An Analysis of Glass Artifacts from the Chapel Complex Excavation at the Presidio of San Diego

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Abstract

Excavations of the Chapel Area Complex of the San Diego Presidio (CA-SDI-38) were conducted by San Diego State University from 1964 to 1976 under the direction of Dr. Paul H. Ezell (1976). This report describes the presidio occupation period glass artifacts recovered from that project and presents some ideas concerning the social status and cultural preferences of the population that deposited the items. The presidio period assemblage contained several pieces indicating that most of the glass was manufactured between 1820 and 1840 and therefore arrived in California as cargo aboard hide and tallow ships.

Categories of glass included bottle, domestic glassware, and window glass. These items probably represent luxury articles that made up smaller portions of a regular cargo or had been specifically ordered by individuals. Chipped glass flakes and tools were also identified. They attest to the further value of glass as a material for tool manufacture by both Mexicans and Native Americans. Most of the work done to date on sites from the Colonial and Mexican periods has been concerned chiefly with architecture, and little information was found on glass for this period from other excavations.

Introduction

The site of the San Diego Presidio (CA-SDI-38) is located at Presidio Park in the City of San Diego, California. Excavations of the Chapel Area Complex were conducted by San Diego State University from 1964 to 1976 under the direction of Dr. Paul H. Ezell (1976). This report describes glass artifacts recovered from that excavation and presents some ideas concerning the social status and cultural preferences of the population that deposited the items. The author worked as a volunteer at the presidio during the closing weeks of the Chapel Area Complex excavations in the summer of 1976, and at the following Mesa College Gateway excavation, under the direction of Dr. Diane Barbolla, from the fall of 1976 to the fall of 1978. In 1980 he completed an analysis of the glass artifacts from the Chapel site as a special study under the direction of Dr. Stephen A. Colston at San Diego State University (Van Wormer 1980). This paper is a much revised and augmented version of a portion of that study. It resulted from the recent effort to study the history and archaeology of the presidio that has been organized by Dr. Paul Chace. The artifact collection from the chapel excavations is currently curated at San Diego State University Department of Anthropology’s Archaeology Collection Management Program Facility (accession number SDSU-0400).

Presidio period glass consisted of bottle and domestic glass fragments as well as window glass. Bottle glass included liquor, apothecary, and unidentified types. Blown three-mold glass, plain undecorated tumblers, pressed glass tableware, stemware, and lighting devices made up the domestic glassware. Window glass consisted of small broken pieces. Two major clusters of bottle and domestic glass were identified, each appearing to represent trash deposits.

Several pieces in the presidio period glass collection indicated that most of the glass was manufactured after 1820 and brought to California on ships involved in the hide and tallow trade. Research on the
occurrence of glass at other Mission and Mexican period sites and its use in late eighteenth and early nineteenth century Mexico showed that glass is comparatively scarce on sites in California from these periods and represents luxury articles which made up smaller portions of a regular cargo. Because of their scarcity, bottles were refilled and reused until they broke. Chipped glass flakes and tools were also identified and attest to the value of glass as a material for tool manufacture by both Mexicans and Native Americans.

**Overview History of San Diego Presidio**

On July 16, 1769, Franciscan priest Father Junípero Serra established the settlement that became the San Diego Presidio as Mission San Diego de Alcalá, on present-day Presidio Hill. Until 1774 the garrison of soldiers at the mission was under the command of the Presidio at Monterey. In July of that year, the settlement became a royal presidio when the missionaries relocated approximately 5 miles to the east (Bancroft 1966:I:229 [1886]). Between 1774 and 1780 the population grew to over 100 people, which included soldiers, civilian craftsmen, and their families. During this period a major construction project was undertaken, and a 300 ft (91 m) square quadrangle, outlined with an adobe defensive wall that enclosed the soldiers’ barracks, a commandant’s house, a guardhouse, homes for civilians and soldiers with dependents, a residential area for visiting clergy, military and mission storehouses, and blacksmith and carpenter shops, replaced the former open cluster of thatched huts and wooden buildings (Williams 1997, 2004).

The next decade saw continued expansion that included the replacement of earthen roofs with tile, completion of a new freestanding outer defensive wall with triangular bastions at each corner, and construction of a new chapel (Williams 1997, 2004; Ezell 2009). Built of sun dried adobe block, the chapel measured about 90 ft (27 m) long and 18 ft (5.5 m) wide with the roof and floor covered in fired ceramic tile. It is unlikely that there were interior seats or pews (Carri-co and Hawkins 1980) (Figure 1). In 1791 the active duty garrison included about 55 soldiers. More than half resided with their families at missions within the presidio district. At this time 212 people (117 males and 95 females) lived within the presidio settlement’s walls. The majority were civilian dependents and retired soldiers. About half were children (Williams 1997, 2004; Ezell 2009).

By 1800 the presidio’s population had fallen slightly to 160 individuals. Between 27 to 33 of the 90 soldiers on duty were stationed at the pueblo of Los Angeles and the five missions within the presidio district, which included San Diego, San Luis Rey, San Juan Capistrano, San Gabriel, and San Miguel in Lower California (Bancroft 1966:1:647–648 [1886]; Engelhard 1920:177).

During the early decades of the nineteenth century the fort consisted of a quadrangle enclosed by an adobe wall with an entrance on the west side. The commandant’s house stood in the center of the compound, with troops’ quarters and the guardhouse located along the west and north walls and officers’ quarters along the east wall. The chapel complex and cemetery were along the southern wall (Ezell 1976; Whitehead 1983; Ezell and Ezell 1986; Williams 1997, 2004) (Figure 2).

