ALEC V. LORETTO

Make Your Own Recorder in C at a–440Hz

PLEASE STUDY THE PLANS AND READ ALL INSTRUCTIONS BEFORE STARTING ON THE INSTRUMENT

Introduction

IT IS ASSUMED that those attempting to make the recorder detailed below possess basic woodworking skills — how to use a saw, how to sharpen a chisel etc. It is further assumed that simple plans can be read. And understood!

The Instrument

In the middle '70s, using the 'Dordrecht' Recorder in The Hague and pictures from Medieval times, I designed a cylindrically bored recorder to play two octaves. Many makers produced instruments from these plans, some using them with their students on recorder making courses. It was a simple matter to find the cross sectional area of the cylindrically bored recorder, then convert it to an instrument of square cross section with walls 4mm thick.

Construction Details

Select suitable straight grained pieces of wood that finish smoothly from plane and sandpaper — maple, beech, sycamore for example. To obtain an accurate surface on the sides of the instrument, it helps if the Top & Bottom Covers are left fractionally wider — say 21mm, rather than their finished size of 20.5mm. When the Covers and Sides are assembled, it is an easy matter to sandpaper the sides smooth. Assembly is made easy by very accurately preparing a piece of wood 350mm long and 12.5mm square. Rub candle grease onto the four sides (to prevent glue sticking to it) and use it as a core, around which the Covers and Sides are assembled. Run thin beads of glue along the surfaces to be glued, thinly spread the glue with an ice-cream stick, and place in position around the candle-greased core the Covers and Sides. Pressure can be applied using rubber bands, masking tape, clamps, etc. To ensure the glue is not adhering to the core, move it during the drying process a little this way and that, removing it completely once the glue is sufficiently dry. If glue has squeezed into the bore remove it before it hardens. Allow the glue to dry thoroughly, remove the rubber bands, masking tape or clamps and clean up the outside with sandpaper. Aim to have a smooth flat finish. The Top Cover requires most work. The sloping Labium should be very accurate, with clean, well finished flat surfaces, top and bottom. Take care with the Labium Edge! Avoid a knife like finish which will introduce a sort of edge tone into the sound. (Form a flautist's embouchure and direct the air stream onto a paper's edge — the sort of 'hissing edge tone' is easily heard.) The window size (or cut-up) of 3.4mm is very important. Too much will give strong low notes and difficult high ones. Too little — vice versa. The dimension given produces a good balance between top and bottom registers. Prepare the Windway Cap and Block. The grooves which form the windway should be very accurate, with a smooth, flat finish on all surfaces. Use files and sanding sticks to get good results. Note that the block should be a snug fit and stay comfortably in position without wedges or glue. The beak can now be roughly shaped — leave final finishing until later. Use a coping or fret saw, to obtain a beak shape pleasing to the eye and to the mouth.

Initial Voicing of the Recorder

The next job is to produce the instrument's lowest tone — a strong, clear, and well focused sound. This calls for patient work with a quiet and gentle brain. If the 'monkey in the brain' is busy talking about life's problems (mortgage, car repairs, wife, husband, girlfriend, boyfriend, children, money, politicians etc etc) it's better to go for a walk or have a cup of tea, anything to settle into a peaceful state of mind! Inspect carefully the three diagrams entitled Recorder Voicing. Avoid the crisp right angled edges; likewise the carefully radiused edges both of which introduce turbulence into the sheet of air leaving the windway's south end. This turbulence is magnified in the recorder's resonating parts producing a 'foggy' sound very much like when droplets of condensation form in the windway. Early recorder makers as well as early organ builders knew a great deal about chamfers. There was a time in my life when I thought I understood chamfers, but the more instruments I made the more I realised that I had a knowledge of chamfers but not as much understanding as I would have wished! However, certain points should be noted:–

a) chamfers should span the width of the windway, but no more — in this case 10mm
b) chamfers should be of constant angle and size across the width of the windway
c) chamfers should be flat, clean and smooth without any roughness whatsoever
d) ideally they should be cut with a razor sharp knife, but 1200 grit abrasive paper mounted on a rigid backing 10mm wide can be used
e) make the chamfers small at first with a flat say of half a millimetre
f) the chamfers included angle should be about 80 degrees — 40 degrees Block & Cap

