

Practical Solutions To Achieve Cost-Effective, Risk-Based Brownfield Remediation

Asbestos in Soil and Made Ground:

**Practical strategies for identifying and removing
asbestos materials to facilitate the 'safe' on-site
re-use of site-generated demolition arisings**

Brownfield Remediation,

15th October, 2015

Grange Tower Bridge Hotel, London

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Quotes for the Day

***“Someone's sitting in the shade today ...
because someone planted a tree a long time ago.”***

legendary investor, Warren Buffett

[speaking on the development of asbestos in soil guidance]

***“I would give a thousand furlongs of sea ...
for an acre of barren ground.”***

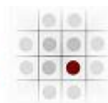
Shakespeare

[making the original ‘Brownfield First’ speech]

Overview

- Outline of developing/current industry guidance:
 - JIWG, SoBRA, SCA, CIRIA
- Some key technical and legal implications – focus on site-generated demolition arisings:
- Effectively applying guidance on-site:
 - Identifying and classifying asbestos risks
 - Interaction with HSE ACoP and guidance

JIWG Membership



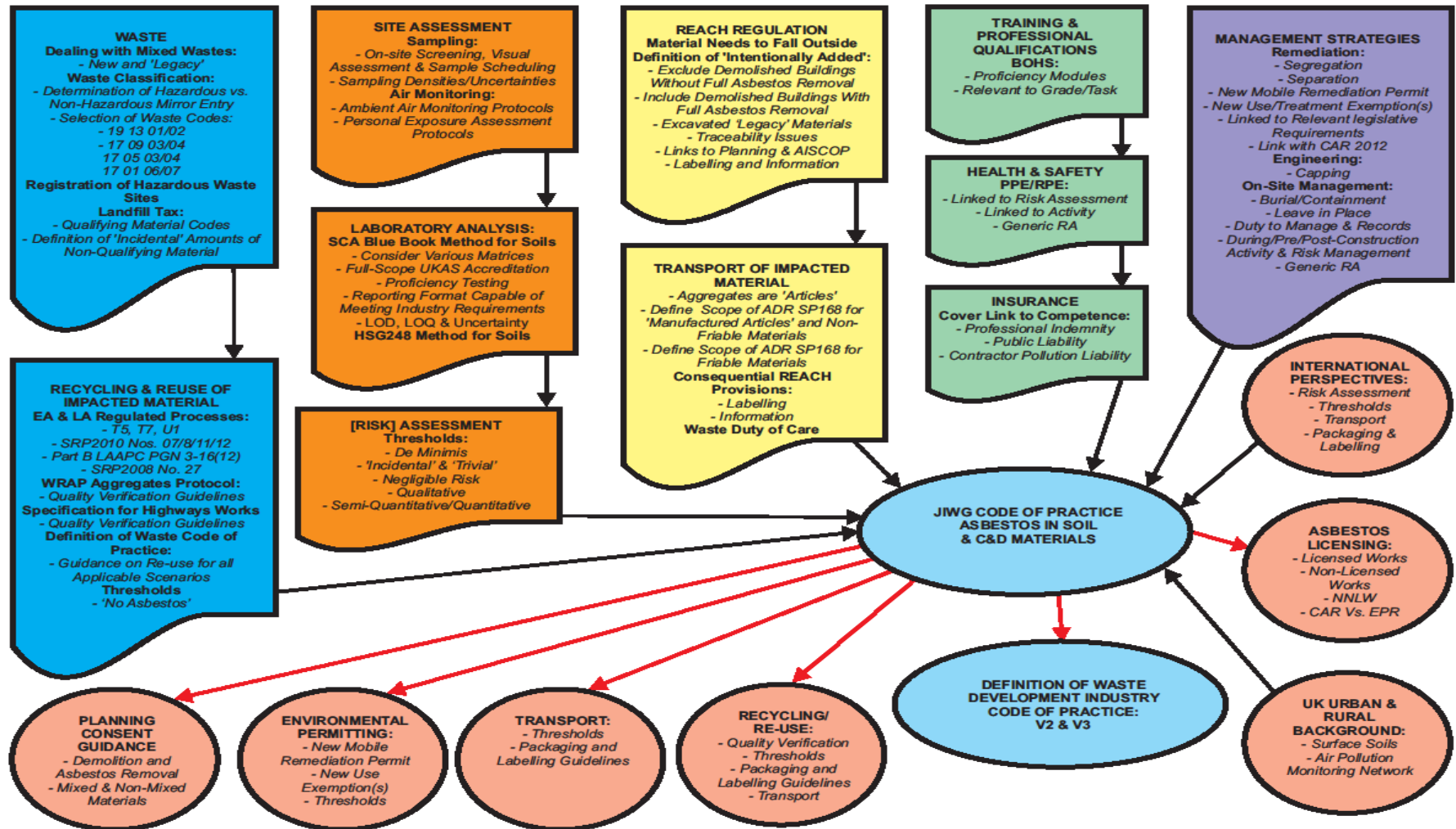
Key Aims? JIWG Terms of Reference

- To bring together the asbestos and brownfield management sectors, promoting the development of a consistent and harmonised approach to regulation
- To develop practical practitioner guidance on asbestos in soil, made ground and C&D materials that provides a consistent approach
- To promote the development of an industry professional qualification framework

Key Aims? JIWG Terms of Reference

- To engage with the principal regulatory bodies with the aim of promoting a consistent, unified and transparent regime for the regulation of land contaminated by asbestos
- To promote and develop an improvement in public and stakeholder awareness of relevant issues
- To promote the work of the Joint Industry Working Group to ensure all organisations are fully informed of its activities

JIWG AiSCoP Outline Framework



JIWG Timeline - Update

- EIC-CL:AIRE Joint Conference, November 2011
- JIWG, 7 meetings, February 2012- Jan 2014
- JIWG Statement on Discussions on Regulation and Enforcement with HSE & EA, March 2013
- Overlap with CIRIA C733 Project Steering Group
- JIWG Task Groups on key aspects, 2013-2014
