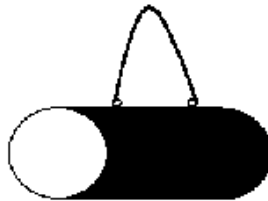


A study on the design, choice of material and technical options

Of
The Eritrean Highlanders

Drum
(koboro)



With the aim of making it:-

- lighter in weight
- comfortable to carry
- comfortable to beat
- produce good quality sound
- and with adjustable sound pitch

by

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Bilen Abay (age 11) beating the drum and displaying the pleasure instigated by the instrument



Driving motive to make the study

While most of us are keen for searching new ways of doing things (changes and improvements for the better) it looks the need to modify the drum has not attracted the attention of the artists or the amateur players of the instrument. It is important to mention that the drum is a very important tool in public festivities as it is in church services. One can safely say that the drum is one of the important instruments in the Eritrean world of music. Together with the hand clapping and wata (the traditional violin) the drum is one of the most important ingredients, without which the festivities can not be attractive and engaging. In the traditional wedding beating the drum nicely is not only essential but also sends a message to the bride and her family. The friends accompanying the bridegroom to his fiancée's home have to play the instruments and dance in a very presentable way because their performance shows the interest and affection they have to the bride.

Having said that, me as an observer (I am neither an artist nor a good beater of the drum), I feel modification of this instrument is long overdue. The wooden drums of the church need to use new materials as big trees are neither available nor allowed to log. The household drum made from metal barrels, which is available in the market is neither designed nor intended to be used as musical instrument but rather to transport oil.

It is therefore time to explore for new designs and materials. Designs and materials intended for the instrument so that the instrument produces qualitative service to the public. I am looking forward to see if this study will contribute to making changes to the quality and availability of the Eritrean drum.



A pair players of the traditional drum. source unknown

History of the traditional drum

The drum is perhaps the oldest musical instrument in the world, with every society employing it in varying degrees. However, it is most revered among the people of Africa, where it comes in various forms and fulfills various functions. The drum is the most important musical instrument in Africa. The traditional drum is an animal-skin covered musical instrument, shaped like a large goblet and some of them made to be played with bare hands while others with two short sticks. The drum was a heartbeat of daily life among many indigenous cultures, including the native peoples of the African continent. The many different variations of the traditional drums were used for daily needs and for ceremony, religion and special events. Legend and folklore accompanied the drums and their role among the many tribes of Africa.

In Eritrea the drum in its present form is believed to have emerged with the coming of christianity in the middle of the 4th century. The history of Eritrean drum, just like other drums, centers on expression, communication and dance. the drum was used at ceremonies to pay homage to the Creator and the ancestors, to herald the home-going of a loved one, to spark courtships, to announce marriages and births, to accompany religious rites and initiation rituals, to herald political and social events, the onset of war, the triumph of battle, to announce emergency gatherings and more.

The drum has rather a very long history in Eritrea. For many centuries it has been used as the main tool of the priests in their church rituals and services. In all their services the priests are accompanied by songs and dances where the drum plays the most important part of the ritual. Other instruments used in the different services are simbals, fluets and mesenko. The drum is built out of a mahagony type tree stem. It is easy to curve the inner part so a wooden pipe with about two centimeter thickness is prepared. The length of the pipe varies with an average length of 47 cm. The diameter of the pipe also varies depending on the size (cross-section) of the tree they find at the time they made them. The diameter on one end of the pipe is greater than on the other end. Both ends of the wooden pipe is covered with tightly stretched fresh animal skin and tighed to each other. After the skin has dried there is no way of tightning it again so the builders make sure that it is tighed tight enough. Such drums produced good sound but not very high. It is essential to worm the drums in the open sun shine a few days before the intended date of use.

The oil metal barrel started to be used as a drum shell when Italia colonized Eritrea in 1885. Starting from that time metal barrels filled with motor oil or cooking oil started to be available everywhere.

