Asbestos in Soil Remediation – Good Practice

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Scale of the Problem …..

Hinkley Point C

Business Park, Guildford

School Redevelopment, Plymouth

Former RAF Site
Remediation Options

• Remediation Options typically available

  ➢ Leave in-situ
  ➢ On-site reuse
  ➢ On-site treatment
    • Hand picking from the ground
    • Hand picking from a picking line
    • Screening
    • Stabilisation
  ➢ Off-site treatment
  ➢ Disposal
Remediation Options

The most suitable remediation option depends on:

- **Type, quantity & distribution** of asbestos present;
- **Area / volume / depth** of asbestos containing soil relevant to development size;
- **Current / proposed land use** – residential, industrial, commercial;
- **Programme / timescale**;
- Interaction with other contaminants, **other remediation processes** being adopted;
- **Clients attitude to asbestos** (risk & liability);
- **Regulators attitude to asbestos** (risk & liability);
- **Local interest groups**;
- **Health and Safety implications**;
- **Cost**
What does asbestos in soil look like?

Asbestos textile (100% Crocidolite)

Asbestos insulation (Amosite)

Asbestos textile (Chrysotile)

Asbestos insulation board (Chrysotile & Amosite)
Licensed/Non-Licensed

Licensed work

- Focus on prevention of exposure/spread
- Notification
- Designated area
- Health records / medicals

Non-licensed work

- NNLW
- “NLW”
- Focus on prevention of exposure/spread
- Notification
- Designated area
- Health records / medicals
“Licensed Work”

• Essentially work with high hazard ACMs
  – Any work on sprayed coatings
  – Over 2hr work on:
    • Loose fill
    • Insulation/lagging
    • AIB
ASBESTOS in SOILS

Visible Lagging Insulation AIB

Licensed Work

Unidentifiable ACM including amosite

RA: Control Limit/STEL liable to be exceeded?

Yes

“Short duration” Exemption Insulation/AIB

No

Non-Licensed Work
ASBESTOS in SOILS

Unidentifiable ACM including amosite

RA: Control Limit/STEL liable to be exceeded?

Yes

Licensed Work

No

All ACMs except lagging/insulation/AIB

“Short duration” Insulation/AIB

Non-Licensed Work

“Maintenance”

“Removal”

Current condition: Is the material “degraded” at the outset of the work?

No

Will the material deteriorate during removal?

No

The work is “Non-notifiable”

Yes

The work is NNLW

Will the material deteriorate during removal?

Yes

The work is NNLW
The work is "Non-notifiable"

Will the material deteriorate during removal?

Current condition: Is the material "degraded" at the outset of the work?

RA: Control Limit/STEL liable to be exceeded?

"Maintenance" "Removal"

All ACMs except lagging/insulation/AIB

"Short duration" Exemption Insulation/AIB

Visible Lagging Insulation AIB

Unidentifiable ACM including amosite

Licensed Work

Non-Licensed Work
Soils: Non-Licensed Work or NNLW?

Examples:

- **AC/Tiles: Intact pieces being picked up or moved using excavator:**
  - Not degraded at outset
  - No deterioration during removal
  - NLW

- **Material in poor condition: Removed using excavator:**
  - Degraded at outset
  - No deterioration during removal
  - NNLW

The work has to be “removal”

Material has to be “degraded” at the outset of the work?

Will the material deteriorate during removal?
Good Practice Examples

- Asbestos Delineation and Work Planning
- Typical Site layout
- Excavation
- Processing
- Off-site Disposal
- Dust suppression
- Air monitoring
- Leave In Situ
- On Site Reuse
Delineating the extent of the problem

- **Asbestos** and Non-Asbestos Areas must be delineated ‘so far as is reasonably practicable’ (finding asbestos by accident should be avoided as far as possible);

- Therefore supplementary investigation may be required before remediation mobilisation or as part of initial site works;

- Known areas of asbestos impacted ground delineated by:
  - Surface inspection
  - Core sampling
  - Trial pitting
  - Trial trenching
  Method determined by asbestos type/quantity

- Only trained, experienced and qualified operatives permitted in areas expected to contain asbestos.
Site Layout and Control Measures

- Prevailing wind direction (Westerly)
- Welfare set-up
- Fence off asbestos impacted areas
- Allow for ‘buffer zone’ if possible
- Consider traffic management (esp. waste)
- Consider neighbours
Excavation

• Pre-excavation:
  – Delineation;
  – Check staff competence;
  – Staff induction;
  – Method statement briefing;
  – Check for services.

