Alabama State Port Authority
McDuffie Island Terminal
Mobile, AL

Replacement of
RCD2 Take-Away System (TAS2)

TECHNICAL SPECIFICATION

Project A218-003

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SI Designations Used in this Specification

All tonnage and tonnage rates are metric using the following SI designations:

Metric Units		Imperial Units	
t	metric tonne	T	short ton
t/h	tonnes per hour	Tph	short tons per hour
t/d	tonnes per day	Tpd	short tons per day
t/a	tonnes per annum	Tpa	short tons per annum

1 Introduction

a. Alabama State Port Authority (ASPA / Owner) is planning to replace and/or modify the existing equipment and components making up the #2 train unloading system (Project), located on McDuffie Island, in Mobile Alabama (Site).

b. Railcars currently deliver unit trains of primarily metallurgical and on occasion thermal coal to the Site to be unloaded and transferred to existing storage yards on existing equipment. The new train unloading system will allow ASPA to unload railcars more reliably and efficiently satisfying immediate needs and future production capacity increases.

c. The Design/Supply Project consists of two distinctive packages:

   i. replacement of the Rotary Railcar Dumper #2, Indexer and Wheel Chock Train Holding System (RCD2). The RCD2 is a separate package, excluded from this Specification.

   ii. replacement of the receiving hoppers, feeders, collection conveyors, transfer onto the take-away conveyor C-16 and ancillary systems (Take-Away System, “TAS”).

d. The new TAS package consists of:

   i. redesign and replacement of the four (4) existing take-away receiving hoppers with new hoppers complete with inlet grizzlies, side deflector panels, liners and all associated plate work and support steel;

   ii. replacement of eight (8) existing vibratory feeders with four (4) apron feeders;

   iii. replacement of two (2) existing 72” under-hopper receiving conveyors (C22 & C23) with one (1) 96” collection conveyor below the apron feeders.

e. The Scope of Work (“Work”) covered in this Technical Specification is the TAS design, supply and delivery to Site, and technical field services and technical assistance during construction as explained herein.

f. Drawings and other documents referenced herein and attached hereto form the basis of the TAS conceptual arrangement. The intent of the conceptual arrangement drawings provided in Attachment 1 RCD2-TAS Dwg Package **(Ref. Para. 12**Error! Reference source not found.**)** is to demonstrate the geometric feasibility and functional soundness of the retrofit project, and to identify and define as many scope items as practical that are specific to this type of brownfield project. The conceptual arrangement is not complete. The Contractor shall verify all data and be responsible for final design and performance as outlined in this Specification.

2 Scope of Work

The TAS Contractor ("Contractor") shall be responsible for the following:

2.1 Design & Supply

a. The Contractor shall be responsible for the Design & Supply portion of the Project as outlined in this Specification and the Attachments hereto (**Ref: Para. 12**). This includes, but is not limited to:

   i. Final engineering design and manufacturing of the TAS to include all necessary labor, materials, equipment, controls, manufacturing, component procurement and supply, inspections and final technical documentation,

   ii. delivery to the Site (including all freight, brokerage, duties, and insurance) and

   iii. field technical services and support during construction, startup, pre-commissioning, commissioning, testing and training.

b. The following Sub-sections provide a high-level summary of the items included in the Design & Supply portion of the Work. Section references noted contain specific details.

2.1.1 General (Ref: Para. 5.1)

a. All the items covered by this Specification to be supplied and installed within the TAS Scope of Work shall be of the Contractor's standard heavy-duty proven design and construction with consideration given to standardized components and avoidance of custom/special components that cannot be easily acquired from the market place.

b. Contractor shall provide components as described in Attachment 3, Preferred Equipment List, to match equipment on site for commonality of spare parts.

c. The Contractor shall focus on, and make provision for, minimizing the operating and maintenance problems arising from the possible buildup of coal and coal dust.

2.1.2 Receiving Hoppers (Ref: Para. 5.2)

a. Welded steel grizzly continuous along the length of all four hoppers.

b. Four (4) new steel receiving hoppers with extended side-shields on three sides (dump (east) side, and north and south ends) to direct coal into the primary hoppers.

2.1.3 Apron Feeders (Ref: Para. 5.3)

a. Four (4) stationary, variable rate, "tractor-type" heavy duty apron feeders with dribble collection conveyors.

2.1.4 Collection Conveyor (Ref: Para. 5.4)

a. 96" belt conveyor designed to collect the discharge from the four (4) apron feeders via individual transfer chutes and to convey coal to existing 72" belt conveyor C-16.

b. Conveyor shall be complete with all structural, mechanical and electrical components necessary for a total operating system.

c. Conveyor shall be equipped with four (4) single idler weigh scales, positioned downstream of each of the four (4) feeder load points.

d. Support legs for installation on existing concrete floor.

e. Full length skirts, closed at the top with removable covers for inspection and replacement of abrasion resistant liners, and removable sections for belt splicing table and vulcanizing equipment.

2.1.5 Chutes and Skirtboards (Ref Para. 5.5)

a. Four transfer chutes from feeders to collection conveyor

b. Collection conveyor head chute with lower transition chute designed to 'soft-load' the coal from the 96" conveyor to the existing C-16 conveyor in a manner that centers the load on C-16 and minimizes or eliminates dust emissions, spillage, chute plugging and excessive chute wear.

c. Abrasion resistant plate liners in areas on both sides of full length skirtboards (collection conveyor and conveyor C16), head chute and transfer chute that come in contact with coal flow.

d. Replacement of existing skirtboards along conveyor C-16 with new skirtboards designed to interface with the collection conveyor transfer chute.

e. Debris grizzly with chute for bobcat cleanup

2.1.6 Platforms, Ladders and Lift Beams (Ref Para. 5.6)

a. Service platforms, lift beams, access ladders, handrails as needed to support, maintain and replace the TAS equipment and components.

b. Lift beams, where not already available, for lifting and handling equipment and replacement components into and out of the vault

2.1.7 Manual Lubrication (Ref: Para. 5.7)

a. Centralized and accessible manual lubrication systems complete with all hoses, stainless steel lines and manifolds

2.1.8 Safety Requirements (Ref: Para. 5.8)

a. Safety requirements include all safety switches (operating and emergency), status indication at the Operator's cab, guards and other devices and components to ensure the safety of personnel and equipment.

2.1.9 Painting & Corrosion Protection (Ref: Para. 5.9)

a. Shop surface preparation and painting systems including all labor, supervision, tools, equipment, cleaning and paint materials and all other materials required to provide an effective protection against corrosion of all supplied equipment as specified herein

b. Protection of all unpainted surfaces for shipping and storage.

2.1.10 Other Requirements (Ref: Para. 5.10)

a. Preparation for shipping and storage of equipment and structures

b. Nameplates for plant and equipment identification and record purposes

2.1.11 Structural Steel (Ref: Para. 6)

a. All structural steel following Structural Design Requirements as outlined herein.

2.1.12 Electrical Equipment, Devices and Control System (Ref: Para. 7)

a. Existing electrical building to be reused for Contractor-supplied electrical panels, drives, controls, etc.

b. All electrical equipment including motor control centers, motors, variable frequency drives, starters, contactors, devices, transducers and instrumentation, etc.

c. PLC, matching HMI hardware, complete set of ABB or Allen Bradley software, functional programming and detail documentation

d. Fiber optic interface hardware for PLC communications

e. All safety and service switches, warning sirens, motion strobe lights and all proximity limit switches complete with activators, flags and supports as required

f. Local control stations for all Take-Away equipment drives for testing and maintenance purposes

g. Local LED lighting around the feeders and at the head end of collection conveyor.

h. All interconnection wiring inside supplied equipment and to field devices as required

i. All brackets and supports for fixing cable trays, conduit, junction boxes, lighting, pull boxes, switches, etc. either pre-welded to the equipment structures or supplied loose with predrilled mounting holes on structures.

j. Hard-wired interlocks

2.1.13 Spare Parts (Ref. Para. 10)

a. Contractor shall identify, supply and deliver critical spare parts for commissioning and for 12 months of operation.

b. Contractor shall provide a separate list of recommended strategic (long term) Spare Parts.

2.1.14 Technical Documentation

a. Contractor to provide the following Technical Documentation:

i. General arrangement and detail drawings, S/M/E arrangement drawings w/ bills of materials, electrical drawings, diagrams, as-built drawings and final alignment drawings.

NOTE: S/M/E arrangement and design drawings shall be submitted to Owner for review and comment at ~30% completion and at completion prior to release for manufacture.

ii. Installation and Commissioning Manual

iii. Operations and Maintenance (O&M) Manual

NOTE: The Operating Philosophy portion of the O&M Manual shall be provided to Owner for review and comment during the design phase of the Work.

iv. Training Manual and Materials

v. Listing and stand-alone pricing of “Special Tools”

vi. Quality Assurance Program

b. Installation and Commissioning Manual shall describe all work associated with receiving, storage on site, field fabrication, field painting and touch-up painting, assembly, S/M/E installation, commissioning and performance testing (no-load, load & performance) of the Contractor supplied equipment and components for the TAS System as described in this Technical Specification. The Manual shall provide complete instructions for the installation and commissioning of the TAS. Special focus shall include, but is not necessarily limited to, the following:

   NOTE: This Manual shall be a deliverable with the final engineering documents for ASPA to use for inquiry of installation contractor bids.

   i. Structural Mechanical Erection Drawings

   ii. Electrical drawings and diagrams complete with wiring and interconnection diagrams, wire specifications, cable routing, cable and conduit schedules, device locations and any other information necessary for electrical installation by others.

   iii. Add standalone copies of any and all PLC programming and all commissioning drive parameters

   iv. Setting, field fitting as required, assembling and aligning all equipment and accessories

   v. All grouting and shimming under machinery and structures as required

   vi. Installation of first fill of all flushing fluids and lubricants for all lubrication systems drives and bearings including hydraulic fluids

   vii. Description of all labor, tools and equipment necessary to support Pre-commissioning, No-Load Testing, Load-Commissioning and Performance Testing

   viii. Lubrication, servicing and maintenance records of the TAS and maintaining service records of work to be carried out, up to the successful completion of the Performance Test.

   ix. Installation and dismantling instructions of temporary structures, supports, cribbing, equipment and services

   x. All required reports, installation and test protocols and schedules.

   xi. The Manual shall be updated to provide a permanent record of: performance and commissioning test data and results, field alignment and surveys and as-built conditions.

