



State of Oregon  
Department of  
Environmental  
Quality

## Beneficial Use of Solid Waste Determination Evaluation Form

Applicant: Columbia Steel Casting Co., Inc.

BUD No.: BUD20101208ColumbiaSteelSlag

Solid Waste: Spent Steel Foundry Slag

Summary of Proposed Beneficial Use: Columbia Steel Casting Co. (Columbia Steel), Inc. applied for a BUD for the use of steel slag as non-residential construction fill, utility trench fill, or road base. The slag would be placed where it would not be in contact with or adversely impact waters of the state and would be covered in a manner that minimizes exposure to human and ecological receptors.

Reviewers: Amanda Romero, Bill Mason, Tom Roick,  
Dan Hafley, and Audrey O'Brien

Date: Application received  
December 8, 2010.  
Review initiated  
December 8, 2010 and  
completed September 27,  
2011.

Tier:  One  Two  Three

### Beneficial Use of Solid Waste

Beneficial use of solid waste is a sustainability practice that may involve using an industrial waste in a manufacturing process to make another product or using a waste as a substitute for construction materials.

The environmental benefits of substituting industrial waste materials for virgin materials includes conserving energy, reducing the need to extract natural resources and reducing demand for disposal facilities.

Oregon Administrative Rules (OAR) 340-093-0260 through OAR 340-093-0290 establish standing beneficial uses and a process for DEQ review of case-specific beneficial use proposals. Under these rules, DEQ may issue a beneficial use determination as an alternative to a disposal permit for proposals that meet the rule criteria. Once a beneficial use determination approval is issued, DEQ no longer regulates the waste as a solid waste as long as the waste is used in accordance with the approved beneficial use determination.

### Beneficial Use Determination Evaluation Summary

- Yes, the Beneficial Use of this solid waste meets all the case-specific performance criteria listed below and is approved.
- No, the Beneficial Use of this solid waste does not meet all the case-specific performance criteria listed below and is not approved.

## Beneficial Use of Solid Waste Determination Evaluation Form

Applicant: Columbia Steel Casting Co. Inc.  
BUD No.: BUD20101208ColumbiaSteelSlag  
Solid Waste: Spent Steel Foundry Slag

### Case-Specific Beneficial Use Performance Criteria:

DEQ may approve an application for a case-specific beneficial use of solid waste only if all the following performance criteria are addressed: 1) Characterization of the Solid Waste; 2) Productive Beneficial Use of the Solid Waste; and, 3) The effect of the Proposed Beneficial Use on Public Health, Safety, Welfare and/or the Environment.

#### 1) Characterization of the Solid Waste

Did the applicant characterize the solid waste and proposed beneficial use sufficiently to demonstrate compliance with the rules for case-specific beneficial use determinations (OAR 340-093-0280) by submitting required information for the appropriate tier? (See tier sections below for detailed characterization information.)

Yes  No

Notes: The applicant submitted all required data and background information in the BUD application.

Was the following information submitted for DEQ review and how adequate was it?

**Tier 1**  Applicable  Not applicable

- Did the applicant provide an adequate description of the material proposed for beneficial use, the manner of generation and the estimated quantity to be used beneficially each year?  
 Yes  No

Notes: Columbia Steel intends to sell spent steel foundry slag as a substitute for natural rock or recycled concrete in non-residential construction applications as a non-residential construction fill, utility trench fill or road-base material. The slag is a waste from an electric arc furnace foundry process. Columbia Steel estimates that maximum annual production of slag is approximately 1,000 tons a year. Currently Columbia Steel has 40,000 tons of steel slag stockpiled.

- Did the applicant provide an adequate description of the proposed beneficial use and justify how the proposed use is beneficial?  
 Yes  No

Notes: The slag will be used as a substitute for natural rock or recycled concrete in non-residential construction fill, utility trench fill or road-base material applications. After being beneficially used, the steel slag will be covered by asphalt, concrete, clean fill or equivalently covered to minimize exposure to human and ecological receptors, such as cover with three inches of asphalt or concrete or six inches of clean soil, rock or sand or similar materials.

