

MASONRY SKILLS

May 1-5, 2017

Training Syllabus



William Penn Mott Jr. Training Center



Memorandum

Date: April 18, 2017

To: Supervisor

From: Debbie Fredricks, Chief
Training Section
California State Parks

Subject: Employee Attendance at Formal Training
Masonry Skills Group 13

An employee from your office will soon be attending the formal training program described in the attachment. Please ensure that the employee is fully prepared to attend the session and that the groundwork is laid for the employee's implementation of the training upon returning to work. You can assist with capturing the full value of the training by taking the following steps:

Prior to Training

1. Make sure that **specific** employee needs are identified and, if necessary, called immediately to the attention of the Training Coordinator.
2. Review with the employee the reason for the employee's attendance.
3. Review objectives and agenda with the employee.
4. Discuss objectives and performance expected after the training.

Immediately Following Attendance

1. Discuss what was learned and intended uses of the training.
2. Review the employee's assessment of the training program for its impact at the workplace.
3. Support the employee's use of the training at the work place.

Three Months Following Training

1. Supervisor evaluates the effectiveness of the training on the employee's job performance and meets with employee to discuss the evaluation.

Thank you for your assistance in seeing that the full benefit of training is realized.

Attachment

cc: Participant

TABLE OF CONTENTS

Formal Training Guidelines	1
Program Attendance Checklist.....	5
Post Training Assignment	6
Agenda.....	7
Program Outline	9
Program Objectives.....	10
Location Map.....	12

Mission Statement Training Section

The mission of the Training Section is to provide knowledge, empowerment, and inspiration through collaboration, consulting, and the delivery of exceptional training programs.

TRAINING SECTION STAFF

Debbie L. Fredricks.....	Training Section Chief
Ann D. Slaughter	Mott Training Center Manager
Jack Futoran	EMS and LFG Training Coordinator
Jeffrey Beach.....	Training Consultant
Dave Galanti	Training Consultant
Karyn Lombard	Training Consultant
Sara M. Skinner	Training Consultant
Jason Smith	Academy Coordinator
Jeremy Alling	Cadet Training Officer
Matt Cardinet	Cadet Training Officer
Raymund Nanadiego	Cadet Training Officer
Lisa Anthony	Program Coordinator
Edith Alhambra	Assistant Program Coordinator
Alex Franck.....	Assistant Program Coordinator
Pamela Yaeger	Assistant Program Coordinator
Jessica Kohls.....	Program Assistant

THE MISSION

of the California Department of Parks and Recreation is to provide for the health, inspiration and education of the people of California by helping to preserve the state's extraordinary biological diversity, protecting its most valued natural and cultural resources, and creating opportunities for high quality outdoor recreation.



FORMAL TRAINING GUIDELINES

Welcome to formal training, an essential component in your career development.

Since 1969, our Department has been providing a continuously changing number of diverse training programs at its main training facility, the William Penn Mott Jr. Training Center, and other locations including Marconi Conference Center. The Department strives to enhance your learning and job performance with formal training of the highest quality.

Our Department's dedication to training is only one aspect of its commitment to you and to the public. This commitment is costly and represents an important investment in you and your career. You and the Department realize a return on that investment by your positive participation in formal training itself and post training follow-through.

The program you will be participating in is described in this training syllabus, which outlines what you can expect from this training and what is expected of you. This syllabus details what you should do before you leave for training; what to do when you arrive; what you will be doing while in training; and, importantly, what you should be able to do when you return to your work site. Specifically:

1. **SYLLABUS:** The syllabus is now accessible on the Employee Training Management System (ETMS) and on the Parks and Recreation website under the Learning/Training Section. Your copy of this syllabus is an important part of your training experience and should be brought with you to training. Read it before you arrive and review it following the program along with material you received at training.
2. **PRE-TRAINING ASSIGNMENTS:** Your completion of pre-training assignments is essential to the success of your training. You are responsible for all reading assignments in preparation for classroom sessions. Time will be provided during working hours to accomplish any assignments which involve either individual or group efforts and resources.
3. **TRAVEL:** Arrange your travel to and from the training through your District or Office. (No reimbursement for travel expense - including per diem costs - will be approved for travel not specifically authorized in advance by the District

Superintendent.) Individuals may claim reimbursement for incidental expenses incurred as outlined in DAM 0410.6. The Mott Training Center does not have the capability to provide transportation to/from Monterey airport.

The cost of your travel (airfare, mileage, rental car, etc.) is paid by your District or Office **to** and **from** the location of the training.

4. HOUSING: Housing will be assigned to participants with a reporting location farther than 50 miles from San Pasqual Battlefield State Historic Park, at the Best Western Hotel, 1700 Seven Oaks Road, Escondido, California 92026. Check-in will begin at 3:00 PM, Sunday, April 30. Reservations have been made, please do not contact hotel directly. If you have special concerns, please contact Training Specialist Jeff Beach at Jeffrey.Beach@parks.ca.gov

Note: You may be assigned a room at a motel while attending training. If so you may be asked to present a valid credit or debit card while checking in to your room. Many motels require a credit card to cover charges incurred such as telephone calls, damages to rooms and/or furnishings, fees to clean rooms that have been smoked in that are not designated as smoking rooms, etc. Be prepared to handle this appropriately.

5. **ENROLLMENT OR HOUSING CANCELLATION POLICY:** To cancel participation in a course, the participant must have their District Superintendent or Section/Office Manager send an email to the Training Specialist assigned to the course requesting to remove the participant. If you do not need lodging or must change or cancel your reservation for lodging, you must contact the Mott Training Center or Training Specialist assigned to the course at least 2 weeks prior to your date of arrival. Lodging, registration, and associated fees will be charged to the employee's District or Section/Office if a training cancellation is received with less than two weeks' notice.

The Training Section is committed to ensuring that the reservation that has been made for you is accurate and needed.

6. MEALS: Meals will NOT be provided, participants will need to handle their own meals, **including bringing a sack lunch each day to class at San Pasqual Battlefield SHP**, as there is no nearby food service to the class location. There are plenty of restaurants, and stores near the Best Western Hotel, so participants will have choices for their other meals, and places to purchase lunch items for class. Participants with reporting locations farther than 50 miles from San Pasqual SHP may file a Travel Expense Claim following the class.
7. CLOTHING: Field uniforms as found in "Description of Required Field Uniforms", DOM Chapter 2300, Uniform Handbooks, will be worn daily by all uniformed employees during formal training sessions **unless otherwise specified in the**

Program Attendance Checklist. Non-uniformed employees shall wear apparel normally worn on the job. Appropriate attire includes apparel suitable for professional office dress. It does not include such items as shorts, t-shirts, tank tops, or sandals.

Because we are on the conference grounds during class, the image we project as State Park employees is important not only during working hours but off duty hours as well, your informal sportswear should be appropriate.

8. TRAINING LOCATION: San Pasqual Battlefield State Historic Park, 15808 San Pasqual Valley Road, Escondido, CA 92027.
9. COURSE LEADERS: The formal training you will attend is developed and, for the most part, conducted by experienced State Park employees in field and staff positions. Some courses will be conducted by qualified instructors from other agencies and educational institutions. Your course leaders have proven their ability and knowledge in their profession, and provide a level of expertise difficult to match.
10. TRAINING SECTION STAFF: Jeff Beach is your Training Specialist and has been assigned the responsibility for your training group. That staff member usually serves as a Course Leader as well as a Coordinator. During the program, you may be asked to assist Training Section Staff in the logistics of your training program (organizing field trip transportation, supervising classroom breaks, etc.). Training Section Staff will do all within their power to make your training experience pleasant and meaningful.
11. TRAINING MATERIALS: May be made available to you at both your unit and the Mott Training Center. Handout materials issued at your unit should be brought to training for possible use. A conference binder or notebook will be issued to you at the training session for note taking and convenience in handling materials. Bring your own pens and pencils.
12. ATTENDANCE: Regular attendance is a critical course requirement and your participation is important to the success of this training. An absence of more than 10% of the course hours constitutes grounds for dropping a participant from the course. The Department Training Specialist may modify this requirement based upon participant knowledge level and/or the portion of the course missed. All absences, except those of an emergency nature, must be approved in advance by the Training Specialist.
13. CELL PHONES: As a courtesy to your fellow participants and course leaders ensure that your cell phone is turned off during classes. Participants should not be receiving or making cell phone calls during class time. Limit those calls to your breaks.

