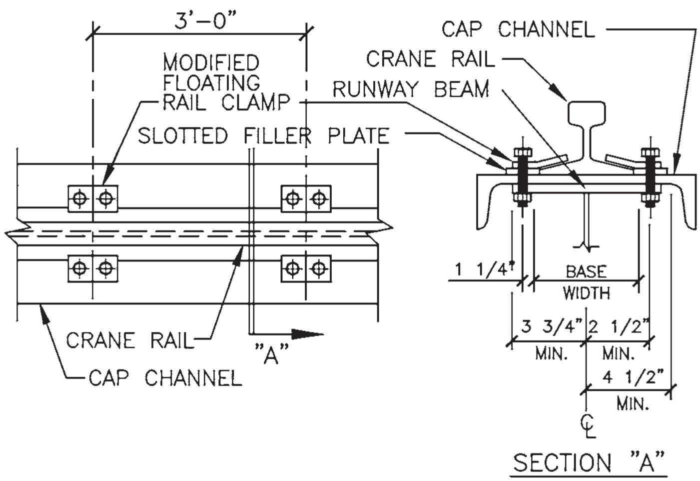

FIGURE 15.19 Attachment of crane rail to runway beam by floating clamps. The manufacturer typically uses 1-in ASTM A325 bolts with lock washers. (*Nucor Building Systems.*)

15.6.7 Runway Stops and Bumpers

Runway stops and bumpers are frequently the last elements considered in the design of a crane system. They should not be the least, however, because a poorly designed crane stop may ruin the crane and the building alike.

Runway bumpers act similarly to their automobile counterparts—absorbing kinetic energy of the crane's impact. Old-style wood and rubber blocks have given way to contemporary spring and hydraulic bumpers such as the one illustrated in Fig. 15.20. ANSI standard B30 and CMAA 70 require that bridge bumpers be designed to resist the force resulting from the crane hitting the stop at 40 percent of the rated speed. If the building is designed in accordance with AISE 13 provisions, it is assumed that the crane will be protected by bumpers up to full speed of travel.[25]

Runway stops, as the name implies, are intended to stop a moving crane. While proprietary bumpers are commonly selected by their suppliers, design of crane stops belongs to the design professional. For monorails and underhung cranes, a short piece of angle attached to the web of the runway beam may be adequate. For top-running bridge cranes, however, a heavy bracket bolted to the top of the runway girder is needed. The bracket either has an attached bumper or is designed to come in contact with a bumper installed on the crane's end truck.

Eventually, of course, the force on the stop must be resisted by the building structure and its bracing. In the absence of specific crane and bumper data, this force may be estimated as the greater of 10 percent of the unloaded crane weight or twice the design tractive force, as suggested by AISC *Design Guide* 7 for interior cranes.

15.7 HOW TO SELECT AND SPECIFY A BUILDING CRANE

The layout of new industrial buildings, especially those with cranes, is usually governed by the equipment they contain. It makes sense therefore to select a satisfactory crane coverage for the process equipment first and then determine the dimensions of the metal building system, rather than the other

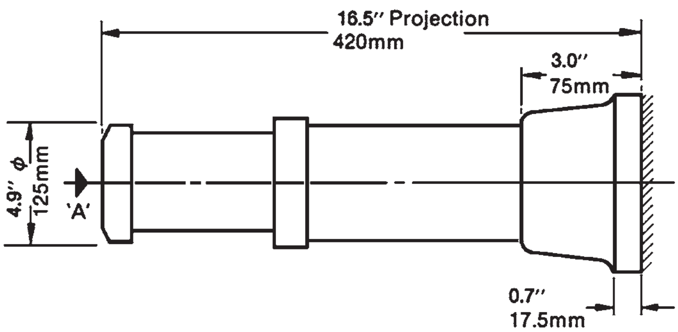

FIGURE 15.20 Hydraulic bumper. (*Gantrex Corporation.*)

way around. The process outlined below roughly follows that of ACCO's *Crane Planning Guide for Metal Buildings.*[12]

The first step involves determination of the required hook coverage—width, length, and height to be serviced by the crane. While the plan dimensions are governed by the equipment layout, the vertical coverage (lift) depends on the size of the lifted items, plus an allowance for the height of any floor-mounted equipment to be cleared and for spreaders or other under-hook devices.

The second step is to determine the type, capacity, and service classification of the crane(s), based on the information contained in this chapter or other guides. For example, one electrically operated 25-ton double-girder top-running bridge crane of CMAA class B in combination with two 5-ton class A jib cranes may be needed. The selected type of movement (hand-pushed or electric) should be satisfactory not only for the short term but for any probable future operational changes as well. If in doubt, it is better to invest in some extra crane capacity from the beginning. The crane service classification should not be selected lightly. According to Dunville,[26] it is the single most critical issue that affects crane cost. Dunville reports that in 1995 his company sold a 10-ton crane with 84-ft span in CMAA Class C (moderate duty) classification for $34,380, while another crane of the same capacity and span but with CMAA Class F (continuous severe duty) was sold for more than $400,000! Also, some manufacturers will not design monorails and underhung cranes for a service classification above CMAA Class C.[27] (The same source suggests that the maximum monorail crane capacity not exceed 5 tons and the underhung crane capacity, 10 tons.)

The third step deals, finally, with the building dimensions. The minimum clear span of the building is determined by adding dimensions EG, B, and C to that of the hook coverage (Fig. 15.21). The minimum clear height of the building is computed by adding dimensions A and R to the hook lift; it is measured to the lowest point of the roof, be it bottom of the frame rafters or a suspended sprinkler pipe. All these dimensions are included in Figs. 15.8, 15.10, and 15.11.

In the fourth step, the runway beams, their supports, and bracing methods are selected and designed.

Last, a configuration and the exterior dimensions of the metal building are determined from the interior dimensions computed in step 3 and information contained in Chap. 3. It is prudent to select a slightly larger building to allow for some variability of designs among manufacturers.

The contract documents should spell out who supplies the items likely to fall in the "gray area" of responsibility such as runway beams, rails, and runway stops. If not provided by the crane supplier, and if specifically called for by contract, these items could become a responsibility of the metal building manufacturer. In that case, all the information about the crane, its wheel loads, supports, etc., should be provided in the contract documents.

Unless instructed otherwise, pre-engineered building manufacturers are likely to follow the impact allowances and loading and deflection criteria specified in the MBMA Manual, still one of the best sources of crane-related information available. If more stringent design standards are to be followed by the building manufacturer and the crane supplier, the appropriate requirements should be included in the contract documents.