



Heat Recovery Steam Generator Applications

A GLOBAL NEED

Insulation can play a significant role in the reduction of heat loss from power plants. Even a small gain in thermal efficiency can save millions of dollars in fuel costs over the life of an installation.

The Heat Recovery Steam Generator (HRSG) is a demanding environment. Insulation materials must be able to retain their strength and resistance to erosion, even in very high temperature conditions, and high velocity gas turbulence. A hot spot caused by insulation deterioration in a stack or boiler can result in a forced stop, days of downtime and loss in the power supply. Thermal Ceramics has more than 25 years' experience in the design and delivery of thermal insulation systems. Our products help power plants all over the world to make vital improvements in efficiency through reduced energy loss.

HIGH EFFICIENCY THERMAL INSULATION FOR HRSG APPLICATIONS

Thermal Ceramics advanced thermal insulation materials help heat recovery steam generation (HRSG) plants to make significant reductions in energy losses.

Our high performance products offer lower thermal conductivity and longer operational life than any other competing insulation materials. The Superwool® insulating fibre range of materials for HRSG applications includes Superwool Plus fibre, a high thermal efficiency blanket, and Pyro-Bloc® monolithic fibre modules for wide ranging applications in boilers, ductwork, auxiliary burners and acoustic applications in silencers.

Superwool Plus insulating fibre

a high temperature low-biopersistent insulating material that provides excellent insulation in applications up to 1200°C (2192°F).

- up to 20% more thermally efficient than competing products
- high fibre index (65%) for exceptional strength and durability
- light-weight and flexible for easy installation

Pyro-Bloc modules

Made from Pyro-Log™ Superwool in edge-grain orientation offer high temperature insulation.

- modular format for rapid, cut-to-fit field installation
- resilient and compressible during installation but hardens upon exposure to working temperatures
- durable for long service life in harsh conditions
- excellent resistance to high velocity gas turbulence up to 45m/s (148ft/s)

SUPERWOOL PLUS INSULATING FIBRE BENEFITS

- > Energy savings up to 17%
- > 1200°C (2192°F) classification temperature
- > No carcinogenic classification
- > Low 'shot' blanket offers improved thermal conductivity performance

PYRO-BLOC MODULE BENEFITS

- > High density for best insulation and strength
- > Proven references for HRSG ductwork with auxiliary burners
- > Compressible in both directions
- > Quick installation
- > Long service life





Insulation CHALLENGE:

The need to minimise heat loss in an HRSG boiler operating at temperatures up to 1000°C (1832°F), in order to reduce energy costs. The thermal efficiency of a traditional low-biopersistence insulation blanket is limited by its fibre index, which is typically about 40-45%.

SOLUTION:

Tests in HRSG steel liner construction have shown that the normal insulation performance can be achieved easily using only 80% of the normal insulation thickness. This allows the duct walls to be reduced in thickness saving costs in the steel mounting studs and, more importantly, allowing the HRSG panels to be shipped more efficiently. Superwool Plus is set to become the new standard for insulating HRSG ductwork.

Insulation CHALLENGE:

Noise and vibration damage causes breakdown of the acoustic insulating material used in the hot silencer and stacks. Bigger, better turbines produce hotter exhaust gases. Under long-term exposure to these higher temperatures, the traditional wool fibre insulation blankets used on hot silencers and stacks tends to break down. As a result, they become vulnerable to vibration damage; the acoustic properties degrade and the material weakens and may collapse.

SOLUTION:

Thermal Ceramics high performance insulation Superwool® Plus insulating fibre performs well in high temperature, high vibration conditions. It is able to provide much better long term acoustic insulation than traditional wool fibre materials with the virtual elimination of large shot particles resulting in an improved fibre network of 30% more fibre providing higher tensile strength.

Insulation CHALLENGE:

The possibility of hot spots in the HRSG boiler lining caused by erosion of the insulation blanket under harsh conditions of high gas velocity 20-30m/s (66-98ft/s) and high temperatures 600 - 700°C (1112 - 1292°F). Traditionally, a stainless steel shroud is installed as a lining to protect the boiler insulation from direct contact with the high velocity gas. This is expensive and requires the use of steel studs, which transfer heat and vibration to the boiler casing.

