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45 Thirty Years of the Golden Trowel



American Concrete Institute

Thirty Years of the Golden Trowel

Recognizing worldwide excellence in floor slab construction

The Golden Trowel® Award was born unceremoniously in the late 1980s as a joke during a working lunch in the offices of The Face® Companies in Norfolk, VA. A group of engineers and consultants had, by then, spent more than a decade developing what is now known as the F-Number System (F_F/F_L [Face floor flatness/floor levelness]), F_{min} , the first concrete floor profileograph, and then the Dipstick®. They also developed many of the placement procedures that were, even at that early date, resulting in substantially flatter and more level floor slabs.

Face's flat floor technologies were becoming more widely employed. A thought came to one of the lunch attendees. "I've got an idea," he said. "We ought to set up a competition for the flattest floors in the world and call it the Golden Trowel."

Everyone laughed, but the merits of an objective, measurement-based contest for the highest-quality flatwork were instantly apparent. The competition would give the best finishers a way to prove their expertise, and the many individual quests for recognition would drive up quality industry-wide. Face resolved to begin the contest in 1990, by which time both ACI and ASTM International were set to recognize F-numbers.

Fast-forward to today. The Golden Trowel is a sought-after industry award, drawing entries from around the world. The results of the 2019 competition, announced at the 2020 World of Concrete in Las Vegas, NV, provide the evidence that quality has improved to a degree that none of those present for the birth of the contest could have imagined three decades ago.

The best floor in the world back in 1990 would not even be considered for a Golden Trowel today. And while these worldwide awards originated in the United States, North America no longer dominates the competition. Four world records were set in the 2019 contest by contractors from Japan, China, Australia, and Brazil. North America was shut out.

Golden Trowels are awarded in several different categories, based on how the floor was initially struck off, how wide the



The Golden Trowel® Award

floor placements were, how much shake-on hardener or steel fibers were used, and other factors that influence flatness and levelness. Golden Trowel Gold Plates are awarded to the winner in each category, while Golden Trowel Silver Plates—also known as Silver Trowels—recognize truly outstanding entries that did not win the ultimate prize.

Why are floors so much better today than those in 1990? "People continue to learn how to use existing concrete placing and finishing tools to greater advantage, and they are passing this knowledge on to a new generation of concrete finishers," said Jeff Rogers, Director of Engineering at The Face Companies. "Concrete floor consultants are learning what works and what doesn't work, and they are teaching the best practices. Batch plants are also being held to high standards on the concrete they deliver to the field."

The tools available now are better than they were even just a few years ago. The laser screed, first introduced by Somero Enterprises, revolutionized the way concrete could be struck off. As laser screeds improved, and as people learned the best ways to use them, the flatness and levelness of floors improved dramatically even as daily output increased significantly. Tandem riding power trowels and the use of pans on power trowels also were a boon. New devices for spreading shake-on hardeners were introduced, allowing

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floors incorporating dry shakes to approach the flatness and levelness of slabs placed without dry shake.

All these changes and innovations have made a big difference. But so has striving for excellence and for the recognition of being the best in the world—by becoming a winner of the Golden Trowel.

2019 World Records

Shimizu Corporation from Japan built a 400 m (1312 ft.) speed-skating rink over polystyrene foam insulation in Hachinohe, Japan. The slab area was 68,344 ft² (6350 m²)—more than four times larger than an NHL-size hockey rink—and the finishers made it flatter and more level than any hockey rink constructed before. The concrete cover for the cooling pipes is especially critical for speed-skating rinks



Pumping and striking off concrete for the speed-skating rink in Hachinohe, Japan, constructed by Shimizu Corporation. Note the laser projector overhead



Shimizu Corporation workers placing concrete and screeding with end-to-end truss screeds. Note the lasers used to align the truss screeds

because the ice temperature varies directly with cover thickness, and skating speeds vary inversely with the ice temperature.

Because concrete thickness varies with levelness, Shimizu's aim was to make the concrete surface as level as possible. Due to the difficulty associated with this kind of placement, in the past no one had ever been able to produce a full-size hockey rink with an F_L number better than 71. Shimizu developed two completely new techniques specifically for this project to help control both flatness and levelness. One innovation was the use of lasers to monitor the relative elevation of six different truss screeds tied together; the other was in using a laser scanner to make a three-dimensional (3-D) picture of the floor, then projecting this picture onto the floor while it was still wet and scraping the high spots before finishing. The result was a surface that measures F_F 74.9 and F_L 81.6, which is a world record, and a levelness number that is 10 points better than anything before.

Another world record was attained by Shanghai WellRock Engineering Co. at Harbin Medisan in Suihua, China. F_{min} numbers relate to how a vehicle such as a high-bay, narrow-aisle lift truck traveling over a fixed path on the floor will react to the floor. Because very narrow-aisle warehouses need to be very flat and level, F_{min} numbers tend to be higher than most F_F and F_L numbers. Previously, the highest F_{min} number was F_{min} 205, achieved by Keystone Concrete of



Finished floor at Harbin Medisan in Suihua, China, constructed by Shanghai WellRock Engineering Co.

