حكومة دبي
GOVERNMENT OF DUBAI

بلدية دبي
Dubai Municipality

# إدارة استراتيجية ومشاريع النفايات

# الدليل الإرشادي الفني لاستعمال الركام الناتج من معالجة رماد القاع الناتج من الحرق

# Waste Strategy and Projects Department

# Technical Guideline for The use of Incinerator Bottom Ash Aggregate (IBAA)

رقم الإصدار:
إدارة الاستراتيجية والتطوير المؤسسي
تاريخ الإصدار : شهر / سنة

| | | | | |
|---|---|---|---|---|
| عنوان الوثيقة | الدليل الإرشادي الفني لاستعمال الركام الناتج من معالجة رماد القاع الناتج عن حرق النفايات<br>Technical Guideline for the use of Incinerator Bottom Ash Aggregate (IBAA) | | | |
| اسم الإدارة | إدارة استراتيجية ومشاريع النفايات<br>Waste Strategy and Projects Department | | | |
| القطاع / المؤسسة | قسم دراسات واستراتيجية النفايات<br>Waste Studies and Strategies Section | | | |
| تصنيف الوثيقة | ¡ مشتركة-سرية | ¡ مشتركة-حساسة | ¤مشتركة-خصوصية | ¡ بيانات مفتوحة |
| رمز الوثيقة | DM-WSPD-WPDI-P01-IBAA | | | |
| رقم الإصدار | الإصدار الأول (x) | | | |
| تاريخ الإصدار | أكتوبر 2026 | | | |

| رقم الإصدار | التاريخ | المؤلف | التوقيع |
|---|---|---|---|
| 1.0 | 2026/10/06 | عمر علاء أبو حويج | |
| 1.0 | 2026/10/06 | مريم منصور الشحي | |
| 1.0 | 2026/10/06 | أحمد موسى الخاجة | |

مراجعة واعتماد الوثيقة

| رقم الإصدار | التاريخ | المراجعين | التوقيع |
|---|---|---|---|
| أدارة استراتيجية ومشاريع النفايات | | | |
| 1.0 | 2026/10/06 | عمار كامل محمد سعيد | |
| 1.0 | 2026/10/06 | وفاء حنون | |
| 1.0 | 2026/10/06 | عماد جمعة محمد | |

| رقم الإصدار | التاريخ | المعتمدين | التوقيع |
|---|---|---|---|
| 1.0 | 2026/10/06 | محمد أحمد الريس<br>مدير إدارة استراتيجية ومشاريع النفايات | |

تعتبر هذه الوثيقة ملكا لبلدية دبي ويمكن أن تحتوي على معلومات قد توصف بالسرية والخصوصية لعمل البلدية. يمنع نسخ أو تصوير أو نقل البيانات والمعلومات الواردة في هذه الوثيقة أو أي جزء منها بأي وسيلة كانت يدوية أو إلكترونية بدون الحصول على إذن رسمي مسبق من بلدية دبي.
النسخة الرسمية المعتمدة من هذه الوثيقة هي فقط الموجودة إلكترونيا على نظام بلدية دبي. يجب التحقق من رقم الإصدار وتاريخ الإصدار قبل الاستخدام.
النسخ المطبوعة تعتبر غير رسمية وغير مضبوطة ضمن نظام الإدارة المتكامل.

## سجل الإصدارات والتعديلات على الوثيقة

أي تعديل للوثيقة يجب أن يراجع ويوافق عليه حسب سياسات وإجراءات ضبط الوثائق والسجلات المعتمدة.

| رقم الإصدار | التاريخ | فريق الإعداد/ المراجعة | ملخص التعديلات |
|---|---|---|---|
| 1 | 2026-10-06 | **إدارة استراتيجية ومشاريع النفايات** | / |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# Table of Contents


| TOPIC | PAGE |
|---|---|
| **1. Introduction** | 6 |
| 1.1 Preface | 6 |
| 1.2 Energy from MSW (EfW) | 6 |
| 1.3 Incinerator Bottom Ash (IBA) | 6 |
| 1.4 Incinerator Bottom Ash Aggregates (IBAA) | 7 |
| **2. Purpose** | 8 |
| **3. Objectives** | 9 |
| **4. Legislation** | 9 |
| **5. Status and Application of this Technical Guideline** | 9 |
| 5.1 Scope of this Technical Guideline | 9 |
| 5.2 Stakeholders | 9 |
| 5.3 Stakeholder Engagement | 10 |
| **6. Glossary of Terms and Definitions** | 11 |
| **7. IBAA Acceptance and Approved Certification** | 13 |
| 7.1 IBAA Acceptance | 13 |
| 7.2 Approved Certification | 13 |
| **8. IBAA Delivery Conformance** | 14 |
| 8.1 Audit Requirement | 14 |
| **Annexes** | 14 |
| Annex A – IBA and IBAA Processing | 15 |
| Annex B – Approved Certification | 16 |
| Annex C – IBAA Criteria for Approved Use | 17 |
| Annex D – IBAA Testing Requirements and Reporting Requirements | 24 |
| Annex E – Approved Testing Facilities | 32 |
| Annex F – Reporting and Data Management | 32 |
| Annex G – Material Safety Data Sheet | 35 |
| Annex H – Training Requirements for IBAA Handlers | 44 |
| Annex I – Relevant Legislation | 47 |
| **Appendix 1 – General Bulk Fill** | 57 |
| **Appendix 2 – Land Reclamation** | 64 |
| **Appendix 3 – Non-Structural Concrete** | 69 |
| **Appendix 4 – Pipe Bedding** | 77 |
| **Appendix 5 – Granular Sub-Base** | 82 |

# List of Tables


| TABLE | PAGE |
|---|---|
| Table 1: Glossary of Terms and Definitions | 11 |
| Table 2: IBAA Enquiry and Assessment Form | 16 |
| Table 3: Typical Mechanical Properties of IBAA | 17 |
| Table 4: Compliance Requirements for Concrete Products | 19 |
| Table 5: Compliance Requirements for Bulk Fill | 19 |
| Table 6: Compliance Requirements for Sub-Base | 20 |
| Table 7: Grading Requirements for Pipe Bedding | 20 |
| Table 8: Compliance Requirements for Land Reclamation | 21 |
| Table 9: Sub-Base Grading Requirements for Land Reclamation | 23 |
| Table 10: Fill Material Grading Requirements for Land Reclamation | 23 |
| Table 11: IBAA Chemical Testing Suite | 24 |
| Table 12: IBAA Mechanical Testing Suite | 29 |
| Table 13: Audit Procedure and Responsibilities | 32 |
| Table 14: IBAA Ingredient Composition | 37 |
| Table 15: Workplace Exposure Standards | 40 |
| Table 16: SDS Review Record | 44 |
| Table 17: SDS Revision History | 44 |
| Table 18: Training Procedure and Responsibilities | 44 |
| Table 19: Training Requirements Revision History | 46 |
| Table 20: Relevant Local Laws, Regulations and Guidance | 47 |
| Table 21: Grading Listing | 60 |
| Table 22: Application Limits | 61 |
| Table 23: IBAA Test –Dubai Standards for general fill applications | 62 |
| Table 24: Sieve passing for general fill applications | 63 |
| Table 25: IBAA Test – Dubai Standards for land reclamation applications | 67 |
| Table 26: Sieve passing for land reclamation applications | 68 |
| Table 27: Application Limits | 72 |
| Table 28: Dubai Standards for Non-Structural Concrete applications, Pre-Treatment Testing | 73 |
| Table 29: Dubai Standards for Non-Structural Concrete applications, Post-Treatment Testing | 74 |
| Table 30: Distance from water body | 81 |
| Table 31: Application Limits | 81 |
| Table 32: IBAA Grading Listing | 82 |
| Table 33: Grading Listing | 86 |
| Table 34: Application Limits | 87 |
| Table 35: IBAA Test –Dubai Standards Testing for Granular Subbase applications | 88 |


# List of Figures


| FIGURE | PAGE |
|---|---|
| Figure 1: IBA and IBAA Processing | 7 |
| Figure 2: IBAA used as road sub-base | 8 |
| Figure 3: IBAA used as a capping layer on a development site | 8 |
| Figure 4: IBA and IBAA processing and approval workflow | 15 |
| Figure 5: Aggregate for Bulk Fill | 59 |
| Figure 6: Aggregate stockpile | 59 |
| Figure 7: Semakau Landfill, Singapore | 65 |
| Figure 8: Aggregate for Land Reclamation | 65 |
| Figure 9: aggregate stockpile and Land Reclamation example | 66 |

| FIGURE | PAGE |
|---|---|
| **Figure 10: Aggregate stockpile and Land Reclamation example** | 66 |
| **Figure 11: IBAA in construction of concrete road dividers** | 70 |
| **Figure 12: IBAA in construction of subterranean backing blocks and pavers** | 70 |
| **Figure 13: Examples of Concrete Products manufactured with IBAA product** | 71 |
| **Figure 14: Cross Section of typical pipe bedding: IBAA product utilised as bedding and backfill** | 78 |
| **Figure 15: IBAA product used in pipe bedding and backfill** | 79 |
| **Figure 16: Typical pipe bedding and backfill** | 79 |
| **Figure 17: Cross Section of Road Structure: IBAA product utilised as Sub-Base** | 84 |
| **Figure 18: IBAA product used in road construction** | 85 |
| **Figure 19: IBAA product as Sub-base material** | 85 |

# 1. Introduction

## 1.1 Preface

As the IBAA derived and produced may be regarded as new, this Technical Guideline takes a conservative approach to its use, critically the specification of IBAA for each Approved Use, and the actual application for each Approved Use on a case-by-case basis by the use of Approved Certification. This Technical Guideline has been prepared to ensure that each Stakeholder takes a responsible path with respect to the undertaking of each Relevant Activity, and coordinates with each other Stakeholder at appropriate interfaces. Compliance with the laws and regulations of the Emirate of Dubai will be achieved, as will world best practice.

The checks and balances in relation to the processing of IBA and IBAA, including the undertaking of any Relevant Activity in the Emirate of Dubai is illustrated in **Annex A**.

This Technical Guideline recognizes the role of derivation and production of IBAA from IBA to support the development of a truly 'circular economy' and other social benefits within the Emirate of Dubai. The use of IBAA will ensure that there is more than one lifecycle for products used in our everyday lives and this has been done in established markets globally.

