technical note technical

Installation of Runway End Identifier Light Baffles at the Medina, Ohio, Municipal Airport

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Tom Paprocki of Galaxy Scientific Corp. provided technical support throughout the course of the evaluation.

16. Abstract

The Federal Aviation Administration (FAA) Office of Aviation Research, Airport Technology Research and Development Branch, AAR-410, conducted this project at the request of the Great Lakes Region Airway Facilities Division, AGL-400. The task was to obtain and install light baffles for the Runway End Identifier Lights (REIL) at the approach end to runway 27 at the Medina Municipal Airport in Medina, Ohio. This request for assistance was initiated to remediate a situation for which the local township had requested congressional assistance.

AAR-410 personnel were sent to the site to conduct a survey of the installation, and as a result, developed “deflector panels” to prevent the light from the REIL units from striking the residence. This installation was unique in that it only required the light to be blocked from a specific spot on the approach zone, not below the entire approach. Typically, baffles would be used for this type of problem. In this case, however, deflector panels were used to block the light from the residence without affecting the usable light required for approaching aircraft. This technical note, with supporting photographs, describes the steps taken in assessing the situation, the fabrication, and final installation of the deflector panels.

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EXECUTIVE SUMMARY

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PURPOSE

The effort described in this technical note was accomplished in response to a request for assistance received from the Federal Aviation Administration (FAA) Great Lakes Region Airway Facilities Division, AGL-400.

OBJECTIVE

The task was to design, fabricate, and install a custom light baffle system for the Runway End Identifier Lights (REIL) system serving instrument approaches to runway (R/W) 27 at the Medina Municipal Airport in Ohio. Occupants in a residence located within the R/W 27 approach area, at a distance of approximately 1/2 mile, had complained of annoying light spillover from the REIL system at night, ever since the lights were installed a year previously. No standard REIL baffle designs exist, since each spillover problem is unique due to variations in approach area configuration and terrain characteristics.

PRELIMINARY ACTIVITIES

A design team of two airport engineers from the Airport Safety Technology Section, AAR-411, at the FAA William J. Hughes Technical Center initially visited the Medina Airport to obtain firsthand information about the problem. A preliminary inspection of the approach area, as viewed from the R/W 27 threshold, revealed that the residence from whence came the complaints was situated somewhat to the left of the R/W centerline extended and at a considerably lower elevation. This was due to the fact that the terrain in the approach area sloped gradually downward over a distance of approximately 1/2 mile toward the road on which the residence was located. Subsequent measurements with a theodolite, taken from the REIL system installation, resulted in the angular measurements depicted in figures 1 (horizontal) and 2 (vertical).

The terrain situation immediately suggested that it might be possible to install relatively low panels in front of the individual REIL units to block the direct components of the light beam that created the distracting spillover, while still retaining full approach area REIL coverage above the level of the runway threshold (figure 3). Installing such “blocking” panels would make attachment of baffles directly onto the light fixtures, with attendant mandatory changing of the toe-out/up angles, unnecessary. In other words, the problem might be solved without reducing the REIL system effectiveness for pilots making instrument approaches to R/W 27.

Under full darkness conditions, the team visited the residence to observe the degree of light pollution caused by the REIL lights and, at high intensity settings, it was found to be quite annoying. In fact, the flashes of light penetrated into the living room of the house, making it almost impossible to watch television without drawing the drapes. Due to reflections off nearby tree and shrubs, it was still distracting while standing on the back deck of the house. There was an obvious cause for concern and a need for immediate action.

