

Coming to a STRUCTURE near You



To help meet tight tolerances in installation, markers were attached to these trusses at the Gerald R. Ford International Airport in Grand Rapids, Michigan.

Reflective survey markers invented in Germany have made their mark in Europe with their many uses. Now their developer hopes they catch on in the United States.

By Craig R. Dylan

About 11 years ago, while attending surveying conferences and equipment shows in Europe, Georg Rothbucher began to hear about problems with existing solutions. "I saw that surveyors were having problems with survey markers while doing field work. They were expensive, they couldn't be attached very well, and they couldn't measure in three dimensions. I was surprised, because they were all using modern equipment, and it doesn't make sense to use the best equipment if you don't have accurate targets and benchmarks."

As a result, Rothbucher went on to invent the Rothbucher System line of high-precision survey markers and became a distributor for them. Located

in Bayerisch Gmain, Germany, his firm ships about 500,000 markers annually with sales in the United States, Australia, and Europe. This year, Rothbucher is adding distributors in the Near East and Middle East. A German manufacturer makes the markers under contract, as Rothbucher's lean firm has only three fulltime employees. He has added a few specialized markers every year to develop the full line.

Rothbucher's first product was a datum marker with a ledge that could be mounted permanently at construction sites, making it easy for all the tradesmen involved in a project to use consistent control during building. One version has plastic bristles that allow recovery of the target after plastering, so the same reference point can be used even after other marks are obscured. Says Rothbucher, "The older guys who saw it said

they liked it because 'everyone needs the same level', and with my system, everyone works off the same benchmark, and even after the plastering is finished you have exactly the same level."

The Rothbucher System now consists of about 20 specialized markers adapted for different needs and different phases of construction. All can be permanently mounted on bridges, railroads, buildings, and anywhere else that precise, discreet monumentation is needed. They typically include crosshairs and a reflective surface that can be read by most total stations. Some are self-adhesive, others attach with epoxy, with threaded inserts, or directly into concrete. One target is designed to attach to formwork and leaves an impression in concrete—Rothbucher likes to point out that it's hard to lose a concrete impression.

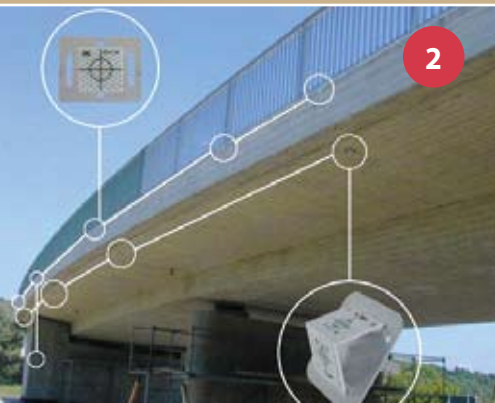


1 Surveyor Tom Hannon installs a marker for monitoring movement of a building in New York City.

2 Three different types of markers were attached to this new bridge for observation.

3 Markers are used to monitor movement of this rail track in Europe.

4 West 50th street marker.



"After 11 years, I think I have solutions for 3D monitoring of most building sites and other situations," says Rothbucher, "but the important thing is the idea behind the system. We're in the 21st century and we're using total stations, but we're still using levels to cross rivers. It doesn't make sense. Surveyors need to monitor precisely in three dimensions."

Rothbucher also likes to point out that his markers keep surveyors out of danger. "After they set the marker, they never have to go back to that point physically," he states. "Governments like that. On bridges, for example, they especially like my markers because they don't have to stop traffic, they avoid accidents, they keep surveyors out of the flow of traffic, and they never lose the reference point. They're also good for railroads because surveyors don't have to block the rail, or even get near it, which means they don't

have to discuss work with the railway company; they just do it."

Environmental Cleanup

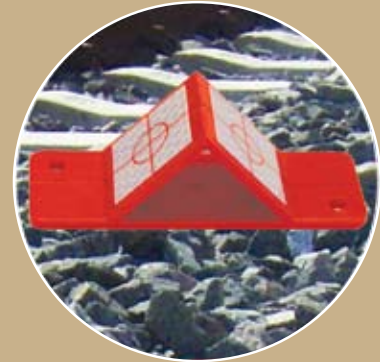
Michael Elenbaas, a project manager at Nederveld, Inc. in Michigan, had a problem. His firm was contracted to monitor the aftermath of an environmental cleanup that excavated 15 feet of soil beneath an interior room in a plant. "We knew we wouldn't be able to set anything in the room because the floor was coming out and accessibility would be a problem. We also faced time constraints; we were only going to have a small window in the early morning to get in and take our shots before work started for the day, so we weren't going to have a lot of time to get on control. And we really wanted to use a one-man crew with a robot station for this one."

A couple of years before, Elenbaas had attended a Michigan Society of Professional Surveyors (MSPS) conference and came across samples and information explaining the Rothbucher System. "We set targets outside the room and through doorways so one man could get check grades and then get as-builts with the same control after soil removal," he recalls. "We used the RS60 reflective targets, setting them into block walls with epoxy and self-tapping screws. We also drilled holes in concrete columns to attach targets."

Elenbaas was able to monitor columns and monitoring wells for the life of the project. While he says they achieved good, consistent control, one minor issue arose. "We found it hard to get a reading on the reflective targets when we were closer than ten feet, so we had to work around that."



« Partnering with Berntsen International, Georg Rothbucher (right) displays his invention at the World of Concrete convention in Las Vegas.



