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, 2019
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 1-1687

PPG INDUSTRIES, INC.
(Exact name of registrant as specified in its charter)

Pennsylvania	25-0730780
(State or other jurisdiction of incorporation or organization)	**(I.R.S. Employer Identification No.)**
One PPG Place Pittsburgh Pennsylvania	15272
(Address of principal executive offices)	**(Zip code)**
Registrant's telephone number, including area code:	412 434-3131

Securities Registered Pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock – Par Value $1.66 2/3	PPG	New York Stock Exchange
0.875% Notes due 2022	PPG 22	New York Stock Exchange
0.875% Notes due 2025	PPG 25	New York Stock Exchange
1.400% Notes due 2027	PPG 27	New York Stock Exchange

Securities Registered Pursuant to Section 12(g) of the Act: None

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 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, and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by checkmark whether the registrant has submitted electronically every Interactive Date File required to be submitted and posted 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 and post such files). Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an 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	☐	Smaller reporting company	☐
(Do not check if a 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 by Rule 12b-2 of the Act). Yes ☐ No ☒

The aggregate market value of common stock held by non-affiliates as of June 30, 2019, was $27,547 million.

As of January 31, 2020, 235,755,928 shares of the Registrant's common stock, with a par value of $1.66 $^{2}/_{3}$ per share, were outstanding. As of that date, the aggregate market value of common stock held by non-affiliates was $28,220 million.

DOCUMENTS INCORPORATED BY REFERENCE

Document	Incorporated By Reference In Part No.
Portions of PPG Industries, Inc. Proxy Statement for its 2020 Annual Meeting of Shareholders	III

PPG INDUSTRIES, INC.
AND CONSOLIDATED SUBSIDIARIES

As used in this report, the terms “PPG,” “Company,” “Registrant,” “we,” “us” and “our” refer to PPG Industries, Inc., and its subsidiaries, taken as a whole, unless the context indicates otherwise.

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Note on Incorporation by Reference

Throughout this report, various information and data are incorporated by reference from the Company’s 2019 Annual Report (hereinafter referred to as “the Annual Report”). Any reference in this report to disclosures in the Annual Report shall constitute incorporation by reference only of that specific information and data into this Form 10-K.

Part I

Item 1. Business

PPG Industries, Inc. manufactures and distributes a broad range of paints, coatings and specialty materials. PPG was incorporated in Pennsylvania in 1883. PPG's vision is to be the world's leading coatings company by consistently delivering high-quality, innovative and sustainable solutions that customers trust to protect and beautify their products and surroundings.

PPG has a proud heritage and demonstrated commitment to innovation, sustainability, community engagement and developing leading-edge paint, coatings and specialty materials technologies. Through dedication and industry-leading expertise, we solve our customers' biggest challenges, collaborating closely to find the right path forward. PPG is a global leader, serving customers in construction, consumer products, industrial and transportation markets and aftermarkets with manufacturing facilities and equity affiliates in more than 70 countries.

Performance Coatings and Industrial Coatings

PPG's business is comprised of two reportable business segments: Performance Coatings and Industrial Coatings. The Performance Coatings and Industrial Coatings reportable business segments supply coatings and specialty materials to customers in a wide array of end-uses, including industrial equipment and components; packaging material; aircraft and marine equipment; automotive original equipment; automotive refinish; as well as for other industrial and consumer products. PPG also serves commercial and residential new build and maintenance customers by supplying coatings to painting and maintenance contractors and directly to consumers for decoration and maintenance. The coatings industry is highly competitive and consists of several large firms with global presence and many firms supplying local or regional markets. PPG competes in its primary markets with the world's largest coatings companies, most of which have global operations, and many regional coatings companies.

PERFORMANCE COATINGS

Strategic Business Unit	Products	Primary End-uses	Main Distribution Methods	Primary Brands
Automotive Refinish Coatings	Coatings, solvents, adhesives, sealants, sundries, software	Automotive and commercial transport/fleet repair and refurbishing, light industrial coatings and specialty coatings for signs	Independent distributors and direct to customers	PPG®, SEM®
Aerospace Coatings	Coatings, sealants, transparencies, transparent armor, adhesives, engineered materials, packaging and chemical management services for the aerospace industry	Commercial, military, regional jet and general aviation aircraft	Direct to customers and company-owned distribution network	PPG®
Protective and Marine Coatings	Coatings and finishes for the protection of metals and structures	Metal fabricators, heavy duty maintenance contractors and manufacturers of ships, bridges and rail cars	Direct to customers, company-owned architectural coatings stores, independent distributors and concessionaires	PPG®
Architectural Coatings Americas and Asia Pacific	Paints, wood stains, adhesives and purchased sundries	Painting and maintenance contractors and consumers for decoration and maintenance of residential and commercial building structures	Company-owned stores, home centers and other regional or national consumer retail outlets, paint dealers, concessionaires, independent distributors and direct to consumers	PPG®, GLIDDEN®, COMEX®, OLYMPIC®, DULUX® (in Canada), SIKKENS®, PPG PITTSBURGH PAINTS®, MULCO®, FLOOD®, LIQUID NAILS®, SICO®, RENNER®, TAUBMANS®, WHITE KNIGHT®, BRISTOL®, HOMAX® among others
Architectural Coatings Europe, Middle East and Africa (EMEA)				SIGMA®, HISTOR®, SEIGNEURIE®, GUITTET®, PEINTURES GAUTHIER®, RIPOLIN®, JOHNSTONE'S®, LEYLAND®, PRIMALEX®, DEKORAL®, TRILAK®, PROMINENT PAINTS®, GORI®, BONDEX®, and DANKE!® among others

Segment Overview	This reportable business segment primarily supplies a variety of protective and decorative coatings, sealants and finishes along with paint strippers, stains and related chemicals, as well as transparencies and transparent armor.
Major Competitive Factors	Product performance, technology, quality, technical and customer service, price, customer productivity, distribution and brand recognition
Global Competitors	Akzo Nobel N.V., Axalta Coating Systems Ltd., BASF Corporation, Benjamin Moore, Cromology, Hempel A/S, Kansai Paints, the Jotun Group, Masco Corporation, Nippon Paint; RPM International Inc, the Sherwin-Williams Company, Tikkurila Oyj and 3M Company
2019 Strategic Acquisitions	Texstars, LLC, Dexmet Corporation and Industria Chimica Reggiana ("ICR"; closed on January 31, 2020). Refer to Note 3, "Acquisitions and Divestitures" under Item 8 of this Form 10-K for more information.
Average Number of Employees in 2019	27,700
Principal Manufacturing and Distribution Facilities	Amsterdam, Netherlands; Birstall, United Kingdom; Busan, South Korea; Carrollton, Texas; Clayton, Australia; Delaware, Ohio; Deurne, Belgium; Gonfreville, France; Huntsville, Alabama; Huron, Ohio; Kunshan, China; Little Rock, Arkansas; Mexico City, Mexico; Milan, Italy; Mojave, California; Oakwood, Georgia; Ontario, Canada; Ostrow Wielkopolski, Poland; Ruitz, France; Shildon, United Kingdom; Sylmar, California; Stowmarket, United Kingdom; Tepexpan, Mexico; and Wroclaw, Poland.

INDUSTRIAL COATINGS

Strategic Business Unit	Products	Primary End-uses	Main Distribution Methods	Primary Brands
Automotive OEM[(a)] Coatings	Specifically formulated coatings, adhesives and sealants and metal pretreaments	Automotive original equipment	Direct to manufacturing companies and various coatings applicators	PPG®
Industrial Coatings	Specifically formulated coatings, adhesives and sealants and metal pretreaments; Services and coatings application	Appliances, agricultural and construction equipment, consumer electronics, automotive parts and accessories, building products (including residential and commercial construction), transportation vehicles and numerous other finished products; On-site coatings services within several customer manufacturing locations as well as at regional service centers.		PPG®
Packaging Coatings	Specifically formulated coatings	Metal cans, closures, plastic tubes, industrial packaging, and promotional and specialty packaging		PPG®
Specialty Coatings and Materials	Amorphous precipitated silicas, TESLIN® substrate, Organic Light Emitting Diode (OLED) materials, optical lens materials and photochromic dyes	SILICA - Tire, battery separator and other end-uses TESLIN - Labels, e-passports, drivers' licenses, breathable membranes, loyalty cards and identification cards OLED - displays and lighting LENS MATERIALS - optical lenses and color-change products		PPG® TESLIN®

(a) Original equipment manufacturer (OEM)

Segment Overview	This reportable business segment primarily supplies a variety of protective and decorative coatings and finishes along with adhesives, sealants, metal pretreatment products, optical monomers and coatings, precipitated silicas and other specialty materials.
Alliances	PPG has established alliances with Kansai Paints to serve Japanese-based automotive OEM customers in North America and Europe and Asian Paints Ltd. to serve certain aftermarket customers and automotive OEM customers in India.
Major Competitive Factors	Product performance, technology, quality, technical and customer service, price, customer productivity and distribution.
Global Competitors	Akzo Nobel N.V., Axalta Coating Systems Ltd., BASF Corporation, Kansai Paints, Nippon Paint and the Sherwin-Williams Company
2019 Strategic Acquisitions	Hemmelrath and Whitford Worldwide Company. Refer to Note 3, "Acquisitions and Divestitures" under Item 8 of this Form 10-K for more information.
Average Number of Employees in 2019	15,300
Principal Manufacturing and Distribution Facilities	Barberton, Ohio; Busan, South Korea; Cieszyn, Poland; Cleveland, Ohio; Delfzijl, Netherlands; Lake Charles, Louisiana; Oak Creek, Wisconsin; Quattordio, Italy; San Juan del Rio, Mexico; Springdale, Pennsylvania; Sumaré, Brazil; Suzhou, Tianjin and Zhangjiagang, China.

Research and Development

($ in millions)	***2019***	***2018***	***2017***
Research and development costs, including depreciation of research facilities	$456	$464	$472
% of annual net sales	3.0%	3.0%	3.2%

Technology innovation has been a hallmark of PPG's success throughout its history. The Company seeks to optimize its investment in research and development to create new products to drive profitable growth. We align our product development with the macro trends in the markets we serve and leverage core technology platforms to develop products for unmet market needs. Additionally, we operate laboratories in close geographic proximity to our customers, and we customize our products for our customers' end-use applications. Our history of successful technology introductions is based on a commitment to an efficient and effective innovation process and disciplined portfolio management. We have obtained government funding for a small portion of the Company's research efforts, and we will continue to pursue government funding where appropriate.

We own and operate several facilities to conduct research and development for new and improved products and processes. In addition to the Company's centralized principal research and development centers (See Item 2. "Properties" of this Form 10-K), operating segments manage their development through centers of excellence. As part of our ongoing efforts to manage our formulations and raw material costs effectively, we operate global competitive sourcing laboratories. Because of our broad array of products and customers, we are not materially dependent upon any single technology platform.

Raw Materials, Energy and Logistics

The effective management of raw materials, energy and logistics is important to PPG's continued success as PPG uses a wide variety of complex raw materials that serve as the building blocks of our manufactured products. The Company's most significant raw materials are epoxy and other resins, titanium dioxide and other pigments, and solvents in the coatings businesses and sand and soda ash in the specialty coatings and materials business. Raw materials include both organic, primarily petroleum-derived, materials and inorganic materials, including titanium dioxide. These raw materials represent PPG's single largest production cost component.

Most of the raw materials and energy used in production are purchased from outside sources, and the Company has made, and plans to continue to make, supply arrangements to meet our planned operating requirements for the future. Supply of critical raw materials and energy is managed by establishing contracts with multiple sources and identifying alternative materials or technology whenever possible. Our raw materials include bio-based materials as part of a product renewal strategy. While prices for certain raw materials typically fluctuate with energy prices and global supply and demand changes, such fluctuations are impacted by the fact that the manufacture of our raw materials is several steps downstream from crude oil and natural gas inputs.

We are continuing our aggressive sourcing initiatives to broaden our supply of high quality raw materials. These initiatives include qualifying multiple sources of supply, both local and international, including suppliers from Asia and other lower cost regions of the world, adding on-site resin production at certain manufacturing locations and reducing the amount of titanium dioxide used in our product formulations.

We are subject to existing and evolving standards relating to the registration of chemicals which could potentially impact the availability and viability of some of the raw materials we use in our production processes. Our ongoing, global product stewardship efforts are directed at maintaining our compliance with these standards. Changes to chemical registration regulations have been proposed or implemented in the European Union and many other countries, including China, Canada, the United States ("U.S."), Brazil, Mexico and South Korea. Because implementation of many of these programs has not been finalized, the financial impact cannot be estimated at this time. We anticipate that the number of chemical registration regulations will continue to increase globally, and we have implemented programs to track and comply with these regulations.

PPG has joined a global initiative to eliminate child labor from the mica industry, and the Company is continuing to take steps, including audits of our suppliers, to ensure compliance with PPG's policy against the use of child labor in our supply chains.

We typically experience fluctuating prices for energy and raw materials driven by various factors, including changes in supplier feedstock costs and inventories, global industry activity levels, foreign currency exchange rates, government regulation, and global supply and demand factors. For 2019 versus 2018, we experienced a deflationary movement in costs, particularly in the second half of 2019, driven by a general slowdown in industrial demand affecting the global supply and demand balance in several of our key purchasing categories. This was in addition to pricing decreases in most of our key feedstocks throughout 2019. In contrast, average raw material costs rose by a mid-single-digit percentage in 2018 versus 2017 due to the rise in feedstock prices, acute shortages in key raw materials and the impact of Chinese environmental regulations.

Given the continuing volatility in certain energy-based input costs, particularly the volatility in oil and oil-based derivatives, and foreign currencies, we are not able to predict with certainty the 2020 full-year impact of changes in raw material pricing versus 2019. Further, given the distribution nature of many of our businesses, logistics and distribution costs are sizable, as are wage and benefit changes. For 2019 versus 2018, we experienced a slight decrease in our logistics costs as a percentage of sales driven by operational efficiency improvements and through sourcing efforts to take advantage of the reduction in industry surface transportation shipping rates due to an improvement in the availability of transportation assets. We expect these costs to remain steady or be slightly lower through 2020 given the continuing efforts by PPG to improve our global operational efficiencies.

Backlog

In general, PPG does not manufacture its products against a backlog of orders. Production and inventory levels are geared primarily to projections of future demand and the level of incoming orders.

Global Operations

PPG has a significant investment in non-U.S. operations. This broad geographic footprint serves to lessen the significance of economic impacts occurring in any one region on our total Net sales and Income before income taxes in the consolidated statement of income. As a result of our expansion outside the U.S., we are subject to certain inherent risks, including economic and political conditions in international markets, trade protection measures and fluctuations in foreign currency exchange rates. During 2019, unfavorable foreign currency translation decreased Net sales by approximately $400 million and Income before income taxes by approximately $50 million.

Our net sales in the developed and emerging regions of the world for the years ended December 31st are summarized below:

($ in millions)	***2019***	***2018***	***2017***
Net sales			
United States, Canada, Western Europe	$10,191	$10,299	$9,911
Latin America, Central and Eastern Europe, Middle East, Africa, Asia Pacific	4,955	5,075	4,837
Total	$15,146	$15,374	$14,748

Refer to Note 21, “Reportable Business Segment Information” under Item 8 of this Form 10-K for geographic information related to PPG’s property, plant and equipment, and for additional geographic information pertaining to sales.

Seasonality

PPG’s Income before income taxes has typically been greater in the second and third quarters and Cash from operating activities has been greatest in the fourth quarter due to end-use market seasonality, primarily in our architectural coatings businesses. Demand for our architectural coatings products is typically the strongest in the second and third quarters due to higher home improvement, maintenance and construction activity during the spring and summer months in the U.S., Canada and Europe. The Latin America paint season is the strongest in the fourth quarter. These cyclical activity levels result in the collection of outstanding receivables and lower inventory on hand in the fourth quarter generating higher Cash from operating activities.

Employee Relations

The average number of people employed worldwide by PPG during 2019 was approximately 47,600. The Company has numerous collective bargaining agreements throughout the world. We observe local customs, laws and practices in labor relations when negotiating collective bargaining agreements. There were no significant work stoppages in 2019. While we have experienced occasional work stoppages as a result of the collective bargaining process and may experience some work stoppages in the future, we believe that we will be able to negotiate all labor agreements on satisfactory terms. To date, these work stoppages have not had a significant impact on our results of operations. Overall, we believe we have good relationships with our employees.

Environmental Matters

PPG is committed to operating in a sustainable manner and to helping our customers meet their sustainability goals. Our sustainability efforts are led by the Technology and Environment Committee of our Board of Directors and our Sustainability Committee, which is comprised of members of PPG’s senior management team. The Sustainability Committee establishes policies, programs, procedures and goals to address sustainability in our business practices, including resource management, climate change, innovation, communications, purchasing, manufacturing and employee wellness.

Our dedication to innovation is intertwined with sustainability. Once again, we increased the percent of our sales from sustainable products to 33% in 2019 from 32% in 2018. We are marketing an ever-growing variety of products and services that provide environmental, safety and other benefits to our customers. Our products contribute to lighter, more fuel-efficient vehicles, airplanes and ships, and they help our customers reduce their energy consumption, conserve water and reduce waste. These products include a compact automotive paint process that saves energy and reduces water usage; sustainable, waterborne coatings formulations; lightweight sealants and coatings for aircraft; coatings that cool surfaces; coatings for recyclable metal packaging; and solutions for autonomous and battery-powered vehicles.

The Company's commitment to sustainability continues to yield tangible results. In 2019, we again made significant progress reducing our energy intensity, greenhouse gas emissions intensity and waste intensity. More information about PPG's sustainability values, efforts, goals and data and our community and employee engagement programs can be found in our Sustainability Report and on our sustainability website at http://sustainability.ppg.com and on the CDP's website at www.cdp.net.

We are subject to existing and evolving standards relating to the protection of the environment. In management's opinion, the Company operates in an environmentally sound manner and is well positioned, relative to environmental matters, within the industries in which it operates. PPG is negotiating with various government agencies concerning current and former manufacturing sites and offsite waste disposal locations, including certain sites on the National Priority List. While PPG is not generally a major contributor of wastes to these offsite waste disposal locations, each potentially responsible party may face governmental agency assertions of joint and several liability. Generally, however, a final allocation of costs is made based on relative contributions of wastes to the site. There is a wide range of cost estimates for cleanup of these sites, due largely to uncertainties as to the nature and extent of their condition and the methods that may have to be employed for their remediation. The Company has established reserves for onsite and offsite remediation of those sites where it is probable that a liability has been incurred and the amount of loss can be reasonably estimated.

Our experience to date regarding environmental matters leads us to believe that it will have continuing expenditures for compliance with provisions regulating the protection of the environment and for present and future remediation efforts at waste and plant sites. Management anticipates that such expenditures will occur over an extended period of time.

In addition to the $304 million currently reserved for environmental remediation efforts, we may be subject to loss contingencies related to environmental matters estimated to be approximately $100 million to $200 million. These reasonably possible unreserved losses relate to environmental matters at a number of sites, none of which are individually significant. The loss contingencies related to these sites include significant unresolved issues such as the nature and extent of contamination at these sites and the methods that may have to be employed to remediate them.

($ in millions)	***2019***	***2018***	***2017***
Capital expenditures for environmental control projects	$15	$20	$7

It is expected that capital expenditures for such projects in 2020 will be in the range of $20 million to $30 million. Although future capital expenditures are difficult to estimate accurately because of constantly changing regulatory standards and policies, it can be anticipated that environmental control standards will become increasingly stringent and the cost of compliance will increase.

Management believes that the outcome of these environmental contingencies will not have a material adverse effect on PPG's financial position or liquidity; however, any such outcome may be material to the results of operations of any particular period in which costs, if any, are recognized. See Note 14, "Commitments and Contingent Liabilities" under Item 8 of this Form 10-K for additional information related to environmental matters and our accrued liability for estimated environmental remediation costs.

Available Information

The Company's website address is *www.ppg.com*. The Company posts, and shareholders may access without charge, the Company's recent filings and any amendments thereto of its annual reports on Form 10-K, quarterly reports on Form 10-Q and its proxy statements as soon as reasonably practicable after such reports are filed with the Securities and Exchange Commission ("SEC"). The Company also posts all financial press releases, including earnings releases, to its website. All other reports filed or furnished to the SEC, including reports on Form 8-K, are available via direct link on PPG's website to the SEC's website, *www.sec.gov*. Reference to the Company's, the SEC's or other websites herein does not incorporate by reference any information contained on those websites and such information should not be considered part of this Form 10-K.

Item 1A. Risk Factors

As a global manufacturer of paints, coatings and specialty materials, we operate in a business environment that includes risks. These risks are not unlike the risks we have faced in the recent past nor are they unlike risks faced by our competitors. Each of the risks described in this section could adversely affect our results of operations, financial position and liquidity. While the factors listed here are considered to be the more significant factors, no such list should be considered to be a complete statement of all potential risks and uncertainties. Unlisted factors may present significant additional obstacles which may adversely affect our businesses and our results of operations, financial position and liquidity.

Increases in prices and declines in the availability of raw materials could negatively impact our financial results.

Our financial results are significantly affected by the cost of raw materials. Raw materials include both organic, primarily petroleum-derived, materials and inorganic materials, including titanium dioxide. These raw materials represent PPG's single largest production cost component.

While not our customary practice, we also import raw materials and intermediates, particularly for use at our manufacturing facilities in the emerging regions of the world. In most cases, those imports are priced in the currency of the supplier and, therefore, if that currency strengthens against the currency of our manufacturing facility, our margins may be lower.

Most of our raw materials are purchased from outside sources, and the Company has made, and plans to continue to make, supply arrangements to meet the planned operating requirements for the future. Adequate supply of critical raw materials is managed by establishing contracts, procuring from multiple sources, and identifying alternative materials or technology whenever possible. The Company is continuing its aggressive sourcing initiatives to effectively broaden our supply of high quality raw materials. These initiatives include qualifying multiple and local sources of supply, including suppliers from Asia and other lower cost regions of the world, adding on-site resin production at certain manufacturing locations, and a reduction in the amount of titanium dioxide and other raw materials used in our product formulations. Our raw materials include bio-based materials as part of a product renewal strategy.

An inability to obtain critical raw materials would adversely impact our ability to produce products. Increases in the cost of raw materials may have an adverse effect on our Income from continuing operations or Cash from operating activities in the event we are unable to offset these higher costs in a timely manner.

The pace of economic growth and level of uncertainty could have a negative impact on our results of operations and cash flows.

Demand for our products and services depends, in part, on the general economic conditions affecting the countries and markets in which we do business. Weak economic conditions in certain geographies and changing supply and demand balances in the markets we serve have negatively impacted demand for our products and services in the past and may do so in the future. Recently, global economic uncertainty has increased due to a number of factors, including slowing global growth, consumer sentiment and commodity market volatility, disruption in existing trade agreements, the imposition of tariffs and the threat of additional tariffs, the United Kingdom's exit from the European Union and weaker demand in China. PPG provides products and services to a variety of end-use markets in many geographies. This broad end-use market exposure and expanded geographic presence lessens the significance of any individual decrease in activity levels; nonetheless, lower demand levels may result in lower sales, which would result in reduced Income from continuing operations and Cash from operating activities.

We are subject to existing and evolving standards relating to the protection of the environment.

Environmental laws and regulations control, among other things, the discharge of pollutants into the air and water, the handling, use, treatment, storage and clean-up of hazardous and non-hazardous waste, and the investigation and remediation of soil and groundwater affected by hazardous substances. In addition, various laws regulate health and safety matters. The environmental laws and regulations we are subject to impose liability for the costs of, and damages resulting from, cleaning up current sites, past spills, disposals and other releases of hazardous substances. Violations of these laws and regulations can also result in fines and penalties. Future environmental laws and regulations may require substantial capital expenditures or may require or cause us to modify or curtail our operations, which may have a material adverse impact on our business, financial condition and results of operations.

We are involved in a number of lawsuits and claims, and we may be involved in future lawsuits and claims, in which substantial monetary damages are sought.

PPG is involved in a number of lawsuits and claims, both actual and potential, in which substantial monetary damages are sought. Those lawsuits and claims relate to contract, patent, environmental, product liability, asbestos exposure, antitrust, employment, securities and other matters arising out of the conduct of PPG's current and past business activities. Any such claims, whether with or without merit, could be time consuming, expensive to defend and could divert management's attention and resources. We maintain insurance against some, but not all, of these potential claims, and the levels of insurance we do maintain may not be adequate to fully cover any and all losses. We believe that, in the aggregate, the outcome of all current lawsuits and claims involving PPG, including those described in Note 14, "Commitments and Contingent Liabilities" under Item 8 of this Form 10-K, will not have a material effect on PPG's consolidated financial position or liquidity; however, such outcome may be material to the results of operations of any particular period in which costs, if any, are recognized. Nonetheless, the results of any future litigation or claims are inherently unpredictable, and such outcomes could have a material adverse effect on our results of operations, Cash from operating activities or financial condition.

Fluctuations in foreign currency exchange rates could affect our financial results.

We earn revenues, pay expenses, own assets and incur liabilities in countries using currencies other than the U.S. dollar. Because our consolidated financial statements are presented in U.S. dollars, we must translate revenues and expenses into U.S. dollars at the average exchange rate during each reporting period, as well as assets and liabilities into U.S. dollars at exchange rates in effect at the end of each reporting period. Therefore, increases or decreases in the value of the U.S. dollar against other currencies will affect our Net sales, Net income and the value of balance sheet items denominated in foreign currencies. We may use derivative financial instruments to reduce our net exposure to currency exchange rate fluctuations related to foreign currency transactions. However, fluctuations in foreign currency exchange rates, particularly the strengthening or weakening of the U.S. dollar against major currencies, could adversely or positively affect our financial condition and results of operations expressed in U.S. dollars.

We are subject to a variety of complex U.S. and non-U.S. laws and regulations, which could increase our compliance costs and could adversely affect our results of operations.

We are subject to a wide variety of complex U.S. and non-U.S. laws and regulations, and legal compliance risks, including securities laws, tax laws, environmental laws, employment and pension-related laws, competition laws, U.S. and foreign export and trading laws, and laws governing improper business practices, including bribery. We are affected by new laws and regulations and changes to existing laws and regulations, as well as interpretations by courts and regulators. These laws and regulations effectively expand our compliance obligations and costs.

For example, regulations concerning the composition, use and transport of chemical products continue to evolve. Developments concerning these regulations could potentially impact the availability or viability of some of the raw materials we use in our product formulations and/or our ability to supply certain products to some customers or markets. Import/export regulations also continue to evolve and could result in increased compliance costs, slower product movements or additional complexity in our supply chains.

Further, although we believe that we have appropriate risk management and compliance programs in place, we cannot guarantee that our internal controls and compliance systems will always protect us from improper acts committed by employees, agents, business partners or businesses that we acquire. Any non-compliance or such improper actions or allegations could damage our reputation and subject us to civil or criminal investigations and shareholder lawsuits, could lead to substantial civil and criminal, monetary and non-monetary penalties, and could cause us to incur significant legal and investigatory fees.

Our international operations expose us to additional risks and uncertainties that could affect our financial results.

PPG has a significant investment in global operations. This broad geographic footprint serves to lessen the significance of economic impacts occurring in any one region. Notwithstanding the benefits of geographic diversification, our ability to achieve and maintain profitable growth in international markets is subject to risks related to the differing legal, political, social and regulatory requirements and economic conditions of many countries. As a result of our operations outside the U.S., we are subject to certain inherent risks, including political and economic uncertainty, inflation rates, exchange rates, trade protection measures, local labor conditions and laws, restrictions on foreign investments and repatriation of earnings, and weak intellectual property protection. Our percentage of sales generated in 2019 by products sold outside the U.S. was approximately 61%.

Changes in the tax regimes and related government policies and regulations in the countries in which we operate could adversely affect our results and our effective tax rate.

As a multinational corporation, we are subject to various taxes in both the U.S. and non-U.S. jurisdictions. Due to economic and political conditions, tax rates in these various jurisdictions may be subject to significant changes. Our future effective income tax rate could be affected by changes in the mix of earnings in countries with differing statutory tax rates, changes in the valuation of deferred tax assets or changes in tax laws or their interpretation. Further, PPG may continue to refine its estimates to incorporate new or better information as it becomes available. Recent developments, including the European Commission’s investigations on illegal state aid as well as the Organisation for Economic Co-operation and Development project on Base Erosion and Profit Shifting may result in changes to long-standing tax principles, which could adversely affect our effective tax rate or result in higher cash tax liabilities. If our effective income tax rate was to increase, our Cash from operating activities, financial condition and results of operations would be adversely affected.

Although we believe that our tax filing positions are appropriate, the final determination of tax audits or tax disputes may be different from what is reflected in our historical income tax provisions and accruals. If future audits find that additional taxes are due, we may be subject to incremental tax liabilities, possibly including interest and penalties, which could have a material adverse effect on our Cash from operating activities, financial condition and results of operations.

Business disruptions could have a negative impact on our results of operations and financial condition.

Unexpected events, including supply disruptions, temporary plant and/or power outages, work stoppages, natural disasters and severe weather events, significant public health issues, computer system disruptions, fires, war or terrorist activities, could increase the cost of doing business or otherwise harm the operations of PPG, our customers and our suppliers. It is not possible for us to predict the occurrence or consequence of any such events. However, such events could reduce our ability to supply products, reduce demand for our products or make it difficult or impossible for us to receive raw materials from suppliers or to deliver products to customers.

Integrating acquired businesses into our existing operations.

Part of the Company's strategy is growth through acquisitions. Over the last decade, we have successfully completed more than 50 acquisitions, and we will likely acquire additional businesses and enter into additional joint ventures in the future. Growth through acquisitions and the formation of joint ventures involve risks, including:

- difficulties in assimilating acquired companies and products into our existing business;
- delays in realizing the benefits from the acquired companies or products;
- diversion of our management's time and attention from other business concerns;
- difficulties due to lack of or limited prior experience in any new markets we may enter;
- unforeseen claims and liabilities, including unexpected environmental exposures, product liability, or existing cyber vulnerability;
- unexpected losses of customers or suppliers of the acquired or existing business;
- difficulty in conforming the acquired business' standards, processes, procedures and controls to those of our operations; and
- difficulties in retaining key employees of the acquired businesses.

These risks or other problems encountered in connection with our past or future acquisitions and joint ventures could cause delays in realizing the anticipated benefits of such acquisitions or joint ventures and could adversely affect our results of operations, Cash from operating activities or financial condition.

Our ability to understand our customers' specific preferences and requirements, and to innovate, develop, produce and market products that meet customer demand is critical to our business results.

Our business relies on continued global demand for our brands and products. To achieve business goals, we must develop and sell products that appeal to customers. This is dependent on a number of factors, including our ability to produce products that meet the quality, performance and price expectations of our customers and our ability to develop effective sales, advertising and marketing programs.

We believe the automotive industry will experience significant and continued change in the coming years. Vehicle manufacturers continue to develop new safety features such as collision avoidance technology and self-driving vehicles that may reduce vehicle collisions in the future, potentially lowering demand for our refinish coatings. In addition, through the introduction of new technologies, new business models or new methods of travel, such as ridesharing, the number of automotive OEM new-builds may decline, potentially reducing demand for our automotive OEM coatings and related automotive parts.

Our future growth will depend on our ability to continue to innovate our existing products and to develop and introduce new products. If we fail to keep pace with product innovation on a competitive basis or to predict market demands for our products, our businesses, financial condition and results of operations could be adversely affected.

The industries in which we operate are highly competitive.

With each of our businesses, an increase in competition may cause us to lose market share, lose a large regional or global customer, or compel us to reduce prices to remain competitive, which could result in reduced margins for our products. Additionally, our ability to achieve price increases may impact the overall economics for the products we offer. Competitive pressures may not only reduce our margins but may also impact our revenues and our growth which could adversely affect our results of operations.

The security of our information technology systems could be compromised, which could adversely affect our ability to operate.

Increased global information technology security requirements, threats and sophisticated and targeted computer crime pose a risk to the security of our systems, networks and the confidentiality, availability and integrity of our data. Despite our efforts to protect sensitive information and confidential and personal data, our facilities and systems may be vulnerable to security breaches. This could lead to negative publicity, theft, modification or destruction of proprietary information or key information, manufacture of defective products, production downtimes and operational disruptions, which could adversely affect our reputation, competitiveness and results of operations.

In 2018, we concluded that previously issued financial statements as detailed below should not be relied upon and restated those previously issued financial statements, which led to, among other things, shareholder litigation, investigations by the SEC and the U.S. Attorney's office, a settlement by the Company with the SEC and unanticipated costs for accounting and legal fees, and which may result in certain other risks.

As discussed in the Explanatory Note, Note 2, "Restatement of Previously Reported Consolidated Annual Financial Statements" and in Note 19, "Quarterly Financial Information (unaudited)" under Item 8 of the 2017 Form 10-K/A, in 2018 we concluded that our previously issued financial statements as of December 31, 2017 and 2016, and for each of the quarterly and year-to-date periods in 2017, and the final quarterly and year-to-date period in 2016, should no longer be relied upon. The determination that the applicable financial statements should no longer be relied upon and that these financial statements would be restated was made following the identification of misstatements. Although the Company restated these financial statements, remediated the material weakness in the Company's internal control over financial reporting, reached a settlement with the SEC and is no longer the subject of an investigation by the U.S. Attorney's Office, we continue to be subject to risks and uncertainties relating to these events, including shareholder derivative litigation, advancement of legal expenses and potential indemnification obligations to certain current and former employees who are responding to investigations by the SEC and U.S. Attorney's Office for alleged violations of the securities laws relating to the restatement described above, potential loss of investor confidence, potential reputational harm and a potential negative impact on our stock price.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

PPG's corporate headquarters is located in the United States in Pittsburgh, Pa. The Company's manufacturing facilities, sales offices, research and development centers and distribution centers are located throughout the world. See Item 1. "Business" of this Form 10-K for the principal manufacturing and distribution facilities by reportable business segment.

The Company's principal research and development centers are located in Allison Park, Pa.; Tianjin, China; Milan, Italy; Monroeville, Pa.; Springdale, Pa.; Amsterdam, Netherlands; Burbank, Calif.; Tepexpan, Mexico; Marly, France and Wroclaw, Poland.

Our headquarters, certain distribution centers and substantially all company-owned paint stores are located in facilities that are leased while our other facilities are generally owned. Our facilities are considered to be suitable and adequate for the purposes for which they are intended and overall have sufficient capacity to conduct business in the upcoming year.

Item 3. Legal Proceedings

PPG is involved in a number of lawsuits and claims, both actual and potential, including some that it has asserted against others, in which substantial monetary damages are sought. These lawsuits and claims may relate to contract, patent, environmental, product liability, asbestos exposure, antitrust, employment, securities and other matters arising out of the conduct of PPG's current and past business activities. To the extent these lawsuits and claims involve personal injury, property damage and certain other claims, PPG believes it has adequate insurance; however, certain of PPG's insurers are contesting coverage with respect to some of these claims, and other insurers may contest coverage. PPG's lawsuits and claims against others include claims against insurers and other third parties with respect to actual and contingent losses related to environmental, asbestos and other matters.

As previously disclosed, the SEC is conducting a non-public investigation of accounting matters described in the Explanatory Note and in Note 2, "Restatement of Previously Reported Consolidated Annual Financial Statements" under Item 8 of the Company's 2017 Form 10-K/A. On September 26, 2019, PPG announced a final settlement with the SEC as to the Company. Without admitting or denying the findings in the SEC's administrative cease-and-desist order, the Company consented to the entry of the order, which imposed no financial penalty. The Company continues to cooperate fully with the SEC's ongoing investigation relating to these accounting matters. The Company is also cooperating fully with an investigation into the same accounting matters commenced by the U.S. Attorney's Office for the Western District of Pennsylvania ("USAO"). As previously disclosed, the USAO has informed PPG that it will not pursue any action as to the Company.

On January 16, 2020, the Company, as a nominal defendant, and certain of its current or former officers and directors were named as defendants in a shareholder derivative action captioned L. Courtland Lee, derivatively on behalf of PPG Industries, Inc. v. Michael H. McGarry, et al. The plaintiff alleges breach of fiduciary duty and unjust enrichment arising out of various alleged acts, and alleged failures to act, by the individually named defendants following financial restatements by the Company.

The Company anticipates that the Court will order a stay of any discovery in the lawsuit and postpone the Company's obligation to respond to the Complaint until an investigation into this matter is completed.

