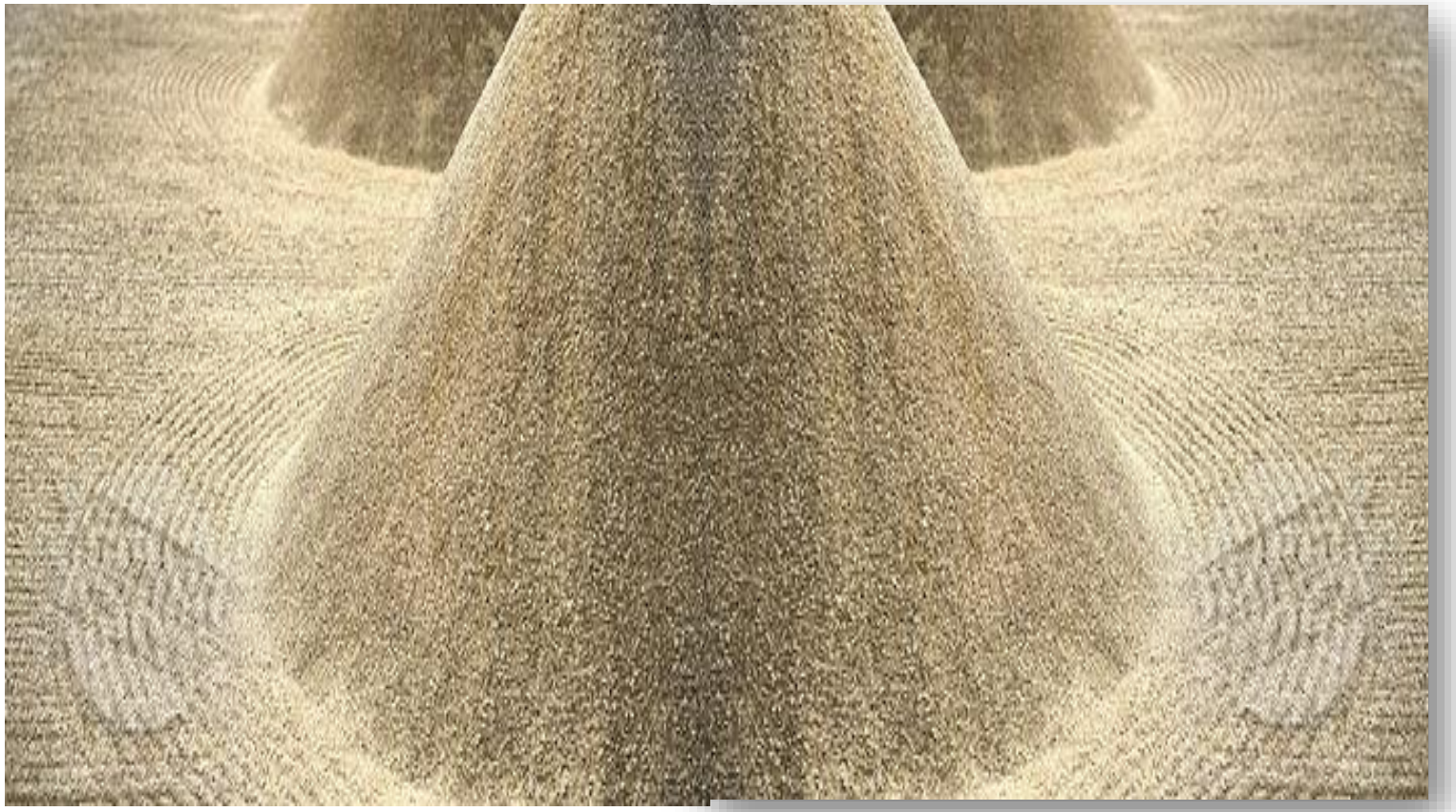
NEXT GENERATION ENGINEERED SAND FOR Concrete , Plaster & DMM

(Technological Innovation For Replacement Of River Sand)



- Technical Presentation for CPWD.
- Mr. Sanjay Nikam
- Principal Consultant of SKGC Group

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ASIA'S GREATEST BRANDS & LEADERS 2019-20

INDIA'S GREATEST BRANDS & LEADERS 2018-19

INTRODUCTION – Shri Krishan Grit Co.

Dr. Sanjeev Gupta – Managing Director

- **Established in year 2000.**
- **Supply of Construction Building Materials including steel.**
- **Turnover – 1200 Cr.**

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INTRODUCTION – Shri Krishan Grit Co.

- Approved by DMRC, RRTS, AAI, NHAI, PWD & many more.
- Owned mines.
- Production capacity 15,000 T/day (5 million T/year). Highest Commercial production in India.
- Technologically advance manufacturing facilities. (Metso, L&T – Kemco). (Ensures consistency in Quality & Quantity)
- Advance fleet management services.
- 1st & Only Company in India – BIS (IS:383) Certified for Aggregates and Sand.

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INTRODUCTION – Mr. Sanjay Nikam

Education:

- **B.E. – Mech. Engg.**
- **PG in Industrial Safety**
- **PG in Management Studies**

Training:

- **Leadership Development Programs. (IMD , Luccane)**
- **Agg. & RMX Business .(Holcim)**
- **HSE Programs**
- **Holcim AGG Manager Course. (University Leicester , UK.)**

Life Members

- **National Safety Council.**
- **MEAI.**
- **Bombay Chamber of Comm.- HSE**
- **Loss Prevention Association .**

Present Professional Work Experience:

Year	Company	Position
2016 onwards	**Suru09 Business Services**	CEO & Principal Consultant
2018 onwards	**Aggregates manufacturer association**	Director

Industrial Segment:

- **Aggregate & M-Sand**
- **Fly ash**
- **Ready Mix Concrete**
- **Dry mix mortar**

Services:

- **Consulting**
- **Project Management**
- **Operations and Maintenance**
- **Technology Channel Partnership**
- **Safety**

Past Professional Work Experience:

Year	Company	Position
2015-2016	Ultratech Cement Ltd.	V.P. Head-Aggregate Business
2011-2015	HOLCIM-SESA Ambuja / ACC Cement Ltd.	Regional AGG Support Manager Sr. V.P. (AGG & New Businesses)
2009-2011	Robo Silicon Pvt. Ltd.	Chief Operating Officer (AGG Business)
2000-2009	RMC Readymix (I) Ltd.	V.P. – Aggregate Business / Project
1995-2000	Clariant (India) Ltd.	Project Manager
1988-1995	BASF/Asian Paints Ltd.	Maintenance Manager

Visiting Faculty at Indian Institute of Technology , Mumbai

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AGENDA

- What is SAND
- NATURAL SAND
- CRUSHED STONE SAND / Engineered Sa
- IS 383: 2016
- MANUFACTURING METHODOLOGY
- TEST REPORTS
- Q & A

Objectives.

- Terminology.
- Differentiation
- Impact on Quality of concrete

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AGENDA

- WHAT IS SAND ?
- NATURAL SAND
- CRUSHED STONE SAND / Engineered Sand
- IS 383: 2016
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- TEST REPORTS
- Q & A

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What is SAND ?

- How is Sand Quality Defined?
  - ➢ What is Sand's **Gradation**
    - Fineness or Coarseness of Sand (Fineness Modulus of Sand)
    - Filler Content (%age of Ultra-fines <150 & 75 microns)
  - ➢ Particle **Shape** (Rounded or Angular & Flaky)
  - ➢ **Cleanliness** (Free from Clay / Silt)

- Naturally occurring granular material
- **Composed of rock & mineral particles**
- Sand composition depends on regional rock sources
- Material ranging from 75 µm to 4.75mm, (mostly in the size of 300µm to 2mm)
- Major use: Construction, Glass making, filtration, sand blasting and, well, beach animation!

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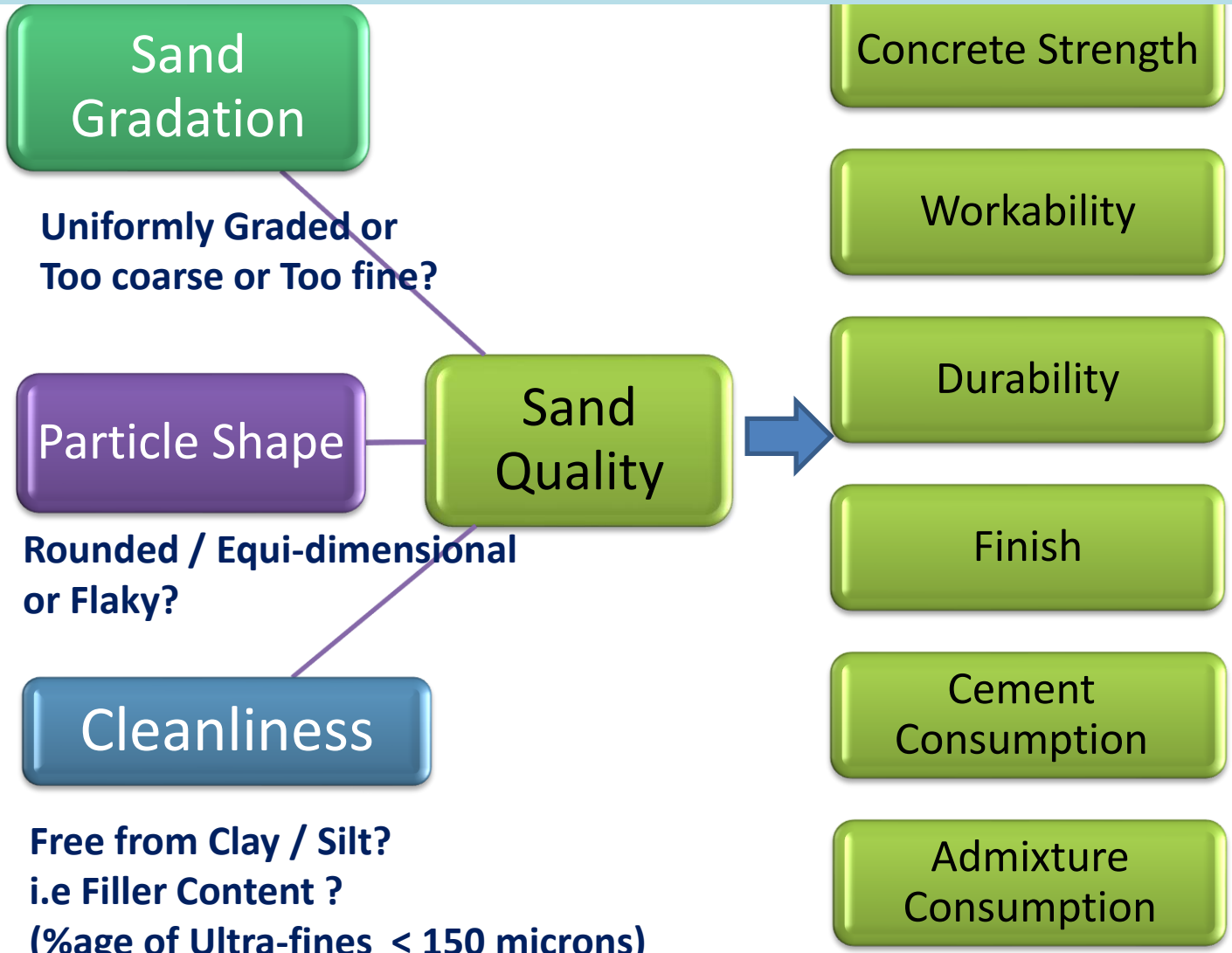
ASIA'S GREATEST BRANDS & LEADERS 2019-20

INDIA'S GREATEST BRANDS & LEADERS 2018-19

What is SAND?

SAND QUALITY ASPECTS AND ITS EFFECT ON CONCRETE



"Engineered Sand" is the only answer for:

- Sand Gradation
- Particle Shape
- Cleanliness

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AGENDA

- What is SAND
- **NATURAL SAND**
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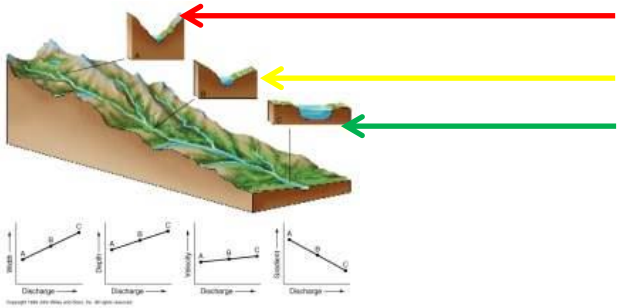
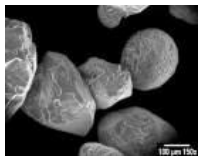
NATURAL SAND

- How do Natural Sand Deposits Occur?
  - Natural sand is formed by natural physical and chemical weathering and erosion processes.
  - The sand is then often transported from it's original position by the actions of water, wind or ice.
  - This movement often causes the sand to stratify into different particle bands.



High energy zone
Course sand
Medium energy zone
medium sand
Low energy zone
fine sand



- Issues with Natural Sand
  - Availability – Difficult to get
  - Quality – No control
    - Different sources
    - Possible contamination with deleterious material
    - Possible adulteration with soil/ clay/ silt
    - Coastal/ Marine sand may contain harmful chlorides
  - Transportation – Often costs more than the sand!
    - Long transportation = More trucks on the road = More pollution
  - Environmental Damages: Irreparable
    - Erosion of rivers at Natural Sand mining areas
    - Damage to the bio diversity of the rivers/ river bed
  - Natural Sand is not a renewable resource (Almost!)

NATURAL SAND - Quality

- Inconsistent River Sand Gradation
  - River sand too coarse in Mumbai, required screening and other processing

Himalayan River Bed Material required processing to extract Sand

Yamuna Sand too fine in Gradation

- Impurities in River Sand

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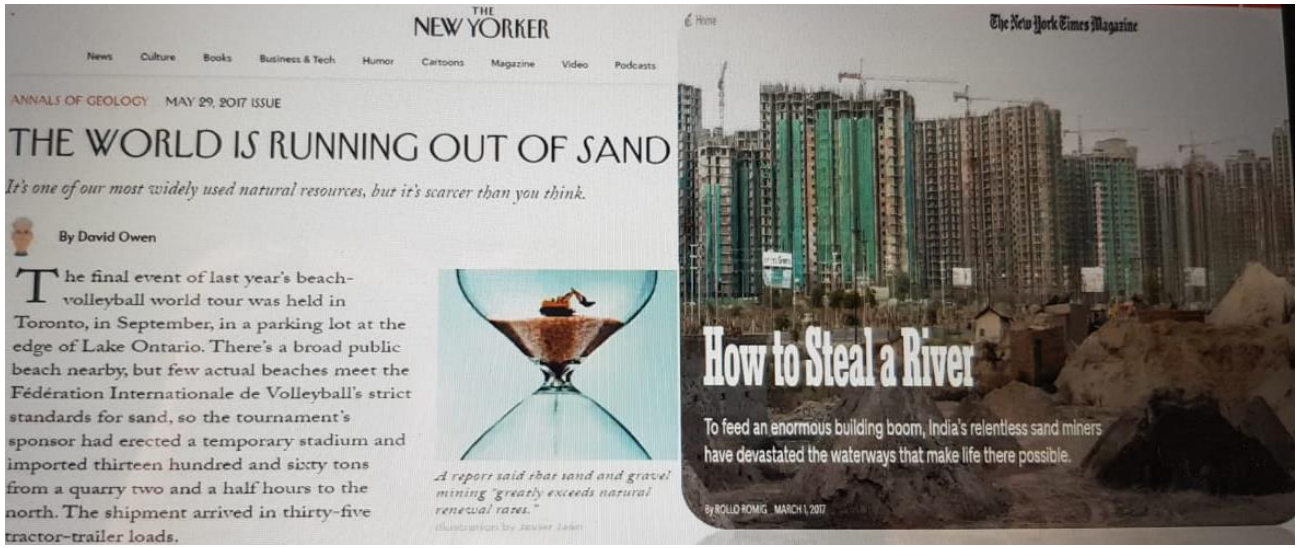
NATURAL SAND – Ecological Imbalance



SUSTAINABLE ALTERNATIVE TO RIVER SAND

- Ecological Imbalance
- Affecting Aquatic Life
- Reduction in Water Table
- Ground Water Depletion
- Water Scarcity
- Detrimental Effect on Civil Structures on Rivers (Bridges / Dams)
- Destruction of flora and fauna of surrounding areas
- Dredging / Transportation –> Pollution -> Higher Carbon Footprint


THE NEW YORKER

News Culture Books Business & Tech Humor Cartoons Magazine Video Podcasts

ANNALS OF GEOLOGY MAY 29, 2017 ISSUE

THE WORLD IS RUNNING OUT OF SAND

It's one of our most widely used natural resources, but it's scarcer than you think.

By David Owen

The final event of last year's beach-volleyball world tour was held in Toronto, in September, in a parking lot at the edge of Lake Ontario. There's a broad public beach nearby, but few actual beaches meet the Fédération Internationale de Volleyball's strict standards for sand, so the tournament's sponsor had erected a temporary stadium and imported thirteen hundred and sixty tons from a quarry two and a half hours to the north. The shipment arrived in thirty-five tractor-trailer loads.

