PIONEER

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Erection Of The Arches

ERECTION OF THE ARCHES

The arches of ECONOSPAN buildings are the main components of the structure, acting as both the sidewalls and the roof. If properly erected, as outlined in the following pages, the building will be weathertight. We recommend, however, to apply caulking to all joints and seams in the arch structure, to avoid possible leakage problems in driving rain or other extreme weather conditions.

We supply, optionally, a superior brand of butyl caulking in strips, which can easily be applied. You may elect, if you wish, to use any good quality cartridge-type caulking, which may be purchased at a local hardware store and applied by means of a caulking gun.

The best method to erect the arches, is to assemble complete arches on the ground, and then raise them into position (see Fig. 10).

CAUTION: ALL BOLTS ARE PLACED INTO THE ARCHES AND LEFT FINGER TIGHT. DO NOT TIGHTEN WITH A WRENCH. ALL BOLTS ARE LEFT LOOSE UNTIL BUILDING IS COMPLETED.

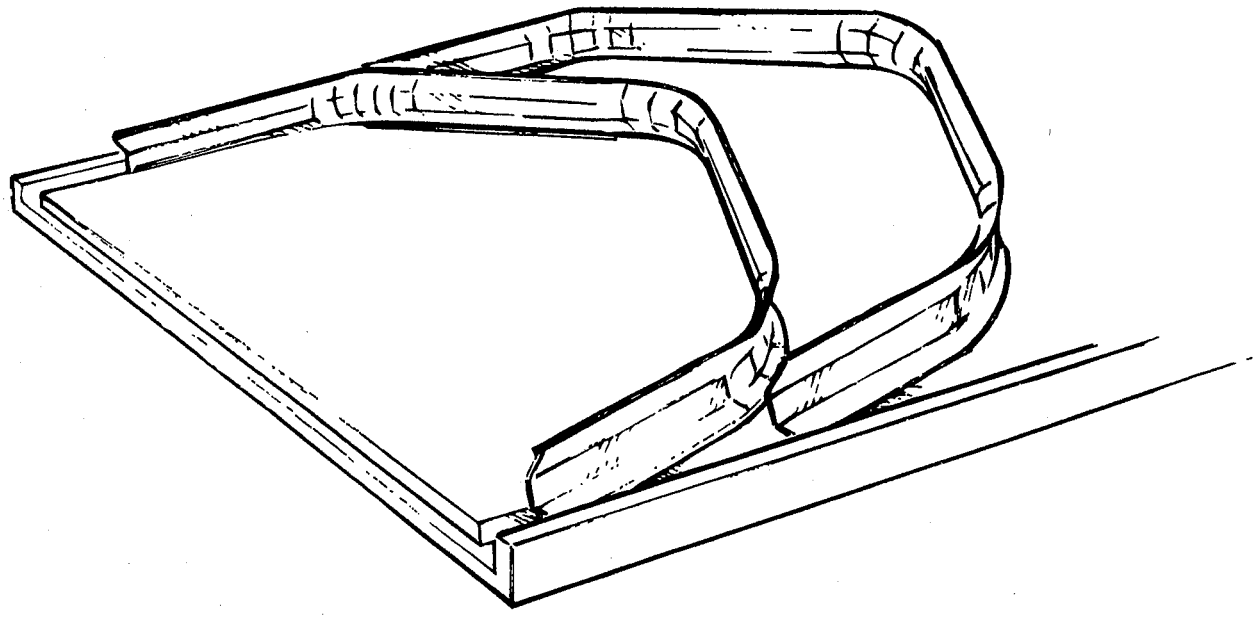


Fig. 10

The arches are assembled using two straight panels, two sharply curved eave panels, straight panels and one top curved peak panel (see fig.11).

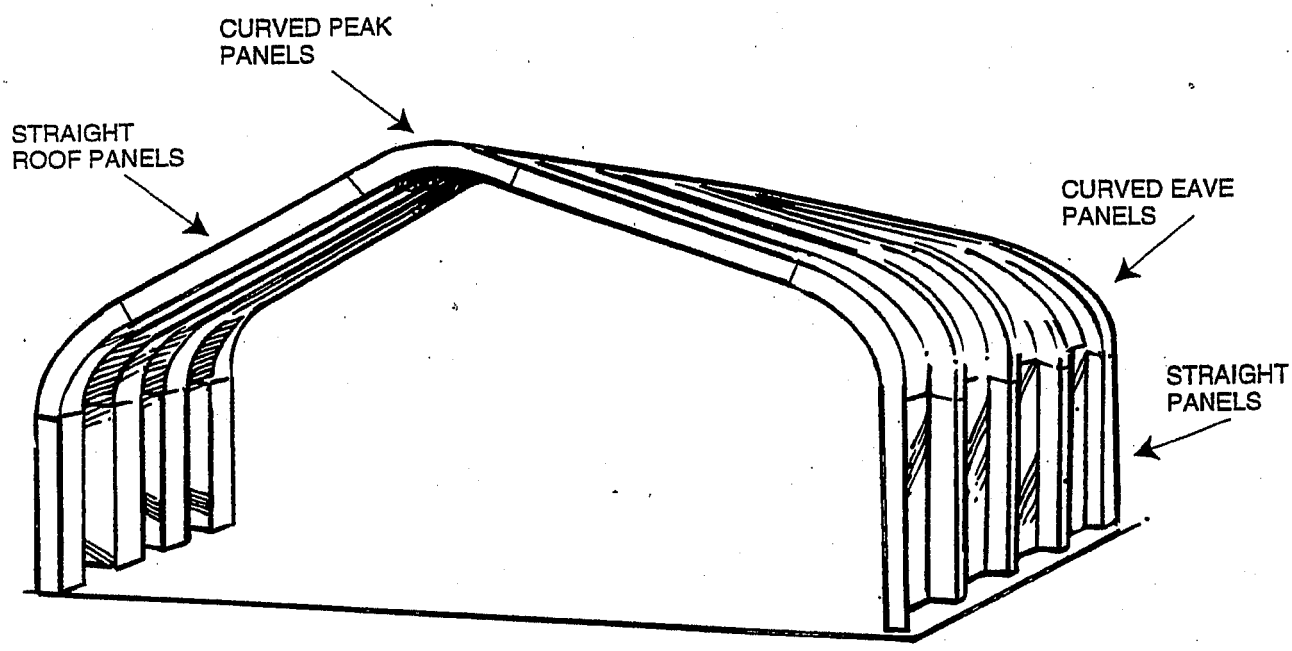


Fig. 11

The straight panels make up the top part of the arch. The eave part of the arch usually consists of a curved panel approximately 99 inches in length.

ERECTION TIP: Check the straight panels and select the ends that have the first line of bolt holes one inch (1") from the bottom edge. This is the end that must go into the concrete trough or base plate. The one inch (1") is measured from the center of the hole to the end of the panel.

To determine the number of panels in each arch for your building model, refer to fig. 12 and table 3.

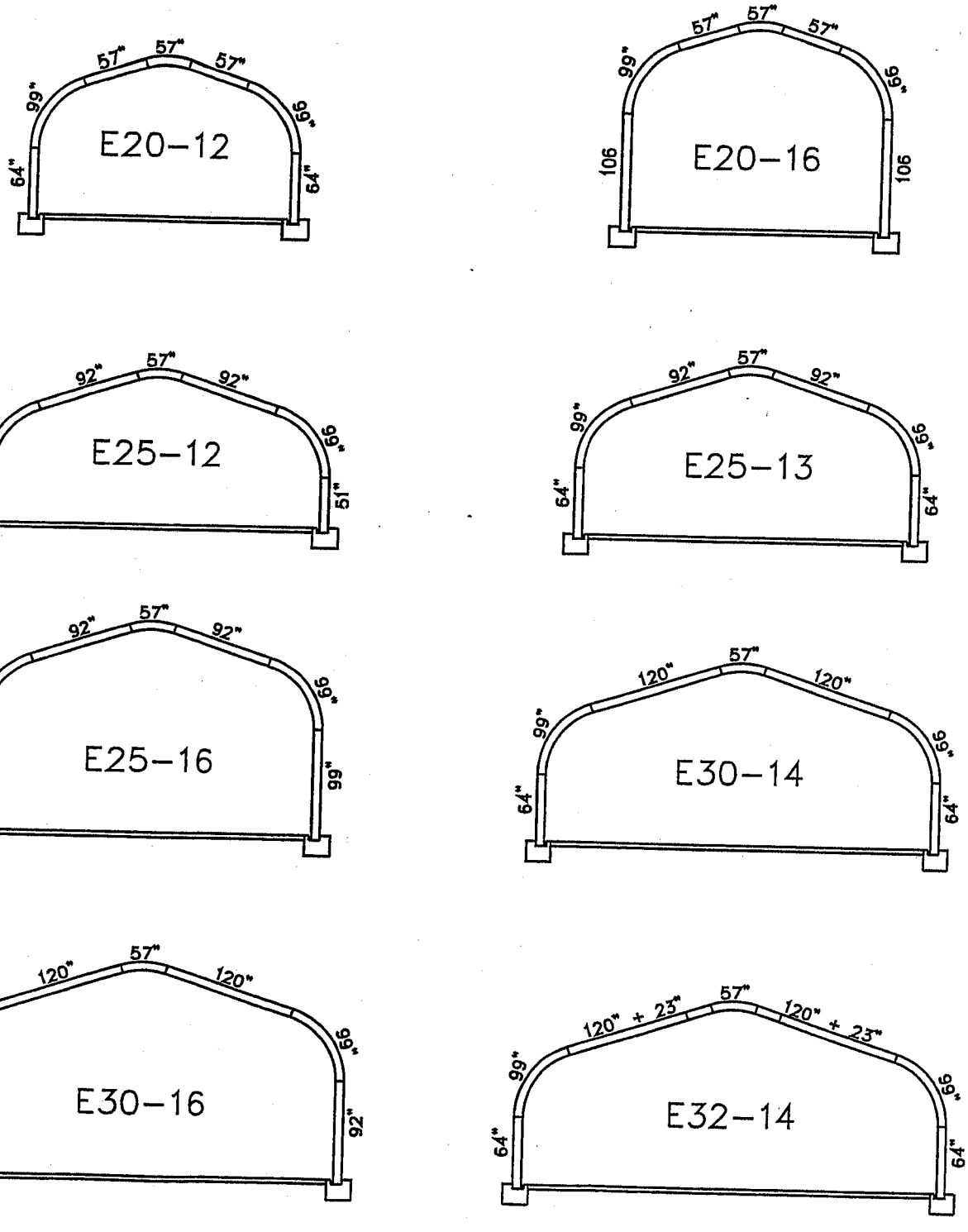
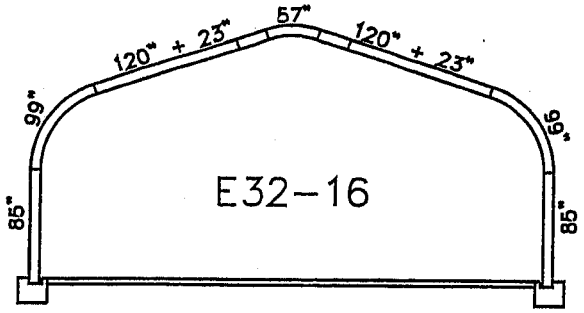


Fig. 12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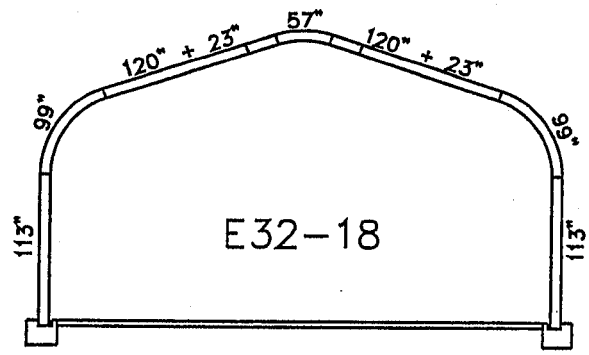
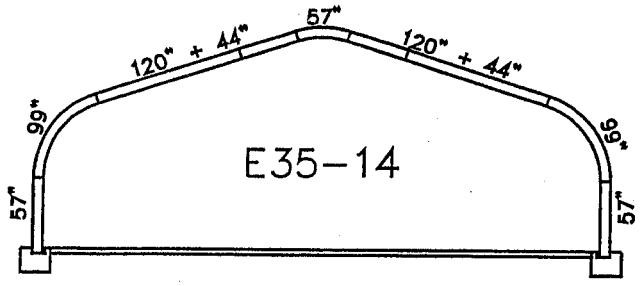
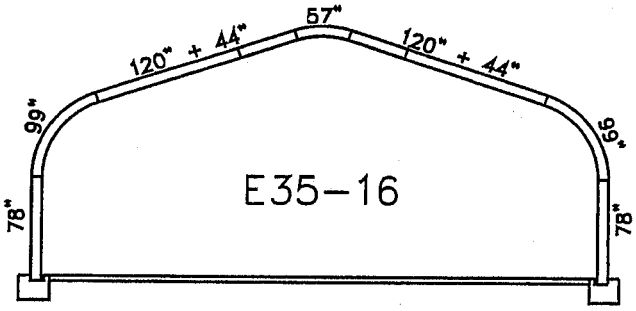
57"
120" + 23"
99"
66"
85"
E32-16
85"


