TABLE E.1
MONITORING APPROACH FOR:
EU003, EU009, EU010, EU012, EU054 and EU056
SCRUBBERS 3, 4, 6, 7, 8, & 9

I. Indicator	Scrubber water inlet pressure.
Measurement Approach	The scrubber water pressure is monitored continuously using a pressure transmitter connected to the plant's Data Historian system.
II. Indicator Range	While the scrubber is operating, an excursion is defined as water pressure outside the range specified below for a continuous period of 2 hours. (Note: If the fan shuts down, the process line shuts down immediately. This is not considered an excursion). An excursion will trigger an investigation of the occurrence and corrective action. Scrubber No. 3: 15 psi to 35 psi Scrubber No. 4: 15 psi to 35 psi Scrubber No. 6: 15 psi to 35 psi Scrubber No. 7: 15 psi to 35 psi Scrubber No. 8: 15 psi to 35 psi Scrubber No. 9: 15 psi to 35 psi
III. Performance Criteria	
A. Data Representativeness	The pressure transmitter is located at the water inlet to the scrubber.
B. Verification of Operational Status	NA
C. Quality Assurance and Control Practices	Install, calibrate, maintain and operate pressure transmitters following manufacturer's specifications.
D. Monitoring Frequency	Water pressure is continuously monitored via the plant's Data Historian system.
Data Collection Procedures	The plant's Data Historian system collects and retains an instantaneous data point every 15 minutes. This data is stored electronically and archived for 5 years.
Averaging Period	None

TABLE E.2
MONITORING APPROACH FOR:
EU011, EU014, and EU 055
SCRUBBER 2, SCRUBBER 5 & PERLITE SCRUBBER

I. Indicator	Scrubber water flow.
Measurement Approach	The scrubber water flow is monitored continuously using a flow meter connected to the plant's Data Historian system.
II. Indicator Range	While the scrubber is operating, an excursion is defined as water flow less than those specified below for a continuous period of 2 hours. (Note: If the fan shuts down, the process line shuts down immediately. This is not considered an excursion). An excursion will trigger an investigation of the occurrence and corrective action. Scrubber No. 2: 165 gpm minimum Scrubber No. 5: 80 gpm minimum Perlite Scrubber: 165 gpm minimum
III. Performance Criteria	
A. Data Representativeness	The flow meter is located at the water inlet to the scrubber.
B. Verification of Operational Status	NA
C. Quality Assurance and Control Practices	Install, calibrate, maintain and operate flow meters following manufacturer's specifications.
D. Monitoring Frequency	Water flow is continuously monitored via the plant's Data Historian system.
Data Collection Procedures	The plant's Data Historian system collects and retains an instantaneous data point every 15 minutes. This data is stored electronically and archived for 5 years.
Averaging Period	None

TABLE E.4
MONITORING APPROACH FOR:
EU050 – SCRUBBER NO. 53 & SCRUBBER NO. 54

I. Indicator	Venturi water flow and differential pressure (in H_20) across the damper.
Measurement Approach	The Venturi water flow and the differential pressure (in H_20) across each scrubber damper is monitored continuously and recorded using a water flow and pressure transmitters connected to the plant's Data Historian system.
II. Indicator Range	Scrubber No. 53: Venturi water flow of 500 gpm (minimum) or greater and differential pressure across the damper of 10 inches water column (minimum) or greater. Scrubber No. 54: Ventrui water flow of 500 gpm (minimum) or greater and differential pressure across the damper of 10 inches water column (minimum) or greater. While the scrubber is operating, an excursion is defined as water flow rate below 500 gpm, or differential pressure drop across the damper which falls below 10 inches water column for a continuous period of 4.5 hours. (Note: This allowable period of 4.5 hours is contingent on Armstrong ceasing feed of boards to the board mill dryer within 2 hours). An excursion will trigger an investigation of the occurrence and corrective action.
III. Performance Criteria	
A. Data Representativeness	The differential pressure across the dampers is measured using pressure transmitters. The pressure transmitter is located at the inlet and outlet of each scrubber. Water flow is measured utilizing flow meters.
B. Verification of Operational Status	NA
C. Quality Assurance and Control Practices	Maintain and operate flow meter and pressure transmitters following manufacturer's specifications.
D. Monitoring Frequency	The Venturi scrubber water flow and differential pressure drop across the dampers are continuously monitored and recorded in the plant's Data Historian System.
Data Collection Procedures	The plant's Data Historian system collects and retains an instantaneous data point every 15 minutes. This data is stored electronically and archived for 5 years.
Averaging Period	None

