2023 INFRASTRUCTURE REPORT

ROADS TO CITIES:
BUILDING TO SUPPORT GROWTH

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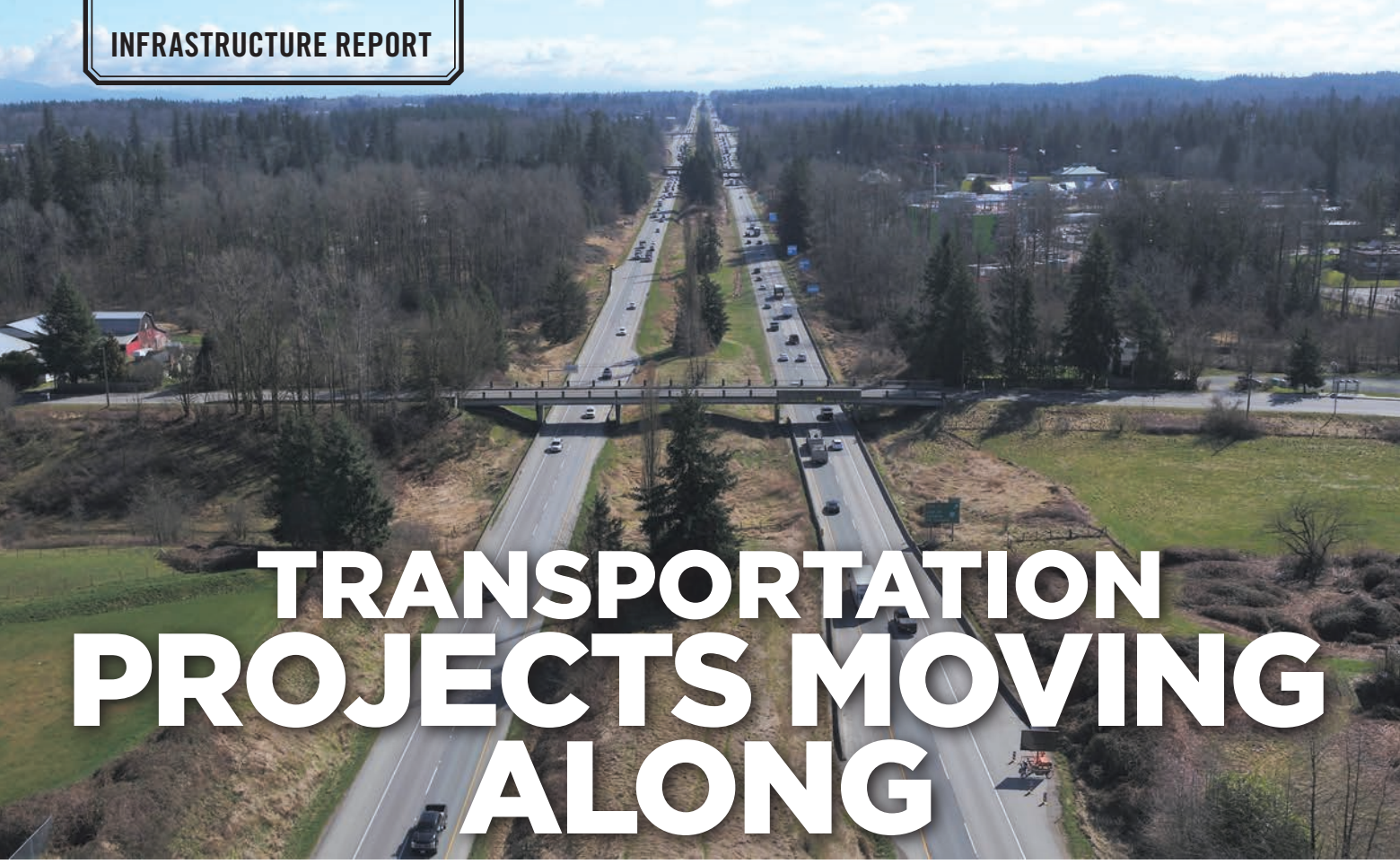
On-Site
CANADA'S CONSTRUCTION MAGAZINE



TRANSPORTATION PROJECTS MOVING ALONG

Despite economic, supply chain and labour challenges, road and rapid transit projects continue to take steps forward.

