ONEOK INC /NEW/
Form S-8
December 21, 2001

Registration No. 333-_____

As filed with the Securities and Exchange Commission on December 21, 2001

SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, DC 20549

FORM S-8
REGISTRATION STATEMENT UNDER THE SECURITIES ACT OF 1933

ONEOK, Inc.
(Exact name of registrant as specified in its charter)

OKLAHOMA	73-1520922
(State or other jurisdiction of incorporation or organization)	(IRS Employer Identification No.)

100 West Fifth Street
Tulsa, Oklahoma 74103
(918) 588-7000
(Address, including zip code and telephone number, including area code of registrant's principal executive offices)

ONEOK, Inc. Long-Term Incentive Plan

(Full title of the plan)

JIM KNEALE	JOHN R. BARKER
Senior Vice President, Chief Financial Officer, and Treasurer	Gable & Gotwals
100 West Fifth Street	100 West Fifth Street, Suite 1100
Tulsa, Oklahoma 74103	Tulsa, Oklahoma 74103
(918) 588-7000	(918) 595-4800

(Names and addresses, including zip code, and telephone numbers, including area code, for agents for service)

CALCULATION OF REGISTRATION FEE

Title of securities to be registered	Amount to be registered (1)	Proposed maximum offering price per share (2)	Proposed maximum aggregate offering price (2)
Common stock, $0.01 par value (3)	2,900,000	$17.39	$50,431,000

Exhibit Index on Page 11.

(1) Represents the number of shares of Common Stock, $0.01 par value, of ONEOK, Inc. registered hereunder for issuance under the ONEOK, Inc. Long-Term Incentive Plan. The 2,900,000 shares covered by this registration statement includes 1,450,000 shares approved for issuance by the registrant's board of directors on February 15, 2001 and approved by the registrant's shareholders on May 17, 2001, and includes an additional 1,450,000 shares necessary to equitably adjust for the registrant's two-for-one stock split having a record date of May 23, 2001 and a distribution date of June 11, 2001, which equitable adjustment is required under Section 9 of the Plan and was approved by the registrant's board of directors on January 18, 2001.

(2) Pursuant to Rules 457(c) and 457(h) promulgated under the Securities Act of 1933, this estimate is based on a price of $17.39 per share of the registrant's Common Stock, the average of the high and low prices of the registrant's Common Stock on the New York Stock Exchange on December 18, 2001 (a date within 5 business days prior to the date of the filing of this registration statement), and is made solely for the purpose of determining the registration fee.

(3) Does not include 1,445,200 shares of Common Stock previously registered by ONEOK, Inc. on its registration statement on Form S-8 (Registration No. 333-81043), to which this registration statement relates and in respect of which a filing fee of $12,040 was previously paid to the Securities and Exchange Commission, nor does it include 554,800 shares carried forward from the registrant's registration statement on Form S-8 (Registration No. 333-41269), in respect of which registration statement a total filing fee of $12,269 was previously paid to the Securities and Exchange Commission, nor does it include the additional number of shares issued or issuable as a result of the registrant's two-for-one stock split having a record date of May 23, 2001 and a distribution date of June 11, 2001.

PURSUANT TO RULE 429 UNDER THE SECURITIES ACT OF 1933, THE PROSPECTUS INCLUDED IN THIS REGISTRATION STATEMENT ALSO REFERS TO 1,445,200 SHARES OF COMMON STOCK PREVIOUSLY REGISTERED UNDER REGISTRATION STATEMENT NO. 333-81043 AND REFERS TO 554,800 SHARES PREVIOUSLY CARRIED FORWARD FROM REGISTRATION STATEMENT NO. 333-41269 AND COVERS ANY ADDITIONAL SHARES ISSUABLE AS A RESULT OF THE REGISTRANT'S TWO-FOR-ONE STOCK SPLIT HAVING A RECORD DATE OF MAY 23, 2001 AND A DISTRIBUTION DATE OF JUNE 11, 2001, IN EACH CASE TO THE EXTENT THAT ANY OF SUCH SHARES REMAIN UNISSUED AS OF THE DATE OF THIS REGISTRATION STATEMENT.

PART I
INFORMATION REQUIRED IN THE SECTION 10(a) PROSPECTUS

The document(s) containing the information specified in Part I of Form S-8 have been or will be sent or given to each employee eligible to participate in the plan as specified in Rule 428(b)(1). These documents, and the documents incorporated by reference pursuant to Item 3 of Part II of this Registration Statement, taken together, constitute the prospectus for purpose of Section

10(a) of the Securities Act of 1933, as amended.

PART II
INFORMATION REQUIRED IN THE REGISTRATION STATEMENT

ITEM 3

INCORPORATION OF DOCUMENTS BY REFERENCE

The following documents previously filed with the Securities and Exchange Commission are hereby incorporated by reference into this Registration Statement:

(1) our annual report on Form 10-K for the year ended December 31, 2000.

(2) our reports on Form 10-Q for the quarterly periods ended March 31, 2001, June 30, 2001 and September 30, 2001.

(3) our current reports on Form 8-K dated January 19, 2001, January 29, 2001, February 22, 2001, May 23, 2001, May 25, 2001, May 30, 2001, June 26, 2001, August 9, 2001, August 9, 2001, September 27, 2001, September 27, 2001, November 14, 2001, November 21, 2001, December 3, 2001, December 3, 2001, and December 21, 2001.

(4) our Proxy Statement filed April 11, 2001 in connection with our annual meeting of shareholders held May 17, 2001.

(5) all documents we file after the date hereof pursuant to Sections 13(a), 13(c), 14 and 15(d) of the Securities Exchange Act of 1934, as amended, prior to the filing of a post-effective amendment which indicates that all securities offered have been sold or which deregisters all securities then remaining unsold. Such documents are deemed to be a part hereof from the date of filing of such documents.

ITEM 5

INTERESTS OF NAMED EXPERTS AND COUNSEL

The legality of the securities that may be issued under the plan has been passed upon by the firm of Gable & Gotwals, 100 West Fifth Street, Suite 1100, Tulsa, Oklahoma 74103-4217, counsel for the Company.

ITEM 6

INDEMNIFICATION OF DIRECTORS AND OFFICERS

ONEOK, Inc. (the "Company"), as an Oklahoma corporation, is empowered by section 1031 of the Oklahoma General Corporation Act, subject to the procedures and limitations stated therein, to indemnify any person against expenses (including attorneys' fees), judgments, fines and amounts paid in settlement actually and reasonably incurred by him in connection with any threatened, pending or completed action, suit or proceeding in which such person is made or threatened to be made a party by reason of his being or having been a director, officer, employee or agent of the Company. The statute provides that indemnification pursuant to its provisions is not exclusive of other rights of indemnification to which a person may be entitled under any bylaw, agreement, vote of shareholders, or disinterested directors, or otherwise. Article VIII of the by-laws of the Company provides that directors and officers of the Company shall be indemnified by the Company to the fullest extent permitted by Oklahoma law as now or hereafter enforced, including the advance of related expenses. In addition, indemnification agreements, the form of which has been previously approved by the shareholders of the Company, have been entered into between the Company and each of its directors and executive officers.

The certificate of incorporation of the Company provides that a director of the corporation shall not be personally liable to the corporation or its shareholders for monetary damages for breach of fiduciary duty as a director, except for liability for (i) any breach of the director's duty of loyalty to the corporation or its shareholders, (ii) acts or omissions not in good faith or which would involve intentional misconduct or a knowing violation of law, (iii) payment of unlawful dividends or unlawful stock purchases or redemptions or (iv) any transaction from which the director derived an improper personal benefit.

Pursuant to Article VIII of the by-laws of the Company, upon authorization and determination (i) by the board of directors by a majority of a quorum consisting of directors who were not parties to the action, suit, or proceeding involved; (ii) if such a quorum is not obtainable, or even if obtainable and a quorum of disinterested directors so directs, by independent counsel in a written opinion; or (iii) by the shareholders, the Company is obligated to indemnify any person who incurs liability by reason of the fact that he is or was a director, officer, employee or agent of the Company, or is or was serving at its request as a director, officer, employee or agent of another corporation, partnership, joint venture, trust or other enterprise, or as a member of any committee or similar body, if he acted in good faith and in a manner he reasonably believed to be in or not opposed to the best interests of the Company, and with respect to any criminal action or proceeding, had no reasonable cause to believe his conduct was unlawful. However, in an action by or in the right of the Company, no indemnification will be made if such person shall be adjudged to be liable to the Company, unless such indemnification is allowed by a court of competent jurisdiction.

The indemnification agreements referred to above provide that the Company is obligated to indemnify the specified director or executive officer to the fullest extent permitted by law. The agreements provide that, upon request by a director or executive officer, the Company is obligated to advance expenses for defense of a claim made against the director or executive officer. The obligation of the Company to indemnify the director or executive officer is subject to applicable law and the determination by a "reviewing party" selected by the board of directors that the director or executive officer is entitled to indemnification. In addition, the agreements obligate the Company to indemnify the specified executive officer or director to the extent of the Company's recoveries under insurance policies regardless of whether the director or executive officer is ultimately determined to be entitled to indemnification. The agreements also provide for partial indemnification if a portion of a claim for indemnification is not allowed by the reviewing party appointed by the board of directors.

Under an insurance policy obtained by the Company, coverage of Company officers and directors against liability for neglect, errors, omissions or breaches of duty in their capacities as such is provided for both the Company, to the extent that it is obligated to indemnify such officers and directors, and the officers and directors themselves. Additional coverage is provided to the Company for claims arising from any such conduct in connection with any purchase or sale of, or any offer to purchase or sell, securities issued by the Company. Such coverage is provided in the amount of $200,000,000, with a retained limit by the

Company of $250,000. The insurance company is obligated to pay any covered loss in excess of the $250,000 retained limit and covered defense costs from the first dollar, up to the policy limit of $200,000,000. Among the policy exclusions are those which exclude coverage for accounting for profits made within the meaning of Section 16(b) of the Securities Exchange Act of 1934, claims based upon or attributable to directors and officers gaining any personal profit or advantage to which such individuals are not legally entitled, and for any claims brought about or attributable to the dishonesty of an officer or director.

It is recognized that the above-summarized provisions of the Company's by-laws, the indemnification agreements and the applicable provisions of the Oklahoma General Corporation Act may be sufficiently broad to indemnify officers, directors and controlling persons of the Company against liabilities arising under such act.

The Company and Western Resources, Inc. ("WRI") have entered into a Registration Rights Agreement that provides for indemnification of the Company's directors, officers, employees and controlling persons, if any, in any offering or sale of shares of common stock, obtainable upon conversion of the Series A Convertible Preferred Stock or Series B Convertible Preferred Stock, against any claims (including amounts paid in settlement), or actions or proceedings in respect thereof, arising out of or based upon an untrue statement or alleged untrue statement of a material fact contained in such registration statement or prospectus contained therein, or any document incorporated by reference therein, or arising out of or based upon any omission or alleged omission to state therein a material fact required to be stated or necessary to make the statements therein not misleading, in each case only to the extent that such untrue statement or alleged untrue statement or omission or alleged omission was made in reliance upon and in conformity with written information furnished to the Company by WRI or an agent or underwriter thereof expressly for use therein.

ITEM 8

EXHIBITS

Exhibit Number	Description
4.1	Certificate of Incorporation of the Company, filed May 16, 1997 (incorporated by reference to Exhibit 3.1 to the Company's Registration Statement on Form S-4, as amended (Commission File No. 333-27467)).
4.2	Certificate of Merger of the Company, filed November 26, 1997 (incorporated by reference to Exhibit (1)(b) to the Company's Quarterly Report on Form 10-Q for the quarter ended May 31, 1998).
4.3	Amendment to Certificate of Incorporation of the Company, filed January 16, 1998 (incorporated by reference to Exhibit (1)(b) to the Company's Quarterly Report on Form 10-Q for the quarter ended May 31, 1998).
4.4	Amendment to Certificate of Incorporation of the Company, filed May 23, 2001 (incorporated by reference to Exhibit 4.15 to the

Company's Registration Statement on Form S-3, filed July 18, 2001, as amended (Commission File No. 333-65392).

4.5 By-laws of the Company, as amended (incorporated by reference to Exhibit (3)(d) to the Company's Annual Report on Form 10-K for the year ended August 31, 1999).

4.6 Certificate of Designation for Convertible Preferred Stock of the Company filed November 26, 1997 (incorporated by reference from Exhibit 3.3 to the Company's Registration Statement on Form S-4, as amended (Commission File No. 333-27467)).

4.7 Certificate of Designation for Series C Participating Preferred Stock of the Company, filed November 26, 1998 (incorporated by reference to Exhibit 1 to the Company's Registration Statement on Form 8-A filed with the Commission on November 26, 1997).

4.8 Form of Common Stock Certificate (incorporated by reference to Exhibit 1 to the Company's Registration Statement on Form 8-A filed with the Commission on November 21, 1997).

4.9 Rights Agreement, dated November 26, 1997, between the Company and Liberty Bank and Trust Company of Oklahoma City, N.A., as Rights Agent (incorporated by reference to Exhibit 2.3 to the Company's Registration Statement on Form S-4, as amended (Commission File No. 333-27467)).

4.10 Shareholder Agreement, dated November 26, 1997, between Western Resources, Inc. and the Company (incorporated by reference to Exhibit 2.2 to the Company's Registration Statement on Form S-4, as amended (Commission File No. 333-27467)).

4.11 Form of Registration Rights Agreement, dated November 26, 1997, between Western Resources, Inc. and the Company (incorporated by reference to Exhibit 3.4 to the Company's Registration Statement on Form S-4, as amended (Commission File No. 333-27467)).

Exhibit Number	Description
5.1*	Opinion of Gable & Gotwals regarding the validity of the securities.
23.1*	Consent of KPMG LLP.
23.2	Consent of Gable & Gotwals (included in Exhibit 5.1).
24.1	Powers of Attorney (included on the signature page hereof).

* Filed herewith.

ITEM 9

UNDERTAKINGS

a. The undersigned registrant hereby undertakes:

(1) To file, during any period in which offers or sales are being made, a post-effective amendment to this registration statement:

(i) To include any prospectus required by Section 10(a)(3) of the Securities Act of 1933;

(ii) To reflect in the prospectus any facts or events arising after the effective date of the registration statement (or the most recent post-effective amendment thereof) which, individually or in the aggregate, represent a fundamental change in the information set forth in the registration statement. Notwithstanding the foregoing, any increase or decrease in volume of securities offered (if the total dollar value of securities offered would not exceed that which was registered) and any deviation from the low or high end of the estimated maximum offering range may be reflected in the form of prospectus filed with the Commission pursuant to Rule 424(b) if, in the aggregate, the changes in volume and price represent no more than a 20% change in the maximum aggregate offering price set forth in the "Calculation of Registration Fee" table in the effective registration Statement.

(iii) To include any material information with respect to the plan of distribution not previously disclosed in the registration statement or any material change to such information in the registration Statement.

provided, however, that paragraphs (a) (1) (i) and (a) (1) (ii) do not apply if the registration statement is on Form S-3, Form S-8 or Form F-3, and the information required to be included in a post-effective amendment by those paragraphs is contained in periodic reports filed with or furnished to the Commission by the registrant pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934 that are incorporated by reference in the registration statement.

(2) That, for the purpose of determining any liability under the Securities Act of 1933, each post-effective amendment shall be deemed to be a new registration statement relating to the securities offered therein, and the offering of such securities at the time of shall be deemed to be the initial bona fide offering thereof.

(3) To remove from registration by means of post-effective amendment any of the securities being registered which remain unsold at the termination of the offering.

b. The undersigned registrant hereby undertakes that, for purposes of determining any liability under the Securities Act of 1933, each filing of the registrant's annual report pursuant to Section 13(a) or Section

15(d) of the Securities Exchange Act of 1934 (and, where applicable, each filing of an employee benefit plan's annual report pursuant to Section 15(d) of the Securities Exchange Act of 1934) that is incorporated by reference in the registration statement shall be deemed to be a new registration statement relating to the securities offered herein, and the offering of such securities at that time shall be deemed to be the initial bona fide offering thereof.

c. Insofar as indemnification for liabilities arising under the Securities Act of 1933 may be permitted to directors, officers and controlling persons of the registrant pursuant to the foregoing provisions, or otherwise, the registrant has been advised that in the opinion of the Securities and Exchange Commission such indemnification is against public policy as expressed in the Act and is, therefore, unenforceable. In the event that a claim for indemnification against such liabilities (other than the payment by the registrant of expenses incurred or paid by a director, officer or controlling person of the registrant in the successful defense of any action, suit or proceeding) is asserted by such director, officer or controlling person in connection with the securities being registered, the registrant will, unless in the opinion of its counsel the matter has been settled by controlling precedent, submit to a court of appropriate jurisdiction the question whether such indemnification by it is against public policy as expressed in the Act and will be governed by the final adjudication of such issue.

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SIGNATURE

Pursuant to the requirements of the Securities Act of 1933, the registrant certifies that it has reasonable grounds to believe that it meets all of the requirements for filing on Form S-8, and has duly caused this registration statement to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of Tulsa and the State of Oklahoma, on the 21st day of December, 2001.

ONEOK, Inc.

/s/ David L. Kyle
By:_______________________________________
David L. Kyle, Chairman of the Board, President and Chief Executive Officer

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POWER OF ATTORNEY

Each person whose individual signature appears below hereby authorizes David L. Kyle and Jim Kneale, or either of them, as attorney-in-fact with full power of substitution, to execute in the name and on behalf of each person, individually and in each capacity stated below, and to file any and all amendments to this registration statement, including any and all post-effective amendments and all instruments necessary or incidental in connection therewith.

SIGNATURES

Pursuant to the requirements of the Securities Act of 1933, this registration statement has been signed by the following persons in the capacities indicated on the 21st day of December, 2001.

Signature	Title
/s/ David L. Kyle	

David L. Kyle	Chairman of the Board, President, and Chief Executive Officer (Principal Executive Officer)
/s/ Edwyna G. Anderson Edwyna G. Anderson	Director
/s/ William M. Bell William M. Bell	Director
/s/ Douglas R. Cummings Douglas R. Cummings	Director
John B. Dicus	Director
/s/ William L. Ford William L. Ford	Director

Signature	Title
/s/ Douglas T. Lake Douglas T. Lake	Director
/s/ Bert H. Mackie Bert H. Mackie	Director
/s/ Jim Kneale Jim Kneale	Senior Vice President, Treasurer and Chief Financial Officer (Principal Financial Officer)
/s/ Douglas A. Newsom Douglas A. Newsom	Director

/s/ Gary D. Parker Gary D. Parker	Director
/s/ J. D. Scott J. D. Scott	Director
/s/ Beverly Monnet Beverly Monnet	Vice President, Controller and Chief Accounting Officer (Principal Accounting Officer)

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EXHIBIT INDEX

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4.7	Certificate of Designation for Series C Participating Preferred Stock of the Company, filed November 26, 1998 (incorporated by

	reference to Exhibit 1 to the Company's Registration Statement on Form 8-A filed with the Commission on November 26, 1997).
4.8	Form of Common Stock Certificate (incorporated by reference to Exhibit 1 to the Company's Registration Statement on Form 8-A filed with the Commission on November 21, 1997).
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* Filed herewith.

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808

Unrealized (losses)/gains – derivative financial instruments
(1
)

(10
)

4

Other comprehensive (loss)/income, net of tax

(147
)

316

336

Total comprehensive income

$1,211

$1,931

$1,231

Less: amounts attributable to noncontrolling interests:

Net income
(17
)

(21
)

(22
)

Unrealized foreign currency translation gains/(losses)
11

(17
)

10

Comprehensive income attributable to PPG

$1,205

$1,893

$1,219

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

Consolidated Balance Sheet

	December 31	
($ in millions)	2018	2017
Assets		
Current assets		
Cash and cash equivalents	$902	$1,436
Short-term investments	61	55
Receivables	2,845	2,903
Inventories	1,783	1,730
Other	370	353
Total current assets	$5,961	$6,477
Property, plant and equipment, net	2,805	2,824
Goodwill	4,070	3,942
Identifiable intangible assets, net	1,972	2,045
Deferred income taxes	229	305
Investments	251	268
Other assets	727	677
Total	$16,015	$16,538
Liabilities and Shareholders' Equity		
Current liabilities		
Accounts payable and accrued liabilities	$3,623	$3,781
Restructuring reserves	99	102
Short-term debt and current portion of long-term debt	651	12
Total current liabilities	$4,373	$3,895
Long-term debt	4,365	4,134
Accrued pensions	645	729
Other postretirement benefits	629	699
Deferred income taxes	429	442
Other liabilities	842	967
Total liabilities	$11,283	$10,866
Commitments and contingent liabilities (See Note 14)		
Shareholders' equity		
Common stock	$969	$969
Additional paid-in capital	788	756
Retained earnings	18,131	17,140
Treasury stock, at cost	(12,958)	(11,251)
Accumulated other comprehensive loss	(2,300)	(2,057)
Total PPG shareholders' equity	$4,630	$5,557
Noncontrolling interests	102	115
Total shareholders' equity	$4,732	$5,672
Total	$16,015	$16,538

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, 2016	$969	$635	$15,521	($9,440)	($2,702)	$4,983	$86	$5,069
Net income attributable to the controlling and noncontrolling interests	—	—	873	—	—	873	22	895
Other comprehensive income/(loss), net of tax	—	—	—	—	346	346	(10)	336
Cash dividends	—	—	(414)	—	—	(414)	—	(414)
Purchase of treasury stock	—	—	—	(1,050)	—	(1,050)	—	(1,050)
Issuance of treasury stock	—	37	—	18	—	55	—	55
Stock-based compensation activity	—	35	—	—	—	35	—	35
Dividends paid on subsidiary common stock to noncontrolling interests	—	—	—	—	—	—	(4)	(4)
Reductions in noncontrolling interests	—	—	—	—	—	—	(7)	(7)
December 31, 2016	$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

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)	2018	2017	2016
Operating activities			
Net income attributable to the controlling and noncontrolling interests	$1,358	$1,615	$895
Less: Income from discontinued operations	18	225	330
Income from continuing operations	$1,340	$1,390	$565
Adjustments to reconcile to cash from operations:			
Depreciation and amortization	497	460	440
Defined benefit pension expense	43	65	85
Pension settlement charge	—	60	968
Business restructuring charge, net	66	—	191
Environmental remediation charges and other costs	77	—	82
Stock-based compensation expense	37	35	45
Gain on sale of land	(26)	—	—
Net gain, from sale of businesses	—	(25)	(39)
Equity affiliate (income)/loss, net of dividends	(1)	(4)	(6)
Deferred income taxes	45	38	171
Contributions to pension plans	(99)	(87)	(188)
Restructuring payments	(66)	(49)	(76)
Funding of asbestos settlement trust	—	—	(813)
Change in certain asset and liability accounts (net of acquisitions):			
Receivables	(69)	(76)	(68)
Inventories	(109)	(116)	56
Other current assets	5	(43)	21
Accounts payable and accrued liabilities	(76)	188	169
Noncurrent assets and liabilities, net	(207)	(170)	(53)
Taxes and interest payable	50	(129)	(268)
Other	(20)	14	(64)
Cash from operating activities - continuing operations	$1,487	$1,551	$1,218
Cash (used for)/from operating activities - discontinued operations	(20)	17	133
Cash from operating activities	$1,467	$1,568	$1,351
Investing activities			
Capital expenditures	($411)	($360)	($380)
Business acquisitions, net of cash balances acquired	(378)	(225)	(349)
Payments for acquisition of equity investment	—	(100)	—
Net proceeds from the sale of businesses	—	593	1,094
Proceeds from sale of land	27	—	—
Proceeds from maturity of short-term investments	—	—	92
Payments for the settlement of cross currency swap contracts	(28)	(34)	(36)
Proceeds from the settlement of cross currency swap contracts	23	37	37
Payments on net investment hedges	—	—	(13)
Other	3	26	27
Cash (used for)/from investing activities - continuing operations	($764)	($63)	$472
Cash used for investing activities - discontinued operations	—	(4)	(36)
Cash (used for)/from investing activities	($764)	($67)	$436
Financing activities			
Net change in borrowings with maturities of three months or less	($1)	($7)	($15)
Net payments on commercial paper and short-term debt	(2)	(93)	(361)

Net proceeds from the issuance of long-term debt (net of discount and issuance costs)	992	—	988
Repayment of long-term debt	(6)	(588)	(379)
Payments related to tax withholding on stock-based compensation awards	(15)	(28)	(26)
Purchase of treasury stock	(1,721)	(813)	(1,050)
Issuance of treasury stock	15	52	31
Dividends paid on PPG common stock	(453)	(434)	(414)
Other	(14)	(43)	16
Cash used for financing activities	($1,205)	($1,954)	($1,210)
Effect of currency exchange rate changes on cash and cash equivalents	(32)	69	(68)
Net (decrease)/increase in cash and cash equivalents	($534)	($384)	$509
Cash and cash equivalents, beginning of year	$1,436	$1,820	$1,311
Cash and cash equivalents, end of year	$902	$1,436	$1,820
Supplemental disclosures of cash flow information:			
Interest paid, net of amount capitalized	$108	$100	$118
Taxes paid, net of refunds	$380	$648	$349

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 expensed as incurred and totaled $280 million, $313 million and $322 million in 2018, 2017 and 2016, respectively.

Research and Development

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

($ in millions)	2018	2017	2016
Research and development – total	$464	$472	$473
Less depreciation on research facilities	23	21	20
Research and development, net	$441	$451	$453

Legal Costs

Legal costs, 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.

Notes to the Consolidated Financial Statements

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 capitalized leased assets is 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. 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. The quantitative goodwill impairment test is performed during the fourth quarter by comparing the estimated fair value of the associated reporting unit as of September 30 to its carrying value. Fair value is estimated using discounted cash flow methodologies.

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.

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.

Product warranties

The Company accrues for product warranties at the time the associated products are sold based on historical claims experience. The reserve, pre-tax 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

Notes to the Consolidated Financial Statements

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 $22 million and $19 million as of December 31, 2018 and 2017, 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.