14. LAUNDRY AND DRY CLEANING: May be taken care of by you at one of several local establishments.
15. POST-TRAINING ASSIGNMENTS: In connection with formal training are to be completed under the direction of your supervisor.
16. COFFEE BREAK REFRESHMENTS: Will be available throughout each session. You will be asked to contribute to the "Hospitality Fund" to defray expenses. Bring your own coffee cup.

PROGRAM ATTENDANCE CHECKLIST

To assist you in your preparation for formal training session at the San Pasqual Battlefield State Historic Park the following list is provided:

- _____1. Read and understand the Masonry Skills Program Syllabus prior to your arrival at the Training Center.
- _____2. Complete the following pre-training assignment.
 - Complete the Masonry Skills Pre-Training Assignment at the end of this syllabus.
 - Discuss the Masonry Skills program with your supervisor. What specific changes in your abilities and performance are expected to result from you attending this training?
 - Discuss the projects you will be assigned in the next twelve months, which will utilize the skills developed during the training program.

NOTE: The Pre-Training Assignment will be collected during the program orientation. Completion of the Pre-Training Assignment and bringing the proper personal protective equipment is mandatory; it will count for 20% of your program grade. If you have questions or need help, call the Program Coordinator, Jeffrey Beach, at (831) 901-5864 or e-mail Jeffrey.Beach@parks.ca.gov

- _____3. Remember to bring the following with you to training:
 - Program syllabus and workbook.
 - Personal safety equipment (eye, ear, head and hand protection).
 - Proper field uniform, rain gear, coveralls and/or appropriate work clothing. See uniform handbook and note in Formal Training Guidelines #7.
 - In case of inclement weather, bring serviceable rain gear.

POST-TRAINING ASSIGNMENT

Prior to ninety days after the completion of this program, the employee and his/her supervisor should discuss the impact and assess the effectiveness this program has had on the employee.

The post-training evaluation process is intended to provide a bridge between classroom instruction and the on-the-job application of training. The information obtained through this process will assist the training participant, supervisor, and Training Center in providing a return on the investment the Department has on training.

MASONRY SKILLS GROUP 13 – A G E N D A – May 1-5, 2017

Lead Instructors: Victor Bjelajac, Joe and Manuel Lechuga
Assistant Program Coordinator: Jonathan Lechuga

Special Notice:

This program will be conducted at the San Pasqual Battlefield State Historic Park, 15808 San Pasqual Valley Road, Escondido, CA 92027. Vans are available to transport participants staying at the Best Western Hotel-Escondido to and from the training site, leaving at 0800 hours sharp each day, returning at 1630.

Sunday

April 30

1500- REGISTRATION: *Check in Best Western Escondido Hotel.* All

Monday

May 1

0830-0900	Orientation	Beach
0900-1000	San Pasqual Battlefield-History and Cultural	Turner/Allen
1030-1100	PEF/CEQA	Krimmel
1100-1200	San Pasqual Battlefield-Natural Resources	Smith
1200-1300	Lunch	
1300-1400	Masonry in Historic Structures	Bjelajac
1400-1430	ADA and Masonry	Bjelajac
1430-1530	Material Estimating	Bjelajac
1530-1630	Layout and Form Construction (lecture and practical)	Bjelajac

Tuesday

May 2

0830-1000	Introduction to Concrete	Lechuga
1000-1030	Safety and THAs	
1030-1200	Rotating projects: Rock wall restoration	All
1200-1300	Lunch	
1300-1600	Rotating projects: Rock wall restoration	All
1600-1630	Clean-Up	All

MASONRY SKILLS GROUP 13 – A G E N D A – May 1-5, 2017

Lead Instructors: Victor Bjelajac, Joe and Manuel Lechuga
Assistant Program Coordinator: Jonathan Lechuga

Special Notice:

This program will be conducted at the San Pasqual Battlefield State Historic Park, 15808 San Pasqual Valley Road, Escondido, CA 92027. Vans are available to transport participants staying at the Best Western Hotel-Escondido to and from the training site, leaving at 0800 hours sharp each day, returning at 1630.

Wednesday

May 3

0830-0930	Rotating projects: Rock wall restoration	All
1200-1300	Lunch	
1300-1600	Rotating projects: Rock wall restoration	All
1600-1630	Clean-Up	All

Thursday

May 4

0830-1200	Rotating projects: Rock wall restoration	All
1200-1300	Lunch	
1300-1530	Rotating projects: Rock wall restoration	All
1530-1600	Clean-Up	All
1600-1630	Review	All

Friday

May 5

0830-1030	Final Exam	All
1030-1130	Program Review	All
1130-1200	Program Summary and Evaluation	Beach
1200-	Lunch and Depart	

PROGRAM: MASONRY SKILLS

36 HOURS

PROGRAM OUTLINE

	<u>Total Hours</u>
<u>ORIENTATION</u>	1.0
Program Overview and MPC Registration.....	
<u>CONCRETE CONSTRUCTION</u>	8.0
Materials.....	
Forms and Forming.....	
Mixing and Placing.....	
Finishing.....	
Estimating	
<u>MASONRY TOPICS</u>	16.0
Soil Cement.....	
Pavers (decorative walks)	
Plastering	
Brick Laying.....	
Block Laying.....	
Stone Setting.....	
Tile Setting	
Repairs.....	
<u>RELATED SUBJECTS</u>	10.0
Safety	
Tools	
Historic Applications	
Performance Evaluations and Examinations.....	
Material Handling and Clean-up.....	
<u>PROGRAM EVALUATION</u>	1.0

Total Hours 36.0

MASONRY SKILLS

PROGRAM ORIENTATION

Purpose: Participants will meet one another, the program coordinator, and facilitators. The group will share expectations for the training program. In addition, program content will be reviewed and registration for Monterey Peninsula College completed.

Performance Objectives: By the close of the session the participant will

1. Review program content, procedure and evaluation processes.
2. Share and record expectations with group members.
3. Adhere to all Training Center guidelines.

HISTORIC MASONRY: ROCK WALL CONSTRUCTION

Purpose: Participants will identify masonry repair materials which are compatible with those used in historic structures.

Performance Objectives: By the close of the session the participant will

1. Demonstrate basic masonry structural mechanics.
2. Review the Philosophy of Historic Preservation and its relationship to masonry structures.
3. Identify:
 - A. Historic masonry construction.
 - B. Historic masonry materials.
 - C. Historic masonry construction practices.
 - D. Conditions that lead to problems in historic masonry.
 - E. Symptoms of the problems and trouble shoot causes.
4. List potential repairs for problems and the effects of some repairs.

SAFETY

Purpose: Participants will be introduced to masonry safety issues.

Performance Objectives: By the close of the session the participant will

1. Review injuries commonly occurring in masonry trades.
2. Identify harmful agents in masonry materials.
3. Review correct lifting and carrying procedures.