In addition, landfills generate landfill gas (primarily a mixture of carbon dioxide and methane) as organic matter in municipal solid waste (MSW) decomposes. Because both are greenhouse gases (GHGs), their release into the atmosphere exacerbates climate change. The use of IBAA reduces the need for landfill disposal of IBA, yielding significant social and environmental benefits for local communities without posing a risk of harm to human health. Energy from MSW (EfW)

EfW facilities treat MSW to reduce the volume of the MSW and avoid the need for disposal of up to 80%, by mass, of MSW to landfill (noting that a residual mass will need to be disposed of to landfill). EfW facilities convert MSW into useful energy (electrical and heat) with IBA remaining. The IBA can be processed and treated to derive Metals and IBAA.

The EfW facility in the Emirate of Dubai was designed to meet 'best available technology' standards. Consequently, it represents state-of-the-art technology for combustion and emissions control.

## 1.2 Incinerator Bottom Ash (IBA)

IBA is an interim material that requires further processing and treatment to recover Metals and to derive IBAA.

The IBA arising from the combustion of MSW will largely contain of residual non-combustibles (for example, bricks and concrete, ceramics and porcelain, glass and sand, rock and stone). The IBA also contains trace amounts of Metals. After the recovery of Metals from IBA, the remaining material is processed to produce an aggregate, IBAA. Currently, IBAA can be used in civil and construction related activities.

IBA, in an untreated, freshly quenched form, cannot be used. Without processing and treatment, IBA must be disposed of to an appropriately classified landfill.

Facilities processing IBA may be within the same premises as the EfW facility or at standalone sites, for example.

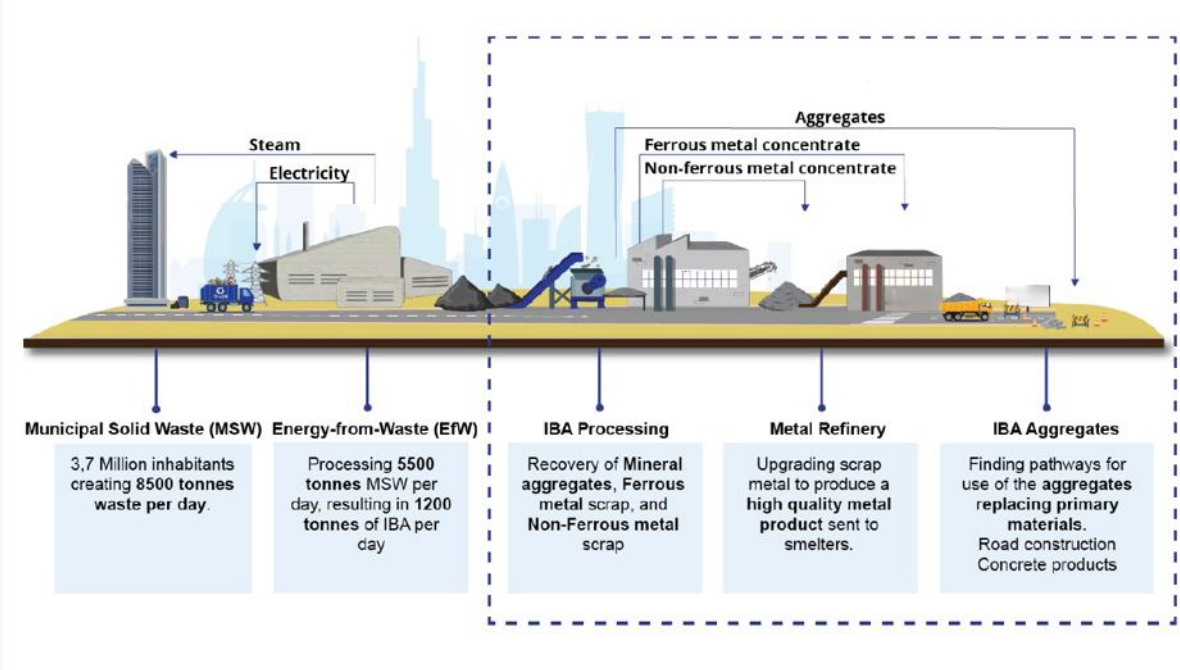



*Figure 1: IBA and IBAA Processing*

1.3 Incinerator Bottom Ash Aggregates (IBAA)

Approximately one quarter of MSW processed through an EfW facility is residual material after combustion of the MSW.

For each 1,000 tonnes of MSW combusted, the following residual material arise, and are recovered:

- 200 tonnes of IBA;
- 180 tonnes of IBAA - replacing natural aggregate in construction; and
- 20 tonnes of Metals.

Typically, Metals are sold, and other IBAA is used for civil and construction activities. For over 40 years or so, IBAA has been used in civil and construction activities, including as sub-base and as capping layers on development sites. In the United Kingdom, IBAA it has been used in the following projects:

- M25 Motorway widening – used at several sections (about 70,000 tonnes);
- M6 Motorway Toll Road (about 30,000 tonnes);
- Olympic development sites (more than 100,000 tonnes);
- Docklands Light Rail (about 15,000 tonnes);
- London Gateway Port (more than 100,000 tonnes); and

- Heathrow Terminal 5 (about 5,000 tonnes).

**Figure 2 and Figure 3 provide images of where IBAA has been used.**




*Figure 2: IBAA used as road sub-base*




*Figure 3: IBAA used as a capping layer on a development site*

## 2. Purpose

The purpose of this Technical Guideline is to establish a consistent framework for the safe, environmentally responsible and technically compliant production, certification, supply and use of incinerator bottom ash aggregate (IBAA) in the Emirate of Dubai.

## 3. Objectives

This Technical Guideline defines stakeholder responsibilities; establishes acceptance, testing, certification and reporting requirements; identifies approved uses and application limits; and supports circular-economy outcomes while protecting human health, safety and the environment.

## 4. Legislation

| The relevant provisions of the following laws and regulations were used as guidance and references in the preparation of this technical guideline |
|---|
| The Director General of the Dubai Municipality, After perusal of: |
| • Decree No. (45) of 2021 Concerning the Dubai Building Code. |
| • Decree No. (34) of 2022 Establishing the Agencies Affiliated to the Dubai Municipality and Determining their Functions. |
| • The Order of 1961 Establishing the Dubai Municipality. |
| • Local Order No. (89) of 1994 Regulating the Engineering Consultancy Profession in the Emirate of Dubai and its amendments. |
| • Local Order No. (3) of 1999 Regulating Construction Works in the Emirate of Dubai and its amendments. |
| • Administrative Resolution No. (32) of 2006 Forming the Committee for Registration and Licensing of Engineering Consultants and Contractors in the Emirate of Dubai and its amendments; and |
| • Administrative Resolution No. (308) of 2021 Approving the Dubai Building Code |

## 5. Status and Application of this Technical Guideline

5.1 Scope of this Technical Guideline

This Technical Guideline applies to any activity undertaken in relation to the use of any IBAA that has been derived or produced at any IBAA Source, including to the use of IBAA to produce any Blended Product (Relevant Activity).

5.2 Stakeholders

This Technical Guideline is binding on each Stakeholder. Any Stakeholder who wishes to undertake any Relevant Activity must undertake that Relevant Activity in accordance with the Resolution, this Technical Guideline, any license / permit and any other applicable law in the Emirate of Dubai.

In addition, each Stakeholder must undertake due diligence to ensure that each other Stakeholder with which it interfaces, and transacts is complying with its obligations under this Technical Guideline. For these purposes, each Stakeholder will warrant to each other Stakeholder compliance and provide information to allow confirmation of the warranty.

Each Stakeholder recognizes and acknowledges that this Technical Guideline may be updated and amended at any time and that any reference to “Code of Conduct” is a reference to this Technical Guideline as may be amended from time to time.

In any event, this Technical Guideline will be reviewed every five (5) years to align with international best practice and standards that are appropriate and to ensure that this Technical Guideline remains consistent with and reflects the requirements of any Applicable Law in the Emirate of Dubai, including the Resolution, and the broader objectives of the Emirate of Dubai.

If any update or amendment is contemplated, it will be announced on dedicated channels.

5.3 Stakeholder Engagement

While it is ultimately the responsibility of each IBAA User to ensure compliance with any applicable law with respect to the use of any IBAA, each IBAA Supplier and IBAA Producer must provide information to demonstrate that any IBAA is compliant with any applicable law, including the Resolution and this Technical Guideline, and to facilitate the Approved Certification process.

The successful application of this Technical Guideline requires all Stakeholders to have interactive engagement with one another.

Specifically, this engagement shall require the recognition of the following interactions:

- Enquiry to use/purchase IBAA – IBAA User;

- Initial assessment on where and how any IBAA is to be used and confirm that the proposed use is in line with this Technical Guideline – IBAA User and IBAA Supplier;
- Preparation of the application evidence: quantity, location, application, use – IBAA User;
- Evidential review of the planned application – IBAA Supplier;
- Acceptance of use signed off by both parties – IBAA Supplier and IBAA User;
- Sale agreement and transaction completed – IBAA Supplier and IBAA User; and
- Confirmation of application to IBAA Supplier – IBAA User.

**Annex B** sets out further details of the Approved Certification processes and requirements and the interfaces required to obtain any Approved Certification.

## 6. Glossary of Terms and Definitions

*Table 1: Glossary of Terms and Definitions*

| Text | Acronym | Definition |
|---|---|---|
| **Administrator** | | Means the administrator of this Code of Practice, being Dubai municipality and any other authorized entity approved by DM |
| **Approved Certificate** | | Means any certificate that the Administrator may issue pursuant to an Approved Certification. |
| **Approved Uses** | | Means any approved use as specified in this Technical Guideline from time to time including:<br>(A) subbase for pavement construction, including carriageways, footpaths, carparks and cycleways;<br>(B) hard / road shoulders and central reservations;<br>(C) fill for embankments;<br>(D) aggregate for concrete that is not reinforced;<br>(E) non-structural works in construction and landscaping, including for the purposes of bulk fill, pipe bedding, reclamation and rehabilitation; and<br>(F) the production of any Blended Product using IBAA, for any of the above uses. |
| **Blended Product** | | Means any product produced with IBAA blended with other natural and recycled aggregates to meet any geotechnical specification. |
| **Energy from MSW** | EfW | The process of recovering energy from MSW through an incineration process to reduce the volume of the MSW and avoid the need for landfill disposal, during which process IBA will be produced. |
| **Greenhouse Gas** | GHG | means any gaseous constituents of the atmosphere that absorb and re-emit infrared radiation and their precursors, including carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride ($SF_6$), nitrogen trifluoride ($NF_3$). |
| **IBAA Source** | | Means any facility designed and constructed for the purpose of EfW in the Emirate of Dubai. |
| **IBAA Producer** | | Means any person licensed/permitted to process any IBA to derive and produce any IBAA. |
| **IBAA Supplier** | | Means any person licensed/permitted to supply any IBAA for any Approved Use in accordance with this Technical Guideline and the applicable Approved Certificate. |
| **IBAA User** | | Means any person licensed/permitted to use any IBAA for any Approved Use in accordance with this Technical Guideline and the applicable Approved Certificate. |
| **IBAA Use Site** | | Means any facility that uses any IBAA for any Approved Use in accordance with this Technical Guideline and the applicable Approved Certificate. |

