Taro (Structural) 22 Feb 01 10:34
Hairpins are reinforcing bars bent into the shape of the letter "U". The bars are used to anchor inserts, anchors, or post-tensioning tendons into concrete to prevent the concrete from "blowing out" at a free edge. The name hairpin refers to the similarity in appearance and function to the pins used to hold one's hair in place.

Ginger (Civil) 22 Feb 01 11:42
Be VERY careful if you are using rebar hairpins structurally. The bending process will work harden the steel. You may get microcracks in your bar which will reduce the steel bar's tensile/shear capacity. In reinforced concrete this is less of a problem as the bent bar is surrounded by concrete, however, in conditions described above there is the work hardening problem and also the likelyhood that you will be pulling on a single point at the top of the "U" bend which will induce other unknown stresses.

Regards

Andy Machon

Taro (Structural) 22 Feb 01 13:18
Hairpins are used structurally very commonly. The 180 degree bend diameter should conform to ACI 318 Section 7.2 to avoid cracking the bars. Also, the hairpins are not typically welded to the inserts or tendon; they simply enclose and confine them.

MPHenry (Structural) 22 Feb 01 14:20
I have come across extensive use of "Hairpins" in the design of foundations for Pre-Engineered Buildings. The structural frames used are usually pin ended portal frames. The horizontal shear loads at the base of the portal frames are transferred to the floor slab of the building using a "hairpin" connection. The "hairpin" consists of a V-shaped length of rebar which is cast into the floor slab and around the anchor bolts of the portal frame columns. The result of this procedure allows one to design the portal frame foundation pad and pedestal for axial load only. All horizontal loading is carried by the hairpin connection. A considerable reduction in foundation size and cost is achieved.

JAE (Structural) 22 Feb 01 14:21
Hairpins are most often seen and used in pre-engineered steel buildings where the exterior columns of the steel frame induce significant horizontal forces at the base of the column. The column base plate and anchor bolts transfer this force into the supporting concrete foundation.

However, many times the foundation pedestals and footings cannot be designed economically to resist this lateral force. If the footing is sunk deep for frost, or the base of the column is raised above the surrounding grade the high eccentricity would cause the footing to grow

substantially. In these situations, engineers use the hairpin bars to transfer the lateral force back into the interior floor slab, which in this case should be reinforced.

Two problems with doing this: 1. The slab may be altered, cut, or slotted for drains in the future which could compromise the integrity of the system. 2. The slab-on-grade could settle, causing cracking and spalling around the interface between the foundation and the slab. You could wrap the rebar, in the slab adjacent to the foundation, with a foam insulation for about 12 inches of length. This would allow flex in the rebar if movement did occur.