



A Maharatna Company

Annexure A to Corrigendum 03

एन टी पी सी लिमिटेड
(भारत सरकार का उद्यम)
NTPC Limited
(A Govt. of India Enterprise)
(Formerly National Thermal Power Corporation Ltd.)
(केंद्रीय कार्यालय नोएडा)
Corporate Center NOIDA

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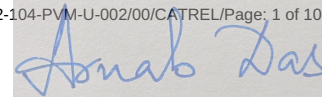
From : Arnab Das ADDL. GENERAL MANAGER	To : BHARAT HEAVY ELECTRICALS LTD NEW DELHI 110049 IN
Cc :	
Subject : EPC PACKAGE FOR DARLIPALI SUPER THERMAL POWER PROJECT -II (1X800) MW Please find enclosed following drawings/ documents for necessary action at your end.	
Vendor Drg. No. : 9551-002-104-PVM-U-002 Orgn. Drg. No. : 9551-002-104-PVM-U-002 Revision No. : 00 Drg. Title : Ash distribution data in various fields of ESP hopper App. Category : CATREL Release Date : 20/04/2026	 Scan to verify
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Name of the Project/ Package : DPALI2- Pre- Award documents, EPC PACKAGE FOR
DARLIPALI SUPER THERMAL POWER PROJECT -II
(1X800) MW

Drawing / Document Number : 9551-002-104-PVM-U-002

Drawing / Document Title : Ash distribution data in various fields of ESP hopper

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Customer No. R8/1579
NTPC/DARLIPALLI SUPER THERMAL POWER PROJECT STAGE - II (1X800MW)

ASH DISTRIBUTION DATA IN VARIOUS FIELDS OF ESP HOPPERS

CUSTOMER: NTPC Ltd

ASH DISTRIBUTION DATA IN VARIOUS FIELDS OF ESP HOPPERS

**PROJECT: DARLIPALLI SUPER THERMAL POWER PROJECT STAGE - II
(1X800MW)**

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Customer No. R8/1579
NTPC/DARLIPALLI SUPER THERMAL POWER PROJECT STAGE - II (1X800MW)

ASH DISTRIBUTION DATA IN VARIOUS FIELDS OF ESP HOPPERS

REQUIREMENTS OF ASH HANDLING SYSTEM FOR ESP (ASH COLLECTION RATES FOR ASH HANDLING SYSTEM DESIGN ONLY)

The Electrostatic Precipitators are installed after the Air-pre-heater collects the maximum amount of fly ash from the dust laden flue gas in a boiler circuit and is stored temporally in the ash hoppers. These fly ashes have to be removed from the hoppers by installing fly ash removal system.

In order to ensure that most efficient and economical design for the fly ash removal system, it is of utmost importance that certain major points are to be brought to the notice of those responsible for the specifications and the design of fly ash handling equipment.

There are 6 electrostatic precipitators of size FAA - 10 X 45M - 2 X 84160 - 2 per boiler. Each ESP is provided with 2 hoppers arrangement across the flow directions. Each ESP is provided with 20 numbers of hoppers. These ash hoppers are located directly beneath the fields and receive the fly ash dislodged from the collecting electrode and emitting system. The hoppers are of conical shape with an outlet opening size of $\phi 300$ mm and are designed to have a valley angle of not less than 65 Deg. This valley angle is provided to ensure free flow of fly ash. For free flow of ash, it is recommended to set the hopper heater temperature at 120 Deg C during normal operation of ESP.

Hopper heaters are provided to avoid condensation of water vapor on the inside surface of the hopper. The ash handling system supplier shall ensure a gas-tight joint at hopper outlet to avoid admission of moisture into the hopper wall and interfere with the free flow of ash inside the ash hoppers.

One of the important factors to be considered while specifying the ash disposal system is the pattern of ash collection in ash hoppers along the flue gas path. The rapping of the collecting electrodes and emitting electrodes are intermittent and are programmed by microprocessor-based rapper controller. This intermittent operation of rapping mechanism is essential from the point of view of operation of the precipitators. Sufficient collection of fly ash on the collecting plates must be permitted so that at the time of rapping, the collected dust shears off the collecting electrodes and falls into the hoppers in the form of large agglomerates thereby minimizing the rapping losses.



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ASH DISTRIBUTION DATA IN VARIOUS FIELDS OF ESP HOPPERS

Ash Collection Rate at Design Condition:

The ESP field wise ash collection rate is furnished for BMCR Worst Coal firing condition for Ash handling system design as per Sec VI/B, Sub.Sec A-01, 4.01.02(A) of Technical Specification. The patterns of ash collection at different field availability conditions are tabulated as below.

