

**REFERENCE LIST OF SUPPLY PROJECTS AND SERVICE PROJECTS  
COMPLETED FROM 2012**

**1. BASE METALS AND NON-FERROUS**

(Projects marked \* were full relines or new furnaces)

Materials: Magnesia, mag chrome, chrome mag, chrome alumina, Alumina chrome and aluminosilicate brick & full range of monolithic products (castable, mortar and ramming mixes). Services are noted as well where applicable.

No.	Year	PLANT	FURNACE/TECHNOLOGY	Supply and Services Scope	Country	Commodity
<b>As Verref Shaped Pty Ltd</b>						
60	2012	QMAG Australia	No. 2 Shaft Kiln	Partial Reline	Australia	Magnesite
61	2013	QMAG Australia	No. 1 Shaft Kiln	Partial Reline	Australia	Magnesite
62	2013	Northam Platinum	Six in Line furnace	Infill and upper side wall emergency repair	South Africa	PGMs
63	2013 *	BCL	Cobalt Slag Cleaning Vessel	Complete Reline	Botswana	Nickel
1	2014	Amplats Union Section	Hatch design Six in Line furnace	Side walls	South Africa	PGMs
2	2014	Amplats Waterval Section	Hatch design Six in Line furnace	Side and end wall repairs	South Africa	PGMs
3	2014	Amplats Polokwane Section	Hatch design Six in Line furnace	End wall repairs and Furnace extension.	South Africa	PGMs
4	2015	Glencore Sudbury	Hatch design Six in Line furnace	Full sidewall replacement	Canada	Nickel
5	2015 *	Bindura Nickel	Six in Line furnace	Full sidewall and roof replacement	Zimbabwe	Nickel
6	2015	Palabora Copper	Reverb furnace	Partial walls and roof replacement.	South Africa	Copper
7	2015	Amplats Waterval Section	Hatch design Six in Line furnace	End wall and matte wall repairs	South Africa	PGMs
8	2015 *	BCL	Niro concentrate driers	Full relines	Botswana	Nickel
9	2015 *	BCL	Cobalt Slag Cleaning Vessel	Full reline	Botswana	Nickel
<b>As Refractory and Metallurgical Solution Pty Ltd</b>						
10	2016 *	Palabora Copper	Reverb furnace	Full Reline	South Africa	Copper
11	2016	Amplats Polokwane Section	Hatch design Six in Line furnace	Sidewall and end wall repairs	South Africa	PGMs
12	2016	Amplats Waterval Section	Hatch design Six in Line furnace No.1	Hearth and sidewall	South Africa	PGMs
13	2016	Dundee Precious Metals	Ausmelt	Emergency Hearth replacement following water leak	Namibia	Copper
14	2017 *	Rand Refinery	Electric Arc Furnace	Spare Lining	South Africa	Au/Pb
15	2017	Zimplats	Electric Arc Furnace	Partial rebuild	Zimbabwe	PGMs
16	2018 *	Amplats Union Section	Hatch design Six in Line furnace	Full hearth, sidewall and roof replacement.	South Africa	PGMs
17	2018 *	Amplats UNKI Smelter	Electric Arc Furnace	Full reline, except lower hearth – new project	Zimbabwe	PGMs
18	2018	Amplats Polokwane	Hatch design Six in Line furnace	Sidewall and end walls, Replacement, flash driers	South Africa	PGMs

