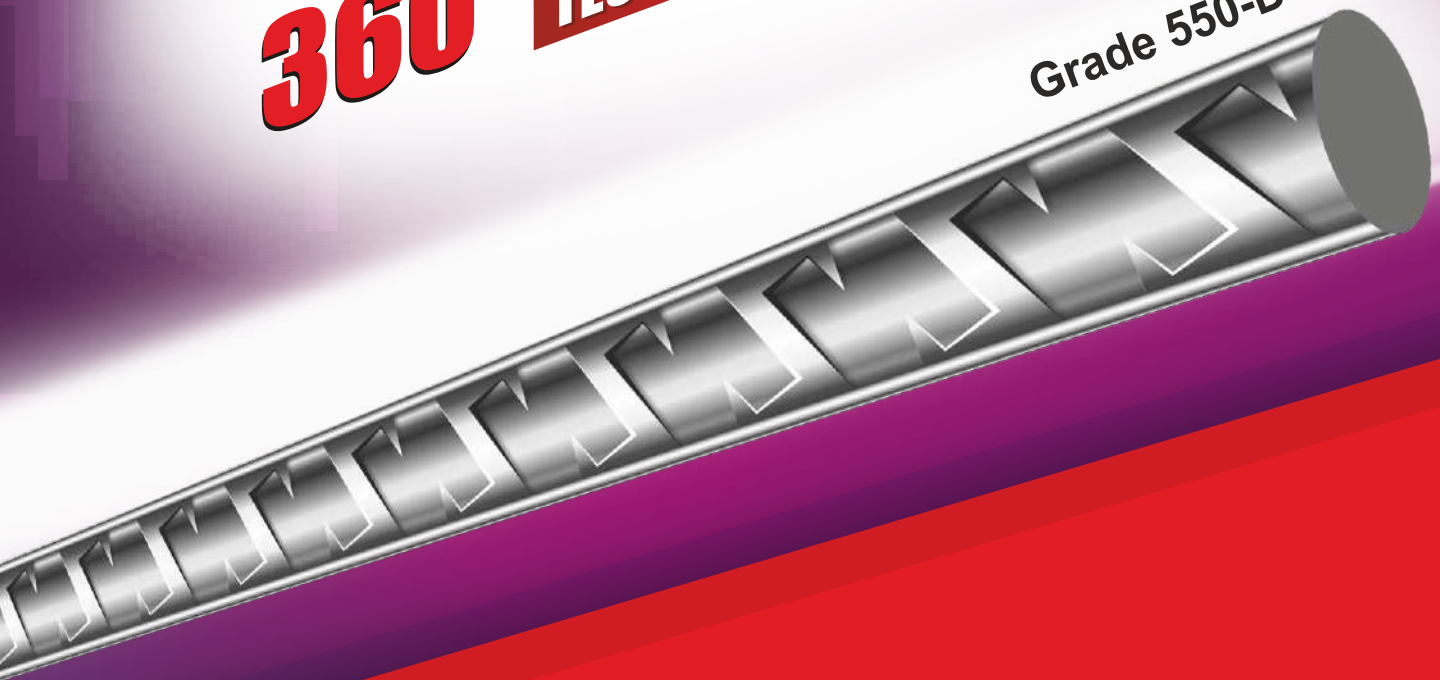




INTRODUCING  
**POWER ALLOY STEEL**  
with **360°** LOCKING TECHNOLOGY



Grade 550-D



**KAMDHENU**  
**PAS10000**

*Ab Steel nahin, Power Alloy Steel Ka hai zamana!*

# C O N T E N T S

Message from Director	01
About Kamdhenu Steel	02
Kamdhenu PAS 10000	03
Power Alloy Steel	05
Kamdhenu PAS 10000 Ductility / Bond Strength	06
Effective Earthquake Resistance / Seismic Design / Wind Load	08
Treatment in three Stages DBT3	10
Kamdhenu PAS 10000 Grade 550-D	12
Weldability / Corrosion Resistance / High Temperature Resistance / Degradation of Steel	17
Chemical Properties / Physical Properties	18
Product Range / Packaging / Unique Service Offerings / Application For Kamdhenu PAS 10000	19



Ab Steel nahin,  
**power Alloy Steel**  
Ka hai zamana!

# **A DREAM THAT IS NOW LAUNCHING MILLION DREAMS...**

What started as a single steel manufacturing unit in 1995, has now proliferated into more than 80 manufacturing units spread across the country. Today, Kamdhenu Group is actively involved in manufacturing, marketing, branding and distribution of a diverse range of products including Reinforcement Steel Bars, Structural Steels, Binding Wires, Colour Coated Sheets and more. For over 25 years, Kamdhenu Group has fulfilled India's multi-sectoral infrastructural needs on the strength of its product's excellence, customer orientation and technology leadership

At Kamdhenu Group, we believe in honesty, transparency, commitment, quality assurance and customer satisfaction as the guiding principles that encourage us to give our best. We are the largest TMT selling brand of India in retail with dedicated marketing network of 8500+ dealers & distributors, having two billion dollar brand sales turnover. We are equipped with the system for the delivery of quality products across India within 48 hours.