Case-I: The ash collection rate is furnished for 9 working fields considering the **first field is in Out of Service condition**. This is because the ESP is designed with one field out of service. (Details furnished in Table-1)

Case-II: The ash collection rate is furnished for 8 working fields considering the **first field and second field are OUT of service condition**. This is because at some time any one field out of service in addition to the Case-I might occur. (Details furnished in Table-2)

Case-III: The ash collection rate is furnished for 9 working fields considering the **last field out of service condition**. This is another variant of Case-I. (Details furnished in Table-3)

Case-IV: The ash collection rate is furnished for all 10 working fields considering all fields are in service for information purpose. (Details furnished in Table-4)



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ASH DISTRIBUTION DATA IN VARIOUS FIELDS OF ESP HOPPERS

(TABLE – 1)

CASE – I								
Pattern of Ash Collection Rate in Different Hoppers Considering 9 Fields Working and First Field Out of Service Condition (At BMCR WC condition, Ref. Sec VI/B, Sub.Sec A-01, 4.01.02(A) of Tech Spec)								
Field Sl. no	Working Field No	Stage Efficiency %	Rapping Frequency Raps/h	Period of Collection (minutes)	Ash Collection per rap (Kg/Rap)	Ash collection Per hopper (Kg/hr)	No. of hoppers per field in a row	Ash collection per ESP (kg/h)
1	OUT OF SERVICE							
2	1	70	15	4	935.73	14036	2	28072
3	2	17.60	12	5	294.08	3529	2	7058
4	3	7.16	10	6	143.60	1436	2	2872
5	4	2.98	6	10	99.58	597.5	2	1195
6	5	1.27	4	15	63.62	254.5	2	509
7	6	0.55	2	30	55.25	110.5	2	221
8	7	0.24	1	60	48.00	48	2	96
9	8	0.11	0.5	120	44.00	22	2	44
10	9	0.05	0.25	240	40.00	10	2	20
Total (kg/h)								40087
Total ash entering in one ESP, kg/h								40103.27
Total ash collected in one ESP, kg/h								40087



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NTPC/DARLIPALLI SUPER THERMAL POWER PROJECT STAGE - II (1X800MW)

ASH DISTRIBUTION DATA IN VARIOUS FIELDS OF ESP HOPPERS

(TABLE – 2)

CASE – II								
Pattern of Ash Collection Rate in Different Hoppers When The First Field And Second Field Out Of Service Condition (At BMCR Worst Coal firing condition, Ref. Sec VI/B, Sub.Sec A-01, 4.01.02(A) of Tech Spec)								
Field Sl. no	Working Field No	Stage Efficiency %	Rapping Frequency Raps/h	Period of Collection (minutes)	Ash Collection per Rap (kg/Rap)	Ash collection Per hopper (kg/h)	No. of hoppers per field in a row	Ash collection per ESP (kg/h)
1	OUT OF SERVICE							
2	OUT OF SERVICE							
3	1	70	15	4	935.73	14036	2	28072
4	2	17.60	12	5	294.08	3529	2	7058
5	3	7.16	10	6	143.60	1436	2	2872
6	4	2.98	6	10	99.58	597.5	2	1195
7	5	1.27	4	15	63.62	254.5	2	509
8	6	0.55	2	30	55.25	110.5	2	221
9	7	0.24	1	60	48.00	48	2	96
10	8	0.11	0.5	120	44.00	22	2	44
Total (kg/h)								40067
Total ash entering in one ESP, kg/h								40103.27
Total ash collected in one ESP, kg/h								40067



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ASH DISTRIBUTION DATA IN VARIOUS FIELDS OF ESP HOPPERS

(TABLE – 3)

CASE – III								
Pattern of Ash Collection Rate in Different Hoppers Considering Last Field Out of Service Condition (At BMCR Worst Coal firing condition, Ref. Sec VI/B, Sub.Sec A-01, 4.01.02(A) of Tech Spec)								
Field Sl. no	Working Field No	Stage Efficiency %	Rapping Frequency Raps/h	Period of Collection (minutes)	Ash Collection per Rap (kg/Rap)	Ash collection Per hopper (kg/h)	No. of hoppers per field in a row	Ash collection per ESP (kg/h)
1	1	70	15	4	935.73	14036	2	28072
2	2	17.60	12	5	294.08	3529	2	7058
3	3	7.16	10	6	143.60	1436	2	2872
4	4	2.98	6	10	99.58	597.5	2	1195
5	5	1.27	4	15	63.62	254.5	2	509
6	6	0.55	2	30	55.25	110.5	2	221
7	7	0.24	1	60	48.00	48	2	96
8	8	0.11	0.5	120	44.00	22	2	44
9	9	0.05	0.25	240	40.00	10	2	20
10	OUT OF SERVICE							
Total (kg/h)								40087
Total ash entering in one ESP, kg/h								40103.27
Total ash collected in one ESP, kg/h								40087



