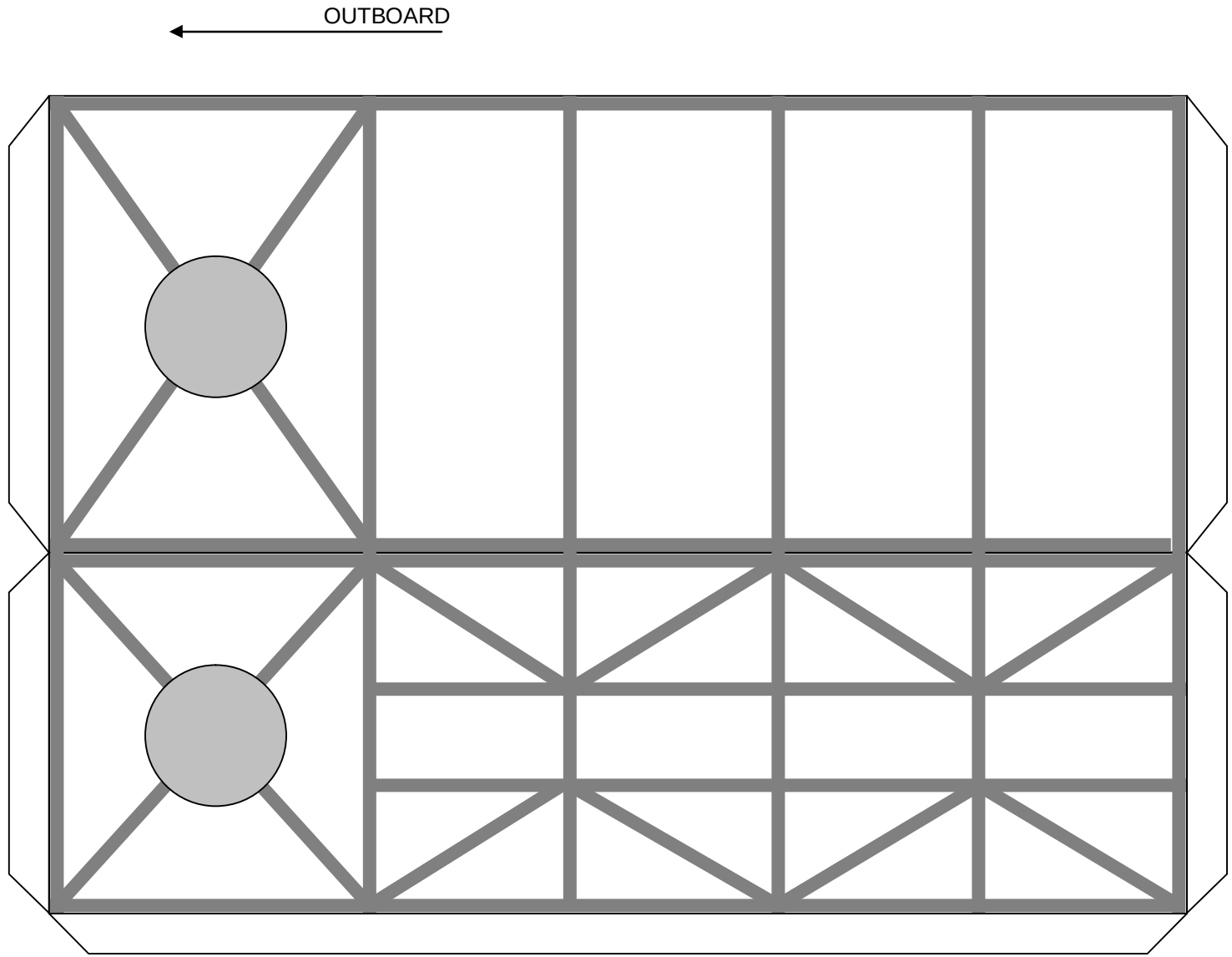
S/P 5-6 TRUSS
OUTER



S/P 5-6 TRUSS
OUTER

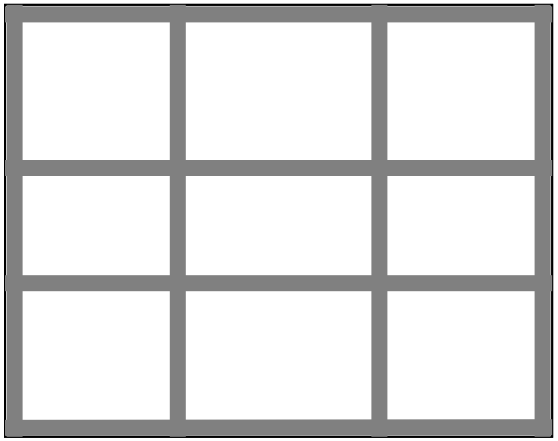


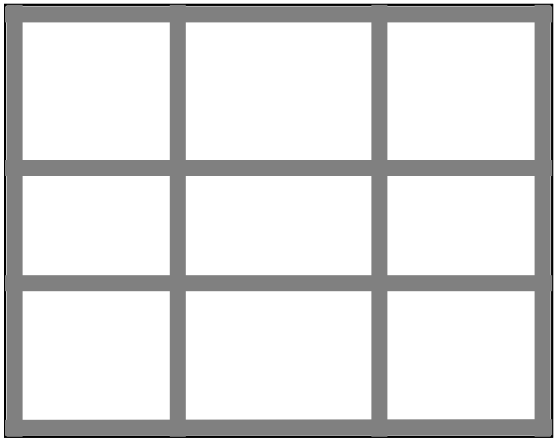
S/P 5-6 TRUSS
OUTER

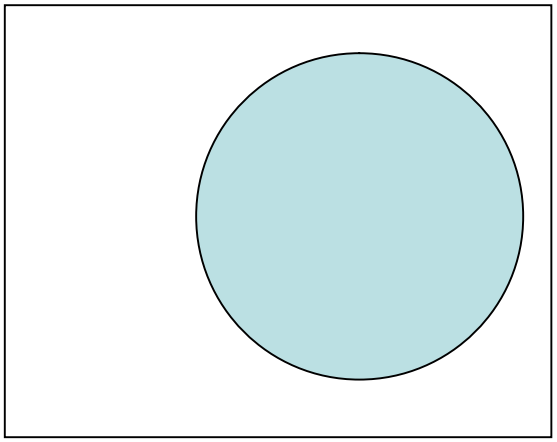


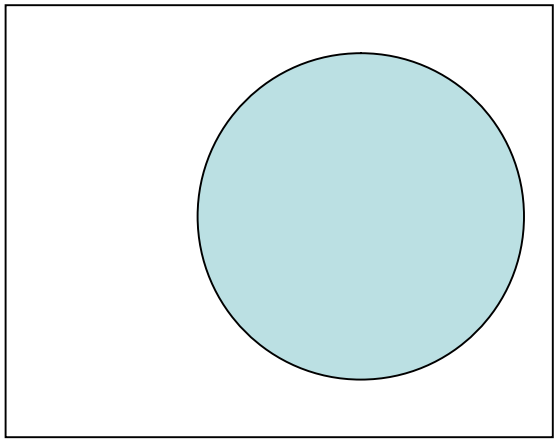
S/P 5-6 TRUSS
END CAPS

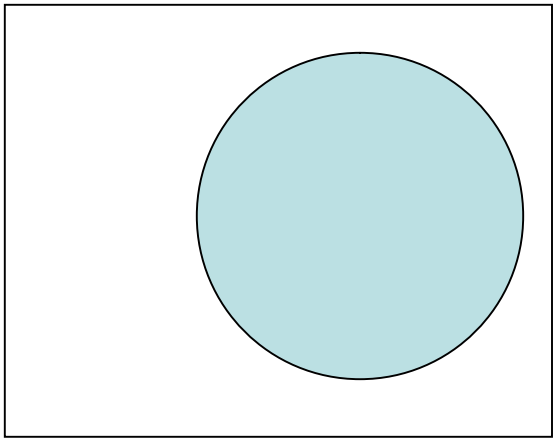
OUTER CAPS

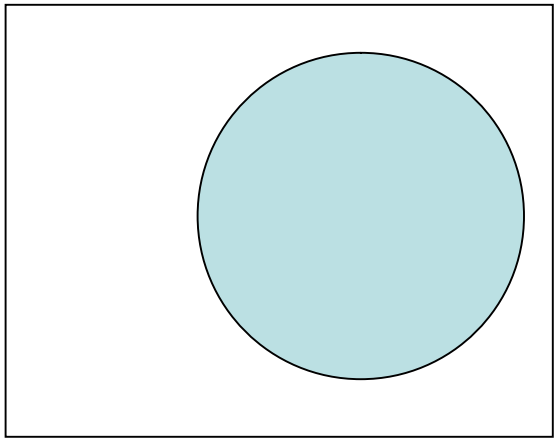


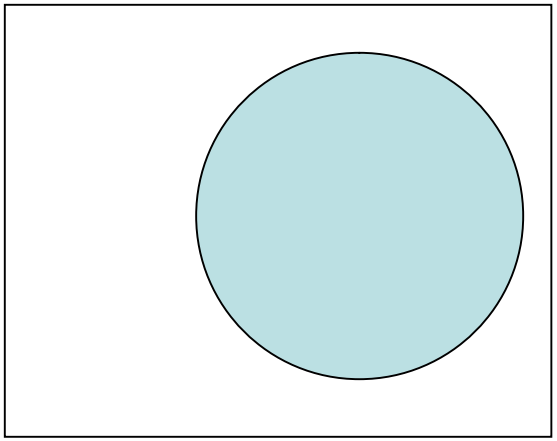


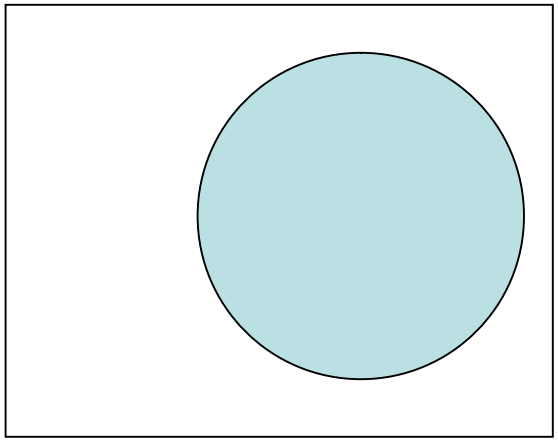






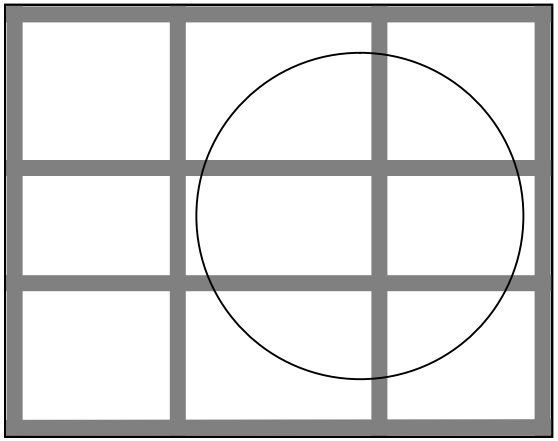


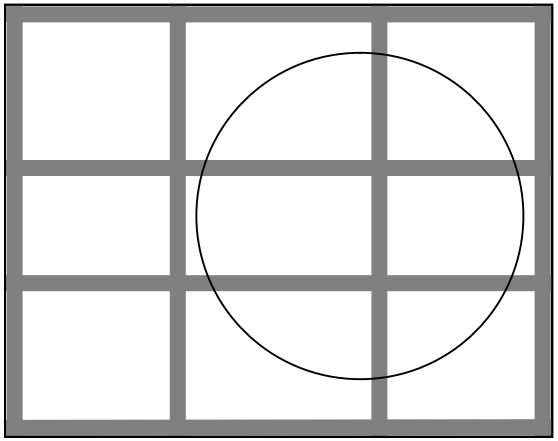


