

华电（印尼）玻雅
2×660MW 坑口电站工程项目
#1 机组检查性大修锅炉中速磨煤机
磨辊套、磨盘衬板在线堆焊

Pekerjaan hardfacing secara online terhadap selubung rol penggiling dan pelat pelapis meja giling pada pulverizer batubara kecepatan menengah boiler Unit #1 dalam pelaksanaan overhaul inspeksi unit

一、采购单位：印尼华瑞电力有限公司

Pihak Pengadaan: PT Pembangunan Listrik Pintar Energi

二、资格条件 Persyaratan Kualifikasi

报价方是印度尼西亚注册公司，具有独立的法人资格，持有有效营业执照，能够独立承担民事责任，具有独立订立合同的权利。

Penyedia jasa merupakan perusahaan yang terdaftar di Indonesia, memiliki status badan hukum yang berdiri sendiri, memegang izin usaha yang sah dan masih berlaku, serta mampu secara mandiri menanggung tanggung jawab perdata, memiliki kewenangan independen untuk mengadakan dan menandatangani perjanjian/kontrak.

报价方近 5 年(2021 年 1 月 1 日至今)至少具有 1 项中速磨煤机磨辊套、磨盘衬板在线堆焊业绩，并提供堆焊业绩的合同原件扫描件（每个原件扫描件均应包括合同封面、采购范围、签字盖章页等主要内容）。

Dalam kurun waktu 5 (lima) tahun terakhir (sejak tanggal 1 Januari 2021 sampai dengan saat ini), Peserta Penawaran sekurang-kurangnya harus memiliki 1 (satu) pengalaman pekerjaan pengelasan pelapisan keras secara online (online hardfacing) pada selubung rol penggiling dan pelat pelapis meja giling pulverizer batubara kecepatan menengah. Peserta Penawaran wajib menyerahkan salinan hasil pemindaian dokumen asli kontrak yang berkaitan dengan pengalaman pekerjaan pelapisan keras tersebut. Setiap salinan hasil pemindaian dokumen asli harus memuat sekurang-kurangnya halaman sampul kontrak, ruang lingkup pengadaan, halaman tanda tangan dan cap/stempel para pihak, serta isi utama lainnya yang dapat

membuktikan keaslian pengalaman pekerjaan dimaksud.

三、**报价截止时间：**2026 年 6 月 25 日雅加达时间 9:00 前。

Batas waktu penyampaian penawaran: Paling lambat tanggal 25 Juni 2026 pukul 09.00 WIB.

四、**工作地点 Lokasi Layanan:** PLTU SUMSEL 8 Desa Tanjung Lalang, Tanjung Agung, Kabupaten Muara Enim, Sumatera Selatan。

五、**工作期限：**详见技术规范书。具体起始时间以采购方通知为准。

Jangka Waktu Layanan Pekerjaan: mengacu pada Spesifikasi Teknis. Waktu mulai pelaksanaan yang sebenarnya mengikuti pemberitahuan dari Pihak Pengguna Jasa.

六、**工作内容及工作要求：**详见技术规范书。

Ruang Lingkup Pekerjaan dan Persyaratan Pelaksanaan Pekerjaan: Sebagaimana diatur secara rinci dalam Spesifikasi Teknis.

七、**其他要求 Persyaratan Lainnya**

1. **报价要求 Persyaratan Penawaran**

(1) 本次报价为固定单价，暂估总价。总价包含但不限于与执行本合同有关的所有费用，如材料费、人工费、税费、利润、保险等费用。代扣代缴税由采购方代为缴纳。报价方分别报出单价和总价，单价固定不变，总价据实结算。所有税率按适用税率执行，如遇国家税率调整，不含税单价保持不变，税率、税费按新的规定执行。

Penawaran ini menggunakan harga satuan tetap dan nilai total sementara (estimasi). Nilai total mencakup, namun tidak terbatas pada, seluruh biaya yang terkait dengan pelaksanaan kontrak ini, termasuk biaya material, biaya tenaga kerja, pajak, keuntungan, asuransi, serta biaya lainnya. Pajak yang wajib dipotong dan dipungut akan dipotong dan disetorkan oleh Pihak Pengguna Jasa sesuai dengan ketentuan peraturan perundang-undangan yang berlaku. Penyedia Jasa wajib mencantumkan harga satuan dan nilai total secara terpisah. Harga satuan bersifat tetap dan tidak dapat diubah, sedangkan nilai total akan diselesaikan berdasarkan realisasi pelaksanaan pekerjaan yang sebenarnya. Seluruh tarif pajak yang berlaku akan mengikuti tarif pajak yang sesuai dengan ketentuan yang berlaku. Dalam hal terjadi penyesuaian tarif pajak oleh negara, harga satuan sebelum pajak tetap tidak berubah, sedangkan tarif dan jumlah pajak akan disesuaikan dan dilaksanakan sesuai dengan

ketentuan terbaru yang berlaku.

(2) 报价人递交的报价响应文件需要签字盖章，请勿重复发送，采购方只认可最后一次报价，且邮件标题名称必须为“玻雅项目 XXX 采购标段报价文件 (**公司) ”。

Dokumen tanggapan penawaran yang disampaikan oleh peserta penawaran wajib ditandatangani dan dibubuhi cap perusahaan. Dokumen penawaran agar tidak dikirimkan berulang kali. Pihak pengadaan hanya mengakui penawaran terakhir yang diterima. Judul/subjek email wajib dicantumkan sebagai:

“Dokumen Penawaran Paket Pengadaan XXX Proyek Boya (Nama Perusahaan)”.

(3) 报价表如下:

Daftar Penawaran adalah sebagai berikut:

报价表						
Daftar Penawaran						
序号 No	名称 Nama Barang	单位 Unit	数量 Jumlah	单价 (Rp) harga satuan	总价 (Rp) Harga total	备注 Keterangan
1	#1 机组检查性大修中速磨煤机磨辊套、磨盘衬板在线堆焊焊丝	千克	7000			1. 焊丝要求详见技术规范书； 2. 总价根据焊丝使用数量据实结算，完成工作所报费用均已全部包含在焊丝报价中。
小计 Subtotal						
增值税 11% (PPN11%)						
合计 Total						

2. 结算付款方式 Cara Pembayaran dan Penyelesaian (Penagihan)

(1) 据实结算，验收合格，甲方在收到双方认可后的正确、合法合规发票

以及结算所需提供的资料后，应在 30 天内支付合同额的 97%，剩余 3%为质保金，质保期为一年，质保期满无质量问题，甲方向乙方支付剩余 3%。

(1) Pembayaran dilakukan berdasarkan realisasi pekerjaan yang sebenarnya. Setelah pekerjaan dinyatakan lulus pemeriksaan dan diterima, serta setelah Pihak A menerima faktur yang benar, sah, dan sesuai dengan ketentuan peraturan perundang-undangan yang telah disetujui oleh kedua belah pihak, beserta dokumen penyelesaian pembayaran, Pihak A wajib membayarkan 97% (sembilan puluh tujuh persen) dari nilai kontrak dalam waktu 30 (tiga puluh) hari. Sisa 3% (tiga persen) dari nilai kontrak akan ditahan sebagai uang jaminan mutu dengan masa jaminan selama 1 (satu) tahun. Apabila setelah berakhirnya masa jaminan mutu tidak terdapat permasalahan kualitas, Pihak A akan membayarkan sisa 3% (tiga persen) tersebut kepada Pihak B.

(2) 通过银行转账付款，报价人应具有银行对公账户。

(2)Pembayaran dilakukan melalui transfer bank. Peserta penawaran wajib memiliki rekening bank atas nama perusahaan (rekening korporasi).

3.评审方式：经评审的最低价法，按照满足采购需求且报价最低原则按顺序推荐候选成交供应商。对不符合资格条件的报价人不予评审。

(3)Metode evaluasi: metode harga terendah setelah evaluasi. Evaluasi dilakukan berdasarkan prinsip pemenuhan seluruh persyaratan pengadaan dengan penawaran harga terendah, dan selanjutnya direkomendasikan secara berurutan sebagai calon penyedia yang ditetapkan. Peserta penawaran yang tidak memenuhi persyaratan kualifikasi tidak akan dilakukan evaluasi.

八、报价响应文件递交方式：纸版密封文件交至玻雅（印尼）发电公司行政办公楼二楼物资部或电子报价发送到指定邮箱 731465071@qq.com。

Metode penyampaian dokumen penawaran: dokumen cetak yang disegel disampaikan ke Departemen Material di lantai 2 Gedung Administrasi PT Huadian Bukit Asam Power, atau penawaran elektronik dikirim ke alamat email yang ditentukan: 731465071@qq.com.

九、联系人及联系电话 **Narahubung dan Nomor Kontak**

商务部分 Bagian Komersial: 于再军 Yu Zaijun 082177928042

技术部分 Bagian Teknis: 李岗 Li Gang 082184383670

十、异议提出渠道和方式：澄清专用邮箱：731465071@qq.com。采购过程中若有疑问可发送至该邮箱，否则不予回复，且邮件标题名称必须为“玻雅项目XXX 采购标段投标疑问（**公司）”。**Saluran dan tata cara penyampaian keberatan/pertanyaan:** klarifikasi hanya dapat disampaikan melalui alamat email khusus klarifikasi, yaitu 731465071@qq.com. Apabila dalam proses pengadaan terdapat pertanyaan, peserta dapat mengirimkan ke alamat email tersebut; pertanyaan yang disampaikan melalui saluran lain tidak akan ditanggapi. Judul/subjek email wajib dicantumkan sebagai:

“Pertanyaan Tender Paket Pengadaan XXX Proyek PLTU Sumsel-8 (**Nama Perusahaan**)”.

十一、采购监督投诉受理邮箱 Alamat Email Penerimaan Pengaduan Pengadaan:chdptlpe@gmail.com。

印尼华瑞电力有限公司

#1机组检查性大修锅炉中速磨煤机磨辊套、磨盘衬板 在线堆焊技术规范书

**Spesifikasi Teknis Pekerjaan Pelapisan Las *Online* Selubung Rol
Penggiling dan Pelat Pelapis Meja Giling *Coal Mill* Kecepatan
Menengah Boiler Unit #1 pada Pemeliharaan Overhaul Inspeksi PT
PEMBANGKITAN LISTRIK PINTAR ENERGI**

审批:

Persetujuan:

审核:

Pemeriksaan:

编写:

Penyusun:

2026.05

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一、总则

一、General rules

1.基本要求

1. Basic Requirements

1.1 本技术规范书适用于印尼华瑞电力有限公司 2026 年 10 月#1 机组检查性大修，4 台中速磨煤机磨辊套、磨盘衬板堆焊工作，它提出了有关堆焊质量、内容、工期、验收标准等方面的技术要求。

1.1 This technical specification applies to the inspection and major overhaul of Unit #1 at Indonesia Huarui Power Co., Ltd. in October 2026, specifically involving the overlay welding of roller sleeves and grinding disc linings for four medium-speed coal mills. It outlines technical requirements regarding welding quality, scope, schedule, and acceptance criteria.

1.2 本技术规范书中提出的是最低限度的技术要求，并未引述相关条文及标准的具体要求，服务方应仔细阅读技术部分的所有规定，服务方提供的材料及施工工艺质量，应完全满足本技术规范书所引述工艺的要求。

1.2 The minimum technical requirements are proposed in this technical specification, and the specific requirements of relevant provisions and standards are not cited. The service provider shall carefully read all the provisions in the technical part, and the quality of materials and construction technology provided by the service provider shall fully meet the requirements of the process cited in this technical specification.

1.3 在签订合同之后，采购方有权提出因规范标准和规程发生变化而产生的一些补充要求，具体项目由双方共同商定，且不增加新的费用。

1.3 After the signing of the contract, the purchaser has the right to put forward some supplementary requirements arising from the change of specifications, standards

and procedures. The specific items shall be agreed by both parties without adding new costs.

1.4 本技术规范书所使用的标准如遇与服务方所执行的标准发生矛盾时，按较优标准执行。

1.4 In case of any conflict between the standards used in this technical specification and the standards implemented by the service provider, the better standard shall be implemented.

1.5 若技术规范书前后有不一致的地方，服务方应在投标前提出澄清，未提出澄清的则以采购方的解释为准。

1.5 If there is any inconsistency between the technical specifications, the service provider shall clarify before the bid, and if no clarification is made, the purchaser's interpretation shall prevail.

1.6 在签订合同之后，采购方保留对本技术规范书提出补充要求和修改的权利，服务方应承诺予以配合。如提出修改，具体项目和条件由双方商定。

1.6 After signing the contract, the purchaser reserves the right to make supplementary requirements and modifications to the technical specification, and the service provider shall promise to cooperate. If modifications are made, the specific items and conditions shall be agreed by both parties.

1.7 本技术规范书经双方共同确认和签字后作为合同的技术附件，与合同正文具有同等效力。

1.7 This technical specification shall be confirmed and signed by both parties as the technical appendix of the contract and shall have the same effect as the text of the contract.

2.服务方资质及业绩要求

2.Service provider qualifications and performance requirements

2.1 印尼境内注册的企业法人，具有独立法人资格，持有有效营业执照，能够独立承担民事责任。

2.1 The enterprise legal person registered in Indonesia has independent legal personality, holds valid business license and can independently bear civil liability.

2.2 近5年至少完成1项中速磨煤机磨辊套、磨盘衬板在线堆焊业绩。

2.2 In the past 5 years, at least one welding performance of medium speed coal mill roller sleeve and grinding plate liner has been completed.

二、工程概况

二、Project Overview

1. 厂址位置

1.Site location

场址位于 MUARA ENIM 县以南 Darmo 镇东南约 3.5km 处（直线距离，下同），东距 CENTRAL BANKO 煤矿约 1.6km，25 号公路在厂址以西约 550m 由北向南通过，Enim 河在厂址以西约 1.0km 由南向北流过。

The site is located approximately 3.5km southeast of Darmo town, south of MUARA ENIM district (straight-line distance, same below). It is about 1.6km east of the CENTRAL BANKO coal mine. Highway 25 runs through the site from north to south about 550 meters to the west, while the Enim River flows from south to north about 1.0km west of the site.

2.气象条件

2.meteorologic condition, weather conditions

本工程所在区域属干湿季明显的热带气候区。干季始于 5 或 6 月，持续约 6 个月到 10 或 11 月结束，其余为湿季。

The project area is a tropical climate zone with a distinct dry and wet season. The dry season begins in May or June and lasts about six months until October or November, and the rest is the wet season.

多年平均年降水量为 3226mm

The average annual precipitation is 3226mm

多年年平均降水日数为 202 天

The average number of rainy days per year is 202

历年最大年降雨量为 4046 mm

The highest annual rainfall is 4046 mm

历年最小年降雨量为 1851 mm

The minimum annual rainfall is 1851 mm

历年极端最高气温为 34.48℃

The extreme maximum temperature in the past years is 34.48℃

历年极端最低气温为 19.77℃

The extreme minimum temperature in the past years is 19.77℃

区域多年逐月气温的变化范围为 21 ~ 33℃, 均值为 27℃, 最冷月为 12 月和 1 月, 5 月到 9 月为最热月, 相对湿度变化范围为 30% ~ 90%, 最小相对湿度常发生在 12 月, 而最大相对湿度常发生在 5 月。

The annual and monthly temperature range of the region is 21 ~ 33℃, with an average of 27℃. The coldest months are December and January, and the hottest months are May to September. The relative humidity range is 30% ~ 90%, with the minimum relative humidity usually occurring in December and the maximum relative humidity usually occurring in May.

多年平均大气压力为 97.94kPa。

The average atmospheric pressure over many years is 97.94kPa.

3. 交通运输

3. traffic

公路:

highway

a) 区域公路

a)Regional Highway

MUARA ENIM 县位于南苏门答腊省西南部, Lematang 河及 25 号公路由南至北纵贯该地区, 该地区对外的交通干线主要为公路, 交通较便利。

25 号公路为沥青路面, 路面宽度为 7m, 路面两侧各有不少于 0.8m 的硬质路肩, 道路通行条件接近于中国的三级公路。

MUARA ENIM County is located in the southwestern part of South Sumatra Province. The Lematang River and Highway 25 run north to south through the area, with the main external transportation routes being highways, making the transportation relatively convenient. Highway 25 is paved with asphalt, has a width of 7 meters, and features hard shoulders of at least 0.8 meters on each side. The road conditions are comparable to those of a third-grade highway in China.

b) 厂外道路

b)Off-site road

煤矿和电厂距离仅 1.6km, 可考虑共建厂外道路。规划煤矿进场道路从电厂北侧通过, 电厂的进厂道路、货运道路可考虑利用煤矿的部分进厂道路; 与煤矿连接的输煤栈桥检修道路可考虑完全利用煤矿进场道路。

The coal mine and power plant are only 1.6km apart, so we can consider building a road outside the plant. The planned road to the coal mine will pass through the north side of the power plant. The power plant's access road and freight road can consider using part of the coal mine's access road. The maintenance road of the coal transport

bridge connected to the coal mine can consider using the coal mine's access road completely.

煤矿检修道路由 25 号公路引接，向东接入煤矿工业广场，长约 2.8km；电厂进厂道路、货运道路均由煤矿检修道路引至 25 号公路，向南进入电厂，长约 0.2km；电厂运灰渣道路由电厂南侧引出，向南接入灰场，道路长约 1.50km。

The coal mine maintenance road connects to Highway 25 and extends eastward to the coal mine industrial square, spanning approximately 2.8 km. Both the power plant access road and freight road branch off from this maintenance road to Highway 25, then proceed southward into the power plant, covering about 0.2 km. The fly ash transportation road originates from the southern side of the power plant and continues southward to the ash disposal site, with a total length of approximately 1.50 km.

上述道路均采用中国的三级厂矿道路标准，路面宽 7m，沥青混凝土路面。

The above roads all adopt China's third-grade factory and mine road standard, with a pavement width of 7m and asphalt concrete pavement.

铁路：

Railway

MUARA ENIM 县内仅有的一条铁路离厂址较远，位于厂址西北方向，自北转向西从该地区通过。

The only railway in MUARA ENIM County is located northwest of the factory site, running westward from the north through the area.

水路：

waterway

Lematang 河为季节性河流，仅具备季节性通航条件，Enim 河基本上不具备通航条件，离厂址最近的码头为西北方向约 200km 的 O.gan 河私人码头。

The Lematang River is a seasonal waterway with only seasonal navigability, while the Enim River is essentially non-navigable. The nearest port to the plant site is the private O.gan River terminal, located approximately 200km northwest.

4.设备现状

4.Device status

玻雅发电公司 2×660MW 机组于 2023 年 10 月投入商业运行，根据年度检修计划，现拟对#1 锅炉部分磨煤机磨辊套、磨盘衬板堆焊修复。

In October 2023, the 2×660MW units of Boya Branch commenced commercial operation. According to the annual maintenance schedule, we plan to perform overlay welding repairs on the grinding roller sleeves and grinding plate liners of some coal mills.

磨煤机协议如下：

The coal mill agreement is as follows

适应煤种 Coal type	烟煤、无烟煤、褐煤、贫瘦煤 Bituminous coal, anthracite, lignite, lean coal
可磨性系数 Grindability coefficient	HGI>35（哈氏可磨度） HGI>35 (Hardness Index)
原煤粒度 Raw coal particle size	0~50mm
磨煤机磨盘转速 Grinder plate speed	30 r/min

本次磨辊套、衬板堆焊修复仅适用于玻雅公司#1 机组检查性大修锅炉 4 台 ZGM113N-II 型中速磨煤机。需修复的磨辊套、磨盘衬板暂定堆焊重量约为 7 吨，根据需要采用在线堆焊方式，具体数量以实际结算数量为准。

This roller sleeve and liner cladding repair is exclusively applicable to four ZGM113N-II medium-speed coal mills in Unit #1 of the Boya Branch during its inspection overhaul. The estimated cladding weight for the required roller sleeves and grinding disc liners is approximately 6.5 tons, to be applied via online cladding technology as needed, with the final quantity subject to actual settlement.

三、修复内容及技术要求

三、Fix content and technical requirements

在磨煤机停运不拆除磨辊套及磨盘衬板的前提下,按照图纸要求对磨煤机磨辊套及磨盘衬板采用明弧堆焊方式施工,不造成设备损坏。

Without removing the grinding roller sleeve and grinding plate liner when the coal mill is out of operation, the grinding roller sleeve and grinding plate liner of the coal mill are welded with open arc according to the drawing requirements, so as not to cause equipment damage.

服务方采取在线堆焊的方式安排堆焊修复时,则双方应在堆焊前后对焊丝重量进行确认签字,将签证单作为结算依据。

If the service provider arranges the repair by online welding, both parties shall confirm and sign the weight of the welding wire before and after the welding, and the visa form shall be used as the basis for settlement.

磨辊套堆焊焊丝(焊条)具有优良的抗磨性及耐压性能,采用的品牌应达到或优于进口品牌:德国法奥迪 VAUTID、德国斯坦因 stein、美国司太立 Stellite,其至少含有 C、Si、Mn、Cr、Fe、Mo、Nb 等元素,部分元素含量至少为: C: 5%~6%、Si: 1%~2%、Mn: 0.8%~3.5%、Cr: 26%~35%、Nb: 5%~7%。

The roll sleeve spot welding wire (rod) features excellent wear resistance and pressure resistance. The selected brand should meet or exceed imported standards: German VAUTID, German Stein, and American Stellite. It must contain at least the following elements: C: 5%–6%, Si: 1%–2%, Mn: 0.8%–3.5%, Cr: 26%–35%, and Nb: 5%–7%.

磨辊套、磨盘衬板堆焊焊丝材质用光谱仪检测,确认材质,并提供材质报告,经采购方确认后方可进行堆焊。

The material of the welding wire used for the grinding roller sleeve and grinding plate backing plate is detected by spectrometer to confirm the material, and the material report is provided. The welding can be carried out only after the confirmation of the purchaser.

因磨煤机磨辊套及磨盘衬板在线堆焊的工作量主要是焊接材料的耗用,工作量按使用焊丝重量计算,每次焊丝开箱前在采购方人员见证下用电子秤称重,使

用前后进行现场签证确认。

Since the workload of online welding of coal mill grinding roller sleeve and grinding plate liner is mainly the consumption of welding materials, the workload is calculated according to the weight of welding wire used. Before each welding wire is unpacked, it is weighed by electronic scale under the witness of purchasing personnel, and on-site verification is carried out before and after use.

对磨损的磨辊装置部件进行修复，修复后组装的磨辊装置总成尺寸、性能达到原设计要求。

The worn parts of the grinding roller device are repaired, and the assembled grinding roller device meets the original design requirements in size and performance.

磨辊套、磨盘衬板堆焊工艺：

Roller sleeve and grinding plate backing plate cladding process

在现场开工前，需对磨煤机磨辊套、磨盘衬板进行焊前原始数据测量，并做完整记录。

Before the site work begins, the original data of the mill roller sleeve and the mill plate liner should be measured before welding, and a complete record should be made.

堆焊前必须安排对工件进行着色探伤检查，确认无影响焊接的裂纹或内部缺陷。如果检查发现裂纹缺陷应通知采购方见证，并打磨直至裂纹缺陷消失后方可实施堆焊工作；堆焊过程中发生由于服务方责任造成的磨辊套、磨盘衬板断裂，服务方应赔偿全新的磨辊套或磨盘衬板。

Prior to overlay welding, the workpiece must undergo dye penetrant testing to confirm the absence of cracks or internal defects that could compromise the welding process. If cracks are detected, the procuring party must be notified and present as witnesses. The workpiece shall be ground until all defects are eliminated before proceeding with overlay welding. Should the service provider be responsible for the fracture of grinding roller sleeves or grinding disc liners during the overlay welding process, they shall compensate by providing new sleeves or liners.

在线堆焊时，焊接地线就近搭接，不得连接到磨辊、减速机上，防止轴承、齿轮因电流通过发生过热损坏。

During online welding, the welding ground wire should be overlapped nearby and should not be connected to the grinding roller or reducer to prevent the bearing and gear from being damaged by overheating due to current passing through.

堆焊前需去除杂质、硬化层。焊接过程中，应严格控制辊面温度不超过 90℃，以确保焊接对基体不产生热应力影响，造成运行中分层、剥落。

Before welding, impurities and hardened layers should be removed. During welding, the temperature of the roller surface should be strictly controlled not to exceed 90℃ to ensure that welding does not affect the thermal stress of the matrix and cause delamination and peeling during operation.

焊接时做好降温冷却工艺，防止加工件整体裂化、变形。

During welding, cooling process should be done to prevent the whole part from cracking and deformation.

堆焊过程中每层厚度不能大于 3 毫米，避免剥落。

The thickness of each layer in the welding process should not be more than 3 mm to avoid peeling.

磨煤机磨辊套及磨盘衬板的堆焊层不得有贯穿性裂纹和密集型气孔、夹渣等缺陷，堆焊和周围母材必须进行渗透探伤检验，并符合 GB/T 9443（铸钢铸铁件渗透检测）的要求。

The overlay welding layer of the coal mill grinding roller sleeve and grinding plate liner must be free from penetrating cracks, dense pores, slag inclusions, or other defects. Both the overlay welding and the surrounding base material must undergo penetrant testing to meet the requirements of GB/T 9443 (Cast Steel and Cast Iron Parts-Penetrant Testing).

过渡层应采用奥氏体不锈钢为焊层打底，以隔离焊接层的裂纹向基体内传递；或消除或减缓因生产过程受到的突然的瞬间冲击，避免硬面层剥落。

The transition layer should be based on austenitic stainless steel to isolate the cracks of the welding layer from the base body; or eliminate or slow down the sudden impact caused by the production process, so as to avoid the peeling of the hard surface layer.

焊接后磨辊套、磨盘衬板耐磨层表面形状应符合原设计要求，用专用测量尺检验时，各测量点的间隙均匀。

After welding, the surface shape of the wear-resistant layer of the grinding roller sleeve and the grinding plate liner should meet the original design requirements. When using the special measuring ruler for inspection, the gap between each

measuring point is uniform.

表面质量用目测的方法检验，尺寸公差用相应的检测工具和仪器进行检验；使用专用卡尺测量堆焊后磨辊、衬板的外形尺寸，对照原产品的图纸要求，其周向尺寸偏差不超过 $\pm 3\text{mm}$ ，径向尺寸偏差不超过 $\pm 1.5\text{mm}$ ，表面应力裂纹均匀，没有明显的凹凸不平，堆焊层表面焊道均匀平整，没有连续性裂纹出现，表面的鳞片状突起不平度不大于 3mm ；表面硬度用硬度仪检测，堆焊时分层检测，表面硬度 $\text{HRC} \geq 60$ 。

Surface quality is visually inspected, while dimensional tolerances are verified using appropriate measuring tools and instruments. Specialized calipers are employed to measure the external dimensions of post-welded grinding rolls and liners. Compared with the original product drawings, the circumferential dimensional deviation should not exceed $\pm 3\text{mm}$, and the radial dimensional deviation should not exceed $\pm 1.5\text{mm}$. Surface stress cracks must be uniform without obvious unevenness, and the weld path on the deposited layer surface should be smooth and flat, with no continuous cracks appearing. The scale-like protrusions on the surface shall not exceed 3mm in unevenness. Surface hardness is tested using a hardness tester. During welding, layered inspections are conducted to ensure the surface hardness reaches $\text{HRC} \geq 60$.

耐磨层的硬度 HRC : 60-65。堆焊后服务方应提供硬度检测报告，供采购方验收。

The wear-resistant layer has a hardness of HRC 60-65. The service provider shall submit a hardness test report after the overlay welding for the purchaser's acceptance.

在施工进行到验收点时，服务方应按采购方有关规定及时通知采购方有关人员进行验收。

When the construction reaches the acceptance point, the service provider shall notify the relevant personnel of the purchaser in time according to the relevant provisions of the purchaser for acceptance.

因生产需求或其他采购方的特殊原因，堆焊修复的磨煤机磨辊套、磨盘衬板尺寸按采购方意见执行。

Due to production demand or other special reasons of the purchaser, the size of the welding repair of the mill roller sleeve and mill plate liner shall be carried out according to the opinion of the purchaser.

磨辊套修复加工主要位置：（1） 15° 接合面；（2）磨辊套堆焊层。

The main repair positions of the grinding roller sleeve are: (1) 15° joint surface; (2) the welding layer of the grinding roller sleeve.

磨辊套的 15°接合面修复：修复前需进行磨损面材质光谱确认，服务方提供材质分析报告，再用与母体材质相同的硬质合金焊丝进行堆焊修补，最后按照原厂图纸尺寸进行车削加工；修复后应去除多余焊疤及飞边，不得有凹陷等焊接缺陷；修复加工后硬度为 $50 \leq \text{HRC} \leq 58$ ，粗糙度要求为 1.6。

Repair of the 15th mating surface of the grinding roller sleeve: Before repair, the material composition of the worn surface must be confirmed through spectral analysis, with the service provider providing a material analysis report. Subsequent repair involves overlay welding using hard alloy welding wire matching the base material, followed by turning operations according to original factory drawings. Post-repair, excess weld scars and flash must be removed, with no dents or other welding defects allowed. The hardened surface shall achieve a hardness of $50 \leq \text{HRC} \leq 58$, with a surface roughness requirement of 1.6.

磨辊套堆焊层修复：堆焊前必须安排对工件进行着色探伤检查，确认无影响焊接的裂纹或内部缺陷；堆焊前需去除杂质、硬化层；焊接过程中，应严格控制辊面温度不超过 90°C，以确保焊接对基体不产生热应力影响；堆焊过程中每层厚度不能大于 3 毫米，避免剥落；堆焊层不得有贯穿性裂纹和密集型气孔、夹渣等缺陷；耐磨层的硬度应 $\text{HRC} \geq 60$ ，堆焊后服务方应提供硬度检测报告。焊丝使用量，按实际称重使用量计算。

Roller bushing overlay repair: Prior to overlay welding, conduct dye penetrant testing on the workpiece to confirm the absence of weld-affected cracks or internal defects. Remove impurities and the hardened layer before welding. During welding, strictly control the roller surface temperature to no more than 90°C to prevent thermal stress on the substrate. Each overlay layer must not exceed 3 mm in thickness to avoid spalling. The overlay layer must be free from through-cracks, dense porosity, or slag inclusions. The wear-resistant layer must have a hardness of $\text{HRC} \geq 60$, and the service provider must provide a hardness test report after welding. Weld wire usage shall be calculated based on actual weighing.

为预防应力异常，在整个堆焊过程中，焊缝层间温度应严格控制，服务方工作人员边焊边检验焊道有无裂纹、气泡等情况，并及时安排处理。

In order to prevent abnormal stress, the temperature between the welding layer should be strictly controlled during the whole welding process. The service staff should check whether there are cracks, bubbles and other conditions in the welding path while welding, and arrange for treatment in time.

如辊套及衬板因堆焊修复过程中造成开裂或碰撞损坏,服务方需免费赔偿整套全新辊套及衬瓦并保证正常使用。

If the roller sleeve and liner plate are cracked or damaged due to collision during the repair process of overlay welding, the service provider shall compensate the whole set of new roller sleeve and liner plate free of charge and ensure normal use.

辊套、衬板堆焊修复后所焊耐磨层使用寿命不少于10000小时,其任一个辊套表面堆焊层不得出现脱落,衬板本体金属外露不得超过1/2,堆焊层不得出现严重的凹坑;任一块衬板表面堆焊层不得出现脱落,衬板本体金属外露不得超过1/2,堆焊层不得出现严重的凹坑。否则由服务方免费进行修复,并重新计算使用寿命。

The service life of roller sleeves and liner plates after overlay welding repair shall not be less than 10,000 hours. The overlay welding layer on any roller sleeve surface must remain intact without peeling, and the exposed metal of the liner plate body shall not exceed 1/2. The overlay welding layer must not develop severe dents. Similarly, the overlay welding layer on any liner plate surface must remain intact without peeling, and the exposed metal of the liner plate body shall not exceed 1/2. The overlay welding layer must not develop severe dents. In case of non-compliance, the service provider shall carry out free repairs and recalculate the service life.

堆焊修复后,服务方应在堆焊修复件外表面注明修复单位及堆焊修复重量,以便采购方对堆焊修复单位进行质量跟踪及验收。服务方应在堆焊修复后的辊套内弧面及衬板非工作面注明第几次堆焊,例如“D1”为第一次堆焊,“D2”为第二次堆焊,以便采购方掌握堆焊次数。

After the cladding repair, the service provider shall mark the repair unit and the cladding weight on the outer surface of the repaired part, enabling the purchaser to track and inspect the quality of the repair unit. The service provider shall also indicate

the cladding sequence on the inner arc surface of the rolled sleeve and the non-working surface of the liner, such as "D1" for the first cladding and "D2" for the second cladding, allowing the purchaser to track the cladding sequence.

严禁不按照辊套、衬板原尺寸进行堆焊修复，如发现因堆焊尺寸不合格造成现场不能修复的需由服务方赔偿采购方全部损失；对虽经修复调整才能勉强满足生产要求的，将由采购方对服务方的多余堆焊重量（或堆焊偏差重量）在费用结算时给予3-5倍的扣除。

It is strictly prohibited to perform overlay welding repairs without adhering to the original dimensions of the roll sleeve and liner plates. If the repair cannot be completed on-site due to non-compliant overlay welding dimensions, the service provider shall compensate the purchaser for all losses. For cases where adjustments are required to barely meet production requirements, the purchaser shall deduct 3-5 times the excess overlay welding weight (or deviation weight) from the service provider during cost settlement.

四、双方责任

四、Responsibilities of both parties

1.采购方责任

1.Purchaser's Responsibility

1.1 负责和服务方修复后的辊套、衬板进行质量验收。

1.1Responsible for quality acceptance of repaired roller sleeves and liners provided by the service provider

1.2 负责向服务方指定需堆焊的辊套及衬板。

1.2 Responsible for specifying the roll sleeve and liner to be welded to the service provider.

1.3 负责与服务方共同对耐磨焊材出入厂区时进行称重。

1.3 Responsible for weighing the wear-resistant welding materials when they enter or leave the factory together with the service provider.

2.服务方责任

2. Service provider responsibility

2.1 负责辊套、衬板堆焊修复的整项工作，并对全部堆焊件质量负责。

2.1 Responsible for the whole work of roll sleeve and liner plate welding repair, and responsible for the quality of all welded parts.

2.2 负责因辊套、衬板堆焊修复所需的全部运输工作。

2.2 Responsible for all transportation required for roll sleeve and liner plate welding repair.

2.3 负责与采购方共同对辊套、衬板堆焊修复相关工作的质量验收。

2.3 Responsible for the quality acceptance of roll sleeve and liner plate welding repair with the purchaser.

2.4 负责与采购方共同对耐磨焊材出入厂区时进行称重。

2.4 Responsible for weighing the wear-resistant welding materials together with the purchaser when they enter or leave the factory.

五、工期要求

五、Construction timeline

1.在线堆焊：2026 年 10 月#1 机组检查性大修期间。

Online cladding: During the inspection and major overhaul of Unit #1 in October 2026.

2.每台磨煤机堆焊时间为 7 天，总工期不超过 30 天。

Each coal mill requires a welding period of 7 days, with the total project duration not exceeding 30 days.

六、质量保证：

六、quality assurance

1.修复后的辊套、衬板质量保证期为 1 年。

1.The warranty period for repaired roller sleeves and liners is 1 year

2.在线堆焊过程中，如因堆焊工艺控制不当或焊材问题而发生辊套断裂的，服务方承担全部损失并免费更换新辊套，新辊套费用由服务方自理。半年内焊件

堆焊表面焊材磨损量达 20mm 以上的,服务方无偿更换磨辊套。

2.During the overlay welding process, if a roller sleeve fractures due to improper process control or welding material defects, the service provider shall cover all losses and replace the sleeve free of charge, with replacement costs borne by the provider. If the wear on the welded surface exceeds 20 mm within six months, the service provider shall replace the worn roller sleeve at no cost.

3.质保期内衬瓦本体金属外露不得超过 1/2, 堆焊层不得出现严重的凹坑;任一块衬瓦表面堆焊层不得出现脱落, 发生一次, 考核 10000 元。
3.During the service life, the exposed metal of the lining body shall not exceed 1/2, and the severe depression shall not appear in the welding layer; the welding layer on any surface of the lining body shall not fall off, and the assessment shall be 1000 to 100,000yuan.