A report said that sand and gravel mining "greatly exceeds natural renewal rates."

The New York Times Magazine

How to Steal a River

To feed an enormous building boom, India's relentless sand miners have devastated the waterways that make life there possible.

By ROLLO ROMIG MARCH 1, 2017

NATURAL SAND – Social Issues

RIVER SAND MINING

Tamil Nadu will not tolerate illegal sand mining: Jayalalitha
Press Trust of India
May 17, 2012

Villagers protest illegal sand mining in Kheralu
Paul John, TNN Jul 24, 2012, 11.21AM IST
AHMEDABAD: Residents of Dedasan and Chailpur villages in Kheralu taluka have taken to the streets, protesting the indiscriminate sand mining along the Sabarmati river.

Illegal sand mining thrives in Satluj riverbed
sand dunes **Dinesh K Sharma, TNN Sep 2, 2012, 02.26AM IST**
FEROZEPUR: Despite a ban on removing sand from riverbeds and small sand dunes, illegal mining of sand on the banks of Satluj in Ferozepur has been going on a large scale.

Sand Mafia allegedly set on fire Maharashtra tehsildar's vehicle
Press Trust of India | Thursday May 3, 2012
A tehsildar escaped unhurt ...Jalgaon district of Maharashtra, police said.

The Bombay High Court banned sand extraction: Deccan Herald

Sand mining: NGT sticks to stand, ban to stay in MP
Rageshri Ganguly, TNN | Aug 1, 2015, 08.03PM IST

Hurt real estate sector reeling under sand bans
Govind Kamat Maad, TNN May 19, 2013, 12.18AM IST

Illegal sand mining: Geology department to auction 18 seized trucks
SURAT: Geology department of the state government has decided to auction 18 trucks ...from Tapi riverbed during the raid carried out on April, 17, 2013

Now, sand is as dear as gold in Hassan
By BR Udaya Kumar ; 22nd August 2011 02:57 AM
HASSAN: At present one has to shell out Rs 20,000 for a truck load of sand.

India's illegal sand mining fuels boom, ravages rivers **By Rama Lakshmi,** **May 19, 2012 Washington Post**
http://articles.washingtonpost.com
Officially, India uses more than 400 million tons of sand for construction in a year, but environmental activists say the illegal mining pushes the real figure over a billion tons.

Ban on Sand Dredging Has Hit Projects: Builders
By Express News Service
01st September 2011 11:50 PM
KOCHI: The ban on sand mining in the district is not proving effective...

Journalists attacked by sand mining mafias in Madhya Pradesh
P Naveen | TNN | Apr 17, 2016, 10.32 PM IST

Illegal sand mining to be cognizable offence : Cabinet
TOI | 22 Nov 2013, 07:55 IST

Sand mining rampant despite b

To Complete Pending Projects Maharashtra Developers Import Sand Mon Oct 26 2015 | PROPGUIDE

Sand mining, transportation banned
Madikeri: June 7, 2015, DHNS


THE TIMES OF INDIA

PAK SC DIRECTS GILANI TO ASK SWITZERLAND TO REVIVE ZARDARI CASES 16

YEDDY GETS HC CLEAN CHIT IN MINING SCAM, EYES CM POST AGAIN 11

MCKAY (28 & 5/28) POWERS AUSTRALIA TO TRISERIES TITLE VICTORY OVER SRI LANKA 20

NEWS DIGEST
21-yr-old crushed to death by sand mafia

DRAVID TO CALL IT A DAY?

City Holi colour poisoning kills boy, lands ove 200 in hospita

Mining mafia murders IPS officer in MP

NEWS DIGEST
Now, sand mafia shoots at MP cop, magistrate

No mining in W Ghats: Green panel
It Also Wants To Curb Industrial Growth In 45 Districts Across Five States

AGENDA

- SAND
- NATURAL SAND
- **CRUSHED STONE SAND / Engineered Sand.**
- IS 383: 2016
- MANUFACTURING METHODOLOGY
- TEST REPORTS
- Q & A

CRUSHED STONE SAND / Engineered Sand – Definition

- **Why Crushed Stone Sand / Engineered Sand**
  - Environmentally Friendly compare to Natural and River Sand
  - Consistent Quality
  - Low Clay Content
  - Gradation as per our requirement
  - Low and recycled rejection
  - West & South Cost Effective Solution.
  - North India

- **Fine aggregates are referred to by many names – Crushed Stone Sand "definition" is required to improve our common understanding**

Fine aggregate / sand is granular material able to pass through the 9mm (3/8") sieve, almost entirely **passing the 4.75-millimeter (No. 4 or 3/16"in.) sieve**, and predominantly retained on the **0.075 mm (200 mesh) or 0.063 mm (230 mesh) sieve**, and resulting from natural disintegration and abrasion of rock or by reduction of suitable source material.

For use in asphalt 2 mm is the dividing point between coarse and fine aggregate. For use in **concreting sand material less than 5 mm** is used, and there are further restrictions on particle size distribution [BS 882; 1983]. *Goodquarry*

Natural sand is used to identify the material traditionally recovered from geologically recent deposits of sand-sized materials. Typically these deposits are from Quaternary deposits in streams, rivers, estuaries, lakes, lagoons or dunes.

Engineered Sand is defined as a **purpose-made crushed fine aggregate** produced from a suitable source material. Production generally involves crushing, screening and possibly washing. Separation into discrete fractions, recombining and **blending may be necessary**.

Guide to the Specification and Use of Manufactured Sand in Concrete - Cement Concrete & Aggregates Australia

Crusher fines / crusher dust are generally **not a purpose made crushed fine aggregate** and are often a non-specification by-product from a crushing and screening process. They are generally a granular material able to pass through the 9mm (3/8") sieve, almost entirely passing the 4.75-millimeter (No 4 or 3/16"in.) They **generally do not meet the gradation, cleanliness (clay and organic content), or particle shape requirement** for use in RMX or concrete products.

Fines, silts, dust, micro-fines are material **finer that 0.063/0.075mm**, i.e. the silt and clay-sized fractions. *Geological Society of Engineering Special Publication no. 17* Dust may be produced as a by-product in the stone or gravel crushing process.

Clay can be defined as particles **smaller than 0.002 mm or 2 microns.**

Slimes, sludge, slurry in aggregates often refers to material finer than 0.063/0.075mm **suspended in water.**

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CRUSHED STONE SAND / Engineered Sand – Why ?

- **Why Crushed Stone Sand / Engineered Sand ?**
  - Consistent Quality : Since Manufactured from quarry the gradation and quality remains consistent throughout the project Product consistency allows more predictable mix to be produced than is achievable with natural sand due to normal natural variations in dug sand gradation. This means that end users of Crushed Stone Sand don't have to allow a safety factor to mitigate for natural gradation variation sand can achieve binder savings.
  - Availability : Due to manufacturing availability is never any issue.
  - Zero Wastage : Due to manufacturing process zero wastage.
  - Compressive Strength : Higher compressive strength compared to river sand by overcoming deficiencies like segregation, bleeding, honey combing, voids and capillary.
  - Eco- Friendly : Engg. Sand is the only alternative to River Sand, with dredging of river sand ban.
  - Economical : Usage of Engg -Sand can drastically reduce the cost since like river sand, it does not contain impurities and wastage is NIL. In International Construction Scenario, no river sand is used at all, only sand is manufactured and used, which gives superior strength and its cubical shape ensures significant reduction in the cement used in the concrete.
  - Zero **Presence of silt and clay** : Natural sand is inherently high in silt and clay. It can be damaging for screed and concrete, if the sand is not sufficiently processed to bring down clay and other impurity content to acceptable levels.

- **Crushed Stone Sand / Engineered Sand - Facts**
  - Engineered Crushed Stone Sand will have the following properties:
    - Continuous grading (4.75mm ~ 0.075mm).
    - Cubical shape (We will see more info in the next slides)
    - Good surface texture
    - Free of deleterious materials
  - All size fractions within the sand should be well represented.
  - A sand gradation should approximately be composed of:
    - 1/3 of fine particles (minus 0.30mm).
    - 1/3 of medium particles (0.30 to 1mm).
    - 1/3 of coarse particles (1 to 4.75mm).

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ASIA'S GREATEST BRANDS & LEADERS 2019-20

INDIA'S GREATEST BRANDS & LEADERS 2018-19

CRUSHED STONE SAND / Engineered Sand – Why ?

➢Natural Sand… Why ???

- Shortage of natural river sand due to depletion of sources.
- Presence of mica and organic matter like shell.
- Presence of oversize +2.5mm particles.
- High percentage of silt, clay i.e. -150 microns.
- Low Concrete strength.

Crushed Stone Sand /Engineered Sand

- Sand can be manufactured from crushed rock, quarry dust, overburden.
- Free from impurities
- Particle size can be controlled in crushing & Screening process.
- Classification removes -150 microns.
- High Concrete strength.
- Workability ?

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CRUSHED STONE SAND / Engineered Sand – Application Guidelines

Annex – sand processing guideline

Key Issues for different Strength Class of Concrete / Mortar

	Issues	Strength Class of Concrete						
		<30MPa / Typical products			30-50MPa / Typical Products			>50MPa / Typical Products
		Readymix Concrete	Light Weight Concrete Blocks	Mortar	Concrete Elements	Shotcrete	Self Compacting Concrete (SCC)	Prestressed Concrete Slabs
Concrete Production	Relative Cost of final product	100	120	150	150	150	>200	>200
	Use of Additives	+	+	+	++	++	++	+++
	Water / Cement Ratio (w/c)	0.6	0.6	0.6	0.5	0.4 - 0.5	0.5	0.4
	Complexness of concrete manufacturing process	+	++	++	+++	++	+++	+++
	Cement Requirement (kg/m^3)	250	250	250	300	300-500	300	350
Aggregate Influence on Concrete Performance	Relative aggregate cost	+++	+++	++	+	++	+	+
	Typical aggregate size fractions	0-32mm	0-32mm	0-4mm	0-20mm	0-6mm	0-20mm	0-20mm
	Amount of filler (<0.075mm) in fine aggregate	0-15% depending on specification	0-15% depending on specification	10-20%	0-10%depending of specification	0-12% depending on the application	>10%, use of specialisted filler materials	0-5%
	Importance of >4mm aggregate shape	++	+	N/A	++	N/A	++	++
	Importance of <4mm aggregate shape	+++	++	+++	+++	+++	+++	+++
	Importance of aggregate surface texture	++	+	+	++	++	+++	+++
	Importance of aggregate angularity	++	+	+++	++	++	+++	+++
	Mineral composition	+	+	++	++	++	++	++
	Consistency of aggregate supply	++	++	++	++	+++	+++	+++
	Need for sand treatment	+	+	+++	++	+	++	++
	Aggregate Specification	ASTM, EN, etc	ASTM, EN, etc	ASTM, EN, etc	ASTM, EN, etc	ASTM, EN, etc	ASTM, EN etc	Internal specification
Concrete Properties	Removal of dust coating from coarse aggregate	Less Common	Less Common	N/A	More Common	N/A	More Common	More Common
	Workability	+++	++	++	+++	++	+++	++
	Finishability	+++	++	+++	++	++	+++	++
	Pumpability	+++	0	0	+	+++	+++	++

Legend:
0 = Has no effect
+ = Little or least effect
+++ = Largest or most significant effect
N/A = Non-Applicable

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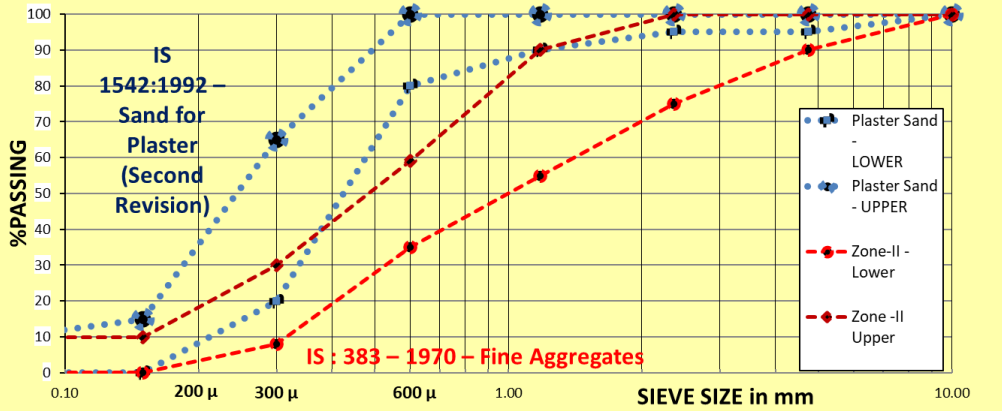
ASIA'S GREATEST BRANDS & LEADERS 2019-20

INDIA'S GREATEST BRANDS & LEADERS 2018-19

CRUSHED STONE SAND / Engineered Sand - Gradation

- Evolution Of Sand Manufacturing Technologies:
- Plaster Sand and Concrete Sand - Gradation Envelopes as per Standards

Sand Gradation Standards
Uniformly Graded Sand Should Fit in these Envelops



Concrete Strength , Durability, Workability, Finish largely depends on Sand gradation i.e Fineness Modulus

- Evolution Of Sand Manufacturing Technologies:
- Desired Fineness Of Sand For Different Applications

In simpler words…
To get FM of 2.8mm will imply that
One should use Sand stock with particle size ~<3.5mm
(with uniform gradation and good percentage of 300 µ, 600 µ, 1mm etc)

Indian Sand Specs:

	Cumulative % Passing Range			
IS Sieve Designation	Zone I	Zone II	Zone III	Zone IV
10mm	100	100	100	100
4.75mm	90 ~ 100	90 ~ 100	90 ~ 100	95 ~ 100
2.36mm	60~95	75 ~ 100	85 ~ 100	95 ~ 100
1.18mm	30 ~ 70	55 ~ 90	75 ~ 100	90 ~ 100
600 microns	15 ~ 34	35 ~ 59	60 ~ 79	80 ~ 100
300 microns	5 ~ 20	8 ~ 30	12 ~ 40	15 ~ 50
150 microns	0 ~ 10	0 ~ 10	0 ~ 10	0 ~ 15

Note: For crushed stone sands, the permissible limit of 150 uM is 20%

Increased Fineness

Construction Work	Desired Fineness Modulus of SAND
Concrete Works	2.5 to 3.1
Plastering Work	1.5 to 2.4
Brick Works	1.2 to 1.5

FM is Average Size of Sand Particles in a stockpile

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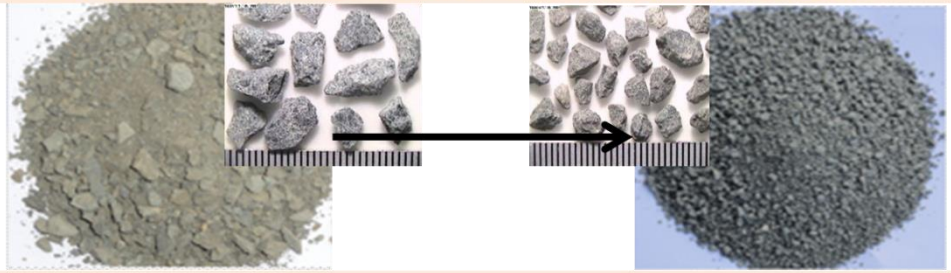
CRUSHED STONE SAND / Engineered Sand - Shape

- Evolution Of Sand Manufacturing Technologies:
- Shape of Sand particles

Well Rounded / Equi-dimensional Shape of Sand Particles – A Must!
This leads to …
Better Workability/ Flow ability, Better Inter- Particle Locking ->
Improved Strength; Lesser Voids and Reduced Cement Consumption



SHAPE OF CRUSHER DUST COMPARED TO GOOD QUALITY Crushed Stone Sand

- Particle Shape

Flaky

Elongated

Flaky & Elongated

Cubical

CRUSHED STONE SAND - Shape

- Particle Shape
  - Cubical shape improves particle packing.
  - Water demand is related to shape of the aggregates.

- Particle Shape
  - Effects of Crushed Stone Sand on Fresh Concrete:
    - Improved workability.
    - Improved finishability.
    - Improved particle packing.
    - Reduced bleeding (Internal bleeding).
  - Effects of Crushed Stone Sand on Hardened Concrete
    - Higher compressive strength and flexural strength for a given cement content.
    - Cubical aggregate gives optimum strength.
    - Reduced Shrinkage.

