Checklist for Track Ballast Measurement

1. General:

Track ballast is a granular material which is laid on the formation to form a bed for the sleepers. In addition to resisting vertical, lateral and longitudinal forces, it also provides resilience and absorbs energy. It also facilitates track drainage. To achieve these functions, track ballast should fulfill some requirements that has been specified in RDSO's specification titled 'Specifications for track ballast' (IRS-GE-1)

Unlike other components of track such as sleepers, rail, fittings etc., it is not a factory made commodity. Hence strict vigil is required for selecting proper quality& quantity of ballast so as to enable it to perform designed function.

Keeping in mind the above objective, the current pamphlet has been prepared in the form of checklist so as to enable field supervisors & engineers of IR to take appropriate decision. In addition to the provisions from above mentioned specification of RDSO, reference has also been taken from checklist issued by IRICEN and Indian railway Vigilance manual and other observations of vigilance on the subject.

Since majority of track in Indian Railway is BG now, this document has been prepared as a checklist for BG track only. However, this pamphlet can also be used for MG/NG track after modifying values as per provisions of RDSO specification.

2. General Requirements of track ballast (Requirements):

Ballast should be hard & durable and as far as possible angular along edges/ corners, free from weathered portions of parent rock, organic impurities and inorganic residues.

Ballast should be cubical in shape as far as possible. Individual pieces should not be flaky and should have generally flat faces with not more than two rounded/ sub rounded faces.

Ballast used on track should be machine crushed. Hand broken ballast can be used in exceptional cases with prior approval of CTE for open line or CAO/C for construction project. Such approval should be obtained prior to invite tenders.

SN	Item to be checked	Remark
1	Whether the ballast is hard & durable.	Yes/No
2	Whether the ballast is free from weathered portions of parent rock.	Yes/No
3	Whether the ballast is free from organic impurities and inorganic residue.	Yes/No
4	Whether the ballast is cubical in shape.	Yes/No
5	Whether the ballast is not flaky.	Yes/No
6	Whether the ballast have generally flat faces with not more than two rounded/ sub rounded faces.	Yes/No
7	Whether the ballast is Machine crushed.	Yes/No
8	Whether the ballast is hand broken.	Yes/No
9	In case of hand broken ballast, whether the prior permission of CTE or CAO(C) has taken before inviting tenders.	Yes/No
10	In case of hand broken ballast, whether the condition of hand broken ballast is mentioned in tender document.	Yes/No

3. Physical properties of ballast:

SN	Physical property	Requirement	In exceptional cases relaxation by CTE in open line and CAO/ C for construction.
1.	Aggregate Abrasion value	30% maximum	35% maximum
2.	Aggregate Impact value	20% maximum	25% maximum
3.	Water absorption test	1% maximum	2.5% maximum

The relaxation in abrasion, Impact value and Water absorption limit is to be prescribed at discretion of CE/CTE in open line and CAO/C for construction project.

SN	Item to be checked	Remark
1	Whether the abrasion value of the track ballast is not more than 30%.	Yes/No
2	Whether the impact value of the ballast is not more than 20%.	Yes/No
3	Whether the Water absorption limit is not more than 1%.	Yes/No
4.	In exceptional case, whether the approval of competent authority (CTE/CAO(C)) for relaxation in designed property is obtained prior to invite tender.	Yes/No
5	In exceptional case, whether the abrasion value of the track ballast is not more than 35%.	Yes/No

6	**In exceptional cases, whether the impact value of the ballast is not more than 25%.**	Yes/No
7	In exceptional cases, whether the Water absorption limit is not more than 2.5%.	Yes/No
8	Whether the list of nominated lab/railway lab is available in tender document.	Yes/No
9	Whether the tests is carried out in nominated test laboratory or railway lab.	Yes/No

4. Requirement of size & gradation of ballast:

Square mesh Sieve size	Retention on sieve	Remark
65 mm	5% maximum	
40 mm	40 to 60 %	Only for machine crushed ballast
20 mm	Not less than 98 % Not less than 95%	For Machine crushed ballast For Hand broken ballast
4.1 Oversize ballast		**Reduction in contracted rate**
65 mm	> 5% but ≤ 10%	05 % on full stack.
	> 10 %	Ballast rejected.
40 mm (For machine crushed ballast only)	> 60% but ≤ 65%	05% on full stack.
	> 65% but ≤ 70%	10 % on full stack.
	> 70 %	Ballast rejected.
4.2 Undersize ballast		
40 mm (machine crushed ballast)	< 40 %	Undersize ballast is not accepted.
20 mm (Machine crushed ballast)	< 98 %	
20 mm square mesh (Hand broken ballast)	< 95 %	

SN	Item to be checked	Remark
% retention on 65 mm square mesh		
1	Whether retention on 65 mm sieve is within 5%.	Yes/No
2	Whether retention on 65 mm sieve is more than 5 % to 10 %.	Yes/No
2(a)	If yes ,Whether rate is reduced by 5% for whole stack.	Yes/No

3.	**If retention on 65 mm sieve is more than 10% , stack should be rejected.**	
% retention on 40 mm square mesh sieve		
4	Whether retention on 40 mm sieve is within 40 % to 60 %.	Yes/No
5	Whether retention on 40 mm sieve is 60 % to 65%.	Yes/No
5(a)	If yes, whether the rate is reduced by 5% for whole stack.	Yes/No
6	Whether retention on 40 mm sieve is 65 % to 70%.	Yes/No
6(a)	If yes, Whether rate is reduced by 10% for whole stack.	Yes/No
7	If retention on 40 mm sieve is more than 70% , stack should be rejected.	Yes/No
8	If retention on 40 mm sieve is less than 40%, stack should be rejected.	Yes/No
% retention on 20 mm square mesh sieve		
9	Whether the retention on 20 mm sq. mesh sieve is less than 98% for machine crushed ballast.	Yes/No
9(a)	If yes, stack should be rejected.	Yes/No
10	Whether the retention on 20 mm sq. mesh sieve is less than 95% for hand broken ballast.	Yes/No
10(a)	If yes, stack should be rejected.	Yes/No

5. Sieve frame and hole tolerances:

Internal size of the sieve frame should be minimum 100x70x10 cm and requirement of test sieve and opening of sieve and their tolerances are given below in table 5.1 & 5.2.

5.1 Requirement of Test Sieves used for Sieve Analysis of Ballast

The test sieves shall be perforated plate sieve type with square holes/apertures, mounted on a frame. The internal size of the frame (i.e. clear size of perforated plate mounted on frame) shall not be less than 100 cm in length, 70 cm in breadth and 10 cm in height on sides.

The weighing equipment used shall NOT have least count more than 100 grams.

Test Sieve of Square Mesh Size	Thickness of plate used for making test sieve	Tolerance
65 mm	3 mm	(+ 1.0 mm) (-0.5 mm)
40mm	2 mm	(±) 0.5 mm
20mm	2 mm	(±) 0.5 mm

5.2 Requirement for Sieve Opening Size, Pitch of Openings and tolerances:

Test Sieve of Square Mesh Size	Nominal size of individual hole/ aperture at mid-section		Pitch of holes/ aperture	
	Nominal Size	Tolerance	Distance	Tolerance
65 mm	65 mm	(±)1.5 mm	80mm	(+)12.0mm (-) 8.0mm
40mm	40mm	(±)1.5 mm	50mm	(+) 7.5 mm (-) 5.0mm
20mm	20mm	(±)1.0mm	25 mm	(+) 4.0mm (-) 2.5 mm

SN	Item to be checked	Remark
1	The size of frame of sieve (LxBxH) is	
2	Whether the frame is as per specification.	Yes/No
3	Whether the sieve opening size is as per specification.	Yes/No
4	Whether the least count of weighing equipment is not more than 100 grams.	Yes/No

6. Sampling of ballast:

SN	Item to be checked	Remark
1	Whether the sample collected and mixed by JCB/power equipment.	Yes/No
2	Whether the sample collected and mixed by manual means.	Yes/No
2(a)	If yes, whether the permission of competent authority is obtained prior to invite tenders and incorporate in tender document.	Yes/No
3	Whether the sample of blast is taken from both side of stack and from the middle of stack after removing outer cover (150 mm-200 mm).	Yes/No
4	Whether the all above sample mixed together by making a cone.	Yes/No
5	Whether the cone is flatten by pressing from the top and divided in to four equal parts.	Yes/No
7	Whether the sample is taken from two opposite parts.	Yes/No
7	Whether the sample is taken by wooden box of size .30x.30x.30 m. (.0.027Cum).	Yes/No

