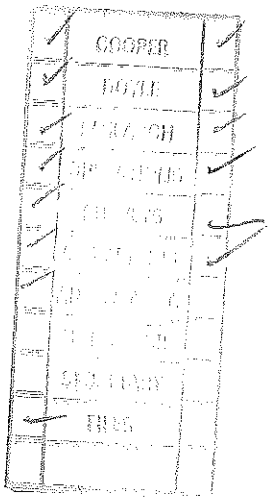
65-3116

MICHIGAN STATE HIGHWAY DEPARTMENT



ANTI-GLARE SCREEN STUDY

Conducted by the

Traffic Division
Traffic Research Section

in cooperation with

THE BUREAU OF PUBLIC ROADS
U. S. Department of Commerce

October 1965

65-3116

MICHIGAN STATE HIGHWAY DEPARTMENT

COMMISSION

Ardale W. Ferguson, Chairman

Charles H. Hewitt

Wallace D. Nunn

Richard F. VanderVeen

State Highway Director. . . . . Howard E. Hill

Director for Engineering . . . . . John E. Meyer

Chief, Office of Design and Traffic . . . . . G. J. McCarthy

Director of Traffic Division. . . . . H. H. Cooper

Acting Traffic Research Engineer. . . . . Frank DeRose, Jr.

Study Engineer. . . . . .Walter J. Roth

TABLE OF CONTENTS

Introduction 1

Description of Materials 2

Location 3

Daytime Observations 4

Nighttime Observations 5

Cost and Maintenance 6

Results 7

ANTI-GLARE SCREEN STUDY

INTRODUCTION

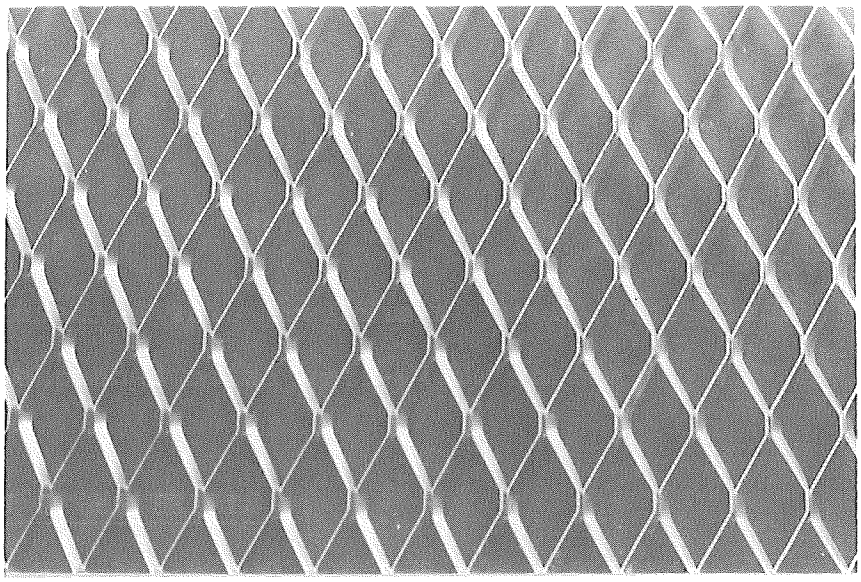
On many sections of our divided highways, there are areas where service roads, ramps, narrow medians, and other roadside characteristics cause direct vehicle headlight glare resulting in confusion and temporary blindness to oncoming drivers. There are also areas where conditions exist which would cause adverse driver reaction, such as areas where drivers are distracted by an event in the opposing lanes of traffic or areas where attractions along the roadway are competing for the drivers' attention. All of the above conditions cause unnecessary and dangerous distractions for the driver. Where these conditions exist with high traffic volumes, it is to be expected that they will have an adverse influence on the general flow of traffic. In rural areas where traffic volumes are not as high as in urban areas, the effect on traffic will not be as great, but the fact that it is affected must be considered.

Many measures have been taken to eliminate the above conditions. These range from plantings of various shrubs and trees along the roadway and construction of berms of earth between and along the roadway to the use of various types of screening devices, commonly referred to as anti-glare screens.