| Text | Acronym | Definition |
|---|---|---|
| **Land Reclamation** | | Means the process of transforming waterlogged, coastal, or unusable areas into land suitable for development, agriculture, or other uses. |
| **Globally Harmonized System of Classification and Labelling of Chemicals** | GHS | An internationally harmonized system for classifying chemical hazards and communicating hazard information through labels and safety data sheets. |
| **Incinerator Bottom Ash** | IBA | The residue is a product of an industrial process and subjected to high temperatures (+ 850°C) is dusty (when dry) and highly alkaline. It contains pieces of metal, glass, porcelain, brick, stone, sand, plus slag and ash, which do not present a hazard when handled properly. |
| **Incinerator Bottom Ash Aggregate** | IBAA | IBAA is a product of an industrial combustion process and is produced from the mechanical treatment and stabilization of IBA. It will contain small pieces of metal, glass, aggregate and silica. |
| **Metals** | | Means any ferrous metal and non-ferrous metal derived from IBA. |
| **Municipal Solid Waste** | MSW | Has the meaning given in the Resolution. |
| **Person** | | When used to refer to an IBAA Producer, IBAA Supplier, IBAA User or a person that undertakes any Relevant Activity, means a company incorporated in the Emirate of Dubai. |
| **Stakeholder** | | Means any IBAA Producer, IBAA Supplier, IBAA User or any person that undertakes any Relevant Activity. |
| **Value Chain Working Group** | | Means the coordination with participants in the IBAA value chain with a view to developing the market for IBAA. |

## 7. IBAA Acceptance and Approved Certification

As the IBAA may be derived from a mixed source, the following steps through the production lifecycle will validate the suitability of any IBAA for the use of that IBAA for Approved Use.

7.1 IBAA Acceptance

To ensure that only suitable IBAA is produced for any Approved Use, IBAA criteria for each grade of IBAA planned to be produced for each Approved Use (**IBAA Criteria**) must be satisfied before the IBAA is applied to any Approved Use, as well as the satisfaction of a IBAA sampling and testing regime to ensure that the IBAA specification is as required (**IBAA Testing Requirements**).

The IBAA Criteria will incorporate all regulatory requirements relating to IBAA. These requirements include all of those arising from approvals and exemptions (if any).

**Annex C** sets out the IBAA Criteria for each Approved Use.

**Annex D** sets out the IBAA Testing Requirements and requirements on digital self-reporting.

**Annex E** sets out the approved testing facilities at which the IBAA Testing Requirements can be verified.

7.2 Approved Certification

In relation to any proposed use (which must be an Approved Use) of any IBAA, before it is used, information needs to be provided to the Administrator of this Technical Guideline, in relation to the actual use of the IBAA.

As soon as practicable, following provision of the required information, the Administrator will undertake Approved Certification on the basis of the applicable standards and procedures as set out under **Annex B**.

If an Approved Certification is issued by the Administrator, the IBAA proposed to be used must only be used in accordance with the conditions as set out in the Approved Certificate.

## 8. IBAA Delivery Conformance

8.1 Audit Requirement

To demonstrate compliance with this Technical Guideline and any Approved Certificate issued, each Stakeholder must have in place a documented management system, which incorporates operational procedures that address the requirements and applicable standards provided in this Technical Guideline and any Approved Certificate issued. These documents will be checked by DM personnel regularly to ensure management system needs to allow for the effective management of Relevant Activities on the IBAA Use Site , and satisfactorily address any significant risks as required to be addressed under any Approved Certificate and this Technical Guideline. It is required that the management system be formally documented and include the provision of training and any site-specific induction practices necessary to meet the requirements as set out in this Technical Guideline and any Approved Certificate issued. Other Requirements

**Annex G** sets out human health and safety equipment and procedures for the handling of IBAA including procedures during adverse weather conditions.

**Annex H** sets out training requirements for persons who handle IBAA.

## Annexes

## Annex A IBA and IBAA Processing

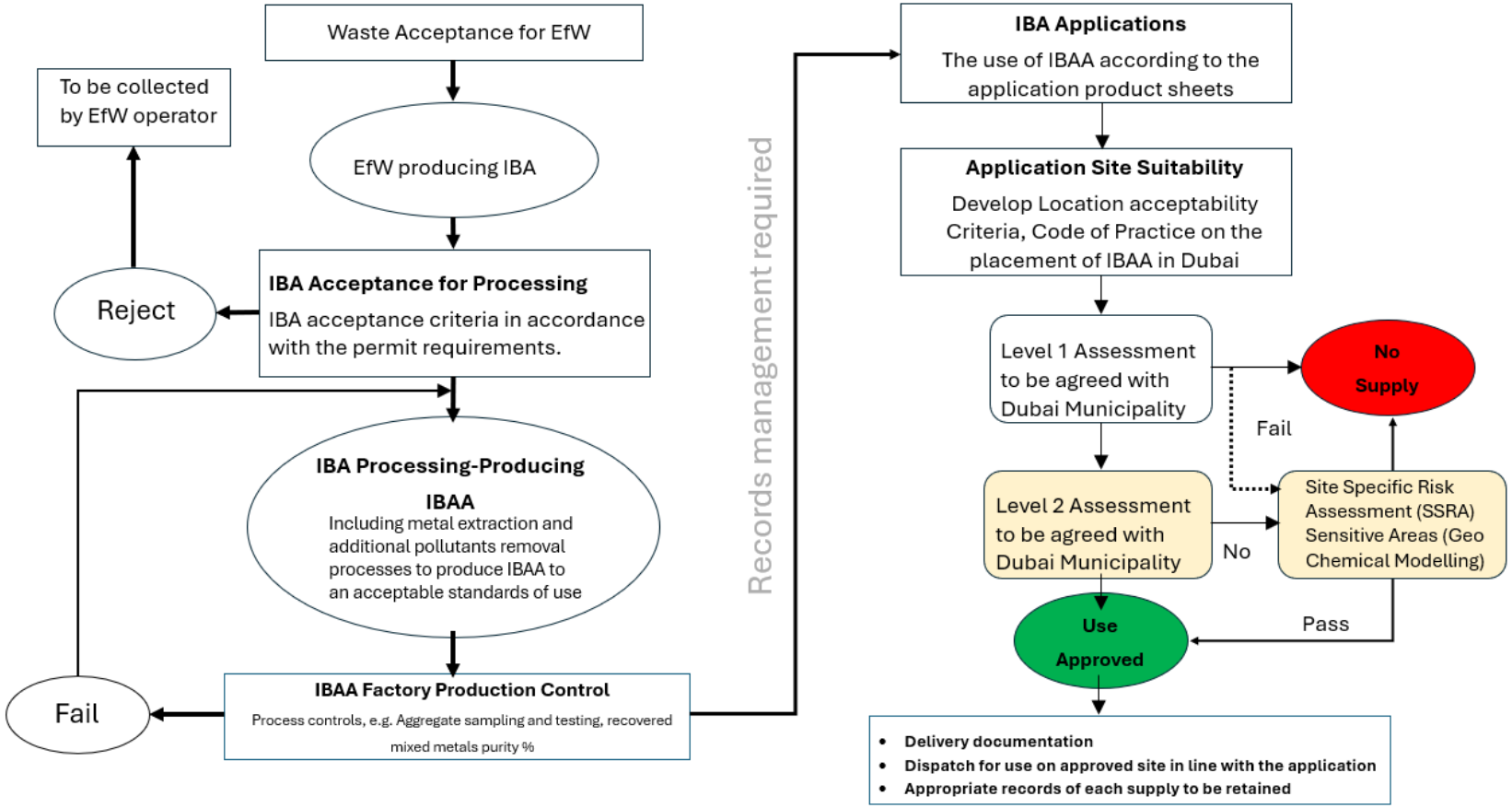



*Figure 4: IBA and IBAA processing and approval workflow*

## Annex B Approved Certification

**Manual Enquiry Form**

*** all information detailed on here is required unless marked as 'optional' – enquiries will not be looked at unless all required information is completed ***

*Table 2: IBAA Enquiry and Assessment Form*

| | |
|---|---|
| **Enquiry Type** (Delete as Applicable) | Quotation / Order to Place / Additional Tonnage |
| Pre-existing CRM Ref (If Additional Tonnage) | |
| Internal reference number (if new enquiry) | |
| **Sales Contact** | |

| | |
|---|---|
| **Company Name** | |

**Site Location**

| | |
|---|---|
| Site Address 1 | |
| Site Address 2 | |
| Site Town/City | |
| Site County | |
| Site Postcode | |
| Local Authority | |
| ABI Ref (Optional) | |
| Internal Notes (Optional) | |
| Start Date | |

**Enquiry** **Assessments only**

| | | | |
|---|---|---|---|
| Dispatch Site | | Approval/Rejection | Risk level |

| | | | |
|---|---|---|---|
| Material 1 | | | |
| Application | | | |
| Sub Application | | Reject Reason | |
| Volume | | | |
| Blending Permit Required | | | |

| | | | |
|---|---|---|---|
| Dispatch Site | | Approval/Rejection | Risk level |
| Material 1 | | | |
| Application | | | |
| Sub Application | | Reject Reason | |
| Volume | | | |
| Blending Permit Required | | | |

| | | | |
|---|---|---|---|
| Dispatch Site | | Approval/Rejection | Risk level |
| Material 1 | | | |
| Application | | | |
| Sub Application | | Reject Reason | |
| Volume | | | |
| Blending Permit Required | | | |

## Annex C IBAA Criteria for Approved Use

### Typical Mechanical Properties of IBAA

*Table 3: Typical Mechanical Properties of IBAA*

| Parameter | Units | Typical Range |
|---|---|---|
| Liquid limit | % | 10% - 15% |
| Plasticity index | % | Non-Plastic |
| Los Angeles Abrasion | % | 30 |
| Linear Shrinkage | % | 2.5 – 2.9 |
| Magnesium Sulphate Soundness | % | 5 - 10 |
| Organic Matter Content | % | Less than 0.2% |
| Acid soluble chloride | % | 0.19 - 0.5 |
| Acid soluble sulphate (SO3) | % | 0.5 |
| Water soluble sulphate | mg/l | 400 - 900 |
| pH | | 8 – 10 |
| CBR | % | 80 |

**Mechanical Properties of IBAA**

The following tables are showing the compliance tests for different product categories for the application of IBAA. These product specifications are retrieved from the “Standard Specifications for the Construction of Roads and Bridges in Dubai Emirates” document provided by RTA. The land Reclamation specifications are provided by DP World. No rights can be derived from the information stated in this Annex C. For the correctness or possible changes in the product specifications reference is made to the “Standard Specifications for the Construction of Roads and Bridges in Dubai Emirates” to be provided By Relevant Authorities.