Backed by cutting edge technology, access to the best quality raw materials, highly skilled manpower, Pan-India presence and innovative business model, we are upbeat about the future. No wonder, with a dynamic workforce of an average age of 35 years, we are a young and dynamic organization ready to take on the world.

Kamdhenu name is currently positioned as "Best Quality at Best Price" brand and has been the pioneer of the revolutionary Franchisee Business Association Model. A highly efficient marketing team equipped with innovative and out-of-the-box ideas helps the company to turn challenges into opportunities. We take pride in giving back to the society and make sure that our thoughts are converted into actions for the generations to come. Apart from our environmental safety campaigns another initiative by 'KAMDHENU JEEVANDHARA FOUNDATION' to ensure basic education and skill development of the underprivileged children and empowerment of women.

# Director Speaks

## INNOVATING FOR A SAFER AND HAPPIER TOMORROW



Greetings friends!

Innovation is the key to a safer and happier tomorrow. And we at Kamdhenu Group are constantly working towards creating innovative products that will make our lives safer and beautiful. The group has so far lived up to the expectations of millions by offering excellent quality construction material. Standing tall on the pillars of trust, transparency and integrity, Kamdhenu Group has rapidly & successfully diversified into various steel products thus, catering to broader market segments and creating a better world for our valuable customers.

The world-class rebar and structural steel products are sheer examples of our innovative approach towards developing construction products according to the modern age construction requirements. Our latest offering, Kamdhenu PAS 10000 is a state-of-the-art powerful alloy steel product that will redefine the construction scenario in the country. As the name suggests, BIS and international quality standards compliant, Kamdhenu PAS 10000 is suitable for making highly durable 10000 PSI concrete. The alloy in it lends it superb anti degradation property and the 360 degree locking technology gives it optimum stability and most effective earthquake resistance. It also comes with innovative ribs for ultra strong grip with concrete.

Ab steel nahin, Power Alloy Steel ka hai zamana!

With warm regards,



Sunil Kumar Agarwal  
Director Kamdhenu Limited

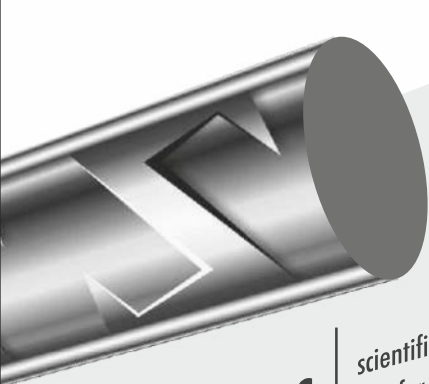
## **LATEST TECHNOLOGY OUTPLAYS COMPETITION**

Kamdhenu PAS 10000 is produced in the ultra modern plant under close supervision of our frontline metallurgists and engineers. The latest technology, spacious billet yard for castwise stacking of billets, reheating furnace, pre-finishing & finishing mill, continuous shear, cold shear to cut bars and the latest steel facilities are the features of the Kamdhenu bar mill. Each lot is tested through a rigorous process so that buildings get higher strength in different geographical conditions.

## **SCIENTIFICALLY RESEARCHED WORLD CLASS FEATURES**

Although steel & concrete are two different materials, they have to behave as a single unit in a reinforcement structure. This happens when the concrete grips steel rebars to form the strongest bond.

Kamdhenu PAS 10000 has a unique innovative rib pattern for ultra-strong grip with concrete in terms of greater rib depth/height and closer rib spacing at different angles. The CNC notch cutting ensures uniform rib pattern which allows uniform bonding with concrete in the entire structure. Kamdhenu PAS 10000 is superior to ordinary rebars due to its uniformity, critically designed ribs, fatigue strength & ductility. Moreover, meticulous testing throughout the steel making & rolling process is conducted to ensure that quality standards are maintained.



**UNIQUE RIBS**

scientifically researched innovative  
ribs for ultra-strong grip with concrete

**360°  
LOCKING TECHNOLOGY**

for optimum stability &  
most effective earthquake resistance



# KAMDHENU PAS10000

Kamdhenu, one of the largest rebar producers in India, is the first company in the country to introduce PAS 10000, a state-of-the-art power alloy steel product, to redefine the construction scenario in the country. PAS 10000 is BIS and international quality standards compliant and is suitable for making highly durable 10000 PSI concrete. The alloy in it lends it superb corrosion-resistant properties and anti-degradation properties. Moreover, it being alloy steel should not be compared with normal mild steel bar, as the unique properties of PAS 10000 is achieved by adding alloying elements in a certain ratio. Further, the 360 degree locking technology gives it optimum stability and most effective earthquake resistance and it also comes with innovative ribs for ultra-strong grip with concrete.

