

# OFFICE MEMORANDUM

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MICHIGAN  
STATE HIGHWAY DEPARTMENT

February 24, 1965

To: R. L. Greenman  
Assistant Testing & Research Engineer

From: E. A. Finney

**Subject:** Anti-glare fence specifications, Research Project No. 61 NM-58

Attached are three copies of Report R-499 on anti-glare fence specifications. This report was prepared by B. W. Pocock as requested in W. W. McLaughlin's memo of October 26, to furnish available information on specifications for anti-glare screens. The only specification for this type of material which has come to our attention is one put out by the Aluminum Company of America, copies of which are attached.

It appears that a complete specification cannot be written at this time, since further research is contemplated by the Traffic Research Division. The points brought out in the subject report should be considered by our Specifications Division, however, in developing a tentative specification.

OFFICE OF TESTING AND RESEARCH

E. A. Finney, Director  
Research Laboratory Division

EAF:BWP:shl

## OFFICE MEMORANDUM



MICHIGAN  
STATE HIGHWAY DEPARTMENT

February 22, 1965

To: E. A. Finney, Director  
Research Laboratory Division

From: B. W. Pocock

Subject: Anti-glare fence specifications, Research Project 61 NM-58  
Report R-499.

C. C. Rhodes asked the writer on January 20 to compile for your consideration information requested in W. W. McLaughlin's memo of October 26 relating to specifications for glare screens. Accordingly, and at Mr. Rhodes' suggestion, a meeting was held on February 1 with Frank DeRose, Assistant Engineer of Traffic Research, for the purpose of covering all factors which should be considered in developing a specification of this type. Present at the meeting were Messrs. DeRose, W. Roth, W. Miller, and myself.

The following points were agreed to by all present:

1. The term anti-glare fence would be acceptable, whereas the term glare fence would not. The term glare screen was not discussed but appears satisfactory.
2. A completely satisfactory specification will have to take account of vertical and horizontal curves, width and nature of the median strip, and the presence or absence of guard rail at the installation site.
3. More than one material will have to be allowed. Suitable materials could be steel, aluminum, wood, plastic, and vegetation.
4. The angle of incidence at complete extinction will have to be specified. In this connection there is a growing confusion about what this angle means. It is the angle between the line of sight and the normal at the point sighted. There is a trend among manufacturers to label the complement of this angle the angle of extinction, with 20 degrees now being proposed.
5. The maximum permissible obstruction to sight when viewed along the normal (zero degrees angle of incidence), and hence the maximum obstruction to free air flow through the fence, must be specified. There are two reasons for this, 1) to assure adequate ability to see through the fence where desirable, and 2) to assure minimum snow fence action.
6. The fence should have a nonreflective finish so as not to comprise a source of glare itself either at night or in the daytime.

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7. The fence should be colored dull gray or dull black. In this connection a black finish could be expected to contribute to melting ice more rapidly than a gray finish.

8. Where steel is used, this should be adequately galvanized after all forming operations have been performed.

9. The strength of the material should be specified in order to prevent sagging and to promote durability. It should be heavy enough to discourage vandalism, and strong enough to take whatever tension is required for installation. Gauge should be specified.

10. It is preferred that the material be available in sheet form. Sections currently considered for straight runs are 4 ft wide (high) by 10 ft long. These are normally placed 21 in. above ground.

11. Present consensus is that barbed wire should not be placed along the top to discourage climbing, but that occasional 2-ft intervals may be provided to permit walking through the fence--probably at least one per mile on straight runs.

12. Design should be such as to promote ease of installation.

13. The material should have adequate weathering properties.

It was agreed that a considerable amount of research on anti-glare fences is still indicated. The Traffic Division under an HPR project plans a 4,000 ft installation on the John C. Lodge Expressway primarily to investigate a so-called tunnel effect (psychological constriction), which may cause drivers to tend to drive either close to the fence or to veer away from the fence. There is also the possibility of a light pulse hypnosis caused by repeated, rhythmic pulses from oncoming headlights flashing at one side as they go by. Further, as the HELP program becomes more popular there is a real danger that radio signals may be weakened by long, straight runs of metallic fencing. Mr. DeRose will keep us informed of his progress and has furnished the accompanying copy of Alcoa's tentative specifications.