c. Operation and Maintenance Manual

   i. The Operation and Maintenance (O&M) Manual shall consist of the following Sections: Operation, Safety, General Service Information, Parts Information, Routine Maintenance Schedule, Routine Maintenance Procedures, Troubleshooting Information, Component Service and Replacement and Operating Philosophy.

   ii. The O&M Manual shall provide sufficient detail to allow the Owner’s personnel to effectively and safely: operate, service, inspect, maintain, adjust, troubleshoot, repair, replace and overhaul all sub-systems and components of the TAS.

iii. Danger, warning and caution, signage shall be posted on the machine and in the MCC building and operator's cab, and shall also be clearly defined in Safety section of the O&M Manual.

iv. Lockout / tagout procedures, electrical and mechanical, shall be developed in cooperation with ASPA and the results included in the appropriate section(s) of the O&M Manual.

v. Special attention must be given to identification of and methods to control hazardous energy conditions in the O&M Manual.

vi. Contractor shall follow the safety guidelines as outlined by OSHA and ANSI.

vii. Contractor shall comply with ASPA's Access Policy (**Ref. Para 4.6**).

d. Training Materials. Contractor to provide all Training Materials used to conduct training sessions consisting of:

i. Electronic presentations and hardcopy handouts.

ii. One electronic copy of each training material file in a native software format mutually agreed upon with the Owner and in pdf format.

iii. Training materials shall separately address operator and maintainer audiences, and shall provide them with accurate and up-to-date reference materials.

iv. Training materials shall be separate and distinct from the Operation and Maintenance Manuals.

e. Special Tools:

i. Describe all special tools required for major maintenance and repair activity.

ii. Contractor to provide separate pricing in the Proposal for "special tools".

f. Quality Assurance Program

i. Contractor is to describe their Quality Control and Assurance Program in the Proposal (Organization & management, documented standards & specifications, shop & field inspections and record keeping, control & prevention of non-conformances, "quality process" during engineering & design, acceptance/rejection of fabrications, etc.)

2.2 Technical Services - Design & Supply

a. Contractor to provide the following Technical Services during Design & Supply portion of the Work:

i. Services of Contractor and Contractor's sub-contractors personnel for technical consultation during detailed design, design reviews by the Owner, shop fabrication and delivery.

ii. In shop inspection and testing services, including load testing of equipment drives (motors, speed reducers, electrical controls, PLC, programming, etc.)

2.3 Technical Field Services & Support

a. The Contractor shall provide the following Technical Field Services and Support:

i. Field supervision and support consisting of: S/M/E construction / installation, startup, pre-commissioning, commissioning, and testing (no-load, load & performance) in accordance with the detailed Installation and Commissioning Manual.

b. The Contractor shall provide On-Site Training to include.

i. Sufficient information, training materials, and experienced trainers to successfully instruct Owner's operators and maintenance personnel how to safely operate, service and maintain the TAS equipment under all conditions. (**Para.2.1.14**)

ii. Contractor shall provide the services of equipment suppliers' personnel where applicable

c. On-call Staffing: Contractor shall provide 24 hour on call staffing for the first 30 days of operation following successful performance testing.

2.4 Work EXCLUDED

a. Demolition and disposal of existing Tandem Rotary Railcar Dumper, Positioner System, Wheel Chock System and TAS system consisting of hoppers, vibratory feeders, two belt conveyors and associated support platforms, head chutes, loading skirts onto C16 and the existing sump pump system.

b. Installation and field assembly of the Take-Away System.

c. Removal of existing electrical panels inside the MCC building, hardware and wiring on the existing TAS not applicable to the new TAS electrical. To be coordinated between Contractor and ASPA.

d. Foundation construction, modifications and/or replacement, including all anchor bolt supply, (as required) to dumper vault concrete to suit Contractor's foundation designs.

e. Civil work, site preparation and access (if applicable).

f. Train unloading station area lighting including area lighting in the underground vault unless otherwise noted herein.

g. Supply and Installation of sump pumps, agitators and water dilution system.

h. Work associated with the RCD2 System, e.g. rotary dumpers, positioner, wheel lock system.

i. Electrical substation and 4160V and/or 480V power supply feeder cables switchgear, circuit breakers, electrical hardware, cabling etc. terminated inside and /or located inside the existing MCC Building.

j. Fiber optic Ethernet cable from the Owner's PLC to Contractor's Take-Away PLC.

k. Supply of lubricants after Performance Testing.

l. Dust suppression system and water supply.

m. Field painting and touch-up.

2.5 Boundary Limits

The boundary limits of the Work will be as follows:

a. The top or surface of existing concrete with anchor bolts, by others, for the replacement hoppers, apron feeders, collection conveyor and platforms. Top of steel for the collection conveyor loading chute and skirts.

b. Interface of the TAS PLC communication equipment and programming with Plant system within the MCC building.

c. 4.16kV switchgear incoming terminals.

d. 4.16kV and/or 480V MCC main switch incoming terminals. Contractor to coordinate with RCD Contractor as to the adequacy of the existing 480V switch capacity for the new RCD2 and TAS system equipment.

3 Design Criteria

3.1 General

a. The TAS consists of replacement hoppers, apron feeders, and collection conveyor; complete with electrical systems to form a fully functional facility designed in accordance with the latest technology and standards to perform to the requirements specified in these documents.

b. TAS will be operated in a corrosive and dusty environment located in an area of high humidity and saltwater mist.

c. The highest practicable standards of safety shall be adopted and implemented at the design stage. A formal safety review shall identify and eliminate potential risks at the outset of the Project.

d. Safe access shall be provided for the purpose of routine maintenance, operation and/or replacement of major equipment and components.

e. Industry standard and good engineering practice shall be used in the design to maximize ease of service and maintenance, access to equipment, ergonomics, ready change-out, light weight covers, easy clean-up and wash-down.

f. Hoppers are accessible by cranes; however, apron feeders and the collection conveyor are located below the hoppers within the concrete vault. Where components are not accessible by crane, suitably sized monorails or jacking equipment shall be provided.

g. The design shall be driven by installation and removal procedures for components, providing the safest and quickest replacement when required. This includes modularity for components subject to wear, minimal adjustment and alignment requirements for components and maintainability with regard to manageable size of components. Lifting lugs shall be provided on all components.

3.2 Performance Requirements & Guarantee

3.2.1 Working Duty and Economic Life

a. The TAS shall be designed for heavy-duty service based on the following criteria:

i.	Throughput (Future projection)	12 - 14 Million Tpa
ii.	Working shifts per day	3
iii.	Working hours per day	24
iv.	Working days per year	353
	(One planned maintenance outage day per month)	

3.2.2 Design Life

a. The TAS components and structures shall be designed, treated and painted to attain a 30-year Design Life. The Contractor shall define the operating and maintenance conditions required to achieve this Design Life in an economical fashion.

3.2.3 System Availability

a. The TAS design shall achieve a minimum availability of 97%, as defined below:

   i. TAS availability shall be calculated as the total calendar hours in a year, less the total scheduled downtime hours in a year, divided by the total calendar hours in a year. Scheduled downtime shall include Planned Maintenance plus any planned downtime outside of scheduled maintenance.

   ii. Planned Maintenance shall take no more than ~265 h/y (~3% of 8,760 h/y), in accordance with the Planned Maintenance requirements outlined by the Contractor in the O&M manual.

   iii. The Planned Maintenance program shall not consider any opportunistic time for planned maintenance during non-operating periods

   iv. The TAS availability shall be calculated on a yearly basis. The TAS availability shall be warranted only for the duration of the "defects liability" period which is the same as the Warranty Period.

b. The Contractor shall provide guidelines and procedures to assist the Owner in achieving these objectives.

3.2.4 System Reliability

a. The TAS design shall achieve a minimum reliability of 98% according to the following:

   i. TAS reliability shall be achieved over any 12-month period within the TAS's specified design life.

   ii. The TAS reliability shall be calculated as the time the System is being utilized, less the repair time, divided by the time the System is being utilized. Utilized time shall be defined as the time during which the System is working at full and/or reduced rates.

3.3 Unloading Rates

a. The Unloading Performance Rate is an hourly rate, at which the TAS will receive and convey coal from the rotary railcar dumper system in order to unload and handle one complete unit train including the time to position and dump the first cars and position the last railcars. Any breakdown or external delays caused by the railway, RCD system and/or downstream conveyors shall be excluded. The following are the required design rates:

3.3.1 Performance Rate

a. Take-Away Unloading Capacity (Peak Design Rate - Future) 6,000 Tph

   (Four feeders operating at peak rate of 1,500 Tph each)

b. The Contractor shall submit the necessary drawings and calculations to demonstrate to the satisfaction of Owner's Engineer the ability of the TAS to achieve the specified Future Peak Design Rate.

c. Nominal rates as described below for each coal product, based on present-day equipment capabilities.

3.3.2 Metallurgical Coal (Primary Product Governing Design)

a. Downstream Conveyors (Peak Rate – Met coal) ~4,800 Tph
(Conveyor C16 - 72" belt, 650 fpm, 35° trough, 25^0 surcharge, 60 pcf, coal, 90% CEMA fill)
(Four feeders operating at a nominal average rate of 1,200 Tph each)

3.3.3 Thermal Coal (Occasional Product System Programmed to Adjust Accordingly)

a. Downstream Conveyors (Peak Rate – Thermal coal) ~3,700Tph
(Conveyor C16 - 72" belt, 650 fpm, 35° trough, 20^0 surcharge, 45 pcf coal, 90% CEMA fill)
(Four feeders operating at a nominal average rate of 925 Tph each)

3.4 Coal Properties & Characteristics

3.4.1 Metallurgical Coal

a. Metallurgical coal is the primary product handled through the train unloading system, and is the basis of the TAS design. The characteristics of the metallurgical coal are as follows:

Table 3-1 – Metallurgical Coal Characteristics

No.	Characteristics	Metallurgical Coal
1	Bulk Density (power calculations)	67 PCF
2	Bulk Density (volumetric calculations)	60 PCF
3	Stacking Angle of Repose	35 Deg
4	Surcharge Angle on Moving Conveyor	25 Deg
5	Particle/Lump Size	100% < ¾" w/ 93-97% <1/4"
6	Moisture Content	9% - 11% as high as 13%
7	Flow Characteristics	Sluggish to Poor
8	Coal Abrasiveness	Moderate

3.4.2 Thermal Coal

a. Thermal coal will be handled by the TAS. The typical characteristics are as follows:

