

UNITED STATES SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

Form 10-K

ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the fiscal year ended December 31, 2018

OR

TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the transition period from _____ to _____

Commission file number 001-11595

ASTEC INDUSTRIES, INC.

(Exact name of registrant as specified in its charter)

Tennessee

(State or other jurisdiction of incorporation or organization)

62-0873631

(I.R.S. Employer Identification No.)

1725 Shepherd Road, Chattanooga, Tennessee

(Address of principal executive offices)

37421

(Zip Code)

Registrant's telephone number, including area code:

(423) 899-5898

Securities registered pursuant to Section 12(b) of the Act:

(Title of each class)

Common Stock, \$0.20 par value

(Name of each exchange on which registered)

NASDAQ National Market

Securities registered pursuant to Section 12(g) of the Act:

None

(Title of class)

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act.

Yes

No

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Exchange Act.

Yes

No

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days.

Yes

No

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files).

Yes

No

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§ 229.405 of this chapter) is not contained herein, and will not be contained, to the best of the registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K.

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company or emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company" and "emerging growth company" in Rule 12b-2 of the Exchange Act. (Check one):

Large Accelerated Filer

Accelerated Filer

Non-accelerated Filer (Do not check if a smaller reporting company)

Smaller Reporting Company

Emerging Growth Company

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act.

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act).

Yes

No

As of June 30, 2018, the aggregate market value of the registrant's voting and non-voting common stock held by non-affiliates of the registrant was approximately \$1,345,595,000 based upon the closing sales price as reported on the NASDAQ National Market System.

Indicate the number of shares outstanding of each of the registrant's classes of common stock, as of the latest practicable date:

As of February 19, 2019, Common Stock, par value \$0.20 – 22,518,019 shares

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the following documents have been incorporated by reference into the Parts of this Annual Report on Form 10-K indicated:

Document	Form 10-K
Proxy Statement relating to Annual Meeting of Shareholders to be held on April 25, 2019	Part III

ASTEC INDUSTRIES, INC.
2018 FORM 10-K ANNUAL REPORT
TABLE OF CONTENTS

PART I		Page
Item 1.	Business	2
Item 1A.	Risk Factors	16
Item 1B.	Unresolved Staff Comments	23
Item 2.	Properties	24
Item 3.	Legal Proceedings	26
Item 4.	Mine Safety Disclosures	27
	Executive Officers	27
PART II		
Item 5.	Market for Registrant's Common Equity, Related Shareholder Matters and Issuer Purchases of Equity Securities	28
Item 6.	Selected Financial Data	29
Item 7.	Management's Discussion and Analysis of Financial Condition and Results of Operations	29
Item 7A.	Quantitative and Qualitative Disclosures About Market Risk	29
Item 8.	Financial Statements and Supplementary Data	29
Item 9.	Changes in and Disagreements with Accountants on Accounting and Financial Disclosure	29
Item 9A.	Controls and Procedures	30
Item 9B.	Other Information	30
PART III		
Item 10.	Directors, Executive Officers and Corporate Governance	30
Item 11.	Executive Compensation	31
Item 12.	Security Ownership of Certain Beneficial Owners and Management and Related Shareholder Matters	31
Item 13.	Certain Relationships and Related Transactions, and Director Independence	32
Item 14.	Principal Accounting Fees and Services	32
PART IV		
Item 15.	Exhibits and Financial Statement Schedules	32
Item 16.	Form 10-K Summary	34
Appendix A	ITEMS 6, 7, 7A, 8, 9A and 15(a)(1), (2) and (3),and 15(b) and 15(c)	A-1
Signatures	Signatures	

FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K contains forward-looking statements made pursuant to the safe harbor provisions of the Private Securities Litigation Reform Act of 1995. Statements contained anywhere in this Annual Report on Form 10-K that are not limited to historical information are considered forward-looking statements within the meaning of Section 27A of the Securities Act of 1933 and Section 21E of the Securities Exchange Act of 1934, including, without limitation, statements regarding:

execution of the Company's growth and operation strategy;
plans for technological innovation;
compliance with covenants in our credit facility;
liquidity and capital expenditures;
sufficiency of working capital, cash flows and available capacity under the Company's credit facilities;
compliance with government regulations;
compliance with manufacturing and delivery timetables;
forecasting of results;
general economic trends and political uncertainty;
government funding and growth of highway construction and commercial projects;
taxes or usage fees;
interest rates;
integration of acquisitions;
industry trends;
pricing, demand and availability of steel, oil and liquid asphalt;
development of domestic oil and natural gas production;
condition of the economy;
strength of the U.S. dollar relative to foreign currencies;
the introduction of new products and the success of new product lines;
presence in the international marketplace;
suitability of our current facilities;
future payment of dividends;
competition in our business segments;
product liability and other claims;
obligations with respect to pellet plants and other products;
protection of proprietary technology;
demand for products;
future fillings of backlogs;
employees;
the seasonality of our business;
tax assets and reserves for uncertain tax positions;
critical accounting policies and the impact of accounting changes;
our backlog;
ability to satisfy contingencies;
contributions to retirement plans and plan expenses;
reserve levels for self-insured insurance plans and product warranties;
construction of new manufacturing facilities;
supply of raw materials;
inventories;
plans to reduce indebtedness; and
the Company's effective tax rate and other impacts of the Tax Cuts and Jobs Act of 2017.

These forward-looking statements are based largely on management's expectations, which are subject to a number of known and unknown risks, uncertainties and other factors discussed in this report and in other documents filed by us with the Securities and Exchange Commission, which may cause actual results, financial or otherwise, to be materially different from those anticipated, expressed or implied by the forward-looking statements. All forward-looking statements included in this document are based on information available to us on the date hereof, and we assume no obligation to update any such forward-looking statements to reflect future events or circumstances. You can identify these statements by forward-looking words such as "expect", "believe", "anticipate", "goal", "plan", "intend", "estimate", "may", "will", "should," "could" and similar expressions.

In addition to the risks and uncertainties identified elsewhere herein and in other documents filed by us with the Securities and Exchange Commission, the risk factors described in this document under the caption "Risk Factors" should be carefully considered when evaluating our business and future prospects.

PART I

Item 1. Business

All dollar amounts included in this section are in thousands.

General

Astec Industries, Inc. (the "Company") is a Tennessee corporation which was incorporated in 1972. The Company designs, engineers, manufactures and markets equipment and components used primarily in road building and related construction activities as well as other products discussed below. The Company's products are used in each phase of road building, from quarrying and crushing the aggregate to application of the road surface. The Company also manufactures certain equipment and components unrelated to road construction, including equipment for the mining, quarrying, construction and demolition industries and port and rail yard operators; gas and oil drilling rigs; water well and geothermal drilling rigs; industrial heat transfer equipment; commercial whole-tree pulpwood chippers; horizontal grinders; blower trucks; concrete plants; commercial and industrial burners; and combustion control systems. The Company's subsidiaries hold 93 United States and 130 foreign patents and have an additional 62 United States and 86 foreign patent applications pending. The Company has been responsible for many technological and engineering innovations in the industries in which it operates. The Company's products are marketed both domestically and internationally. In addition to equipment sales, the Company manufactures and sells replacement parts for equipment in each of its product lines and replacement parts for some competitors' equipment. The distribution and sale of replacement parts is an integral part of the Company's business.

The Company's 17 manufacturing subsidiaries are:

- (i) Astec, Inc. (including its Astec-Prairie du Chien/Dillman division), which designs, engineers, manufactures and markets asphalt plants and related components;
- (ii) Roadtec, Inc., which designs, engineers, manufactures and markets highway class asphalt pavers, material transfer vehicles, milling machines, soil stabilizing-reclaiming machinery and other equipment used in road building and resurfacing;
- (iii) Carlson Paving Products, Inc., which designs, engineers, manufactures and markets asphalt paver screeds and commercial pavers;
- (iv) Telsmith, Inc., which designs, engineers, manufactures and markets aggregate processing and mining equipment used in the aggregate, mineral mining, metallic mining and recycling industries;

- (v) Kolberg-Pioneer, Inc., which designs, engineers, manufactures and markets aggregate processing equipment for the crushed stone, gravel, manufactured sand, recycle, top soil and remediation markets;
- (vi) Johnson Crushers International, Inc., which designs, engineers, manufactures and markets portable and stationary aggregate and ore processing equipment for the crushed stone, gravel, manufactured sand, recycle, top soil and remediation markets;
- (vii) Astec Mobile Screens, Inc., which designs, engineers, manufactures and markets mobile screening plants, portable and stationary structures and vibrating screens for the aggregate, recycle and material processing industries;
- (viii) Breaker Technology Ltd/Inc., which designs, engineers, manufactures and markets rock breaking systems in addition to mobile processing equipment and utility vehicles for the mining and quarrying industries;
- (ix) Osborn Engineered Products SA (Pty) Ltd, which designs, engineers, manufactures and markets a complete line of bulk material handling and minerals processing plant and equipment used in the aggregate, mineral mining, metallic mining and recycling industries and also markets equipment produced by other Astec companies;
- (x) Astec do Brasil Fabricacao de Equipamentos Ltda., which manufactures and sells rock crushers, feeders, screens and asphalt plants and represents the brands of several other Astec companies in the South American construction and mining industries;
- (xi) Telestack Limited, which designs, manufactures and installs a complete line of material handling systems to serve the port handling, bulk material handling and aggregate markets;
- (xii) Heatec, Inc., which designs, engineers, manufactures and markets thermal fluid heaters, process heaters, waste heat recovery equipment, liquid storage systems and polymer and rubber blending systems;
- (xiii) CEI Enterprises, Inc., which designs, engineers, manufactures and markets thermal fluid heaters, storage tanks, concrete plants and rubberized asphalt and polymer blending systems;
- (xiv) GEFECO, Inc., which designs and manufactures portable drilling rigs and related equipment for the water well, environmental, geothermal, geotechnical, groundwater monitoring, construction, mining and shallow oil and gas exploration and production industries, as well as trailer-mounted, high-pressure, high-volume double fluid pumps for use in the oil and gas energy services industry;
- (xv) Peterson Pacific Corp., which designs, engineers, manufactures and markets whole-tree pulpwood chippers, horizontal grinders and blower trucks;
- (xvi) Power Flame Incorporated, acquired on August 1, 2016, which designs, engineers, manufactures and markets commercial and industrial burners and combustion control systems; and
- (xvii) RexCon, Inc., formed to acquire substantially all the assets and liabilities of RexCon LLC on October 1, 2017, which designs, engineers, manufactures and markets high-quality stationary and portable, central mix and ready mix concrete batch plants, concrete mixers and concrete paving equipment.

The Company also has subsidiaries in Australia (Astec Australia Pty Ltd) and Germany (Astec Mobile Machinery GmbH, which is in the process of being closed), and is in the start-up phase of a new subsidiary in Chile, that market, service and install equipment and provide parts in the regions in which they operate for many of the products produced by the Company's manufacturing subsidiaries.

The Company's strategy is to be the industry's most cost-efficient producer in each of its product lines while continuing to develop innovative new products and provide first class service for its customers. Management believes that the Company is the technological innovator in the markets in which it operates and is well positioned to capitalize on the need to rebuild and enhance roadway and utility infrastructure as well as in other areas in which it offers products and services, both in the United States and abroad.

Segment Reporting

The Company's business units have their own management teams and offer different products and services. The Company's business units are aggregated into three reportable business segments based upon the nature of the product or services produced, the type of customer for the products, the similarity of economic characteristics, the manner in which management reviews results and the nature of the production process, among other considerations. The Company's reportable business segments are (i) Infrastructure Group, (ii) Aggregate and Mining Group and (iii) Energy Group. The remaining business units not included in one of the reportable segments provide support and corporate oversight for all the Company's business units and include Astec Industries, Inc., the parent company, and Astec Insurance Company, a captive insurance company. We refer to these two companies as the "Corporate" category throughout this document. The Company records U.S. federal income tax expenses and state deferred taxes for all business segments on the parent company's books; therefore, these taxes are included in the Corporate category for segment reporting.

Financial information in connection with the Company's financial reporting for segments of a business and for geographic areas under FASB Accounting Standards Codification 280 is included in Note 18, Operations by Industry Segment and Geographic Area, in "Notes to Consolidated Financial Statements" presented in Appendix A of this report.

Infrastructure Group

The Infrastructure Group segment is made up of five business units. These business units include Astec, Inc. ("Astec"), Roadtec, Inc. ("Roadtec"), Carlson Paving Products, Inc. ("Carlson"), Astec Mobile Machinery GmbH ("AMM") and Astec Australia Pty Ltd ("Astec Australia"). Three of the business units (Astec, Roadtec and Carlson) design, engineer, manufacture and market a complete line of asphalt plants and their related components, asphalt pavers, screeds, milling machines, material transfer vehicles, stabilizers and related ancillary equipment. The other two business units (AMM and Astec Australia) primarily sell, service and install products produced by the manufacturing subsidiaries of the Company with a majority of their sales to customers in the infrastructure industry. As mentioned above, AMM is in the process of being closed.

Products

Astec designs, engineers, manufactures and markets a complete line of asphalt and related components primarily for the asphalt production and paving industries. Certain component equipment supplied by Astec for asphalt plants is manufactured by other Company subsidiaries such as heating and storage equipment (manufactured by the Company's Energy Group) and material handling equipment (manufactured by the Company's Aggregate and Mining Group). A typical asphalt mixing plant consists of heating and storage equipment for liquid asphalt; cold feed bins for blending aggregates; a counter-flow continuous type unit (Astec Double Barrel) for drying, heating and mixing; a baghouse composed of air filters and other pollution control devices; hot storage bins or silos for temporary storage of hot-mix asphalt; and a control house. Astec introduced the concept of high plant portability for asphalt plants in 1979. Its current generation of portable asphalt plants is marketed as the Six Pack and consists of six or more portable components designed to be easily transported from one construction site to another, thereby reducing relocation expenses and interruption of operations. High plant portability is an industry innovation developed and successfully marketed by Astec.

Astec developed the patented water injection warm mix asphalt system, which allows the asphalt mix to be prepared and placed at lower temperatures than conventional systems and operates with a substantial reduction in emissions during paving and load-out. Previous technologies for warm mix production rely on expensive additives, procedures and/or special asphalt cement delivery systems that significantly increase the cost per ton of mix. The Company's Astec multi-nozzle device eliminates the need for the expensive additives by mixing a small amount of water and asphalt cement together to create microscopic bubbles that reduce the viscosity of the liquid asphalt coating on the rock, thereby allowing the mix to be handled and worked at lower temperatures.

Astec is focused on producing equipment with the most advanced mix recycling technology in the industry. More tons of recyclable asphalt pavement ("RAP") are available than are currently being utilized due to restrictions in the amount of RAP allowed by various governmental agencies. Astec's recycle technology is continuously being enhanced and is providing the science to alleviate the concerns driving such restrictions and to improve RAP utilization percentages in the asphalt industry. Astec's latest system improvement, the RAP Pre-Dryer System, was successfully field prototyped in 2018 and is now available to the industry. It has produced mixes of up to 80% RAP and can consistently produce mixes with 70% RAP. Astec has also enhanced its Double Barrel equipment line by providing a system with increased drum length and an external mixer that provides the capability to use up to 65% RAP without pre-drying.

The components in Astec's asphalt mixing plants are fully automated and use both microprocessor-based and programmable logic control systems for efficient operation. The plants are manufactured to meet or exceed federal and state clean air standards. Astec also builds batch type asphalt plants and has developed specialized asphalt recycling equipment for use with its hot-mix asphalt plants.

Many of the Company's highly technical, sophisticated large asphalt plants, while ideally suited for the United States domestic market, are not as well suited in many foreign markets. Astec is nearing completion on two newly styled plants designed especially for foreign markets where Astec's current product offerings have not been well received.

Roadtec manufactures asphalt pavers, material transfer vehicles, milling machines, soil stabilizing-reclaiming machinery and other equipment used in road building and resurfacing. Roadtec pavers have been designed to minimize maintenance costs while exceeding road surface smoothness requirements. The equipment offered by Roadtec can be used in tandem with each other or separately with equipment already owned by the customer.

Roadtec's Shuttle Buggy is a mobile, self-propelled material transfer vehicle which allows continuous paving by separating truck unloading from the paving process while remixing the asphalt. A typical asphalt paver must stop paving to permit truck unloading of asphalt mix. By permitting continuous paving, the Shuttle Buggy allows the asphalt paver to produce a smoother road surface while reducing the time required to pave the road surface and reducing the number of haul trucks required. As a result of the pavement smoothness achieved with this machine, certain states now require the use of the Shuttle Buggy. Studies using infrared technology have revealed problems caused by differential cooling of the hot-mix during hauling. The Shuttle Buggy remixes the material to a uniform temperature and gradation, thus eliminating these problems. Roadtec's newest versions of its highly successful Shuttle Buggy includes the Guardian System that is designed to anticipate equipment maintenance needs resulting in more uptime reliability while also providing production and performance data as well as real time location information to the owner. Roadtec's Spray Paver model, which is recommended for use with the Shuttle Buggy, is also designed to carry and spray tack coat directly in front of the hot mix asphalt in a single process, thus eliminating the need for a separate tack truck.

Roadtec manufactures milling machines designed to remove old asphalt from the road surface before new asphalt mix is applied. Roadtec's line of milling machines, which are designed for larger jobs, are manufactured with a simplified control system, wide conveyors, direct drives and a wide range of horsepower and cutting capabilities to provide versatility in product application. In addition to its half-lane and larger highway class milling machines, Roadtec also manufactures a smaller, utility class machine for two-to-four foot cutting widths and a utility class cold planer model mounted on steel wheels.

Roadtec currently produces soil stabilizers in configurations of 275HP, 440HP, 625HP and 755HP. These machines double as asphalt reclaiming machines for road rehabilitations, in addition to their primary purpose of stabilizing soil sub-grades with additives to provide an improved base on which to pave.

Carlson manufactures its patented screeds which attach to asphalt paving machines and place asphalt on the roadbed at a desired thickness and width while smoothing and compacting the surface. Carlson screeds can be configured to fit many types of asphalt paving machines, including machines manufactured by both the Company and its competitors. The Carlson screed uses a hydraulic powered generator to electrify elements that heat a screed plate so asphalt will not stick to it while paving. A generator is also available to power tools or lights for night paving. Carlson offers options to its screeds which allow extended paving widths and the addition of a curb on the road edge. Carlson also offers five models of 8 to 15 foot commercial class pavers designed for parking lots, residential driveways and secondary road applications.

Astec Mobile Machinery, which historically functioned primarily as a distributor of Roadtec products in the European market, ceased its operations in early 2019, and its assets are currently being liquidated. While reviewing performance criteria against actual results of all Astec companies during a strategic planning meeting held by management in late 2018, it was determined that Astec Mobile Machinery did not meet the desired performance metrics. Documents were filed by the Company in the German court system in December 2018 to begin the process of liquidating Astec Mobile Machinery. The Company expects the liquidation of Astec Mobile Machinery to be completed in 2019. Roadtec expects to market its products directly to European customers that were previously serviced by Astec Mobile Machinery.

Astec Australia markets relocatable and portable asphalt plants and components produced by Astec, Heatec and CEI, asphalt paving equipment and components produced by Roadtec and Carlson, and aggregate equipment produced by the Company's Aggregate & Mining Group. A majority of its sales are to customers in the infrastructure industry. In addition to selling equipment, Astec Australia provides complete support for its customers' equipment with service, training and spare parts. Astec Australia also provides turnkey installation solutions for large asphalt plants, aggregate and mining plants and bitumen tank farms.

Marketing

The Company markets its hot-mix asphalt products domestically under the Astec and Astec Dillman trademarks and internationally under the Astec trademarks. Asphalt plants and related equipment are sold directly to asphalt producers or domestic and foreign government agencies through Astec's domestic sales department and the International Sales Group of Astec Industries and through a Company-owned dealership (Astec Australia).

The Company markets its asphalt paving equipment both domestically and internationally to highway and heavy equipment contractors, utility contractors and foreign and domestic governmental agencies both directly and through dealers (including Astec Australia in the Australian and New Zealand markets). Mobile construction equipment and factory authorized machine rebuild services are marketed both directly and through dealers.

This segment's products are marketed by 74 direct sales staff, 49 domestic independent distributors and 113 international independent distributors, including Astec's subsidiaries in Australia and Germany (the latter of which is ceasing operations, as noted above).

Raw Materials

Raw materials used in the manufacture of products in the Infrastructure Group include carbon steel, pipe and various types of alloy steel, which are normally purchased from distributors and other sources. Raw materials for manufacturing are normally readily available. Most steel is delivered on a “just-in-time” arrangement from the supplier to reduce inventory requirements at the manufacturing facilities, but steel is occasionally inventoried after purchase. Section 232 and Section 301 Tariffs that went into effect in 2018 have negatively impacted raw materials pricing for the group. Other components used in the manufacturing processes include engines, gearboxes, power transmissions and electronic systems.

Competition

This industry segment faces strong competition in price, service and product performance and competes with both large publicly-held companies and various smaller manufacturers. Domestic hot-mix asphalt plant competitors include Gencor Industries, Inc., ADM and Almix. In the international market, the hot-mix asphalt plant competitors include Ammann, Fayat/Marini, Benninghoven/Deere and local manufacturers. Paving equipment and screed competitors include Weiler, Caterpillar Paving Products, Volvo Construction Equipment, Voegel America, Dynapac, Bomag Fayat Group and Lee Boy. The segment’s milling machine equipment competitors include Wirtgen, CMI, Caterpillar, Bomag, Dynapac and Volvo.

Employees

At December 31, 2018, the Infrastructure Group segment employed 1,626 individuals, of which 1,101 were engaged in manufacturing, 218 in engineering and 307 in selling, general and administrative functions. None of the employees of the Infrastructure Group are covered by collective bargaining agreements.

Backlog

The backlog for the Infrastructure Group at December 31, 2018 and 2017 was approximately \$149,436 and \$239,495, respectively. Included in the December 31, 2017 backlog was approximately \$60,000 for a three-line pellet plant from one customer under a Company-financed arrangement whereby the Company expected to record the related revenues when payment became assured. As the sale is not anticipated to be completed, the Company removed the order from its backlog in 2018. Management expects the entire current backlog to be filled in 2019.

Aggregate and Mining Group

The Company’s Aggregate and Mining Group is comprised of eight business units which are focused on designing and manufacturing heavy processing equipment, as well as servicing and supplying parts for the aggregate, metallic mining, recycling, ports and bulk handling markets. These business units are Telsmith, Inc. (“Telsmith”), Kolberg-Pioneer, Inc. (“KPI”), Astec Mobile Screens, Inc. (“AMS”), Johnson Crushers International, Inc. (“JCI”), Breaker Technology Ltd/Breaker Technology, Inc. (“BTI”), Osborn Engineered Products, SA (Pty) Ltd (“Osborn”), Astec do Brasil Fabricacao de Equipamentos Ltda. (“Astec Brazil”) and Telestack Limited (“Telestack”).

Products

Telsmith designs, engineers, manufactures and supports equipment servicing the construction, aggregate, metallic mining and recycling markets. Telsmith's core products are crushers, vibrating equipment, modular relocatable stationary plants, mobile portable plants and larger track-mounted systems. Telsmith also provides consulting and engineering services to provide complete "turnkey" processing systems. These systems often include electrical control centers and plant automation products engineered and produced by Telsmith.

Telsmith maintains an ISO 9001:2015 certification, an internationally recognized standard of quality assurance. In addition, Telsmith has achieved CE designation (a standard for quality assurance and safety) on its crushing and vibration equipment products marketed into European Union countries.

Telsmith is a world leader in the development of hydraulic relief jaw crushers having patented its first model in 2002. Hydraulic relief jaw crushers are a significant improvement in safety, adjustment and clearing of material in jaw crushers. Today's Hydra-Jaw® line includes four models: H2238, H2550, H3244 and H3450.

Telsmith's Vibro-King TL vibrating screen line features sizes from 4x10 single deck to 8x24 quadruple deck screens. The "TL" screen vibrator, with its many service minded features, was introduced to the marketplace in 2006 and has been well received by customers. The "Neverwear" sealing system is guaranteed to keep lubricants in and to never wear out. The "TL" includes wide 233 series bearings for added capacity, simple counterweight adjustments and Telsmith's unique J-beam tray design.

KPI, JCI and AMS design, engineer, manufacture and support a complete line of stationary and portable aggregate processing equipment for the aggregate metallic and nonmetallic, bulk handling, sand and gravel, mining, quarrying, concrete and asphalt recycling and industrial markets. This equipment is marketed through an extensive network of KPI/JCI/AMS dealers.

KPI/JCI/AMS products include a complete line of primary, secondary, tertiary and quaternary crushers, including jaw, horizontal shaft impactor, vertical shaft impactor and cone rock crushers as well as industry related washing and conveying equipment, mobile screening plants, portable and stationary screen structures and vibrating and high frequency screens. These rock crushers are used by mining, quarrying and sand and gravel producers to crush oversized aggregate to salable size, in addition to their use for recycled concrete and asphalt. This equipment can be purchased as individual components, as portable plants for flexibility or as completely engineered systems for both portable, stationary and RAP applications. They also offer the highly-portable Fast Pack System, featuring quick setup and teardown, thereby maximizing production time and minimizing downtime. KPI/JCI/AMS also offers portable fully self-contained and self-propelled Fast Trax track-mounted jaw, cone, VSI and horizontal shaft crushers, which are ideal for either recycle or hard rock applications, allowing the producer to move the equipment to the material. The KPI/JCI/AMS expanded GT line of track-mounted crushing and screening plants focuses more specifically on the need for rental and global markets.

KPI/JCI/AMS portable plants combine various combinations of crushing, screening and conveying equipment mounted on tow away chassis and track chassis configurations. Due to high transportation costs of construction materials, many producers use portable equipment to process materials they need in close proximity to their job sites. Portable plants allow aggregate producers the ability to quickly and efficiently move equipment from one location to another as their jobs necessitate. The portable track plants are fully self-contained and allow operators to be producing materials within minutes of unloading equipment off of their transport trucks. The introduction of track-mounted crushing and screening plants has enabled contractors to perform jobs that in the past were not economically feasible and also allows our dealers to compete in the large track-mounted rental market.

KPI/JCI/AMS sand classifying and washing equipment is designed to clean, separate and re-blend material from sand deposits to meet the size specifications for critical applications. Products offered include fine and coarse material washers, log washers, blade mills, sand classifying tanks, cyclones, dewatering screens, density classifiers, sieve bend screens and attrition cells. Additional portable and stationary plants are also offered to handle the growing needs in construction sands, specialty sands and fines recovery. Screening plants are available in both stationary and highly portable models and are complemented by a full line of radial stacking and overland belt conveyors. Screening plants also serve the recycle, crushed stone, industrial and general construction industries.

KPI/JCI/AMS conveying equipment is designed to move or store aggregate and other bulk materials in radial cone-shaped or windrow stockpiles. The SuperStacker telescoping conveyor and Wizard Touch automated controls are designed to add efficiency and accuracy to whatever the stockpile specifications require. Additionally, high capacity rail and barge loading/unloading material handling systems are an important part of the KPI/JCI/AMS product lines.

BTI designs, engineers, manufactures and markets a complete line of industry leading rockbreaker systems for the mining, quarry and recycling markets, and provides large-scale stationary rockbreakers for open pit mining, as well as mid-sized stationary rock breakers for underground applications. In addition, BTI offers a full line of smaller rock breaker systems for mobile track and portable primary crushing plants. BTI designs, engineers, manufactures and markets a complete line of four wheel drive articulated production and utility vehicles, scalars and rock breakers for underground mining.

In addition to supplying equipment for the mining and quarry industries, BTI also designs, manufactures and markets a complete line of hydraulic breakers, compactors and demolition attachments for the North American construction and demolition markets.

BTI currently maintains ISO 9001:2015 (quality assurance) and ISO 14001:2015 (environmental assurance) certifications, internationally recognized standards of quality and environmental assurance. In addition, BTI has achieved certification for OHSAS 18001 Occupational Health & Safety standards and expects to transition to ISO 45001 certificate during 2019. BTI offers an extensive aftermarket sales and service program through a highly qualified and trained dealer network.

Osborn, which is located in South Africa, maintains an ISO 9001:2008 certification for quality assurance and designs, engineers, manufactures and markets a range of minerals processing equipment. This equipment is used in the aggregate, mining, metallurgical and recycling industries. Osborn has been a licensee of TelSmith's technology for over 60 years and is also a licensee of KPI's vertical and horizontal shaft impact crushers. Osborn also offers the following equipment: single and double-toggle jaw crushers; cone crushers; rotary breakers; roll crushers; rolling ring crushers; mills; out-of-balance or exciter-driven screens and feeders; and modular "containerized" crusher and screening systems. Osborn also markets equipment produced by other Astec companies in the sub-Saharan African market.

Osborn has recently added a number of new products to its product offerings, including a 300 HP gyratory crusher for secondary applications, horizontal shaft impactors, an extension to the range of out-of-balance exciter gearboxes and a low profile apron feeder, in addition to numerous modernization and updates to its existing product lines.

Assembly operations began in Astec Brazil's newly constructed 132,400 square foot facility in the fourth quarter of 2014, and complete production operations began in the first quarter of 2015. Manufacturing operations, sales, distribution and product support are all located within the new facility, which currently has 57 employees. The Company is expected to utilize 120 employees at the facility when it reaches full capacity. Products manufactured by Astec Brazil include crushing equipment, vibrating equipment, stationary plants, mobile portable systems and asphalt plants. Astec Brazil represents the brands of KPI/JCI/AMS, BTI and Telsmith in the aggregate and mining markets and Astec, Inc. in the asphalt market. Astec Brazil also markets products in the Brazilian market that are produced by the other Astec Aggregate and Mining companies and Astec asphalt plants.

Astec Brazil delivered its first asphalt plant in early 2016; however, sales in the South American market have continued to be hampered by the economic downturn in South America and more specifically in Brazil. The Company plans to position itself to significantly increase the production and sales volumes by Astec Brazil and also plans to manufacture other product lines at the facility once the business environment improves in the region. The Company currently has a 93% ownership interest in Astec Brazil.

Telestack designs, engineers, manufactures and markets mobile bulk material handling solutions that are designed to handle all free-flowing bulk materials, including but not limited to ores, coal, aggregates, fertilizers, grains, woodchips and pellets. Telestack's comprehensive suite of product offerings is sold on a global basis and operates within a significant number of working environments such as mines, quarries, ports, rail yards, power stations and steel mills.

Telestack maintains ISO 9001:2015 (quality assurance), ISO 14001:2015 (environmental assurance) and ISO 18001:2007 (health and safety assurance) accreditations. Telestack is also an approved supplier of equipment that conforms to Western Australian Mining Standards (AS 4324:1).

Marketing

Aggregate processing and mining equipment is marketed by approximately 115 direct sales employees, 137 domestic independent distributors and 174 international independent distributors. The principal purchasers of aggregate processing equipment include highway and heavy equipment contractors, sand and gravel producers, recycle and crushing contractors, mine operators, quarry operators, port and inland terminal authorities, power stations and foreign and domestic governmental agencies.

Raw Materials

Raw materials used in the manufacture of products in the Aggregate and Mining Group include carbon steel and various types of alloy steel, which are normally purchased from distributors. Raw materials for manufacturing are normally readily available; however, certain highly customized components may require longer than normal lead times. Section 232 and Section 301 Tariffs that went into effect in 2018 have negatively impacted raw materials pricing for the group. Purchased raw materials from China, in the form of carbon steel castings, ductile iron castings and other components are now being reviewed for sourcing from other global suppliers. BTI purchases hydraulic breakers under a purchasing arrangement with a South Korean supplier. The Company believes the South Korean supplier has sufficient capacity to meet the Company's anticipated demand; however, alternative suppliers exist for these components should any supply disruptions occur.

Competition

The Aggregate and Mining Group faces strong competition in price, service and product performance. Aggregate and Mining equipment competitors include Metso Minerals, Sandvik Mining and Construction, Terex MP and Powerscreen, Epiroc (formerly Atlas Copco Mining), Thor, Masaba, Edge Innovate, McCloskey, Superior Industries, Wirtgen (Klemmann), Deister, McLanahan, CDE Global, Weir Minerals (Trio) and other smaller manufacturers, both domestic and international.

Employees

At December 31, 2018, the Aggregate and Mining Group segment employed 1,666 individuals, of which 1,210 were engaged in manufacturing, 159 in engineering and engineering support functions and 297 in selling, general and administrative functions.

Telsmith has a labor agreement covering approximately 130 manufacturing employees which expires on March 9, 2022. Approximately 117 of Osborn's manufacturing employees fall within the scope of a collective labor union agreement that expires on June 30, 2020. Astec Brazil has an annual union agreement covering all its employees that expires on September 30, 2019. None of the other employees of the Aggregate and Mining Group are covered by collective bargaining agreements.

Backlog

At December 31, 2018 and 2017, the backlog for the Aggregate and Mining Group was approximately \$130,691 and \$116,987, respectively. Approximately \$9,726 of the increase in backlogs between years relates to orders from domestic U.S. customers. Management expects the current backlog to be filled in 2019.

Energy Group

The Company's Energy Group is currently comprised of six business units focused on supplying heavy equipment such as heaters, drilling rigs, concrete plants, wood chippers and grinders, pump trailers, storage equipment and related parts to the oil and gas, construction, and water well industries, as well as commercial and industrial burners used primarily in commercial, industrial and process heating applications. The business units currently included in the Energy Group are Heatec, Inc. ("Heatec"), CEI Enterprises, Inc. ("CEI"), GEFCO, Inc. ("GEFCO"), Peterson Pacific Corp. ("Peterson"), Power Flame Incorporated ("Power Flame") and RexCon, Inc. ("RexCon"). Power Flame, located in Parsons, Kansas, was acquired in August 2016. RexCon, located in Burlington, WI, was formed to acquire substantially all of the assets and liabilities of RexCon, LLC on October 1, 2017.

Products

Heatec designs, engineers, manufactures and markets a variety of thermal fluid heaters, process heaters, waste heat recovery equipment, liquid storage systems and polymer and rubber blending systems under the HEATEC trademark. For the construction industry, Heatec designs and manufactures a complete line of asphalt heating and storage equipment to serve the hot-mix asphalt industry, including complete asphalt terminal facilities, polymer plants and emulsion facilities. In addition, Heatec builds a wide variety of heaters to fit a broad range of applications, including heating equipment for marine vessels, roofing material plants, refineries, oil sands, energy related processing, chemical processing and water heaters for many industrial applications. Heatec has the technical staff to custom design heating systems and has systems operating as large as 75 million BTU's per hour.

CEI designs, engineers, manufactures and markets thermal fluid heaters, portable and stationary storage tanks, rubberized asphalt and polymer blending systems for the asphalt and other industries. CEI has also produced one model of concrete production plant, which is now integrating with the RexCon product line.

GEFCO designs and manufactures portable drilling rigs and related equipment for the water well, environmental, geothermal, geotechnical, groundwater monitoring, construction, mining and shallow oil and gas exploration and production industries. Portable drilling rigs are offered in a variety of designs with optional equipment, including truck, trailer or track mounted units, diesel engine on deck or power take-off powered units, hydraulic pump drives, transmission, hydraulic pumps and motors, hydraulic cylinders, gear boxes, plumbing and all related controls. GEFCO also designs and manufactures trailer-mounted, high-pressure, high-volume double fluid pumpers for use in the oil and gas energy services energy.

Peterson designs, engineers, manufactures and distributes large whole-tree pulpwood chippers, biomass chippers, horizontal grinders and blower trucks primarily for the construction, landscaping, recycling, and biomass energy markets.

Power Flame, a market leader in its segment, designs, engineers, manufactures and markets commercial and industrial burners and combustion control systems. Power Flame produces a broad range of natural gas, fuel oil, or combination-fueled models with outputs ranging from 400 thousand BTU's to 120 million BTU's per hour. Power Flame's burners are used primarily in commercial, industrial and process heating applications.

RexCon was formed to acquire substantially all of the assets and liabilities of RexCon LLC on October 1, 2017. RexCon is a leader in the design and production of high-quality stationary and portable, central mix and ready mix concrete batch plants, concrete mixers and concrete paving equipment for contractors and ready mix concrete producers.

Marketing

The Energy Group markets its products domestically through a combination of employee sales agents, manufacturer representatives and distributors, while international sales efforts are typically conducted with the assistance of independent sales agents. The group's products are marketed by approximately 69 direct sales employees, 79 domestic independent distributors and 44 international independent distributors. Customers typically include oil and gas field operators, industrial product manufacturers, independent contractors, ready mix concrete producers, heating equipment distributors and government agencies. The market for the Company's heat transfer equipment is diverse because of the multiple applications for such equipment.

Raw Materials

Raw materials used in the manufacture of products in the Energy Group include carbon steel and various types of alloy steel, which are normally purchased from distributors and other sources. Raw materials for manufacturing are normally readily available. Most steel is delivered on a “just-in-time” arrangement from suppliers to reduce inventory requirements at the manufacturing facilities, but steel is occasionally inventoried after purchase. Section 232 and Section 301 Tariffs that went into effect in 2018 have negatively impacted raw materials pricing for the group. Components used in the manufacturing process include engines, hydraulic pumps and motors, gearboxes, track clutches, burners, power transmissions and electronic systems.