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CRUSHED STONE SAND / Engineered Sand- Cleanliness

- Sand Manufacturing Technologies:
  - **Cleanliness of Sand**
    - Standards specify:
      - Fine sand should consist of natural sand or crushed stone sand.
      - It should be **hard, durable, clean and be free from organic matter** etc.
      - Fine Sand **should not contain any appreciable amount of clay and harmful impurities such as alkalis, salts, coal, decayed vegetation etc.**

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AGENDA

- SAND
- NATURAL SAND
- CRUSHED STONE SAND / Engineered Sand
- **IS 383: 2016**
- MANUFACTURING METHODOLOGY
- TEST REPORTS
- Q & A

IS 383: 2016

New Revision 2016

भारतीय मानक
Indian Standard

IS 383 : 2016

Coarse and Fine Aggregate for Concrete — Specification

(Third Revision)

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली-110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002
www.bis.org.in www.standardsbis.in

January 2016 Price Group 8

SAND TERMINOLOGIES

Concrete Sand

Creek Sand

Dust

Fine Aggregates

Sea Sand

Classified Sand

Zone - 2 Sand

Copper Sand

Flyash Sand

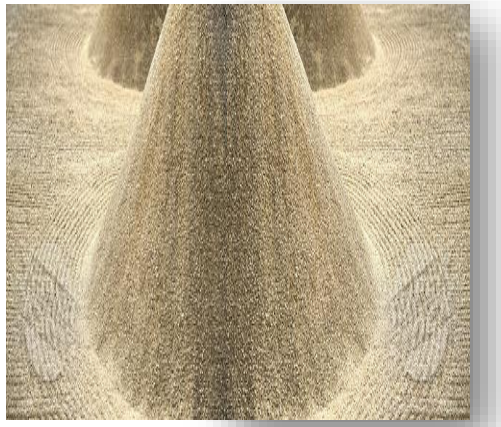
P - Sand

Silica Sand

Plaster Sand

Zone - 3 Sand

CRF



Engineered Sand

Mineral Sand

Zone - 1 Sand

Crushed Stone Sand

Bottom Ash Sand

Natural Sand

Manufactured Sand

M - Sand

Crushed Gravel Sand

Slag Sand

Mixed Sand

Washed Sand

Dry Sand

River Sand

Filtered Sand

Zone – 4 Sand

VSI Sand

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IS 383: 2016

This standard covers the requirements for **aggregates** for use in the production of **concrete** for normal structural purposes.

Aggregates can be :

- **crushed** or **uncrushed**,
- derived from **natural sources**, such as river terraces and riverbeds, glacial deposits, rocks, boulders and gravels,
- **manufactured** aggregates produced from **other than** natural sources

New in 2016 Revision

IS 383: 2016

Fine Aggregate - Aggregate most of which **passes** 4.75 mm IS Sieve and contains only so much ***coarser material*** as permitted in ***Clause 6.3.***

Natural Sand - Fine aggregate resulting from the natural disintegration of rock and which has been deposited by streams or glacial agencies. This may also be called as uncrushed sand.

Crushed Sand

Crushed stone sand - Fine aggregate produced by crushing ***hard stone***.

Crushed gravel sand - Fine aggregate produced by crushing ***natural gravel***.

Mixed Sand - Fine aggregate produced by blending ***natural sand*** and ***crushed stone sand*** or crushed gravel sand in suitable proportions.

Manufactured Fine Aggregate (Manufactured Sand) –

Fine aggregate manufactured from ***other than*** natural sources, by processing materials, using thermal or other processes such as separation, washing, crushing and scrubbing.

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IS 383: 2016 – Grading Zone

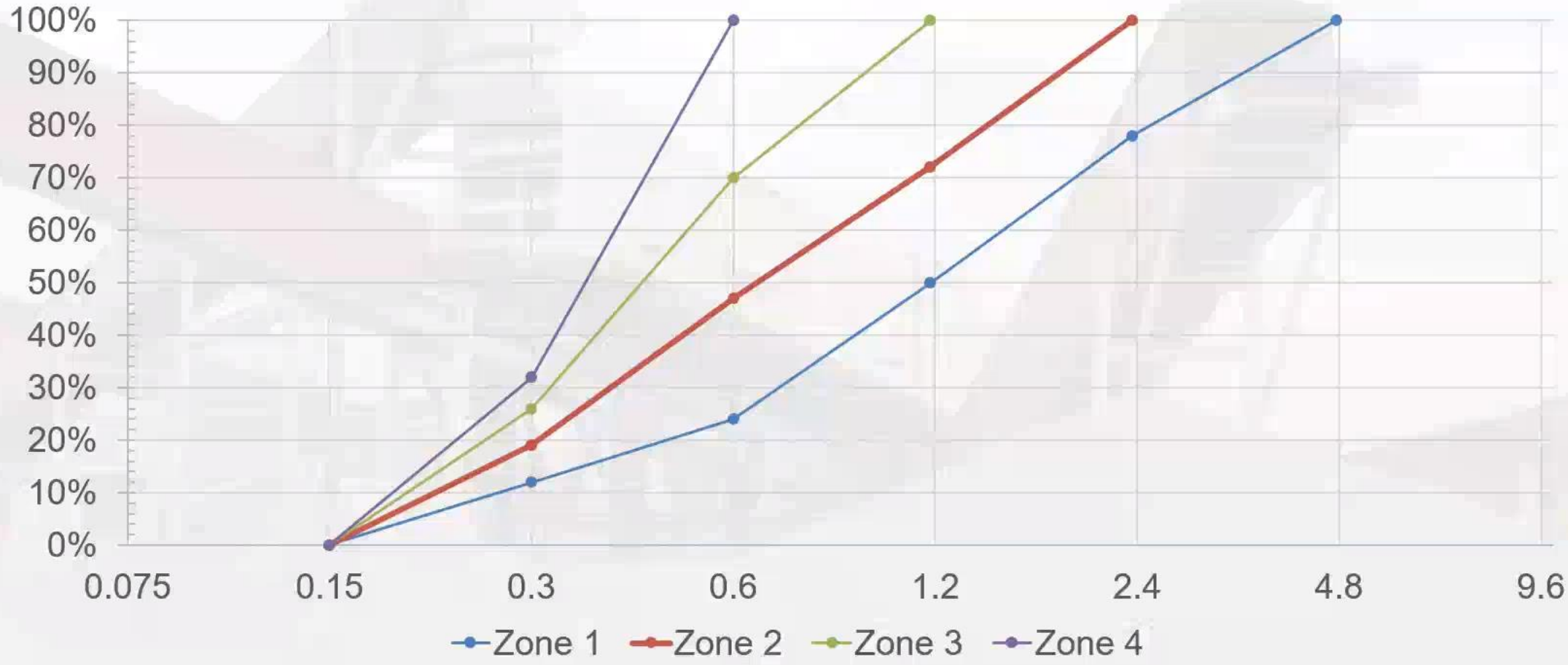
	Percentage Passing			
	Grading Zone			
Sieve Size	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**
10 mm	100%	100%	100%	100%
4.75 mm	90-**100%**	90-100%	90-100%	95-100%
2.36 mm	60-95%	75-**100%**	85-100%	95-100%
1.18 mm	30-70%	55-90%	75-**100%**	90-100%
600 µm	**15-34%**	**35-59%**	**60-79%**	**80-100%**
300 µm	5-20%	8-30%	12-40%	15-50%
150 µm	**0**-10%	**0**-10%	**0**-10%	**0**-15%
75 µm	*0-3%*	*0-3%*	*0-3%*	*0-3%*

	Percentage Passing			
	Grading Zone			
Sieve Size	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**
10 mm	Nil oversize	Nil oversize	Nil oversize	Nil oversize
4.75 mm	**100%** 0-10% oversize	0-10% oversize	0-10% oversize	0-5% oversize
2.36 mm	78 ± 18%	**100%** 0-25% oversize	0-15% oversize	0-5% oversize
1.18 mm	50 ± 20%	72 ± 18%	**100%** 0-25% oversize	0-10% oversize
600 µm	**24 ± 10%**	**47 ± 12%**	**70 ± 9%**	**100%** 0-20% oversize
300 µm	12 ± 7%	19 ± 11%	26 ± 14%	32 ± 18%
150 µm	**0%** 0-10% undersize	**0%** 0-10% undersize	**0%** 0-10% undersize	**0%** 0-15% undersize
75 µm	*upto 3%*	*upto 3%*	*upto 3%*	*upto 3%*

* Above Gradation is for " River Sand " . For Crushed stone Sand / Engineered Sand permissible limit on 150 micron IS sieve is increased to 20 %.

IS 383: 2016 - Graphs

Table 9 – Fine Aggregates *(Simplified/Decluttered)*



as determined by the method described in IS 2386 (Part 1)

IS 383: 2016 – Zone 2

Table 9 – Fine Aggregates – **Zone 2** *(Demystified)*

Sieve Size	Cumulative Passing %	Mean %	Particle Size	Fraction %
10 mm	100%	100%	10 ~ 4.75 mm	5%
4.75 mm	90-100%	95%	4.75 ~ 2.36 mm	7%
2.36 mm	75-100%	88%	2.36 ~ 1.18 mm	16%
1.18 mm	55-90%	72%	1.18 ~ 0.6 mm	25%
600 µm	**35-59%**	**47%**	**600 ~ 300 µm**	**28%**
300 µm	8-30%	19%	300 ~ 150 µm	14%
150 µm	0-10%	5%	150 ~ 75 µm	3%
75 µm	0-3%	2%	75 µm ~ Pan	2%

* Above Gradation is for " River Sand " . For Crushed stone Sand / Engineered Sand permissible limit on 150 micron IS sieve is increased to 20 %.

AGENDA

- SAND
- NATURAL SAND
- CRUSHED STONE SAND
- IS 383: 2016
- **MANUFACTURING METHODOLOGY**
- TEST REPORTS
- Q & A

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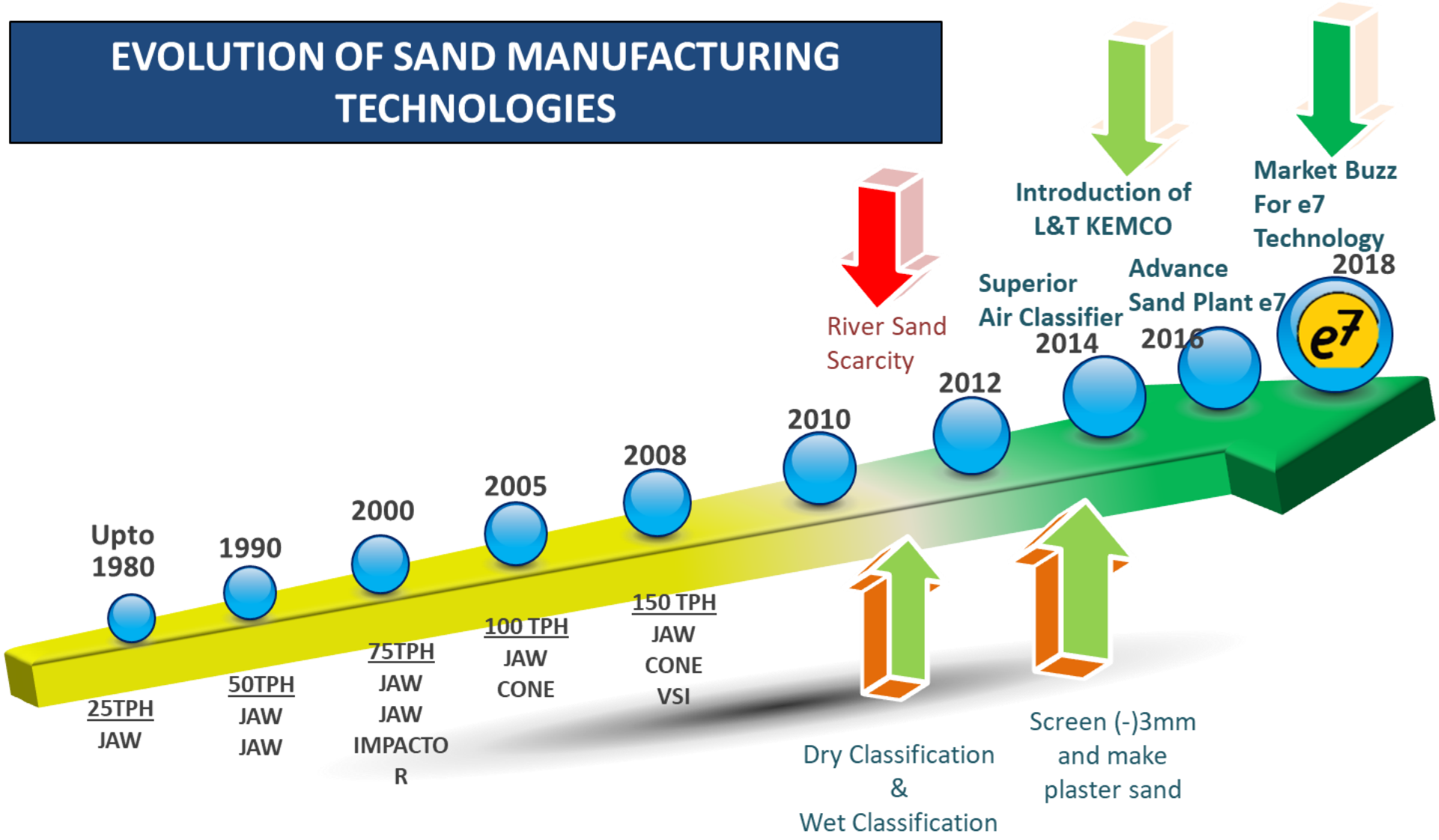
MANUFACTURING METHODOLOGY - Evolution

EVOLUTION OF SAND MANUFACTURING TECHNOLOGIES



skgc

MANUFACTURING METHODOLOGY - Plan

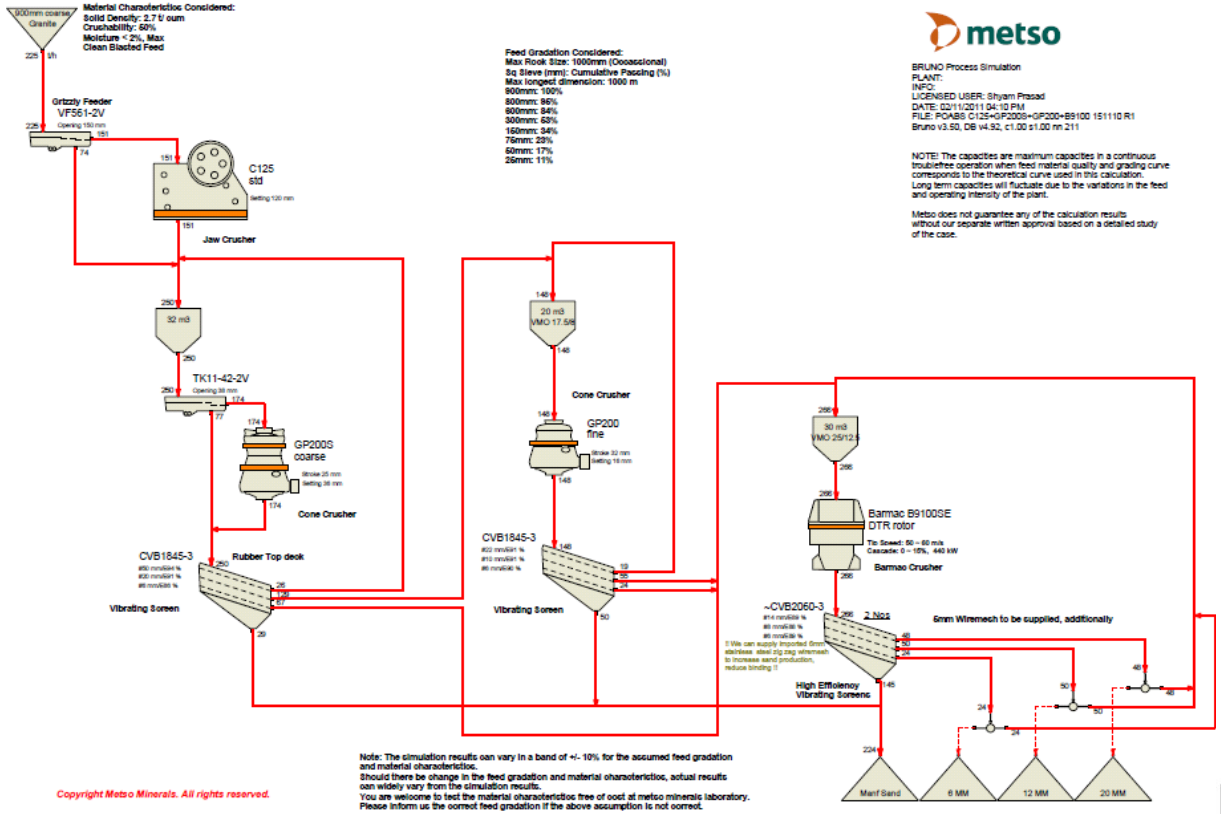
skgc

ASIA'S GREATEST BRANDS & LEADERS 2019-20

INDIA'S GREATEST BRANDS & LEADERS 2018-19

MANUFACTURING METHODOLOGY – Flow Sheet

- Flow Sheet of Sand Plant:

