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Superior quality ballast ensures extended track life

The type of ballast used for the rail industry has to conform to very clearly defined specifications. AfriSam liaises closely with its customers to ensure that their exact requirements for ballast are fully understood and fulfilled precisely.

“The supply, installation and subsequent maintenance of the ballast should be a joint venture between AfriSam and its customers,” insists Ray Bonser, AfriSam Aggregates Product Technical Manager. AfriSam is able to draw on decades of in-depth expertise to source, manufacture and supply ballast that will promote the safety and stability of rail tracks over long periods of time without breaking down.

AfriSam is renowned for its quality assurance and reliability, having supplied Spoornet and numerous private sector customers for many years, so it was no surprise that it was selected to provide ballast for Gautrain. Stability and longevity of both track and ballast come under particular pressure with this project, which will operate some 24 train sets of four rail cars each at speeds of between 160 and 180 kms per hour, 18 hours a day. Sourcing precisely the right type of ballast is obviously crucial.

AfriSam provides high quality 73 mm dolomitic and doleritic aggregate for ballast for Gautrain sourced from its Olifantsfontein and Rooikraal quarries respectively, while the ferro quarry in North East Pretoria supplies ballast for general usage to Spoornet and other parastatals. AfriSam's quarry in Witbank also supplies felsite ballast to Spoornet. Production of ballast at Olifantsfontein was started specifically to meet Gautrain's needs, demonstrating AfriSam's commitment to finding very specific solutions to customers' needs.

"Ballast must be able to bear loads properly without breaking down," explains Bonser. "It must be closely packed beneath the sleeper and of sufficient depth, otherwise the sleepers will tend to move up and down as the wheels of the train pass over them, eventually causing the sub-grade to be disturbed." This is particularly severe when concrete, rather than wooden sleepers are used.

The correct ballast of the correct depth enhances the stability of the track, protects the sub-grade and resists the abrasion and degradation caused by intermittent traffic loads.

Meeting all the specifications

"Ballast must be free-draining," continues Bonser. "This is measured by the minimum percentage (40%) voids in the ballast. It must be hard, strong, stable,

easy to clean, workable, resistant to deformation, easily available and reasonably inexpensive. Angular stones are preferable to rounded ones since they interlock more readily to inhibit track movement." It stands to reason that softer materials, such as limestone, are not particularly suitable since they will degrade under loads when wet.

"Fulfilling the correct specifications, however, will be inadequate if the ballast is not properly deposited," he adds. "It must be piled as high as the ties, with allowance for a substantial 'shoulder' to be placed at the ends. This shoulder is the only thing restraining lateral movement of the track and should be at least 150 mm wide."

Ballast aggregate is laid in its pure state with no additives to support it.

Consequently, when supplying ballast to specific requirements, AfriSam exercises tight control over the quality of the ballast itself. It then uses appropriate screens to monitor the size and consistency of the aggregate.

"Ballast quality must be consistent, meeting stringent test requirements," Bonser points out. AfriSam provides customers, such as Spoornet, with samples of aggregates for testing, such as grading, to check that the correct distribution of particle sizes is achieved.

Numerous tests check different qualities of the aggregate, including the Flakiness Index, the Relative Density Test, the Los Angeles Abrasion Test, the Plasticity Index and the soundness tests.

Maintenance

High ballast pressures combined with dynamic traffic loads cause frictional wear of the ballast stones leading to the fracture of individual stones and resulting in loss of stability.

Tamping is one of the methods used to maintain the line, but unfortunately, it can lead to an increase in the percentage of fine ballast particles (fines). An excess of fines, known as fouling, contributes to ballast degradation so it becomes vital to clean these ballast fines. Badly fouled ballast will result in clogging and reduced ability to drain properly, which results in debris being sucked up from the sub-ballast, causing yet more fouling.

“It is not always necessary to replace all the fouled ballast, nor remove it for cleaning,” says Bonser. “Removing and cleaning ballast from the shoulder is often sufficient, provided that the shoulder ballast is removed to the correct depth.”

This cleaning, however, can be undertaken only a certain number of times before the ballast is so damaged that it cannot be re-used. When fouled track ballast cannot be corrected by shoulder cleaning it must be replaced altogether. Thus, regular inspection of the ballast shoulder is important.

Maintenance activities such as replacing ties, tamping and ballast clean can upset the stability of the shoulder, so after such maintenance, trains should run at reduced speed on the repaired routes, or alternatively, machinery must be used to compact the shoulder again.

CAPTION PIC 01 : Ballast at the Gautrain Midrand Depot North looking South

CAPTION PIC 02 : A view of the ballast on the mainline construction

CAPTION PIC 03 : Ballast being compacted during the mainline construction

CAPTION PIC 04 : Ballast being loaded

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FROM : CORALYNNE & ASSOCIATES
P O BOX 16336 ATLASVILLE 1465
TEL : +27 011 422 1949
FAX : +27 086 634 6991
EMAIL : coralyn@onwe.co.za

FOR : VICTOR BOUGUENON
AFRISAM
P O BOX 6367
WELTEVREDENPARK 1715
TEL : +27 011 670 5520
www.afrisam.com