- Did the applicant provide a sufficient comparison of the chemical and physical characteristics of the material proposed for beneficial use with the material it will replace?  
 Yes  No

Notes: Columbia Steel provided a general comparison of the physical characteristics of slag and natural rock. Columbia Steel intends to sort the slag based on size to ensure the slag meets optimal fraction size for natural rock or recycled concrete substitution. DEQ is requiring that the

**Beneficial Use of Solid Waste  
Determination Evaluation Form**

Applicant: Columbia Steel Casting Co. Inc.  
BUD No.: BUD20101208ColumbiaSteelSlag  
Solid Waste: Spent Steel Foundry Slag

slag be screened with sieves no smaller than 250 micrometers, the size of a US standard No. 60 sieve mesh, so that the finest particle fraction is removed from slag available for sale.

- Did the applicant successfully demonstrate compliance of the proposed beneficial use with the performance criteria in OAR 340-093-0280 based on knowledge of the process that generated the material, properties of the finished product, or testing?  
 Yes  No
- If required, did the applicant provide any other DEQ required information to evaluate the proposal?  
 Yes  No

**Tier 2**  Applicable  Not applicable

Did the applicant submit all the information required for a Tier 1 application?

Yes  No

- Did the applicant submit adequate sampling and analysis to make a determination of suitability for beneficial use? (Note: The analysis must provide chemical, physical, and biological characterization of the material proposed for beneficial use and identify potential contaminants in the material or the end product, as applicable.)

Yes  No

Notes: Columbia Steel provided Totals and Synthetic Precipitation Leaching Procedure (SPLP) lab analyses which were compared to the range of contaminants found in typical steel slag and evaluated against several risk based screening tables. The screening was based on non-residential uses. DEQ used the most recent (2010) slag analytical data for the comparison as the data previously submitted (2006) used a different, less optimal testing method. The 2010 data comparison showed minimal risk to the environment based on the proposed uses as a substitute for natural rock or recycled concrete in non-residential construction applications as a non-residential construction fill, utility trench fill or road-base material under the conditions that DEQ has identified.

- When applicable, did the applicant provide a risk screening comparing the concentration of hazardous substances in the material to existing, DEQ approved, risk-based screening level values, and demonstrate compliance with acceptable risk levels?

Yes  No

Notes: The only analyte which exceeded background, risk based concentrations, and EPA Industrial Regional Screening levels was Manganese. This concentration is also higher than the EPA level for groundwater protection. SPLP tests indicate that manganese does not leach from slag currently stored at Columbia Steel. DEQ is concerned about runoff of fine particles and will require that the slag, once in place, must be sufficiently covered to prevent exposure to receptors and must not be used in drainage areas or other areas likely to be in direct contact with surface or groundwater.

**Beneficial Use of Solid Waste  
Determination Evaluation Form**

Applicant: Columbia Steel Casting Co. Inc.  
BUD No.: BUD20101208ColumbiaSteelSlag  
Solid Waste: Spent Steel Foundry Slag

- When applicable, did the applicant supply the location or type of land use where the material will be applied, consistent with the risk scenarios used to evaluate risk?  
 Yes  No

Notes: The intended use is for non-residential construction purposes only. The screening tools used to evaluate risk were based on industrial and occupational exposures. Additionally, DEQ will require that the slag be screened with sieves no smaller than 250 micrometers, the size of a US standard No. 60 sieve mesh, so that the finest particle fraction is removed from slag available for sale. Additionally, the material will not be stored or used in any waterway, wetland, drainage application, or in any manner that poses a threat to waters of the state and covered after used to prevent exposures to receptors.

When applicable, did the applicant supply contact information of property owner(s) if this is a site-specific land application proposal, including name, address, phone number, e-mail, site address and site coordinates (latitude and longitude)?  Yes  No

Notes: Not applicable. This application is not for a specific identified land application at a specific time and location. The slag will be applied to the land but DEQ will not know specifically where or when ahead of time. DEQ has identified conditions under which the slag can be beneficially used and is requiring that Columbia Steel provide information to purchasers about the conditions under which the steel slag may be beneficially used. DEQ is also requiring that Columbia Steel provide an annual report of who they sell the slag to, for what purpose and the volume sold to each purchaser. DEQ will review this information annually to determine if any follow up is needed to verify that the slag was beneficially used according to specified conditions (not stored or used in or near water, used only as non-residential construction fill, utility trench fill or road-base material, and covered by asphalt, concrete, clean fill or equivalently covered to minimize exposure to human and ecological receptors, such as cover with three inches of asphalt or concrete or six inches of clean soil, rock or sand or similar materials). Columbia Steel must also keep records of who buys the slag, for what purpose and the volume. Columbia Steel must retain these records for five years.

