TECHNIQUES

FOR

ERECTING GRANITE MONUMENTS

BASED ON INFORMATION DEVELOPED BY THE GEORGIA INSTITUTE OF TECHNOLOGY IN COOPERATION WITH PERSONNEL OF THE ELBERTON GRANITE ASSOCIATION, INC.

Compiled by:
E.G.A. Certified Memorials Program

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Introduction

The erection of the monument is one action toward which all other phases of the Monument Industry is directed. The goal of the memorialist, however expressed, should be the permanent placement of a suitable and enduring monument. A casual inspection of almost any cemetery will reveal that, unfortunately, this goal is not always attained. One of the chief factors in the unsightly appearance of many traditional cemeteries today is the poor installation jobs evident in numerous memorials.

When engineers from the Georgia Institute of Technology were studying the Monument Industry recently, under the sponsorship of the Elberton Granite Association, Inc., they spent considerable time looking into the matter of what the Industry could do to improve and maintain the appearance of traditional cemeteries and the granite monuments placed in them.

Stated simply, the Georgia Tech report made three basic recommendations:

1. **Extreme care should be exercised in selecting granite of high monumental quality.**
2. **Monuments should be clean when set and should be kept clean with reasonable maintenance practices thereafter.**
3. **Proper foundation installation and monument setting procedures should be practiced by all concerned.**

These recommendations resulted from actual observance of monuments set in cemeteries in various parts of the United States. It must be remembered that the observers were engineers, not monument people, and they called attention to certain phases of the Industry which those who earn their livelihood in it may have been taking for granted.

To some degree, the Elberton Granite Association has given attention already to two of these three recommendations. First, the E.G.A. Certified Memorials Program was inaugurated which, if used by retailers and Elberton manufacturers, provides the extreme care recommended in selecting granite of "high monumental quality." On the matter of cleaning, E.G.A. has recently published a detailed pamphlet setting forth helpful and useful suggestions for cleaning monuments both in the plant and in the cemetery.

The third recommendation is the basis for this pamphlet which seeks to spark constructive thinking and encourage improvements in the techniques employed to erect granite memorials. As was true in the cleaning pamphlet, it is not intended to claim that the methods set forth herein are the only, or the best, methods that can be employed. It is hoped that the suggestions will cause monument dealers and cemeteries to take a special look at the appearance of the memorials they erect to see if room for improvement exists.

INSTALLING THE FOUNDATION

It is realized that the matter of installing foundations is one that is not always under the control of the monument dealer. Many cemeteries install foundations on a fee basis; other dealers have foundations installed and monuments set by contract arrangement. Other dealers make their own installations, and procedures will vary from dealer to dealer, and from operator to operator. "Foundations" may range all the way from a sack or so of cement cut into the moist soil in the excavation, with the monument set upon the resulting mixture then and there, to the finishing of foundations that meet the most exacting requirements. For the purpose of this study, attention will be given to: the chemical composition of concrete; its effects upon granite; and suggestions for offsetting some of the objectionable effects.

CHEMICAL COMPOSITION

The engineers advise that cement is alkaline in nature, and the strong alkalis present in cement can be as harsh as strong acids to a porous material like granite. Portland cement, before treatment with water, consists of a mixture of calcium silicates and calcium aluminate. When treated with water, the calcium aluminate hydrolyzes, forming calcium hydroxide and aluminum hydroxide. These hydroxides can have corrosive effects such as the familiar Red Devil lye, which is a sodium hydroxide. Additionally, aluminum hydroxide is "amphoteric", that is, it can act as either an acid or a base in combining with another compound and can combine with impurities in the batch.

For these reasons, extreme care must be taken to mix each batch of concrete exactly in conformity with established standards; otherwise, unfavorable reactivity results.

REACTIVITY

The time of reactivity in a given batch of concrete is dependent upon a number of factors: temperature; humidity; length of time the concrete remains damp; and, most importantly, the initial amount of water used in the mixture. Regular concrete should not be poured if the temperature is below 40 degrees F., because reactivity is too slow at the colder temperatures for proper setting (there are special cements made for cold weather use, but this article has reference to regular materials normally employed for foundations). Under extremely high temperatures, on the other hand, extra precautions are necessary to prevent too rapid drying. The usual practice is to cover the cement with wet bags, wet canvas, etc. The longer concrete is kept damp, the greater the reaction that takes place. Most concretes continue to increase in strength with age and are 45% to 65% stronger after curing for one year than they are after one month.