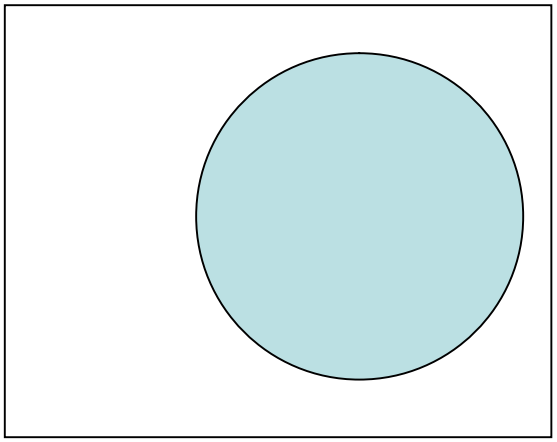


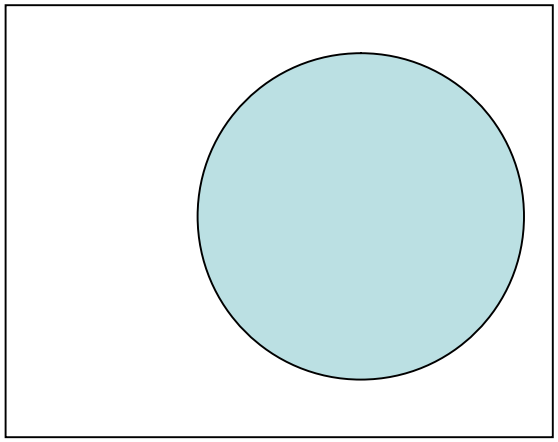
S/P 5-6 TRUSS
END CAPS

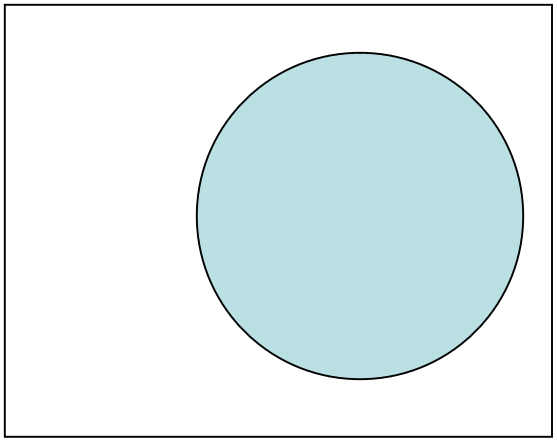
OUTER CAPS

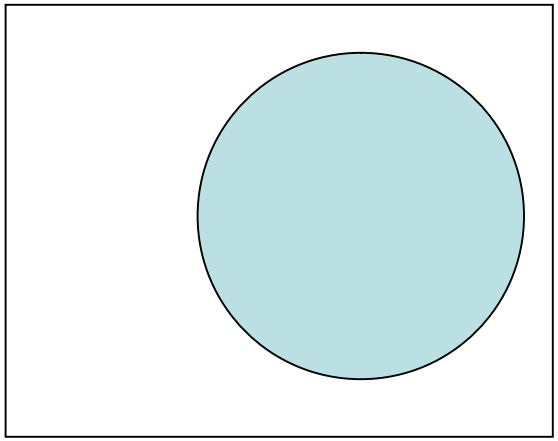


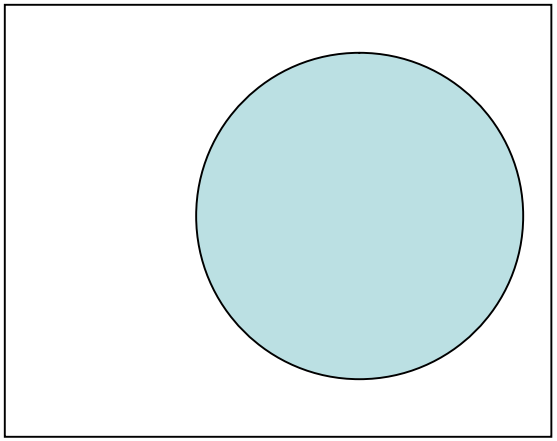


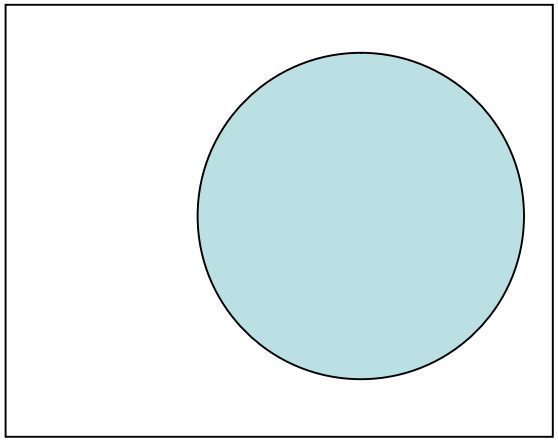




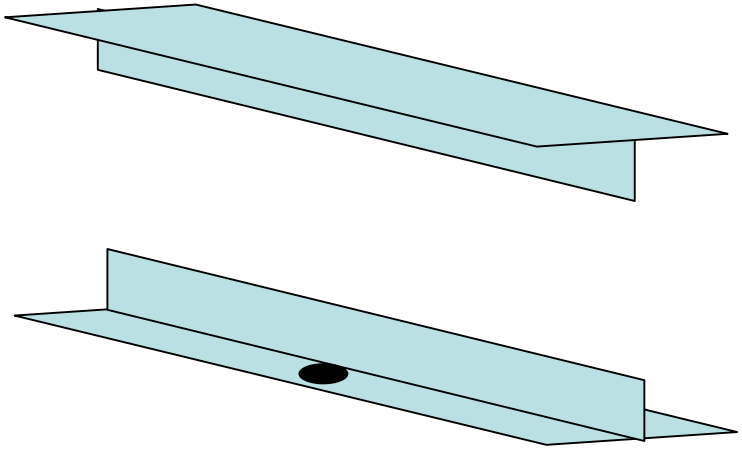






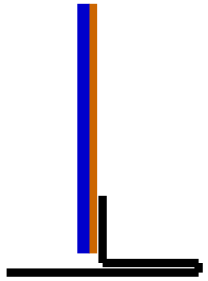


MAIN SOLAR PANELS – PHOTO-VOLTAIC ARRAY (PVA)



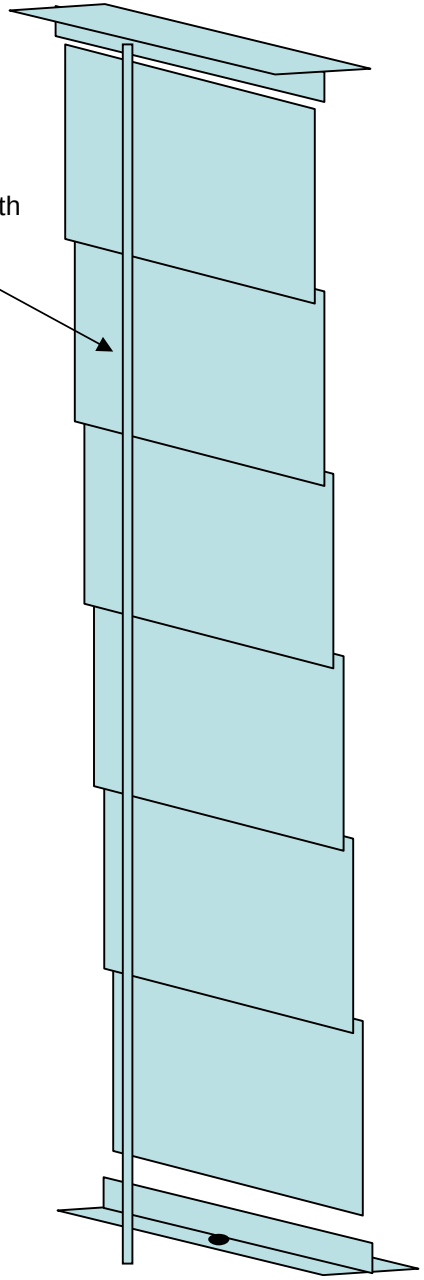
Glue up reinforcing beams from card stock rectangle sized to match width of solar array.

