



ASTM E 2129 – STANDARD PRACTICE FOR DATA COLLECTION FOR SUSTAINABILITY ASSESSMENT OF BUILDING PRODUCTS

REVISED
11/2008

USG PRODUCTS AND RESPONSES:

ASTM E 2129 Section	ASTM E 2129 Question	USG Answer	USG Explanation
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CRITERION 1 — Materials (Product Feedstock)

<p>1.1</p>	<p>Have efforts (such as mining management, site restoration, use of 100 percent recycled content, etc.) been made to minimize and/or avoid negative environmental impacts (such as impact to rare or endangered resources or species, releases of toxic chemicals or hazardous air pollutants, etc.) in obtaining raw materials for this product? If yes, describe these efforts.</p>	<p>YES</p>	<p>USG began exploring the use of synthetic gypsum at our Baltimore plant as early as 1974 by using a blend of mined gypsum and up to 30% of titano-gypsum, a by-product of the pigment industry. By 1986, USG’s Galena Park plant was the first US wallboard facility to use 100% recaptured post-industrial gypsum from flue-gas desulfurization (FGD) from coal-fired power plants.</p> <p>By using FGD synthetic gypsum, USG not only conserves natural resources but has been able to establish manufacturing plants closer to higher population centers, reducing transportation to market. Currently, all gypsum panel cores produced at seven of the 21 USG drywall plants use 100% of this material. Six other USG plants use locally available synthetic gypsum at varying rates of consumption to replace natural gypsum rock. In 1996, USG began using FGD synthetic gypsum in ceiling panels. FIBEROCK Brand gypsum panels, a family of high-performance panels, have a recycled content of more than 97 percent.</p> <p>USG has used 100 percent recycled face and back papers in all gypsum panels since the early 1960s. Further, no bleach is used in the production of our products. USG annually uses approximately 650,000 tons of secondary fiber (waste paper) to manufacture wallboard and ceiling products, making the company one of the nation’s top ten consumers of secondary fiber.</p>
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			<p>USG manufactures acoustical ceiling panels and metal suspension (grid) systems. Several of our ceiling panel lines contain mineral fiber, a by-product (slag) of the steel-making process. USG uses approximately 150,000 tons of slag annually in the production of mineral wool for our ceiling panels. For information on the recycled content of USG metal grid systems and other products, please consult the <i>USG Sustainability Tables</i> or refer to a specific USG product's Material Safety Data Sheet (MSDS). See notes 1 and 2 below.</p> <p>USG thoroughly investigates all raw materials used in product manufacturing to evaluate potential hazardous chemical releases (air, water, terrestrial) and to minimize or eliminate any potential negative environmental impacts. Components of each raw material are examined to determine toxicity and short- and long-term environmental hazards. Evaluations cover carcinogenicity, mutagenicity, and reproductive toxicity. Soil impacts, leaching capabilities, and effects on terrestrial and aquatic fauna, flora, microorganisms, and water environments are also fully studied and mitigated.</p> <p>In addition, USG has a long history of successful reclamation relative to our mining operations (for example, see www.usg.com/news/virginiareclamationaward.asp). Our reclamation efforts have consistently and substantially exceeded all state and federal requirements. Selected examples of comprehensive USG reclamation efforts include:</p> <ul style="list-style-type: none">▪ Alabaster, MI quarry — the state's largest wetlands remediation project;▪ Fort Dodge, IA plant — continuous concurrent reclamation, resulting in return of significant acreage to agricultural use;

