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## *chapter 7.* PORTLAND CEMENT PLASTER SYSTEM

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### 7.1 GENERAL

Portland cement plaster, or stucco, as it is often called, is an excellent exterior wall material if properly installed. It is strong, durable, waterproof (in the common sense of the term), and can be furnished in a wide range of colors and textures; it is an excellent material to be applied on a wood-frame building.

Unfortunately, portland cement plaster is also one of the most abused materials currently used in construction. This chapter is not intended to be a plasterer's manual, but because of the common waterproofing problems of plaster over wood, a few critical aspects of this system are set forth.

### 7.2 MATERIALS

#### 7.2.1 Plaster

Portland cement plaster is a cementitious material; in fact, if it is treated as a thin-shell, fine aggregate concrete, many of its problems disappear. Water-to-cement ratios are critical and batch slump control is highly desirable. In the authors' opinion, a 2-1/2 inch slump on a plaster cone should be considered maximum under all conditions. As the plaster cures and ages, it shrinks as water is lost, exactly like concrete. Also like concrete in wet weather, it absorbs moisture and swells. This shell of plaster constantly moves and creates stresses. In a quality job, these stresses

often produce fine hairline cracks. What must be avoided are the concentrated stresses that produce large-scale cracks.

A major cause of large cracks is an uneven thickness of the plaster shell. This is often seen in line-wire jobs that crack at each stud line. This uneven thickness generally results in concentrating shrinkage stresses, and cracks, at the thin locations. Portland cement plaster is also thermally active with about the same coefficient of expansion as steel, much more than wood in the longitudinal direction. These thermal stresses also contribute to cracks, particularly when combined with water shrinkage and moisture content-related dimensional changes of the wood.

In addition to slump control, another method to reduce cracks is to introduce fiber into the plaster mix. In days of yore, quality jobs used hair quite effectively to reduce cracking. Then came glass fiber, which has not proven too satisfactory. Now we have polypropylene fiber, which appears to offer the best of all properties. Polypropylene fiber added to the scratch and brown coats of plaster significantly reduces plaster cracking.

Because plaster is in an almost continuous state of movement, it is essential, in the authors' opinion, to protect the membrane from this movement. Contrary to popular

opinion, plaster often adheres to the membrane if it is in direct contact with it. When this condition occurs, even a small crack in the plaster can result in a tear or rip in the membrane. Cracks in plaster are open conduits for water penetration, so a failed membrane in this area results in extensive degradation of the wood framing. For this reason, the authors strongly suggest that a slip sheet be applied over the membrane to ensure that no contact is made between the plaster and the membrane during construction. Almost anything can be used for the slip sheet: newspaper or even Grade "D" building paper.

### 7.2.2 Line-wire Installation

One of the best plaster systems is the line-wire system. Properly done, this system allows the plaster skin to float semifree of the frame, so that stress in the wood framing does not affect the plaster coat. However, line-wire must meet the following criteria:

1. Maximum spacing of 8 inches and preferably 6 inches for a quality job
2. Stretched tight
3. Galvanized
4. Secure, but loose, fastening to the wood frame

