Automatic Crossing Gates on CTA

Are Interconnected with Street Traffic Lights

Problem was to clear street vehicles off the crossing when trains are approaching—Holding circuits prevents sudden stops and starts of street vehicles on the crossing

AT LARAMIE AVENUE grade crossing on the Douglas Park Line of the Chicago Transit Authority, located in the town of Cicero, Ill., manually - operated mechanical crossing gates have been replaced with automatically-controlled electric gates, and the new project includes a tie-in with street traffic Stop-and-Go lights to prevent accumulation of vehicles (stopped bumper-to-bumper on the tracks) when a train may be approaching.

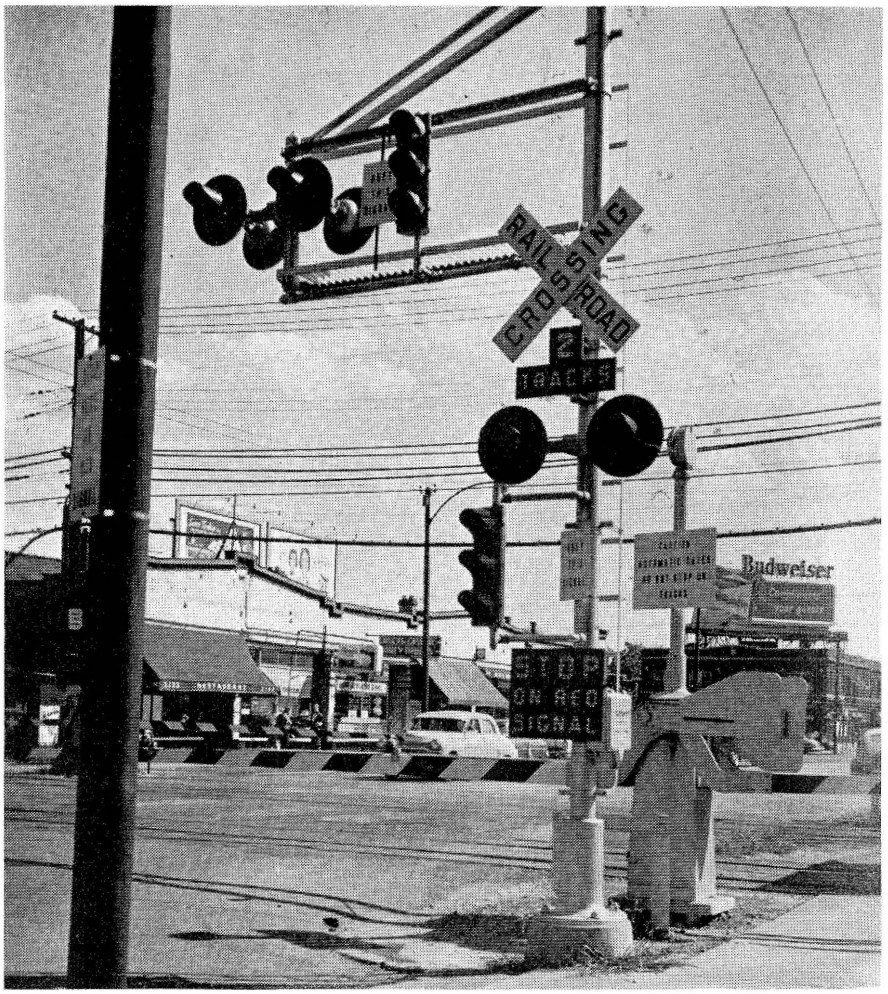
The station and platform are between the two main tracks, east of Laramie Avenue. All trains stop at this platform. The pavement on Laramie Avenue is 50 ft. wide which permits two lanes of traffic each way. Street traffic is so heavy that it might well be classed as a "constant flow" from early in the morning until late at night. The trains are made up of electrically-propelled multiple-unit cars. During peak periods 7 a.m. to 9 a.m., and 4 p.m. to 6 p.m. trains are operated each way on 3 minute headway. These trains are made up of six cars during rush periods. During the off-peak hours of the day, 2-car trains are operated on headways ranging from 6 minutes during the day to 30 minutes at night. Thus the traffic ranges from two trains to about 13 trains per hour, with a total of 185 scheduled trains in each direction in a 24-hour period. During rush hours there is a train, one way or the other, every one and one half minutes.

In the previous layout, there were four street gates at the four quadrants of the crossing. When the gates were down, the entire width of the pavement was thus obstructed. When the gateman saw a train approaching, he rang a locomotive-type bell as a pre-warning, and then, as the flow of street vehicles would permit, he lowered the gates. During the rush hours, a flagman was on duty to control the street traffic and get cars off the crossing so that the gateman could lower the gates.

