

ABC Need-to-Know Criteria for Biosolids Land Appliers



ABC

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Introduction

As part of the development of a biosolids land application certification program, the Association of Boards of Certification (ABC) conducted a national job analysis of land appliers in 2006. The purpose of the job analysis was to identify the essential job tasks performed by land appliers and the capabilities required to competently perform these job tasks. The results of this job analysis provided ABC with the foundation for the development of valid land application certification exams.

This *Need-to-Know Criteria* was developed from the results of ABC's national land appliers job analysis. The information in this document reflects the essential job tasks performed by land appliers and their requisite capabilities. This document is intended to be used by certification programs and trainers to help prepare land appliers for certification.

How the Need-to-Know Criteria was Developed

Task Survey

ABC's Biosolids Task Force provided technical assistance throughout the job analysis process. This task force worked with ABC staff to develop the national job task survey. The task survey was sent to 381 land appliers throughout the United States and Canada. 203 of the surveys mailed were returned for a response rate of 53%.

In this survey, land appliers were asked to rate job tasks and required capabilities on rating scales for frequency of performance and seriousness of inadequate or incorrect performance. These two rating scales were used because they provide useful information (i.e., how critical each task is and how frequently each task is performed) pertaining to certification. The task survey also included a background information section where demographic data such as gender, age, ethnic origin, educational level attained, and work experience were collected. Space was provided at the end of the survey for appliers to list any important tasks performed on their job which were not included on the survey, and to make general comments.

Survey Results

Survey respondents responsible for preparing the annual EPA Sludge Discharge Monitoring Report or who were responsible for calculating the biosolids agronomic loading rate were classified as class II land appliers. All other survey respondents were classified as class I. The mean, standard deviation, and the percentage of respondents performing each task statement at each class level were computed. The mean was used to determine the importance of items and the standard deviation was used to identify items with a wide variation in responses. The percentage of respondents performing each task statement was used to identify tasks and capabilities commonly performed by appliers throughout the United States and Canada.

A criticality value of $2(\text{mean seriousness rating}) + \text{mean frequency rating}$ was calculated for each item on the survey. This formula gives extra weight to the seriousness rating in determining critical items and was appropriate because it emphasized the purpose of certification — to provide competent appliers.

Core Competencies

The ABC Biosolids Task Force reviewed the results of the task survey to identify the most important and commonly performed job tasks and capabilities for land appliers. Tasks and their requisite capabilities performed by at least 50% of the respondents and with a high criticality value were designated as core competencies. They were the most important and commonly performed job tasks and capabilities. The core competencies were considered the essential tasks and capabilities for land appliers.

The core competencies are clustered into the following job duties:

- Communications and Outreach
- New Site Evaluation
- Nutrient Management System
- Site Operation and Management
- Monitoring and Recordkeeping
- Equipment Operation
- Safety

Two levels of certification are offered by ABC, with class I being the lowest level and class II the highest level. Class I covers material required for a field operator and Class II covers material required for a manager. The following pages list the core competencies for each class level of land applier.

The level of knowledge (i.e., comprehension, application, analysis) required for each task is also identified in the following pages.

- **Comprehension** is the most basic level of understanding and remembering. Items written at the comprehension level require examinees to recognize, remember, or identify important ideas.
- Items written at the **application** level require examinees to interpret, calculate, predict, use or apply information and solve problems.
- Items written at the **analysis** level require examinees to compare, contrast, diagnose, examine, analyze, and relate important concepts.

The level of knowledge is a hierarchy from basic comprehension to analysis. The level of knowledge tested is cumulative. Therefore, tasks identified as application may include questions written at both the comprehension and application levels. Tasks identified as analysis may include questions written at the comprehension, application and analysis levels.

ABC Core Competencies for Biosolids Land Appliers

Communications and Outreach		
Job Tasks Required for Communications and Outreach	Class I	Class II
Communicate land application concepts to the public	Application	Analysis
Communicate responsibilities to the landowner/farmer	Comprehension	Analysis
Communicate with local officials and stakeholders		Analysis
Communicate with media		Comprehension
Communicate with regulatory agencies	Application	Analysis
Develop a complaint response plan		Analysis
Develop public outreach and participation programs		Comprehension
Obtain local support		Analysis
Participate in local meetings		Comprehension
Provide application report to landowner/farmer		Analysis
Capabilities Required for Communications and Outreach	Class I	Class II
Ability to communicate in writing		Required
Ability to communicate verbally	Required	Required
Ability to conduct meetings		Required
Ability to interact constructively with others	Required	Required
Ability to translate technical language into common terminology		Required
Knowledge of categories of beneficial use of biosolids	Required	Required
Knowledge of community groups affected by land application project		Required
Knowledge of information available to increase public support and awareness	Required	Required
Knowledge of media relations		Required
Knowledge of public relationship building techniques		Required
Knowledge of stakeholders and contact information	Required	Required