TABLE E.5
MONITORING APPROACH FOR:
EU080 and EU081
BAGHOUSES 21 and 22

I. Indicator	Static pressure across the baghouse.
Measurement Approach	The static air pressure is measured using a pressure transmitter.
II. Indicator Range	While the baghouse is operating, an excursion is defined as static pressure outside the range specified below for a continuous period of 2 hours. (Note: If the fan shuts down, the process line shuts down immediately. This is not considered an excursion). An excursion will trigger an investigation of the occurrence and corrective action. Baghouse 21: between 2.8 and 8 inches water column Baghouse 22: between 2 and 8 inches water column
III. Performance Criteria A. Data Representativeness	The pressure transmitter measures the static pressure across the baghouse.
B. Verification of Operational Status	NA
C. Quality Assurance and Control Practices	Maintain and operate transmitter following manufacturer's specifications.
D. Monitoring Frequency	Pressure is continuously monitored via the plant's Data Historian system.
Data Collection Procedures	The plant's Data Historian system collects and retains an instantaneous data point every 15 minutes. This data is stored electronically and archived for 5 years.
Averaging Period	None

MONITORING APPROACH JUSTIFICATION FOR
EU003, EU009, EU010, EU011, EU012, EU014, EU054, EU055 and EU056

I. Background

Activities associated with these scrubbers (except for EU055) include various dust sources associated with the manufacture of ceiling tile. These sources include feeders, stackers, conveyors, equalizers, tenoners, saws and sanders. Process flow diagrams are included in Attachment A. Fume hoods collect dust from the process equipment and a fan pulls the vapors through vent lines and into the scrubber.

For EU 055, raw perlite is expanded with natural gas fired perlite expanders. Expanded perlite is separated from the flue gases in cyclones, and particulate and combustion by-product emissions are controlled by a Ducon Dynamic Scrubber, Type UW-4 (EU 055).

Each of the nine Scrubbers is a Ducon Dynamic Scrubber, Type UW-4. A detailed description of the scrubbers is included in the permit application forms and in Attachment H.

II. Rationale for Selection of Performance Indicators

In February 2004, the Armstrong plant commenced an extensive Six Sigma Greenbelt engineering project to evaluate certain operational aspects of the plant's Ducon wet scrubbers, optimize overall scrubber performance, and determine performance indicators and their respective operating ranges. The ultimate goal of the project was to maintain stable operating conditions to ensure scrubber efficiency, maintain compliance with the plant's Title V air operating permit, ensure that the emission control devices are operating in accordance with manufacturer specifications, and validate maintenance procedures for the scrubbers to ensure compliance with applicable permit limits.

Considerable progress and improvements have been made as a result of the Six Sigma project. All nine of the scrubbers have been outfitted with new instrumentation and monitoring devices, and tied into the plant's Data Historian system, which will continuously monitor the required performance indicators. This is a substantial improvement over the previous monitoring method of manually recording the data once each eight-hour shift. The scope of the recent Six Sigma engineering project provided that Scrubbers No. 2 and 5 were equipped with flow meters and monitored for water flow rate. The remaining wet scrubbers are monitored for water supply pressure which is a direct indicator of flow rate.

One of the findings of the study was that air inlet static pressure is a good indicator of vacuum for dust removal from the process, but not a critical variable in scrubber cleaning performance. Ducon Technologies' technical engineer, Mr. Thomas Kelleher, further validated this finding by stating that while air inlet static pressure is a good measure of performance for other types of scrubbers, it is not for the Dynamic Scrubbers, Type UW-4 which are used at the Pensacola Plant. He stated that neither pressure drop nor static pressure is a good indicator of scrubber performance for this type of scrubber. Based on these findings, Armstrong is proposing water pressure or water flow rate as the sole CAM performance indicator for the scrubbers. By monitoring one relevant indicator continuously, we expect to collect more meaningful performance data than by the previous monitoring scheme whereby two questionably relevant parameters were monitored every eight hours.

III. Rationale for Selection of Indicator Levels

Performance indicator ranges included in this plan were established by a combination of manufacturer's recommendations, engineering studies, and historical data. The indicator ranges are supported by the 2004 compliance test results, which are summarized in Tables E.6 through E.14. Operating parameters associated with compliance tests prior to 2004 are not included in the table. They are not relevant to the current operation because of the extensive changes to the scrubber monitoring system in 2004.

The manufacturer of all nine of the Dynamic Type UW-4 wet scrubbers is Ducon Technologies. The manufacturer's design liquid flow rate is165 gpm.

For Scrubber No. 2, the manufacturer's design liquid flow rate of 165 gpm was used.

The minimum water flow rate for Scrubber No. 5 was based on compliance test data, and the 2004 Six Sigma engineering study. The data is shown in Table E.11.

The proposed CAM range for the perlite scrubber is supported by historical operating data. According to the Data Historian monitoring system, the water flow rate fluctuates between 165 and 190 gpm during normal operation. As shown in Table E.14, the compliance test results for 2004 show that the emissions were less than half of the permitted limit. The perlite scrubber has tested well below its compliance limit for the past 5 years. The manufacturer's design liquid flow rate is 165 gpm.

