INFORMATION OF HEAT SHIELD SHEET

(CONSTRUCTION EXAMPLES & VERIFICATION RESULTS)

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INTRODUCTION OF PRODUCTS(HEAT SHIELD SHEET)

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THE HEAT SHIELD WAS ORIGINALLY DEVELOPED IN THE SPACE INDUSTRY. IN THE UNIVERSE WHERE THE TEMPERATURE DIFFERENCE IS SEVERE, THE HEAT INSULATION MATERIALS CURRENTLY IN USE CANNOT HANDLE THIS. THAT`S WHY THE METAL IS CONCEIVED. I PARTICULAR, ALUMINIUM IS HIGH-PERFORMACE REFLECTIVE MATERIAL WITH HIGH REFLECTANCE.THE TOP HEAT BARRIER(THB) THAT WE PROPPSE IS AN ULTRA-THIN (0.1～0.3mm THICK) HEAT SHIELD SHEER THAT USES A HIGH-PURITY ALMINNIUM MATERIAL & HAS SPECAL COATING (X COART). ＊THERE IS ALSO THICKNESS OF 3.0～8.0mm DEPENDING ON THE APPLICATION. TOP HEAT BARRIER(THB) IS A SHEET WITH A REFLECTANCE OF 98%.THEREFORE, IT IS AN EXCELLENT PRODUCT THAT REPELS 98% OF RADIANT HEAT & TRANSMITS OR ABSORBS REMAINING 2%.

MAT`L	BRICK	ASPHALT	CONCRETE	WINDOW GLASS	WOOD	PLATINUM	COPPER	THB
REFLECTANCE	5～7％	10～15％	6～15％	5～10％	8～10％	93％	95％	98％

FROM THE TABLE, MOST OF THE BUILDING MATERIALS AROUND US ABSORB MOST OF THE HEAT.

WHAT IS RADIANT HEAT

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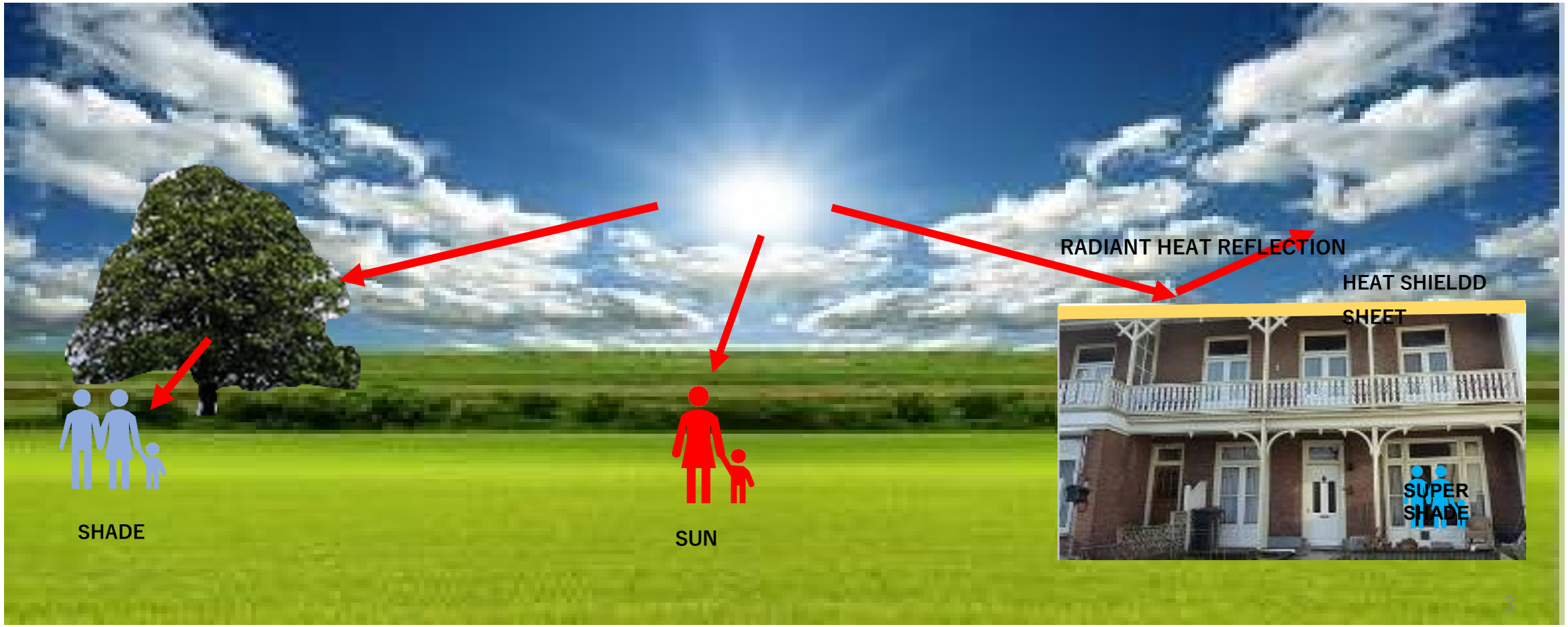
RADIANT HEAT IS HEAT THAT IS EMMITED RADIALLY, AND HAS THE PROPERTY OF TRAVELLING IN A STRAIGHT LINE & GENERATING HEAT ONLY WHEN IT HITS A SUBSTANCE. FOR EXAMPLE, EVEN AT A TEMPERATURE OF 25℃, IT FEELS HOT ENOUGH TO SWEAT IN THE SUN, BUT EVEN AT A SAME TEMPERATURE, IT FEEL COOL WHEN IT IS IH THE SHADE OF TREE OR IN THE SHADOW OF A BUILDING. THIS IS BACAUSE THE SUN WARMS UP WHEN RADIANT HEAT IS APPLIED TO THE HUMAN BODY.THE DIFFERENCE IN COOLNESS BETWEEN THE SHADE & SUN IS ACTUALLY DUE TO THE GREAT EFFORT OF RADIANT HEAT. THEREFORE, RADIANT HEAT COUNERMEASURES ARE THE KEY TO HEAT STROKE COUNERMEASURES.



FEATURES OF HEAT SHEILD SHEET(THB)

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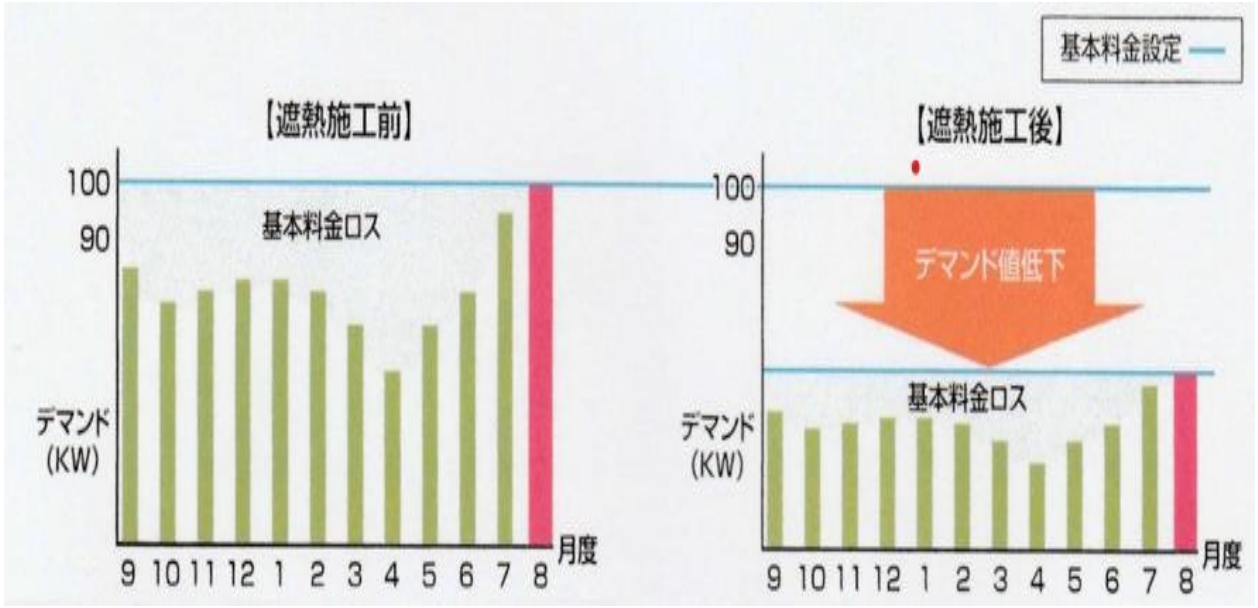
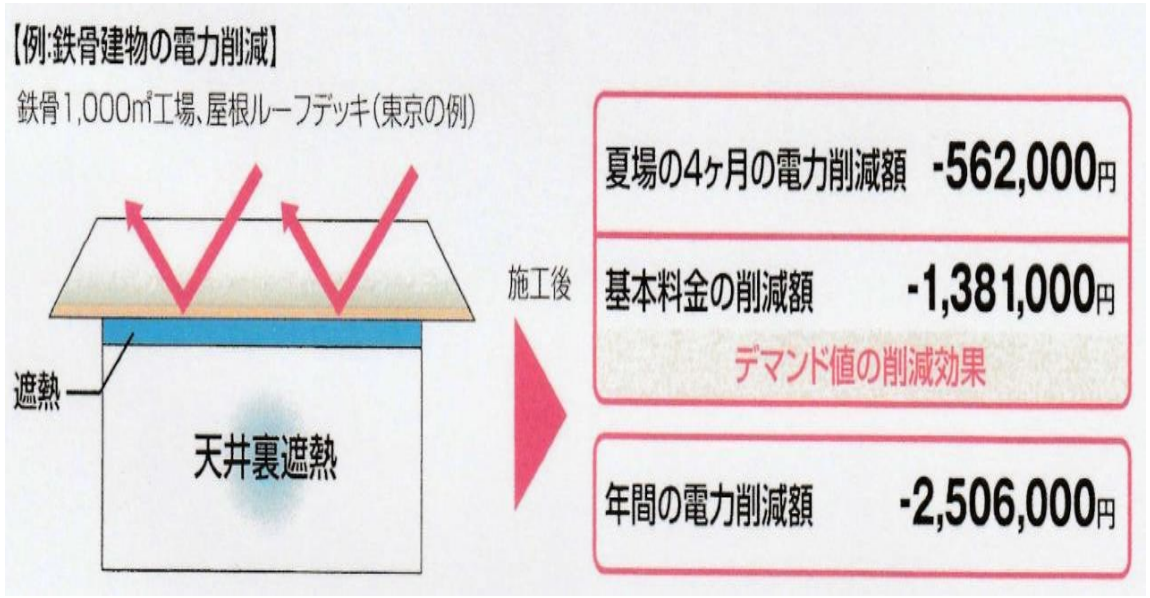
HEAT SHIELD (THB) IS AN EFFECTIVE MEANS OF REDUCING THE DEMAND VALUE.

INVASION OF HEAT INTO BUILDINGS IN THE SUMMER HAS A LARGE EFFECT AS A FACTOR THAT RAISES THE DEMAND VALUE.GENERALLY, HEAT INTRUSION FROM THE ROOF OF BUILDING REACHES 85%～90% OF TOTAL AMOUNT OF THE HEAT, BUT THERE WAS NO EFFECTIVE WAY TO CUT THIS.HOWEVER, THE TOP HEAT BARRIER HEAT SHIELD METHOD WE PROPOSE HAS MADE IT POSSIBLE TO CUT 95% OF HTHE BEAT FROM THE ROOF DURING PEAK HOURS.

