

Hide Room Renovation at Beef Processing Plant

By Robert "Bob" Roberts

In a perfect world, all concrete repair jobs would be in wide-open, easily accessible areas, with no need to work around keeping part of the facility operational. Of course, this is very rarely the case. In many cases, the repair job is a challenge—not just the repair, but access to the repair, and the job environment itself. Renovating a hide room at a beef processing plant was a project that contained many of these challenges.

The hide room in a beef processing plant is a separate section of the facility, where the hides of the cattle are initially processed. In this building, the freshly removed hides go through a large vat for their first stage of processing. This vat is filled with heavy brine (salt) water because it does not evaporate, leaving the hides moist, which prevents them from becoming brittle. Once the hide is initially placed in the vat, it is pushed along the raceway of the vat by two large paddles that keep the hides in motion, thus causing the initial cleaning of any embedded dirt off the hide. Because cattle have a high body temperature, the vat water gets quite warm, causing the environment of the hide room to be rather warm, musty, and humid. At the time of our first investigation, the plant was processing an estimated 1200 head of cattle per day.

This hide room building was originally erected in 1978. It is a cast-in-place structure with what were originally 12 inch thick walls. The load-bearing walls were poured in place with two sections of #4 reinforcing steel mats, 12 inches on center in the walls. In 1984, the management added structural steel in the vat area for additional support to the roof structure since they were adding new pipe raceways on the roof.

Our investigation showed that the continued unabridged bombardment of chlorides for so many years caused the internal #4 reinforcing steel mat to virtually completely degrade, and cause major spalling on the walls (Figure 1). The beams were also spalling excessively into the vat and surrounding areas (Figure 2), which was not only unsightly, but created a safety hazard as well. The structure was determined to be sound but in serious need of repair. The management needed a permanent, safe solution. To make matters more difficult, any repairs had to be made while the plant was in full operation.



Figure 1: West wall (prior to start) on south end of room



Figure 2: Beam deterioration over hide vat



Figure 3: Workers remove deteriorated concrete



Figure 4: Application of bonding agent to concrete behind new fiberglass reinforcing prior to shotcreting

The project presented several other challenges to the repair operation, including:

- There was only a 4 foot elevated rampway to access the deteriorated east wall.
- Ventilation and lighting were very poor.
- Working around the vat area was rather dangerous, for fear of falling in.
- The “pulled” and stacked hides had to be covered and draped throughout the repair for their protection.
- The project had to be worked on around the plant hide room crew hours.
- The area was always hot, wet and musty.
- All beam repairs over the vat had to be accessed by special planking.

The Repair Solution

The final repair solution had many aspects. The spalling concrete throughout the structure had to be removed, along with any rusted and deteriorated steel. The weak concrete had to then be removed down to a sound substrate. Because of limited accessibility, the removal work was a challenge.

The repair was separated into twelve different work sections, along the existing joints of the walls. The sections were approximately 15 feet in length, 12+ feet in height on the west wall, and varied in height along the vat wall (east side). The main reason the walls were separated into 12 sections was to limit repairs to three sections at a time, in various locations, so as not to stress the structure any further.

The work areas were shored. The concrete in these sections had to be removed carefully, using a lightweight electric 30-pound hammer with chisel tips (Figure 3). The concrete had to be chipped out at a 45-degree angle to avoid going through the wall or possibly fracturing the existing substrate.

After the initial removal of the bad concrete, the area was sandblasted to remove any laitance, efflorescence, and weak or delaminated concrete. Once a sound substrate was achieved, any steel to be left in place (beams only) was prepared, following ICRI guidelines for all preparation.

To replace the deteriorated #4 reinforcing steel, it was determined that fiberglass (non-metallic) reinforcing bars would be used because of the environmental conditions of the project. On a 12 inch x 12 inch pattern, ½ inch diameter holes were drilled into the prepared concrete walls. The holes were then blown out with compressed air. The 4 inch fiberglass dowels were glued into place using an epoxy paste. A mat of ½ inch fiberglass reinforcing was installed 12 inches on center and tied into place using plastic ties. They were tied continuous with proper overlap. No metal was used at all on this area of replacement.

The next step was to “rebuild” a new concrete interior wall, and to make sure it bonded well to the existing surface. Shotcrete was chosen as the repair material. For these sections, dowels were epoxied into place at the top and the bottom of the repair area, and then tied into the mat. Asphalt-impregnated expansions were placed at all stops (joints). Prior to the application of the shotcrete (usually 24 hours prior) the surface areas were kept moist with water, and just before the application, the surface was saturated with a bonding agent (Figure 4). The shotcrete was a 7.5 bag mix, of the following design:

Cement	529 lbs
Fly Ash	176 lbs
Silica Fume	50 lbs
River sand	2070 lbs
3/8” pea gravel	700 lbs
Water	250 lbs
Datard 17	18 ounces
Fibermesh	1.5 lbs

This mix had very low moisture, and a 1 to 2 inch maximum slump. The mix had to be pressed by hand in the hopper on the pump. The use of shotcrete enabled all of the prepared sections to be placed and finished in one afternoon (Figure 5).



Figure 5: Shotcrete application

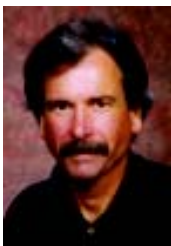
Repair of Beams

The beams were prepared according to ICRI guidelines. The existing reinforcing steel, after aggregate blasting, was sealed with a multi-viscosity epoxy (two coats). Because of the tight workspace, a wood-box form, fabricated and fastened in place on the repair areas of the beam (Figure 6), worked better than no form. This method allowed shotcreting more beam area than without the forms. The shotcrete mix design used in the walls was used here as well.

This project began in the month of April 1999 and continued until completion in September 1999. Even with the hazardous and undesirable site conditions, the project was performed safely, without any lost time.



Figure 6: Wood box forms used for beam repairs



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