

# PROFESSIONAL DOME PLANS

Third Edition 3.01

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Building a dome as a do-it-yourself project can be a real challenge. It's difficult to know where to begin even for those with considerable building experience. If you dig deep enough, you can find plenty of information describing the geometry of domes, although most of it is rather technical and theoretical and often lacks the kind of practical hands on advice needed to turn theory into a finished product.

This plan book is designed to fill that void by focusing almost entirely on simple, detailed shop drawings that show how domes are built with virtually no need for higher math. In fact, the only math you'll see in these plans are the 4 basic functions used in a list of formulas for calculating the length of various parts.

The underlying geometry describes carbon 60, the third stable form of pure carbon after graphite and diamond called buckminsterfullerene or buckyballs. Its shape is a 3 frequency (3v) icosahedron which is an industry-standard for dome homes. If that sounds complicated, and I'm pretty sure it does, I guarantee you it doesn't matter. Understanding the complex geodesic math involved in the design of domes is completely unnecessary when it comes to the actual process of building one. All you'll need are basic woodworking skills and a little patience. With that, you should have little trouble building your own dome.

## TERMS

HEXagons and PENTagons: 3v icosadomes are made up of two basic shapes of isosceles triangles arranged in groups. There are five groups of six panels each, called Hex groups, and six groups of five panels each, called Pent groups. These are easy to imagine by using a classic black and white soccer ball. The white patches are Hex groups and the black patches are Pent groups. By putting one Pent group on top and cutting an imaginary plane under the other five Pent groups that surround it, you will see the approximate 3/8 sphere described in these plans.

A CHORD is the line that defines the side of a triangular panel. All chords intersect the imaginary sphere at both ends to create nodes and a soccer ball shape with flat triangular facets.

COHRD FACTORS are numbers that represent ratios that are multiplied by the dome diameter (DD) to calculate the length of chords. They are always stated as the DD x the number. An example would be: 540"

x .2048135683 = 110.5993269" or 110 19/32" which is the A chord for a 45' dome.

Sometimes dome books use chord factors referenced to the true radius or diameter of the sphere the dome is based on. While technically accurate, these numbers are a little difficult to work with because you can't easily measure the true radius or diameter of a 3v dome. This is because the true center of the sphere lies below the floor plane that divides the dome into useful structures. While the chord factors used here are related to the true diameter, they are referenced to the diameter at floor level. This is a number twice the radius from the center of the floor to any corner (p. 9). No two corners are opposite each other in a straight line however so in a 40' dome there is no 40' line but rather a 20' radius that scribes a 40' circle.

Even though the diameter is never really measured, it still serves as a perfect benchmark to ratio many other dimensions from. For example: the radius of a 40' dome is 40' x .5 or 20'. Similarly, the true diameter of a 40' dome is 40' x 1.015063688 or 40' 7 7/32". This will work with all scalable dimensions if you have the right ratios.

Incidentally, nearly all measurements are given in inches rather than feet with the exception being explanations like the one above. Decimal calculations done in feet add the complication of converting the remainder to inches which is just another opportunity for error.

STRUTS are the individual boards that make up the sides of the panels. Their lengths are found by multiplying the DD x a chord factor minus a constant that allows for the angled cross-section of the adjacent strut.

The labeling of struts corresponds to the group they're associated with. H stands for Hex and P for

Pent followed by A, B or C added in a clockwise direction beginning with the base: HA, HB and HC for Hex panels, and PA, PB and PC for Pents.

BACKERS are the boards that fill in the panels and provide backing for the Sheetrock®. They are labeled with a P or H followed by 1, 2, 3 etc. from largest to smallest.

RISER WALLS are typically short walls that sit directly under the lower Pent groups. In domes smaller than 45' they are necessary to allow adequate height for entry through the natural openings. By raising the dome they also provide more usable floor space on the second floor.

The ratios provided in the Elevation drawing (p.11) give an idea of the effect of different riser wall heights on interior space. Simply multiply the DD x the ratio of a selected node and you will get its height, excluding the riser wall, for any size dome. Now add whatever riser wall height you want and you'll see exactly where that node will be on the second floor. This can be very helpful in deciding where to put skylights in case you might want to see something other than sky.

SHEAR PANELS are rectangular stress skin panels that are bolted and strapped to the ends of the riser walls and to the foundation. They prevent the riser walls from being pushed over by the dome by holding them in a ridged vertical position. Standard Shear Panels sit in line with the exterior walls and should be incorporated into the walls' design. The suggested size represents the minimum. The larger the area of shear the stronger and safer the design.

Extension Shear Panels project from the dome perpendicular to the openings and provide a base to build extensions on. In this arrangement they form a buttress which is very effective in resisting the overturning forces of the dome.

The TENSION RING is the line of struts that surrounds the dome just above the natural openings. This is where the compressional forces of live and dead loads are transformed into tension and constrained by the straps in a circle around the dome. The give and take of compression and tension is of course far more complicated than that, but the conclusion is the same. The tension ring holds the dome together and is one of the most critical links in the system. Great care should be taken to see that it's secure. In fact it's probably wise (although it's not always done) to double the A strut in the Hex panels over the openings. This gives you a double strut around the entire dome. At the cost of 5 boards it seems a small price to pay for the added security. To properly install straps, you need solid material beneath all the nails, so without a second strut you will need to add blocking anyway .

## FORMAT

DOME DRAWINGS: The two drawings on pages 10 and 11 show a top view and an elevation of an approximate 40' dome on a 3 1/2' riser wall. They are consistent except for a slightly different placement of skylight panels and no shear panels in the top view. Ratios are given for several dimensions which should give you some feel for the proportions of different sized domes.

In the elevation, dotted lines, which normally represent hidden lines, are instead used to show panels

visible only from the inside. The little numbers at the vertex of each panel match numbers on the individual panel drawings to indicate their general type and location.

In the lower Pent groups you'll notice that the two Bottom Side Pent panels have the backers laid out parallel to the A strut rather than perpendicular. Often domes are built with all the Pent panels constructed identically as Standard Pent panels. With larger domes or in heavy snow loads, you should consider using this alternate parallel layout. Structurally, the bottom three Pent panels are really more of a wall the dome sits on than part of the dome itself. Running the backers in this more or less vertical arrangement, in the Bottom Side Pents, makes much better use of their load bearing capacity and greatly improves the panels' resistance to buckling under stress.

PANEL DRAWINGS: All panels are drawn skin side up with the skin removed. Possible plywood layouts are shown on the next page. Panels are also all shown framed as 2x6 with backers on 24" centers although 2x4 domes and big domes in heavy snow loads may be safer when built with 16" centers.

As for 2x4 versus 2x6 construction, I would advise not to build any serious dome home with 2x4s. A good case can be made for the relative strength and energy efficiency of 2x4s in domes versus 2x6s in a conventional structure, but it's an apples and oranges argument. The real comparison is dome to dome and in that case 2x6 is better in nearly every way, if perhaps a trifle more expensive in material. Local building officials, who are often unfamiliar with dome construction methods, are also much less likely to have a 2x6 dome violate their comfort zone.

All parts measurements are taken from the outer surface of the framing at the outside upper edge of the

panels as defined by the chord lines. This allows for the dome to be made from any dimension lumber from 2x2s to 2x12s, without changing the lengths of the parts.

Triangular skylight drawings are shown with the 2x4 curb removed and drawn truncated in the center. A cross-section of this detail appears at the upper left of each drawing. Rectangular Velux® skylights are flush mounted without curbs.

Bolt hole layouts are intended to be universal and work, in most cases, with any panel of the same basic size and shape. The exceptions are with a few Velux skylights and are noted on the drawings.