TOP HEAT BARRIER`S SPECIALITY IS AMAZING POWER SAVING





SIGNIFICANT POWER SAVING DUE TO LOWER DEMAND VALUE

THE BASIC CHARGE OF A LARGE DEMAND COMPANY OVER 500 KW IS A DEMAND VALUE CONTRACT, BUT DEMAND VALUE IS DETERMINED WHEN THE POWER CUNSUMPTION IS THE HIGHEST. THIS VALUE WILL BE APPLIED FOR 1 YEAR AS DEMAND VALUE AND THERE WILL BE A SMALL BASIC CHARGE LOSS FOR OTHER MONTHS. HOWEVER, THE DEMAND VALUE CAN NOE BE LOWERED EVEN IF ELECTRICITY TURNED OFF DILIGENTLY.

APPLICATIONS & EFFECTS OF HEAT SHIELD (THB)

INDUSTRY / EFFECTS	SCHOOL/HOSPITAL/NURSING SPORTS CLUB FACILITY	LOGISTICS/TRANSPORTATION	MFG/PROCESS COMPANY (FOOD/CHEMICAL/ OTHER MFG INDUSTRIES)	AGRICULTURAL BUILDING	FRANCHISE CHAIN STORE	AMUSEMENT FACILITY
	GYMNASIUM/ SCHOOL BUILDING, DOME TENT	LOGISTIC WAREHOUSE/ CONTAINER /COLD STORAGE TRUCK	REFRIGERATOR/MFG BUILDING/RAW MAT`L STORAGE/PRODUCT WAREHOUSE	ANIMAL HUSBANDRY VEGITABLE CULTIVATION BUILDING/GRAIN W/H	DRUG STORE/RESTAURANT/ SUPER MARKET/CONVINIENCE STORE/CLOTHING STORE	HOT SPRING FACILITY AMUSEMENT FACILITY HIGHWAY SERVICE AREA
POWER SAVING	◎	◎	◎	◎	◎	◎
FUEL SAVING	○	○	◎	◎	○	◎
OFFICE(SURROUNDING) ENVIRONMENT IMPROVEMENT	◎	◎	◎	◎	○	○
PRODUCT DETERIORATION PREVENTION	—	○	◎	◎	○	—
FREEZING/CONDENSATION PREVENTION	○	○	○	○	○	○
HEAT STROKE/AIR CONDITIONING DESEASE/COLD SENSITIVITY MEASURES	◎	○	○	○	○	◎

1. CONSTRUCTION EXAMPLE & VERIFICATION RESULTS OF STEEL WAREHOUSE ROOF

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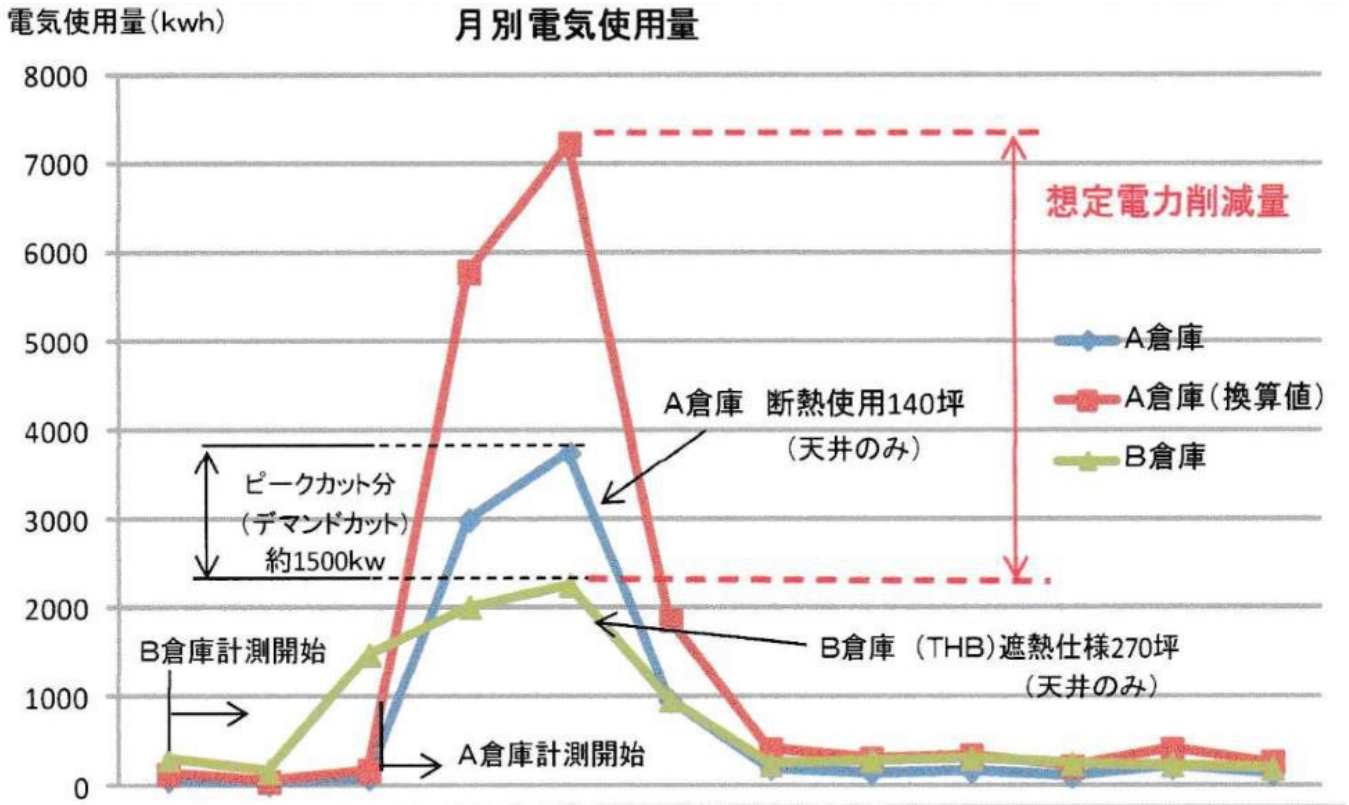
1－（1）CONSTRUCTION CONDITIONS

