FAQs

TECHNICAL GUIDE TO SILPOZ

★ SHOWS IMPORTANT FAQs

How to do DEMO of Silpoz at site?

For doing a successful demo of Silpoz at construction site, the following points are to be taken into consideration.

1. Take Silpoz and cement (OPC 53 preferred) from fresh lot. Open the bags at the time of demo only.
   Previously opened bags are to be avoided.
2. The minimum size of demo cannot be smaller than 1 bag of Silpoz. Bigger the size of the demo, more accurate the results will be.
3. Use potable water only.
4. Water requirement will be approx. 10 lit / bag of Silpoz. After adding 6 lit / bag, slow down the addition. Add water till you get proper consistency and workability, and not beyond that. Normally, applicator takes judgment of water by experience.
5. Probable sizes of demo:

SR. NO.	CEMENT (KG)	SILPOZ (BAGS)	WATERAPPROX. (LIT.)	COVERAGE EXPECTED (SQ. FT.)
1	6.25	1	10	23
2	12.50	2	20	46
3	18.75	3	30	69
4	25.00	4	40	92
5	31.25	5	50	115
6	37.50	6	60	138
7	43.75	7	70	161
8	50.00	8	80	184

6. The mortar should be made in a mixer giving enough time for mixing Silpoz, Cement and Water.

7. The background should be prepared as under:
    - Select clean and oil free wall / column / beam / ceiling or combination of some of them for demo purpose.
    - The background should not face direct sunlight or heavy wind.
    - The surface must be even and uniform to avoid variation in thickness of the plaster. Thick plasters generate cracks.
    - Small cracks are always expected at the junction of the wall and RCC member. This can be avoided by using wire mesh.
    - If the background is smooth, it requires to be hacked to make the surface rough to hold the plaster properly and ensure tight boding.
    - Dampen the background before applying plaster. RCC background may not require much dampening. Walls are to be watered properly especially when AAC blocks are used which has very high absorption value. If not dampened, mortar water will be absorbed by the background to promote cracks.

8. Skilled applicator should start applying mortar on the wall with proper pressure to avoid de-bonding in future. The thickness should be uniformly maintained (anywhere between 12 to 16 mm) and plaster surface must be true according to a plumb line.The applicator has to complete the job at one go to avoid joint cracks.
9. The following readings are to be noted on an Observation Sheet:
    - Coverage in Sq Ft. The plaster should be done in a regular shape like square, rectangle etc. so that area can easily be calculated. Also note down Minimum, Maximum and Average plaster thickness.
    - The quantity of materials used including water.
    - The feedback of engineers and applicator.
    - Observe the rebound loss whether it is More or Average or Less. It is good if it is less.
    - Observe any irregularity like cracks, de-bonding etc. if it occurs during application.
    - Take signature of engineers present during demo on the Observation Sheet.
    - Also take photographs and video during application covering site engineers and Silpoz bags in the frame.

11) **Last but not the least, develop a friendly relationship with the applicators and engineers because for any new product they are not always ready and adaptive.**

FAQ- 1

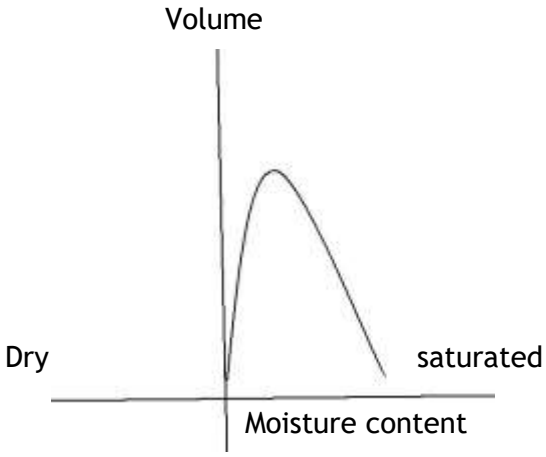
Why SILPOZ plaster has better strength than River sand plaster?

Angular and cubical shape of the manufactured sand in Silpoz produces better and stronger mortar as it has excellent interlocking property which ultimately leads to higher strength and lower permeability.

With spherical particles, River sand does not have those qualities in spite of having very good workability.