• Install asbestos controls:
  – Single point of access via decontamination unit(s);
  – Set-up primary decontamination bays;
  – Set-up dust suppression equipment;
  – Erect signage;
  – Set-up air monitoring strategy.

• Excavate into stockpiles:
  – likely to be suitable for reuse;
  – likely to be unsuitable for reuse;
  (Visual assessment by Experienced Asbestos Operatives)

• Stockpile testing:
  – Soil sampling and testing to demonstrate compliance with the remedial strategy;
  – Sufficient time for analysis must be allowed for within remediation programme (~10days).
Processing - Handpicking from a picking line:

- Only suited to bonded asbestos (High Disturbance)
- Use in conjunction with a screener with variable speed belt & water suppression;
- Takes up a lot of space;
- Not very mobile (take soil to the line);
- Needs lots of staff;
- Will not remove 100% ACM’s.

Former RAF Base Warrington

Picking line summary (12,500m³)

- Cement bonded fragments;
- Carried out for betterment to permit reuse onsite beneath a sports pitch;
- Average processing rate 26m³/hour
- 10 week programme
Processing - Handpicking from the ground:

- Suited to all asbestos material types where removal of gross visible contamination is applicable;
- Generally suitable for small soil volumes;
- Clearly will not remove free fibres;
- Balance cost v’s disposal essential;
- H&S implications: man v’s machine;

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Handpicking Trials (247m³)

- AIB and minor insulation material
- Target 0.1%w/w
- Pre handpicking = 1.226%w/w
- Post handpicking = 0.012%w/w
- 20 hours for 2 operatives.
- Rate of processing was adapted to meet target level.
Off-site disposal

- Reliable approach obviating any ‘blight’ issues;
- Sometimes there is no other option;
- Waste characterisation is critical;
- Landfill tax regime is changing;
- Hydrock have developed a robust risk based disposal approach for our asbestos disposal projects.
Off-site disposal – Fully enclosed skips

**Fully enclosed skip:** double bagged hand picked waste with high potential for fibre release incl. used PPE (or where no bulk soil removal required).
Off-site disposal – Skips (Polythene Encapsulated)

Skips (polythene encapsulated waste): High risk bulk material that can’t be double bagged (e.g. asbestos on steelwork or gross contamination).

Northampton Waterside

Hinkley Point C
Off-site disposal – Tipper lorries

Tipper lorries: bulk removal of lower risk asbestos contaminated soil

Hinkley Point C
Off-site disposal – Tipper lorries
Dust Suppression

• Dust suppression shall always be required. Methods include:
  – Bulk sprays
  – Handheld sprays
  – Mains connected Hose pipes
  – Atomiser units
  – Linear boundary spray lines
  – Surfactant addition
Air Monitoring

- Air monitoring is a valuable line of evidence to show compliance and can be used:
  - Boundary monitoring
  - Personal monitoring
  - Inside adjacent buildings
  - Under the covers of disposal vehicles
  - At the receiving landfill

Henley Business Park, Guildford
Leave in-situ

• The presence of asbestos containing materials does not necessarily require them to be removed or treated, especially where they pose low risk at depth;
• Regulatory approval will be required;
• Confidence that subsequent works shall not disturb the ACM’s is essential;
• Marker membrane and cover system may be required depending upon works above;
• Accurate survey co-ordination to permit transfer of information in the Health and Safety File.
On-site reuse

- Materials with ACM removed to agreed levels can be reused in accordance with an agreed remedial strategy and Materials Management Plan providing the principles are agreed with the regulators;
- In this instance 48,000m$^3$ of acceptable material transported into a 9m deep basement to facilitate site decommissioning;
- Detailed acceptance criteria to be satisfied including:
  - Waste Acceptance Criteria
  - Geotechnical parameters
  - Soil chemistry
  - Radiological parameters
  - Gravimetric analysis for Asbestos
- Approx. 4,000 25T dumper loads of soil reused saving the equivalent of 12,000 lorry movements on local roads.
Other issues to consider

• Vehicle access and egress procedures including waste streams

• Maintaining emergency procedures
  – Personal injury
  – Machine breakdown

• Working adjacent to public areas including residential properties
  – Public perception
  – Demonstrate that control measures are effective

• Enclosure Working may be necessary where
  – Potential for fibre release is high (e.g. lagged pipes in open ducts)
  – Surrounded by sensitive receptors

• Protect employees and adjacent contractors
  – Worker perception
  – Training and record keeping
  – Demonstrate that control measures are effective

• Personal, plant and equipment decontamination
  – Duty to prevent spread / reduce of asbestos (CAR Regulation 16)

• Validation and regulatory approval

• Advising the client how to manage residual risks
Conclusions

• Working methods adopted need to be of the highest quality to meet regulatory requirements and comply with CAR2012 and insurer requirements;

• Asbestos in the ground is unpredictable and flexibility on site is needed;

• Experienced, competent and trained staff are essential to meeting objectives safely;

• Licensing issues need to be considered and engagement with local HSE is critical

• We should use a risk based approach to remediation; asbestos does not necessarily have to be removed;

• Forward planning essential to meeting objectives;

• Materials Management Planning critical to make best use of materials following appropriate processing and removal.
Former RAF Site Case Study
Lee Wood CEng, MC IWEM, MInstLM
Senior Project Manager
Hydrock
Former RAF Site Case Study

Site History to 2013

- Ex-RAF Site which underwent demolition around 2003
- Site being redeveloped for residential use
- Three site investigations carried out between 2000 and 2007
- 100’s of trial pits and 100’s samples tested for asbestos
- No asbestos identified
- Phase 1 of the site developed for housing between 2008 and 2012
- No asbestos identified
Hydrock called to site to inspect suspected buried asbestos identified during archaeological investigation works
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Lead to the discovery of 2 impacted areas:
- Asbestos cement pipelines & viceroy wrapped pipeline (Area C)
- Asbestos impacted soils containing a mixture of cement bound asbestos, insulation, gaskets, rope etc (Area B)
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- Asbestos discovery warranted further investigation targeting buried asbestos
- Further investigation identified one further area impacted with asbestos cement and AIB (Area A):
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Area to the south of Area B constrained by trees and TPOs
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Area to the south of Area B constrained by trees and TPOs

Now you see it!
Former RAF Site Case Study

Area to the south of Area B constrained by trees and TPOs

Now you don’t!
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The Problem:

- House builder set to start redevelopment of Phase 2
- Being presented with a number of asbestos impacted areas
- Remediation works likely to comprise a mixture of:
  - non Notifiable;
  - Notifiable, non Licensable; and
  - Notifiable Licensable.
- Trees in impacted area posing a significant constraint to investigation and remediation
- Potential for significant delays and costs

Client:  

Project Manager:  

Hydrock
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Objectives:

• an updated Remediation Strategy that adequately addressed the risks posed by asbestos
• a sustainable solution that offered best value for money
• a solution that minimised delay to the build programme
• an approach to site works that is practical to implement
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The Solution:

Revised Strategy:

- **Disposal** of asbestos containing materials and heavily impacted soils with a content >0.1% to a suitable facility
- **Re-use** of asbestos impacted soils with a content of <0.1% in POS area beneath a geo-synthetic maker layer and a 1m clean cap
- UKATA asbestos awareness **training** for ground workers to identify suspected ACMs
- Category B **training** of selected ground workers to enable them to handle cement bound ACMs
- Having asbestos **expertise** on call to assess suspected ACMs encountered during the works
- **Inspection and validation** of garden plots and cover systems.
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Regulatory Agreements

- Local Planning Authority
- Environment Agency
- NHBC
- Client
- Future POS Management Company
- HSE for Notifiable or Licensable Works
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Implementation

Programme of remediation works aligned with build programme and site constraints

Initial works: Hand pick of cement bound asbestos fragments – non notifiable works
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Implementation

Stage 1 Remediation:

Area A: AIB/AC impacted soils excavated, picked to below target level of 0.1% for re-use on site

ACMs disposed of to suitable facility

Notified Licensed works
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Implementation

Stage 1 Remediation:

Area C: AC Pipelines and viceroy wrapped pipelines disposed of to suitable facility

Notified Licensed works
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Implementation

Plan of site after Stage 1 Works

SI along alignment of new road

However, risk of encountering asbestos still remains
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Implementation

• Further Site Investigation:
  - TPO’s removed and trees felled to facilitate SI
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Implementation
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Implementation
Stage 2 Remediation:

Area B & D: picked to below target level of 0.1% for re-use on site

ACMs disposed of to suitable facility

Notified Licenced works

Completion Report and H&S File.
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On-going works:

• The risk of asbestos remains
• Further training of ground workers
• Vigilant site staff reporting back to Hydrock
• Inspection and validation of garden areas