Competition

The Energy Group faces strong competition in price, service and product performance and competes both with large companies that have resources significantly greater than those of the Company and with various smaller manufacturers. Major competitors include Gencor, Almix, Fulton, Sigma Thermal, Erie Strayer, Con-E-Co, Meeker, Versa Drill, Schramm, Atlas Copco, National Oil Well, Forum Energy Tech, Oil Country, NOV/Rolligon, Stewart & Stevenson, Dragon, Morbark, CBI (Terex), Precision Doppstadt, Bandit, Jenz, Komptech, Finn Corp, Webster Engineering, Cleaver Brooks, Riello, Industrial Combustion, Limpsfield Combustion and Stephen’s Manufacturing.

Employees

At December 31, 2018, the Energy Group segment employed 1,059 individuals, of which 705 were engaged in manufacturing, 128 in engineering and 226 in selling, general and administrative functions. Approximately 98 of GEFCO’s manufacturing employees fall within the scope of a collective bargaining agreement that expires on June 20, 2021. Power Flame is a party to a collective bargaining agreement that applies to approximately 105 of its manufacturing employees and expires on December 7, 2019. None of the other employees of the Energy Group are covered by collective bargaining agreements.

Backlog

The backlog for the Energy Group at December 31, 2018 and 2017 was approximately \$64,834 and \$54,987, respectively. Management expects the entire current backlog to be filled in 2019.

Corporate (Other Business Units)

This category consists of the business units that do not meet the requirements of separate disclosure as an operating segment or inclusion in one of the other reporting segments and includes Astec Industries, Inc., the parent company, Astec Insurance Company, a captive insurance company and a sales organization in its start-up phase in Chile. The parent company and the captive provide support and corporate oversight for all the other business units. The Company records U.S. federal income tax expenses and state deferred taxes for all business segments on the parent company’s books; therefore, these taxes are included in the Corporate category for segment reporting.

Employees

At December 31, 2018, the Corporate category employed 50 individuals, all of which were engaged in executive management, corporate finance and administrative functions.

Common to All Operating Segments

The following information applies to all operating segments of the Company.

Raw Materials

Steel is a major component in the Company's equipment. Steel prices rose significantly during 2018 and were impacted by the Section 232 and 301 tariff actions. Steel prices have recently become stable at these elevated levels, and we anticipate prices to remain in this range for the first half of 2019. The Company continues to utilize forward-looking contracts (with no minimum or specified quantity guarantees) coupled with advanced steel purchases to minimize the impact of any price increases. The Company will review the trends in steel prices entering into the second half of 2019 and establish future contract pricing accordingly.

Government Regulations

The Company is subject to various laws and governmental regulations concerning environmental matters and employee safety and health in the United States and other countries. The Environmental Protection Agency, the Occupational Safety & Health Administration, other federal agencies and certain state agencies have the authority to promulgate regulations that have an effect on the Company's operations. Many of these federal and state agencies may seek fines and penalties for violations of these laws and regulations. The Company has been able to operate under these laws and regulations without any material adverse effect on its business.

None of the Company's operating segments operate within highly regulated industries. However, air pollution control equipment manufactured by the Company, principally for hot-mix asphalt plants, must comply with certain performance standards promulgated by the federal Environmental Protection Agency under the Clean Air Act applicable to "new sources" or new plants. Management believes the Company's products meet all material requirements of such regulations and applicable state pollution standards and environmental protection laws.

In addition, due to the size and weight of certain equipment the Company manufactures, the Company and its customers may encounter various state regulations on maximum weights transportable on highways. Also, some states have regulations governing the operation of asphalt mixing plants, and most states have regulations relating to the accuracy of weights and measures, which affect some of the control systems manufactured by the Company.

Compliance with these government regulations has no material effect on the Company's capital expenditures, earnings or competitive position within the market.

Employees

At December 31, 2018, the Company and its subsidiaries employed 4,401 individuals, of which 3,016 were engaged in manufacturing, 505 in engineering, including support staff, and 880 in selling, administrative and management functions.

Other than the TelSmith, Osborn and Astec Brazil labor agreements described under the "Employee" subsection of the Aggregate and Mining Group above and the GEFCO and Power Flame labor agreements described under the "Employee" subsection of the Energy Group above, there are no collective bargaining agreements applicable to employees of the Company or its subsidiaries. The Company considers its employee relations to be good.

Manufacturing

The Company manufactures many of the component parts and related equipment for its products, while several large components of its products are purchased “ready-for-use”. Such items include engines, axles, tires and hydraulics. In many cases, the Company designs, engineers and manufactures custom component parts and equipment to meet the particular needs of individual customers. Manufacturing operations during 2018 took place at 21 separate locations. The Company’s manufacturing operations consist primarily of fabricating steel components and the assembly and testing of its products to ensure that the Company achieves quality control standards.

Seminars and Technical Bulletins

The Company periodically conducts technical and service seminars, which are primarily for dealer representatives, contractors, owners, employees and other users of equipment manufactured by the Company. These seminars, which are led by Company management and employees, along with select outside speakers and discussion leaders, cover a range of subjects, including, but not limited to operational and service processes, technological innovation, promotional programs, customer and dealer training and previews of future products.

In addition to seminars, the Company publishes a number of technical bulletins and information bulletins detailing various technological and business issues relating to the industries in which it operates.

Patents and Trademarks

The Company seeks to obtain patents to protect the novel features of its products and processes. The Company’s subsidiaries hold 93 United States patents and 130 foreign patents. The Company’s subsidiaries have 62 United States and 86 foreign patent applications pending.

The Company and its subsidiaries have 86 trademarks registered in the United States, including logos for Astec, Astec Dillman, Carlson Paving, CEI, GEFCO, Heatec, KPI-JCI, Peterson Pacific, Power Flame, Roadtec, Telestack and Telsmith, and the names ASTEC, CARLSON, HEATEC, JCI, KOLBERG, PETERSON, POWER FLAME, ROADTEC, TELESTACK and TELSMITH, as well as a number of other product names. The Company also has 115 trademarks registered in foreign jurisdictions, including Australia, Argentina, Brazil, Canada, China, France, Great Britain, Germany, India, Italy, Kazakhstan, Mexico, Paraguay, New Zealand, Peru, Russia, South Africa, South Korea, Thailand, Uruguay, Vietnam and the European Union. The Company and its subsidiaries have five foreign trademark registration applications pending.

Engineering and Product Development

The Company dedicates substantial resources to engineering and product development. At December 31, 2018, the Company and its subsidiaries had 505 full-time individuals employed in engineering and design capacities.

Seasonality and Backlog

Revenues for recent years, adjusted for acquisitions, have been strongest during the first, second and fourth quarters with the third quarter consistently being weaker. We expect future operations in the near term to be typical of this historical trend.

As of December 31, 2018 and 2017, the Company had a backlog for delivery of products at certain dates in the future of approximately \$344,962 and \$411,469, respectively. The Company's contracts reflected in the backlog generally are not, by their terms, subject to termination. Management believes the Company is in substantial compliance with all manufacturing and delivery timetables.

Competition

Each business segment operates in domestic markets that are highly competitive with respect to price, service and product quality. While specific competitors are named within each business segment discussion above, imports do not generally constitute significant competition for the Company in the United States, except for milling machines and track-mounted crushers. In international sales, however, the Company often competes with foreign manufacturers that may have a local presence in the market the Company is attempting to penetrate.

In addition, asphalt and concrete are generally considered competitive products as a surface choice for new roads and highways. A portion of the interstate highway system is paved in concrete, but over 90% of all surfaced roads in the United States are paved with asphalt. Although concrete is used for some new road surfaces, asphalt is used for most resurfacing.

Available Information

The Company's internet website can be found at www.astecindustries.com. We make available, free of charge on or through our internet website, access to our annual report on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K, and amendments to those reports filed pursuant to Section 13(a) or 15(d) of the Exchange Act as soon as reasonably practicable after such material is filed with, or furnished to, the Securities and Exchange Commission. Information contained in our website is not part of, and is not incorporated into, this Annual Report on Form 10-K.

Item 1A. Risk Factors

Downturns in the general economy or the commercial and residential construction industries may adversely affect our revenues and operating results.

General economic downturns, including downturns in the commercial and residential construction industries, could result in a material decrease in our revenues and operating results. Demand for many of our products, especially in the commercial construction industry, is cyclical. Sales of our products are sensitive to the states of the U.S., foreign and regional economies in general, and in particular, changes in commercial construction spending and government infrastructure spending. In addition, many of our costs are fixed and cannot be quickly reduced in response to decreased demand. The following factors could cause a downturn in the commercial and residential construction industries:

- a decrease in the availability of funds for construction;
- declining economy domestically and internationally;
- labor disputes in the construction industry causing work stoppages;
- rising gas and oil prices;
- rising steel prices and steel surcharges;
- rising interest rates;
- energy or building materials shortages;
- inclement weather; and
- availability of credit for customers.

Downturns in the general economy and restrictions in the credit markets may negatively impact our earnings, cash flows and/or financial position and access to financing sources by the Company and our customers.

Worldwide economic conditions and the international credit markets significantly deteriorated in recent years and may remain depressed for the foreseeable future. Continued deterioration of economic conditions and credit markets could adversely impact our earnings as sales of our products are sensitive to general declines in U.S. and foreign economies and the ability of our customers to obtain credit. In addition, we rely on the capital markets and the banking markets to meet our financial commitments and short-term liquidity needs if internal funds are not available from our operations. Further disruptions in the capital and credit markets, or deterioration of our creditors' financial condition, could adversely affect the Company's ability to draw on its revolving credit facility. The Company's current credit facility, as amended in February 2019, expires in December 2023, and deterioration in the credit markets could make it more difficult or expensive for us to replace our current credit facility, enter into a new credit facility or obtain additional financing.

A decrease or delay in government funding of highway construction and maintenance may cause our revenues and profits to decrease.

Many of our customers depend on government funding of highway construction and maintenance and other infrastructure projects. Any decrease or delay in government funding of highway construction and maintenance and other infrastructure projects could cause our net sales and profits to decrease. Historically, federal government funding of infrastructure projects has typically been accomplished through bills that establish funding over a multi-year period, such as the Safe, Accountable, Flexible and Efficient Transportation Equity Act - A Legacy for Users ("SAFETEA-LU"), which provided \$286.5 billion to fund federal transit projects from 2004 to 2009. SAFETEA-LU funding expired on September 30, 2009, and federal transportation funding operated on a number of shorter term appropriations until December 4, 2015 when the Fixing America's Surface Transportation Act ("FAST Act") was enacted. Among other expenditures, the FAST Act approved funding for highways of approximately \$205 billion and funding for transit projects of approximately \$48 billion for the five-year period ending September 30, 2020.

Given the inherent uncertainty in the political process, the level of government funding for federal highway projects will similarly continue to be uncertain. Governmental funding that is committed or earmarked for federal highway projects is always subject to repeal or reduction. Although continued funding under the FAST Act is expected, it may be at lower levels than originally approved. In addition, Congress could pass legislation in future sessions that would allow for the diversion of previously appropriated highway funds for other national purposes, or it could restrict funding of infrastructure projects unless states comply with certain federal policies.

The cyclical nature of our industry and the customization of the equipment we sell may cause adverse fluctuations to our revenues and operating results.

We sell equipment primarily to contractors whose demand for equipment depends greatly upon the volume of road or utility construction projects underway or to be scheduled by both government and private entities. The volume and frequency of road and utility construction projects are cyclical; therefore, demand for many of our products is cyclical. The equipment we sell is durable and typically lasts for several years, which also contributes to the cyclical nature of the demand for our products. As a result, we may experience cyclical fluctuations to our revenues and operating results. Any difficulty in managing the Company's manufacturing workflow during downturns in demand could adversely affect our financial results.

A significant change in the price or availability of oil could reduce demand for our products. Significant increases in the purchase price of certain raw materials used to manufacture our equipment could have a negative impact on the cost of production and related gross margins.

A significant portion of our revenues relates to the sale of equipment involved in the production, handling, recycling or installation of asphalt mix. Liquid asphalt is a byproduct of the refining of oil, and asphalt prices correlate with the price and availability of oil. An increase in the price of oil or a decrease in the availability of oil would increase the cost of producing asphalt, which would likely decrease demand for asphalt, resulting in decreased demand for many of our products. This would likely cause our revenues and profits to decrease. Rising gasoline, diesel fuel and liquid asphalt prices will also adversely impact the operating and raw material costs of our contractor and aggregate producer customers, and if such customers do not properly adjust their pricing, they could experience reduced profits resulting in possible delays in purchasing capital equipment.

Contrary to the impact of increasing oil prices on many of the Company's products impacted by changes in the cost of asphalt mix as discussed above, the products manufactured by the Company's Energy Group, which are used in drilling for oil and natural gas, in heaters for refineries and oil sands, and in double fluid pump trailers for fracking and oil and gas extraction, would be negatively impacted by lower oil and natural gas prices, to the extent that such lower prices lead to decreased development in the oil and natural gas production industries.

Steel is a major component in the Company's equipment. Steel prices fluctuate routinely. Our reliance on third-party suppliers for steel and other raw materials exposes us to volatility in the prices and availability of these materials. Price increases or a decrease in the availability of these raw materials could increase our operating costs and adversely affect our financial results.

Acquisitions that we have made in the past and future acquisitions involve risks that could adversely affect our future financial results.

We have completed several acquisitions in the past, including the acquisition of RexCon in October 2017 and Power Flame in August 2016. We may acquire additional businesses in the future. We may be unable to achieve the benefits expected to be realized from our acquisitions. In addition, we may incur additional costs and our management's attention may be diverted because of unforeseen expenses, difficulties, complications, delays and other risks inherent in acquiring businesses, including the following:

- we may have difficulty integrating the financial and administrative functions of acquired businesses;
- acquisitions may divert management's attention from our existing operations;
- fluctuations in exchange rates and a weakening of the dollar may impact the competitiveness of acquired businesses;
- we may have difficulty in competing successfully for available acquisition candidates, completing future acquisitions or accurately estimating the financial effect of any businesses we acquire;
- we may have delays in realizing the benefits of our strategies for an acquired business;
- we may not be able to retain key employees necessary to continue the operations of the acquired business;
- acquisition costs may deplete significant cash amounts or may decrease our operating income;
- we may choose to acquire a company that is less profitable or has lower profit margins than our company;
- future acquired companies may have unknown liabilities that could require us to spend significant amounts of additional capital; and
- we may incur domestic or international economic declines that impact our acquired companies.

Competition could reduce revenue from our products and services and cause us to lose market share.

We currently face strong competition in product performance, price and service. Some of our domestic and international competitors have greater financial, product development and marketing resources than we have. If competition in our industry intensifies or if our current competitors enhance their products or lower their prices for competing products, we may lose sales or be required to lower the prices we charge for our products. This may reduce revenue from our products and services, lower our gross margins or cause us to lose market share.

Our success depends on key members of our management and other employees.

Certain members of our senior management team are of significant importance to our business and operations. The loss of their services may adversely affect our business. On January 22, 2019, Ben Brock resigned as Chief Executive Officer and President of the Company and as a member of the Company's Board of Directors. We have named an interim Chief Executive Officer and President and are currently conducting a search for a new Chief Executive Officer and President. Such management changes could materially affect our business. In addition, our ability to attract and retain qualified engineers, skilled manufacturing personnel and other professionals, either through direct hiring or acquisition of other businesses employing such professionals, will also be an important factor in determining our future success.

Difficulties in managing and expanding in international markets could divert management's attention from our existing operations.

In 2018, international sales represented approximately 21.8% of our total sales as compared to 21.3% in 2017. We plan to continue our significant sales and production efforts in international markets. In furtherance thereof, we recently filled a new company position of Group Managing Director-International and are in the start-up phase of a new sales/service subsidiary in Chile. In connection with any increase in international sales efforts, we will need to hire, train and retain qualified personnel in countries where language, cultural or regulatory barriers may exist. Any difficulties in expanding our international sales may divert management's attention from our existing operations. In addition, international revenues are subject to the following risks:

- fluctuating currency exchange rates, which can reduce the profitability of foreign sales;
- the burden of complying with a wide variety of foreign laws and regulations;
- dependence on foreign sales agents;
- political and economic instability of governments;
- the imposition of protective legislation such as import or export barriers; and
- fluctuating strengths or weakness of the dollar, which can impact net sales or the cost of purchased products.

We may be unsuccessful in complying with the financial ratio covenants or other provisions of our credit agreement.

As of December 31, 2018, we were in compliance with the financial covenants contained in our credit agreement with Wells Fargo Bank, N.A. However, in the future we may be unable to comply with the financial covenants in our credit facility or to obtain waivers with respect to such financial covenants. If such violations occur, the Company's creditors could elect to pursue their contractual remedies under the credit facility, including requiring immediate repayment in full of all amounts then outstanding. As of December 31, 2018, the Company had \$58,778 of borrowings and \$11,044 of letters of credit outstanding under the under the Wells Fargo credit agreement. Additional amounts may be borrowed in the future. The Company's Osborn, Astec Brazil, Telestack and Astec Australia subsidiaries have entered into their own independent loan agreements.

Our quarterly operating results are likely to fluctuate, which may decrease our stock price.

Our quarterly revenues, expenses and operating results have varied significantly in the past and are likely to vary significantly from quarter to quarter in the future. As a result, our operating results in some quarters may fall below the expectations of securities analysts and investors, which could result in a decrease in the market price of our common stock. The reasons our quarterly results may fluctuate include:

- general competitive and economic conditions, domestically and internationally;
- delays in, or uneven timing in, the delivery of customer orders;
- the seasonal trend in our industry;
- the introduction of new products by us or our competitors;
- product supply shortages; and
- reduced demand due to adverse weather conditions.

Period-to-period comparisons of such items should not be relied on as indications of future performance.

We may face product liability claims or other liabilities due to the nature of our business. If we are unable to obtain or maintain insurance or if our insurance does not cover liabilities, we may incur significant costs which could reduce our profitability.

We manufacture heavy machinery, which is used by our customers at excavation and construction sites, ports and inland terminals and on high-traffic roads. Any defect in or improper operation of our equipment can result in personal injury and death, and damage to or destruction of property, any of which could cause product liability claims to be filed against us. The amount and scope of our insurance coverage may not be adequate to cover all losses or liabilities we may incur in the event of a product liability claim. We may not be able to maintain insurance of the types or at the levels we deem necessary or adequate or at rates we consider reasonable. Any liabilities not covered by insurance could reduce our profitability or have an adverse effect on our financial condition.

If we are unable to protect our proprietary technology from infringement or if our technology infringes technology owned by others, then the demand for our products may decrease or we may be forced to modify our products, which could increase our costs.

We hold numerous patents covering technology and applications related to many of our products and systems as well as numerous trademarks and trade names registered with the U.S. Patent and Trademark Office and in foreign countries. Our existing or future patents or trademarks may not adequately protect us against infringements, and pending patent or trademark applications may not result in issued patents or trademarks. Our patents, registered trademarks and patent applications, if any, may not be upheld if challenged, and competitors may develop similar or superior methods or products outside the protection of our patents. This could reduce demand for our products and materially decrease our revenues. If our products are deemed to infringe upon the patents or proprietary rights of others, we could be required to modify the design of our products, change the name of our products or obtain a license for the use of some of the technologies used in our products. We may be unable to do any of the foregoing in a timely manner, upon acceptable terms and conditions, or at all, and the failure to do so could cause us to incur additional costs or lose revenues.

If we become subject to increased governmental regulation, we may incur significant costs.

Our hot-mix asphalt plants contain air pollution control equipment and several of our other products contain engines that must comply with performance standards promulgated by the Environmental Protection Agency. These performance standards may increase in the future. Changes in these requirements could cause us to undertake costly measures to redesign or modify our equipment or otherwise adversely affect the manufacturing processes of our products. Such changes could have a material adverse effect on our operating results.

In addition, we may incur material costs or liabilities in connection with other regulatory requirements applicable to our business, including, for example, state regulation of our component equipment, the accuracy of weights and measures, and the maximum weight transportable on highways and roads.

Goodwill and other intangible assets comprise a material portion of our total assets. We must test our goodwill and other intangible assets for impairment at least annually, which could result in a material, non-cash write-down of goodwill or intangible assets and could have a material adverse impact on our results of operations and shareholders' equity.

Goodwill and intangible assets are subject to impairment assessments at least annually (or more frequently when events or changes in circumstances indicate that an impairment may have occurred). During 2018, we recorded goodwill impairment charges totaling \$11,190 at two of our business units. A decrease in our market capitalization, profitability or negative or declining cash flows increases the risk of goodwill impairment. Future impairment charges could have a material adverse impact on our results of operations and shareholders' equity.

As an innovative leader in the industries in which we operate, we occasionally undertake the engineering, design, manufacturing, construction and installation of equipment systems that are new to the market. Estimating the costs of such innovative equipment can be difficult and could result in our realization of significantly reduced or negative margins on such projects. Additionally, if the newly designed equipment were not to function as expected, the Company could be responsible for reimbursing the customer for its financial losses, including, but not limited to, the possible refund of the purchase price.

At various times, we have experienced negative margins on certain large projects, including wood pellet plants that we have recently produced. These large projects have included both existing and innovative equipment designs, on-site construction and promised minimum production levels. Designing innovative equipment to function as expected is inherently difficult and significant additional design phase, field testing and redesign costs may be incurred. In addition, any number of unforeseen circumstances can impact actual project costs. Production delays, design changes and adverse weather conditions, and other factors can also result in construction and testing delays, which can cause significant cost overruns or failure to meet required completion dates. In certain circumstances, we may incur contractual penalties as a result of such delays or the failure to satisfy minimum production levels, and we may be liable to customers for other losses they incur in connection with such delays, including possible refund of the purchase price. We may not be able to sufficiently predict the extent of such unforeseen cost overruns and may experience significant losses on specialized projects in the future. Additionally, the Company typically incurs substantial research and development costs each year and has historically received significant research and development tax credits due to these expenditures. Congress could reduce or eliminate such tax credits in future years, which could have a material adverse effect on our operating results.

Our Articles of Incorporation and Bylaws and Tennessee law may inhibit a takeover, which could delay or prevent a transaction in which shareholders might receive a premium over market price for their shares.

Our charter and bylaws and Tennessee law contain provisions that may delay, deter or inhibit a future acquisition or an attempt to obtain control of us. This could occur even if our shareholders are offered an attractive value for their shares or if a substantial number or even a majority of our shareholders believe the takeover is in their best interest. These provisions are intended to encourage any person interested in acquiring us or obtaining control of us to negotiate with and obtain the approval of our Board of Directors in connection with the transaction. Provisions that could delay, deter or inhibit a future acquisition or an attempt to obtain control of us include the following:

- having a staggered Board of Directors;
- requiring a two-thirds vote of the total number of shares issued and outstanding to remove directors other than for cause;
- requiring advance notice of actions proposed by shareholders for consideration at shareholder meetings;
- limiting the right of shareholders to call a special meeting of shareholders;
- requiring that all shareholders entitled to vote on an action provide written consent in order for shareholders to act without holding a shareholders' meeting; and
- being governed by the Tennessee Control Share Acquisition Act.

We identified material weaknesses in our internal control which, if not remediated appropriately or timely, could result in loss of investor confidence and adversely impact our stock price.

As disclosed in Part II, Item 9A, during 2018, management identified certain material weaknesses in internal control that are relevant to the preparation of our consolidated financial statements. As a result, management concluded that our internal control over financial reporting was not effective as of December 31, 2018. We are implementing remedial measures and, while there can be no assurance that our efforts will be successful, we plan to remediate the material weaknesses prior to the end of 2019. These measures may result in additional technology and other expenses. If we are unable to remediate the material weaknesses, or are otherwise unable to maintain effective internal control over financial reporting or disclosure controls and procedures, our ability to record, process and report financial information accurately, and to prepare financial statements within required time periods, could be adversely affected, which could subject us to litigation or investigations requiring management resources and payment of legal and other expenses, negatively affect investor confidence in our financial statements and adversely impact our stock price.

Increased cybersecurity requirements, vulnerabilities, threats and more sophisticated and targeted computer crime could pose a risk to our systems, networks, products, solutions, services and data.

Increased global cybersecurity vulnerabilities, threats, computer viruses and more sophisticated and targeted cyber-related attacks, as well as cybersecurity failures resulting from human error and technological errors, pose a risk to the security of the Company's and its customers', partners', suppliers' and third-party service providers' products, systems and networks and the confidentiality, availability and integrity of the Company's and its customers' data. Despite our efforts to protect our systems and confidential information, we may be vulnerable to material security breaches, theft, misplaced, lost or corrupted data, programming errors, employee errors and/or misappropriation that could potentially lead to the compromising of confidential information, improper use of our systems, software solutions or networks, unauthorized access, use, disclosure, modification or destruction of information, defective products, production downtimes and operational disruptions, any of which could have a material effect on our business.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

The location, approximate square footage, acreage occupied and principal function and use by the Company's reporting segments of the properties owned or leased by the Company are set forth below:

Location	Approximate Square Footage	Approximate Acreage	Principal Function (Use by Segment)
Chattanooga, Tennessee	543,200	65	Offices, manufacturing and training center – Astec (Infrastructure Group)
Chattanooga, Tennessee	--	4	Storage yard – Astec (Infrastructure Group)
Rossville, Georgia	40,500	3	Manufacturing – Astec (Infrastructure Group)
Prairie du Chien, Wisconsin	91,500	39	Manufacturing – Astec Prairie du Chien/Dillman division of Astec (Infrastructure Group)
Chattanooga, Tennessee	237,000	15	Offices, manufacturing and training center – Roadtec (Infrastructure Group)
Chattanooga, Tennessee	53,700	7	Manufacturing/Rebuild – Roadtec (Infrastructure Group)
Chattanooga, Tennessee	155,000	--	Leased warehouse – Roadtec (Infrastructure Group)
Orlando, Florida	9,000	--	Leased machine repair and service facility – Roadtec (Infrastructure Group)
Tacoma, Washington	55,850	8	Offices and manufacturing – Carlson (Infrastructure Group)
Tacoma, Washington	4,400	1	R&D/Services Offices-Carlson (Infrastructure Group)
Acacia Ridge, Queensland Australia	36,000	5	Offices, warehousing, service, light fabrication and storage yard – Astec Australia Pty Ltd (Infrastructure Group)
Canning Vale, WA Australia	9,000	--	Leased office, warehouse and workshop - Astec Australia Pty Ltd (Infrastructure Group)
Laverton North, Victoria Australia	6,500	--	Leased office, warehouse and workshop – Astec Australia Pty Ltd (Infrastructure Group)

Location	Approximate Square Footage	Approximate Acreage	Principal Function (Use by Segment)
Hamel, Germany	35,300	3	Offices and light assembly – Asphalt Mobile Machinery GmbH (Infrastructure Group)
Mequon, Wisconsin	236,000	30	Offices and manufacturing – Telsmith (Aggregate and Mining Group)
Yankton, South Dakota	312,000	50	Offices and manufacturing – KPI (Aggregate and Mining Group)
Eugene, Oregon	140,300	33	Offices and manufacturing – JCI (Aggregate and Mining Group)
Sterling, Illinois	60,000	8	Offices and manufacturing – AMS (Aggregate and Mining Group)
Sterling, Illinois	7,500	--	Warehouse - AMS (Aggregate and Mining Group)
Thornbury, Ontario, Canada	60,500	12	Offices and manufacturing – BTI (Aggregate and Mining Group)
Riverside, California	12,500	--	Leased offices, sales, assembly and warehouse – BTI (Aggregate and Mining Group)
Solon, Ohio	8,900	--	Leased offices, sales, assembly and warehouse – BTI (Aggregate and Mining Group)
Johannesburg, South Africa	229,000	21	Offices and manufacturing – Osborn (Aggregate and Mining Group)
Cape Town, South Africa	1,100	--	Leased sales office and warehouse – Osborn (Aggregate and Mining Group)
Durban, South Africa	835	--	Leased sales office – Osborn (Aggregate and Mining Group)
Kathu, South Africa	--	61	Undeveloped land – Osborn (Aggregate and Mining Group)
Omagh, Northern Ireland	115,000	8	Offices and manufacturing-Telestack (Aggregate and Mining Group)
Vespasiano-MG, Brazil	132,400	10	Offices and manufacturing – Astec Brazil (Aggregate and Mining Group)
Chattanooga, Tennessee	135,100	73	Offices, manufacturing and storage – Heatec (Energy Group)

Location	Approximate Square Footage	Approximate Acreage	Principal function (use by Segment)
Eugene, Oregon	135,000	15	Offices and manufacturing – Peterson Pacific Corp. (Energy Group)
West Columbia, South Carolina	12,300	--	Leased distribution center – Peterson Pacific Corp. (Energy Group)
Albuquerque, New Mexico	115,000	14	Offices and manufacturing – CEI (Energy Group)
Enid, Oklahoma	350,000	42	Offices and manufacturing – GEFCO, Inc. (Energy Group)
Parsons, Kansas	88,000	7	Offices and manufacturing – Power Flame (Energy Group)
Burlington, Wisconsin	112,100	26	Offices and manufacturing – RexCon (Energy Group)
Chattanooga, Tennessee	10,000	2	Corporate offices – Astec Industries, Inc. (Corporate)
Chattanooga, Tennessee	14,100	--	Leased Hanger and Offices – Astec Industries, Inc. (Corporate)
Las Condes, Santiago, Chile	387	--	Leased sales office (Corporate)

The properties above are owned by the Company unless they are indicated as being leased.

Item 3. Legal Proceedings

The Company is currently a party to various claims and legal proceedings that have arisen in the ordinary course of business. If management believes that a loss arising from such claims and legal proceedings is probable and can reasonably be estimated, the Company records the amount of the loss (excluding estimated legal costs) or the minimum estimated liability when the loss is estimated using a range and no point within the range is more probable than another. As management becomes aware of additional information concerning such contingencies, any potential liability related to these matters is assessed and the estimates are revised, if necessary. If management believes that a material loss arising from such claims and legal proceedings is either (i) probable but cannot be reasonably estimated or (ii) reasonably possible but not probable, the Company does not record the amount of the loss, but does make specific disclosure of such matter.

The Company and certain of its current and former executive officers have been named as defendants in a putative shareholder class action lawsuit filed on February 1, 2019, in the United States District Court for the Eastern District of Tennessee. The action is styled City of Taylor General Employees Retirement System v. Astec Industries, Inc., et al., Case No. 1:19-cv-00024-PLR-CHS. The complaint generally alleges that the defendants violated the Securities Exchange Act of 1934, as amended (the “Exchange Act”), and Rule 10b-5 promulgated thereunder by making allegedly false and misleading statements and that the individual defendants are control persons under Section 20(a) of the Exchange Act. The complaint was filed on behalf of shareholders who purchased shares of the Company’s stock between July 26, 2016 and October 22, 2018 and seeks monetary damages on behalf of the purported class. We dispute these allegations and intend to defend this lawsuit vigorously.

Based upon currently available information and with the advice of counsel, management believes that the ultimate outcome of its current claims and legal proceedings, individually and in the aggregate, will not have a material adverse effect on the Company's financial position, cash flows or results of operations. However, claims and legal proceedings are subject to inherent uncertainties and rulings unfavorable to the Company could occur. If an unfavorable ruling were to occur, there exists the possibility of a material adverse effect on the Company's financial position, cash flows or results of operations.

Item 4. Mine Safety Disclosures

None.

Executive Officers

The name, title, ages and business experience of the executive officers of the Company are listed below.

Richard J. Dorris has served as the Company's Interim Chief Executive Officer and President since January 22, 2019 and also continues to serve as the Company's Chief Operating Officer and Executive Vice President, positions he has held since January 2014. He previously served as the Group Vice President and President of the Company's Energy Group from August 2012 to December 2013 and as President of Heatec, Inc. from 2004 to January 2014. From 1999 to 2004, he held the positions of National Accounts Manager, Project Manager and Director of Projects for Astec, Inc. Prior to joining Astec, Inc., he was President of Esstee Manufacturing Company from 1990 to 1999 and was Sales Engineer from 1984 to 1990. He is 58.

David C. Silvius, a Certified Public Accountant, has served as the Vice President, Chief Financial Officer and Treasurer of the Company since August 2011. He previously served as Corporate Controller of the Company from 2005 to 2011 and as Corporate Financial Analyst from 1999 to 2005. Mr. Silvius also serves as Treasurer of each of the Company's U.S. operating subsidiaries and Vice President of Astec Insurance Company. He is 51.

Jaco van der Merwe has served as Group President-Infrastructure since January 2019 after having previously served as Group President-Energy since August 2016. From 1998 until 2016, he held various positions at Atlas Copco, including Vice President Marketing for the Deephole Drilling group (2013-2016), President/General Manager for the Mining and Rock Excavation Customer Center (2010-2013), and various other division leadership positions. Mr. van der Merwe's career with Atlas Copco began as Quality Manager in 1998. Prior to joining Atlas Copco, he held various positions at Denel Aviation. He is 46.

Jeffrey M. Schwarz has served as Group President-Aggregate and Mining since August 2018. Prior to this role he served as President of Johnson Crushers, Inc. ("JCI") since July 2014. He joined JCI as General Manager of AggReCon West, a division of JCI responsible for direct selling to end users in the Pacific Northwest. Prior to joining JCI he was Aggregates Manager for Kerr Contractors and held several management positions with a construction materials supplier from 1995 to 2008. He is 52.

J. Scott Barker has served as Group President-Energy since January 2019 after having served as President of GEFCO, Inc. since April 2017. Before joining GEFCO, he held several leadership roles with Ingersoll Rand and Atlas Copco during his 12 years there, including Vice President of Operations for the Drilling solutions division, President of the Rocktec division, and President of the Underground Rock Excavation division. He is 55.

Stephen C. Anderson has served as Vice President of Administration since August 2011, as Secretary of the Company since January 2007 and as the Director of Investor Relations since January 2003. Mr. Anderson also manages the corporate information technology, vendor finance and aviation departments. He has also been President of Astec Insurance Company since January 2007. He was Vice President of Astec Financial Services, Inc. from 1999 to 2002. Prior to his employment with the Company, Mr. Anderson spent a combined 14 years in commercial banking with AmSouth and SunTrust Banks. He is 55.

Robin A. Leffew has served as Corporate Controller since August 2011 and also serves as Secretary of Astec Insurance Company. She previously served as the Company's Director of Internal Audit from 2005 to 2011 and Controller of Astec, Inc. from 1990 to 2005. From 1987 to 1990, she served as Corporate Financial Analyst for the Company. She is 57.

PART II

Item 5. Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities

The Company's Common Stock is traded in the Nasdaq National Market under the symbol "ASTE." The Company paid a cash dividend of \$1.00 per share on its Common Stock in the fourth quarter of 2012 and paid quarterly cash dividends of \$0.10 per quarter from the second quarter of 2013 through the second quarter of 2018. Beginning in the third quarter of 2018, the quarterly cash dividend was increased to \$0.11 per share. Prior to 2012, the Company had not paid any cash dividends.

The following information describes the Company's stock repurchases during the year ended December 31, 2018 under the share repurchase program approved by our Board of Directors which authorizes the Company to repurchase up to \$150 million of its common stock, as announced to the public in an 8-K filing on July 30, 2018:

Period	Number of Shares (in thousands)	Average Price Paid per Share	Number of Shares purchased as part of publically announced plan (in thousands)	Maximum Dollar Value of Shares that May Yet Be Purchased Under the Plan (in thousands)
August 2018	297	\$ 46.91	297	\$ 136,080
September 2018	--	--	--	136,080
October 2018	238	35.10	238	127,711
November 2018	47	39.29	47	125,851
December 2018	--	--	--	125,851
Total	582	\$ 41.46	582	\$ 125,851

The high and low sales prices of the Company's Common Stock as reported on the Nasdaq National Market for each quarter during the last two fiscal years are as follows:

	2018	Price Per Share	
		High	Low
	1 st Quarter	\$ 64.80	\$ 53.89
	2 nd Quarter	\$ 61.61	\$ 52.84
	3 rd Quarter	\$ 63.69	\$ 44.92
	4 th Quarter	\$ 52.88	\$ 27.86
	2017	Price Per Share	
		High	Low
	1 st Quarter	\$ 73.37	\$ 59.02
	2 nd Quarter	\$ 66.66	\$ 52.35
	3 rd Quarter	\$ 58.06	\$ 45.70
	4 th Quarter	\$ 59.22	\$ 48.44

As of February 19, 2019, there were approximately 210 holders of record of the Company's Common Stock.

Item 6. Selected Financial Data

Selected financial data appears in Appendix "A" of this Report.

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

Management's discussion and analysis of financial condition and results of operations appears in Appendix "A" of this Report.

Item 7A. Quantitative and Qualitative Disclosures about Market Risk

Information regarding the Company's market risk appears in Appendix "A" of this Report under the heading "Market Risk and Risk Management Policies."

Item 8. Financial Statements and Supplementary Data

Financial statements and supplementary financial information appear in Appendix "A" of this Report.

Item 9. Changes In and Disagreements with Accountants on Accounting and Financial Disclosure

None.

Item 9A. Controls and Procedures

Evaluation of Disclosure Controls and Procedures

The Company maintains disclosure controls and procedures that are designed to ensure that information required to be disclosed by the Company in the reports it files or submits under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms, and that such information is accumulated and communicated to the Company's management, including its principal executive officer and principal financial officer, as appropriate to allow timely decisions regarding required disclosure.

The Company's management, under the supervision and with the participation of the Company's principal executive officer and principal financial officer, has evaluated the effectiveness of the Company's disclosure controls and procedures as of the end of the period covered by this report. Based upon that evaluation, the Company's principal executive officer and principal financial officer concluded that, as of the end of the period covered by this report, the Company's disclosure controls and procedures (as defined in Rule 13a-15(e) under the Exchange Act) were not effective as of December 31, 2018 due to the material weaknesses in internal control over financial reporting described in **Management's Report on Internal Control Over Financial Reporting** in Appendix A of this Report.