FAQ- 2

DLBD and BULKING PERCENTAGE



DLBD, for a particular sand, depends on particle size distribution. DLBD is measured after completely drying the sand.

While, Bulking purely depends on moisture content. Dry sand has minimum volume. As moisture increases, volume increases upto certain limit. Thereafter, volume starts reducing. When the sand is fully saturated with water, again volume is minimum and same as that of dry sand. The graph is like "U" upside down. Therefore, DLBD gives u density when Silpoz is completely dry.

Find bulk density of Silpoz without drying. The difference in volume is Bulking.

HOW TO DETERMINE PERCENTAGE OF BULKING?

1. Take a freshly taken out sample from the Silpoz bag in to a measuring cylinder. Note down level H1.
2. Pour water in the cylinder to completely cover Silpoz sample. Shake it. The sample is now fully saturated with water. Saturated sample has minimum volume equal to dry Silpoz. Say, new reduced level of sample after settlement is H2.
3. (H1 - H2) is bulking.
4. **Percentage Of Bulking = (H1 - H2) X 100 / H2**

FAQ- 3

Defects in Plastering

The following defects may arise in plaster for different reasons.

1. **Blistering of plastered surface:** This is the formation of small patches of plaster swelling out beyond the plastered surface, arising out of late slaking of lime particles in the plaster. This is due to coarse particles of cement.

2. **Cracking:** Formation of cracks in the plaster work results from the following major reasons.
    - **Imperfect preparation of background**: Sometimes walls, columns or beams are not properly made ready for the plaster by dampening them or by making them rough enough to hold the plaster.
    - **Structural defects in building**: Walls and RCC members may generate cracks due to structural fault leading cracks to plaster.
    - **Discontinuity of surface**: Plaster should be done at one go. If there is discontinuity, the joint will show crack at the junction.
    - **Movements in the background**: Due to thermal expansion or rapid drying of RCC members / walls on which plaster is to be applied.
    - **Movements in the plaster surface**: Expansion or shrinkage of plaster due to excess or insufficient moisture in the plaster may generate cracks. Wall may absorb water from the plaster if AAC blocks are used which has a capacity of more than 30% absorption. Even clay bricks have capacity of more than 15% absorption. Cement concrete block / hollow blocks are better options which have tendency to absorb only 6%.
    - **Excessive shrinkage due to application of thick coat:** Generally, the plaster should be 12 to 16 mm thick. If the thickness is more than that, the chances of cracks increases. The top surface of plaster, exposed to atmosphere, dries faster as compared to bottom in contact with the wall. This leads to cracking.
    - **Faulty workmanship:** The applicator has to prepare the background. He has to prepare mortar with optimum water. He has then to apply with proper pressure to wall. If applicator is not experienced, there are chances of numbers of irregularities in the plaster.

3. **Efflorescence:** It is the whitish crystalline substance which appears on the surface due to presence of salts in cement and water. Efflorescence can be removed by dry brushing and washing the surface repeatedly.
4. **Flaking:** It is the formation of very loose mass of plastered surface, due to poor bond between successive coats due to faulty workmanship.
5. **Peeling:** It is the complete dislocation of some portion of plastered surface, resulting in the formation of a patch. This also results from imperfect bond. The background should be rough enough to hold the plaster. Smooth surface will have no bonding with the plaster. Smooth surfaces are to be hacked before applying plaster.
6. **Popping:** It is the formation of conical hole in the plastered surface due to presence of some particles in cement which expand on setting.
7. **Uneven surface:** This is obtained purely due to poor workman ship

Some defects may occur due to Gap gradation in sand, excess fines or Silt, very high or very low FM etc. But, when SILPOZ is used, such problems related with sand are not expected. Also, cracks due to heat of hydration of cement are not possible in Silpoz as it is balanced by the proper counterpart incorporated in Silpoz.

FAQ- 4

NON-STRUCTURAL CRACKS IN PLASTER

Any Plaster has to shrink and crack to relieve stress. So it is desirable that it should develop a large number of fine, unnoticeable cracks at close spacing. It is impossible and also not desirable to have plaster without cracks as that is how plaster would breathe through fine cracks!