The Mexican Revolution in 1810 completely disrupted contact between California and central Mexico. During the following decade, no supplies were sent, and the troops went unpaid (Bancroft 1966:II:251 [1886]; Killea 1975:2129; Francis 1976:334; Duggan 2004:45,59). Missions and pueblos provided food. At San Diego the population numbered around 250. They lived in deteriorating buildings and worked with old, worn-out equipment that continued to decline. By 1821, when Mexico gained independence from Spain, the bastions and other portions of the outer defensive

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In 1825 California Governor José María Echeandía made the presidio his residence, bringing a surge in population. In 1830 about 520 inhabitants lived in San Diego (Bancroft 1966:II:544 [1886]). Most did not reside within the confines of the presidio compound. As the settlement grew, the defense walls completely disappeared, and housing expanded, stretching from the original site down the hill to the community growing around the plaza (Williams 2004).

Figure 1. This conceptual drawing of the San Diego Presidio Chapel is based upon archaeological evidence, shipping manifests and inventories, and descriptions of pre-1800 Mexican Colonial period churches. Courtesy Richard Carrico. From Carrico and Hawkins (1980).
This expansion in population and trade did not benefit the troops, who continued to be unpaid and poorly equipped. A report in 1828 stated that the troops at San Diego were “ill clothed, in great need, and unable to collect their wages” (Francis 1976:345). During the 1830s, the original site on the hill was gradually abandoned as the population moved into homes around the plaza (Williams 1997, 2004). In 1835 the garrison numbered 27 soldiers, 11 of whom were on duty at the presidio (Bancroft 1966:III:609 [1886]). That same year Richard Henry Dana, author of *Two Years Before the Mast*, visited the fort and found it:

… built in the form of an open square, like all the other presidios, and was in a most ruinous state with the exception of one side,
in which the commandant lived, with his family. There were only two guns, one of which was spiked the other had no carriage. Twelve, half clothed and half starved looking fellows, composed the garrison; and they, it was said, had not a musket apiece [Dana 1964:119 (1840)].

In 1837 the few troops that remained were called north to put down a revolt and never came back. From that date the presidio was abandoned and in ruins (Bancroft 1966:III:609 [1886]; Killea 1966:10).

**Glass Artifacts**

A total of 12,423 g of glass were recovered from the Chapel Area Complex excavation. Forty-four percent (5,503 g) dated to the period of presidio occupation. Items that did not have attributes indicating manufacture after the mid-1830s were accepted as being from the presidio period even though some may have been made through the mid-nineteenth century. This bias seemed justified because the types of glass in the collection suggested no major post-presidio period deposition until the early twentieth century, when Old Town San Diego and the ruins of the presidio became a popular tourist area.

Datable glass fell into two distinct temporal groups—those with attributes suggesting probable or possible manufacture before the mid-1830s and those dating to the very late nineteenth to twentieth centuries that exhibited amethyst sun coloring, machine made manufacture, and datable brands and/or maker’s marks. No specimens with characteristic shapes or embossing of mid-nineteenth century liquor, patent medicine, soda, culinary, or other bottle or glass types common from ca. 1840 through the 1870s were identified (Switzer 1974; Schulz et al. 1980; Felton and Schulz 1983). Glass that could be dated between 1880 and 1930 constituted only 10 percent (1,283 g) of all the glass recovered. Of this, almost half (633 g) represented machine-made bottles with cork closures dating between 1906 and 1930. Glass that was manufactured after 1930 made up 46 percent (5,637 g) of the collection (Van Wormer 1980).

The temporal attributes of the collection suggested that the majority, if not all, of the glass artifacts that exhibited datable attributes indicating probable manufacture before the mid-1830s were from the time of the presidio’s occupation and not the random discard of squatters or visitors after the site was abandoned. Most of this latter-day discard occurred during the twentieth century when the presidio became a popular tourist area. An ongoing analysis of the presidio chapel ceramics by Susan Walter has led to similar conclusions for the deposition of those artifacts. All the transferware patterns identified were introduced before the mid-1830s. The only post-presidio period ceramics were a small number of early twentieth century wares (Susan Walter, personal communication 2013).

This paper discusses only presidio period glass artifacts. Categories identified included bottle, domestic, and window glass. Bottle glass consisted of liquor, apothecary, and unidentified types. Domestic glassware included blown three-mold glass, plain undecorated tumblers, pressed glass tableware, stemware, and lighting devices. Window glass consisted of flat, heavily patinated aqua colored fragments. Additionally, chipped artifacts derived from black bottle or clear domestic glass were documented. The different types were quantified by weight, and when possible a minimum number of vessels or items was estimated (Table 1). As discussed above, glass that dated after the fort’s abandonment consisted of intrusive materials that have been reported elsewhere (Van Wormer 1980).

**Bottle Glass Category**

Bottle glass made up 53 percent (2,917 g) of the glass artifact collection. The majority of the bottle glass assemblage consisted of black (dark olive green)
glass fragments, which made up 98 percent by weight (2,861 g). Aqua pieces constituted 1.5 percent (41 g); clear fragments made up .5 percent (15 g) of this assemblage. Through analysis of necks, bases, and certain sidewall pieces, it was estimated that the fragments represented a minimum number of 21 vessels. These included liquor bottles (57.14 percent), apothecary vials (9.52 percent), and unidentified types (33.33 percent). The different bottle types identified are listed in Table 2.

The 12 liquor containers included wine, ale or porter, and case (gin) bottles. Some may have contained other products. Since alcoholic beverages were the most common products to be sold in containers of these shapes, they have been classified as liquor bottles for this study.

