Administrative Services
2147-TAMU
College Station, TX 77843-2147
Tel. 979-845-4786| Fax. 979-458-1217|agrilifeas.tamu.edu

April 23, 2020

TO BIDDER:

Transmitted herewith is Invitation For Bid #B0600014. To submit a bid, please complete the Invitation For Bid form and return it to the Texas A&M AgriLife Purchasing Department by the bid opening date and time. Mailed, hand delivered, facsimile (979-458-1217), and emailed (bids@ag.tamu.edu) bids will be accepted if received prior to the Bid Opening Date/Bid Submission Deadline. If submitting a bid through the mail or by hand delivery, please show the Invitation For Bid Number and the Bid Opening Date/Bid Submission Deadline in the lower left hand corner of a sealed envelope.

Bids must be submitted on the Texas A&M AgriLife Purchasing Department's Invitation For Bid form. The bid must be signed and dated to be considered. Please enter your company name, address, and your State of Texas vendor identification number on page 1 of the Invitation for Bid. If the number is unavailable, enter your federal taxpayer identification number or your social security number. Please read carefully the terms and conditions. Sections 1.13, 10.9, 13, and 20 of the terms and conditions should be completed and submitted with your bid. Sections that are not applicable should be marked "NA".

Bids will be opened on the date and at the time stated on the Invitation For Bid form. Bidders and/or their representative may attend the bid opening if desired. Please note: The bid opening will be held at 578 John Kimbrough Blvd. Room #412, College Station, Texas 77843. Paid visitor parking is located in the first row of Lot 97.

After the bids have been evaluated, the vendor receiving a bid award from this solicitation will be issued a purchase order.

Mailing Address for Bids:
Texas A&M AgriLife Purchasing Department
2147 TAMU
College Station, TX 77843-2147

Physical Address for Bids: (for Fed Ex, UPS, hand delivery, etc.)
Texas A&M AgriLife Purchasing Department
578 John Kimbrough Blvd., Room #419
College Station, TX 77843

If you would like additional information concerning our purchasing procedures, please contact:

Chris Chamberlain, CTPM
Assistant Director of Purchasing
Texas A&M AgriLife Administrative Services
Purchasing Department
979-845-4786 979-458-1217 (fax)
cchamberlain@tamu.edu

INVITATION FOR BID — RETURN SEALED BIDS TO:

TEXAS A&M AGRILIFE PURCHASING
2147 TAMU
COLLEGE STATION, TX 77843-2147
PHONE: 979-847-5801
FAX: 979-458-1217
EMAIL: BIDS@AG.TAMU.EDU

BIDDER MUST SIGN BELOW

FAILURE TO SIGN WILL DISQUALIFY BID

____
AUTHORIZED SIGNATURE

____
PRINT OR TYPE NAME

____
TITLE DATE

____
COMPANY NAME

____
ADDRESS

____
CITY STATE ZIP

____
PHONE FAX

____
VENDOR ID NUMBER (SEE SECTION 1.8 OF TERMS & CONDITIONS)

____
DUNS NUMBER (IF AVAILABLE)

Bid Opening Date/Bid Submission Deadline: May 14, 2020, at 3:00PM (CST)

Invitation For Bid Number: B060014

BY SIGNING, VENDOR AGREES TO COMPLY WITH ALL TERMS AND CONDITIONS ATTACHED HERETO.

BY SIGNING, BIDDER CERTIFIES THAT IF A TEXAS ADDRESS IS SHOWN AS THE ADDRESS OF THE BIDDER, BIDDER QUALIFIES AS A TEXAS RESIDENT BIDDER AS DEFINED IN 34 TEXAS ADMINISTRATIVE CODE, RULE 20.32(68).

BID TO BE “F.O.B. DESTINATION FREIGHT PREPAID AND ALLOWED” UNLESS SPECIFIED OTHERWISE BELOW.

DESTINATION OF GOODS:
Texas A&M AgriLife Center at Vernon
11708 Hwy 70 S.
Vernon, Tx 76384

Item	Description	Quantity	UOM	Unit Price	Ext Price
	ELECTRICAL FOR PEANUT SHELLING EQUIPMENT				
1	Base Bid: Contractor shall furnish all labor, materials, and equipment necessary to extend power from the Main Distribution panel across to a new peanut processing equipment line, plus connection as necessary to power the equipment. Provide at least two duplex convenience outlets, one near each end of equipment line. Full automation is NOT INCLUDED, but motor starters, variable frequency drives, etc. (furnished by others) shall be installed and connected/wired to power the equipment as part of this project. See attached specifications and terms & conditions.	1	Job	__________	__________
2	Alternate 1: Furnish motor starters, variable frequency drives (VFDs), etc. to control the Bratney equipment as scheduled in the Appendix.	1	Job	__________	__________
3	Alternate 2: Furnish labor, materials, and equipment necessary to upgrade service extending underground from the transformer pole serving building (approximately 130’) and replace existing 200A 3-phase panel with new 600A Main Distribution Panel, including breakers necessary to protect new and existing circuits plus extra spaces.	1	Job	__________	__________

Number of days to completion after receipt of purchase order: ______ days

GRAND TOTAL: ____________

If claiming preference under 34 Texas Administrative Code, Rule 20.38, please complete section 1.13 of the terms and conditions and submit with signed bid response.

If claiming to be a TPASS certified Historically Underutilized Business (HUB), please specify:
(__) BLK (__) HSP (__) W/O (__) A/P (__) AI (__) SDV

Chris A Chamberlain

PURCHASING AGENT FOR TEXAS A&M AGRILIFE

Administrative Services
2147-TAMU
College Station, TX 77843-2147
Tel. 979-845-4786| Fax. 979-458-1217|agrilifeas.tamu.edu

TEXAS A&M AGRILIFE

ATTACHMENT A
INVITATION FOR BID #B060014

HUB Policy and HUB Subcontracting Plan Requirements and Preproposal Webinar

Per TAMU System Policy 25.06, The Texas A&M University System, Universities, and the Agencies are to encourage the use of Historically Underutilized Businesses (HUBs) both directly and indirectly in the members' prime contracts, subcontracts, and purchasing transactions. The goal of the HUB Program is to promote equal access and equal opportunity in Agency contracting and purchasing. Subcontracting opportunities are defined as opportunities to contract with a vendor to perform work, to supply commodities, or contribute toward completing work for a governmental entity.

For proposals totaling $100,000 or more, a completed HUB Subcontracting Plan (HSP) must be submitted. For proposals totaling less than $100,000 an HSP is not required. If required, failure to submit a comprehensive, acceptable HSP will be considered a material failure to comply with the requirements of the Invitation For Bid (IFB) and will result in rejection of the submittal. The HSP shall be submitted with the IFB response.

Documents attached are the Agency Specific Texas HUB Subcontracting Plan form, HSP checklist, and Prime Contractor Progress Assessment Report (PAR) form. The State of Texas HSP forms can also be found at the following site: https://comptroller.texas.gov/purchasing/vendor/hub/forms.php

An HSP pre-proposal webinar conference is scheduled for: **Tuesday, April 28, 2020, at 2:00 p.m CST.**
Attend via web meeting address at:
https://agrilife-tamu.webex.com/webappng/sites/agrilife-tamu/dashboard?siteurl=agrilife-tamu
Meeting # 922 557 770

Conference materials regarding HSP compliance may be found at the following link:
http://agrilifeas.tamu.edu/documents/conference-resource.pdf

NIGP Commodity codes identified for possible HUB Subcontracting include, but are not limited to, the following:

- 910-82 Wiring and Other Electrical Maintenance and Repair Services
- 285-19 Conduit and Fittings, Rigid
- 280-24 Building Cable and Wire, Single and Multiconductor
- 285-14 Circuit Breakers, Load Centers, Boxes, and Panel Boards
- 285-95 Wiring Devices: Adapters, Caps, Connectors, Extension Cords, Fluorescent and HP Starters, Outlets, Plates and Covers, Plugs, Receptacles, Safety Cord Lock, Switches, Terminals, etc.

This list is neither mandatory nor exhaustive. Other areas of subcontracting may be more appropriate given the Bidder's business structure and internal resources. Please see the attached HUB Subcontracting Plan for further instructions that require Bidders to identify the specific areas intended for subcontracting.

Search for HUBs on CMBL for each class/item via the following website:
https://mycpa.cpa.state.tx.us/tpasscmblsearch/index.jsp

Contact the HUB Coordinator, Jaime Vykukal, for questions on completing the HSP.

HUB Coordinator
Jaime Vykukal
Jaime.vykukal@ag.tamu.edu
979-458-5988
2147 TAMUS
College Station, TX. 77843

Questions:
If discrepancies, ambiguities, or omissions are found in the bidding documents, or if further information or interpretation is desired, please contact the following in writing:

Chris Chamberlain
Fax, 979/458-1217
E-mail, cchamberlain@tamu.edu

All questions must be received on or before Wednesday, May 6, 2020, at 3:00 pm CST. When deemed appropriate by the Agency, questions will be answered by bid addendum. All provisions and requirements of such addenda will supersede or modify affected portion of the bidding documents. All addenda will be incorporated in and bound with the contract documents. No other explanations or interpretations will be considered binding.

Terms and Conditions
The Bidder agrees to comply with the Agency's terms and conditions. These supersede any other terms and conditions issued and/or referenced by the Bidder. Having the status of a state agency, Texas A&M AgriLife must abide by the laws of the State of Texas. Any contract resulting from this bid solicitation shall be construed and governed by the laws of the State of Texas.

Terms of Payment
Net 30, based on the requirements of the "Final Acceptance and Payment" section of the specifications.

Warranty
See the "Guarantee" section of the specifications.

Shipping
F.O.B. Destination

Discounts
Provide any and all applicable discounts on the items in this Invitation For Bid.

Insurance
The Bidder is required to carry insurance naming the Texas A&M University System Board of Regents for and on behalf of the Texas A&M University System, the Texas A&M University System, and Texas A&M AgriLife as additional insureds for the duration of the contract. Renewed, revised, or new certificates of insurance shall be sent to the Texas A&M AgriLife Purchasing Office via fax to 979-458-1217or email to purchasing@ag.tamu.edu. Not carrying the required insurance could lead to cancellation of this agreement by the Agency.

Public Information:
a) Bidder acknowledges that the Agency is obligated to strictly comply with the Public Information Act, Chapter 552, Texas Government Code, in responding to any request for public information pertaining to this Agreement, as well as any other disclosure of information required by applicable Texas law.
b) Upon the Agency's written request, Bidder will promptly provide specified contracting information exchanged or created under this Agreement for or on behalf of the Agency.
c) Bidder acknowledges that the Agency may be required to post a copy of the fully executed Agreement on its Internet website in compliance with Section 2261.253(a)(1), Texas Government Code.

The requirements of Subchapter J, Chapter 552, Texas Government Code, may apply to any resulting agreement and the bidder agrees that any resulting agreement can be terminated if the awarded vendor knowingly or intentionally fails to comply with a requirement of that subchapter.

Records Retention:
Awarded Bidder will preserve all contracting information, as defined under Texas Government Code, Section 552.003 (7), related to the Agreement for the duration of the Agreement and for seven years after the conclusion of the Agreement.

Prohibition on Contracts Related to Persons Involved in Human Trafficking:
Under Section 2155.0061, Government Code, the Bidder certifies that the individual or business entity named in this contract is not ineligible to receive the specified contract and acknowledges that this contract may be terminated and payment withheld if this certification is inaccurate.

Conflict of Interest
By executing any resulting agreement, the Bidder and each person signing on behalf of the Bidder certifies, and in the case of a sole proprietorship, partnership or corporation, each party thereto certifies as to its own organization, that to the best of their knowledge and belief, no member of the Texas A&M System or the A&M System Board of Regents, nor any employee, or person, whose salary is payable in whole or in part by the A&M System, has direct or indirect financial interest in the award of any resulting agreement, or in the services to which any resulting agreement relates, or in any of the profits, real or potential, thereof.

Prohibition on Contracts with Companies Boycotting Israel

To the extent that Texas Government Code, Chapter 2270 applies to this solicitation, Bidder certifies that (a) it does not currently boycott Israel; and (b) it will not boycott Israel during the term of any resultant Agreement. Bidder acknowledges any resultant Agreement may be terminated and payment withheld if this certification is inaccurate.

Certification Regarding Business with Certain Countries and Organizations

Pursuant to Subchapter F, Chapter 2252, Texas Government Code, the Bidder certifies it is not engaged in business with Iran, Sudan, or a foreign terrorist organization. The Bidder acknowledges any resulting agreement may be terminated if this certification is inaccurate.

Previous Employment.

The vendor acknowledges and understands that Section 2252.901, Texas Government Code, prohibits TAMUS from using state appropriated funds to enter into any employment contract, consulting contract, or professional services contract with any individual who has been previously employed, as an employee, by the Member within the past twelve (12) months. If vendor is an individual, by accepting this purchase order or contract, Vendor certifies that Section 2252.901, Texas Government Code, does not prohibit the use of state appropriated funds for satisfying the payment obligations herein.

Not Eligible for Rehire

Vendor is responsible to ensure that employees participating in work for any A&M System member have not been designated by the A&M System as Not Eligible for Rehire as defined in System policy 32.02, Section 4. Non-conformance to this requirement may be grounds for termination of this agreement.

Best Value Criteria

Bidders please note: Texas A&M AgriLife reserves the right to accept or reject any or all bids, to waive informalities and technicalities, to accept the offer considered most advantageous and award the bid based on best value criteria. In determining what is the best value to the Agency, the Agency shall consider any or all of the following:

1) purchase price
2) the reputation of the vendor and the vendor's goods or services.
3) the quality of the vendor's goods or services.
4) the extent to which the goods or services meet the agency's needs.
5) the vendor’s past relationship with the agency.
6) the total long-term cost to the agency in acquiring the vendor’s good or services.
7) the length and coverage of the vendor's warranty.
8) the completion time.
9) any other relevant factor that a private business entity might consider in selecting a vendor.

SPECIFICATIONS

ELECTRICAL FOR PEANUT SHELLING EQUIPMENT

TEXAS A&M AGRILIFE RESEARCH

VERNON, TEXAS

TEXAS A&M SYSTEM

TEXAS A&M AGRILIFE
ADMINISTRATIVE SERVICES - ENGINEERING

STATE OF TEXAS
JAMES D. DUNN, JR.
61604
REGISTERED PROFESSIONAL ENGINEER

James D. Dunn, Jr.
4/17/2020

PROJECT NO. 0236

April 2020

NOTICE OF PROJECT

Electrical for Peanut Shelling Equipment
Texas Foundation Seed Service
Texas A&M AgriLife Research, Vernon, Texas
April 2020 Project No. 0236

SCOPE OF WORK

Base Bid - Furnish all labor, materials and equipment necessary to extend power from the Main Distribution panel across to a new peanut processing equipment line plus connection as necessary to power the equipment. Provide at least two duplex convenience outlets. One near each end of equipment line.

Full Automation is NOT INCLUDED, but motor starters, variable frequency drives, etc. **(furnished by others)** shall be installed and connected/wired to power the equipment as part of this project.

Alternate 1 – Furnish motor starters, variable frequency drives (VFDs), etc. to control the Bratney equipment as scheduled in the Appendix.

Alternate 2 - Furnish labor, materials and equipment necessary to upgrade service extending underground from the transformer pole serving building (approximately 130') and replace existing 200A 3-phase panel with new 600A Main Distribution Panel, including breakers necessary to protect new and existing circuits plus extra spaces.

INSTRUCTIONS TO BIDDERS

PROJECT SITE

The project site is located at **Texas Foundation Seed Service, 11914US 70 South, Vernon, Texas. (near Lockett).**

Owner's Representative is **David Jones 940-552-9941 (ext. 236).**

No information noted in the specifications shall relieve the Contractor of the responsibility of visiting the site and making such investigations as he/she may require.

MANDATORY EXAMINATION OF SITE

To arrange for site inspection on your own, contact Owner's Representative as noted.

A mandatory site inspection is required prior to bidding. Each contractor shall be required to visit the site and examine the condition of the site. Contractors that visited site previously are not required to re-visit. The Contractor shall sign in with the Owner's Representative and provide the following information in writing:

Company Name	**Phone Number**
Address	**E-mail**
City, State	**Person's Name**
	Date/Time

Failure to comply with this section will be grounds for rejection of bid.

No information noted in the specifications shall relieve the Contractor of the responsibility of visiting the site and making such investigations as he/she may require.

After investigating the project site and comparing the Drawings and Specifications with the existing conditions, the bidder should immediately notify the Buyer of any conditions for which requirements are not clear, or about which there is any question regarding the extent of the Work involved.

Should the successful bidder fail to fully investigate and should a question arise later as to the extent of the Work involved in any particular case, the Buyer and agency Engineer will make the proper interpretation of the Contract Documents.

CONTACTS

Owner's Representative - **David Jones 940-552-9941 (ext. 236).**
Buyer – Chris Chamberlain, 979-845-4786, cchamberlain@tamu.edu
Engineer – Jimmy Dunn, 979-845-2180, jd-dunn@tamu.edu

QUALIFICATIONS OF BIDDER

The Owner may make such investigations as necessary to determine the ability of the Bidder to perform the Work, and the Bidder shall furnish any requested information and data including an audited financial statement within 5 days of the Bid Opening. The Owner reserves the right to reject any bid if, the evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that this Bidder is properly qualified to complete the Work.

BONDS

Bid Bond / Proposal Guaranty - **Not required.**

Performance & Payment Bonds - (re. Appendix for example forms)

CONTRACT AWARD

The Owner agrees if the Contract is awarded, the award will be made within sixty (60) days of the bid opening date, unless otherwise stated in the Request for Quote.

Immediately following action by the awarding authority, the successful bidder will be notified of the award.

The Owner reserves the right to accept or reject any or all alternates or to accept any combination of alternates considered advantageous.

PERFORMANCE and PAYMENT BONDS

Performance and Payment Bonds are not required on contracts of $25,000 or less. Chapter 2253, Texas Government Code, T.C.S., requires that **if the Contract Sum exceeds $25,000, the Contractor shall provide an executed Payment Bond and if the Contract Sum exceeds $100,000, the Contractor shall also provide an executed Performance Bond.**

1. Each bond shall be executed and contain an embossed seal by a Surety(ies) on forms approved by the Attorney General of Texas. If any Surety upon any bond furnished in connection with the Contract becomes insolvent, or otherwise not authorized to do business in the State, the Contractor shall promptly furnish equivalent security to protect the interests of the State and of persons supplying labor, materials and/or equipment in the performance of the Work.
2. Each bond shall have attached a valid Power-of-Attorney issued by the Surety, signed and sealed with the corporate embossed seal, authorizing the agent who signs the bond to commit the Surety to the terms of the bond, and stating the limit on the face of the Power-of-Attorney, if any, in the total amount for which the agent is empowered to issue a single bond.

3. The Owner may consider Performance and Payment Bonds only from a Surety authorized to do business in Texas.

The cost of any such bonding must be included in the Base Bid amount. No additional charges will be allowed for bonding. **Bonds must be executed on standard TAMUS forms.**

PURCHASE ORDER

Texas A&M - AgriLife Research / AgriLife Extension / Forest Service / Veterinary Medical Diagnostic Lab reserves the right to substitute the word "Purchase Order" for "Contract" in the documents whenever it feels that a signed Purchase Order will expedite the Project

INSURANCE

The Contractor shall obtain and maintain, for the duration of this Agreement or longer, the minimum insurance coverage set forth below. With the exception of Professional Liability (E&O), all coverage shall be written on an occurrence basis. All coverage shall be underwritten by companies authorized to do business in the State of Texas or eligible surplus lines insurers operating in accordance with the Texas Insurance Code and have a financial strength rating of A- or better and a financial strength rating of VII or better as measured by A.M. Best Company or otherwise acceptable to Texas A&M AgriLife Research/Extension/Forest Service. By requiring such minimum insurance, the Owner shall not be deemed or construed to have assessed the risk that may be applicable to the Contractor under this Agreement. The Contractor shall assess its own risks and if it deems appropriate and/or prudent, maintain higher limits and/or broader coverage. The Contractor is not relieved of any liability or other obligations assumed pursuant to this Agreement by reason of its failure to obtain or maintain insurance in sufficient amounts, duration, or types. No policy will be canceled without unconditional written notice to Texas A&M AgriLife Research/Extension/Forest Service at least ten days before the effective date of the cancellation.

Coverage	Limit
Worker's Compensation	
Statutory Benefits (Coverage A)	Statutory
Employers Liability (Coverage B)	$1,000,000 Each Accident
	$1,000,000 Disease/Employee
	$1,000,000 Disease/Policy Limit

Workers' Compensation policy must include under Item 3.A. on the information page of the workers' compensation policy the state in which work is to be performed for Texas A&M AgriLife Research/Extension/Forest Service. Workers' compensation insurance is required, and no "alternative" forms of insurance will be permitted.

Automobile Liability

Business Auto Liability Insurance covering all owned, non-owned or hired automobiles, with limits of not less than $1,000,000 Single Limit of liability per accident for Bodily Injury and Property Damage;

If a separate Business Auto Liability policy is not available, coverage for hired and non-owned auto liability may be endorsed on the Commercial General Liability policy.

Additional Endorsements

The Auto and Commercial General Liability Policies shall name the Texas A&M University System Board of Regents for and on behalf of The Texas A&M University System and Texas A&M AgriLife Research/Extension/Forest Service as additional insured's.

Commercial General Liability

Each Occurrence Limit	$1,000,000
General Aggregate Limit	$2,000,000
Products / Completed Operations	$1,000,000
Personal / Advertising Injury	$1,000,000
Damage to rented Premises	$300,000
Medical Payments	$5,000

The required commercial general liability policy will be issued on a form that insures the Contractor's or its subcontractors' liability for bodily injury (including death), property damage, personal and advertising injury assumed under the terms of this Agreement

The Contractor shall deliver to Texas A&M AgriLife Research/Extension/Forest Service:

Evidence of insurance on a Texas Department of Insurance approved certificate form verifying the existence and actual limits of all insurance after the execution and delivery of this Agreement and prior to the performance of any services by the Contractor under this Agreement. Additional evidence of insurance will be provided on a Texas Department of Insurance approved certificate form verifying the continued existence of all required insurance no later than thirty (30) days after each annual insurance policy renewal.

All insurance policies, with the exception of worker's compensation, employer's liability and professional liability shall be endorsed and name The Board of Regents for and on behalf of The Texas A&M University System, The Texas A&M University System and Texas A&M AgriLife Research/Extension/Forest Service as Additional Insureds up to the actual liability limits of the policies maintained by the Contractor. Commercial General Liability and Business Auto Liability will be endorsed to provide primary and non-contributory coverage. The Commercial General Liability Additional Insured endorsement will include on-going and completed operations and will be submitted with the Certificates of Insurance.

All insurance policies shall be endorsed to provide a waiver of subrogation in favor of The Board of Regents of The Texas A&M University System, The Texas A&M University System and Texas A&M AgriLife Research/Extension/Forest Service. No policy will be canceled without unconditional written notice to Texas A&M AgriLife Research/Extension/Forest Service at least ten days before the effective date of the cancellation. *All insurance policies* shall be endorsed to require the insurance carrier providing coverage to send notice to Texas A&M AgriLife Research/Extension/Forest Service ten (10) days prior to the effective date of cancellation, material change, or non-renewal relating to any insurance policy required in this Section 11.

Any deductible or self-insured retention must be declared to and approved by Texas A&M AgriLife Research/Extension/Forest Service prior to the performance of any services by the Contractor under this Agreement. The Contractor is responsible to pay any deductible or self-insured retention for any loss. All deductibles and self-insured retentions will be shown on the Certificates of Insurance.

