A CLASSIFICATION SYSTEM FOR DRAWN GLASS BEADS

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INTRODUCTION

A number of classification systems have been developed for glass beads over the years with Beck (1928), Karklins (1985), Kidd and Kidd (1970), Ross (1976) and Stone (1974) being among the most noteworthy. Unfortunately, none of them is totally adequate for the task at hand. Some do not cover all the existing manufacturing categories, while others are based on flawed thinking or do not explain their typological categories or terminology in sufficient detail. Furthermore, few explain what minor bead attributes are significant and should be recorded. Part of a comprehensive classification system for glass beads being developed by members of the North American Glass and Ceramic Bead Classification System Workshop held at the 1994 SHA Conference on Historical and Underwater Archaeology, the typology for drawn glass beads presented herein is an attempt to correct the existing deficiency.

DRAWN BEAD MANUFACTURING TECHNIQUES

Before introducing the proposed classification system, potential users may find the following description of the drawn-bead manufacturing process of use. The techniques described below are those employed by European beadmakers during the past 400 years. However, it should be pointed out that similar methods (of unknown antiquity) are also utilized to produce beads in present-day India (Francis 1983: 196). For detailed and accurate contemporary descriptions of the European beadmaking process, *see* Anonymous (1835; 1987), Carroll (1917), J.P.B. (1856), Karklins (1990) and Karklins and Jordan (1990).

In the manufacture of drawn beads,[1] a tube up to 275 m in length was rapidly drawn out from a hollow gather of glass by two men (Carroll 1917: 7). Depending on what stylistic variation was required, the gather may have been 1) composed of several differently colored layers; 2) supplied with rods or lumps of colored glass to create stripes; 3) marvered or thrust into a mold to create a specific shape; and/or 4) twisted during the drawing process to impart a spiral effect. Starting in 1917, monochrome tubes were also produced using an automated process developed by Edward Danner of the Libbey Glass Company wherein molten glass flowing over a

metal mandrel was mechanically drawn out into a continuous tube (Douglas and Frank 1972: 46-51). Compressed air pumped from the end of the mandrel created the perforation. If the mandrel (which formed the perforation) was polyhedral, the perforation of the resultant tube was the same shape. This is the only characteristic that distinguishes "mandrel-drawn" beads from those produced using the older method.

When the tubes created by either process were sufficiently cool, they were broken into manageable lengths which were then sorted according to their diameter. If desired, enamel paint was sucked up into the tubes to color them internally. The tubes were subsequently chopped into bead lengths. In the early days this was accomplished by placing them on a sharp broad chisel set in a bench or block of wood and striking them with another similar blade. About 1822, a mechanical tube-cutting machine was developed which greatly increased the speed and efficiency of this task (Karklins 1990: 72).

The resultant tube sections were either left unaltered, except for the possible grinding of facets, or their broken ends were heat rounded. Prior to 1817, this was accomplished by placing the segments (generally under about 6 mm in diameter) in a copper pan with sand or ground charcoal (Karklins 1990: 73) or a mixture of sand and ash (Karklins and Jordan 1990: 6) and then putting the pan in a furnace. The contents were continually stirred with a hoe-like tool until the tube segments became sufficiently rounded. A contemporary method for rounding larger beads involved the use of a spear-like tool (*a speo*)(Gasparetto 1958:186) or a large fork-like instrument with sturdy iron wires protruding from a metal handle (e.g., Ross 1989:85, fig. C). The tube segments were slipped onto the wires so that they did not touch and the tool was revolved in a furnace, rounding the tubes.

A much more efficient process for rounding beads came into use in 1817. It involved mixing the rough beads with lime and charcoal to plug the holes and then placing the tube segments in a metal drum containing sand occasionally mixed with charcoal dust (Karklins 1990: 72). The drum was then placed in a furnace at an angle and rotated at a slow speed, a technique commonly referred to as "tumbling." In this and the pan method, the heat and agitation rounded the broken ends while the various packing mixtures kept the beads from sticking together and prevented their perforations from collapsing as the glass became viscid. Depending on the temperature and the amount of time that the tube segments were heat treated, they might range from practically unaltered tube segments to practically globular.

After cooling, the beads were cleaned and then sized by passing them through a series of graduated screens. They were generally then polished and strung in bunches or packaged loose for the world market. However, during the 17th century, certain beads were subsequently turned over to lampworkers who reheated each of the beads and applied insets ("flush-eye" beads) or trailed decoration (e.g., "Roman"

beads). Others were heated and pressed with a tool to flatten them.