Wine bottle pieces included four base and four lip fragments. These represented cylindrical bottles about 30 cm in height and 7 cm in diameter with sloping shoulders and long necks (Figures 3 and 4). The bases exhibited kickups formed with blow pipe or glass-tipped pontil rods (Jones 1971:63–64). Necks consisted of sheared lips with laid-on rings. The vessels were probably blown in shoulder height dip molds, although a lack of large shoulder or sidewall pieces made this impossible to determine with certainty. The shape is typical of Bordeaux style wine bottles used during the early to mid-nineteenth century. This type of container was also used for olive oil (McKearin and McKearin 1941: plate 223; Munsey 1970:63; Switzer 1974:29; Felton and Schulz 1983:54; Society for Historic Archaeology 2013). The sheared lip with laid-on ring was common from the late 1700s to about 1885 (Noël Hume 1961:101, 105; McKearin and Wilson 1978:206–207). One glass bottle seal from the Chateau Malescot winery provided evidence that at least some of these bottles contained French wines (Figure 5). This winery has been operating in France’s Bordeaux region since 1697. Their products appear to have been widely exported. A similar seal has been

<table>
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<tr>
<th>Category</th>
<th>MNI</th>
<th>Percent by MNI</th>
<th>Weight (g)</th>
<th>Percent by Weight</th>
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</thead>
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<tr>
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<td>35</td>
<td>2,917</td>
<td>53</td>
</tr>
<tr>
<td>Domestic glass</td>
<td>39</td>
<td>65</td>
<td>2,209</td>
<td>40</td>
</tr>
<tr>
<td>Window glass</td>
<td>–</td>
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<td>377</td>
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<tr>
<td><strong>Totals</strong></td>
<td>60</td>
<td>100</td>
<td>5,503</td>
<td>100</td>
</tr>
</tbody>
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Table 1. Glass Categories by Minimum Number of Items (MNI) and Weight.

<table>
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<tr>
<th>Type</th>
<th>Product Description</th>
<th>Product Count</th>
<th>Product Percent</th>
<th>Type Count</th>
<th>Type Percent</th>
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<tr>
<td>Liquor</td>
<td>wine</td>
<td>4</td>
<td>33.33</td>
<td>12</td>
<td>57.14</td>
</tr>
<tr>
<td></td>
<td>ale, porter (junk bottles)</td>
<td>7</td>
<td>58.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>gin (case bottle)</td>
<td>1</td>
<td>8.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apothecary</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>9.52</td>
</tr>
<tr>
<td>Unidentified</td>
<td></td>
<td></td>
<td></td>
<td>7</td>
<td>33.33</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td></td>
<td></td>
<td>21</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Table 2. Bottle Glass Category by Type and Product Minimum Number of Vessel Counts.
identified from excavations in the Boston area (Culture Embossed 2013; Wine Cellar 2013).

Four necks and seven bases that exhibited dome-shaped kickups represented ale or porter bottles. The bottles had been squat, cylindrical containers about 20 cm in height and 8 cm in diameter with flattened shoulders and long necks (Figures 6 and 7). Necks included two lip styles. Two had been finished with hand-formed, slanted collars over laid-on rings, a style commonly used between 1790 and 1830 (Noël Hume 1961:101, 105). The remaining two necks had applied, finished round collars and rings formed with a hand-operated lipping tool. Lip finishing tools were probably in use in Europe by 1820 (McKearin and Wilson 1978:206–207, 217; Lindsey 2010; Society for Historical Archaeology 2013).

Basal kickups were made by various techniques including use of a multipiece conical tool and a mold. Kickups formed with a conical tool were manufactured after 1825 (Jones 1971). Lack of mold seams on the remaining bases suggests they were probably blown in shoulder height dip or three-piece molds (Toulouse 1969). Three basal kickups exhibited sand pontil marks (Jones 1971). Three others did not have pontil marks, indicating manufacture sometime after 1830, when the snap case began to replace the pontil rod (Toulouse 1968:204; McKearin and Wilson 1978:14).
Figure 4. Hypothetical wine bottle based on fragments. Illustrated by Harry J. Price.

Known as junk bottles, these vessels were commonly used for hop beverages such as ale, porter, and beer, although they sometimes held such diverse products as wine, cider, and flavoring extracts. The bottle style was adopted in both England and the United States sometime between 1800 and 1815 and remained popular through the middle of the nineteenth century (Switzer 1974:16–21; McKearin and Wilson 1978:215–217, 229–232).

Ten black glass sidewall fragments exhibiting flat surfaces and sharp angular corners represented at least one case bottle. Case bottles were tapered rectangular vessels with a square cross section frequently used for gin (Figure 8). Blown in full-height molds, they were common throughout the seventeenth, eighteenth, and nineteenth centuries (Munsey 1970:84–86; McKearin and Wilson 1978:224–228).

In addition to alcoholic beverage bottles, two apothecary vials were identified, both represented by aqua base fragments and 15 cylindrical sidewall pieces of the same color (Figure 9). One base was 4 cm in diameter with a kickup formed with a narrow metal or wooden rod (Jones 1971). It had a glass-tipped pontil mark. The second base was 1.5 cm in diameter and exhibited a blow pipe pontil mark on the flat bottom.

During the seventeenth, eighteenth, and early nineteenth centuries, manufacturers in the United States and Great Britain used cylindrical glass vials that held from 1 to 7 oz (.03 to .21 liters) for medicinal powders, pills, liquids, and patent medicines. Often made of clear or aqua glass, as opposed to the more common black glass of the period, these small bottles were produced in molds as well as by

Original contents of at least seven individual bottles could not be determined. These were represented by six black glass bases and a single clear neck with an inward folded finish. Their fragmented condition gave no clue to method of vessel manufacture.

**Domestic Glassware Category**

The domestic glassware assemblage constituted 40 percent by weight (2,209 g) of the glass artifact collection. Analysis of vessel style and method of manufacture resulted in the identification of five distinct types: blown three-mold glassware, plain undecorated tumblers, pressed glass tableware, stemware, and lighting devices (Table 3). In Table 4, the 39 domestic glassware objects are tabulated by item. Twenty-nine tumblers made up 74 percent of the assemblage. The remaining items included two dishes (5.13 percent), one plate (2.56 percent), two wine glasses (5.13 percent), two oil lamps (5.13 percent), two candlesticks (5.13 percent), and a single unidentified vessel (2.56 percent).

**Blown Three-Mold Glassware**

Blown three-mold glassware made up 22 percent (497 g) of the domestic glass. First produced by American manufacturers about 1820, this type of patterned tableware could be made cheaply and compete with more
expensive English and Irish cut glass (McKearin and McKearin 1941:240–241). American glasshouses generated over 145 different patterns of this inexpensive product in a variety of shapes that included virtually every form of common glass tableware (McKearin and McKearin 1941:240, 264–273). Vessels were blown in full-size metal molds. Although three-piece molds were used most frequently, two-piece and four-piece molds were also utilized (McKearin and McKearin 1941:244).

Manufactured in large quantities until the late 1830s, by 1842 blown three-mold glassware was almost completely replaced as the popular glass tableware in the United States by lacy pattern pressed glass (McKearin and McKearin 1941:240–241, 244). The production period of blown three-mold glassware, from 1820 to 1840 falls within the era of the California hide and tallow trade. From 1820 to 1846, New England, British, Sandwich (Hawaiian) Islands, and Mexican based ships that carried cargos of manufactured goods to exchange for cowhides and tallow dominated California’s economy (Ogden 1927, 1929, 1981; Dallas 1955; Hackel 1998:129–134). The blown three-mold glassware undoubtedly arrived in San Diego on board New England hide ships.
Blown three-mold glassware fragments were identified by their diagnostic concave-convex patterned surface. McKearin and McKearin (1941:245) explained that “where there was a protuberance on the outside surface of the object, there was a corresponding hollow on the inner surface and vice versa … the pattern [was] raised inside and out at directly opposite points.” Analysis of base and sidewall fragments identified eight tumblers and an additional vessel fragment. Three tumblers were partially reconstructed. Each measured 7 cm in height, with a base diameter of 6 cm and a rim diameter of 7 cm (Figure 10).

The glassware exhibited four distinct patterns, all common on blown three-mold vessels (McKearin and McKearin 1941:247–248, 257–259). Three tumblers have vertical ribbing and diamond diapering divided by horizontal bands. Two of these were partially reconstructed. A third partially reconstructed tumbler exhibited a vertical ribbed pattern. Three additional fragmentary base and sidewall tumbler pieces also displayed vertical ribbing. A single tumbler fragment had a gothic-like vertical ribbing. A fragment of an additional unidentified vessel featured a baroque pattern, although it gave no clue as to original vessel shape. The remaining blown three-mold pieces consisted of small fragments that exhibited vertical ribbing and diamond diaper. They were too small to identify vessel shape or quantity.

**Plain Undecorated Tumblers**

Plain undecorated tumblers accounted for 1,385 g, or 63 percent by weight, of the domestic glass (Figure 11). Tumbler pieces consisted of bases, rims, and side fragments manufactured of clear glass. All bases or base fragments exhibited pontil marks. The rim pieces were hand finished. Plain tumbler sidewall fragments were identified by comparing and matching them to rim pieces through an analysis of glass thickness, texture, and curvature. Both rim and sidewall fragments averaged 1 mm in thickness and had swirl marks, similar to those on bottles blown in paste or turn molds, as well as stretch marks that resulted from the manipulation of glass during manufacture. On most pieces these marks had been etched into the fragments as a result of patination and deterioration of the glass.

Examination of the base fragments identified 18 individual tumblers. None could be reconstructed. Two were 9 cm in diameter, and four were 4 cm in diameter. The remainder measured from 6 to 6.7 cm in diameter. Three exhibited ground-off pontil marks, while the rest had glass-tipped pontil marks. All but
Table 3. Domestic Glassware Category by Type and Minimum Number of Item Counts.

<table>
<thead>
<tr>
<th>Type</th>
<th>Item</th>
<th>Item Count</th>
<th>Item Percent</th>
<th>Type Count</th>
<th>Type Percent</th>
</tr>
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<tr>
<td>Blown three-mold</td>
<td>tumbler</td>
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<td>88.89</td>
<td>9</td>
<td>23.08</td>
</tr>
<tr>
<td></td>
<td>unidentified</td>
<td>1</td>
<td>11.11</td>
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<td></td>
</tr>
<tr>
<td>Plain undecorated tumbler</td>
<td>18</td>
<td>46.15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressed glass tableware</td>
<td>vertically ribbed tumbler</td>
<td>3</td>
<td>42.86</td>
<td>6</td>
<td>15.38</td>
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<td></td>
<td>dish</td>
<td>1</td>
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</tr>
<tr>
<td></td>
<td>plate</td>
<td>1</td>
<td>14.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>lacy pattern dish</td>
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<td>14.29</td>
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<td></td>
</tr>
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<td>Stemware</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>5.13</td>
</tr>
<tr>
<td>Lighting devices</td>
<td>oil lamp</td>
<td>2</td>
<td>50.0</td>
<td>4</td>
<td>10.26</td>
</tr>
<tr>
<td></td>
<td>candlestick</td>
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Table 4. Domestic Glassware Category by Minimum Number of Item Count.