BY SAUL CHERNOS

Supply chains continue to be stressed, labour shortages remain chronic, and the economy is delivering inflation and recession. Yet road and rapid transit projects enjoy considerable momentum across Canada even as the various players manoeuvre, with varying degrees of success, to obtain approvals and keep financing and timelines in order.

BILLIONS IN ONTARIO PLANS

Ontario offers a classic illustration of the drive to expand transportation capacity. The Toronto area is growing rapidly and the current provincial government has been jockeying to expand the network of roads and bridges to alleviate congestion.

"We have $785 million worth of goods per day traveling on our highways, and we know that the population of the Greater Golden Horseshoe, alone, is expected to grow to almost 15 million people by 2051," says Andrew Hurd, director of policy and stakeholder relations with the Ontario Road Builders' Association.

The Bradford Bypass, a high-profile $800 million project that stands to connect Highways 400 and 404 north of Toronto, was taken off the table by an earlier provincial government but was subsequently revived, and its future looks promising. Early work began last fall on a bridge crossing the bypass near Yonge Street, and environmental assessment work could be completed by year's end. A second major project northwest of Toronto, Highway 413 appears to also be moving forward as well, although it continues to face a possible federal environmental assessment even as it undergoes preliminary design.

Hurd is optimistic that both projects will succeed and says, despite inflation, supply chain pressures and a tight labour market, the roadbuilding segment remains strong across the province.

"We're looking at approximately $87 billion over the next 10 years," Hurd says, drawing on government budget numbers to peg highway and bridge construction in Ontario at $3 billion and public transit at more than $8 billion over each of the next three years.

"It's a strong outlook," Hurd says, contextualizing transportation as the backbone of the province's domestic and export-driven economy. "With immigration increasing, with more people coming to Ontario, we think it's essential that infrastructure projects such as Highway 413 and the Bradford Bypass are built as part of a multimodal strategy to keep Ontario moving."

The $3 billion annual figure for Ontario's roads and bridges includes roughly $2.3 billion worth of rehabilitation and expansion work. Crews are currently widening Highway 401 in Mississauga and Milton, improving

PHOTO COURTESY OF THE B.C. MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE

Highway 7 between Kitchener and Guelph, and rehabilitating the QEW Garden City Skyway, which includes a new twin bridge over the Welland Canal to connect St. Catharines and Niagara-on-the-Lake.

Design work is also underway on a replacement of the aging Frederick Street Bridge in Kitchener, and EA and engineering is slated for later this year for a dedicated passing lane on Highway 11 north of North Bay. In the northwest, the province is looking to widen Highway 17 from Kenora to the Manitoba border.

Rapid transit projects have also been active. Despite delays and rising costs on light-rail lines in Ottawa and Toronto, new routes such as downtown Toronto's Ontario Line are breaking ground.

RAILS AND ROADS TO THE WEST

Activity is also strong out west. Alberta Roadbuilders and Heavy Construction Association CEO Ron Glen says Calgary West, the final segment of a substantial Ring Road undertaking, should be completed in about a year, and crews are working on Edmonton's Yellowhead Trail Freeway conversion, assorted bridges, underpasses and rehabilitation projects, and an overpass on Highway 1A near Cochrane.

Future plans include twinning Highway 3, the southernmost east-west connection between Saskatchewan and British Columbia.

Public transit projects, meanwhile, include extending the Edmonton Valley Line West and Valley Line East LRTs, though the latter, like light-rail lines in Ottawa and Toronto, is behind schedule. Calgary, meanwhile, is planning its new Green Line LRT as a P3.

For all the activity, however, Glen says municipalities anticipate reduced provincial funding over the next few years, which could impact transportation capital programs.

One provincial project has faced a significant struggle: The province halted plans last year to employ a P3 to upgrade Deerfoot Trail, a major north-south freeway in Calgary, opting instead to procure the bulk of the plans in smaller, more manageable sections. At the time, transportation minister Prasad Panda said pricing volatility and historically high inflation in the construction sector meant a P3 approach was no longer economically viable.

"We will focus on improving the most congested areas on the highway first to improve traffic flow and reduce travel times for commuters in the Calgary region," Panda said in announcing the change.

Work is underway to identify the most critical areas for improvement that can be tendered and completed as quickly as possible, and the province has pledged $210 million towards sections deemed highest priority.

