

# **STUDY GUIDE**

## **SPECIAL K**

### **SUBCLASS K**

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## **Special K Study Guide - Grades 1-4**

### INTRODUCTION

Wisconsin DNR assigns the Special K category to those wastewater treatment facilities which are required to have a certified operator, but do not fit well into our existing subclass categories. In general, a facility with a specific WPDES permit that discharges to a surface water and uses a unique treatment system will require an operator certified in Special K. If have any questions as to whether your facility requires a Special K operator, please contact your regional DNR engineer or operator certification coordinator.

The Special K subclass is specific to a certain treatment system, and generally cannot be transferred to another facility. Examples of systems that would require a Special K operator are: recirculating sand or gravel filters with a surface water discharge, river clean-up projects, an oil and grease separator followed by settling (in a pond or clarifier) with direct surface discharge, an elaborate industrial treatment process, or a landfill leachate treatment system with a direct surface water discharge.

Based upon the flow and process complexity at the facility, the DNR will classify the system as Grade 1, 2, 3, or 4. There is only one Special K exam for Grades 1 - 4. The general wastewater examination is not required for Special K certification.

Once the exam is passed, you will be a Grade T, operator-in-training. To go up in Grade levels, you would need to document the appropriate years of experience on the DNR's wastewater operator experience form (Form 3400-066A). Please visit our website for more information at <http://dnr.wi.gov> and search keywords "Operator Certification".

### GENERAL GUIDANCE ON FINDING REFERENCES

The best two references for studying for a Special K exam are: the facility's WPDES permit and the facility's O&M Manual. The O&M manual should also list other references as it pertains to the particular treatment process. Further information may be obtained through your facility's consultant, your DNR basin engineer, or through the internet.

KNOWLEDGE OF TREATMENT GOALS: THE DISCHARGE LIMITS

1. Name the pollutants controlled by your treatment plant's discharge permit, for your liquid process discharge. For direct dischargers, these are in the WPDES permit. For pretreatment dischargers, these are either from federal and state categorical regulations or from the local sewer use ordinance). List all effluent pollutants for which monitoring is required. If you discharge to ground water, put the GW monitoring parameters after the treatment process testing.
2. Know the effluent limits for the pollutants listed above. Be sure to include the **UNITS**. Most discharges have a weekly or monthly average limit, a daily maximum or minimum limit and sometimes a total mass limit. You need to be aware of all of these, as they define the treatment goals you must reach.
3. Know the permit required sampling frequency and sample type, for the pollutants listed above.

KNOWLEDGE OF TREATMENT PROCESS: HOW IS IT DONE?

4. Know the frequency of testing for the pollutants or other parameters for process control purposes. Many facilities will measure a pollutant more frequently than required, to help operate the treatment process. Or they will do process control testing, which is not required to be reported in the permit.
5. Make a sketch showing flow through your plant's treatment units. Use solid lines to show the liquid flow, and dashed lines to show the solids/sludge flow. If you have several treatment trains, show them separately. Show chemical addition points and any inline process monitoring points. If you have the ability to divert spills to a holding tank, show where the tank is in the flow scheme.
6. Describe each wastewater treatment process used at your facility and state the purpose of the process (what it is supposed to do). You may use the attached list of processes on p.6 to jog your memory. Include any specific chemicals which are added as part of that process. If you have a different process, be able to name and describe it.
7. List the tasks your substitute must perform to make sure the plant operates correctly (Assume you have to leave town for a day). Be specific. When an adjustment must be made, describe how the operator decides how much is enough.
8. Describe how equipment maintenance is handled at your facility.





Example List of Processes

Physical Treatment Processes

Activated Carbon Filtration  
Ammonia Stripping  
Diatomaceous Earth Filtration  
Distillation  
Electrodialysis  
Evaporation  
Flocculation  
Flotation  
Flow Equalization  
Foam Fractionization  
Freezing  
Gas-Phase Separation  
Grinding (Comminutors)  
Grit Removal  
Microstraining  
Mixing  
Moving Bed Filters  
Multimedia Filtration  
Rapid Sand Filtration  
Recirculating Sand Filter  
Reverse Osmosis  
Screening  
Sedimentation (Settling)  
Slow Sand Filtration  
Solvent Extraction  
Sorption

Chemical Treatment Processes

Carbon Adsorption  
Chemical Precipitation  
Coagulation  
Dechlorination  
Disinfection (Chlorine)  
Disinfection (Ozone or UV)  
Electrochemical Treatment  
Ion Exchange  
Neutralization (acid/base)  
Oxidation  
Reduction

Biological Treatment Processes

Activated Sludge  
Aeration Lagoons  
Anaerobic Lagoons  
Anaerobic Digestion  
Nitrification-Denitrification  
Pre-Aeration  
Rotating Biological Contactors

Sand Filters (Buried)  
Septic Tank  
Spray Irrigation/Land Application  
Stabilization Ponds  
Trickling Filters

Sludge Treatment & Disposal Processes

Aerobic Digestion  
Anaerobic Digestion  
Belt Press  
Centrifugation  
Chemical Conditioning  
Chlorine Treatment  
Composting  
Drying Beds  
Elutriation  
Flotation Thickening  
Gravity Belt Unit  
Gravity Thickener (clarifier)  
Heat Drying  
Heat Treatment  
Incineration  
Land Application  
Landfill  
Pressure Filtration (Ex: plate-frame press)  
Pyrolysis  
Sludge Lagoons  
Vacuum Filtration  
Vibration  
Wet Oxidation

Other

Effluent Recycle to Process Makeup Water  
Counter Flow Rinsing





- 9. List the major process variables that can be controlled by the plant operator.  
[NOTE: These vary greatly depending upon the treatment process; for example, pH, filter loading rate, clarifier detention time, sludge concentration. WHAT ARE THE THINGS IN THE PROCESS THAT YOU CAN AFFECT OR CONTROL?]
- 10. Describe the operations that must be performed to control the variables listed in 9 (measurements, process control tests, valves turned, etc.) WHAT ACTIONS DO YOU TAKE TO DO THE CONTROLLING?
- 11. List the reasons why you have altered these process variables in your daily work.

**EXAMPLE:** PROCESS VARIABLE: *Sludge blanket* [the thing you can affect]

ACTIONS NEEDED TO CONTROL IT: *Measure sludge depth 2x/day, with sludge depth finder, measure sludge consistency with a settling test daily and a TSS test 3x/week, adjust sludge pump between \_\_\_\_ and \_\_\_\_.* [what you do to affect it]

WHY ACTIONS WERE TAKEN: *We keep the sludge blanket at 2-4 feet in order to get good compaction (a sludge concentration between \_\_\_\_ and \_\_\_\_ ) and clear effluent. Too much sludge causes \_\_\_\_\_. Too little sludge causes \_\_\_\_\_. [why you bother to control this process variable]*

Example:

PROCESS VARIABLE \_\_\_\_\_ ACTIONS NEEDED TO CONTROL IT:

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WHY ACTIONS WERE TAKEN: \_\_\_\_\_

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12. Describe the adjustments you make to the process when the influent loading changes (when it increases, and when it decreases):
  
13. Describe several operational problems which you experienced at your plant, and explain how they were solved.
  
14. Describe your plan of action to follow in case of a MAJOR problem/upset at your treatment plant.