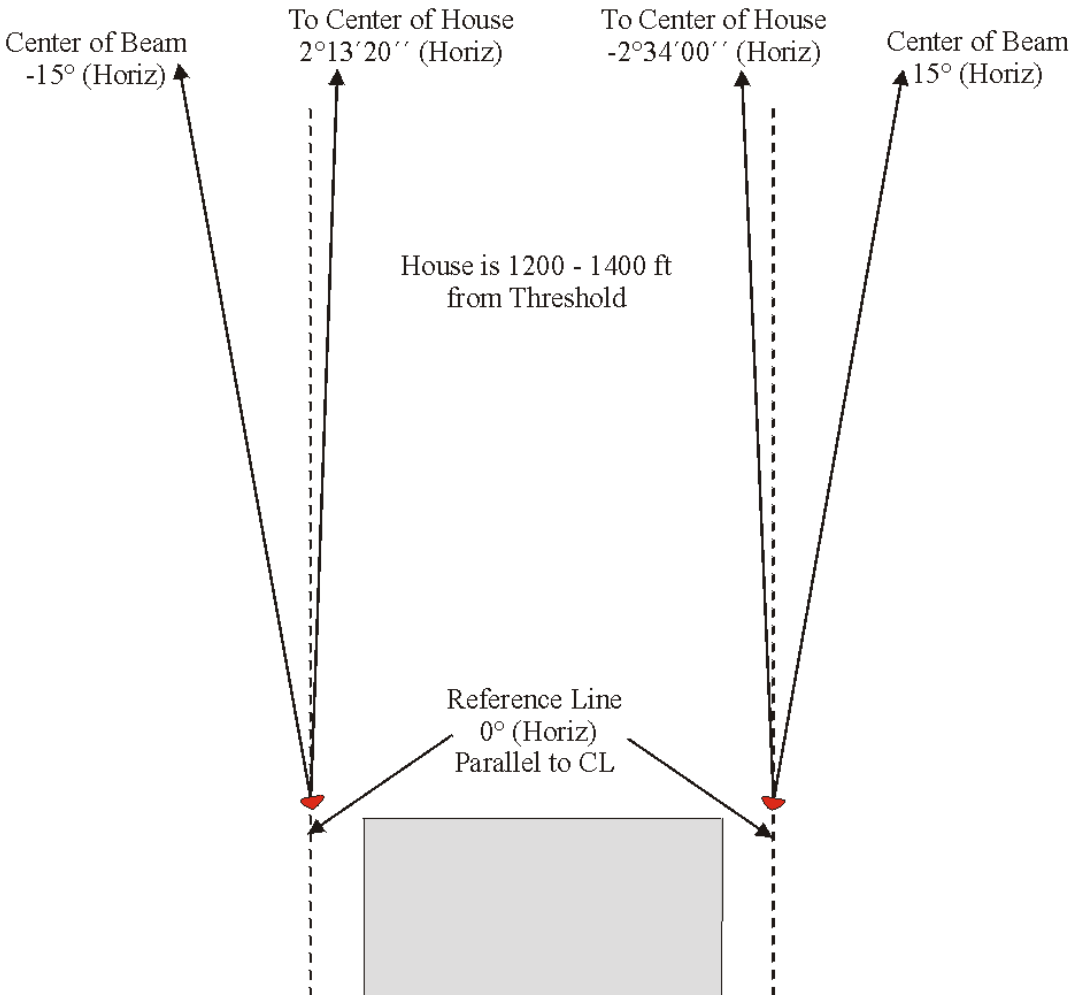

FIGURE 1. RESIDENCE LOCATION RELATIVE TO RUNWAY THRESHOLD (HORIZONTAL)

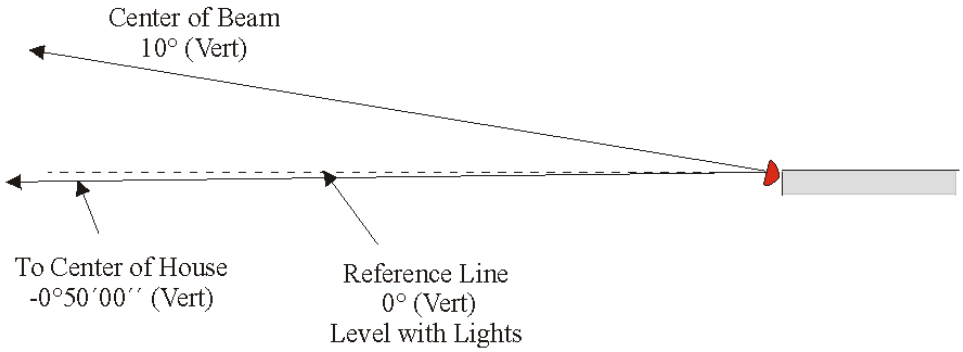

FIGURE 2. RESIDENCE LOCATION RELATIVE TO RUNWAY THRESHOLD (VERTICAL)