Mounting rod – 36” plus length to insert into truss.



Beam profile – about ½” wide.

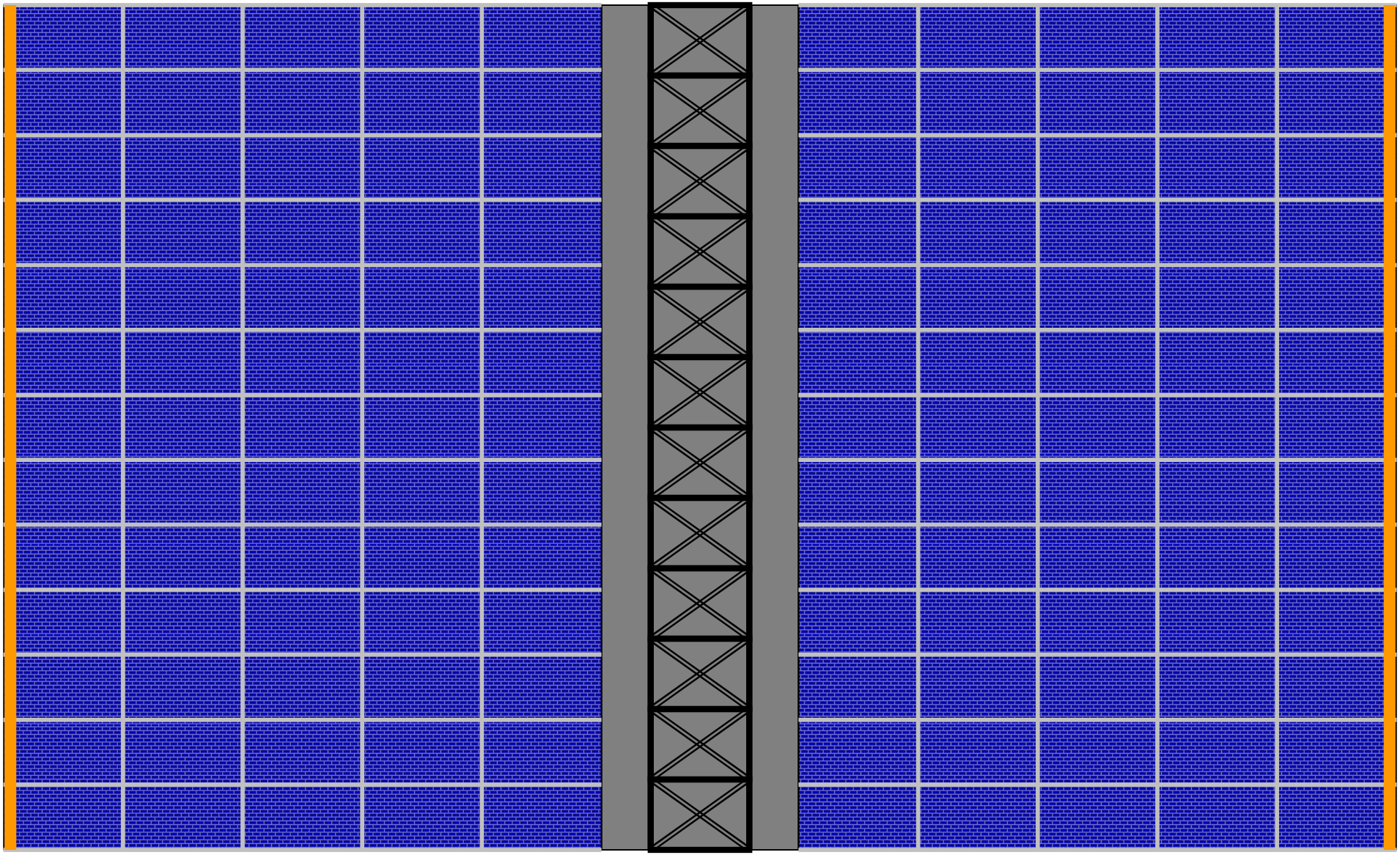
“GOLD” SIDE VIEW



Glue reinforcing beams at ends to gold side;
cut hole to run mounting rod through bottom beam;
butt-glue rod to top beam to support array

SOLAR PANEL – FRONT; ONE OF SIX PER ARRAY; EIGHT ARRAYS TOTAL. **(48 PAGES)**

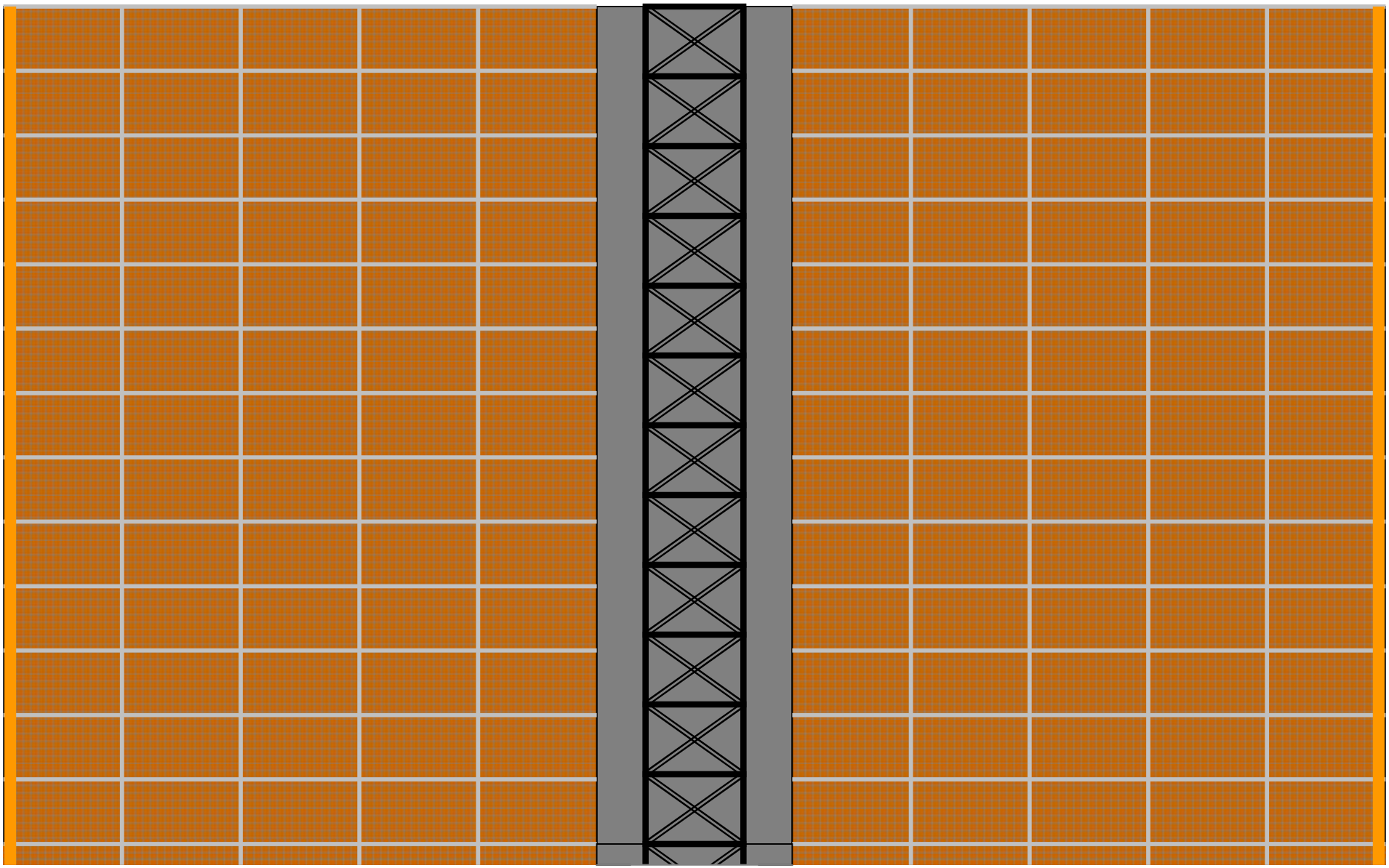
PRINT ON PLAIN PAPER – back to back with next page, use "gold side" to guide cutting.