<table>
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<tr>
<th>Item</th>
<th>Type</th>
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<th>Type Percent</th>
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<tr>
<td>Plate</td>
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<td>pressed glass</td>
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<td>Tumblers</td>
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<td>29</td>
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<td>blown three-mold</td>
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<td>plain tumbler</td>
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<td>vertically ribbed pressed glass tumbler</td>
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<td></td>
<td>stemware</td>
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<td>Oil lamp</td>
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<td>lighting devices</td>
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<td>lighting devices</td>
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Glass Artifacts from the Chapel Complex Excavation, Presidio of San Diego

Figure 10. Blown three-mold tumbler fragments.

Figure 11. Plain tumbler bases.
one showed wear from prolonged periods of use. Eight did not have mold seams, suggesting they had been free blown without molds. The method of manufacture of two others could not be determined due to their fragmented condition. The remainder were blown in molds. Glass tumblers of this type were common throughout the eighteenth and early nineteenth centuries (McKearin and McKearin 1941:305–310; Noël Hume 1969a:24; Brown 1971:166–167).

**Pressed Glass Tableware**

Pressed glass tableware fragments constituted 4 percent (95 g) of the domestic glassware (Figure 12). Introduced in 1825, pressed glass manufacture consisted of a two-step process. The operator first placed a quantity of molten glass into a mold and then inserted a lever or plunger that pressed the glass into the desired vessel form (McKearin and McKearin 1941:25–26, 334–335). Pressed glass tableware fragments included pieces of three vertically ribbed tumblers, one 3.5 cm in diameter and the other two 6 cm in diameter, a dish 6 cm in diameter with a sunburst pattern on the base, a plate fragment, and two fragments of at least one lacy pattern pressed glass dish. Lacy style pressed glass was manufactured in the New England states from the late 1820s until about 1850. English, French, and Belgian glass houses also produced lacy glassware during this period (McKearin and McKearin 1941:336, 338–339). Like blown three-mold glassware, the period of manufacture of lacy pattern pressed glass falls largely within the era of the hide and tallow trade and the fragments probably arrived in San Diego aboard hide ships. The two fragments identified gave no clue as to original size or shape.

**Stemware**

Stemware made up 4 percent (80 g) of the presidio period domestic glass. The pieces were badly broken, and only two individual vessels could be identified. These included one conical foot, 6 cm in diameter with a tapered stem, and one bladed stem fragment (Figure 13). The conical foot exhibited a glass-tipped pontil mark. Both were wine glass fragments (Noël Hume 1969b:190). Six additional stemware foot pieces were identified that appeared to have had an original diameter of about 6 cm. They were too small to determine the number and shape of vessels represented.

![Figure 12. Pressed glass tableware fragments. Top: ribbed glass tumbler bases. Bottom: from left, two fragments of lacy pressed glass, plate, and dish with sunburst pattern.](image-url)
The conical foot with a tapered stem was manufactured between 1780 and 1805, while the bladed stem fragment dated to ca. 1815 (Noël Hume 1969b:190). An unevenness in the upper portion of the bladed stem suggested that it had been formed by hand, while the conical foot with tapered stem provided no clue to its method of manufacture. Factories in England and the United States produced wine glasses with these foot and stem styles (Noël Hume 1969a; 1969b:190).

**Lighting Devices**

Remains of oil lamps and candleholders made up 7 percent by weight (152 g) of the domestic glassware. Clear globular and tapered, cylindrical-shaped fragments represented at least two oil lamps. In addition, two clear pressed glass candlestick sockets were identified (Figure 14) (McKearin and McKearin 1941:378–386, plates 189–192; Pyne Press 1972:5; Darbee 1976; Corning Museum of Glass 2013). The candlestick sockets exhibited a heavy fluted ribbed pattern on the exterior surface. The shallow domed bases had been ground flat on the exterior rim and drilled in the center. The larger one measured 4.12 cm at the base and 4.45 cm around the partial rim, which was chipped along the upper edge. The smaller socket was identical in manufacture but was represented only by the base. It measured 3.48 cm in diameter.

**Chipped Glass Artifacts**

Twelve glass fragments exhibited modification from flaking and/or wear due to use as scraping implements (Figure 15). They were of either black bottle glass or clear domestic glass and were included in the total weights for those respective categories. Together the bottle and domestic glass fragments modified through utilization or tool manufacture made up .6 percent (38.5 g) of the assemblage.

Due to the brittle nature of glass, it often accidentally breaks into forms that appear to have been purposely altered. For this reason extreme caution was applied in attempting to determine which fragments were genuinely altered and which may have been accidentally broken. Only pieces that exhibited well-defined bulbs of percussion, striking platforms, and flaking scars on the sides opposite the bulb were identified as flakes. Those fragments identified as tools exhibited flake scars or wear on only one or two continuous edges. The flake scars did not occur randomly, as would be expected on fragments that had been altered by accident, but exhibited uniformly placed scars along the altered edges. Furthermore, the edges were not sharp, but worn dull from use. No piece with merely a sharp edge was accepted.

