AirportImprovement™

Detroit Metro Quells Noise Complaints With Unique Ground Run-up Enclosure

SPECIAL EDITION

Runway & Ramp

Detroit Metro Quells Noise Complaints With Unique Ground Run-up Enclosure

By Robert **Nordstrom**

factsfigures

Project: Ground Run-up Enclosure

Location: Detroit Metropolitan Wayne Co. Airport

Size: Nearly 90,000 sq. ft.

Dimensions: 310 ft. long, 290 ft. wide, 42 ft. tall

Prime Consultant: C&S Companies

Prime Contractor: Dan's Excavating

GRE Design & Construction: Blast Deflectors, Inc.

Engineering & Construction Admin. Support: Kimley-Horn of MI

Aerodynamic & Acoustical Design: BridgeNet Int'l

Noise & Land Use Compatibility Study: Barnard Dunkelberg & Co, a Mead & Hunt Company

Environmental Planning: Barnard Dunkelberg & Co, a Mead & Hunt Company

Pavement Engineering: Roy D. McQueen & Assoc.

Geotechnical Engineering: Somat Engineering

Civil Engineering: Northwest Consultants

Avionics Consultant: David Quintet

Key Benefits: Facility absorbs noise produced when crews run aircraft engines at full power while on the tarmac to test post-maintenance performance levels

Of Note: Structure is one of the largest GREs in the world; sub-grade design helps preserve sight lines for air traffic controllers despite the facility's midfield location; precisely angled exterior steel panels reflect aircraft radar signals

Ever since Detroit Metropolitan Wayne County Airport (DTW) opened a new midfield ground run-up enclosure (GRE) last November, its neighbors are snoozing soundly through the night — and noise complaints have dramatically decreased.


Kelly **Ferencz**

"The calls have pretty much disappeared since we built the GRE," reports DTW Project Manager Kelly Ferencz. "Most of the heavy maintenance on aircraft takes place in the evening hours. This meant that engine run-ups were done when neighboring residents were trying to sleep."

Efforts to build DTW's one-of-a-kind $11 million structure began back in 2009. That's when a noise study conducted by Barnard Dunkelberg & Company (now part of Mead & Hunt) confirmed what airport officials already suspected from spikes in noise complaints when crews ran engines at full power of aircraft on the tarmac to confirm maintenance work.

"The study showed excessive noise intrusion that was not day-night sound level based, but rather maximum noise level based as a result of aircraft maintenance run-ups," reports company president, Ryk Dunkelberg. "Study results recommended that the airport construct an enclosure to minimize the impact of noise on residents in neighboring communities."

The 90,000-square-foot structure the airport built is not only one of the newest GREs in the United States, it's also one of the largest in the world. In addition, it features custom design elements such as a below-grade profile and precisely angled steel-clad panels.

Before the unique facility was built, noise from engine run-ups affected approximately 1,800 residences over 20 square miles surrounding the airport. Now, only those within 2.2 square miles are affected.

Design Twists

At 310 feet long and 290 feet wide, the airport's new three-sided GRE is large enough to accommodate a Boeing 747-8 (the largest aircraft

Building the 42-foot-tall structure on an excavated site preserved controllers' line of sight to the airfield.

that flies into DTW). It also provides enough room for a Boeing 757 to turn around inside, under its own power. During construction, contractors placed approximately 25,000 square yards of Portland cement concrete pavement.

More than 2,000 acoustical panels line the structure's interior to absorb engine noise. Maintenance crews using the GRE at night can activate the facility's lights remotely with a passcode before they arrive, and a timer shuts them off after a pre-set amount of time.

Wayne County Airport Authority, DTW's owner, hired C&S Companies to provide planning and engineering services for the project. Blast Deflectors, Inc. designed and constructed the GRE as a subcontractor to prime contractor Dan's Excavating.

C&S Project Manager Bob Koller recalls that the project required extensive coordination with the FAA and various stakeholders. "The facility is located in the middle of the airfield between two parallel runways, which significantly increased the complexity of the design compared with a location on the perimeter of the airfield," explains Koller. "When we submitted the initial design, the FAA (via its Safety Risk Management Panel) analyzed the facility's impact on airport safety and identified several concerns."

Bob **Koller**

The first significant design challenge was maintaining a line of sight to all runways and taxiways for FAA air traffic controllers. To do so, designers essentially placed the 42-foot tall structure in a large hole — almost 15 feet below grade at its deepest point.

The widescale excavation meant that the foundation of the GRE and apron pavement would be built on previously undisturbed clay soil. To allay concerns about site drainage during and after construction, crews placed a layer of crushed open-graded aggregate below frost depth and installed a drain system to disperse water beneath the foundations and in the pavement section.

Rick Kincaid, project manager for Dan's Excavating, notes that he has never heard of another below-grade GRE. "It required a lot of earthwork," he recalls. "Opening up a hole this big meant that much of the surrounding acreage would be draining into it. So the first thing we had to do was establish drainage by tapping into a 70-inch sewer drain that was about 27 feet deep."

Crews used approximately 160,000 cubic yards of excavated material to build engineered sloping berms around the enclosure. This not only reduced the airport's material expenses, but also minimized vehicle emissions and costs associated with hauling away the excavated matter.

Because the GRE is located close to the airport's very high frequency omnidirectional range (VOR), which radiates VHF radio signals as azimuth information to pilots, maintaining a clear line of sight around the VOR was crucial. A computer-modeled avionics study confirmed that the new structure would not degrade the VOR signal.

The GRE's location relative to the airport radar systems presented another challenge. One radar antenna is located on the roof of the air traffic control tower and the other systems are located due west of the GRE.

Don **Bergin**

"In designing a GRE, many site-specific factors must be carefully analyzed, including aerodynamics, acoustic objectives, prevailing winds, position on the airfield, aircraft mix and user requirements," explains Don Bergin, director of technical sales for Blast Deflectors, Inc. "During the design stage, concerns were raised that the proposed facility location could interfere with the airport's ground radar system. Radar signals potentially could reflect off of the facility and create false signals."

Coordinating with C&S and the FAA, the company went back to the drawing board and returned with a unique design to mitigate this problem. "The geometrically precise steel-clad panels of the facility were set at a 14-degree angle in order to reflect radar downward, where it could be dispersed into the ground," Bergin explains. "In effect, Detroit's facility is our first 'stealth' GRE."

The team also worked closely with FAA engineers to determine the proper site grading characteristics to eliminate potential interference with the radar systems. Final site grading included specific embankment elevations and slope irregularities to minimize the presence of large, smooth surfaces that might reflect radar.

Silence Is Golden

Director of Airfield Capital Projects Tom McCarthy considers DTW's new noise-absorbing GRE a success. With more than 90% of all ground run-ups occurring in the new facility, associated noise complaints have been eliminated, he reports.

Ferencz acknowledges that the airport initially experienced pushback from the airlines regarding the distances aircraft have to taxi to access the enclosure. But those complaints diminished once the facility was in full use. "It's a bit more effort for them, but they seem to have embraced it," she relates. "And the community is enjoying the results of this project, with the reduced noise in the area. For me, no comment is a good comment."

Many of the comments, however, are overwhelmingly positive. To date, DTW's new facility has garnered three awards: the FAA Great Lakes Region 2012 Safety Award; the Michigan Concrete Association 2013 Award of Excellence; and the Michigan Engineering Merit Award from the American Council of Engineering Companies.

"We were very fortunate to have a great team, in terms of airport authority stakeholders, the designers and the contractors," Ferencz summarizes. "We had to overcome a lot of obstacles along the way, but we worked through them together and now the community is enjoying the results."

To share or view this article online visit **AirportImprovement.com.**