An engineering study was performed on Scrubber No. 3 to determine the correlation between scrubber water flow rate and scrubber water pressure. A flow rate of 150 gpm was measured at 13 psi water pressure. It was determined that a flow rate of 165 gpm would correspond to 15 psi water pressure. This information was generalized to the other scrubbers, and used as the basis for the minimum CAM indicator on Scrubbers 3, 4, 6, 7, 8, and 9.

The maximum CAM indicator for Scrubbers 3, 4, 6, 7, 8, and 9 is a scrubber water pressure of 35 psi. Based on the design of the system, a back pressure of 35 psi is expected when the spray nozzles are plugged. The Ducon Dynamic Type UW-4 Scrubbers are outfitted with two ¾" nozzles in the top section, and two to four ½" nozzles in the bottom section. In accordance with the plant's scrubber maintenance plan, a nozzle inspection is scheduled every six weeks. In addition, the possibility of clogged spray nozzles has been greatly reduced by the installation of a new strainer at the plant's wastewater treatment plant on November 26, 2004 (see attached drawing of the water cleaning process). Because the perforations in the strainer are smaller than the orifice size of the scrubber nozzles, the water, which is recycled back to the wet scrubbers, is less likely to contain particles that could possibly plug the spray nozzles.

Prior to 2009, the strainer at the plant's wastewater treatment plant required manual cleaning of debris that was caught in the strainer. To improve the functionality of the recycled water strainer system, Armstrong has installed a more robust, self-cleaning straining system that senses when the strainer needs to be cleaned and automatically

performs that function. This system utilizes pressure indicator feedback which allows the plant to monitor pressure drop across the strainer as an indicator of solids removal from the recycled water supply. The new system is integrated into the plant's Data Historian and monitored continuously. These additional measures further minimize the likelihood of partially plugged spray nozzles.

MONITORING APPROACH JUSTIFICATION FOR
EU050

I. Background

Formed pulp boards are dried in a 112.35 MMBtu/hr natural gas fired Boardmill Dryer. Emissions from the Boardmill Dryer North exhaust are controlled by Scrubber #53 and from the South exhaust by Scrubber #54. Both are EMTROL Venturi Model 64/144W20-60 high efficiency scrubbers. The remaining fugitive emissions from circulation are captured by a Wet End Seal (as permitted on 12/1/08 in permit 0330006-014-AC) and mixed with ambient air before being exhausted to the atmosphere. A detailed description of the two control devices is included in the permit application forms and in Attachment H.

II. Rationale for Selection of Performance Indicators

Scrubber #53 and Scrubber #54 are EMTROL Venturi Model 64/144W20-60 high efficiency scrubbers. To ensure efficient operation, and to comply with the applicable emission limit, adequate water flow must be supplied to the each scrubber and suitable differential pressure across each scrubber damper must be maintained. This guidance was provided by the manufacturer (EMTROL) and validated by the engineering performance testing following startup of the new scrubbers and during the EPA Method 5 compliance testing that was conducted on June 19, 2014.

III. Rationale for Selection of Indicator Level

The indicator ranges are supported by manufacturer recommendations, performance engineering testing conducted after start-up of the new scrubbers, and compliance testing conducted for PM on June 19, 2014. Table E.15 summarizes the relevant compliance test results.

MONITOR APPROACH JUSTIFICATION FOR
EU080 and EU081

I. Background

Activities associated with Baghouses 21 and 22 include various dust sources associated with the operation of the PIF line. These sources include a line sander, flipper, and wheelabrator. Process flow diagrams are included in Attachment A. Baghouse No. 21 (EU080) is a Fuller Jet Pulse Model 272 C10 baghouse. Baghouse No. 22 (EU081) is a Fuller Jet Pulse Model 168 C10 baghouse. A detailed description of the baghouses is included in the permit application forms and Attachment H.

II. Rationale for Selection of Performance Indicators

The current Title V permit requires monitoring airflow differential pressure across the baghouse. It is used as the CAM performance indicator, and is monitored continuously via the plant's Data Historian system.

III. Rationale for Selection of Indicator Level

The CAM indicator levels for the baghouses were based on a combination of particulate matter tests, visible emission tests, and manufacturer's recommended specifications. Particulate matter tests were performed on Baghouse No. 21 and No. 22 in 2001, although annual PM testing is not required by the Title V permit.

For Baghouse No. 21 and No. 22, the minimum pressure drop was chosen based on the minimum pressure drop observed during recent VE tests. The observed pressure drop is not a strong function of the bag cleaning cycle, as the bag cleaning pulses are every 25 seconds.

Relevant test results are summarized in Tables E.17 through E.18