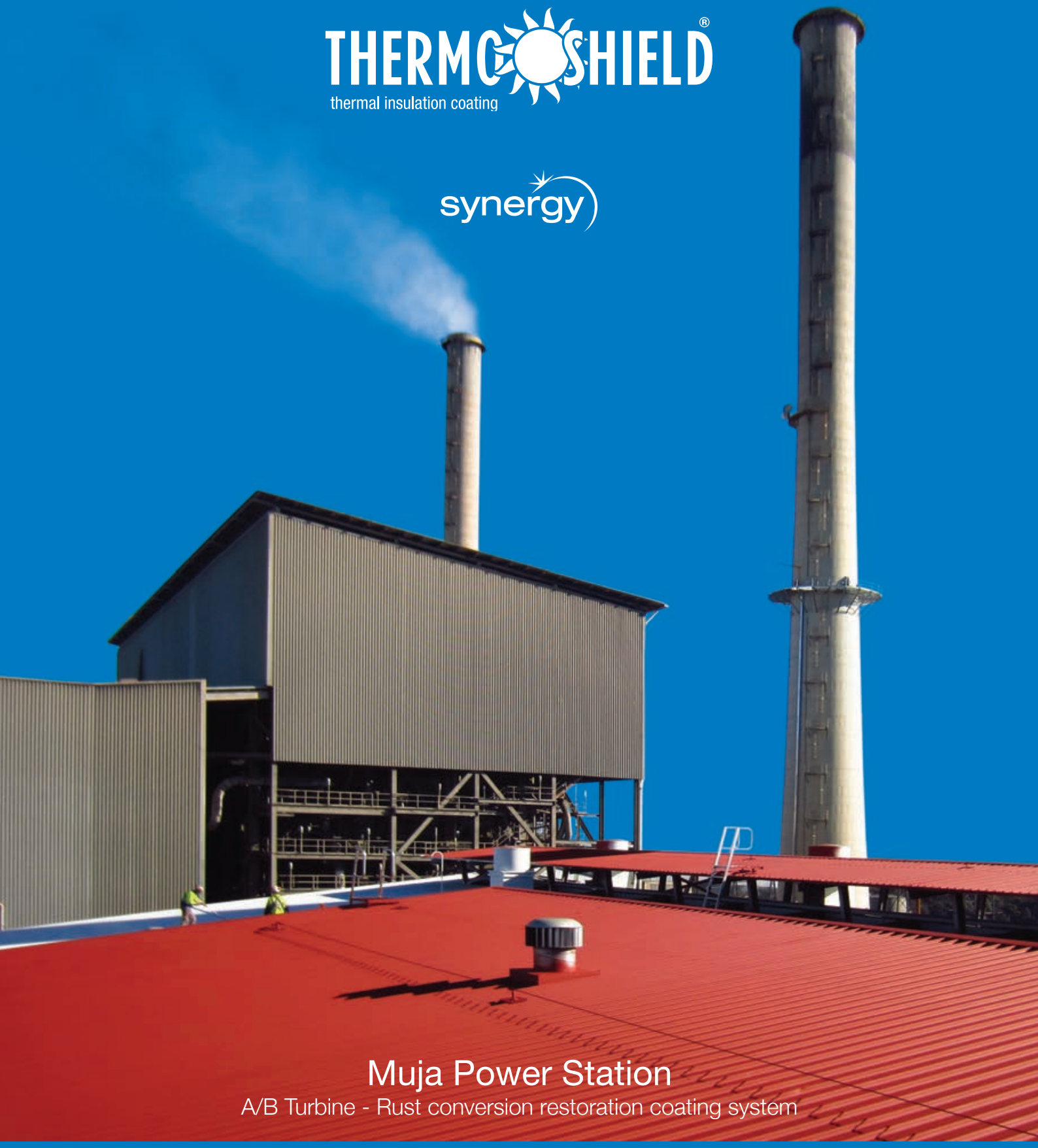
THERMOSHIELD®
thermal insulation coating

synergy



Muja Power Station

A/B Turbine - Rust conversion restoration coating system

Asset Protection | Preventative Maintenance | Future Proofing

CORROSION control

Waterproof

THERMOSHIELD PROUDLY MADE IN AUSTRALIA

10 YEAR warranty IF APPLIED BY THERMOSHIELD APPROVED APPLICATORS

ISO 9001 & 14001 Certified

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Asset Protection | Preventative Maintenance | Future proofing

Rust Conversion restoration coating system

Project Site: Muja Power Station | A&B Turbine – Boiler House roof
Site address: Power station road, Collie WA

Executive summary

The AB turbine roof is suffering from widespread, advanced surface rusting. If left untreated, full replacement of roof sheeting would be highly likely in upcoming years due to irreparable corrosion.