Certificates of Insurance and Additional Insured Endorsements as required by this Agreement shall be emailed or mailed to the following Texas A&M AgriLife Research/Extension/Forest Service contact:

Name: Jimmy Dunn
Email: jd-dunn@tamu.edu
Address: AgriLife Admin Services – Engineering
TAMU 2147
College Station, Texas 77843-2147

The insurance coverage required by this Agreement will be kept in force until all services have been fully performed and accepted by Texas A&M AgriLife Research/Extension/Forest Service in writing, except as may be noted.

The furnishing of the above listed insurance coverage, as may be modified herein, must be tendered prior to performance of the Contract. Failure to provide the insurance in a timely fashion may result in loss of the Contractor's bid surety and/or cancellation of the Contract.

The Owner shall be entitled, upon request and without expense, to receive copies of the policies and all endorsements as they apply to the limits set out in these specifications.

If insurance policies are not written for the amounts specified, the Contractor shall carry Umbrella or Excess Liability Insurance for any differences in amounts specified. If Excess Liability Insurance is provided, it shall follow the form of the primary coverage.

FINAL ACCEPTANCE AND PAYMENT

Schedule of Values: Prior to Notice to Proceed, Contractor shall submit a Schedule of Values detailing a breakdown of labor and material values for each division of work.

Progress Payments: Invoices/draws may be submitted at monthly intervals for progress payment of labor and materials on site to date. Retainage of 10% shall be withheld till final.

Notification: When the work is completed, the Contractor shall notify the engineer that the work will be ready for pre-final inspection on a definite date. Upon verification by the engineer that the deficiencies found during pre-final inspection have been corrected and the Work is ready for final inspection and acceptance, the engineer will within 10 days make a final inspection, and when the work is found acceptable under the Contract documents, without exceptions, and the contract is fully preformed, the Owner will make final payment to the Contractor.

Final Payment Documentation: Neither the final payment nor the remaining retained percentages shall become due until the Contractor submits to the Engineer (1) an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the work for which the owner or its property might in any way be responsible, have been paid or will be paid or otherwise satisfied within thirty days after receipt of final payment from the Owner, or within the period of time required by Article 601f, T.C.S., (2) consent of surety, if any, to final payment and (3) if required by the Owner, other data establishing payment or satisfaction of all such obligations, such as receipts, release and waivers of claims arising out of the Contract, to the extent and in such form as may be designated by the Owner.

Final Payment: The making of final payment shall constitute a waiver of all claims by the Owner except those arising from: (1) faulty or defective work appearing after Beneficial Occupancy; (2) failure of the work to comply with the requirement of the contract documents documents ; (3) terms of any special warranties required by the contract documents. Acceptance of Final Payment shall constitute a waiver of all claims by the contractor except those specifically enumerated at the time of final payment.

DIVISION 1 - GENERAL REQUIREMENTS

INTENT

The intent is to have the specified electrical work accomplished turn-key.

Any items not specifically noted but required for a fully functional system shall be furnished and installed at no additional cost.

RULES AND REGULATIONS

Work shall be performed in accordance with requirements of the state of Texas, the National Electrical Code (NEC) latest edition, Life Safety Code and other applicable requirements as published by the National Fire Protection Association (NFPA), as well as the rules and regulations of the local power supplier. .

Give precedence to drawings and specifications when they require higher standards than those required by rules and regulations.

Rules and regulations govern in case of direct conflict between regulations, drawings and specifications.

This project is <u>not</u> subject to local/municipal codes and/or permitting as it is being constructed on property belonging to the state of Texas.

<u>It is the responsibility of the Contractor to call 811 / Texas 811 to verify any underground lines/utilities before any digging, trenching and/or other underground work is started on site.</u>

WORK AREA AND ACCESS

All work, materials storage, staging, and parking shall be confined within the area(s) designated by the Owner's Representative.

Access to the building(s) shall be coordinated directly with the Owner's Representative. No construction traffic will be allowed over field/pasture roads or other non-designated areas.

USE OF FACILITIES

The Contractor shall insure that Owner's personnel and equipment will not be endangered during construction and will be allowed continued normal operation within the buildings and grounds.

SANITARY FACILITIES

Facilities are available on site

TOOLS, EQUIPMENT AND VEHICLES

The Contractor shall furnish all tools (hand, power, pneumatic, etc.), equipment, and vehicles for the construction of this project. **All facilities, tractors, welders, forklifts, etc. are off limits.**

CONSTRUCTION UTILITIES

Electrical Power: Electrical power will be available for construction work. The Contractor must furnish necessary labor, extension cords, temporary panels, lighting, equipment, etc. for his/her own use.

DELIVERIES

The Contractor shall have personnel at the site necessary to accept delivery and accomplish unloading / handling of materials and equipment. The Owner will not be responsible for accepting and/or unloading of materials and equipment associated with this job.

STORAGE AND PROTECTION

The Contractor shall properly store materials and equipment at the jobsite within an area designated by the Owner's Representative. Protect same from the elements when in open storage. The Contractor will be responsible for keeping the assigned area free from fire hazards relating to improper storage procedures.

The Owner accepts no responsibility for the security of the stored materials.

Properly protect equipment, insulation, and other materials during construction. Handle materials, equipment and devices carefully to prevent damage.

Material or equipment improperly handled or damaged from rough usage or improper storage shall be removed and replaced with new units when so directed by the Engineer.

CLARIFICATION

In case of doubt, do not proceed with work without first obtaining from the Engineer additional information or detail drawings as may be necessary for proper execution of work. Report discrepancies found in drawings and specifications without delay.

SUBSTITUTION OF MATERIALS

Where *any* article or thing is specified by proprietary name, trade name, name of manufacturer or catalog number with or without the addition of such expressions as "or equal" or "approved equal", it is to be understood that the article named or the equal thereof is intended, subject to the approval of the Engineer as to the equality thereof, and it is distinctly understood (1) that the Engineer shall use his judgement in determining whether or not any article or thing proposed to be substituted is the equal of any article or thing as specified; (2) that the decision of the Engineer on such questions of equality shall be final; and (3) that in the event of any adverse decision by the Engineer, no claim of any sort shall be made or allowed against the Owner.

CUTTING AND PATCHING

Required cutting and patching shall be done by the Contractor and/or responsible Subcontractor as necessary to accomplish the work described. Insure that all related penetrations, both old and new, are accomplished in a workmanlike manner and sealed as necessary for weather tight conditions upon completion of work.

DAMAGES

Care shall be exercised to prevent damages to existing facilities, trees, lawns, site improvements, site utilities, equipment, etc. Any such damages occurring shall be promptly corrected as directed by the Engineer. No claims for corrected work due to damages resulting from the Contractor or his Subcontractor shall be considered for payment.

WASTE DISPOSAL AND CLEANING

All material removed/replaced shall become property of the Contractor unless otherwise agreed with the Owner's Representative.

Debris shall be contained in a container, truck, or restricted refuse area as coordinated with the Engineer and Owner's Representative.

The Contractor shall be responsible for keeping the jobsite picked up clean and uncluttered during the course of construction. This includes timely removal and proper legal disposal off-site of all waste and debris associated with his/her job.

The Contractor shall provide safe and reliable transportation of debris, so that no material is allowed to fall onto public property or any other property other than the destination to which the removed materials are being transported.

Prior to final inspection and acceptance, perform final cleaning and removal of all waste, debris, and/or surplus materials resulting from this work.

SUBMITTALS

Submittals shall be required for all equipment, devices and for any proposed substitutions of materials. Two copies required for Engineer's use.

The submittals shall include copies of manufacturer's catalog descriptions, performance characteristics, data sheets and/or other information relative to a description of the items.

MANUALS

The Contractor shall furnish two (2) copies of all Owner's manuals and warranties prior to final payment, all in clear vinyl jackets and assembled within 3-ring binder covers.

GUARANTEE

The Contractor shall guarantee that the work performed under this section is free from faulty materials and workmanship and will remain so for a period of **one year** from the date of completion and acceptance by the Owner.

ELECTRICAL FOR PEANUT SHELLING EQUIPMENT LINE

Texas Foundation Seed Service
Texas A&M AgriLife Research, Vernon, Texas
April 2020 Project No. 0236

SCOPE OF WORK

Base Bid - Furnish all labor, materials and equipment necessary to extend power from the Main Distribution panel across to a new peanut processing equipment line plus connection as necessary to power the equipment. Provide at least two duplex convenience outlets. One near each end of equipment line.

Full Automation is NOT INCLUDED, but motor starters, variable frequency drives, etc. **(furnished by others)** shall be installed and connected/wired to power the equipment as part of this project.

Alternate 1 – Furnish motor starters, variable frequency drives (VFDs), etc. to control the Bratney equipment as scheduled in the Appendix.

Alternate 2 - Furnish labor, materials and equipment necessary to upgrade service extending underground from the transformer pole serving building (approximately 130') and replace existing 200A 3-phase panel with new 600A Main Distribution Panel, including breakers necessary to protect new and existing circuits plus extra spaces.

SUBMITTALS

Submittals for approval required for all equipment, devices, etc.

EXISTING CONDITIONS

The building is existing and space inside for the equipment line is cleared. However the peanut processing equipment is not in place at this time, but is expected within the next few months.

Re. Appendix for photos.

Clear floor space available for the equipment layout measures approximately 20'W x 75'L along an interior partition wall in an existing metal building. The building is 20' eave height with 1:12 roof pitch. Therefore approximately 24' clear height to inside at peak allowing for depth of structural members.

There is existing equipment along the north and west walls of the space.

GENERAL

Re. Appendix for Electrical specifications from Bratney Companies (the equipment Contractor), used and included herein with permission.

All electrical work shall be installed with proper regard for and in harmony with other construction. Required cutting and patching shall be done by this Subcontractor as described hereinafter. Adjacent general construction shall not be weakened or damaged and should any question arise as to the placement of conduit, fixtures or other materials or equipment, the Engineer shall be referred to for instructions. The Subcontractor will be responsible for all damage caused by his work or through the neglect of his workmen.

Furnish all other trades with information relative to roughing, spacing and space requirements. Plan all work in advance to determine whether interferences occur and whether existing services are complementary.

The intent is for a turnkey installation. To that end, furnish and install any items required for a complete installation but not specifically shown on the plans at no additional expense to the Owner.

SUPERVISION

Maintain on the job site (at all times work is in progress) a competent supervisor of electrical work.

PERMITS, FEES AND INSPECTIONS

No municipal permits required, but the Contractor shall obtain any required permits, pay any fees and arrange for any inspections required by the local power supplier.

GROUNDING/BONDING

Securely ground all outlets, panel boxes, switch boxes, equipment and all other devices in strict accordance with requirements of the National Electrical Code.

Grounding conductors with a green colored insulated jacket shall be provided and installed in all raceways.

Grounding materials, devices and workmanship shall be as approved by the Engineer.

MOUNTING/ATTACHMENT

No devices shall be mounted only to metal wall panels. Unistrut or angle stands attached to the building frame and/or floor shall be used as backup or for direct attachment.

CONDUIT and FITTINGS

Rigid metal conduit shall be galvanized, rigid metallic conduit as manufactured by National Electric Company, Triangle Conduit Company or equal.

Metallic Tubing shall conform to National Electrical Code requirements for electric metallic tubing in dimension and wall thickness. Finish for steel tube shall be galvanized or sherradized inside and outside with lacquer or synthetic resin coating inside as manufactured by General Electric, Republic, Triangle or equal.

All conduit shall be run in a neat and workmanlike manner with particular care being taken for convenience of arrangements and identification of circuits attached to the panel box.

All control wire shall be run in conduit.

Attach conduit with approved clamps. The use of wire, nails or perforated hanger iron for securing conduit will not be permitted. No conduit shall be attached to the steel wall panels.

Conduit shall be properly sized for THW conductor fill even if THWN conductors are used. Conduit shall not be smaller than 3/4" diameter, except min. ½" for low voltage control wire.

Ream all conduit after cutting.

Keep ends plugged watertight during construction.

Swab all damp conduit dry before pulling wires.

Use standard bends in conduit larger than 1". Conduit with crushed or deformed walls shall not be used. Attach conduit fittings to panels, pull boxes, switch boxes, outlet boxes, etc. with locknuts and bushing inside.

WIRE AND CABLE

Conductors shall be sized appropriately to supply the new panel.

Feeders and branch circuit conductors shall be type THW or THWN Code grade copper, 600 volt. Insulation thickness shall not be less than 15 mils thick plus outer covering.

Ground/bond wires, as a minimum, shall be as detailed on the drawings and as specified in Grounding/Bonding section.

Wire shall be sized so that the drop in the potential to the farthest point on the circuit does not exceed 3%.

Interior wire no. 8 or larger shall be stranded and smaller wire shall be solid except where noted otherwise.

Low voltage control wire shall be solid copper conductor with thermo-plastic insulation.

Run all mains and feeders full length with no joints or splices. Joints in branch circuits may occur at pull boxes, outlet boxes, junction boxes and panels only.

One conductor in each circuit shall be identified by a distinctive color and the unified plan of color coding, Article 210 of the National Electric Code, shall be followed throughout the entire installation.

CIRCUITS

On completion of this wiring, leave a typed schedule of circuit identification on a card in panel door pocket with an additional copy for permanent file to be delivered to the Owner.

Follow National Electric Code, Article 210 for color coding.

Circuits for outlets shall be configured so that no more than 2 duplex receptacles are controlled by a single 20 amp circuit.

BOXES

Boxes shall be of sufficient size to allow easy handling of wire and shall be covered. **All boxes shall be accessible** as defined by the National Electrical Code.

The Engineer reserves the right to make slight changes in the location of the outlets for centering, for convenience or for improved function. Such changes are to be made without additional expense to the Owner, provided instructions for moving are issued before actual installation of raceway and outlets.

Boxes shall be suitable for the application.

OUTLET RECEPTACLES

All receptacles shall be NEMA heavy duty straight blade, specification grade, grounding types, high-dielectric casing, **20 amp, 125 volts**. Leviton, as scheduled, or approved equal.

Confirm correct configuration per plan.

Receptacles shall include weather resistant covers.

PANELS

Panels shall be configured for bolt in breakers, Square D by Schneider Electric or approved equal.

All panels shall have copper buses, surface mounted and configured for appropriate feed.

Configuration, voltage, ratings, etc. as specified and necessary

New Main Distribution Panel shall be 3-phase, 600A, with main circuit breaker (MCB), configured with breakers as necessary for new and existing circuits, **plus min. 20% extra/blank spaces** for future circuits.

Sub panels shall be as necessary.

BREAKERS/OVER CURRENT PROTECTION

Provide breakers/over current protection for circuits as necessary for existing and new circuits sized per code and the equipment manufacturer.

APPENDIX

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Equipment Power Requirements

QTY	DESCRIPTION	ESTIMATED MOTOR HP	TYPE
1	Bulk Bag Bucket Elevator	1	FVNR
1	Cleaner	1.5	FVNR
1	Cleaner Bucket Elevator	1	FVNR
1	Airleg w/ Feeder	3	FVNR
1	Destoner	0.5	VFD
1	Destoner Bucket Elevator	1	FVNR
1	Sheller	2@1 & 1@1.5	VFD
1	Sheller Continuous Cup Elevator	2	FVNR
1	Gravity Table Feeder	0.75	VFD
1	Gravity Table Blower	4	VFD
1	Gravity Table CCE	2	FVNR
1	Color Sorter	2	FVNR
1	Color Sorter CCE	2	FVNR
1	Dust Filter	50	SoftStr
1	Dust Filter Airlock	1	FVNR
1	Dust Filter	50	SoftStr
1	Dust Filter Airlock	1	FVNR

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Electrical Specifications

Version: 1.4

Dated: January XX, 2019

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DIVISION 16 – ELECTRICAL

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Section 16000 Description of Work

1.0 General Information

1.1 The Contractor shall furnish and supply all permits, labor, equipment and materials (not furnished by Bratney, the owner and/or others) necessary to furnish, erect, install, and test the electrical and automation systems for the project in accordance with the drawings, documents, specifications, and details. All materials and equipment necessary to form a complete and operational system shall be provided and installed by the Contractor, unless otherwise indicated. Bratney and/or the owner may furnish materials where indicated in sections of the scope of work and where noted in the bid documents. Equipment and work that has been previously installed in prior packages shall be identified in the scope and noted in the bid documents. The Contractor shall include in the work all accessories and devices necessary for the intended operation of any system, whether or not specifically shown or specified.

1.2 Items furnished by the Automation Controls Contractor: As listed in the Electrical Scope of work. Items such as MCPs, MCCs, PLCs, HMIs, Level Sensors, Motion Detectors, Pushbutton Stations, etc. shall be furnished by the Automation Controls Contractor and installed by the Electrical Contractor. Refer to the Electrical Scope of Work for the project for additional details.

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Coordinate exact locations in the field with the Bratney project manager and owner prior to rough-in.

1.3 All work shall be in accordance with the drawings, specifications, and standards supplied by Bratney and/or the Automation Controls Contractor, good engineering and construction practices, and meet all applicable local and national codes. Unless specifically dimensioned, most drawing information is diagrammatic only – showing the general arrangement.

1.4 The project will include all electrical and automation items shown on the drawings and specified on written documentation. This would include all accessories and devices necessary for the intended operation of any system, whether or not specifically shown or specified.

1.5 All equipment provided by the Contractor must be new and inspected to verify an unblemished condition upon receipt. The Contractor is responsible for damage to the equipment and materials in his care.

1.6 Whenever connections to existing facilities are required, coordination with the Bratney and the Owner is necessary to schedule the work to minimize interruption of service and interference with the normal function of the building.

1.7 A designated contact of the Contractor shall be named for Bratney and the Owner to coordinate all correspondence and scheduling. The exception to this is if the electrical contractor is a sub-contractor to an Automation Controls Contractor.

1.8 The Contractor shall route all new conduit and as dictated by existing field conditions and shall coordinate routing with new and existing structures, equipment, ductwork, piping, and conduits with the other contractors. If possible, the installation of all new conduit shall be firmly fastened parallel to building lines - both horizontally and vertically. Where interferences occur due to lack of coordination, and the electrical or automation must be relocated, the contractor will provide such relocation without additional cost. **Pay special attention when routing conduit near equipment as to provide required clearance around equipment and not to block any maintenance access points. Do not route conduit near floor or other areas that would block product cleanup/sweeping operations.**

1.9 The Contractor shall follow manufacturer's recommendations and written instructions for the installation of all equipment, materials, and assemblies. Should conflicts arise between these documents and manufacturer's instructions, the more stringent requirement shall govern. The installation shall be in a neat and workmanlike manner.

1.10 All Contractor personnel responsible for work described herein shall be qualified in the disciplines required to complete the described work in accordance with the applicable specifications, standards, codes, laws, ordinances, and regulations.

1.11 The Contractor is responsible to coordinate installation of conduit, cable tray, and electrical equipment with other trades and conditions in the building and the outside site work and participate in coordination of all shop drawings. Variance from work shown on drawings shall require prior approval by Bratney and/or Owner.

1.12 The Contractor shall reestablish/maintain the integrity of all existing rated assemblies that require modification due to the scope of work. This would include maintaining any fire-stopping or fire-wall integrity with conduit passing through it. Cable tray and the cables and tubing within

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cable tray passing through fire-resistant rated walls, floors, partitions, and ceilings shall be sealed with KBS Sealbags, International Protective Coatings Flame Safe series, or 3M Company's CP-25, in accordance with the manufacturer's instructions and as may be shown on drawings and sketches.

1.13 The Contractor shall have the electrical installation inspected as required by the Authority Having Jurisdiction. All documentation shall be presented to Bratney for distribution to the Owner. Costs for inspection and certification shall be at the Contractor's expense.

Section 16010 Documents

1.0 Precedence of Documents

This specification is general information for work done on a Bratney project. However, many clients/owners have specific specification that must be met and do take precedence over these specifications unless specifically stated differently in the Scope of Work. If applicable refer to Owner's General Requirements for additional information on implementation of these specifications.

2.0 Description of Project Drawings

2.1 The intent of this section is to describe and provide the usage guidelines of the drawings which are either made available to or are created by the Contractor.

2.2 Drawings are classified as follows:

a. One-Line Diagrams
b. Power and Control Schematics
c. Interconnection and Conduit Drawings
d. Electrical Arrangement Drawings
e. Layout Drawings
f. Arc Flash Drawings and Documentation
g. Process and Instrumentation Diagrams (P&ID)
h. Equipment List

2.3 One-Line Diagrams

One-Line Diagrams are drawings that identify the overall electrical power distribution requirements of the project (at least the current portion of the project) and show all major electrical equipment requiring 480VAC/3/60 and above power plus any lower voltage distribution/power panels and transformers. One-Line Diagrams shall be used in conjunction with the other drawings listed below.

One-Line Diagrams include but are not limited to specifying and documenting the following items:

a. Main switchboard or distribution panel and the incoming service entrance cables to it.

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b. All devices (secondary gear, transformers, major equipment) connected to the main switchboard or distribution panel with cable information. This also includes any devices mounted in the equipment.

c. All devices connected to secondary gear including motor control panels (MCP) or motor control centers (MCC), transformers, lighting panels, and other distribution panels with cabling information.

d. Information documented for switchboards, secondary gear, MCPs/MCCs, lighting and distribution panels shall include NEMA rating, breaker information, fuse sizes, and other pertinent information needed for arc flash calculations.

e. Cable information includes type, size, and length along with conduit type. In the design phase, an estimated length is to be listed with the drawing and updated after construction showing actual lengths.

f. Miscellaneous major pieces of equipment requiring power connections with cable specifications and numbers.

g. All motors connecting to the MCPs/MCCs with reference to the associated motor schematics for cabling.

2.4 Power and Control Schematics

a. Power Schematic shows all power cabling incoming, internal and outgoing from the MCP/MCC or any other power cabinet. This includes all devices with 3 phase electrical requirements. Device tags, terminal symbols and locations, cable/wire type and size, cable/wire label identifier and control interconnects are clearly identified on the drawing.

b. Elementary Control Schematic shows wire connections and specification requirements for devices that don't have 3 phase electrical requirements. Generally, this shows 120VAC/1/60 power and lower devices such as relays, timers, dc power supplies, field devices, etc. not connected to I/O of the control system. Device tags, terminal symbols and locations, cable/wire type and size, cable/wire label identifier and control interconnects are clearly identified on the drawing.

c. I/O Control Schematic Diagrams are drawings that show connection requirements for all control wiring connected to the PLCs. The equipment legend and cable legend appear on I/O Schematic Diagrams as they do on other types of Schematic Diagrams. Spare I/O points are indicated as Spare and are to be used for future connections. In addition to wiring requirements, the I/O Schematic Diagram identifies PLC I/O card model and type, as well as I/O addressing.

2.5 Interconnection and Conduit Drawings

a. The Interconnection Diagram is a point-to-point connection drawing that identifies miscellaneous wiring requirements of various electrical and communication systems (i.e., PLC equipment, control equipment). Drawn as a schematic, it indicates the type and number of wires going from one panel to another and from a panel to field devices. Equipment tags are used to identify source and destination of the wires. This drawing is not necessarily for conduit runs but does separate the various connections by voltage.

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b. The Conduit Drawing will show exact details of type, size, and identification label of each cable/wire in a conduit which is labeled and sized. A general arrangement drawing is part of this conduit drawing showing both layout and elevation views of location of each conduit.

2.6 Electrical Arrangement Drawings

a. Electrical Power Plan is a drawing that identifies the location of various pieces of electrical equipment on plan view drawings of specific areas of the site and/or building. In addition to power equipment locations, other utility systems such as telephone, security, closed circuit TV, etc. should be shown if part of the project. The drawings are also an ideal method of portraying unique equipment requiring special voltage services or specialty receptacles.

b. Electrical Lighting Plan is a plan drawing that identifies lighting requirements for specific areas of the facility. It uses an array of symbols to depict all light fixtures, switches, push-buttons, receptacles, J-boxes, etc. Reference is made to various drawings that specify manufacturer and model of each device as it is represented on the Electrical Lighting Plan. In addition to the specific devices shown, the plan shall portray the following:

1. Fixture mounting height.
2. Lighting panel number and circuit identification.
3. Dimensions of fixtures from column centerlines.
4. Reference to installation details required to install various devices.
5. Switch and receptacle locations.