BUILDING STRUCTURE ：BUILDING A STEEL STRUCTURE
CONSTRUCTION SITE：UNDER ROOF（DIRECT APPLIED ON STEEL FRAME@MAIN BUILDING）
CONSTRUCTION AREA：464㎡
CONSTRUCTION MAT`L：GLASS WOOL 50㎜
SET TEMPERATURE：26℃

BUILDING STRUCTURE :BUILDING B STEEL STRUCTURE
CONSURUCTION SITE：UNDER ROOF（DIRECTLY APPLIED ON STEEL FRAME@MAIN BUILDING）
CONSTRUCTION AREA：894㎡
CONSTRUCTION MAT`L：HEAT SHIELD SHEET(THB-X)
SET TEMPERATURE : 26℃

1－（2）VERIFICATION RESULTS



REFERENCE

①IN WINTER, YOU RARELY USE AIRCONDITIONER.THEREFORE, YOU ARE PAYING A HIGH BASIC FEE THROUGHOUT THE YEAR FOR AIR CONDITIONING IN THE SUMMER.

②COMPARING BUILDING A(CONVERTED VALUE)& BUILDING B、IT CAN BE SEEN THAT THE POWER CONSUMPTION DURING THE PEAK IN AUGUST WAS REDUCED BY 68 %.

③IT SAVES ABOUT 50% OF ELECTRICITY THROUGHOUT THE YEAR.

④FOR BUILDINGS THAT REQUIRE, THE DIFFERENCE IS EVEN GREATER.

ELECTRICITY USAGE(Kwh)

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	TOTAL
BUILDING A	71	28	94	2,998	3,742	968	217	162	178	115	218	141	8,932
BUILDING B(CONVERTED VALUE)	137	54	181	5,782	7,217	1,867	419	312	343	222	420	272	17,226
BUILDING B	310	173	1,477	2,016	2,262	974	250	300	317	256	243	202	8,780

＊BUILDING A (CONVERED VALUE) IS THE VALUE CONVERTED FROM DIFFERENCE IN AREA BECAUSE HEIGHT IS THE SAME AS BUILDING B, WHICH SHIELDED 464M2 BUILDING WITH HEAT SHIELD MATERIALS.

2. FREEZER WAREHOUSE CEILING CONSTRUCTION EXAMPLE & VERIFIATION RESULTS

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2－（1）CONSTRUCTION CONDITIONS

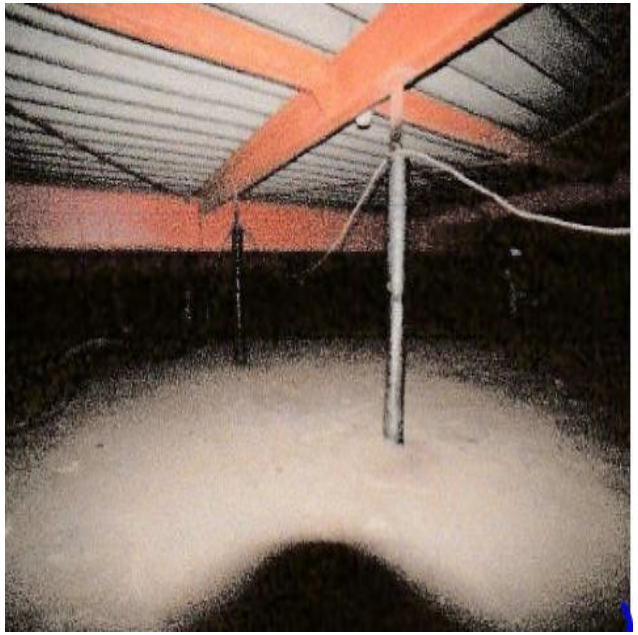
CONSTRUCTION SITE: SHIZUOKA PREF

INDUSRTY ： FOOD FACTORY

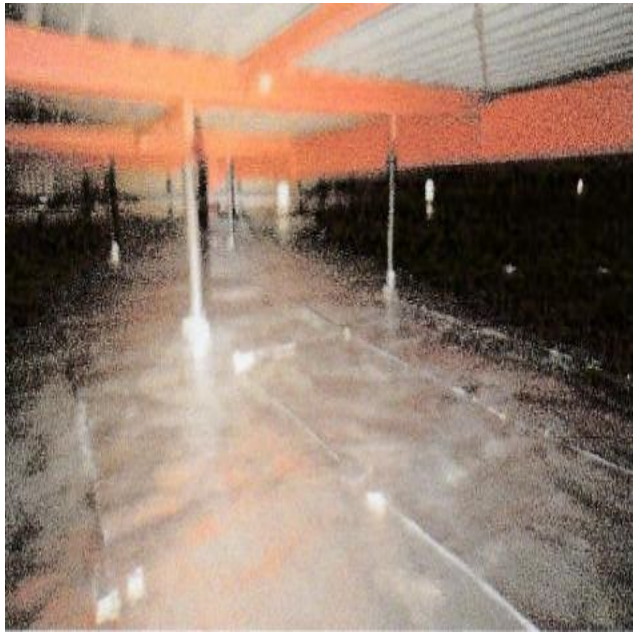
CONSTRUCTION TARGET: TUNA FREEZER WAREHOUSE (METAL BUILDING)