- Did the applicant supply an adequate description of how the material will be managed to minimize potential adverse impacts to public health, safety, welfare, or the environment?  
 Yes  No

Notes: DEQ has requested that Columbia Steel provide a plan for managing spent steel slag as well as other materials at their site prior to being sold for beneficial use. The materials must not be stored in a way that impacts surface or groundwater and must not be speculatively accumulated.

**Tier 3**  Applicable  Not applicable

- Did the applicant submit all the information required for a Tier 1 & Tier 2 application?  
 Yes  No

## Beneficial Use of Solid Waste Determination Evaluation Form

Applicant: Columbia Steel Casting Co. Inc.  
BUD No.: BUD20101208ColumbiaSteelSlag  
Solid Waste: Spent Steel Foundry Slag

### Notes:

- Did the applicant provide an adequate discussion of the justification for the proposal?  
 Yes  No

### Notes:

- Is there an estimated length of time that would be required to complete the project, if it is a demonstration?  
 Yes  No

### Notes:

- If it is a demonstration project, are their methods proposed to ensure safe and proper management of the material?  
 Yes  No

### Notes:

## 2) Productive Beneficial Use of the Solid Waste

Has the applicant demonstrated that the proposed beneficial use is a productive use of the material by providing information substantiating the criteria listed below?

Yes  No

- Did the applicant successfully identify or demonstrate a reasonably likely proposed beneficial use for the material that is not speculative?  
 Yes  No

This criterion consists of three parts.

### 1. Identified Use:

Has the applicant clearly stated what the waste is going to be used for, that the waste is compatible with that use and the proposed quantity is necessary?  
 Yes  No

### 2. Reasonably Likely Use:

Has the applicant identified, with supporting documentation, the timeframe within which this use is likely to occur (e.g., zoning info, master plan for development, letters from local jurisdictions, etc)?  
 Yes  No

### 3. Not Speculative:

For Land application - has this material been used at other sites for the same purpose, is the material feasible for use at this site for this purpose, or has the applicant identified a known potential for this use at this site?  
 Yes  No  N/A

For uses other than land application - has the material been used in a product before, is the material feasible for use in a product, or has the applicant identified a known potential for use in this product?  
 Yes  No  N/A

**Beneficial Use of Solid Waste  
Determination Evaluation Form**

Applicant: Columbia Steel Casting Co. Inc.  
BUD No.: BUD20101208ColumbiaSteelSlag  
Solid Waste: Spent Steel Foundry Slag

Notes: Columbia Steel intends to sell the slag as a substitute for natural rock or recycled concrete in non-residential construction fill, utility trench fill or road-base material. Columbia Steel provided a general comparison of the physical characteristics of slag and natural rock, and provided documentation of similar slag uses in other states. Construction applications using materials according to engineering standards are not considered disposal activities. Columbia Steel intends to sort the spent steel slag based on size to ensure that slag best meets the fraction size for natural rock or recycled concrete substitution. DEQ is requiring that the slag be screened with sieves no smaller than 250 micrometers, the size of a US standard No. 60 sieve mesh, so that the finest particle fraction is removed from slag available for sale.

This application is not for a specific identified land application at a specific time and location. The slag will be applied to the land but DEQ will not know specifically where or when ahead of time. DEQ has identified conditions under which the slag can be beneficially used and is requiring that Columbia Steel provide information to purchasers about the conditions under which the steel slag may be beneficially used. DEQ is also requiring that Columbia Steel provide an annual report of who they sell the slag to, for what purpose and the volume sold to each purchaser. DEQ will review this information annually to determine if any follow up is needed to verify that the slag was beneficially used according to specified conditions (not stored or used in or near water, used only as non-residential construction fill, utility trench fill or road-base material, and covered by asphalt, concrete, clean fill or equivalently covered to minimize exposure to human and ecological receptors, such as cover with three inches of asphalt or concrete or six inches of clean soil, rock or sand or similar materials).

Columbia Steel must also retain records for five years of who buys the slag, for what purpose and at what volume. Columbia Steel has stated that they know of several contractors who have shown an interest in using their slag for construction fill. To address the concern that this BUD approval not result in speculative accumulation of this waste at Columbia Steel's property, DEQ has added a provision to the proposed approval letter that states "If Columbia Steel has not sold 500 tons of spent steel slag for beneficial use under the conditions of this BUD approval within two construction seasons (approximately 24 months from the date of approval), DEQ may re-evaluate this approval and may withdraw this approval and require Columbia Steel to manage the steel slag in a different manner or dispose of the steel slag at a permitted solid waste disposal site."

