



DRAGON Rock Wool
Your Energy Save

keep learning, keep growing



KHAI HOAN CO., LTD

Rep Office: 232/2 Binh Loi, Ward 13, Binh Thanh Dist, HCMC, Vietnam

Head Quarter: 292/37/3 Binh Loi, Ward 13, Binh Thanh Dist, HCMC, Vietnam

Tel: (+84) 3553 0150 - Fax: (+84) 3553 0151

Email: khaihoaninsu@vnn.vn - Website: www.khaihoaninsu.com

- THERMAL INSULATION
- FIRE PROTECTION
- ACOUSTICS



➔ INTRODUCTION

DRAGON Rock Wool®

DRAGON Rock Wool® is the trademark of all the rock wool insulation products registered & manufactured by KHAI HOAN-VIET LONG COMPANY.

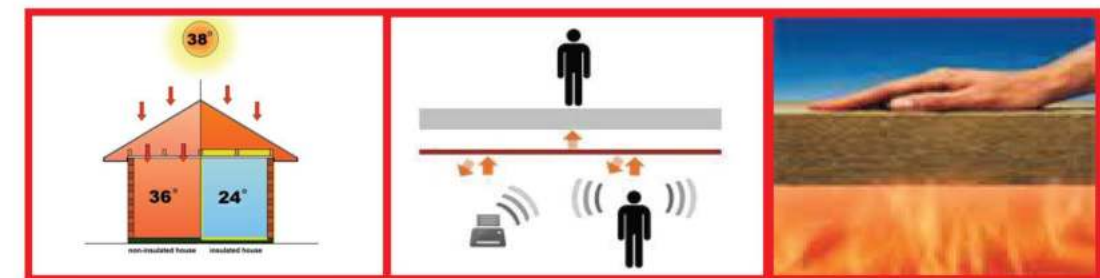
DRAGON Rock Wool® is made from basalt rock and lime-stone processed in cupola furnace and pendulum systems at an extremely high melting point of approximately over 1300 degrees Celsius. The combined process results in a non-combustible material which is excellent in fire resistance and thermal insulation. As an excellent sound-absorbing material, DRAGON Rock Wool® can be applied to partition walls to effectively reduce noise. Made from 100% of natural basalt rocks, DRAGON Rock Wool® is non-poisonous, hazard-free to human's health, environment-friendly and free from parasite infestation and fungi growth.

➔ APPLICATIONS

DRAGON Rock Wool® offers the unique 3-in-1 functional solution:

Thermal – Acoustics – Fire Insulation

excellently meeting all the Vietnamese & international standards of building designs.



INTRODUCTION

Density (Kg/m ³)	40	50	60	80	100	120	140	160
Service temperature (°C)	450				650			
Thermal Conductivities (W/mK) ASTM C518 - 15								
20°C	0.037	0.037	0.037	0.036	0.035	0.033	0.031	0.031
100°C	0.048	0.037	0.037	0.037	0.035	0.035	0.033	0.030
200°C	-	0.055	0.053	0.05	0.049	0.047	0.046	0.044
300°C	-	0.078	0.075	0.067	0.063	0.061	0.061	0.060
400°C	-	0.110	0.108	0.093	0.082	0.079	0.077	0.076
Sound Absorption Coefficients Thickness 50mm								
125 Hz	0.25	0.30	0.28	0.26	0.37	0.35	0.33	0.31
250 Hz	0.68	0.48	0.55	0.73	0.62	0.67	0.66	0.65
500 Hz	1.05	0.97	0.95	0.9	0.91	0.89	0.87	0.86
1.000 Hz	1.09	0.99	0.99	0.98	0.98	0.97	0.95	0.94
2.000 Hz	1.05	0.97	0.97	0.95	0.95	0.96	0.95	0.93
4.000 Hz	1.07	0.99	0.98	0.97	0.97	0.95	0.94	0.94
Early Fire Hazard Indices ASTM E 136								
Ignitability	0	0	0	0	0	0	0	0
Spread of flame	0	0	0	0	0	0	0	0
Heat Evolved	0	0	0	0	0	0	0	0
Smoke developed	0	0	0	0	0	0	0	0
Resistance at 700 °C in 3 hours					0	0	0	0

PRODUCT DESCRIPTION

DRAGON Rock Wool® Slab

DRAGON Rock Wool® slab – shaped insulation made from rockwool mixed with phenolic resin to mechanically form a flexible material which is easy to handle and apply. DRAGON Rock Wool® meets specification requirements for the thermal insulation, fire protection and sound absorption.