2.7 Layout Drawings

Layout Drawings will graphically represent design and the placement of electrical units on a scaled view. The drawings may use site or facility, building, room, equipment and panel layouts depending on the scope of the project. At a minimum, every MCP/MCC and Control panel must have a scaled layout drawing with equipment list that is updated at the end of the project.

2.8 Arc Flash Drawings and Documentation

The following is typically by owner or others. Refer to Electrical Scope of Work if included in this project. If to be done by others provide support information (equipment/breaker information, wire size/length, etc.) as required.

If the Owner's existing facility has complete arc flash analysis drawings and reports, the review and/or update to the existing documentation shall be considered. If no existing analysis is found, the Electrical Scope of Work will define whether the scope of this study and documentation is included for the current project only or the whole facility.

Arc Flash Drawings and Documentation may include, but not be limited to the following:

a. One-line electrical drawings

b. One-line electrical drawings displaying arc flash hazard incident levels, voltage and fault currents, equipment manufacturer and model numbers, over-current protective devices, etc.

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c. Arc Flash Evaluation Report

d. Fault Analysis Input Report

e. Fault Contribution Reports

f. Time Current Characteristics with data blocks

g. Panel Warning Labels

2.9 Process and Instrumentation Diagrams (P&ID)

a. Process Flow Diagrams (PFD) are drawings provided by Bratney which show the flow of product in a schematic form. The detail includes (but not limited to) the operating and design criteria (horsepower, speed control, temperature, pressure, level, etc.) for each piece of equipment and control devices (VFDs, control valves/gates, transmitters, controllers, etc.) complete with equipment tag identification. Since the drawings are schematic in nature, they may not indicate all offsets and changes in elevation required to accommodate existing conditions.

b. Process and Instrumentation Diagrams, if required by the client, shall be provided by the Automation Controls Contractor. The detail includes (but not limited to) symbols of each signal (electrical, pneumatic, hydraulic, etc.) and its control type (hardwire, I/O, communication protocol) with identification tag. Depending on the project, Bratney might assist with the P&IDs, refer to the Scope of Work.

c. Prior to start of material fabrication or any other construction activities, the Contractor shall verify existing conditions; compare the results with the information given on the PFD and/or P&ID drawings and report inconsistencies to Bratney's project manager. The Contractor shall not deviate from the contract drawings without approval of Bratney.

2.10 Equipment List

a. Process Equipment listed in spreadsheet format providing information for the power and control requirements for each piece of equipment. Bratney will typically provide this list with periodic revisions if equipment requirements change.

Section 16020 Compliance with Codes, Standards, and Regulations

1.0 Applicable Codes and Standards

1.1 All work performed shall comply with the latest revisions of applicable codes and standards of the following organizations:

a. Occupational Safety and Health Act (OSHA)

b. National Fire Protection Association (NFPA) and National Electrical Code (NEC)

c. All state and local codes as they apply

d. Service Rules and Regulations of Local Electric Utility Company

e. National Electrical Manufacturer's Association (NEMA)

f. Electrical Industry Association/Telephone Industry Association (EIA/TIA)

g. American National Standards Institute (ANSI)

h. Institute of Electrical and Electronic Engineers (IEEE)

1.2 All equipment and material shall meet the applicable standards of the following:

a. ANSI – American National Standards Institute

b. ASTM – American Society for Testing and Materials

c. NEMA – National Equipment Manufacturers Association

d. ICEA – Insulated Cable Engineers Association

e. SAMA – Scientific Apparatus Makers Association

f. ISA – Instrument Society of America

g. IEEE – Institute of Electrical and Electronic Engineers

h. NEC – National Electrical Code

i. UL – Underwriters Laboratories

j. CSA – Canadian Standards Association (Canada only)

k. IEC- International Electrical Code

l. SIL – Safety Integrity Level

2.0 Area Electrical Location Classifications

2.1 All Equipment purchased and installed shall be rated/suitable for the designated area classification. As a design/build company for the seed and grain industry, the following definitions and common practices are used by most projects undertaken by the Bratney Companies. However, each project is unique, so the Contractor needs to review each requirement to applicable codes to ensure compliance.

2.2 Hazardous (Classified) – In the seed/grain industry, this is defined as locations where fire or explosion hazards may exist due to combustible dust.

a. Adherence to NEC - Class II, Div. 1, Group G specifications – These locations are where combustible dust is in the air under normal operating conditions in quantities sufficient to produce explosive or ignitable mixtures. Most generally, these areas are without sufficient dust collection at the point of dust generation. Examples may be cob-storage, enclosed or semi-enclosed receiving bays, equipment tunnels, open top bulk storage, etc. A Dust Ignition Proof electrical installation will be required.

b. Adherence to NEC – Class II, Div. 2, Group G specifications – These locations are where dust may be present but due to dust filtration systems, the quantity is normally insufficient to produce explosive or ignitable mixtures or to interfere with normal operations of electrical equipment but may interfere with the safe dissipation of heat for electrical equipment. Most grain facilities fall into this category although seed facilities are exempted from this hazardous category via Informational Note No. 2 of Paragraph 500.5.C.2 of the NEC. At a

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minimum, the following areas of a seed facility would fall in this category: dust, cob, fines, cull and husk load-out if in enclosed areas, enclosed product receiving areas, etc. A Dust Tight electrical installation will be required.

2.3 Unclassified Dust-tight NEMA 12 – This is the general classification that Bratney assumes for seed facilities that they have designed slow moving conveyance, sufficient dust collection systems, and the owner has a good housekeeping practices. Areas in a seed facility under this classification would be indoor receiving/staging/ unloading, husk/sort, dryers, shelling, bulk storage, conditioning/cleaning, treating, bagging, and re-bagging. The motors are normally specified as TEFC. Dust-tight boxes and enclosures shall be used. EMT conduit with compression fittings, Galvanized rigid steel or IMC conduit with threaded fittings shall be used as well as Sealing rings or "Myers" type hubs used when conduit enters an enclosure. A Dust Tight electrical installation will be required.

2.4 Unclassified NEMA 3R/4 - This is the general classification that Bratney assumes for outdoor installation or any wet location that is within the facility. NEMA 4 would be used for dust tight conditions in outdoor locations. Galvanized Rigid Steel Conduit or IMC shall be used outdoors above grade with EMT conduit with watertight compression fittings used in damp locations, when pre-approved by Owner. PVC schedule 40 conduit is generally not acceptable above grade. Sealing rings or "Myers" type hubs shall be used entering enclosures above termination points. Electrical conduits should not enter/exit electrical panels from the top. For direct burial – PVC Schedule 40 conduit shall be used and shall transition to an RMC elbow and RMC riser before emerging from below grade. Steel risers shall be protected from the earth and concrete with two layers of half lapped 3M Scotch rap 50 or 51 corrosion protective tape.

2.5 Unclassified NEMA 1 – These are general locations including office areas, warehouse, storage locations, employee break rooms, operator control rooms, labs, maintenance shops to 18 inches above the floor, etc. EMT conduit with compression fittings, Galvanized rigid steel or IMC conduit with threaded fittings shall be used. Type MC Cable may be used within enclosed walls or ceilings of office or lab areas. Additional applications must be pre-approved by Owner.

2.6 Other Locations: Applicable NEC requirements shall be followed for all other hazardous locations if included in this project (i.e. fuel dispensing areas, etc.).

Section 16100 Commissioning the System

1.0 Power Up

1.1 Before the system can be powered up, a coordination meeting with Bratney, the Owner, Electrical Contractor, Automation Controls Contractor, and Safety representative must be held to plan the power up. Topics include but are not limited to:

a. Notification of key personnel

b. Lock-out/Tag-out Procedures/notification

c. Critical Test Points

1.2 Also, before power up, each location of power connections must be verified that connections are made and tight, fuses installed or breakers set, disconnects are open, doors are closed (and locked-out/tagged-out if installation not complete) and everyone in the area is notified of the power up. **Verify all motor overloads are properly adjusted to the amp rating of the motor actually installed.**

1.3 Using the proper PPE, qualified technicians shall verify the proper voltage at each critical test point as power is turned on throughout the system.

2.0 I/O and Field Instrument checkout

2.1 The Electrical Contractor is a resource for the Automation Controls Contractor during the checkout of I/O and Field Instruments.

2.2 After the Automation Controls Contractor has verified operations of the MCPs/MCCs, then the motor rotations can be checked. In some instances, a plan may be developed to provide temporary power to check motor rotation and run conveyors for mechanical adjustments before the Automation Controls Contractor is on-site. If that is the case, coordination between the Electrical Contractor, Bratney and the Owner is a must.

2.3 As the Automation Controls Contractor is verifying all I/O, the Electrical Contractor must be available to troubleshoot any wiring issues that were developed during installation.

3.0 Dry Run

3.1 A dry run involves operating the system without product so startup, shutdown, alarm logic, HMI operations/feedback etc. can be checked before production is introduced. This is also useful for the mechanical installers of equipment to check and train conveyor belts, cup elevators and other items. Make sure this is coordinated with Bratney and the Owner.

3.2 The Electrical Contractor should verify voltage and amperage readings of critical items – the larger motors at a minimum.

3.3 The Electrical Contractor should be available to assist in troubleshooting wiring issues discovered during this time.

4.0 Wet Run

4.1 A wet run is operating the system with product (it may be scrap or lower value product). Initial runs should be run at a minimal rate to allow time to check the equipment. This is useful for the mechanical installers of equipment to check mechanical settings of their equipment, flow rates, vibrations, etc.

4.2 The Electrical Contractor should verify voltage and amperage readings of critical items that may be close to maximum loading.

4.3 The Electrical Contractor should be available to assist in troubleshooting wiring issues discovered during this time.

5.0 Production Run

5.1 If a wet run has been used, then the initial product run should yield good product for the Owner. If a wet run has not been done, then provisions may need to be made for product that is not to be packaged or stored as good product.

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5.2 The Electrical Contractor shall be on-call during the first few days of production if dry and wet runs have been done. If a wet run has not been done, the electrical contractor shall be available on-site for initial running and can only be dismissed with approval of the Automation Contractor and Bratney.

Section 16200 General Material

1.0 Cleaning and Painting

1.1 Remove all temporary stickers and markings, wipe clean, and paint (touch up) all scratches and abrasions before releasing electrical equipment to Bratney and the Owner.

1.2 Junction boxes, disconnect, and control enclosures shall be clean and free of unnecessary items such as loose wire, hardware, packing materials, jigs, tools, metal shavings, etc.

1.3 Remove all excess threading compound and pulling lubricant from conduit system.

1.4 Remove all unused raceway hangers.

1.5 Cabinet trims and similar prefabricated equipment shall be factory primed and finish painted with enamel in vendor's standard color. This equipment shall not be painted in the field unless the factory finishes have been marred or as otherwise directed.

1.6 All field cuts of galvanized conduit supports, braces, etc., shall be treated with a galvanized primer.

1.7 All surfaces damaged by welding shall be touched up to match the original finish.

1.8 Conduit, hangers, boxes, fittings, etc. installed should be manufactured from corrosion-resistant materials that do not require paint. Refer to other sections of this document for construction material requirements.

1.9 All field-mounted electrical equipment supports (racks, etc.) shall be painted to match surrounding surfaces. Painting to be completed before equipment is fastened to supports.

1.10 Electrical equipment enclosures that expose no energized parts with operating door open (dead front) shall not be repainted. Manufacturer's standard finish is adequate. All damaged surfaces shall be touched up to match the original finish.

1.11 Electric motors need not be field painted.

1.12 Mask all equipment nameplates when painting to preserve the data. Remove the mask after painting is complete.

1.13 Field-mounted distribution equipment (power and branch circuit panels) and disconnect switches shall not be field painted unless otherwise specified in this document.

2.0 Material Protection

2.1 The Contractor will provide required protection for all Bratney and/or Owner supplied material delivered to the Contractor against vandalism, theft, and environmental conditions.

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2.2 Electrical and automation equipment shall be protected at all times against damage and external contaminants (dust, dirt, welding slag, etc.) that may result from construction activity in the immediate area.

2.3 During shop fabrication and field erection, every effort should be made to cover automation or electrical equipment or plug holes where dirt, water, or insects could enter.

2.4 All electrical equipment shall be protected from welding sparks, falling objects and damage due to construction activities.

2.5 The Contractor shall be responsible for handling and protecting the electrical equipment such that it is maintained in new condition until the facility is turned over to Owner.

2.6 All electronic and pneumatic field-mounted devices and sensors shall be stored above ground in an air-conditioned area.

2.7 Control items on gates and valves and similar items shall be stored indoors.

2.8 Items stored outdoors shall have all openings sealed and protected. Temporary covers shall be of sufficient durability to last until expected installation is completed. Temporary covers shall be made of materials suitable for the environment to which they are exposed.

3.0 Fuses

3.1 250-volt thru 600-volt fuses unless otherwise noted, shall be manufactured by:

a. Bussman or Mersen Type: UL Class J or RK-1

4.0 Lugs

4.1 Terminals and lugs shall have the UL label.

4.2 Lugs shall be rated for copper or copper and aluminum conductors.

4.3 Lugs for #10 or smaller shall be nylon-insulated fork or ring-torque type.

4.4 Lugs for #8 and larger shall be of the circumferential compression type unless otherwise specified.

5.0 Pull/Junction/Outlet Boxes

5.1 Outlet boxes, where concealed, shall be of one-piece pressed steel (not sectional), square or rectangular, galvanized or primed. Pressed steel outlet boxes shall be provided with the proper size knockouts for the conduits, and all unused knockouts shall remain closed. Minimum box size shall be nominal 3 1/2-inch deep trade size. Boxes shall be minimum 4-inch square with appropriate plaster ring for quantity of devices indicated.

5.2 Where finished surfaces are of tile or block, and conduits are concealed, outlet boxes shall be provided with approved covers with square corners and depth to suit the thickness of the wall of the tile or block.

5.3 Pressed steel outlet boxes shall not be used on exposed or exterior conduit work. Where conduits run exposed, all outlet boxes shall be cast metal FS or FD boxes with suitable gasketed covers and fittings. Boxes for ceiling outlets, which receive fixtures, shall have fixture

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studs permanently fastened to the box construction. Outlet boxes for exterior lights shall have gasketed covers.

5.4 Boxes shall have a removable cover.

5.5 Junction and pull boxes shall be constructed of sheet metal of the following thicknesses: Boxes 12 inches x 12 inches or smaller shall be #14 gage, between 12 inches x 12 inches and 24 inches x 30 inches #12 gage, and boxes larger than 24 inches x 30 inches #10 gage. Boxes shall be smooth and shall be set square and true with the walls and ceilings. Purchased, cataloged boxes shall bear the UL label.

5.6 Custom-fabricated boxes shall comply with NEC and NEMA requirements.

5.7 Breathers or drip holes shall be provided on boxes in outdoor or damp locations.

5.8 Covers greater than 25 pounds on elevated boxes shall be hinged.

5.9 Provide cabinets and enclosures suitable for the environment and hazardous classification. NEMA Type 1 for clean areas only. NEMA 12 is the minimum requirement for industrial, indoor areas, NEMA 3R/4 for outdoor and NEMA 4X for corrosive areas.

6.0 600 Volt Cable

6.1 600-volt single conductor wire for feeders, power, and control wiring shall be Type THWN-THHN wire having PVC insulation with an outer jacket of Zytel nylon resins.

6.2 600-volt multi-conductor power and control cable shall be composed of single conductors insulated with Type THWN-THHN wire having an outer jacket of Zytel® nylon resins. The single conductors are to be cabled, taped, and overall sheathed with a PVC jacket. Conductor identification shall be white numbers on black insulation.

6.3 600-volt multi-conductor cable shall satisfy the requirements of NEC 336 and UL 1277 - Type TC power and control tray cables.

7.0 Instrumentation Cable

Cable for instrumentation shall be Type PLTC 300 volt per NEC Article 725/Type ITC cable per NEC Article 727.

8.0 Supporting Devices

8.1 Carbon Steel Bolts, Nuts, and Washers

a. Bolts: ASTM A307, Grade A, Hex (SAE Grade 2)

b. Nuts: ASTM A563, Grade A, Hex

c. Washers Flat: ASTM F844

d. Washers Lock: ANSI B18.21.1

8.2 Carbon Steel Bolt, Nut, and Washer Coatings

a. Cadmium: (Electroplated) ASTM A165 and yellow chromate treated in accordance with Federal Specification QQ-P-416, Type II, and Class 3.

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b. Cadmium: (Mechanically Deposited Type II) ASTM B696, yellow chromate.

c. Zinc: (Electroplated) ASTM B633 and yellow chromate treated in accordance with Federal Specification QQ-P-416, Type II, and Class 3.

d. Zinc: (Mechanically Deposited Type II) ASTM B695, yellow chromate.

e. Zinc: (Hot-Dip) ASTM A153, Class C and D.

f. Zinc: (Hot-Dip Galvanized) ASTM A123, hot dipped after fabrication.

8.3 Stainless Steel Bolts, Nuts, and Washers

a. Bolts: ASTM A193; AISI Types 304N and 316N.

b. Nuts: ASTM A194; AISI Types 304 and 316.

c. Washers Flat: AISI Types 304 and 316.

d. Washers Lock: AISI Types 304 and 316.

9.0 Wire Ties

9.1 Wire ties to be Thomas & Betts Ty-Rap or approved equal.

9.2 Wire ties shall be suitable for the environment in which they are installed.

Section 16240 Conduits

1.0 General

1.1 All conduits shall be installed using approved fittings and couplings, and as specified herein or as specified in other project documents.

1.2 Exterior conduit systems shall be rigid metal conduit (RMC) except as otherwise noted. Interior conduit systems shall be Electrical Metallic Tubing (EMT), rigid metal conduit (RMC), or intermediate metal conduit (IMC) except as otherwise noted. Underground (or wet locations) conduit systems shall be Rigid Nonmetallic Conduit (RNC)/ (PVC) or rigid metal conduit (RMC) except as otherwise noted.

2.0 Installation

2.1 Conduits installed through concrete or concrete block walls shall be taped the penetration length and a minimum of 6 inches past both sides of the wall. Conduit shall be degreased at the tape application point and then half-lap wrapped with PVC tape.

2.2 Conduit shall not be routed across the front or back of any installed device in a manner that prevents equipment access, opening of covers, or removal of equipment.

2.3 Conduits shall be plugged tightly or capped immediately after installation for protection against the entrance of moisture and foreign matter into the conduit system.

2.4 Conduit to field instruments, pushbuttons, motors, etc., shall end at a conduit body or box (drain equipped) that is installed a minimum of 6 inches below the conduit connection to the device or motor.

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2.5 When conduit is located in unheated areas or is exposed to water or weather, a low-point drain shall be provided in conduit bodies and FS/FD boxes.

2.6 All conduit and fittings must be installed "wrench tight" to assure a low impedance fault current return path to its power source.

2.7 In office space, it is the intent that most conduits be concealed unless special approval is given by owner. If approved, where exposed, it shall be run as close to ceilings and/or walls as possible and installed parallel with adjacent structural elements.

2.8 All conduit fasteners for horizontal routing shall be mounted at a spacing not to exceed 5 feet on center. All conduit fasteners for vertical routing shall be mounted at a spacing not to exceed 8ft. on center.

2.9 Conduits shall be installed above process and service piping wherever possible.

2.10 Conduit runs shall be routed to avoid interference with piping, air ducts, and other service and utility systems and in locations that would restrict the maintenance and removal of equipment.

2.11 Conduit runs shall maintain a minimum clearance of 12 inches from parallel process and service piping and vessels. Where it is necessary to cross process or service lines, a minimum clearance of 6 inches shall be maintained. Provide greater distances where required to limit the temperature rise of the conduit run to 40ºC or de-rate conductors accordingly.

2.12 Conduit runs with no bends between pull points are not restricted in length, however excessive pulling tension on the conductors shall be a determining factor in establishing these distances.

2.13 Conduit shall be bent using tools approved for the purpose and of the correct size. Bends shall be made in a manner that will insure the internal diameter of the conduit is not effectively reduced.

2.14 The over use of conduit bodies in lieu of conduit bends is discouraged. Conduit bends should be made, where practical, to facilitate conductor pulls. Locations of pulling points should be selected for accessibility with limited requirements for ladders or scaffolds.

2.15 Conduit cuts shall be made square and perpendicular with the conduit. Cut ends shall be made free of burrs or other obstructions by reaming or other suitable means, so that it will not cause damage to the conductors when pulled in.

2.16 Conduits shall be threaded using standard NPT dies with 3/4-inch taper per foot. Threads shall conform to the manufacturer's standard length and quality. All cutting oils shall be removed from conduit ends prior to installation.

2.17 Prior to assembly, threads shall be treated with a conductive type anti-seize compound to enhance conductivity and inhibit corrosion. Galvanized conduits shall be treated with T&B Kopr-Shield or approved equal.

2.18 Conduit threaded ends shall be screwed tightly, at least three full threads, into couplings, conduit bodies, and threaded hubs to insure a reliable ground fault return path. When installed properly, no more than 1/2 thread should protrude beyond the point of termination.

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2.19 Running threads shall not be used for connections of conduit systems. Where sections of a conduit system cannot be screwed together in the conventional method, conduit unions, listed as suitable for the area where they are to be installed shall be used.

2.20 Expansion fittings, listed for the classification, shall be installed where conduits cross structural expansion connections.

2.21 Conduit penetrations shall not be made through finished roofs without the approval of Bratney and/or the Owner.

2.22 Conduit penetrations made through concrete floors shall be made with a power driven concrete drill. The underside of the floor to be drilled shall have protection in place prior to drilling to prevent loose materials from dropping to the area below.

2.23 Conduit penetrations through grating shall be sized for minimum clearance around conduit. The circumference of the opening shall be made free of all sharp edges and the cut surfaces shall be touched up with coating materials of the same specification as the original. Where opening infringes on the load bearing integrity of the grating, additional supports shall be provided.

2.24 Conduit penetrations made in floors designated as containment floors shall be made in a manner that maintains the integrity of the containment design.

2.25 When spare conduits are required to be installed, they shall be provided with a #14 galvanized pull wire or comparable non-metallic rope to facilitate future wire pulling and shall be capped off at each end.

3.0 Support

3.1 All conduits shall be securely supported by individual ring hangers and rods, steel trapeze hangers, galvanized malleable iron one-hole pipe straps, or beam clamps attached to the structural members of the building. The use of perforated band iron is not acceptable.

3.2 Rigid metal conduit shall be supported from structural members and cable tray with hangers approved for the purpose.

3.3 Conduit systems shall be securely fastened in place and supported at distances no greater than indicated in applicable NEC articles.

3.4 Conduit systems shall not be supported from piping systems, valves, instruments, roof or equipment without approval of Bratney and/or the Owner.

3.5 Materials and devices used for the support of conduit systems shall be compatible with the conduit system, the material of the structural members and suitable for use in the environmental classification where installed.

4.0 Termination

4.1 In outside, wet or damp locations, conduits shall be terminated in screw type hubs listed for use in this classification. Entries into enclosures shall be in the bottom or side and not from the top.

4.2 In inside, dry, non-hazardous locations, the double locknut (dish type) and bushing method of termination is acceptable.

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4.3 In inside, dry, dust-tight locations, the sealing-ring (T&B), double locknut (dish type) and bushing method of termination is acceptable.

4.4 Where the "knock-out" is of the concentric type and other than the largest knock-out is used, the conduit system must be bonded to the enclosure by use of a grounding bushing or other approved means to insure the grounding integrity of the system.

4.5 In Hazardous Areas and when terminating systems above 600 volts, the double locknut and bushing method shall not be depended upon for bonding and as a ground fault return path.

4.6 Conduits containing conductors of #4 AWG or larger shall be provided with insulated bushings as required by the NEC.

4.7 Conduits entering enclosures shall not extend inside the enclosure any greater distance than is required to properly terminate the conduit and shall be positioned to allow conductors to enter the enclosure without violating their minimum bending radii. Boxes shall be sized as required by applicable NEC Articles.