Drawn beads exhibit certain characteristics. They may consist of unaltered tube segments (generally known as "bugles") with uneven broken ends. Bubbles in the glass and striae on the surface, if present, are oriented parallel to the axis of the perforation. The perforation is usually parallel sided and has a smooth surface. Beads rounded using the spit method sometimes exhibit a slight projection at one end or a scar where two beads had fused but were later broken apart. Two drawn beads fused end to end with their perforations perfectly aligned also indicate spit rounding.

CLASSIFYING DRAWN GLASS BEADS

The system presented herein is loosely based on that developed for drawn beads by Kenneth and Martha Kidd (1970) as expanded by Karklins (1985). It is designed to allow a researcher to analyze his or her beads in a logical manner with a minimum of guesswork and a high degree of information retrieval. Beads can reveal much about how they were made and when if only we will take the time to properly examine and record them.

In this system, drawn beads are classified (in descending order of importance) on the basis of their 1) manufacturing sub-group; 2) structure (single layered vs. multi-layered) and the presence or absence of heat rounding; 3) form (body cross section, and whether the body is straight or twisted); 4) type of coloration (pigment in the glass, enamel paint on the perforation surface, or gilt or paint on the surface); and 5) type of decoration. These attributes are coded and allow like beads to be grouped together.

Three other sets of non-coded attributes (shape; diaphaneity and color of the bead and its decorative elements; and number, shape and location of cut facets, if any) determine the variety. There are also several other non-coded attributes that need to be recorded -- size, luster and patination among them.

1) Manufacturing Sub-group

The principal criterion for classifying beads is the manufacturing sub-group:

HD - Hand Drawn: This is the process used in Europe for the production of monochrome tubing until 1917, and for multi-layered and decorated tubing until the present day. Most, if not all, drawn beads found on North American sites of the pre-1917 period were made by hand drawing.

MD - Mandrel Drawn: Beads made by this process (post 1917) are always monochromatic, and generally indiscernible from hand-drawn beads except that their

perforations will be multi-sided if the mandrel was polyhedral.

UD - Unspecified Drawn: A generic sub-category to be used when it is uncertain which of the above two processes was employed.

(pmm) - Post-Manufacture Modification: The parenthetical letters **pmm** appended to one of the above codes identify a bead that has been modified by someone outside the factory or workshop, generally on this side of the Atlantic. This includes grinding a bead to remove its exterior layer(s) or modify its form, as well as burning, a process which frequently alters a bead's diaphaneity, color and shape.

2) Structure and Heat Rounding

The next step in classifying a bead is to ascertain its structure (single layered, smooth multilayered, or corrugated multilayered) and whether it has been heat rounded:

I - Non-heat-treated beads with monochrome bodies

II - Heat-treated beads with monochrome bodies

III - Non-heat-treated beads with multilayered bodies (layers are smooth)

IV - Heat-treated beads with multilayered bodies (layers are smooth)

V - Non-heat-treated beads with multilayered bodies (layers are corrugated)(the cores of some Group V beads are not corrugated; this should be noted)

VI - Heat-treated beads with multilayered bodies (layers are corrugated)(the cores of some Group VI beads are not corrugated; this should be noted)

3) Form

Next, determine the bead's form. This is based on its cross-section and whether the tube was twisted during the drawing process:

A - Curvilinear beads (round or oblate cross-section) with straight bodies (Note: a curvilinear bead that is undecorated will always fall into this category)

AA - Curvilinear beads (round or oblate cross-section) with twisted bodies

B - Polyhedral beads with straight bodies (note cross-section shape)

BB - Polyhedral beads with twisted bodies (note cross-section shape)

C - Ribbed or ridged beads with straight bodies (provide rib/ridge count)

CC - Ribbed or ridged beads with twisted bodies (provide rib/ridge count)

4) Type of Coloration

How color was imparted to a bead determines its next code:

1 - Pigment present in the glass itself (also includes colorless beads)

2 - Enamel paint applied to the perforation surface (the color of the glass also needs to be recorded)

3 - Gilt or paint applied to the surface of a bead (the color of the body of the bead must also be recorded, if possible)

5) Type of Decoration

The type of decoration (or its absence) is the final codified item of information. The following categories may be combined as needed (e.g., 03/04.):

01 - Undecorated

02 - Simple stripes (monochrome)

03 - Compound stripes (multicolored)

04 - Insets (as in "flush eye" beads)

05 - Trailed decoration (as in "Roman" beads)

06 - Ground facets (specify location, shape and number in description)

NON-CODED ATTRIBUTES WHICH DETERMINE VARIETY

The three following sets of non-coded attributes (shape; diaphaneity and color of the bead and its decorative elements; and number, shape and location of cut facets, if any) determine the variety. This may be identified by appending a sequential number preceded by a dash to the end of the code defined by the codified attributes. Just keep in mind that the numbers are arbitrary and will vary from site to site.