Empty barrels were simply thrown and easily available for making a drum. The normal size was between 15 and 20 liters. It easily replaced the wooden pipe and even today that is the material used for the household drums. The one advantage of introducing this material was that the trees were somewhat spared from logging for the purpose of making a drum. But the church continued to use the wooden drums until today. The reason could be that the churches have big trees of their own.

Construction material of the traditional drum

a. Church drums

The construction of the Eritrean drum is deceptively simple, as there are only two stages: wood carving and the placement of animal-skin heads. All is done by hand.

Wood is hollowed and carved into the desired shape. Traditional drums are made from various mahogany woods. In the past it is believed that a drum made from a single piece of wood has the best quality but today drum makers can create drums from several pieces due to environmental concerns and strict deforestation regulations. Creating the drum from several pieces also allows for a combination of woods, which delivers different tonal qualities.

The traditional drum is made from a single piece of wood and carved into the shape of a goblet that is hollow throughout with a skin covering over the top. The drum is played with bare hands. Oxen and cow skins are the most suitable for covering the playing surface of the drum due to the perfect climatic and grazing conditions in the tropics. It is also thicker and tougher and impacts greatly on the quality of the sound. The skins therefore undoubtedly provide the very best sound.

b. Household drums

As the metal barrels that drums are built from now are not originally intended for that purpose but for the supply of motor oil or cooking oil, the dimension is not and cannot be the most suitable for a drum. The use of empty metal barrels is still continuing. They were and still are converting ready-made metal barrels for a drum. Any drum one sees in Eritrea or used by Eritreans overseas one would always see markings from the original supply like MOBILE OIL 15 litres or AGIP OIL 10 litres. Besides the players of the drum have to beat it hard to produce sufficient sound for the song in play. There often happens unpleasant experience by the drummer when he/she discovers pain and injury to their hands. Another disadvantage is that if and when the stretched animal skin covering the pipe head becomes loose there is no way of tightening it up again.

Shape

Drums can appear in a wide variety of shapes and sizes. Some of these shapes include cylindrical or semi-cylindrical. The Eritrean drums used in the churches are big in size and have a bowl shaped top. All drums have frames usually round shaped that is fitted over the drum to keep the head in proper place. Often designs are made in the frame that coincides with the design of the rest of the drum to enhance its appearance for different purposes and occasions. This all depends on the artist who constructs it. The shell almost invariably has a circular opening over which the drumhead is stretched, but the shape of the remainder of the shell varies widely. In musical tradition the most usual shape is a cylinder, although some drums use bowl-shaped shells. Other shapes include a goblet shaped frame design.

Drums with cylindrical shells can be open at one end or can have two drum heads. Single-headed drums normally consist of a skin which is stretched over an enclosed space, or over one of the ends of a hollow vessel. Drums with two heads covering both ends of a cylindrical shell often have a small hole somewhat halfway between the two heads. The shell forms a resounding chamber for the resulting sound.

Placing the Head

Once the shell has been hollowed and carved, the outside is sanded and finished. An animal skin is then stretched over the top to form the drum head. Heads are typically made of cow or goat skin of varying thickness, each enhancing different frequency ranges and attack qualities. The heads are pulled taut by the tightening of a rope laced from the heads to the drum body or to another head, depending on the drum. The rope used to make the drum should be strong and non-stretching.

Traditional drums use only rope to secure the skin, but modern ones may feature a set of two metal rings through which the skin is clamped, the outer of which has loops for the rope. The rope is laced through the loops and strung to a third metal ring with loops placed lower on the drum. All drums made from metal barrel are double-sided which means the drums feature a head on both ends. These heads are stung together by rope that spans from one head to the other. These drums can be played by both the hands or by using wooden sticks.

Size

Traditional drum makers determined the size not by pre-selected specifications but by the diameter of the tree that has become available to them. It is for that reason drums of the same size are seldom found. Of course for finding the best diameter, one must know that bigger is not always better. A too large drum will give powerful bass, but there will be lots of overtones in the

sound and the slap will have lots of ringing in them. The best is to try a good combination of material and size to fit ones preference.