On May 20, 2018, a putative securities class action lawsuit was filed in the U.S. District Court for the Central District of California against the Company and three of its current and former officers. On September 21, 2018, an Amended Class Action Complaint was filed in the lawsuit. The Amended Complaint, captioned Trevor Mild v. PPG Industries, Inc., Michael H. McGarry, Vincent J. Morales, and Mark C. Kelly, asserted securities fraud claims under Sections 10(b) and 20(a) of the Securities Exchange Act of 1934 on behalf of a putative class of persons who purchased or otherwise acquired stock of the Company between January 19, 2017 and May 10, 2018. The allegations related to, among other things, allegedly false and misleading statements and/or failures to disclose information about the Company's business, operations and prospects. The parties reached a settlement in principal on May 1, 2019. On June 2, 2019, the plaintiff filed with the Court a Petition for Preliminary Approval of the proposed settlement, including the proposed settlement amount of $25 million. On November 22, 2019, the Court entered final judgment approving the settlement. PPG's insurance carriers confirmed to the Company insurance coverage for the full amount of the settlement. The settlement payment is expected to occur in 2020.

From the late 1880's until the early 1970's, PPG owned property located in Cadogan and North Buffalo Townships, Pennsylvania which was used for the disposal of solid waste from PPG's former glass manufacturing facility in Ford City, Pennsylvania. In October 2018, the Pennsylvania Department of Environmental Protection (the "DEP") approved PPG's cleanup plan for the Cadogan Property. In April 2019, PPG and the DEP entered into a consent order and agreement ("CO&A") which incorporated PPG's approved cleanup plan and a draft final permit for the collection and discharge of seeps emanating from the former disposal area. The CO&A includes a civil penalty of $1.2 million for alleged past unauthorized discharges. PPG's former disposal area is also the subject of a citizens' suit filed by the Sierra Club and PennEnvironment seeking remedial measures beyond the measures specified in PPG's approved cleanup plan, a civil penalty in addition to the penalty included in the CO&A and plaintiffs' attorneys fees. PPG believes that the citizen's suit is without merit and intends to defend itself vigorously.

For many years, PPG has been a defendant in lawsuits involving claims alleging personal injury from exposure to asbestos. For a description of asbestos litigation affecting the Company, see Note 14, "Commitments and Contingent Liabilities" to the accompanying consolidated financial statements under Part I, Item 8 of this Form 10-K.

In the past, the Company and others have been named as defendants in several cases in various jurisdictions claiming damages related to exposure to lead and remediation of lead-based coatings applications. PPG has been dismissed as a defendant from most of these lawsuits and has never been found liable in any of these cases. After having not been named in a new lead-related lawsuit for 15 years, PPG was named as a defendant in two new Pennsylvania state court lawsuits filed by Montgomery County and Lehigh County in the respective counties on October 4, 2018 and October 12, 2018. Both suits seek declaratory relief arising out of alleged public nuisances in the counties associated with the presence of lead paint on various buildings constructed prior to 1980. The Company believes these actions are without merit and intends to defend itself vigorously.

Information About Our Executive Officers

Set forth below is information related to the Company's executive officers as of February 20, 2020.

Name	*Age*	*Title*
Michael H. McGarry [a]	61	Chairman and Chief Executive Officer since September 2016
Anne M. Foulkes [b]	57	Senior Vice President and General Counsel since September 2018
Timothy M. Knavish [c]	54	Executive Vice President since October 2019
Rebecca B. Liebert [d]	52	Executive Vice President since October 2019
Vincent J. Morales [e]	54	Senior Vice President and Chief Financial Officer since March 2017
Amy R. Ericson [f]	54	Senior Vice President, Packaging Coatings since July 2018
Ramaparasad Vadlamannati [g]	57	Senior Vice President, Protective and Marine Coatings and President PPG EMEA since October 2019

(a) Mr. McGarry served as President and Chief Executive Officer from September 2015 through August 2016, President and Chief Operating Officer from March 2015 through August 2015; Chief Operating Officer from August 2014 through February 2015; Executive Vice President from September 2012 through July 2014; and Senior Vice President, Commodity Chemicals from July 2008 through August 2012.

(b) Ms. Foulkes served as Senior Vice President, General Counsel and Secretary from August 2018 to September 2018, Vice President and Associate General Counsel and Secretary from March 2016 through July 2018 and Assistant General Counsel and Secretary from April 2011 through February 2016.

(c) Mr. Knavish served as Senior Vice President, Architectural Coatings and President, PPG EMEA from January 2019 through September 2019, Senior Vice President, Industrial Coatings from October 2017 through December 2018, Senior Vice President, Automotive Coatings from March 2016 through September 2017, Vice President, Protective and Marine Coatings from August 2012 through February 2016 and Vice President, Automotive Coatings, Americas from March 2010 through July 2012.

(d) Ms. Liebert served as Senior Vice President, Automotive Coatings from June 2018 to September 2019. She previously served as President and Chief Executive Officer of Honeywell UOP from 2016 to 2018, Senior Vice President and General Manager, Catalyst Adsorbents and Specialties of Honeywell UOP from 2015 to 2016 and Senior Vice President and General Manager, Gas Processing and Hydrogen of Honeywell UOP from 2012 to 2015.

(e) Mr. Morales served as Vice President, Finance from June 2016 through February 2017. From June 2015 through June 2016, he served as Vice President, Investor Relations and Treasurer and from October 2007 through May 2015 he served as Vice President, Investor Relations.

(f) Ms. Ericson was appointed Senior Vice President, Packaging Coatings in July 2018 when she joined PPG from SUEZ SA. She previously served as President of SUEZ Chemical Monitoring and Solutions from 2017 until 2018, President of General Electric Water Services Company from 2015 to 2017 and President and Chief Executive Officer of Alstom SA's U.S. business from 2013 to 2015.

(g) Mr. Vadlamannati served as Senior Vice President, Protective and Marine Coatings from March 2016 through September 2019, Vice President, Architectural Coatings, EMEA and Asia/Pacific from August 2014 through February 2016, Vice President, Architectural Coatings, EMEA from February 2012 through July 2014, Vice President, Architectural Coatings, EMEA for Region Western Europe from March 2011 through January 2012 and Vice President, Automotive Refinish, EMEA from September 2010 through February 2011.

Item 4. Mine Safety Disclosures

Not Applicable.

Part II

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

The information required by Item 5 regarding market information, including PPG’s stock exchange listing and quarterly stock market prices, dividends and holders of common stock is included in Exhibit 13.1 filed with this Form 10-K and is incorporated herein by reference. Annual information is also included in the 2019 Financial Overview and Shareholder Information on page 3 of the Annual Report to shareholders.

Issuer Purchases of Equity Securities - Fourth Quarter 2019

Month	Total Number of Shares Purchased	Avg. Price Paid per Share	Total Number of Shares Purchased as Part of Publicly Announced Programs	Max. Number of Shares That May Yet Be Purchased Under the Programs(1)
October 2019				
Repurchase program	—	$—	—	13,270,110
November 2019				
Repurchase program	100,338	$128.54	100,338	12,786,858
December 2019				
Repurchase program	1,033,842	$132.61	1,033,842	11,314,379
Total quarter ended December 31, 2019				
Repurchase program	1,134,180	$132.25	1,134,180	11,314,379

(1) In December 2017, PPG's board of directors approved a $2.5 billion share repurchase program. The remaining shares yet to be purchased under the program has been calculated using PPG’s closing stock price on the last business day of the respective month. This repurchase program has no expiration date.

No shares were withheld in satisfaction of the exercise price and/or tax withholding obligation by holders of employee stock options who exercised options granted under the Company’s equity compensation plans in the fourth quarter of 2019.

Item 6. Selected Financial Data

The information required by Item 6 regarding the selected financial data for the five years ended December 31, 2019 is included in Exhibit 13.2 filed with this Form 10-K and is incorporated herein by reference. This information is also reported in the Five-Year Digest on page 90 of the Annual Report to shareholders.

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

The following discussion includes a comparison of our results of operations and liquidity and capital resources for the years ended December 31, 2019 and 2018. A discussion of changes in our results of operations for the year ended December 31, 2018 as compared to the year ended December 31, 2017 has been omitted from this Form 10-K, but may be found in "Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations" of our 2018 Form 10-K, filed with the Securities and Exchange Commission on February 21, 2019.

Performance Overview

Net Sales by Region

($ in millions, except percentages)	*2019*	*2018*	*% Change 2019 vs. 2018*
United States and Canada	$6,475	$6,485	(0.2)%
Europe, Middle East and Africa (EMEA)	4,549	4,678	(2.8)%
Asia Pacific	2,542	2,618	(2.9)%
Latin America	1,580	1,593	(0.8)%
Total	$15,146	$15,374	(1.5)%

Net sales decreased $228 million due to the following:

- *Lower sales volumes (-3%)*
- *Unfavorable foreign currency translation (-2%)*

Partially offset by:

- *Higher selling prices (+2%)*
- *Acquisition-related sales (+2%)*

We achieved higher selling prices across nearly all businesses, reflecting the value of our products and services. These increases helped to offset general cost inflation, including employee wages and benefits.

U.S. and Canada net sales were relatively flat compared to the prior year. Higher selling prices and net sales from acquired businesses were almost entirely offset by lower sales volumes. The unfavorable impact from customer assortment changes in the U.S. architectural DIY channel negatively impacted sales volumes.

Europe, Middle East and Africa (EMEA) net sales decreased nearly 3% versus the prior year, driven by unfavorable foreign currency translation and lower sales volumes, partially offset by higher selling prices in all businesses and net sales from acquired businesses.

Asia Pacific net sales decreased nearly 3% versus the prior year, driven by unfavorable foreign currency translation and lower sales volumes, partially offset by net sales from acquired businesses and higher selling prices.

Latin America net sales decreased slightly versus the prior year, driven by lower sales volumes and unfavorable foreign currency translation, partially offset by higher selling prices.

For specific business results see the Segment Results section within Item 7 of this Form 10-K.

Cost of sales, exclusive of depreciation and amortization

($ in millions, except percentages)	*2019*	*2018*	*% Change 2019 vs. 2018*
Cost of sales, exclusive of depreciation and amortization	$8,653	$9,001	(3.9)%
Cost of sales as a % of net sales	57.1%	58.5%	(1.4)%

Cost of sales, exclusive of depreciation and amortization, decreased $348 million due to the following:

- *Lower sales volumes*
- *Foreign currency translation*
- *Restructuring cost savings*

Partially offset by:

- *Cost of sales attributable to acquired businesses*
- *General cost inflation*

Selling, general and administrative expenses

($ in millions, except percentages)	2019	2018	% Change 2019 vs. 2018
Selling, general and administrative expenses	$3,604	$3,573	0.9%
Selling, general and administrative expenses as a % of net sales	23.8%	23.2%	0.6%

Selling, general and administrative expenses increased $31 million primarily due to:

- *Wage and other cost inflation*
- *Selling, general and administrative expenses from acquired businesses*

Partially offset by:

- *Foreign currency translation*
- *Cost management including restructuring cost savings*

Other charges and other income

($ in millions, except percentages)	2019	2018	% Change 2019 vs. 2018
Interest expense, net of Interest income	$100	$95	5.3%
Business restructuring, net	$176	$66	166.7%
Other charges	$98	$122	(19.7)%
Other income	($89)	($114)	(21.9)%

Interest expense, net of Interest income

Interest expense, net of Interest income increased $5 million in 2019 versus 2018 primarily due to higher levels of debt in the current year.

Business restructuring, net

Pretax restructuring charges of $194 million were recorded in 2019, offset by certain changes in estimates to complete previously recorded programs of $18 million. A pretax restructuring charge of $83 million was recorded in the second quarter of 2018, offset by certain changes in estimates to complete previously recorded programs of $17 million. Refer to Note 8, "Business Restructuring" in Item 8 of this Form 10-K for additional information.

Other charges

Other charges consist primarily of environmental remediation charges. These charges were principally for environmental remediation at a former chromium manufacturing plant and associated sites in New Jersey. Refer to Note 14, "Commitments and Contingent Liabilities" in Item 8 of this Form 10-K for additional information.

Other income

Other income was lower in 2019 than prior year primarily due to a gain in 2018 on the sale of land near a facility of the Company’s former commodity chemicals business.

Effective tax rate and earnings per diluted share, continuing operations

($ in millions, except percentages)	2019	2018	% Change 2019 vs. 2018
Income tax expense	$392	$353	11.0%
Effective tax rate	23.6%	20.9%	2.7%
Adjusted effective tax rate, continuing operations*	23.7%	22.1%	1.6%
Earnings per diluted share, continuing operations	$5.22	$5.40	(3.3)%
Adjusted earnings per diluted share, continuing operations*	$6.22	$5.92	5.1%
*See the Regulation G reconciliations - results of operations			

The effective tax rate for the year-ended December 31, 2019 was 23.6%, an increase of 2.7% from the prior year. In 2018, the tax rate benefited from certain favorable adjustments, including finalization of the provisional toll charge recorded in 2017 for unremitted foreign earnings under the U.S. Tax Cuts and Jobs Act.

As reported, earnings per diluted share from continuing operations for the year ended December 31, 2019 decreased year-over-year. Refer to the Regulation G Reconciliations - Results from Operations for additional information. The Company's earnings per diluted share and adjusted earnings per diluted share benefited from the 2.7 million and 15.9 million shares of stock repurchased in 2019 and 2018, respectively, in conjunction with the Company's cash deployment objectives.

Regulation G Reconciliations - Results from Operations

PPG believes investor's understanding of the Company's performance is enhanced by the disclosure of net income from continuing operations, earnings per diluted share from continuing operations and PPG's effective tax rate from continuing operations adjusted for certain items. PPG's management considers this information useful in providing insight into the Company's ongoing performance because it excludes the impact of items that cannot reasonably be expected to recur on a quarterly basis or that are not attributable to our primary operations. Net income from continuing operations, earnings per diluted share from continuing operations and the effective tax rate from continuing operations adjusted for these items are not recognized financial measures determined in accordance with U.S. generally accepted accounting principles ("U.S. GAAP") and should not be considered a substitute for net income, earnings per diluted share, the effective tax rate or other financial measures as computed in accordance with U.S. GAAP. In addition, adjusted net income, adjusted earnings per diluted share from continuing operations and the adjusted effective tax rate from continuing operations may not be comparable to similarly titled measures as reported by other companies.

Income before income taxes from continuing operations is reconciled to adjusted income before income taxes from continuing operations, the effective tax rate from continuing operations is reconciled to the adjusted effective tax rate from continuing operations and net income from continuing operations (attributable to PPG) and earnings per share – assuming dilution (attributable to PPG) are reconciled to adjusted net income from continuing operations (attributable to PPG) and adjusted earnings per share – assuming dilution below:

($ in millions, except percentages and per share amounts)	Income Before Income Taxes	Tax Expense	Effective Tax Rate	Net income from continuing operations (attributable to PPG)	Earnings per diluted share(2)
Year-ended December 31, 2019					
As reported, continuing operations	$1,661	$392	23.6%	$1,243	$5.22
Includes:					
Net charges related to business restructuring-related costs(1)	222	54	24.4%	168	0.71
Net charges related to environmental remediation	61	14	23.0%	47	0.20
Charges related to acquisition-related costs(3)	17	4	23.5%	13	0.05
Net charges related to litigation matters	12	3	24.1%	9	0.04
Adjusted, continuing operations, excluding certain items	$1,973	$467	23.7%	$1,480	$6.22

($ in millions, except percentages and per share amounts)	Income Before Income Taxes	Tax Expense	Effective Tax Rate	Net income from continuing operations (attributable to PPG)	Earnings per diluted share(2)
Year-ended December 31, 2018					
As reported, continuing operations	$1,693	$353	20.9%	$1,323	$5.40
Includes:					
Net tax benefit related to U.S. Tax Cuts and Jobs Act	—	13	N/A	(13)	(0.05)
Charges related to customer assortment changes	18	4	24.3%	14	0.05
Charges related to environmental remediation and other costs	77	19	24.3%	58	0.24
Net charges related to business restructuring-related costs(1)	75	22	29.3%	53	0.21
Charges related to litigation matters	24	5	24.3%	19	0.08
Charges related to acquisition-related costs(3)	6	2	25.5%	4	0.02
Charge related to brand rationalization	6	2	26.8%	4	0.02
Gain from the sale of a non-operating asset	(26)	(6)	24.3%	(20)	(0.08)
Charge related to impairment of a non-manufacturing asset	9	2	24.3%	7	0.03
Adjusted, continuing operations, excluding certain items	$1,882	$416	22.1%	$1,449	$5.92

(1) Included in net charges related to business restructuring-related costs, are business restructuring charges, accelerated depreciation of certain assets and other related costs, offset by releases related to previously approved programs.

(2) Earnings per diluted share is calculated based on unrounded numbers. Figures in the table may not recalculate due to rounding.

(3) Acquisition-related costs include advisory, legal, accounting, valuation, and other professional or consulting fees incurred to effect acquisitions. These costs are included in Selling, general and administrative expense in the consolidated statement of income. Acquisition-related costs also include the impact for the step up to fair value of inventory acquired in certain acquisitions which are included in Cost of sales, exclusive of depreciation and amortization in the consolidated statement of income.

Performance of Reportable Business Segments

Performance Coatings

			$ Change	% Change
($ in millions, except percentages)	*2019*	*2018*	*2019 vs. 2018*	*2019 vs. 2018*
Net sales	$9,034	$9,087	($53)	(0.6)%
Segment income	$1,409	$1,300	$109	8.4%

Performance Coatings net sales decreased slightly due to the following:

- *Unfavorable foreign currency translation (-3%)*
- *Lower sales volumes (-1%)*

Partially offset by:

- *Higher selling prices (+2%)*
- *Acquisition-related sales (+1%)*

For the full year 2019, PPG achieved higher selling prices across all businesses, reflecting the value of our products and services, offset by unfavorable foreign currency translation in all businesses.

Architectural coatings - Americas and Asia Pacific net sales decreased by a mid-single-digit percentage versus the prior year. The unfavorable impact from customer assortment changes in the U.S. architectural DIY channel negatively impacted sales volumes. The U.S. and Canada company-owned stores network net sales decreased slightly compared to the prior year. The PPG-Comex architectural coatings businesses had slightly higher net sales, excluding the impact of foreign currency translation and acquisitions (organic sales), and continued to benefit from the opening of a net of approximately 160 new concessionaire locations. Net sales in Asia Pacific were negatively impacted by unfavorable foreign currency translation.

Architectural coatings - EMEA net sales decreased by a mid-single-digit percentage due to unfavorable foreign currency translation; however, organic sales increased by a low-single-digit percentage year-over-year driven by higher selling prices. Despite volume growth in certain key countries, sales volumes were lower year-over-year.

Automotive refinish coatings net sales were relatively flat versus the prior year including the increase in net sales from the SEM acquisition. Sales volumes were impacted by softer U.S. industry demand evidenced by lower collision claims during the year. Organic sales increased in all other major geographic regions as customers continued to adopt PPG’s industry-leading technologies.

Aerospace coatings net sales increased by over 10% versus the prior year, driven by higher sales volumes. This increase was supported by market outperformance in all major platforms stemming from technology-advantaged products and robust industry demand.

Protective and marine coatings increased net sales by a mid-single-digit percentage versus the prior year, driven by strong sales volumes in China and Europe and price gains in each region. Net sales in the U.S. were negatively impacted by reduced activity in the oil and gas sector.

Segment income increased $109 million year-over-year due to higher selling prices and the continued benefits from the Company’s ongoing restructuring programs. These benefits were partially offset by the earnings impact of lower sales volumes, which were mostly attributable to the previously announced customer assortment changes, and other cost inflation. Additionally, unfavorable foreign currency translation decreased segment income by approximately $25 million, primarily related to the weakening of key currencies, including the Mexican peso and euro.

Looking Ahead

Looking ahead, industry demand levels in the first quarter of 2020 are expected to be similar to those experienced in the fourth quarter of 2019. Acquisitions are forecasted to add about $25 million of net sales primarily from Dexmet, Texstars, and ICR. In addition, net sales will be impacted due to lower production rates by an aerospace customer. Based on current exchange rates, foreign currency translation is not expected to have a material impact on segment sales or earnings.

Industrial Coatings

($ in millions, except percentages)	2019	2018	$ Change 2019 vs. 2018	% Change 2019 vs. 2018
Net sales	$6,112	$6,287	($175)	(2.8)%
Segment income	$862	$818	$44	5.4%

Industrial Coatings segment net sales decreased due to the following:

- *Lower sales volumes (-6%)*
- *Unfavorable foreign currency translation (-3%)*

Partially offset by:

- *Acquisition-related sales (+4%)*
- *Higher selling prices (+2%)*

For the full year 2019, PPG achieved higher selling prices in all major regions for nearly all businesses, reflecting the value of our products and services, offset by unfavorable foreign currency translation in all businesses.

In the automotive OEM coatings business, net sales decreased by a mid-single-digit percentage driven by lower sales volumes versus the prior year, consistent with the overall global industry automotive build rate. Partially offsetting the lower sales volumes were acquisition-related sales from the Hemmelrath acquisition and higher selling prices in all major regions.

Industrial coatings net sales increased slightly versus the prior year, despite lower sales volumes due to weakening global manufacturing demand for certain end-use products. Lower sales volumes were more than offset by acquisition-related sales from the Whitford acquisition.

Packaging coatings net sales decreased by a mid-single-digit percentage due to lower sales volumes versus the prior year. Year-over-year volumes were impacted by lower demand in packaged foods. However, sales volumes increased in Latin America due to customer conversions in the region during the year.

Specialty coatings and materials net sales were lower by a low-single-digit percentage versus the prior year, despite sales volume growth in the U.S. and EMEA.

Segment income increased $44 million year-over-year. Segment income benefited from improving selling prices, continued benefits from the Company's ongoing restructuring programs and acquisition-related income, which were partially offset by the earnings impact of lower sales volumes and other cost inflation. Unfavorable foreign currency translation decreased segment income by approximately $20 million, primarily related to the Chinese yuan, Mexican peso and the euro.

Looking ahead

Looking ahead, global industrial demand trends are expected to remain subdued through the first quarter of 2020, with inconsistencies by region. Significant public health issues could have an unfavorable impact in certain industries and regions. The company will continue to prioritize operating margin recovery, focusing on executing its cost savings program and implementing contingency actions where necessary. Acquisition-related sales are forecast to add about $60 million stemming from Whitford and Hemmelrath. Based on current exchange rates, foreign currency translation is not expected to have a material impact on segment sales or earnings.

Review and Outlook

During 2019, economic conditions were generally positive in all of our major geographic regions despite soft global manufacturing activity that weakened during the year and remained mixed by end-uses. PPG's net sales excluding foreign currency translation impact grew approximately 1% versus the prior year. Acquisition-related sales from acquisitions completed in 2018 and 2019 contributed 2% to net sales growth year-over-year, net of dispositions. Foreign currency translation was unfavorable throughout the year and impacted net sales by about 3%. Raw material costs moderated during the year, but remain elevated after a multi-year inflationary period. Some other key costs continued to increase in 2019 such as employee wage and benefit costs.

U.S. and Canada

During 2019, the pace of economic growth moderated in the U.S. and Canada versus the prior year, led by weaker U.S. GDP growth. Automotive OEM industry builds were relatively flat compared to 2018. Demand in the residential and commercial construction markets was modestly higher in 2019 compared to 2018. New home starts advanced approximately 2% in 2019 versus approximately 4% in 2018. Residential remodeling was down 2% in 2019 versus 2018, while commercial construction was down approximately 4% compared to flat in 2018. Market demand for architectural paint continued to shift more to professional trade painters as continued lower U.S. unemployment resulted in consumers choosing professional painters rather than completing projects themselves; although, demand in U.S. do-it-yourself (DIY) paint stores was stable after several years of weaker trends. PPG's architectural coatings sales volumes in the U.S. and Canada was impacted by DIY customer assortment changes that reduced net sales by more than $100 million. The aerospace coatings business had above-market sales volume growth of nearly a double-digit percentage year-over-year. The automotive refinish coatings business was impacted by lower collision rates, changes to inventory management by our customers and a continuing trend of a higher number of automobiles in accidents being scrapped rather than being repaired and repainted offsetting modest growth in miles driven. PPG's packaging coatings business was impacted by lower packaged food demand which offset growth in the packaged beverage segment. PPG's automotive OEM coatings business performance was slightly below industry demand levels due to customer mix. Higher selling prices and acquisition-related sales nearly offset lower sales volumes in the automotive OEM coatings business. For the industrial coatings business, acquisition-related sales and higher selling prices were partially offset by lower sales volumes. The U.S. and Canada remained PPG's largest region, representing approximately 43% of 2019 net sales.

Europe, Middle East and Africa

European economic activity was weak in 2019. Industrial production and manufacturing rates in the region were lower than 2018 and worsened as the year progressed. The region was impacted by continuing uncertainty over the United Kingdom's exit from the European Union and overall contracting demand in most of the end-use markets that PPG supplies. Regional demand continued to be mixed by country and end-uses. Demand for PPG's products was impacted by a decline in automotive industry builds and soft manufacturing activity in most of the general industrial coatings sub-segments. PPG's architectural coatings - EMEA business organic sales were higher by a low-single-digit percentage as higher selling prices offset lower sales volumes.

EMEA represented approximately 30% of PPG's 2019 net sales, similar to prior year levels. Regional coatings volumes remain approximately 20% below 2008 pre-recession levels. Net sales, excluding the impact of foreign translation, increased in 2019 compared to 2018 as higher selling prices and acquisition-related sales more than offset lower sales volumes. The euro and British pound both depreciated against the U.S. dollar during 2019.

Asia Pacific and Latin America

The emerging regions of Asia Pacific and Latin America represented 27% of PPG's 2019 net sales in aggregate, similar to the prior year.

Asia Pacific remained the largest emerging region, with net sales of approximately $2.5 billion, led by China, which remained PPG's second largest country by revenue. The Performance Coatings segment grew sales volumes in Asia Pacific, led by strong sales volume growth in the protective and marine coatings and aerospace coatings businesses. Sales volumes in the Industrial Coatings segment were lower by a high-single-digit percentage year-over-year, mostly due to a decline in the automotive OEM coatings business, particularly in China and India where new automobile sales were lower, and a decline in the industrial coatings business driven by weakening global manufacturing demand.

Overall, demand in Latin America declined year-over-year driven by lower automotive industry builds and overall softer economic conditions in most countries, including a weak trading environment in Mexico. In Mexico, the PPG-Comex business added a net of approximately 160 new concessionaire locations. The overall region's performance was supported by strong growth in the packaging coatings business. Weaker sales volumes were offset by higher selling prices. Foreign currency translation was volatile and finished 2% unfavorable compared to 2018, principally driven by weaker currencies, including the Mexican peso and Brazilian real.

Outlook

Looking ahead to 2020, we expect modest global market growth that will likely be uneven by region and end-use. We expect most regional growth rates to be similar to 2019, with the softest conditions expected in the EMEA region.

We anticipate PPG's U.S. and Canada regional growth will be led by aerospace coatings, albeit at lower levels than 2019 due to expected production curtailments at one customer, especially in the first half of the year. Automotive OEM builds are expected to be relatively flat compared to 2019. We expect modestly positive growth in housing and commercial construction.

We expect similar industry demand trends in 2020 in Europe as those experienced in 2019 with continuing improvement in profitability due to margin improvement. Regional growth is expected to remain mixed by sub-region and country. Favorable end-use trends are expected to continue in aerospace coatings, with the potential for heightened volatility in automotive OEM builds due to new regional emission standards. Industrial coatings demand is expected to remain soft as industry growth rates are anticipated to be flat to modestly lower. Demand is expected to contract but be mixed by country in the architectural coatings business. We continue to monitor the economic environment in the U.K., as its exit from the European Union progresses and impacts consumer sentiment and coatings demand.

In Asia Pacific, we expect improved industrial production growth in China, Southeast Asia and India as the year progresses. In China, we foresee continued above global average growth with heightened risk as the Chinese economy continues to shift and rely more on domestic consumption. The sharp decline in automotive OEM activity realized in the past 18 months is expected to moderate and improve as 2020 progresses, with year-over-year demand patterns expected to become more favorable in the second half of 2020. The recovery in marine coatings new-build demand is expected to remain subdued.

In Latin America, we anticipate slightly better economic conditions in Mexico, most of Central America and South America compared to 2019.

Significant other factors

In June 2019, PPG initiated a $184 million global restructuring program. The program is the result of a comprehensive internal operational assessment to identify further opportunities to improve profitability of the overall business portfolio. PPG recognized approximately $15 million of savings from this program in 2019. The majority of restructuring actions are expected to be completed by the end of the fourth quarter 2020 with the remainder of the actions expected to be completed in 2022.

We made significant progress on the global restructuring programs that were announced in December 2016 and May 2018. The Company achieved approximately $70 million of savings in 2019 relating to these programs. These restructuring actions are expected to be completed by the end of the second quarter of 2020. Aggregate restructuring savings related to the 2019, 2018 and 2016 programs was approximately $85 million in 2019.

We will continue to aggressively manage the Company's cost structure to ensure alignment with the overall demand environment and will make adjustments as required to remain cost competitive in the marketplace. Aggregate restructuring savings are expected to be at least $75 million in 2020.

Raw materials are a significant input cost to the process of manufacturing coatings. PPG experiences fluctuating energy and raw material costs driven by various factors, including changes in supplier feedstock costs and inventories, global industry activity levels, foreign currency exchange rates, and global supply and demand factors. In aggregate, average raw material costs were modestly lower in 2019 versus 2018 due to variety of reasons, including softer industry demand and lower crude oil prices. PPG currently expects overall raw material prices to be impacted by weak industrial supply and demand conditions in 2020. Cost inflation is expected in several other areas including wage, benefit, and logistics costs in 2020.

In 2019, we achieved broad selling price improvement, reflecting the Company's efforts to offset inflationary pressures. Further benefits from selling price actions are necessary in 2020 to recover operating margins, reflecting the value of our products. The Company will carefully monitor all costs during 2020 and assess the need for additional selling price increases.

In 2019, we experienced unfavorable foreign currency translation throughout the year. Based on mid-January 2020 exchange rates, the Company does not expect year-over-year foreign currency translation to significantly impact 2020 net sales or income before income taxes. The foreign currency environment continues to be volatile, and the impact on 2020 net sales and income before income taxes could differ from this expectation. The Company generally purchases raw materials, incurs manufacturing costs and sells finished goods in the same currency, so we typically incur only modest foreign currency transaction related impacts.

We are monitoring the potential impact of the recent outbreak of the coronavirus in China, which could negatively impact our global business and results of operations in 2020.

The 2020 effective tax rate from continuing operations is expected to be in the range of 22% to 24%. This range represents the Company's best estimate, including recent updates to the 2017 the U.S. Tax Cuts and Jobs Act.

Over the past five years, the Company used over $4.5 billion of cash to repurchase approximately 45 million shares of PPG stock, including $325 million in 2019. The Company ended the year with approximately $1.5 billion remaining under its current share repurchase authorization. During 2019, the Company deployed nearly $700 million for acquisitions, including the purchase of a remaining minority interest, and approximately $470 million for dividends. PPG increased its per-share dividend in September 2019, marking the 48th annual per share dividend increase and the 120th consecutive year of annual dividend payments.

PPG ended 2019 with approximately $1.3 billion in cash and short-term investments. The Company expects continued strong cash generation in 2020.

Accounting Standards Adopted in 2019

Note 1, "Summary of Significant Accounting Policies" under Item 8 of this Form 10-K describes the Company's recently adopted accounting pronouncements.

Accounting Standards to be Adopted in Future Years

Note 1, “Summary of Significant Accounting Policies” under Item 8 of this Form 10-K describes accounting pronouncements that have been promulgated prior to December 31, 2019 but are not effective until a future date.

Commitments and Contingent Liabilities, including Environmental Matters

PPG is involved in a number of lawsuits and claims, both actual and potential, including some that it has asserted against others, in which substantial monetary damages are sought. See Item 3. “Legal Proceedings” and Note 14, “Commitments and Contingent Liabilities” under Item 8 of this Form 10-K for a description of certain of these lawsuits.

As discussed in Item 3 and Note 14, although the result of any future litigation of such lawsuits and claims is inherently unpredictable, management believes that, in the aggregate, the outcome of all lawsuits and claims involving PPG, including asbestos-related claims, will not have a material effect on PPG’s consolidated financial position or liquidity; however, any such outcome may be material to the results of operations of any particular period in which costs, if any, are recognized.

It is PPG’s policy to accrue expenses for contingencies when it is probable that a liability has been incurred and the amount of loss can be reasonably estimated. Reserves for environmental contingencies are exclusive of claims against third parties and are generally not discounted. In management’s opinion, the Company operates in an environmentally sound manner and the outcome of the Company’s environmental contingencies will not have a material effect on PPG’s financial position or liquidity; however, any such outcome may be material to the results of operations of any particular period in which costs, if any, are recognized. Management anticipates that the resolution of the Company’s environmental contingencies will occur over an extended period of time.

As also discussed in Note 14, PPG has significant reserves for environmental contingencies. Please refer to the Environmental Matters section of Note 14 for details of these reserves. A significant portion of our reserves for environmental contingencies relate to ongoing remediation at PPG's former chromium manufacturing plant in Jersey City, N.J. and associated sites ("New Jersey Chrome"). There are multiple, future events yet to occur, including further remedy selection and design, remedy implementation and execution and applicable governmental agency or community organization approvals. Considerable uncertainty exists regarding the timing of these future events for the New Jersey Chrome sites. Further resolution of these events is expected to occur over the next several years. As these events occur and to the extent that the cost estimates of the environmental remediation remedies change, the existing reserve for this environmental remediation matter will continue to be adjusted.

Liquidity and Capital Resources

During the past two years, PPG had sufficient financial resources to meet its operating requirements, to fund our capital spending, including acquisitions, share repurchases and pension plans and to pay increasing dividends to shareholders.

Cash and cash equivalents and short-term investments

($ in millions)	***2019***	***2018***
Cash and cash equivalents	$1,216	$902
Short-term investments	57	61
Total	$1,273	$963

Cash from operating activities - continuing operations

($ in millions, except percentages)			***% Change***
	2019	***2018***	***2019 vs. 2018***
Cash from operating activities	$2,084	$1,487	40.1%

2019 vs. 2018

The $597 million increase in Cash from operating activities - continuing operations was primarily due to favorable changes in working capital, excluding the impact of business acquisitions, and lower cash contributions to its defined benefit pension plans year-over-year.

Operating working capital

Operating working capital is a subset of total working capital and represents (1) receivables from customers, net of allowance for doubtful accounts, (2) inventories, and (3) trade liabilities. See Note 4, “Working Capital Detail” under Item 8 of this Form 10-K for further information related to the components of the Company’s operating working capital. We believe operating working capital represents the key components of working capital under the operating control of our businesses.

A key metric we use to measure our working capital management is operating working capital as a percentage of sales (fourth quarter sales annualized).

($ in millions, except percentages)	2019	2018
Trade receivables, net	$2,479	$2,505
Inventories, FIFO	1,834	1,896
Trade creditors' liabilities	2,098	2,177
Operating working capital	$2,215	$2,224
Operating working capital as a % of fourth quarter sales, annualized	15.1%	15.3%
Trade receivables, net as a % of fourth quarter sales, annualized	16.9%	17.2%
Days sales outstanding	56	56
Inventories, FIFO as a % of fourth quarter sales, annualized	12.5%	13.0%
Inventory turnover	4.6	4.8

Environmental expenditures

($ in millions)	2019	2018
Cash outlays related to environmental remediation activities	$77	$64

We expect cash outlays for environmental remediation activities in 2020 to be between $80 million and $100 million.

Defined benefit pension plan contributions

($ in millions)	2019	2018
U.S. defined benefit pension plans	$—	$75
Non-U.S. defined benefit pension plans	$13	$24

Contributions to PPG's non-U.S. defined benefit pension plans in 2019 were required by local funding requirements. PPG expects to make mandatory contributions to its non-U.S. defined benefit pension plans in the range of $15 million to $20 million in 2020. PPG may make voluntary contributions to its defined benefit pension plans in 2020 and beyond.

Cash used for investing activities

($ in millions, except percentages)			% Change
	2019	2018	2019 vs. 2018
Cash used for investing activities	($1,009)	($764)	32.1%

2019 vs. 2018

The $245 million increase in cash used for investing activities - continuing operations, was primarily due to higher spending on business acquisitions.

