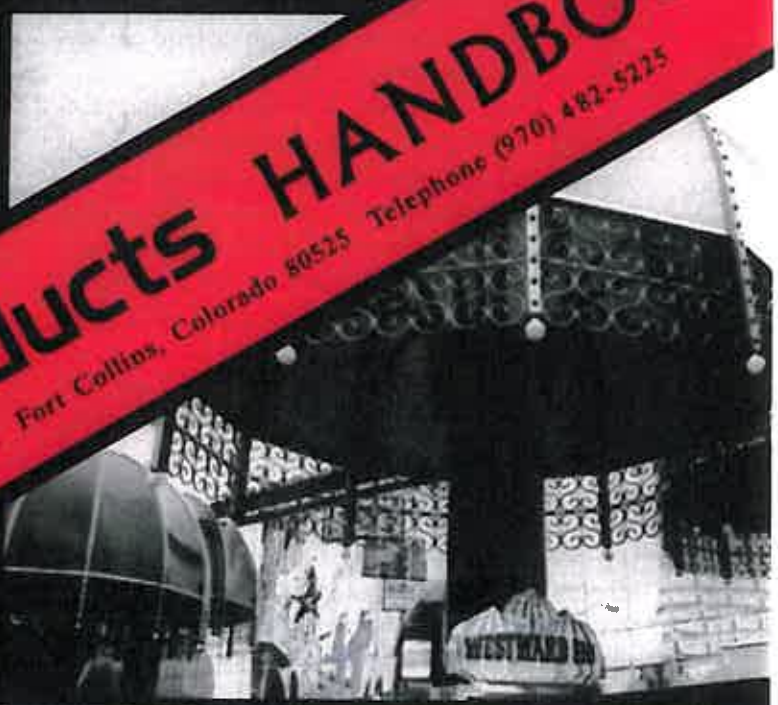
6TH EDITION



ABC Sign Products HANDBOOK

2028 S.E. Frontage Rd., Fort Collins, Colorado 80525 Telephone (970) 482-5225

INTRODUCTION

The Brooks family entered the electric sign industry in 1945. With over fifty years experience in sign manufacturing, we offer this 6th Edition Handbook to assist our new customers, or new employees of our customers to learn the techniques we have developed for using our products to build well engineered, trouble-free signs efficiently and economically.

The benefits and incentive for any company to change their methods of construction from steel to ABC's aluminum extrusion systems are several, and very important.

First is reducing cost and increasing profitability. When our systems are properly used, as described in this and other ABC literature, we can virtually guarantee that any company will save from 10 to 15 percent on the overall cost of building complete cabinet type signs. This makes a company more competitive, and they win more of the jobs they bid for.

Second is quality. ABC's frames are pre-engineered, and will result in very high quality, long lasting, trouble free signs that any company can sell with confidence and pride.

Third is volume turnover. Any company can produce more dollar volume with a given amount of space and number of people because frame construction labor is reduced by about 50% compared to steel construction. There are other advantages, but these are the most important.

Beginning in 1961 our people pioneered the now common use of extruded aluminum frame systems in the sign industry. Over the ensuing 35 years, new ABC extrusions were developed to meet the needs of the industry. Today, there are twenty different ABC sign frames for building internally illuminated displays. Additionally there are four Retrofit frames, a Backlit Awning construction system, a Post and Panel system, and ABC's Snapper Frames for quick-change kiosk and poster signs. Many accessory parts were also developed to meet unusual signage needs and to augment the versatility of our frame systems.

These assemblies are protected by a number of U.S. and Canadian patents. They are all illustrated and described in detail in our ABC Product Catalog, which includes a series of "Easy Sheets", with much valuable engineering information and instructions for the correct use of each frame system.

Certainly, no other company offers such a complete line of aluminum sign frame components. Regardless of the size, type or shape of signs one makes, ABC has a frame for it, and expert salespeople with the best customer support in the industry.

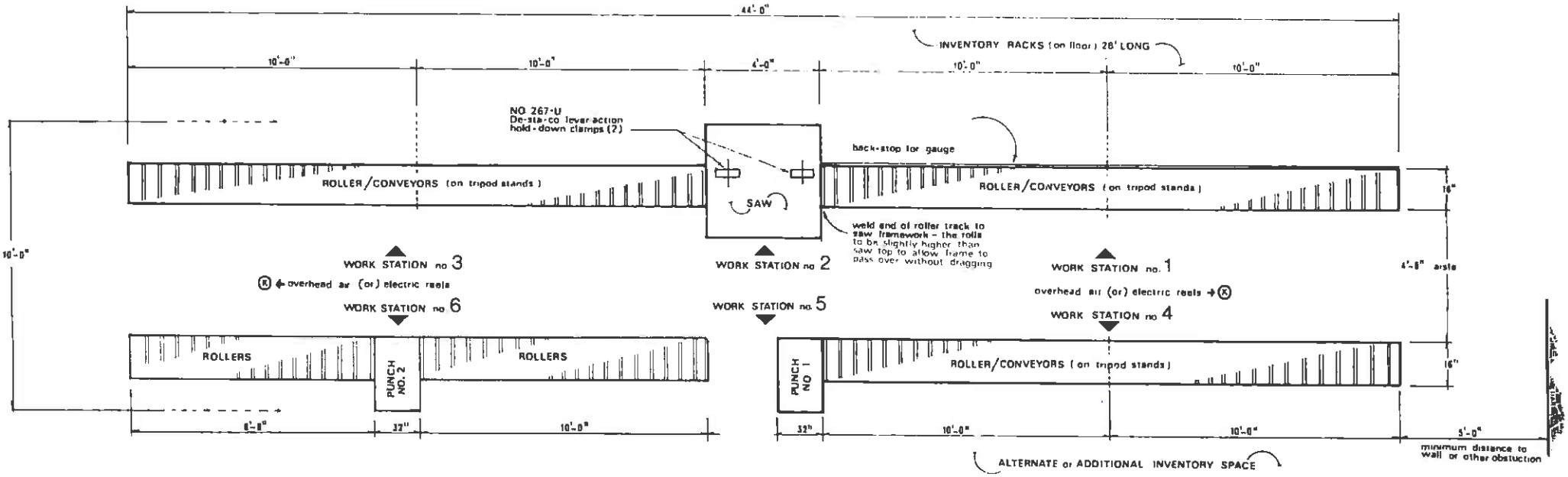
Jackson Brooks and Company, (JBC,) a subsidiary of ABC Sign Products, is a wholesale sign manufacturer serving other sign companies exclusively all over the United States. Every product sold by ABC Sign Products is fully developed and tested by JBC before it is released for sale to the industry.

Another outgrowth of ABC is its Computer Products Division, one of the first in the field of CAD/CAM routing machines, estimating and job-cost software and other related computer technology for the sign industry.

These three Divisions complement each other, and together make ABC Sign Products a very unique, specialized company, dedicated entirely to the sign industry. Perhaps few industries have seen more rapid change in recent years than our industry has. This Handbook will hopefully help our customers to remain competitive, to stay on the cutting edge of sign construction technology, and above all, to be consistently profitable.

Jackson Brooks
Fall, 1996

Dedicated to the memory of Walter and C.V "Brownie" Brooks who helped pave the way



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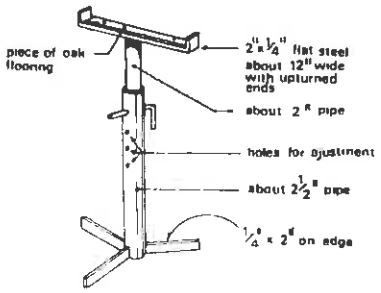
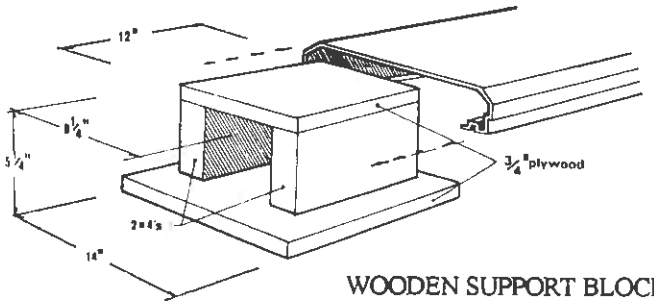
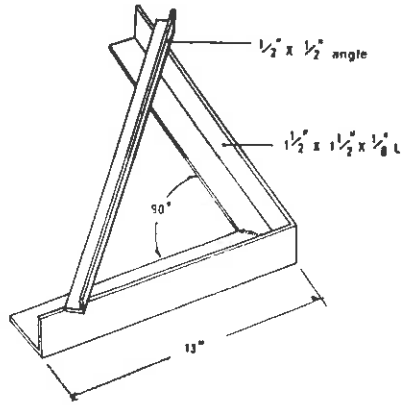