**Bulk Fill**

*Table 5: Compliance Requirements for Bulk Fill*

| TEST | Dubai RTA Standard | Dubai RTA Limits |
|---|---|---|
| Grading (PSD) | BS 1377: Part 2 1990 Clause 9.2 or 9.3, AMD 9027: 1996 | N.A. |
| Liquid Limit | BS 1377 Part 2: 1990 Test 4.5 and AMD 9027-1996 | 40% max |
| Plasticity Index | BS 1377 Part 2: 1990 Test 5.4, AMD 9027-1996 | 6% max |
| Linear Shrinkage | BS 1377 Part 2: 1990 Method 6.5, AMD 9027-1997 | 3% max |
| Soaked CBR | BS 1377 Part 4: 1990 Test 7, AMD8259:1995& AMD 13925-2002 | 15% min |
| Free Swell | BS EN 1377 Part 5: 1990, AMD 8260: 1994 | 1.5% max |
| Organic Matter Content | BS 1377 Part 3: 1990 Method 3, AMD 9028-1996 | 2% max |
| Acid Soluble Chloride | BS 1377:P3 1990 M7.3, AMD 9028:1996 | 2% max |
| Acid Soluble Sulphate | BS 1377:P3 1990 M5.5, AMD 9028:1996 | 2% max |
| Water Soluble Chloride | BS 1377:P3 1990 M7.2, AMD 9028:1996 | 5% max |
| Water Soluble Sulphate | BS 1377:P3 1990 M5.5, AMD 9028:1996 | 5% max |
| pH | BS 1377:P3 1990 M9, AMD 9028:1996 | 7 - 9 |

**Sub Base**

*Table 6: Compliance Requirements for Sub-Base*

| TEST | Dubai Standard | Dubai RTA Limits |
|---|---|---|
| Liquid Limit | BS 1377 Part 2: 1990 Test 4.5 and AMD 9027-1996 | 35% max |
| Plasticity Index | BS 1377 Part 2: 1990 Test 5.4, AMD 9027-1996 | 6% max |
| Sand Equivalent Value | ASTM D-2419-2009 | 25% min |
| Los Angeles Abrasion | ASTM C131-2006 or ASTM C535-2009 | 30% max |
| Linear Shrinkage | BS 1377 Part 2: 1990 Method 6.5, AMD 9027-1997 | 3% max |
| Soundness | ASTM C88-2013 | Coarse = 12% max |
| | | Fine = 10% max |
| Organic Matter Content | BS 1377 Part 3: 1990 Method 3, AMD 9028-1996 | 0.2% maximum |
| Acid Soluble Chloride | BS 812: 1988: Part 117 | 1% maximum |

| | | |
|---|---|---|
| Acid Soluble Sulphate | BS EN 1744-1:1998 | 0.5% maximum |
| Soaked CBR | BS 1377 Part 4: 1990 Test 7, AMD 8259:1995 & AMD 13925-2002 | 30% minimum |

**Pipe Bedding**

*Table 7: Grading Requirements for Pipe Bedding*

| Standard | BS EN 933-1 and BS 1377 part 2 method 9.2 or 9.3:1990, AMD 9027:1996 | |
|---|---|---|
| **Sieve (mm)** | **Min % Passing** | **Max % Passing** |
| 4.75 | 100 | 100 |
| 2 | 66 | 92 |
| 0.0425 | 30 | 50 |
| 0.015 | 12 | 28 |
| 0.075 | 5 | 15 |

**Land Reclamation**

*Table 8: Compliance Requirements for Land Reclamation*

| TEST | Dubai Standard | Dubai DP World Limits |
|---|---|---|
| Water Absorption | EN 1097-6:2013 | 7.50% |
| Bulk Density | EN 1097-3 | < 2.0 Mg/m3 |
| Angle of Shearing Resistance | BS 1377-7:1990 | < 37 deg |
| Clay Content | Not specified | 1% |
| General classification and standards | BS6349-5, ISO 14688 and BS 1377-3. | Clean, hard, dense, durable material |
| Organic matter | BS 1377 Part 3: 1990 Method 3, AMD 9028-1996 | 2% max |
| Liquid Limit | BS 1377 Part 2: 1990 Test 4.5 and AMD 9027-1996 | 35% max |
| Plasticity Index | BS 1377 Part 2: 1990 Test 5.4, AMD 9027-1996 | < 6% |

| | | |
|---|---|---|
| Minimum Soaked CBR content | BS 1377 Part 4: 1990 Test 7, AMD8259:1995& AMD 13925-2002 | 10% min |
| Gypsum and other salts | Not specified | 2% max |
| Acid Soluble Sulphate | BS 1377:P3 1990 M5.5, AMD 9028:1996 | 0.6w% max |
| Acid Soluble Chloride | BS 1377:P3 1990 M7.3, AMD 9028:1996 | 0.6w% max |
| Shell content | Not specified | 0.1 max |
| Permeability after ground improvement (compaction) | Not specified | <= 1x10-5 m/s. |

*Table 9: Sub-Base Grading Requirements for Land Reclamation*

| Grading for subbase in land reclamation | | |
|---|---|---|
| **Standard** | **BS 1377-2:2022 CL10 / ISO 17892-4:2016 CL 4.2 & 5.2** | |
| **Sieve (mm)** | **Min % Passing** | **Max % Passing** |
| 300 | | 100 |
| 125 | 95 | 100 |
| 0.063 | 0 | 10-12 |

*Table 10: Fill Material Grading Requirements for Land Reclamation*

| Grading for Fill Material Land Reclamation | | |
|---|---|---|
| **Cumulative % passing** | **Lower bound (mm)** | **Upper bound (mm)** |
| 0% | 0.02 | 0.15 |
| 10% | 0.063 | 0.5 |
| 15% | 0.075 | 0.9 |
| 50% | 0.27 | 0 |
| 60% | 0.38 | 15 |
| 85% | 0.75 | 45 |
| 90% | 0.9 | 60 |
| 95% | 1.2 | 90 |
| 100% | 2 | 150 |

## Annex D IBAA Testing Requirements and Reporting Requirements

**TESTING - MECHANICAL**

*Table 12: IBAA Mechanical Testing Suite*

| IBAA - Testing Suite | | | | | | |
|---|---|---|---|---|---|---|
| **No** | **Test Name** | | | | | |
| | | **Material Size** | **Comments/Reason for Testing** | **Test Availability** | **Test Method Available** | **Comments** |
| 1 | 1744-1 - Sulphates & pH (WSS SO4, mg/L) | Fines, Type 1 | To test for sulphate/sulphide content and impact on metals and concrete. | YES | BS 1377-3 : 2018+A1 2021 cl. 7.3 & BS 1377-3 : 2018+A1 2021 cl. 12 | |
| 2 | Asbestos | | Detection of any asbestos particles - 0%. | YES | GC-01 | |
| 3 | Bulk Density - Rodded & Loose - BS EN 1097-3 | Coarse, Fines, Type 1 | Self | Yes | ASTM C29/C29M-17a, Method A & C | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | Dust Suppression Water - Microbial | Dust Suppression Water | E.Coli, Listeria, Salmonella, Total Coliforms, Legionella. | Yes | 1-Total Coliforms & E.coli by IDEXX<br>2- Legionella by {ISO11731:2017}<br>3- Salmonella {ISO 19250-2010} by VIDAS,& FDA BAM.<br>4- Listeria.spp ISO 11290-1. | |
| 6 | Grading (PSD) - BS EN 933-1 | Type 1 | Particle Size Distribution - size grading. | Yes | BS EN 933-1:2012 BS-1377 PT-2 | |
| 7 | Supplier Declared Grading - BS EN 933-1 | Type 1 | Requirement for Type 1 sub-base. | Yes | BS EN 933-1:2012 | |
| 8 | Moisture Content - BS EN 1097-5 | Type 1 | Carried out with PSD test. | Yes | BS-1377 PT-2 | |
| 9 | Leachate Analysis - BS 12457-3 (MIBAAA) | Coarse, Fines | Stricter test than 1744 Leachates. (used for geochemical modelling) | Yes | BS 12457-3 | |
| 10 | Leachate Analysis - BS EN 1744 | Type 1 | Measures chemical properties in aggregates. | Yes | BS EN 1744 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 11 | Los Angeles Abrasion - BS EN 1097-2 (-14mm+10mm) | Type 1 | Durability (Attrition) | Yes | ASTM C131/C131M.20 | Available by ASTM C131/C131M-20 (-12.5+9.5) |
| 12 | Loss on Ignition - EN 1744 | Type 1 | Organic content | Yes | BS 1377-3 : 2018+A1 2021 cl. 4 | |
| 13 | Magnesium Sulphate Soundness - BS EN 1367-2 | Type 1 | Durability over life. | Yes | ASTM C88 -18 | |
| 14 | Microbiology | Fines | E.Coli, Listeria, Salmonella. | Yes | 1- E.coli FDA BAM. 2- Salmonella {ISO 19250-2010} by VIDAS,& FDA BAM. 3- Listeria.spp ISO 11290-1. | |
| 16 | Particle Density & Water Absorption - BS EN 1097-6 | Type 1 | Water absorption before run off. | Yes | BS 1377 PART 2 1990 CL 8.4 | |
| 18 | Plasticity Limit | Type 1 | Whether a material is plastic (clay content) | Yes | BS 1377-32 1990 cl 5.3 AMD 9027 1996 | |
| 21 | Vibrating Hammer - BS EN 13286-4 | Fines, Type 1 | Compacted density of IBAA. | Yes | BS 1377-4 1990 cl 3.7 AMD 13925 2002 | |

## Annex E Approved Testing Facilities

The following laboratory can perform the required test work regarding IBAA applications, amongst other tests. The laboratory was audited for compliance for IBAA testing.