Capital expenditures, including business acquisitions

($ in millions, except percentages)			% Change
	2019	2018	2019 vs. 2018
Capital expenditures (1)	$413	$411	0.5%
Business acquisitions, net of cash balances acquired	$643	$378	70.1%
Total capital expenditures, including acquisitions	$1,056	$789	33.8%
Capital expenditures, excluding acquisitions, as a % of sales	2.7%	2.7%	—%

(1) Includes modernization and productivity improvements, expansion of existing businesses and environmental control projects.

Capital expenditures related to modernization and productivity improvements, expansion of existing businesses and environmental control projects is expected to be in the range of 2.5% to 3.0% of sales during 2020.

A primary focus for the Company in 2020 will continue to be cash deployment focused on shareholder value creation, with a preference for business acquisitions.

Cash used for financing activities

($ in millions, except percentages)	2019	2018	% Change 2019 vs. 2018
Cash used for financing activities	($758)	($1,205)	(37.1)%

2019 vs. 2018

The $447 million decrease in cash used for financing activities - continuing operations, was primarily due to lower net purchases of treasury stock year-over-year, partially offset by the repayment of long term debt.

Share repurchase activity

($ in millions, except number of shares)	2019	2018
Number of shares repurchased (millions)	2.7	15.9
Cost of shares repurchased	$325	$1,721

The Company has approximately $1.5 billion remaining under the current authorization from the Board of Directors, which was approved in December 2017. The current authorized repurchase program has no expiration date.

Dividends paid to shareholders

($ in millions)	2019	2018
Dividends paid to shareholders	$468	$453

PPG has paid uninterrupted annual dividends since 1899, and 2019 marked the 48th consecutive year of increased annual per-share dividend payments to shareholders. The Company raised its per-share quarterly dividend by 6% to $0.51 per share paid in September 2019.

Debt issued and repaid

Debt Issued (net of discount and issuance costs)	Year	$ in millions
$300 million 2.4% Note due 2024 and $300 million 2.8% Notes due 2029	2019	$595
$300 million 3.2% Note due 2023 and $700 million 3.75% Notes due 2028	2018	$992

Debt Repaid	Year	$ in millions
0.00% Note (€300)	2019	$334
2.3% Notes	2019	$300

The ratio of total debt, including finance leases (previously referred to as capital leases), to total debt and equity was 49% at December 31, 2019, down from 52% in 2018.

Credit agreements and lines of credit

In August 2019, PPG amended and restated the Credit Agreement with several banks and financial institutions as further discussed in Note 9, "Borrowings and Lines of Credit" under Item 8 of this Form 10-K. The Credit Agreement amends and restates the Company's existing five year credit agreement dated as of December 18, 2015. The Credit Agreement provides for a $2.2 billion unsecured revolving credit facility. The Credit Agreement will terminate on August 30, 2024. During the years ended December 31, 2019 and 2018, there were no borrowings outstanding under the existing or the prior credit agreement.

The Credit Agreement also supports the Company’s commercial paper borrowings. As of December 31, 2019, there were $100 million of commercial paper borrowings outstanding. There were no commercial paper borrowings outstanding as of December 31, 2018 under the prior credit agreement.

In addition to the amounts available under lines of credit, the Company maintains access to the capital markets and may issue debt or equity securities from time to time, which may provide an additional source of liquidity.

See Note 9, “Borrowings and Lines of Credit” under Item 8 of this Form 10-K for information regarding notes entered into and repaid as well as details regarding the use and availability of committed and uncommitted lines of credit, letters of credit, guarantees and debt covenants.

Contractual obligations

We continue to believe that our cash on hand and short term investments, cash from operations and the Company's access to capital markets will continue to be sufficient to fund our operating activities, capital spending, acquisitions, dividend payments, debt service, share repurchases, contributions to pension plans, and PPG's significant contractual obligations. These significant contractual obligations are presented in the following table.

		Obligations Due In:			
($ in millions)	Total	2020	2021-2022	2023-2024	Thereafter
Contractual Obligations					
Long-term debt	$4,931	$500	$832	$596	$3,003
Short-term debt	10	10	—	—	—
Commercial paper	100	—	—	100	—
Finance lease obligations	11	3	3	2	3
Interest payments(1)	1,184	137	215	183	649
Operating leases(2)	889	191	268	164	266
Pension contributions(3)	20	20	—	—	—
Unconditional purchase commitments(4)	213	86	77	32	18
Other commitments	74	6	13	13	42
Total	$7,432	$953	$1,408	$1,090	$3,981

(1) Interest on all outstanding debt, including finance lease obligations.

(2) Includes interest payments.

(3) Includes the high end of the range of the expected non-US mandatory pension contributions for 2020 only, as PPG is unable to estimate the pension contributions beyond 2020.

(4) The unconditional purchase commitments are principally take-or-pay obligations related to the purchase of certain materials, including industrial gases and electricity, consistent with customary industry practice.

Other liquidity matters

At December 31, 2019, the total amount of unrecognized tax benefits for uncertain tax positions, including an accrual of related interest and penalties along with positions only impacting the timing of tax benefits, was $177 million. The timing of payments will depend on the progress of examinations with tax authorities. PPG does not expect a significant tax payment related to these obligations within the next year. The Company is unable to make a reasonably reliable estimate as to when any significant cash settlements with taxing authorities may occur.

Off-Balance Sheet Arrangements

The Company's off-balance sheet arrangements include unconditional purchase commitments disclosed in the "Liquidity and Capital Resources" section in the contractual obligations table as well as letters of credit and guarantees as discussed in Note 9, "Borrowings and Lines of Credit" under Item 8 of this Form 10-K.

Critical Accounting Estimates

Management has evaluated the accounting policies used in the preparation of the financial statements and related notes presented under Item 8 of this Form 10-K and believes those policies to be reasonable and appropriate. We believe that the most critical accounting estimates made in the preparation of our financial statements are those related to accounting for contingencies, under which we accrue a loss when it is probable that a liability has been incurred and the amount can be reasonably estimated, and to accounting for pensions, other postretirement benefits, business combinations, goodwill and other identifiable intangible assets with indefinite lives because of the importance of management judgment in making the estimates necessary to apply these policies.

Contingencies

Contingencies, by their nature, relate to uncertainties that require management to exercise judgment both in assessing the likelihood that a liability has been incurred as well as in estimating the amount of potential loss. The most important contingencies impacting our financial statements are those related to environmental remediation, to pending, impending or overtly threatened litigation against the Company and to the resolution of matters related to open tax years. For more information on these matters, see Note 14, "Commitments and Contingent Liabilities" and Note 12, "Income Taxes" under Item 8 of this Form 10-K.

Defined Benefit Pension and Other Postretirement Benefit Plans

Accounting for pensions and other postretirement benefits involves estimating the cost of benefits to be provided well into the future and attributing that cost over the time period each employee works. To accomplish this, we make extensive use of assumptions about inflation, investment returns, mortality, turnover, medical costs and discount rates. The Company has established a process by which management reviews and selects these assumptions annually. See Note 13, “Employee Benefit Plans” under Item 8 of this Form 10-K for information on these plans and the assumptions used.

Business Combinations

In accordance with the accounting guidance for business combinations, the Company uses the acquisition method of accounting to allocate costs of acquired businesses to the assets acquired and liabilities assumed based on their estimated fair values at the dates of acquisition. The excess costs of acquired businesses over the fair values of the assets acquired and liabilities assumed will be recognized as goodwill. The valuations of the acquired assets and liabilities will impact the determination of future operating results. In addition to using management estimates and negotiated amounts, the Company uses a variety of information sources to determine the estimated fair values of acquired assets and liabilities including: third-party appraisals for the estimated value and lives of identifiable intangible assets and property, plant and equipment; third-party actuaries for the estimated obligations of defined benefit pension plans and similar benefit obligations; and legal counsel or other experts to assess the obligations associated with legal, environmental and other contingent liabilities.

The business and technical judgment of management was used in determining which intangible assets have indefinite lives and in determining the useful lives of finite-lived intangible assets in accordance with the accounting guidance for goodwill and other intangible assets.

Goodwill and Intangible Assets

The Company tests indefinite-lived intangible assets and goodwill for impairment by either performing a qualitative evaluation or a quantitative test at least annually, or more frequently if an indication of impairment arises. The qualitative evaluation is an assessment of factors to determine whether it is more likely than not that the fair value of a reporting unit or asset is less than its carrying amount. In the quantitative test, fair values are estimated using a discounted cash flow model. Key assumptions and estimates used in the discounted cash flow model include discount rates, tax rates, future revenues, operating cash flows and capital expenditures. For more information on these matters, see Note 1, “Summary of Significant Accounting Policies” under Item 8 of this Form 10-K.

We believe that the amounts recorded in the financial statements under Item 8 of this Form 10-K related to these contingencies, pensions, other postretirement benefits, business combinations, goodwill and other identifiable intangible assets with indefinite lives are based on the best estimates and judgments of the appropriate PPG management, although actual outcomes could differ from our estimates.

Currency

Comparing spot exchange rates at December 31, 2018 and at December 31, 2019, the U.S. dollar weakened against certain currencies in the countries where PPG operates, most notably the British pound, Canadian dollar, and the Mexican peso. As a result, consolidated net assets at December 31, 2019 increased by $106 million from December 31, 2018. Comparing spot exchange rates at December 31, 2017 and at December 31, 2018, the U.S. dollar strengthened against certain other major currencies associated with countries in which PPG operates, most notably the Australian dollar, British pound, Chinese yuan, euro and South Korean won. As a result, consolidated net assets at December 31, 2018 decreased by approximately $167 million from December 31, 2017.

Comparing average exchange rates during 2019 to those of 2018, the U.S. dollar strengthened against currencies of the countries within the regions PPG operates, including EMEA, Asia Pacific, and Latin America. This had an unfavorable impact of approximately $50 million on full year 2019 income before income taxes from the translation of this foreign income into U.S. dollars. Comparing average exchange rates during 2018 to those of 2017, in the countries in which PPG operates, there was a favorable impact of $21 million on full year 2018 income before income taxes from the translation of this foreign income into U.S. dollars.

Forward-Looking Statements

Management’s Discussion and Analysis and other sections of this Annual Report contain forward-looking statements that reflect the Company’s current views with respect to future events and financial performance.

You can identify forward-looking statements by the fact that they do not relate strictly to current or historic facts. Forward-looking statements are identified by the use of the words “aim,” “believe,” “expect,” “anticipate,” “intend,” “estimate,” “project,” “outlook,” “forecast” and other expressions that indicate future events and trends. Any forward-looking statement speaks only as of the date on which such statement is made, and the Company undertakes no obligation to update any forward looking statement, whether as a result of new information, future events or otherwise. You are advised, however, to consult any further disclosures we make on related subjects in our reports to the Securities and Exchange Commission. Also, note the following cautionary statements.

Many factors could cause actual results to differ materially from the Company's forward-looking statements. Such factors include global economic conditions, increasing price and product competition by foreign and domestic competitors, fluctuations in cost and availability of raw materials, the ability to achieve selling price increases, the ability to recover margins, customer inventory levels, our ability to maintain favorable supplier relationships and arrangements, the timing of and the realization of anticipated cost savings from restructuring initiatives, the ability to identify additional cost savings opportunities, difficulties in integrating acquired businesses and achieving expected synergies therefrom, economic and political conditions in the markets we serve, the ability to penetrate existing, developing and emerging foreign and domestic markets, foreign exchange rates and fluctuations in such rates, fluctuations in tax rates, the impact of future legislation, the impact of environmental regulations, unexpected business disruptions, the effectiveness of our internal control over financial reporting, the results of governmental investigations and the unpredictability of existing and possible future litigation. However, it is not possible to predict or identify all such factors.

Consequently, while the list of factors presented here and under Item 1A is considered representative, no such list should be considered to be a complete statement of all potential risks and uncertainties. Unlisted factors may present significant additional obstacles to the realization of forward-looking statements.

Consequences of material differences in the results compared with those anticipated in the forward-looking statements could include, among other things, lower sales or income, business disruption, operational problems, financial loss, legal liability to third parties, other factors set forth in Item 1A of this Form 10-K and similar risks, any of which could have a material adverse effect on the Company's consolidated financial condition, results of operations or liquidity.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk

PPG is exposed to market risks related to changes in foreign currency exchange rates, interest rates, and was exposed to changes in PPG's stock price. The Company may enter into derivative financial instrument transactions in order to manage or reduce these market risks. A detailed description of these exposures and the Company's risk management policies are provided in Note 10, "Financial Instruments, Hedging Activities and Fair Value Measurements" under Item 8 of this Form 10-K.

The following disclosures summarize PPG's exposure to market risks and information regarding the use of and fair value of derivatives employed to manage its exposure to such risks. Quantitative sensitivity analyses have been provided to reflect how reasonably possible, unfavorable changes in market rates can impact PPG's consolidated results of operations, cash flows and financial position.

Foreign Currency Risk

We conduct operations in many countries around the world. Our results of operations are subject to both currency transaction and currency translation risk. Certain foreign currency forward contracts outstanding during 2019 and 2018 were designated as a hedge of PPG's exposure to foreign currency transaction risk. As of December 31, 2019 and 2018, the fair value of these contracts was a net liability of $7 million and a net asset of $36 million, respectively. The potential reduction in PPG's Income before income taxes resulting from the impact of adverse changes in exchange rates on the fair value of its outstanding foreign currency hedge contracts of 10% for European and Canadian currencies and 20% for Asian and Latin American currencies for the years ended December 31, 2019 and 2018 would have been $357 million and $291 million, respectively.

In August 2019 and February 2018, PPG entered into U.S. dollar to euro cross currency swap contracts for $300 million and $575 million, respectively; with a combined notional amount of $875 million outstanding, resulting in a net asset with a fair value of $48 million and $35 million as of December 31, 2019 and 2018, respectively. A 10% increase in the value of the euro to the U.S. dollar would have had an unfavorable effect on the fair value of these swap contracts by reducing the value of these instruments by $87 million and $57 million at December 31, 2019 and 2018, respectively.

As of December 31, 2019 and 2018, PPG had non-U.S. dollar denominated debt outstanding of $2.3 billion and $2.6 billion, respectively. A weakening of the U.S. dollar by 10% against European currencies and by 20% against Asian and South American currencies would have resulted in unrealized translation losses of $255 million and $299 million as of December 31, 2019 and 2018, respectively.

Interest Rate Risk

The Company manages its interest rate risk of fixed and variable rates while attempting to minimize its interest costs. In the first quarter of 2018, PPG entered into interest rate swaps which converted $525 million of fixed rate debt to variable rate debt. The fair value of these contracts was an asset of $35 million and $8 million as of December 31, 2019 and 2018, respectively. An increase in variable interest rates of 10% would lower the fair value of these swaps and increase interest expense by $7 million and $10 million for the periods ended December 31, 2019 and 2018, respectively. A 10% increase in interest rates in the U.S., Canada, Mexico and Europe and a 20% increase in interest rates in Asia and South America would have an insignificant effect on PPG's variable rate debt obligations and interest expense for the periods ended December 31, 2019 and 2018, respectively. Further, a 10% reduction in interest rates would have increased the fair value of the Company's fixed rate debt by approximately $67 million and $84 million as of December 31, 2019 and 2018, respectively; however, such changes would not have had an effect on PPG's annual Income before income taxes or cash flows.

Item 8. Financial Statements and Supplementary Data

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Shareholders of PPG Industries, Inc.

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheet of PPG Industries, Inc. and its subsidiaries (the “Company”) as of December 31, 2019 and 2018, and the related consolidated statements of income, of comprehensive income, of shareholders' equity and of cash flows for each of the three years in the period ended December 31, 2019, including the related notes and schedule of valuation and qualifying accounts for each of the three years in the period ended December 31, 2019 appearing under Item 15(a)(2) (collectively referred to as the “consolidated financial statements”). We also have audited the Company's internal control over financial reporting as of December 31, 2019, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2019 and 2018, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2019 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2019, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the COSO.

Change in Accounting Principle

As described in Note 1 to the consolidated financial statements, the Company changed the manner in which it accounts for leases in 2019.

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, 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 Report on Establishing and Maintaining Adequate Internal Control Over Financial Reporting. Our responsibility is to express opinions on the Company’s consolidated financial statements and on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (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 audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements 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. 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 audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

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 (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) 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 (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 or procedures may deteriorate.

Critical Audit Matters

The critical audit matter communicated below is a matter arising from the current period audit of the consolidated financial statements that was communicated or required to be communicated to the audit committee and that (i) relates to accounts or disclosures that are material to the consolidated financial statements and (ii) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matter below, providing a separate opinion on the critical audit matter or on the accounts or disclosures to which it relates.

Quantitative Goodwill Impairment Test

As described in Notes 1 and 7 to the consolidated financial statements, the Company's consolidated goodwill balance was $4,470 million as of December 31, 2019. Management tests goodwill for impairment by either performing a qualitative evaluation or a quantitative test, at least annually, or more frequently if an indication of impairment exists. Management's quantitative goodwill impairment testing is performed during the fourth quarter of each year by comparing the estimated fair value of an associated reporting unit as of September 30 to its carrying value. Fair value is estimated using a discounted cash flow model. Key assumptions and estimates used in the discounted cash flow model include projected future revenues, discount rates, operating cash flows, capital expenditures and tax rates.

The principal considerations for our determination that performing procedures relating to quantitative goodwill impairment testing is a critical audit matter are there was significant judgment by management when developing the fair value measurement of any reporting units where a quantitative test was performed and there was a high degree of auditor judgment, subjectivity, and effort in performing procedures and in evaluating audit evidence relating to management's cash flow projections, including the significant assumption related to projected future revenues.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to management's quantitative goodwill impairment test, including controls over the valuation of any reporting units for which a quantitative test was performed. These procedures also included, among others, testing management's process for developing the fair value estimate. This included evaluating the appropriateness of the discounted cash flow model, testing the completeness, accuracy, and relevance of underlying data used, and evaluating management's assumption related to projected future revenues. Evaluating management's assumption related to projected future revenues involved evaluating whether the assumption used by management was reasonable considering (i) the current and past performance of the reporting unit, (ii) the consistency with external market and industry data, and (iii) whether the assumption was consistent with evidence obtained in other areas of the audit.

/s/ PricewaterhouseCoopers LLP

Pittsburgh, Pennsylvania
February 20, 2020

We have served as the Company's auditor since 2013.

Management Report

Responsibility for Preparation of the Financial Statements and Establishing and Maintaining Adequate Internal Control Over Financial Reporting

We are responsible for establishing and maintaining adequate internal control over financial reporting as defined in Rules 13a-15(f) and 15d-15(f) under the Securities Exchange Act of 1934, as amended. 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.

We conducted an evaluation of the effectiveness of the Company's internal control over financial reporting as of December 31, 2019. In making this evaluation, we used the criteria set forth by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) in *Internal Control - Integrated Framework (2013)*. Based on this evaluation we have concluded that, as of December 31, 2019, the Company's internal control over financial reporting were effective.

PricewaterhouseCoopers LLP, an independent registered public accounting firm, has issued their report, included on pages 34-35 of this Form 10-K, regarding the Company's internal control over financial reporting.

/s/ Michael H. McGarry

Michael H. McGarry
Chairman and Chief Executive Officer
February 20, 2020

/s/ Vincent J. Morales

Vincent J. Morales
Senior Vice President and Chief Financial Officer
February 20, 2020

Consolidated Statement of Income

	For the Year		
($ in millions, except per share amounts)	*2019*	*2018*	*2017*
Net sales	$15,146	$15,374	$14,748
Cost of sales, exclusive of depreciation and amortization	8,653	9,001	8,209
Selling, general and administrative	3,604	3,573	3,554
Depreciation	375	354	331
Amortization	136	143	129
Research and development, net	432	441	451
Interest expense	132	118	105
Interest income	(32)	(23)	(20)
Business restructuring, net	176	66	—
Pension settlement charges	—	—	60
Other charges	98	122	74
Other income	(89)	(114)	(150)
Income before income taxes	$1,661	$1,693	$2,005
Income tax expense	392	353	615
Income from continuing operations	$1,269	$1,340	$1,390
Income from discontinued operations, net of tax	—	18	225
Net income attributable to the controlling and noncontrolling interests	$1,269	$1,358	$1,615
Less: Net income attributable to noncontrolling interests	26	17	21
Net income (attributable to PPG)	$1,243	$1,341	$1,594
Amounts attributable to PPG			
Income from continuing operations, net of tax	$1,243	$1,323	$1,369
Income from discontinued operations, net of tax	—	18	225
Net income (attributable to PPG)	$1,243	$1,341	$1,594
Earnings per common share			
Income from continuing operations, net of tax	$5.25	$5.43	$5.34
Income from discontinued operations, net of tax	—	0.07	0.88
Net income (attributable to PPG)	$5.25	$5.50	$6.22
Earnings per common share - assuming dilution			
Income from continuing operations, net of tax	$5.22	$5.40	$5.31
Income from discontinued operations, net of tax	—	0.07	0.87
Net income (attributable to PPG)	$5.22	$5.47	$6.18

Consolidated Statement of Comprehensive Income

	For the Year		
($ in millions)	*2019*	*2018*	*2017*
Net income attributable to the controlling and noncontrolling interests	$1,269	$1,358	$1,615
Other comprehensive (loss)/income, net of tax			
Defined benefit pension and other postretirement benefits	(156)	9	78
Unrealized foreign currency translation adjustments	106	(155)	248
Derivative financial instruments	(1)	(1)	(10)
Other comprehensive (loss)/income, net of tax	(51)	(147)	316
Total comprehensive income	$1,218	$1,211	$1,931
Less: amounts attributable to noncontrolling interests:			
Net income	(26)	(17)	(21)
Unrealized foreign currency translation adjustments	1	11	(17)
Comprehensive income attributable to PPG	$1,193	$1,205	$1,893

The accompanying notes to the consolidated financial statements are an integral part of these consolidated statements.

Consolidated Balance Sheet

	December 31	
($ in millions)	***2019***	***2018***
Assets		
Current assets		
Cash and cash equivalents	$1,216	$902
Short-term investments	57	61
Receivables	2,756	2,845
Inventories	1,710	1,783
Other current assets	431	370
Total current assets	$6,170	$5,961
Property, plant and equipment, net	2,983	2,805
Goodwill	4,470	4,070
Identifiable intangible assets, net	2,131	1,972
Deferred income taxes	220	229
Investments	258	251
Operating lease right-of-use assets	782	—
Other assets	694	727
Total	$17,708	$16,015
Liabilities and Shareholders' Equity		
Current liabilities		
Accounts payable and accrued liabilities	$3,496	$3,623
Restructuring reserves	196	99
Short-term debt and current portion of long-term debt	513	651
Current portion of operating lease liabilities	170	—
Total current liabilities	$4,375	$4,373
Long-term debt	4,539	4,365
Operating lease liabilities	622	—
Accrued pensions	745	645
Other postretirement benefits	661	629
Deferred income taxes	452	429
Other liabilities	911	842
Total liabilities	$12,305	$11,283
Commitments and contingent liabilities (See Note 14)		
Shareholders' equity		
Common stock	$969	$969
Additional paid-in capital	950	788
Retained earnings	18,906	18,131
Treasury stock, at cost	(13,191)	(12,958)
Accumulated other comprehensive loss	(2,350)	(2,300)
Total PPG shareholders' equity	$5,284	$4,630
Noncontrolling interests	119	102
Total shareholders' equity	$5,403	$4,732
Total	$17,708	$16,015

The accompanying notes to the consolidated financial statements are an integral part of this consolidated statement.

Consolidated Statement of Shareholders' Equity

($ in millions)	Common Stock	Additional Paid-In Capital	Retained Earnings	Treasury Stock	Accumulated Other Comprehensive (Loss)/Income	Total PPG	Non-controlling Interests	Total
January 1, 2017	$969	$707	$15,980	($10,472)	($2,356)	$4,828	$87	$4,915
Net income attributable to the controlling and noncontrolling interests	—	—	1,594	—	—	1,594	21	1,615
Other comprehensive income, net of tax	—	—	—	—	299	299	17	316
Cash dividends	—	—	(434)	—	—	(434)	—	(434)
Purchase of treasury stock	—	—	—	(813)	—	(813)	—	(813)
Issuance of treasury stock	—	49	—	34	—	83	—	83
Dividends paid on subsidiary common stock to noncontrolling interests	—	—	—	—	—	—	(5)	(5)
Reductions in noncontrolling interests	—	—	—	—	—	—	(5)	(5)
December 31, 2017	$969	$756	$17,140	($11,251)	($2,057)	$5,557	$115	$5,672
Net income attributable to the controlling and noncontrolling interests	—	—	1,341	—	—	1,341	17	1,358
Other comprehensive loss, net of tax	—	—	—	—	(136)	(136)	(11)	(147)
Cash dividends	—	—	(453)	—	—	(453)	—	(453)
Purchase of treasury stock	—	—	—	(1,721)	—	(1,721)	—	(1,721)
Issuance of treasury stock	—	28	—	14	—	42	—	42
Stock-based compensation activity	—	4	—	—	—	4	—	4
Dividends paid on subsidiary common stock to noncontrolling interests	—	—	—	—	—	—	(7)	(7)
Reductions in noncontrolling interests	—	—	—	—	—	—	(12)	(12)
Reclassification from other comprehensive income to retained earnings - Adoption of ASU 2018-02	—	—	107	—	(107)	—	—	—
Adjustment to retained earnings - Adoption of ASU 2016-16	—	—	(4)	—	—	(4)	—	(4)
December 31, 2018	$969	$788	$18,131	($12,958)	($2,300)	$4,630	$102	$4,732
Net income attributable to the controlling and noncontrolling interests	—	—	1,243	—	—	1,243	26	1,269
Other comprehensive loss, net of tax	—	—	—	—	(50)	(50)	(1)	(51)
Cash dividends	—	—	(468)	—	—	(468)	—	(468)
Purchase of treasury stock	—	—	—	(325)	—	(325)	—	(325)
Issuance of treasury stock	—	151	—	92	—	243	—	243
Stock-based compensation activity	—	10	—	—	—	10	—	10
Dividends paid on subsidiary common stock to noncontrolling interests	—	—	—	—	—	—	(8)	(8)
Other	—	1	—	—	—	1	—	1
December 31, 2019	$969	$950	$18,906	($13,191)	($2,350)	$5,284	$119	$5,403

The accompanying notes to the consolidated financial statements are an integral part of this consolidated statement.

Consolidated Statement of Cash Flows

	For the Year		
($ in millions)	***2019***	***2018***	***2017***
Operating activities			
Net income attributable to controlling and noncontrolling interests	$1,269	$1,358	$1,615
Less: Income from discontinued operations	—	18	225
Income from continuing operations	$1,269	$1,340	$1,390
Adjustments to reconcile net income to cash from operations:			
Depreciation and amortization	511	497	460
Pension expense	54	43	65
Pension settlement charge	—	—	60
Business restructuring, net	176	66	—
Environmental remediation charges and other costs, net	61	77	—
Stock-based compensation expense	39	37	35
Gain on sale of land	—	(26)	—
Net gain, from sale of businesses	—	—	(25)
Equity affiliate loss/(income), net of dividends	4	(1)	(4)
Deferred income taxes	(5)	45	38
Cash contributions to pension plans	(13)	(99)	(87)
Cash used for restructuring actions	(58)	(66)	(49)
Change in certain asset and liability accounts (net of acquisitions):			
Receivables	121	(69)	(76)
Inventories	145	(109)	(116)
Other current assets	(95)	5	(43)
Accounts payable and accrued liabilities	(63)	(76)	188
Noncurrent assets and liabilities, net	(13)	(207)	(170)
Taxes and interest payable	(32)	50	(129)
Other	(17)	(20)	14
Cash from operating activities - continuing operations	$2,084	$1,487	$1,551
Cash (used for)/from operating activities - discontinued operations	(4)	(20)	17
Cash from operating activities	$2,080	$1,467	$1,568
Investing activities			
Capital expenditures	($413)	($411)	($360)
Business acquisitions, net of cash balances acquired	(643)	(378)	(225)
Payments for acquisition of equity investment	—	—	(100)
Net proceeds from the sale of businesses	—	—	593
Proceeds from sale of land	—	27	—
Payments for the settlement of cross currency swap contracts	(8)	(28)	(34)
Proceeds from the settlement of cross currency swap contracts	28	23	37
Other	27	3	26
Cash used for investing activities - continuing operations	($1,009)	($764)	($63)
Cash used for investing activities - discontinued operations	—	—	(4)
Cash used for investing activities	($1,009)	($764)	($67)
Financing activities			
Net change in borrowings with maturities of three months or less	$6	($1)	($7)
Net proceeds/(payments) on commercial paper and short-term debt	100	(2)	(93)
Net proceeds from the issuance of long-term debt (net of discount and issuance costs)	595	992	—
Repayment of long-term debt	(637)	(6)	(588)

Repayment of acquired debt	(23)	—	—
Payments related to tax withholding on stock-based compensation awards	(20)	(15)	(28)
Purchase of treasury stock	(325)	(1,721)	(813)
Issuance of treasury stock	61	15	52
Dividends paid on PPG common stock	(468)	(453)	(434)
Purchase of noncontrolling interest	(39)	—	—
Other	(8)	(14)	(43)
Cash used for financing activities	($758)	($1,205)	($1,954)
Effect of currency exchange rate changes on cash and cash equivalents	1	(32)	69
Net increase/(decrease) in cash and cash equivalents	$314	($534)	($384)
Cash and cash equivalents, beginning of year	$902	$1,436	$1,820
Cash and cash equivalents, end of year	$1,216	$902	$1,436
Supplemental disclosures of cash flow information:			
Interest paid, net of amount capitalized	$127	$108	$100
Taxes paid, net of refunds	$348	$380	$648
Supplemental disclosure of noncash investing activities:			
Reissuance of common stock for business acquisition	$164	$—	$—

The accompanying notes to the consolidated financial statements are an integral part of this consolidated statement.

Notes to the Consolidated Financial Statements

1. Summary of Significant Accounting Policies

Principles of Consolidation

The accompanying consolidated financial statements include the accounts of PPG Industries, Inc. ("PPG" or the "Company") and all subsidiaries, both U.S. and non-U.S., that it controls. PPG owns more than 50% of the voting stock of most of the subsidiaries that it controls. For those consolidated subsidiaries in which the Company's ownership is less than 100%, the outside shareholders' interests are shown as noncontrolling interests. Investments in companies in which PPG owns 20% to 50% of the voting stock and has the ability to exercise significant influence over operating and financial policies of the investee are accounted for using the equity method of accounting. As a result, PPG's share of income or losses from such equity affiliates is included in the consolidated statement of income and PPG's share of these companies' shareholders' equity is included in Investments on the consolidated balance sheet. Transactions between PPG and its subsidiaries are eliminated in consolidation.

Use of Estimates in the Preparation of Financial Statements

The preparation of financial statements in conformity with U.S. generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the financial statements, as well as the reported amounts of income and expenses during the reporting period. Such estimates also include the fair value of assets acquired and liabilities assumed resulting from the allocation of the purchase price related to business combinations consummated. Actual outcomes could differ from those estimates.

Revenue Recognition

Revenue is recognized as performance obligations with the customer are satisfied, at an amount that is determined to be collectible. For the sale of products, this generally occurs at the point in time when control of the Company's products transfers to the customer based on the agreed upon shipping terms.

Shipping and Handling Costs

Amounts billed to customers for shipping and handling are reported in Net sales in the consolidated statement of income. Shipping and handling costs incurred by the Company for the delivery of goods to customers are included in Cost of sales, exclusive of depreciation and amortization in the consolidated statement of income.

Selling, General and Administrative Costs

Amounts presented in Selling, general and administrative in the consolidated statement of income are comprised of selling, customer service, distribution and advertising costs, as well as the costs of providing corporate-wide functional support in such areas as finance, law, human resources and planning. Distribution costs pertain to the movement and storage of finished goods inventory at company-owned and leased warehouses and other distribution facilities.

Advertising Costs

Advertising costs are charged to expense as incurred and totaled $283 million, $280 million and $313 million in 2019, 2018 and 2017, respectively.

Research and Development

Research and development costs, which consist primarily of employee related costs, are charged to expense as incurred.

($ in millions)	***2019***	***2018***	***2017***
Research and development – total	$456	$464	$472
Less depreciation on research facilities	24	23	21
Research and development, net	$432	$441	$451

Legal Costs

Legal costs, which primarily include costs associated with acquisition and divestiture transactions, general litigation, environmental regulation compliance, patent and trademark protection and other general corporate purposes, are charged to expense as incurred.

Income Taxes

Income taxes are accounted for under the asset and liability method. Deferred tax assets and liabilities are recognized for the future tax consequences attributable to operating losses and tax credit carryforwards as well as differences between the financial statement carrying amounts of existing assets and liabilities and their respective tax bases. The effect on deferred tax assets and liabilities of a change in tax rates is recognized in Income tax expense in the consolidated statement of income in the period that includes the enactment date.

A valuation allowance will be provided against deferred tax assets if PPG determines it is more likely than not such assets will not ultimately be realized.

PPG does not recognize a tax benefit unless it concludes that it is more likely than not that the benefit will be sustained on audit by the taxing authority based solely on the technical merits of the associated tax position. If the recognition threshold is met, PPG recognizes a tax benefit measured at the largest amount of the tax benefit that, in PPG's judgment, is greater than 50 percent likely to be realized. PPG records interest and penalties related to uncertain tax positions in Income tax expense in the consolidated statement of income.

Foreign Currency Translation

The functional currency of most significant non-U.S. operations is their local currency. Assets and liabilities of those operations are translated into U.S. dollars using year-end exchange rates; income and expenses are translated using the average exchange rates for the reporting period. Unrealized foreign currency translation gains and losses are deferred in Accumulated other comprehensive loss on the consolidated balance sheet.

Cash Equivalents

Cash equivalents are highly liquid investments (valued at cost, which approximates fair value) acquired with an original maturity of three months or less.

Short-term Investments

Short-term investments are highly liquid, high credit quality investments (valued at cost plus accrued interest) that have stated maturities of greater than three months to less than one year. The purchases and sales of these investments are classified as Investing activities in the consolidated statement of cash flows.

Marketable Equity Securities

The Company's investment in marketable equity securities is recorded at fair market value and reported as Other current assets and Investments on the consolidated balance sheet with changes in fair market value recorded in income.

Inventories

Inventories are stated at the lower of cost or net realizable value. Most U.S. inventories are stated at cost, using the last-in, first-out ("LIFO") method of accounting, which does not exceed net realizable value. All other inventories are stated at cost, using the first-in, first-out ("FIFO") method of accounting, which does not exceed net realizable value. PPG determines cost using either average or standard factory costs, which approximate actual costs, excluding certain fixed costs such as depreciation and property taxes. See Note 4, "Working Capital Detail" for further information concerning the Company's inventory.

Derivative Financial Instruments

The Company recognizes all derivative financial instruments (a "derivative") as either assets or liabilities at fair value on the consolidated balance sheet. The accounting for changes in the fair value of a derivative depends on the use of the instrument.

For derivative instruments that are designated and qualify as cash flow hedges, the unrealized gains or losses on the derivatives are recorded in the consolidated statement of comprehensive income. Amounts in Accumulated other comprehensive loss on the consolidated balance sheet are reclassified into Income before income taxes in the consolidated statement of income in the same period or periods during which the hedged transactions are recorded in Income before income taxes in the consolidated statement of income.

For derivative instruments that are designated and qualify as fair value hedges, the change in the fair value of the derivatives are reported in Income before income taxes in the consolidated statement of income, offsetting the gain or loss recognized for the change in fair value of the asset, liability, or firm commitment that is being hedged.

For derivatives, debt or other financial instruments that are designated and qualify as net investment hedges, the gains or losses associated with the financial instruments are reported as translation gains or losses in Accumulated other comprehensive loss on the consolidated balance sheet. Gains and losses in Accumulated other comprehensive loss related to hedges of the Company's net investments in foreign operations are reclassified out of Accumulated other comprehensive loss and recognized in Income before income taxes in the consolidated statement of income upon a substantial liquidation, sale or partial sale of such investments or upon impairment of all or a portion of such investments. The cash flow impact of these instruments are classified as Investing activities in the consolidated statement of cash flows.

Changes in the fair value of derivative instruments not designated as hedges for hedge accounting purposes are recognized in Income before income taxes in the consolidated statement of income in the period of change.

Property, Plant and Equipment

Property, plant and equipment is recorded at cost. Depreciation is computed on a straight-line method based on the estimated useful lives of related assets. Additional depreciation expense is recorded when facilities or equipment are subject to abnormal economic conditions, restructuring actions or obsolescence.

The cost of significant improvements that add to productive capacity or extend the lives of properties are capitalized. Costs for repairs and maintenance are charged to expense as incurred. When a capitalized asset is retired or otherwise disposed of, the original cost and related accumulated depreciation balance are removed from the accounts and any related gain or loss is recorded in Income before income taxes in the consolidated statement of income. The amortization cost of finance lease assets are recorded in Depreciation expense in the consolidated statement of income. Property and other long-lived assets are reviewed for impairment whenever events or circumstances indicate that their carrying amounts may not be recoverable. See Note 5, “Property, Plant and Equipment” for further details.

Goodwill and Identifiable Intangible Assets

Goodwill represents the excess of the cost over the fair value of acquired identifiable tangible and intangible assets less liabilities assumed from acquired businesses. Identifiable intangible assets acquired in business combinations are recorded based upon their fair value at the date of acquisition.

PPG is a multinational manufacturer with 9 operating segments (which the Company refers to as “strategic business units”) that are organized based on the Company’s major products lines. These operating segments are also the Company’s reporting units for purposes of testing goodwill for impairment, which is tested at least annually in connection with PPG’s strategic planning process or more frequently if an indication of impairment exists. The Company tests goodwill for impairment by either performing a qualitative evaluation or a quantitative test. The qualitative evaluation is an assessment of factors, including reporting unit specific operating results as well as industry, market and general economic conditions, to determine whether it is more likely than not that the fair values of a reporting unit is less than its carrying amount, including goodwill. The Company may elect to bypass this qualitative assessment for some or all of its reporting units and perform a quantitative test. Quantitative goodwill impairment testing is performed during the fourth quarter of each year by comparing the estimated fair value of an associated reporting unit as of September 30 to its carrying value. Fair value is estimated using a discounted cash flow model. Key assumptions and estimates used in the discounted cash flow model include projected future revenues, discount rates, operating cash flows, capital expenditures and tax rates. In 2019, the annual impairment testing review of goodwill did not result in impairment of the Company’s reporting units.

The Company has determined that certain acquired trademarks have indefinite useful lives. The Company tests the carrying value of these trademarks for impairment at least annually, or as needed whenever events and circumstances indicate that their carrying amount may not be recoverable. The annual assessment takes place in the fourth quarter of each year either by completing a qualitative assessment or quantitatively by comparing the estimated fair value of each trademark as of September 30 to its carrying value. Fair value is estimated by using the relief from royalty method (a discounted cash flow methodology). The qualitative assessment includes consideration of factors, including revenue relative to the asset being assessed, the operating results of the related business as well as industry, market and general economic conditions, to determine whether it is more likely than not that the fair value of the asset is less than its carrying amount. In 2019, the annual impairment testing review of indefinite-lived intangibles did not result in an impairment.

Identifiable intangible assets with finite lives are amortized on a straight-line basis over their estimated useful lives (1 to 30 years) and are reviewed for impairment whenever events or circumstances indicate that their carrying amount may not be recoverable.

Receivables and Allowances

All trade receivables are reported on the consolidated balance sheet at the outstanding principal adjusted for any allowance for credit losses and any charge offs. The Company provides an allowance for doubtful accounts to reduce receivables to their estimated net realizable value when it is probable that a loss will be incurred. Those estimates are based on historical collection experience, current economic and market conditions, a review of the aging of accounts receivable and the assessments of current creditworthiness of customers.

Leases

The Company determines if a contract is a lease at the inception of the arrangement. The Company reviews all options to extend, terminate, or purchase its right of use assets at the inception of the lease and accounts for these options when they are reasonably certain of being exercised. Certain real estate leases contain lease and non-lease components, which are accounted for separately. For certain equipment leases, lease and non-lease components are accounted for as a single lease component.

Leases with an initial term of twelve months or less are not recorded on the consolidated balance sheet. Lease expense for these leases is recognized on a straight-line basis over the lease term.

Variable lease expense is based on contractual arrangements with PPG's lessors determined based on external indices or other relevant market factors. In addition, PPG's variable lease expense also includes elements of a contract that do not represent a good or service but for which the lessee is responsible for paying.

Nearly all of PPG's lease contracts do not provide a readily determinable implicit rate. For these contracts, PPG's estimated incremental borrowing rate is based on information available at the inception of the lease.

Product warranties

The Company accrues for product warranties at the time the associated products are sold based on historical claims experience. The reserve, pretax charges against income and cash outlays for product warranties were not significant to the consolidated financial statements of the Company for any year presented.

Asset Retirement Obligations

An asset retirement obligation represents a legal obligation associated with the retirement of a tangible long-lived asset that is incurred upon the acquisition, construction, development or normal operation of that long-lived asset. PPG recognizes asset retirement obligations in the period in which they are incurred, if a reasonable estimate of fair value can be made. The asset retirement obligation is subsequently adjusted for changes in fair value. The associated estimated asset retirement costs are capitalized as part of the carrying amount of the long-lived asset and depreciated over its useful life. PPG's asset retirement obligations are primarily associated with the retirement or closure of certain assets used in PPG's manufacturing process. The accrued asset retirement obligation is recorded in Accounts payable and accrued liabilities and Other liabilities on the consolidated balance sheet, and was $21 million and $22 million as of December 31, 2019 and 2018, respectively.

PPG's only conditional asset retirement obligation relates to the possible future abatement of asbestos contained in certain PPG production facilities. The asbestos in PPG's production facilities arises from the application of normal and customary building practices in the past when the facilities were constructed. This asbestos is encapsulated in place and, as a result, there is no current legal requirement to abate it. Because there is no requirement to abate, the Company does not have any current plans or an intention to abate and therefore the timing, method and cost of future abatement, if any, are not known. The Company has not recorded an asset retirement obligation associated with asbestos abatement, given the uncertainty concerning the timing of future abatement, if any.

Accounting Standards Adopted in 2019

Effective January 1, 2019, PPG adopted Accounting Standards Update ("ASU") No. 2016-02, "Leases." This ASU requires substantially all leases be recorded on the balance sheet as right of use assets and lease obligations. PPG adopted the ASU using a retrospective adoption method at January 1, 2019, as outlined in ASU No. 2018-11, "Leases - Targeted Improvements." Under this method of adoption, there is no impact to the consolidated statement of income and consolidated balance sheet. PPG determined that there was no cumulative-effect adjustment to beginning Retained earnings on the consolidated balance sheet. PPG will continue to report periods prior to January 1, 2019 in its financial statements under prior guidance as outlined in Accounting Standards Codification Topic 840, "Leases." In addition, PPG elected the package of practical expedients permitted under the transition guidance within the new standard, which among other things, allowed carry forward of historical lease classifications. Adoption of this standard did not materially impact PPG's Income before income taxes and had no impact on the consolidated statement of cash flows. See Note 2, "Leases" for further details.

Accounting Standards to be Adopted in Future Years

In August 2018, the Financial Accounting Standards Board ("FASB") issued ASU No. 2018-15, "Intangibles - Goodwill and Other - Internal-Use Software." This ASU requires capitalization of certain implementation costs incurred in a cloud computing arrangement that is a service contract. PPG adopted the new standard effective January 1, 2020. PPG is nearly complete in the assessment and implementation of this ASU and does not believe this ASU will have a material impact on its consolidated financial position, results of operations or cash flows.

In June 2016, the FASB issued ASU No. 2016-13, "Financial Instruments - Credit Losses." This ASU requires an organization to measure all expected credit losses for financial assets, including trade receivables, held at the reporting date based on historical experience, current conditions, and reasonable and supportable information. Financial institutions and other organizations will now use forward-looking information to better estimate their credit losses. PPG adopted the new standard effective January 1, 2020. PPG is nearly complete in its assessment of this ASU and has updated its internal controls and operational processes and procedures to include certain forward looking considerations in its current process of developing and recognizing credit losses for its financial assets accounted for at amortized cost. PPG is nearly complete in the assessment and implementation of this ASU and does not believe this ASU will have a material impact on its consolidated financial position, results of operations or cash flows.

2. Leases

PPG leases certain retail paint stores, warehouses, distribution facilities, office space, fleet vehicles and equipment.

The components of lease expense for the year ended December 31, 2019 were as follows:

($ in millions)	***Classification in the Consolidated Statement of Income***	***2019***
Operating lease cost	Cost of sales, exclusive of depreciation and amortization	$34
Operating lease cost	Selling, general and administrative	198
Total operating lease cost		$232
Finance lease cost:		
Amortization of right-of-use assets	Depreciation	$2
Interest on lease liabilities	Interest expense	1
Total finance lease cost		$3
Total lease cost		$235

Lease expense for operating leases was $289 million and $288 million in 2018 and 2017, respectively.

Total operating lease cost for the year ended December 31, 2019 is inclusive of the following:

($ in millions)	***2019***
Variable lease costs	$15
Short-term lease costs	$5

($ in millions)	***Classification on the Consolidated Balance Sheet***	***2019***
Assets:		
Operating	Operating lease right-of-use assets	$782
Finance[(a)]	Property, plant, and equipment, net	17
Total leased assets		$799
Liabilities:		
Current		
Operating	Current portion of operating lease liabilities	$170
Finance	Short-term debt and current portion of long-term debt	3
Noncurrent		
Operating	Operating lease liabilities	$622
Finance	Long-term debt	8
Total lease liabilities		$803

(a) Net of accumulated depreciation of $11 million.

($ in millions)	***2019***
Cash paid for amounts included in the measurement of lease liabilities:	
Operating cash flows paid for operating leases	$210
Operating cash flows paid for finance leases	$1
Financing cash flows paid for finance leases	$4
Right-of-use assets obtained in exchange for lease obligations:	
Operating leases	$219
Finance leases	$1

	2019
Weighted-average remaining lease term (in years)	
Operating leases	7.4
Finance leases	6.2
Weighted-average discount rate	
Operating leases	3.0%
Finance leases	9.4%

As of December 31, 2019, maturities of lease liabilities were as follows:

($ in millions)	Operating Leases	Finance Leases
2020	$191	$3
2021	150	2
2022	118	2
2023	92	2
2024	72	1
Thereafter	266	3
Total lease payments	$889	$13
Less: Interest	97	2
Total lease obligations	$792	$11

Disclosures related to periods prior to adoption of ASU 2016-02

PPG adopted ASU 2016-02 using a retrospective adoption method at January 1, 2019 as noted in Note 1, "Summary of Significant Accounting Policies." As required, the following disclosure is provided for periods prior to adoption. Minimum lease commitments as of December 31, 2018 that have initial or remaining lease terms in excess of one year are as follows:

($ in millions)	Operating Leases	Capital Leases
2019	$207	$3
2020	$157	$3
2021	$116	$1
2022	$93	$1
2023	$76	$1
Beyond 2023	$244	$3

3. Acquisitions and Divestitures

Acquisitions

Announced Acquisition: Alpha Coating Technologies, LLC

In February 2020, PPG announced that it will acquire Alpha Coating Technologies, LLC, a manufacturer of powder coatings for light industrial applications and heat sensitive substrates. The transaction is expected to close in the first quarter of 2020.

Completed Acquisitions

Industria Chimica Reggiana

On January 31, 2020, PPG completed the acquisition of Industria Chimica Reggiana S.p.A, an Italian manufacturer of automotive refinish products. The pro-forma impact on PPG's sales and results of operations, including the pro-forma effect of events that are directly attributable to the acquisition, was not significant. The results of this business since the date of acquisition have been reported within the automotive refinish coatings business within the Performance Coatings reportable business segment.

Texstars, LLC

On October 25, 2019, PPG completed the acquisition of Texstars, LLC, a manufacturer of high-performance transparencies, wingtip lenses and plastic components for aerospace and defense vehicles and a leader in advanced transparent coatings. The pro-forma impact on PPG's sales and results of operations, including the pro-forma effect of events that are directly attributable to the acquisition, was not significant. The results of this business since the date of acquisition have been reported within the aerospace coatings business within the Performance Coatings reportable business segment.

Dexmet Corporation

On August 14, 2019, PPG completed the acquisition of Dexmet Corporation, a specialty materials manufacturer. Dexmet Corporation specializes in customized, highly-engineered, expanded and perforated metal foils and polymers used for structural applications. The pro-forma impact on PPG's sales and results of operations, including the pro-forma effect of events that are directly attributable to the acquisition, was not significant. The results of this business since the date of acquisition have been reported within the aerospace coatings business within the Performance Coatings reportable business segment.

Hemmelrath

On April 16, 2019, PPG completed the acquisition of Hemmelrath, an automotive coatings manufacturer. Hemmelrath is a global manufacturer of coatings for automotive original equipment manufacturers ("OEMs"). The pro-forma impact on PPG's sales and results of operations, including the pro-forma effect of events that are directly attributable to the acquisition, was not significant. The results of this business since the date of acquisition have been reported within the automotive OEM coatings business within the Industrial Coatings reportable business segment.

Whitford Worldwide Company

On March 1, 2019, PPG completed the acquisition of Whitford Worldwide Company ("Whitford"), a global manufacturer that specializes in low-friction and nonstick coatings for industrial applications and consumer products. Whitford operates 10 manufacturing facilities globally. The pro-forma impact on PPG's sales and results of operations, including the pro-forma effect of events that are directly attributable to the acquisition, was not significant. The results of this business since the date of acquisition have been reported within the industrial coatings business within the Industrial Coatings reportable business segment.

SEM Products, Inc.

In the fourth quarter of 2018, PPG completed the acquisition of SEM Products, Inc., a U.S.-based manufacturer of specialized automotive refinish products (“SEM”). SEM is a leading manufacturer of repair and refinish products used primarily for automotive and other transportation applications. The pro-forma impact on PPG's sales and results of operations, including the pro-forma effect of events that are directly attributable to the acquisition, was not significant. The results of this business since the date of acquisition have been reported within the automotive refinish coatings business within the Performance Coatings reportable business segment.

The Crown Group

On October 2, 2017, PPG acquired The Crown Group (“Crown”), a U.S.-based coatings application services business. Crown is one of the leading component and product finishers in North America. Crown applies coatings to customers’ manufactured parts and assembled products at several U.S. sites. Most of Crown’s facilities, which also provide assembly, warehousing and sequencing services, are located at customer facilities or positioned near customer manufacturing sites. The company serves manufacturers in the automotive, agriculture, construction, heavy truck and alternative energy industries. The pro-forma impact on PPG's sales and results of operations, including the pro-forma effect of events that are directly attributable to the acquisition, was not significant. The results of this business since the date of acquisition have been reported within the industrial coatings business within the Industrial Coatings reportable business segment.

Taiwan Chlorine Industries

Taiwan Chlorine Industries (“TCI”) was established in 1986 as a joint venture between PPG and China Petrochemical Development Corporation (“CPDC”) to produce chlorine-based products in Taiwan, at which time PPG owned 60 percent of the venture. In conjunction with the 2013 separation of its commodity chemicals business, PPG conveyed to Axiall Corporation ("Axiall") its 60% ownership interest in TCI. Under PPG’s agreement with CPDC, if certain post-closing conditions were not met following the three year anniversary of the separation, CPDC had the option to sell its 40% ownership interest in TCI to Axiall for $100 million. In turn, Axiall had a right to designate PPG as its designee to purchase the 40% ownership interest of CPDC. In April 2016, Axiall announced that CPDC had decided to sell its ownership interest in TCI to Axiall. In June 2016, Axiall formally designated PPG to purchase the 40% ownership interest in TCI. In August 2016, Westlake Chemical Corporation acquired Axiall, which became a wholly-owned subsidiary of Westlake. In April 2017, PPG finalized its purchase of CPDC's 40% ownership interest in TCI. The difference between the acquisition date fair value and the purchase price of PPG's 40% ownership interest in TCI has been recorded as a loss in discontinued operations during the year-ended December 31, 2017. PPG's ownership in TCI is accounted for as an equity method investment and the related equity earnings are reported within Other income in the consolidated statement of income and in Legacy in Note 21, "Reportable Business Segment Information."

Other Acquisitions

In 2019, 2018, and 2017, the Company completed several smaller business acquisitions. The total consideration paid for these acquisitions, net of cash acquired, debt assumed and other post closing adjustments, was $9 million, $108 million and $74 million, respectively.

In January 2018, PPG acquired ProCoatings, a leading architectural paint and coatings wholesaler located in The Netherlands. ProCoatings, established in 2001, distributes a large portfolio of well-known professional paint brands through its network of 27 multi-brand stores. The results of this business since the date of acquisition have been reported within the architectural coatings - Europe Middle East and Africa ("EMEA") business within the Performance Coatings reportable business segment.

In January 2017, PPG acquired certain assets of automotive refinish coatings company Futian Xinshi ("Futian"), based in the Guangdong province of China. Futian distributes its products in China through a network of more than 200 distributors.

In January 2017, PPG completed the acquisition of DEUTEK S.A., a leading Romanian paint and architectural coatings manufacturer, from the Emerging Europe Accession Fund. DEUTEK, established in 1993, manufactures and markets a large portfolio of well-known professional and consumer paint brands, including OSKAR and Danke!. The company's products are sold in more than 120 do-it-yourself stores and 3,500 independent retail outlets in Romania.

Divestitures

Glass Segment

In 2017, PPG completed a multi-year strategic shift in the Company's business portfolio, resulting in the exit of all glass operations which consisted of the global fiber glass business, PPG's ownership interest in two Asian fiber glass joint ventures and the flat glass business. Accordingly, the results of operations, including the gains on the divestitures, and cash flows have been recast as discontinued operations for all periods presented. PPG now has two reportable business segments.

The net sales and income from discontinued operations related to the former Glass segment for the three years ended December 31, 2019, 2018, and 2017 were as follows:

($ in millions)	***2019***	***2018***	***2017***
Net sales	$—	$—	$217
Income from operations	$3	$21	$30
Net gains on the divestitures of businesses	—	—	343
Income tax expense	1	5	140
Income from discontinued operations, net of tax	$2	$16	$233

During 2018, PPG released $13 million of previously recorded accruals and contingencies established in conjunction with the divestitures of businesses within the former Glass segment as a result of completed actions, new information and updated estimates. Also during 2018, PPG made a final payment of $20 million to Vitro S.A.B. de C.V related to the transfer of certain pension obligations upon the sale of the former flat glass business.

North American Fiber Glass Business

On September 1, 2017, PPG completed the sale of its North American fiber glass business to Nippon Electric Glass Co. Ltd. ("NEG"). Cash proceeds from the sale were $541 million, resulting in a pretax gain of $343 million, net of certain accruals and contingencies established in conjunction with the divestiture.

PPG's fiber glass operations included manufacturing facilities in Chester, South Carolina, and Lexington and Shelby, North Carolina; and administrative and research-and-development operations in Shelby and in Harmar, Pennsylvania, near Pittsburgh. The business supplies the transportation, energy, infrastructure and consumer markets.

Other Divestitures

Plaka Business

In June 2017, PPG completed the sale of the assets of its Mexico-based Plaka plasterboard and cement-board business to Knauf International GmbH and recorded a $25 million pretax gain on the sale.

Notes to the Consolidated Financial Statements

4. Working Capital Detail

($ in millions)	2019	2018
Receivables		
Trade - net[(1)]	$2,479	$2,505
Equity affiliates	3	4
Other - net	274	336
Total	$2,756	$2,845
Inventories[(2)]		
Finished products	$1,047	$1,105
Work in process	197	193
Raw materials	431	452
Supplies	35	33
Total	$1,710	$1,783
Accounts payable and accrued liabilities		
Trade	$2,098	$2,177
Accrued payroll	455	424
Customer rebates	280	283
Other postretirement and pension benefits	85	80
Income taxes	46	112
Other	532	547
Total	$3,496	$3,623

(1) Allowance for doubtful accounts was $22 million and $24 million as of December 31, 2019 and 2018, respectively.

(2) Inventories valued using the LIFO method of inventory valuation comprised 34% and 36% of total gross inventory values as of December 31, 2019 and 2018, respectively. If the FIFO method of inventory valuation had been used, inventories would have been $124 million and $113 million higher as of December 31, 2019 and 2018, respectively. During the years ended December 31, 2019 and 2018, certain inventories accounted for on the LIFO method of accounting were reduced, which resulted in the liquidation of certain quantities carried at costs prevailing in prior years. The effect on Income before income taxes was income of $1 million and $2 million for the years ended December 31, 2019 and 2018, respectively.

5. Property, Plant and Equipment

($ in millions)	Useful Lives (years)	2019	2018
Land and land improvements	1-30	$511	$489
Buildings	20-40	1,573	1,472
Machinery and equipment	5-25	3,575	3,387
Other	3-20	1,092	989
Construction in progress		314	296
Total[(1)]		$7,065	$6,633
Less: accumulated depreciation		4,082	3,828
Net		$2,983	$2,805

(1) Interest capitalized in 2019, 2018 and 2017 was $6 million, $4 million and $7 million, respectively.

6. Investments

($ in millions)	2019	2018
Investments in equity affiliates	$129	$132
Marketable equity securities (See Note 10)	80	69
Other	49	50
Total	$258	$251

Investments in equity affiliates represent PPG's ownership interests in entities between 20% and 50% that manufacture and sell coatings and certain chemicals. In 2017, PPG purchased a 40% ownership interest in TCI. Refer to Note 3, "Acquisitions and Divestitures" for additional information.

PPG's share of undistributed net earnings of equity affiliates was $11 million as of December 31, 2019 and December 31, 2018. Dividends received from equity affiliates were $15 million, $15 million and $8 million in 2019, 2018 and 2017, respectively.

Notes to the Consolidated Financial Statements

7. Goodwill and Other Identifiable Intangible Assets

Goodwill			
($ in millions)	*Performance Coatings*	*Industrial Coatings*	*Total*
January 1, 2018	$3,104	$838	$3,942
Acquisitions, including purchase accounting adjustments	248	(13)	235
Foreign currency impact	(86)	(21)	(107)
December 31, 2018	$3,266	$804	$4,070
Acquisitions, including purchase accounting adjustments	166	230	396
Foreign currency impact	10	(6)	4
December 31, 2019	$3,442	$1,028	$4,470

Identifiable Intangible Assets						
	December 31, 2019			*December 31, 2018*		
($ in millions)	*Gross Carrying Amount*	*Accumulated Amortization*	*Net*	*Gross Carrying Amount*	*Accumulated Amortization*	*Net*
Indefinite-Lived Identifiable Intangible Assets						
Trademarks	$1,167	$—	$1,167	$1,140	$—	$1,140
Definite-Lived Identifiable Intangible Assets						
Acquired technology	$710	($549)	$161	$648	($515)	$133
Customer-related	1,578	(885)	693	1,396	(798)	598
Trade names	210	(111)	99	190	(96)	94
Other	51	(40)	11	44	(37)	7
Total Definite Lived Intangible Assets	$2,549	($1,585)	$964	$2,278	($1,446)	$832
Total Identifiable Intangible Assets	$3,716	($1,585)	$2,131	$3,418	($1,446)	$1,972

The Company's identifiable intangible assets with definite lives are being amortized over their estimated useful lives. Aggregate amortization expense was $136 million, $143 million and $129 million in 2019, 2018 and 2017, respectively.

($ in millions)	*2020*	*2021*	*2022*	*2023*	*2024*
Estimated future amortization expense	$135	$120	$115	$105	$85

8. Business Restructuring

The Company records restructuring liabilities that represent charges incurred in connection with consolidations of certain operations, including operations from acquisitions, as well as headcount reduction programs. These charges consist primarily of severance and other cash costs. As a result of these programs, the Company will also incur incremental non-cash accelerated depreciation expense for certain assets due to their reduced expected asset life. These charges are not allocated to the Company's reportable business segments. Refer to Note 21, "Reportable Business Segment Information" for additional information.

2019 Restructuring Program

In June 2019, the Company approved a business restructuring plan which included actions to reduce its global cost structure. The program is the result of a comprehensive internal operational assessment to identify further opportunities to improve the profitability of the overall business portfolio. This program includes further manufacturing optimization; targeted pruning of low-profit business in certain regions; exiting certain smaller product lines that are not meeting profitability objectives; reorganization of certain business unit cost structures based on the current economic climate; and certain redundancy actions related to recent acquisitions.

A pretax restructuring charge of $184 million was recorded in PPG's second quarter 2019 financial results. In the third quarter of 2019, additional programs were approved by management and charges of $10 million were recorded in PPG's financial results. These charges represent employee severance and certain other cash costs. The majority of restructuring actions are expected to be completed by the end of the fourth quarter 2020 with the remainder of the actions expected to be completed in 2022.

2018 Restructuring Program

In April 2018, the Company approved a business restructuring plan which included actions to reduce its global cost structure. The program was in response to the impacts of customer assortment changes in our U.S. architectural coatings business during the first quarter 2018 and sustained, elevated raw material inflation. The program aims to further right-size employee headcount and production capacity in certain businesses based on product demand, as well as reductions in various global functional and administrative costs.

A pretax restructuring charge of $83 million was recorded in PPG's second quarter 2018 financial results, of which $80 million represented employee severance and other cash costs. The majority of restructuring actions are expected to be completed by the end of the second quarter of 2020.

Other Adjustments

In 2019 and 2018, adjustments were recorded to reduce the remaining restructuring reserves established under previously approved programs to reflect the current estimate of the costs to complete these actions of approximately $18 million and $49 million, respectively. These amounts are recorded in Business restructuring, net in the consolidated statement of income.

The reserve activity for the years ended December 31, 2019 and 2018, was as follows:

Restructuring Reserve Activity	
($ in millions)	***Total Reserve***
December 31, 2017	$102
Total 2018 restructuring charge	83
Additional actions approved	32
Release of prior reserves and other adjustments	(49)
Cash payments	(66)
Foreign currency impact	(4)
Other	12
December 31, 2018	$110
2019 restructuring charges	194
Release of prior reserves and other adjustments	(18)
Cash payments	(58)
Foreign currency impact	(4)
December 31, 2019	$224

Notes to the Consolidated Financial Statements

9. Borrowings and Lines of Credit

Long-term Debt Obligations

($ in millions)	*Maturity Date*	*2019*	*2018*
0.00% note (€300)	2019	$—	$343
2.3% notes	2019	—	299
3.6% notes	2020	499	498
9% non-callable debentures(1)	2021	134	133
0.875% notes (€600)	2022	671	685
3.2% notes ($300)(2)	2023	298	298
2.4% notes ($300)	2024	297	—
0.875% note (€600)	2025	665	679
1.4% notes (€600)	2027	665	679
3.75% notes ($700)(3)	2028	695	694
2.5% note (€80)	2029	88	91
2.8% notes ($300)	2029	297	—
7.70% notes	2038	174	174
5.5% notes	2040	247	247
3% note (€120)	2044	127	131
Commercial paper	Various	100	—
Various other non-U.S. debt(4)	Various	38	39
Finance lease obligations	Various	11	12
Impact of derivatives on debt(1)(5)	N/A	36	10
Total		$5,042	$5,012
Less payments due within one year	N/A	503	647
Long-term debt		$4,539	$4,365

(1) PPG entered into several interest rate swaps, which were subsequently settled in prior periods. The impact of these settlements are being amortized over the remaining life of the debentures as a reduction to interest expense. The weighted average interest rate for these borrowings was 8.4% for the years ended December 31, 2019 and 2018.

(2) In February 2018, PPG entered into interest rate swaps which converted $150 million of the notes from a fixed interest rate to a floating interest rate based on the three month London Interbank Offered Rate (LIBOR). The impact of the derivative on the notes represents the fair value adjustment of the debt. The average effective interest rate for the portion of the notes impacted by the swaps was 2.9% and 2.7% as of December 31, 2019 and 2018, respectively. Refer to Note 10, “Financial Instruments, Hedging Activities and Fair Value Measurements” for additional information.

(3) In February 2018, PPG entered into interest rate swaps which converted $375 million of the notes from a fixed interest rate to a floating interest rate based on the three month LIBOR. The impact of the derivative on the notes represents the fair value adjustment of the debt. The average effective interest rate for the portion of the notes impacted by the swaps was 3.3% and 3.2% as of December 31, 2019 and 2018, respectively. Refer to Note 10, “Financial Instruments, Hedging Activities and Fair Value Measurements” for additional information.

(4) Weighted average interest rate of 3.7% and 3.8% as of December 31, 2019 and 2018, respectively.

(5) Fair value adjustment of the 3.2% $300 million notes and 3.75% $700 million notes as a result of fair value hedge accounting treatment related to the outstanding interest rate swaps as of December 31, 2019 and 2018, respectively. Refer to Note 10, “Financial Instruments, Hedging Activities and Fair Value Measurements” for additional information.

2019 Activities

In August 2019, PPG completed a public offering of $300 million aggregate principal amount of 2.4% notes due 2024 and $300 million aggregate principal amount of 2.8% notes due 2029. These notes were issued pursuant to PPG’s existing shelf registration statement and pursuant to an indenture between the Company and The Bank of New York Mellon Trust Company, N.A., as trustee, as supplemented (the "2019 Indenture"). The 2019 Indenture governing these notes contains covenants that limit the Company’s ability to, among other things, incur certain liens securing indebtedness, engage in certain sale-leaseback transactions, and enter into certain consolidations, mergers, conveyances, transfers or leases of all or substantially all the Company’s assets. The terms of these notes also require the Company to make an offer to repurchase the notes upon a Change of Control Triggering Event (as defined in the 2019 Indenture) at a price equal to 101% of their principal amount plus accrued and unpaid interest. The Company may issue additional debt from time to time pursuant to the 2019 Indenture. The aggregate cash proceeds from the notes, net of discounts and fees, was $595 million.

In November 2019, PPG’s €300 million 0.00% notes and $300 million 2.3% notes matured, upon which the Company paid $634 million to settle these obligations.

2018 Activities

In February 2018, PPG completed a public offering of $300 million aggregate principal amount of 3.2% notes due 2023 and $700 million aggregate principal amount of 3.75% notes due 2028. These notes were issued pursuant to PPG's existing shelf registration statement and pursuant to an indenture between the Company and The Bank of New York Mellon Trust Company, N.A., as trustee, as supplemented (the "2018 Indenture"). The 2018 Indenture governing these notes contains covenants that limit the Company's ability to, among other things, incur certain liens securing indebtedness, engage in certain sale-leaseback transactions, and enter into certain consolidations, mergers, conveyances, transfers or leases of all or substantially all the Company's assets. The terms of these notes also require the Company to make an offer to repurchase the notes upon a Change of Control Triggering Event (as defined in the 2018 Indenture) at a price equal to 101% of their principal amount plus accrued and unpaid interest. The Company may issue additional debt from time to time pursuant to the 2018 Indenture.

The aggregate cash proceeds from the notes, net of discounts and fees, was $992 million. A portion of the notes were converted from a fixed interest rate to a floating interest rate using interest rate swap contracts. For more information, refer to Note 10, "Financial Instruments, Hedging Activities and Fair Value Measurements."

2017 Activities

In November 2017, PPG's €500 million 3-year variable rate bank loan matured and the Company repaid this obligation using $587 million of cash on hand.

Credit agreements

In August 2019, PPG amended and restated its five-year credit agreement (the "Credit Agreement") with several banks and financial institutions. The Credit Agreement amends and restates the Company's existing five year credit agreement dated as of December 18, 2015. The Credit Agreement provides for a $2.2 billion unsecured revolving credit facility. The Company has the ability to increase the size of the Credit Agreement by up to an additional $750 million, subject to the receipt of lender commitments and other conditions precedent. The Credit Agreement will terminate on August 30, 2024. The Company has the right, subject to certain conditions set forth in the Credit Agreement, to designate certain subsidiaries of the Company as borrowers under the Credit Agreement. In connection with any such designation, the Company is required to guarantee the obligations of any such subsidiaries under the Credit Agreement. For the years ended December 31, 2019 and 2018, there were no amounts outstanding under the existing or prior credit agreement. The indicative borrowing rate on a one month, U.S. dollar denominated borrowing was 2.8% at December 31, 2019.

Borrowings under the Credit Agreement may be made in U.S. Dollars or in euros. The Credit Agreement provides that loans will bear interest at rates based, at the Company's option, on one of two specified base rates plus a margin based on certain formulas defined in the Credit Agreement. Additionally, the Credit Agreement contains a Commitment Fee, as defined in the Credit Agreement, on the amount of unused commitments under the Credit Agreement ranging from 0.060% to 0.125% per annum.

The Credit Agreement also supports the Company's commercial paper borrowings which are classified as long-term based on PPG's intent and ability to refinance these borrowings on a long-term basis. Commercial paper borrowings of $100 million were outstanding as of December 31, 2019. There were no commercial paper borrowings outstanding as of December 31, 2018 under the prior credit agreement.

The Credit Agreement contains usual and customary restrictive covenants for facilities of its type, which include, with specified exceptions, limitations on the Company's ability to create liens or other encumbrances, to enter into sale and leaseback transactions and to enter into consolidations, mergers or transfers of all or substantially all of its assets. The Credit Agreement also requires the Company to maintain a ratio of Total Indebtedness to Total Capitalization, as defined in the Credit Agreement, of 60% or less; provided, that for any fiscal quarter in which the Company has made an acquisition for consideration in excess of $1 billion and for the next five fiscal quarters thereafter, the ratio of Total Indebtedness to Total Capitalization may not exceed 65% at any time. As of December 31, 2019, Total Indebtedness to Total Capitalization as defined under the Credit Agreement was 46%.

The Credit Agreement contains, among other things, customary events of default that would permit the lenders to accelerate the loans, including the failure to make timely payments when due under the Credit Agreement or other material indebtedness, the failure to satisfy covenants contained in the Credit Agreement, a change in control of the Company and specified events of bankruptcy and insolvency.

Restrictive Covenants and Cross-Default Provisions

As of December 31, 2019, PPG was in full compliance with the restrictive covenants under its various credit agreements, loan agreements and indentures.

Additionally, the Company's Credit Agreement contains customary cross-default provisions. These provisions provide that a default on a debt service payment of $50 million or more for longer than the grace period provided under another agreement may result in an event of default under this agreement. The Company's 9% non-callable debentures also contain a customary cross default provision triggered by the Company's default on a debt service payment of $10 million or more. None of the Company's primary debt obligations are secured or guaranteed by the Company's affiliates.

Long-term Debt Maturities

($ in millions)	***Maturity per year***
2020	$503
2021	$166
2022	$669
2023	$302
2024	$396
Thereafter	$3,006

Short-term Debt Obligations

($ in millions)	***2019***	***2018***
Various, weighted average 3.6% and 3.4% as of December 31, 2019 and 2018, respectively.	$10	$4

Lines of Credit, Letters of Credit, Surety Bonds and Guarantees

PPG's non-U.S. operations have uncommitted lines of credit totaling $396 million of which $2 million was used as of December 31, 2019. These uncommitted lines of credit are subject to cancellation at any time and are generally not subject to any commitment fees.

The Company had outstanding letters of credit and surety bonds of $152 million and $158 million as of December 31, 2019 and 2018, respectively. The letters of credit secure the Company's performance to third parties under certain self-insurance programs and other commitments made in the ordinary course of business.

As of December 31, 2019 and 2018, guarantees outstanding were $9 million and $14 million, respectively. The guarantees relate primarily to debt of certain entities in which PPG has an ownership interest and selected customers of certain PPG businesses. A portion of such debt is secured by the assets of the related entities. The carrying value of these guarantees were zero at December 31, 2019 and 2018, and the fair values of these guarantees were zero and $1 million at December 31, 2019 and 2018, respectively. The fair value of each guarantee was estimated by comparing the net present value of two hypothetical cash flow streams, one based on PPG's incremental borrowing rate and the other based on the borrower's incremental borrowing rate, as of the effective date of the guarantee. Both streams were discounted at a risk free rate of return. The Company does not believe any loss related to these letters of credit, surety bonds or guarantees is likely.

10. Financial Instruments, Hedging Activities and Fair Value Measurements

Financial instruments include cash and cash equivalents, short-term investments, cash held in escrow, marketable equity securities, accounts receivable, company-owned life insurance, accounts payable, short-term and long-term debt instruments, and derivatives. The fair values of these financial instruments approximated their carrying values at December 31, 2019 and 2018, in the aggregate, except for long-term debt instruments.

