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INFORMATION MEMORANDUM
ON PRODUCT "NAVOEDGE"

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NAVOZZO MATERIALS PRIVATE LIMITED

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CHAPTER 1: NAVOEDGE

A. INTRODUCTION

NavoEdge is a high-performance concrete additive developed using repurposed mining waste and proprietary, patented activators. The material is micronized and precisely classified to ensure consistent quality and performance, and it conforms to **ASTM C1797** standards.

NavoEdge enables a reduction in cement content by **40 ~ 50 kg per cubic meter** in concrete grades ranging from **M25 to M45**, while maintaining required **compressive and flexural strength**. In addition, it enhances concrete durability by reducing **water permeability** and **shrinkage cracking**.

For ready-mix concrete manufacturers, NavoEdge delivers **direct cost savings of ₹50 ~ ₹125 per cubic meter** of concrete without compromising performance.

Designed with sustainability at its core, NavoEdge supports a **circular economy** by converting mining waste into a valuable construction input. By reducing cement consumption and using a **low-energy manufacturing process**, it enables the production of greener, more durable concrete with a lower environmental footprint.

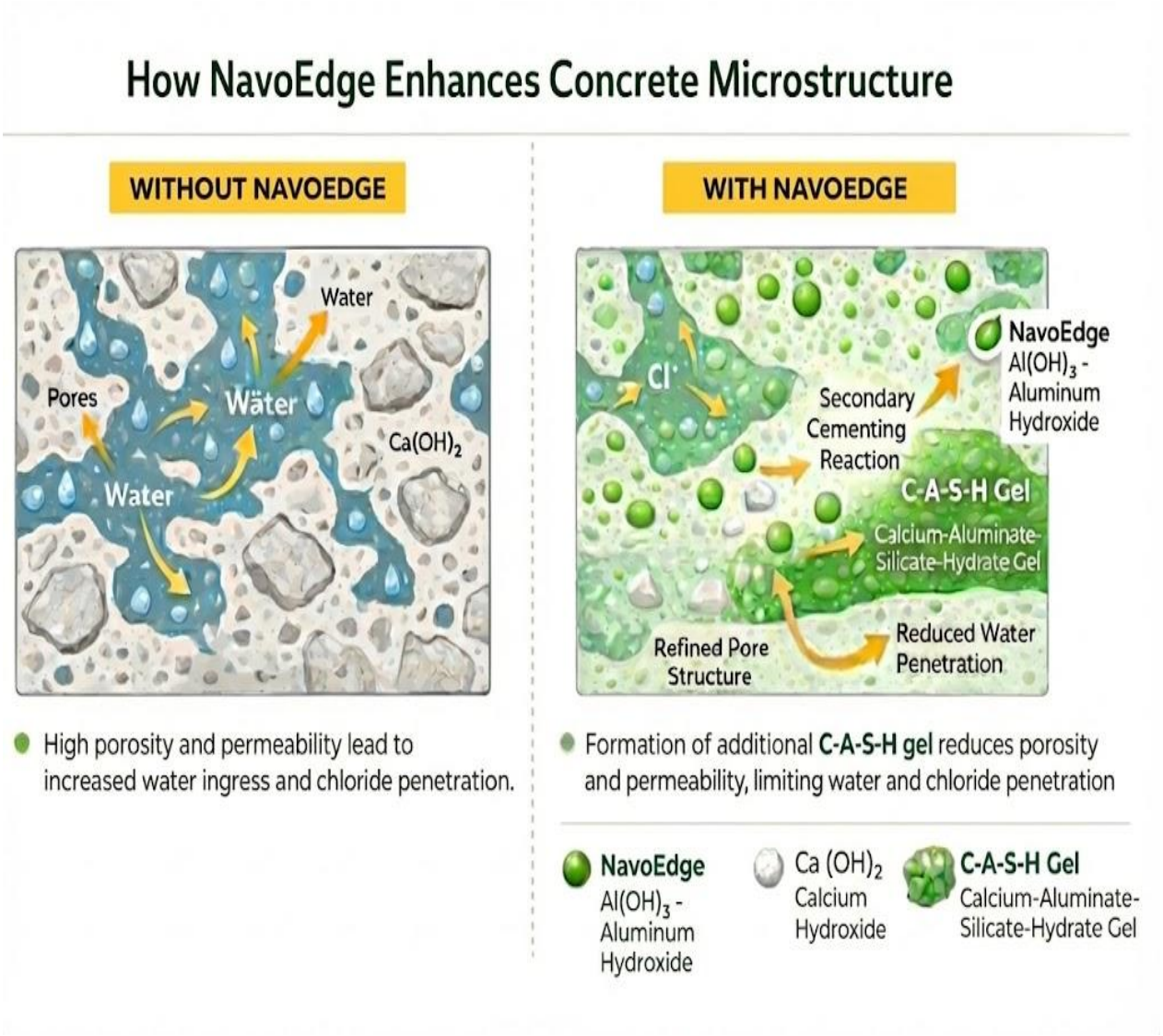
B. TECHNOLOGICAL OVERVIEW

NavoEdge is a pozzolanic, performance-enhancing concrete additive engineered to modify and refine the microstructure of concrete through controlled secondary cementitious reactions.

The reactive silica and alumina present in NavoEdge actively participate in hydration chemistry by reacting with calcium hydroxide [$Ca(OH)_2$] released during cement hydration. This reaction leads to the formation of additional **calcium-alumino-silicate-hydrate (C-A-S-H) gel**, rather than conventional C-S-H alone. The presence of reactive alumina in an activated state promotes a denser and more stable hydration product, resulting in enhanced matrix densification and strength development.

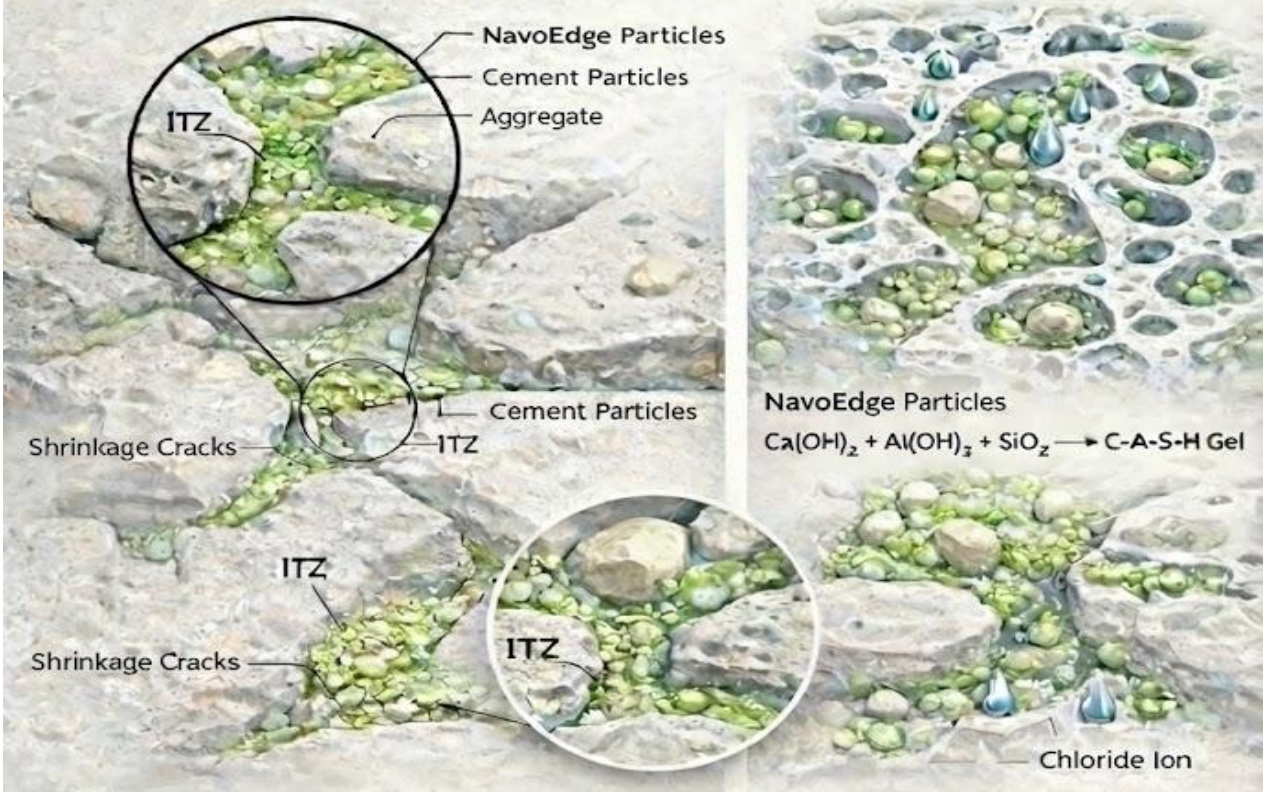
The formation of C-A-S-H gel refines the pore structure and interfacial transition zone (ITZ), significantly reducing concrete porosity and permeability. As a result, concrete incorporating NavoEdge exhibits **lower water ingress** and **restricted chloride ion penetration**, thereby reducing susceptibility to chloride-induced corrosion of embedded reinforcing steel and improving long-term durability.

