

**ENGINEERING CONTROL: FENCES**

Office of Land Quality

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**Guidance Created: January 11, 2010****Guidance Updated: April 2013, July 2017, and May 2021****1.0 Purpose, Scope and Applicability:**

This guidance is to provide information about fences which may be used as an engineering control to limit exposure to contamination left at a site. Fences are not remedial measures and only reduce risk to the extent that they limit access. Therefore, IDEM does not endorse the exclusive use of fencing as the only means to eliminate potential exposure pathways. The fences described in this document are a reasonable means of limiting access to both animals and humans. Fences described here will be limited to reasonable types to prevent or discourage entry to the site.

This guidance is intended to apply to environmental sites where contamination has been left in place and controls are needed to limit access to the site. Other rules may apply to some environmental programs. For solid waste disposal facilities, 329 IAC 10-2-1 states that public access must be controlled by “using effective artificial barriers or effective natural barriers or both as appropriate to protect human health and the environment.” No specifications are indicated. For controlling access to hazardous waste facilities, 329 IAC 3.2 references 40 CFR 264.14 which states that a facility must have an “artificial or natural barrier (e.g., a fence in good repair or a fence combined with a cliff), which completely surrounds the active portion of the facility and a means to control entry at all times through the gates or other entrances to the active portion of the facility” (sic).

In general fences are relatively inexpensive and easy to install. This guidance will focus on describing the two most common types of security fence, palisade and chain link fence. The most common specifications for materials and installation will be outlined. Also, installation issues and operation and maintenance criteria will be discussed.

**2.0 Fence Material Specifications and Definitions:****Fence Type**

The two main types of security fences are palisade and chain link. A palisade fence is a series of panels of vertical bars called pales. The thickness and shape of the pale (generally W or D shape) determine the strength of the fence. Additions such as pointed or spear pale heads are added security measures. Palisade fences may not limit access to wildlife to the extent that a chain link fence limits access.

The main components of a chain link fence are the framework, fencing fabric and gates. Fence framework consists of support posts and tension wire. The diameter and thickness of the support posts determine the strength and durability of the fence. In general, approximately one third of the above ground post height should be below ground surface and the depth should be below the frost line to provide appropriate stability. In addition, posts should be set in concrete. The post hole diameter should be at least three times the post diameter. Gate posts will need additional support. Manufacturer's guidelines should be followed. These depths should be checked to ensure that they do not trigger any construction worker safety measures if the fence is installed over contaminated soil or groundwater.

Tensions wire may be installed on the top or bottom of the fence. For security purposes, a bottom tension wire is recommended as it will help deter people or animals from pushing their way under the bottom of the fence.

Fence fabric is stretched between the framework posts to prevent access. The gauge of wire, size of the mesh and type of protective coating of the fence fabric determine the strength and longevity of the fence. Heavier wire gauge and smaller mesh size form stronger fences. The Chain Link Manufacturers Association (CLMA) recommends security fences be constructed using 11 to 6 gauge wire (smaller gauge indicates a larger diameter wire) with a mesh size from 2" to 3/8" (CLMA, 2009). Mesh size is the clearance between wires forming the parallel sides of the fabric diamonds. The wire is generally coated with galvanized zinc or aluminized to keep it from corroding. PVC coated fence fabric is also available as an added aesthetic and anti-corrosion measure.

Gate construction should follow manufacturer's instructions or ASTM F 900 Specifications for Industrial and Commercial Swing gates. Many appropriate gate types may be used depending on desired security measures. Locking hardware may be required depending on the security requirements.

### **Durability**

Fence material should have a minimum life expectancy of at least twenty years unless site specific criteria determine that a shorter life span is acceptable. Conversely, if fencing is part of a site remedy decision, replacement at the end of its life may be stipulated in site decision documents.

### **Fence Height**

To provide maximum security, fences should be 7-9 feet high. However, shorter fences may be adequate for many facilities.

### **Security**

If additional deterrence is desired, outriggers, such as barbed wire may be attached to the top of the fence angled out and away from the facility. This addition makes climbing the fence more difficult and prevents ladders from being placed against the fence.

### **Signs**

Proper signage affixed to the fence offers a reasonable assurance that interested parties will be deterred from the facility. Signs are necessary to warn against trespassing and also provide information about the hazards existing on a site. Common recommendations indicate that

signs should be affixed at two hundred foot intervals or at least one per perimeter fence face. Size recommendations vary. Indiana Solid Waste regulations (329 IAC 10-2-1) indicate signs should be 16 square feet and contain the type of waste and contact numbers among other information. Hazardous waste facility regulations (40 CFR 264.14) suggest a sign with the legend, “Danger- Unauthorized Personnel Keep Out” which must be visible at 25 feet.

### **3.0 Fence Installation:**

#### **Site Preparation.**

Local building codes and ordinances should be checked as they may stipulate the type of fence or prohibit fencing. Structures and land topography should be surveyed to ensure that they do not provide an easy means of breaching the fence. Any trees with limbs or branches hanging over the fence should be trimmed so that intruders cannot use them to go over the fence. All undergrowth should be cleared for several feet (typically 6 feet) on both sides of the fence both to aid in construction and to aid in security by providing a clear view through the fence.

The fence should surround the area of contamination. In addition, the fence should be placed so that construction does not cause exposure to the onsite contamination in concentrations exceeding applicable guidelines.

Drainage Culverts and Utility Openings may need to be addressed to prevent access to the site. Design should incorporate debris catching and clearance methods and proper wording should be put in the operations and maintenance manual to ensure that drainage structures remain operable.