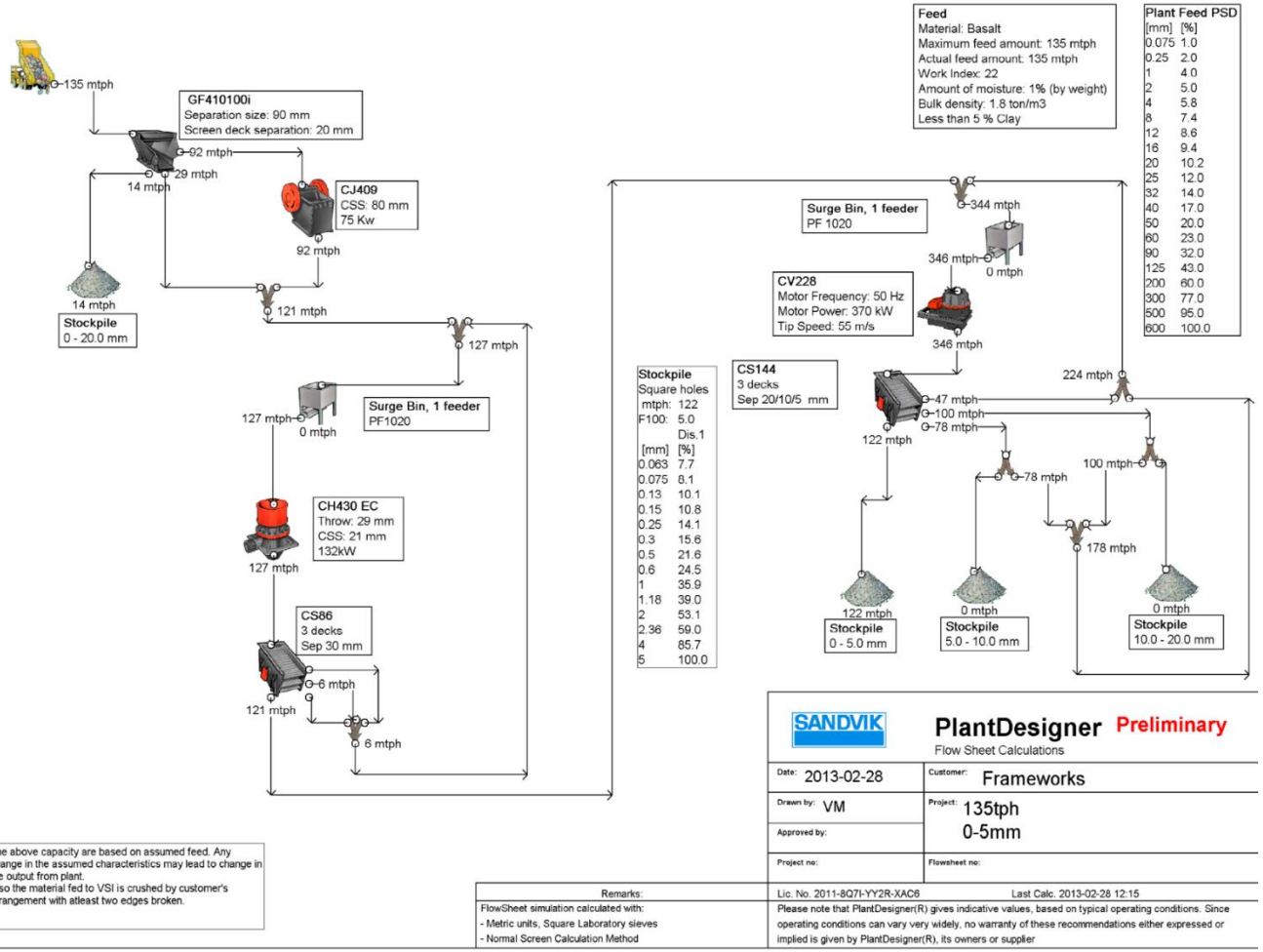


metso

BRUNO Process Simulation
PLANT:
INFO:
LICENSED USER: Shyam Prasad
DATE: 02/11/2011 04:10 PM
FILE: POABS C125+GP200S+GP200+B9100 151110 R1
Bruno v3.50, DB v4.92, c1.00 s1.00 nn 211

NOTE: The capacities are maximum capacities in a continuous troublefree operation when feed material quality and grading curve corresponds to the theoretical curve used in this calculation. Long term capacities will fluctuate due to the variations in the feed and operating intensity of the plant.

Metso does not guarantee any of the calculation results without our separate written approval based on a detailed study of the case.



The above capacity are based on assumed feed. Any change in the assumed characteristics may lead to change in the output from plant.
Also the material fed to VSI is crushed by customer's arrangement with atleast two edges broken.

SANDVIK

PlantDesigner Preliminary
Flow Sheet Calculations

Date: 2013-02-28	Customer: Frameworks
Drawn by: VM	Project: 135tph 0-5mm
Approved by:	
Project no:	Flowsheet no:

Remarks:	Lic. No. 2011-8Q7I-YY2R-XAC6 Last Calc. 2013-02-28 12:15
FlowSheet simulation calculated with: - Metric units, Square Laboratory sieves - Normal Screen Calculation Method	Please note that PlantDesigner(R) gives indicative values, based on typical operating conditions. Since operating conditions can vary very widely, no warranty of these recommendations either expressed or implied is given by PlantDesigner(R), its owners or supplier

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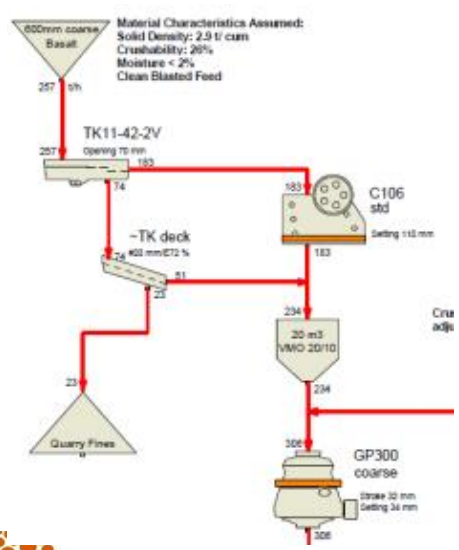
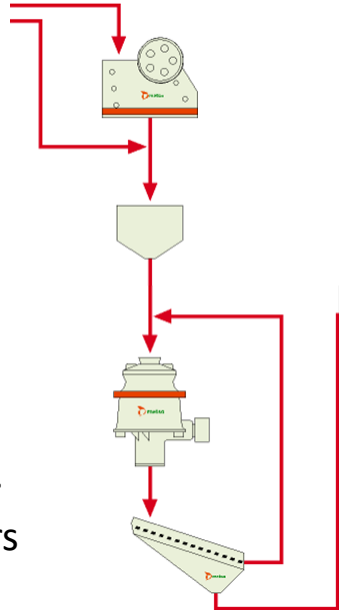
MANUFACTURING METHODOLOGY - Primary

- Removal of clay:
  - Overburden, Weathered Rock fines and clay should be removed
  - These are removed by scalping before the primary crusher.
  - The scalped particles (generally Minus 20mm) report to a stockpile, and can be used in landfill/ sub layers or road etc.



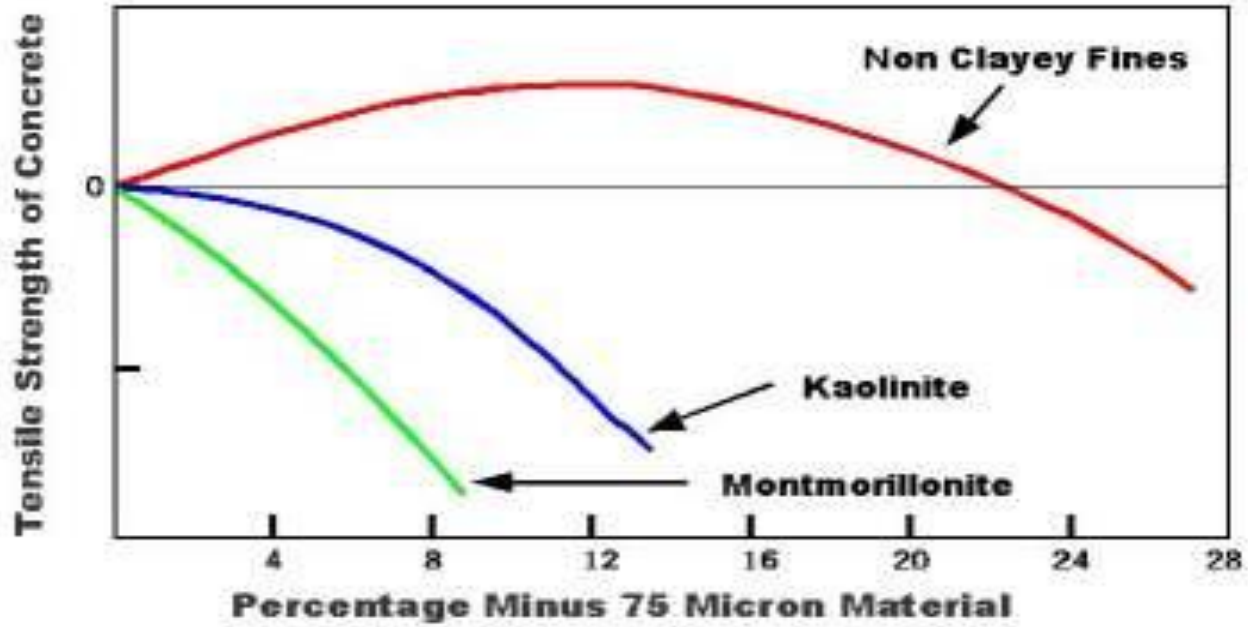
- Primary and Secondary crushers
  - Generally Jaw Crushers and Cones do the reduction work in primary and secondary stages.
  - Jaw Crusher s are sized based on the largest feed material size and the capacity of the crushing plant.
  - A surge bin/ tunnel is recommended between the primary and secondary stages
  - Feeders with variable frequency drive help in balanced feeding to the crushers.
  - In low abrasive softer material, Impactors can be used as primary crusher to achieve highest reduction.



Manufacturing Sand – Good Practice

Rock Characteristics

- The first factor to consider is the cleanliness of the feed rock.
- All feed should be scalped as required at the primary crusher to remove any potential clay.
- Clay is detrimental to the strength of the concrete as it reacts with the



Source, A. Maldonado, S. Orsetti and C. Tourenq,

MANUFACTURING METHODOLOGY - Primary

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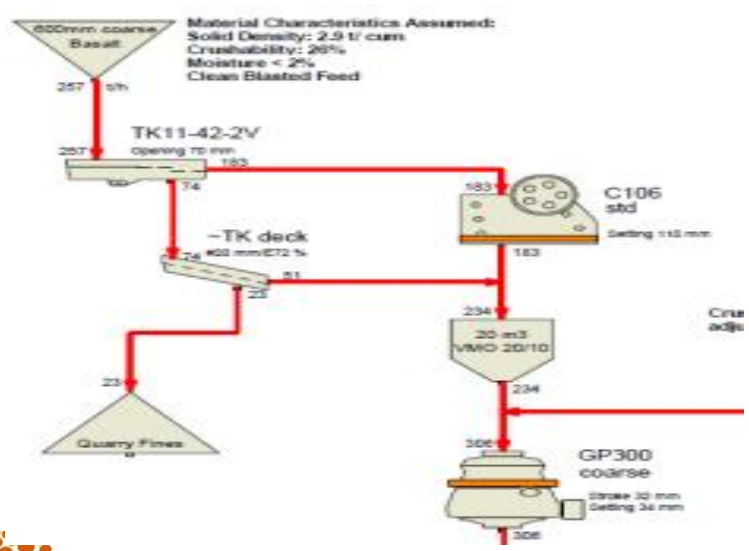

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  - Jaw Crusher s are sized based on the largest feed material size and the capacity of the crushing plant.
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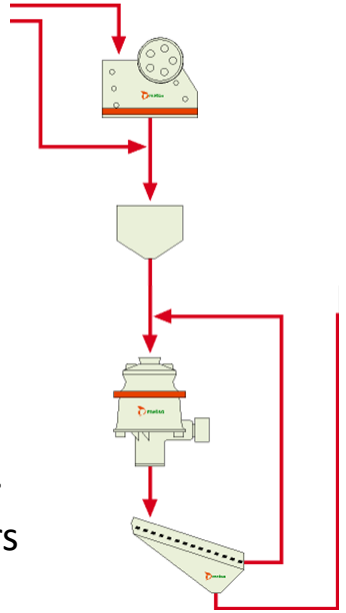

GRIZZLY

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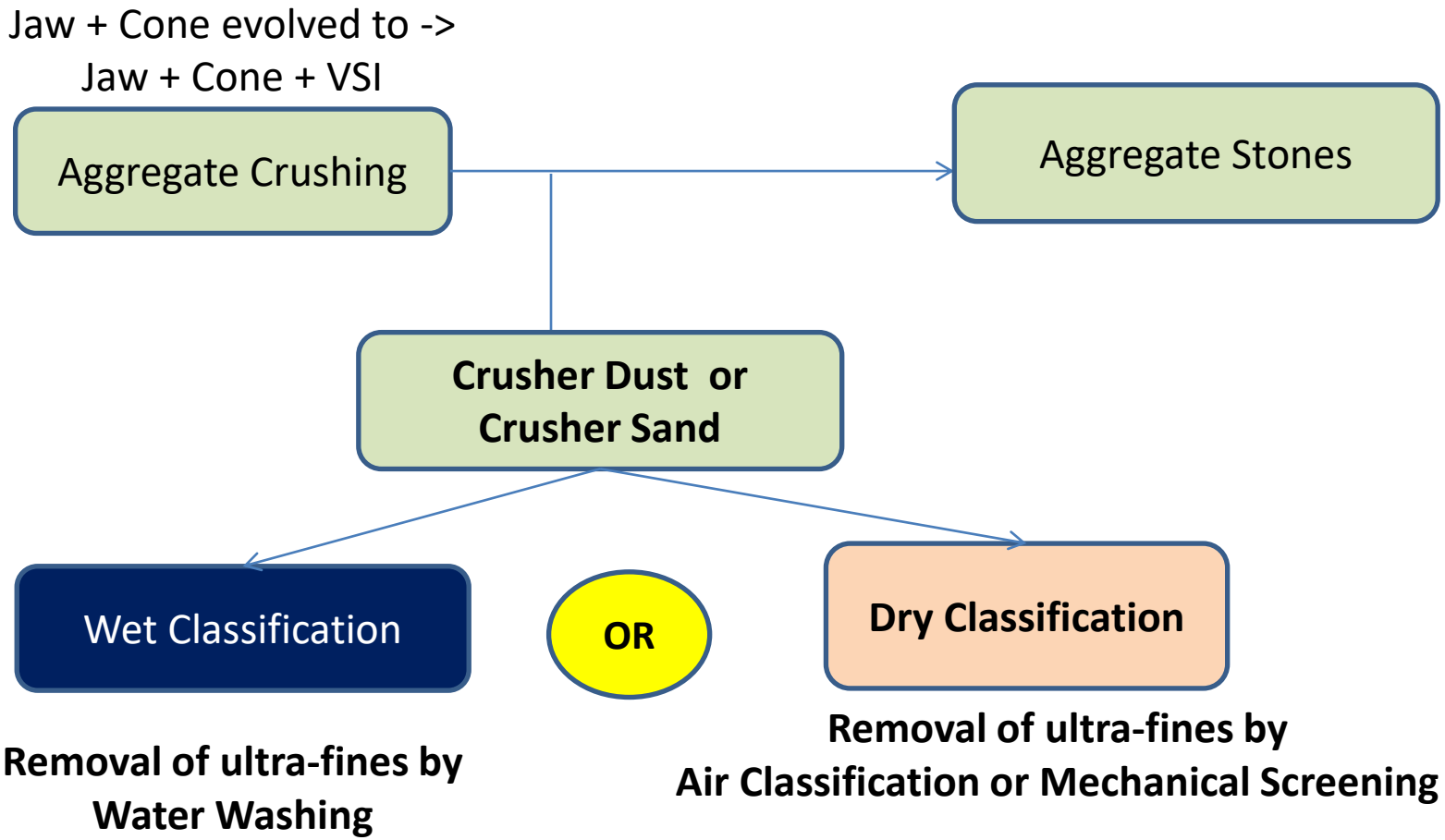
SURU09 Business Services

