Innovative Pre-insulated duct system for Sustainable Buildings

Efficient & fire safe
ABOUT US

KIMMCO-ISOVER is a Joint Venture between Alghanim Industries and Saint-Gobain

Mineral wool leader in the Middle East

- 2 manufacturing facilities: Glass wool & Stone wool
- Over 40 years of track record in manufacturing and supply of insulation material
- 5 Sales offices in GCC & Authorized distributors in over 40 other countries
Energy efficiency
-The first fuel of a sustainable global energy system

Buildings
A source of enormous untapped efficiency potential

Energy

Emission
28%

Source: IEA (2019)
Vision-
Carbon neutral
Mitigating Climate Change

Green Buildings plays a critical role in achieving Energy efficiency in Buildings

Benefits of Green Buildings

Global Green Buildings Materials Market

- Insulation: US$71 Billion in 2027
- CAGR of 5%
- Source: Research and Markets
With human in center, Green Buildings are Evolving
Green Building
- Ecofriendly Product/Systems
- Energy Efficient Solutions
- Healthy

.. But Fire aspects should not be ignored
Fire aspects Should not be ignored

- The Influence of risk factor on sustainable buildings

When improving only energy efficiency of the building without considering fire risk

X3 times

Co₂ emission due to fire

Rebuild

Fire

Demolition

14% Up-to

Construction

Time

Operation

Carbon Emission

Risk

30-40 Kg/sqmt

Source: Bridging the Gap: fire safety & green Building - The Influence of risk factor on sustainable buildings - Environmental impact of automatic fire sprinklers - DCD
Growing challenges for Engineers/consultants

Building Materials Manufactures

- Green Building Requirements
- Design/architecture
- Building materials/systems
- Low Cost
- Faster construction
- Fire Safety
Understand the fire behavior of the Building materials and Systems
SMOKE IS MORE FATAL THAN FIRE ...

- Carbon Monoxide: High impact
- Other Toxic gases: High impact
- Too low Oxygen level to sustain life: High impact
- Incapacitation- Physical/mental: No impact
- Bodily burns: High impact
- Non-visibility due to smoke: High impact
- Psychological effect: Some impact
- Physical injuries: No impact

MAJOR CASE OF CASUALTY IN A FIRE
Fire Curve

Indicates quantity of heat supplied by materials before flash-over.

Flashover point

Fire resistance:

Indicates how long does a construction can withstand a flashover.

Temp.

Time.
Fire reaction of Building products

- Safe evacuation
- Reduced fire growth
- Damages can be minimized

Fire resistance of Building elements

- Try to save the building
- Try to prevent fire from spreading
- No chance to escape from the fire room
# EN13501 – Euroclass system

<table>
<thead>
<tr>
<th>Euro Class</th>
<th>Contribution to Fire</th>
<th>Type of insulation productions</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Non-Combustible</td>
<td></td>
<td>Stone wool, Glass wool, Foam Glass</td>
</tr>
<tr>
<td>A2</td>
<td>Limited Combustion- No flashover</td>
<td></td>
<td>High density &amp; binder or faced Stone wool and Glass wool</td>
</tr>
<tr>
<td>B</td>
<td>No Flashover</td>
<td></td>
<td>Some faced Glass wool &amp; Some Phenolic Foams</td>
</tr>
<tr>
<td>C</td>
<td>Flashover after 10 minutes</td>
<td></td>
<td>Some PIR</td>
</tr>
<tr>
<td>D</td>
<td>Flashover after 2 minutes</td>
<td></td>
<td>Most of he PIR</td>
</tr>
<tr>
<td>E</td>
<td>Flashover before 2 minutes</td>
<td></td>
<td>Flame retarded EPS, PUR</td>
</tr>
<tr>
<td>F</td>
<td>No performance Determined</td>
<td></td>
<td>Non flame – retarded EPS</td>
</tr>
</tbody>
</table>
**Scope:** Determine the relative burning behavior of the material by observing the flame spread along the specimen.

**Class A:**
- Flame Spread 0-25; smoke-developed 0-450

**Class B:**
- Flame Spread 26-75; smoke-developed 0-450

**Class C:**
- Flame Spread 76-200; smoke-developed 0-450

**ASTM E84**

**Reaction to fire**

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1, A2</td>
<td>No flash over</td>
</tr>
<tr>
<td>B</td>
<td>No flash</td>
</tr>
<tr>
<td>C</td>
<td>Flash over between 10 and 20 minutes</td>
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<tr>
<td>D</td>
<td>Flash over between 2 and 10 min.</td>
</tr>
<tr>
<td>E</td>
<td>Flash over before 2 min.</td>
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<tr>
<td>F</td>
<td>Products non classified (not tested)</td>
</tr>
</tbody>
</table>

**Tendency to release smoke**

<table>
<thead>
<tr>
<th>Smoke level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>s1</td>
<td>Little or no smoke</td>
</tr>
<tr>
<td>s2</td>
<td>Quite a lot of smoke</td>
</tr>
<tr>
<td>s3</td>
<td>Substantial smoke release</td>
</tr>
</tbody>
</table>