**Dubai Central Laboratory**

Umm Hurair Road - Al Karama – Dubai, UAE

PO Box 67

Tel: (+971 4) 3027216

Contact person:

Email: labs@dm.gov.ae

Website: http://www.dm.gov.ae

**Note: Any other laboratories approved by DM**

## Annex F Reporting and Data Management

### REPORTING AND DATA MANAGEMENT

*Table 13: Audit Procedure and Responsibilities*

| | |
|---|---|
| **1. Purpose** | Compliance with the Technical Guideline to ensure clear instructions are in place for reporting and data management being fully auditable in dealing with IBAA. |
| **2. Scope** | Covers the applicable use and location of IBAA material, capturing the initial enquiry, user, timing, source, application, volume, category, source pathway receptor assessment. |
| **3.** | Responsibility |
| Role | Responsibility |
| Managing Director | Accountable. This is the single person who has overall decision-making authority and who is accountable for this procedure |
| Site Manager | Responsible: The site manager is responsible for implementing (or doing) what is stated in the procedure i.e. ensuring that data collection processes are in place and data is recorded and reported are required. |
| **4. Definitions** | Competent Person: Person who has acquired, through education, training, qualification or experience, or a combination of these, the knowledge and skills to perform the task required.<br><br>Management System: The way in which an organization manages the interrelated parts of its business in order to achieve its business objectives |
| **5. Procedure** | **Application Enquiry**<br><br>To meet the requirements of the IBAA Technical Guideline the pending IBAA User must certify that the material can be used for an applicable application and the location of use is safe for humans and the environment.<br><br>**Recording**<br><br>Management system must be established to record application enquiry, user, timing, source, application, volume, and category. An assessment of the IBAA Site is to be determine use of IBAA material in the determined location. Acceptance or rejection of use shall be determined, advised and recorded in the management system. |

| | |
|---|---|
| | . |

**Audit Procedure**

| | |
|---|---|
| Owner/Authorizer: | |
| Description Revision: | Two-yearly Review |

The following procedure defines the frequency and strategy behind the auditing procedure of [Enter Name] Management Systems. [Enter Name] operations over a 3-year cycle and to support this approach [Enter Name] conduct two audits per year at each operational site. (ISO 9001 and ISO 14001).

ISO 45001 internal auditing is outsourced to [Enter Audit Company Name] and consists of two audits per operational site each year. Findings are dealt with in the same manner as other audits (see below).

CMS (Competency Management System) is audited centrally by an auditor within the technical and environmental team on two occasions per year. A combined full audit is carried out once per year to complete the internal audit arrangements.

**Audit Planning**

Scope – to establish firm operating parameters for preparing, conducting and following-up internal audits, with defined responsibilities at both site and Management level.

**Pre-audit – Team**

- Establish audit schedule – Environmental and Technical Team determine the next 12 months' schedule at the start of each year, and this is reviewed periodically throughout the year. Two cycles are in place for ISO 9001/14001 covering the generic clauses of both standards.

**Audit day**

- Opening meeting:
    - Outline planned activities
- Carry out audit
- Closing meeting
    - Summarise good points, opportunities for improvement, observations and non-conformities
    - Agree follow-up audit or site visit as required, to be planned where the audit result is non-conformity/observation-heavy or repeated major issues are found.
    - Any opportunities for improvement that are deemed beneficial for follow up will be discussed.

**Post-audit**

- Supply report within one week, any opportunities for improvement that would benefit site will also be included in the Audit assessment findings section.
- Site to supply response within one week of receipt (when required). Failure to comply will result in a non-conformity.

**Analysis**

- Technical Department to analyse audits on on-going basis to identify trends and persistent issues. These are then summarised for Management Review.

**Competency**

It is the responsibility of the Technical Team to determine whether an individual is capable of carrying out audit activity on their own.

## Annex H Training requirements for IBAA handlers

**PROCEDURE NO:**

*Table 18: Training Procedure and Responsibilities*

| | |
|---|---|
| **1. Purpose** | Defines the steps required to ensure clear instructions are in place to communicate what training is required for the handling of IBAA at a treatment facility. Ensures appropriate training is in place to meet business objectives. |
| **2. Scope** | Covers employee training from induction and throughout their employment. May also apply to Contractors carrying out activities normally undertaken by employees. |
| **3. Roles and Responsibilities** | |
| Role | Responsibility |
| Managing Director | Accountable. This is the single person who has overall decision-making authority and who is accountable for this procedure |
| Site Manager | Responsible: The site manager is responsible for implementing (or doing) what is stated in the procedure i.e. ensuring that data collection processes are in place and data is recorded and reported are required. |
| IBAA Handlers | Consulted & Informed: These are the people that are consulted in preparing the procedure and need to be informed or have a job to do once the procedure is issued. |

| | |
|---|---|
| **4. Definitions** | Competent Person: Person who has acquired, through education, training, qualification or experience, or a combination of these, the knowledge and skills to perform the task required.<br><br>Management System: The way in which an organization manages the interrelated parts of its business in order to achieve its business objectives |
| **5. References** | IBAA Technical Guideline for Dubai<br><br>The Dubai Government Administrative Resolution for IBAA |
| **6. Procedure** | **Training Requirements**<br><br>To meet the requirements of the IBAA Technical Guideline IBAA processing sites require a written management system. A core component of which is the provision and documentation of relevant training for individuals processing IBAA.<br><br>**Induction**<br><br>On joining, all employees undergo an induction. The induction aims to familiarise new employees with the organisation and its purpose, introduce them to other people on site, give key information on company processes and information such as policies and procedures, and ensure they gain an awareness of their role and the competences required.<br><br>**General Training Needs**<br><br>Provide general training to all employees, contractors, and where applicable visitors to the site, including site inductions, health and safety training, first aid, isolation, preventative maintenance and reporting.<br><br>**Specific Training Needs**<br><br>Provide existing training matrices and templates relevant to the task/role: Management = Demonstrate Technical Competence, Machine Operators and Site Operators = Demonstrate production and material handling efficiency.<br><br>**Assessing Competence**<br><br>Local/National/Regional approaches. Certifications and on the job training. |

| | |
|---|---|
| | **Training Records**<br><br>Management system process to capture and record all training programs, completion and certifications.<br><br>Written or electronic records should be made of all relevant training undertaken. All training records will be stored securely for a period of **seven years** unless otherwise required by legal or contractual obligations. Records that are no longer required will be securely deleted or destroyed. |

**The Document to be reviewed 2 years from date of issue or whenever there are substantial changes to the input material, the process or the destinations for the material.**

*Table 19: Training Requirements Revision History*

| Rev. No | Description of Change | Author | Release Date |
|---|---|---|---|
| 1.0 | New document | | 15/05/2024 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

## Annex I Relevant Legislation

Capitalised terms used but not defined in this document have the same definition as provided in the relevant law or regulation.

*Table 20: Relevant Local Laws, Regulations and Guidance*

| Part A – Relevant Local Laws and Regulations | | | |
|---|---|---|---|
| **No.** | **Law / Regulation** | **Type** | **Brief overview of legislation** |
| 1. | Dubai Law No. 22/2015 On the Organization of Public-Private Partnership in the Emirate of Dubai | Commercial Law | This law provides a legal framework for establishing and governing partnerships between public and private sectors in the Emirate of Dubai. It applies to all Projects. [1]<br><br>The law provides guidance on:<br>• procedures for selecting PPP projects, including bidding processes, feasibility studies and criteria for awarding contracts;<br>• risk allocation between public and private sectors;<br>• drafting and negotiating PPP contracts;<br>• transparency and accountability in the procurement and implementation on PPP projects (such as through reporting and public scrutiny); and<br>• procedures for resolving disputes between parties. |
| 2. | Dubai Administrative Decision No. 125/2001 On the Approval of the Building | Construction Law | This decision outlines the regulations and specifications that govern construction activities in the Emirate of Dubai.<br>Key provisions include those on:<br>• Building standards<br>• Zoning regulations |

[1] Project is defined as any " *facility, service activity, or product supervised, presented or produced by a Government Agency*" (which includes a Free Zone Authority).

| | | | |
|---|---|---|---|
| | Code Regulations and Construction Specifications | | • Construction Materials and Methods<br>• Environmental and Permitting considerations<br>• Inspection, compliance, and enforcement/ penalties. |
| 3. | Dubai Executive Council Decision No. 58/2017 On The Approval of the Fees and Fines for the Disposal of Waste in the Emirate of Dubai | Environmental Law | This decision lists fees for disposal of various types of waste including: public waste, municipal waste, hazardous waste , medical waste etc. |
| 4. | Dubai Administrative Decision No. 211/1991 On the Issuance of the Implementing Regulation of Dubai Local Order No 61/1991 Regarding the Environment Protection Regulations in | Environmental Law | The decision provides detailed guidelines for implementing environmental protection regulations outlined in Dubai Local Order No. 61 of 1991, including with respect to:<br>• Environmental standards;<br>• Permitting and licensing;<br>• Environmental Impact Assessments; and<br>• Pollution control. |

| | | | |
|---|---|---|---|
| | the Emirate of Dubai | | |
| 5. | Dubai Order No. 61/1991 Regulations on the Protection of the Environment in the Emirate of Dubai | Environmental Law | Explained above at Item 4. |
| 6. | Local order 11 of 2003 on public health and safety of society in the emirate of Dubai | Regulation | This local order includes a wide range of regulations aimed at safeguarding public health, ensuring hygiene standards, and promoting safety measures within the community, including:<br>• Health and hygiene standards;<br>• Control of communicable diseases;<br>• Food safety and sanitation;<br>• Environmental health (such as air and water quality standards, noise pollution control);<br>• Waste management; and<br>• Public safety measures. |
| 7. | Decree No. 45 of 2021 Concerning the Dubai Building Code | Construction Law | This law creates an undertaking by all individuals and public and private entities to apply the Building Code published by the Dubai Municipality.<br>We have not reviewed the Building Code in detail but understand it pertains to various aspects related to building design, construction, safety, and sustainability. |
| 8. | Decree No. (34) of 2022 Establishing the Agencies | Environmental Law, Construction Law | Establishes the following agencies of Dubai Municipality and outlines their respective functions and responsibilities:<br>• the Environment, Health, and Safety Agency;<br>• the Public Facilities Agency; |

| | | | |
|---|---|---|---|
| | Affiliated to the Dubai Municipality and Determining their Functions | | • the Waste and Sewerage Agency; and<br>• the Buildings Regulation and Permits Agency |
| 9. | The Order of 1961 Establishing the Dubai Municipality | Administrative Law | Establishes the Dubai Municipality which is the governmental body responsible for various public services, urban planning, and infrastructure development in the Emirate of Dubai. |
| 10 | Local Order No. (89) of 1994 Regulating the Engineering Consultancy Profession in the Emirate of Dubai and its amendments | Construction Law | This law creates a Committee to oversee and regulate the professional practice of engineers, including:<br>• registration and licensing of engineers and engineering offices;<br>• maintaining ethics within the profession;<br>• investigating violations committed by licensed engineering offices. |
| 11 | Local Order No. (3) of 1999 Regulating Construction Works in the Emirate of Dubai and its amendments | Construction Law | This Order clarifies the procedures and rules that must be followed in order to complete works of construction, destruction or variation, works to, or maintenance of buildings including:<br>• Permitting and approvals processes<br>• Building standards and regulations<br>• Zoning and land use controls<br>• Health and safety measures<br>• Quality assurance and control |