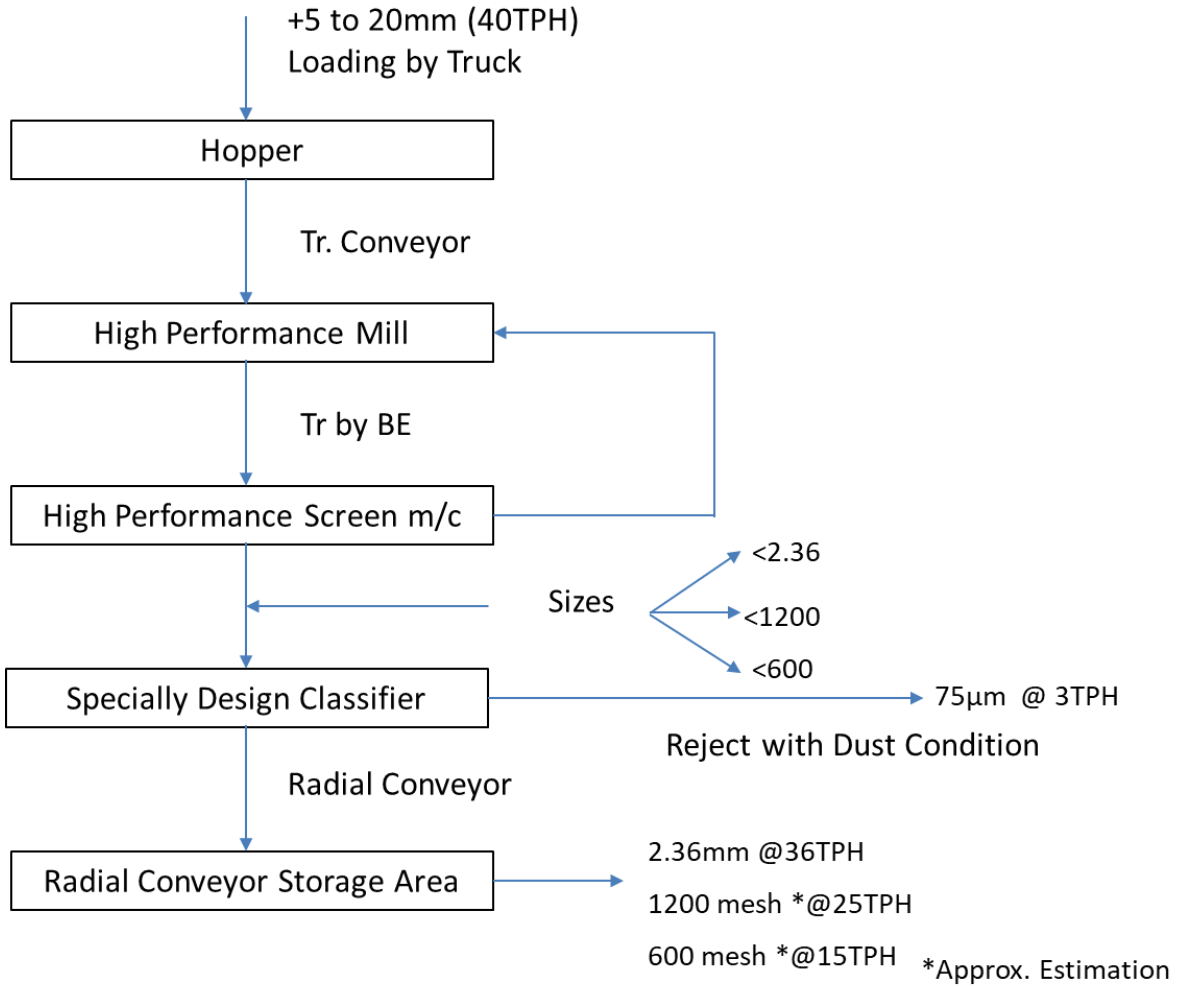
MANUFACTURING METHODOLOGY - Classification

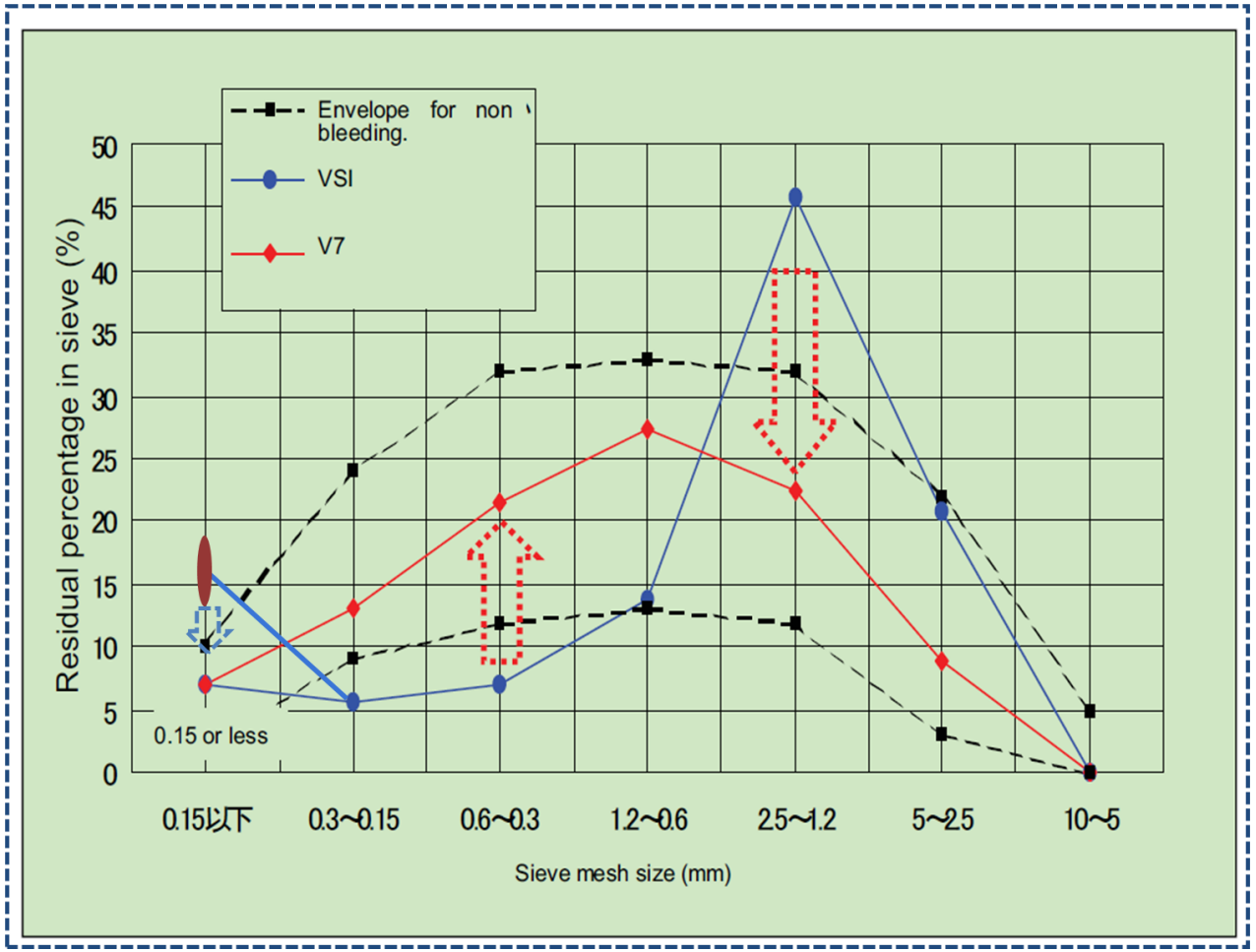
Technologies employed in India till date?

Manufacturing Sand (M-Sand) in India till today is limited to just cleaning of crusher dust i.e removal of ultra-fines only



MANUFACTURING METHODOLOGY – Advanced Technology





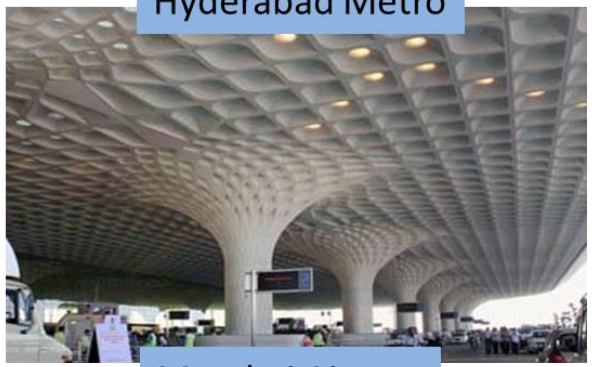
MANUFACTURING METHODOLOGY – Advanced Technology

- Use of Crushed Stone Sand

Mumbai Metro

Hyderabad Metro

Cochi Metro



Mumbai Airport

- L&T collaborated with Kemco, Japan to introduce World's most advanced Sand Manufacturing Technology in India and other select countries

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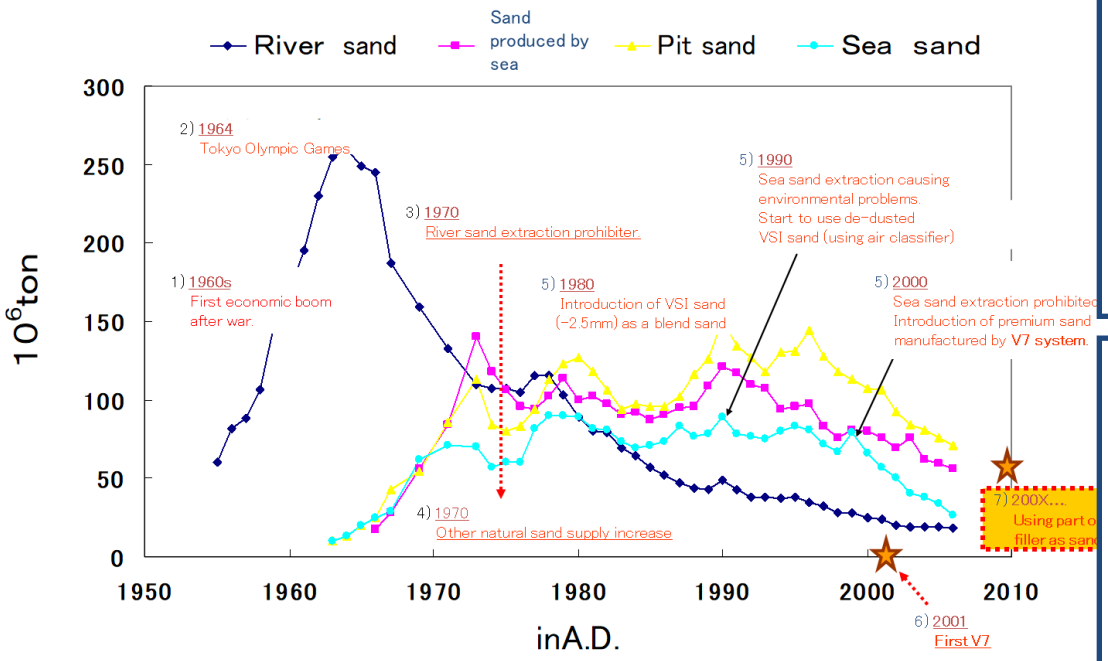
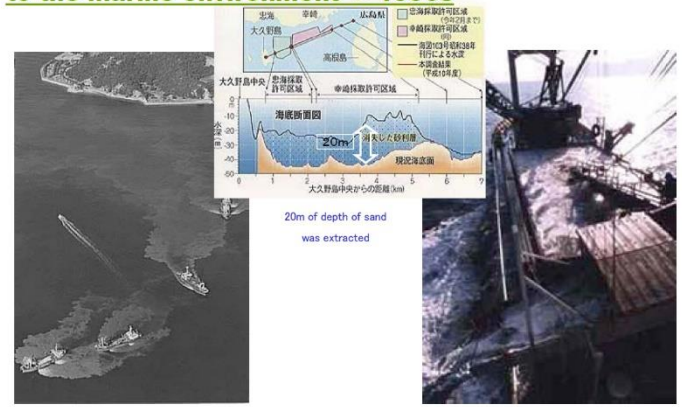
MANUFACTURING METHODOLOGY – Japan Story

By 2010 River sand completely replaced by Kemco Sands



Extraction of sea sand causes the serious harm to the marine environment=> 1990s

P-4



Sea water gets turbid through sand extraction.

A dredger extracting sea sand..

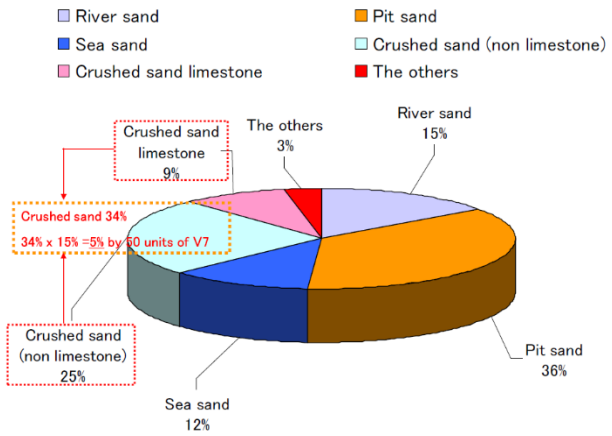
Current and future availability of sand in Japan Segment by segment

P-6

Options	Current situation	Future availability
River sand	Getting short	×
Sea sand	Getting short	×
Pit sand	Decreasing	△Limited volume
Slag	Very limited area and volume	△Limited volume
Import from China	China banned sand export in May, 2006.(Natural sand supply in China is also getting short)	×
Crushed sand	Increasing	◎

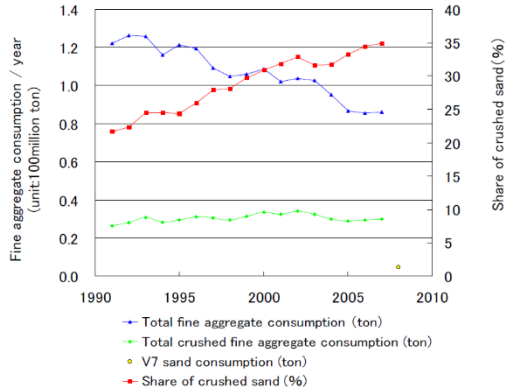
Where sand comes from in Japan - 2007

P-8



The increasing percentage of manufactured sand in total sand consumption

P-7



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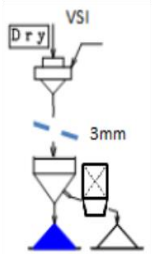
MANUFACTURING METHODOLOGY – Advanced Technology



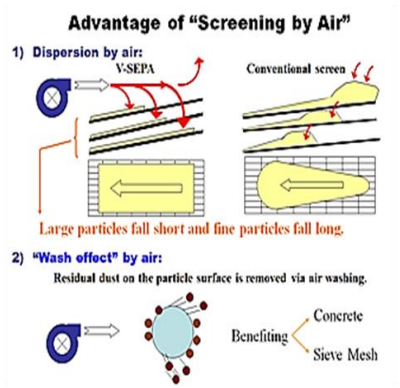
Suppliers:

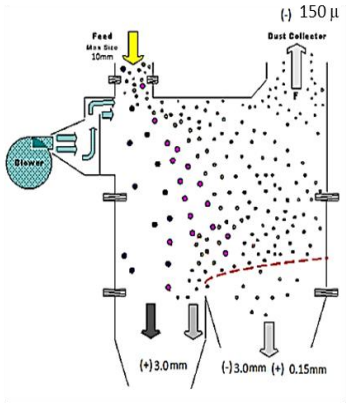
- L&T- Kemco in Dry Process

In Wet-Process…

- Sandvik + CDE in wet process

-3mm PLASTER SAND MANUFACTURING METHOD





L&T- Kemco Air Screening Technology (e-Sepa) –

- Improved Screen Efficiency due to forces air circulation
- PLC Controls to adjust suction volume and blower speeds

Issues:

- Low Productivity of system due to re-circulation of +3-5mm
- Flaky Shape
- Difficulty in handling material in excess of 2% moisture

ADAVANCED SAND MANUFACTURING SOLUTIONS

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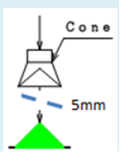
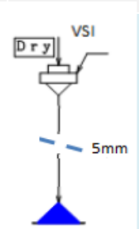
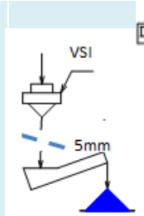
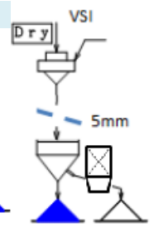
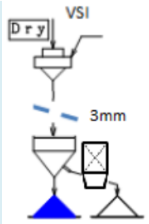
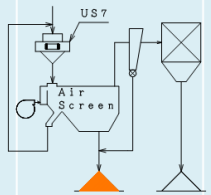
ASIA'S GREATEST BRANDS & LEADERS 2019-20

INDIA'S GREATEST BRANDS & LEADERS 2018-19

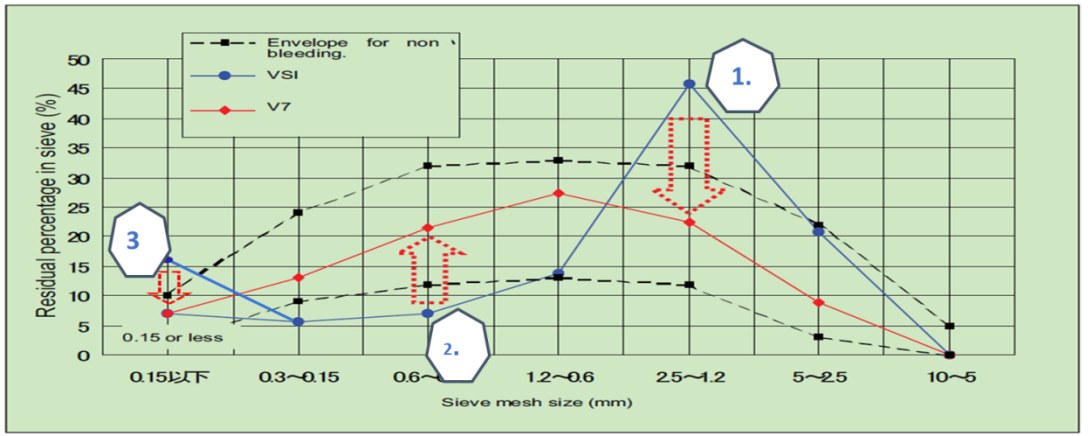
MANUFACTURING METHODOLOGY - Comparison

Comparison Of Sands -Different Technologies

Sand Quality	Cone Sand (Crusher Dust)	VSI Sand (Crusher Dust)	VSI -> Washed Sand	VSI -> Air Classified Sand	VSI-> Screen @3mm-> Classifier/ Washed	e7 Sand Plant	Natural River Sand
Overall Grading	👎	👎	👎	👎	👍	👍👍 Precise Control	👍👍 *May Vary
Cleanliness / Ultra-fines	👎 Dusty	👎👎 Dusty	👍	👍	👍	👍👍 Precise Control	👍 *Chances of Clay
Fineness Modulus	👎👎 Very Coarse	👎 Less Coarse	👎👎 Very Coarse	👎👎	👍	👍👍 Precise Control	👍👍 *May Vary
Shape	👎👎 Very Flaky	👎 Less Flaky	👎 Less Flaky	👎 Less Flaky	👎 Less Flaky	👍👍 Equi-Dimensional	👍👍 Spherical
Surface Finish/ Interlock	👎 Very rough	👍	👍	👍	👍	👍	👎 Smooth
Flow							