Management's Report on Internal Control Over Financial Reporting

Management's report appears in Appendix A of this Report.

Management's Remediation Plan

Management's remediation plan with respect to the material weaknesses in internal control over financial reporting described above appears in Appendix A of this Report.

Changes in Internal Controls Over Financial Reporting

Except for the material weaknesses described in **Management's Report on Internal Control Over Financial Reporting** in Appendix A of this Report that have been identified during the quarter ended December 31, 2018, there have been no changes in the Company's internal control over financial reporting (as defined in Rule 13a-15(f) under the Exchange Act) during the quarter ended December 31, 2018 that have materially affected, or are reasonably likely to materially affect, the Company's internal control over financial reporting.

Item 9B. Other Information

None

PART III

Item 10. Directors, Executive Officers and Corporate Governance

Information regarding the Company's directors, director nominating process, audit committee and audit committee financial expert is included under the captions "Certain Information Concerning Nominees and Directors" and "Corporate Governance" in the Company's Proxy Statement to be delivered to the shareholders of the Company in connection with the Annual Meeting of Shareholders to be held on April 25, 2019 (referred to herein as the Company's 2019 Proxy Statement), which is incorporated herein by reference. Information regarding compliance with Section 16(a) of the Exchange Act is also included under the caption "Section 16(a) Beneficial Ownership Reporting Compliance" in the Company's 2019 Proxy Statement, which is incorporated herein by reference. Information with respect to our executive officers is set forth in Part I of this Report under the caption "Executive Officers."

The Company's Board of Directors has approved a Code of Conduct and Ethics that applies to the Company's employees, directors and officers (including the Company's principal executive officer, principal financial officer and principal accounting officers). The Code of Conduct and Ethics is available on the Company's website at www.astecindustries.com/investors/.

Item 11. Executive Compensation

Information included under the captions "Compensation Discussion and Analysis", "Executive Compensation", "Director Compensation", "Corporate Governance—Compensation Committee Interlocks and Insider Participation" and "Compensation Committee Report" in the Company's 2019 Proxy Statement is incorporated herein by reference.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Shareholder Matters

Equity Compensation Plan Information

The following table provides information as of December 31, 2018 regarding compensation plans under which the Company's equity securities are authorized for issuance.

Plan Category	(a) Number of Securities to be Issued Upon Exercise of Outstanding Options, Warrants, Rights and RSU's	(b) Weighted Average Exercise Price of Outstanding Options, Warrants and Rights ⁽³⁾	(c) Number of Securities Remaining Available for Future Issuance Under Equity Compensation Plans (Excluding Securities Reflected in Column (a))
Equity Compensation Plans Approved by Shareholders ⁽¹⁾	165,238 ⁽²⁾	N/A	503,635 ⁽⁴⁾
Equity Compensation Plans Not Approved by Shareholders ⁽⁵⁾	27,546 ⁽⁶⁾	N/A	71,736 ⁽⁷⁾
Total	<u>192,784</u>		<u>575,371</u>

(1) Our 2011 Incentive Plan.

(2) Represents unvested RSUs granted under our 2011 Incentive Plan.

(3) Restricted Stock Units do not have an exercise price.

(4) Represents shares available for issuance under our 2011 Incentive Plan.

(5) Our Amended and Restated Non-Employee Director Stock Incentive Plan.

(6) Represents Deferred Stock Units granted under our Amended and Restated Non-Employee Director Stock Incentive Plan.

(7) Represents shares available for issuance under our Amended and Restated Non-Employee Director Stock Incentive Plan.

Equity Compensation Plans Not Approved by Shareholders

Our Amended and Restated Non-Employee Directors Compensation Plan provides that annual retainers payable to our non-employee directors will be paid in the form of cash, unless the director elects to receive the annual retainer in the form of common stock, which may, at the director's option, be received on a deferred basis. If the director elects to receive Common Stock, whether on a current or deferred basis, the number of shares to be received is determined by dividing the dollar value of the annual retainer by the fair market value of the Common Stock on the date the retainer is payable.

In addition, our Amended and Restated Non-Employee Directors Compensation Plan also provides that each non-employee director will receive an annual stock award in the form of restricted stock units (RSUs) that vest on the day preceding the Company's next annual shareholder's meeting. The RSUs have no rights to dividends prior to their conversion to shares of Common Stock. Individual directors can elect to defer the conversion to Common Stock if they so choose.

Information included under the caption "Stock Ownership of Certain Beneficial Owners and Management" in the Company's 2019 Proxy Statement is incorporated herein by reference.

Item 13. Certain Relationships and Related Transactions and Director Independence

Information included under the captions "Corporate Governance—Independent Directors" and "Transactions with Related Persons" in the Company's 2019 Proxy Statement is incorporated herein by reference.

Item 14. Principal Accounting Fees and Services

Information included under the caption "Audit Matters" in the Company's 2019 Proxy Statement is incorporated herein by reference.

PART IV

Item 15. Exhibits and Financial Statement Schedules

(a)(1) The following financial statements and other information appear in Appendix "A" to this Report and are filed as a part hereof:

- . Selected Consolidated Financial Data.
- . Management's Discussion and Analysis of Financial Condition and Results of Operations.
- . Management's Report on Internal Control over Financial Reporting.
- . Reports of Independent Registered Public Accounting Firm.
- . Consolidated Balance Sheets as of December 31, 2018 and 2017.
- . Consolidated Statements of Operations for the Years Ended December 31, 2018, 2017 and 2016.
- . Consolidated Statements of Comprehensive Income (Loss) for the Years Ended December 31, 2018, 2017 and 2016.
- . Consolidated Statements of Cash Flows for the Years Ended December 31, 2018, 2017 and 2016.
- . Consolidated Statements of Equity for the Years Ended December 31, 2018, 2017 and 2016.
- . Notes to Consolidated Financial Statements.

(a)(2) Financial Statement Schedules are not filed with this Report because the Schedules are either inapplicable or the required information is presented in the Financial Statements or Notes thereto.

(a)(3) The following Exhibits are incorporated by reference into or are filed with this Report:

3.1	Amended and Restated Charter of the Company, adopted on April 28, 1986 and amended on September 7, 1988, May 31, 1989 and January 15, 1999 (incorporated by reference from the Company's Quarterly Report on Form 10-Q for the period ended September 30, 2011).
3.2	Amended and Restated Bylaws of the Company, adopted on March 14, 1990 and amended on July 29, 1993, July 26, 2007 and July 23, 2008 (incorporated by reference from the Company's Quarterly Report on Form 10-Q for the period ended March 31, 2011).
10.1	Trust under Astec Industries, Inc. Supplemental Retirement Plan, dated January 1, 1996 (incorporated by reference from the Company's Annual Report on Form 10-K for the year ended December 31, 1995). *
10.2	Astec Industries, Inc. 1998 Long-Term Incentive Plan (incorporated by reference from Appendix A of the Company's Proxy Statement for the 1998 Annual Meeting of Shareholders). *
10.3	Astec Industries, Inc. 2006 Incentive Plan (incorporated by reference from Appendix A of the Company's Proxy Statement for the 2006 Annual Meeting of Shareholders). *
10.4	Amendment Number 1 to Astec Industries, Inc. 2006 Incentive Plan (incorporated by reference from the Company's Annual Report on form 10-K for the year ended December 31, 2008).*
10.5	Astec Industries, Inc. Supplemental Executive Retirement Plan, as amended and restated through January 1, 2009 (incorporated by reference from the Company's Annual Report on Form 10-K for the year ended December 31, 2008). *
10.6	Amendment One to the Amended and Restated Astec Industries, Inc. Supplemental Executive Retirement Plan, effective October 21, 2010 (incorporated by reference from the Company's Annual Report on Form 10-K for the period ending December 31, 2010). *
10.7	Astec Industries, Inc. 2011 Incentive Plan (incorporated by reference from Appendix A of the Company's Definitive Proxy Statement for the 2011 Annual Meeting of Shareholders). *
10.8	Amended and Restated Credit Agreement, dated as of April 12, 2012, between Astec Industries, Inc. and Certain of its Subsidiaries and Wells Fargo Bank, National Association (incorporated by reference from the Company's Quarterly Report on Form 10-Q for the period ending March 31, 2012).
10.9	Amendment to "Appendix A" of the Astec Industries, Inc. Supplemental Executive Retirement Plan, effective April 28, 2016 (incorporated by reference from the Company's Quarterly Report on Form 10-Q for the period ending March 31, 2016). *
10.10	Astec Industries, Inc. Executive Change in Control Severance Plan, effective July 28, 2016 (incorporated by reference from the Company's Quarterly Report on Form 10-Q for the period ending June 30, 2016). *
10.11	Amendment to "Appendix A" of the Astec Industries, Inc. Supplemental Executive Retirement Plan, effective October 27, 2016 (incorporated by reference from the Company's Quarterly Report on Form 10-Q for the period ending September 30, 2016). *
10.12	Astec Industries, Inc. Amended and Restated Non-Employee Directors Compensation Plan, original effective April 23, 1998 with amended and restated provisions effective April 29, 2016 (incorporated by reference from the Company's Annual Report on Form 10-K for the period ending December 31, 2016 filed on March 1, 2017). *
10.13	Amendment to "Appendix A" of the Astec Industries, Inc. Supplemental Executive Retirement Plan, effective April 27, 2017 (incorporated by reference from the Company's Quarterly Report on Form 10-Q for the period ending March 31, 2017). *
10.14	First Amendment to Amended and Restated Credit Agreement, dated as of April 12, 2017, between Astec Industries, Inc. and Certain of its Subsidiaries and Wells Fargo Bank, National Association (incorporated by reference from the Company's Quarterly Report on Form 10-Q for the period ending March 31, 2017)

10.15	Amendment to "Appendix A" of the Astec Industries, Inc. Supplemental Executive Retirement Plan, effective July 27, 2017 (incorporated by reference from the Company's Quarterly Report on Form 10-Q for the period ending June 30, 2017). *
10.16	Amendment to "Appendix A" of the Astec Industries, Inc. Supplemental Executive Retirement Plan, effective October 26, 2017 (incorporated by reference from the Company's Quarterly Report on Form 10-Q for the period ending September 30, 2017). *
10.17	Amendment to "Appendix A" of the Astec Industries, Inc. Supplemental Executive Retirement Plan, effective February 23, 2018 (incorporated by reference from the Company's Quarterly Report on Form 10-Q for the period ending March 31, 2018). *
10.18	Amendment to "Appendix A" of the Astec Industries, Inc. Supplemental Executive Retirement Plan, effective August 2, 2018 (incorporated by reference from the Company's Quarterly Report on Form 10-Q for the period ending June 30, 2018). *
10.19	Pellet Plant Agreement between Astec, Inc., Astec Industries, Inc. Highlands Pellets, LLC, Highlands, LLC, Arkansas Teacher Retirement System and GIP CAPS Pine L.P. (incorporated by reference from the Company's Quarterly Report on Form 10-Q for the period ending June 30, 2018).
10.20	Separation Agreement and General Release, dated January 21, 2019, between Benjamin G. Brock and Astec Industries, Inc. (incorporated by reference from the Company's Current Report on Form 8-K filed on January 22, 2019).
10.21	Amendment to Exhibit A of the Astec Industries, Inc. Executive Change in Control Severance Plan, effective February 21, 2019 *
10.22	Amendment to "Appendix A" of the Astec Industries, Inc. Supplemental Executive Retirement Plan, effective January 1, 2019. *
10.23	Second Amendment to Amended and Restate Credit Agreement, effective February 26, 2019.
21	Subsidiaries of the Registrant.
23	Consent of Independent Registered Public Accounting Firm.
31.1	Certification of Interim Chief Executive Officer of Astec Industries, Inc. pursuant Rule 13a-14(a)/15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act Of 2002.
31.2	Certification of Chief Financial Officer of Astec Industries, Inc. pursuant Rule 13a-14(a)/15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act Of 2002.
32	Certification of Interim Chief Executive Officer and Chief Financial Officer of Astec Industries, Inc. pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act Of 2002.
101.INS	XBRL Instance Document
101.SCH	XBRL Taxonomy Extension Schema
101.CAL	XBRL Taxonomy Extension Calculation Linkbase
101.DEF	XBRL Taxonomy Extension Definition Linkbase
101.LAB	XBRL Taxonomy Extension Label Linkbase
101.PRE	XBRL Taxonomy Extension Presentation Linkbase

* Management contract or compensatory plan or arrangement.

- (b) The Exhibits to this Report are listed under Item 15(a)(3) above.
- (c) The Financial Statement Schedules to this Report are listed under Item 15(a)(2) above.

The Exhibits are numbered in accordance with Item 601 of Regulation S-K. Inapplicable Exhibits are not included in the list.

Item 16. Form 10-K Summary

None

APPENDIX “A”
to
ANNUAL REPORT ON FORM 10-K
ITEMS 6, 7, 7A, 8, 9A and 15(a)(1), (2) and (3) and 15(b) and 15(c)

**INDEX TO FINANCIAL STATEMENTS AND
FINANCIAL STATEMENT SCHEDULES**

ASTEC INDUSTRIES, INC.

Contents	Page
Selected Consolidated Financial Data	A-3
Supplementary Financial Data	A-4
Management's Discussion and Analysis of Financial Condition and Results of Operations	A-5
Management's Report on Internal Control over Financial Reporting	A-23
Reports of Independent Registered Public Accounting Firm	A-26
Consolidated Balance Sheets as of December 31, 2018 and 2017	A-29
Consolidated Statements of Operations for the Years Ended December 31, 2018, 2017 and 2016	A-30
Consolidated Statements of Comprehensive Income (Loss) for the Years Ended December 31, 2018, 2017 and 2016	A-31
Consolidated Statements of Cash Flows for the Years Ended December 31, 2018, 2017 and 2016	A-32
Consolidated Statements of Equity for the Years Ended December 31, 2018, 2017 and 2016	A-34
Notes to Consolidated Financial Statements	A-35
Comparison of 5-Year Cumulative Total Return	A-64

**FINANCIAL
INFORMATION**

SELECTED CONSOLIDATED FINANCIAL DATA

(in thousands, except as noted*)

	2018	2017	2016	2015	2014
Consolidated Statement of Operations Data					
Net sales	\$ 1,171,599	\$ 1,184,739	\$ 1,147,431	\$ 983,157	\$ 975,595
Gross profit	135,766	243,129	265,269	218,843	215,316
Gross profit %	11.6%	20.5%	23.1%	22.3%	22.1%
Selling, general and administrative expenses	180,795	160,775	153,145	145,180	141,490
Research and development	28,332	26,817	24,969	23,676	22,129
Restructuring and asset impairment charges	13,060	--	--	--	--
Income (loss) from operations	(86,421)	55,537	87,155	49,987	51,697
Interest expense	(1,045)	(840)	(1,395)	(1,611)	(720)
Other income	536	1,218	529	3,055	1,207
Net income (loss)	(60,744)	37,590	54,988	31,966	34,206
Net income (loss) attributable to controlling interest	(60,449)	37,795	55,159	32,797	34,458
Earnings (loss) per common share*:					
Net income (loss) attributable to controlling interest					
Basic	(2.64)	1.64	2.40	1.43	1.51
Diluted	(2.64)	1.63	2.38	1.42	1.49
Consolidated Balance Sheet Data					
Working capital	\$ 371,760	\$ 423,823	\$ 407,972	\$ 399,785	\$ 388,862
Total assets	855,457	889,579	843,601	777,353	802,265
Short-term debt	--	--	4,632	--	2,814
Current maturities of long-term debt	413	2,469	2,538	4,528	1,027
Long-term debt, less current maturities	59,709	1,575	4,116	5,154	7,061
Total equity	585,290	686,765	648,841	609,858	596,152
Cash dividends declared per common share*	0.42	0.40	0.40	0.40	0.40
Book value per share at year-end (shareholders' equity / diluted shares outstanding for the year)*	25.53	29.58	27.99	26.30	25.62

SUPPLEMENTARY FINANCIAL DATA

(in thousands, except as noted*)

Quarterly Financial Highlights (Unaudited)

		<u>First Quarter</u>	<u>Second Quarter</u>	<u>Third Quarter</u>	<u>Fourth Quarter</u>
2018	Net sales	\$ 325,453	\$ 272,528	\$ 256,613	\$ 317,005
	Gross profit (loss)	78,005	1,108	58,284	(1,631)
	Net income (loss)	20,216	(40,768)	6,903	(47,095)
	Net income (loss) attributable to controlling interest	20,267	(40,674)	6,995	(47,037)
	Earnings (loss) per common share*				
	Net income (loss) attributable to controlling interest:				
	Basic	0.88	(1.76)	0.31	(2.08)
	Diluted	0.87	(1.76)	0.30	(2.08)
	Dividends paid	0.10	0.10	0.11	0.11
2017	Net sales	\$ 318,401	\$ 301,909	\$ 252,054	\$ 312,375
	Gross profit	75,771	65,524	39,084	62,750
	Net income (loss)	15,080	14,359	(2,703)	10,854
	Net income (loss) attributable to controlling interest	15,120	14,420	(2,667)	10,922
	Earnings (loss) per common share*				
	Net income (loss) attributable to controlling interest:				
	Basic	0.66	0.63	(0.12)	0.47
	Diluted	0.65	0.62	(0.12)	0.47
	Dividends paid	0.10	0.10	0.10	0.10
Common Stock Price*					
	2018 High	\$ 64.80	\$ 61.61	\$ 63.69	\$ 52.88
	2018 Low	53.89	52.84	44.92	27.86
	2017 High	\$ 73.37	\$ 66.66	\$ 58.06	\$ 59.22
	2017 Low	59.02	52.35	45.70	48.44

The Company's common stock is traded in the Nasdaq National Market under the symbol ASTE. Prices shown are the high and low sales prices as announced by the Nasdaq National Market. As determined by the proxy search on the record date for the Company's 2019 annual shareholders' meeting, the number of holders of record is approximately 210.

MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

(Dollar and share amounts in thousands, except per share amounts, unless otherwise specified)

The following discussion contains forward-looking statements that involve inherent risks and uncertainties. Actual results may differ materially from those contained in these forward-looking statements. For additional information regarding forward-looking statements, see "Forward-looking Statements".

Overview

The Company is a leading manufacturer and seller of equipment for the road building, aggregate processing, geothermal, water, oil and gas, and wood processing industries. The Company's businesses:

design, engineer, manufacture and market equipment used in each phase of road building, including mining, quarrying and crushing the aggregate, mobile bulk and material handling solutions, producing asphalt or concrete, recycling old asphalt or concrete and applying the asphalt;

design, engineer, manufacture and market additional equipment and components, including equipment for geothermal drilling, oil and natural gas drilling, industrial heat transfer, wood chipping and grinding, commercial and industrial burners, combustion control systems; and

manufacture and sell replacement parts for equipment in each of its product lines.

The Company, as we refer to it herein, consists of a total of 22 companies that are consolidated in our financial statements, which include 17 manufacturing companies, three companies that operate as dealers for the manufacturing companies, a captive insurance company and the parent company. The companies fall within three reportable operating segments: the Infrastructure Group, the Aggregate and Mining Group and the Energy Group.

Infrastructure Group - This segment consists of five business units, three of which design, engineer, manufacture and market a complete line of asphalt plants, asphalt pavers and related components and ancillary equipment. The two remaining companies in the Infrastructure Group are Company-owned dealers which sell, service and install equipment produced by the manufacturing subsidiaries of the Company, with the majority of sales to the infrastructure industry. The Company-owned dealer in Germany is being closed in 2019 and its assets liquidated.

Aggregate and Mining Group - This segment consists of eight business units that design, manufacture and market heavy equipment and parts in the aggregate, metallic mining, quarrying, recycling, ports and bulk handling industries.

Energy Group - This segment consists of six business units that design, manufacture and market heaters, gas, oil and combination gas/oil burners, combustion control systems, drilling rigs, concrete plants, wood chippers and grinders, pump trailers, commercial and industrial burners, combustion control systems, storage equipment and related parts to the oil and gas, construction, and water well industries. RexCon, Inc. was added to this group effective October 1, 2017 as described below.

Individual Company subsidiaries included in the composition of the Company's segments are as follows:

1. **Infrastructure Group** – Astec, Inc., Roadtec, Inc., Carlson Paving Products, Inc., Astec Australia, Pty Ltd and Astec Mobile Machinery GmbH (which is being dissolved in 2019).
2. **Aggregate and Mining Group** – Telsmith, Inc., Kolberg-Pioneer, Inc., Johnson Crushers International, Inc., Osborn Engineered Products SA (Pty) Ltd, Breaker Technology, Inc., Astec Mobile Screens, Inc., Astec do Brasil Fabricacao de Equipamentos LTDA and Telestack Limited.
3. **Energy Group** – Heatec, Inc., CEI, Inc., GEFCO, Inc., Peterson Pacific Corp., Power Flame Incorporated and RexCon, Inc. Power Flame Incorporated was acquired and added to the group in August 2016. RexCon, Inc. was added to the group upon its formation and acquired substantially all of the assets and liabilities of RexCon LLC in October 2017.

The Company also has one other category, Corporate, that contains the business units that do not meet the requirements for separate disclosure as a separate operating segment or inclusion in one of the other reporting segments. The business units in the Corporate category are Astec Insurance Company (“Astec Insurance” or “the captive”), Astec Industries LatAm SpA, a Company-owned distributor in Chile in the start-up phase of operations and Astec Industries, Inc., the parent company.

The Company’s financial performance is affected by a number of factors, including the cyclical nature and varying conditions of the markets it serves. Demand in these markets fluctuates in response to overall economic conditions and is particularly sensitive to the amount of public sector spending on infrastructure development, privately funded infrastructure development, changes in the prices of liquid asphalt, oil and natural gas and steel.

Federal funding provides a significant portion of all highway, street, roadway and parking construction in the United States. The Company believes that federal highway funding influences the purchasing decisions of the Company’s customers, who are typically more comfortable making capital equipment purchases with long-term federal legislation in place.

In July 2012, the “Moving Ahead for Progress in the 21st Century Act” (“Map-21”) was approved by the U.S. federal government, which authorized \$105 billion of federal spending on highway and public transportation programs through fiscal year 2014. In August 2014, the U.S. government approved short-term funding of \$10.8 billion through May 2015. Federal transportation funding operated on short-term appropriations until December 4, 2015 when the Fixing America’s Surface Transportation Act (“FAST Act”) was signed into law. The \$305 billion FAST Act approved funding for highways of approximately \$205 billion and transit projects of approximately \$48 billion for the five-year period ending September 30, 2020.

The Company believes a multi-year highway program (such as the FAST Act) will have the greatest positive impact on the road construction industry and allows its customers to plan and execute longer-term projects. Given the inherent uncertainty in the political process, the level of governmental funding for federal highway projects will similarly continue to be uncertain. Since elected in late 2016, the current executive branch of the federal government has stressed that one of its priorities is a new infrastructure bill including increased funding for roads, bridges, tunnels, airports, railroads, ports and waterways, pipelines, clean water infrastructure, energy infrastructure and telecommunication needs. Proposals being considered may rely in part on direct federal spending as well as increased private sector funding in exchange for federal tax credits. Governmental funding that is committed or earmarked for federal highway projects is always subject to repeal or reduction. Although continued funding under the FAST Act or funding of a bill passed by the new administration is expected, it may be at lower levels than originally approved or anticipated. In addition, Congress could pass legislation in future sessions that would allow for diversion of previously appropriated highway funds for other purposes, or it could restrict funding of infrastructure projects unless states comply with certain federal policies. The level of future federal highway construction is uncertain and any future funding may be at levels lower than those currently approved or that have been approved in the past.

The public sector spending described above is needed to fund road, bridge and mass transit improvements. The Company believes that increased funding is unquestionably needed to restore the nation’s highways to a quality level required for safety, fuel efficiency and mitigation of congestion. In the Company’s opinion, amounts needed for such improvements are significantly greater than amounts approved to date, and funding mechanisms such as the federal usage fee per gallon of gasoline, which is still at the 1993 level of 18.4 cents per gallon, would likely need to be increased along with other measures to generate the funds needed.

In addition to public sector funding, the economies in the markets the Company serves, the price of liquid asphalt, the price of oil and natural gas, and the price of steel may each affect the Company’s financial performance. Economic downturns generally result in decreased purchasing by the Company’s customers, which, in turn, causes reductions in sales and increased pricing pressure on the Company’s products. Rising interest rates also typically negatively impact customers’ attitudes toward purchasing equipment. The Federal Reserve has maintained historically low interest rates in response to the economic downturn which began in 2009; however, the Federal Reserve has increased the Federal Funds Rate several times in recent quarters, beginning in December 2016 and future rate increases are expected; however, the current Federal Funds Rate is still considered in the historically low range.

Significant portions of the Company's revenues from the Infrastructure Group relate to the sale of equipment involved in the production, handling, recycling or application of asphalt mix. Liquid asphalt is a by-product of oil refining. An increase or decrease in the price of oil impacts the cost of asphalt, which is likely to alter demand for asphalt and therefore affect demand for certain Company products. While increasing oil prices may have a negative financial impact on many of the Company's customers, the Company's equipment can use a significant amount of recycled asphalt pavement, thereby partially mitigating the effect of increased oil prices on the final cost of asphalt for the customer. The Company continues to develop products and initiatives to reduce the amount of oil and related products required to produce asphalt. Oil price volatility makes it difficult to predict the costs of oil-based products used in road construction such as liquid asphalt and gasoline. Oil prices began rising in early 2016 and have continued to fluctuate during 2017 and 2018. Fluctuations are expected to continue in the future. Minor fluctuations in oil prices should not have a significant impact on customers' buying decisions. Other factors such as political uncertainty in oil producing countries, interruptions in oil production due to disasters, whether natural or man-made, or other economic factors could significantly impact oil prices, which could negatively impact demand for the Company's products. The Company believes the continued funding of the FAST Act federal highway bill passed in December 2015 has a greater potential to impact the buying decisions of the Company's customers than does the fluctuation of oil prices in 2019.

Contrary to the impact of oil prices on many of the Company's Infrastructure Group products as discussed above, the products manufactured by the Energy Group, which are used in drilling for oil and natural gas, in heaters for refineries and oil sands, and in double fluid pump trailers for fracking and oil and gas extraction, would benefit from higher oil and natural gas prices, to the extent that such higher prices lead to increased development in the oil and natural gas production industries. The Company believes further development of domestic oil and natural gas production capabilities is needed and would positively impact demand for the Company's oil and gas related products.

Steel is a major component in the Company's equipment. Steel prices rose significantly during the first half of 2018 and were impacted by the Section 232 and 301 tariffs enacted. Steel prices have stabilized at the elevated levels, and the Company anticipates prices to remain in this range for the first half of 2019. The Company continues to utilize forward-looking contracts (with no minimum or specified quantity guarantees) coupled with advanced steel purchases to minimize the impact of any price increases. The Company will continue to review the trends in steel prices in 2019 and establish future contract pricing accordingly.

In addition to the factors stated above, many of the Company's markets are highly competitive, and its products compete worldwide with a number of other manufacturers and dealers that produce and sell similar products. From 2010 through mid-2012, a weak U.S. dollar, combined with improving economic conditions in certain foreign economies, had a positive impact on the Company's international sales. The continued strengthened U.S. dollar since mid-2012 has negatively impacted pricing in certain foreign markets the Company serves. The Company expects the U.S. dollar to remain strong in the near term relative to most foreign currencies. Increasing domestic interest rates or weakening economic conditions abroad could cause the U.S. dollar to further strengthen, which could negatively impact the Company's international sales.

In the United States and internationally, the Company's equipment is marketed directly to customers as well as through dealers. During 2018, approximately 60% of the Company's sales were to the end user. The Company expects this ratio to be between 60% and 70% for 2019.

The Company is operated on a centrally led, but decentralized basis, with a complete operating management team for each operating subsidiary. Finance, insurance, legal, shareholder relations, corporate accounting and other corporate matters are primarily managed at the corporate level (i.e., Astec Industries, Inc., the parent company). The engineering, design, sales, manufacturing and basic accounting functions are the responsibility of each individual subsidiary. Standard accounting procedures are prescribed and followed in all reporting.

The Company's current profit sharing plans allow corporate officers, subsidiary presidents and other key management employees at each subsidiary the opportunity to earn profit sharing incentives based upon the Company's and/or the individual groups or subsidiaries' return on capital employed, EBITDA margin and safety. Corporate officers' and subsidiary presidents' awards, when calculated at targeted performance, are between 35% and 100% of their base salary, depending upon their responsibilities, and the plans allow for awards of up to 200% of target incentive compensation. Each subsidiary also has the opportunity to earn up to 10% of its after-tax profit as a profit-sharing incentive award to be paid to its employees.

The Company's current long-term incentive plans allow corporate officers, subsidiary presidents and other corporate or subsidiary management employees to be awarded Restricted Stock Units ("RSUs") if certain goals are met based upon the Company's Total Shareholder's Return ("TSR") as compared to a peer group and the Company's pretax profit margin. The grant date value of corporate officers' and subsidiary presidents' awards, when calculated at targeted performance, are between 20% and 100% of their base salary, depending upon their responsibilities, and the plans allow for awards of up to 200% of target incentive compensation. Additional RSUs may be granted to other key subsidiary management employees based upon individual subsidiary profits.

Beginning in 2018 and continuing through mid-2019, the Company retained the services of a specialized consulting firm to assist with the accumulation of company-wide purchasing data and a system for maintaining similar data in the future for management to utilize in negotiations with suppliers or potential suppliers in order to obtain reduced prices on raw materials and equipment components purchased. The firm is also assisting with the development of sales and operational planning procedures designed to achieve significant reductions in inventory levels maintained for normal production needs and to reduce existing excess inventories. The Company expects the results of these efforts to positively impact its gross margins and inventory levels in 2019 and the future.

Results of Operations: 2018 vs. 2017

Pellet Plant Agreement

The Company was party to a 2015 sales contract with the purchaser of a large wood pellet plant, on which \$143,300 of cumulative revenue had previously been recorded based on the over-time method. The contract contained certain production output and operational provisions, which if not timely met, could have resulted in the Company having to refund the purchase price to the customer. Additional contract provisions could have required the Company to compensate the customer for production shortfalls caused by the Company and other potential costs (depending on the market price of wood pellets). The plant did not meet the production output and operational specifications by the deadline set forth in the contract and the Company subsequently entered into an agreement with the customer on July 20, 2018 whereby the Company agreed to pay the customer \$68,000 and to forgive \$7,315 in accounts receivable to obtain a full release of all the Company's contractual obligations under the sales contract. The terms of the pellet plant agreement resulted in the Company's Infrastructure Group recording reductions in sales of \$75,315 and gross margins of \$71,029 in 2018. The Company paid the scheduled \$68,000 during 2018. The pellet plant agreement also stipulates that the customer will pay the Company \$7,000 if the wood pellet plant's performance satisfies certain emissions targets prior to May 1, 2019.

Georgia Pellet Plant

The Company manufactured its first wood pellet plant for a customer under a Company-financed arrangement whereby the Company deferred the recognition of revenue as payment under the arrangement was not assured. The original customer is attempting to obtain financing to purchase the plant at a reduced price; however, the Company believes the ultimate consummation of the sale to this customer is uncertain. After considering the uncertainty of completing the sale to the existing customer; the lack of success in attempting to market the plant to other pellet plant operators; the cost of repossessing the plant; and the Company's decision to exit the pellet plant business line, the pellet plant inventory's net realizable value has been written down to zero, resulting in a charge to cost of sales of \$65,706 in the fourth quarter of 2018.

Net Realizable Value Inventory Adjustment

Inventories are valued at the lower of cost or net realizable value which requires the Company to make specific estimates, assumptions and professional judgement to determine if adjustments of inventories values to their net realizable value are necessary. In the fourth quarter of 2018, after an in-depth analysis of the age, quantities on hand, market acceptance of the equipment, management's inventory and working capital control objectives, and other related factors, it was determined that various specific equipment models of the Company's Energy Group inventories, primarily related to oil and gas equipment, required an adjustment of \$7,487 to cost of sales to reduce inventories to their net realizable values.

Liquidation of Subsidiary

While reviewing performance criteria against actual results of all Astec companies during a strategic planning meeting held by management in late 2018, it was determined that Astec Mobile Machinery GmbH ("AMM") did not meet the desired performance metrics. Documents were filed by the Company in the German court system in December 2018 to begin the process of liquidating AMM. The Company expects the liquidation of AMM to be completed in 2019. A restructuring charge of \$1,870 was recorded by the Infrastructure Group in December 2018 related to the liquidation of AMM.

Goodwill Impairment

The Company tests goodwill at least annually for impairment. Goodwill testing and valuation procedures were performed by the Company in the fourth quarter of 2018 using actual financial results and forecasts approved by the Company. The testing resulted in impairments at two of the businesses recently acquired by the Company, RexCon, Inc. and Power Flame Incorporated. As a result, the Energy Group recorded goodwill impairment of \$11,190 in the fourth quarter of 2018.

Net Sales

Net sales decreased \$13,140 or 1.1% to \$1,171,599 in 2018 from \$1,184,739 in 2017. Sales are generated primarily from new equipment purchases made by customers for use in construction of privately funded infrastructure, public sector spending on infrastructure and sales of equipment for the aggregate, mining, wood pellet, quarrying and recycling markets, and for oil and gas and geothermal industries. Excluding the \$75,315 one-time pellet plant sales reduction described above, total net sales increased \$62,175 between years.

Domestic sales for 2018 were \$915,814 or 78.2% of net sales compared to \$932,294 or 78.7% of net sales for 2017, a decrease of \$16,480 or 1.8%. The decrease in domestic sales was due to the one-time pellet plant charge described above. This sales decrease was offset by increased non-pellet related equipment sales of \$58,835 from 2017 to 2018 resulting from sales increases in most of the Company's Energy and Aggregate and Mining major product lines due to the continuing positive economic conditions in the domestic markets and the impact of the FAST Act funding.

International sales for 2018 were \$255,785 or 21.8% of net sales compared to \$252,445 or 21.3% of net sales for 2017, an increase of \$3,340 or 1.3%. The Company experienced improved international sales for its aggregate and mining equipment during 2018 and decreased sales of infrastructure related equipment during 2018, while equipment sold by the Energy Group remained relatively flat between 2017 and 2018. Sales reported by the Company for 2018 would have been \$750 higher had 2018 foreign exchange rates been the same as 2017 rates. The increase in international sales occurred primarily in South America, Africa, Europe and the Middle East, offset by sales decline in Asia, Brazil, Russia, Canada and China. The Company continues its efforts to grow its international business by increasing its presence in the markets it serves and the opening of Company-owned distributors.

Parts sales for 2018 were \$308,703 or 26.3% of net sales compared to \$283,361 or 23.9% of net sales for 2017, an increase of \$25,342 or 8.9%. All of the Company's major product lines experienced increased parts sales in 2018 as compared to 2017.

Gross Profit

Gross profit for 2018 was \$135,766 or 11.6% of net sales as compared to \$243,129 or 20.5% of net sales in 2017, a decline of \$107,363 or 44.2%. The decrease in gross profit was primarily due to the pellet plant charges discussed above, which resulted in a decrease in gross margins of \$136,735. These decreases were offset by increases of \$29,372 in gross profit (non-pellet related) in all other product lines.

Selling, General and Administrative Expense

Selling, general and administrative expense for 2018 was \$180,795 or 15.4% of net sales compared to \$160,775 or 13.6% of net sales for 2017, an increase of \$20,020 or 12.5% primarily due to increases in payroll and related expense of \$10,005, consulting expense of \$7,032, commissions and travel expenses of \$6,745 and legal and professional fee expense of \$3,039, offset by a decrease in ConExpo expense of \$4,363.

Research and Development

Research and development expenses increased \$1,515 or 5.6% to \$28,332 in 2018 from \$26,817 in 2017. During 2018, the Company continued its focus on research and development spending for new products as well as improvements to existing product lines and adaptation of those products to other markets.

Impairment and Restructuring Charges

Impairment and restructuring charges total \$13,060 in 2018 and include a goodwill impairment charge of \$11,190 and a charge of \$1,870 related to the closing of the Company-owned distributor in Germany, which is expected to be completed in 2019.

Interest Expense

Interest expense in 2018 increased \$205 or 24.4% to \$1,045 from \$840 in 2017 due to an increase in debt levels of the Company in 2018.

Interest Income

Interest income decreased \$350 or 26.9% to \$952 in 2018 from \$1,302 in 2017 due primarily to a reduction in interest received in 2018 from a wood pellet plant customer compared to amounts received in 2017.

Other Income

Other income decreased \$682 or 56.0% to \$536 in 2018 from \$1,218 in 2017. The decrease in other income is primarily due to the reclassification of licensing fees to sales under new accounting guidance adopted in 2018.

Income Tax

Income tax benefit for 2018 was \$25,234, compared to income tax expense of \$19,627 for 2017. The effective tax rates for 2018 and 2017 were 29.3% and 34.3%, respectively. The Company's tax rates are affected by recurring items which are generally consistent from period to period, as well as discrete items that may occur in any given period but are not consistent from period to period. In addition to the U.S. federal tax rate reduction from 35% to 21% for tax years beginning in 2018 and state income tax expense or benefit items, the items having the most significant impact on the effective tax rate for 2018 include a benefit of \$4,660 for research and development tax credits, a benefit of \$1,403 for the liquidation of a foreign subsidiary, expense of \$978 for domestic and foreign valuation allowance changes and expense of \$1,856 related to unrecognized tax benefits for tax positions taken in 2018.