SOLAR PANEL – BACK; ONE OF SIX PER ARRAY

(48 PAGES)

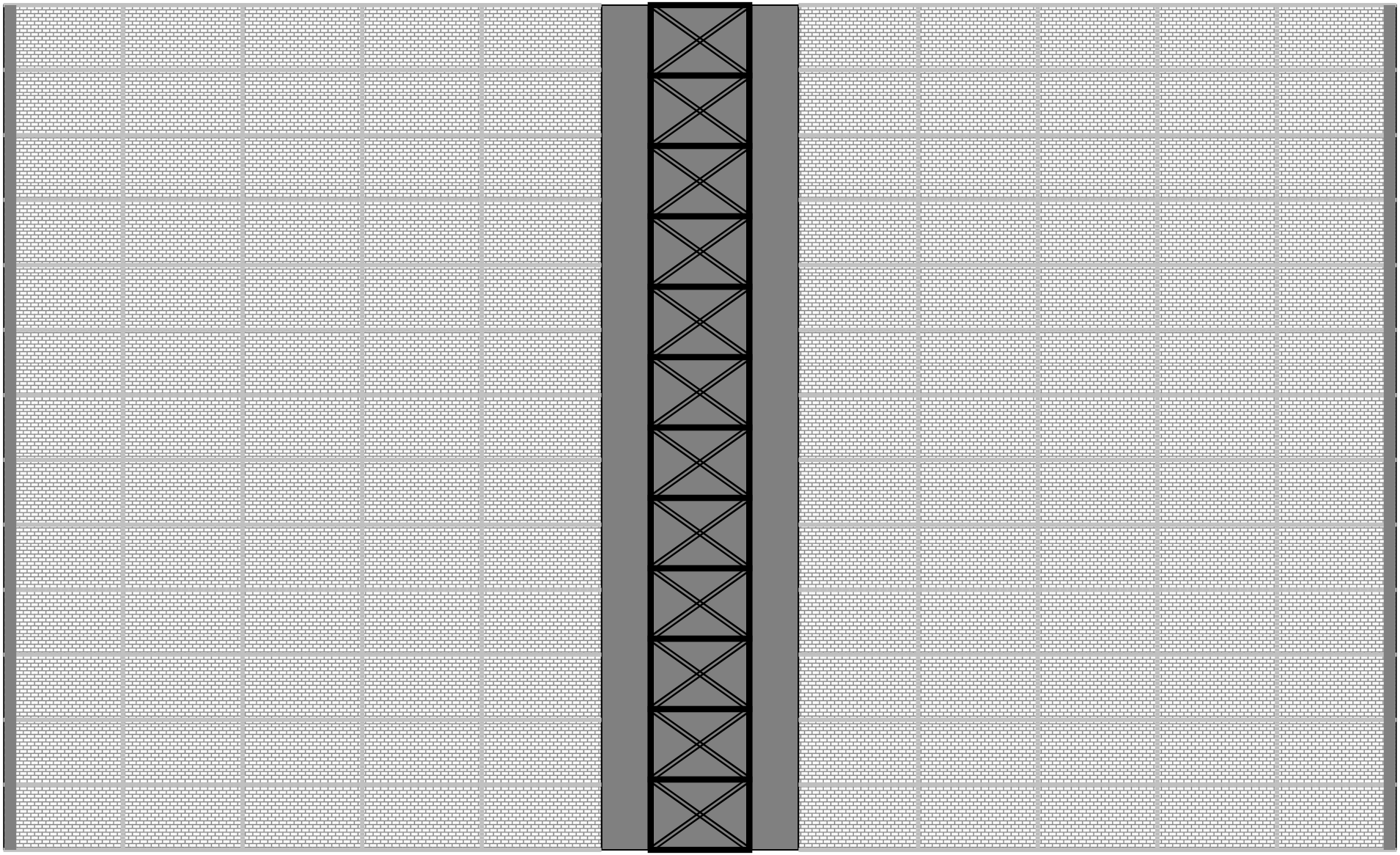
PRINT ON PLAIN PAPER – cut out panel from this side.



Use overlap on bottom edge to connect to next segment

SOLAR PANEL – FRONT; ONE OF SIX PER ARRAY; EIGHT ARRAYS TOTAL. **(48 PAGES)**

PRINT ON PLAIN PAPER – back to back with next page, use "gold side" to guide cutting.

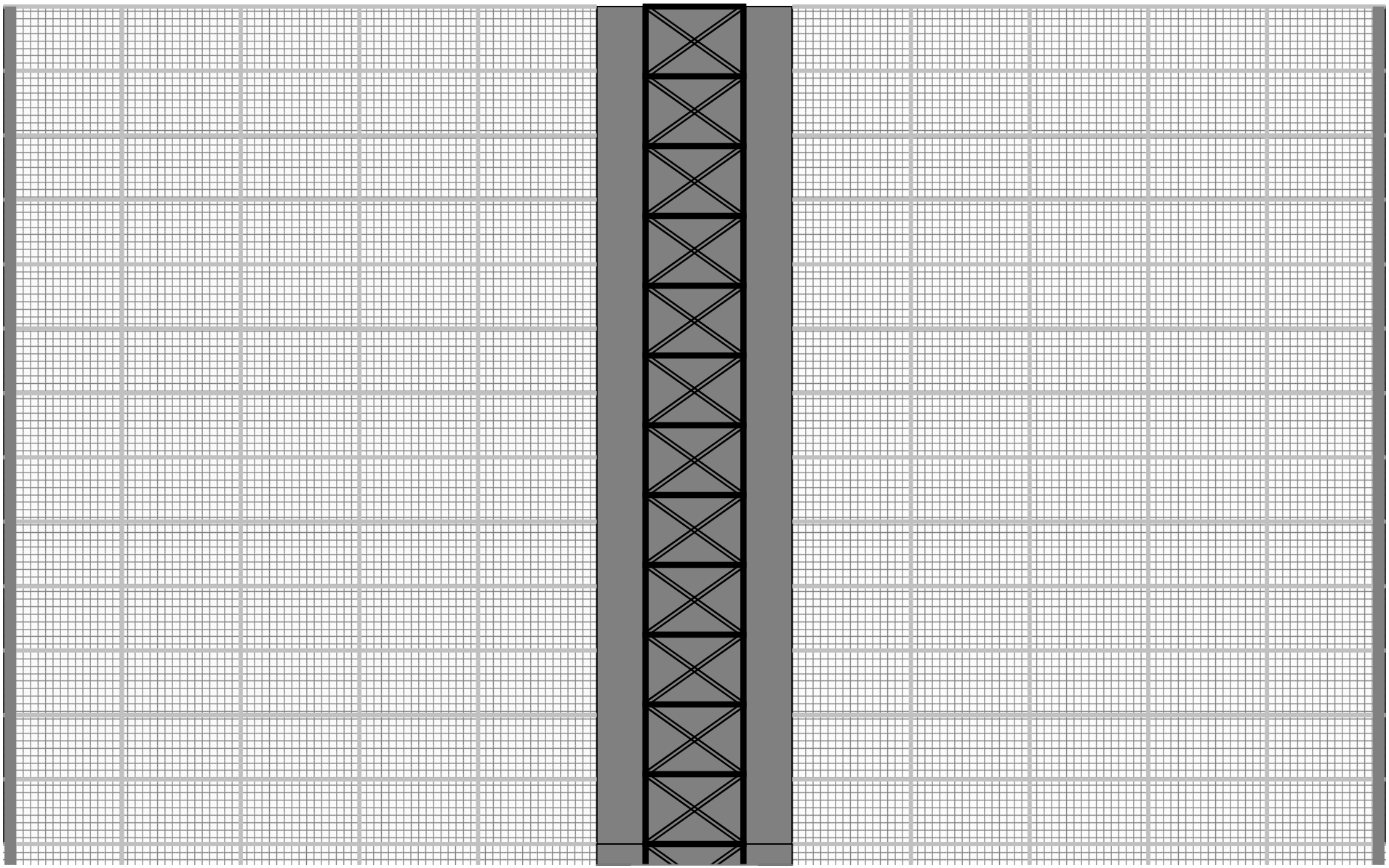


ALTERNATE – PRINT ON BLUE PAPER; GLUE NEXT PAGE ON BACK

SOLAR PANEL – BACK; ONE OF SIX PER ARRAY

(48 PAGES)

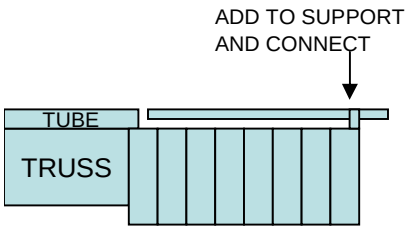
PRINT ON PLAIN PAPER – cut out panel from this side.