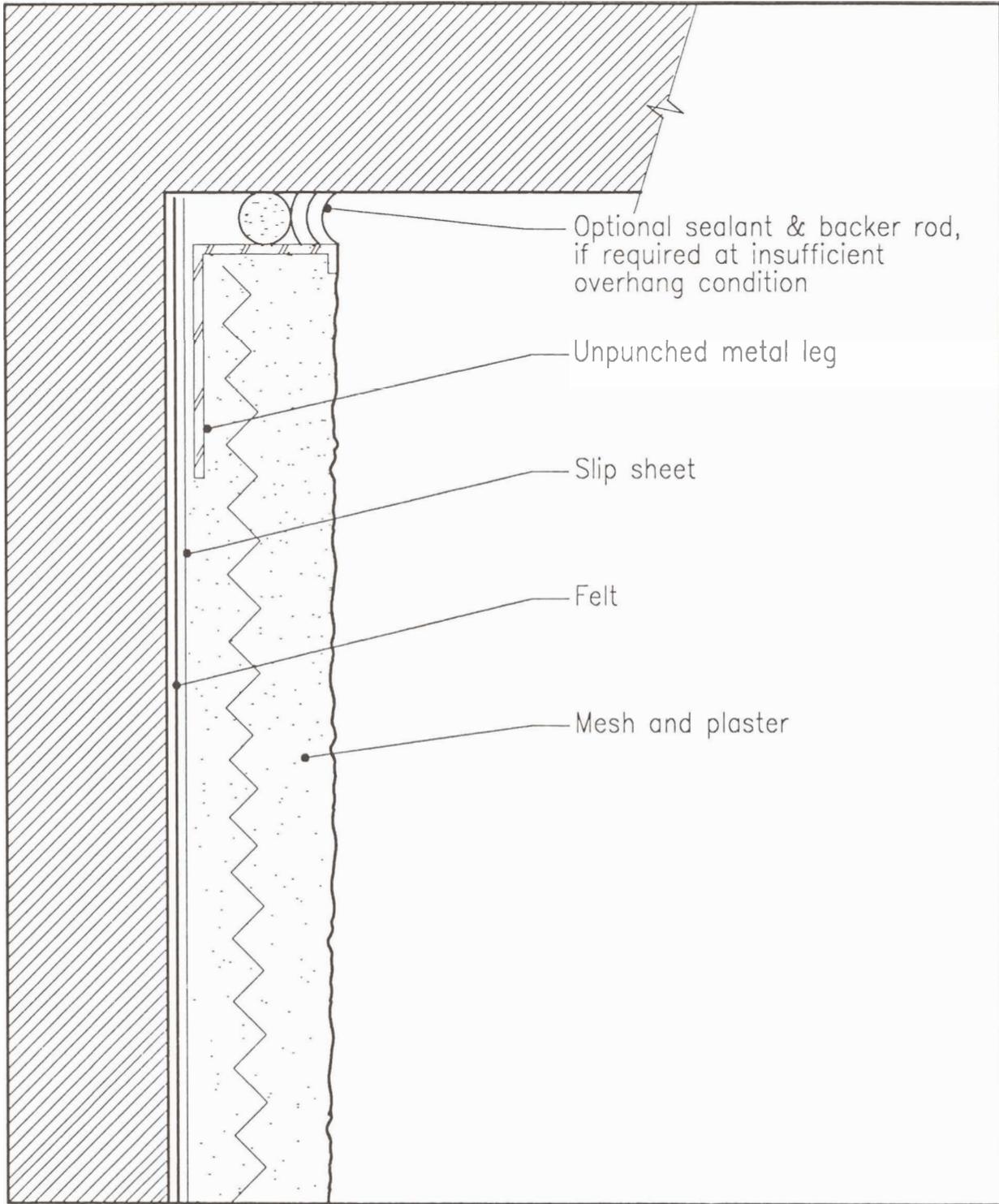
### 7.2.3 Membrane

The previous section on membranes is extremely important for plaster work. All the comments and details should be followed, plus a couple of special ones. The membrane should be a heavy-duty

material capable of taking the physical abuse associated with plaster work; #30 felt has a long tradition of service, and some of the new high-quality sheets appear good. Even so, care must be exercised in the installation of the membrane and in the application of the scratch coat for the plaster work. Also, the membrane must be properly shingled with unpunched casing beads and drip screens at wall perimeters. Water that penetrates the plaster and flows down the face of the membrane must be allowed to flow out through the weep screen. Special care must be used at the wall head and sill, because in one case the metal must be over the membrane and, in the other, behind it (see **Figures 7-1A-C**). Vertical casing beads in severe exposures should be treated like jambs of metal-flanged windows.

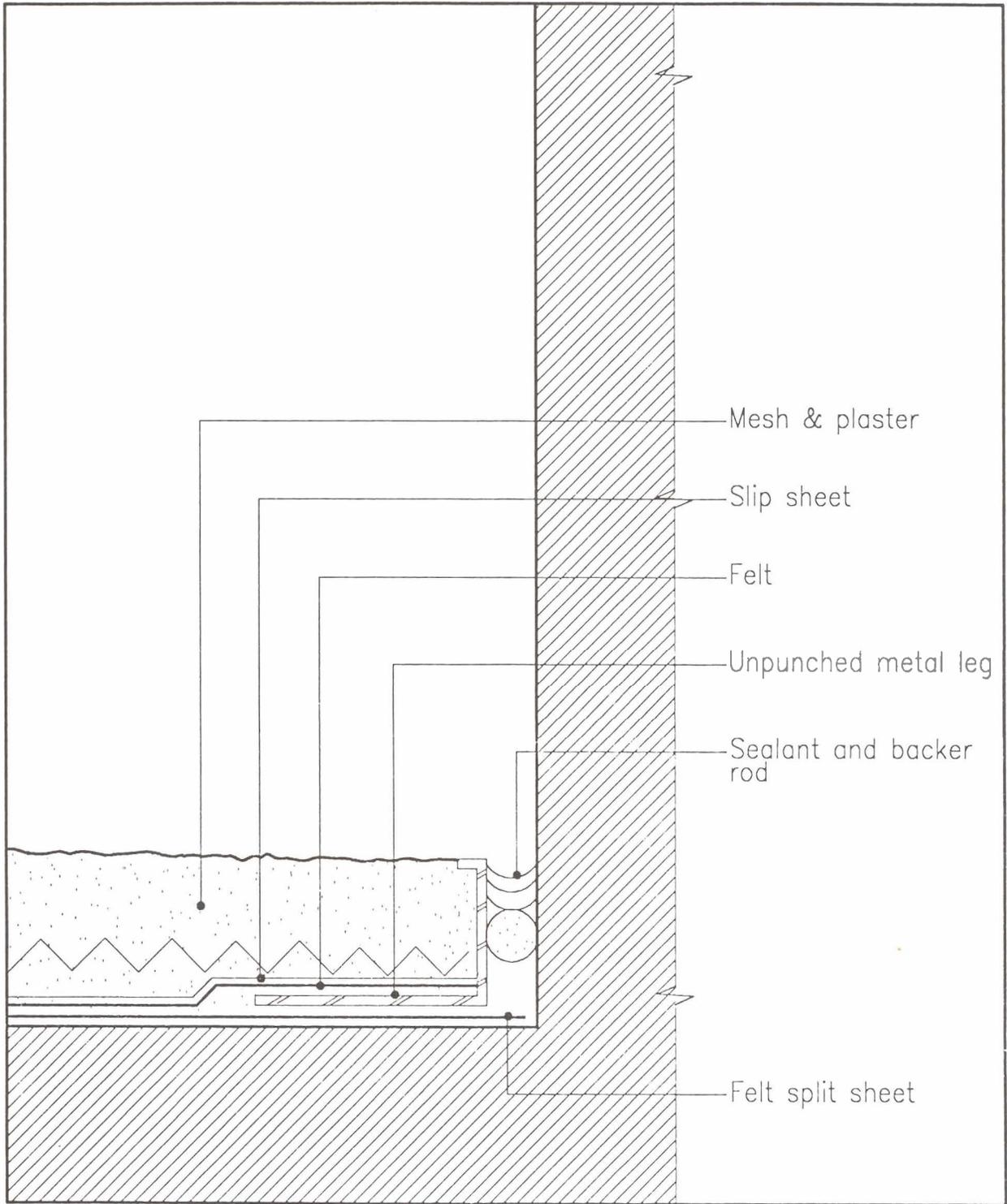
### 7.2.4 Reinforcement Mesh

The authors prefer galvanized 1-1/2 inch 17-gauge wire mesh applied with gasketed nails to the studs over an independent slip sheet. This allows for movement of the mesh while still being firmly attached and offers adequate spacing between the mesh and the slip sheet. However, excellent results have been obtained using the self-furred, paper-backed lath. Never use the factory-laminated felt/paper system. Try to avoid fastening the mesh too tightly to the studs, which may result in breaking the membrane and rigidly fastening the mesh to the frame. We recommend mesh reinforcement at all corners. Expanded metal mesh provides a more rigid initial installation, but even when cut from galvanized sheets, this installation will rust in wet areas.