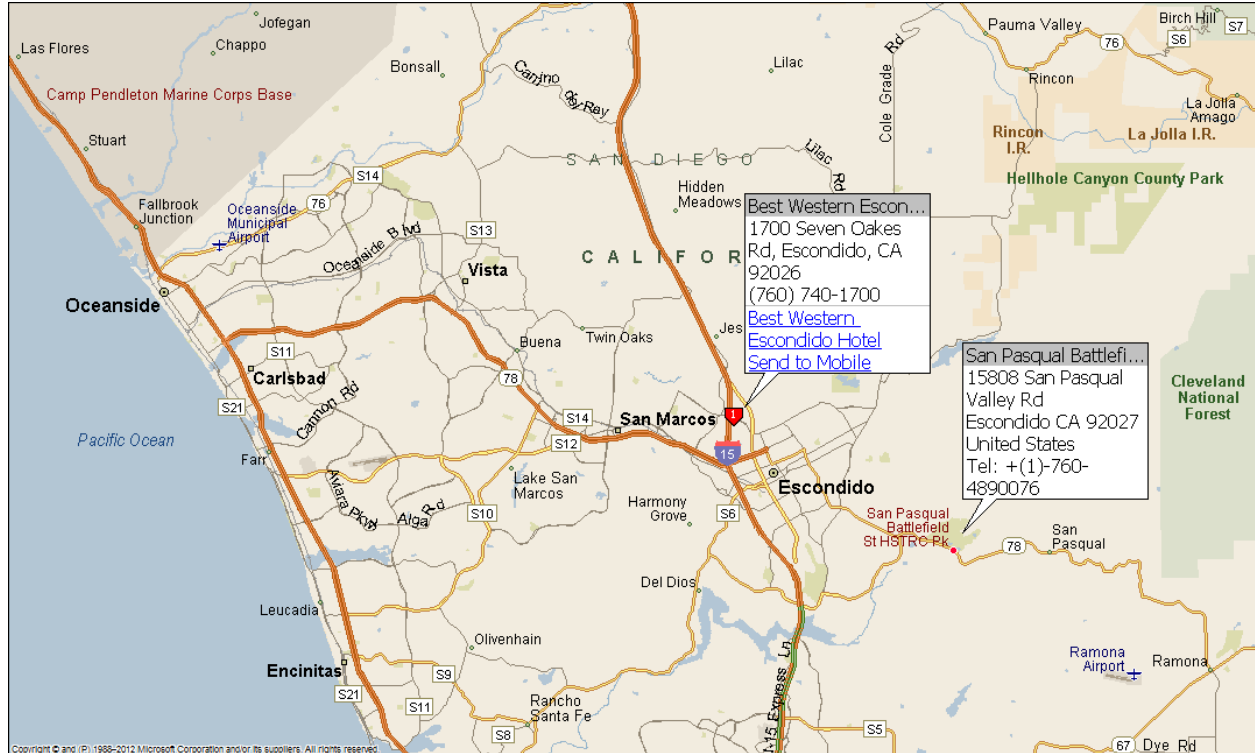
CONCRETE MASONRY SKILLS

Purpose: Participants will be able to plan, prepare and use concrete in common, small-scale park applications.

Performance Objectives: By the close of the session the participant will

1. List the ingredients and mixes of concrete.
2. Identify basic construction practices for building concrete forms.
3. Describe the processes involved in finishing concrete steps, sidewalks, and drives.
4. Apply the mathematics used in calculating quantity of concrete.
5. Discuss the importance and use of steel in concrete construction.

Lodging and Training Location Maps



Masonry Skills

Pre-Training Assignment



MASONRY SKILLS

The function of the California Department of Parks and Recreation as stated in the Public Resources Code is ".....to acquire, protect, develop, and interpret for the inspiration, use, and enjoyment of the people of the state a balanced system of areas of outstanding scenic recreational and historic importance. These areas shall be held in trust as irreplaceable portions of California's natural and historic heritage". With the exception of acquisition, the daily routine of every park maintenance worker is summed up in the mission of the Department. Every decision made, and every action taken, by a maintenance worker affects both the resource and the visitor's enjoyment of the resource. Something as small as replacing a missing shingle on a building's roof has a direct bearing on the life of the structure and the condition of its furnishings. Additionally, if the building is historic, the type of shingle and workmanship used in the repair affect the interpretation of the structure. The personal mission of every Park Maintenance Worker must include maximizing the visitors experience and working diligently to preserve the resources entrusted to their care.

SAFETY

On every masonry project, the maintenance worker must be alert to potential dangers the project may pose to the public, park employees, and self. It is of the utmost importance that all persons on the project site be knowledgeable in the safe and proper use of the tools and equipment they will be using. Although the project supervisor or lead person is responsible for identifying special precautions to be taken, the responsibility for a safe workplace is shared by all employees. Safety is the single most important subject the maintenance worker must learn about the masonry (or any other) trade. Accidents do not "just happen" -- they are caused by unsafe acts, unsafe conditions, or a combination of the two. Accidents can be prevented if safety rules are learned and followed. OSHA and CAL-OSHA (Occupational Safety and Health Act) establishes minimum standards of safety, or safety orders, for all phases of industrial activity. The General Industry Safety Orders and Construction Safety Orders apply specifically to building construction. Safety Orders should be available in your unit's maintenance library. In California the Safety Orders are included in Title 8 of the California Administrative Code.

CODES

All work performed on facilities within the California State Park System must meet acceptable standards. Acceptable standards for Federally owned facilities are found in the Uniform Building Code and the Public Resources Code. The California Building Code is Title 24 of the *California Code of Regulations* (CCR). Title 24 is based on the Uniform Building Code and is the building standard for state owned buildings. The purpose of this code is to insure that structures are safe, accessible, and adequate for their intended use. Although there are significant differences between the two codes, Title 24 adopts many portions of the UBC by reference numbers. It is necessary to refer to both Title 24 and the Uniform Building Code whenever modifying or constructing a California State Park structure. The latest Code edition should be available in every

maintenance library. The California Public Resources Code gives the Department of Parks and Recreation responsibility for preserving California's irreplaceable natural and cultural resources. Two processes which help the maintenance worker fulfill that function are commonly referred to as "CEQA" and "5024". CEQA stands for California Environmental Quality Act and basically says that nothing will be done that will adversely affect the environment. 5024 refers to the Public Resources Code and is basically interpreted to say that nothing will be done to alter the character of historic structures. The Department of Parks and Recreation has developed policies based on CEQA and 5024, which can be found in the Resource Management chapter of the Departmental Operations Manual. The Maintenance Chief is generally responsible to see that the CEQA or 5024 requirements have been met before work begins. When in doubt.....ask! The Public Resources Code and Departmental Operations Manual should be available in your unit's maintenance library.

Reference Pages from the Complete Masonry - Sunset Books: 31-2, 45, 104-5, 107, 128, 140-142, 152, 162, & 188

ceramic tile

If you're looking for splashes of color, or a patio surface as smooth as that of an indoor room, ceramic tile is your best choice. Visit several tile stores and contemplate the vast array of colors and shapes.

Be sure that the tiles and the installation materials will survive your climate. In most cases, ceramic tile must be set in a bed of mortar (usually, thinset mortar) atop a solid concrete slab. Latex-reinforced sanded grout is durable enough for most outdoor applications, especially if you apply a sealer every year or so.

Mexican Saltillos and terra-cotta tiles have a soft reddish glow that lends warmth to a patio. However, most types are suitable for warm climates only; with one hard freeze, they could crack.

Many glazed ceramic floor tiles survive even in harsh climates if they are properly laid. However, a high-gloss glaze is slippery when wet. Some types have a slightly bumpy surface for skid resistance.

Quarry tiles are unglazed and very hard, so their surface is skid resistant and durable. Their colors generally are limited to earth tones and pastels.

Modern methods produce porcelain tiles that are amazingly tough and easy to maintain. And porcelain can be made to resemble almost any type of ceramic or stone tile.

While some people regard porcelain tile as an imperfect replica that lacks the true texture and natural beauty of stone or ceramic, others swear by the ease with which porcelain can be cleaned and its excellent stain resistance.

Mosaics are composed of many small tiles joined together, usually with a mesh backing. They are as



brick

Essentially brick is still made the same way it has been since ancient time—firing a clay mixture in a kiln. The higher the firing temperature, the stronger the brick. The result of the process is a building block of rustic charm at home in any landscape. Brick is not as strong and weather resistant as are concrete pavers (see pages 34–35). But if you choose the right type, a brick patio or wall can last for centuries with little maintenance.

Especially in an area with freezing winters, many bricks that survive on walls will not survive as patio pavers, where they are subject to much more pressure. Some bricks designed to withstand freezing weather when used in walls are not suitable for use as pavers. Pavers are in contact with a lot more moisture than wall bricks. When the moisture freezes and expands, it can cause the bricks to crumble. For a patio, use bricks rated SX if

your ground freezes; use bricks rated MX only in a warm climate. Consult with your dealer to make sure that the brick you buy will last. A coat or two of sealer will repel moisture and make bricks last longer, but it will not transform wall bricks into patio bricks.

A brickyard will offer a wide array of wall bricks. “Cored” bricks have three or more holes to reduce weight and to give the mortar greater grabbing power.

Wire-cut bricks have rough vertical lines; rough-facing bricks have the appearance of cracked earth. A fingerprint brick has several indentations that look like thumbprints. Bricks may be a single color, speckled, or composed of several slightly different hues. Used common bricks are often partially covered with white efflorescence.

Paving bricks, suitable for cold weather, are sometimes dark in color with a slightly glossy surface. A “frogged” brick has an old-fashioned indentation bearing the name of the manufacturer; you may want to scatter some of these throughout a patio. Faux “used” bricks are often concrete pavers made to look like old common brick.

ADOBE BLOCK

Traditional adobe block was made simply by mixing clay with straw, cutting it into slabs, and allowing it to dry in the sun. The resulting material needed to be covered with adobe plaster and could be used only in warm, dry climates. Today, asphalt emulsion or Portland cement is added to the mix to improve stability. These blocks can hold up even in cold climates, though they are not widely available outside the Southwest.



Adobe blocks are massive— $4 \times 8 \times 16$ and $4 \times 8 \times 8$ are two common sizes. These large, earth-toned slabs look great in open garden spaces.

Some types are irregular in shape, while others are manufactured with the same precision as bricks or concrete pavers. Adobe blocks can be laid in sand to form a patio, or they can be stacked to form a wall.

TOOLS FOR BUILDING PATIOS AND WALLS

Many of these tools have remained unchanged for centuries. Always buy the correct tool for the job, even if you will use it only once. Makeshift solutions will cause frustration and lead to sloppy work.

You can mix small batches of mortar in a 5-gallon bucket, but it is easier to mix mortar in a wheelbarrow or in a plastic

masonry trough. (A wheelbarrow is preferable because it is at a more comfortable working height.) Choose a heavy-duty wheelbarrow with air-filled tires.

A mason's hoe (A) mixes mortar and concrete quickly. Once mortar is mixed, either scoop it directly from the wheelbarrow or place a workable amount on a hawk (B). Throw a line of mortar

using a brick trowel (C). A pointing trowel (D) helps slip mortar into tight spots. For some projects, you will need a grout bag (E) to slip mortar into joints after the masonry units have been installed.

Use a torpedo level (F) to check masonry units for level. Hook a wooden or plastic corner block (G) to a brick at either end of a wall and stretch mason's line between them, so that you can quickly align bricks as you lay them. When tapping bricks and pavers into place, use a rubber mallet (H). Brick tongs (I) pick up six or more bricks for easy carrying.

Make simple cuts in masonry units by chipping with a mason's hammer (J). A brickset chisel (K) is just the right size for cutting most bricks; a cold chisel (L) with a narrower blade bites into tougher materials.

To finish joints in a brick or a block wall, use a jointer (M). Brush joints with a mason's brush (N), which is just the right stiffness to clean away excess mortar without marring the joint.



concrete basics

In most areas, you need a permit to pour more than a very small concrete slab. Check with your building department; they have very specific requirements, and you'll achieve better results if you follow them to the letter.

THE RIGHT MIX

Concrete is composed of Portland cement, sand, gravel (also called aggregate), and water. For different ways of putting the ingredients together, see pages 106–7.

Portland cement is the glue that holds it all together. The more cement, the stronger the concrete. To strengthen a small batch of concrete or mortar, add a shovel or two of cement. When ordering from a ready-mix concrete company, specify how much cement you want. A “six-bag mix” contains six bags of cement per yard of concrete—strong enough for most projects, but check with

your building inspector to make sure a stronger mix isn't required.

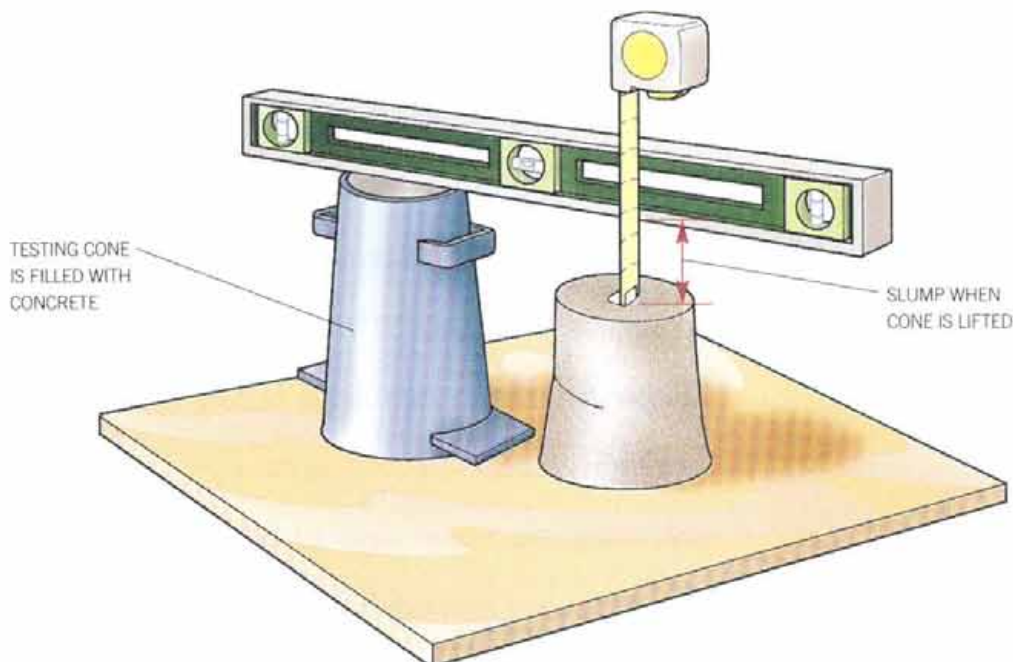
Gravel stones should be no larger than one-third the thickness of the slab; avoid the temptation to throw in large rocks to fill space. A correct mix will have enough sand to fill in the spaces between the gravel stones. If dirt gets into a concrete mix, the concrete will be weakened.

The mix should contain enough water so that you can easily pour and work it; but too much water weakens the concrete and causes cracks. An inspector may test concrete for “slump” using a special testing cone (below).

A sag of about 4 or 5 inches indicates the right consistency for most jobs—not too soupy and not too dry.

If you live in an area with freezing winters, order air-entrained concrete, which contains tiny bubbles. The bubbles lend a bit of flexibility, so the concrete is less likely to crack when it freezes. An air-entrained agent can be added when using a power mixer.

If it might freeze during the pour or a few days afterward, consider ordering an accelerating additive, which makes the concrete harden quicker. If the weather is hot and dry, consider adding a retardant, which slows up the drying time. If the concrete sets too fast, you may not have enough time to adequately finish the surface.