Net Income Attributable To Controlling Interest

The Company had a net loss attributable to controlling interest of \$60,449 in 2018 compared to net income of \$37,795 in 2017, a decrease of \$98,244. Earnings per diluted share decreased \$4.27 to a loss of \$2.64 in 2018 from income of \$1.63 in 2017. Weighted average diluted shares outstanding for the years ended December 31, 2018 decreased to 22,902 from 23,184 in 2017, due primarily to the Company repurchasing 582 shares of its common stock in late 2018 under the Company's stock buy-back program partially offset by stock incentive plan activity.

Backlog

The backlog of orders at December 31, 2018 was \$344,962 compared to \$411,469 at December 31, 2017, a decrease of \$66,507 or 16.2%. The decrease in the backlog of orders was due to a decrease in domestic backlog of \$75,161, including a \$60,249 reduction of pellet plant related backlog, partially offset by an increase in international backlog of \$8,654 or 11.5%. The Infrastructure Group backlog decreased \$90,058, including \$60,249 of pellet plant related backlog, or 37.6% from 2017. The Aggregate and Mining Group backlog increased \$13,704 or 11.7% from 2017, and the backlog in the Energy Group increased \$9,847 or 17.9% over the 2017 levels. The Company is unable to determine whether the changes in backlogs were experienced by the industry as a whole.

Net Sales by Segment

	2018	2017	\$ Change	% Change
Infrastructure Group	\$ 442,289	\$ 553,691	\$ (111,402)	(20.1)%
Aggregate and Mining Group	453,164	403,720	49,444	12.2%
Energy Group	276,146	227,328	48,818	21.5%

Infrastructure Group: Sales in this group decreased \$111,402 or 20.1%. Domestic sales for the Infrastructure Group decreased \$92,643 or 19.9% in 2018 compared to 2017. The decrease in domestic sales was due primarily to the one-time pellet plant sales reduction of \$75,315 discussed above. International sales for the Infrastructure Group decreased \$18,759 or 21.5% in 2018 compared to 2017. The decrease in international sales for the Infrastructure Group occurred mainly in Canada, Russia, the West Indies, Mexico and Post-Soviet States. Parts sales for the Infrastructure Group increased 4.5% in 2018 compared to 2017. The Company expects to introduce new asphalt plant models in 2019 that are designed to better meet the needs of the international market.

Aggregate and Mining Group: Sales in this group increased \$49,444 or 12.2%. Domestic sales for the Aggregate and Mining Group increased \$24,592 or 8.9% in 2018 compared to 2017 primarily due to improved sales into the Company's traditional rock quarry markets and increased sales of the Company's larger aggregate equipment. International sales for the Aggregate and Mining Group increased \$24,852 or 19.7% in 2018 compared to 2017. The increase in international sales is due to increased sales by the Company's Northern Ireland subsidiary due to an improved mix of project machines compared to highly customized equipment, and the Company's continued sales efforts in the international markets. The increase in international sales for the Aggregate and Mining Group occurred primarily in South America, Africa, Europe, the Middle East, Mexico and Russia and was offset by sales declines in Asia, Brazil, Post-Soviet States, Japan and China. Parts sales for the Aggregate and Mining Group increased 12.1% in 2018 compared to 2017 due to an increase in parts packages sold with equipment orders, improved sales by the Company's South African subsidiary and sales into the traditional rock quarry markets.

Energy Group: Sales in this group increased \$48,818 or 21.5%. Domestic sales for the Energy Group increased \$51,571 or 27.4% in 2018 compared to 2017 due to an increase in RexCon (acquired in October 2017) concrete plant sales of \$31,200 compared to 2017 and improved sales of oil and gas pumps, industrial heaters and related equipment. International sales for the Energy Group decreased \$2,753 or 7.0% in 2018 compared to 2017. The decrease in international sales was due primarily to decreased sales of oil and gas drilling rigs. The decrease in international sales occurred in Australia, China, Brazil and the Middle East and was offset by increased sales in Canada and South America (excluding Brazil). Parts sales for the Energy Group increased 14.8% in 2018 compared to 2017 due to increased sales in all major product lines.

Segment Profit (Loss)

	2018	2017	\$ Change	% Change
Infrastructure Group	\$ (112,954)	\$ 26,641	\$ (139,595)	(524.0)%
Aggregate and Mining Group	45,464	35,748	9,716	27.2%
Energy Group	3,070	16,219	(13,149)	(81.1)%
Corporate	1,586	(40,963)	42,549	103.9%

Infrastructure Group: Profit for this group decreased \$139,595 from 2017. This group's profits were impacted by a decrease in gross profit of \$130,384 (including a decrease in gross margins of \$136,735 due primarily to the pellet plant charges discussed above).

Aggregate and Mining Group: Profit for this group increased \$9,716 or 27.2% from 2017. This group's profits were impacted by an increase in gross profit of \$19,180 on increased sales of \$49,444 and by a 170 basis point increase in gross margin due to product mix considerations and increased margins at the Company's Canadian, South African and certain domestic subsidiaries.

Energy Group: Profit for this group decreased \$13,149 or 81.1% from 2017. This group's profits were impacted by a 290 basis point decrease in gross margins (due partially to the \$7,487 net realizable value adjustments discussed above), which was offset by an increase of \$3,977 in gross margin dollars on an increase in sales of \$48,818. The group's profits were negatively impacted by a \$17,335 increase in selling, general and administrative expenses, of which \$11,190 relates to goodwill impairments recorded by Power Flame and RexCon, which were acquired in 2016 and 2017, respectively.

Corporate: Net corporate expenses decreased \$42,549 from 2017, primarily due to decreased income taxes of \$46,125 offset by increased repairs and maintenance of \$2,225 (primarily a major plane engine overhaul) and increased accounting fees of \$1,413.

Results of Operations: 2017 vs. 2016

Net Sales

Net sales increased \$37,308 or 3.3% to \$1,184,739 in 2017 from \$1,147,431 in 2016. Sales are generated primarily from new equipment purchases made by customers for use in construction of privately funded infrastructure, public sector spending on infrastructure and sales of equipment for the aggregate, mining, wood pellet, quarrying and recycling markets, and for oil and gas and geothermal industries. Excluding a decline in domestic wood pellet plant sales discussed below, total sales increased \$164,508 between years.

Domestic sales for 2017 were \$932,294 or 78.7% of net sales compared to \$941,273 or 82.0% of net sales for 2016, a decrease of \$8,979 or 1.0%. The decrease in domestic sales was due to a \$127,200 decline in pellet plant related sales due to no new orders being received in 2017, offset by increases in sales of most of the Company's other major product lines due to the continuing positive economic conditions in the domestic markets and the impact of the FAST Act funding.

International sales for 2017 were \$252,445 or 21.3% of net sales compared to \$206,158 or 18.0% of net sales for 2016, an increase of \$46,287 or 22.5%. The Company experienced improved markets for most of its major product lines internationally in 2017 compared to 2016 caused by improved global market conditions, the stabilization of the U.S. dollar in certain foreign markets and a slight recovery in the mining and oil and gas sectors. The Company believes its strategy of keeping its sales and service structure in place during the recent downturn aided international sales in 2017. Sales reported by the Company for 2017 would have been \$2,884 lower had 2017 foreign exchange rates been the same as 2016 rates. The increase in international sales occurred primarily in Canada, Russia, Australia, Brazil and Africa, offset by sales decline in South America (excluding Brazil), Japan and Mexico. The Company continues its efforts to grow its international business by increasing its presence in the markets it serves.

Parts sales for 2017 were \$283,361 or 23.9% of net sales compared to \$263,457 or 23.0% of net sales for 2016, an increase of \$19,904 or 7.6%. All of the Company's major product lines experienced increased parts sales in 2017 as compared to 2016.

Gross Profit

Gross profit for 2017 was \$243,129 or 20.5% of net sales as compared to \$265,269 or 23.1% of net sales in 2016, a decline of \$22,140 or 8.3%. Due to cost overruns incurred in 2017 by the Company on the installation phase of its customer's Arkansas wood pellet plant sold in 2016 and the identification of design issues its customers' wood pellet plants in Arkansas and Georgia discovered in the third quarter of 2017, the Company experienced an overall reduction in wood pellet plant margins of \$60,107 between years. As the Company financed the sale of the \$60,249 Georgia wood pellet plant, no revenue from the sale has been recorded.

Selling, General and Administrative Expense

Selling, general and administrative expense for 2017 was \$160,775 or 13.6% of net sales compared to \$153,145 or 13.3% of net sales for 2016, an increase of \$7,630 or 5.0%, due to an increase of \$8,646 in selling expenses resulting primarily from increased ConExpo Show-related costs of \$4,355 and other increased costs related to the \$164,508 increase in total sales excluding wood pellet plants.

Research and Development

Research and development expenses increased \$1,848 or 7.4% to \$26,817 in 2017 from \$24,969 in 2016. During 2017, the Company continued its focus on research and development spending for new products as well as improvements to existing product lines and adaptation of those products to other markets.

Interest Expense

Interest expense in 2017 decreased \$555 or 39.8%, to \$840 from \$1,395 in 2016 due to a reduction in debt levels at the Company's subsidiary in Brazil and reduced interest on tax return audit assessments.

Interest Income

Interest income increased \$496 or 61.5% to \$1,302 in 2017 from \$806 in 2016 due primarily to interest received in 2017 from a wood pellet plant customer.

Other Income

Other income increased \$689 or 130.2% to \$1,218 in 2017 from \$529 in 2016 due primarily to a \$347 deposit forfeited by a customer on a cancelled order, reduced investment losses of \$180 and improved licensing fee income of \$105.

Income Tax

Income tax expense for 2017 was \$19,627, compared to \$32,107 for 2016. The effective tax rates for 2017 and 2016 were 34.3% and 36.9%, respectively. The reduction in tax rates between periods is due primarily to an increase in the percent impact of the Company's Domestic Production Activities Deduction and Research and Development Tax Credit (due to similar dollar impacts on lower taxable earnings) and a \$1,056 reduction in income tax expense in the fourth quarter of 2017 due to the application of the provisions of Tax Cuts and Jobs Act of 2017, enacted by the U.S. government on December 22, 2017.

Net Income Attributable To Controlling Interest

The Company had net income attributable to controlling interest of \$37,795 in 2017 compared to \$55,159 in 2016, a decrease of \$17,364, or 31.5%. Earnings per diluted share decreased \$0.75 to \$1.63 in 2017 from \$2.38 in 2016. Weighted average diluted shares outstanding for the years ended December 31, 2017 and 2016 were 23,184 and 23,142, respectively.

Backlog

The backlog of orders at December 31, 2017 was \$411,469 compared to \$361,831 at December 31, 2016, an increase of \$49,638, or 13.7%. Backlogs for both periods include a \$60,249 pellet plant order the Company which was later cancelled in mid-2018. The increase in the backlog of orders was due to an increase in domestic backlog of \$36,786 or 12.3% and an increase in international backlog of \$12,852 or 20.5%. The Infrastructure Group backlog increased \$7,271 or 3.1% from 2016. The Aggregate and Mining Group backlog increased \$28,036 or 31.5% from 2016 while the backlog in the Energy Group increased \$14,331 or 35.2% over the 2016 levels. The Company is unable to determine whether the changes in backlogs were experienced by the industry as a whole.

Net Sales by Segment

	2017	2016	\$ Change	% Change
Infrastructure Group	\$ 553,691	\$ 608,908	\$ (55,217)	(9.1)%
Aggregate and Mining Group	403,720	359,760	43,960	12.2%
Energy Group	227,328	178,763	48,565	27.2%

Infrastructure Group: Sales in this group decreased \$55,217 or 9.1%. Excluding a \$127,200 decrease in wood pellet plant sales, the group's sales increased \$71,983 in 2017 as compared to 2016. Domestic sales for the Infrastructure Group decreased \$80,666 or 14.7% in 2017 compared to 2016. The decrease in domestic sales was due to a \$127,200 decline in pellet plant related sales due to no new orders being received in 2017, offset by increases in sales of most other major product lines due to the continuing positive economic conditions in the domestic markets and the impact of the FAST Act funding. International sales for the Infrastructure Group increased \$25,449 or 41.3% in 2017 compared to 2016. The increase in international sales was due primarily to the improved sales of mobile asphalt equipment and increased sales by the Company owned distributor in Australia. The increase in international sales for the Infrastructure Group occurred mainly in Canada, Australia and Russia, offset by a decrease in sales in South America and Japan. Parts sales for the Infrastructure Group increased 3.7% in 2017 compared to 2016.

Aggregate and Mining Group: Sales in this group increased \$43,960 or 12.2%. Domestic sales for the Aggregate and Mining Group increased \$32,206 or 13.1% in 2017 compared to 2016 primarily due to improved sales into the Company's traditional rock quarry markets, increased sales of the Company's larger aggregate equipment due to the release of pent-up demand and increased sales by the Company's Northern Ireland subsidiary in the U.S. domestic market. International sales for the Aggregate and Mining Group increased \$11,754 or 10.3% in 2017 compared to 2016. The increase in international sales is due to an easing of pent-up demand, the Company's continued sales efforts in the international markets and improved sales by the Company's Brazilian subsidiary. The increase in international sales for the Aggregate and Mining Group occurred primarily in Canada, Brazil, Australia, Asia and Africa, offset by sales declines in Mexico, Japan and South America. Parts sales for the Aggregate and Mining Group increased 7.9% in 2017 compared to 2016 due to improved sales by the Company's South African subsidiary and sales into the traditional rock quarry markets.

Energy Group: Sales in this group increased \$48,565 or 27.2%. Domestic sales for the Energy Group increased \$39,482 or 26.6% in 2017 compared to 2016 due to an increase in sales of \$14,739 by Power Flame, which was acquired on August 1, 2016, and improved sales of wood chipping and grinding equipment, drilling rigs and oil and gas pumpers. RexCon, Inc., which was acquired on October 1, 2017, also contributed \$2,449 of domestic sales in 2017. International sales for the Energy Group increased \$9,083 or 30.0% in 2017 compared to 2016. The increase in international sales was due primarily to increased sales by Power Flame of \$3,287 and increased sales of oil and gas drilling rigs. The increase in international sales occurred in Canada, Africa, China, Brazil and the Middle East, offset by decreased sales in South America (excluding Brazil). Parts sales for the Energy Group increased 19.6% in 2017 compared to 2016 due to increased sales in all major product lines.

Segment Profit (Loss)

	2017	2016	\$ Change	% Change
Infrastructure Group	\$ 26,641	\$ 71,482	\$ (44,841)	(62.7)%
Aggregate and Mining Group	35,748	34,877	871	2.5%
Energy Group	16,219	4,145	12,074	291.3%
Corporate	(40,963)	(55,992)	15,029	26.8%

Infrastructure Group: Profit for this group decreased \$44,841 or 62.7% from 2016. This group's profits were impacted by a decrease in gross profit of \$42,821 or 550 basis points. The Company experienced an overall reduction in wood pellet plant margins of \$60,107 between years due to cost overruns incurred by the Company in 2017 on the installation phase of its customer's Arkansas wood pellet plant sold in 2016 and the identification of design issues its customers' wood pellet plants in Arkansas and Georgia discovered in the third quarter of 2017. As the Company financed the original sale of the Georgia wood pellet plant, no revenue from the sale has been recorded. Segment profits were also negatively impacted by a \$3,448 increase in selling expenses, including \$1,986 related to the ConExpo Show and other cost increases related to the \$71,983 increase in group sales, excluding wood pellet plants. Research and development costs also increased by \$1,475 between periods.

Aggregate and Mining Group: Profit for this group increased \$871 or 2.5% from 2016. This group's profits were impacted by an increase in gross profit of \$2,440 on increased sales of \$43,960, offset by a 220 basis point decrease in gross margin due to intercompany profit eliminations, product mix considerations and reduced margins at the Company's Northern Ireland subsidiary. The group's profits were also negatively impacted by increased ConExpo Show costs of \$1,842.

Energy Group: Profit for this group increased \$12,074 or 291.3% from 2016. This group's profits were impacted by an increase in gross profit of \$17,954 on increased sales of \$48,565 and a 330 basis point increase in gross margins. Margins were favorably impacted by significant improvements at the Company's GEFCO subsidiary, due to a 64% increase in sales, and by the addition of Power Flame, which was acquired on August 1, 2016. The group's profits were negatively impacted by a \$5,540 increase in selling, general and administrative expenses, of which \$3,280 relates to additional costs incurred by Power Flame and RexCon, which were acquired in 2016 and 2017, respectively.

Corporate: Net corporate expenses decreased \$15,029 from 2016 due to decreases in profit sharing and SERP expenses of \$5,031 and decreased income taxes of \$10,617.

Liquidity and Capital Resources

The Company's primary sources of liquidity and capital resources are its cash on hand, borrowing capacity under a \$100,000 revolving credit facility with a lender and cash flows from operations. The Company had \$25,821 (of which \$21,933 was held by our foreign subsidiaries) of cash available for operating purposes at December 31, 2018. The Company had borrowings of \$58,778 and outstanding letters of credit of \$11,044 resulting in additional borrowing availability of \$30,178 under the credit facility as of December 31, 2018. Borrowings under the Company's credit agreement are subject to an interest rate equal to the daily one-month LIBOR rate plus a 0.75% margin, resulting in a rate of 3.27% at December 31, 2018. The credit agreement contains certain financial covenants, including provisions concerning required levels of annual net income, minimum tangible net worth and maximum allowed capital expenditures. The Company was in compliance with these covenants as of December 31, 2018.

In February 2019, the \$100,000 amended and restated credit agreement discussed above was again amended to increase the unsecured line of credit to a maximum of \$150,000 and to extend the maturity date of the agreement to December 29, 2023. Upon disposition of the Georgia wood pellet plant, the Company is required to apply the proceeds, if any, as a payment against any outstanding balance on the line of credit. Other significant terms were left unchanged.

The Company's South African subsidiary, Osborn Engineered Products SA (Pty) Ltd ("Osborn"), has a credit facility of \$6,600 with a South African bank to finance short-term working capital needs, as well as to cover performance letters of credit, advance payment and retention guarantees. As of December 31, 2018, Osborn had no outstanding borrowings, but had \$397 in performance, advance payment and retention guarantees outstanding under the facility. The facility has been guaranteed by Astec Industries, Inc., but is otherwise unsecured. A 0.75% unused facility fee is charged if less than 50% of the facility is utilized. As of December 31, 2018, Osborn had available credit under the facility of \$6,203. The interest rate is 0.25% less than the South Africa prime rate, resulting in a rate of 10.0% as of December 31, 2018.

The Company's Brazilian subsidiary, Astec do Brasil Fabricacao de Equipamentos Ltda. ("Astec Brazil"), has outstanding working capital loans totaling \$1,207 from Brazilian banks with interest rates ranging from 10.4% to 11.0%. The loans' maturity dates range from January 2019 to April 2024 and are secured by Astec Brazil's manufacturing facility and also by letters of credit totaling \$3,200 issued by Astec Industries, Inc. Additionally, Astec Brazil has various 5-year equipment financing loans outstanding with Brazilian banks in the aggregate of \$137 as of December 31, 2018 that have interest rates ranging from 3.5% to 16.3%. These equipment loans have maturity dates ranging from January 2019 to April 2020.

Cash Flows from Operating Activities

	2018	2017	Increase / Decrease
Net income (loss)	\$ (60,744)	\$ 37,590	\$ (98,334)
Depreciation and amortization	27,913	25,802	2,111
Provision for warranties	13,219	16,725	(3,506)
Deferred income tax benefits	(25,385)	(291)	(25,094)
Restructuring and asset impairment charges	13,060	--	13,060
Increase in receivables	(16,189)	(7,749)	(8,440)
(Increase) decrease in inventories	30,757	(19,618)	50,375
Increase in prepaid expenses	(11,943)	(5,181)	(6,762)
Increase in accounts payable	9,843	630	9,213
Increase (decrease) in customer deposits	(522)	9,379	(9,901)
Decrease in accrued product warranties	(17,539)	(14,642)	(2,897)
Other, net	7,745	(764)	8,509
Net cash provided (used) by operating activities	<u>\$ (29,785)</u>	<u>\$ 41,881</u>	<u>\$ (71,666)</u>

Net cash provided by operating activities decreased \$71,666 in 2018 compared to 2017. The primary reason for the decrease in operating cash flows relates to the payment of a \$68,000 settlement agreement with a pellet plant customer in 2018.

Cash Flows from Investing Activities

	<u>2018</u>	<u>2017</u>	<u>Increase / Decrease</u>
Expenditures for property and equipment	\$ (27,440)	\$ (20,046)	\$ (7,394)
Business acquisition, net of cash acquired	--	(26,443)	26,443
Other	15	(411)	426
Net cash used by investing activities	<u>\$ (27,425)</u>	<u>\$ (46,900)</u>	<u>\$ 19,475</u>

Net cash used by investing activities decreased by \$19,475 in 2018 compared to 2017 due primarily to the reductions in cash expenditures for business acquisitions offset by an increase in expenditures for property and equipment.

Cash Flows from Financing Activities

	<u>2018</u>	<u>2017</u>	<u>Increase / Decrease</u>
Payment of dividends	\$ (9,625)	\$ (9,226)	\$ (399)
Borrowings under bank loans	148,504	--	148,504
Repayments of bank loans	(91,964)	(7,242)	(84,722)
Repurchase of Company stock	(24,138)	--	(24,138)
Other, net	(83)	(324)	241
Net cash provided (used) by financing activities	<u>\$ 22,694</u>	<u>\$ (16,792)</u>	<u>\$ 39,486</u>

Financing activities provided cash of \$22,694 in 2018 and used cash of \$16,792 in 2017, resulting in a total increase between periods of \$39,486. The change is primarily due to an increase of \$58,778 in borrowings under the Company's \$100,000 line of credit and \$24,138 expended under the Company's stock buy-back program.

Approved capital expenditures for 2019 total \$39,477. Capital expenditures are for various purchases of machinery and equipment, automobiles and technology to meet the needs across all Company subsidiaries. The Company expects to finance these expenditures using currently available cash balances, internally generated funds and available credit under the Company's credit facility.

Financial Condition

The Company's current assets decreased to \$560,991 at December 31, 2018 from \$602,969 at December 31, 2017, a decrease of \$41,978. The decrease is due to decreases in cash and cash equivalents of \$36,459 and inventories of \$35,435, offset by increases in trade receivables of \$15,783. Additionally, accounts receivable days outstanding increased from 34.3 in 2017 to 38.2 in 2018.

The Company's current liabilities increased to \$189,231 at December 31, 2018 from \$179,146 at December 31, 2017, an increase of \$10,085. The increase is primarily due to increases in accounts payable of \$10,197.

Market Risk and Risk Management Policies

The Company is exposed to changes in interest rates, primarily from its revolving credit agreements. A hypothetical 100 basis point adverse move (increase) would increase interest expense by approximately \$600 annually if current debt levels are maintained. The Company does not hedge variable interest.

The Company is subject to foreign exchange risk at its foreign operations. Foreign operations represent 16.1% and 15.9% of total assets at December 31, 2018 and 2017, respectively, and 11.6% and 10.8% of total net sales for the years ended December 31, 2018 and 2017, respectively. Each period, the balance sheets and related results of operations of the Company's foreign subsidiaries are translated from their functional foreign currency into U.S. dollars for reporting purposes. As the U.S. dollar strengthens against those foreign currencies, the foreign denominated net assets and operating results become less valuable in the Company's reporting currency. When the U.S. dollar weakens against those currencies, the foreign denominated net assets and operating results become more valuable in the Company's reporting currency. At each reporting date, the fluctuation in the value of the net assets and operating results due to foreign exchange rate changes is recorded as an adjustment to other comprehensive income (loss) in equity. The Company views its investments in foreign subsidiaries as long-term and does not hedge the net investments in foreign subsidiaries.

From time to time, the Company's foreign subsidiaries enter into transactions not denominated in their functional currency. In these situations, the Company evaluates the need to hedge those transactions against foreign currency rate fluctuations. When the Company determines a need to hedge a transaction, the subsidiary enters into a foreign currency exchange contract. The Company does not apply hedge accounting to these contracts and, therefore, recognizes the fair value of these contracts in the consolidated balance sheets and the change in the fair value of the contracts in current earnings.

Due to the limited exposure to foreign exchange rate risk, a 10% fluctuation in the foreign exchange rates at December 31, 2018 or 2017 would not have a material impact on the Company's consolidated financial statements.

Contractual Obligations

Contractual obligations and the period in which payments are due as of December 31, 2018 are as follows:

Contractual Obligations	Payments Due by Period				
	Total	Less Than 1 Year	Years 2 to 3	Years 4 to 5	More Than 5 Years
Operating lease obligations	\$ 3,702	\$ 1,992	\$ 1,488	\$ 210	\$ 12
Inventory purchase obligations	5,453	5,359	87	6	1
Debt obligations	60,122	413	431	59,206	72
Interest on debt obligations	6,303	1,922	3,844	537	--
Total	\$ 75,580	\$ 9,686	\$ 5,850	\$ 59,959	\$ 85

The above table excludes the Company's liability for unrecognized tax benefits, which totaled \$2,048 at December 31, 2018, since the timing of cash settlements to the respective taxing authorities cannot be reliably predicted. Interest obligations represent interest on the Company's line of credit outstanding at December 31, 2018 assuming the interest rate remained constant until the maturity date of the loan. Interest on debt in Brazil was ignored due to its immateriality.

In 2018 and 2017, the Company made contributions of approximately \$1,376 and \$415, respectively, to its pension plan. Currently, the Company has not planned any contributions to the pension plan in 2019. The Company's funding policy is to make at least the minimum annual contributions required by applicable regulations.

Contingencies

Management has reviewed all claims and lawsuits and has made adequate provision for any losses that can be reasonably estimated. Based upon currently available information and with the advice of counsel, management believes that the ultimate outcome of its current claims and legal proceedings, individually and in the aggregate, will not have a material adverse effect on the Company's financial position, cash flows or results of operations. However, claims and legal proceedings are subject to inherent uncertainties and rulings unfavorable to the Company could occur. If an unfavorable ruling were to occur, there exists the possibility of a material adverse effect on the Company's financial position, cash flows or results of operations.

Certain customers have financed purchases of the Company's products through arrangements in which the Company is contingently liable for customer debt in the aggregate amount of \$2,247 at December 31, 2018. These obligations have average remaining terms of 1.6 years. The Company has recorded a liability of \$1,183 related to these guarantees at December 31, 2018.

The Company is contingently liable under letters of credit of approximately \$11,044, primarily for performance guarantees to customers, banks or insurance carriers, including \$3,200 of letters of credit guaranteeing certain Astec Brazil bank debt. The outstanding letters of credit expire at various dates through October 2020. As of December 31, 2018, the Company's foreign subsidiaries are contingently liable for a total of \$2,016 in performance letters of credit, advance payments and retention guarantees. The maximum potential amount of future payments under these letters of credit and guarantees for which the Company could be liable is \$13,060 as of December 31, 2018.

The Company manufactured its first wood pellet plant for a customer under a Company-financed arrangement whereby the Company deferred the recognition of revenue as payment under the arrangement was not assured. The original customer is attempting to obtain financing to purchase the plant at a reduced price; however, the Company believes the ultimate consummation of the sale to this customer is uncertain. After considering the uncertainty of completing the sale to the existing customer; the lack of success in attempting to market the plant to other pellet plant operators; the cost of repossessing the plant; and the Company's decision to exit the pellet plant business line, the pellet plant inventory's net realizable value has been written down to zero.

The Company and certain of its current and former executive officers have been named as defendants in a putative shareholder class action lawsuit filed on February 1, 2019, in the United States District Court for the Eastern District of Tennessee. The action is styled City of Taylor General Employees Retirement System v. Astec Industries, Inc., et al., Case No. 1:19-cv-00024-PLR-CHS. The complaint generally alleges that the defendants violated the Securities Exchange Act of 1934, as amended (the "Exchange Act"), and Rule 10b-5 promulgated thereunder by making allegedly false and misleading statements and that the individual defendants are control person under Section 20(a) of the Exchange Act. The complaint was filed on behalf of shareholders who purchased shares of the Company's stock between July 26, 2016 and October 22, 2018 and seeks monetary damages on behalf of the purported class. We dispute these allegations and intend to defend this lawsuit vigorously. The Company is unable to estimate the possible loss or range of loss at this time.

Off-balance Sheet Arrangements

As of December 31, 2018, the Company does not have off-balance sheet arrangements as defined by Item 303(a)(4) of Regulation S-K.

Critical Accounting Policies and Estimates

The Company's consolidated financial statements are prepared in accordance with U.S. generally accepted accounting principles. Application of these principles requires the Company to make estimates and judgments that affect the amounts as reported in the consolidated financial statements. Accounting policies that are critical to aid in understanding and evaluating the results of operations and financial position of the Company include the following:

Inventory Valuation: Inventories are valued at the lower of first-in first-out cost or net realizable value. The most significant component of the Company's inventories is steel. Open market prices (including tariffs recently enacted) are subject to volatility and determine the cost of steel for the Company. During periods when open market prices decline, the Company may need to reduce the carrying value of the inventory. In addition, certain items in inventory become obsolete over time, and the Company reduces the carrying value of these items to their net realizable value. These reductions are determined by the Company based on estimates, assumptions and judgments made from the information available at that time. See Note 1, Summary of Significant Accounting Policies, of the Notes to Consolidated Financial Statements included in this Annual Report, for a description of the process used by the Company to value inventories at the lower of first-in first-out cost or market. The Company does not believe it is reasonably likely that the inventory values will materially change in the near future.

Revenue Recognition: Revenue is generally recognized on sales at the point in time when persuasive evidence of an arrangement exists, the price is fixed or determinable, the product has been delivered or services have been rendered and there is reasonable assurance of collection of the sales proceeds. Revenue is measured as the amount of consideration the Company expects to receive in exchange for transferring goods or providing services. The Company generally obtains purchase authorizations from its customers for a specified amount of product at a specified price with specified delivery terms. A significant portion of the Company's equipment sales represents equipment produced in the Company's plants under short-term contracts for a specific customer project or equipment designed to meet a customer's specific requirements. Most of the equipment sold by the Company is based on standard configurations, some of which are modified to meet customer needs or specifications. The Company provides customers with technical design and performance specifications and performs pre-shipment testing to ensure the equipment performs according to design specifications, regardless of whether the Company provides installation services in addition to selling the equipment. Significant down payments are required on many equipment orders with other terms allowing for payment shortly after shipment, typically 30 days. Taxes assessed by a governmental authority that are directly imposed on revenue-producing transactions between the Company and its customers, such as sales, use, value-added and some excise taxes, are excluded from revenue. Expected warranty costs for our standard warranties are expensed at the time the related revenue is recognized. Costs of obtaining sales contracts with an expected duration of one year or less are expensed as incurred. As contracts are typically fulfilled within one year from the date of the contract, revenue adjustments for a potential financing component or the costs to obtain the contract are not made. Other contract assets are not material.

Depending on the terms of the arrangement with the customer, recognition of a portion of the consideration received may be deferred and recorded as a contract liability if we have to satisfy a future obligation, such as to provide installation assistance, service work to be performed in the future without charge, floor plan interest to be reimbursed to our dealer customers, payments for extended warranties, for annual rebates given to certain high volume customers or for obligations for future estimated returns to be allowed based upon historical trends.

Certain contracts include terms and conditions through which the Company recognizes revenues upon completion of equipment production, which is subsequently stored at the Company's plant at the customer's request. Revenue is recorded on such contracts upon the customer's assumption of title and transfer of control and when collectability is reasonably assured. In addition, there must be a fixed schedule of delivery of the goods consistent with the customer's business practices, the Company must not have retained any specific performance obligations such that the earnings process is not complete and the goods must have been segregated from the Company's inventory prior to revenue recognition.

The Company has certain sales containing multiple performance obligations, whereby revenue attributable to the sale of a product is recognized when the product is shipped, and the revenue attributable to services provided with respect to the product (such as installation services) is recognized when the service is performed. Consideration is allocated to deliverables using observable market prices from stand-alone performance obligations or a cost plus margin approach when one is not available. Otherwise, the Company uses third-party evidence of selling price or the Company's best estimate of the selling price for the deliverables. The Company evaluates sales with multiple performance obligations to determine whether revenue related to individual elements should be recognized separately, or as a combined unit. In addition to the previously mentioned general revenue recognition criteria, the Company only recognizes revenue on individual delivered elements when there is objective and reliable evidence that the delivered element has a determinable value to the customer on a standalone basis and there is no right of return.

Goodwill and Other Intangible Assets: Intangible assets are classified into two categories: (1) intangible assets with definite lives subject to amortization, and (2) goodwill. Intangible assets with definite lives are tested for impairment if conditions exist that indicate the carrying value may not be recoverable. Risk factors that may be considered include an economic downturn in the general economy, a geographic market or the commercial and residential construction industries, a change in the assessment of future operations as well as the cyclical nature of our industry and the customization of the equipment we sell, each of which may cause adverse fluctuations in operating results. Other risk factors considered would be an increase in the price or a decrease in the availability of oil that could reduce the demand for our products in addition to the significant fluctuations in the purchase price of raw materials that could have a negative impact on the cost of production and gross margins as well as others more fully described in the Risk Factors section of our Form 10-K. An impairment charge is recorded when the carrying value of the definite lived intangible asset is not recoverable by the cash flows generated from the use of the asset. Some of the inputs used in the impairment testing are highly subjective and are affected by changes in business factors and other conditions. Changes in any of the inputs could have an effect on future tests and result in impairment charges.

Goodwill is not amortized but is tested for impairment annually or more frequently if events or circumstances indicate that such intangible assets or goodwill might be impaired. See Note 1, Summary of Significant Accounting Policies, of the Notes to Financial Statements included in this Annual Report, for a description of testing performed by the Company to determine if the recorded value of intangible assets or goodwill has been impaired. See Note 5, Goodwill, of the Notes to Consolidated Financial Statements included in this Annual Report, for a detail of goodwill by segment and impairment charges recorded in 2018.

The useful lives of identifiable intangible assets are determined after considering the specific facts and circumstances related to each intangible asset. Factors considered when determining useful lives include the contractual term of any agreement, the history of the asset, the Company's long-term strategy for the use of the asset, any laws or other local regulations which could impact the useful life of the asset, and other economic factors, including competition and specific market conditions. Intangible assets that are deemed to have definite lives are amortized, generally on a straight-line basis, over their useful lives, ranging from 5 to 19 years.

Income Taxes: The Company accounts for income taxes under the guidance of FASB Accounting Standards Codification Topic 740-10, "Income Taxes". Deferred tax assets and liabilities are recognized for the future tax consequences attributable to differences between financial statement carrying amounts of existing assets and liabilities and their respective tax bases and operating loss and tax credit carryforwards. Deferred tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be recovered or settled. A valuation allowance, which represents a reserve on deferred tax assets for which utilization is not more likely than not, is recorded. Judgment is required in determining the provision for income taxes, deferred tax assets and liabilities and the valuation allowance recorded against net deferred tax assets. Income tax contingency accruals are determined and recorded under the guidance of ASC Topic 740-10. Liabilities for uncertain income tax positions are based on a two-step process. The first step is to evaluate the tax position for recognition by determining if the weight of available evidence indicates that it is more likely than not that the position will be sustained on audit, including resolution of related appeals or litigation processes, if any. The second step requires an estimate and measurement of the tax benefit as the largest amount that is more than 50% likely to be realized upon ultimate settlement. It is inherently difficult and subjective to estimate such amounts, as the Company must determine the probability of various possible outcomes. We reevaluate these uncertain tax positions on a quarterly basis or when new information becomes available. These reevaluations are based on factors including, but not limited to, changes in facts or circumstances, changes in tax law, successfully settled issues under audit, expirations due to statutes, and new audit activity. Such a change in recognition or measurement could result in the recognition of a tax benefit or an increase to accrued taxes.

U.S. Tax Reform: On December 22, 2017, the Tax Cuts and Jobs Act of 2017 (the “Tax Act”) was signed into law making significant changes to the Internal Revenue Code. Changes include, but are not limited to, a federal corporate tax rate decrease from 35% to 21% for tax years beginning after December 31, 2017, the transition of U.S international taxation from a worldwide tax system to a territorial system and a one-time transition tax on the mandatory deemed repatriation of foreign earnings. The Company’s fourth quarter 2017 provision for income taxes was reduced by \$1,056, (comprised of a \$1,548 reduction in income tax expense recorded in connection with the remeasurement of deferred tax assets and liabilities and \$492 of additional income tax expense recorded in connection with the transition tax on the mandatory deemed repatriation of foreign earnings) due to applying the provisions of the Tax Act.

Recent Accounting Pronouncements

In May 2014, the Financial Accounting Standards Board (“FASB”) issued Accounting Standards Update (“ASU”) No. 2014-09, “Revenue from Contracts with Customers”, which supersedes existing revenue guidance under U.S. GAAP. The standard’s core principle is that a company will recognize revenue when it transfers promised goods or services to customers in an amount that reflects the consideration to which the company expects to be entitled in exchange for those goods or services. Certain provisions of the standard were clarified in March 2016 with the issuance of ASU No. 2016-08, “Revenue from Contracts with Customers (Topic 606)”, which provided additional implementation guidance in order to eliminate the potential for diversity in practice arising from inconsistent application of the principal versus agent guidance. Under the new guidance, when an entity determines it is a principal in a transaction, the entity recognizes revenue in the gross amount of consideration; however, in transactions where an entity determines it is an agent, the entity recognizes revenue in the amount of any fee or commission to which it expects to be entitled. These new standards require companies to use more judgment and to make more estimates than under previous guidance and expand required disclosures to include information regarding contract assets and liabilities as well as a more disaggregated view of revenue. The standards are effective for public companies for annual periods beginning after December 15, 2017 and, as such, the Company adopted the new standards effective January 1, 2018, using the modified retrospective transition method. See Note 17 of the Notes to Consolidated Financial Statements included in this Annual Report, Revenue Recognition, for additional disclosures required by the standards. The adoption of the standards did not have a material impact on the Company’s financial position, results of operations or cash flows, and no cumulative effect adjustment to retained earnings was necessitated.