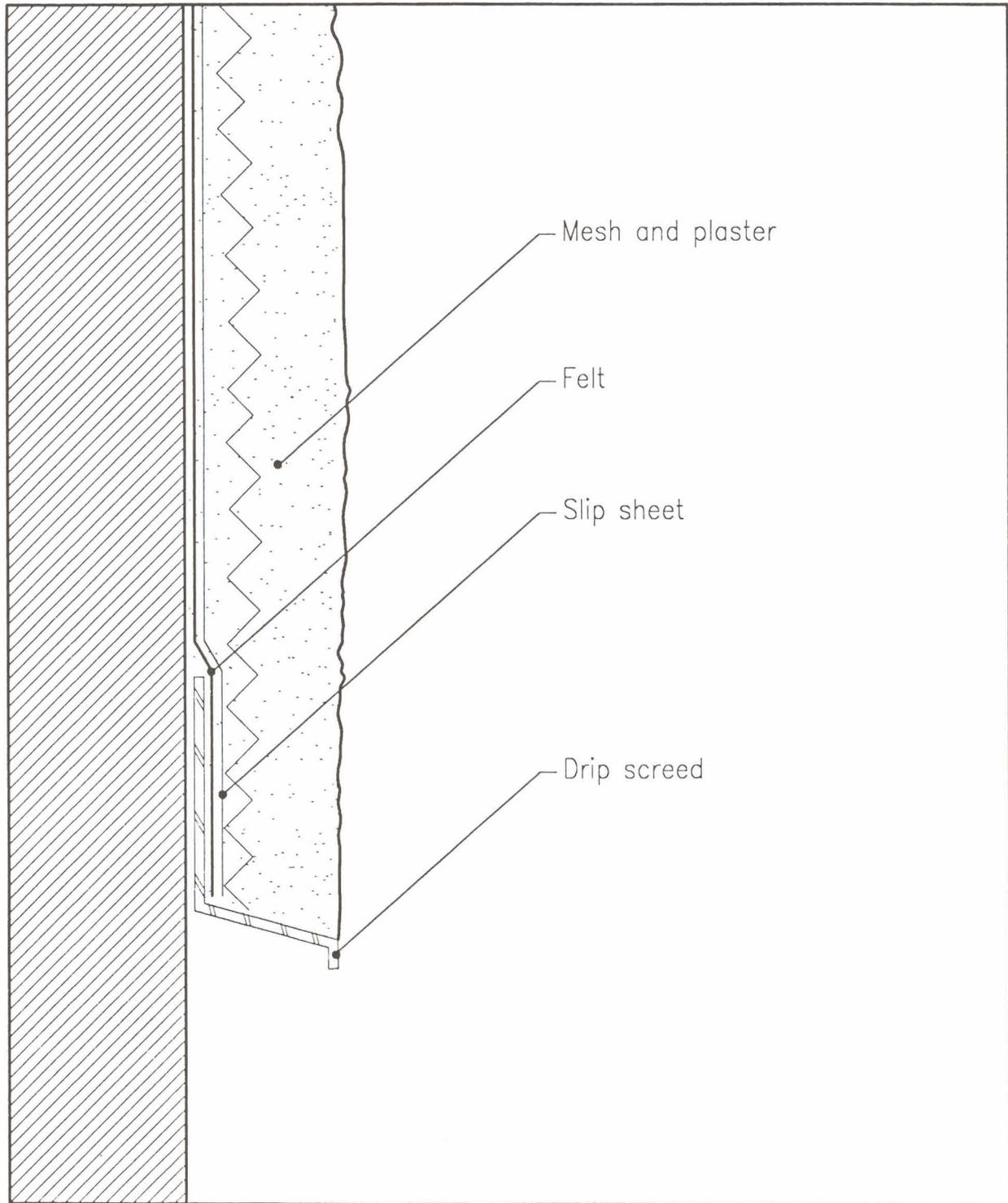
# CEMENT PLASTER TOP EDGE WALL DETAIL

Figure 7-1A



# CEMENT PLASTER VERTICAL EDGE WALL DETAIL

Figure 7-1B



**CEMENT PLASTER**  
BOTTOM EDGE WALL DETAIL

Figure 7-1C

### 7.3 APPLICATION

Plaster with good mesh embedment should be carefully applied to avoid rupture of the membrane or slip sheet. Additionally, good mix control, addition of fiber, and proper curing should result in a long-lasting, quality job.