4.8 Conduits terminating in non-metallic enclosures shall be electrically bonded together and to any other metallic objects contained in or attached to the enclosure as required by the NEC.

5.0 Underground Installation

5.1 Conduit shall be rigid galvanized steel (RMC), rigid nonmetallic plastic (PVC) Schedule 40, (90°C), or fiber duct Type II.

5.2 Steel conduit shall be protected from the earth and concrete with two layers of half lapped 3M Scotch rap 50 or 51 corrosion protective tape.

5.3 Trench shall be a minimum of 4 inches below the indicated elevation of the bottom of the conduit and a minimum of 3 inches from the side of the trench to the outside of the conduit.

5.4 Conduit shall be installed one-fourth to one-third of the conduit diameter in a minimum of 4 inches of select backfill that is free of stones and has been lightly tamped. After conduit is properly installed and checked for grade, additional select backfill shall be placed by shovel at the sides of the conduit and carefully tamped. Following inspection and approval of the installation, a minimum of 6 inches of additional select backfill shall be placed over the conduit and lightly compacted by walking over or tamping.

5.5 Before backfilling, a mandrel shall be pulled through the conduit. If the mandrel fails to pass through or the cables on the mandrel twist to an unacceptable degree indicating that the conduit is obstructed or misaligned or that bend radii are too small, the conduit shall be exposed, and the defect corrected.

NOTE: The length of the mandrel depends upon the diameter of the conduit and the radii of bends. The outside diameter of the mandrel shall be 1/4 inch to 3/8 inch less than the inside diameter of the conduit.

5.6 To identify the presence of buried conduit, a continuous 2-inch wide, red, corrosion-resistant marking tape of the type that can be located with a metal detector (such as W. H. Brady Co. Detectable Identoline) shall be placed 6 inches below finish grade along the length of the conduit.

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5.7 Final backfill, without large stones shall be placed and compacted by conventional means. The compaction shall meet the specifications of the geotechnical report.

5.8 Roads, grades, lawns, etc. shall be restored to the condition they were in before the conduit was installed.

5.9 When underground conduit enters the bottom of an enclosure, switchboard, floor-standing panelboard, or similar enclosure, the conduits, including their end fittings, shall not rise more than 3 inches above the bottom of the enclosure.

5.10 The transition from underground to aboveground conduit shall transition from underground PVC conduit to a rigid metallic conduit (RMC) elbow and riser. All vertical parts of the conduit system (including the riser elbow) shall be RMC.

5.11 All spare or unused conduits shall be properly capped to prevent entry of undesirable objects.

6.0 Conduit Bodies, Boxes, Enclosures

6.1 Commercially fabricated or shop fabricated boxes and enclosures shall comply with the requirements of the NEC and NEMA and be sized to provide bending, connection, and slack wire space.

6.2 Knockouts punched in boxes but not used shall be sealed with properly sized gasketed Hole-Seals or approved equal.

6.3 Conduit bodies and fittings shall be of the same or compatible material as the conduit being installed.

6.4 Pull, junction, and terminal boxes shall be of materials suitable for the area and environmental classifications they are to be installed in and shall be sized and installed in compliance with NEC.

7.0 Seals/Sealing

7.1 Conduit seals shall not be poured until all the cables passing through the seals have been pulled, tested, and proven operational.

7.2 Sealing compound shall be installed in accordance with manufacturer's instructions, with due regard to maximum time of exposure to air prior to application.

7.3 Sealing fittings shall be distinctively and permanently marked (red paint) at the time of filling, to signify that they have been sealed.

7.4 Conduit systems shall be sealed to prevent the entrance of moisture when the following conditions exist:

a. In outdoor locations, if conduit must enter the top of an enclosure and is approved by Bratney and/or the Owner, the conduit shall be fitted with a listed drain type seal-off fitting immediately before entering the enclosure. The fitting shall be filled with Kearney "Air Seal", "Waterguard Duct Seal 2000", or approved equal.

b. Where outside conduit enters indoor building, the conduit shall have a drain type fitting installed immediately before entrance to building and the fitting shall be filled with Kearney "Air Seal", "Waterguard Duct Seal 2000", or approved equal.

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c. In indoor locations where conduit passes between areas of different temperatures or room pressures, the conduit shall have a fitting installed immediately before entrance into different environment and the fitting shall be filled with Kearney "Air Seal", "Waterguard Duct Seal 2000", or approved equal.

7.5 Conduits passing through fire rated walls, floors, partitions, and ceilings shall have the space around, between, and on both sides of the penetration sealed with materials or devices listed as suitable for use as a fire stop.

8.0 Flexible Conduit

8.1 The connections to all equipment subject to vibration shall be made in liquidtight flexible metal conduit Type UA with approved connectors, in lengths not exceeding 72 inches.

8.2 The connections to the motors shall be made with liquidtight flexible conduit Type UA in lengths generally not exceeding 72 inches. Provide all required approved connectors and other items to make final connections.

8.3 Listed flexible metal conduit shall be installed in compliance with applicable NEC articles.

8.4 Listed liquidtight flexible metal conduit shall be installed in compliance with applicable NEC articles.

8.5 In Classified areas, flexible connections shall be made in compliance with applicable NEC articles.

8.6 Listed flexible metal conduit and listed liquidtight flexible metal conduit when assembled with fittings listed as suitable for grounding do not require bonding jumpers when all of the following conditions exist:

a. Circuit voltage is 120 volts to ground or less.

b. Circuit protective device is 20 amperes or less.

c. Conduit size is 3/4 inch or less.

d. Conduit length is 6 feet or less.

e. Installation is in a nonhazardous area.

f. Conduit is terminated in listed fittings.

8.7 Otherwise, a bonding jumper contained in the conduit or attached and parallel to the conduit is required. The bonding jumper shall be sized in accordance with applicable NEC tables.

Section 16260 Flexible Cable Carrier System

1.0 General

1.1 If wiring connections are required for travelling equipment, then a flexible cable carrier system shall be used to support the cabling.

1.2 If flexible cable carrier is used, then guide troughs must be used to enable proper movement.

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1.3 If a festoon system is used, a manufactured trolley must be used to support the cable and to allow free movement throughout the entire length of travel.

2.0 Specifications

2.1 Flexible cable carrier shall be sized to accommodate all cables connected to travelling equipment. Carrier shall have a minimum interior width of 3-inches when travel distance exceeds 25 feet.

2.2 Material shall be UV resistant and allow intermittent operation under a temperature range of -40 degrees to 220 degrees Fahrenheit.

2.3 Cable carrier or festoon system shall be rated for speeds up to 16 ft/sec at installed length.

2.4 Provide with appropriate strain relief at both ends of carrier or festoon, including mounting brackets.

2.5 Cables installed in carrier or festoon shall meet same operating specifications as carrier or festoon.

3.0 Guide Troughs

3.1 Guide troughs shall be constructed of galvanized steel.

3.2 Guides shall be appropriately sized to accommodate flexible cable carrier.

3.3 All mounting hardware shall be installed so that fasteners are flush with bottom of guide trough.

3.4 Troughs shall contain guide bars that allow track to move freely along path of travel.

Section 16280 Wires and Cables

1.0 General

1.1 Conductors, unless otherwise noted, shall be stranded copper, 600-volt THWN/THHN.

1.2 Signal cable shall be continuous without splices except at terminal boxes as indicated on design.

1.3 All 120-volt branch circuit wiring for lighting and receptacles shall be two-wire circuits. Each circuit shall have its own neutral conductor. Common neutrals are not permitted.

1.4 Splices and taps in conduit fittings shall be permitted for low voltage control, signal, communications, and similar type circuits where the nominal circuit voltage does not exceed 50 volts, for conductor size #12 and smaller.

1.5 The maximum number of conductors in boxes shall not exceed the provisions of the NEC.

1.6 All above the ground power cables shall be installed in conduit.

1.7 Separation of different types of circuits shall meet the requirements of the NEC.

1.8 Within any equipment containing electrical devices, wire ties shall be used to service and support wires. (Tape shall not be used.) Wiring shall be neatly trained parallel to equipment

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edges. Wire ties shall not be installed so tightly as to damage conductors or conductor insulation.

1.9 All spare wires in control cables shall be identified, taped, coiled, and neatly stowed. Spare wires shall be of sufficient length to permit connection anywhere within the enclosure.

1.10 Temporary jumpers for control wiring shall be red in color and a minimum of 2 feet long and identified as a temporary jumper.

1.11 No more than two conductors shall be connected to one side of a terminal on terminal block assemblies.

1.12 Wire shall be pulled into raceways under moderate tension. Manufacturer's recommended pulling tensions shall not be exceeded. Any lubricant used shall not have a deleterious effect on the conductor insulation. No oil or grease is acceptable.

2.0 Termination

2.1 Wiring larger than #10 AWG shall be terminated with solder-less compression-type lugs and installed with manufacturer's recommended tool.

2.2 Compression or mechanical connection lugs shall be sized to match the conductor. Conducting strands shall not be reduced at the connection lug to fit lugs not sized for the conductor.

2.3 Stranded wire up to #10 AWG shall be terminated to screw-type terminals with insulated locking spade, or flanged fork lugs sized to match screw diameter.

2.4 Thermocouple cable conductor ends shall be terminated to the thermocouple termination screws with formed eyes. When terminal blocks are required, the current carrying contact bars shall match the extension wire material and shall be box lug type such as Phoenix Company Type MTKD.

2.5 The jackets and shields of shielded low-signal cable shall be maintained to within 3 inches of the terminals to which the conductors are connected. Shields shall be grounded at only one end of the cable (source cabinets unless otherwise indicated by manufacturer). When the 3-inch rule cannot be adhered to, shields shall be individually insulated, one from the other, so that they only touch at point of termination. The shield at the ungrounded end of the cable shall be left approximately 1-inch long, bent back over the outer jacket, and tape insulated with Scotch 33 to prevent contact with any grounded source.

2.6 Instrument analog cables are to be kept separated from electrical power and 24-volt digital cables inside instrument cabinets and enclosures by using separate wireways or by routing cables along different paths. They shall not be bundled together.

2.7 Wire ties or plastic wireway shall be used to support wires within any equipment containing electrical devices. Tape shall not be used. Wires shall be neatly trained; parallel devices may be removed and/or serviced without unduly disturbing the wiring. No wire shall be routed across the face or rear of an instrument, junction box, or device in a manner which will prevent the opening of covers, removal of equipment, or access to leads, terminals, or instruments. Wires shall be routed through field-designated wireways.

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2.8 Each conducting end of spare wires in multi-conductor cables shall be insulated with crimp-on insulators, coiled, tagged as spare, and neatly stowed. Spare wires shall be of sufficient length to permit connection anywhere within the enclosure. Wirenuts or spring connectors shall not be used to extend conductors that are too short to reach their designated point.

2.9 Electrical connectors and terminals shall be tightened according to the manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

2.10 Thermocouple and RTD cables shall be installed continuous without splices or junctions between thermocouple and converter or panel instrument. Cable shields shall be grounded as required.

2.11 Terminal blocks shall be marked to match drawings.

3.0 Color Coding

3.1 Color Code of conductors shall follow NFPA 79 as follows (or as determined by local codes):

a. Black – AC Supply
b. Red – AC Control
c. White – AC Neutral
d. Blue – DC Control - Positive
e. White with Blue Stripe – DC Control - Negative
f. Orange – External power source circuits that remain powered up when local power has been disconnected
g. Green – Equipment Ground
h. Brown – 480VAC, Left Phase
i. Orange – 480VAC, Middle Phase
j. Yellow – 480VAC, Right Phase
k. Black – 120/208VAC, Left Phase and 120/240VAC, Left Phase
l. Red – 120/208VAC, Middle Phase and 120/240VAC, Right Phase
m. Blue – 120/208VAC, Right Phase

3.2 Conductors for low voltage signal cables shall be color coded and connected as follows:

a. 4-20 mA Signals
   1. Positive – Black
   2. Negative - White
b. RTD Signals
   1. Positive - Black
   2. Negative - White

3. Compensation - Red

c. Thermocouples

1. Alloy Identification

Type	Positive (Insulation)	Negative (Insulation)	Jacket
T	Copper (Blue)	Constantan (Red)	Brown

Section 16285 Wiring Devices

1.0 Description

1.1 This section specifies the furnishing, installation, and connection of wiring devices.

1.2 This section includes switches, receptacles, plugs, connectors, and cover plates.

2.0 Submittals

2.1 Product Data

a. Product Data shall be provided for all wiring devices. Sufficient information, clearly presented, shall be included to determine compliance.

b. Include electrical ratings, dimensions, mounting details, materials, wiring, accessories and connection diagrams. Also include manufacturer's name and catalog number.

3.0 Products

3.1 General

a. Wiring Devices shall be in accordance with applicable UL, NEMA, and NEC codes and standards, and as described in the scope of work.

b. Wiring Devices shall be standard manufactured products. All components of the wiring devices shall be the product and assembly of the same manufacturer.

3.2 Manufacturers

a. Wiring Devices shall be manufactured by one of the following or approved equivalent.

1. Leviton
2. Hubbell
3. Cooper
4. Pass & Seymour

3.3 Wiring Devices

a. Toggle Switches

1. Commercial Specification Grade, 20-amp 120/277 volt, UL Listed, CSA Certified – single-pole, double-pole, 3-way, 4-way as required.

b. Straight Blade Receptacles

1. Commercial Specification Grade, 20-amp 125 volt, grounding, UL Listed, CSA Certified – simplex, duplex as required.

c. GFCI Receptacles

1. Commercial Specification Grade, 20-amp 125 volt, grounding, UL Listed, CSA Certified – duplex.

d. Locking Receptacles

1. Commercial Specification Grade, amperage and voltage as required, UL Listed, CSA Certified.

e. Locking Plugs and Connectors

1. Commercial Specification Grade, amperage and voltage as required, UL Listed, CSA Certified.

f. Device Cover Plates

1. Provide cover plates to match the application and location installed.
2. Exterior receptacles shall be provided with metal "in use" weatherproof type cover.

4.0 Installation

4.1 Receptacles: Identify panelboard and circuit number from which served.

4.2 Install in accordance with manufacturer's instructions. Test for proper operation. Repair or replace units until satisfactory results are obtained.

4.3 Protect installed products until completion of project.

Section 16290 Local Disconnect Switches

1.0 General

1.1 Unless specified in the Scope of Work, all motors will have a local method of disconnect. This may be an individual disconnect switch mounted next to the motor.

1.2 All local disconnect methods shall have means to be locked out and tagged.

2.0 Submittals

2.1 Product Data

a. Product Data shall be provided for all disconnect switches. Sufficient information, clearly presented, shall be included to determine compliance.

b. Include electrical ratings, dimensions, mounting details, materials, wiring, accessories and connection diagrams. Also include manufacturer's name and catalog number.

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3.0 Installation

3.1 Elevators or continuous conveyors traveling through walls shall have two (2) local disconnects. One shall be mounted at the motor and the second one shall be mounted at the tail shaft end.

3.2 Motors located within a safety gate shall have the local disconnect located so that it can be locked and tagged from outside of the safety gate. The exception is for machines and equipment that are designed as units with a common disconnect or if the safety gate is hard-wired as an interlock to the system.

Section 16295 Equipment Identification

1.0 General

1.1 All electrical equipment shall be identified as specified herein.

1.2 Contractor shall submit for approval by Bratney a list of all nameplates before proceeding.

1.3 Unless otherwise approved, nameplates shall be white plastic laminate engraving stock with engraved black letters.

1.4 In addition to labeling defined herein, all panels, enclosures, etc. shall include labeling required by applicable NEC and UL requirements.

1.5 Main Service Entrance Equipment shall be provided with a label indicating the calculated Available Fault Current and the date it was calculated.

1.6 Install an arc flash hazard warning label on all electrical equipment.

1.7 If a building has more than one Service Entrance provide a plaque by each service entrance indicating the other service entrance disconnect locations and the loads fed from each service.

2.0 Apparatus and Enclosure Labeling

2.1 Provide white laminated (plastic) engraved nameplates not smaller than 3-inches x 1-inch x 1/8-inch-thick with black letters not less than 3/16 inch as follows:

1st Line – Panel Name/Number:
2nd Line – Voltages/Phase:
3rd Line – Source:
4th Line – Load:

Nameplates should be provided for the following equipment:
Doors and compartments on switchgear
Motor Control Panels (MCP)
Power panelboards*
Lighting panelboards*
Motor control centers (MCC)
Power distribution transformers
Switchboards*
Switchgear

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* During circuit installation, provide and maintain temporary hand-written panel directories. After circuit installation is complete, provide permanent typewritten directories.

2.2 White laminated (plastic) engraved nameplates for the automation field devices are furnished by the Automation Control Contractor and installed by the Electrical Contractor.

2.3 Special Labeling

a. Voltage and phase labels shall be applied to apparatus and equipment containing single-phase power 120 volts and over, and all 3-phase power. Labels shall have factory-printed black on orange lettering, 1 inch in height, be self-sticking, and made of vinyl cloth.

b. All motor control centers, Industrial Control Panels, disconnect switches, switchboards and/or distribution panels, and junction boxes containing 460VAC or greater and exterior dimensions of 24 inches x 24 inches or greater shall include the following label:
"DANGER: HIGH VOLTAGE".

c. All motor control centers, motor control panels, control cabinets, switchboards and/or distribution panels, and junction boxes with exterior dimensions of 30 inches x 30 inches or greater shall include the following label:
"NOTICE: AUTHORIZED PERSONNEL ONLY".

d. Enclosures containing one or more external voltage sources shall be provided with red laminated (plastic) engraved nameplate with white letters not less than 1/2-inch high that reads as follows:
"ENERGIZED FROM MORE THAN ONE EXTERNAL SOURCE"

e. If the possibility of a back-feed exists, provide a red laminated (plastic) engraved nameplate, with white letters not less than 1/2-inch high that reads as follows:
"WARNING BACKFEED"

f. Provide and locate adjacent to each current transformer red laminated (plastic) engraved nameplate with white letters not less than 1/2-inch high that reads as follows:

"DO NOT DISCONNECT C.T. SECONDARY"

g. Disconnect switches and outlets connected to standby power shall be provided with a yellow laminated (plastic) engraved nameplate with black letters not less than 3/8-inch high that reads as follows:

"STANDBY POWER"

2.4 Control Panel Labeling

a. All internal panel mounted devices/components (relays, breakers, fuse blocks, motor controllers, terminals, etc.) shall be labeled: *"DEVICE NO. (e.g., RE 432)"*.

2.5 All electrical panels requiring labels listing Personal Protective Equipment (PPE) requirements shall be the Owner's responsibility unless otherwise specified. This includes Arc-Flash protection and Shock Hazard boundaries.

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Section 16400 Switchboards ≤ 600 Volt

1.0 Description

1.1 This section specifies the furnishing, installation, and connection of Low-Voltage Switchboards and/or Distribution Panels.

1.2 All panels listed herein shall be referred to as "Switchboards".

1.3 All switchboards listed in this section shall utilize circuit breakers for over-current protective devices unless otherwise specified.

2.0 Submittals

2.1 Shop Drawings/Approval Drawings

a. Shop drawings shall be provided with all switchboards. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

b. Include electrical ratings, dimensions, mounting details, materials, required clearances, terminations, weight, temperature rise, wiring and connection diagrams, plan, front, side, and rear elevations, sectional views, bus work, circuit breaker frame sizes, trip and short-circuit rating, long-time, short-time, instantaneous and ground fault options, accessories, and device nameplate data.

c. Show the size, ampere-rating, number of bars per phase and neutral in each bus run (horizontal and vertical), bus spacing, equipment ground bus, and bus material.

2.2 Manuals

a. Submit, simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals including technical data sheets, wiring diagrams, and information for ordering replacement parts.

1. Wiring diagrams shall have their terminals identified to facilitate installation, maintenance, and operation.

2. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnection between the items of equipment.

3. Provide a clear and concise description of operation, which gives, in detail, the information required to properly operate the equipment.

4. Approvals will be based on complete submissions of manuals together with shop drawings.

b. Two weeks prior to final inspection, deliver two hard copies and one digital copy of the final updated maintenance and operating manuals to Bratney.

1. The manuals shall be updated to include any information necessitated by shop drawing approval.

2. Complete "As Installed" wiring and schematic diagrams shall be included which show all items of equipment and their interconnecting wiring.

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3. Show all terminal identification.
4. Include information for testing, repair, trouble shooting, assembly, disassembly, and recommended maintenance intervals.
5. Provide a replacement parts list with current prices. Include a list of recommended spare parts, tools, and instruments for testing and maintenance purposes.
6. Furnish manuals in loose-leaf binder or manufacturer's standard binder.

2.3 Unless specified in the Scope of Work the Owner shall coordinate Arc Flash Analysis, calculations and labeling for the facility revisions, including reconnection to all existing electrical installations where applicable. The Contractor shall provide the Owner with new electrical equipment specifications including accurate one-line diagrams showing wire sizes and lengths, conduit type, equipment manufacturer, breaker model numbers and setting options, fuse model numbers and sizes, etc., for others to perform analysis.

3.0 Products

3.1 General

a. Switchboards shall be provided complete, ready for operation including, but not limited to housing, buses, circuit breakers, instruments and related transformer, fuses, wiring, etc.

b. Switchboards shall utilize standard manufactured products. All components of the switchboards shall be the product and assembly of the same manufacturer. All similar units of all switchboards shall be of the same manufacturer.

c. Manufacturer's nameplate shall include complete ratings of switchboards in addition to the manufacture date.

d. The switchboard withstand rating shall be suitable for a minimum of 125% of the specified available fault current.

3.2 Manufacturers

a. Switchboards shall be manufactured by Square D or approved equivalent.

1. Recommended equipment model and/or part numbers:
   - Square D, Class 2741/2742 QED-2/S

3.3 Basic Arrangement

a. Switchboard

1. Definition:
   - Switchboard fed directly from a utility transformer.
   - Arrangements:
     - Arrangement I:
       - Arrangement shall be used when arc flash incident energy levels 100 cal/cm^2 and above (approximately 2000 kVA and larger transformers) are encountered.
       - Switchboard shall be divided into separate enclosure sections.

- Main enclosure: Main breaker only.
- Distribution enclosures: Feeder breakers, metering, SPDs, etc.
- Connections between main and distribution enclosure sections shall be cabled. Busing between these enclosure sections is not acceptable.

- Arrangement II:
  - Arrangement shall be used when arc flash incident energy levels below 100 cal/cm^2 are encountered.
  - Switchboard may consist of a common main and distribution enclosure.
  - Main breaker may be grouped with distribution breakers, metering, SPDs, etc.
  - Connections between main and distribution sections may be bused.

- Arrangement shall be pre-approved by Owner.

2. Device mounting
   - Main Breaker: As indicated in "Arrangements" above.
   - Feeder Breakers: Group mounted.
   - Surge Protective Devices: Permanently mounted.
   - Metering: Per utility or manufacture's recommendations.
   - Other devices: Per manufacture's recommendations.

3. Over-current Protective Devices
   - Main Circuit Breakers:
     - Circuit breakers shall provide ground-fault protection.
     - Circuit breakers shall be solid state adjustable trip type.
   - Feeder Circuit Breakers:
     - Circuit breakers ≥ 400A shall be solid state adjustable trip type.

3.4 Housing

a. Provide a completely enclosed, steel enclosure not less than the gage required by the appropriate ANSI and UL standards. The enclosure is to consist of the required number of vertical sections bolted together to form one metal enclosed rigid switchboard. The sides, top and rear shall be covered with removable screw on sheet steel plates.

b. The environmental NEMA rating of each enclosure shall be suitable for the area classification for which it is to be installed.

c. Provide ventilating louvers where required (and permitted) to limit the temperature rise of current carrying parts. All openings shall be protected against entrance of falling dirt, water, or foreign matter.

d. All penetrations between panels shall be properly sealed to minimize arc flash propagation.

e. Enclosure shall be thoroughly cleaned, phosphate treated, and primed with rust-inhibiting paint. Final finish coat shall be the manufacturer's standard gray.

3.5 Buses

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1. Buses shall be arranged for 3 phase, 4 wire distribution. Main phase buses (through bus), neutral bus, and ground bus shall be full capacity the entire length of the switchboard. Provide for future extensions by means of bolt holes or other approved method. Brace the bus to withstand the available short circuit current at the particular location. No magnetic material shall be used between buses to form a magnetic loop.

b. Material and Size: Buses and connections shall be hard drawn copper or plated aluminum of 98 percent conductivity. Bus temperature rise shall not exceed 65 degrees C (149 degrees F) above ambient.

c. Bus Connections: Provide a minimum of two plated bolts per splice. Where physical bus size permits only one bolt, provide a means other than friction to prevent turning, twisting or bending. Torque bolts to the manufacturer's recommended values.

d. Neutral Bus: Provide bare or plated bus and mount on insulated bus supports. Provide neutral disconnect link to permit isolation of neutral bus from the common ground bus and service entrance conductors.

e. Ground Bus: Provide an un-insulated copper equipment ground bus bar sized per UL 891 the length of the switchboard and secure at each section.

f. Main Bonding Jumper: Connect an appropriately sized copper bus or wiring between the neutral and ground buses to establish the system common ground point.

3.6 Internally Integrated Surge Protective Devices – (If required by Scope of Work)

a. A dedicated, properly sized over-current protective device must be provided for each SPD.

3.7 Meters and Instrument Transformers – (If required by Scope of Work)

a. Locations and/or quantities of Meters and Instrument Transformers if required will be specified in Scope of Work.

b. Instrument Transformers: IEEE C57.13, and the following:

1. Potential Transformers: Provide appropriately sized potential transformers compatible with metering and distribution equipment.

2. Current Transformers: Provide appropriately sized current transformers compatible with metering and distribution equipment.

c. Power Meter: Power meter shall be Square D PM850, or comparable. The power meter shall be a multi-functional, digital, data acquisition and control device. The power meter shall display over 50 values and extensive Min/Max data on an LCD display. Each power meter shall offer true RMS metering and communications standard. On-board memory shall be 800K bytes.

1. Power Meter features shall include:

- True RMS Metering
- High accuracy: 0.5% on current and voltage
- Harmonic Analysis Data through 63rd harmonic
- Automatic Alarm/Relay control

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- On-board event and data logging
- Waveform capture
- UL listed, CSA Approved, CE Marketing, NOM Approved

3.8 Provisions for Future

a. Where "space" is noted in the scope of work, the space shall be equipped with bus connections to the future over-current device with suitable insulation and bracing to maintain proper short circuit rating and physical clearance. Provide buses for the ampere rating as shown for the future device.

3.9 Control Wiring

a. Control wiring shall be 600-volt class B stranded SIS. Install all control wiring complete at the factory adequately bundled and protected. Wiring across hinges and between shipping units shall be Class C stranded. Wiring shall be sized in accordance with NEC. Provide control circuit fuses.

3.10 Circuit Breakers

a. The Contractor shall work with manufacturer's representative(s) to verify Overcurrent protective devices are designed for maximum arc flash protection, system coordination, and safety.

b. Provide UL listed and labeled circuit breakers.

c. Unless otherwise specified, breakers 1200 ampere frame size and less shall be manually operated. Breakers larger than 1200 ampere frame size shall be electrically operated or stored energy type.

d. Circuit breakers shall be dead front.

e. Provisions shall be included for padlocking each breaker in the open position.

f. Unless otherwise specified, circuit breakers shall be 3 pole, 600 volts AC and below, 60 cycle with indicated frame size, trip rating and system voltage.

g. Adjustable Trip Circuit Breakers

1. Provide solid state adjustable trip type circuit breakers.
2. Trip units shall have field adjustable tripping characteristics as follows:
   - Ampere Setting
   - Long time band
   - Short time trip point
   - Short time delay
   - Instantaneous trip point
   - Ground fault trip point
   - Ground fault trip delay

3. Provide local visual trip indication for overload, short circuit and ground fault trip occurrences.

h. Non-adjustable Molded Case Trip Circuit Breakers

1. Thermal magnetic molded case circuit breakers shall have integral thermal and instantaneous magnetic trip in each pole.

4.0 Installation

4.1 Inspection

a. Examine area to receive switchboard to provide adequate clearance for switchboard installation.

b. Check that concrete pads are level and free of irregularities.

c. Start work only after unsatisfactory conditions are corrected.

4.2 Installation

a. Install switchboard in accordance with manufacturer's written guidelines, the NEC, local codes, and drawings.

b. Enclosures with flat bottoms (not open) and/or not typically intended for floor mounting shall be mounted on a raised platform of 1-½ inches minimum.

c. Floor mounted enclosures shall be mounted on a raised 3-½ inch minimum concrete pad.

4.3 Field Quality Control

a. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

b. Check tightness of accessible bolted bus joints using calibrated torque wrench per manufacturer's recommended torque values.

c. Test ground fault systems by operating push-to-test buttons.

4.4 Adjusting

a. Adjust all operating mechanisms for free mechanical movement per manufacturer's specifications.

b. Tighten bolted bus connections in accordance with manufacturer's instructions.

c. Adjust circuit breaker trip and time delay settings to values as noted on manufacturer's engineered drawings or guidance of manufacturer's project engineer.

4.5 Cleaning

a. Touch up all scratched or marred surfaces to match original finish.

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Section 16500 Panelboards

5.0 Description

5.1 This section specifies the furnishing, installation, and connection of panelboards.

5.2 All panelboards listed in this section shall utilize circuit breakers for over-current protective devices unless otherwise specified.

6.0 Submittals

6.1 Shop Drawings/Approval Drawings

a. Shop drawings shall be provided for all panelboards. Sufficient information, clearly presented, shall be included to determine compliance.

b. Include electrical ratings, dimensions, mounting details, materials, weight, wiring, accessories and connection diagrams. Also include complete nameplate data, including manufacturer's name and catalog number.

c. Shop drawings shall indicate location of the main, branches, and solid neutral.

6.2 Unless specified in the Scope of Work the Owner shall coordinate Arc Flash Analysis, calculations and labeling for the facility revisions, including reconnection to all existing electrical installations where applicable. The Contractor shall provide the Owner with new electrical equipment specifications including accurate one-line diagrams showing wire sizes and lengths, conduit type, equipment manufacturer, breaker model numbers and setting options, fuse model numbers and sizes, etc., to perform analysis.

7.0 Products

7.1 General

a. Panelboards shall be in accordance with applicable UL, NEMA, and NEC codes and standards, and as described in the scope of work.

b. Panelboards shall be standard manufactured products. All components of the panelboards shall be the product and assembly of the same manufacturer. All similar units of all panelboards shall be of the same manufacturer.

7.2 Manufacturers

a. Panelboards shall be manufactured by Square D or approved equivalent.

1. Recommended equipment model and/or part numbers:

- Square D, Class 1640 NQOD
- Square D, Class 1670 NF
- Square D, Class 2110 (I-Line)

7.3 Panelboards

a. All panelboards shall have NEMA enclosure and trim rated for the environment in which the panelboard is installed.

b. All panelboards shall be of dead-front construction. Panelboard trim shall have concealed door hinges and mounted with trim screws.

c. All bus bars shall be constructed of copper or plated aluminum.

d. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type. Panelboard busing shall be such that when any two adjacent single-pole breakers are connect to opposite phases and multi-pole circuit breakers can be installed in any location. Current-carrying parts of the bus assembly shall be plated. Mains ratings shall be as shown.

e. Mechanical lugs furnished with panelboards shall be cast, stamped, or machined metal alloys of sizes suitable for the conductors to be connected.

f. Neutral bus (where applicable) shall be 100% rated and mounted on insulated supports. Neutral bus shall be split so that all incoming neutral conductors may be the same length.

g. Provide grounding bus bar equipped with screws or lugs for the connection of grounding wires.

h. Buses braced for the available short circuit current, but not less than 10,000 amperes symmetrical for 120/208-volt panelboards, and 14,000 amperes symmetrical for 277/480 volt panelboards.

i. Branch circuit panels shall have buses fabricated for bolt-on type circuit breakers.

j. Where designated as circuit breaker "spaces", include all necessary busing, device support and connections. Provide blank cover for each space.

k. In two-section panelboards, the main bus in each section shall be full size. The first section shall be furnished with sub-feed lugs on the line side of the main lugs only, or through-feed lugs for main circuit breaker type panels, and with cable connections to the second section. Panelboard sections with tapped bus or crossover bus are not acceptable.

l. Provide fully-rated panelboards. Series-rated panelboards are not permitted.

m. Provide galvanized steel enclosures to house panelboards. Enclosures for outdoor panels shall be factory primed and suitably treated with corrosion-resisting paint finish meeting UL 50 and UL 67.

7.4 Molded Case Circuit Breakers for panelboards

a. Circuit breakers shall be UL 489 listed and labeled, in accordance with NEC.

b. Molded case circuit breakers shall have a minimum interrupting rating for the available short circuit current, but not less than:

    1. 120/208-volt panelboard: 10,000 amperes symmetrical.

    2. 277/480-volt panelboard: 14,000 amperes symmetrical.

c. Molded case circuit breakers shall have automatic, trip free, non-adjustable, inverse time, and instantaneous magnetic trips.

d. Circuit breaker shall possess the following features:

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1. A rugged, integral housing made of molded insulating material.
2. Silver alloy contacts.
3. Arc quenchers and phase barriers for each pole.
4. Quick-make, quick-break operating mechanisms.
5. A common trip bar for each pole of multi-pole breakers with single operating handle.
6. Circuit breaker shall visually indicate position of OFF, ON, or TRIPPED.
7. Line connections bolted to breakers.
8. For circuit breakers being added to existing panelboards, coordinate the breaker type and rating with existing panelboards. Update the panel circuit directory as required.

8.0 Installation

8.1 Inspection

a. Examine area to receive panelboard to provide adequate clearance for panelboard installation.

b. Start work only after unsatisfactory conditions are corrected.

8.2 Installation

a. Install panelboard in accordance with manufacturer's instructions, the NEC, local codes, and drawings.

b. Locate panelboards so that present and future conduits may be conveniently connected.

c. Provide and install a typewritten circuit directory in each panelboard. Include sufficient information for each circuit so that loads may be easily identified. Directory shall be mounted in holder behind protective cover.

d. Mount panelboard plumb at a maximum height such that the center of the top circuit breaker handle does not exceed 79 inches above floor level.

e. Floor mounted enclosures shall be mounted on a raised 3-½ inch minimum concrete pad.

8.3 Field Quality Control

a. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

b. Check tightness of accessible bolted bus joints using calibrated torque wrench per manufacturer's recommended torque values.

8.4 Adjusting

a. Adjust all operating mechanisms for free mechanical movement per manufacturer's specifications.

b. Tighten bolted bus connections in accordance with manufacturer's instructions.

8.5 Cleaning

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a. Touch up all scratched or marred surfaces to match original finish.

Section 16550 Dry-Type Transformers

1.0 General

1.1 The Contractor shall furnish and install single-phase and three-phase general purpose individually mounted dry-type transformers of the two-winding type, self-cooled as required.

1.2 The transformers and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of ANSI, NEMA and UL.

1.3 Transformers shall meet the requirements of federal law 10 CFR Part 431 "Energy Efficiency Program for Certain Commercial and Industrial Equipment"

2.0 Submittals

2.1 Shop Drawings/Approval Drawings

a. Shop drawings shall be provided for all Dry-Type Transformers. Sufficient information, clearly presented, shall be included to determine compliance.

b. Include electrical ratings, dimensions, mounting details, materials, weight, wiring, accessories and connection diagrams. Also include complete nameplate data, including manufacturer's name and catalog number.

3.0 Products

3.1 The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

3.2 For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

3.3 The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

3.4 Preferred manufacturers:

a. Square D or approved equal.

4.0 Installation

4.1 Contractor shall furnish all labor, materials and items of service required to complete installation as specified in the Electrical Scope of Work.

4.2 Dry Type Transformers shall be installed in accordance with all codes and equipment manufacturer's recommendations.

4.3 Examine conditions for compliance with requirements for installation tolerances, power characteristics, and other conditions affecting performance. Do not proceed with installation until unsatisfactory conditions have been corrected.

4.4 Floor mounted enclosures shall be mounted on a raised 3-½ inch minimum concrete pad.

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4.5 Enclosure:

a. The enclosure shall be made of heavy-gauge steel. All transformers shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring. The maximum temperature of the enclosure shall not exceed 90 degrees C. The core of the transformer shall be grounded to the enclosure.

b. Enclosures shall be finished with ANSI 61 color, weather-resistant enamel.

c. The transformer/enclosure shall be rated for the location installed.

Section 16610 Fuses

1.0 Fuse Applications

1.1 Where fuses are used on a project, the electrical Contractor shall furnish and install a complete set of fuses for all fusible equipment on the job as specified. Contractor shall provide a list of replacement fuses in each panel. The list shall state the name of the manufacturer; fuse model number, class, and size of the fuse. Each list shall be attached to panel or enclosure.

a. Fuses for Mains, Feeders and Branch Circuits shall be as follows:

1. Circuits 601 to 6000 amperes shall be protected by current limiting Class L time-delay fuses.
2. Circuits 600 amperes or less shall be protected by current limiting Class J time-delay or Class RK1 time-delay fuses.
   - Class J fuses are recommended for all new applications.
   - Class RK 1 fuses are common/recommended replacements for existing applications of Class RK 5 (or other existing) fuses where Class J fuses cannot be applied.
3. All fuses shall be of the same manufacturer to assure selective coordination.

b. System Coordination

1. Over-current protective devices shall be installed so as to be coordinated with other over-current protective devices within the system. (I.e. Down-stream fuses should fault before upstream over-current protective devices.)
2. All fuses shall be of the same manufacturer to assure selective coordination.

2.0 Substitution

Fuse sizes and types are based on fuse current-limiting performance and selectivity ratios. Alternative submittals to furnish materials other than those specified shall be approved by Bratney and/or the Owner prior to purchasing along with a short circuit and selective coordination study.

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Section 16700 Grounding

1.0 Description of Work

Provide grounding as required by the project and the NEC.

2.0 General

2.1 Driven ground rods, where specified, shall be 3/4-inch diameter, 10 feet long copper weld rods or as otherwise shown.

2.2 Grounding conductors shall be #4/0 copper or as otherwise required.

2.3 Unless otherwise approved by Bratney and/or the Owner, all underground connections shall be exothermically welded permanent fusion connections.

2.4 Mechanical grounding connectors, bolts, flat washers, shakeproof (star) washers, contact nuts, nuts, and components shall be high copper alloy everdur, durium, or silicon bronze.

2.5 In addition to providing raceway bonding connections for conduit entrances to motors 575 volts and under, motors rated above 600 volts shall be bonded to the grounding electrode system with a code-sized conductor that connects directly to the underground grounding ring or grid.

2.6 Where "Hazardous Area" grounding and bonding methods are required, continue back to main panel (neutral to equipment ground bond) per NEC.

3.0 Installation

3.1 Buildings

a. Form and connect a grounding electrode system as required by the NEC including, but not limited to, the following electrodes where applicable:

1. Metal water piping within 5 feet of pipe entering the building and before connections to valves or meters.
2. Effectively grounded metal frame of building.
3. Concrete encased electrode consisting of 20 feet of continuous reinforcing bars or bare copper conductor, minimum of ½-inch in diameter or #4 AWG, respectively, installed in concrete foundation of building.
4. Ground rod(s) spaced at least 6 feet apart from other ground rods or grounding electrodes listed above.
5. Other grounding electrodes allowed by NEC to achieve grounding impedance as outlined in testing requirements herein.

b. All steel framework buildings and pipe bends which carry cable trays shall be effectively grounded.

c. In noncorrosive soil and atmospheres, the system, circuit, enclosure, and equipment grounding conductors shall be bare stranded soft annealed copper of the size required by the NEC.

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d. In corrosive soils and atmospheres, the system, circuit, enclosure, and equipment-grounding conductors shall be PVC jacketed stranded soft annealed copper of the size required by the NEC.

e. Each aboveground and underground metallic utility and process pipe, cable tray, metallic ducts, pneumatic conveying tube, support messenger, and conduit entering building shall be bonded to the building grounding electrode system. Bonding locations and conductor sizes shall be as required by the NEC and shall be installed so they can be easily inspected.

f. Bond lightning protection system to the structure grounding electrode system in accordance with NFPA 780, where applicable.

3.2 Equipment – General

a. All metal enclosures of electrical equipment shall be bonded to the raceway system that serves them and a separate equipment grounding conductor installed with the feeder.

b. For installations where electrical equipment rated at 600 volts or less are served by raceway systems consisting of metal cable tray and rigid metal conduit, the raceway systems are not considered adequate equipment grounding means. A separate equipment grounding conductor shall be installed.

c. Electrical equipment secured to and in electrical contact with a metal back plate or structure provided for its support which is bonded by one of the means indicated in the NEC shall be considered effectively grounded. The structural metal frame of a building shall not be used as the required equipment-grounding conductor for alternating current driven equipment.

d. The conductors and the surface of metal to be bonded shall be cleaned of conductive inhibiting materials, degreased, and treated with a corrosion inhibiting and conductive type compound. After the connection is complete, restore the paint or other type coating removed from the area surrounding the bonding connection.

e. Shake-proof (star) washers shall be used on bolted, tapped and bolted, and stud and contact nut grounding connections.

3.3 Primary and Secondary System

a. Distribution systems shall be grounded per NEC.

b. Three-phase, 4-wire transformers, 480-120/208 volt and single-phase, 3-wire transformers, 480-120/240 volt for lighting or power service located within buildings shall have their neutrals connected to either the nearest metallic water piping, or the nearest metallic building structure, located in the area served by the transformer. All above ground connections shall be visible and accessible. The neutrals for such systems shall not be grounded at any other points.

c. The distribution system shall have a system ground return path through equipment grounding conductors accompanying phase conductors through the raceway systems.

d. All substation ground grids shall be bonded to the structural steel framework of the building served.

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e. Transformers installed for the facility electrical distribution systems shall be grounded per NEC.

f. The neutral (grounded) conductor from the transformers shall be brought to service equipment and connected to the disconnecting means grounded conductor terminal or bus. A main bonding jumper shall connect the grounded conductor terminal or bus to the service disconnecting means enclosure. The grounded neutral conductor shall also be connected to the transformer case, be visible and accessible, and sized as required by the NEC.

3.4 Bonding

a. Bonding jumpers shall be copper and sized in accordance with the NEC.

b. Preparation of surfaces for bonding connections shall be made to assure the surface is clean for good bonding connections.

c. Bonding jumpers are necessary across any swivel joint or expansion joint in an electrical system.

d. All connections of grounding conductor cables for grounding of buses, steel columns, cable splices, and other such items shall be made by exothermic weld process or compression process as directed.

3.5 Flexible Conduit Bonding Jumpers

a. Flexible conduit bonding jumper shall be required with UL listed flexible metallic conduit for any of the conditions listed below:

1. Circuit voltage is greater than 120 volts to ground.
2. Circuit protective device is greater than 20 amperes.
3. Flexible metallic conduit size is greater than 3/4 inch.
4. Flexible metallic conduit length greater than 6 feet.
5. Equipment that is in a hazardous area.

b. For the conditions listed above, a stranded bonding jumper #12 copper (minimum) shall be installed.

NOTE: Externally mounted bonding jumpers shall be installed parallel with the axis of the conduit (not wrapped around the conduit) and cable tied at 9-inch intervals.

3.6 Wireways

a. Wireways shall be bonded in accordance with NEC.

3.7 Conduit

a. Unless otherwise shown on drawings, rigid metal conduit shall be bonded to metal enclosures, equipment, and raceways, in accordance with the NEC.

b. Bonding jumpers sized as specified herein or as shown on drawings or in accordance with the NEC, shall be installed across electrical raceway expansion joints and swivel joints.

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c. All conduits shall contain a minimum of one separate equipment grounding conductor sized according to the NEC.

3.8 Cable Tray

a. All cable trays shall be grounded in accordance with the NEC.

3.9 Lighting Fixtures

a. Each lighting fixture shall have an equipment ground that connects it solidly to the conduit system carrying the branch feeder.

3.10 Enclosures/Boxes

a. Unless otherwise indicated on the drawings or in this specification, if the enclosures of the electric power sources are bonded to the grounding electrode system, the raceway system, when made up of metallic rigid conduit, will not be adequate bonding for enclosures, boxes, and equipment not containing power sources. However, when a conductor within a multi-conductor cable has been designated as a grounding conductor, or is bare, or has green insulation, that conductor shall be connected to the equipment grounding terminals or grounding bus bars at both ends of the cable.

b. Rigid metal conduit terminations to nonmetallic enclosures and boxes shall be equipped with grounding bushings, be bonded together, and to a grounding bus bar with a grounding conductor that matches the size of the largest conductor within the conduits or sized in accordance with the NEC. Metallic devices within the enclosure shall be bonded to the grounding bus bar.

3.11 Portable Equipment

a. All portable electrical equipment shall be grounded in accordance with NEC Article 250.

b. Noncurrent-carrying metal parts of portable electrical equipment that are cord and plug connected shall be bonded to the equipment grounding conductor in accordance with NEC Article 250.

4.0 Ground Testing

4.1 Maximum acceptable grounding resistance of the building grounding system shall not exceed 25 Ohms for general-purpose locations and 10 Ohms for hazardous locations.

4.2 Ground resistance shall be measured at the time of installation. If ground resistance exceeds the maximum permissible, the Contractor should contact the project manager for further instructions.

Section 16800 Lighting

1.0 General

1.1 Furnish lighting material, equipment, and installation as specified in the project documents. If the project is an existing building, generally the contractor shall install lights similar to existing fixtures.

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1.2 The Contractor shall design the lighting prior to construction and then relocate as required to eliminate shadowing around process equipment before completion of the work. The lighting layout shall be reviewed with Bratney and the Owner before design is finalized and must be updated with as-built documents at completion.

1.3 Submittals of lighting fixtures are necessary if the Owner has not provided a standard fixture list. Lamps must be furnished with the fixtures.

1.4 All fixtures shall be rated for the location they are being placed – ex: hazardous, NEMA 12, damp/wet, hot/cold ambient starting temperature, etc.

2.0 Submittals

2.1 Shop Drawings/Approval Drawings

a. Shop drawings shall be provided with all lighting and lighting controls. Sufficient information, clearly presented, shall be included to determine compliance.

b. Provide lighting layouts/calculations and proposed light fixtures submitted for review and approval prior to ordering.

3.0 Lighting Types and Levels

3.1 Office Areas

a. 2'x4' grid fluorescent troffers (2, 3 or 4 lamp) or LED equivalent.

b. 120V or 277V depending on the facility.

c. 50 foot-candles average at 30" above the floor.

3.2 Breakrooms, Restrooms

a. 2'x4' grid fluorescent troffers (2, 3 or 4 lamp) or LED equivalent, if drop ceiling or 4' surface mount fluorescent units (2, 3 or 4 lamp) or LED equivalent, if not drop ceiling.

b. 120V or 277V depending on the facility.

c. 30 foot-candles average at 30" above the floor.

3.3 Labs, Control Rooms, Electrical Rooms or other low ceiling process areas with multiple staffing

a. 4' suspended or surface mount, enclosed and gasketed fluorescent units (2, 3 or 4 lamp) or LED equivalent.

b. 120V or 277V depending on the facility.

c. 50 foot-candles average at 30" above the floor.

3.4 General Indoor Process Equipment Areas

a. 4' suspended or surface mount, enclosed and gasketed fluorescent units (2, 3 or 4 lamp) or LED equivalent.

b. Shadow elimination - either 4' suspended or surface mount, enclosed and gasketed fluorescent units (2, 3 or 4 lamp) or LED equivalent, or wall packs.

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c. 120V or 277V depending on the facility.

d. 30 foot-candles average at the floor or walkway.

3.5 Warehouse

a. 4' suspended or surface mount, enclosed and gasketed fluorescent units (4 or 6 lamp) or LED equivalent.

b. 120V or 277V depending on facility.

c. 20 foot-candles average at the floor or walkway.

3.6 Shop Building

a. 4' suspended or surface mount, enclosed and gasketed fluorescent units (4 or 6 lamp) or LED equivalent.

b. 120V or 277V depending on facility.

c. 30 foot-candles average at 30" above floor.

3.7 Outdoor or Semi-Enclosed Process Equipment Areas

a. Metal Halide or LED equivalent.

b. 120V or 277V depending on facility.

c. 20 foot-candles average at the floor or walkway.

3.8 Outdoor Task Areas – Receiving, Chopper, Truck Scale, etc.

a. Metal Halide or LED equivalent.

b. 120V or 277V depending on facility.

c. 10 foot-candles average at 30" above ground.

3.9 Exterior Walk Areas

a. Metal Halide or LED equivalent.

b. 120V or 277V depending on facility.

c. 2 foot-candles average at ground.

3.10 Roadway and Exterior Area

a. Metal Halide or LED equivalent.

b. 120V or 277V depending on facility.

c. 1 foot-candle average at ground.

3.11 Specific process areas not defined above will be defined in the Scope of Work.

4.0 Installation

4.1 In raceways (e.g., service poles), install a green equipment grounding wire.

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4.2 Extra care shall be taken that fixtures, conduit, and raceways are installed with uniformly good workmanship with particular attention to alignment, level, and neat appearance.

4.3 The fixtures, raceway, wiring, and accessories shall be suitable for the intended use, environment, and area classification.

4.4 Lighting fixtures (luminaires) and equipment shall be mounted as specified in the contractor's layout drawings. Luminaires may be relocated due to interferences +6 inches vertically or horizontally from the position shown on the drawings. If a luminaire must be relocated more than 6 inches, Bratney shall be notified before installation.

4.5 The maximum number of conductors in a lighting conduit shall be per the NEC. No shared neutrals allowed.

4.6 Where splices or terminations occur in outlet boxes for lighting and convenience circuits, identify and label the through and tapped circuits, including accompanying neutrals for 120-volt circuits. Traveler conductors for 3-way and 4-way switch circuits shall be identified and labeled in all switch, outlet, and junction boxes. Neutral conductors shall be identified as required by the NEC.

4.7 Conductors for lighting circuits shall be stranded copper, sized as required per NEC (minimum #12 AWG), with Type THWN/THHN 600-volt insulation. Increase conductor size as required for voltage drop.

4.8 Conductors shall extend a minimum of 6 inches past the front edge of conduit bodies and outlet boxes for connection of devices or makeup of branch circuit takeoffs.

4.9 Wiring, conduit, and associated components over non-hazardous areas with suspended T-grid ceilings shall be secured in place at intervals as required by the NEC.

4.10 Flexible cord sets shall be connected to plugs and devices so tension will not be transmitted to joints or terminals. The ends of stranded conductors in cord sets shall be provided with lugs that securely anchor the strands of the conductor to the connection point.

4.11 Fluorescent Fixtures

a. The four corner points of lay-in troffer luminaries shall be secured to the T-grid rails of drop ceilings with vendor (accessory) lock clips, and #14-gauge steel general purpose utility wire. Contractor shall attach the fixture housing corners to the holes in the T-grid rails to secure the troffer using utility wire. Fixture supports shall meet seismic zone requirements where applicable.

b. Fluorescent fixtures with exposed lamps/tubes (non-enclosed fixtures) shall contain a wire guard or lamp tube guards. Fluorescent fixtures with exposed lamps/tubes and guards shall be pre-approved for use by Owner.

4.12 Emergency Lighting

a. Emergency lighting shall be installed in accordance with all NFPA Codes as well as applicable building codes. (NEC, NFPA 101 Life Safety Code, etc.)

b. Emergency light units shall be connected to the lighting circuit ahead of any light switch. Battery-operated emergency lighting units as described in NEC shall be connected ahead of any local lighting switches and to the same branch circuit feeding normal lighting in the area. However, battery-operated emergency lighting units may be circuited independent of the general lighting supply, with provisions for automatically transferring the emergency lights upon the event of failure of the general lighting system supply.

c. Illuminated exit signs shall be LED type and shall have battery backup power to operate sign illumination during power outages for a 1.5 hour minimum.

4.13 Functional Testing for Lighting Controls

a. Provide functional testing of lighting controls and systems. Specifically, all lighting controls and associated software must be calibrated, adjusted, programmed and assured to operate in accordance with manufacturer installation instructions. Specific requirements are to be identified for occupancy sensors, programmable schedule controls and photo-sensors.

4.14 O & M Manuals

a. Provide as-built drawings of the lighting and control system, recommended re-lamping program, schedule for inspecting and recalibrating lighting controls, and a complete narrative of how each lighting control system is supposed to operate, including its recommended settings and shall be turned over to the owner within 90 days of system acceptance.

Section 16930 Equipment Testing

NOTE: Energizing or de-energizing systems will only be done by qualified persons approved by Bratney and/or the Owner.

1.0 Ground Continuity Tests

1.1 Test Reports – Contractor shall submit two copies of the following test reports for approval:

a. Between each main secondary feeder switchboard ground and its termination point.

b. Between each unit of electrical apparatus on each main secondary feeder to the ultimate distribution point, excluding branch circuit conductors.

c. Meggered values of all 600-volt cables and equipment.

1.2 Earth resistance tests of grounding grids. The building, substation, and computer grounding systems shall not exceed those values specified in 25 Ohms in general purpose locations and 10 Ohms in hazardous locations.

1.3 All cable, conductor, and equipment inspection and tests shall be made before any circuit is energized.

1.4 Continuity tests shall be performed after control and signal cables and conductors have been pulled in place and terminated.

1.5 Electronic, communication, and solid-state devices, or enclosure frames containing such devices, shall not be exposed to meggering.

1.6 Contractor shall provide all instruments required for meggering and ground resistance testing.

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2.0 Installation

2.1 When the installation of all apparatus and wiring is complete, test all electrical conductors to insure continuity, freedom from grounds, and insulation resistance values in accordance with the requirements of the NEC and local inspection authorities.

2.2 Set and adjust all overload devices to suit the load conditions and tests made to determine actual loads.

2.3 All motors above 50 horsepower shall be meggered before placing in operation but it is good electrical installation practice to test all motors.

2.4 It is recommended as good electrical installation practice to megger test all motor control centers, bus ducts, feeder cables, and branch circuits rated below 600 volts (480 volts nominal). It should be megger tested between phase conductors and between phase conductors and ground, using a 1000-volt megger. Tests shall be made upon completion of all connections and splices and insertion of all overcurrent devices. Tests shall indicate freedom from short circuits and grounds.

2.5 Make all tests in the presence of the Owner's representative.

3.0 Personnel Training and Equipment Testing

3.1 Qualified personnel shall test the high-voltage cable, cable terminators, and transformers prior to energization.

3.2 Qualified personnel shall set and test the low-voltage switchboard and circuit breaker static trip devices.

3.3 The Contractor shall coordinate the above activities with Bratney's site supervisor and the Owner's resident engineer or his representative.

4.0 Testing Procedure and Values

4.1 Electrical power conductors and equipment 600 volts and below shall be megger tested in accordance with standard industrial practice or as stated in vendor manuals or installation instructions, and as specified herein.

4.2 Whether a hand or motor-driven generator is used, the megger test shall be applied for a minimum of 1 minute and held until the reading reaches a constant value for 15 seconds.

NOTE: As the potential of the megger is high enough to be dangerous, all ungrounded terminals of the equipment being tested shall be guarded from accidental personnel contact. After completion of the test, ungrounded terminals shall be grounded for at least 5 seconds before anyone touches them, and cable shall remain grounded for not less than 30 seconds to allow the absorbed charge to drain off. Leaving the megger connected to the conductor for the above duration will allow the potential to drain off through the meter connections.

4.3 The following items shall be megger tested as indicated:

a. 600 Volts AC Power Feeders

1. Set megger to the 1000-volt range.

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2. Ground conductors not under test.
3. Connect megger between conductor under test and ground.
4. Momentarily ground the opposite end of the conductor under test to verify continuity.
5. Test conductor insulation resistance.
6. Repeat Steps 2 through 5 for each conductor. Acceptable Value – 100 Ohms minimum

b. AC Motors Rated 300 Volts to 600 Volts
1. Set megger to the 1000-volt range.
2. Disconnect motor from supply conductors.
3. Test phase-to-phase continuity
4. Test phase-to-ground (motor frame) insulation resistance. Acceptable Value – 50 Ohms minimum

c. AC Motors Rated Below 300 Volts
1. Set megger to the 500-volt range.
2. Disconnect motor from supply conductors.
3. Test phase-to-phase continuity.
4. Test phase-to-ground (motor frame) insulation resistance. Acceptable Value – 20 Ohms minimum

d. AC Starters and Switches – 600 Volts and Under
1. Set megger to the 500-volt range.
2. Disconnect line and load leads.
3. Close switch. Block starter closed.
4. Ground phases not under test
5. Test each phase to enclosure. Acceptable Value – 3 Ohms minimum

e. Dry Type Transformers
1. Set megger voltage range as follows:

Nominal Voltage	Megger Voltage
0-300	500
300-600	1000

2. Ground windings not under test.
3. Test ungrounded windings. Acceptable Value - 100 Ohms minimum (both windings)

f. Motor Control Centers
1. Set megger to the 1000-volt range.

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2. Disconnect feeder cables (open switches and breakers).
3. Ground buses not under test.
4. Test between ungrounded bus and motor control center enclosure.
5. Test each bus. Acceptable Value – 10 Ohms minimum

g. Switchboard - 600 Volts
1. Remove LV breakers.
2. Remove control circuit fuses.
3. Disconnect or remove fuses in PT primaries.
4. Disconnect bus feeders.
5. Clean bus supports.
6. Ground buses not under test.
7. Set megger to the 2500-volt range.
8. Test each bus. Acceptable Value – 10 Ohms minimum

h. Lightning and Surge Arrestors
1. Disconnect ungrounded leads.
2. Clean with General Electric 1500 thinner.
3. Set megger to the 2500-volt range.
4. Test each arrestor. Acceptable Value – 1 Ohm minimum (Normal readings are 10 Ohms or higher)

i. Grounding Electrode System
1. Use Ground Megger.
2. Measurements shall be made by the three-point method.
3. Test records shall include the soil conditions at the time measurements are taken. Measurements shall not be taken less than 48 hours after rainfall.
4. When space and ground covering will not permit driving test rods, a ground of known low resistance value may be used as a reference ground.

Acceptable Values

5. Lightning Protection
   - Hazardous Areas – 10 Ohms maximum
   - Nonhazardous Areas – 25 Ohms maximum
6. Substation Fences
   - 5 Ohms maximum

7. Property and Security Fences
   - 25 Ohms maximum

j. Generators Rated 480 Volts
   1. Disconnect load leads.
   2. Lift ground lead if grounded at the generator.
   3. Set megger to the 1000-volt range.
   4. Test phase-to-phase continuity.
   5. Test phase-to-ground (generator frame) insulation resistance. Acceptable Values – 50 Ohms minimum

5.0 Other Checks and Tests

5.1 With Bratney's on-site personnel's help, perform the following on all motors prior to start-up:

a. Check shaft for freedom of rotation.

b. Verify that all driven equipment coupled to motors and all motors have been properly lubricated and in running condition before tests are made.

c. Bump motor to verify proper rotation (this may require mechanical disengagement) and assure rotation indication label is applied properly; if not, re-label.

5.2 Perform the following on all motors during or immediately after start-up:

a. Check motor for smooth operation (vibration).

b. Take No-load and loaded current readings using a clamp-on ammeter. Document and provide report to Bratney.

5.3 Check no-load and full-load voltage at each transformer. Document and provide report to Bratney.

5.4 Check resistance between process and utility piping, heating and ventilating ducts and pneumatic conveying tubes, and building steel in electrical Class 1 or 2, Div. 1 or 2 hazardous areas. With an approved multi-meter, resistance shall not exceed 100 Ohms.

NOTE: Contractor shall notify Owner if he encounters readings above 100 Ohms, and bonding has been performed as shown on drawings or specified herein.

5.5 Check single-phase, 3-wire, 120-volt AC, polarized receptacles for correctness of polarity and proper grounding.

Section 16999 Temporary Power

1.0 General

1.1 Installation shall meet the requirements of the NEC. The predominant NEC Article covering this work is Article 590 and the articles referenced from Article 590.

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1.2 All metal parts of electrical equipment shall be effectively grounded and bonded.

1.3 All wiring components shall be suitable for wet locations.

1.4 Each 120-volt branch circuit to receptacles and lighting shall have a dedicated neutral conductor for each ungrounded conductor. No common neutrals are allowed.

1.5 Identify and label all disconnect switches. State the circuit voltage source and the equipment being serviced. Label all receptacles with the circuit voltage present and the circuit number.

2.0 Equipment

2.1 Bratney owns a variety of temporary power panels and transformers that can be used depending on the amount of power and number of locations required on a job site. If this information is not included in the RFP, contact the Bratney project engineer to see if this equipment is available for use.

2.2 All 600-volt fuses shall be UL class RK1 current limiting fuses.

2.3 All 120-volt circuit breakers supplying lighting and receptacles shall be rated at 20 amps.

3.0 Cable

3.1 All wiring shall be in cable or cable assemblies. No single conductor open wiring is allowed.

3.2 All cabling electrically downstream from the distribution panels shall be approved for hard or extra hard usage.

3.3 All cable assemblies shall contain an equipment grounding conductor as a part of the cable assembly.

3.4 Cables shall be installed in a way that they are protected from accidental damage. Sharp corners and projections shall be avoided. Cables shall not be routed through doorways.

3.5 All cables shall be adequately supported with nonconductive supporting materials.

3.6 Cables entering enclosures containing devices requiring termination shall be secured to the box with fittings designed for the purpose.

3.7 480-volt cables shall be labeled with its circuit voltage at its point of origin and destination and at points along its length in such a way that the label is visible from all viewing locations along its route.

4.0 Lighting

4.1 Interior lighting shall be provided to supply an illumination level of 5 foot-candles measured at a point 30 inches above the floor. Illumination measurement shall be taken at night.

4.2 Lighting fixtures may be incandescent, quartz, or HID (High Intensity Discharge) or any combination and are not to be suspended by their electric cords unless cords and lights are designed for this means of suspension.

4.3 Branch circuits supplying lighting shall not be GFCI protected and shall be loaded at a maximum of 70% of circuit rating.

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4.4 Lamps shall be protected from accidental contact or breakage by a suitable fixture or lampholder with a guard.

5.0 Receptacles

5.1 All 120-volt receptacles shall be UL class "A" GFCI receptacles. No GFCI breakers shall be used.

5.2 Branch circuits supplying receptacles shall have no more than 2 duplex receptacles per circuit.

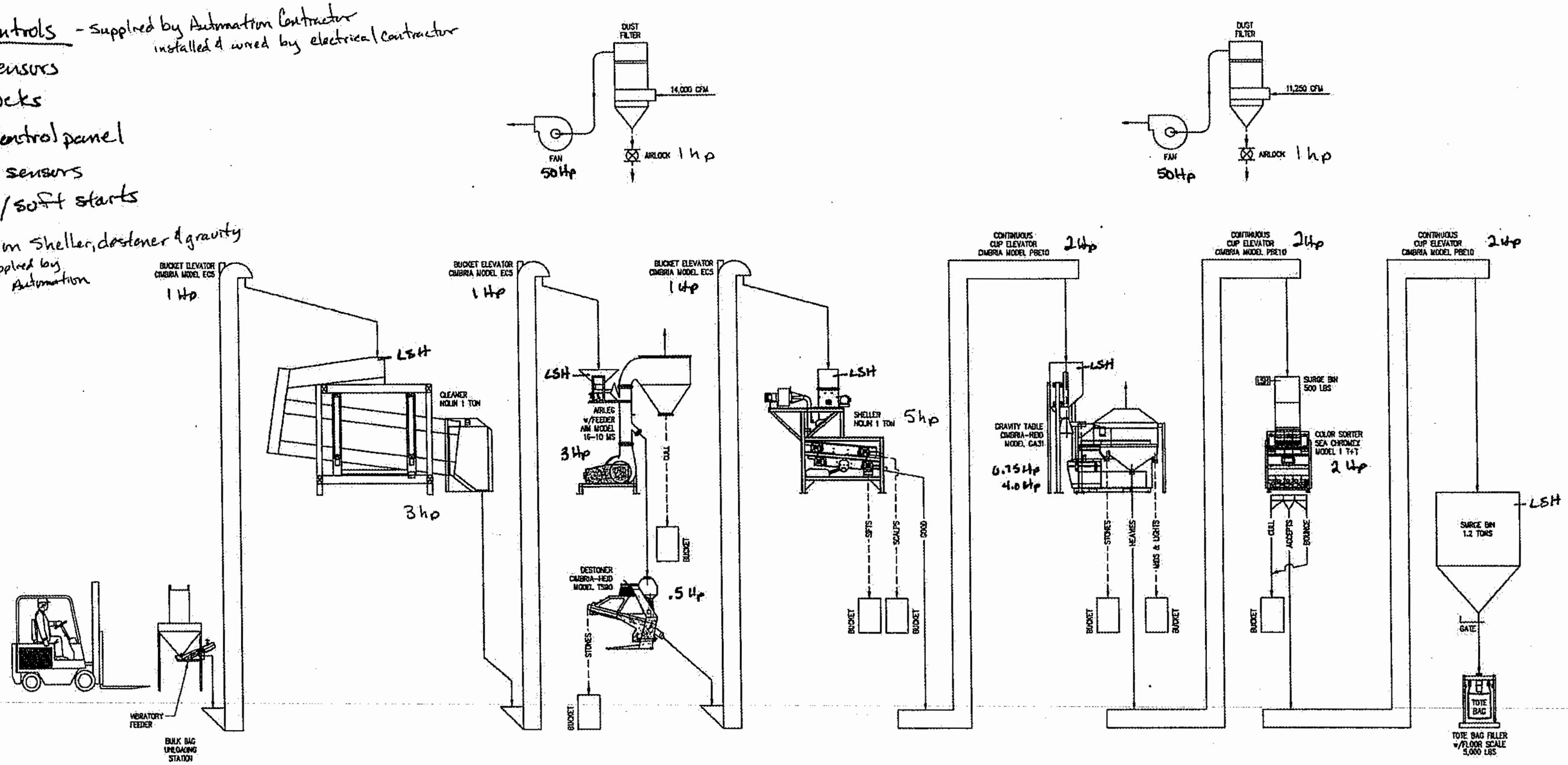
5.3 All receptacles shall be the 3-wire grounding type and shall be labeled with the circuit number and lighting panel number that feed it.

5.4 All receptacles shall be tested for correct voltage, polarity, and GFCI operability prior to being put into service. The GFCI operability shall be tested with the push to test button on the receptacle. Polarity and voltage shall be tested before use. Acceptable voltage level (line to neutral) is between 110 and 125 volts.

5.5 Exterior receptacles shall be provided with metal "in use" weatherproof type cover.

Basic Controls - Supplied by Automation Contractor
installed & wired by electrical contractor
- Level sensors
- interlocks
- HMI control panel
- motion sensors
- VFDs / soft starts

VFDs on Sheller, destoner & gravity
- Supplied by Automation



CONCEPTUAL DRAWING
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August 15, 2018, 8:18am
Drawing: G:\Operations\2-Bids\1-Des Moines\Bids 2017\170086-999 Texas A&M - Vernon, TX - Peanut\DRAWINGS\Prelim\Dwg\PFD-101_B_08-15-18.dwg Layout: PFD-101

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PROCESS FLOW DIAGRAM
PEANUT RESEARCH FACILITY

170086-999
PROJECT NUMBER

PFD-101
DRAWING NUMBER

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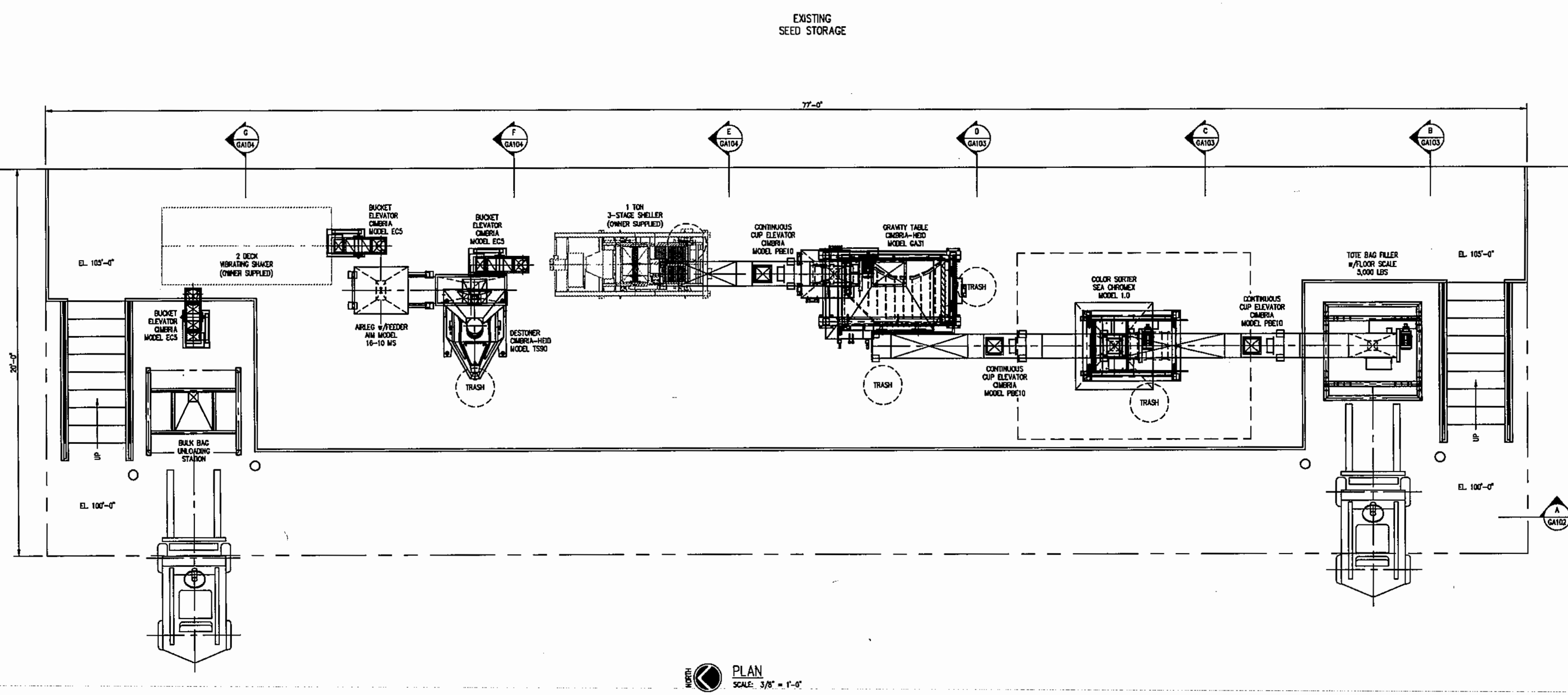

PLAN
SCALE: 3/8" = 1'-0"

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Drawing: B:\Operations\2-Bids\1-Des Moines\Bids 2017\170086-999 Texas A&M - Vernon, TX - Peanut\DRAWINGS\Research Plant\Current\Dwg\GA-101thruGA-104_B_12-16-19.dwg Layout: GA-101

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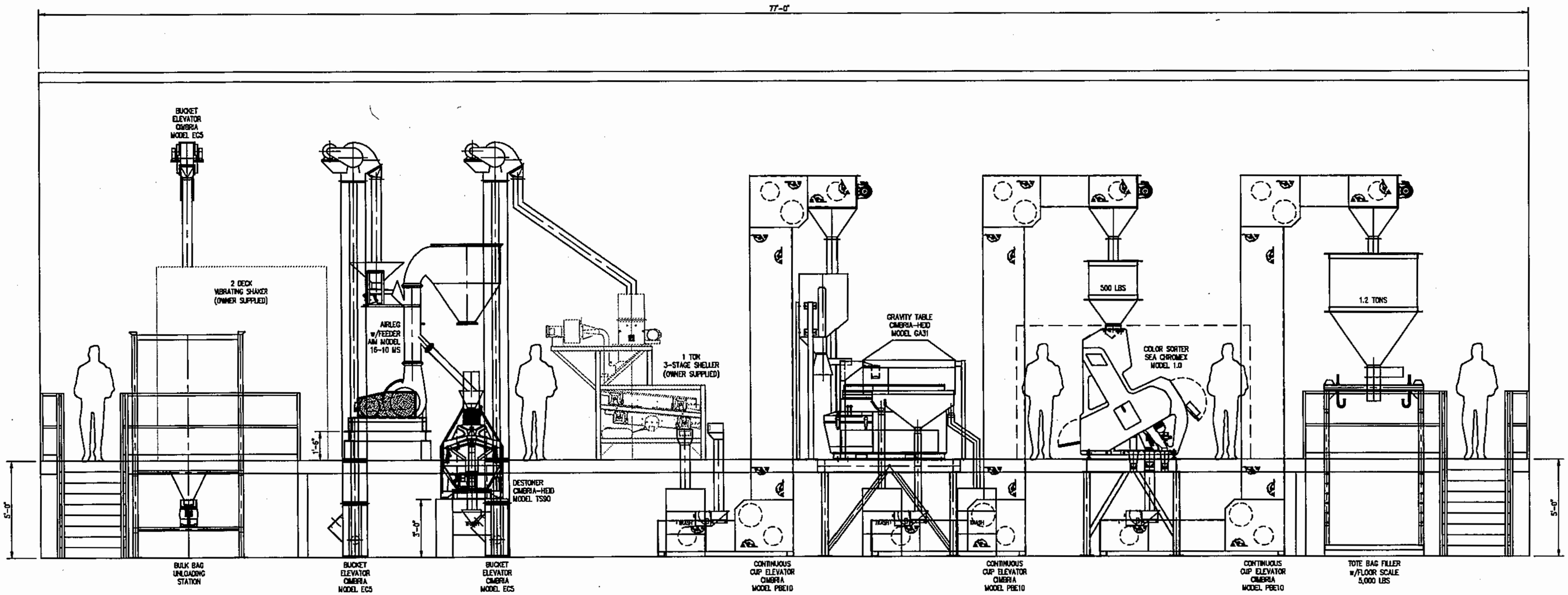

B GA102 SECTION (LOOKING EAST)
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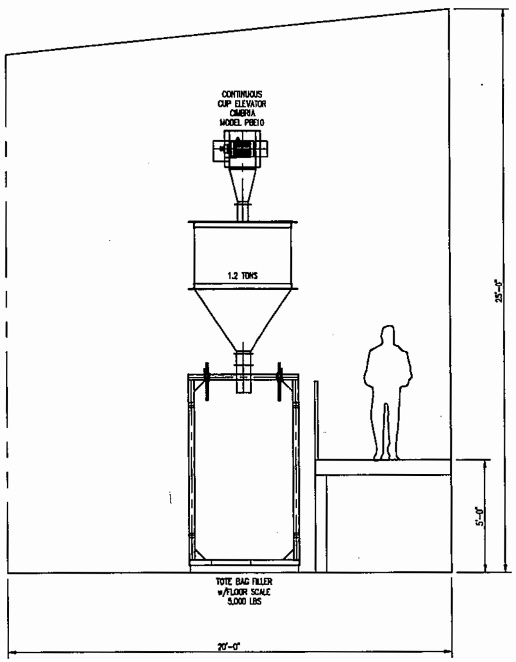
B
REV.



(B / GA103) SECTION (LOOKING NORTH)
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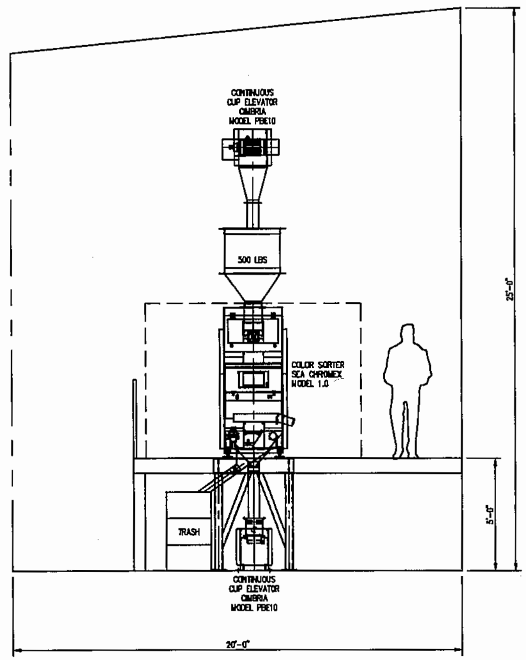

(C / GA103) SECTION (LOOKING NORTH)
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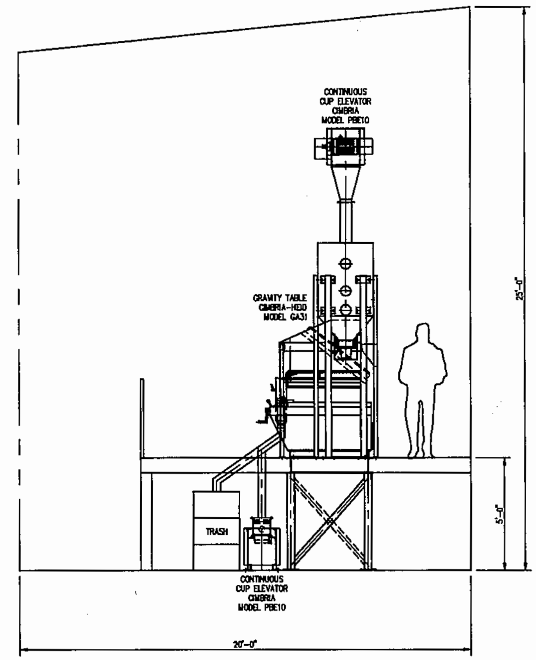


(D / GA103) SECTION (LOOKING NORTH)
SCALE: 3/8" = 1'-0"

CONFIDENTIAL
CONCEPTUAL DRAWING
-FOR ESTIMATING PURPOSES ONLY-

January 02, 2020, 8:38am
Drawing: G:\Operations\3-Bids\1-Des Moines\Bids 2017\170086-999 Texas A&M - Vernon, TX - Peanut\DRAWINGS\Research Plant\Current\Dwg\GA-101thruGA-104_B_12-16-19.dwg Layout: GA-103

REV. NO.	REV. DATE	REVISION DESCRIPTION	BY	CHECKED BY / APPROVED BY
A	8-15-18	CONCEPTUAL RELEASE	BLB	CD
B	12-16-19	CONCEPTUAL RELEASE	BLB	CD

BRATNEY COMPANIES
3400 109th STREET - DES MOINES, IA 50322 - 515.270.2417
3676 N. HARBOR LN. - SUITE 100 - BOISE, ID 83702 - 800.247.6755
950 RIVERSIDE PARKWAY - SUITE 60 - WEST SACRAMENTO, CA 95605 - 916.364.8686
www.bratney.com - INTEGRATING INNOVATIVE SOLUTIONS

DRAWN BY: BLB	CHECKED BY: CD
APPROVED BY: CD	ISSUE DATE: 8-15-18
SCALE: 3/8" = 1'-0"	

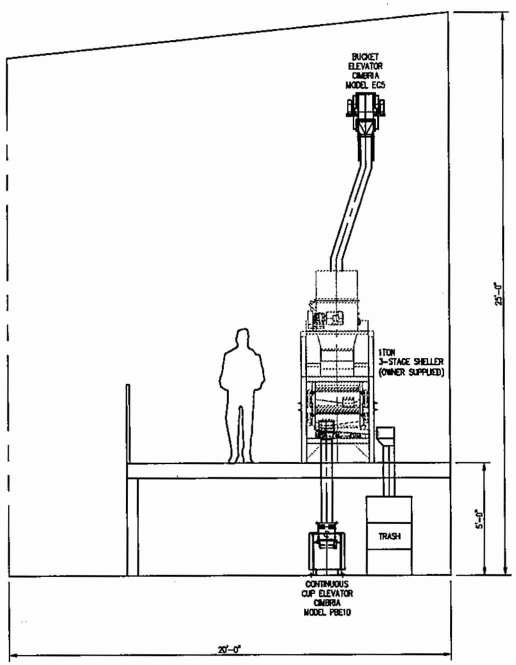
TEXAS A&M
VERNON, TEXAS

SECTIONS B/GA-103, C/GA-103 & D/GA-103
PEANUT RESEARCH FACILITY

170086-999
PROJECT NUMBER

GA-103
DRAWING NUMBER

B
REV.



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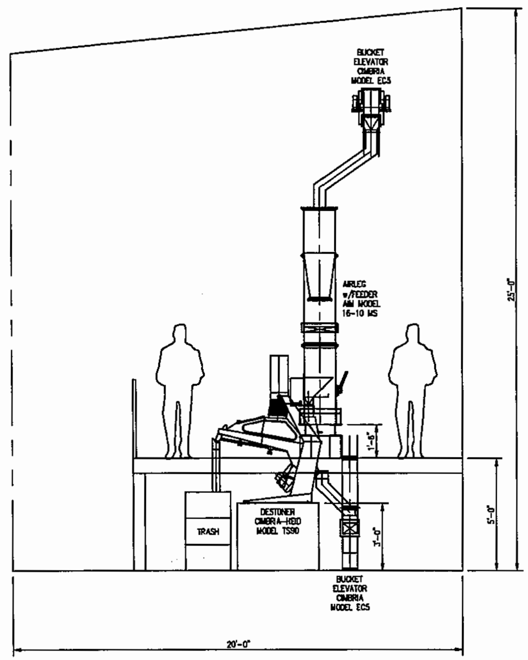

SECTION (LOOKING NORTH)
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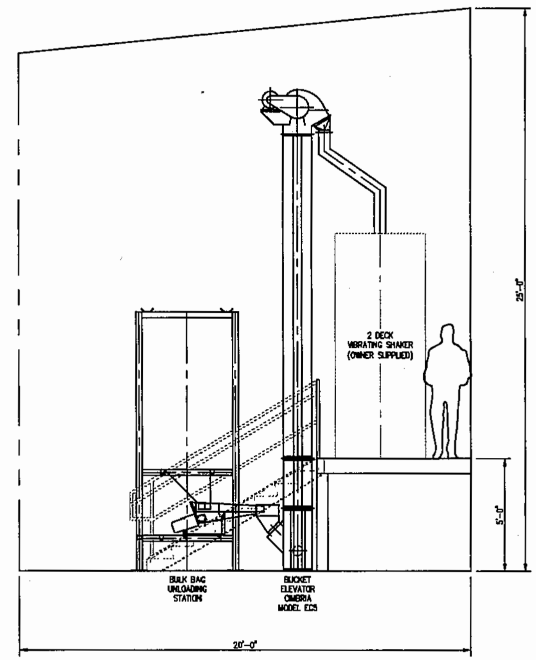

SECTION (LOOKING NORTH)
SCALE: 3/8" = 1'-0"

CONFIDENTIAL
CONCEPTUAL DRAWING
-FOR ESTIMATING PURPOSES ONLY-

January 02, 2020, 8:56am
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REV. NO.	REV. DATE	REVISION DESCRIPTION	BY	CHECKED BY / APPROVED BY
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B	12-16-19	CONCEPTUAL RELEASE	BLB	CD

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DRAWN BY: BLB | CHECKED BY: CD
APPROVED BY: CD | ISSUE DATE: 8-15-18
SCALE: 3/8" = 1'-0"

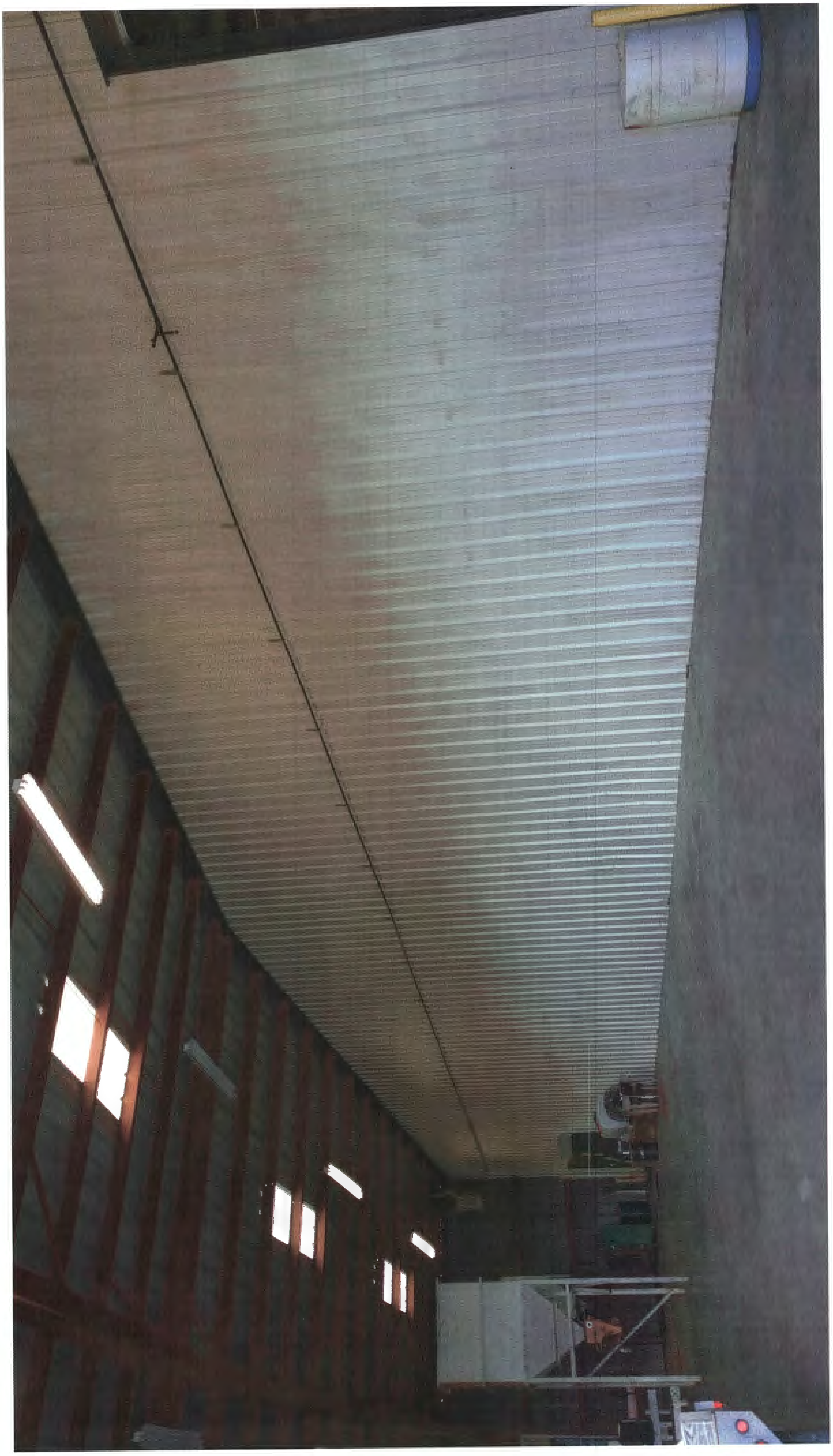
TEXAS A&M
VERNON, TEXAS

SECTIONS E/GA-104 & F/GA-104
PEANUT RESEARCH FACILITY

170086-999
PROJECT NUMBER

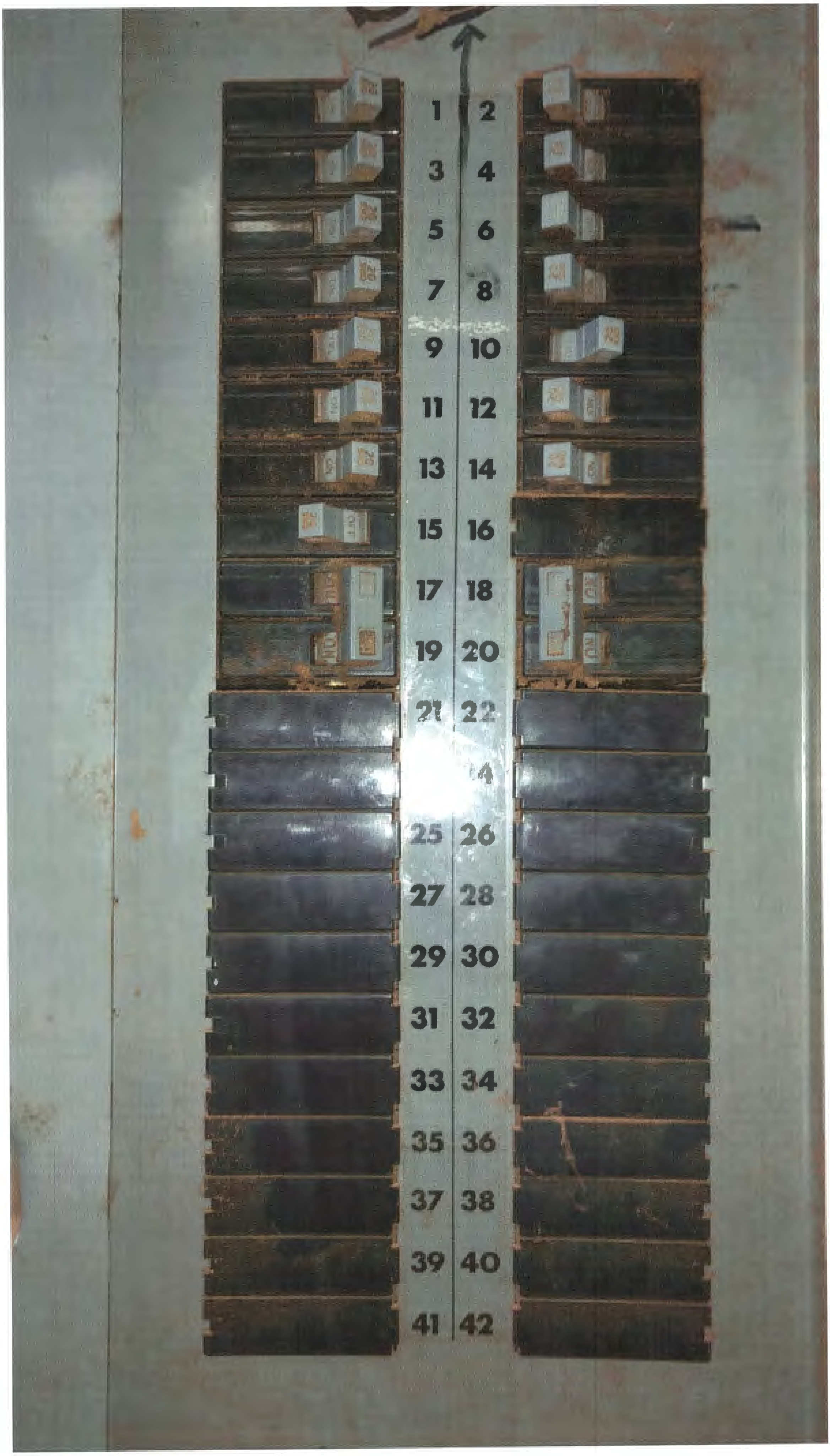
GA-104
DRAWING NUMBER

B
REV.



Elec.
Door
MAIN
MAIN
EXIT


1 2
3 4
5 6
7 8
9 10
11 12
13 14
15 16
17 18
19 20
21 22
23 24
25 26
27 28
29 30
31 32
33 34
35 36
37 38
39 40
41 42
PIT
TRASH


1 2
3 4
5 6
7 8
9 10
11 12
13 14
15 16
17 18
19 20
21 22
25 26
27 28
29 30
31 32
33 34
35 36
37 38
39 40
41 42

Panelboard ______________ Volts ________ φ ________

This board fed from panel ______________________

CIRCUIT DIRECTORY

1 Warehouse N Row Lites	2 Warehouse 2nd North Lites
3 Warehouse Middle Row Lites	4 Warehouse South Row Lites
5 Cleaning Plant North Lites	6 Night Lites
7 Cleaning Plant South Lites	8 Cleaning Plant Electric Door
9 Outside South Weather Proof Plugs	10 Cleaning Plant [illegible]
11 Outside Lights	12 Bathroom
13 Warehouse Electric Door	14 Office
15 Space heaters	16 SPARE
17 AC	18 Furnace
19 Compresor	20 "

Pub. No. 12493 Cutler-Hammer E·T·N

PAYMENT BOND

STATE OF TEXAS

COUNTY OF **WILBARGER** KNOW ALL MEN BY THESE PRESENTS

That we,____, as Principal, and ____, as Surety, are hereby held and firmly bound unto the State of Texas in the penal sum of:____Dollars (___________) for the payment whereof, the said Principal and Surety bind themselves, their heirs, executors, administrators and successors, jointly and severally firmly by these presents.

The conditions of this obligation are such that, whereas the Principal entered into a certain contract (the "Contract"), which Contract is incorporated into this Payment Bond by this reference, with the State of Texas acting by and through the Board of Regents of The Texas A&M University System, as Obligee, dated ___________________ for the **Electrical for Peanut Shelling Equipment, Texas Foundation Seed Service, Texas A&M AgriLife Research, Vernon, Texas** Project No. **0236**

NOW, THEREFORE, if the Principal shall promptly make payments to all claimants, as defined in Chapter 2253, Texas Government Code, supplying labor and materials in the prosecution of the work provided for in said Contract, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

This Bond is made and entered into solely for the protection of all claimants supplying labor and material in the prosecution of the Work provided for in said Contract, and all such claimants shall have a direct right of action under the Bond as provided in Chapter 2253, Texas Government Code.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the Work to be performed under the Contract shall in any wise affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the Work to be performed under the Contract.

The Surety agrees to pay the State of Texas upon demand all loss and expense, including attorney's fees and court costs, incurred by the State of Texas by reason of or on account of any breach of this obligation by the Surety.

IN WITNESS WHEREOF, the Principal and Surety have duly signed and sealed this instrument this

________ day of ____________, 2020.

____________________________ Principal (PRINCIPAL'S SEAL-if a corporation)

By:___________________________

Name:_________________________

Title:__________________________

__________________________, Surety (SURETY'S SEAL)

By: __________________________

Name:_________________________
Attorney-in-Fact

** Payment Bond not required on projects of $25,000 or less; only required on projects totaling >$25,000.

PERFORMANCE BOND

STATE OF TEXAS

COUNTY OF **WILBARGER** KNOW ALL MEN BY THESE PRESENTS

That we, ____________________, as Principal, and ______________________________ ____________________________, as Surety, are hereby held and firmly bound unto the State of Texas in the penal sum of: ____ Dollars ($___________) for the payment whereof, the said Principal and Surety bind themselves, their heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

The conditions of this obligation are such that, whereas the Principal entered into a certain contract (the "Contract"), which Contract is incorporated into this Performance Bond by this reference, with the State of Texas acting by and through the Board of Regents of The Texas A&M University System, as Obligee, dated _________ for the **Electrical for Peanut Shelling Equipment, Texas Foundation Seed Service, Texas A&M AgriLife Research, Vernon, Texas**, Project No. **0236**.

NOW, THEREFORE, if the Principal shall faithfully perform the Contract in accordance with the Contract Documents, including any warranties, and shall fully indemnify, and save harmless the State of Texas from all costs and damage that the State of Texas may suffer by reason of the Principal's default or failure to perform and shall fully reimburse and repay the State of Texas all outlay and expense that the State of Texas may incur in making good any such default or failure to perform, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

In the event the Principal is declared in default under the Contract, Surety will, within fifteen (15) days of the determination of such default, take over and assume responsibility for completion of such Contract and become entitled to the payment of the balance of the Contract Price, or the Surety shall make other arrangements satisfactory to the Obligee for the completion of the defaulted Work. Conditioned upon the Surety's faithful performance of its obligations, the Surety's liability shall not exceed the penalty of this Bond.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the Work to be performed under the Contract or to the Specifications accompanying the same shall in any manner affect its obligation on this Performance Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the Work or to the Specifications.

The Surety agrees to pay to the State of Texas upon demand all loss and expenses, including attorney's fees and court costs, incurred by the State of Texas by reason of or on account of any breach of this obligation by the Surety.

This Bond is issued pursuant to the requirements of Section 2253.021, Texas Government Code, as amended.

IN WITNESS WHEREOF, the Principal and Surety have executed and sealed this instrument this ________ day of ___________________, 2020.

________________________, Principal (PRINCIPAL'S SEAL if a corporation)

By: Name:______________________

Title:________________________

______________________________Surety (SURETY'S SEAL)

By: __________________________

Name:_________________________
Attorney-in-Fact

** Performance Bond not required on projects of $100,000 or less; only required on projects totaling > $100,000.

ITEMS BELOW APPLY TO AND BECOME A PART OF TERMS AND CONDITIONS OF BID
ANY EXCEPTIONS THERETO MUST BE IN WRITING

The following are the terms and conditions for Texas A&M AgriLife Research, Texas A&M AgriLife Extension Service, and Texas A&M Veterinary Medical Diagnostic Laboratory (TVMDL), hereafter referred to as the Agency.

---

1. BIDDING REQUIREMENTS

1.1 Bidders must comply with all rules, regulations and statutes relating to purchasing in the State of Texas in addition to the requirements of this form.

1.2 Pricing must be quoted on a "per unit" basis, extended as indicated. Any trade discounts included must be itemized and deducted from extended prices. Unit prices shall govern in the event of extension errors. Bidder guarantees product or service offered will meet or exceed specifications included as part of this Invitation for Bid (IFB). If a price quotation is submitted as part of the bid, the quotation must be referenced on the bid document and signed by the bidder to establish formal linkage to the bid.

1.3 Bids should be submitted on this form. Each bid that is mailed should be placed in a separate envelope completely and properly identified. Bidder should show opening date and bid invitation number on the fax coversheet, subject line of email, or the lower left hand corner of the sealed envelope. Please show return address of company. Bids must be received by the Agency on or before the hour and date specified for the bid opening.

1.4 When sending bids via the U.S. Postal Service, use the address on the front of this IFB. When using a delivery service or hand delivering, which requires a street address, address is Administrative Services Building, 578 John Kimbrough Blvd., Room #419, Texas A&M University, College Station, TX 77843-2147.

1.5 Late or unsigned bids will not be considered under any circumstances.

1.6 Bids should be quoted "F.O.B. destination, freight prepaid and allowed". If quoting freight otherwise, show exact delivery cost and who bears cost if not included in unit price.

1.7 Bid prices are requested to be firm for the Agency's acceptance within 30 days of the bid opening date. "Discount from list" bids are not acceptable unless requested. Cash discount will not be considered in determining an award. All cash discounts will be taken if earned.

1.8 Bids should give Vendor ID Number, full name and address of bidder. Failure to sign bid will disqualify it. Person signing bid should show title or authority to bind his or her firm in a contract. Firm name should appear on each page of a bid (after page 1, in the upper right hand corner). The Vendor ID Number is the taxpayer number assigned and used by the Comptroller of Public Accounts of Texas. Enter this number in the spaces provided on the front side (upper left) of the IFB. If this number is not known, complete the following: 1. Enter your Federal Employer Identification Number. 2. Sole owner should also enter Social Security Number.

1.9 Bid cannot be altered or amended after opening time. Any alterations made before opening time should be initialed by bidder or authorized agent of bidder. No bid can be withdrawn after opening time without approval by the Agency based on a written acceptable reason.

1.10 Purchases made for the Agency's use are exempt from the State Sales Tax and Federal Excise Tax. Do not include tax in bid. Excise Tax Exemption Certificate will be furnished by the Agency upon request.

1.11 The Agency reserves the right to make an award on the basis of low line item bid, low total of line items, or in any other combination that will serve the best interest of the Agency and to reject any and all bid items at the sole discretion of the Agency. The Agency also reserves the right to accept or reject all or any part of any bid, waive minor technicalities and award the bid to best serve the interests of the Agency. Any contract may also be extended up to three months at the sole discretion of the Agency.

1.12 Consistent and continued tie bidding could cause rejection of bids by the Agency and/or investigation for antitrust violations.

1.13 Check below if preference is claimed under Texas Administrative Code, Title 34, Part 1, Chapter 20, Subchapter C, Section §20.38:

- ☐ Goods produced or offered by a Texas bidder that is owned by a Texas resident service-disabled veteran
- ☐ Goods produced in Texas or offered by a Texas bidder that is not owned by a Texas resident service-disabled veteran
- ☐ Agricultural products grown in Texas
- ☐ Agricultural products offered by a Texas bidder
- ☐ Services offered by a Texas bidder that is owned by a Texas resident service-disabled veteran
- ☐ Services offered by a Texas bidder that is not owned by a Texas resident service disabled veteran
- ☐ Texas Vegetation Native to the Region
- ☐ USA produced supplies, materials or equipment
- ☐ Products of persons with mental or physical disabilities
- ☐ Products made of recycled, remanufactured, or environmentally sensitive materials including recycled steel
- ☐ Energy Efficient Products
- ☐ Rubberized asphalt paving material
- ☐ Recycled motor oil and lubricants
- ☐ Products produced at facilities located on formerly contaminated property
- ☐ Products and services from economically depressed or blighted areas
- ☐ Vendors that meet or exceed air quality standards
- ☐ Recycled or Reused Computer Equipment of Other Manufacturers
- ☐ Foods of Higher Nutritional Value

1.14 The telephone number for fax submission of bids is 979-458-1217. This is the only number that will be used for the receipt of bids. The Agency shall not be responsible for failure of electronic equipment or operator error. Late, illegible, incomplete, or otherwise non-responsive bids will not be considered.

1.15 Inquiries pertaining to IFBs must include the IFB number and opening date.

2. SPECIFICATIONS

2.1 Any catalog, brand name, or manufacturer's reference used in the IFB is descriptive only (not restrictive), and is used to indicate type and quality desired. Bids on brands of like nature and quality will be considered unless otherwise specified. If bidding other than specified, bid should show manufacturer, brand or trade name, and other description of the product offered. If brand(s) other than specified is offered, illustrations and complete description of product offered are requested to be made part of the bid. If bidder takes an exception to specifications or reference data in his or her bid, bidder will be required to furnish brand names, numbers, etc., as specified in the IFB.

2.2 All items shall be new and unused, in first class condition, including containers suitable for shipment and storage, unless otherwise indicated in IFB. Oral agreements to the contrary will not be recognized.

2.3 All electrical items must meet all applicable OSHA standards and regulations, and bear the appropriate listing from UL, FMRC or NEMA.

2.4 Samples, when requested, must be furnished free of expense to the Agency. If not destroyed in examination, they will be returned to the bidder, upon request, at bidder's expense. Each sample should be marked with bidder's name and address, and the Agency bid number. Do not enclose in or attach bid to sample.

2.5 The Agency will not be bound by any oral statement or representation contrary to the written specifications of this IFB.

2.6 Manufacturer's standard warranty shall apply unless otherwise stated in the IFB.

3. TIE BIDS

In case of tie bids, the award will be made in accordance with Rule §20.36 (b) (3) in Title 34 of the Texas Administrative Code.

4. DELIVERY

4.1 Bid should show number of days required to place material in receiving Agency's designated location under normal conditions. Failure to state delivery time obligates supplier to complete delivery in 14 calendar days. Unrealistically short or long delivery promises may cause bid to be disregarded.

4.2 If delay is foreseen, supplier shall give written notice to the Agency. Bidder must keep the Agency advised at all times of the status of the order. The Agency has the right to extend delivery date if reasons appear valid. If the vendor fails to deliver these supplies by the promised delivery date or a reasonable time thereafter, without giving acceptable reasons for delay, or if supplies are rejected for failure to meet specifications, the Agency reserves the right to purchase specified supplies elsewhere, and charge the full increase in price, cost of handling, and rebidding, if any, to the vendor.

4.3 No substitutions or cancellation permitted without written approval of the Agency.

4.4 Delivery shall be made during normal working hours only, unless prior approval for late delivery has been obtained from the Agency.

5. INSPECTIONS AND TESTS

All goods will be subject to inspection and test by the Agency to the extent practicable at all times and places. Authorized Agency personnel shall have access to any supplier's place of business for the purpose of inspecting merchandise. Tests shall be performed on samples submitted with the bid or on samples taken from regular shipment. In the event products tested fail to meet or exceed all conditions and requirements of the specifications, the cost of the sample used and the cost of the testing shall be borne by the bidder. Goods which have been delivered and rejected in whole or in part may, at the Agency's option, be returned to the bidder or held for disposition at bidder's risk and expense. Latent defects may result in revocation of acceptance.

6. AWARD OF CONTRACT

A response to an IFB is an offer to contract with the Agency based upon the terms, conditions, and specifications contained in the IFB. Bids do not become contracts until they are accepted and an authorized purchase order is issued. The contract shall be governed, construed, and interpreted under the laws of the State of Texas. The factors listed in Texas Education Code, Title 3, Chapter 51, Section 51.9335, shall also be considered in making an award when specified. Any legal actions must be filed in Brazos County, TX.

7. PAYMENT

Vendor shall submit one copy of an itemized invoice showing order number and Agency purchase order number. Please note: If the invoice is not addressed as instructed, payment will be delayed. The Agency will incur no penalty for late payment if payment is made in 30 or fewer days from receipt of goods or services and an uncontested invoice. All payments will be made in accordance with the Texas Prompt Payment Act, Texas Government Code, Chapter 2251.

8. PATENTS OR COPYRIGHTS

The bidder agrees to protect the Agency from claims involving infringement of patents or copyrights.

9. BIDDER ASSIGNMENTS

Bidder hereby assigns to the Agency any and all claims for overcharges associated with this contract which arise under the antitrust laws of the United States 15 U.S.C.A. Section 1, et seq. (1973), and which arise under the antitrust laws of the State of Texas, Texas Business and Commerce Code Ann. Sec. 15.01, et seq. (1967).

10. BIDDER AFFIRMATION

Signing this IFB with a false statement is a material breach of contract and shall void the submitted bid and any resulting contracts, and the bidder shall be removed from all bid lists. By signature hereon affixed, the bidder hereby certifies that:

10.1 The bidder has not given, offered to give, nor intends to give at any time hereafter any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor, or service to a public servant in connection with the submitted IFB.

10.2 The bidder is not currently delinquent in the payment of any franchise tax owed to the State of Texas.

10.3 Under §2155.004, Texas Government Code, the bidder certifies that the individual or business entity named in this bid or any contract resulting from this IFB is not ineligible to receive the specified contract and acknowledges that the contract may be terminated and payment withheld if this certification is inaccurate. §2155.004 prohibits a person or entity from receiving a state contract if they received compensation for participating in preparing the solicitation or specifications for the contract.

10.4 Pursuant to 15 U.S.C. §1, *et seq*. and Texas Business and Commerce Code §15.01, *et seq*. neither the bidder nor the firm, corporation, partnership, or institution represented by the bidder, or anyone acting for such a firm, corporation, or institution has violated the antitrust laws of this state, federal antitrust laws, nor communicated directly or indirectly the bid made to any competitor or any other person engaged in such line of business.

10.5 The bidder shall defend, indemnify, and hold harmless the Agency, all of its officers, agents, contractors, and employees from and against all claims, actions, suits, demands, proceedings costs, damages, and liabilities, from any acts or omissions of vendor or any agent, employee, subcontractor, or supplier of vendor in the execution or performance of any contract with vendor resulting from this IFB. Bidder shall coordinate its defense with Texas Attorney General as requested by the Texas A&M University System, Office of the General Counsel. This section is not intended to and shall not be construed to require bidder to indemnify or hold harmless the State or Agency for any claims or liabilities resulting from the negligent acts or omissions of the Agency or its employees.

10.6 Bidder agrees that any payments due under this contract will be applied towards any debt, including but not limited to, delinquent taxes and child support that is owed to the State of Texas.

10.7 In accordance with §2155.4441, Texas Government Code, bidder agrees that during the performance of a contract for services, it shall purchase products and materials produced in Texas when they are available at a price and time comparable to products and materials produced outside this state.

10.8 Pursuant to Section 2262.003 of the Texas Government Code, the State Auditor may conduct an audit or investigation of the vendor or any other entity or person receiving funds from the State directly under this contract or indirectly through a subcontract under this contract. The acceptance of funds by the vendor or any other entity or person directly under this contract or indirectly through a subcontract under this contract acts as acceptance of the authority of the State Auditor, under the direction of the Legislative Audit Committee, to conduct an audit or investigation in connection with those funds. Under the direction of the Legislative Audit Committee, the vendor or other entity that is the subject of an audit or investigation by the State Auditor must provide the State Auditor with access to any information the State Auditor considers relevant to the investigation or audit. Vendor will ensure that this clause concerning the authority to audit funds received indirectly by subcontractors through the vendor and the requirement to cooperate is included in any subcontract it awards.

10.9 Bidder certifies that they are in compliance with Section 669.003 of the Texas Government Code, relating to contracting with an executive head of a state agency. If Section 669.003 applies, bidder will complete the following information in order for the bid to be evaluated:

Name of Former Executive: ____

Name of State Agency: ____

Date of Separation from State Agency: ______________________________

Position with Bidder:____

Date of Employment with Bidder: __________________________________

10.10 Bidder certifies that the bidding entity and its principals are eligible to participate in this transaction and have not been subjected to suspension, debarment, or similar ineligibility determined by any federal, state, or local government entity. Bidder certifies that the bidding entity is in compliance with the State of Texas statutes and rules relating to procurement, and that bidder is not listed on the federal government's terrorism watch list as described in Executive Order 13224. Entities ineligible for federal procurement are listed at https://www.sam.gov

10.11 Bidder represents and warrants that payment to the bidder and the bidder's receipt of appropriated or other funds under any contract resulting from this IFB are not prohibited by §556.005 or §556.008, Texas Government Code, relating to the prohibition of using state funds for lobbying activities.

10.12 Sections 2155.006 and 2261.053, Texas Government Code, prohibit state agencies from awarding contracts to any person who, in the past five years, has been convicted of violating a federal law or assessed a penalty in connection with a contract involving relief for Hurricane Rita, Hurricane Katrina, or any other disaster, as defined by §418.004, Texas Government Code, occurring after September 24, 2005. Under §2155.006, Texas Government Code, bidder certifies that the individual or business entity named in its bid is not ineligible to receive a contract and acknowledges that any contract resulting from this IFB may be terminated and payment withheld if this certification is inaccurate.

10.13 Bidder represents and warrants ("EIR Accessibility Warranty") that the electronic and information resources and all associated information, documentation, and support that it offers to provide to the Agency under this bid (collectively, the "EIRs") comply with the applicable requirements set forth in Title 1, Chapter 213 of the Texas Administrative Code and Title 1, Chapter 206, Rule §206.70 of the Texas Administrative Code (as authorized by Chapter 2054, Subchapter M of the Texas Government Code.) To the extent vendor becomes aware that the EIRs, or any portion thereof, do not comply with the EIR Accessibility Warranty, then vendor represents and warrants that it will, at no cost to the Agency, either (1) perform all necessary remediation to make the EIRs satisfy the EIR Accessibility Warranty or (2) replace the EIRs with new EIRs that satisfy the EIR Accessibility Warranty. In the event that vendor is unable to do so, then the Agency may terminate this Agreement and vendor will refund to the Agency all amounts the Agency has paid under this purchase order within thirty (30) days after the termination date.

11. NOTE TO BIDDERS

If bidder takes any exceptions to any provisions of the IFB, these exceptions must be specifically and clearly identified by section in the bid and bidder's proposed alternative must also be provided in the bid. Bidders cannot take a 'blanket exception' to the entire IFB. If any bidder takes a 'blanket exception' to the entire IFB or does not provide proposed alternative language, the bid may be disqualified from further consideration.

12. TEXAS PUBLIC INFORMATION ACT

12.1 The bidder acknowledges that the Agency is obligated to strictly comply with the Public Information Act, Chapter 552, Texas Government Code, in responding to any request for public information pertaining to any resulting Agreement, as well as any other disclosure of information required by applicable Texas law.

12.2 Upon the Agency's written request, the bidder will provide specified public information exchanged or created under any resulting Agreement that is not otherwise excepted from disclosure under Chapter 552, Texas Government Code, to the Agency in a non-proprietary format acceptable to the Agency. As used in this provision, "public information" has the meaning assigned Section 552.002, Texas Government Code, but only includes information to which the Agency has a right of access.

12.3 The bidder acknowledges that the Agency is required to post a copy of any fully executed Agreement on its Internet website in compliance with Section 2261.253(a)(1), Texas Government Code.

13. TEXAS FAMILY CODE SECTION 231.006

Pursuant to §231.006(d), Texas Family Code, regarding child support, the bidder certifies that the individual or business entity named in this bid is not ineligible to receive the specified payment and acknowledges that the contract may be terminated and payment may be withheld if this certification is inaccurate. Furthermore, any bidder subject to §231.006, Texas Government Code, must include names and Social Security numbers of each person with at least 25% ownership of the business entity submitting the bid. This information must be provided prior to award. Enter the Name & Social Security Numbers for each person below:

Name:	Social Security Number:
Name:	Social Security Number:
Name:	Social Security Number:

14. PROTEST PROCEDURES

Any actual or prospective bidder who is aggrieved in connection with this IFB, evaluation, or award of any contract resulting from this IFB may formally protest as provided in the Agency's rules at http://agrilifeas.tamu.edu/library/pdf/purchasing/vendor-protests.pdf.

15. NON-APPROPRIATION OF FUNDS

Any contract resulting from this IFB is subject to termination or cancellation, without penalty to the Agency, either in whole or in part, subject to the availability of federal or state funds. The Agency is a state agency whose authority and appropriations are subject to actions of the Texas Legislature. If the Agency becomes subject to a legislative change, revocation of statutory authority, or lack of appropriated funds which would render the Agency's or bidder's delivery or performance under the contract impossible or unnecessary, the contract will be terminated or cancelled and be deemed null and void. Additionally, any federally funded purchases may also be terminated for the same reasons. In the event of a termination or cancellation under this Section, the Agency will not be liable to bidder for any damages, which are caused or associated with such termination, or cancellation, and the Agency will not be required to give prior notice.

16. FORCE MAJEURE

Neither bidder nor Agency shall be liable to the other for any delay in, or failure of performance, of any requirement included in any contract resulting from this IFB caused by Force Majeure. The existence of such causes of delay or failure shall extend the period of performance until after the causes of delay or failure have been removed provided the non-performing party exercises all reasonable due diligence to perform. Force Majeure is defined as acts of God, war, fires, explosions, hurricanes, floods, failure of transportation, or other causes that are beyond the reasonable control of either party and, that by exercise of due foresight, such party could not reasonably have been expected to avoid, and which, by the exercise of all reasonable due diligence, such party is unable to overcome. Each party must inform the other in writing, with proof of receipt, within three (3) business days of the existence of such Force Majeure, or otherwise waive this right as a defense.

17. CONFLICT OF INTEREST

An Agency employee may not have an interest in, or in any manner be connected with, a contract or bid for a purchase of goods or services by an agency of the State; or in any manner, including by rebate or gift, accept or receive from a person to whom a contract may be awarded, directly or indirectly, anything of value or a promise, obligation, or contract for future reward or compensation. Entities who are interested in seeking business opportunities with the Agency must be mindful of these restrictions when interacting with public purchasers of the Agency.

18. INDEPENDENT CONTRACTOR

Bidder or bidder's employees, representatives, agents and any subcontractors shall serve as an independent contractor in providing the services under any contract resulting from this IFB. Bidder and bidder's employees, representatives, agents and any subcontractors shall not be employees of the Agency. Should bidder subcontract any of the services required in this IFB, bidder expressly understands and acknowledges that in entering into such subcontract(s), the Agency is in no manner liable to any subcontractor(s) of bidder. In no event shall this provision relieve bidder of the responsibility for ensuring that the services rendered under all subcontracts are rendered in compliance with this IFB.

19. DISPUTE RESOLUTION

The dispute resolution process provided for in Chapter 2260 of the Texas Government Code shall be used as further described herein, by the Agency, and the bidder to attempt to resolve any claim for breach of contract made by vendor:

19.1 Bidder's claim for breach of this contract, that the parties cannot resolve in the ordinary course of business, shall be submitted to the negotiation process provided in Chapter 2260, Subchapter B, of the Texas Government Code. To initiate the process, bidder shall submit written notice, as required by Subchapter B, to:

Dr. David Lunt, Texas A&M AgriLife Research

Dr. Robert Whitson, Texas A&M AgriLife Extension Service

Dr. Amy Swinford, Texas A&M Veterinary Medical Diagnostic Laboratory (TVMDL)

Said notice shall also be given to all other representatives of the Agency and bidder otherwise entitled to notice under the parties' contract. Compliance by bidder with Subchapter B is a condition precedent to the filing of a contested case proceeding under Chapter 2260, Subchapter C, of the Texas Government Code.

19.2 The contested case process provided in Chapter 2260, Subchapter C, of the Texas Government Code is the bidder's sole and exclusive process for seeking a remedy for any and all alleged breaches of contract by the Agency if the parties are unable to resolve their disputes under subparagraph (a.) of this paragraph.

19.3 Compliance with the contested case process provided in Subchapter C is a condition precedent to seeking consent to sue from the Legislature under Chapter 107 of the Civil Practices and Remedies Code. Neither the execution of this contract by the Agency, nor any conduct of any representative of the Agency thereafter, shall be considered a waiver of sovereign immunity to suit.

(1) The submission, processing, and resolution of bidder's claim is governed by the published rules as adopted by the Office of the Attorney General of the State of Texas pursuant to Chapter 2260 as currently effective, hereafter enacted or subsequently amended.

(2) Neither the occurrence of an event nor the pendency of a claim constitutes grounds for the suspension of the performance by the bidder, in whole or in part.

(3) The designated individual responsible on behalf of the Agency for examining any claim or counterclaim and conducting any negotiations related thereto, as required under Section 2260.052 of the Texas Government Code shall be Dr. David Lunt (Research) / Dr. Robert Whitson (Extension) / Dr. Amy Swinford (TVMDL).

20. EXPORT CONTROL

Bidder agrees to comply with all applicable US Export Control laws and regulations to include the Export Administration Regulations (EAR), the International Traffic in Arms (ITAR) and any other applicable US export laws and regulations. As a research member of the Texas A&M University System, the Agency typically does not take receipt of export controlled goods, technical data, services or technology ("materials") except as may be specifically agreed to by the Agency. Bidder agrees that it will not provide or make accessible to the Agency any export controlled materials without first informing the Agency of the export controlled nature of the materials and obtaining from the Agency, its written consent to accept such materials as well as any specific instructions for delivering controlled materials to the Agency. Bidder agrees to obtain government approval or export license if required from the appropriate US government agency and to share that information with the Agency prior to delivery of such materials.

Bidder shall provide the Agency with applicable export control classification number (ECCN) or category (EAR or ITAR) for item(s), and/or indicate whether the item(s) to be purchased are export controlled.

ECCN or ITAR Category:____