- Technology and Options

Sr. No.	IS Sieve Zone-II (IS 383-1970)	% Passing	% Retention	2 Stage	3 Stage (VSI)	BHS	KEMKO	KORITSU	Washing Screening (ASHTEC)
1.	- 2.36	75-100	25-Nil	More	More	OK	OK	OK	More
2.	- 600 micron	35-59	41-65	Less	Less	OK	OK	OK	Less
3.	- 150 micron	0-10	90-100	OK	More	More	OK	OK	OK
4.	Shape	----	----	BAD	Average	Good	Good	Good	Avg.



skgc

MANUFACTURING METHODOLOGY

M/s. Shri Krishan Grit Co. Kotputli
Customer Profile: Established building contractor from Delhi. Experienced in Crushing & Sand Manufacturing

Integrated to Metso make 3 Stage Plant (Jaw+ Cone+ VSI)

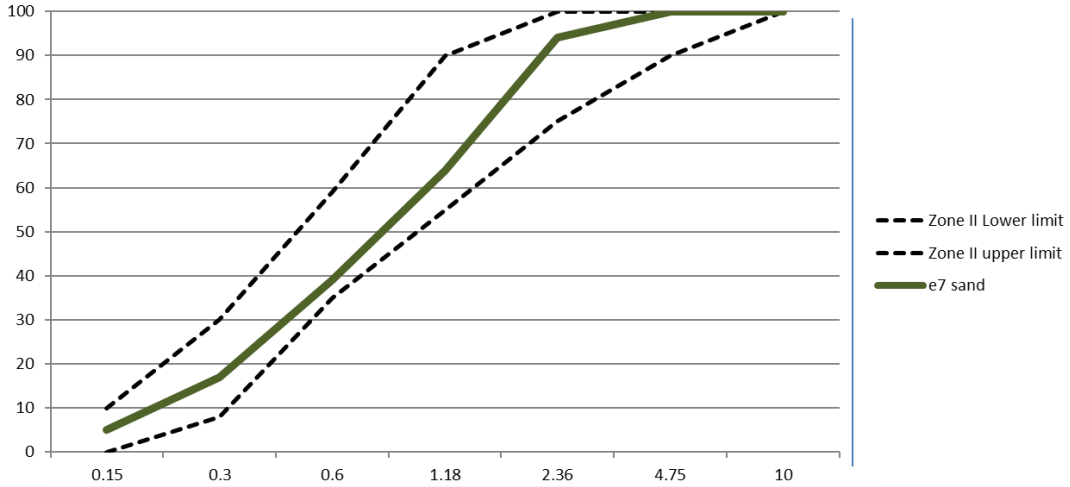
Product : Concrete Sand IS 383 Zone –II, 2.7FM

Feed Rate to e7 : 60 TPH
Feed Material : Granite
Feed Materia Size : 0/3.5 – 10 mm

Product Issue : High amount of 75-300 micron & Low 300-1.18micon due to typical material crystalline character.
Solution : Separate Screen to use to screen out excess 75-300 micron.
** This materials are good to be more in sand. Separately also salable for dry mix mortar.*

MANUFACTURING METHODOLOGY – Final Quality

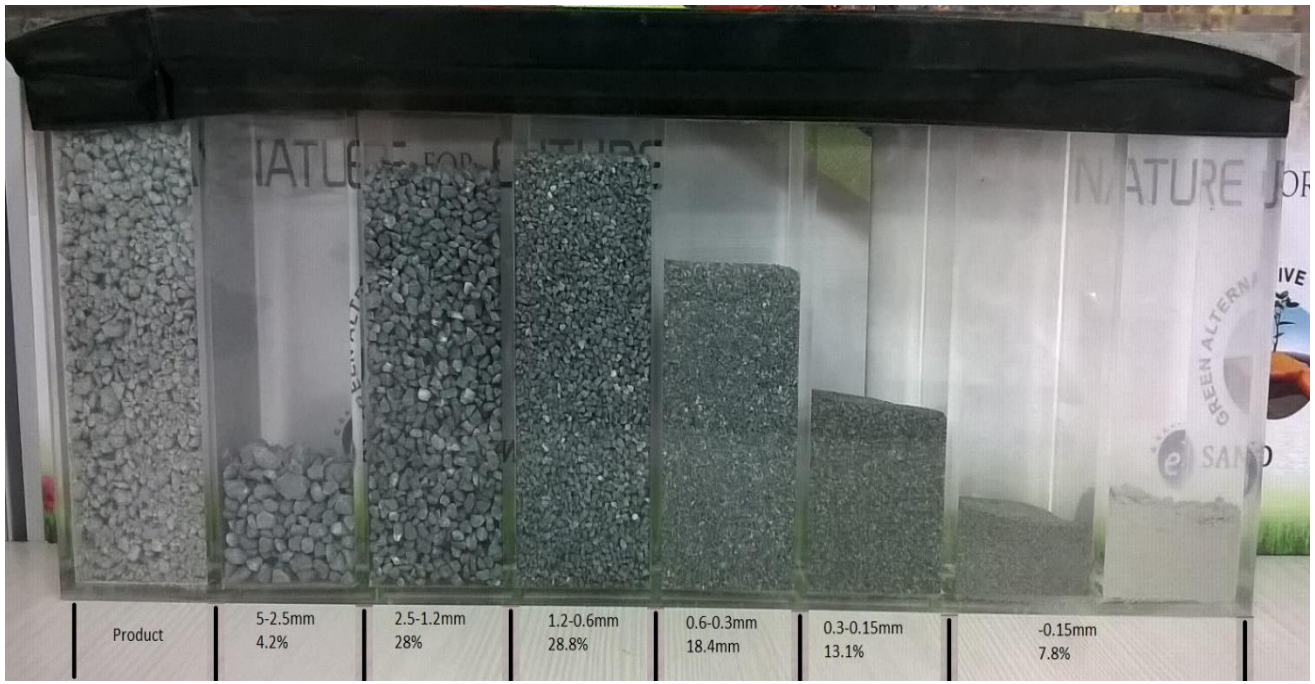
- TYPICAL GRADATION – Engineered Sand Plant



	Weight % Passing						
	0.15mm	0.3mm	0.6mm	1.18mm	2.36mm	4.75mm	10mm
Zone II L.L.	0	8	35	55	75	90	100
Zone II U.L.	10	30	59	90	100	100	100
e7 Sand	5	17	39	64	94	100	100

The plant settings can be controlled through automated system to get desired gradation (desired FM) … including Plaster Sand

- Engineered Sand address all aspects of Sand Quality



PRECISE GRADATION ; PRECISE CONTROL OF ULTRA-FINES; IMPROVED SHAPE OFFERS LOT OF FLEXIBILITY TO PRODUCE SAND OF DESIRED TYPE

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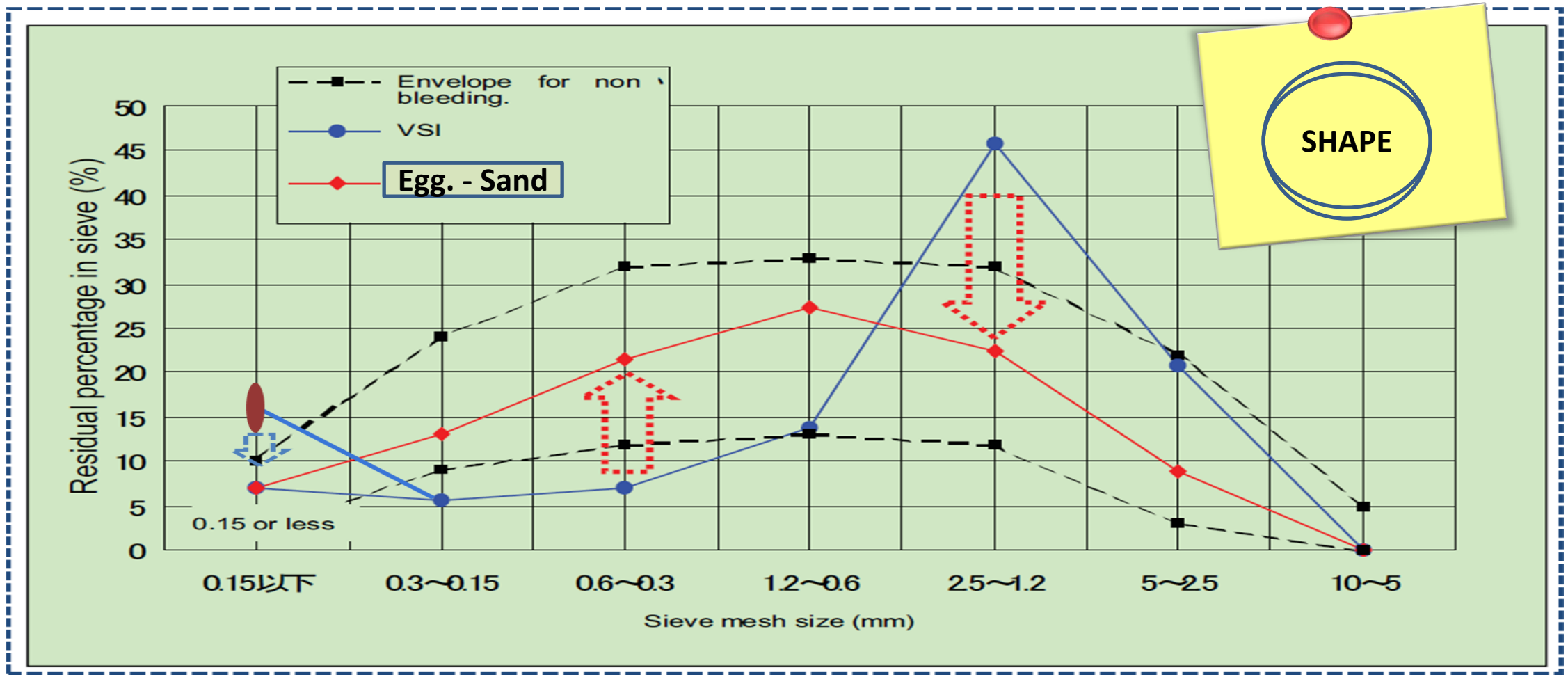
ASIA'S GREATEST BRANDS & LEADERS 2019-20

INDIA'S GREATEST BRANDS & LEADERS 2018-19

MANUFACTURING METHODOLOGY – Advanced Technology



IS 383: 2016 – Zone 2

Table 9 – Fine Aggregates – **Zone 2** *(Demystified)*

Sieve Size	Cumulative Passing %	Mean %	Particle Size	Fraction %
10 mm	100%	100%	10 ~ 4.75 mm	5%
4.75 mm	90-100%	95%	4.75 ~ 2.36 mm	7%
2.36 mm	75-100%	88%	2.36 ~ 1.18 mm	16%
1.18 mm	55-90%	72%	1.18 ~ 0.6 mm	25%
600 µm	**35-59%**	**47%**	**600 ~ 300 µm**	**28%**
300 µm	8-30%	19%	300 ~ 150 µm	14%
150 µm	0-10%	5%	150 ~ 75 µm	3%
75 µm	0-3%	2%	75 µm ~ Pan	2%

* Above Gradation is for " River Sand " . For Crushed stone Sand / Engineered Sand permissible limit on 150 micron is increased to 20 %.

IS 383: 2016 – Grading Zone

	Percentage Passing			
	Grading Zone			
Sieve Size	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**
10 mm	100%	100%	100%	100%
4.75 mm	90-**100%**	90-100%	90-100%	95-100%
2.36 mm	60-95%	75-**100%**	85-100%	95-100%
1.18 mm	30-70%	55-90%	75-**100%**	90-100%
600 µm	**15-34%**	**35-59%**	**60-79%**	**80-100%**
300 µm	5-20%	8-30%	12-40%	15-50%
150 µm	**0**-10%	**0**-10%	**0**-10%	**0**-15%
75 µm	*0-3%*	*0-3%*	*0-3%*	*0-3%*

	Percentage Passing			
	Grading Zone			
Sieve Size	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**
10 mm	Nil oversize	Nil oversize	Nil oversize	Nil oversize
4.75 mm	**100%** 0-10% oversize	0-10% oversize	0-10% oversize	0-5% oversize
2.36 mm	78 ± 18%	**100%** 0-25% oversize	0-15% oversize	0-5% oversize
1.18 mm	50 ± 20%	72 ± 18%	**100%** 0-25% oversize	0-10% oversize
600 µm	**24 ± 10%**	**47 ± 12%**	**70 ± 9%**	**100%** 0-20% oversize
300 µm	12 ± 7%	19 ± 11%	26 ± 14%	32 ± 18%
150 µm	**0%** 0-10% undersize	**0%** 0-10% undersize	**0%** 0-10% undersize	**0%** 0-15% undersize
75 µm	*upto 3%*	*upto 3%*	*upto 3%*	*upto 3%*

* Above Gradation is for " River Sand " . For Crushed stone Sand / Engineered Sand permissible limit on 150 micron IS sieve is increased to 20 %.

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TEST REPORTS – ACC / Ambuja

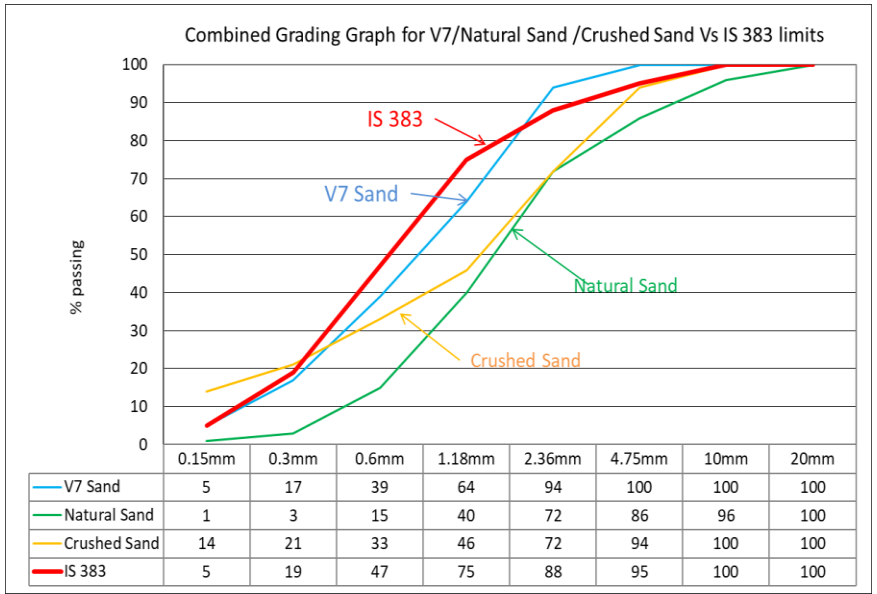
Sieve Analysis of Crushed Sand

I.S. Sieve size	Weight Retained	Percent Retained	Cumulative Percent Retained	Cumulative Percent Passing	Limits Zone II
40 mm	0.00	0.00	0%	100%	100
20 mm	0.00	0.00	0%	100%	100
10 mm	0.00	0%	0%	100%	100
4.75 mm	63.00	6%	6%	94%	90 - 100
2.36 mm	221.00	22%	28%	72%	75 - 100
1.18 mm	256.00	26%	54%	46%	55 - 90
600 mic	130.00	13%	67%	33%	35 - 59
300 mic	119.00	12%	79%	21%	8 -- 30
150 mic	68.00	7%	86%	14%	0 - 10
Pan	143.00	14%	100%	0%	0
Total Wt	1000.00	100%	100%	0%	

Specific Gravity	2.76
DLBD	1.663
Finess Modulus	3.2
Zone	I

M. Blue & Shape

Area	Type	MBV	Silt content	Ecs	U
		mg/g	%	sec	%
	Standard	0.5-1.75	Low is Good	Low is Good	U<45
Mumbai – baba	CRF	3.23	16.50	23.48	40.95
Mumbai Turbhe	CRF	5.17	10.50	25.76	40.98
Bombay Pada 1	CRF	3.03	14.10	25.39	42.52
Bombay Pada 2	CRF	3.12	20.10	24.62	39.89
Mumbai –Borivali	CRF	4.37	15.50	22.99	41.70
Japan	V7 Japan	1.51	10.70	14.75	44.03



	0.15mm	0.3mm	0.6mm	1.18mm	2.36mm	4.75mm	10mm	20mm
V7 Sand	5	17	39	64	94	100	100	100
Natural Sand	1	3	15	40	72	86	96	100
Crushed Sand	14	21	33	46	72	94	100	100
IS 383	5	19	47	75	88	95	100	100

Sieve Analysis of Natural Sand

I.S. Sieve size	Weight Retained	Percent Retained	Cumulative Percent Retained	Cumulative Percent Passing	Limits Zone II
40 mm	0.00	0.00	0%	100%	100
20 mm	0.00	0.00	0%	100%	100
10 mm	39.00	4%	4%	96%	100
4.75 mm	99.00	10%	14%	86%	90 - 100
2.36 mm	147.00	15%	29%	72%	75 - 100
1.18 mm	313.00	31%	60%	40%	55 - 90
600 mic	253.00	25%	85%	15%	35 - 59
300 mic	117.00	12%	97%	3%	8 -- 30
150 mic	19.00	2%	99%	1%	0 - 10
Pan	13.00	1%	100%	0%	0
Total Wt	1000.00	100%	100%	0%	

Specific Gravity	2.65
DLBD	1.69
Finess Modulus	3.87
Zone	I

TEST REPORTS – Sai Rydam RMC

- Laboratory Trial results at Sai Rydam RMC
  - ➢ Compressive Strength / Cement-Flyash Consumption
  - ➢ Natural Sand vs VSI Sand vs Crushed Sand / e7 - Engineered Sand

Sr. No.	SOURCE	ID MARK	CEMENTATIOUS		COMPRESSIVE STRENGTH(MPA)	
	Material		Cement	Flyash	7days	28days
1	VSI Sand	CG-3	300	100	20.68	32.43
2	VSI Sand	CG-4	338	112	30.35	42.32
3	VSI Sand	CG-5	375	125	34.18	49.11
1	Classified Sand	HG-3	300	100	28.27	50.47
2	Classified Sand	HG-4	338	112	38.05	52.49
3	Classified Sand	HG-5	375	125	41.13	57.59
1	e7 Sand	DG-3	300	100	35.85	58.00
1	e7 Sand	DG-4	338	112	39.36	62.88
3	e7 Sand	DG-5	375	125	54.29	67.13
1	Vaitarna River Sand	EG-3	300	100	21.08	36.31
2	Vaitarna River Sand	EG-4	338	112	34.76	48.13
3	Vaitarna River Sand	EG-5	375	125	38.44	54.88
1	Local Crushed Rock fines	BG-3	300	100	18.57	32.98
2	Local Crushed Rock fines	BG-4	338	112	32.89	43.59
3	Local Crushed Rock fines	BG-5	375	125	32.90	46.95

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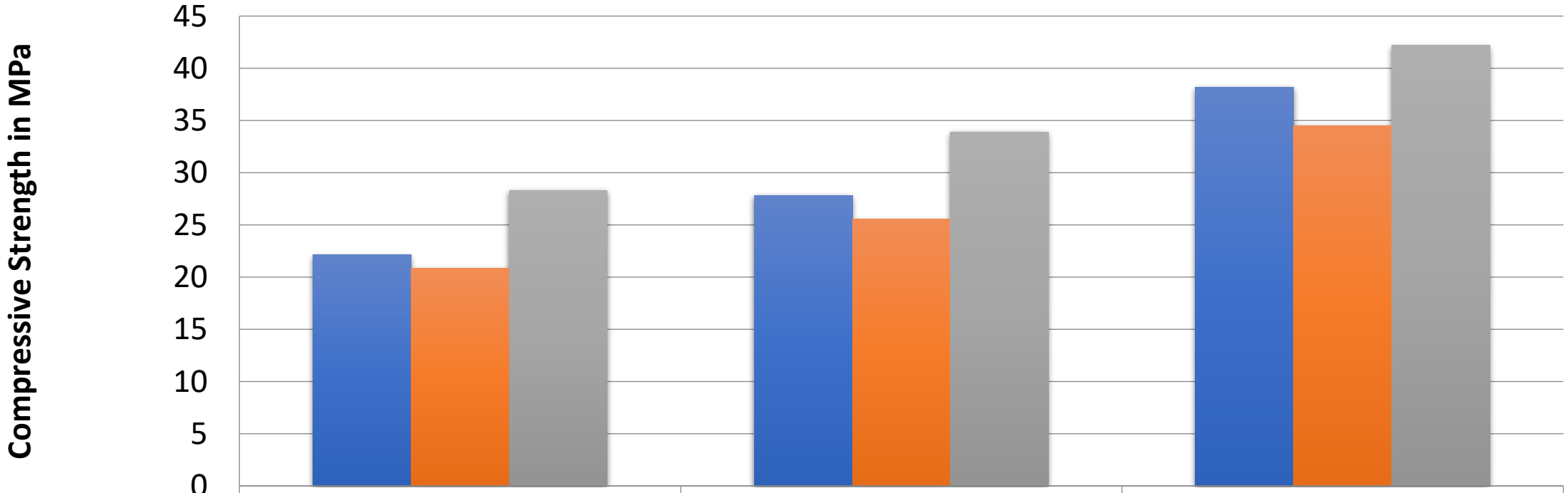
ASIA'S GREATEST BRANDS & LEADERS 2019-20

INDIA'S GREATEST BRANDS & LEADERS 2018-19

Laboratory Trial results

Code	Workability (mm)			Compressive Strength N/mm2			Bulk Density (Kg/m3)	Specific Gravity	Zone of Sand	Temperature	Cohesivity	Remarks
	0	30	60	3 Days	7 Days	28 Days						
05.03.12/NS/01	110	40	0	22.50	28.41	33.28	1.69	3.03	I	30	Good	
05.03.12/CS/01	0	0	0	21.87	26.04	32.13	1.66	2.76	I	29	Satisfactory	
05.03.12/V7/01	**130**	**75**	**40**	**28.87**	**33.90**	37.53	**1.60**	**2.73**	**II**	**29**	**Very Good**	
06.03.12/NS/02	80	20	0	21.75	27.00	39.60	1.69	2.90	I	30	Good	
06.03.12/CS/02	0	0	0	20.79	25.23	36.23	1.65	2.78	I	30	Satisfactory	
06.03.12/V7/02	**130**	**80**	**50**	**27.06**	**33.42**	40.60	**1.60**	**2.83**	**II**	**29**	**Very Good**	
07.03.12/NS/03	110	30	10	23.70	29.33	42.96	1.68	2.97	I	29	Good	
07.03.12/CS/03	0	0	0	21.23	27.43	36.47	1.63	2.70	I	29	Satisfactory	
07.03.12/V7/03	**130**	**70**	**40**	**29.35**	**33.42**	46.24	**1.60**	**2.78**	**II**	**29**	**Very Good**	
09.03.12/NS/04	80	30	0	20.47	26.64	37.00	1.68	3.10	I	29	Good	
09.03.12/CS/04	0	0	0	19.44	23.45	33.23	1.65	2.68	I	28	Satisfactory	
09.03.12/V7/04	**130**	**70**	**50**	**27.97**	34.88	44.52	**1.60**	**2.73**	**II**	**29**	**Very Good**	

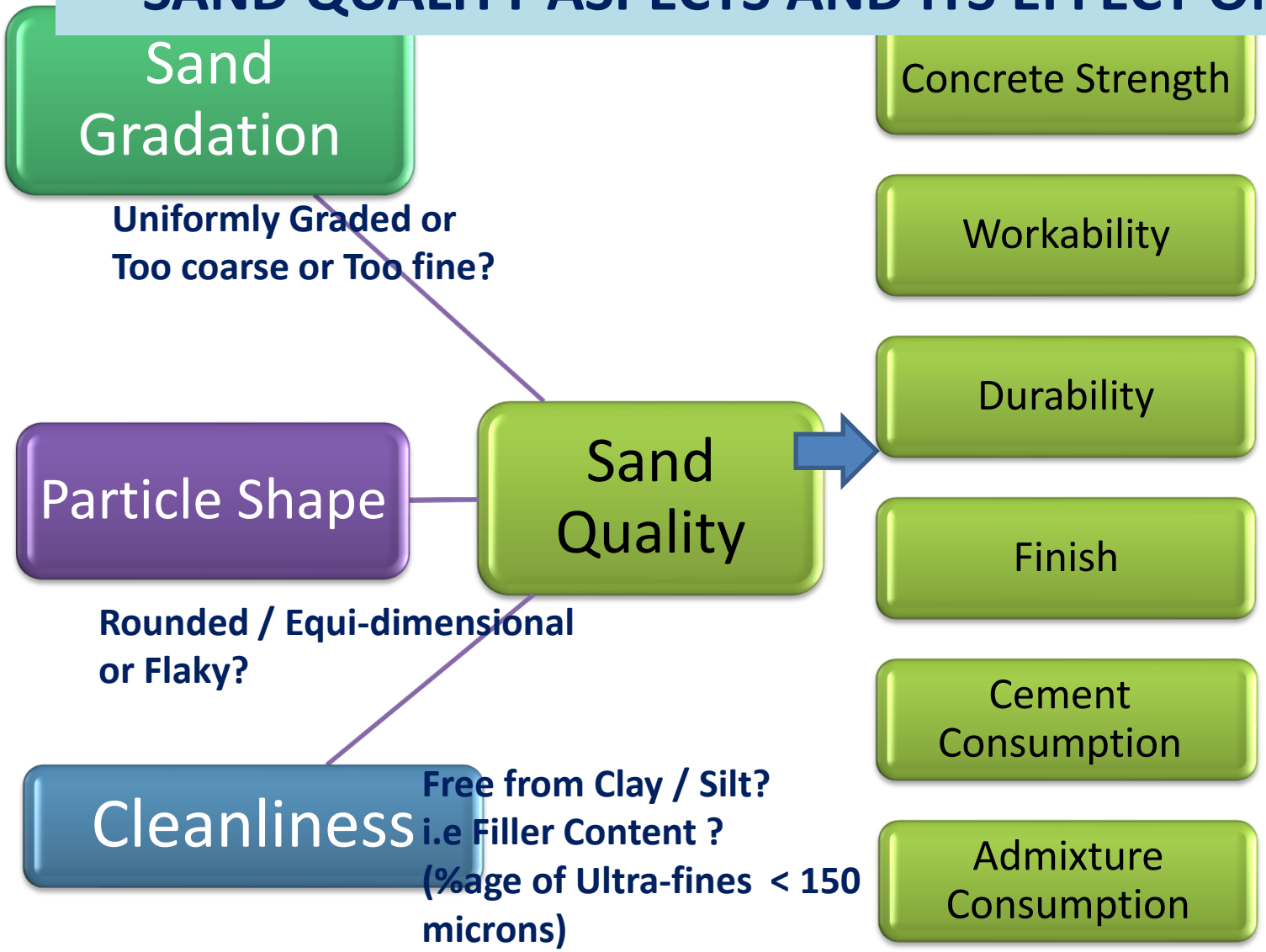
Compressive Strength Comparison



	3 Days	7 Days	28 Days
Natural Sand	22.11	27.85	38.21
VSI Sand	20.83	25.54	34.52
Engg. Sand	28.31	33.91	42.22

TEST REPORTS

SAND QUALITY ASPECTS AND ITS EFFECT ON CONCRETE



CPWD Conc. Specifications

M-25 – 330kg
M-35 – 350kg
M-40 – 370kg
M-50 – 410kg

TEST REPORTS - Mumbai

- Quality Sand of Mumbai Plant with improved Water absorption: 2.78

BUREAU VERITAS

NABL Accredited Lab

Test Order/Report No: BVIPL: FA : 25941C/1636/1/2017 REPORT Date: 23-03-2017
Date of Reciept : 15.03.2017 Page 1 of 1

L&T - STEC JV-MUMBAI
L and T STEC Metro 3,Package 7 Project Office,1st Floor,
Wycel Administrative Building, Opp.Seepz Gate No.1, MIDC, Andheri-East, Mumbai-400093

TEST REPORT ON PHYSICAL PROPERTIES OF FINE AGGREGATE

Source of Sample	:	Sample supplied by the customer.
Number of Sample Tested	:	02(Two only)
Customer's Reference	:	LT-STEC-AAO-QAS-P07-OS-233 dated 11.03.2017
Condition of Sample	:	Satisfactory
UIN	:	17008381
Source*	:	Stone Crusher at Thane
Project*	:	UGC 01 & UGC 07 of Mumbai Metro Project
Period of Test	:	20.03.2017 to 22.03.2017

1. SIEVE ANALYSIS: AS PER IS 2386 PART 1-1963 RA 2011:

Sl. No.	Sieve Size mm	% Passing Sample 1 CRF- Feed	% Passing Sample 2 CRF- Produce	LIMITS AS PER IS 383 -2016 ZONE I	ZONE II	ZONE III	ZONE IV
1	10	100.00	100.00	100	100	100	100
2	4.75	74.30	100.00	90-100	90-100	90-100	95-100
3	2.36	50.10	94.80	60-95	75-100	85-100	95-100
4	1.18	28.80	60.60	30-70	55-90	75-100	90-100
5	0.600	19.00	36.90	15-34	35-59	60-79	80-100
6	0.300	13.20	20.00	5-20	8-30	12-40	15-50
7	0.150	9.30	9.10	0-10	0-10	0-10	0-15
Fineness Modulus		4.05	2.79	NOTE- For crushed stone sands, the permissible limit on 0.150 mm Sieves is increased to 20 %. This does not affect the 5 % allowance permitted in Cl.6.3 applying the other sieve sizes.			

2. PHYSICAL TEST: IS 2386 PART 3 -1963 RA 2011

Sl. No.	Test conducted	RESULTS Sample 1 CRF- Feed	RESULTS Sample 2 CRF- Produce
1	Water Absorption (%)	2.96	2.56
2	Material finer than 75 µ (%)	9.80	6.70

* As furnished by the customer.

Note: 1. The results relate only to the items tested.
2. Report shall not be reproduced except in full, without the written approval of the lab.
3. Any correction invalidates this report.

For Bureau Veritas (India) Pvt. Ltd.
Construction Services Laboratory
SHABNAM KAZI
Authorised Signatory
Checked By
CONC/W2126

Bureau Veritas (India) Pvt. Ltd. - Construction Services Laboratory

1. SIEVE ANALYSIS: AS PER IS 2386 PART 1-1963 RA 2011:

Sl. No.	Sieve Size mm	% Passing Sample 1 CRF- Feed	% Passing Sample 2 CRF- Produce	LIMITS AS PER IS 383 -2016 ZONE I	ZONE II	ZONE III	ZONE IV
1	10	100.00	100.00	100	100	100	100
2	4.75	74.30	100.00	90-100	90-100	90-100	95-100
3	2.36	50.10	94.80	60-95	75-100	85-100	95-100
4	1.18	28.80	60.60	30-70	55-90	75-100	90-100
5	0.600	19.00	36.90	15-34	35-59	60-79	80-100
6	0.300	13.20	20.00	5-20	8-30	12-40	15-50
7	0.150	9.30	9.10	0-10	0-10	0-10	0-15
Fineness Modulus		4.05	2.79	NOTE- For crushed stone sands, the permissible limit on 0.150 mm Sieves is increased to 20 %. This does not affect the 5 % allowance permitted in Cl.6.3 applying the other sieve sizes.			

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1	Water Absorption (%)	2.96	2.56
2	Material finer than 75 µ (%)	9.80	6.70

- Quality Sand of Mumbai Plant with improved Water absorption: 2.78

RECOGNIZED R&D UNIT BY GOVERNMENT OF INDIA

STRUCTWEL DESIGNERS & CONSULTANTS PVT. LTD.