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			<ul style="list-style-type: none"> ▪ Windsor, Nova Scotia (Canada) — depleted pits at our Fundy Gypsum site were reclaimed for water-fowl habitat, and we partnered with Ducks Unlimited to create extensive refuge areas, recreational trails, and interpretive exhibits; ▪ Grants, NM and Lovelock, NV perlite processing mills and quarries — comprehensive site reclamations; ▪ Oakfield, NY and Locust Cove, VA mining and plant sites — mine closings and complete reclamations, including daily pumping of 2-3 million gallons of mine water to supply a state wildlife refuge at the Oakfield site and use of the Locust Cove site as fully reclaimed and restored livestock pasturage; and ▪ Midland Mine, CA — permanent sealing and reclamation of numerous shafts, tunnels, and open cuts, installation of bat gates to accommodate nesting areas of local non-migratory bat species, and successful effort to minimize reclamation impact on local population of the California Desert Tortoise, a federally protected species. <p>Note that the Alabaster wetlands mitigation project and the Midland mine closure project have been certified by the Wildlife Habitat Council. The Locust Cove reclamation project received the Virginia Statewide Mining Reclamation Award in 2002.</p>
1.2	Does the product meet the requirements of EPA regulations for content of Volatile Organic Compounds (VOCs)? (The EPA National VOC Rule can be found in the <i>Federal Register</i> of September 11, 1998 –	YES	<p>VOCs of all USG products are below EPA regulations. Please consult the <i>USG Sustainability Tables</i> or refer to a specific USG product’s MSDS for information on product VOC ratings. See notes 1 and 2 below.</p> <p>USG utilizes aqueous-based systems in approximately 95 percent of its manufacturing</p>

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	Volume 63, Number 176, pages 48847)		processes. We minimize the use of solvents in all USG manufacturing processes.
1.3	Does the product (coatings, adhesives, etc.) meet the requirements of South Coast Air Quality Management District (SCAQMD) regulations for content of VOCs?	YES	All USG products meet the SCAQMD requirements for VOCs. Please consult the <i>USG Sustainability Tables</i> or refer to a specific product’s MSDS for information on product VOC ratings. See notes 1 and 2 below.
1.4	Does the product meet federal regulations concerning substances listed as being carcinogenic by the National Toxicology Program?	YES	All USG products meet exposure limits listed on the National Toxicology Program carcinogenic list. Please refer to the MSDS for any and all products for complete listings of ingredients and trace amounts of natural elements. Note that all USG products meet all federal regulations, including guidelines established by the National Toxicology Program (NTP). Individual USG products’ MSDSs provide complete relevant information on this topic. No substance in any USG product exceeds exposure amounts specified in the NTP’s carcinogenics list. Please consult individual USG product MSDSs for complete listings of ingredients and trace amounts of natural elements. See Note 2 below.

CRITERION 2 — Manufacturing

2.1	Has the manufacturer taken steps to minimize the use of nonrenewable energy	YES	Two major USG paper mills — at Otsego, MI, and Oakfield, NY — utilize natural gas cogeneration units. Cogeneration supplies clean power and steam for our mills’ man-
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	<p>from the point at which raw materials are gathered to the point at which the final product is transported to the building site? If yes, describe these measures.</p>		<p>ufacturing processes while consuming 30 percent less fuel.</p> <p>At Sperry, USG recovers waste heat from the kiln exhaust and is used to preheat combustion air via a heat exchanger. At many of our board plants, USG recovers waste heat from the kiln exhaust from the wet zone is also introduced directly in the dry zone via an equalizer which reduces kiln fuel requirements. At East Chicago and Baltimore, kiln exhaust is also used to heat gauging water and recover some condensate in a direct contact heat exchanger. At Baltimore, waste heat in the board at the kiln exit is also recovered by channeling kiln end leakage air over the boards which also directly reduces kiln fuel requirements.</p> <p>At the Sperry and Hagersville mills, kettle calciner exhaust is introduced directly into the rock dryer to reduce rock drying fuel requirements. At both East Chicago and Baltimore mills, kettle calciner exhaust is introduced directly in the synthetic gypsum dryer to reduce synthetic gypsum drying fuel requirements.</p> <p>At East Chicago, Stony Point, and Hagersville, the High Efficiency Kettle (HEK) achieves its high efficiency by indirectly heating the gypsum through the steel wall of the burner tube and then directly heating the gypsum when the combustion gases exit the burner tube directly into contact with the gypsum, resulting in an exhaust temperature that is no higher than the gypsum temperature.</p>