REINFORCING CONCRETE

Building departments have specific requirements for steel reinforcement. Wire mesh embedded in a slab keeps the slab together if it cracks during or after curing. Reinforcing bar (rebar) is used to make walls and footings stronger. To prevent concrete from cracking while it cures, you can have fiber mesh added to the ready-mix truck, or you can buy bags of dry-mix concrete that are fiber reinforced. Unfortunately, fiber mesh does nothing after the concrete is cured, so don't make the common mistake of using it to replace wire mesh.

CALCULATING CONCRETE NEEDS

Use the following guidelines to figure gravel and sand needs as well as concrete. Take careful measurements of the area to be filled. Measure for thickness in a number of spots to obtain a reliable average; a discrepancy of $\frac{1}{2}$ inch can make a big difference in the amount of concrete you need. A supplier can quickly calculate for you, but it's a good idea for you to double-check the calculations. This is easy to do, if you use a calculator.

Concrete is typically sold by the cubic yard, also just called a yard. A yard of concrete (or sand, or gravel) fills an area 3 feet by 3 feet by 3 feet. For small projects like postholes, you may choose to measure cubic footage instead. A 60-pound bag produces $\frac{1}{2}$ cubic

foot; a 90-pound bag yields $\frac{2}{3}$ cubic foot.

For a rectangular slab or footing, multiply the width in feet times the length in feet, times the thickness in inches. Divide the result by 12 to get the number of cubic feet. Divide that number by 27 to get the number of cubic yards. For example, if a slab measures 12 feet by 14 feet and is $3\frac{1}{2}$ inches thick, use the following formula:

$$12 \times 14 \times 3.5 = 588$$

$$588 \div 12 = 49 \text{ cubic feet}$$

$$49 \div 27 = 1.8 \text{ cubic yards.}$$

Add about 10 percent for waste and order 2 yards.

To figure for a circular slab (which is actually a shallow cylinder), multiply the radius in feet squared times pi (3.14), times

the thickness in inches. As with a rectangle, divide that number by 12 to get the cubic feet and divide that sum by 27 to get the number of cubic yards. For example, if an area is 8 feet in radius (16 feet in diameter) and 4 inches thick, use the following formula:

$$8 \times 8 = 64$$

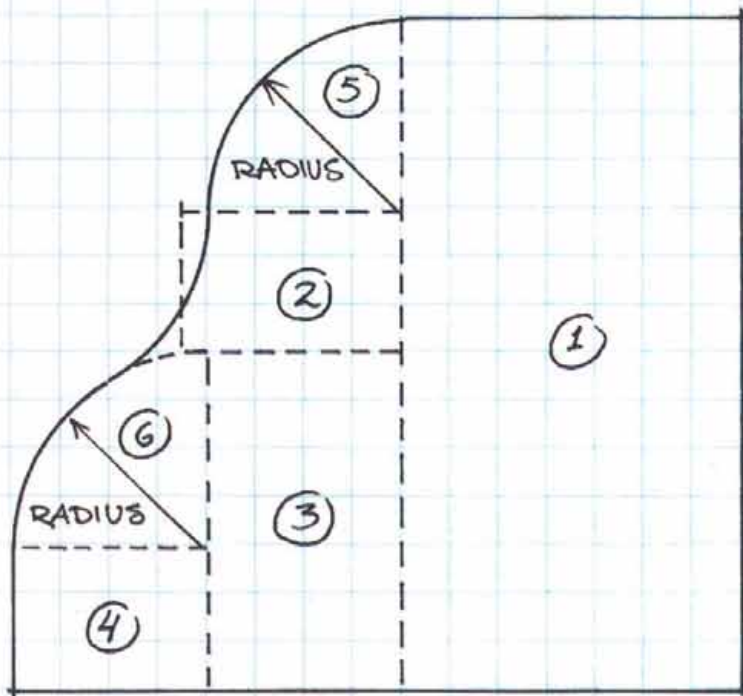
$$64 \times 3.14 \times 4 = 804$$

$$804 \div 12 = 67 \text{ cubic feet}$$

$$67 \div 27 = 2.5 \text{ cubic yards}$$

Add about 10 percent for waste and order $2\frac{3}{4}$ yards.

If your patio is an irregular shape, divide it into rectangles and portions of circles to obtain an estimate of the square footage. In the example shown below, a patio is divided into four rectangles and two quarter circles. Note how area #2 is treated as a rectangle.



USING A POWER MIXER

Rent a mixer with a capacity of at least 4 cubic feet. A mixer can be either electric or gas-powered. Stabilize the mixer so it does not “walk” while it is mixing.

Consult with your supplier and a building inspector for the correct mix. Typically, a yard of concrete calls for five 94-pound bags of Portland cement, 20 cubic feet of gravel, and 15 cubic feet of sand. Combine the ingredients using these ratios: 4½ shovelfuls of gravel, 2 shovelfuls of cement, and 3½ shovelfuls of sand.

With the mixer off, add several gallons of water and all the gravel. Turn the mixer on to scour the drum. Add all the sand, along with all but the last 10 percent of the water. Next, add the Portland cement. Once the mixture is a uniform color and texture, add the air-entraining agent if you’re using it. Continue mixing for a couple of minutes more, adding more water until you achieve the right consistency.

ORDERING READY-MIX

Many ready-mix companies do not want to bother with any quantity less than a yard. Others have special trucks designed to mix smaller amounts at the job site. If one company does not want your business, call other companies until you find one that does.

Make sure that the concrete meets or exceeds code requirements, which may specify number of sacks of cement per yard, slump



(see page 104), p.s.i. (pounds per square inch) rating, and perhaps additives. Check that your concrete will be delivered “fresh”; if yours is the second or third stop on a truck’s route, the concrete will be old and could set up quickly.

THE RIGHT CONSISTENCY

Properly mixed concrete is completely wet, so it does not

crumble; but it is not soupy. If (wearing gloves) you pick some up and squeeze, it should roughly hold its shape, and liquid should not drip through your fingers.

Another way to test for consistency: Drop a shovelful on a flat surface and slice through it with the shovel blade. It should hold its basic shape, yet be liquid enough to pour.



tiling over concrete

Consult with a tile dealer and choose floor tiles that are proven to survive winters in your area. Tiles with a glazed surface are slick when wet, while quarry tiles and other types have a slip-resistant surface. Installing smaller tiles results in more grout lines, which improve slip resistance. Some tiles can be cut easily with a snap tile cutter; others require a wet saw.

For a patio, you may choose to use only field tiles, which have unfinished edges; the edges will not be very visible. On a stairway or other area where edges are on display, use bullnose tiles, which have one edge that is rounded off and finished.

The concrete itself should be solid; tiling will not add appreciable strength. Chip away any high spots and patch any large depressions (see pages 176–77). Small cracks will be filled when you apply thinset mortar.

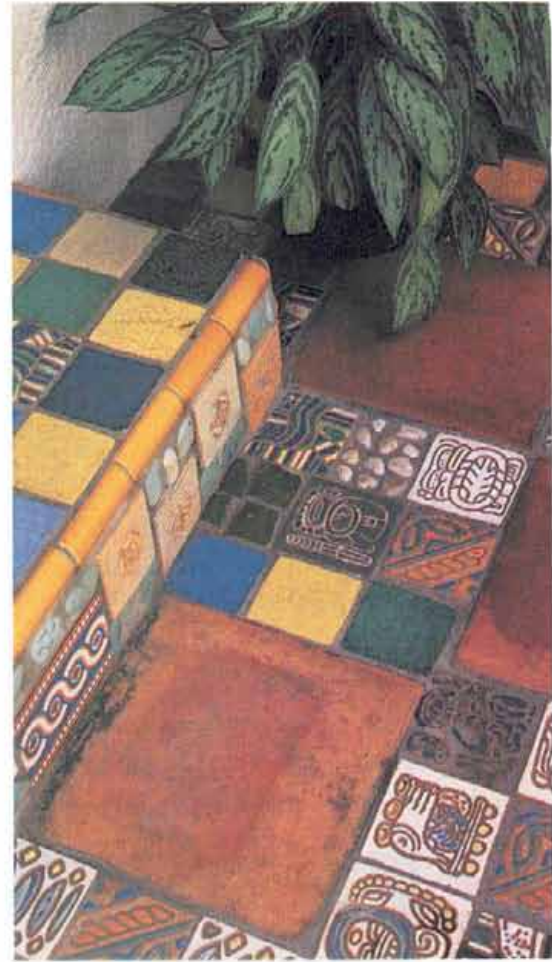
1 Lay Out a Dry Run

Set the tiles out as they will appear in the finished job. Use plastic

spacers to maintain consistent joints. See that all the joints—including any joints between horizontal and vertical tiles—are the same width. Cut tiles as needed.