Houston, TX. In 2019, Shanghai WellRock produced a world-record floor for a high-bay, narrow-aisle warehouse with an average F_{min} of 245.38. And this floor included 1 lb/ft² (5 kg/m²) of dry-shake hardener and 25 lb/yd³ (15 kg/m³) of steel fibers, making this achievement even more impressive.

A third world record was achieved by Brazil's Europiso Comercio de Pisos Industriais for its wet-screed/hand-screed project at CD Bresco Londrina. This floor was over 105,000 ft² (9755 m²) and included 0.8 lb/ft² (4 kg/m²) of dry shake; it measured F_F 115.2/ F_L 60.8, beating the previous world record by 10 points. Hand-screeding a floor is tedious work, so it was amazing that they were able to do this over such a large surface area.

The fourth world record was set by S&C Services, an Australian company, for producing a fiber-concrete laser-screeded floor with 77 ft (24 m) wide bays, measuring F_F 165.5/ F_L 116.9, which broke the previous world record by 80 points. Currently, there are many great concrete floor contractors using laser screeds, so this category is perhaps the hardest one to win.

A total of 137 different contractors from North and South America, Europe, Central America, Asia, and Australasia have claimed the 336 Trowels awarded in the contest's history. Remarkably, the four new world records were set by companies that had never competed in the Golden Trowel contest before the 2019 competition.

Other 2019 Golden Trowels

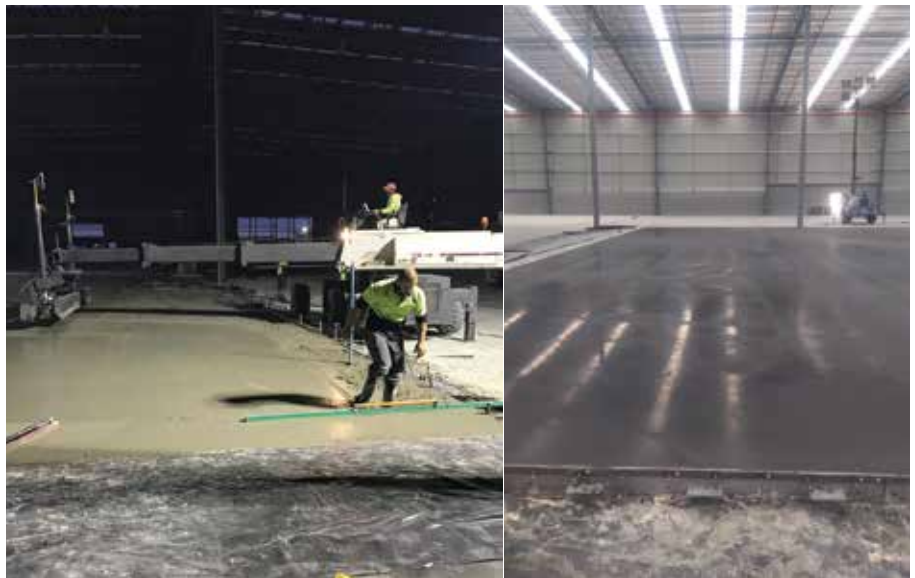
Producing concrete floor surfaces for ice rinks is a challenge because the concrete is placed over multiple layers of extruded polystyrene foam insulation and over cooling pipes that will create the ice surface above the concrete.

Vee-Jay Cement Contracting of St. Louis, MO, created an outstanding set of three ice rinks for the same customer. Before 2019, there had been only one full-size rink with better F numbers, yet Vee-Jay was able to maintain high F_F and F_L numbers for all three rinks. This is Vee-Jay's fifth Golden Trowel award.

The George J. Shaw Construction Company of Kansas City, MO, was



Crew from Europiso Comercio de Pisos Industriais hand-striking off a floor



S&C Services produced a fiber-concrete laser-screeded floor measuring F_F 165.5/ F_L 116.9



Vee-Jay Cement Contracting created three ice rinks for the same customer

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B.S.Y. Construction Co. constructed an elevated floor supported on piles

tasked with making a very large elevated deck that was cut up into many different parts, some with different elevations. Because of the configuration of the surface, it was not practical to use a small laser screed, so all 140,000 ft² (13,000 m²) were hand-screeded. This is the company's third Golden Trowel award.

Alphapiso Tec. Em Pisos of São Paulo, Brazil, produced a super-large laser-screeded floor at GTIS CA-35 Bloco 200 that was more than 600,000 ft² (55,740 m²) and 70 ft (21 m) wide, and it measured F_F 101 and F_L 62.3, which is a superior result for a floor this large, especially one that incorporated dry shake. This marks their ninth Golden Trowel award.