DRAGON Rock Wool® SLAB										
Dimension (mm)	600 x 1200 x 25 600 x 1200 x 50 600 x 1200 x 75 600 x 1200 x 100									
Service Temperature (°C)	400 – 650									
Thermal Conductivity (W/mK)	0.0352 (Standard ASTM C518 – 15)									
Fire Performance	Non-Combustible (Standard BS 476 – 04, ASTM E136, ASTM C592, ASTM C612)									
Facings	Bare, Aluminum foil									
Density (Kg/m ³)										
40	50	60	70	80	90	100	120	140	160	175



DRAGON Rock Wool® Blanket

Reinforced flexible DRAGON Rock Wool® insulation blanket with aluminum foil/wire mesh is ideally used in the application of any irregular surfaces such as: fittings, valves, boilers, tanks, vessels, constructions and interior decoration, etc

DRAGON Rock Wool® (blanket, blanket foil, blanket wire mesh)										
Dimension (mm)	600 x 5000 x 50 600 x 3000 x 75 600 x 3000 x 100									
Service Temperature (°C)	400 – 650									
Thermal Conductivity (W/mK)	0.0352 (Standard ASTM C518 – 15)									
Fire Performance	Non – Combustible (Standard BS 476 – 04, ASTM E136, ASTM C592, ASTM C612)									
Facings	Bare, Aluminum foil, Wire mesh									
Density (Kg/m ³)										
40	50	60	70	80	90	100	120	140	160	



DRAGON Rock Wool® Pipe Section

DRAGON Rock Wool® pipe sections are strong, non- combustible, pre-formed insulation units. The sections are pre-split lengthwise for easy snap on application. DRAGON Rock Wool® pipe sections are available in a wide range of thickness with difference inside diameters. Pipe sections are pre-laminated with kraft paper or aluminum foil upon request.



DRAGON Rock Wool® PIPE SECTION	
Density (Kg/m ³)	120
Service Temperature (°C)	400 – 650
Thermal Conductivity (W/mK)	0.0352 (Standard ASTM C518 – 15)
Fire Performance	Non – Combustible (Standard BS 476 – 04, ASTM E136, ASTM C592, ASTM C612)
Facings	Bare, Aluminum foil

DENSITY 120 Kg/m ³						
Lengths (mm)		1,000				
Diameter		Thickness (mm)				
NPS (inch)	ID (mm)	25	40	50	80	100
1/2"	22	•	•	•	•	•
3/4"	27	•	•	•	•	•
1"	34	•	•	•	•	•
1.1/2"	43	•	•	•	•	•
1.3/4"	49	•	•	•	•	•
2"	60	•	•	•	•	•
2.1/2"	76	•	•	•	•	•
3"	90	•	•	•	•	•
4"	114	•	•	•	•	•
5"	140	•	•	•	•	•
6"	168	•	•	•	•	•
8"	219	•	•	•	•	•
10"	273	•	•	•	•	•
12"	325	•	•	•	•	•

OTHER DENSITIES PRODUCED BY REQUEST

➔ SANDWICH PANELS

DRAGON Panel system comprises of pre-fabricated composite sandwich panel is with high density rockwool. DRAGON Panel is installed in area: facades, partitions, ceilings of commercial buildings, plants, offices and public areas...

DRAGON Panel possesses the following excellent advantages:

- Outstanding non-combustible & acoustic performance
- No thermal bridges and excellent thermal insulation
- Quick installation & easy handling
- Can be installed horizontally or vertically
- Flexible in design with choice of color
- Cost-saving



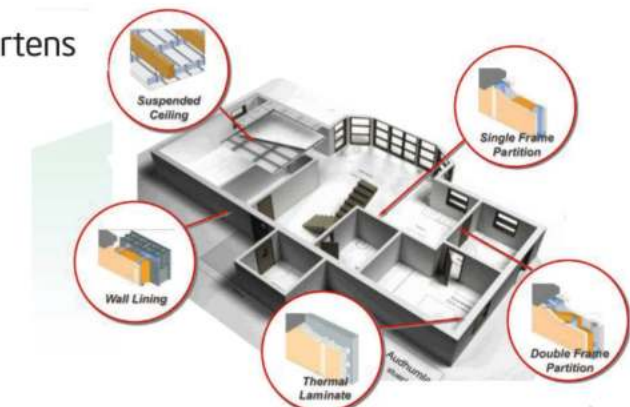
➔ INTERIOR ACOUSTIC INSULATION SOLUTIONS

In acoustic design, sounds are classified into 2 types: expected & unexpected ones. The tasks that acoustic designers are assigned are to guarantee the quality of the expected sounds and minimize the intensity of the unexpected sounds or disturbance noise. The main duties of the acoustic designer are to control the impact of the sound waves onto the surfaces of the room and select the suitable reverberation time for each specific type of space.