ADJUSTABLE FLOOR STANDS
At least 4 for each sign in progress



WOODEN SUPPORT BLOCK
For hole cutting with drill press



TYPICAL WELDING JIG BRACKET
4 pair required for four cornered sign

SUGGESTED EXTRUSION DEPARTMENT EQUIPMENT LAYOUT

ABC®

Sign Products

6th EDITION HANDBOOK

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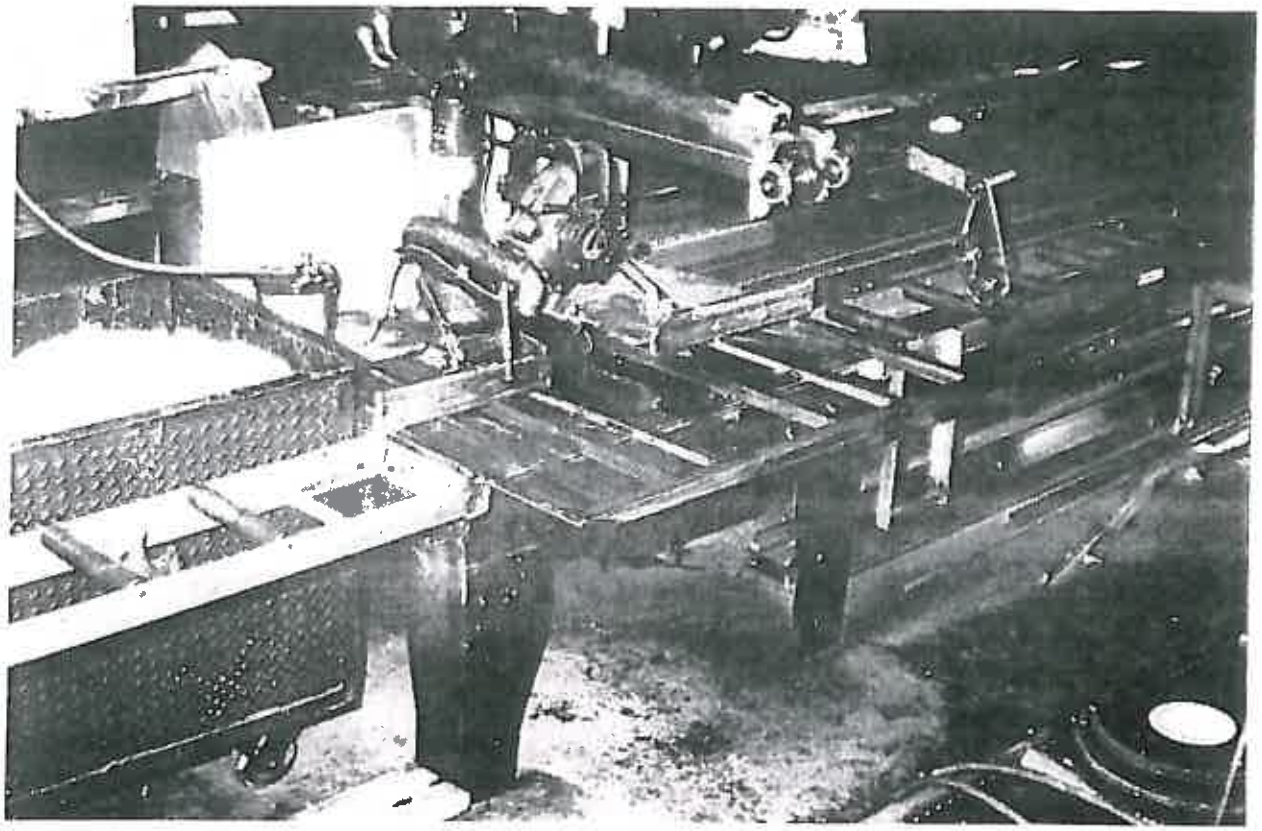


EQUIPMENT REQUIREMENTS

Compared to steel fabrication, the investment in equipment and space to fabricate extruded aluminum sign frames is rather minimal.

The illustrated Equipment Layout Plan is an ideal arrangement for ABC aluminum frame assembly. The equipment consists of:

1. A 7.5 HP, chain drive, 16" metal-cutting radial arm saw, fitted with an air pressurized water-soluble mist lubricant tank.

2. Eight 10' sections of conveyor rollers, mounted on adjustable tripod stands.

3. A small manual or power punch press for punching fluorescent lamp socket holes. JBC's is a manual Whitney foot press to which we have adapted an air cylinder and foot switch.

4. A suitable power punch press and a 4-1/2" die for punching hand-holes in frames. We recommend the Number 20 Lehman Press.

5. A drill press for cutting pipe holes with a fly-cutter.

6. Suitable aluminum welding equipment.

If possible, the saw line should be against a wall as a safety measure, in the event a piece of metal should be thrown out of the saw. The wall behind the saw may also be used to mount inventory racks for storing the 26' lengths of extrusions.

If a large inventory of extrusions is used, racks mounted on the floor near the saw line are suggested.

To minimize handling, locate the saw line as close as possible to the incoming freight door, since the extrusion packages weigh approximately 400 pounds. If large mill orders are received, they will come in 2,000 pound bundles.

SAW SET UP AND ALIGNMENT

The initial set up of the saw and the proper alignment of the back-stop to the saw are critical to achieve perfect miters and square cuts. They must be exactly 90 degrees from the forward traverse of the saw blade.

Note that the bed of the saw is an open framework so chips can fall through, which would otherwise pack up around the backstop. The open

frame also allows short parts to be clamped to the framework with Vise Grip tools.

The conveyors are welded to the saw frame at a 90 degree angle, with the rollers slightly higher than the bed of the saw, so that aluminum frames may be rolled back and forth without quite touching the saw bed framework.

Weld or bolt two pieces of 3" X 3" steel or aluminum angle to the saw bed; one on the right side, and one on the left of the saw for a backstop against which the extrusion frames are pushed to align them to the saw. If they are steel, put oak hardwood or an aluminum facing on the back-stop to prevent scratching the aluminum. The back-stop must be in front of the saw blade when the blade is all the way back, so that the saw may be turned on without the blade contacting the 3-1/4" high Large A/Flexframe when it is clamped in place for cutting.

If a used or rebuilt saw is considered, be certain there is no wear or looseness of the radial arm locking devices which hold the arm true at any given angle. Any movement prevents accurate miter cuts.

HAND TOOLS AND JIGS

We recommend using air tools as much as possible. They are sturdier and more reliable. Overhead or wall-mounted air line reels are placed at several work stations, so that the air lines are pulled down when in use, and reeled back when not in use. Similar reels are available for electrical cords, and eliminates the tangle of air lines and electric cords around the worker's feet. There should be water traps and dryers at the air compressors.

Welding jigs, similar to the one illustrated in the layout plan, are made up of light steel angle. They are clamped to the mitered frame pieces to hold them in alignment as they are welded or bolted together.

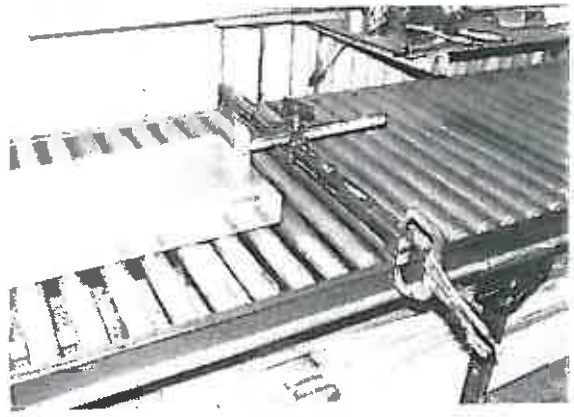
A quantity of large C-clamp type Vise Grip tools, as well as a few small standard Vise Grip tools will be necessary. They are convenient to hold the jigs, or certain extrusion parts together or to hold short frame section to the saw bed to be cut. Furniture clamps are also handy, especially on the Wide-Fab Frame assembly.

HOLD-DOWN DEVICES

Some companies equip their saw tables with air cylinder hold-down devices. We prefer to use simple, adjustable, hand operated De-Stay-Co clamps, one welded to the back stop on each side of the saw, as close to the blade as possible without interfering with the full movement of the saw.

These are DeStaCo type 267-U, to the ends of which we have welded a tube and nut so that a long 1/2" bolt can be threaded up or down for clamping any depth of frame to be cut. Use a lock-nut to fix the clamp at any length.

Note the piece of wood we place under the hold-down clamp which extends beyond the frame so the operator may put more or less pressure on the frame being cut. The operator cuts across a mark by eye, and the pressure on the wood assists the operator to follow the line when the frame may not be perfectly flat on the saw table. This is more quickly and easily understood when it is actually done.



USING A BACK-GAUGE

Except when cutting the A/Flexframes for 8" radius corners, regardless of the type of ABC frame system being cut, it will always be placed on the rollers with the outside of the frame facing up. The saw blade is rotated over on its vernier at a 45 degree angle, which requires the frame to be fed into the saw from the right side.

A movable backgauge, with a means of clamping it to the back-stop rail aids in cutting two or more frame assemblies to exactly the same length. Since any rectangular frame will have two pairs of identical sides, the back-gauge is an easy and quick way of cutting the second matching part to exactly the same length as the first. This is further explained under MITER CUTTING.

SAW BLADES

While wood or steel may also be cut on a big DeWalt saw, we cut nothing but aluminum on

ours. Special carbide tipped saw blades are made specifically for cutting aluminum. They have rather widely spaced teeth which throw the chips out of the kerf. These blades have replaceable carbide tooth tips. We keep at least two blades, so that we have a fresh blade while another is being serviced. Your industrial equipment supplier can recommend and provide proper blades.

It is important to use sharp blades, as they will leave a burr on the cut when they begin to get dull. Take care to avoid cutting through a screw which is holding the assembly together near the cut, as this will dull the blade instantly, or knock teeth tips off. These screws are placed an inch away from the miter cuts to avoid being hit by the blade. If a tooth is lost, there will be a different noise and vibration can be noticed. The saw blade is unsafe if this happens, and should be shut off immediately!

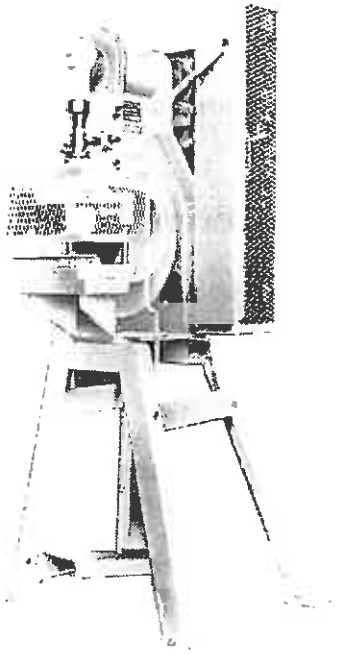
With a sharp blade and a mist coolant spray, aluminum cuts very easily. The forward direction of blade rotation tends to pull the blade right through the cut, and must be held back when cutting. That is why a chain drive is recommended, which controls the saw much better. Cutting slowly gives the smoothest edges on the aluminum.

Although the direction of rotation throws the chips or any small piece of metal which might break loose backwards, it is wise to avoid standing in front of the blade by moving a bit to the right side. Always wear a face mask and ear muffs to reduce the noise.

HOLE-DRILLING, PUNCHING AND CUTTING

Other than miter sawing the frame assembly and welding the corners together, most of

the labor to assemble an extrusion sign frame is for drilling screw and bolt holes, punching lamp holder and service hand holes, then mounting retainers and covers or wireways with screws, and mounting steel hardware with bolts. It is therefore important that these functions are properly understood, and that the best tools and equipment are provided if maximum efficiency is to be achieved.