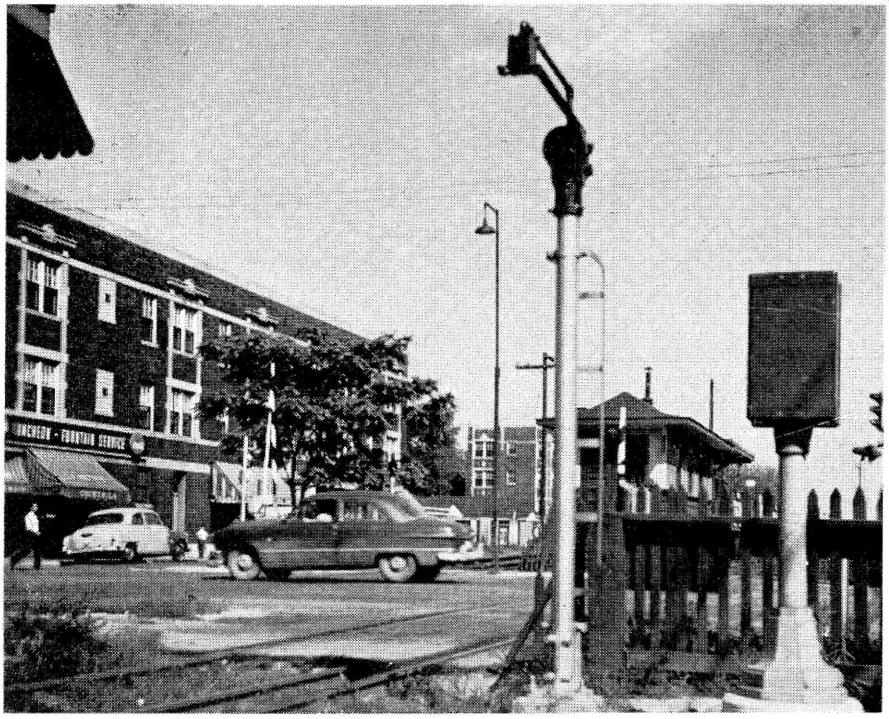
New Gates with Flashers

The new installation includes only two street gates, located at the two-entering quadrants. When down, each gate arm extends half way across the pavement, thus obstructing the lanes of traffic approaching the crossing, but no arm obstructs street vehicles from departing from the crossing. Sidewalk gate arms are at all four entrances to the crossing.

A standard railroad flashing-light signal is located on a separate mast at each street gate. For the southward location a second flashing-light signal is mounted on a cantilever bracket arm extending out over the pavement where it can be seen by drivers in the second lane from the curb. A bell is located on the mast on the flashing-light signal on the north side of the track. When control of the crossing protection is initiated, the bell rings and the lamps on the gate arms and the flashing-light signals are operated for a pre-warning period of five seconds; then the gate arms are released and are lowered to the down position within 10 seconds, thus leaving a minimum of 5 seconds "down-time" before the train arrives at the crossing. When the rear of the train clears the track circuit



Street traffic light is mounted same place as southward crossing gate



Motorman's signal and release located just short of the crossing

over the crossing, the gates are raised in 4 seconds, and the gate lamps and flashing-light signals are cut out.

Motorman's Signal

Each train, when approaching the crossing, is governed by a motorman's signal mounted on an 8-ft. mast at the right of the track just short of the property line. Normally each motorman's signal is dark. When control of the crossing protection is initiated, the motorman's signal displays a flashing-green aspect. When the gates have been lowered the aspect of the motorman's signal changes to steady green. If this steady green is not being displayed, the motorman of an eastbound train must be governed accordingly to stop his train short of the crossing. This is practicable because the speed in this area is not more than 30 mph.

Westbound Controls

Every westbound train stops at the station platform which is just east of this Laramie Avenue grade crossing. Ordinarily each stop is about 19 seconds, but could be less if only a few passengers get off or get on. As a westbound train approaches, no control of the crossing protection is initiated. According to instructions the motorman brings his train to the station stop with the front end of the leading car opposite a wayside marker, and, in this location, the front truck wheels enter track circuit W2 (about 75 ft. from the crossing). By thus shunting this track circuit, control of the crossing protection is initiated, and the green lamp in the motorman's crossing signal starts to flash. After the gates are down, the signal displays steady green, and the train then proceeds westward over the crossing. Any non-scheduled westbound train must pull in to track circuit W2 and wait for the gates to come down before proceeding over the crossing.

