If mortar is specified by ASTM C270 property requirements for compressive strength rather than the default proportion specification, mix *design data* should be submitted for review, along with the results of *preconstruction tests* verifying compliance with the required compressive strength. Grout mixes that are required to attain a specified compressive strength should also require mix design and test result submittals. The results of preconstruction tests must be available for comparison with the results of any *field tests* that may be required, because they are the only valid criteria against which field test results can be compared. For structural masonry projects on which the contractor chooses to verify the strength of masonry by *prism tests,* these results should also be submitted.

The A/E may sometimes require that a manufacturer or fabricator perform testing of a specific product lot, run, shipment, etc. For example, masonry unit manufacturers might be required to submit test results verifying compliance with specified properties such as compressive strength or absorption. For structural masonry projects on which the contractor chooses to verify the strength of masonry by the unit strength method, these unit strength test results should be compared to minimum requirements listed in the code tables. This type of submittal is called a *source quality control submittal.*

Instead of laboratory test results, some products may be submitted with written *certification* from the manufacturer that the item complies with specified requirements. Certifications are usually in the form of a letter, and require the signature of an authorized company representative. The MSJC Specifications require that in addition to reinforcing steel shop drawings, certifications of compliance be submitted for each type and size of reinforcement, anchor, tie, and metal accessory to be used in the construction. Certification of unit, mortar, and grout materials may also be required instead of test results for some projects that do not involve structural masonry elements.

On projects where field inspection is provided by someone other than the project engineer, the specifications should require submittal of *inspection reports* on materials, protection measures, construction procedures, reinforcing steel placement, and grouting operations. If the project engineer is doing field inspections, the same type of information may be kept on file as field notes.

For some products such as cleaning agents or mortar coloring pigments, the A/E may require submittal of *manufacturer's instructions* for application, mixing, or handling of materials. Hazardous materials should require submittal of material safety data sheets (MSDS). *Manufacturer's field reports* are also sometimes required if the A/E wants to verify that a representative of the cleaning agent manufacturer, for instance, has visited the project site to inspect substrate conditions or to instruct the contractor in the application of certain materials or cleaning methods.

Finally, the A/E may require the submittal of proposed *hot and/or cold weather construction procedures* to meet the requirements stipulated by the MSJC Code and Specifications. The contractor's submittal should describe the specific methods and procedures proposed to be used to meet these requirements.

### 17.6.7 Closeout Submittals

Closeout submittals include such things as record documents, extended warranty information, maintenance instructions, operating manuals, and spare

parts. Masonry construction does not usually involve this type of documentation. If coatings or clear water repellents are used to reduce the surface absorption of the masonry, and if those materials carry a manufacturer's extended warranty, the information would be submitted by the applicator of the material rather than by the masonry contractor.

## 17.7 SAMPLE PANELS AND MOCK-UPS

Sample panels and mock-ups are an important part of quality assurance programs. They can also be an effective tool of communication between the design office and the job site in setting both technical and more qualitative aesthetic standards. For aesthetic criteria, sample and mock-up panels are the *only* practical and effective method of establishing a fair and equitable procedure for evaluating the completed work. For technical criteria, mock-ups provide a well-defined yardstick for measuring performance without dispute.

### 17.7.1 Sample Panel

A sample panel is defined as a site-constructed panel of masonry to be used as a basis of judgment for *aesthetic* approval of the appearance of the materials and workmanship (*see Fig. 17-4*). Sample panels should not routinely be used to make design decisions on color, bond pattern, or joint type unless the work of constructing multiple sample panels has been contracted separately from the project construction based on a unit price per panel. Color matching masonry on renovation or rehabilitation projects may require numerous panels to make such decisions. Design panels should be constructed very early to allow time for procurement of the selected materials.

### 17.7.2 Mock-Up

A mock-up is more than just the units and mortar of the traditional masonry sample panel. Mock-ups also incorporate other elements of the project masonry including, as appropriate, backing wall, reinforcing steel, shelf angles or supports, ties or anchors, joint reinforcement, flashing, weep holes, and control or expansion joints (*see Fig. 17-5*). Design elements such as windows or parapets that may be considered critical aesthetically or from a per-

**Figure 17-4** Traditional masonry sample panels for evaluating unit color, color range, mortar color, joint tooling, and general workmanship.