

SAFETY CONSIDERATIONS AND ELECTRICAL STIMULATION

Ronald W. Anderson, P.E.

Facilities Group, Technical Services, Meat and Poultry Inspection Program, FSQS,
USDA, Washington, DC, 20250

Our interest in electrical stimulation first surfaced in January 1979 when Texas A and M University announced a seminar on the subject to be held in Corpus Christi, Texas. I contacted the organizer of that meeting to ask that means to protect people from the 500-600 Volt exposure be included in the presentation. They did their job well because I got several calls as a result of that meeting.

Several slides will be shown identifying a variety of equipment and installations that illustrate the need for protection measures.

Food Safety and Quality Service (FSQS) sanitation and safety standards--the two can't be separated--were developed in conjunction with the Occupational Safety and Health Administration (OSHA) to promote understanding of our objectives and to minimize enforcement conflict and industry harassment. We observed some of the first installations in this country and then in cooperation with the equipment manufacturers and OSHA, identified the hazards and appropriate preventive measures.

Typically, slaughterhouse hazards have been mechanical in nature and can be seen or heard. However, the hazard of electrical shock, which electrical stimulation presents, offers no visible or audible warning. Electrical stimulation, except for down hide pulling, is a new concept to the industry. The danger lies in the fact that it intentionally exposes a surface that is charged with lethal quantities of electricity. Sounds bad, doesn't it?

Since this concept is new to the country and does not have broad general awareness, we have taken a conservative approach instituting redundant safety features in an effort to ensure people protection. As we learn more and this process becomes more widely understood and applied, we expect to simplify our protection requirements.

Recently in this country, stimulating voltages below 50 have been tested on cattle and have yielded results approaching those of the higher stimulating voltages. Since stimulation voltages below 50 have not been demonstrated to present a dangerous shock hazard, none of the safety measures will be required to protect from electric shock. Sanitation and operation procedures will be the same as for high voltage requirements.

Before we get into the protection devices, let's look at the different stimulating methods being used. The earliest point where electrical stimulation is being used is in the bleeding area and this, of course, is with the hide on. Some of the advantages of this location are that electrical stimulation causes additional blood to exude from the carcass where it can readily be handled instead of providing supplementary blood disposal facilities. The bleeding area tends to be isolated and self-excluding and this reduces the likelihood of exposure of humans to the energized carcass. This location requires a surface contact stimulator because we will not allow the carcass to be penetrated through the hide. Because the device contacts the hide only, no sanitizing is required between carcasses.

The next line position where cattle are being stimulated is after dehiding and before eviscerating. There are several problems here depending on the stage of dress and the condition of cattle. The result that must be avoided is the expression of feces and/or urine during stimulation, whether for tenderness or hide pulling. Stimulating surfaces must be sanitized after each carcass because they contact the skinned carcass.

Steps that can be taken to prevent feces or urine discharge are to not rim the bung until after stimulation. This allows the natural function of the sphincter muscles when contracted because of stimulation to form a tight bladder and large intestine shut off to resist the pressure of the visceral cavity contraction. If this proves inadequate, a midline incision can be made to allow viscera relief space without building extreme visceral pressure during stimulation. If the bung is rimmed, the rectum including the neck of the bladder can be satisfactorily tied off to prevent discharge. Rimming the bung in itself provides some pressure relief.

In some instances, the head has been left attached and when this is done, the violent carcass reaction to high voltage stimulation is exaggerated by the extended carcass length and longer arc radius traced by the head. This requires more clearance in the shocking enclosure (large).

Electrical stimulation of the eviscerated carcass eliminates the possibility of any visceral fluid discharge. Since the eviscerated carcass weighs less than the uneviscerated carcass, exercise caution to be sure that violent contractions do not cause the carcass to jump off the rail. If reaction is too violent, a retaining device to prevent the trolley from disengaging the rail must be provided.

When split carcasses are stimulated, the contortions or curling are sometimes severe enough to pull the back apart. Halves are not often stimulated except for comparison purposes or unavailable whole carcass location.

Equipment is commercially available to automatically stimulate continuously on the rail at speeds over 300 head/hour and on small unpowered rail operations via manually inserted probes.

Our people safety effort was principally to prevent electric shock. We have required barriers at all openings either to physically prevent entrance into the stimulating chamber or shut down the stimulators if anything passed through any ground level opening. Flashing or rotating lights and audible signals are to warn of the operation of the stimulator. "Danger - High Voltage" signs are another deterrent to the curious or the unsuspecting. Emergency stop buttons to shut off stimulating voltage must be so labeled at each accessible opening to the stimulating enclosure. The power supply must be locked off or other suitable means provided during nonstimulating periods to prevent the stimulating surfaces from being energized by unauthorized personnel.

The deenergized system must be mechanically operable for inspection and maintenance purposes. Stimulating surfaces must be removed from contact with skinned carcasses when mechanically inoperative or unable to be sanitized. Carcasses do not need to be stimulated so long as the contact surfaces are cleaned between carcasses. While energized, carcass or stimulating surfaces must not be sprayed or contacted by water stream.

Stimulating circuit (High Voltage) unless intentionally isolated from service ground must use bonded grounding conductor from each section of carcass rail within the stimulating section to service ground. If carcass rail and carcass drive mechanism are insulated from ground for purpose of stimulation isolation and with stimulator transformer secondary isolated, the rail or carcass must be electrically bonded to the return path of the circuit.

The stimulating enclosure must be made of nonelectrical conducting material or be positively grounded.

For manual systems, the stimulating probe may not be energized while a person is accidentally within the stimulating enclosure. When not in use, the probe will be sheathed in a sanitary insulated enclosure. The portable probe conductor must be of such length and located in such a position that it cannot contact the uninsulated portion of the return path or extend outside the stimulating enclosure. Personnel should not reasonably be able to contact both sides of the circuit simultaneously.

Electrical stimulation may only be installed after blueprints showing the installation have been approved by the Facilities Group and permission granted by the Equipment Group. The purpose of the facilities review is to determine that there is adequate space to accomplish all of the kill floor functions, sufficient floor drains and acceptable materials of construction. Permission from the Equipment Group assures that the stimulator has been found acceptable and to send the safety and sanitation operating procedures to the inspector in charge.