120" + 23"
57"
120" + 23"
99"
66"
113"
E32-18
113"


120" + 44"
57"
120" + 44"
99"
66"
57"
E35-14
57"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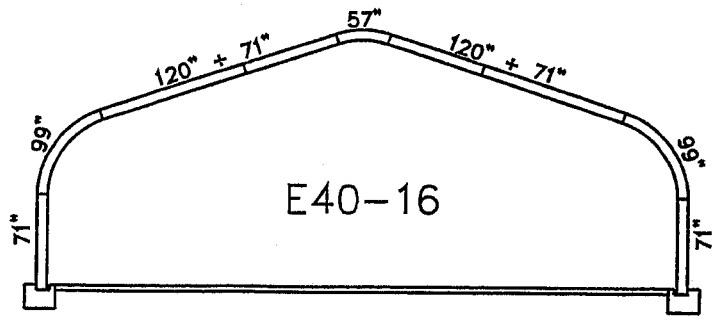
57"
120" + 44"
99"
66"
78"
E35-16
78"


120" + 71"
57"
120" + 71"
99"
66"
71"
E40-16
71"

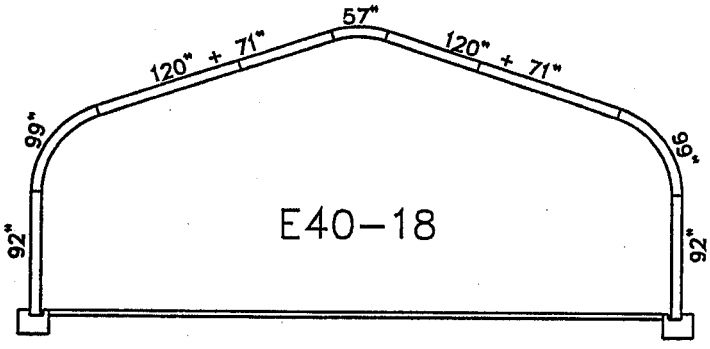
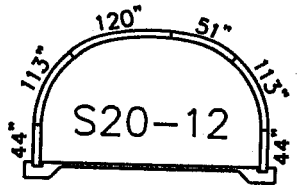
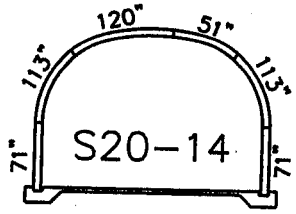
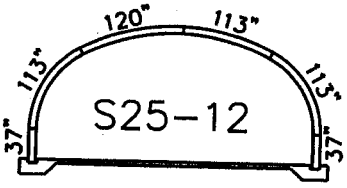

120" + 71"
57"
120" + 71"
99"
66"
92"
E40-18
92"

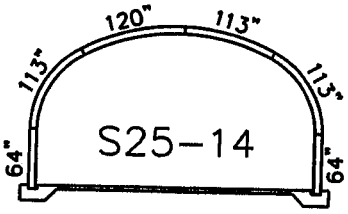
Fig. 12 (Cont.)

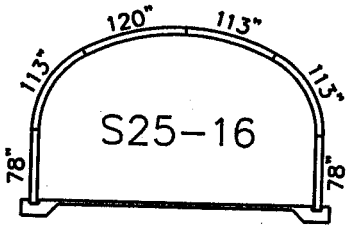
To determine the number of panels in each arch for your building model, refer to fig. 12 and table 3.

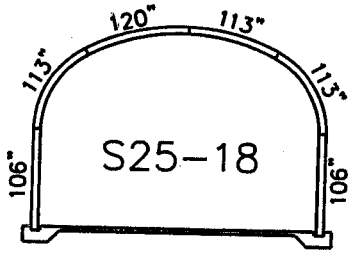


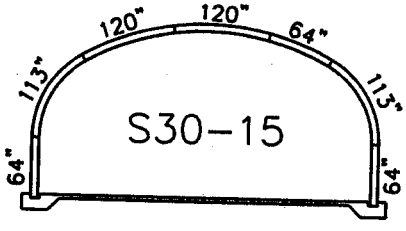












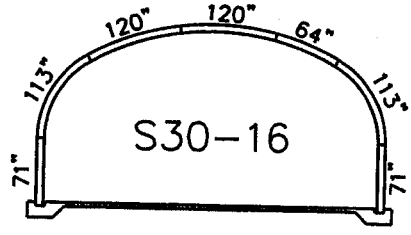
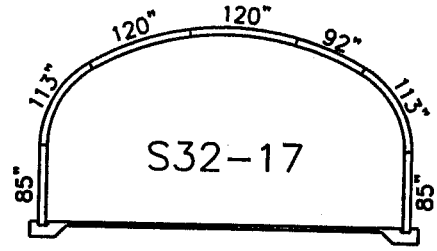


Fig. 12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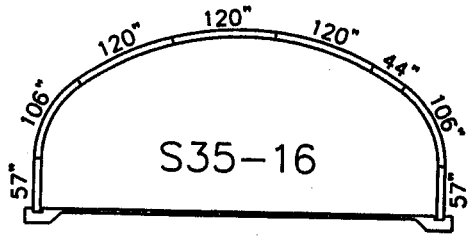
120"
92"
113"
113"
85"
85"
S32–17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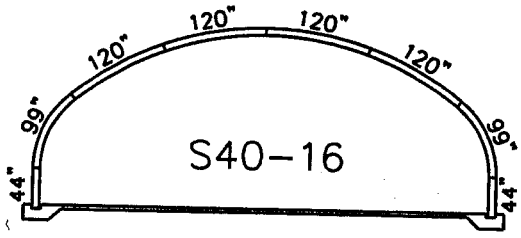
120"
120"
44"
106"
106"
57"
57"
S35–16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120"
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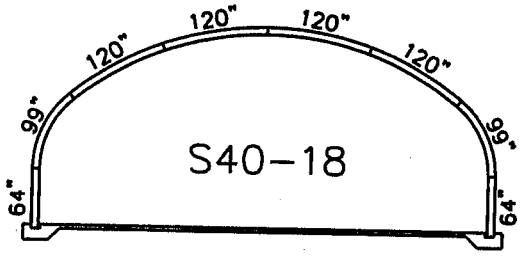
99"
44"
44"
S40–16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120"
120"
120"
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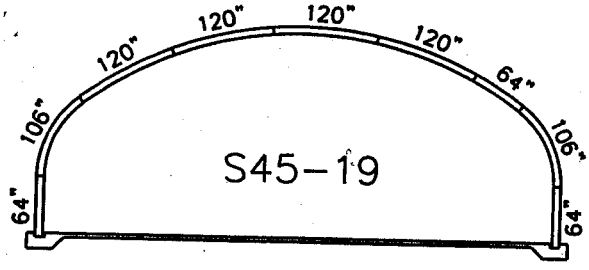
99"
64"
64"
S40–18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120"
120"
120"
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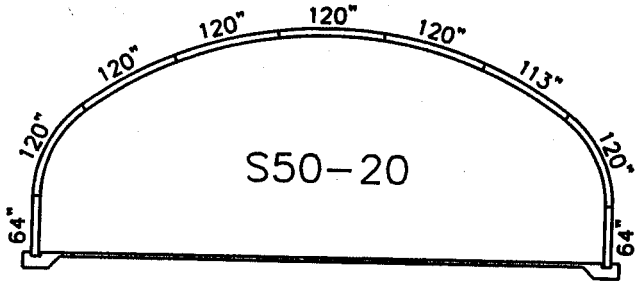
106"
106"
64"
64"
S45–19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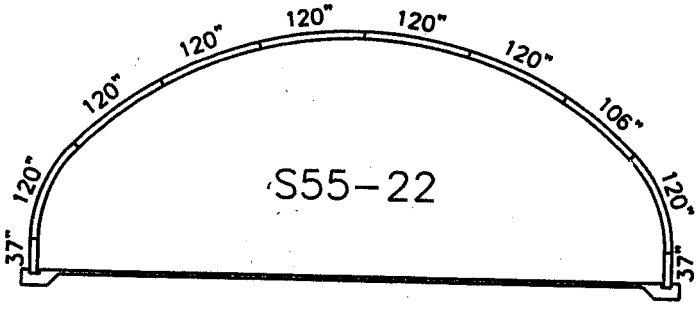
120"
120"
120"
113"
120"
120"
64"
64"
S50–20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120"
120"
120"
120"
106"
120"
120"
37"
37"
S55–22

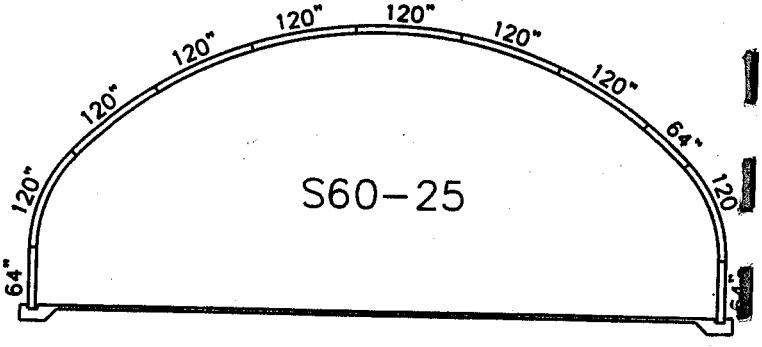

120"
120"
120"
120"
120"
120"
120"
64"
120"
120"
64"
64"
S60–25

Fig. 12 (Cont.)

To determine the number of panels in each arch for your building model, refer to fig. 12 on page 24 and 25, and table 3.

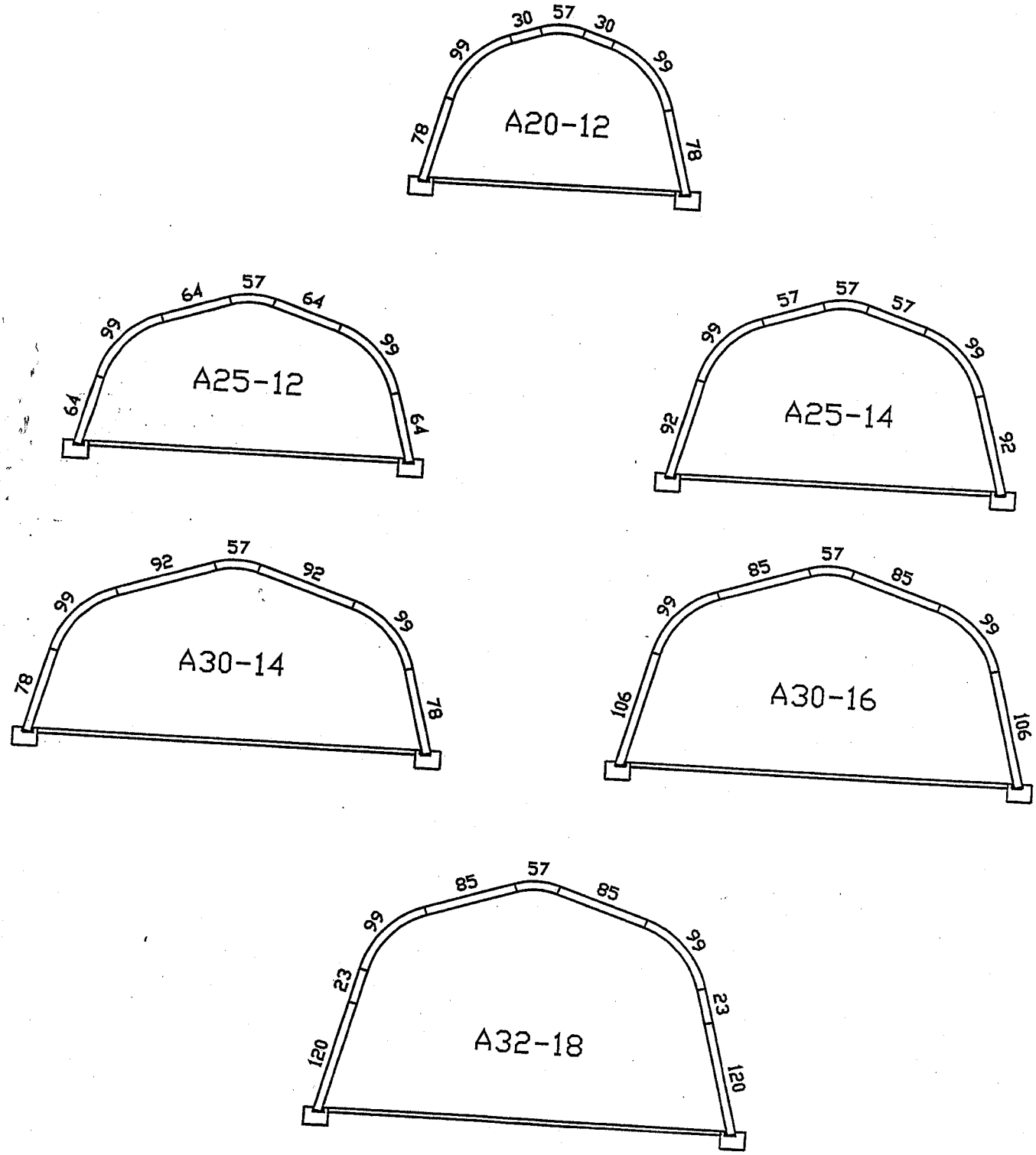
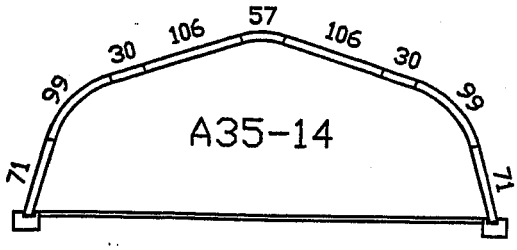