| | | | |
|---|---|---|---|
| | | | • Environmental protection (such as requirements for waste management and pollution prevention). |
| 1 | Dubai Local order 44 of 1990 on Standard Specifications of Concrete Blocks Used in the Emirate of Dubai. | Construction Law | This legislation sets forth various specifications governing the production, quality, and use of concrete blocks in construction projects within the Emirate of Dubai.<br>This has been amended by the Local Order at row18 below. |
| 1 | Law Number 15/2008 on protection of groundwater in Dubai | Environmental Law | This law contains various provisions aimed to prevent over-exploitation, contamination, and depletion of groundwater sources. For example, the Municipality limits the drilling of a well or any extraction of groundwater without a license. The Municipality also determines the water quantities allowed to be extracted from wells, depending on the level of water balance in the location and the concentration of the chemical elements and purposes of use. |
| 1 | Local Order Number 8 of 2002 concerning sewage, irrigation and water drainage in the Emirate of Dubai | Environmental Law | The order governs the management, treatment, and disposal of sewage, as well as regulating irrigation practices and water drainage systems within the emirate. It outlines various provisions in order to ensure the efficient and sustainable use of water resources, protect public health, and mitigate environmental impacts associated with wastewater and drainage.<br><br>In particular, it defines powers and duties of certain Administrations within Dubai Municipality for planning and executing all public sewage works (and outlines rules to be followed when connecting to the public sewage network). The Order also establishes a regime for a private sewage network system and the rules and regulations that must be followed to obtain the license for this. |

| | | | |
|---|---|---|---|
| 15 | Local order 7 of 2002 on management of waste disposal sites in the Emirate of Dubai as amended by Local order 5 of 2003 | Regulation | |
| 16 | Dubai Administrative Decision No. 37/2021<br>Amending some Provisions of the Regulation of Building Conditions and Specifications | Construction Law | |
| 17 | Dubai Local Order No. 1/2012<br>Amending Dubai Local Order No 44/1990 on "The Standard Specifications of the Concrete | Construction Law | |

| | | | |
|---|---|---|---|
| | Blocks used in the Emirate of Dubai" | | |
| 18 | Dubai Administrative Decision No. 73/1993<br>On the Identification of Standards and Procedures Acceptable to the Waste Business in the Emirate of Dubai | Environmental Law | |
| 19 | Administrative Resolution No. (32) of 2006 Forming the Committee for Registration and Licensing of Engineering Consultants and Contractors in the Emirate of Dubai and its amendments | Construction Law | |

| | | | |
|---|---|---|---|
| 20 | Administrative Resolution No. (308) of 2021 Approving the Dubai Building Code | Construction Law | |
| 21 | Dubai Administrative Decision No. 37/2021<br>Amending some Provisions of the Regulation of Building Conditions and Specifications | Construction Law | |
| 22 | Local Order No. (110) of 2003 Concerning Public Health and Community Safety in the Emirate of Dubai | | |

| **Part B – Other Relevant Technical Guidelines, Circulars and Guidance Documents relating to Dubai** | | |
|---|---|---|
| **No.** | **Law / Regulation** | **TYPE** |

| | | |
|---|---|---|
| 1. | Technical Guideline no. 1 Disposal of Hazardous Wastes, June 2011 | Dubai Municipality<br>Technical Guideline |
| 2. | Technical Guideline no. 1 Waste storage requirements for municipal solid waste 2015 | Dubai Municipality<br>Technical Guideline |
| 3. | Technical Guideline no. 2 Waste collection and transport 2015 | Dubai Municipality<br>Technical Guideline |
| 4. | Technical Guideline no. 3 Waste trading 2015 | Dubai Municipality<br>Technical Guideline |
| 5. | Technical Guideline no. 4 Duty of Care 2015 | Dubai Municipality<br>Technical Guideline |
| 6. | Technical Guideline no. 5 Waste classification 2015 | Dubai Municipality<br>Technical Guideline |
| 7. | Technical Guideline no. 6 Commercial centers recycling guide 2015 | Dubai Municipality<br>Technical Guideline |
| 8. | Technical Guideline no. 7 Mandatory Waste segregation | Dubai Municipality<br>Technical Guideline |
| 9. | Technical Guideline no. 8 Hazardous waste disposal 2021 | Dubai Municipality<br>Technical Guideline |

| | | |
|---|---|---|
| 10 | Technical Guideline no. 9 Recyclable Waste Materials 2021 | Dubai Municipality Technical Guideline |
| 11 | Technical Guideline no. 10 Disposal of Unwanted Materials, 2021 | Dubai Municipality Technical Guideline |
| 12 | Technical Guideline no. 11 Transportation and handling of hazardous waste in emirate of Dubai 2021. SPS- TG-No. 11 | Dubai Municipality Technical Guideline |
| 13 | RTA Project: R1048/4 Improvements of Expo 2020 Roads Network Contract | Dubai Guidance Document |
| 14 | RTA Standard specification for Construction of Roads and Bridges in Dubai Emirate | Dubai Guidance Document |
| 15 | DM- EPSS-TG no .8 Management of Recyclable Waste Material December 2014 | Dubai Guidance Document |
| 16 | DM-EPSS TG no. 10 Waste Minimisation December 2014 | Dubai Guidance Document |
| 17 | Circular No. (1) of 2018 – Update on the Status of Hazardous Waste Disposal Service system | Dubai Municipality Circular |
| 18 | Circular No. (5) of 2018 – Update the Status of Financial Records of Waste Generators Applying of Waste Disposal Services (WDS) Permits. | Dubai Municipality Circular |
| 19 | Circular No. (2) of 2017 – Requirement for Efficient and safe Transportation of solid waste. | Dubai Municipality Circular |
| 20 | Circular No. (4) of 2015 – Require efficient and safe transportation of solid waste. | Dubai Municipality Circular |
| 21 | Circular No. (5) of 2015 – Waste management related activities in Emirate of Dubai. | Dubai Municipality Circular |

| | | |
|---|---|---|
| 22 | Dubai Plan 2021 | Policy |
| 23 | Dubai Sustainable Concrete Baseline 2018 | Policy |
| 24 | Dubai Health Authority Medications Disposal and Waste Management Policy 2021 | Policy |
| 25 | Dubai Integrated Waste management strategy 2021-2041 | Policy |
| 26 | Dubai Industrial Strategy 2030 | Strategy / Policy |
| 27 | Dubai Health Strategy 2021 | Strategy / Policy |
| 28 | Dubai Integrated Waste Management Strategy | Strategy / Policy |
| 29 | Dubai Building Code 2021 | Building Code |
| **Part C - Legislation and Policies relating to the Circular Economy in the UAE** | | |
| 30 | Federal Law 12 of 2018 on Integrated Waste management | Federal Law |
| 31 | Federal Ministerial Resolution No. (21) | Federal Law |
| 32 | Road and Transportation Authority construction specifications on the use of aggregates in pavement and concrete structures | Federal Law |
| 33 | Cabinet Resolution no. 39 of 2021 regarding the Executive Regulations of Federal Law 12 | Federal Law |
| 34 | Cabinet order no. 37 of 2001 for Executive Order of Federal law No 24 of 1999 for Regulation of Handling Hazardous Materials, Hazardous Waste and Medical waste. | Federal Law |
| 35 | Ministerial Resolution no. 21 on the use of recycled aggregates from construction and demolition waste for road construction and infrastructure projects | Federal Law |

| | | |
|---|---|---|
| 36 | Federal Law 11 of 2006 regarding Protection and Development of the Environment | Federal Law |
| 37 | Commercial Companies Law Federal Law No 32 of 2021 | Federal Law |
| 38 | UAE Circular Economy Policy 2021-2031 | Policy |
| 39 | UAE General Environment Policy 2021 | Policy |
| 40 | National Waste policy | Policy |

Appendix 1 – General Bulk Fill

# Manufactured IBA Aggregates for use as: General Bulk Fill

## Product Information Sheet

=

## Manufactured Aggregates

The vast majority of the incinerator bottom ash consists of resources that can be reused as an alternative aggregate suitable for many civil engineering applications. For the replacement of natural aggregates and sand, Manufactured Aggregates should comply with civil and environmental specifications to ensure proper use of the manufactured aggregates.

## General Bulk Fill




*Figure 5: Aggregate for Bulk Fill*

## Application



*Figure 6: Aggregate stockpile*

## Benefits & Sustainability

**IBAA Advantages**

- 20% less material usage. *
- 20% less vehicle movements. *
- 20% less $CO_2$ emissions. *
- Cementitious and mild pozzolanic performance benefits.
- Greater resource circularity and promotion of government recycling initiatives through resource ex-traction from waste streams that would otherwise have been disposed of.

* *When compared against the use of primary aggregates*

**In Summary**

**Significant $CO_2$ savings** against primary aggregates

**Fewer trucks** on the roads

Primary Resources saved and **waste diverted from landfills**

## Regulatory basis

Suitable material for Bulk Fill defined in the RTA Specification as being from any acceptable source, as approved by the engineer and contract of works. The Bulk fill should meet the following grading requirements as stated in the RTA specification.

*Table 21: Grading Listing*

| SIEVES (mm) | % PASSING GRADUATION A | % PASSING GRADUATION B |
|---|---|---|
| 63 | 100 | 100 |
| 0.075 | 0 - 20 | 0-10 |

*Table 22: Application Limits*

| Test | Dubai Limits |
|---|---|
| Liquid Limit | 40% max. |
| Plasticity Index | 6% max. |

| | |
|---|---|
| Linear Shrinkage | 3% max. |
| Organic Matter Content | 2% max. |
| Acid Soluble Chloride | 2% max. |
| Acid Soluble Sulphate | 2% max. |
| pH | 7 – 9 |

Limits are completely dependent on the receptor to which the material is being applied. The above limits are subject to global best practice. Users must note at all times, Users should seek to meet local regulations at all times.

Blending of IBAA with Primary Aggregates is permitted providing the product meets the requirements of the specification for intended use, this includes the grading following blending and all other performance-based tests.

At all times when blending any aggregate with Incinerator Bottom Ash Aggregate (IBAA) the above limits must be adhered too. Blending should never exceed 20% with the determined required mix.