Tune

The traditional church drums and the nowadays common metal barrel drums are untunable but placing them in warm room prior to their use makes them produce higher sound when they are beaten. The heat makes a difference only on the skin by expanding it and making it tighter. There is no other techniques to make them produce good sound. Drums are the world's oldest musical instruments, and the basic design has remained virtually unchanged for thousands of years.

Sound of a drum

Several factors determine the sound a drum produces, including the type, shape and construction of the drum shell, the type of drum heads it has, and the tension of these drumheads. Different drum sounds have different uses in music. A drum player may prefer drums that are loud, dry and low-pitched. Since these drum beaters want different sounds, their drums will be constructed a little differently.

The drum head has the most effect on how a drum sounds. Each type of drum head serves its own musical purpose and has its own unique sound. The second biggest factor affecting the sound produced by a drum is the tension at which the drum head is held against the shell of the drum. When the hoop is placed around the drum head and shell and tightened down with tension rods, the tension of the head can be adjusted. When the tension is increased, the amplitude of the sound is reduced and the frequency is increased, making the pitch higher and the volume lower.

The type of shell also affects the sound of a drum. Because the vibrations stay longer in the shell of the drum, the shell can be used to increase the volume and to manipulate the type of sound produced. The larger the diameter of the shell, the lower the pitch. The larger the depth of the drum, the louder the volume. Shell thickness also determines the volume of drums. Thicker shells produce louder drums. Today all types of music make use of drums to keep a rhythm to music from country music and folk music, to pop music or jazz, a drum set is prominent.

Types of Drums

A drum is any sound producing instrument where a "membrane" is draped tightly onto a circular shell of some type. The membrane is then struck to create sound. There are multiple types of drums, and they are named primarily by their shape. Many cultures around the world use these

instruments for rituals or entertainment, and one type of drum is usually popular in a certain part of the world.

Cylindrical Drums

There are two basic types of cylindrical drums. A frame drum has a circumference wider than the height or depth of its shell and is usually small enough to hold in one hand. The tambourine is a type of frame drum, and most drums in a rock band set are this type. A long drum is taller or deeper than its circumference length; these drums can be extremely large, sometimes made from whole tree trunks.

Barrel Drums

A barrel drum is so called because it is shaped like a barrel, meaning it is actually wider in the middle than it is on the top or bottom. These drums, which often have a membrane head on the top only, are popular in Asian countries.

Goblet Drums

Goblet drums are shaped the exact opposite of barrel drums. The drum itself is narrower in the middle than it is on top or bottom, much like the drinking cup it is named after. The top and bottom of the drum usually have different circumferences, with the top usually wider. These drums are mostly seen in the Middle East, Eastern Europe and North Africa.

Waisted Drums

Waisted drums are similar to goblet drums, except that the top and bottom have the same circumference; they can also be called hourglass drums. These drumheads are usually connected to each other by multiple thick laces, and these laces can be grabbed and squeezed while playing, which will change the drum's pitch. These drums are mostly found in Korea and West Africa.

Other types include the water drums, ngo ma drums, Kutiro and more.

Need for change

Both types of drums available in Eritrea today remain unchanged since their introduction in our country. The wooden church drum is centuries old and the household metal drum about 130 years old. There are two good reasons for making a change. For the wooden church drum big trees are not available nor is it allowed to log trees. For the household metal drum, the material and the dimension is not designed or intended for musical instrument so it has to be replaced by material and design that produces good sound and with possibilities to adjust the volume.

After spending some time looking at the design, material used and quality of sound of several drums around the world I have come to the conclusion on which design and what material the new drum should be constructed of. From existing drums in Africa, Asia and Latin America (the ones I had the opportunity to see or test) the one that fits best to the Eritrean condition, sound wise, weight wise and material wise is the Yak Bereya drum from Sri Lanka. It needs some modification with the positioning of the head rings otherwise the shell can easily be assembled, glued, drum head covered and the strap, the rope and rings installed. with the help of a carpenter. It is light to carry and comfortable to beat. The sound it produces is good and the volume adjustable. I have 6 drums with me now and they have been tested for about a year on different occasions in Eritrean wedding festivities.