Table 3-2 – Thermal Coal Characteristics

No.	Characteristics	Thermal Coal
1	Bulk Density (power calculations)	50 PCF
2	Bulk Density (volumetric calculations)	45 PCF
3	Stacking Angle of Repose	35 Deg
4	Surcharge Angle on Moving Conveyor	25 Deg

5	Particle/Lump Size	Granular. 100% < ~2”
6	Moisture Content	8% - 10%
7	Flow Characteristics	Average to Free flowing
8	Coal Abrasiveness	Moderate

3.5 Operating Wind Speed

The following is the Train Unloading System operating wind speed requirements

a. Warning Wind Speed (no shut down, monitor wind closely) 20 mph

b. Shutdown Wind Speed: 35 mph

3.6 Climatic and Service Conditions

a. Location Mobile, Alabama

b. Temperatures:

i. Average Maximum (5/19 thru 9/27) 84° F (29^0 C)

ii. Maximum Dry Bulb 104° F (40^0 C)

iii. Average Minimum (12/1 thru 2/27) 66° F (19^0 C)

iv. Minimum Dry Bulb 14° F (-10^0C)

c. Precipitation

i. Rainfall (Annual average) 66.29”

ii. Extreme Daily Rainfall 7.25”

d. Humidity

i. Relative Humidity up to 100%

e. Winds:

i. Average speed (Jan thru Apr) ~10 mph

ii. Most Frequent Directions North (Feb thru July), East (Aug thru Oct)

iii. Maximum Hourly Speed TBD

iv. Maximum Gust Speed TBD

v. Days with Winds >35 mph (shutdown speed) TBD

vi. Storm wind 130 mph

f. Additional Comments

i. TAS design shall be appropriate for the ambient conditions, which include marine atmosphere with fine coal dust.

ii. The TAS equipment shall be suitably designed to withstand washdown sprays at 150 PSI.

iii. For the design of bearings and gearboxes, the maximum ambient shade dry bulb temperature shall be taken as 122°F and a minimum temperature of 14°F.

iv. For structural design, a minimum temperature range of 120°F, from minimum to the maximum air temperature shall be adopted.

v. Train Unloading Station will be open to the elements, i.e. no enclosures.

4 CODES AND STANDARDS

4.1 General

a. The TAS shall be designed to internationally accepted standards approved by the Owner.

b. The Contractor shall state in its Proposal the standards to be applied. If the Contractor prefers to work to standards other than those specified in these Technical Specifications, Contractor shall submit with the Proposal, sufficient data, in English, to permit the Owner to judge the suitability thereof.

c. In case of conflict between standards and this Specification, the most stringent requirements shall apply unless otherwise approved by the Owner.

d. All references to codes, standards and/or material specifications shall be to the latest revision, including all effective supplements or addenda thereto, as of the date of the invitation to submit Proposals.

4.2 Mechanical Standards

a. Unless specifically noted otherwise, all mechanical components, equipment and materials to be supplied under the "Scope of Work" shall meet or exceed the requirements of all applicable codes and standards as referenced in the text and listed below:

Table 4-1. Mechanical Standards	
AGMA	American Gear Manufacturer's Association
AFBMA	Antifriction Bearing Manufacturers Association
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
FM	Factory Mutual
HI	Hydraulic Institute
ISO	International Standards Organization
NFPA	National Fluid Power Association
JIC	Joint Industry Conference
SAE	Society of Automotive Engineers
UL	Underwriters Laboratories

4.3 Structural Standards

Unless specifically noted otherwise, all structural components, equipment and structural materials to be supplied under the "Scope of Work" shall meet or exceed the requirements of all applicable codes and standards as referenced in the text and listed below:

Table 4-2. Structural Standards	
AISC	American Institute of Steel Construction
AWS	American Welding Society
AREMA	American Railway Engineering Maintenance-of-Way Association
ASTM	American Society for Testing and Materials
ASTM A325M/A325	High-Strength Bolts for Structural Steel Joints Including Suitable Nuts and Plain Hardened Washers
ASTM A370	American Society for Testing and Materials
IBC	International Building Code
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
SSPC	Society for Protective Coatings

4.4 Electrical Standards

Unless specifically noted otherwise, all electrical components, equipment and electrical materials to be supplied under the "Scope of Work" shall meet or exceed the requirements of all applicable codes and standards as referenced in the text and listed below:

Table 4-3. Electrical Standards	
ANSI	American National Standards Institute
IEEE	Institute of Electrical and Electronic Engineers
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
UL	Underwriter’s Laboratory
FM	Factory Mutual

4.5 Corrosion Protection Standards

The following corrosion protection standards generally apply and form part of this Specification:

Table 4-4. Corrosion Protection Standards	
SSPC	Steel Structures Painting Council, all applicable standards

4.6 Safety Standards & Procedures

The following safety standards generally apply and form part of this Specification:

Table 4-5. Safety Standards	
OSHA	Occupational Safety and Health Administration
ANSI	American National Standards Institute
Alabama State Port Authority Access Policy: http://www.asdd.com/portaccess.html	

5 Design Requirements

5.1 General

The TAS Contractor ("Contractor") shall:

a. provide all the items covered by this Specification and to be supplied and installed within the Take-Away Scope of Work shall be of the Contractor's standard heavy-duty proven design and construction. Contractor shall notify Owner of any departure from its available and proven design and specifications unless otherwise required to suit the operation and duty specified herein.

b. provide, where possible, standardized electric motors, gear reducers, shafts, bearings and all other components requiring periodic maintenance shall be standardized to minimize spare parts and components inventory,

c. avoid the use of custom / special components that cannot be easily acquired from the market place,

d. identify any custom / specialized parts or components in the Proposal, should they be required,

e. focus on, and make provision for, minimizing the operating and maintenance problems arising from the possible buildup of coal and coal dust,

f. furnish the necessary equipment drawings, design loads and calculations in accordance with the project schedule to enable the Owner's installation contractor to design, construct and/or modify the concrete vault and other foundations, where applicable, to accommodate the new Take-Away equipment,

g. include time and resources to conduct a review of the foundation drawings (provided by Others) for general fit-up and co-ordination purpose,

h. identify for the Owner the maximum electrical power requirement for all supplied equipment,

i. provide all access platforms, walkways and ladders necessary for routine inspection, maintenance and service. E.g. at each of the apron feeders and at the head end of the new collection conveyor. Access shall not compromise material flow or risk coal buildup.

j. provide foundation / equipment loads, anchor bolt sizes, bolt patterns, shear pockets, etc necessary for installation contractor to design and install foundations and equipment supports,

k. provide all field bolts, fasteners, shims, gaskets, brackets, etc.

5.2 Receiving Hoppers

a. The Contractor shall provide a complete Hopper, Grizzly and Support Structure that shall include, but may not be limited to the following:

   i. Welded steel grizzly with 12" x 12" openings, installed flush with the top of hopper, which shall be flush with the top of existing concrete.

   ii. Four (4) steel hopper structures, reinforced and stiffened, with wear plate liners. Hoppers shall be fabricated in large sections with consideration for shipping and minimizing installation time and complexity.

iii. Provide corner plate treatments in all hopper corners to reduce the risks of material buildup in hopper valleys. Corner plates shall be seal welded.

iv. Extended side-shields on three sides; east side (dump side), and north and south ends, to direct coal into the primary hoppers.

v. Self-relieving hopper outlets (ie. narrower opening at the back gradually increasing in width to the front), arranged above horizontal apron feeders.

vi. Auto-adjusting, PLC controlled, hydraulic actuated, slide gates ("shear gates") shall be provided at the outlet wall of each hopper. The gates shall be lined with the same liner material as defined for chutes and hoppers.

vii. Head chutes with transition chutes and skirtboards in accordance to Para. 5.5).

viii. All bolts, washers and nuts and miscellaneous hardware for shop and field installation. Grade classifications and manufacturers of bolts and hardware are to be specified. Bevel washers are required for connections to channel flanges.

ix. Anchor bolt patterns, loads and anchor bolt requirements for installation by others on the existing concrete vault structure.

x. Coordination and detailing of the interface between the hopper, grizzly and hopper side shields and the RCD sill beams located above the hopper.

b. Fabrication and Materials of Construction

i. The hopper shall be fabricated in such a manner as to reduce the shipping cost and installation cost. The vendor is encouraged to provide alternatives to the design that will be more efficient and economical while maintaining the geometrical concept.

ii. Structural design to comply with requirements in Para 6.

iii. Wear plates shall be ½" thick polished carbide overlay (¼" carbide over ¼" backing plate) and shall be placed in all impact and sliding areas. Wear plates shall be bolted. All liners to be shop installed except along field splices.

iv. Hopper design is based on mass flow and a plate corrosion allowance of 1/16".

v. All plate seam welds shall be continuous full penetration butt welds.

vi. Field welding shall be kept to a minimum. Vendor to clearly identify all field welding for Owner's review and approval.

vii. Intermittent welds are not permitted.

viii. All fasteners shall be U.S. standard sizes and galvanized.

ix. All structural steel is to be quoted with the coating system identified in Para. 5.9

5.3 Apron Feeders

The Apron Feeders (Feeders) design and supply shall include, at the minimum the following:

a. General Design Criteria:

i. Furnish all labor, supervision, materials and equipment, tools, and services to provide the complete design, documentation, supply, shop fabrication, testing, packing, inspection, and delivery of four (4) 72" wide 'tractor-type' heavy duty Apron Feeders.

ii. Feeders shall include a 'dribble collection' conveyor, located below and along the full length of the return side of feeder pans. The conveyor is to collect coal dribble from the pans, and convey into the feeder discharge hoods for deposit onto the collection conveyor.

iii. Feeders shall be designed to operate at variable rates to accommodate the criterion outlined in Para 3.3. Desired rates addressing different coal characteristics and downstream conveyor system capabilities shall be achieved through a combination of feeder speed and shear gate opening size.

iv. Feeders shall be designed to start and operate when the hoppers are heaped to the top of the spill plates.

v. Feeders shall be fabricated and pre-assembled in the shop to the maximum extent practical for shipping and simplified field installation. However, the design must consider the following:

Feeder design and assembly must consider the units will be located inside the RCD vault area beneath the hopper with limited access to remove the feeder as an assembly. Contractor must consider future removal, replacement, and accessibility for maintenance with special attention to replacement of defective components without requiring other components to be removed first, except for access panels.