1. **Crazing**

   Crazing is a network of fine cracks, usually in a hexagonal pattern, which measure between 5 and 75 mm across each hexagon. They are usually very fine and shallow and do not extend through the whole depth of the plaster. It is due to concentration of cement or fine particles at a point where chances of crazing increases. Craze cracks are of little importance, do not open and close with time, and can be covered using a reasonable quality paint.

   Solution-Proper mixing

2. **Map Cracking / Plastic shrinkage**

   Map cracking is similar to crazing except that it is usually deeper (sometimes going through the plaster) and the hexagons of the pattern may measure up to 200 mm across. Cracking which results when an excessive amount of water is lost from the plaster in the first hours after application is also known as plastic shrinkage cracking.

   Solution

   (1) Proper mixing (2) Do not allow plaster to dry quickly in the first hours before curing started. Plaster base should be properly dampened. The wall should not absorb water from the plaster. Avoid using AAC blocks.

3. **Drying Shrinkage cracks**

   Drying shrinkage cracks are the result of moisture loss after the plaster has hardened. Plaster will tend to develop a few, widely-spaced cracks. Plaster applied in layers that are too thick will also tend to crack in this way. These cracks are normally stable and can be filled with a proprietary filler and painted over.

   Solution

   Proper curing for at least 7 days such that the plaster remains moistened all the time. The wall facing direct sun and wind may require more frequent curing.

Causes of excessive early moisture loss are:

1. Evaporation if the wall is not protected from sun and wind.

2. Suction into the walls if the bricks are absorbent and they have not been dampened. AAC blocks are mainly responsible for this defect.

FAQ- 5

How much water to be added to Silpoz mortar?

The water being added to Silpoz mortar acts as a lubricant for the artificial sand to increase the workability and reacts with cement to form binding paste for the plaster sand particles of Silpoz. The same water is used later for self-curing purpose for some time.

Water in mortar should not be visible. Also, mortar should not look shiny. The water should be clean, potable and free from chloride and organic impurities. The presence of chloride may bring Efflorescence on the plaster surface.

Normally, 80 litres of water is to be added to a batch of [1 bag cement + 8 bags of Silpoz]. In monsoon, it is approx. 60 litres.

The Strength and Workability of Silpoz mortar depend largely upon the right quantity of water being added. If the quantity of water is more or less than optimum, the strength will be adversely affected. The excess water may increase workability further but also increases Shrinking and decreases Density and Durability of the plaster.

As a thumb rule:

10% more/less water - 15% less strength

50% more/less water - 50% less strength

Therefore, the addition of water in Silpoz mortar should be minimum (around 80 lit per batch) such that required workability is achieved and not below that.

FAQ- 6

WHAT IS FINENESS MODULUS (FM) OF SAND?

Fineness modulus is an empirical factor obtained by adding the cumulative percentages of sand retained on each of the standard sieves ranging from 4.75 mm to 150 micron and dividing this sum by 100.

WHY TO DETERMINE FINENESS MODULUS?

Fineness modulus is generally used to get an idea of how coarse or fine the sand is. More fineness modulus value indicates that the sand is coarser and small value of fineness modulus indicates that the sand is finer.

Fineness modulus of different type of sand is as per given below.

TYPE OF SAND	FINENESS MODULUS RANGE
PLASTER SAND or SILPOZ	1.8 – 2.6
MEDIUM SAND	2.6 – 2.9
CONCRETE SAND	2.9 – 3.2

Generally sand having fineness modulus more than 3.2 is not used for making good concrete.

Fineness modulus can also be used to combine two different sands to get the desirable grading.

PROCEDURE TO DETERMINE FINENESS MODULUS?

Sieve the aggregate using the appropriate sieves (4.75 mm, 2.36 mm, 1.18 mm, 600 micron, 300 micron & 150 micron)

Record the weight of aggregate retained on each sieve.