The method used in this preliminary study falls under the last category - expanded metal anti-glare screen.[1]

DESCRIPTION OF MATERIALS

This screen was installed in 4' x 10' sections. It was mounted at a height of 21 inches from the ground on 3 inch diameter aluminum posts with tension wires at the top, midpoint, and bottom. This gave a 69 inch top height which was high enough to block out any light from trucks. The 21 inch bottom height, as recommended by the manufacturer, was low enough to block out the glare from the lowest vehicles. The screening material was expanded from .051 inch thick sheet aluminum giving a .93" x 2" diamond pattern with .188 inch strand width (see photo below). This provides positive blankout of light passage up to approximately a 20^{o} angle.



Approximately 1/3 Actual Mesh Size

---

1 As manufactured by the Aluminum Company of America.

LOCATION

During the course of the study, two different situations were investigated along Interstate 96 east of Brighton, Michigan.

The first situation involved a detour during the construction of the Interstate 96 freeway. The eastbound traffic, which was being detoured, entered the freeway at a point on the outside of a 30 minute curve (see Figure 1). The curve, plus the entrance angle of the detour, caused the headlights of the eastbound vehicles to be aimed across the westbound roadway (see Figures 1 & 3). A 250 foot section of anti-glare screen was installed in the freeway median to alleviate this condition.

In the second situation, headlight glare from westbound vehicles on the service road lessened visibility for eastbound freeway traffic (see Figure 2). A 400 foot section of anti-glare screen was installed between the freeway and the service road in this critical area of headlight glare.

The screening was located 5 feet from the edge of the roadway when it was in the median and 20 feet from the edge of the roadway when it was moved to the present location between the eastbound lane and the service road.

The two installations were observed and photographed over a three year period. The daytime photographs show the physical characteristics of the screen and what the driver sees as he passes by during the day. They also show that the screen would present little resistance to blowing snow, a fact which was substantiated by winter

observations (see Figures 9 & 10). The nighttime photographs show the screen's effectiveness in blocking headlight glare.

DAYTIME OBSERVATIONS

Various photographs were taken to show the screen's effectiveness. Figure 4 shows the first anti-glare screen installation shortly after it was erected. In the area of the second post from the left, note that the lower part of the vehicle is visible under the screen while the top is concealed by the screen.

The pictures in Figures 5 through 15 show the screen after it was moved to the second location. These pictures were taken nearly three years after the screen was first erected.

Figures 5 through 8 show the screen as seen from angles of 10, 15, 25, and 40 degrees, respectively. From 10^{o}, the lower portion of the truck is completely concealed; from 15^{o}, it is faintly visible; from 25^{o}, the entire truck is visible but the portion behind the screen is little more than a silhouette; and from 40^{o}, the entire truck can be observed in some detail.

In Figure 9, the screen is viewed from the perpendicular. The car and trees can be observed in detail through the screen, and the screen itself is faintly visible.

In Figure 10, the screen is being observed from the angle of minimum restriction of view, about 135^{o}, as measured from the center line of eastbound roadway. Objects behind the screen can be observed in detail and the screen is barely visible.

NIGHTTIME OBSERVATIONS

Figure 11 is an unobstructed view of an approaching vehicle.

Figure 12 is a time exposure of a westbound vehicle on the service road as seen from eastbound I-96. The bright glare in the left of this figure is from westbound I-96 traffic, as opposed to no glare from the vehicle on the service road. The vehicle is located near the right edge of the photo behind the screen.

Figure 13 is a time exposure of a vehicle on eastbound I-96 approaching and passing the glare screen as seen by a driver on the service road. Note the cutoff in glare when the vehicle passed behind the screen. The bright glare spots to the left are just beyond the screen's end over a bridge railing, which shows up in Figure 5. This point is about one inch from the left edge of the photo.

Figures 14 and 15 are time exposures showing trucks passing the glare screen on eastbound I-96. The photograph in Figure 14 was taken at approximately 10^{o} and the one in Figure 15 at 15^{o}. Light streaks above the screen are the truck's running lights shown in time lapse. The cutoff of glare is quite similar to that shown in Figure 13. The end of the screening is about 3/4 of an inch from the left edge of the photo.

All the nighttime photographs were taken after the screen had experienced some deterioration. If they had been taken when the screen was new, the contrast would be even more pronounced.

The real test of the screen, of course, is what effect it has on headlight glare at night. It is difficult to reproduce in a photograph the situation exactly as the driver sees it.

Although the photographs in this report do not appear exactly as the view one would see at the location, they do portray the contrast between the situation with and without the screen. Actual photometric readings were not taken at this location. They were, however, determined in the laboratory and the screen blocked all light passage up to about 19^{o}.

COST AND MAINTENANCE

The cost of purchasing and installing this glare screen at the time of installation in 1961 was approximately $3.25 per foot. Maintenance cost would vary depending upon the type of location. Actual maintenance costs for this installation were not available. They were included in general roadside maintenance by the county doing the maintenance and could not be determined. During the time the screening was located in the median and since it has been moved to its present location, damage to the screen has been extensive. Several sections of the screening have been ruined by vehicles crashing into it. Snow plowing has caused some damage; however, this was not extensive enough to remove the screen's effectiveness. Observations in this study showed that during the winter the screen developed bowing and some sags from being struck by snow which was thrown from plows (this shows somewhat in Figure 6). This detracts appearance-wise, but the screen is still effective as a glare shield.

In replacing the fence after it was struck by vehicles, the aluminum tension wires had become somewhat brittle and tended to break easily when repaired by crews. The screen becomes stretched and distorted and is virtually destroyed when run thru and over by a vehicle.

To date, most maintenance had involved repairing sections damaged by vehicles. It appears that in the near future the entire installation will require tightening to correct the sagging and bowing that was becoming quite apparent. However, the screen is still in effective condition to block headlight glare.

RESULTS

The observations made during this study show conclusively that an expanded metal screen can reduce headlight glare to a level at which the driver's vision does not appear impaired when the screen is erected on an approximately straight line. Curved installations were not investigated in this study. It is, however, recommended that curved areas be included in studies involving anti-glare screens. Also, driver reaction, together with other aspects, should be considered in such studies. The screen itself appears as though, under conditions of natural weathering, it would endure many years longer than the three-year study period. However, periodic tightening may be required unless a more durable suspension system is developed. This type of glare screening certainly lends itself to any narrow divider area or where salt conditions preclude use of any vegetation barrier. There are areas, also, wherein this could perform double duty as anti-glare screen and as a pedestrian barrier.

In conclusion, it is felt that this screen material should be considered for use in any area where it is determined that headlight glare is a problem. It is also felt that a material of this nature be used where vision blockage from one roadway to the next is desired and in areas where bloackage of unsatisfactory roadside attractions is desirable.