- Is the use a valuable part of a manufacturing process, an effective substitute for a valuable raw material or commercial product, or otherwise authorized by the Department and does not constitute disposal?  Yes  No

Notes: Columbia Steel intends to sell the slag as a substitute for natural rock or recycled concrete as non-residential construction fill, utility trench fill or road-base material. Construction applications using materials according to engineering standards are not considered disposal activities. Columbia Steel provided documentation of similar slag uses in other states.

## Beneficial Use of Solid Waste Determination Evaluation Form

Applicant: Columbia Steel Casting Co. Inc.  
BUD No.: BUD20101208ColumbiaSteelSlag  
Solid Waste: Spent Steel Foundry Slag

- Is the use in accordance with applicable engineering standards, commercial standards, and agricultural or horticultural practices?  Yes  No

Notes: Columbia Steel intends to sort the slag based on size to ensure that slag will meet optimal fraction size for natural rock or recycled concrete substitution. DEQ is requiring that the slag be screened with sieves no smaller than 250 micrometers, the size of a US standard No. 60 sieve mesh, so that the finest particle fraction is removed from slag available for sale.

### 3) Effect of Proposed Beneficial Use on Public Health, Safety, Welfare and/or the Environment

Has the applicant demonstrated the proposed beneficial use will **not** create an adverse impact to public health, safety, welfare, or the environment, by providing information substantiating compliance with the criteria listed in the bullet list below?

Yes  No

- Has the applicant demonstrated that the material is not a hazardous waste under ORS 466.00?  Yes  No

Notes: According to lab analyses, slag from Columbia Steel does not designate as hazardous waste. Scientific journal data indicates that slag from electric arc furnace foundry processes does not normally designate as a hazardous waste.

- Has the applicant demonstrated that until the time this material is used according to a beneficial use determination, the material will be managed, including any storage, transportation, or processing, to prevent releases to the environment or nuisance conditions?  Yes  No

Notes: DEQ will require Columbia Steel to manage materials on site prior to shipment off-site for beneficial use. The on-site materials must not be stored in a way that impacts surface or groundwater and must not be speculatively accumulated. DEQ will require that Columbia Steel inform buyers of the requirements, once they receive it, to store and manage the steel slag to prevent environmental and nuisance conditions.

- Has the applicant demonstrated that hazardous substances in the material, if any, meet one of the criteria in the bulleted list below?  Yes  No
  - Hazardous substances do not significantly exceed the concentration in a comparable raw material or commercial product;
  - Hazardous substances do not exceed naturally occurring background concentrations; or
  - Hazardous substances will not exceed acceptable risk levels, including persistence and potential bioaccumulation, when the material is managed according to a beneficial use determination.

Notes: Analytical data for a number of potential pollutants were evaluated against several risk-based criteria. Conservative (health-protective) risk-based criteria were used to evaluate the slag. For example, the risk-based criteria were designed to protect workers that could have a reasonable maximum exposure over a lifetime, and actual exposures are expected to be lower.

**Beneficial Use of Solid Waste  
Determination Evaluation Form**

Applicant: Columbia Steel Casting Co. Inc.  
BUD No.: BUD20101208ColumbiaSteelSlag  
Solid Waste: Spent Steel Foundry Slag

Of the analytes tested, manganese and arsenic were the only metals that exceeded both the DEQ occupational risk based concentrations and EPA industrial regional screening level thresholds. The concentration for arsenic in the Columbia Steel slag is still lower than natural background levels due to the volcanic nature of Oregon's native soils.

Manganese concentrations in the steel slag are about twice as high as acceptable DEQ occupational risk based concentrations for ingestion, dermal contact and inhalation. According to the EPA, particles less than 250 micrometers in size can adhere to skin, which increases the chances of ingestion. Also, particles larger than 250 micrometers do not become airborne, and therefore would not be potential dust inhalation exposures.

The only analyte which exceeded background, risk based concentrations, and EPA regional industrial soil levels was manganese. The sample concentration was also higher than the EPA level for groundwater protection. Synthetic precipitation leaching potential tests indicated that manganese does not leach from slag currently stored at Columbia Steel. DEQ is concerned about runoff of slag particles. Columbia Steel proposed, and DEQ will require, that the slag, once in place, must be sufficiently covered to prevent exposure to receptors and must not be stored or used in drainage areas or other areas likely to be in direct contact with surface or groundwater.

Columbia Steel intends to sort the slag based on size to ensure that the slag best meets fraction size for natural rock or recycled concrete substitution. Accordingly, DEQ will require that the slag used beneficially must be larger than 250 micrometers in size. DEQ is requiring that the slag be screened with sieves no smaller than 250 micrometers, the size of a US standard No. 60 sieve mesh, so that the finest particle fraction is removed from slag available for sale.

Aged slag (slag that has been exposed to rainwater for a period of time --- more than approximately six months) is less leachable. Free lime on the outside of the slag tends to harden with exposure to rainwater and creates a barrier that decreases leaching of slag constituents. Fresh slag used for future construction applications will require careful placement to ensure that leaching or runoff is kept to the absolute minimum possible. For this reason, DEQ will not allow the slag to be stored or used in drainage applications or near water or wetland areas and the slag must not be stored or used in ways that would allow discharge to groundwater, surface water, or wetland areas. These conditions will prevent use in areas that might adversely affect waters of the state, including streams and stream habitats.

Columbia Steel has been storing the slag outdoors. Through a letter sent to Columbia Steel on June 3, 2011, DEQ has requested that Columbia Steel provide a plan for managing spent steel slag as well as other materials at their site prior to being sold for beneficial use. The materials must not be stored in a way that impacts surface or groundwater and must not be speculatively accumulated.

The material will be transported and must be managed at a construction site in the same manner as the materials it replaces, such as natural rock or recycled concrete, so as to prevent runoff to waters of the state. As a condition of sale, Columbia Steel must inform buyers that the slag, after



**Beneficial Use of Solid Waste  
Determination Evaluation Form**

Applicant: Columbia Steel Casting Co. Inc.  
BUD No.: BUD20101208ColumbiaSteelSlag  
Solid Waste: Spent Steel Foundry Slag

being beneficially used, must be covered by asphalt, concrete, clean fill or equivalently covered to minimize exposure to human and ecological receptors, such as cover with three inches of asphalt or concrete or six inches of clean soil, rock or sand or similar materials. Columbia Steel must provide DEQ with copies of the information provided to buyers and must keep a record of buyers. DEQ may follow up with buyers and verify that the material is being beneficially used as approved.

Has the applicant demonstrated that the proposed beneficial use will not result in the increase of a hazardous substance in a sensitive environment, such as a park, wildlife refuge or wetland?

Yes  No

Notes: Slag will not be placed in waterways, wetlands, or other sensitive environments.

- Has the applicant demonstrated that the proposed beneficial use will not create objectionable odors, dust, unsightliness, fire, or other nuisance conditions?

Yes  No

Notes: Columbia Steel proposes to sell the slag for use in non-residential construction applications where the slag will be stored and used and then capped or covered to prevent problems with dust and unsightliness. Odor and fire are not considered potential problems.

- Has the applicant indicated that the proposed beneficial use will comply with any other applicable federal, state, and local regulations?

Yes  No

Notes: DEQ regulates Columbia Steel through air quality, water quality, hazardous waste, solid waste and cleanup requirements. DEQ will require Columbia Steel to inform buyers that they will need to make sure that storage and use of steel slag meets applicable federal, state and local requirements.

4) Public Involvement Evaluation (Note: this is not a Beneficial Use evaluation criterion)

Determine a public involvement recommendation using the current, **Guidance to DEQ Solid Waste Program Staff and Managers on Public Notice & Participation.**

- Is public notice and participation being recommended for this application?

Yes  No

Notes: DEQ will initiate a public comment period and hold a public meeting to receive any public comments on this proposed beneficial use determination approval. This proposed beneficial use approval will apply to multiple locations and/or customers as Columbia Steel intends to sell the slag as a substitute for natural rock or recycled concrete in non-residential construction fill, utility trench fill or road-base material. DEQ anticipates that there may be moderate public interest in beneficial use of steel slag and has determined that a public comment period and information meeting should be held to explain the proposed beneficial use and to take any comments regarding the proposed beneficial use prior to DEQ approval.