When an eastbound train enters approach track circuit E2, control of the crossing protection is initiated; the eastward motorman's signal flashes green until the gates are down, and then the aspect changes to steady green so that the train proceeds on across the crossing before making its station stop at the platform.

Directional Holding Feature

If the crossing protection is in operation with the gates down, due to the approach of an eastbound train, for example, and a westbound train enters "holding" track circuit W1, then the gates will not go up when the rear of the eastward train clears the crossing, but rather, the gates stay down until both the westbound and eastbound trains have proceeded over the crossing.

Similarly, if the gates are down because of control initiated by a westbound train, and an eastbound train enters eastward holding circuit E1, then the gates stay down until both the eastward and westward trains have proceeded over the crossing.

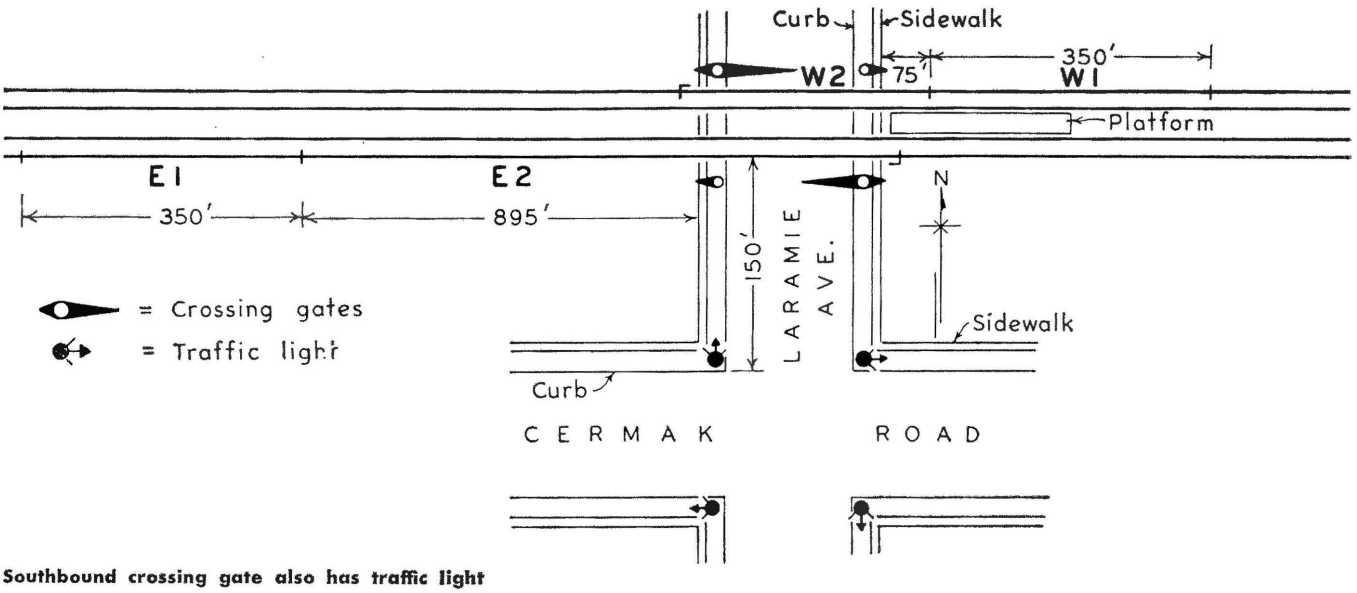
This "holding" feature was thus included in the controls because of the frequency of gate operation to eliminate a circumstance in which the gates would be raised or partly raised, and then quickly lowered again, which would be confusing and perhaps hazardous for street traffic.

Why Traffic Lights?

Cermak Road, a heavy-traffic street, runs parallel with the tracks and about 150 ft. south of the tracks. Conventional red-yellow-green, stop-and-go traffic signals are in service at the intersection of Cermak Road and Laramie Avenue. These traffic lights are automatically controlled as part of a progressive system on Cermak Road, therefore the railroad could not use a pre-emption feature to seize control of these traffic lights. The automatic control cycle for the traffic lights is 75 seconds long, including 35 seconds green for Cermak Road and 31 seconds green for Laramie.

Previously when the southward traffic light on Laramie Avenue at Cermak Road turned from green to red, street vehicles would stop bumper-to-bumper all the way north from Cermak Road to a point north of the railroad, so that these vehicles would be stopped on the railroad crossing with no chance to get off the tracks if a train were approaching. To prevent such a circumstance the new project includes a standard red-yellow-green traffic light on the north side of the mast of the southward flashing-light signal. A second southward traffic light is mounted half way out on the flashing-light cantilever arm where it can be seen readily by southbound drivers in the second lane from the curb. Also a third southward traffic light is mounted at the east curb facing north, so that it likewise can be seen by southbound drivers in the second lane.

These southward street traffic lights at the railroad are controlled so that they turn from green through yellow to red, 10 seconds ahead of the southward traffic light at Cermak Road. This 10 seconds provides distance and space to clear out all southbound vehicles that are on the crossing and the traffic light north of the crossing prevents more southward vehicles from entering onto the crossing. Thus the railroad crossing is clear of street vehicles for about 31 seconds.



Southbound crossing gate also has traffic light

During this period, with the traffic signal displaying red when an approaching westbound train, for example, initiates a control, the flashers will operate and the gates will be lowered in the usual manner, within 20 seconds, and the traffic light on the gate mast will continue to display red until the train passes over the crossing and the gate is raised. Then the control of the traffic light goes back to the cycle control at whatever point on the cycle is then in effect, with certain exceptions.

Can't Grab Green on Short Notice

If the green aspect of the southward traffic light at the railroad crossing has been displayed for only 10 seconds or less, a sudden change back to red would be confusing to drivers of street vehicles, and might cause confusion in which a vehicle could be blocked on the tracks. If a train enters an approach track circuit during the first 10 seconds of green aspect on the traffic light, the operation of the crossing protection and release of the gates will be delayed until the end of the 10 seconds. At the end of the 10-second period, the traffic light will display 3 seconds of yellow-green, and then will turn red. Then the operation of the crossing protection starts, and the gates are lowered.

If, when the rear of a train clears the crossing, there is at least 7 seconds of green left in the traffic light cycle, the red traffic light aspect will change at once to red-yellow, and when the gates are fully raised, the traffic light will go green. On the other hand, if when a train clears the crossing there is less than 7 seconds of green left in the traffic light cycle, the red aspect will continue, not only until the gates are raised but also on through the next red cycle. This is done so there will not be a situation in which a driver of a heavy truck, just gets moving, when a red traffic light is thrown in his face. In order to eliminate the possibility of disturbing the Cermak Road signal system, the railroad installed its own traffic controller that is separate from the Cermak Road system, with the exception of a two-wire interconnection through which a synchronizing pulse is received every 75 seconds.

If the traffic light cycle control system fails, the approach track circuits are cut out of the controls of the crossing protection. Therefore, as a train approaches, the motorman's signals remain dark, and the train stops short of the crossing. Then the motorman operates a special wayside release lever, which is mounted at a level where he can reach it by opening his cab window. Operation of such a release, directly initiates operation of the crossing protection and lowers the gates, to stay down until the train passes over the crossing.

Electric propulsion at 660 volts d.c. is in service on this territory, and therefore a.c. track circuits are used. Throughout the length of each track circuit, propulsion return current is removed from one running rail which, with properly located insulated rail joints, is used as a one-rail track circuit, the other running rail being the common side. Adequate return capacity for the d.c. propulsion current is secured by laying an extra dummy rail between the two running rails.

To avoid the cost of installation and maintenance of storage battery, two 60-amp., three-wire, 120/240 volt a.c. services are brought into a transfer switch located in a relay case at the crossing. One leg of the three-wire service is used to operate gates at the first crossing east of this location; and the other leg is used to operate gates at the first crossing west. This power is carried on the messenger in two-conductor No. 4 cable. The load of the equipment at Laramie Avenue is balanced between the two legs. During the past nine years of operation of automatic gates at various locations on this line, there have been no power outages.

In the case at each gate mast there is a selenium rectifier operating on 115 volts a.c., which supplies the 12 volts d.c. up to 10 amp., to feed the gate motor. This practice is acceptable on this territory because the a.c. indirectly comes from the same source as the d.c. propulsion. Therefore if the source fails, no trains can be operated and therefore no hazard exists if the gates are not operated. The rectifiers were furnished by the Accurate Engineering Company.

This crossing protection was planned and installed by CTA forces under the jurisdiction of C. W. Wolf, electrical engineer, and C. A. Butts, signal engineer, and under the direct supervision of D. H. Worcester, general signal supervisor, and with the cooperation of the officials of the town of Cicero and Ronald Techen, traffic engineer. The gates were furnished by the Griswold Signal Company, and the relays by the Union Switch & Signal Division of Westinghouse Air Brake Co.