1) Shape

Drawn beads come in a variety of shapes. Figure 1 illustrates and names the more common ones. Consult Beck (1928) for more obscure shapes. At times, a set of like beads will grade almost imperceptibly from one shape to another as, for example, from a short barrel through a standard barrel to a long barrel. In such cases identifying each shape as a variety is meaningless. Instead list the overall shape range followed by the shape which predominates, if any one does; e.g., short to long barrel (standard barrels predominate).

In certain cases, especially for tubular beads, it is useful to note if the walls of a bead are thin or thick in regard to the size of the perforation.

2) Diaphaneity and Color

The *diaphaneity* of a bead and its decorative elements, if any, is described using the terms opaque, translucent and transparent.

Opaque (op.) beads are impenetrable to light except on the thinnest edges

Translucent (tsl.) specimens transmit light but diffuse it so that an object (such as a pin in the perforation) viewed through them is indistinct

Transparent (tsp.) beads are such that a pin in the perforation is clearly visible

Sometimes diaphaneity will vary slightly in an otherwise like batch of beads. In such an instance, list the range (e.g., tsl./tsp.). As the presence of numerous tiny bubbles will effect the diaphaneity of a bead, their presence should be noted.

Colors should be designated using common descriptive names followed by the appropriate color code in the Munsell notation system (Munsell Color 1976). For those using either the *Color Harmony Manual* or the Inter-Society Color Council - National Bureau of Standards *Centroid Color Charts*, a list of recorded Munsell equivalents is provided in Karklins (1989).

Beads exhibiting lightly patinated surfaces should be moistened with water or saliva to reveal their true color. Those covered with a thick layer of patina need to be mechanically cleaned in a small area before being moistened.

The color of opaque beads must obviously be determined using reflected light. In the case of translucent and transparent beads, transmitted light should be used with the reflected color being noted if it varies significantly (e.g., transparent reddish purple or green beads which appear black unless held up to a strong light). If the glass is dichroic (i.e., it has a distinctive golden or opalescent cast), this should also be

noted. Record colors from the outside inward.

To properly determine the color of a bead, it should be mounted on the tip of a teasing needle and compared to the Munsell color (or other) chips against a neutral background in natural daylight or daylight-approximating fluorescent light. Incandescent lighting should be avoided as it imparts an orange hue to the glass.

To facilitate an ordered bead inventory, beads should be listed on the basis of their body color and decorative elements as arranged in the Munsell system. The neutral values (white, gray, black) come first, followed by red, yellowish red, yellow, greenish yellow, green, bluish green, blue, purplish blue, purple, and reddish purple.

3) Facets and Ground Beads

Facets were sometimes ground on beads, either in a pattern or randomly, either as decoration or to round sharp corners and edges. Their location, shape and number should be recorded. Be sure to differentiate between cut facets and original tube faces (on polyhedral beads) which were imparted by marvering or molding prior to the drawing process.

Related to faceting, beads (such as the very large globular and ellipsoidal chevrons) sometimes had their bodies ground to shape. If this can be determined, it should be noted.

OTHER NON-CODED ATTRIBUTES

The following attributes need to be recorded but will not affect variety designations:

1) Size

Minimally, the range of each variety's least diameter and length should be recorded to the nearest tenth of a millimeter using vernier calipers. Means and modes are not particularly meaningful unless the beads comprise a distinct size population. Ideally, the least diameter and length of each specimen should be recorded as this ratio relates to actual manufacturer's sizes. It should always be noted when measurements are of incomplete specimens as such data will be useless for identifying size populations. It is sometimes useful to discuss relative size groups within a collection. Terms such as small, medium and large may then be used but should be defined.

2) Patination and Luster

Beads are often patinated and this feature may sometimes be the only clue to its relative age. The color and degree of the patination should be noted. Researchers should keep in mind that the patina on beads may be thin yet have a yellowish tint that can change the color of, say, a bright blue bead to turquoise blue. Removing the patina from one or two specimens will usually reveal the true color.

Unpatinated beads will generally exhibit one the following types of luster. The two most common types are **shiny** (smooth and bright) and **dull** (not shiny). Other that may be encountered, especially on 19th- and 20th-century specimens, are **metallic** (having a metallic sheen), **iridized** (having an iridescent surface), **greasy** (having an oily appearance), **matte** (etched with acid) and **satiny** (characterized by a fibrous structure).