The most important consideration in the length of time cement remains reactive, and also whether or not it becomes impermeable to ground water, is the **amount of water used initially** with the cement in the concrete batch. Tests by the Portland Cement Association showed the following: mortar discs 1″ x 6″ subjected to 20 lbs. per sq. in. water pressure showed **no leakage** after seven days of cure when made with **5.6 gallons** of water per sack of cement. However, mortar made with **9 gallons** or more of water per sack of cement showed high leakage rate after curing for more than a month.

If concrete is properly mixed and poured under favorable conditions, therefore, a foundation can be ready for use after a **minimum of seven days** of curing. Although it will not have reached its maximum strength, the major part of its reactivity will have ceased and it should be fairly impermeable to ground water.

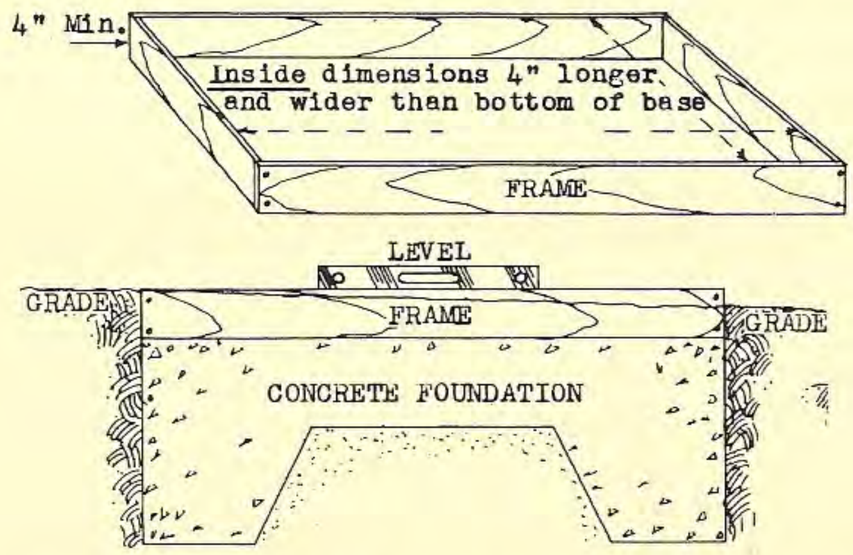
What happens if the foundation is used before it cures properly? The Georgia Tech engineers say that setting granite directly on wet cement is asking for trouble. The porous granite pulls water out of the cement too rapidly; the cement may harden but it will remain porous. Therefore, it will transmit ground water, along with water-soluble acids and other impurities from the soil, through its pores by capillary action into the granite itself. This moisture, ground water and soil impurities cause darkening of the granite. If the die is not properly jointed, this may feed up into the die by capillary action, resulting in the "wet" joints often seen.

ABOVE OR BELOW GRADE LEVEL?

While it is simpler to "level off" the foundation below the grade level, a foundation with its top leveled with the high point of the grade on the lot, or slightly above grade level, is preferred. If the foundation is extended at least 2″ wider than the sides and ends of the base, this facilitates mowing and trimming and, at the same time, provides a buffer between the granite base and the mower. It also allows proper room for grouting the bottom edges of the base to the foundation. The extended foundation is particularly recommended where a soil problem exists (such as Georgia red clay, or mineral-bearing soils). When foundations are installed below grade level and the soil pulled up against the base course, staining occurs. Raising and extending the foundation helps keep the soil away from the base of the monument.

Naturally extension requires more concrete for the enlarged foundation. 4′-0″ x 1′-2″ foundation 4′-0″ deep, with no extension, contains 18-8 cu. ft. With a 2″ extension around, increasing the size of the foundation to 4-4 x 1-6 x 4-0, the cubic content is 26-0 ft. However, cemeterians and monument dealers who are using the extended foundations by and large have found the advantages far exceeding the additional costs.