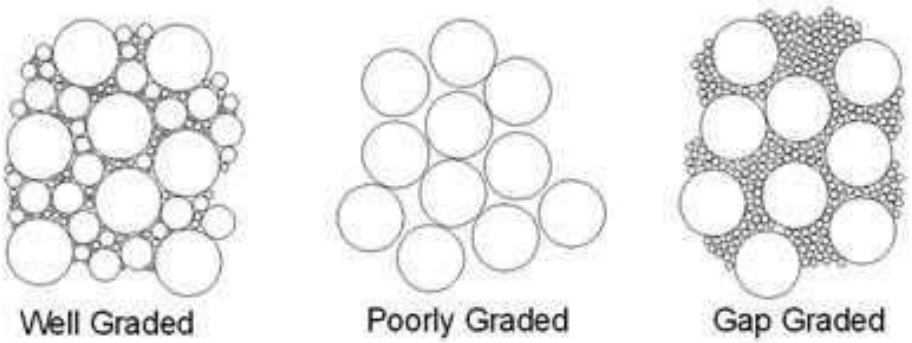
Calculate the cumulative weight of aggregate retained on each sieve.

Calculate the cumulative percentage of aggregate retained.

Add the cumulative weight of aggregate retained and divide the sum by 100. This value is termed as fineness modulus

FAQ- 7

GAP GRADATION



In Silpoz sand, the particle size varies from 100 microns to 2.36 mm. All in between sizes have a particular weight concentration as per Fineness Modulus to ensure maximum density or tight matrix.

In Silpoz, we use well graded manufactured sand, which means representation of all the standard particle sizes in certain proportion. Assumption made in well gradation is that voids created by the higher size of particles will be filled-up by immediate next lower size of particles and again some smaller voids will be left out which will again be filled-up by next lower size particles in order to achieve maximum density. This arrangement of particles is called Gap Grading. This kind of gradation is possible in the factory only while manufacturing Silpoz.
In river sand, such gradation is not assured leading to poorly graded or Gap graded sand. In poor gradation, all particles are of the same size to leave voids unfilled. In Gap graded sand, some in between sizes are missing.

ADVANTAGES OF SILPOZ DUE TO WELL GRADED SAND

1) Requirement of plastering material is reduced by 26 to 40% in comparison with ordinary plastering material options when Silpoz is used.
2) Point contact between various size fractions is maintained, thus reducing the drying shrinkage.
3) It requires less cement as the net volume of voids and surface area of sand particles are reduced to a greater extent when Silpoz is used.

FAQ- 8

HOW WORKABILITY WILL INCREASE IN NEW SILPOZ?

Silpoz = river sand + cement saver (Old version - not in market now)

Silpoz - New = 100% workable manufactured sand + cement saver

Let us consider the workability in river sand as 100%. To make the manufactured sand 100% workable like river sand, the following steps are to be followed during the manufacturing process of Silpoz.

The above mixture is equivalent to river sand only. Silpoz is a combination of above mixture and Cement Saver. **So, when Silpoz is used, only half cement is used as compared to river sand.**

FAQ- 9

Why 8 bags of Silpoz with 1 bag of cement?

We recommend that 8 bags of Silpoz should be used with 1 bag of cement, preferably 53 grade. The reason for this ratio is as under.

Ideally, 1 Cement : 4 Sand is the right proportion for the normal plaster. But, in case of Silpoz, we recommend 1:8. This is possible as additives in 8 bags of Silpoz are capable to generate extra cementicious compound equal to another bag of cement when Silpoz mixed with cement and water in the mixer. Thus, even if 1 bag of cement is used, the mortar has cementicious quantity of 2 bags which allows us to use 8 bags of sand with 1 bag of cement.

Chemical Reaction:

During the hydration of cement, Free lime is released. Such free lime is available in more quantity in 53 Grade cement. Silpoz provides Reactive Silica which combines with the Free lime to produce C-S-H gel which is responsible for the extra strength.

$3\ Ca(OH)_2$	+	$2\ SiO_2$	=	$C_3\ S_2\ H_3$ (C-S-H gel)
(Free Lime)		(Reactive Silica)		

FAQ- 10

Silpoz cannot be tested as an ordinary sand

As defined in the brochure, Silpoz is a combination of (1) Engineered - Artificial - Plaster - Sand, (2) Appropriate additives to impart workability and (3) Cement saver, used for a crack-free Internal & External plaster.

The manufactured sand we use in SILPOZ confirms to IS 1542 : 1992. Accordingly, the silt in the sand is below 10% only.

We use certain admixtures and fly ash in Silpoz for the reasons mentioned in our technical brochure. These compounds are very fine and chemically reactive. They are generally below 150 microns in size to retain their reactivity.

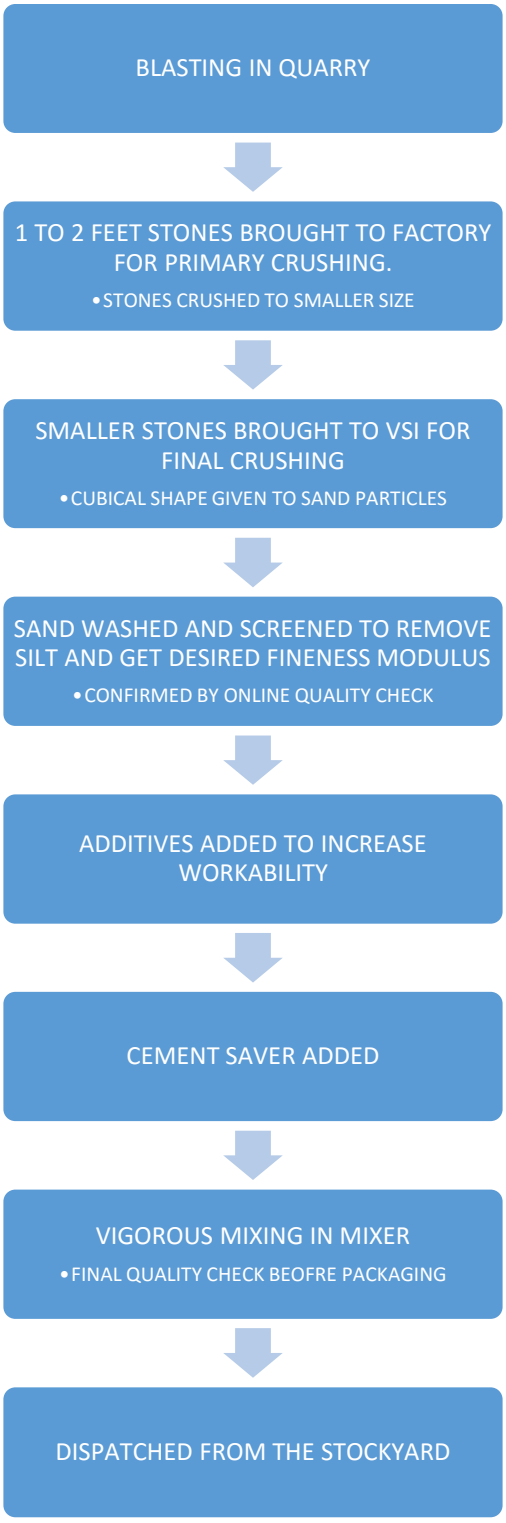
Therefore, during the Sieve analysis of Silpoz, we find particles below 150 microns more than 10% and we wrongly presume them to be silt.

So, Silpoz is to be treated as a product and not as simple sand. And, testing procedures of sand cannot be directly applied to Silpoz for above reasons.

The test report is always provided with every despatch of Silpoz to avoid any confusion by the company.

FAQ- 11

SILPOZ MANUFACTURING PROCESS



FAQ- 12

Does SILPOZ sand confirm the gradation recommended by IS 1542: 1992?

There are few reasons why in Silpoz the particles of sand are on little coarser side.

Technical reason for higher FM and higher retention on 1.18 mm and 600 microns sieves, beyond suggested by the referred code, is that we add fine additives (< 100 microns) to the product for quality enhancement. This addition further lowers the FM below 1.4 which creates real problem for applicators. Theoretically, it is possible to easily manufacture sand with recommended gradation. But, the FM will go down below 1.4 and overall the sand will look too fine. Such ideal sand is not possible to get from any river as river sand will have an FM of around 3. So, applicators are always trained to use coarser sand for plastering. They would reject the ideal sand with an FM of 1.4 as they are not used to. Therefore, keeping practical aspects in mind, some coarser particles are incorporated in Silpoz such that the final result is not altered much.

FAQ- 13

How Far SILPOZ Is Responsible For Cracks Or Other Defects In Plaster?

Following are few major influential factors responsible for Cracks & other defects in plaster:

1. Sand / Silpoz

   If FM or Silt is out of control

2. Cement

   Poor quality cement, coarse particles, old stock, low grade, PPC with Silpoz

3. Background

   Background like RCC members or walls may have different water absorption tendency (such joints are to be done with wire-mesh), Poor line-level and finish

4. Curing

   Untimely or insufficient curing

5. Weather

   If water-cement ratio, curing timing etc. not changed with weather.