3) Tube-Sectioning Attributes

Most drawn tubing was sectioned by placing it on a sharp metal edge and then striking it with another sharp edge. This often leaves demicones of percussion as found on gunflints. However, long beads (such as those found on early sites in the Northeast) may have been formed by snapping a tube held in the hands. Beads formed in this manner will not exhibit demicones. Beads formed from thick stock (over about 1/2 in. in diameter) were frequently sectioned by using a diamond saw during the 19th and 20th centuries. Saw marks may be in evidence although they may have been obliterated by subsequent grinding.

4) Perforation Shape

As mentioned earlier, mandrel-drawn beads may have polyhedral perforations imparted by a polyhedral mandrel. The shape of the perforation, generally square or hexagonal, and intended to reflect light so that the beads sparkle, should be noted.

5) Casing

Beads made by the hand-drawn method were often cased in clear glass to increase their brilliance. This was frequently done for translucent grayish white and opaque Indian-red beads but apparently never for transparent blue, opaque black or opaque white beads. The presence of this layer, often microscopic, should be noted but does not qualify an otherwise monochrome bead for inclusion in one of the four multilayered categories described above (codes III-VI).

6) Old Versus New

Bead collections often contain relatively recent beads that, on paper, are identical to much earlier ones. Their shapes and sizes may be identical, only a bright

surface and more intense pigmentation reveal their newness. In such cases, segregate the two groups.

7) End Treatment

For tubular beads, note if the ends are unaltered breaks, slightly rounded or well rounded; or if they have been cut (sawn) or ground flat.

SAMPLE DRAWN BEAD DESCRIPTIONS

Sample descriptions of several drawn bead varieties are presented below:

HD.II.A.3.05-1. Long tube; gilded tsp. light gold (2.5Y 7/8) body decorated with a raised wavy thread of op. light gold (2.5Y 7/8) glass around either end; ends are well rounded; 1 specimen. Dimensions: 11.0 mm (L) x 3.5 mm (D).

HD.III.BB.1.03/06-1. Long tube (square sectioned), twisted; op. Indian red (10R 4/8) on tsl. yellowish green (10GY 6/6); decorated with 4 spiral stripes of tsp. bright navy blue (7.5PB 2/7) on op. white (N 9/0); cased in clear glass; ends broken; corners ground down; light grayish patina; 20 specimens. Dimensions: 9.5 mm (L) x 2.7 mm (D) - 15.2 mm (L) x 6.3 mm (D).

HD.VI.A.1.01-1. Standard barrel; chevron with 4 starry layers: 1) op. white (N 9/0) outer layer decorated with 8 tsp. dark navy blue (10B 2/4) and 8 op. Indian red (10R 4/8) stripes; 2) op. Indian red; 3) op. white; 4) thick op. Indian red core; dull surface; 3 specimens. Dimensions: 10.2 mm (L) x 10.5 mm (D) - 14.2 mm (L) x 13.7 mm (D).

MD.II.B.2.01-1. Short hexagonal barrel; colorless body; op. grayish blue (2.5PB 5/4) enamel on perforation surface; hexagonal perforation; shiny exterior surface; 1 specimen. Dimensions: 2.3 mm (L) x 2.6 mm (D).

ENDNOTES

1. Also known as tube, cane and hollow-cane beads, the term "drawn" is preferred as it refers to the production process rather than the form of the finished product.

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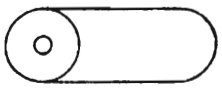
Figure 1. Common Drawn-Bead Shapes (Tubular forms).

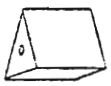
Length Designators:

short standard long very long

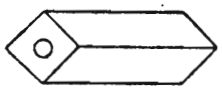
Shapes



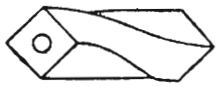
Round tube



Triangular tube

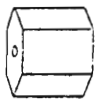


Square tube

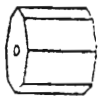


Twisted square tube

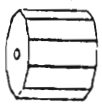
Alternating-twist tube (square sectioned)



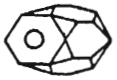
Hexagonal tube



Heptagonal tube



Octagonal tube



Cornerless-hexagonal tube
(also heptagonal and octagonal)

Multi-faceted hexagonal tube
(also heptagonal and octagonal)

Figure 1, contd. Common Drawn-Bead Shapes (Rounded forms).

Length Designators:

short

standard

long

Spheroid

Barrel

Ellipsoid

Slender ellipsoid

Waisted

Melon

Flat

Collared spheroid (or other applicable shape)