Illustration showing pozzolanic reactions in NavoEdge:



NavoEdge
Mechanism of Action

NavoEdge is derived from mining waste and engineered to optimize concrete microstructure through pozzolanic activity.



1 ITZ Refinement & Shrinkage Reduction

NavoEdge particles fill the interfacial transition zones, refining the ITZ and reducing concrete shrinkage.

2 Secondary C-A-S-H Formation

Pozzolanic reactions consume $Ca(OH)_2$ and $Al(OH)_3$ with silica present from NavoEdge to form additional C-A-S-H gel, increasing concrete density and overall strength.

3 Pore Blocking

The refined microstructure seals pores, reducing water and chloride ion permeability, enhancing long-term durability.

C. BENEFITS OF USING NAVOEDGE

- Enables **reduction of cement content by 40 ~ 50 kg/m³** while maintaining compressive and flexural strength in M25–M45 concrete grades.
- Forms additional **C-A-S-H gel**, resulting in a **denser, stronger, and more stable cementitious matrix**.
- Refines **pore structure and interfacial transition zones (ITZ)**, improving microstructural integrity.
- **Reduces water permeability**, limiting moisture ingress and improving durability.
- **Restricts chloride ion penetration**, lowering the risk of chloride-induced corrosion of reinforcement.
- **Reduces shrinkage and micro-cracking**, improving dimensional stability.
- Enhances resistance to **chemical attacks** in aggressive environments.
- **Reduces consumption of virgin raw materials**, supporting sustainable concrete production.
- **Encourages utilization of mining and industrial waste**, promoting circular economy practices.
- **Minimizes waste disposal and landfill dependence**.
- **Delivers superior cost efficiency** compared to similar performance-enhancing materials.
- Manufactured using a **low-energy process**, contributing to reduced embodied carbon in concrete.

D. APPLICATION & DOSAGE

NavoEdge is incorporated into concrete **in the same manner as other cementitious materials** used in ready-mix concrete (RMC) production. It can be added **manually or through automated batching and mixing systems**, without requiring any special handling or process modification.

The recommended dosage of NavoEdge ranges from **1.0% to 2.0% by weight of the original cementitious content**, depending on the concrete grade, performance requirements, and desired durability characteristics.

As a standard reference mix, **a reduction of approximately 40 kg of cement per cubic meter** can be achieved using **1.5% NavoEdge**, while maintaining strength and performance parameters. Additional dosage and cement-reduction permutations may be optimized through **site or plant trials**, based on specific mix designs and project requirements.

E. COST COMPARISON

Concrete Mix Design	Traditional Design Mix (in Kgs)	Proposed Design Mix (in Kgs)	Changes (in Kgs)
OPC 43/53	210 ~ 260	180 ~ 220	20 ~ 50
Fly Ash	100 ~ 120	100 ~ 120	–
NavoEdge (% of original cementitious weight)		1% ~ 2%	~ 6

Net Cost Savings: Rs. 50 ~ Rs. 125 per m^3

Chapter 2: PHYSICAL SPECIFICATION

PHYSICAL PROPERTIES

Sr. No.	Property	Specification
1.	Color	Grey Powder
2.	Specific Gravity	2.4 ~ 2.6
3.	Retention on 45 Micron Sieve	1% ~ 3%
4.	Bulk Density (Loose)	0.65 ~ 0.75 g/cm³
5.	pH (10% Solution, 28°C)	8 ~ 10
6.	Moisture Content (% by mass)	< 1.0%
7.	Optimum Dosage Recommendation	1.0% ~ 2.0% (By cementitious mass)
8.	Packaging Size	25 kg / 50 kg
9.	Shelf Life	6 months

CHAPTER 3: STANDARDS

(Extract)

ASTM C1797 – Standard Specification for Ground Calcium Carbonate and Aggregate Mineral Fillers for use in Hydraulic Cement Concrete