Mr. Miller brought up an approximately 20-km installation of a diamond-patterned steel linked anti-glare fence between Darmstadt and Frankfurt-am-Main in West Germany, with which he was familiar. This installation had close to the same extinction angle as Alcoa's. It was placed along the Autobahn in what was conceded to be the worst spot in West Germany. The median was 4 meters wide, and the fence was very effective--not only as a glare screen but also as a guard rail. He has personally seen one case in which a huge semi (tractor-trailer type) was directed back into its own lane after collision with this installation. It would appear that one should keep in mind possible dual roles for these installations, both that of a glare screen and that of a guard rail.

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Recommendations

In light of the above meeting and in view of prior and current investigations of anti-glare screen materials and installations, the following recommendations can be made at this time:

1. The active material shall be known as Anti-Glare Screen and the installation as Anti-Glare Fence.
2. Anti-Glare Screen shall be made of steel or aluminum. Screens made of other materials might be considered if proved satisfactory under experimentation.
3. All steel parts shall be galvanized after forming.
4. Finish shall be dull black or dull gray.
5. The angle of extinction (cutoff angle) is defined as the angle formed by the plane of the fence and the line of sight of the driver at the point on the fence at which approaching headlight just begin to be visible. This angle shall be 20 degrees plus or minus 2 degrees.

This definition of extinction angle follows current trends among manufacturers and is probably more readily understood by the general public than the definition in physics textbooks which use the complement. It is also of interest here to note that at an extinction angle of 20 degrees on interstate highways with medians 70 ft wide, an approaching car would be 291 ft down the highway from the observing driver. At 70 mph the two cars would be abreast in 1-1/2 seconds. During this brief interval the oncoming headlights, starting at zero, would only gradually increase in intensity to some maximum, after which peripheral vision, being the only vision involved, would have the effect of causing the intensity to appear to diminish to zero once more as the car passed. The entire cycle should comprise no disturbing influence, which seems to be case from actual experience. On highways with medians of 94 ft the approaching cars would be 357 ft apart at 20 degrees and would pass each other in 1-3/4 sec at 70 mph. Here also the time interval would appear to be adequately short.

6. The minimum open area of the fabricated screen when viewed at an angle of 90 degrees shall be 60 percent as traced with a pencil and measured with a planimeter.

This requirement derives from the necessity that the installation shall exhibit minimum snow fence action. Aluminum and steel samples submitted for this determination had 62 percent and 69 percent open area respectively.

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7. Curves and elevations. On horizontal curves, where an extinction angle as defined above is considered too small, this may be increased to the desired angle by installing a second similar screen on the opposite side of the posts and offsetting the two screens until the desired angle has been reached. A similar technique may be employed in situations where opposing lanes are at different elevations by offsetting vertically as required. Vertical offsetting may also be of value with vertical curves.

## OFFICE OF TESTING AND RESEARCH

B. W. Pocock, Supervisor  
New Materials and Methods Section  
Research Laboratory Division

BWP:shl

Attachment

**SUGGESTED SPECIFICATIONS**  
**FOR**  
**ALCOA GLARE SCREEN**



**ALUMINUM COMPANY OF AMERICA**

**1501 ALCOA BUILDING**

**PITTSBURGH 19, PENNSYLVANIA**

1963

## MATERIAL SPECIFICATIONS

Item	Industry or ASTM* alloy designation	ASTM designation	Description
Fabric	3003-H14*	B209	Expanded Metal Mesh 48 in. wide by 6, 8, or 10 ft. long having .051 in. thickness. Mesh erected on straight roadways to be .250 in. strand width and 1.33 in. X 4.0 in. center to center of bridges while mesh erected on horizontal curves to be .188 in. strand width and .93 in. X 2.0 in. center to center of bridges.
Tension Wire	6061-T94	B211	.192 in. diameter.
Hog Ring Fasteners	6061-T94 or 5052-H38*	B211	.110 in. diameter.
Line Posts & Terminal Posts	6063-T6*	B241	2-1/2 in. A.S.A. Schedule 10 Pipe with plain ends. (Actual O.D. = 2.875 in.) (Actual wall = .120 in.)
Post Caps	356-F ) SG70A-F*)	B108 (Sand) or B26 (Perm. mold)	Castings to fit on outside of post tops.
Turnbuckles	356-T6 ) SG70A-T6*)	B108 or B26	Cast Part.
	6061-T6*	B211	Wrought Part.
Wire Rope Clamps	6062-T6*	B221	Alcoa Part No. 396.6 or equivalent. (To be supplied without electrical surface finish and No-Ox-Id-xx.)
430 Stainless Steel Strapping	A-178-54*	Type 430 (Grade 4 Cold Rolled)	.020 in. X 5/8 in. coiled strip bright finish.
430 Stainless Steel Seals	A-178-54*	Type 430 (Grade 4 Cold Rolled)	.020 in. X 1-1/4 in. thread-on type (Single Crimp).

## INSTALLATION SPECIFICATIONS

### 1. POST SPACING

All line posts shall be spaced at equal distance in the fence line on 6 ft., 8ft., or 10 ft. centers. Posts shall be plumb and the tops of the posts properly aligned.

Line posts holes shall be 18 inches deep with a minimum diameter of 9 inches. The top exposed surface of the concrete footing shall be sloped to shed water and provide a neat appearance when completed. Terminal posts shall be the same size and material as line posts, but they shall be guyed to the ground using the standard tension wire.

### 2. POST TOPS

Post tops shall be firmly seated on the outside of the top of the posts.

### 3. FENCE FABRIC

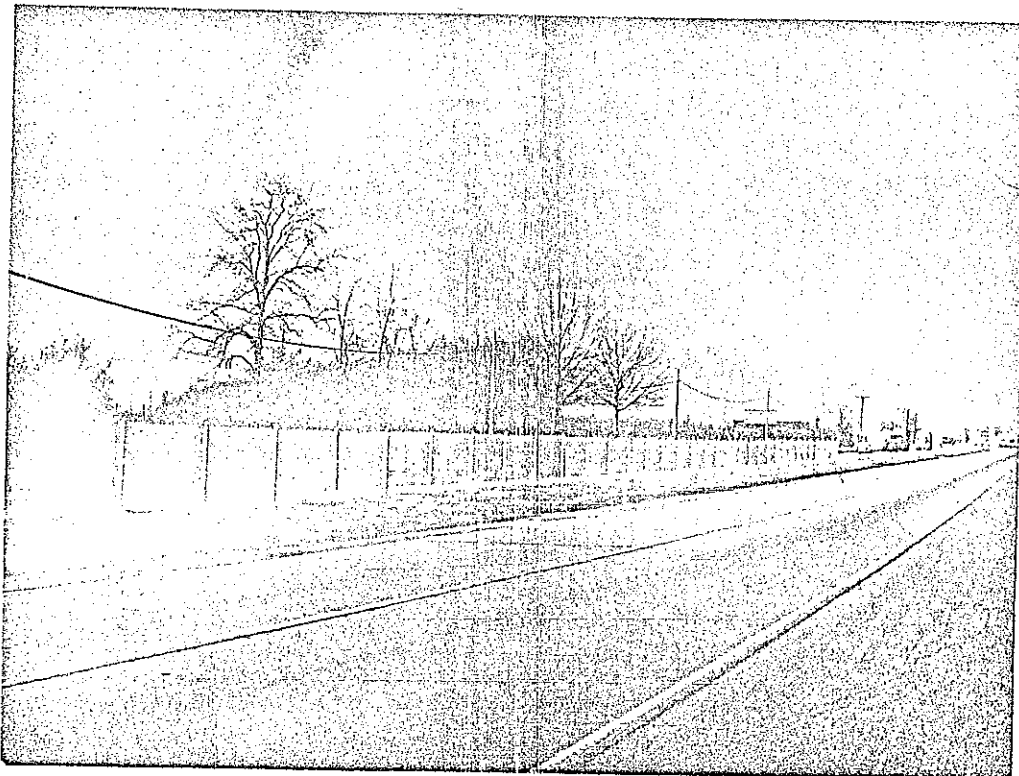
Fence fabric shall be installed 21 inches above a line connecting the inner edges of the roadway and shall be securely fastened to the posts using .020 in. X 5/8 in. stainless steel strapping and seals. The ends of adjacent panels of fabric should overlap a distance of one bridge.

### 4. TENSION WIRE

A tension wire shall be attached to the top and bottom of the fence fabric using aluminum hog ring type fasteners at a maximum space of 2 ft. The tension wire will pass intermediate posts and be connected by means of turnbuckles. A turnbuckle shall be located every one hundred feet in the line of fence, both for the top tension wire and the bottom tension wire.

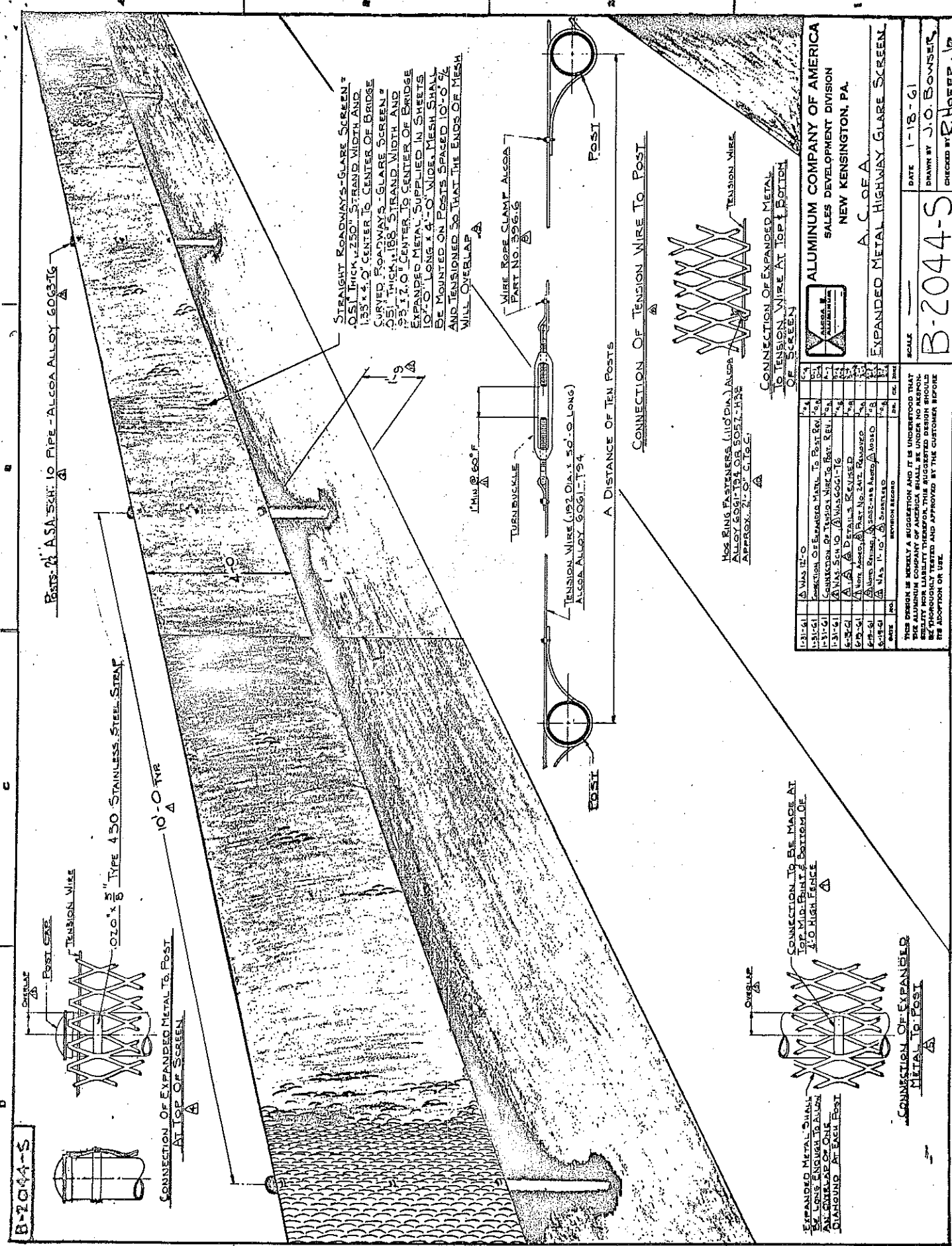
### 5. FABRIC FASTENERS

Fabric shall be fastened to each line post using .020 in. X 5/8 in. stainless steel straps and seals. Sufficient tension shall be applied to the strapping using standard hand tensioners to hold fabric against posts tightly. Amount of tension applied to the strapping should not deform the fabric. Seal shall be crimped when strapping is at proper tension.



Alcoa Glare Screen Installation on U.S. 130 near Hightstown, New Jersey.





STRAIGHT ROADWAYS-GLARE SCREEN 2  
 .051 THICK, 2.50" STRAND WIDTH AND  
 1.35 x 4.0" CENTER TO CENTER OF BRIDGE  
 CURVED ROADWAYS-GLARE SCREEN 2  
 .051 THICK, 1.80" STRAND WIDTH AND  
 1.75 x 4.0" CENTER TO CENTER OF BRIDGE  
 EXPANDED METAL SUPPLIED IN SHEETS  
 10'-0" LONG x 4'-0" WIDE. MESH SHALL  
 BE MOUNTED ON POSTS SPACED 10'-0" ON  
 AND TENSIONED SO THAT THE ENDS OF MESH  
 WILL OVERLAP

WIRE ROPE CLAMP ALCOA  
 PART NO. 3966.6

TENSION WIRE (1/2" DIA. x 50'-0" LONG)  
 ALCOA ALLOY 6061-T34

CONNECTION OF TENSION WIRE TO POST

MESH FASTENERS (1/10" DIA.) ALCOA  
 ALLOY 5051-T34 OR 5052-T34  
 APPROX. 2'-0" C.T.C.

CONNECTION OF EXPANDED METAL  
 TO TENSION WIRE AT TOP & BOTTOM  
 OF SCREEN

ALUMINUM COMPANY OF AMERICA  
 SALES DEVELOPMENT DIVISION  
 NEW KENSINGTON, PA.  
 A.C.O.E.A.  
 EXPANDED METAL HIGHWAY GLARE SCREEN

DATE	NO.	REVISION	BY	CHK.
11-14-61		1		
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DATE 1-18-61

DRAWN BY J.O. BOWSER  
 CHECKED BY R. HOFER

B-2044-S

SCALE

CONNECTION TO BE MADE AT  
 TOP, MID, POINT & BOTTOM OF  
 4'-0" HIGH FENCE

CONNECTION OF EXPANDED  
 METAL TO POST

EXPANDED METAL SHALL  
 BE GIVEN SUFFICIENT  
 CLEARANCE TO CLEAR  
 ROADWAY AT EACH POST