It may take 20+ years for rust bloom on galvanised steel to first appear but once present, the rate of deterioration is exponential. In recent years, the sheet rusting has become noticeable worse and urgent attention is required if the coating option were to be chosen over full roof replacement.

The strongly preferred option is the rust conversion, restoration coating system due to significantly less health & safety risks as well as being a significantly greater cost saving exercise.

Despite being a costly & dangerous task for removal & installation, a new roof could have a life span of up to 20-30 years. With the long term future of the Muja power station uncertain, this could also be seen as a major over capitalization of investment.

The report will be presented somewhat uniquely by starting with an image summary then 'before & after' examples. After this, the full process will be documented chronologically and each stage will be demonstrated.

COATING SUMMARY – Coating system stages (imagery):

First coat | **RUST CONVERTER** – applied only to rusted metal:

Second coat | **RUST INHIBITOR ETCH PRIMER** – applied to all areas:

Third coat | **THERMOSHIELD** ceramic membrane – light grey 1st coat:

Fourth coat | **THERMOSHIELD** ceramic membrane – white 2nd coat:

Fifth coat | **THERMOSHIELD** ceramic membrane – light grey 3rd coat:

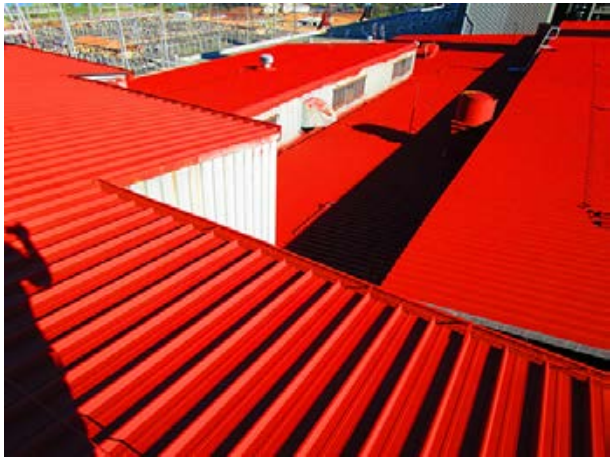
BEFORE & AFTER EXAMPLES:

Original condition:

Completed coating system:

Original condition:

Post rust converter & primer coats:



Completed coating system:

BEFORE & AFTER EXAMPLES continued:

Original condition:

Rust converter applied:

Rust inhibitor etch primer applied:

3 x Thermoshield coats | Completed coating system:

BEFORE & AFTER EXAMPLES continued:

Original condition:

Completed coating system:

Original condition:

Completed coating system:

BEFORE & AFTER EXAMPLES continued:

Original condition:

Rust converter applied:

Rust inhibitor etch primer applied:

3 x Thermoshield coats | Completed coating system:

BEFORE & AFER EXAMPLES continued:

Original condition:

Completed coating system:

Original condition:

Rust converter being applied:

Completed coating system:

BEFORE & AFTER EXAMPLES continued:

Original condition:

Completed coating system:

Original condition:

Post rust converter & primer coats:

Completed coating system:

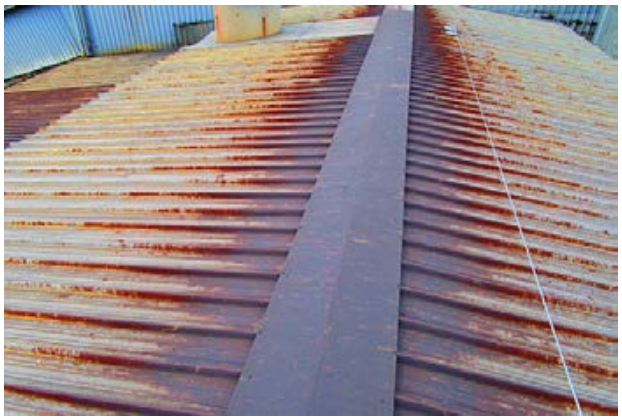
Section 1: **Original Condition**

The boiler house roof was suffering from advanced, widespread surface rusting.