Reclassifications

Certain reclassifications of prior years' data have been made to conform to the current year presentation. These reclassifications had no impact on our previously reported Net income, cash flows or shareholders' equity.

Accounting Standards Adopted in 2018

Effective January 1, 2018, PPG adopted Accounting Standard Updates ("ASU") No. 2017-07, "Improving the Presentation of Net Periodic Pension Cost and Net Periodic Postretirement Benefit Cost." This ASU requires the service cost component of these costs to be disaggregated from all other components and to be reported in the same line item or items as other compensation costs. The other components of these costs are required to be presented in the consolidated statement of income separately from the service cost component. This ASU required retrospective adoption for all prior periods presented.

The effect of the retrospective adoption on the consolidated statement of income related to the net periodic pension and other postretirement benefit costs was as follows:

	For the Year Ended December 31, 2017		
($ in millions)	As Previously Reported	Reclassifications	As Revised
Cost of sales, exclusive of depreciation and amortization	$8,207	$2	$8,209
Selling, general and administrative	$3,564	($10)	$3,554
Research and development, net	$453	($2)	$451
Other charges	$64	$10	$74
Income before income taxes	$2,005	$—	$2,005

	For the Year Ended December 31, 2016		
($ in millions)	As Previously Reported	Reclassifications	As Revised
Cost of sales, exclusive of depreciation and amortization	$7,693	($28)	$7,665
Selling, general and administrative	$3,588	($33)	$3,555
Research and development, net	$459	($6)	$453
Other charges	$175	$67	$242
Income before income taxes	$779	$—	$779

In February 2018, the Financial Accounting Standards Board ("FASB") issued ASU No. 2018-02, "Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income." This ASU allows a reclassification from Accumulated other comprehensive income to Retained earnings for stranded tax effects resulting from the Tax Cuts and Jobs Act. PPG early adopted this standard in the first quarter of 2018 using the specific identification method and recorded a reclassification from Other comprehensive (loss)/income, net of tax in the consolidated statement of comprehensive income to Retained earnings on the consolidated balance sheet of $107 million.

Effective January 1, 2018, PPG adopted ASU No. 2014-09, “Revenue from Contracts with Customers: Topic 606.” See Note 2, “Revenue Recognition” for further details regarding the impact of adoption of this standard.

Notes to the Consolidated Financial Statements

PPG's adoption of the following ASU's in 2018 did not have a material impact on PPG's consolidated financial position, results of operations or cash flows:

Accounting Standard Update	
2018-14	Compensation - Retirement Benefits - Defined Benefit Plans
2017-12	Derivatives and Hedging - Targeted Improvements to Accounting for Hedging Activities
2017-09	Stock Compensation - Scope of Modification Accounting
2016-16	Intra-Entity Transfers of Assets Other Than Inventory
2016-15	Classification of Certain Cash Receipts and Cash Payments
2016-01	Recognition and Measurement of Financial Assets and Liabilities

Accounting Standards to be Adopted in Future Years

In August 2018, the 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. The amendments in this ASU are effective for fiscal years beginning after December 15, 2019 and for interim periods therein with early adoption permitted. PPG 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 held at the reporting date based on historical experience, current conditions, and reasonable and supportable forecasts. Financial institutions and other organizations will now use forward-looking information to better inform their credit loss estimates. The amendments in this ASU are effective for fiscal years beginning after December 15, 2019 and for interim periods therein. Entities may chose to adopt the new ASU as of its fiscal year beginning after December 15, 2018. PPG does not plan to early adopt this standard. PPG does not believe this ASU will have a material impact on its consolidated financial position, results of operations or cash flows.

In February 2016, the FASB issued ASU No. 2016-02, "Leases." This ASU requires all lessees to recognize on the balance sheet right to use assets and lease liabilities for the rights and obligations created by lease arrangements with terms greater than 12 months. Additionally, in July 2018, the FASB issued ASU No. 2018-11, "Targeted Improvements." This ASU provides an additional transition method to adopt the new leasing standard. Under this new transition method, an entity initially applies the new leasing standard using a cumulative-effect adjustment to the opening balance of retained earnings but will continue to report comparative periods under existing guidance in accordance with ASC 840, Leases. PPG adopted the new standard effective January 1, 2019, using this new transition method and does not expect a material cumulative-effect adjustment to the opening balance of Retained earnings. The Company is nearly complete in assessing the impact the adoption will have on its consolidated financial statements and expects an impact on assets and liabilities on its consolidated balance sheet in the range of $700 million to $750 million. These lease obligations will be classified as debt on the consolidated balance sheet. Due to the corresponding increase in total debt, the Company's total debt to total debt and equity ratio and other financial ratios that include total debt or total capital will be impacted with the adoption of this ASU in the first quarter of 2019.

2. Revenue Recognition

Background

In May 2014, the FASB issued ASU No. 2014-09, "Revenue from Contracts with Customers: Topic 606." This ASU replaces nearly all existing U.S. GAAP guidance on revenue recognition. The standard prescribes a five-step model for recognizing revenue, the application of which may require significant judgment. The new guidance requires PPG to evaluate the transfer of promised goods or services to customers and recognize revenue in an amount that reflects the consideration which the Company expects to be entitled to receive in exchange for those goods and services.

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. This approach is consistent with the Company's historical revenue recognition methodology.

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.

Notes to the Consolidated Financial Statements

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, 2018 and 2017, service revenue constituted approximately 5% of total revenue.

Net sales by segment and region for the years ended December 31, 2018, 2017 and 2016 were as follows:

	Performance Coatings			Industrial Coatings			Total Net Sales		
($ in millions)	2018	2017	2016	2018	2017	2016	2018	2017	2016
United States and Canada	$4,062	$4,031	$4,055	$2,423	$2,276	$2,199	$6,485	$6,307	$6,254
EMEA	2,936	2,761	2,619	1,742	1,628	1,545	4,678	4,389	4,164
Asia Pacific	1,071	970	959	1,547	1,553	1,472	2,618	2,523	2,431
Latin America	1,018	968	947	575	561	474	1,593	1,529	1,421
Total	$9,087	$8,730	$8,580	$6,287	$6,018	$5,690	$15,374	$14,748	$14,270

The Company adopted the ASU using the modified retrospective approach which required the financial statements to reflect the new standard as of January 1, 2018, and as a result, contracts that ended prior to January 1, 2018 were not included within the Company’s assessment. Accordingly, the amounts in the comparative consolidated statements of income and consolidated balance sheet have not been adjusted for the adoption of this standard. The ASU also provided additional clarity that resulted in reclassifications to or from Net sales, Cost of sales, exclusive of depreciation and amortization, Selling, general and administrative and Other income. Certain costs historically reported in Selling, general and administrative costs will now be recorded in Cost of sales, exclusive of depreciation and amortization in the consolidated statement of income, as they represent costs incurred in satisfaction of performance obligations. In addition, the cost of certain customer incentives are now recorded as a reduction of Net sales rather than Cost of sales, exclusive of depreciation and amortization or Selling, general and administrative costs. The following table summarizes the impact of the adoption of this ASU on the consolidated statement of income for the year ended December 31, 2018:

	Year Ended December 31, 2018		
($ in millions)	Without adoption	Adjustments	As Reported
Net sales	$15,399	($25)	$15,374
Cost of sales, exclusive of depreciation and amortization	$8,925	$76	$9,001
Selling, general and administrative	$3,682	($109)	$3,573
Other income	($122)	$8	($114)
Income before income taxes	$1,693	$—	$1,693

3. Acquisitions and Divestitures

Acquisitions

Announced Acquisitions

In January 2019, PPG announced that it has reached a definitive agreement to acquire automotive coatings manufacturer Hemmelrath. The transaction is expected to close in the first half of 2019.

In December 2018, PPG announced that it has reached a definitive agreement to acquire Whitford Worldwide Company, a global manufacturer that specializes in low-friction and nonstick coatings for industrial applications and consumer products. The transaction is expected to close in the first quarter of 2019.

Completed Acquisitions

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, headquartered in Rock Hill, South Carolina, 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 segment.

Notes to the Consolidated Financial Statements

The Crown Group

On October 2, 2017, PPG acquired The Crown Group ("Crown"), a U.S.-based coatings application services business, which is reported as part of PPG's Industrial Coatings reportable segment. Crown is one of the leading component and product finishers in North America. Crown applies coatings to customers' manufactured parts and assembled products at 11 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 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 20, "Reportable Business Segment Information."

MetoKote Corporation

In July 2016, PPG completed the acquisition of MetoKote Corporation ("MetoKote"), a U.S.-based coatings application services business. MetoKote applies coatings to customers' manufactured parts and assembled products. It operates on-site coatings services within several customer manufacturing locations, as well as at regional service centers, located throughout the U.S., Canada, Mexico, the United Kingdom, Germany, Hungary and the Czech Republic. Customers ship parts to METOKOTE® service centers where they are treated to enhance paint adhesion and painted with electrocoat, powder or liquid coatings technologies. Coated parts are then shipped to the customer's next stage of assembly. MetoKote coats an average of more than 1.5 million parts per day.

The following table summarizes the estimated fair value of assets acquired and liabilities assumed as reflected in the final purchase price allocation for MetoKote.

($ in millions)			
Current assets		$38	
Property, plant, and equipment	73		
Identifiable intangible assets with finite lives	86		
Goodwill	166		
Deferred income taxes [a]	(12		)
Total assets		$351	
Current liabilities	(23		)
	(22		)

Other long-term liabilities	
Total liabilities	($45)
Total purchase price, net of cash acquired	$306

(a) The net deferred income tax liability is included in assets due to the Company's tax jurisdictional netting.

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. While calculating this impact, no cost savings or operating synergies that may result from the acquisition were included. The results of this business since the date of acquisition have been reported within the industrial coatings business within the Industrial Coatings reportable segment.

Notes to the Consolidated Financial Statements

Other Acquisitions

In 2018, 2017, and 2016, 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 $108 million, $74 million and $43 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 23 multi-brand stores. The company employs nearly 100 people. The results of this business since the date of acquisition have been reported within the architectural coatings Americas and Asia Pacific business within the Performance Coatings reportable 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, 2018, 2017, and 2016 were as follows:

($ in millions)	2018	2017	2016
Net sales	$—	$217	$908
Income from operations	$21	$30	$111
Net gains on the divestitures of businesses	—	343	421
Income tax expense	5	140	202
Income from discontinued operations, net of tax	$16	$233	$330

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 pre-tax 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, which employed more than 1,000 people and had net sales of approximately $350 million in 2016, supplies the transportation, energy, infrastructure and consumer markets.

Flat Glass Business

In October 2016, PPG completed the sale of its flat glass manufacturing and glass coatings operations to Vitro S.A.B. de C.V. PPG received approximately $740 million in cash proceeds and recorded a pre-tax gain of $421 million on the sale. Under the terms of the agreement, PPG divested its entire flat glass manufacturing and glass coatings operations, including production sites located in Fresno, California; Salem, Oregon; Carlisle, Pennsylvania; and Wichita Falls, Texas; four distribution/fabrication facilities located across Canada; and a research-and-development center located in

Harmar, Pennsylvania. PPG's flat glass business included approximately 1,200 employees. The business manufactures glass that is fabricated into products used primarily in commercial and residential construction.

Notes to the Consolidated Financial Statements

European Fiber Glass Business
In October 2016, PPG completed the sale of its European fiber glass business to glass manufacturer NEG. PPG recorded a pre-tax loss of $42 million, consisting predominately of a $46 million pension settlement charge. The European fiber glass business manufactures reinforcement materials for thermoset and thermoplastic composite applications for the transportation, energy, infrastructure and consumer end-uses. Manufacturing facilities in Hoogezand, Netherlands, and Wigan, England, and a research and development facility in Hoogezand were included in the transaction.
PFG Fiber Glass Joint Ventures
In November 2016, PPG sold its 50% ownership interests in its two PFG fiber glass joint ventures to its joint venture partner Nan Ya Plastics Corporation (“Nan Ya”). Nan Ya is affiliated with Taiwan-based Formosa Plastics Group. The PFG fiber glass joint ventures supply electronic yarn fibers used in integrated electronic circuit boards and fiber glass reinforcement products for automotive applications. PPG recorded a net pre-tax gain of $36 million on the sale.
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 pre-tax gain on the sale. The Company's consolidated balance sheet presents the assets and liabilities of the Plaka business as held for sale as of December 31, 2016.
Pittsburgh Glass Works
In April 2016, PPG sold its minority ownership interest in Pittsburgh Glass Works LLC ("PGW") to LKQ Corporation concurrent with the majority partner’s sale of its ownership interest. PPG recorded a pre-tax gain on the sale of $20 million. PPG accounted for its interest in PGW under the equity method of accounting. PPG’s share of net earnings from PGW are reported in Other income in the consolidated statement of income for all periods presented and have not been reclassified as discontinued operations, as the divestiture of PGW does not represent a strategic shift in PPG’s operations and PGW did not have a major impact on PPG's ongoing results of operations.
4. Working Capital Detail

($ in millions)	2018	2017
Receivables		
Trade - net[1]	$2,505	$2,559
Equity affiliates	4	5
Other - net	336	339
Total	$2,845	$2,903
Inventories[2]		
Finished products	$1,105	$1,083
Work in process	193	177
Raw materials	452	437
Supplies	33	33
Total	$1,783	$1,730
Accounts payable and accrued liabilities		
Trade	$2,177	$2,321
Accrued payroll	424	441
Customer rebates	283	261
Other postretirement and pension benefits	80	78
Income taxes	112	100
Other	547	580
Total	$3,623	$3,781

(1) Allowance for doubtful accounts was $24 million and $25 million as of December 31, 2018 and 2017, respectively.
(2) Inventories valued using the LIFO method of inventory valuation comprised 36% and 34% of total gross inventory values as of December 31, 2018 and 2017, respectively. If the FIFO method of inventory valuation had been used, inventories would have been $113 million and $103 million higher as of December 31, 2018 and 2017,

respectively. During the years ended December 31, 2018 and 2017, 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 $2 million and zero for the years ended December 31, 2018 and 2017, respectively.