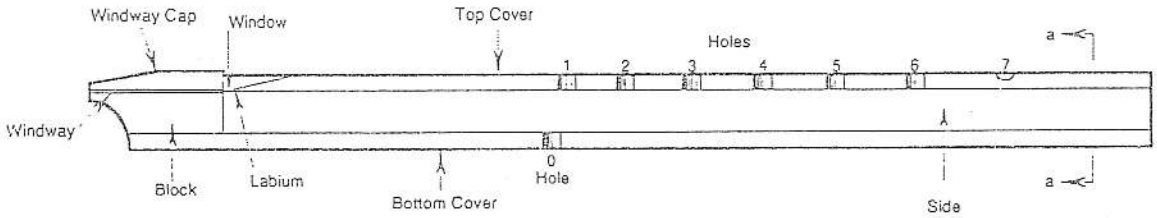
In the late 60s and early 70s I conducted many bench tests with large windways, labia, and adjustable chamfers using thin cotton and talcum powder to see what was happening. I reached the conclusion that suitable chamfers enabled the sheet of air leaving the windway to:–

1. maintain its width, in this case 10mm
2. take up a larger dimension than the distance from the windway floor (the Block) to the windway roof (the Cap), then travel across the window to the labium edge without it breaking up due to turbulence — see example 3.

Although the plan shows the Windway Cap glued in place, it can be held in position with four small diameter woodscrews, suitably positioned. This enables easy adjustment of the Windway Cap chamfer — usually called Top Chamfer. Likewise the Block can be removed to adjust its chamfer — usually

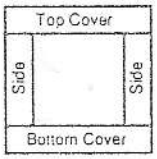
referred to as Block or Bottom Chamfer. When making chamfers it easy to go too far and remove too much wood. For this reason it is a good idea to make Windway Cap and Block about 1.5mm longer than the finished length which gives considerable opportunities to remove all evidence of unsuitable chamfers and start again! Much can be learned from close inspection of recorder chamfers on say, a descant (soprano) recorder. And even more can be teamed from simple trial and error. But however one learns, the aim is to produce a recorder with yet to be drilled tone holes, whose lowest tone is full, stable and focused. Chamfers too large will give healthy low notes but noisy upper notes. Chamfers too small will produce a sweet sounding instrument without a great deal of character that might lack stability and firmness. Don't be nervous! Be prepared to modify the size and angles of the chamfer. The initia voicing one gives to the recorder may wel have to be adjusted later on to produce good sound and response over the instrument's range. At this stage, with the instrument dry and at about 20 degree Celsius, the lowest tone should be C abou 6 cents sharp. The finger holes and undercutting will add to the effective size of the bore enabling the instrument t finish up at a–440Hz.

MEDIEVAL RECORDER in C (a — 440 Hz)



General View

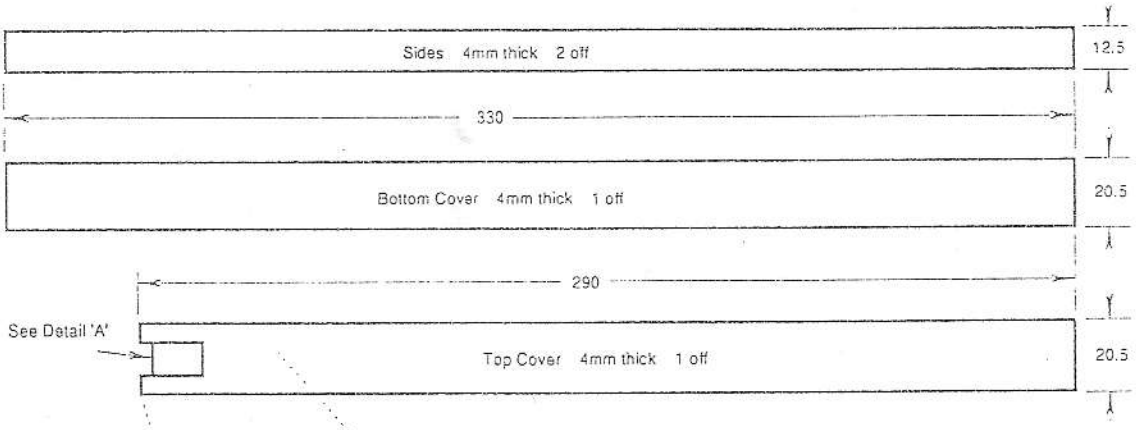
Showing the location of the various parts detailed in the drawings



Cross Section

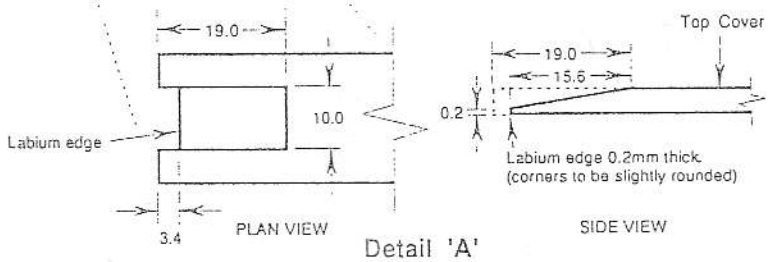
View a—a

(Prior to shaping)



Cover and Side Details

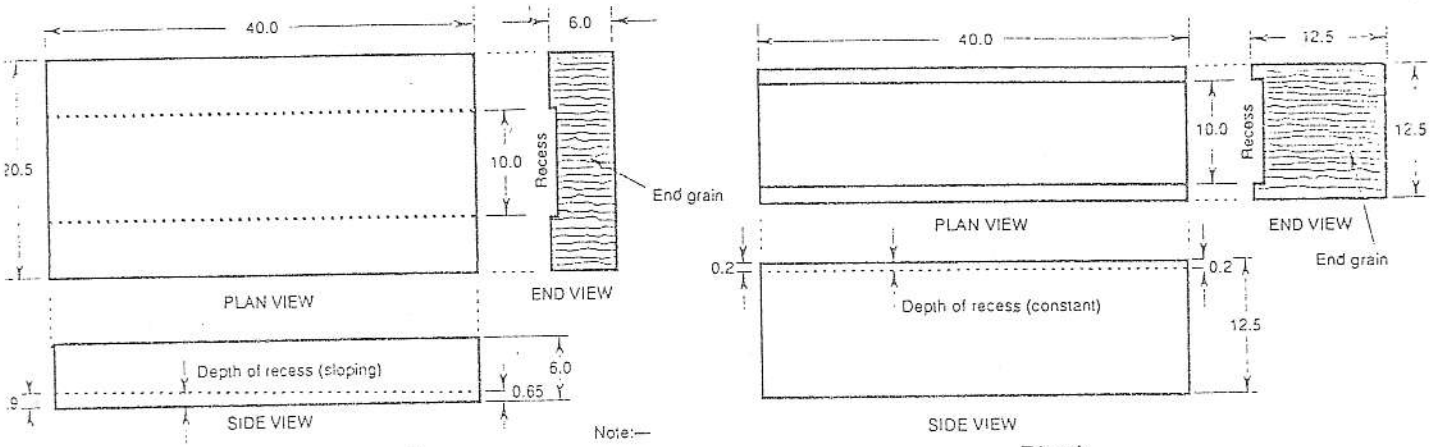
Dimensions in millimeters



Detail 'A'