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2.2	Is any of the waste produced in making this product reclaimed on-site? If yes, what percentage of the waste is reclaimed? Of the waste that is reclaimed on-site, how is that waste handled?	YES	USG's plants recycle plant waste back into the manufacturing process whenever possible. As a result of our recycling strategies, USG typically achieves a 96 percent recovery rate during our manufacturing processes. Of the remaining four percent plant waste, a large fraction is recycled into small strips to support gypsum panel stacks. These pieces are often returned to our plants and further recycled, resulting in an overall plant efficiency rating of approximately 98 percent. Ceiling tiles that are chipped or broken during the manufacturing process are returned to the slurry and recycled. Efficiency among USG's Interior Products plants is rated at more than 85 percent.
2.3	Does the process for manufacturing this product avoid the release of substances listed on the U.S. EPA's Toxics Release Inventory at or above the levels that require reporting to the EPA? If no, indicate how much of each substance is released per unit of product.	YES	USG emissions listed on the Toxics Release Inventory (TRI) are reported annually by all USG facilities. Specific information can be found at http://www.epa.gov/tri/ .
2.4	Have any recent improvements been made to limit negative environmental impacts relating to the manufacturing process? If yes, describe the benchmark against which the improvements are	YES	USG currently uses more recaptured, post-industrial gypsum produced by flue-gas desulfurization (FGD) processes at North American coal-fired utility plants than does any other manufacturer. This "synthetic gypsum" represents approximately 33 percent of the raw gypsum material used by USG to manufacture drywall, plaster, and

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	measured and the degree of improvement.		ceiling panel products. FGD-produced synthetic gypsum is delivered to our plants in powder form, thus reducing mining and grinding of natural gypsum rock. It accounts for approximately ten percent of our drywall products' embodied energy rating.
2.5	If water is used during the production process, have water conservation and/or recycling measures been initiated? If yes, describe the measures and what percentage of the total water usage they address.	YES	<p>All USG paper mills recycle approximately 90 percent to 98 percent of the waste water produced during the manufacturing process (rate of recycling depends on the individual mill). This very high recycling rate achieves water savings of between four and six million gallons per day at individual mills. Water is recycled several times during the manufacturing process. After multiple recycling processes, remaining water is discharged as waste water or steam; or, it is embodied in the product (which adds to our gypsum-based products' flame- and fire-resistance characteristics).</p> <p>USG wet felted ceiling tile lines recycle approximately 90 percent of the wastewater produced during the forming process. As with the paper mills the water is recycled several times during the manufacturing process.</p> <p>USG continues to reduce the amount of water used in its manufacturing processes. This effort results in progressively increased water savings and also reduces the amount of energy needed to dry our wallboard products during manufacturing.</p>
2.6	Has the manufacturer undertaken any of the following actions? If yes, describe the benchmark against which the improvements are measured and the degree of	YES	Please see responses 2.6a – 2.6g below.

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	improvement.		
2.6-a	Redesigned a production process to decrease greenhouse gas emissions?	YES	Two major USG paper mills — at Otsego, MI, and Oakfield, NY — utilize natural gas cogeneration units. Cogeneration supplies clean power and steam for our mills’ manufacturing processes while consuming 30 percent less fuel. We also make efficient use of the steam heat and power produced during cogeneration to drive our drying kilns — an additional economic and environmental bonus resulting from the process.
2.6-b	Redesigned a production process to decrease liquid effluents?	YES	<p>We continue to increase our manufacturing efficiencies, and our three most recently constructed gypsum drywall plants are acknowledged as the industry’s efficiency leaders.</p> <p>USG’s new drywall plants are designed to achieve zero discharge of waste water during the manufacturing process. Our new plants recycle any water lost due to upset conditions or regular maintenance of the product line. Except during upset conditions or as a result of maintenance, water used in the drywall manufacturing process remains in the product or is discharged as steam from plant emission stacks.</p> <p>At Sperry, USG recovers waste heat from the kiln exhaust and is used to preheat combustion air via a heat exchanger. At many of our board plants, USG recovers waste heat from the kiln exhaust from the wet zone is also introduced directly in the dry zone via an equalizer which reduces kiln fuel requirements. At East Chicago and Baltimore, kiln exhaust is also used to heat gauging water and recover some conden-</p>