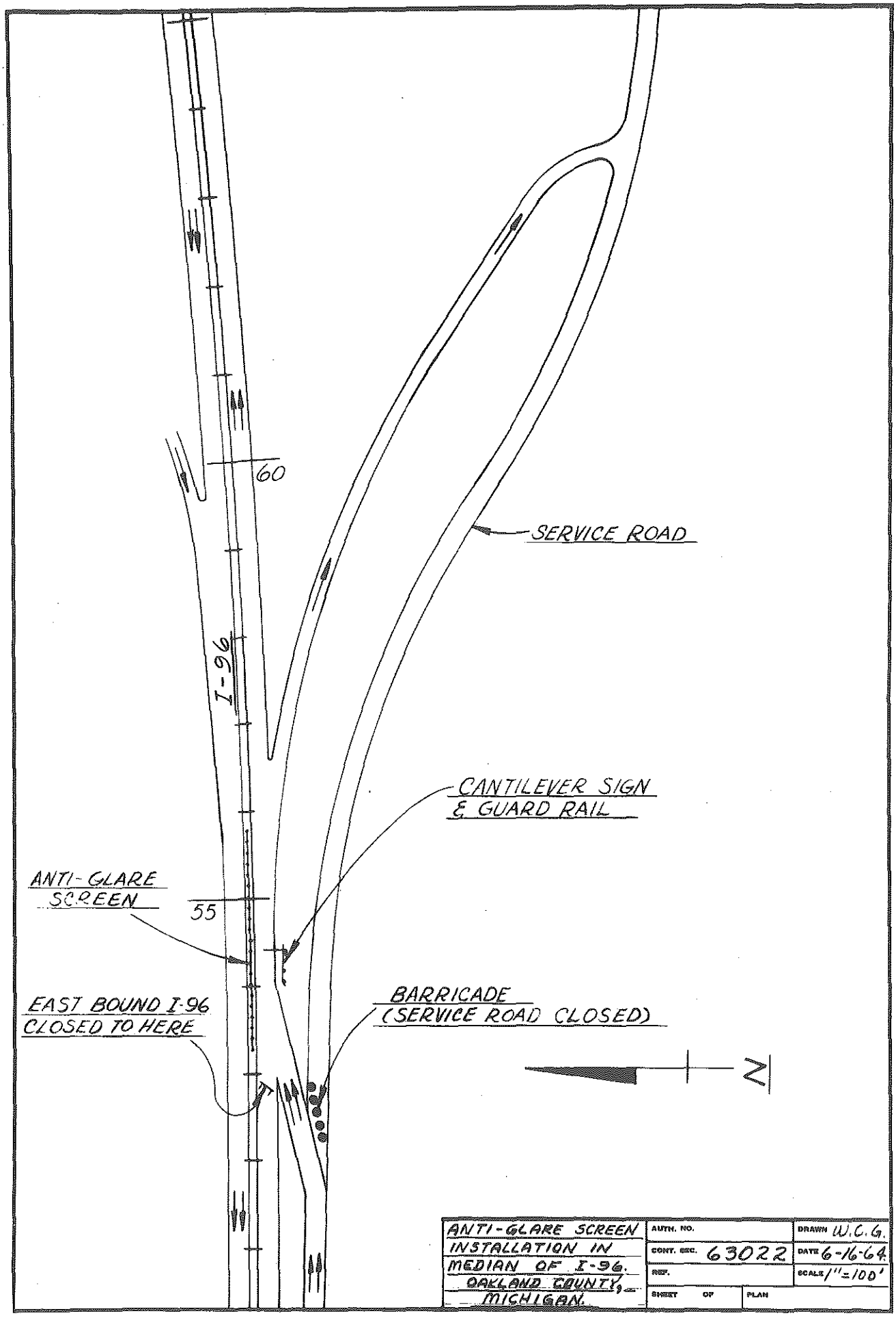

60
SERVICE ROAD
I-96
CANTILEVER SIGN
& GUARD RAIL
ANTI-GLARE
SCREEN
55
EAST BOUND I-96
CLOSED TO HERE
BARRICADE
(SERVICE ROAD CLOSED)
N
ANTI-GLARE SCREEN
INSTALLATION IN
MEDIAN OF I-96.
OAKLAND COUNTY,
MICHIGAN.
AUTH. NO.
CONT. SEC. 63022
REF.
SHEET OF PLAN
DRAWN W.C.G.
DATE 6-16-64
SCALE 1"=100'

FIGURE 1

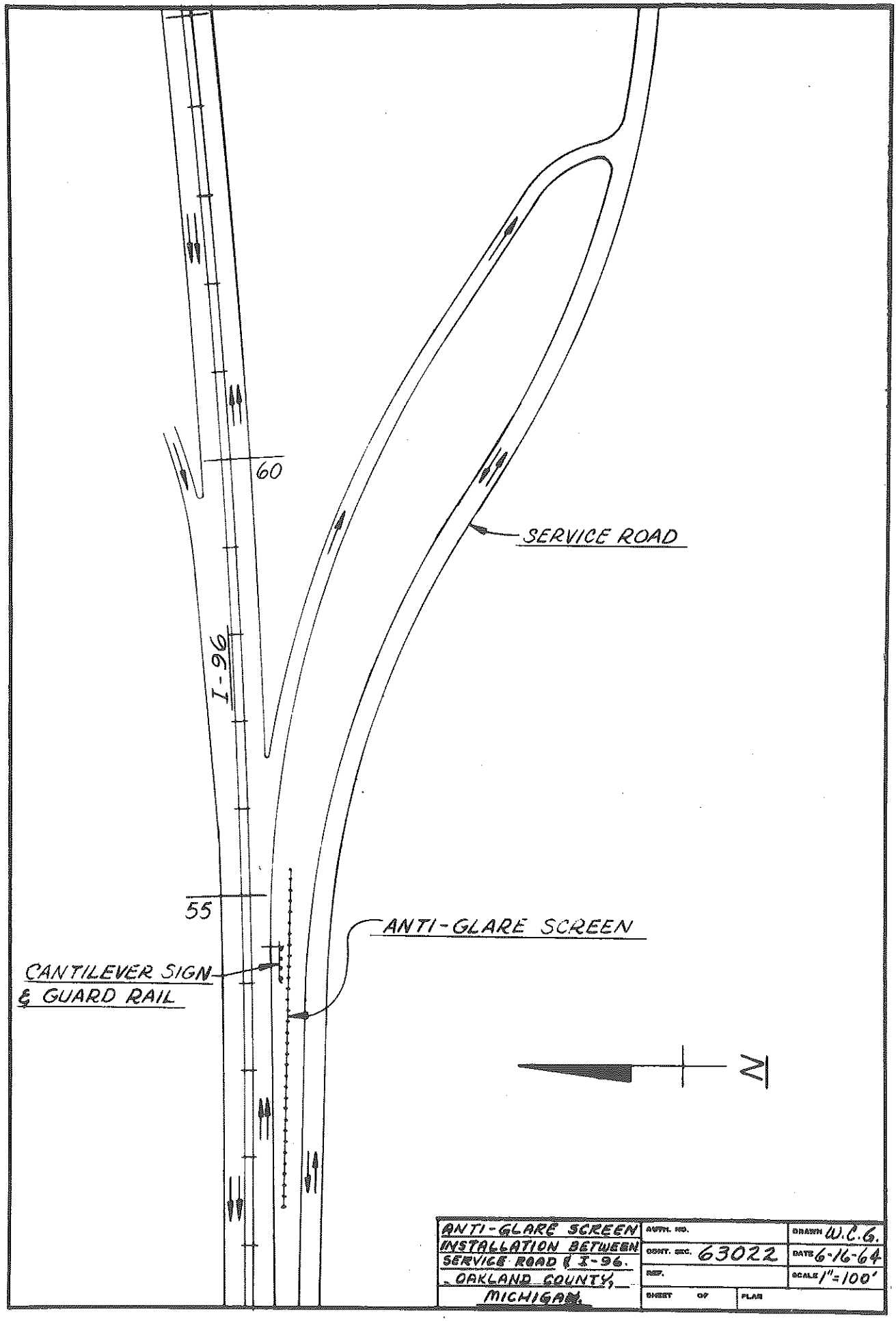
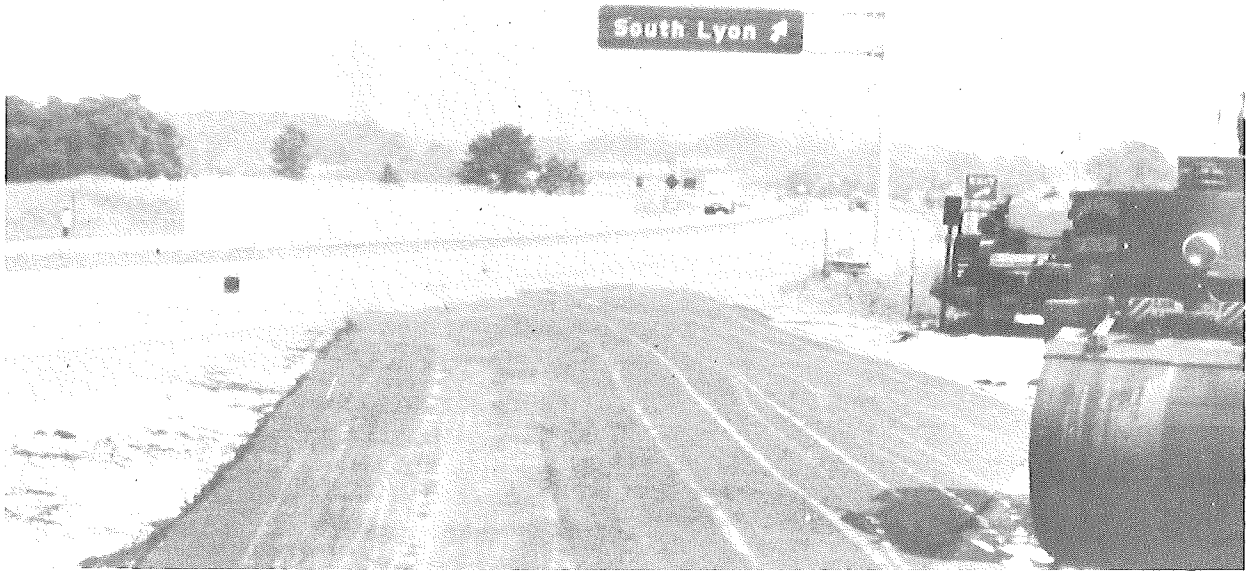