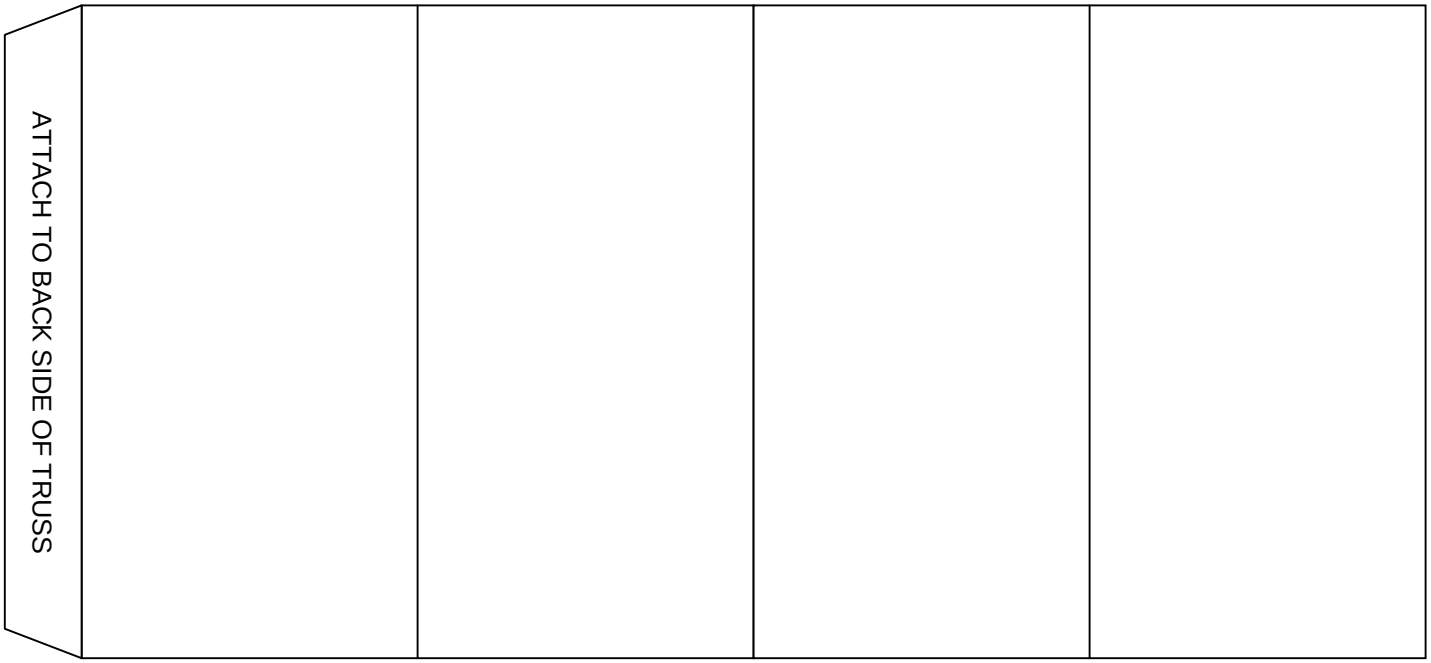


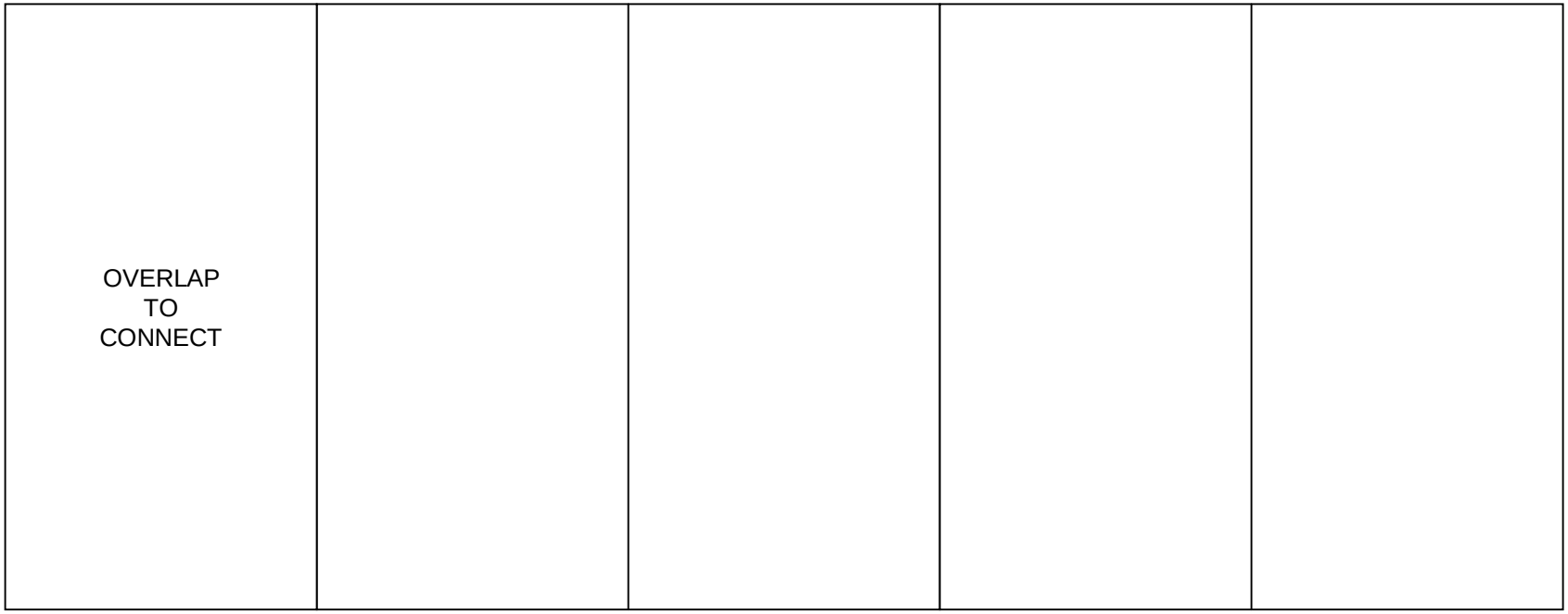
ALTERNATE – PRINT ON YELLOW/GOLD PAPER

Use overlap on bottom edge to connect to next segment

SOLAR PANEL – RADIATOR. ONE OF FOUR; ONE PER ARRAY AXLE.
TRUSS 4&6.

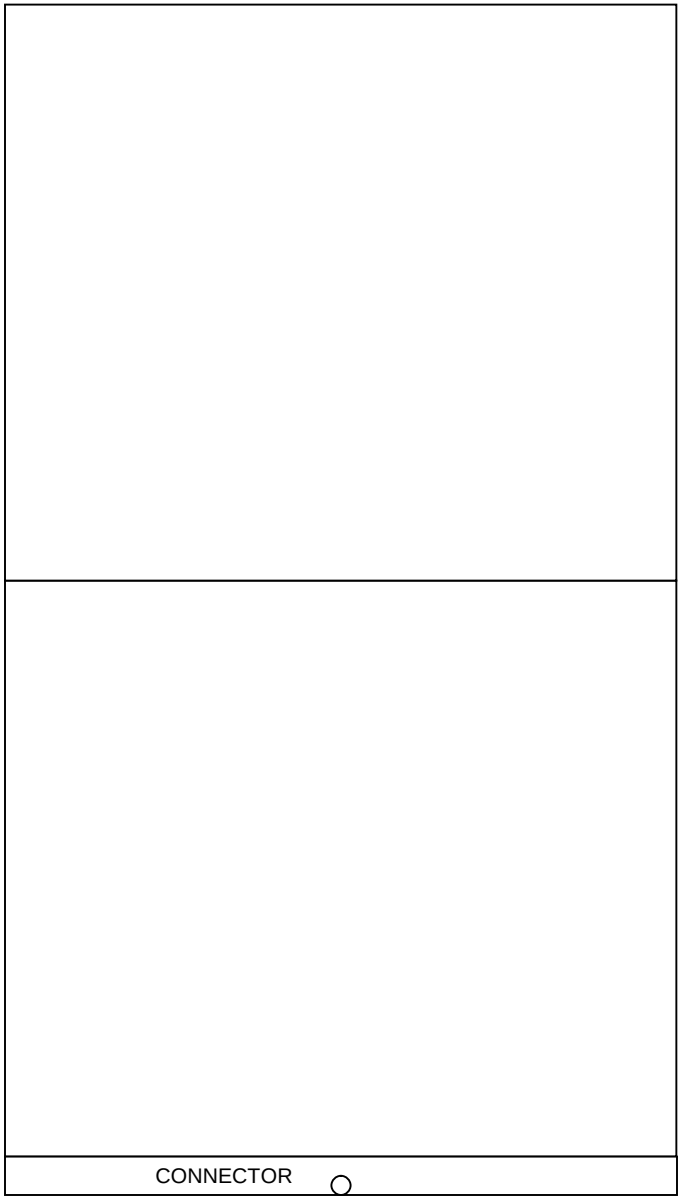


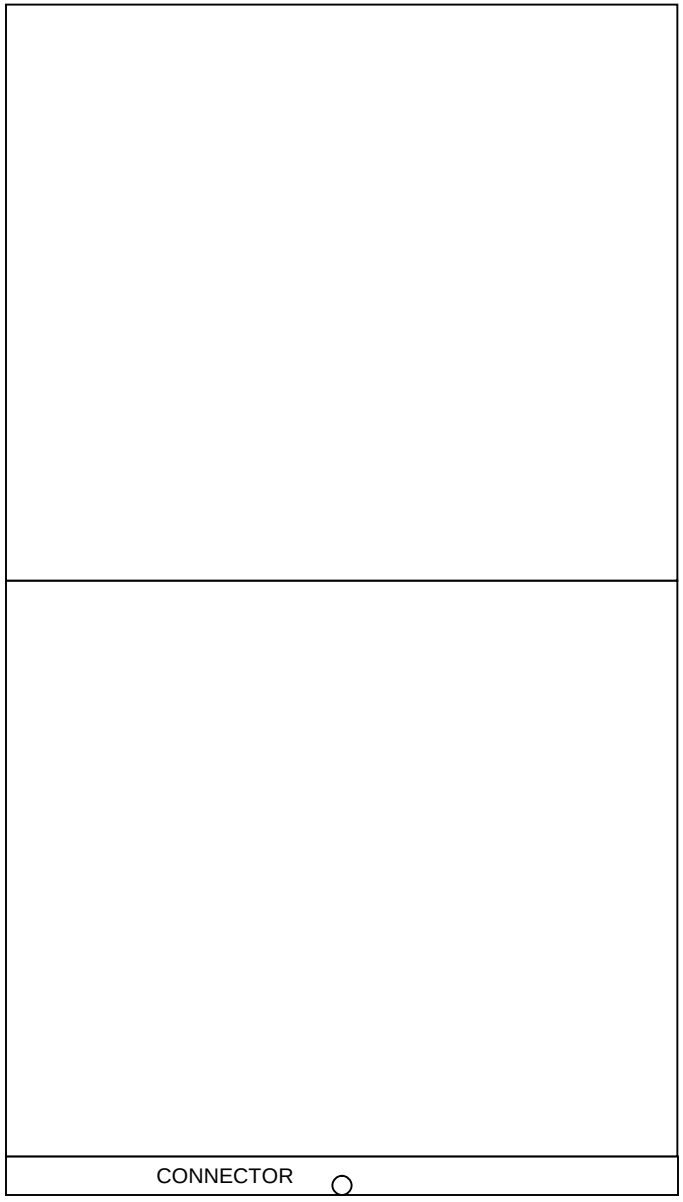




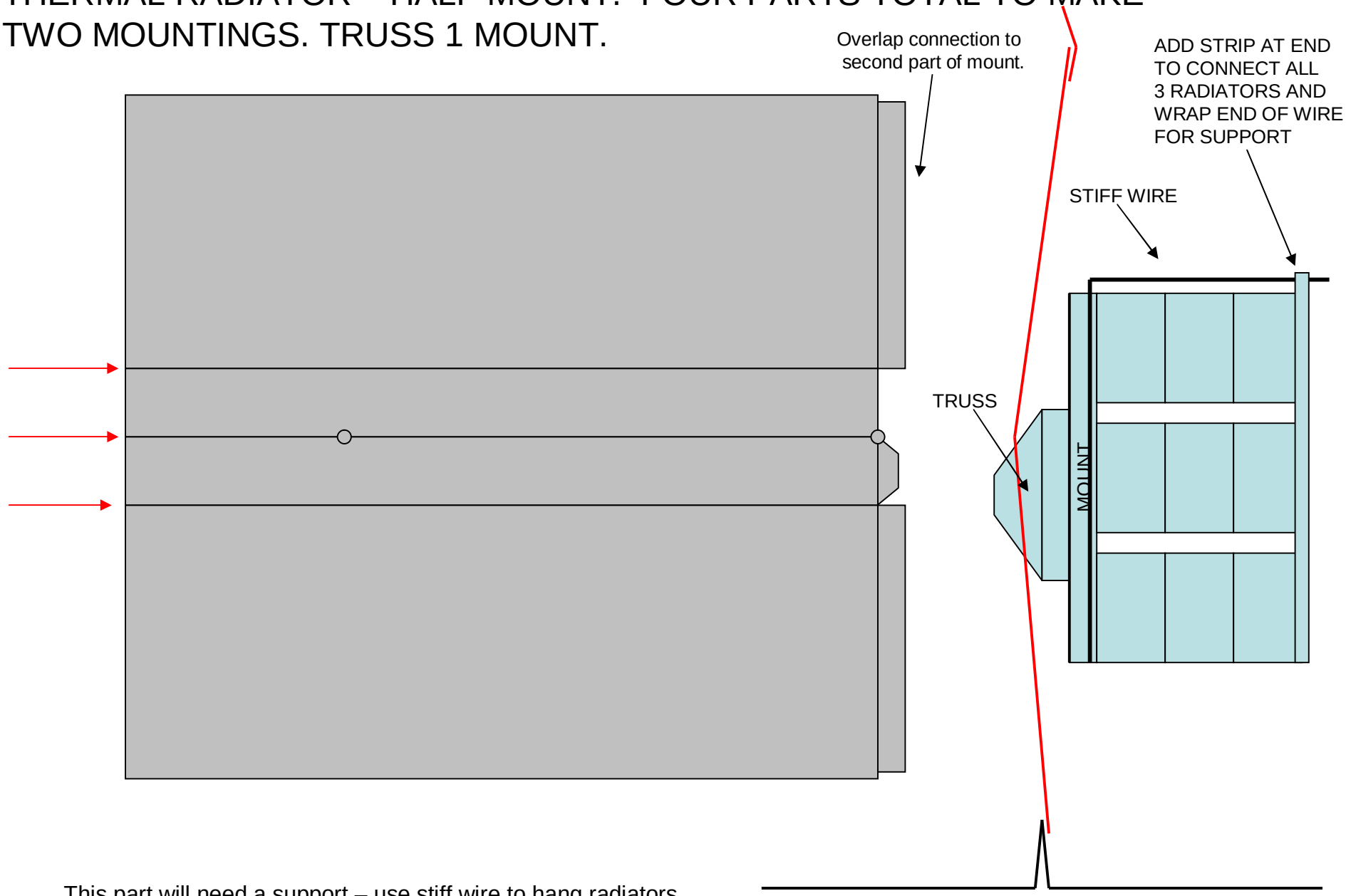
THERMAL RADIATOR. EIGHT SECTIONS PER STRING; THREE STRINGS PER TRUSS; MOUNT ON TRUSS 1. (print page 12 times total)

PRINT ON PLAIN PAPER



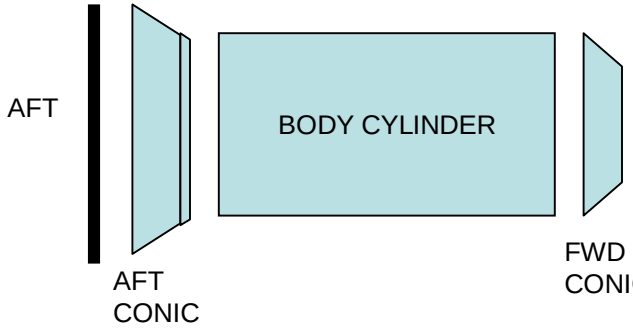


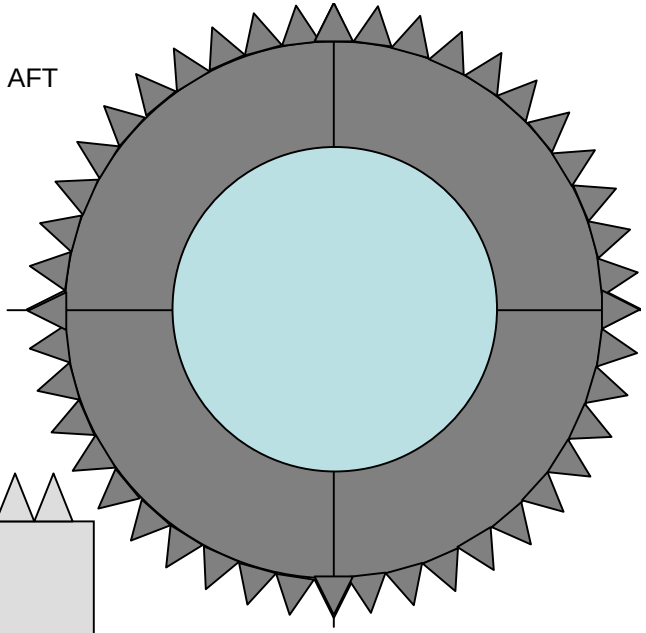
THERMAL RADIATOR – HALF MOUNT. FOUR PARTS TOTAL TO MAKE TWO MOUNTINGS. TRUSS 1 MOUNT.



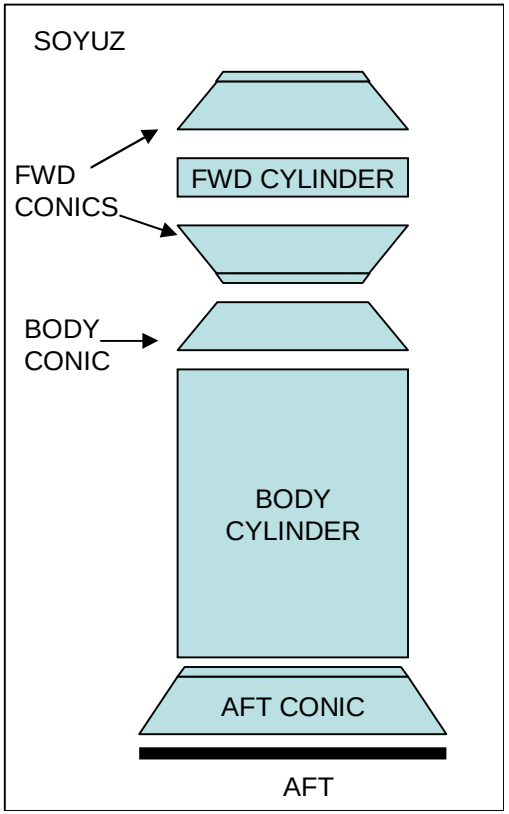
This part will need a support – use stiff wire to hang radiators. Base of each radiator set attaches to mount. Mount attaches to truss (see NASA website for detail).