Finger Holes

Carefully mark the thumb and finger hole positions. Inspect the plans to see where and how hole 7 is drilled. To prevent the drill splintering through into the bore, the candle greased core can be reinserted. If possible use good quality lip-and-spur wood drills. Hole 7 can be duplicated as it is on surviving originals, the unused hole being stopped with sealing wax, bees wax etc. Carefully shape where the finger stops hole 7 — an unsuitable scallop makes for problems. And to give the instrument a more comfortable feel, the Top Cover can be

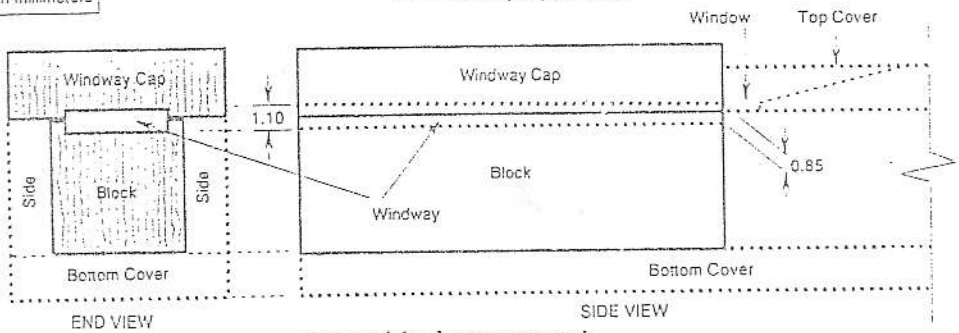


Windway Cap

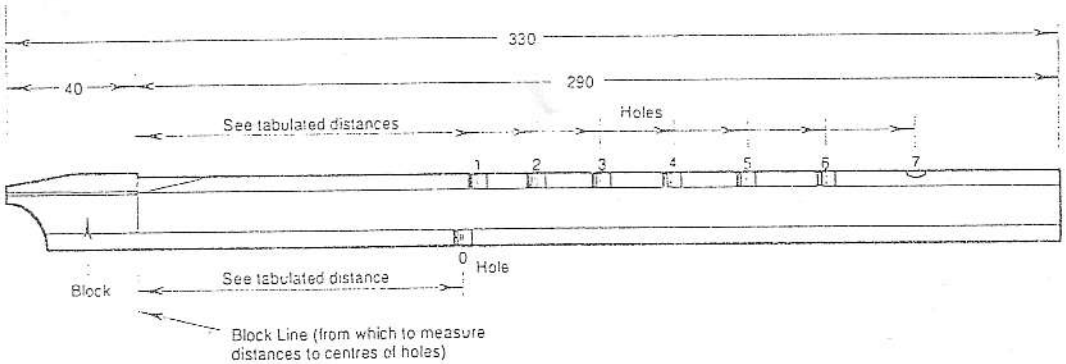
Block

Note:—
(i) Recesses shown exaggerated for clarity.
(ii) 'End grain' direction to be as shown in both Windway Cap and Block.

Dimensions in millimeters



Assembly Arrangement
(Windway exaggerated for clarity)



Hole No	0	1	2	3	4	5	6	7
Diameter	7.0	6.0	7.0	7.5	7.0	8.0	9.0	8.5
Distance	102	107	126	147	171	192	216	243

Placement and Sizes of Holes

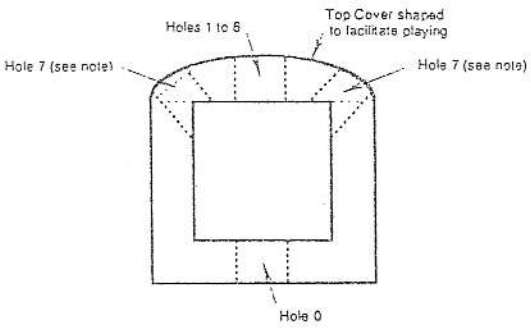
Dimensions in millimeters

rounded see the plans for details. Rounding the Bottom Cover is optional — either along its entire length or in the vicinity of the thumbhole. Avoid thinning the walls where the holes are drilled. Walls 4mm thick will give an instrument at a–440Hz. Appreciably thinner walls will give an instrument higher in pitch.