6. Workmanship

   Improper pressure while applying mortar may generate de-bonding of plaster

7. Mixing

   Improper mixing will wrongly allow concentration of different aggregates at different points

8. Water : cement

   Improper water will create cracks and strength problems too

9. Water

   Acidic, hard or high TDS water

10. Work continuity

    Discontinuity in plastering will generate cracks at the joint.

11. Plaster thickness

    Thick plaster will have brighter chances of cracks

12. Location / Orientation of walls

    If walls are facing direct sun or wind, water will evaporate at faster rate to generate cracks.

13. Cement : SILPOZ

    This ratio is normally 1:8

However, this can be changed for special applications to avoid defects in plaster. It is solely end user's decision.

Conclusion:

1. Minor cracks are common and unavoidable.
2. Defects in plaster are expected even when best quality river sand is used.
3. Silpoz can be tested for FM and Silt before unloading the truck easily
4. Tested Silpoz can never be responsible for any defects
5. For cracks & other defects, remaining 12 factors are always responsible to be checked immediately which are under the control of the end-users.

FAQ- 14

What if only Portland Pozzolana Cement (PPC) is available with Silpoz for plastering?

The functions of Silpoz are:

To provide artificial sand with a workability of river sand

To reduce cement consumption by utilizing free-lime released during the hydration of Ordinary Portland cement

Now, if PPC is used in place of OPC while plastering, the second function will be difficult to perform. Means, cement consumption cannot be reduced and Silpoz cannot be used in the prescribed ratio of Cement: Silpoz as 1:8.

However, under this circumstance, one can easily use Silpoz with lower ratios like 1: (7 to 4) depending on the strength requirement and quality of PPC (43 or 53 grade) used without any problem.

However, as per function 1, Silpoz will provide properly graded sand having sufficient workability for the plastering purpose.

FAQ- 15

What happens if 43 Grade cement OR PPC is used with Silpoz?

During the hydration of cement, FREE LIME is always liberated. Higher the grade of the cement, more will be the amount of FREE LIME. So, it is obvious that if 53 grade cement is used, there will be more free lime available as compared to 43 grade cement.

When Silpoz is used, instead of ordinary sand, this liberated free lime will be combined with the reactive silica of Silpoz to produce cementicious C-S-H gel for extra strength.

Therefore, cement and Silpoz can be used in 1:8 proportion for the same strength. However, if 43 grade cement is used, the strength will be little less but not below technical requirement.

User can also change the proportion and go for 1:7 or 1:6 for better strength with 43 grade cement. However, it is user's decision.

Our recommendation is 53 grade cement when used in 1:8 ratio.

In case of ordinary sand, this free lime would have been surfaced as a defect called

Efflorescence. So, the usage of Silpoz makes it possible to convert Waste in to Best OR Defect in to Effect.

PPC already contains reactive silica (Pozzolana) in it which combines with the free lime and imparts extra strength. So, if PPC is used with Silpoz, there is no free lime available for Silpoz to react with to give extra strength. Therefore, PPC is not advised with Silpoz at all.

FAQ- 16

Why cement is not an ingredient of Silpoz like other RMM or RMP products?

It is a strategic decision of not including cement in Silpoz.

As we know, manufactured sand or river sand always contain moisture in it. The sand needs to be dried before mixing with cement. The mixture ultimately goes to the customer's site where again water is added for plastering. So, drying is done just to transport cement from manufacturer's place to site.

The following are few reasons why cement is not incorporated in Silpoz:

1. Drying cost is too high. Why should one waste this amount when ultimately water is to be added as soon as the product reaches the site?
2. If sand is not dried properly, the cement will start getting hydrated. The product will be ruined due to hard lump formation.
3. More capital investment on drying by manufacturer - more will be the cost.
4. End-users may or may not trust the Quality and Quantity of cement used in the product as cement is high valued ingredient. Why should they?
5. Extra care is to be taken in monsoon as we do in case of cement bags. Also, the bags should be protected from moisture at site where curing is a common activity all the time.