Fig. 12


A35-14
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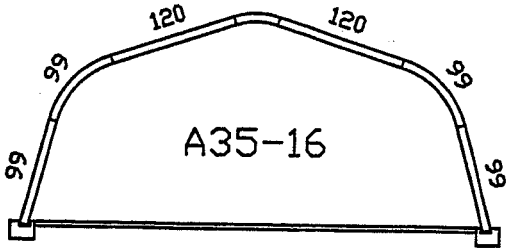
99
30
106
57
106
30
99
71


A35-16
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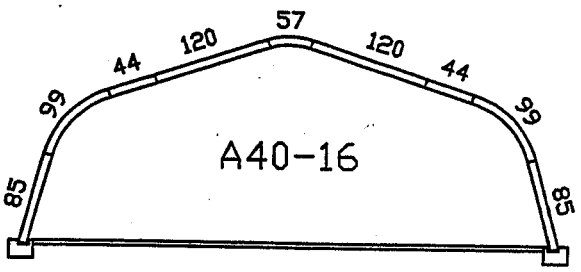
120
120
99
99


A40-16
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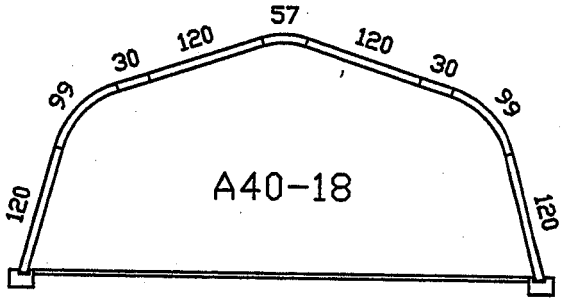
99
44
120
57
120
44
99
85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99
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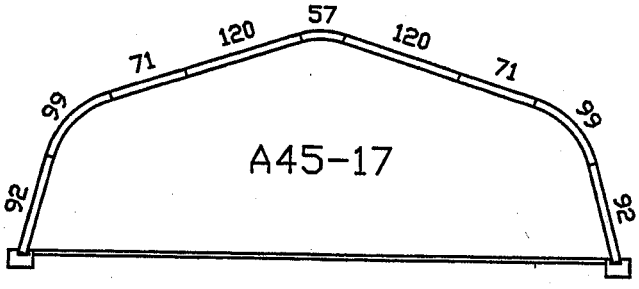
A45-17
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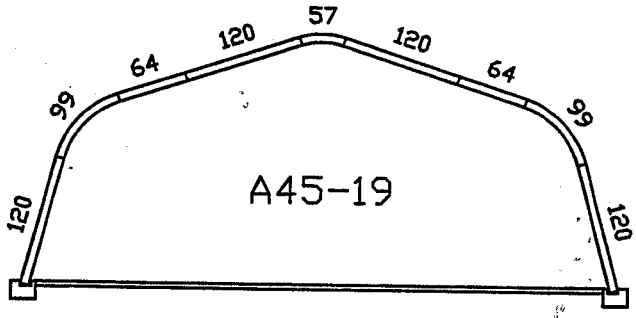
99
71
120
57
120
71
99
92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57
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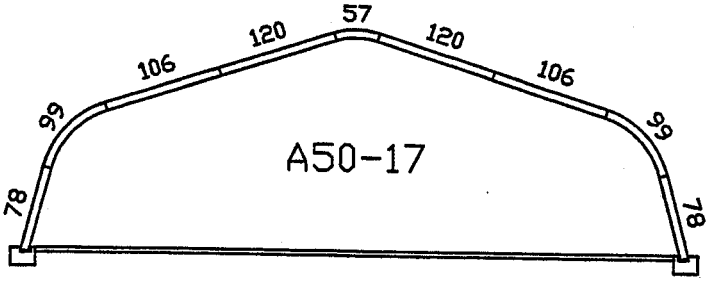
64
99
120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106
120
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120
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99
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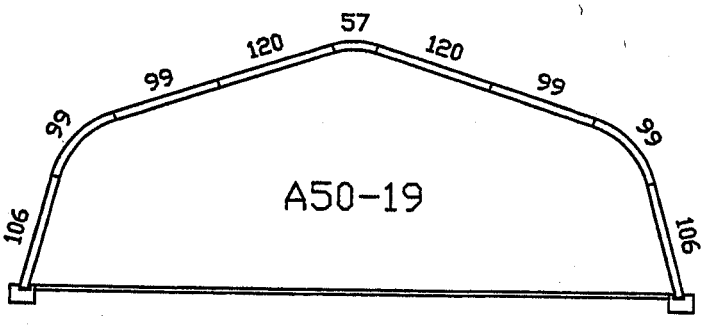

A50-19
106
99
99
120
57
120
99
99
106

Fig. 12 (Cont.)

CAUTION: Check the number of panels per arch in table 3 before you begin bolting the panels together! An error in the number of panels in each arch will result in the wrong shape of the arches.

TABLE 3

NUMBER OF PANELS IN EACH ARCH				
MODEL	STRAIGHT PANEL LENGTH (IN.)	EAVE PANEL LENGTH (IN.)	ROOF PANEL LENGTH (IN.)	PEAK PANEL LENGTH (IN.)
E20-12	64	99	57	57
E20-16	106	99	57	57
E25-12	51	99	92	57
E25-13	64	99	92	57
E25-16	99	99	92	57
E30-14	64	99	120	57
E30-16	92	99	120	57
E32-14	64	99	120 + 23*	57
E32-16	85	99	120 + 23*	57
E32-18	113	99	120 + 23*	57
E35-14	57	99	120 + 44*	57
E35-16	78	99	120 + 44*	57
E40-16	71	99	120 + 71*	57
E40-18	92	99	120 + 71*	57

***Roof portion consists of two panels, a 120 inch panel and a short panel. The two panels should be alternated in location in order to stagger the lap between successive arches.**

CAUTION: Check the number of panels per arch in table 3 before you begin bolting the panels together! An error in the number of panels in each arch will result in the wrong shape of the arches.

TABLE 3

NUMBER OF PANELS IN EACH ARCH								
MODEL	CURVED ROOF PANELS			CURVED EAVE PANELS			STRAIGHT PANEL	
	NUMBER OF STD. PANELS (120")	SHORT PANEL QTY.	SHORT PANEL LENGTH (IN.)	NUMBER OF STD. PANELS (120")	SHORT PANEL QTY.	SHORT PANEL LENGTH (IN.)	QTY.	LENGTH (IN.)
S20-12	1	1	51	-	2	113	2	44
S20-14	1	1	51	-	2	113	2	71
S25-12	1	1	113	-	2	113	2	37
S25-14	1	1	113	-	2	113	2	64
S25-16	1	1	113	-	2	113	2	78
S25-18	1	1	113	-	2	113	2	106
S30-15	2	1	64	-	2	113	2	64
S30-16	2	1	64	-	2	113	2	71
S32-17	2	1	92	-	2	113	2	85
S35-16	3	1	44	-	2	106	2	57
S40-16	4	-	-	-	2	99	2	44
S40-18	4	-	-	-	2	99	2	64
S45-19	4	1	64	-	2	106	2	64
S50-20	4	1	113	2	-	-	2	64
S55-22	5	1	106	2	-	-	2	37
S60-25	6	1	64	2	-	-	2	64

CAUTION: Check the number of panels per arch in table 3 before you begin bolting the panels together! An error in the number of panels in each arch will result in the wrong shape of the arches.

TABLE 3

NUMBER OF PANELS IN EACH ARCH				
MODEL	STRAIGHT PANEL LENGTH (IN.)	EAVE PANEL LENGTH (IN.)	ROOF PANEL LENGTH (IN.)	PEAK PANEL LENGTH (IN.)
A20-12	78	99	30	57
A25-12	64	99	64	57
A25-14	92	99	57	57
A30-14	78	99	92	57
A30-16	106	99	85	57
A32-18	120+23*	99	85	57
A35-14	71	99	106+30*	57
A35-16	99	99	120	57
A40-16	85	99	120+44*	57
A40-18	120	99	120+30*	57
A45-17	92	99	120+71*	57
A45-19	120	99	120+64*	57
A50-17	78	99	120+106*	57
A50-19	106	99	120+99*	57

*Roof or straight portion consists of two panels, a long panel and a short panel. The two panels should be alternated in location in order to stagger the lap between successive arches.

NOTE: A double bead of caulking, if used, should be applied, as shown in fig.13, before the panels are joined together.

NOTE: When joining the panels to create a full arch, it is important to properly overlap the panels, so that rain will flow easily down the arch without leaking into the joint (see fig.14).

The panels are bolted end-to-end. It is usually easier to insert the bottom bolts first and tighten them a little, to "nest" the two panels. Next, the bolts in the sides are inserted. It is often necessary to use a drift pin in one of the side holes to make the adjoining side hole "line up" (see fig.15). The drift pin should be used with care, to avoid ripping the sheet around the hole, as this could result in leakage. It is not always an easy job to insert the bolts in the side holes, but with some experience and a reasonable amount of care a strong and leakproof joint will result.

NOTE: If a bolt hole is accidentally ripped or torn by the drift pin some caulking should be applied around the bolt head to seal the hole.

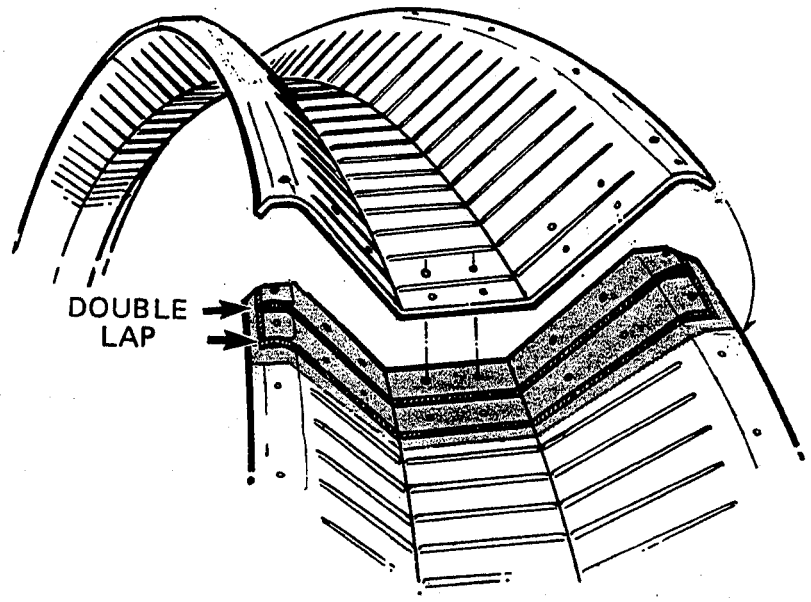


Fig. 13

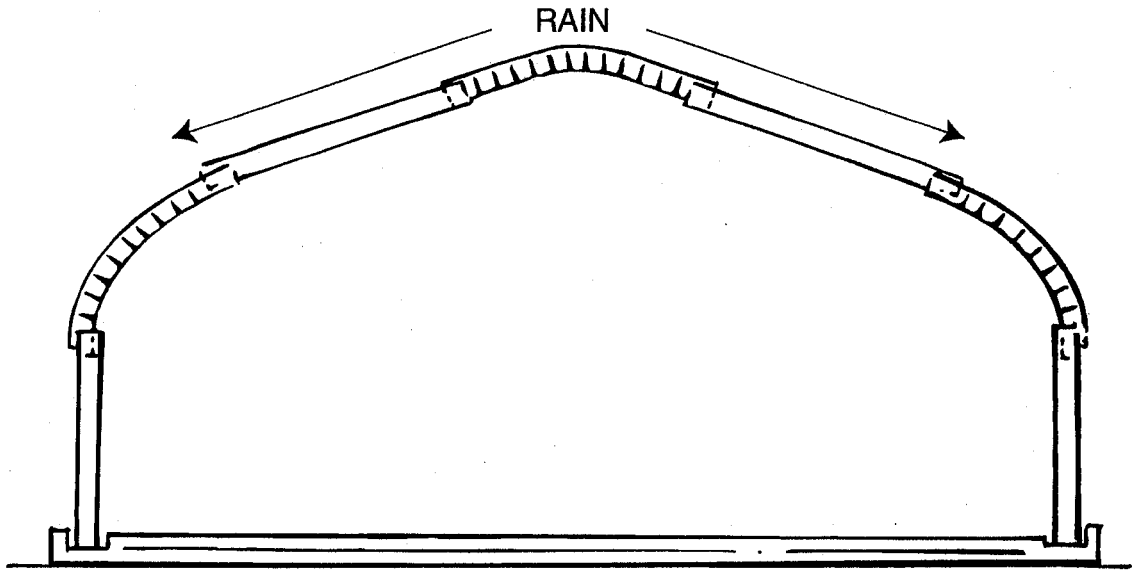


Fig. 14

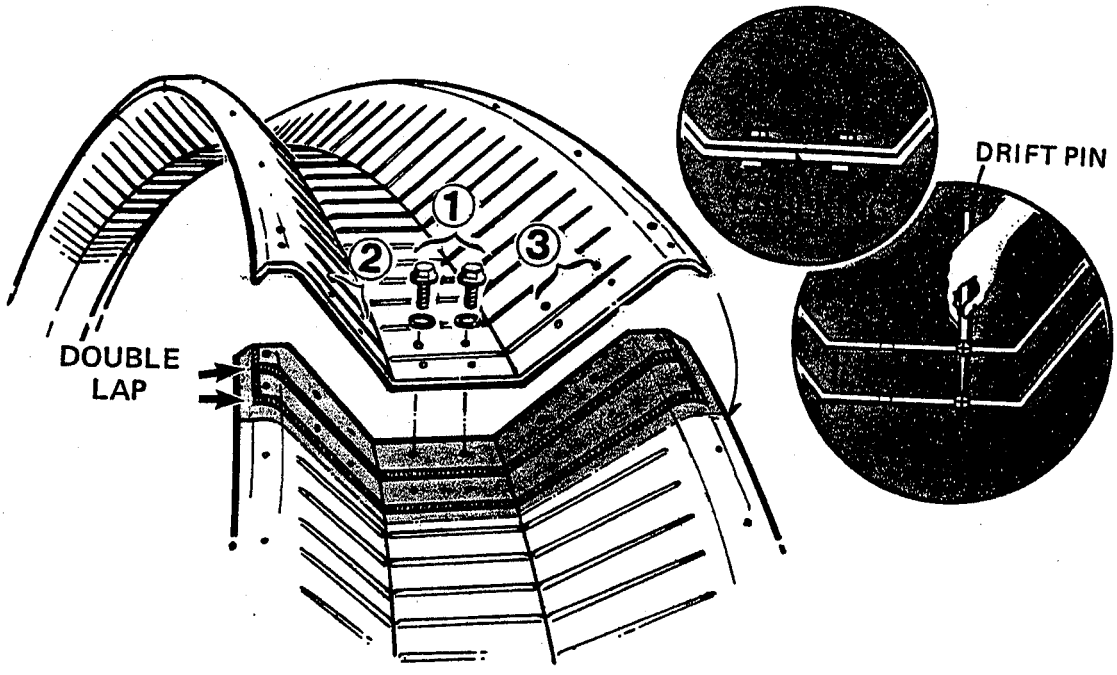


Fig. 15

NOTE: All bolts are placed into the arches and left finger tight. Do not tighten with a wrench. All bolts are left loose until building is completed.

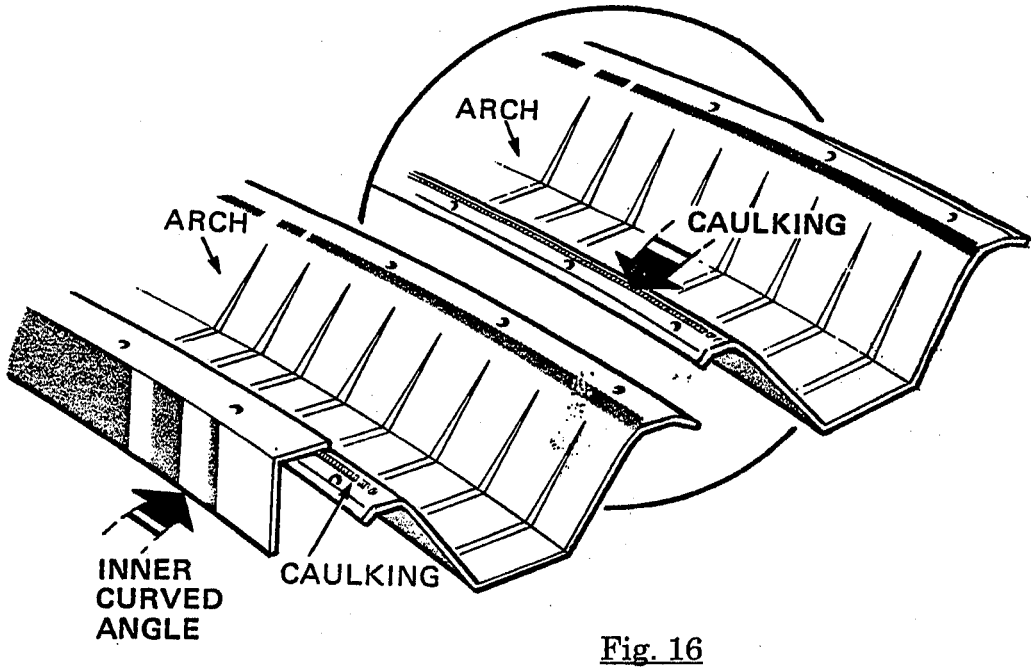


Fig. 16

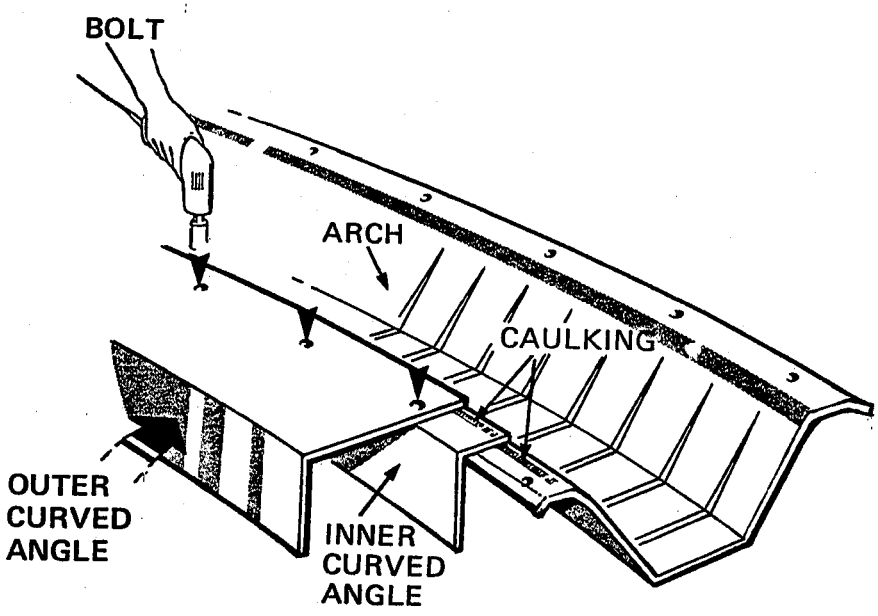


Fig. 17

Special care should be taken erecting the first arch, as single arches are very flexible and can be hard to control, and yet distortion must be avoided. It is recommended to bolt on the curved angles before raising the first arch, as this adds to the stiffness of the arch.

NOTE: The curved angles are shipped as a curved bundle. The bundle contains "inner' and outer" curved angles. The inner curved angles are narrower than the outer ones. Take the bundle apart and compare the quantities with your packing-list, to make certain that you have correctly identified all pieces.

A piece of inner curved angle is now placed into position on the arch, as shown in fig.16. Make sure to apply a strip of caulking, if used, between the arch panel and the inner curved angle. It is good practice to wipe the edge of the arch panel with a rag before applying the caulking, as the arch panels are protected by a thin film of special oil, which may prevent the caulking from sticking to the steel. Do not insert any bolts at this time - first take a piece of outer curved angle, apply a strip of caulking on top of the inner curved angle, between the bolt holes and the outside edge, and position the outer curved angle on top, as shown in fig.17. Align the bolt holes in the three sheets with the help of a drift pin, insert the bolts and tighten them.

NOTE: The same rule applies for overlapping the curved angles as for the arches: all joints must be caulked and the overlaps should allow for proper rain run-off (see fig.18).

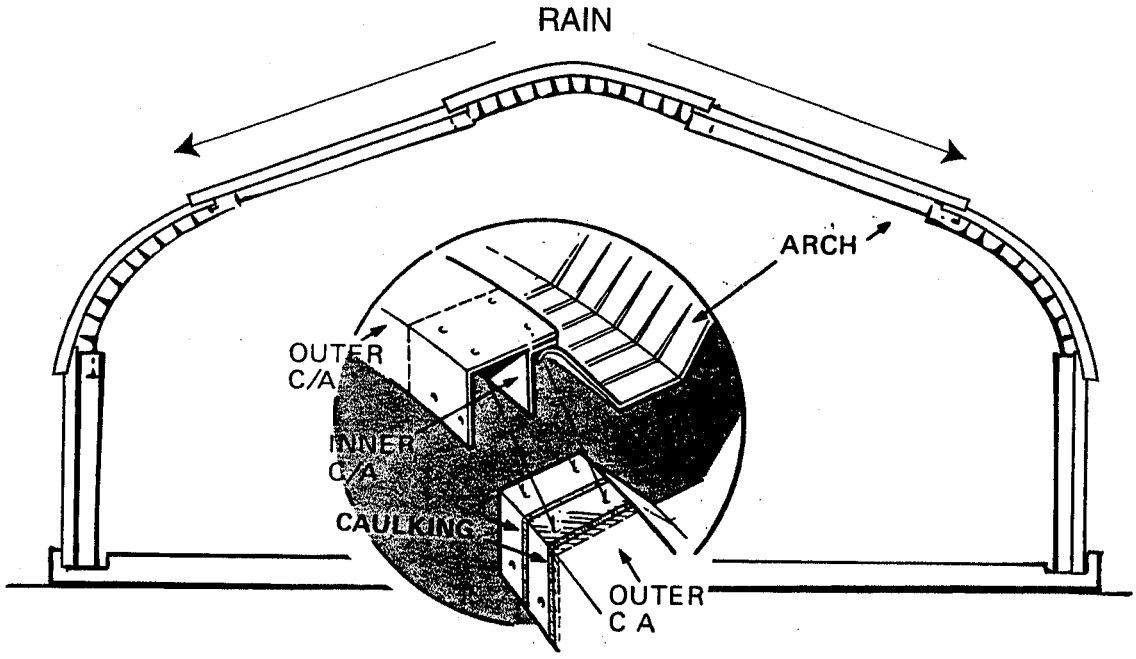


Fig. 18

Again, the first arch is the most difficult to raise, and all precautions should be taken to avoid damage or injury. It is especially important to avoid twisting the arch, as this usually results in permanent damage to one or more arch panels. It is generally better to raise the arches manually, as the use of a crane often results in distortion of the arch and subsequent buckling of an arch panel. The use of scaffolding is strongly recommended. Rental scaffolds are available in many areas, but home-made scaffolding may be used.

CAUTION: All scaffolds and platforms should be properly "tied off" or otherwise secured against overturning. Provide the necessary handrails for your crew and make certain that sturdy-ladders are available. It is especially important to secure scaffolding when the arches are being pulled up into position.