Construction materials of the new drum

The Eritrean drum is one of the few drums that is fully mobile. It is hang on the shoulder of the player all the time and beaten by bare hands. The shoulder strap of the drum is hung over the shoulder and positioned at approximate height of the players breast. The flat skin head cover of the drum can easily be reached with both hands. While the right hand is the main beater of the rythem, the left hand is employed to make the auxiliary rythem with a lower pitch. The sound is controlled by applying pressure on the strings.

To construct a drum all one needs is wood, tanned leather of animal skin, rope and rings. Specification of the new drum:-

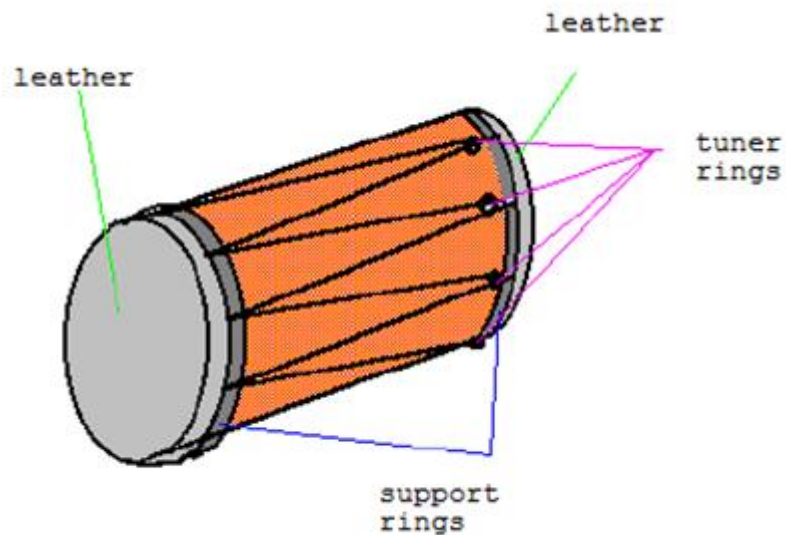
1. Wooden cylinder of 42 cm length. Outer diameter 26 cm and inner diameter 24 cm.
2. 2 wooden rings of 29 cm diameter and inner diameter of 28 cm (can be replaced by iron rings)
3. 2 tanned leather of animal hide each 50 cm in diameter
4. 8 meters long rope
5. 9 iron rings of 2 cm in diameter

Drawings and specification of the new drum

On modern drums, the drumhead is placed over the opening of the drum, which in turn is held onto the shell by a rim, which is then held by means of a number of tuning screws or tension rods which screw into lugs placed evenly around the circumference. The head's tension can be adjusted by loosening or tightening the rods. Many such drums have six to ten tension rods. The

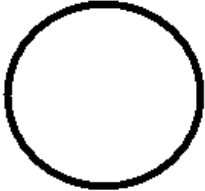
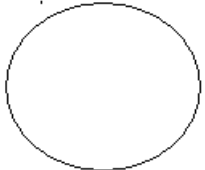
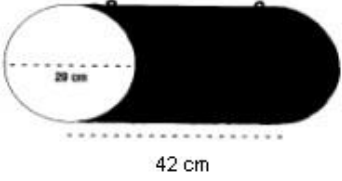



sound of a drum depends on several variables, including shape, size and thickness of its shell, materials from which the shell was made, type of drumhead used and tension applied to it, position of the drum, location, and the velocity and angle in which it is struck.

Unlike the traditional drum this new drum uses tanned leather. The owner of the drum can easily remove the tanned leather from the drum and keep it in a drawer. It would take about 3 minutes to dismantle or reassemble the leather to the drum.