vi. All safety and service switches, warning sirens, motion strobe lights and all proximity limit switches complete with activators, flags and supports as required.

vii. Safety guards and enclosures around all moving equipment, e.g. couplings, shafts and guards along the full length of the feeders.

viii. Electrical devices supplied with all necessary mounting brackets and fasteners to permit simplified field assembly by the installation contractor.

b. Drive Systems:

i. Drives shall be right angle type; rigid coupled to the head shaft using a rigid flange coupling. Motor shall be "C" face mounted to reducer. Drives shall be shipped fully assembled, with the mating half of the rigid coupling also mounted to the head shaft. Drive components shall be mounted on a rigid drive base (if applicable) utilizing a torque arm with shock absorbing torque link and mounting bracket.

ii. Preference is for electro-mechanical drives, space permitting. Hydraulic drives to be provided only if required by space constraints and with ASPA's approval.

iii. **Contractor to describe apron feeder drive system in Proposal and explain any alternatives**.

iv. Drives shall utilize the VFDs to provide a soft start.

v. Reducers shall have a minimum mechanical rating of 1.5 times the motor nameplate power.

vi. Drainage and sample points on the drive gearbox shall be easily accessible, have a ball valve with a suitable end to screw in a drain hose and a plug when not being used.

c. Mechanical Components:

   i. Head shaft assembly shall be mounted with pillow block spherical roller bearings with labyrinth seals, and 4 bolt base.

   ii. Bearings shall be selected for a minimum B10 life of 100,000 hours.

   iii. Head sprockets shall be segmental, cast manganese alloy sprockets with double pitch design for double wear. Sprocket segments shall be bolted to hubs that are keyed to the head shaft.

   iv. Carrying and Return roller assemblies shall be “sealed-for-life” crawler tractor type.

   v. Tail wheels and take-up assembly shall consist of an adjustable rail frame weldment with “sealed-for-life” tractor idler wheels and corrosion resistant screw-type take-ups.

   vi. Chain shall be crawler track type, “sealed and lubricated track” lifetime lubricated, Caterpillar type chain with drop forged induction hardened steel links, hardened bushings and pins (or equal)

   vii. High strength pans (flights) shall be minimum 1” thick, cast manganese steel flights complete with chain bolts and nuts.

d. Dribble-Collection Conveyor Beneath Feeders

   i. A dribble-collection conveyor shall be provided, which mounts under the apron feeder frame. All necessary supports and fasteners shall be provided.

   ii. The preferred dribble collection conveyor is a drag chain style with steel flights. The alternative design is a belt conveyor style. The final design shall be a solution that fits within the space available.

   iii. The dribble collection conveyor shall be of the equipment manufacturer’s standard design, whether drag chain or belt conveyor, complete the necessary features to reduce carryback and spillage on the vault floor.

   iv. Dribble conveyor shall extend the full length of the Apron Feeder and be wider than the Apron Feeder pans to provide complete coverage for the collection of carry back coal.

   v. Supply shall include a discharge chute that will be integrated into with the apron feeder chute for discharge onto the collection conveyor.

e. Lubrication

   i. Equipment shall be designed, where suitable for the environment, using sealed-for-life components to minimize grease requirements.

   ii. Points requiring routine or periodic lubrication shall be provided with Alemite button head fittings. Where the fittings are not easily accessible without the use of ladders, they shall be piped to a common manifold located on a platform or floor.

   iii. For each component of equipment requiring lubrication, the Contractor or its equipment supplier shall advise the make, type, quantity and frequency or rate of feed of the recommended lubricants. The Contractor or equipment manufacturer shall also name three major suppliers of each type of lubricant required.

5.4 Collection Conveyor & Existing C16 Modifications

The Collection Conveyor (Conveyor) design and supply shall include, at the minimum the following:

a. General Design Criteria:

i. The Collection Conveyor is fed by four (4) apron feeders and will discharge onto existing conveyor C-16 (refer to Para. 3.3 for Unloading Rates for existing downstream system).

ii. Furnish all labor, supervision, materials and equipment, tools, and services to perform the complete design, documentation, supply, shop fabrication, testing, packing, inspection, and delivery of one (1) 96" wide belt conveyor system.

iii. The Collection Conveyor shall be furnished complete with head, tail, bend and snub pulleys, idlers, belt side travel switches and training idlers, if applicable, on the carrying and return sides, single idler weigh scales, steel supports and bracing, chutes, continuous skirtboards along its length beginning with the most northern load point, conveyor belting, belt cleaners, belt plows, drive mechanism including gearbox, coupling, motor, pull cord switches, zero speed switch, plugged chute switch, and other equipment as required to make a complete conveyor unit.

iv. Equipment and electrical devices shall be selected to match, to the maximum extent practical, existing conveying equipment on Site. (Refer to Attachment 3, Preferred Equipment List).

v. Collection Conveyor shall be designated to meet or exceed CEMA Standards. Conveyor drive motor shall be adequate to start under a flooded condition and operate continuously fully loaded.

vi. Equipment selection and system design to operate as described in Section 3 .

vii. All bolts, washers and nuts and miscellaneous hardware for shop and field installation. Manufacture of bolts to be specified and grades of hardware identified. Bevel washers are required for connections to channel flanges including those for attaching idlers.

b. Conveyor Belt

i. Contractor to evaluate specifications of the belting currently being used on the Site for suitability for Collection Conveyor and utilize equivalent belting if possible. (Refer to Attachment 3 and below)

ii. Existing 96" conveyor belting on site has the following primary characteristics:

- Domestic Belt Only
- Number of Plies — 5 ply
- PIW Rating — 1250 piw
- Belting materials: — Polyester/Nylon
- Cover Material: — RMA Grade II or Better
Minimum 3/16" Top Cover x 1/8" Bottom Cover
- DIN Abrasion Rating: — 100 or Less
- Elongation at Break: — Less than 30%
- Permanent Elongation: — 2% or Less

iii. The conveyor belt shall be sized for start-up under fully loaded conditions.

iv. Belt length shall be suitable for mechanical splice

v. Contractor shall provide a belt splicing area on the conveyor with access, removable skirting and stringers suitably sized to support the splicing activity.

c. Shafting

i. All shafting will be designed in accordance with ASME "Code for the Design of Transmission Shafting" with service factors of 1.5 k_T (shock & fatigue torsion) and 1.5 for k_B (shock & fatigue bending).

ii. Specification for all shafting is to be AISI No. C-1045 cold rolled steel TGP or approved equal, unless otherwise noted.

iii. Keys and keyways shall be in accordance with Conveyor Equipment Manufacturers Association (CEMA) and ANSI standards. Drive shafts keyed. Non-drive shafts to have a minimum of one key.

iv. All tail shafts shall be suitable for proximity switch mount (both ends).

v. Turned down shafts shall be avoided.

d. Pulleys

i. All pulleys shall be designed in accordance with CEMA standards and shop assembled with QD Hubs, shaft, bearings and keys for shipping.

ii. All pulleys shall be welded steel flat faced drum type with ½-inch Holz Slide Lag Diamond Pattern Grooved lagging for Drive pulleys and smooth lagging for other pulleys. Hubs to have QD bushings.

iii. Drive pulleys shall have keyways. Lagging shall have a 60(+/-5) durometer Shore “A” hardness.

iv. Pulley Diameters shall be sized to suit loads imposed.

e. Bearings

i. All bearings included in the proposal shall be self-aligning spherical roller type with lip seals designed for a minimum L-10 life of 100,000 hours of normal operation.

ii. The Contractor shall supply complete specification together with descriptions of the bearing assemblies, indicating the method of lubrication and sealing.

iii. Pillow blocks shall be sized to suit loads imposed (Refer to Attachment 3, Preferred Equipment List) and shall have closed ends where possible. On each shaft one bearing shall be fixed and one floating in the housing. On the drive shaft the fixed bearing shall be on the drive assembly side of the conveyor. All bearings shall have sole plates with stainless steel jackscrews. Shims shall be stainless steel and allow for a minimum of 1/8” additional shim height over actual required design shim. All shims shall be split finger type allowing addition of reduction without removal of anchoring bolts.

iv. All lubrication shall be in accordance with Para. 5.7 Manual Lubrication

f. Idlers

i. General: Idlers shall match existing 96" conveyors (Refer to Attachment 3, Preferred Equipment List), with sealed for life permanently lubricated tapered roller bearings.

ii. Carrying Idlers: (Refer to Attachment 3 Preferred Equipment List)

- CEMA E classification
- BW + 9" bolt centers,
- 20 degree transition /35 degree carry, 3-equal length, 6" diameter rolls
- Use adjustable tilt side rolls to allow for roll replacement in-place without having to lift the conveyor belt or remove skirt boards.
- Maximum spacing 4'-6" except 1'-3" in loading areas and 2'-0" in skirting area immediately after the loading area.

iii. Trough idlers in loading zones shall be steel roll type.

iv. Return Idlers:

- CEMA E classification
- BW + 9" bolt centers,
- Single Roll, Straight Return, 6" diameter rolls
- Return idlers shall be installed with a maximum spacing 10 feet.

v. Transition Idlers: Transition idlers are required at terminal pulley locations.

vi. Carrying Training Idlers: (Refer to Attachment 3 Preferred Equipment List)

- Positive type, troughed belt training idler
- CEMA E classification
- BW + 9" bolt centers,
- One (1) required approximately mid-way between the head and tail pulleys.

vii. Return Training Idler: (Refer to Attachment 3 Preferred Equipment List)

- Positive type
- CEMA E classification
- BW + 9" bolt centers,
- One (1) required approximately mid-way between the head and tail pulleys.

g. Belt Cleaners and Plows

i. Belt cleaners and plows shall be suitable for mechanical spiced belt

ii. Belt plows shall be V-type, mounted at the tail pulley location, return side.

iii. Primary belt cleaner shall be Extra Heavy Duty with torsion-style tensioning system and replaceable urethane blade.

iv. Secondary belt cleaner shall have adjustable tungsten carbide blades. The chute design shall take into account the area needed to mount the secondary cleaner below the head pulley.

v. All belt cleaners shall be complete with stainless steel hardware.

vi. Discharge chute enclosures shall provide easy access to both the primary and secondary belt cleaners for routine inspection during operation and for blade replacement.

h. Conveyor Drive Equipment

i. Reducers shall be right angle type; coupled to the head shaft using a rigid flange coupling. Motor shall be TEFC "C" mounted to reducer. Drives shall be shipped fully assembled, with the mating half of the rigid coupling mounted to the head shaft. Drive components shall be mounted on a rigid drive base utilizing a torque arm with shock absorbing torque link and mounting bracket.