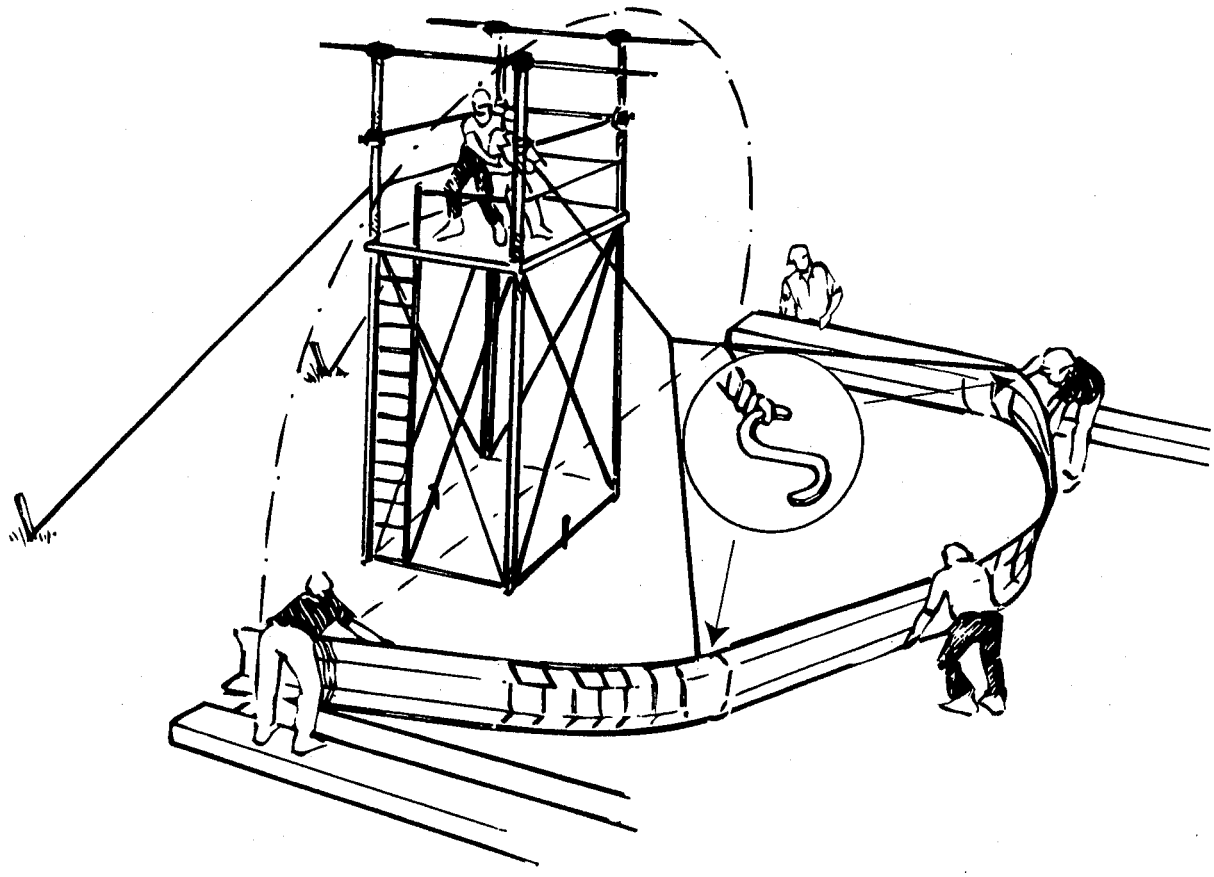
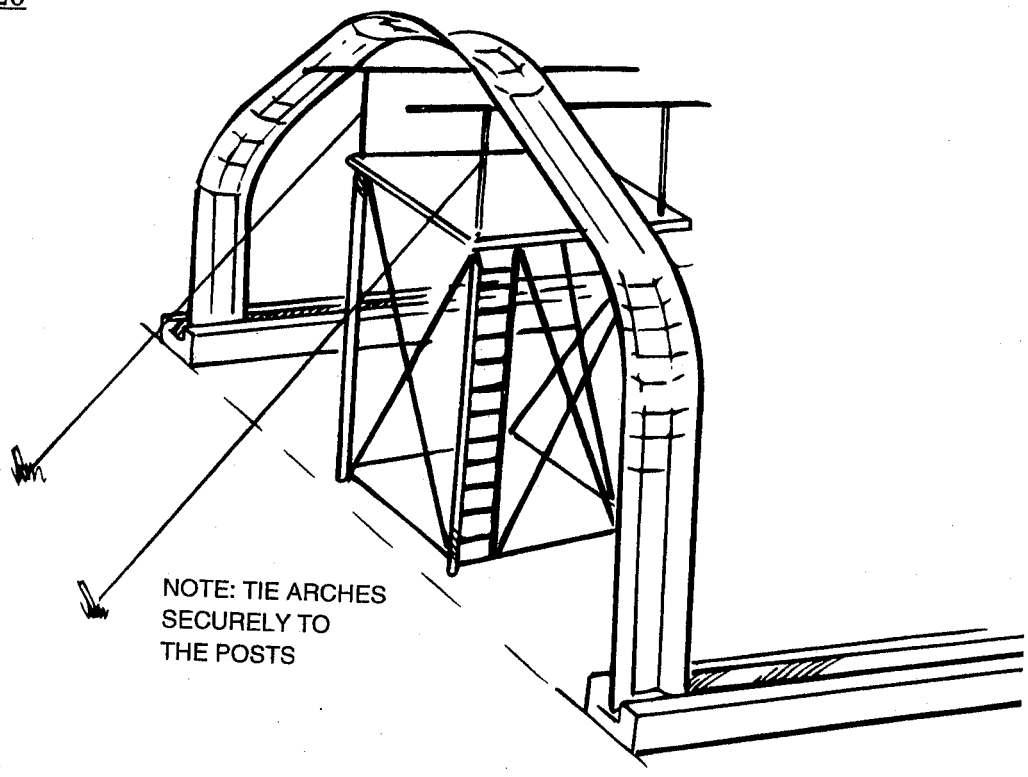


Fig. 19

Putting up the first arch may be done as follows:

1. Place two men on the scaffold, with ropes connected to the arch.
2. Have one man at each end of the arch to guide the arch into the foundation trough, and to lift the end as the arch comes upright, to avoid bending the corners.
3. Depending on building size and available manpower, station three or four men along the circumference of the arch, to help lift and control the arch. Provide these men with two-by-fours to enable them to push up the arch when it is raised.
4. Attach ropes to the arch by means of "S" hooks or by looping the rope around the arch. Use two ropes about 10 or 12 feet apart, or use a spreader, as shown in fig.19.
5. One person should be in charge of the hoisting operation, to avoid confusion.
6. The entire crew should slowly and carefully lift the arch off the ground. The two men stationed at the ends should lift the corners clear of the concrete and guide the ends in place.
7. The rest of the crew should lift the arch, taking care to keep it as straight as possible. When the top is about 6 feet off the ground, the man at the top takes his two-by-four and continues to support the arch.

Fig. 20



NOTE: It is often helpful to nail two short boards to the upper end of the two-by-fours, making a fork to support the panel edge.

8. As the arch continues to rise, others take their two-by-fours in turn, so that the arch is supported along its perimeter at all times.
9. Once the arch reaches the vertical position, it should be properly secured to the scaffold or by guide wires tied to stakes driven into the ground (see fig.20). This is very important, especially when it is windy.

CAUTION: It is not safe for a man to stand on top of a single arch, as the arch, by itself, cannot support this load.

Once the first arch has been raised it should be positioned at the correct location in the trough. The distance from the end of the side-wall concrete to the centre of the hole in the arch panel should be exactly 2 inches, as shown in fig.21. This is important for the location of the endwall at a later stage.

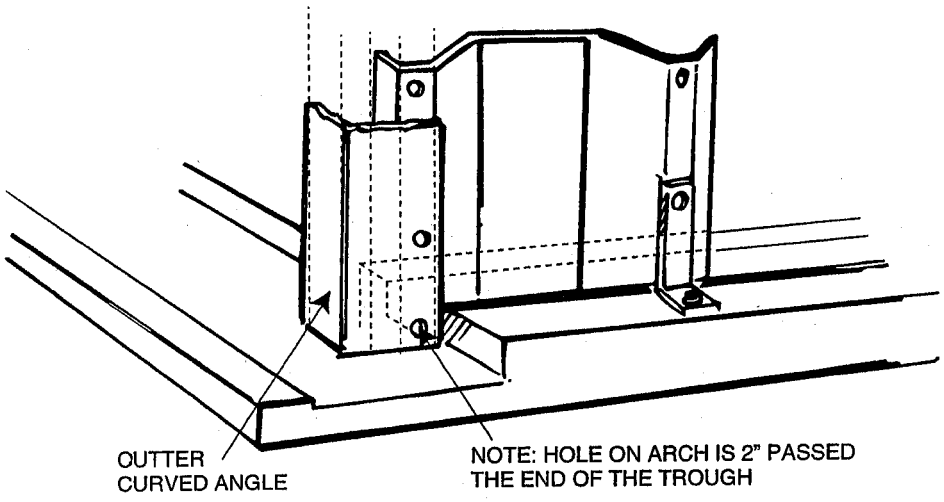


Fig. 21

Before the next arch is raised into position, caulking (if used) should be applied along the entire length of the arch (see fig.22). Be sure to wipe the underside of the edge to remove the protective oil, so that the caulking will stick to the steel when the arch is placed upright. Apply the caulking in a continuous strip between the outside edge of the panel and the bolt holes.

NOTE: It is a good idea not to wipe the oil from the top of the previous arch. When the next arch is placed in position, a little oil on the rim of the previous arch makes it easier to slide the arches back and forth to line up the bolt holes.

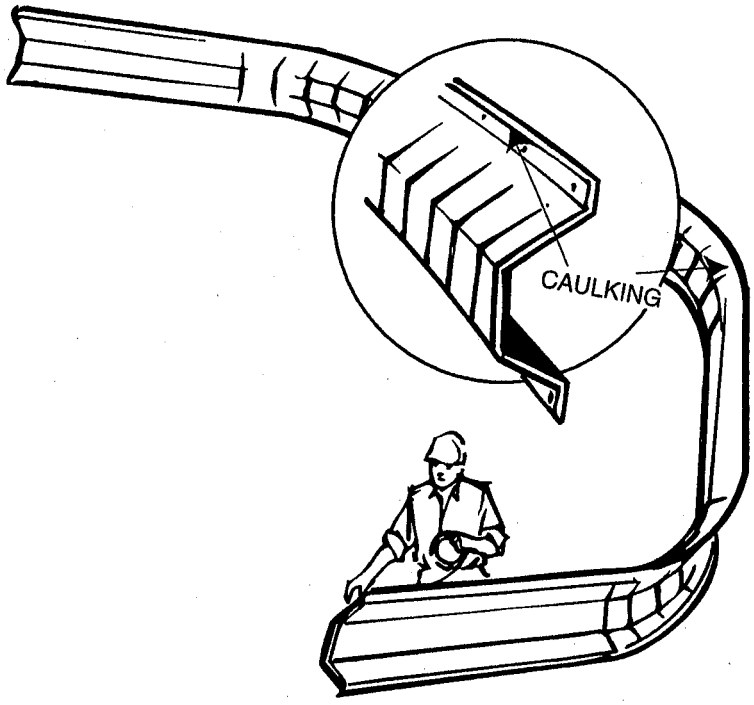


Fig. 22

The next arch is raised in the same manner, and lifted over the rim of the previous one (see fig.23). Drift pins are used to align the bolt holes so that the bolts can be inserted.

NOTE: Use the drift pins carefully, to avoid tearing or elongating the bolt holes, as this may result in leaks. it may take some practice, but it is quite possible to insert all bolts without damaging the panels.

At this stage only every third or fourth bolt needs to be inserted (see fig.24). It is generally easier to insert the first bolt at the peak of the arch and then work your way down the sides. Although this is possible for one man to do this by reaching around the panel, it is much easier to work in two-man teams, with one man on the outside and one on the inside of the arch.

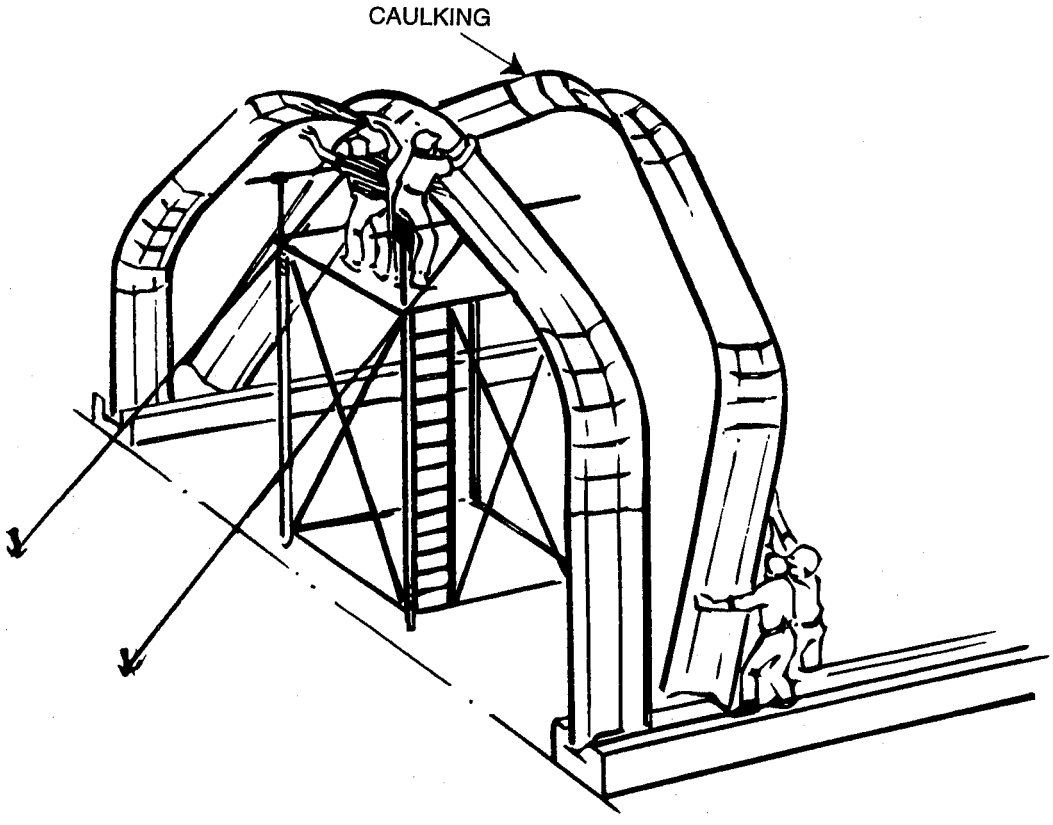


Fig. 23

As the arches are erected they should be secured, not only against being blown over by a sudden gust, but also against being lifted out of the troughs. Especially when many arches have been erected and joined together, a strong wind can generate enough suction to lift several arches out of the trough, possibly creating extensive damage. It is important, then, to secure the arches to the foundation, for example as shown in fig.25.