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			<p>sate in a direct contact heat exchanger. At Baltimore, waste heat in the board at the kiln exit is also recovered by channeling kiln end leakage air over the boards which also directly reduces kiln fuel requirements.</p> <p>At the Sperry and Hagersville mills, kettle calciner exhaust is introduced directly into the rock dryer to reduce rock drying fuel requirements. At both East Chicago and Baltimore mills, kettle calciner exhaust is introduced directly in the synthetic gypsum dryer to reduce synthetic gypsum drying fuel requirements.</p> <p>At East Chicago, Stony Point, and Hagersville, the High Efficiency Kettle (HEK) achieves its high efficiency by indirectly heating the gypsum through the steel wall of the burner tube and then directly heating the gypsum when the combustion gases exit the burner tube directly into contact with the gypsum, resulting in an exhaust temperature that is no higher than the gypsum temperature.</p>
2.6-c	Redesigned a production process to utilize less toxic materials?	YES	USG continuously seeks to identify suitable raw materials that will enable us to produce highest-quality materials while reducing or eliminating toxic components. USG was the world’s first manufacturer to eliminate asbestos in its joint compounds. Previously, we had eliminated mercury-based biocides in ready-mixed joint compounds; more recently, we have substituted for a tributyltin-based preservative compound with a substantially reduced toxic component.

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2.6-d	Substituted safer solvents in a production process?	YES	USG's Occupational Safety group has developed an effective, comprehensive protocol for plant use of solvents and solvent substitutes. In recent years, our plants have replaced solvent cleaners with water-based cleaning agents. Water is recycled through several stages during applicable production processes.
2.6-e	Instituted more stringent dust controls?	YES	Employee exposure to airborne contaminants, including dust, is regularly and carefully monitored at all locations and during all stages of the production process. Relative to specific manufacturing processes, operations, and environments, stringent controls are applied to restrict employee airborne-contaminant exposure to 50 percent of the OSHA PEL or ACGIH TLV standards, whichever rating is lower. Dust is closely monitored in our plants and misted during rock crushing.
2.6-f	Installed smoke-stack particulate collectors or gas scrubbers?	YES	Most USG calcining units (used in the process of refining gypsum-based raw materials) and all USG mineral fiber lines are equipped with effective dust-collection systems.
2.6-g	Installed or improved in-plant solid and toxic waste reduction programs?	YES	USG plants are 96 percent efficient; USG InteriorProducts plants are 85 percent efficient. Relative to USG plants' overall manufacturing efficiency, 96 percent of the raw and supplier-processed materials consumed by our plants is incorporated into finished product. Similarly, 85 percent of the raw and processed materials consumed by USG Interior Products plants is incorporated into finished product.

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2.7	Does the manufacturing facility comply with OSHA requirements?	YES	<p>Safety is a core value at USG, and safety standards at our facilities consistently exceed OSHA requirements. Note that, in 1914, the U.S. Gypsum Company joined with 67 other leading firms to establish the National Safety Council. U.S.Gypsum’s safety record is five times greater than other gypsum companies and 18 times greater than the overall industry standard.</p> <p>U.S. Gypsum has a long history of occupational and operational safety achievement. Our company has won more U.S. Mine Safety and Health Administration (MSHA) Sentinels of Safety awards (64) than any other U.S. company. In addition, we have received 15 first-place Sentinels of Safety awards in MSHA’s nonfuel/nonmetal underground and quarry categories. Currently, eight USG facilities have received the OSHA VPP Star. Other USG locations are making concerted efforts to achieve that certification. Information on the U.S. Department of Labor’s Mine Safety and Health Administration safety records can be found at www.nsha.org.</p>