7. Method of measurement:

a) In case of stack supply

Requirement of stack:

i) Height: Not less than 1m and not more than 2 m in plain area and not less than 0.5 m and not more than 2 m in hilly area.
ii) Top width: Not less than 1 m.
iii) Cubical content of stack: Not less than 30 cum in plain area and not less than 15 cum in hilly area.
iv) Slope of stack (H:V): Not be flatter than 1.5:1.

SN	Item to be checked	Remark
1	Whether the location of stacks is approved by competent authority.	Yes/No
2	Whether the drawing for location of stack is prepared and approved by competent authority.	Yes/No
3	Whether the location of stacks is marked and ballast is stacked at marked location.	Yes/No
4	Whether the certificate of levelness is given by nominated SSE/JE	Yes/No
5	Whether the stacks are on neat and firm ground.	Yes/No
6	Whether the drainage is proper near the stacks.	Yes/No
7	Whether the ballast is received from a single source (Quarry).	Yes/No
8	Whether the height of stack is as per specification.	Yes/No
9	Whether the top width is as per specification.	Yes/No
10	Whether the cubical content of stack is as per specification.	Yes/No
11	Whether the slope is as per specification.	Yes/No
12	Whether ballast passing register is maintained.	Yes/No
13.	Whether the register is signed jointly by Railway or contractor representative.	Yes/No
14	Whether ground balance register is maintained.	Yes/No
b)	**In case of wagon supply**	
1	Whether the continuous white line is painted at predetermine level.	Yes/No
2	Whether the cubical content of wagon is painted.	Yes/No
3	Whether the wagon/ hopper is loaded fully up to predetermine level.	Yes/No
4	Whether the wagon/ hopper is completely emptied.	Yes/No

8. Measurement of ballast:

SN	Item to be checked	Remark
1	Whether the measurement is done by nominated JE/SSE	Yes/No
2	Whether measurement is verified by nominated officer.	Yes/No
3	Whether the representative of contractor was present at the time of above measurements.	Yes/No
4	Whether the measurement is recorded in ballast passing register	Yes/No
4(a)	If yes, details like agreement no., date of measurement, stack no. and the complete location of stack is written in register.	Yes/No
5	Whether the Result of quantity and qualitative check as per sieve analysis is noted like oversize/undersize etc.	Yes/No
6	Whether the length, width and height is measured at least four places i.e. bottom and top of both side are taken for averaging.	Yes/No
7	Whether the lime is sprinkled along the edges on measured stack.	Yes/No

9. Good Practices:

1	Transit pass or material memo should be submitted by supplier from the same district. (vigilance observation)
2	It should be ensured that the same numbers of transit pass or material memo is not repeated by the supplier. (vigilance observation)
3	It should be ensured that transit pass or material memo received with the supply. (vigilance observation)
4	Permission of running out ballast should be given only after the passing of bill. (vigilance observation)
5	Sieve analysis results should be recorded in MB while recording measurement of ballast. (vigilance observation)
6	To avoid re-occurrence of simultaneous disturbance of all stacks and irregularity in quantity measurement, ADEN in charge should inform the measurement details to the CVO engineering immediately after the test check. (vigilance observation)

OUR OBJECTIVE

To upgrade Maintenance Technologies and Methodologies and achieve improvement in productivity and performance of all Railway assets and manpower which inter-alia would cover Reliability, Availability, and Utilisation.

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Checklist for Track Ballast Measurement



केमटेक/सिविल/2022/ ट्रैक बलास्ट चेकलिस्ट /1.0
CAMTECH/C/2022/ Track Ballast checklist /1.0
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Indian Railways
Centre for Advanced Maintenance Technology

महाराजपुर, ग्वालियर - 475005
Maharajpur, Gwalior – 474005
Telephone : 0751-2470869, Fax : 0751-2470841
E-mail :dircivilcamtech@gmail.com
भारतीय रेल उच्च अनुरक्षण प्रौद्योगिकी केन्द्र, महाराजपुर ग्वालियर (म.प्र.)

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