2 Trowel Thinset Mortar

Purchase latex- or polymer-reinforced thinset mortar. The thinset should be just stiff enough to hold the ridge shapes created by troweling. If it starts to harden, throw it out and mix a new batch. Apply the mortar using a square-notched trowel of the size recommended for your tile. First press the mortar into the concrete, allowing the notches to scrape



the concrete. Then pass over the surface with less pressure, to create a flat, even surface.



working with mortar

A professional mason can “throw” a neat line of mortar at just the right thickness with ease and speed. Even if you are very handy, it would take months of practice to become that proficient. But you can learn to throw mortar well enough to construct a straight wall with neat joints if you practice throwing mortar on a concrete or a brick surface for a couple of hours. You will work much slower than a pro, but the result will be a masonry project that you can point to with pride.

Buy bags of mortar mix—Portland cement mixed with sand. Type N mortar is strong enough for most home masonry projects. If you will be installing brick below grade or would like extra strength, buy type S. If it is convenient, use a trowel to scoop mortar directly out of a wheelbarrow. Often, however, it is easier to load a shovelful of mortar onto a hawk or a piece of plywood about 16 inches square and work from there.

The techniques on these pages pertain to any brick wall. For details on planning the wall and

positioning the bricks, see pages 142–45.

1 Mix and Test the Mortar

Pour about one-third bag of mortar mix into a wheelbarrow or mixing trough. (You can mix larger batches as you become more proficient.) Add water a little at a time and mix with a mason's hoe.

It's critical to get the mix right. Mortar is thick enough when you can cut ridges in it with a mason's trowel and the ridges hold their shape. The mortar is too dry if it appears crumbly. As another test, scoop up some mortar with a

mason's trowel and hold it upside down. The mortar should stick to the trowel for a second or two. If the mortar is too dry or too wet, add water or dry mix.

2 Throw a Line

Scoop up mortar with the trowel. With the face of the trowel pointing up, snap the trowel downward quickly. The mortar will lift very slightly and make a smacking sound as it settles back onto the trowel. This loosens the mortar's grip on the trowel.

Next comes the tricky part. To throw a line of mortar, extend your arm so that the trowel is at the point farthest from you. Rotate the trowel until mortar starts to slide off, and pull the trowel back toward you. The goal is to deposit mortar in an even line about 1 inch thick, three-quarters of a brick wide, and two or three bricks long. The process should be quick and smooth.



3 Furrow the Mortar

Turn the trowel upside down and drag its point through the mortar to produce a channel about half the thickness of the mortar line. Take care that the mortar does not slide off the side of the bricks. If excess mortar does slide onto the bricks below, slice the mortar off in the same manner as shown in step 6.

4 Butter a Brick End

Every brick, except the first one in a course, needs to have at least one end buttered. To do so, hold the brick in one hand and load the trowel with a small

amount of mortar. Scrape the trowel at a 45-degree angle to the brick end and then lightly pull the trowel back; shape the mortar in this way in all four directions.

5 Push a Brick into Place

Set the brick on the mortar bed, about 2 inches away from the brick it will abut, and slide it into place. Ideally, a little mortar will squeeze out of all the joints. Any small gaps at the joints can be filled in when you strike the joint (see step 7, page 144). If there are gaps greater than an inch, remove the brick and start again.

If a brick sits too high, tap it down, using the handle of the trowel. If it is too low, do not pull it upward; that would create a weak joint. Remove the brick, scrape off the mortar, and start again.

6 Slice Off the Excess

Use the trowel like a knife to slice off the squeezed-out mortar. If you slice quickly and in one motion, little mortar will smear onto the face of the bricks.

Every 10 minutes or so (depending on the heat and humidity), strike and perhaps clean the joints (see page 144).



brick garden walls

Garden walls are freestanding, which means that they do not retain soil. Low, short garden walls can be built with a single wythe—that is, with only one horizontal row of bricks. But such walls are not strong; you can even push them over by hand. Double-wythe brick walls are much stronger, although if they are more than 2 feet high they may not be strong enough to act as retaining walls.

Any mortared wall—brick or otherwise—must rest atop a solid concrete footing (see pages 134–35). Wait a week or so for the footing concrete to cure before building the wall. Before you start laying bricks, practice the mortar techniques shown on pages 140–41.

To quickly measure the bricks for the correct height, make a story pole. Lay a number of bricks with $\frac{3}{8}$ -inch spaces between them, on edge on a flat surface. Then lay a length of 1×2 or 1×4 next to the bricks and draw marks indicating the centers of each mortar joint. Alternatively, purchase a ready-made story pole. A standard model has marks every 8 inches to indicate three courses of common brick plus the mortar joints.

CHOOSING A BOND

For strength, a freestanding brick wall must have two wythes—essentially two parallel, abutting walls. Usually, some bricks are turned sideways to tie the wythes together; these bricks are called “headers,” while the rest of the bricks are the “stretchers.” Over the centuries, masons have developed patterns, called “bonds,”

that combine headers and stretchers in regular patterns.

Most bonds require cutting bricks. To help you maintain rhythm and concentration as you throw mortar and lay bricks, cut a number of bricks factory-style ahead of time. For cutting techniques, see pages 76–79.

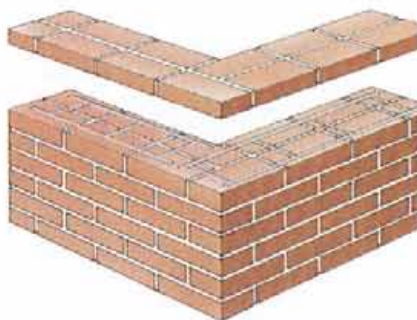
RUNNING BOND has no headers. Be sure to embed metal reinforcement in the mortar every four or five courses to tie the wythes

together. Cut ladder-type reinforcement roughly to fit, as shown below, or push corrugated wall ties into the mortar every foot or so.

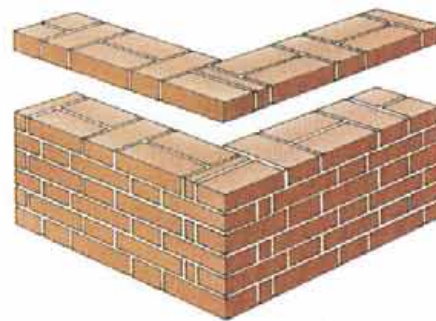
FLEMISH BOND alternates headers and stretchers in each course. You'll need to cut closure bricks at the corners.

ENGLISH BOND alternates courses of headers and stretchers. This pattern also requires you to cut closure bricks at the corners.

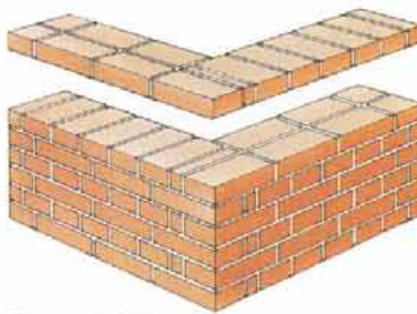
COMMON BOND, also known as American bond, is shown being installed on pages 143–44. It uses headers every fifth course and requires a small amount of extra cutting.



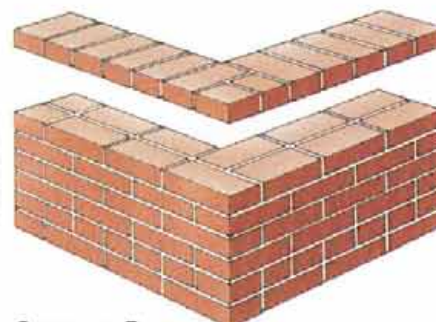
RUNNING BOND



FLEMISH BOND



ENGLISH BOND



COMMON BOND

stuccoing a wall

Stucco can cover an ugly or damaged concrete, block, or brick wall and create a blank canvas that you can paint or decorate as you choose. Left blank, stucco has a soft, mellow appearance.

It will take a couple of hours to get the hang of stuccoing. Fortunately, the base coat—which you install at the beginning of your learning curve—will be covered up. Before applying the finish coat, practice on a vertical piece of plywood or on an obscure portion of the wall. That way, when you start applying the final coat to a visible area, you will have developed sufficient skill in your strokes to produce a surface that is consistent in appearance.

The masonry surface to be covered must be clean and dry, as well as free of any loose material. If a brick wall is flaking or has produced the dusty white powder called efflorescence, correct the problem before proceeding. See pages 180–81 for cleaning instructions.

1 Apply the First Coat

Paint the surface with a latex bonding agent. Pour half a bag of dry stucco base-coat mix into a wheelbarrow. Add water and mix with a mason's hoe to produce a pasty consistency. The stucco should be just firm enough to hold its shape when you pick it up with a trowel.

Place a shovelful of stucco on a hawk or a piece of plywood. Hold the hawk against the wall as you work, so that you can catch

any drips. Scoop up the stucco with a straight finishing trowel and slather it onto the wall, while pressing it into place. Aim at a coat that has a uniform thickness of $\frac{1}{8}$ inch.

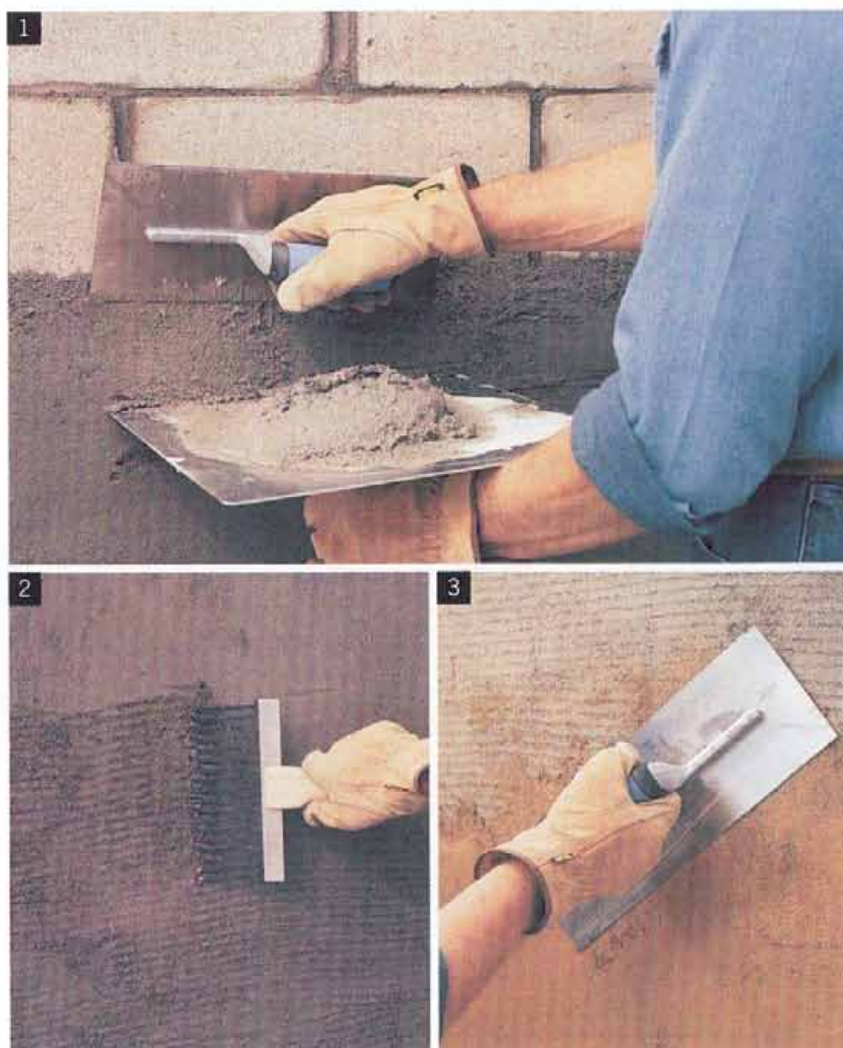
2 Scarify the Base Coat

When the base coat has started to stiffen, comb the surface with a scarifying tool. Work to produce

indentations without raising large crumbs. For maximum strength, regularly spray with water to ensure that the base coat cures slowly—ideally, for two days.

3 Apply a Finish Coat

Mix stucco for the finish coat using the same method you used for the base coat, except make the mix slightly wetter. If you buy white stucco finish, you can mix it with dry colorant for long-lasting color. Apply the finish coat in the same way as you applied the base coat.



mortared stone walls

A mortared stone wall must rest on a solid concrete footing; otherwise, the mortar joints will crack. See pages 134–35 for pouring a footing. Make sure that the foundation meets local codes, which take into account regional weather conditions.

Don't depend on the mortar to hold the wall together. Choose stones that are close to square and that are flat on at least some sides so that they can rest on top of each other without wobbling. Sort the stones into three or four piles according to size, to make it easier to find the stone you need. If the stones are dirty, clean them with a mason's brush and water. Use a wire brush if the dirt is stubborn; a dirty stone will not adhere well to mortar. If the stones are very porous, spray them or soak them in water just prior to installing them.

1 Make a Batter Gauge

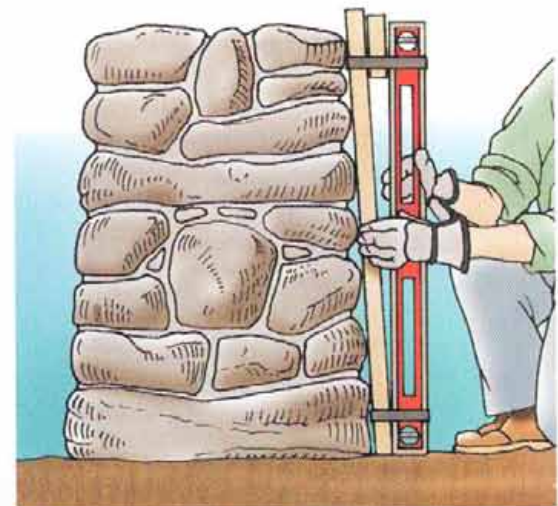
Make a simple batter gauge with a 4-foot carpenter's level, a straight 2×2 or 2×4 , a scrap of 2×2 , and some tape. The gauge shown here will indicate a slope of about 2 inches per 4 feet when the level is held plumb.