CRITERION 3 – Operational Performance of Installed Product

3.1	If applicable, does the product qualify for an EPA EnergyStar?	N/A	
3.2	Describe routine maintenance procedures for the product.		Instructions on cleaning and maintaining can be obtained in many USG sources (literature, pamphlets, packaging labels, etc.). The best overall source for this type of

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3.3	How long will the product last in the building if maintained properly with routine maintenance procedures?		The life of the building, when installed properly and properly maintained. Most USG products require little or no maintenance other than painting during the building/products' life unless abused.
3.4	Does the manufacturer provide detailed instructions with the product upon delivery to the job site for the proper use and maintenance required in order to insure that this product will last this long?	YES	Instructions on product shipping, handling, installation, and maintenance can be obtained in many USG sources (literature, pamphlets, packaging labels, shipping fliers, etc.). The best overall source for this type of information is the USG <i>Gypsum Construction Handbook</i> . This information can be viewed and downloaded at www.usg.com or requested in hardcopy at 1-888-874-2450 or samplit@usg.com .

CRITERION 4 – Indoor Environmental Quality

4.1	Is there any other information about how this product contributes to indoor environmental quality (positively or negatively; e.g. acoustical properties, lighting, potential risks to workers during application, etc.) that has not already been reported, but that sender of this	YES	IEQ ceiling tile values, including light reflection, acoustical values, and fire performance, can be found in the Architectural Literature for ceiling tile products (SC 2000). The best source of information on fire and sound performance of gypsum systems is the SA 100 Architectural Literature. Additional information can be found in various gypsum products' Architectural Literature. The complete <i>Gypsum Architectural Cata-</i>
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	questionnaire should know? If yes, describe.		<p><i>log</i> (SA 99) can be ordered at 1-888-874-2450 or via samplit@usg.com.</p> <p>VOCs of most USG products can be found on the products' MSDS, which can be downloaded at www.usg.com. Please see Note 2 below.</p> <p>USG products are among the lowest VOC-emitting materials in the industry and help to significantly improve Indoor Air Quality (IAQ) ratings. Select USG products emit zero formaldehyde, a standard unmatched by other materials manufacturers. Copies of Certificates for Zero Emitting and Low Emitting VOCs per California Environmental Specification 01350 for Classroom and Office Design are available upon request.</p>

CRITERION 5 — Corporate Environmental Policy

5.1	Does the manufacturer have a written environmental policy? If yes, indicate how to obtain a copy.	YES	USG environmental policy is covered in "Committed to the Environment," publication number X2985. This information can be viewed and downloaded at www.usg.com or requested in hardcopy at 1-888-874-2450 or samplit@usg.com .
5.2	Does the manufacturer have a reclamation program or any other program in place to facilitate the recycling or reuse of its product by accepting return of the product at the end of its useful life? If no, comment on the environmental impact of the product as a waste material. If yes,	YES	Most USG plants (both gypsum and ceiling panel) utilize grinding equipment to recycle product made at individual facilities. For example, USG recycled over 430,000 tons of cut-off and damaged (C&D) construction drywall in 2007, accounting for 3.5 percent of our raw material needs. We have worked with several waste-management firms on the requirements of returned C&D materials, and we continue to investigate new methods for returning materials where local conditions allow.

Note 1: *USG Sustainability Tables* can be accessed at http://www.usg.com/USG_Marketing_Content/usg.com/web_files/Documents/A56_Sustainability_tables.pdf.

Note 2: An individual USG product's Material Safety Data Sheet (MSDS) can be accessed via our main website at <http://www.usg.com>.

Note 3: Questions taken from *ASTM E 2129-01*, approved 10 January 2001, published March 2001. For additional information, please visit the ASTM International website at http://www.astm.org/cgi-bin/SoftCart.exe/NEWSITE_JAVASCRIPT/DOMnewstandards.shtml?L+mystore+rpau1908+1030138270.



ASTM E 2129 – STANDARD PRACTICE FOR DATA COLLECTION FOR SUSTAINABILITY ASSESSMENT OF BUILDING PRODUCTS

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	comment on how much of the product is actually reused or recycled at the end of the product's life.		<p>Note that USG Ceilings plants have implemented a program to accept ceiling tile removed from job sites and to recycle salvaged tile back into the new-product manufacturing process.</p> <p>USG has recycled drywall as permitted by job specific conditions since the 1960s. However, many factors influence the feasibility of recycling, including alternate uses of re-grind drywall, shipping distance, contamination, etc. We are currently developing a specification on requirements of C&D waste for return. For additional information on re-grind uses, see the USG webpage at www.drywallrecycling.com.</p> <p>USG has a long history of vigorous reclamation, including the reclamation and restoration of mining sites. For example, please see http://www.usg.com/news/virginiareclamationaward.asp. In many cases, USG's reclamation initiatives have far exceeded state and federal requirements. For additional information, please see our response to Question 1.1 above.</p>
5.3	Does the manufacturer have a program in place to reduce the amount of the product's packaging? If yes, describe.	YES	<p>USG has made a very substantial effort to reduce and reuse product packaging (e.g., use of paper strips on the ends of two-panel drywall bundles; reusable tarps employed during the shipping process). We continue to evaluate and apply methods to reduce packaging. USG currently has a program in place to reduce packaging on all company literature and to employ recycled paper for production of literature whenever possible.</p> <p>One of our ceiling-tile product lines has reduced packaging material volume by 75</p>

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			percent by replacing corrugated sleeves with heavy paper. We continue to implement packaging-reduction programs at every opportunity.
5.4	Does the manufacturer have a program in place to facilitate the return, reuse, recycling, or composting of the Product's packaging? If yes, describe.	YES	<p>USG has a successful program in place regarding protection of its drywall panels during shipping. We wrap our products in reusable tarps, which are returned from their destination points and reused for subsequent shipments.</p> <p>Plastic pails used as packaging for our ready-mixed joint compounds and textures can be recycled by plastics manufacturing facilities or reused as containers. Our cardboard carton packaging is recycled as "Old Corrugated Cardboard" (OCC). Shipping and storage pallets that are no longer usable are regularly recycled by our individual board, ceiling and joint-compound facilities.</p>
5.5	Can the environmental claims on this questionnaire be substantiated with invoices, data sheets, or other documentation? If yes, indicate how.	YES	Many USG publications include portions of this information, although no other individual publication covers all the information shown here. Environmental information is disclosed in the USG publication designated X 2598. Also, please consult the <i>USG Sustainability Tables</i> or refer to a specific USG product's MSDS. See notes 1 and 2 below.
5.6	Does the manufacturer provide information on the service life of the product or encourage the use of professional guidelines to determine the service life of the	YES	The service life of most USG products depends on proper installation, maintenance, and upkeep. Assuming installation, maintenance, and upkeep as recommended for the specific product, its service life will equal the service life of the building. The best overall source for this type of information is the <i>USG Gypsum Construction Handbook</i> .

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	product?		This information can be viewed and downloaded at www.usg.com or requested in hardcopy at 1-888-874-2450 or samplit@usg.com .
5.7	Does the manufacturer provide information regarding natural disaster mitigation, such as performance of the product during a natural disaster of appropriate response after a natural disaster?	YES	Plaster products have performed extremely well through natural disasters. Similarly, drywall and ceiling panels have performed well during natural disasters, and compression components are used in earthquake lay-in ceiling designs as documented in our literature. Repair and reassembly of systems after natural disasters is covered in the <i>USG Gypsum Construction Handbook</i> and in specific product literature as appropriate.
5.8	Is there any additional, objective information you could provide about the environmental quality of the building product or statement you offer that you would like taken into consideration? If yes, describe the information and indicate how copies of this evidence could be obtained upon request.	YES	USG has several programs available for the educational benefit of architects, contractors, and code officials. Information on these programs is available at www.usg.com or by e-mail at ces@usg.com .

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