Noise absorption is when a sound wave touches a material and it does not reflect. Acoustically designed materials must be porous and absorbs air. The noise reduction coefficient (NRC) of rock wool (stone/basalt wool) is ~0.9-1.00 (at frequencies of from 500Hz and above). This means up to 90-100% of the sound wave is absorbed.

DRAGON Rock Wool® delivers various acoustic solutions to interior spaces of the following types of building:

- Educational centers, schools, kindergartens
- Offices
- Commercial centers
- Lobbies & halls
- Gymnasiums & closed sport centers
- Living rooms & family theatres
- Clinics & sanatoria
- Kitchen spaces & restaurants
- Plant spaces & technical rooms



➔ THERMAL-ACOUSTIC INSULATION SOLUTIONS FOR ROOFS



The roof is one of the most important parts of a building structure since 26% of the energy consumed in a building is lost through the roof system. It is essential to preserve the energy use efficiency.

DRAGON Rock Wool® has all the solutions to the roof's thermal insulation: flat roofs, pitched roofs with the highest efficiency in energy use.

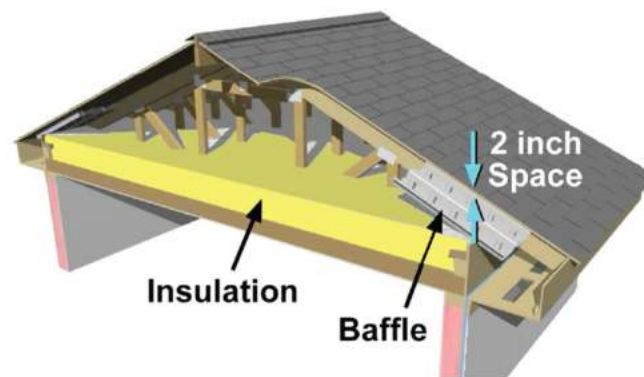
For pre-fabricated steel structures, DRAGON Rock Wool® solutions meet such demands as thermal insulation, fire protection, good noise absorption, lightweight and durability.

➔ SOLUTIONS FOR CEILINGS

The ceiling is the ideal space to implement tasks like acoustic insulation, fire protection and thermal insulation. For installation at high spaces, the ceiling systems with the soft & porous properties for excellent sound absorption. The NRC of the DRAGON Rock Wool® is 0.9-1 (which means 90%-100% of the sound intensity to be absorbed in the material) at the frequencies of from 500Hz and

As the Ceiling Attenuation Class (CAC) goes, its value is impacted by the factors below:

- The thickness of the ceiling tile
- The surface of the ceiling tile
- The frame of the ceiling
- The height of the ceiling
- The thickness of the mineral wool layer above the ceiling (partially or entirely)



According to a study by the OWAcooustic Premium Design, every centimeter of the thickness of the acoustic mineral wool layer brings 2dB to the CAC value of the ceiling.

Ceilings with DRAGON Rock Wool®, therefore, own three valuable properties: acoustic insulation, thermal insulation & of good energy save.

➔ SOLUTIONS TO DRYWALL & PARTITIONING SYSTEMS

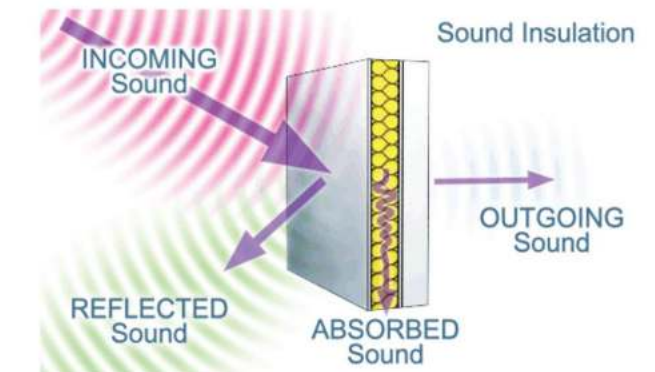
Partitions of a building work as climate shields, help prevent from heat, cold, rain, noise & fire. During design phases, architects take close focus on the functions of the partitions named acoustic & thermal insulation in order to create a pleasant & healthy environment for work & life.

DRAGON Rock Wool® possesses perfect solutions to all types of partitions meeting most demanding functions.

Exceptionally designed for acoustic function, DRAGON Rock Wool® is the optimal choice to attain perfect STC values (Sound Transmission Class). DRAGON Rock Wool® is built-in with plasterboard, fiber cement/calcium silicate & gyplining... systems to construct most acoustically efficient insulated partitions.