**POWER ALLOY STEEL**  
with **360° LOCKING TECHNOLOGY**



**POWER** | suitable for bonding with 10,000 PSI concrete

**STEEL** | **ALLOY** | with improved corrosion resistance  
compliant with BIS quality and International quality standards

## KAMDHENU PAS 10000 DUCTILITY

### Safety of concrete structure is of prime concern

Concrete is brittle without ductility and cannot be used for structural applications without reinforcement. The ductility within a structure, something which concrete does not have, is provided by steel reinforcement. Therefore, the steel must be sufficiently ductile so that every reinforced concrete section including structural elements, has the capacity to deform by an adequate amount.

Ductility of an element is its ability to withstand deflection or extensive cracking in an overload situation without sudden catastrophic collapse.

Imagine a beam built of plain concrete without reinforcing steel supported at both ends and in the middle. If we load both spans then:

- ▶ On initial loading, the beam deflects a little.
- ▶ In the second stage of loading, the beam collapses all of a sudden.

Now, if the concrete is reinforced with steel bars and loaded in the same way as before then:

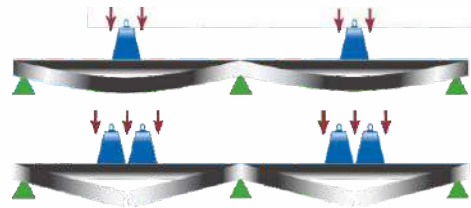
- ▶ In initial stage of the loading, the beam deflects a little.
- ▶ In the second stage of loading, the beam continues to deform.
- ▶ In the third stage of loading, the beam deflects some more and small cracks appear.
- ▶ In the fourth stage of loading, the beam deflects even more and cracking becomes more extensive.

In general, higher steel ductility provides greater ductility to the beam.

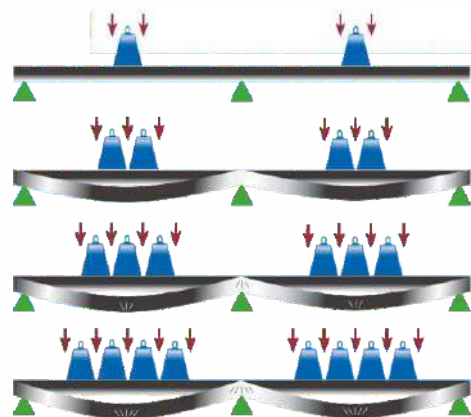
## BOND STRENGTH

In addition to strength and ductility requirements, reinforced concrete needs adequate bonding between steel and concrete to ensure that the composite works efficiently and cracks are under control. Perfect bonding between concrete and ductility is a property of reinforcing steel that is essential in those applications where structures are subject to unexpected forces (Seismic, dynamic, impact, etc.)

Kamdhenu PAS 10000 boasts more than 200% higher value as compared to basic bond strength as it comes with innovative ribs for ultra strong grip with concrete.



This happens because concrete is a brittle material with low ductility.  
BRITTLE = NON DUCTILE



"In general, the higher the steel ductility, the greater the ductility of the beam".  
"The tensile ductility of steel is its ability to deform when loaded above its elastic limit without fracturing".





# ***Power Alloy Steel***

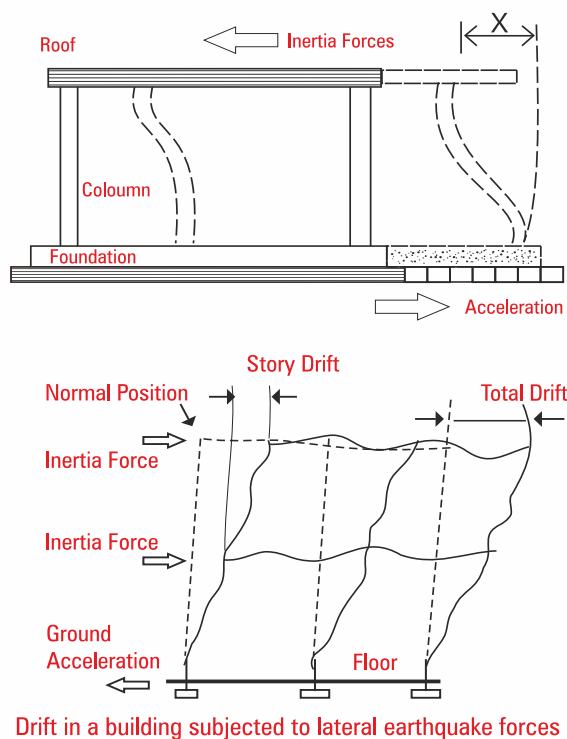
## ***Fortified Steel for Fort-like strong buildings***

Alloy Steel is made when a variety of alloying elements are alloyed with steel in certain composition to improve its mechanical properties. These alloying elements are added to produce specific properties that are not found in regular Carbon Steel.