- Framework & research needs identified (SoBRA)
- **JIWG Receptor Risk Ranking/Work Categorisation algorithm spreadsheets; being 'tweaked', Autumn 2015**
- **JIWG Interpretation of HSE ACoP L143; end 2015**
- **JIWG AiSCoP under way; spring 2016**
- **... but must dovetail with HSG 248, The Analyst's Guide**

JIWG AiSCoP Update

- Framework finalised, author briefs being developed and some contracts awarded
 - Initial focus on permitting and production of recycled C&D materials, waste duty of care, landfill tax,
- HSE Managing Asbestos ACoP L143; being interpreted by JIWG for soil and C&D materials to support AiSCoP:
 - HSE support, input and endorsement(?)
 - Will clarify interpretation of application of CAR 2012
 - First draft reviewed by the JIWG and HSE
 - Second draft *in prep*; consultation Nov/Dec 2015

SoBRA Update: Risk Assessment

- SoBRA sub-group work feeding into AiSCoP
- SoBRA outputs provided as free access technical bulletins/briefing notes on the SoBRA website and CL:AIRE JIWG webpage:
- **Qualitative risk ranking methodology** for different activities and exposure scenarios, using the existing qualitative risk ranking systems developed in R&D 66 for soil contaminants, IAQM for construction dust, and material and priority scoring methods in HSG 264 and HSG 227, and supported by empirical evidence on fibre release [G. Burdett, HSL, S. Cole, AECOM, S. Forster, Remedia Group]

Decision Support Tool: Receptor Risk Ranking

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Stage 1

Hazard Identification

Select ACM type (run model for each type to generate 'Worst Case' output)
Original form/clearly identifiable products?
Extent of degradation of ACMs
Amount of asbestos fibre in selected ACM/fibre type as % of host material
Asbestos fibre type

Insulating boards
Clearly identifiable as original form insulating boards
Weathered (Slight degradation in ACM)
Minor quantities - <0.001 to 0.01 %wt/wt
Amosite, tremolite, anthophyllite, with/without chrysotile

Score

3

2

2

1

2

Sub-total

10

Hazard ranking

Low

Stage 1

Hazard Identification

Select ACM type (run model for each type to generate 'Worst Case' output)
Original form/clearly identifiable products?
Extent of degradation of ACMs
Amount of asbestos fibre in selected ACM/fibre type as % of host material
Asbestos fibre type