Of course, when the province finally changed course from the P3 plan, $15 million worth of design work already completed by the three consortiums vying for the contract "was just shot out the window," Glen says. The ARHCA is pressing the province to establish a new highway trust company to manage projects and make the process more predictable and stable.

"As soon as you start getting really complex you increase the risk," Glen says. "Fluctuating interest rates makes it very risky to do these risk transfer projects."

Uncertainty and risk aren't always dampers for transportation projects, however. In British Columbia, chaotic weather is actually driving construction. Kelly Scott, president of the B.C. Road Builders and Heavy Construction Association, says rehabilitation and flood-proofing continues along sections of the Coquihalla Highway where intense atmospheric river rainfalls damaged roads and bridges in late 2021.

"They're engineering it so it can withstand 1,000-year floods like the one we had," Scott says, describing work improving dike systems along the Lower Mainland and enhancing bridge abutments to strengthen vulnerable pinch-points. Crews are also adding layers of rip-rap and other armour rock along riverbanks where the worst flooding occurred to prevent erosion and keep the river in the riverbed.

"Emergency repairs have been completed and we're now improving the pinch-points to make them more climate resilient," Scott says, noting significant upgrades to three bridges.

As with the other provinces, additional routine activity is ongoing. Projects range from the Pattullo Bridge replacement in the Lower Mainland, to ongoing widening along Highway 1 from Kamloops to Golden, and an expected announcement about widening towards Chilliwack.

Illustration of the Calgary Ring Road project.

"It's recognition that the Port of Vancouver needs to have a dependable infrastructure system to ship goods across the world," Scott says, forecasting three to four years of work.

"I think you're going to hear more about investments in a national infrastructure corridor through the ports of Vancouver and Prince Rupert," he says, noting that climate change impacts on infrastructure and the economy have stakeholders investing to build back better.

THE NEED FOR A NATIONAL APPROACH

While transportation projects are strong in Ontario and Canada's two westernmost provinces, crews are busy from coast to coast to coast. From Highway 104 improvements in Nova Scotia, to tunnel and bridge work in Quebec, to new all-season roads in the far north, each region has its own narrative, but Canadian Construction Association president Mary Van Buren describes transportation infrastructure as a national imperative requiring ongoing attention.

The CCA's most recent infrastructure

PHOTO COURTESY OF THE GOVERNMENT OF ALBERTA

report card, released in 2019 before Covid throttled the global economy, noted 40 per cent of roads and bridges in fair, poor or very poor condition.

"It showed there's a need to fix what we have," says Van Buren. "As a nation we need to invest in order to enable our economy."

With the Investing in Canada Plan allocating $180 billion over 10 years for everything from public transit to climate change impact mitigation, to enabling rural and northern communities, she acknowledges the federal government is paying attention. Still, 65 per cent of Canada's GDP comes from trade-enabling infrastructure, and she says the country is under-investing relative to other strong exporters such as Australia and the United States.

"One of the challenges is that, as a nation, we don't have a long-term infrastructure plan. Everything tends to be done on political cycles."

Van Buren is calling for a 25-year plan prioritizing infrastructure spending.

"That would allow us to line up the labour force we need and would give confidence to businesses and industry to invest in technology, to invest in greening — all those things," she says. "Otherwise, we can fall into boom-and-bust, which isn't effective or productive."

LIMITED BY LABOUR?

While long-term planning could address the shortage of skilled workers, unemployment in construction remains chronically below historical levels.

"The availability of labour will continue to have an impact on project schedules, particularly in regions where labour market tightness is particularly acute," says Bill Ferreira, executive director of BuildForce Canada, which specializes in labour market analysis.

Still, he points out the shortage isn't unique to construction. It reflects a broader demographic reality, with 20 per cent of Canada's population between the ages of 50 and 64, and only about 16 per cent of the country's population under the age of 15.

"More people will be entering into retirement than will be available to backfill for those individuals," he says. "The scarcity of young people means competition for young talent is going to be incredibly intense."

Ferreira says immigration can help maintain a core working age cohort, as can promoting careers in the skilled trades, and the industry continues to engage people who have historically been underrepresented.