SOLUTION:

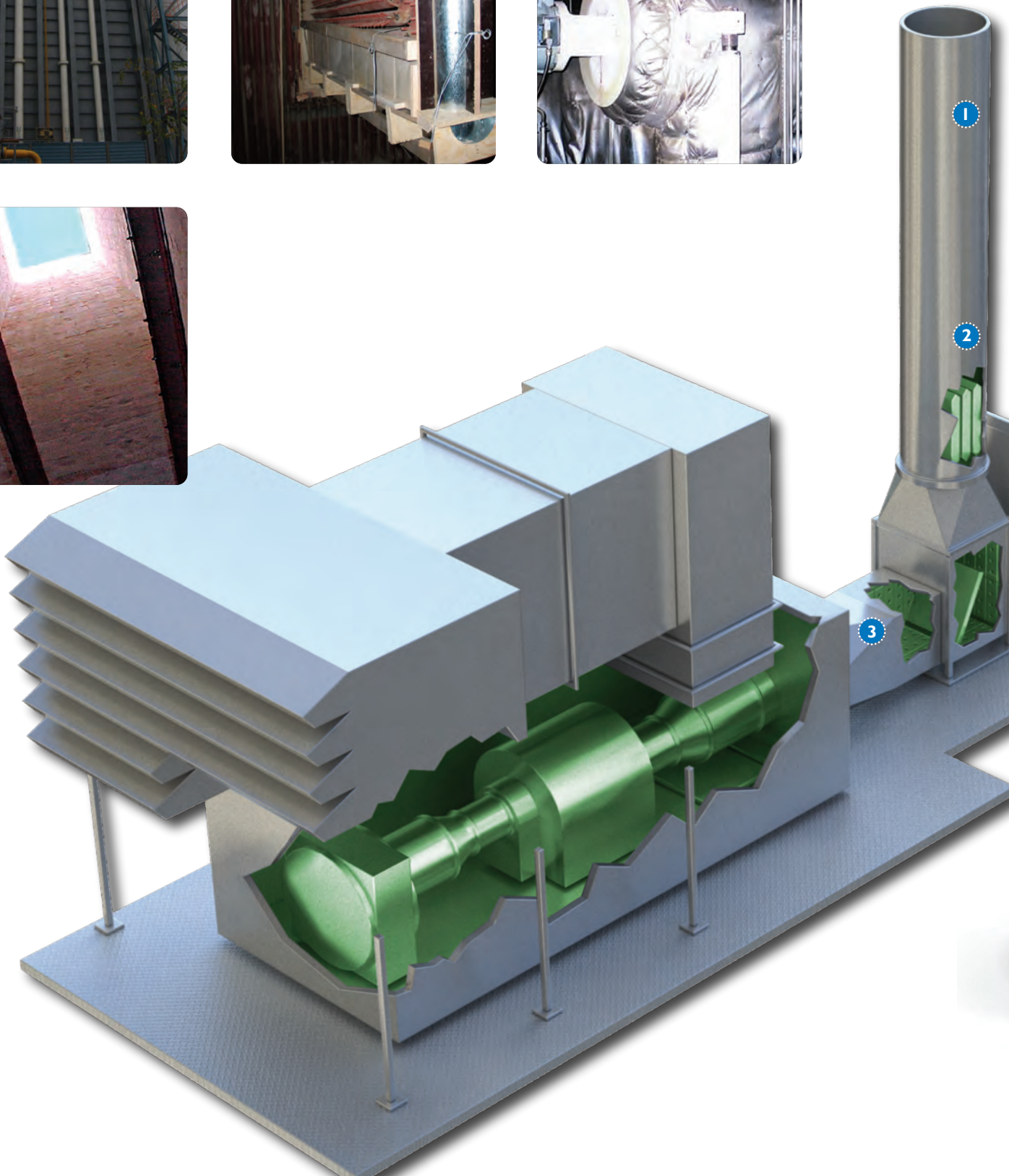
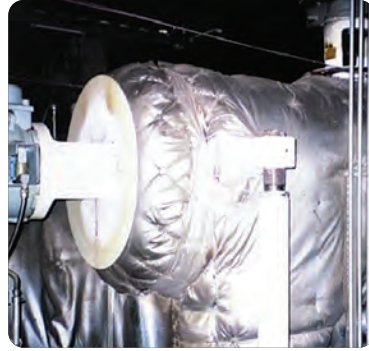
Thermal Ceramics high performance insulation Pyro-Bloc® modules can withstand higher gas velocities than other insulating materials, thanks to their unique interlocking fibre construction which hardens on exposure to working temperatures. The Pyro-Bloc modules minimise the number of joints and allows for compression of the module in all directions during installation. The design greatly reduces or eliminates gaps at elevated temperatures. Pyro-Bloc modules offer more robust, thermal efficient insulation linings at lower costs.

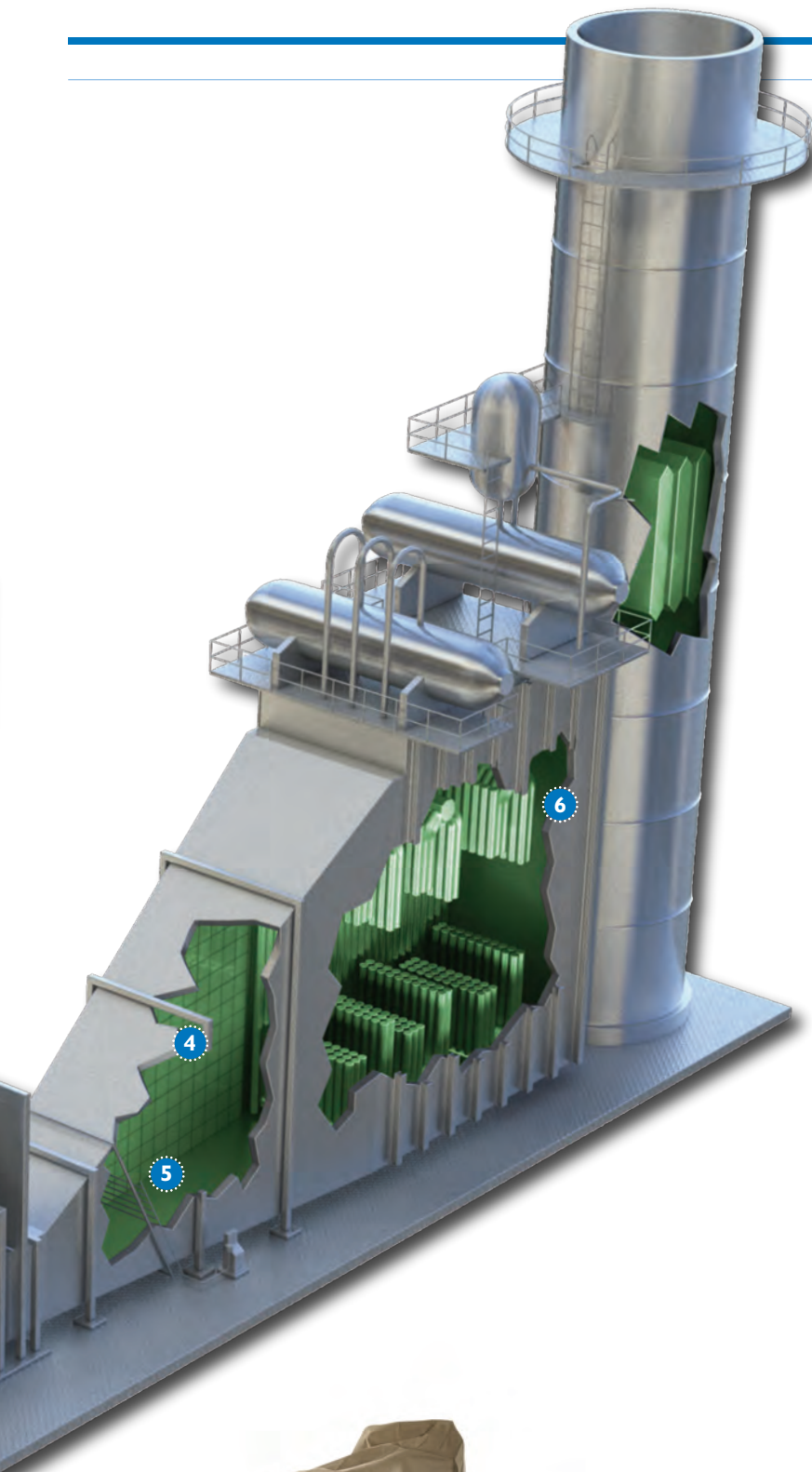
HEAT RECOVERY STEAM GENERATION



Performance expectations of an HRSG is typically 10 years or more.

Thermal insulation in the HRSG must be able to withstand temperatures approaching 1093°C (2000°F) and gas velocities up to 37m/sec (120 ft/sec). Our products help power plants all over the world to make vital improvements in efficiency through reduced energy loss.





Superwool® Plus

Insulating fibre

Heat Recovery Steam Generator - typical applications

1 Stacks
 Superwool Plus Blanket
 Cerablanket®
 Pyro-Bloc® Modules

2 Silencers
 Superwool Plus AC2 Blanket
 Cerablanket AC2

3 Ductwork
 Superwool Plus Blanket
 Cerablanket
 Pyro-Bloc Modules

Auxillary Burners
4 Pyro-Bloc Modules
 Superwool Plus Blanket

Floor
5 Pyro-Bloc Modules
 Pyro-Stack™, Z-Blok™
 Insulating Castables
 Kaolite®, Firelite®, TriMor®
 Insulating Firebrick
 K®, JM™, TJM™ brands
 Insulating Block
 TR®-19, Ceraboard®

Casing Hotspots
6 Therm-O-Hot Patch™
 Superwool Sealcoat™ HT

SUPERWOOL® PLUS INSULATING FIBRE

Excellent thermal conductivity for reduced energy loss

Superwool Plus has a high fibre index which yields a 20% improvement in conductivity at 1000°C (1832°F). This translates to cooler cold surfaces and less energy loss (or less mass of fibre required to give the same performance).

Advanced control of the manufacturing process allows the fibre diameter to be kept predominantly in the optimal 1 to 6µm range, maximising the fibre surface area available for lower thermal and good thermal stability.

Long-term effective at high temperatures

The classification temperature for Superwool Plus fibre is 1200°C (2192°F) (EN1094-1). This means that shrinkage of the material is less than 4% with continuous use at this (maximum) temperature.

This high performance is achieved through consistent use of pure raw materials in manufacture.

Good tensile strength for ease of installation and durability

The patented manufacturing process results in an improved fibre network, reducing shot content resulting in a fibre matrix of up to 30% more fibres per unit of mass.

In tensile strength tests, Superwool Plus consistently out-performs competing products.



- **Excellent thermal insulation properties**
- **Free of binder or lubricant**
- **Thermal stability**
- **Low thermal conductivity**
- **Good resistance to tearing and vibration, flexible and resilient**
- **Immune to thermal shock and offers excellent shock resistance**
- **Low heat storage capacity**
- **Inorganic - smoke free**
- **Good sound absorption**
- **AES fibers are not classified carcinogenic by IARC or under any national regulations on a global basis. They have no requirement for warning labels under GHS (Globally Harmonized System for the classification and labeling of chemicals)**

PYRO-BLOC® MODULES

Abrasion resistant, high-density modules

Pyro-Bloc modules comprise two sections of Superwool fibre Pyro-Log in edge-grain orientation, held in position with two stainless steel tubes. This, and their high density makes them much more resistant to erosion than folded modules, particularly where a high velocity of gas moving through the unit tends to abuse linings.

Easy to install in tricky areas

Pyro-Log™ monolithic fibre are easy to cut and fit around openings and modify in the field. It provides a superior finished surface for such special shapes as peep site frames, tube penetrations and burner tiles. The modules are especially ideal for corners, bullnoses, or transition sections.

- **High un-compressed densities give low thermal conductivity and a more uniform and faster installation**
- **Fast one step installation**
- **Resistant to mechanical damage and gas flow abrasion**
- **Anchorage remote from the hot face protects steel work**



Project reference list

Please contact your local Morgan Advanced Materials office for further advice.

- 1. Exhaust duct.** Pyro-Bloc® Y modules, 12# ZR with Unikote® M, installed to replace original lining of blanket/stainless liner (Henry Vogt unit).
- 2. Exhaust duct.** Pyro-Bloc Y modules, 12# ZR with Unikote, installed to replace original board lining.
- 3. Duct roof and walls.** Aluminium foil vapour barrier, backing blanket and hydrotemp duct floor. Tri-Mor® Guncrete® BFS, Tri-Mor Insulite®, Kaowool® board, vapour barrier, Kaowool board and hydrotemp. Superheater floor and headed box cast Tri-Mor Insulite.
- 4. Duct from burner to boiler roof, walls and floor.** Lined with Pyro-Bloc blanket modules, aluminium foil vapour, backing blanket, hydrotemp duct from generator. 2 layers 19/128 blanket with vapour barrier between, hydrotemp and hot face protected with 316 ss Knitmesh 310 ss threaded anchors.
- 5. Lining waste heat boiler.** Pyro-Bloc modules, backing blanket, aluminium foil vapour barrier and hydrotemp, anti-corrosive coating on casting.
- 6. Duct roof and walls.** Lined with Pyro-Bloc blanket modules, with backing blanket. Floor lined with Tri-Mor Insulcast®, Tri-Mor Coolcast® and hydrotemp. Y anchors welded to sloping area. Canopy and economiser by-pass duct lined with Kaowool blanket and covered with Knitmesh.
- 7. Duct roof and walls.** Lined with Pyro-Bloc modules, aluminium foil vapour barrier, backing blanket and hydrotemp. Floor lined with Tri-Mor Guncrete, Tri-Mor BFS, Tri-Mor Insulite, Kaowool board vapour barrier, board and hydrotemp. Superheated floor and headed box cast with Tri-Mor Insulite.
- 8. Exhaust duct.** Pyro-Bloc Y modules, 12# R, installed spring 1991 (new Zurn unit).
- 9. Supply of lining materials for waste gas incinerator.** Pyro-Bloc modules hydrotemp coating and dense fire bricks for walkway (still in operation).
- 10. Lining flame duct and boiler casing of waste heat unit.** Pyro-Bloc modules.
- 11. Lining for waste heat unit burner duct roof and walls.** Pyro-Bloc modules, vapour barrier. Backing blanket and hydrotemp floor:- I.F.BN., Pyro-Log® fibre (blanket laid) vapour barrier. Cerablok™ hydrotemp.
- 12. Exhaust duct.** Pyro-Bloc Y modules, 12# R, installed (new Zurn unit).
- 13. Lining various sections of CHP scheme.** Pyro-Bloc modules, vapour barrier blanket and hydrotemp. SS plates, blanket, vapour barrier, blanket and hydrotemp. Moistfelt, vapour barrier, blanket and hydrotemp.
- 14. Burner duct (walls).** Pyro-Bloc modules, aluminium foil vapour barrier, backing blanket and hydrotemp (floor) concrete with Cerablok backing and vapour barrier.
- 15. Ducting - roof, walls and floor.** Pyro-Bloc modules, aluminium foil vapour barrier, blanket and hydrotemp.
- 16. Exhaust duct.** Pyro-Bloc Y modules, 12# ZR with Unikote M. Installed September 1993 (two Deltak units).
- 17. Burner duct (walls).** Pyro-Bloc modules, aluminium foil vapour barrier, backing blanket and hydrotemp (floor) concrete with Cerablok backing and vapour barrier.
- 18. 2 sets of ductwork lined with Pyro-Bloc modules.** Hot face coated with white cement at burner end as protection against flame impingement.
- 19. Duct roof and walls.** Pyro-Bloc modules, aluminium foil vapour barrier, backing blanket and hydrotemp duct floor. Tri-Mor Guncrete.
- 20. BFS.** Tri-Mor Insulite, Kaowool board, vapour barrier, Kaowool board and hydrotemp. Superheater floor and headed box cast with Tri-Mor Insulite.
- 21. Exhaust duct.** Pyro-Bloc Y-modules, 12# R (new Zurn unit).
- 22. Exhaust duct.** Pyro-Bloc modules, 12# R with Unikote M. First installation May 1997 (Coen burner section - 6 units).
- 23. Exhaust duct.** Pyro-Bloc Y-modules, (new Deltak unit).

ABOUT MORGAN ADVANCED MATERIALS



Morgan Advanced Materials is a global engineering company offering world-leading competencies in materials science, specialist manufacturing and applications engineering.

We focus our resources on the delivery of products that help our customers to solve technically challenging problems, enabling them to address global trends such as energy demand, advances in healthcare and environmental sustainability.

What differentiates us?

Advanced material science and processing capabilities. Extensive applications engineering experience. A strong history of innovation and reinvention. Consistent and reliable performance. A truly global footprint. We find and invest in the best people.

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