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No.	Year	PLANT	FURNACE/TECHNOLOGY	Supply and Services Scope	Country	Commodity
19	2019	Amplats Waterval	Hatch design Six in Line furnace No.2	Matte endwall and partial ring repair.	South Africa	PGMs
20	2019	Zimplats	Electric Arc Furnace	Upper Sidewalls replacement.	Zimbabwe	PGMs
21	2019	Amplats Waterval	Hatch design Six in Line furnace No.1	Matte end wall repairs	South Africa	PGMs
22	2019	Amplats Union Section	Hatch design Six in Line furnace	Matte end wall repairs	South Africa	PGMs
23	2019*	Rand Refinery	Electric Arc Furnace	Full Reline	South Africa	Au/Pb
24	2019	Amplats UNKI Smelter	Electric Arc Furnace	Upper sidewalls from skewback level	Zimbabwe	PGMs
25	2020	Amplats various	Hatch design Six in Line furnace	Matte end wall repairs	South Africa	PGMs
26	2020	Amplats ACP	Ausmelt converter	Developed and supplied bespoke Castable for freeboard	South Africa	PGMs
27	2021*	Amplats UNKI Smelter	Electric Arc Furnace	Upper sidewalls from skewback level	Zimbabwe	PGMs
28	2021	Zimplats	Electric Arc Furnace	Upper sidewalls	Zimbabwe	PGMs
29	2021	Amplats ACP	Ausmelt Converter	Castable for freeboard	South Africa	PGMs
30	2021	Hatch (Northam plats)	Hatch design Six in Line furnace	Upper sidewalls and roof	South Africa	PGMs
31	2021*	SPMP Oman	Rotary Kiln	Review of design with changes, Supply Full reline (brick and castable)	Oman	Sb/Au
32	2021*	Tharisa	DC Furnace	Design a lining and supply Full reline excluding roof	South Africa	PGMs
33	2021*	Amplats ACP	Ausmelt Converter	Full hearth and sidewall brick	South Africa	PGMs
34	2021	Amplats Waterval	Hatch design Six in Line furnace No.1	Matte endwall repair	South Africa	PGMs
35	2021	Amplats Waterval	Hatch design Six in Line furnace No.2	Ring repair	South Africa	PGMs
36	2022*	SPMP Oman	Rotary Kiln and offgas system	Full redesign of kiln and complete offgas system Supply materials for reline (brick and castable)	Oman	Sb/Au
37	2022	Amplats Polokwane	Hatch design Six in Line Furnace	Full Reline, excluding hearth	South Africa	PGMs
38	2022	Amplats ACP	Ausmelt Converter	Castable for freeboard	South Africa	PGMs
39	2023*	Rand Refinery	Electric Arc Furnace	Full Reline	South Africa	Au/Pb
40	2024	Amplats UNKI Smelter	Electric Arc Furnace	Upper sidewalls from skewback level	Zimbabwe	PGMs
41	2023	Hatch (Zimplats )	Hatch design Six in Line furnace	Infill Refractories	Zimbabwe	PGMs
42	2023*	SPMP	Rotary Kiln	Full reline Brick and castable	Oman	Sb/Au
43	2024*	RST	EAF	Full reline, hearth and sidewalls	South Africa	PGMs
44	2024*	Northam Platinum	Metix EAF's	Full reline, hearth and sidewalls	South Africa	PGMs
45	2025*	RST	EAF	Full and partial relines, hearth and sidewalls	South Africa	PGMs
46	2025*	Northam Platinum	Metix EAF's	Full and partial relines, hearth and sidewalls	South Africa	PGMs

Materials (refractory brick, castable, mortar, ramming, gunning, expansion papers and fibre blanket) have and are also supplied on a regular basis for consumable applications as follows:

South Africa	Anglo American Platinum, Palabora Copper, Impala Platinum, Lonmin Platinum (Sibanye Stillwater), Northam Platinum, Arxo Metals (Tharisa) Fry's Metals, Rand Refinery, Mintek, Sasol, RST
Namibia	SinomineTsumeb
Botswana	BCL (Closed)
Zambia	KCM, Mopani Copper, Kansanshi Copper
Congo	STL, Gecamines.
Zimbabwe	Zimplats, Bindura Nickel, Riozim, UNKI
Chile	Glencore Copper (Noranda Smelter), Antofagasta and Anglo American Chagres.
Canada	Vale Inco and Glencore INO (Falconbridge/Sudbury).
USA	Asarco Arizona, Sibanye Stillwater Mining, Freeport.
Indonesia	PT Vale (Inco) - Converter brick supply.
Middle East	SPMP – Oman

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**2. OTHER COMMODITIES**

Materials: Alumina silicate, magnesia & chrome mag brick, acid brick, insulation brick and monolithic products. Consumable ladle brick supplied to Scaw Metals, Highveld Steel, Richards Bay Minerals, Tronox and Arcelor Mittal.