Below is a diagram of the boiler house roof:

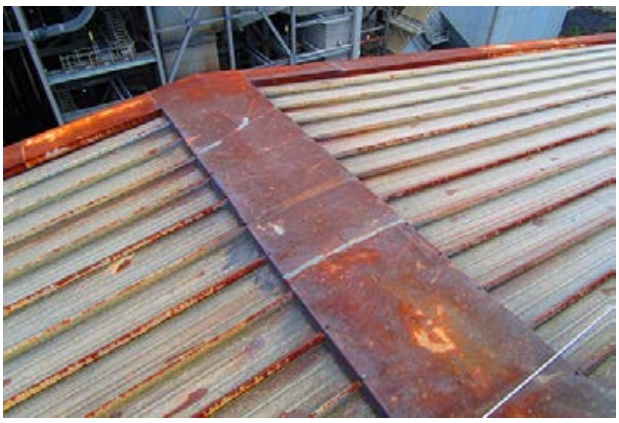
The highlighted green area in the diagram above demonstrates the section of the roof the below "*before*" photos were taken from.

The below photos demonstrates the overall severity of the surface rust/corrosion:

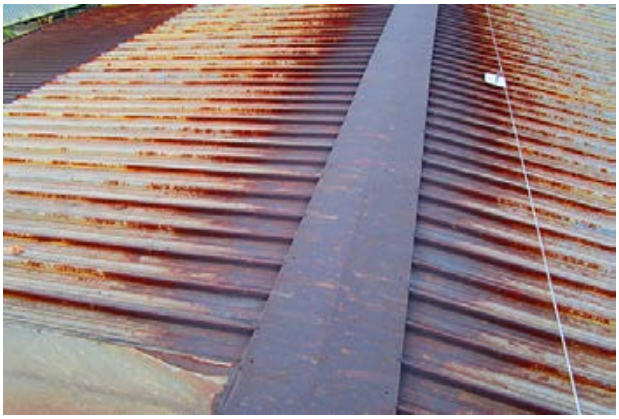


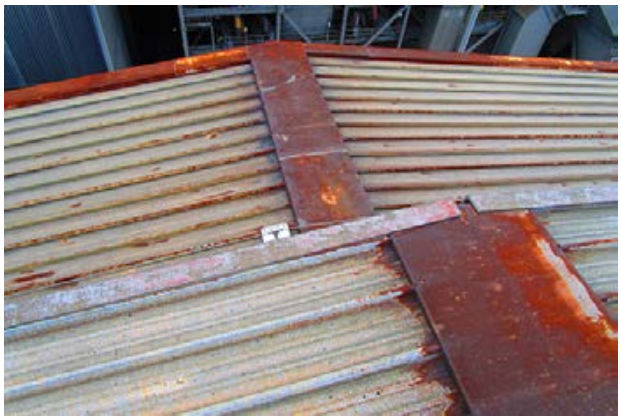
Section 1: **Original Condition** (western side) continued:

A lot of coal ash would be found on the roof after being expelled from the chimney towers. The combination of water & coal creates as corrosive element to the underlying metal.



Section 1: **Original Condition** (western side) continued:



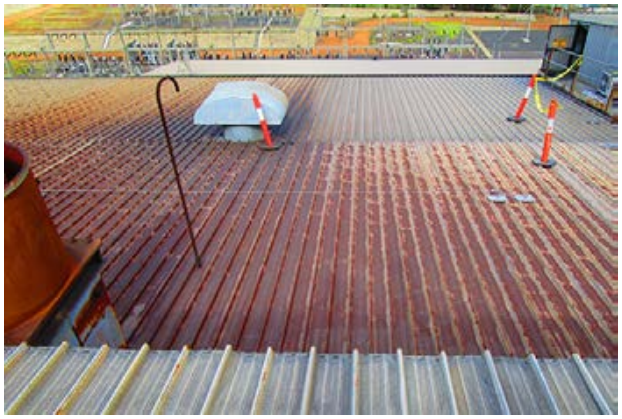


Section 1: **Original Condition** (eastern side)

Below is a diagram of the boiler house roof:

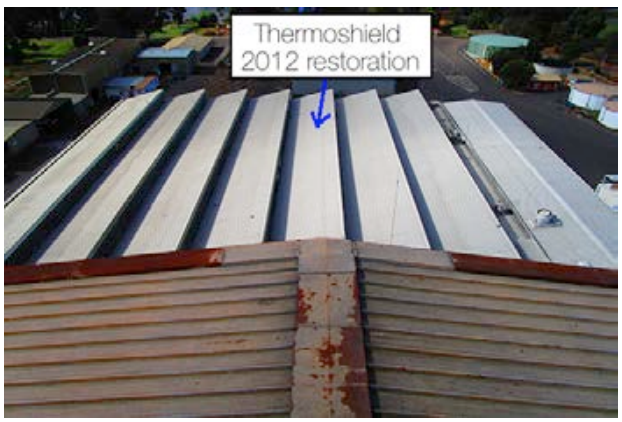
The highlighted blue area in the diagram above demonstrates the section of the roof the below "*before*" photos were taken from.

The below photos demonstrates the overall severity of the surface rust/corrosion on the eastern side of the boiler house roof:



Section 1: **Original Condition** (eastern side) continued:

The eastern roof neighbours the 'A.B workshop' which was restored by Thermoshield in 2012 (below right). Inspections during the 2016 works confirmed no signs of product failure or rust re-surfacing:



Section 1: **Original Condition** (central roof)

Below is a diagram of the boiler house roof:

The highlighted yellow area in the diagram above demonstrates the section of the roof the below "*before*" photos were taken from.

The below photos demonstrates the overall severity of the surface rust/corrosion from the middle, most upper roof of the A.B boiler house:

Section 2: **Surface preparation** (high pressure cleaning):

Possibly the most important component of the overall process, but most certainly the most difficult & time consuming!

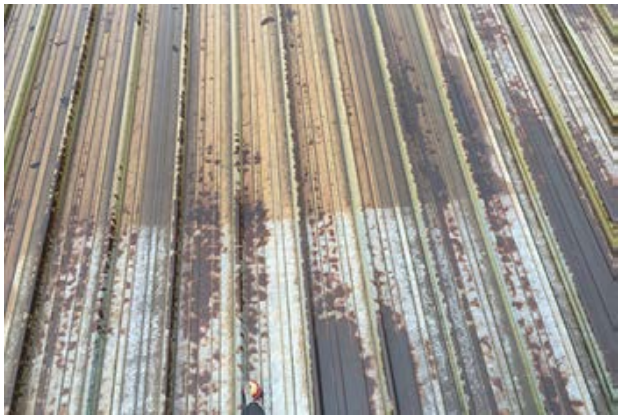
The power washing & overall surface preparation took approximately 1 week.

All grime, coal & rust flakes were removed under high pressure water to ensure the rust converter made contact to the rust itself, not rust flakes or a layer of dirt.

You can see from the below photos there is a clear line showing whereby the dirt/grime layer has been removed and bare metal is exposed:

Again the below (left) photo shows a clear line showing the removal of years of coal/dirt grime that has no doubt caused the metal to corrode over time.

In addition, below (right) shows power washing in the outer corners of the roof with applicator safely secured to 2 hook ups – to eliminate pendulum effect for the 2 live edges in play:



There were 2 power washers in operation, each with a spotter for added safety & protection.

Section 3: **Rust conversion:**

Following [high] power washing, rust conversion commenced.

The rust converting etch primer is applied to rusted steel only and not clean steel.

Our rust converting primer of choice has a lower pH and this enables it to be applied directly over rusted steel, where the converting action turns all the rust (namely, the mixed iron oxides and hydrated oxides) into a stable metal phosphate, whilst simultaneously forming a tough protective coating over the converted steel.

This is an irreversible reaction, which leads to a permanent rust conversion - if correct surface preparation and application occurs.

Section 3: **Rust conversion** continued:

Section 3: **Rust conversion** continued:




Single spot flashback

Original condition:

Rust conversion complete:

Rust conversion complete:

Section 4: **Rust inhibitor etch primer:**

Once rust has been converted to a stable, metal phosphate within the paint film, a rust preventative primer coat is then applied.