**Release of flaming droplets/particles**

<table>
<thead>
<tr>
<th>Droplets level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>d0</td>
<td>None</td>
</tr>
<tr>
<td>d1</td>
<td>Some</td>
</tr>
<tr>
<td>d2</td>
<td>High amount of droplets</td>
</tr>
</tbody>
</table>
“Effective fire protections & prevention measures have the potential to reduce the impact of fire on environment & safety to a point the impact Controlled”

Source - *The Influence of risk factor on sustainable buildings*
Duct system is one the Key component of HVAC system

HVAC has a huge impact on total energy consumption of a Building

 HVAC Energy Consumption

60% Global
70% GCC

in a typical building

RECREE-2015
WHAT IS AIR DUCT?

Ducts are conduits or passages used in heating, ventilation, and air conditioning (HVAC) to deliver and remove air. As such, air ducts are one method of ensuring acceptable indoor air quality, thermal comfort and acoustic performance.

Source: https://www.wikipedia.org/
TYPES OF DUCTS IN GCC

Metal Duct
- GI
- Steel
- Aluminum

Pre-Insulated Duct “PID”
- Plastic organic base
- Glass Wool self-support

Flexible Duct for connection

Insulation
Video Source: Sente

GI metal duct
Pre-Insulated Duct “PID”

Typical PID construction

Insulation Core

Al-foil

Al-foil
Why to insulate Ducts?

1. Primary Function
   - Reduce Heat gain/loss (Energy conservation)
   - Energy Efficiency
   - Reduce the risk Condensation

2. Secondary Function
   - Acoustics

Acoustic Insulation
Primary Function

Reduce Heat gain/loss (Energy Conservation)

- Thermal Comfort
- Energy Savings
- Cost Savings
- Low Capital cost – small size machines
- Low machine ware & tear
- Low maintenance

Reduce the risk Condensation

- Water leakage
- Damp proof – No mold & fungal growth
- Sick Building
- Extra maintenance
How the primary function of Energy conservation & reduce the risk of condensation are achieved:

<table>
<thead>
<tr>
<th>Material</th>
<th>Additional Insulation Required</th>
<th>Fire Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic</td>
<td>No</td>
<td>Prefer at least for Class B, s1.d0</td>
</tr>
<tr>
<td>Non-Organic</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>PIR</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Phenolic</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Glass wool</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

- **GI metal duct**: Additional insulation is wrapped around the duct of suitable thickness.
- **PID - Organic**: Additional insulation is wrapped around the duct of suitable thickness.
- **PID - Glass wool**: Additional insulation is wrapped around the duct of suitable thickness.

Know the fire performance of the insulation material - Prefer at least for Class B, s1.d0.
Air leakage in HVAC ducts

Test in accordance with EN1507. EN12237

Airflow rate \([m^3/h/m^2]\)
Pressure \([Pa]\)

Class A
(Leaking GI duct)

Class B
(better sealed GI duct)

Class C

Class D

GW-PID

Energy Saving =

Air-tightness +

Temperature gain

Total leaks flow (%)

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>GW-PID</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>5%</td>
<td>1.60%</td>
<td>0.50%</td>
<td>0.20%</td>
</tr>
</tbody>
</table>

1.12 [kW/m²]
-78%

0.72 [kW/m²]
-65%

0.25 [kW/m²]

Loss due to air leakage

Loss due to temp. difference

Nude metal duct

Metal with + 25mm GW

GW-PID
Secondary function – Acoustic

2

**Ventilation/air-conditioning system**
Noise transmission due to the ventilation and/or air-conditioning system itself.

**Machinery vibrations**
Noise transmission due to the structure on account of vibration.

**Air circulation**
Generation of noise by the air speed effect.

**Grilles and diffusers**
Noise transmission via grilles and diffusers.

**Propagation Noise**
Noise going through duct

**Breakout Noise**
Noise coming out of duct wall
Secondary function – Acoustic

Propagation noise

GI metal duct

PID-Organic

PID -Glass wool

Line the inside of the duct with sound absorbing material

- Normally it is Glass wool insulation is used in this region
- Sometime organic insulation is also used

Air duct noise silencer
Time saving by high productivity

Questions the Safety of the installers

GI metal duct

PID-Organic

Plastic base

Glass Wool

PID -Glass wool
+50% Savings in installation cost

- >50% Lighter in weight vs. GI duct, so it is Easy to carry & install and requires few numbers of workers on site
- No special cranes required
- Less hangers & accessories
- Easy to store & saving spaces

Time saving by high productivity
Challenges

- Insulation - energy conservation
- Air-leakage
- Heavy – less productivity/safety
- Insulation for Acoustics

**Glass Wool**

- Inbuilt guarantee insulation performance
- 5% leakage v/s 0.2% - Best in class
- 5 times less weight and faster
- Inbuilt sound insulation

**PID - Glass wool**

- Know the fire performance of the insulation material – Prefer at least for Class B, s1, d0
Case study: CLIMAVER – Glass wool based pre insulated duct System
**CLIMAVER PLUS R**
- External & Internal facing: alu + kraft