Core Competencies (continued)

New Site Evaluation		
Job Tasks Required for New Site Evaluation	Class I	Class II
Assess attitudes of landowner and neighbors		Analysis
Assess nutrient requirements		Analysis
Calculate acreage needed		Analysis
Evaluate access to site	Comprehension	Analysis
Evaluate agricultural practices		Analysis
Evaluate buffer zone requirements	Comprehension	Analysis
Evaluate compliance with regulations and permits	Comprehension	Analysis
Evaluate potential for odor impacts	Comprehension	Analysis
Evaluate site conditions	Comprehension	Analysis
Evaluate soil properties		Analysis
Locate new application sites		Analysis
Capabilities Required for New Site Evaluation	Class I	Class II
Ability to determine soil suitability for land application systems		Required
Ability to express to others the benefits of biosolids application	Required	Required
Ability to interpret soils maps		Required
Knowledge of conservation planning		Required
Knowledge of effect seasonal high water table has on agricultural operations		Required
Knowledge of information contained in soil survey	Required	Required
Knowledge of local area resident concerns	Required	Required
Knowledge of odor control techniques		Required
Knowledge of odor sources and contributing conditions	Required	Required
Knowledge of regulatory and permit requirements	Required	Required
Knowledge of road and traffic constraints	Required	Required
Knowledge of types of soils and slope classes which would limit biosolids use		Required

Nutrient Management System		
Job Tasks Required for Nutrient Management System	Class I	Class II
Collect Data to Develop Nutrient Management Plan		
Biosolids nutrients		Application
Calculation of available land application area		Application
Crop rotations		Application
Fertilizer recommendation for crops		Application
Historic/projected crop yields		Application
Nutrient credits from other sources		Application
Precipitation and other water sources		Application
Soils		Application
Implement Nutrient Management Program		
Determine agronomic rate of biosolids application		Analysis
Develop a nutrient management plan		Analysis
Develop maps (soils, topographic, site)		Analysis
Estimate phosphorus in biosolids		Analysis
Estimate plant available nitrogen in biosolids		Analysis

Core Competencies (continued)

Nutrient Management System (continued)		
Capabilities Required for Nutrient Management System	Class I	Class II
Ability to calculate plant available nitrogen		Required
Ability to determine realistic crop yield		Required
Knowledge of available cooperative extension services		Required
Knowledge of constituents that are easily leached through the soil		Required
Knowledge of elements of a nutrient management program		Required
Knowledge of forms of nitrogen found in biosolids and soils		Required
Knowledge of impact of agricultural cropping practices on biosolids application		Required
Knowledge of nitrogen cycle		Required
Knowledge of nutrient movement in the environment		Required
Knowledge of phosphorus management planning		Required
Knowledge of role of vegetation in nutrient management		Required

Site Operation and Management		
Job Tasks Required for Site Operation and Management	Class I	Class II
Calculate biosolids storage requirements		Analysis
Clean up stockpile and staging areas	Application	Application
Comply with crop and grazing restrictions	Application	Application
Control off-site migration of biosolids	Application	Analysis
Coordinate operations with the landowner/farmer	Application	Analysis
Determine how to minimize odors	Application	Analysis
Determine method of application and application rates		Analysis
Ensure compliance with site restrictions	Application	Analysis
Ensure even application of biosolids	Application	Application
Inspect site (pre, during, post)	Application	Analysis
Mark buffer zones and setbacks	Application	Application
Minimize field impact from vehicles	Application	Application
Monitor weather conditions	Application	Analysis
Obtain regulatory approval for land application site		Analysis
Plan haul route	Comprehension	Analysis
Prepare annual land application plan		Analysis
Prepare spill response plan		Analysis
Restrict public access as required	Application	Analysis
Select stockpiling areas		Analysis
Store biosolids after treatment and prior to land application	Application	Application
Treat sludge prior to land application	Comprehension	Application

Core Competencies (continued)

Site Operation and Management (continued)		
Capabilities Required for Site Operation and Management	Class I	Class II
Ability to acquire meteorological data	Required	Required
Ability to calculate nutrient application rate		Required
Ability to calibrate equipment	Required	Required
Ability to determine biosolids application rate		Required
Ability to identify and correct uneven application	Required	Required
Ability to perform mathematical calculations and physical measurements	Required	Required
Ability to read and interpret maps	Required	Required
Knowledge of agronomy pertaining to soil management and crop production		Required
Knowledge of application methods	Required	Required
Knowledge of best management practices	Required	Required
Knowledge of characteristics of biosolids that are suitable for land application	Required	Required
Knowledge of common nutrients found in biosolids	Required	Required
Knowledge of conservation practices		Required
Knowledge of crops used in land application	Required	Required
Knowledge of effects of seasons, weather, and soil conditions on operations	Required	Required
Knowledge of materials that cannot be permitted for land application	Required	Required
Knowledge of odor sources and odor control techniques	Required	Required
Knowledge of pathogen reduction		Required
Knowledge of permit requirements	Required	Required
Knowledge of pollutants that may be present in biosolids	Required	Required
Knowledge of regulatory approval process		Required
Knowledge of soil compaction	Required	Required
Knowledge of sources of wastewater solids	Required	Required
Knowledge of spill response procedures	Required	Required
Knowledge of types of biosolids		Required
Knowledge of requirements for temporary biosolids storage	Required	Required
Knowledge of site restrictions for Class A and B biosolids	Required	Required
Knowledge of vector attraction reduction	Required	Required

Core Competencies (continued)

Monitoring and Recordkeeping		
Job Tasks Required for Monitoring and Recordkeeping	Class I	Class II
Sampling		
Prepare written sampling plan		Analysis
Preserve and ship samples	Application	Application
Sample soil for nutrient status and pH analysis	Application	Application
Select laboratory to conduct analyses		Analysis
Monitoring		
Monitor crop response for nutrient status		Application
Monitor land conditions for erosion		Application
Monitor nutrient content in biosolids		Application
Monitor pathogen concentrations in biosolids		Application
Monitor pathogen reduction		Application
Monitor pH in biosolids		Application
Monitor pH in soils		Analysis
Monitor pollutant concentration in biosolids and soils		Application
Monitor vector attraction reduction		Application
Prepare written monitoring procedure		Analysis
Recordkeeping and Reporting		
Develop a noncompliance reporting procedure		Analysis
Maintain records	Comprehension	Analysis
Provide reports to regulatory authority		Analysis
Record data	Application	Application
Report emergencies, spills or failures	Application	Application
Capabilities Required for Monitoring and Recordkeeping		
	Class I	Class II
Ability to interpret laboratory results		Required
Ability to read charts and graphs	Required	Required
Ability to review reports		Required
Ability to transcribe data	Required	Required
Knowledge of biosolids sampling procedures and handling requirements		Required
Knowledge of biosolids testing requirements		Required
Knowledge of chain of custody procedures	Required	Required
Knowledge of enforcement powers for violations of permits	Required	Required
Knowledge of EPA concentration limits for trace elements		Required
Knowledge of federal sampling frequency requirements		Required
Knowledge of general chemistry		Required
Knowledge of local, state and federal biosolids regulations	Required	Required
Knowledge of recordkeeping purpose, procedures, and requirements	Required	Required
Knowledge of site life or maximum cumulative pollutant loading	Required	Required
Knowledge of soil sampling procedures and sample handling requirements	Required	Required
Knowledge of soil testing requirements		Required

Core Competencies (continued)

Equipment Operation		
Job Tasks Required for Equipment Operation	Class I	Class II
Calibrate land application equipment	Analysis	Analysis
Check field conditions	Analysis	Analysis
Clean equipment	Application	Application
Deliver biosolids to farm fields	Analysis	Analysis
Load biosolids into application vehicles	Application	Application
Modify application rate	Application	Analysis
Operate general farm implements and spreading equipment	Application	Application
Perform equipment preventive maintenance	Analysis	Analysis
Capabilities Required for Equipment Operation	Class I	Class II
Ability to adjust equipment	Required	Required
Ability to determine biosolids application rate		Required
Ability to determine which application equipment to use		Required
Ability to identify categories of land application equipment	Required	Required
Ability to identify best method of application for a site	Required	Required
Knowledge of effect of equipment on soil conditions	Required	Required
Knowledge of general mechanical/electrical principles	Required	Required
Knowledge of highway regulations	Required	Required
Knowledge of tillage equipment	Required	Required
Knowledge of unacceptable biosolids at surface after subsurface injection	Required	Required

Safety		
Job Tasks Required for Safety	Class I	Class II
Analyze safety conditions	Analysis	Analysis
Demonstrate safe work habits	Application	Application
Develop standard operating procedures	Comprehension	Analysis
Provide and maintain a safe workplace for employees	Analysis	Analysis
Provide safety training to employees	Comprehension	Analysis
Capabilities Required for Safety	Class I	Class II
Ability to identify and safely enter confined spaces	Required	Required
Ability to identify fire hazards	Required	Required
Ability to interpret Material Safety Data Sheets	Required	Required
Knowledge of applicable OSHA regulations	Required	Required
Knowledge of components of a site safety program	Required	Required
Knowledge of hazards and injuries associated with land application sites	Required	Required
Knowledge of personal hygiene practices	Required	Required
Knowledge of personal protection equipment	Required	Required
Knowledge of risks and safety procedures regarding hydraulic systems	Required	Required
Knowledge of safety considerations associated with pressure/vacuum systems	Required	Required
Knowledge of safety precautions that must be used around application vehicles	Required	Required
Knowledge of spill prevention and cleanup	Required	Required

Biosolids Land Application Certification Exam Specifications

The ABC biosolids land application certification exams evaluate an applier's knowledge of tasks required to be certified. The ABC Biosolids Task Force determined the content of each exam based on the results of the national job analysis. To pass an ABC exam, an applier must demonstrate knowledge of these core competencies.

The specifications for the exams are based on a weighting of the job analysis results so that they reflect the criticality of tasks performed on the job. The specifications list the percentage of questions on the exam that fall under each job duty. For example, 8% of the class I exam consists of questions relating to the job duty "Communications and Outreach" and its associated tasks and capabilities. For a list of tasks and capabilities associated with each job duty, please refer to the list of core competencies on the previous pages.

ABC Biosolids Land Application Exam Specifications

	Exam Level	
	Class I	Class II
Communications and Outreach	8%	16%
New Site Evaluation	13%	17%
Nutrient Management System	0%	20%
Site Operation and Management	29%	22%
Monitoring and Recordkeeping	15%	25%
Equipment Operation	22%	0%
Safety	13%	0%

Suggested Exam References

The following are approved as reference sources for the ABC examinations. Land appliers should use the latest edition of these reference sources to prepare for the exam.

Class I and II Exams

- California State University, Sacramento, *Operation of Wastewater Treatment Plants*, Volume II. Available from: www.owp.csus.edu, phone (916) 278-6142
- Code of Federal Regulations, Title 40, Part 503: *Standards for the Use or Disposal of Sewage Sludge*. Available online at: www.access.gpo.gov/nara/cfr/waisidx_04/40cfr503_04.html
- National Biosolids Partnership. 2005. *National Manual of Good Practice for Biosolids*. Alexandria, VA. Available online from: www.biosolids.org, select “NBP EMS Program,” then “Manual of Good Practice”
- U.S. Environmental Protection Agency. September 1994. *A Plain English Guide to the EPA Part 503 Biosolids Rule*. EPA/832/R-93/003. Available online from: www.epa.gov/owm/mtb/biosolids/publ.htm
- U.S. Environmental Protection Agency. July 2003. *Environmental Regulations and Technology: Control of Pathogens and Vector Attraction in Sewage Sludge*. EPA/625/R-92/013. Available online at: www.epa.gov/ord/NRMRL/pubs/625r92013/625R92013.pdf
- U.S. Environmental Protection Agency. December 1994. *Land Application of Sewage Sludge*. EPA/831-B-93-002b. Available online from: www.epa.gov/owm/mtb/biosolids/publ.htm
- U.S. Environmental Protection Agency. September 1995. *Process Design Manual – Land Application of Sewage Sludge and Domestic Septage*. EPA/625/K-95/001. Available online at: www.epa.gov/ord/WebPubs/landapp.pdf
- Water Environment Federation. 1998. *Design of Municipal Wastewater Treatment Plants - MOP 8, Volume 3: Solids Processing and Disposal*. Available from: www.wef.org, phone (800) 666-0206
- Water Environment Federation. 2002. *Survival Guide: Public Communications for Water Professionals*. Available from: www.wef.org, phone (800) 666-0206

Class II Exams Only

- Washington State Department of Ecology. April 1999. *Managing Nitrogen from Biosolids*. Available online at: www.nwbiosolids.org/Pubs/ManagingNitrogen.pdf
- Water Environment Research Foundation. *Estimating Plant-Available Nitrogen in Biosolids*. Project Number: 97-REM-3. Available from: www.werf.org, phone (703) 684-2470
- Water Environment Research Foundation. 2006. *Public Perception of Biosolids Recycling: Developing Public Participation and Earning Trust*. Project Number: 00-PUM-5. Available from: www.werf.org, phone (703) 684-2470