In January 2016, the FASB issued ASU No. 2016-01, “Financial Instruments - Overall (Subtopic 825-10)”, which requires, among other things, equity investments with readily determinable fair values, except those accounted for under the equity method of accounting or those that result in consolidation of the investee, to be measured at fair value with changes in fair value recognized in net income. The new standard was further clarified by the issuance of ASU No. 2018-03, “Technical Corrections and Improvements to Financial Instruments – Overall (Subtopic 825-10), Recognition and Measurement of Financial Assets and Financial Liabilities” in February 2018. The standards are effective for public companies in fiscal years beginning after December 15, 2017, and the Company adopted the standard effective January 1, 2018. The adoption of these standards did not have a material impact on the Company’s financial position, results of operations or cash flows.

In February 2016, the FASB issued ASU No. 2016-02, “Leases (Topic 842)”, which significantly changes the accounting for operating leases by lessees. The accounting applied by lessors is largely unchanged from that applied under previous guidance. The new guidance establishes a right-of-use (“ROU”) model and requires lessees to recognize lease assets and lease liabilities in the balance sheet, initially measured at the present value of the lease payments, for leases which were classified as operating leases under previous guidance. Lease cost included in the statement of operations will be calculated so that the cost of the lease is allocated over the lease term, generally on a straight-line basis. The Company has made an accounting policy election to exclude leases with a term of 12 months or less from the requirement to record related assets and liabilities. Certain provisions of ASU No. 2016-02 were later modified or clarified by the issuance of ASU 2018-11, “Leases (Topic 842): Targeted Improvements” and ASU 2018-10, “Codification Improvements to Topic 842, Leases”. A modified retrospective transition approach is required by the ASU and its provisions must be applied to all leases existing at the date of initial application. An entity may choose to use either (1) the standard’s effective date or (2) the beginning of the earliest comparative period presented in the financial statements as its date of initial application. The new standards are effective for public companies for fiscal years beginning after December 15, 2018. The Company adopted the new standards effective January 1, 2019 using the effective date as the date of initial application. Consequently, financial information will not be updated and the disclosures required under the new standards will not be provided for periods before January 1, 2019. The standards provide a number of optional practical expedients in transition which the Company is continuing to evaluate. The Company does not expect the adoption of these standards to have a material impact on its results of operations or cash flows; however, the Company continues to evaluate the impact the adoption of the new standards will have on its financial position. While the Company continues to assess all of the effects of adoption, it currently believes the most significant effects relate to the recognition of new ROU assets and lease liabilities on its consolidated balance sheet for its operating leases and new disclosures about its leasing activities.

In June 2016, the FASB issued ASU No. 2016-13, “Financial Instruments – Credit Losses (Topic 326), Measurement of Credit Losses on Financial Instruments”. The standard changes how credit losses are measured for most financial assets and certain other instruments that currently are not measured through net income. The standard will require an expected loss model for instruments measured at amortized cost as opposed to the current incurred loss approach. In valuing available for sale debt securities, allowances will be required to be recorded, rather than the current approach of reducing the carrying amount, for other than temporary impairments. A cumulative adjustment to retained earnings is to be recorded as of the beginning of the period of adoption to reflect the impact of applying the provisions of the standard. The standard is effective for public companies for periods beginning after December 15, 2019 and the Company expects to adopt the new standard as of January 1, 2020. The Company has not yet determined what impact, if any, the adoption of this new standard will have on the Company’s financial position, results of operations or cash flows.

In August 2016, the FASB issued ASU No. 2016-15, “Statement of Cash Flows (Topic 230), Classification of Certain Cash Receipts and Cash Payments (a consensus of the Emerging Issues Task Force)” which clarifies how certain cash receipts and cash payments should be presented on the statement of cash flows. The statement also addresses how the predominance principle should be applied when cash payments have aspects of more than one class of cash flows. The standard is effective for public companies in fiscal years beginning after December 15, 2017, and the Company adopted the standard effective January 1, 2018. The adoption of this standard did not have a material impact on the Company’s consolidated statements of cash flows.

In October 2016, the FASB issued ASU No. 2016-16, “Income Taxes (Topic 740), Intra-Entity Transfers of Assets Other Than Inventory” which requires companies to account for the income tax effects of intercompany sales and transfers of assets other than inventory, such as intangible assets, when the transfer occurs. This is a change from previous guidance, which required companies to defer the income tax effects of intercompany transfers of assets until the asset has been sold to an outside party or otherwise recognized by being depreciated, amortized, or impaired. The new guidance requires companies to defer the income tax effects of only intercompany transfers of inventory. The standard is effective for public companies in fiscal years beginning after December 15, 2017. The Company adopted the new standard effective January 1, 2018. The application of this standard did not have a material impact on the Company’s financial position, results of operations or cash flows.

In January 2017, the FASB issued ASU No. 2017-01, “Business Combinations (Topic 805), Clarifying the Definition of a Business,” which provides additional guidance to assist entities with evaluating whether transactions should be accounted for as acquisitions (or disposals) of assets or businesses. The standard is effective for public companies for annual or interim periods beginning after December 15, 2017. The Company adopted the new standard effective January 1, 2018. The application of this standard did not have a material impact on the Company’s financial position, results of operations or cash flows.

In August 2017, the FASB issued ASU No. 2017-12, “Derivatives and Hedging (Topic 815), Targeted Improvements to Hedging Activities”, to improve the financial reporting of hedging relationships to better portray the economic results of an entity’s risk management activities in its financial statements. The new guidance is effective for public companies for fiscal years beginning after December 15, 2018 and interim periods within those fiscal years with early adoption permitted in any interim period after its issuance. The Company adopted the new standard effective January 1, 2019. The Company does not expect the application of this standard to have a material impact on its financial position, results of operations or cash flows.

In February 2018, the FASB issued ASU No. 2018-02, “Income Statement – Reporting Comprehensive Income (Topic 220), Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income”, which permits companies to reclassify tax effects stranded in accumulated other comprehensive income (“OCI”) as a result of tax reform impacting tax rates or other items, such as changing from a worldwide tax system to a territorial system, from OCI to retained earnings. Other tax effects stranded in OCI due to other reasons, such as prior changes in tax laws or changes in valuation allowances, may not be reclassified. Additional disclosures will also be required upon adoption of the new standard. The new standard is effective for fiscal years beginning after December 15, 2018, with early adoption permitted. The Company adopted this new standard effective January 1, 2019. The Company does not expect the adoption of this standard to have a material impact on its financial position, results of operations or cash flows.

In March 2018, the FASB issued ASU No. 2018-05 “Income Taxes (Topic 740), amendments to SEC Paragraphs Pursuant to SEC Staff Accounting Bulletin No. 118 (SEC Update)”, which addresses the accounting and disclosures around the enactment of the Tax Cuts and Jobs Act and the Securities and Exchange Commission’s Staff Accounting Bulletin No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act (“SAB 118”). The Company adopted this new standard in the first quarter of 2018. See Note 14 of the Notes to Consolidated Financial Statements included in this Annual Report, Income Taxes, for the disclosures related to this amended guidance.

In August 2018, the FASB issued ASU No. 2018-13, "Fair Value Measurement (Topic 820): Disclosure Framework – Changes to the Disclosure Requirements for Fair Value Measurement" which aims to improve the overall usefulness of disclosures to financial statement users and reduce unnecessary costs to companies when preparing fair value measurement disclosures. The standard is effective for annual and interim periods beginning after December 15, 2019 with early adoption permitted. The Company expects to adopt this new standard effective January 1, 2020. The Company does not expect the adoption of this new standard to have a material impact on its financial position, results of operations or cash flows.

Forward-Looking Statements

This annual report contains forward-looking statements made pursuant to the safe harbor provisions of the Private Securities Litigation Reform Act of 1995. Statements contained anywhere in this Annual Report that are not limited to historical information are considered forward-looking statements within the meaning of Section 21E of the Securities Exchange Act of 1934, including, without limitation, statements regarding:

- execution of the Company's growth and operation strategy;
- plans for technological innovation;
- compliance with covenants in our credit facility;
- liquidity and capital expenditures;
- sufficiency of working capital, cash flows and available capacity under the Company's credit facilities;
- compliance with government regulations;
- compliance with manufacturing and delivery timetables;
- forecasting of results;
- general economic trends and political uncertainty;
- government funding and growth of highway construction and commercial projects;
- taxes or usage fees;
- interest rates;
- integration of acquisitions;
- industry trends;
- pricing, demand and availability of steel, oil and liquid asphalt;
- development of domestic oil and natural gas production;
- condition of the economy;
- strength of the U.S. dollar relative to foreign currencies;
- the introduction of new products and the success of new product lines;
- presence in the international marketplace;
- suitability of our current facilities;
- future payment of dividends;
- competition in our business segments;
- product liability and other claims;
- obligations with respect to pellet plants and other products;
- protection of proprietary technology;
- demand for products;
- future fillings of backlogs;
- employees;
- the seasonality of our business;
- tax assets and reserves for uncertain tax positions;
- critical accounting policies and the impact of accounting changes;
- our backlog;
- ability to satisfy contingencies;
- contributions to retirement plans and plan expenses;
- reserve levels for self-insured insurance plans and product warranties;
- construction of new manufacturing facilities;
- supply of raw materials;
- inventories;
- plans to reduce indebtedness; and
- the Company's effective tax rate and other impacts of the Tax Cuts and Jobs Act of 2017.

These forward-looking statements are based largely on management's expectations, which are subject to a number of known and unknown risks, uncertainties and other factors discussed in this report and in other documents filed by the Company with the Securities and Exchange Commission, which may cause actual results, financial or otherwise, to be materially different from those anticipated, expressed or implied by the forward-looking statements. All forward-looking statements included in this document are based on information available to the Company on the date hereof, and the Company assumes no obligation to update any such forward-looking statements to reflect future events or circumstances. You can identify these statements by forward-looking words such as "expect", "believe", "anticipate", "goal", "plan", "intend", "estimate", "may", "will", "should", "could" and similar expressions.

In addition to the risks and uncertainties identified elsewhere herein and in other documents filed by us with the Securities and Exchange Commission, the risk factors described in this document under the caption "Risk Factors" should be carefully considered when evaluating our business and future prospects, including without limitation risks relating to: changes or delays in highway funding; rising interest rates; changes in oil prices; changes in steel prices; changes in the general economy; unexpected capital expenditures and decreases in liquidity; the timing of large contracts; production capacity; general business conditions in the industry; non-compliance with covenants in the Company's credit facilities; demand for the Company's products; and those other factors listed from time to time in the Company's reports filed with the Securities and Exchange Commission. Certain of the risks, uncertainties and other factors discussed above are more fully described in the section titled "Risk Factors" in the Company's Annual Report on Form 10-K for the year ended December 31, 2018.

ASTEC INDUSTRIES, INC.

MANAGEMENT'S REPORT ON INTERNAL CONTROL OVER FINANCIAL REPORTING

The management of Astec Industries, Inc. and subsidiaries (the "Company") is responsible for establishing and maintaining adequate internal control over financial reporting for the Company. The Company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with U.S. generally accepted accounting principles. The Company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of assets of the Company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with U.S. generally accepted accounting principles, and that receipts and expenditures of the Company are being made only in accordance with authorizations of management and directors of the Company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the Company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies and procedures may deteriorate.

A material weakness is a deficiency, or a combination of deficiencies, in internal control over financial reporting, such that there is a reasonable possibility that a material misstatement of the Company's annual or interim financial statements will not be prevented or detected on a timely basis.

Management, under the supervision and with the participation of the Company's principal executive officer and principal financial officer, evaluated the effectiveness of the Company's internal control over financial reporting as of December 31, 2018 using the criteria set forth by the Committee of Sponsoring Organizations of the Treadway Commission in *Internal Control - Integrated Framework (2013)* ("COSO 2013 Framework").

Based on this assessment, the following control deficiencies in internal control over financial reporting were identified as of December 31, 2018.

Corporate

Goodwill Impairment

We did not design effective management review controls over the annual goodwill impairment test. Specifically, (i) management's corroboration of assumptions used in the third-party valuation analyses was not conducted at a sufficient level of precision and (ii) we did not have effective controls over the methods and accuracy of calculations performed by a third-party valuation specialist retained by the Company.

These deficiencies were due to insufficient knowledge and experience of the Company's personnel with a Step 1 quantitative goodwill impairment assessment in accordance with FASB ASC Topic 350, *Intangibles – Goodwill and Other*, and the fact that the Company did not perform an effective risk assessment process to evaluate relevant risks of material misstatement associated with the valuation of goodwill.

Income Taxes

We did not operate effective controls over (i) the completeness and accuracy of the data used in the determination of the current and deferred income tax balances at a sufficient level of precision and (ii) the formulas embedded in the spreadsheets used in the income tax calculations.

These deficiencies resulted from an ineffective risk assessment process to evaluate the relevant risks inherent in the determination of the year-end income tax provision and related disclosures.

Business Units

We did not have sufficient trained resources that were knowledgeable and experienced in the application of the COSO 2013 Framework to our financial reporting processes and related internal controls at certain business units. We did not have sufficient Corporate monitoring activities over certain business units that resulted in the following control deficiencies:

General Information Technology Controls

We did not design and maintain effective general information technology controls (“GITCs”) related to the newly implemented enterprise resource planning (“ERP”) system at Roadtec, Inc. (“Roadtec”), a subsidiary which operates as a business unit in the Infrastructure segment. Specifically, we did not:

- design and maintain an effective systems development plan to test and approve the pre-production and post-production implementation of the Roadtec ERP system aligned with the business and information technology requirements;
- design and implement effective program change management controls over the Roadtec ERP system; and
- design and implement effective user access controls in the Roadtec ERP system to ensure appropriate segregation of duties and to adequately restrict user and privileged access to appropriate Roadtec personnel.

These deficiencies resulted from the lack of experience on the part of Roadtec’s IT personnel with the implementation of a complex IT system and insufficient understanding of the risks presented by such implementation. In addition, users of the new ERP system were not sufficiently trained in the system’s functionalities to ensure their appropriate use and operation. As a result of these GITC deficiencies, the automated controls across substantially all financial reporting processes of the Roadtec business unit that depend on the effective operation of the GITCs and manual controls that are dependent upon the completeness and accuracy of information derived from the Roadtec ERP system were also considered to be ineffective.

Revenue Recognition

We did not design and operate effective controls over the accuracy and disclosure of revenue recognized from the Company’s contracts with customers at certain of the Company’s business units. Specifically, we did not:

- design, implement and operate effective controls at a sufficient level of precision over the identification and allocation of the transaction price to multiple performance obligations in accordance with FASB ASC Topic 606, *Revenue from Contracts with Customers* (“ASC 606”);
- design, implement and operate effective controls over the accuracy of pricing of parts sales; and
- design, implement and effectively perform controls over the identification of sales transactions by category for purposes of preparing disclosures required by ASC 606 and elimination of intercompany transactions.

These deficiencies were due to management of certain business units not sufficiently understanding the requirements of ASC 606 and changes required to the business units’ specific revenue recognition policies and transaction processes. The Company did not perform an effective risk assessment process to understand the changes necessary to the financial reporting process and related controls at these business units to address the risks relating to the recognition, measurement and presentation of revenue in accordance with the new accounting standard.

Inventories

We did not design and operate effective controls over the existence, accuracy and valuation of inventories at certain of the Company’s business units. Specifically, we did not have effective operation of controls ensuring that all inventory counts were performed, over the accuracy of capitalized labor costs and the review of the inventory reserve calculations at certain business units.

These deficiencies were due to management of certain business units not sufficiently understanding the risks of material misstatement related to these inventory assertions.

The control deficiencies described above resulted in several misstatements to the Company’s preliminary consolidated financial statements that were corrected prior to the issuance of the annual consolidated financial statements. These control deficiencies create a reasonable possibility that a material misstatement to the consolidated financial statements will not be prevented or detected on a timely basis, and, therefore, we concluded that the deficiencies represent material weaknesses in our internal control over financial reporting and therefore that our internal control over financial reporting was not effective as of December 31, 2018.

Our independent registered public accounting firm, KPMG LLP, who audited the consolidated financial statements included in this annual report on Form 10-K, has expressed an adverse opinion on the operating effectiveness of the Company's internal control over financial reporting. KPMG LLP's report appears on page A-26 of this annual report on Form 10-K.

Management's Remediation Plan

Management has been implementing and continues to implement measures designed to ensure that control deficiencies contributing to the material weaknesses are remediated, such that these controls are designed, implemented and operating effectively. The remediation actions include:

1. designing and implementing enhanced controls for the goodwill impairment analysis, including control activities associated with the review of data provided to third-party valuation specialists and the appropriateness of the assumptions and methodology used to measure the fair value of reporting units and the reasonableness of the conclusions in the third-party valuation specialists' reports;
2. evaluating the assignment of responsibilities associated with the accounting for goodwill impairment, including considering hiring additional resources or providing additional training to existing resources;
3. implementing income tax software to automate the calculation of our income tax expense (benefit) and the impact on the income tax related balance sheet accounts;
4. educating and re-training employees at certain business units on our business processes and internal controls such that employees are aware of the importance of designing and operating effective internal controls to mitigate the risks identified;
5. hiring additional employees, with the appropriate expertise and competence, to assume assigned responsibility and accountability for monitoring the financial reporting processes and internal controls at business units;
6. designing and implementing additional Corporate monitoring activities over internal controls at certain business units;
7. developing and providing additional training to employees at Roadtec to enhance their understanding of Roadtec's new ERP system so that they can effectively operate the system and have sufficient knowledge about GITCs, with a focus on those related to program change management and user access over systems impacting financial reporting;
8. designing and implementing enhanced controls at Roadtec related to program change management and user access over systems impacting financial reporting;
9. designing and implementing enhanced controls to monitor the effectiveness of the underlying business process controls at Roadtec that are dependent on the data and financial reports generated from the ERP system;
10. developing a training program for management at certain business units to increase their knowledge of revenue recognition and the related disclosures in accordance with ASC 606;
11. Corporate management performing site visits at certain business units and evaluating revenue recognition for certain equipment contracts in accordance with ASC 606;
12. designing and implementing enhanced controls over the accuracy of pricing for parts sales and completeness and accuracy of intercompany sales transactions at certain business units; and
13. designing and implementing enhanced controls over the existence, accuracy and valuation of inventories at certain business units.

Management believes that these actions, and the improvements achieved as a result, will effectively remediate the material weaknesses. However, the material weaknesses in our internal control over financial reporting will not be considered remediated until the remediated controls operate for a sufficient period of time and management has concluded, through testing, that these controls are operating effectively.

Management is committed to implementing the planned remediation actions as promptly as possible and will provide regular updates (at least on a quarterly basis) to the Audit Committee of the Board of Directors regarding the progress of its remediation efforts.

As a result of the material weaknesses noted above, the Company completed additional substantive procedures prior to filing this Form 10-K for the year ended December 31, 2018. Based on these procedures, management believes that the Company's consolidated financial statements included in this Form 10-K have been prepared in accordance with generally accepted accounting principles. In addition, these material weaknesses did not result in any restatement of prior-period consolidated financial statements and there were no changes in previously released financial results. The Company's principal executive officer and principal financial officer have certified that, based on such officer's knowledge, the consolidated financial statements, and other financial information included in this Form 10-K, fairly present in all material respects the financial condition, results of operations and cash flows of the Company as of, and for, the periods presented in this Form 10-K. In addition, management developed a remediation plan for these material weaknesses, which is described above.

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Shareholders and Board of Directors
Astec Industries, Inc.:

Opinion on Internal Control Over Financial Reporting

We have audited Astec Industries, Inc. and subsidiaries' (the "Company") internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission. In our opinion, because of the effect of the material weaknesses, described below, on the achievement of the objectives of the control criteria, the Company has not maintained effective internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) ("PCAOB"), the consolidated balance sheets of the Company as of December 31, 2018 and 2017, and the related consolidated statements of operations, comprehensive income (loss), equity, and cash flows for each of the years in the three-year period ended December 31, 2018, and related notes (collectively, the "consolidated financial statements"), and our report dated March 15, 2019 expressed an unqualified opinion on those consolidated financial statements.

A material weakness is a deficiency, or a combination of deficiencies, in internal control over financial reporting, such that there is a reasonable possibility that a material misstatement of the Company's annual or interim financial statements will not be prevented or detected on a timely basis. The following material weaknesses have been identified and included in management's assessment:

- Ineffective management review controls over the annual goodwill impairment assessment due to insufficient knowledgeable and experienced personnel and ineffective risk assessment;
- Ineffective controls over the completeness and accuracy of data and formulas embedded in the spreadsheets used in income tax calculations due to ineffective risk assessment;
- Insufficient trained personnel knowledgeable and experienced in the application of the COSO 2013 Framework at certain business units and insufficient corporate monitoring of certain business units;
- Ineffective general information technology controls over the newly implemented enterprise resource planning system at the Roadtec subsidiary due to the lack of experienced personnel in implementing complex IT systems and insufficient training on the IT system's functionalities;
- Ineffective controls over the accuracy and disclosure of revenue at certain business units due to insufficient understanding of the requirements of revenue recognition and not performing an effective risk assessment; and
- Ineffective controls over the existence, accuracy and valuation of inventories at certain business units due to insufficient understanding of relevant risks of material misstatement.

The material weaknesses were considered in determining the nature, timing, and extent of audit tests applied in our audit of the 2018 consolidated financial statements, and this report does not affect our report on those consolidated financial statements.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management's Report on Internal Control Over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audit also included performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control Over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ KPMG LLP

Knoxville, Tennessee
March 15, 2019

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Shareholders and Board of Directors
Astec Industries, Inc.:

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheets of Astec Industries, Inc. and subsidiaries (the “Company”) as of December 31, 2018 and 2017, the related consolidated statements of operations, comprehensive income (loss), equity and cash flows for each of the years in the three-year period ended December 31, 2018, and the related notes (collectively, the “consolidated financial statements”). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the years in the three-year period ended December 31, 2018, in conformity with U.S. generally accepted accounting principles.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (“PCAOB”), the Company’s internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control – Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission, and our report dated March 15, 2019 expressed an adverse opinion on the effectiveness of the Company’s internal control over financial reporting.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company’s management. Our responsibility is to express an opinion on these consolidated financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ KPMG LLP

We have served as the Company’s auditor since 2015.

Knoxville, Tennessee
March 15, 2019

CONSOLIDATED BALANCE SHEETS

(Dollar and share amounts in thousands, except per share amounts unless otherwise specified)

	December 31	
	2018	2017
Assets		
Current assets:		
Cash and cash equivalents	\$ 25,821	\$ 62,280
Investments	1,946	1,624
Trade receivables, net	130,569	114,786
Other receivables	3,409	5,166
Inventories	355,944	391,379
Prepaid income taxes	24,459	12,556
Prepaid expenses and other assets	18,843	15,178
Total current assets	560,991	602,969
Property and equipment, net	192,448	190,396
Investments	14,890	14,553
Goodwill	32,748	45,732
Intangible assets, net	25,370	30,952
Deferred tax assets	27,490	2,576
Other long-term assets	1,520	2,401
Total assets	\$ 855,457	\$ 889,579
Liabilities and Equity		
Current liabilities:		
Current maturities of long-term debt	\$ 413	\$ 2,469
Accounts payable	70,614	60,417
Customer deposits	48,069	49,381
Accrued product warranty	10,928	15,410
Accrued payroll and related liabilities	24,126	23,297
Accrued loss reserves	1,832	2,504
Other accrued liabilities	33,249	25,668
Total current liabilities	189,231	179,146
Long-term debt	59,709	1,575
Deferred income tax liabilities	1,020	1,509
Other long-term liabilities	20,207	20,584
Total liabilities	270,167	202,814
Equity:		
Preferred stock - authorized 4,000 shares of \$1.00 par value; none issued	--	--
Common stock – authorized 40,000 shares of \$0.20 par value; issued and outstanding – 22,513 in 2018 and 23,070 in 2017	4,503	4,614
Additional paid-in capital	120,601	141,931
Accumulated other comprehensive loss	(33,883)	(24,243)
Company shares held by SERP, at cost	(1,886)	(1,960)
Retained earnings	495,245	565,330
Shareholders' equity	584,580	685,672
Non-controlling interest	710	1,093
Total equity	585,290	686,765
Total liabilities and equity	\$ 855,457	\$ 889,579

See Notes to Consolidated Financial Statements

CONSOLIDATED STATEMENTS OF OPERATIONS

(in thousands, except per share data)

	Year Ended December 31		
	2018	2017	2016
Net sales	\$ 1,171,599	\$ 1,184,739	\$ 1,147,431
Cost of sales	1,035,833	941,610	882,162
Gross profit	135,766	243,129	265,269
Selling, general and administrative expenses	180,795	160,775	153,145
Research and development expenses	28,332	26,817	24,969
Restructuring and asset impairment charges	13,060	--	--
Income (loss) from operations	(86,421)	55,537	87,155
Other income:			
Interest expense	(1,045)	(840)	(1,395)
Interest income	952	1,302	806
Other income	536	1,218	529
Income (loss) before income taxes	(85,978)	57,217	87,095
Income tax provision (benefit)	(25,234)	19,627	32,107
Net income (loss)	(60,744)	37,590	54,988
Net loss attributable to non-controlling interest	295	205	171
Net income (loss) attributable to controlling interest	\$ (60,449)	\$ 37,795	\$ 55,159
Earnings (loss) per Common Share:			
Net income (loss) attributable to controlling interest:			
Basic	\$ (2.64)	\$ 1.64	\$ 2.40
Diluted	(2.64)	1.63	2.38
Weighted average number of common shares outstanding:			
Basic	22,902	23,025	22,992
Diluted	22,902	23,184	23,142

See Notes to Consolidated Financial Statements

CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME (LOSS)

(in thousands)

	Year Ended December 31		
	2018	2017	2016
Net income (loss)	\$ (60,744)	\$ 37,590	\$ 54,988
Other comprehensive income (loss):			
Change in unrecognized pension and post-retirement benefit costs	(162)	689	(80)
Tax (expense) benefit on change in unrecognized pension and post-retirement benefit costs	38	(69)	29
Foreign currency translation adjustments	(9,516)	6,699	(2,420)
Tax expense on foreign currency translation adjustments	--	--	(5,527)
Other comprehensive income (loss)	(9,640)	7,319	(7,998)
Comprehensive loss attributable to non-controlling interest	439	232	137
Comprehensive income (loss) attributable to controlling interest	\$ (69,945)	\$ 45,141	\$ 47,127

See Notes to Consolidated Financial Statements

CONSOLIDATED STATEMENTS OF CASH FLOWS

(in thousands)

	Year Ended December 31		
	2018	2017	2016
Cash Flows from Operating Activities			
Net income (loss)	\$ (60,744)	\$ 37,590	\$ 54,988
Adjustments to reconcile net income (loss) to net cash provided (used) by operating activities:			
Depreciation	22,411	21,312	20,818
Amortization	5,502	4,490	3,995
Provision for doubtful accounts	223	482	280
Provision for warranties	13,219	16,725	18,912
Deferred compensation provision (benefit)	(1,554)	(574)	1,742
Deferred income tax benefit	(25,385)	(291)	(3,521)
Gain on disposition of fixed assets	(71)	(388)	(224)
Stock-based compensation	2,182	3,142	2,936
Restructuring and asset impairment charges	13,060	--	--
Distributions to SERP participants	(767)	(206)	(532)
Change in operating assets and liabilities, net of effects of acquisitions:			
Sale (purchase) of trading securities, net	(758)	473	(1,873)
Trade and other receivables	(16,189)	(7,749)	(4,895)
Inventories	30,757	(19,618)	30,839
Prepaid expenses	(11,943)	(5,181)	4,846
Other assets	(3,698)	(779)	2,069
Accounts payable	9,843	630	8,836
Customer deposits	(522)	9,379	(762)
Accrued product warranty	(17,539)	(14,642)	(15,125)
Income taxes payable	3,683	(597)	181
Accrued retirement benefit costs	(1,100)	45	(50)
Accrued loss reserves	(125)	122	229
Other accrued liabilities	8,887	(1,118)	11,142
Other	843	(1,366)	(25)
Net cash provided (used) by operating activities	(29,785)	41,881	134,806
Cash Flows from Investing Activities			
Business acquisition, net of cash acquired	--	(26,443)	(39,764)
Proceeds from sale of property and equipment	375	480	614
Expenditures for property and equipment	(27,440)	(20,046)	(27,367)
Sale (purchase) of investments	(360)	(891)	290
Net cash used by investing activities	(27,425)	(46,900)	(66,227)

See Notes to Consolidated Financial Statements

CONSOLIDATED STATEMENTS OF CASH FLOWS (CONTINUED)

(in thousands)

	Year Ended December 31		
	2018	2017	2016
Cash Flows from Financing Activities			
Payment of dividends	\$ (9,625)	\$ (9,226)	\$ (9,217)
Borrowings under bank loans	148,504	--	5,973
Repayment of bank loans	(91,964)	(7,242)	(5,903)
Purchase of shares of subsidiaries	(28)	(106)	(696)
Sale (purchase) of Company shares by SERP, net	377	289	(153)
Withholding tax paid upon vesting of restricted stock units	(432)	(507)	(1,024)
Repurchase of Company stock	(24,138)	--	--
Net cash provided (used) by financing activities	22,694	(16,792)	(11,020)
Effect of exchange rates on cash	(1,943)	1,720	(250)
Increase (decrease) in cash and cash equivalents	(36,459)	(20,091)	57,309
Cash and cash equivalents, beginning of year	62,280	82,371	25,062
Cash and cash equivalents, end of year	<u>\$ 25,821</u>	<u>\$ 62,280</u>	<u>\$ 82,371</u>
Supplemental Cash Flow Information			
Cash paid during the year for:			
Interest	\$ 856	\$ 588	\$ 1,407
Income taxes, net of refunds	<u>\$ 8,523</u>	<u>\$ 26,917</u>	<u>\$ 28,455</u>

See Notes to Consolidated Financial Statements

CONSOLIDATED STATEMENTS OF EQUITY

For the Years Ended December 31, 2018, 2017 and 2016 (in thousands)

	Common Stock Shares	Common Stock Amount	Additional Paid-In Capital	Accumulated Other Comprehensive Loss	Company Shares Held by SERP	Retained Earnings	Non- Controlling Interest	Total Equity
Balance December 31, 2015	22,988	\$ 4,598	\$ 137,883	\$ (23,564)	\$ (1,778)	\$ 490,933	\$ 1,786	\$ 609,858
Net income						55,159	(171)	54,988
Dividends (\$0.40 per share)			9			(9,226)		(9,217)
Other comprehensive loss				(7,998)				(7,998)
Change in ownership percentage of subsidiary							(1,322)	(1,322)
Stock-based compensation	5	1	2,935					2,936
RSU vesting	53	10	(10)					--
Withholding tax on vested RSUs			(1,024)					(1,024)
Sale of Company stock held by SERP, net			27		(180)			(153)
Cumulative effect of adopting ASU No. 2016-09			150			(95)		55
Other							718	718
Balance December 31, 2016	23,046	4,609	139,970	(31,562)	(1,958)	536,771	1,011	648,841
Net income						37,795	(205)	37,590
Dividends (\$0.40 per share)			10			(9,236)		(9,226)
Other comprehensive income				7,319				7,319
Change in ownership percentage of subsidiary							(43)	(43)
Stock-based compensation	1		2,172					2,172
RSU vesting	23	5	(5)					--
Withholding tax on vested RSUs			(507)					(507)
Sale of Company stock held by SERP, net			291		(2)			289
Other							330	330
Balance December 31, 2017	23,070	4,614	141,931	(24,243)	(1,960)	565,330	1,093	686,765
Net loss						(60,449)	(295)	(60,744)
Dividends (\$0.42 per share)			11			(9,636)		(9,625)
Other comprehensive loss				(9,640)				(9,640)
Change in ownership percentage of subsidiary							(159)	(159)
Stock-based compensation	2		2,815					2,815
RSU vesting	23	5	(5)					--
Withholding tax on vested RSUs			(432)					(432)
Sale of Company stock held by SERP, net			303		74			377
Repurchase of Company stock	(582)	(116)	(24,022)					(24,138)
Other							71	71
Balance December 31, 2018	22,513	\$ 4,503	\$ 120,601	\$ (33,883)	\$ (1,886)	\$ 495,245	\$ 710	\$ 585,290

See Notes to Consolidated Financial Statements

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

(Dollar and share amounts in thousands, except per share amounts unless otherwise specified)

1. Summary of Significant Accounting Policies

Basis of Presentation - The consolidated financial statements include the accounts of Astec Industries, Inc. and its domestic and foreign subsidiaries (the "Company"). The Company's significant wholly-owned and consolidated subsidiaries at December 31, 2018 are as follows:

Astec Australia Pty Ltd	Astec do Brasil Fabricacao de Equipamentos Ltda. (93% owned)
Astec, Inc.	Astec Insurance Company
Astec Industries LatAm SpA	Astec Mobile Machinery GmbH
Astec Mobile Screens, Inc.	Breaker Technology, Inc.
Breaker Technology Ltd.	Carlson Paving Products, Inc.
CEI Enterprises, Inc.	GEFCO, Inc.
Heatec, Inc.	Johnson Crushers International, Inc.
Kolberg-Pioneer, Inc.	Osborn Engineered Products SA (Pty) Ltd (99% owned)
Peterson Pacific Corp.	Power Flame Incorporated
RexCon, Inc.	Roadtec, Inc.
Telestack Limited	Telsmith, Inc.

All intercompany accounts and transactions have been eliminated in consolidation.

Use of Estimates - The preparation of financial statements in conformity with U.S. generally accepted accounting principles requires management to make estimates and assumptions that affect the amounts reported and disclosed in the financial statements and accompanying notes. Actual results could differ from those estimates.

Foreign Currency Translation - Subsidiaries located in Australia, Brazil, Canada, Chile, Germany, Northern Ireland, and South Africa operate primarily using local functional currencies. Accordingly, assets and liabilities of these subsidiaries are translated using exchange rates in effect at the end of the period, and revenues and costs are translated using average exchange rates for the period. The resulting adjustments are presented as a separate component of accumulated other comprehensive income (loss). Foreign currency transaction gains and losses, net are included in cost of sales and amounted to gains of \$539 and \$431 in 2018 and 2017, respectively and a loss of \$246 in 2016.

Fair Value of Financial Instruments - For cash and cash equivalents, trade receivables, other receivables and accounts payable, the carrying amount approximates the fair value because of the short-term nature of those instruments. Trading equity investments are valued at their estimated fair value based on their quoted market prices and debt securities are valued based upon a mix of observable market prices and model driven prices derived from a matrix of observable market prices for assets with similar characteristics obtained from a nationally recognized third party pricing service.

Financial assets and liabilities are categorized as of the end of each reporting period based upon the level of judgment associated with the inputs used to measure their fair value. The inputs used to measure the fair value are identified in the following hierarchy:

- Level 1 - Unadjusted quoted prices in active markets for identical assets or liabilities.
- Level 2 - Unadjusted quoted prices in active markets for similar assets or liabilities; or unadjusted quoted prices for identical or similar assets or liabilities in markets that are not active; or inputs other than quoted prices that are observable for the asset or liability.

Level 3 - Inputs reflect management's best estimate of what market participants would use in pricing the asset or liability at the measurement date. Consideration is given to the risk inherent in the valuation technique and the risk inherent in the inputs to the model.

All financial assets and liabilities held by the Company at December 31, 2018 and 2017 are classified as Level 1 or Level 2, as summarized in Note 3, Fair Value Measurements.

Cash and Cash Equivalents - All highly liquid investments with an original maturity of three months or less when purchased are considered to be cash and cash equivalents.

Investments - Investments consist primarily of investment-grade marketable securities. Trading securities are carried at fair value, with unrealized holding gains and losses included in net income. Realized gains and losses are accounted for on the specific identification method. Purchases and sales are recorded on a trade date basis. Management determines the appropriate classification of its investments at the time of acquisition and reevaluates such determination at each balance sheet date.

Accounts Receivable - The Company sells products to a wide variety of customers. Accounts receivable are carried at their outstanding principal amounts, less an allowance for doubtful accounts. The Company extends credit to its customers based on an evaluation of the customers' financial condition generally without requiring collateral, although the Company normally requires advance payments or letters of credit on large equipment orders. Credit risk is driven by conditions within the economy and the industry and is principally dependent on each customer's financial condition. To minimize credit risk, the Company monitors credit levels and financial conditions of customers on a continuing basis. After considering historical trends for uncollectible accounts, current economic conditions and specific customer recent payment history and financial stability, the Company records an allowance for doubtful accounts at a level which management believes is sufficient to cover probable credit losses. Amounts are deemed past due when they exceed the payment terms agreed to by the customer in the sales contract. Past due amounts are charged off when reasonable collection efforts have been exhausted and the amounts are deemed uncollectible by management. As of December 31, 2018, concentrations of credit risk with respect to receivables are limited due to the wide variety of customers.