**CLIMAVER neto**
- External facing: alu + kraft
- Internal facing: Black textile
What is fire performance of CLIMAVER®?

2

an innovatively duct solution for Sustainable Buildings

Environment  Economical  Social
### Reaction to fire

<table>
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<tr>
<th>Letter</th>
<th>Description</th>
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<tr>
<td>A1, A2</td>
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### Tendency to release smoke

- **s1** Little or no smoke
- **s2** Quite a lot of smoke
- **s3** Substantial smoke release

### Release of flaming droplets/particles

- **d0** None
- **d1** Some
- **d2** High amount of droplets

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**By Nature it is**

**NON COMBUSTIBLE**

**CLIMAVER®**

**UL 181 CERTIFIED**

- Standards of the National Fire Protection Association for the Installation of Air-Conditioning and Ventilating Systems - NFPA

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**Fire classification according EN13501**

<table>
<thead>
<tr>
<th>Rigid</th>
<th>Flexible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface burning characteristics</td>
<td>✔</td>
</tr>
<tr>
<td>Flame Penetration</td>
<td>✔</td>
</tr>
<tr>
<td>Burning</td>
<td>✔</td>
</tr>
<tr>
<td>Corrosion</td>
<td>✔</td>
</tr>
<tr>
<td>Mold Growth and Humidity</td>
<td>✔</td>
</tr>
<tr>
<td>Temperature</td>
<td>✔</td>
</tr>
<tr>
<td>Puncture</td>
<td>✔</td>
</tr>
<tr>
<td>Static Load</td>
<td>✔</td>
</tr>
<tr>
<td>Impact</td>
<td>✔</td>
</tr>
<tr>
<td>Erosion</td>
<td>✔</td>
</tr>
<tr>
<td>Pressure</td>
<td>✔</td>
</tr>
<tr>
<td>Collapse</td>
<td>✔</td>
</tr>
<tr>
<td>Tension</td>
<td>✔</td>
</tr>
<tr>
<td>Torsion</td>
<td>✔</td>
</tr>
<tr>
<td>Bending</td>
<td>✔</td>
</tr>
<tr>
<td>Leakage</td>
<td>✔</td>
</tr>
</tbody>
</table>

**Fire**

**Durability**

13
Make ductwork more sustainable with **CLIMAVER®**
Make ductwork more sustainable with **CLIMAVER®**

For a typical building office, using 1000m² of CLIMAVER® instead of insulated metal duct would save:

- **-30 Tons of CO₂**
  - More than 36 years driving 20km a day connecting work
  - Equivalent to 180,000 km travelled by car or 30 tons of CO₂ emissions

- **4000x**
  - The electricity usage of 4000 inhabitants for 24h
  - Equivalent to 215,000 Mu of electricity consumption saved over 25 years

- **More than 3 tons of steel to be installed, insulated and dismantled at the end of the life cycle**
<table>
<thead>
<tr>
<th>Category</th>
<th>Credits</th>
<th>Points</th>
<th>CLIMAVER offer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrative process</td>
<td>Credit “integrative process”</td>
<td>1</td>
<td>BIM</td>
</tr>
<tr>
<td>Energy &amp; atmosphere</td>
<td>Optimize energy performance</td>
<td>Up to 18</td>
<td>Air tightness &amp; efficacy</td>
</tr>
<tr>
<td>Material &amp; resources</td>
<td>Building life cycle impact reduction</td>
<td>5</td>
<td>LCA</td>
</tr>
<tr>
<td>Material &amp; resources</td>
<td>Environmental product declaration</td>
<td>2</td>
<td>EPD</td>
</tr>
<tr>
<td>Material &amp; resources</td>
<td>Sourcing of raw materials</td>
<td>2</td>
<td>Recycled content attestation</td>
</tr>
<tr>
<td>Material &amp; resources</td>
<td>Material ingredients</td>
<td>2</td>
<td>EUCEB, ISO 14001</td>
</tr>
<tr>
<td>Material &amp; resources</td>
<td>Construction and demolition waste management</td>
<td>2</td>
<td>Waste reduction doc CLIMAVER</td>
</tr>
<tr>
<td>Indoor Environmental Quality</td>
<td>Low-emitting materials</td>
<td>3</td>
<td>GREENGUARD certificate</td>
</tr>
<tr>
<td>Indoor Environmental Quality</td>
<td>Thermal comfort</td>
<td>1</td>
<td>K value and Thermal comfort</td>
</tr>
<tr>
<td>Indoor Environmental Quality</td>
<td>Acoustic performance</td>
<td>1</td>
<td>Best with Neto and meets ASHRA</td>
</tr>
<tr>
<td>Innovation</td>
<td>Innovation</td>
<td>5</td>
<td>Software: Techcalc, Acoustic, dimensions, BIM objects</td>
</tr>
</tbody>
</table>

Up to-42 Points
• Building must focus on People, Environment & Wealth
• Green Building does not mean include all the Green Products
• Building must be suitable all though its lifetime
Thank you
Questions & answer