Get the Trusses Right

Elenbaas has also used Rothbucher self-adhesive targets on new construction at Gerald R. Ford International Airport in Grand Rapids, Michigan. A large canopy was built to span the area between the parking lot and terminal, and the design depended on 14 trusses. "They were huge, about 130 feet long," says Elenbaas, "and each truss was delivered from Quebec in three pieces, which were assembled on site." Because the canopy is roofed in glass that would stand 60 feet in the air, tolerances for the truss assembly were exceptionally tight, and Elenbaas used self-adhesive reflective tape targets to advantage.

"Each truss section came with work points marked by the factory, and the sections were assembled with a jig for welding," says Elenbaas. "We used the work points to define a baseline off the middle section, and we were on site during assembly to make sure everything was straight and true." The truss sections were made of large steel tubing, which made measurement something of a puzzle. "We stuck the adhesive targets right on the work point. I don't know how else we would have defined a point on a round surface. The minimal prism offset was great."

Monitoring Building Movement

Tom Hannon, PLS, is a project manager at the Elmwood Park, New Jersey headquarters of Langan Engineering

and Environmental Services. "We do a lot of building monitoring in New York City, and that seemed like a decent way to use these," he reports. Hannon explains that when buildings are demolished or when new construction starts, the owners of adjoining buildings understandably worry about the effect huge foundation excavations might have on their properties.

So Langan is hired to monitor affected buildings for movement. "We ordered a few Rothbucher targets, and we use epoxy to stick them to buildings, which are mainly brick. Before we tried these, we were mounting actual prisms, which worked, but they cost \$75 each—some buildings needed 15 to 20 prisms!" Hannon also notes the varying capabilities of the different markers, such as models with reflective targets on angled faces that can be shot from different angles. "Before, we'd have to set prisms on window ledges or something. We can set these where we need them."

In addition to buildings, Langan sometimes monitors retaining walls. "Owners notice voids or cracks and call us to see if they have a problem that's getting worse over time," says Hannon, "We'll set several targets and come back a few times in the first couple of weeks, then we'll come out monthly, and we like to come by after big storm events, to see if wet soil is having any effect. On several jobs, we've had the markers in place for six months or more."

Will It Prove Successful Here?

Rothbucher targets are widely accepted in Europe, and some applications are mandated by government agencies there. In Bavaria, for example, hundreds of bridges have Rothbucher targets permanently mounted, especially in high traffic areas. Contractors use them routinely in residential and commercial construction, while less obvious monitoring applications include tunnels, sluices and ditches, ski lifts, building facades, rock faces, and earth slopes. In some cases, they make excellent boundary markers and serve as ongoing control points.

But the Rothbucher system hasn't caught on big yet in the United States, and similar systems haven't either. "We're hoping to change that," says Tim Klaben of Berntsen International. Berntsen recently became the U.S. source for Rothbucher products, and Klaben thinks they will prove useful for surveyors on this side of the Atlantic. "Georg seems to have anticipated most of the common uses you might think of right away and a lot of less common uses as well. We think as surveyors learn more about this way of working, they'll see that it makes sense to have permanent, stable control on different jobs." ▼

CRAIG R. DYLAN is a freelance writer specializing in the geospatial and infrastructure industries.

RS Smart Targets

FROM

Berntsen

Survey Markers

Item #	Description	25-49	50-99	100-249	250+
RSZ3	30 x 30 mm Reflective Adhesive Target	2.45	2.05	1.88	1.75
RSZ4	40 x 40 mm Reflective Adhesive Target	3.11	2.60	2.40	2.22
RSZ6	60 x 60 mm Reflective Adhesive Target	5.46	4.55	4.20	3.90

RS11	Datum Marker	2.97	2.47	2.28	2.12
RS20	Smart Datum w/ Stubs	3.07	2.56	2.36	2.20

Item #	Description	1-24	25-49	50-99	100 +
RS30	Smart Target w/ Level & 30 x 30 mm Reflective Target	6.73	6.10	5.46	5.04
RS40	Smart Target w/ Level & Cross Hairs	5.47	4.21	3.47	2.90
RS50	Smart Target w/ 30 x 30 mm Reflective Target	6.73	6.10	5.46	5.04
RS60	Smart Target w/ 40 x 40 mm Reflective Target	8.31	7.64	6.37	5.88
RS70	Smart Target w/ Cross Hairs	5.47	4.21	3.47	2.90
RSKZ6	Smart Target w/ 60 x 60 mm Reflective Target	25.06	20.05	16.70	15.43
RSALU22	Metal Smart Target w/ 220 x 220mm Reflective Target	72.75	64.36	59.40	56.75

RS80	Angle Target w/ 2 Target Reflectors 40 x 40 mm	16.45	15.49	12.90	11.91
RS90	Angle Target w/ 3 Target Reflectors 40 x 40 mm	19.95	17.99	15.88	14.66
RS100	Smart Angle Targets w/ 4 Cross Hairs	9.95	8.34	7.30	6.42

Item #	Description	1-24	25-49	50-99	100+
RSK80	Adapter w/ Smart Angle Target RS80	29.12	24.27	22.40	20.80
RSK130	Adapter w/ 2 Target Reflectors 30 x 30 mm	17.05	16.08	13.49	12.50
RSAMG80	Metal Adapter w/ Thread & Smart Angle Target RS80	62.91	52.43	48.40	44.94
RSAM80	Metal Adapter w/o Thread & Smart Angle Target RS80	59.16	49.30	45.51	42.25

RSL300	Laser Scanner Target	6.73	6.10	5.46	5.04
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UV6800	Multi-Purpose Adhesive (Fits Std. Caulk Gun)	11.30	p/ Cartridge		
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