PLYWOOD DRAWINGS: These drawings show possible ways of cutting plywood skins from 4x8 and occasionally 4x10 plywood. When cutting skins for a dome other than the ones pictured, follow the basic style shown here. Make sure any seams between plywood pieces fall on backing and are glued and stapled. In panelized stress skin domes, the skin carries a good deal of the load, so breaks in the skin are potential breaks in the load transfer.

RISER WALL DRAWINGS: Riser walls are drawn with an additional end view to make them clearer. The bottom plates and studs are not shown separately because they have only simple angles evident from the main drawings.

The riser walls pictured for the three domes drawn are sized to position the A Strut in the Hex panels over the openings about 36" off the second floor. This allows for a nice view from a skylight.

Riser walls can be almost any height as long as the shear panels are proportionate. A good rule of thumb is the shear panel should be at least as wide as it is tall.

It's actually best to incorporate the shear panels right into the exterior walls. This way the effective area of shear will increase where any plywood laps beyond the minimum framing of the shear panel itself.

When building on a concrete slab, make sure you carefully locate and incorporate the bottom straps into the foundation when it is poured. No matter how strongly built your riser walls and shear panels are, they're useless unless properly attached to the foundation.

It's also possible to use no riser wall at all. This is a interesting alternative for domes over 45' built on a tight budget. It's often less expensive to build these domes per square foot because there are fewer and larger components for the same usable floor space. 45' is about as small as you can go with this design though, in that you need a minimum height for the exterior doors.

If you choose to use this simplified design you will need a bottom plate under the dome beveled to the same angle as the riser wall top.

STRUT & BACKER CROSS-SECTIONS: Struts, because they must be beveled on both edges, always require a wider initial piece of lumber than backers. If for instance, backers are made from full 2x6s, then their accompanying struts will have to be cut down from 2x8s. Similarly if struts start out as 2x6s and are minimally milled, they will end up slightly smaller and the backers will need to be ripped down to match. The drawings on page 8 show both options for 2x4, 2x6 and 2x8 domes.

PARTS DRAWINGS: These drawings are the real heart of the plans. They appear with every panel and show a simplified view of its most complicated parts (simple blocks are omitted).

Boards are shown as if lying flat on your radial arm saw table. They are to rough scale with the lengths truncated to save space. Very slight angles have been exaggerated for clarity. Degree marks are omitted as unnecessary.

Angles are given in reference to the saw with S indicating the Swing of the arm and T being the Tilt of the head. B indicates the Bevel of your table saw and appears with the end view.

Dimensions of backers that vary only in length are shown in a list above or below the drawings with only the longest backer shown.

Identifying labels are placed on the same end of the boards as they appear in the scale drawings. The little arrows show the side of the boards the skin is attached to. Make sure you apply these labels and arrows to every board as you go about cutting. If you don't, I guarantee you that you won't be able to tell them apart especially with the Hex struts.

ANGLES: Angles are always displayed to the second decimal and are never rounded off. This makes matching the 10 digit equivalents listed with the formulas easy. You may never need to use any of these precision numbers but if you ever want to calculate some new part, they can be a very useful starting point.

DIMENSIONS: Dimensions are rounded generally to the nearest 1/32" with very slight adjustments made to allow for matching struts that round in opposite directions.

This level of accuracy may seem extreme, but it's my experience that people are capable of making all the necessary mistakes without help from sloppy dimensions. Just seeing numbers like 110 19/32" tends to make one work more carefully. Then too, domes are far less forgiving than most wooden structures. Even

small errors will accumulate making the last panels difficult to install.

The lengths of parts for arbitrary-sized domes can be calculated using 12 simple, although very precise formulas, on page 6. They all use the same approach —  $DD \times a$  ratio minus a constant or two to get the final length.

There are also 4 tables that list strut and backer lengths precalculated for 49 dome sizes from 12' to 60' with backer lengths figured for both 16" and 24" centers.

## FABRICATION

**GLUING:** Consider gluing if the dome you're building is over 35' or will be subjected to heavy loads. The method of dome building shown in these plans relies heavily on the skin to transfer stress from panel to panel. When bound to the struts with glue, this capacity is greatly increased. Shear panels must be glued in any case, even if you choose not to glue the entire dome.

Glue should be waterproof and "structural", of the resorcinol phenolic resin type. Construction adhesives, while better than nothing, will creep under constant stress over time. Structural glues won't.

**NAILING & STAPLING:** Nail the framing with a pneumatic nail gun. Hot dip galvanized, full round head, 3 1/2" by .120" spiral shank nails should work well. These nails are very long and thin. This allows good penetration when shooting at an angle at the strut ends. The .120" shank also minimizes the chance of splitting the ends of the struts. Another advantage of air nailing is that it's much faster. Also, if you have a slightly warped strut, as sometimes happens, you can set one nail as a pivot point and then with a big

Crescent® wrench twist the strut into position just beyond the right spot with one hand, then fasten it quickly with the other and it will relax back to a perfect alignment.

Nail the framing on 2x6 domes with 5 nails in the panel corners where the struts meet and 4 in both ends of the backers if using .120" shank nails.

When backers run perpendicular to the A, strut they should be snugged up and fastened first from the inside on the sharp end with small staples or nails. This insures a tight fit which allows the backers to key in place because of the bevel of the struts.

Flush all framing on the skin side pushing any error to the inside of the panel. This guarantees an intimate glue joint with minimal bridging between parts.

When attaching skins I prefer to use staples. If gluing the skins, space staples 3" on center around the perimeter and on both sides of any seams and 5" on center everywhere else. If not gluing, space them even tighter. If any staples remain above the panel surface, tap them down flush with a hammer to insure a good glue joint. Also make sure the crown of the staple does not run parallel to the grain of the top ply of the plywood. You want the crown to cross the grain and pull the plywood down.

Nail and staple guns can be rented from most general rental companies. A Senco® SN65 or FramePro 650 FRH will work well for framing. A Senco® SNS45 or SNS50 stapler with N-19-BAB staples can be used for skins. If you have difficulty finding 3 1/2" by .120" gun nails locally, you can find them at mazenails.com. in Peru, Illinois, USA.

**JIGS:** When building just one or two domes, making elaborate production jigs is unrealistic and unnecessary. Well cut struts with cleanly fastened corners will have the proper chords and should

produce a nearly perfect dome if the struts are straight. Bowed struts, on the other hand, will cause a lot of problems. Even a 1/4" belly in the sides of two adjacent panels will push the panels apart 1/2" at the tips. If you do get one end together, the other end will usually get worse. Errors like this can be overpowered sometimes during assembly, but it's not much fun.

A simple jig made from three dead straight 2x4s nailed to the surface of a work table, snug around a panel, will help keep the struts straight while installing the backers and attaching the skin.

**LUMBER:** For any larger dome lumber should be #1 grade for struts and at least #2 & better for backers. Where skins will be glued and the inside finished, it should also be kiln dried. Air dried lumber will work as long as it's well seasoned with a moisture content as low as KD. Green or wet lumber will not support a good glue joint and tends to warp as it dries.

**PLYWOOD:** Plywood should be at a minimum 1/2" 5 ply CDX or the equivalent, and glued down when running parallel to the backers. Never use 3 ply or 4 ply plywood in this arrangement. It's very weak across the grain and will be spongy under foot, especially on 24" centers.

**BOLT HOLES:** Bolt holes are laid out from the vertex down both equal sides for the B and C Struts. For the A struts they're laid out from the center to both ends. This is because in the case of A Struts, HAs match PAs but must also match themselves. An HA to HA paring will double any error made in laying out the bolt holes from one end. Layout done from the center will minimize this problem.