Finishing the Beak

Refer to the plans for suggestions concerning the shape of the beak. Finish it with sandpapers to give a smooth surface comfortable to the lips. If the extra 1.5mm was not required ensure that the north end of the beak is flush all round without, say, the Cap protruding past the Sides and Block.

The instrument is now ready for tuning, and how to do that will be covered in the next issue. In its present pre-tuned condition the instrument will play a little sharp, the undercutting of the holes increasing the bore size, thereby lowering slightly the pitch. Sealing the wood, both inside and out, will also be dealt with, as will a few suggestions to assist in understanding in what things are most affected when changes are made. And if you've had fun making this recorder future issues will include plans of an alto in F (a–440Hz) and Ganassi Recorders in a variety of sizes and pitches. May I take this opportunity to thank Peter Trenam of Fairlie (New Zealand) for his skill in producing the plans, and for his patience in dealing with me while I chopped and changed a variety of requests!

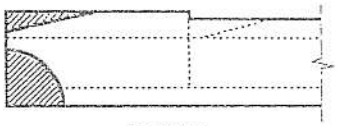


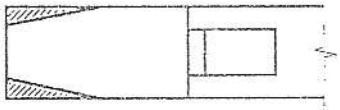
Top Cover Shaping etc.

Note re Hole No 7:— Only one required. Both may be drilled, but the one not in use should be plugged. (e.g. with beeswax or similar).

Hole No. 7 Detail

Showing surface 'scalloped' to suit finger





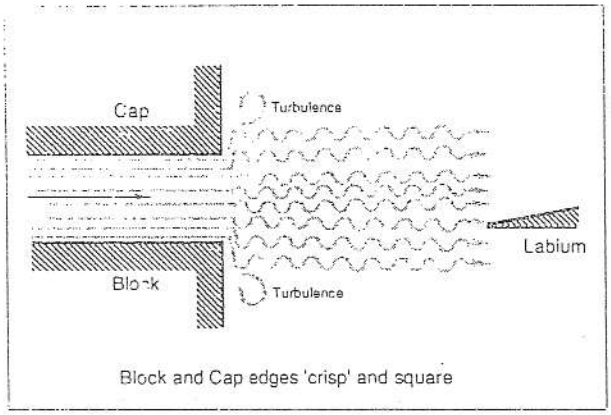
Beak Shaping

Remove shaded pieces

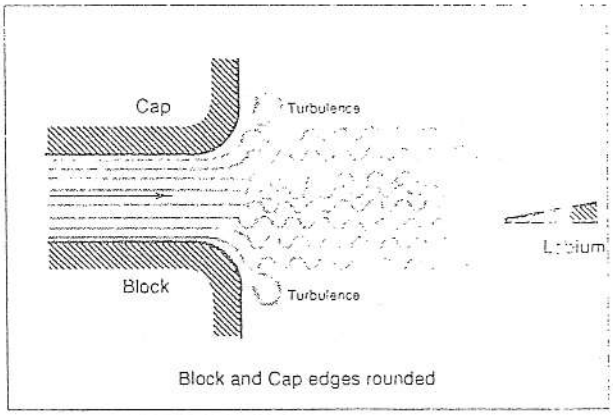
Medieval Recorder

Sheet 5 of 6

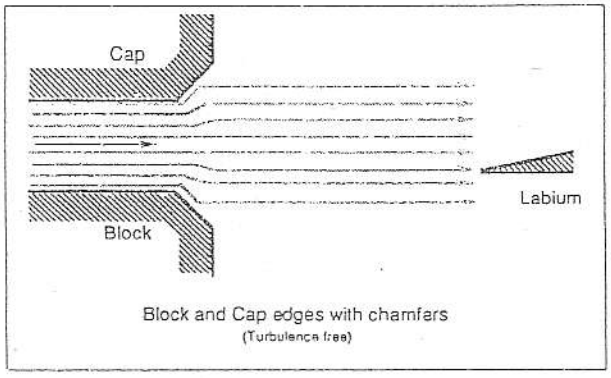
Miscellaneous Details



Block and Cap edges 'crisp' and square



Block and Cap edges rounded



Block and Cap edges with chamfers
(Turbulence free)