#### **Construction**

Construction activities should be planned so that they do not cause exposure to contaminated soil and groundwater. Fences should be constructed in accordance with manufacturer’s guidelines for the chosen fence type. ASTM F 567 Standard Practice for Installation of Chain Link Fence may be used as installation guidance to supplement manufacturer’s instructions.

### **4.0 Operation and Maintenance (O/M):**

A plan for operation, maintenance and monitoring should be submitted for review and approval for all sites proposing engineering controls including fences. The plan may be submitted as part of a work plan, (i.e., corrective action plan, remediation work plan) or as a standalone document. This plan or portions of this plan can be referenced in a statutory enforcement document to serve as a primary mechanism for long term management of the fence.

The entire perimeter of the fence should be inspected on a yearly basis unless a different site-specific maintenance timeframe has been designated. The inspections should ensure that the fence remains intact, and to evaluate damage due to settling, exposure to the weather, wear from traffic, increasing age and other factors that can reduce the effectiveness of the fence in limiting access to the site. Any deterioration of the structural integrity of the fence should be noted. The fence should be inspected for gaps at the bottom of the fence and signs of

burrowing under the fence. Gates should be inspected. If locks are required, they should be inspected to make sure they are providing appropriate security. Drainage structures should be inspected. If debris removal is required it should be noted and accomplished as soon as possible. Signs should be inspected to ensure that they are present and legible. An example O&M plan is included as Attachment 1.

## 5.0 References:

ASTM International, Standard Guide for Application of Engineering Controls to Facilitate Use or Redevelopment of Chemical-Affected Properties, ASTM International, E 2435-05, July 2005.

ASTM International Standard F567, Practice for Installation of Chain Link Fence.

CLMA (Chain Link Manufacturers Association); 2009; Security Fencing Guidelines: available at: <https://chainlinkinfo.org/security-fencing-guidelines/>

Department of Defense; Military Handbook Design Guidelines for Security Fencing, Gates, Barriers and Guard Facilities; MIL-HDBK-1013/10; May 14, 1993. Available online at: [https://www.wbdg.org/FFC/NAVFAC/DMMHNAV/1013\\_1a.pdf](https://www.wbdg.org/FFC/NAVFAC/DMMHNAV/1013_1a.pdf)

Department of Defense: UFGS 32 31 13 Chain Link Fences and Gates. Available online at: <https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-32-31-13>

Indiana Department of Environmental Management, “Remediation Closure Guide”, Non Rule Policy Document Waste-0046-R1, <https://www.in.gov/idem/resources/nonrule-policies/effective-nonrule-policies/>, March 22, 2012.

# Appendix 1:

## EXAMPLE FENCE OPERATION AND MAINTENANCE PLAN

[DATE]

Property Located at:

[ACTIVITY ADDRESS]

[City, County]

[IDEM Program Area and Program ID]

### Introduction

*Instructions: This document is an example 'Operation and Maintenance Plan' for a fence at the above-referenced property. Edit the template appropriately in the bracketed areas.*

This Operation and Maintenance Plan has been prepared by [*insert name of preparer*] for the fence installed at the above-referenced site. It outlines the policies and procedures for the long-term maintenance and monitoring of the fence. The contaminated [soil] [and/or] [groundwater plume] is impacted by [enter list of contaminant(s)]. The locations of the fence maintained in accordance with this plan, as well as the impacted [soil] [and] [groundwater plume] are identified in the attached map.

### Cover Purpose

The fence serves as an engineering control to limit access to the site.

### Inspection Activities

The entire perimeter of the fence as depicted in the map may be inspected [*insert proposed time frame* (annually, semi-annually, quarterly, etc.)] [in the months of [April or May] [*insert other timeframe*]]. The inspections may be performed to ensure that the fence remains intact, and effective at limiting access. All gates should be closed and locked as agreed upon. Damage to fence anchor posts and chain link fabric, pales or other fence material should be noted and repaired. Any gaps at the bottom of the fence and signs of burrowing under the fence should be noted. Any evidence of trespassing should be noted and addressed. If debris removal is required, it should be noted and accomplished as soon as possible. Signs should be inspected to ensure that they are present and legible.

A log of the inspections and any repairs should be maintained by the property owner. The log may include recommendations for necessary repairs. Once repairs are completed, they may be documented in the inspection log. The inspection log should be kept on site and made immediately available for review by the IDEM Office of Land Quality (OLQ), its successor, and/or other appropriate state agency.

**Maintenance Activities**

If problems are noted during the annual inspections or at any other time during the year, repairs may be scheduled as soon as practical.

The property owner, in order to maintain the integrity of the fence may maintain a copy of this Maintenance Plan on-site and make it available to all interested parties (i.e. on-site employees, contractors, future property owners, etc.) for viewing.

**Amendment or Withdrawal of Maintenance Plan**

This Maintenance Plan can be amended or withdrawn by the property owner and its successors with the written approval of the IDEM Office of Land Quality.

Contact information for person/persons responsible for implementing this plan.

[NAME]  
[ADDRESS]  
[PHONE #]

Site Owner and Operator:

[NAME]  
[ADDRESS]  
[PHONE #]

OLQ:

[OLQ Program Area]  
[ADDRESS]  
[PHONE #]

**Inspection / Maintenance Activity Log:** The following table should be used to track and monitor maintenance activity to ensure that remedial objectives continue to be met in the future. This table can be included in the proposed remedial action plan (or equivalent document).

Inspection Date	Inspector	Inspection Criteria	Maintenance Action Needed	Previous Maintenance Completed?