Center is most accurately found by measuring it twice from both ends of the strut. If both lines are not

in exactly the same spot, a line splitting the difference will be the center.

Bolt holes can be jigged by drilling holes for guides in the center of a 2x4 and clamping it flush to the top of the framing. Just make sure you mark the vertex end in the case of B and C Struts and always flush that end. With A Struts, lay the jig holes out from center and match that mark to a center line made on the struts themselves.

Bolt holes should be drilled 1 3/4" down the outside face of the struts at 90° to their surface. This transfers stress in as direct a path as possible from skin to skin. Holes should be 5/8" when predrilled to allow for adjustments.

Bolt placement and spacing are somewhat arbitrary. The layouts illustrated follow a deliberately conservative pattern of a bolt approximately every 24" beginning and ending about 10" or less from the tips. The purpose here is not only to transfer loads, but is also to prevent Sheetrock® cracking. With domes, the joints in the Sheetrock® unavoidably fall right on the joints between the panels creating a weak spot. In a 45' dome this amounts to more than 700' of joint. That's a lot of potential for damage, so a few extra bolts are worth the price.

**HARDWARE:** Bolts can be 1/2" x 4" grade 2. Washers can be 1/2" heavy flat washers but 3/8" malleable iron washers work a lot better. Their hole is just a little over 3/8" so 1/2" bolts (which are actually under 1/2") will fit through them most of the time without reaming. The difference is in the amount of torque they will take. Flat washers will bend in a cup shape under stress and noticeably crush the wood underneath them. Malleable iron washers, which have at least three times the bearing surface, will feel tight long before you notice any crushed wood. This allows

you to torque the bolts closer to specs. and get the struts tighter together.

**STRAPS:** The size and strength of straps used depends on the size of dome you build and the loads you expect. Single 3' long Simpson MTS37 straps, or the equivalent in strength, have been used on 45' domes in snow loads below 30 lbs. In heavier snow loads, a second ring of straps should be installed at the next ring of struts up from the tension ring.

## ASSEMBLY

Raising a dome is fairly straightforward. Domes are sometimes raised by prefabricating the lower five Pent groups on the ground and then tilting them up as one piece. While this works well enough for smaller 2x4 domes, it would be difficult and certainly dangerous with a 60' 2x6 dome. With larger domes you may want to begin with just the bottom three Pent panels and go one at a time from then on. In any case, make sure to brace everything well as you go. A dome is not self supporting until the first forty panels are up and form a complete tension ring.

Bolts should be tightened as you go along except for the two Hex to Hex seams in the Hex group that meets the last Pent Panel. Leaving these bolts a little loose allows you to flex the dome open slightly with two long poles and slip the final Pent panel in more easily. After the dome is up it's a good idea to go around and retorque the bolts one last time before you cover them up. Sometimes a few just get missed otherwise.

Take time to finish one step before racing on to the next. Riser walls and shear panels, if used, should be completely strapped to the foundation prior to raising

the dome. This guarantees that no movement takes place before the straps are called on to take up load.

Strapping should be installed on the dome itself as soon as the tension ring is finished. This is because tension straps allow a very slight movement of the panels as they load up. As you add additional panels, the straps will come under tension and seat, allowing no further movement. If you wait until after the dome is up to install the straps, it will actually be the bolts at the tension ring that are taking the stress and not the straps. Now add a roof, Sheetrock® and about two feet of snow, and you may get a minor movement of the panels as the straps take up the additional load. The result at worst will likely be nothing more than hairline cracks over the openings but they're worth avoiding if you can.

## SMALL SCALE DOMES

These plans focus mainly on building large scale domes which is reflected in the use of full-dimension lumber in all of the drawings and tables. Small scale domes for use as a back yard storage building or potting shed don't really need this heavy lumber and can be sensibly built making panels from thinner lumber such as 1x4s. You can easily calculate the parts for these domes using the formulas on page 6. They need only minor modifications that account for the smaller cross-section of the lumber.

To figure struts, use the same ratios but reduce the following constant by the percentage your lumber is thinner than standard 1 1/2" lumber. For instance: 3/4" lumber is 1/2 as thick as standard lumber so you would divide the constant by 2. 1/2" lumber is 1/3 as thick so you would divide the constant by 3, and so on.

To figure backers, you again use the same ratios and reduce the first constant by the percentage your

lumber is thinner. The second constant, however, should remain the same. Its only purpose is to calculate the change in the length of a backer relative to its position on layout. No cross-sectional dimensions are involved in this process so it is unaffected by lumber thickness.

## FORMULAS

Calculating the length of struts is straightforward. The dome diameter (DD) is first multiplied by a ratio to figure the entire length of a panel's side or chord. A constant, which allows for the angled cross-section of the adjacent strut, is then subtracted to produce the finished strut length.

Calculating backers is a little more complicated. In the case of backers running parallel to any strut, the DD is first multiplied by a ratio to establish the chord. A constant is then subtracted that allows for the angled cross-section of both intersecting struts as if they crossed at both ends. A second constant is then subtracted for every inch the backer is away from the base line on layout. That is if the backer you want is 13 1/2" from the edge, you would multiply the second constant by 13.5 and subtract.

If the backers are perpendicular to the A Strut, the DD is first multiplied by a ratio that establishes a line that bisects the panel through the vertex. A constant is then subtracted that allows for the cross-section of the A Strut plus the intersection of the B and C Struts. This produces a number equal to the length of the first center backer. Subsequent backers are figured by subtracting a second constant for every inch they are from the center line on layout. Remember that since the reference line is to the center of the panel, and not the edge of a backer, a 3/4" allowance must be made on the first layout. That is, on 16' centers laid out on

center, the second backer would be 15 1/4" from center not 16". Laid out off center, the first backer would be 7 1/4" from the reference line, not 8".

Building a dome is really not that different from any other building project. In the beginning there are always two big questions:

1. What do the parts look like?
2. How do they go together?

If you know the answers to these two questions your odds of success are pretty good. To that end, I hope you find these plans helpful.

j.o. hill

*Most formulas and data have been zeroed in the sample version.*

## HEX STRUTS

$$\begin{aligned} HA &= DD \times .2048135683 - 1.732050808'' \\ HB &= DD \times .0000000000 - 0.000000000'' \\ HC &= DD \times .0000000000 - 0.000000000'' \end{aligned}$$

## HEX BACKERS

$$\text{Perpendicular to the A Strut} = DD \times .0000000000 - 0.000000000'' - (0.000000000'' \text{ per inch of layout})$$

$$\text{Parallel to the A Strut} = DD \times .0000000000 - 0.000000000'' - (0.000000000'' \text{ per inch of layout})$$

$$\text{Parallel to the B or C Struts} = DD \times .0000000000 - 0.000000000'' - (0.000000000'' \text{ per inch of layout})$$

## PENT STRUTS

$$\begin{aligned} PA &= DD \times .0000000000 - 0.000000000'' \\ PB &= DD \times .0000000000 - 0.000000000'' \\ PC &= DD \times .0000000000 - 0.000000000'' \end{aligned}$$

## PENT BACKERS

$$\text{Perpendicular to the A Strut} = DD \times .0000000000 - 0.000000000'' - (0.000000000'' \text{ per inch of layout})$$

$$\text{Parallel to the A Strut} = DD \times .0000000000 - 0.000000000'' - (0.000000000'' \text{ per inch of layout})$$

$$\text{Parallel to the B or C Struts} = DD \times .0000000000 - 0.000000000'' - (0.000000000'' \text{ per inch of layout})$$

## REFERENCE ANGLES

0.000000000°	00.0000000°	00.0000000°
0.000000000°	00.0000000°	29.29158251°
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0.000000000°	00.0000000°	00.0000000°
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To inquire about how to buy Sierra Skylights, contact:

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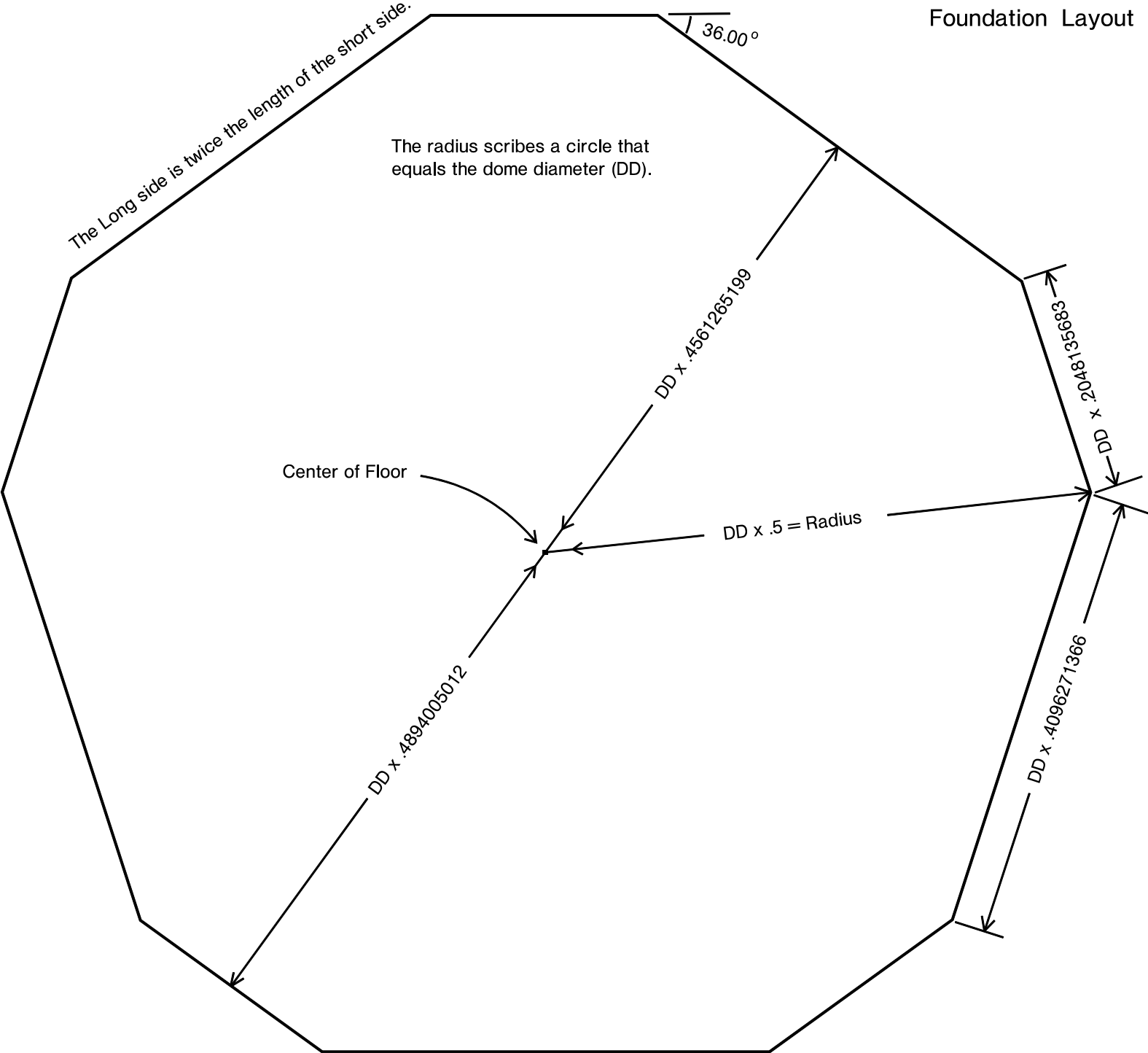
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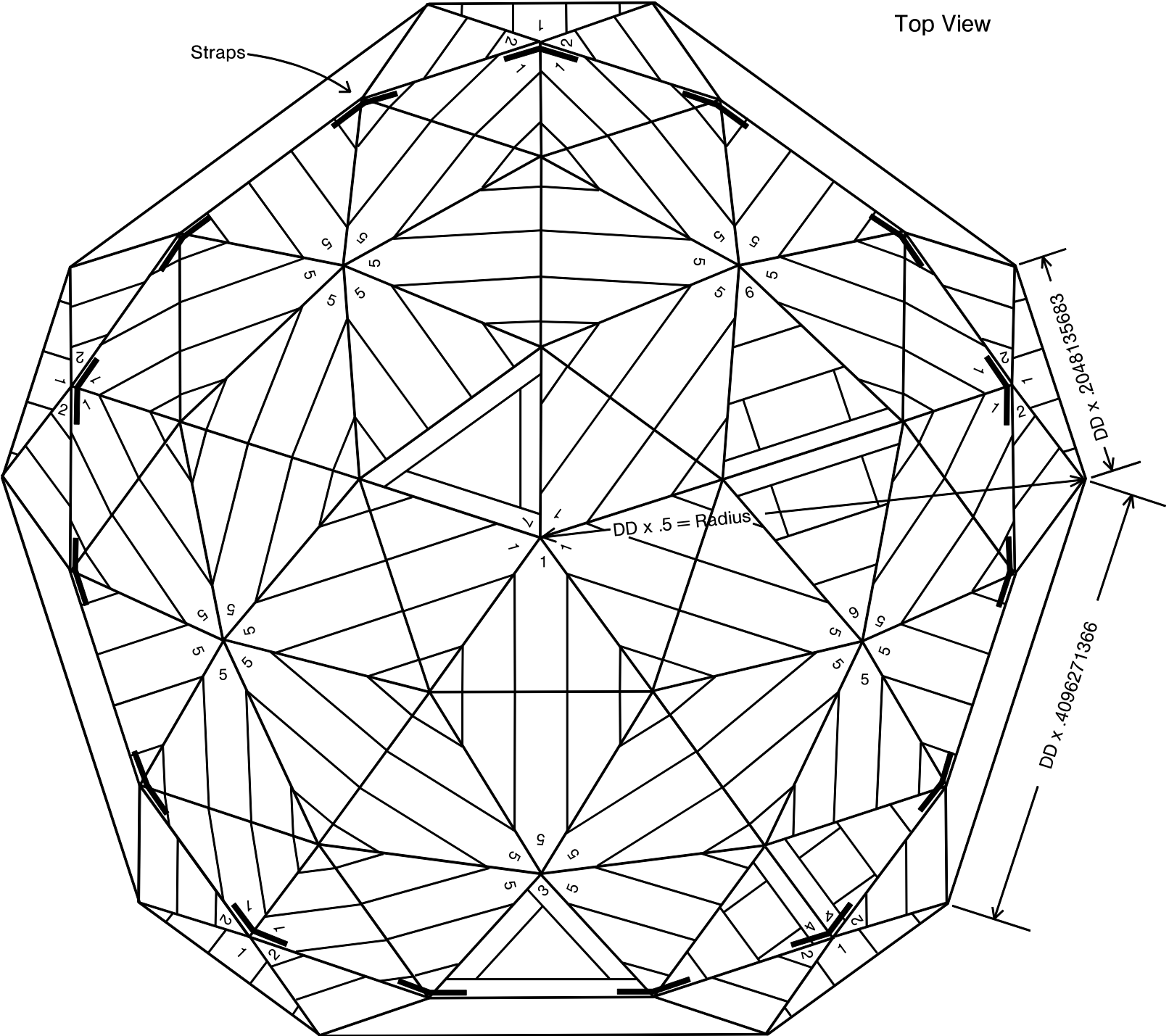
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Foundation Layout



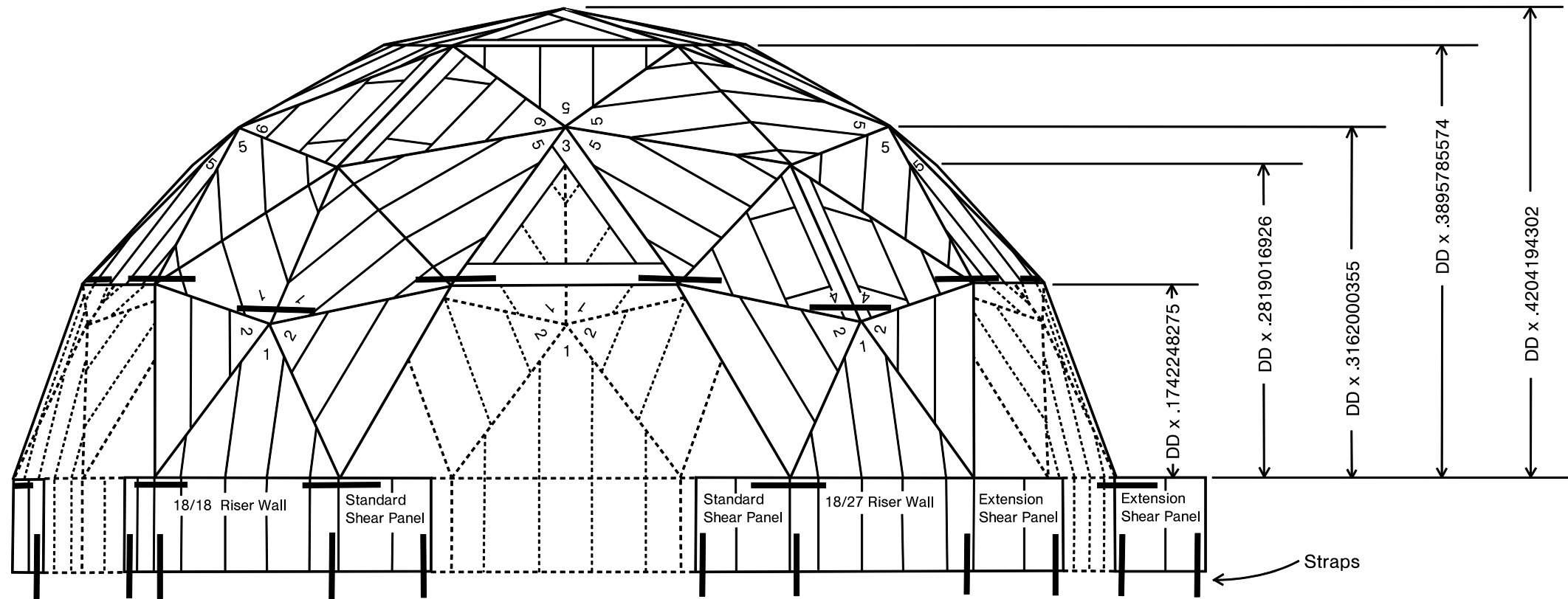


Top View

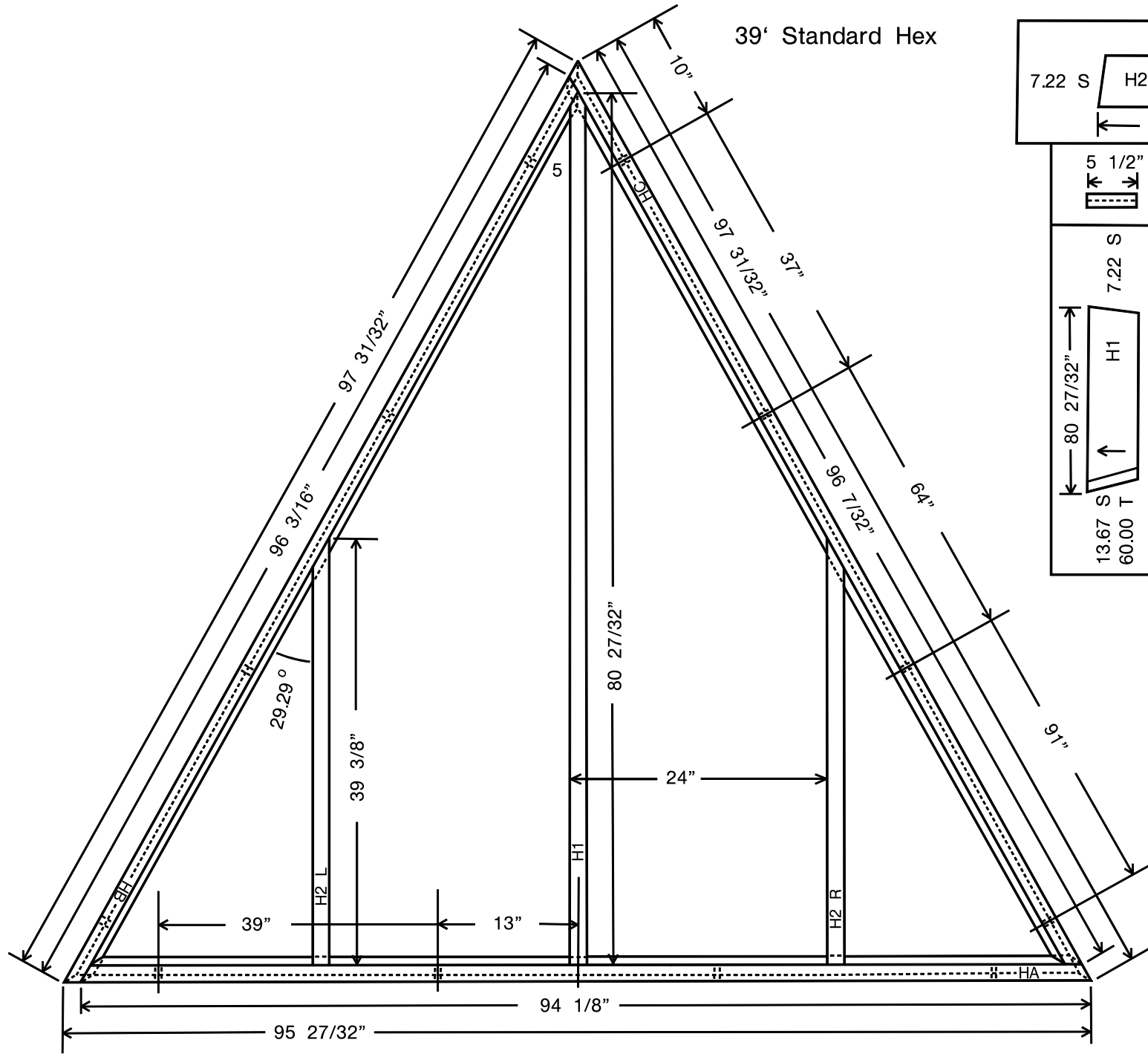


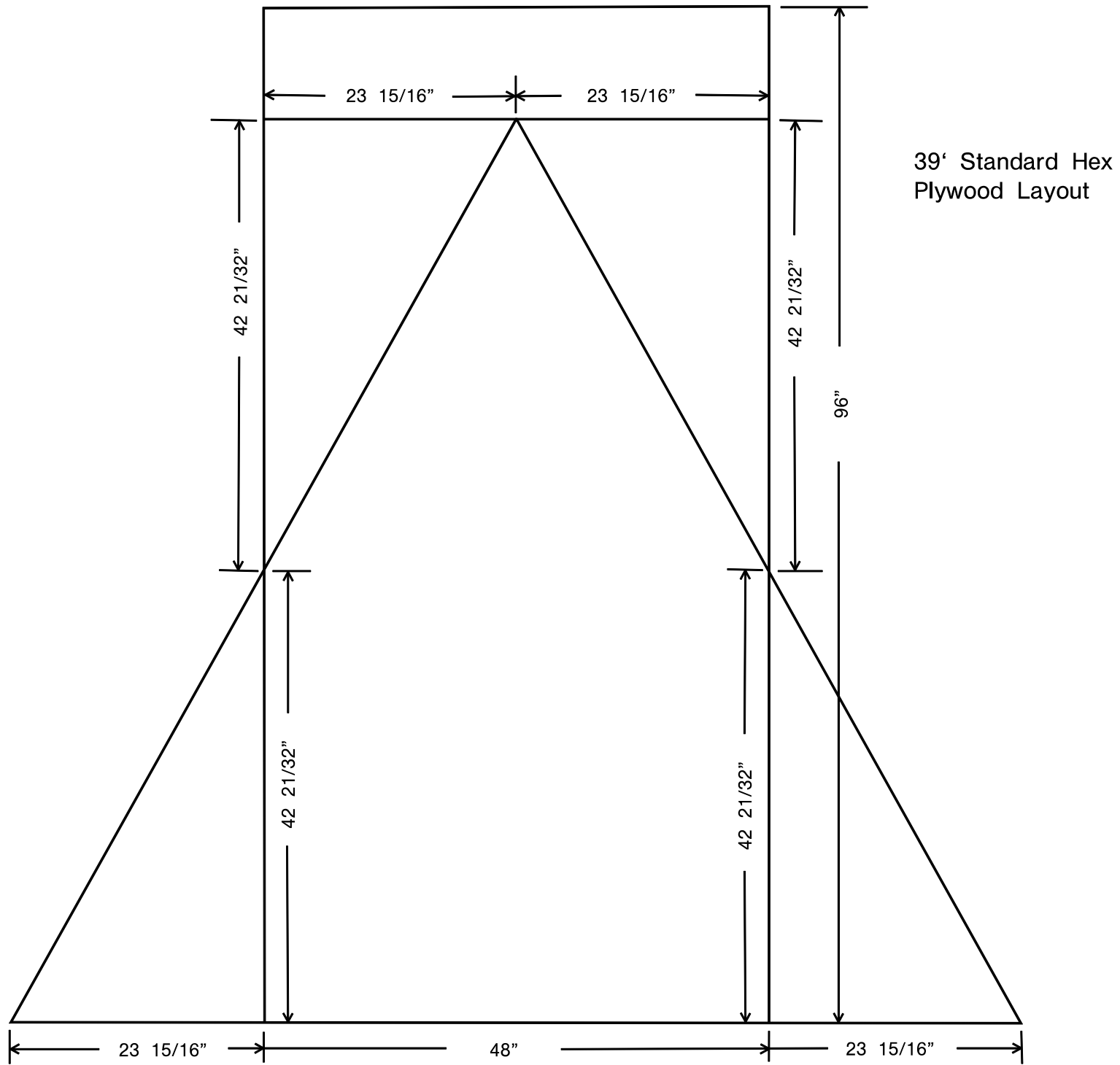
- 1 = Standard Pent
- 2 = Bottom Side Pent
- 3 = Hex Sierra Skylight
- 4 = Pent Velux Skylight
- 5 = Standard Hex
- 6 = Hex Velux Skylight
- 7 = Pent Sierra Skylight

# Elevation



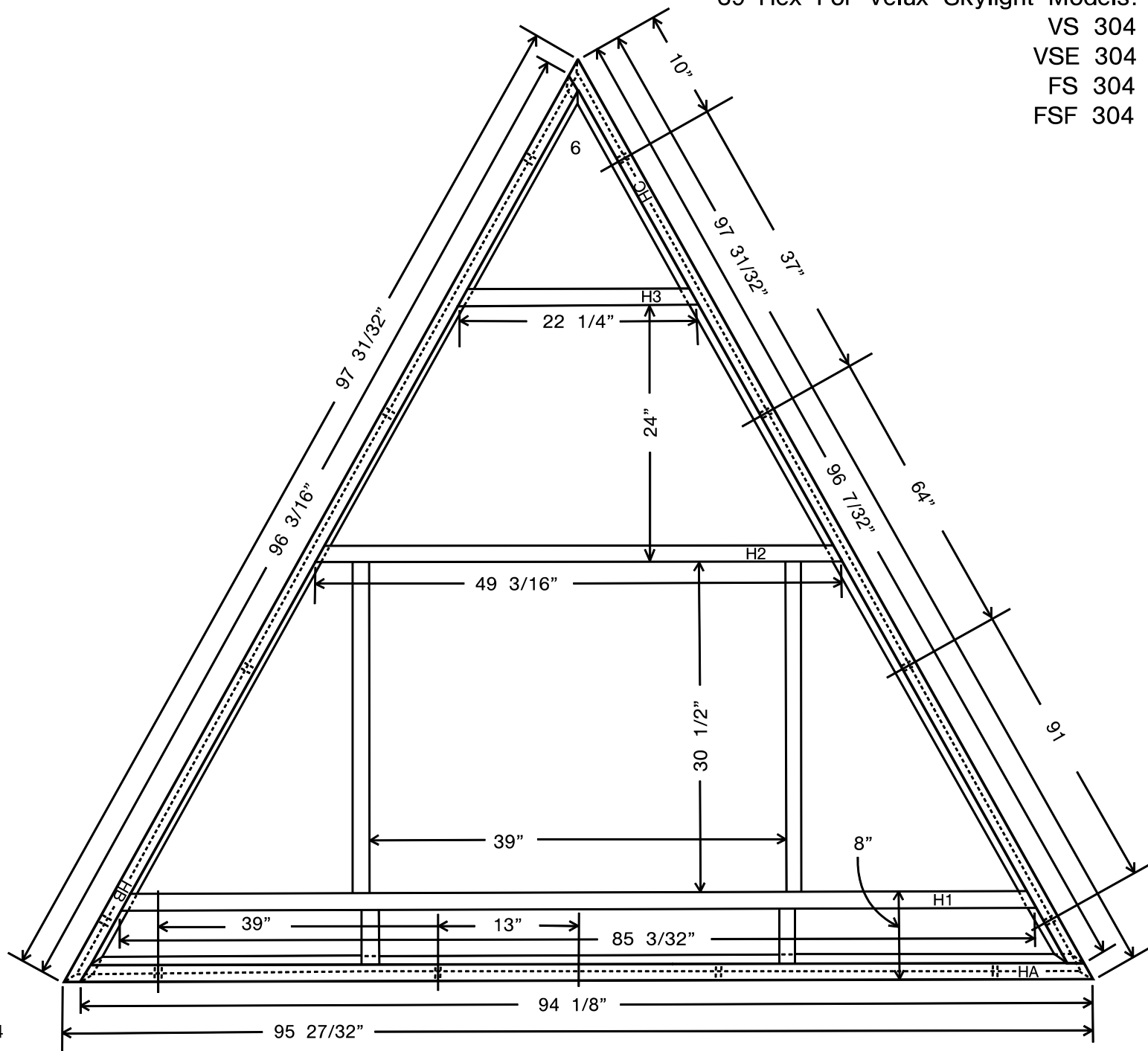
39' Standard Hex

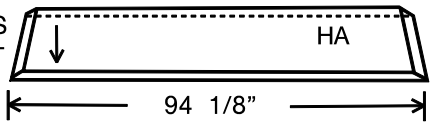
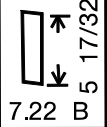
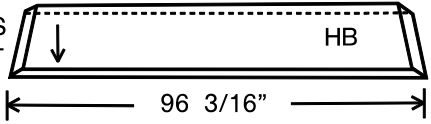
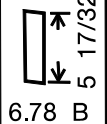
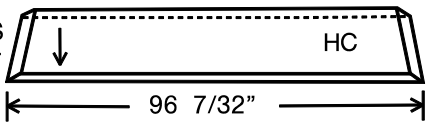
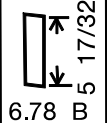
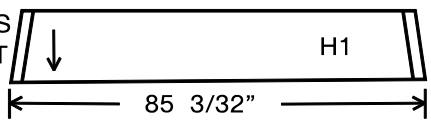
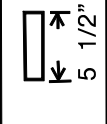


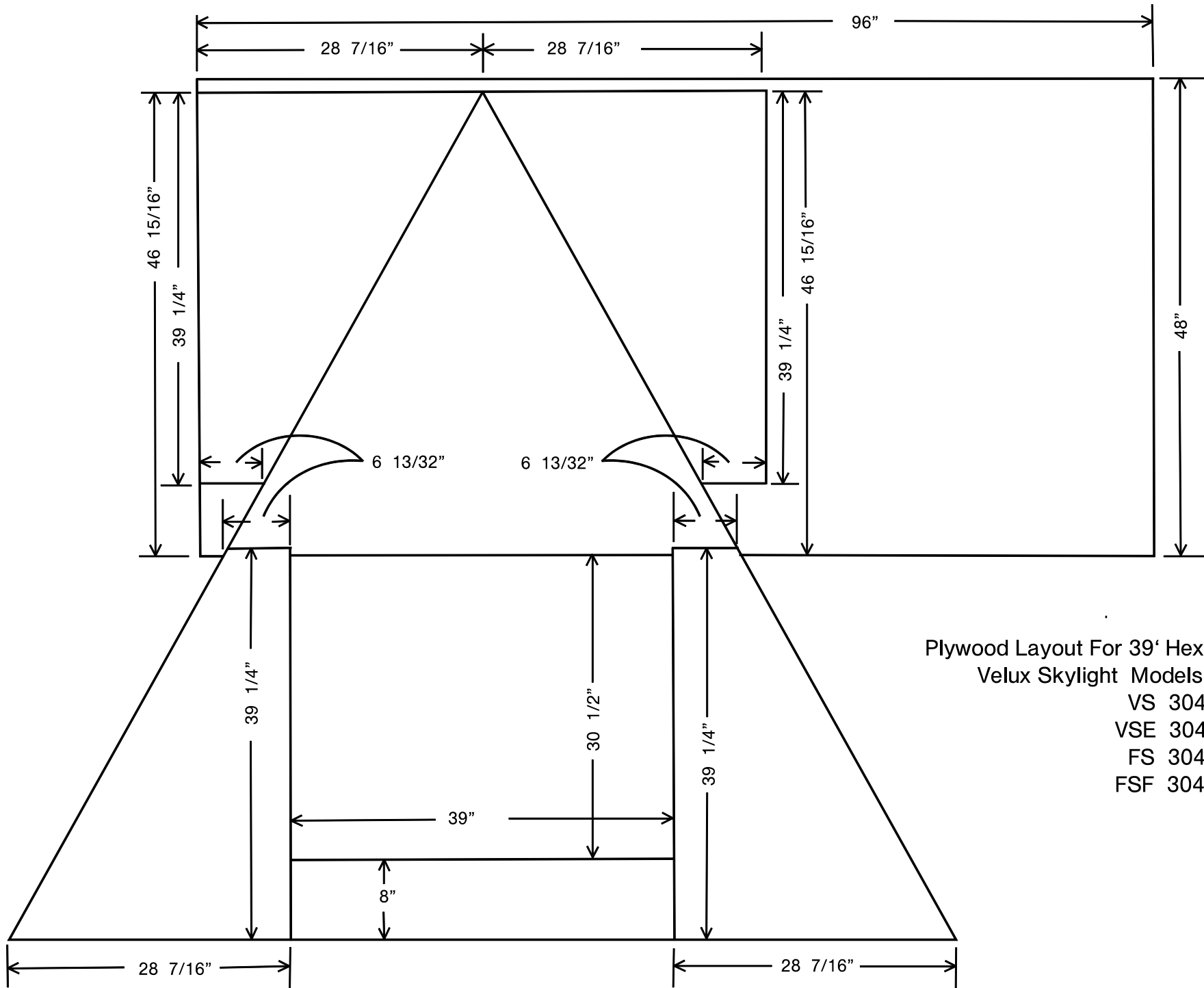



39' Hex For Velux Skylight Models:

- VS 304
- VSE 304
- FS 304
- FSF 304



11.64 S 27.84 T		11.64 S 27.84 T	
11.90 S 30.00 T		11.90 S 27.84 T	
11.90 S 27.84 T		11.90 S 30.00 T	
7.77 S 29.06 T		7.77 S 29.06 T	
(1) 85 3/32" (2) 49 3/16" (3) 22 1/4"			



Plywood Layout For 39' Hex  
 Velux Skylight Models:  
 VS 304  
 VSE 304  
 FS 304  
 FSF 304

## License Agreements

Please read the license agreements carefully.  
There are two versions.

- (1) A **Personal License** which allows you to build an unlimited number of domes for personal use for \$54.95 U.S.  
and  
(2) A **Commercial License** which allows the same personal use but also allows you to build domes commercially for \$184.95 U.S. plus a very modest royalty.

### License Agreement (Personal)

#### Introduction.

This is a License Agreement (the "Agreement"), effective as of this date (the "Effective Date"), between Precision Structures LLC (the "Licensor") of 2565 Potter Street, Eugene, Oregon 97405, and you (the "Licensee"). Licensor and Licensee shall be collectively referred to as "the parties."

Licensor is the owner of certain proprietary rights to the written work *Professional Dome Plans, Third Edition* ("the Work.") Licensee desires to license certain rights in the Work therefore the parties agree as follows:

#### The Work.

The Work refers to all proprietary rights, including but not limited to copyrights.

#### Grant of Rights - Personal License:

Licensor grants to Licensee a nonexclusive, nontransferable, non-commercial license to use the Work in building an unlimited number of domes for Licensee's personal use.

#### Personal and Non-commercial Use Limitation.

The Work is for Licensee's personal and non-commercial use. Licensee may not modify, copy, distribute, transmit, display, reproduce, publish, license, create derivative works from, transfer or sell the Work or any portion of it.

#### Reservation of Rights.

Licensor expressly reserves all rights other than those being conveyed or granted in this Agreement.

#### Term.

This Agreement shall commence upon the Effective Date and shall expire simultaneously with the expiration of the copyright of the Work unless sooner terminated pursuant to a provision of this Agreement.

#### License Fee.

As a nonrefundable, nonrecoupable fee for executing this license, Licensee agrees to pay to Licensor upon execution of this Agreement the sum of \$54.95 U.S.

#### Limitation of Licensor Liability.

Licensor's maximum liability to Licensee under this agreement, regardless on what basis liability is asserted, shall in no event exceed the total amount paid to Licensor under this Agreement. Licensor shall not be liable to Licensee for any incidental, consequential, punitive or special damages.

#### Compliance with Intellectual Property Laws.

The license granted in this Agreement is conditioned on Licensee's compliance with the provisions of all applicable laws and regulations, including but not limited to intellectual property laws of the United States and any foreign country. All copies of the Work as well as all promotional material shall bear appropriate proprietary notices.

