

MISSOURI DEPARTMENT OF NATURAL RESOURCES



CLEANUP LEVELS FOR MISSOURI (CALM) Appendix G

Engineering Controls

**Division of Air and Land Protection
Hazardous Waste Program**

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CLEANUP LEVELS FOR MISSOURI (CALM)

APPENDIX G - ENGINEERING CONTROLS

PUB468G





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1. INTRODUCTION

For the purpose of this document, an engineering control is defined as a physical barrier that serves to limit exposure to or control migration of contaminants of concern. A surface cap that covers contaminated soil with compacted clay, asphalt or other materials is an example of an engineering control. Subsurface barriers, such as slurry walls and sheet piling are also considered engineering controls. Future revisions to this appendix will address subsurface barriers, and other engineering controls.

Engineering controls require long term maintenance, therefore an institutional control, such as a restrictive covenant, is required to ensure that the engineering control remains effective.

2. SURFACE CAPS

Surface caps can reduce the potential for exposure by eliminating exposure pathways (via ingestion, inhalation and dermal contact) and can also reduce migration of contaminants. Direct contact with contaminated soil (which can result in exposure via ingestion or dermal contact) and inhalation of contaminated dust are common routes of exposure at uncapped sites. A properly designed and maintained surface cap can significantly reduce these two routes of exposure. An effective surface cap may also reduce migration of contaminants by reducing infiltration and erosion.

In most cases treatment or removal of contaminated soil is preferred over surface capping, since it addresses the source of contamination and it is more likely to result in a walk-away cleanup (i.e., no long term maintenance or institutional control required). However, site owners or prospective purchasers may consider treatment or removal impractical at the site due to engineering/construction considerations or financial constraints.

The department will consider whether a surface cap is appropriate for a site by evaluating the effectiveness of the surface cap in limiting exposure to or controlling migration of the contaminants of concern at the site. However, as a general guideline, surface capping may not be considered a viable option if contaminant(s) of concern are present at concentrations equal to or greater than the lower of either: 1) the soil saturation concentration, or 2) ten times (10x) the Tier 1 C_{IDI} STARC value for the appropriate land use scenario. Surface cap design, installation and maintenance procedures must be reviewed and approved by the department prior to installation or verification. In addition to information required by other portions of this document, the site owner or prospective purchaser who wishes to cap contamination must submit the following:

**Figure G1 - Surface Cap Information Requirements**

- ▶ A justification for selecting surface capping as an integral part of the remedial action plan instead of pursuing further treatment or removal of contaminated soil. This justification may cite engineering/construction considerations, financial constraints or other factors;
- ▶ A detailed discussion of the chemical and physical properties of the contaminants of concern as these properties related to environmental fate and transport at the site. Note: Contaminants that have high boiling points, low vapor pressures, low water solubility and strong adhesion to soil are best suited for capping.
- ▶ The concentration(s) of the contaminant(s) of concern and their vertical and horizontal extent.
- ▶ Basic design parameters, dimensions and materials of construction for the surface cap;
- ▶ The topographic, geologic and hydrologic characteristics of the site as these characteristics relate to the effectiveness of the surface cap;
- ▶ An indication of the distance between contaminated soil and the surface of the first saturated zone encountered, including consideration of seasonal variations;
- ▶ A discussion of subsurface conduits (e.g., sewer systems) and their potential effect on migration of contaminants;
- ▶ The STARC level calculations which take into account the benefits of the surface cap;
- ▶ A detailed discussion of installation and quality control procedures;
- ▶ An operations and maintenance plan;
- ▶ An indication of traffic patterns and an estimate of the daily volume of auto and truck traffic over the surface cap, if applicable;
- ▶ A regrading plan;
- ▶ An indication of the source of the “clean” materials that are to be used in constructing the surface cap and procedures for verifying that the material is “clean”; and,
- ▶ A specification of the type of vegetative cover, if applicable.



The following are examples of basic cap design parameters that may be acceptable, depending on actual site conditions. The examples are not intended to be prescriptive; alternative designs may also be acceptable. As above, all proposed designs will be evaluated by the department on a site-specific basis.

2.1 Surface Cap Example A

- On top of contaminated soil place two feet (2') of compacted clay with a coefficient of permeability of 1×10^{-5} or less and overlay with one foot (1') of soil capable of sustaining vegetative growth.
- The compacted clay portion of the cap consists of soils classified under the unified soil classification system as CH, CL, ML, SC or MH.
- Establish and maintain vegetation to minimize erosion.

2.2 Surface Cap Example B

- On top of contaminated soil place one foot (1') of compacted clay with a coefficient of permeability of 1×10^{-5} or less, overlay the compacted clay with high density polyethylene (HDPE) liner (minimum thickness of 60 mil) and overlay the HDPE liner with two feet (2') of soil capable of sustaining vegetative growth.
- The compacted clay portion of the cap shall consist of soils classified under the unified soil classification system as CH, CL, ML, SC or MH.
- Establish and maintain vegetation to minimize erosion.

3. RELATIONSHIP TO INSTITUTIONAL CONTROLS

If contamination is capped, the department will require an institutional control as described in Appendix E. The department may add language to the Appendix E institutional control instruments to ensure the long term effectiveness of the surface cap. In addition, engineering controls will be periodically inspected by the department. This will require a contract and one-time monitoring fee as described in Appendix E.