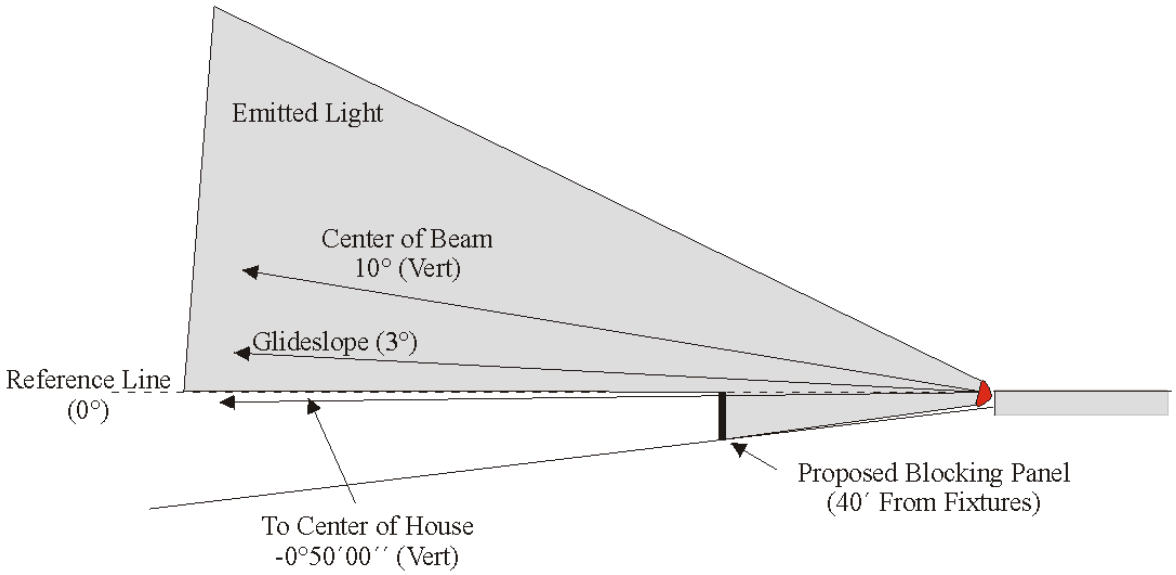

FIGURE 3. EMITTED LIGHT PATTERN WITH BLOCKING PANEL

Subsequently, a large cardboard box was used to simulate the effect of panels located as masks approximately 75 feet in front of the light units. After considerable adjustment of the box height and lateral location, an optimum configuration was found that, when viewed from the residence, virtually eliminated all of the annoying effects of direct light from the REIL units. Comments received from the occupants of the house that evening indicated that they considered the proposed solution to be satisfactory.

Having taken all of the necessary measurements and having proved the practicality of the proposed masking panel solution, the team returned to the Technical Center to prepare the required equipment and materials for subsequent installation at the Medina Airport.

INSTALLATION

A decision was made to procure beforehand, and transport to Medina, Ohio, by truck, all of the materials required for the masking panel installation. Using data obtained during the preliminary inspection at the airport, a design for the installation was formulated as shown in figure 4. All materials were obtained from local hardware stores. A gasoline-powered posthole digger was also rented for the installation.

The masking panel assemblies consisted of 4-foot by 3-foot 0.085-inch aluminum sheets painted flat black and mounted on 2-inch rigid conduit tubing. The conduit, with frangible couplings, was supported on additional 5-foot sections of subsurface conduit surrounded by concrete. This type of mounting was necessary due to the unstable nature of the terrain and the existence of frost-heave problems. Posthole preparation, pouring of the concrete footings, and erection of the masking panels was accomplished in approximately 5 hours.