"We're starting to see positive signs. When we look at apprenticeship registrations, particularly in the Red Seal trades, we're starting to see the number of women registering in programs is just under six per cent now. That's up from about three and a half percent ten years ago."

The sector also collaborates with Indigenous communities and businesses. "It depends on the region and the size of Indigenous communities," Ferreira says.

INFRASTRUCTURE TO SHOW RESILIENCE

Labour market and economic uncertainties notwithstanding, Pedro Antunes, chief economist with the Conference Board of Canada, says signs point to a gradual recovery and relatively strong prospects for infrastructure. Steadily increasing immigration, especially in larger urban centres, necessitates improved mobility yet also helps supply labour power to keep projects moving.

"We're seeing a supply of workers coming in available to work and a lot of organizations picking up those workers because they've been having trouble meeting demand," Antunes says.

The same duality applies to economic pressures. Inflation has sent costs soaring, yet higher price tags have enabled tax revenues, helping raise funds for infrastructure.

"Weaker economic growth this year is going to stress a lot of governments, and some of them will see weaker revenue growth," Antunes says. "But I think the fiscal situation is better than it was looking even a year ago."

One source of financing aimed at helping projects deemed particularly worthy but otherwise vulnerable is the Canada Infrastructure Bank. The Crown corporation currently has $3.7 billion invested in rapid transit and trade and transportation buckets, with a view to helping finance projects meeting federal imperatives such as reducing greenhouse gas emissions and serving remote regions.

Two of its higher-profile projects include the rebuilding of the New Westminster Bridge, which provides rail service to the Port of Vancouver, and modernizing Tshiuetin Rail Transportation, a freight and passenger service connecting three northern Quebec First Nations.

"Our mandate is to be a force to unstick important projects that wouldn't otherwise get done. We have the ability to be patient capital and wait until demand ramps up for repayment to start, where traditional lenders wouldn't be able to wait," says CIB chief investment officer John Casola.

"It doesn't matter what your political perspective is — at the end of the day there's very little disagreement about the fact that we need lots of important infrastructure in this country." ☐

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RAP:
A solid part of the circular economy

As one of the most recycled materials in North America, asphalt pavement is reducing reliance on virgin materials.

BY ADAM FREILL

By weight, asphalt from roads is the most recycled commodity in North America, reducing the carbon impact of the roadbuilding industry and contributing to the circular economy while allowing contractors to deliver surfaces that match or exceed the performance of roads built without reclaimed materials.

"Asphalt pavement should be considered a green product because 100 per cent of asphalt pavement can be recycled," says Alan Lichwa, asphalt and construction quality manager for Western Canada at Lafarge Canada. "Both components, asphalt binder and aggregates, can be reused in new asphalt pavements."

The amount of Reclaimed Asphalt Pavement (RAP) permitted in a new mix varies from jurisdiction to jurisdiction in Canada, with some allowing up to 40 per cent, although comfort zones tend to be closer to 10 to 15 per cent, he explained. In addition to local regulations, Lichwa says the type of roadway being constructed, specifications being followed, and the availability of the recycled material are also factors.

"If the quality of the asphalt road being ground out is deemed to be questionable for re-use in new asphalt, it can be recycled within the granular base layer constructed beneath the roadways," adds Mate Jurkin, GTA asphalt plants manager with The Miller Group, further illustrating the ways that paving firms can reduce their reliance on virgin materials. "The only exception where an asphalt roadway would not be recycled is if it is deemed to have a contaminated product." These, he says, would be disposed of with utmost caution.

As pavement ages, the oxidizing binder becomes more brittle, so when using RAP, the loss of this flexibility in the old surface will impact the chemistry of the new mix.

"The challenge is to create a new asphalt pavement that is flexible using less flexible material," says Lichwa. "This challenge can be overcome with the use of additives and different technologies that allow us to produce asphalt pavements with high amounts of recycled material."

Where once concerns about the longevity and performance of roads using RAP were common, quality control measures and best practices are illustrating how the use of these recycled materials can create a road that meets or exceeds expected life cycles.

"With the proper additives and technologies, an asphalt pavement using recycled materials can outperform an asphalt pavement without recycled materials," says Lichwa, adding that the percentage of recycled materials influences the other components in the mix, including the chemicals that help incorporate the recycled material.

Best practices are essentially the same whether reclaimed materials are used or not, however, both before the mix is created and after the roadway is paved.

"Best practice starts with a thorough pavement design, including analysis of traffic and climate data, to select the best type of mix for a road," says Jurkin. "In order for the road to live to its long-term expectations it should undergo routine maintenance, such as crack sealing, and scheduled preventative maintenance."

Lichwa adds that reducing and monitoring moisture in the recycled material, quality control testing on recycled material, and quality control testing on the final product are also practices that should be followed.

As the use of recycled asphalt in roads has evolved, so too have industry specifications, testing and paving methods.

"We are moving towards more performance-based specifications, a different method of processing the RAP, use of asphalt cement rejuvenators, and more robust testing parameters," says Jurkin. "It is more common internationally, but we may soon see cold-recycled mixes which make use of up to 100 per cent RAP and recycled with an asphalt emulsion at a mobile plant."

"As a whole, the asphalt industry is changing not just because the addition of recycled materials," says Lichwa. "There is a strong push for performance-based testing to be done on pavements to help quantify the effects of recycled materials… new technologies in asphalt mix design have changed how we understand asphalt mixes and help us design with high amounts of recycled materials."

That's good for the end customer, as well as for the environment.

PHOTO: COURTESY OF BOMAG

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Our new electric lineup made a lot of noise in Vegas. Which is impressive, since they cut noise in half while keeping the same power. That means you can work overnight or indoors. And we also built them to fast charge at a station, or recharge directly on the jobsite, because even small machines should deliver big results.

JOHN DEERE

JOHNDEERE.CA/VEGAS2023

HITTING THE ROAD

Newest generation of pavers and rollers focus on advanced automation and greener technologies.

BY TREENA HEIN

Current trends in road construction equipment put a spotlight on greater efficiency and improved operation with less environmental impact than ever.

"Right now, manufacturers are continuing to push for greener technologies like battery-powered and alternative-fuelled equipment, but they're also focusing on increasing efficiency and output quality, as well as safety," explains Sheldon Allan, paving industry support specialist at Finning, a major Canadian CAT distributor.

Martin Hilken, product marketing team lead at Vögele, also highlights sustainability, but points to user-friendliness, process automation and cost-effectiveness as well.

"The aim is to make the machines even easier and more intuitive to operate and learn," he says.

Intuitive and efficient operation are driving innovations for manufacturers of pavers, as well as compaction equipment.

"Many of the changes and updates to asphalt compactors have revolved around making the operator's job simpler, to give them more confidence and ultimately greater satisfaction in a job well done," says Jeremy Dulak, product manager with CASE Construction Equipment. "This has included more comfortable operator stations, improved visibility, more intuitive control locations, and giving the operators greater control flexibility."

Hilken adds that asphalt paving processes are being automated as far as possible in order to reduce the workload on operators and counteract paving errors.

Allan agrees that automation is coming, saying, "Although a fully autonomous paving train isn't available yet, the puzzle pieces are being introduced on a regular basis."

PHOTO: BOMAG

PHOTO: CATERPILLAR

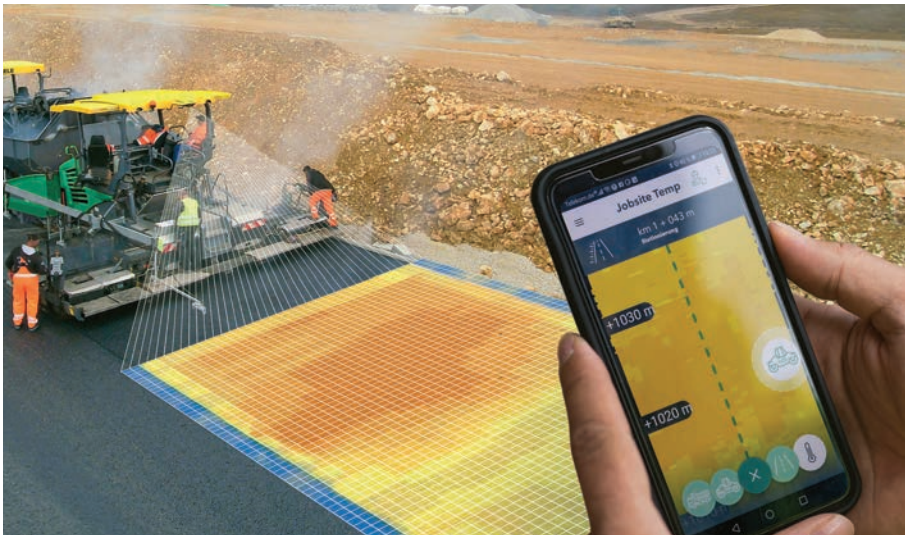

PHOTO: WIRTGEN GROUP

Costs will be trimmed in paving equipment, says Hilken, through more-efficient drives, but alternative drive technologies are also being considered.