SET TEMPRETURE： －**55°C**

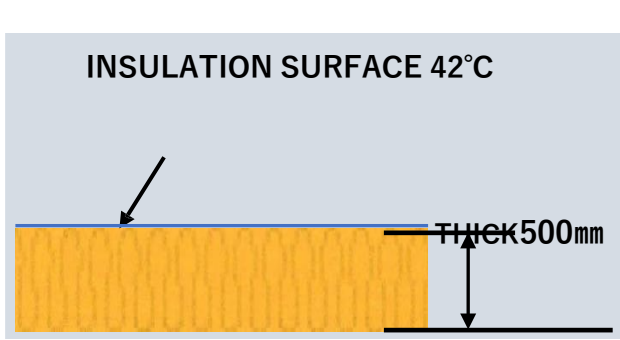
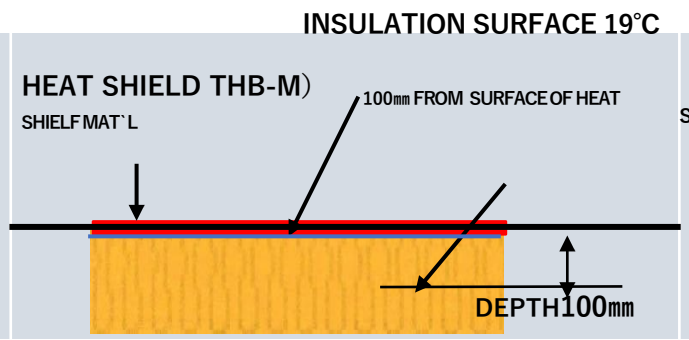
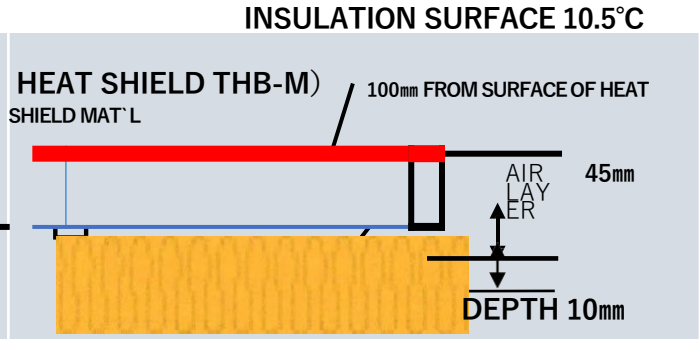
BEFORE CONSTRUCTION



AFTER CONSTRUCTION



2－（2）VERIFICATION RESULTS

	BEFORE CONSTRUCTION (INSULATION ONLY)	AFTER CONSTRUCTION (HEAT SHIELD SHEET IS LAID ON INSULATING MATERIAL)	AFTER CONSTRUCTION(AN AIR LAYER OF 45mm IS SET BETWEEN HEAT SHIELD SHEET & HEAT INSULATION & PASTE)
			
MEASUREMENT DATE	AUG 8, 2012	AUG 27, 2012	OCT 25, 2012
OUTSIDE TEMPERATURE AT TIME OF MEASUREMENT	31.3℃	32℃	23.1℃
INSULATION SURFACE TEMPERATURE	42℃	19℃	10.5℃
TEMPERATURE OF 100㎜ FROM SURFAC EOF INSULATION	—	－0.9℃	－5.5℃
FREEZER WAREHOUSE TEMPERATURE	－28	－33℃	－40℃

CONSIDERATION

①TEMPERATURE OF BEHIND HUT WAS NOT MEASURED, BUT ITS APROXIMATELY 70～80℃,& TEMPERATURE DIFFERENCE BETWEEN HUT & TUNA WAREHOUSE IS 100℃ OR MORE. WITH THIS TEMPERATURE DIFFERENECE, IT IS LIKE SETTING UP A WAREHOUSE AT -40℃ IN A BATH AT 70℃ & EFFECT OF CONDUCTION HEAT BECOMES VERY LARGE.

②IT WAS EFFECTIVE TO INSTALL HEAT SHIELD SHEET ON HEAT INSLATION MATERIAL.

③FURTHERMORE, THE EFFECTIVE WAS ENHANCED JUST BY INSTALLING AN AIR LAYER & HEAT SHIELD SHEET ON OCT 25, & A TEMPERATURE DROP OF 12℃ WAS REALIZED.

＊IN THIS WAY, AS FURTHER IMPROVEMENT IN FACTORY IT IS ADVISABLE TO PROVIDE A SPACE BETWEEN INSULATION MAT`L & HEAT SHIELD SHEET TO REDUCE CONDUCTION HEAT.

3. FREEZING ROOM CONCTRUCTION EXAMPLE & VERIFICATION RESULTS

NIIGATA PREF K FOOD PROCESSING FACTORY　FREEZING ROOM CONSTRUCTION　AREA：65㎡




CONSTRUCTION SITE：CEILING, SIDE, DOOR

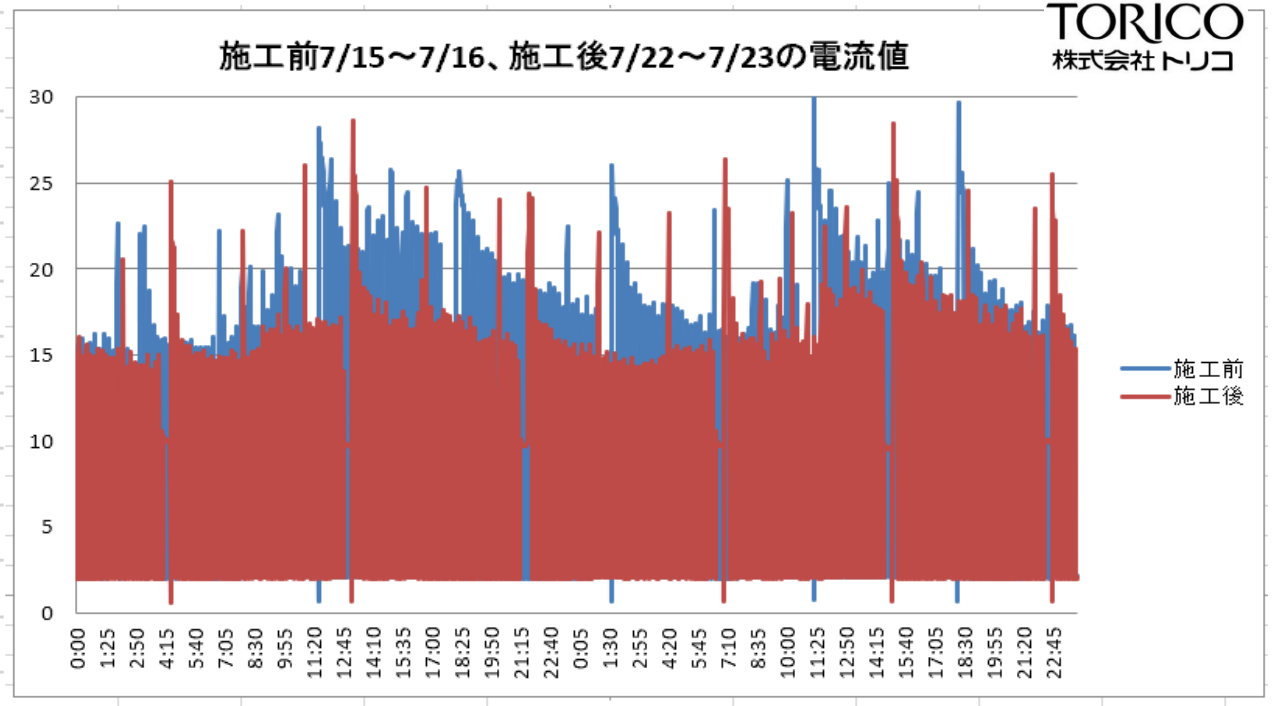
- SET TEMPERATURE：−20℃/TIME
- DOOR OPEN/CLOSE FREQUENCY:20/DAY
- DOOR OPEN TIME: 2 MINUTES/TIME
- MEASURE CURRENT VALUE OF FIRST PHASE(R/U) BY CRAMP METER
- MEASUREMENT INTERVAL IS 1 MINUTE (60 SECONDS)
- THE DATA WAS COMPARED OVER 2 DAYS WHEN MX & MIN TEMPERATURE OF OJIYA CITY, NIIGATA PREF WERE THE SAME.