Notes to the Consolidated Financial Statements

5. Property, Plant and Equipment

($ in millions)	Useful Lives (years)	2018	2017
Land and land improvements	1-30	$489	$487
Buildings	20-40	1,472	1,488
Machinery and equipment	5-25	3,387	3,432
Other	3-20	989	958
Construction in progress		296	229
Total(1)		$6,633	$6,594
Less: accumulated depreciation		3,828	3,770
Net		$2,805	$2,824

(1) Interest capitalized in 2018, 2017 and 2016 was $4 million, $7 million and $8 million, respectively.

6. Investments

($ in millions)	2018	2017
Investments in equity affiliates	$132	$135
Marketable equity securities (See Note 10)	69	79
Other	50	54
Total	$251	$268

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 and $12 million as of December 31, 2018 and December 31, 2017, respectively. Dividends received from equity affiliates were $15 million, $8 million and $7 million in 2018, 2017 and 2016, respectively.

7. Goodwill and Other Identifiable Intangible Assets

Goodwill

($ in millions)	Performance Coatings	Industrial Coatings	Total
January 1, 2017	$2,870	$702	$3,572
Acquisitions, including purchase accounting adjustments	23	89	112
Foreign currency translation	211	47	258
December 31, 2017	$3,104	$838	$3,942
Acquisitions, including purchase accounting adjustments	248	(13)	235
Foreign currency translation	(86)	(21)	(107)
December 31, 2018	$3,266	$804	$4,070

Identifiable Intangible Assets

($ in millions)	December 31, 2018 Gross Carrying Amount	December 31, 2018 Accumulated Amortization	December 31, 2018 Net	December 31, 2017 Gross Carrying Amount	December 31, 2017 Accumulated Amortization	December 31, 2017 Net
Indefinite-Lived Identifiable Intangible Assets						
Trademarks	$1,140	$—	$1,140	$1,158	$—	$1,158
Definite-Lived Identifiable Intangible Assets						
Acquired technology	$648	($515)	$133	$613	($489)	$124
Customer-related	1,396	(798)	598	1,437	(762)	675
Tradenames	190	(96)	94	166	(87)	79
Other	44	(37)	7	44	(35)	9
Total Definite Lived Intangible Assets	$2,278	($1,446)	$832	$2,260	($1,373)	$887
Total Identifiable Intangible Assets	$3,418	($1,446)	$1,972	$3,418	($1,373)	$2,045

Notes to the Consolidated Financial Statements

The Company’s identifiable intangible assets with definite lives are being amortized over their estimated useful lives. Aggregate amortization expense was $143 million, $129 million and $121 million in 2018, 2017 and 2016, respectively.

($ in millions)	2019	2020	2021	2022	2023
Estimated future amortization expense	$125	$100	$95	$85	$80

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 costs and asset write-downs.

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 current 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 remainder of the charge represents the write-down of certain assets. In addition, other cash costs of approximately $25 million will be incurred, consisting of approximately $10 million of incremental restructuring-related cash costs for certain items that are required to be expensed on an as-incurred basis and approximately $15 million for items which are expected to be capitalized. The Company also expects approximately $20 million of incremental non-cash accelerated depreciation expense for certain assets due to their reduced expected asset life as a result of this program, $9 million of which was recognized in the year ended December 31, 2018. Substantially all actions from this business restructuring plan are expected to be complete by the end of the first quarter of 2020. As of December 31, 2018, approximately 1,000 employees remain to be impacted.

2016 Restructuring Program

In December 2016, a pre-tax restructuring charge of $191 million was recorded. The restructuring actions will result in the net reduction of approximately 2,000 positions, with substantially all actions to be completed by the end of the second quarter of 2019. As of December 31, 2018, approximately 100 employees remain to be impacted.

Other Adjustments

In 2018, adjustments of approximately $49 million were recorded to reduce the remaining restructuring reserves established in 2016 to reflect the current estimate of the costs to complete these actions. Also in 2018, some additional restructuring actions were approved and charges of approximately $32 million were recorded. These amounts are recorded in Business restructuring, net in the consolidated statement of income.

A summary of restructuring charges by reportable business segment is as follows:

Restructuring Charges

($ in millions)	Severance and Other Costs	Asset Write-offs	Total
Performance Coatings	$77	$45	$122
Industrial Coatings	52	14	66
Corporate	7	—	7
Release of prior reserves	(4)	—	(4)
Total 2016 restructuring charge	$132	$59	$191
Performance Coatings	$49	$3	$52
Industrial Coatings	21	—	21
Corporate	10	—	10
Total 2018 restructuring charge	$80	$3	$83

Notes to the Consolidated Financial Statements

The reserve activity for the three years ended December 31, 2018, 2017, and 2016 was as follows:

Restructuring Reserve Activity

($ in millions)	Total Reserve
December 31, 2016	$130
2017 Activity	3
Cash payments	(49)
Foreign currency impact	18
December 31, 2017	$102
Total 2018 restructuring charge	83
Additional actions approved	32
Release of prior reserves and other adjustments [(1)]	(49)
Cash payments	(66)
Foreign currency impact	(4)
Other	12
December 31, 2018	$110

(1) Reductions to remaining restructuring reserves to reflect the current estimate of the costs to complete the actions.

9. Borrowings and Lines of Credit

Long-term Debt Obligations

($ in millions)	Maturity Date	2018	2017
0.00% note (€300)	2019	$343	$358
2.3% notes	2019	299	299
3.6% notes	2020	498	497
9% non-callable debentures[(1)]	2021	133	133
0.875% notes (€600)	2022	685	716
3.2% notes ($300)[(2)]	2023	298	—
0.875% note (€600)	2025	679	710
1.4% notes (€600)	2027	679	711
3.75% notes ($700)[(3)]	2028	694	—
2.5% note (€80)	2029	91	95
7.70% notes	2038	174	174
5.5% notes	2040	247	247
3% note (€120)	2044	131	137
Various other non-U.S. debt[(4)]	Various	39	43
Capital lease obligations	Various	12	15
Impact of derivatives on debt[(1)(5)]	N/A	10	3
Total		$5,012	$4,138
Less payments due within one year	N/A	647	4
Long-term debt		$4,365	$4,134

(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, 2018 and 2017.

(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 2.7% for the period ended December 31, 2018. 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 3.2% for the period ended December 31, 2018. Refer to Note 10, “Financial Instruments, Hedging Activities and Fair Value Measurements” for additional information.

(4) Weighted average interest rate of 3.8% and 3.7% as of December 31, 2018 and 2017, 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, 2018. Refer to Note 10, “Financial Instruments, Hedging Activities and Fair Value Measurements” for additional information.

Notes to the Consolidated Financial Statements

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 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 Notes upon a Change of Control Triggering Event (as defined in the 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 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.

2016 Activities

In December 2016, PPG’s $125 million 6.65% notes, due 2018, were redeemed using $133 million of cash on hand. Also, the Company prepaid its $250 million Term Loan Credit Agreements, one with the Bank of Tokyo-Mitsubishi UFJ, Ltd. and the other with BNP Paribas, which PPG entered into during May 2016. The Bank of Tokyo-Mitsubishi UFJ, Ltd. Term Loan would have originally terminated and all amounts outstanding would have been payable in March 2017. The BNP Paribas Term Loan would have originally terminated and all amounts outstanding would have been payable in May 2017.

In November 2016, PPG completed a public offering of €300 million 0.000% Notes due 2019 and €600 million 0.875% Notes due 2025. 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 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 Notes upon a Change of Control Triggering Event (as defined in the 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 Indenture.

The aggregate cash proceeds from the notes, net of discounts and fees, was $987 million. The notes are denominated in euro and have been designated as hedges of net investments in the Company’s European operations. For more information, refer to Note 10 “Financial Instruments, Hedging Activities and Fair Value Measurements.”

In January 2016, PPG’s $250 million 1.9% notes matured, and the Company repaid these obligations using cash on hand.

Credit agreements

In December 2015, PPG entered into a five-year credit agreement (the “Credit Agreement”) with several banks and financial institutions. The Credit Agreement provides for a $1.8 billion unsecured revolving credit facility. The Company has the ability to increase the size of the Credit Agreement by up to an additional $500 million, subject to the receipt of lender commitments and other conditions. The Credit Agreement will terminate on December 18, 2020. 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. There were no amounts outstanding under the Credit Agreement during the years ended December 31, 2018 and 2017. The Credit Agreement also supports the Company’s commercial paper borrowings. There were no commercial paper borrowings outstanding as of December 31, 2018 and 2017.

Restrictive Covenants and Cross-Default Provisions
As of December 31, 2018, 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
2019	$647
2020	497
2021	131
2022	685
2023	298
Thereafter	$2,754

Short-term Debt Obligations

($ in millions)	2018	2017
Various, weighted average 3.4% and 1.9% as of December 31, 2018 and 2017, respectively.	$4	$8

Lease Obligations

Rental expense for operating leases was $289 million, $288 million and $273 million in 2018, 2017 and 2016, respectively. The primary leased assets include paint stores, transportation equipment, warehouses and other distribution facilities, and office space, including the Company's corporate headquarters located in Pittsburgh, Pa. As of January 1, 2019, PPG has adopted ASU 2016-02. See Note 1, "Summary of Significant Accounting Policies" for further information.

Minimum lease commitments for operating leases that have initial or remaining lease terms in excess of one year are as follows:

($ in millions)	As of December 31, 2018
2019	$207
2020	157
2021	116
2022	93
2023	76
Beyond 2023	$244

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

PPG's non-U.S. operations have uncommitted lines of credit totaling $401 million of which $3 million was used as of December 31, 2018. 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 $158 million and $163 million as of December 31, 2018 and 2017, 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, 2018 and 2017, guarantees outstanding were $14 million. 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 and $1 million at December 31, 2018 and 2017, respectively, and the fair values of these guarantees were $1 million at December 31, 2018 and 2017. 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, 2018 and 2017, in the aggregate, except for long-term debt instruments.

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Hedging Activities

The Company has exposure to market risk from changes in foreign currency exchange rates and interest rates, and had exposure to PPG’s stock price changes. As a result, financial instruments, including derivatives, have been used to hedge 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, 2018.

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 2018 and 2017, 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, 2018 related to hedges of anticipated transactions that were no longer expected to occur.

Fair Value Hedges

Prior to June 2016, PPG entered into renewable equity forward arrangements to hedge the impact to PPG's Income before income taxes for changes in the fair value of 2,777,778 shares of PPG stock that were contributed to the asbestos settlement trust as discussed in Note 14, “Commitments and Contingent Liabilities.” These financial instruments were recorded at fair value as assets or liabilities and changes in the fair value of these financial instruments are reflected in Asbestos settlement, net on the consolidated statement of income. The total principal amount paid for these shares was approximately $60 million. During the terms of the equity forward arrangements, PPG paid interest to the counterparty based on the principal amount, and the counterparty paid PPG an amount equal to the dividends paid on the shares, which reduced the transaction price by approximately $10 million, net. The difference between the principal amount and any amounts related to unpaid interest or dividends and the market price for the shares, adjusted for credit risk, represented the fair value of the financial instruments as well as the amount that PPG received when the counterparty chose to settle the financial instruments. In conjunction with the funding of the asbestos settlement trust, the equity forward arrangements were settled. At settlement, in June 2016, the fair value of the equity forward arrangement was an asset of $258 million.

The Company uses interest rate swaps from time to time to manage it’s 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 of 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 $8 million at December 31, 2018. There were no interest rate swaps outstanding as of December 31, 2017.

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 intercompany and third party transactions denominated in foreign currencies. Underlying notional amounts related to these foreign currency forward contracts were $50 million and $284 million at December 31, 2018 and 2017, respectively. As of December 31, 2018 and 2017, the fair value of all foreign currency forward contracts designated as cash flow hedges was a liability of $1 million and a net asset of $3 million, respectively.

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

Notes to the Consolidated Financial Statements

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, 2018 and 2017, the fair value of these contracts was an asset of $35 million and $2 million, respectively.

At December 31, 2018 and 2017, PPG had designated €2.3 billion 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, 2018 and 2017 was $2.6 billion and $2.7 billion, respectively.

During 2017 and 2016, 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. There were no such instruments used 2018. The Company paid $3 million to settle a foreign currency forward contract in 2017. There were no foreign currency forward contracts outstanding as of December 31, 2018, 2017,and 2016.