TABLE 1 Chemical and Physical Requirements

Parameter	Type A	Type B	Type C
$CaCO_3$, % by mass	≥ 92	≥ 70	NA
Sum of $CaCO_3$ + $MgCO_3$, % by mass	≥ 95	≥ 90	NA
Methylene blue value (mg/g)	≤ 3	≤ 5	≤ 5
Total Organic Carbon Content % by mass	≤ 0.5	≤ 0.5	≤ 0.5
Particle size distribution, minimum % by mass passing			
300-µm (No. 50) sieve	100	100	100
150-µm (No.100) sieve	100	85	
75-µm (No. 200) sieve	95	70	65
45-µm (No. 325) sieve	90	65	
Fineness (m^2/kg)[D]	Report[A]	Report[A]	Report[A]
Moisture Content (%)[B] by mass	≤ 1	≤ 1	≤ 1
Strength Activity Index, % of control at 28d[C]	≥ 75	≥ 75	≥ 75
Water Requirement, maximum % by mass of control	120	120	120

[A] The purchaser has the authority to approve a change in the fineness or to add a range if needed.
[B] The moisture content is listed for materials that can be pneumatically transferred. If material is not pneumatically transferred, then the purchaser can waive the moisture content requirement.
[C] The purpose of testing the Strength Activity Index is to evaluate whether the material has any detrimental effect when used in concrete.
[D] There is no specification limit but the value is reported to provide information to the purchaser. The proportioning of a concrete mixture may be dependent on the fineness of the material to be used. If there is a change in fineness, the purchaser should be notified so that appropriate adjustments can be made to the concrete mixtures.

Specific to NavoEdge

4.2 Type C is typically a byproduct from the crushing of quarried stone, with mineral composition that depend on the stone from which it is derived. The chemical and physical properties shall comply with the requirements of Table 1.

4.3 The Type classification shall be stated by the supplier of the product.

NOTE 3—ACI CT-13 defines mineral filler as a finely divided mineral product at least 65 % of which passes the ~~75-µm~~75 µm (No. 200) sieve. This specification establishes requirements for GCC and AMF materials that meet this definition.

5. General Requirements

5.1 The chemical and physical requirements for Type A, Type B, and Type C shall conform to the requirements in Table 1.

5.2 The purchaser has the authority to request measurement by a specified method of the chloride ion content of the material.

6. Sampling

6.1 Obtain a sample from each lot for testing in accordance with Practice C50/C50M or Practice D75/D75M.

7. Test Methods

7.1 Calcium carbonate and magnesium carbonate content – Test Methods C25 or Annex A1.

7.2 Methylene Blue Value – AASHTO T330 or Test Method C1777.

~~NOTE 4—The specification values are based on testing research using AASHTO T330 while ASTM C1777 was under development. Data comparison between AASHTO T330 and C1777 will be made when sufficient data sets become available.~~

7.3 Total Organic Carbon (TOC) Content – Specification C595/C595M-15 Annex A3.

7.4 Particle Size Distribution (PSD) – Test Method C110 for Types A and B. Test Method C136/C136M and Test Method C117 for Type C.

CHAPTER 4: CASE STUDIES

NavoEdge Case Study M25

In this case, the cement content is reduced by 40 kg per cubic meter, with NavoEdge added at a dosage of 1.5% of the original cementitious material.

Mix 1	NavoEdge M25 Case Study					
S.N.	Particulars	Control Mix*	NavoEdge Mix	Changes	Price / Kg (Ex-GST)*	Cost Variation
1	**Mangalam OPC 43**	298.00	258.00	40.00	₹5.25	**₹210.00**
2	**Fly Ash**	75.00	75.00	0.00	₹1.43	**₹0.00**
3	**NavoEdge – 1.50%**	0.00	**5.60**	(5.60)	₹21	**(₹118.00)**
	Aggregate:					
1	20 MM	692.00	704.00	(12.00)	₹0.50	**(₹6.00)**
2	10 MM	480.00	492.00	(12.00)	₹0.50	**(₹6.00)**
3	Sand	714.00	730.00	(16.00)	₹0.60	**(₹10.00)**
	Admixture	2.20	2.20	0.00	₹40.00	**₹0.00**
	Water	161.00	150.00	11.00	₹0.112	**₹1.23**
	W/C	0.43	0.44			
	Total	2422.20	2416.80	5.4		**₹72.03**
	Savings %					**2.58%**