2 Lay the First Stones on the Footing

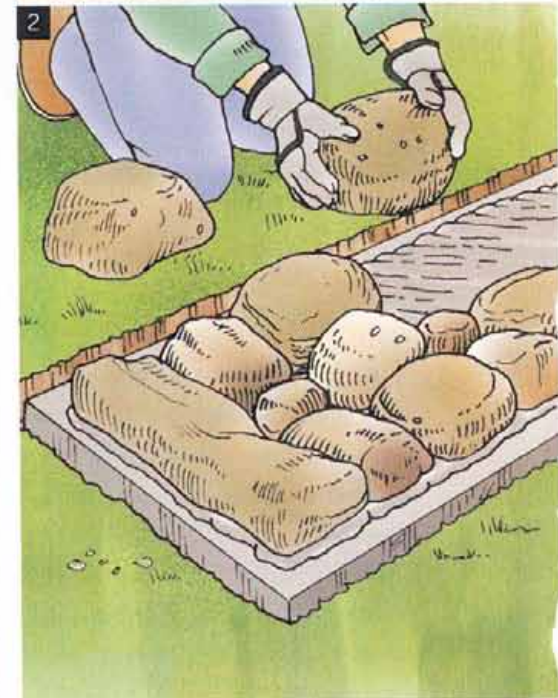
Dry-lay the bottom stones on the footing to create an arrangement that looks good. Then move them close by, so that you can easily replace them in order. Mix a stiff batch of type N or type S mortar

(see page 140). Spread a bed of mortar $\frac{1}{2}$ to 1 inch thick on the footing and set the bottom stones in it. As you work, periodically check that the mortar is sticking to the stones. If the mortar starts to harden or to crumble, throw it out and mix a new batch.

1



2



glossary

adobe: Clay bricks made into blocks. Originally, adobe was dried in the sun. Modern adobe is typically fired in a kiln and may be reinforced with asphalt.

ashlar: Stones cut into rectangular units; used for building walls with a geometric appearance.

batter: The way a retaining wall leans back toward the soil it retains, to add greater strength.

bleed water: Moisture that rises to the surface of concrete as it is being worked. Bleed water should be allowed to dry before the concrete is worked further.

bolster: A device, made of wire or of a small concrete block with wire, used to hold rebar at the correct height.

brick: A paving unit made from clay that has been molded and fired in a kiln.

buttering: Smearing mortar with a trowel onto one or more edges of a brick or other masonry unit just prior to setting it in place. Tiles may be "back buttered," meaning that mortar is troweled onto their backs.

concrete: A mixture of water, sand, gravel or crushed stone, and Portland cement.

concrete block: A wall unit formed of high-strength concrete, usually with two or three hollow cells.

concrete pavers: Paving units formed from high-strength concrete; available in a variety of sizes and shapes.

control joint: A shallow line that is meant to contain stress cracks and is scribed in a concrete slab.

course: In a masonry wall, one horizontal row.

curing: The process by which concrete or mortar achieves maximum strength in the weeks after being installed. The slower the curing process, the stronger the final product will be.

dry-mix concrete: Bags, usually 60 or 80 lb., containing all the dry ingredients of concrete; add water and mix in a wheelbarrow or trough.

edging: The process of rounding the edge of a concrete slab to make it less likely to chip when bumped.

efflorescence: A whitish discoloration on brick that typically occurs when moisture causes minerals to bleed to the surface.

finishing: The third and final step (after screeding and floating) in smoothing concrete; usually done with either a steel trowel or a broom.

floating: The intermediate stage of smoothing wet concrete (see screeding and finishing), usually using a bullfloat, a darby, or a magnesium float. Floating causes bleed water to rise to the surface.

footing: A concrete base used for the support of structures. A wall requires a long footing that is wider than the wall. To avoid frost heave in cold climates, a footing should extend below the frost line.

frost line: The maximum depth at which soil freezes during winter. This measurement is determined by local building codes.

header: A wall brick or block that is positioned perpendicular to the stretchers so that its short end, rather than its longer side, is visible when the wall is completed.

isolation joint: The junction where a concrete slab is mechanically separated from an abutting surface, usually with a fibrous isolation joint material. This inhibits cracks from forming when the slab heaves or expands and contracts differently than the abutting surface.

mortar: A mixture of Portland cement, sand, water, and sometimes lime, used to join masonry units.

paver: Any regularly sized unit used to form the finished surface of a patio. The most common pavers are paving bricks, concrete pavers, and cut stones.

plumb: The condition of being perfectly vertical, in other words, exactly 90 degrees from level.

Portland cement: A mixture of lime, silica, alumina, and iron that has been fired and then crushed into a fine powder. The result is a powerful adhesive used in mortar and concrete.

ready-mixed concrete: Concrete delivered wet in a truck, ready to pour.

reinforcing bar (rebar): Lengths of steel pole used to strengthen concrete. Rebar is typically set in the middle of the concrete's thickness, and the pieces are tied together with wire.

reinforcing wire or mesh: Steel wire welded into a grid, commonly with 6-inch squares. Stucco lath is a denser mesh that should be used for smaller projects.

repointing: Also called tuckpointing. Refinishing mortar joints that have begun to decay.

rowlock: A cap brick (used to finish the top of a wall) laid on edge and perpendicular to the wall.

sailor: On a patio, an edging brick set standing upright with its face outward.

screeding: The first step in smoothing wet concrete, typically by moving a straight board across the top form boards. Screeding also refers to smoothing a sand bed prior to installing pavers. In that case, a special screeding guide is used. The guide is composed of two pieces of lumber attached so as to screed the sand at a height that is one paver thickness below the edging. In another type of installation, lengths of pipe are used as screed guides.

soldier: An edging brick set upright with the edge facing out.

story pole: A tool used to quickly check that bricks in a wall are at the correct height. It consists of a board marked at regular intervals; each mark indicates the center of a mortar joint between bricks.

stretcher: A wall brick or block laid lengthwise. In a typical wall, most bricks or blocks are stretchers.

stucco: A particularly hard form of mortar, often made with white Portland cement, that is troweled onto a wall to form a durable exterior surface.

surface bonding agent: A stucco-like material applied to the face of concrete blocks that have been stacked, rather than mortared, in place.

tuckpointing: (See repointing.)

weep hole: A hole, near the bottom of a mortared retaining wall or a house wall, through which collected moisture can seep out. Never plug weep holes, or you could damage the wall.

wythe: In a masonry wall, the width of one brick or block laid across the top form.

Masonry Skills Pre-Training Assignment

Name: _____

1. The function of the California Department of Parks and Recreation is "to _____, _____, _____ and _____ ... areas of outstanding scenic recreational and historic importance."
2. _____ is the single most important subject the maintenance worker must learn about the masonry work.
3. What is the "mission statement" for your unit of the park system?

4. All employees are responsible for maintaining a _____ workplace.
5. Accidents do not "just happen" - they are caused by unsafe _____ or _____.
6. _____ is based on the Uniform Building Code and is the building standard for all state owned buildings.
7. _____ stands for California Environmental Quality Act and basically says that nothing will be done that will adversely affect the environment.
8. _____ basically interpreted to say that nothing will be done to alter the character of historic structures.
9. Mortar is _____ enough when you can cut ridges in it with a mason's trowel.
10. Every brick needs to have at least one end _____.
11. Adobe _____ are massive – 4"X8"X16" and 4"X8"X8" are two common sizes.
12. Concrete is composed of Portland cement, _____ and gravel.
13. A "yard" of concrete contains _____ cubic feet.
14. A "six bag mix" contains six bags of cement per _____ of concrete.

15. The normal width of a mortar joint between bricks is _____ inch.
16. Double Wythe brick walls are _____.
17. Batter is a term used in _____ walls.
18. _____ stones are cut into rectangular units.
19. Thinset is a mortar used to set _____.
20. Portland cement comes in _____ pound bags.
21. A slump test is used on _____.
22. The tool to finish joints in brick or block is called a _____.
23. Mortar can be carried on a _____.
24. In most cases, _____ must be set in a bed of mortar.
25. The base coat of stucco has uniform thickness of _____.