No.	Year	PLANT	FURNACE/TECHNOLOGY	Supply and Services Scope	Country	Commodity
40	2014	Middelburg Ferrochrome	DC Arc Furnace	Sidewall replacement	South Africa	FeCr
41	2014	ArcelorMittal Newcastle	Newcastle	Hot Blast Main supply and sacrificial pad in blast furnace.	South Africa	Iron
42	2016	Arcelor Mittal VDB	Coke Ovens	Coke oven reline, SD brick supply.	South Africa	Coke
43	2018	Middelburg Ferrochrome	DC Arc Furnace	Upper sidewall replacement	South Africa	FeCr
44	2018	Sasol Secunda	EAF	Full hearth and upper sidewall	South Africa	Petrochemical
45	2021	Sappi Saiccor	Sulphur Burner Chamber and Boilers	Full supply and install for boiler 4	South Africa	Paper
46	2021	Sappi Saiccor	Sulphur Burner Chamber and Boilers	Full supply and install for boiler 5	South Africa	Paper
47	2022	Sappi Saiccor	Sulphur Burner Chamber and Boilers	Full supply and install for boileras 1 and 6	South Africa	Paper
48	2023	Richards Bay Minerals	ZTP reactor	Full supply of acid refractory materials and technical support	South Africa	Ilmenite/Zircon

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**Reference List**

**3. SERVICES RENDERED**

RMS started marketing and rendering service offerings to the market from 2018.

No.	Year	PLANT	FURNACE/TECHNOLOGY	Services Scope	Country	Commodity
1	2018	SPMP	Rotary kiln and DC furnaces	Review of operational readiness for a greenfield site	Oman	Sb/Au
2	2018	Unki	Electric Arc Furnace	Installation QA/QC; Technical support during installation	Zimbabwe	PGMs
3	2019	SPMP	Rotary kiln	Recovery of kiln after refractory failure during commissioning	Oman	Sb/Au
4	2019	SPMP	DC furnace (Refining)	Recovery of Refining furnace after refractory failure	Oman	Sb/Au
5	2019	SPMP	Rotary kiln	Third party inspection of refractory Installation support of refractory supplied by third party		Sb/Au
6	2019	Tharisa	DC Furnace	Conducted desktop study on refractory and slag interquactions. Confirm refractory selection using rotary slag testwork.	South Africa	PGMs
7	2019	SAPPI	Simon Carves Sulphur burner and boiler	Completed desktop study on boiler failure with reference to refractory qualities to identify the best suited refractory quality for the chamber and boiler.	South Africa	Paper
8	2020	SPMP	Rotary kiln and DC furnaces	Technical evaluation of refractories for rotary kiln and DC furnaces including rotary slag testwork	Oman	Sb/Au
9	2020	Angloamerican Platinum	ACP	Develop and test a bespoke castable for the ACP. Conducted extensive rotary slag testwork on castable developed.	South Africa	PGMs
10	2020	SAPPI	Simon Carves Sulphur burner and boiler	Conducted pre-inspection of boiler 3 failure and made several recommendations for achieving 2-3 year campaign life. Conducted third-party quality inspections on installation process which included reviewing the QCP, bricking practices, expansion compliance and monolithic installation.	South Africa	Paper
11	2021	SPMP	Rotary Kiln and Offgas system	Redesign refractory design for the kiln and offgas system to before cyclones to achieve low heat losses Installation support through QA/QC and design support during installation	Oman	Sb/Au
12	2021	Tharisa	DC Furnace	Design refractory lining excluding the roof with furnace design company	South Africa	PGMs
13	2021	SAPPI	Simon Carves Sulphur burner and boiler	Conducted pre-inspection of boiler 4 failure and made several recommendations for achieving 2-3 year campaign life. Conducted third-party quality inspections on installation process which included reviewing the QCP, bricking practices, expansion compliance and monolithic installation.	South Africa	Paper
14	2021	Dundee Precious Metals	Ausmelt and Pierce Smith C	Conducted extensive Rotary Slag Testwork on third party materials and RMS supplied materials to evaluate performance	Namibia	Copper
15	2021	Angloamerican Platinum	ACP	Conducted extensive Rotary Slag Testwork on third party materials and RMS supplied health materials to evaluate performance	South Africa	PGMs