Eight flakes, three scraping tools, and a projectile point fragment were identified. Five of the flakes were of black glass, and three were of clear glass. Two tools were black glass bottle bases used as convex scrapers. The third was a black glass flake with a concave wear pattern on one side. The point fragment was also made of black bottle glass, and both the base and tip were broken off. It measured 2 cm in length by 1 cm in width and weighed 1 g. The piece had been finely pressure flaked and exhibited cortex (unmodified
original surface) on one side. The original point was probably a small triangular type, common on late prehistoric period sites in San Diego County (True 1970). Utilized glass artifacts have been recovered from other Spanish-Mexican period sites in California (Harrington 1933:81; Greenwood 1976:171; Marshall 1982:34–47; Farnsworth 1987:412–413; Allen 1998:243–244; Silliman 2004:130–131; Voss 2002:316, 322; Smith-Lintner 2007:355, 357). It could easily be assumed that the altered pieces of glass recovered from the presidio Chapel Area Complex represented activities of Indians who applied their knowledge of lithic technology to a new medium. The skillfully worked point and the well-formed bulbs, prepared platforms,
and delicate scars of the flakes suggest manufacture by skilled lithic craftsmen; however, utilized glass fragments from Spanish-Mexican period sites might have been used by non-aboriginal inhabitants (Marshall 1982:34–37). A tradition of using glass fragments as scraping and cutting implements still exists in Mexico, and the author has observed Mexican Natives in southern Lower California utilize broken pieces of glass to smooth an axe handle. It seems probable, therefore, that Mexican residents at the San Diego Presidio could have made and used the two glass scrapers.

**Window Glass Category**

Seven percent (377 g) of the presidio period glass consisted of window glass (Figure 16). Window glass fragments were aqua in color, flat on both sides, and heavily patinated. In many instances the glass had started to deteriorate. The fragments average 1 mm in thickness.

**Distribution of Glass Artifacts within the Chapel Area Complex**

The horizontal distribution of the different glass types is shown in Figures 17 through 20. Very little glass occurred in the chapel or the rooms designated as living quarters. These housed members of the clergy, when present, and served as a warehouse for missionary stores (Ezell and Ezell 1986). In the cemetery and south of the courtyard, three distinct clusters of glass are apparent. Two are concentrations containing a mixture of black and aqua bottle glass, blown three-mold glassware, pressed glass tableware, and tumbler fragments. The third is a cluster of window glass.

The first cluster is on the north side of the southern defense wall, directly south of the sacristy. It constituted 34 percent (1,864 g) of the presidio period glass collection. Glass artifacts occurred to a depth of 56 in (1.42 m), however 64 percent (1,196 g) occurred between the surface and 30 in (.76 m). Fragments of blown three-mold glass and a piece of pressed glass recovered from a depth of 33 in (.84 m) indicate a period of deposition after 1825 (McKearin and McKearin 1941:240–241, 336). A heavy concentration of English ceramics that date after 1818, as well as butchered bone fragments, Mexican ceramics, and Native American pottery, also occurred in this area (Krase 1979:37; Catalog 2013). The cluster, therefore, appears to represent a refuse deposit. The manufacture period of the glass and English ceramics, as well as their country of origin, indicate the refuse includes

![Figure 16. Window glass fragments.](image-url)
many items that were probably brought to California on English and American hide ships.

The second cluster is in the southeast corner of the excavated area, and it is best illustrated as a concentration of bottle glass (Figure 17). It constituted 4 percent (228 g) of the presidio period glass. Glass occurred to a depth of 56 in (1.42 m), while 78 percent (177 g) was recovered between the surface and 18 in (.46 m). Pressed glass and blown three-mold glassware fragments indicated a period of deposition after 1825. As with the first cluster, a heavy concentration of English ceramics also occurred in this area (Krase 1979:37). Artifacts within this cluster also represent a refuse deposit made up largely of materials brought to California on British and New England hide ships.

The third cluster consists of window glass in the cemetery between the baptistry and the sacristy (Figure 20). This comparatively heavy concentration in the center of the cemetery represents a curious phenomenon. It made up 14 percent (58 g) of all window glass recovered. Even more perplexing is the fact that almost no window glass occurs within the chapel or in association with the north or west walls where it would be expected if it represented broken windows.

The late Dr. Paul Ezell suggested one possible explanation for this distribution. In early December 1841 Bishop Francisco Garcia Diego y Moreno administered the Sacrament of Confirmation to 125 people in the abandoned presidio chapel (Bancroft 1966:IV:169–96

Figure 17. Bottle glass distribution.

PCAS Quarterly 50(1&2)
Perhaps in preparation for this event the chapel was cleaned of debris that may have accumulated during the almost five years since the presidio had been abandoned. If the refuse was tossed out into the cemetery, this would account for the concentration of window glass in the cemetery’s center and lack of the same within and around the chapel.

**Summary and Conclusions**

A total of 12,423 g of glass was recovered from the excavation of the chapel at the Royal Presidio of San Diego. The glass was divided into time periods by the identification of specific datable attributes. Glass manufactured and used during the time that the San Diego presidio was occupied made up 44 percent by weight of the glass recovered.

Presidio period glass consisted of bottle and domestic glass fragments as well as window glass. Bottle glass consisted of liquor, apothecary, and unidentified types. Domestic glassware included blown three-mold glass, plain undecorated tumblers, pressed glass tableware, stemware, and lighting devices. Window glass consisted of flat, heavily patinated aqua colored fragments. Chipped glass artifacts were also identified.

The presidio period glass collection contains several pieces that suggest most of the glass was manufactured after 1820 and was transported as cargo on hide.

![Figure 18. Plain tumbler fragment distribution.](image-url)
and tallow ships. These pieces include three bottle bases which exhibit a kickup formed with a multipiece, conical-shaped tool, indicating manufacture after 1825 (Jones 1971:67; three other bottle bases without pontil marks, indicating manufacture after 1830 (Toulouse 1968:204; McKearin and Wilson 1978:14); fragments of blown three-mold glassware manufactured in the United States between 1820 and 1840 (McKearin and McKearin 1941:240–241); and fragments of lacy patterned pressed glass manufactured between 1825 and 1850 (McKearin and McKearin 1941:332, 336).

Two major clusters of bottle and domestic glass were identified. Each appeared to represent trash deposits. One cluster occurred in the southeast corner of the excavated area. The other was located directly south of the sacristy on both sides of the southern defense wall. Both were deposited after 1820, and each contained materials whose country of origin and period of manufacture suggests that they were brought to California on Boston and English hide ships. In addition to these clusters, a shallow scattering of glass of the same period was distributed throughout the cemetery and courtyard, and a cluster of window glass occurred in the center of the cemetery.

By comparing glass recovered from the chapel excavation to other Mission and Mexican period sites in California, the author anticipated insight into the consumption habits and personal preferences of
Glass Artifacts from the Chapel Complex Excavation, Presidio of San Diego

presidio personnel. Unfortunately, most of the work done to date on sites from the Colonial and Mexican periods has been concerned chiefly with architecture, and little information is available on glass from these excavations.

On the other hand, reports on glass artifacts recovered from seventeenth, eighteenth, and early nineteenth century sites in the eastern United States are common (Noël Hume 1954, 1955, 1961; Cotter and Hudson 1957:46; Maxwell 1964; Brown 1971; Kelso 1979). When the glass recovered from the Chapel Complex is compared to the glass from these excavations, the most obvious difference is the large number of glass items from contemporary sites in the eastern United States and the comparatively small quantity of glass found at the Chapel Area Complex at the San Diego Presidio.

One possible explanation for this is that since these presidio artifacts represent only the chapel, the sample is not indicative of the true consumption patterns of presidio personnel. However, the small amount of information that is available suggests that although it is not uncommon, glass on Spanish and Mexican period sites is comparatively scarce, and because of the small quantity and badly broken condition of pieces recovered, analysis in many reports consists of little more than fragment counts and descriptions of color (Greenwood 1975:88–92; McIntyre 1976:257; Benté et al.)

Figure 20. Window glass fragments and chipped glass artifacts distribution.
In the few other examples when glass items have been described, the types recovered have been similar to those found at the San Diego Presidio Chapel excavation, but fewer in number. For instance, at the San Francisco Presidio three deposits produced glass. At the first, Polín Spring, occupied during the early to mid-nineteenth century, two spirits (British wine) bottles and an unidentified bottle were recognized along with a utilized glass flake (Voss 2002:316, 322). At the second, Building 13, occupied from 1776 to 1800, fragments of two bottles were recovered—a spirits container (British wine) and a “French blue green bubbled” bottle. Glass tableware from this deposit included a hollow ware vessel and a stemware base. A piece of pane glass, 1 mm thick, was also recovered (Voss 2002:449–451). The third, the soldiers’ apartment, occupied from 1815 to 1826, produced a single liquor (British wine) bottle (Voss 2002:539). At another site, the Peralta family’s Rancho San Antonio on the east side of San Francisco Bay, a pharmaceutical bottle and the base of a black glass liquor bottle that had been used as a scraping tool, along with window pane, lamp, pattern molded, and pressed glass, were recovered from an 1830s to 1840s deposit (Smith-Lintner 2007:355, 372). This limited evidence indicates that, like at the San Diego Presidio Chapel deposit, glass items from other mission and Mexican period sites are low in number. Liquor (spirits) bottles dominate, with other products like pharmaceuticals occasionally making up part of the assemblages. The overall numbers are even less than the small quantity of glass items from the San Diego Presidio Chapel Complex, and glass tableware and window glass make up much smaller portions of those collections.

There appear to be three major factors that account for the small amount of glass recovered from Colonial and Mexican period sites in California. The first involves a Mexican earthenware tradition. Glass products were never as common in New Spain as they were in the English American colonies. During the Colonial period, Alta California depended solely on Mexico as its source of imported supplies. Large scale glass manufacturing did not develop in Mexico. Although produced in Mexico City and Puebla, the output was mostly for local use. Products were mainly confined to metallurgical equipment used for the separation of precious metals, pharmaceutical items, and other medical items. European imports and the reluctance of the wealthier classes to adopt the use of glass items in their daily lives kept the industry from developing into an important part of the manufacturing economy. The more affluent households purchased the comparatively small amount of domestic glassware produced. Bottles and drinking glasses were used by a small number of businesses including wine shops, pulquerias, and ice cream parlors. The use of glass bottles in households appears to have been less common. Eighteenth century depictions of daily life in Mexico occasionally show a bottle or two in paintings of kitchens and open-air markets (Barber 1908; Deagan 1987:129–130; Peralta Rodríguez and Alvizar Rodríguez 2010; Peralta Rodríguez 2011:15–34; 2013). Very little glass was exported to the northwestern frontiers (Williams 1992:15–16).

In place of glass, Mexican colonials continued to fashion earthenware to hold liquids, as had their Indian and Spanish forefathers. Drinking mugs and cups, bottles, jars, jugs, and pitchers were made from clay (Lister and Lister 1976:26, 31, 54, 88–89; Charlton and Reiff Katz 1979; Barnes 1980:104; López Cervantes 1990:22, 27, 31–35, 61–72, 82–84, 98–101, 111–126), while in England and the American colonies, glass articles produced in English factories were popular (Noël Hume 1961:94). Therefore, even though the hide and tallow trade gave Mexican California access to American and English manufactured goods, which included glassware, the Mexican Californian was accustomed to using earthenware vessels and felt little need for glass items as utilitarian articles.
The second major factor involves the storage, transportation, and sale of liquid products in casks. Bottles were not as commonly used to store or ship liquid products in Mexican California as they were in England and the United States. Imported liquors, as well as California wine and brandy, were regularly stored and shipped in casks during the Colonial and Mexican periods (Dana 1965:64 [1840]; Dallas 1955:194; Perissinotto 1998:377–405). Although casks were used in Europe, England also shipped beverages and other products in bottles, and many of these were exported to the British American colonies (Noël Hume 1961:94; 1974:79–84). Spain, as well, shipped bottled products to her New World possessions (Deagan 1987:129). However, their numbers seem to have been widely dispersed among the numerous Spanish American colonies; as noted above, glass bottles appear to have been used sparingly in the households of New Spain, and few were exported to the northern frontier (Williams 1992:15–16; Perissinotto 1998:377–405; Peralta Rodríguez 2011:15–34, 2013).

The third major factor that accounts for the scarcity of glass in Spanish and Mexican period sites and specifically in the San Diego Presidio Chapel Complex is the nature of the hide and tallow trade prior to the secularization of the missions in 1835. Before secularization, the missions were the economic centers of Alta California and the main source of hides. The needs of the missionaries dictated the type of merchandise sent to California. Since the missionaries required utilitarian articles, it is highly unlikely that glass items would have made up major portions of cargos sent to California.

It seems that the glass artifacts from the presidio period would not have been common in the cargos of hide ships prior to 1835, yet since the presidio was abandoned by 1837, the items recovered were probably shipped to the West Coast before the missions were secularized. In light of the fact that glass was not ordinarily used as a utilitarian article, nor to store liquids, and that these items would not have been among the average cargo of the period, it appears that the glass recovered from the San Diego Presidio chapel excavation represents luxury articles, which made up smaller portions of a regular cargo or had been specifically ordered by individuals who could afford them. In 1835 Henry Delano Fitch specifically ordered a set of English ceramics (Krase 1979:77), and it would seem that the presidio elite could have obtained domestic glassware as well as expensive bottled liquor, such as French wine, in the same manner. When the impoverished condition of the presidio troops during this period is considered, it becomes even more apparent that only the officers and government officials who constituted the upper crust of presidial society could have afforded these items.

Scrutiny of supply ship manifests from the Colonial period confirms this scenario and shows that glass items were also uncommon in California prior to Mexican Independence. Bottles were rarely used for the shipment of liquids, and the small quantity of domestic glassware sent from Mexico consisted of high-end luxury items, many of which were specifically ordered for the officers. In the published book of 52 requisitions and invoices (memorias y facturas) listing goods ordered for and received by the Santa Barbara Presidio between 1779 and 1810, glass items are infrequent. Of the thousands of indexed entries, only a few list articles of glass (Perissinotto 1998:15, 377–405). The varied kinds of items are identified and enumerated below, and relevant page citations from Perissinotto (1998) are provided.

There were six entries for domestic glassware that included two glass vessels invoiced in 1788 (pp. 122–123), a glass rack with six crystal gold rimmed glasses received in 1791 (pp. 188, 189), a dozen crystal glasses specifically designated for the officers and requested in 1792 (pp. 208, 209), a pair of crystal cruets for the presidio chapel requested in 1793 (pp. 226, 227), and a dozen crystal glasses, “half each of one and two quartillos capacity,” ordered for the offi-
Pharmaceutical supplies made of glass or shipped in glass vessels constituted three entries. A vial of universal balsam and another of cider syrup were invoiced in 1791 (pp. 188, 189), and “a little box with twelve cupping glasses, filled with seedless cotton wool” was ordered in 1793 (pp. 226, 227). Three additional entries listed glass containers. A glass jar (bote de vidrio) was received in 1788 (pp. 122, 123). The requisition for 1793 asked for “1 crate of Puebla glassware with flasks of all sizes, jars, and the rest assorted” (pp. 222, 223). In 1804 four bottles of pink syrup (jarave de Clavel) were ordered for the officers (pp. 326, 327).

Containers for liquids made of materials other than glass included earthenware jars (pp. 177, 303, 307, 363, 329), earthenware water jars (pp. 353, 363), and tin plate flasks (pp. 151, 227, 189). The use of barrels for liquids is well established in these documents. There are 29 entries for single barrels of wine, 13 of which were specifically designated for mass (para misa) (pp. 54, 76, 88, 96, 102, 120, 132, 148, 166, 192, 204, 224, 234, 242, 248, 254, 276, 278, 286, 294, 310, 314, 324, 340, 356). In addition there are 11 entries for single barrels of aguardiente (pp. 54, 55, 88, 96, 102, 192, 234, 242, 248, 254, 360).

The quality of the glass recovered gives some insight into the economic circumstances of the presidio elites. As previously stated, the domestic glass recovered consisted chiefly of blown three-mold and pressed glassware. Both of these types of glassware were common types made for a middle class market (McKearin and McKearin 1941:240–241, 336). Expensive items such as fine cut glass are completely absent from the assemblage, suggesting that if the elites of the presidio owned any expensive glassware, it would have been very little. Their tables were set with glassware that was common in middle-class homes in the United States.

Finally, the small number of bottles from the presidio is consistent with documentary sources indicating that glass bottles were uncommon during this period. Because of their scarcity, they were refilled and reused until they broke. Bottle reuse is reflected in the wear on several of the bottle bases. In addition, no whole bottles were recovered, suggesting they were not discarded until they were broken. The fragments of worked glass that were identified attest to the further value of glass as a material for tool manufacture by both Mexicans and Indians.

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