PUNCH PRESSES

A good punch press for the cost is the LEHMAN No 20 press and shear. Their address is P O Box 578, Mineral Wells, Texas 76067. Their phone number is (817) 325-7806.

Lehman is familiar with ABC extrusion requirements, and can provide the punch press with a 4-1/2" diameter punch and die set. This is the proper size to use on ABC's Large and Small A/Flexframes, which are serviced by reaching through the frame wall. ABC provided Lehman with drawings of the die set and the proper stripper needed to fit our frame. Nothing larger than 4-1/4" or anything other than round holes should be used in the A/Flexframes. *Rectangular holes weaken the frame.*

Roper Whitney makes small punch presses and standard punch and die sets, including "D" punches for fluorescent lamp holders. Their small presses cost almost as much as a Lehman press however, and some companies have bought two Lehman presses; one for the hand holes and one for lamp socket holes. It is not practical to change dies

ROPER WHITNEY PRESS

to be able to use just one punch press. Any industrial supply company can advise current availability of other small presses.

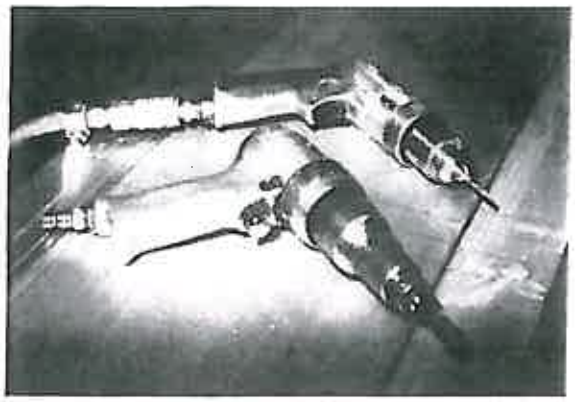
DRILL PRESS AND CIRCLE-CUTTER

Large pipe holes, from 1-3/4" to 7-7/8" diameter, can be cut with a #55 General circle cutter in a drill press. Circle cutters, also called Fly-Cutters, have an adjustable carbide cutting tips with a center drill bit. They are cheap and work well with a lubricant sprayed from aerosol cans. The wooden support block can be made as illustrated on the equipment layout plan which gives the size and how it is used.

The wood block is clamped firmly to the drill press bed, and the frame is clamped over it, face down. The Fly-cutter cuts through the aluminum, into the wood, so the wood top must be replaced from time to time. Use ear muffs, as this procedure is very noisy.

An alternative to using a fly cutter is to use a heavy duty hand-held router, with stock hole templates made up of masonite or plywood, clamped to the frame web. These techniques are only used for larger pipe holes. Another alternative is to use a hand-held plasma cutter, using the same hole templates as for the router. This is very fast if the equipment is available.

These techniques are only for large holes All bolt holes should be drilled.



DRILLS

Much of the labor for fabricating ABC extrusions is for drilling screw holes, putting in screws, removing screws and installing hardware with bolts. Three different size drill bits are required in the process as described later, and rather than frequently changing bits, we find it is much faster to use three drill motors with snap-on air fittings, each with a different size bit.

These same tools can be used with screw driver bits. They are variable speed and reversible. Air routers, wrenches, shears and saws are also available.

WOODEN JIG ON DRILL PRESS

MILLER ARC & HELIARC WELDER

WELDING EQUIPMENT

A variety of aluminum welding equipment is available from industrial equipment suppliers. We recommend two types; TIG and MIG.

The MIG system feeds a wire through a hand gun, and the TIG (Tungsten-Inert Gas) is similar to brazing. A rod is hand-fed into an arc from an inert gas shielded electrode. It provides a pure environment for the welding. With practice, a beautiful, strong beaded weld can be made with TIG.

The wire-feed system is faster, and with proper temperature setting for any given aluminum thickness, is very strong, but not as "pretty" as TIG welding.

JBC uses both, regularly. Most welds are done with MIG for speed, but certain welds, such as those **inside** the Access Frame corners are made with the TIG. MIG and TIG can also be used for welding steel, using different rods of course, but still in the inert gas shield for a pure environment.

Both systems are easy to learn, and instruction is usually available from the distributors of the equipment, and is also taught at any Vocational school. As with any welding, practice is required to become expert.

There has been much improvement in solid-state welding and cutting equipment. Dealers are the best source of information.

RECOMMENDED CONSTRUCTION PROCEDURES

Extrusion fabrication is essentially very simple; much more so than skilled metal working. Nevertheless, it is necessary to work intelligently if one is to achieve the highest level of productivity with simple equipment. The methods ABC recommends herein are based upon 35 years experience, always with careful time and material record keeping for cost accounting.

While the procedures are simple, nevertheless there is a learning curve, and even with good supervision, it may take a new entry-level employee a year or more to become as efficient as they are likely to be in the long term. However, this is a short apprenticeship compared to most skills required in the sign industry.

Without realizing it, anyone can gradually fall into poor work habits, or become complacent and fail to pay attention to the many small things that contribute so much to efficiency. A large part of a shop supervisor's responsibility is to maintain high standards of work procedures consistently, and to review these procedures occasionally.

Compared to steel construction, built to identical engineering and U.L. requirements, building any given sign cabinet with ABC's extrusions and accessories, wired and ready for the faces, will save approximately 50% of the labor hours. The savings for the completed sign including the faces, ready for delivery, will usually save 10 to 15% of the total cost. This is a substantial advantage over competitors who still work with steel, so it is worth all the effort it takes to acquire and set up proper equipment, and to train the extrusion fabrication personnel properly.

ONE PERSON TO THE JOB

Except for very large or unusual cabinets, one person can do all the work necessary to build and wire an ABC extrusion sign cabinet. A helping hand may be needed to move or turn a sign frame over, but essentially, it should be built by one person. This is especially true of the early stages of construction; the pre-assembly, layout work, miter-cutting, hole punching and drilling, and welding the frame. Once welded together, and laid down flat on floor stands, more than one person can then work efficiently installing steel struts and brackets, internal bracing and trusses, pipe stubs or plates, and wiring the sign. When installing flexible faces, two people working on opposite sides of the frame are more efficient.

WORK APRONS

Each extrusion worker should wear a work apron during the layout, pre-assembly, miter-sawing, assembly and wiring of the sign. The work apron should have chuck keys on a reel, tape measure, extra drill bits of the required sizes, marking pens and pencils, and a small supply of screws, Nutserts, rivets and other fasteners which are always required. This eliminates a great deal of lost time looking for something, or interrupting the job to get something. This is one of those small but very important suggestions.

STEP 1 - PRE-ASSEMBLY AND LAYOUT OF THE FRAME

A. Regardless of which ABC frame assembly is used, it should be pre-assembled with its retainers and Covers before it is cut on the miter saw. (Covers are only used on the several Access Frames.)

B. Place all the straight lengths of the parts required for that particular frame, outside face up, preferably to the right of the saw table, although any of the roller tables may be used for the layout work.

C. Using small vise grip tools, clamp the parts together at each end of the assembly in order to drill the holes for fasteners. Then lay out all the miter cuts to be made. *Note that we have modified a carpenter's square by spot-welding a sheet metal flange to the long side. By placing the square on one side and pulling it against the frame, it is immediately square to the frame.*

Mark the frame for saw-cuts and screw holes with a marking pen or pencil. Retainer screws are normally 12" on center. The screws for the C-Cover on the Access Frames are usually placed 24" on center.

For very large cantilevered signs, screws can be placed closer together, especially on the top and bottom frame members. Each connected part then contributes additional strength to the frame assembly.

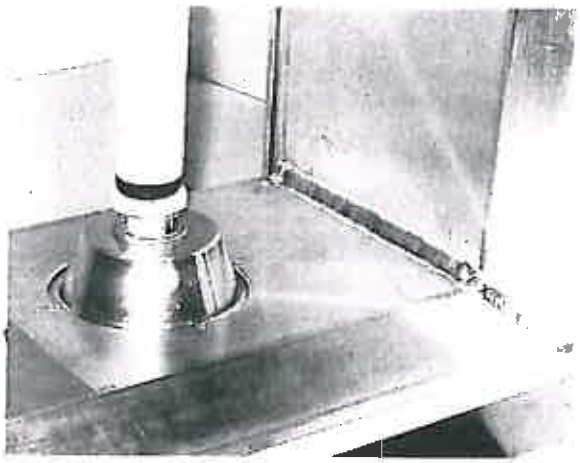
Allow about 1" of space between the marks for saw-cuts. These marks should be quite visible, as the saw blade is to follow these marks by eye.

D. The exact length of any ABC extrusion frame, in the lamp direction (for vertical or horizontal lamping) is given in EASY SHEET #4. For example; a Large A/Flexframe using 8' vertical lamps, will always be cut 4-1/2" over the nominal lamp length, therefore the overall size of the frame in the vertical direction would be 8'-4-1/2". Naturally, the markings for the size of the frame must be exact, especially in the lamp direction, to make the lamps fit properly.

The first row of screws across the frame near each saw cut should set back 1" from the actual cut line to prevent the blade from hitting a screw when the blade is in the 45 degree position.

An advantage of ABC extrusions, compared to steel construction, is that extrusion fabrication is a "modular" technique. Everything is done the same way each time a frame is built of a particular frame system. It is the nearest thing to mass-production which can be used for building custom signs one at a time.

NOTE: The overall frame sizes of any ABC frame system can be modified, even in the lamp direction. (See EASY SHEET 17.) For the Access frames, ABC can provide spun aluminum cone-cups, used to either ***increase*** or ***decrease*** the frame size in the lamp direction. These are only used when the sign cannot be the standard size in the lamp direction, such as for fitting existing pan-formed plastic face molds, made for a different frame type.



Again using the normal 8'-4-1/2" frame described above as an example, by using an ***extended*** cone cup on either the top or bottom frame only, the overall size, in the lamp direction, becomes 8'-6". If an ***extended*** cone cup is used on both top and bottom frames, the overall size will be 8'-7-1/2".

If the cone cups are ***inverted***, the frame size would be reduced by 1-1/2" for each cup. The example then would become 8'-3" or 8'-1-1/2", depending upon the use of one or two cone cups per lamp.