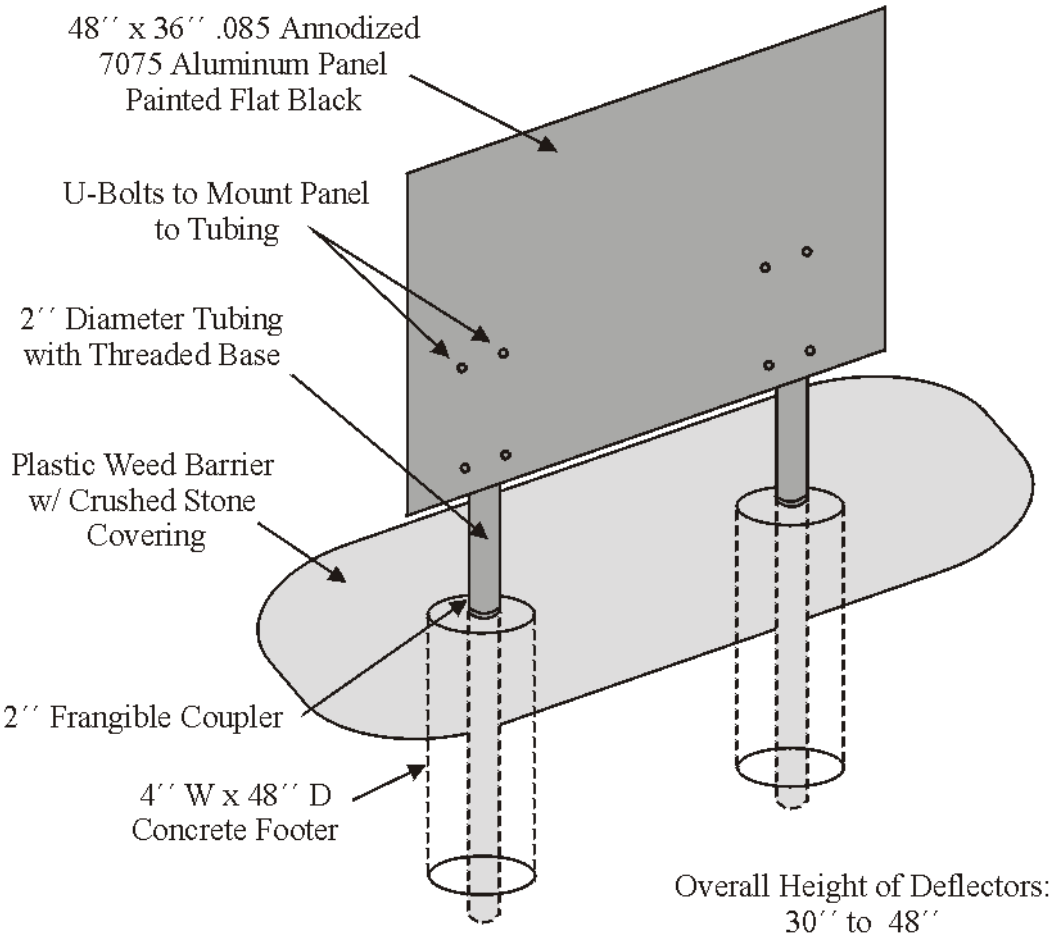

FIGURE 4. DEFLECTOR CONSTRUCTION DETAILS

The concrete was sufficiently hardened to permit installation of the panels by early evening and, as soon as complete darkness prevailed, the REIL lighting system was turned on at high intensity to observe the effectiveness of the masking panels. During observation from the porch of the house from which complaints had previously been received, it was determined that the masking was completely effective. No direct light from the strobe units could be seen from anywhere in the vicinity of the house and even reflections from tall trees nearby had been reduced significantly. The occupants of the house expressed complete satisfaction with the results.

Placement of plastic sheeting with stone cover to prevent grass growth in the immediate vicinity of the panels and cleanup of the installation site was accomplished the following morning.

Photographs of the site and final installation are presented in appendix A.