Making a frame for the top of the foundation out of 4″ dressed lumber (allowing for the extension on the inside measurements of the frame) provides a ready means of leveling the top of the foundation (see illustration). The frame may be installed prior to pouring; or the foundation may be poured to within a few inches of the top of the excavation and the frame then installed. The frame should be leveled with, or slightly above, the high point of the grade of the monument site; once it is leveled and firmly fixed in correct position, the pouring can be completed and the top of the foundation smoothed. This results in a level bed to receive the monument base. The frame is removed after the foundation has cured and before the monument is set.



EXTENDED FOUNDATION FOR SETTING MONUMENTS

1. **Build top frame as shown. Level top of frame with high point of grade.**
2. **Install foundation, using proper cement and water mix; not over 5.6 gallons of water to each sack of cement.**
3. **Allow foundation to cure for a minimum of seven days before installing monument.**
4. **Purpose: To allow foundation to become impermeable to ground water before installing monument. Extension facilitates grouting of base to foundation and acts as a buffer between base and mowing equipment.**

SETTING TECHNIQUES

Once the foundation is properly installed, the next step is the setting of the monument. "Setting a monument", is a collective term which actually refers to a number of related actions, the nature of which may vary from dealer to dealer, and from area to area. These basic actions begin with the cleaning of the monument in the shop after the lettering is completed; handling and hauling incidental to delivery to the cemetery site; unloading and placement of the component parts of the monument in place upon the foundation; and the final clean-up operations and "delivery" to the purchaser.

The setting procedure should not be taken lightly, for the dealer's public relations are probably more in the limelight during and after this setting service than at any other time. He is involved not only with the lot owner, but with cemetery officials. His mobile equipment is seen oftener in the performance of setting work than at any other time. For this reason, the best available equipment to do the job under conditions prevailing in the dealer's area is recommended. Certainly all equipment, from a wheelbarrow to a semi-trailer rig, should be kept well painted and spotlessly clean. Company names and other advertising on rolling stock should be professionally rendered and in good taste. Properly marked, equipment can be a "silent salesman."

Mechanical equipment of varying descriptions is available to facilitate the setting of monuments. Setting equipment ranges all the way from pinch bars and wooden rollers to various types of hydraulic lifts, power cranes, etc. Regardless of the equipment however, the dealer should realize that the employees performing his setting service are carrying his good name into the cemeteries into direct contact with the public. They should be well trained in setting procedures, of course; but they should also be trained in their responsibility to the firm and to the industry in which they work. More important than the equipment is the willingness to do the best job possible in setting the monument. It should always be borne in mind that this is a permanent installation — once the monument is in place, more than likely it will never be set again. **Do it right the first time, every time.**

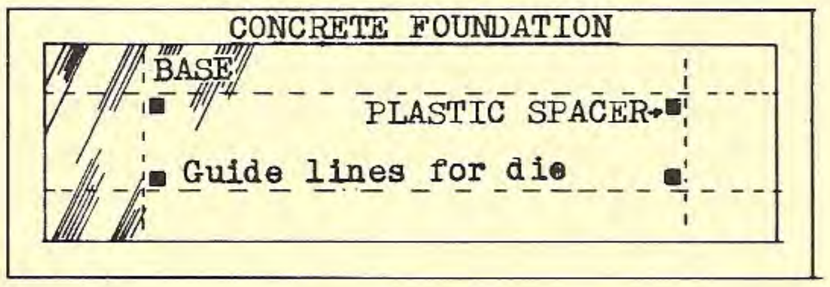
METHODS OF JOINTING

Most setters use the commercial setting compounds obtainable through the supply houses. The usual procedure is to make a "rope" of the compound, lay it along the joint line on the base, then lower the die into place. However, unless some type of spacer is used between the die and the base, most of the setting compound will be squeezed out when the die is lowered into position. Many different spacers have been used—pieces of wedge lead, bottle caps, hose washers, etc. However, most of these share the disadvantage of not being impervious to the pressure of weight, and a good portion of the compound is squeezed out and trimmed away, leaving a very narrow joint that is not enough to stop capillary movement of the aforementioned ground water and soil impurities up through the base into the die.