*Table 24: Sieve passing for general fill applications*

| TEST | Dubai RTA Standard | Dubai RTA Limits |
|---|---|---|
| Liquid Limit | BS 1377 Part 2: 1990 Test 4.5 and AMD 9027-1996 | 40% min |
| Plasticity Index | BS 1377 Part 2: 1990 Test 5.4, AMD 9027-1996 | 6% max |
| Linear Shrinkage | BS 1377 Part 2: 1990 Method 6.5, AMD 9027-1997 | 3% max |
| Soaked CBR | BS 1377 Part 4: 1990 Test 7, AMD8259:1995& AMD 13925-2002 | 15% min |
| Organic Matter Content | BS 1377 Part 3: 1990 Method 3, AMD 9028-1996 | 2% max |
| Acid Soluble Chloride (Combined Aggregate) | BS 1377:P3 1990 M7.3, AMD 9028:1996 | 2% max |
| Acid Soluble Sulphate (Combined Aggregate) | BS 1377:P3 1990 M5.5, AMD 9028:1996 | 2% max |
| Water Soluble Chloride | BS 1377:P3 1990 M7.2, AMD 9028:1996 | 5% max |
| Water Soluble Sulphate | BS 1377:P3 1990 M5.5, AMD 9028:1996 | 5% max |
| pH | BS 1377:P3 1990 M9, AMD 9028:1996 | 7 - 9 |

| **Back Fill material** | **BS 1377: Part 2 1990 Clause 9.2 or 9.3, AMD 9027: 1996 or BS 812: Part 103: Section 103.1:1985, cl.7.2 or 7.3, AMD 6003:1989** | |
|---|---|---|
| **Sieve (mm)** | **Min % Passing** | **Max % Passing** |
| 63 | 20% | 100% |
| 0.075 | 0% | 20% |
| **Free Drainage Backfill** | **BS 1377: Part 2 1990 Clause 9.2 or 9.3, AMD 9027: 1996 or BS 812: Part 103: Section 103.1:1985, cl.7.2 or 7.3, AMD 6003:1989** | |
| **Sieve (mm)** | **Min % Passing** | **Max % Passing** |
| 37.5 | 100% | 100% |
| 10 | 85% | 100% |
| 5 | 45% | 85% |

| | | |
|---|---|---|
| 0.6 | 5% | 45% |
| 0.075 | 0% | 5% |

Appendix 2 – Land Reclamation

# Manufactured IBA Aggregates for use as:

# Land Reclamation

## Product Information Sheet

## Manufactured Aggregates

The vast majority of the incinerator bottom ash consists of resources that can be reused as an alternative aggregate suitable for many civil engineering applications. For the replacement of natural aggregates and sand, Manufactured Aggregates should comply with civil and environmental specifications to ensure proper use of the manufactured aggregates.

## Land Reclamation

This specification sheet is compiled to give guidance on the use of Manufactured IBAA in civil works as a general bulk fill for Land Reclamation projects.




*Figure 7: Semakau Landfill, Singapore*



*Figure 8: Aggregate for Land Reclamation*

## Benefits & Sustainability

### IBAA Advantages

- 20% less material usage. *
- 20% less vehicle movements. *
- 20% less $CO_2$ emissions. *
- Cementitious and mild pozzolanic performance benefits.
- Greater resource circularity and promotion of government recycling initiatives through resource ex-traction from waste streams that would otherwise have been disposed of.

* *When compared against the use of primary aggregates*

### In Summary

**Significant $CO_2$ savings** against primary aggregates

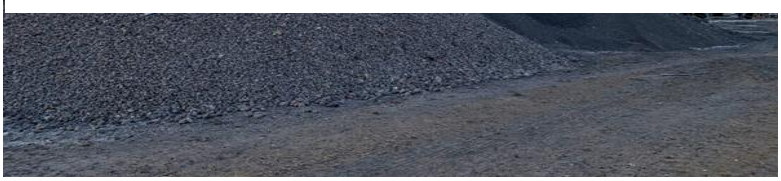
**Fewer trucks** on the roads

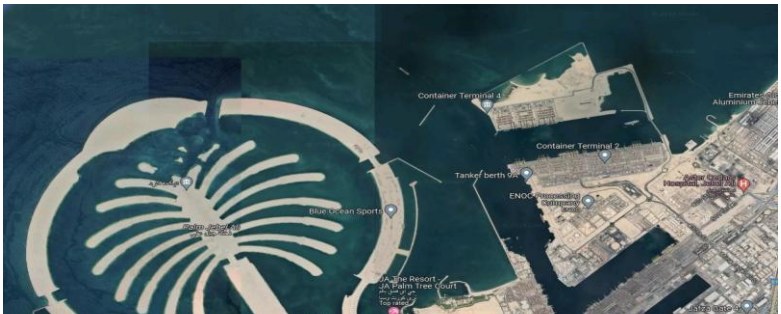
Primary Resources saved and **waste diverted from landfills**

## Application



*Figure 9: aggregate stockpile and Land Reclamation example*





## Regulatory basis

Reclamation material shall also comply with the following physical, durability and chemical characteristics. detailed in Table 25 and 26.

*Table 25: IBAA Test – Dubai Standards for land reclamation applications*

| TEST | Dubai Standard | Dubai DP World Limits |
|---|---|---|
| Water Absorption | EN 1097-6:2013 | 7.50% |
| Apparent Relative Density | EN 1097-6 2013 | > 2.2 $Mg/m^3$ |
| Bulk Density | EN 1097-3 | < 2.0 $Mg/m^3$ |
| Angle of Shearing Resistance | BS 1377-7:1990 | < 37 deg |
| Clay Content | Not specified | 1% |
| General classification and standards | BS6349-5, ISO 14688 and BS 1377-3. | Clean, hard, dense, durable material |
| Organic matter | BS 1377 Part 3: 1990 Method 3, AMD 9028-1996 | 2% max |
| Liquid Limit | BS 1377 Part 2: 1990 Test 4.5 and AMD 9027-1996 | 35% max |
| Plasticity Index | BS 1377 Part 2: 1990 Test 5.4, AMD 9027-1996 | < 6% |
| Minimum Soaked CBR content | BS 1377 Part 4: 1990 Test 7, AMD8259:1995& AMD 13925-2002 | 10% min |
| Gypsum and other salts | Not specified | 2% max |
| Acid Soluble Sulphate | BS 1377:P3 1990 M5.5, AMD 9028:1996 | 0.6w% max |
| Acid Soluble Chloride | BS 1377:P3 1990 M7.3, AMD 9028:1996 | 0.6w% max |
| Chloride content (8S812) (top 150mm only) | | 3.3% max |
| Sulphate content (8S812) (top 150mm only) | | 2.0% max |
| Shell content | Not specified | 0.1 max |

*Table 26: Sieve passing for land reclamation applications*

| Standard | BS 1377-2:2022 CL10 / ISO 17892-4:2016 CL 4.2 & 5.2 | | Dubai IBAA Results |
|---|---|---|---|
| Sieve (mm) | Min % Passing | Max % Passing | % Passing |
| 300 | | 100 | 100 |
| 125 | 95 | 100 | 100 |
| 0.063 | 0 | 10-12 | 2 |

Blending of IBAA with Primary Aggregates is permitted providing the product meets the requirements of the specification for intended use, this includes the grading following blending and all other performance-based tests.

At all times when blending any aggregate with Incinerator Bottom Ash Aggregate (IBAA) the above limits must be adhered too. Blending should never exceed 20% with the determined required mix

# Appendix 3 – Non-Structural Concrete



SHARED – CONFIDENTIAL / مشترك – خاص

# Manufactured IBA Aggregates

# for use in:

# Non-Structural concrete

## Product Information Sheet



SHARED – CONFIDENTIAL / مشترك – خاص

## Manufactured Aggregates

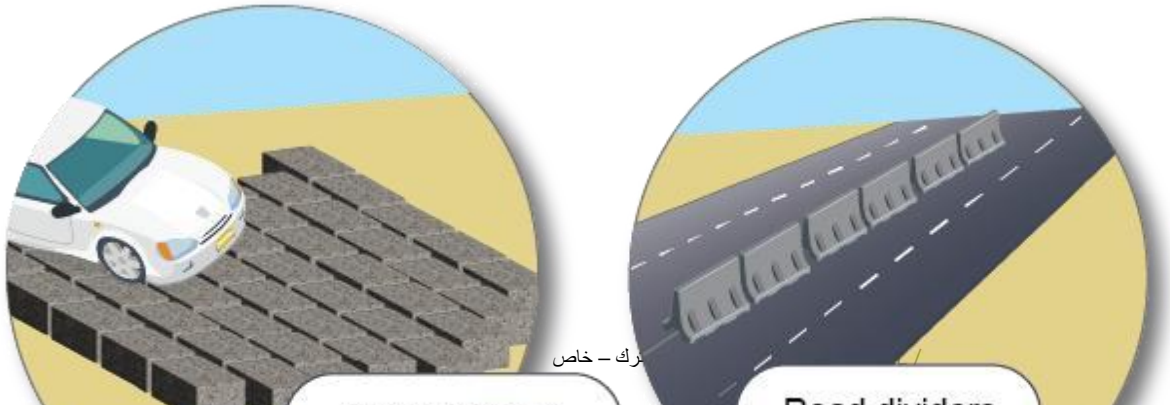
The vast majority of the incinerator bottom ash consists of resources that can be reused as an alternative aggregate suitable for many civil engineering applications. For the replacement of natural aggregates and sand, Manufactured Aggregates should comply with civil and environmental specifications to ensure proper use of the manufactured aggregates.

IBAA is a sustainable and cost-effective building solution as an alternative material in the construction of non-structural concrete products.

## Non-Structural Concrete (without reinforcement)

This specification sheet is compiled to give guidance on the use of Manufactured IBAA in non-structural concrete applications where there is no requirement for reinforcement. These products may include but are not limited to CBP (Concrete block paving), Flag and Kerb blocks and walling blocks (where the surface will not be finished with paint, plaster, or any other aesthetic coatings).

Concrete with Manufactured IBAA should be able to be reused in a second life cycle (and subsequent life cycles) as concrete product or as concrete granulate. The requirements that this concrete product must currently meet for reuse as a concrete product (for example, as concrete block paving) are known. Often, the technical lifetime is not the decisive factor for the initial life cycle, and the concrete product may be reusable (without or with some processing/reprocessing).



نزك – خاص



*Figure 12: IBAA in construction of subterranean backing blocks and pavers*



*Figure 11: IBAA in construction of concrete road dividers*



SHARED – CONFIDENTIAL / مشترك – خاص

## Application

رمز الوثيقة









Phoenix
up

- خاص

*Figure 13: Examples of Concrete Products manufactured with IBAA product*

## Regulatory basis

The manufactured aggregates should comply with:

Use in concrete without reinforcement and without structural application. When used in concrete without reinforcement and without structural application, IBAA must be in compliance with EN 12620:2002.