PROGRESS


AFT
BODY CYLINDER
AFT
CONIC
FWD
CONIC

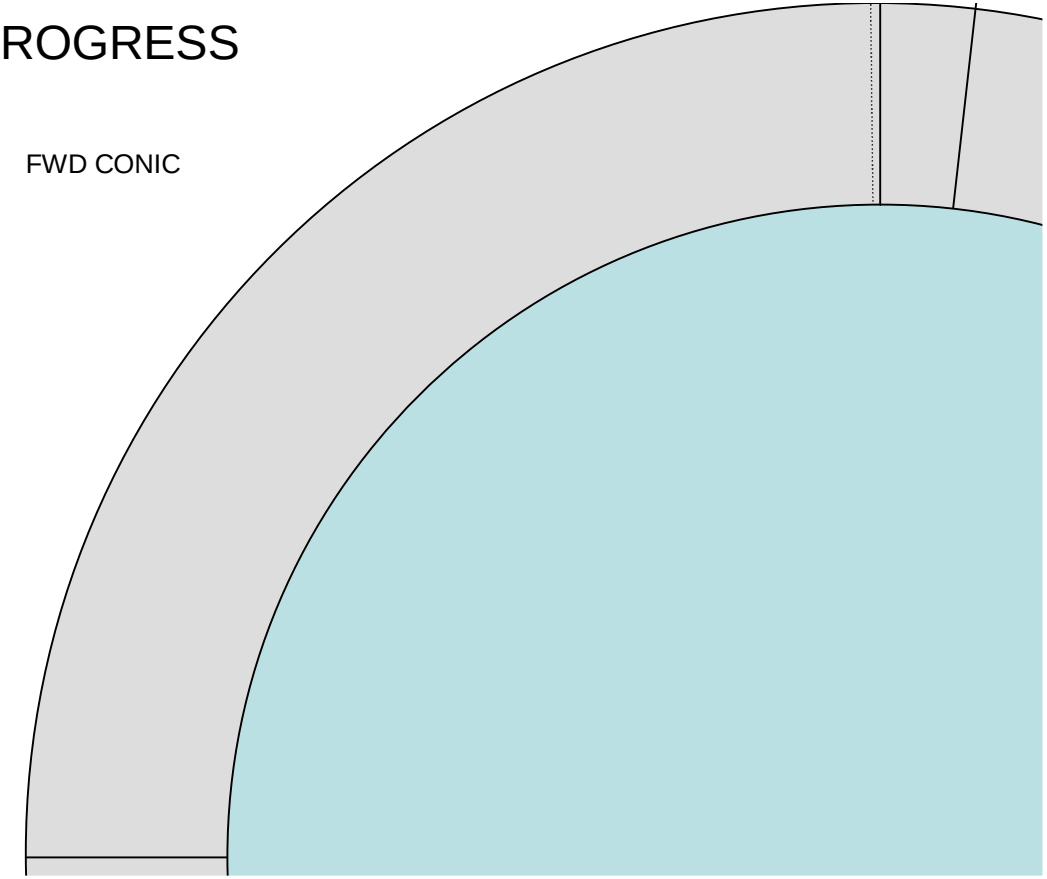

AFT


BODY CYLINDER

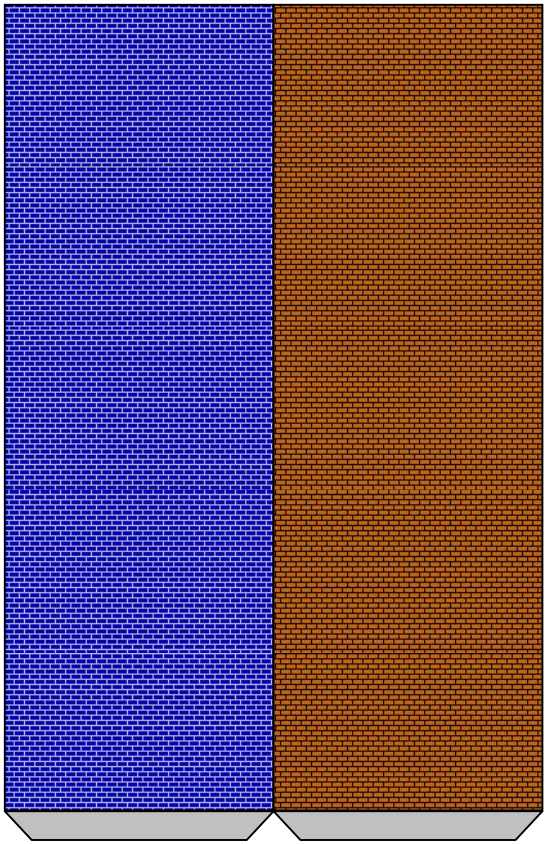

SOYUZ
FWD
CONICS
FWD CYLINDER
BODY
CONIC
BODY
CYLINDER
AFT CONIC
AFT

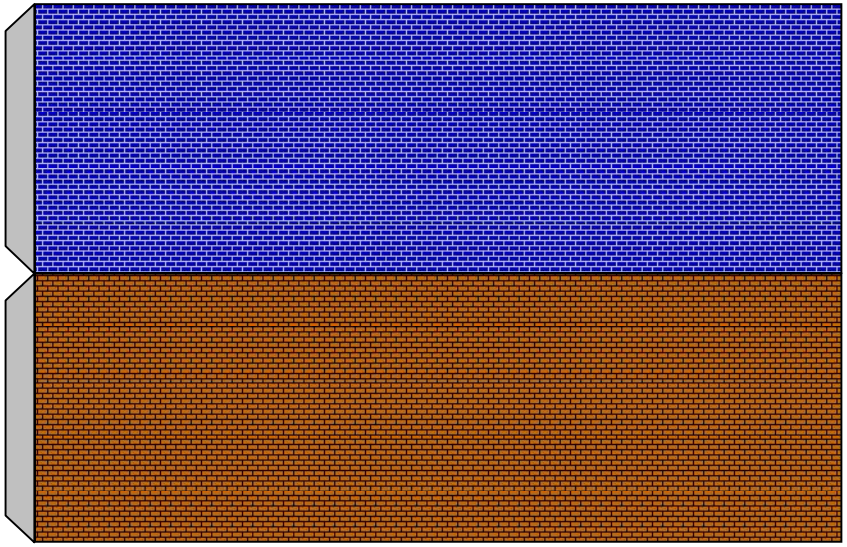
PROGRESS

FWD CONIC

