Plastic Shelters for New Lambs

protection from weather during first few days after birth reduced losses in tests during January–March lambing season

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Losses of range-born lambs—in some instances as high as 90%—have resulted from severe rainstorms during the lambing season on the north coast sheep ranges. Conventional protective range shelters or barns usually are economically unfeasible because of the cost. An inexpensive, experimental polyethylene plastic shelter was tested at the Hopland Field Station in southern Mendocino County during the 1957 lambing period, when 19″ of rain fell. The percentage of lambs saved that season was higher than in any previous year since the Field Station was established in 1951.

The shelter—20′ × 96′ located at station headquarters at an elevation of 800′—was used in connection with the lambing operation. The shelter had a light framework of wood with the roof and south side covered with 8 mil thick—eight thousandths of an inch—polyethylene film. The west half of the building—48′—was covered with black film, the east half with translucent film. All framing material and posts were rough sawed redwood except for the surfaced Douglas fir purlins and batts used to hold the plastic film down at the eaves and ends.

Only 50 man hours of labor were needed for the entire construction job. Stub posts were set in the ground to a 3′ depth in holes prepared by a mechanical post hole digger. In areas where high winds are common, the holes should be deeper or deadmen should be used. The trusses were prefabricated by two men using a simple jig—taking only six minutes for each truss—and leveled and bolted to the stub posts. Purlins were attached to the trusses with galvanized steel timber ties. The plastic film was stretched over the framework and fastened in five hours by four men who worked from the bed of a truck when necessary so no scaffolding was needed.

The lumber required for the building—including the 4″ × 6″ supporting stub posts but not the lumber for the pens—amounted to about one third board foot per square foot of floor space. Some 3,000 square feet of plastic film were needed to cover the roof and one side.

The shelter was divided into 12 pens—8′ × 20′—in each of which several ewes with their lambs were placed one day after they had lambed to be sheltered for two or more days.

Inside view of shelter showing instruments and protected ewes and lambs.

Shielded thermocouples for measuring air temperatures and globe thermometers for measuring spherical radiation were installed 36″ above floor level at the center of each half of the shelter and outside at some distance from the shelter. The responses from these instruments were recorded automatically. In addition, surface temperatures of the plastic films were obtained manually at intervals.

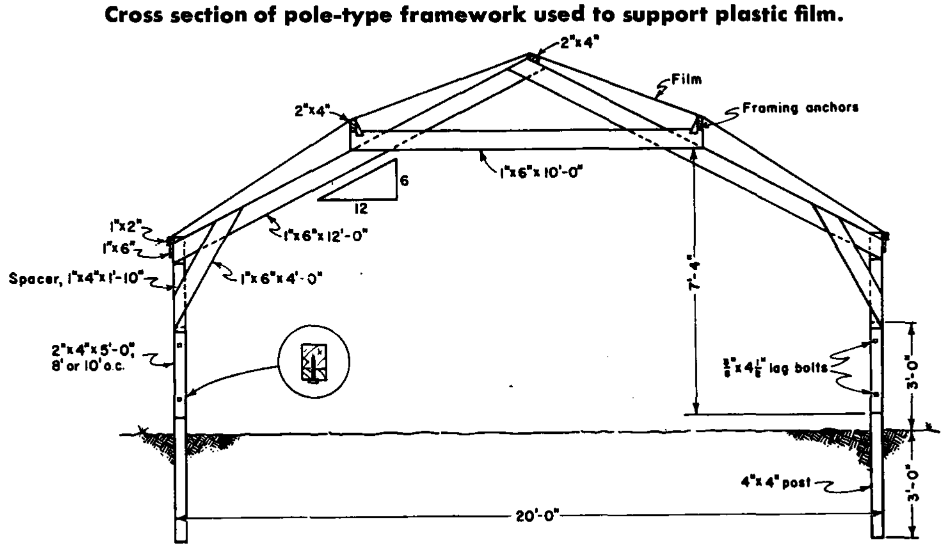
There were no apparent differences in the behavior of the ewes and lambs under the black or the translucent film. However, on sunny warm days the thermal environment under the translucent film appeared to be too warm for the animals. Under conditions of cool, wet weather, when protection for young lambs is most needed, there was little difference in effect of the two colors upon environment. Comparative evaluation of the two colors of plastic films is complicated by the unknown effect of quality of radiation on the health and growth of sheep.

Air temperatures, as measured by the thermocouples, showed very little difference at the three locations—outside, under translucent plastic, and under black plastic—during the night and at other times when there was no direct sunshine. However, on sunny days, the air temperature under the translucent plastic was as much as 15°F and under the black plastic 6°F higher than the outside temperature.

The radiant heat load, as measured by the globe thermometers, in BTU—British thermal units—incident upon each square foot of surface area of a sphere, was considerably more under the translucent plastic when the sun was shining than outside, and somewhat less under the black plastic than outside. Spherical radiation includes reflection and radiation from the ground and lower hemisphere surfaces.

There was a considerable difference in surface temperatures of the two films, as obtained by touch thermocouples. The translucent plastic, because of its low absorptivity for solar radiation, in-

Cross section of pole-type framework used to support plastic film.



creased in temperature less than did the black plastic, when the sun was shining. At times during the day from 10:00 a.m. to 2:00 p.m. when air temperatures were from 52°F–58°F, the translucent film ranged from 58°F–76°F and the black plastic from 66°F–116°F.

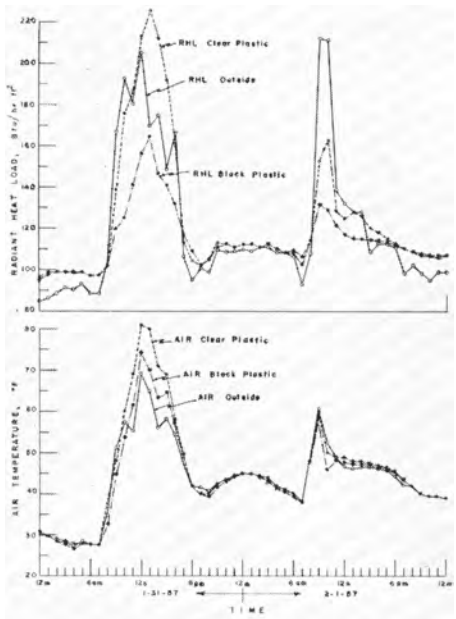
Nighttime condensation on the underside of the translucent film dried off more slowly than under the black when the sun came out and there was some tendency for conditions to be wetter under this film.

There was no structural damage or deterioration to the wood framework after the one season's test.

The design proved adequate for wind and rain but, as no snow fell during the test, it was not stressed by a snow load.

The building site was somewhat protected by trees from wind, the principal natural force to be resisted by a light structure. Roof slopes should minimize wind stresses. A roof slope from flat to 27°–30° experiences an upward pressure. When the slope exceeds this angle there is still an upward pressure on the leeward side, but a positive or downward pressure on the windward side. Both slopes of the experimental sheep shelter roof were at angles to minimize wind stress on the windward side. The slope was slightly below 30° on the top half of the roof and slightly above 30° on the lower half of the roof.

The mechanical damage to the plastic film during the six months it was in place consisted of some abrasion at the places where film lay on purlins and was not secured with batts and at a heat-welded splice in the black film. There was deterioration of the translucent plastic along a seam that had been folded for



Top—Radiant heat load under translucent plastic, black plastic, and outside the shelter. Bottom—Air temperatures.

shipment. On warm days the plastic stretched, causing a sagging roof. A slight wind caused a flopping of the loose film against the purlins and there was considerable wear at these points.

Plastic manufacturers advise that translucent plastic loses most of its strength in one season whereas black film loses one half of its strength in 10–15 years.

Polyethylene films should be attached solidly to the framework wherever they touch and be protected from any puncture by a sharp object. When films are installed during cold weather they should be stretched tightly over the framework. When they are installed during warm weather sufficient slack should be allowed for contraction when the weather becomes cold. Because considerable force is exerted by even the slightest air movement, plastic should be installed on a calm day.

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A 20′ × 96′ plastic-covered shelter. Shielded thermocouples for measuring air temperatures and globe thermometers for measuring spherical radiation were installed under the translucent film, under the black film, and outside the shelter.