#### Licensor's Right to Terminate.

Licensor shall have the right to terminate this Agreement for the following reasons:

- (a) Licensee assigns or sublicenses the Work in violation of the Agreement;
- or
- (b) Licensee breaches any other term of the Agreement.

#### Effect of Termination.

After termination of this license, all rights granted to the Licensee under this Agreement shall terminate and

revert to Licensor, and Licensee will refrain from further use of the Work.

#### Attorneys' Fees and Expenses.

The prevailing party shall have the right to collect from the other party its reasonable costs and necessary disbursements and attorneys' fees incurred in enforcing this Agreement.

#### Dispute Resolution - Alternative Dispute Resolution.

If a dispute arises and cannot be resolved by the parties, either party may make a written demand for formal resolution of the dispute. The written request will specify the scope of the dispute. Within 30 days after such written notice, the parties agree to meet, for one day, with an impartial mediator and consider dispute resolution alternatives other than litigation. If an alternative method of dispute resolution is not agreed upon within 30 days of the one-day mediation, either side may start litigation proceedings.

#### Governing Law.

This Agreement shall be governed in accordance with the laws of the State of Oregon and of the United States of America.

#### Jurisdiction.

The parties consent to the exclusive jurisdiction and venue of the federal and state courts located in Lane County, Oregon, United States of America in any action arising out of or relating to this Agreement. The parties waive any other venue to which either party might be entitled by domicile or otherwise.

#### Waiver.

The failure to exercise any right provided in this Agreement shall not be a waiver of prior or subsequent rights.

#### Invalidity.

If any provision of this Agreement is invalid under applicable statute or rule of law, it is to be considered omitted and the remaining provisions of this Agreement shall in no way be affected.

**Entire Understanding.**

This Agreement expresses the complete understanding of the parties and supersedes all prior representations, agreements and understandings, whether written or oral. This Agreement may not be altered except by a written document signed by both parties.

**Notices.** Any notice or communication required or permitted to be given under this Agreement shall be sufficiently given when received by certified mail, or sent by facsimile transmission or overnight courier.

**No Joint Venture.**

Nothing contained in this Agreement shall be construed to place the parties in the relationship of agent, employee, franchisee, officer, partners or joint ventures. Neither party may create nor assume any obligation on behalf of the other.

**Assignability.**

Licensee may not assign or transfer its rights or obligations pursuant to this Agreement. Any assignment or transfer in violation of this section shall be void.

**Execution.**

Each party executing this agreement personally or on behalf of a corporation warrants that the party is authorized to enter this Agreement and that this Agreement is binding on the party.

**License Agreement (Commercial)****Introduction.**

This is a License Agreement (the "Agreement"), effective as of this date (the "Effective Date"), between Precision Structures LLC (the "Licensor") of 2565 Potter Street, Eugene, Oregon 97405, and you (the "Licensee"). Licensor and Licensee shall be collectively referred to as "the parties."

Licensor is the owner of certain proprietary rights to the written work *Professional Dome Plans, Third Edition* ("the Work.") Licensee desires to license certain rights in the Work therefore the parties agree as follows:

**The Work.**

The Work refers to all proprietary rights, including but not limited to copyrights.

**Grant of Rights - Commercial License:**

Licensor grants to commercial Licensee a nonexclusive, nontransferable, non-commercial license to use the Work in building an unlimited number of domes for Licensee's personal use. In addition, Licensor grants to Licensee a nonexclusive, nontransferable, commercial license to use the Work in building an unlimited number of domes for Licensee's customers provided Licensee pays the Royalties as set out below.

**Use Limitation.**

Licensee may not modify, copy, distribute, transmit, display, reproduce, publish, license, create derivative works from, transfer or sell the Work or any portion of it. However, Licensee may make a working copy of pages to be used in a shop setting as cutting lists provided that said copies are used for no other purpose and are destroyed after use.

**Reservation of Rights.**

Licensor expressly reserves all rights other than those being conveyed or granted in this Agreement.

**Term.**

This Agreement shall commence upon the Effective Date and shall expire simultaneously with the expiration of the copyright of the Work unless sooner terminated pursuant to a provision of this Agreement.

**License Fee.**

As a nonrefundable, nonrecoupable fee for executing this license, Licensee agrees to pay to Licensor upon execution of this Agreement the sum of either:

- (a) \$184.95 U.S. if purchased as an original Commercial License,
  - or
  - (b) \$130.00 U.S. if purchased as an upgrade from an existing Personal License,
- and thereafter to pay promptly other sums payable under the terms of this Agreement.

**Royalties.**

All royalties ("Royalties") provided for under this Agreement shall accrue when the respective domes are contracted, built, sold, billed or paid for, whichever occurs first.

**Licensed Work Royalty.**

Commercial Licensee agrees to pay a Royalty of ten cents U.S. (\$.10) per square foot on the area of a circle in square feet scribed by the radius of the dome at ground level on each dome built for a customer. The formula used will be:  $\text{Pi } (\pi) \text{ times the radius squared where } \pi \text{ equals } 3.14.$

For example:

(1) The royalty due on a 40-foot dome with a radius of 20 feet would be  $20'^2 = 400' \times 3.14 = 1256 \text{ sq. ft. and } 1256 \text{ sq. ft.} \times \$ .10 \text{ per sq. ft.} = \$125.60.$

(2) The royalty due on a 12-foot dome with a radius of 6 feet would be  $6'^2 = 36' \times 3.14 = 113 \text{ sq. ft. and } 113 \text{ sq. ft.} \times \$ .10 \text{ per sq. ft.} = \$11.30.$

**Payments to Licensor.**

Within thirty days after the Royalty accrues, Licensee shall pay to Licensor at the address set out above or at the web site [domeplans.com](http://domeplans.com) the Royalty described in the preceding paragraph. All payments shall be paid in United States currency drawn on a United States bank. The acceptance by Licensor of any of royalties paid shall not preclude Licensor questioning the correctness at any time of any payments.

**Audit.**

Licensee shall keep accurate books of account and records covering all transactions relating to the license granted in this Agreement, and Licensor or its duly authorized representatives shall have the right upon five days prior written notice, and during normal business hours, to inspect and audit Licensee's records relating to the Work licensed under this Agreement. If the results indicate an underpayment, Licensee shall promptly reimburse Licensor for all costs of the audit along with the



amount due with interest on such sums. Interest shall accrue from the date the payment was originally due, and the interest rate shall be 1.5% per month, or the maximum rate permitted by law, whichever is less. All books of account and records shall be made available and kept available for at least two years after Royalties accrue under this Agreement.

**Late Payment.**

Time is of the essence with respect to all payments to be made by Licensee under this Agreement. If Licensee is late in any payment provided for in this Agreement, Licensee shall pay interest on the payment from the date due until paid at a rate of 1.5% per month, or the maximum rate permitted by law, whichever is less.

**Limitation of Licensors Liability.**

Licensors maximum liability to Licensee under this agreement, regardless on what basis liability is asserted, shall in no event exceed the total amount paid to Licensor under this Agreement. Licensor shall not be liable to Licensee for any incidental, consequential, punitive or special damages.

**Compliance with Intellectual Property Laws.**

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**Licensors Right to Terminate.**

Licensor shall have the right to terminate this Agreement for the following reasons:

(a) Licensee fails to pay Royalties when due and such failure is not cured within thirty days after written notice from the Licensor;

(b) Licensee assigns or sublicenses the Work in violation of the Agreement; or

(c) Licensee breaches any other term of the Agreement.

**Effect of Termination.**

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