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ISO 9001:2008

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Chairman & Managing Director

ACCREDITED LABORATORY BASED ON ISO/IEC 17025

CIN : U74210MH1978PTC020348

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PAGE 1 OF 1

TEST REPORT NO. & DATE	R&D/LAB/SAN/2016-17/SAN0239916/4426 21/02/2017
1. Name & Address of Customer	M/s. MAUER CARE SERVICES G4, Ankuraksh Chs, Near Naupada Police Station, Teen Hath Naka, Thane (West) 400 602.
2. Project / Site	Self
3. Customer's Reference	E Mail Dtd. - 08/02/2017
4. Sample i) Description ii) Quantity iii) Date of receipt iv) Condition	Fine Aggregate 25 Kg 08/02/2017 Acceptable
5. Test method followed, if any	IS : 2386 - 1963 Part – I & Part III, IS: 1542 : 1992 ,IS 2116 : 1980
6. Date of Testing	18/02/2017

TEST REPORT

1. Sample	Crushed Sand
2. Source	Plaster Sand
3. Dry Bulk Density (Loose) Kg/lit	1.64
4. Specific gravity	2.78

5. Sieve Analysis

IS. SIEVE	Retained Wt. gms.	Cumulative Wt. Retained gms.	Cumulative % Wt. retained	% Passing	Requirment As Per IS 1542 for Plaster	Requirment As Per IS 2116 for Masonry mortar
40 mm	0.00	0.00	0.00	100.00		
20 mm	0.00	0.00	0.00	100.00	100.00	
10 mm	0.00	0.00	0.00	100.00	95 – 100	100.00
4.75 mm	153.00	153.00	7.65	92.35	95 – 100	90 -100
2.36 mm	514.00	667.00	33.35	66.65	90 – 100	70 – 100
1.18 mm	494.00	1161.00	58.05	41.95	80-100	40 – 100
600 micron	429.00	1590.00	79.50	20.50	20-65	5 – 70
300 micron	254.00	1844.00	92.20	7.80	0-15	0 – 50
150 micron	156.00	2000.00	100.00	0.00		
Passing 150 micron						
weight of sample(gms)	2000.0					

6. Fineness Modulus	2.71
7. Silt Content by Vol. % (at 2 hrs) by Wt. %	3.39 0.97 2.78
8. Water Absorption %	--
9. Free Moisture Content %	--
10. *Deleterious Materials %	--
11. Bulkage %	

NOTE :
-- Permissible limits for Silt Content by vol. : 8 % (CPWD Specification)
-- Permissible limits for Silt Content by wt. : 3% for Natural Sand & 15% for Crushed Sand (IS: 383)
-- This test report refers only to the sample submitted for testing.
-- This test report is valid at the time of and under the conditions specified herein.
-- This test report may not be reproduced in part, without the permission of this laboratory.
-- This test report may not be reproduced in part, without the permission of this laboratory.
-- Any correction invalidates this test report.
* Test is not under the scope of accreditation.

Vinayak Samant
Authorised Signatory

SST/D/report 2016-17/nabl/phy/fa/SAN0239916

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Pune (Labor +91-20-2554 +91-8950241
Customer Support : +91-9323376991/9323376992

T 0502

- Gradation - % Passing: -2.5mm ~93%; -1.18mm ~67%; -0.6mm~42%; 0.3mm ~21%; 0.15mm – 7.5%
- FM ~ 2.7
- Silt ~0.97%
- Water Absorption ~2.78

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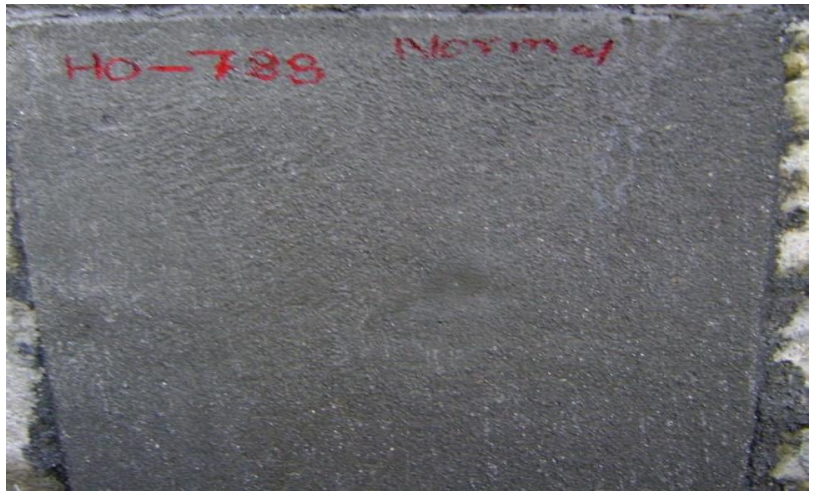
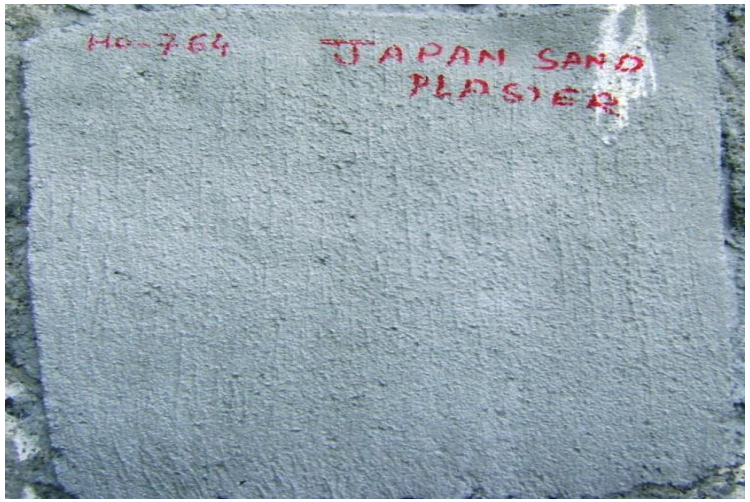
ASIA'S GREATEST BRANDS & LEADERS 2019-20

INDIA'S GREATEST BRANDS & LEADERS 2018-19

TEST REPORTS – Plaster Application

OBSERVATION	
HO-788 RMP **(River Sand)**	HO 764 **E7 Sand Plaster**
Water demand---16 %	Water demand---16 %
Eassily Mixable	Need more efforts to mix.
No sagging	No Sagging
No Cracking observed up to 40mm thickness by Wedge tester	No Cracking observed up to 40mm thickness by Wedge tester
Dry Adhesion Strength after 1 day -0.28 MPA	Dry Adhesion Strength after 1 day -0.29 MPA
Dry Adhesion Strength after 3 days -0.37 MPA	Dry Adhesion Strength after 3 days -0.39 MPA
Dry Adhesion Strength after 7 days -0.51 MPA	Dry Adhesion Strength after 7 days -0.53 MPA
Dry Adhesion Strength after 14 days **0.58**	Dry Adhesion Strength after 14 days **0.62**
Photo after 4 days of application thickness -10mm	Photo after 4 days of application thickness -10mm





Dry Mix Mortar

Cement Market –

- **400 MTPA**

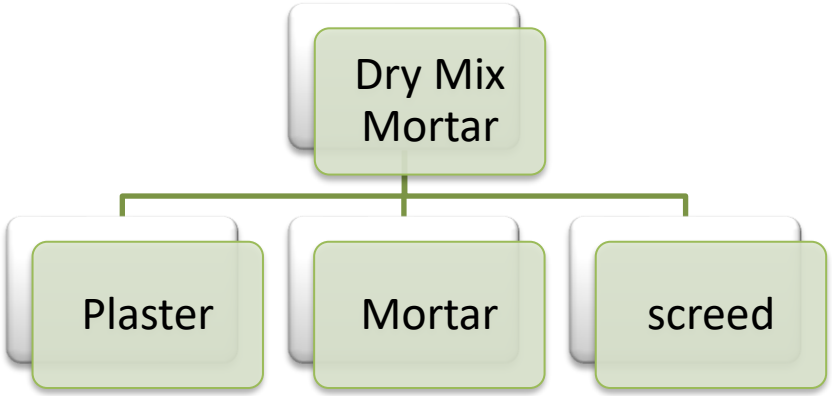
Mortar Market -Consume 15% of total Cement Consumption.

- Ratio 1:5 (Cement : Rest ingredients)

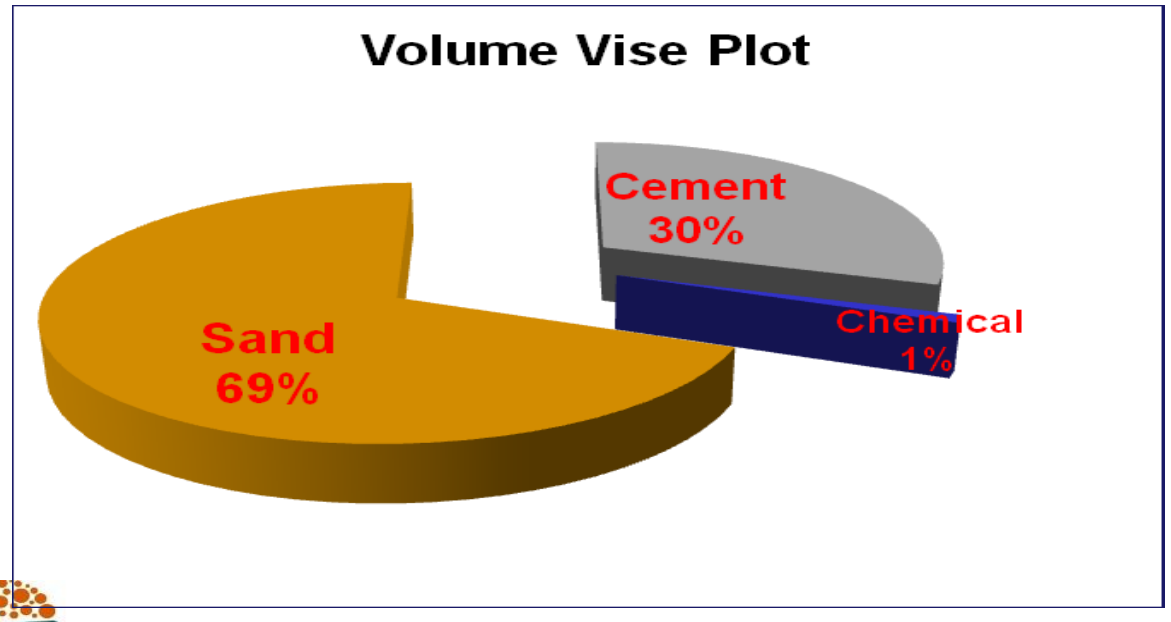
Total Mortar Market-

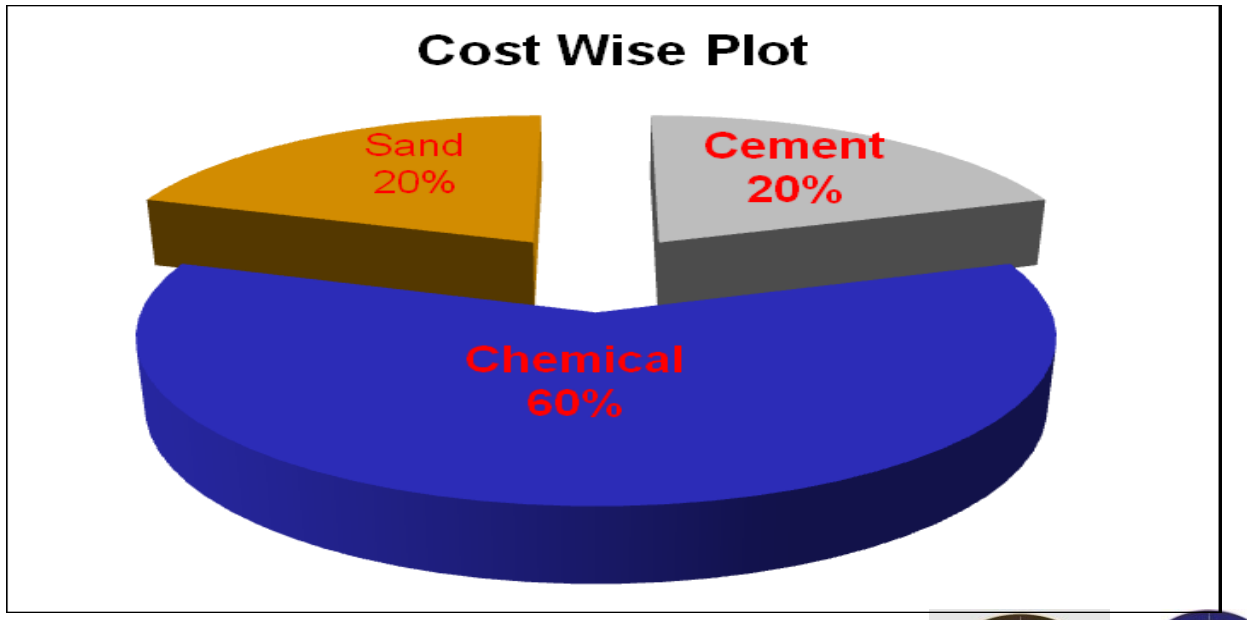
- **300 MTPA**
- Growth 10%-12%

Category & Potential



- **Growth Drivers**
  - Spray Machines
  - Faster Construction

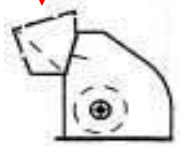




Flow Chart of Production Process

stone (0- 20 mm.)

Adv. Sand Plant
(0 – 20 mm.) 70 ton/hr.



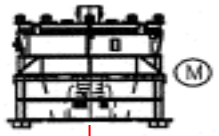
Exhaust Air
From K3

Dryer 60 ton/hr.

Screening

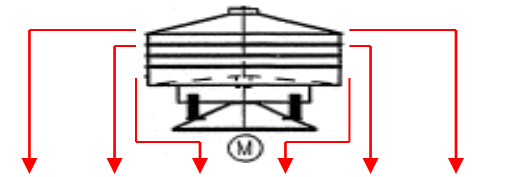
< 2.36 mm.

Fine mill(≤ 5 mm..)
70 ton/hr.



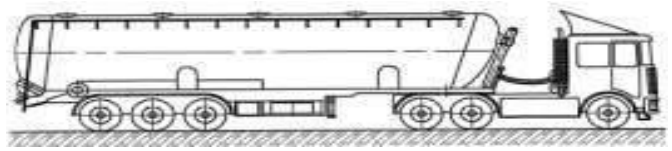
Separator &

Fine Screening



SAND SILOS

Weighing# 1



Bulk Truck

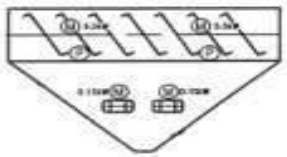
Binder Silo

Weighing#2

Additive Bin

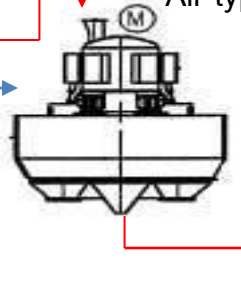
Weighing#3

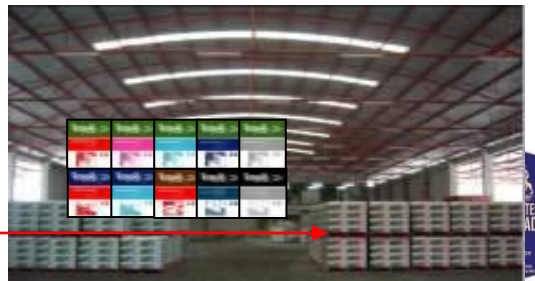
Finished Product Silo



Ploughshare Mixer 3 cu.m.

Air type Packer 90 ton/hr.





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IS 383: 2016 – Grading Zone

	Percentage Passing			
	Grading Zone			
Sieve Size	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**
10 mm	100%	100%	100%	100%
4.75 mm	90-**100%**	90-100%	90-100%	95-100%
2.36 mm	60-95%	75-**100%**	85-100%	95-100%
1.18 mm	30-70%	55-90%	75-**100%**	90-100%
600 µm	**15-34%**	**35-59%**	**60-79%**	**80-100%**
300 µm	5-20%	8-30%	12-40%	15-50%
150 µm	**0**-10%	**0**-10%	**0**-10%	**0**-15%
75 µm	*0-3%*	*0-3%*	*0-3%*	*0-3%*

	Percentage Passing			
	Grading Zone			
Sieve Size	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**
10 mm	Nil oversize	Nil oversize	Nil oversize	Nil oversize
4.75 mm	**100%** 0-10% oversize	0-10% oversize	0-10% oversize	0-5% oversize
2.36 mm	78 ± 18%	**100%** 0-25% oversize	0-15% oversize	0-5% oversize
1.18 mm	50 ± 20%	72 ± 18%	**100%** 0-25% oversize	0-10% oversize
600 µm	**24 ± 10%**	**47 ± 12%**	**70 ± 9%**	**100%** 0-20% oversize
300 µm	12 ± 7%	19 ± 11%	26 ± 14%	32 ± 18%
150 µm	**0%** 0-10% undersize	**0%** 0-10% undersize	**0%** 0-10% undersize	**0%** 0-15% undersize
75 µm	*upto 3%*	*upto 3%*	*upto 3%*	*upto 3%*

* Above Gradation is for " River Sand " . For Crushed stone Sand / Engineered Sand permissible limit on 150 micron IS sieve is increased to 20 %.

Plant photos.

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ASIA'S GREATEST BRANDS & LEADERS 2019-20

INDIA'S GREATEST BRANDS & LEADERS 2018-19

Plant Photos

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ASIA'S GREATEST BRANDS & LEADERS 2019-20

INDIA'S GREATEST BRANDS & LEADERS 2018-19

Products.

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ASIA'S GREATEST BRANDS & LEADERS 2019-20

INDIA'S GREATEST BRANDS & LEADERS 2018-19

Products.

skgc

ASIA'S GREATEST BRANDS & LEADERS 2019-20

INDIA'S GREATEST BRANDS & LEADERS 2018-19

Applications.

Finished plaster with ready made Mortar showing uniform finish after application of color

skgc

ASIA'S GREATEST BRANDS & LEADERS 2019-20

INDIA'S GREATEST BRANDS & LEADERS 2018-19


THANK
YOU

Q & A

Q & A time

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