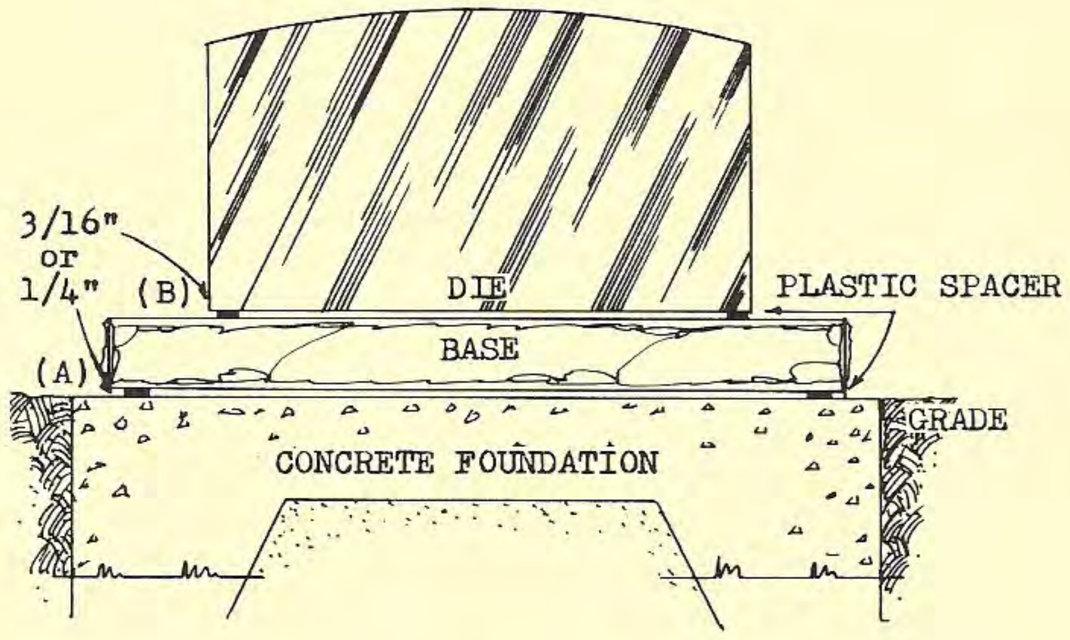
SPACE AGE MATERIALS

High-density plastic "cushions" for setting monuments are being manufactured by the Safetyloid Company, 151 Foundry Street, Wakefield, Massachusetts. (There may be others but this is a product many dealers use regularly.) The material is moisture-proof and will not scratch or mark granite or marble; it is impervious to weather conditions and withstands terrific pressure without changing shape (the manufacturer claims that a 2″ x 2″ x 1″ cushion will support 100,000 pounds). These setting cushions are produced in 1″ x 1″ squares and in various thicknesses from ⅛″ to ¼″. (A joint $\frac{3}{16}$″ or ¼″ is recommended. This allows for breaking capillary action between die and base. Also, it allows room for repointing any break that may occur in the joint in later years, thus eliminating "water traps"). These cushions are inexpensive: 1″ x 1″ x ¼″ squares cost about 5 cents each in lots of 100. They were introduced to the industry several years ago and are used by many dealers, both for cemetry setting and for cushions between dies and bases on displayed monuments.

The firm also makes 1″ x ¼″ strips in 6″, 8″ and 10″ lengths for this purpose and can supply other sizes as needed.



SETTING AND JOINTING



USE PLASTIC SPACERS OR SETTING CUSHIONS:

(a) Between cement foundation and bottom of base.

(b) Between bed of base and joint of die.

Spacers or cushions are available in 1″ x 1″ squares 3/16″ and ¼″ thick. Cushions can be held in place with a bit of setting compound.

Joint between die and base should be tightly sealed with setting compound.

Space between foundation and bottom of base should be sealed with cement or waterproof grout.

AN EXPERIMENTAL SETTING

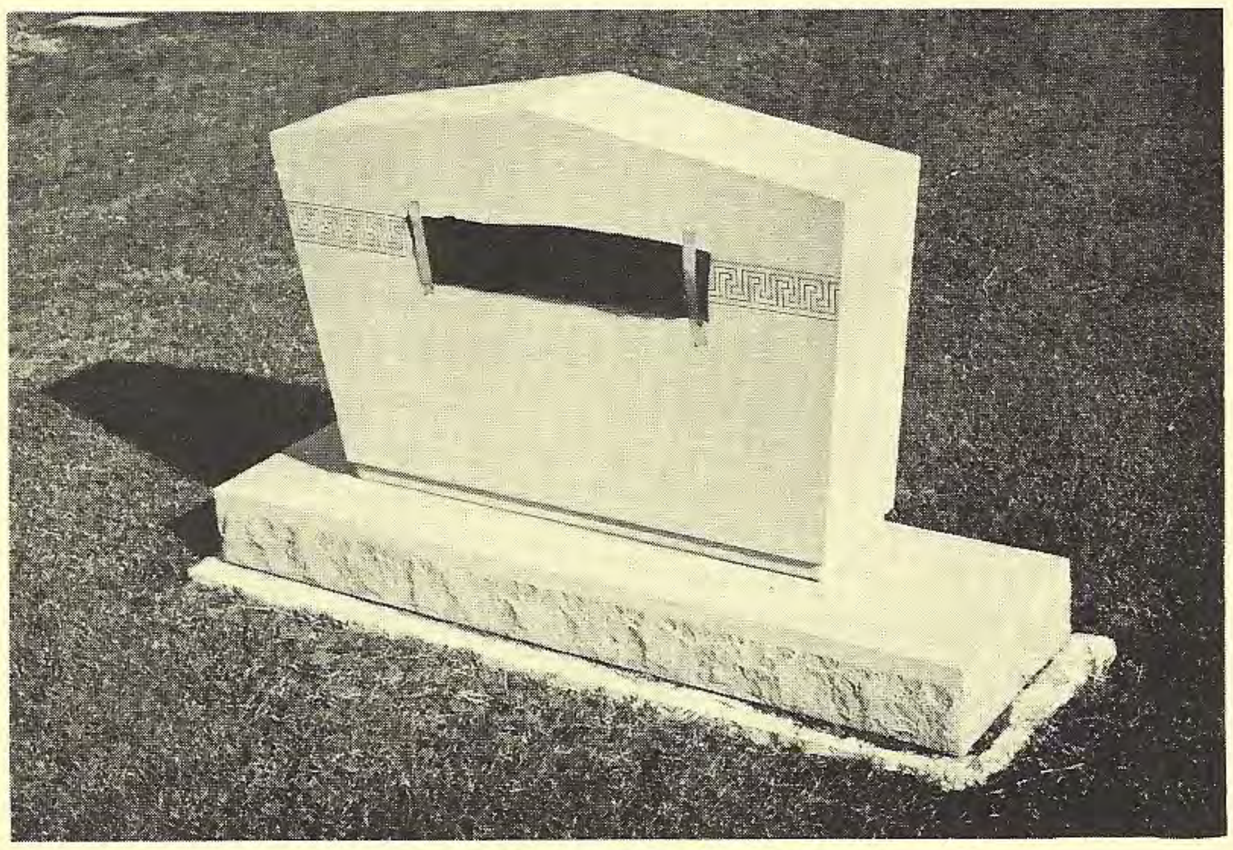
In December, 1965 a monument was erected in a local cemetery on a platform foundation with a 2″ extension. Plastic cushions or spacers 1″ x 1″ x¼″ were used, not only between the die and the base, but also between the **foundation** and the **bottom of the base.** The foundation was allowed to cure for ten days before setting. A photograph of this monument (A) which has a roof top and reverse-tapered ends is at right.

Another monument, cut by the same manufacturer, out of the same granite, and installed by the same setting crew, was set the same week in December, 1965. This is the oval-top monument (B) in the other photograph at right. (Names have been covered due to the comparison being made.)