60
I-96
55
SERVICE ROAD
ANTI-GLARE SCREEN
CANTILEVER SIGN
& GUARD RAIL
N
ANTI-GLARE SCREEN
INSTALLATION BETWEEN
SERVICE ROAD & I-96.
OAKLAND COUNTY,
MICHIGAN.
AUTH. NO.
CONT. SEC. 63022
REF.
SHEET OF
FILE
DRAWN W.C.G.
DATE 6-16-64
SCALE 1" = 100'

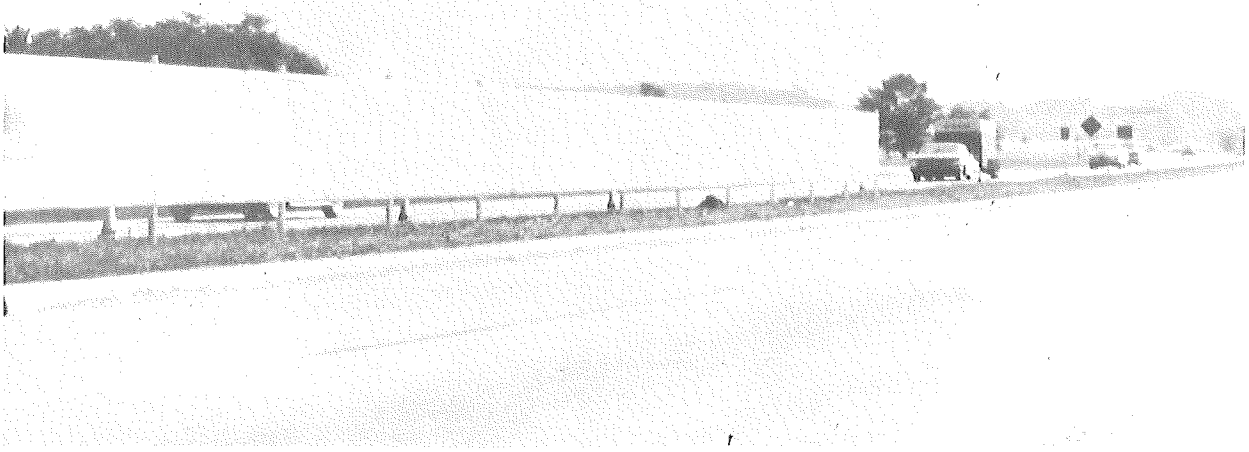
FIGURE 2

Fig. 3



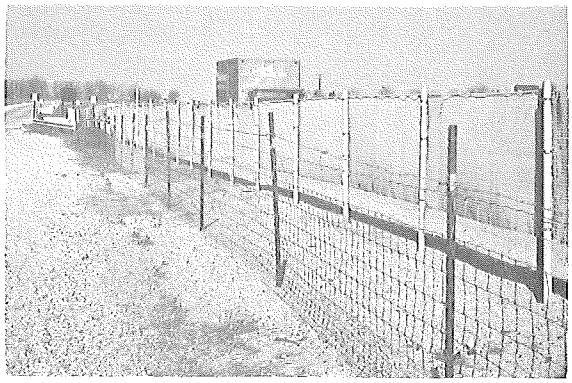
Eastbound approach to Anti-Glare Screen in Median of I-96 at Kent Lake Road.

Fig. 4



Close up view of Anti-Glare Screen in Median of I-96 at Kent Lake Road.

Fig. 5



Anti-Glare Screen viewed at 10^{o} angle from Service Road.

Fig. 6

Anti-Glare Screen viewed at 15^{o} angle from Service Road.

Fig. 7

Anti-Glare Screen viewed at 25^{o} angle from Service Road, westbound.

Fig. 8

Anti-Glare Screen viewed at 40^{o} angle from Service Road, westbound.

Fig. 9

Anti-Glare Screen viewed at 90^{o} angle

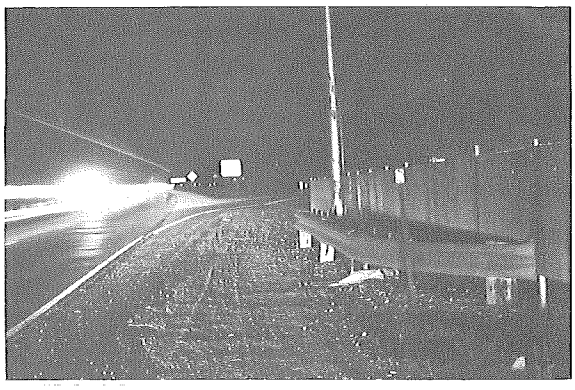
Fig. 10

Anti-Glare Screen viewed from 135^{o} angle from east-bound roadway.

Fig. 11

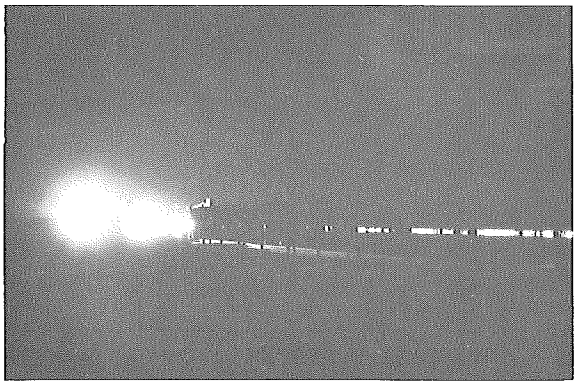
Unobstructed view of approaching vehicle.

Fig. 12



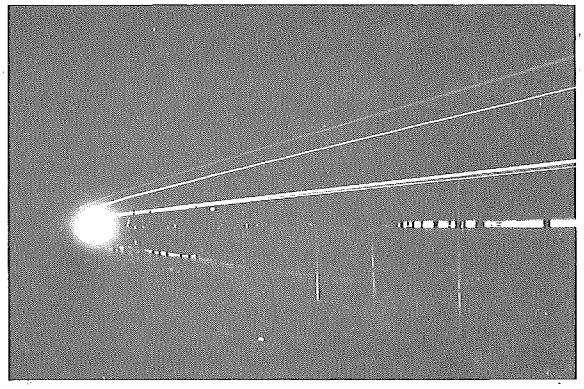
Vehicle on Service Road viewed from eastbound I-96.

Fig. 13



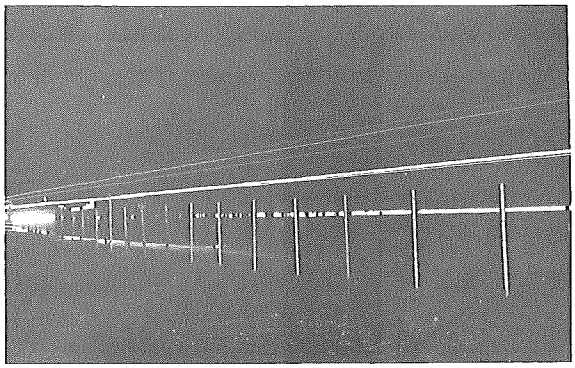
Vehicle on eastbound I-96 passing Anti-Glare Screen as seen from Service Road.

Fig. 14



Truck passing Anti-Glare Screen on eastbound I-96 as viewed from Service Road at approximately 10^{o} angle.

Fig. 15



Truck passing Anti-Glare Screen on eastbound I-96 as viewed from Service Road at approximately 15^{o} angle.