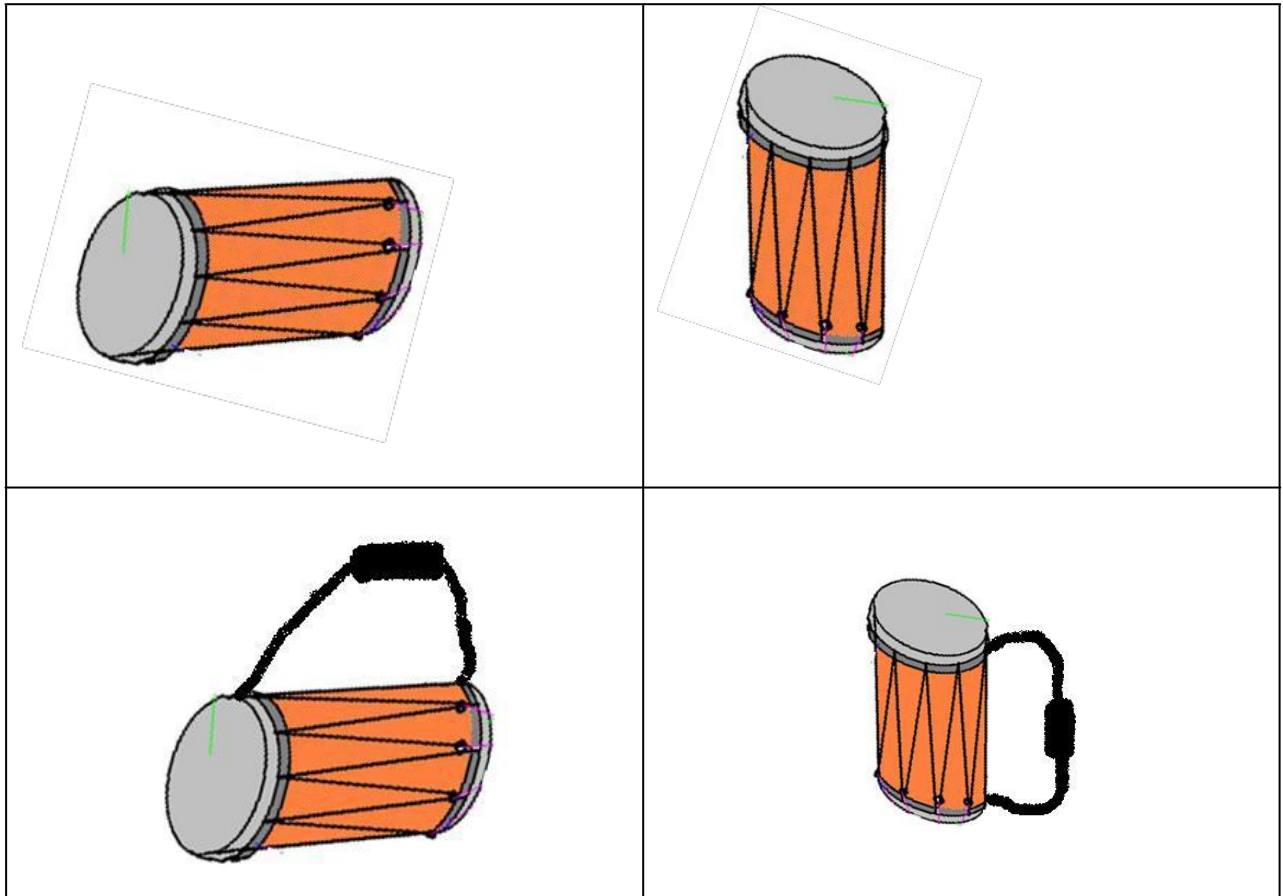


There are 9 holes just next to the inner edge of the support ring on the leather and there are also tuner rings around the wooden casing of the drum through which the tension ropes pass tied to the support rings on both heads of the drum.