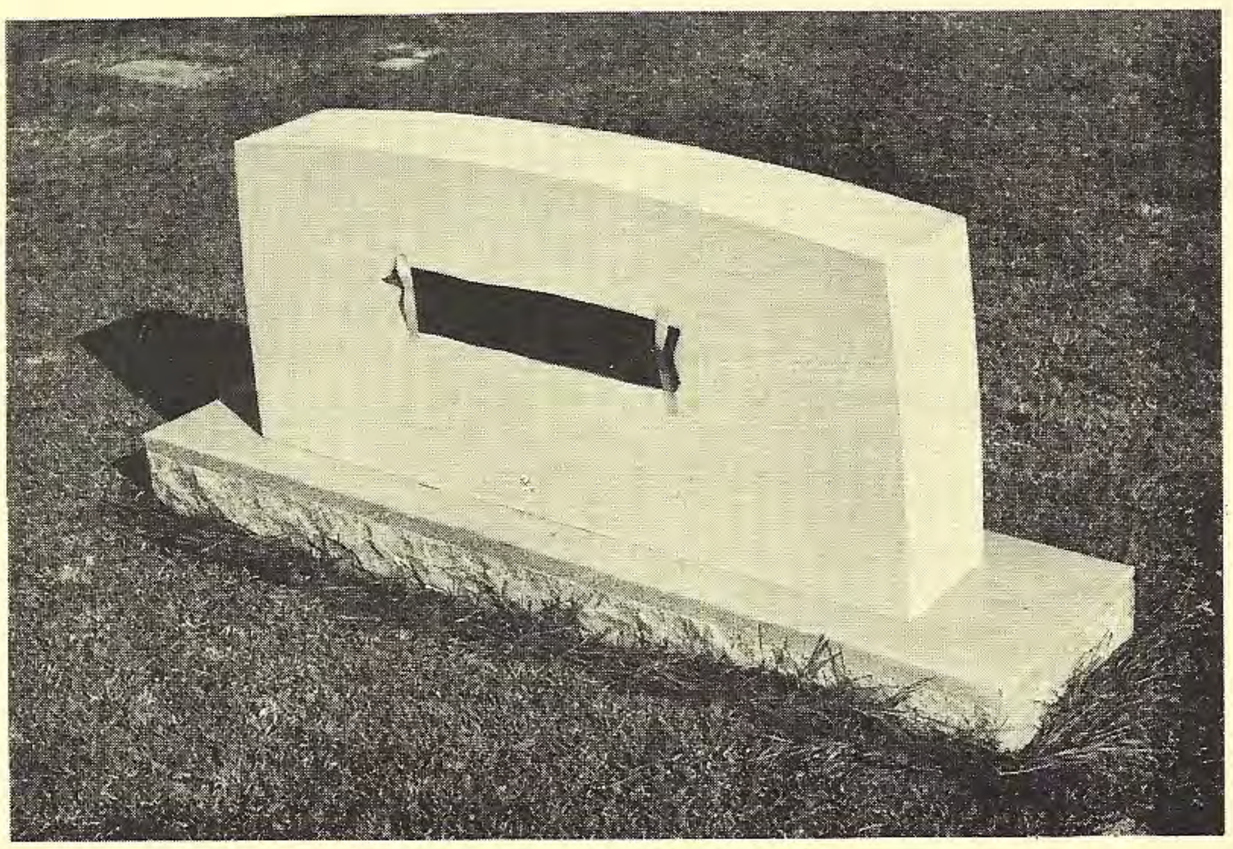
The roof-type monument was set according to the drawing accompanying this article. The oval top monument was set in the conventional manner—foundation below grade, no extension, the monument set in place the same day the foundation was installed.

These two photographs were made October 23, 1967 by the same photographer, with the same camera setting, and within 5 minutes of each other. While it is difficult to print the photographs with true clarity, there is a considerable difference in the appearance of these two similar monuments. The base on the roof-type monument is as clear and clean as the day the work was set. On the oval-top monument, set in the conventional manner, the rock face sides, the carbo margin and the top of the base are considerably darkened. On the roof-type monument, the ¼″ plastic cushions have provided a good strong joint that sealed perfectly. On the oval-top monument, the weight of the die has squeezed most of the setting compound out of the joint.

Since the method of setting the roof-top monument was somewhat of an experiment, with cushions between the **foundation** and the **base,** the base has not yet been grouted to the foundation. Grass clippings under the edges of the base indicate the rise above the foundation.



MONUMENT A — ROOF TOP



MONUMENT B — OVAL TOP

CONCLUSIONS

Properly installed foundations, proper setting and jointing, and proper spacement between component parts of monuments will add materially to the permanent beauty of memorials in our traditional cemeteries.

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