Insulating boards
Bonded/firmly linked in matrix: cement, vinyl, composites
Woven textiles, string, rope, paper, felt
Insulating boards
Coatings, loose fill insulation, lagging
No visible ACMs but dispersed fibres/fibre bundles visible/identified
Amosite, tremolite, anthophyllite, with/without chrysotile

Score

3

2

2

1

2

Sub-total

10

Hazard ranking

Low

Decision Support Tool: Receptor Risk Ranking

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Stage 2
Emission Factors

	Score	
Depth to impacted material	Material present at the surface, very likely to be disturbed during routine use of site/works, or by wind	4
Activity type and effect on deterioration of ACMs in-situ/during work	Low intensity, no deterioration expected	0
Mass ratio of free fibres to overall mass asbestos fibre in sample	Negligible < 5 %	0
Best description of primary host material matrix	Ceramics - Concrete, Bricks, Mortar, Tiles, Clayware (crushed or not)	4
Respirable fibre index for source material	Negligible	0
Sub-total		8
Exposure ranking		Low
Combined hazard and exposure ranking		18 Low

Stage 2
Emission Factors

	Score	
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Mass ratio of free fibres to overall mass asbestos fibre in sample	Negligible < 5 %	0
Best description of primary host material matrix	Negligible < 5 %	4
Respirable fibre index for source material	Very Low > 5% - 10% Low > 10% - 25% Medium > 25% - 50% High > 50-100%	0
Sub-total		8
Exposure ranking		Low
Combined hazard and exposure ranking		18 Low

Decision Support Tool: Receptor Risk Ranking

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Stage 3
Pathway and Receptor Sensitivity

		Score
Distance from source of dispersion	>10m<50m	2
Receptor category	Residential	No score required
Site occupancy/duration of exposure	>> 10 hours per day (e.g. 24 hour residential exposure)	4
Receptor age	Infant (under 5)	4
Calculated sub-total (distance x (duration + age))		16
Receptor ranking		Low
Combined hazard, exposure and receptor ranking		34 Low

Stage 3
Pathway and Receptor Sensitivity

		Score
Distance from source of dispersion	>10m<50m	2
Receptor category	Material undisturbed in-situ at depth, no dispersion anticipated	No score required
Site occupancy/duration of exposure	>100m distance	4
Receptor age	>= 50m<100m	4
Calculated sub-total (distance x (duration + age))		16
Receptor ranking		Low
Combined hazard, exposure and receptor ranking		34 Low

- Accompanied by detailed user guide
- Must be backed by justification for use of parameter inputs

SoBRA Update: Risk Assessment

- Database of asbestos fibre release during various brownfield site activities – looking for further data from industry that has already been collected for projects and can be suitably anonymised to be included in the database
- Development and field testing of an activity-based sampling methodology for typical garden soil disturbance – a field test was conducted by IOM last year, data being evaluated
- Development of a decision matrix for asbestos cement fragments in surface and near surface soils under Part 2A
- Dissection and re-interpretation of the published RIVM empirical data

SoBRA Update: Site Monitoring

- Development of dust/asbestos monitoring protocols for brownfield earthwork activities:
 - To obtain activity-based dust generation data to risk-rank remediation, earthwork and construction activities, and better understand potential fugitive environmental emissions and employee and environmental exposures
 - Designed to provide methods by which different activities involving earthworks at brownfield sites can be monitored consistently and data collated to inform the potential for dust release and the subsequent risk ranking of those activities
 - Circulated to industry (contractors, consultants and site owners)

Analysis Update: Blue Book Method

- EA's Standing Committee of Analysts committee, 2014:
 - Led by EIC Environmental Laboratories WG; JIWG input
 - HSL, UKAS, environmental laboratories and consultants
 - Development of a **standardised** method for quantification of asbestos in soils/associated materials
 - Anticipate industry-wide requirement to follow method
 - Method will be underpinned by, inform and will be incorporated into JIWG AiSCoP
 - Expanded analytical results outputs will assist in qualitative risk ranking
 - V9 draft open and widespread consultation, July 2015
 - V10 amendments, October 2015; final end 2015/2016