"For the smallest pavers, the focus will be on battery-electric drives, while intensive research is being carried out into other alternatives for machines in larger performance classes," he says.

Among other advancements, a new design for screed plates is coming to the market. These plates, notes Allan, have a three-dimensional angular design that provides a kneading action as the asphalt mix passes through the grooves.

"This reduces air voids and increases density behind the screed, leading to longer-lasting roads with increased joint density and better smoothness (IRI) scores," he explains.

CATERPILLAR

Caterpillar recently announced new features in its large asphalt pavers, like the AP1055F, a high-production, rubber track paver. These aim to reduce errors and increase consistency and efficiency.

Pave Start Assist is an optional integrated system that uses smart cylinders on the screed and tractor. Allan explains that once the paver is set up to produce the best quality mat, the screed setup can be stored into the paver's display. This allows for repeatable performance, which reduces errors and improves mat quality and joints while also saving time.

Other new features include a hopper level temperature sensor, which identifies issues with incoming material, and thermal mapping, which identifies thermal variations early.

Caterpillar compaction equipment also incorporates sensor systems through options such as object detection, compaction control and cameras (birds' eye and front/rear). These options improve operator effectiveness and efficiency by extending sightlines, ensuring adequate coverage and more, says Allan.

"Caterpillar has also introduced its 'Command for Compaction' feature, a semi-autonomous option for soil compactors that brings together machine control, positioning and object detection systems," he says. "The operator drives the soil compactor around the perimeter and inputs passes, speed and overlap. The system then takes over."

WIRTGEN/VÖGELE

Vögele's newest paver features include Road Scan, a non-contacting temperature measurement system that enables seamless control and documentation of the asphalt temperature directly behind the paving screed.

"There is a version specially developed for the North American market that enables collected data to be transmitted online via a secure serve," says Hilken. "The data is conveniently forwarded to the Departments of Transport via a direct download from WITOS Paving Analysis. The data provided meets the VETA requirements."

Vögele's 3D control systems, Navitronic Plus and Navitronic Basic, are available for several pavers, including the 8-ft SUPER 1700-3i and 10-ft SUPER 2003-3i. Navitronic Basic not only provides conventional grade and slope control, but also automatically controls the paving position. Navitronic Plus has the same features but also takes over steering of the Vögele tracked pavers.

"This makes the Navitronic Plus a true 3D control system of a kind offered by Vögele only," says Hilken.

GOMACO

Concrete paving machine manufacturer GOMACO recently introduced the GP460,

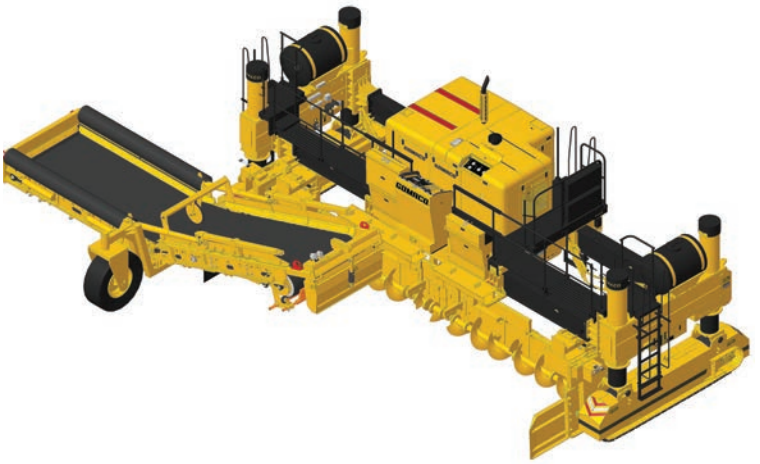

PHOTO: GOMACO

PHOTO: BOMAG

which is a placer/spreader that can go up to 50 feet (15.2 m) wide, and a slipform paver that can go up to 40 feet (12.2 m).

