

Best Practice Guide No.2

The Placing and Compaction of Fly Ash as Structural Fill

A Guide for Site Foremen

Recommended Plant

1. Spreading: Flat tracked dozer (Drott or similar)
2. Rolling: Towed or self propelled vibrating roller, e.g. Bomag 90 or larger according to site.
3. Small tools: Tarmac rakes have been found more useful than shovels for hand spreading

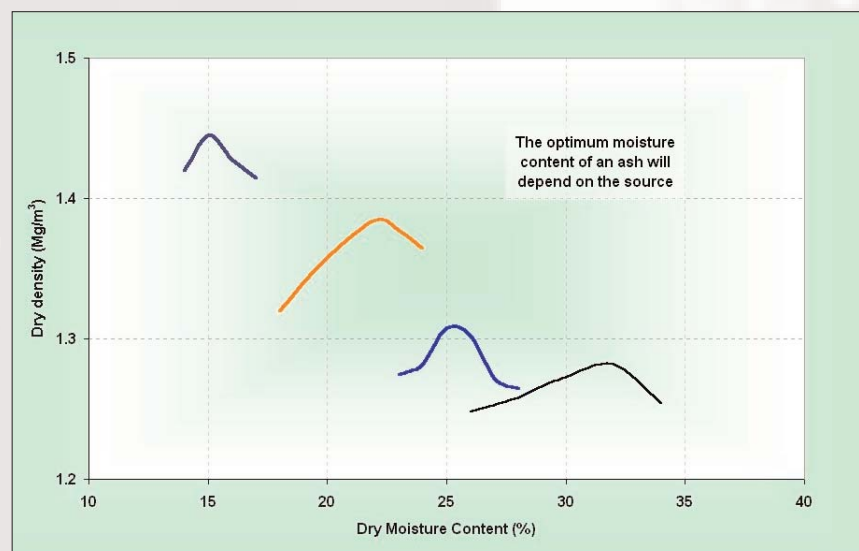
- Heavy dead weight self-propelled smooth wheeled rollers are not recommended.
- Pneumatic-tyred rollers have been found suitable, but there is little experience of their use in the UK.
- Once on site the PFA must be spread and rolled as soon as possible to avoid loss of moisture and consequent dusting.



Recommended Procedure

1. The PFA should be spread in layers (recommended approximately 225mm in the loose state) and be well "tracked" with the spreading plant.
2. Every effort is made to add sufficient water to the PFA at the point of loading, but should it be too dry, it should be sprayed with water during "tracking" and before rolling. Stockpile PFA will normally require the addition of further water after delivery, especially in windy/drying weather conditions.
3. If material is stockpiled the amount should be kept to a minimum and should be regularly sprayed with water to prevent dust problems.

4. It has been found from experience that the moisture content of the PFA can be roughly checked by visual inspection. PFA moulded in the hand should keep together in one mass when slight pressure is exerted; when it is approximately at the correct moisture content, no moisture should be squeezed out. The moisture content can easily be measured using a 'Speedy' moisture meter. Microwave ovens have also been used, but care must be taken that the sample is not 'overdone' which may result in combustion of the carbon in the PFA.



5. The PFA should be spread in loose layers approximately 225mm thick, compacting to 150mm thick. On large sites this is usually done with a bulldozer. Thicker layers are possible, but it is recommended that a trial is done to confirm the effectiveness of compaction. On confined sites where access is limited and a vibrating plate is used for compaction then thinner layers may be required.

6. The rolling should consist of not less than 8 passes of the vibrating roller. The first two passes should be without vibration, the remaining passes should be with vibration on and the final pass should be in such a direction that the surface "cracks" are tightened up (this is usually a reverse pass, but depends on the slope). Sometimes a final pass with the vibration switched off will assist in closing up surface "cracks". Pneumatic tyred rollers produce a superior finish with fewer surface cracks, as long as the PFA is not over-stressed.

7. Density testing can monitor the performance of the placing and compacting of PFA. Because of the disturbance to the upper layer, density tests should be carried out in the penultimate layer. The sand replacement and core cutter methods have been found to be reliable for this. Nuclear density meters have been used but the carbon content of the PFA can influence the results. It is recommended that any results be checked against oven dried tests on occasion.

8. It is important to protect side slopes as soon as possible after completion of the fill operation to prevent scour in the event of heavy rain. If the working area becomes saturated the water will not penetrate significantly and the PFA will dry out rapidly if left. If the area needs to be worked before the PFA is allowed to dry out then it can be bladed into a stockpile to dry and then reused at a later date.

Type of Compaction Plant	Best Location	Remarks
1 - Allam Rampactor 2 - Wacker rammer	Very confined areas: eg. the narrow strip next to bridge abutments, retaining walls, underpasses etc.	a) The largest size shoe should be used b) Ensure the correct moisture content and layer thickness is correct to ensure adequate compaction.
3 - Tandem Vibrating	Small and medium sized areas: a) Behind bridge abutments and retaining walls. b) Structural fills to buildings, etc.	Bomag models smaller than those recommended are considered too light for PFA. Best results are obtained if the surface of the PFA is thoroughly 'tracked' by the spreading plant prior to compaction and the initial roller pass is without vibration. Usually 8 roller passes are sufficient.
4 - Towed vibrating <i>Vibroll types T182 or similar</i> 5 - Self propelled Pneumatic tyred roller types: <i>Albaret Autopactor</i> <i>Albaret - Unipactor</i> <i>Blaw Knox - Salcro</i>	Large Areas: eg. embankments and other large open sites.	The surface of the PFA should be thoroughly tracked by the spreading plant before self propelled pneumatic tyred roller can operate successfully.

• Note 1. From long term experience the following types of rollers are not successful on PFA - Dead-weight Smooth Wheeled Rollers (Small, medium or large), Sheepsfoot Rollers, Grid Rollers and Vibrating Plates.

• Note 2. There are various makes of rollers now in use of equivalent performance to the above-recommended types of plant. The above table therefore is by no means complete and lists only the types and models that UKQAA members have seen in operation and appraised for their suitability for compacting PFA.

The information given in this Site Guide is for guidance only. For some conditions and applications differing techniques may be found to be more suitable. For detailed advice contact the UKQAA Technical Officer.

In general usage the term 'fly ash' is used for pulverized coal ash but it can also cover ash from burning other materials. Such 'fly ash' may have significantly differing properties and may not offer the same advantages as ash from burning pulverized coal. UKQAA datasheets only refer to PFA / fly ash produced from the burning of coal in power stations.