Material dimension

	<p>Drum head measurement</p> <p>Outer diameter of 26 cm Inner diameter of 24 cm</p>
	<p>Two wooden rings measurement</p> <p>Outer diameter of 29 cm Inner diameter of 28 cm</p>
	<p>Wooden cylinder measurement</p> <p>42 cm length</p>
	<p>2 tanned leather of animal hides</p> <p>50 cm diameter each</p>
	<p>Drum tension rope</p> <p>A total of 8 meters length</p>
	<p>9 iron rings</p> <p>Each of 2 cm diameter</p>

Photographs of the new drum



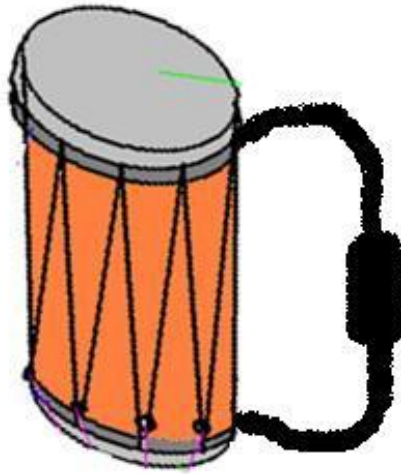
Internet link to listen the drum sound

http://www.info.lk/srilanka/sightsandsoundsofsrilanka/srilankanmusicandsounds/srilankandrums/yak_beraya.htm



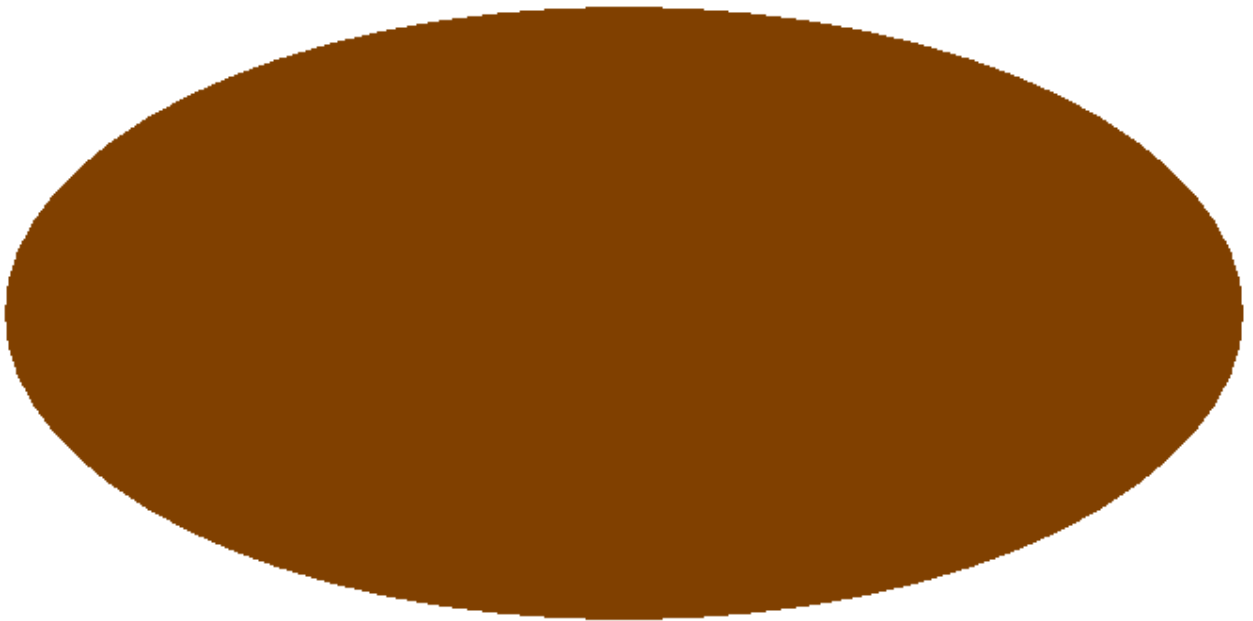
Sound pitch adjustment possibilities of the new drum

The new drum is tunable. One of the most important factor affecting the sound produced by a drum is the tension at which the drum head is held against the shell of the drum or against the other head. When the hoop is placed around the drumhead and shell and tightened down by tensioning the rods, the tension of the head can be adjusted. In the new drum the drumheads are connected to each other by multiple thick laces, and these laces can be grabbed and squeezed while playing, which will change the drum's pitch. In other words the sound is controlled by applying pressure on the strings.