ii. All conveyor drive equipment including, but not limited to, speed reducers, couplings, drive motors, and associated components shall be capable of starting under conditions of a flooded belt, a minimum of four times per hour. Speed reducer shall equal or exceed AGMA design standards.

iii. The AGMA rated service factor used in the selection of gears for horsepower requirements shall be no less than 1.5 for helical reducers and 2.0 for worm gears. The thermal horsepower rating shall exceed the applied motor horsepower without cooling fans. All service factors shall be applied to motor horsepower for purpose of gear selection. Fan cooled units are not acceptable.

iv. Conveyor shall have an electrical soft start drive.

v. Coupling fit (interference) shall conform to coupling manufacturer's recommendation and AGMA.

i. Take-Up

i. Hydraulic-assist screw take-up at the tail pulley with mechanical locks, utilizing portable jack supplied by Owner.

ii. Utilize corrosion resistant materials to ensure long term functionality of all take-up components.

j. Single Idler Weigh Scales

i. Four (4) single idler weigh scales, positioned downstream of each of the four (4) feeder load points shall be provided with the necessary local control and PLC programming to enable operator to monitor individual feed rates and adjust each feeder speed accordingly to ensure uniform draw down of coal in the hoppers.

k. Existing C16 Conveyor Modifications

i. Provide new skirtboards, lined as specified herein, to be installed onto existing conveyor C16 (72" w/ 35 deg trough). C16 skirtboards must properly interface with the Collection Conveyor transfer and inlet chute considering C16 belt speed and idler geometry. (Ref Para 5.5).

ii. Provide new cleanup collection chute for bobcat discharge onto C16

5.5 Chutes and Skirtboards

a. The apron feeders are assumed to operate at equal rates when operating simultaneously. In addition, two (2) feeders may be operated while two (2) are idle, as described in Modes of Operation (ref Para 7.4). Chutes and Skirts designs must consider all operating

scenarios and be designed to effectively contain and transfer the coal while avoiding spillage and plugged chutes.

b. Apron feeder and conveyor discharge / loading points shall be enclosed to the maximum extent possible. A dust curtain shall be installed at the discharge of skirtboards and the inlet to the head box where applicable.

c. All chutes shall be made in large bolted sections for ease of maintenance, installation and removal. Bolted top sections shall be removable for access to head pulleys without requiring complete dismantling of the head chute.

d. Chutes shall be enclosed to contain dust and designed not to plug under peak operating conditions.

e. All chutes and chute supports, including structures, shall be designed to support a full load of material.

f. Chutes shall be designed for impact and flow of material. Plate thickness shall be defined by Contractor for this service, but shall not be less than 3/8" thick mild steel plate suitably supported and reinforced with stiffeners.

g. All sections of plate in contact with the flow of material will be lined with ½" thick polished carbide overlay (¼" carbide over ¼" backing plate), abrasion resistant removable liner material. Liner material shall be attached with countersunk bolts and be sized for ease of handling and replacement.

h. Head chutes shall be designed to capture and direct all material removed by the belt cleaning system and head snub pulleys to the receiving belt. Dribble chute surface shall be lined with UHMW.

i. Chutes shall have "quick opening" doors for inspection and cleaning located so that they may be opened during operation. The maximum door size shall be 24" x 24", constructed of 1/4-inch steel, stiffened to prevent warping, hinged, gasketed, and latched in place.

j. Removable skirt top covers shall be supplied the full length.

k. Skirtboards shall be designed having ample width, depth and length as indicated per CEMA design standards. Minimum vertical clearance above the belt shall be 1-1/2 times the maximum bed of material.

l. Inlet transfer chute from the collection conveyor to C16 shall be provided such that it extends between skirtboards to within 6" of the top of C16 conveyor belt in order to center the load thus minimizing or eliminating dust emissions, spillage, chute plugging and excessive chute and skirtboard wear.

5.6 Platforms, Ladders and Lift Beams

Contractor is to design and supply the following:

a. Four (4) wrap-around service platforms to provide maintenance to the apron feeders.

b. Lift beams on the drive sides of the apron feeders, supported on the hopper walls above, and removable access panels in the service platforms for maintenance and removal of apron feeder parts down to the concrete floor level below.

c. Four (4) ladders to access the new apron feeder service platforms from concrete floor.

d. Service platform at the head end of the 96" belt conveyor to access the drive and with adequate strength and clearance around the head chute and conveyor drive for access by a Bobcat hoisted in from the adjacent hoist shaft.

e. Access ladder from the collection conveyor head end support platform to the bottom of the concrete vault, near the existing C-16 tail pulley.

f. RCD drive support platforms at grade level (requires coordinate with RCD Contractor), excluding handrails. NOTE: All grade-level handrails and handrail modifications for the retrofit project will be by others (installation contractor).

g. Platforms, ladders, lift beams and structures to comply with Structural Steel (Ref: Para. 6).

h. Handrail and toe plates shall meet OSHA requirements. Grating shall be galvanized, non-slip, grating type.

i. Contractor shall provide all mounting details, foundation loads and requirements for all platforms, ladders, lift beams and structures to be installed on or to existing concrete vault floors, walls or beams. (Refer to Attachment 2 – Existing Vault Foundation Drawings).

5.7 Manual Lubrication

Manual lubrication systems shall meet the following requirements:

a. Manual lubrication shall be applied to grease points requiring lubrication no more frequently than every six months.

b. All grease lines shall be grouped together to central distribution blocks that are accessible from walkways, platforms or floors.

c. Grease nipples shall be provided for bearings where appropriate.

d. All grease nipples shall be standard Alemite #A1184 button-head grease fittings.

5.8 Safety Requirements

5.8.1 Safety Switches

a. Safety switches shall be provided for the following conditions:

   i. Plugged Chute

   ii. Emergency Stop Pull Cord Switches and Push Buttons

   iii. Zero Speed

   iv. Belt Misalignment

   v. Warning Sirens and Strobe Lights

b. All safety switch circuits shall be designed to provide an indication at the operator's control panel. Dry contacts shall be provided for each alarm/trip to output to Owner's PLC.

c. Safety controls including emergency stops, all personnel safety devices shall be hard wired to the associated starter in MCCs and/or VFDs with indication to the PLC.

d. Plugged Chute

   i. The switches will be mounted in the bottom section of every transfer point and will consist of a probe and remote mounted control unit.

ii. The switch design shall be such to allow normal flow of material without damage to the device or cause nuisance trips.

iii. Operation of the plugged chute switch shall stop the equipment whose switch is tripped and signal the Owner's PLC to stop all upstream conveying equipment

e. Emergency Stop

i. Manually resettable emergency pull cord switches, operated by a nylon / PVC coated, stainless steel cable running both sides the full length of the conveying equipment and where personnel access is possible. Switches will be of the 'slack cable actuation' type with 2 NO/2 NC contacts.

ii. An emergency pushbutton shall be located at each major drive and integral with the local control station.

iii. Operation of the emergency pull cord or pushbutton shall stop the equipment whose pull cord switch is tripped and signal the Owner's PLC Such that upstream conveying equipment will be tripped via the PLC.

iv. Pullcord switches will be single or double ended. Single ended switches will be used at head and tail ends of the conveyor. Dead-ending of the pullcords is not allowed.

f. Zero Speed Switch

i. A "mag-con" type speed switch shall be provided to monitor pulley speed. Its location shall be a non-driven pulley. It shall indicate a stopped conveyor, speed drop or other mechanical failures.

ii. The switch circuit shall be designed to stop the conveyor and be used for interlocking with other devices. A timing relay of the adjustable type shall be provided to by-pass the circuit during start-up and accelerating periods.

g. Belt Misalignment Switches

i. Belt misalignment switches will be at the conveyor head and tail ends.

ii. Each unit will have 2 Form 'C' contacts: one @ 10° alarm and one @ 20° alarm.

h. Warning Sirens & Strobe Lights

i. Start-up warning horns and warning lights will be provided and distributed to be audible and visible for the full length of the respective conveyor.

5.8.2 Safety Guards

a. Removable Safety Guards will be provided for all exposed rotating or moving parts, closed on all sides and designed for servicing and inspection without requiring removal of other machinery. All such guards will be in compliance with the requirements of "OSHA" Rules and Regulations.

b. Removable expanded metal protection guards shall be provided per OSHA regulations at all locations of revolving or moving machinery components and as specified herein. The following guards shall be provided: drive guards, tail guards, side nip and other guards required to isolate any exposed, assessable and moving feeder components.

c. Sheet metal enclosures shall be provided for all exposed gears; sheet metal or expanded metal guards shall be provided for all couplings.

d. Vertical expanded metal guards enclosing return idlers for areas that have an access under the conveyor 5-feet to 12-feet in height above any access level.

e. All pulley and idler guards shall be easily removable without tools. Guard design shall incorporate hinges, pins, latches or other means to secure guards in position. Guards shall be easily removed by one person and shall have handles.

f. Where conveyor belts enter hoods or enclosures, rounded edges (or other means) shall be provided adjacent to the edge of the belt to prevent cutting of the belt.

5.9 Painting & Corrosion Protection

This following paint system is for structural steel in a corrosive environment

a. General

   i. Remove all weld splatter, and grind rough welds to a smooth surface.

   ii. Remove sharp edges and corners by grinding or machining to a minimum of 1/32 inch plus radius, unless otherwise noted. Edges of bolt holes shall be deburred, but need not be rounded.

   iii. Prime, intermediate and finish painting of the internal and external surfaces of all fabricated structures, chutes, hydraulic enclosures, etc.

   iv. All paint shall be of the same manufacturer and applied in strict accordance with manufacturer's instructions.

b. Abrasive Blast Cleaning:

   i. Fresh water wash to remove all dirt and contamination.

   ii. Remove all oil, grease and similar materials by solvent cleaning according to SSPC-SP1, prior to blast cleaning.

   iii. Near white blast to Sa 2½ (ISO 8501-1:1988) or SSPC-SP10. Ensure that an anchor profile of 40 - 60 microns (1.5 to 2.5 mils) is achieved.

   iv. Ensure chloride and sulphate levels on blasted surfaces are less than 10-20 mg / cm2.

   v. Weld, grind, and re-blast any surface defects revealed by the blast cleaning process.

   vi. If oxidation has occurred between blasting and application, the surface will be re-blasted to the specified standard.

   vii. All plates used to fabricate box / enclosed sections shall be blasted to an SSPC-SP6 prior to welding. Box / enclosed sections, unable to be painted with a minimum zinc rich primer and top coat, shall be sealed in accordance with Para 6.3.

c. <u>Paint System:</u>

   Contractor shall propose a paint system that is equal to or better than the system requested below, suitable for structural steel in a corrosive environment.