The coating is the “twin sister” to the converter, which is designed mainly for application over well-rusted steel. When the primer cures into an abrasion-resistant skin, its impervious to further rust.

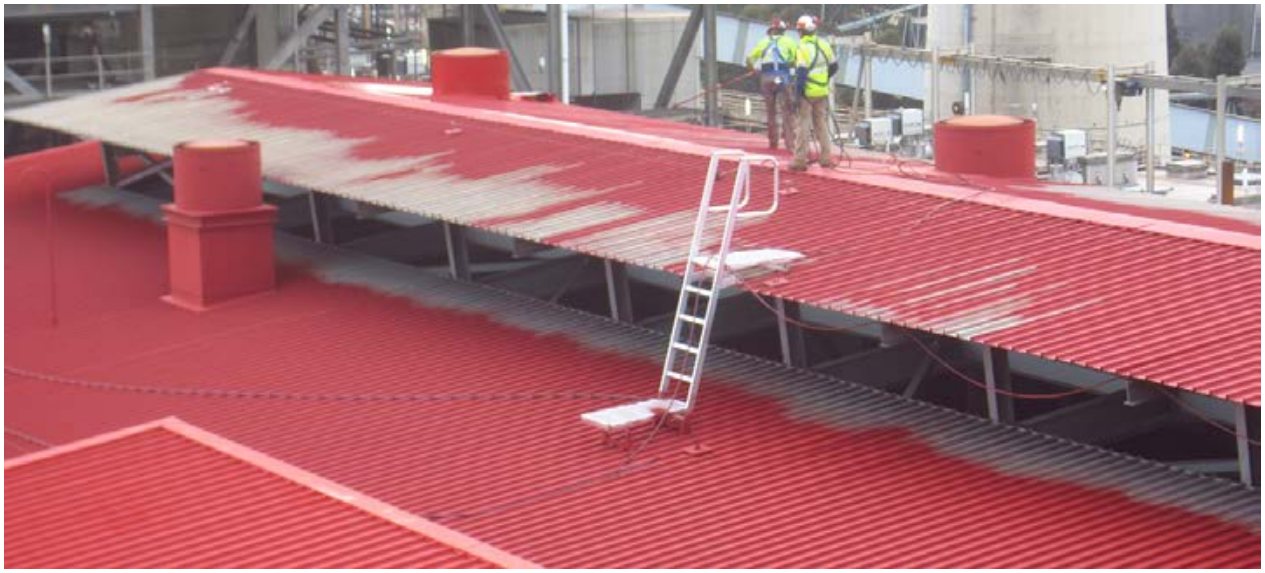
The primer coat, like the rust converter is an acrylic based primer is designed for application over the rust conversion layer to form a compatible.

The primer is applied to ALL METAL surfaces (not just the rusted) prior to protective top coats.

Primer coating commencement to eastern roof side:

The rust inhibitor primer is also vivid red in colour, like the rust converter. It is slightly brighter which helps ensure you know where you’re spraying.

Primer coating in full swing on the western roof side:



Section 4: **Rust inhibitor etch primer** continued:

The below series of photos focus on progress shots:

Every coating pass gets what we call a backhand pass & a forehand.

You can see below [left] the sprayer angels the head backwards at an approx. 45degree angle, ensuring a thick coverage on the backside of the sheet profile.

Below [right] the sprayer goes over the same area with the forehand pass, focusing on front edge of the sheet profile. Ensuring complete coverage of the entire sheet, not just the trough:

This technique ensures no rust is hidden from coating beneath the shadows of the profile ribs. The bottom of the sheet troughs essentially gets 2 x coats each passing.