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 $2.5 billion and $2.2 billion at December 31, 2018 and 2017, respectively. As of December 31, 2018 and 2017, the fair values of these contracts were a net asset of $36 million and a liability of $20 million, respectively.

Gains/Losses Deferred in Accumulated other comprehensive loss

As of December 31, 2018 and 2017, the Company had accumulated pre-tax 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 $161 million and $16 million, respectively.

The following tables summarize the location and amount of gains (losses) related to derivative and debt financial instruments for the years ended December 31, 2018, 2017 and 2016. All dollar amounts are shown on a pre-tax basis.

($ in millions)	2018 (Loss)/Gain Deferred in AOCL	Gain/(Loss) Recognized	2017 Loss Deferred in AOCL	Gain Recognized	2016 Gain/(Loss) Deferred in AOCL	(Loss)/Gain Recognized	Caption in Consolidated Statement of Income
Fair Value							
Interest rate Swaps		$3		$—		$—	Interest expense
Total Fair Value		$3		$—		$—	
Cash Flow							
Foreign currency forward contracts[1]	($9)	($8)	($7)	$9	$1	($5)	Other charges and Cost of sales
Total Cash Flow	($9)	($8)	($7)	$9	$1	($5)	
Net Investment							
Cross currency swaps	$21	$13	($61)	$—	$25	$—	Interest expense
Foreign denominated debt	124	—	(403)	—	122	—	
Foreign currency forward contracts	—	—	—	—	(14)	—	
Total Net Investment	$145	$13	($464)	$—	$133	$—	
Economic							
Foreign currency forward contracts		$55		$14		$14	Other charges

(1) For the period ended December 31, 2018, the amounts excluded from effectiveness recognized in earnings based on an amortization approach was expense of $4 million.

Fair Value Measurements

The Company follows a fair value measurement hierarchy to measure its assets and liabilities. As of December 31, 2018 and 2017, 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:

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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, 2018 and 2017 that are classified as Level 3 inputs.

Assets and liabilities reported at fair value on a recurring basis

	December 31, 2018			December 31, 2017		
($ in millions)	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3
Assets:						
Other current assets:						
Marketable equity securities	$4	$—	$—	$4	$—	$—
Foreign currency forward contracts[(a)]	—	—	—	—	6	—
Foreign currency forward contracts[(b)]	—	45	—	—	—	—
Cross currency swaps[(c)]	—	—	—	—	2	—
Other assets:						
Cross currency swaps[(c)]	$—	$35	$—	$—	$—	$—
Interest rate swaps[(d)]	—	8	—	—	—	—
Investments:						
Marketable equity securities	$69	$—	$—	$79	$—	$—
Liabilities:						
Accounts payable and accrued liabilities:						
Foreign currency forward contracts[(a)]	$—	$1	$—	$—	$23	$—
Foreign currency forward contracts[(b)]	—	9	—	—	—	—

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

Long-Term Debt

($ in millions)	December 31, 2018[(a)]	December 31, 2017[(b)]
Long-term debt - carrying value	$5,000	$4,123
Long-term debt - fair value	$5,101	$4,341

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

(b) Excluding capital lease obligations of $15 million and short term borrowings of $8 million as of December 31, 2017.

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.

Assets and liabilities reported at fair value on a nonrecurring basis

There were no significant adjustments to the fair value of nonmonetary assets or liabilities during the year ended December 31, 2018. In conjunction with the 2016 restructuring actions, certain nonmonetary assets were written down to their fair value. Refer to Note 8, "Business Restructuring" for further details associated with these actions."

Call and put option on noncontrolling interest

PPG owns a majority interest in a coatings business whose financial results are included in PPG's consolidated financial statements. PPG has recorded the noncontrolling interest in this consolidated affiliate as a liability instead of equity on its

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consolidated balance sheets due to call and put option provisions associated with the noncontrolling interest, which have similar terms. This liability was $40 million and $44 million at December 31, 2018 and 2017, respectively.

11. Earnings Per Common Share

($ in millions, except per share amounts)	2018	2017	2016
Earnings per common share (attributable to PPG)			
Income from continuing operations, net of tax	$1,323	$1,369	$543
Income from discontinued operations, net of tax	18	225	330
Net income (attributable to PPG)	$1,341	$1,594	$873
Weighted average common shares outstanding	243.9	256.1	265.6
Effect of dilutive securities:			
Stock options	0.8	0.9	0.8
Other stock compensation plans	0.7	0.8	1.0
Potentially dilutive common shares	1.5	1.7	1.8
Adjusted weighted average common shares outstanding	245.4	257.8	267.4
Earnings per common share (attributable to PPG):			
Income from continuing operations, net of tax	$5.43	$5.34	$2.05
Income from discontinued operations, net of tax	0.07	0.88	1.24
Net income (attributable to PPG)	$5.50	$6.22	$3.29
Earnings per common share - assuming dilution (attributable to PPG)			
Income from continuing operations, net of tax	$5.40	$5.31	$2.04
Income from discontinued operations, net of tax	0.07	0.87	1.23
Net income (attributable to PPG)	$5.47	$6.18	$3.27

There were 1.0 million, 0.6 million, and 0.6 million outstanding stock options excluded in 2018, 2017 and 2016, 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)	2018	2017	2016
Current			
U.S. federal	$7	$179	($251)
U.S. state and local	4	49	(12)
Foreign	297	349	306
Total current income tax expense	$308	$577	$43
Deferred			
U.S. federal	$44	$107	$173
U.S. state and local	7	(16)	(10)
Foreign	(6)	(53)	8
Total deferred income tax expense	$45	$38	$171
Total income tax expense	$353	$615	$214

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

	2018	2017	2016
U.S. federal income tax rate	21.0 %	35.0 %	35.0 %
Changes in rate due to:			
U.S. tax cost - Tax Cuts & Jobs Act	(2.5)	11.0	—
U.S./foreign tax differential	3.3	(9.3)	(17.7)
U.S. current tax benefit on foreign exchange realization	—	(4.9)	(3.0)
U.S. tax incentives	(1.0)	(2.3)	(3.7)
U.S. tax (benefit) cost on foreign dividends	(0.4)	(1.9)	0.4
U.S. state and local taxes	0.5	1.1	(1.8)
U.S. deferred tax benefit on foreign income	—	(0.6)	(3.1)
Asbestos charge	—	—	19.1
Other	—	2.6	2.3
Effective income tax rate	20.9 %	30.7 %	27.5 %

On December 22, 2017, the U.S. enacted the Tax Cuts and Jobs Act (the “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 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.

During 2018, PPG implemented updated regulations for certain aspects of the 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.

The total tax expense for 2017 includes a deferred tax benefit of $22 million related to the $60 million of pre-tax pension settlement charges discussed in Note 13, “Employee Benefit Plans.” During 2016, the Company recorded a $151 million net tax charge associated with the funding of the Pittsburgh Corning (“PC”) asbestos settlement trust (the “Trust”) described in Note 14, "Commitments and Contingent Liabilities." Further, in conjunction with the funding of the Trust, PPG provided taxes on the earnings of certain foreign subsidiaries and recorded one-time book tax benefits for its contribution of the Company's ownership interest in PC's European subsidiary to the Trust and for a change in the measurement of certain deferred tax liabilities.

Income (Loss) before income taxes of the Company’s U.S. operations for 2018, 2017 and 2016 was $571 million, $713 million and $(210) million, respectively. Income before income taxes of the Company’s foreign operations for 2018, 2017 and 2016 was $1,122 million, $1,292 million and $989 million, respectively.

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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)	2018	2017
Deferred income tax assets related to		
Employee benefits	$366	$399
Contingent and accrued liabilities	149	164
Operating loss and other carry-forwards	251	221
Inventories	7	6
Property	48	51
Other	82	135
Valuation allowance	(164)	(173)
Total	$739	$803
Deferred income tax liabilities related to		
Property	$310	$314
Intangibles	545	578
Employee benefits	46	11
Derivatives	1	1
Undistributed foreign earnings	5	24
Other	9	20
Total	$916	$948
Deferred income tax liabilities – net	($177)	($145)

Net operating loss and credit carryforwards

($ in millions)	2018	2017	Expiration
Available net operating loss carryforwards:			
Indefinite expiration	$462	$447	NA
Definite expiration	796	247	2019 - 2038
Total	$1,258	$694	NA
Net operating loss carryforwards, tax effected	$192	$210	NA
Income tax credit carryforwards	$61	$9	2019 - 2038

A valuation allowance of $164 million and $173 million has been established for carry-forwards and certain other items at December 31, 2018 and 2017, when the ability to utilize them is not likely.

Undistributed foreign earnings

The Company had $3 billion and $3.4 billion of undistributed earnings of non-U.S. subsidiaries as of December 31, 2018 and 2017, respectively. These amounts relate to approximately 250 subsidiaries in approximately 75 taxable jurisdictions. The Company estimates repatriation of undistributed earnings of non-U.S. subsidiaries as of December 31, 2018 and 2017 would have resulted in a U.S. tax cost of approximately $19 million and $30 million, respectively.

Over the past several years, 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, 2018, 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 2007. 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)	2018	2017	2016
January 1	$148	$94	$82
Current year tax positions - additions	36	37	25
Prior year tax positions - additions	17	26	8
Prior year tax positions - reductions	(6)	—	(11)
Statute of limitations expirations	(9)	(8)	(8)
Settlements	(15)	(10)	—
Foreign currency translation	(5)	9	(2)
December 31	$166	$148	$94

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 $140 million as of December 31, 2018.

Interest and penalties

($ in millions)	2018	2017	2016
Accrued interest and penalties related to unrecognized tax benefits	$16	$15	$9
Loss recognized in income tax expense related to interest and penalties	$2	$4	$1

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 92% of the projected benefit obligation at December 31, 2018, of which the U.S. defined benefit pension plans represent the largest component.

U.S. defined benefit plans

As of January 1, 2006, the Company closed the salaried defined benefit plans to new entrants. The defined benefit plan of certain hourly employees was closed to new entrants in 2006 or thereafter. Eligible employees participate in a defined contribution retirement plan. 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 changing 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 86% of the projected benefit obligation at December 31, 2018. 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.

The U.S. welfare benefit plans include an Employee Group Waiver Plan ("EGWP") for certain Medicare-eligible retirees and their dependents which includes a fully-insured Medicare Part D prescription drug plan. As such, PPG is not eligible to receive the federal subsidy provided under the Medicare Act of 2003 for these retirees and their dependents.

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.

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In 2016, the Company communicated plan design changes to certain Medicare-eligible retiree plan participants. Effective January 1, 2017, the Company-sponsored Medicare-eligible plans were replaced by a Medicare private exchange. By offering retiree health coverage through a private Medicare exchange, PPG is able to provide Medicare-eligible participants with more choice of plans and plan designs, greater flexibility, and different price points for coverage. Beginning January 1, 2017, PPG's contribution for health care coverage related to Medicare-eligible retirees is in the form of a tax-free account known as a Health Reimbursement Arrangement (HRA). The HRA can be used to pay for health care and prescription drug plan premiums and certain out-of-pocket medical costs; unused funds can be carried over to future years.

The announcement of these plan design changes 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 plan design change will be amortized to periodic postretirement benefit cost over a 5.6 year period.

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)	2018	2017	2018	2017	2018	2017
Projected benefit obligation, January 1	$1,706	$1,692	$1,756	$1,560	$3,462	$3,252
Service cost	17	19	11	14	28	33
Interest cost	57	60	40	38	97	98
Actuarial losses (gains) - net	(129)	124	(117)	61	(246)	185
Benefits paid	(70)	(104)	(55)	(63)	(125)	(167)
Plan transfers	—	—	(8)	—	(8)	—
Foreign currency translation adjustments	—	—	(88)	165	(88)	165
Settlements and curtailments	—	(84)	(24)	(1)	(24)	(85)
Former glass business changes, net	—	—	—	(1)	—	(1)
Other	1	(1)	3	(17)	4	(18)
Projected benefit obligation, December 31	$1,582	$1,706	$1,518	$1,756	$3,100	$3,462
Market value of plan assets, January 1	$1,196	$1,115	$1,687	$1,446	$2,883	$2,561
Actual return on plan assets	(82)	156	(53)	133	(135)	289
Company contributions	75	54	24	33	99	87
Participant contributions	—	—	—	1	—	1
Benefits paid	(49)	(47)	(53)	(62)	(102)	(109)
Plan settlements	—	(82)	(24)	(13)	(24)	(95)
Foreign currency translation adjustments	—	—	(95)	149	(95)	149
Other	—	—	(8)	—	(8)	—
Market value of plan assets, December 31	$1,140	$1,196	$1,478	$1,687	$2,618	$2,883
Funded Status	($442)	($510)	($40)	($69)	($482)	($579)
Amounts recognized in the Consolidated Balance Sheet:						
Other assets (long-term)	—	—	189	173	189	173
Accounts payable and accrued liabilities	(18)	(16)	(8)	(7)	(26)	(23)
Accrued pensions	(424)	(494)	(221)	(235)	(645)	(729)
Net liability recognized	($442)	($510)	($40)	($69)	($482)	($579)

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	Other Postretirement Benefit Plans					
	United States		International		Total PPG	
($ in millions)	2018	2017	2018	2017	2018	2017
Projected benefit obligation, January 1	$641	$692	$112	$100	$753	$792
Service cost	9	10	1	—	10	10
Interest cost	21	21	3	3	24	24
Actuarial losses (gains) - net	(38)	(39)	(9)	12	(47)	(27)
Benefits paid	(45)	(43)	(4)	(5)	(49)	(48)
Foreign currency translation adjustments	—	—	(8)	8	(8)	8
Former glass business changes, net	—	—	—	(8)	—	(8)
Other	(1)	—	(1)	2	(2)	2
Projected benefit obligation, December 31	$587	$641	$94	$112	$681	$753
Amounts recognized in the Consolidated Balance Sheet:						
Accounts payable and accrued liabilities	(48)	(48)	(4)	(6)	(52)	(54)
Other postretirement benefits	(539)	(593)	(90)	(106)	(629)	(699)
Net liability recognized	($587)	($641)	($94)	($112)	($681)	($753)

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, 2018 and 2017 was $2,944 million and $3,382 million, respectively.

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

	Pensions	
($ in millions)	2018	2017
Plans with PBO in Excess of Plan Assets:		
Projected benefit obligation	$1,935	$2,544
Fair value of plan assets	$1,269	$1,792
Plans with ABO in Excess of Plan Assets:		
Accumulated benefit obligation	$1,883	$2,434
Fair value of plan assets	$1,269	$1,749

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

	Pensions		Other Postretirement Benefits	
($ in millions)	2018	2017	2018	2017
Accumulated net actuarial losses	$800	$835	$113	$180
Accumulated prior service cost (credit)	2	—	(178)	(239)
Total	$802	$835	($65)	($59)

The accumulated net actuarial losses for pensions and other postretirement benefits relate primarily to historical declines in the discount rate as well as updated mortality assumptions. The accumulated net actuarial losses exceed 10% of the higher of the market value of plan assets or the PBO at the beginning of the year, therefore, amortization of such excess has been included in net periodic benefit costs for pension and other postretirement benefits in each of the last three years. 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.

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The net decrease in Accumulated other comprehensive loss (pre-tax) in 2018 relating to defined benefit pension and other postretirement benefits is primarily attributable to pension and other postretirement plan design changes, as follows:

($ in millions)	Pensions	Other Postretirement Benefits
Net actuarial loss (gain) arising during the year	$39	($47)
New prior service cost	2	1
Amortization of actuarial loss	(63)	(19)
Amortization of prior service credit	—	60
Foreign currency translation adjustments	(10)	(1)
Impact of settlements and curtailments	(1)	—
Net change	($33)	($6)

The 2018 net actuarial gain related to the Company's pension and other postretirement benefit plans of $8 million was primarily due to an increase in the weighted average discount rate used to determine the benefit obligation at December 31, 2018, partially offset by asset performance losses on plan assets for the year.

Net periodic benefit cost

Effective January 1, 2018, PPG adopted ASU No. 2017-07, "Improving the Presentation of Net Periodic Pension Cost and Net Periodic Postretirement Benefit Cost." See Note 1, "Summary of Significant Accounting Policies" for more information.

	Pensions			Other Postretirement Benefits		
($ in millions)	2018	2017	2016	2018	2017	2016
Service cost	$28	$33	$48	$10	$10	$15
Interest cost	97	98	142	24	24	31
Expected return on plan assets	(150)	(141)	(213)	—	—	—
Amortization of prior service credit	—	—	(1)	(60)	(59)	(31)
Amortization of actuarial losses	63	75	110	19	12	19
Settlements, curtailments, and special termination benefits	5	60	1,015	—	—	—
Net periodic benefit cost/(income)	$43	$125	$1,101	($7)	($13)	$34

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. All other components of net periodic benefit cost are now recorded in Other charges, except for pension settlement 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, 2018 and 2017:

	United States		International		Total PPG	
	2018	2017	2018	2017	2018	2017
Discount rate	4.4 %	3.7 %	2.9 %	2.5 %	3.7 %	3.2 %
Rate of compensation increase	1.5 %	1.5 %	0.9 %	1.1 %	1.2 %	1.3 %

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, 2018:

	2018	2017	2016
Discount rate	3.2 %	3.6 %	3.6 %
Expected return on assets	5.4 %	5.4 %	6.1 %

Rate of compensation increase	1.2 %	1.3 %	1.6 %

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 2018, 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 1 percentage point, with other assumptions held constant, would impact 2018 net periodic pension expense by $12 million. The global expected return on plan assets assumption to be used in determining 2019 net periodic pension expense will be 5.4% (7.4% for the U.S. plans only).

The discount rate used in accounting for pensions and other postretirement benefits is determined by reference to a current yield curve and by considering the timing and amount of projected future benefit payments. In 2016, the Company changed the method it uses to estimate the service and interest cost components of net periodic benefit cost for pension and other postretirement benefit costs for substantially all of its U.S. and foreign plans. Historically, the service and interest cost components were estimated using a single weighted-average discount rate derived from the yield curve used to measure the projected benefit obligation at the beginning of the period. The Company has elected to use a full yield curve approach ("Split-rate" method) in the estimation of these components of benefit cost by applying specific spot rates along the yield curve used in the determination of the benefit obligation to the relevant projected cash flows. The Company made this change to improve the correlation between projected benefit cash flows and the corresponding yield curve spot rates and to provide a more precise measurement of service and interest costs. This change does not affect the measurement of the Company's total benefit obligations. The Company accounted for this change as a change in estimate and, accordingly, began recognizing its effect in fiscal year 2016. A change in the discount rate of 1 percentage point, with all other assumptions held constant, would impact 2019 net periodic benefit expense for our defined benefit pension and other postretirement benefit plans by $19 million and $22 million, respectively.

In 2018, 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 healthcare cost trend rate (inflation) used for 2018 was 5.8% declining to a projected 4.5% in the year 2024. For 2019, the assumed weighted-average healthcare cost trend rate used will be 5.6% declining to a projected 4.4% between 2018 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)	2018	2017	2016
U.S. defined benefit pension plans[(a)]	$75	$54	$134
Non-U.S. defined benefit pension plans[(b)]	$24	$33	$54

(a) During 2016, U.S. contributions totaling $12 million associated with the former glass segment were recast as cash flows from operations - discontinued operations and are excluded from the table above.

(b) During 2016, non-U.S. contributions totaling $4 million associated with the former European fiberglass business were recast as cash flows from operations - discontinued operations and are excluded from the table above.

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 2018 and 2017 were required by local funding requirements. PPG expects to make mandatory contributions to its non-U.S. plans in the range of $20 million to $30 million in 2019. PPG may make voluntary contributions to its defined benefit pension plans in 2019 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
2019	$136	$53

2020	$139	$53
2021	$145	$53
2022	$147	$52
2023	$153	$51
2024 to 2028	$826	$228

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U.S. Qualified Pension

Beginning in 2012, the Company initiated a lump sum payout program that gave certain terminated vested participants in certain U.S. defined benefit pension plans the option 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 ($22 million after-tax).

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 ($14 million after-tax).

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, 2018 and 2017 for all PPG defined benefit plans:

Asset Category	2018	2017
Equity securities	15-45%	15-45%
Debt securities	30-65%	30-65%
Real estate	0-10%	0-10%
Other	20-40%	20-40%

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The fair values of the Company's pension plan assets at December 31, 2018 and 2017, by asset category, are as follows:

	December 31, 2018				December 31, 2017			
($ 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	$43	$94	$—	$137	$—	$83	$—	$83
Small cap	23	—	—	23	29	—	—	29
Non-U.S.								
Developed and emerging markets[2]	115	103	—	218	115	79	—	194
Debt securities:								
Cash and cash equivalents	3	19	—	22	—	11	—	11
Corporate[3]								
U.S.[4]	—	220	77	297	—	201	86	287
Developed and emerging markets[2]	—	4	—	4	—	43	—	43
Diversified[5]	—	142	—	142	—	124	—	124
Government								
U.S.[4]	68	8	—	76	68	1	—	69
Developed markets	—	6	—	6	—	101	—	101
Other[6]	—	14	359	373	—	14	418	432
Real estate, hedge funds, and other	—	304	359	663	—	185	498	683
Total assets in the fair value hierarchy	$252	$914	$795	$1,961	$212	$842	$1,002	$2,056
Common-collective trusts[7]	—	—	—	657	—	—	—	827
Total Investments	$252	$914	$795	$2,618	$212	$842	$1,002	$2,883

(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, 2018 and 2017 was as follows:

($ in millions)	Real Estate	Other Debt Securities	Hedge Funds and Other Assets	Total
January 1, 2017	$129	$16	$370	$515
Realized gains	11	45	3	59
Unrealized losses	—	—	5	5
Transfers (out)/in, net	(5)	355	36	386
Foreign currency losses	3	2	32	37
December 31, 2017	$138	$418	$446	$1,002
Realized gains (losses)	9	(29)	10	(10)
Unrealized losses	—	—	(28)	(28)

Transfers (out)/in, net	(6)	(12)	(119)	(137)
Foreign currency loss	(4)	(18)	(10)	(32)
December 31, 2018	$137	$359	$299	$795

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.

Notes to the Consolidated Financial Statements

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.

U.S. pension annuity contracts

In June 2016, the Company entered into a Definitive Purchase Agreement by and among the Company, Massachusetts Mutual Life Insurance Company (“MassMutual”) and State Street Bank & Trust Company (“State Street”), as independent fiduciary to the Company’s United States defined benefit pension plans (the “Plans”), and a Definitive Purchase Agreement by and among the Company, Metropolitan Life Insurance Company (“MetLife”) and State Street.

In August 2016, pursuant to the two Definitive Purchase Agreements, the Plans purchased group annuity contracts that irrevocably transferred to the two insurance companies certain pension benefit obligations for approximately 13,200 of the Company’s retirees in the United States who started receiving their monthly retirement benefit payments on or before April 1, 2016. The value of the benefit obligation of each affected former salaried employee’s retirement benefit obligation is irrevocably guaranteed by, and split equally between, MassMutual and MetLife. Pursuant to these Definitive Purchase Agreements, MassMutual serves as the lead administrator. The value of each affected former hourly employee’s retirement benefit obligation is irrevocably guaranteed by MetLife, and MetLife will serve as the administrator. The amount of each affected retiree’s annuity payment is equal to the amount of such individual’s pension benefit. The purchase of group annuity contracts was funded directly by the assets of the Plans. By irrevocably transferring the obligations and assets to MassMutual and MetLife, the Company reduced its overall pension projected benefit obligation by approximately $1.6 billion and recognized a non-cash pension settlement charge of approximately $535 million after-tax ($857 million pre-tax).

Following the transfer of the aforementioned U.S. retiree obligations and assets to third party insurers, PPG contributed $29 million and $146 million to its U.S. plans in 2017 and 2016, respectively. These contributions were funded using cash on hand.

During 2016, in advance of the purchase of group annuity contracts, PPG merged two of its qualified defined benefit pension plans that contained retired plan participants into one surviving plan. In conjunction with the merger and purchase of group annuity contracts, PPG remeasured its qualified pension plan benefit obligations using prevailing discount rates as of July 31, 2016 which averaged 3.6% as compared to a 4.5% discount rate as of December 31, 2015. The remeasurement increased the Company's cumulative pension benefit obligation of its remaining plans by $306 million and increased the Company's full year 2016 qualified defined benefit pension expense by approximately $10 million.

Canadian pension annuity contracts

In 2016, the Company purchased group annuity contracts that transferred pension benefit obligations for certain of the Company’s retirees and terminated vested participants in Canada who started receiving their monthly retirement benefit payments on or before April 1, 2016 to Sun Life Assurance Company of Canada (“Sun Life”) and The Canada Life Assurance Company (“Canada Life”). The amount of each affected retiree’s annuity payment is equal to the amount of such individual’s pension benefit. The purchase of group annuity contracts was funded directly by the assets of the Canadian plans. By transferring the obligations and assets to Sun Life and Canada Life, the Company reduced its overall pension projected benefit obligation by approximately $200 million and recognized a non-cash pension settlement charge of $47 million after-tax ($64 million pre-tax). The Company made voluntary contributions aggregating $7 million to the Canadian plans in 2016 related to the pension annuity contracts. These contributions were funded using cash on hand.

Sale of the flat glass business

In 2016, PPG completed the sale of its flat glass business as discussed in Note 3, “Acquisitions and Divestitures.” PPG transferred to Vitro certain defined benefit pension liabilities resulting in a settlement charge of $11 million which was included in Income from discontinued operations, net of tax. This transaction lowered the projected benefit obligation of PPG’s defined benefit pension plan by approximately $100 million. PPG transferred pension assets of $55 million in

2016 in connection with the sale and transferred an additional $20 million of pension assets in 2018 as a result of finalization of the pension transfer.

Sale of the European fiber glass business

In 2016, PPG completed the sale of its European fiber glass business as discussed in Note 3, “Acquisitions and Divestitures.” PPG transferred to NEG certain defined benefit pension liabilities resulting in a net settlement charge of $46 million. This amount is included in Income from discontinued operations, net of tax in 2016.This transaction lowered the projected benefit obligation of PPG's defined benefit pension plans by approximately $340 million. In 2016, PPG transferred pension assets of approximately $250 million in connection with the sale.

Retained liabilities and legacy settlement charges

PPG has retained certain liabilities for defined benefit pension and postretirement benefits earned for service up to the date of sale of its former automotive glass and service business for employees who were active as of the divestiture date and for individuals who were retirees of the business as of the divestiture date, totaling $313 million and $369 million at December 31, 2018 and 2017, respectively. PPG recognized expense of $1 million, $2 million, and $20 million related to these obligations in 2018, 2017, and 2016, respectively.

There have been multiple PPG facility closures in Canada. These various plant closures have resulted in partial and full windups, and related settlement charges, of pension plans for various hourly and salary employees employed by these locations. The charges are recorded for the individual plans when a particular windup is approved by the Canadian pension authorities and the Company has made all contributions to the individual plan and has discharged the liability through either lump sum payments to participants or purchasing annuities. The Company may incur additional charges related to this matter in the future.

During 2016, PPG completed the wind-up of two legacy Canadian plans and recorded after-tax wind-up charges totaling $34 million ($47 million pre-tax). Cash contributions made in conjunction with these windups were approximately $1 million.

Other Plans

Defined contribution plans

The Company has defined contribution plans for certain employees in the U.S., China, United Kingdom, Australia, Italy, and other countries. For the years ended December 31, 2018, 2017, and 2016, the Company recognized expense for its defined contribution retirement plans of $63 million, $57 million and $70 million, respectively. The Company's annual cash contributions to its defined contribution retirement plans approximated the expense recognized in each year.

Employee savings plan

PPG's Employee Savings Plan ("Savings Plan") covers substantially all employees in the U.S., Puerto Rico and Canada. The Company makes matching contributions to the Savings Plan, 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 2018.

In 2016, the Company terminated its U.S. defined contribution plan and subsequently merged the plan into the Savings Plan. Under the combined plan, eligible employees will continue to receive a contribution equal to between 2% and 5% of annual compensation, based on age and years of service.

Compensation expense and cash contributions related to the Company match of participant contributions to the Savings Plan for 2018, 2017, and 2016 totaled $47 million, $46 million and $48 million, respectively. A portion of the Savings Plan 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 Plan totaling $13 million, $14 million, and $14 million for 2018, 2017, and 2016, respectively, are deductible for U.S. Federal tax purposes.

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.

Notes to the Consolidated Financial Statements

The (benefit) cost 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 $(1) million, $19 million and $7 million in 2018, 2017 and 2016, 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 (expense) income of $(2) million, $18 million, and $5 million in 2018, 2017 and 2016, 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 $110 million and $121 million as of December 31, 2018 and 2017, respectively, and the investments in marketable securities, which are included in Investments and Other current assets on the accompanying consolidated balance sheet, were $73 million and $83 million as of December 31, 2018 and 2017, 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 and property damage, 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 if the settlement is not implemented. 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.

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).

Pittsburgh Corning Corporation asbestos bankruptcy settlement

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. At the time of the bankruptcy filing, the Company had been named as one of many defendants in approximately 114,000 open 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: (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 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 will be 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.

In accordance with the PC plan of reorganization, PPG's equity interest in PC was canceled. PPG satisfied its funding obligations to the Trust on June 9, 2016, when it conveyed to the Trust the stock it owned in Pittsburgh Corning Europe and 2,777,778 shares of PPG's common stock and made a cash payment to the Trust in the amount of $764 million. PPG's historical insurance carriers participating in the PC plan of reorganization are required to make cash payments to the Trust of approximately $1.7 billion, subject to a right of prepayment at a 5.5% discount rate.

On October 13, 2016, the Bankruptcy Court issued an order entering a final decree and closing the Chapter 11 case. That order provided that the Bankruptcy Court retained jurisdiction to enforce any order issued in the case and any agreements approved by the court, enforce the terms and conditions or the modified third amended Plan, and consider any requests to reopen the case.

The following table outlines the impact on PPG's financial statements for the year-ended December 31, 2016, including the change in fair value of the PPG stock contributed to the Trust, the equity forward instrument and the increase in the net present value of the payments made to the trust.

	Consolidated Balance Sheet			
	Asbestos Settlement Liability		Equity Forward (Asset) Liability	Pre-tax Charge
($ in millions)	Current	Long-term		
Balance as of and Activity for the year ended December 31, 2015	$796	$252	($223)	$12
Change in fair value:				
PPG stock	34	—	—	34
Equity forward instrument	—	—	(35)	(35)
Accretion of asbestos liability	—	6	—	6
Settlement of equity forward instrument with counterparty [a]	—	—	(49)	—
Contribution of PCE shares and relinquishment of PC investment	(15)	—	—	—
Contribution of 2,777,778 shares of PPG stock to the PC Trust	(308)	—	308	—
Contribution of cash to the PC Trust [a]	(506)	(258)	—	—
Reclassification	(1)	—	(1)	—
Balance as of and Activity for the year ended December 31, 2016	$—	$—	$—	$5

(a) Cash outflows related to the asbestos settlement funding totaled $813 million in 2016.

Non-PC relationship asbestos claims

At the time PC filed for bankruptcy, PPG had been named as one of many defendants in one or more of the categories of asbestos-related claims identified above. Over the course of the 16 years during which the PC bankruptcy proceedings, and corresponding preliminary injunction staying the prosecution of asbestos-related claims against PPG, were pending, certain plaintiffs alleging premises claims filed motions seeking to lift the stay with respect to more than 1,000 individually-identified premises claims. The Bankruptcy Court granted motions to lift the stay in respect to certain of these premises claims and directed PPG to engage in a process to address any additional premises claims that were the subject of pending or anticipated lift-stay motions. As a result of the overall process as directed by the Bankruptcy Court involving more than 1,000 premises claims between 2006 and May 27, 2016, hundreds of these claims were withdrawn or dismissed without payment and approximately 650 premises claims were dismissed upon agreements by PPG and its insurers to resolve such claims in exchange for monetary payments.

With respect to the remaining claims not identified above and still reportable within the inventory of 114,000 asbestos-related claims 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 asbestos-related claims against it.

Notes to the Consolidated Financial Statements

Current open and active claims post-Pittsburgh Corning bankruptcy
The Company is aware of approximately 460 open and active asbestos-related claims pending against the Company and certain of its subsidiaries. These claims consist primarily of non-PC Relationship Claims and claims against a subsidiary of PPG. The Company is defending the remaining open and active claims vigorously.
Since April 1, 2013, a subsidiary of PPG has been implicated in claims alleging death or injury caused by asbestos-containing products manufactured, distributed or sold by a North American architectural coatings business or its predecessors which was acquired by PPG. All such claims have been either served upon or tendered to the seller for defense and indemnity pursuant to obligations undertaken by the seller in connection with the Company's purchase of the North American architectural coatings business. The seller has accepted the defense of these claims subject to the terms of various agreements between the Company and the seller. The seller's defense and indemnity obligations in connection with newly filed claims ceased with respect to claims filed after April 1, 2018.
PPG has established reserves totaling approximately $180 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 potential future asbestos liabilities. These reserves include a $162 million reserve established in 2009 in connection with an amendment to the PC plan of reorganization. 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. 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. PPG will monitor the activity associated with its remaining asbestos claims and evaluate, 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 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 of December 31, 2018 and 2017, PPG had reserves for environmental contingencies associated with PPG's former chromium manufacturing plant in Jersey City, N.J. ("New Jersey Chrome") and for other environmental contingencies, including National Priority List sites and legacy glass and chemical manufacturing sites. These reserves are reported as Accounts payable and accrued liabilities and Other liabilities in the accompanying consolidated balance sheet.
Environmental Reserves

($ in millions)	2018	2017

New Jersey Chrome	$151	$136
Glass and chemical	90	71
Other	50	51
Total	$291	$258
Current Portion	$105	$73

Notes to the Consolidated Financial Statements

Pre-tax charges against income for environmental remediation costs are included in “Other charges” in the accompanying consolidated statement of income. The pre-tax charges and cash outlays related to such environmental remediation in 2018,
2017 and 2016, were as follows:

($ in millions)	2018	2017	2016
New Jersey Chrome	$62	$4	$60
Other	16	6	34
Total	$78	$10	$94
Cash outlays for environmental spending	$64	$44	$47

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, pre-tax 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 2019 and $20 million to $50 million annually from 2020 through 2023.
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. In 2018 and 2016, PPG completed updated 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 has been adjusted accordingly as noted in the table above. Principal factors affecting costs included 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 increased 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 $151 million at December 31, 2018. 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 22%, 19% 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. Final 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 be adjusted.

Notes to the Consolidated Financial Statements

Remediation: other sites

Among other sites at which PPG is managing environmental liabilities, remedial actions are occurring at a legacy chemical manufacturing site in Barberton, Ohio, where PPG has completed a Facility Investigation and Corrective Measure Study under USEPA's Resource Conservation and Recovery Act ("RCRA") 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. PPG is currently performing additional investigation activities at this location.

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, 2016	581,146,136	(314,270,127)	266,876,009
Purchases	—	(10,725,869)	(10,725,869)
Issuances	—	1,180,020	1,180,020
December 31, 2016	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

Per share cash dividends paid were $1.86 in 2018, $1.70 in 2017 and $1.56 in 2016.

Notes to the Consolidated Financial Statements

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, 2016	($1,332)	($1,379)	$9	($2,702)
Current year deferrals to AOCI (a)	(299)	—	—	(299)
Current year deferrals to AOCI, tax effected (b)	(167)	29	3	(135)
Reclassifications from AOCI to net income	—	779	1	780
Period change	($466)	$808	$4	$346
December 31, 2016	($1,798)	($571)	$13	($2,356)
Current year deferrals to AOCI (a)	542	—	—	542
Current year deferrals to AOCI, tax effected (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, tax effected (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)

(a) Except for income taxes of $9 million 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 benefit (cost) related to unrealized foreign currency translation adjustments on tax inter-branch transactions and net investment hedges for the years ended December 31, 2018, 2017 and 2016 was $4 million, $141 million and $(34) million, respectively.

(c) The tax cost related to the adjustment for pension and other postretirement benefits for the years ended December 31, 2018, 2017 and 2016 was $(34) million, $(33) million and $(403) 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 at December 31, 2018 and 2017 was $209 million and $243 million, respectively.

(d) The tax cost related to the change in the unrealized loss on derivatives for the year ended December 31, 2018 was $2 million. The tax cost related to the change in the unrealized gain on derivatives for the years ended December 31, 2017 and 2016 was $5 million and $2 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)	2018	2017	2016
Gain on sale of assets[(1)]	$33	$28	$6
Royalty income	10	11	12
Share of net earnings of equity affiliates (See Note 6)	16	12	8
Gain on disposals of ownership interests in business affiliates	—	25	46
Income from a legal settlement	—	18	—

Other	55	56	55
Total	$114	$150	$127

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

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 7.8 million as of December 31, 2018.

Notes to the Consolidated Financial Statements

($ in millions)	2018	2017	2016
Total stock-based compensation	$37	$35	$45
Income tax benefit recognized	$8	$12	$17

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:

	2018	2017	2016
Weighted average exercise price	$115.98	$101.53	$95.29
Risk free interest rate	2.9 %	2.4 %	1.6 %
Expected life of option in years	6.5	6.5	6.5
Expected dividend yield	1.7 %	1.8 %	2.1 %
Expected volatility	21.0 %	22.0 %	22.8 %

The weighted average fair value of options granted was $25.27 per share, $21.15 per share and $17.94 per share for the years ended December 31, 2018, 2017, and 2016, 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, 2018	3,575,625	$83.34	6.4	$120
Granted	533,105	$115.98		
Exercised	(288,760)	$50.82		
Forfeited/Expired	(58,970)	$106.32		
Outstanding, December 31, 2018	3,761,000	$90.10	6.1	$61
Vested or expected to vest, December 31, 2018	3,724,235	$89.89	6.1	$61
Exercisable, December 31, 2018	1,924,079	$77.79	4.3	$56

At December 31, 2018, 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, 2018, 2017 and 2016:

($ in millions)	2018	2017	2016
Total intrinsic value of stock options exercised	$19	$40	$34
Cash received from stock option exercises	$15	$52	$32
Income tax benefit from the exercise of stock options	$4	$15	$12
Total fair value of stock options vested	$10	$13	$16

Notes to the Consolidated Financial Statements

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 2016, 2017 and 2018 will vest at the 100% level. As of December 31, 2018, three of the six possible performance targets had been met for the 2016 grant, two of the four possible performance targets had been met for the 2017 grant, and one of two possible performance targets had been met for the 2018 grant.

RSU Activity	Number of Shares	Weighted Average Fair Value	Intrinsic Value (in millions)
Outstanding, January 1, 2018	615,607	$101.73	$63
Granted	252,885	$112.98	
Released from restrictions	(194,329)	$99.80	
Forfeited	(42,432)	$106.15	
Outstanding, December 31, 2018	631,731	$102.80	$65
Vested or expected to vest, December 31, 2018	616,894	$102.67	$63

There was $17 million of total unrecognized compensation cost related to unvested RSUs outstanding as of December 31, 2018. This cost is expected to be recognized as expense over a weighted average period of 1.8 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 2016-2018, 2017-2019, and 2018-2020 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, 2018, there was $5 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 1.8 years.

Notes to the Consolidated Financial Statements

19. Quarterly Financial Information (unaudited)

($ 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					
Continuing operations	$328	$371	$368	$256	$1,323
Discontinued operations	6	—	10	2	18
Net income	$334	$371	$378	$258	$1,341
Earnings per common share					
Continuing operations	$1.32	$1.51	$1.52	$1.07	$5.43
Discontinued operations	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					
Continuing operations	$1.31	$1.51	$1.51	$1.07	$5.40
Discontinued operations	0.02	—	0.04	0.01	0.07
Earnings per common share – assuming dilution	$1.33	$1.51	$1.55	$1.08	$5.47

($ in millions except per share amounts)	2017 Quarter Ended March 31	June 30	September 30	December 31	Full Year 2017(1)
Net sales	$3,486	$3,804	$3,776	$3,682	$14,748
Cost of sales(2)	1,902	2,083	2,104	2,120	8,209
Net income attributable to PPG					
Continuing operations	$331	$497	$393	$148	$1,369
Discontinued operations	6	(1)	217	3	225
Net income	$337	$496	$610	$151	$1,594
Earnings per common share					
Continuing operations	$1.29	$1.93	$1.53	$0.59	$5.34
Discontinued operations	0.02	—	0.85	0.01	0.88
Earnings per common share	$1.31	$1.93	$2.38	$0.60	$6.22
Earnings per common share - assuming dilution					
Continuing operations	$1.28	$1.92	$1.52	$0.58	$5.31
Discontinued operations	0.02	—	0.84	0.01	0.87
Earnings per common share – assuming dilution	$1.30	$1.92	$2.36	$0.59	$6.18

(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. 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 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 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 segment is comprised of the automotive original equipment manufacturer (“OEM”) coatings, industrial coatings, packaging coatings, and the specialty coatings and materials operating segments. This reportable 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.

Notes to the Consolidated Financial Statements

Production facilities and sales for Performance Coatings and Industrial Coatings are global. PPG's reportable segments continue to pursue opportunities to further develop their global reach, including efforts in Asia, Eastern Europe and Latin America. Each of the reportable 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, including certain environmental remediation, pension and other postretirement benefit costs, and certain charges for legal and other matters which are considered to be unusual or non-recurring. 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, the cost of corporate legal cases, net of related insurance recoveries and the cost of certain insurance and stock-based compensation programs. Net periodic pension expense is allocated to the operating segments and the portion of net periodic pension expense related to the corporate staff functions 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 segment income of the reportable segments.

($ in millions)	2018	2017	2016
Net sales to external customers[1]			
Performance Coatings	$9,087	$8,730	$8,580
Industrial Coatings	6,287	6,018	5,690
Total Net sales	$15,374	$14,748	$14,270
Segment income			
Performance Coatings	$1,300	$1,313	$1,322
Industrial Coatings	818	979	1,060
Total Segment income	$2,118	$2,292	$2,382
Corporate / Non-Segment Items[1]			
Legacy items[2]	$5	($2)	($17)
Environmental remediation charges and other costs	(77)	—	(82)
Business restructuring, net	(66)	—	(191)
Accelerated depreciation related to restructuring actions	(9)	—	—
Impairment of a non-manufacturing asset	(9)	—	—
Accounting investigation costs	(14)	—	—
Legacy legal settlements	(10)	—	—
Costs related to customer assortment change	(18)	—	—
Transaction-related costs[3]	(6)	(9)	(8)
Gain from sale of a non-operating asset	26	13	—
Brand rationalization charge	(6)	—	—
Gain from a legal settlement	—	18	—
Asset write-downs	—	(7)	(23)
Pension settlement charges	—	(60)	(968)
Gains on disposals of ownership interests in business affiliates	—	25	46

Interest expense, net of interest income	(95)	(85)	(99)
Corporate unallocated[1]	(146)	(180)	(261)
Total Income before income taxes	$1,693	$2,005	$779

Notes to the Consolidated Financial Statements

($ in millions)	2018	2017	2016
Depreciation and amortization			
Performance Coatings	$274	$272	$272
Industrial Coatings	181	164	143
Corporate / Non-Segment Items(1)	42	24	25
Total	$497	$460	$440
Share of net earnings of equity affiliates			
Performance Coatings	$1	$2	$5
Industrial Coatings	—	—	1
Corporate / Non-Segment Items(1)	15	10	2
Total	$16	$12	$8
Segment assets(4)			
Performance Coatings	$9,846	$9,763	$9,168
Industrial Coatings	4,441	4,563	3,972
Corporate / Non-Segment Items(1)	1,728	2,212	2,631
Total	$16,015	$16,538	$15,771
Investment in equity affiliates			
Performance Coatings	$33	$32	$30
Industrial Coatings	13	13	13
Corporate / Non-Segment Items(1)	86	89	3
Total	$132	$134	$46
Expenditures for property (including business acquisitions)			
Performance Coatings	$545	$224	$187
Industrial Coatings	157	328	510
Corporate / Non-Segment Items(1)	87	133	32
Total	$789	$685	$729

($ in millions)	2018	2017	2016
Geographic Information			
Net sales(5)			
United States and Canada	$6,485	$6,307	$6,254
Europe, Middle East and Africa ("EMEA")	4,678	4,389	4,164
Asia Pacific	2,618	2,523	2,431
Latin America	1,593	1,529	1,421
Total	$15,374	$14,748	$14,270
Segment income			
United States and Canada	$1,022	$1,135	$1,176
EMEA	549	560	235
Asia Pacific	306	361	589
Latin America	241	236	382
Total	$2,118	$2,292	$2,382
Property—net			
United States and Canada	$1,254	$1,224	$1,184
EMEA	777	826	726
Asia Pacific	482	493	447
Latin America	292	281	251
Total	$2,805	$2,824	$2,608

(1) Corporate intersegment net sales represent intersegment net sales eliminations. Corporate unallocated costs include the costs of corporate staff functions not directly associated with the operating segments, certain legal and insurance costs and stock-based compensation expense.

(2) Legacy items include current costs related to former operations of the Company, including pension and other postretirement benefit costs, legal costs and certain charges which are considered to be non-recurring. Legacy items also include equity earnings from PPG's investment in TCI. Refer to Note 3, "Acquisitions and Divestitures".

(3) Transaction-related costs include advisory, legal, accounting, valuation, and other professional or consulting fees incurred to effect significant acquisitions, as well as similar fees and other costs to effect divestitures not classified as discontinued operations. These costs also include the flow-through cost of sales for the step up to fair value of inventory acquired in acquisitions.

(4) 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. Non-segment items also includes the assets of businesses which have been reclassified as discontinued operations in the consolidated statement of income. Refer to Note 3, "Acquisitions and Divestitures".

(5) 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, 2018 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 47 for management's annual report on internal control over financial reporting. See Report of Independent Registered Public Accounting Firm on page 46 for PricewaterhouseCoopers LLP's audit report on the Company's internal control over financial reporting.
(d) Remediation of Material Weakness.
In connection with the investigation described in the Explanatory Note within the 2017 Form 10-K/A, the Company identified and implemented actions to improve the effectiveness of its internal control over financial reporting and disclosure controls and procedures, including enhancing the Company's resources and training with respect to financial reporting and disclosure responsibilities. Management reviewed and will continue to review such actions with the Audit Committee. The steps taken to remediate the Company's material weakness included the following:

- The Company terminated the employment of the former Vice President and Controller.
- Two employees who acted under the direction of the former Vice President and Controller were re-assigned to different positions within the Company where they do not have a Financial Reporting Oversight Role or a role in the design or operation of internal control over financial reporting, disclosure controls or accounting policy.
- The Company appointed its former Director of Corporate Audit Services and former Assistant Controller, Financial Reporting as Acting Controller and, on July 19, 2018 appointed him the Company's permanent Vice President and Controller.
- The Company's Chairman and Chief Executive Officer has emphasized to all employees, and to the Company's finance employees specifically, the importance of acting ethically and adhering to the Company's Global Code of Ethics.

The Company is committed to maintaining a strong internal control environment and to ensuring that a proper, consistent tone is communicated throughout the organization. In addition to the steps set forth above, the Company has also taken other remedial measures as described below:

- The Company re-emphasized (1) its commitment to ethical standards, (2) the requirements of the Company's Code of Ethics, (3) reporting obligations and (4) non-retaliation policy for complaints;
- The Company enhanced its corporate finance department by adding personnel with responsibility for areas identified in the investigation and enhanced segregation of duties in the finance department;
- The Company enhanced policies and procedures relating to the preparation, approval and entry of journal entries;
- The Company enhanced its process to evaluate and adjust certain significant expense accruals;
- The Company enhanced its policies and procedures relating to inventory standard cost revaluations;

- The Company enhanced its policies and procedures concerning accounting entries related to discontinued operations;
- The Company now requires additional annual/onboarding education for finance staff;
- The Company will conduct additional periodic risk assessments and targeted internal audit reviews; and
- The Company separated the financial forecasting process from financial accounting.

As discussed in Management's Report on page 47, management has determined that, as of December 31, 2018, the remedial measures described above have been satisfactorily implemented and that the Company has had sufficient time to test the design and operating effectiveness of such remedial measures. As such, the material weakness identified in the Company's internal control over financial reporting has been remediated.

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 2019 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 "Executive Officers of the Company."

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.

Information about compliance with Section 16(a) of the Exchange Act is included in the Proxy Statement under the caption "Beneficial Ownership – Section 16(a) Beneficial Ownership Reporting Compliance" 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, 2018, 2017 and 2016.

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, 2018, 2017, and 2016

($ in millions)	Balance at Beginning of Year	Charged to Costs and Expenses	Deductions(1)	Balance at End of Year
2018	$25	$18	($19)	$24
2017	$36	$15	($26)	$25
2016	$43	$22	($29)	$36

(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 Aug. 1, 1982, was filed as Exhibit 4.1 to the Registrant's Registration Statement on Form S-3 (No. 333-44397) dated January 16, 1998.
4.1	First Supplemental Indenture, dated as of April 1, 1986, was filed as Exhibit 4.2 to the Registrant's Registration Statement on Form S-3 (No. 333-44397) dated January 16, 1998.
4.2	Second Supplemental Indenture, dated as of October 1, 1989, was filed as Exhibit 4.3 to the Registrant's Registration Statement on Form S-3 (No. 333-44397) dated January 16, 1998.
4.3	Third Supplemental Indenture, dated as of November 1, 1995, was filed as Exhibit 4.4 to the Registrant's Registration Statement on Form S-3 (No. 333-44397) dated January 16, 1998.
4.5	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.
4.6	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.
4.7	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.
4.8	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.
4.9	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.
4.10	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.
4.11	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.
*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 10.14 to the Registrant's Annual Report on Form 10-K for the period ended December 31, 2008.
*10.17	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.
*10.18	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.
*10.19	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.
*10.20	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.
*10.21	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.
*10.22	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.
*10.23	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.
10.24	Term Loan Agreement, dated November 20, 2014, between PPG Industries, Inc. and Sumitomo Mitsui Banking Corporation, as Administrative Agent and as Initial Lender was filed as Exhibit 10.39 to the Registrant's Annual Report on Form 10-K for the period ended December 31, 2014.
10.25	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.
*10.26	

	Employment arrangement with Jean-Marie Greindl, was filed as Exhibit 10.1 to the Registrant's Quarterly Report on Form 10-Q for the quarter ended March 31, 2016.
*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 quarter 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 quarter ended September 30, 2018.

†* 10.29	PPG Industries, Inc. Incentive Compensation Plan for Key Employees, as amended and restated on January 1, 2019.
†* 10.30	PPG Industries, Inc. Management Award Plan, as amended and restated on January 1, 2019.
† 13.1	Market Information, Dividends and Holders of Common Stock.
† 13.2	Selected Financial Data for the Five Years Ended December 31, 2018.
† 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	XBRL Instance Document
** 101.SCH	XBRL Taxonomy Extension Schema Document
** 101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document
** 101.DEF	XBRL Taxonomy Extension Definition Linkbase Document
** 101.LAB	XBRL Taxonomy Extension Label Linkbase Document
** 101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document

† 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 XBRL (Extensible Business Reporting Language) as of and for the year ended December 31, 2018: (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 21, 2019.

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 21, 2019.

Signature	Capacity
/s/ Michael H. McGarry	Director, Chairman and Chief Executive Officer
Michael H. McGarry	
/s/ Vincent J. Morales	Senior Vice President and Chief Financial Officer (Principal Financial Officer and Duly Authorized Officer)
Vincent J. Morales	
/s/ William E. Schaupp	Vice President and Controller (Principal Accounting Officer and Duly Authorized Officer)
William E. Schaupp	

S. F. Angel	Director		
J. G. Berges	Director		
J. V. Faraci	Director		
H. Grant	Director		
V. F. Haynes	Director	By	/s/ Vincent J. Morales
M. L. Healey	Director		Vincent J. Morales, Attorney-in-Fact
G. R. Heminger	Director		
M. J. Hooper	Director		
M. W. Lamach	Director		
M. H. Richenhagen	Director		