Hedging Activities

The Company has exposure to market risk from changes in foreign currency exchange rates and interest rates. As a result, financial instruments, including derivatives, have been used to hedge a portion of these underlying economic exposures. Certain of these instruments qualify as fair value, cash flow, and net investment hedges upon meeting the requisite criteria, including effectiveness of offsetting hedged or underlying exposures. Changes in the fair value of derivatives that do not qualify for hedge accounting are recognized in Income before income taxes in the period incurred.

PPG's policies do not permit speculative use of derivative financial instruments. PPG enters into derivative financial instruments with high credit quality counterparties and diversifies its positions among such counterparties in order to reduce its exposure to credit losses. The Company did not realize a credit loss on derivatives during the three-year period ended December 31, 2019.

All of PPG's outstanding derivative instruments are subject to accelerated settlement in the event of PPG's failure to meet its debt or payment obligations under the terms of the instruments' contractual provisions. In addition, if the Company would be acquired and its payment obligations under its derivative instruments' contractual arrangements are not assumed by the acquirer, or if PPG would enter into bankruptcy, receivership or reorganization proceedings, its outstanding derivative instruments would also be subject to accelerated settlement.

In 2019 and 2018, there were no derivative instruments de-designated or discontinued as a hedging instrument. There were no gains or losses deferred in Accumulated other comprehensive loss on the consolidated balance sheet that were reclassified to Income before income taxes in the consolidated statement of income during the three-year period ended December 31, 2019 related to hedges of anticipated transactions that were no longer expected to occur.

Fair Value Hedges

The Company uses interest rate swaps from time to time to manage its exposure to changing interest rates. When outstanding, the interest rate swaps are typically designated as fair value hedges of certain outstanding debt obligations of the Company and are recorded at fair value.

In February 2018, PPG entered into interest rate swaps which converted $525 million of fixed rate debt to variable rate debt. The swaps are designated as fair value hedges and are carried at fair value. Changes in the fair value of these swaps and changes in the fair value of the related debt are recorded in Interest expense in the accompanying consolidated statement of income. The fair value of these interest rate swaps was $35 million and $8 million at December 31, 2019 and 2018, respectively.

Cash Flow Hedges

PPG designates certain foreign currency forward contracts as cash flow hedges of the Company’s exposure to variability in exchange rates on third party transactions denominated in foreign currencies. Underlying notional amounts related to these foreign currency forward contracts were $43 million and $50 million at December 31, 2019 and 2018, respectively. As of December 31, 2019 and 2018, the fair value of all foreign currency forward contracts designated as cash flow hedges was a liability of $1 million for both periods.

Net Investment Hedges

PPG uses cross currency swaps and foreign currency euro-denominated debt to hedge a significant portion of its net investment in its European operations, as follows:

In August 2019, PPG entered into U.S. dollar to euro cross currency swap contracts with a total notional amount of $300 million and designated these contracts as hedges of the Company’s net investment in its European operations. During the term of these contracts, PPG will receive payments in U.S. dollars and make payments in euros to the counterparties.

In February 2018, PPG entered into U.S. dollar to euro cross currency swap contracts with a total notional amount of $575 million and designated these contracts as hedges of the Company's net investment in its European operations. During the term of these contracts, PPG will receive payments in U.S. dollars and make payments in euros to the counterparties. Also in February 2018, the Company settled outstanding U.S. dollar to euro cross currency swap contracts with a total notional amount of $560 million.

As of December 31, 2019 and 2018, the fair value of the 2019 and 2018 U.S. dollar to euro cross currency swap contracts was a net asset of $48 million and an asset of $35 million, respectively.

At December 31, 2019 and 2018, PPG had designated €2.0 billion and €2.3 billion, respectively, of euro-denominated borrowings as hedges of a portion of its net investment in the Company’s European operations. The carrying value of these instruments at December 31, 2019 and 2018 was $2.2 billion and $2.6 billion, respectively.

During 2017, PPG used foreign currency forward contracts to hedge a portion of its net investment in its European operations. Changes in the fair value of these derivative instruments were recorded in Accumulated other comprehensive loss on the consolidated balance sheet as gains or losses. The Company paid $3 million to settle a foreign currency forward contract in 2017. There were no foreign currency forward contracts designated as net investment hedges used or outstanding as of and for the periods ended December 31, 2019, 2018 and 2017.

Other Financial Instruments

PPG uses foreign currency forward contracts to manage net transaction exposures that do not qualify for hedge accounting; therefore, the change in the fair value of these instruments is recorded in Other charges in the consolidated statement of income in the period of change. Underlying notional amounts related to these foreign currency forward contracts were $2.8 billion and $2.5 billion at December 31, 2019 and 2018, respectively. As of December 31, 2019 and 2018, the fair values of these contracts were a net liability of $6 million and a net asset of $36 million, respectively.

Gains/Losses Deferred in Accumulated Other Comprehensive Loss

As of December 31, 2019 and 2018, the Company had accumulated pretax unrealized translation gains in Accumulated other comprehensive loss on the consolidated balance sheet related to the euro-denominated borrowings, foreign currency forward contracts, and the cross currency swaps of $235 million and $161 million, respectively.

The following table summarizes the location within the consolidated financial statements and amount of gains/(losses) related to derivative and debt financial instruments for the years ended December 31, 2019, 2018 and 2017. All dollar amounts are shown on a pretax basis.

	2019		2018		2017		
($ in millions)	Gain Deferred in AOCL	Gain/(Loss) Recognized	(Loss)/Gain Deferred in AOCL	Gain/(Loss) Recognized	Loss Deferred in AOCL	Gain Recognized	Caption in Consolidated Statement of Income
Fair Value							
Interest rate Swaps		$3		$3		$—	Interest expense
Total Fair Value		$3		$3		$—	
Cash Flow							
Foreign currency forward contracts	$2	($3)	($9)	($8)	($7)	$9	Other charges and Cost of sales
Total Cash Flow	$2	($3)	($9)	($8)	($7)	$9	
Net Investment							
Cross currency swaps	$13	$18	$21	$13	($61)	$—	Interest expense
Foreign denominated debt	61	—	124	—	(403)	—	
Total Net Investment	$74	$18	$145	$13	($464)	$—	
Economic							
Foreign currency forward contracts		$55		$55		$14	Other charges

Fair Value Measurements

The Company follows a fair value measurement hierarchy to measure its assets and liabilities. As of December 31, 2019 and 2018, respectively, the assets and liabilities measured at fair value on a recurring basis were cash equivalents, equity securities and derivatives. In addition, the Company measures its pension plan assets at fair value (see Note 13, "Employee Benefit Plans" for further details). The Company's financial assets and liabilities are measured using inputs from the following three levels:

Level 1 inputs are quoted prices in active markets for identical assets and liabilities that the Company has the ability to access at the measurement date. Level 1 inputs are considered to be the most reliable evidence of fair value as they are based on unadjusted quoted market prices from various financial information service providers and securities exchanges.

Level 2 inputs are directly or indirectly observable prices that are not quoted on active exchanges, which include quoted prices for similar assets and liabilities in active markets, quoted prices for identical or similar assets or liabilities in markets that are not active, inputs other than quoted prices that are observable for the asset or liability and inputs that are derived principally from or corroborated by observable market data by correlation or other means. The fair values of the derivative instruments reflect the instruments' contractual terms, including the period to maturity, and uses observable market-based inputs, including forward curves.

Level 3 inputs are unobservable inputs employed for measuring the fair value of assets or liabilities. The Company does not have any recurring financial assets or liabilities that are recorded in its consolidated balance sheets as of December 31, 2019 and 2018 that are classified as Level 3 inputs.

Assets and liabilities reported at fair value on a recurring basis

	December 31, 2019			December 31, 2018		
($ in millions)	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3
Assets:						
Other current assets:						
Marketable equity securities	$5	$—	$—	$4	$—	$—
Foreign currency forward contracts[(a)]	—	14	—	—	45	—
Other assets:						
Cross currency swaps[(b)]	$—	$52	$—	$—	$35	$—
Interest rate swaps[(c)]	—	35	—	—	8	—
Investments:						
Marketable equity securities	$80	$—	$—	$69	$—	$—
Liabilities:						
Accounts payable and accrued liabilities:						
Foreign currency forward contracts[(d)]	$—	$1	$—	$—	$1	$—
Foreign currency forward contracts[(a)]	—	20	—	—	9	—
Other liabilities:						
Cross currency swap[(b)]	$—	$4	$—	$—	$—	$—

(a) Derivatives not designated as hedging instruments
(b) Net investment hedges
(c) Fair value hedges
(d) Cash flow hedges

Long-Term Debt

($ in millions)	December 31, 2019[(a)]	December 31, 2018[(b)]
Long-term debt - carrying value	$5,031	$5,000
Long-term debt - fair value	$5,363	$5,101

(a) Excluding finance lease obligations of $11 million and short term borrowings of $10 million as of December 31, 2019.
(b) Excluding capital lease obligations of $12 million and short term borrowings of $4 million as of December 31, 2018.

The fair values of the debt instruments were based on discounted cash flows and interest rates then currently available to the Company for instruments of the same remaining maturities and were measured using level 2 inputs.

Call and put option on noncontrolling interest

In December 2019, PPG paid cash to acquire the remaining noncontrolling interest in a coatings business, of which PPG previously had a majority interest. Prior to this transaction, the minority shareholder's results were included in Net income attributable to noncontrolling interests on the consolidated statement of income. Historically, PPG recorded the noncontrolling interest in this consolidated affiliate as a liability instead of equity on its consolidated balance sheets due to call and put option provisions associated with the noncontrolling interest, which had similar terms. As a result of the December 2019 transaction, this liability is no longer outstanding as of December 31, 2019. As of December 31, 2018, the liability was $40 million.

Notes to the Consolidated Financial Statements

11. Earnings Per Common Share

($ in millions, except per share amounts)	2019	2018	2017
Earnings per common share (attributable to PPG)			
Income from continuing operations, net of tax	$1,243	$1,323	$1,369
Income from discontinued operations, net of tax	—	18	225
Net income (attributable to PPG)	$1,243	$1,341	$1,594
Weighted average common shares outstanding	236.9	243.9	256.1
Effect of dilutive securities:			
Stock options	0.6	0.8	0.9
Other stock compensation plans	0.7	0.7	0.8
Potentially dilutive common shares	1.3	1.5	1.7
Adjusted weighted average common shares outstanding	238.2	245.4	257.8
Earnings per common share (attributable to PPG):			
Income from continuing operations, net of tax	$5.25	$5.43	$5.34
Income from discontinued operations, net of tax	—	0.07	0.88
Net income (attributable to PPG)	$5.25	$5.50	$6.22
Earnings per common share - assuming dilution (attributable to PPG)			
Income from continuing operations, net of tax	$5.22	$5.40	$5.31
Income from discontinued operations, net of tax	—	0.07	0.87
Net income (attributable to PPG)	$5.22	$5.47	$6.18

There were 0.9 million, 1.0 million, and 0.6 million outstanding stock options excluded in 2019, 2018 and 2017, respectively, from the computation of earnings per diluted common share due to their anti-dilutive effect.

12. Income Taxes

The provision for income taxes by taxing jurisdiction and by significant components consisted of the following:

($ in millions)	2019	2018	2017
Current			
U.S. federal	$86	$7	$179
U.S. state and local	15	4	49
Foreign	296	297	349
Total current income tax expense	$397	$308	$577
Deferred			
U.S. federal	($1)	$44	$107
U.S. state and local	13	7	(16)
Foreign	(17)	(6)	(53)
Total deferred income tax expense	($5)	$45	$38
Total income tax expense	$392	$353	$615

A reconciliation of the statutory U.S. corporate federal income tax rate to the Company's effective tax rate follows:

	2019	2018	2017
U.S. federal income tax rate	21.0 %	21.0 %	35.0 %
Changes in rate due to:			
U.S. tax cost/(benefit) - Tax Cuts & Jobs Act	0.3	(2.5)	11.0
U.S./foreign tax differential	2.9	3.3	(9.3)
U.S. current tax benefit on foreign exchange realization	—	—	(4.9)
U.S. tax incentives	(0.7)	(1.0)	(2.3)
U.S. tax benefit on foreign dividends	(0.9)	(0.4)	(1.9)
U.S. state and local taxes	1.3	0.5	1.1
U.S. deferred tax benefit on foreign income	—	—	(0.6)

Other	(0.3)	—	2.6
Effective income tax rate	**23.6 %**	**20.9 %**	**30.7 %**

Notes to the Consolidated Financial Statements

The effective income tax rate for 2019 and 2018 was 23.6% and 20.9%, respectively. The lower effective income tax rate in 2018 reflected a net benefit for provisional adjustments related to the Tax Cuts and Jobs Act. The company continues to realize tax credit incentives mostly comprised of U.S. benefits for research and development activities. Provisions for income taxes in 2019 also included a net benefit of global intangible low taxed income expense, foreign derived intangible income deductions and foreign tax credits. The total benefit for these U.S. provision items in 2019 was $22 million.

In 2018, PPG implemented updated regulations for certain aspects of the Tax Cuts and Jobs Act and PPG completed its accounting for the provisional amounts recognized in its consolidated financial statements in 2017. The finalization of the provisional accounting during 2018 resulted in a net tax benefit of $42 million, which consisted of a benefit of $20 million related to unrepatriated foreign earnings, a benefit of $22 million for adjustments to certain deferred taxes, a benefit of $14 million for foreign derived intangible income, partially offset by an expense of $14 million for global intangible low taxed income.

On December 22, 2017, the U.S. enacted the Tax Cuts and Jobs Act which, among other things lowered the U.S. corporate statutory income tax rate from 35% to 21%, eliminated certain deductible items and added other deductible items for corporations, imposed a tax on unrepatriated foreign earnings and eliminated U.S. taxes on most future foreign earnings.

In December 2017, as a result of the Tax Cuts and Jobs Act, the Company recorded a provisional net tax charge of $134 million, which included a tax on unrepatriated earnings of $250 million, a charge of approximately $125 million related to the remeasurement of U.S. deferred taxes at the new enacted statutory rate, partially offset by a benefit from the reversal of an existing deferred tax liability on repatriated foreign earnings of approximately $150 million and a benefit resulting from PPG's decision to accelerate recognition of certain U.S. tax attributes during the fourth quarter. The total tax expense for 2017 includes a deferred tax benefit of $22 million related to the $60 million of pretax pension settlement charges discussed in Note 13, "Employee Benefit Plans."

Income before income taxes of the Company's U.S. operations for 2019, 2018 and 2017 was $596 million, $571 million and $713 million, respectively. Income before income taxes of the Company's foreign operations for 2019, 2018 and 2017 was $1,065 million, $1,122 million and $1,292 million, respectively.

Deferred income taxes

Deferred income taxes are provided for the effect of temporary differences that arise because there are certain items treated differently for financial accounting than for income tax reporting purposes. The deferred tax assets and liabilities are determined by applying the enacted tax rate in the year in which the temporary difference is expected to reverse.

($ in millions)	***2019***	***2018***
Deferred income tax assets related to		
Employee benefits	$382	$366
Contingent and accrued liabilities	148	149
Operating loss and other carry-forwards	225	251
Inventories	4	7
Other	87	82
Valuation allowance	(158)	(164)
Total	$688	$691
Deferred income tax liabilities related to		
Property	$277	$262
Intangibles	594	545
Employee benefits	65	46
Other	2	15
Total	$938	$868
Deferred income tax liabilities – net	($250)	($177)

Net operating loss and credit carryforwards

($ in millions)	***2019***	***2018***	***Expiration***
Available net operating loss carryforwards, Tax Effected:			
Indefinite expiration	$157	$124	NA
Definite expiration	25	68	2020 - 2039
Total	$182	$192	NA
Income tax credit carryforwards	$59	$61	2020 - 2039

Notes to the Consolidated Financial Statements

A valuation allowance of $158 million and $164 million has been established for carry-forwards and certain other items at December 31, 2019 and 2018, respectively, when the ability to utilize them is not likely.

Undistributed foreign earnings

The Company had $3.6 billion and $3.0 billion of undistributed earnings of non-U.S. subsidiaries as of December 31, 2019 and 2018, respectively. These amounts relate to approximately 290 subsidiaries in approximately 75 taxable jurisdictions. The Company estimates repatriation of undistributed earnings of non-U.S. subsidiaries as of December 31, 2019 and 2018 would have resulted in a tax cost of $32 million and $19 million, respectively.

PPG has established deferred tax liabilities on certain undistributed earnings, namely in connection with divestitures and the funding of the Pittsburgh Corning Asbestos Trust (refer to Note 14, "Commitments and Contingent Liabilities").

As of December 31, 2019, with exception of the aforementioned deferred liability established for the asbestos trust, the Company has not changed its intention to reinvest foreign earnings indefinitely or repatriate when it is tax effective to do so, and as such, has not established a liability for foreign withholding taxes or other costs that would be incurred if the earnings were repatriated.

Unrecognized tax benefits

The Company files federal, state and local income tax returns in numerous domestic and foreign jurisdictions. In most tax jurisdictions, returns are subject to examination by the relevant tax authorities for a number of years after the returns have been filed. The Company is no longer subject to examinations by tax authorities in any major tax jurisdiction for years before 2008. Additionally, the Company is no longer subject to examination by the Internal Revenue Service for U.S. federal income tax returns filed for years through 2014. The examinations of the Company's U.S. federal income tax returns for 2015 through 2016 are currently underway.

A reconciliation of the total amounts of unrecognized tax benefits (excluding interest and penalties) as of December 31 follows:

($ in millions)	***2019***	***2018***	***2017***
January 1	$166	$148	$94
Current year tax positions - additions	25	36	37
Prior year tax positions - additions	4	17	26
Prior year tax positions - reductions	(9)	(6)	—
Statute of limitations expirations	(6)	(9)	(8)
Settlements	(12)	(15)	(10)
Foreign currency translation	(1)	(5)	9
December 31	$167	$166	$148

The Company expects that any reasonably possible change in the amount of unrecognized tax benefits in the next 12 months would not be significant.

The total amount of unrecognized tax benefits that, if recognized, would affect the effective tax rate was $143 million as of December 31, 2019.

Interest and penalties

($ in millions)	***2019***	***2018***	***2017***
Accrued interest and penalties related to unrecognized tax benefits	$17	$16	$15
Loss recognized in income tax expense related to interest and penalties	$1	$2	$4

The Company recognizes accrued interest and penalties related to unrecognized tax benefits in income tax expense.

13. Employee Benefit Plans

Defined Benefit Plans

PPG has defined benefit pension plans that cover certain employees worldwide. The principal defined benefit pension plans are those in the U.S., Canada, the Netherlands and the U.K. These plans in the aggregate represent approximately 93% of PPG's total projected benefit obligation at December 31, 2019, of which the U.S. defined benefit pension plans represent the largest component.

As of January 1, 2006, the Company's U.S. salaried defined benefit plans were closed to new entrants. In 2011, the Company approved amendments related to certain U.S. defined benefit plans so that depending upon the affected employee's combined age and years of service to PPG, certain employees stopped or will stop accruing benefits either in 2011 or at the end of 2020. The affected employees will participate in the Company's defined contribution retirement plans from the date their benefits under their respective defined benefit plans are frozen.

The Company has amended other defined benefit plans in other countries in a similar way and plans to continue reviewing and potentially amending other PPG defined benefit plans in the future.

Postretirement medical

PPG sponsors welfare benefit plans that provide postretirement medical and life insurance benefits for certain U.S. and Canadian employees and their dependents of which the U.S. welfare benefit plans represent approximately 87% of PPG's total projected benefit obligation at December 31, 2019. Salaried and certain hourly employees in the U.S. hired on or after October 1, 2004, or rehired on or after October 1, 2012 are not eligible for postretirement medical benefits.

These plans in the U.S. and Canada require retiree contributions based on retiree-selected coverage levels for certain retirees and their dependents and provide for sharing of future benefit cost increases between PPG and participants based on management discretion. The Company has the right to modify, amend or terminate certain of these benefit plans in the future.

Effective January 1, 2017, the Company-sponsored Medicare-eligible plans were replaced by a Medicare private exchange. The announcement of this plan design change triggered a remeasurement of PPG's retiree medical benefit obligation using prevailing interest rates. The plan design change resulted in a $306 million reduction in the Company's postretirement benefit obligation. PPG accounted for the plan design change prospectively, and the impact will be amortized to periodic postretirement benefit cost over a 5.6 year period through 2022.

The following table sets forth the changes in projected benefit obligations ("PBO") (as calculated as of December 31), plan assets, the funded status and the amounts recognized on the accompanying consolidated balance sheet for the Company's defined benefit pension and other postretirement benefit plans:

	Defined Benefit Pension Plans					
	United States		International		Total PPG	
($ in millions)	2019	2018	2019	2018	2019	2018
Projected benefit obligation, January 1	$1,582	$1,706	$1,518	$1,756	$3,100	$3,462
Service cost	13	17	10	11	23	28
Interest cost	64	57	41	40	105	97
Actuarial losses (gains) - net	263	(129)	186	(117)	449	(246)
Benefits paid	(80)	(70)	(64)	(55)	(144)	(125)
Plan transfers	—	—	—	(8)	—	(8)
Foreign currency translation adjustments	—	—	34	(88)	34	(88)
Settlements and curtailments	—	—	(4)	(24)	(4)	(24)
Other	—	1	(2)	3	(2)	4
Projected benefit obligation, December 31	$1,842	$1,582	$1,719	$1,518	$3,561	$3,100
Market value of plan assets, January 1	$1,140	$1,196	$1,478	$1,687	$2,618	$2,883
Actual return on plan assets	219	(82)	190	(53)	409	(135)
Company contributions	—	75	13	24	13	99
Benefits paid	(55)	(49)	(56)	(53)	(111)	(102)
Plan settlements	—	—	(4)	(24)	(4)	(24)
Foreign currency translation adjustments	—	—	42	(95)	42	(95)
Other	—	—	(2)	(8)	(2)	(8)
Market value of plan assets, December 31	$1,304	$1,140	$1,661	$1,478	$2,965	$2,618
Funded Status	($538)	($442)	($58)	($40)	($596)	($482)
Amounts recognized in the Consolidated Balance Sheet:						
Other assets (long-term)	—	—	183	189	183	189
Accounts payable and accrued liabilities	(26)	(18)	(8)	(8)	(34)	(26)
Accrued pensions	(512)	(424)	(233)	(221)	(745)	(645)
Net liability recognized	($538)	($442)	($58)	($40)	($596)	($482)

	Other Postretirement Benefit Plans					
	United States		International		Total PPG	
($ in millions)	2019	2018	2019	2018	2019	2018
Projected benefit obligation, January 1	$587	$641	$94	$112	$681	$753
Service cost	8	9	—	1	8	10
Interest cost	23	21	3	3	26	24
Plan amendments	(17)	—	—	—	(17)	—
Actuarial losses (gains) - net	59	(38)	1	(9)	60	(47)
Benefits paid	(44)	(45)	(5)	(4)	(49)	(49)
Foreign currency translation adjustments	—	—	4	(8)	4	(8)
Other	—	(1)	(1)	(1)	(1)	(2)
Projected benefit obligation, December 31	$616	$587	$96	$94	$712	$681
Amounts recognized in the Consolidated Balance Sheet:						
Accounts payable and accrued liabilities	(46)	(48)	(5)	(4)	(51)	(52)
Other postretirement benefits	(570)	(539)	(91)	(90)	(661)	(629)
Net liability recognized	($616)	($587)	($96)	($94)	($712)	($681)

The PBO is the actuarial present value of benefits attributable to employee service rendered to date, including the effects of estimated future pay increases. The accumulated benefit obligation ("ABO") is the actuarial present value of benefits attributable to employee service rendered to date, but does not include the effects of estimated future pay increases. The ABO for all defined benefit pension plans as of December 31, 2019 and 2018 was $3.4 billion and $2.9 billion, respectively.

The following table details the pension plans where the benefit liability exceeds the fair value of the plan assets:

	Pensions	
($ in millions)	2019	2018
Plans with PBO in Excess of Plan Assets:		
Projected benefit obligation	$2,223	$1,935
Fair value of plan assets	$1,449	$1,269
Plans with ABO in Excess of Plan Assets:		
Accumulated benefit obligation	$2,176	$1,883
Fair value of plan assets	$1,449	$1,269

Net actuarial losses and prior service cost/(credit) deferred in accumulated other comprehensive loss

	Pensions		Other Postretirement Benefits	
($ in millions)	2019	2018	2019	2018
Accumulated net actuarial losses	$920	$800	$166	$113
Accumulated prior service cost (credit)	2	2	(138)	(178)
Total	$922	$802	$28	($65)

The accumulated net actuarial losses for pensions and other postretirement benefits relate primarily to historical declines in the discount rates. The accumulated net actuarial losses exceeded 10% of the higher of the market value of plan assets or the PBO at the beginning of each of the last three years; therefore, amortization of such excess has been included in net periodic benefit costs for pension and other postretirement benefits in these periods. The amortization period is the average remaining service period of active employees expected to receive benefits unless a plan is mostly inactive in which case the amortization period is the average remaining life expectancy of the plan participants. Accumulated prior service cost (credit) is amortized over the future service periods of those employees who are active at the dates of the plan amendments and who are expected to receive benefits.

The net increase in Accumulated other comprehensive loss (pretax) in 2019 relating to defined benefit pension and other postretirement benefits is primarily attributable to pension and other postretirement plan discount rate declines, as follows:

($ in millions)	Pensions	Other Postretirement Benefits
Net actuarial loss arising during the year	$179	$60
New prior service credit	—	(17)
Amortization of actuarial loss	(62)	(8)
Amortization of prior service credit	—	57
Foreign currency translation adjustments	5	1
Impact of settlements and curtailments	(2)	—
Net change	$120	$93

The 2019 net actuarial loss related to the Company's pension and other postretirement benefit plans was primarily due to a decrease in the weighted average discount rate used to determine the benefit obligation at December 31, 2019, partially offset by asset performance gains on plan assets for the year.

Net periodic benefit cost

	Pensions			Other Postretirement Benefits		
($ in millions)	2019	2018	2017	2019	2018	2017
Service cost	$23	$28	$33	$8	$10	$10
Interest cost	105	97	98	26	24	24
Expected return on plan assets	(139)	(150)	(141)	—	—	—
Amortization of prior service credit	—	—	—	(57)	(60)	(59)
Amortization of actuarial losses	62	63	75	8	19	12
Settlements, curtailments, and special termination benefits	3	5	60	—	—	—
Net periodic benefit cost/(income)	$54	$43	$125	($15)	($7)	($13)

Service cost for net periodic pension and other postretirement benefit costs is included in Cost of sales, exclusive of depreciation and amortization, Selling, general and administrative, and Research and development, net in the accompanying consolidated statements of income. Except for Pension settlement charges in 2017, all other components of net periodic benefit cost are recorded in Other charges in the accompanying consolidated statements of income.

Key assumptions

The following weighted average assumptions were used to determine the benefit obligation for the Company's defined benefit pension and other postretirement plans as of December 31, 2019 and 2018:

	United States		International		Total PPG	
	2019	2018	2019	2018	2019	2018
Discount rate	3.3%	4.4%	2.2%	2.9%	2.8%	3.7%
Rate of compensation increase	2.5%	1.5%	2.8%	0.9%	2.6%	1.2%

The following weighted average assumptions were used to determine the net periodic benefit cost for the Company's defined benefit pension and other postretirement benefit plans for the three years in the period ended December 31, 2019:

	2019	2018	2017
Discount rate	3.7%	3.2%	3.6%
Expected return on assets	5.4%	5.4%	5.4%
Rate of compensation increase	1.8%	1.2%	1.3%

These assumptions for each plan are reviewed on an annual basis. In determining the expected return on plan asset assumption, the Company evaluates the mix of investments that comprise each plan's assets and external forecasts of future long-term investment returns. The Company compares the expected return on plan assets assumption to actual historic returns to ensure reasonability. For 2019, the return on plan assets assumption for PPG's U.S. defined benefit pension plans was 7.4%. A change in the rate of return of 100 basis points, with other assumptions held constant, would impact 2019 net periodic pension expense by $13 million. The global expected return on plan assets assumption to be used in determining 2020 net periodic pension expense will be 5.0% (7.4% for the U.S. plans only).

The discount rates used in accounting for pension and other postretirement benefits are determined using a yield curve constructed of high-quality fixed-income securities as of the measurement date and using the plans' projected benefit payments. The Company has elected to use a full yield curve approach in the estimation of the service and interest cost components of net periodic pension benefit cost (income) for countries with significant pension plans. The full yield curve approach (also known as the split-rate or spot-rate method) allows the Company to align the applicable discount rates with the cost of additional service being earned and the interest being accrued on these obligations. A change in the discount rate of 100 basis points, with all other assumptions held constant, would impact 2020 net periodic benefit expense for our defined benefit pension and other postretirement benefit plans by $16 million and $6 million, respectively.

In 2019, the Company updated mortality tables used to calculate its U.S. defined benefit pension and other postretirement benefit liabilities. The Company considered the available mortality tables released by the Society of Actuaries' Retirement Plans Experience Committee and performed a review of its own mortality history, as well the industry in which the Company operates to assess future improvements in mortality rates based on its U.S. population. The Company chose to value its U.S. defined benefit pension and other postretirement benefit liabilities using a slightly modified assumption of future mortality which better approximates our plan participant population.

The weighted-average health care cost trend rate (inflation) used for 2019 was 5.0% declining to a projected 4.3% in the year 2039. For 2020, the assumed weighted-average health care cost trend rate used will be 4.8% declining to a projected 4.3% between 2020 and 2039 for medical and prescription drug costs, respectively. These assumptions are reviewed on an annual basis. In selecting rates for current and long-term health care cost assumptions, the Company takes into consideration a number of factors, including the Company's actual health care cost increases, the design of the Company's benefit programs, the demographics of the Company's active and retiree populations and external expectations of future medical cost inflation rates.

Contributions to defined benefit pension plans

($ in millions)	***2019***	***2018***	***2017***
U.S. defined benefit pension plans	$—	$75	$54
Non-U.S. defined benefit pension plans	$13	$24	$33

PPG made voluntary contributions of $75 million to its U.S. defined benefit pension plans in 2018. Contributions made to PPG's non-U.S. defined benefit pension plans in 2019 and 2018 were required by local funding requirements. PPG expects to make mandatory contributions to its non-U.S. plans in the range of $15 million to $20 million in 2020. PPG may make voluntary contributions to its defined benefit pension plans in 2020 and beyond.

Benefit payments

The estimated benefits expected to be paid under the Company's defined benefit pension and other postretirement benefit plans are:

($ in millions)	***Pensions***	***Other Postretirement Benefits***
2020	$145	$51
2021	$143	$51
2022	$146	$50
2023	$153	$49
2024	$160	$48
2025 to 2029	$845	$209

U.S. Qualified Pension

Beginning in 2012, the Company offered a lump sum payout option that gave certain terminated vested participants in certain U.S. defined benefit pension plans the opportunity to take a one-time lump sum cash payment in lieu of receiving a future monthly annuity. During 2017, PPG paid $87 million in lump sum benefits to terminated vested participants who elected to participate in the program. As the lump-sum payments were in excess of the expected 2017 service and interest costs for the qualified pension plans, PPG remeasured the periodic benefit obligation of the qualified plans and recorded a settlement charge totaling $35 million.

U.S. Non-qualified Pension

In the first quarter 2017, PPG made lump-sum payments to certain retirees who had participated in PPG's U.S. non-qualified pension plan (the "Nonqualified Plan") totaling approximately $40 million. As the lump-sum payments were in excess of the expected 2017 service and interest costs for the Nonqualified Plan, PPG remeasured the periodic benefit obligation of the Nonqualified Plan as of March 1, 2017 and recorded a settlement charge totaling $22 million.

Plan assets

Each PPG sponsored defined benefit pension plan is managed in accordance with the requirements of local laws and regulations governing defined benefit pension plans for the exclusive purpose of providing pension benefits to participants and their beneficiaries. Investment committees comprised of PPG managers have fiduciary responsibility to oversee the management of pension plan assets by third party asset managers. Pension plan assets are held in trust by financial institutions and managed on a day-to-day basis by the asset managers. The asset managers receive a mandate from each investment committee that is aligned with the asset allocation targets established by each investment committee to achieve the plan's investment strategies. The performance of the asset managers is monitored and evaluated by the investment committees throughout the year.

Pension plan assets are invested to generate investment earnings over an extended time horizon to help fund the cost of benefits promised under the plans while mitigating investment risk. The asset allocation targets established for each pension plan are intended to diversify the investments among a variety of asset categories and among a variety of individual securities within each asset category to mitigate investment risk and provide each plan with sufficient liquidity to fund the payment of pension benefits to retirees.

The following summarizes the weighted average target pension plan asset allocation as of December 31, 2019 and 2018 for all PPG defined benefit plans:

Asset Category	*2019*	*2018*
Equity securities	15-45%	15-45%
Debt securities	30-65%	30-65%
Real estate	0-10%	0-10%
Other	20-40%	20-40%

The fair values of the Company's pension plan assets at December 31, 2019 and 2018, by asset category, are as follows:

	December 31, 2019				December 31, 2018			
($ in millions)	Level 1[1]	Level 2[1]	Level 3[1]	Total	Level 1[1]	Level 2[1]	Level 3[1]	Total
Asset Category								
Equity securities:								
U.S.								
Large cap	$58	$80	$—	$138	$43	$94	$—	$137
Small cap	41	—	—	41	23	—	—	23
Non-U.S.								
Developed and emerging markets[2]	143	84	—	227	115	103	—	218
Debt securities:								
Cash and cash equivalents	10	16	—	26	3	19	—	22
Corporate[3]								
U.S.[4]	—	337	77	414	—	220	77	297
Developed and emerging markets[2]	—	2	—	2	—	4	—	4
Diversified[5]	—	237	—	237	—	142	—	142
Government								
U.S.[4]	72	9	—	81	68	8	—	76
Developed markets	—	7	—	7	—	6	—	6
Other[6]	—	18	377	395	—	14	359	373
Real estate, hedge funds, and other	—	303	381	684	—	304	359	663
Total assets in the fair value hierarchy	$324	$1,093	$835	$2,252	$252	$914	$795	$1,961
Common-collective trusts[7]	—	—	—	713	—	—	—	657
Total Investments	$324	$1,093	$835	$2,965	$252	$914	$795	$2,618

(1) These levels refer to the accounting guidance on fair value measurement described in Note 10, "Financial Instruments, Hedging Activities and Fair Value Measurements."

(2) These amounts represent holdings in investment grade debt or equity securities of issuers in both developed markets and emerging economies.

(3) This category represents investment grade debt securities from a diverse set of industry issuers.

(4) These investments are primarily long duration fixed income securities.

(5) This category represents commingled funds invested in diverse portfolios of debt securities.

(6) This category includes mortgage-backed and asset backed debt securities, municipal bonds and other debt securities including derivatives.

(7) Certain investments that are measured at net asset value per share (or its equivalent) are not required to be classified in the fair value hierarchy.

The change in the fair value of the Company's Level 3 pension assets for the years ended December 31, 2019 and 2018 was as follows:

($ in millions)	Real Estate	Other Debt Securities	Hedge Funds and Other Assets	Total
January 1, 2018	$138	$418	$446	$1,002
Realized gains/(losses)	9	(29)	10	(10)
Unrealized losses	—	—	(28)	(28)
Transfers out, net	(6)	(12)	(119)	(137)
Foreign currency losses	(4)	(18)	(10)	(32)
December 31, 2018	$137	$359	$299	$795
Realized gains/(losses)	18	38	(3)	53
Unrealized (losses)/gains	(7)	—	15	8
Transfers (out)/in, net	(27)	(12)	17	(22)
Foreign currency gains/(losses)	2	(8)	7	1
December 31, 2019	$123	$377	$335	$835

Real estate properties are externally appraised at least annually by reputable, independent appraisal firms. Property valuations are also reviewed on a regular basis and are adjusted if there has been a significant change in circumstances related to the property since the last valuation.

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Other debt securities consist of insurance contracts, which are externally valued by insurance companies based on the present value of the expected future cash flows.

Hedge funds consist of a wide range of investments which target a relatively stable investment return. The underlying funds are valued at different frequencies, some monthly and some quarterly, based on the value of the underlying investments. Other assets consist primarily of small investments in private equity funds and senior secured debt obligations of non-investment grade borrowers.

Sale of the flat glass business

In 2018, PPG transferred pension assets of $20 million as a result of the sale of its flat glass business in 2016 and subsequent finalization of the transfer of pension obligations to the buyer.

Other Plans

Employee savings plans

PPG's Employee Savings Plans ("Savings Plans") cover substantially all employees in the U.S., Puerto Rico and Canada. The Company makes matching contributions to the Savings Plans, at management's discretion, based upon participants' savings, subject to certain limitations. For most participants not covered by a collective bargaining agreement, Company-matching contributions are established each year at the discretion of the Company and are applied to participant savings up to a maximum of 6% of eligible participant compensation. For those participants whose employment is covered by a collective bargaining agreement, the level of Company-matching contribution, if any, is determined by the relevant collective bargaining agreement. The Company-matching contribution remained at 100% for 2019.

Compensation expense and cash contributions related to the Company match of participant contributions to the Savings Plans for 2019, 2018, and 2017 totaled $49 million, $47 million and $46 million, respectively. A portion of the Savings Plans qualifies under the Internal Revenue Code as an Employee Stock Ownership Plan. Accordingly, dividends received on PPG shares held in that portion of the Savings Plans totaling $11 million, $13 million, and $14 million for 2019, 2018, and 2017, respectively, are deductible for PPG's U.S. Federal tax purposes.

Defined contribution plans

Additionally, the Company has defined contribution plans for certain employees in the U.S., China, United Kingdom, Australia, Italy, and other countries. The U.S. defined contribution plan is in the Employee Savings Plan and eligible employees receive a contribution equal to between 2% and 5% of annual compensation, based on age and years of service. For the years ended December 31, 2019, 2018, and 2017, the Company recognized expense for its defined contribution retirement plans of $70 million, $63 million and $57 million, respectively. The Company's annual cash contributions to its defined contribution retirement plans approximated the expense recognized in each year.

Deferred compensation plan

The Company has a deferred compensation plan for certain key managers which allows them to defer a portion of their compensation in a phantom PPG stock account or other phantom investment accounts. The amount deferred earns a return based on the investment options selected by the participant. The amount owed to participants is an unfunded and unsecured general obligation of the Company. Upon retirement, death, disability, termination of employment, scheduled payment or unforeseen emergency, the compensation deferred and related accumulated earnings are distributed in accordance with the participant's election in cash or in PPG stock, based on the accounts selected by the participant.

The plan provides participants with investment alternatives and the ability to transfer amounts between the phantom non-PPG stock investment accounts. To mitigate the impact on compensation expense of changes in the market value of the liability, the Company has purchased a portfolio of marketable securities that mirror the phantom non-PPG stock investment accounts selected by the participants, except the money market accounts. These investments are carried by PPG at fair market value, and the changes in market value of these securities are also included in Income before income taxes in the consolidated statement of income. Trading occurs in this portfolio to align the securities held with the participant's phantom non-PPG stock investment accounts, except the money market accounts.

The cost (benefit) of the deferred compensation plan, comprised of dividend equivalents accrued on the phantom PPG stock account, investment income and the change in market value of the liability, was $21 million, $(1) million and $19 million in 2019, 2018 and 2017, respectively. These amounts are included in Selling, general and administrative in the consolidated statements of income. The change in market value of the investment portfolio was income (expense) of $20 million, $(2) million, and $18 million in 2019, 2018 and 2017, respectively, and is also included in Selling, general and administrative in the consolidated statements of income.

The Company's obligations under this plan, which are included in Accounts payable and accrued liabilities and Other liabilities on the consolidated balance sheet, totaled $123 million and $110 million as of December 31, 2019 and 2018, respectively, and the investments in marketable securities, which are included in Investments and Other current assets on the accompanying consolidated balance sheet, were $85 million and $73 million as of December 31, 2019 and 2018, respectively.

14. Commitments and Contingent Liabilities

PPG is involved in a number of lawsuits and claims, both actual and potential, including some that it has asserted against others, in which substantial monetary damages are sought. These lawsuits and claims may relate to contract, patent, environmental, product liability, antitrust, employment and other matters arising out of the conduct of PPG's current and past business activities. To the extent that these lawsuits and claims involve personal injury, property damage, and certain other claims, PPG believes it has adequate insurance; however, certain of PPG's insurers are contesting coverage with respect to some of these claims, and other insurers, as they had prior to the asbestos settlement described below, may contest coverage with respect to some of the asbestos claims. PPG's lawsuits and claims against others include claims against insurers and other third parties with respect to actual and contingent losses related to environmental, asbestos and other matters.

The results of any current or future litigation and claims are inherently unpredictable. However, management believes that, in the aggregate, the outcome of all lawsuits and claims involving PPG will not have a material effect on PPG's consolidated financial position or liquidity; however, such outcome may be material to the results of operations of any particular period in which costs, if any, are recognized.

Shareholder Class Action

On May 20, 2018, a putative securities class action lawsuit was filed in the U.S. District Court for the Central District of California against the Company and three of its current and former officers. On September 21, 2018, an Amended Class Action Complaint was filed in the lawsuit. The Amended Complaint, captioned Trevor Mild v. PPG Industries, Inc., Michael H. McGarry, Vincent J. Morales, and Mark C. Kelly, asserted securities fraud claims under Sections 10(b) and 20(a) of the Securities Exchange Act of 1934 on behalf of a putative class of persons who purchased or otherwise acquired stock of the Company between January 19, 2017 and May 10, 2018. The allegations related to, among other things, allegedly false and misleading statements and/or failures to disclose information about the Company's business, operations and prospects. The parties reached a settlement in principal on May 1, 2019. On June 2, 2019, the plaintiff filed with the Court a Petition for Preliminary Approval of the proposed settlement, including the proposed settlement amount of $25 million. On November 22, 2019, the Court entered final judgment approving the settlement. PPG's insurance carriers confirmed to the Company insurance coverage for the full amount of the settlement. The settlement payment is expected to occur in 2020.

As of December 31, 2019, an accrued liability of $25 million for the proposed settlement amount and a corresponding asset for the insurance coverage of $25 million is included in Accounts payable and accrued liabilities and Other current assets, respectively.

Asbestos Matters

Prior to 2000, the Company had been named as a defendant in numerous claims alleging bodily injury from (i) exposure to asbestos-containing products allegedly manufactured, sold or distributed by the Company, its subsidiaries, or for which they are otherwise alleged to be liable; (ii) exposure to asbestos allegedly present at a facility owned or leased by the Company; or (iii) exposure to asbestos-containing products of Pittsburgh Corning Corporation ("PC") for which the Company was alleged to be liable under a variety of legal theories (the Company and Corning Incorporated were each 50% shareholders in PC prior to April 27, 2016).

Pittsburgh Corning Corporation asbestos bankruptcy

In 2000, PC filed for Chapter 11 in the U.S. Bankruptcy Court for the Western District of Pennsylvania in an effort to permanently and comprehensively resolve all of its pending and future asbestos-related liability claims. The Bankruptcy Court subsequently entered a series of orders preliminarily enjoining the prosecution of asbestos litigation against PPG until after the effective date of a confirmed PC plan of reorganization. During the pendency of this preliminary injunction staying asbestos litigation against PPG, PPG and certain of its historical liability insurers negotiated a settlement with representatives of present and future asbestos claimants. That settlement was incorporated into a PC plan of reorganization that was confirmed by the Bankruptcy Court on May 24, 2013 and ultimately became effective on April 27, 2016. With the effectiveness of the plan, the preliminary injunction staying the prosecution of asbestos litigation against PPG expired by its own terms on May 27, 2016. In accordance with the settlement, the Bankruptcy Court issued a permanent channeling injunction under Section 524(g) of the Bankruptcy Code that prohibits present and future claimants from asserting claims against PPG that arise, in whole or in part, out of exposure to asbestos or asbestos-containing products manufactured, sold and/or distributed by PC or asbestos on or emanating from any PC premises. The channeling injunction, by its terms, also prohibits codefendants in cases that are subject to the channeling injunction from asserting claims against PPG for contribution, indemnification or other recovery. The channeling injunction also precludes the prosecution of claims against PPG arising from alleged exposure to asbestos or asbestos-containing products to the extent that a claimant is alleging or seeking to impose liability, directly or indirectly, for the conduct of, claims against, or demands on PC by reason of PPG's prior: (i) ownership of a financial interest in PC; (ii) involvement in the management of PC, or service as an officer, director or employee of PC or a related party; (iii) provision of insurance to PC or a related party; or (iv) involvement in a financial transaction affecting the financial condition of PC or a related party. The foregoing PC related claims are referred to as "PC Relationship Claims."

The Bankruptcy Court's channeling injunction channels the Company's liability for PC Relationship Claims to a trust funded in part by PPG and its participating insurers for the benefit of current and future PC asbestos claimants (the "Trust"). The Trust is the sole recourse for holders of PC Relationship Claims. PPG and its affiliates have no further liability or responsibility for, and are permanently protected from, pending and future PC Relationship Claims. The channeling injunction does not extend to present and future claims against PPG that arise out of alleged exposure to asbestos or asbestos-containing products historically manufactured, sold and/or distributed by PPG or its subsidiaries or for which they are alleged to be liable that are not PC Relationship Claims, and does not extend to claims against PPG alleging personal injury allegedly caused by asbestos on premises presently or formerly owned, leased or occupied by PPG. These claims are referred to as "non-PC Relationship Claims."

Non-PC relationship claims

With respect to the asbestos-related claims pending against the Company at the time PC filed for bankruptcy, the Company considers such claims to fall within one or more of the following categories: (1) claims that have been closed or dismissed as a result of processes undertaken during the bankruptcy; (2) claims that may have been previously filed on the dockets of state and federal courts in various jurisdictions, but are inactive as to the Company; and (3) claims that are subject, in whole or in part, to the channeling injunction and thus will be resolved, in whole or in part, in accordance with the Trust procedures established under the PC bankruptcy reorganization plan. As a result of the foregoing, the Company does not consider these three categories of claims to be open or active litigation against it, although the Company cannot now determine whether, or the extent to which, any of these claims may in the future be reinstituted, reinstated, or revived such that they may become open and active non-PC Relationship Claims against it.

Current open and active claims post-Pittsburgh Corning bankruptcy

As of December 31, 2019, the Company was aware of approximately 605 open and active asbestos-related claims pending against the Company and certain of its subsidiaries. These claims consist of non-PC Relationship Claims against PPG and claims against a PPG subsidiary the Company acquired on April 1, 2013. The Company is defending these open and active claims vigorously.

PPG has established reserves totaling approximately $190 million for asbestos-related claims that would not be channeled to the Trust which, based on presently available information, we believe will be sufficient to encompass all of PPG's current and estimable potential future asbestos liabilities. These reserves, which are included within Other liabilities on the accompanying consolidated balance sheets, represent PPG's best estimate of its liability for these claims.

These reserves include a $162 million reserve established in 2009 in connection with an amendment to the PC plan of reorganization for non-PC Relationship Claims other than claims arising from premises-related exposures. PPG does not have sufficient current claim information or settlement history on which to base a better estimate of this liability in light of the fact that the Bankruptcy Court's injunction staying most asbestos claims against the Company was in effect from April 2000 through May 2016.

These reserves also include PPG's best estimate, following an analysis performed in 2019 of its claims history and discussions with consultants and its counsel, of the value of the Company's potential liability for premises-related non-PC Relationship Claims against it and claims against PPG's subsidiary acquired on April 1, 2013 that are presently pending, and that are projected to be asserted through December 31, 2028. In the fourth quarter of 2019, PPG increased the reserve related to these matters and recognized a charge of approximately $10 million included in Other charges in the consolidated statement of income.

PPG monitors the activity associated with its asbestos claims and evaluates, on a periodic basis, its estimated liability for such claims, its insurance assets then available, and all underlying assumptions to determine whether any adjustment to the reserves for these claims is required.

The amount reserved for asbestos-related claims by its nature is subject to many uncertainties that may change over time, including (i) the ultimate number of claims filed; (ii) the amounts required to resolve both currently known and future unknown claims; (iii) the amount of insurance, if any, available to cover such claims; (iv) the unpredictable aspects of the litigation process, including a changing trial docket and the jurisdictions in which trials are scheduled; (v) the outcome of any trials, including potential judgments or jury verdicts; (vi) the lack of specific information in many cases concerning exposure for which PPG is allegedly responsible, and the claimants' alleged diseases resulting from such exposure; and (vii) potential changes in applicable federal and/or state tort liability law. All of these factors may have a material effect upon future asbestos-related liability estimates. As a potential offset to any future asbestos financial exposure, under the PC plan of reorganization

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PPG retained, for its own account, the right to pursue insurance coverage from certain of its historical insurers that did not participate in the PC plan of reorganization. While the ultimate outcome of PPG's asbestos litigation cannot be predicted with certainty, PPG believes that any financial exposure resulting from its asbestos-related claims will not have a material adverse effect on PPG's consolidated financial position, liquidity or results of operations.

Environmental Matters

It is PPG's policy to accrue expenses for environmental contingencies when it is probable that a liability has been incurred and the amount of loss can be reasonably estimated. Reserves for environmental contingencies are exclusive of claims against third parties and are generally not discounted. In management's opinion, the Company operates in an environmentally sound manner and the outcome of the Company's environmental contingencies will not have a material effect on PPG's financial position or liquidity; however, any such outcome may be material to the results of operations of any particular period in which costs, if any, are recognized. Management anticipates that the resolution of the Company's environmental contingencies will occur over an extended period of time.

As remediation at certain legacy environmental sites progresses, PPG continues to refine its assumptions underlying the estimates of the expected future costs of its remediation programs. PPG's ongoing evaluation may result in additional charges against income to increase the reserves for these sites. Remediation activities at our legacy sites are not related to the ongoing operations of PPG. In 2019, 2018 and 2017, certain charges have been recorded based on updated estimates to increase existing reserves for these sites. Certain other charges related to environmental remediation actions are also expensed as incurred.

As of December 31, 2019 and 2018, PPG had reserves for environmental contingencies associated with PPG's former chromium manufacturing plant in Jersey City, New Jersey ("New Jersey Chrome"), glass and chemical manufacturing sites, and for other environmental contingencies, including current manufacturing locations and National Priority List sites. These reserves are reported as Accounts payable and accrued liabilities and Other liabilities in the accompanying consolidated balance sheet.

Environmental Reserves

($ in millions)	***2019***	***2018***
New Jersey Chrome	$134	$151
Glass and chemical	96	90
Other	74	50
Total	$304	$291
Current Portion	*$62*	*$105*

Pretax charges against income for environmental remediation costs are included in Other charges in the accompanying consolidated statement of income. The pretax charges and cash outlays related to such environmental remediation in 2019, 2018 and 2017, were as follows:

($ in millions)	***2019***	***2018***	***2017***
New Jersey Chrome	$43	$62	$4
Other	34	16	6
Total	$77	$78	$10
Cash outlays for environmental spending	*$77*	*$64*	*$44*

The Company continues to analyze, assess and remediate the environmental issues associated with New Jersey Chrome as further discussed below. During the past three years, charges for estimated environmental remediation costs were significantly higher than PPG's historical range. Excluding the charges related to New Jersey Chrome, pretax charges against income for environmental remediation have ranged between approximately $5 million and $35 million per year for the past 10 years.

Management expects cash outlays for environmental remediation costs to range from $80 million to $100 million in 2020 and $20 million to $50 million annually from 2021 through 2024.

It is possible that technological, regulatory and enforcement developments, the results of environmental studies and other factors could alter the Company's expectations with respect to future charges against income and future cash outlays. Specifically, the level of expected future remediation costs and cash outlays is highly dependent upon activity related to New Jersey Chrome as discussed below.

Remediation: New Jersey Chrome

In June 2009, PPG entered into a settlement agreement with the New Jersey Department of Environmental Protection (“NJDEP”) and Jersey City, New Jersey (which had asserted claims against PPG for lost tax revenue) which was in the form of a Judicial Consent Order (the "JCO"). Under the JCO, PPG accepted sole responsibility for the remediation activities at its former chromium manufacturing location in Jersey City and 19 additional sites. The principal contaminant of concern is hexavalent chromium. The JCO also provided for the appointment of a court-approved Site Administrator who is responsible for establishing a master schedule for the remediation of the 20 PPG sites which existed at that time. One site was subsequently removed from the JCO process during 2014 and will be remediated separately at a future date. A total of 19 sites remain subject to the JCO process.

The most significant assumptions underlying the estimate of remediation costs for all New Jersey Chrome sites are those related to the extent and concentration of chromium impacts in the soil, as these determine the quantity of soil that must be treated in place, the quantity that will have to be excavated and transported for offsite disposal, and the nature of disposal required. PPG regularly evaluates the assessments of costs incurred to date versus current progress and the potential cost impacts of the most recent information, including the extent of impacted soils, percentage of hazardous versus non-hazardous soils, daily soil excavation rates, and engineering, administrative and other associated costs. Based on these assessments, the reserve is adjusted accordingly. Principal factors affecting costs include refinements in the estimate of the mix of hazardous to non-hazardous soils to be excavated, an overall increase in soil volumes to be excavated, enhanced water management requirements, decreased daily soil excavation rates due to site conditions, initial estimates for remedial actions related to groundwater, and oversight and management costs. The reserve adjustments for the estimated costs to remediate all New Jersey Chrome sites are exclusive of any third party indemnification, as the recovery of any such amounts is uncertain.

Groundwater remediation at the former Garfield Avenue chromium-manufacturing site and five adjacent sites is expected to occur over several years after NJDEP’s approval of the work plan. Ongoing groundwater monitoring will be utilized to develop a final groundwater remedial action work plan which is currently expected to be submitted to NJDEP in 2021.

PPG’s financial reserve for remediation of all New Jersey Chrome sites is $134 million at December 31, 2019. The major cost components of this liability continue to be related to excavation, transportation and disposal of impacted soil, as well as construction services. These components each account for approximately 20%, 14% and 28% of the accrued amount, respectively.

There are multiple, future events yet to occur, including further remedy selection and design, remedy implementation and execution and applicable governmental agency or community organization approvals. Considerable uncertainty exists regarding the timing of these future events for the New Jersey Chrome sites. Further resolution of these events is expected to occur over the next several years. As these events occur and to the extent that the cost estimates of the environmental remediation remedies change, the existing reserve for this environmental remediation matter will continue to be adjusted.

Remediation: Glass, Chemicals and Other Sites

Among other sites at which PPG is managing environmental liabilities, remedial actions are occurring at a chemical manufacturing site in Barberton, Ohio, where PPG has completed a Facility Investigation and Corrective Measure Study under the United States Environmental Protection Agency's Resource Conservation and Recovery Act Corrective Action Program. PPG has also been addressing the impacts from a legacy plate glass manufacturing site in Kokomo, Indiana under the Voluntary Remediation Program of the Indiana Department of Environmental Management and a site associated with a legacy plate glass manufacturing site near Ford City, Pennsylvania under the Pennsylvania Land Recycling Program under the oversight of the Pennsylvania Department of Environmental Protection. PPG is currently performing additional investigation and remedial activities at these locations.

With respect to certain other waste sites, the financial condition of other potentially responsible parties also contributes to the uncertainty of estimating PPG’s final costs. Although contributors of waste to sites involving other potentially responsible parties may face governmental agency assertions of joint and several liability, in general, final allocations of costs are made based on the relative contributions of wastes to such sites. PPG is generally not a major contributor to such sites.

Remediation: Reasonably Possible Matters

In addition to the amounts currently reserved for environmental remediation, the Company may be subject to loss contingencies related to environmental matters estimated to be as much as $100 million to $200 million. Such unreserved losses are reasonably possible but are not currently considered to be probable of occurrence. These reasonably possible unreserved losses relate to environmental matters at a number of sites, none of which are individually significant. The loss contingencies related to these sites include significant unresolved issues such as the nature and extent of contamination at these sites and the methods that may have to be employed to remediate them.

The impact of evolving programs, such as natural resource damage claims, industrial site re-use initiatives and domestic and international remediation programs, also adds to the present uncertainties with regard to the ultimate resolution of this unreserved exposure to future loss. The Company's assessment of the potential impact of these environmental contingencies is subject to considerable uncertainty due to the complex, ongoing and evolving process of investigation and remediation, if necessary, of such environmental contingencies, and the potential for technological and regulatory developments.

15. Shareholders' Equity

A class of 10 million shares of preferred stock, without par value, is authorized but unissued. Common stock has a par value of $1.66 $^{2}/_{3}$ per share; 1.2 billion shares are authorized.

	Common Stock	*Treasury Stock*	*Shares Outstanding*
January 1, 2017	581,146,136	(323,815,976)	257,330,160
Purchases	—	(7,427,557)	(7,427,557)
Issuances	—	1,271,796	1,271,796
December 31, 2017	581,146,136	(329,971,737)	251,174,399
Purchases	—	(15,877,364)	(15,877,364)
Issuances	—	564,399	564,399
December 31, 2018	581,146,136	(345,284,702)	235,861,434
Purchases	—	(2,722,800)	(2,722,800)
Issuances	—	2,541,836	2,541,836
December 31, 2019	581,146,136	(345,465,666)	235,680,470

Per share cash dividends paid were $1.98, $1.86 and $1.70 in 2019, 2018 and 2017, respectively.

16. Accumulated Other Comprehensive Loss

($ in millions)	*Unrealized Foreign Currency Translation Adjustments*	*Pension and Other Postretirement Benefit Adjustments, net of tax (c)*	*Unrealized Gain/(Loss) on Derivatives, net of tax (d)*	*Accumulated Other Comprehensive Loss*
January 1, 2017	($1,798)	($571)	$13	($2,356)
Current year deferrals to AOCI	542	—	—	542
Current year deferrals to AOCI, net of tax (b)	(311)	20	(4)	(295)
Reclassifications from AOCI to net income	—	58	(6)	52
Period change	$231	$78	($10)	$299
December 31, 2017	($1,567)	($493)	$3	($2,057)
Current year deferrals to AOCI (a)	(292)	—	—	(292)
Current year deferrals to AOCI, net of tax (b)	148	(12)	(7)	129
Reclassifications from AOCI to net income	—	21	6	27
Period change	($144)	$9	($1)	($136)
Reclassification from AOCI to Retained earnings - Adoption of ASU 2018-02	(23)	(84)	—	(107)
December 31, 2018	($1,734)	($568)	$2	($2,300)
Current year deferrals to AOCI (a)	71	—	—	71
Current year deferrals to AOCI, net of tax (b)	36	(167)	1	(130)
Reclassifications from AOCI to net income	—	11	(2)	9
Period change	$107	($156)	($1)	($50)
December 31, 2019	($1,627)	($724)	$1	($2,350)

(a) Except for income taxes of $7 million and $9 million as of December 31, 2019 and 2018, respectively, related to foreign currency impacts of certain unasserted earnings, unrealized foreign currency translation adjustments related to translation of foreign denominated balance sheets are not presented net of tax given that no deferred U.S. income taxes have been provided on undistributed earnings of non-U.S. subsidiaries because they are deemed to be reinvested for an indefinite period of time.

(b) The tax (cost)/benefit related to unrealized foreign currency translation adjustments on tax inter-branch transactions and net investment hedges as of December 31, 2019, 2018 and 2017 was $(19) million, $4 million and $141 million, respectively.

(c) The tax benefit/(cost) related to the adjustment for pension and other postretirement benefits as of December 31, 2019, 2018 and 2017 was $57 million, $(34) million and $(33) million, respectively. Reclassifications from AOCI are included in the computation of net periodic benefit costs (See Note 13, "Employee Benefit Plans"). The cumulative tax benefit related to the adjustment for pension and other postretirement benefits as of December 31, 2019 and 2018 was $266 million and $209 million, respectively.

(d) The tax cost related to the change in the unrealized loss on derivatives as of December 31, 2019, 2018 and 2017 was $1 million, $2 million, and $5 million, respectively. Reclassifications from AOCI are included in the gain or loss recognized on cash flow hedges (See Note 10 "Financial Instruments, Hedging Activities and Fair Value Measurements").

17. Other Income

($ in millions)	*2019*	*2018*	*2017*
Gain on sale of assets(1)	$7	$33	$28
Royalty income	8	10	11
Share of net earnings of equity affiliates (See Note 6)	11	16	12
Gain on disposal of ownership interest in business affiliate	—	—	25
Income from a legal settlement	—	—	18
Other	63	55	56
Total	$89	$114	$150

(1) In 2018, PPG had a $26 million gain on the sale of land near a facility of the Company's former commodity chemicals business.

18. Stock-Based Compensation

The Company's stock-based compensation includes stock options, restricted stock units ("RSUs") and grants of contingent shares that are earned based on achieving targeted levels of total shareholder return. All current grants of stock options, RSUs and contingent shares are made under the PPG Industries, Inc. Amended and Restated Omnibus Incentive Plan ("PPG Amended Omnibus Plan"), which was amended and restated effective April 21, 2016. Shares available for future grants under the PPG Amended Omnibus Plan were 6.7 million as of December 31, 2019.

Notes to the Consolidated Financial Statements

($ in millions)	2019	2018	2017
Total stock-based compensation	$39	$37	$35
Income tax benefit recognized	$9	$8	$12

Stock Options

PPG has outstanding stock option awards that have been granted under the PPG Amended Omnibus Plan. Under the PPG Amended Omnibus Plan, certain employees of the Company have been granted options to purchase shares of common stock at prices equal to the fair market value of the shares on the date the options were granted. The options are generally exercisable 36 months after being granted and have a maximum term of 10 years. Upon exercise of a stock option, shares of Company stock are issued from treasury stock.

The fair value of stock options issued to employees is measured on the date of grant and is recognized as expense, net of estimated forfeitures, over the requisite service period. PPG estimates the fair value of stock options using the Black-Scholes option pricing model. The risk-free interest rate is determined by using the U.S. Treasury yield curve at the date of the grant and using a maturity equal to the expected life of the option. The expected life of options is calculated using the average of the vesting term and the maximum term, as prescribed by accounting guidance on the use of the simplified method for determining the expected term of an employee share option. The expected dividend yield and volatility are based on historical stock prices and dividend amounts over past time periods equal in length to the expected life of the options. PPG applies an estimated forfeiture rate that is calculated based on historical activity.

The following weighted average assumptions were used to calculate the fair values of stock option grants in each year:

	2019	2018	2017
Weighted average exercise price	$109.74	$115.98	$101.53
Risk free interest rate	2.6%	2.9%	2.4%
Expected life of option in years	6.5	6.5	6.5
Expected dividend yield	1.6%	1.7%	1.8%
Expected volatility	20.0%	21.0%	22.0%

The weighted average fair value of options granted was $22.50 per share, $25.27 per share and $21.15 per share for the years ended December 31, 2019, 2018, and 2017, respectively.

Stock Options Outstanding and Exercisable	Number of Shares	Weighted Average Exercise Price	Weighted Average Remaining Contractual Life (in years)	Intrinsic Value (in millions)
Outstanding, January 1, 2019	3,761,000	$90.10	6.1	$61
Granted	588,870	$109.74		
Exercised	(832,177)	$73.78		
Forfeited/Expired	(107,940)	$107.41		
Outstanding, December 31, 2019	3,409,753	$96.93	6.1	$125
Vested or expected to vest, December 31, 2019	3,312,698	$96.54	6.1	$122
Exercisable, December 31, 2019	1,819,591	$86.67	4.4	$85

At December 31, 2019, unrecognized compensation cost related to outstanding stock options that have not yet vested totaled $7 million. This cost is expected to be recognized as expense over a weighted average period of 1.5 years.

The following table presents stock option activity for the years ended December 31, 2019, 2018 and 2017:

($ in millions)	2019	2018	2017
Total intrinsic value of stock options exercised	$38	$19	$40
Cash received from stock option exercises	$61	$15	$52
Income tax benefit from the exercise of stock options	$9	$4	$15
Total fair value of stock options vested	$12	$10	$13

Restricted Stock Units ("RSUs")

Long-term incentive value is delivered to selected key management employees by granting RSUs, which have either time or performance-based vesting features. The fair value of an RSU is equal to the market value of a share of PPG stock on the date of grant. Time-based RSUs vest over the three-year period following the date of grant, unless forfeited, and will be paid out in the form of stock, cash or a combination of both at the Company's discretion at the end of the three year vesting period. Performance-based RSUs vest based on achieving specific annual performance targets for earnings per share growth and cash flow return on capital over the three calendar year-end periods following the date of grant. Unless forfeited, the performance-based RSUs will be paid out in the form of stock, cash or a combination of both at the Company's discretion at the end of the three-year performance period if PPG meets the performance targets. The amount paid for performance-based awards may range from 0% to 180% of the original grant, based upon the frequency with which the annual earnings per share growth and cash flow return on capital performance targets are met over the three calendar year periods comprising the vesting period. PPG has assumed that performance-based RSUs granted in 2017, 2018 and 2019 will vest at the 100% level. As of December 31, 2019, three of the six possible performance targets had been met for the 2017 grant, two of the four possible performance targets had been met for the 2018 grant, and one of two possible performance targets had been met for the 2019 grant.

RSU Activity	*Number of Shares*	*Weighted Average Fair Value*	*Intrinsic Value (in millions)*
Outstanding, January 1, 2019	631,731	$102.80	$65
Granted	241,113	$111.25	
Released from restrictions	(229,238)	$100.98	
Forfeited	(32,064)	$109.34	
Outstanding, December 31, 2019	611,542	$109.30	$67
Vested or expected to vest, December 31, 2019	580,878	$109.17	$63

There was $17 million of total unrecognized compensation cost related to unvested RSUs outstanding as of December 31, 2019. This cost is expected to be recognized as expense over a weighted average period of 1.7 years.

Contingent Share Grants

The Company also provides grants of contingent shares to selected key executives that may be earned based on PPG total shareholder return ("TSR") over the three-year period following the date of grant. Contingent share grants (referred to as "TSR awards") are made annually and are paid out at the end of each three-year period based on the Company's performance. Performance is measured by determining the percentile rank of the total shareholder return of PPG common stock in relation to the total shareholder return of the S&P 500 for the three-year period following the date of grant. This comparison group represents the entire S&P 500 Index as it existed at the beginning of the performance period, excluding any companies that have been removed from the index because they ceased to be publicly traded. The payment of awards following the three-year award period will be based on performance achieved in accordance with the scale set forth in the plan agreement and may range from 0% to 220% of the initial grant. A payout of 100% is earned if the target performance is achieved. Contingent share awards for the 2017-2019, 2018-2020, and 2019-2021 periods earn dividend equivalents for the award period, which will be paid to participants or credited to the participants' deferred compensation plan accounts with the award payout at the end of the period based on the actual number of contingent shares that are earned. Any payments made at the end of the award period may be in the form of stock, cash or a combination of both. The TSR awards qualify as liability awards, and compensation expense is recognized over the three-year award period based on the fair value of the awards (giving consideration to the Company's percentile rank of total shareholder return) remeasured in each reporting period until settlement of the awards.

As of December 31, 2019, there was $6 million of total unrecognized compensation cost related to outstanding TSR awards based on the current estimate of fair value. This cost is expected to be recognized as expense over a weighted average period of 1.7 years.

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19. Quarterly Financial Information (unaudited)

($ in millions, except per share amounts)	2019 Quarter Ended March 31	June 30	September 30	December 31	Full Year 2019[1]
Net sales	$3,624	$4,024	$3,826	$3,672	$15,146
Cost of sales[2]	2,073	2,288	2,181	2,111	8,653
Net income (attributable to PPG)					
Income from continuing operations, net of tax	$312	$270	$366	$295	$1,243
Income/(Loss) from discontinued operations, net of tax	—	2	1	(3)	—
Net income (attributable to PPG)	$312	$272	$367	$292	$1,243
Earnings per common share					
Income from continuing operations, net of tax	$1.32	$1.14	$1.55	$1.24	$5.25
Income/(Loss) from discontinued operations, net of tax	—	0.01	—	(0.01)	—
Earnings per common share	$1.32	$1.15	$1.55	$1.23	$5.25
Earnings per common share - assuming dilution					
Income from continuing operations, net of tax	$1.31	$1.13	$1.54	$1.23	$5.22
Income/(Loss) from discontinued operations, net of tax	—	0.01	—	(0.01)	—
Earnings per common share – assuming dilution	$1.31	$1.14	$1.54	$1.22	$5.22

($ in millions except per share amounts)	2018 Quarter Ended March 31	June 30	September 30	December 31	Full Year 2018[1]
Net sales	$3,781	$4,131	$3,817	$3,645	$15,374
Cost of sales[2]	2,181	2,379	2,253	2,188	9,001
Net income (attributable to PPG)					
Income from continuing operations, net of tax	$328	$371	$368	$256	$1,323
Income from discontinued operations, net of tax	6	—	10	2	18
Net income (attributable to PPG)	$334	$371	$378	$258	$1,341
Earnings per common share					
Income from continuing operations, net of tax	$1.32	$1.51	$1.52	$1.07	$5.43
Income from discontinued operations, net of tax	0.02	—	0.04	0.01	0.07
Earnings per common share	$1.34	$1.51	$1.56	$1.08	$5.50
Earnings per common share - assuming dilution					
Income from continuing operations, net of tax	$1.31	$1.51	$1.51	$1.07	$5.40
Income from discontinued operations, net of tax	0.02	—	0.04	0.01	0.07
Earnings per common share – assuming dilution	$1.33	$1.51	$1.55	$1.08	$5.47

(1) Full year earnings-per-share was calculated using the full year weighted average shares outstanding. As such, the sum of the quarters may not equal the total earnings-per-share for the year.

(2) Exclusive of depreciation and amortization.

20. Revenue Recognition

The Company recognizes revenue when control of the promised goods or services is transferred to the customer and in amounts that the Company expects to collect. The timing of revenue recognition takes into consideration the various shipping terms applicable to the Company's sales. For most transactions, control passes in accordance with agreed upon delivery terms.

The Company delivers products to company-owned stores, home centers and other regional or national consumer retail outlets, paint dealers, concessionaires and independent distributors, company-owned distribution networks, and directly to manufacturing companies and retail customers. Each product delivered to a third party customer is considered to satisfy a performance obligation. Performance obligations generally occur at a point in time and are satisfied when control of the goods passes to the customer. The Company is entitled to collection of the sales price under normal credit terms in the regions in which it operates. Accounts receivable are recognized when there is an unconditional right to consideration. Payment terms vary from customer to customer, depending on creditworthiness, prior payment history and other considerations.

The Company also provides services by applying coatings to customers' manufactured parts and assembled products and by providing technical support to certain customers. Performance obligations are satisfied over time as critical milestones are met and as services are provided. PPG is entitled to payment as the services are rendered. For the years ended December 31, 2019, 2018 and 2017, service revenue constituted approximately 5% of total revenue.

Net sales by segment and region for the years ended December 31, 2019, 2018 and 2017 were as follows:

	Performance Coatings			*Industrial Coatings*			*Total Net Sales*		
($ in millions)	*2019*	*2018*	*2017*	*2019*	*2018*	*2017*	*2019*	*2018*	*2017*
United States and Canada	$4,057	$4,062	$4,031	$2,418	$2,423	$2,276	$6,475	$6,485	$6,307
EMEA	2,869	2,936	2,761	1,680	1,742	1,628	4,549	4,678	4,389
Asia Pacific	1,095	1,071	970	1,447	1,547	1,553	2,542	2,618	2,523
Latin America	1,013	1,018	968	567	575	561	1,580	1,593	1,529
Total	$9,034	$9,087	$8,730	$6,112	$6,287	$6,018	$15,146	$15,374	$14,748

21. Reportable Business Segment Information

Segment Organization and Products

PPG is a multinational manufacturer with 9 operating segments (which the Company refers to as “strategic business units”) that are organized based on the Company’s major products lines. The Company’s reportable business segments include the following two segments: Performance Coatings and Industrial Coatings. The operating segments have been aggregated based on economic similarities, the nature of their products, production processes, end-use markets and methods of distribution.

The Performance Coatings reportable business segment is comprised of the automotive refinish coatings, aerospace coatings, architectural coatings – Americas and Asia Pacific, architectural coatings - EMEA, and protective and marine coatings operating segments. This reportable business segment primarily supplies a variety of protective and decorative coatings, sealants and finishes along with paint strippers, stains and related chemicals, as well as transparencies and transparent armor.

The Industrial Coatings reportable business segment is comprised of the automotive OEM coatings, industrial coatings, packaging coatings, and the specialty coatings and materials operating segments. This reportable business segment primarily supplies a variety of protective and decorative coatings and finishes along with adhesives, sealants, metal pretreatment products, optical monomers and coatings, precipitated silicas and other specialty materials.