For any of ABC's Conventional Frames which normally use a sheared flat wireway cover inside the frame, these wireway cover may be

broken into "hat-sections" to result in most any desired overall frame size in the lamp direction.

Depending on your shop's requirements to fit existing molds for formed faces, we suggest you make a size chart to place near the saw which gives the frame size in the lamp direction for each different ABC frame you may use. This eliminates shop drawings, many of the verbal communications and other things required in steel construction, and reduces potential for errors.

STEP 2 - HOLE DRILLING AND PUNCHING

All ABC Retainers and accessory parts which fasten to the frame have a small "abutment flange" on the underside to enable the assembler to push the parts tightly together against the back-stop with one hand, while drilling the screw holes with the other hand. Also, extruded 'drill grooves" are a feature of all ABC parts which will require drilling for screws. The assembler can quickly drill holes in a straight line without jigging, punching or marring the parts by having a drill "walk".

A. Beginning 1" inside the miter cut lines, drill all the pre-marked screw holes for the Retainers and Cover, (if any,) with a #30 bit. Drill through the outer parts and also through the frame to which they will be attached. Be sure the abutting flange is pushed tightly against the frame as described above, so the parts fit properly.

B. Now place # 7 sheet metal screws only in those holes just behind the saw cut lines. For Access frames with Cover, there will be four screws in a row across the assembly. For Conventional frames, there will only be the two screws in the retainers. ***These screws are only temporary, to hold the assembly together until after the mitered saw cuts are made, after which the parts will be dismantled.***

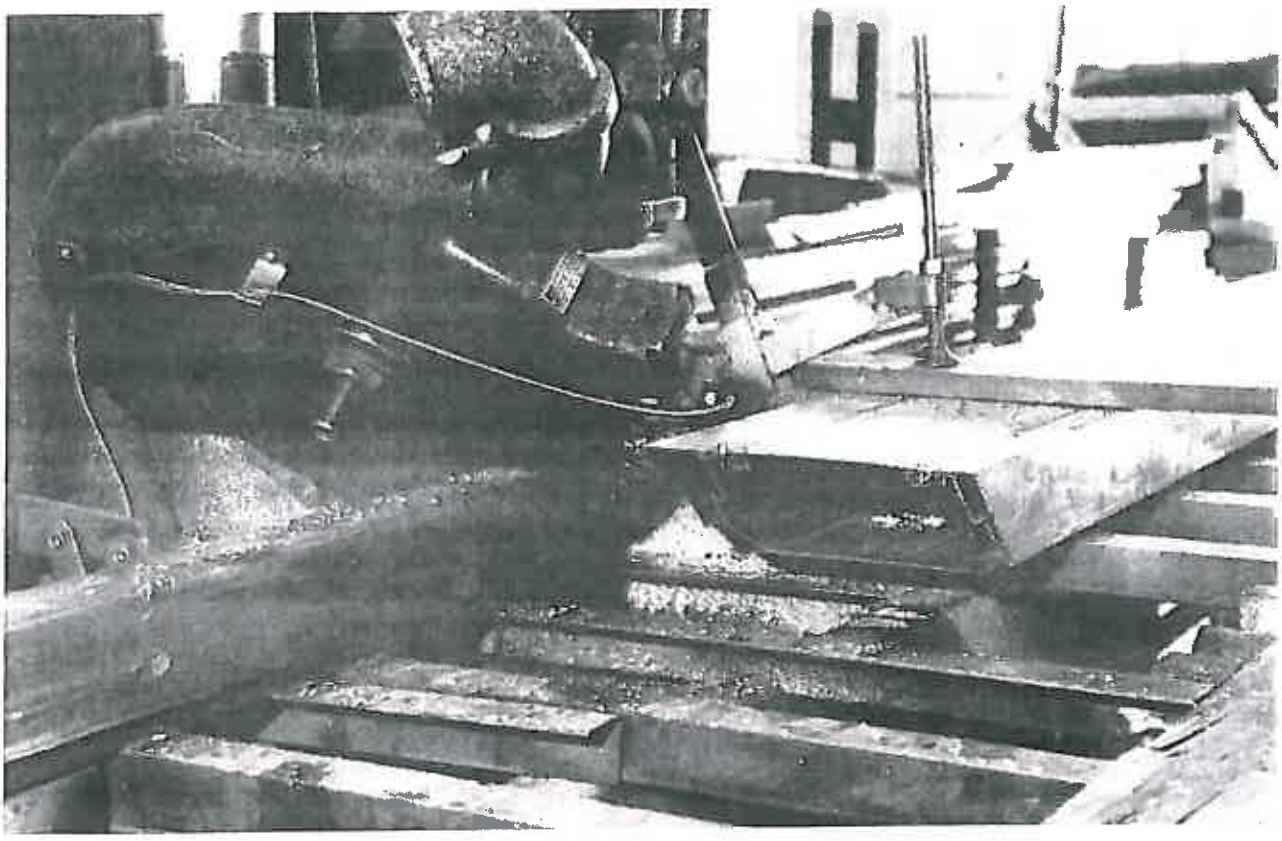
STEP 3 - MITER CUTTING THE FRAME

Before beginning the cutting operation, put on the safety mask and ear muffs, then proceed as follows:

A. With the assembly to the right of the saw, roll it into position to be cut. Without turning the saw on, pull the blade up to the assembly to align the right edge of the saw blade with the mark to be cut. With the extrusion assembly pushed back against the back-stop, pull the clamps down, with a piece of hardwood under the clamp. The frame should be clamped down snugly, but not so tight as to deform the assembly.

B. Turn the mist coolant spray on. It should spray directly on the blade, not the aluminum assembly. Be certain the saw blade is far enough back to miss the extrusion assembly, then turn the saw on. Then, standing slightly to the right of the saw, using the right hand on the chain crank, and the left hand on the end of the hardwood which extends beyond the frame, slowly pull the saw through the assembly, following the marker line by eye. By watching the blade travel by eye, and by applying a little pressure on the wood with the left hand, one can control the flatness of the frame as it lays on the cutting table. For very large frames, such as the Large A/Flexframe assembly, these may not be totally flat on the bottom side, and this pressure prevents any slight "rocking" motion from occurring.

C. When using the saw for the first time, it is advisable to make a number of practice cuts with a small section of frame assembly, and weld one or two corners together, after which all the foregoing will make perfect sense. These may also serve as corner samples for the salespeople to show customers the features of the frame system, comparing it to steel construction.

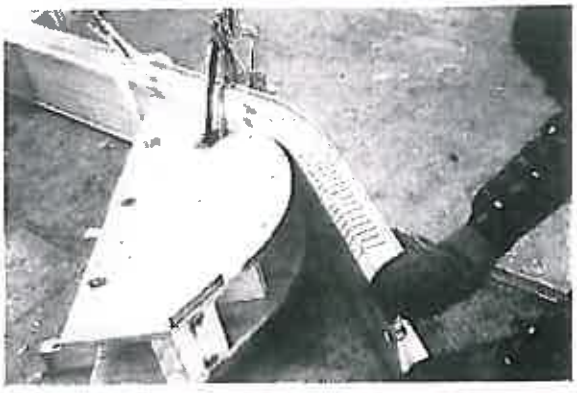


D. Repeating the above steps, cut the left end of each frame piece and stack them on the rollers to the left of the saw as each one is cut. When all four frame pieces have the left end mitered, move them all to the right side of the saw, turning them end-for-end as they are moved, with the opposite ends of each piece facing the saw.

E. Place any one of the pieces in the saw and align it as before. Clamp it down and miter the un-cut end. Before it is un-clamped, move the Back-Gauge to abut the outer end of the now finished piece of frame, and clamp the Back Gauge in that position. Without moving the Back-Gauge, remove the first frame section, and place the one which is to match the length of the first one against the back gauge, and clamp it down.

This second piece of the identical pair can now be mitered quickly, as it will be exactly the same distance from the Back-Gauge to the saw blade as the first one.

Repeat these steps with the other pair of frame sections, and the miter sawing operation is completed. The use of the back gauge is especially helpful in speeding up the cutting of a quantity sign order, as many identical pieces can then be cut quickly and accurately.



CUTTING FRAMES FOR CURVES AND RADIUS CORNERS.

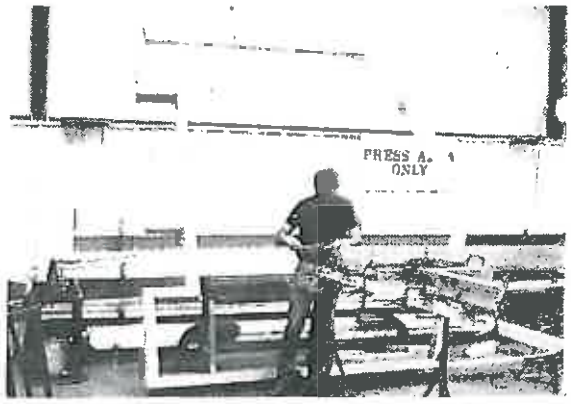
ABC offers five different conventional frame systems ranging from 12" wide to 5" wide. There are a variety of pre-fabricated radius corners, with radius retainers available for these frames. These are all described in detail on the back side of EASY SHEET #3. These are by far the most economical radius corners on the market.

The front side of EASY SHEET #3 describes the standard corner kits for the Large and Small A/Flexframes, and how to cut the Access Frames to use them.

EASY SHEET #8 fully describes how to

kerf-cut the Access Frames to form most any radius or irregular curved shapes. It also gives a chart for kerf spacing for any radius to be kerf-cut. This is a technique JBC perfected over the years, and one with which the most intricate sign shapes can be built entirely of our frame systems, still saving a great deal of cost compared to steel fabrication for the same shapes.

Kerf-cutting can be used on most of ABC's frame systems, making irregular signs much easier to build.



CUTTING GEOMETRIC SHAPES

Radial arm saws are equipped with a vernier in degrees. Many geometric shapes can be cut quickly and accurately using the vernier to set your saw angles. Using a six-sided hexagon as an example, this shape segments the 360 degree circle into six points of 120 degree angles. To miter a 120 degree angle, we divide it by 2, and set the saw at a 60 degree angle. An eight-sided octagon requires a 67-1/2 degree saw angle setting. *This is the saw angle, and may not correspond to the vernier degrees, depending on where "zero" degrees are on the vernier in relation to the saw position.*

Any angle can be cut for signs with angled shapes such as trapezoids. When combined with kerf cut curves and straight lines, virtually any shape sign can be made with most ABC frames.

STEP 4 - PUNCHING AND CUTTING HOLES

After miter cutting the frame, all hole punching, drilling and cutting for lamp holders, ballast mounting, pipes stubs, internal strut brackets, and mounting or lifting hardware is to be done.

For small signs, there is little to do, but for very large signs, this will require a considerable part of the time to build the frame.

A. Remove the temporary screws holding the retainers and Cover (if any,) numbering each part with a felt pen for re-installation when the final assembly is done.

Marks such as "1-left" and 1-right" can be used, or any marks which make sense to the assemblers.

B. IMPORTANT: Now, re-drill all the screw holes in the Retainers and C-Cover with a 3/16" bit. This is to make these screw holes oversize, so the screws will not bind in the outer parts, but will pull the outer parts down tightly to the frame or flanges underneath. Only then will these parts fit and function as they are designed to do. This is extremely important on the top Covers of Access Frames, where gaskets are required to prevent undue water entry.

C. For Retainers, we suggest you drill a 1/4" oversize hole, only for those screws next to the mitered ends. Using a pair of Klien pliers, put a slight downward bend at about 45 degrees across these 1/4" screw holes. On final assembly, use #10 screws, only in these holes. They will pull the lower (face) sides of the Retainers tightly together for a perfect mitered fit.

NOTE: For signs which require countersunk screws, this is the point at which the outer screw holes must be shaped with a counter-sink bit. Due to the thin-wall extrusions, we have had good results using a Zephyr 330-S micrometer tool, which has a positive-lock feature. Literature and tools are available from Zephyr Mfg. Co. 201 Hindry Ave. Inglewood, Calif. 90307. Phone (213) 776-7600.

For Retainers which are never to be removed for any reason, 3M's VHB tape may be used, eliminating all screws. Except for minimal internal welds, all of ABC's Architectural Frames are designed to be entirely assembled with VHB tape, with no visible fasteners, creating a new level of aesthetics for this type of signage which is often at pedestrian eye-level.

Until the assembler is completely familiar with any and all of ABC's frame systems, use the Product Catalog sheets which have full-size cross section drawings of the assembly. "EASY SHEET" #4 gives a chart of maximum pipe sizes for each frame, and recommended maximum lamp centers for every ABC frame system.

D. Next, layout and mark the pipe hole(s) if any, and beginning from the pipe centers, (for the

Access Frames) layout all the socket holes on whatever centers are required. If any of the Conventional Frames which use a wireway cover are being fabricated, the wireway cover and lamp socket holes will be made later, after the frame has been welded together. For any single face sign, the lamps should be placed as far back in the frame as possible. (See Catalog sheets for illustrations.) Lamp centers = Visible opening divided by number of lamps desired (not to exceed maximum recommended spacing on EASY SHEET 4)

E. Use ABC's engineering information in DESIGN AND ENGINEERING CRITERIA, in the Product Catalog, to determine the proper placement, size and type of all steel pipe plate sizes and thickness, bolt size and torque specifications, internal struts, diagonal truss members (when required) and the various means of attaching these steel members with bolted connections.

These are **simple, easy to understand formulas** which ensure a properly engineered, easy to build sign frame system that will be trouble-free when properly constructed. And like all ABC's systems, these steel internal support members become standardized, and are done the same way each time a sign is built. Little or no custom engineering is required, even in hurricane-prone regions, except for extremely large or unusual applications.

All the plates, brackets, strut members, truss cables and proper bolt sizes and lengths should become standard, off-the-shelf parts, made up in some quantity, ready to apply to whatever ABC frame system is being built. This is another very important time and cost saving feature of the ABC systems.

F. Next, punch all the 4-1/2" hand holes, usually 24" on center, between every other lamp socket hole. Then roll the frame through to the small punch press and punch all the lamp socket holes.

G. Now, carefully drill all the bolt holes for strut brackets, pipe plate mounting bolts, wall-mount Z-Brackets (see "EASY SHEET" #5,) lifting clips, and any other bolt-holes which are required. No bolt hole should be larger than necessary for any given size bolt. The holes for high-stress connections, such as the top and bottom steel pipe plates should never be more than 1/16" larger than the bolt size specified. These are friction connections, and depend on close tolerance bolt

holes and proper torque specification to prevent any movement in extreme wind conditions.

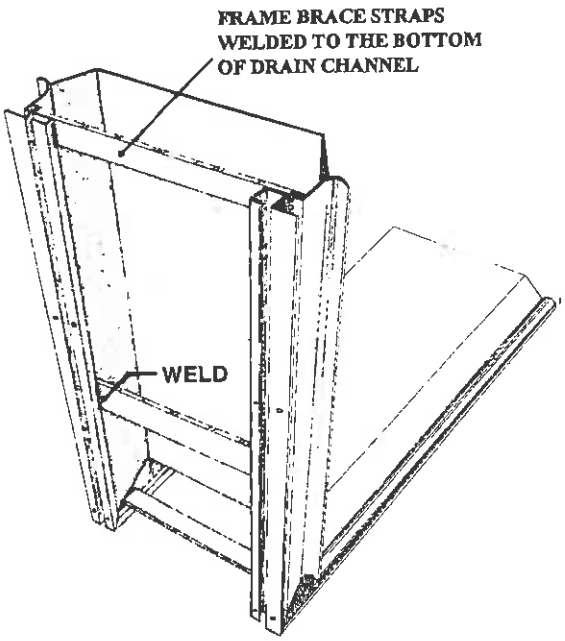
Various types of struts and brackets and different methods of mounting them to each ABC Frame type are given in "EASY SHEET" #11.

H. Mount all ballasts with Nutserts and 1/4" machine screws. The Nutserts are internally threaded, and are swedged into a 3/8" drilled hole in the frame web wall. The mounting bolts screw into the Nutserts, taking the place of nuts, making it possible to install or remove the ballasts without reaching under the frame web to hold a nut.

Nutserts and hand tools are products of ADVEL ENGINEERED FASTENERS, 10 Henry Street, Teterboro, NJ 07608, phone 301/288-0500. They can provide the name of their nearest distributor.

I. For the Large and Small A/Flexframes, aluminum Frame Brace straps are always required. These are illustrated and explained on the catalog sheets and also in EASY SHEET #17. Before the frame is welded together, these aluminum straps are welded to the A/Flexframes on 4' to 5' maximum centers all around the perimeter of the frame.

These supports hold the frame to its width tolerance, and prevent the frame from spreading under the stress of flexible face tension and wind load on the faces. Without these braces, the frame



might spread slightly, making it difficult or impossible to replace screws when the Cover has been removed for service access.

Before the frame is welded together, all accessory parts such as hand-hole cover doors, steel brackets, Frame Brace straps, pipe plates, C-Irons for single face signs and lift-clips should be finished.

STEP 5 - WELDING THE MITERED CORNERS

Each different ABC extrusion system may require different jigs or clamps to hold the frame together and square for welding the corners. The ideal method should allow the whole frame to be held together, so that all four corners can be welded in quick sequence.

Corner jigs such as those illustrated on the equipment layout plan can usually be clamped to most frames with Vise-Grips.

The Large and Small A/Flexframes have slots in the frame for inserting aluminum corner angles for bolting the corners together. These slots are made for 3/16" thick architectural (inside square legged) aluminum angles, cut to a precise width They are deliberately a very tight fit, requiring the aluminum angles to be knocked in with a mallet or hammer. These can also be used as welding jigs. Bolt-together kits are illustrated and explained further in EASY SHEETS #10 and #17.

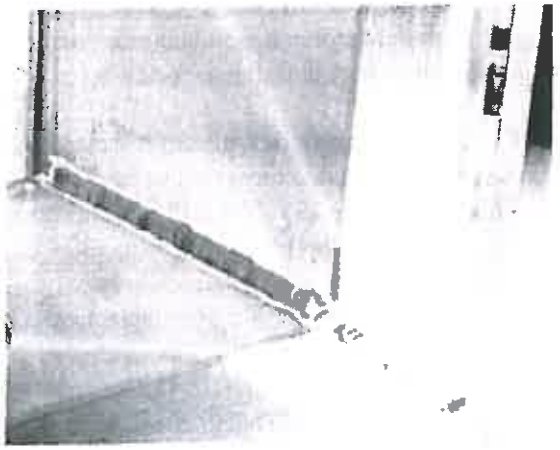
By jigging or clamping the entire frame together, it can stand up for easy access to the welds, and progressively turned over as required.

Regardless of the means of holding the frame corners together, all major welding is to be done **inside the frame** where it will not be visible on the outside of the frame.

Each weld should begin with tack-welds, while using a framing square to get the frame weld started at a true 90 degree angle. Then the weld can be completed.

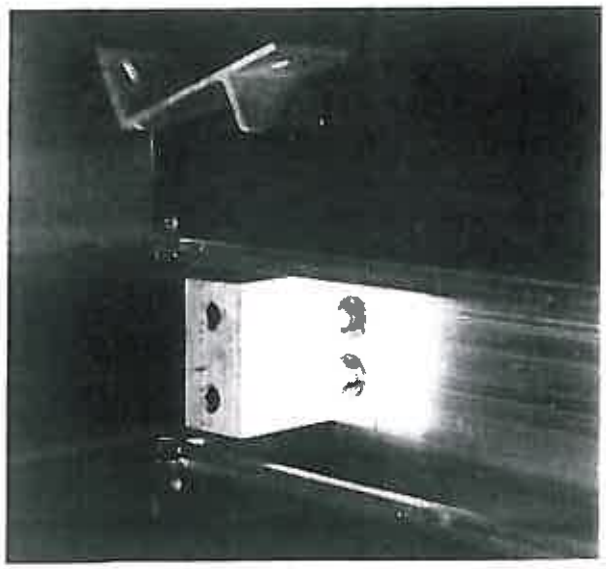
For the Access Frames, weld all across the broad flat bottom of the frame. Make sure the frame is square, then continue down the 45 degree beveled sides to the under side of the curved saddle. Then, move to the **inside** of the frame and continue the weld up the sidewalls to the drain channel. Also weld the underside of the drain channels as carefully as possible. Silicone may be required later to ensure there are no water leaks in the top corners of the drain channels.

Be sure that no welds will interfere with the fitting of the Retainers.



TIG WELDED A/FLEXFRAME

Certain other ABC Accessories may require some welding. Divider Bars, for example, are usually bolted to aluminum bars, which are welded to the frame. This allows the Divider Bars to be removable. (see EASY SHEET #14)



PROJECTING MOUNT Z-BRACKETS

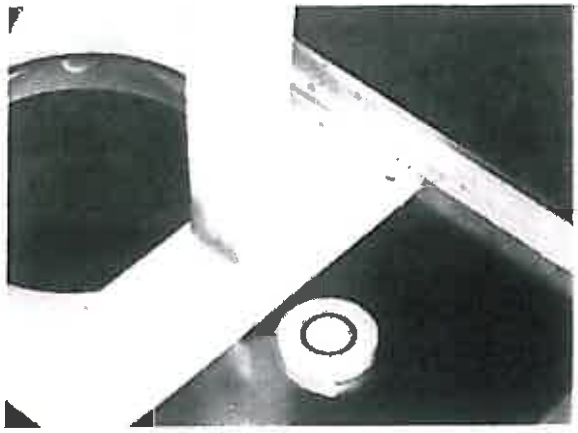
The Z-Brackets for wall or flag-mounting Access Frames may be welded directly to the frame, but if they are to take very critical structural loads, we recommend they also be bolted through the frame, in addition to welding.
(see EASY SHEET 5)

The Abutting Flex Joints (EASY SHEET #12) are usually bolted to a steel angle which is bolted to the frame, similar to the methods for attaching Divider Bars. They are also attached to every steel strut for substantial bracing.

STEP SIX - INSTALLING PIPE STUBS, STRUTS, TRUSSES.

The final step to complete the sign frame is the installation of any pipe stubs, steel struts, diagonal truss cables, etc For small signs, there may be little or none of the above, and the sign cabinet is ready to wire.

For most of the hardware and accessories which may be required in some signs, the INDEX OF EASY SHEETS is given below.



INDEX FOR EASY SHEETS

1. TENSIONING FLEXIBLE FACES

2. HANGER BAR APPLICATION. How to use the A/Flexframe to properly support rigid plastic faces.

3. RADIUS CORNER FABRICATION. Corner kits and prefabricated corner assemblies for the A/Flexframes and Conventional Frames.

4. LAMP AND PIPE CHART. For net frame sizes, maximum pipe sizes and maximum lamp spacing for any frame.

5. Z-BRACKET INSTALLATION. Use of ABC Z-Bracket for flush mounting Access signs to a wall or to columns.

6. WIDE-FAB FRAME CONSTRUCTION. Choice of Wide Fab, Bleed-Face, Type II or Hingable Frames for building very large signs, or small signs requiring extra face-to-face dimensions.

7. BLEEDFACE SADDLE CONSTRUCTION. An accessory part for use with the standard A/Flexframes to extend the face-to-face dimension

and/or to use in a Bleed-Face application. Also suitable for kerf-cutting curved frames.

8. KERF-CUTTING FOR RADIUS FRAME FABRICATION.

9. STRUT APPLICATIONS FOR HINGE FRAMES AND RETRO-FIT FRAMES.

10. WELD-FREE CABINET CONSTRUCTION. Alternative bolt-together instructions for Access Frames for shops without welding equipment.

11. STRUCTURAL FRAME SUPPORT BRACES. Techniques for installing steel struts to bolted brackets for any ABC Frame.

12. ABC FLEX-JOINTS. Explains the use of Flex-Joints for building large signs in completed sections to stack together without face shadows. Also for jointed sections with changeable faces.

13. INSIDE AND OUTSIDE "R" COMPONENTS. Accessory parts for building hinged frames for signs requiring multiple inner and outer rigid plastic faces.

14. ABC DIVIDER BARS. A choice of Divider Bar sizes to support rigid plastic faces in sections for very large signs, or for changeable panel signs.

15. FINISHED FRAME DIMENSIONS. Illustrates every ABC frame with optional components, with the exact width and depth dimensions for each variation.

16. ABC WIREWAY EXTRUSIONS. Illustrates the types and sizes of wireways and raceways for incandescent or fluorescent lamps and ballasts.

17. ACCESSORY PARTS. Lists standard ABC accessory parts available from ABC to save customers time and costs. Includes Strut Brackets, Bolt-together Corner Brackets, steel Pipe plates and pipe rings, water-tight gasket and flashing components, Hinged face props, Frame Channel Support (Frame Brace) straps, Cone Cups, Locks for Hinge frames.

18. DIAGONAL TRUSS MEMBERS Details for proper use of Diagonal Truss members.

For those who are learning to use ABC's frame systems, it will be helpful to study these Easy Sheets in detail to become familiar with all the accessories, special parts, and items which are available from ABC. Some of the more common items should be carried in inventory as "off-the-shelf" items. It is much less costly in most instances to buy these from ABC who makes them in quantity, than for shops to make themselves.

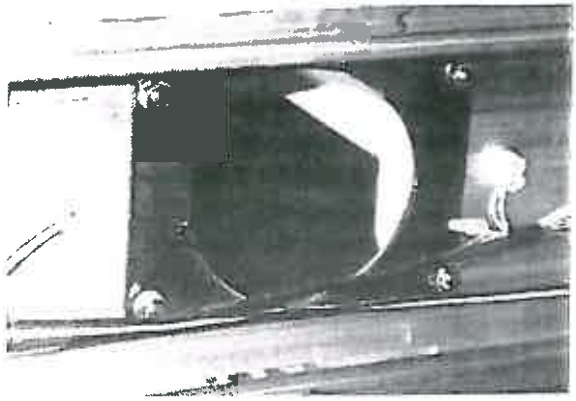
Much time would be lost if any shop interrupted the assembly procedure to stop and make up the steel brackets, pipe plates and other hardware items that are used on almost every sign. **Standardization of these things is one of the most important means by which labor is saved compared to steel fabrication,** where every piece has to be measured, cut, punched, welded or broken, then painted.

When a sign cabinet reaches a length of 10' or more, certain internal hardware and braces may be required. All the added structural items are to be determined from the ABC Engineering and Design Criteria" pamphlet in the Product Catalog.

Using the ABC frame systems, there is never any peripheral angle iron framing required. If a proper frame type is used for any given sign size, the frame is of adequate strength without such perimeter angle iron framing. When any sign must be engineered by a professional engineer, the engineering data for each frame is given on the Catalog Sheet for each ABC Frame.

A. For any pipe mounted, or wall mounted sign, there is a standard hardware procedure which we recommend. For all signs which are to be pipe-mounted, whether to slip over a pipe in the field, or to have the pipe stub with match-plates or pipe rings built into the sign, standard rectangular steel plates are used, with four bolt holes and the pipe hole for whatever pipe diameter is required.

Select the proper pipe plate size for the sign being built from the Engineering and Design Criteria and bolt a plate at the bottom and top frame, with the proper size A-325 or grade 5 bolts, hardened flat washers, and nuts. Remember that you are building a sign to resist the most extreme wind conditions to which the sign will ever be subjected, and that these bolted pipe plates are the most critical, where the full force of the wind-load is transferred to the steel support column. These are **friction** connections, and depend on the bolt and washer diameters being properly torqued, with a torque wrench, or by the alternative "Turn of the

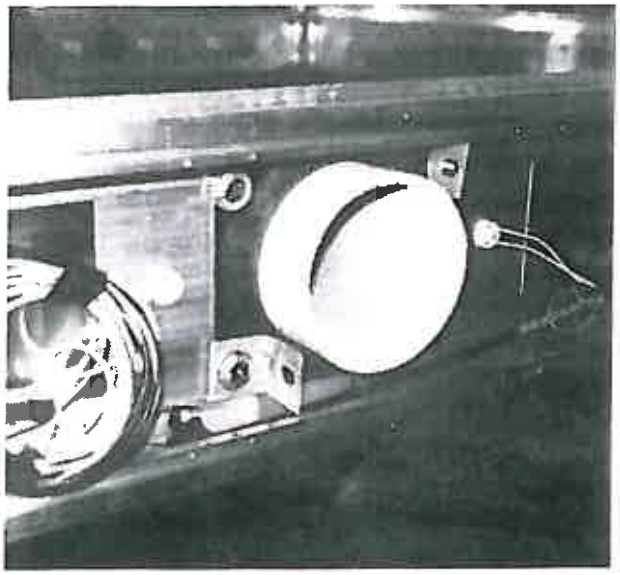


Nut" technique to do the job properly. Tack weld the nuts after they are properly torqued to prevent possible loosening.

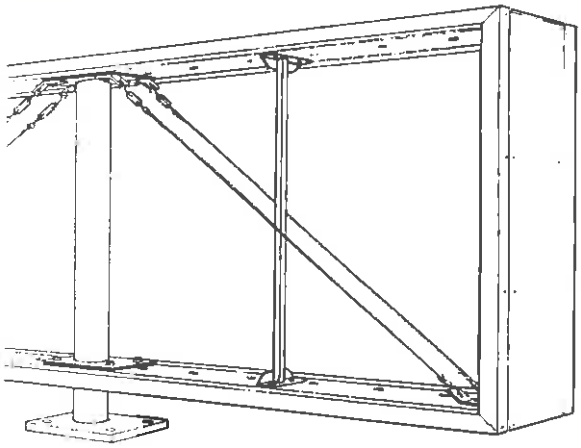
Be certain that the holes drilled in the aluminum frame for these critical bolted connection are **never more than 1/6" larger than the bolt.**

Once the plates are bolted to the frame as specified, insert the pipe through the plates, and for the Access Frames, **extend the pipe 1-1/2" into the top frame.** This will reduce the broadside wind-force on the bolts because the whole pipe plate and sign frame are pushing against the pipe. The bolts are designed to resist the unbalanced windload, or the twisting action around the pipe to which signs are subjected.

Another reason to extend the pipe into the Access frame at the top is to allow the electrical feed wires to come out the top of the pipe, directly into the frame wireway. The service connection for such pipe mounted signs should always be taken to the top center of the frame. Fillet weld completely around the pipe to both plates.



B. If steel struts are required, bolt the steel brackets to the frame as illustrated in EASY SHEET #11. Then weld the steel struts to the steel brackets. The proper size struts are listed in the chart on EASY SHEET #9, and also in the Engineering and Design Criteria. We recommend light wall steel tube for struts, as it is lighter, stronger and less expensive than angles or pipes, and all struts can be made from just a few sizes of steel tube carried in stock. These can easily be cut to length with a friction-blade chop-saw.



C. Install steel angle brackets, or wall clips in the top of the sign for lifting hardware. For Access Frames, these go inside the frame, preferably bolted through the frame and also through the internal brackets used for vertical struts. This results in very strong, safe lifting hardware. Smaller single pipe signs without vertical struts can be lifted from brackets bolted to the top pipe plate, using the same bolts as for the plate.

For any Conventional Frame, the lifting clips must be on the outside of the frame. For Conventional Frames, we rivet a large steel washer to the frame for a single bolt, and use a 45 degree steel wall clip for lifting the sign. We tack weld the nut to the washer inside the frame, and after the sign is hung, the clip can be removed, and the bolt replaced in the nut, without opening the sign.

D. For Wall mounted Access Frames, use the Z-Brackets as illustrated in the Easy Sheets. for Conventional Frames, bolt steel or aluminum brackets at the rear of the sign, and at the front end of the sign for guy-wires if any are to be used.

E. From EASY SHEET #18, determine if Diagonal Truss members are required, and if they

are, install them as recommended as the next step of construction.

STEP 7-SPLICING AND WATERPROOFING REMOVABLE SERVICE COVERS.

Service access is very important, not only to give easy, safe access to the lamps and other electrical components of the sign, but to ensure the sign is water-tight, with proper flashing or drainage out the bottom.

All ABC extruded Retainers and frames are designed so that water over-flowing in the bottom retainers will drain **out**, not into the frame and wireways. Even though U.L. requires drain holes in the bottom retainers, these can become plugged with dirt over time. Even then, our basic design, where the front lip of the retainers are always lower than the inside, or lower than the frame wall to which they attach, makes it impossible for the water to enter the bottom frame members.

A very large volume of water is drained from plastic faces into the bottom retainers on any sign, and we have purposely designed them to handle, and to dump a large volume of water. Few competing frame system have given proper thought to the service aspects of signs. ABC, through fifty years of experience, including 35 years of outside installation and maintenance work, is very much aware of the importance of these matters.

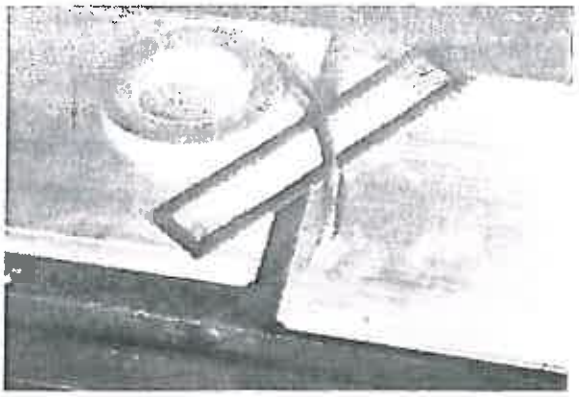
ABC's A/Flexframes, used mainly for large signs, offer complete service access around the entire perimeter of the sign, by means of the removable C-Covers. Under these Covers there is a large water drainage channel. Water on the top of the sign is drained into these channels. It is carried to the ends of the channels, where it flows down the side channels and out the bottom of the sign frame, never entering the wireway.

Obviously, it is very important that these drain channels are not drilled through, and that they are welded or silicone sealed under the top mitered ends to ensure proper drainage. Before mounting the Covers, water should be poured into these top channels to be certain they are not leaking at the ends.

Since service people will have to remove the screws to open the C-Covers for field service, it is advisable to keep the length of the Covers to not more than 10', and preferably less.

Ballasts are usually mounted on the ends of the Access Frames when vertical lamps are used, although they can be mounted anywhere in the frame, and can also be mounted side-by-side, due to the frame's width.

Wherever they are mounted, it is a good idea to make a short section of the Cover which is easy to remove without removing a great length of the Cover. Remember that the sign will likely be serviced by someone who will not know where the ballasts are, and it is wise, therefore, to put a BALLAST LOCATION label on the Cover where the ballasts are to be found. ABC can provide these labels for our customers.

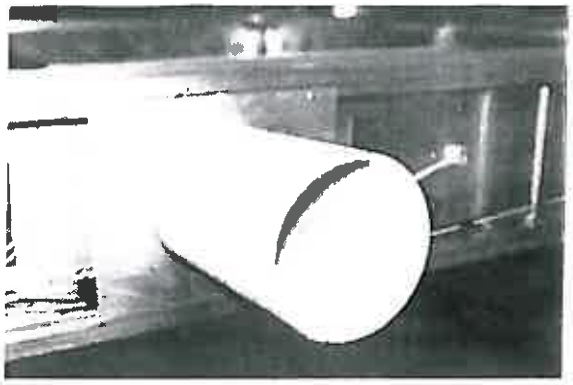


The Covers on the top of an Access Frame, if over 10' long, must be spliced. The Cover is cut in pieces, and flat aluminum metal tabs, with special neoprene tape, available from ABC is applied to the underside of the tabs. This tape is a U.L. listed ABC accessory. It has a permanent adhesive on one side only, which is affixed to the tab. The tab can be riveted to one piece of the Cover, and screwed to the mating piece of Cover. The neoprene gasket seals the cover from water, yet can be opened and replaced repeatedly, and still seal as it is replaced.

On the top corners of the Cover (on an Access Frame,) there must be a flashing angle, made of aluminum and with the neoprene tape. This angle can be permanently attached to the top cover, with screws or rivets. The vertical end Cover can be

slipped out from under the flashing if it is removed for service. This top corner flashing is essential to prevent water entry in the Access Frame.

For the bottom of an Access Frame, no flashing is required, just butt joints of the Cover.



For pipe mounted frames, we suggest a small, separate piece of cover, with a hole cut to slip over the pipe, be permanently mounted to the bottom frame. The Covers on either side of it open separately, giving good service access.

Apply continuous strips of the U.L. approved neoprene gasket tape on both frame flanges under the top C-Covers of Access Frames and Wide-Fab Frames to prevent water entry into the wireways during extreme conditions of rain, ice or snow. **NOTE:** This is only necessary under the **top** covers. (See also: Easy Sheet 17 and the "Splicing" Easy Sheet provided in the Access Frame section of the ABC Product Catalog.)

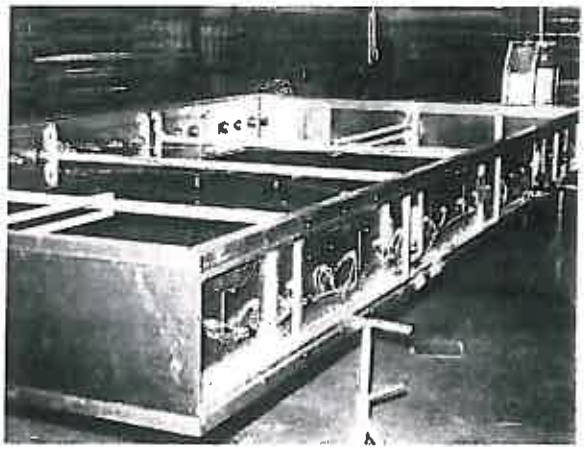
Many ABC Access Frames are used by our customers to build signs for corporate signage programs. These are usually shipped out for installation and service by others. One should assume that those signs may be installed and serviced by people who do not know how the service is to be done through the Cover. For this reason, we suggest a metallic label be permanently attached on the lower corners of the frame with service entry instructions. Without such labels, we know of instances where service people have virtually dismantled the retainers and de-tensioned flexible faces trying to reach the lamps or ballasts.

It is also advisable to have instruction on the crate or sign which instructs installation people where and how to find the lifting clips and service wiring under the top Covers.

STEP 8 - WIRING THE SIGN

Easy access of wiring and conforming to U.L. wiring requirements are other reasons why ABC extrusions are so much less time consuming to build than steel angle and sheet metal signs.

Whatever type frame is used, the entire frame becomes the wireway. It is more spacious, easy to reach into; especially the Access Frames, and the aluminum is a natural heat-sink which conducts heat from the ballast and dissipates it through the frame. We do not use vents in any of our extrusions for this reason, as the heat will quickly dissipate through the frame itself. However, in very high humidity regions, vents may help to prevent mildew from forming on the inside of the faces.

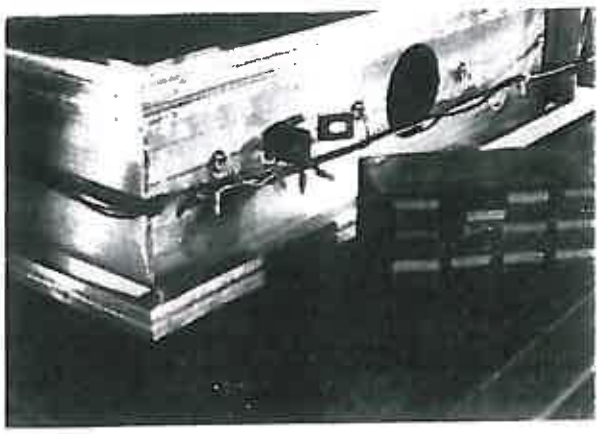


1. Place the frame flat on floor stands, adjusted to waist height for comfortable, easy wiring while standing normally. Wear the work apron with all the wire-nuts, crimpers, strippers and tools required for wiring.

JBC uses rolling wiring carts with spools of various colors of wire. All the wiring clips, sockets, service switches, photo cells, etc. are inventoried in bins near the wiring area. No time is lost making clips or looking for hardware.

2. The sawn corners of extrusions can be very sharp. File these with a coarse metal file, and use insulated metal clips to secure the wiring bundles, and to hold them away from the metal edges, which could damage the insulation from vibration and movement in transportation.

All of ABC's Conventional Frames use sheet metal wireway covers for mounting the lamp sockets. These are wired open, and when the wireways are ready to be mounted, the frames have slots on one side into which one side of the wireway cover inserts. It is held by screws on the other side, thereby reducing the labor for drilling and fastening the wireway by half.

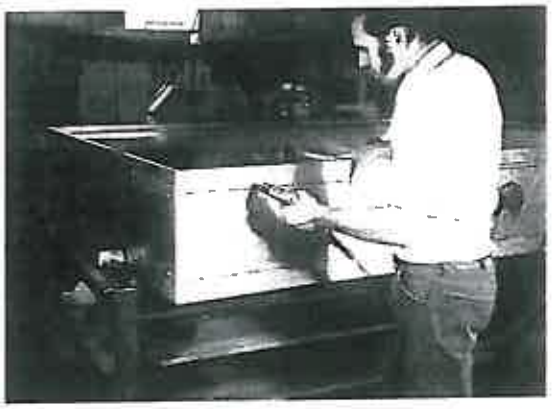


C. When the wiring of the ballasts and lamps sockets is completed, bundle the wires neatly. All ABC frames are designed to prevent any water from entering the bottom channel. But if there should ever be a failure of all the drainage system, it is a good idea to clip the bottom wire bundles to the sidewall of the frame, off the channel floor.

Install any waterproof service switches by cutting appropriate holes in the lower corner of the C-Cover or Conventional Frame. Photo Cells are installed in the same manner.

STEP 9 - FINAL ASSEMBLY

After the wiring is completed, the sign is ready for the final assembly of the Retainers, and for the Access Frames, the Covers. All the screw holes have been drilled as the work began, and the loose parts have been marked for quick re-orientation to their proper places on the frame.



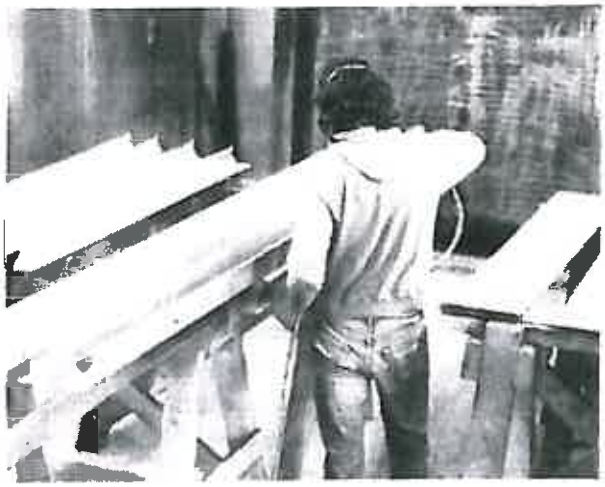
Using #7 metal screws and the air-driver, mount the retainers. Start by putting the center screw in each Retainer. Then for larger Retainers, use the #10 metal screws at each end, and pull the mitered Retainer faces together as described earlier. Remember the trick of breaking a slight crimp across the #10 screw hole on the Retainer if the fit is not perfect at first.

For the Access Frames, screw the Covers on, and remove the sharp edges by filing the sharp edges across each corner of the Retainers and Covers. Place the flashing pieces on the Covers, and the sign frame is finished, ready to be painted or if to be left mill finish, to be cleaned, and then to have the faces installed.

STEP 10 - PAINTING THE ALUMINUM FRAME

If the frame is not to be left unfinished, (mill finish) the most important part of painting aluminum is to be certain the frame is properly cleaned with an aluminum metal prep or clean lacquer thinner. **Be certain rags are completely clean. Do not buy shop rags which are used in garages or other shops where oil or chemical residue can contaminate the rags, even after being laundered.**

Next, prime the frame with an approved and proven aluminum primer. It should be applied immediately after cleaning the frame, as aluminum will oxidize very rapidly, and if left for long after cleaning, the oxide may prevent proper penetration of the primer into the metal.



One of the best features of the Access Frames is that the frame itself is never painted, **and is never transported into the paint booth.** Only the Retainers and Covers need to be painted, and they are usually painted separately. For flexible faces, they are mounted to the sign after the faces are installed.

At JBC, we are currently using DuPont Variprime, which has an activator thinner, and a pot

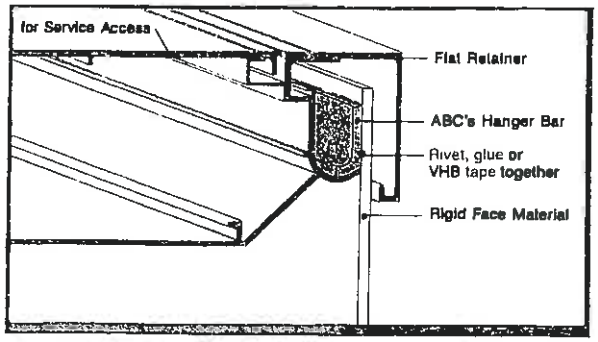
life of about eight hours. These primers, with active ingredients, actually etch the aluminum to give proper adhesion for the finish coat. We also use DuPont Centari for normal finishes, or DuPont Imron polyurethane for extended life finishes.

Whatever brand of paints a shop may prefer, it is advisable to use their whole system for finishing aluminum, for to use one brand of primer with another brand of paint will no doubt void any warranty from the manufacturer.

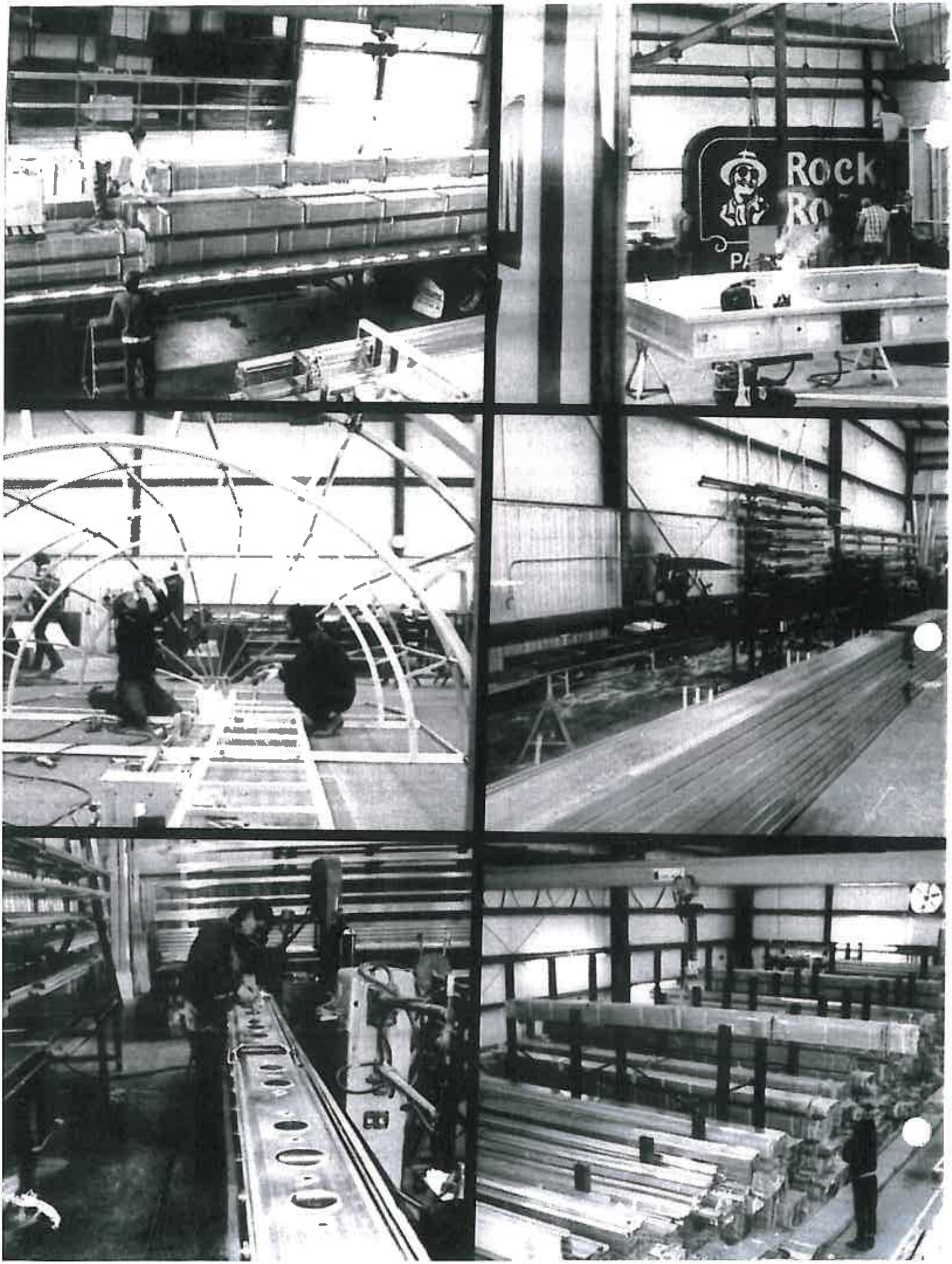
SECTION 11 - INSTALLING RIGID PLASTIC FACES

Acrylic or polycarbonate faces should always be suspended from the top margin, with a cemented or riveted hanger bar on the face. ABC recommends the use of their extruded modified acrylic hanger bar which can be cemented or riveted. It comes in 16′ lengths, and is made especially to fit our curved saddle hanger bar on the Access frame, although it can also be used on any other hanger bar rail.

If a shop makes its own hanger bar strips, they should be applied in one **continuous** piece, by laminating strips with offset joints, so that there is no interruption in the cemented hanger bar. If an open joint is left in the hanger strip, and the hanger bar rail to which the face is hung is the least bit uneven, the face will eventually crack at the joint. That is why our extruded hanger bar, in one piece up to 16′ long, is recommended for rigid plastic face installation.



Also, be certain to leave adequate expansion and contraction room in the Retainers when trimming the faces to their final size. Acrylic will expand and contract 1/16″ per foot plus and minus in extreme temperatures, and this must be considered when selecting the proper frame and Retainer type for any given size sign. All ABC Retainers have been engineered to withstand hurricane wind forces without bending outwardly.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