Kamdhenu Power Alloy Steel is high grade steel that is alloyed with high value alloying elements like Chromium, Cobalt, Manganese, Molybdenum, Nickel, Tungsten, Vanadium etc. These elements are added in varying proportions and combinations to optimally increase certain desirable chemical and physical properties in Rebars such as hardness, corrosion resistance, strength and ductility.

When an alloying element is added, it is combined with carbon and it makes a secondary precipitate, i.e. Alloy Carbide. Whenever there is a load on a building and steel is subject to beyond proof-stress then the Iron Carbide atoms get dislocated and the vacant place is occupied by Alloy Carbide which is very hard in nature. This increases the plastic region of steel, i.e. increases the tensile strength of the steel, reduces the earlier fracture of steel in a building and increases the safety factor of the building. The load-bearing capacity of Kamdhenu PAS 10000 is 28% higher as compared to normal steel. The addition of the micro-alloying elements makes the structure stronger and safer in earthquake prone zones.

## ***Effective earthquake resistance comes from Strong Floor-slab, Columns and Foundation***

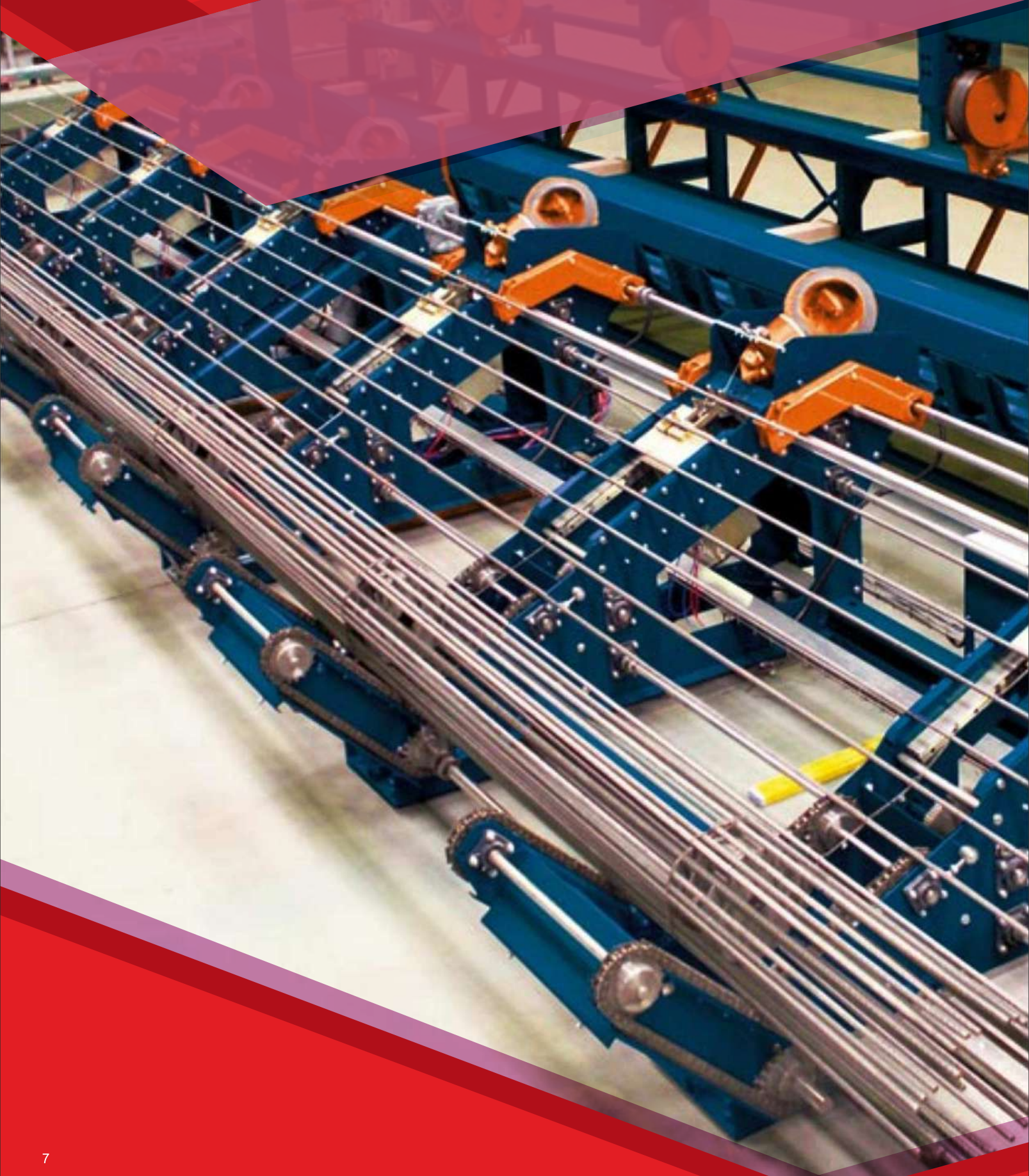


Earthquake causes shaking of the ground and as a building rests on the ground, it experiences motion at its base. As per Newton's First Law of Motion, even though the base of the building moves with the ground, the roof has a tendency to stay at its original position. Since the walls and columns are connected to it, they drag the roof along. If the roof has a mass  $M$  and experience of acceleration  $a$ , the inertia force is mass  $M$  times acceleration  $a$ , and its direction is opposite to that of acceleration. Larger the mass of building, higher the inertia force and that's why lighter buildings sustain the earthquake more.

During an earthquake, the column undergoes relative movement between their ends. As shown in figure the movement is "X" between roof and ground. Due to internal forces in columns, these come back to the straight vertical position. The larger is the displacement "X"; larger is internal force in columns.

Also the Horizontal Inertia forces are transferred from top to foundation through columns, so the connection between Floor-slabs, Columns and Foundation must be strong enough to safely transfer these inertia forces through them.