DISCUSSION

Although the solution to the spillover light problem described herein appears very simple and easy to implement, it must not be assumed that all cases of light pollution stemming from REIL installations near houses or residences can be eliminated in this manner. The descending terrain in front of the REIL system and relatively great distance between the house and the light source permitted the use of blocking or masking panels whose height did not intrude above the plane of the runway surface.

In situations where the REIL light units are level with, or even below, the level of the residence, it will very likely be necessary to design and fabricate custom baffles (venetian blind like covers) to be affixed directly to the front surface of the flasher unit. Not only will a certain amount of useful light guidance below the critical angle of masking be denied to an approaching pilot, especially if he is somewhat below normal approach angles, but a measure of circling guidance may also be reduced due to the baffle configuration. Also, attached baffles will necessitate changing the applied vertical and horizontal alignment of the REIL light units as specified in FAA Order 6850.5, further affecting the useful approach zone coverage of the system.

In almost every instance, it will be necessary to custom design the baffle dimensions and to try various configurations on-site before the optimum compromise between masking achieved and visual guidance maintained can be assured.

APPENDIX A—PHOTOGRAPHS OF SITE AND FINAL INSTALLATION OF DEFLECTOR PANELS

FIGURE A-1. HOUSE WITHIN APPROACH ZONE

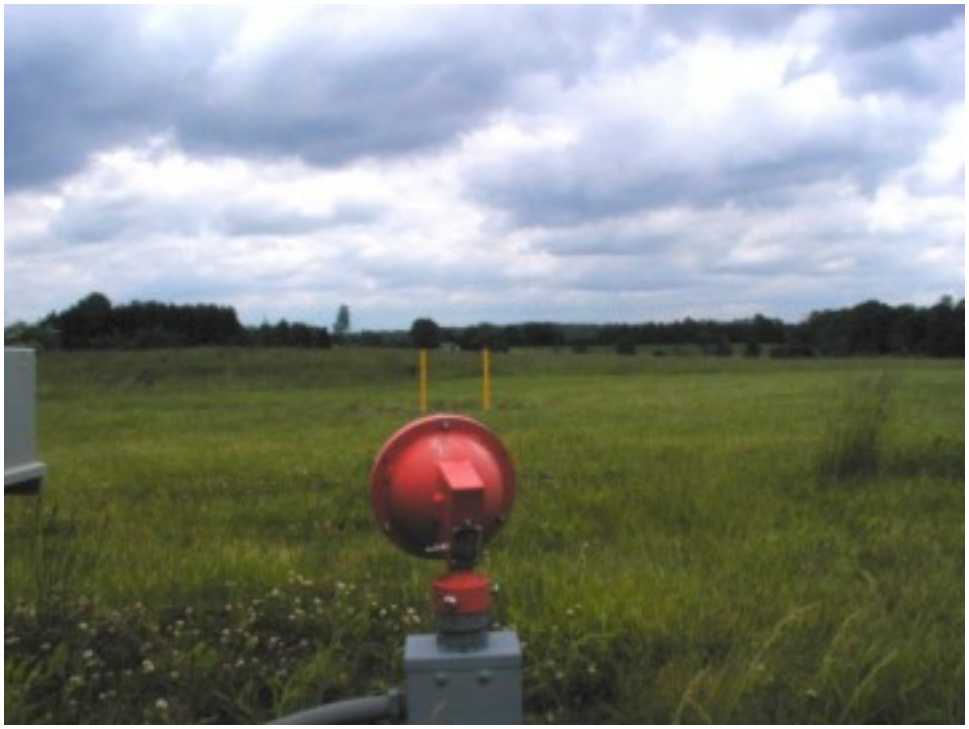

FIGURE A-2. POSITIONING OF DEFLECTOR PANEL MOUNTING POSTS

FIGURE A-3. DEFLECTOR PANEL IN PLACE

FIGURE A-4. COMPLETED DEFLECTOR PANEL—FRONT VIEW

FIGURE A-5. COMPLETED DEFLECTOR PANEL—REAR VIEW

FIGURE A-6. CLOSE-UP OF FRANGIBLE COUPLER/CONCRETE FOOTER