Medieval Recorder

Sheet 6 of 6

Voicing Details

ALEC LORETTO

MAKE YOUR OWN MEDIEVAL TREBLE RECORDER IN F

Those intending to make this recorder should refer to the 1996 September and December issues of *The Recorder Magazine*. The making and tuning instructions for the descant in C apply equally to this treble recorder in F. There are however a few matters requiring special mention.

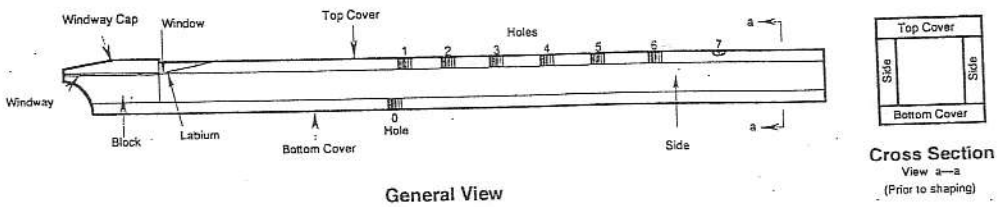
1] The square piece of wood around which the recorder is assembled should be sufficiently long and measure 16.8mm by 16.8mm.

2] **Window Size**. The height of the window [or *cut up* to use the organ maker's term] on this recorder can vary from 4mm to 4.8mm. The 4mm dimension will produce an instrument that has a firm but not powerful bottom register, combined with a clear yet strong upper register, over a range of two octaves. Increasing the window height will give a stronger lower register and limit the instrument's ability to produce easily the uppermost notes. At 4.8mm window height the recorder will play strongly and firmly over an octave and a fifth, with the remaining high notes being strong and unfocussed and maybe even impossible to obtain. Take your pick!

3] **Finger Holes**. The plan shows holes 1 through 6 centred on a straight line, with hole 7 offset to make easier the reach for the little finger of the right hand. If made in this manner the instrument can be most uncomfortable to play unless one has rather long fingers with a wide spread. To ease this problem it is possible to position the finger holes in more comfortable positions. To determine exactly where the holes should be placed for maximum comfort cut out small cardboard discs of the hole diameters and lightly glue them in position. Try fingering these discs, moving them East or West [but not North or South] until the most comfortable finger hole positions have been found. With a pin, prick through the cardboard discs to mark on the recorder's top exactly where the centres of the holes lie, then carefully drill them. Don't be alarmed if only one or two holes are in a centred position, with the remainder lying to the East or West of the centre line. As long as the holes are the correct distance from the south end of the block [that is, the correct distance from the Block Line] their East/West position does not affect the instrument's ability to be played in tune. The finger holes on all recorders made from this plan should have the same North/South positions, but it is very unlikely they will have the same East/West positions. These East/West adjustments are to cater for individually shaped hands, their particular finger lengths, and the most comfortable stretches they can manage.

Again, my thanks to Peter Trenam of Fairlie, New Zealand, for providing the drawings.