Table 5-2 Paint System		
Surface Preparation:	SSPC-SP10	
Paint System:	**DFT (mil)**	
Primer	2-3	Organic Zinc Rich Epoxy
Intermediate coat	5-6	High build epoxy polyamide
Top coat	5-6	High build epoxy polyamide Color to be advised by the Owner
Minimum Total DFT 3 coats	12	(9 mil with alternate top coat)

d. Equipment

i. Components such as electrical motors etc. will be packaged for ocean shipment to prevent ingress of salt water and salt fog.

ii. Motors and manufactured machinery components furnished to the Contractor by others shall have original manufacture's coating suitable for use in a corrosive operating environment.

iii. Bare mechanical surfaces will be coated with a temporary rust preventative, Rus-Ban 373, 375 or equal.

iv. Galvanic corrosion will be prevented by electrically insulating dissimilar metals.

v. Care will be exercised in the selection and installation of electrical fixtures, conduits, and cable trays.

vi. Aluminum and copper alloys will be avoided.

e. Color Code

The color of the primer will contrast with the surface being painted, and the color of each subsequent coat will contrast with the previous coat and be approved by the Owner.

Safety colors in accordance with the standard MSHA will be as follows:

i. Safety Yellow will be used for designating caution, to mark stumbling, falling or tripping hazards such as protruding parts, curbing, dead ends, handrails, and kickplates, ladders, cages and equipment safety guards.

ii. Safety Red will be used to mark instruments used for combating fire, such as fire extinguishers, fire hydrants, fire stations, fire water pipes (exposed) etc.

iii. Safety Green will be used to mark first aid equipment, such as dispensaries, medicine, cabinets, gas mask containers, respirator containers, safety showers, stretchers, etc.

iv. Safety Orange will be used to promote safety and exposed unguarded hazards such as on machines or equipment that might cut, crush, electrocute or otherwise injure workers. Surfaces of machinery guards, exposed parts such as pulleys, gears or cutting devices. Electric and crane pendant switches.

f. Contractor to define in the Proposal where, if any, galvanizing of components or structures is being considered.

5.10 Other Requirements

a. Preparation for Shipping and Storage

i. All mechanical equipment shall be cleaned of dirt, grease, mill scale and other foreign matter with all finished surfaces coated with a protective material that will prevent rust formation or damage during shipment and job storage, but which can be readily removed when equipment is installed.

ii. Contractor shall prepare equipment for shipment to protect it from damage during shipment and subsequent 3-month storage.

iii. Equipment shall be completely drained of all water and thoroughly dry prior to shipment. When such draining requires removal of plugs, drain valves, etc., Vendor shall make sure that these parts are reinserted or reassembled prior to shipment.

iv. All openings and machined surfaces shall be provided with protection to prevent damage, corrosion and entrance of foreign matter during shipment and storage.

v. Threaded or socket weld connections shall be protected with screwed or snap-in (snap-on) type, securely held, plastic protectors. Cast-iron plugs are not acceptable for protection unless part of the permanent assembly.

vi. Prepared weld connections shall be protected by wooden disks that cover the entire weld end area, and are secured by metal straps and fasteners.

vii. Covers, straps or fasteners shall not be welded to equipment.

viii. Equipment shall be adequately supported for shipment. All loose parts shall be crated or boxed for shipment and appropriately identified. Where shipment is braced internally, it shall be marked conspicuously, "Remove internal braces before testing and operating."

ix. All large and heavy shipping units shall have suitable skids for moving. Crating shall also be adequate for lifting with slings. If location of slings is critical, these locations shall be marked accordingly.

x. Vendor to identify storage requirements for up to 3 months.

b. Nameplates

xi. Nameplates for plant and equipment identification and record purposes shall be manufactured from stainless steel with a matte or satin finish, and engraved with black lettering of a size which is legible from a working position. The nameplate shall note the purchaser’s equipment number, the item designation, and important technical data.

6 Structural Design Requirements

6.1 General

a. Structures shall be of heavy duty construction and of adequate strength, stiffness and durability to withstand all loads and conditions to which it will be subjected, without excessive vibration and deflection.

b. Designs shall ensure critical components have a design safety margin appropriate for the perceived risk, maximize safety and use proven methods and materials.

c. Unless specifically stated otherwise, the design and construction shall be based on the applicable sections and latest revisions of the applicable codes.

6.2 Design Loads

a. The Contractor shall assume full responsibility for calculating all design loads including dead loads, live loads and all dynamic loads.

6.2.1 Live & Dynamic Loads

a. Live loads shall consider all loads resulting from the intended use and operation of the Take-Away equipment including the effects of:

   i. Impact loading caused by each railcar dump

   ii. Loads to stairs, platforms and walkways. (Minimum 100 psf)

   iii. Incrustation

   iv. Spillage

6.3 Design Basis

a. All structural components shall be designed using the appropriate load factors. Deflections shall be checked using un-factored loads.

b. A corrosion or wear allowance shall be included in the design where applicable.

c. Components shall be designed to accommodate the loads and effects produced by thermal expansion and contraction (when applicable).

d. Consideration shall be given to the installation and replacement of heavy items.

e. Where practical, the member and connection details shall be designed to avoid accumulation and retention of coal and coal dust or water during normal operation or wash down. Remaining areas, which would otherwise be subject to accumulation of coal fines, shall be provided with shedding plates so arranged as to not impede access to the structure or equipment for inspection or maintenance. Where pockets or depressions cannot be avoided, ample drain holes of minimum 1 inch diameter (or equivalent area for non-circular holes) shall be provided at low points in each pocket or depression.

f. Closed metal sections shall be used where possible to assist in preventing build up. Closed sections shall be sealed to prevent ingress of moisture. End cover plates of minimum ¼ inch thickness shall be installed by welding all-around on all open ends of all hollow structural sections and structural pipe members, including handrails. Large closed sections shall be provided with a watertight means of access for inspection and maintenance.

g. Seal welds shall not be used on faying surfaces of bolted connections and where continuous seal welding would contravene the requirements of the AWS code. In this case, the un-welded corners of the lap joint shall be sealed using a suitable sealant or caulking material prior to application of topcoat paint.

h. Arrangements and details, which create closed areas, e.g. areas difficult to reach for welding and painting, such as back-to-back angles, shall not be used.

6.4 Materials

a. All material used in construction shall be new and free from defects.

b. The materials selected shall be stated in the proposal documents, noting their qualifications under ASTM or other acceptable standards and their impact test properties as established by Charpy V-notch impact testing.

c. Hopper plate and structural stiffeners shall conform to the latest standards of ASTM A36, Fy=36 ksi. All wide flange sections shall conform to ASTM 992 grade 50, Fy=50 ksi.

d. All structural steel and miscellaneous steel shall be ASTM A36 or better. Mill certificates or material test reports providing chemical composition and physical properties shall be obtained by the Contractor for all structural steel. Copies of mill certificates or test reports shall be furnished to the Owner upon request.

e. Unless otherwise agreed in writing by the Owner, minimum steel thicknesses for plates and rolled sections shall be:

i.	Flanges and stiffeners	3/8 inch
ii.	Webs of rolled sections	3/16 inch
iii.	Angles and stems of Tees	¼ inch

f. Walkway and platform grating shall be anti-skid, heavy duty, hot dipped galvanized and free draining.

6.5 Connections

a. Wherever practical, connections shall be located away from highly stressed areas.

b. Work points at the intersection of connecting members shall be located to minimize eccentricities.

c. Beam connections combined with bracing connections or subject to lateral or longitudinal loads from columns, shall be designed for the combined effect of the bracing forces plus the beam reaction plus the axial force transmitted through the connection.

d. Cross bracing shall be connected at intersection points.

6.6 Bolting

a. Bolted connections shall use high strength bolts, installed fully tensioned.

b. Exclude threads from shear planes where possible.

c. Design connections where slippage cannot be tolerated (including connections subject to fatigue or frequent load reversal) as slip critical connections.

d. All structural steel bolts shall be galvanized.

e. All high strength bolts shall be supplied with raised distinguishing marks.

f. Faying surfaces of slip-critical bolted connections shall be coated with inorganic zinc rich primer or other surface coating certified to satisfy the applicable requirements. Such surfaces shall not be painted or contaminated in any other way.

g. All bolted structural connections shall have at least two bolts.

h. Minimum size for high strength bolts shall be 3/4 inch.

6.7 Welding Processes

a. Welding methods other than electric arc welding will not be accepted.

b. All welding shall be carried out in strict accordance with the requirements of AWS D1.1.

6.7.1 Additional Welding Requirements

a. All welds shall be continuous for the full length of the joint, unless accepted otherwise by the Owner. Intermittent fillet welds shall not be used.

b. No welded joint shall be located in the highest stressed area of any structural member.

c. Field welded splices in members will not be permitted unless reviewed and approved by Owner.

d. Access holes (“mouse-holes”) may be employed as required to facilitate sound groove welds. These access holes shall be no larger than necessary for access, free from sharp or re-entrant corners, and finished to be free from notches, nicks, gouges, slag and welding spatter. These access holes need not be filled with weld metal or cover plated. Access holes shall in any case not be made in highly stressed members.

e. Critical welds shall be identified in the quality control plan.

f. Contractor shall clearly identify on the drawings all critical weld areas and arrange for the appropriate non-destructive testing method of these welds, e.g. end rings, by a testing laboratory registered by the ASTM, or other approved authority. Testing procedures include, where applicable

   i. Radiographic testing

   ii. Ultrasonic testing

   iii. Magnetic particle testing

   iv. Both ultrasonic and magnetic particle testing.

   v. Dye penetration testing

6.8 Trial Assembly

a. All structural components shall be trial-assembled and match marked and/or doweled during fabrication to ensure correct fit during filed erection. Components shall be designed to be shipped in the fewest pieces possible to minimize the number of field connections.