2019 Silver Trowels

Golden Trowel Silver Plates are “distinguished honorable mentions” and are not awarded in every category. Sometimes a floor that would have won a Golden Trowel, or might even have been a world record, is overshadowed by an even more spectacular floor the same year. This kind of a floor still deserves recognition and is therefore awarded a Silver Plate.

Alphapiso produced a laser-screeded floor that was somewhat smaller than the winning floor but still quite large at over 250,000 ft² (23,225 m²), with bays that were 50 to 70 ft (15 to 21 m) wide, which included dry shake, resulting in a fantastic F_F 124.4/F_L 71.1. In any other year, this floor would have been a world record; the only reason that this award is a Silver Trowel is because of the S&C (Australia) world record in this category.

In addition to being world-class with a laser screed, Alphapiso also knows how to hand-screed floors. They produced a hand-screeded floor that was over 50,000 ft² (4645 m²), again with hand-cast dry shake, which had the third-highest-ever F_L number. This also would have been the third-highest-ever combined F_F + F_L number and would have won a Golden Trowel, except that Europiso produced their

world record in this category.

BCI Concrete of Backus, MN, produced an NHL-size ice rink over polystyrene foam with a great F_F of 90.0 and F_L of 51.4. This would have been a Golden Trowel winner, except for Vee-Jay's exceptional trio of rinks.

Full-Tilt Constructors of Sanford, FL, seems to specialize in super-large and ultra-large 96 ft (29 m) wide laser-screeded floors. They produced a floor that measured F_F 95.6/F_L 66.9. These are great numbers for any size floor, but this floor is nearly 1,000,000 ft² (93,000 m²). It is very hard to keep making superior-quality floors day after day; this is an example of what those among the best in the business can do. This is Full-Tilt's third Silver Trowel award. It would have ranked as a Golden Trowel if not for Alphapiso's Bloco 200 floor.

The Golden Trowel Asia

Over the first 25 years of the Golden Trowel contest, there were winning entries from North and South America, Australia, and Europe, but not one from Asia. As an incentive for contractors to improve floor quality in Asia, the Face Companies inaugurated the Golden Trowel Asia contest in 2015. The first Golden Trowel Asia was awarded that year; three were subsequently awarded in 2017, five in 2018, and seven more in 2019. Winners have come from China, Thailand, Singapore, Japan, and Malaysia. Two recent world records from Asia—one from China and one from Japan—make it apparent that the contest has had an effect.

2019 Golden Trowel Asia Awards

Shanghai WellRock Engineering Company produced a floor at Taicang, China, to a German DIN standard that was over 10,000 ft² (929 m²) using concrete with both dry shake and steel fibers. This floor was measured essentially as an elevation tolerance with a narrow allowable elevation envelope and resulted in 99.9% of the floor within 3/8 in.

(76 mm) of the same elevation.

B.S.Y. Construction Co. had a giant project (over 900,000 ft² [83,610 m²]) in Chachoengsao, Thailand, that required constructing an elevated floor supported on piles because of poor soil conditions in the area. This is a type of floor that is essentially unknown in the United States. The closest thing to this type of floor typically seen is an elevated unshored deck. ACI specifications state that because the deck will deflect due to the weight of the concrete floor, only F_F is reported on elevated unshored decks. However, in this case, both F_F and F_L were measured and reported as F_F 63.7 and F_L 40, which is excellent under these conditions.

Using a Somero laser screed, Chengdu Keyixin Technology Co. Ltd. produced a large and very wide floor in Pinghu, China, that measured F_F 66.9/ F_L 66.3. This is a very close second to the best that has been recorded in Asia. In Singapore, Mitramas Pte Ltd produced a narrow-aisle floor to F_{min} tolerances that averaged to over F_{min} 126. This is higher than the F_{min} projects in the United States that won Golden Trowels as late as 2010.

2019 Silver Trowel Asia Awards

PT Multibrata Anugerah Utama is the first company from Indonesia to win a Silver Trowel Asia award for its 253,000 ft² (23,500 m²) Copperhead-on-elevated-piles project in Cikarang, Indonesia, that measured F_F 57/ F_L 42.2.

The Chengdu Yiheng Materials Company produced an 82 ft (25 m) wide, 225,000 ft² (20,900 m²) laser-screeded floor for the Chengdu Dongbai Logistics Park in Chengdu, China, that measured F_F 66.1/ F_L 59.1. This floor used a heavy dose of both dry shake and steel fibers. The only reason this is not a Golden Trowel Asia award is because of Chengdu Keyixin's laser-screeded floor in Pinghu, China.

Finally, Channakorn Engineering

Company produced an almost 290,000 ft² (26,940 m²) laser-screeded floor at the KRC Warehouse 2 in Siracha, Thailand, that was F_F 59.7/ F_L 62.7.

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