Interaction of JIWG with CIRIA guidance

- Complementary
- JIWG AiSCoP building on CIRIA guidance, and:
 - Clarifies regulatory guidance in discussion with key regulators
 - Greater focus on asbestos-contaminated recycled aggregates
 - Provides suite of qualitative assessment and support tools
 - Free to download via CL:AIRE website

Some Legal & Technical Implications

- What can be re-used and where?
- Waste vs product
- Control of Asbestos Regulations 2012
- EU REACH Regulation
- Environmental Permitting Regime
- WRAP Aggregates Quality Protocol
- CL:AIRE Definition of Waste Code of Practice
- Waste classification, disposal and landfill tax

CAR 2012: Regulation 7

7 (3) In cases of final demolition or major refurbishment of premises, the plan of work must, so far as is reasonably practicable, specify that asbestos must be removed before any other major works begin ...

... unless removal would cause a greater risk to employees than if the asbestos had been left in place.

In other words:

“Regulation 7(3)) also allows certain well bonded asbestos products, usually with low asbestos content, to remain *in-situ* in buildings that are being demolished (where removal is not reasonably practicable).

CAR 2012: Regulation 7

- ... but is leaving asbestos products in buildings scheduled for demolition on brownfield sites the sustainable/low cost, best available option?
- Current HSE (draft) guidance states:

“Demolition rubble may be used as infill materials on construction projects.”

HSG 248 The Analyst's Guide 2016, Draft for Consultation, October 2015

- What about the asbestos left *in-situ*?
- What about other, environmental legislation and guidance?
- Conflicts?
- Sustainability issues?

EU REACH Regulation

- Annex XVII to REACH states, in respect of all forms of asbestos, that:

*“The manufacture, placing on the market and use of these [asbestos] fibres and of articles and mixtures containing these [asbestos] fibres **added intentionally** is prohibited.”*

- So, this effectively represents an EU-wide ban on use of materials containing asbestos ...
- ... but define “intentionally added”?
- Leaving ACMs in buildings scheduled for demolition?
- Does this cover recycled aggregates (RA) generated on-site from demolition materials?

EU REACH Regulation/ECHA

- ECHA guidance supporting REACH states that, in respect of recycled aggregates (articles/products) produced from construction and demolition waste:

European Chemical Agency, Guidance on waste and recovered substances, v2, May 2010

- they are not considered 'wastes', effectively bringing them under certain other provisions of REACH.
- REACH, Appendix 7, *Special provisions on the labelling of articles containing asbestos*:

"3.1. The following particulars shall appear on clearly legible and indelible labelling:

*(a) **the symbol and relevant indications of danger** ...;*

*(b) **safety instructions** which must be selected in accordance with the particulars in this Annex ..."*

EU REACH Regulation

“For unpackaged articles [such as RA] containing asbestos, labelling in accordance with 3.1 shall be effected by means of:

a hand-out with labelling in accordance with 3.1.”

- So, REACH effectively requires ‘asbestos’ labelling and risk/safety advice to be provided in cases where RA contains asbestos
- But use of asbestos ‘intentionally added’ into products is effectively banned ...*no de minimis?*

Environmental Permitting Regime

- EA and LA Environmental Permits which regulate the production of RA:
 - No asbestos/hazardous materials in feedstock material
 - *Ergo*, asbestos in buildings must be removed prior to demolition, or post-demolition, to allow its processing ...
 - ... but must define “no asbestos” ...
 - Asbestos present in feedstock; is it waste requiring disposal/pre-treatment prior to processing?
 - Is it realistic to remove “all asbestos”?
 - WM3: inconsistent classification of material with visible ACMs and dispersed fibres; hazardous/non-hazardous
 - What comprises risk-based pragmatism?
 - ... a de minimis threshold; linked to SCA BBM LOD?

WRAP Aggregates Quality Protocol

- Strict protocol must be followed in order to demonstrate 'end of waste'
- Pre-requisite for Highways Specification material
- “No asbestos” requirement; how to demonstrate?

- Permit compliance
- Factory Production Control
- Sample and test
- QP conformance
- Records management
- No more processing (e.g. to remove asbestos) prior to use



Building Demolition: Asbestos Removal

- Plan for safe and proper removal of all ACMs
- Caution: turnkey removal/demolition vs LARC
- Independent oversight of removal
- Checks, monitoring, validation, record-keeping

- Comprehensive and iterative pre-demolition survey(s)
- Independent of contractor
- Link surveys to removal; reconcile asbestos found, removed and disposed of
- Caution: what is under floor slab/in underground ducts?



Remediation of Bulk ACMs: Hand Pick

- If not all ACMs removed pre-demolition ...
- ... likely to be unacceptable waste feedstock and require 'remediation' prior to processing
- Segregation of visible ACM fragments for disposal

- **Caution: resultant material unlikely to be 'asbestos free'**
- Residual hazard and risk may remain
- Material may still be 'unsuitable' for recycling for planned reuse as aggregate on-site



Remediation of Bulk ACMs: Hand Pick

- Caution: material reprocessed and spread on-site may subsequently be found by others to be contaminated ...
- ... may require subsequent 'remediation'

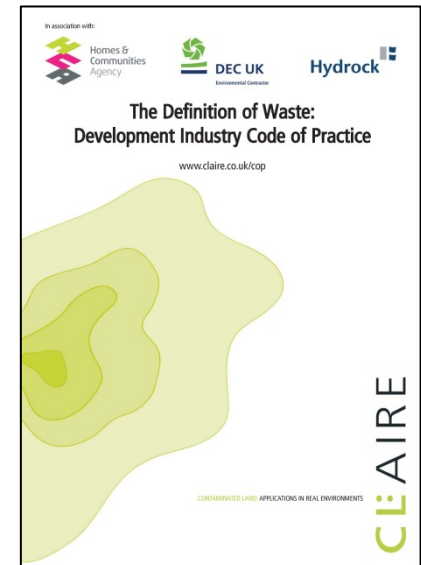
- Caution: significant time delays to development
- Caution: significant added costs
- Caution: resultant material unlikely to be 'asbestos free'
- Residual hazard and risk may remain



CL:AIRE Definition of Waste CoP

- Alternatively, may need to use DoW-DiCoP to demonstrate 'end of waste' of unsuitable material
- Source segregated material from demolition, such as crushed brick and concrete, to be reused on the site of production within earthworks, sub-base or drainage

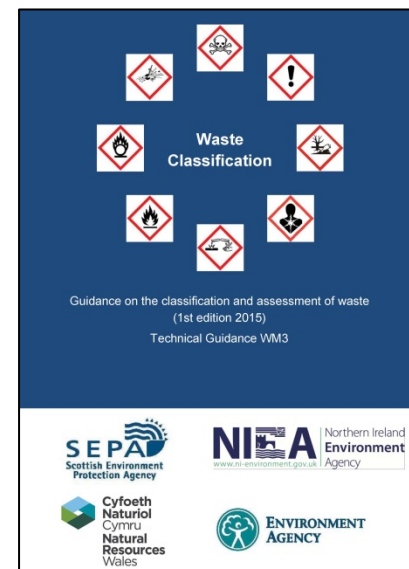
- Processing for suitability will require a permit
- Protection of human health paramount
- Suitability for use test
- Certainty of use
- Quantities necessary for proposed use
- Risk-based remediation strategy
- Robust Materials Management Plan



Waste Classification/Landfill Tax

- For waste, limited options for classification of asbestos-contaminated soil and C&D materials
- > 0.1% wt/wt free fibres = HazWaste
- Visible ACMs = HazWaste

- Strict rules for Qualifying Material for reduced rate Landfill Tax
- WM3 Waste Codes effectively exclude soil and C&D materials contaminated with visible ACMs from Qualifying Material
- No HazWaste permitted or waste mixed with HazWaste material
- 'Incidental amounts' of standard material (including asbestos?) only or Standard rate



Effectively applying guidance ‘on-site’

1. Ensure practical compliance with CAR; JIWG interpretation of HSE ACoP L143
2. Plan ahead: start with potential sources in buildings and controlled removal/validation
3. Keep asbestos out of the RA production/re-use loop wherever possible
4. For existing material on-site, robust desk study and SI; use CIRIA, JIWG, HSG 248
5. Detailed analysis pays dividends; SCA BBM/HSG 248
6. Analytical data; know what to ask for and assess fully
7. Risk assessment: consider both Human Health and CAR compliance for works; JIWG/SoBRA, CIRIA

Decision Support Tool: CAR2012 Work Categories

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Stage 1

Hazard Factors		Score
Select ACM type (run model for each type to generate 'Worst Case' output)	No visible ACMs but dispersed fibres/fibre bundles visible/identified	4
Original form/clearly identifiable products?	Not clearly identifiable as original form insulating boards, coatings, loose fill insulation, lagging	0
Extent of degradation of ACMs at outset of work	Disaggregated (dominated by loose fibres; extreme degradation in ACM and/or free asbestos fibres)	4
Amount of asbestos fibre in selected ACM/fibre type as % of host material	Trace quantities - <0.0001 to 0.001 %wt/wt	0
Asbestos fibre type	Amosite, tremolite, anthophyllite, with/without chrysotile	2
Sub-total		10
Hazard ranking		Low

Stage 1

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Select ACM type (run model for each type to generate 'Worst Case' output)	No visible ACMs but dispersed fibres/fibre bundles visible/identified	4
Original form/clearly identifiable products?	Not clearly identifiable as original form insulating boards, coatings, loose fill insulation, lagging	0
Extent of degradation of ACMs at outset of work	Disaggregated (dominated by loose fibres; extreme degradation in ACM and/or free asbestos fibres)	4
Amount of asbestos fibre in selected ACM/fibre type as % of host material	Trace quantities - <0.0001 to 0.001 %wt/wt	0
Asbestos fibre type	Trace quantities - <0.0001 to 0.001 %wt/wt	2
	Minor quantities - <0.001 to 0.01 %wt/wt	
	Small quantities - >0.01 to <0.05 %wt/wt	
	Significant quantities - >0.05 to <0.1 %wt/wt	10
	Large quantities - >0.1 %wt/wt	
Sub-total		10
Hazard ranking		Low

Decision Support Tool: CAR2012 Work Categories

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Stage 2

Exposure Factors

		Score
Occupational exposure period	> 2 hours in a 7 day period and Up to 10 hours in a day (e.g. full time occupational exposure)	4
Activity type and effect on deterioration of ACMs during work	Low intensity, no deterioration expected	0
Anticipated airborne fibre concentration	<0.1 fibres/ml or <0.4 fibres/ml (4 Hr TWA)	0
Best description of primary host material matrix	Made Ground - Recycled Aggregate, Track Ballast	4
Respirable fibre index for source material	Negligible	0
Sub-total		8

Exposure ranking

Low

Combined hazard and exposure ranking

18

Low

Stage 2

Exposure Factors

		Score
Occupational exposure period	> 2 hours in a 7 day period and Up to 10 hours in a day (e.g. full time occupational exposure)	4
Activity type and effect on deterioration of ACMs during work	< 1 hour in any week (e.g. very short term exposure event) Short, non-continuous work	0
Anticipated airborne fibre concentration	< 2 hours in a 7 day period (e.g. Short Duration Work)	0
Best description of primary host material matrix	> 2 hours in a 7 day period and Up to 10 hours in a day (e.g. full time occupational exposure)	4
Respirable fibre index for source material	Negligible	0
Sub-total		8

Exposure ranking

Low

Combined hazard and exposure ranking

18

Low

Decision Support Tool: CAR2012 Work Categories

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Stage 3

Risk Assessment Outputs

Probable Licensing Status	Non-Licensed Work
RPE*	EN149 type FFP3 disposable
Dust Suppression*	Manual/localised dust suppression
Hygiene/Welfare	Localised and basic personal decontamination facilities

*reduction in protection measures possible if natural mitigation factors are present (e.g. raining, wet ground)

- To be used in conjunction with detailed flow chart
- Accompanied by detailed user guide
- Must be backed by justification for use of parameter inputs

Thank you for listening...

...any questions?

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Asbestos in Soil and Construction & Demolition Materials