7 Electrical Design Requirements

7.1 General

a. MCC Building: The existing MCC Building will be re-used to house all Contractor supplied electrical equipment. The only electrical equipment to remain in the building will be the 4160V and 480V switchgear, a small PLC cabinet and lighting panel. Space in the MCC Building will be shared with the RCD Contractor's electrical equipment.

b. This section provides the electrical power and control system requirements for normal control and emergency operation of the TAS. The electrical system, comprising power, control, and all associated TAS electrical equipment and wiring shall be designed and supplied; pre-assembled and tested wherever possible, prior to shipment to the Site.

c. Programming, testing and commissioning of the entire electrical system shall be the responsibility of the Contractor.

d. The electrical system shall include, but is not limited to:

   i. VFDs, switchgear and MCCs

   ii. Motors and motor control equipment

   iii. Miscellaneous transducers and control devices

   iv. Control power transformers and panel boards

   v. Operator's and auxiliary control consoles, including all required operating and control pushbuttons, switches, indicators and instrumentation

   vi. Programmable Logic Controller (PLC) including PLC programming and documentation

   vii. Fiber optic Ethernet

   viii. Local lighting around apron feeders and head end of the collection conveyor.

e. The electrical system shall incorporate only new equipment. Workmanship shall be of the highest quality. The shop installation and assembly shall be neat in appearance and in compliance with all required local, national and international codes, standards and practices.

f. All equipment and material supplied shall conform to project standards unless otherwise approved by the Owner. Refer to Attachment 3 – Preferred Equipment List for acceptable manufacturers.

7.1.1 Design References

a. All design work and content of the Installation Manuals shall comply with all rules and regulations of statutory authorities having jurisdiction over the facility in Alabama.

7.1.2 Area Classification

a. Equipment locations to be NEC Class II Division 1 Group F (combustible or conductive dust, present during normal operation for coal dust)

b. Motors shall be NEMA TEFC

c. Field panels, instruments, pushbuttons, switches, etc., shall be NEMA 4X stainless steel.

d. MCC Building switchgear, MCCs, and panels shall be rated minimum NEMA 12.

7.2 Power Distribution - Standard Voltages

Table 7-1. Standard Voltages				
Description	**Voltage**	**Phase**	**Wire**	**Frequency**
Medium Voltage	4160V	3	3	60 Hz
Low Voltage	480V/120V	3	4	60 Hz
Motors above 150 hp	4160V	3	3	60 Hz
Motors 1 hp to 150 hp	480V	3	3	60 Hz
Motors smaller than 1 hp	240V	1	2	60 Hz
Control Power	24VDC 120 VAC	1 1	2 2	 60 Hz
Lighting	120V	1	2	60 Hz
VFD Variable Frequency Drives input voltage can be as high as 4160V for large KW motor				

7.2.1 Process Control Equipment

a. 4-20mA DC field signals for analog measurement and control.

7.3 Equipment

7.3.1 MV Switchgear Assemblies

a. 4160V switchgear is currently located in the existing MCC building:

   i. Contractor shall inspect the current 4160 V switchgear and coordinate with the RCD2 Contractor to determine its suitability and capacity to support both the TAS and RCD2 systems.

7.3.2 480V Motor Control Centers (If Applicable)

a. Motor Control Centers (MCCs) shall be located in the existing MCC building. MCCs shall be suitable for the voltage and NEMA 12 rating. The unit shall be a free standing structure and suitable for installation against the wall. All the electrical components shall be accessible from the front and sides. MCC building requires cable entries at top of the unit. Internal separation of the assemblies shall be conformed to IEC Form 4a.

b. 480V MCCs shall comply with the following:

   i. Motor starter unit shall be a combination of circuit breaker, contactor, overload protection unit, control transformer, wire terminals, manual reset and pilot lights outside each door. Each unit shall be fully wired and connected to the various motor drive and control systems. Contactors shall be magnetically operated and powered from 120V, single phase control supplies derived from within the starter unit. The minimum size starter shall be NEMA Size 1.

ii. Thermal overloads shall be reset from the front of the starter door.

iii. Each starter or disconnect switch shall be equipped with an external handle in front of the door. On each door handle there shall be provision for minimum of three padlocks to lock the unit in “ON” or “OFF” position.

7.3.3 Variable Frequency Drives (VFDs)

a. Modular type VFDs using Pulse Width Modulated technology shall be supplied as required for the TUS.

b. In general each motor requiring a VFD shall be fed from its own standalone VFD. An exception to this would be a mechanical device requiring 2 or more motors on the same device. In this case one standalone VFD would be allowed to drive all the motors on that device.

c. General Description and Construction of VFDs

i. The VFDs shall be mounted in dust tight enclosures, rated NEMA 12, with external mounted safety disconnect devices. VFDs shall be installed in stand-alone cabinets suitable for wall or floor mounting in the existing MCC building with manufacturer recommended space around for cooling.

ii. VFD cabinet internal components shall be constructed of a modular nature such that drive maintenance and replacement of parts can be done in the field with front access only and without any required removal or rear access to the main cabinets.

iii. A mechanical interlock shall prevent an operator from opening any VFD door when the safety disconnect is in the ON position. Another mechanical interlock shall prevent an operator from placing the safety disconnect switch in the ON position while a VFD door is open. It shall be possible for authorized personnel to mechanically defeat these interlocks.

iv. Provisions shall be made for locking all VFD disconnects in the OFF position with up to three padlocks. Provisions shall also be made for accepting a padlock to lock the VFD enclosure doors.

v. Current limiting fuses shall be installed and wired to the VFDs inputs.

vi. The speed range shall be from a minimum speed of 0.5 Hz to a maximum speed of 120 Hz.

vii. The drives shall be able to slow down a motor operating in reverse and start the same motor in correct rotation.

viii. Over current capacity shall be 150% for 1 minute.

ix. Operating carrier frequency shall be maximum 10 kHz.

x. VFDs shall be able to develop no less than 200% of rated motor torque at .5 Hz (60 Hz base) in a Sensorless Flux Vector mode using a standard squirrel cage induction motor without an encoder feedback signal.

7.3.4 Motors

a. General

i. All electrically driven equipment shall be supplied complete with drive motor.

ii. All motors shall be horizontally mounted. If required, vertically mounted motors shall be provided with an adequately sized peaked cover to prevent dust and material from collecting on and in the fan.

iii. All motors shall be high efficiency, AC squirrel cage, induction type motors of NEMA B, design and suitable for operation from 60 Hz power.

iv. Motors shall have Class F insulation and be rated with a Class B temperature rise at full load current.

v. Motors shall have a 1.15 service factor, copper rotor and windings, and shall be rated for extra severe duty.

vi. If variable frequency drives are used, the motors shall be specifically inverter duty rated for this service.

b. Standard Voltage Ratings (Refer Para. 7.2)

7.3.5 Cables and Wiring

Contractor shall consider the following when preparing the electrical portion of the Installation & Commissioning Manual.

a. Electrical wiring and materials shall conform to the latest edition of the IEC, National Electrical Code (NEC), and to the applicable ANSI, IEEE and NEMA standards. All wires shall be tagged at each end and color coded for permanent identification. Minimum size of power conductor shall be #12AWG copper. Insulation shall be moisture, ozone and heat resistant with moisture and oil resistant flame retarding covering, in accordance with IPCEA (Insulated Power Cable Engineers Association) specifications.

b. MV cables for fixed installation shall have copper conductors with XLPE insulation and screens rated for the prospective ground fault current of the respective system. Three core MV cables shall be single wire armored with an overall PVC sheath.

c. 480V power cables shall have stranded copper conductors, 0.6/1kV 90° XLPE insulation with an overall PVC sheath. For high current application, single core XLPE insulated cables may be used. For cables subject to “flexible” applications, EPR/CSP rubber type cabling shall be used.

d. All VFD power cabling shall be special VFD duty shielded cable.

e. 120V multi-core control cables shall have #14AWG stranded copper conductors 0.6/1kV 90° insulation with a ground conductor as standard.

f. 24VDC control and Instrument cables shall have a twisted pair format with overall or individual screened pairs as required for signal conditions. The cables shall be rated 300VDC.

g. Fiber optic cables shall have loose tube construction.

h. Equipment shall be pre-wired by the Contractor in the shop with all electrical devices connected to terminal strips in a junction box or boxes mounted on a stationary portion of the equipment. All loose parts and cables shall be identified and supplied by the Contractor with field installation by Others.

7.3.6 PLC Inputs & Outputs

a. General

i. All inputs/outputs required for the Train Unloading Station PLC operation from field mounted control and monitoring devices shall be wired directly to area remote marshalling panel(s). (i.e. parallel or series connections in the field will not be permitted).

ii. The PLC, provided by others, shall be sized to monitor and control all train unloading station equipment and all ancillary equipment. Contractor shall coordinate with the Owner and RCD Contractor the interface of their equipment and operating philosophy into the overall Project PLC program.

b. PLC & Marshalling Cubicle

i. The PLC cubicle shall also contain marshalling terminals for the interconnection of field and other cabling to the PLC inputs and outputs.

7.3.7 Instruments, Relays, Control Devices, etc.

a. Instruments and meters shall be provided to adequately indicate the functioning of the equipment.

b. Ammeters shall be furnished on all 4160V starter panels, on VFDs, and on 480V starters for motors larger than 100 hp.

c. Voltmeters, with three phase voltmeter switches, shall be furnished to indicate primary and secondary voltage. Where the above is available from the electronic motor protection units, separate meters are not required.

d. Current transformers shall have sufficient thermal and mechanical ratings to withstand currents equal to the maximum interrupting and momentary current ratings of the protective equipment.

e. Instruments, panel-mounted relays and meters shall be semi-flush. All instruments, gauges, charts, etc., shall have units in the metric system of measurement.

f. In general, all panel-mounted relays shall be of the switchboard draw out type, with built-in testing facilities, and shall be fitted with targets as required to indicate operation.

g. Field mounted instruments requiring routine inspection or calibration shall be provided with rain/sun shields. Field instruments shall be sealed to IP65 minimum.

h. Field instruments shall have standard 4-20 mA output signals, isolated where possible.