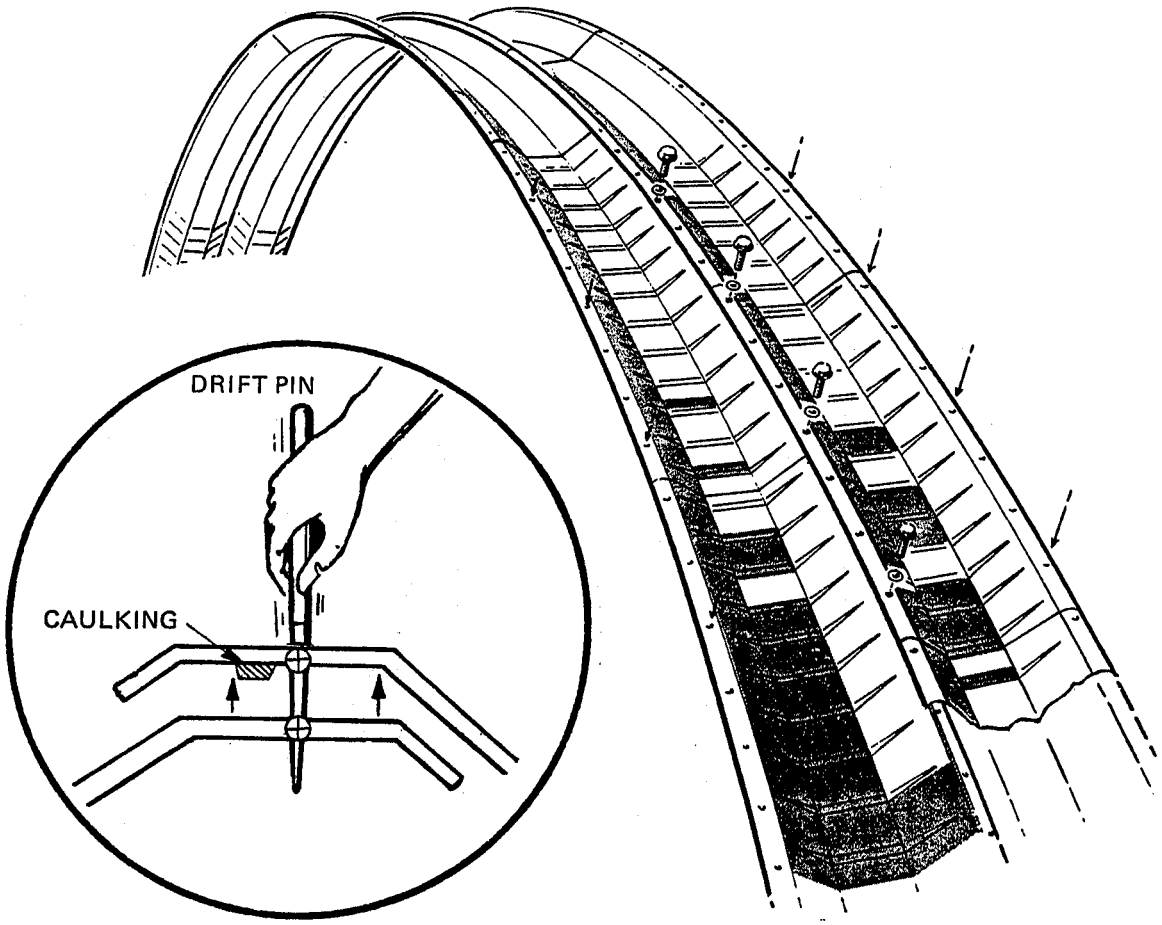


Fig. 24

At this stage, the arches are still very flexible. It is necessary to check the shape of the arch and especially the length of the building to make certain that the arches are not "spreading" (growing in length). The dimensions from bolt hole to bolt hole should be 24 inches, as shown in fig.26. This dimension should be checked regularly, on both sides of the building as well as at the peak. If the structure tends to spread, it can be adjusted by pushing back on the arch sections. This is not difficult if it is done a few arches at a time, as shown in fig.27, and it should not be overlooked: if the entire building spreads and is not checked before all arches have been raised, it may be very difficult to bring it back to the proper size, and this, in turn, may make it impossible to install the rear endwall in its trough. We ship metal strapping angles with each building (usually packed with the endwall panels) and this strapping is punched at 24 inch centres. Three pieces of strapping should be bolted onto the first arches, and as the erection proceeds three more pieces are bolted on (see fig.28 and fig.29). As more arches are raised, the first three straps are removed and moved along, and this system is continued until all arches have been erected at the proper dimensions.