Below photos demonstrates the comprehensive result of this technique:

Section 4: **Rust inhibitor etch primer** continued:

During, or progress photos continued:

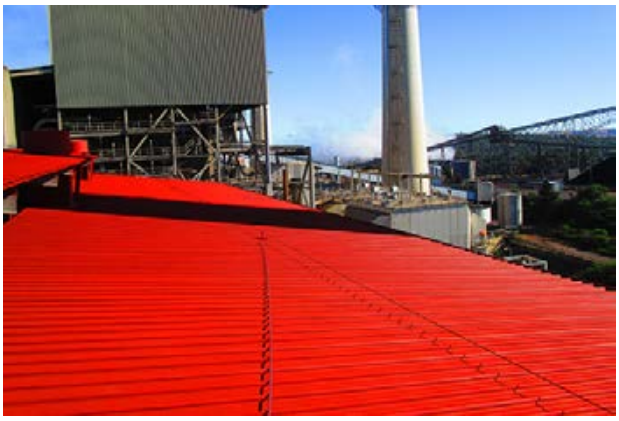







Section 4: **Rust inhibitor etch primer** continued:

Completed rust inhibitor etch primer coating:





Section 4: **Rust inhibitor etch primer** finished:

Single spot flashback

Original condition:

Rust conversion & primer complete:

Rust inhibitor primer completed:

Section 5: **Thermoshield – protective ceramic membrane:**

Following rust conversion and primer the acrylic Thermoshield adhesion to the acrylic rust converter and etch primer is outstanding. All products contain phosphating action when drying.

All products within the coating system are highly compatible.

Thermoshield thermal ceramic coating creates a thick, non-permeable membrane that acts to encase the converted metal, eliminating any and all environmental exposure.

Corrosion ultimately requires water and oxygen. Following permanent rust conversion, the metal is sealed beneath the thick 'blanket' of the Thermoshield ceramic coating, eliminating water and oxygen exposure to the metal.

Thus, essential elements for rust/corrosion have been eliminated from the equation.

First coat of Thermoshield (light grey):


Coating over the vivid red with a high contrasting colour ensures that no spots are missed.

If you spray to lightly, the red will show through. Full red elimination ensures a thick, uninterrupted blanket coverage


The first coat was in fact a very light grey, which is hard to tell from until 2nd coat photos which will follow.

Section 5: **Thermoshield** First coat (shale grey) continued:

Backhand pass – focusing on reverse side of rib:

Forehand pass – completing front side of rib:

The above technique ensures complete, uninterrupted coating coverage.

It also results in thicker than specified dry film thickness, delivering added protection & value.

Section 5: **Thermoshield** First coat (shale grey) continued:

Completed first coat photos:

Section 6: **Thermoshield** Second coat (white):

The second coat was applied in basic white. This is to enable the sprayer to clearly see if they have full coverage & not missed any spots.

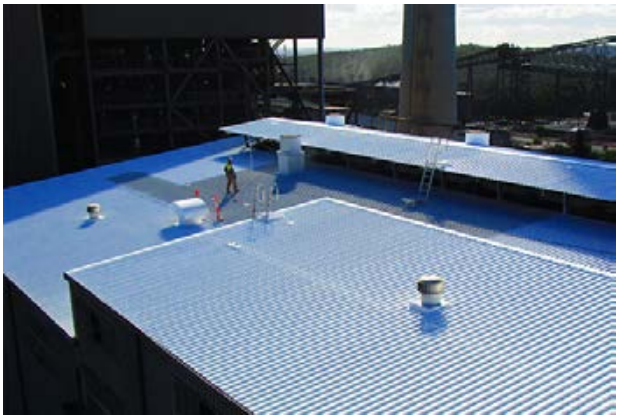
Because the product is so thick, the underlying colour whether it be vivid red, grey or white is completely covered each time.

This ensures maximum protection & evenness of membrane protection without weak links.

Below photos show the white Thermoshield 2nd coat, over the 1st (shale grey) coat:

Wide angle photo clearly showing a thick, even coverage with colour contrast:

Section 6: **Thermoshield** Second coat (white) continued:



Completed second coat in white Thermoshield:

Section 7: **Thermoshield** Third coat (light grey):

The third & final coat is designed to build dry film thickness for maximum protection from corrosive environmental exposure & the damaging effects of UV.

After the final coat, any soft areas on the roof were clearly marked for safety purposes.