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Customer No. R8/1579
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ASH DISTRIBUTION DATA IN VARIOUS FIELDS OF ESP HOPPERS

(TABLE – 4)

CASE – IV								
Pattern of Ash Collection Rate in Different Hoppers Considering all fields in service (At BMCR Worst Coal firing condition, Ref. Sec VI/B, Sub.Sec A-01, 4.01.02(A) of Tech Spec) for information purpose.								
Field Sl. no	Working Field No	Stage Efficiency %	Rapping Frequency Raps/h	Period of Collection (minutes)	Ash Collection per Rap (Kg/Rap)	Ash collection Per hopper (kg/h)	No. of hoppers per field in a row	Ash collection per ESP (kg/h)
1	1	70	15	4	935.73	14036	2	28072
2	2	17.60	12	5	294.08	3529	2	7058
3	3	7.16	10	6	143.60	1436	2	2872
4	4	2.98	6	10	99.58	597.5	2	1195
5	5	1.27	4	15	63.62	254.5	2	509
6	6	0.55	2	30	55.25	110.5	2	221
7	7	0.24	1	60	48.00	48	2	96
8	8	0.11	0.5	120	44.00	22	2	44
9	9	0.05	0.25	240	40.00	10	2	20
10	10	0.02	0.125	480	32.00	4	2	8
Total (kg/h)								40095
Total ash entering in one ESP, kg/h								40103.27
Total ash collected in one ESP, kg/h								40095



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ASH DISTRIBUTION DATA IN VARIOUS FIELDS OF ESP HOPPERS

Ash collection Pattern:

It may be noted that in the first working field 935.73 kg of ash is dislodged by rapping, in one minute. The second rapping takes place only after (period of collection – 1) 3 minutes and again raps off 935.73 kg of ash. In case the first working field is rendered ineffective due to certain problems, the second working field which was earlier collecting ash at the rate of 294.08 kg/rap will now be collecting 935.73 kg/rap just like the first field. The same logic is applicable for the subsequent fields in series as indicated in the Table.

The ash handling system shall have to cope with sudden surges in the pattern of ash collection in the hoppers. There shall not be any reduction in ash evacuation capacity of hoppers subsequent to first field hoppers for the reason explained above.

In case, the capacity of ash handling is inadequate, it will lead to frequent choking and undue build-up of ash in the hoppers, ultimately resulting in tripping of the fields of electrostatic precipitator.

Therefore, it is imperative that these factors are taken into consideration while specifying the ash handling system for the electrostatic precipitator.

Table 1-4 shows that the ash evacuation capacity of the first 3 fields shall be same.

However, in practice, there will be natural collection of ash when the fields are switched off depending upon the particle size. If the first field is off, it is expected that, the natural collection would be around 20% and if the first two fields are off, it would be around 25%. Though the fields are off, there will be rapping in operation. Therefore, the ash handling system should work even when the fields are switched off.



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ASH DISTRIBUTION DATA IN VARIOUS FIELDS OF ESP HOPPERS

NOTE

1. The above data to be used for designing the ash handling system purpose.
2. The ESP ash collection rates furnished above are for ONE ESP ONLY and the same values shall be considered for other FIVE ESPs also.
3. The predicted values of ash collection data at different hoppers is based on design point condition. However, while designing ash-handling system, **suitable margins** for the ash handling system operation and maintenance has to be considered over and above the data indicated above.
4. It may be noted that for maintaining flow ability of ash, stainless steel lining is provided at the bottom portion of the hopper. Space provision of 400 X 400 mm is envisaged in each hopper on two opposite sides for installation of fluidiser pad. Kindly note that for hoppers of stainless-steel lining 360 X 360 mm size inside the hopper will be cut at works before dispatch. Hopper wall 5 to 8 mm thick shall be cut open at site suitably by Ash handling vendor/executing agencies during installation of fluidizer pad if applicable.
5. It is recommended to evacuate the ash hoppers periodically and it may please be noted that the accumulation of ash beyond the permitted level of ESP hoppers may, not only affect the ESP performance due to damage / misalignment of ESP internals but also may lead to structural failure because of overloading of ash.