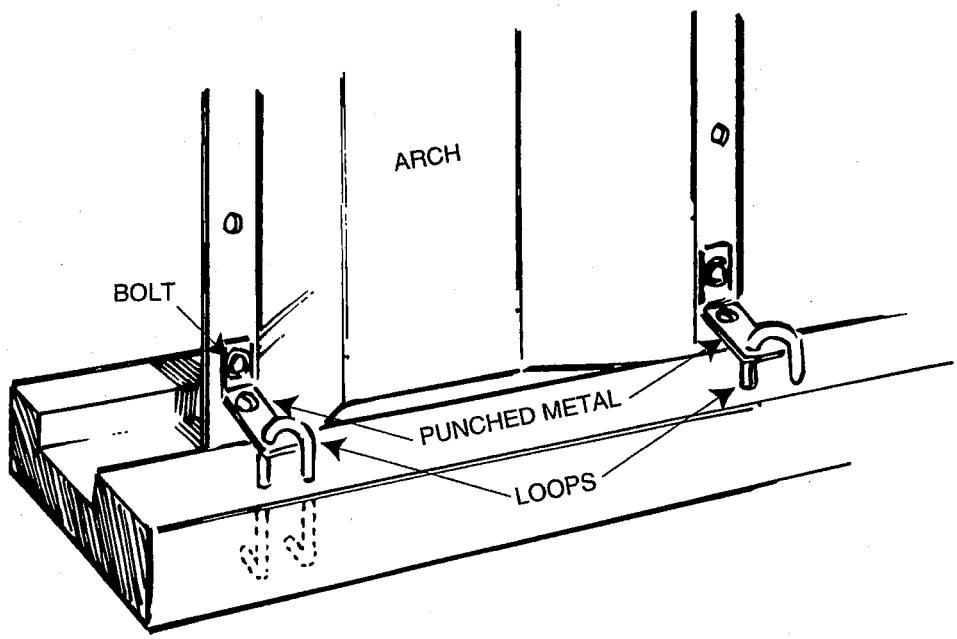


Fig. 25

NOTE: Wire loops and punched metal not supplied with building

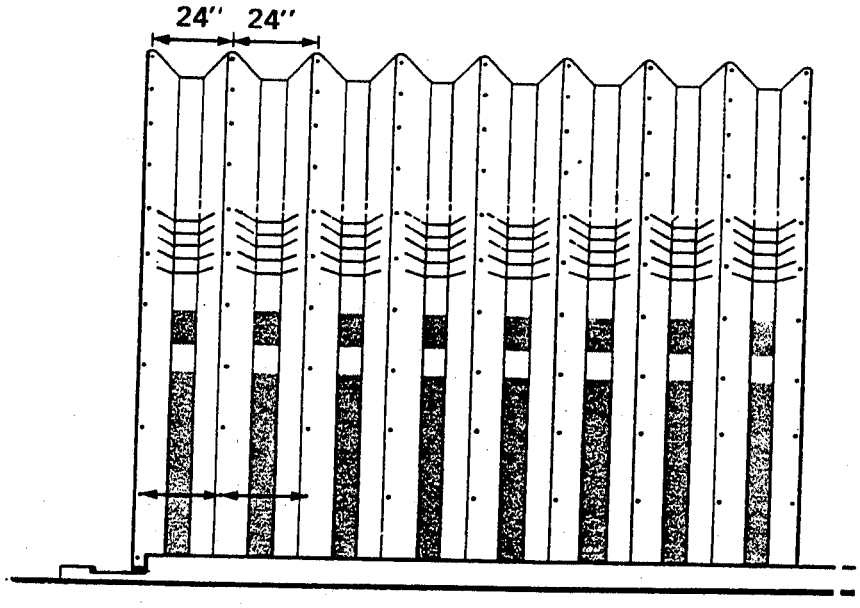


Fig. 26

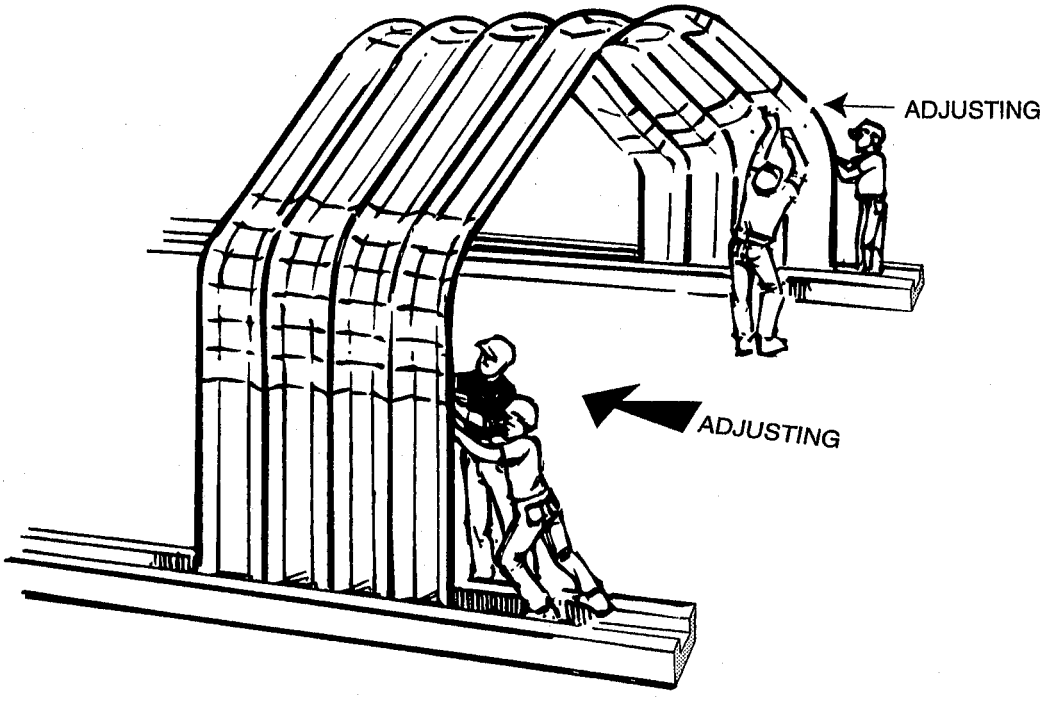


Fig. 27

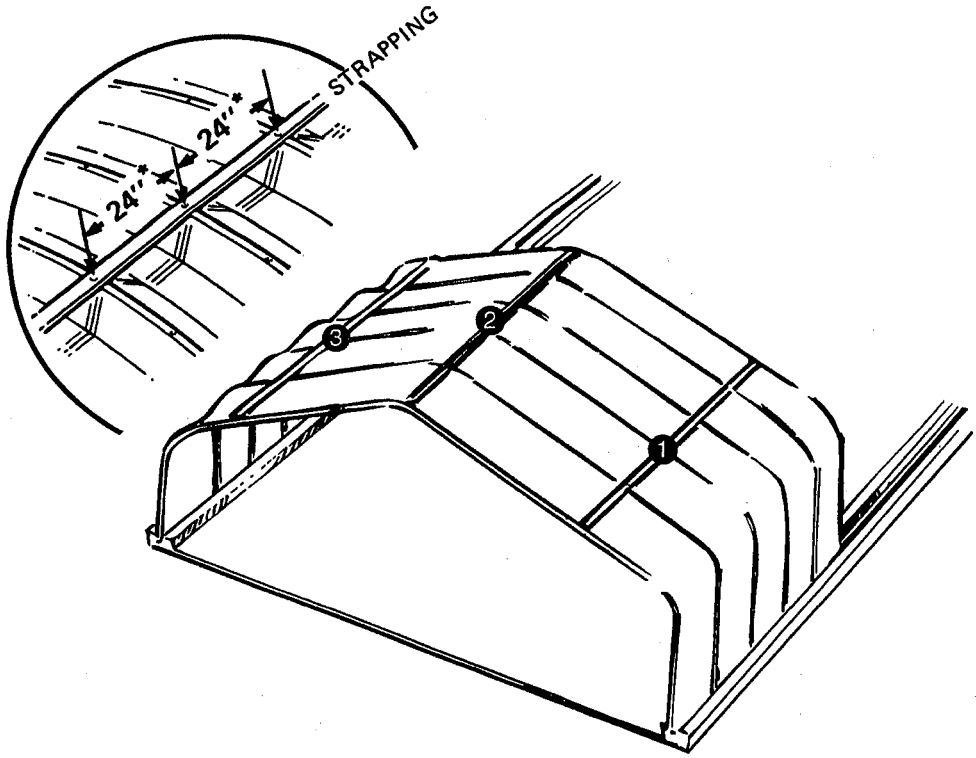

STRAPPING
24"*
24"*
24"*
1
2
3

Fig. 28

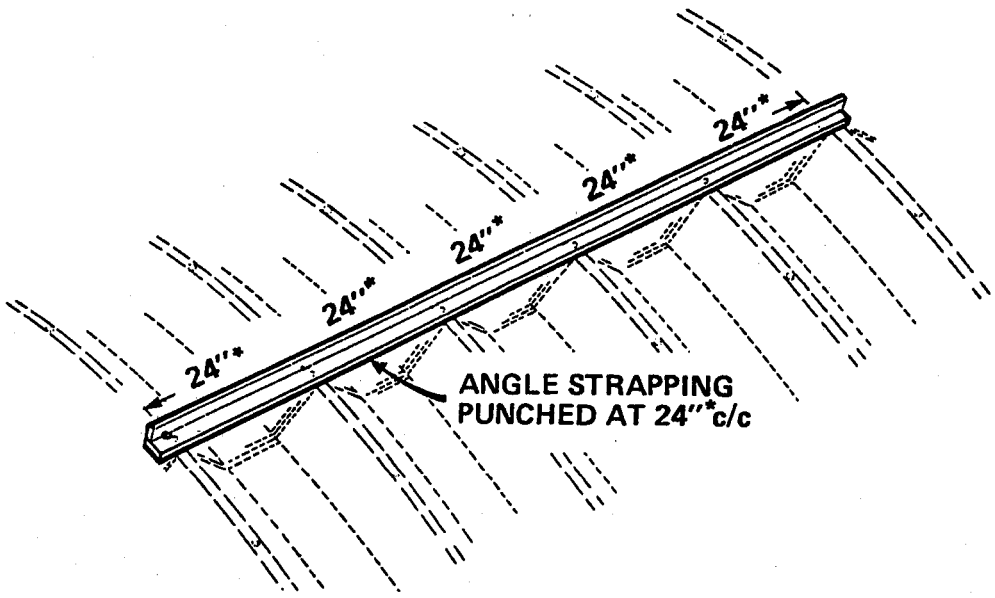

24"*
24"*
24"*
24"*
24"*
ANGLE STRAPPING
PUNCHED AT 24"*c/c

Fig. 29

HALF ARCH METHOD

There is another method of erecting the arches, which many people find convenient if the arches are very large or if manpower is limited. If you feel the half arch method is more suitable, you may decide to erect your PIONEER building in this manner. You should, however, still read the entire description of the complete arch method, as all directions on caulking (if used) and overlapping of the panels apply to both methods.
When you are ready to begin, check fig.12 and table 3 for the number of panels in each arch, so that you can lay out the panels on the ground in the right order.

> NOTE: Make certain that the short panels are staggered from side to side on successive arches! See the note at the bottom of page 28. You should also remember to check the proper way of overlapping the panels, as an incorrect overlap is not easily corrected once the arch is up in the air.

Putting up the first arch may be done as follows:

1. Place one or two men on the scaffold, with ropes connected to the first half arch.
2. Have one man at the bottom end of the arch to guide it into the trough, and to lift the end as the arch comes upright, to avoid bending the corners.
3. Have the rest of the crew stationed along the half arch, to help lift and support it in the air. Provide them with two-by-fours to enable them to push up the arch.
4. Slowly and carefully lift the arch off the ground, lifting the corner clear of the concrete and guiding the end into the trough.
5. Support the top end on the scaffold as shown in fig.19A, and secure it temporarily by means of ropes or otherwise.
6. Now raise the second half of the arch in the same fashion, guide it into position (see fig.19B) and bolt it to the first half.

> CAUTION: A single arch, by itself, is very flexible. Under no circumstances should anyone attempt to sit or stand on top of it. See also the remarks on page 33.

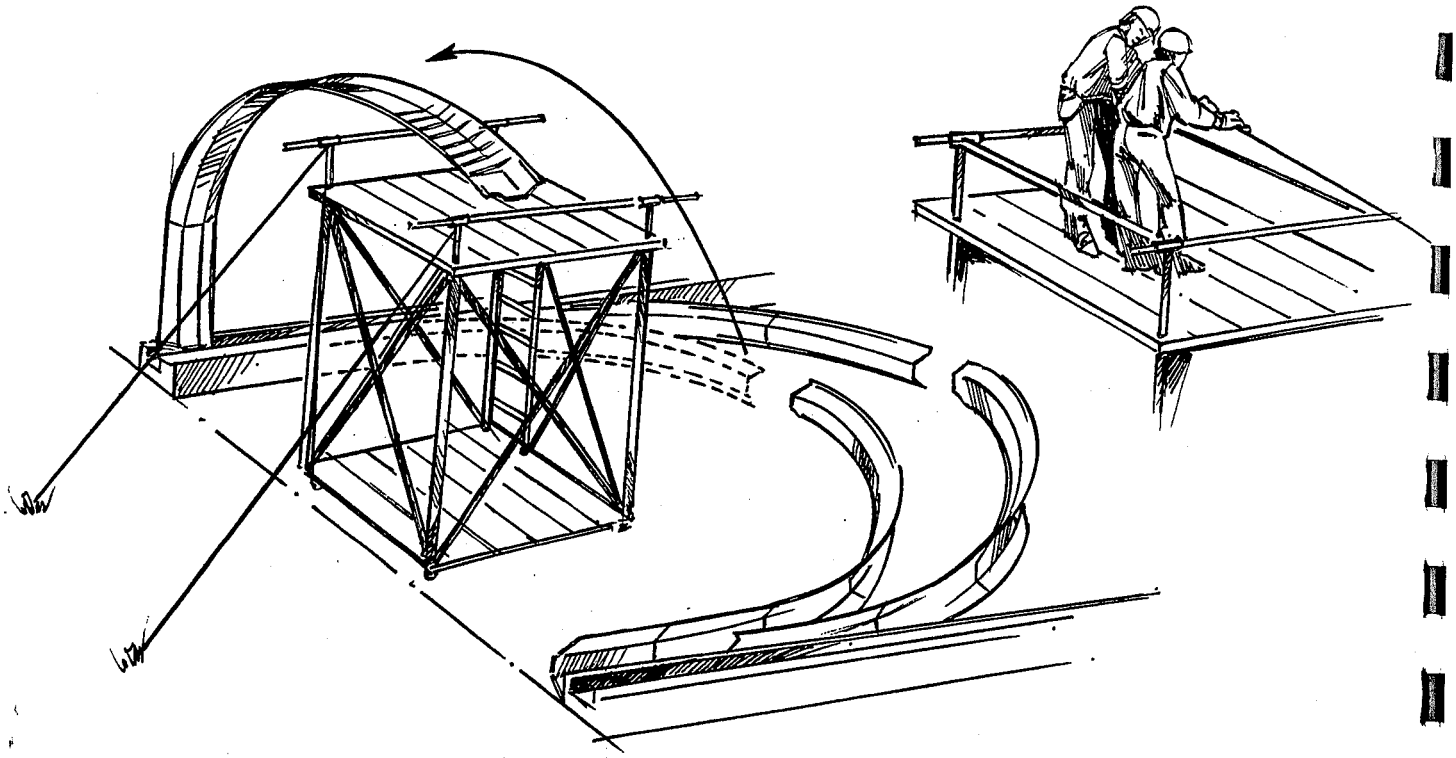


Fig.19A

When the first arch has been completed and properly secured, another half arch can be raised, and bolted to the first arch by inserting every third or fourth bolt. See fig.19C.

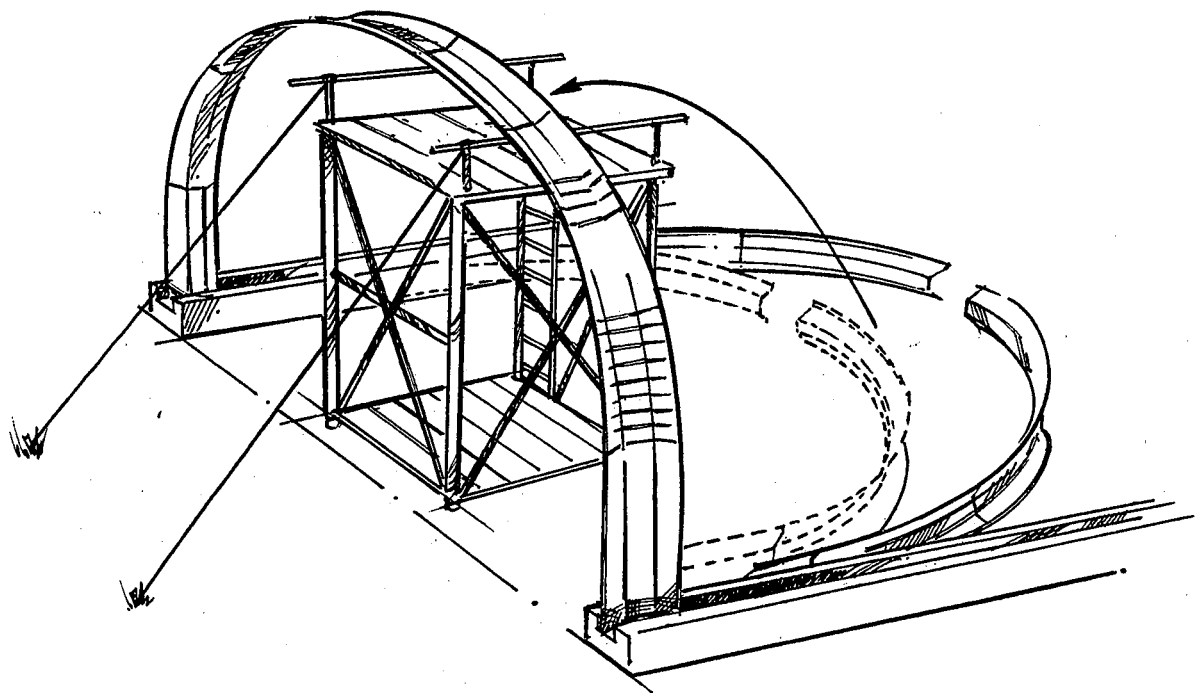


Fig.19B

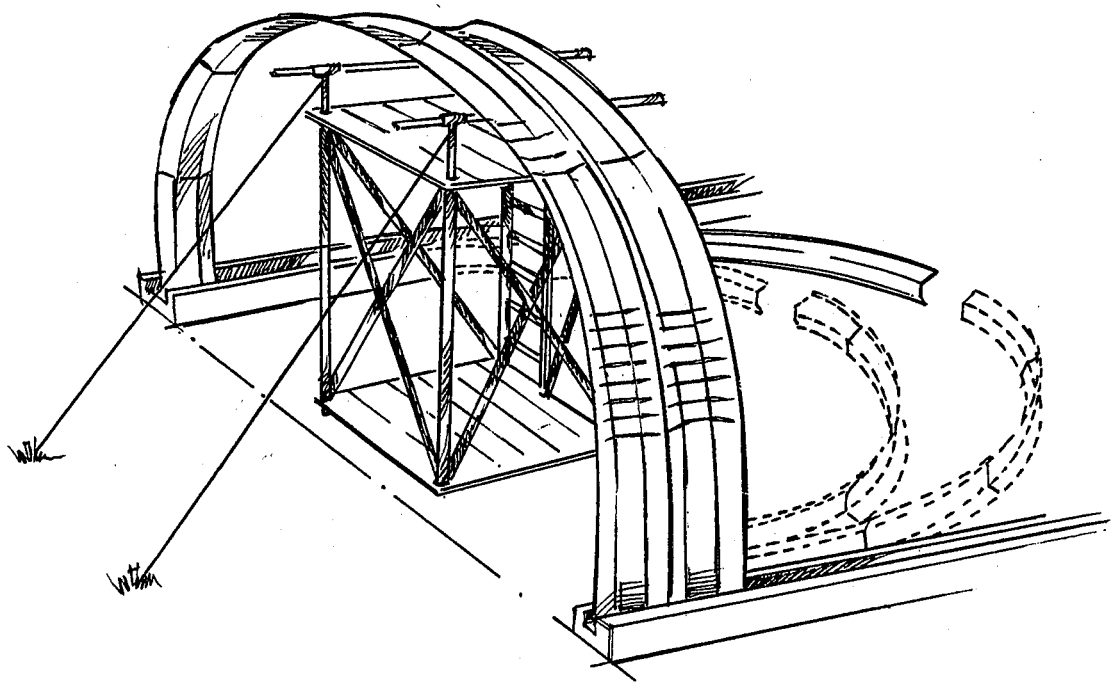


Fig.19C

Now raise the remaining half of the second arch, and bolt it in place. The other arches are added on in the same fashion, half an arch at a time, until all arches have been erected.