*Table 27: Application Limits*

| Test | Dubai Limits |
|---|---|
| Content of very fine material | ≤ 10% |
| Particle density – coarse | ≥ 2.0 |
| Water adsorption | As specified |
| Sulphate content (SO3) | ≤ 0.8 |
| Alkali content (Na2o-eq) | ≤ 0.2% |
| Loss of Ignition | ≤ 5% |

Limits are completely dependent on the receptor to which the material is being applied. The above limits are subject to global best practice., Users should seek to meet local regulations at all times.



SHARED – CONFIDENTIAL / مشترك – خاص

Blending of IBAA with Primary Aggregates is permitted providing the product meets the requirements of the specification for intended use, this includes the grading following blending and all other performance-based tests.

At all times when blending any aggregate with Incinerator Bottom Ash Aggregate (IBAA) the above limits must be adhered too. Blending should never exceed 20% with the determined required mix.



SHARED – CONFIDENTIAL / مشترك – خاص

## Benefits & Sustainability

### IBAA Advantages

- 20% less material usage. *
- 20% less vehicle movements. *
- 20% less $CO_2$ emissions. *
- Cementitious and mild pozzolanic performance benefits.
- Greater resource circularity and promotion of government recycling initiatives through resource ex-traction from waste streams that would otherwise have been disposed of.

* *When compared against the use of primary aggregates*

### In Summary

**Significant $CO_2$ savings** against primary aggregates

**Fewer trucks** on the roads

Primary Resources saved and **waste diverted from landfills**

## Appendix 4 – Pipe Bedding

# Manufactured IBA Aggregates

# for use in:

# Pipe Bedding

## Product Information Sheet

## Manufactured Aggregates

The vast majority of the incinerator bottom ash consists of resources that can be reused as an alternative aggregate suitable for many civil engineering applications. For the replacement of natural aggregates and sand, Manufactured Aggregates should comply with civil and environmental specifications to ensure proper use of the manufactured aggregates.

IBAA is a sustainable and cost-effective building solution as pipe and sewerage bedding material.

# Granular fill for Pipe Bedding

This specification sheet is compiled to give guidance on the use of Manufactured IBAA in civil works as a granular fill for pipe bedding.




*Figure 14: Cross Section of typical pipe bedding: IBAA product utilised as bedding and backfill*

# Application



*Figure 15: IBAA product used in pipe bedding and backfill*



*Figure 16: Typical pipe bedding and backfill*

## Benefits & Sustainability

**IBAA Advantages**

- 20% less material usage. *
- 20% less vehicle movements. *
- 20% less CO2 emissions. *
- Cementitious and mild pozzolanic performance
- benefits.
- Greater resource circularity and promotion of government recycling initiatives through resource extraction from waste streams that would otherwise have been disposed of.

* When compared against the use of primary aggregates

**In Summary**

**Significant $CO_2$ savings** against primary aggregates

**Fewer trucks** on the roads

Primary Resources saved and **waste diverted from landfills**

# Regulatory basis

The Granular Fill material should be well graded, depending on the nominal size of the aggregate and/or design requirements for the intended application and location for use in consideration of distance from water body as described in the table below:

*Table 30: Distance from water body*

| Distance to water body (Metres) | Maximum tonnage (tonnes) | Volume After compaction assuming 1.7T/m3 (m3) | Maximum surface area of a structural platform (m2) |
|---|---|---|---|
| 25-50 | 4,420 | 2,600 | 2,600 |
| 50-100 | 6,800 | 4,000 | 4,000 |
| 100-150 | 13,600 | 8,000 | 8,000 |
| 150-200 | 20,400 | 12,000 | 12,000 |
| 200-250 | 27,200 | 16,000 | 16,000 |
| 250-300 | 34,000 | 20,000 | 20,000 |
| 300-350 | 40,800 | 24,000 | 24,000 |
| 350-400 | 47,600 | 28,000 | 28,000 |
| 400-450 | 54,400 | 32,000 | 32,000 |
| 450-500 | 61,200 | 36,000 | 36,000 |
| More than 500 | 68,000 | 40,000 | 40,000 |

*Table 31: Application Limits*

| Test | Dubai Limits |
|---|---|
| Liquid Limit | 40% max. |
| Plasticity Index | 6% max. |
| Linear Shrinkage | 3% max. |
| Organic Matter Content | 2% max. |
| Acid Soluble Chloride | 2% max. |
| Acid Soluble Sulphate | 2% max. |
| pH | 7 – 9 |

Limits are completely dependent on the receptor to which the material is being applied. The above limits are subject to global best practice., Users should seek to meet local regulations at all times.

Blending of IBAA with Primary Aggregates is permitted providing the product meets the requirements of the specification for intended use, this includes the grading following blending and all other performance-based tests.

At all times when blending any aggregate with Incinerator Bottom Ash Aggregate (IBAA) the above limits must be adhered too. Blending should never exceed 20% with the determined required mix.

Granular Sub-base material shall also comply with the following physical, durability and chemical characteristics, as outlined in the RTA specification. Recent testing results detailed in the Table below.:

*Table 32: IBAA Grading Listing*

| Standard | BS EN 933-1 and BS 1377 part 2 method 9.2 or 9.3:1990, AMD 9027:1996 | |
|---|---|---|
| **Sieve (mm)** | **Min % Passing** | **Max % Passing** |
| 4.75 | 100 | 100 |
| 2 | 66 | 92 |
| 0.0425 | 30 | 50 |
| 0.015 | 12 | 28 |
| 0.075 | 5 | 15 |

## Appendix 5 – Granular Sub-Base

# Manufactured IBA Aggregates for use as:

# Granular Sub-Base

## Product Information Sheet

## Manufactured Aggregates

The vast majority of the incinerator bottom ash consists of resources that can be reused as an alternative aggregate suitable for many civil engineering applications. For the replacement of natural aggregates and sand,

Manufactured Aggregates should comply with civil and environmental specifications to assure proper use of the manufactured aggregates.

IBAA is a sustainable and cost-effective building solution as a road subbase or bulk fill in roadways and structural platform projects.

# Granular Sub-base

This specification sheet is compiled to give guidance on the use of Manufactured IBAA in civil works as a sub-base in road construction.




*Figure 17: Cross Section of Road Structure: IBAA product utilised as Sub-Base*

# Application



*Figure 18: IBAA product used in road construction*



*Figure 19: IBAA product as Sub-base material*

## Benefits & Sustainability

### IBAA Advantages

- 20% less material usage. *
- 20% less vehicle movements. *
- 20% less CO2 emissions. *
- Cementitious and mild pozzolanic performance
- benefits.
- Greater resource circularity and promotion of government recycling initiatives through resource extraction from waste streams that would otherwise have been disposed of.

* When compared against the use of primary aggregates

### In Summary

**Significant $CO_2$ savings** against primary aggregates

**Fewer trucks** on the roads

Primary Resources saved and **waste diverted from landfills**

## Regulatory basis

Granular Sub-base is described in the RTA Specification as hard, durable natural/screened gravel, recycled or crushed stones that free from Clay and other deleterious substances. The Granular Subbase material should be well graded and meet either Grading A or B listed below, depending on the nominal size of the aggregate and/or design requirements for the intended application.

*Table 33: Grading Listing*

| SIEVES (mm) | % PASSING GRADUATION A | % PASSING GRADUATION B |
|---|---|---|
| 50 | | 100 |
| 37.5 | 100 | 75 - 100 |
| 25.4 | 70 - 100 | 55 -85 |
| 20 | 60 - 90 | 50 - 80 |
| 10 | 45 - 75 | 40 - 70 |
| 5 | 30 - 60 | 30 - 60 |
| 2.36 | 20 - 50 | 20 - 50 |
| 0.6 | 10 - 30 | 10 - 30 |
| 0.075 | 0 - 10 | 0 - 10 |

*Table 34: Application Limits*

| Test | Dubai Limits |
|---|---|
| Liquid Limit | 35% max. |
| Plasticity Index | 6% max. |
| Los Angeles Abrasion | 30% max. |
| Linear Shrinkage | 3% max. |
| Soundness (Magnesium Sulphate Solution) | 12% max. |
| Organic Matter Content | 0.2% max. |
| Acid Soluble Chloride | 1% max. |
| Acid Soluble Sulphate | 0.5% max. |
| pH | 10 |

Limits are completely dependent on the receptor to which the material is being applied. The above limits are subject to global best practice., Users should seek to meet local regulations at all times.

Blending of IBAA with Primary Aggregates is permitted providing the product meets the requirements of the specification for intended use, this includes the grading following blending and all other performance-based tests.

At all times when blending any aggregate with Incinerator Bottom Ash Aggregate (IBAA) the above limits must be adhered too. Blending should never exceed 20% with the determined required mix.

Granular Sub-base material shall also comply with the following physical, durability and chemical characteristics, as outlined in the RTA specification.

Table 35: TSAA Test –Dubai Standards Testing for Granular Subbase as Outlined

| TEST | Dubai Standard | Dubai RTA Limits |
|---|---|---|
| Liquid Limit | BS 1377 Part 2: 1990 Test 4.5 and AMD 9027-1996 | 35% max |
| Plasticity Index | BS 1377 Part 2: 1990 Test 5.4, AMD 9027-1996 | 6% max |
| Sand Equivalent Value | ASTM D-2419-2009 | 25% min |
| Los Angeles Abrasion | ASTM C131-2006 or ASTM C535-2009 | 30% max |
| Linear Shrinkage | BS 1377 Part 2: 1990 Method 6.5, AMD 9027-1997 | 3% max |
| Soundness (Magnesium Sulphate Solution -5 cycles) | ASTM C88-2005 | Coarse = 12% max<br>Fine = 10% max |
| Organic Matter Content | BS 1377 Part 3: 1990 Method 3, AMD 9028-1996 | 0.2% maximum |
| Acid Soluble Chloride (Combined Aggregate) | BS 812: 1988: Part 117 | 1% maximum |
| Acid Soluble Sulphate (Combined Aggregate) | BS EN 1744-1:1998 | 0.5% maximum |
| pH | BS EN 1097-1 | 10.0 |
| Soaked CBR | BS 1377 Part 4: 1990 Test 7, AMD 8259:1995 & AMD 13925-2002 | 30% minimum |
| Water Absorption | STM C128-2007a & C127-2007 | Coarse = 2.0% max<br>Fine = 2.3% max |