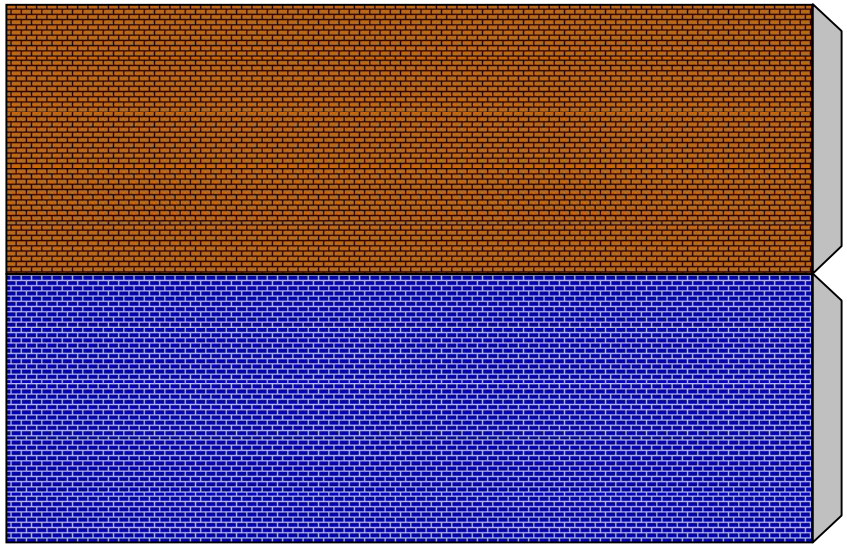


SOYUZ ARRAY



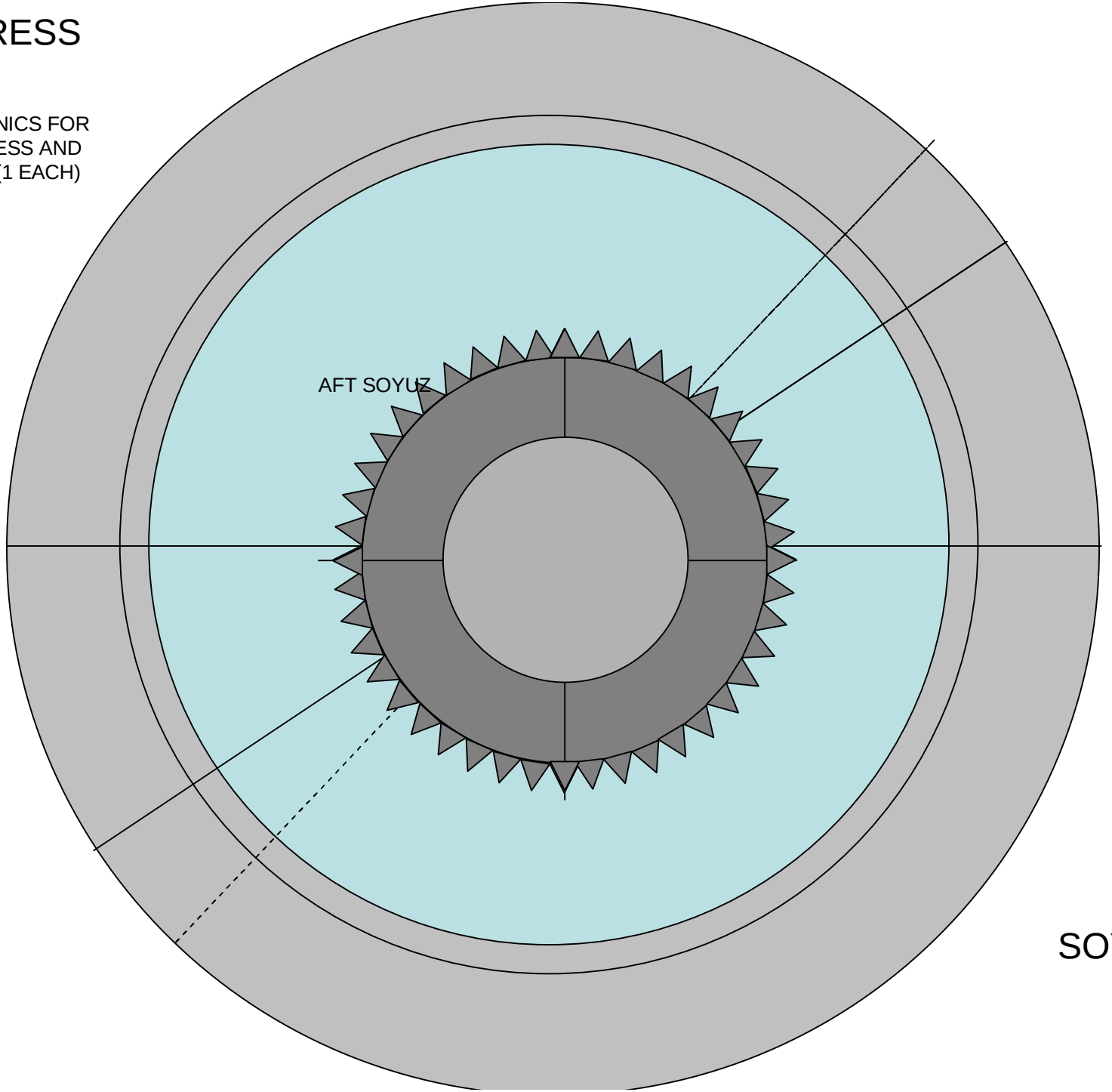


PROGRESS ARRAYS



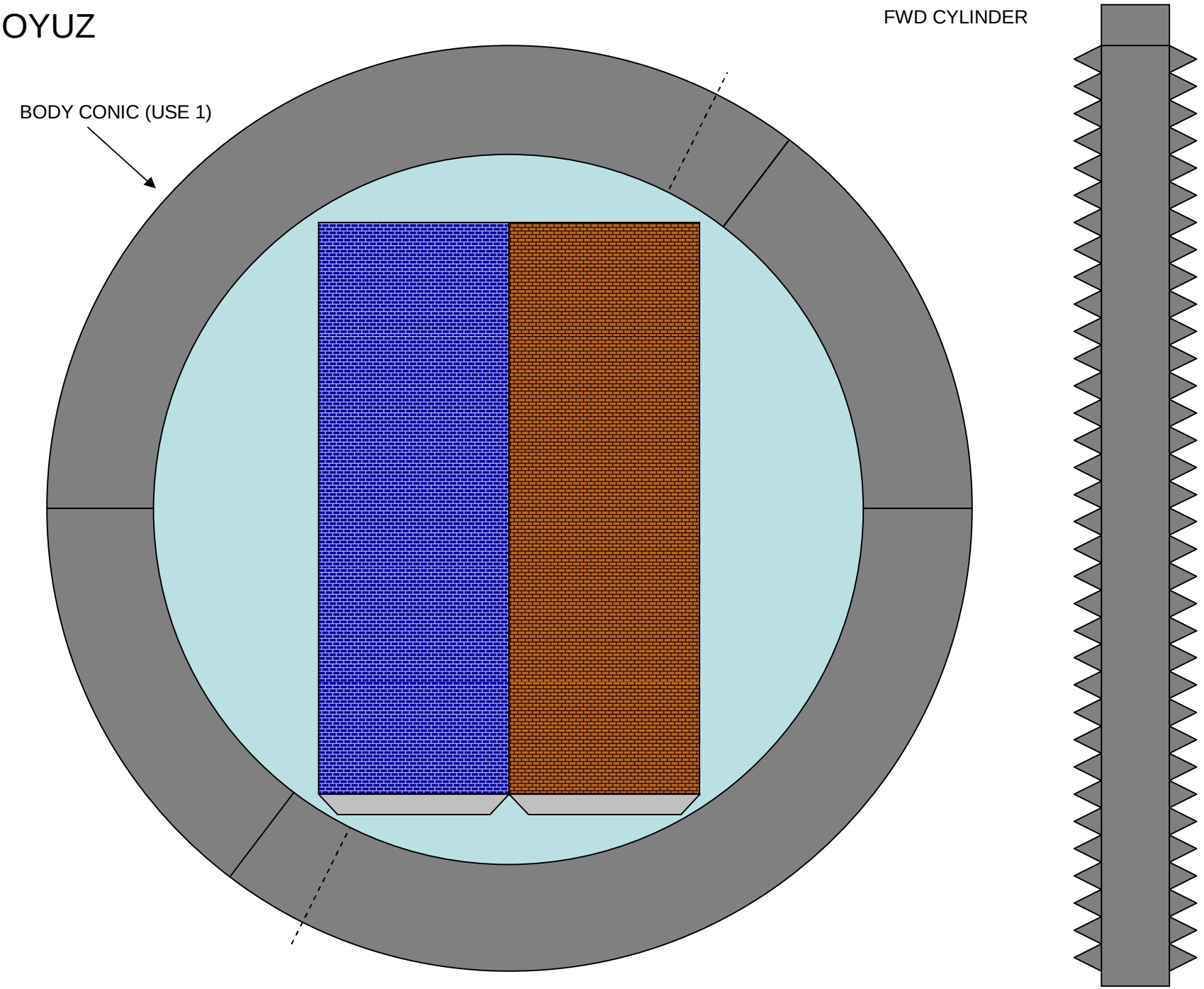
PROGRESS

AFT CONICS FOR PROGRESS AND SOYUZ (1 EACH)

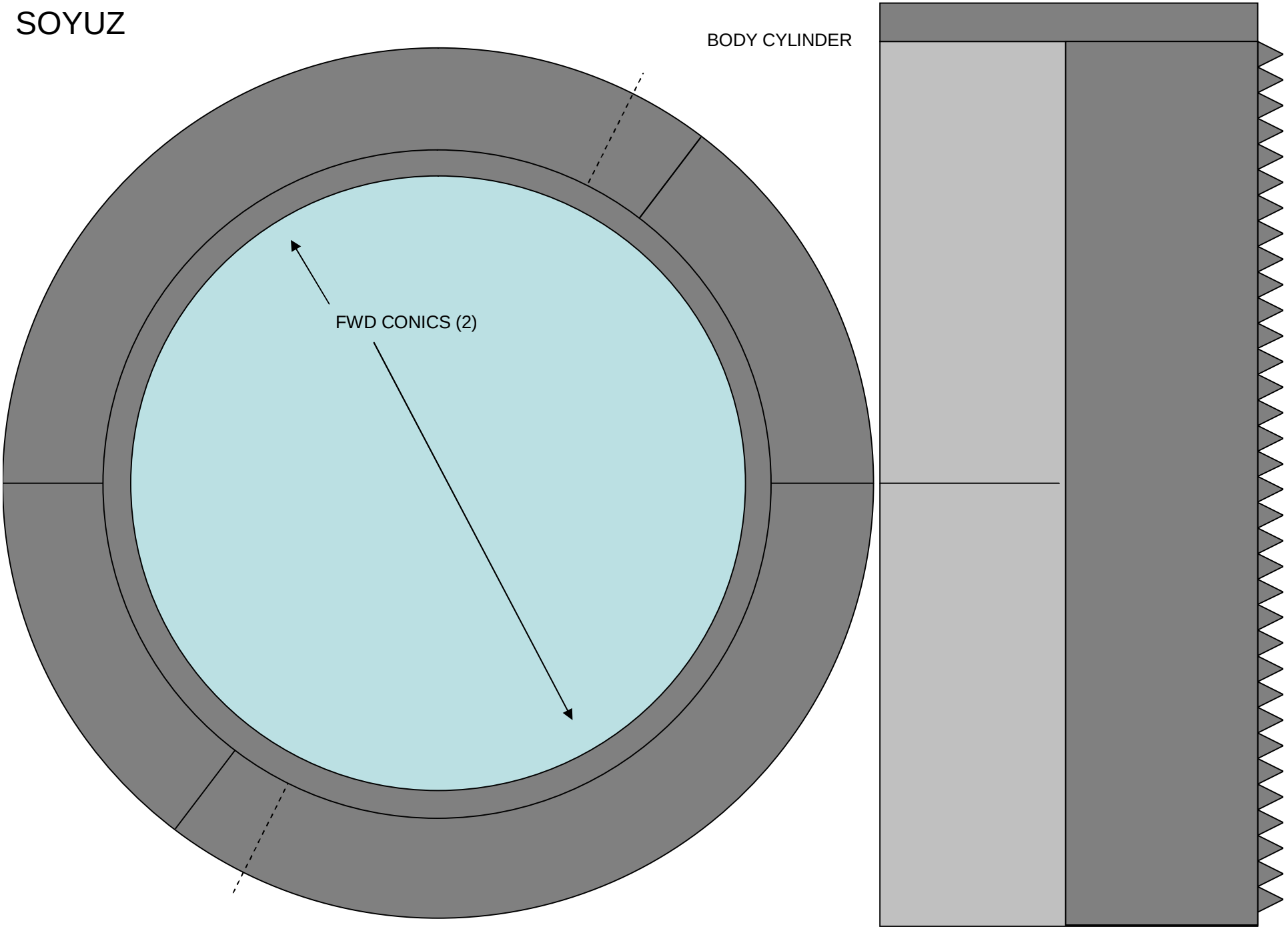


SOYUZ

SOYUZ



SOYUZ



PARTS