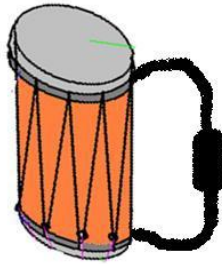


There are 18 tension ropes. The two adjacent ropes pass through one of the 9 metal rings tied to the support rings on both heads of the drum. For the drawings and specifications look at page 11 and 12. Obviously the sound of a drum depends on several variables but adjustment to the wanted pitch by the drum player can be done by moving the metal rings up and down. Another possibility we got the opportunity to test is by taping a microphone head on the body of the shell and wirelessly linking it to electronic amplifiers.

Illustration of drum players





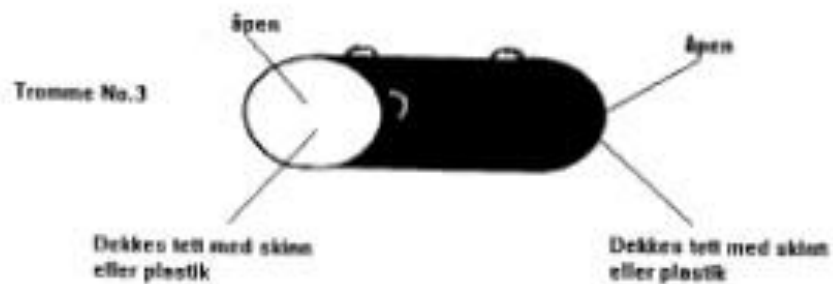


Tests on the following drums with different designs, materials and dimensions were made but without satisfactory results.

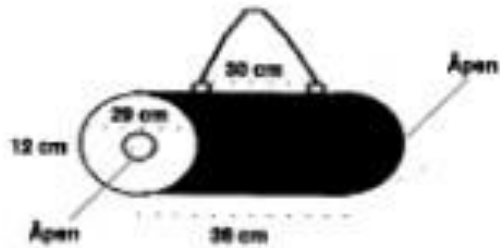
variable tests of sound, material, design and dimensions

test locations:-

Rogaland musikkonservatorium, Bjergstad
Rogaland Sang og Musikkråd, Sandvigå 27
Sandnes Musikkole, Langgt. 74



Drum No. 1

**Material (pipe)**

Aluminium sheet

Material (ring)

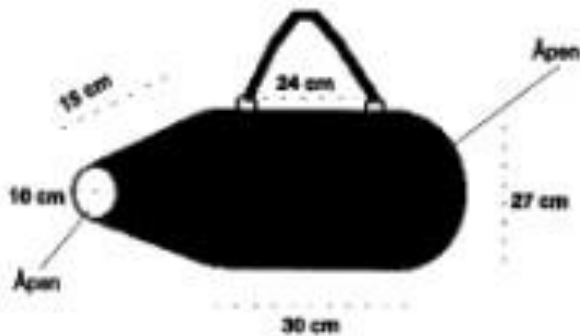
Metal

2 inner rings on both edges
 1 inner ring in the middle if necc.

Dimension

pipe length = 38 cm
 pipe diameter = 28 cm
 hole diameter = 12 cm
 distance between bells = 30 cm
 pipe sheet thickness =
 edge rings thickness =
 middle ring thickness =
 hole ring thickness =

Drum No. 2

**Material (pipe)**

Aluminium sheet

Material (ring)

Metal

2 inner rings on both edges
 1 inner ring for the small hole

Dimension

See diagram of drum No. 2
 pipe and ring sheet thickness
 should be the same as in Drum No. 1

Drum types in different regions of the world



various types of African drum



Talking drums from Ghana



Varaity of Caribbean drums



Cuba's bongo drum



South Africa's Kpanlogo



Traditional Japanese



Japanese daikos



Chinese



Sri Lankan



Latin American - Cuica



Latin American - Kongas



Turkey's engraved copper drum



Latin America - Bongos



Latin America - Pandeiro



Latin America - Pentetonic steel drum



Tabla drums from India



North African drum



Egyptian drum



Sudanese war drum



Australian tambourines



Burmese drum