# **KAMDHENU** **PAS10000**

## ***Earth-quake resistant DBT3+ Security***

### **—— Extra Ductility ——**

*This deflects beams to reduce load at joints of columns*

### **—— Extra Strong Bond ——**

*The steel bar doesn't slip from concrete and retains its firm grip*

### **—— Extra Tensile Strength ——**

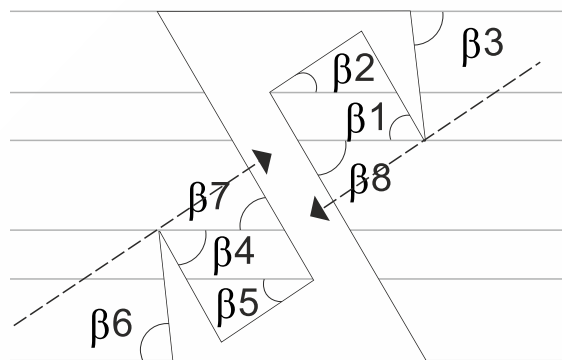
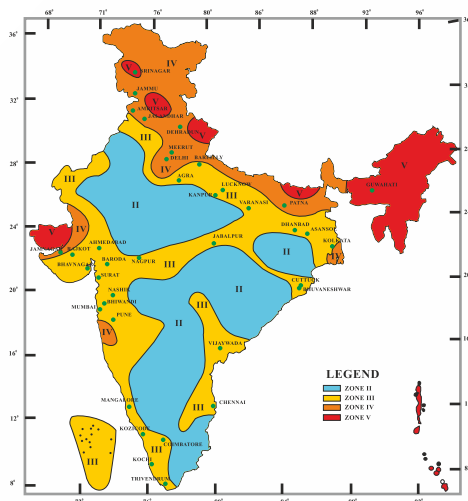
*Higher than normal to reduce fracture of steel*

## SEISMIC DESIGN

Kamdhenu PAS 10000 is best suited for constructions in high seismic zones. When the building structure is subjected to seismic forces; the manner in which the structure reacts is highly dependent on the ductility of the steel and the bond with concrete. Kamdhenu PAS 10000 revealed superior seismic resistance properties during stimulated earthquake conditions.

$F = ma$  is the force that building exerts at the time of earthquake. At the same time, the force at point of contact of steel is  $F = ma \sin B1$ . However, in 360 degree ribs pattern, the same is acting in opposite direction,  $F = ma \sin (-B4)$ , i.e.,  $F = -ma \sin B4$  in opposite direction.

The two forces are equal in magnitude but opposite in direction at every point of contact of steel and concrete. Therefore, it reduces the chance of slip of steel from concrete and prevents the building from collapsing at the time of an earthquake and its after-effects.



## ENLARGE SHAPE OF RIBS

$\beta 1 - 60^\circ$	$\beta 2 - 34^\circ$
$\beta 5 - 34^\circ$	$\beta 6 - 84^\circ$
$\beta 3 - 84^\circ$	$\beta 4 - 60^\circ$
$\beta 7 - 60^\circ$	$\beta 8 - 60^\circ$

## WIND LOAD

High rise buildings are subject to heavy wind load. Higher the building, more is the wind load at the top. If stress load crosses beyond the yield stress, it can lead to structural failure. Kamdhenu PAS 10000, being alloy steel has more strength, more load-bearing capacity and more resistant to fracture of steel thus, making high-rise buildings safer.



**TECHNOLOGICAL INNOVATION**  
**KAMDHENU** 550-D TMT  
**PAS10000**

# 550-D



Kamdhenu has always been a front-runner in the construction segment as far as technological advancements are concerned. With many firsts under its umbrella, Kamdhenu's appetite for innovation has given construction industry numerous path-breaking inventions.

## **KAMDHENU PAS 10000 (550-D TMT)**

Its latest innovation 550-D is a technological advancement that re-writes the standards of construction. Developed keeping in mind the essentials of earthquake resistant construction Kamdhenu PAS 10000 550-D is the answer to all your needs. Kamdhenu PAS 10000 550-D is totally Sulphur and Phosphorus controlled and purified to the latest quality standards to give your construction the extra strength to withhold under extreme hot and cold weather conditions. Sulphur and Phosphorus are the harmful impurities that make a rebar vulnerable to cracking. Kamdhenu PAS 10000 550-D reduces the combined level of these impurities up to 0.075% as per the latest BIS specifications. Therefore, Kamdhenu PAS 10000 550-D is many times better and absolutely reliable than other rebars available in the market. With Kamdhenu PAS 10000 550-D comes a promise of strength, stability and standard for every company or individual involved in the process of construction.

## **PROCESS OF MANUFACTURING**

With its most advanced and highly equipped production units, Kamdhenu manufactures TMT Bars (Thermo-Mechanical Treatment). It uses the latest and most sophisticated technology to manufacture high quality Kamdhenu TMT Bars. The technology is formulated in three steps namely Quenching stage, Tempering stage and Cooling stage. Manufactured under the best quality control parameters these bars give high ductility, bendability and weldability and are fully-equipped to resist earthquakes



## WELDABILITY

Kamdhenu PAS 10000 bars offer superior weldability than conventional TMT bars due to its low carbon equivalent characteristics. It can be easily butt-welded using ordinary coated electrode of similar strength. No pre-warming or post-heat treatment is necessary in manual arc welding either.

## HIGH TEMPERATURE RESISTANCE

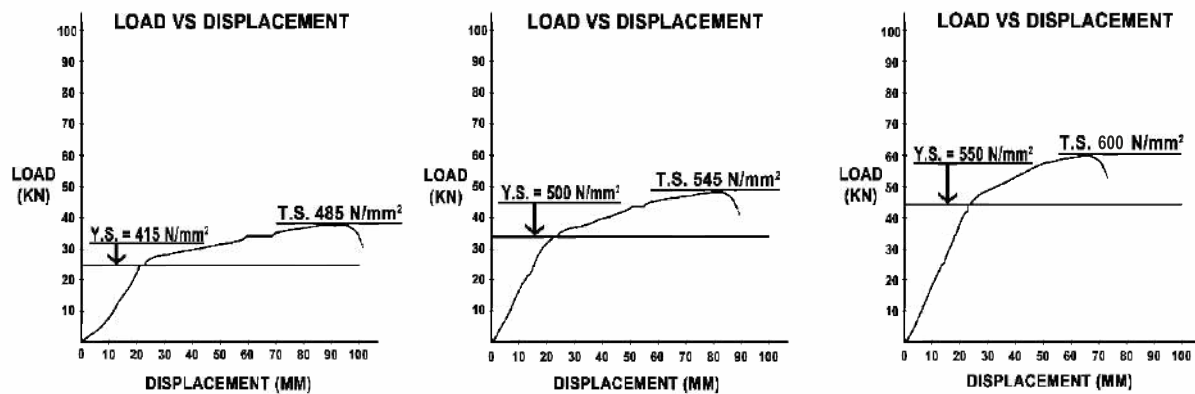
The alloying elements added in Kamdhenu PAS 10000 bar makes it capable of withstanding higher temperature, and decreases the creep rate of steel successfully, because the alloying elements have higher melting point and better heat distribution property. Therefore, Kamdhenu PAS 10000 bars retain more than 80% of its ambient temperature yield strength at 400 degree Celsius and 50% at 550 degree Celsius.

## PITTING OF STEEL

It is a form of localized corrosion that leads to the creation of small holes at the metal surface. The pit created acts as anode and metal surface as the cathode. Due to chemical reaction, the pit has a tendency to attract chloride, which results in the acceleration of the pitting of steel. It attacks in the forms of spots and pits.

When two different metals and water come together as electrolytes, it results in galvanic corrosion. Also known as Pitting corrosion, the iron particles in the steel are oxidized and produce rust, which forms many galvanic elements in small areas. It often occurs with low alloy structural steel in damp conditions. This pitting of steel may reduce tensile strength and ductility of steel in the pitted area.





"Kamdhenu PAS 10000 rebars are hot rolled from steel billets and subjected to PLC controlled online thermo mechanical treatment in three successful stages which are necessary for making a high quality rebar". The three stages are:

## QUENCHING STAGE

Under the Quenching stage, high pressure water spray is used as a cooling treatment for the hot ribbed bars. The effectiveness of the water spraying equipment in this stage is critical as to rapidly harden the surface layer, faster than the critical rate, to form the martensite while core remains austenite. As a result, we get a hard outer layer with better ductility.

## TEMPERING STAGE

The Tempering stage is very important for bars as after quenching they leave the water quenching line and are exposed to air. The heat flux from the still hot core reheats the surface by conduction thus self-tempering the surface to a structure called "Tempered Martensite" which is strong and tough. The core is still austenitic at this stage and remains soft & ductile.

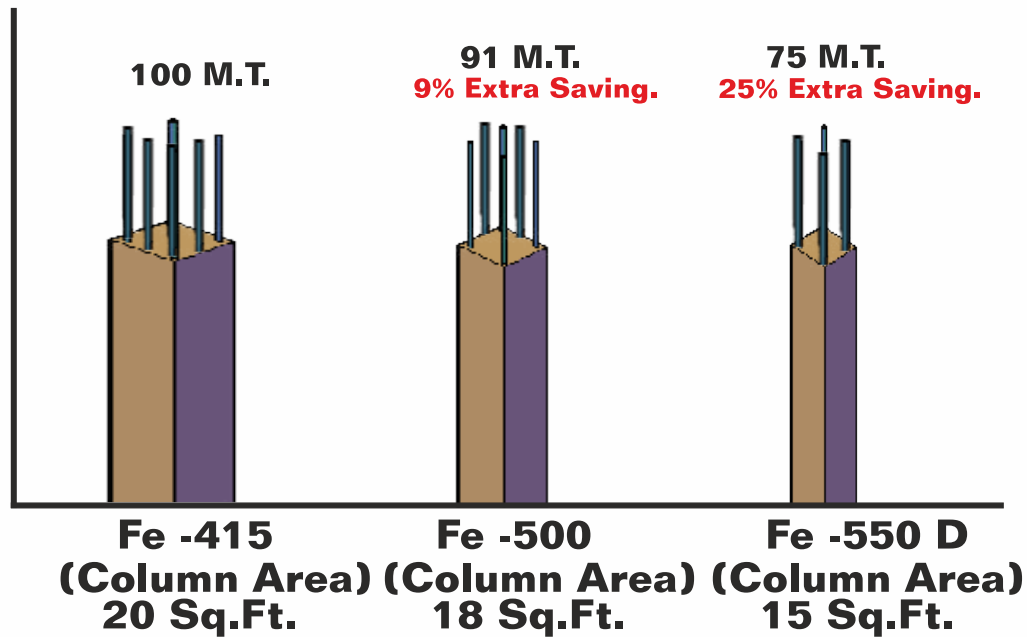
## ADVANTAGES OF **KAMDHENU PAS 10000 (550-D TMT)**

- Earthquake resistant, increasing the sturdiness of construction
- Decreasing the level of Sulphur and Phosphorus, ensuring less impurities
- Non-vulnerable to cracking under extreme hot and cold conditions
- Higher Bonding strength with higher ductility
- Better ductility, bendability and weldability
- Higher thermal stability (400 to 600 degrees)
- Anti-corrosive properties to prevent the formation of coarse carbides
- High elongation values, excellent workability
- Bear dynamic and seismic loading (high fatigue resistance)

## POWER OF BRAND ENHANCED WITH **GRADE Fe 550 D**

Steel is an essential element for any construction activity like multi-storey buildings, houses, airports & bridges etc. With the constant transformation of steel industry there is a growing market need for steel bars with higher strength & elongation. The 21st century has seen a rapid increase in the cost of TMT bars & has also brought greater focus on safety & quality norms of construction. This encouraged Kamdhenu Limited to develop 550 D grade TMT bars with properties of high strength which also enables cost savings in construction by reducing consumption, to meet the increasing demand in the market.

## STEEL REQUIRED IN M.T.



As shown above, if we use 500 or 415 grade TMT bar instead of 550 D grade TMT bar then apart from increasing the area of column in the structure, the consumption of steel by using 500 or 415 grade will also be 9% & 25% extra respectively, in comparison to the consumption of steel by using 550 D grade.

## CHALLENGES

Today steel structures are being designed with 415 & 500 grade TMT bars due to lack of awareness hence, the consumption & cost of steel is higher as compared to what should ideally be used in construction. Moreover, various brands claim that their product is of 500 grade whereas, they are manufacturing 415 grade instead. If a RCC column is designed for 550 D grade steel but the steel actually used doesn't qualify the strength of 550 D grade, then it can lead to collapse of structure. Kamdhenu PAS 10000 guarantees its 550 D grade TMT bars to be cost effective and safe for construction of any structure.



## COOLING STAGE

The third stage of “Atmospheric Cooling” occurs on the cooling bed, where the austenitic core is transformed into a ductile ferrite pearlite core. The final structure consists of a combination of a strong outer layer of tempered martensite and a ductile core of ferrite-pearlite.

## CNC PATTERN

The CNC notch Cutting m/c ensure uniform rib pattern which allow uniform bonding with concrete for the whole structure. Due to uniformity and critically designed ribs, fatigue strength and ductility of Kamdhenu PAS 10000 is much superior to ordinary steel bars.

## COST SAVING

In a structure, advanced TMT steel bars with a yielding quantity of  $550 \text{ N/mm}^2$  are required in a lesser quantity thereby, decreasing the general expense of the structure. In addition to reducing the steel consumption and ensuring savings in cost, the use of 550 D grade steel can also increase carpet area of construction by reducing the column area, as 550 D grade TMT bars have high tensile strength and it occupies less space.

## CHEMICAL PROPERTIES

Kamdhenu PAS 10000 has been produced as a unique range product of the Company which meets the quality standards accorded by the BIS specifications. Its carbon level is maintained at a much lower point than the specifications, which results in its excellent ductility, high bendability, better corrosion resistance & superior weldability. The other undesirable impurities like S&P that impair the overall longevity of rebars inside construction are also maintained at a much lower point in Kamdhenu PAS 10000 than the specifications.

Chemical Element	Unit	IS : 1786 Fe-550D	KAMDHENU PAS 10000
C	%	0.25 (max.)	0.23 (max.)
CE	%	0.61 (max.)	0.38 (max.)
S	%	0.040 (max.)	0.035 (max.)
P	%	0.040 (max.)	0.035 (max.)
S+P	%	0.075 (max.)	0.070 (max.)

\*As contained in 90% of the heat.

## PHYSICAL PROPERTIES

Kamdhenu PAS 10000 is manufactured by a unique method maintaining a combination of strength & ductility that far exceeds the minimum limit specified in BIS.

Mechanical properties	unit	IS : 1786 Fe-550D	KAMDHENU PAS 10000
Yield Stress (YS)	N/mm <sup>2</sup>	550 (min.)	565 (min.)
Ultimate Tensile Strength (UTS)	N/mm <sup>2</sup>	600 (min.)	625 (min.)
UTS/YS	Ratio	1.08 (min.)	1.10 (min.)
Elongation	%	14.5 (min.)	16.0 (min.)
Uniform Elongation	%	5.0 (min.)	7.5 (min.)

\*As contained in 90% of the heats.

## CORROSION RESISTANCE

While steel is the most durable and strong metal, it is susceptible to basic corrosion that might reduce its life. Corrosion is an electrochemical process that happens in the presence of moisture and oxygen. The iron in the steel oxidized to produce rust which occupies and increases up to 6 times in the volume of the original material.

By understanding the science behind corrosion, a superior quality of steel come into being. Kamdhenu PAS10000 has a micro-alloy structure and made with a perfect chemical combination that reduces corrosion.

When the alloying element added in the steel reacts with oxygen, it makes a thin layer of alloy oxide. This layer reduces the cathodic and anodic reaction between pit and surface of steel and prevents the movement of chlorides, thereby slowing down the formation of pits on steel surface.

## DEGRADATION OF STEEL

Degradation of steel is different from corrosion of steel. All kinds of steel form a thin layer of rust on its surface when exposed to air and water. After this thin layer is formed, the degradation process starts which reduces the life of steel. A test named CPR (Corrosion Penetration Rate) was conducted to determine the degradation of steel in milli inch per year.

The results revealed that the degradation of Kamdhenu PAS 10000 is 4-5 times less as compared to normal steel bars thus, increasing the life of steel in a building.



Ab Steel nahin,  
**power Alloy Steel**  
Ka hai zamana !

## PRODUCT RANGE

Kamdhenu PAS 10000 rebars are available in various sizes at retail/distribution networks across India: 8, 10, 12, 16, 20, 25, & 32 mm.

## PRODUCT PACKAGING

Each Kamdhenu PAS 10000 rebar is supplied in a fixed length of 12 meters to ensure standard processing and therefore causing less wastage during fabrication. Kamdhenu PAS 10000 is supplied section wise in convenient pre-packed bundles with fixed number of pieces per bundle.

## UNIQUE SERVICE OFFERINGS

Selling by piece - Every Kamdhenu PAS 10000 rebar is sold in a standard length of 12 meters, thereby removing the hassle of weighing.

Recommended Consumer Price (RCP): Kamdhenu PAS 10000 rebars are sold at RCP for better transparency. The RCP is displayed at all dealers' outlets.

## APPLICATION FOR KAMDHENU PAS 10000

Kamdhenu PAS 10000 should be applied where high ductility is desired. These applications include structures that are subject to forces difficult to quantify because of the nature of those forces or due to lack of knowledge about those forces such as:

- ▶ Dynamic loading
- ▶ Explosions
- ▶ Sudden impact
- ▶ Compressive and tensile forces





## **KAMDHENU LIMITED**

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