➔ IMPACT SOUND INSULATION SOLUTIONS



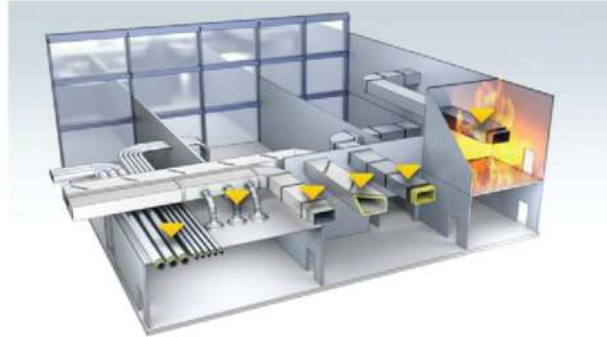
Floors are the area to receive physical impacts like footsteps or falling objects, dragging chairs...It is extremely important for designing experts to control the sounds created by these physical impacts in order to keep the quietness between rooms, especially within hi-rise buildings. Rock mineral wool is the most popular solution to the impact insulation for floor systems.

Moreover, DRAGON Rock Wool® with our solutions perfectly combining with other materials applied to the ceiling system of the below floor.

➔ TOTAL INSULATION SOLUTIONS FOR HVAC SYSTEMS (HEAT-VENTILATING-AIR CONDITIONING)

The HVAC system (Heat-Ventilating-Air Conditioning) plays multi-functional roles. Solutions from DRAGON Rock Wool® include:

- Non-combustible material solutions
- Solutions to energy use efficiency for all the parts of the HVAC system:



- * The heating system
- * The water piping system
- * The chimney system
- * The exhaust system
- * The HVAC equipment
- * The ventilating system

These systems must meet the requirements: thermal insulation, fire protection & noise reduction.

The product range serving the HVAC system's functionalities from DRAGON Rock Wool® is attached with aluminum jackets to help prevent from condensation. The anti-condensation functionality enhances the performance of the HVAC system, and helps the system avoid damages to the pipings, the surrounding structures and the equipment. The solutions from DRAGON Rock Wool® is maintenance-free, thoroughly efficient in thermal/acoustic/fire insulation during the system life cycle.

➔ FIRE PROTECTION SOLUTIONS

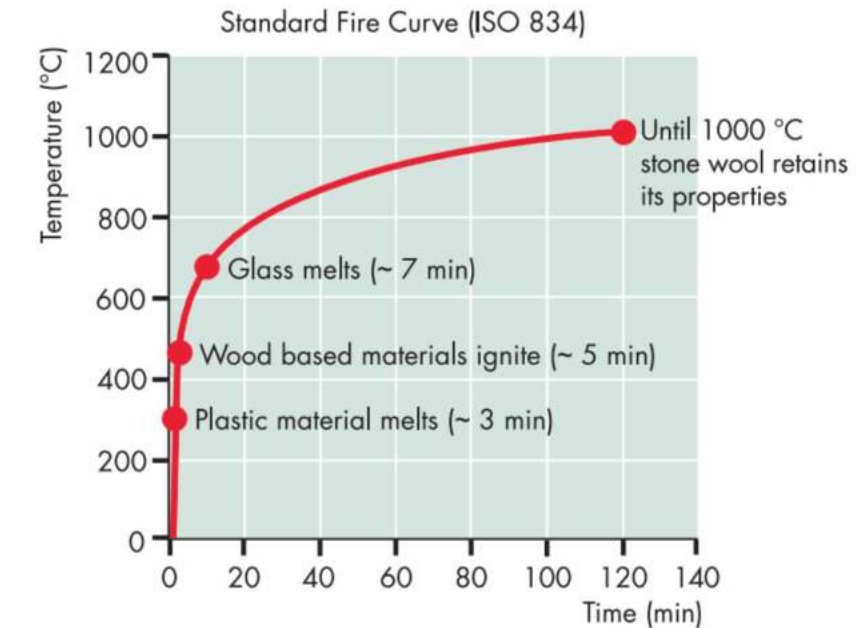
Fire within the building can cause serious damages in terms of human & property. Statistically, insurance companies, on a yearly basis, pay half of their insurance fees to fire-related accidents. The building together with its interiors help the fire spread faster. Built-in fire insulation solutions help effectively minimize the risks of human & property loss.

Fire protection systems within a building are built in its structure so as to withstand the fire in during a specific period of time. These systems protect the structure & human lives within the building by minimizing or stopping the fire from spreading from within or outside. Therefore, the stability of the structure is retained as well as the safety of the exits for the people to escape.