Production facilities and sales for Performance Coatings and Industrial Coatings are global. PPG’s reportable business segments continue to pursue opportunities to further develop their global reach, including efforts in Asia, Eastern Europe and Latin America. Each of the reportable business segments in which PPG is engaged is highly competitive. The diversification of our product lines and the worldwide sales tend to minimize the impact on PPG’s Net sales and Income before income taxes in the consolidated statement of income of changes in demand in a particular industry or in a particular geographic area.

The accounting policies of the operating segments are the same as those described in the summary of significant accounting policies (See Note 1, “Summary of Significant Accounting Policies”). The Company allocates resources to operating segments and evaluates the performance of operating segments based upon segment income, which is income before interest expense – net, income taxes, and noncontrolling interests and excludes certain charges which are considered to be unusual or non-recurring. The Company also evaluates performance of operating segments based on working capital reduction, margin growth, and sales volume growth. Legacy items include current costs related to former operations of the Company not classified as discontinued operations at the time of the disposal, including pension and other postretirement benefit costs, certain charges for legal matters and certain environmental remediation costs, and certain other charges which are not associated with PPG’s current business portfolio. These legacy costs are excluded from the segment income that is used to evaluate the performance of the operating segments.

Corporate unallocated costs include the costs of corporate staff functions not directly associated with the operating segments, certain legal cases, net of related insurance recoveries and the cost of certain insurance and stock-based compensation programs. The service cost component of net periodic pension expense related to current employees of each reportable business segment is allocated to that reportable business segment and the remaining portion of net periodic pension expense is included in the Corporate unallocated costs.

Product movement between Performance Coatings and Industrial Coatings is limited, is accounted for as an inventory transfer, and is recorded at cost plus a mark-up, the impact of which is not significant to the net sales or segment income of the reportable business segments.

($ in millions)	2019	2018	2017
Net sales to external customers			
Performance Coatings	$9,034	$9,087	$8,730
Industrial Coatings	6,112	6,287	6,018
Total Net sales	$15,146	$15,374	$14,748
Segment income			
Performance Coatings	$1,409	$1,300	$1,313
Industrial Coatings	862	818	979
Total Segment income	$2,271	$2,118	$2,292
Corporate / Non-Segment Items			
Legacy items	($1)	$5	($2)
Business restructuring-related costs, net[1]	(222)	(75)	—
Environmental remediation charges and other costs, net	(61)	(77)	—
Acquisition-related costs[2]	(17)	(6)	(9)
Litigation matters, net	(12)	(24)	18
Impairment of a non-manufacturing asset	—	(9)	—
Costs related to customer assortment changes	—	(18)	—
Gain from the sale of non-operating assets	—	26	13
Brand rationalization charge	—	(6)	—
Asset write-downs	—	—	(7)
Pension settlement charge	—	—	(60)
Gain on disposal of ownership interest in business affiliate	—	—	25
Interest expense, net of interest income	(100)	(95)	(85)
Corporate unallocated	(197)	(146)	(180)
Total Income before income taxes	$1,661	$1,693	$2,005

($ in millions)	2019	2018	2017
Depreciation and amortization			
Performance Coatings	$255	$274	$272
Industrial Coatings	194	181	164
Corporate / Non-Segment Items	62	42	24
Total	$511	$497	$460
Share of net earnings of equity affiliates			
Performance Coatings	$1	$1	$2
Industrial Coatings	—	—	—
Corporate / Non-Segment Items	10	15	10
Total	$11	$16	$12
Segment assets[3]			
Performance Coatings	$10,636	$9,846	$9,763
Industrial Coatings	4,912	4,441	4,563
Corporate / Non-Segment Items	2,160	1,728	2,212
Total	$17,708	$16,015	$16,538
Investment in equity affiliates			
Performance Coatings	$33	$33	$32
Industrial Coatings	14	13	13
Corporate / Non-Segment Items	82	86	89
Total	$129	$132	$134
Expenditures for property (including business acquisitions)			
Performance Coatings	$483	$545	$224

Industrial Coatings	510	157	328
Corporate / Non-Segment Items	63	87	133
Total	$1,056	$789	$685

Notes to the Consolidated Financial Statements

($ in millions)	2019	2018	2017
Geographic Information			
Net sales[(4)]			
United States and Canada	$6,475	$6,485	$6,307
Europe, Middle East and Africa (“EMEA”)	4,549	4,678	4,389
Asia Pacific	2,542	2,618	2,523
Latin America	1,580	1,593	1,529
Total	$15,146	$15,374	$14,748
Segment income			
United States and Canada	$1,073	$1,022	$1,135
EMEA	569	549	560
Asia Pacific	342	306	361
Latin America	287	241	236
Total	$2,271	$2,118	$2,292
Property—net			
United States and Canada	$1,300	$1,254	$1,224
EMEA	836	777	826
Asia Pacific	538	482	493
Latin America	309	292	281
Total	$2,983	$2,805	$2,824

(1) Included in business restructuring-related costs, net are business restructuring charges, accelerated depreciation of certain assets and other related costs, offset by releases related to previously approved programs.

(2) Acquisition-related costs include advisory, legal, accounting, valuation, and other professional or consulting fees incurred to effect acquisitions. These costs are included in Selling, general and administrative expense in the consolidated statement of income. Acquisition-related costs also include the impact for the step up to fair value of inventory acquired in certain acquisitions which are included in Cost of sales, exclusive of depreciation and amortization in the consolidated statement of income.

(3) Segment assets are the total assets used in the operation of each segment. Corporate assets are principally cash and cash equivalents, cash held in escrow, short term investments and deferred tax assets.

(4) Net sales to external customers are attributed to geographic regions based upon the location of the operating unit shipping the product.

Item 9. Changes in and Disagreements With Accountants on Accounting and Financial Disclosure

None.

Item 9A. Controls and Procedures

(a) Evaluation of disclosure controls and procedures.

Based on their evaluation as of the end of the period covered by this Form 10-K, the Company's principal executive officer and principal financial officer have concluded that the Company's disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934 (the "Exchange Act")) are effective to ensure that information required to be disclosed by the Company in reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in Securities and Exchange Commission rules and forms and to ensure that information required to be disclosed by the Company in the reports that it files or submits under the Exchange Act is accumulated and communicated to the Company's management, including its principal executive and principal financial officers, as appropriate, to allow timely decisions regarding required disclosure.

(b) Changes in internal control over financial reporting.

There were no changes in the Company's internal control over financial reporting that occurred during the Company's quarter ended December 31, 2019 that have materially affected, or are reasonably likely to materially affect, the Company's internal control over financial reporting.

(c) Management report on internal control over financial reporting.

See Management Report on page 36 for management's annual report on internal control over financial reporting. See Report of Independent Registered Public Accounting Firm on pages 34-35 for PricewaterhouseCoopers LLP's audit report on the Company's internal control over financial reporting.

Item 9B. Other Information

None.

Part III

Item 10. Directors, Executive Officers and Corporate Governance

The information about the Company's directors required by Item 10 and not otherwise set forth below is contained under the caption "Proposal 1: Election of Directors" in PPG's definitive Proxy Statement for the 2020 Annual Meeting of Shareholders (the "Proxy Statement") which the Company anticipates filing with the Securities and Exchange Commission, pursuant to Regulation 14A, not later than 120 days after the end of the Company's fiscal year, and is incorporated herein by reference.

The executive officers of the Company are elected by the Board of Directors. The information required by this item concerning the Company's executive officers is incorporated by reference herein from Part I of this report under the caption "Information About Our Executive Officers."

Information regarding the Company's Audit Committee is included in the Proxy Statement under the caption "Corporate Governance – Audit Committee" and is incorporated herein by reference.

Information regarding the Company's codes of ethics is included in the Proxy Statement under the caption "Corporate Governance – Codes of Ethics" and is incorporated herein by reference.

Item 11. Executive Compensation

The information required by Item 11 is contained in the Proxy Statement under the captions "Compensation of Directors," "Compensation Discussion and Analysis," "Compensation of Executive Officers," "Potential Payments upon Termination or Change in Control," "Corporate Governance – Compensation Committee Interlocks and Insider Participation," and "Corporate Governance – Officers-Directors Compensation Committee Report to Shareholders" and is incorporated herein by reference.

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

The information required by Item 12 is contained in the Proxy Statement under the captions "Beneficial Ownership" and "Equity Compensation Plan Information" and is incorporated herein by reference.

Item 13. Certain Relationships and Related Transactions, and Director Independence

The information required by Item 13 is contained in the Proxy Statement under the captions "Corporate Governance – Director Independence," "Corporate Governance – Review and Approval or Ratification of Transactions with Related Persons" and "Corporate Governance – Certain Relationships and Related Transactions" and is incorporated herein by reference.

Item 14. Principal Accounting Fees and Services

The information required by Item 14 is contained in the Proxy Statement under the caption "Independent Registered Public Accounting Firm" and is incorporated herein by reference.

Part IV

Item 15. Exhibits, Financial Statement Schedules

(a)(1) Consolidated Financial Statements and Reports of Independent Registered Public Accounting Firm (see Part II, Item 8 of this Form 10-K).

The following information is filed as part of this Form 10-K:

(a)(2) Consolidated Financial Statement Schedule for the years ended December 31, 2019, 2018 and 2017.

The following Consolidated Financial Statement Schedule should be read in conjunction with the previously referenced financial statements:

Schedule II – Valuation and Qualifying Accounts

Allowance for Doubtful Accounts for the Years Ended December 31, 2019, 2018, and 2017

($ in millions)	*Balance at Beginning of Year*	*Charged to Costs and Expenses*	*Deductions(1)*	*Balance at End of Year*
2019	$24	$24	($26)	$22
2018	$25	$18	($19)	$24
2017	$36	$15	($26)	$25

(1) Notes and accounts receivable written off as uncollectible, net of recoveries, amounts attributable to divestitures and changes attributable to foreign currency translation.

All other schedules are omitted because they are not applicable.

(a)(3) Exhibits. The following exhibits are filed as a part of, or incorporated by reference into, this Form 10-K.

Index to Exhibits

	3	Statement with Respect to Shares Eliminating the Series A Junior Participating Preferred Stock, was filed as Exhibit 3.1 to the Registrant’s Quarterly Report on Form 10-Q for the period ended September 30, 2014.
	3.1	Restated Articles of Incorporation of PPG Industries, Inc., was filed as Exhibit 3.2 to the Registrant’s Quarterly Report on Form 10-Q for the period ended September 30, 2014.
	3.2	Articles of Amendment to the Restated Articles of Incorporation of PPG Industries, Inc. effective June 12, 2015, was filed as Exhibit 3.1 to the Registrant’s Current Report on Form 8-K filed on June 18, 2015.
	3.3	Amended and Restated Bylaws of PPG Industries, Inc., as amended on December 10, 2015, was filed as Exhibit 3.1 to the Registrant’s Current Report on Form 8-K filed on December 15, 2015.
	4	Indenture, dated as of March 18, 2008, was filed as Exhibit 4.1 to the Registrant’s Current Report on Form 8-K filed on March 18, 2008.
	4.1	Supplemental Indenture, dated as of March 18, 2008, was filed as Exhibit 4.2 to the Registrant’s Current Report on Form 8-K filed on March 18, 2008.
	4.2	Second Supplemental Indenture, dated as of November 12, 2010, was filed as Exhibit 4.3 to the Registrant’s Current Report on Form 8-K filed on November 12, 2010.
	4.3	Third Supplemental Indenture, dated as of August 3, 2012, was filed as Exhibit 4.4 to the Registrant’s Current Report on Form 8-K filed on August 3, 2012.
	4.4	Fourth Supplemental Indenture, dated as of November 12, 2014, between PPG Industries, Inc. and The Bank of New York Mellon Trust Company, was filed as Exhibit 4.2 to the Registrant’s Current Report on Form 8-K filed on November 12, 2014.
	4.5	Fifth Supplemental Indenture, dated as of March 13, 2015, between PPG Industries, Inc. and The Bank of New York Mellon Trust Company, N.A., as trustee, was filed as Exhibit 4.3 to the Registrant’s Current Report on Form 8-K filed on March 13, 2015.
	4.6	Sixth Supplemental Indenture, dated as of November 3, 2016, between PPG Industries, Inc. and The Bank of New York Mellon Trust Company, N.A., as trustee, was filed as Exhibit 4.3 to the Registrant’s Current Report on Form 8-K filed on November 3, 2016.
	4.7	Seventh Supplemental Indenture, dated as of February 27, 2018, between PPG Industries, Inc. and The Bank of New York Mellon Trust Company, N.A., as trustee, was filed as Exhibit 4.3 to the Registrant’s Current Report on Form 8-K filed on February 27, 2018.
	4.8	Eighth Supplemental Indenture, dated as of August 15, 2019, between PPG Industries, Inc. and The Bank of New York Mellon Trust Company, N.A., was filed as Exhibit 4.3 to the Registrant’s Current Report on Form 8-K filed on August 15, 2019.
†	4.9	PPG Industries, Inc. Description of Securities.
*	10	PPG Industries, Inc. Nonqualified Retirement Plan, as amended and restated September 24, 2008, was filed as Exhibit 10 to the Registrant’s Annual Report on Form 10-K for the period ended December 31, 2011.
*	10.1	Form of Change in Control Employment Agreement entered into with executives prior to January 1, 2008, as amended, was filed as Exhibit 10.2 to the Registrant’s Annual Report on Form 10-K for the period ended December 31, 2007.
*	10.2	Form of Change in Control Employment Agreement entered into with executives on or after January 1, 2008 through December 31, 2009, was filed as Exhibit 10.24 to the Registrant’s Annual Report on Form 10-K for the period ended December 31, 2007.
*	10.3	Form of Change in Control Employment Agreement entered into with executives on or after January 1, 2010, was filed as Exhibit 10.3 to the Registrant’s Annual Report on Form 10-K for the period ended December 31, 2009.
*	10.4	Form of Change in Control Employment Agreement entered into with executives on or after June 30, 2012 was filed as Exhibit 10.4 to the Registrant’s Annual Report on Form 10-K for the period ended December 31, 2012.
*	10.5	Form of Change in Control Employment Agreement entered into with executives on or after January 1, 2014, was filed as Exhibit 10.2 to the Registrant’s Quarterly Report on Form 10-Q for the period ended March 31, 2014.
*	10.6	PPG Industries, Inc. Deferred Compensation Plan for Directors related to compensation deferred prior to January 1, 2005, was filed as Exhibit 10.3 to the Registrant’s Annual Report on Form 10-K for the period ended December 31, 1997.

*	10.7	PPG Industries, Inc. Deferred Compensation Plan for Directors related to compensation deferred on or after January 1, 2005, as amended February 15, 2006, was filed as Exhibit 10.4 to the Registrant's Quarterly Report on Form 10-Q for the period ended March 31, 2006.
*	10.8	PPG Industries, Inc. Deferred Compensation Plan related to compensation deferred prior to January 1, 2005, as amended effective July 14, 2004, was filed as Exhibit 10.1 to the Registrant's Quarterly Report on Form 10-Q for the period ended June 30, 2004.
*	10.9	PPG Industries, Inc. Deferred Compensation Plan related to compensation deferred on or after January 1, 2005, as amended and restated September 24, 2008, was filed as Exhibit 10.6 to the Registrant's Annual Report on Form 10-K for the period ended December 31, 2008.
*	10.10	PPG Industries, Inc. Deferred Compensation Plan related to compensation deferred on or prior to January 1, 2005, as amended and restated effective January 1, 2011, was filed as Exhibit 10.3 to the Registrant's Quarterly Report on Form 10-Q for the period ended June 30, 2012.
*	10.11	PPG Industries, Inc. Deferred Compensation Plan related to compensation deferred on or after to January 1, 2005, as amended and restated effective January 1, 2011, was filed as Exhibit 10.4 to the Registrant's Quarterly Report on Form 10-Q for the period ended June 30, 2012.
*	10.12	PPG Industries, Inc. Executive Officers' Long Term Incentive Plan was filed as Exhibit 10.1 to the Registrant's Current Report on Form 8-K dated February 15, 2005.
*	10.13	PPG Industries, Inc. Amended and Restated Omnibus Incentive Plan, was filed as Annex A to the Registrant's Definitive Proxy Statement for its 2011 Annual Meeting of Shareholders filed on March 10, 2011.
*	10.14	PPG Industries, Inc. Amended and Restated Omnibus Incentive Plan, was filed as Annex B to the Registrant's Definitive Proxy Statement for its 2016 Annual Meeting of Shareholders filed on March 10, 2016.
*	10.15	Form of Time-Vested Restricted Stock Unit Award Agreement for Directors, was filed as Exhibit 10 to the Registrant's Quarterly Report on Form 10-Q for the period ended June 30, 2014.
*	10.16	Form of Non-Qualified Stock Option Award Agreement, was filed as Exhibit 10.3 to the Registrant's Quarterly Report on Form 10-Q for the period ended September 30, 2009.
*	10.17	Form of Non-Qualified Stock Option Award Agreement, was filed as Exhibit 10.4 to the Registrant's Quarterly Report on Form 10-Q for the period ended June 30, 2011.
*	10.18	Form of Non-Qualified Stock Option Award Agreement, was filed as Exhibit 10.2 to the Registrant's Quarterly Report on Form 10-Q for the period ended March 31, 2013.
*	10.19	Form of TSR Share Award Agreement, was filed as Exhibit 10.6 to the Registrant's Quarterly Report on Form 10-Q for the period ended March 31, 2013.
*	10.20	Form of Performance-Based Restricted Stock Unit Award Agreement, was filed as Exhibit 10.4 to the Registrant's Quarterly Report on Form 10-Q for the period ended March 31, 2013.
*	10.21	Form of Performance-Based Restricted Stock Unit Award Agreement for Key Employees, was filed as Exhibit 10.3 to the Registrant's Quarterly Report on Form 10-Q for the period ended March 31, 2013.
*	10.22	Form of Time-Vested Restricted Stock Unit Award Agreement, was filed as Exhibit 10.5 to the Registrant's Quarterly Report on Form 10-Q for the period ended March 31, 2013.
	10.23	Five-Year Credit Agreement dated as of December 18, 2015 among PPG Industries, Inc.; the several banks and financial institutions party thereto; JPMorgan Chase Bank, N.A., as administrative agent; The Bank of Tokyo-Mitsubishi UFJ, Ltd., BNP Paribas, Citibank, N.A. and PNC Bank, National Association, as co-syndication agents; and J.P. Morgan Securities LLC, The Bank of Tokyo-Mitsubishi UFJ, Ltd., BNP Paribas Securities Corp., Citigroup Global Markets Inc., and PNC Capital Markets LLC, as co-lead arrangers and co-bookrunners, was filed as Exhibit 10.1 to the Registrant's Current Report on Form 8-K filed on December 22, 2015.
	10.24	Amended and Restated Five Year Credit Agreement dated as of August 30, 2019 among PPG Industries, Inc.; the several banks and financial institutions party thereto; JPMorgan Chase Bank, N.A., as administrative agent; BNP Paribas, Citibank, N.A. MUFG Bank, Ltd. and PNC Bank, National Association, as co-syndication agents; and J.P. Morgan Chase Bank, N.A., BNP Paribas Securities Corp., Citibank, N.A., MUFG Bank, Ltd. and PNC Capital Markets LLC, as co-lead arrangers and co-bookrunners, was filed as Exhibit 10.1 to the Registrant's Current Report on Form 8-K filed on September 4, 2019.
*	10.25	Employment arrangement with Jean-Marie Greindl, was filed as Exhibit 10.1 to the Registrant's Quarterly Report on Form 10-Q for the period ended March 31, 2016.
*	10.26	Post-Termination Agreement, dated March 28, 2019, by and between Jean-Marie Greindl and PPG Industries Europe SarL, was filed as Exhibit 10.1 to the Registrant's Quarterly Report on Form 10-Q for the period ended March 31, 2019.
*	10.27	Letter Agreement with Rebecca Liebert was filed as Exhibit 10.1 to the Registrant's Quarterly Report on Form 10-Q for the period ended September 30, 2018.

*	10.28	Letter Agreement with Amy R. Ericson was filed as Exhibit 10.2 to the Registrant's Quarterly Report on Form 10-Q for the period ended September 30, 2018.
*	10.29	PPG Industries, Inc. Incentive Compensation Plan for Key Employees, as amended and restated on January 1, 2019 was filed as Exhibit 10.29 to the Registrant's Annual Report on Form 10-K for the period ended December 31, 2018.
*	10.30	PPG Industries, Inc. Management Award Plan, as amended and restated on January 1, 2019 was filed as Exhibit 10.30 to the Registrant's Annual Report on Form 10-K for the period ended December 31, 2018.
†	13.1	Market Information, Dividends and Holders of Common Stock.
†	13.2	Selected Financial Data for the Five Years Ended December 31, 2019.
†	21	Subsidiaries of the Registrant.
†	23	Consent of PricewaterhouseCoopers LLP.
†	24	Powers of Attorney.
†	31.1	Certification of Principal Executive Officer Pursuant to Rule 13a-14(a) or 15d-14(a) of the Exchange Act, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
†	31.2	Certification of Principal Financial Officer Pursuant to Rule 13a-14(a) or 15d-14(a) of the Exchange Act, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
††	32.1	Certification of Chief Executive Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
††	32.2	Certification of Chief Financial Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
**	101.INS	Inline XBRL Instance Document
**	101.SCH	Inline XBRL Taxonomy Extension Schema Document
**	101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase Document
**	101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase Document
**	101.LAB	Inline XBRL Taxonomy Extension Label Linkbase Document
**	101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase Document
	104	Inline XBRL for the cover page of this Annual Report on Form 10-K, included in the Exhibit 101 Inline XBRL Document Set.

† Filed herewith.

†† Furnished herewith.

* Management contracts, compensatory plans or arrangements required to be filed as an exhibit hereto pursuant to Item 601 of Regulation S-K.

** Attached as Exhibit 101 to this report are the following documents formatted in Inline XBRL (Extensible Business Reporting Language) as of and for the year ended December 31, 2019: (i) the Consolidated Statement of Income, (ii) the Consolidated Balance Sheet, (iii) the Consolidated Statement of Shareholders' Equity, (iv) the Consolidated Statement of Comprehensive Income (Loss), (v) the Consolidated Statement of Cash Flows, (vi) Notes to Consolidated Financial Statements and (vii) Financial Schedule of Valuation and Qualifying Accounts.

Item 16. Form 10-K Summary

None.

Signatures

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the Registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized on February 20, 2020.

PPG INDUSTRIES, INC.
(Registrant)

By /s/ Vincent J. Morales
Vincent J. Morales
Senior Vice President and Chief Financial Officer
(Principal Financial Officer and Duly Authorized Officer)

/s/ William E. Schaupp
William E. Schaupp
Vice President and Controller (Principal Accounting Officer and Duly Authorized Officer)

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed by the following persons on behalf of the Registrant and in the capacities indicated on February 20, 2020.

Signature	Capacity
/s/ Michael H. McGarry Michael H. McGarry	Director, Chairman and Chief Executive Officer
/s/ Vincent J. Morales Vincent J. Morales	Senior Vice President and Chief Financial Officer (Principal Financial Officer and Duly Authorized Officer)
/s/ William E. Schaupp William E. Schaupp	Vice President and Controller (Principal Accounting Officer and Duly Authorized Officer)
S. F. Angel	Director
J. G. Berges	Director
S. A. Davis	Director
J. V. Faraci	Director
H. Grant	Director
V. F. Haynes	Director
M. L. Healey	Director
G. R. Heminger	Director
M. J. Hooper	Director
M. W. Lamach	Director
M. H. Richenhagen	Director
C. R. Smith	Director

By /s/ Vincent J. Morales
Vincent J. Morales, Attorney-in-Fact

DESCRIPTION OF THE REGISTRANT'S SECURITIES REGISTERED PURSUANT TO SECTION 12 OF THE SECURITIES EXCHANGE ACT OF 1934

As of February 20, 2020, PPG Industries, Inc. (the "Company") has four classes of securities registered under Section 12 of the Securities Exchange Act of 1934, as amended (the "Exchange Act"): (1) its common stock, par value $1.66 2/3 per share (the "Common Stock"); (2) its 0.875% Notes due 2022 (the "2022 Notes"); (3) its 0.875% Notes due 2025 (the "2025 Notes"); and (4) its 1.400% Notes due 2027 (the "2027 Notes" and together with the 2022 Notes and the 2025 Notes, the "Notes").

Description of the Common Stock

The following description of the Common Stock is a summary and does not purport to be complete. It is subject to and qualified in its entirety by reference to the Company's Restated Articles of Incorporation, as amended (the "Articles of Incorporation"), and the Company's Amended and Restated Bylaws (the "Bylaws"), each of which are incorporated by reference as an exhibit to the Annual Report on Form 10-K of which this Exhibit 4.9 is a part. The Company encourages interested parties to read the Articles of Incorporation, the Bylaws and the applicable provisions of the Pennsylvania Business Corporation Law for additional information.

Authorized Capital Shares

The Company's authorized capital shares consist of 1,200,000,000 shares of Common Stock and 10,000,000 shares of preferred stock, without par value (the "Preferred Stock"). The outstanding shares of the Common Stock are fully paid and nonassessable.

Voting Rights

Holders of the Common Stock are entitled to one vote per share on all matters submitted to a vote of the Company's shareholders, including the election of directors. There are no cumulative voting rights associated with the Common Stock.

Dividend Rights

Subject to the rights of holders of outstanding shares of the Preferred Stock, if any, the holders of the Common Stock are entitled to receive dividends when, as and if declared by the Company's Board of Directors in its discretion out of funds legally available for the payment of dividends.

Liquidation Rights

Subject to any preferential rights of outstanding shares of the Preferred Stock, if any, holders of the Common Stock will be entitled to share ratably in any of the Company's assets legally available for distribution to the Company's shareholders after the payment in full of all debts and distributions in the event of the dissolution of the Company.

Other Rights and Preferences

There are no sinking fund or redemption provisions or preemptive, conversion or exchange rights applicable to the Common Stock.

Listing

The Common Stock is listed on The New York Stock Exchange and trades under the symbol “PPG.”

Description of the Notes

The following description of the Notes is a summary and does not purport to be complete. It is subject to and qualified in its entirety by reference to the Indenture, dated as of March 18, 2008 (the “Base Indenture”), between the Company and The Bank of New York Mellon Trust Company, N.A., as trustee (the “Trustee”), as supplemented by (i) the First Supplemental Indenture, dated as of March 18, 2008 (the “First Supplemental Indenture”), (ii) in the case of the 2022 Notes and the 2027 Notes, also by the Fifth Supplemental Indenture, dated as of March 13, 2015 (the “Fifth Supplemental Indenture”), and (iii) in the case of the 2025 Notes, also by the Sixth Supplemental Indenture, dated as of November 3, 2016 (the “Sixth Supplemental Indenture”). The Base Indenture, the First Supplemental Indenture, the Fifth Supplemental Indenture and the Sixth Supplemental Indenture are incorporated by reference as exhibits to the Annual Report on Form 10-K of which this Exhibit 4.9 is a part. The 2022 Notes, the 2025 Notes and the 2027 Notes each are listed on The New York Stock Exchange and trade under the bond trading symbols of “PPG22,” “PPG25” and “PPG27,” respectively.

In the following description, the Base Indenture as supplemented through the date of the filing of the Annual Report on Form 10-K of which this Exhibit 4.9 is a part is referred to as the “Indenture.” The Company encourages interested parties to read the Indenture for additional information.

General

The 2022 Notes, the 2025 Notes and the 2027 Notes each initially were issued in the aggregate principal amount of €600,000,000. The Company is permitted to issue additional Notes of each series without the consent of the holders of that series, but the Company will not issue such additional Notes unless they are fungible for U.S. federal income tax purposes with the relevant series of Notes or are issued under a different CUSIP number. As of February 20, 2020, no such additional Notes have been issued.

The Notes are the Company’s direct, unsecured and unsubordinated obligations and rank equally and ratably with all of the Company’s other unsecured and unsubordinated indebtedness. The Notes are effectively subordinated to all of the Company’s current and future secured indebtedness.

The maturity dates of the 2022 Notes, the 2025 Notes and the 2027 Notes are March 13, 2022, November 3, 2025 and March 13, 2027, respectively.

The Notes of each series are in the form of one or more global notes that the Company has deposited with or on behalf of a common depositary for the accounts of Clearstream Banking, *société anonyme* ("Clearstream") and Euroclear Bank, S.A./N.V. ("Euroclear") and are registered in the name of the nominee of the common depositary. The Company has appointed The Bank of New York Mellon, London Branch to act as paying agent, registrar and transfer agent in connection with the Notes, as well as to serve as the common depositary for the Notes. The Bank of New York Mellon, London Branch is an affiliate of the Trustee. The term "paying agent" includes The Bank of New York Mellon, London Branch and any successors appointed from time to time in accordance with the provisions of the Indenture. The Company has designated as an agency where the Notes may be presented for payment, exchange or registration of transfer, in each case as provided in the Indenture, the office of the paying agent at One Canada Square, London E14 5AL.

The Notes of each series were issued in euro and only in minimum denominations of €100,000 and integral multiples of €1,000 in excess thereof.

The Notes are not redeemable at the option of the holder prior to maturity and are not subject to any sinking fund.

Interest and Principal

The 2022 Notes and the 2027 Notes each bear interest from March 13, 2015 at fixed interest rates of 0.875% and 1.400% per annum, respectively. The 2025 Notes bear interest from November 3, 2016 at a fixed interest rate of 0.875% per annum. Interest is paid annually on March 13 for the 2022 Notes and the 2027 Notes and on November 3 for the 2025 Notes, including on the maturity date of each series of Notes (each an "interest payment date"). The Company will pay interest on the Notes to the persons in whose names the Notes are registered at the close of business on the February 26 or October 19, as applicable (in each case, whether or not a business day), immediately preceding the related interest payment date. Interest on each series of Notes will be computed on the basis of the actual number of days in the period for which interest is being calculated and the actual number of days from and including the last date on which interest was paid on the applicable series of Notes, to but excluding the next date on which interest is paid or duly provided for. This payment convention is referred to as ACTUAL/ACTUAL (ICMA) as defined in the rulebook of the International Capital Market Association.

The Company will pay the principal of and interest on each note to the registered holder in euro in immediately available funds; *provided* that, if the euro is unavailable to the Company due to the imposition of exchange controls or other circumstances beyond the Company's control or if the euro is no longer being used by the then member states of the Eurozone (other than Greece) or for the settlement of transactions by public institutions of or within the international banking community, then all payments in respect of the Notes will be made in U.S. dollars until the euro is again available to the Company or so used. In such circumstances, the amount payable on any date in euro will be converted into U.S. dollars on the basis of the most recently available market exchange rate for euro, as determined by the Company in its sole discretion. Any payment in respect of the Notes so made in U.S. dollars will not constitute an event of default under any series of the Notes or the Indenture. So long as the Notes of a particular series are in book-entry form, the Company will make payments of principal and interest with respect to that series of Notes through the London paying agent described below.

Optional Redemption

Prior to December 13, 2021, the 2022 Notes are redeemable in whole or in part, at the Company's option, at any time and from time to time at a redemption price equal to the greater of (i) 100% of the principal amount of the 2022 Notes to be redeemed and (ii) the sum of the present values of the Remaining Scheduled Payments of principal and interest thereon discounted to the redemption date on an annual basis (ACTUAL/ACTUAL (ICMA)) at the applicable Comparable Government Bond Rate, plus 15 basis points, plus accrued interest thereon to the date of redemption. On or after December 13, 2021, the Company may redeem some or all of the 2022 Notes, in whole or in part, at its option, at any time and from time to time at a redemption price equal to 100% of the principal amount of the 2022 Notes to be redeemed, plus accrued interest thereon to the date of redemption.

Prior to August 3, 2025, the 2025 Notes are redeemable in whole or in part, at the Company's option, at any time and from time to time at a redemption price equal to the greater of (i) 100% of the principal amount of the 2025 Notes to be redeemed and (ii) the sum of the present values of the Remaining Scheduled Payments of principal and interest thereon discounted to the redemption date on an annual basis (ACTUAL/ACTUAL (ICMA)) at the applicable Comparable Government Bond Rate, plus 15 basis points, plus accrued interest thereon to the date of redemption. On or after August 3, 2025, the Company may redeem some or all of the 2025 notes, in whole or in part, at its option, at any time and from time to time at a redemption price equal to 100% of the principal amount of the notes to be redeemed, plus accrued interest thereon to the date of redemption.

Prior to December 13, 2026, the 2027 Notes are redeemable in whole or in part, at the Company's option, at any time and from time to time at a redemption price equal to the greater of (i) 100% of the principal amount of the notes to be redeemed and (ii) the sum of the present values of the Remaining Scheduled Payments of principal and interest thereon discounted to the redemption date on an annual basis (ACTUAL/ACTUAL (ICMA)) at the applicable Comparable Government Bond Rate, plus 20 basis points, plus accrued interest thereon to the date of redemption. On or after December 13, 2026, the Company may redeem some or all of the 2027 Notes, in whole or in part, at its option, at any time and from time to time at a redemption price equal to 100% of the principal amount of the 2027 Notes to be redeemed, plus accrued interest thereon to the date of redemption.

The redemption price for the Notes will include, in each case, accrued and unpaid interest on the principal amount of the Notes to be redeemed to the redemption date. The redemption price paid for the Notes upon any such redemption will be paid in euro.

"Comparable Government Bond Rate" means, with respect to any redemption date for each series of Notes, the price, expressed as a percentage (rounded to three decimal places, with 0.0005 being rounded upwards), at which the gross redemption yield on the notes to be redeemed, if they were to be purchased at such price on the third business day prior to the date fixed for redemption, would be equal to the gross redemption yield on such business day of the Comparable Government Bond (as defined below) on the basis of the middle market price of the

Comparable Government Bond prevailing at 11:00 a.m. (London time) on such business day as determined by an independent investment bank selected by the Company.

"Comparable Government Bond" means, with respect to each series of Notes, in relation to any Comparable Government Bond Rate calculation, at the discretion of an independent investment bank selected by us, a German government bond whose maturity is closest to the maturity of the Notes to be redeemed, or if such independent investment bank in its discretion determines that such similar bond is not in issue, such other German government bond as such independent investment bank may, with the advice of three brokers of, and/or market makers in, German government bonds selected by the Company, determine to be appropriate for determining the Comparable Government Bond Rate.

"Remaining Scheduled Payments" means, with respect to each series of Notes to be redeemed, the remaining scheduled payments of the principal thereof and interest thereon that would be due after the related redemption date but for such redemption; *provided, however*, that, if such redemption date is not an interest payment date with respect to such Notes, the amount of the next succeeding scheduled interest payment thereon will be deemed to be reduced by the amount of interest accrued thereon to such redemption date.

Unless the Company defaults in payment of the applicable redemption price, on and after the redemption date, interest will cease to accrue on the Notes or portions thereof called for redemption. If less than all of any series of Notes are to be redeemed, the Notes of the series to be redeemed will be selected by the trustee by such method the trustee deems to be fair and appropriate in accordance with applicable depositary procedures.

Redemption for Tax Reasons

If, as a result of any change in, or amendment to, the laws (or any regulations or rulings promulgated under the laws) of the United States (or any taxing authority in the United States), or any change in, or amendments to, an official position regarding the application or interpretation of such laws, regulations or rulings, the Company becomes or, based upon a written opinion of independent counsel selected by the Company, the Company will become obligated to pay additional amounts as described below under the heading "- Payment of Additional Amounts" with respect to the Notes, then the Company may at any time at the Company's option redeem, in whole, but not in part, the Notes at a redemption price equal to 100% of their principal amount, together with accrued and unpaid interest (including any additional amounts) on those Notes to, but not including, the date fixed for redemption.

Payment of Additional Amounts

The Company will, subject to the exceptions and limitations set forth below, pay as additional interest on the Notes of each series such additional amounts as are necessary in order that the net amount of the principal of and interest on the Notes received by a beneficial owner who is not a United States person (as defined below), after withholding or deduction for any present or future tax, assessment or other governmental charge imposed by the United States or a taxing authority in the United States, will not be less than the amount that would have been received by such beneficial owner if such tax had not been withheld or deducted; provided, however, that the foregoing obligation to pay additional amounts shall not apply:

1. to any tax, assessment or other governmental charge that is imposed by reason of the holder (or the beneficial owner for whose benefit such holder holds such Note), or a fiduciary, settlor, beneficiary, member or shareholder of the holder or beneficial owner if the holder or beneficial owner is an estate, trust, partnership or corporation, or a person holding a power over an estate or trust administered by a fiduciary holder, being considered as:

   a. being or having been engaged in a trade or business in the United States or having or having had a permanent establishment in the United States;

   b. having a current or former connection with the United States (other than a connection arising solely as a result of the ownership of the notes, the receipt of any payment or the enforcement of any rights hereunder), including being or having been a citizen or resident of the United States;

   c. being or having been a personal holding company, a passive foreign investment company or a controlled foreign corporation for United States income tax purposes or a corporation that has accumulated earnings to avoid United States federal income tax; or

   d. being or having been a "10-percent shareholder" of the Company as defined in section 871(h)(3) of the United States Internal Revenue Code of 1986, as amended (the "Code") or any successor provision;

2. to any holder that is not the sole beneficial owner of the Notes, or a portion of the Notes, or that is a fiduciary, partnership or limited liability company, but only to the extent that a beneficial owner with respect to the holder, a beneficiary or settlor with respect to the fiduciary, or a beneficial owner or member of the partnership or limited liability company would not have been entitled to the payment of an additional amount had the beneficiary, settlor, beneficial owner or member received directly its beneficial or distributive share of the payment;

3. to any tax, assessment or other governmental charge that would not have been imposed but for the failure of the holder or any other person to comply with certification, identification or information reporting requirements concerning the nationality, residence, identity or connection with the United States of the holder or beneficial owner of the Notes, if compliance is required by statute, by regulation of the United States or any taxing authority therein or by an applicable income tax treaty to which the United States is a party as a precondition to exemption from such tax, assessment or other governmental charge;

4. to any tax, assessment or other governmental charge that is imposed otherwise than by withholding by the Company or a paying agent from the payment;

5. to any tax, assessment or other governmental charge that would not have been imposed but for a change in law, regulation, or administrative or judicial interpretation that

becomes effective more than 15 days after the payment becomes due or is duly provided for, whichever occurs later;

6. to any estate, inheritance, gift, sales, excise, transfer, wealth, capital gains or personal property tax or similar tax, assessment or other governmental charge;

7. to any tax, assessment or other governmental charge required to be withheld by any paying agent from any payment of principal of or interest on any note, if the holder or beneficial owner would have been able to avoid such withholding by presenting the Note (where presentation is required) to another available paying agent;

8. to any tax, assessment or other governmental charge that would not have been imposed but for the presentation by the holder of any Note, where presentation is required, for payment on a date more than 30 days after the date on which payment became due and payable or the date on which payment thereof is duly provided for, whichever occurs later;

9. to any tax, assessment or other governmental charge that is imposed or withheld solely by reason of the beneficial owner being a bank (i) purchasing the Notes in the ordinary course of its lending business or (ii) that is neither (A) buying the Notes for investment purposes only nor (B) buying the Notes for resale to a third-party that either is not a bank or holding the Notes for investment purposes only;

10. to any tax, assessment or other governmental charge imposed under Sections 1471 through 1474 of the Code (or any amended or successor provisions), any current or future regulations or official interpretations thereof, any agreement entered into pursuant to Section 1471(b) of the Code or any fiscal or regulatory legislation, rules or practices adopted pursuant to any intergovernmental agreement entered into in connection with the implementation of such sections of the Code; or

11. in the case of any combination of items (1), (2), (3), (4), (5), (6), (7), (8), (9) and (10).

The Notes are subject in all cases to any tax, fiscal or other law or regulation or administrative or judicial interpretation applicable to the Notes. Except as specifically provided under this heading, the Company will not be required to make any payment for any tax, assessment or other governmental charge imposed by any government or a political subdivision or taxing authority of or in any government or political subdivision with respect to the Notes.

As used under this heading and under the heading "-Redemption for Tax Reasons," the term "United States" means the United States of America, the states of the United States, the District of Columbia, and any political subdivision thereof, and the term "United States person" means any individual who is a citizen or resident of the United States for U.S. federal income tax purposes, a corporation, partnership or other entity created or organized in or under the laws of the United States, any state of the United States or the District of Columbia (other than a partnership that is not treated as a United States person under any applicable Treasury regulations), or any estate or trust the income of which is subject to United States federal income taxation regardless of its source.

Book-Entry and Settlement

The Company has obtained the information under this heading "- Book-Entry and Settlement" concerning Clearstream and Euroclear and their book-entry systems and procedures from sources that the Company believes to be reliable. The Company takes no responsibility for an accurate portrayal of this information. In addition, the description of the clearing systems under this heading "- Book-Entry and Settlement" reflects the Company's understanding of the rules and procedures of Clearstream and Euroclear as they are currently in effect. Those clearing systems could change their rules and procedures at any time.

The Notes of each series are represented by one or more fully registered global notes. Each such global note has been deposited with, or on behalf of, a common depositary, and registered in the name of the nominee of the common depositary for the accounts of Clearstream and Euroclear. Each such global security was deposited with The Bank of New York Mellon, as common depositary (the "Common Depositary") and registered in the name of the Common Depositary or its nominee.

Except as set forth below, the global notes may be transferred, in whole and not in part, only to Euroclear or Clearstream or their respective nominees. A holder may hold its interests in the global notes in Europe through Clearstream or Euroclear, either as a participant in such systems or indirectly through organizations which are participants in such systems. Clearstream and Euroclear will hold interests in the global notes on behalf of their respective participating organizations or customers through customers' securities accounts in Clearstream's or Euroclear's names on the books of their respective depositaries. Book-entry interests in the Notes and all transfers relating to the Notes are reflected in the book-entry records of Clearstream and Euroclear. The address of Clearstream is 42 Avenue JF Kennedy, L-1855 Luxembourg, Luxembourg, and the address of Euroclear is 1 Boulevard Roi Albert II, B-1210 Brussels, Belgium.

Any secondary market trading of book-entry interests in the Notes will take place through Clearstream and Euroclear participants and will settle in same-day funds. Owners of book-entry interests in the Notes will receive payments relating to their Notes in euro, except as described above.

Clearstream and Euroclear have established electronic securities and payment transfer, processing, depositary and custodial links among themselves and others, either directly or through custodians and depositaries. These links allow the Notes to be issued, held and transferred among the clearing systems without the physical transfer of certificates. Special procedures to facilitate clearance and settlement have been established among these clearing systems to trade securities across borders in the secondary market.

The policies of Clearstream and Euroclear will govern payments, transfers, exchanges and other matters relating to the investor's interest in the Notes held by them. The Company has no responsibility for any aspect of the records kept by Clearstream or Euroclear or any of their direct or indirect participants. The Company also does not supervise these systems in any way.

Clearstream and Euroclear and their participants perform these clearance and settlement functions under agreements they have made with one another or with their customers. They are not obligated to perform or continue to perform these procedures and may modify them or discontinue them at any time.

Except as provided below, owners of beneficial interests in the Notes are not entitled to have the Notes registered in their names, will not receive or be entitled to receive physical delivery of the Notes in definitive form and will not be considered the owners or holders of the Notes under the Indenture, including for purposes of receiving any reports delivered by the Company or the Trustee pursuant to the Indenture. Accordingly, each person owning a beneficial interest in a Note must rely on the procedures of the depositary and, if such person is not a participant, on the procedures of the participant through which such person owns its interest, in order to exercise any rights of a holder of Notes.

Certificated Notes

If the depositary for any of the Notes represented by a registered global note is at any time unwilling or unable to continue as depositary or ceases to be a clearing agency registered under the Exchange Act, and a successor depositary registered as a clearing agency under the Exchange Act is not appointed by the Company within 90 days, the Company will issue Notes in definitive form in exchange for the registered global note that had been held by the depositary. Any Notes issued in definitive form in exchange for a registered global note will be registered in the name or names that the depositary gives to the Trustee or other relevant agent of the Trustee. It is expected that the depositary's instructions will be based upon directions received by the depositary from participants with respect to ownership of beneficial interests in the registered global note that had been held by the depositary. In addition, the Company may at any time determine that the Notes shall no longer be represented by a global note and will issue Notes in definitive form in exchange for such global note pursuant to the procedure described above.

Trustee, Paying Agents and Security Registrar

The Bank of New York Mellon Trust Company, N.A. is the trustee under the Indenture governing the Notes. The Bank of New York Mellon, London Branch, is the paying agent for the notes in London.

Base Indenture Provisions

Governing Law

The Notes and the Indenture are governed by the laws of the State of New York.

Consolidation, Merger and Sale of Assets

The Company may not merge or consolidate with any other entity or sell or convey all or substantially all of its assets to any person, firm, corporation or other entity, except that the Company may merge or consolidate with, or sell or convey all or substantially all of its assets to, any other entity if:

- the Company is the continuing entity or the successor entity (if other than us) is organized and existing under the laws of the United States of America, a State thereof or the District of Columbia and the successor entity expressly assumes payment of the principal of and interest on all the debt securities, and the performance and observance of all of the covenants and conditions of the Indenture to be performed by the Company; and

- there is no default under the Indenture.

Upon such a succession, the Company will be relieved from any further obligations under the applicable indenture. For purposes of this subsection, “substantially all of the Company’s assets” means, at any date, a portion of the non-current assets reflected in the Company’s consolidated balance sheet as of the end of the most recent quarterly period that represents at least 66 2/3% of the total reported value of such assets.

Events of Default

A holder of Notes will have special rights if an Event of Default occurs and is not cured. The term “Event of Default” means any of the following with respect to a series of Notes:

- the Company does not pay interest on a series of Notes within 30 days of the due date;
- the Company does not pay the principal of or premium, if any, on a series of Notes on the applicable due date;
- the Company does not pay any sinking fund installment on a series of Notes within 30 days of the due date;
- the Company remains in breach of any other covenant or warranty in Notes of such series or in the Indenture for 90 days after the Company receives a notice of default stating that the Company is in breach, as provided in the Indenture; or
- certain events of bankruptcy, insolvency or reorganization occur.

Remedies If an Event of Default Occurs.

If an Event of Default has occurred and continues with respect to a series of Notes, the Trustee or the holders of not less than 25% in principal amount of the Notes of the affected series may declare the entire principal amount of all of Notes of the affected series to be due and immediately payable. This is called a “declaration of acceleration of maturity.” Under some circumstances, a declaration of acceleration of maturity may be canceled by the holders of at least a majority in principal amount of the Notes of that series.

The Trustee generally is not required to take any action under the Indenture at the request of any holders unless one or more of the holders has provided to the Trustee security or indemnity reasonably satisfactory to it.

If reasonable protection from expenses and liabilities is provided, the holders of a majority in principal amount of the outstanding Notes of the relevant series may direct the time, method and place of conducting any lawsuit or other formal legal action seeking any remedy available to the Trustee and to waive certain past defaults regarding the relevant series. The Trustee may refuse to follow those directions in some circumstances.

If an Event of Default occurs and is continuing regarding a series of Notes, the Trustee may use any sums that it holds under the Indenture for its own reasonable compensation and expenses incurred prior to paying the holders of Notes of that series.

Before any holder of any series of Notes may institute an action for any remedy, except payment on such holder's debt security when due, the holders of not less than 25% in principal amount of the Notes of that series outstanding must request the Trustee to take action. Holders must also offer and give the Trustee satisfactory security and indemnity against liabilities incurred by the Trustee for taking such action.

"Street Name" and other indirect holders should consult their banks or brokers for information on how to give notice or direction to or make a request of the Trustee and to make or cancel a declaration of acceleration.

The Company will furnish every year to the Trustee a written statement of certain of the Company's officers certifying that, to their knowledge, the Company is in compliance with the Indenture and the Notes, or else specifying any default.

No Event of Default regarding one series of Notes is necessarily an Event of Default regarding any other series of Notes.

Satisfaction and Discharge

The Indenture will be satisfied and discharged if:

- the Company delivers to the Trustee all debt securities then outstanding under the Indenture, including any Notes then outstanding, for cancellation; or
- all debt securities under the Indenture not delivered to the Trustee for cancellation, including any Notes then outstanding, have become due and payable, are to become due and payable within one year or are to be called for redemption within one year and the Company deposits an amount sufficient to pay the principal, premium, if any, and interest to the date of maturity, redemption or deposit (in the case of debt securities that have become due and payable), as the case may be, provided that in any case the Company has paid all other sums payable under the Indenture.

Defeasance and Covenant Defeasance

The Indenture provides that:

- the Company may elect either:
  - to defease and be discharged from any and all obligations with respect to any Notes of such series (except for the obligations to register the transfer or exchange of such Notes, to replace temporary or mutilated, destroyed, lost or stolen Notes, to maintain an office or agency in respect of the Notes and to hold moneys for payment in trust) ("defeasance"); or
  - to be released from its obligations with respect to applicable restrictions under the Base Indenture; and

- the Events of Default described in the third, fourth and sixth bullets under "- Events of Default" above will not be Events of Default under the Indenture with respect to such series of Notes ("covenant defeasance"), upon the deposit with the Trustee (or other qualifying trustee), in trust for such purpose, of money or certain U.S. government obligations which through the payment of principal and interest in accordance with their terms will provide money, in an amount sufficient to pay the principal of (and premium, if any) and interest on such Notes, on the scheduled due dates.

In the case of defeasance, the holders of such Notes are entitled to receive payments in respect of such Notes solely from such trust. Such a trust may only be established if, among other things, the Company has delivered to the Trustee an opinion of counsel (as specified in the Indenture) to the effect that the holders of the Notes affected thereby will not recognize income, gain or loss for federal income tax purposes as a result of such defeasance or covenant defeasance and will be subject to federal income tax on the same amounts, in the same manner and at the same times as would have been the case if such defeasance or covenant defeasance had not occurred. Such opinion of counsel, in the case of defeasance described above, must refer to and be based upon a ruling of the Internal Revenue Service or a change in applicable federal income tax law occurring after the date of the Indenture.

Exhibit 13.1

PPG INDUSTRIES, INC. AND CONSOLIDATED SUBSIDIARIES
Market Information, Dividends and Holders of Common Stock
For the Year Ended December 31, 2019

Market Information

Stock Exchange Listings

PPG common stock is traded on the New York Stock Exchange (symbol:PPG).

Quarterly Stock Market Price

	2019		2018	
Quarter Ended	**High**	**Low**	**High**	**Low**
March 31	$113.31	$96.82	$122.07	$108.74
June 30	121.29	104.44	113.90	100.36
September 30	121.00	105.99	116.73	101.17
December 31	134.36	112.02	111.42	94.37

Dividends

	2019		2018	
Month of Payment	**Amount (Millions)**	**Per Share**	**Amount (Millions)**	**Per Share**
March	$113	$0.48	$112	$0.45
June	114	0.48	110	0.45
September	120	0.51	116	0.48
December	121	0.51	115	0.48
Total	$468	$1.98	$453	$1.86

PPG has paid uninterrupted annual dividends since 1899. The latest quarterly dividend of 51 cents per share was approved by the board of directors on January 16, 2020, payable March 12, 2020 to shareholders of record February 21, 2020.

Holders of Common Stock

The number of holders of record of PPG common stock as of January 31, 2020 was 13,574 as shown on the records of the Company’s transfer agent.

Exhibit 13.2

PPG INDUSTRIES, INC. AND CONSOLIDATED SUBSIDIARIES
Selected Financial Data
(Millions, except per share amounts)

	Year Ended December 31				
	2019	**2018**	**2017**	**2016**	**2015**
Net Sales	$15,146	$15,374	$14,748	$14,270	$14,241
Amounts Attributable to PPG					
Continuing Operations	$1,243	$1,323	$1,369	$543	$1,311
Discontinued Operations	—	18	225	330	95
Net income (attributable to PPG)	$1,243	$1,341	$1,594	$873	$1,406
Earnings per common share:					
Continuing Operations	$5.25	$5.43	$5.34	$2.05	$4.83
Discontinued Operations	—	0.07	0.88	1.24	0.35
Net Income	$5.25	$5.50	$6.22	$3.29	$5.18
Earnings per common share - assuming dilution:					
Continuing Operations	$5.22	$5.40	$5.31	$2.04	$4.79
Discontinued Operations	—	0.07	0.87	1.23	0.35
Net Income	$5.22	$5.47	$6.18	$3.27	$5.14
Dividends per share	1.98	1.86	1.70	1.56	1.41
Total assets	17,708	16,015	16,538	15,771	17,076
Long-term debt	4,539	4,365	4,134	3,787	4,026

The financial information of all prior periods has been reclassified to reflect discontinued operations and retroactive adoption of certain Accounting Standard Updates.

PPG Industries, Inc.
And Consolidated Subsidiaries

Subsidiaries of the Registrant
December 31, 2019

Significant subsidiaries included in the 2019 consolidated financial statements of the Company are:

United States:	Jurisdiction of Incorporation or Organization	Percentage of Voting Power
AIPCF V Texstars Blocker Inc.	Delaware	100
CG Holdings Manufacturing Co.	Michigan	100
Cuming Microwave Corporation	Massachusetts	100
Dexmet Corporation	Delaware	100
Dexmet Holding Corporation	Delaware	100
I.V.C. Industrial Coatings, Inc.	Indiana	100
MetoKote Corporation	Delaware	100
MetoKote Mexico Holdings, Inc.	Ohio	100
PaintZen, Inc.	Delaware	100
Polymeric Systems, Inc.	Delaware	100
PPG Architectural Finishes, Inc.	Delaware	100
PPG Hemmelrath Coatings, Inc.	Delaware	100
PPG Holdings Argentina USA LLC	Delaware	100
PPG Holdings Latin America USA LLC	Delaware	100
PPG Industries International, Inc.	Delaware	100
PPG Industries Ohio, Inc.	Delaware	100
PPG Industries Securities, LLC	Delaware	100
PPG Kansai Automotive Finishes U.S., LLC	Delaware	60
PRC-DeSoto International, Inc.	California	100
SEM Products, Inc.	North Carolina	100
Sierracin Corporation	Delaware	100
Sierracin/Sylmar Corporation	California	100
Texstars, LLC	Delaware	100
The Crown Group Co.	Michigan	100
Vanex, Inc.	Delaware	100
Whitford Corporation	Pennsylvania	100
Whitford Worldwide Company, LLC	Delaware	100
Other Americas:		
Alermac Inversiones, S.A. de C.V.	Mexico	100
Centro de Investigación en Polímeros, S.A. de C.V.	Mexico	100
Comercial Mexicana de Pinturas, S.A. de C.V.	Mexico	100
Comex Industrial Coatings, S.A. de C.V.	Mexico	100
Consorcio Comex, S.A. de C.V.	Mexico	100
Distribuidora Kroma, S.A. de C.V.	Mexico	100
Empresa Aga, S.A. de C.V.	Mexico	100
Fpu Industrial, S.A. de C.V.	Mexico	100
Grupo Comex, S.A. de C.V.	Mexico	100
MetoKote Canada Limited	Canada	100
MetoKote de Mexico S. de RL de CV	Mexico	100
Plásticos Envolventes, S.A. de C.V.	Mexico	100

PPG ALESCO Automotive Finishes Mexico, S. de R.L. de C.V.	Mexico	60
PPG Architectural Coatings (Puerto Rico) Inc.	Puerto Rico	100
PPG Architectural Coatings Canada Inc.	Canada	100
PPG AP Resinas, S.A. de C.V.	Mexico	100
PPG Canada Inc.	Canada	100
PPG Industrial do Brasil - Tintas E. Vernizes - Ltda.	Brazil	100
PPG Industries Argentina S.R.L.	Argentina	100
PPG Industries Colombia Ltda.	Colombia	100
PPG Industries de Mexico, S.A. de C.V.	Mexico	100
PPG Kansai Automotive Finishes Canada, LP	Canada	60
PPG Mexico, S.A. de C.V.	Mexico	100
Viasa, S.A. de C.V.	Mexico	100
EMEA:		
Brown Brothers Distribution Limited	United Kingdom	100
Chorlton Trade Paints Limited	United Kingdom	100
EPIC Insurance Co. Ltd.	Bermuda	100
Hodij Coatings B.V.	The Netherlands	100
Johnstone's Paints Limited	United Kingdom	100
Kalon Investment Company Limited	United Kingdom	100
Kalon South Africa Proprietary Limited	South Africa	100
Metokote UK Limited	United Kingdom	100
Peintures de Paris SAS	France	99.94
PPG AC - France SA	France	99.94
PPG Architectural Coatings Ireland Limited	Ireland	100
PPG Architectural Coatings UK Limited	United Kingdom	100
PPG Cameroun SA	Cameroon	51.5
PPG Cieszyn S.A.	Poland	100
PPG Coatings B.V.	The Netherlands	100
PPG Coatings BVBA/SPRL	Belgium	100
PPG Coatings Danmark A/S	Denmark	100
PPG Coatings Deutschland GmbH	Germany	100
PPG Coatings Europe B.V.	The Netherlands	100
PPG Coatings Nederland BV	The Netherlands	100
PPG Coatings S.A.	France	99.9
PPG Deco Czech a.s.	Czech Republic	100
PPG Deco Polska sp. z.o.o.	Poland	100
PPG Deco Slovakia, s.r.o.	Slovakia	100
PPG Deutschland Business Support GmbH	Germany	100
PPG Deutschland Sales & Services GmbH	Germany	100
PPG Distribution S.A.S.	France	99.94
PPG DYRUP, S.A.	Portugal	100
PPG Europe B.V.	The Netherlands	100
PPG Finance B.V.	The Netherlands	100
PPG France Business Support S.A.S.	France	100
PPG France Manufacturing S.A.S.	France	100
PPG Guadeloupe SAS	Guadeloupe	100
PPG Hemmelrath Lackfabrik GmbH	Germany	100
PPG Holdco SAS	France	100
PPG Holdings (U.K.) Limited	United Kingdom	100

PPG Ibérica, S.A.	Spain	100
PPG Ibérica Sales & Services, S.L.	Spain	100
PPG Industrial Coatings B.V.	The Netherlands	100
PPG Industries (UK) Ltd	United Kingdom	100
PPG Industries Delfzijl B.V.	The Netherlands	100
PPG Industries Europe Sàrl	Switzerland	100
PPG Industries France S.A.S.	France	100
PPG Industries Italia S.r.l.	Italy	100
PPG Industries Kimya a Sanayi VE Ticaret AS	Turkey	100
PPG Industries Lackfabrik GmbH	Germany	100
PPG Industries Lipetsk LLC	Russia	100
PPG Industries LLC	Russia	100
PPG Industries Middle East FZE	U.A.E.	100
PPG Industries Netherlands B.V.	The Netherlands	100
PPG Industries Poland Sp. Z.o.o.	Poland	100
PPG Italia Business Support S.r.l.	Italy	100
PPG Italia Sales & Services S.r.l.	Italy	100
PPG Luxembourg Finance S.àR.L.	Luxembourg	100
PPG Luxembourg Holdings S.àR.L.	Luxembourg	100
PPG Romania S.A.	Romania	100
PPG Switzerland GmbH	Switzerland	100
PPG Trilak Kft.	Hungary	100
PPG Univer S.P.A.	Italy	100
ProCoatings B.V.	The Netherlands	100
Prominent Paints Proprietary Limited	South Africa	100
Revocoat France SAS	France	100
Revocoat Holding SAS	France	100
Revocoat Iberica SLU	Spain	100
Sealants Europe SAS	France	100
Sigma Marine & Protective Coatings Holding B.V.	The Netherlands	100
SigmaKalon (BC) UK Limited	United Kingdom	100
SigmaKalon Middle East B.V.	The Netherlands	63.2
Whitford B.V.	The Netherlands	100
Whitford Ltd. (UK)	United Kingdom	100
Whitford S.r.l.	Italy	100
Asia:		
Broad Range Development Limited	Hong Kong	100
Foshan Bairun Chemicals Co., Ltd.	China	100
Hemmelrath Automotive Coatings (Jilin) Co., Ltd.	China	100
PPG Aerospace Materials (Suzhou) Co. Ltd.	China	100
PPG Asian Paints Private Ltd.	India	50
PPG Coatings (Hong Kong) Co., Limited	Hong Kong	100
PPG Coatings (Kunshan) Co., Ltd.	China	100
PPG Coatings (Malaysia) Sdn. Bhd.	Malaysia	100
PPG Coatings (Shanghai) Co., Ltd.	China	100
PPG Coatings (Thailand) Co., Ltd.	Thailand	100
PPG Coatings (Tianjin) Co., Ltd.	China	100
PPG Coatings (Wuhu) Company, Ltd.	China	100
PPG Coatings (Zhangjiagang) Co., Ltd.	China	100

PPG COATINGS SINGAPORE PTE. LTD.	Singapore	100
PPG Industries (Korea) Ltd.	South Korea	100
PPG Industries (Singapore) Pte., Ltd.	Singapore	100
PPG Industries Australia PTY Limited A.C.N. 055 500 939	Australia	100
PPG Industries New Zealand Limited	New Zealand	100
PPG Japan Ltd.	Japan	100
PPG Management (Shanghai) Co., Ltd.	China	100
PPG Packaging Coatings (Suzhou) Co., Ltd.	China	100
PPG Paints Trading (Shanghai) Co., Ltd.	China	100
PPG Performance Coatings (Hong Kong) Limited	Hong Kong	100
PPG SSC Co., Ltd.	South Korea	80.01
PRC-DeSoto Australia Pty Ltd.	Australia	100
Protec Pty Ltd. A.C.N. 007 857 392	Australia	100
PT. PPG Coatings Indonesia	Indonesia	100
PT. PPG Indonesia	Indonesia	100
Sikar (Shanghai) Trading Co. Ltd.	China	100
Spraylat Coatings (Shanghai) Limited	China	100
Whitford Jiangmen Ltd.	China	100
Whitford Ltd. (HK)	Hong Kong	100
Whitford Pte. Ltd.	Singapore	100

Exhibit 23

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Registration Statement on Form S-3 No. 333-232895 and Registration Statements on Form S-8 Nos. 333-140559, 333-140561, 333-140562, 333-173656, 333-173657, 333-173658, 333-176852, 333-192988, 333-212813, 333-217448, and 333-217449, of PPG Industries, Inc. of our report dated February 20, 2020 relating to the financial statements, financial statement schedule and the effectiveness of internal control over financial reporting, which appears in this Form 10-K.

/s/ PricewaterhouseCoopers LLP
Pittsburgh, Pennsylvania
February 20, 2020

PPG INDUSTRIES, INC.

POWER OF ATTORNEY

(10-K)

I, Stephen F. Angel, a Director of PPG Industries, Inc. (the “Corporation”), a Pennsylvania corporation, hereby constitute and appoint Michael H. McGarry, Anne M. Foulkes and Vincent J. Morales, or any of them, my true and lawful attorneys or attorneys-in-fact, with full power of substitution and revocation, to sign, in my name and on my behalf as a Director of the Corporation, the Corporation’s Form 10-K for the fiscal year ended December 31, 2019, to be filed with the Securities and Exchange Commission, Washington, DC.

WITNESS my hand this 20th day of February, 2020.

/s/ STEPHEN F. ANGEL

Stephen F. Angel

PPG INDUSTRIES, INC.

POWER OF ATTORNEY

(10-K)

I, James G. Berges, a Director of PPG Industries, Inc. (the “Corporation”), a Pennsylvania corporation, hereby constitute and appoint Michael H. McGarry, Anne M. Foulkes and Vincent J. Morales, or any of them, my true and lawful attorneys or attorneys-in-fact, with full power of substitution and revocation, to sign, in my name and on my behalf as a Director of the Corporation, the Corporation’s Form 10-K for the fiscal year ended December 31, 2019, to be filed with the Securities and Exchange Commission, Washington, DC.

WITNESS my hand this 20th day of February, 2020.

/s/ JAMES G. BERGES

James G. Berges

PPG INDUSTRIES, INC.

POWER OF ATTORNEY

(10-K)

I, Steven A. Davis, a Director of PPG Industries, Inc. (the “Corporation”), a Pennsylvania corporation, hereby constitute and appoint Michael H. McGarry, Anne M. Foulkes and Vincent J. Morales, or any of them, my true and lawful attorneys or attorneys-in-fact, with full power of substitution and revocation, to sign, in my name and on my behalf as a Director of the Corporation, the Corporation’s Form 10-K for the fiscal year ended December 31, 2019, to be filed with the Securities and Exchange Commission, Washington, DC.

WITNESS my hand this 20th day of February, 2020.

/s/ STEVEN A. DAVIS

Steven A. Davis

PPG INDUSTRIES, INC.

POWER OF ATTORNEY

(10-K)

I, John V. Faraci, a Director of PPG Industries, Inc. (the "Corporation"), a Pennsylvania corporation, hereby constitute and appoint Michael H. McGarry, Anne M. Foulkes and Vincent J. Morales, or any of them, my true and lawful attorneys or attorneys-in-fact, with full power of substitution and revocation, to sign, in my name and on my behalf as a Director of the Corporation, the Corporation's Form 10-K for the fiscal year ended December 31, 2019, to be filed with the Securities and Exchange Commission, Washington, DC.

WITNESS my hand this 20th day of February, 2020.

/s/ JOHN V. FARACI

John V. Faraci

PPG INDUSTRIES, INC.

<u>POWER OF ATTORNEY</u>

(10-K)

I, Hugh Grant, a Director of PPG Industries, Inc. (the “Corporation”), a Pennsylvania corporation, hereby constitute and appoint Michael H. McGarry, Anne M. Foulkes and Vincent J. Morales, or any of them, my true and lawful attorneys or attorneys-in-fact, with full power of substitution and revocation, to sign, in my name and on my behalf as a Director of the Corporation, the Corporation’s Form 10-K for the fiscal year ended December 31, 2019, to be filed with the Securities and Exchange Commission, Washington, DC.

WITNESS my hand this 20th day of February, 2020.

/s/ HUGH GRANT

Hugh Grant

PPG INDUSTRIES, INC.

POWER OF ATTORNEY

(10-K)

I, Victoria F. Haynes, a Director of PPG Industries, Inc. (the “Corporation”), a Pennsylvania corporation, hereby constitute and appoint Michael H. McGarry, Anne M. Foulkes and Vincent J. Morales, or any of them, my true and lawful attorneys or attorneys-in-fact, with full power of substitution and revocation, to sign, in my name and on my behalf as a Director of the Corporation, the Corporation’s Form 10-K for the fiscal year ended December 31, 2019, to be filed with the Securities and Exchange Commission, Washington, DC.

WITNESS my hand this 20th day of February, 2020.

/s/ VICTORIA F. HAYNES

Victoria F. Haynes

PPG INDUSTRIES, INC.

POWER OF ATTORNEY

(10-K)

I, Melanie L. Healey, a Director of PPG Industries, Inc. (the "Corporation"), a Pennsylvania corporation, hereby constitute and appoint Michael H. McGarry, Anne M. Foulkes and Vincent J. Morales, or any of them, my true and lawful attorneys or attorneys-in-fact, with full power of substitution and revocation, to sign, in my name and on my behalf as a Director of the Corporation, the Corporation's Form 10-K for the fiscal year ended December 31, 2019, to be filed with the Securities and Exchange Commission, Washington, DC.

WITNESS my hand this 20th day of February, 2020.

/s/ MELANIE L. HEALEY

Melanie L. Healey

PPG INDUSTRIES, INC.

POWER OF ATTORNEY

(10-K)

I, Gary R. Heminger, a Director of PPG Industries, Inc. (the "Corporation"), a Pennsylvania corporation, hereby constitute and appoint Michael H. McGarry, Anne M. Foulkes and Vincent J. Morales, or any of them, my true and lawful attorneys or attorneys-in-fact, with full power of substitution and revocation, to sign, in my name and on my behalf as a Director of the Corporation, the Corporation's Form 10-K for the fiscal year ended December 31, 2019, to be filed with the Securities and Exchange Commission, Washington, DC.

WITNESS my hand this 20th day of February, 2020.

/s/ GARY R. HEMINGER

Gary R. Heminger

PPG INDUSTRIES, INC.

POWER OF ATTORNEY

(10-K)

I, Michele J. Hooper, a Director of PPG Industries, Inc. (the “Corporation”), a Pennsylvania corporation, hereby constitute and appoint Michael H. McGarry, Anne M. Foulkes and Vincent J. Morales, or any of them, my true and lawful attorneys or attorneys-in-fact, with full power of substitution and revocation, to sign, in my name and on my behalf as a Director of the Corporation, the Corporation’s Form 10-K for the fiscal year ended December 31, 2019, to be filed with the Securities and Exchange Commission, Washington, DC.

WITNESS my hand this 20th day of February, 2020.

/s/ MICHELE J. HOOPER

Michele J. Hooper

PPG INDUSTRIES, INC.

POWER OF ATTORNEY

(10-K)

I, Michael W. Lamach, a Director of PPG Industries, Inc. (the “Corporation”), a Pennsylvania corporation, hereby constitute and appoint Michael H. McGarry, Anne M. Foulkes and Vincent J. Morales, or any of them, my true and lawful attorneys or attorneys-in-fact, with full power of substitution and revocation, to sign, in my name and on my behalf as a Director of the Corporation, the Corporation’s Form 10-K for the fiscal year ended December 31, 2019, to be filed with the Securities and Exchange Commission, Washington, DC.

WITNESS my hand this 20th day of February, 2020.

/s/ MICHAEL W. LAMACH

Michael W. Lamach

PPG INDUSTRIES, INC.

POWER OF ATTORNEY

(10-K)

I, Martin H. Richenhagen, a Director of PPG Industries, Inc. (the “Corporation”), a Pennsylvania corporation, hereby constitute and appoint Michael H. McGarry, Anne M. Foulkes and Vincent J. Morales, or any of them, my true and lawful attorneys or attorneys-in-fact, with full power of substitution and revocation, to sign, in my name and on my behalf as a Director of the Corporation, the Corporation’s Form 10-K for the fiscal year ended December 31, 2019, to be filed with the Securities and Exchange Commission, Washington, DC.

WITNESS my hand this 20th day of February, 2020.

/s/ MARTIN H. RICHENHAGEN

Martin H. Richenhagen

PPG INDUSTRIES, INC.

POWER OF ATTORNEY

(10-K)

I, Catherine R. Smith, a Director of PPG Industries, Inc. (the “Corporation”), a Pennsylvania corporation, hereby constitute and appoint Michael H. McGarry, Anne M. Foulkes and Vincent J. Morales, or any of them, my true and lawful attorneys or attorneys-in-fact, with full power of substitution and revocation, to sign, in my name and on my behalf as a Director of the Corporation, the Corporation’s Form 10-K for the fiscal year ended December 31, 2019, to be filed with the Securities and Exchange Commission, Washington, DC.

WITNESS my hand this 20th day of February, 2020.

/s/ CATHERINE R. SMITH

Catherine R. Smith

Exhibit 31.1

PRINCIPAL EXECUTIVE OFFICER CERTIFICATION

I, Michael H. McGarry, certify that:

1. I have reviewed this annual report on Form 10-K of PPG 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.

/s/ Michael H. McGarry

Michael H. McGarry

Chairman and Chief Executive Officer

February 20, 2020

Exhibit 31.2

PRINCIPAL FINANCIAL OFFICER CERTIFICATION

I, Vincent J. Morales, certify that:

1. I have reviewed this annual report on Form 10-K of PPG 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.

/s/ Vincent J. Morales

Vincent J. Morales
Senior Vice President and Chief Financial Officer
(Principal Financial Officer)
February 20, 2020

Exhibit 32.1

CERTIFICATION PURSUANT TO 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 on Form 10-K of PPG Industries, Inc. for the period ended December 31, 2019 as filed with the Securities and Exchange Commission on the date hereof (the “Report”), I, Michael H. McGarry, Chairman and Chief Executive Officer of PPG Industries, Inc., certify to the best of my knowledge, pursuant to 18 U.S.C. §1350, as adopted pursuant to §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 PPG Industries, Inc.

/s/ Michael H. McGarry

Michael H. McGarry

Chairman and Chief Executive Officer

February 20, 2020

Exhibit 32.2

CERTIFICATION PURSUANT TO 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 on Form 10-K of PPG Industries, Inc. for the period ended December 31, 2019 as filed with the Securities and Exchange Commission on the date hereof (the “Report”), I, Vincent J. Morales, Senior Vice President and Chief Financial Officer of PPG Industries, Inc., certify to the best of my knowledge, pursuant to 18 U.S.C. §1350, as adopted pursuant to §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 PPG Industries, Inc.

/s/ Vincent J. Morales

Vincent J. Morales
Senior Vice President and Chief Financial Officer
(Principal Financial Officer)
February 20, 2020