At this time, the centre point of the arches should be found. This may conveniently be done by counting the bolt holes when the arches are still on the ground, and marking the centres.

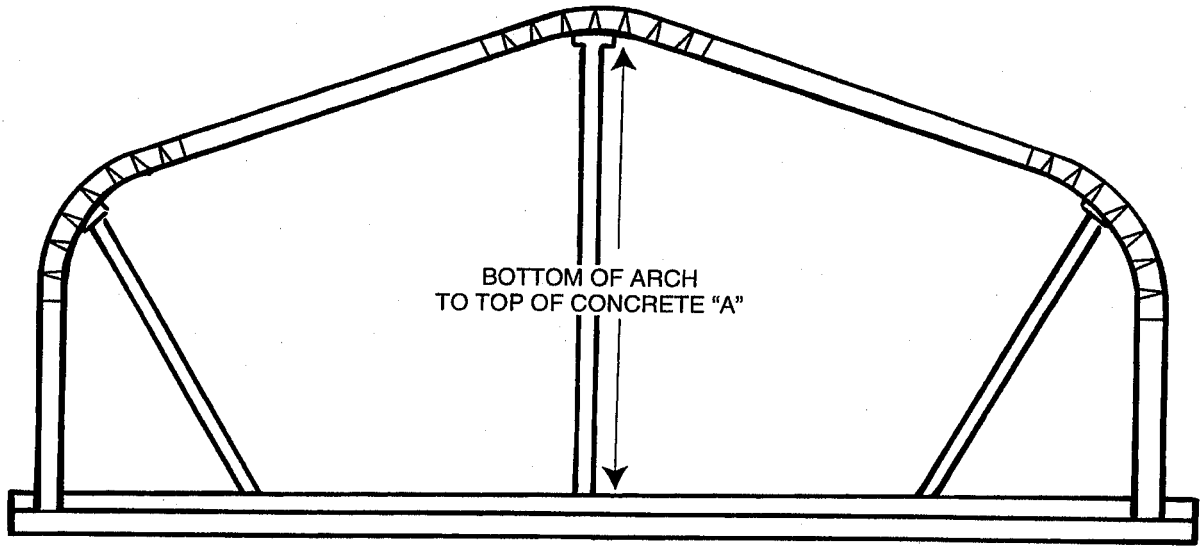


Fig. 30

At this time, the centre point of the arches should be found. This may conveniently be done by counting the bolt holes when the arches are still on the ground, and marking the centres.

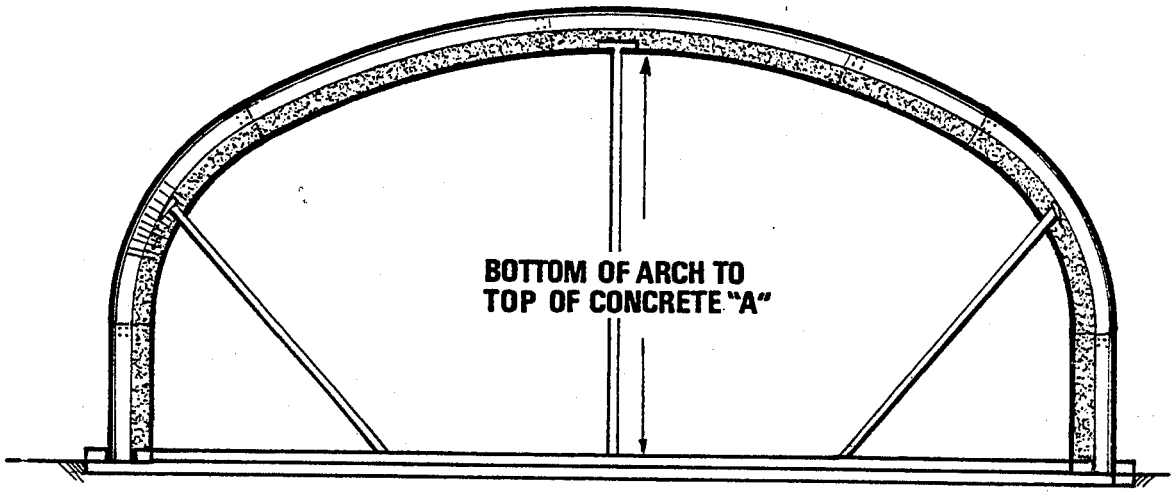


Fig.30

At this time, the center point of the arches should be found. This may conveniently be done by counting the bolt holes when the arches are still on the ground, and marking the centers.

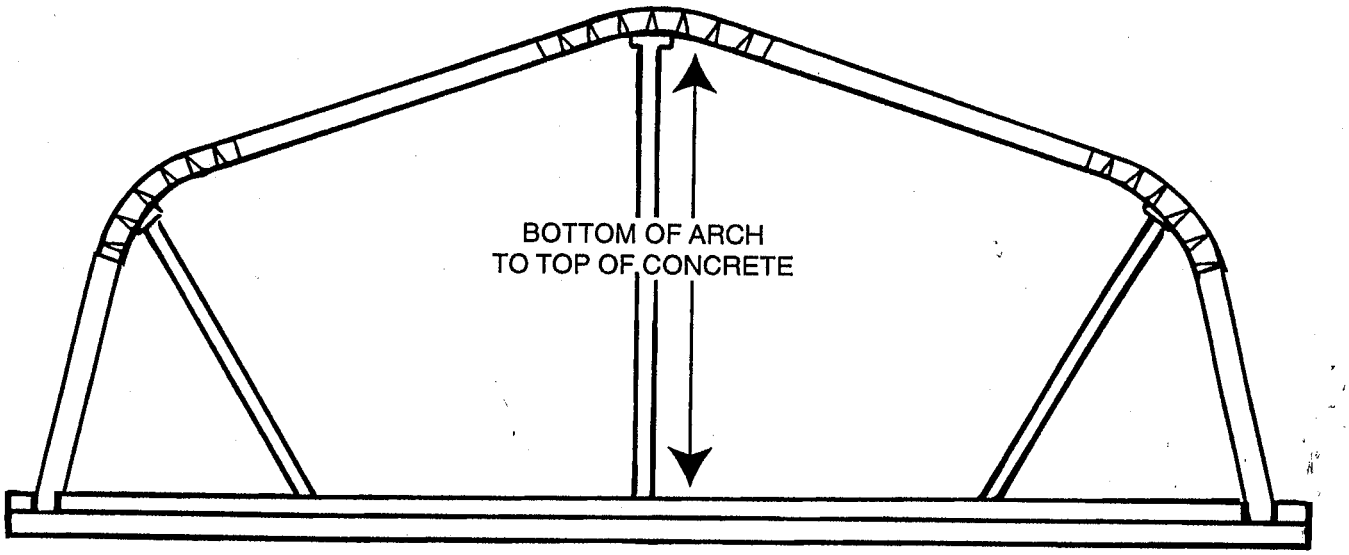


Fig. 33

The centre line of the foundation should be found by measuring, and should be clearly marked on the concrete. Now, if a plumb bob is suspended from the centre of an arch, the arch can be adjusted so that the plumb bob is directly over the centre line on the foundation. If necessary the arch can be propped up with 2 x 6 boards to maintain correct height, as shown for each model in table 4. Bracing the arches in this manner is important for maintaining proper shape of the building, as well as for making the erection of subsequent arches easier. Bracing may be used at intervals of say 10 feet along the length of the building, to maintain the correct dimensions. The arches are extremely flexible, especially before the bolts are tightened, and repeatedly checking dimensions at this stage of the erection may prevent problems later, when the endwalls are being installed (see fig.30).

TABLE 4

BUILDING MODEL:	DIMENSION "A"
E20-12	11'-3 1/2"
E20-16	14'-9"
E25-12	11'-0"
E25-13	12'-2"
E25-16	15'-1"
E30-14	12'-10 1/2"
E30-16	15'-2 1/2"
E32-14	13'-3"
E32-16	15'-0"
E32-18	17'-3 1/2"
E35-14	13'-2 1/2"
E35-16	14'-11"
E40-16	15'-1"
E40-18	16'-10"

The center line of the foundation should be found by measuring, and should be clearly marked on the concrete. Now, if a plumb bob is suspended from the center of an arch, the arch can be adjusted so that the plumb bob is directly over the center line on the foundation. If necessary the arch can be propped up with 2 x 6 boards to maintain correct height, as shown for each model in table 4.

Bracing the arches in this manner is important for maintaining proper shape of the building, as well as for making the erection of subsequent arches easier. Bracing may be used at intervals of say 10 feet along the length of the building, to maintain the correct dimensions. The arches are extremely flexible, especially before the bolts are tightened, and repeatedly checking dimensions at this stage of the erection may prevent problems later, when the endwalls are being installed (see fig.33).

TABLE 4

BUILDING MODEL	DIMENSION "A"
S20-12	11' - 2"
S20-14	13' - 5"
S25-12	11' - 3"
S25-14	13' - 6"
S25-16	14' - 8"
S25-18	17' - 0"
S30-15	14' - 4"
S30-16	14' - 11"
S32-17	16' - 5"
S35-16	15' - 3"
S40-16	15' - 2"
S40-18	16' - 11"
S45-19	17' - 10"
S50-20	19' - 4"
S55-22	20' - 7"
S60-25	24' - 2"

The center line of the foundation should be found by measuring, and should be clearly marked on the concrete. Now, if a plumb bob is suspended from the center of an arch, the arch can be adjusted so that the plumb bob is directly over the center line on the foundation. If necessary the arch can be propped up with 2 x 6 boards to maintain correct height, as shown for each model in table 4. Bracing the arches in this manner is important for maintaining proper shape of the building, as well as for making the erection of subsequent arches easier. Bracing may be used at intervals of say 10 feet along the length of the building, to maintain the correct dimensions. The arches are extremely flexible, especially before the bolts are tightened, and repeatedly checking dimensions at this stage of the erection may prevent problems later, when the endwalls are being installed (see fig.33).

TABLE 4

BUILDING MODEL:	DIMENSION "A"
A20-12	11'-3"
A25-12	11'-0"
A25-14	13'-1"
A30-14	12'-10"
A30-16	14'-11"
A32-18	17'-2"
A35-14	13'-2"
A35-16	15'-3"
A40-16	15'-0"
A40-18	17'-5"
A45-17	16'-4"
A45-19	18'-4"
A50-17	16'-1"
A50-19	18'-2"

ERECTION OF THE ENDWALLS

The erection of the endwalls is very important, and extra care should be taken at this stage to ascertain that all dimensions are correct. Read the instructions carefully until all steps are clear in your mind before you attempt the actual installation.

> NOTE: A certain amount of field-cutting and drilling is sometimes necessary in the installation of the endwalls. Before you cut any pieces, however, make sure that you have read the manual and verified your dimensions!

Before the endwall panels are installed, the large strips of dark-grey foam material (found in the hardware box) should be inserted, end-to-end, into the curved angles, to provide a weather-seal for the profiled tops of the panels.

> NOTE: It is not necessary to use foam stuffer at the flat panels in the four corners of your ECONOSPAN building, and no foam strips are provided for this purpose. Also, if your particular model has flat panels over the doors you do not require foam strips for those panels, as the flat panels seal to the curved angles. To find out whether your building has flat panels or not, look at table 6 on page 50: if your model has a connector beam, then it does NOT have flat panels.

> NOTE: Caulking of the vertical endwall panels is NOT required and no caulking is supplied for this purpose.