Concrete compressive strength										
DATE OF TRIAL	TRIAL No.	TRIAL MIX	1 DAY Mpa		3 DAYS Mpa		7 DAYS Mpa		28 DAYS Mpa	
			STRENGTH	AVERAGE	STRENGTH	AVERAGE	STRENGTH	AVERAGE	STRENGTH	AVERAGE
8/9/2025	1	CONTROL	7.82	7.44	17.18	17.43	21.50	21.56	37.34	39.02
			7.38		17.78		20.90		39.16	
			7.11		17.33		22.28		40.56	
	2	NavoEdge 1.50%	5.36	5.48	17.07	17.03	18.59	18.11	42.80	41.95
			5.46		16.92		17.23		42.67	
			5.61		17.10		18.52		40.37	

*This data represents the average price across all brands in Rajasthan

NavoEdge Case Study M30

In this case, Cement is reduced by 50 Kg, fly ash is increased by 10 Kg, with NavoEdge dosed at 1.25% of the original cementitious mass.

Mix 1	NavoEdge M30 Case Study					
S.N.	Particulars	Control Mix*	NavoEdge Mix	Changes	Price / Kg (Ex-GST)*	Cost Variation
1	**Wonder OPC 53**	320.00	270.00	50.00	₹5.25	**₹ 263.00**
2	**Fly Ash**	120.00	**130.00***	**(10.00)**	₹1.43	**(₹14.30)**
3	**NavoEdge – 1.25%**	0.00	**6.60**	(6.60)	₹21	**(₹138.60)**
	Aggregate:					
1	20 MM	520.00	520.00	0.00	₹0.50	**₹ 0.00**
2	10 MM	510.00	510.00	0.00	₹0.50	**₹ 0.00**
3	Sand	410.00	440.00	(30.00)	₹0.60	**(₹18.00)**
	Admixture	2.85	2.60	0.25	₹40	**₹ 10.00**
	Water	155	150.00	5.00	₹0.112	**₹ 0.56**
	W/C	0.35	0.38.00			
	Total	2037.85	2029.20	8.65		**₹ 102.16**
	Savings %					**3.72%**

Concrete compressive strength						
DATE OF TRIAL	TRIAL No.	TRIAL MIX	7 DAYS Mpa		28 DAYS Mpa	
			STRENGTH	AVERAGE	STRENGTH	AVERAGE
10/10/2025	1	CONTROL	29.03	29.23	39.23	39.40
			29.65		40.10	
			29.00		38.86	
	2	NavoEdge 1.25%	27.90	28.86	38.23	39.27
			29.24		39.78	
			29.43		39.80	

*This data represents the average price across all brands in Rajasthan

NavoEdge Case Study M35

In this case, the cement content is reduced by 50 kg per cubic meter, with NavoEdge added at a dosage of 1.75% of the original cementitious material.

Mix 1	NavoEdge M35 Case Study					
S.N.	**Particulars**	**Control Mix***	**NavoEdge Mix**	**Changes**	**Price / Kg (Ex-GST)***	**Cost Variation**
1	**Ultratech OPC 53**	340.00	290.00	50.00	₹5.25	**₹262.50**
2	**Fly Ash**	100.00	100.00	0.00	₹1.43	**₹0.00**
3	**NavoEdge – 1.75%**	0.00	**7.70**	(7.70)	₹21.00	**(₹161.70)**
	Aggregate:					
1	20 MM	673.00	683.00	(10.00)	₹0.50	**(₹5.00)**
2	10 MM	449.00	464.00	15.00	₹0.50	**(₹7.50)**
3	Sand	784.00	800.00	(16.00)	₹0.60	**(₹9.60)**
	Admixture	3.36	3.36	0.00	₹40.00	**₹0.00**
	Water	150.00	150.00	0.00	₹0.112	**₹0.00**
	W/C	0.34	0.38			
	Total	2499.36	2498.06	1.3		**₹78.70**
	Savings %					**2.53%**

Concrete compressive strength								
DATE OF TRIAL	**TRIAL No.**	**TRIAL MIX**	**3 DAYS Mpa**		**7 DAYS Mpa**		**28 DAYS Mpa**	
			STRENGTH	**AVERAGE**	**STRENGTH**	**AVERAGE**	**STRENGTH**	**AVERAGE**
19/07/2025	1	CONTROL	28.96	28.02	37.53	33.80	45.80	47.56
			26.30		31.06		48.47	
			28.81		32.81		48.40	
	2	NavoEdge 1.75%	24.95	25.34	33.94	34.12	48.26	46.62
			26.72		32.98		47.15	
			24.35		35.45		44.46	

*This data represents the average price across all brands in Rajasthan