It's built on the framework of the GOMACO two-track GP4 slipform paver with the ability to convert the prime mover into a concrete placer/spreader. The prime mover is equipped with vibrator circuits for paving and auger drive circuits for placing. Control of the new technology is achieved through GOMACO's G+ digital control system, which handles the controls conversion needed for each application while also bringing onboard machine-to-machine communication, sonic sensors, 3D machine guidance, and more.

The GP460 is also available with an optional sonic sensor system to monitor the concrete depth as it is placed. Information from the sonic sensors is used by the G+ control system on the paver using M2M communication to provide an optimum and consistent head of concrete in front of the paver.

BOMAG

Among BOMAG's newest offerings are its BM 2200/65 and BM 1200/35-2 cold milling machines. The BM 2200/65 is equipped with the company's exclusive Ion Dust Shield technology for effective reduction of fine dust and particulate matter generated by the milling process. It turns captured fine dust into course dust, improving environmental safety on jobsites.

In its implementation of "intelligent compaction," BOMAG equips its new BW 120 SLC-5 combination roller with Intelligent Vibration Control. This system alerts the operator in real-time when optimum compaction is achieved.

Its highway-class BW 174 AP-5 AM and BW 206 AD-5 AM tandem rollers both feature its Asphalt Manager, which allows operators to enter the asphalt lift thickness so that the system will automatically adjust compaction force relative to material thickness and temperature. Vibration direction is automatically matched to the roller's travel direction to prevent ripples in the mat.

BOMAG also offers electric compaction in its roller lineup, with a new tamper, single-direction plate and tandem ride-on roller through its e-Performance line. The BT 60 e tamper has a plug-and-play system for easy charging without tools, and an optional quick charger allows for the battery to charge in less than two hours.

The new BP 18/45 e single direction plate uses the same battery as the BT 60 e and features an optional water tank for asphalt compaction.

The BW 100 AD e-5 tandem roller is designed to operate for a full typical workday with one charge. Two high-efficiency electric motors independently control the drum vibration and travel/steering, so only one motor is needed for travel mode to conserve power.

VOLVO CE

Sensor systems and autonomous operation that improve efficiency, consistency and overall performance are the latest trends in rollers at Volvo Construction Equipment.

"Intelligent compaction has come a long way in the last several years and is growing in use," says Mark Eckert, the manufacturer's product manager for compactors.

Volvo CE's most advanced sensor system, Compact Assist for Asphalt with Density Direct, provides operators with real-time density estimates of the surface area being compacted, enabling greater accuracy and consistency.

The company introduced its newest compactor, the DD25 Electric asphalt compactor, in January. It's a smaller machine for jobs like street repairs and bike paths and the company's first electric machine for the road segment. Volvo CE also makes three electric excavators and two electric wheel loaders.

Due to the size of its components, the DD25 Electric is more responsive in terms of speed and vibrations, providing better performance on grade. It's also better at high elevations compared to a diesel machine, says Eckert.

On that note, Volvo CE's newest diesel compactor is the DD128C, which offers the highest frequency in the industry.

"The rear 55-inch drum has auto-reversing eccentrics that ensure eccentric rotation in the direction the machine is traveling for unparalleled smoothness," Eckert explains. "It's also equipped with an automatic drum wetting system that provides speed-de-

pendent water flow to minimize water usage and ensure uniform coverage to prevent material pick-up."

CASE

At CASE, the aim is to provide contractors with the flexibility to choose equipment that fits their company's workflow.

"If you look across the line, we give people options in size, drum type, and setting and performance capabilities that really allow a contractor to select the machine that is best for them," says Dulak. "There's no forcing one size to fit all. As you look at our more compact rollers, they now have many of the control settings and capabilities of large-frame rollers in terms of frequency and amplitude and dialing in that machine."

The manufacturer's focus on providing a comprehensive line of asphalt paving equipment that meets the need of every paving contractor provides a lot of choice in its equipment, which ranges from compact double-drum and combi rollers to full-sized double-drum vibratory rollers. CASE also offers large-scale pneumatic tire rollers for larger highway and roadbuilding projects.

"If you look at compact solutions from 39 inches up to large-frame drums at 66 inches, we have 11 machines in that range with various drum and tire styles, compaction settings, et cetera, to fit every business," illustrates Dulak. "And then if you need the true large-scale roadbuilder with massive flexibility in compaction: you have the PT240D." ☐

PHOTO: VOLVO CE

PHOTO: CASE

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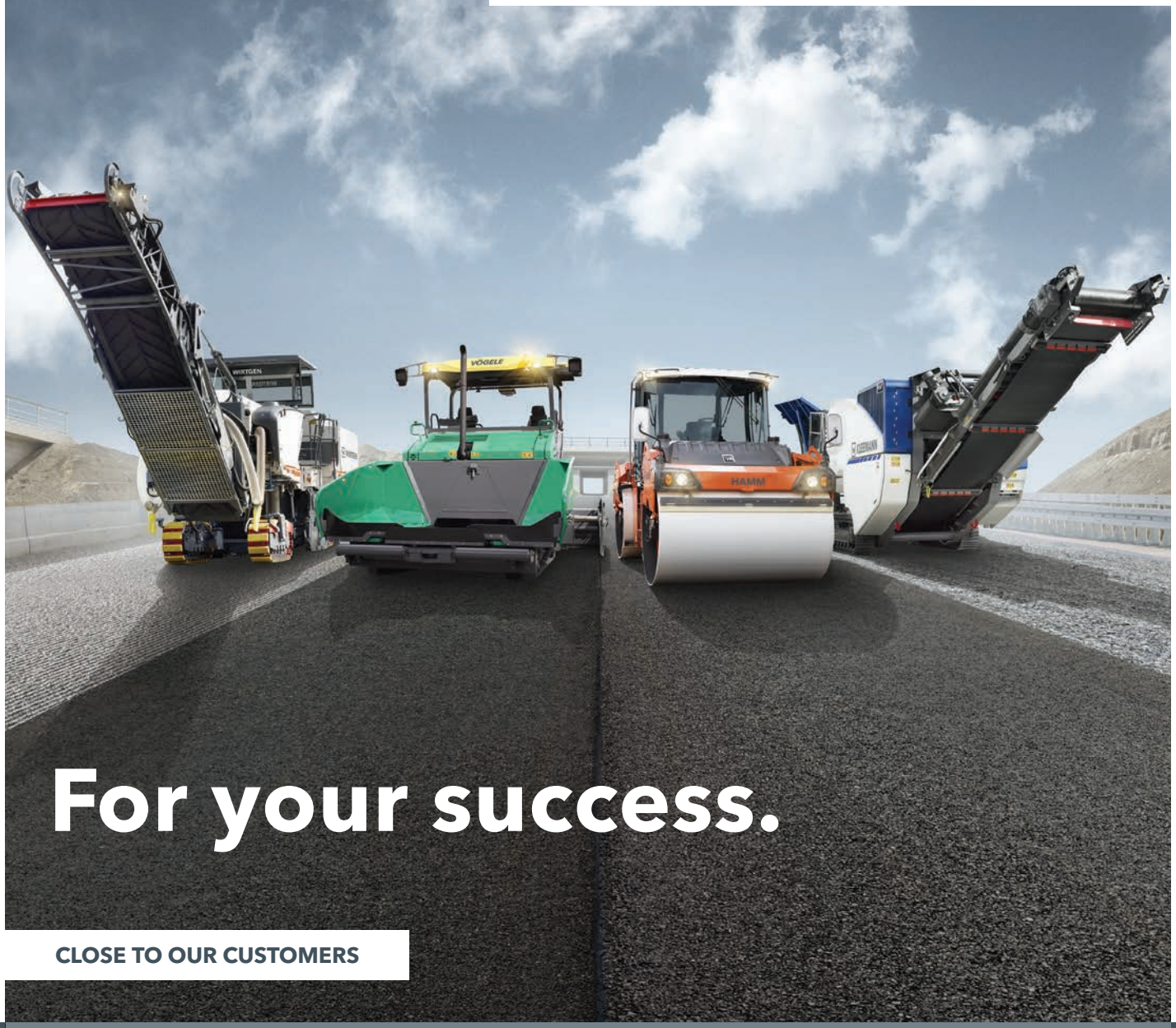

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