7.3.8 Lighting

a. Local lighting shall be provided where stated in this Specification, i.e. feeder area and head end of collection conveyor. All areas, activity areas, machinery platforms, walkways and stairways, and operating areas within the TAS Scope of Work shall be fully illuminated in accordance with required regulatory standards. All lighting shall be LED type.

b. As a guide, the following minimum illumination levels shall be required:

i. Platforms, passageways, stairways & ladders 100 lux (10 footcandle)

ii. Operator's Cab 1,000 lux (90 footcandle)

iii. MCC & Hydraulic buildings 500 lux (46 footcandle)

7.4 Modes of Operation

7.4.1 Summary

Take-Away unloading operation shall be PLC controlled from the Operator's cab as follows:

a. Coal Selection Normal Operation – Operator to select the coal to be unloaded, i.e. Thermal or Metallurgical, for each of the Automatic Modes below.

b. Sticky Metallurgical Coal Operation: when a train arrives and the operator determines the coal in the cars is not fully emptying, operator can select the vibratory 180^0 rotation feature for each of the Automatic Modes below.

c. Automatic – Normal Tandem Dump Operation

d. Automatic – North Dumper Operation / south dumper out of service

e. Automatic – South Dumper Operation / north dumper out of service

f. Manual – Allows Operator manual control and/or adjustments of all the functions from the Operator's cab if necessary

g. Local – For testing and maintenance purposes there shall be local control stations to operate individual equipment.

h. TAS Interface: Operator must be given the ability to select the dump cycle based on the type of coal to be unloaded, (i.e. metallurgical or thermal coal) and to adjust hopper feeder speeds and/or shear gate opening with the coal mode selection and the ability to individually adjust the feeder operation to ensure uniform drawdown of coal in the hoppers. This coal mode of operation is necessary to prevent overloading of the downstream conveyors because of the difference in the coal densities and the current rate constraints of the downstream conveying system.

7.4.2 Automatic Normal Tandem Dump Operation

a. RCD Operator selects Tandem Dump and the coal to be unloaded and/or other preset adjustments as determined through consultation with the Owner.

b. The apron feeders speeds will be automatically adjusted to pre-determined settings (determined through testing) appropriate for the coal handled and tandem dump operation.

c. Suitable shear gate openings will be identified during testing to find a) the optimum setting for steam and metallurgical coal, for tandem dumper operation and, b) the appropriate feeder speeds to achieve the desired rates specified in Section 3.3. Once these settings are identified they shall be set in the PLC to become automatically set.

d. RCD Operator initiates dump sequence with momentary CYCLE START push button signal from the Operator's cab. The tandem dumpers automatically rotate to dump and return to the seated position, and the TAS receives and transfers the coal to downstream conveyors.

7.4.3 Single Dump Operation (North or South Dumper)

a. The single car dump operation is much the same process as the Normal Tandem Dump. The operator selects the Active Dumper for the unloading process. The type coal (metallurgical or steam) and, if metallurgical, its condition (normal or sticky).

b. Similar to the Tandem Dump Operation, the apron feeders speeds and shear gates openings will be identified through similar testing for each coal handled during the Single Dump Operation, only operating at their individual peak rate as outlined in Para. 3.3. Gate setting will be set in the PLC program and become automatic.

7.4.4 Manual Mode

a. In the manual mode, the apron feeders and collection conveyor shall be individually controllable from the HMI on the operator's panel located in the operator's cab.

7.4.5 Local Mode - Maintenance

a. In the local mode, equipment shall be fully controllable from individual local control stations located at the equipment.

b. A local JOG-STOP control station shall be provided for each drive for maintenance purposes and shall be located adjacent to each drive.

c. The local control station can only be activated when the RCD operator selects Jog on the Auto-Off-Jog selector switch inside the cab.

7.4.6 Control System

a. The operator's panel shall provide control in automatic, manual, or local mode and shall include the AUTOMATIC-MANUAL-JOG selector switch.

b. Local operator's stations shall only be active when JOG mode is selected on the operator's control panel. All local motion controls shall be spring-return-to-off stopping equipment motion when switch is released.

c. Control circuits shall be energized at 24 VDC from sources within the dumper system.

7.4.7 Programmable Logic Controller (PLC)

d. A PLC shall be implemented for all feeder and conveyor control logic which does not involve human safety.

e. Safety controls including emergency stops, all personnel safety devices and equipment overtravel devices shall be hard wired to the associated starter in MCCs and/or VFDs with indication to the PLC.

f. The data handling capability of the PLC shall be used to transmit and receive status, permission and trouble signals over a fiber optic data highway to the PLC or PC in the designated substation at the Site.

g. Remote I/O, supplied by the RCD Contractor, shall be located in the control cab for all cab control functions. An HMI panel, supplied and programmed by the RCD Contractor with the cooperation and input from the Contractor and Owner shall be located in the operator's cab.

7.4.8 Local Operator's Stations

a. Local operator's stations shall be approved for the location in which they are installed. The minimum stainless steel enclosure classification shall be NEMA 4X.

b. Local operator's stations shall be waterproof.

8 Commissioning

a. The installation contractor shall not proceed with any Commissioning of any Take-Away equipment prior to the Owner's acceptance of the Contractor's Installation & Commissioning Manual as described in Section 2.1.14 and the Contractor's technical commissioning personnel are on Site.

b. Commissioning shall involve the Owner, the Contractor and its Subcontractors (as required), the RCD Contractor and its Subcontractors (as required) and the installation contractor. Herein after referred to as the Commissioning Team. Commissioning shall include, but not be limited to:

   i. Pre-commissioning tests including lubrication, drive rotation, control sequence, input/output, grounding and continuity tests;

   ii. Cold Commissioning tests to check the operation of the TAS in isolation from the RCD system;

   iii. Full-load Commissioning tests in conjunction with the RCD equipment;

   iv. Compilation of punch-list of items required to complete construction and prompt resolution thereof; and,

   v. Inclusion of all final testing and commissioning data into the final Installation & Commissioning Manual.

c. The Contractor shall be responsible for supervising and supporting all stages of Commissioning associated with its Work, and shall recognize that a significant time interval may transpire between the Cold Commissioning and Full-load Commissioning. Specialists and necessary tools shall be provided by the Contractor to assist with start-up and calibration of the equipment to ensure performance.

d. Contractor's field personnel shall be capable, qualified and able to perform the duties required to the satisfaction of the Owner and shall be vested with authority to make decisions binding on the Contractor.

e. Prior to Commissioning, the Contractor shall conduct safety walk-throughs with the Owner's staff. These walk-throughs will review the safety provisions of the Work and may trigger remedial actions that must be completed before Commissioning may start.

f. Also prior to Commissioning, the Contractor shall review the lockout procedures outlined in the Safety section of the O&M manuals for any new, replacement or modified equipment in consultation with the Owner.

g. During Commissioning, the Contractor shall furnish necessary technical services as required to resolve preliminary operating problems as they develop. Commissioning shall not be complete until satisfactory operation is achieved.

9 Performance Test

a. The TAS Performance Tests shall involve the Owner, the Contractor and its subcontractors (as required), the RCD Contractor and its subcontractors (as required), and the installation contractor. Herein after referred to as the Commissioning Team. The Performance Test shall be based on the following:

   i. The TAS and RCD2 Systems shall be operated in the Normal Tandem Dump, North Dumper Operation and South Dumper Operation Modes to test the variability of rates and flow across the apron feeders to the collection conveyor.

   ii. Be executed following successful completion of Full-load Commissioning;

   iii. Verify motor currents operate within the motor and VFD ratings;

   iv. The unloading tests shall demonstrate the TAS's Ideal capacity as noted below:

b. Normal Cycle

   The Normal Cycle Time test would demonstrate the TAS's ability to handle sticky coal. Unfortunately, this condition cannot be simulated and the probability of receiving a train loaded with sticky coal arriving at the time of the Performance Test is low.

   However, when such a train arrives the Contractor will be requested to provide a technical person to witness the TAS handling of the sticky coal.

c. Ideal Cycle

   The Ideal Cycle Time test shall demonstrate the TAS's ability to receive coal from the RCD railcar unloading system and transfer it to the downstream system under ideal conditions with no pauses:

d. In support of the Performance Tests, the Owner will ensure that adequate trains are available for unloading; the remainder of the downstream system is operational and performing at the required desired rate; and the appropriate storage yard capacity is available. If any down-stream delays occur, the system will be paused immediately before a dump cycle, and the pause time will not be included in the operating load test time.

e. No delays shall be attributable to the TAS during the Performance Tests. Any cause for interruption attributed to the Contractor shall be resolved to the satisfaction of the Owner and the test repeated.

f. If the Guaranteed Performance data is attained during the Performance Tests, the Contractor shall prepare an acceptance report, which shall be immediately signed by the Contractor and the Owner. This report shall be considered a correct and complete record of the Performance Test. If the Guaranteed Performance data is not attained, the Contractor shall repair the deficiencies and repeat the Performance Test.

10 Spare Parts

a. Contractor shall prepare a detailed list and breakout cost in the Proposal pricing for all critical short term recommended spare parts necessary for:

   i. Commissioning and start-up

   ii. Twelve (12) months of operation

b. Contractor to prepare a similar list and cost breakdown for recommended strategic (long term) spares for ASPA's future consideration.

11 Contractor's Proposal

The contractor's proposal shall include the following as identified in this Technical Specification

11.1 Acknowledgement of Technical Specification

a. Contractor shall acknowledge their Proposal is in compliance with this TAS Technical Specification and if not, clearly identify all deviations, exceptions and exclusions to the requirements outlined herein.

b. The Contractor shall advise the Owner of any recommendations that could improve safety, efficiency, availability, reliability, throughput or functionality, or that may have a significant impact on the cost or operation of the TAS System.

   Such recommendations shall be priced as options to the base Proposal.

11.2 Proposal Pricing

Contractor shall breakout the following pricing and information as requested and referenced by paragraph herein;

a. Special Tools (**Ref: Para. 2.1.13.**)

b. Technical Field Services & Support (**Ref: Para. 2.2**)

   Contractor to provide estimated number of hours, duration, rates and expenses, for the following Technical Field Services & Support defined herein

   iii. Field supervision and support beginning with installation thru performance testing.

   iv. On Site training

   v. On-call Staffing

11.3 Additional Information

Contractor shall provide the following additional information in their Proposal as requested and referenced by paragraph herein;

a. Identify all proprietary, custom and/or special parts and/or components not easily available in the market place. **(Ref: Para.5.1.d)**

b. Submit RCD Contractor's Quality Assurance Program **(Ref: Para. 2.1.14. f)**

c. Describe the apron feeder drive arrangement **(Ref: Para. 5.3.b)**

12 Attachments

a. Attachment 1: TUS2 Dwg Package
b. Attachment 2 Existing Vault Foundation Drawings
c. Attachment 3 Preferred Equipment List

END OF SPECIFICATION