MEDIEVAL RECORDER in F (a—440 Hz)



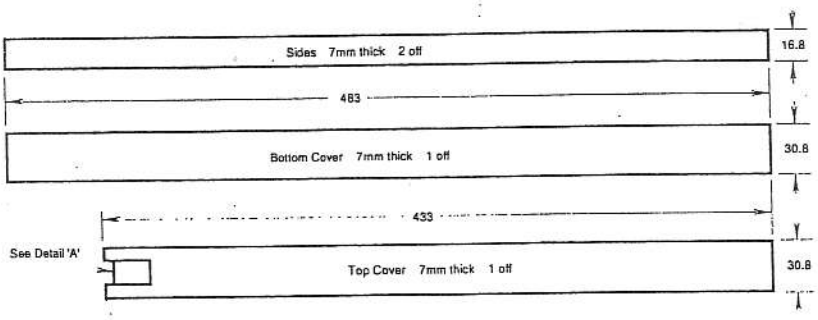
General View

Showing the location of the various parts detailed in the drawings

Cross Section

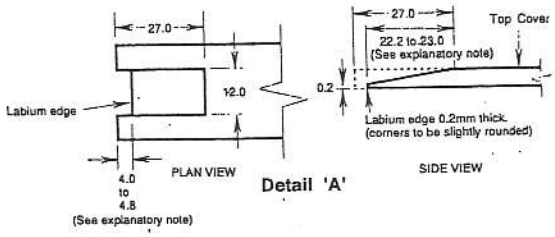
View a—a

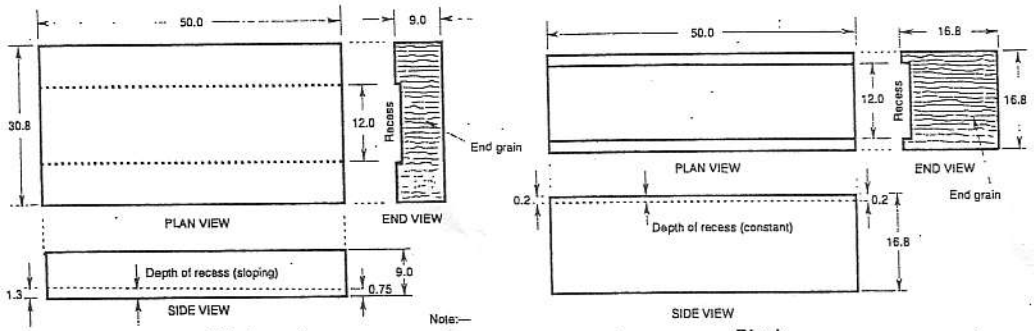
(Prior to shaping)



Cover and Side Details

Dimensions in millimeters





Note:—
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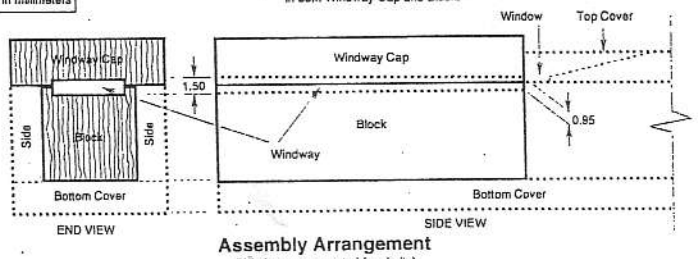
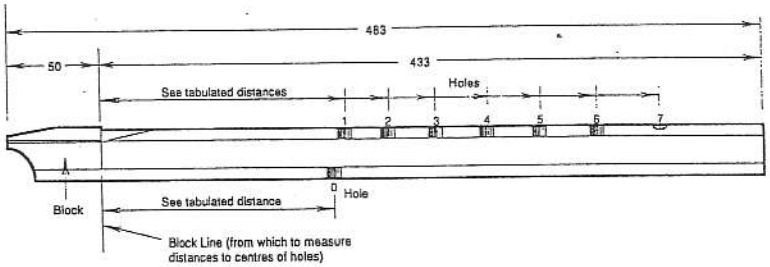
Dimensions in millimeters



Assembly Arrangement
(Windway exaggerated for clarity)



Hole No	0	1	2	3	4	5	6	7
Diameter	9.0	8.0	9.0	9.0	9.0	9.5	11.0	9.5
Distance	153	160	189	220	254	287	324	362

Placement and Sizes of Holes

Dimensions in millimeters