3－（2）VERIFICATION RESULTS

冷凍庫室施工実績データ

日付	最高気温(℃)	最低気温(℃)	日付	最高気温(℃)	最低気温(℃)
7/15	34.3	23.6	7/22	34.3	24.8
7/16	33.0	23.9	7/23	33.2	25.6

日付	平均電流(A)	最高電流(A)	日付	平均電流(A)	最高電流(A)
7/15	9.82	28.21	7/22	7.80	28.64
7/16	9.38	29.90	7/23	8.48	28.43
2日間	9.60	29.90	2日間	8.14	28.64
平均電力(W)	3325.54		平均電力	2819.78	

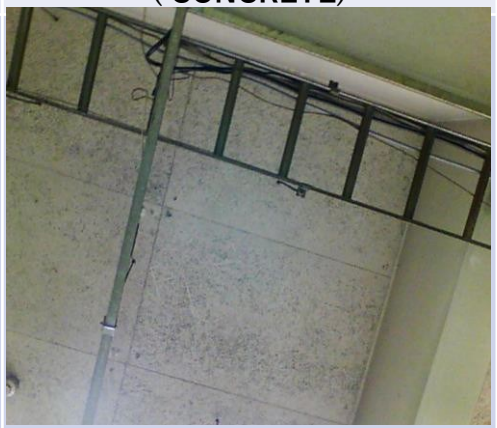
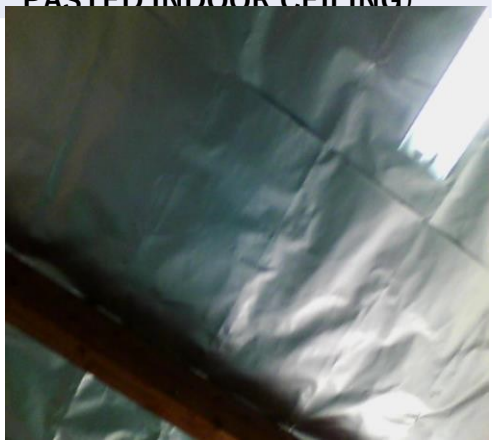
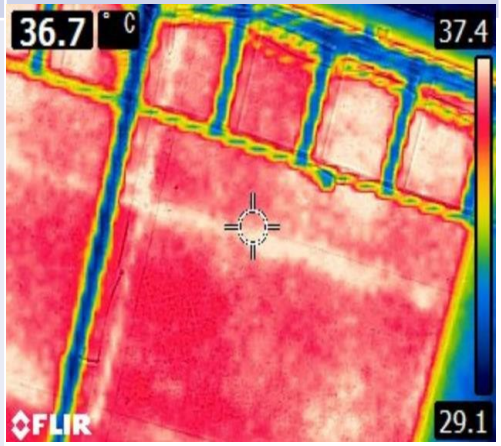
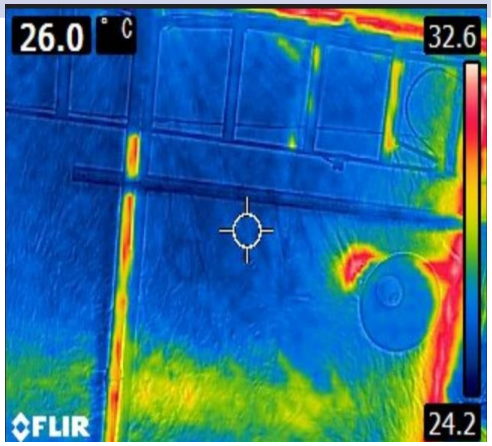
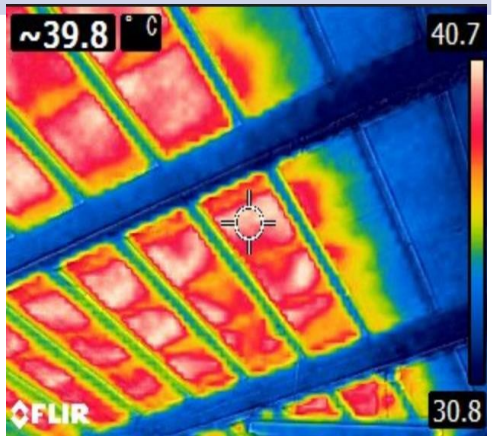
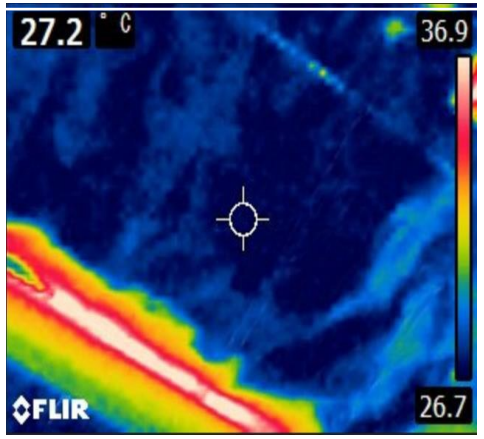


（RESULTS）

* THE AVERAGE CURRENT VALUE AFTER CONSTRUCTION IS REDUCED BY -15.2%.
* EVEN IF OPEN/CLOSE FREQUENCY & OPEN TIME OF FREEZER ROOM DOOR WAS SMALL, HEAT SHIELD EFFECT WAS OBTAINED.
* FROM CONSTRUCTION RESULTS, IT CAN BE SEEN THAT THERE IS A FURTHER EFFECT IN LALRGE SIZE FREEZER ROOM/REFRIGERATOR ROOM & WHEN FREQUENCY OF OPENING/CLOSING IS HIGH IN A DAY.

4. FACTORY CONSTRUCTION EXAMPLE & THERMOGRAPHY VERIFICATION RESULTS

4－（1）CONSTRUCTION CONDITIONS

CONSTRUCTION SITE:AREA	NIIGATA ORED OJIYA CITY N FACTORY・1,300㎡		NIIGATA OREF, NISHI KAMBARA GUN S FACTORY ・165㎡	
DATE・MEASUREMENT TIME OUTSIDE TEMPERATURE	JULY 18, 2018・14:00・34℃		AUG 22, 2018・13:00・31℃	
	NOT CONSTRUCTED（CONCRETE）	HEAT SHIELD SHEET(DIRECTLY PASTED INDOOR CEILING)	NOT CONSTRUCTED（GALVANIZED IRON ROOF）	HEAT SHIELD SHEET（DIRETLY PASTED INDOOR CEILING）
PCITURES OF CONSTRUCTION SITE				
THERMOGRAPHY IMAGE				
CEILING TEMPERATURE	36.7℃	26.0℃	39.8℃	27.2℃

4－（2）VERIFICATION RESULTS

① AS A RESULT OF MEASURING THE CEILING BY THERMOGRAPHY WHEN THE HEAT SHIELD SHEET WAS INSTALLED IN BOTH N FACTORY & S FACTORY, THERE WAS A TEMPERATURE DIFFERENT OF 10℃ OR MORE.

② FROM THE RESULTS OF THERMOGRAPHY, IT WAS VERIFIED THAT HEAT SHIELD SHEET WAS APPLIED TO REFLECTS OUTSIDE AIR HEAT & REFLECTS COOLING TEMPERATURE OF INDOOR AIR CONDITIONER.

③ AT FACTORY N, SET AIR CONDITONING TEMPERAURE WAS 20℃～23℃ AT UNCONSTRUCTED BUILDINGS &26℃ IN THE BUILDING WITH HEAT SHIELD SHEET INSTALLED.

④ HEAT SHIELD SHEETS ARE SUITABLE FOR IMPROVING WORKPLACE ENVIRONMENT FOR FACTORY & FOR MEASURES AGAINST HEAT STROKE.

⑤ FROM THIS RESULT, THE SAME EFFECT IS OBTAINED NOT ONLY IN SUMMER BUT ALSO IN WINTER.

⑥ IT CAN BE SEEN THAT THE HEAT SHIELD SHEET IS EFFECTIVE IN REDUCING THE AMOUNT OF ELECTRICITY.

5．PIGPEN・COWSHED CONSTRUCTION EXAMPLE

PIGPEN　　AREA：1700㎡ MAT`L：GALVANIZED IRON ROOF OUTDOOR

CONSTRUCTION ON FEED/STORAGE TANK OF COWSHED

① IN SUMMER, PIG WERE GATHERED ON THE SIDE WHERE HAT SHIELD SHEET WAS INSTALLAED ON ONLY HALF OF PIGPEN.

②THE ROOF OF PIGPEN IS OLD, & HEAT SHIELD SHEET IS STRONG AGAIBST Pf IN STEAD OF REPLACING ROOF（SEE TEST DATA), BASED ON THE RESULT OF ①, APPLY OF HEAT SHIELD SHEET ON ENTIRE ROOF IS ADOPTED .(IT WAS CHEAPER THAN ROOF REPLACEMENT.

③ INSTALLED ON FEED/STORAGE TANK TO REDUCE THE SPOILAGE OF FEED IN THE SUMMER.

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屋根・壁遮熱　80℃の屋根を40℃に! 省エネルギー30%を実現!

特許庁 長官奨励賞受賞（平成30年）

建物の屋根や外壁等外装材の外側に、接着剤や両面テープ等を使用し、色付(眩しくない)トップヒートバリアー遮熱材を直貼りします。透湿性0%の素材を外装材に取付するので、屋根材等の耐久性能も向上します。また、紫外線も100%カットされますので、接着剤や両面テープの劣化も少なく安心です。

折板屋根遮熱(ハゼ折)

折板屋根遮熱(ボルト式)

折板屋根遮熱(フラット貼)

金属カバー屋根遮熱
(スレート+金属カバー工法+屋根遮熱)

コンクリート屋根遮熱

金属カバー工法屋根遮熱

瓦棒葺き遮熱

屋上排煙ハッチ遮熱

バルコニー遮熱(シート防水下地)

住宅外壁遮熱

倉庫外壁遮熱

ガラス窓遮熱

屋内用遮熱

電食防止処理遮熱材・直貼工法

これまで遮熱は、遮熱材による輻射熱の反射が基本で、熱源と遮熱材の間に反射空間が必要とされてきました。弊社が開発した"遮熱材の低放射性能"を利用した"直貼り工法"は世界初です。熱源側に反射空気層が不要、即ちスペーサー等で空間を作る必要がなく、工期も短く安価に出来る工法です。しかも遮熱材の放射率2～10%程度の性能が利用出来、革新的な省エネ効果を生み出す事が出来ます。

外装材の室内側遮熱　省エネルギー30%実現! 総施工費40%削減!

中小企業庁 長官賞受賞（平成28年）

建物の屋根や外壁等外装材の室内側に接着剤や両面テープを使用し、トップヒートバリアー遮熱材を直貼りします。外装材との間に反射空気層を設ける必要が無く、コストが大幅に削減可能です。工場等空間の大きい室内側全面に施工すると、真夏38℃でもエアコンゼロが実現します。

折板(ハゼ折)屋根下遮熱

スレート屋根下遮熱

機械倉庫屋根下遮熱

プレハブ倉庫屋根、壁遮熱

屋根材直貼遮熱

木造屋根(野地下側)遮熱

7． HIGH-TEMPERATURE EQUIPMENT & OUTDOOR EQUIPMENT CONSTRUCTION EXAMPLE

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高温設備遮熱

日本弁理士会会長賞受賞
（平成28年）

直貼工法、省エネルギー30～50%実現! MAX220℃

乾燥炉や配管から高温の溶解炉等、熱を放出する設備にトップヒートバリアー遮熱材を直貼りする事により、
大幅な省エネが可能です。又、炉周囲の温度を室温プラス5℃程度まで下げる事が出来、熱中症対策に効果的です。

大型乾燥炉遮熱

溶鉱炉遮熱

ガス炉遮熱

大型乾燥炉遮熱

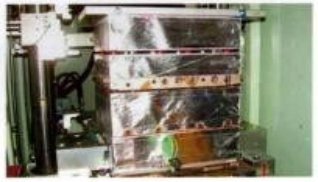
保温設備遮熱（ピン止め）

滅菌器遮熱

温水タンク遮熱

ボイラー遮熱

樹脂成形金型遮熱



高温タンク遮熱

ダクト・ファン遮熱

配管遮熱

屋外設備機器遮熱

省エネルギー30%実現! あらゆる設備に対応!

外貼遮熱

金属、木材、コンクリート、プラスチック等素材を選ばず、屋外のあらゆる設備にご使用頂けます。トップヒートバリアー遮熱材を接着剤や両面テープで貼りますが、色付の屋外用遮熱テープを使う事も出来ます。

配電設備遮熱

空調機室外機遮熱

犬小屋遮熱

内貼遮熱

省エネはしたいが外装材の色を変えたくない、或いは外部施工だと破損し易いので設備の内側にしたい等の場合、外装材の内側に直貼り可能です。トップヒートバリアー遮熱材は薄いので、容積が低減する事はありません。

コンテナ等遮熱

自動車遮熱

自販機等遮熱

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農業用設備遮熱

生産性25%UP、省エネルギー50%実現のキノコハウス

ビニールハウス等簡易設備で農産物を生産、しかも冷暖房設備を使って温度調整している所では生産性向上や省エネルギーに効果的です。既存のビニールハウスの外側からテントを被せる要領で簡単に取り付けられます。又、鶏舎、畜舎等の屋根や外壁に施工する事で、ブラックグローブ現象も抑えられます。

植物工場遮熱

大型ビニールハウス外装遮熱

キノコハウス屋根・壁遮熱

食物生産庫遮熱

畜舎屋根遮熱

食物倉庫遮熱

内装材の室内側遮熱 省エネルギー30%実現! 西日対策、北壁結露対策

室内の壁、床、天井等に、トップヒートバリアー遮熱材を直貼りします。大半は、ビニールクロスの糊付け機を使用して取り付けますが、ビス止め、粘着シート、両面テープ等種々の方法でも取り付け可能です。遮熱材の表面に特殊印刷が可能で、あらゆる図柄をプリントする事が出来ます。

特許庁長官奨励賞受賞(平成27年)

天井遮熱(ジプトン下地)

天井遮熱(クロス下地)

プリント遮熱(クロス下地)

壁遮熱(ケイカル板下地)

床遮熱(コンクリート床)

床遮熱(遮熱材+人工芝)

10 · HEAT SHIELD SHEET (THB)PRODUCT LIST

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PRODUCT NAME (CODE)	THICKNESS	SIZE	NOTE
THB-M	0. 2	1 M × 50M	FOR WOODEN CONSTRUCTION (FOR NEW CONSTRUCTION)
THB-X	0. 2	1 M × 50M	UNIVERSAL TYPE
THB-FX	0. 2	1 M × 50M	NON-COMBUSTIBLR CERTIFIED PRODUCTS
THB-FD	0. 3	1 .07M × 30M	HEAT RESISTANT 120℃
THB-FR30	0. 3	1 M × 30M	HEAT RESISTANT220℃
THB-HGR N	0. 3	1 .07M × 30M	FOR OUTDOOR (GREEN)
THB-WGR 2	0. 2	1 M × 50M	FOR OUTDOOR (GREEN)
THB-SOW2	0. 2	1 M × 50M	FOR INDOOR/OUTDOOR (OFF WHITE)
THB-SOW1	0. 2	1 M × 50M	FOR INDOOR (OFF WHITE)
THB-WBER 1	0. 1	1 M × 50M	FOR INDOOR (BEIGE)
THB-WGR1	0. 1	1 M × 100M	FOR INDOOR (GREEN)
THB-J	0. 25	1 M × 100M	EVAPORATION TYPE
THB-P	8. 0	1 M × 35M	FOR ANTI-CONDENSATION
THB-BBE	3. 0	1 M × 50M	FOR OUTDOOR EQUIPMENT (OUTDOOR UNITS ETC)

TORICO SDN BHD

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Shopee: www.shopee.com.my/torico.my