Annexure – 3: Technical Specification: Cast Iron Shots

The bidder is requested to note the following,

A. Each lot of cast iron shots shall be accompanied by MTC (Material Test Certificate)/Quality Certificate indicating Chemical composition, Mechanical characteristics as per the details in Section 6 of this Annexure. **The lot here is considered as one truck with approximately 16/ 21/ 25 MT (as per truck capacity) of cast iron shots**. The certificate shall carry the Indian Standards Institute (ISI) mark confirming to the required Indian Standards (IS) for each individual test.
B. The surface of the shots shall be smooth finish, free of adhering sand, slag inclusions and any other foreign material.
C. The specified material shall be free from adulteration.
D. In case the MTCs are not available or incomplete or when material quality differs from Standard Specifications such material shall not be accepted.

1. Description

The Static cavity Cast iron Receiver is the unique design developed by the India One team for thermal storage. The primary object of the invention is to introduce a less complex decentralized system for solar thermal energy storage where energy is stored in the form of heat and when required converts water to saturated/superheated steam in cast iron cavity receiver results in direct steam generation (DSG) in solar thermal power plants.

In this design, the static cast iron cavity receiver acts as thermal storage unit with high heat capacity providing operational flexibility to the system. The thermal storage unit comprises heat transfer coils that are tightly wrapped around the cast Iron body. The entire assembly of CI body and the coil is surrounded by **Cast Iron Shots** which are further enclosed in the outer MS cylindrical shell. Ref. figure below:

1- Cast Iron cavity block
2- Heat transfer coil
3- Outer MS cylindrical shell
4- End plates
5- Cast Iron Shots

2. Technical Specification

2.1 Metal melting, treatment & casting:

The cast iron shots are obtained by re-melting pig iron with coke and limestone in a furnace known as cupola or in induction casting. It is primarily an alloy of iron and carbon.

3. Standards

The material combination for cast iron shots shall be confirming to IS 4606:1983.

4. Quality checks and Testing Certification required

The following parameters shall be checked by the GIZ

I. Test certificate from third party NABL approved labs and/or from the manufacturer test labs confirming the test chemistry and density must be provided for each lot of cast iron shots confirming to the specifications mentioned in Section 5 below. The lot here is considered as one truck with approximately 16, 21 or 25 MT of cast iron shots.

II. Density Check should confirm the specified density both for individual cast iron shot

III. Random sampling of the material arrived at the gate of the project site shall be undertaken by GIZ, at its sole discretion and sent to third party NABL approved labs for chemical and density analysis. The material if found not complying with the technical specifications, as per the reports by the laboratory has to be replaced by the supplier with the required technical specifications at its own cost. The material taken away for sample will not be returned by GIZ.

IV. For Chemical composition and Density of the CI shots GIZ or the consultant appointment by GIZ shall get the test conducted by third party NABL approved labs for verifying the test reports submitted by bidder and ensure the quality of the material actually received at the site.

V. The specified material should be free from the adulteration. Random sampling from the material before dispatch shall be performed to check the purity of the specified material

5. Specifications to be followed

Relevant Test Certificate to be furnished by the bidder for chemical specification and density.

5.1. Physical properties

Description	Required specification
Density	**7.0 to 7.5 g/cm^3**

5.2. Mechanical properties

Description	Required specification
Raw material	Cast Iron
Specification Standard	**IS 4606:1983**
Grade/Size	CI Shots >1.2mm and < than 2.2mm These should be produced using sieve size of 1.2 mm and 2.2 mm

5.3. Chemical properties

SL. No	Chemistry	Composition as per IS 4606:1983
1	Carbon	0.60 – 1.25%
2	Manganese	1.25% max
3	Silicon	0.20 – 1.10% max
4	Sulphur	0.05% max
5	Phosphorous	0.05% max
6	Microstructure	Tempered martensite

5.4. Tolerances

Description	Required specification	Proposition by Supplier
Diameter	CI Shots Size : >1.2mm and < 2.2mm These should be produced using sieve size of 1.2 mm and 2.2 mm	

6. Required sizes and Quantities

The quantities offered shall be mentioned by the bidder as per the prescribed format in Annexure – 5. In the table below the total required quantities are mentioned.

Material	Size (Diameter of shots)	Weight (M tons)
Cast Iron Shots	**CI Shots >1.2mm and < than 2.2mm**	**180 MT**

7. Packaging

The shots shall be delivered to project site in high density polyethylene (HDPE) bags each weighing 25 kg to 50 kg.

Declaration:

1. *I/ we hereby declare that we have attached the sample test certificate for chemical and density tests as per the requirements defined above.*

2. *All the applicable Test certificates for the supplied material will be provided at the time of delivery of material.*

3. *I/ We hereby confirm that all the specification given above has been properly understood and agree to supply the material conforming to the required standard / specification.*

(Signature of Bidder)

Seal/ Stamp and Date: