

SDSTA Yates Ore Motor-Generator Set Refurbishment RFB

RFB Posted: September 11, 2020
Questions Due: September 18, 2020 2:00 P.M. (MT)
Answers Posted: September 22, 2020 2:00 P.M. (MT)
Bid Due Date: September 25, 2020 2:00 P.M. (MT)

The South Dakota Science and Technology Authority (SDSTA) is requesting a bid for the transport and refurbishment associated with the two Flywheel Bearings [#118 & #119] and On-hand Spare Flywheel Bearing of the Yates Ore Motor-Generator Set. This motor-generator set is located in the Yates Hoist Building, near the Yates Shaft (630 East Summit Street Lead, SD 57754), at the Sanford Underground Research Facility (SURF). The lowest price technically acceptable (LPTA) source selection process will be used for awarding this contract. Selection will be made based on the lowest evaluated price of bids meeting or exceeding the acceptability criteria detailed in Section 4. Fixed bid prices shall be submitted for all items indicated herein, except for unforeseen conditions of MG set components that would warrant the need for repairs.

Documents included in this Request for Bids include:

- A. This Request for Bid
- B. Terms and Conditions
- C. Component Photos
- D. Example Bearing Photos from Earlier Refurbishment
- E. Oil Clearance Requirements
- F. Operating Condition Videos Link

This RFB is organized as follows:

- Section 1.0 – Introduction
- Section 2.0 – SDSTA Requirements
- Section 3.0 – Scope of Work
- Section 4.0 – Bid Requirements
- Section 5.0 – General Requirements
- Section 6.0 – Bid Submission Requirements
- Section 7.0 – Reference Materials

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1.0 Introduction

The Yates Ore Hoist is driven by twin 1,500 horsepower DC motors. Power for these motors is supplied by an original 1930's vintage motor-generator (MG) set, consisting of a 2,000 horsepower wound-rotor induction AC motor that drives two 1,250 kilowatt DC generators and a 68.07 ton flywheel. When work began in June 2020 to refurbish the Yates Cage MG Set, the Yates Ore MG Set was shut down to install jumper cables that would allow the cage drive motors to temporarily receive power from the Yates Ore MG Set. During startup of the Yates Ore MG Set, it was discovered that the flywheel bearings [#118 & #119] were having a difficult time allowing the common shaft to rotate and the AC Motor [#113] was pulling an excessive amount of amperage. The West DC Generator [#112] was also noticeably very dirty and had odd build up on the coils. When the Ore Hoist MG Set was refurbished in 2016, insufficient funds were available to refurbish the two flywheel bearings and on-hand spare flywheel bearing. To assure good shaft alignment of the rotating assembly, the two pedestal supported journal bearings [#118 & #119] supporting the flywheel [#111] and on-hand spare flywheel bearing will be refurbished through this contract. To improve the overall condition and reliability of the Yates Ore Hoist MG set and ensure that shaft maintenance can resume uninterrupted until the Drives, Brakes, and Clutches project is executed in FY22/FY23, the West DC Generator [#112] will also be sent out for refurbishment, but through a separate contract.

The layout of the Yates Ore Hoist MG set can be seen in Figure 1 below with identification numbers shown next to the major components.

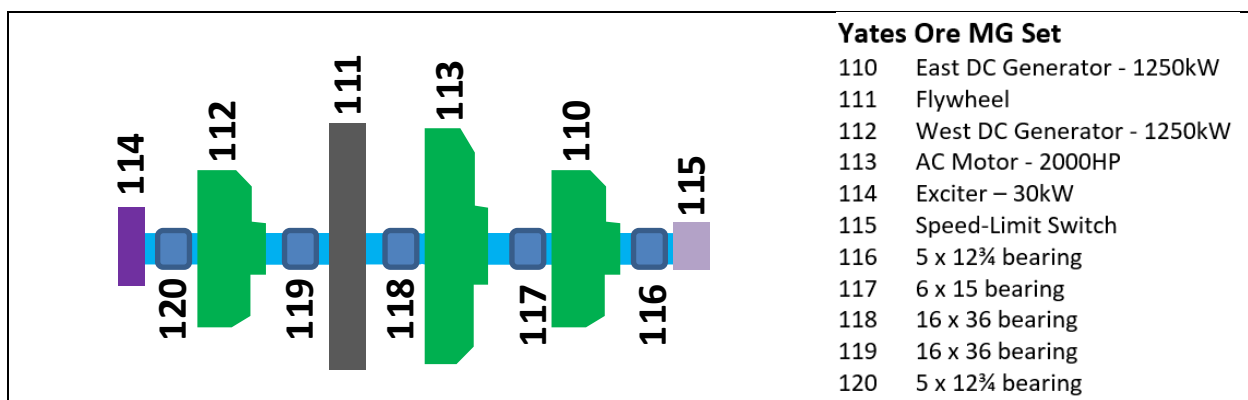


Figure 1: Yates Ore MG Set Component Layout and Identification

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The overall approach for this project is:

- 1.1** The On-hand Spare Flywheel Bearing will be transported to a refurbishing/repairing facility offsite. Once there, the On-hand Spare Flywheel will be refurbished to-like new condition.
- 1.2** The refurbished On-hand Spare Flywheel Bearing will be transported back to the SURF. Once there, the refurbished bearing will be unloaded.
- 1.3** After the MG set has been shut down by SDSTA, Flywheel Bearing [#119] will be removed and replaced with the on-hand spare bearing. The MG set will then then be aligned, commissioned, and restarted.
- 1.4** The removed Flywheel Bearing [#119] will then be transported to a refurbishing/repairing facility offsite. Once there, the Flywheel Bearing [#119] will be refurbished to like-new condition.
- 1.5** The refurbished Flywheel Bearing [#119] will be transported back to the SURF. Once there, the refurbished bearing will be unloaded.
- 1.6** After the MG set has been shut down a second time by SDSTA, Flywheel Bearing [#118] will be removed and replace with newly refurbished Flywheel Bearing [#119]. The MG set will then be aligned and restarted.
- 1.7** Flywheel Bearing [#118] will be transported to a refurbishing/repairing facility offsite. Once there, the Flywheel Bearing [#118] will be refurbished to like-new condition.
- 1.8** The refurbished Flywheel Bearing [#118] will be transported back to the SURF. Once there, the refurbished bearing will be unloaded and stored as a new on-hand spare.

The sequential breakdown of the above items has been detailed in Section 3.0.

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2.0 SDSTA Conditions

MG Set Component Specifications

The original equipment design conditions are as follows:

- **East DC Generator [#110] Specifications:** 1250 kW, 600 volts, 2080 amps, 713 rpm, Westinghouse Open-type Frame DD 513.7, SO 8-P-264, Serial Number 1S8P264 (new nameplate serial number shows 1 05/16)
- **West DC Generator [#112] Specifications:** 1250 kW, 600 volts, 2080 amps, 713 rpm, Westinghouse Open-type Frame DD 513.7, SO 8-P-265, Serial Number 1S8P263
- **AC Motor [#113] Specifications:** 2000 hp, 2200 volts, 468 amps/term, 60Hz, 3 Phase, 712 rpm, Westinghouse Open-type Frame 10-58-14, 40 Degree Celsius Rise, 837 rotor volts, 1085 rotor amps, Westinghouse SO 8-P-265 Type CW, Serial Number 1S8P265
- **DC Exciter [#114] Specifications:** 30 kW, 250 volts, 120 amps, 708 rpm, Westinghouse ODP Frame 163 Type SK, 100% load @ 24hours with 40 Degree Celsius Rise, Style 8P266, Serial Number 1S8P266
- **Bearing [#116] Specifications:** Yates Ore Hoist East Generator Outboard Bearing, 5" ID x 12-3/4" L hydrodynamic journal type bearing with oil slingers. This bearing has cast iron shells consisting of two halves. The interiors of the shells are lined with high grade Babbitt metal.
- **Bearing [#117] Specifications:** Yates Ore Hoist East Generator Inboard Bearing, 6" ID x 15" L hydrodynamic journal type bearing with oil slingers. This bearing has cast iron shells consisting of two halves. The interiors of the shells are lined with high grade Babbitt metal.
- **Bearing [#118] Specifications:** Yates Ore Hoist Flywheel East Bearing, 16" ID x 36" L hydrodynamic journal type bearing with oil slingers. Hydrostatic lift is provided during initial rotation by filtered lube pumps. This bearing has cast iron shells consisting of two halves. The interiors of the shells are lined with high grade Babbitt metal.
- **Bearing [#119] Specifications:** Yates Ore Hoist Flywheel West Bearing, 16" ID x 36" L hydrodynamic journal type bearing with oil slingers. Hydrostatic lift is provided during initial rotation by filtered lube pumps. This bearing has cast iron shells consisting of two halves. The interiors of the shells are lined with high grade Babbitt metal.

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- **Bearing [#120] Specifications:** Yates Ore Hoist West Generator Outboard Bearing, 5" ID x 12-3/4" L hydrodynamic journal type bearing with oil slingers. This bearing has cast iron shells joined from two sections. The interiors of the shells are lined with high grade Babbitt metal.
- **On-hand Spare Flywheel Bearing Specifications:** Yates Ore Hoist Flywheel Bearing, 16" ID x 36" L hydrodynamic journal type bearing with oil slingers. This bearing has cast iron shells consisting of two halves. The interiors of the shells are lined with high grade Babbitt metal.

Onsite Equipment and Personnel

The following onsite equipment and personnel are available to assist in the removal and transport of MG set components between the transporting trucks and the MG set room:

- **Overhead Cranes:** The MG set room in the Yates Hoist Building contains a 25-ton overhead crane that can be used to hoist equipment towards the perimeter of the MG set room. The hoist room in the Yate Hoist Building contains a 30-ton overhead crane that can be used to hoist equipment towards the large entry doors. A trained SDSTA operator will be available to control the cranes.
- **Forklift:** A Lull forklift rated at 10,000 lbs. and a trained SDSTA operator will be available to load and unload components onsite.

Present Operating Conditions

- An internet link to recent video recordings of the Yates Ore MG set while it is operating has been provided in the reference noted in Section 7.4.
- The Offeror may choose to perform an in-person walkthrough at his or her own expense prior to submitting a bid.
- The MG set is housed in a heated building, which is cooled by using exhaust fans and by opening windows.
- Variable frequency drives are not used with this MG set.

Disassembly

- The bearing shells will be removed from their supporting pedestals prior to shipment. The bearing pedestals will remain in place.

3.0 Scope of Work

- 3.1 Arrange to have a transporting truck arrive at the SURF, where SDSTA personnel will load the On-hand Spare Flywheel Bearing onto the truck for transport to the refurbishing facility offsite.

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- 3.2** Transport the On-hand Spare Flywheel Bearing to the refurbishing facility.
- 3.3** Refurbish the On-hand Spare Flywheel Bearing to like-new condition.
- 3.4** Arrange to have a transporting truck transport the refurbished On-hand Spare Flywheel Bearing back to the SURF. Once there, the refurbished bearing will be unloaded by SDSTA personnel.
- 3.5** Arrange to have a transporting truck arrive at the SURF, where SDSTA personnel will load Flywheel Bearing [#119] onto the truck for transport to the refurbishing facility offsite. This could possibly be arranged to take place using the same truck used to transport the On-hand Spare Flywheel Bearing if the truck is able to wait one day while bearing [#119] is removed from the MG-set and packaged for transport.
- 3.6** Transport the Flywheel Bearing [#119] to the refurbishing facility.
- 3.7** Refurbish the Flywheel Bearing [#119] to like-new condition.
- 3.8** Arrange to have a transporting truck transport the refurbished Flywheel Bearing [#119] back to the SURF. Once there, the refurbished bearing will be unloaded by SDSTA personnel.
- 3.9** Arrange to have a transporting truck arrive at the SURF, where SDSTA personnel will load Flywheel Bearing [#118] onto the truck for transport to the refurbishing/repairing facility offsite. This could possibly be arranged to take place using the same truck used to transport Flywheel Bearing [#119] if the truck is able to wait one day while bearing [#118] is removed from the MG-set and packaged for transport.
- 3.10** Refurbish the Flywheel Bearing [#118] to like-new condition.
- 3.11** Arrange to have a transporting truck transport the refurbished Flywheel Bearing [#118] back to the SURF. Once there, the refurbished bearing will be unloaded by SDSTA personnel.

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4.0 Bid Requirements, Acceptability Criteria, and Pricing Breakdown

Bid Requirements

Your bid should be provided in digital format as a pdf file with standard letter size format. Please note there is a 30-page limit for your response to bid requirements. Bids must contain the following:

- 4.1 Provide the contact information, including an email address, for the Offeror's designated contact person who can receive and distribute RFB information.
- 4.2 Provide the contractual relationship, name, and a brief description of the role of each subcontracting organization that would be involved in the performance of this project. Note that the named subcontractors and outside associates or consultants must be used, and any change must be approved by the SDSTA.
- 4.3 Note exceptions to the draft contract or other RFB materials.
- 4.4 Disclose any existing relationships and previous work with the SDSTA/SURF.
- 4.5 Provide demonstrated evidence of meeting the acceptability criteria (subsections 4.5.1 through 4.5.3) for this contract.

Acceptability Criteria: The SDSTA will award a contract resulting from this solicitation to the responsible offeror whose bid package conforms to the bid requirements and is determined to be the lowest priced among those bids rated "technically acceptable." For purposes of determining whether a bid is "technically acceptable," the following criteria for acceptability shall apply:

4.5.1 Evaluation Criterion #1

Offeror shall have an effective worker safety and health program established for all work performed under this contract.

Evaluation Factors:

- Provide a description of the safety programs of contractors and subcontractors who would be performing work under this contract.
- Provide safety records for the past three years (incident/injury

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records, OSHA300 logs and EMR data) of contractors and subcontractors who would be performing work at SURF under this contract.

4.5.2 **Evaluation Criterion #2**

Offeror shall have an effective quality management program established for all services offered under this contract.

Evaluation Factors:

- Provide a description of the quality management programs of contractors and subcontractors who would be performing work under this contract. QA/QC manuals will not count towards the 30-page limit.

4.5.3 **Evaluation Criterion #3**

Offeror shall have experience refurbishing journal bearings of similar size, construction, and vintage as those detailed in Section 1, Section 2, and Section 7.

Evaluation Factors:

- Describe at least two examples of Babbitt lined journal bearings that the contractor/subcontractor has refurbished within the past 10 years. The dimension(s) of the bearing example(s) should be as close as possible to 16"ID x 36"L. Examples should note the customer, the location, and the dates of the projects. Examples should also detail the extent of the refurbishment (inspecting, testing, rebabbiting, milling, repairing, etc.) and the results.
- Provide resumes for all key project staff that would be working on this project. Resumes shall note qualifications, certifications and experience with similar, relevant projects.

Each criterion will be rated using the following scoring method:

Acceptable	<i>Meets criteria for acceptability/evaluation required under the technical provisions. Weaknesses are correctable.</i>
Marginal	<i>Fails to meet criteria for acceptability/evaluation. Any significant deficiencies are correctable. Lacks essential information to define a bid package.</i>

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Unacceptable	<i>Fails to meet a criterion for acceptability or an acceptable evaluation standard and the deficiency is uncorrectable. Bid package would have to undergo a major revision to become acceptable. Demonstrated lack of understanding of the SDSTA's requirements or omissions of major areas.</i>
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- 4.6** Provide a bid sheet with the pricing breakdown detailed below. The Offeror may submit a marked up copy of Section 4.6. Alternatively, the Offeror may submit a custom bid sheet, so long as the same line items are used as shown in the breakdown below.

Pricing Breakdown: Prices shall be broken down based on grouped scope of work (SoW) items from Section 3. These groups include transporting and refurbishing the flywheel bearings. Pricing shall be based on meeting an overall project duration of 80 working days (M-F), which includes a standard refurbishment time of 15 working days for each of the bearings (excluding unforeseen repairs). All lump-sum prices listed below shall account for all materials, labor, tools, equipment, lodging, per diem, overhead, and all contractor/subcontractor expenses directly related to planning and executing the transporting and refurbishment of the bearings.

Transporting (SoW items 3.1, 3.2, 3.4, 3.5, 3.6, 3.8, 3.9, 3.11)

Lump Sum Price for Transporting \$ _____

Refurbishing (SoW items 3.3, 3.7, 3.10)

Lumped sum pricing for refurbishing the journal bearings shall be broken out in the table below. In the event that initial inspections have determined repairs are needed prior to reconditioning, these repair services shall be quoted as adders based on parts and hourly labor rates. The labor rates for repairs shall be noted in the table below.

Two separate line items have been included in the table below for leather bearing seals. Seals shall be made of 9/11 oz. thick harness leather with skive cuts between holes to allow shaft fitting as one-piece seals; however, the SDSTA will consider alternative seal construction if detailed by the Offeror in the bid materials. The new seals shall ship loose with the bearings for future installation by the SDSTA.

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On-hand Spare Bearing Lump-sum Recondition	\$
Bearing [#118] Lump-sum Recondition	\$
Bearing [#119] Lump-sum Recondition	\$
QTY. 3 Leather Bearing Seals for 16.254" Shaft Diameter	\$
QTY. 3 Leather Bearing Seals for 16.233" Shaft Diameter	\$
Shop Labor Rate for Repairs	\$ /hr
Machine Shop Labor Rate for Repairs	\$ /hr

5.0 General Requirements

5.1 **Bearing Reconditioning**

The steps detailed in Subsections 5.1.1 through 5.1.8 shall be performed at a minimum as part of reconditioning the bearings. All costs (material, labor, oversight, etc.) required to complete this service shall be included in the lump-sum bearing reconditioning prices detailed in Section 4.6.

5.1.1 **Initial Shop Inspections and Tests**

An initial inspection shall be made to take dimensional measurements and assess the general condition of the bearing shell exterior and oil slinger rings for defects, cracks, and broken welds.

5.1.2 **Melt and Remove Old Babbitt**

Old babbitt shall be removed from the shell using industry standard methods and temperature limits.

5.1.3 **Inspect Shell Interior**

An inspection shall be made to assess the general condition of the bearing shell interior for defects, cracks, and broken welds.

5.1.4 **Repair (if needed)**

Repairs are not included as part of the reconditioning service; however, this subsection serves as a placeholder to show between which reconditioning steps repairs would likely occur. Refer to Section 5.2 for the general requirements that apply to repairs.

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5.1.5 **Apply New Babbitt**

- Prepare bearing surfaces by cleaning with stainless steel brushes, grit blasting, and solvents to remove oils and contaminant residues. Mild heat may be used to draw oils from the cast iron.
- Apply flux and commercial pure tin to the interfacing surface to obtain a high-quality bond between the Babbitt and the shell.
- The new Babbitt metal is to be applied using the centrifugal casting method while industry standard levels of heating & cooling are applied to the shell and the Babbitt.
- The new Babbitt metal is to consist of newly refined ASTM B-23, Grade 2 alloy.

5.1.6 **Machine Work**

Machine bore newly poured bearings to like-new dimensions. Machine & drill oil reliefs, oil ports, and oil slinger grooves.

5.1.7 **Final Shop Inspections and Tests**

Record all finished dimensions for future service. The refurbished bearings shall be tested using the following tests:

- Ultrasonic inspection (UT): Each bearing shall be ultrasonically inspected to ensure optimum bonding of the Babbitt to the base metal.

5.1.8 **Prepare for Transport**

The shells shall receive a final cleaning and protective coating prior to transport.

5.2 **Repairing**

If initial tests and inspections have determined that repairs are needed, the Offeror shall develop a brief report of the findings with an explanation of the recommended repairs. The report shall also provide a quote for labor and materials to perform the repairs. The Offeror shall not proceed any further in refurbishing or repairing this MG set component without written approval by the SDSTA.

5.3 **Applicable Standards and Practices**

In addition to the manufacturer's instructions, the standards and practices listed below shall be followed for refurbishing and commissioning this MG set and shall be a component of the Contractor/Subcontractors' QA/QC programs. If different standards or practices would be followed during this project, the Offeror shall note the followed standards and practices as part

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of the evidence for meeting the acceptability criteria given in response to subsections 4.5.2 and 4.5.3.

- **DOD-STD-2183** – Bond Testing, Babbitt-Lined Bearings
 - The Chalmers and chisel tests are not required.
 - Alternative standard: **ISO 4386-1:2019** – Non-destructive ultrasonic testing of bond of thickness greater than or equal to 0.5mm
- **DOD-STD-2188** – Babbitting of Bearing Shells (Metric)
- **EASA Sleeve Bearing Repair Tips**, EASA Convention 2007

5.4 The Contractor/Subcontractors shall abide by all applicable federal, state, and local laws and ordinances, as amended from time to time. Including but not limited to, the applicable local laws and ordinances.

5.5 **Warranties:** All service work and parts supplied to refurbish the Flywheel Bearings [#118 & #119] shall be guaranteed with a shelf-life warranty and an in-service warranty. Any warranted failures shall be corrected at no cost to the SDSTA including transportation of the component to and from the SURF. These warranties are void if the DC Generator has had any unauthorized work, unauthorized modifications, or if the bearing has failed to function due to improper storage, improper setup, improper use, neglect, contaminant damage, tampering, or acts of God.

- **Shelf-life Warranty:** The shelf-life warranty period begins on the date of shipment from the refurbishing facility and remains in effect until one of the following three conditions is met: the component is installed and put into service, a period of (5) years has elapsed, or the warranty has been voided. Upon delivery, the Contractor shall provide instructions on proper storage requirements for upholding the shelf-life warranty.
- **In-service Warranty:** The in-service warranty period begins on the date the bearing has been put into service and if done before expiration of the shelf-life warranty. The in-service warranty then remains in effect until one of the following two conditions is met: a period of (90) days has elapsed, or the warranty has been voided. Written notification shall be given to the Contractor promptly after each refurbished bearing has been installed and placed into service.

5.6 Prior to the commencement of work, the following planning documents shall be provided to the SDSTA for approval:

- **Quality Control Plan**

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- Notes who the contractor's QC representative will be.
 - Summarizes or outlines the personnel, procedures, instructions, and reports that will be used to ensure quality.
 - Summarizes the procedure for how nonconforming items will be dealt with.
 - Includes a submittal register detailing what submittals and deliverables will be made while tracking approval dates.
- 5.7** The Contractor/Subcontractors shall be responsible for ensuring the bearings are properly prepared, secured, and tied down for shipment. All bearings shall be covered, secured, and protected from water, dust, and damage during transit. The SDSTA shall provide the wooden crate used to transport the bearings.
- 5.8** **Transfer Records:** All records (project reports, warranty information, meeting notes, data files, project data, original tracings, maps, field sketches, lab reports, test data, etc.) generated shall be the property of the SDSTA and shall be turned over to the SDSTA upon completion of the contract or as directed. All deliverables shall be required to be delivered to the SDSTA in hardcopy and electronic (original software and PDF) format.
- 5.9** The contractor/subcontractors shall be responsible for the proper handling of all waste resulting from this project's scope of work.
- 5.10** The SDSTA may at its sole and absolute discretion reject any and all, or parts of any and all submissions; re-advertise this solicitation; postpone or cancel at any time this solicitation process; or waive any irregularities in this solicitation or in the submittals received as a result of this solicitation.
- 5.11** All expenses involved with the preparation and submission of materials to the SDSTA, or any work performed in connection therewith, shall be borne by the Offeror(s). No payment will be made for any responses received, nor any other effort required of or made by the Offeror(s) prior to commencement of work as defined by a contract approved by the SDSTA.
- 5.12** The bid package materials will be evaluated by the Selection Committee appointed by the SDSTA. The Selection Committee will recommend an

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Offeror by consensus based on the Selection Criteria noted in this RFB.

- 5.13** The SDSTA reserves the right to enter contract negotiations with the selected Offeror. If the SDSTA and the Offeror do not agree to terms of a Contract, the SDSTA may elect to terminate negotiations and begin negotiating with other vendors. This process will continue until a contract has been executed, or, all submittals have been rejected. No Offeror shall have any claims and/or rights against the SDSTA arising from such negotiation and/or the qualification process.
- 5.14** The SDSTA reserves the right to contract for all or part of the work program described in this RFB.
- 5.15** Offeror(s) submitting bid materials should not submit any information in response to this solicitation which the Offeror(s) considers to be a trade secret or confidential. The submission of any information in connection with this solicitation shall be deemed conclusively to be a waiver of any trade secret or other protection, which would otherwise be available to the Offeror. In the event that the Offeror submits information in violation for this restriction, either inadvertently or intentionally and clearly identifies that information in the submission as protected or confidential, the SDSTA will endeavor to redact and return that information to the Offeror. The Selection Committee will then evaluate the balance of the submission. The redaction or return of information pursuant to this clause may render a submission nonresponsive.
- 5.16** Bid security: Bids over \$50,000 must be accompanied by a bid security as follows:
- Bid Bond: A bid bond of ten percent (10%) of the total amount of the bid including all add alternatives, shall be furnished by the Contractor. A form of Bid Bond is included with the bid documents.
 - Certified Check or Cashier's Check: In lieu of a Bid Bond, a certified check or cashier's check for five percent (5%) of the amount of the bid, including all add alternates, may be furnished. Such check shall be certified or issued by either a state or national bank and payable to the South Dakota Science and Technology Authority.
 - Payment and Performance Bond: Upon award of contract, Contractor shall provide a Payment and Performance Bond produced by a South

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Dakota licensed insurance producer (agent) and issued by a South Dakota licensed surety in an amount not less than the amount of the awarded contract. The Payment and Performance Bond surety or sureties shall meet all requirements of South Dakota law. This bond is to secure the faithful performance of the contract and the payment of those to whom the offeror may become legally indebted for labor, materials, tools, equipment, or services of any kind used or employed by the offeror in performing the work. The surety bond shall be on a form similar to the form of Payment and Performance Bond in the time state shall be cause for consideration by the Owner of awarding the contract to another responsible and responsive offeror, and retention of the bid deposit.

- Power of Attorney: Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

6.0 Bid Submission Requirements

The contractor shall submit an electronic copy (.pdf format) of the bid no later than **2:00 p.m. mountain time on September 25, 2020**, to: mbaumann@sanfordlab.org. Late submissions will not be accepted.

The bid period may be extended at the discretion of the SDSTA based on the quantity and/or complexity of questions. Any notices of extension of time to respond will be distributed to all prospective offeror by the SDSTA.

7.0 Reference Materials

- 7.1 *Bearings [118_119] Yates Ore MG Set.pdf* – This document contains pictures taken in August 2020 of the bearings along the common shaft of the Yates Cage MG Set. These photos show the external parts of the bearing pedestal housings.
- 7.2 *Example Bearing Photos from Ore Hoist MG Set.pdf* – This document contains pictures taken when some of the bearings on the Yates Ore Hoist MG Set were being disassembled and refurbished in 2014/2016.
- 7.3 *Oil Clearance Requirements.pdf* – This document shows the minimum and maximum clearances permitted between the journal and sleeve of the bearing.
- 7.4 *Operating Condition Videos Link.pdf* – A series of videos were recorded

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in August 2020 of this MG set in its operating condition. These video can be accessed by clicking on the hyperlink in this document, which should then open the user's web browser and load the Microsoft OneDrive directory where these videos are being stored. The user may play the videos in the web browser or download to his/her computer first.