Allowance for Doubtful Accounts - The following table represents a rollforward of the allowance for doubtful accounts for the years ended December 31, 2018, 2017 and 2016:

	Year Ended December 31		
	2018	2017	2016
Allowance balance, beginning of year	\$ 1,716	\$ 1,511	\$ 1,837
Provision	223	482	280
Write offs	(696)	(308)	(560)
Other	(59)	31	(46)
Allowance balance, end of year	\$ 1,184	\$ 1,716	\$ 1,511

Inventories - The Company's inventory is comprised of raw materials, work-in-process, finished goods and used equipment.

Raw material inventory is comprised of purchased steel and other purchased items for use in the manufacturing process or held for sale for the after-market parts business. The category also includes the manufacturing cost of completed equipment sub-assemblies produced for either integration into equipment manufactured at a later date or for sale in the Company's after-market parts business.

Work-in-process inventory consists of the value of materials, labor and overhead incurred to date in the manufacturing of incomplete equipment or incomplete equipment sub-assemblies being produced.

Finished goods inventory consists of completed equipment manufactured for sale to customers.

Used equipment inventory consists of equipment accepted in trade or purchased on the open market. The category also includes equipment rented to prospective customers on a short-term or month-to-month basis. Used equipment is valued at the lower of acquired or trade-in cost or net realizable value determined on each separate unit. Each unit of rental equipment is valued at the lower of original manufacturing, acquired or trade-in cost or net realizable value.

Inventories are valued at the lower of cost (first-in, first-out) or net realizable value, which requires the Company to make specific estimates, assumptions and judgments in determining the amount, if any, of reductions in the valuation of inventories to their net realizable values. The net realizable values of the Company's products are impacted by a number of factors, including changes in the price of steel, competitive sales pricing, quantities of inventories on hand, the age of the individual inventory items, market acceptance of the Company's products, the Company's normal gross margins, actions by our competitors, the condition of our used and rental inventory and general economic factors. Once an inventory item's value has been deemed to be less than cost, a net realizable value allowance is calculated and a new "cost basis" for that item is effectively established. This new cost is retained for that item until such time as the item is disposed of or the Company determines that an additional write-down is necessary. Additional write-downs may be required in the future based upon changes in assumptions due to general economic downturns in the markets in which the Company operates, changes in competitor pricing, new product design or other technological advances introduced by the Company or its competitors and other factors unique to individual inventory items.

The most significant component of the Company's inventory is steel. A significant decline in the market price of steel could result in a decline in the market value of the equipment or parts we sell. During periods of significant declining steel prices, the Company reviews the valuation of its inventories to determine if reductions are needed in the recorded value of inventory on hand to its net realizable value.

The Company reviews the individual items included in its finished goods, used equipment and rental equipment inventory on a model-by-model or unit-by-unit basis to determine if any item's net realizable value is below its carrying value. This analysis is expanded to include items in work-in-process and raw material inventory if factors indicate those items may also be impacted. In performing this review, judgments are made and, in addition to the factors discussed above, additional consideration is given to the age of the specific items of used or rental inventory, prior sales offers or lack thereof, the physical condition of the specific items and general market conditions for the specific items. Additionally, an analysis of raw material inventory is performed to calculate reserves needed for obsolete inventory based upon quantities of items on hand, the age of those items and their recent and expected future usage or sale.

When the Company determines that the value of inventory has become impaired through damage, deterioration, obsolescence, changes in price levels, excessive levels of inventory or other causes, the Company reduces the carrying value to the net realizable value based on estimates, assumptions and judgments made from the information available at that time. Abnormal amounts of idle facility expense, freight, handling cost and wasted materials are recognized as current period charges.

Property and Equipment - Property and equipment is stated at cost. Depreciation is calculated for financial reporting purposes using the straight-line method based on the estimated useful lives of the assets as follows: airplanes (20 years), buildings (40 years) and equipment (3 to 10 years). Both accelerated and straight-line methods are used for tax compliance purposes. Routine repair and maintenance costs and planned major maintenance are expensed when incurred.

Goodwill and Other Intangible Assets - The Company classifies intangible assets as either intangible assets with definite lives subject to amortization or goodwill.

The Company tests intangible assets with definite lives for impairment if conditions exist that indicate the carrying value may not be recoverable. Such conditions may include an economic downturn in a geographic market or a change in the assessment of future operations. An impairment charge is recorded when the carrying value of the definite lived intangible asset is not recoverable by the future undiscounted cash flows expected to be generated from the use of the asset.

The Company determines the useful lives of identifiable intangible assets after considering the specific facts and circumstances related to each intangible asset. Factors considered when determining useful lives include the contractual terms of agreements, the history of the asset, the Company's long-term strategy for the use of the asset, any laws or other local regulations which could impact the useful life of the asset, and other economic factors, including competition and specific market conditions. Intangible assets that are deemed to have definite lives are amortized over their useful lives as follows: dealer network and customer relationships: 8-19 years; trade names: 15 years; other: 5-19 years.

Goodwill is not amortized. The Company tests goodwill for impairment during the fourth quarter of each year or more frequently if events or circumstances indicate that goodwill might be impaired. Beginning in 2018, the Company changed its annual goodwill impairment testing date from December 31 to October 31 to better align the testing date with its financial planning process and alleviate resource constraints. The Company would not expect a materially different outcome in any given year as a result of testing on October 31 as compared to December 31. The Company uses qualitative factors to determine whether it is more likely than not (a likelihood of more than 50 percent) that the fair value of a reporting unit is less than its carrying value, including goodwill. The Company estimates the fair values of each of its reporting units with goodwill using the income approach.

The income approach uses a reporting unit's projection of estimated future operating results and cash flows which are then discounted using a weighted average cost of capital determined based on current market conditions for the individual reporting unit. The projection uses management's best estimates of cash flows over the projection period based on estimates of annual and terminal growth rates in sales and costs, changes in operating margins, selling, general and administrative expenses, working capital requirements and capital expenditures. Other factors used in evaluating the fair value of a reporting unit could include deterioration in the general economy, fluctuations in foreign exchange, deterioration in the industry or markets in which the reporting unit operates, an increased competitive market, a regulatory or political development in the market, increases in raw materials, labor costs or other factors that have a negative effect on earnings and cash flows, a decline in actual or budgeted earnings and cash flows, or entity specific changes in management, key personnel, strategy or customer base. If the fair value of a reporting unit is found to be less than its book value, the Company will record an impairment loss equal to the excess, if any, of the book value over the fair value.

The fair value of reporting units that do not have goodwill are estimated using either the income or market approaches, depending on which approach is the most appropriate for each reporting unit. The fair value of the reporting units that serve operating units in supporting roles, such as the captive insurance company and the corporate reporting unit are estimated using the cost approach. The sum of the fair values of all reporting units is compared to the fair value of the consolidated Company, calculated using the market approach, which is inferred from the market capitalization of the Company at the date of the valuation, to confirm that the Company's estimation of the fair value of its reporting units is reasonable.

Determining the fair values of the Company's reporting units involves the use of significant estimates and assumptions. Due to the inherent uncertainty involved in making these estimates and assumptions, actual results could differ materially from those estimates.

Impairment of Long-lived Assets - In the event that facts and circumstances indicate the carrying amounts of long-lived assets may be impaired, an evaluation of recoverability is performed. If an evaluation is required, the estimated future undiscounted cash flows associated with the asset are compared to the carrying amount for each asset (or group of assets) to determine if a write-down is required. If this review indicates that the assets will not be recoverable, the carrying values of the impaired assets are reduced to their estimated fair value. Fair value is estimated using discounted cash flows, prices for similar assets or other valuation techniques.

Self-Insurance Reserves - The Company retains the risk for a portion of its workers' compensation claims and general liability claims by way of a captive insurance company, Astec Insurance Company ("Astec Insurance" or the "captive"). The objectives of Astec Insurance are to improve control over and reduce the cost of claims; to improve focus on risk reduction with the development of a program structure which rewards proactive loss control; and to ensure management participation in the defense and settlement process for claims.

For general liability claims, the captive is liable for the first \$1,000 per occurrence. The Company carries general liability, excess liability and umbrella policies for claims in excess of amounts covered by the captive.

For workers' compensation claims, the captive is liable for the first \$350 per occurrence. The Company utilizes a large national insurance company as third-party administrator for workers' compensation claims and carries insurance coverage for claims liabilities in excess of amounts covered by the captive.

The financial statements of the captive are consolidated into the financial statements of the Company. The short-term and long-term reserves for claims and potential claims related to general liability and workers' compensation under the captive are included in accrued loss reserves or other long-term liabilities, respectively, in the consolidated balance sheets depending on the expected timing of future payments. The undiscounted reserves are actuarially determined to cover the ultimate cost of each claim based on the Company's evaluation of the type and severity of individual claims and historical information, primarily its own claims experience, along with assumptions about future events. Changes in assumptions, as well as changes in actual experience, could cause these estimates to change in the future. However, the Company does not believe it is reasonably likely that the reserve level will materially change in the foreseeable future.

The Company is self-insured for health and prescription claims under its Group Health Insurance Plan at all but one of the Company's domestic manufacturing subsidiaries. The Company carries reinsurance coverage to limit its exposure for individual health claims above certain limits. Third parties administer health claims and prescription medication claims. The Company maintains a reserve for the self-insured health plan which is included in accrued loss reserves on the Company's consolidated balance sheets. This reserve includes both unpaid claims and an estimate of claims incurred but not reported, based on historical claims and payment experience. Historically, the reserves have been sufficient to provide for claims payments. Changes in actual claims experience or payment patterns could cause the reserve to change, but the Company does not believe it is reasonably likely that the reserve level will materially change in the near future.

The remaining U.S. subsidiary is covered under a fully insured group health plan. Employees of the Company's foreign subsidiaries are insured under separate health plans. No reserves are necessary for these fully-insured health plans.

Revenue Recognition - Revenue is generally recognized on sales at the point in time when pervasive evidence of an arrangement exists, the price is fixed and determinable, the product has been delivered or services have been rendered and there is reasonable assurance of collection of the sales proceeds. Revenue is measured as the amount of consideration the Company expects to receive in exchange for transferring goods or providing services. The Company generally obtains purchase authorizations from its customers for a specified amount of products at a specified price with specific delivery terms. A significant portion of the Company's equipment sales represents equipment produced in the Company's manufacturing facilities under short-term contracts for a customer's project or equipment designed to meet a customer's requirements. Most of the equipment sold by the Company is based on standard configurations, some of which are modified to meet customer's needs or specifications. The Company provides customers with technical design and performance specifications and typically performs pre-shipment testing, when feasible, to ensure the equipment performs according to the customer's need, regardless of whether the Company provides installation services in addition to selling the equipment. Significant down payments are required on many equipment orders with other terms allowing for payment shortly after shipment, typically 30 days. Taxes assessed by a governmental authority that are directly imposed on revenue-producing transactions between the Company and its customers, such as sales, use, value-added and some excise taxes, are excluded from revenue. Expected warranty costs for our standard warranties are expensed at the time the related revenue is recognized. Costs of obtaining sales contracts with an expected duration of one year or less are expensed as incurred. As contracts are typically fulfilled within one year from the date of the contract, revenue adjustments for a potential financing component or the costs to obtain the contract are not made.

Depending on the terms of the arrangement with the customer, recognition of a portion of the consideration received may be deferred and recorded as a contract liability if we have to satisfy a future obligation, such as to provide installation assistance, service work to be performed in the future without charge, floor plan interest to be reimbursed to our dealer customers, payments for extended warranties, for annual rebates given to certain high volume customers or for obligations for future estimated returns to be allowed based upon historical trends.

Certain contracts include terms and conditions pursuant to which the Company recognizes revenues upon the completion of production, and the equipment is subsequently stored at the Company's plant at the customer's request. Revenue is recorded on such contracts upon the customer's assumption of title and risk of ownership, which transfers control of the equipment, and when collectability is reasonably assured. In addition, there must be a fixed schedule of delivery of the goods consistent with the customer's business practices, the Company must not have retained any specific performance obligations such that the earnings process is not complete and the goods must have been segregated from the Company's inventory prior to revenue recognition.

The Company had one large pellet plant sale on which revenue was recorded over time based upon the ratio of costs incurred to estimated total costs. Penalties were accounted for as a reduction in sales.

Service and Equipment Installation Revenue – Purchasers of certain of the Company’s equipment often contract with the Company to provide installation services. Installation is typically separately priced in the contract based upon observable market prices for stand-alone performance obligations or a cost plus margin approach when one is not available. The Company may also provide future services on equipment sold at the customer’s request, which may be for equipment repairs after the warranty period expires. Service is billed on a cost plus margin approach or at a standard rate per hour.

Used Equipment Sales - Used equipment is obtained by trade-in on new equipment sales, as a separate purchase in the open market or from the Company’s equipment rental business. Revenues from the sale of used equipment are recognized upon transfer of control to the customer at agreed upon pricing.

Freight Revenue – Under a practical expedient allowed under ASU 2014-09, the Company records revenues earned for shipping and handling as revenue at the time of shipment, regardless of whether or not it is identified as a separate performance obligation. The cost of shipping and handling is classified as cost of goods sold concurrently.

Other Revenues – Miscellaneous revenues and offsets not associated with one of the above classifications include rental revenues, extended warranty revenues, early pay discounts and floor plan interest reimbursements.

Advertising Expense - The cost of advertising is expensed as incurred. The Company incurred \$4,136, \$3,793, and \$4,045 in advertising costs during 2018, 2017 and 2016, respectively, which is included in selling, general and administrative expenses.

Income Taxes - Income taxes are based on pre-tax financial accounting income. Deferred tax assets and liabilities are recognized for the expected tax consequences of temporary differences between the tax bases of assets and liabilities and their reported amounts. The Company periodically assesses the need to establish valuation allowances against its deferred tax assets to the extent the Company no longer believes it is more likely than not that the tax assets will be fully utilized.

The Company evaluates a tax position to determine whether it is more likely than not that the tax position will be sustained upon examination, based upon the technical merits of the position. A tax position that meets the more-likely-than-not recognition threshold is subject to a measurement assessment to determine the amount of benefit to recognize and the appropriate reserve to establish, if any. If a tax position does not meet the more-likely-than-not recognition threshold, no benefit is recognized. The Company is periodically audited by U.S. federal and state as well as foreign tax authorities. While it is often difficult to predict final outcome or timing of resolution of any particular tax matter, the Company believes its reserve for uncertain tax positions is adequate to reduce the uncertain positions to the greatest amount of benefit that is more likely than not realizable.

Product Warranty Reserve - The Company accrues for the estimated cost of product warranties at the time revenue is recognized. Warranty obligations by product line or model are evaluated based on historical warranty claims experience. For equipment, the Company’s standard product warranty terms generally include post-sales support and repairs of products at no additional charge for periods ranging from three months to two years or up to a specified number of hours of operation. For parts from component suppliers, the Company relies on the original manufacturer’s warranty that accompanies those parts. Generally, Company fabricated parts are not covered by specific warranty terms. Although failure of fabricated parts due to material or workmanship is rare, if it occurs, the Company’s policy is to replace fabricated parts at no additional charge.

The Company engages in extensive product quality programs and processes, including actively monitoring and evaluating the quality of our component suppliers. Estimated warranty obligations are based upon warranty terms, product failure rates, repair costs and current period machine shipments. If actual product failure rates, repair costs, service delivery costs or post-sales support costs differ from our estimates, revisions to the estimated warranty liability may be required.

Pension and Retirement Plans - The determination of obligations and expenses under the Company's pension plan is dependent on the Company's selection of certain assumptions used by independent actuaries in calculating such amounts. Those assumptions are described in Note 12, Pension and Retirement Plans and include among others, the discount rate, expected return on plan assets and the expected mortality rates. In accordance with U.S. generally accepted accounting principles, actual results that differ from assumptions are accumulated and amortized over future periods and, therefore, generally affect the recognized expense in such periods. Significant differences in actual experience or significant changes in the assumptions used may materially affect the pension obligations and future expenses.

The Company recognizes the overfunded or underfunded status of its pension plan as an asset or liability. Actuarial gains and losses, amortization of prior service cost (credit) and amortization of transition obligations are recognized through other comprehensive income (loss) in the year in which the changes occur. The Company measures the funded status of its pension plan as of the date of the Company's fiscal year-end.

Stock-based Compensation - The Company recognizes the cost of employee and director services received in exchange for equity awards in the consolidated financial statements based on the grant date calculated fair value of the awards. The Company recognizes stock-based compensation expense over the period during which a recipient is required to provide service in exchange for the award (the vesting period). The Company's equity awards are further described in Note 16, Shareholders' Equity.

Earnings Per Share - Basic earnings (loss) per share is based on the weighted average number of common shares outstanding and diluted earnings (loss) per share includes potential dilutive effects of restricted stock units and shares held in the Company's supplemental executive retirement plan.

The following table sets forth a reconciliation of the number of shares used in the computation of basic and diluted earnings (loss) per share:

	Year Ended December 31		
	2018	2017	2016
Denominator:			
Denominator for basic earnings (loss) per share	22,902	23,025	22,992
Effect of dilutive securities:			
Restricted stock units	--	96	85
Supplemental executive retirement plan	--	63	65
Denominator for diluted earnings (loss) per share	<u>22,902</u>	<u>23,184</u>	<u>23,142</u>

Derivatives and Hedging Activities - The Company recognizes all derivatives in the consolidated balance sheets at their fair value. Derivatives that are not hedges are adjusted to fair value through income. If the derivative is a hedge, depending on the nature of the hedge, changes in the fair value of derivatives are either offset against the change in fair value of assets, liabilities, or firm commitments through income or recognized in other comprehensive income (loss) until the hedged item is recognized in income. The ineffective portion of a derivative's change in fair value is immediately recognized in income. From time to time, the Company's foreign subsidiaries enter into foreign currency exchange contracts to mitigate exposure to fluctuation in currency exchange rates. See Note 13, Derivative Financial Instruments, regarding foreign exchange contracts outstanding at December 31, 2018 and 2017.

Business Combinations - The Company accounts for business combinations using the acquisition method. Accordingly, intangible assets are recorded apart from goodwill if they arise from contractual or legal rights or if they are separable from goodwill. Related third-party acquisition costs are expensed as incurred and contingent consideration is booked at its fair value as part of the purchase price. See Note 21, Business Combinations, regarding acquisitions completed by the Company in the years ended December 31, 2017 and 2016.

Subsequent Events Review - Management has evaluated events occurring between December 31, 2018 and the date these consolidated financial statements were filed with the Securities and Exchange Commission for proper recording or disclosure therein.

Recent Accounting Pronouncements - In May 2014, the Financial Accounting Standards Board (“FASB”) issued Accounting Standards Update (“ASU”) No. 2014-09, “Revenue from Contracts with Customers”, which supersedes existing revenue guidance under U.S. GAAP. The standard's core principle is that a company will recognize revenue when it transfers promised goods or services to customers in an amount that reflects the consideration to which the company expects to be entitled in exchange for those goods or services. Certain provisions of the standard were clarified in March 2016 with the issuance of ASU No. 2016-08, “Revenue from Contracts with Customers (Topic 606)”, which provided additional implementation guidance in order to eliminate the potential for diversity in practice arising from inconsistent application of the principal versus agent guidance. Under the new guidance, when an entity determines it is a principal in a transaction, the entity recognizes revenue in the gross amount of consideration; however, in transactions where an entity determines it is an agent, the entity recognizes revenue in the amount of any fee or commission to which it expects to be entitled. These new standards require companies to use more judgment and to make more estimates than under previous guidance and expand required disclosures to include information regarding contract assets and liabilities as well as a more disaggregated view of revenue. The standards are effective for public companies for annual periods beginning after December 15, 2017 and, as such, the Company adopted the new standards effective January 1, 2018, using the modified retrospective transition method. See Note 17, Revenue Recognition, for additional disclosures required by the standards. The adoption of the standards did not have a material impact on the Company’s financial position, results of operations or cash flows, and no cumulative effect adjustment to retained earnings was recorded.

In January 2016, the FASB issued ASU No. 2016-01, “Financial Instruments - Overall (Subtopic 825-10)”, which requires, among other things, equity investments with readily determinable fair values, except those accounted for under the equity method of accounting or those that result in consolidation of the investee, to be measured at fair value with changes in fair value recognized in net income. The new standard was further clarified by the issuance of ASU No. 2018-03, “Technical Corrections and Improvements to Financial Instruments – Overall (Subtopic 825-10), Recognition and Measurement of Financial Assets and Financial Liabilities” in February 2018. The standards are effective for public companies in fiscal years beginning after December 15, 2017, and the Company adopted the standard effective January 1, 2018. The adoption of these standards did not have a material impact on the Company's financial position, results of operations or cash flows.

In February 2016, the FASB issued ASU No. 2016-02, “Leases (Topic 842)”, which significantly changes the accounting for operating leases by lessees. The accounting applied by lessors is largely unchanged from that applied under previous guidance. The new guidance establishes a right-of-use (“ROU”) model and requires lessees to recognize lease assets and lease liabilities in the balance sheet, initially measured at the present value of the lease payments, for leases which were classified as operating leases under previous guidance. Lease cost included in the statement of operations will be calculated so that the cost of the lease is allocated over the lease term, generally on a straight-line basis. The Company has made an accounting policy election to exclude leases with a term of 12 months or less from the requirement to record related assets and liabilities. Certain provisions of ASU No. 2016-02 were later modified or clarified by the issuance of ASU 2018-11, “Leases (Topic 842): Targeted Improvements” and ASU 2018-10, “Codification Improvements to Topic 842, Leases”. A modified retrospective transition approach is required by the ASU and its provisions must be applied to all leases existing at the date of initial application. An entity may choose to use either (1) the standard’s effective date or (2) the beginning of the earliest comparative period presented in the financial statements as its date of initial application. The new standards are effective for public companies for fiscal years beginning after December 15, 2018. The Company adopted the new standards effective January 1, 2019 using the effective date as the date of initial application. Consequently, financial information will not be updated and the disclosures required under the new standards will not be provided for periods before January 1, 2019. The standards provide a number of optional practical expedients in transition which the Company is continuing to evaluate. The Company does not expect the adoption of these standards to have a material impact on its results of operations or cash flows; however, the Company continues to evaluate the impact the adoption of the new standards will have on its financial position. While the Company continues to assess all of the effects of adoption, it currently believes the most significant effects relate to the recognition of new ROU assets and lease liabilities on its consolidated balance sheet for its operating leases and new disclosures about its leasing activities.

In June 2016, the FASB issued ASU No. 2016-13, “Financial Instruments – Credit Losses (Topic 326), Measurement of Credit Losses on Financial Instruments”. The standard changes how credit losses are measured for most financial assets and certain other instruments that currently are not measured through net income. The standard will require an expected loss model for instruments measured at amortized cost as opposed to the current incurred loss approach. In valuing available for sale debt securities, allowances will be required to be recorded, rather than the current approach of reducing the carrying amount, for other than temporary impairments. A cumulative adjustment to retained earnings is to be recorded as of the beginning of the period of adoption to reflect the impact of applying the provisions of the standard. The standard is effective for public companies for periods beginning after December 15, 2019 and the Company expects to adopt the new standard as of January 1, 2020. The Company has not yet determined what impact, if any, the adoption of this new standard will have on the Company's financial position, results of operations or cash flows.

In August 2016, the FASB issued ASU No. 2016-15, “Statement of Cash Flows (Topic 230), Classification of Certain Cash Receipts and Cash Payments (a consensus of the Emerging Issues Task Force)” which clarifies how certain cash receipts and cash payments should be presented on the statement of cash flows. The statement also addresses how the predominance principle should be applied when cash payments have aspects of more than one class of cash flows. The standard is effective for public companies in fiscal years beginning after December 15, 2017, and the Company adopted the standard effective January 1, 2018. The adoption of this standard did not have a material impact on the Company's consolidated statements of cash flows.

In October 2016, the FASB issued ASU No. 2016-16, “Income Taxes (Topic 740), Intra-Entity Transfers of Assets Other Than Inventory” which requires companies to account for the income tax effects of intercompany sales and transfers of assets other than inventory, such as intangible assets, when the transfer occurs. This is a change from previous guidance, which required companies to defer the income tax effects of intercompany transfers of assets until the asset has been sold to an outside party or otherwise recognized by being depreciated, amortized, or impaired. The new guidance requires companies to defer the income tax effects of only intercompany transfers of inventory. The standard is effective for public companies in fiscal years beginning after December 15, 2017. The Company adopted the new standard effective January 1, 2018. The application of this standard did not have a material impact on the Company's financial position, results of operations or cash flows.

In January 2017, the FASB issued ASU No. 2017-01, “Business Combinations (Topic 805), Clarifying the Definition of a Business,” which provides additional guidance to assist entities with evaluating whether transactions should be accounted for as acquisitions (or disposals) of assets or businesses. The standard is effective for public companies for annual or interim periods beginning after December 15, 2017. The Company adopted the new standard effective January 1, 2018. The application of this standard did not have a material impact on the Company's financial position, results of operations or cash flows.

In August 2017, the FASB issued ASU No. 2017-12, “Derivatives and Hedging (Topic 815), Targeted Improvements to Hedging Activities”, to improve the financial reporting of hedging relationships to better portray the economic results of an entity's risk management activities in its financial statements. The new guidance is effective for public companies for fiscal years beginning after December 15, 2018 and interim periods within those fiscal years with early adoption permitted in any interim period after its issuance. The Company adopted the new standard effective January 1, 2019. The Company does not expect the application of this standard to have a material impact on its financial position, results of operations or cash flows.

In February 2018, the FASB issued ASU No. 2018-02, “Income Statement – Reporting Comprehensive Income (Topic 220), Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income”, which permits companies to reclassify tax effects stranded in accumulated other comprehensive income (“OCI”) as a result of tax reform impacting tax rates or other items, such as changing from a worldwide tax system to a territorial system, from OCI to retained earnings. Other tax effects stranded in OCI due to other reasons, such as prior changes in tax laws or changes in valuation allowances, may not be reclassified. Additional disclosures will also be required upon adoption of the new standard. The new standard is effective for fiscal years beginning after December 15, 2018, with early adoption permitted. The Company adopted this new standard effective January 1, 2019. The Company does not expect the adoption of this standard to have a material impact on its financial position, results of operations or cash flows.

In March 2018, the FASB issued ASU No. 2018-05 “Income Taxes (Topic 740), amendments to SEC Paragraphs Pursuant to SEC Staff Accounting Bulletin No. 118 (SEC Update)”, which addresses the accounting and disclosures around the enactment of the Tax Cuts and Jobs Act and the Securities and Exchange Commission's Staff Accounting Bulletin No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act (“SAB 118”). The Company adopted this new standard in the first quarter of 2018. See Note 14, Income Taxes, for the disclosures related to this amended guidance.

In August 2018, the FASB issued ASU No. 2018-13, “Fair Value Measurement (Topic 820): Disclosure Framework – Changes to the Disclosure Requirements for Fair Value Measurement” which aims to improve the overall usefulness of disclosures to financial statement users and reduce unnecessary costs to companies when preparing fair value measurement disclosures. The standard is effective for annual and interim periods beginning after December 15, 2019 with early adoption permitted. The Company expects to adopt this new standard effective January 1, 2020. The Company does not expect the adoption of this new standard to have a material impact on its financial position, results of operations or cash flows.

2. Inventories

Inventories consist of the following:

	December 31	
	2018	2017
Raw materials and parts	\$ 173,919	\$ 146,144
Work-in-process	69,718	129,441
Finished goods	89,152	94,571
Used equipment	23,155	21,223
Total	\$ 355,944	\$ 391,379

3. Fair Value Measurements

The Company has various financial instruments that must be measured at fair value on a recurring basis, including marketable debt and equity securities held by Astec Insurance, and marketable equity securities held in an unqualified Supplemental Executive Retirement Plan (“SERP”). The financial assets held in the SERP also constitute a liability of the Company for financial reporting purposes. The Company’s subsidiaries also occasionally enter into foreign currency exchange contracts to mitigate exposure to fluctuations in currency exchange rates.

For cash and cash equivalents, trade receivables, other receivables and accounts payable, the carrying amount approximates the fair value because of the short-term nature of these instruments. Investments are carried at their fair value based on quoted market prices for identical or similar assets or, where no quoted prices exist, other observable inputs for the asset. The fair values of foreign currency exchange contracts are based on quotations from various banks for similar instruments using models with market based inputs.

As indicated in the tables below, the Company has determined that its financial assets and liabilities at December 31, 2018 and 2017 are level 1 and level 2 in the fair value hierarchy:

	December 31, 2018		
	<u>Level 1</u>	<u>Level 2</u>	<u>Total</u>
Financial Assets:			
Trading equity securities:			
SERP money market fund	\$ 229	\$ --	\$ 229
SERP mutual funds	4,755	--	4,755
Preferred stocks	248	--	248
Trading debt securities:			
Corporate bonds	5,398	--	5,398
Municipal bonds	--	1,546	1,546
Floating rate notes	1,300	--	1,300
U.S. Treasury bills	2,210	--	2,210
Asset-backed securities	--	442	442
Other	--	708	708
Derivative financial instruments	--	333	333
Total financial assets	<u>\$ 14,140</u>	<u>\$ 3,029</u>	<u>\$ 17,169</u>
Financial Liabilities:			
SERP liabilities	\$ --	\$ 6,641	\$ 6,641
Total financial liabilities	<u>\$ --</u>	<u>\$ 6,641</u>	<u>\$ 6,641</u>

	December 31, 2017		
	<u>Level 1</u>	<u>Level 2</u>	<u>Total</u>
Financial Assets:			
Trading equity securities:			
SERP money market fund	\$ 124	\$ --	\$ 124
SERP mutual funds	4,839	--	4,839
Preferred stocks	364	--	364
Trading debt securities:			
Corporate bonds	5,661	--	5,661
Municipal bonds	--	1,912	1,912
Floating rate notes	753	--	753
U.S. Treasury bills	1,030	--	1,030
Asset-backed securities	--	526	526
Other	--	968	968
Total financial assets	<u>\$ 12,771</u>	<u>\$ 3,406</u>	<u>\$ 16,177</u>
Financial Liabilities:			
SERP liabilities	\$ --	\$ 8,552	\$ 8,552
Derivative financial instruments	--	112	112
Total financial liabilities	<u>\$ --</u>	<u>\$ 8,664</u>	<u>\$ 8,664</u>

The Company reevaluates the volume of trading activity for each of its investments at the end of each reporting period and adjusts the level within the fair value hierarchy as needed.

4. Investments

The Company's trading securities consist of the following:

	<u>Amortized Cost</u>	<u>Gross Unrealized Gains</u>	<u>Gross Unrealized Losses</u>	<u>Fair Value (Net Carrying Amount)</u>
December 31, 2018				
Trading equity securities	\$ 5,546	\$ 50	\$ 365	\$ 5,231
Trading debt securities	11,817	55	267	11,605
Total	<u>\$ 17,363</u>	<u>\$ 105</u>	<u>\$ 632</u>	<u>\$ 16,836</u>
December 31, 2017				
Trading equity securities	\$ 4,964	\$ 394	\$ 31	\$ 5,327
Trading debt securities	10,971	58	179	10,850
Total	<u>\$ 15,935</u>	<u>\$ 452</u>	<u>\$ 210</u>	<u>\$ 16,177</u>

Trading equity investments are valued at their estimated fair value based on their quoted market prices and trading debt securities are valued based upon a mix of observable market prices and model driven prices derived from a matrix of observable market prices for assets with similar characteristics obtained from a nationally recognized third-party pricing service. Additionally, a significant portion of the trading equity securities are in equity money market and mutual funds and also comprise a portion of the Company's liability under its SERP. See Note 12, Pension and Retirement Plans, for additional information on these investments and the SERP.

Trading debt securities are comprised mainly of marketable debt securities held by Astec Insurance. Astec Insurance has an investment strategy that focuses on providing regular and predictable interest income from a diversified portfolio of high-quality fixed income securities.

5. Goodwill

Goodwill represents the excess of the purchase price over the fair value of identifiable net assets acquired in business combinations. Current U.S. accounting guidance provides that goodwill and indefinite-lived intangible assets be tested for impairment at least annually. The Company performs the required valuation procedures each year as of December 31 after the following year's forecasts are submitted and reviewed.

Goodwill impairment is the excess of the carrying amount of a reporting unit (that includes goodwill) over its fair value. Impairment is limited to the carrying amount of goodwill allocated to the reporting unit. The Company estimated the fair value of its reporting units as of December 31, 2018 based upon a combination of discounted cash flows and market approaches. Weighted average cost of capital assumptions used in the calculations ranged from 23.9% to 25.8% and terminal growth rate of 3% was also assumed. The sum of the reporting units valuations determined by the Company was reconciled to the Company's overall market capitalization. The valuations performed in the fourth quarter of 2018 indicated impairment in the amount of \$11,190 in two of the Company's reporting units in the Energy Group. The valuations performed in 2017 and 2016 indicated no impairment of goodwill. In addition, as part of a business unit restructuring, additional goodwill of \$955 was written off.

The changes in the carrying amount of goodwill and accumulated impairment losses by reporting segment during the years ended December 31, 2018 and 2017 are as follows:

	Infrastructure Group	Aggregate and Mining Group	Energy Group	Total
Balance, December 31, 2016:				
Goodwill	\$ 10,758	\$ 31,920	\$ 19,369	\$ 62,047
Accumulated impairment	(2,310)	(12,196)	(6,737)	(21,243)
Net	<u>8,448</u>	<u>19,724</u>	<u>12,632</u>	<u>40,804</u>
Acquisition	--	--	3,488	3,488
Foreign currency translation	125	1,315	--	1,440
Balance, December 31, 2017:				
Goodwill	10,883	33,235	22,857	66,975
Accumulated impairment losses	(2,310)	(12,196)	(6,737)	(21,243)
Net	<u>8,573</u>	<u>21,039</u>	<u>16,120</u>	<u>45,732</u>
Restructuring write off	(955)	--	--	(955)
Foreign currency translation	(49)	(790)	--	(839)
Impairment	--	--	(11,190)	(11,190)
Balance, December 31, 2018:				
Goodwill	9,879	32,445	22,857	65,181
Accumulated impairment	(2,310)	(12,196)	(17,927)	(32,433)
Net	<u>\$ 7,569</u>	<u>\$ 20,249</u>	<u>\$ 4,930</u>	<u>\$ 32,748</u>

6. Intangible Assets

Intangible assets consisted of the following at December 31, 2018 and 2017:

	2018			2017		
	Gross Carrying Value	Accumulated Amortization	Net Carrying Value	Gross Carrying Value	Accumulated Amortization	Net Carrying Value
Dealer network and customer relationships	\$ 30,909	\$ 14,472	\$ 16,437	\$ 31,376	\$ 10,856	\$ 20,520
Trade names	9,536	2,509	7,027	9,650	1,914	7,736
Other	6,618	4,712	1,906	6,821	4,125	2,696
Total	<u>\$ 47,063</u>	<u>\$ 21,693</u>	<u>\$ 25,370</u>	<u>\$ 47,847</u>	<u>\$ 16,895</u>	<u>\$ 30,952</u>

Amortization expense on intangible assets was \$5,125, \$4,064 and \$3,562 for 2018, 2017 and 2016, respectively. Intangible asset amortization expense is expected to be \$3,944, \$3,511, \$3,118, \$2,660 and \$2,178 in the years ending December 31, 2019, 2020, 2021, 2022 and 2023, respectively, and \$9,959 thereafter.

7. Property and Equipment

Property and equipment at cost, less accumulated depreciation, is as follows:

	December 31	
	2018	2017
Land	\$ 15,774	\$ 15,568
Building and land improvements	145,913	143,339
Construction in progress	10,410	10,680
Manufacturing and office equipment	260,420	244,324
Aviation equipment	14,424	14,227
Less accumulated depreciation	(254,493)	(237,742)
Total	\$ 192,448	\$ 190,396

Depreciation expense was \$22,411, \$21,312 and \$20,818 for the years ended December 31, 2018, 2017 and 2016, respectively.

8. Leases

The Company leases certain land, buildings and equipment for use in its operations under various operating leases. Total rental expense charged to operations under operating leases was approximately \$3,618, \$3,211 and \$2,792 for the years ended December 31, 2018, 2017 and 2016, respectively.

Minimum rental commitments for all noncancelable operating leases at December 31, 2018 are as follows:

2019	\$ 1,992
2020	1,100
2021	388
2022	144
2023	66
Thereafter	12
	<u>\$ 3,702</u>

9. Debt

On April 12, 2017, the Company and certain of its subsidiaries entered into an amended and restated credit agreement whereby the lender extended to the Company an unsecured line of credit of up to \$100,000, including a sub-limit for letters of credit of up to \$30,000. As of December 31, 2018, outstanding borrowings under the agreement totaled \$58,778, which are included in long-term debt in the accompanying consolidated balance sheets. No amounts were outstanding at December 31, 2017 under the agreement. Letters of credit totaling \$11,044, including \$3,200 of letters of credit issued to banks in Brazil to secure the local debt of Astec do Brasil Fabricacao de Equipamentos Ltda. ("Astec Brazil"), were outstanding under the credit facility as of December 31, 2018, resulting in additional borrowing ability of \$30,178 under the credit facility. The credit agreement has a five-year term expiring in April 2022. Borrowings under the agreement are subject to an interest rate equal to the daily one-month LIBOR rate plus a 0.75% margin, resulting in a rate of 3.27% as of December 31, 2018. The unused facility fee is 0.125%. Interest only payments are due monthly. The amended and restated credit agreement contains certain financial covenants, including provisions concerning required levels of annual net income and minimum tangible net worth.

In February 2019, the \$100,000 amended and restated credit agreement discussed above was again amended to increase the unsecured line of credit to a maximum of \$150,000 and to extend the maturity date of the agreement to December 29, 2023. Upon disposition of the Georgia wood pellet plant, the Company is required to apply the proceeds, if any, as a payment against any outstanding balance on the line of credit. Other significant terms were left unchanged.

The Company's South African subsidiary, Osborn Engineered Products SA (Pty) Ltd ("Osborn"), has a credit facility of \$6,600 with a South African bank to finance short-term working capital needs, as well as to cover performance letters of credit, advance payment and retention guarantees. As of December 31, 2018 and 2017, Osborn had no outstanding borrowings but had \$397 in performance, advance payment and retention guarantees outstanding under the facility at December 31, 2018. The facility has been guaranteed by Astec Industries, Inc., but is otherwise unsecured. A 0.75% unused facility fee is charged if less than 50% of the facility is utilized. As of December 31, 2018, Osborn had available credit under the facility of \$6,203. The interest rate is 0.25% less than the South Africa prime rate, resulting in a rate of 10.0% as of December 31, 2018.

The Company's Brazilian subsidiary has outstanding working capital loans totaling \$1,207 and \$3,402 from Brazilian banks with interest rates ranging from 10.4% to 11.0% at December 31, 2018 and 2017, respectively. The loans' maturity dates ranging from January 2019 to April 2024 and are secured by Astec Brazil's manufacturing facility and also by letters of credit totaling \$3,200 issued by Astec Industries, Inc. Additionally, Astec Brazil has various five-year equipment financing loans outstanding with Brazilian banks in the aggregate of \$137 and \$642 as of December 31, 2018 and 2017, respectively, that have interest rates ranging from 3.5% to 16.3%. These equipment loans have maturity dates ranging from January 2019 to April 2020. Astec Brazil's loans are included in the accompanying consolidated balance sheets as current maturities of long-term debt of \$413 and long-term debt of \$931 as of December 31, 2018.

Long-term debt maturities are expected to be \$413, \$217, \$214, \$58,992 and \$214 in the years ending December 31, 2019, 2020, 2021, 2022 and 2023, respectively, and \$72 thereafter.

10. Product Warranty Reserves

The Company warrants its products against manufacturing defects and performance to specified standards. The warranty period and performance standards vary by product, but generally range from three months to two years or up to a specified number of hours of operation. The Company estimates the costs that may be incurred under its warranties and records a liability at the time product sales are recorded. The warranty liability is primarily based on historical claim rates, nature of claims and the associated costs.

Changes in the Company's product warranty liability during 2018, 2017 and 2016 are as follows:

	<u>2018</u>	<u>2017</u>	<u>2016</u>
Reserve balance, beginning of year	\$ 15,410	\$ 13,156	\$ 9,100
Warranty liabilities accrued	13,219	16,725	18,912
Warranty liabilities settled	(17,539)	(14,642)	(15,125)
Other	(162)	171	269
Reserve balance, end of year	<u>\$ 10,928</u>	<u>\$ 15,410</u>	<u>\$ 13,156</u>

11. Accrued Loss Reserves

The Company accrues reserves for losses related to known workers' compensation and general liability claims that have been incurred but not yet paid or are estimated to have been incurred but not yet reported to the Company. The undiscounted reserves are actuarially determined based on the Company's evaluation of the type and severity of individual claims and historical information, primarily its own claim experience, along with assumptions about future events. Changes in assumptions, as well as changes in actual experience, could cause these estimates to change in the future. Total accrued loss reserves at December 31, 2018 were \$8,261 and \$8,119 at December 31, 2017, of which \$6,429 and \$5,615 were included in other long-term liabilities at December 31, 2018 and 2017, respectively.

12. Pension and Retirement Plans

Prior to December 31, 2003, all employees of the Company's Kolberg-Pioneer, Inc. subsidiary were covered by a defined benefit pension plan. After December 31, 2003, all benefit accruals under the plan ceased and no new employees could become participants in the plan. Benefits paid under this plan are based on years of service multiplied by a monthly amount. The Company's funding policy for the plan is to make at least the minimum annual contributions required by applicable regulations.

The Company's investment strategy for the plan is to earn a rate of return sufficient to match or exceed the long-term growth of pension liabilities. The investment policy states that the Plan Committee in its sole discretion shall determine the allocation of plan assets among the following four asset classes: cash equivalents, fixed-income securities, domestic equities and international equities. The Plan Committee attempts to ensure adequate diversification of the invested assets through investment in an exchange traded mutual fund that invests in a diversified portfolio of stocks, bonds and money market securities.

The following provides information regarding benefit obligations, plan assets and the funded status of the plan:

	Pension Benefits	
	2018	2017
Change in benefit obligation		
Benefit obligation, beginning of year	\$ 16,916	\$ 16,104
Interest cost	578	630
Actuarial (gain)/loss	(1,021)	867
Benefits paid	(732)	(685)
Benefit obligation, end of year	<u>15,741</u>	<u>16,916</u>
Accumulated benefit obligation	<u>15,741</u>	<u>16,916</u>
Change in plan assets		
Fair value of plan assets, beginning of year	14,717	13,241
Actual gain/(loss) on plan assets	(909)	1,746
Employer contribution	1,376	415
Benefits paid	(732)	(685)
Fair value of plan assets, end of year	<u>14,452</u>	<u>14,717</u>
Funded status, end of year	<u>\$ (1,289)</u>	<u>\$ (2,199)</u>
Amounts recognized in the consolidated balance sheets		
Noncurrent liabilities	\$ (1,289)	\$ (2,199)
Net amount recognized	<u>\$ (1,289)</u>	<u>\$ (2,199)</u>
Amounts recognized in accumulated other comprehensive loss consist of		
Net loss	\$ 5,687	\$ 5,463
Net amount recognized	<u>\$ 5,687</u>	<u>\$ 5,463</u>
Weighted average assumptions used to determine benefit obligations as of December 31		
Discount rate	4.10%	3.50%
Expected return on plan assets	6.00%	6.25%
Rate of compensation increase	N/A	N/A

The measurement date used for the plan was December 31. In determining the expected return on plan assets, the historical experience of the plan assets, the current and expected allocation of the plan assets and the expected long-term rates of return were considered.

All assets in the plan are invested in an exchange traded mutual fund (level 1 in the fair value hierarchy). The allocation of assets within the mutual fund as of December 31 and the target asset allocation ranges by asset category are as follows:

Asset Category	Actual Allocation		2018 & 2017 Target Allocation Ranges
	2018	2017	
Equity securities	46.9%	49.4%	40 - 65%
Debt securities	46.2%	43.2%	30 - 50%
Cash and equivalents	6.9%	7.4%	0 - 15%
Total	<u>100.0%</u>	<u>100.0%</u>	

Net periodic benefit cost for 2018, 2017 and 2016 included the following components:

	Pension Benefits		
	2018	2017	2016
Components of net periodic benefit cost			
Interest cost	\$ 578	\$ 630	\$ 650
Expected return on plan assets	(802)	(720)	(782)
Amortization of actuarial loss	465	530	480
Net periodic benefit cost	<u>241</u>	<u>440</u>	<u>348</u>
Other changes in plan assets and benefit obligations recognized in other comprehensive income			
Net actuarial (gain) loss for the year	690	(159)	533
Amortization of net loss	(465)	(530)	(480)
Total recognized in other comprehensive income	<u>225</u>	<u>(689)</u>	<u>53</u>
Total recognized in net periodic benefit cost and other comprehensive income	<u>\$ 466</u>	<u>\$ (249)</u>	<u>\$ 401</u>
Weighted average assumptions used to determine net periodic benefit cost for years ended December 31			
Discount rate	3.50%	4.00%	4.28%
Expected return on plan assets	6.25%	6.25%	7.00%

No contributions are expected to be funded by the Company during 2019.

Amounts in accumulated other comprehensive loss expected to be recognized in net periodic benefit cost in 2019 for the amortization of a net loss is \$520.

The following estimated future benefit payments are expected in the years indicated:

	Pension Benefits
2019	\$ 840
2020	870
2021	910
2022	920
2023	940
2024 - 2028	4,920

The Company sponsors a 401(k) defined contribution plan to provide eligible employees with additional income upon retirement. The Company's contributions to the plan are based on employee contributions. The Company's contributions totaled \$7,451, \$7,182 and \$5,943 in 2018, 2017 and 2016, respectively.

The Company maintains a SERP for certain of its executive officers. The plan is a non-qualified deferred compensation plan administered by the Board of Directors of the Company, pursuant to which the Company makes quarterly cash contributions of a certain percentage of executive officers' compensation. Investments are self-directed by participants and can include Company stock. Upon retirement, participants receive their apportioned share of the plan assets in the form of cash.

Assets of the SERP consist of the following:

	December 31, 2018		December 31, 2017	
	Cost	Market	Cost	Market
Company stock	\$ 1,886	\$ 1,658	\$ 1,960	\$ 3,589
Equity securities	5,262	4,983	4,589	4,963
Total	<u>\$ 7,148</u>	<u>\$ 6,641</u>	<u>\$ 6,549</u>	<u>\$ 8,552</u>

At the end of each quarter, the Company adjusts the deferred compensation liability such that the balance of the liability equals the total fair market value of all assets held by the trust established under the SERP. Such liabilities are included in other long-term liabilities on the consolidated balance sheets. The equity securities are included in investments in the consolidated balance sheets and classified as trading equity securities. See Note 4, Investments, for additional information. The cost of the Company stock held by the plan is included as a reduction in shareholders' equity in the consolidated balance sheets.

The change in the fair market value of Company stock held in the SERP results in a charge or credit to selling, general and administrative expenses in the consolidated statements of operations because the acquisition cost of the Company stock in the SERP is recorded as a reduction of shareholders' equity and is not adjusted to fair market value; however, the related liability is adjusted to the fair market value of the stock as of each period end. The Company recognized income of \$1,556 and \$575 in 2018 and 2017, respectively, and expense of \$1,742 in 2016, related to the change in the fair value of the Company stock held in the SERP.

13. Derivative Financial Instruments

The Company is exposed to certain risks relating to its ongoing business operations. The primary risk managed by using derivative instruments is foreign currency risk. From time to time, the Company's foreign subsidiaries enter into foreign currency exchange contracts to mitigate exposure to fluctuations in currency exchange rates. The fair value of the derivative financial instrument is recorded on the Company's balance sheet and is adjusted to fair value at each measurement date. The changes in fair value are recognized in the consolidated statements of operations in the current period. The Company does not engage in speculative transactions nor does it hold or issue derivative financial instruments for trading purposes. The average U.S. dollar equivalent notional amount of outstanding foreign currency exchange contracts was \$11,082 during 2018. At December 31, 2018, the Company reported \$333 of derivative assets in other current assets. The Company reported \$112 of derivative liabilities in other current liabilities at December 31, 2017. The Company recognized, as a component of cost of sales, a net gain on the change in fair value of derivative instruments of \$1,147 for the year ended December 31, 2018. The Company recognized net losses on the change in fair value of derivative instruments of \$663 and \$336 for the years ended December 31, 2017 and 2016, respectively. There were no derivatives that were designated as hedges at December 31, 2018 or 2017.

14. Income Taxes

For financial reporting purposes, income (loss) before income taxes includes the following components:

	Year Ended December 31		
	2018	2017	2016
United States	\$ (86,874)	\$ 55,980	\$ 87,326
Foreign	896	1,237	(231)
Income (loss) before income taxes	\$ (85,978)	\$ 57,217	\$ 87,095

The provision (benefit) for income taxes consists of the following:

	Year Ended December 31		
	2018	2017	2016
Current provision (benefit):			
Federal	\$ (3,995)	\$ 16,178	\$ 30,623
State	892	2,866	4,098
Foreign	3,254	874	907
Total current provision	151	19,918	35,628
Deferred provision (benefit):			
Federal	(19,142)	107	(2,653)
State	(5,788)	(455)	(1,213)
Foreign	(455)	57	345
Total deferred benefit	(25,385)	(291)	(3,521)
Total provision (benefit):			
Federal	(23,137)	16,285	27,970
State	(4,896)	2,411	2,885
Foreign	2,799	931	1,252
Total income tax provision (benefit)	\$ (25,234)	\$ 19,627	\$ 32,107

The Company's income tax provision (benefit) is computed based on the domestic and foreign federal statutory rates and the average state statutory rates, net of related federal benefit.

The provision (benefit) for income taxes differs from the amount computed by applying the statutory federal income tax rate to income (loss) before income taxes. A reconciliation of the provision (benefit) for income taxes at the statutory federal income tax rate to the amount provided is as follows:

	Year Ended December 31		
	2018	2017	2016
Tax expense (benefit) at the statutory federal income tax rate	\$ (18,055)	\$ 20,026	\$ 30,483
Domestic production activity deduction	--	(1,661)	(1,641)
State income tax, net of federal income tax	(2,976)	1,520	1,876
Research and development tax credits	(4,660)	(922)	(785)
FIN 48 impact	1,856	124	(240)
Liquidation of subsidiary	(1,403)	--	--
Valuation allowance impact	978	1,585	1,638
U.S. tax reform impact	(193)	(505)	--
Other items	(781)	(540)	776
Total income tax provision (benefit)	\$ (25,234)	\$ 19,627	\$ 32,107

Deferred income taxes reflect the net tax effects of temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes.

Significant components of the Company's deferred tax assets and liabilities are as follows:

	December 31	
	2018	2017
Deferred tax assets:		
Inventory reserves	\$ 4,513	\$ 4,287
Warranty reserves	2,275	3,560
Bad debt reserves	182	299
State tax loss carryforwards	7,265	2,710
Accrued vacation	1,612	1,712
SERP	364	367
Deferred compensation	881	1,293
Restricted stock units	1,728	1,664
Goodwill	2,157	--
Pension and post-employment benefits	1,536	1,448
Outside basis difference	4,496	--
Federal net operating loss	15,655	--
Foreign net operating losses	5,069	6,310
Other	5,025	2,478
Valuation allowances	(8,540)	(8,318)
Total deferred tax assets	44,218	17,810
Deferred tax liabilities:		
Property and equipment	16,156	14,562
Intangibles	541	769
Goodwill	--	654
Pension	1,051	758
Total deferred tax liabilities	17,748	16,743
Total net deferred assets	\$ 26,470	\$ 1,067

As of December 31, 2018, the Company has a federal net operating loss carryforward of \$74,548 from year 2018. The Company expects to utilize the 2018 federal net operating loss against earnings in future years.

As of December 31, 2018, the Company has state net operating loss carryforwards of \$261,673 and foreign net operating loss carryforwards of approximately \$16,759, which will be available to offset future taxable income. If not used, these carryforwards will expire between 2019 and 2030. A significant portion of the valuation allowance for deferred tax assets relates to the future utilization of state and foreign net operating loss and state tax credit carryforwards. Future utilization of these net operating loss and state tax credit carryforwards is evaluated by the Company on a periodic basis and the valuation allowance is adjusted accordingly. In 2018, the valuation allowance on these carryforwards was increased by \$978 due to the unrealizable portion of certain entities' state and foreign net operating loss carryforwards. The Company has also determined that the recovery of certain other deferred tax assets is realizable. The valuation allowance for these deferred tax assets was decreased by \$756 during 2018.

The following table represents a roll forward of the deferred tax asset valuation allowance for the years ended December 31, 2018, 2017 and 2016:

	Year Ended December 31		
	2018	2017	2016
Allowance balance, beginning of year	\$ 8,318	\$ 8,280	\$ 8,065
Provision	978	1,585	1,639
Write-offs	--	(1,862)	(289)
Other	(756)	315	(1,135)
Allowance balance, end of year	\$ 8,540	\$ 8,318	\$ 8,280

Undistributed earnings of the Company's Canadian subsidiary, Breaker Technology Ltd. ("BTL"), South African subsidiary, Osborn Engineered Products SA, (Pty), Ltd. ("Osborn"), Australian subsidiary, Astec Australia Pty, Ltd. ("Astec Australia"), and Northern Ireland subsidiary, Telestack Limited ("Telestack"), are considered to be indefinitely reinvested; accordingly, no provision for U.S. federal and state income taxes has been provided thereon. As of December 31, 2018, the cumulative amounts of undistributed GAAP earnings for BTL, Osborn, Astec Australia and Telestack are \$7,789, \$29,800, \$490 and \$1,477, respectively. A portion of these amounts may be subject to taxation under the one-time transition tax included in the Tax Cuts and Jobs Act of 2017. Based upon the provisions in the Tax Cuts and Jobs Act of 2017, any future qualified dividends out of these amounts will not be subject to U.S. income taxes. However, upon any future inclusion as Subpart F income or capital gains, the Company would be subject to additional U.S. income taxes (subject to an adjustment for foreign tax credits). Upon any repatriation, withholding taxes due to the foreign jurisdictions may have to be paid. At this time, it is not practicable to determine the amount of the unrecognized deferred tax liability for temporary differences related to investments in foreign subsidiaries.

The Company files income tax returns in the U.S. federal jurisdiction, and in various state and foreign jurisdictions. The Company is no longer subject to U.S. federal income tax examinations by authorities for years prior to 2014. With few exceptions, the Company is no longer subject to state and local or non-U.S. income tax examinations by authorities for years prior to 2013.

The Company has a liability for unrecognized tax benefits of \$2,048 and \$365 (excluding accrued interest and penalties) as of December 31, 2018 and 2017, respectively. The Company recognizes interest and penalties accrued related to unrecognized tax benefits in tax expense. The Company recognized tax benefits of \$66 and \$22 in 2018 and 2017, respectively, for penalties and interest related to amounts that were settled for less than previously accrued. The net total amount of unrecognized tax benefits that, if recognized, would affect the Company's effective tax rate is \$2,243 and \$370 at December 31, 2018 and 2017, respectively. The Company does not expect a significant increase or decrease to the total amount of unrecognized tax benefits within the next twelve months.

A reconciliation of the beginning and ending unrecognized tax benefits excluding interest and penalties is as follows:

	Year Ended December 31		
	2018	2017	2016
Balance, beginning of year	\$ 365	\$ 238	\$ 603
Additions for tax positions taken in current year	1,722	127	235
Reductions due to lapse of statutes of limitations	(39)	--	(16)
Decreases related to settlements with tax authorities	--	--	(584)
Balance, end of year	\$ 2,048	\$ 365	\$ 238

The December 31, 2018 balance of unrecognized tax benefits includes no tax positions for which the ultimate deductibility is highly certain but the timing of such deductibility is uncertain. Accordingly, there is no impact to the deferred tax accounting for certain tax benefits.

On December 22, 2017, the Tax Cuts and Jobs Act of 2017 (the "Tax Act") was signed into law making significant changes to the Internal Revenue Code. Changes include, but are not limited to, a federal corporate tax rate decrease from 35% to 21% for tax years beginning after December 31, 2017, the transition of U.S international taxation from a worldwide tax system to a territorial system and a one-time transition tax on the mandatory deemed repatriation of foreign earnings. The Company's fourth quarter 2017 provision for income taxes was reduced by \$1,056, (comprised of a \$1,548 reduction in income tax expense recorded in connection with the remeasurement of deferred tax assets and liabilities and \$492 of additional income tax expense recorded in connection with the transition tax on the mandatory deemed repatriation of foreign earnings) due to applying the provisions of the Tax Act.

On December 22, 2017, Staff Accounting Bulletin No. 118 ("SAB 118") was issued to address the application of U.S. GAAP in situations when a registrant does not have the necessary information available, prepared, or analyzed (including computations) in reasonable detail to complete the accounting for certain income tax effects of the Tax Act. In accordance with SAB 118, the Company determined that the \$492 additional 2017 income tax expense was a provisional amount and constituted a reasonable estimate at December 31, 2017, based upon the best information then available. The final impact was \$1,727 and differed from the provisional amount due to, among other things, additional analysis, changes in interpretations and assumptions the Company made, additional regulatory guidance issued and actions the Company took as a result of the Tax Act. The subsequent adjustment, \$1,235, is included in 2018 income tax expense.

While the Tax Act provides for a territorial tax system beginning in 2018, it includes two new U.S. tax base erosion provisions, the global intangible low-taxed income (“GILTI”) provisions and the base-erosion and anti-abuse tax (“BEAT”) provisions.

The GILTI provisions require the Company to include, in its U.S. income tax return, foreign subsidiary earnings in excess of an allowable return on the foreign subsidiary’s tangible assets. The Company has elected to account for GILTI tax in the period in which it is incurred, and therefore, has recorded tax benefits of \$545 in its consolidated financial statements for the year ended December 31, 2018.

The BEAT provisions in the Tax Act eliminates the deduction of certain base-erosion payments made to related foreign corporations, and impose a minimum tax, if greater than regular tax. The Company does not expect to be subject to this tax, and therefore, has not included any tax impacts of BEAT in its consolidated financial statements for the year ended December 31, 2018.

The changes to existing U.S. tax laws as a result of the Tax Act, which we believe have the most significant impact on the Company’s federal income taxes are as follows:

Reduction of the U.S. Corporate Income Tax Rate: The Company measures deferred tax assets and liabilities using enacted tax rates that will apply in the years in which the temporary differences are expected to be recovered or paid. Accordingly, the Company recognized a deferred tax benefit and related increase in deferred tax assets of \$1,548 in its 2017 consolidated financial statements due to the remeasurement necessitated by the Tax Act’s provision reducing the reduction in the U.S. corporate income tax rate from 35% to 21%. This benefit is attributable to the Company being in a net deferred tax liability position when considering only U.S. federal deferred items. The Company has significant deferred tax assets related to foreign jurisdictions and U.S. state income taxes.

Transition Tax on Foreign Earnings: The Company recognized a provisional income tax expense of \$492 for the year ended December 31, 2017 related to the one-time transition tax on certain foreign earnings. The final determination of the transition tax of \$1,727 was completed in 2018.

Repeal of Domestic Production Activities Deduction: While not effective until 2018, the Tax Act repeals the Domestic Production Activities Deduction (“DPAD”) previously provided under IRC §199. The DPAD benefit has historically been material to the Company’s federal income taxes. The DPAD benefits included in the effective tax rate reconciliations for 2017 and 2016 were \$1,661 and \$1,641, respectively.

15. Contingent Matters

Certain customers have financed purchases of Company products through arrangements in which the Company is contingently liable for customer debt of \$2,247 at December 31, 2018. These arrangements expire at various dates through July 2021 and provide that the Company will receive the lender’s full security interest in the equipment financed if the Company is required to fulfill its contingent liability under these arrangements. The Company has recorded a liability of \$1,183 related to these guarantees as of December 31, 2018.

In addition, the Company is contingently liable under letters of credit issued by a lender totaling \$11,044 as of December 31, 2018, including \$3,200 of letters of credit guaranteeing certain Astec Brazil bank debt. The outstanding letters of credit expire at various dates through October 2020. As of December 31, 2018, the Company’s foreign subsidiaries are contingently liable for a total of \$2,016 in performance letters of credit, advance payments and retention guarantees. The maximum potential amount of future payments under these letters of credit and guarantees for which the Company could be liable is \$13,060 as of December 31, 2018.

The Company manufactured its first wood pellet plant for a customer under a Company-financed arrangement whereby the Company deferred the recognition of revenue as payment under the arrangement was not assured. The original customer is attempting to obtain financing to purchase the plant at a reduced price; however, the Company believes the ultimate consummation of the sale to this customer is uncertain. After considering the uncertainty of completing the sale to the existing customer; the lack of success in attempting to market the plant to other pellet plant operators; the cost of repossessing the plant; and the Company’s decision to exit the pellet plant business line, the pellet plant inventory’s net realizable value has been written down to zero.

The Company and certain of its current and former executive officers have been named as defendants in a putative shareholder class action lawsuit filed on February 1, 2019, in the United States District Court for the Eastern District of Tennessee. The action is styled City of Taylor General Employees Retirement System v. Astec Industries, Inc., et al., Case No. 1:19-cv-00024-PLR-CHS. The complaint generally alleges that the defendants violated the Securities Exchange Act of 1934, as amended (the "Exchange Act"), and Rule 10b-5 promulgated thereunder by making allegedly false and misleading statements and that the individual defendants are control person under Section 20(a) of the Exchange Act. The complaint was filed on behalf of shareholders who purchased shares of the Company's stock between July 26, 2016 and October 22, 2018 and seeks monetary damages on behalf of the purported class. We dispute these allegations and intend to defend this lawsuit vigorously. The Company is unable to estimate the possible loss or range of loss at this time.

The Company is currently a party to various claims and legal proceedings that have arisen in the ordinary course of business. If management believes that a loss arising from such claims and legal proceedings is probable and can reasonably be estimated, the Company records the amount of the loss (excluding estimated legal fees) or the minimum estimated liability when the loss is estimated using a range and no point within the range is more probable than another. As management becomes aware of additional information concerning such contingencies, any potential liability related to these matters is assessed and the estimates are revised, if necessary. If management believes that a loss arising from such claims and legal proceedings is either (i) probable but cannot be reasonably estimated or (ii) reasonably possible but not probable, the Company does not record the amount of the loss, but does make specific disclosure of such matter. Based upon currently available information and with the advice of counsel, management believes that the ultimate outcome of its current claims and legal proceedings, individually and in the aggregate, will not have a material adverse effect on the Company's financial position, cash flows or results of operations. However, claims and legal proceedings are subject to inherent uncertainties and rulings unfavorable to the Company could occur. If an unfavorable ruling were to occur, there exists the possibility of a material adverse effect on the Company's financial position, cash flows or results of operations.

16. Shareholders' Equity

The Company rewards key members of management with restricted stock units ("RSUs") each year based upon the financial performance of the Company and its subsidiaries. Under the terms of the Company's shareholder-approved 2011 Incentive Plan, up to 700 shares of newly-issued Company stock is available for awards. Awards granted in 2016 and prior vest at the end of five years from the date of grant, or at the time a recipient retires after reaching age 65, if earlier, while awards granted after 2016 are scheduled to have a three-year vesting period. Additional RSUs are granted to the Company's outside directors under the Company's Non-Employee Directors Compensation Plan with a one-year vesting period. The fair value of the RSUs vested during 2018, 2017 and 2016 was \$1,869, \$1,991 and \$3,289, respectively. The grant date tax benefit was increased by \$67, \$290 and \$220, respectively, upon the vesting of RSUs in 2018, 2017 and 2016.

Compensation expense of \$2,032, \$2,978 and \$2,426 was recorded in the years ended December 31, 2018, 2017 and 2016, respectively, to reflect the fair value of RSUs granted (or anticipated to be granted for 2018 performance) amortized over the portion of the vesting period occurring during the period. Related income tax benefits of \$528, \$1,132 and \$934 were recorded in 2018, 2017 and 2016, respectively. Based upon the grant date fair value of RSUs, it is anticipated that \$3,022 of additional compensation costs will be recognized in future periods through 2022 for RSUs earned through December 31, 2018. The weighted average period over which this additional compensation cost will be expensed is 1.8 years. RSUs do not participate in Company-paid dividends.

Changes in restricted stock units during the year ended December 31, 2018 are as follows:

	2018	Weighted Average Grant Date Fair Value
Unvested restricted stock units, beginning of year	161	\$ 53.09
Units granted	61	58.45
Units forfeited	(25)	50.84
Units vested	(32)	45.79
Unvested restricted stock units, end of year	<u>165</u>	<u>56.82</u>

The grant date fair value of the restricted stock units granted during 2018, 2017 and 2016 was \$3,553, \$5,399 and \$1,946, respectively.

17. Revenue Recognition

As discussed in Note 1, Summary of Significant Accounting Policies, the Company adopted the provisions of ASU No. 2014-09, "Revenue from Contracts with Customers" and its related amendments effective January 1, 2018. The adoption of this standard did not have a material impact on the timing or amounts of revenues recognized by the Company, and, as such, no cumulative effect adjustment was recorded as of the adoption of the standard.

The following table disaggregates the Company's revenue by major source for the period ended December 31, 2018 (excluding intercompany sales):

	Infrastructure Group	Aggregate and Mining Group	Energy Group	Total
Net Sales - Domestic:				
Equipment sales	\$ 296,974	\$ 220,015	\$ 178,584	\$ 695,573
Pellet plant agreement sale reduction	(75,315)	--	--	(75,315)
Parts and component sales	119,823	71,862	42,666	234,351
Service and equipment installation revenue	10,822	1,844	6,355	19,021
Used equipment sales	8,098	3,127	4,358	15,583
Freight revenue	12,502	6,265	5,896	24,663
Other	1,022	(741)	1,657	1,938
Total domestic revenue	<u>373,926</u>	<u>302,372</u>	<u>239,516</u>	<u>915,814</u>
Net Sales - International:				
Equipment sales	43,516	98,604	24,308	166,428
Parts and component sales	19,215	44,609	10,528	74,352
Service and equipment installation revenue	3,152	1,069	390	4,611
Used equipment sales	1,693	2,948	908	5,549
Freight revenue	1,043	3,266	417	4,726
Other	(256)	296	79	119
Total international revenue	<u>68,363</u>	<u>150,792</u>	<u>36,630</u>	<u>255,785</u>
Total net sales	<u>\$ 442,289</u>	<u>\$ 453,164</u>	<u>\$ 276,146</u>	<u>\$ 1,171,599</u>

Revenue is recognized when obligations under the terms of a contract are satisfied and generally occurs with the transfer of control of the product or services at a point in time. Revenue is measured as the amount of consideration the Company expects to receive in exchange for transferring goods or providing services. See Note 1, Summary of Significant Accounting Policies, for further information regarding the types and timing of the Company's revenue transactions. Contract assets and liabilities, excluding customer deposits, are immaterial at December 31, 2018.

The Company had a pellet plant sale which was accounted for over time using the ratio of costs incurred to estimated total costs. Pellet plant sales recognized under the over-time method in 2018 for production activities were not significant. Penalties are accounted for as a reduction in net sales. During July 2018, the Company entered into an agreement with its pellet plant customer due to unresolved issues which inhibited the plant's ability to meet contractual provisions by the date required in the Company's sales contract with its customer. Under the terms of the pellet plant agreement, the Company paid its customer \$68,000. Considering this payment and other provisions of the pellet plant agreement, including the forgiveness of \$7,315 of accounts receivable due from the customer, a \$75,315 reduction in sales was recorded in 2018.

18. Operations by Industry Segment and Geographic Area

The Company has three reportable segments, each of which is comprised of multiple business units that offer similar products and services and meet the requirements for aggregation. A brief description of each segment is as follows:

Infrastructure Group - The Infrastructure Group segment is made up of five business units. These business units include Astec, Inc. (“Astec”), Roadtec, Inc. (“Roadtec”), Carlson Paving Products, Inc. (“Carlson”), Astec Mobile Machinery GmbH (“AMM”) and Astec Australia Pty Ltd (“Astec Australia”). Three of the business units (Astec, Roadtec and Carlson) design, engineer, manufacture and market a complete line of asphalt plants and their related components, asphalt pavers, screeds, milling machines, material transfer vehicles, stabilizers and related ancillary equipment. The other two business units (AMM and Astec Australia) primarily sell, service and install products produced by the manufacturing subsidiaries of the Company and a majority of their sales are to customers in the infrastructure industry. During late 2018, the Company decided to close AMM, located in Germany, in 2019, and its assets are being liquidated. The principal purchasers of the products produced by this group are asphalt producers, highway and heavy equipment contractors, and foreign and domestic governmental agencies. The Infrastructure Group had sales to one pellet plant customer totaling \$7,987, or 0.7% of total Company sales in 2017 and \$135,187, or 11.8% of total Company sales in 2016. Pellet plant sales in 2018, excluding the pellet plant agreement sales reduction of \$75,315, as discussed in Note 17, Revenue Recognition, were not material. The pellet plant equipment sold to this customer was manufactured by each of the Company’s segments.

Aggregate and Mining Group - The Company's Aggregate and Mining Group is comprised of eight business units which are focused on designing and manufacturing heavy processing equipment, as well as servicing and supplying parts for the aggregate, metallic mining, recycling, ports and bulk handling markets. These business units are Telsmith, Inc. (“Telsmith”), Kolberg-Pioneer, Inc. (“KPI”), Astec Mobile Screens, Inc. (“AMS”), Johnson Crushers International, Inc. (“JCI”), Breaker Technology Ltd/Breaker Technology, Inc. (“BTI”), Osborn Engineered Products, SA (Pty) Ltd (“Osborn”), Astec do Brasil Fabricacao de Equipamentos Ltda. (“Astec Brazil”) and Telestack Limited (“Telestack”). The principal purchasers of products produced by this group are distributors, open mine operators, quarry operators, port and inland terminal operators, highway and heavy equipment contractors and foreign and domestic governmental agencies.

Energy Group - The Company’s Energy Group is currently comprised of six business units focused on supplying heavy equipment such as heaters, drilling rigs, concrete plants, wood chippers and grinders, pump trailers, storage equipment and related parts to the oil and gas, construction, and water well industries, as well as commercial and industrial burners used primarily in commercial, industrial and process heating applications. The business units currently included in the Energy Group are Heatec, Inc. (“Heatec”), CEI Enterprises, Inc. (“CEI”), GEFCO, Inc. (“GEFCO”), Peterson Pacific Corp. (“Peterson”), Power Flame Incorporated (“Power Flame”) and RexCon, Inc. (“RexCon”). Power Flame, located in Parsons, Kansas, was acquired in August 2016. RexCon, located in Burlington, WI, was formed to acquire substantially all of the assets and liabilities of RexCon, LLC on October 1, 2017. The principal purchasers of products produced by this group are oil, gas and water well drilling industry contractors, processors of oil, gas and biomass for energy production, ready mix concrete producers and contractors in the construction and demolition recycling markets.

Corporate - This category consists of business units that do not meet the requirements for separate disclosure as an operating segment or inclusion in one of the other reporting segments and includes the Company's parent company, Astec Industries, Inc., a captive insurance company and a Company-owned distributor in the start-up phase of operations in Chile. The Company evaluates performance and allocates resources to its operating segments based on profit or loss from operations before U.S. federal income taxes, state deferred taxes and corporate overhead and thus these costs are included in the Corporate category.

The accounting policies of the reportable segments are the same as those described in the summary of significant accounting policies. Intersegment sales and transfers are valued at prices comparable to those for unrelated parties.

Segment information for 2018

	Infrastructure Group	Aggregate and Mining Group	Energy Group	Corporate	Total
Revenues from external customers	\$ 442,289	\$ 453,164	\$ 276,146	\$ --	\$ 1,171,599
Intersegment revenues	21,568	16,603	17,578	--	55,749
Restructuring and asset impairment charges	1,870	--	11,190	--	13,060
Interest expense	10	384	17	634	1,045
Depreciation and amortization	8,424	9,383	9,149	957	27,913
Income taxes	880	2,349	306	(28,769)	(25,234)
Profit (loss)	(112,954)	45,464	3,070	1,586	(62,834)
Assets	536,744	590,512	309,397	367,211	1,803,864
Capital expenditures	14,823	8,731	4,580	769	28,903

Segment information for 2017

	Infrastructure Group	Aggregate and Mining Group	Energy Group	Corporate	Total
Revenues from external customers	\$ 553,691	\$ 403,720	\$ 227,328	\$ --	\$ 1,184,739
Intersegment revenues	25,965	16,209	24,877	--	67,051
Interest expense	49	634	9	148	840
Depreciation and amortization	7,581	9,363	7,904	954	25,802
Income taxes	1,318	462	491	17,356	19,627
Profit (loss)	26,641	35,748	16,219	(40,963)	37,645
Assets	666,651	558,684	304,158	390,300	1,919,793
Capital expenditures	7,424	9,194	3,540	604	20,762

Segment information for 2016

	Infrastructure Group	Aggregate and Mining Group	Energy Group	Corporate	Total
Revenues from external customers	\$ 608,908	\$ 359,760	\$ 178,763	\$ --	\$ 1,147,431
Intersegment revenues	16,957	35,031	24,946	--	76,934
Interest expense	31	948	4	412	1,395
Depreciation and amortization	7,205	10,033	6,655	920	24,813
Income taxes	3,033	664	437	27,973	32,107
Profit (loss)	71,482	34,877	4,145	(55,992)	54,512
Assets	657,225	518,351	271,121	417,351	1,864,048
Capital expenditures	14,451	7,437	5,018	178	27,084

The totals of segment information for all reportable segments reconciles to consolidated totals as follows:

	<u>2018</u>	<u>2017</u>	<u>2016</u>
Net income attributable to controlling interest			
Total profit (loss) for reportable segments	\$ (64,420)	\$ 78,608	\$ 110,504
Corporate expenses, net	1,586	(40,963)	(55,992)
Net loss attributable to non-controlling interest	295	205	171
Recapture (elimination) of intersegment profit	2,090	(55)	476
Total consolidated net income (loss) attributable to controlling interest	<u>\$ (60,449)</u>	<u>\$ 37,795</u>	<u>\$ 55,159</u>
Assets			
Total assets for reportable segments	\$ 1,436,653	\$ 1,529,493	\$ 1,446,697
Corporate assets	367,211	390,300	417,351
Elimination of intercompany profit in inventory	(4,986)	(7,075)	(7,020)
Elimination of intercompany receivables	(664,914)	(717,873)	(688,369)
Elimination of investment in subsidiaries	(300,709)	(303,209)	(272,766)
Other	22,202	(2,057)	(52,292)
Total consolidated assets	<u>\$ 855,457</u>	<u>\$ 889,579</u>	<u>\$ 843,601</u>

Sales into major geographic regions were as follows:

	Year Ended December 31		
	<u>2018</u>	<u>2017</u>	<u>2016</u>
United States	\$ 915,814	\$ 932,294	\$ 941,273
Canada	61,582	65,509	37,539
Africa	45,613	36,847	31,557
Australia and Oceania	38,645	40,201	29,948
South America (excluding Brazil)	30,081	18,562	28,204
Other European Countries	25,985	18,679	19,198
Mexico	9,632	8,508	13,489
Russia	9,571	13,609	3,185
Middle East	7,877	4,881	3,403
Brazil	6,292	10,478	4,300
Other Asian Countries	5,472	10,286	6,926
Japan and Korea	3,649	4,760	10,825
China	2,765	6,113	4,595
Post-Soviet States (excluding Russia)	2,730	5,951	3,293
Central America (excluding Mexico)	2,706	2,929	5,904
West Indies	1,494	3,421	2,994
India	957	1,026	318
Other	734	685	480
Total foreign	<u>255,785</u>	<u>252,445</u>	<u>206,158</u>
Total consolidated sales	<u>\$ 1,171,599</u>	<u>\$ 1,184,739</u>	<u>\$ 1,147,431</u>

Long-lived assets by major geographic region are as follows:

	December 31	
	2018	2017
United States	\$ 162,775	\$ 158,683
Brazil	8,866	11,114
Northern Ireland	7,641	6,342
South Africa	4,682	5,684
Australia	4,624	4,532
Canada	3,480	2,893
Germany	345	1,148
Chile	35	--
Total foreign	29,673	31,713
Total	\$ 192,448	\$ 190,396

19. Accumulated Other Comprehensive Loss

The after-tax components comprising accumulated other comprehensive loss is summarized below:

	December 31	
	2018	2017
Foreign currency translation adjustment	\$ (30,656)	\$ (21,140)
Unrecognized pension and post-retirement benefit cost, net of tax of \$2,230 and \$2,192, respectively	(3,227)	(3,103)
Accumulated other comprehensive loss	\$ (33,883)	\$ (24,243)

See Note 12, Pension and Retirement Plans, for discussion of the amounts recognized in accumulated other comprehensive loss related to the Company's Kolberg-Pioneer, Inc. defined pension plan.

20. Other Income

Other income consists of the following:

	Year Ended December 31		
	2018	2017	2016
Investment loss	\$ (228)	\$ (96)	\$ (276)
Licensing fees	--	651	546
Other	764	663	259
Total	\$ 536	\$ 1,218	\$ 529

21. Business Combinations

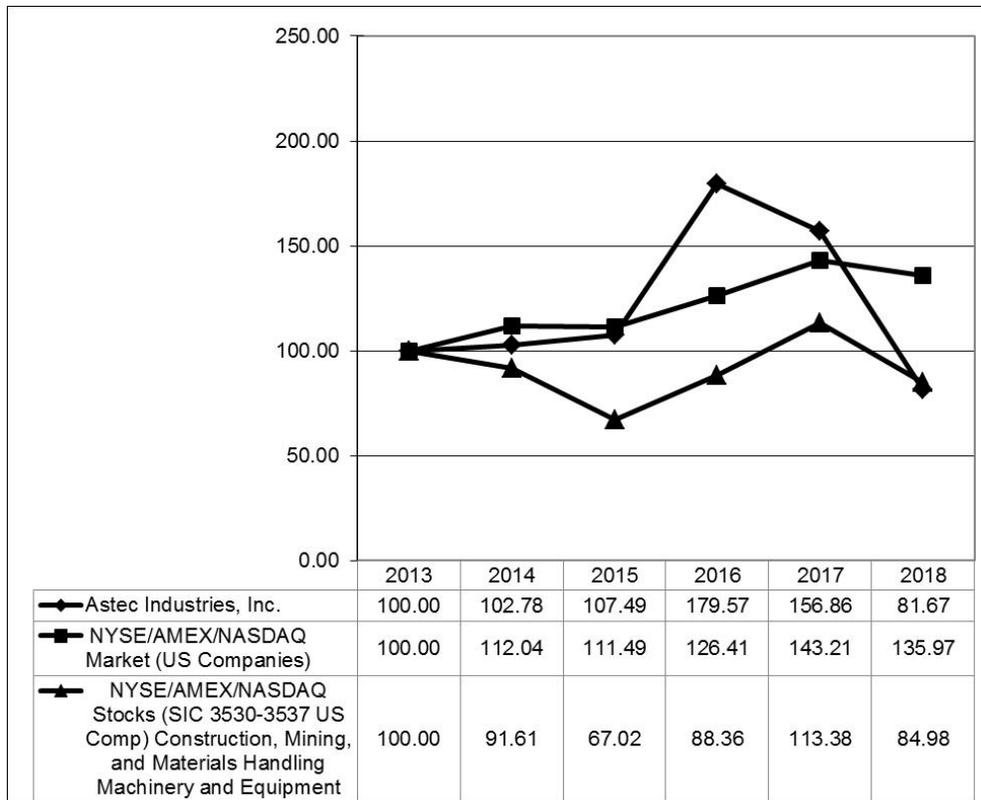
In October, 2017, the Company acquired substantially all of the assets and liabilities of RexCon LLC ("RexCon") for a total purchase price of \$26,443. The purchase price was paid in cash with \$3,000 deposited into escrow for a period of time not to exceed 18 months pending final resolution of certain post-closing adjustments and any indemnification claims. The Company's allocation of the purchase price includes the recognition of \$3,488 of goodwill and \$7,778 of other intangible assets consisting of non-compete agreements (5-year useful life), technology (19-year useful life), trade names (15-year useful life), and customer relationships (18-year useful life). The revenues and results of operations of RexCon were not significant in relation to the Company's consolidated financial statements for the period ended December 31, 2017 and would not have been material on a proforma basis to any earlier period. RexCon's operating results are included in the Company's Energy Group beginning in the fourth quarter of 2017. The Company determined that the full \$3,488 of goodwill that was acquired in the acquisition was impaired in the fourth quarter of 2018.

RexCon, located in Burlington, Wisconsin was founded in 2003 through an asset acquisition with the original company founded over 100 years ago. RexCon is a manufacturer of high-quality stationary and portable, central mix and ready mix concrete batch plants, concrete mixers and concrete paving equipment. RexCon specializes in providing portable, high-production concrete equipment to contractors and producers worldwide in a totally integrated turnkey production system, including customized site layout and design engineering, batch plants, mixers, water heaters and chillers, ice production and delivery systems, material handling conveyors, gensets and power distribution, cement silos and screws, central dust collection, aggregate heating and cooling systems, batch automation controls and batch office trailers.

In August 2016, the Company acquired substantially all of the assets and certain liabilities of Power Flame Incorporated (“Power Flame”) for a total purchase price of \$39,765. The purchase price was paid in cash with \$4,000 deposited into escrow for a period of time not to exceed two years pending final resolution of certain post-closing adjustments and any indemnification claims. The Company’s allocation of the purchase price resulted in the recognition of \$12,632 of goodwill and \$17,990 of other intangible assets consisting of technology (19 year useful life), trade names (15 year useful life) and customer relationships (18 year useful life). The revenues and results of operations of Power Flame were not significant in relation to the Company’s consolidated financial statements for the period ended December 31, 2016 and would not have been material on a proforma basis to any earlier period. Power Flame’s operating results are included in the Energy Group beginning in the third quarter of 2016. The Company determined that an amount equal to \$7,702 of the goodwill that was acquired in the acquisition was impaired in the fourth quarter of 2018.

Power Flame, located in Parsons, Kansas, began operations in 1948 and manufactures and sells gas, oil and combination gas/oil and low NOx burners with outputs ranging from 400 thousand BTU’s per hour to 120 million BTU’s per hour as well as combustion control systems designed for commercial, industrial and process heating applications.

**Comparison of 5 Year Cumulative Total Return
Assumes Initial Investment of \$100
Performance Graph for Astec Industries, Inc.**



Notes:

- A. Data complete through last fiscal year.
- B. Corporate Performance Graph with peer group uses peer group only performance (excludes only company).
- C. Peer group indices use beginning of period market capitalization weighting.
- D. Prepared by Zacks Investment Research, Inc. Used with permission. All rights reserved Copyright 1980-2019.
- E. Calculated (or Derived) based from CRSP NYSE/AMEX/NASDAQ Market (US Companies), Center for Research in Security Prices (CRSP®), Graduate School of Business, The University of Chicago. Copyright 2018. Used with permission. All rights reserved.
- F. The graph assumes \$100 invested at the closing price of the Company's common stock on December 31, 2013 and assumes that all dividends were invested on the date paid.

ASTEC INDUSTRIES, INC.
FORM 10-K
INDEX OF EXHIBITS FILED HERewith

Exhibit Number	Description
Exhibit 10.21	Amendment to Exhibit A of the Astec Industries, Inc. Executive Change in Control Severance Plan, effective February 21, 2019
Exhibit 10.22	Amendment to "Appendix A" of the Astec Industries, Inc. Supplemental Executive Retirement Plan, effective January 1, 2019.
Exhibit 10.23	Second Amendment to Amended and Restated Credit Agreement, effective February 26, 2019.
Exhibit 21	Subsidiaries of the Registrant.
Exhibit 23	Consent of Independent Registered Public Accounting Firm.
Exhibit 31.1	Certification pursuant to Rule 13a-14(a)/15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
Exhibit 31.2	Certification pursuant to Rule 13a-14(a)/15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
Exhibit 32	Certification pursuant to Rule 13a-14(b)/15d-14(b) of the Securities Exchange Act of 1934 and 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101.INS	XBRL Instance Document
101.SCH	XBRL Taxonomy Extension Schema
101.CAL	XBRL Taxonomy Extension Calculation Linkbase
101.DEF	XBRL Taxonomy Extension Definition Linkbase
101.LAB	XBRL Taxonomy Extension Label Linkbase
101.PRE	XBRL Taxonomy Extension Presentation Linkbase

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, Astec Industries, Inc. has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

ASTECH INDUSTRIES, INC.
(Registrant)

BY: /s/ Richard J. Dorris
Richard J. Dorris, Interim Chief Executive
Officer and President

Date: March 15, 2019

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the Registrant and in the capacities and on the dates indicated:

SIGNATURE	TITLE	DATE
<u>/s/ Richard J. Dorris</u> Richard J. Dorris	Interim Chief Executive Officer and President (Principal Executive Officer)	March 15, 2019
<u>/s/ David C. Silvious</u> David C. Silvious	Chief Financial Officer, Vice President and Treasurer (Principal Financial and Accounting Officer)	March 15, 2019
<u>/s/ William D. Gehl</u> William D. Gehl	Director and Chairman of the Board	March 15, 2019
<u>/s/ James B. Baker</u> James B. Baker	Director	March 15, 2019
<u>/s/ Tracey H. Cook</u> Tracey H. Cook	Director	March 15, 2019
<u>/s/ William G. Dorey</u> William G. Dorey	Director	March 15, 2019
<u>/s/ Daniel K. Frierson</u> Daniel K. Frierson	Director	March 15, 2019
<u>/s/ Charles F. Potts</u> Charles F. Potts	Director	March 15, 2019
<u>/s/ Glen E. Tellock</u> Glen E. Tellock	Director	March 15, 2019
<u>/s/ William B. Sansom</u> William B. Sansom	Director	March 15, 2019
<u>/s/ William Bradley Southern</u> William Bradley Southern	Director	March 15, 2019
<u>/s/ Mary L. Howell</u> Mary L. Howell	Director	March 15, 2019

EXHIBIT A

**PARTICIPANTS IN THE
ASTEC INDUSTRIES, INC. EXECUTIVE
CHANGE IN CONTROL SEVERANCE PLAN
as of February 21, 2019**

Tier I Participants	Chief Executive Officer
Tier II Participants	Chief Operating Officer Chief Financial Officer Group Presidents Vice President of Administration Corporate Controller
Tier III Participants	Subsidiary Presidents

**AMENDMENT TO “APPENDIX A” OF THE
ASTEC INDUSTRIES, INC.
SUPPLEMENTAL EXECUTIVE RETIREMENT PLAN**

THIS AMENDMENT to “Appendix A” of the Astec Industries, Inc. Supplemental Executive Retirement Plan, as amended and restated as of January 1, 2008 (the “Plan”), is adopted by Astec Industries, Inc. (the “Company”), effective as of January 1, 2019.

WHEREAS, Article 2 of the Plan permits the Board of Directors of the Company (the “Board”) to designate participants in the Plan from time to time, whose names and effective dates of participation shall be set forth on Exhibit A to the Plan;

NOW, THEREFORE, the Company hereby amends “Appendix A” of the Plan in the form attached hereto, to update the same for changes in Plan participation approved by the Board, by action taken on February 21, 2019.

Except as amended herein, the Plan shall continue in full force and effect.

ASTEC INDUSTRIES, INC.

Date: February 21, 2019

By: /s/ Stephen C. Anderson
Name: Stephen C. Anderson
Title: Secretary

“APPENDIX A”
Each Participant’s Date of Participation

Name of Participant	Effective Dates of Participation
W. Norman Smith	January 1, 1995
Tim Gonigam	August 1, 2000
Stephen C. Anderson	January 1, 2003
Richard Dorris	January 3, 2005
David C. Silvious	July 1, 2005
Neil Peterson	January 1, 2008
Joe Cline	February 1, 2008
Chris Colwell	May 31, 2011
Robin Leffew	August 1, 2011
Matthew B. Haven	January 1, 2013
Jeff May	October 1, 2013
Tom Wilkey	January 1, 2014
Jeff Schwarz	July 1, 2014
John Irvine	April 28, 2016
Jaco Van Der Merwe	October 1, 2016
Scott Barker	April 3, 2017
Neil Whitworth	May 30, 2017
Michael G. Anderson	July 7, 2017
Jody Volner	November 1, 2017
Robert Kilgore	August 2, 2018
Greg Renegar	January 1, 2019

**SECOND AMENDMENT TO
AMENDED AND RESTATED CREDIT AGREEMENT**

THIS SECOND AMENDMENT TO AMENDED AND RESTATED CREDIT AGREEMENT (this "Amendment"), dated this 26th day of February, 2019, is made and entered into on the terms and conditions hereinafter set forth, by and among ASTEC INDUSTRIES, INC., a Tennessee corporation (the "Borrower"), ASTEC, INC., a Tennessee corporation ("AI"), ASTEC MOBILE SCREENS, INC., a Nevada corporation ("AMS"), BREAKER TECHNOLOGY, INC., a Tennessee corporation ("BTI"), CEI ENTERPRISES, INC., a Tennessee corporation ("CEI"), CARLSON PAVING PRODUCTS, INC., a Washington corporation ("CPP"), GEFCO, INC., a Tennessee corporation ("GI"), HEATEC, INC., a Tennessee corporation ("HI"), JOHNSON CRUSHERS INTERNATIONAL, INC., a Tennessee corporation ("JCI"), KOLBERG-PIONEER, INC., a Tennessee corporation ("KPI"), PETERSON PACIFIC CORP., an Oregon corporation ("PPC"), POWER FLAME INCORPORATED, a Tennessee corporation ("PFI"), ROADTEC, INC., a Tennessee corporation ("RI"), TELSMITH, INC., a Delaware corporation ("TI"; together with AI, AMS, BTI, CEI, CPP, GI, HI, JCI, KPI, PPC, PFI, and RI, each a "Guarantor" and individually and collectively, the "Guarantors"), and WELLS FARGO BANK, NATIONAL ASSOCIATION, a national banking association (the "Bank").

WITNESSETH:

WHEREAS, the Borrower, the Guarantors and the Bank are party to that certain Amended and Restated Credit Agreement dated as of April 12, 2012, as amended by that certain First Amendment to Amended and Restated Credit Agreement dated as of April 12, 2017 (as heretofore and hereafter may have been further amended, restated or otherwise modified from time to time, the "Credit Agreement"; capitalized terms used and not otherwise defined herein shall have the meanings assigned thereto in the Credit Agreement), pursuant to which the Bank has previously made available to the Borrower a line of credit loan of up to One Hundred Million and 00/100 Dollars (\$100,000,000.00); and

WHEREAS, the Borrower, the Guarantors and the Bank desire to amend the Credit Agreement in certain respects as hereinafter set forth;

NOW, THEREFORE, in consideration of the foregoing and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Borrower, the Guarantors and the Bank hereby agree as follows:

1. Definitions.

(a) Article 1 of the Credit Agreement, Definitions, is hereby amended to delete the following existing definitions and insert the following therefor:

"Guarantors" means AI, AMS, BTI, CEI, CPP, GI, HI, JCI, KPI, PPC, PFI, RI, and TI (viz., the members of the Borrower Consolidated Group other than Borrower, Brazilian LLC, BTL, OEP, AIC, AMM, AAP and TSL) and each other subsidiary or other member of the Borrower Consolidated Group that shall now or hereafter execute and deliver a Guaranty.

"Guaranty" means (i) that certain Second Amended and Restated Guaranty dated as of April 12, 2017 and (ii) any other guaranty agreement executed by any Guarantor in favor of Bank, as any may be amended, restated or otherwise modified from time to time.

"Line of Credit Loan Amount" means One Hundred Fifty Million and 00/100 Dollars (\$150,000,000); *provided, however*, that with respect to any Asset Disposition (in a single transaction or a series of related transactions) where the value of the assets so disposed of exceeds ten percent (10%) of the Total Assets of the Borrower Consolidated Group (as of the time of the disposition) (a "Specified Asset"), at Bank's election and upon thirty (30) days' prior written notice to Borrower, Bank may reduce the Line of Credit Loan Amount in an amount (expressed as a percentage) up to the percentage obtained by dividing (x) the value of the Specified Asset by (y) Total Assets of the Borrower Consolidated Group (as of the time of the disposition) (the "Reduction Percentage"); *provided, however*, if the Borrower notifies the Bank prior to, or within 15 Business Days after, such Asset Disposition that the Borrower or such applicable Member of the Borrower Consolidated Group intends to reinvest the cash consideration received from the disposition of the Specified Assets in Additional Asset within 360 days of receipt thereof, the Line of Credit Loan Amount shall not be so reduced unless the Borrower and/or the Borrower Consolidated Group fails to so reinvest such proceeds within such period, in which case, the Line of Credit Loan Amount shall be so reduced by an amount (expressed as a percentage) equal to the amount by which the Borrower and/or the Borrower Consolidated Group has so failed to effect such reinvestment, *provided, further*, subject to compliance with Section 7.2(C), upon the closing of the Hazlehurst Disposition, Borrower shall pay such Net Cash Proceeds to the Bank in accordance with Section 4.3(C) to be applied as a prepayment of the Loans without a permanent reduction in the Line of Credit Loan Amount.

"Line of Credit Loan Maturity Date" means December 29, 2023.

"Line of Credit Note" means that certain Second Amended and Restated Line of Credit Note of even date herewith from Borrower to Bank, in the principal amount of \$150,000,000.00, and includes any amendment to or modification of such note and any promissory note given in extension or renewal of, or in substitution for, such note.

(b) Article 1 of the Credit Agreement, Definitions, is hereby amended to insert the following existing definitions in alphabetical order:

"Additional Assets" means (i) any property or assets of the Borrower Consolidated Group that are substantially similar to the Specified Asset; (ii) any property or assets used or to be used by the Borrower Consolidated Group in a Related Business (including any capital expenditures on any property or assets already so used); (iii) the Equity Interests of a Person that is engaged in a Related Business and becomes a Guarantor hereunder as a result of the acquisition of such Equity Interests by the Borrower or another Guarantor; and (iv) any combination of (i) through (iii) above, all in accordance with the terms of this Agreement.

"Hazlehurst Disposition" means the disposition or sale of the wood pellet plant located in Hazlehurst, Georgia, owned by Astec, Inc.

"Related Business" means those businesses in which the Borrower Consolidated Group is engaged as of February 28, 2019, or that are similar, related, complementary, incidental or ancillary thereto or extensions, developments or expansions thereof.

2. Payments, Additional Costs, Etc. Article II of the Credit Agreement, The Line of Credit Loan, is hereby amended by inserting the following Section 2.7 immediately following Section 2.6:

2.7. Reduction of Line of Credit Loan Amount. Borrower may, upon notice to Bank, from time to time permanently reduce the Line of Credit Loan Amount; provided that (i) any such notice shall be received by Bank not later than 12:00 noon, five (5) Business Days prior to the date of reduction, (ii) any such partial reduction shall be in an aggregate amount of \$1,000,000.00 or any integral multiples of \$100,000 in excess thereof (or such lesser amount as shall be approved by Bank), (iii) Borrower shall not reduce the Line of Credit Loan Amount if, after giving effect thereto and to any concurrent prepayments hereunder, the unpaid principal balance of the Line of Credit Loan plus the undrawn amount of all outstanding Letters of Credit exceeds the amount Borrower could borrow at such time as set forth herein, and (iv) if, after giving effect to any reduction of the Line of Credit Loan Amount, the Letter of Credit Commitment exceeds the amount of the Line of Credit Loan Amount, such Letter of Credit Commitment shall be automatically reduced by the amount of such excess. Any fees accrued until the effective date of any reduction of the Line of Credit Loan Amount shall be paid on the effective date of such reduction.

3. Effectiveness. This Amendment shall be effective only upon the satisfaction of the following conditions:

- (a) Borrower Parties and Bank shall have executed and delivered a counterpart of this Amendment;
- (b) Borrower Parties shall have executed and delivered a certificate of an officer or other representative acceptable to Bank dated as of the date of this Amendment, certifying as to the incumbency and signatures of the representatives of such Person signing, the Loan Documents together with the following documents attached thereto: (i) a copy of the resolutions of each Borrower Party's Governing Body authorizing the execution, delivery and performance of the Loan Documents, (ii) a copy certificate as of the most recent date practicable by the secretary of state (or similar Governmental Authority) of the state of each Borrower Party's organization of its Organizational Documents filed with such secretary of state (or similar Governmental Authority), (iii) a copy of each Borrower Party's other Organizational Documents; and (iv) a certificate of the most recent date practicable of the secretary of state (or similar appropriate Governmental Authority) of each Jurisdiction in which each Borrower's is organized as to the existence and good standing of such Borrower Party within such Jurisdiction;
- (c) Each of the representations and warranties of the Members of the Borrower Consolidated Group contained in Sections 4, 5 and 6 shall be true and correct in all material respects as of the date as of which all of the other conditions contained in this Section 3 shall have been satisfied; and
- (d) The Bank shall have received such documents, instruments, certificates, opinions and approvals as it reasonably may have requested.

4. Organization, Good Standing, Requisite Power and Authorization, Enforceability.

- (a) Each Borrower Party is a corporation duly organized, validly existing and in good standing under the laws of the state of its organization. Each Borrower Party has all requisite power, authority and legal right to execute and deliver this Amendment and all other instruments and documents to be executed and delivered by such Borrower Party pursuant to this Amendment and to perform and observe the provisions thereof and to carry out the transactions contemplated thereby. All actions on the part of any Member of the Borrower Consolidated Group that are required for the execution and delivery of this Amendment and the other Loan Documents and the performance and observance of the provisions thereof by such Member have been duly authorized and effectively taken.
- (b) This Amendment will constitute, upon execution and delivery thereof, shall constitute, legal, valid and binding obligations of the Borrower Parties, enforceable against such Borrower Party in accordance with their respective terms, except as enforcement thereof may be limited by bankruptcy, insolvency, moratorium, reorganization or other similar laws affecting creditors' rights generally.

5. Representations and Warranties. As an inducement to the Bank to enter into this Amendment, each Member of the Borrower Consolidated Group hereby represents and warrants that after giving effect to this Amendment (provided that it is understood that (i) with respect to Brazilian LLC, BTL, OEP, TSL, AMM and AAP, such representations and warranties are being made on their behalf by the Borrower, and (ii) each such Person is making its representations only on its own behalf, and only to the extent of its knowledge with respect to any other Member of the Borrower Consolidated Group):

- (a) the representations and warranties set forth in Article VI of the Credit Agreement are true and correct in all material respects on and as of the date of this Amendment except for representations and warranties that expressly relate to an earlier date, which remain true and correct as of said earlier date;
- (b) no Default or Event of Default exists under the Credit Agreement, any of the other Loan Documents or any other documents executed in connection therewith; and
- (c) no authorization, consent, license, or exemption from, or filing or registration with, any Governmental Authority, nor any material approval or consent of any other Person, is or will be necessary to the valid execution, delivery, or material performance by the parties thereto of this Amendment or of any other instrument or document executed and delivered in connection therewith, except for such thereof that have heretofore been obtained and remain in full force and effect.

6. Reaffirmation; Effect of Amendment; Continuing Effectiveness of Credit Agreement and Loan Documents.

- (a) Each Borrower Party (i) acknowledges and consents to all of the terms and conditions of this Amendment, (ii) affirms all of its obligations under the Loan Documents as amended hereby, and (iii) agrees that this Amendment and all documents executed in connection herewith do not operate to reduce or discharge any Borrower Party's obligations under the Loan Documents.
- (b) Neither this Amendment nor any other indulgences that may have been granted to any Member of the Borrower Consolidated Group by the Bank shall constitute a course of dealing or otherwise obligate the Bank to modify, expand or extend the agreements contained herein, to agree to any other amendments to the Credit Agreement or to grant any consent to, waiver of or indulgence with respect to any other noncompliance with any provision of the Loan Documents.
- (c) Neither this Amendment, nor the failure to exercise or any delay in the exercise of any right or remedy of the Bank under the Loan Documents shall constitute a waiver of any of the rights or remedies of the Bank arising under the Credit Agreement, any other Loan Document or otherwise, and no single or partial exercise of any such rights or remedies shall preclude any other or further exercise of any rights or remedies of the Bank under the Loan Documents or the exercise of any other right.
- (d) Upon and after the effectiveness of this Amendment, each reference in the Credit Agreement to "this Agreement," "hereunder," "hereof" or words of like import referring to the Credit Agreement, and each reference in the other Loan Documents to "the Credit Agreement," "thereunder," "thereof" or words of like import referring to the Credit Agreement, shall mean and be a reference to the Credit Agreement as modified hereby. This Amendment shall constitute a Loan Document for all purposes of the Credit Agreement and the other Loan Documents.
- (e) Any noncompliance by any Member of the Borrower Consolidated Group with any of the covenants, terms, conditions or provisions of this Amendment shall constitute an Event of Default.
- (f) Except to the extent amended or modified hereby, the Credit Agreement, the other Loan Documents and all terms, conditions and provisions thereof shall continue in full force and effect in all respects and shall be construed in accordance with the modifications of the Credit Agreement effected hereby. Without limiting the generality of the foregoing, the Collateral secures and shall continue to secure the payment of all obligations with respect to the Loan Documents, in each case taking into account the modifications of the Credit Agreement effected hereby.

7. Release and Waiver. The Borrower on behalf of itself and Brazilian LLC, BTL, OEP, TSL, AMM and AAP and each other Borrower Party hereby acknowledge and stipulate that it has no claims or causes of action of any kind whatsoever against the Bank, its affiliates, officers, directors, employees or agents. Each Borrower Party represents that it is entering this Amendment freely, and with the advice of counsel as to its legal alternatives. The Borrower on behalf of itself and Brazilian LLC, BTL, OEP, TSL, AMM and AAP and each other Borrower Party hereby release the Bank, its affiliates, officers, directors, employees and agents, from any and all claims, causes of action, demands and liabilities of any kind whatsoever whether direct or indirect, fixed or contingent, liquidated or unliquidated, disputed or undisputed, known or unknown, which such Member of the Borrower Consolidated Group has or may acquire in the future relating in any way to any event, circumstance, action or failure to act to the date of this Amendment, *excluding, however*, claims or causes of actions resulting solely from the Bank's own gross negligence or willful misconduct. The release by the Borrower Parties herein, together with the other terms and provisions of this Amendment, are executed by the Borrower Parties advisedly and without coercion or duress from the Bank, each Borrower Party having determined that the execution of this Amendment, and all of its terms, conditions and provisions are in such Borrower Party's economic best interest.

8. Further Actions. Each of the parties to this Amendment agrees that at any time and from time to time upon written request of any other party, it will execute and deliver such further documents and do such further acts and things as such other party reasonably may request in order to effect the intents and purposes of this Amendment.

9. Counterparts. This Amendment may be executed in multiple counterparts or copies, each of which shall be deemed an original hereof for all purposes. One or more counterparts or copies of this Amendment may be executed by one or more of the parties hereto, and some different counterparts or copies executed by one or more of the other parties. Each counterpart or copy hereof executed by any party hereto shall be binding upon the party executing same even though other parties may execute one or more different counterparts

or copies, and all counterparts or copies hereof so executed shall constitute but one and the same agreement. Each party hereto, by execution of one or more counterparts or copies hereof, expressly authorizes and directs any other party hereto to detach the signature pages and any corresponding acknowledgment, attestation, witness or similar pages relating thereto from any such counterpart or copy hereof executed by the authorizing party and affix same to one or more other identical counterparts or copies hereof so that upon execution of multiple counterparts or copies hereof by all parties hereto, there shall be one or more counterparts or copies hereof to which is(are) attached signature pages containing signatures of all parties hereto and any corresponding acknowledgment, attestation, witness or similar pages relating thereto.

10. Miscellaneous.

(a) Except as amended hereby, the Credit Agreement shall remain in full force and effect. This Amendment does not constitute a waiver of any Event of Default, whether or not the Bank is aware of any such Event of Default.

(b) This Amendment shall be governed by, construed and enforced in accordance with the laws of the State of Tennessee, without reference to the conflicts or choice of law principles thereof.

(c) The headings in this Amendment and the usage herein of defined terms are for convenience of reference only, and shall not be construed as amplifying, limiting or otherwise affecting the substantive provisions hereof.

(d) All references herein to the preamble, the recitals or sections, paragraphs, subparagraphs, annexes or exhibits are to the preamble, recitals, sections, paragraphs, subparagraphs, annexes and exhibits of or to this Amendment unless otherwise specified. The words "hereof", "herein" and "hereunder" and words of similar import, when used in this Amendment, refer to this Amendment as a whole and not to any particular provision of this Amendment.

(e) Any reference herein to any instrument, document or agreement, by whatever terminology used, shall be deemed to include any and all amendments, modifications, supplements, extensions, renewals, substitutions and/or replacements thereof as the context may require.

(f) When used herein, (1) the singular shall include the plural, and vice versa, and the use of the masculine, feminine or neuter gender shall include all other genders, as appropriate, (2) "include", "includes" and "including" shall be deemed to be followed by "without limitation" regardless of whether such words or words of like import in fact follow same, and (3) unless the context clearly indicates otherwise, the disjunctive "or" shall include the conjunctive "and".

[Remainder of page intentionally left blank. Signature pages follow.]

IN WITNESS WHEREOF, the parties hereto have executed this Amendment as of the date first above written.

BORROWER PARTIES:

ASTEC INDUSTRIES, INC.,
a Tennessee corporation

By: /s/ David C. Silvius
Name: David C. Silvius
Title: Chief Financial Officer

ASTEC, INC.,
a Tennessee corporation

By: /s/David C. Silvius
Name: David C. Silvius
Title: Treasurer

ASTEC MOBILE SCREENS, INC.,
a Nevada corporation

By: /s/David C. Silvius
Name: David C. Silvius
Title: Treasurer

BREAKER TECHNOLOGY, INC.,
a Tennessee corporation

By: /s/David C. Silvius
Name: David C. Silvius
Title: Treasurer

CEI ENTERPRISES, INC.,
a Tennessee corporation

By: /s/David C. Silvius
Name: David C. Silvius
Title: Treasurer

CARLSON PAVING PRODUCTS, INC.,
a Washington corporation

By: /s/David C. Silvius
Name: David C. Silvius
Title: Treasurer

GEFCO, INC.,
a Tennessee corporation

By: /s/David C. Silvius
Name: David C. Silvius
Title: Treasurer

HEATEC, INC.,
a Tennessee corporation

By: /s/David C. Silvius
Name: David C. Silvius
Title: Treasurer

JOHNSON CRUSHERS INTERNATIONAL, INC.,
a Tennessee corporation

By: /s/David C. Silvius
Name: David C. Silvius
Title: Treasurer

KOLBERG-PIONEER, INC.,
a Tennessee corporation

By: /s/David C. Silvius
Name: David C. Silvius
Title: Treasurer

PETERSON PACIFIC CORP.,
an Oregon corporation

By: /s/David C. Silvius
Name: David C. Silvius
Title: Treasurer

POWER FLAME INCORPORATED.,
a Tennessee corporation

By: /s/David C. Silvius
Name: David C. Silvius
Title: Treasurer

ROADTEC, INC.,
a Tennessee corporation

By: /s/David C. Silvius
Name: David C. Silvius
Title: Treasurer

TELSMITH, INC.,
a Delaware corporation

By: /s/David C. Silvius
Name: David C. Silvius
Title: Treasurer

[Bank signature page continues on following page]

BANK:

WELLS FARGO BANK, NATIONAL
ASSOCIATION,
a national banking association

By: /s/ Marsha B. Moffitt
Name: Marsha B. Moffitt
Title: SVP

LIST OF SUBSIDIARIES

Name	Percentage Owned	Jurisdiction of Incorporation
Astec Australia Pty Ltd	100	Australia
Astec do Brasil Fabricacao de Equipamentos Ltda.	93	Brazil
Astec, Inc.	100	Tennessee
Astec Industries LatAm SpA	100	Chile
Astec Insurance Company	100	Vermont
Astec Mobile Machinery GmbH	100	Germany
Astec Mobile Screens, Inc.	100	Nevada
Breaker Technology, Inc.	100	Tennessee
Breaker Technology Ltd	100	Ontario, Canada
Carlson Paving Products, Inc.	100	Washington
CEI Enterprises, Inc.	100	Tennessee
GEFCO, Inc.	100	Tennessee
Heatec, Inc.	100	Tennessee
Johnson Crushers International, Inc.	100	Tennessee
Kolberg-Pioneer, Inc.	100	Tennessee
Osborn Engineered Products SA (Pty) Ltd	99	South Africa
Peterson Pacific Corp.	100	Oregon
Power Flame Incorporated	100	Tennessee
RexCon, Inc.	100	Tennessee
Roadtec, Inc.	100	Tennessee
Telestack, Limited	100	Northern Ireland
Telsmith, Inc.	100	Delaware

Consent of Independent Registered Public Accounting Firm

The Board of Directors
Astec Industries, Inc.:

We consent to the incorporation by reference in the registration statements (Nos. 333-123266, 333-124420, 033-61461, 333-133013, 333-134398 and 333-176177) on Form S-8 of Astec Industries, Inc. of our reports dated March 15, 2019, with respect to the consolidated balance sheets of Astec Industries, Inc. and subsidiaries as of December 31, 2018 and 2017, and the related consolidated statements of operations, comprehensive income (loss), equity and cash flows for each of the years in the three-year period ended December 31, 2018, and the related notes (collectively, the “consolidated financial statements”), and the effectiveness of internal control over financial reporting as of December 31, 2018, which reports appear in the December 31, 2018 annual report on Form 10-K of Astec Industries, Inc.

Our report dated March 15, 2019, on the effectiveness of internal control over financial reporting as of December 31, 2018, expresses our opinion that Astec Industries, Inc. did not maintain effective internal control over financial reporting as of December 31, 2018 because of the effect of material weaknesses on the achievement of the objectives of the control criteria and contains an explanatory paragraph that states that the following material weaknesses have been identified and included in management’s assessment:

- Ineffective management review controls over the annual goodwill impairment assessment due to insufficient knowledgeable and experienced personnel and ineffective risk assessment;
- Ineffective controls over the completeness and accuracy of data and formulas embedded in the spreadsheets used in income tax calculations due to ineffective risk assessment;
- Insufficient trained personnel knowledgeable and experienced in the application of the COSO 2013 Framework at certain business units and insufficient corporate monitoring of certain business units;
- Ineffective general information technology controls over the newly implemented enterprise resource planning system at the Roadtec subsidiary due to the lack of experienced personnel in implementing complex IT systems and insufficient training on the IT system’s functionalities;
- Ineffective controls over the accuracy and disclosure of revenue at certain business units due to insufficient understanding of the requirements of revenue recognition and not performing an effective risk assessment; and
- Ineffective controls over the existence, accuracy and valuation of inventories at certain business units due to insufficient understanding of relevant risks of material misstatement.

/s/ KPMG LLP

Knoxville, Tennessee
March 15, 2019

**Certification pursuant to Rule 13a-14(a)/15d-14(a),
as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002**

I, Richard J. Dorris, certify that:

1. I have reviewed this annual report on Form 10-K of Astec Industries, Inc.;
 2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
 3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
 4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
-

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 15, 2019

/s/Richard J. Dorris

Richard J. Dorris
Interim CEO and President
(Principal Executive Officer)

**Certification pursuant to Rule 13a-14(a)/15d-14(a),
as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002**

I, David C. Silvious, certify that:

1. I have reviewed this annual report on Form 10-K of Astec Industries, Inc.;
 2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
 3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
 4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
 - (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
 - (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
 - (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
 - (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
-

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 15, 2019

/s/ David C. Silvius

David C. Silvius
CFO, Vice President and Treasurer
(Principal Financial Officer)

**Certification pursuant to Rule 13a-14(b)/15d-14(b) of the Securities
Exchange Act of 1934 and 18 U.S.C. Section 1350, as adopted
pursuant to Section 906 Of The Sarbanes-Oxley Act Of 2002**

In connection with the Annual Report of Astec Industries, Inc. (the "Company") on Form 10-K for the period ended December 31, 2018 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), the undersigned, Richard J. Dorris and David C. Silvius, certify, pursuant to Rule 13a-14(b)/15d-14(b) of the Securities Exchange Act of 1934 and 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that:

- (1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
- (2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

/s/ Richard J. Dorris

Richard J. Dorris
Interim CEO and President
(Principal Executive Officer)
March 15, 2019

/s/ David C. Silvius

David C. Silvius
Chief Financial Officer, Vice President and Treasurer
(Principal Financial Officer)
March 15, 2019