Upon selecting materials for Fire Protection, two factors are well considered: the material's reaction to fire and their performance during fire.

DRAGON Rock Wool® is tested and certified as a non-combustible material by the prestigious international testing center-SGS according to BS 476-04 & ASTM E136. DRAGON Rock Wool®'s service temperatures of 400-650°C and melting temperature of up to 1000°C totally fit in with fire insulation solutions for functional partitioning/ceiling systems in residential and commercial buildings. DRAGON Rock Wool® excellently complies with Vietnamese & international designing standards of fire protection.

Solutions of fire protection from DRAGON Rock Wool® is entirely supported by accessories specifically developed for each range of thermal insulation products: aluminum jackets, elbows, tees, valves, piping boxes, flanges, reducers, fire collars...All the accessories are manufactured up to the requested specifications.



➔ FOR INDUSTRIAL SECTORS

DRAGON Rock Wool® brings sustainable energy saving solutions to all the sections of the construction process: processing plants, boilers, plant chimneys, piping systems to various tanks.

Processing plants & power plants absolutely require thermal insulation solutions meeting demands: durable, maintenance free and energy saving. The solutions must be reliable, safe and durable. Any mistake in designing & selecting solutions to this type of project has bad impacts on the project owner's profit.

Pipes are the core of the processing industry since hot or cold fluids are driven to tanks through pipes. The objective of thermal insulation is minimize the energy loss. Properly designed piping systems are the prerequisite to a best operating system. DRAGON Rock Wool® offers full ranges of thermal insulation products from straight to curved pipes of stable quality, which help optimize the function of fluid driving throughout the system.

One plus to the DRAGON Rock Wool® product ranges is their extremely low amount of chloride and flouride inside. Please be noted chloride is the metal corrodent and directly impacts the piping system's lifetime.

➔ MSDS

In October 2001, after a comprehensive review of the findings in 1988, the International Agency Research on Cancer (ARC) decided to remove rock wool from its list–Category 2B–possible carcinogens, and reclassified into‘Category 3–not classifiable as carcinogenic to human. At present, all rockwool products used as Insulation material, are classified as Category 3 and non-asbestos.

The IARC specically noted that “Epidemiological studies published during the 15 years since the previous IARC Monographs review of these fibers in 1988 provide no evidence of increased ricks of lung cancer or mosothelima (cancer of the lining of the body cavities) from occupational exposures during manufacture of these materials and inadequate evidence overall of any cancer risk”.

However, rock wool may result in temporary itching and sensible when touched directly frequently. Therefore, it is necessary to use PPE during erection. Dust released during installation is not classified as hazardous.

➔ PROJECT REFERENCE

FACTORY

- Nghi Son Power Plant
- Tra Vinh Power Plant
- O Mon Power Plant 2
- Formosa Ha Tinh
- SODA Chu Lai Power Plant
- VECO MDF
- Nam Viet Oil Refinery
- Tan Binh Chemical Factory 1,2
- NH3 – Chemical Thai Binh
- DAP Lao Cai
- Bien Hoa Sugar Factory
- An Khe Sugar Factory
- Bridgestone Hai Phong
- Vinamilk Plant
- Dielac Milk Plant

BUSINESS CENTER

- Big C Ha Long-Quang Ninh
- Big C Nha Trang
- Vivo City-HCMC
- AEON Mall Binh Duong
- AEON Mall Tan Phu (Long Bien)..

OTHER CINEMAS

- Sao Vang Long Xuyen...

AIRPORT

- Da Nang International Airport
- Phu Bai International Airport
- Da Nang International Airport
- Noi Bai International Airport
- Tra Noc Airport...

THE COMPLEX, RESORT

- Ho Tram Casino-Xuyen Moc-Vung Tau
- Sokha Hotel-Phnom Penh (Cambodia)
- Novotel Saigon Hotel
- Salinda Resort & Spa Phu Quoc
- Hoang Anh Gia Lai Myanmar...

CGV CINEMA

- CGV Vivo City
- CGV Vung Tau
- CGV Quy Nhon
- CGV Can Tho
- CGV AEON Binh Duong (Tan Phu)...

CINEPLEX GALAXY

- Galaxy Kinh Duong Vuong
- Galaxy Quang Trung

➔ PROJECT IMAGES



Aeon Tan Phu Celadon Trading Center



MGM Ho Tram Casino – Xuyen Moc – Vung Tau



Tra Vinh Power Plant



Da Nang International Airport



CGV Cinema



Formosa Ha Tinh