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No.	Year	PLANT	FURNACE/TECHNOLOGY	Services Scope	Country	Commodity
16	2021	Fry's Metals	Rotary lead furnaces	Conducted a desktop study for Fry's Metals to assist on it's global drive to standardize on refractories. The technical desktop study focussed on three specific refractory brick qualities.	South Africa	Lead
17	2022	SPMP	Rotary kiln	Technical evaluation of refractories for rotary kiln including rotary slag testwork Phase 2	Oman	Sb/Au
18	2022	SPMP	Rotary Kiln and Offgas system	Redesign refractory design for the kiln and offgas system to after cyclones to achieve low heat losses and improve refractory integrity in offgas area Management of supply of refractories and ancillaries (anchors, boards, insulation) Installation support through QA/QC and design support during installation	Oman	Sb/Au
19	2022	RayTech	Electric Arc Furnace	Refractory design and review of taphole design for a copper slag cleaning furnace in Vietnam	Vietnam	Copper
20	2022	SAPPI	Simon Carves Sulphur burner and boiler	Conducted pre-inspection of boiler 5 failure and made several recommendations for achieving 2-3 year campaign life. Principal contractor for the full rebuild of boiler 5 and sub-contracted a trusted installer to conduct the rebuild. Conducted third-party quality inspections on installation process which included reviewing the QCP, bricking practices, expansion compliance and monolithic installation.	South Africa	Paper
21	2022	SAPPI	Simon Carves Sulphur burner and boiler	Conducted pre-inspection of boiler 6 failure and made several recommendations for achieving 2-3 year campaign life. Conducted third-party quality inspections on installation process which included reviewing the QCP, bricking practices, expansion compliance and monolithic installation.	South Africa	Paper
22	2022	Komoto Copper	Sulphur burner unit	Third party inspection from demolition to installation of sulphur plant which included inspecting of new refractory materials, reviewing bricking practices, expansion compliance and monolithic installation.	DRC	Copper
23	2020-ongoing	Fry's Metals	Rotary lead furnaces	Conduct regular thermal scans of the furnaces to detect abnormal wear and predict furnace life	South Africa	Lead
24	2023	Richards Bay Minerals	ZTP Reactor	Lining installed moved. contacted to assist with a recovery plan	South Africa	Ilmenite
25	Various	Various	Refractory brick and precast	Conduct non destructive acoustic testwork to determine internal defects and CCS of brick	South Africa	Various
26	2024	RBM	Ladle Refractories	Conduct rotary slag, spall and physical tests on imported refractory vs locally produced refractory brick.	South Africa	Ilmenite
27	2024	EAS	Bio Mass Incinerator	Conduct post mortem on bio-mass incinerator refractory failure	South Africa	Bio-Mass
28	2024	Mopani Copper	ISA Smelt and MSEF	Supplied engineer to support in QA/QC for a complete reline of the ISA Smelt furnace and matte settling furnace.	Zambia	Copper
29	2025	Sibanye Stillwater	EAF Reline	Supplied engineer to support in QA/QC for a complete reline of the Tenova EAF.	South Africa	PGMs

RMS offer the following services to the pyrometallurgical and chemical industries:

- Third party services including:
  - Quality assurance and quality control of refractory products worldwide.
  - Post-mortem analysis of used/failed refractory products.
  - Quality assurance and quality control of installations.
  - Testing of refractories,
  - Dynamic refractory testing in rotary slag vessel and
  - Design review of refractory linings and refractory specifications.
- Consulting services

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**Reference List**

- For all refractory related problems/ changes
- Operational practices for copper, nickel, PGM's, iron and steel, foundry, lead, zinc, ilmenite, antimony, gold.
- Metallurgical accounting for base metal smelters and refineries.
- Operational leadership in complex metallurgical processes; and
- New process and plant commissioning support.
- Refractory theory training.

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