Once our coating system was completely, it visually hid a lot of the weak areas – so we needed to highlight these spots for future roof traffic:

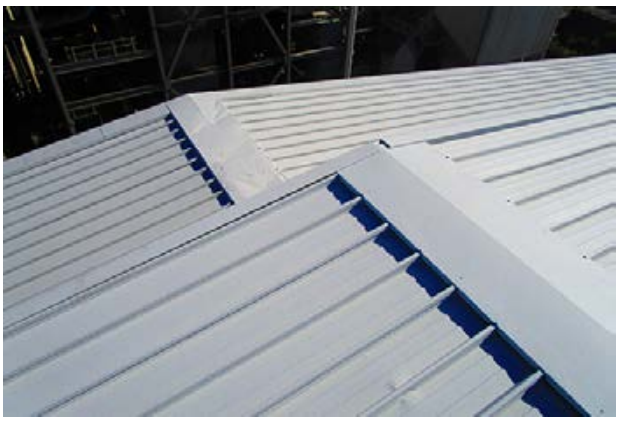
Section 7: **Thermoshield** 3rd coat (light grey) – PROJECT COMPLETION:

After an extensive surface preparation & 5 coats of paint applied, very pleased to present the completed rust conversion & future proofing protective coating system.

Below series of completed photos are of the western half of the boiler house roof, highlighted green in the below diagram:

Starting with the northern area:

Below [left] demonstrates the contrast from the previous roof condition & restored boiler house roofs:



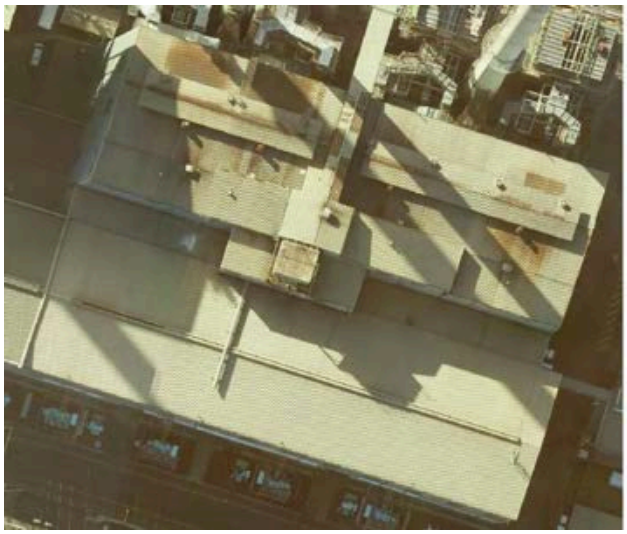
Section 7: **Thermoshield** – PROJECT COMPLETION continued:

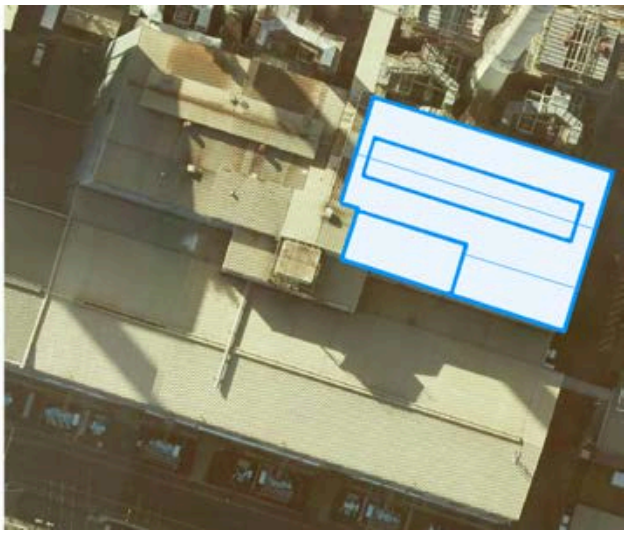







Below series of completed photos are of the eastern half of the boiler house roof, highlighted blue in the below diagram:





Third & final coat applied in a light grey (shale grey):

The rust conversion process is permanent & irreversible.

Once the rust converter & rust inhibitor primer have cured, the thick ceramic membrane creates a non permeable protective 'blanket' shielding the metal from all environmental & chemical exposure (such as coal ash deposited on roof sheet from chimney stacks).

Section 7: **Thermoshield** – PROJECT COMPLETION continued:

Section 7: **Thermoshield** – PROJECT COMPLETION continued:

Below series of completed photos are of the eastern half of the boiler house roof, highlighted yellow in the below diagram:

Third & final coat applied in a light grey (shale grey):

Section 8: **Conclusion:**

After a grueling month comprising of a thorough surface preparation and 5 separate coats - the below panoramic photo demonstrates the completed rust conversion restoration coating system. Complete with 10 year warranty: