Project Manual

for

Camp – East – Electrical Upgrade
(East Campus 13.2kV Switchgear Replacement)

Client Project # CP00124516
Stanley Project # 23143.01.00

University of Colorado at Boulder
Boulder, Colorado

Issued for Construction
October 13, 2010
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#### PROJECT
Camp-East-Electrical Upgrade / East Campus 13.2kV Switchgear Replacement

#### CLIENT:
University of Colorado at Boulder

#### LOCATION:
Boulder, Colorado

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ADVERTISEMENT FOR BIDS
State of Colorado
University of Colorado
Notice Number: 10-29

Project No: CP 124516
Project Title: CAMP - EAST -Electrical Upgrade
Estimated Construction Cost: $3,000,000.00
ARRA Funding?: No

Settlement Notices
For all projects with a total dollar value above $50,000 Notice of Final Settlement is required by C.R.S. 38-26-107.
Final Settlement, if required, will be advertised via: Newspaper

Project Description
East Campus 13.2kV Switchgear Replacement for the University of Colorado at Boulder. To download a full project description: http://www.colorado.edu/facilitiesmanagement/pdc/construction/open.html

Project Information
1. The Principal Representative has determined that the entire project shall be substantially complete within 210 calendar days from the date of the Notice to Proceed, and the project shall be finally complete, including the delivery of any or all guarantees and warranties, the submittal of sales and use tax payment forms, the completion of the final punch list and the calling for final inspection, within 30 calendar days, if applicable, from the date of substantial completion. In accordance with Article 46 of the General Conditions of the Contract, Time of Completion and Liquidated Damages, failure to complete the work within the agreed number of calendar days shall be considered breach of contract and subject the bidder to liquidated damages to the extent specified in Article 54D of the General Conditions of the Contract.

2. The right is reserved to waive informalities or irregularities and to reject any and all Bids.

3. Bidders may procure Bidding Documents from: http://www.colorado.edu/facilitiesmanagement/pdc/construction/open.html
There will not be a charge for contract documents downloaded from the website.

4. Each Bid shall be submitted on the required Bid Form and must be accompanied by a Bid Bond on State Buildings Programs Bid Bond Form Sc-6.14 in an amount not less than 5% of the total Bid. The Bid Bond may also be (1) a cashier's check or (2) a certified check made payable to the Treasurer of the State of Colorado in an amount not less than 5% of the total Bid. The Bid Bond is submitted as a guaranty that the Bid will be maintained in full force and effect for a period of thirty (30) days after the opening of the Bids for the project.

5. The Bidder promises, in submitting his Bid, that if issued a Notice of Award, he will, within the prescribed time, execute the required Agreement, furnish the required Performance Bond, Labor and Material Payment Bond, Insurance Policy and Certificates of Insurance, or forfeit his Bid Guaranty as Liquidated Damages.

6. Preference shall be given to Colorado resident bidders and for Colorado labor, as provided by law.

7. Contractor's Registration Requirement deleted as of 11/2/09.
Pre-Bid Meeting

A mandatory Pre-Bid Meeting will be held 10/26/2010 10:00 AM at Department of Facilities Management, Research Laboratory No. 2, 1540 30th Street, Room 321, Boulder, CO 80309

Sealed Bids will be received from qualified contractors until this date and time at this location:

Date & Time: 11/08/2010 02:00 PM

Address: Department of Facilities Management
Research Laboratory No. 2
1540 30th Street, Third Floor
Boulder, CO 80309-0453

Point of Contact

Name: Andy Jordan, Project Manager
Agency: University of Colorado at Boulder
Phone: 303-735-5410
Fax: 303-492-4082
Email: robert.a.jordan@colorado.edu

This Notice is also available on the web at www.colorado.gov/dpa/dfp/sbrep

Media of Publication: The Daily Journal
Publication Date: 10/21/10
1. **BID FORM:** Bidders are required to use the Bid form attached to the bidding documents. Each bidder is required to bid on all alternates and indicate the time to substantial completion in calendar days, and if applicable because designated in the Advertisement For Bids, the bidder is required to indicate the period of time agreed to finally complete the project after the date of substantial completion, also in calendar days. Bids indicating times for substantial completion or final acceptance in excess of the number of days indicated in the Advertisement for Bids may be found non-responsive and may be rejected. The bid shall not be modified or conditioned in any manner. Bids shall be submitted in sealed envelopes bearing the address and information shown below. If a bid is submitted by mail, this aforementioned sealed envelope should be enclosed in an outer envelope and sent to the following addressee:

**INSERT NAME OF AGENCY AND ADDRESS WHERE BID SHOULD BE DELIVERED**

The outside of the sealed inner envelope should bear the following information:

- **Project #**   CP 124516
- **Project Name**   CAMP – EAST – Electrical Upgrade
- **Name and Address of Bidder**   ____________________________________
- **Date of Opening**   November 8, 2010
- **Time of Opening**   2:00 PM

A bid with missing or inconsistent information may be considered non-responsive and may not be evaluated. The University will be the sole judge in determining the acceptability of an offer. The University also reserves the right to reject any or all bids in part or in whole and to waive technicalities. Any decision shall be considered final.

2. **INCONSISTENCIES AND OMISSIONS:** Bidders may request clarification of any seeming inconsistencies, or matters seeming to require explanation, in the bidding documents at least three (3) business days prior to the time set for the opening of Bids. Decisions of major importance on such matters will be issued in the form of addendum.

3. **APPLICABLE LAWS AND REGULATIONS:** The bidder’s attention is called to the fact that all work under this Contract shall comply with the provisions of all state and local laws, approved state building codes, ordinances and regulations which might in any manner affect the work to be done or those to be employed in or about the work. Attention is also called to the fact that the use of labor for work shall be governed by the provisions of Colorado law which are hereinafter set forth in Articles 27 and 52E of the GENERAL CONDITIONS.

4. Note that the Special Provisions of the General Conditions of the Contract includes the following language: **UNAUTHORIZED IMMIGRANTS – PUBLIC CONTRACTS FOR SERVICES - CRS 8-17.5-101 and 24-76.5-101.** The Contractor certifies that the Contractor shall comply with the provisions of CRS 8-17.5-101 et seq. The Contractor shall not knowingly employ or contract with an illegal alien to perform work under this contract or enter into a contract with a subcontractor that fails to certify to the Contractor that the subcontractor shall not knowingly employ or contract with an illegal alien to perform work under this contract. The Contractor represents, warrants, and agrees that it (i) has verified that it does not employ any illegal aliens, through participation in the Basic Pilot Employment Verification Program administered by the Social Security Administration and Department of Homeland Security, and (ii) otherwise will comply with the requirements of CRS 8-17.5-102(2)(b). The Contractor shall comply with all reasonable requests made in the course of an investigation under CRS 8-17.5-102 by the Colorado Department of Labor and
Employment. If the Contractor fails to comply with any requirement of this provision or CRS 8-17.5-101 et seq., the State may terminate this contract for breach and the Contractor shall be liable for actual and consequential damages to the State.

A Contractor that operates as a sole proprietor hereby swears or affirms under penalty of perjury that the Contractor (i) is a citizen of the United States or otherwise lawfully present in the United States pursuant to federal law, (ii) shall comply with the provisions of CRS 24-76.5-101 et seq, and (iii) shall produce one of the forms of identification required by CRS 24-76.5-103 prior to the effective date of this Contract. Except where exempted by federal law and except as provided in CRS 24-76.5-103(3), a Contractor that receives federal or state funds under this contract must confirm that any individual natural person eighteen years of age or older is lawfully present in the United States pursuant to CRS 24-76.5-103(4) if such individual applies for public benefits provided under this contract.

5. **TAXES:** The bidder's attention is called to the fact that the Bid submitted shall exclude all applicable federal excise or manufacturers' taxes and all state sales and use taxes as hereinafter set forth in Article 9C of the GENERAL CONDITIONS.

6. **OR EQUAL:** The words “OR EQUAL” are applicable to all specifications and drawings relating to materials or equipment specified. Any material or equipment that will fully perform the duties specified, will be considered “equal”, provided the bid submits proof that such material or equipment is of equivalent substance and function and is approved, in writing. Requests for the approval of "or equal" shall be made in writing at least five (5) business days prior to bid opening. During the bidding period, all approvals shall be issued by the Architect/Engineer in the form of addenda at least two (2) business days prior to the bid opening date.

7. **ADDENDA:** Owner/architect initiated addenda shall not be issued later than two (2) business days prior to bid opening date. All addenda shall become part of the Contract Documents and receipt must be acknowledged on the Bid form.

8. **METHOD OF AWARD - LOWEST RESPONSIBLE BIDDER:** If the bidding documents for this project require alternate prices, additive and/or deductible alternates shall be listed on the alternates bid form provided by the Principal Representative. Bidders should note the Method of Award is applicable to this Bid as stated below.

   A. **DEDUCTIBLE ALTERNATES:** The lowest responsible Bid, taking into account the Colorado resident bidder preference provision of Colorado law, will be determined by and the contract will be awarded on the base bid combined with deductible alternates, deducted in numerical order in which they are listed in the alternates bid form provided by the Principal Representative. The subtraction of alternates shall result in a sum total within available funds. If this bid exceeds such amount, the right is reserved to reject all bids. An equal number of alternates shall be subtracted from the base bid of each bidder within funds available for purposes of determining the lowest responsible bidder.

   B. **ADDITIVE ALTERNATES:** The lowest responsible Bid, taking into account the Colorado resident bidder preference provision of Colorado law, will be determined by and the contract will be awarded on the base bid plus all additive alternates added in the numerical order in which they are listed in the alternates bid form provided by the Principal Representative. The addition of alternates shall result in a sum total within available funds. If this bid exceeds such amount, the right is reserved to reject all bids. An equal number of alternates shall be added to the base bid of each bidder within funds available for purposes of determining the lowest responsible bidder.

   C. **DEDUCTIBLE AND ADDITIVE ALTERNATES:** Additive alternates will not be used if deductible alternates are used and deductible alternates will not be used if additive alternates are used.

The Advertisement for Bids can be located at the web site: [www.colorado.gov/dpa/dfp/sbrep/constructdesign.htm](http://www.colorado.gov/dpa/dfp/sbrep/constructdesign.htm) (Click on the link below the second paragraph Colorado Construction and Design Notices)
9. CONTRACTOR QUALIFICATIONS:

A. Prime Contractors:
   a. Prime Contractors bidding this project must complete “University of Colorado (UCB) Contractor Statement of Experience,” and submit it with their Bid.
   b. The Prime Contractor must meet the following minimum requirements and provide written information substantiating their qualifications for evaluation. A Bidder may be found to be non-responsive and their bid rejected if the minimum requirements are not met.

   (1) The Prime Contractor must have successfully completed three (3) projects of $2,000,000.00 (or larger) in the last five (5) years which were similar in complexity and type to this project. For each project list:

   - Name and location of project, along with a brief description of the project (include size & function).
   - Name, address and phone number of client/ owner and their representative.
   - Contract value and type of contract (prime or subcontract).
   - Year in which work was completed.

   (2) The Contractor must have successfully completed an aggregate of $8,000,000.00 of projects in the last five (5) years which were similar in complexity and type on which he acted as the prime contractor (may be the same projects listed in item (1), if applicable).

   (3) The firm must have been in business as a Contractor for the last five (5) years.

B. Subcontractors
   a. The Prime Contractor is required to provide subcontractors which meet minimum qualifications for the trades listed below. The right is reserved to reject subcontractors that do not meet the minimum requirements. The Prime Contractor will be required to replace rejected subcontractor(s) with one(s) that meet the minimum requirements with no increase in the Bid Amount prior to the Award of Contract.

   Prime Contractor and Subcontractor(s) are advised that there are conditions within the Contract Documents requiring special knowledge and experience to properly execute. The University will require verification of experience to adequately provide materials and perform labor required for the following:

   (1) Electrical
   (2) Mechanical

   b. For the trades listed (subcontractors) above, the apparent low bidder must submit, within 72 hours of receipt of bids except for holidays and weekends, the “University of Colorado Contractor’s Statement of Experience.

   c. In addition to the information requested in Item (1), the Subcontractor must meet the following minimum requirements and provide written information substantiating their qualifications for evaluation. A Bidder may be found to be non-responsive and their bid rejected if the minimum requirements are not met.

      (1) The firm must have been in business for the last five (5) years as trade proposed for this work.

      (2) The firm must have successfully completed at least two (2) projects of similar size, type, and complexity in the last five (5) years. The information must include the following:

         (a) Building type description (function use)
         (b) Building gross square footage
         (c) Subcontract description (be specific)
         (d) Subcontract amount
(e) Subcontract change orders
(f) Building owner representative and current telephone number
(g) Building architect name and current telephone number
(h) General contract name and current telephone number

(3) This firm shall give evidence of being able to be bonded up to the value of his work for this project. A letter shall be provided by the bonding agency assuring capability of bonding this subcontract amount.

10. **SITE ACCESS:** Contractors / Bidders may schedule a time subsequent to the Site Inspection / Pre-bid Conference to take measurements or further observe existing conditions by contacting:

Andy Jordan, Project Manager
University of Colorado at Boulder
Department of Facilities Management
303-735-5410 / email: robert.a.jordan@colorado.edu

11. **BID SCHEDULE:**
Publication date: 10/21/10
Plans specification available: 10/25/10
Mandatory pre-bid conference: 10/26/10 2:00 PM
Last day for questions: 10/29/10 4:00 PM
Last day for addenda issue: 11/01/10 4:00 PM
Bid date: 11/08/10 2:00 PM

END
City of Boulder
Sales/Use Tax Division
303-441-3050

CONTRACTORS WORKING ON NON-CITY PERMITTED PROJECTS

To all Contractors working within the City of Boulder:

Under Boulder’s Revised Code, the contractor is deemed to be the consumer of materials used in the construction project. Contractors may not avoid payment of the City of Boulder sales or use tax by placing provisions in a construction agreement or by using the name of a tax-exempt entity on an invoice or purchase order, regardless that the contractor is indicated thereon as the agent of a tax-exempt entity. **No exemption certificate issued by the Colorado Department of Revenue or any other taxing authority shall be recognized as a basis for exemption from sales or use taxes.**

Estimated use tax must be remitted to the City of Boulder prior to the start of the project. The tax is computed on the full contract price of the project. Follow these steps to compute and remit the sales/use tax to the City:

1. Multiply the full contract price by 0.5 and then multiply the resulting product by the tax rate of 3.41% (0.0341). This is the tax that is due to the City prior to the start of the project.
2. Remit the tax to the Sales Tax Department at 1777 Broadway, P.O. Box 791, Boulder, CO 80306-0791 along with a copy of this completed form.
3. At the completion of the project the construction company has two options for closing out the project with the city.
   - Use the formula in (1.) above to compute the final tax due based on the final contract price (including all change orders). Remit the additional tax due or file a request for refund with the City; or
   - Request that the city perform a full audit. Contact Ed Kaiser at 303-441-3921 or kaisere@bouldercolorado.gov to inform the City of which option you have chosen.

Contractor Name: __________________________________________
Address: ________________________________________________
Phone #: ___________________________ Contact Person: _______
Project Name: __________________________
Project Address: ________________________________________

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Full Contract price</td>
</tr>
<tr>
<td>B.</td>
<td>Multiply ‘A’ by 0.5</td>
</tr>
<tr>
<td>C.</td>
<td>Multiply ‘B’ by 0.0341</td>
</tr>
</tbody>
</table>

“C” is the amount of tax due to the City of Boulder. If you have any questions regarding sales/use tax or this process, contact Ed Kaiser at the above phone number or address.

Date received: __________________________ City Authority Signature: __________________________

1777 BROADWAY P.O. BOX 791 BOULDER, CO 80306 303/441-3921
University of Colorado at Boulder

CONTRACTOR’S
STATEMENT OF EXPERIENCE

Project Name:  CAMP – EAST – Electrical Upgrade

Project No.  CP 124516

Project Manager:  Andy Jordan
Email:  robert.a.jordan@colorado.edu

Architect/Engineer:  Stanley Consultants, Inc.
Email:  OggGerald@stanleygroup.com

Phone:  303-925-8314 Office

This is a project specific qualification form. Contractor must fill this out on each project.
INDEX OF DOCUMENTS

• INFORMATION FORM Page 3
• TYPES OF WORK Page 4
• IDENTIFICATION FORM Page 5
• PERSONNEL OF ORGANIZATION FORM Page 7
• PROJECT EXPERIENCE FORM Page 8
• WORK CURRENTLY UNDER CONTRACT FORM Page 9
• SURETIES FORM Page 10
• CORPORATION / CO-PARTNERSHIP FORM Page 11
• AFFIDAVIT FOR CORPORATION Page 12
• AFFIDAVIT FOR CO-PARTNERSHIP Page 13
• AFFIDAVIT FOR INDIVIDUAL Page 14
• BIDDING INFORMATION Page 15
UNIVERSITY OF COLORADO AT BOULDER
CONTRACTOR’S QUALIFICATION STATEMENT

INFORMATION FORM

STATEMENT OF ________________________________

(Contractor)

ADDRESS ______________________________________

(Street or PO Box) (City) (State) (Zip)

TELEPHONE/FAX NO. __________________________

(telephone) (fax)

DATE OF EXPERIENCE STATEMENT ____________________________

PRINCIPLE OWNER/OFFICER ________________________________

(Names(s) and Official Title(s))

Please indicate below if your company qualifies as one of the following:

Minority Business Enterprise (MBE) YES ___ NO ___

Justification: ____________________________________________

_______________________________________________________

______________________

Woman-Owned Business Enterprise (WBE) YES ___ NO ___

Justification: ____________________________________________

_______________________________________________________

______________________

Small Business Enterprise (SBE) YES ___ NO ___

Justification: ____________________________________________

_______________________________________________________

______________________

Disadvantaged Business Enterprise (DBE) YES ___ NO ___

Justification: ____________________________________________

_______________________________________________________

______________________
UNIVERSITY OF COLORADO AT BOULDER
CONTRACTOR’S QUALIFICATION STATEMENT

TYPES OF WORK

(1) If you are a General Contractor interested in bidding on all types of construction, mark “All Classes of Construction” only.
(2) If you are interested in contracting directly with the University for certain types of work only, mark in the column provided after the particular types of work on which you wish to bid.

<table>
<thead>
<tr>
<th>TYPES OF WORK</th>
<th>MARK WITH (X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. All Classes of Construction</td>
<td></td>
</tr>
<tr>
<td>2. General</td>
<td></td>
</tr>
<tr>
<td>3. Mechanical</td>
<td></td>
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<tr>
<td>4. Electrical</td>
<td></td>
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<tr>
<td>5. Excavating and Grading</td>
<td></td>
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<tr>
<td>6. Concrete</td>
<td></td>
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<tr>
<td>7. Structural Steel</td>
<td></td>
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<tr>
<td>8. Steel and Miscellaneous Iron</td>
<td></td>
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<tr>
<td>9. Painting and Decorating</td>
<td></td>
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<tr>
<td>10. Laboratory Equipment</td>
<td></td>
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<tr>
<td>11. Elevator Installation</td>
<td></td>
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<tr>
<td>12. Plumbing</td>
<td></td>
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<tr>
<td>13. Heating and Ventilating</td>
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<tr>
<td>14. Air Conditioning</td>
<td></td>
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<tr>
<td>15. Boiler and Equipment</td>
<td></td>
</tr>
<tr>
<td>16. Environmental (Describe)</td>
<td></td>
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<tr>
<td>17. Other (Describe)</td>
<td></td>
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<tr>
<td>18. Other (Describe)</td>
<td></td>
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<tr>
<td>19. Other (Describe)</td>
<td></td>
</tr>
<tr>
<td>20. Other (Describe)</td>
<td></td>
</tr>
</tbody>
</table>
UNIVERSITY OF COLORADO AT BOULDER
CONTRACTOR’S QUALIFICATION STATEMENT

IDENTIFICATION
(The signatory of this questionnaire guarantees the truth and accuracy of all statements and of all answers to questions hereinafter made.)

LEGAL NAME ____________________________________________________________

PRINCIPAL OFFICE
(Street or PO Box) (City) (State) (Zip)

_____ A Corporation _____ A Copartnership _____ An Individual _____ Combination

GENERAL INFORMATION
A. Are you licensed as a contractor? Yes ( ) No ( )

Licensed in Location License No.
the name of (City or State) & Type

__________________________________________________________

B. How many years has your organization been in business as a contractor under your present business name? ____________________________

C. How many years experience in ____________________________ construction work has your organization had? ____________________________ (Type)

(a) As a prime contractor? ____________________ (b) As a subcontractor?

D. Have you or your organization, or any officer or partner thereof, failed to complete a contract? ________________
If so, give details ____________________________________________________________

E. If you have a controlling interest in any firms presently qualified with the University, show names thereof:

__________________________________________________________

F. We normally perform ________ % of the work with our own forces.

List trades: ____________________________________________________________

Where qualification is based on a combination of several organizations, show the experience and equipment of the combined organizations.
G. Has your firm been involved in any litigation in the past five (5) years? Yes ( ) No ( )
If yes, explain (listing type, kind, plaintiff, defendant, etc. and state the current status).

H. Are there any activities or interests of officers, principle stockholders, or employees of your firm or other factors which would place your firm and the University of Colorado at Boulder in a position of “Conflict of Interests”?

Yes ( ) No ( ) If yes, or in doubt, explain.

I. Has your firm ever been involved in any bankruptcy action as a bankrupt?

Yes ( ) No ( ) If yes, explain.
UNIVERSITY OF COLORADO AT BOULDER
CONTRACTOR’S QUALIFICATION STATEMENT

PERSONNEL OF ORGANIZATION

1. Name the persons with whom you have been associated in business as partners or business associates in each of the last five (5) years.

_______________________________________________________________________________________________________________________________________

_______________________________________________________________________________________________________________________________________

_______________________________________________________________________________________________________________________________________

2. Show the construction experience of the principal individuals of your present organization in the following tabulation:

<table>
<thead>
<tr>
<th>Individual’s Name</th>
<th>Present Position or Office in Your Organization</th>
<th>Years of Construction Experience</th>
<th>Magnitudes and Type of Work</th>
<th>In What Capacity</th>
</tr>
</thead>
</table>
UNIVERSITY OF COLORADO AT BOULDER
CONTRACTOR’S QUALIFICATION STATEMENT

PROJECT EXPERIENCE

Show the projects your organization has completed during the last five years in the following tabulation:

<table>
<thead>
<tr>
<th>Year Completed</th>
<th>Project</th>
<th>Type of Work (See Page 2)</th>
<th>Location</th>
<th>Contract Value</th>
<th>Contracting Authority</th>
<th>In what Capacity</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
### WORK CURRENTLY UNDER CONTRACT

<table>
<thead>
<tr>
<th>Expected Completion Date</th>
<th>Project</th>
<th>Type of Work (See Page 1)</th>
<th>Location</th>
<th>Contract Value</th>
<th>Contracting Authority</th>
<th>Architect or Engineer</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>
SURETIES

List the Surety Companies that have bonded your work for the past five (5) years:

<table>
<thead>
<tr>
<th>Name of Surety and Name and Address of Agent</th>
<th>Project and Location</th>
<th>Period of Bond From</th>
<th>Period of Bond To</th>
<th>General Comments</th>
</tr>
</thead>
</table>
CORPORATION / CO-PARTNERSHIP

CORPORATION:
(If a corporation, answer this:)

When Incorporated

In What State

President’s Name

Vice President’s Name

Secretary’s Name

Treasurer’s Name

CO-PARTNERSHIP:
(If a co-partnership, answer this:)

Date of Organization

State whether partnership is general, limited, or association

Name and address of each partner:

(name)        (name)

(address)       (address)

WHERE QUALIFICATION IS BASED ON A COMBINATION OF ORGANIZATIONS, THE APPROPRIATE (ATTACHED) AFFIDAVITS MUST BE EXECUTED FOR EACH MEMBER OF SUCH COMBINATION.
UNIVERSITY OF COLORADO AT BOULDER
CONTRACTOR’S QUALIFICATION STATEMENT

AFFIDAVIT FOR CORPORATION

________________________________________ certifies and says: That he is
(Name of officer)

________________________________________ of the ______________________________________
(Official capacity)

corporation submitting this statement of experience: that he/she has read the same, and
that the same is true of his/her own knowledge: that the statement is for the purpose of
inducing the University of Colorado to supply the submittor with plans and specifications,
and that any vendor, or other agency therein named is hereby authorized to supply the
University of Colorado with any information necessary to verify the statement: and that
furthermore, should this statement at any time cease to properly and truly represent
his/her condition in any substantial respect, it will refrain from further bidding on
University work until it shall have submitted a revised and corrected statement.

I certify and declare under penalty of perjury that the foregoing is true and correct:

Subscribed on ___________ at __________, __________, State of ________________
(date) (city) (county)

NOTE: Use full corporate name and
attach corporate seal here. ____________________________________
(Officer must sign here)

NOTE: Statement will be returned unless affidavit is completed in EVERY respect.
AFFIDAVIT FOR CO-PARTNERSHIP

_____________________________ certifies and says: That he/she is a partner of (Name of partner)

the partnership of _____________________: That said partnership (Name of Firm)

submitted this statement of experience: that he/she has read the same, and that the same is true of his/her own knowledge: that the statement is for the purpose of inducing the University of Colorado to supply the submitter with plans and specifications, and that any vendor, or other agency therein named is hereby authorized to supply the University of Colorado with any information necessary to verify the statement: and that furthermore, should this statement at any time cease to properly and truly represent the condition of said firm in any substantial respect, it will refrain from further bidding on University work until they shall have submitted a revised and corrected statement.

I certify and declare under penalty of perjury that the foregoing is true and correct:

Subscribed on __________ at __________, __________, State of ________________
(date) (city) (county)

The foregoing statement and affidavit are hereby offered.

_____________________________ (Member of Firm must sign here)

_____________________________ (Title)

_____________________________ (Remaining members of Firm sign here) (Name of Firm)

NOTE: Statement will be returned unless affidavit is completed in EVERY respect.
UNIVERSITY OF COLORADO AT BOULDER
CONTRACTOR’S QUALIFICATION STATEMENT

AFFIDAVIT FOR INDIVIDUAL

doing business

(Name of individual) (Name of Firm)
certifies and says: That he/she is the person submitting this statement of experience:
that he/she has read the same, and that the same is true of his/her own knowledge: that
the statement is for the purpose of inducing the University of Colorado to supply the
submittor with plans and specifications, and that any vendor, or other agency therein
named is hereby authorized to supply the University of Colorado with any information
necessary to verify the statement: and that furthermore, should this statement at any
time cease to properly and truly represent his/her condition in any substantial respect, it
will refrain from further bidding on University work until it shall have submitted a revised
and corrected statement.

I certify and declare under penalty of perjury that the foregoing is true and correct:

Subscribed on at , State of
(date) (city) (county)

NOTE: Statement will be returned unless affidavit is completed in EVERY respect. (Applicant must sign here)
QUALIFICATION

The University of Colorado will qualify or disqualify a Contractor on the basis of:

(1) The information contained in this statement and
(2) Past contract experience with the University.

NOTIFICATION

The University of Colorado will, in writing, notify Contractors of their qualification or disqualification.

END
STATE OF COLORADO
OFFICE OF THE STATE ARCHITECT
STATE BUILDINGS PROGRAMS

BID

Institution/Agency: University of Colorado at Boulder
Project No./Name: CP 124516 / CAMP – EAST – Electrical Upgrade

Bidder Acknowledges Receipt of Addenda No.s:

| Base Bid |
|------------------|------|
| (Refer to Bid Alternate Form SC-6.13.1 Attached, If Applicable) | $ |

Bidder’s Time of Completion

| a. Time Period from Notice to Proceed to Substantial Completion: | 210 calendar days |
| b. Time Period from Substantial completion to Final Acceptance: | 30 calendar days |
| c. Time of Completion of Entire Project (a + b): | 240 calendar days |

1. **BID:** Pursuant to the advertisement by the State of Colorado dated 10/19/10 the undersigned bidder hereby proposes to furnish all the labor and materials and to perform all the work required for the complete and prompt execution of everything described or shown in or reasonably implied from the Bidding Documents, including the Drawings and Specifications, for the work and for the base bid indicated above. Bidders should include all taxes that are applicable.

2. **EXAMINATION OF DOCUMENTS AND SITE:** The bidder has carefully examined the Bidding Documents, including the Drawings and Specifications, and has examined the site of the work, so as to make certain of the conditions at the site and to gain a clear understanding of the work to be done.

3. **PARTIES INTERESTED IN BID:** The bidder hereby certifies that the only persons or parties interested in this Bid are those named herein, and that no other bidder or prospective bidder has given any information concerning this Bid.

4. **BID GUARANTEE:** This Bid is accompanied by the required Bid Guarantee. You are authorized to hold said Bid Guarantee for a period of not more than thirty (30) days after the opening of the Bids for the work above indicated, unless the undersigned bidder is awarded the Contract, within said period, in which event the Director, State Buildings and Real Estate Programs, may retain said Bid Guarantee, until the undersigned bidder has executed the required Agreement and furnished the required Performance Bond, Labor and Material Payment Bond, Insurance Policy and Certificates of Insurance.

5. **TIME OF COMPLETION:** The bidder agrees to achieve substantial completion of the entire project within the number of calendar days entered above, and if applicable, further agrees that the period between the date of substantial completion and the date of final acceptance of the entire project will not exceed the number of calendar days noted above. If awarded this work, the bidder agrees to begin work within ten (10) days from the date of the Notice to Proceed subject to Article 46, Time of Completion and Liquidated Damages of The General Conditions of the Contract, and agrees to prosecute the work with due diligence to completion. The bidder represents that Article 54D has been reviewed to determine the type and amount of any liquidated damages that may be specified for this contract.
6. **EXECUTION OF DOCUMENTS:** The bidder understands that if this Bid is accepted, he must execute the required Agreement and furnish the required Performance Bond, Labor and Material Payment Bond, Insurance Policy and Certificates of Insurance within ten (10) days from the date of the Notice of Award, and that the bidder will be required to sign to acknowledge and accept the Contract Documents, including the Drawings and Specifications.

7. **ALTERNATES:** Refer to the Information for Bidders (SC-6.12) for Method of Award for Alternates and use State Form SBO-6.13.1 Bid Alternates form to be submitted with this bid form if alternates are requested by the institution/agency in the solicitation documents.

Submit wage rates (direct labor costs) for prime contractor and subcontractor as requested by the institution/agency in the solicitation documents.

The right is reserved to waive informalities and to reject any and all Bids.

Dated this _______ Day of _____________________ , 2010.

(Corporate Seal)

THE BIDDER:

Company Name

Address (including city, state and zip)

Phone number:

Signature

Name (Print) and Title

Print Email address:

SIGNATURES: If the Bid is being submitted by a Corporation, the Bid should be signed by an officer, i.e., President or Vice-President. The signature of the officer shall be attested to by the Secretary and properly sealed. If a sole proprietorship or a partnership is submitting the Bid, the Bid shall so indicate and be properly signed.
<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Conductor - 15kV; linear foot (LF): Unit price includes all costs and pulling a three phase feeder through an underground electrical ductbank, and miscellaneous associated work required to furnish and install 15kV conductor of each type, material, and sizes listed.</td>
<td>$</td>
</tr>
<tr>
<td>2. Underground electrical conduit – Six individual 6” Conduits buried 3'-0&quot; below finished grade to the top of the ductbank; linear foot (LF): Unit price includes all costs for excavation, trenching, shoring, conduit, spacers, fittings, concrete, backfilling, compacting, and miscellaneous associated work required to furnish and install the ductbank.</td>
<td>$</td>
</tr>
<tr>
<td>3. Concrete; cubic yard (CY): Unit price includes labor, equipment, materials, tests, placing, forming, finishing, curing, installation of embedded items, and incidental work necessary for concrete construction. Unit price does not include reinforcing steel.</td>
<td>$</td>
</tr>
<tr>
<td>4. Reinforcing Bar or Welded Wire Fabric; pound (Lb): Unit price includes all work in connection with furnishing and installing. Pounds of reinforcing bar defined as theoretical weights of various sizes and lengths of bars shown on fabricator’s Shop Drawings.</td>
<td>$</td>
</tr>
<tr>
<td>5. Electrical Contractor Labor; hourly (Hr): Unit price includes hourly labor rates for all supervisor, journeyman, and apprentice.</td>
<td>$</td>
</tr>
<tr>
<td>6. General Contractor Lab; hourly (Hr): Unit price includes hourly labor rates for all supervisor, journeyman, and apprentice.</td>
<td>$</td>
</tr>
</tbody>
</table>
STATE OF COLORADO
OFFICE OF THE STATE ARCHITECT
STATE BUILDINGS PROGRAMS

BID BOND

Institution/Agency:  University of Colorado at Boulder
Project No./Name:  CP 124516 / CAMP – EAST – Electrical Upgrade

KNOW ALL MEN BY THESE PRESENTS:

WHEREAS, ________________________________, hereinafter called the “PRINCIPAL”, is submitting a PROPOSAL for the above described project, to the STATE OF COLORADO, hereinafter called the “OBLIGEE”.

WHEREAS, the Advertisement for Bids has required as a condition of receiving the Proposals that the Principal submit with the PROPOSAL GUARANTY in an amount not less than five per cent (5%) of the Proposal, which sum it is specifically agreed is to be forfeited as Liquidated Damages in the event that the Principal defaults in his obligation as hereinafter specified, and, in pursuance of which Requirement, this Bid is made, executed and delivered.

NOW THEREFORE, the Principal and ________________________________, a corporation of the State of ________________________________, duly authorized to transact business in Colorado, as Surety, are held and firmly bound unto the Obligee, in the sum of five per cent (5%) of the Principal’s total bid price, lawful money of the United States for the payment of which sum, well and truly to be made to the Obligee, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

FURTHER THAT, a condition of the obligation that the Principal shall maintain his Proposal in full force and effect for thirty (30) days after the opening of the proposals for the project, or, if the Principal’s Proposal is accepted, the Principal shall, within the prescribed time, execute the required Agreement, furnish the required Performance Bond, Labor and Material Payment Bond, Insurance Policy, and Certificates of Insurance, then this obligation shall be null and void, otherwise it shall remain in full force and effect, and subject to forfeiture upon demand as Liquidated Damages.

IN WITNESS WHEREOF said Principal and Surety have executed this Bond, this ______ day of __________, A.D., 2010.

(Corporate Seal)

THE PRINCIPAL

Company Name

Address (including city, state and zip)

Phone number:

Signature

Name (Print) and Title

SIGNATURES

If the “Principal” is doing business as a Corporation, the Bid Bond shall be signed by an officer, i.e., President or Vice President. The signature of the officer shall be attested to by the Secretary and properly sealed.

If the “Principal” is an individual or a partnership, the Bid Bond shall so indicate and be properly signed.

(Corporate Seal)

THE SURETY

By

Attorney-in-Fact

Secretary

ATTEN

Address (including city, state and zip)

Phone number:

Signature

Name (Print) and Title

THIS BOND MUST BE ACCOMPANIED BY POWER OF ATTORNEY, EFFECTIVELY DATED. FAILURE TO PROVIDE A PROPERLY EXECUTED BID BOND WITH A PROPERLY EXECUTED POWER OF ATTORNEY WILL RESULT IN THE BIDDER’S PROPOSAL BEING DEEMED NON-RESPONSIVE.
NOTICE OF AWARD

TO:

The State of Colorado, represented by the undersigned, has considered the Proposals submitted for the above described work.

Your Proposal, deemed to be in the best interest of the State of Colorado, in the amount of ***Hundred Thousand and no/100 Dollars ($ .00*) is hereby accepted, pending final execution of the Agreement.

Base Bid $ .00
Total Contract Amount $ .00*

You are required to execute the approved Agreement and to furnish the Performance Bond, Labor and Material Payment Bond, Insurance Policy and Certificates of Insurance within ten (10) days from the date of this Notice.

If you fail to execute said Agreement and to furnish said Performance Bond, Labor and Material Payment Bond, Insurance Policy and Certificates of Insurance within ten (10) days from the date of this Notice, the State Controller will be entitled to retain the amount of the Proposal Guaranty submitted with your Proposal as Liquidated Damages. In this event, the right is reserved to consider all of your rights arising out of the acceptance of your Proposal as abandoned and to award the work covered by your Proposal to another, or to re-advertise the work, or otherwise dispose thereof.

By [Signature]

Paul M. Leef, AIA, LEED™ AP / Date
Campus Architect
Director, Planning, Design & Construction
State Buildings Programs
(of Authorized Delegate)

By [Signature]

Ronald L. Ried, Director / Date
Facilities Management Business Services
Principal Representative
(Institution or Agency)

When completely executed, this form is to be sent by certified mail to the Contractor by the Principal Representative or by any other means to which the parties agree.
STATE OF COLORADO
OFFICE OF THE STATE ARCHITECT
STATE BUILDINGS PROGRAMS

University of Colorado at Boulder

CONTRACTOR'S AGREEMENT
DESIGN/BID/BUILD
(STATE FORM SC-6.21)

CONTRACT ID NUMBER:

AGENCY IDENTIFICATION NUMBER:

PROJECT NUMBER: CP 124516

PROJECT NAME: EAST – Electrical Upgrade

PROJECT MANAGER: Andy Jordan

CONTRACTOR:

November 2010
STATE OF COLORADO  
CONTRACTOR'S AGREEMENT DESIGN/BID/BUILD  
(STATE FORM SC-6.21) 

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<tr>
<td>ARTICLE 5. Contract Sum</td>
<td>1</td>
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Attachment – Notice of Award  

Exhibits:  
- A Contractor's Bid (Form SC-6.13)  
- B Performance Bond (Form SC-6.22)  
- C Labor and Material Payment Bond (Form SC-6.221)  
- D Insurance Certificates  
- E Certification and Affidavit Regarding Unauthorized Immigrants (required at contract signing prior to commencing work)  
- F—Contract Management Information (Construction Contractor)
STATE OF COLORADO
CONTRACTOR'S AGREEMENT DESIGN/BID/BUILD
(STATE FORM SC-6.21)

Agency I.D. No.: ___________________ Contract ID No.: ___________________ Project No. CP 124516

CAMP – EAST – Electrical Upgrade

1. PARTIES. THIS AGREEMENT is entered into by and between the STATE OF COLORADO, acting by and through the Regents of the University of Colorado, a body corporate, hereinafter referred to as the Principal Representative, and ______________________ having its offices at ______________________ hereinafter referred to as the Contractor.

2. EFFECTIVE DATE AND NOTICE OF NONLIABILITY. This Agreement shall not be effective or enforceable until it is approved and signed by the State Controller or its designee (hereinafter called the "Effective Date"), but shall be effective and enforceable thereafter in accordance with its provisions. The State shall not be liable to pay or reimburse Contractor for any performance hereunder or be bound by any provision hereof prior to the Effective Date.

WHEREAS, the Principal Representative intends to repair/replace East Campus 13.2kV switchgear, Hereinafter called the Project; and

WHEREAS, authority exists in Law and Funds have been budgeted, appropriated, and otherwise made available, and a sufficient unencumbered balance thereof remains available for payment in Fund Number / Account Number CP 124516, Contract Encumbrance Number TBD, and

WHEREAS, this is a phase one waived contract, waiver number 156 Contractors Agreement for Capital Construction Form SC6.21.

WITNESSETH, that the State of Colorado and the Contractor agree as follows:

ARTICLE 1. PERFORMANCE OF THE WORK
The Contractor shall perform all of the Work required for the complete and prompt execution of everything described or shown in, or reasonably implied from the Contract Documents for the above referenced Project. The Contractor agrees to perform the Work to the highest industry standards and to the satisfaction of the State of Colorado and its Architect/Engineer in strict accordance with the provisions of the Contract Documents.

The Contractor agrees to Substantially Complete the Project within 210 calendar days from the date of the Notice to Proceed, in addition, the Contractor agrees to finally complete the Project from Substantial Completion to Final Acceptance within 30 calendar days for a total time of completion of the entire Project of 240 calendar days. The Contractor shall perform the Work with due diligence to completion.

Timely completion of the Project is an essential condition of this Agreement. The Contractor shall be subject to any liquidated damages described in Article 54D of The General Conditions of the Construction Contract SC-6.23 for failure to satisfactorily complete the Work within the time periods in Article 3 above.

ARTICLE 2. PROVISIONS OF THE CONTRACT DOCUMENTS
The Contractor agrees to perform the Work to the highest industry standards and to the satisfaction of the State of Colorado and its Architect/Engineer in strict accordance with the provisions of the Contract Documents.

ARTICLE 3. TIME OF COMPLETION
The Contractor agrees to Substantially Complete the Project within 210 calendar days from the date of the Notice to Proceed, in addition, the Contractor agrees to finally complete the Project from Substantial Completion to Final Acceptance within 30 calendar days for a total time of completion of the entire Project of 240 calendar days. The Contractor shall perform the Work with due diligence to completion.

ARTICLE 4. ESSENTIAL CONDITION
Timely completion of the Project is an essential condition of this Agreement. The Contractor shall be subject to any liquidated damages described in Article 54D of The General Conditions of the Construction Contract SC-6.23 for failure to satisfactorily complete the Work within the time periods in Article 3 above.

Rev. 7/2010 Page 1 of 10 CP 124516 / CAMP – EAST – Electrical Upgrade
ARTICLE 5. CONTRACT SUM
The Contractor shall be paid for the performance of this Agreement, subject to any additions and deductions as provided for in Articles 32, 34 and 35 of The General Conditions of the Construction Contract SC-6.23, the sum of Hundred and Thousand, Hundred and no/100 Dollars* ($ *)

| Base Bid | $ |
| Total Contract Amount | $ |

ARTICLE 6. CONTRACT DOCUMENTS
The Contract Documents, as enumerated in Article 1 of The General Conditions of the Construction Contract Sc-6.23, are all essential parts of this Agreement and are fully incorporated herein.

ARTICLE 7. SAFETY and SECURITY - Contractor understands that concern for the safety and well-being of University students and staff is of particular importance to the University. Contractor expressly acknowledges that it is Contractor’s duty to take reasonable precautions to protect the University’s students and staff. The extent of such precautions will depend on the particular circumstances of the work to be performed. However, to the extent that work to be performed involves security-sensitive functions or security-sensitive areas (e.g. unsupervised access to minors or work involving access to security-sensitive data), such precautions may include, but are not limited to, conducting criminal history checks on employees or agents assigned to such work at the University.”
SIGNATURE APPROVALS:

THE PARTIES HERETO HAVE EXECUTED THIS CONTRACT

*Persons signing for Contractor hereby swear and affirm that they are authorized to act on Contractor’s behalf and acknowledge that the State is relying on their representations to that effect. Principal is not a recognized title and will not be accepted

Project Name/Number: CP 124516 / CAMP – EAST – Electrical Upgrade

THE CONTRACTOR

STATE OF COLORADO, acting by and through:
The Regents of the University of Colorado
A Body Corporate

By: Ronald. R. Ried, Director
Facilities Management Business Services

Date: ____________________________

*Signature

By ______________________________
Name (print) ____________________ Title ______________________________

DATE: ____________________________

APPROVED

DEPARTMENT OF PERSONNEL & ADMINISTRATION
STATE BUILDINGS PROGRAMS
State Architect (or authorized Delegate)

By: Paul M. Leef, AIA, LEED TM AP
Campus Architect / Director, Planning, Design & Construction

Date: ____________________________

ALL CONTRACTS MUST BE APPROVED BY THE STATE CONTROLLER:

CRS §24-30-202 requires the State Controller to approve all State Contracts. This Contract is not valid until signed and dated below by the State Controller or delegate. Contractor is not authorized to begin performance until such time. If Contractor begins performing prior thereto, the State of Colorado is not obligated to pay Contractor for such performance or for any goods and/or services provided hereunder.

APPROVED:

STATE OF COLORADO
STATE CONTROLLER’S OFFICE State Controller (or authorized delegate)

By: ______________________________
Steve McNally, Associate Vice Chancellor & Controller

Date: ____________________________

APPROVED:

DEPARTMENT OF LAW
ATTORNEY GENERAL (or authorized delegate)

By: ______________________________

Date: ____________________________

Rev. 7/2010
SC-6.21

CP 121944 / W 322760 – CINC – Replace Built-up Roof
STATE OF COLORADO
CONTRACTOR'S AGREEMENT DESIGN/BID/BUILD
(STATE FORM SC-6.21)

EXHIBIT A – CP 124516 / CAMP – EAST – Electrical Upgrade

CONTRACTOR'S BID (Form SBP-6.13)
STATE OF COLORADO
CONTRACTOR'S AGREEMENT DESIGN/BID/BUILD
(STATE FORM SC-6.21)

EXHIBIT C – CP 124516 / CAMP – EAST – Electrical Upgrade

LABOR AND MATERIAL PAYMENT BOND (Form SC-6.221)
STATE OF COLORADO
CONTRACTOR'S AGREEMENT DESIGN/BID/BUILD
(STATE FORM SC-6.21)

EXHIBIT D – CP 124516 / CAMP – EAST – Electrical Upgrade

INSURANCE CERTIFICATE(S) (attached)
STATE OF COLORADO
CONTRACTOR'S AGREEMENT DESIGN/BID/BUILD
(STATE FORM SC-6.21)

EXHIBIT E – CP 124516 / CAMP – EAST – Electrical Upgrade

Certification and Affidavit Regarding Unauthorized Immigrants (required at contract signing prior to commencing work) (UI-1, attached)
STATE OF COLORADO
OFFICE OF THE STATE ARCHITECT
STATE BUILDINGS PROGRAMS

PERFORMANCE BOND

Institution/Agency: University of Colorado at Boulder
Project No./Name: CP 124516 / CAMP – EAST – Electrical Upgrade

BONDING COMPANY: DO NOT MAKE ANY CHANGES TO THE LANGUAGE IN THIS BOND.

KNOW ALL PERSONS BY THESE PRESENTS:

That the Contractor

as Principal and hereinafter called “Principal,”

and

as Surety and hereinafter called “Surety,” a corporation organized and existing under the laws of ___________, are held and firmly bound unto the STATE OF COLORADO acting by and through the Regents of the University of Colorado, a body corporate, hereinafter called the “Principal Representative”, in the sum of ____________________________ Dollars ($__________________________)

for the payment whereof the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly, by these presents.

WHEREAS, the Principal and the State of Colorado acting by and through the Principal Representative have entered into a certain Contract, hereinafter called “Contract,” dated ______________________, 2010, for the construction of a PROJECT described as CAMP – EAST – Electrical Upgrade

which Contract is hereby by reference made a part hereof;
NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION, is such that, if the Principal shall promptly, fully and faithfully perform all the undertakings, covenants, terms, conditions and agreements of said Contract during the original term of said Contract any extensions thereof that may be granted by the Principal Representative with or without notice to the Surety, and during the life of any guaranty required under the Contract, and shall also well and truly perform and fulfill all undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modifications to the Surety being hereby waived, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

AND THE SAID SURETY, for value received hereby stipulates and agrees that whenever the Principal shall be, and declared by the Principal Representative to be in default under said Contract, the State of Colorado having performed its obligations thereunder, the Surety may promptly remedy the default or shall promptly (1) Complete the Contract in accordance with its terms and conditions, or (2) Obtain a bid or bids for submittal to the Principal Representative for completing the Contract in accordance with its terms and conditions, and upon determination by the Principal Representative and Surety of the lowest responsible bidder, arrange for a contract between such bidder and the State of Colorado acting by and through the Principal Representative and make available as work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion, less the balance of the contract price but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount herebefore set forth. The term “balance of the contract price” as herein used shall mean the total amount payable to the Principal under the Contract and any amendments thereto, less the amount properly paid by the State of Colorado to the Contractor.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the State of Colorado.

IN WITNESS WHEREOF said Principal and Surety have executed this Bond, this ______ day of ___________________, A.D. 2010.

(Corporate Seal)  
THE PRINCIPAL

ATTEST:

By: ___________________________  
Title: ___________________________

Secretary  
(Corporate Seal)  
SURETY

By: ___________________________  
Attorney-in-fact

THIS BOND MUST BE ACCOMPANYED BY POWER OF ATTORNEY, EFFECTIVELY DATED

Note: This bond is issued simultaneously with another bond conditioned for the full and faithful payment for all labor and material of the contract.
LABOR AND MATERIAL BOND

Institution/Agency: University of Colorado at Boulder
Project No./Name: CP 124516 / CAMP – EAST – Electrical Upgrade

BONDING COMPANY: DO NOT MAKE ANY CHANGES TO THE LANGUAGE IN THIS BOND.

KNOW ALL PERSONS BY THESE PRESENTS:

That the Contractor

as Principal and hereinafter called "Principal,"

and

as Surety and hereinafter called "Surety," a corporation organized and existing under the laws of ___________ are held and firmly bound unto the STATE OF COLORADO acting by and through the Regents of the University of Colorado at Boulder, a body corporate, hereinafter called "Principal Representative," and to all subcontractors and any others who have supplied or furnished or shall supply or furnish materials, rental machinery, tools, or equipment actually used in the performance of the hereinafter identified Contract, or who have performed or shall perform labor in the performance of or in connection with said Contract, hereinafter called "Obligees" in the sum of ___________ Dollars ($__________)

together with interest at the rate of eight per cent (8%) per annum on all payments becoming due in accordance with said Contract, from the time such payments shall become due until such payment shall be made, for the payment of which, well and truly made to the Obligees, the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly, by these presents.

WHEREAS, the Principal and the State of Colorado acting by and through the Principal Representative have entered into a certain Contract, hereinafter called "Contract," dated ______________, 2010 for the construction of a PROJECT described as CAMP – EAST – Electrical Upgrade

which Contract is hereby by reference made a part hereof;
NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Principal and the Surety shall fully indemnify and save harmless the State of Colorado and the Principal Representative from and against any and all costs and damages, including patent infringements, which either may suffer by reason of any failure or failures of the Principal promptly and faithfully to perform all terms and conditions of said Contract and shall fully reimburse and repay the State of Colorado and the Principal Representative all outlay and expense which the State of Colorado and the Principal Representative may incur in making good any such failure or failures, and further, if the Principal and his subcontractors shall duly and promptly pay for any and all labor, materials, team hire, sustenance, provisions, provender, rental machinery, tools, or equipment and other supplies which have been or shall be used or consumed by said Principal or his subcontractors in the performance of the work of said Contract, and it said Principal shall duly and promptly pay all his subcontractors the sums due them for any and all materials, rental machinery, tools, or equipment and labor that have been or shall be furnished, supplied, performed or used in connection with performance of said Contract, and shall also fully indemnify and save harmless the State of Colorado and the Principal Representative to the extent of any and all expenditures which either or both of them may be required to make by reason of any failures or defaults by the Principal or any subcontractor in connection with such payments; then this obligation shall be null and void, otherwise it shall remain in full force and effect.

It is expressly understood and agreed that any alterations which may be made in the terms of said Contract or in the work to be done under said Contract, or any extension(s) of time for the performance of the Contract, or any forebearance on the part of either the State of Colorado or the Principal to any of the others, shall not in any way release the Principal and the Surety, or either of them, their heirs, executors, administrators, successors or assigns from their liability hereunder, notice to the Surety of any such alteration, extension or forbearance being hereby waived.

IN WITNESS WHEREOF, the Principal and the Surety have executed this Bond, this _________ day of ________, A.D., 2010.

(Corporate Seal)

THE PRINCIPAL

_________________________

BY:

Title:

SURETY

_________________________

By: _______________________

Attorney-in-fact

THIS BOND MUST BE ACCOMPANIED BY POWER OF ATTORNEY, EFFECTIVELY DATED

Note: This bond is issued simultaneously with another bond conditioned for the full and faithful performance of the contract.
STATE OF COLORADO
OFFICE OF THE STATE ARCHITECT
STATE BUILDINGS PROGRAMS

THE GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT
DESIGN/BID/BUILD
(STATE FORM SC-6.23)

Project Name: CAMP – EAST – Electrical Upgrade
Project No: CP 124516
Project Manager: Andy Jordan
Date October 2010
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Note: The sections of the General Conditions indicated in italics (Articles 35 General and 35A, 35B, 37, 38, 46,
48B, 49 and 50) are regulatory and cannot be modified except through appropriate rule making procedures
through the Division of Finance and Procurement, Department of Personnel & Administration.
ARTICLE 1. DEFINITIONS

A. CONTRACT DOCUMENTS

The Contract Documents consist of the following some of which are procedural documents used in the administration and performance of the Agreement:

1. Agreement; (SC-6.21);
2. Performance Bond (SC-6.22) and Labor and Material Payment Bond (SC-6.221);
3. General Conditions of the Construction Contract (SC- 6.23) and if applicable, Supplementary General Conditions;
4. Detailed Specification Requirements, including all addenda issued prior to the opening of the bids; and,
5. Drawings, including all addenda issued prior to the opening of the bids.
6. Change Orders (SC-6.31) and Amendments (SC-6.0), if any, when properly executed.
7. Authorization to Bid (SBP-6.10)
8. Information for Bidders (SBP-6.12);
9. Bid (SBP-6.13);
10. Bid Bond (SBP-6.14);
11. Notice of Award (SBP-6.15);
12. Builder’s risk insurance certificates of insurance (ACORD 25-S);
13. Liability and workers’ compensation certificates of insurance;
14. Notice to Proceed (Design/Bid/Build) (SBP-6.26);
15. Notice of Approval of Occupancy/Use (SBP-01);
16. Notice of Partial Substantial Completion (SBP-071);
17. Notice of Substantial Completion (SBP-07);
18. Notice of Partial Final Acceptance (SC-6.27);
19. Notice of Final Acceptance (SBP-6.271);
20. Notice of Partial Contractor's Settlement (SC-7.3);
21. Notice of Contractor's Settlement (SBP-7.31);
22. Application and Certificate for Contractor’s Payment (SBP-7.2);
23. Other procedural and reporting documents or forms referred to in the General Conditions, the Supplementary General Conditions, the Specifications or required by the State Buildings Programs or the Principal Representative, including but not necessarily limited to Pre-Acceptance Check List (SBP-05) and the Building Inspection Record (SBP-BIR). A list of the current standard State Buildings Programs forms applicable to this Contract may be obtained from the Principal Representative on request.

B. DEFINITIONS OF WORDS AND TERMS USED

1. AGREEMENT. The term “Agreement” shall mean the written agreement entered into by the State of Colorado acting by and through the Principal Representative and the Contractor for the
2. performance of the Work and payment therefore, on State Form SC-6.21. The term Agreement when used without reference to State Form SC-6.21 may also refer to the entirety of the parties’ agreement to perform the Work described in the Contract Documents or reasonably inferable there from. The term “Contract” shall be interchangeable with this latter meaning of the term Agreement

3. ARCHITECT/ENGINEER. The term “Architect/Engineer” shall mean either the architect of record or the engineer of record under contract to the State of Colorado for the Project identified in the Contract Documents.

4. OCCUPANCY. The term “Occupancy” means occupancy taken by the State as Owner after the Date of Substantial Completion at a time when a building or other discrete physical portion of the Project is used for the purpose intended. The Date of Occupancy shall be the date of such first use, but shall not be prior to the date of execution of the Notice of Approval of Occupancy/Use. Prior to the date of execution of a Notice of Approval of Occupancy/Use, the state shall have no right to occupy and the project may not be considered safe for occupancy for the intended use.

5. CHANGE ORDER. The term “Change Order” means a written order, signed by a Procurement Officer, directing the Contractor to make changes in the Work, in accordance with Article 35A, The Value of Changed Work.

6. COLORADO LABOR. The term “Colorado labor” shall be defined, as provided in § 8-17-101, C.R.S., as any person who is a resident of the state of Colorado, at the time of employment, without discrimination as to race, color, creed, sex, age, or religion except when sex or age is a bona fide occupational qualification, or shall have such other meaning as the term may otherwise be given in § 8-17-101, C.R.S., as amended.

7. CONTRACTOR. The word “Contractor” shall mean the person, company, firm, corporation or other legal entity entering into a contract with the State of Colorado acting by and through the Principal Representative

8. DAYS. The term “days” whether singular or plural shall mean calendar days unless expressly stated otherwise. Where the term “business days” is used it shall mean business days of the State of Colorado.

9. DRAWINGS. The term “Drawings” shall mean all drawings approved by appropriate State officials which have been prepared by the Architect/Engineer showing the work to be done, except that where a list of drawings is specifically enumerated in the Supplementary General Conditions or division 1 of the Specifications, the term shall mean the drawings so enumerated, including all addenda drawings.

10. EMERGENCY FIELD CHANGE ORDER. The term “Emergency Field Change Order” shall mean a written change order for extra work or a change in the work necessitated by an emergency as defined in Article 35C executed on State form SC 6.31 and identified as an Emergency Field Change Order. The use of such orders is limited to emergencies and to the amounts shown in Article 35C.

11. FINAL ACCEPTANCE. The terms “final acceptance” or “finally complete” mean the stage in the progress of the work, after substantial completion, when all remaining items of work have been completed, all requirements of the Contract Documents are satisfied and the Notice of Acceptance can be issued. Discrete physical portions of the Project may be separately and partially deemed finally complete at the discretion of the Principal Representative when that portion of the Project reaches such stage of completion and a partial Notice of Acceptance can be issued.

12. NOTICE. The term “Notice” shall mean any communication in writing from either contracting party to the other by such means of delivery that receipt cannot properly be denied. Notice shall be provided to the person identified to receive it in Article 54E, Notice Identification, or to such other person as either party identifies in writing to receive Notice. Notice by facsimile transmission where proper transmission is evidence shall be adequate where facsimile numbers are included in Article 54E. Notwithstanding an email delivery or return receipt, email Notice shall not be adequate. Acknowledgment of receipt of a voice message shall not be deemed to waive the requirement that Notice, where required, shall be in writing.
13. OWNER. The term “Owner” shall mean the Principal Representative.

14. PRINCIPAL REPRESENTATIVE. The term “Principal Representative” shall be defined, as provided in § 24-30-1301(11), C.R.S., as the governing board of a state department, institution, or agency; or if there is no governing board, then the executive head of a state department, institution, or agency, as designated by the governor or the general assembly and as specifically identified in the Contract Documents, or shall have such other meaning as the term may otherwise be given in § 24-30-1301(11), C.R.S., as amended. The Principal Representative may delegate authority. The Contractor shall have the right to inquire regarding the delegated authority of any of the Principal Representative’s representatives on the project and shall be provided with a response in writing when requested.

15. PROCUREMENT OFFICER. The term “Procurement Officer” means any person duly authorized to enter into and administer contracts and make written determinations with respect thereto. “Procurement Officer” includes an authorized representative of the Principal Representative acting within the limits of his or her authority.

16. PRODUCT DATA. The term “Product Data” shall mean all submittals in the form of printed manufacturer’s literature, manufacturer’s specifications, and catalog cuts.

17. REASONABLY INFERABLE: The phrase “reasonably inferable” means that if an item or system is either shown or specified, all material and equipment normally furnished with such items or systems and needed to make a complete installation shall be provided whether mentioned or not, omitting only such parts as are specifically excepted, and shall include only components which the Contractor could reasonably anticipate based on his or her skill and knowledge using an objective, industry standard, not a subjective standard. This term takes into consideration the normal understanding that not every detail is to be given on the Drawings and Specifications. The phrase shall not, however, be construed to make the Contractor, rather than the Architect/Engineer, responsible for producing the Drawings and Specifications.

18. SAMPLES. The term “Samples” shall mean examples of materials or work provided to establish the standard by which the Work will be judged.

19. SC. The term “SC” means “State Contract” which is used in connection with labeling applicable State form documents (e.g. “SC 6.23” is the State form number for these General Conditions of the Contract).

20. SBP. The term “SBP” means “State Buildings”, which is used in connection with labeling applicable State form documents (e.g., “SBP-01” is the form number for Notice of Approval of Occupancy/Use).

21. SHOP DRAWINGS. The term “Shop Drawings” shall mean any and all detailed drawings prepared and submitted by Contractor, Subcontractor at any tier, vendors or manufacturers providing the products and equipment specified on the Drawings or called for in the Specifications.

22. SPECIFICATIONS. The term “Specifications” shall mean the requirements of divisions 1 through 17 of the project manual prepared by the Architect/Engineer describing the work to be accomplished.

23. STATE BUILDINGS PROGRAMS. The term “State Buildings Programs” is the shortened name of the division of State Buildings Programs. It shall refer to the division of the executive department of State government responsible for project administration, review, approval and coordination of plans, construction procurement policy, contractual procedures, and code compliance and inspection of all buildings, public works and improvements erected for state purposes; except public roads and highways and projects under the supervision of the division of wildlife and the division of parks and outdoor recreation as provided in § 24-30-1301, et seq, C.R.S. The term State Buildings Programs shall also mean that individual within a State Department agency or institution, including institutions of higher education, who has signed an agreement accepting delegation to perform all or part of the responsibilities and functions of State Buildings Programs.

24. SUBMITTALS. The term “submittals” means drawings, lists, tables, documents and samples prepared by the Contractor to facilitate the progress of the work as required by these General Conditions or the Drawings and Specifications. They consist of Shop Drawings, Product Data, Samples, and various administrative support documents including but not limited to lists of subcontractors, construction progress schedules, schedules of values, applications for
payment, inspection and test results, requests for information, various document logs, and as-
built drawings. Submittals are required by the Contract Documents, but except to the extent
expressly specified otherwise are not themselves a part of the Contract Documents.

25. SUBSTANTIAL COMPLETION. The terms “substantial completion” or “substantially complete
” mean the stage in the progress of the work when the construction is sufficiently complete, in
accordance with the Contract Documents as modified by any Change Orders, so that the Work,
or at the discretion of the Principal Representative, any designated portion thereof, is available
for its intended use by the Principal Representative and a Notice of Substantial Completion can
be issued. Portions of the Project may, at the discretion of the Principal Representative, be
designated as substantially complete.

26. SURETY. The term “Surety” shall mean the company providing the labor and material
payment and performance bonds for the Contractor as obligor.

27. WORK. The term “Work” shall mean all or part of the labor, materials, equipment, and other
services required by the Contract Documents or otherwise required to be provided by the
Contractor to meet the Contractor’s obligations under the Contract.

ARTICLE 2. EXECUTION, CORRELATION, INTENT OF DOCUMENTS, COMMUNICATION AND
COOPERATION

A. EXECUTION
The Contractor, within ten (10) days from the date of Notice of Award, will be required to:
1. Execute the Agreement, State Form SC-6.21;
2. Furnish fully executed Performance and Labor and Material Payment Bonds on State Form s
SC-6.22 and SC-6.221; and
3. Furnish certificates of insurance evidencing all required insurance on standard Acord forms
designed for such purpose.
4. Furnish certified copies of any insurance policies requested by the Principal Representative.

B. CORRELATION
By execution of the Agreement the Contractor represents that the Contractor has visited the site, has
become familiar with local conditions and local requirements under which the Work is to be performed,
including the building code programs of the State Buildings Program as implemented by the Principal
Representative, and has correlated personal observations with the requirements of the Contract
Documents.

C. INTENT OF DOCUMENTS
The Contract Documents are complementary, and what is called for by any one document shall be as
binding as if called for by all. The intention of the documents is to include all labor, materials,
equipment and transportation necessary for the proper execution of the Work. Words describing
materials or work which have a well-known technical or trade meaning shall be held to refer to such
recognized standards.

In any event, if any error exists, or appears to exist, in the requirements of the Drawings or
Specifications, or if any disagreement exists as to such requirements, the Contractor shall have the
same explained or adjusted by the Architect/Engineer before proceeding with the work in question. In
the event of the Contractor’s failure to give prior written Notice of any such errors or disagreements of
which the Contractor or the Subcontractors at any tier are aware, the Contractor shall, at no additional
cost to the Principal Representative, make good any damage to, or defect in, work which is caused by
such omission.

Where a conflict occurs between or within standards, Specifications or Drawings, which is not resolved
by reference to the precedence between the Contract Documents, the more stringent or higher quality
requirements shall apply so long as such more stringent or higher quality requirements are reasonably
inferable. The Architect/Engineer shall decide which requirements will provide the best installation.
With the exception noted in the following paragraph, the precedence of the Contract Documents is in
the following sequence:
1. The Agreement (SC-6.21);
2. The Supplementary General Conditions, if any;
3. The General Conditions (SC-6.23); and
4. Drawings and Specifications, all as modified by any addenda.

Change Orders and Amendments, if any, to the Contract Documents take precedence over the original Contract Documents.

Notwithstanding the foregoing order of precedence, the Special Provisions of Article 52 of the General Conditions, Special Provisions, shall take precedence, rule and control over all other provisions of the Contract Documents.

Unless the context otherwise requires, form numbers in this document are for convenience only. In the event of any conflict between the form required by name or context and the form required by number, the form required by name or context shall control. The Contractor may obtain State forms from the Principal Representative upon request.

D. PARTNERING, COMMUNICATIONS AND COOPERATION

In recognition of the fact that conflicts, disagreements and disputes often arise during the performance of construction contracts, the Contractor and the Principal Representative aspire to encourage a relationship of open communication and cooperation between the employees and personnel of both, in which the objectives of the Contract may be better achieved and issues resolved in a more fully informed atmosphere.

The Contractor and the Principal Representative each agree to assign an individual who shall be fully authorized to negotiate and implement a voluntary partnering plan for the purpose of facilitating open communications between them. Within thirty days (30) of the Notice to Proceed, the assigned individuals shall meet to discuss development of an informal agreement to accomplish these goals.

The assigned individuals shall endeavor to reach an informal agreement, but shall have no such obligation. Any plans these parties voluntarily agree to implement shall result in no change to the contract amount, and no costs associated with such plan or its development shall be recoverable under any contract clause. In addition, no plan developed to facilitate open communication and cooperation shall alter, amend or waive any of the rights or duties of either party under the Contract unless and except by written Amendment to the Contract, nor shall anything in this clause or any subsequently developed partnering plan be deemed to create fiduciary duties between the parties unless expressly agreed in a written Amendment to the Contract. It is also recognized that projects with relatively low contract values may not justify the expense or special efforts required. In the case of small projects with an initial Contract value under $500,000, the requirements of the preceding paragraph shall not apply.

ARTICLE 3. COPIES FURNISHED

The Contractor will be furnished, free of charge, the number of copies of Drawings and Specifications as specified in the Contract Documents, or if no number is specified, all copies reasonably necessary for the execution of the work.

ARTICLE 4. OWNERSHIP OF DRAWINGS

Drawings or Specifications, or copies of either, furnished by the Architect/Engineer, are not to be used on any other work. At the completion of the Work, at the written request of the Architect/Engineer, the Contractor shall endeavor to return all Drawings and Specifications.

The Contractor may retain the Contractor’s Contract Document set, copies of Drawings and Specifications used to contract with others for any portion of the Work and a marked up set of as-built drawings.
ARTICLE 5. ARCHITECT/ENGINEER’S STATUS
The Architect/Engineer is the representative of the Principal Representative for purposes of administration of the Contract, as provided in the Contract Documents and the Agreement. In case of termination of employment or the death of the Architect/Engineer, the Principal Representative will appoint a capable Architect/Engineer against whom the Contractor makes no reasonable objection, whose status under the Contract shall be the same as that of the former Architect/Engineer.

ARTICLE 6. ARCHITECT/ENGINEER DECISIONS AND JUDGMENTS, ACCESS TO WORK AND INSPECTION

A. DECISIONS
The Architect/Engineer shall, within a reasonable time, make decisions on all matters relating to the execution and progress of the Work or the interpretation of the Contract Documents, and in the exercise of due diligence shall be reasonably available to the Contractor to timely interpret and make decisions with respect to questions relating to the design or concerning the Contract Documents.

B. JUDGMENTS
The Architect/Engineer is, in the first instance, the judge of the performance required by the Contract Documents as it relates to compliance with the Drawings and Specifications and quality of workmanship and materials.

The Architect/Engineer shall make judgments regarding whether directed work is extra or outside the scope of Work required by the Contract Documents at the time such direction is first given. If, in the Contractor’s judgment, any performance directed by the Architect/Engineer is not required by the Contract Documents or if the Architect/Engineer does not make the judgment required, it shall be a condition precedent to the filing of any claim for additional cost related to such directed work that the Contractor, before performing such work, shall first obtain in writing, the Architect/Engineer’s written decision that such directed work is included in the performance required by the Contract Documents. If the Architect/Engineer’s direction to perform the work does not state that the work is included in the performance required by the Contract Documents, the Contractor shall, in writing, request the Architect/Engineer to advise in writing whether the directed work will be considered extra work or work included in the performance required by the Contract Documents.

The Architect/Engineer shall respond to any such written request for such a decision within three (3) business days and if no response is provided, or if the Architect/Engineer’s written decision is to the effect that the work is included in the performance required by the Contract Documents, the Contractor may file with the Principal Representative and the Architect/Engineer a Notice of claim in accordance with Article 36, Claims. Whether or not a Notice of claim is filed, the Contractor shall proceed with the ordered work. Disagreement with the decision of the Architect/Engineer shall not be grounds for the Contractor to refuse to perform the work directed or to suspend or terminate performance.

C. ACCESS TO WORK
The Architect/Engineer, the Principal Representative and representatives of State Buildings Programs shall at all times have access to the work. The Contractor shall provide proper facilities for such access and for their observations or inspection of the work.

D. INSPECTION
The Architect/Engineer has agreed to make, or that structural, mechanical, electrical engineers or other consultants will make, periodic visits to the site to generally observe the progress and quality of the Work to determine in general if the Work is proceeding in accordance with the Contract Documents. Observation may extend to all or any part of the Work and to the preparation, fabrication or manufacture of materials.

Without in any way meaning to be exclusive or to limit the responsibilities of the Architect/Engineer or the Contractor, the Architect/Engineer has agreed to observe, among other aspects of the Work, the following for compliance with the Contract Documents:
1. Bearing surfaces of excavations before concrete is placed based upon the findings and recommendations of the Principal Representative’s soils engineering consultant;
2. Reinforcing steel after installation and before concrete is poured;
3. Structural concrete;
4. Laboratory reports on all concrete testing based upon the findings and recommendations of the Principal Representative’s testing consultant;
5. Structural steel during and after erection and prior to its being covered or enclosed;
6. Steel welding; Principal Representative will furnish steel welding inspection consultant/agency if required or necessary for the project;
7. Mechanical and plumbing work following its installation and prior to its being covered or enclosed;
8. Electrical work following its installation and prior to its being covered or enclosed;
9. Compaction testing reports based upon the findings and recommendations of the Principal Representative’s testing consultant; and
10. Any special or quality control testing required in the Contract Documents provided by the Principal Representative’s testing consultant.

If the Specifications, the Architect/Engineer's instructions, laws, ordinances of any public authority require any work to be specifically tested or approved, the Contractor shall give the Architect/Engineer timely notice of its readiness for observation by the Architect/Engineer or inspection by another authority, and if the inspection is by another authority, of the date fixed for such inspection, required certificates of inspection being secured by the Contractor. The Contractor shall give all required Notices to the Principal Representative or his or her designee for inspections required for the building inspection program. It shall be the responsibility of the Contractor to determine the Notice required by the State pursuant to Building Inspection Record for the Project, according to State form SBP-B.I.R., or the equivalent form required by the Principal Representative as approved by the State Buildings Program. If any such work is covered up without approval or consent of the Architect/Engineer or prior to any building code inspection, it must, if required by the Architect/Engineer, the Principal Representative or the State Buildings Programs, be uncovered for examination, at the Contractor’s expense. If such work is found to be not in accordance with the Contract Documents, the Contractor shall pay such costs, unless he or she shall show that the defect in the work was caused by another contractor engaged by the Principal Representative. In that event, the Principal Representative shall pay such cost. In addition, examination of questioned work may be ordered, and if so ordered, the work must be uncovered by the Contractor. If such work be found in accordance with the Contract Documents, the Contractor shall be reimbursed the cost of examination and replacement.

ARTICLE 7. CONTRACTOR’S SUPERINTENDENCE AND SUPERVISION
The Contractor shall employ, and keep present on the Project during its progress, a competent superintendent and any necessary assistants, all satisfactory to the Architect/Engineer and the Principal Representative. The superintendent shall not be changed except with the consent of the Architect/Engineer and the Principal Representative, unless the superintendent proves to be unsatisfactory to the Contractor and ceases to be in his or her employ. The superintendent shall represent the Contractor in his or her absence and all directions given to the superintendent shall be as binding as if given to the Contractor. Directions received by the superintendent shall be documented by the superintendent and confirmed in writing with the Contractor.

The Contractor shall give efficient supervision to the Work, using his or her best skill and attention. He or she shall carefully study and compare all Drawings, Specifications and other written instructions and shall without delay report any error, inconsistency or omission which he or she may discover in writing to the Architect/Engineer. The Contractor shall not be liable to the Principal Representative for damage to the extent it results from errors or deficiencies in the Contract Documents or other instructions by the Architect/Engineer, unless the Contractor knew or had reason to know, that damage would result by proceeding and the Contractor fails to so advise the Architect/Engineer.

The superintendent shall see that the Work is carried out in accordance with the Contract Documents and in a uniform, thorough and first-class manner in every respect. The Contractor’s superintendent shall establish
all lines, levels, and marks necessary to facilitate the operations of all concerned in the Contractor’s Work. The Contractor shall lay out all work in a manner satisfactory to the Architect/Engineer, making permanent records of all lines and levels required for excavation, grading, foundations, and for all other parts of the Work.

ARTICLE 8. MATERIALS AND EMPLOYEES

Unless otherwise stipulated, the Contractor shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation and other facilities necessary for the execution and completion of the Work.

Unless otherwise specified, all materials shall be new and both workmanship and materials shall be first class and of uniform quality. The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials.

The Contractor is fully responsible for all acts and omissions of the Contractor’s employees and shall at all times enforce strict discipline and good order among employees on the site. The Contractor shall not employ on the Work any person reasonably deemed unfit by the Principal Representative or anyone not skilled in the work assigned to him.

ARTICLE 9. SURVEYS, PERMITS, LAWS, TAXES AND REGULATIONS

A. SURVEYS

The Principal Representative shall furnish all surveys, property lines and bench marks deemed necessary by the Architect/Engineer, unless otherwise specified.

B. PERMITS AND LICENSES

Permits and licenses necessary for the prosecution of the Work shall be secured and paid for by the Contractor. Unless otherwise specified in the Specifications, no local municipal or county building permit shall be required. However, State Buildings Programs requires each Principal Representative to administer a building code inspection program, the implementation of which may vary at each agency or institution of the State. The Contractors’ employees shall become personally familiar with these local conditions and requirements and shall fully comply with such requirements. State electrical and plumbing permits are required, unless the requirement to obtain such permits is altered by State Building’s Programs. The Contractor shall obtain and pay for such permits.

Easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the Principal Representative, unless otherwise specified.

C. TAXES

1. REFUND OF SALES AND USE TAXES

The Contractor shall pay all local taxes required to be paid, including but not necessarily limited to all sales and use taxes. If requested by the Principal Representative prior to issuance of the Notice to Proceed or directed in the Supplementary General Conditions or the Specifications, the Contractor shall maintain records of such payments in respect to the Work, which shall be separate and distinct from all other records maintained by the Contractor, and the Contractor shall furnish such data as may be necessary to enable the State of Colorado, acting by and through the Principal Representative, to obtain any refunds of such taxes which may be available under the laws, ordinances, rules or regulations applicable to such taxes. When so requested or directed, the Contractor shall require Subcontractors at all tiers to pay all local sales and use taxes required to be paid and to maintain records and furnish the Contractor with such data as may be necessary to obtain refunds of the taxes paid by such Subcontractors. No State sales and use taxes are to be paid on material to be used in this Project. On application by the purchaser or seller, the Department of Revenue shall issue to a Contractor or to a Subcontractor at any tier, a certificate or certificates of exemption per § 39-26-114(1)(d), C.R.S., and § 39-26-203, C.R.S.

2. FEDERAL TAXES
The Contractor shall exclude the amount of any applicable federal excise or manufacturers’ taxes from the proposal. The Principal Representative will furnish the Contractor, on request, exemption certificates.

D. LAWS AND REGULATIONS
The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the Work as drawn or specified. If the Contractor observes that the Drawings or Specifications require work which is at variance therewith, the Contractor shall without delay notify the Architect/Engineer in writing and any necessary changes shall be adjusted as provided in Article 35, Changes In The Work.

The Contractor shall bear all costs arising from the performance of work required by the Drawings or Specifications that the Contractor knows to be contrary to such laws, ordinances, rules or regulations, if such work is performed without giving Notice to the Architect/Engineer.

ARTICLE 10. PROTECTION OF WORK AND PROPERTY
A. GENERAL PROVISIONS
The Contractor shall continuously maintain adequate protection of all work and materials, protect the property from injury or loss arising in connection with this Contract and adequately protect adjacent property as provided by law and the Contract Documents. The Contractor shall make good any damage, injury or loss, except to the extent:

1. Directly due to errors in the Contract Documents;
2. Caused by agents or employees of the Principal Representative; and,
3. Due to causes beyond the Contractor’s control and not to fault or negligence; provided such damage, injury or loss would not be covered by the insurance required to be carried by the Contractor;

B. SAFETY PRECAUTIONS
The Contractor shall take all necessary precautions for the safety of employees on the Project, and shall comply with all applicable provisions of federal, State and municipal safety laws and building codes to prevent accidents or injury to persons on, about or adjacent to the premises where the Work is being performed. He or she shall erect and properly maintain at all times, as required by the conditions and progress of the Work, all necessary safeguards for the protection of workers and the public and shall post danger signs warning against the hazards created by such features of construction as protruding nails, hoists, well holes, elevator hatchways, scaffolding, window openings, stairways and falling materials; and he or she shall designate a responsible member of his or her organization on the Project, whose duty shall be the prevention of accidents. The name and position of any person so designated shall be reported to the Architect/Engineer by the Contractor.

The Contractor shall provide all necessary bracing, shoring and tying of all structures, decks and framing to prevent any structural failure of any material which could result in damage to property or the injury or death of persons; take all precautions to insure that no part of any structure of any description is loaded beyond its carrying capacity with anything that will endanger its safety at any time during the execution of this Contract; and provide for the adequacy and safety of all scaffolding and hoisting equipment. The Contractor shall not permit open fires within the building enclosure. The Contractor shall construct and maintain all necessary temporary drainage and do all pumping necessary to keep excavations and floors, pits and trenches free of water. The Contractor shall be solely responsible for all construction means, methods, techniques, sequences and procedures, and for coordinating all portions of the Work, except as otherwise noted.

The Contractor shall take due precautions when obstructing sidewalks, streets or other public ways in any manner, and shall provide, erect and maintain barricades, temporary walkways, roadways, trench covers, colored lights or danger signals and any other devices necessary or required to assure the safe passage of pedestrians and automobiles.
C. EMERGENCIES
In an emergency affecting the safety of life or of the Work or of adjoining property, the Contractor without special instruction or authorization from the Architect/Engineer or Principal Representative, is hereby permitted to act, at his or her discretion, to prevent such threatened loss or injury; and he or she shall so act, without appeal, if so authorized or instructed. Provided the Contractor has no responsibilities for the emergency, if the Contractor incurs additional cost not otherwise recoverable from insurance or others on account of any such emergency work, the Contract sum shall be equitably adjusted in accordance with Article 35, Changes In The Work.

ARTICLE 11. DRAWINGS AND SPECIFICATIONS ON THE WORK
The Contractor shall keep on the job site one copy of the Contract Documents in good order, including current copies of all Drawings and Specifications for the Work, and any approved Shop Drawings, Product Data or Samples, and as-built drawings. As-built drawings shall be updated weekly by the Contractor and Subcontractors to reflect actual constructed conditions including dimensioned locations of underground work and the Contractor's failure to maintain such updates may be grounds to withhold portions of payments otherwise due in accordance with Article 33, Payments Withheld. All such documents shall be available to the Architect/Engineer and representatives of the State. In addition, the Contractor shall keep on the job site one copy of all approved addenda, Change Orders and requests for information issued for the Work.

The Contractor shall develop procedures to insure the currency and accuracy of as-built drawings and shall maintain on a current basis a log of requests for information and responses thereto, a Shop Drawing and Product Data submittal log, and a Sample submittal log to record the status of all necessary and required submittals.

ARTICLE 12. REQUESTS FOR INFORMATION AND SCHEDULES
A. REQUESTS FOR INFORMATION
The Architect/Engineer shall furnish additional instructions with reasonable promptness, by means of drawings or otherwise, necessary for the proper execution of the Work. All such drawings and instructions shall be consistent with the Contract Documents and reasonably inferable there from. The Architect/Engineer shall determine what additional instructions or drawings are necessary for the proper execution of the Work.

The Work shall be executed in conformity with such instructions and the Contractor shall do no work without proper drawings, specifications or instructions. If the Contractor believes additional instructions, specifications or drawings are needed for the performance of any portion of the Work, the Contractor shall give Notice of such need in writing through a request for information furnished to the Architect/Engineer sufficiently in advance of the need for such additional instructions, specifications or drawings to avoid delay and to allow the Architect/Engineer a reasonable time to respond. The Contractor shall maintain a log of the requests for information and the responses provided.

B. SCHEDULES
1. SUBMITTAL SCHEDULES
Prior to filing the Contractor’s first application for payment, a schedule shall be prepared which may be preliminary to the extent required, fixing the dates for the submission and initial review of required Shop Drawings, Product Data and Samples for the beginning of manufacture and installation of materials, and for the completion of the various parts of the Work. It shall be prepared so as to cause no delay in the Work or in the work of any other contractor. The schedule shall be subject to change from time to time in accordance with the progress of the Work, and it shall be subject to the review and approval by the Architect/Engineer. It shall fix the dates at which the various Shop Drawings Product Data and Samples will be required from the Architect/Engineer. The Architect/Engineer, after review and agreement as to the time provided for initial review, shall review and comment on the Shop Drawings, Product Data and Samples in accordance with that schedule. The schedule shall be finalized, prepared and submitted with respect to each of the elements of the Work in time to avoid delay, considering reasonable periods for review, manufacture or installation.
At the time the schedule is prepared, the Contractor, the Architect/Engineer and Principal Representative shall jointly identify the Shop Drawing, Product Data and Samples, if any, which the Principal Representative shall receive simultaneously with the Architect/Engineer for the purposes of owner coordination with existing facility standards and systems. The Contractor shall furnish a copy for the Principal Representative when so requested. Transmittal of Shop Drawings and Product Data copies to the Principal Representative shall be solely for the convenience of the Principal Representative and shall neither create nor imply responsibility or duty of review by the Principal Representative.

The Contractor may also, or at the direction of the Principal Representative at any time shall, prepare and maintain a schedule, which may also be preliminary and subject to change to the extent required, fixing the dates for the initial responses to requests for information or for detail drawings which will be required from the Architect/Engineer to allow the beginning of manufacture, installation of materials and for the completion of the various parts of the Work. The schedule shall be subject to review and approval by the Architect/Engineer. The Architect/Engineer shall, after review and agreement, furnish responses and detail drawings in accordance with that schedule. Any such schedule shall be prepared and approved in time to avoid delay, considering reasonable periods for review, manufacture or installation, but so long as the request for information schedule is being maintained, it shall not be deemed to transfer responsibility to the Contractor for errors or omissions in the Contract Documents where circumstances make timely review and performance impossible.

The Architect/Engineer shall not unreasonably withhold approval of the Contractor’s schedules and shall inform the Contractor and the Principal Representative of the basis of any refusal to agree to the Contractor’s schedules. The Principal Representative shall attempt to resolve any disagreements.

2. SCHEDULE OF VALUES
Within twenty-one (21) calendar days after the date of the Notice to Proceed, the Contractor shall submit to the Architect/Engineer and Principal Representative, for approval, and to the State Buildings Programs when specifically requested, a complete itemized schedule of the values of the various parts of the Work, as estimated by the Contractor, aggregating the total price. The schedule of values shall be in such detail as the Architect/Engineer or the Principal Representative shall require, prepared on forms acceptable to the Principal Representative. It shall, at a minimum, identify on a separate line each division of the Specifications including the general conditions costs to be charged to the Project. The Contractor shall revise and resubmit the schedule of values for approval when, in the opinion of the Architect/Engineer or the Principal Representative, such resubmittal is required due to changes or modifications to the Contract Documents or the Contract sum.

The total cost of each line item so separately identified shall, when requested by the Architect/Engineer or the Principal Representative, be broken down into reasonable estimates of the value of:

a. Material, which shall include the cost of material actually built into the Project plus any local sales or use tax paid thereon; and,
b. Labor and other costs.

The cost of subcontracts shall be incorporated in the Contractor’s schedule of values, and when requested by the Architect/Engineer or the Principal Representative, shall be separately shown as line items.

The Architect/Engineer shall review the proposed schedules and approve it after consultation with the Principal Representative, or advise the Contractor of any required revisions within ten (10) days of its receipt. In the event no action is taken on the submittal within ten days, the
Contractor may utilize the schedule of values as its submittal for payment until it is approved or until revisions are requested.

When the Architect/Engineer deems it appropriate to facilitate certification of the amounts due to the Contractor, further breakdown of subcontracts, including breakdown by labor and materials, may be directed.

This schedule of values, when approved, will be used in preparing Contractor’s applications for payment on State Form SC-7.2, Application for Payment.

3. CONSTRUCTION SCHEDULES

Within twenty-one (21) calendar days after the date of the Notice to Proceed, the Contractor shall submit to the Architect/Engineer and the Principal Representative, and to the State Buildings Programs when specifically requested, on a form acceptable to them, an overall timetable of the construction schedule for the Project. Unless the Supplementary General Conditions or the Specifications allow scheduling with bar charts or other less sophisticated scheduling tools, the Contractor’s schedule shall be a critical-path method (CPM) construction schedule. The CPM schedule shall start with the date of the Notice to Proceed and include submittals activities, the various construction activities, change order work (when applicable), close-out, testing, demonstration of equipment operation when called for in the Specifications, and acceptance. The CPM shall at a minimum correlate to the schedule of values line items and shall be cost loaded if requested by the Architect/Engineer or Principal Representative.

The completion time shall be the time specified in the Agreement and all Project scheduling shall allocate float utilizing the full period available for construction as specified in the Agreement on State Form SC 6.13, without indication of early completion, unless such earlier completion is approved in writing by the Principal Representative and State Building Programs.

The time shown between the starting and completion dates of the various elements within the construction schedule shall represent one hundred per cent (100%) completion of each element.

All other elements of the CPM schedule shall be as required by the Specifications. In addition, the Contractor shall submit monthly updates of the construction schedule. These updates shall reflect the Contractor’s “work in place” progress.

When requested by the Architect/Engineer, the Principal Representative or the State Buildings Programs, the Contractor shall revise the construction schedule to reflect changes in the schedule of values.

When the testing of materials is required by the Specifications, the Contractor shall also prepare and submit to the Architect/Engineer and the Principal Representative a schedule for testing in accordance with Article 14, Samples and Testing.

ARTICLE 13. SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. SUBMITTAL PROCESS

The Contractor shall check and field verify all dimensions. The Contractor shall check, approve and submit to the Architect/Engineer in accordance with the schedule described in Article 12, Requests for Information and Schedules, all Shop Drawings, Product Data and Samples required by the specifications or required by the Contractor for the work of the various trades. All Drawings and Product Data shall contain identifying nomenclature and each submittal shall be accompanied by a letter of transmittal identifying in detail all enclosures. The number of copies of Shop Drawings and Product Data to be submitted shall be as specified in the Specifications and if no number is specified then three copies shall be submitted.

The Architect/Engineer shall review and comment on the Shop Drawings and Product Data within the time provided in the agreed upon schedule for conformance with information given and the design
concept expressed in, or reasonably inferred from, the Contract Documents. The nature of all corrections to be made to the Shop Drawings and Product Data, if any, shall be clearly noted, and the submittals shall be returned to the Contractor for such corrections. If a change in the scope of the Work is intended by revisions requested to any Shop Drawings and Product Data, the Contractor shall be requested to prepare a change proposal in accordance with Article 35, Changes In The Work. On resubmitted Shop Drawings, Product Data or Samples, the Contractor shall direct specific attention in writing on the transmittal cover to revisions other than those corrections requested by the Architect/Engineer on any previously checked submittal. The Architect/Engineer shall promptly review and comment on, and return, the resubmitted items.

The Contractor shall thereafter furnish such other copies in the form approved by the Architect/Engineer as may be needed for the prosecution of the work.

B. FABRICATION AND ORDERING
Fabrication shall be started by the Contractor only after receiving approved Shop Drawings from the Architect/Engineer. Materials shall be ordered in accordance with approved Product Data. Work which is improperly fabricated, whether through incorrect Shop Drawings, faulty workmanship or materials, will not be acceptable.

C. DEVIATIONS FROM DRAWINGS OR SPECIFICATIONS
The review and comments of the Architect/Engineer of Shop Drawings, Product Data or Samples shall not relieve the Contractor from responsibility for deviations from the Drawings or Specifications, unless he or she has in writing called the attention of the Architect/Engineer to such deviations at the time of submission, nor shall it relieve the Contractor from responsibility for errors of any sort in Shop Drawings or Product Data. Review and comments on Shop Drawings or Product Data containing identified deviations from the Contract Documents shall not be the basis for a Change Order or a claim based on a change in the scope of the Work unless Notice is given to the Architect/Engineer and Principal Representative of all additional costs, time and other impacts of the identified deviation by bringing it to their attention in writing at the time the submittals are made, and any subsequent change in the Contract sum or the Contract time shall be limited to cost, time and impacts so identified.

D. CONTRACTOR REPRESENTATIONS
By preparing, approving, and/or submitting Shop Drawings, Product Data and Samples, the Contractor represents that the Contractor has determined and verified all materials, field measurements, and field construction criteria related thereto, and has checked and co-ordinated the information contained within each submittal with the requirements of the Work, the Project and the Contract Documents and prior reviews and approvals.

ARTICLE 14. SAMPLES AND TESTING
A. SAMPLES
The Contractor shall furnish for approval, with such promptness as to cause no delay in his or her work or in that of any other Contractor, all Samples as directed by the Architect/Engineer. The Architect/Engineer shall check and approve such Samples, with reasonable promptness, but only for conformance with the design intent of the Contract Documents and the Project, and for compliance with any submission requirements given in the Contract Documents.

B. TESTING - GENERAL
The Contractor shall provide such equipment and facilities as the Architect/Engineer may require for conducting field tests and for collecting and forwarding samples to be tested. Samples themselves shall not be incorporated into the Work after approval without the permission of the Architect/Engineer.

All materials or equipment proposed to be used may be tested at any time during their preparation or use. The Contractor shall furnish the required samples without charge and shall give sufficient Notice of the placing of orders to permit the testing thereof. Products may be sampled either prior to shipment or after being received at the site of the Work.
Tests shall be made by an accredited testing laboratory. Except as otherwise provided in the Specifications, sampling and testing of all materials, and the laboratory methods and testing equipment, shall be in accordance with the latest standards and tentative methods of the American Society of Testing Materials (ASTM). The cost of testing which is in addition to the requirements of the Specifications shall be paid by the Contractor if so directed by the Architect/Engineer, and the Contract sum shall be adjusted accordingly by Change Order; provided however, that whenever testing shows portions of the Work to be deficient, all costs of testing including that required to verify the adequacy of repair or replacement work shall be the responsibility of the Contractor.

C. TESTING - CONCRETE AND SOILS

Unless otherwise specified or provided elsewhere in the Contract Documents, the Principal Representative will contract for and pay for the testing of concrete and for soils compaction testing through an independent laboratory or laboratories selected and approved by the Principal Representative. The Contractor shall assume the responsibility of arranging, scheduling and coordinating the concrete sample collection efforts and soils compaction efforts. Testing shall be performed in accordance with the requirements of the Specifications, and if no requirements are specified, the Contractor shall request instructions and testing shall be as directed by the Architect/Engineer or the soils engineer, as applicable, and in accordance with standard industry practices.

The Principal Representative and the Architect/Engineer shall be given reasonable advance notice of each concrete pour and reserve the right to either increase or decrease the number of cylinders or the frequency of tests.

Soil compaction testing shall be at random locations selected by the soils engineer. In general, soils compaction testing shall be as directed by the soils engineer and shall include all substrate prior to backfill or construction.

D. TESTING - OTHER

Additional testing required by the Specifications will be accomplished and paid for by the Principal Representative in a manner similar to that for concrete and soils unless noted otherwise in the Specifications. In any case, the Contractor will be responsible for arranging, scheduling and coordinating additional tests. Where the additional testing will be contracted and paid for by the Principal Representative the Contractor shall give the Principal Representative not less than one month advance written Notice of the date the first such test will be required.

ARTICLE 15. SUBCONTRACTS

The Contractor shall, within twenty one (21) days after the date of the Notice of Award, submit to the Architect/Engineer, the Principal Representative and State Buildings Programs a preliminary list of Subcontractors. It shall be as complete as possible at the time, showing all known Subcontractors planned for the work. The list shall be supplemented as other Subcontractors are determined by the Contractor and any such supplemental list shall be submitted to the Architect/Engineer, the Principal Representative and State Buildings Programs not less than ten (10) days before the Subcontractor commences work.

The Contractor’s list shall include those Subcontractors, if any, which the Contractor indicated in its bid would be employed for specific portions of the Work if such indication was requested in the bid documents issued by the State. The substitution of any Subcontractor listed in the Contractor’s bid shall be justified in writing not less than ten (10) days after the date of the Notice of Award, and shall be subject to the approval of the Principal Representative. For reasons such as the Subcontractor’s refusal to perform as agreed, subsequent unavailability or later discovered bid errors, or other similar reasons, but not including the availability of a lower Subcontract price, such substitution may be approved. The Contractor shall bear any additional cost incurred by such substitutions.

The Contractor shall not employ any Subcontractor that the Architect/Engineer, within seven (7) days after the date of receipt of the Contractor’s list of Subcontractors or any supplemental list, objects to in writing as being unacceptable to either the Architect/Engineer, the Principal Representative or State Buildings Programs.
Programs. If a Subcontractor is deemed unacceptable, the Contractor shall propose a substitute Subcontractor and the Contract sum shall be adjusted by any demonstrated difference between the Subcontractor’s bids, except where the Subcontractor has been debarred by the State or fails to meet qualifications of the Contract Documents to perform the work proposed.

The Contractor shall be fully responsible to the Principal Representative for the acts and omissions of Subcontractors and of persons either directly or indirectly employed by them. All instructions or orders in respect to work to be done by Subcontractors shall be given to the Contractor.

ARTICLE 16. RELATIONS OF CONTRACTOR AND SUBCONTRACTOR
The Contractor agrees to bind each Subcontractor to the terms of these General Conditions and to the requirements of the Drawings and Specifications, and any Addenda thereto, and also all the other Contract Documents, so far as applicable to the work of such Subcontractor. The Contractor further agrees to bind each Subcontractor to those terms of the General Conditions which expressly require that Subcontractors also be bound, including without limitation, requirements that Subcontractors waive all rights of subrogation, provide adequate general commercial liability and property insurance, automobile insurance and workers’ compensation insurance as provided in Article 25, Insurance.

Nothing contained in the Contract Documents shall be deemed to create any contractual relationship whatsoever between any Subcontractor and the State of Colorado acting by and through its Principal Representative.

ARTICLE 17. MUTUAL RESPONSIBILITY OF CONTRACTORS
Should the Contractor cause damage to any separate contractor on the work, the Contractor agrees, upon due Notice, to settle with such contractor by agreement, if he or she will so settle. If such separate contractor sues the Principal Representative on account of any damage alleged to have been so sustained, the Principal Representative shall notify the Contractor, who shall defend such proceedings if requested to do so by Principal Representative. If any judgment against the Principal Representative arises there from, the Contractor shall pay or satisfy it and pay all costs and reasonable attorney fees incurred by the Principal Representative, in accordance with Article 52C, Indemnification, provided the Contractor was given due Notice of an opportunity to settle.

ARTICLE 18. SEPARATE CONTRACTS
The Principal Representative reserves the right to enter into other contracts in connection with the Project or the Contract. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate his or her work with theirs. If any part of the Contractor’s work depends, for proper execution or results, upon the work of any other contractor, the Contractor shall inspect and promptly report to the Architect/Engineer any defects in such work that render it unsuitable for such proper execution and results. Failure of the Contractor to so inspect and report shall constitute an acceptance of the other contractor’s work as fit and proper for the reception of work, except as to defects which may develop in the other Contractor’s work after the execution of the Contractor’s work.

To insure the proper execution of subsequent work, the Contractor shall measure work already in place and shall at once report to the Architect/Engineer any discrepancy between the executed work and the Drawings.

ARTICLE 19. USE OF PREMISES
The Contractor shall confine apparatus, the storage of materials and the operations of workmen to limits indicated by law, ordinances, permits and any limits lines shown on the Drawings. The Contractor shall not unreasonably encumber the premises with materials.

The Contractor shall enforce all of the Architect/Engineer’s instructions and prohibitions regarding, without limitation, such matters as signs, advertisements, fires and smoking.
ARTICLE 20. CUTTING, FITTING OR PATCHING
The Contractor shall do all cutting, fitting or patching of work that may be required to make its several parts come together properly and fit it to receive or be received by work of other Contractors shown upon, or reasonably inferred from, the Drawings and Specifications for the complete structure, and shall provide for such finishes to patched or fitted work as the Architect/Engineer may direct. The Contractor shall not endanger any work by cutting, excavating or otherwise altering the work and shall not cut or alter the work of any other Contractor save with the consent of the Architect/Engineer.

ARTICLE 21. UTILITIES
A. TEMPORARY UTILITIES
Unless otherwise specifically stated in the Specifications or on the Drawings, the Principal Representative shall be responsible for the locations of all utilities as shown on the Drawings or indicated elsewhere in the Specifications, subject to the Contractor's compliance with all statutory or regulatory requirements to call for utility locates. When actual conditions deviate from those shown the Contractor shall comply with the requirements of Article 37, Differing Site Conditions. The Contractor shall provide and pay for the installation of all temporary utilities required to supply all the power, light and water needed by him and other Contractors for their Work and shall install and maintain all such utilities in such manner as to protect the public and workmen and conform with any applicable laws and regulations. Upon completion of the work, he or she shall remove all such temporary utilities from the site. The Contractor shall pay for all consumption of power, light and water used by him or her and the other Contractors, without regard to whether such items are metered by temporary or permanent meters. The Superintendent shall have full authority over all trades and Subcontractors at any tier to prevent waste. The cut-off date on permanent meters shall be either the agreed date of the date of the Notice of Substantial Completion or the Notice of Approval of Occupancy/Use of the Project.

B. PROTECTION OF EXISTING UTILITIES
Where existing utilities, such as water mains, sanitary sewers, storm sewers and electrical conduits, are shown on the Drawings, the Contractor shall be responsible for the protection thereof, without regard to whether any such utilities are to be relocated or removed as a part of the Work. If any utilities are to be moved, the moving must be conducted in such manner as not to cause undue interruption or delay in the operation of the same.

C. CROSSING OF UTILITIES
When new construction crosses highways, railroads, streets, or utilities under the jurisdiction of State, city or other public agency, public utility or private entity, the Contractor shall secure proper written permission before executing such new construction. The Contractor will be required to furnish a proper release before final acceptance of the Work.

ARTICLE 22. UNSUITABLE CONDITIONS
The Contractor shall not work at any time, or permit any work to be done, under any conditions contrary to those recommended by manufacturers or industry standards which are otherwise proper, unsuited for proper execution, safety and performance. Any cost caused by ill-timed work shall be borne by the Contractor unless the timing of such work shall have been directed by the Architect/Engineer or the Principal Representative, after the award of the Contract, and the Contractor provided Notice of any additional cost.

ARTICLE 23. TEMPORARY FACILITIES
A. OFFICE FACILITIES
The Contractor shall provide and maintain without additional expense for the duration of the Project temporary office facilities, as required and as specified, for his or her own use and the use of the Architect/Engineer, representatives of the Principal Representative and State Buildings Programs.

B. TEMPORARY HEAT
The Contractor shall furnish and pay for all the labor, facilities, equipment, fuel and power necessary to supply temporary heating, ventilating and air conditioning, except to the extent otherwise specified, and shall be responsible for the installation, operation, maintenance and removal of such facilities and
equipment. Unless otherwise specified, the permanent HVAC system shall not be used for temporary heat in whole or in part. If the Contractor desires to put the permanent system into use, in whole or in part, the Contractor shall set it into operation and furnish the necessary fuel and manpower to safely operate, protect and maintain that HVAC system. Any operation of all or any part of the permanent HVAC system including operation for testing purposes shall not constitute acceptance of the system, nor shall it relieve the Contractor of his or her one-year guarantee of the system from the date of the Notice of Substantial Completion of the entire Project, and if necessary due to prior operation, the Contractor shall provide manufacturers’ extended warranties from the date of the Contractor’s use prior to the date of the Notice of Substantial Completion.

C. WEATHER PROTECTION
The Contractor shall, at all times, provide protection against weather, so as to maintain all work, materials, apparatus and fixtures free from injury or damages.

D. DUST PARTITIONS
If the Work involves work in an occupied existing building, the Contractor shall erect and maintain during the progress of the work, suitable dust-proof temporary partitions, or more permanent partitions as specified, to protect such building and the occupants thereof.

E. BENCH MARKS
The Contractor shall maintain any site bench marks provided by the Principal Representative and shall establish any additional benchmarks specified by the Architect/Engineer as necessary for the Contractor to layout the work and ascertain all grades and levels as needed.

F. SIGN
The Contractor shall erect and permit one 4’ x 8’ sign only at the site to identify the Project as specified or directed by the Architect/Engineer which shall be maintained in good condition during the life of the Project.

G. SANITARY PROVISION
The Contractor shall provide and maintain suitable, clean, temporary sanitary toilet facilities for any and all workmen engaged on the Work, for the entire construction period, in strict compliance with the requirement of all applicable codes, regulations, laws and ordinances, and no other facilities, new or existing, may be used by any person on the Project. When the Project is complete the Contractor shall promptly remove them from the site, disinfect, and clean or treat the areas as required. If any new construction surfaces in the Project other than the toilet facilities provided for herein are soiled at any time, the entire areas so soiled shall be completely removed from the Project and rebuilt.

ARTICLE 24. CLEANING UP
The Contractor shall keep the building and premises free from all surplus material, waste material, dirt and rubbish caused by employees or work, and at the completion of the Work shall remove all such surplus material, waste material, dirt, and rubbish, as well as all tools, equipment and scaffolding, and shall wash and clean all window glass and plumbing fixtures, perform cleanup and cleaning required by the Specifications and leave all of the work clean unless more exact requirements are specified.

ARTICLE 25. INSURANCE
A. GENERAL LIABILITY, PROPERTY DAMAGE AND AUTOMOBILE
The Contractor shall procure and maintain comprehensive commercial general liability and property damage insurance and comprehensive automobile liability and property damage insurance as hereinafter specified, at his or her own expense, during the life of this Contract. This insurance shall include a provision preventing cancellation without forty-five (45) days’ prior Notice by certified mail and shall state whether the coverage is “claims made” or “per occurrence”. The Contractor shall obtain “per occurrence” insurance unless otherwise agreed in writing by the Principal Representative. A completed Certificate of Insurance shall be filed with State Buildings Programs within ten (10) days after the date of the Notice of Award, said Certificate to specifically state the inclusion of the coverages and provisions set forth herein.
This insurance must protect the Contractor from all claims for bodily injury, including death, and all claims for destruction of or damage to property, arising out of or in connection with, any operations under this Contract, whether such operations be by the Contractor or by any Subcontractor under him or anyone directly or indirectly employed by the Contractor or by a Subcontractor. All such insurance shall be written with limits and coverages as specified below and shall be written on a Comprehensive Form of Policy. In the event any of the hazards or exposures, normally listed in standard policies as “Exclusions”, are involved or required under this Contract, then such hazards or exposures shall be covered and protection afforded under the policy and such exclusions (X), (c) and (u), as excerpted from standard policies, must be removed from the policy as listed below:

“(X) Injury to or destruction of any property arising out of blasting or explosion, other than the explosion of air or steam vessels, piping under pressure, prime movers, machinery of power transmitting equipment”

“(c) The collapse of or structural injury to any building or structure due to: (1) grading of land, excavating, burrowing, filling, backfilling, tunneling, pile driving, cofferdam work or caisson work; or (2) moving, shoring, underpinning, raising or demolition of any building or structure, or removal or rebuilding of any structural support thereof;”

“(u) (1) injury to or destruction of wires, conduits, pipes, mains, sewers or other similar property, or any apparatus in connection therewith, below the surface of the ground, if such injury or destruction is caused by and occurs during the use of mechanical equipment for the purpose of grading of land, paving, excavating or drilling; or, (2) injury to or destruction of property at any time resulting there from.”

Such insurance shall be written with limits and coverages as follows, and the State of Colorado shall be named as an additional insured listed on the Acord form. The additional insured endorsement shall be requested on Insurance Services Office, Inc. (ISO) endorsement form No. CG20101185. If CG20101185 is not available, the endorsement shall be furnished by CG20101093. Additionally, CG20371001 shall be included, if possible. All aggregate amounts must be specified on the Acord form.

A. **Commercial General Liability (CGL)**, (including bodily injury, personal injury and property damage) with the following coverages depending upon format:

1. Occurrence basis policy-combined single limit of $1,000,000
2. Annual Aggregate limit policy-not less than $2,000,000
   
   (Acord example) Minimum limits: $1,000,000 each occurrence
   
   $2,000,000 general aggregate with dedicated limits per project site
   
   $2,000,000 products and completed operations aggregate

The following coverages shall be included in the CGL:

1. Premises-Operations
2. Explosion/Collapse Hazard
3. Underground Hazard
4. Products/Completed Operations Hazard
5. Broad Form Contractual
6. Independent Contractors
7. Broad Form Property Damage
8. Personal Injury
B. **Automobile Liability** and business auto liability covering liability arising out of any auto (including owned, hired and non-owned autos).

Occurrence basis policy-combined single limit of $1,000,000

(Acord example) Minimum limit: $1,000,000 combined single limit each accident

Coverages:

1. Specific waiver of subrogation
2. Contractual liability

C. **Umbrella/Excess Liability** *(for construction projects exceeding $10,000,000, provide the following coverage):* The vendor shall maintain umbrella/excess liability insurance on an occurrence basis in excess of the underlying insurance described in Sections A, B, and D, which is at least as broad as each and every area of the underlying policies. The amounts of insurance required in Sections A, B, and D may be satisfied by the vendor purchasing coverage for the limits specified or by any combination of underlying and umbrella limits, so long as the total amount of insurance is not less than the limits specified in each section previously mentioned.

(Acord example) Minimum limit: $5,000,000 combined single limit and aggregate limit

Coverages:

1. Additional insured endorsement
2. Pay on behalf of wording
3. Concurrency of effective dates with primary
4. Blanket contractual liability
5. Punitive damages coverage (where not prohibited by law)

B. **WORKERS’ COMPENSATION INSURANCE**

The Contractor shall procure and maintain Workers’ Compensation Insurance at his or her own expense during the life of this Contract, including occupational disease provisions for all employees. This insurance, if issued by a private carrier, shall contain the same forty-five (45) days’ Notice of cancellation as required in Article 25, Insurance for the Comprehensive General Liability Insurance. Evidence of such insurance shall be by the issuance of either a Certificate by the State Compensation Insurance Fund (or its successor) or, if issued by a private carrier, the completion of a Certificate of Insurance, and such Certificate shall be filed with the State Buildings Program. The Certificate shall be filed within ten (10) days after the date of the Notice of Award.

The Contractor shall also require each Subcontractor to furnish Workers’ Compensation Insurance, including occupational disease provisions for all of the latter’s employees, and to the extent not furnished, the Contractor accepts full liability and responsibility for Subcontractor’s employees.

In cases where any class of employees engaged in hazardous work under this Contract at the site of the Project is not protected under the Workers’ Compensation statute, the Contractor shall provide, and shall cause each Subcontractor to provide, adequate and suitable insurance for the protection of employees not otherwise protected.
C. **BUILDER’S RISK INSURANCE**

Unless otherwise expressly stated in the Supplementary General Conditions (e.g. where the State elects to provide for projects with a completed value of less than $1,000,000), the Contractor shall effect and maintain a policy of insurance to provide, at Contractor’s expense, All Risk Builder’s Risk Insurance Coverage which shall be in the dollar amount of the total Project for which the Work of this Contract is to be done. Such policy may have a deductible clause but not to exceed ten thousand dollars ($10,000.00).

The Contractor shall waive all rights of subrogation as regards the State of Colorado, its officials, its officers, its agents and its employees, all while acting within the scope and course of their employment. The Insurer shall not void such insurance policy by reason of the Contractor waiving said rights. The Contractor shall require all Subcontractors at any tier to similarly waive all such rights of subrogation and shall expressly include such a waiver in all subcontracts. The insurance shall remain in effect until the Date of Notice specified on the Notice of Acceptance, State Form SBP-6.27, whether or not the building or some part thereof is occupied in any manner prior to final acceptance of the Project, and shall remain fully in effect notwithstanding any acceptance of the work of any Subcontractor on the Project. Such insurance shall be in an amount equal to the total insurable value of the construction. Upon request, the amount of such insurance shall be increased to include the cost of any additional work to be done on the Project, or materials or equipment to be incorporated in the Project, or materials or equipment to be incorporated in the Project, under other independent contracts let or to be let. In such event, the Contractor shall be reimbursed for this cost as his or her share of the insurance in the same ratio as the ratio of the insurance represented by such independent contracts let or to be let to the total insurance carried.

All such insurance shall insure the State of Colorado acting by and through its Principal Representative, the Contractor and his or her Subcontractors at any tier as their interests may appear. The insurance shall include a loss payable provision naming the State Controller, as loss payee.

The Principal Representative, with approval of the State Controller, shall have the power to adjust and settle any loss. Unless it is agreed otherwise, all monies received shall be applied first on rebuilding or repairing the destroyed or injured work.

The Certificate of Insurance shall specifically state the inclusion of the provisions herein above. A certificate for such insurance shall be filed with State Buildings Programs within ten (10) days after date of Notice of Award. The Insurance shall include a provision preventing cancellation without forty five (45) days’ prior Notice in writing by certified mail.

D. **ADDITIONAL MISCELLANEOUS INSURANCE PROVISIONS**

Certificates of Insurance and/or insurance policies required under this Contract shall be subject to the following stipulations and additional requirements:

1. The clause entitled “Other Insurance Provisions” contained in any policy including the State of Colorado as an additional named insured shall not apply to the State of Colorado;
2. Any and all deductibles or self-insured retentions contained in any Insurance policy shall be assumed by and at the sole risk of the Contractor;
3. If any of the said policies shall fail at any time to meet the requirements of the Contract Documents as to form or substance, or if a company issuing any such policy shall be or at any time cease to be approved by the Division of Insurance of the State of Colorado, or be or cease to be in compliance with any stricter requirements of the Contract Documents, the Contractor shall promptly obtain a new policy, submit the same to State Building Programs for approval if requested, and submit a Certificate of Insurance as hereinbefore provided. Upon failure of the Contractor to furnish, deliver and maintain such insurance as provided herein, this Contract, in the sole discretion of the State of Colorado, may be immediately declared suspended, discontinued, or terminated. Failure of the Contractor in obtaining and/or maintaining any required insurance shall not relieve the Contractor from any liability under the Contract, nor
shall the insurance requirements be construed to conflict with the obligations of the Contractor concerning indemnification;

4. All requisite insurance shall be obtained from financially responsible insurance companies, authorized to do business in the State of Colorado and acceptable to the State;

5. Receipt, review or acceptance by the State of any insurance policies or certificates of insurance required by this Contract shall not be construed as a waiver or relieve the Contractor from its obligation to meet the insurance requirements contained in these General Conditions.

ARTICLE 26. CONTRACTOR’S PERFORMANCE AND PAYMENT BONDS
The Contractor shall furnish a Performance Bond and a Labor and Material Payment Bond on State Forms SC-6.22, Performance Bond, and SC-6.221, Labor and Material Payment Bond, or such other forms as State Buildings Programs may approve for the Project, executed by a corporate Surety authorized to do business in the State of Colorado and in the full amount of the Contract sum. The expense of these bonds shall be borne by the Contractor and the bonds shall be filed with State Buildings Programs.

If, at any time, a Surety on such a bond is found to be, or ceases to be in strict compliance with any qualification requirements of the Contract Documents or the bid documents, or loses its right to do business in the State of Colorado, another Surety will be required, which the Contractor shall furnish to State Buildings Programs within ten (10) days after receipt of Notice from the State or after the Contractor otherwise becomes aware of such conditions.

ARTICLE 27. LABOR AND WAGES
In accordance with laws of Colorado, C.R.S. § 8-17-101, et. seq., as amended, Colorado labor shall be employed to perform the work to the extent of not less than eighty percent (80%) of each type or class of labor in the several classifications of skilled and common labor employed on the Project. If the Federal Davis-Bacon Act shall be applicable to the Project, as indicated in Article 54B, Modification of Article 27, the minimum wage rates to be paid on the Project will be specified in the Contract Documents.

ARTICLE 28. ROYALTIES AND PATENTS
The Contractor shall be responsible for assuring that all rights to use of products and systems have been properly arranged and shall take such action as may be necessary to avoid delay, at no additional charge to the Principal Representative, where such right is challenged during the course of the work. The Contractor shall pay all royalties and license fees required to be paid and shall defend all suits or claims for infringement of any patent rights and shall save the State of Colorado harmless from loss on account thereof, in accordance with Article 52C, Indemnification; provided, however, the Contractor shall not be responsible for such loss or defense for any copyright violations contained in the Contract Documents prepared by the Architect/Engineer or the Principal Representative of which the Contractor is unaware, or for any patent violations based on specified processes that the Contractor is unaware are patented or that the Contractor should not have had reason to believe were patented.

ARTICLE 29. ASSIGNMENT
Except as otherwise provided hereafter the Contractor shall not assign the whole or any part of this Contract without the written consent of the Principal Representative. This provision shall not be construed to prohibit assignments of the right to payment to the extent permitted by Section 4-9-406, C.R.S., as amended, provided that written Notice of assignment adequate to identify the rights assigned is received by the Principal Representative and the controller for the agency, department, or institution executing this Contract (as distinguished from the State Controller). Such assignment of the right to payment shall not be deemed valid until receipt by the Principal Representative and such controller and the Contractor assumes the risk that such written Notice of assignment is received by the Principal Representative and the controller for the agency, department, or institution involved. In case the Contractor assigns all or part of any moneys due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any moneys due or to become due to the Contractor shall be subject to all claims of all persons, firms, and corporations for services rendered or materials supplied for the performance of the work called for in this Contract, whether said service or materials were supplied prior to or after the assignment. Nothing in this Article shall be deemed a waiver of any other defenses available to the State against the Contractor or the assignee.
**ARTICLE 30. CORRECTION OF WORK BEFORE ACCEPTANCE**

The Contractor shall promptly remove from the premises all work or materials condemned or declared irreparably defective as failing to conform to the Contract Documents on receipt of written Notice from the Architect/Engineer or the Principal Representative, whether incorporated in the Work or not. If such materials shall have been incorporated in the Work, or if any unsatisfactory work is discovered, the Contractor shall promptly replace and re-execute his or her work in accordance with the requirements of the Contract Documents without expense to the Principal Representative, and shall also bear the expense of making good all work of other contractors destroyed or damaged by the removal or replacement of such defective material or work.

If the Contractor does not remove such condemned or irreparably defective work or material within a reasonable time, the Principal Representative may, after giving a second seven (7) day advance Notice to the Contractor and the Surety, remove them and may store the material at the Contractor’s expense. The Principal Representative may accomplish the removal and replacement with its own forces or with another Contractor. If the Contractor does not pay the expense of such removal and pay all storage charges within ten (10) days thereafter, the Principal Representative may, upon ten (10) days’ written Notice, sell such material at auction or at private sale and account for the net proceeds thereof, after deducting all costs and expenses which should have been borne by the Contractor. If the Contractor shall commence and diligently pursue such removal and replacement before the expiration of the seven day period, or if the Contractor shall show good cause in conjunction with submittal of a revised CPM schedule showing when the work will be performed and why such removal of condemned work should be scheduled for a later date, the Principal Representative shall not proceed to remove or replace the condemned work.

Should any defective work or material be discovered during the process of construction, or should reasonable doubt arise as to whether certain material or work is in accordance with the Contract Documents, the value of such defective or questionable material or work shall not be included in any application for payment, or if previously included, shall be deducted by the Architect/Engineer from the next application submitted by the Contractor.

If the Contractor does not perform repair, correction and replacement of defective work, in lieu of proceeding by issuance of a Notice of intent to remove condemned work as outlined above, the Principal Representative may, not less than seven (7) days after giving the original written Notice of the need to repair, correct, or replace defective work, deduct all costs and expenses of replacement or correction as instructed by the Architect/Engineer from the Contractor’s next application for payment in addition to the value of the defective work or material. The Principal Representative may also make an equitable deduction from the Contract sum by unilateral Change Order, in accordance with Article 33, Payments Withheld and Article 35, Changes In The Work.

If the Contractor disagrees with the Notice to remove work or materials condemned or declared irreparably defective, the Contractor may request facilitated negotiation of the issue and the Principal Representative’s right to proceed with removal and to deduct costs and expenses of repair shall be suspended and tolled until such time as the parties meet and negotiate the issue.

During construction, whenever the Architect/Engineer has advised the Contractor in writing, in the Specifications, by reference to Article 6, Architect/Engineer Decisions And Judgments, of these General Conditions or elsewhere in the Contract Documents of a need to observe materials in place prior to their being permanently covered up, it shall be the Contractor’s responsibility to notify the Architect/Engineer at least forty-eight (48) hours in advance of such covering operation. If the Contractor fails to provide such notification, Contractor shall, at his or her expense, uncover such portions of the work as required by the Architect/Engineer for observation, and reinstall such covering after observation. When a covering operation is continued from day to day, notification of the commencement of a single continuing covering operation shall suffice for the activity specified so long as it proceeds regularly and without interruption from day to day, in which event the Contractor shall coordinate with the Architect/Engineer regarding the continuing covering operation.
ARTICLE 31. APPLICATIONS FOR PAYMENTS

A. CONTRACTOR’S SUBMITTALS

On or before the first day of each month and no more than five days prior thereto, the Contractor may submit applications for payment for the work performed during such month covering the portion of the Work completed as of the date indicated, and payments on account of this Contract shall be due within thirty (30) days after the last day of the period for which payment is requested. The Contractor shall submit the application for payment to the Architect/Engineer on State forms SBP-7.2, Certificate for Contractor's Payment, or such other format as the State Buildings Programs shall approve, in an itemized format in accordance with the schedule of values or a cost loaded CPM when required, supported to the extent reasonably required by the Architect/Engineer or the Principal Representative by receipts or other vouchers, showing payments for materials and labor, prior payments and payments to be made to Subcontractors and such other evidence of the Contractor’s right to payments as the Architect/Engineer or Principal Representative may direct.

If payments are made on account of materials not incorporated in the Work but delivered and suitably stored at the site, or at some other location agreed upon in writing, such payments shall be conditioned upon submission by the Contractor of bills of sale or such other procedure as will establish the Principal Representative’s title to such material or otherwise adequately protect the Principal Representative’s interests, and shall provide proof of insurance whenever requested by the Principal Representative or the Architect/Engineer, and shall be subject to the right to inspect the materials at the request of either the Architect/Engineer or the Principal Representative.

All applications for payment, except the final application, and the payments there under, shall be subject to correction in the next application rendered following the discovery of any error.

B. ARCHITECT/ENGINEER CERTIFICATION

In accordance with the Architect/Engineer’s agreement with the Principal Representative, the Architect/Engineer after appropriate observation of the progress of the work shall certify to the Principal Representative the amount that the Contractor is entitled to, and forward the application to the Principal Representative. If the Architect/Engineer certifies an amount different from the amount requested or otherwise alters the Contractor’s application for payment, a copy shall be forwarded to the Contractor.

If the Architect/Engineer is unable to certify all or portions of the amount requested due to the absence or lack of required supporting evidence, the Architect/Engineer shall advise the Contractor of the deficiency. If the deficiency is not corrected at the end of ten (10) days, the Architect/Engineer may either certify the remaining amounts properly supported to which the Contractor is entitled, or return the application for payment to the Contractor for revision with a written explanation as to why it could not be certified.

C. RETAINAGE WITHHELD

Unless otherwise provided in the Supplementary General Conditions, an amount equivalent to ten percent (10%) of the amount shown to be due the Contractor on each application for payment shall be withheld until fifty percent (50%) of the work required by the Contract has been performed. Thereafter, the remaining Certificates for Contractor's Payment (SBP-7.2) shall be paid without retaining additional funds, if in the opinion of the Architect/Engineer and the Principal Representative, satisfactory progress is being made in the Work. The withheld percentage of the contract price of any such work, improvement, or construction shall be administered according to § 24-91-101, et seq., C.R.S., as amended, and except as provided in § 24-91-103, C.R.S., as amended, and Article 31D, shall be retained until the Work or discrete portions of the Work, have been completed satisfactorily, finally or partially accepted, and advertised for final settlement as further provided in Article 41.

D. RELEASE OF RETAINAGE

The Contractor may, for satisfactory and substantial reasons shown to the Principal Representative’s satisfaction, make a written request to the Principal Representative and the Architect/Engineer for release of part or all of the withheld percentage applicable to the work of a Subcontractor which has
completed the subcontracted work in a manner finally acceptable to the Architect/Engineer, the Contractor, and the Principal Representative. Any such request shall be supported by a written approval from the Surety furnishing the Contractor’s bonds and any surety that has provided a bond for the Subcontractor. The release of any such withheld percentage shall be further supported by such other evidence as the Architect/Engineer or the Principal Representative may require, including but not limited to, evidence of prior payments made to the Subcontractor, copies of the Subcontractor’s contract with the Contractor, any applicable warranties, as-built information, maintenance manuals and other customary close-out documentation. Neither the Principal Representative nor the Architect Engineer shall be obligated to review such documentation nor shall they be deemed to assume any obligations to third parties by any review undertaken.

The Contractor’s obligation under these General Conditions to guarantee work for one year from the date of the Notice of Substantial Completion or the date of any Notice of Partial Substantial Completion of the applicable portion or phase of the Project, shall be unaffected by such partial release; unless a Notice of Partial Substantial Completion is issued for the work subject to the release of retainage.

Any rights of the Principal Representative which might be terminated by or from the date of any final acceptance of the Work, whether at common law or by the terms of this Contract, shall not be affected by such partial release of retainage prior to any final acceptance of the entire Project.

The Contractor remains fully responsible for the Subcontractor’s work and assumes any risk that might arise by virtue of the partial release to the Subcontractor of the withheld percentage, including the risk that the Subcontractor may not have fully paid for all materials, labor and equipment furnished to the Project.

If the Principal Representative considers the Contractor’s request for such release satisfactory and supported by substantial reasons, the Architect/Engineer shall make a “final inspection” of the applicable portion of the Project to determine whether the Subcontractor’s work has been completed in accordance with the Contract Documents. A final punch list shall be made for the Subcontractor’s work and the procedures of Article 41, Completion, Final Inspection, Acceptance and Settlement, shall be followed for that portion of the work, except that advertisement of the intent to make final payment to the Subcontractor shall be required only if the Principal Representative has reason to believe that a supplier or Subcontractor to the Subcontractor for which the request is made, may not have been fully paid for all labor and materials furnished to the Project.

ARTICLE 32. CERTIFICATES FOR PAYMENTS
State Form SBP-7.2, Certificate For Contractor’s Payment, and its continuation detail sheets, when submitted, shall constitute the Certificate of Contractor’s Application for Payment, and shall be a representation by the Contractor to the Principal Representative that the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and materials for which payment is requested have been incorporated into the Project except as noted in the application. If requested by the Principal Representative the Certificate of Contractor’s Application for Payment shall be sworn under oath and notarized.

ARTICLE 33. PAYMENTS WITHHELD
The Architect/Engineer, the Principal Representative or State Buildings Programs may withhold, or on account of subsequently discovered evidence nullify, the whole or any part of any application on account of, but not limited to any of the following:

1. Defective work not remedied;
2. Claims filed or reasonable evidence indicating probable filing of claims;
3. Failure of the Contractor to make payments to Subcontractors for material or labor;
4. A reasonable doubt that the Contract can be completed for the balance of the contract price then unpaid;
5. Damage or injury to another contractor or any other person, persons or property except to the extent of coverage by a policy of insurance;
6. Failure to obtain necessary permits or licenses or to comply with applicable laws, ordinances, codes, rules or regulations or the directions of the Architect/Engineer;
7. Failure to submit a monthly construction schedule;
8. Failure of the Contractor to keep work progressing in accordance with the time schedule;
9. Failure to keep a superintendent on the work;
10. Failure to maintain as built drawings of the work in progress;
11. Unauthorized deviations by the Contractor from the Contract Documents; or
12. On account of liquidated damages.

In addition, the Architect Engineer, Principal Representative or State Buildings Programs may withhold or nullify the whole or any part of any application for any reason noted elsewhere in these General Conditions of the Contract. Nullification shall mean reduction of amounts shown as previously paid on the application. The amount withheld or nullified may be in such amount as the Architect/Engineer or the Principal Representative estimates to be required to allow the State to accomplish the Work, cure the failure and cover any damages or injuries, including an allowance for attorneys fees and costs where appropriate. When the grounds for such withholding or nullifying are removed, payment shall be made for the amounts thus withheld or nullified on such grounds.

ARTICLE 34. DEDUCTIONS FOR UNCORRECTED WORK
If the Architect/Engineer and the Principal Representative deem it inexpedient to correct work injured or not performed in accordance with the Contract Documents, the Principal Representative may, after consultation with the Architect/Engineer and ten (10) days’ Notice to the Contractor of intent to do so, make reasonable reductions from the amounts otherwise due the Contractor on the next application for payment. Notice shall specify the amount or terms of any contemplated reduction. The Contractor may during this period elect to correct or perform the work. If the Contractor does not elect to correct or perform the work, an equitable deduction from the Contract sum shall be made by Change Order, in accordance with Article 35, Changes In The Work, unilaterally if necessary. If either party elects facilitation of this issue after Notice is given, the ten-day notice period shall be extended and tolled until facilitation has occurred.

ARTICLE 35. CHANGES IN THE WORK
The Principal Representative, or such other Procurement Officer as the Principal Representative may designate, without invalidating the Agreement, and with the approval of State Buildings Programs and the State Controller, may order extra work or make changes with or without the consent of the Contractor as hereafter provided, by altering, adding to or deducting from the Work, the Contract sum being adjusted accordingly. All such changes in the Work shall be within the general scope of and be executed under the conditions of the Contract, except that any claim for extension of time made necessary due to the change or any claim of other delay or other impacts caused by or resulting from the change in the Work shall be presented by the Contractor and adjusted by Change Order to the extent known at the time such change is ordered and before proceeding with the extra or changed work. Any claims for extension of time or of delay or other impacts, and any costs associated with extension of time, delay or other impacts, which are not presented before proceeding with the change in the Work, and which are not adjusted by Change Order to the extent known, shall be waived.

The Architect/Engineer shall have authority to make minor changes in the Work, not involving extra cost, and not inconsistent with the intent of the Contract Documents, but otherwise, except in an emergency endangering life or property, no extra work or change in the Contract Documents shall be made unless by 1) a written Change Order, approved by the Principal Representative, State Buildings Programs, and the State Controller prior to proceeding with the changed work; or 2) by an Emergency Field Change Order approved by the Principal Representative and State Buildings Programs as hereafter provided in Article 35C, Emergency Field Ordered Changed Work; or 3) by an allocation in writing of any allowance already provided in the encumbered contract amount, the Contract sum being later adjusted to decrease the Contract sum by any unallocated or unexpended amounts remaining in such allowance. No change to the Contract sum shall be valid unless so ordered.
A. THE VALUE OF CHANGED WORK

1. The value of any extra work or changes in the Work shall be determined by agreement in one or more of the following ways:
   a. By estimate and acceptance of a lump-sum amount;
   b. By unit prices specified in the Agreement, or subsequently agreed upon, that are extended by specific quantities;
   c. By actual cost plus a fixed fee in a lump sum amount for profit, overhead and all indirect and off-site home office costs, the latter amount agreed upon in writing prior to starting the extra or changed work.

2. Where the Contractor and the Principal Representative cannot agree on the value of extra work, the Principal Representative may order the Contractor to perform the changes in the Work and a Change Order may be unilaterally issued based on an estimate of the change in the Work prepared by the Architect/Engineer. The value of the change in the Work shall be the Principal Representative’s determination of the amount of equitable adjustment attributable to the extra work or change. The Principal Representative’s determination shall be subject to appeal by the Contractor pursuant to the claims process in Article 36, Claims. The Principal Representative is the Procurement Officer for purposes of all of the remedies provisions of the Contract.

3. Except as otherwise provided in Article 35B, Detailed Breakdown, below, the Cost Principles of the Colorado Procurement Rules in effect on the date of this Contract, pursuant to § 24-107-101, C.R.S., as amended, shall govern all Contract changes.

B. DETAILED BREAKDOWN

In all cases where the value of the extra or changed work is not known based on unit prices in the Contractor’s bid or the Agreement, a detailed change proposal shall be submitted by the Contractor on a Change Order Proposal (SC-6.312), or in such other format as the State Buildings Program approves, with which the Principal Representative may require an itemized list of materials, equipment and labor, indicating quantities, time and cost for completion of the changed work.

Such detailed change proposals shall be stated in lump sum amounts and shall be supported by a separate breakdown, which shall include estimates of all or part of the following when requested by the Architect/Engineer or the Principal Representative:

1. Materials, indicating quantities and unit prices including taxes and delivery costs if any (separated where appropriate into general, mechanical and electrical and/or other Subcontractors’ work; and the Principal Representative may require in its discretion any significant subcontract costs to be similarly and separately broken down).
2. Labor costs, indicating hourly rates and time and labor burden to include Social Security and other payroll taxes such as unemployment, benefits and other customary burdens.
3. Costs of project management time and superintendence time of personnel stationed at the site, and other field supervision time, but only where a time extension, other than a weather delay, is approved as part of the Change Order, and only where such project management time and superintendence time is directly attributable to and required by the change; provided however that additional cost of on-site superintendence shall be allowable whenever in the opinion of the Architect/Engineer the impact of multiple change requests to be concurrently performed will result in inadequate levels of supervision to assure a proper result unless additional superintendence is provided.
4. Construction equipment (including small tools). Expenses for equipment and fuel shall be based on customary commercially reasonable rental rates and schedules. Equipment and hand tool costs shall not include the cost of items customarily owned by workers.
5. Workers’ compensation costs, if not included in labor burden.
6. The cost of commercial general liability and property damage insurance premiums but only to the extent charged the Contractor as a result of the changed work.
7. Overhead and profit, as hereafter specified.
8. Builder’s risk insurance premium costs.
9. Bond premium costs.
10. Testing costs not otherwise excluded by these General Conditions.
11. Subcontract costs.

Unless modified in the Supplementary General Conditions, overhead and profit shall not exceed the percentages set forth in the table below.

<table>
<thead>
<tr>
<th>To the Contractor or to Subcontractors for the portion of work performed with their own forces:</th>
<th>OVERHEAD</th>
<th>PROFIT</th>
<th>COMMISSION</th>
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<tr>
<td>10%</td>
<td>5%</td>
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<table>
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<tr>
<th>To the Contractor or to Subcontractors for work performed by others at a tier immediately below either of them:</th>
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<tbody>
<tr>
<td>5%</td>
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Overhead shall include: a) insurance premium for policies not purchased for the Project and itemized above, b) home office costs for office management, administrative and supervisory personnel and assistants, c) estimating and change order preparation costs, d) incidental job burdens, e) legal costs, f) data processing costs, g) interest costs on capital, h) general office expenses except those attributable to increased rental expenses for temporary facilities, and all other indirect costs, but shall not include the Social Security tax and other direct labor burdens. The term “work” as used in the proceeding table shall include labor, materials and equipment and the “Commission” shall include all costs and profit for carrying the subcontracted work at the tiers below except direct costs as listed in items 1 through 11 above if any.

On proposals for work involving both additions and credits in the amount of the Contract sum, the overhead and profit will be allowed on the net increase only. On proposals resulting in a net deduct to the amount of the Contract sum, profit on the deducted amount shall be returned to the Principal Representative at fifty percent (50%) of the rate specified. The inadequacy of the profit specified shall not be a basis for refusal to submit a proposal.

Except in the case of Change Orders or Emergency Field Change Orders agreed to on the basis of a lump sum amount or unit prices as described in paragraphs 35A1 and 35A2 above, The Value of Changed Work, the Contractor shall keep and present a correct and fully auditable account of the several items of cost, together with vouchers, receipts, time cards and other proof of costs incurred, summarized on a Change Order form (SC-6.31) using such format for supporting documentation as the Principal Representative and State Buildings Programs approve. This requirement applies equally to work done by Subcontractors. Only auditable costs shall be reimbursable on Change Orders where the value is determined on the basis of actual cost plus a fixed fee pursuant to paragraph 35A3 above, or where unilaterally determined by the Principal Representative on the basis of an equitable adjustment in accordance with the Procurement Rules, as described above in Article 35A, The Value Of Changed Work.

Except for proposals for work involving both additions and credits, changed work shall be adjusted and considered separately for work either added or omitted. The amount of adjustment for work omitted shall be estimated at the time it is directed to be omitted, and when reasonable to do so, the agreed adjustment shall be reflected on the schedule of values used for the next Contractor’s application for payment.

The Principal Representative reserves the right to contract with any person or firm other than the Contractor for any or all extra work; however, unless specifically required in the Contract Documents, the Contractor shall have no responsibility without additional compensation to supervise or coordinate the work of persons or firms separately contracted by the Principal Representative.
C. EMERGENCY FIELD CHANGE ORDERED WORK

The Principal Representative, without invalidating the Agreement, and with the approval of State Buildings Programs and without the approval of the State Controller, may order extra work or make changes in the case of an emergency that is a threat to life or property or where the likelihood of delays in processing a normal Change Order will result in substantial delays and or significant cost increases for the Project. Emergency Field Orders are not to be used solely to expedite normal Change Order processing absent a clear showing of a high potential for significant and substantial cost or delay. Such changes in the Work may be directed through issuance of an Emergency Field Change Order signed by the Contractor, the Principal Representative (or by a designee specifically appointed to do so in writing), and approved by the Director of State Buildings Program or his or her delegate. The change shall be directed using an Emergency Field Change Order form (SC-6.31E).

If the amount of the adjustment of the Contract price and time for completion can be determined at the time of issuance of the Emergency Field Change Order, those adjustments shall be reflected on the face of the Emergency Field Change Order. Otherwise, the Emergency Field Change Order shall reflect a not to exceed (NTE) amount for any schedule adjustment (increasing or decreasing the time for completion) and an NTE amount for any adjustment to Contract sum, which NTE amount shall represent the maximum amount of adjustment to which the Contractor will be entitled, including direct and indirect costs of changed work, as well as any direct or indirect costs attributable to delays, inefficiencies or other impacts arising out of the change. Emergency Field Change Orders directed in accordance with this provision need not bear the approval signatures of the State Controller.

On Emergency Field Change Orders where the price and schedule have not been finally determined, the Contractor shall submit final costs for adjustment as soon as practicable. No later than seven (7) days after issuance, except as otherwise permitted, and every seven days thereafter, the Contractor shall report all costs to the Principal Representative and the Architect/Engineer. Weekly cost reports and the final adjustment of the Emergency Field Change Orders amount and the adjustment to the Project time for completion shall be prepared in accordance with the procedures described in Article 35A, The Value of Changed Work, and B, Detailed Breakdown, above. Unless otherwise provided in writing signed by the Director of State Buildings Programs to the Principal Representative and the Contractor, describing the extent and limits of any greater authority, individual Emergency Field Change Orders shall not be issued for more than $25,000, nor shall the cumulative value of Emergency Field Change Orders exceed an amount of $100,000.

D. APPROPRIATION LIMITATIONS - § 24-91-103.6, C.R.S., as amended

The amount of money appropriated, as shown on the Agreement (SC 6.21), is equal to or in excess of the Contract amount. No Change Order, Emergency Field Change Order, or other type of order or directive shall be issued by the Principal Representative, or any agent acting on his or her behalf, which directs additional compensable work to be performed, which work causes the aggregate amount payable under the Contract to exceed the amount appropriated for the original Contract, as shown on the Agreement (SC-6.13), unless one of the following occurs: (1) the Contractor is provided written assurance from the Principal Representative that sufficient additional lawful appropriations exist to cover the cost of the additional work; or (2) the work is covered by a contractor remedy provision under the Contract, such as a claim for extra cost. By way of example only, no assurance is required for any order, directive or instruction by the Architect/Engineer or the Principal Representative to perform work which is determined to be within the performance required by the Contract Documents; the Contractor’s remedy shall be as described elsewhere in these General Conditions.

Written assurance shall be in the form of an Amendment to the Contract reciting the source and amount of such appropriation available for the Project. No remedy granting provision of this Contract shall obligate the Principal Representative to seek appropriations to cover costs in excess of the amounts recited as available to pay for the work to be performed.
ARTICLE 36. CLAIMS

It is the intent of these General Conditions to provide procedures for speedy and timely resolution of disagreements and disputes at the lowest level possible. In the spirit of on the job resolution of job site issues, the parties are encouraged to use the partnering processes of Article 2D, Partnering, Communications and Cooperation, before turning to the more formal claims processes described in this Article 36, Claims. The use of non-binding dispute resolution, whether through the formal processes described in Article 39, Non-Binding Dispute Resolution – Facilitated Negotiations, or through less formal alternative processes developed as part of a partnering plan, are also encouraged. Where such process cannot resolve the issues in dispute, the claims process that follows is intended to cause the issues to be presented, decided and where necessary, documented in close proximity to the events from which the issues arise. To that end, and in summary of the remedy granting process that follows commencing with the next paragraph of this Article 36, Claims, the Contractor shall 1) first, seek a decision by the Architect/Engineer, and 2) shall second, informally present the claim to Principal Representative as described hereafter, and 3) failing resolution in the field, give Notice of intent to exercise statutory rights of review of a formal contract controversy, and 4) seek resolution outside the Contract as provided by the Procurement Code.

If the Contractor claims that any instructions, by detailed drawings, or otherwise, or any other act or omission of the Architect/Engineer or Principal Representative affecting the scope of the Contractor’s work, involve extra cost, extra time or changes in the scope of the Work under this Contract, the Contractor shall have the right to assert a claim for such costs or time, provided that before either proceeding to execute such work (except in an emergency endangered life or property), or filing a Notice of claim, the Contractor shall have obtained or requested a written decision of the Architect/Engineer following the procedures as provided in Article 6A and B, Architect/Engineer Decisions and Judgments, respectively; provided, however, that in the case of a directed change in the Work pursuant to Article 36A4, no written judgment or decision of the Architect/Engineer is required. If the Contractor is delayed by the lack of a response to a request for a decision by the Architect/Engineer, the Contractor shall give Notice in accordance with Article 38, Delays And Extensions Of Time.

Unless it is the Architect/Engineer’s judgment and determination that the work is not included in the performance required by the Contract Documents, the Contractor shall proceed with the work as originally directed. Where the Contractor’s claim involves a dispute concerning the value of work unilaterally directed pursuant to Article 35A4 the Contractor shall also proceed with the work as originally directed while his or her claim is being considered.

The Contractor shall give the Principal Representative and the Architect/Engineer Notice of any claim promptly after the receipt of the Architect/Engineer’s decision, but in no case later than three (3) business days after receipt of the Architect/Engineer’s decision (or no later than ten (10) days from the date of the Contractor’s request for a decision when the Architect/Engineer fails to decide as provided in Article 6). The Notice of claim shall state the grounds for the claim and the amount of the claim to the extent known in accordance with the procedures of Article 35, Changes In The Work. The period in which Notice must be given may be extended by the Principal Representative if requested in writing by the Contractor with good cause shown, but any such extension to be effective shall be in writing.

The Principal Representative shall respond in writing, with a copy to the Architect/Engineer, within a reasonable time, and except where a request for facilitation of negotiation has been made as hereafter provided, in no case later than seven (7) business days (or at such other time as the Contractor and Principal Representative agree) after receipt of the Contractor’s Notice of claim regarding such instructions or alleged act or omission. If no response to the Contractor’s claim is received within seven (7) business days of Contractor’s Notice (or at such other time as the Contractor and Principal Representative agree) and the instructions have not been retracted, it shall be deemed that the Principal Representative has denied the claim.

The Principal Representative may grant or deny the claim in whole or in part, and a Change Order shall be issued if the claim is granted. To the extent any portion of claim is granted where costs are not clearly shown, the Principal Representative may direct that the value of that portion of the work be determined by
any method allowed in Article 35A, The Value Of Changed Work. Except in the case of a deemed denial, the Principal Representative shall provide a written explanation regarding any portion of the Contractor's claim that is denied.

If the Contractor disagrees with the Principal Representative’s judgment and determination on the claim and seeks an equitable adjustment of the Contract sum or time for performance, he or she shall give Notice of intent to exercise his or her statutory right to seek a decision on the contract controversy within ten (10) days of receipt of the Principal Representative’s decision denying the claim. A “contract controversy,” as such term is used in the Colorado Procurement Code, § 24-109-106, C.R.S., shall not arise until the initial claim process described above in this Article 36 has been properly exhausted by the Contractor. The Contractor's failure to proceed with work directed by the Architect/Engineer or to exhaust the claim process provided above in this Article 36, shall constitute an abandonment of the claim by the Contractor and a waiver of the right to contest the decision in any forum.

At the time of filing the Notice of intent to exercise his or her statutory right to seek a decision on the contract controversy, the Contractor may request that the Principal Representative defer a decision on the contract controversy until a later date or until the end of the Project. If the Principal Representative agrees, he or she shall so advise the Contractor in writing. If no such request is made, or if the Principal Representative does not agree to such a request, the Principal Representative shall render a written decision within twenty (20) business days and advise the Contractor of the reasons for any denial. Unless the claim has been decided by the Principal Representative (as opposed to delegates of the Principal Representative), the person who renders the decision on this statutory contract controversy shall not be the same person who decided the claim. To the extent any portion of the contract controversy is granted where costs are not clearly shown, the Principal Representative may direct that the value of that portion of the work be determined by any method allowed in Article 35A, The Value Of Changed Work. In the event of a denial the Principal Representative shall give Notice to the Contractor of his or her right to administrative and judicial reviews as provided in the Colorado Procurement Code, § 24-109-201 et seq, C.R.S., as amended. If no decision regarding the contract controversy is issued within twenty (20) business days of the Contractor's giving Notice (or such other date as the Contractor and Principal Representative have agreed), and the instructions have not been retracted or the alleged act or omission have not been corrected, it shall be deemed that the Principal Representative has ruled by denial on the contract controversy. Except in the case of a deemed denial, the Principal Representative shall provide an explanation regarding any portion of the contract controversy that involves denial of the Contractor's claim.

Either the Contractor or the Principal Representative may request facilitation of negotiations concerning the claim or the contract controversy, and if requested, the parties shall consult and negotiate before the Principal Representative decides the issue. Any request for facilitation by the Contractor shall be made at the time of the giving of Notice of the claim or Notice of the contract controversy. Facilitation shall extend the time for the Principal Representative to respond by commencing the applicable period at the completion of the facilitated negotiation, which shall be the last day of the parties’ meeting, unless otherwise agreed in writing.

Disagreement with the decision of the Architect Engineer, or the decision of the Principal Representative to deny any claim or denying the contract controversy, shall not be grounds for the Contractor to refuse to perform the work directed or to suspend or terminate performance. During the period that any claim or contract controversy decision is pending under this Article 36, Claims, the Contractor shall proceed diligently with the work directed.

In all cases where the Contractor proceeds with the work and seeks equitable adjustment by filing a claim and or statutory appeal, the Contractor shall keep a correct account of the extra cost, in accordance with Article 35B, Detailed Breakdown supported by receipts. The Principal Representative shall be entitled to reject any claim or contract controversy whenever the foregoing procedures are not followed and such accounts and receipts are not presented.

The payments to the Contractor in respect of such extra costs shall be limited to reimbursement for the current additional expenditure by the Contractor made necessary by the change in the work, plus a
reasonable amount for overhead and profit, determined in accordance with Article 35B, Detailed Breakdown, determined solely with reference to the additional work, if any, required by the change.

**ARTICLE 37. DIFFERING SITE CONDITIONS**

**A. NOTICE IN WRITING**

The Contractor shall promptly, and where possible before conditions are disturbed, give the Architect/Engineer and the Principal Representative Notice in writing of:

1. subsurface or latent physical conditions at the site differing materially from those indicated in or reasonably assumed from the information provided in the Contract Documents; and,
2. unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents.

The Architect/Engineer shall promptly investigate the conditions, and if it is found that such conditions do materially so differ and cause an increase or decrease in the Contractor’s costs of performance of any part of the work required by the Contract Documents, whether or not such work is changed as a result of such conditions, an equitable adjustment shall be made and the Contract sum shall be modified in accordance with Article 35, Changes In The Work.

If the time required for completion of the work affected by such materially differing conditions will extend the work on the critical path as indicated on the CPM schedule, the time for completion shall also be equitably adjusted.

**B. LIMITATIONS**

No claim of the Contractor under this clause shall be allowed unless the Contractor has given the Notice required in Article 37A, Notice In Writing, above. The time prescribed for presentation and adjustment in Articles 36, Claims and 38, Delays And Extensions Of Time, shall be reasonably extended by the State to the extent required by the nature of the differing conditions; provided, however, that even when so extended no claim by the Contractor for an equitable adjustment hereunder shall be allowed if not quantified and presented prior to the date the Contractor requests a final inspection pursuant to Article 41A, Notice Of Completion.

**ARTICLE 38. DELAYS AND EXTENSIONS OF TIME**

If the Contractor is delayed at any time in the progress of the Work by any act or neglect of the State of Colorado or the Architect/Engineer, or of any employee or agent of either, or by any separately employed Contractor or by strikes, lockouts, fire, unusual delay in transportation, unavoidable casualties or any other causes beyond the Contractor’s control, including weather delays as defined below, the time of Completion of the Work shall be extended for a period equal to such portion of the period of delays directly affecting the completion of the Work as the Contractor shall be able to show he or she could not have avoided by the exercise of due diligence.

The Contractor shall provide Notice in writing to the Architect/Engineer, the Principal Representative and State Buildings Programs within three (3) business days from the beginning of such delay and shall file a written claim for an extension of time within seven (7) business days after the period of such delay has ceased, otherwise, any claim for an extension of time is waived.

Provided that the Contractor has submitted reasonable schedules for approval when required by Article 12, Requests for Information and Schedules, if no schedule is agreed to fixing the dates on which the responses to requests for information or detail drawings will be needed, or Shop Drawings, Product Data or Samples are to be reviewed as required or allowed by Article 12B, Schedules, no extension of time will be allowed for the Architect/Engineer’s failure to furnish such detail drawings as needed, or for the failure to initially review Shop Drawings, Product Data or Samples, except in respect of that part of any delay in furnishing detail drawings or instructions extending beyond a reasonable period after written demand for such detailed drawings or instructions is received by the Architect/Engineer. In any event, any claim for an extension of time for such cause will be recognized only to the extent of delay directly caused by failure to furnish detail.
drawings or instructions or to review Shop Drawings, Product Data or Samples pursuant to schedule, after such demand.

All claims for extension of time due to a delay claimed to arise or result from ordered changes in the scope of the Work, or due to instructions claimed to increase the scope of the Work, shall be presented to the Architect/Engineer, the Principal Representative and State Buildings Programs as part of a claim for extra cost, if any, in accordance with Article 36, Claims, and in accordance with the Change Order procedures required by Article 35, Changes In The Work.

Except as otherwise provided in this paragraph, no extension of time shall be granted when the Contractor has failed to utilize a CPM schedule or otherwise identify the Project’s critical path as specified in Article 12, Requests for Information and Schedules, or has elected not to do so when allowed by the Supplementary General Conditions or the Specifications to use less sophisticated scheduling tools, or has failed to maintain such a schedule. Delay directly affecting the completion of the Work shall result in an extension of time only to the extent that completion of the Work was affected by impacts to the critical path shown on Contractor’s CPM schedule. Where the circumstances make it indisputable in the opinion of the Architect/Engineer that the delay affected the completion of the Work so directly that the additional notice of the schedule impact by reference to a CPM schedule was unnecessary, a reasonable extension of time may be granted.

Extension of the time for completion of the Work will be granted for delays due to weather conditions only when the Contractor demonstrates that such conditions were more severe and extended than those reflected by the ten-year average for the month, as evidenced by the Climatological Data, U. S. Department of Commerce, for the Project area.

Extensions of the time for completion of the Work due to weather will be granted on the basis of one and three tenths (1.3) calendar days for every day that the Contractor would have worked but was unable to work, with each separate extension figured to the nearest whole calendar day.

For weather delays and delays caused by events, acts or omissions not within the control of the Principal Representative or any person acting on the Principal Representative’s behalf, the Contractor shall be entitled to an extension of time only and shall not be entitled to recovery of additional cost due to or resulting from such delays. This Article does not, however, preclude the recovery of damages for delay by either party under other provisions in the Contract Documents.

ARTICLE 39. NON-BINDING DISPUTE RESOLUTION – FACILITATED NEGOTIATIONS

The Contractor and Principal Representative agree to designate one or more mutually acceptable persons willing and able to facilitate negotiations and communications for the resolution of conflicts, disagreements or disputes between them at the specific request of either party with regard to any Project decision of either of them or any decision of the Architect/Engineer. The designation of such person(s) shall not carry any obligation to use their services except that each party agrees that if the other party requests the intervention of such person(s) with respect to any such conflict, dispute or disagreement, the non-requesting party shall participate in good faith attempts to negotiate a resolution of the issue in dispute. If the parties cannot agree on a mutually acceptable person to serve in this capacity one shall be so appointed; provided, however, that either party may request the director of State Buildings Programs to appoint such a person, who, if appointed, shall be accepted for this purpose by both the Contractor and the Principal Representative.

The cost, if any, of the facilitative services of the person(s) so designated shall be shared if the parties so agree in any partnering plan; or in the absence of agreement the cost shall be borne by the party requesting the facilitation of negotiation.

Any dispute, claim, question or disagreement arising from or relating to the Contract or an alleged breach of the Contract may be subject to a request by either party for facilitated negotiation subject to the limitations hereafter listed, and the parties shall participate by consultation and negotiation with each other, as guided by the facilitator and with recognition of their mutual interests, in an attempt to reach an equitable solution satisfactory to both parties.
The obligation to participate in facilitated negotiations shall be as described above and elsewhere in these General Conditions, as by way of example in Article 36, Claims, or Article 34, Deductions for Uncorrected Work, and to the extent not more particularly described or limited elsewhere, each party’s obligations shall be as follows:

1. a party shall not initiate communication with the facilitator regarding the issues in dispute; except that any request for facilitation shall be made in writing with copies sent, faxed or delivered to the other party;
2. a party shall prepare a brief written description of its position if so requested by the facilitator (who may elect to first discuss the parties’ positions with each party separately in the interest of time and expense);
3. a party shall respond to any reasonable request for copies of documents requested by the facilitator, but such requests, if voluminous, may consist of an offer to allow the facilitator access to the parties' documents;
4. a party shall review any meeting agenda proposed by a facilitator and endeavor to be informed on the subjects to be discussed;
5. a party shall meet with the other party and the facilitator at a mutually acceptable place and time, or, if none can be agreed to, at the time and place designated by the facilitator for a period not to exceed four hours unless the parties agree to a longer period;
6. a party shall endeavor to assure that any facilitation meeting shall be attended by any other persons in their employ that the facilitator requests be present, if reasonably available, including the Architect/Engineer;
7. each party shall participate in such facilitated face-to-face negotiations of the issues in dispute through persons fully authorized to resolve the issue in dispute;
8. each party shall be obligated to participate in negotiations requested by the other party and to perform the specific obligations described in paragraphs (1) through (10) this Article 39, Facilitated Negotiation, no more than three times during the course of the Project;
9. neither party shall be under any obligation to resolve any issue by facilitated negotiation, but each agrees to participate in good faith and the Principal Representative shall direct the Architect/Engineer to appropriately document any resolution or agreement reached and to execute any Amendment or Change Order to the Contract necessary to implement their agreement; and,
10. any discussions and documents prepared exclusively for use in the negotiations shall be deemed to be matters pertaining to settlement negotiations and shall not be subsequently available in further proceedings except to the extent of any documented agreement.

In accordance with State Fiscal Rules and Article 52F, Choice of Law; No Arbitration, nothing in this Article 39 shall be deemed to call for arbitration or otherwise obligate the State to participate in any form of binding alternative dispute resolution.

A partnering plan developed as described in Article 2D, Communications and Cooperation, may modify or expand the requirements of this Article but may not reduce the obligation to participate in facilitated negotiations when applicable. In the case of small projects estimated to be valued under $500,000, the requirements of this Article may be deleted from this Contract, by modification in Article 54, Optional Provisions And Elections. When so modified, the references to the parties’ right to elect facilitated negotiation elsewhere in these General Conditions shall be deleted.

**ARTICLE 40. RIGHT OF OCCUPANCY**

The Principal Representative shall have the right to take possession of and to use any completed or partially completed portions of the Work, even if the time for completing the entire Work or portions of the Work has not expired and even if the Work has not been finally accepted, and the Contractor shall fully cooperate with the Principal Representative to allow such possession and use. Such possession and use shall not constitute an acceptance of such portions of the Work.

Prior to any occupancy of the Project, an inspection shall be made by the Architect/Engineer, State Buildings Programs and the Contractor. Such inspection shall be made for the purpose of ensuring that the building is
secure, protected by operation safety systems as designed, operable exits, power, lighting and HVAC systems, and otherwise ready for the occupancy intended and the Notice of Substantial Completion has been issued for the occupancy intended. The inspection shall also document existing finish conditions to allow assessment of any damage by occupants. The Contractor shall assist the Principal Representative in completing and executing State Form SBP-01, Approval of Occupancy/Use, prior to the Principal Representative’s possession and use. Any and all areas so occupied will be subject to a final inspection when the Contractor complies with Article 41, Completion, Final Inspection, Acceptance and Settlement.

ARTICLE 41. COMPLETION, FINAL INSPECTION, ACCEPTANCE AND SETTLEMENT

A. NOTICE OF COMPLETION

When the Work, or a discrete physical portion of the Work (as hereafter described) which the Principal Representative has agreed to accept separately, is substantially complete and ready for final inspection, the Contractor shall file a written Notice with the Architect/Engineer that the Work, or such discrete physical portion, in the opinion of the Contractor, is substantially complete under the terms of the Contract. The Contractor shall prepare and submit with such Notice a comprehensive list of items to be completed or corrected prior to final payment, which shall be subject to review and additions as the Architect/Engineer or the Principal Representative shall determine after inspection. If the Architect/Engineer or the Principal Representative believe that any of the items on the list of items submitted, or any other item of work to be corrected or completed, or the cumulative number of items of work to be corrected or completed, will prevent a determination that the Work is substantially complete, those items shall be completed by the Contractor and the Notice shall then be resubmitted.

B. FINAL INSPECTION

Within ten (10) days after the Contractor files written Notice that the Work is substantially complete, the Architect/Engineer, the Principal Representative, and the Contractor shall make a “final inspection” of the Project to determine whether the Work is substantially complete and has been completed in accordance with the Contract Documents. State Buildings Programs shall be notified of the inspection not less than three (3) business days in advance of the inspection. The Contractor shall provide the Principal Representative and the Architect/Engineer an updated punch list in sufficient detail to fully outline the following:

1. work to be completed, if any; and
2. work not in compliance with the Drawings or Specifications, if any.

A final punch list shall be made by the Architect/Engineer in sufficient detail to fully outline to the Contractor:

1. work to be completed, if any;
2. work not in compliance with the Drawings or Specifications, if any; and
3. unsatisfactory work for any reason, if any.

The required number of copies of the final punch list will be countersigned by the authorized representative of the Principal Representative and will then be transmitted by the Architect/Engineer to the Contractor, the Principal Representative, and State Buildings Programs. The Architect/Engineer’s final punch list shall control over the Contractor’s preliminary punch list.

C. NOTICE OF SUBSTANTIAL COMPLETION

Notice of Substantial Completion shall establish the date of substantial completion of the Project. The Contractor acknowledges and agrees that because the departments, agencies and institutions of the State of Colorado are generally involved with the business of the public at large, greater care must be taken in establishing the date of substantial completion than might otherwise be the case to ensure that a project or building or discrete physical portion of the Work is fully usable and safe for public use, and that such care necessarily raises the standard by which the concept of substantial completion is applied for a public building.
The Notice of Substantial Completion shall not be issued until the following have been fully established:

1. All required building code inspections have been called for and the appropriate code officials have affixed their signatures to the Building Inspection Record indicating successful completion of all required code inspections;

2. All required corrections noted on the Building Inspection Record shall have been completed unless the Architect/Engineer, the Principal Representative and State Buildings Programs, in their complete and absolute discretion, all concur that the condition requiring the remaining correction is not in any way life threatening, does not otherwise endanger persons or property, and does not result in any undue inconvenience or hardship to the Principal Representative or the public;

3. The building, structure or Project can be fully and comfortably used by the Principal Representative and the public without undue interference by the Contractor’s employees and workers during the completion of the final punch list taking into consideration the nature of the public uses intended and taking into consideration any stage or level of completion of HVAC system commissioning or other system testing required by the Specifications to be completed prior to issuance of the Notice of Substantial Completion;

4. The Project has been fully cleaned as required by these General Conditions, and as required by any stricter requirements of the Specifications, and the overall state of completion is appropriate for presentation to the public; and

5. The Contractor has provided a schedule for the completion of each and every item identified on the punch list which specifies the Subcontractor or trade responsible for the work, and the dates the completion or correction of the item will be commenced and finished; such schedule will show completion of all remaining final punch list items within the period indicated in the Contract for final punch list completion prior to Final Acceptance, with the exception of only those items which are beyond the control of the Contractor despite due diligence. The schedule shall provide for a reasonable punch list inspection process. Unless liquidated damages have been specified in Article 54D(2), the cost to the Principal Representative, if any, for re-inspections due to failure to adhere to the Contractor’s proposed punch-list completion schedule shall be the responsibility of the Contractor and may be deducted by the Principal Representative from final amounts due to the Contractor.

Substantial completion of the entire Project shall not be conclusively established by a decision by the Principal Representative to take possession and use of a portion, or all of the Project, where portions of the Project cannot meet all the criteria noted above. Notice of Substantial Completion for the entire Project shall, however, only be withheld for substantial reasons when the Principal Representative has taken possession and uses all of the Project in accordance with the terms of Article 40, Right Of Occupancy. Failure to furnish the required completion schedule shall constitute a substantial reason for withholding the issuance of any Notice of Substantial Completion.

The Contractor shall have the right to request a final inspection of any discrete physical portion of the Project when in the opinion of the Architect/Engineer a final punch list can be reasonably prepared, without confusion as to which portions of the Project are referred to in any subsequent Notice of Partial Final Settlement which might be issued after such portion is finally accepted. Discrete physical portions of the Project may be, but shall not necessarily be limited to, such portions of the Project as separate buildings where a Project consists of multiple buildings. Similarly, an addition to an existing building where the Project also calls for renovation or remodeling of the existing building may constitute a discrete physical portion of the Project. In such circumstances, when in the opinion of the Principal Representative, the Architect/Engineer and State Buildings Programs, the requirements for issuance of a Notice of Substantial Completion can be satisfied with respect to the discrete portion of the Project, a partial Notice of Substantial Completion may be issued for such discrete physical portion of the Project. The ability to beneficially occupy a discrete physical portion of the Project shall also be considered.
D. NOTICE OF ACCEPTANCE

The Notice of Acceptance shall establish the completion date of the Project. It shall not be authorized until the Contractor shall have performed all of the work to allow completion and approval of the Pre-Acceptance Checklist (SBP-05).

Where partial Notices of Substantial Completion have been issued, partial Notices of Final Acceptance may be similarly issued when appropriate for that portion of the Work. Partial Notice of Final Acceptance may also be issued to exclude the work described in Change Orders executed during later stages of the Project where a later completion date for the Change Ordered work is expressly provided for in the Contract as amended by the Change Order, provided the work can be adequately described to allow partial advertisement of any Notice of Partial Final Settlement to be issued without confusion as to the work included for which final payment will be made.

E. SETTLEMENT

Final payment and settlement shall be made on the date fixed and published for such payment except as hereafter provided. The Principal Representative shall not authorize final payment until all items on the Pre-Acceptance check list (SBP-05) have been completed, the Notice of Acceptance issued, and the Notice of Contractors Settlement published. If the work shall be substantially completed, but Final Acceptance and completion thereof shall be prevented through delay in correction of minor defects, or unavailability of materials or other causes beyond the control of the Contractor, the Principal Representative in his or her discretion may release to the Contractor such amounts as may be in excess of three times the cost of completing the unfinished work or the cost of correcting the defective work, as estimated by the Architect/Engineer and approved by State Buildings Programs. Before the Principal Representative may issue the Notice of Contractor’s Settlement and advertise the Project for final payment, the Contractor shall have corrected all items on the punch list except those items for which delayed performance is expressly permitted, subject to withholding for the cost thereof, and shall have:

1. Delivered to the Architect/Engineer:
   a. All guarantees and warranties;
   b. All statements to support local sales tax refunds, if any;
   c. Three (3) complete bound sets of required operating maintenance instructions; and,
   d. One (1) set of as-built Contract Documents showing all job changes.

2. Demonstrated to the operating personnel of the Principal Representative the proper operation and maintenance of all equipment.

Upon completion of the foregoing the Project shall be advertised in accordance with the Notice of Contractor’s Settlement by two publications of Notice, the last publication appearing at least ten (10) days prior to the time of final settlement. Publication and final settlement should not be postponed or delayed solely by virtue of unresolved claims against the Project or the Contractor from Subcontractors, suppliers or materialmen based on good faith disputes; the resolution of the question of payment in such cases being directed by statute.

Except as hereafter provided, on the date of final settlement thus advertised, provided the Contractor has submitted a written Notice to the Architect/Engineer that no claims have been filed, and further provided the Principal Representative shall have received no claims, final payments and settlement shall be made in full. If any unpaid claim for labor, materials, rental machinery, tools, supplies or equipment is filed before payment in full of all sums due the Contractor, the Principal Representative and the State Controller shall withhold from the Contractor on the date established for final settlement, sufficient funds to insure the payment of such claim, until the same shall have been paid or withdrawn, such payment or withdrawal to be evidenced by filing a receipt in full or an order for withdrawal signed by the claimant or his or her duly authorized agent or assignee. The amount so withheld may be in the amount of 125% of the claims or such other amount as the Principal Representative reasonably deems necessary to cover expected legal expenses. Such withheld amounts shall be in addition to any
amount withheld based on the cost to compete unfinished work or the cost to repair defective work. However, as provided by statute, such funds shall not be withheld longer than ninety (90) days following the date fixed for final settlement with the Contractor, as set forth in the published Notice of Contractor’s Settlement, unless an action at law shall be commenced within that time to enforce such unpaid claim and a Notice of such action at law shall have been filed with the Principal Representative and the State Controller. At the expiration of the ninety (90) day period, the Principal Representative shall authorize the State Controller to release to the Contractor all other money not the subject of such action at law or withheld based on the cost to compete unfinished work or the cost to repair defective work.

Notices of Partial Final Settlement may be similarly advertised, provided all conditions precedent have been satisfied as though that portion of the work affected stood alone, a Notice of Partial Acceptance has been issued, and the consent of surety to the partial final settlement has been obtained in writing. Thereafter, partial final payments may be made to the Contractor subject to the same conditions regarding unpaid claims.

ARTICLE 42. GENERAL WARRANTY AND CORRECTION OF WORK AFTER ACCEPTANCE
The Contractor warrants that the materials used and the equipment furnished shall be new and of good quality unless specified to the contrary. The Contractor further warrants that the Work shall in all respects be free from material defects not permitted by the Specifications and shall be in accordance with the requirements of the Contract Documents. Neither the final certificate for payment nor any provision in the Contract Documents shall relieve the Contractor of responsibility for defects or faulty materials or workmanship. The Contractor shall be responsible to the Principal Representative for such warranties for the longest period permitted by any applicable statute of limitations.

In addition to these general warranties, and without limitation of these general warranties, for a period of one year after the date of any Notice of Substantial Completion, or any Notice of Partial Substantial Completion if applicable, the Contractor shall remedy defects, and faulty workmanship or materials, and work not in accordance with the Contract Documents which was not accepted at the time of the Notice of Final Acceptance, all in accordance with the provisions of Article 45, One-Year Guarantee And Special Guarantees And Warranties.

ARTICLE 43. LIENS
Colorado statutes do not provide for any right of lien against public buildings. In lieu thereof, § 38-26-107, C.R.S., provides adequate relief for any claimant having furnished labor, materials, rental machinery, tools, equipment, or services toward construction of the particular public work in that final payment may not be made to a Contractor until all such creditors have been put on Notice by publication in the public press of such pending payment and given opportunity for a period of up to ninety (90) days to stop payment to the Contractor in the amount of such claims.

ARTICLE 44. ONE-YEAR GUARANTEE AND SPECIAL GUARANTEES AND WARRANTIES
A. ONE-YEAR GUARANTEE OF THE WORK
The Contractor shall guarantee to remedy defects and repair or replace the Work for a period of one year from the date of the Notice of Substantial Completion or from the dates of any partial Notices of Substantial Completion issued for discrete physical portions of the Work. The Contractor shall remedy any defects due to faulty materials or workmanship and shall pay for, repair and replace any damage to other work resulting there from, which shall appear within a period of one year from the date of such Notice(s) of Substantial Completion. The Contractor shall also remedy any deviation from the requirements of the Contract Documents which shall later be discovered within a period of one year from the date of the Notice of Substantial Completion; provided, however, that the Contractor shall not be required to remedy deviations from the requirements of the Contract Documents where such deviations were obvious, apparent and accepted by the Architect/Engineer or the Principal Representative at the time of the Notice of Final Acceptance. The Principal Representative shall give Notice of observed defects or other work requiring correction with reasonable promptness. Such Notice shall be in writing to the Architect/Engineer and the Contractor.
The one year guarantee of the Contractor’s work may run separately for discrete physical portions of
the Work for which partial Notices of Substantial Completion have been issued, however, it shall run
from the last Notice of Substantial Completion with respect to all or any systems common to the work
to which more than one Notice of Substantial Completion may apply.

This one-year guarantee shall not be construed to limit the Contractor’s general warranty described in
Article 42, General Warranty and Correction of Work After Acceptance, that all materials and
equipment are new and of good quality, unless specified to the contrary, and that the Work shall in all
respects be free from material defects not permitted by the Specifications and in accordance with the
requirements of the Contract Documents.

B. SPECIAL GUARANTEES AND WARRANTIES
In case of work performed for which product, manufacturers or other special warranties are required by
the Specifications, the Contractor shall secure the required warranties and deliver copies thereof to the
Principal Representative through the Architect/Engineer upon completion of the work.

These product, manufacturers or other special warranties, as such, do not in any way lessen the
Contractor’s responsibilities under the Contract. Whenever guarantees or warranties are required by
the Specifications for a longer period than one year, such longer period shall govern.

ARTICLE 45. GUARANTEE INSPECTIONS AFTER COMPLETION
The Architect/Engineer, the Principal Representative and the Contractor together shall make at least two (2)
complete inspections of the work after the Work has been determined to be substantially complete and
accepted. One such inspection, the “Six-Month Guarantee Inspection,” shall be made approximately six (6)
months after date of the Notice of Substantial Completion, unless in the case of smaller projects valued
under $500,000 this inspection is declined in Article 54A, Modification of Article 45, in which case the
inspection to occur at six months shall not be required. Another such inspection, the “Eleven-Month
Guaranty Inspection” shall be made approximately eleven (11) months after the date of the Notice of
Substantial Completion. The Principal Representative shall schedule and so notify all parties concerned,
including State Buildings Programs, of these inspections. If more than one Notice of Substantial Completion
has been issued at the reasonable discretion of the Principal Representative separate eleven month
inspections may be required where the one year guarantees do not run reasonably concurrent.

Written punch lists and reports of these inspections shall be made by the Architect/Engineer and forwarded
to the Contractor, the Principal Representative, State Buildings Programs, and all other participants within
ten (10) days after the completion of the inspections. The punch list shall itemize all guarantee items, prior
punch list items still to be corrected or completed and any other requirements of the Contract Documents to
be completed which were not waived by final acceptance because they were not obvious or could not
reasonably have been previously observed. The Contractor shall immediately initiate such remedial work as
may be necessary to correct any deficiencies or defective work shown by this report, and shall promptly
complete all such remedial work in a manner satisfactory to the Architect/Engineer, the Principal
Representative and State Buildings Programs.

If the Contractor fails to promptly correct all deficiencies and defects shown by this report, the Principal
Representative may do so, after giving the Contractor ten (10) days written Notice of intention to do so.

The State of Colorado, acting by and through the Principal Representative, shall be entitled to collect from
the Contractor all costs and expenses incurred by it in correcting such deficiencies and defects, as well as all
damages resulting from such deficiencies and defects.

ARTICLE 46. TIME OF COMPLETION AND LIQUIDATED DAMAGES
It is hereby understood and mutually agreed, by and between the parties hereto, that the date of beginning,
rate of progress, and the time for completion of the Work to be done hereunder are ESSENTIAL
CONDITIONS of this Agreement, and it is understood and agreed that the Work embraced in this Contract
shall be commenced at the time specified in the Notice to Proceed (SC-6.26).
It is further agreed that time is of the essence of each and every portion of this Contract, and of any portion of the Work described on the Drawings or Specifications, wherein a definite and certain length of time is fixed for the performance of any act whatsoever. The parties further agree that where under the Contract additional time is allowed for the completion of the Work or any identified portion of the Work, the new time limit or limits fixed by such extension of the time for completion shall be of the essence of this Agreement.

The Contractor acknowledges that subject to any limitations in the Advertisement for Bids, issued for the Project, the Contractor’s bid is consistent with and considers the number of days to substantially complete the Project and the number of days to finally complete the Project to which the parties may have stipulated in the Agreement, which stipulation was based on the Contractor’s bid. The Contractor agrees that work shall be prosecuted regularly, diligently and uninterruptedly at such rate of progress as will ensure the Project will be substantially complete, and fully and finally complete, as recognized by the issuance of all required Notices of Substantial Completion and Notices of Final Acceptance, within any times stipulated and specified in the Agreement, as the same may be amended by Change Order or other written modification, and that the Principal Representative will be damaged if the times of completion are delayed.

It is expressly understood and agreed, by and between the parties hereto, that the times for the Substantial Completion of the Work or for the final acceptance of the Work as may be stipulated in the Agreement, and as applied here and in Article 54D, Modifications of Article 46, are reasonable times for these stages of completion of the Work, taking into such consideration all factors, including the average climatic range and usual industrial conditions prevailing in the locality of the building operations.

If the Contractor shall neglect, fail or refuse to complete the Work within the times specified in the Agreement, such failure shall constitute a breach of the terms of the Contract and the State of Colorado, acting by and through the Principal Representative, shall be entitled to liquidated damages for such neglect, failure or refusal, as specified in Article 54D, Modification of Article 46.

The Contractor and the Contractor’s Surety shall be jointly liable for and shall pay the Principal Representative, or the Principal Representative may withhold, the sums hereinafter stipulated as liquidated damages for each calendar day of delay until the entire Project is 1) substantially completed, and the Notice (or all Notices) of Substantial Completion are issued, 2) finally complete and accepted and the Notice (or all Notices) of Acceptance are issued, or 3) both. Delay in substantial completion shall be measured from the Date of the Notice to Proceed and delay in final completion and acceptance shall be measured from the Date of the Notice of Substantial Completion.

In the first instance, specified in Article 54D(1), Modification of Article 46, liquidated damages, if any, shall be the amount specified therein, for each calendar day of delay beginning after the stipulated number of days for Substantial Completion from the date of the Notice to Proceed, until the date of the Notice of Substantial Completion. Unless otherwise specified in any Supplementary General Conditions, in the event of any partial Notice of Substantial Completion, liquidated damages shall accrue until all required Notices of Substantial Completion are issued.

In the second instance, specified in Article 54D(2), Modification of Article 46, liquidated damages, if any, shall be the amount specified in Article 54D, Modification of Article 46, for each calendar day in excess of the number of calendar days specified in the Contractor’s bid for the Project and stipulated in the Agreement to finally complete the Project (as defined by the issuance of the Notice of Acceptance) after the final Notice of Substantial Completion has been issued.

In the third instance, when so specified in both Articles 54D(1) and (2), both types of liquidated damages shall be separately assessed where those delays have occurred.

The parties expressly agree that said amounts are a reasonable estimate of the presumed actual damages that would result from any of the breaches listed, and that any liquidated damages that are assessed have been agreed to in light of the difficulty of ascertaining the actual damages that would be caused by any of these breaches at the time this Contract was formed; the liquidated damages in the first instance representing an estimate of damages due to the inability to use the Project; the liquidated damages in the
second instance representing an estimate of damages due to the additional administrative, technical, supervisory and professional expenses related to and arising from the extended closeout period including delivery of any or all guarantees and warranties, the submittals of sales and use tax payment forms, the calling for the final inspection and the completion of the final punch list.

The parties also agree and understand that the liquidated damages to be assessed in each instance are separate and distinct, although potentially cumulative, damages for the separate and distinct breaches of delayed substantial completion or final acceptance. Such liquidated damages shall not be avoided by virtue of the fact of concurrent delay caused by the Principal Representative, or anyone acting on behalf of the Principal Representative, but in such event the period of delay for which liquidated damages are assessed shall be equitably adjusted in accordance with Article 38, Delays And Extensions Of Time.

ARTICLE 47. DAMAGES
If either party to this Contract shall suffer damage under this Contract in any manner because of any wrongful act or neglect of the other party or of anyone employed by either of them, then the party suffering damage shall be reimbursed by the other party for such damage. Except to the extent of damages liquidated for the Contractor’s failure to achieve timely completion as set forth in Article 46, Time of Completion and Liquidated Damages, the Principal Representative shall be responsible for, and at his or her option may insure against, loss of use of any existing property not included in the Work, due to fire or otherwise, however caused. Notwithstanding the foregoing, or any other provision of this Contract, to the contrary, no term or condition of this contract shall be construed or interpreted as a waiver, express or implied, of any of the immunities, rights, benefits, protection, or other provisions of the Colorado Governmental Immunity Act, Section 24-10-101, et seq., CRS, as now or hereafter amended. The parties understand and agree that liability for claims for injuries to persons arising out of negligence of the State of Colorado, its departments, institutions, agencies, boards, officials and employees is controlled and limited by the provisions of Section 24-10-101, et seq., CRS, as now or hereafter amended and the risk management statutes, Section 24-30-1501, et seq., CRS, as now or hereafter amended.

Notice of intent to file a claim under this clause shall be made in writing to the party liable within a reasonable time of the first observance of such damage and not later than the time of final payment, except that in the case of claims by the Principal Representative involving warranties against faulty work or materials Notice shall be required only to the extent stipulated elsewhere in these General Conditions. Claims made to the Principal Representative involving extra cost or extra time arising by virtue of instructions to the Contractor to which Article 36, Claims, applies shall be made in accordance with Article 36. Other claims arising under the Contract involving extra cost or extra time which are made to the Principal Representative under this clause shall also be made in accordance with the procedures of Article 36, whether or not arising by virtue of instructions to the Contractor; provided however that it shall not be necessary to first obtain or request a written judgment of the Architect/Engineer.

Provided written Notice of intent to file a claim is provided as required in the preceding paragraph, nothing in this Article shall limit or restrict the rights of either party to bring an action at law or to seek other relief to which either party may be entitled, including consequential damages, if any, and shall not be construed to limit the time during which any action might be brought. Nothing in these General Conditions shall be deemed to limit the period of time during which any action may be brought as a matter of contract, tort, warranty or otherwise, it being the intent of the parties to allow any and all actions at law or in equity for such periods as the law permits. All such rights shall, however be subject to the obligation to assert claims and to appeal denials pursuant to Article 36, Claims, where applicable.

ARTICLE 48. STATE’S RIGHT TO DO THE WORK; TEMPORARY SUSPENSION OF WORK; DELAY DAMAGES

A. STATE’S RIGHT TO DO THE WORK
If after receipt of Notice to do so, the Contractor should neglect to prosecute the Work properly or fail to perform any provision of the Contract, the Principal Representative, after a second seven (7) days’ advance written Notice to the Contractor and the Surety may, without prejudice to any other remedy the Principal Representative may have, take control of all or a portion of the Work, as the Principal Representative deems necessary and make good such deficiencies deducting the cost thereof from
the payment then or thereafter due the Contractor, as provided in Article 30, Correction Of Work Before Acceptance and Article 33, Payments Withheld, provided, however, that the Architect/Engineer shall approve the amount charged to the Contractor by approval of the Change Order.

B. TEMPORARY SUSPENSION OF WORK
The State, acting for itself or by and through the Architect/Engineer, shall have the authority to suspend the Work, either wholly or in part, for such period or periods as may be deemed necessary due to:

1. Unsuitable weather;
2. Faulty workmanship;
3. Improper superintendence;
4. Contractor’s failure to carry out orders or to perform any provision of the Contract Documents;
5. Loss of, or restrictions to, appropriations;
6. Conditions, which may be considered unfavorable for the prosecution of the Work.

If it should become necessary to stop work for an indefinite period, the Contractor shall store materials in such manner that they will not become an obstruction or become damaged in any way; and he or she shall take every precaution to prevent damage to or deterioration of the Work, provide suitable drainage and erect temporary structures where necessary.

Notice of suspension of work shall be provided to the Contractor in writing stating the reasons therefore. The Contractor shall again proceed with the work when so notified in writing.

The Contractor understands and agrees that the State of Colorado cannot predict with certainty future revenues and could ultimately lack the revenue to fund the appropriations applicable to this Contract. The Contractor further acknowledges and agrees that in such event that State may, upon Notice to the Contractor, suspend the work in anticipation of a termination of the Contract for the convenience of the State, pursuant to Article 50, Termination For Convenience of State. If the Contract is not so terminated the Contract sum and the Contract time shall be equitably adjusted at the time the Principal Representative directs the work to be recommenced and gives Notice that the revenue to fund the appropriation is available.

C. DELAY DAMAGES
The Principal Representative and the State of Colorado shall be liable to the Contractor for the payment of any claim for extra costs, extra compensation or damages occasioned by hindrances or delays encountered in the work only when and to the limited extent that such hindrance or delay is caused by an act or omission within the control of the Principal Representative, the Architect/Engineer or other persons or entities acting on behalf of the Principal Representative. Further, the Principal Representative and the State of Colorado shall be liable to the Contractor for the payment of such a claim only if the Contractor has provided required Notice of the delay or impact, or has presented its claim for an extension of time or claim of other delay or other impact due to changes ordered in the work before proceeding with the changed work. Except as otherwise provided, claims for extension of time shall be Noticed and filed in accordance with Article 38, Delays and Extensions of Time, within three (3) business days of the beginning of the delay with any claim filed within seven (7) days after the delay has ceased, or such claim is waived. Claims for extension of time or for other delay or other impact resulting from changes ordered in the Work shall be presented and adjusted as provided in Article 35, Changes in the Work.

ARTICLE 49. STATE’S RIGHTS TO TERMINATE CONTRACT

A. GENERAL
If the Contractor should be adjudged bankrupt, or if he or she should make a general assignment for the benefit of his or her creditors, or if a receiver should be appointed to take over his affairs, or if he or she should fail to prosecute his or her work with due diligence and carry the work forward in accordance with the construction schedule and the time limits set forth in the Contract Documents, or if he or she should fail to subsequently perform one or more of the provisions of the Contract Documents
to be performed by him, the Principal Representative may serve written Notice on the Contractor and the Surety on performance and payment bonds, stating his or her intention to exercise one of the remedies hereinafter set forth and the grounds upon which the Principal Representative bases his or her right to exercise such remedy.

In such event, unless the matter complained of is satisfactorily cleared within ten (10) days after delivery of such Notice, the Principal Representative may, without prejudice to any other right or remedy, exercise one of such remedies at once, having first obtained the concurrence of the Architect/Engineer in writing that sufficient cause exists to justify such action.

B. CONDITIONS AND PROCEDURES

1. The Principal Representative may terminate the services of the Contractor, which termination shall take effect immediately upon service of Notice thereof on the Contractor and his or her Surety, whereupon the Surety shall have the right to take over and perform the Contract. If the Surety does not provide Notice to the Principal Representative of its intent to commence performance of the Contract within ten (10) days after delivery of the Notice of termination, the Principal Representative may take over the Work, take possession of and use all materials, tools, equipment and appliances on the premises and prosecute the Work to completion by such means as he or she shall deem best. In the event of such termination of his or her service, the Contractor shall not be entitled to any further payment under the Contract until the Work is completed and accepted. If the Principal Representative takes over the Work and if the unpaid balance of the contract price exceeds the cost of completing the Work, including compensation for any damages or expenses incurred by the Principal Representative through the default of the Contractor, such excess shall be paid to the Contractor. If, however, the cost, expenses and damages as certified by the Architect/Engineer exceed such unpaid balance of the contract price, the Contractor and his or her Surety shall pay the difference to the Principal Representative.

2. The Principal Representative may require the Surety on the Contractor’s bond to take control of the Work and see to it that all the deficiencies of the Contractor are made good, with due diligence within ten (10) days of delivery of Notice to the Surety to do so. As between the Principal Representative and the Surety, the cost of making good such deficiencies shall all be borne by the Surety. If the Surety takes over the Work, either by election upon termination of the services of the Contractor pursuant to Section B(1) of this Article 49, State’s Right To Terminate Contract, or upon instructions from the Principal Representative to do so, the provisions of the Contract Documents shall govern the work to be done by the Surety, the Surety being substituted for the Contractor as to such provisions, including provisions as to payment for the Work, the times of completion and provisions of this Article as to the right of the Principal Representative to do the Work or to take control of all or a portion of the Work.

3. The Principal Representative may take control of all or a portion of the Work and make good the deficiencies of the Contractor, or the Surety if the Surety has been substituted for the Contractor, with or without terminating the Contract, employing such additional help as the Principal Representative deems advisable in accordance with the provisions of Article 48A, State's Right To Do The Work; Temporary Suspension Of Work; Delay Damages. In such event, the Principal Representative shall be entitled to collect from the Contractor and his or her Surety, or to deduct from any payment then or thereafter due the Contractor, the costs incurred in having such deficiencies made good and any damages or expenses incurred through the default of Contractor, provided the Architect/Engineer approves the amount thus charged to the Contractor.

If the Contract is not terminated, a Change Order to the Contract shall be executed, unilaterally if necessary, in accordance with the procedures of Article 35, Changes In The Work.
C. ADDITIONAL CONDITIONS

If any termination by the Principal Representative for cause is later determined to have been improper, the termination shall be automatically converted to and deemed to be a termination by the Principal Representative for convenience and the Contractor shall be limited in recovery to the compensation provided for in Article 50, Termination For Convenience Of State. Termination by the Contractor shall not be subject to such conversion.

ARTICLE 50. TERMINATION FOR CONVENIENCE OF STATE

A. NOTICE OF TERMINATION

The performance of Work under this Contract may be terminated, in whole or from time to time in part, by the State whenever for any reason the Principal Representative shall determine that such termination is in the best interest of State. Termination of work hereunder shall be effected by delivery to the Contractor of a Notice of such termination specifying the extent to which the performance of work under the Contract is terminated and the date upon which such termination becomes effective.

B. PROCEDURES

After receipt of the Notice of termination, the Contractor shall, to the extent appropriate to the termination, cancel outstanding commitments hereunder covering the procurement of materials, supplies, equipment and miscellaneous items. In addition, the Contractor shall exercise all reasonable diligence to accomplish the cancellation or diversion of all applicable outstanding commitments covering personal performance of any work terminated by the Notice. With respect to such canceled commitments, the Contractor agrees to:

1. settle all outstanding liabilities and all claims arising out of such cancellation of commitments, with approval or ratification of the Principal Representative, to the extent he or she may require, which approval or ratification shall be final for all purposes of this clause; and,

2. assign to the State, in the manner, at the time, and to the extent directed by the Principal Representative, all of the right, title, and interest of the Contractor under the orders and subcontracts so terminated, in which case the State shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts.

The Contractor shall submit his or her termination claim to the Principal Representative promptly after receipt of a Notice of termination, but in no event later than three (3) months from the effective date thereof, unless one or more extensions in writing are granted by the Principal Representative upon written request of the Contractor within such three month period or authorized extension thereof. Upon failure of the Contractor to submit his or her termination claim within the time allowed, the Principal Representative may determine, on the basis of information available to him, the amount, if any, due to the Contractor by reason of the termination and shall thereupon pay to the Contractor the amount so determined.

Costs claimed, agreed to, or determined pursuant to the preceding and following paragraph shall be in accordance with the provisions of § 24-107-101, C.R.S., as amended and associated Cost Principles of the Colorado Procurement Rules as in effect on the date of this Contract.

Subject to the preceding provisions, the Contractor and the Principal Representative may agree upon the whole or any part of the amount or amounts to be paid to the Contractor by reason of the termination under this clause, which amount or amounts may include any reasonable cancellation charges thereby incurred by the Contractor and any reasonable loss upon outstanding commitments for personal services which he or she is unable to cancel; provided, however, that in connection with any outstanding commitments for personal services which the Contractor is unable to cancel, the Contractor shall have exercised reasonable diligence to divert such commitments to other activities and operations. Any such agreement shall be embodied in an Amendment to this Contract and the Contractor shall be paid the agreed amount.

The State may from time to time, under such terms and conditions as it may prescribe, make partial payments against costs incurred by the Contractor in connection with the termination portion of this
Contract, whenever, in the opinion of the Principal Representative, the aggregate of such payments is within the amount to which the Contractor will be entitled hereunder.

The Contractor agrees to transfer title and deliver to the State, in the manner, at the time, and to the extent, if any, directed by the Principal Representative, such information and items which, if the Contract had been completed, would have been required to be furnished to the State, including:

a. completed or partially completed plans, Drawings and information; and,

b. materials or equipment produced or in process or acquired in connection with the performance of the work terminated by the Notice.

Other than the above, any termination inventory resulting from the termination of the Contract may, with written approval of the Principal Representative, be sold or acquired by the Contractor under the conditions prescribed by and at a price or prices approved by the Principal Representative. The proceeds of any such disposition shall be applied in reduction of any payments to be made by the State to the Contractor under this Contract or shall otherwise be credited to the price or cost of work covered by this Contract or paid in such other manners as the Principal Representative may direct. Pending final disposition of property arising from the termination, the Contractor agrees to take such action as may be necessary, or as the Principal Representative may direct, for the protection and preservation of the property related to this Contract which is in the possession of the Contractor and in which the State has or may acquire an interest.

Any disputes as to questions of fact, which may arise hereunder, shall be subject to the Remedies provisions of the Colorado Procurement Code, §§ 24-109-101, et seq., C.R.S., as amended.

ARTICLE 51. CONTRACTOR'S RIGHT TO STOP WORK AND/OR TERMINATE CONTRACT

If the Work shall be stopped under an order of any court or other public authority for a period of three (3) months through no act or fault of the Contractor or of any one employed by him, then the Contractor may on seven (7) days’ written Notice to the Principal Representative and the Architect/Engineer stop work or terminate this Contract and recover from the Principal Representative payment for all work executed, any losses sustained on any plant or material, and a reasonable profit. If the Architect/Engineer shall fail to issue or otherwise act in writing upon any certificate for payment within ten (10) days after it is presented and received by the Architect/Engineer, as provided in Article 31, Applications For Payments, or if the Principal Representative shall fail to pay the Contractor any sum certified that is not disputed in whole or in part by the Principal Representative in writing to the Contractor and the Architect/Engineer within thirty (30) days after the Architect/Engineer’s certification, then the Contractor may on ten (10) days’ written Notice to the Principal Representative and the Architect/Engineer stop work and/or give written Notice of intention to terminate this Contract.

If the Principal Representative shall thereafter fail to pay the Contractor any amount certified by the Architect/Engineer and not disputed in writing by the Principal Representative within ten (10) days after receipt of such Notice, then the Contractor may terminate this Contract and recover from the Principal Representative payment for all work executed, any losses sustained upon any plant or materials, and a reasonable profit. The Principal Representative’s right to dispute an amount certified by the Architect/Engineer shall not relieve the Principal Representative of the obligation to pay amounts not in dispute as certified by the Architect/Engineer.

ARTICLE 52. SPECIAL PROVISIONS

A. CONTROLLER’S APPROVAL CRS 24-30-202(1)

This Contract shall not be deemed valid until it has been approved by the Colorado State Controller or designee.

B. FUND AVAILABILITY CRS 24-30-202(5.5)

Financial obligations of the State payable after the current fiscal year are contingent upon funds for that purpose being appropriated, budgeted, and otherwise made available
C. GOVERNMENTAL IMMUNITY
No term or condition of this contract shall be construed or interpreted as a waiver, express or implied, of any of the immunities, rights, benefits, protections, or other provisions, of the Colorado Governmental Immunity Act, CRS §24-10-101 et seq., or the Federal Tort Claims Act, 28 U.S.C. §§1346(b) and 2671 et seq., as applicable now or hereafter amended.

D. INDEPENDENT CONTRACTOR 4 CCR 801-2
Contractor shall perform its duties hereunder as an independent contractor and not as an employee. Neither Contractor nor any agent or employee of Contractor shall be deemed to be an agent or employee of the State. Contractor and its employees and agents are not entitled to unemployment insurance or workers compensation benefits through the State and the State shall not pay for or otherwise provide such coverage for Contractor or any of its agents or employees. Unemployment insurance benefits will be available to Contractor and its employees and agents only if such coverage is made available by Contractor or a third party. Contractor shall pay when due all applicable employment taxes and income taxes and local head taxes incurred pursuant to this contract. Contractor shall not have authorization, express or implied, to bind the State to any agreement, liability or understanding, except as expressly set forth herein. Contractor shall (a) provide and keep in force workers' compensation and unemployment compensation insurance in the amounts required by law, (b) provide proof thereof when requested by the State, and (c) be solely responsible for its acts and those of its employees and agents.

E. COMPLIANCE WITH LAW
Contractor shall strictly comply with all applicable federal and State laws, rules, and regulations in effect or hereafter established, including, without limitation, laws applicable to discrimination and unfair employment practices.

F. CHOICE OF LAW
Colorado law, and rules and regulations issued pursuant thereto, shall be applied in the interpretation, execution, and enforcement of this contract. Any provision included or incorporated herein by reference which conflicts with said laws, rules, and regulations shall be null and void. Any provision incorporated herein by reference which purports to negate this or any other Special Provision in whole or in part shall not be valid or enforceable or available in any action at law, whether by way of complaint, defense, or otherwise. Any provision rendered null and void by the operation of this provision shall not invalidate the remainder of this contract, to the extent capable of execution.

G. BINDING ARBITRATION PROHIBITED
The State of Colorado does not agree to binding arbitration by any extra-judicial body or person. Any provision to the contrary in this contract or incorporated herein by reference shall be null and void.

H. SOFTWARE PIRACY PROHIBITION. Governor's Executive Order D 002 00
State or other public funds payable under this contract shall not be used for the acquisition, operation, or maintenance of computer software in violation of federal copyright laws or applicable licensing restrictions. Contractor hereby certifies and warrants that, during the term of this contract and any extensions, Contractor has and shall maintain in place appropriate systems and controls to prevent such improper use of public funds. If the State determines that Contractor is in violation of this provision, the State may exercise any remedy available at law or in equity or under this contract, including, without limitation, immediate termination of this contract and any remedy consistent with federal copyright laws or applicable licensing restrictions.

I. EMPLOYEE FINANCIAL INTEREST/CONFLICT OF INTEREST CRS 24-18-201 & CRS 24-50-507
The signatories aver that to their knowledge, no employee of the State has any personal or beneficial interest whatsoever in the service or property described in this contract. Contractor has no interest and shall not acquire any interest, direct or indirect, that would conflict in any manner or degree with the performance of Contractor’s services and Contractor shall not employ any person having such known interests.
J. **VENDOR OFFSET CRS 24-30-202(1) & CRS 24-30-202.4**
Subject to CRS §24-30-202.4 (3.5), the State Controller may withhold payment under the State's vendor offset intercept system for debts owed to State agencies for: (a) unpaid child support debts or child support arrearages; (b) unpaid balances of tax, accrued interest, or other charges specified in CRS §39-21-101, et seq.; (c) unpaid loans due to the Student Loan Division of the Department of Higher Education; (d) amounts required to be paid to the Unemployment Compensation Fund; and (e) other unpaid debts owing to the State as a result of final agency determination or judicial action.

K. **PUBLIC CONTRACTS FOR SERVICES. CRS §8-17.5-101.** [Not Applicable to agreements relating to the offer, issuance, or sale of securities, investment advisory services or fund management services, sponsored projects, intergovernmental agreements, or information technology services or products and services] Contractor certifies, warrants, and agrees that it does not knowingly employ or contract with an illegal alien who will perform work under this contract and will confirm the employment eligibility of all employees who are newly hired for employment in the United States to perform work under this contract, through participation in the E-Verify Program or the Department program established pursuant to CRS §8-17.5-102(5)(c), Contractor shall not knowingly employ or contract with an illegal alien to perform work under this contract or enter into a contract with a subcontractor that fails to certify to Contractor that the subcontractor shall not knowingly employ or contract with an illegal alien to perform work under this contract. Contractor (a) shall not use E-Verify Program or Department program procedures to undertake pre-employment screening of job applicants while this contract is being performed, (b) shall notify the subcontractor and the contracting State agency within three days if Contractor has actual knowledge that a subcontractor is employing or contracting with an illegal alien for work under this contract, (c) shall terminate the subcontract if a subcontractor does not stop employing or contracting with the illegal alien within three days of receiving the notice, and (d) shall comply with reasonable requests made in the course of an investigation, undertaken pursuant to CRS §8-17.5-102(5), by the Colorado Department of Labor and Employment. If Contractor participates in the Department program, Contractor shall deliver to the contracting State agency, Institution of Higher Education or political subdivision a written, notarized affirmation, affirming that Contractor has examined the legal work status of such employee, and shall comply with all of the other requirements of the Department program. If Contractor fails to comply with any requirement of this provision or CRS §8-17.5-101 et seq., the contracting State agency, institution of higher education or political subdivision may terminate this contract for breach and, if so terminated, Contractor shall be liable for damages.

L. **PUBLIC CONTRACTS WITH NATURAL PERSONS. CRS §24-76.5-101.**
Contractor, if a natural person eighteen (18) years of age or older, hereby swears and affirms under penalty of perjury that he or she (a) is a citizen or otherwise lawfully present in the United States pursuant to federal law, (b) shall comply with the provisions of CRS §24-76.5-101 et seq., and (c) has produced one form of identification required by CRS §24-76.5-103 prior to the effective date of this contract.

**ARTICLE 53. MISCELLANEOUS PROVISIONS**

A. **CONSTRUCTION OF LANGUAGE**
The language used in these General Conditions shall be construed as a whole according to its plain meaning, and not strictly for or against any party. Such construction shall, however, construe language to interpret the intent of the parties giving due consideration to the order of precedence noted in Article 2C, Intent of Documents.

B. **SEVERABILITY**
Provided this Agreement can be executed and performance of the obligations of the Parties accomplished within its intent, the provisions hereof are severable and any provision that is declared invalid or becomes inoperable for any reason shall not affect the validity of any other provision hereof, provided that the Parties can continue to perform their obligations under this Agreement in accordance with its intent.
C. SECTION HEADINGS
The captions and headings in this Agreement are for convenience of reference only, and shall not be used to interpret, define, or limit its provisions.

D. AUTHORITY
Each person executing the Agreement and its Exhibits in a representative capacity expressly represents and warrants that he or she has been duly authorized by one of the parties to execute the Agreement and has authority to bind said party to the terms and conditions hereof.

E. INTEGRATION OF UNDERSTANDING
This Contract is intended as the complete integration of all understandings between the parties and supersedes all prior negotiations, representations, or agreements, whether written or oral. No prior or contemporaneous addition, deletion, or other amendment hereto shall have any force or effect whatsoever, unless embodied herein in writing. No subsequent novation, renewal, addition, deletion, or other amendment hereto shall have any force or effect unless embodied in a written Change Order or Amendment to this Contract.

F. VENUE
All suits or actions related to this Agreement shall be filed and proceedings held in the State of Colorado and exclusive venue shall be in the City and County of Denver.

G. NO THIRD PARTY BENEFICIARIES
Enforcement of this Agreement and all rights and obligations hereunder are reserved solely to the Parties. Any services or benefits which third parties receive as a result of this Contract are incidental to the Contract, and do not create any rights for such third parties.

H. WAIVER
Waiver of any breach under a term, provision, or requirement of this Agreement, or any right or remedy hereunder, whether explicitly or by lack of enforcement, shall not be construed or deemed as a waiver of any subsequent breach of such term, provision or requirement, or of any other term, provision, or requirement.

I. INDEMNIFICATION
Contractor shall indemnify, save, and hold harmless the State, its employees and agents, against any and all claims, damages, liability and court awards including costs, expenses, and attorney fees and related costs, incurred as a result of any act or omission by Contractor, or its employees, agents, subcontractors, or assignees pursuant to the terms of this contract.

J. STATEWIDE CONTRACT MANAGEMENT SYSTEM
If the maximum amount payable to Architect/Engineer under this Contract is $100,000 or greater, either on the Effective Date or at anytime thereafter, this section shall apply.

Architect/Engineer agrees to be governed, and to abide, by the provisions of CRS 24-102-205, 24-102-206, 24-103-601, 24-103.5-101, 24-105-101, and 24-105-102 concerning the monitoring of vendor performance on state contracts and inclusion of contract performance information in a statewide contract management system.
Architect/Engineer’s performance shall be subject to Evaluation and Review in accordance with the terms and conditions of this Contract, State law, including C.R.S 24-103.5-101, and State Fiscal Rules, Policies and Guidance. Evaluation and Review of Architect/Engineer’s performance shall be part of the normal contract administration process and Architect/Engineer’s performance will be systematically recorded in the statewide Contract Management System. Areas of Evaluation and Review shall include, but shall not be limited to quality, cost and timeliness. Collection of information relevant to the performance of Architect/Engineer’s obligations under this Contract shall be determined by the specific requirements of such obligations and shall include factors tailored to match the requirements of Architect/Engineer’s obligations. Such performance information shall be entered into the statewide Contract Management System at intervals established herein and a final Evaluation, Review and Rating shall be rendered within 30 days of the end of the Contract term. Architect/Engineer shall be notified following each performance Evaluation and Review, and shall address or correct any identified problem in a timely manner and maintain work progress.

Should the final performance Evaluation and Review determine that Architect/Engineer demonstrated a gross failure to meet the performance measures established hereunder, the Executive Director of the Colorado Department of Personnel and Administration (Executive Director), upon request by the Principal Representative, and showing of good cause, may debar Architect/Engineer and prohibit Architect/Engineer from bidding on future contracts. Architect/Engineer may contest the final Evaluation, Review and Rating by: (a) filing rebuttal statements, which may result in either removal or correction of the evaluation (CRS 24-105-102(6)), or (b) under CRS 24-105-102(6), exercising the debarment protest and appeal rights provided in CRS 24-109-106, 107, 201 or 202, which may result in the reversal of the debarment and reinstatement of Architect/Engineer, by the Executive Director, upon a showing of good cause.

ARTICLE 54. OPTIONAL PROVISIONS AND ELECTIONS
The provisions of this Article 54 alter the preceding Articles or enlarge upon them as indicated:
The Principal Representative and or the State Buildings Programs shall mark boxes and initial where applicable.

A. MODIFICATION OF ARTICLE 45. GUARANTEE INSPECTIONS AFTER COMPLETION
If the box below is marked the six month guarantee inspection is not required.
☐ _______ Principal Representative initial

B. MODIFICATION OF ARTICLE 27. LABOR AND WAGES
If the box is marked the Federal Davis-Bacon Act shall be applicable to the Project. The minimum wage rates to be paid on the Project shall be furnished by the Principal Representative and included in the Contract Documents.
☐ _______ Principal Representative initial

C. MODIFICATION OF ARTICLE 39. NON-BINDING DISPUTE RESOLUTION – FACILITATED NEGOTIATIONS
If the box is marked, and initialed by the State as noted, the requirement to participate in facilitated negotiations shall be deleted from this Contract. Article 39. Non-Binding Dispute Resolution – Facilitated Negotiations, shall be deleted in its entirety and all references to the right to the same where ever they appear in the contract shall be similarly deleted.
The box may be marked only for projects with an estimated value of less than $500,000.
☐ _______ Principal Representative initial
D. MODIFICATION OF ARTICLE 46. TIME OF COMPLETION AND LIQUIDATED DAMAGES

If an amount is indicated immediately below, liquidated damages shall be applicable to this Project as, and to, the extent shown below. Where an amount is indicated below, liquidated damages shall be assessed in accordance with and pursuant to the terms of Article 46, Time Of Completion And Liquidated Damages, in the amounts and as here indicated. The election of liquidated damages shall limit and control the parties right to damages only to the extent noted.

1. For the inability to use the Project, for each day after the number of calendar days specified in the Contractor’s bid for the Project and the Agreement for achievement of Substantial Completion, until the day that the Project has achieved Substantial Completion and the Notice of Substantial Completion is issued, the Contractor agrees that an amount equal to N/A Dollars ($N/A) shall be assessed against Contractor from amounts due and payable to the Contractor under the Contract, or the Contractor and the Contractor’s Surety shall pay to the Principal Representative such sum for any deficiency, if amounts on account thereof are deducted from remaining amounts due, but amounts remaining are insufficient to cover the entire assessment.

2. For damages related to or arising from additional administrative, technical, supervisory and professional expenses related to and arising from the extended closeout period, for each day in excess of the number of calendar days specified in the Contractor’s bid for the Project and the Agreement to finally complete the Project as defined by the issuance of the Notice of Final Acceptance) after the issuance of the final Notice of Substantial Completion, the Contractor agrees that an amount equal to N/A Dollars ($N/A) shall be assessed against Contractor from amounts due and payable to the Contractor under the Contract, or the Contractor and the Contractor’s Surety shall pay to the Principal Representative such sum for any deficiency, if amounts on account thereof are deducted from remaining amounts due but amounts remaining are insufficient to cover the entire assessment.

E. NOTICE IDENTIFICATION

All Notices pertaining to General Conditions or otherwise required to be given shall be transmitted in writing, to the individuals at the addresses listed below, and shall be deemed duly given when received by the parties at their addresses below or any subsequent persons or addresses provided to the other party in writing.

Notice to Principal Representative: _______________________________

_______________________________

With copies to: State Buildings Programs (or Delegate) State of Colorado

_______________________________

_______________________________

_______________________________

_______________________________

Notice to Contractor: _______________________________

_______________________________

_______________________________

_______________________________

_______________________________

With copies to: _______________________________

_______________________________

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Supplementary General Conditions
University of Colorado at Boulder

1. GENERAL CONDITIONS, ARTICLE 23. F. SIGN – DELETE the entire section.

2. GENERAL CONDITIONS, ARTICLE 25 INSURANCE - DELETE the entire section and replace with the following:

The Contractor shall obtain and maintain, at its own expense and for the duration of the contract, the minimum insurance coverages set forth below. By requiring such minimum insurance, the University shall not be deemed or construed to have assessed the risk that may be applicable to the Contractor under this contract. The Contractor shall assess its own risks and if it deems appropriate and/or prudent, maintain higher limits and/or broader coverages. The Contractor is not relieved of any liability or other obligations assumed or pursuant to the Contract by reason of its failure to obtain or maintain insurance in sufficient amounts, duration, or types.

COVERAGES

1. Commercial General Liability – ISO CG 00001 or equivalent. Coverage to include:
   • Premises and Operations
   • Explosions, Collapse and Underground Hazards
   • Personal / Advertising Injury
   • Products / Completed Operations
   • Liability assumed under an Insured Contract (including defense costs assumed under contract)
   • Broad Form Property Damage
   • Independent Contractors
   • Additional Insured—Owners, Lessees or Contractors Endorsement, ISO Form 2010 (2004 Edition or equivalent), if possible.
   • Additional Insured—Owners, Lessees or Contractors Endorsement, ISO CG 2037 (7/2004 Edition or equivalent), if possible.

2. Automobile Liability including all:
   • Owned Vehicles
   • Non-Owned Vehicles
   • Hired Vehicles

3. Excess/Umbrella Liability (Applies to projects totaling $10,000,000 or more)
   • Excess of Commercial General Liability, Automobile Liability, and Employers’ Liability.
   • Coverages should be as broad as primary.
   • Risk Management reserves the right to require higher limits.

4. Workers Compensation
   • Statutory Benefits (Coverage A)
   • Employers Liability (Coverage B)

5. Builder’s Risk Completed Value (Applies to buildings additions and new buildings)
   • See Builders Risk section in this document.

6. Installation Floater
   • Special cause of loss
   • Theft
   • Faulty workmanship
   • Vandalism
   • Labor costs to repair damaged work
7. **Contractors Pollution Liability**

This section applies only to the following types of proposals:

- ASBESTOS/LEAD ABATEMENT Contracting Services

The University requires this coverage whenever work at issue under this contract involves potential pollution risk to the environment or losses caused by pollution conditions (including asbestos) that may arise from the operations of the Contractor described in the Contractor’s scope of services. Policy shall cover the Contractors completed operations. Such coverage shall include:

- Bodily Injury, sickness, disease, mental anguish or shock sustained by any person, including death.
- Property Damage including natural resource damages, physical injury to or destruction of tangible property including resulting loss of use, clean up costs, and the loss of use of tangible property that has not been physically injured or destroyed.
- Defense, including costs, charges and expenses incurred in the investigation, adjustment or defense of claims for such compensatory damages.
- Cleanup costs, removal, storage, disposal, and or use of the pollutant; and defense, including costs and expenses incurred in the investigation, defense, or settlement of claims.
- Coverage shall apply to sudden and gradual pollution conditions resulting from the escape of release of smoke, vapors, fumes, acids, alkalis, toxic chemicals, liquids, or gases, natural gas, waste materials, or other irritants, contaminants, or pollutants (including asbestos). If the coverage is written on a claims-made basis, the Contractor warrants that any retroactive date applicable to coverage under the policy precedes the effective date of this contract; and that continuous coverage will be maintained or an extended discovery period will be exercised for a period of three (or specify desired number) years beginning from the time that work under this contract is completed.
- On the Automobile Liability Coverage endorsements CA9948 and MCS-90 are required if the Contractor is transporting any type of hazardous materials.
- The Regents of the University of Colorado, a body corporate as “Additional Insured” for work that is being performed by the Contractor and as respects the Contractors Pollution Liability.

**LIMITS REQUIRED**

The Contractor shall carry the following limits of liability as required below:

**Commercial General Liability**

- General Aggregate $2,000,000
- Products/Completed Operations Aggregate $2,000,000
- Each Occurrence Limit $1,000,000
- Personal/Advertising Injury $1,000,000
- Fire Damage (Any One Fire) $50,000
- Medical Payments (Any One Person) $5,000

**Excess/Umbrella Liability (as required-See Coverages #3)**

- General Aggregate Limit $5,000,000
- Products/Completed Operations Aggregate $5,000,000

**Automobile Liability**

- Bodily Injury/Property Damage (Each Accident) $1,000,000
Workers’ Compensation

Coverage A (Workers’ Compensation)  Statutory
Coverage B (Employers Liability)   $100,000 Each Accident
$100,000 Disease Ea. Employ
$500,000 Disease-Policy Limit

Contractors Pollution Liability (as required-See Coverages #7)

Per Loss $1,000,000
Aggregate $1,000,000

Builder’s Risk (as required-See Coverages #5)

- This coverage is required for new buildings or additions to existing buildings.
- See the Builders Risk section (below) for required terms and conditions.

Installation Floater

This coverage is to cover materials and equipment to be installed in existing structures.
- Shall be written for 100% of the completed value (replacement cost basis)
- Deductible maximum is $10,000.00
- Waiver of Subrogation applies on Builders Risk

ADDITIONAL INSURANCE REQUIREMENTS

1. All insurers must be licensed or approved to do business within the State of Colorado, and unless otherwise specified, all policies must be written on a per occurrence basis.
2. The Contractor shall provide the University of Colorado a Certificate of Insurance Form evidencing all required coverages, prior to commencing work or entering University premises.
3. The Contractor shall name “The State of Colorado and The Regents of the University of Colorado, a body corporate” as an Additional Insured as respects General Liability.
4. Upon request by the University, Contractor must provide a copy of the actual insurance policy effecting coverage(s) required by the contract.
5. The University requires that all policies of insurance be written on a primary basis, non-contributory with any other insurance coverages and/or self-insurance carried by the University.
6. A Separation of Insureds Clause must be included in general liability policies.
7. The Contractor shall advise the University in the event any general aggregate or other aggregate limits are reduced below the required per occurrence limit. At their own expense, the Contractor will reinstate the aggregate limits to comply with the minimum requirements and shall furnish to the University a new certificate of insurance showing such coverage is in force.
8. Contractor’s insurance carrier should possess a minimum A.M. Best’s Insurance Guide rating of A- VI.
9. Commercial General Liability Completed Operations policies must be kept in effect for up to three (3) years after completion of the project.
10. Contractors Pollution Liability policies must be kept in effect for up to three (3) years after completion of the project.
11. Provide a minimum of thirty (30) days advance written notice to the University for cancellation, non-renewal, or material changes to policies required under the contract.
12. Certificate Holder: University of Colorado, University Risk Management, 4001 Discovery Drive, Suite 230, Campus Box 587, Boulder, CO 80303

Failure of the Contractor to fully comply with these requirements during the term of the Contract may be considered a material breach of contract and may be cause for immediate termination of the Contract at the option of the University. The University reserves the right to negotiate additional specific insurance requirements at the time of the contract award.
Non-Waiver
The parties hereto understand and agree that The University is relying on, and does not waive or intend to
waive by any provision of this Contract, the monetary limitations or any other rights, immunities, and
protections provided by the Colorado Governmental Immunity Act, 24-10-101 et seq., as from time to time
amended, or otherwise available to the University or its officers, employees, agents, and volunteers.

Mutual Cooperation
The University and Contractor shall cooperate with each other in the collection of any insurance proceeds
which may be payable in the event of any loss, including the execution and delivery of any proof of loss or
other actions required to effect recovery.

Builder’s Risk Insurance
(As required—See Coverages #5

Unless otherwise provided, the Contractor shall purchase and maintain, in a company or companies
lawfully authorized to do business in the jurisdiction in which the project is located, Builder’s Risk
Insurance in the amount of the initial contract amount as well as subsequent modifications for the entire
project at the site on a replacement cost basis without voluntary deductibles. Such Builder’s Risk Insurance
shall be maintained, unless otherwise provided in the contract documents or otherwise agreed in writing by
all persons and entities who are beneficiaries of such insurance, until final payment has been made or until
no person or entity other than the University has insurable interest in the property to be covered, whichever
is earlier. The Builder’s Risk insurance shall include interests of the University of Colorado, the General
Contractor, subcontractors and sub-tier contractors in the project.

Builders’ Risk Coverage shall be on a Special Covered Cause of Loss Form and shall include theft,
vandalism, malicious mischief, collapse, false-work, temporary buildings and debris removal including
demolition, increased cost of construction, architect’s fees and expenses, flood and earthquake, and all
below and above ground structures, water and sewer mains. Other coverages may be required if provided
in contract documents. Coverages shall be written for 100% of the completed value (replacement cost
basis) of the work being performed. At the option of the University of Colorado, the University of
Colorado may include Soft Costs (including Loss of Use)/Delay in Opening Endorsement under the
builder’s risk policy. The University of Colorado agrees to provide the necessary exposure base
information for quotation by the Builder’s Risk carrier. The University of Colorado agrees to pay the
premium associated with the Soft Costs coverage, the University of Colorado decides to purchase this
coverage.

The Builder’s Risk shall also include the follow amendments/provisions:
• Waiver of Subrogation against all parties named as insured, but only to the extent the loss is covered.
• Beneficial Occupancy Clause. The policy shall specifically permit partial or beneficial occupancy at or
before substantial completion or final acceptance of the entire work. Partial occupancy or use of the work
shall not commence until the insurance company or companies providing insurance have consented to such
partial occupancy or use. The University of Colorado and Contractor shall take reasonable steps to obtain
consent of the insurance company or companies and agree to take no action, other than upon mutual written
consent, with respect to occupancy or use of the work that could lead to cancellation, lapse or reduction of
insurance.
• Equipment Breakdown Coverage (a.k.a. Boiler & Machinery) required by the Contract Documents or
by law, which shall specifically cover insured equipment during installation and testing (including hot
testing).
• Deletion of Coinsurance Provisions
• Replacement Costs Basis - including modification of the valuation clause to cover all costs needed to
repair the structure or work (including overhead and profits) and will pay based on the values figured at the
time of rebuilding or repairing, not at the time of loss
• Deletion of any exclusions pertaining to Law, Ordinance or Regulation
• Deletion of exclusions for design errors & omissions
• Modification of the electrical apparatus breakdown exclusions and the mechanical breakdown exclusion so that it does not apply to subsequent loss or damage
• Modify exclusion pertaining to damage to interior of building caused by an perils insured against are covered
• Resultant Damage Extension including amendment of exclusion pertaining to design error
• Settling, cracking, shrinking or expansion (including coverage for loss resulting from settling, cracking, shrinking or expansion) of foundation walls, floors, or other parts of the structure
• Other coverages may be required if provided in Contract Documents
• The deductible shall not exceed $10,000 and shall be the responsibility of the Contractor except for losses that involve all Acts of God such as flood, earthquake, windstorm, tsunami, volcano, etc.
• The Policy shall be amended to show thirty (30) days notice of cancellation. Such notice shall be given to the University of Colorado and Contractor.

If requested, the Contractor shall file with the University of Colorado a copy of the policy that includes the insurance coverages required in this section. The policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to the Project.

If the Contractor does not intend to purchase such Builder’s Risk Insurance required by the Contract and with all of the coverages in the amount described above, the Contractor shall so inform the University of Colorado as stated in writing prior to commencement of the work. The University of Colorado may then effect insurance that will protect the interests of the University of Colorado, the General Contractor, Subcontractors and sub-tier contractors in the project. Coverages applying shall be the same as stated above including other coverages that may be required by the University of Colorado. The cost shall be charged to the Contractor. Coverage shall be written for 100% of the completed value of the work being performed, with a deductible not to exceed $10,000 per occurrence for most projects.

All deductibles will be assumed by the Contractor. Waiver of Subrogation is to apply against all parties named as insureds, but only to the extent the loss is covered, and Beneficial Occupancy Endorsements are to apply.

If the University of Colorado is damaged by the failure or neglect of the Contractor to purchase or maintain insurance as described above, without so notifying the University of Colorado, then the Contractor shall bear all reasonable costs properly attributable thereto.

Contractors engaged in modifications of existing structures are required to secure a Beneficial Occupancy Endorsement that enables the University of Colorado to occupy the facility during construction.

Revised 02/20/06
STATE OF COLORADO
OFFICE OF THE STATE ARCHITECT
STATE BUILDINGS PROGRAMS

CHANGE ORDER BULLETIN

<table>
<thead>
<tr>
<th>Change Order Bulletin No:</th>
<th>__________________________</th>
<th>Date</th>
<th>____________</th>
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<tbody>
<tr>
<td>Contractor:</td>
<td>__________________________</td>
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<tr>
<td>Institution or Agency:</td>
<td>University of Colorado at Boulder</td>
<td></td>
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<tr>
<td>Project No./Name:</td>
<td>CP 124516 / CAMP – EAST – Electrical Upgrade</td>
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<tr>
<td>Description of Work:</td>
<td>__________________________</td>
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This bulletin is issued to define the scope of revision in drawings and/or specifications for a contemplated change order. The work called for by these revisions shall be in accordance with the requirements of the original contract documents.

Please prepare and submit a proposal for the changes described below. For pricing use State Form SC-6.312. A formal change order State Form SC-6.31 will be issued after approval of your proposal by the Principal Representative and the Architect. Your proposal shall include a statement as to the effect this change will have on the time for completion of the project.

This bulletin is **NOT** an authorization to proceed.

DESCRIPTION OF CHANGE:

SPECIFICATION REVISIONS:

STATUS OF EXISTING WORK:

PREPARED BY: __________________________
ARCHITECT/ENGINEER OR CONTRACTOR

APPROVED BY: __________________________
PRINCIPAL REPRESENTATIVE
(INSTITUTION or AGENCY)
STATE OF COLORADO
OFFICE OF THE STATE ARCHITECT
STATE BUILDINGS PROGRAMS
CHANGE ORDER PROPOSAL

Change Order Proposal No. _______ Date _______

Reference
Change Order Bulletin No: _______ Date _______

Contractor
University of Colorado at Boulder

Institution or Agency
CP 124516 / CAMP – EAST – Electrical Upgrade

Project No./Name

(Before completing this form, read instructions on reverse side.)

PART I - WORK PERFORMED BY CONTRACTOR

Line 1. Direct Labor Costs______________________________________________________________ $  
Line 2. Labor Overhead (Direct Labor Burdens) (_____% X Line 1)............................... $  
Line 3. Total Contractor’s Labor Costs (Lines 1 and 2).................................................. $  
Line 4. Direct Materials Costs......................................................................................... $  
Line 5. Materials Overhead (Delivery Costs & Taxes) (_____% X Line 4)...................... $  
Line 6. Total Materials Costs (Lines 4 and 5)................................................................. $  
Line 7. Total Equipment Costs......................................................................................... $  
Line 8. PART I - TOTAL CONTRACTOR’S L, M & E COSTS (Lines 3, 6 and 7)............... Part I $  

PART II - WORK PERFORMED BY SUBCONTRACTOR

Line 9. Direct Labor Costs____________________________________________________________ $  
Line 10. Labor Overhead (Direct Labor Burdens) (_____% X Line 9)......................... $  
Line 11. Total Subcontractor’s Labor Cost (Lines 9 and 10)............................................. $  
Line 12. Direct Materials Costs......................................................................................... $  
Line 13. Materials Overhead (Delivery Costs & Taxes) (_____% X Line 12)............... $  
Line 14. Total Subcontractor’s Materials Costs (Lines 12 and 13)............................. $  
Line 15. Total Subcontractor’s Equipment Costs............................................................... $  
Line 16. Total Subcontractor’s L, M & E Costs (Lines 11, 14 and 15)......................... $  
Line 17. Subcontractor’s Overhead (Indirect Costs), (_____% X Line 16)............... $  
Line 18. Subcontractor’s Profit (5% X Line 16) or (2½% Deduct)............................... $  
Line 19. PART II - TOTAL SUBCONTRACTOR’S COSTS (Lines 11, 14 and 18)........ Part II $  

PART III - CONTRACTOR’S OVERHEAD & PROFIT

Line 20. Contractor’s Overhead (Indirect Costs), (_____% X Part I Total)................ $  
Line 21. Contractor’s Profit (5% X Part I Total)................................................................. $  
Line 22. PART III - TOTAL CONTRACTOR OVERHEAD & PROFIT (Lines 20 and 21)........ Part III $  

PART IV - CONTRACTOR’S MARKUP ON SUBCONTRACTOR

Line 23. Contractor’s Commission on Subcontractor (5% X Part II Total)............... $  
Line 24. Contractor’s Profit on Subcontractor (5% X Part II Total) or (2½% Deduct) $  
Line 25. PART IV - TOTAL CONTRACTOR MARKUP ON SUBCONTRACTOR (Lines 23 & 24)........... Part IV $  

PART V - SUBTOTAL C.O. PROPOSAL (Parts I and II and III and IV)......................... Part V (Subtotal) $  

PART VI - CONTRACTOR’S BOND COST (_____% X Part V)........................................... Part VI $  

PART VII - GRAND TOTAL CHANGE ORDER PROPOSAL (Sum of Totals: Parts V and VI) Grand Total $  

PART VIII - CONTRACT TIME

COMPLETION DATE (IS) (IS NOT) EXTENDED ______ CALENDAR DAYS AS A RESULT OF THIS PROPOSAL.

CONTRACTOR’S CERTIFICATE:
This is to certify that, to the best of my knowledge and belief, the cost/price data submitted in response to the listed C.O. Bulletin, are accurate, complete and current as of 20 ______  

Firm: __________________________ Name & Title: __________________________  
Signature: __________________________ Date: ________  

*Date:  
*The proposal shall remain in full force and effect for a period of ______ calendar days from date of signature.

ARCHITECT/ENGINEER’S CERTIFICATE:
This is to certify that I have analyzed the proposal and find, to the best of my knowledge and belief, that the proposal represents current, fair, factual and competitive cost/price data.

Firm: __________________________ Name: __________________________  
Signature: __________________________ Date: ________  

*Date:  
*The proposal shall remain in full force and effect for a period of ______ calendar days from date of signature.

PRINCIPAL REPRESENTATIVE STATE BUILDINGS PROGRAMS
(Institution or Agency) (or Authorized Delegate)  
________________________ Date __________________________ Date ________
INSTRUCTIONS FOR COMPLETING "CHANGE ORDER PROPOSAL"

COST/PRICE DATA SUMMARY (STATE FORM SC-6.312)

BULLETIN NUMBER/DATED: Insert C.O. Bulletin No. and Date Issued
LEFT HAND BOX: Fill in Contractor's Name; State Project Number and Title
RIGHT HAND BOX: Fill in Description of Changes from Bulletin, noting exceptions that are listed in the Bulletin but are excluded; i.e., not priced on this form.

PART I - WORK PERFORMED BY CONTRACTOR:

Line 1. Direct Labor Costs: Fill in subtotal of direct labor costs, which includes base rates plus applicable fringe benefits.

<table>
<thead>
<tr>
<th>Trade</th>
<th>Rate</th>
<th>Hours</th>
<th>Extended Costs</th>
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</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

On Contractor's letterhead/spreadsheet show costs as follows:

Direct Labor Costs = $

Line 2. Labor Overhead (Direct Labor Burdens, etc.): Fill in as a percentage of Line 1.


<table>
<thead>
<tr>
<th>Materials</th>
<th>Units</th>
<th>Unit Cost</th>
<th>Extended Costs</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

On letterhead/spreadsheet, show direct materials costs as follows:

Direct Materials Costs = $

Line 5. Materials Overhead: Fill in as percentage cost of Line 4. Overhead costs include delivery, taxes, insurance costs, etc. (As mutually agreed upon at contract signing)

Line 6. Total Materials Costs: Fill in total of lines 4 and 5.

Line 7. Total Equipment Costs: Fill in total equipment costs including indirect overhead costs in hourly rate - except indirect labor costs.

<table>
<thead>
<tr>
<th>Description</th>
<th>Rate</th>
<th>Hours</th>
<th>Extended Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

On letterhead/spreadsheet show total equipment costs as follows:

Total Equipment Cost = $


PART II - WORK PERFORMED BY SUBCONTRACTOR:

Line 9. Direct Labor Costs: Fill in subtotal of direct labor costs, which includes base rates plus applicable fringe benefits.

On Subcontractor's letterhead/spreadsheet show costs by trade, rate, hours and extended costs. See Instructions for line 1.

Line 10. Labor Overhead (Direct Labor Burdens, etc.): Fill in as a percentage of Line 9.


On letterhead/spreadsheet, show direct materials costs by materials, units, unit costs and extended costs. See Instructions for line 4.

Line 13. Materials Overhead: Fill In as a percentage of line 12. Overhead costs include delivery, taxes, insurance costs, etc.


Line 15. Total Subcontractor’s Equipment Costs: Fill in total equipment costs including indirect overhead costs in hourly rate - except indirect labor costs. On letterhead/spreadsheet show total equipment costs by description, rate, hours and extended costs. See Instructions for line 7.

Line 16. Total Subcontractor’s Labor, Materials and Equipment (L, M & E) Costs: Fill in total of lines 11, 14 and 15.

Line 17. Subcontractor’s Overhead (Indirect Costs): Fill in as percentage cost of line 16. See Article 35 of General Conditions.


PARTS III THROUGH VIII - Self-explanatory.

CERTIFICATIONS

A. The Contractor, who prepares this proposal form, certifies the cost/price data by signing, dating, and forwarding same to the Architect/Engineer (or Consultant) for further action.

B. The Architect/Engineer (or Consultant) reviews and analyzes the cost/price data for the requirements that these are: 1) currently prevalent, 2) reasonably fair, 3) factually applicable, and 4) equivalently competitive market selling prices. The Architect/Engineer (or Consultant) may negotiate--after receipt of the cost proposal--any or all of the cost elements of the proposal to support a recommendation of acceptance to the Principal Representative. Certification by the A/E (or Consultant) of the above requirements is made upon his signature. The Architect/Engineer (or Consultant) forwards the proposal with the supporting back-up to the Agency.

C. Authority for the Institution or Agency (usually the Principal Representative) reviews the proposal, signs, dates, and forwards to State Buildings Programs or Delegate for final action.

D. State Buildings Programs or Delegate reviews the cost proposal, with all supporting back-up, for technical and procedural requirements and, if in order, signs and dates the proposal.
STATE OF COLORADO
OFFICE OF THE STATE ARCHITECT
STATE BUILDINGS PROGRAMS

CHANGE ORDER

Change Order No: __________________________ Date __________________________
Contractor: __________________________

Institution or Agency: University of Colorado at Boulder
Project No./Name: CP 124516 / CAMP – EAST – Electrical Upgrade

Your Change Order Proposal, dated __________ is hereby being designated for approval of the following work:
(Note: If more space is needed for description of work, attach additional 8-1/2’ x 11’ sheets hereto.)

This change order was originated by the Contractor ☐, Architect/Engineer ☐, State ☐, and I/We do hereby recommend acceptance and approval of the change to the Contractor’s Agreement Dated __________ which is by this reference, made a part hereof, and identified as Exhibit ______ with an increase ☐, a decrease ☐, no change ☐, of $_____.

Contract completion date is extended ☐ days ☐, is not extended ☐. New completion date is ___ (Month/Day/Year)

*Persons signing for Architect/Engineer/Contractor hereby swear and affirm that they are authorized to act on Architect/Engineer/Contractor’s behalf and acknowledge that the State is relying on their representations to that effect. Principal is not a recognized title and will not be accepted.

Architect/Engineer Firm __________________________
Name and Title (print) __________________________ Date __________
Signature __________________________

Contractor (Name of Firm) __________________________
Name and Title (print) __________________________ Date __________
Signature __________________________

University of Colorado at Boulder
Institution or Agency __________________________
Principal Representative (Signature) __________________________ Date __________

<table>
<thead>
<tr>
<th>CONTRACT STATUS</th>
<th>STATE BUILDINGS PROGRAMS</th>
<th>STATE CONTROLLER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Contract Value $ __________________________ Exhibit A</td>
<td>(or Authorized Delegate)</td>
<td>(or Authorized Delegate)</td>
</tr>
<tr>
<td>Previous increases by CO/Amend $ __________________________</td>
<td>Paul M. Leef, AIA, LEED™ AP</td>
<td>Steve McNally, Associate Vice Chancellor &amp;</td>
</tr>
<tr>
<td>Previous decreases by CO/Amend $ __________________________</td>
<td>Campus Architect &amp;</td>
<td>Controller</td>
</tr>
<tr>
<td>Value After Prior CO’s/Amend $ __________________________</td>
<td>Director, Planning, Design &amp; Construction</td>
<td></td>
</tr>
<tr>
<td>This CO/Amend Increases ☐ Decreases ☐ $ __________________________ Exhibit B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CURRENT CONTRACT VALUE $ __________________________</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Approved ☐ PM
Approved ☐ PM Supervisor
10/14/09
University of Colorado at Boulder
ENVIRONMENTAL HEALTH AND SAFETY
413 UCB, (303) 492-6025, Fax (303) 492-2854

ENVIRONMENTAL SITE ASSESSMENT FORM

<table>
<thead>
<tr>
<th>Building &amp; Location</th>
<th>Job Description</th>
<th>Work Order / Project Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAMP</td>
<td>Description of work that will be done</td>
<td>MY010905</td>
</tr>
</tbody>
</table>

Follow-up required for:
- ASBESTOS MATERIALS
- RADIOACTIVE MATERIALS
- ENVIRONMENTAL COMPLIANCE
- LEAD MATERIALS
- LASER OR X-RAY
- HAZARDOUS MATERIALS

Suspect Building Components, Materials, and Site Conditions:
Lists all suspect materials for asbestos and/or lead-based paint. Also describes any other environmental and safety conditions, e.g. laboratory, hazardous materials, radiation issues, etc. Will address other conditions of the building being worked in, e.g. classroom, offices, laboratories, or other uses.

SAMPLE REPORT ONLY

Samples / Results:
Lists all known results of suspect materials or environmental monitoring results. Where suspect materials are not known, lists these as presumed positive.

SAMPLE REPORT ONLY

REQUIRED ACTION:
Identifies any action that may be required by all parties for the project, conditions that shall be followed, and all other notations relevant to the project. Explains further steps that must be taken for the project and responsibilities of key project staff, e.g. Project Managers, Contractors, EH&S, etc.

SAMPLE REPORT ONLY

EH&S Inspector: Certified CDPHE Inspector
EH&S Manager: Michael Yanker
Date Inspected: 1/9/2005
Date Reviewed: 1/9/2005

This report based upon conditions, regulations, policies at time of inspection and is valid for 90 days. Changing scope of work requires re-inspection. If areas contain hazardous materials (asbestos, chemicals, gases, bio-hazards, radioactive materials or radiation) and/or involve laboratories, shops, haz exhausts, tanks, sewer drains or traps, storm or surface water, or other occupational hazards, work must be coordinated with appropriate EH&S manager. No new materials containing asbestos may be used for any part of the construction project. Project must conform with all applicable codes & standards. Project Rep must submit to EH&S Env Compliance - comprehensive haz materials/chemical inventory used to determine additional requirements. Contractor and/or Project Rep must provide above information to employees, subcontractors and other relevant parties.

University Representative / Project Manager

Contractor Name: Contractor

Contractor Representative: (signature) Foreman or Superintendent

Phone Number: Phone Number:

Date Signed:
STATE OF COLORADO
OFFICE OF THE STATE ARCHITECT
STATE BUILDINGS PROGRAMS

NOTICE TO PROCEED (DESIGN/BID/BUILD CONTRACT)

Date of Notice:

Date/Description of Contract Documents:

Institution/Agency: University of Colorado at Boulder
Project No./Name: CP 124516 / CAMP – EAST – Electrical Upgrade

Attach Notice of Code Compliance from Code Review Agent/Building Official for Documents Listed Above

To:

This is to advise you that your Performance Bond, Labor and Material Payment Bond, the requisite Builder’s Risk Insurance Policy or Certificate for same, and Certificates of Insurance have been received. Our issuance of this Notice does not relieve you of responsibility to assure that the bond and insurance requirements of the Contract Documents are met for the duration of the Agreement. The Agreement dated ______________ covering the above described work has been fully executed.

You are hereby authorized and directed to proceed within ten (10) days from date of this Notice as required in the Agreement. Any liquidated damages for failure to achieve substantial completion by the date agreed that may be applicable to this contract will be calculated using the date of this Notice for the date of the commencement of the Work.

Actual on-site construction may not commence until all applicable building permits have been obtained by the Contractor.

The completion date of the Project is ______________.(M/D/YYYY)

By _________________ Date
State Buildings Programs (or Authorized Delegate)
Paul M. Leeft, AIA, LEED TM AP
Campus Architect &
Director, Planning, Design & Construction

By _________________ Date
Principal Representative (Institution or Agency)
Ronald L. Ried, Director
Facilities Management Business Services

When completely executed, this form is to be sent by certified mail to the Contractor by the Principal Representative; or by any other means to which the parties agree.
STATE OF COLORADO
OFFICE OF THE STATE ARCHITECT
STATE BUILDINGS PROGRAMS

CERTIFICATION AND AFFIDAVIT REGARDING UNAUTHORIZED IMMIGRANTS

Institution/Agency:  University of Colorado at Boulder
Project No./Name:  CP 124516 / CAMP – EAST – Electrical Upgrade

A. CERTIFICATION STATEMENT  CRS 8-17.5-101 & 102 (HB 06-1343, SB 08-193)

The Vendor, whose name and signature appear below, certifies and agrees as follows:

1. The Vendor shall comply with the provisions of CRS 8-17.5-101 et seq. The Vendor shall not knowingly employ or contract with an unauthorized immigrant to perform work for the State or enter into a contract with a subcontractor that knowingly employs or contracts with an unauthorized immigrant.

2. The Vendor certifies that it does not now knowingly employ or contract with an unauthorized immigrant who will perform work under this contract, and that it will participate in either (i) the “E-Verify Program”, jointly administered by the United States Department of Homeland Security and the Social Security Administration, or (ii) the “Department Program” administered by the Colorado Department of Labor and Employment in order to confirm the employment eligibility of all employees who are newly hired to perform work under this contract.

3. The Vendor shall comply with all reasonable requests made in the course of an investigation under CRS 8-17.5-102 by the Colorado Department of Labor and Employment. If the Vendor fails to comply with any requirement of this provision or CRS 8-17.5-101 et seq., the State may terminate work for breach and the Vendor shall be liable for damages to the State.

B. AFFIDAVIT  CRS 24-76.5-101 (HB 06S-1023)

4. If the Vendor is a sole proprietor, the undersigned hereby swears or affirms under penalty of perjury under the laws of the State of Colorado that (check one):

   ○ I am a United States citizen, or
   ○ I am a Permanent Resident of the United States, or
   ○ I am lawfully present in the United States pursuant to Federal law.

I understand that this sworn statement is required by law because I am a sole proprietor entering into a contract to perform work for the State of Colorado. I understand that state law requires me to provide proof that I am lawfully present in the United States prior to starting work for the State. I further acknowledge that I will comply with the requirements of CRS 24-76.5-101 et seq. and will produce the required form of identification prior to starting work. I acknowledge that making a false, fictitious, or fraudulent statement or representation in this sworn affidavit is punishable under the criminal laws of Colorado as perjury in the second degree under CRS 18-8-503 and it shall constitute a separate criminal offense each time a public benefit is fraudulently received.

CERTIFIED and AGREED to this ______ day of ____________, 2010.

VENDOR:

______________________________
Vendor Full Legal Name

______________________________  ______________________________
Signature of Authorized Representative  Title

State Form UI-1  Page 1 of 1
Issued 7/2008
NOTICE OF SUBSTANTIAL COMPLETION

Date of Substantial Completion: ____________________________

Date to be inserted by the Principal Representative

Institution/Agency: University of Colorado at Boulder

Project No./Name: CP 124516 / CAMP – EAST – Electrical Upgrade

TO: Andy Jordan, Project Manager
University of Colorado at Boulder
Department of Facilities Management
Campus Box 453 UCB
Boulder, CO 80309-0453
(Principal Representative)

And

(Contractor)

This is to advise you that the Work has been reviewed, inspected and determined, to the best knowledge, information and belief of the Architect/Engineer, to be substantially complete as of the date noted above in accordance with the criteria outlined in Article 41 of The General Conditions of the Contract and the Specifications, including without limitation a) suitable for occupancy, b) inspected for code compliance with Building Inspection Records signed by code officials for the State, Inspection Cards completely signed-off or a Temporary Certificate, or Certificate, of Occupancy has been issued, c) determined to be fully and comfortably usable, and d) fully cleaned and appropriate for presentation to the public.

A punch list of work to be completed, work not in compliance with the Drawings or Specifications, and unsatisfactory work is attached hereto, along with the Contractor’s schedule for the completion of each and every item identified on the punch list specifying the Subcontractor or trade responsible for the work, and the dates the completion or correction will be commenced and finished within any period indicated in the Agreement for punch list completion prior to Final Acceptance.

Except as stated on the reverse side of this Notice of Substantial Completion, all manufacturers’ warranties, other special warranties and the Contractor’s one-year obligation to perform remedial work, shall commence on the Date of Substantial Completion noted above.

This Notice of Substantial Completion shall be effective and establish the Date of Substantial Completion only when fully executed on the reverse by the Contractor and the Principal Representative. The Principal Representative accepts the Work as substantially complete as of the Date of Substantial Completion herein noted. The Contractor agrees to complete or correct the Work identified on the attached punch list and to do so in accordance with attached punch list completion schedule.
The responsibilities of the Principal Representative and the Contractor for security, maintenance, heat, utilities, and insurance shall be as specified in the Contract Documents or as otherwise hereafter noted:

Exceptions, if any, to the commencement of warranties shall be:

The attached final punch list consists of ________ pages, and the attached Contractor’s schedule showing the dates of commencement and completion of each punch list item consists of ________ pages.

When completely executed, this form shall be sent to the Contractor and the Principal Representative with a copy to State Buildings Programs.
## PRE-ACCEPTANCE CHECKLIST

**Institution or Agency:** University of Colorado at Boulder  
**Final Punch List Date:**  
**Architect/Engineer:** Stanley Consultants, Inc.  
**Contractor:**  
**Project No./Name:** CP 124516 / CAMP – EAST – Electrical Upgrade

---

After Contractor is satisfied that work is complete as per Notice of Substantial Completion Punch List, a date for final review is established. Architect/Engineer inspection is made with Contractor(s) and Principal Representative and State Buildings Programs (SBP) present. Forms are processed as required.

<table>
<thead>
<tr>
<th>DATE COMPLETED</th>
<th>A/E SIGNOFF</th>
<th>REMARKS</th>
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<tbody>
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</tbody>
</table>

1. The Notice of Approval of Occupancy/Use has been fully executed.  
2. Schedule for corrections, deficiencies, and items to be supplied are established by Contractor.  
3. Final Change Orders are processed (must be completed prior to Notice of Acceptance).  
4. The Principal Representative shall not authorize final payment until all items on the punch list have been completed, the Notice of Acceptance issued and the Notice of Contractor’s Settlement Date is published.  
5. Permanent keying, keys and keying instructions have been performed.  
6. Extra materials as per specifications are delivered to Principal Representative.  
7. As-built drawings have been submitted to Architect/Engineer.  
8. Guarantee/Warranty documentation requirements are met.  
9. Removal of Contractor’s temporary work including cleanup and debris removal.  
10. State personnel are instructed in system and equipment operations as required by contract.  
11. All Instructions, manuals, guides, and charts have been transmitted to Principal Representative.

---

**Architect/Engineer**  
Stanley Consultants, Inc.  
**Date**

**Contractor**  
**Date**

**State Buildings Programs**  
(or Authorized Delegate)  
**Date**

**Principal Representative**  
(Institution or Agency)  
**Date**

Paul M. Leef, AIA, LEED TM AP  
Campus Architect &  
Director, Planning, Design & Construction  
Ronald L. Ried, Director  
Facilities Management Business Services
STATE OF COLORADO
OFFICE OF THE STATE ARCHITECT
STATE BUILDINGS PROGRAMS

NOTICE OF FINAL ACCEPTANCE

Date of Notice of Acceptance:  

Date to be inserted by A/E after consultation with the Principal Representative

Institution/Agency:  University of Colorado at Boulder

Project No./Name:  CP 124516 / CAMP – EAST – Electrical Upgrade

TO:

Notice is hereby given that the State of Colorado, acting by and through the Regents of the University of Colorado at Boulder, accepts as complete* the above numbered project.

State Buildings Programs  Date  Principal Representative  Date
(or Authorized Delegate)  
Paul M. Leef, AIA, LEED TM AP  Ronald L. Ried, Director
Campus Architect &  Facilities Management Business
Director, Planning, Design &  Services
Construction

*When completely executed, this form is to be sent by certified mail to the Contractor by the Principal Representative.
STATE OF COLORADO
OFFICE OF THE STATE ARCHITECT
STATE BUILDINGS PROGRAMS

NOTICE OF CONTRACTOR’S SETTLEMENT

Institution/Agency: University of Colorado at Boulder
Notice Number: 
Project No./Title: CP 124516 / CAMP – EAST – Electrical Upgrade

Notice is hereby given that on , 2010 at Department of Facilities Management, 1540 30th Street, Room 303, Campus Box 453 UCB, Boulder, CO 80309, final settlement will be made by the STATE OF COLORADO acting by and through the Regents of the University of Colorado at Boulder, with hereinafter called the "CONTRACTOR", for and on account of the contract for the construction of a PROJECT as referenced above.

1. Any person, co-partnership, association or corporation who has an unpaid claim against the said project, for or on account of the furnishing of labor, materials, team hire, sustenance, provisions, provender, rental machinery, tools or equipment and other supplies used or consumed by such Contractor or any of his subcontractors in or about the performance of said work, may at any time up to and including said time of such final settlement, file a verified statement of the amount due and unpaid on account of such claim.

2. All such claims shall be filed with the Authority for College, Institution, Department or Agency.

3. Failure on the part of a creditor to file such statement prior to such final settlement will relieve the State of Colorado from any and all liability for such claim.

Authorized Facility Manager or Authorized Individual

Name: Andy Jordan, Project Manager
Agency: University of Colorado at Boulder
Phone: 303-735-5410
Fax: 303-492-4082
Email: 

MEDIA OF PUBLICATION:

PUBLICATION DATE: 
First:

NOTES TO EDITOR:

Transmit one copy of the Affidavit of Publication, and invoice, to: Marsha Slepicka, University of Colorado at Boulder, Department of Facilities Management, Campus Box 453 UCB, Boulder, CO 80309-0453.
Contractors working on the UCB campus must comply with all applicable University, City, State and Federal environmental regulations and standards.

This includes but is not limited to:

- Developing and implementing Storm Water Management Plans, obtaining associated permits (i.e. dewatering), and using erosion control techniques and Best Management Practices (BMP’s) to protect drains and sewer systems from inappropriate discharges, paying special attention to preventing any contaminants from entering storm sewers or surface water collection systems.
- Properly managing and disposing of hazardous and regulated materials.
- Controlling dust, odors, vapors, debris and run-off during project activities.
- Reporting spills or releases of hazardous materials immediately! Call 911 and during weekdays report to EH&S 303-492-6025.

You are expected do your part to promote awareness and compliance. Violations can result in serious penalties and fines for contractors!

Questions, Comments or Concerns? – Please Contact:
Environmental Health and Safety 303-492-6025.

ENVIRONMENTAL & SAFETY REMINDERS at Construction Sites

<table>
<thead>
<tr>
<th>Spills and Emergencies</th>
<th>Post contingency/preparedness plan; prevent releases to the environment; call 911 immediately to report hazardous spills, &amp; weekdays report to EH&amp;S 303-492-6025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Waste &amp; Debris</td>
<td>Keep saw-cut slurry, drywall mud, grout and mortar, paint, sediment, and all Waste other wastes and process water OUT OF GUTTERS, STREETS, STORM DRAINS, AND PARKING LOTS! Use proper BMP’s to protect from run-off and discharges, see website for examples of BMP’s related to project activities: <a href="http://www.bouldercolorado.gov/wwf/government/index.html">http://www.bouldercolorado.gov/wwf/government/index.html</a>; sweep and shovel solid materials to contractor supplied construction dumpster; allow solids to settle before pouring off water to the sanitary sewer. Identify drains in advance and designate sanitary sewer drain(s) where it’s OK to dump liquids that are pre-approved by EH&amp;S 303-492-6025.</td>
</tr>
<tr>
<td>OSHA</td>
<td>Follow applicable regulations for confined space entry (e.g. tunnels), MSDS, product identification &amp; labeling, PPE, trenching and shoring, fall protection, welding vision screens, etc.</td>
</tr>
<tr>
<td>Asbestos &amp; Lead-Based Paint</td>
<td>Assume all building materials are asbestos-containing unless written report(s) indicate otherwise. A pre-construction environmental site assessment (ESA) is required prior to beginning work--call EH&amp;S Asbestos/Lead Unit 303-492-6168.</td>
</tr>
<tr>
<td>Dust Control</td>
<td>Use wet methods, exhaust fans, HEPA vacs, barriers, etc.; watch for fire alarms in buildings that could be activated by dusts; visible emissions are not permitted.</td>
</tr>
<tr>
<td>Hazardous Materials &amp; Waste</td>
<td>Includes paints and solvents, oils, fuels, coolants, corrosives, cleaners, pesticides, PCB light ballasts, mercury vapor lamps, smoke detectors, rechargeable and lead acid batteries, and many other materials and products. Do not place in the trash or down the drain. Coordinate disposal with EH&amp;S Haz Mat Unit 303-492-8351.</td>
</tr>
<tr>
<td>Odors and Vapors, IAQ</td>
<td>Use protective measures such as barriers, smoke eaters, exhaust fans, ventilation system controls, etc. to capture harmful odors/vapors; watch for building air intakes &amp; coordinate work with building occupants to avoid exposures/complaints.</td>
</tr>
<tr>
<td>De-watering</td>
<td>Water must be visibly clear without a petroleum “sheen” to be discharged; solids must be settled-out or removed prior to discharge. Dewatering permits may be required from the Colorado Department of Public Health and Environment (CDPHE) - Water Quality Division 303-692-3500.</td>
</tr>
<tr>
<td>Utility Locates</td>
<td>Before digging, ALWAYS call the Utility Notification Center of Colorado (UNCC) 1-800-922-1987.</td>
</tr>
</tbody>
</table>
STATE OF COLORADO
OFFICE OF THE STATE ARCHITECT
STATE BUILDINGS PROGRAMS

NOTICE OF APPROVAL OF OCCUPANCY/USE

Date of Occupancy: 

Institution/Agency: University of Colorado at Boulder

Project No./Name: CP 124516 / CAMP – EAST – Electrical Upgrade

Portion(s) of project for which occupancy is approved:

Type of Occupancy: Total or Partial

The items identified below if applicable must be completed with before Occupancy is approved.

<table>
<thead>
<tr>
<th>Date Completed</th>
<th>A/E Signoff</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The Notice of Substantial Completion has been issued and the Building Inspection Record is Cards are completely signed-off (or a Temporary Certificate, or Certificate, of Occupancy has been issued and copies attached.</td>
<td></td>
</tr>
<tr>
<td>2a. Notification has been made to the local Fire Department concerning which portion(s) of the building will be occupied and the date(s).</td>
<td></td>
</tr>
<tr>
<td>2b. Fire alarms, smoke detection systems and building fire sprinkler systems have been fully checked and are operable.</td>
<td></td>
</tr>
<tr>
<td>2c. The building’s fire connections must be installed and operable, if applicable.</td>
<td></td>
</tr>
<tr>
<td>3. Coordination for final utility and service connections and meters (water, gas, sewer, electricity and telecommunication) has been made and systems are in full operating order.</td>
<td></td>
</tr>
<tr>
<td>4. Sterilization of plumbing systems has been performed.</td>
<td></td>
</tr>
<tr>
<td>5. Operational test of systems and equipment has been performed as required.</td>
<td></td>
</tr>
<tr>
<td>6. Systems adjustments such as balancing, equipment operations, etc., have been performed. Reports have been submitted to the Architect/Engineer for approval.</td>
<td></td>
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<tr>
<td>7. Principal Representative furnished equipment and furnishings are coordinated and placed.</td>
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<tr>
<td>8.</td>
<td>All elements left unfinished must be in such condition that there would be no hazard to the health or safety of the occupants.</td>
</tr>
<tr>
<td>9.</td>
<td>All restroom facilities must be fully functional and operable.</td>
</tr>
<tr>
<td>10.</td>
<td>All light fixtures must be installed and operable.</td>
</tr>
<tr>
<td>11.</td>
<td>All exit lights and emergency lighting systems have been checked and are operable.</td>
</tr>
<tr>
<td>12.</td>
<td>All windows have been glazed and hardware is available for ventilation purposes.</td>
</tr>
<tr>
<td>13.</td>
<td>All routes of egress must be clear of construction materials and debris at all times.</td>
</tr>
<tr>
<td>14.</td>
<td>There must be a means of pedestrian access to each building. Contractor must have sidewalks installed before occupancy and pedestrian barricades and other means of public protection as required.</td>
</tr>
</tbody>
</table>

Occupancy does not constitute acceptance of the project as being complete. It simply provides the Principal Representative the opportunity to occupy/use the project or the applicable portion thereof prior to final completion and acceptance. Occupants can expect to be impacted by the Contractor’s efforts to complete the project. The Contractor would not repair any damage caused by the occupants.

Architect/Engineer  
**Stanley Consultants, Inc.**

Principal Representative  
(Institution or Agency)  
Ronald L. Ried, Director  
Facilities Management Business Services

State Buildings Programs  
(or Authorized Delegate)  
Paul M. Leef, AIA, LEED TM AP  
Campus Architect & Director, Planning, Design & Construction

___approved by PM
Post Construction Warranty Report

Project: **CP 124516 / CAMP – EAST – Electrical Upgrade**

Warranty Contractor: 

Date Warranty Begins: 

Date Warranty Expires: 

Facilities Management (F/M) FAX No. 303-492-4082 Reported By: 

Campus Box 453 UCB, Boulder, CO 80309-0453 F/M Rep. Informed: 

Date Reported: 

Taken By: 

**Extended Warranty Item:** 

**Description of Warranty Item:** 

Date Reported to Contractor: 

**Contractor Response:** 

Date of Resolution: 

**Note:** 

Post construction warranty rpt
## CONTRACTOR'S APPLICATION FOR PAYMENT

### Detail of Schedule of Values

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description of Work</th>
<th>Material</th>
<th>Labor and Other</th>
<th>Totals (C + D)</th>
<th>Materials On-Site But Not In Place</th>
<th>WORK IN PLACE</th>
<th>Total Amount Due to Date (F+G+H)</th>
<th>% Complete and in Place (I / E)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>(K)</td>
<td>ORIGINAL CONTRACT TOTALS (SUM)</td>
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<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>#DIV/0!</td>
</tr>
<tr>
<td>(L)</td>
<td>AMENDMENTS/CHANGE ORDER DEDUCTIONS</td>
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<td></td>
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<td></td>
<td>$0.00</td>
<td>#DIV/0!</td>
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<tr>
<td>(M)</td>
<td>AMENDMENTS/CHANGE ORDER ADDITIONS</td>
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<td></td>
<td></td>
<td></td>
<td>$0.00</td>
<td>#DIV/0!</td>
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<tr>
<td>(N)</td>
<td>PRESENT CONTRACT TOTALS</td>
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State Form SBP-7.2
Rev. 2/2008
Page 1 of 1
## Pay Application Details

<table>
<thead>
<tr>
<th>PAY APPLICATION #</th>
<th>FROM</th>
<th>TO</th>
<th>P.O. NO.</th>
</tr>
</thead>
</table>

**CONTRACTOR:**

**AGENCY/INSTITUTION:** University of Colorado at Boulder

**PROJECT #/TITLE:** CP 121944 / W 322760 - CINC - Replace Built-up Roof

### Amendments/Change Order Summary

<table>
<thead>
<tr>
<th>Prior amendments / Change Orders</th>
<th>Deductions (L)</th>
<th>Additions (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>**CO#**s:</td>
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<tr>
<td><strong>Total</strong></td>
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</table>

**Approved This Period**

<table>
<thead>
<tr>
<th>Number</th>
<th>Date</th>
<th>Date</th>
</tr>
</thead>
</table>

**PRESENT CONTRACT TOTAL (N/E):**

<table>
<thead>
<tr>
<th>Current to Date Total Amount</th>
<th>Retainage</th>
<th>Current to Date Payment Less Retainage</th>
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**Prior Payments Total Amount Earned**

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<tr>
<th>Retainage</th>
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<tbody>
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**This Payment Total Amount Earned**

<table>
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<tr>
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<tbody>
<tr>
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**Warrant Amount**

| $0.00 |

**Net change by Amendments / Change Orders (L + M):**

| $0.00 |

### Architect/Engineer's Certification

In accordance with the Contract and this Application for Payment, the above Contractor is entitled to a payment of:

| $0.00 |

**State Form SBP-7.2 Rev. 2/2008 Page 1 of 1**
<table>
<thead>
<tr>
<th>Spec. Section No.</th>
<th>Sub No.</th>
<th>Contr No.</th>
<th>Description</th>
<th>Contr/ SUB Contr</th>
<th>Submit Date</th>
<th>No. of Copies Rec</th>
<th>Action</th>
<th>Date Returned to Architect</th>
<th>Date Returned to Contractor</th>
<th>Distribution copies-Trans</th>
<th>DAYS OUT TO Architect</th>
<th>DAYS OUT TO Contractor</th>
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</table>

**NOTES:**

a. The Submittal Log lists the specification section that requires submittals. It is the Contractor's responsibility to reference the appropriate subsection of the specification section for specific individual submittal requirements and to submit accordingly.

b. The Submittal Log does not necessarily list all specification sections that require submittals. The Contractor is responsible for any additional submittals that may be called for and required on drawings in the individual schedules and notes.
1.01 CONDITIONS AND REQUIREMENTS

Division 1 - General Requirements shall govern work under all Divisions of the Specifications.

1.02 SPECIFICATION LANGUAGE EXPLANATION

Specifications are of abbreviated, simplified or streamlined type and include incomplete sentences. Omissions of words or phrases such as "the Contractor shall," "in conformity therewith," "shall be," "as noted on the Drawings," "a," "the" are intentional. Supply omitted words or phrases by inference in same manner as they are when "NOTE" occurs on Drawings. Supply words "shall be" or "shall" by inference when colon is used within sentences or phrases. Supply words "on the Drawings" by inference when "as indicated" is used with sentences or phrases.

Where reference is made to specifications, societies, institutes, or associations or manufacturer's directions, they are, except as may be inconsistent herewith, made part of specifications, to same extent as if written out in full herein. Use latest edition, at time of bidding, if a date is not given.

1.03 SUBMITTALS

A. Prepare data for use by the University of Colorado, Facilities Management personnel.

B. Format:
   1. Submit electronically in Portable Document Format (PDF) format as one document, OCR (Optical Character Recognition) searchable, bookmarked according to the Construction Specifications Institute (CSI) standards.

   2. Title shall be "SPECIFICATIONS", and shall include:
      a. Name of project and submittal stage and date of submittal (month, day, and year).
      b. University of Colorado Project number (Include on cover and in header or footer of each page)

1.04 CONTENT OF MANUAL

A. An electronically-written table of contents shall be provided for each volume, arranged according to CSI standards. Include the following:
   1. Name of responsible installing principal contractor, address, and telephone number.

1.05 ABBREVIATIONS

References in Contract Documents to trade associations, technical societies, recognized authorities and other institutions include following organizations, which are sometimes referred to only by corresponding abbreviations:

- AA Aluminum Association
- AAMA Architectural Aluminum Manufacturer's Association
- ACI American Concrete Institute
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIMA</td>
<td>Acoustical and Insulating Materials Association (successor to AMA and IBI)</td>
</tr>
<tr>
<td>AISC</td>
<td>American Institute of Steel Construction</td>
</tr>
<tr>
<td>AISI</td>
<td>American Iron and Steel Institute</td>
</tr>
<tr>
<td>AITC</td>
<td>American Institute of Timber Construction</td>
</tr>
<tr>
<td>AMA</td>
<td>Acoustical Materials Association</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute (successor to USASI and ASA)</td>
</tr>
<tr>
<td>APA</td>
<td>American Plywood Association</td>
</tr>
<tr>
<td>ASHRAE</td>
<td>American Society of Heating, Refrigerating and Air Conditioning Engineers</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society for Testing Materials</td>
</tr>
<tr>
<td>AWI</td>
<td>Architectural Woodwork Institute</td>
</tr>
<tr>
<td>AWPA</td>
<td>American Wood Preservers Association</td>
</tr>
<tr>
<td>AWS</td>
<td>American Welding Society</td>
</tr>
<tr>
<td>CDA</td>
<td>Copper Development Associations, Inc.</td>
</tr>
<tr>
<td>CM/GC</td>
<td>Construction Manager/General Contractor</td>
</tr>
<tr>
<td>CRA</td>
<td>California Redwood Association</td>
</tr>
<tr>
<td>CRSI</td>
<td>Concrete Reinforcing Steel Institute</td>
</tr>
<tr>
<td>CS</td>
<td>Commercial Standard (U.S. Department of Commerce)</td>
</tr>
<tr>
<td>DFPA</td>
<td>Douglas Fir Plywood Association</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
</tr>
<tr>
<td>FGMA</td>
<td>Flat Glass Marketing Association</td>
</tr>
<tr>
<td>FIA</td>
<td>Factory Insurance Association</td>
</tr>
<tr>
<td>FM</td>
<td>Factory Mutual Engineering Division</td>
</tr>
<tr>
<td>FS</td>
<td>Federal Specification</td>
</tr>
<tr>
<td>MIA</td>
<td>Marble Institute of America</td>
</tr>
<tr>
<td>MIL</td>
<td>Military Specification</td>
</tr>
<tr>
<td>MILMA</td>
<td>Metal Lath Manufacturer's Association</td>
</tr>
<tr>
<td>NAAMM</td>
<td>The National Association of Architectural Metal Manufacturers</td>
</tr>
<tr>
<td>NBFU</td>
<td>National Board of Fire Underwriters</td>
</tr>
<tr>
<td>NBS</td>
<td>National Bureau of Standards</td>
</tr>
<tr>
<td>NCMA</td>
<td>National Concrete Masonry Association</td>
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<tr>
<td>NEC</td>
<td>National Electric Code (of NBFU)</td>
</tr>
<tr>
<td>NEMA</td>
<td>National Electrical Manufacturers' Association</td>
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<tr>
<td>NFPA</td>
<td>National Fire Protection Association</td>
</tr>
<tr>
<td>NIOSH</td>
<td>National Institute of Occupational Safety and Health</td>
</tr>
<tr>
<td>NMWIA</td>
<td>National Mineral Wool Insulation Association</td>
</tr>
<tr>
<td>NPVLMA</td>
<td>National Paint, Varnish and Lacquer Manufacturers' Association</td>
</tr>
<tr>
<td>NTMA</td>
<td>The National Terrazzo and Mosaic Association</td>
</tr>
<tr>
<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
</tr>
<tr>
<td>PCA</td>
<td>Portland Cement Association</td>
</tr>
<tr>
<td>PCI</td>
<td>Prestressed Concrete Institute</td>
</tr>
<tr>
<td>PEI</td>
<td>Porcelain Enamel Institute</td>
</tr>
<tr>
<td>PS</td>
<td>Product Standard (U.S. Department of Commerce)</td>
</tr>
<tr>
<td>SCI</td>
<td>Structural Clay Products Institute</td>
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<tr>
<td>SDI</td>
<td>Steel Deck Institute</td>
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<tr>
<td>SJI</td>
<td>Steel Joist Institute</td>
</tr>
<tr>
<td>SMACNA</td>
<td>Sheet Metal and Air Conditioning Contractor's National Association</td>
</tr>
<tr>
<td>SPA</td>
<td>Southern Pine Association</td>
</tr>
<tr>
<td>SPI</td>
<td>The Society of Plastic Industry, Inc.</td>
</tr>
<tr>
<td>SPR</td>
<td>Simplified Practice Recommendation (U.S. Department of Commerce)</td>
</tr>
<tr>
<td>SSPC</td>
<td>Steel Structures Painting Council</td>
</tr>
<tr>
<td>SWI</td>
<td>Steel Window Institute</td>
</tr>
</tbody>
</table>
1.04 LAYING OUT WORK

The Contractor will furnish reference bench mark and maintain bench mark and all other grades, lines, and levels and dimensions as indicated in the Contract Documents. Report any errors or inconsistencies in above to Owner before commencing work.

Except as delegated by subcontract or normal trade practice, the Contractor will be responsible for all lines, elevations, and measurements of work indicated.

1.05 EXAMINATION OF SITE

Failure to visit the site will in no way relieve any Contractor from the necessity of furnishing materials or performing work that may be required to complete work in accordance with the Contract Documents without additional cost to Owner.

END OF SECTION
PART 1 - GENERAL

1.00 PROJECT DESCRIPTION

A. The Scope of Work included in the single, lump sum price, comprises the provision by the Contractor for the construction of the East Campus 13.2kV Switchgear Replacement for the University of Colorado at Boulder. The project includes the tasks described herein.

B. The East Campus buildings will remain on-line and occupied throughout the entire duration of the project. It is the Contractor’s responsibility to coordinate the installation of the various project elements with the Owner to assure maximum availability of the buildings.

C. The services shall be performed in accordance with the attached Agreement and include the following:

1. Procurement and installation of one Power Distribution Center (PDC) building to replace the existing medium voltage, metal-clad, switchgear line-up at the East Campus. The PDC shall include but not be limited to the following:

   a. One Power Distribution Center (PDC) switchgear building.

   b. One 15kV medium voltage, metal-clad, double-ended switchgear line-up.

   c. The building and switchgear shall be shipped whole, fully tested and operational.

   d. Hardware and software associated with the power monitoring and control system (PMCS) as shown on the drawings including but not limited to SEL-2032s, SEL-351s, engineering workstation, and associated wiring. Monitoring and control screens shall be developed and tested similar to those of the existing Main Campus system. The new East Campus switchgear shall be capable of being monitored and controlled from either the existing Main Campus Engineering Center Electrical Vault PMCS engineering workstation or the Main Campus PowerHouse PMCS engineering workstation.

2. Installation of the underground electrical and communication ductbanks to connect the existing Main Campus Switchgear to the new East Campus Switchgear as well as reconnect the new East Campus Switchgear to the existing East Campus buildings. This includes but is not limited to the interception of the existing underground electrical ductbank adjacent the Main Campus Engineering Center Electrical Vault, at the East Campus System Biotechnology Building manhole #TBD, and at the East Campus manhole #301 adjacent the Boulder Creek crossing.

3. Procurement and installation of medium voltage cable to connect the existing Main Campus Switchgear to the new East Campus Switchgear as well as reconnect the new East Campus Switchgear to the existing East Campus buildings.

4. Procurement and installation of the fiber optic cable to connect the existing SEL-3351 located at the Main Campus Engineering Center Electrical Vault to the new switchgear communications in the PDC building.

5. Installation of the structural vault beneath the PDC building to support the building as well as facilitate underground electrical services to enter the switchgear.

6. Installation of the structural wall to conceal the PDC building.

7. Provide all utility locates and necessary utility potholing prior to any excavation of work. This information shall be submitted with the PDC building and switchgear shop drawings before purchasing any material for the structural vault beneath the PDC building.
8. Provide a construction traffic and control plan for all areas of work as indicated on the drawings as well as the means to execute the traffic and control plan to protect pedestrians and minimize the disruption to campus. Emergency vehicle access to all areas shall be maintained at all times.

9. Complete and submit all applicable University forms and inspections including but not limited to Hot Work Permits found in [http://www.colorado.edu/facilitiesmanagement/pdc/safety/index.html](http://www.colorado.edu/facilitiesmanagement/pdc/safety/index.html).

10. Providing a temporary 2.5MW diesel generator with 24 hour fuel storage to supply power to the East Campus while the 15kV feeders from Main Campus to East Campus are replaced. Fuel for full load operation for a four week duration shall be anticipated.

1.01 SCHEDULE OF DRAWINGS, SPECIFICATIONS AND ADDENDA

The following Drawings, Project Manual, and Addenda from the Contract Documents.

A. Set(s) of Drawings & project manuals dated October 2010. Drawing list is as follows:

<table>
<thead>
<tr>
<th>DRAWING NO.</th>
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<tbody>
<tr>
<td>GG01</td>
<td>General – Cover Sheet &amp; Drawing Index</td>
</tr>
<tr>
<td>GG02</td>
<td>General – Code Review Analysis</td>
</tr>
<tr>
<td>GG03</td>
<td>General – Main &amp; East Campus – Construction Access</td>
</tr>
<tr>
<td>GG04</td>
<td>General – Main Campus – Construction Access</td>
</tr>
<tr>
<td>GG05</td>
<td>General – Colorado Avenue – Construction Access</td>
</tr>
<tr>
<td>GG06</td>
<td>General – East Campus – Construction Access</td>
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CIVIL DRAWINGS
CU01 Civil – East Campus – Site/Demolition Plan

STRUCTURAL DRAWINGS
SG01 Structural - Legend & General Notes
SF01 Structural – Power Distribution Center (PDC) Building – Plan & Sections
SF02 Structural – Power Distribution Center (PDC) Building – Sections & Details
SF03 Structural – Screen Wall – Sections & Details

ELECTRICAL DRAWINGS
ED01 Electrical – Details & Cross Sections – Ductbank & Grounding
ED02 Electrical – Details & Cross Sections – Cable Tray & Grounding
E001 Electrical – East Campus – Overall One-Line Diagram
E002 Electrical – East Campus 13.2KV Switchgear – One-Line Diagram
E003 Electrical – East Campus 13.2KV Switchgear – Three-Line Diagram Sheet 1 of 4
E004 Electrical – East Campus 13.2KV Switchgear – Three-Line Diagram Sheet 2 of 4
E005 Electrical – East Campus 13.2KV Switchgear – Three-Line Diagram Sheet 3 of 4
E006 Electrical – East Campus 13.2KV Switchgear – Three-Line Diagram Sheet 4 of 4
EP01 Electrical – Overall Campus – Ductbank Routing
EP02 Electrical – Main Campus – Ductbank Routing
EP03 Electrical – East Campus South – Ductbank Routing
EP04 Electrical – East Campus North – Ductbank Routing
EP05 Electrical – Manholes 76 & 26 – Plans, Sections & Details
EP06 Electrical – Manholes 62 & SBB – Plans, Sections & Details
EP07 Electrical – Manholes 301 & 61 – Plans, Sections & Details
SECTION 01010

SUMMARY OF WORK

EP08  Electrical – Building 569-Brick House – Building Arrangement
EP09  Electrical – Power Distribution Center (PDC) – Building Arrangement
EP10  Electrical – PDC Vault – Plans, Sections & Details
EW01  Electrical – East Campus13.2KV Switchgear – Main Breaker Schematic (Typical)
      Sheet 1 of 2
EW02  Electrical – East Campus13.2KV Switchgear – Main Breaker Schematic (Typical)
      Sheet 2 of 2
EW03  Electrical – East Campus13.2KV Switchgear – Tie Breaker Schematic
      Sheet 1 of 2
EW04  Electrical – East Campus13.2KV Switchgear – Tie Breaker Schematic
      Sheet 2 of 2
EW05  Electrical – East Campus13.2KV Switchgear – Feeder Breaker Schematic
      (Typical)
EW06  Electrical – East Campus13.2KV Switchgear – Bus Differential Schematic
EW07  Electrical – East Campus13.2KV Switchgear – Potential Transformer Schematic
EW08  Electrical – East Campus13.2KV Switchgear – Door Details

INSTRUMENTATION & CONTROL DRAWINGS

I001  I&C – East Campus 13.2KV Switchgear – Power Monitoring & Control System
IS01  I&C – East Campus 13.2KV Switchgear – Main-Tie-Main ATO Logic Diagram

C. Addenda: All Addenda issued prior to bidding.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. Work covered: Work under this contract includes all materials, equipment and labor necessary to complete the work indicated on the drawings, described in specifications, addenda or reasonably inferred.

1.03 CONTRACTORS

All work will be executed under one prime construction contract between the Owner and the Contractor.

Except as indicated otherwise, all work under this contract will be under the direction of the prime contractor.

1.04 JOB CONDITIONS

A. Limit construction operations to those methods and procedures which will not adversely and unduly affect the Owner’s occupied spaces inclusive of parking facilities.

B. Do not interrupt building access and use, except as permitted by the Owner.

Provide eight (8) work days notice to the Owner of construction activities which will severely impact the occupancy and use of adjacent areas.
C. Provide temporary barriers and/or partitions as required to protect the occupants of the building and the general public from injury due to the work of this project; and/or to protect adjacent areas of the building from the spread of dust and dirt caused by the work or this project.

Remove temporary barriers and partitions upon completion of the Project.

1. Temporary partitions shall be constructed of 1/2" plywood on the construction face nominal 2” X 4” wood studs and 1/2” gypsum wallboard on the public occupied face.

D. Do not interrupt power, lighting, plumbing, telephone and HVAC services to occupied areas without Owner's approval. Such interruptions must be scheduled at least eight (8) work days in advance and have Owner's approval.

1.05 PROTECTION OF WORK AND ADJACENT PROPERTY

A. Buildings and property adjacent to work included in this project may be subject to damage due to construction operations.

Prior to the start of the work included in this Contract engage the services of a photographer to record the existing condition of adjacent structures and property. Contractor shall provide one set on disk to the Owner and retain negatives and one set of prints for their records. Sufficient photos with adequate detail to thoroughly document the conditions surrounding the work shall be provided.

B. At the completion of the project, Contractor shall restore existing buildings, landscaping, parking facilities and property to same condition as prior to the start of the work.

C. In addition to the requirements of the General Conditions of the Contract for Construction, the Contractor shall:

1. Notify, in writing, the Owner of University or private property which interferes with the work and arrange with them for disposition of such property.

2. Provide and maintain proper shoring and bracing to prevent earth from caving or washing into excavation. Provide temporary protection around openings through and at floors, roofs, and other openings.

3. Provide and maintain proper shoring and bracing for existing underground utilities, sewers, etc., encountered during excavation work, to protect them from collapse or other type of damage until such time as they are to be removed, incorporated into the work of this project, or can be properly back-filled upon completion of new work.

4. Weather Protection: Provide protection against rain, snow, wind, ice, storms, or heat so as to maintain work, materials, apparatus, and fixtures free from injury or damage. At the end of each day's work, cover new work likely to be damaged.

5. Provide and maintain adequate protection of the work from damage due to freezing, especially freezing earth and soils. Risk of proceeding with the work on or with freezing or frozen materials will be the sole responsibility of the Contractor.

6. Water Protection: Provide protection from damage at all times from rain water, ground water, backing up of drains or sewers, and other water. Provide pumps and equipment enclosures to provide this protection.

7. The Contractor will maintain free of obstructions and debris, all designated corridors and emergency exits, handicap access ramps and sidewalks to building. Provide temporary directional handicapped signage for routing to the nearest accessible facilities.
1.06 EXISTING FURNITURE AND EQUIPMENT

The Owner will remove or relocate existing movable furniture and equipment from the areas in which the Contractor is working. Notify the Owner not less than three days prior to starting work in areas where furniture and equipment require moving.

1.07 CONTRACTOR’S ACCESS PARKING AND STAGING AREAS

A. Work included in this project will need to be performed within the limitations of available access at the site. The University shall limit the area available for staging and parking due to the additional number of construction projects planned during the execution of this contract. Contractor shall adjust the means and methods of construction to allow for the restrictions surrounding the site.

B. All parking on campus except for some one-hour zones on city streets and a few metered spaces is under control and authority of the Parking and Transportation Services (PTS) of the University. All University parking is by permit only.

C. Types of parking and staging are defined as follows:

- **General Staging Areas** are approved areas adjacent to the site when available or in University designated group staging yards. General Staging Areas may be used for any purpose, including employee parking, on a space available basis, but must be coordinated through the UCB Project Manager and PTS. Vehicles may not park outside of general staging areas except in areas coordinated and approved by PTS.

- **Restricted Staging Areas** are approved areas near the site for the construction dumpster, off-loading of equipment, contractor’s work trailer, and materials that are soon to be incorporated into the work. No vehicles shall park in a restricted staging area for more than 20 minutes between the hours of 8:00 a.m. and 5:00 p.m. weekdays.

- **Contractor Employee Parking** are areas for workers needing parking on campus. Coordinate through UCB Project Manager and PTS.

- **Prohibited Parking** are areas designated in the Contract Documents as No Parking areas. The contractor shall not allow any parking in areas so designated under any circumstance.

D. The restrictions in this Section are in addition to any other restrictions or rules provided by PTS. Fees shall be assessed for the use of any PTS facility for staging and construction activities.

E. The designated staging area for this project shall be: **Note - review staging with planning & parking services.**

Some projects might need to have more information included in this Section. Here are some examples.

F. The staging areas for this project are located in landscaped areas. The contractor shall protect all trees located within the staging areas to the drip line of the trees. Sod and planting beds within the staging areas shall be restored to a “like-new” condition upon completion of the work.
G. Vehicles parked on sidewalks or in landscape areas outside the designated staging areas cause damage to University property. The contractor shall reimburse the University $25.00 per vehicle per occurrence for vehicles parked outside the designated staging areas. This amount shall be in addition to any fines which might be levied by PTS.

1.08 OCCUPANCY REQUIREMENTS

A. Owner may occupy designated areas for the purpose of storage of furnishings and equipment and installation of equipment.

B. Execute Certificate of Substantial Completion for each designated portion of work prior to Owner occupancy. Contractor shall allow:
   1. Access for Owner personnel.
   2. Use of parking facilities.
   3. Operation of HVAC and electrical systems.

C. On occupancy, Owner will provide, for occupied areas:
   1. Operation of HVAC and electrical systems.

1.09 CONSTRUCTION AND SEQUENCE SCHEDULE:

A. In order to accommodate the uninterrupted operation of the existing building during the various phases of construction, the sequence of construction operations shall be as follows:
   1. The sequence concept is to: (1) prepare the existing facility to function during renovation through completion; (2) thence occupy the newly remodeled portion; and (3) upon completion, finally reoccupy the remodeled portions.
   2. Utilizing this concept break down the Schedule into broad scope categories augmented by “Owner Action” and “Contractor action” columns that indicate coordination tasks which define the various phases of the work.
   3. The intent of the categorization is to generally summarize the nature and extent of work to be performed without in any way limiting specific requirements of the Contract Documents.
   4. Some overlapping between the several construction operations will occur, and where possible, permission may be granted to start certain portions of the work before the previous operations were completed in their entirety. Such detail scheduling shall be done as the work progresses, provided that the Owner’s operations remain uninterrupted, but in all cases must receive Owner approval.
   5. Where it may not be possible to complete certain mechanical and electrical services in connection with making the work complete and ready for occupancy, temporary services as directed and as approved shall be installed to permit occupancy by the Owner at the earliest possible date.
   6. The construction sequence schedule and related drawings are intended to aid the Contractor in bidding and in the preparation of a specific construction schedule. Deviations of sequence may be made upon approval of the Owner and the Architect. The preparation of a specific construction schedule remains the responsibility of the Contractor.
1.10 TEMPORARY ELECTRIC SERVICE

A. Connect to existing power service. Power consumption shall not disrupt owners need for continuous service. *(Owner or Contractor) choose one* to pay for power consumed. Provide power outlets for construction operations, branch wiring, distribution boxes, and flexible power cords as required.

END OF SECTION
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section.

1.02 SURVEYS, LAYOUTS, AND LEVELS

A. General: Working from lines and levels established by the existing building, and as shown in relation to the work, establish and maintain bench marks and other dependable markers to set the lines and levels for the work of construction as needed to properly locate every element of the work of the entire project. Calculate and measure required dimensions as shown (within recognized tolerances if not otherwise indicated); do not scale the drawings to determine dimensions. Continuously advise tradesmen performing the work of the marked lines and levels provided for use in the layout of work.

1.03 PROJECT RECORD DOCUMENTS

A. Maintain at job site, one copy of:
   1. Contract Drawings
   2. Specifications
   3. Addenda
   4. Reviewed Shop Drawings
   5. Change Orders
   6. Other Modifications to Contract
   7. Field Test Records
   8. As-Built Drawings

B. Maintain documents in clean, dry, legible condition and do not use record documents for construction purposes. Make documents available at all times for inspection by the Consultant and Owner.

C. Label each document "Project Record" in 1" or larger printed letters.

D. Record drawing information in colored pencil with different colors for the various systems and defined by color legend.

E. Record drawings and specifications shall include the following:
   1. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure. Location of concealed valves, dampers, controls, balancing devices, junction boxes, clean-outs, and other items requiring access or maintenance.
   2. Field changes of dimension and detail, changes made by Change Order or Field Order and details not on original contract drawings.
   3. Fire protection and alarm systems shop drawings.
SECTION 01020  ADMINISTRATION AND SUPERVISION

F. Submit all record drawings to the Consultant at the completion of the project.

1.04 CLEANING

A. Cleaning and Protection Work: At the time each unit of work or element of the construction is completed (substantially) in each area of the Project, clean the unit or element to a condition suitable for occupancy and use (as intended), and restore minor or superficial damage. Replace units and elements which are damaged beyond successful restoration. Clean and restore adjoining surfaces and other work which was soiled or damaged (superficially) during the installation; replace other work damaged beyond successful restoration. Where the performance of subsequent work could possibly result in damage to the complete unit or element, provide protective covering or other provisions to minimize possible damage. Repeat cleaning and protection operations during remainder of construction period, wherever work might otherwise be damaged by sustained soiling or exposure.

B. During Construction: Oversee cleaning and ensure that building, grounds, and public properties are maintained free from accumulation of waste materials and rubbish. At reasonable intervals during daily progress of work, clean up site and access and dispose of waste materials, rubbish, and debris. Vacuum clean interior building areas when ready and continue vacuum cleaning on an as-needed basis until building is ready for acceptance or occupancy.

1.05 PROJECT SIGN

Erect no project sign or job-site sign of any kind, except warning signs as specified in Section 01500, without written authorization of the Owner.

1.06 COORDINATION

A. The Contractor shall coordinate the work so as not to interfere with the building custodian's normal cleanup activities.

B. The Contractor shall be responsible for coordinating all the work of the project. The Contractor shall coordinate the efforts of all subcontractor(s) and the deliveries of suppliers so that the work progresses in an orderly fashion without delay towards timely completion of a complete project in accordance with the drawings and specifications.

C. The Contractor shall note that concurrent with his work, other contractors, suppliers, and the Owner's facilities and maintenance personnel may be working in relatively close proximity. The Contractor will be solely responsible for coordinating his work with that of other contractors and will make no claims for failure to do so.

1.08 METHODS OF CONSTRUCTION

A. The procedure and method of construction is the prerogative and the responsibility of the Contractor. If professional assistance is required to safely implement method of construction, the Contractor shall, on his own, employ professional help.

END OF SECTION
Part 1 - General

1.01 General

Quantities indicated on the drawing or extra quantities specified shall be included in the Contractor's Base Bid. For Adding or Deducting from Base Bid quantities, the unit prices described in this section will be applied. The Contractor will be notified, in writing, of the quantities applicable for each unit price, and the Contract Price will be adjusted accordingly by Change Order.

All unit prices shall include all labor, materials, equipment, services, delivery to the project, overhead, profit, insurance, and all other incidental expenses to complete the work specified unless indicated otherwise. All work covered by unit prices shall be performed in accordance with requirements of the applicable sections of the Specifications.

1.02 Unit Prices

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Conductor - 15kV; linear foot (LF): Unit price includes all costs for material and pulling a three phase feeder through an underground electrical ductbank, and miscellaneous associated work required to furnish and install 15kV conductor of each type, material, and sizes listed.</td>
<td>$</td>
</tr>
<tr>
<td>2. Underground electrical conduit – Six individual 6” Conduits buried 3’-0” below finished grade to the top of the ductbank; linear foot (LF): Unit price includes all costs for excavation, trenching, shoring, conduit, spacers, fittings, concrete, backfilling, compacting, and miscellaneous associated work required to furnish and install the ductbank.</td>
<td>$</td>
</tr>
<tr>
<td>3. Concrete; cubic yard (CY): Unit price includes labor, equipment, materials, tests, placing, forming, finishing, curing, installation of embedded items, and incidental work necessary for concrete construction. Unit price does not include reinforcing steel.</td>
<td>$</td>
</tr>
<tr>
<td>4. Reinforcing Bar or Welded Wire Fabric; pound (Lb): Unit price includes all work in connection with furnishing and installing. Pounds of reinforcing bar defined as theoretical weights of various sizes and lengths of bars shown on fabricator's Shop Drawings.</td>
<td>$</td>
</tr>
<tr>
<td>5. Electrical Contractor Labor; hourly (Hr): Unit price includes hourly labor rates for all supervisor, journeyman, and apprentice.</td>
<td>$</td>
</tr>
<tr>
<td>6. General Contractor Lab; hourly (Hr): Unit price includes hourly labor rates for all supervisor, journeyman, and apprentice.</td>
<td>$</td>
</tr>
</tbody>
</table>

End of Section
PART 1 - GENERAL

1.01 SUMMARY

A. General Contractor is responsible for all of the work of this contract.
   1. Assign and subcontract portions of the work as required to assure that all work is constructed in compliance with these documents.
   2. Coordinate the work of the several subcontractors for the project.
   3. Coordinate work of this contract with work by separate contractors.

B. Each subcontractor shall:
   1. Coordinate work of his own employees and subcontractors.
   2. Expedite his work to assure compliance with schedules.
   3. Coordinate his work with that of other subcontractors and work by separate contractor.
   4. Comply with orders and instructions of owner.

C. Related Requirements
   1. All Division 1 Sections.

1.02 CONSTRUCTION ORGANIZATION AND START-UP

A. Establish on-site lines of authority and communications.
   1. Attend pre-construction meeting with subcontractors upon commencement of the project.
   2. Establish procedures for intra-project communications.
      a. Submittals.
      b. Reports and records.
      c. Recommendations.
      d. Coordination Drawings.
      e. Schedules.
      f. Resolution of conflicts.
      a. Consult with Architect to obtain interpretation.
      b. Assist in resolution of questions or conflicts which may arise.
      c. Transmit written interpretations to subcontractors, and to other concerned parties.
   4. Assist in obtaining permits and approvals.
      a. Obtain building permits and special permits required for work or for temporary facilities.
      b. Verify that subcontractors have obtained inspections for work and for temporary facilities.
   5. Control the use of site.
      a. Supervise field engineering and site layout.
      b. Allocate space for each subcontractor's use for field offices, sheds, work and storage areas.
      c. Establish access, traffic and parking allocations and regulations.
      d. Monitor use of site during construction.
1.03 CONTRACTOR DUTIES

A. Construction Schedules.
   1. Coordinate schedules with several subcontractors.
   2. Monitor schedules as work progresses.
      a. Identify potential variances between schedules and probable completion dates for each phase.
      b. Recommend adjustments in schedule to meet required completion dates.
      c. Adjust schedules of subcontractors as required.
      d. Document changes in schedule.
   3. Observe work of each subcontractor to monitor compliance with schedule.
      a. Verify that labor and equipment are adequate for the work and the schedule.
      b. Verify that product procurement schedules are adequate.
      c. Verify that product deliveries are adequate to maintain schedule.

B. Process Shop Drawings, Product Data and Samples.
   1. Review for compliance with Contract Documents.
      a. Field dimensions and clearance dimensions.
      b. Relation to available space.
      c. Relation to other trades, equipment and systems.
      d. Submit to Architect.

C. Monitor the use of temporary utilities.
   1. Verify that adequate services are provided and maintained.

D. Inspection and Testing.
   1. Inspection work to assure performance in accord with requirements of Contract Documents.
   2. Administer special testing and inspections of suspected work.
   3. Reject work which does not comply with requirements of Contract Documents.
   4. Coordinate testing laboratory services.
      a. Verify that required laboratory personnel are present.
      b. Verify that tests are made in accordance with specified standards.
      c. Review test reports for compliance with specified criteria.
      d. Recommend and administer required retesting.

E. Monitor contractor’s periodic cleaning.
   1. Enforce compliance with specifications.
   2. Resolve any conflicts.

F. Coordinate changes.
   1. Recommend necessary or desirable changes.
   2. Assist owner in negotiating change orders.
   3. Promptly notify all subcontractors of pending changes.

G. Maintain Reports and Records at Job Site available to Architect and Subcontractors.
   1. Log progress of work of each subcontractor.
   2. Records
      a. Contracts.
      b. Purchase orders.
c. Materials and equipment records.
d. Applicable handbooks, codes and standards.
3. Obtain information from subcontractors and maintain file of Project Record Documents.
4. Assemble documentation for handling of claims and disputes.

H. Coordinate work of this Contract and requirements of this section with work by Separate Contract including but not limited to:
   1. Removal of asbestos containing materials by separate contract.

1.04 CONTRACT CLOSEOUT

A. Coordinate equipment start-up.
   1. Provide seven days notification prior to start-up of each item.
   2. Ensure that each piece of equipment or system is ready for operation.
   3. Execute start-up under supervision of responsible persons in accordance with manufacturer's instructions.
   4. Perform required testing and balancing.
   5. Record dates of start of operation of systems and equipment. Submit written report that equipment or system has been properly installed and is functioning correctly.
   6. Provide written notice of beginning of warranty period for equipment put into service.

B. Demonstration and Instructions
   1. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to Substantial Completion.
   2. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, seasonal operation, and shutdown of each item of equipment.

C. At completion of work of each Section, conduct an inspection to assure that
   1. Specified cleaning has been accomplished.
   2. Temporary facilities have been removed from site.

D. At completion
   1. Conduct an inspection to list work to be completed or corrected.
   2. Supervise correction and completion of work as established in Certificate of Completion.

E. When a portion of the Project is occupied prior to final completion, coordinate established responsibilities of each subcontractor.

F. Final completion.
   1. When each Subcontractor determines that work is finally complete, conduct an inspection to verify completion of work.
   2. Assist owner and architect in inspection.

G. Administer contract closeout.
   1. Receive and review Subcontractor's final submittals.
   2. Transmit to architect with recommendation for action.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Carefully coordinate the interface between Division 15 (Mechanical) and Division 16 (Electrical) before submitting any equipment for review or commencing installation.

B. Responsibility: Unless otherwise indicated, all motor and controls for Division 15 equipment shall be furnished, set in place and wired in accordance with the following schedule:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>FURNISHED UNDER</th>
<th>SET IN PLACE UNDER</th>
<th>POWER WIRING UNDER</th>
<th>CONTROL WIRING UNDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment Motor</td>
<td>15</td>
<td>15</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>Automatically Controlled</td>
<td></td>
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<tr>
<td>Starter/Contractors:</td>
<td></td>
<td></td>
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<tr>
<td>Separate</td>
<td>15</td>
<td>16</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Factory Mounted &amp; Wired</td>
<td>15</td>
<td>15</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>In Motor Control Centers</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Manually Controlled</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starter/Contractors:</td>
<td></td>
<td></td>
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<tr>
<td>Separate</td>
<td>15</td>
<td>16</td>
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<td>15</td>
</tr>
<tr>
<td>Factory Mounted &amp; Wired</td>
<td>15</td>
<td>15</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Motor Speed Controllers</td>
<td>15</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Disconnect (Note 1) Switches</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>Contactors</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>Thermal Overload (Note 1) Switches</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>Manual Operation (Note 2)</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>Switches</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>Control Relays (Note 2)</td>
<td>15</td>
<td>15</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>Control Transformers</td>
<td>15</td>
<td>15</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Control Circuit Outlets</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>Thermostats (Note 2)</td>
<td>15</td>
<td>15</td>
<td>-</td>
<td>15</td>
</tr>
</tbody>
</table>
### GENERAL REQUIREMENTS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>FURNISHED UNDER</th>
<th>SET IN PLACE UNDER</th>
<th>POWER WIRING UNDER</th>
<th>CONTROL WIRING UNDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Switches (Note 2) Not in C Panel</td>
<td>15</td>
<td>15</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Push Button Stations, Pilot Lights</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Thermostats (Note 2) Controls: Integral with Equipment or Directly Applied to Ducts, Pipes, etc.</td>
<td>15</td>
<td>15</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Valve Motors, Damper Motors, Solenoid Valves, etc.</td>
<td>15</td>
<td>15</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>EP Valves or Switches, P.E. Switches</td>
<td>15</td>
<td>15</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>Control Circuit Outlets</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>Fire Alarm Systems</td>
<td>16</td>
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</tr>
<tr>
<td>Fire Sprinkler Alarm</td>
<td>16</td>
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<td>-</td>
<td>16</td>
</tr>
<tr>
<td>Firestats</td>
<td>16</td>
<td>16</td>
<td>-</td>
<td>16</td>
</tr>
<tr>
<td>Smoke Detectors Including Relays for Fan Control</td>
<td>16</td>
<td>16</td>
<td>-</td>
<td>16</td>
</tr>
<tr>
<td>Control Air Compressor</td>
<td>15</td>
<td>15</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Refrigerated Air Dryer</td>
<td>15</td>
<td>15</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Equipment Interlocks</td>
<td>15</td>
<td>15</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>Boiler and Water Heaters</td>
<td>15</td>
<td>15</td>
<td>16</td>
<td>15</td>
</tr>
</tbody>
</table>

**NOTES:**

1. If furnished as part of factory wired equipment furnished and set in place under Division 15, wiring and connections under Division 16.
2. If float switches, line thermostats, P.E. switches, time switches, or other controls carry the FULL LOAD CURRENT to any motor, they shall be furnished under Division 15, but they shall be set in place and connected under Division 16 except that where such items are an integral part of the mechanical equipment, or directly attached to ducts, piping, or other mechanical equipment, they shall be set in place under Division 15 and connected under Division 16. If they do not carry the FULL LOAD CURRENT to any motor, they shall be furnished, set in place and wired under Division 15.
C. Control Wiring: Consists of wiring in pilot circuits of contact or starters, sensors, controllers, and relays, and wiring for valve and damper operators.
   1. Connections: Connections to all controls directly attached to ducts, piping and mechanical equipment shall be made with flexible connections.

D. Starters: Provide magnetic starters for all three phase motors and equipment complete with:
   1. Control transformers.
   2. 120V holding coils.
   3. Integral hand-off-auto switch.
   4. Auxiliary contacts required for system operation plus one (1) spare.

E. Remote Switches and Push Button Stations: Provide all remote switches and/or push button stations required for manually operated equipment (if no automatic controls have been provided) complete with pilot lights of an approved type lighted by current from load side of starter.

F. Special Requirements: Motors, starters and other electrical equipment installed in moist areas or areas of special conditions, such as explosion proof, shall be designed and approved for installation in such areas with appropriate enclosure.

G. Identification: Provide identification of purpose for each switch and/or push button station furnished. Identification may be either engraved plastic sign or permanent mounting to wall below switch, or stamping on switch cover proper. All such identification signs and/or switch covers in finished areas shall match other hardware in the immediate areas.

H. Control Voltage:
   1. Maximum allowable control voltage 120V. Fully protect control circuit conductors in accordance with National Electrical Code.
   2. Provide 20A breakers in emergency panels under Division 16 as required for Building Management System Air Temperature Controls (BMS/ATC). Provide all control transformers, control wiring and connections to circuits under Section 15950 of Division 15.

I. Related Requirements
   1. Section 16480: Electric Motors
      a. Coordinate with efficiency requirements.

J. Contractor must review all concrete embedded items (including conduit) with owner prior to placement.
PART 2 - PRODUCTS

2.01 MOTOR HORSEPOWER

A. In general, all motors 1/2 HP and above shall be three phase, all motors less than 1/2 HP shall be single phase.

B. Voltage and phase of motors as scheduled on the electrical drawings shall take precedence in the case of a conflict between the mechanical and electrical drawings or General Condition 2.01 A., above.

C. Work under Division 15 includes coordinating the electrical requirements of all mechanical equipment with the requirements of the work under Division 16, before ordering the equipment.
   1. If motor horsepower is changed under the work of Division 15, without a change in duty of the motor's driven device, coordination of additional electrical work (if any) and additional payment for the work (if any) shall be provided under the section of Division 15 initiating the change. Increases or decreases in motor horsepower from that specified shall not be made without written approval from the Engineer.

PART 3 - EXECUTION

NOT USED.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included: This section establishes general requirements in addition to those indicated in the General Conditions of the Contract for Construction pertaining to cutting, fitting, and patching of the work required to:
   1. Make the several parts fit properly.
   2. Uncover work to provide for installation, inspection, or both, of ill-timed work.
   3. Remove and replace work not conforming to requirements of Contract Documents.
   4. Patch new construction into existing construction.

B. Related Work:
   1. In addition to requirements specified, upon the Consultant's request, uncover work to provide for inspection of covered work, and remove samples of installed materials for testing.
   2. Do not cut or alter work performed under separate contract without the Consultant's written permission.

1.02 QUALITY ASSURANCE

A. Perform all cutting and patching in strict accordance with pertinent requirements of the Specifications and, in the event no such requirements are determined, in conformance with the Consultant's written direction.
   1. Use skilled workmen to perform all cutting and patching work.
   2. Use methods least likely to damage existing surfaces and materials to remain, while providing proper surfaces to receive installation of repair, patching, and/or new work.

B. Visual Quality:
   1. Do not cut and patch work exposed to public view, and the exterior and/or interior of the building in a manner that will result in an unacceptable appearance as determined by the Consultant.
   2. Do not cut and patch work in a manner that will result in obvious appearance that cutting and patching work was done.
   3. When cutting existing structural concrete, do not extend saw cuts beyond the corners of the required opening on either side of the opening.

1.03 EXISTING CONSTRUCTION

A. Where cutting and patching of existing construction is required; prior to start of work, inform Owner of existing construction to be disturbed. Owner will determine if elements of existing construction contain asbestos. Do not proceed with work until after Owner has examined areas to be disturbed. Refer to Exhibit A, Project Pre-Inspection for Possible Presence of Asbestos for additional information concerning the possible presence of materials containing asbestos.

1.04 SUBMITTALS

A. Submit proposed cutting and patching procedures in writing for the following categories of work prior to proceeding with this work:
1. Cutting new openings in existing structural concrete walls, parapets, and suspended slabs.
2. Cutting new openings in existing roofs and roofing materials.

B. Submittals shall comply with Section 01300.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Except as otherwise indicated in pertinent sections of these specifications, or as directed by the Consultant, use materials which are identical to existing materials in workmanship, appearance, and performance.

B. If identical materials are not available, match existing as closely as possible, especially existing visual characteristics.

PART 3 - EXECUTION

3.01 INSPECTION

A. Before proceeding, inspect existing conditions, including elements subject to movement or damage during cutting, excavating, backfilling, and patching.

B. After uncovering the work, inspect conditions affecting installation of new work.

C. If uncovered conditions are not as anticipated or if existing construction is not as indicated on the Drawings, immediately notify the Consultant for further instructions.

3.02 PREPARATION

A. Provide shoring, bracing, and support as required to maintain structured integrity of the project.

B. Take all necessary action required to protect adjacent existing surfaces from damage due to the work of this section.

C. Take all precautions necessary to protect existing surfaces and materials, new work, and the work of this section from damage due to adverse weather conditions.

D. Provide temporary support of work to cut and adjacent work to prevent failure or damage due to the work of this section.

E. Properly prepare substrate surfaces exposed during cutting as required to receive the work of this or other sections of these specifications in strict compliance with manufacturer’s recommendations and these specifications.
3.03 EXECUTION

A. Perform all required cutting and patching as required or reasonably implied under pertinent sections of these specifications.

B. Perform cutting and demolition by methods which will prevent damage to other portions of the work and will provide proper finished installation complying with the specified tolerances and finishes.

3.04 PERFORMANCE

A. Execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs and new work. Saw-cut and otherwise isolate areas to be demolished.

B. Repair or otherwise rebuild and/or construct all surfaces affected by cutting and demolition. Execute fitting and adjustment of products to provide totally finished installation to comply with tolerances, finishes, and profiles of adjacent surfaces, whether new or existing.

C. Restore work which has been cut or exposed by demolition; install new construction in compliance with specifications for type of new work to be done or as required to match existing adjacent surfaces. In no case shall any exposed existing surface be left in a raw, marred, or unfinished surface.

D. Refinish entire surfaces as necessary to provide an even finish.
   1. Continuous Surfaces: To nearest intersections.

END OF SECTION
PART 1 - GENERAL

1.01 RELATED DOCUMENTS:
   A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 - Specification sections, apply to work of this section.

1.02 SUMMARY:
   A. Section Includes:
      1. General administrative requirements and procedures and related applicable codes.

1.03 APPROVAL AND RECOMMENDATION AGENCIES:
   A. The University of Colorado at Boulder has jurisdiction for the interpretation and enforcement of code requirements for construction of projects.

1.04 CODES:
   A. All Contractors shall comply with all applicable codes, ordinances and regulations in effect at the time of bid openings.

APPROVED STATE BUILDING CODES

The following approved building codes and standards have been adopted by State Buildings Programs (SBP) as the minimum requirements to be applied to all state-owned buildings and physical facilities including capital construction and controlled maintenance construction projects.

(as adopted by the Colorado State Buildings Program as follows: Chapters 2-35 and Appendices C and I)

**The 2006 edition of the International Mechanical Code (IMC)**
(as adopted by the Colorado State Buildings Program as follows: Chapters 2-15 and Appendix A)

(as adopted by the Colorado State Buildings Program)

**The 2008 edition of the National Electrical Code (NEC)**
(National Fire Protection Association Standard 70) (as adopted by the Colorado State Electrical Board)

**The 2009 edition of the International Plumbing Code (IPC)**
(as adopted by the Colorado Examining Board of Plumbers as follows: Chapter 1 Section 101.2, 102, 105, 107, Chapters 2-13 and Appendices B, D, E, F, and G)

(as adopted by the Colorado Examining Board of Plumbers as follows: Chapter 1 Section 101, 102, 105, 107, Chapters 2-8 and Appendices A, B and C)

Please consult the website [www.dora.state.co.us/plumbing/index.htm](http://www.dora.state.co.us/plumbing/index.htm) for additional information on the revisions and exceptions to the IPC and IFGC and the inclusion of the new 105 and 107 sections. It is OSA/SBP’s intent to adopt the 2009 International Building Code (IBC), the 2009 International Mechanical Code (IMC), and the 2009 International Energy Conservation Code (IECC) to be implemented at the start of the fiscal year on July 1, 2010.
The National Fire Protection Association Standards (NFPA)

The 2004 edition of the ASME Boiler and Pressure Vessel Code
(as adopted by the Department of Labor and Employment/Boiler Inspection Section as follows: sections I, IV, VIII-Divisions 1 and 2 and 3, X and B31.1)

The 2004 edition of the National Boiler Inspection Code (NBIC)
(as adopted by the Department of Labor and Employment/Boiler Inspection Section)

The 2004 edition of the Controls and Safety Devices for Automatically Fired Boilers CSD-1
(as adopted by the Department of Labor and Employment/Boiler Inspection Section)

(as adopted by the Department of Labor and Employment/Boiler Inspection Section)

The 2007 edition of ASME A17.1 Safety Code for Elevators and Escalators
(as adopted by the Department of Labor and Employment/Conveyance Section and as amended by ASME International)

The 2005 edition of ASME A17.3 Safety Code for Existing Elevators and Escalators
(as adopted by the Department of Labor and Employment/Conveyance Section and as amended by ASME International)

The 2005 edition of ASME A18.1 Safety Standard for Platform Lifts and Stairway Chairlifts
(as adopted by the Department of Labor and Employment/Conveyance Section and as amended by ASME International)

The current edition of the Rules and Regulations Governing the Sanitation of Food Service Establishments
(as adopted by the Department of Public Health and Environment/Colorado State Board of Health)

(as adopted by the Colorado General Assembly as follows: CRS 9-5-101, as amended, for accessible housing)

Note: Additional codes, standards and appendices may be adopted by the state agencies and institutions in addition to the minimum codes and standards herein adopted by State Buildings Programs.

1. The 2006 edition of the IBC became effective on July 1 of 2007. Consult the state electrical and plumbing boards and the state boiler inspector and conveyance administrator and the Division of Fire Safety for adoption of current editions and amendments to their codes.

2. Projects should be designed and plans and specifications should be reviewed based upon the approved codes at the time of A/E contract execution. If an agency prefers to design to a different code such as a newer edition of a code that State Buildings Programs has not yet adopted, the agency must contact SBP for approval and then amend the A/E contract with a revised Exhibit D, Approved State Building Codes. Please note that the state plumbing and electrical boards enforce the editions of their codes that are in effect at the time of permitting not design.

3. The state’s code review agents, or the State Buildings Programs approved agency building official, shall review all documents for compliance with the codes stipulated herein. Note: The Department of Public Health and Environment, Division of Consumer Protection will review drawings for food service related projects.
4. This policy does not prohibit the application of various life safety codes as established by each agency for specific building types and funding requirements. NFPA 101 and other standards notwithstanding, approved codes will supersede where their minimum requirements are the most restrictive in specific situations. If a conflict arises, contact State Buildings Programs for resolution.

5. It is anticipated that compliance with the federal Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG) and Colorado Revised Statutes Section 9-5-101 will be met by compliance with the 2006 International Building Code and ICC/ANSI A117.1. However, each project may have unique aspects that may require individual attention to these legislated mandates.

6. The 2003 edition of the International Building Code (IBC) is to be applied to factory-built nonresidential structures as established by the Division of Housing within the Department of Local Affairs.

A. Appendices

Appendices are provided to supplement the basic provisions of the codes. Approved IBC Appendices are as follows:

1. Mandatory
   IBC Appendix Chapter C - Agricultural Buildings
   IBC Appendix Chapter I - Patio Covers

2. Optional
   Any non-mandatory appendix published in the International Building Code may be utilized at the discretion of the agency. Use of an appendix shall be indicated in the project code approach.

B. Amendments

None

C. Referenced Codes

1. While not adopted in entirety, portions of the following codes are referenced in the International Building Code (IBC), the International Mechanical Code (IMC), the International Energy Conservation Code (IECC) the International Plumbing Code (IPC), and the International Fuel Gas Code (IFGC). These following codes would be applied as reference standards.

   2006 International Fire Code (IFC)
   2006 International Existing Building Code (IEBC)

D. Referenced Standards

The IBC, IMC, IECC, IPC and IFGC standards shall be utilized to provide specific, or prescriptive, requirements on how to achieve the requirements established in the code. These standards may be unique to the code or may be derived from other established industry standards. Recognized standards may also be used to show compliance with the standard of duty established by the code.
1.05 OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA):

A. The Contractor shall have sole responsibility for compliance on the job site to all applicable portions of the Occupational Safety and Health Act. The Contractor is responsible for other regulatory requirements as they relate to occupational Health and Safety requirements. For example, NIOSH, ANSI, and MSA.

B. Protection of life, health and public welfare as it relates to the execution of the construction contract is the responsibility of the Contractor. The Owner’s Representative may, at their discretion, observe, inspect, or comment on plans, procedures, or actions employed at the project as they relate to safety of life, health or public welfare. If conditions are imposed by the Owner which interfere with, or imply actions detrimental to safety, written notice shall be returned to the Owner for action prior to affecting any unsafe conditions.

C. Contractors shall use OSHA Lock Out / Tag Out procedures when working with energized equipment.

D. All contractors entering confined spaces owned by CU or while conducting work under contract with CU shall develop a written program and utilize procedures that, at a minimum, comply with all federal, state and local confined space standards and all applicable regulatory requirements. Contractors shall, independent of the University, monitor the space to obtain their own data to ensure a safe entry and exit. Any data generated by a contractor’s confined space entry, should be provided to the Facilities Management confined Space Program Manager.

E. When contractors perform work that may involve Facilities Management controlled permit required confined spaces, Facilities Management will:
   1. Inform contractors of permit required confined spaces and that entry is allowed only after compliance with the confined space entry standard;
   2. Require contractors planning to enter a confined space to provide the Facilities Management Confined Space Program Manager in charge of that space, 48-hour advance notice of such planned entry. The contractors entry will be in accordance with the current Occupational Safety and Health Administration confined space entry standard and a signed document stating such, shall be provided to the FM Confined Space Program Manager prior to entry.

F. The FM Confined Space Program Manager, following receipt of notice of contractor planned entry, will:
   1. Apprise contractor of the hazards identified in the confined space and of any prior experience that is documented on the space;
   2. Appraise the contractor of any precautions or procedures that CU has implemented for the protection of workers in or near the confined space;
   3. Coordinate entry operations with the contractor when both Facilities Management and contractor personnel are working in or around the confined space;
   4. Debrief the contractor at the end of the entry operations regarding hazards confronted or created.

1.06 HOT WORK PERMITS

A. All contractors shall be required to obtained a Hot Work Permit, three (3) working days in advance, for work that involves welding, heat treating, grinding, thawing pipe, hot riveting, soldering and brazing, power driven fasteners and similar activities involving spark, flame or heat. Compliance with the requirements of the applicable fire code, the International Building Code, and NFPA Standard 51B are mandatory and all contractors performing hot work activities shall read and understand these code requirements. To obtain a current Hot Work Permit, go to website:

http://fm.colorado.edu/firesafety/hotwork.html
B. Contractors shall read and comply with the procedures and requirements for Fire Watch, Fire Alarm Interruption and Fire Suppression Interruption as found on the following websites:

Fire Watch Procedures:
http://fm.colorado.edu/firesafety/firewatch.html

Fire Alarm and Detection System Interruption/Outage:
http://fm.colorado.edu/firesafety/firealarmdetectsys.html

Fire Suppression System Interruption/Outage:
http://fm.colorado.edu/firesafety/firesuppressionsystems.html

C. No hot work shall be conducted in any campus facility without a hot work permit. Any person or firm who conducts hot work without a permit shall be fined one thousand dollars ($1,000) for each occurrence and their non-permitted activities shall be stopped immediately until they obtain a hot work permit. Contractor shall be responsible for any damages caused as a result of improper hot work activities or the work stoppage.

D. Individuals or firms who obtain a permit shall fully read, understand and implement the requirements of the permit. Any person or firm who conducts hot work without the full implementation of the permit requirements shall be fined five hundred dollars ($500) the first time and one thousand dollars ($1,000) for subsequent occurrences. When the requirements of the hot work permit are not being implemented, the improper activities shall be stopped immediately until a hot work permit is obtained. Contractor shall be responsible for any damages caused as a result of improper hot work activities or the work stoppage. Any contractor who is found to be in non-compliance a third time, will not be allowed to work on campus until further notice by Facilities Management.

E. The campus inspectors, project managers and fire marshal shall have the authority to stop improper or non-permitted hot work activities.

F. The Contractor shall notify the CU Fire Alarm Supervisor to deactivate all smoke alarms in the vicinity of the work prior to any demolition and construction work activity. Failure of the Contractor to comply with the smoke alarm deactivation requirement and cause a false alarm and arrival of the Boulder Fire Department shall be a $400 fine per occurrence.

1.07 PERMITS

A. The contractor must obtain a no fee building permit prior to starting work from Office Manager, Facilities Management at (303) 492-2904 in the Planning, Design and Construction Office, Research Laboratory No. 2, 1540 30th Street, Boulder, Colorado. Building permits are required on all projects except the following:

1. Fences not over 6 feet high & general landscape work
2. Retaining walls which are not over 4 feet in height, unless supporting a surcharge of impounding Class I, II or III-A liquids
3. Platforms, walks and driveways not more than 30 inches above grade and not over any basement or story below.
4. Painting, papering, and similar finish work that meet the requirements of chapter 8 of UBC. (Uniform Building Code).
5. Temporary motion picture, television and theater stage sets and scenery. Review for fire-safety issues is required.

B. The contractor must post the permit(s) in a prominent location at the jobsite including all inspection reports. The contractor shall have an updated set of contract documents available at the jobsite for all inspections.
1.08 INSPECTIONS

A. The Contractor must schedule all required inspections 48 hours in advance by calling (303) 492-2922. CU or their designated inspectors will complete these inspections within 48 hours with the exception of weekends and state holidays.

B. The contractor is required to arrange for the following inspections:
1. Required inspections: General. Reinforcing steel or structural framework of any part of any building of structure shall not be covered or concealed without first obtaining the approval of the building official.
2. Lath or gypsum board inspection: To be made after lathing and gypsum board, interior and exterior, is in place, but before any plastering is applied or before gypsum board joints and fasteners are taped and finished.
3. Final inspection: To be made after finish grading and the building is completed and ready for occupancy.
4. Special inspection: Special inspection may be required on special projects and special types of construction.
5. Re-inspections: A re-inspection fee may be assessed for each inspection or reinspection when such portion of work for which inspection is called is not complete or when corrections called for are not made.

C. The Contractor will be responsible for all cost related to re-inspections and will be billed at a rate of $50.00 per hour for CU re-inspections and at the testing agency bill-out rate for other re-inspections.

1.09 UNIVERSITY OF COLORADO SEXUAL HARASSMENT POLICY

A. Contractors should be aware of and review the University of Colorado at Boulder’s policies that prohibit discrimination and harassment on the basis of race, color, national origin, sex, age, disability, creed, religion, sexual orientation or veteran status. These policies are located on the web at: http://www.colorado.edu/odh/ Contractor personnel must adhere to these policies and conduct themselves in a manner that does not discriminate or harass as a result of interacting with an around the University of Colorado faculty, staff and students and visitors.

1.10 FIRE ALARM INTERRUPTION

A. Contractor shall contact CU Fire Alarm Systems Supervisor at 303-492-0633 prior to all interruptions or shutdowns of fire alarm systems. Interruptions or shutdowns shall be scheduled three (3) working days in advance with CU Fire Alarm Systems Shop, CU Project Manager and building proctor. Contractor shall provide a fire watch as directed by CU Fire Alarm Systems Shop during interruption or shutdown.

B. The Contractor shall be responsible for preventing nuisance alarm due to activities at their work site. Common sources of nuisance alarms are:
1. Smoke (soldering, welding, cooking, etc.)
2. Grinding
3. Dust (drilling, sweeping, canister vacuums, sand blasting, etc.)
4. Water leaking (plumbing leaks, overflows)
5. Water sprayed on or near detectors (pressure washing or cleaning with water)
6. Popcorn or other food burning in microwaves
7. Static electricity (covering or uncovering detectors)
8. Changing filters on air handling units (dust)
9. Steam (leaks, pressure pop-offs)
10. Broken or frozen sprinkler heads
11. Sprinkler drain valves turned by mistake
12. Vandalism
Precautions to prevent nuisance alarms are:
1. During construction projects, treat all buildings, except totally new construction, as though they were occupied buildings with live systems.
2. Do not assume that all detectors are in plain sight. Contact University personnel for verification.
3. Maintain dust control measures per UCB Standards:
   a. Maintaining barriers
   b. Covering air returns
   c. Asking CU personnel to cap or disable smoke detectors (Note any capping or disabling of fire safety devices is to be done ONLY by CU personnel, not contractors.)
   d. Avoiding recirculation of dust or smoke through the building air handling system.
4. Follow campus hot work procedures. Refer to specification Section 01060, paragraph 1.06.
3. Do not expose fire alarm devices to water or extreme temperatures.
4. Contact Fire Systems Group for any actions that affect fire detection, alarm, and suppression systems.

1.11 STORMWATER MANAGEMENT PLAN (SWMP)
A. Stormwater Management Plan (SWMP): Prior to any construction activity disturbing one acre of land or more, an approved SWMP and a Stormwater Permit for Construction Activity application from the Colorado Department of Public Health and Environment (CDPHE) are required. The SWMP shall be prepared in accordance with the CDPHE requirements for “Contents of the Stormwater Management Plan” and the UDFCD’s Urban Storm Drainage Criteria Manual, Volume 3, “Best Management Practices” (UDFCD Drainage Criteria Manual). Stormwater quality management and erosion control measures are to be constructed and maintained in accordance with the SWMP and the UDFCD Drainage Criteria Manual.

1.12 ENVIRONMENTAL/STORMWATER POLLUTION PREVENTION
A. Contractors working on the UCB campus must comply with all applicable University, City, State and Federal environmental regulations and standards. The contractor shall keep material such as saw-cut slurry, drywall mud, grout and mortar, paint, sediment, and all other wastes and process water out of gutters, streets, storm drains and parking lots. The contractor shall also be responsible for proper disposal of all waste materials. Immediately notify 911, EH&S 303-492-6025 and project manager of accidental hazardous materials releases.
B. Contractors are required to locate drains or other water discharge points in the area of the project and provide measures to protect from illicit discharges, prior to construction activities. For assistance with determining where a drain leads to (storm vs. sanitary, especially floor drains), contact the Facilities Management service center at 303-492-5522.
C. The contractor shall be responsible for all costs associated with damages and clean-up as a result of contractor caused illicit discharges of process water or other materials into the storm water system. Also, in addition to any penalties or fines imposed by the City, State or Federal agencies, the contractor shall be fined one thousand dollars ($1,000) by UCB for the first time an incident occurs and may be put on probation from working on campus. The contractor will be prohibited from working on campus, until further notice by UCB, if they are found to be responsible for an illicit discharge a second time.
D. For the purpose of eliminating storm water pollution, the contractor shall implement effective Best Management Practices (BMPs). BMPs include general good housekeeping practices, appropriate scheduling of activities, operational practices, maintenance procedures and other measures to prevent the discharge of pollutants directly or indirectly to the storm water system. These BMPs shall be maintained for the duration of the contractor's work. Contractors are required to visit website: http://www.bouldercolorado.gov/www/pace/government/index.html for examples of BMP’s that are applicable to project activities. The Contractor shall ensure that all applicable employees and sub-contractors who work on site are trained and comply with storm water pollution prevention methods and proper BMP’s.

E. In addition to the BMP’s the contractor will be required to sign an Environmental Responsibilities form for all projects. The contractor shall post a copy of this form on site, throughout the duration of the project, in a visible area for all workers to see. Also, the contractor will be required to fill out a Pre-Construction Water Quality Certification form indicating any/all potential discharges of process water, chemicals, de-watering, or other materials to sewer systems or landscape areas that are expected to result from project activities.

1.13 UTILITY LOCATES

Contractor MUST CALL 811 (or 1-800-922-1987) for utility locates BEFORE DIGGING on any project at the University of Colorado at Boulder. This includes even small projects such as, but not limited to, planting trees or shrubs, sidewalk removal/installation or fence post installation. Digging without calling can disrupt service to the campus or surrounding neighborhoods and potentially result in fines and repair costs.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Specification system format.
   2. Grammar (syntax) description.

1.02 DESCRIPTION

A. These specifications have been derived from automated specification systems, and include minor deviations from format and traditional writing forms. Such deviations must be recognized as a normal result of this production technique, and no other meaning will be implied or permitted.

B. Imperative language of the technical sections is directed to the Contractor. The term "provide" used repeatedly in the text is defined to mean..."furnish and install, complete, in place and ready for operation and use unless specifically indicated otherwise."

C. Specifications are of abbreviated, simplified or streamlined type and include incomplete sentences. Omissions of work or phrases such as "the Contractor shall", "in conformity therewith," "shall be," "as noted on the Drawings", "A", "The", are intentional. Supply omitted words or phrases by inference in same manner as they are when "Note" occurs on Drawings. Supply words "on the Drawings" by inference when "as indicated" is used with sentences or phrases.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

Not used

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Remodel Work scheduling.
   2. Construction sequence scheduling.

B. Related Sections:
   1. Section 01500 - Temporary Facilities and Controls.

1.02 SYSTEM DESCRIPTION

A. An essential condition of this Contract shall be the scheduling and conduct of all phases of
   construction operations in such a manner that the Owner's operations and use of the existing
   buildings and campus shall be uninterrupted at all times, except for such limited interruption as is
   required and approved by the owner.

B. Contractor shall repair at his own expense all damage done to Owner's property, unknown utilities
   and adjoining public property as a result of Contractor's construction activities.

1.03 PROJECT/SITE CONDITIONS

A. Access and use of site:
   1. Contractor shall use the designated site access for construction offices and material
      storage in such a manner that access to existing buildings and campus remain
      accessible at all times for use.
   2. Confine operations to as limited a use of the existing building and campus as possible. A
      route of access to and from the work for employees shall be agreed upon and it shall be
      the Contractor's responsibility to see that the agreed route is maintained in order to
      prevent unwarranted or unnecessary traffic through the existing buildings or site.

B. Owner notice and approval:
   1. All arrangements and scheduling in connection with the work of this Contract shall be
      made with and subject to the approval of the Consultant and the Owner.
   2. All work under this Contract which will require interruption of service of the existing
      building shall be scheduled to suit the need and convenience of the Owner's operation,
      and arrangements shall be made with the Owner and the Architect at least eight (8)
      working days in advance of the start of such work.

PART 2 - PRODUCTS

Not Used
PART 3 - EXECUTION

3.01 REMODELING

A. Construction activities of all areas to be constructed in existing facilities shall be completely separated from the rest of the building by dust-proof enclosures erected by Contractor.

B. All surfaces in existing facilities not indicated to be remodeled, or removal of existing items by any Contractor, shall be repaired by the responsible Contractor to match existing adjoining similar surfaces.

3.02 CLEAN-UP

A. All areas within existing facilities, which are not within enclosed areas to be constructed used for access to work areas shall be completely cleaned of all debris and made "broom-clean" at the end of each day's work.

B. Dust, which permeates areas of existing facilities because of improperly constructed dust-proof barriers, shall be the responsibility of the Contractor. The Contractor shall employ the services of a professional cleaning company to clean any area outside of the designated construction dust barriers that are contaminated by Contractor's operations. Completely clean all such areas to the satisfaction of the Owner at no additional cost.

END OF SECTION
PART 1 - GENERAL

1.01 RELATED DOCUMENTS:
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 - Specification sections, apply to work of this section.

1.02 SUMMARY:
A. Section Includes:
1. General administrative requirements and procedures for Hazardous Communication Program.

B. Related Sections:
1. Summary of Work: Section 01010.

1.03 WORK BY OWNER:
A. Asbestos:
1. The Owner has completed an Environmental Site Assessment to identify asbestos containing materials and other immediate Health and Safety items. Do not begin work until Form Exhibit A (copy following the Supplementary General Conditions) has been executed. Where asbestos materials or other hazardous conditions are known to exist in locations affected by this project, remediation measures will be taken by the Owner under separate contract. The Contractor shall coordinate his sequence and schedule with that of the environmental remediation work.
2. In the event that the Contractor encounters any material on the site which is reasonably believed hazardous, which has not been rendered harmless, the Contractor shall:
   a. Stop work immediately in affected areas.
   b. Report the condition in writing to the Department of Facilities Management Project Administrator.
   c. Report the condition in writing to the Architect.
   d. Resume work only under the provisions of this section.

1.04 SUBMITTALS:
A. Material Safety Data Sheets (MSDS):
1. Copies of all material safety data sheets for all applicable products, including but not limited to; paint, adhesives, mastics, solvents, and finishes, etc., shall be retained on site by the Contractor for all applicable products used during the construction and/or remodeling work. Furnish copies of all MSDS's to the Owner and Architect and include in the Project Record Document submittal.

1.05 QUALITY ASSURANCE:
A. Asbestos containing materials may exist within the general project area where such materials are not expected to be disturbed during the work. The Contractor shall review the Environmental Health and Safety Environmental Site Assessment Form at the project site and become familiar with known asbestos and hazardous containing materials in the work areas.
1.06 PROJECT/SITE CONDITIONS:

A. Hazard Communication Requirements:

1. All Contractors are responsible for compliance with mandatory federal rules and regulations concerning Hazard Communication, including, but not limited to those regulations contained in 29 CFR 1910.1200 Hazard Communication, 1910.146 Confined Space, 1910.147 Lock-out Tag-out, 1910.1101 Asbestos, and 1926.62 Lead. Contractor and all subcontractors working at sites under the control of the Owner shall make available to the Architect, upon request, copies of the Hazard Communication Program used by their firm. In addition to this requirement, all regulations related to Multi-employer workplaces shall be adhered to. These regulations are found in 29 CFR 1910.1200, (e) (2) (I) through (e) (4) specifically:

(e) (2) Multi-employer workplaces. Employers who produce, use, or store hazardous chemicals at workplace in such a way that employees of other employer(s) may be exposed (for example, employees of a construction contractor working on site) shall additionally ensure that the hazard communication programs developed and implemented under paragraph (e) include the following:

(e) (2) (i) The methods the employer will use to provide the other employer(s) with a copy of the material safety data sheet, or to make it available at a central location in the workplace, for each hazardous chemical the other employer(s)’ employees may be exposed to while working;

(e) (2) (ii) The methods the employer will use to inform the other employer(s) of any precautionary measures that need to be taken to protect employees during the workplace’s normal operating conditions and in foreseeable emergencies; and,

(e) (2) (iii) The methods the employer will use to inform the other employer(s) of the labeling system used in the workplace

(e) (3) The employer may rely on an existing hazard communication program to comply with these requirements, provided that it meets the criteria established in this paragraph (e).

(e) (4) The employer shall make the written hazard communication program available, upon request, to employees, their designated representatives, the Assistant Secretary and the Director, in accordance with requirements of 29 CFR 1910.20 (e).

2. The referenced regulations were excerpted from 29 CFR 1910.1200. This excerpt shall not be relied upon for compliance with mandatory federal, state and local regulations. The Contractor shall comply with all such regulations and shall be solely liable for insuring that all requirements under applicable regulations are met.

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Asbestos and Hazardous Materials Discovery:

1. The Contractor is cautioned to be alert to the possibility that his work may uncover asbestos-containing or hazardous materials. If suspected materials are found, the Contractor shall notify the Owner and stop all work in the area immediately. If the suspected materials prove to contain asbestos or hazardous materials, the Owner will arrange to have the materials abated in a timely manner.
3.02 HAZARDOUS MATERIALS/EQUIPMENT REMOVAL:

A. Definition:
1. Removal of hazardous materials/equipment is extremely dangerous. Hazardous materials/equipment is defined to include, but not limited to the following:
   a. Fume hoods
   b. Hood exhaust duct work
   c. Exhaust fans
   d. Laboratory casework and equipment
   e. PCB ballast’s
   f. Mercury and Sodium Vapor Lights
   g. Adjacent material that could come in contact with workers or public.

B. Protection:
1. Hazardous materials/equipment removal shall include the protection of personnel, material, environment and safe legal disposal of the equipment; and further includes the following:
   a. Notification of Project Administrator and appropriate Environmental Health and Safety Unit
   b. Proper protective clothing for personnel involved in the removal.
   c. Appropriate emergency and first aid facilities.
   d. Removal procedures shall be accomplished during minimal occupancy of the remainder of the building on the weekends or at night.

C. Disposal:
1. All equipment related to the use, storage or processing of hazardous materials/equipment shall be removed and properly disposed of under the direct, full-time supervision of a qualified Laboratory Specialist fully conversant with the chemistry and properties of the material/equipment involved. Certification is required. Contractors are responsible for the removal of all hazardous materials/equipment and chemicals from the work site as well as proper disposal of all hazardous waste generated by their project.

2. Hazardous waste disposal must include prior notification to the Department of Environmental Health and Safety in order to verify that the appropriate procedures and documentation are used. Copies of all paper work for shipping and disposing of these materials (hazardous waste manifests, land disposal restrictions, etc.) will be provided by the Contractor to the Department of Environmental Health & Safety (303) 492-6025. Where appropriate, the Main Campus EPF ID COD007431505 will be used for these shipments.

3. Hazardous chemicals, waste, and other pollutants may not be discharged to the sanitary or storm sewer systems at anytime. Releases to the environment must be reported to CUPD/EH&S immediately.

END OF SECTION
PART 1 - GENERAL

1.01 REQUIREMENTS

A. The types and minimum requirements for project meetings are included but are not necessarily limited to the following categories:

Pre-construction meeting
Progress and Coordination meetings
Specially called meetings

B. The pre-construction meeting will be scheduled within fifteen days after date of Notice to Proceed, at a central site location designated by the Owner and convenient for all parties.

1. Attendance:
   a. Owner's Representative
   b. Consultant and his sub-consultants, as applicable
   c. Contractor's Superintendent
   d. Major Subcontractor(s)
   e. Others as appropriate

2. Suggested Agenda:
   a. Distribution and discussion of:
      List of major subcontractors and suppliers
      Projected construction schedules
      Critical work sequencing
      Major equipment deliveries and priorities
      Project Coordination
      Designation of responsible personnel
   b. Procedures and processing of:
      Field decisions
      Proposal requests
      Submittals
      Change Orders
      Applications for Payment
   c. Adequacy of Distribution of Contract Documents
   d. Procedure for Maintaining Record Documents
   e. Inspections
   f. Stormwater Management Plan (SWMP)

C. The Architect/Engineer will: Record the minutes; including significant proceedings and decisions.

D. The Contractor shall schedule and administer subcontractor and vendor pre-construction meetings throughout progress of the work. He will:

1. Prepare agenda for meetings.
2. Distribute written notice of each meeting four days in advance of meeting date.
3. Make physical arrangements for meetings.
4. Preside at meeting.
5. Record the minutes; including significant proceedings and decisions.
6. Representatives of Contractors, Subcontractors, and Suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
7. Use of Premises:
   Office, work, staging and storage areas
   Owner’s requirements
8. Temporary construction Facilities, Utilities, Controls and Construction Aids
9. Safety, First-aid, Security and Housekeeping Procedures
10. Administrative Procedures and Documents as Required by Owner

1.02 PROGRESS AND COORDINATION MEETING

The Contractor will schedule and administer job progress and coordination meeting at the site.

A. Attendance:
1. Owner as needed
2. Consultant and his sub-consultants as needed
3. Subcontractor as appropriate to the agenda
4. Suppliers as appropriate to the agenda
5. Others

B. Suggested Agenda:
1. Review of work progress since previous meeting.
2. Field observations, problems and conflicts.
3. Problems which impede Construction Schedule.
4. Review of off-site fabrication and delivery schedules.
5. Corrective measures and procedures to regain projected schedule.
6. Revisions to Construction Schedule.
7. Coordination of schedules.
8. Progress and schedule during succeeding work period.
9. Review submittal schedules and expedite as required.
11. Pending changes and substitutions.
12. Review proposed changes for:
   a. Effect on Construction Schedule and on completion date.
   b. Effect on other contracts of the Project.

C. The Architect/Engineer shall record and distribute the minutes of all progress meetings throughout the construction period and shall visit the site a minimum of once every two weeks. The Architect/Engineer shall average one visit per week during construction.

The structural engineer shall visit the site immediately prior to every major structural concrete slab pour; every major foundation wall pour; at least twice for each major segment of work [i.e., caissons, columns, steel roof joists, etc].

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Submit shop drawings, product data and samples as required by various sections of the specifications.

1.02 QUALITY ASSURANCE

A. Shop Drawings:
   1. Drawings shall be presented in a clear and thorough manner.
   2. Details shall be identified by reference to sheet, detail, schedule, or room numbers shown on drawings.

B. Product Data:
   1. Preparation:
      a. Clearly mark each copy to identify pertinent products or models.
      b. Show performance characteristics and capabilities.
      c. Show dimensions and clearances required.
      d. Show wiring or piping diagrams and controls.
   2. Manufacturer’s standard schematic drawings and diagrams.
      a. Modify drawings and diagrams to delete information that is not applicable to the work.
      b. Supplement Standard information to provide information specifically applicable to the work.

C. Samples:
   1. Office samples shall be of sufficient size and quantity to clearly illustrate:
      a. Functional characteristics of the product with integrally related parts and attachment devices.
      b. Full range of color, texture and pattern

D. Mock-ups:
   1. Provide complete mock-up of exterior materials to be incorporated into the work.
      a. Mock-up shall include a sample of all materials used in exterior construction, whether specified elsewhere or not in these documents, including but not limited to, masonry, stone, window systems, precast concrete, roof systems, flashing, sealants, masonry paving, paint and other readily visible materials.
      b. Secure Owner approval of mock-ups prior to ordering and placement of materials. Modify mock-ups as directed by the Architect or Owner until acceptable.
      c. Confirm exact mock-up(s) required by Owner prior to fabrication of mock-up(s).
   2. Remove mock-up at the conclusion of the project or when directed by the Architect.
      a. Restore or finish site to finish condition indicated on the Drawings.

E. Responsibilities of the Contractor:
   1. Review shop drawings, product data, samples and project record drawings for specification performance prior to submission.
2. Determine and Verify:
   a. Field measurements
   b. Field construction criteria
   c. Catalog numbers and similar data
   d. Conformance with specifications
3. Coordinate each submittal with requirements of the work and of the Contract Documents.
4. Notify the Consultant in writing, at the time of submission, of any deviations in the submittals for requirements of the Contract Documents.
5. Begin no fabrication or work that requires submittals until return of submittals with Consultant’s acceptance.
6. Contractor’s responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Consultant’s review of submittals.
7. Contractor shall stamp, sign or initial, and date each submittal to show compliance with the Contract Documents prior to submittal to the Consultant.

1.03 SUBMITTALS

A. Make submittals promptly in accordance with approved schedule and in such sequence as to cause no delay in the work.

B. Number of Submittals Required:
   1. Shop Drawings: Submit one reproducible transparency and four opaque reproductions. Three copies will be retained by the Consultant.
   2. Product Data: Submit seven copies, three of which will be retained by the Consultant.
   3. Samples: Submit the number stated in each specification section.

C. Submittals shall contain:
   1. Date of the submission and dates of any previous submissions.
   2. Project title and number.
   4. Names of:
      a. Contractor and Subcontractor(s), if applicable.
      b. Supplier
      c. Manufacturer
   5. Identification of product with the specification section number.
   6. Field dimensions, clearly identified as such.
   7. Relation to adjacent or critical features of the work or materials.
   8. Applicable standards, such as ASTM or Federal specification numbers.
   10. Identification of revisions on resubmittals.
   11. An 8"x3" blank space in lower right-hand corner for review stamps.

D. Resubmission Requirements:
   1. Make any corrections or changes in the submittals required by the Consultant and resubmit until accepted.
   2. Shop drawings and product data:
      a. Revise initial drawings or data and resubmit as specified for initial submittal.
      b. Indicate any changes that have been made, other than those requested by the Consultant.
3. **Samples:** Submit new samples as required for initial submittal.

**E. Distribution:**
1. Distribute reproductions of approved shop drawings and copies of product data to affected subcontractors and retain one copy for use at the job-site.
2. Distribute approved samples as directed.

**F. Consultant's Duties:**
1. Review submittals with reasonable promptness and in accordance with schedule.
2. Review of separate item does not constitute review of an assembly in which item functions.
3. Affix stamp and initials or signature, and indicate requirements for resubmittal or acceptance of submittal.
4. Return submittals to the Contractor for distribution or for resubmission.

**G. Schedule of Values and pay applications:**
1. Submit typed schedule on State Form SC7.2; Contractor's standard form or media-driven printout will be considered on request.
2. Format: Table of Contents of this Project Manual.
3. Include in each line item a directly proportional amount of Contractor's overhead and profit.

**H. Schedule of Submittals:** The Contractor shall submit the submittals required by the specifications. The Contractor shall develop a submittal schedule that confirms the submittals and the time frame for review by the consultants.

**I. Construction Schedule:**
1. The Contractor shall submit a critical-path method (CPM) construction schedule prior to start of construction activities. The CPM schedule shall include notice to proceed, submittal activities, construction activities, change order work (when applicable), close-out, testing, demonstration, and acceptance. The CPM shall correlate specifically to the schedule of values line items and be cost loaded.

Float, slack time, or contingency within the schedule (i.e., the difference in time between the project’s early completion date and the required contract completion date), and total float within the overall schedule, is not for the exclusive use of either the principal representative or the Contractor, but is jointly owned by both and is a resource available to and shared by both parties as needed to meet contract milestones and the contract completion date.

The Contractor will be required to submit an as-built progress CPM schedule with each progress billing. This CPM schedule will be the basis for making progress payments. The level of detail and quantity of work activities in the CPM schedule should be negotiated with the principal representative prior to starting construction.

**J. Progress Photos**
1. The Contractor shall submit up to 12 - 3x4 inch progress photos with each progress payment. The photos should demonstrate the work in place and be dated with a short description of the photographed item.
K. Coordination Drawings:
1. The Contractor shall submit coordination drawings with all mechanical, electrical, fire protection, and building monitoring systems prior to the Consultant review of any shop drawings or submittals for work in those trades. Approval of required shops and submittals must be obtained prior to starting work, and must be obtained prior to approval of pay applications of the work. The drawings shall be created to include all trades on a particular level of the building on one drawing. Identify conflicts between the systems or between the systems and architectural elements such as ceiling heights, ceiling types, or walls. Conduit routing for electrical, mechanical, energy management system, and security trades shall be included. Identify potential solutions to the conflicts for the Consultant and Owner to review during the submittal process. Revise the coordination drawings to show any comments made during the submittal review process, and reissue for use by all affected trades, Owner and Consultant.

2. The Coordination drawings shall include sectional coordination documents. Identify elevations of systems A.F.F. (above finish floor) and component dimensions. Show elevations whenever component changes height.

L. Daily Reports
1. The contractor shall submit daily reports, due by 5 p.m. the following day. The report should include weather, equipment, manpower count, subcontractors on site, short description of work for that day, inspections, visitors, items that may affect progress or quality of project.

M. Request for Information (RFI):
1. The Contractor will be responsible for submitting RFIs on AIA form G716 or similar. The RFI should identify in writing any unclear, inconsistent, or conflicting item in the documents that could not be answered by thorough review by the Contractor or subcontractors. The RFI should include a description of the item and a proposed solution. The RFI should indicate schedule or cost impact, if any. Contractor shall be required to submit cost or schedule impact within seven days of receipt of the RFI response. Each RFI shall be numbered in sequence.

N. Weekly Logs:
1. The Contractor shall provide an updated RFI, change request, and submittal logs at weekly construction meetings. Contractor shall provide a 2-week detailed construction schedule at the weekly construction meeting.

PART 2 - MATERIALS
Not used.

PART 3 - EXECUTION
Not used.

END OF SECTION
PART 1 - GENERAL

1.01 SUPPLEMENTAL TESTING

If required, the following testing shall be performed at the expense of the contractor installing the material being tested:

A. Material Substitution: Any tests of basic material or fabrication equipment offered as a substitute for specified item on which a test may be required in order to prove its compliance with the specifications.

B. Mechanical/Electrical: Tests on mechanical and electrical systems required to insure their proper installation and operation.

C. Any test that fails shall be paid for by the installing contractor subject to the following conditions:
   1. Quantity and nature of tests will be determined by the Consultant.
   2. All test shall be done in the presence of the Owner or his representative.
   3. Proof of noncompliance will make the installing contractor liable for any corrective action which the Owner feels is prudent including complete removal and replacement of defective material.

Nothing contained herein is intended to imply that the installing contractor does not have the right to have tests performed on any material at any time for his own information and job control so long as the Consultant or Owner does not assume responsibility for costs or for giving them consideration when appraising quality of materials.

D. The Consultant shall determine the type and number of tests to be performed on the project.

1.02 TEST REPORTS

Reports of all tests made by testing laboratories shall be distributed by the testing laboratory as follows:
1 copy - Contractor
1 copy - Applicable supplier or subcontractor
1 copy - Owner
1 copy - Consultant
Other copies - as directed

1.03 QUALITY CONTROL SYSTEM

A. General: The contractor shall establish a quality control system to perform sufficient inspection and tests of all items of work, including that of all subcontractors, to ensure conformance to the Contract Documents for materials, workmanship, construction, finish, functional performance and identification. This control shall be established for all construction except where the Contract Documents provide for specific compliance tests by testing laboratories or Consultants employed by the Owner.

The quality control system is the means by which the Contractor assures that construction complies with the requirements of the Contract Documents. Controls shall be adequate to cover all construction operations and should be keyed to the proposed construction schedule.
B. The Contractor shall designate a quality control representative on staff to review the work to insure compliance with the contract documents by weekly jobsite visits for observation. The designated employee shall not be involved in the performance of the work. The quality control representative shall review the work and make necessary corrections to bring the work into compliance prior to scheduling the Architect for the final punchlist review.

C. Records: The Contractor shall maintain correct records on an appropriate form for all inspections and tests performed, instruction received from the Owner and actions taken as a result of those instructions. These records shall include evidence that the required inspections or tests have been performed (including type and number of inspections or tests, nature of defects, causes for rejection, etc.) proposed or directed remedial action, and corrective action taken. The Contractor shall document inspections and tests as required by each Section of the Specifications.

1.04 INDEPENDENT TESTING AGENCY SERVICES

A. The Owner will employ and pay for the services of an independent Testing Agency to perform the Inspections, special inspections, tests and other services when required by sections of the specification. Services shall be performed in accordance with requirements of governing authorities and with specified standards.

1. Contractor shall cooperate with Testing Agency personnel and shall furnish tools, sample of materials, design mixes, equipment and assistance as requested.

2. Contractor shall provide and maintain, for the sole use of the Testing Agency, adequate facilities for the safe storage and proper curing of concrete testing cylinders on the project site for the first 24 hours after casting as required by ASTM C 31, Method of Making and Curing Concrete Test Specimens in the field.

3. Contractor shall notify Testing Agency sufficiently in advance of operations to allow for completion of initial tests and proper assignment of inspection personnel.

4. Contractor shall notify the testing agency sufficiently in advance of cancellation of required testing operations. The Contractor shall assume responsibility for costs incurred due to the failure to provide such notice.

END OF SECTION
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF REQUIREMENTS

A. This section of the General Requirements outlines the basic requirements for temporary services, utilities, and facilities which will indirectly enable adequate construction progress and processes, and will accommodate other necessary activities at the project site except as otherwise indicated, the costs of providing and using temporary services are included in the Contract Sum.

1.03 QUALITY ASSURANCE

A. Comply with governing regulations and utility company regulations and recommendations for the construction of temporary facilities, including but not necessarily limited to, code compliance, permits, inspections, testing, and health and safety compliance.

1.04 SITE CONDITIONS

A. Provide Temporary facilities and services at the time first needed at the site and maintain, expand, and modify the facilities as needed throughout the construction period and do not remove until no longer needed.

PART 2 - EXECUTION

2.01 GENERAL

A. Use qualified tradesmen for the installation of temporary facilities. Locate facilities where they will serve the total project construction work adequately and result in minimum interference with performance of the work. Relocate, modify, and extend facilities as required during the course of the work to properly accommodate the entire work of the project.

2.02 TEMPORARY FACILITIES

A. Temporary Water: Connect to existing water source as designated by the Owner for construction operations.

B. Temporary Telephone: Provide, maintain and pay for telephone service to field office at time of project mobilization. If a mobile phone is designated as the field office phone then it shall be a local number.

C. Sanitary Facilities: Comply with governing regulations, including safety and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install sanitary facilities in available locations which will best serve the needs of personnel at the project site. Toilet rooms in existing buildings or in new construction may not be used without written approval of the Owner.
D. Temporary Heat and Ventilation: Provide such OSHA approved heat and fuel, heating units, equipment as necessary to provide the required environmental conditions and to protect the work from damage due to cold. Maintain equipment in a clean, safe condition.

E. Fire Extinguisher:
   1. Except as otherwise indicated or required, comply with the applicable recommendations of NFPA No. 10 "Portable Fire Extinguisher" for each area of each construction activity whenever combustible materials, flammable liquids, and similar exposures to possible fires are present.
   2. Locate extinguisher where most convenient and effective for the intended purposes. Store combustible materials in recognized fire-safe locations and containers.

F. Protection
   1. Barricades, Warning Signs, and lights: Comply with recognized standards and code requirements for the erection of substantial and structurally adequate barricades wherever needed to prevent accidents and losses. Paint with appropriate colors, graphics and warning signs to inform personnel at the site and the general public where exposure exists of the hazard being protected. Provide lighting where appropriate and needed for the recognition of the facility, including flashing red lights where appropriate.

G. Temporary Enclosure: Wherever required, provide temporary enclosure of materials, equipment, work in progress, and completed portions of work, so as to afford protection for both the work and employees.

H. Miscellaneous Facilities:
   1. Provide ladders, ramps, and temporary stairs for access to all levels of the construction for general access by all trades. Individual contractors and subcontractors shall furnish their own stepladders, scaffolds, staging, work platforms, and other facilities for use of their workmen and as necessary for safety of all personnel.

I. Field Office:
   1. The Contractor shall provide and maintain a suitable temporary field office for his own use. Offices and all other temporary structures shall be removed from the site upon completion of the work.
   2. Temporary structures or storage used for storage and offices for contractors shall be located on the site in an orderly manner as determined by the Owner.

2.03 OPERATIONS AND TERMINATIONS

A. Supervision: Enforce strict discipline in the use of temporary facilities at the project site. Limit availability of facilities to essential and intended uses, so as to minimize waste and possibility of abuses and the resulting unsanitary and hazardous or dangerous conditions.
B. Maintenance: Operate and maintain temporary facilities in good operating condition through the time of use and until removal is authorized. Protect from damage by freezing temperatures and similar elements at the site.

C. Termination and removal: At the time the need has ended for each temporary facility, or when it has been replaced by authorized use of a permanent facility, or at the time of Substantial completion, promptly remove the facility unless requested by the Consultant to be retained for a longer period of time. Complete or restore permanent work which may have been delayed or otherwise affected by the temporary facility. Replace work which cannot be satisfactorily restored. Except as otherwise indicated, the materials and equipment of temporary facilities remain the property of the contractors.

END OF SECTION
PART 1 - GENERAL

A. Provide labor, equipment, and materials for fabrication of a project sign as specified by the Project Architect.

B. Project sign(s) shall be required for all major renovation and new construction projects. The location(s) shall be at a point on or adjacent to the worksite where its visibility to the passing public is most apparent.

C. The maximum size of project sign backgrounds shall be 40 sq. ft. In most cases, an 8’ x 4’ plywood panel is recommended. For smaller projects, sign backgrounds may be less, but in no case shall be smaller than 16 sq. ft.

PART 2 – PRODUCT

A. Fabricate project sign of three (3) treated 4” x 4” wood posts for 4’-0” x 8’-0” backgrounds or two (2) treated 4” x 4” wood posts for smaller backgrounds. Posts shall be set in 12” diameter holes at least three (3) feet deep and filled with concrete. Backgrounds shall be at least 3/4” thick exterior A/C plywood, “Duraply” pre-treated surface, sheet metal overlay cemented to background, or other approved surface. Seal edges of plywood with paint. Supporting posts shall receive two coats of exterior grade paint or stain.

B. Design of the sign, including graphics, lettering, and colors, shall be furnished by the Project Architect and approved by the University. At a minimum, the sign shall include the following information:

1. An artist’s conception of the completed building or other facility as envisioned by the Project Architect.
2. Project name in prominent sized lettering.
3. Name of principal occupant or use.
4. Owner’s name: “University of Colorado at Boulder.” Use approved style lettering and “CU” logo.
5. Under owner’s name add: “Project Manager: Department of Facilities Management.”
6. Project Architect and Principal Consultants’ names. Include city and state of each, and telephone number of Project Architect.
7. Include “Project Start [date],” and “Project Completion [date].”

PART 3 – EXECUTION

A. Project sign shall be in place prior to the start of construction, and shall not be removed until the point of substantial completion.

B. Location(s), number(s), size, configuration, and other details of the installation, including height above grade, shall be furnished and approved by the Project Architect with the approval of the University.

C. An experienced professional sign painter shall be hired and approved by the Project Architect and the University to prepare the graphics and lettering for the sign.

D. If, at the end of the project, the sign is re-usable, it shall be disposed of as directed by the University.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Products.
   2. Transportation and Handling.
   4. Manufacturer's Instructions.
   5. Product Options.
   6. Products List.
   7. Substitutions.

B. Related Sections:
   1. Section 01400 - Quality Control.
   2. Section 01730 - Operation and Maintenance Data.

1.02 QUALITY ASSURANCE

A. Conform to applicable specifications and standards.

B. Comply with size, make, type and quality specified, or as specifically approved in writing by the Consultant.

C. Manufactured and Fabricated Products:
   1. Two or more items of the same kind shall be identical, by the same manufacturer.
   2. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.

1.03 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.

B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

1.04 STORAGE AND PROTECTION

A. Store products in accordance with manufacturer's instruction, with seals and labels intact and legible.

B. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged, and are maintained under required conditions.

1.05 MANUFACTURER'S INSTRUCTIONS

A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including one copy to the Consultant and one copy to the Contractor.
B. Perform work in accord with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.06 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards.

B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not specifically named.

C. Consultant will review requests for substitutions with reasonable promptness, and notify, by Addendum, of the decision to accept or reject the requested substitution.

1.07 PRODUCT LIST

A. Within 15 days after signing of agreement, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

1.08 SUBSTITUTIONS

A. Will only be considered prior to bid or in the event that Equipment is not available.

1.09 SYSTEMS DEMONSTRATION

A. Prior to final inspection, demonstrate operation of each system to Consultant and Owner.

B. Instruct Owner's personnel in operation, adjustment, and maintenance of equipment and systems, using the operation and maintenance data as the basis of instruction.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION
PART 1 - GENERAL

1.01 SUBSTANTIAL COMPLETION AND FINAL INSPECTION

A. The Contractor shall comply with procedures stated in the General Conditions of the Contract for Notice of Completion, Final Inspection, Notice of Substantial Completion and Notice of Acceptance.

B. Should the Architect/Engineer or the Principle Representative determine that the work is not substantially complete, or the punch list items exceed 25, he will immediately notify the Contractor, in writing, stating reasons. After Contractor completes work, he shall resubmit certification and request for final inspection. The Contractor will be responsible for all costs beyond two Architect/Engineer walk-throughs.

C. Owner may occupy designated portions of the Project under provisions stated in the General Conditions of the Contract.

1.02 CLOSE-OUT FORMS

The Architect/Engineer will complete the Notice of Approval of Beneficial Occupancy, Closing-out Checklist and Contract Close-out forms and forward them to the Contractor. Comply with procedures stated in General Conditions of the Contract.

1.03 FINAL SETTLEMENT AND PAYMENT

A. Contractor shall comply with procedures stated in the General Conditions of the Contract before final settlement and payment are made.

B. The Contractor shall also submit the following prior to the final application for payment:
   1. Contractor’s Affidavit of Payment of Debit and Claims: AIA G706.
   2. Contractor’s Affidavit of Release of Liens (claims): AIA G706A, with:
      a. Consent of Surety to final payment: AIA G707
      b. Contractor’s release of waivers of claims.
      c. Separate release of waivers of claims for subcontractors, suppliers and others with claim rights, against property of owner, together with list of those parties.

1.04 GUARANTEE INSPECTION

A. The Contractor shall comply with procedures stated in the General Conditions of the Contract for Guarantee Inspections after completion of the work.

1.05 WARRANTIES AND SPECIAL GUARANTEES

The Contractor shall comply with procedures and criteria outlined in the General Conditions of the Contract for all warranties and special guarantees of the work.

1.06 OPERATING AND MAINTENANCE DATA

A. Refer to Section 01730 - Operating and Maintenance.

B. Mechanical - By Mechanical Contractor: See Division 15.
C. Electrical - By Electrical Contractor: See Division 16.

1.07 DEMONSTRATIONS

A. Refer to Section 01730 - Operating and Maintenance

B. Mechanical - By Mechanical Contractor: See Division 15

C. Electrical - By Electrical Contractor: See Division 16.

1.08 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, and maintenance materials in quantities specified in each Section, in addition to that used for construction of work. Coordinate with Owner, deliver to Project site and obtain receipt prior to final payment.

B. At the completion of the project, all loose keys for hose bibs; adjustment keys and wrenches for door closers and panic hardware; and keys for electric switches, electrical panels, etc., shall be accounted for by the Contractor and turned over to the Owner.

END OF SECTION
PART 1 - GENERAL

1.01 CLEANING

A. Clean-up During Construction: Each contractor shall keep the building and premises free from all surplus material, waste material, dirt and rubbish caused by his employees or work, and at the completion of his work he shall remove all such surplus material, waste material, dirt and rubbish, as well as his tools, equipment and scaffolding, and shall leave his work clean and spotless, unless more exact requirements are specified. In case of dispute, the owner may remove all such items and charge the cost of such removal to the contractor.

Each sub-contractor shall perform his clean-up daily and shall transport his rubbish to an on-site location designated by the Contractor who will arrange for its removal.

B. Cleaners: With the exception of clean-up of the site and cleaning specifically assigned to Contractors under various sections of the specifications, all final clean-up of exterior and interior of the building shall be done by professional cleaners.

C. Final Clean-up:
1. Exterior: In addition to items specified below, any new surfaces on exterior, concrete, metal, etc., shall be carefully and thoroughly cleaned.
2. Glass: Both sides of all glass in work areas shall be carefully and thoroughly cleaned by professional window cleaners and left absolutely clean and free from paint, grease, dirt, etc.
3. Hardware: Clean and polish all hardware and leave clean and free from paint, grease, dirt, etc.
4. Plumbing: Clean and polish all plumbing fixtures, fittings, and exposed plated piping. Leave clean and free from paint, grease, dirt, etc. Remove all labels.
5. Electrical: Clean and polish all electric fixtures, including glassware, switch plates, etc. and leave clean and free from paint, grease, dirt, etc.
6. Equipment: Carefully and thoroughly clean all items of equipment, mechanical, electrical, cabinets, ductwork, etc.
7. Floors: Thoroughly clean all floors. Vacuum and clean carpeting. Shampooing of pre-existing carpet is required once project is complete. Contractor is responsible for this.
   a. Contractors are responsible for cleaning (stripping floors if necessary) then applying the required two coats of sealer and three coats of finish before releasing the building for occupancy. Facilities Management will provide a contact person for help concerning campus standards free of charge. Or Custodial floor care services may be sub-contracted out through Facilities Management's work order system.
   b. Facilities Management Approved Sealers and Finishes for Vinyl Tile Flooring:

CU requires floor care products to be from the same product line. (Different brands may interact disastrously).

All of these products may be ordered through Construction Stores, but these products not stocked at Stores, please place orders at least two weeks in advance.
Campus safety standards require at least TWO (2) coats of Sealer be applied to a cleaned floor, and at least THREE (3) coats of Finish must be applied on top of the sealer.

c. Floor Cleaning Procedures:
   1. Sweep floor clean of debris
   2. Cord off area if necessary
   3. Put up Caution signs
   4. Mix Stripper or Cleaning solution according to label
   5. Apply solution to floor
   6. Start setting up equipment
   7. Place RED abrasive pad on buffer (buffer less than 300 rpms)
   8. Begin stripping or cleaning floor working with buffer moving it side to side across the floor.
   9. Use HEPA filtered water vacuum to begin to suck up slurry*
      *use of HEPA filtered water vacuum is required on existing floor tile which contains asbestos.
   10. Apply additional coats of water and re-vacuum up floor
   11. Mop floor with clean water, change rinse water often
   12. Mop floor a second time
   13. Mop floor to dry completely
   14. Clean up equipment
   15. Wash red pad with clean water.

d. Sealing Procedures:
   1. Using a new mop head or clean wax mop and clean bucket, apply first coat of approved sealer to floor
   2. Allow floor to dry completely (at least 20 minutes)
   3. Apply second coat of sealer
   4. Allow floor to dry

e. Finishing (Waxing) Procedures:
   1. Using a clean wax mop and bucket apply first coat of approved finish (wax)
   2. Allow floor to dry completely (at least 20 minutes)
   3. Apply second coat of finish (wax)
   4. Allow floor to dry completely (at least 20 minutes)
   5. Apply third coat of finish (wax)
   6. Allow floor to dry completely (at least 30 minutes)
   7. Wash mop and bucket with clean water
   8. If floor is dry - remove caution signs and open area up
f. **Burnishing Procedures:**
The next working day
1. Sweep floor clean of debris
2. Spot mop floor to remove spots and dirt
3. Set up High Speed Burnisher to make for a safe environment
4. Start Burnishing. Walk forward in a straight line
5. At end of row, turn around and start forward again
6. Repeat steps 5 & 6 until finished
7. Clean up equipment and pad.

E. **Completion:** The entire work inside and out, and the entire premises shall be in first-class, clean condition upon completion before being accepted by the Owner.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This section describes the definitions, recording and maintenance requirements and the submittal requirements for record documents.

1.02 DEFINITIONS

A. The Project Record Documents are intended to indicate all changes and deviations from the original contract documents and permanently record the “as-built” condition of material, equipment and structure. The project record documents shall include the contract drawings, project manual, addenda, change orders, modifications and clarifications, field directives, approved shop drawings, approved product data, manufacturer’s certificates and project test results.

1.03 SUBMITTALS

A. Submit the project record documents in conformance with Section 01700 and prior to the final applications for payment. The final application for payment will not be approved prior to the submittal of record documents.

1.04 QUALITY ASSURANCE

A. The project record documents shall be updated at a minimum on a weekly basis and shall be readily available for inspection by the owner and consultants. Maintain a separate set of complete documents for exclusive use of record documents and protect the documents from damage in a clean, dry location. Note: Progress applications for payment will not be approved if record documents are not current.

B. The record documents shall contain a clear, legible record of all detail and dimensional changes and locate all concealed work including, but not limited to:

1. Interior and Exterior Utilities
2. Valves
3. Dampers
4. Controls
5. Junction Boxes
6. Clean-outs
7. Access Doors

C. The project manual (specifications) shall indicate all manufacturers’ products complete with catalogue number and trade name of products installed. All changes and corrections to the project manual shall be clearly indicated.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Compile product data and related information appropriate for the University of Colorado's maintenance and operation of products furnished.

B. Prepare operating and maintenance data as specified in this section and as referenced in other pertinent sections of specifications.

C. Instruct the University of Colorado, Facilities Management personnel in the maintenance of PRODUCTS and in the operation of equipment and systems.

1.02 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel:
   1. Trained and experienced in maintenance and operation of the described products.
   2. Completely familiar with requirements of this section.
   3. Skilled as a technical writer to the extent required to communicate essential data.
   4. Skilled as a draftsman competent to prepare required drawings.

1.03 SUBMITTALS

A. Prepare data in the form of an instructional manual for use by the University of Colorado, Facilities Management personnel. Quantities are listed in Part 1.07.

B. Format:
   1. Submit electronically in Portable Document Format (PDF) format as one document, OCR (Optical Character Recognition) searchable, bookmarked according to the Construction Specifications Institute (CSI) standards.
   2. Title shall be "OPERATING AND MAINTENANCE INSTRUCTIONS", and shall include:
      a. Name of project and date of completion (month and year).
      b. Project number.
      c. Identify of general subject matter covered in the manual (e.g., Architectural, Mechanical, Electrical and/or Civil).

1.04 CONTENT OF MANUAL

A. An electronically-written table of contents shall be provided for each volume, arranged according to CSI standards.

   Include the following:
   1. Name of responsible installing principal contractor, address, and telephone number.
   2. A list of each product being included, indexed to the content of the volume.
   3. List with each product, the name, address, and telephone number of:
      a. Maintenance contractor, as appropriate.
      b. Identity of the area of responsibility of each.
   4. Identify each product by product name and other identifying symbols.
B. Product Data:
1. Local source of supply for parts and replacement.
2. Include only those sheets that are pertinent to the specific product, with the following information.
   a. Clearly identify the specific product or part installed.
   b. Clearly identify the data applicable to the installation.
   c. Delete references to inapplicable information.

C. Drawings:
1. Supplement product data with drawings as necessary to clearly illustrate:
   a. Relations of component parts of equipment and systems.
   b. Control and flow diagrams.
2. Coordinate drawings with information in project record drawings to ensure correct illustration of completed installation.
3. Do not use project record drawings as maintenance drawings.

D. Provide written text, as required, to supplement product data for the particular installation:
1. Organize in a consistent format under separate headings for different procedures.
2. Provide a logical sequence of instructions for each procedure.

E. Provide a copy of each warranty, bond, and service contract issued. Provide information sheets for the University of Colorado, Facilities Management's personnel and give:
1. Proper procedures in the event of failure.
2. Instances that might affect the validity of warranties or bonds.

1.05 MANUALS FOR ARCHITECTURAL MATERIAL AND FINISHES

A. Submit copies (per schedule shown in paragraph 1.07) of complete manual in final form.

B. Content for architectural products include applied materials and finishes.
1. Manufacturer's data, giving full information on products.
   a. Catalog number, size, and composition.
   b. Color and texture designations.
   c. Information required for reordering special manufactured products.
2. Instructions for care and maintenance:
   a. Manufacturer's recommendation for types of cleaning agents and methods.
   b. Cautions against cleaning agents and methods that are detrimental to the product.
   c. Recommended schedule for cleaning and maintenance.

C. Content for moisture-protection and weather-exposed products:
1. Provide manufacturer's data, giving fully information on products.
   a. Applicable standards
   b. Chemical composition
   c. Details of installation
2. Provide instructions for inspection, maintenance, and repair.
1.06 MANUAL FOR NON-ARCHITECTURAL EQUIPMENT AND SYSTEMS

A. Submit copies (per schedule) of complete manual in final form.

B. Content for each unit of equipment and system, as appropriate shall contain:
   1. Description of unit and component parts (Consultant-approved submittals).
      a. Function, normal operating characteristics, and limiting conditions.
      b. Performance curves, engineering data, and tests.
      c. Complete nomenclature and Commercial number of all replaceable parts.
   2. Operating Procedures:
      a. Start-up, break-in, routine, and normal operating instructions.
      b. Regulation, control, stopping, shutdown, and emergency instructions.
      c. Summer and winter operating instructions.
      d. Special operating instructions.
   3. Maintenance Procedures:
      a. Routine operations.
      c. Disassembly, repair, and reassembly.
      d. Alignment, adjustment, and checking.
   4. Servicing and Lubrication Schedule, including a list of lubricants required.
   5. Manufacturer's operating and maintenance instructions.
   6. Description of sequence of operation by control manufacturer.
   7. Original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance and replacement.
      a. Predicted life of parts subject to wear.
      b. Items recommended to be stocked as spare parts.
   8. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

C. Content for each electric and electronic system, as appropriate, shall contain:
   1. Description of system and component parts:
      a. Function, normal operating characteristics, and limiting conditions.
      b. Performance curves, engineering data, and tests.
      c. Complete nomenclature and Commercial number of replaceable parts.
   2. Operating Procedures:
      a. Routing and normal operating instructions.
      b. Sequences required.
      c. Special operating instructions.
   3. Maintenance Procedures:
      a. Routing operations.
      c. Disassembly, repair, and reassembly.
      d. Adjustment and checking.
      e. Manufacturer's printed operating and maintenance instructions.
      f. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

D. Prepare and include additional data when the need for such data becomes apparent during instruction of the University of Colorado, Facilities Management's personnel.
1.07 OPERATION & MAINTENANCE MANUAL

A. Operations and Maintenance Manuals – all disciplines – submit electronically in Portable Document Format (PDF) format as one document, OCR (Optical Character Recognition) searchable, bookmarked according to the Construction Specifications Institute (CSI) standards.

1.08 SUBMITTAL SCHEDULE

A. Submit one electronic copy to the Consultants and one to the University of draft of proposed formats and outlines of contents upon completion of the submittal process. The Consultants and the University staff will review the draft and will submit comments through the consultants.

B. Submit electronic copies of complete manual(s) in final form 15 days prior to final inspection or acceptance. Comments will be submitted after final inspection.

C. Submit specified number of CDs or DVDs of approved data in final form prior to acceptance.

1.09 INSTRUCTION OF UNIVERSITY OF COLORADO, FACILITIES MANAGEMENT PERSONNEL

A. Fully instruct the University of Colorado, Facilities Management personnel's designated operating and maintenance personnel in the operation, adjustment, and maintenance of all products, equipment, and systems as required elsewhere in the specification.

B. Operating and Maintenance manual may be required as the basis of instruction.

PART 2 - MATERIAL

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Prepare commissioning process based on the Commissioning Checklists found in the UCB Standards website:

   http://fm.colorado.edu/construction/standards/

B. Coordinate the requirements of Project Closeout and Operating and maintenance sections that are part of Division 1.

C. Schedule the required commissioning activities with the University of Colorado Facilities Department and their consultants at least 72 hours prior to conducting Commissioning activities.

PART 2 - MATERIALS

   Not Used.

PART 3 - EXECUTION

   NOT USED

END OF SECTION
PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:
   1. Construction Storm Water Requirements
   2. Post-Construction Storm Water Requirements

B. Related Sections
   1. Section 02200 - Earthwork
   2. Section 02221 – Trenching, Backfilling, Compaction

1.02 QUALITY ASSURANCE

A. All construction sites
   1. All construction sites that disturb any land must take appropriate erosion control and
      stormwater detention measures to contain water run-off from site.

B. Construction sites – one acre and larger
   1. All construction sites that are one acre and larger must prepare and submit a Storm
      Water Management Plan (SWMP) for approval before any work begins. The SWMP
      must conform to all the requirements contained herein.

1.03 SUBMITTALS

A. Storm Water Management Plan (SWMP)

   Storm Water Management Plan (SWMP): Prior to any construction activity disturbing one acre of
   land or more, an approved SWMP and a Stormwater Permit for Construction Activity application
   from the Colorado Department of Public Health and Environment (CDPHE) are required. The
   SWMP shall be prepared in accordance with the CDPHE requirements for “Contents of the
   Stormwater Management Plan” and the UDFCD’s Urban Storm Drainage Criteria Manual, Volume
   management and erosion control measures are to be constructed and maintained in accordance
   with the SWMP and the UDFCD Drainage Criteria Manual.

PART 2 – MATERIALS

2.01 Storm Water Management Plan

A. Preparation Standards: Design of the SWMP and the Storm Water Quality and Erosion Control
   Plan shall include the following elements:
   1. Protection for adjacent properties (including public right-of-way) from erosion and/or
      sediment deposition.
   2. Protection for public streets from the deposit of sediment from run-off or vehicles tracking
      mud at construction access routes.
   3. Stabilization for all disturbed areas as defined in the UDFCD Drainage Criteria Manual.
4. Protection for all storm sewer inlets from the entry of sediment-laden water.
5. Long-term stability of cut and fill slopes and the successful establishment of permanent vegetative cover on exposed soil.
6. The following standard notes:
   a. “All temporary erosion control facilities shall be installed before any construction activities take place”.
   b. “Solid waste, industrial waste, yard waste and any other pollutants or waste on any construction site shall be controlled through the use of BMP’s. Waste and/or recycling containers shall be provided and maintained by the owner or contractor on construction sites where there is the potential for release of waste. Uncontained waster that may blow, wash or otherwise be released from the site is prohibited. Sanitary waste facilities shall be provided and maintained by the owner or contractor”.
   c. “Ready-mixed concrete, or any materials resulting from the cleaning of vehicles or equipment containing or used in transporting or applying it, shall be contained on construction sites for proper disposal. Release of these materials is prohibited”.
   d. “Cover shall be applied within 14 days to inactive soil stockpiles, and shall be maintained for stockpiles that are proposed to remain in place longer than 30 calendar days”.
   e. “BMP’s shall be implemented to prevent the release of sediment from construction sites. Vehicle tracking of mud shall not be allowed to enter the MS4 or waters of the State. Sediment tracked onto public streets shall be removed immediately”.
   f. “Techniques shall be used to prevent dust, sediment or debris blowing from the site”.
   g. “Stormwater discharges from construction activities shall not cause or threaten to cause pollution, contamination or degradation of waters of the State”.
   h. “All earth disturbances shall be designed, constructed and completed to limit the exposed area of any disturbed land to the shortest possible period of time”.
   i. “Bulk storage structures for petroleum products and other chemicals shall have adequate protection so as to contain all spills and prevent any spilled material from entering the MS4 or waters of the State”.
   j. Any disturbance to temporary and permanent BMP’s resulting from construction activity shall be repaired or replaced within 48 hours.

PART 3 – EXECUTION

3.1 PERMITTING

A. Contractor shall develop the SWMP in accordance with all of the requirements herein and utilizing the most recent SWMP guidance document prepared by the CDPHE and good engineering hydrologic and pollution control practices and submit to the University for approval.

B. Contractor shall apply for and obtain a CDPHE storm water general permit for construction activities. Provide copies of the permit to the University prior to the start of construction operations.
3.2 CONSTRUCTION

A. The Contractor will be required to have the SWMP on site at all times and shall be prepared to respond to maintenance of specific BMP's.

B. The Contractor shall inspect all BMP's at least every 14 days and within 24 hours after any precipitation or snow melt event that causes surface run-off. Inspections of BMP's shall be conducted by an individual who has successfully completed formal training in erosion and sediment control by an organization acceptable to the University. A certification of successful completion of such training shall be provided upon request.

C. The Contractor shall amend the SWMP whenever there is a change in design, construction, operation, or maintenance, which has an effect on the potential for discharge of pollutants to the MS4 or receiving waters, or if the SWMP proves to be ineffective in achieving the general objectives of controlling pollutants in stormwater discharges associated with construction activities.

D. Records of inspection are to be maintained on site with the SWMP. Inspection records are to be available at the project site at all times and shall be made available to the University upon request.

E. Prior to commencement of work, all general contractors, subcontractors and utility agencies shall obtain and comply with the approved, current SWMP for the project.

3.3 POST CONSTRUCTION

At the conclusion of all construction activities and as a part of construction close-out, contractor shall remove all temporary BMP's and inactivate the stormwater permit.

END OF SECTION
PART 1    GENERAL

1.01 SECTION INCLUDES
   A. Clearing and grubbing.
   B. Stripping.
   C. Disposal.

PART 2    PRODUCTS

   NOT USED

PART 3    EXECUTION

3.01 CLEARING AND GRUBBING
   A. Clearing: Remove and dispose of fences, trees, logs, brush, rubbish, and other objectionable
      material.
   B. Grubbing: remove and dispose of stumps and roots 3" and larger in diameter.
   C. Building areas: Entirely remove trees, stumps, brush, roots, and other vegetation.
   D. Other areas: Remove trees, stumps, brush, roots, and other vegetation to a depth of not less than 18"
      below subgrade or existing ground line, whichever is lower.
   E. Backfill depressions caused by grubbing, and compact to conform to density of surrounding earth.

3.02 STRIPPING
   A. Strip areas to be occupied by new construction.
   B. Completely strip topsoil, rubbish, vegetation, and other foreign materials.
   C. Minimum depth: 4".
   D. Stockpile clean topsoil free from subsoil, stones, and other foreign materials, for future use as
      specified in Section 02920.
   E. Dispose of excess stripped material to locations off-site.

3.03 DISPOSAL
   A. Dispose removed materials to locations off site. Off-site locations shall be arranged for by Contractor
      and at its expense.

END OF SECTION

1) J. L. Varone
2) S. C. Smith
PART 1  GENERAL

1.01 SECTION INCLUDES

A. Stripping.

B. Earth and borrow excavation.

C. Finish grading and protection.

1.02 MEASUREMENT AND PAYMENT

A. If quantities of the following items are changed from those required by Contract Documents, lump sum Contract Price will be adjusted on basis of unit adjustment prices set forth in Agreement.

1. Grading; cubic yard (CY): Unit adjustment price includes furnishing all materials, equipment and labor required to perform necessary excavation to construct embankments, subgrades, ditches, and incidental earthwork including stripping, compaction, moisture control, sampling and laboratory testing, protection, and removal and disposal of excess and unstable or unsuitable materials. Measure as volume of compacted fill in place.

PART 2  EXECUTION

2.01 STRIPPING

A. Prior to grading and/or borrow excavation, strip topsoil, vegetation and other objectionable material from construction areas. Average depth assumed to be 6" to 8". Stockpile clean topsoil at job site. Dispose of vegetation and other objectionable material at off-site location selected by Contractor.

2.02 EARTH EXCAVATION

A. Grading shall consist of excavation, removal and satisfactory disposal of excess excavated materials taken from within Project area, construction of subgrades, ditches, and incidental work; and removal and satisfactory disposal of unstable and unsuitable materials and their replacement with satisfactory materials where needed.

B. Remove unstable material encountered and replace with suitable material.

C. Dispose of unstable material off site at location selected by Contractor and in coordination with project management officials.

2.03 FINISH GRADING

A. Finish fill, excavated areas, and other disturbed areas to uniform grade and section normally obtainable with blade grader.

B. Allowable template tolerances: 0.10' (30 mm).

C. Finish grade to neat appearance and to provide positive drainage.

2.04 PROTECTION

A. Water shall be used as controlling agent to prevent operations from polluting air with dust.

B. Regulations as set forth by OSHA and appropriate state agencies, shall govern.
END OF SECTION

1) S. Buell
2) J. L. Varone
PART 1  GENERAL

1.01  SECTION INCLUDES

A. Soil and material testing.
B. Excavation, backfilling, and grading for structures.
C. Dewatering.
D. Protective and support systems and associated work.
E. Importing backfill materials.
F. Disposal of excess or unsatisfactory materials.
G. Underground obstructions.

1.02  RELATED SECTIONS

A. Section 01400 – Quality Control.

1.03  DEFINITIONS

A. Support system (per OSHA): Structure such as underpinning, bracing, or shoring, which provides support to adjacent structure, underground installation, or sides of an excavation.

B. Protective system (per OSHA): Method of protecting employees from cave-ins, from materials that could fall or roll from an excavation face or into an excavation, or from collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, and other systems that provide necessary protection.

1.04  QUALITY ASSURANCE

A. OWNER will retain services of qualified professional soils consultant and testing laboratory.
B. Responsibilities of soils consultant and testing laboratory will include:
   1. Sampling, testing, and approval of backfill materials prior to and during placement.
   2. Sampling and testing to determine moisture-density and maximum density characteristics of materials in accordance with ASTM D698.
   3. Observation of placement, selection of test locations, and testing of material during placement to determine that uniformity of compaction and specified compaction requirements are met. Determine in-place densities in accordance with ASTM D1556, D2167, or D2922, as applicable. Determine moisture contents in accordance with ASTM D2216 or D3017, as applicable.
   4. Providing reports to ENGINEER and OWNER giving information on materials and testing performed.
   5. Making recommendations to ENGINEER where deviations from Specifications occur or conditions are considered undesirable.

C. Responsibilities of CONTRACTOR shall include:
   1. Providing samples of backfill materials to OWNER's testing laboratory.
   2. Notifying OWNER's soil consultant and testing laboratory a minimum of 5 working days before commencing work that requires testing and minimum of 3 working days notice of any work requiring testing thereafter.
   3. Providing access in field for compaction testing and inspection and testing of natural bearing soils.
4. Allowing inspection and approval of subgrades and fill layers by OWNER's soil consultant before further Work in that area is performed.

D. CONTRACTOR shall retain services of registered professional engineer to perform OSHA specified duties related to protective and support systems if required by OSHA.
   1. Responsibilities of registered professional engineer shall include:
      a. Designs and approvals where required by OSHA.
      b. Supervision and inspection of work performed under design or approvals.
   2. CONTRACTOR's professional engineer shall have a minimum of 5 years of relevant experience.
   3. CONTRACTOR's professional engineer shall be registered in the state of Colorado and provide evidence of professional liability insurance covering activities.

1.05 SUBMITTALS

A. Samples of backfill materials to OWNER's testing laboratory.

1.06 SCHEDULE

A. Provide OWNER minimum of 7 days notice of scheduled installation of components of support system that involve use of impact or vibratory hammers such as driven H- or sheet piling.

1.07 UNDERGROUND OBSTRUCTIONS

A. Known underground utilities, foundations, and other underground obstructions in vicinity of new construction are not shown; obtain utility locates prior to excavation.

B. Contractor MUST CALL 811 (or 1-800-922-1987) for utility locates BEFORE DIGGING on any project at the University of Colorado at Boulder. This includes even small projects such as, but not limited to, planting trees or shrubs, sidewalk removal/installation or fence post installation. Digging without calling can disrupt service to the campus or surrounding neighborhoods and potentially result in fines and repair costs.

C. Protect underground utilities encountered during excavation. Provide support of utilities as required to facilitate excavation and project construction. Repair, without compensation, existing active utilities damaged during operations.

D. Notify ENGINEER of unexpected subsurface conditions and discontinue Work in area until OWNER provides directive and notification to resume work.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Use specified material obtained from off-site borrow area obtained by CONTRACTOR unless job excavated material meets specifications.

B. Exclude debris, large stones, rocks, roots, organic or frozen material, expansive material and other deleterious materials.

2.02 STRUCTURAL BACKFILL

A. Type: Excavated or imported material conforming to one of following ASTM D2487 (Unified Soil Classification System) classifications: GW, GP, SW, or SP.

B. Use for all backfill.
2.03 COHESIVE BACKFILL

A. Type: Excavated or imported natural clay materials conforming to ASTM D2487 (Unified Soil Classification System) classification CL.

B. Use: Surface water barrier. Provide a one foot thick layer of cohesive material directly below topsoil in landscaped and lawn areas.

2.04 SUPPORT AND PROTECTION SYSTEMS

A. Provide support and protection systems where shown and where required to protect public, workers, and existing and new utilities, property and structures.

B. Design of support and protection systems shall be responsibility of CONTRACTOR and shall conform to OSHA requirements.

C. Design of system shall include:
   1. Loading effects from:
      a. Soil.
      b. Ground water.
      c. Surcharge loading (construction and public traffic on adjacent roadways).
      d. Existing structures dead load and live load.
   2. Consideration of effects on existing structures including vibration and settlement. Installation and removal of support systems shall not cause damage to existing facilities.

PART 3 EXECUTION

3.01 EARTH EXCAVATION

A. Excavate as required for construction work. Extend excavation sufficient distance from walls and footings to allow for placement and removal of forms. Stockpile topsoil on site for reuse.

B. Use special care when excavating under and around existing facilities. Support existing facilities and earth under facilities to prevent settlement resulting from construction operations.

3.02 BACKFILL

A. Backfilling around structures:
   1. Backfill only after concrete has attained 85% of specified 28-day compressive strength.
   2. Prevent displacement of construction during backfilling operations; backfill opposite sides of structures simultaneously.

B. Backfill to match existing elevations and as required for drainage. Maintain surface and slopes for drainage during operations.

C. Placement:
   1. Maintain surfaces free of water, debris, and excessively wet, frozen, and other deleterious materials.
   2. Place backfill materials in successive horizontal layers not more than 8" in loose depth.
   3. Place materials at proper moisture content for obtaining densities as specified. Generally maintain within -1% to +3% of optimum.
   4. Material too dry or too wet to compact properly: Moisten or aerate to extent necessary to produce desired results.
D. Compaction:

1. Compact backfill within structure outlines, beneath and within 10’ of sidewalks, streets, drives, and parking areas to at least 98% of maximum density as determined by ASTM D698.
2. Compact backfill in other areas to at least 93% of maximum dry density as determined by ASTM D698.
3. Perform sampling and testing in each layer of backfill placed to confirm adequacy of compaction. Minimum of one sample and test for each layer.
4. Do not use pneumatic tired rollers, sheeps-foot type heavy mechanical tamping rollers or heavy vibratory compactors within 6’ of structure, walls, pipes, or other construction which might be damaged by compaction equipment.
5. If tests indicate inadequate compaction, remove, replace and recompact material until compliance with these specifications is achieved.

3.03 DEWATERING

A. Furnish, install, and remove dewatering equipment necessary to drain and keep excavations free of water under all circumstances.

B. Prevent surface water from flowing into excavations and into existing or new structures; promptly remove any water accumulated.

C. Maintain dewatering operations until Work area is accepted as complete.

3.04 SUPPORT AND PROTECTION SYSTEMS

A. Where existing utilities are in vicinity of support and protection systems that has components to be drilled or driven into soil, expose existing utilities to verify location prior to start of installation of support and protection systems components to avoid damage to existing utilities.

B. Remove support and protection system in manner to avoid damage or disturbance to Work. Leave support system in place, where removal will endanger Work, public, workers, adjacent utilities, property or structures or where it has been used as permanent formwork for concrete construction.

3.05 SITE GRADING

A. Grade areas disturbed by construction operations.

B. Finish grade to smooth, uniformly sloping surfaces to match existing elevations and as required for drainage.

C. Fill depressions and provide for positive drainage away from buildings and structures.

D. Finish with 4” layer of topsoil in areas to be seeded.

3.06 DISPOSAL OF MATERIAL

A. Dispose of excess and unsuitable excavated material off site in disposal area obtained by CONTRACTOR except excavated topsoil shall be stockpiled at site and reused.

B. Dispose of debris, large stones, rocks, roots, and organic materials off site in disposal area obtained by CONTRACTOR.

END OF SECTION

1) J. L. Varone
2) S. C. Smith
PART 1    GENERAL

1.01 SECTION INCLUDES

   A. Pipe culverts

1.02 MEASUREMENT AND PAYMENT

   A. If quantities of the following items are changed from those required by Contract Documents, lump sum
      Contract Price will be adjusted on basis of unit adjustment prices set forth in Agreement.
      1. Pipe Culvert; linear foot (LF): Unit adjustment price includes furnishing materials, equipment, and
         labor to construct pipe culvert in place including excavation, bedding, jointing, and backfilling.
      2. End Sections; each (Ea): Includes furnishing materials, equipment, and labor to install end
         sections on pipe culverts, including excavation, bedding, jointing, and backfilling.

1.03 INFORMATIONAL SUBMITTALS

   A. Submit certificates of compliance for materials as specified.

PART 2    PRODUCTS

2.01 MATERIALS

   A. Reinforced concrete pipe (RCP): AASHTO M170. Diameter and class shown on Drawings.
   
   B. Corrugated metal pipe (CMP): AASHTO M36. Diameter and gage shown on Drawings. Band
      angles, bolts, and nuts used with coupling bands and special fittings shall be galvanized according to
      ASTM A164, Type RS.
   
   C. Bituminous coated corrugated metal pipe (BCCMP): AASHTO M190, Type A. Diameter and gage
      shown on Drawings.
   
   D. Standard end sections (aprons), when called for on Drawings, shall be of same material as pipe to
      which they are attached.
   
   E. Antiseep diaphragms: Same material as pipe.
   
   F. Flumes: Same material as pipe except gage may be 16.

PART 3    EXECUTION

3.01 PIPE INSTALLATION

   A. Execute Work in the dry; provide pumping or drainage necessary to completely remove water from
      work area.
   
   B. Commence at lowest point in line.
   
   C. Bedding: Provide firm, compacted foundation of uniform density throughout length of pipe; shape to
      provide full bearing contact for lower quadrant of pipe. Foundation shall be free from clods, frozen
      lumps, rocks, roots, or other foreign material.
   
   D. Keep pipe clean of dirt and foreign material. Protect pipe from damage at all times.
E. Seal joints in RCP culverts with preformed flexible gasket or mastic joint sealer. When mastic joint sealer is used, completely fill joint with material after pipes have been brought together. Push or pull each section of pipe as tight as reasonably possible to section in place to ensure tight joints.

F. Provide joints in CMP culverts in accordance with manufacturer’s recommendations.

G. Fill handling holes in RCP culverts with a precast plug, seal, and cover with mastic or mortar.

H. Backfilling:
   1. Use material excavated from site. Use best granular material available for placement under pipe haunches and for backfill on sides of pipe up to top of pipe.
   2. Backfill material shall be free of clods, rocks, organic matter, and other deleterious material.
   3. Placing and compacting:
      a. Place and compact soil under haunches and on sides of pipe with special care.
      b. Place backfill material simultaneously on both sides of pipe in layers not exceeding 6” in depth.
      c. Compact backfill material, under haunches and on sides of pipe up to top of pipe, to 95% as determined by ASTM D698.

I. Carry hand-compacted backfill sufficient height above top of pipe to eliminate possibility of damage to pipe by equipment.

J. Lay culvert pipe with camber to allow for embankment settlement.
   1. Compute camber as 1” per 5’ of cover over pipe.
   2. Center of culvert shall be not higher than inlet of pipe.

END OF SECTION

1) S. Buell
2) J. L. Varone
PART 1  GENERAL

1.01  SECTION INCLUDES

   A. Asphaltic pavement including prime coat, tack coat, preparation and compaction of asphaltic mixtures, and surface tests.

1.02  MEASUREMENT AND PAYMENT

   A. If quantity of asphaltic concrete pavement is changed from that required by Contract Documents, lump sum Contract Price will be adjusted on basis of unit adjustment price set forth in Agreement.

   B. Asphaltic Concrete Pavement; square yard (SY): Unit adjustment price includes furnishing all materials, equipment, and labor to construct asphaltic pavement including subgrade preparation; prime coat; tack coats; preparation, hauling, spreading, and compacting asphaltic mixtures; surface tests and all sampling and laboratory testing of materials.

1.03  QUALITY ASSURANCE

   A. Samples of materials proposed for use shall be submitted to an approved testing laboratory for test, analysis, and development of job-mix formulas.

   B. Sample materials in accordance with AASHTO T2 (aggregates), T40 (asphaltic material) and T168 (asphaltic paving mixtures).

   C. Submit job-mix formula for each mixture. Formulas shall be determined by an approved testing laboratory based on "Marshall Method" and following criteria:

<table>
<thead>
<tr>
<th></th>
<th>Base Course Mixture</th>
<th>Binder and Surface Course Mixture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt Content</td>
<td>3% to 7%</td>
<td>3.5% to 7%</td>
</tr>
<tr>
<td>No. of Compaction Blows, Each End</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Stability, minimum</td>
<td>750</td>
<td>750</td>
</tr>
<tr>
<td>Flow</td>
<td>8-16</td>
<td>8-16</td>
</tr>
<tr>
<td>Percent Air Voids</td>
<td>3-8</td>
<td>3-5</td>
</tr>
<tr>
<td>Percent Voids in Mineral Aggregate, minimum</td>
<td>14</td>
<td>16</td>
</tr>
</tbody>
</table>

1. Following tolerances will be allowed per single test:

<table>
<thead>
<tr>
<th>Passing Sieve</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 4 and larger</td>
<td>±4</td>
</tr>
<tr>
<td>No. 8 thru No. 100</td>
<td>±3</td>
</tr>
<tr>
<td>No. 200</td>
<td>±2</td>
</tr>
<tr>
<td>Asphalt Content</td>
<td>±0.3</td>
</tr>
</tbody>
</table>

2. Submit job-mix formulas to Engineer prior to any pavement construction.

PART 2  PRODUCTS

2.01  ASPHALTIC MATERIALS

   A. Use following asphaltic materials for purpose indicated and meet requirements for type and grade of applicable specifications listed in AISS No. 2, "Specifications for Paving and Industrial Asphalts."

2. Tack coat: Liquid asphalt RC-70.

2.02 MINERAL AGGREGATE

A. Mineral filler shall meet requirements of AASHTO M17.

B. Fine aggregate shall consist of hard, durable grains of natural sand, crushed stone, or crushed gravel.

C. Coarse aggregate shall consist of crushed stone, crushed gravel, or crushed slag. Aggregate shall be produced from sources which normally show an abrasion loss not exceeding 40, determined in accordance with AASHTO T96 and a freezing and thawing loss not greater than 10, determined in accordance with AASHTO T104, 5-cycle, sodium sulfate solution.

D. Combination of aggregates shall meet following gradation:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
<th>Sieve (Weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base Course</td>
<td>Surface Course</td>
</tr>
<tr>
<td>2&quot;</td>
<td>100</td>
<td>---</td>
</tr>
<tr>
<td>1-3/4&quot;</td>
<td>95-100</td>
<td>---</td>
</tr>
<tr>
<td>7/8&quot;</td>
<td>60-85</td>
<td>---</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>65-95</td>
<td>98-100</td>
</tr>
<tr>
<td>No. 4</td>
<td>48-75</td>
<td>71-93</td>
</tr>
<tr>
<td>No. 8</td>
<td>35-50</td>
<td>52-72</td>
</tr>
<tr>
<td>No. 30</td>
<td>18-36</td>
<td>18-29</td>
</tr>
<tr>
<td>No. 200</td>
<td>4-8</td>
<td>5-9</td>
</tr>
</tbody>
</table>

PART 3 EXECUTION

3.01 SEQUENCE OF WORK

A. Construction operations shall be undertaken in following sequence:
   1. Clean aggregate base course, prepare, and apply prime coat.
   2. Prepare, transport, spread, and roll first layer of asphaltic concrete base course.
   3. Prepare and apply tack coat.
   4. Prepare, transport, spread, and roll second layer of base course.
   5. Prepare and apply tack coat.
   6. Prepare, transport, spread, and roll asphaltic concrete binder course.
   7. Prepare and apply tack coat.
   8. Prepare, transport, spread, and roll asphaltic concrete surface course.

3.02 EQUIPMENT

A. Asphalt mixing plant designed to produce a uniform mixture within job-mix tolerances.

B. Self-powered paving machine with electronic level control and long ski-grade follower capable of spreading mixture to thickness and width specified, true to line, grade, and crown shown on Drawings.

C. Sufficient number of smooth, metal-bedded haul trucks to ensure orderly and continuous paving operations.

D. Pressure distributor capable of applying prime and/or tack coats uniformly without atomization.

E. One or more steel-wheeled, self-propelled rollers, weighing 10 to 12 tons.
F. One or more self-propelled, pneumatic-tired rollers capable of producing minimum compression of 300 lb/in. width of tire tread.

G. Power broom or power blower.

H. Hand tools as necessary to complete Work.

3.03 PRIME COAT INSTALLATION

A. After aggregate base course has been prepared, surface shall be made free of all loose material, and when in a warm, dry condition, apply asphaltic material uniformly at rate of 0.3 to 0.5 gal/sq yd.

B. Allow prime coat to cure until it has been absorbed by surface and will not pick up. Minimum curing time shall be not less than 24 hours. Pools of asphalt material occurring in depressions shall be broomed or squeegeed over surrounding surface same day prime coat is applied. At no time during curing period shall traffic be allowed upon primed surface.

C. If primed surface is damaged, it shall be repaired. Prime coat shall be maintained at all times until cover coat is constructed.

3.04 TACK COAT INSTALLATION

A. Prior to placing second layer of base course and prior to placing binder and surface course, clean all exposed surface of loose or foreign material; and then apply tack coat at rate of 0.02 to 0.05 gal/sq yd.

3.05 PREPARING MIXTURE

A. Regulate exact proportions of various materials within limits required by job-mix formula so as to produce satisfactory bituminous coating and mixture. Order of sequence in which several aggregates shall be drawn or weighed may vary under different conditions. Aggregates shall first be mixed dry, then asphalt cement added. Mixer shall be so operated that mixture is of consistently uniform temperature and as discharged from mixer will not vary more than 20°F. Temperature of base course mixture shall not exceed 310°F and that of binder and/or surface course mixture shall not exceed 330°F.

B. In batch type mixers, size of batch shall not exceed manufacturer's rated capacity. Dry-mixing time, after all aggregates are in mixer, shall be not less than 5 seconds. Wet-mixing time, after all asphalt has been added and before opening discharge gate, shall be not less than 25 seconds. Length of dry- and wet-mixing periods may vary, but total mixing time shall be not less than 40 seconds.

C. In continuous-type plants, mixing time may be determined by weight method using following formula:

\[
\frac{\text{Pugmill contents, lb}}{\text{Pugmill output, lb/sec}} = \frac{\text{Mixing time (seconds)}}{\text{Mixing time shall be at least 30 seconds.}}
\]

3.06 PLACING ASPHALTIC CONCRETE MIXTURE

A. Drawings show thickness of various courses. Place a maximum thickness of 3" in any 1 lift.

B. Remove all standing water from surface prior to paving operations.

C. Spread mixture on areas of uniform width with electronically controlled asphalt spreader with long ski-grade follower. Spread mixture at such a rate that when compacted, layer will be substantially of thickness and dimensions specified or shown on Drawings. Use string line as a guide for finishing machine to maintain edge alignment.
D. Asphaltic concrete mixtures shall have a minimum temperature of 225°F for base course and 245°F for binder and/or surface course. Deliver hot asphaltic concrete at a rate sufficient to provide as nearly continuous travel of spreading unit as possible.

E. For irregular areas where use of a finishing machine is not practical, mixtures may be spread by hand methods. Spread hot mixture uniformly with hot shovels and rakes. After spreading hot mixture, carefully smooth mixture to remove all segregated coarse aggregate and rake marks. Rakes and lutes for hand spreading and smoothing shall be of type designed for use on asphalt mixtures.

F. Apply tack coat to edge of paving placed previous day prior to placing adjacent lane.

3.07 COMPACTION

A. Compact each layer thoroughly and promptly. For all rollers, initial contact with hot mixture shall be made by compaction roll. Roll longitudinal joints smooth and even at time of construction.

B. Use mechanical tampers in areas inaccessible to rollers. Use steel-tired finish rollers to smooth out all marks and roughness in surface. Overall rolling procedure shall produce a surface free of ridges, marks, or bumps.

C. Compact each layer to not less than 97% of maximum density obtained by laboratory job-mix formula.

3.08 JOINT CONSTRUCTION

A. Offset longitudinal joints at least 3" for each succeeding layer. Adjust spreading of hot mixture along longitudinal joints to secure complete closure of joint and full compression of mixture with a smooth surface after compaction.

B. Separate transverse construction joints by not less than 6’. Saw cold mixture layer to a straight line at right angles to center line so that a full thickness, a true surface, and a vertical edge will be provided.

3.09 TOLERANCES

A. After asphaltic mixture has been compacted, test surface for smoothness by means of a 10’ straightedge placed parallel to center line of pavement and touching surface. If ordinates measured from straightedge to pavement surface exceed 1/4”, entire area so affected shall be corrected.

3.10 FIELD QUALITY CONTROL

A. Place asphalt paving mixture only when specified density can be obtained. Take precautions at all times to compact mixture before it cools too much to obtain required density. Do not place mixture on any wet or frozen surface or when weather conditions will otherwise prevent its proper handling or finishing.

B. Do not place asphaltic surface course and/or leveling-binder course when air temperature is below 40°F. If course is 1" or less in thickness, temperature must be 50°F or above.

C. Do not place asphaltic base course when air temperature is below 40°F.

D. Provide one sample of in-place mixture for each days run to laboratory for testing. Sample shall be tested for requirements specified.

E. Provide armored thermometer suitable for asphalt temperature testing prior to placement.

END OF SECTION
SECTION 02900
LANDSCAPING, GENERAL

PART 1 - GENERAL

1.1 SUMMARY:

A. Section includes:

1. Landscaping general requirements.
2. Landscaping accessories.

B. Related Sections:

1. Section 02111 – Tree and Plant Protection
2. Section 02810 - Irrigation System.
3. Section 02920 - Soil Preparation.
4. Section 02930 - Lawns and Grasses.
5. Section 02931 – Native Grasses Seeding
6. Section 02932 – Bluegrass Sodding
7. Section 02950 - Trees, Plants and Ground Covers.

1.2 REFERENCES:

A. Uniform Federal Accessibility Standards (UFAS).

B. University of Colorado, Boulder Campus Office of Facilities Planning:

1. Campus Master Plan.
2. Campus District Micro Master Plans (when applicable).
3. Williams Village Master Site Development Plan and Design Guidelines (when applicable).
4. Research Park Master Site Development Plan and Design Guidelines (when applicable).

1.3 DEFINITIONS:

A. The terms listed below have been used in this section and throughout the UCB Standards. Definitions are provided for each.

1. Landscape: Every single item on the campus floor except buildings occupied by people, materials storage, or equipment.
2. Operations: The series of actions taken to establish procedures and various controls that keep the campus functioning a high level of efficiency. These Include: Planning, scheduling, budgeting, coordinating, supervising, improving, and maintaining the campus landscape.
3. Maintenance: The constant and continuing upkeep of campus facilities and plant material.
4. Development: The physical evolvement of the campus landscape through the enhancement of existing facilities and the creation of new facilities where none
5. Facilities: The physical objects that are built, installed, or established that serve a particular purpose in the campus landscape, such as buildings, walks, streets, parking lots, benches, lighting, and all other man-made items in the campus landscape -- but not plant material.


1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Materials List:

1. Plant material including source and location.
2. Mulches; organic rocks.
3. Amendments.
4. Accessories including edging, stake-guy system.

C. Plant and Material Certifications:

1. Certificates of inspection as required by government authorities.
2. Manufacturer’s or vendor’s certified analysis for soil amendments and fertilizer materials.
3. Label data substantiating that plants, trees, shrubs and planting materials comply with specified requirements.
4. Seed vendor’s certified statement for each grass seed mixture required. Stating botanical and common name, percentages by weight, and percentages of purity, germination, and weed seed for each grass seed species.

D. Planting Schedule: Proposed planting schedule, indicating dates for each type of landscape work during normal seasons for such work in area of site. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. Once accepted, revise dates only as approved in writing, after documentation of reason for delays.

E. Maintenance Instructions: Typewritten instructions recommending procedures to be established by Owner for maintenance of landscape work for one full year. Submit prior to expiration of required maintenance period(s).

1.5 QUALITY ASSURANCE:

A. Pre-Planting Inspection:

1. The Owner and Landscape Consultant will inspect all trees at the nursery before planting commences.
2. All plant fertilizers, backfill mixes, mulches and soil amendments will be accepted by the Owner prior to planting operations.
B. Planting Inspections:

1. The Owner or Landscape Consultant will inspect the staked location of all trees prior to planting.
2. The Owner or Landscape Consultant will inspect the staked locations of container stock prior to planting. Contractor to report any variance of quantity on unit price contracts.

C. Pre-Maintenance Inspection:

1. The Owner or Landscape Consultant will inspect site at the completion of all planting operations.

D. Final Inspection:

1. Final acceptance of the Owner and Landscape Consultant will not be given until all deficiencies are corrected.

1.6 DELIVERY, STORAGE AND HANDLING

A. Packaged Material: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

1.7 JOB CONDITIONS

A. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.

PART 2 - MATERIALS

2.1 TOPSOIL

A. Topsoil for landscape work may not be available at site and must be furnished and as specified.

B. Provide new topsoil that is fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other liter, and free of roots, stumps, stones larger than 2 inches in any direction, and other extraneous or toxic matter harmful to plant growth.

1. Obtain topsoil from local sources or from areas having similar soil characteristics to that found at project site. Obtain topsoil only from naturally well-drained sites where topsoil occurs in depth of no less than 4 inches. Do not obtain from bogs or marshes.
2.2   SOIL AMENDMENTS AND FERTILIZERS:

A. Type, analysis and application shall be determined by the Landscape Consultant based upon type of planting and the results of specific project soil analysis.

B. Submit specific product analysis for approval.

C. Organic Compost: Composted Cow Manure at 4 cubic yards per 1000 square feet.

D. Compost: A-1 Premium 3 Organic Compost

E. Mulch: Organic mulch free from deleterious materials and suitable for top dressing of trees, shrubs, or plants.

2.3   LANDSCAPE MATERIALS:

A. Bark Mulch:

1. Western Red Cedar Mulch

B. Gravel Mulch:

1. 3/4" crushed mountain rock, color as selected.
2. Submit sample for acceptance. Depth shall be 3" minimum.

C. Soil Separator Fabric:

1. 4 oz. per square yard polypropylene fabric, water permeable, and unaffected by U.V. light, freezing and thawing.
2. Approved substitute fabrics.
3. Provide at all barking beds and gravel beds.

D. Pre-Emergent Herbicide:

1. Apply beneath all mulch layers and soil separator fabric. Apply at manufacturer's specified rate. Comply with EPA requirements regarding application and use of product.
2. Submit manufacturer's data for approval.

E. Landscape Edging

2. Install per manufacturer’s instructions.
F. Crusher Fines: The following type, size, and color. Applied over specified filtration fabric.

1. Size ¼” minus  
2. Color: Wyoming Red (or approved equal)  
3. Applied to 3” depth  

G. Anti-Desiccant: Emulsion type, film-forming agent designed to permit transpiration, but retard excessive loss of moisture from plants. Deliver in manufacturer’s fully identified containers and mix in accordance with manufacturer’s instructions.

H. Wrapping: tree-wrap tape not less than 4 inches wide, designed to prevent borer damage and winter freezing.


PART 3 - EXECUTION

3.1 PREPARATION:

A. Lay out individual tree and shrub locations and areas for multiple plantings, Stake locations and outline areas and secure Architect’s acceptance before start work. Make minor adjustments as may be required.

B. After receiving approval of staked locations, and prior to digging, the Contractor shall request and verify locations of all utilities within the planting area.

END OF SECTION 02900
SECTION 02920
SOIL PREPARATION

PART I - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ripping
2. Fertilizer
3. Soil Conditioner
4. Fine Grading

B. Related Sections:

1. SECTION 02815 - Irrigation Systems
2. SECTION 02932 – Bluegrass Sodding
3. SECTION 02931 – Native Grasses Seeding
4. SECTION 02930 – Bluegrass Seeding

1.2 SUBMITTALS

A. Quality Control Submittals:

1. Certificates: State, federal and other inspection certificates shall accompany invoice for materials showing source or origin. Submit to Owner prior to acceptance of material.

1.3 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Section 01600

B. Fertilizer: Deliver inorganic or chemical fertilizer to site in original unopened containers bearing manufacturer's guaranteed chemical analysis, name, trade name, trademark and conformance to state law, bearing name and warranty of producer.

C. Notify Owner of delivery schedule in advance so material can be inspected upon arrival at project site. Immediately remove unacceptable material from project site.

1.4 PROJECT/SITE CONDITIONS

A. General: Do not perform work when climate and existing site conditions will not provide satisfactory results.

B. Vehicular accessibility on site shall be as directed by the Landscape Architect. Repair damage to prepared ground and surface caused by vehicular movement during work
under this section to original condition at no additional cost to the Owner. Coordinate access with the University of Colorado Project Manager.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Topsoil: Strip, existing 4" of topsoil in all proposed sod areas. Stockpile on-site for future distribution in new sod areas 4" deep.

B. Soil Conditioner: A-1 Premium 3 Organic Compost EKO™ compost as provided by Pioneer Sand & Gravel, or equal to be aged organic matter, meeting the following minimum requirements:

1. Minimum Requirements:
   a. Organic matter: 45% minimum.
   b. Salt content: 4.0 mmhos/cm maximum.
   c. pH range: 4.3 - 7.5.

2. Organic material may be:
   a. Aged sawdust or other nitrogen-treated, decomposing wood products
   b. Dried, pulverized poultry manure
   c. Humus
   d. Compost
   e. Aged, treated, pulverized manure
   f. Treated sewage sludge
   g. Other organic material as approved by the Project Manager

3. Aspen humus will not be accepted.

4. Mountain Peat shall not be allowed as a soil improvement.

C. First Application Fertilizer to all landscape areas: Inorganic mixture with the following chemical composition: Before sodding, incorporate 4 lbs. of diammonium phosphate (18-46-0) per 1000 sq. ft. tilled into a depth of 6".

PART 3 - EXECUTION

3.1 EXAMINATION

A. General: Verify that existing site conditions are as specified and indicated before beginning work under this Section.

1. Grades: Inspect to verify rough grading is within +0.1 foot of grades indicated and specified.

2. Damaged Earth: Inspect to verify that earth rendered unfit to receive planting due to concrete, water, mortar, limewater or any other contaminant dumped on it has been removed and replaced with clean earth from a source approved by the Landscape Architect.

B. Unsatisfactory Conditions: Report in writing to General Contractor with copy to Owner.
C. Acceptance: Beginning of installation means acceptance of existing conditions by installer.

3.2 PREPARATION

A. Protection:
   1. Contractor shall locate sewer, water, irrigation, gas, electric, phone and other pipelines, conduits or utilities and equipment prior to commencing work.
   2. Contractor shall be responsible for proper repair to landscape, utilities, walls, pavements and other existing site improvements damaged by operations under this section.

B. Weed Control: Remove annual weeds by tilling. Remove perennial weeds by applying herbicide 1 week before soil preparation and as needed, but no sooner than two weeks before soil preparation is to begin.

C. Surface Grade: Remove weeds, debris, clods and rocks larger than 1/2". Dispose of accumulated debris at direction of Landscape Architect.

D. Runoff: Take measures and furnish equipment and labor necessary to control the flow, drainage, and accumulation of water. Insure that all water will run off the grades.

E. Erosion Control: Take measures and furnish equipment and labor necessary to control and prevent soil erosion, blowing soil and accumulation of wind-deposited material on the site throughout duration of work.

3.3 INSTALLATION

A. Soil Amendment:
   1. Evenly distribute aged organic matter, and first application of fertilizer in landscaped areas at the following rates:
      a. Aged organic matter at the rate of 2 3 cu. yds. per 1,000 sq. ft. to sod and seed areas. Aspen humus will not be accepted.
      b. Fertilizer Application:
         1) First application is specified under Section 02920, 2.1 C.
   2. After applying soil conditioner and fertilizer, thoroughly till area to depth of 6" minimum by plowing, harrowing, or disking until soil is well pulverized and thoroughly mixed.

B. Fine Grading in all Landscape Areas:
   1. Do fine grading for areas prior to planting.
   2. For ground surface areas surrounding buildings to be landscaped, maintain required positive drainage away from buildings.
   3. Establish finish grades to within 0.04 foot of grades indicated.
   4. Noxious weeds or parts thereof shall not be present in the surface grade prior to...
landscaping.

5. Prior to acceptance of grades, hand rake to smooth, even surface free of debris, clods, rocks, and vegetable matter greater than 1/2".

3.4 NOTIFICATION AND INSPECTION

A. Inspection: Provide notice to Landscape Architect requesting inspection at least 7 days prior to anticipated date of completion.

B. Deficiencies: Landscape Architect will specify deficiencies to Contractor who shall make satisfactory adjustments and shall again notify Landscape Architect for final inspection.

3.5 CLEANING

A. General: Remove debris and excess materials from site. Clean out drainage inlet structures. Clean paved and finished surfaces soiled as a result of work under this Section, in accordance with direction given by Landscape Architect.

3.6 PROTECTION

A. General: Provide and install barriers as required and as directed by Landscape Architect to protect completed areas against damage from pedestrian and vehicular traffic until acceptance by Owner. Contractor is not responsible for malicious destruction caused by Others.

END OF SECTION 02920
SECTION 02931
NATIVE GRASSES SEEDING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide seeded lawns as shown and specified. Renovated lawn area refer to existing lawn areas disturbed by construction.
   1. Soil Preparation
   2. Seeding lawns, athletic fields, and other indicated areas
   3. Maintenance

B. Related Sections:
   1. SECTION 02815 - Irrigation System
   2. SECTION 02920 – Soil Preparation

1.2 QUALITY ASSURANCE

A. Comply with Section 02920 requirements.

1.3 SUBMITTAL

A. Submit seed vendor's certification for required grass seed mixture, indicating percentage by weight, and percentages of purity, germination, and weed seed for each grass species.
   1. Specified native seed mix – indicated

B. Submit the following material samples:
   1. Custom native seed mix

C. Warranty for Native Seed Areas: At completion of work, furnish written warranty to Owner based upon requirements as specified.
1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver seed and fertilizer materials in original unopened containers, showing weight, analysis, and name of manufacturer. Store in a manner to prevent wetting and deterioration.

1.5 PROJECT CONDITIONS

A. Work notification: Notify owner's authorized representative at least seven (7) working days prior to start of seeding operations.

B. Protect existing utilities, paving, and other facilities from damage caused by seeding operations.

C. Perform seeding work only after planting and other work affecting ground surface has been completed.

D. Restrict traffic from lawn areas until grass is established. Erect signs and barriers as required.

E. Provide hose and lawn watering equipment as required.

F. The irrigation system will be installed prior to seeding. Locate, protect, and maintain the irrigation system during seeding operations. Repair irrigation system components during seeding operations at Contractor's expense.

1.6 WARRANTY

A. Provide a uniform stand of grass by watering, mowing, and maintaining seeded areas until final acceptance. Reseed areas, with specified materials, which fail to provide a uniform stand of grass until all affected areas are accepted by the Consultant and the Owner.

PART 2 - PRODUCTS

2.1 PRODUCTS

2.2 MATERIALS

A. Native seed:
1. Fresh, clean, and new crop mixture mixed by an approved method.
2. All irrigated seed areas are to be the following custom blended native seed mix:

   30% Blue grama – Bouteloua gracilis
   20% Western Wheatgrass – Agropyron smithii
   20% Sand Dropseed – Sporobolus cryptandrus
   15% Hairy Grama – Bouteloua hirsute
   10% Galleta – Hilaria jamesii

5% Wildflower Seed Mix
   consisting of at least four species at not more than 25% each of the following acceptable perennial wildflowers:
   • Golden Aster – Heterotheca villosa
   • Desert Four O’clock – Mirabilis multiflora
   • Scarlet Globemallow – Sphaeralcea coccinea
   • Blazing Star – Menizelia oligosperma
   • Western Wallflower – Erysimum asperum
   • Fireweed – Liatris angustifolium
   • Gayfeather – Liatris punctata
   • Blanket Flower – Gallardia aristata
   • Blue Flax – Linum perenne lewisii

3. Variations to seed mix will be acceptable based on topsoil analysis. Variations are to be approved by Landscape Architect.
4. Seeding Rate: 40 lbs/acre for Hydroseeding. Other seeding methods to be reviewed and approved by Landscape Architect and Owner.

B. Water: Free of substance harmful to seed growth. Hoses or other methods of transportation furnished by Contractor.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine finish surfaces, grades and depth. Do not start seeding work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Limit preparation to areas which are ready to be seeded immediately.

B. The contractor shall prepare the subgrade to all areas to be seeded by discing or rototilling the soil to a depth of six (6) inches. No organic amendments will be applied to dryland seed grass area.
C. Prior to the second tillage, the fertilizer shall be applied to the surface of the rough subgrade of the areas to be seeded and tilled during the second operation. When completed, the soil shall be firmed by rolling and float drag, followed by steel raking, to provide for the proper seeded surface. The seed bed shall be totally free from rock or clay clods over one (1) inch in diameter.

3.3 INSTALLATION

A. Seeding:

1. Seed immediately after preparation of bed. Seed irrigated seed areas between April 1 - August 15 and dryland areas between October 1 - April 15 or at such other times acceptable to the Landscape Architect.

2. Seed indicated areas within contract limits and areas adjoining contract limits disturbed as a result of construction operations.

3. Native Seed:

   a. Do not use wet seed or seed which is moldy or otherwise damaged in transit or storage. Deliver seed to the job site in the original unopened containers and present certified labels to the Consultant prior to opening containers.

   b. Seeding shall be done by means of broadcast seeding. Seeds shall be uniformly sown and raked to a depth of approximately 1/4”.

3.4 MAINTENANCE, GUARANTEE, AND ACCEPTANCE

A. Maintenance Period and Guarantee:

1. The maintenance and warranty period shall begin immediately after each area is seeded until final acceptance of the project. During this time, the contractor shall be responsible for watering, if needed, mowing, spraying, weeding, and all related work and costs as necessary to insure that seeded areas are in a vigorous growing condition until final acceptance. The Landscape Architect will direct the contractor on what seeded areas need to be replaced at the final walk-through.

2. The contractor shall, for a period of one (1) year, monitor his work once every two months to verify that major settlement has not taken place and that no seeded area has become waterlogged in settled swales or other areas. Should settlement occur, the contractor shall repair damage according to these specifications.
3. The contractor shall maintain the seeded areas until all work on the contract has been completed and accepted. Maintenance shall consist of, in addition to watering, mowing, weed control, and protection from vandalism, the repair of areas damaged by erosion protection from vandalism, the repair of areas damaged by erosion or wind.

Such areas shall be repaired during the maintenance period at no expense to the Owner to re-establish the condition and grade of the soil prior to application of the mulch and shall be refertilized, reseeded, and remulched as directed. Major repair of areas due to the work or failure of other contractor's systems or work shall be by that contractor who damaged the work, provided that during this maintenance period the lawn contractor notifies the Owner's authorized representative in writing of such damage within ten (10) days of the occurrence. Major damage due to vandalism (major damage is defined as damaged costing over $5,000.00 in time and materials) in any one incident shall be borne by the Owner, again provided that notification was made within ten (10) days as specified herein. After receiving final acceptance, maintenance shall become the responsibility of the Owner.

4. The seeded areas shall be accepted on the basis of having a uniform plant growth over the entire seeded area. Two (2) months after seeding, the areas seeded shall be reviewed by the Landscape Architect and the Contractor. Any areas (as determined by the Landscape Architect) where the seed has failed to germinate shall be reseeded and raked to cover the seed. Any area where the seed has failed to grow, reseeding shall be at the Contractor's expense until grass is established and accepted. Acceptable uniform plant growth shall be defined as when the scattered bare spots, not greater than 4 square inches, do not exceed 5% of the seeded area.

3.6 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from seeding operations.

END OF SECTION 02930
PART 1    GENERAL

1.01 SECTION INCLUDES

A. Cast-in-place concrete including formwork, reinforcing steel and miscellaneous materials.

1.02 QUALITY ASSURANCE

A. OWNER will retain services of qualified independent testing laboratory.

B. Responsibility of testing laboratory will include:
   1. Obtaining, making and transporting field samples of concrete for testing.
   2. Conduct tests on following materials as specified under paragraph “Tests.”
      a. Concrete strength tests.
      b. Concrete slump tests.
      c. Concrete air content test.
   3. Tests on in-place concrete or concrete cores to verify concrete strength where tests on concrete strength tests indicate insufficient strength.
   4. Provide test reports.
   5. Reports shall indicate whether or not materials meet specifications.

C. Perform Work in accordance with ACI 117 and 301.

D. Tests:
   1. Establish proposed concrete design mix proportions on basis of either field experience and/or trial mixtures in accordance with ACI 318, Chapter 5, except specific requirements shall conform to requirement of these specifications. Determine and submit supporting data, standard deviation, trial batch tests, required average strength, proportions, air content, and slump range for each mix.
   2. Concrete strength tests:
      b. Field tests: Sample in accordance with ASTM C172; make and test 3 cylinders from each sample on basis of not less than:
         1) One sample from each day’s placement for each class of concrete.
         2) One sample from each 150 cu yd (120 cu m).
         3) One sample for each 5,000 sq ft (460 sq m) of surface area for slabs or walls.
         4) For a given class of concrete, if frequency of testing specified above would provide less than 3 samples, sample at least 3 randomly selected batches or each batch if 3 batches or fewer are required.
      c. Cylinders shall be laboratory cured. Test one laboratory cured cylinder at 7 days and other two at 28 days for average strength.
      d. If tests indicate deficient strength as defined by ACI 318, immediately adjust mix to increase average of subsequent test results and, when directed, perform drilled core testing, ASTM C42/C42M. Testing and remedial work shall be at no additional cost to OWNER.
   3. Slump tests:
      a. Test each batch as delivered; comply with ASTM C172 and C143/C143M.
      b. If slump exceeds Specifications, promptly remove batch from Work and dispose of off-site at location selected by CONTRACTOR. Do not add water in excess of specified water-cement ratio to batch to achieve desired slump.
   4. Air content tests:
      a. Sample on basis specified above for field strength tests.
      b. Obtain samples from concrete at point of discharge.
      c. Determine air content by pressure method; comply with ASTM C231.
      d. If air content does not meet Specifications, remove deficient concrete from Work.
1.03  SUBMITTALS

A. Tests, or certificates of compliance with standards specified in this Section at least 14 days prior to commencing concrete placement for:
   1. Cement: From each car from which cement will be used.
   2. Fly ash: From each separate shipment from which fly ash is being used.
   3. Aggregates: For each size aggregate from each source of aggregate, for grading, deleterious substances and soundness.

B. List of admixtures, joint fillers, sealants, curing compounds, and other manufactured materials proposed identifying manufacturer and type. Provide data on specific items when requested by ENGINEER.

C. Testing laboratory reports required at least 14 days prior to commencing concrete placement for each class of concrete and each size aggregate:
   1. Proposed concrete design mix.
   2. Tests on concrete cylinders from trial batch of proposed mix.

1.04  STORAGE OF MATERIALS

A. Cement: Keep clean, dry, and free from weather damage.

B. Aggregates: Stockpile each gradation separately on clean, noncontaminating surface.

PART 2  PRODUCTS

2.01  CEMENT

A. Portland cement: ASTM C150, Type II.

B. White cement: Nonstaining, ASTM C150, Type I.

2.02  AGGREGATE

A. Regular aggregate: Strong, durable, well-graded minerals conforming to ASTM C33 requirements for grading, deleterious substances and soundness.

B. Aggregates not conforming exactly to above specifications may be used provided:
   1. Special tests or actual service establish that such aggregates will produce concrete of quality specified.

C. Coarse aggregate nominal size:
   1. 1-1/2" to No. 4: Use for all concrete unless specified otherwise.
   2. 3/4" to No. 4: Use for slabs and thin sections and areas where clear spacing between reinforcing bars is less than 3".

2.03  FLY ASH

A. Conform to ASTM C618 including Supplementary Optional Physical Requirements in Table 2A.

B. Fly ash for total Project shall be obtained from single source.

C. Design concrete mixes to include fly ash in amount of approximately 15% to 20% of cement by weight.

D. May be used at CONTRACTOR's option for all concrete.
2.04 WATER
A. Clean, fresh, free from injurious amounts of oil, alkali, acid, salts, organic materials, or other substances that may be deleterious to concrete or steel.

2.05 ADMIXTURES
A. Water-reducing and set-controlling admixture, ASTM C494, type as required. Use for all concrete.
B. Air entraining agent, ASTM C260. Use in accordance with manufacturer's recommendations. Use for all concrete.

2.06 REINFORCING
A. Bars: ASTM A615/A615M, Grade 60 deformed bars.
B. Bend bars cold to conform to required details.
C. Sidewalks:
   1. #4 @ 12” on center each way centered in slab.
      a. Use for 6” thick sidewalks.
   2. Welded wire fabric: ASTM A185 plain wire deformed wire in flat sheets. 6” x 6”/W1.4 x W1.4.
      a. Use for 4” thick sidewalks unless shown otherwise.

2.07 EPOXY GROUTED REINFORCING STEEL
A. Horizontal and vertical reinforcing bars installed in concrete from above: Hilti “HY 150 System”; ITW Ramset/Red Head “Epcon System”; or Rawl/Sika “Foil-Fast System”.
B. Use for anchoring reinforcing bars into existing concrete.

2.08 FORMS
A. Acceptable materials:
   1. Douglas fir, exterior type, concrete form plywood, 5/8” (15 mm) thick minimum, conforming to DOC PS 1, Grade B-B, Class I or II.
   2. Removable metal forms with surfaces equal to Douglas fir, exterior type, concrete form plywood.
B. Form ties: Type leaving no metal within 1” (25 mm) of finished surface after removal of forms.
C. Form coating:
   1. Wood forms: Nonstaining mineral oil or commercially produced form-release agent that will not bond with, stain, or adversely affect concrete surfaces and curing, and will not impair bond or adhesion of subsequent treatment of concrete surfaces, "Nox-Crete Form Coating," by Nox-Crete Chemicals, or equal.
   2. Metal forms: Treat surfaces as recommended by manufacturer before placing reinforcing.

2.09 JOINT MATERIALS
A. Expansion joint filler: Preformed nonextruding and resilient nonbituminous type, ASTM D1752, Type 1. Use for all expansion joints except sidewalks.
B. Joint material: 0.5” thick, closed cell polyethylene foam, Texmastic “Vinyltex 3600”, Sonneborn “Sonoflex F”, or approved equal.
   1. Use for sidewalks.
C. Joint sealant:
2. Provide primer as recommended by manufacturer.
3. Use for expansion joints.

D. Joint sealant backing rod:
1. Type: “Ethafoam” round, preformed resilient rod by Dow Chemical Co.; “Sonofoam Closed Cell Backer-Rod” round, preformed, closed-cell polyethylene rod by Sonneborn, or equal.
2. Diameter: Manufacturer’s recommendations for joint width.
3. Use for proper depth control of sealant.

2.10 WATERSTOPS

A. Polyvinyl chloride:
2. Manufacturer: Greenstreak, Vinylex Corp., or equal.
3. Size: 3/8” x 6” flat, ribbed profile.

2.11 CURING MATERIALS

A. Liquid membrane-forming compound:
1. ASTM C309, Type 1 with fugitive dye, except Type 2 with white pigment for surfaces exposed to direct rays of sun.
2. Do not use compounds containing wax, oil, resin, varnish, or other bases that will prevent bonding of finishes such as additional concrete.
3. Use for curing at CONTRACTOR’s option except where other products are specified for particular application.

B. Plastic film:
1. Polyethylene plastic film, white, nonstaining, conforming to ASTM D2103.
2. Minimum 4-mil thickness.
3. Use for curing at CONTRACTOR’s option except where other products are specified for particular application.

C. Absorptive mat:
1. Cotton fabric, burlap fabric, or burlap-polyethylene material woven or bonded to prevent separation.
2. Material shall be clean and nondetrimental to concrete or finish.
3. Use for curing at CONTRACTOR’s option except where other products are specified for particular application.

2.12 GROUT

A. Regular grout:
1. One part portland cement to 3 parts fine aggregate with sufficient water to maintain adequate workability. Substitute white cement for normal portland cement to match color of adjacent concrete.
2. Minimum strength: 4,000 psi at 28 days.
3. Use for patching except where shown or specified otherwise.

2.13 CONCRETE DESIGN AND USE

A. Each concrete design mix shall be established in strict accordance with ACI 318 by proportioning on basis of either experience and/or trial mixtures.
B. Strength classifications:

<table>
<thead>
<tr>
<th>Class</th>
<th>Specified Compressive Strength, f'c</th>
<th>Required Average Compressive Strength, f'cr</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4,000 psi</td>
<td>5,200 psi</td>
</tr>
</tbody>
</table>

C. Required average compressive strengths: Produce concrete of average strengths noted above unless test results substantiate a lower permissible average strength based on standard deviation criteria set forth in ACI 318.

D. Maximum water-cement ratio: 0.48 by weight. Where pozzolan fly ash is used, water-cement plus pozzolan ratio shall not exceed specified ratio.

E. Air entrainment: Concrete shall contain entrained air within following limits.

<table>
<thead>
<tr>
<th>Nominal Maximum Size of Coarse Aggregate, In.</th>
<th>Total Air Content, Percent By Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot;</td>
<td>4 to 8</td>
</tr>
<tr>
<td>1-1/2&quot;</td>
<td>3 to 6</td>
</tr>
</tbody>
</table>

F. Workability:
1. Proportions of concrete shall produce a mixture, suited to placement methods, which will work readily into corners and angles of forms and around reinforcement and embedded items. Segregation of materials or presence of free water will not be permitted.
2. Slump of concrete: Use minimum practical; vary within limits given to suit placement conditions; in no case is slump to be increased by addition of water in excess of design mix quantity:

<table>
<thead>
<tr>
<th>Type of Construction</th>
<th>Slump, in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>Maximum</td>
</tr>
<tr>
<td>All concrete unless noted otherwise</td>
<td>2</td>
</tr>
<tr>
<td>Sidewalks</td>
<td>1</td>
</tr>
</tbody>
</table>

G. Concrete use:

2.14 READY-MIX CONCRETE

A. Provide concrete from an established, approved ready-mix plant. Ready-mix plant equipment and facilities shall be certified in accordance with NRMCA QC-3.

B. Equipment and methods: Conform to ASTM C94/C94M.

PART 3 EXECUTION

3.01 PREPARATION

A. Construct forms strong, straight, adequately braced and securely fastened.

B. Remove laitance from previously placed or existing concrete; thoroughly clean surface before placing additional concrete.

C. Apply form coating on formwork in accordance with manufacturer’s instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.
3.02 PLACING CONCRETE

A. Clean transporting equipment, reinforcing, and embedded items before placing concrete. Remove water and debris from places to be occupied by concrete.

B. Place no concrete until forms, reinforcing, and embedded items have been verified as adequately supported and accurately placed. Place no concrete over water-covered, muddy, or frozen soil.

C. Immediately remove concrete where water, soils, or other deleterious substances are permitted to mix with concrete, form or embedded item movement occurs, or inadequate consolidation is obtained.

D. Hot weather concreting:
   1. Applies to concrete placed when ambient temperature exceeds 90°F (32°C).
   2. Conform to ACI 305R recommendations and requirements.

E. Cold weather concreting:
   1. Applies to concrete placed when ambient temperature is below 40°F (4°C).
   2. Conform to ACI 306R recommendations and requirements.
   3. If temporary heating facilities used are of type which produce an atmospheric condition of high carbon dioxide content, seal off concrete in such manner that no damage will result to concrete surface.

F. Employ best industry practices to prevent segregation during placing. Do not drop concrete more than 5'. Use tremied or pumped concrete to provide proper placement. Place in layers approximately 18" deep.

G. Place concrete continuously in each section until completed. Permit not more than 30 minutes between depositing adjacent layers of concrete within each section, unless an acceptable set retarder is used in concrete mix.

H. Thoroughly compact, puddle, and vibrate concrete into corners and around reinforcing and embedded items. Use internal vibration where size of section permits.

I. Maintain concrete placing temperature between 50°F and 90°F except as specified for hot and cold weather concreting.

J. Place sections of concrete in sequence that eliminates shrinkage effects to greatest extent practicable.

K. Protect concrete from injury due to sun, cold weather, running water, construction operations, and other causes until properly cured.

3.03 REINFORCEMENT PLACEMENT

A. Remove scale, loose flaky rust, dirt, grease, curing compound, and other coatings that would impair bond.

B. Install slab-reinforcing bars in correct position by use of preformed bolsters and spacers.

C. Space bars properly and tie securely in position before placing concrete. Tack welding to keep reinforcing in place is not permitted.
3.04 CONSTRUCTION JOINTS

A. Install only where shown or where specifically permitted.
B. Provide keyway 1-1/2" (38 mm) deep covering approximately 1/3 area of construction joint, unless shown otherwise.
C. Install waterstop where shown or specified.
D. A delay, until concrete is no longer plastic, shall occur after placing concrete for walls before placing concrete for slabs, beams, or girders supported thereon.
E. Slabs-on-grade: Saw-cut control joints as soon as possible after concrete hardens.

3.05 EXPANSION JOINTS

A. Formed joints: Make exposed edge of concrete slightly rounded with edger at joints to contain joint sealant.
B. Install materials in accordance with manufacturers' instructions. Set preformed material securely in place before placing concrete.
C. Install joint filler to within joint width (1/2" minimum) of exposed surface. Fill remainder of joint with joint sealant.

3.06 SIDEWALK JOINTS

A. Contraction joints, minimum depth ¼ thickness of concrete. Space at even intervals and match existing adjacent work (if any).
B. Longitudinal joints in conformance with drawings.
C. Expansion joints with preformed joint filler in a vertical position, deviating not more than ¼" from a straight line. Install at all existing and proposed structures projecting through, into, or against pavement, in accordance with drawings.

3.07 EMBEDDED ITEMS

A. Install items required under this contract to be embedded in concrete. Install items required by others for embedding in concrete, if so instructed before placing concrete.
B. Fasten embedded items securely in proper position before placing concrete.
C. Conduit or pipe embedded in slabs or walls:
   1. Locate in center of slab or wall and space not closer than 3 diameters on center; locate to avoid impairing strength of concrete.
   2. Coordinate placing of reinforcing with conduit or pipe location. Do not cut reinforcing to clear conduit or pipe.
D. Aluminum pipe shall not be embedded in concrete. Where aluminum projects into or rests against surface of concrete, coat surfaces of aluminum to prevent direct contact with concrete.

3.08 GROUTING

A. Roughen concrete surfaces by light chipping to remove laitance to approximately 1/2". Do not expose reinforcing steel.
B. Remove materials which might interfere with bond; prepare surfaces in strict conformance to manufacturer's instructions.

C. Mix, place, and cure grout in strict accordance to manufacturer's instructions.

3.09 FINISHING

A. Flatwork:
1. Tamp concrete to force coarse aggregate down from surface.
2. Screed with straightedge, eliminate high and low places, bring surface to required finish elevations.
3. Dusting of surface with dry cement or sand during finishing operations is not permitted.
4. Apply curing compounds and similar materials in accordance with manufacturer's instructions during or after finishing.
5. Finish surfaces within following tolerances as measured with a 10' straightedge:
   a. Sidewalks: 3/16".
   b. Other slabs: 3/16".
   c. Top surfaces of structures other than slabs: In accordance with ACI 117.
6. Broomed or belted finish:
   a. Float surface to true, even plane.
   b. Steel trowel to smooth, uniform surface.
   c. Lightly broom with fiber brush or drag burlap belt across surface in direction transverse to traffic flow.
   d. Use on sidewalks, paving, and exterior slabs.
7. Trowel finish:
   a. Float surface to true, even plane.
   b. Steel trowel to smooth, uniform finish, free of defects; steel trowel second time to final burnish finish; use edger on exposed edges.
   c. Use on interior floor slab of PDC vault.

B. Formed surfaces:
1. Remove fins, projections, and loose material.
2. Clean surfaces of form oil.
3. Patch honeycomb, aggregate pockets, voids, and holes as follows:
   a. Chip out until sound concrete is exposed to minimum depth of 1".
   b. Prepare patching mortar with approximately 2 parts normal portland cement, one part white cement, 9 parts fine aggregate; vary proportions of cement as necessary to match color of adjacent concrete.
   c. Saturate surfaces with water and fill cavities with patching mortar.
4. Fill holes left by form ties with patching mortar.
5. Cure patches as specified for concrete.

3.10 FORM REMOVAL

A. Minimum time before removal after placing concrete, unless permitted otherwise:
1. Footings: 24 hours.
2. Walls: 48 hours (24 hours for metal-lined forms).
3. Self-supported beams and slabs: 14 days.
4. Time specified above represents cumulative time during which temperature of concrete is maintained above 50°F and for concrete without set-controlling admixtures.

B. In any event, do not remove supporting forms and shoring until concrete has acquired sufficient strength to safely support own weight plus construction loads.

C. Take care when removing forms that concrete is not marred or gouged and that corners are true, sharp and unbroken.
3.11 CURING

A. Cure all concrete; begin curing as soon as possible after placement of concrete.

B. Plastic film curing:
   1. Dampen surface of concrete and lay plastic film with minimum 6" side laps and free of wrinkles; tape side laps.
   2. Hold film in place with lumber or use similar provisions to prevent exposure of concrete for 7 days after placing.
   3. Immediately repair tears in film.

C. Water curing:
   1. Keep concrete continuously wet for 7 days after placing.
   2. Use on concrete surfaces not receiving compound or plastic film curing.
   3. Clean, nonstaining absorptive mat may be used with water curing.
   4. Do not use for curing cold weather concrete.

END OF SECTION

1) J. L. Varone
2) S. C. Smith
PART 1 GENERAL

1.01 SECTION INCLUDES

A. Masonry mortar.
B. Masonry grout.
C. Anchorages and reinforcements.
D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03001 - Concrete Work
B. Section 04200 - Masonry Units.

1.03 INFORMATIONAL SUBMITTALS

A. Quality assurance data:
   1. Certificates of compliance for reinforcing.
   2. Certified laboratory tests for compressive strength of mortar and grout mixes shall be submitted for review prior to commencement of masonry work, unless approved mix as specified is used.

B. Field test reports.

1.04 QUALITY ASSURANCE

A. Masonry construction and materials shall conform to requirements of "Specifications for Masonry Structures (ACI 530.1/ASCE 6/TMS 602)," published by ACI.

B. Testing laboratories:
   1. Owner will retain services of qualified independent testing laboratory. Responsibilities of testing laboratory will include:
      a. Field sampling and testing of mortar and grout.
      b. Obtain, make samples, and trial batches of mortar and grout (if required) and perform laboratory and field testing specified.
      c. Special Inspection in accordance with IBC 1704.5 for portions of CMU construction identified on Drawings as requiring Special Inspection.
      d. Provide reports to Owner giving information on inspections, materials, design mixes, testing performed and test results.
      e. Reports shall indicate whether materials meet specifications.

1.05 STORAGE

A. Cement and lime: Keep clean, dry, free of contact with ground and protect from weather damage.
B. Aggregate: Stockpile on clean, noncontaminating surface.

1.06 ENVIRONMENTAL REQUIREMENTS

A. At temperatures below 40°F, heat, but do not scorch, sand; heat mixing water to not over 160°F and keep mortar and grout between 40°F and 120°F. Maintain temperature of mortar and grout above freezing.
B. When mean daily air temperature is 40°F or below, completed masonry shall be protected in accordance with Section 04200.

PART 2 PRODUCTS

2.01 MATERIALS - GENERAL

A. Water: Potable, clean, free from deleterious amounts of oil, acid, alkali, and organic matter.

B. Do not use admixtures to lower freezing point.

C. Air content of mortar and grout shall not exceed 12%.

D. Use same brand of each different proprietary material throughout Project.

2.02 MORTAR

A. Proportions and strength: ASTM C270 “Proportion Specifications.” Proportions shall be as indicated in Table 1.

<table>
<thead>
<tr>
<th>Mortar Type</th>
<th>Parts by Volume Portland Cement</th>
<th>Part by Volume Hydrated Lime</th>
<th>Aggregate Measured in a Damp Loose Condition</th>
<th>Compressive Strength, minimum (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>1</td>
<td>1/4</td>
<td>Not less than 2-1/4 and not more than 3 times sum of volumes of cements and limes used</td>
<td>2,500</td>
</tr>
<tr>
<td>S</td>
<td>1</td>
<td>Over 1/4 to 1/2</td>
<td></td>
<td>1,800</td>
</tr>
</tbody>
</table>

B. Use portland cement-lime mortar. No masonry cement allowed.

C. Use no admixtures, salts, or anti-freeze compounds.

D. Use Type M for masonry work in contact with earth. Use Type S mortar for other unreinforced and reinforced masonry work. Use Type N mortar for brick and stone veneers.

E. Preblended mortar: Cementitious materials, aggregate, and admixtures shall be blended at factory under controlled conditions, and mix shall only require addition of water of job Site.

F. Mixing:
   1. Accurately measure mortar materials by volume.
   2. Mix sand, lime, and cement dry to uniform color using drum-type mixer.
   3. Add water to bring mortar to proper consistency for use.
   4. Mix for at least 3 minutes after adding water.
   5. Thoroughly clean mixer after discharging each batch.
   6. Use mortar within 2-1/2 hours after initial mixing and discard mortar not used within this time.
   7. Mortar may be retempered by adding water and remixing at any time within 2 hours after initial mixing.

G. Use same brand of each different proprietary material throughout Project.

H. Color: To be selected after award of Contract.
2.03  GROUT

A. Type: Fine or coarse, at Contractor’s option, complying with mix proportions and installation requirements of IBC 2006.

B. Type: Fine.
   1. Conform to ASTM C476 (2,000 psi minimum compressive strength).
   2. Trial mix:
      a. One part by volume of fresh, standard brand portland cement, Type I, ASTM C150.
      b. One tenth part by volume of lime putty. Lime shall be 92% hydrated lime, ASTM C207, Type S.
      c. 2-1/4 to 3 parts by volume of fine aggregate, ASTM C404.

C. Type: Coarse:
   1. Conform to ASTM C476 (2,000 psi minimum compressive strength).
   2. Trial mix:
      a. One part by volume of fresh, standard brand portland cement, Type I, ASTM C150.
      b. One tenth part by volume of lime putty. Lime shall be 92% hydrated lime, ASTM C207, Type S.
      c. 2-1/4 to 3 parts by volume of fine aggregate, ASTM C404, plus 1 to 2 parts by volume of coarse aggregate, ASTM C404.

2.04  REINFORCEMENT AND ANCHORAGES

A. Manufacturers and products listed are for reference purposes. Equivalent products by other manufacturers are acceptable.

B. Horizontal joint reinforcing:
   1. Exterior walls: Dur-O-waL standard 9-gage side rods with 9-gage cross rods of hot-dipped galvanized steel (1.5 oz psf). Width shall be approximately 2” less than width of wall.
   2. Types:
      b. Miscellaneous anchors: For field conditions not specifically identified, provide proper anchoring system meeting above conditions regarding galvanizing and fasteners.
   3. Provide prefabricated corner and “T” intersection units for use at corners and load bearing wall intersections, and other special shapes as needed.

C. Reinforcing bars: Deformed, 60,000 psi minimum yield strength conforming to ASTM A615 Grade 60.

D. Anchors:
   1. Masonry anchor devices: Mill galvanized or hot-dipped galvanized for exterior wall conditions.

E. Veneer anchors: Dur-O-waL, D/A 213, 14-gage (2 mm) hot-dipped galvanized anchor with D/A 807 copolymer corrosion-resistant screws.

2.05  MASONRY FLASHINGS

A. Through-wall flashing: “Perm-a-Barrier” wall flashing, self-adhesive, cold-applied sheet consisting of 32 mils (0.8 mm) of rubber-bonderized asphalt integrally bonded to 8-mil (0.2 mm), high-density, cross-laminated polyethylene film. Use in conjunction with “Bituthene Mastic” and “Perm-a-Barrier” surface conditioner. W. R. Grace and Company, or equal.

B. Drip edge flashing: 26-gage (0.4 mm) stainless steel.

2.06  ACCESSORIES

A. Weep holes: “Cell Vent” by Dur-O-waL, D/A 1006, or equal. Size to fit vertical brick joints.
PART 3 EXECUTION

3.01 MIXING MORTAR AND GROUT

A. Conform to ASTM C270 for mortar and ASTM C476 for grout, except as otherwise specified herein.

B. Accurately measure materials, using mechanical measuring device or other method that will consistently maintain specified proportions by volume.

C. Mix mortar and grout with a maximum amount of water consistent with satisfactory workability.

D. Mix in drum-type mixer for at least 3 minutes and not more than 5 minutes. Mortar or grout that has stiffened due to evaporation of water shall be retempered by adding water as frequently as needed to restore required consistency and shall be used and placed in final position within 2-1/2 hours after initial mixing. Empty drum completely before starting new batch.

3.02 REINFORCEMENT AND ANCHORAGES

A. See Drawings for joint reinforcement spacing.

B. Place joint reinforcement continuous in first and second joint below top of walls.

C. Lap joint reinforcement ends minimum 6”.

D. Place reinforcing bars supported and secured against displacement using rebar positioners. Positioners shall be located at top of first course and top of each grout lift course, and at intervals not exceeding 200 bar diameters. Maintain position within 1/2” of true dimension.

E. Veneer anchors: Fasten veneer anchor ties at maximum 16” oc vertically and 24” oc horizontally. Place at maximum 8” oc each way around perimeter of openings.

F. Reinforce joint corners and intersections with prefabricated corner and "T" intersection joint reinforcing.

3.03 MASONRY FLASHINGS

A. Through-wall flashing: Install stainless steel drip flashing 2” wide with 1/2” drip set at 45° angle. Set in place and then lap self-adhesive wall flashing over drip flashing.

B. Extend wall flashings through veneer, turn up minimum 8” and bed into mortar joints of masonry back-up.

C. Extend wall flashings up one masonry course to form flashing dam at end of wall flashings. Seal all penetrations through flashings watertight.

D. Follow manufacturer's installation recommendations.

E. Lap end joints minimum 6” and seal watertight.

F. Use adhesive recommended by flashing manufacturer.

G. Calk underside of drip flashing.

3.04 WEEP HOLES

A. Install in vertical brick joints at 24” oc maximum above through-wall flashings.
3.05 LINTELS AND BOND BEAMS

A. Construct masonry lintels and bond beams in accordance with details shown on Drawings. Maintain minimum 8" bearing on each side of opening.

B. Bond beams shall be continuous except where shown on Drawings.

C. Bond beams shall be single course (8"), solid grouted.

D. Use reinforcing bars of one-piece lengths only.

E. Place and consolidate grout fill without disturbing reinforcing.

F. Allow lintels to reach 2,000 psi compressive strength before removing temporary supports.

G. At bearing points, fill wall masonry cores with grout minimum 12" from opening.

3.06 FIELD TESTING - MORTAR AND GROUT

A. During construction, perform 1 test of mortar for each wall. Test in accordance with ASTM C780.

B. During construction, perform 1 test of grout for each wall. Test in accordance with ASTM C1019.

END OF SECTION

1) J. L. Varone
2) S. C. Smith
PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete masonry units.

B. Brick units.

C. Mortar, grout, and masonry accessories.

1.02 RELATED REQUIREMENTS

A. Section 04050 - Common Work Results for Masonry.

1.03 INFORMATIONAL SUBMITTALS

A. Quality assurance data:
   1. Certificates of compliance for masonry units.
   2. Field tests as specified.
   3. Test reports for face brick units indicating compliance with ASTM standards, type, grade, and physical requirements. Samples submitted shall be accompanied with current test data verifying that sample will meet 24-hour cold water absorption test of below 6%.

1.04 ACTION SUBMITTALS

A. Samples:
   1. Four samples of face brick. Submit samples to mockup size as indicated in article "Mockup" to clearly illustrate texture and color range.

1.05 QUALITY ASSURANCE

A. Masonry construction and materials shall conform to all requirements of “Specifications for Masonry Structures (ACI 530.1/ASCE 6/TMS 602),” published by the American Concrete Institute, except as modified by the requirements of these contract documents.

B. Testing laboratories:
   1. Owner will retain services of qualified independent testing laboratory. Responsibilities of testing laboratory will include:
      a. Perform inspections and laboratory and field testing specified.
      b. Special Inspection in accordance with IBC 1704.5.
      c. Provide reports to Owner giving information on inspections, materials, testing performed and test results.
      d. Reports shall indicate whether materials meet specifications.

1.06 MOCK-UPS

A. Construct face brick mockup to 4’ x 4’ panel size, demonstrating color range, texture, coursing, and mortar specified.

B. Obtain Owner’s approval of mockup prior to proceeding with Work.

C. Provide separate mockup panel for each type of face brick.

D. Remove panel when directed by Owner.
E. Construct mockup panels complying with article "Environmental Requirements."

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units in dry location on plank platforms of adequate size. Platform must prevent absorption of moisture from ground.

B. Completely cover masonry units with waterproof tarpaulins, polyethylene sheet, or other waterproof material. Loose plank covering not allowed. Units shall be in air-dry condition before placement.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Cold weather requirements: IMIAC Recommended Practices and Specifications for Cold Weather Masonry Construction. In addition, the following shall apply:
   1. Temperature of masonry units shall be not less than 20°F when laid in masonry. Remove visible ice on masonry units before unit is laid in masonry.
   2. Heat mortar sand or mixing water in accordance with Section 04 05 00.
   3. Install wind breaks when wind velocity is in excess of 15 mph.
   4. Where mean daily temperatures are between 40°F and 32°F, protect completed masonry from rain or snow by covering with weather resistive membrane for 24 hours after construction.
   5. Where mean daily temperatures are between 32°F and 25°F, completely cover completed masonry from rain or snow by covering with weather resistive membrane for 24 hours after construction.
   6. Where mean daily temperatures are between 25°F and 20°F, maintain masonry temperature above 32°F for 24 hours after construction by enclosure with supplementary heat, by electric heating blankets, by infrared heat lamps, or by other acceptable methods.
   7. Where ambient temperatures are below 20°F, provide an enclosure for masonry under construction and use heat sources to maintain temperatures above 32°F within enclosure.

B. Protect masonry work prior to, during, and 48 hours after completion.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Hollow units: 2-cell per unit. Provide all units by same manufacturer.
   1. Load-bearing and exterior non load-bearing units: ASTM C90.
   3. Nominal face measurements 8” x 16” with depth as shown on Drawings.
   4. Minimum strength as specified.
   5. Use normal weight units

B. Provide special units for 90° corners, bond beams, and lintels.

C. Minimum compressive strength (average of 3 units): 1,900 psi based on net area when tested according to ASTM C140.

2.02 BRICK

A. Face brick:
   1. Hard-burned face brick as selected by Owner.
   2. Modular dimension, 8” x 2-2/3” x 4”.
   3. ASTM C216: Type FBS; Grade SW.
   4. Brick shall be from same source, manufactured at same time, and match in range, color, and texture.
   5. Color and texture: Selection will be made by Owner after award of contract.
2.03 STONE

A. Type: Cut Indiana limestone.
B. Color: Buff.
C. Grade: Standard.
D. Finishes: Smooth.
E. Accurately cut stone to shape and dimension, including requirements necessary for proper installation and anchorage. Butt joints at corners.
F. Anchors, dowels, and other fastenings: Stainless steel Type 302 or 304 and as noted on Drawings.
G. Use: Cap at top of masonry wall.

2.04 MORTARS, GROUTS, ACCESSORIES

A. Portland Cement:
   1. Fly Ash:
      a. Comply with ASTM C593.
   2. Slag:
      a. Comply with ASTM C989; Grade 80.

PART 3 EXECUTION

3.01 PREPARATION

A. Concrete masonry units: Do not wet down units prior to laying. Units shall be dry when laid.
B. Brick: One day before laying, wet down all brick until water runs freely from pile. In extremely warm weather, additional wetting down may be required a few hours prior to laying. Brick shall be dry to touch at time of laying.
C. Verify that all reinforcing, anchors, dowels, lintels, flashings, and other built-in items are on hand, of proper size, and locations established.
D. Verify embedded items and inserts are properly sized and located.
E. Provide temporary bracing during erection of masonry work. Maintain in place until structure is self-supporting.

3.02 COURSING

A. Place masonry to lines and levels indicated.
B. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.
C. Lay concrete masonry units in one-half running bond. Course one block unit and mortar joint to equal 8". Form concave mortar joints.
D. Lay brick in one-half running bond. Course 3 brick units and mortar joints to equal 8". Form concave mortar joints.
3.03 PLACING AND BONDING

A. Lay masonry in full bed of mortar with vertical joints slushed full and properly jointed with other Work. Buttering corners of joints, and deep or excessive furrowing of mortar joints not permitted.

B. Fully bond intersections, and external and internal corners.

C. Do not shift or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.

D. Remove excess mortar.

E. Perform job site cutting with proper tools to provide straight unchipped edges. Do not break masonry unit corners or edges.

3.04 TOLERANCES

A. Variation from unit to adjacent unit: 1/16" maximum.

B. Variation from plane of wall: 1/4" in 10' and 1/2" in 20' or more.

C. Variation from plumb: 1/2" maximum.

D. Variation from level coursing: 1/8" in 3'; 1/4" in 10'; 1/2" maximum.

E. Variation of joint thickness: 1/8" in 3'.

F. Maximum variation from cross sectional thickness of walls: 1/4".

3.05 BUILT-IN WORK

A. As Work progresses, install metal door frames, and other built-in items into Work.

B. Install built-in items plumb and level.

C. Bed anchors of metal door frames in mortar joints. Fill frame voids solid with mortar. Fill masonry cores with mortar minimum 12" from framed openings.

3.06 CUTTING AND FITTING

A. Cut and fit masonry as necessary to accommodate installation of electrical outlets, conduits, plumbing pipes, built-in anchors, lintels, etc., and other work for all trades as required. Coordinate with other Work to provide correct size, shape, and location.

B. Properly seal all openings required by other trades after their installation by means of foamed-in insulation.

C. Notify Engineer prior to cutting or fitting any area not indicated or where appearance or strength of masonry work may be impaired.

3.07 FIELD QUALITY CONTROL

A. During construction, perform 1 prism test for each wall. Test in accordance with ASTM C1314. Net area compressive strength of masonry prism shall be 1,500 psi.
3.08 CLEANING

A. Remove excess mortar and smears.

B. Replace defective mortar. Match adjacent work.

C. Clean exposed surfaces with cleaning solution not harmful to masonry or adjacent materials. Consult masonry manufacturer for acceptable cleaners.

D. Use nonmetallic tools in cleaning operations.

E. Waste management:
   1. Mixing equipment: Minimize water used to wash equipment.
   2. Broken, waste masonry units: Remove from site and dispose of as directed by Owner.
   3. Cured, crushed waste mortar: Remove from site and dispose of as directed by Owner.

3.09 PROTECTION

A. Protect finished installation.

B. Maintain protective boards at exposed external corners that may be damaged by construction activities. Provide such protection without damaging completed work.

C. Keep expansion and expansion-contraction joint voids clear of mortar.

D. Provide temporary bracing during erection of concrete block work. Maintain in place until structure is self-supporting.

E. Heat materials and provide temporary protection of completed portions of masonry work. Comply with governing codes and with "Construction and Protection Recommendations for Cold Weather Masonry Construction" of Technical Notes on Brick and Tile Construction by Brick Industry Association (BIA). Extend covering at least 2' down both sides of walls and hold securely in place.

F. Prevent mortar or soil from staining face of masonry to be left exposed or painted. Remove immediately mortar in contact with such masonry. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.

G. Protect sills, ledges, and projections from droppings of mortar.

H. At end of each day's work, cover tops of walls with building paper or by other means to protect wall from becoming excessively wet.

I. Treat exterior concrete masonry units as specified in Section 07180 - Water Repellents.
PART 1  GENERAL

1.01  SECTION INCLUDES

   A.  Ladders.
   B.  Checkered plate.
   C.  Shop painting.

1.02  ACTION SUBMITTALS

   A.  Shop Drawings for miscellaneous steel.

1.03  QUALITY ASSURANCE

   A.  Perform welding in accordance with AWS D1.1 “Structural Welding Code”.

PART 2  PRODUCTS

2.01  MATERIALS

   A.  Secondary steel plates and shapes:  ASTM A36/A36M.  Weld in conformance to requirements of AWS D1.1.
   B.  Galvanizing:  ASTM A123/A123M.

2.02  STEEL LADDERS

   A.  Conform to details shown on Drawings.
   B.  Material:  Galvanized steel.
   C.  Rung type:  Steel, 4-row, 13-gage tread-grip (with end notching for fit-up with ladders utilizing pipe rail) by Morton Manufacturing Co., or equal.

2.03  STEEL CHECKERED PLATE

   A.  Material:  ASTM A786/A786M, Fig. 3, Patterns 3, 4, or 5, 1/4” thick, galvanized.

2.04  FACTORY FINISHING

   A.  Surface preparation:  Remove oil, grease, dirt, rust, loose mill scale, and other foreign elements by "Power Tool Cleaning" in accordance with SSPC-SP3.
   B.  Shop primer:  Apply one coat of “90-97 Tnemec-Zinc,” by Tnemec Co., Inc. or equal; apply in accordance with manufacturer's directions including recommended coverage.
   C.  Omit shop prime coat from surfaces subject to field welding or to be embedded in concrete.
   D.  Omit shop prime coat from galvanized surfaces, stainless steel, and aluminum.
   E.  Leave unpainted steel clean and free from rust.
PART 3   EXECUTION

3.01   ERECTION
   A. Anchor ladders, and miscellaneous items securely to structural steel framing, concrete or masonry.
   B. Install expansion anchors in accordance with manufacturer's recommendations.

3.02   ANCHOR RODS AND MASONRY ANCHORS
   A. Install in strict accordance with manufacturer's directions.
   B. Perform work using manufacturer's standard equipment including adhesive cartridges, dispensing guns, mixer tubes and extensions, brush, and air nozzle for compressed air cleaning of holes. Contractor shall possess equipment at site prior to start of installation and workers shall demonstrate knowledge of procedure for installing anchors prior to installation.
   C. Where holes are within 6" of edge of concrete, core drill holes.
   D. Inspect existing concrete at anchor rod locations for soundness. Report to Engineer evidence of deteriorated or weak concrete detected from drilling operation or from inspection.

3.03   ANCHOR BOLTS
   A. Install embedded anchor bolts as shown on Drawings.
   B. Coat threaded portion of anchor bolts with oil or grease and wrap with protective tape at time bolts are positioned for new construction. Tape shall remain in place until bolts are secured.

3.04   FIELD PAINTING
   A. Apply one field coat of primer to cleaned surfaces of bolts, new welds and abrasions to shop coat after erection.
   B. Do not paint aluminum, stainless steel, or galvanized steel work.

END OF SECTION

1) J. L. Varone
2) S. C. Smith
PART 1  GENERAL

1.01  SECTION INCLUDES

A. Fluid-applied membrane waterproofing.
B. Flashing.
C. Protection board.

1.02  RELATED SECTIONS

A. Section 02315 - Excavating, Backfilling, and Compacting for Structures.

1.03  DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Site in manufacturer's original, sealed containers bearing original labels.
B. Store materials as recommended by manufacturer in enclosed area free from contact with soil and weather. Maintain materials at not less than 50 °F (10 °C) for at least 24 hours before use.
C. Handle materials in a manner to prevent damage. Remove damaged materials from Site and replace with new specified materials.

1.04  SUBMITTALS

A. Product Data: Submit manufacturer's Product Data, installation instructions, use limitations and recommendations. Include certification of data indicating Volatile Organic Compound (VOC) content of components of waterproofing system.

1.05  QUALITY ASSURANCE

A. Installer:
   1. Firm which has at least 5 years of experience in work and materials of type required by this Section.
   2. Submit letter from manufacturer stating that the applicator is certified to apply the system specified in this section.
   3. Provide certification letter on manufacturer's letterhead and signed by an officer of the company.
B. Materials: For each type of material required for work of this Section, provide primary materials which are products of one manufacturer.
C. Manufacturer's representative: Make arrangements necessary to have trained employee of manufacturer on Site periodically during membrane waterproofing work to review installation procedures.

1.06  ENVIRONMENTAL REQUIREMENTS

A. Apply waterproofing system in fair weather when air and surface temperatures are within manufacturer's recommended range.
B. Surfaces to receive membrane shall be clean, free of water, dew, frost, snow, and ice.
C. Do not allow waste products (petroleum, grease, solvents, etc.) to come in contact with membrane. Any exposure to foreign materials or chemical discharges must be presented to membrane manufacturer for evaluation to determine any impact on membrane assembly performance.
1.07 WARRANTY

A. Upon completion of work, CONTRACTOR shall supply OWNER with single source manufacturer's written five (5) year warranty for complete system including, but not limited to, material, water tightness, and installation.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Membrane Waterproofing: "Hydrotech MM6125" by American Hydrotech Inc., or OWNER approved substitute.

B. Protection Board:
   1. "Permaboard" by American Hydrotech, Inc.
   2. "Sealtight Protection Course" by W. R. Meadows, Inc.
   3. "Protection Board-V" by Carlisle Coatings and Waterproofing.
   5. Or equal.

2.02 MATERIALS

A. Membrane: Single component, fluid applied, polymer-enhanced, asphalt-emulsion membrane.

B. Surface conditioner: Membrane manufacturer’s standard suitable for concrete surfaces.

C. Protection board:
   1. Asphalt board type, minimum thickness 120 mils (1/4").
   3. Minimum burst strength: 175 psi per ASTM D2529.

D. Flashing/Reinforcing:
   1. 60 mil thick, red lead curative, uncured neoprene flashing/reinforcing sheet.
   3. Approved membrane manufacturer’s standard.

E. Adhesives/Sealant: Membrane manufacturer’s standard.

F. Miscellaneous materials: Primer, mastic, liquid membrane, tape and accessories specified or acceptable to manufacturer of membrane waterproofing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Installer shall examine conditions of substrates and other conditions under which Work shall be performed and notify CONTRACTOR, in writing, of circumstances detrimental to proper completion of Work. Do not proceed with Work until unsatisfactory conditions are corrected.

3.02 PREPARATION OF SUBSTRATES

A. Refer to manufacturer's literature for requirements for preparation of substrates.

B. Surfaces shall be structurally sound and free of voids, spalled areas, loose aggregate, and sharp protrusions.

C. Remove contaminates such as grease, oil, and wax from exposed surfaces.
D. Use compressed air to remove dust, dirt, loose stone, and debris.

E. Use repair materials and methods which are acceptable to manufacturer of sheet membrane waterproofing.

F. Cast-in-place concentrate substrates:
   1. Do not proceed with installation until concrete has properly cured and dried in accordance with membrane manufacturer’s requirements.
   2. Fill form tie rod holes with grout and finish flush with surrounding surface.
   3. Repair bug holes over 1/2" in length and 1/4" deep and finish flush with surrounding surface.
   4. Remove scaling to sound, unaffected concrete and repair exposed area.
   5. Grind irregular construction joints to suitable flush surface.

G. Related materials: Treat joints and install flashing as recommended by waterproofing manufacturer.

3.03 INSTALLATION

A. System shall be installed in strict accordance with manufacturer’s printed instructions

B. Refer to manufacturer’s recommendations on installation, including but not limited to the following:
   1. Apply primer at rate recommended by manufacturer. Recoat areas not waterproofed if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect surfaced from excessive application of primer.
   2. Delay application of membrane until primer is completely dry. Dry time will vary with weather conditions.

C. Membrane Waterproofing:
   1. Minimum asphalt membrane dry (cured) thickness: 180 mil.
   2. Apply to below grade surface of concrete walls, down each side to the bottom of walls and to outside edge of base slab as shown on Drawings.

D. Protection board:
   1. Verify compatibility with membrane waterproofing.
   2. Install on horizontal and vertical surfaces to completely cover top slabs and sides of tunnels.
   3. Lay out and position protection board to lay flat on horizontal surfaces.
   5. Extend down to bottom of walls.
   6. Protect from damage during backfilling operations.

3.04 CLEANING AND PROTECTION

A. Remove any masking materials after installation. Clean any stains on materials to be exposed in completed work.

B. Protect completed membrane waterproofing from subsequent construction activities as recommended by manufacturer.

END OF SECTION

1) J. L. Varone
2) S. C. Smith
PART 1 - GENERAL

1.1 SUMMARY:

A. Section Includes:

1. Water repellents for the following:
   a. Exterior brick.
   b. Unpainted exterior concrete masonry unit surfaces.
   c. Exterior architectural precast concrete surfaces.

B. Related Sections:

1. Section 03300 - Cast-in-Place Concrete.
2. Section 03450 - Architectural Precast Concrete.
3. Section 04200 - Unit Masonry.
4. Section 09900 - Painting.

1.2 QUALITY ASSURANCE:

A. Qualifications:

1. Installer shall be a water-repellent coating firm specializing in special coatings, experienced in the application of the types of water repellents required with not less than 3 years of successful experience.

B. Manufacturer shall certify application procedures including:

1. Coverage rate.
2. Temperature and site conditions.
3. Conformance with manufacturer's recommendations.

C. Indicate laboratory test results for water repellents on substrate simulating Project conditions. Use same materials and methods of applications to be used on the Project.

D. Mock-Up: Apply water repellent to mock-up or other sample, partial coverage, before proceeding with installation. Obtain approval of final appearance. Mock-up will become the standard of quality for judging completed work.
1.3 WARRANTY:
   A. Provide manufacturer's 5 year written warranty covering material and application.

PART 2 - PRODUCTS

2.1 MATERIALS:
   A. Clear Sealer for Brick and Concrete:
      1. "Chemstop Regular Masonry Waterproofing" by Tamms Industries.
      2. "Clear Double 7" by Hydrozo, Inc.
      3. "Weather Seal 201-GP" by ProSoCo, Inc.
      4. Approved substitute.

   B. Clear Sealer for CMU:
      1. "Euco Weather-Guard" by The Euclid Chemical Company.
      2. "Weather Seal Siloxane" by ProSoCo, Inc.
      3. "Baracade SMS 250" by Tamms Industries.

PART 3 - EXECUTION

3.1 PREPARATION:
   A. Coordination with Sealants: Where feasible, delay application of water repellents until installation of sealants has been completed in joints adjoining surfaces to be coated with repellent.

3.2 INSTALLATION:
   A. Comply with the manufacturer's instructions.

   B. Consult manufacturer's technical representative for recommendations applicable to project conditions.

   C. Apply in two coats.

END OF SECTION 07180
PART 1  GENERAL

1.01  SECTION INCLUDES

A. Hollow metal doors and frames.
B. Frame anchors.

1.02  RELATED REQUIREMENTS

A. Section 04050 - Common Work Results for Masonry.
B. Section 08700 - Hardware.

1.03  ACTION SUBMITTALS

A. Shop Drawings indicating door and frame elevations and sections, materials, gages and finishes, fabrication and erection details, locations of finish hardware by dimension and locations/details of openings and louvers.

1.04  QUALITY ASSURANCE

A. Qualifications: Hollow metal distributor shall be qualified by manufacturer of products to be furnished, and have in their regular employment, a knowledgeable person who will be available at reasonable times to consult with Engineer, Contractor, and Owner regarding matters affecting door and frame openings.

1.05  DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard wrapped, crated, palletized or otherwise protected during transit and site storage.
B. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinshed items are equal to new work and accepted by Engineer; otherwise, remove and replace damaged items.
C. Store doors and frames at site in dry secure place.
   1. Place units on minimum 4" high wood blocking.
   2. Avoid use of nonvented plastic or canvas shelters that could create humidity chamber.
   3. If cardboard wrapper on door becomes wet, remove carton immediately.
   4. Provide 1/4" spaces between stacked doors to promote air circulation.

PART 2  PRODUCTS

2.01  MANUFACTURERS

A. Ceco Door Products.
B. Curries Co.
C. Republic Doors and Frames.
D. Steelcraft.
2.02 HOLLOW METAL DOORS

A. Doors, full flush:
   1. Face sheet: Flush; smooth, weatherproof, cold-rolled stretcher leveled steel.
   2. Face sheet thickness:
      a. Exterior doors: 14-gage. (2.0 mm).
   3. Top and bottom edge: Flush; continuous steel closure channel, 16-gage minimum, welded to each face.
   4. Hardware reinforcement: Manufacturer's standard for hardware specified for each door.
   5. Lock and hinge rail edge: Seamless, welded, filled, and ground smooth full height; 14-gage minimum standard rails full height.
   7. Cores:
      a. Exterior doors: Solid slab of polystyrene foam permanently bonded to each face skin.
      b. Provide steel-reinforced core as required for application.
   8. Door thickness: 1-3/4".
   9. Size: As shown on Drawings.
  10. Number of hinges:
      a. Minimum 3 hinges per door leaf for doors 84" or less in height.
      b. One additional hinge for each 24" of additional height beyond 84".

2.03 DOOR FABRICATION

A. Fabricate all doors in accordance with ANSI/SDI A250.8, except where more stringent requirements are specified.


C. Reinforce and prepare doors to receive hardware.

D. Fill surface depressions with metallic paste filler and grind smooth uniform finish.

E. Touch up areas where galvanized coating has been removed due to sanding or handling.

F. Chemically treat surfaces and apply manufacturer's standard, baked-on prime coat.

2.04 HOLLOW METAL FRAMES

A. Type: Welded frames.

B. Door bumpers: Manufacturer's standard resilient type; removable for replacement.

C. Frame profile and jamb depth: As indicated on Drawings.

2.05 FRAME FABRICATION

A. Fabricate frames from minimum 14-gage steel.

B. Exterior frames: Hot-dipped galvanized, zinc-coated commercial quality carbon steel, ASTM A924 with ASTM A653, A60 zinc coating, mill phosphatized. Associated stops, anchors, clips, reinforcement, and trim shall also be galvanized.

C. Accurately form and cut mitered corners of welded type frames. Weld on inside surfaces. Grind welded joints to smooth uniform finish.
D. Accurately form interlocking joints of knocked down frames to maintain alignment of parts when field assembled.

E. Accurately cope and securely weld butt joints of mullions and transoms of glazed lights, and interior screens. Grind welded joints to smooth uniform finish.

F. Reinforce frames wider than 4' as required by the application.

G. Reinforce, provide cutouts, and prepare frames to receive hardware and electronic devices.

H. Place minimum of 2 single bumpers on double door frames. Place on frame heads.

I. Fill surface depressions of hollow metal frames with metallic paste filler and grind to smooth finish.

J. Provide removable mullions for double doors.

K. Provide removable head section and center astragal for double doors. Reinforce head sections where mullions occur.

L. Touch up areas where galvanized coating has been removed due to sanding or handling.

M. Chemically treat surfaces and apply manufacturer’s standard baked on prime coat.

N. Coat inside of exterior frames with corrosion-inhibiting bituminous material.

2.06 FRAME ANCHORS

A. Wall anchors for frame attachment to masonry construction:
   1. Anchors built into exterior or masonry: Galvanized.
   2. Masonry anchors: Adjustable, flat, corrugated or perforated “T” shaped anchors with leg not less than 2” wide by 10” long or masonry “wire” type not less than 3/16” diameter.

B. Provide frame jamb anchors; 1 each jamb per 30” of frame height or fraction thereof.

C. Floor anchors, angle clip type:
   1. 16-gage minimum.
   2. To receive 2 fasteners per jamb.
   3. Welded to bottom of each jamb.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install doors and frames in accordance with SDI 100, except as amended in this Section.

B. Jambs of frames set against masonry: Fill frames solid with grout.

END OF SECTION

1) J. L. Varone
2) S. C. Smith
SECTION 08710
FINISH HARDWARE

PART 1 - GENERAL

1.1 SUMMARY:

A. Section Includes:

1. Items known commercially as finish hardware or builders hardware, required for swing, sliding, or folding doors.

2. Types of finish hardware:
   a. Hinges
   b. Continuous Hinges (subject to approval by Access Services)
   c. Pivots
   d. Spring hinges
   e. Lock cylinders and keys
   f. Lock and latch sets
   g. Bolts
   h. Exit devices
   i. Push/Pull units
   j. Sliding door equipment
   k. Closers
   l. Overhead holders
   m. Miscellaneous door control devices
   n. Door trim units
   o. Protection plates
   p. Weatherstripping for exterior doors
   q. Sound stripping for interior doors
   r. Automatic drop seals (door bottoms)
   s. Astragals or meeting seals on pair of doors
   t. Thresholds
   u. Automatic door operators
   v. Electrically activated panic hardware

B. Related Sections:

1. Section 06200 - Finish Carpentry: Installation of finish hardware.
2. Section 08100 - Metal Doors and Frames.
3. Section 08210 - Wood Doors.
4. Section 08740 - Electro-Mechanical Hardware.
5. Hardware for Special Door Units: Refer to applicable special door sections.
6. Divisions 6 and 12: Casework hardware.

1.2 REFERENCES:

B. Fire-Rated Openings:
   1. National Fire Protection Association (NFPA) Standard No. 80. This requirement takes precedence over other requirements for such hardware.
   2. Underwriters Laboratory (UL).

C. Emergency Exit Devices:
   1. Fire-Rated Doors: Provide UL or WHI label on exit devices indicating "Fire Exit Hardware".

1.3 SUBMITTALS:
   A. Manufacturer's technical product data of each item of hardware.
   B. Hardware Schedule:
      1. Organize hardware schedule into "hardware sets" indicating complete designations of every item.
      2. Include specific hardware directions for every door opening.
   C. Templates:
      1. Hardware templates to fabricators of other work which is to receive finish hardware.

1.4 PRE AND POST INSTALLATION AND INSPECTION
   A. After installation of all door closers, locks, and exit devices, General Contractor to have Manufacturer's representative submit a written report to the Architect with copies to the General Contractor and hardware supplier upon completion of service. This report shall include any installation errors and specifying specific door number.

1.5 QUALITY ASSURANCE:
   A. Supplier Qualifications:
      1. Recognized builders hardware supplier, with warehousing facilities, who has been furnishing hardware in the Denver-Metro area for a period of not less than 3 years.
      2. Employs an experienced AHC certified hardware consultant, available for consultation during the course of the work.

1.6 WARRANTY:
   A. Mechanical failure on door closers for 10 years.
B. Blanket coverage on locksets for 5 years.

C. Failure on parts of all hardware except door closers for 2 years.

PART 2 - PRODUCTS

2.1 HINGES:

A. Manufacturers:

<table>
<thead>
<tr>
<th>Stanley</th>
<th>Hager</th>
<th>Ives</th>
</tr>
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<tbody>
<tr>
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<td>BB1279</td>
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<td>FBB199</td>
<td>BB1199</td>
<td>5BB1-HW (BRASS)</td>
</tr>
<tr>
<td>FBB168</td>
<td>BB1168</td>
<td>5BB1-HW (STEEL)</td>
</tr>
</tbody>
</table>

B. Five knuckle, button tip, full mortise template type with non-rising loose pins and ball or oilite bearings.

C. Exterior Doors: 4 ball bearing, non-ferrous .180 or .190 gage hinges with non-removal pin construction or non-rising loose pin with security set screw.

1. Doors to 36" Width: 4.5" x 4.5" hinges.
2. Doors over 36" Width: 5" x 5" hinges.

D. Interior Doors: Ball bearing type, wrought steel construction, with .134 or .145 gage.

1. Doors to 36" Width: 4.5" x 4.5" hinges.
2. Doors over 36" Width: 5" x 5" hinges.

E. Number of Hinges:

1. Minimum 3 hinges per door leaf for doors 84" or less in height.
2. One additional hinge for each 24" of additional height.
3. Or substitute Continuous Hinge (subject to approval by Access Services)

2.2 LOCKS:

A. Manufacturers:

1. Schlage L9000 Series (no substitutions) with the following characteristics:
   a. Non-handed case.
   b. Ability to reverse locking hub without opening case cover.
   c. Independent spindles.

2. Minor Rekeying at Remodel Work: Match existing key system.

B. Heavy-duty mortise type.

C. Supply all locks with construction cylinders to secure the building until replaced by Owner with "Medeco" cylinders at job completion. All locks must accommodate "Medeco" cylinders.

D. Lock Throw: 3/4" minimum throw of latch and 1" minimum throw of deadbolt.
E. Trim: Cast lever and cast escutcheon, Schlage Lock Co. #03L (no substitutions).

F. Finish:
   2. Remodel Projects: Match finish of existing hardware in adjacent areas.

2.3 DOOR CLOSERS:

A. Manufacturer:
   1. LCN (no substitutions).
   2. Closer Series is 4040XP on exterior doors only or as directed by Access Services for high usage doors. All other doors requiring closure use 4041
      a. Provide EDA arm (Extra Duty Arm) on parallel arm applications.
      b. Provide "CUSH" arm where required.
   3. Through bolted on all doors unless otherwise directed by Owner.
   5. Interior Doors: Delayed action and conform to UFAS requirements.

B. Size of Units:
   1. Adjust closers to comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather, wind conditions, and adjust for positive latching security doors.

2.4 EXIT DEVICES:

A. Manufacturer:
   1. Von Duprin, Inc. (no substitutions).
   2. Vertical rods shall be 9927 Less Bottom Rod for Wood Doors and 9947 Less Bottom Rod for Metal Doors requiring a fire rating with double door situation with no mullion. Exterior double doors with no mullion should receive maglocks as locking mechanism.
   3. Series shall be Von Duprin #99 (or #33 if necessary).

ARCHITECT TO SECURE PERMISSION FROM UNIVERSITY FOR ALTERNATE FINISH.
B. Exit Device Dogging: Except on fire-rated doors, wherever closers are provided on doors equipped with exit devices, equip the units with Allen key dogging device to hold the push bar down and the latch bolt in the open position.

C. Fire Rated Exit Devices: Provide with U.L. Label showing listing for "Fire Exit Hardware."

D. Through-bolt on all doors including center cases, end cases, rod guides and latches.

2.5 DOOR TRIM, STOPS, AND HOLDERS:

A. Manufacturers:

1. Ives
2. Hager
3. Trimco
4. Rockwood
5. Quality
6. Master Manufacturers, Inc.
7. Glynn-Johnson
8. Approved substitute.

B. Door Stops:

1. Locate in position to permit maximum door swing but not to present a hazard or obstruction.

C. Push/Pull Units and Kick Plates:

1. Manufacturer's standard exposed fasteners.
2. Through-bolted push/pull units for matched pairs, but not for single units.
3. Trim Plates: .050" in thickness.
4. Protection Plates (armor, kick, or mop): Minimum 2" less than door width on stop side and minimum 1/2" less than door width on pull side.
5. Wheelchair Entries: Kick plates shall be a minimum 12" high.

D. Thresholds:

1. Height and slope shall conform to ANSI A117.1 and UFAS requirements.
2. Equip all exterior openings with flat corrugated thresholds, with abrasive surfaces.
A. Overhead Holders:

Glynn Johnson 900 or 100 Series – No Substitutions

1. Use surface mounted devices unless otherwise approved by the Owner.

2. Through bolt mount on all doors unless otherwise approved by the Owner.

3. Do not use devices with "hold-open" feature, electromagnetic or otherwise, for doors which are to be used for “airlock” vestibules (typically at exterior doors), or stairwells that serve as vestibules.

B. Automatic Flush Bolts and Coordinators:

1. Do not use automatic flush bolts or coordinators unless otherwise approved by the Owner or required by Code.

2.6 DOOR STRIP UNITS:

A. Manufacturers:

1. Pemko.
2. Reese.
4. Master Manufacturers, Inc.
5. National Guard.
6. Approved substitute.

B. Continuous Weatherstripping:

1. At each edge of every exterior door leaf.
2. At each edge of computer room doors.

C. Smoke Seal Applications: As required to meet all applicable codes.

1. Provide National Guard No. 2525 or approved substitute.

B. Fasteners:

1. Unless otherwise noted, use manufacturer's standard exposed fasteners for door trim units (kick plates, edge trim, viewers, knockers, mail drops, and similar units).

NOTE: USE OF NATIONAL GUARD NO. 2525 SMOKE SEAL ELIMINATES THE NEED FOR AUTOMATIC FLUSH BOLTS AND DOOR COORDINATORS, AND IS THE PREFERRED DESIGN SOLUTION.
2. Noncorrosive fasteners as recommended by manufacturer for application indicated.

C. Weatherstrip and Smoke Seals:
   1. Silicone rubber seal; vinyl not acceptable.

2.7 FINISHES:
   A. Match the finish of the locksets.
   B. Closers: Finish to match door hardware (powder coated)
   C. Thresholds and Weatherstrip Housing: Aluminum with natural aluminum finish.
   D. Coordinate all the various manufactured items furnished on this work to ensure an acceptable uniform finish.

2.8 KEYING:
   A. Final cylinders and keying shall be "Medeco" purchased by the Owner and installed by the Contractor.

2.9 AUTOMATIC DOOR OPERATORS:
   A. Manufacturer:
      1. LCN-Pneumatic only (no substitutions). Power keyed cutoff switch (contact Access Services for type). Reference UCB Standards 08740, Part 2.1, B. 7981 ES or 7982ES
   B. Handicap Accessibility Features: Design system to allow handicap access after-hours when building is secured. Provide devices which may be left turned on after-hours without causing damage or undue wear to the device or any other associated hardware. Use ES relay if integrated into electronic hardware.
   C. Rod and Arm Assembly Shoes: Through bolt on all doors.
   D. Wall Plate Actuators: 8310-856 Hardwired or 8310-844 & 8310-865
   E. Card Reader Integration or Exterior Disable: Contact Access Services

2.10 ELECTRICALLY ACTIVATED PANIC HARDWARE:
   A. Manufacturer:
      1. Von Duprin RX-EL99 or RX-EL33 with PS873x2 BB and EPT-10 (no substitution except at certain historical locations).

PART 3 - EXECUTION
   Not Used

END OF SECTION 08710
PART 1 GENERAL

1.01 SECTION INCLUDES

A. General electrical requirements for equipment and services including, but not limited to:
   1. Factory wiring.
   2. Low voltage field wiring.
   3. Low voltage splices and terminations.
   4. Low voltage cabinets and electrical enclosures.
   5. Equipment safety grounding.
   6. Low voltage fuses and fuse blocks.
   7. Electrical meters.
   8. Control relays and switches.
  10. Indicating lights.
  11. Alarm and trip contacts.
  12. Low voltage starters.
  13. Low voltage circuit breakers and disconnect switches.
  15. Power factor correction capacitors.
  16. Outlet, pull, and junction boxes.
  17. Plates and covers.
  18. Wiring devices,
  20. Panelboards.
  21. Welding.
  22. Shop finish.
  23. Rust-inhibiting compounds.
  25. Packaging, identification, and tagging.
  27. Trip setting coordination.
  28. Grounding and bonding.
  29. Fireproofing and fire ratings.
  30. Testing and demonstration.

1.02 INFORMATIONAL SUBMITTALS

A. Submit with Bid: Description of manufacturer’s standard factory test procedure for logic systems.

B. Product Data:
   1. List of proposed material identifying manufacturer, type and model number for equipment to be
      provided for complete job.
   2. Manufacturer’s catalog sheets marked to indicate specific type, model or catalog number of
      equipment to be provided.
   3. Equipment drawings, elementary diagrams, schematics, wiring, performance curves, instruction
      manuals, and all other documentation necessary for complete description of material being
      supplied and as required to support installation, commissioning and maintenance of equipment.
      Manufacturer’s standard connection diagram or schematic showing more than one scheme of
      connection will not be accepted.
   4. Manufacturer’s technical descriptions, product data sheets, and applicable manuals for use in
      protective device system coordination including:
      a. Fuse manufacturer, type, ratings, and protection curves.
      b. Circuit breaker manufacturer, type, trip setting ranges, and protection curves.
      c. Relay trip device ranges, curves, and setting manuals.
      d. Transformer damage curves.
      e. CT ratios and saturation curves.
f. VT ratings.
5. List of recommended spare parts required for equipment start-up, commissioning and operation.
6. List of special maintenance tools required for installation and operation of equipment.
7. If necessary, provide additional data to clearly demonstrate that proposed alternate equipment meets or exceeds equipment as specified.
8. When requested by Engineer, submit system information, including but not limited to, utility feeders, existing relays, circuit breakers, fuses, and transformers.

1.03 CLOSEOUT SUBMITTALS

A. Operation and maintenance manuals. Provide at minimum:
   1. Itemized equipment list.
   2. General description and technical data.
   3. Receiving, storage, installation, and testing instructions.
   4. Operating and maintenance procedures.
   5. Complete set of final drawings requiring no further action.
   6. Complete documentation of inspections and tests performed, including logs, curves, and certificates. Documentation shall note any replacement of equipment or components that failed during testing.
   7. Spare parts list.
   8. Lubrication recommendations.

1.04 MAINTENANCE MATERIALS

A. Extra materials: Provide touchup paint in same type and color to repair at least 25% of finish-painted equipment surface. Paint shall be sufficient to perform touch-up painting in accordance with shop-applied material instructions for repair painting.

B. Each piece of equipment shall be furnished with special tools as required for installation, maintenance, and dismantling of equipment.
   1. Furnish in quantities as necessary to complete work on schedule.
   2. Tools shall be new and shall become property of Owner.
   3. Tools and intended use shall be identified in assembly instructions. Tools shall only be used for their intended purpose.

1.05 QUALITY ASSURANCE

A. Manufacturer qualifications:
   1. Manufacturer of equipment specified shall be recognized in industry for normally supplying this type of equipment.
   2. Manufacturer shall be ISO certified.
   3. When requested by Engineer, provide list of similar equipment installations that have employed identical equipment from manufacturer.

B. Installer qualifications:
   1. Installer shall be skilled in trade and shall have thorough knowledge of products and equipment specified.
   2. Cutting, drilling, trenching, or channeling necessary to properly install equipment shall be performed by competent skilled crafts people in safe, professional manner.

C. Regulatory requirements: Perform electrical construction in accordance with NEC, local and state codes as applicable to job site.

D. Materials and equipment furnished for permanent installation shall be new, unused, and undamaged.

E. Asbestos not allowed.
F. Parts shall be manufactured to American industry standard sizes and gages to facilitate maintenance and interchangeability. Metric sized components not allowed unless specifically requested and approved.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Pack, ship, handle, and store in accordance with manufacturer’s requirements.

B. Ship equipment completely factory assembled unless physical size, arrangement, configuration, or shipping and handling limitations make this impracticable. Shipping splits and required field assembly shall be identified with equipment submittals.

C. Costs associated with sections, accessories, or appurtenances requiring field assembly shall be Contractor’s responsibility.

D. Separately packaged parts and accessories shall be consolidated and shipped together with equipment. Mark each container clearly to identify contents and as belonging with main equipment.
   1. Provide individual weatherproof itemized packing slips attached to outside of each container for contents included. Provide duplicate inside each container.
   2. Attach master packing list, covering accessory items for equipment, to main piece of equipment.
   3. Mark each container with project identification number for equipment and container number followed by total number of containers.

E. Equipment shall be suitably protected during shipment, handling, and storage. Damage incurred during shipment shall be repaired at not cost to Owner.

F. Protect coated surfaces against impact, abrasion, and discoloration.

G. Electrical equipment and insulation systems shall be protected against ingress of moisture. Use space heaters if necessary to protect against moisture.

H. Exposed threads shall be greased and protected.

I. Pipe, tube, and conduit connections shall be closed with rough usage plugs. Seal and tape open ends of piping, tubing, and conduit.

J. Equipment openings shall have covers, and taped to seal equipment.

K. Store materials in clean, dry place. Protect from weather, dirt, water, construction debris, and physical damage in accordance with manufacturer’s instructions.

1.07 SCHEDULING

A. Coordinate with Owner early and late shipping and delivery schedules for items requiring storage and handling at Site.

1.08 WARRANTY

A. Electrical equipment shall be provided with manufacturer’s standard warranty, but not less than 1 year.

PART 2 PRODUCTS

2.01 DESIGN CRITERIA

A. Service conditions: Provide equipment and material suitable for intended service and installation at location indicated.
B. Low-voltage auxiliary and control power.
   1. Electrical power for ac control and instrumentation equipment:
      a. Provide devices necessary for proper operation and protection of equipment during electrical
         power supply and ambient temperature fluctuations specified.
      b. Design for continuous operation at any voltage from 85% to 110% of nominal voltage.
         Dropout voltage shall be 60% of nominal for relays and 75% for contactors and starters.
   2. Electrical power for dc devices:
      a. Design for continuous operation on ungrounded station battery system, capable of
         maintaining operation at any voltage from 80% to 112% of nominal voltage.
      b. Electrical devices served shall not impose ground connection on supply.

C. Auxiliary power: Design auxiliary equipment for low voltage service, with electrical power designed to
   operate from one of nominal electrical power sources as follows and as indicated on Drawings:

<table>
<thead>
<tr>
<th>Volts</th>
<th>Phase</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>480Y/277</td>
<td>3 or 1</td>
<td>60</td>
</tr>
<tr>
<td>208Y/120</td>
<td>3 or 1</td>
<td>60</td>
</tr>
<tr>
<td>120/240</td>
<td>1</td>
<td>60</td>
</tr>
<tr>
<td>125</td>
<td>1</td>
<td>Dc</td>
</tr>
</tbody>
</table>

2.02 FACTORY WIRING

A. Select cable for electrical and environmental conditions of installation, and suitable for unusual service
   conditions where encountered.
   1. Proper temperature application cable shall be used throughout, but shall be not less than 90ºC
      rated.
   2. Conductors routed over hinges shall use extra-flexible stranding.
   3. Cable insulation shall be rated for maximum service voltage used, but not less than 600 volts.
   4. Splices not allowed.

B. Panel, control cabinet, switchboard, motor control center, and switchgear wiring shall use flame
   retardant cross-linked polyethylene (XLP) or flame retardant ethylene-propylene rubber (EPR)
   insulation that meet or exceed requirements of UL 44 for Types SIS, and XHHW.
   1. Minimum size: No. 14 AWG (1.5 mm²).
   2. Conductors: Annealed bare copper Class B stranding passing IEEE 1202 and UL VW-1 flame
      test.

C. Instrumentation, thermocouple, and thermocouple extension wire shall use twisted shielded
   pairs/triads having flame retardant cross-linked polyethylene (XLPE) insulation, and chlorinated
   polyethylene (CPE) jacket.
   1. Minimum size: No. 16 AWG (1.0 mm²).
   2. Conductor type:
   3. Provide each pair/triad with shield.
   4. Shielding shall consist of aluminum-polyester tape and flexible strand tin-coated No.18 AWG
      (0.75 mm²) copper drain wire.
   5. Drain wire for each instrument cable shall be insulated with spaghetti sleeve. One end of shield
      wire shall be terminated on grounded terminal.
   6. Cables shall pass IEEE 1202 and ICEA 70,000 Btu/Hr vertical tray flame test, and each conductor
      shall pass UL VW-1 flame test.

D. Terminations:
   1. Conductor terminal connectors shall be insulated, ring tongue, compression type connectors
      properly sized for conductor and terminal.
      a. Connectors shall be constructed of copper and shall be tin-plated.
b. Interior surface of connector wire barrel shall be serrated; exterior surface of connector wire barrel shall be furnished with crimp guides.

2. Noninsulated terminal connectors shall be used for conductors terminated on devices equipped with individual fitted covers, such as, but not limited to, control switches and lockout relays.

3. Connections requiring disconnect plug and receptacle type devices shall be provided with factory-terminated conductors on each plug and receptacle.
   a. Plugs and receptacles shall be factory wired into junction boxes containing terminal blocks for external connections.
   b. Conductors on disconnect portion of plug-receptacle assemblies shall be in common jacket.

4. Prior to shipment of equipment, remove temporary wiring installed in factory for equipment testing.

5. Current transformers shall terminate on shorting type terminal blocks. Ship with shorting jumpers installed.

E. Identification and labeling:
   1. Provide conductor identification sleeve on each end of each internal conductor. Mark each sleeve with opposite end destination identification with nonsmudging, permanent black ink. Sleeves shall be UV-resistant self-adhesive type or PVC, not less than 1/2” long.
   2. Permanently label each terminal block, terminal, conductor, relay, breaker, fuse block, and other auxiliary devices to coincide with identification indicated on manufacturer’s drawings.

2.03 FIELD WIRING

A. Nationally or internationally recognized cable manufacturer shall produce cable provided.
   1. Metal-clad cable, NEC Type MC, may not be substituted in place of cable and conduit unless specified otherwise, or unless approved in writing.
   2. Comply with code and Project requirements directly associated with use of each cable type.

B. Cables specified are for voltages 600 volts and below.

C. Wiring shall be bare copper with not less then 98% conductivity, unless specified otherwise.

D. General-purpose building conductor used on interior lighting circuits and general-purpose branch circuits routed entirely in conduit shall be single conductor.
   1. Voltage rating: 600-volt.
   2. Conductor: Class B, solid or stranded, annealed, uncoated copper, minimum size No. 12 AWG (4.0mm²).
   3. Insulation: PVC complying with physical and electrical requirements of UL for type THHN/THWN.
   4. Jacket: Overall clear nylon jacket applied over conductor insulation, UL-listed as gasoline and oil resistant.
   5. Provide conductor sizes No. 8 AWG and smaller in colors to match wire color-codes. Sizes No. 6 AWG and larger shall be color-coded with field-applied tape.
   6. Rated continuous operating temperature shall be 90ºC in wet and dry locations for operation at maximum 75ºC.

E. Single-conductor, low-voltage power cable for motors, feeders, branch circuits, and dc circuits routed in conduit, duct bank, or cable tray:
   1. Voltage rating: 600-volt.
   2. Conductor: Annealed, bare copper, Class B, stranded, minimum size No. 12 AWG (4.0mm²).
   3. Insulation: Ethylene propylene rubber (EPR), complying with physical and electrical requirements for NEC Type RHH or RHW-2.
   4. Jacket: Flame-retardant, heat, moisture, and sunlight resistant; cross-linked low-smoke, nonhalogen polyolefin (XLPO).
   5. Conductor sizes No. 8 AWG and smaller shall be provided in colors to match wire color-codes. Sizes No. 6 AWG and larger may be color-coded with field applied tape.
   6. Wire shall be identified by surface marking indicating manufacturer, conductor size, conductor material, voltage rating, UL symbol, and listed type.
   7. Cables smaller than No. 1/0 AWG (50 mm²) shall be routed entirely in conduit and duct bank in. Sizes No. 1/0 AWG (50 mm²) and larger may be routed in cable tray, if so rated.
8. Conductors shall pass IEEE 1202 70,000 Btu/hr, and ICEA T-29-520, 210,000 Btu/hr vertical tray flame tests, and UL VW-1 vertical flame test.
9. Temperature rating shall be 90°F for normal operation in wet or dry locations.

F. Multiconductor, low-voltage power cables for motors, feeders, and branch circuits routed in cable tray, conduit or duct bank:
1. Voltage rating: 600-volt.
2. Conductors: Annealed, bare copper, Class B, stranded, minimum size No. 12 AWG (4.0mm²).
3. Insulation: Flame-retardant, cross-linked polyethylene (XLPE) or cross-linked polyolefin (XLPO), complying with physical and electrical requirements for NEC Type XHHW-2.
4. Jacket: Flame-retardant, heat, moisture, and sunlight-resistant; cross-linked, low-smoke, nonhalogen polyolefin (XLPO).
5. Phase conductors shall be cabled together with Class B stranded, uncoated copper grounding conductor and fillers. Ground wire size shall comply with requirements of UL 1277.
6. Cover cable assembly with helically applied polyester binder tape with minimum 10% overlap.
7. Marking: Insulated phase conductors shall be black and shall have printed numbers in accordance with ICEA Method 4. Each cable shall be identified by means of surface ink printing indicating manufacturer, number of conductors, size, metal, voltage rating, and UL listing as suitable for cable tray use.
8. Cables shall pass IEEE 1202 70,000 Btu/hr, and ICEA T-29-520, 210,000 Btu/hr vertical tray flame tests, and individual conductors UL VW-1 vertical flame test.
9. Conductors shall be temperature rated for 90°F maximum continuous operating temperature in wet or dry locations.

G. Multiconductor, low-voltage power cables for motors fed from adjustable speed drives, any installation:
1. Voltage rating: 600-volt.
2. Conductors: Annealed, bare copper, Class B, stranded, minimum size No. 10 AWG (4.0mm²).
3. Insulation: Flame-retardant, cross-linked polyethylene (XLPE) complying with physical and electrical requirements for NEC Type XHHW-2.
5. Armor/shield: Continuously welded and corrugated high conductivity aluminum.
6. Ground conductors: 3 segmented Class B strand, annealed copper conductors sized to meet requirements of UL 1569.
7. Marking: Insulated phase conductors shall be black and shall have printed numbers in accordance with ICEA Method 4. Each cable shall be identified by means of surface ink printing indicating manufacturer, number of conductors, size, metal, voltage rating, and UL listing.
8. Cables shall pass IEEE 1202 70,000 Btu/hr, and ICEA T-29-520, 210,000 Btu/hr vertical tray flame tests, and individual conductors UL-approved and marked with FT-4 designation.
9. Rated for Class 1, Div 1 hazardous locations.
10. Conductors shall be temperature rated for 90°C maximum continuous operating temperature in wet or dry locations.

H. Multiconductor cable for control, interlocks, current transformers (CTs), voltage transformers (VTs), meters, and relays routed in cable tray and conduit:
1. Voltage rating: 600-volt.
2. Sizes:
   a. Motor control, switchgear and breaker control, interlock control, metering, relaying, and general power control circuits shall be minimum size No. 14 AWG (1.5 mm²).
   b. CT and VT circuits shall be minimum No. 10 AWG (4.0 mm²).
4. Insulation: Flame-retardant, cross-linked polyethylene (XLPE) or cross-linked polyolefin (XLPO), complying with physical and electrical requirements for NEC Type XHHW-2.
5. Jacket: Flame-retardant, heat, moisture, and sunlight resistant; cross-linked, low-smoke, nonhalogen polyolefin (XLPO).
6. Conductors shall be cabled together with nonhygroscopic fillers.
7. Cover cable assembly with helically applied binding tape with minimum 10% overlap.
8. Marking:
a. Insulated conductors shall have colored insulation meeting ICEA Method 1, Table 2 color code to identify conductors.

b. Each cable shall be identified by means of surface ink printing indicating manufacturer, number of conductors, size, voltage rating, and UL listing as rated for cable tray.

9. Cables shall pass IEEE 1202 70,000 Btu/hr, and ICEA T-29-520, 210,000 Btu/hr vertical tray flame tests, and individual conductors UL VW-1 vertical flame test.

10. Temperature rating shall be 90°C maximum continuous operating temperature in wet or dry locations.

I. Instrumentation cable installed indoor or outdoor routed in cable tray, conduit, and ducts:

1. Voltage rating: 600-volt.
2. Conductors: Annealed, bare copper, Class B, stranded, minimum size No. 16 AWG (1.0 mm²).
3. Insulation: Flame-retardant, cross-linked polyethylene (XLPE) or cross-linked polyolefin (XLPO).
4. Jacket: Flame-retardant, heat, moisture, and sunlight-resistant; cross-linked, low-smoke, nonhalogen polyolefin (XLPO).
5. Pairs/triads: Each twisted with lay not exceeding 2” (50 mm).
7. Assembly:
   a. Each pair or triad shall be cabled together with aluminum/polyester tape shield helically wrapped with minimum lap of 15% of tape width and isolation tape. Entire cable assembly shall have overall aluminum/polyester tape shield helically wrapped.
   b. Flexible strand tin-coated No.18 AWG (0.75 mm²) copper drain wire shall be helically wound between twisted conductors and tape shield.
8. Each instrumentation cable shall be identified by means of surface ink printing indicating manufacturer, conductor size, and quantity, UL listing.
9. Cables shall pass IEEE 1202 70,000 Btu/hr, and ICEA T-29-520, 210,000 Btu/hr vertical tray flame tests, and individual conductors UL VW-1 vertical flame test.
10. Temperature rating shall be 90°C maximum continuous operating temperature in wet or dry locations.

J. Thermocouple extension cable circuited in cable tray or conduit:

1. Voltage rating: 600-volt.
2. Conductors: Minimum No. 16 AWG solid alloy (+Chromel / -Constantan) in accordance with ANSI and ASTM/ISA Type EX, KX or JX as indicated on Drawings.
3. Insulation: Flame-retardant, cross-linked polyethylene (XLPE) or cross-linked polyolefin (XLPO).
4. Jacket: Flame-retardant, heat, moisture, and sunlight-resistant; cross-linked, low-smoke, nonhalogen polyolefin (XLPO).
5. Color code: Yellow (+Chromel) and red (-Constantan), meeting requirements of UL, type “PLTC.”
6. Assemble insulated conductors with 1.5” to 2.5” twisted lay.
7. Assembly: Provide with helically applied, laminated aluminum/polyester tape shield, with minimum lap of 15% of tape width. Flexible strand tin-coated No.18 AWG (0.75 mm²) copper drain wire shall be helically wound between twisted conductors and tape shield.
8. Each thermocouple cable shall be identified by means of surface ink printing indicating manufacturer, conductor size, UL listing as “PLTC,” thermocouple type.
9. Cables shall pass IEEE 1202 70,000 Btu/hr, and ICEA T-29-520, 210,000 Btu/hr vertical tray flame tests, and individual conductors UL VW-1 vertical flame test.
10. Temperature rating shall be 90°C maximum continuous operating temperature in wet or dry locations.

K. Provide high-temperature wire around process equipment operating at temperatures exceeding standard cable ratings.

1. Voltage rating: 600-volt.
2. Temperature rating: Up to 1000°C.
5. Jacket: Overall metallic sheath.

L. Category 6 communication cable circuited in tray, conduit or used for field wiring internal to cabinets.
1. **Conductor:** Solid, bare copper minimum No. 23 AWG.
2. **Insulation:** Fluorinated ethylene propylene (FEP) insulated singles.
3. **Insulated conductors:** Unshielded, twisted 4 pairs enclosed with a spline fluorinated ethylene propylene filler material.
4. **Cable assembly** shall be covered with clear “Flamearrest” jacket, sequentially marked at 2’ (600 mm) intervals. Ripcord shall be integrally installed to allow easy removal of jacket material.
5. Each communication cable shall be identified by means of surface ink printing indicating manufacturer, model, or catalog number. Cable shall meet TIA/EIA Draft 9A CAT6.
6. **Cables** shall be capable of passing UL flame test Type CMP.
7. **Manufacturer:** Belden “DataTwist” 7852A.

M. **Twin-axial communication cable** installed indoors in cable tray and conduit:
1. **Voltage rating:** 600-volt.
2. **Conductor:** One pair, bare copper, No. 18 AWG with 7 x 26 stranding.
3. **Insulation:** Flame-retardant polyolefin.
4. **Assembly:** Aluminum foil-polyester tape shield with No. 20 AWG, 7 x 28 stranded tinned copper drain wire with 100% shield coverage, and tinned copper braid shield with minimum 55% coverage. Overall cable assembly shall be Type “PLTC.”
5. **Jacket:** Polyvinyl chloride (PVC).
6. **Cable** shall be UL-listed 1581 for flame resistance.
7. **Temperature rating** shall be 75°C in dry maximum operating temperatures in dry locations.
8. **Manufacturer:** Belden, “DataTray” 600-volt, industrial twin-axial cable, Catalog Number 3072F.

N. **Fiber communication cable:** Corning Cable Systems Type FREEDM. No substitutions. Order number: 012KWF-14150A20.

### 2.04 SPLICES AND TERMINATIONS

A. Splices, except as in lighting and general purpose power circuits specified below, not allowed unless specifically indicated on Drawings or required for connection to equipment.

B. **Temperature rating** of splices and terminations shall be rated no less than 75°C.

C. Splices allowed in lighting and general-purpose power circuits:
   1. Provide wire and cable connectors of high-conductivity, corrosion-resistant material with contact area equal to at least current carrying capacity of wire or cable.
   2. General lighting and general-purpose building power circuits:
      a. Twist-type, insulated spring connectors for splices on solid or stranded conductors smaller than No. 6 AWG.
      b. Use indent, hex screw, or bolt clamp-type connectors, with or without tongue for splices on solid or stranded conductors No. 6 AWG and larger.
      c. Apply insulating 600-volt tape.

D. Insulating tapes and compounds for terminations and splices shall be UL-listed for intended use, location, and voltage by manufacturer.

E. Termination of conductors to equipment with bolted connections:
   1. Use compression type lugs:
   2. Compression lugs for cables 250 kcmil and larger shall have at least 2 clamping elements of compression indents, and provision for at least 2 bolts for joining to apparatus terminals.
   3. Crimping hand tools used for securing conductors in compression type connectors or terminal lugs shall be made for purpose and conductor sizes involved.
   4. Crimping tools shall be ratchet-type preventing tool from opening until crimp action is completed.
   5. Tools shall be product approved by connector manufacturer.

F. **Terminals:**
   1. Conductors No. 10 AWG and smaller: Marathon 1500 Series.
2. Conductors larger than No. 4/0 AWG: Terminate to tinned copper bus bar drilled and tapped with standard NEMA sized and spaced holes.

G. Coordinate sizes and types of conductor terminals for 600-volt power cable terminations in equipment with furnished conductor and terminal connector data.

H. Provide 600-volt rated terminal blocks for instrumentation and control conductors for connection to circuits external to specified equipment, and for internal circuits crossing shipping splits.
   1. Use crimp-on terminals matching termination point terminations in manufacturer-furnished panels. Splices not allowed.
   2. Terminal blocks for thermocouple extension wire: Buchanan “Medium Duty” with thermocouple contacts or Marathon 200 Series with Omega Engineering, Inc. Type TL terminal lugs.
   3. Furnish with white marking strips.
   5. Fuses may be mounted on terminal blocks.
   6. Maximum 2 conductors in accordance with termination point.

I. Terminal blocks for external connections shall leave from centrally mounted location, not from individual devices in enclosure.
   1. Group-in instrument and control compartment for easy accessibility.
   2. Provide sufficient space on each side of each terminal block to allow orderly arrangement of leads to be terminated on block.
   3. Locate auxiliary equipment in compartments, enclosures, or junction boxes so service personnel will have direct access without interference from structural members and instruments without removal of barriers, cover plates, or wiring.
   4. Do not mount terminal blocks in compartments containing cables or buses operating at voltages above 600 volts.
   5. Size for wire sizes of incoming conductors as necessary.

J. Install shorting-type terminal blocks nearest current transformer in accessible location for each set of CTs supplied with equipment furnished, no other shorting-type terminal blocks allowed, unless specified otherwise.

K. Install din-rail mounted miniature circuit breakers (MCB) for protection of VT circuits on line and load side. Breakers shall have alarm contacts wired to terminal blocks.

L. Terminate each conductor in multiconductor control cable or as shown on Drawings. Provide 10% spare terminals for circuit modifications.

M. Each control switch and lockout relay shall have minimum of 4 spare normally open and 4 spare normally closed contacts wired out to terminal blocks.

N. Circuit identification number listed on either circuit schedule or panel schedule shall be used to identify circuit, positioned as near as possible to end of each conductor on multiple single wire circuits and on cable jacket for multiconductor cables.

O. Cable designations shall be visible after installation without requiring physical movement of cable.

2.05 ELECTRICAL ENCLOSURES

A. Size junction boxes, pull boxes, and enclosures in accordance with requirements of NEC.

B. Junction boxes and pull boxes 4” (100 mm) trade size or smaller in any dimension shall be galvanized malleable iron, or cast ferrous metal NEMA rated for installed location. Do not use concentric knockouts.
C. Junction boxes, pull boxes, and electrical enclosures larger than 4” (100 mm) trade size in any dimension shall be as follows, unless required otherwise.
   1. NEMA rating for electrical enclosures installed in nonhazardous locations:
      a. Indoor:
         1) Dry environmentally controlled area: NEMA 12.
         2) Noncorrosive wet or hose-down area: NEMA 4.
         3) Corrosive wet or hose-down area: NEMA 4X
      b. Outdoor:
         1) Corrosive area: NEMA 4X.
         2) Noncorrosive area hose-down or spray area: NEMA 4.
         3) Noncorrosive area nonhose-down area NEMA 3R.
   2. Construct noncast-metal electrical enclosures from reinforced steel plate capable of supporting devices mounted on or within enclosure without deflection. Steel plate thickness shall conform to UL requirements.
   3. Enclosures shall be of adequate strength to support mounted components during shipment and installation.
   4. Conduit entrances shall be field drilled.
   5. Electrical enclosures located in outdoor, wet, or hose down areas shall be provided with space heaters. Provide space heaters completely wired within enclosure. Provide following:
      a. Space heater.
      b. Adjustable thermostat with set point temperature indicator.
      c. One miniature circuit breaker protective device.
      d. Space heaters, thermostat, and protection shall not interfere with cable into or out of enclosure, or with maintenance or replacement of devices within enclosure.
      e. Use of space heaters shall not change or discolor any painted surface.
      f. Space heater capacity shall maintain enclosure internal temperature above dew point under specified service conditions.
      g. Space heaters shall be rated for 240 volts ac minimum, and shall be sized for operation on applied voltage of 120 volts ac.

D. Outdoor electrical enclosures with ventilating openings:
   1. Louver on outdoor electrical equipment and protect in accordance with NEMA type.
   2. Equip openings on outdoor electrical equipment with fine mesh filters and stainless steel bug screens.

2.06 OUTLET BOXES

A. Outlet boxes for concealed wiring systems shall be sheet metal, galvanized or cadmium plated.

B. Boxes shall be minimum 4” (100 mm) square, 1-1/2” (38 mm) deep, sized to accommodate devices and number of conductors in accordance with NEC. Equip with plaster ring or cover as necessary for flush finish.

C. Exposed conduit systems shall have surface-mounted boxes unless specified otherwise. Boxes for exposed wiring in nonhazardous, noncorrosive, and nonweatherproof locations shall be malleable iron, cadmium finish or cast aluminum alloy, minimum 4” (100 mm) square, 1-1/2” (38 mm) deep.

D. Enclosures shall be as required for areas in which they are installed and as specified.
   1. Boxes shall be installed flush in masonry construction and be designed for intended use.
   2. Recessed boxes where fixture will be mounted shall be minimum 4” (100 mm) and octagonal in shape or 4” (100 mm) square by 1-1/2” (38 mm) deep with round plaster ring. Where used as junction box, boxes shall be minimum 4” (100 mm) square by 2-1/8” (53 mm) deep.
   3. Outlet boxes for wall concealed telephone and signaling systems shall be 4” (100 mm) square by 1-1/2”(38 mm) deep, minimum. Furnish with plaster ring and cover plate.
   4. Floor boxes for floor outlets shall be cast-metal with threaded conduit entrances, brass flange ring and brass duplex flap cover plate. Boxes shall be watertight and have leveling and adjustment screws for adjusting cover plate to finished floor. Boxes shall be minimum 4” (100 mm) diameter and 3-1/2” (88 mm) deep with approved gasket or seal between adjusting ring and box.
5. Floor outlets for combination signaling, data, and power outlets shall be constructed of steel base, PVC housing, and steel bracket to allow feed through wiring as well as activation load-bearing support. Box construction shall meet UL 514A requirements.
   a. Entire housing shall be removable for unrestricted access.
   b. Once assembled, PVC housing shall be capable of carrying 6,000 lb (2722 kg) load.
   c. Coordinate outlet requirements with communication system requirements.
6. Floor boxes in 2-hour rated floors shall be secured in cored hole and shall be UL classified and listed for 2-hour rated floors.

2.07 PULL AND JUNCTION BOXES

A. Furnish junction boxes and pull boxes were shown on Drawings, and where necessary to facilitate pulling wires and cables without damage.

B. Above ground boxes shall be formed from sheet steel, with corners folded in and securely welded with inward flange on each of 4 edges.

C. Drill box for mounting and attachment of cover; galvanize after fabrication.

D. Cover shall be made of one-piece galvanized steel and provided with stainless steel round head machine screws.

E. Box and cover shall be made of code gage steel, or heavier if shown on Drawings.

F. Boxes shall be minimum 4-1/2" (113 mm) deep. Size shall be in accordance with NEC. Use next larger standard size when necessary in accordance with manufacturer standard sizes.

G. Pull and junction boxes shall be furnished without knockouts for field drilling.

H. Enclosures shall be as required for areas in which installed and in accordance with requirements specified.

I. Underground boxes shall be specifically designed and constructed for intended installed location, and shall be either pre-formed concrete or PVC. Covers shall be capable of withstanding, without failure, type of traffic in general area.

J. If pull and junction boxes are exposed in and around architecturally finished surfaces, paint box to match finish of nearby surfaces, unless indicated otherwise.

K. Bolt-on junction box covers 3'-0" (900 mm) square or larger, or heavier than 25 lb. (11 kg) shall have permanent rigid handles. Covers larger than 3'-0" x 4'-0" (900 mm x 1200 mm) shall be split.

2.08 EQUIPMENT SAFETY GROUNDING

A. Install exposed raceway electrically continuous. Conduit and tray shall not be considered to be only ground conductor.

B. Furnish equipment that is part of integral shipping unit or assembly with bare copper ground conductor extending to central ground connection lug. Lug shall be suitable for field connection to local ground. Electrical equipment shall be considered any device that is energized.

C. Single-point ground connections required for proper operation of electronic equipment shall be insulated from equipment safety ground. Such connections shall be extended, using insulated cable, to single insulated termination point suitable for field connection to appropriate ground system.

D. Conduits that contain power circuits shall have ground conductor installed inside conduit. Ground conductor shall be bonded to equipment or tray or duct ground at both ends.
E. Provide ground bushing on each conduit containing power circuit. Connect ground bushings together inside enclosure and to enclosure ground lug or ground bus.
   1. Use No. 8 AWG conductor for ground bushings trade size 1-1/2" (38 mm) and smaller.
   2. Ground bushings larger than 1-1/2" (38 mm) shall be sized in accordance with requirements of NEC, but in no case shall they be smaller than No. 8 AWG.

F. Ground conductor: Uninsulated, Class B standard, round soft drawn uncoated copper as defined in ICEA S-19-81, unless specified otherwise.

G. Hardware: Clamps, bolts, washers, nuts, and other hardware used with grounding conductor shall be copper, copper alloy, high copper alloy, or silicon bronze.

2.09 PIN AND SOCKET CONNECTORS
A. Unless shown on Drawings, not allowed.

2.10 FUSES AND FUSE BLOCKS
A. Modular-type, Class H screw terminal fuse blocks with Bakelite frame and reinforced retaining clips. Blocks shall be similar in construction and by same manufacturer.
B. Slow blow fuses: Bussmann Type MDL or Gould Shawmut Type GDL with ampere ratings of 1/4, 1/2, 1, or 2.
C. Fast acting fuses: Bussmann Type NON or Gould Shawmut Type OT with ampere ratings of 1, 3, 6, 10, 15, 20, or 30.
D. Extremely fast acting fuses: Bussmann Type KAB with ampere ratings of 1, 3, 6, 10, 15, 20, or 30.

2.11 ELECTRICAL METERS
A. Meters for measuring electrical quantities shall be utility grade, multifunction, switchboard-type with accuracy of ±0.2% or better for volts and amperes, and 0.4% for power functions.
B. Readouts shall have true RMS capability with at least 1/2" (13 mm) high intensity LED displays and be capable of surge withstand exceeding IEEE C37.90.1.
C. Instruments checked in field and found to be inaccurate in excess of percent error shall be returned for replacement without cost to Owner.
D. Design meters for operation through 5-ampere current transformer secondary and 120-volt voltage transformer secondary.
E. Provide communications capability; coordinate with Owner.

2.12 CONTROL RELAYS
A. General service, industrial grade auxiliary relays rated 600-volt.
B. Contacts shall be reversible from N.O. to N.C. in field.
C. Timing relays for critical service: Agastat Series 7000.

2.13 CONTROL SWITCHES
A. Multistage, rotary-type rated 120 volts ac or 125 volts dc, 3 amperes, as required.
B. Handles shall be black, fixed, modern, pistol grip type. Provide engraved black plastic escutcheon plates with targets.

C. Provide with colored LED lamps and nameplates as required.

2.14 PUSHBUTTONS

A. Standard pushbuttons shall be heavy, industrial-type rated 120 volts ac or 125 volts dc, 3 amperes, as required.

B. Provide with colored LED lamps and nameplates as required.

2.15 INDICATING LIGHTS

A. Status indicating lights shall be high-intensity, cluster, LED-type for panel mounting.

B. Coordinate indicating light colors with indicated conditions as follows. Indicating lights shall be energized when condition exists and shall be de-energized when condition does not exist:
   1. Red: Equipment energized: such as motor running, valve open, or breaker closed.
   2. Green: Equipment de-energized: such as motor stopped, valve closed, or breaker open.
   3. Amber: Equipment abnormality: such as motor trip, breaker trip, or relay trip.
   4. White: Monitoring of control power or trip coil: such as lockout relay trip coil monitor or breaker trip coil monitor. Light is on during normal circuit operation and off during loss of power or loss of coil.
   5. Blue: Loss of control power.

2.16 ALARM AND TRIP CONTACTS

A. Alarm contacts for remote annunciation shall be suitable for operation at 120 volts ac and 125 volts dc. Contacts shall be rated at least 0.5-ampere make and break, minimum.

B. Alarm contacts shall be normally closed contacts that open to alarm condition.

C. Trip contacts for remote trip shall be suitable for operation at 125 volts dc and shall be rated 5 amperes make or break, minimum.

2.17 LOCAL SEPARATE CIRCUIT BREAKERS

A. Provide 3-pole, molded-case, separately enclosed circuit breakers of not less than interrupting rating shown on Drawings at rated voltage.
   1. Provide with thermal and instantaneous trip elements.
   2. Breakers shall use high-conductivity copper for current carrying parts. Breaker enclosures shall have NEMA type enclosure as specified.

B. Each breaker shall be manually operated with quick-make, quick-break, and trip-free toggle mechanism. Thermal elements shall withstand sustained overloads and short-circuit currents without injury and without affecting calibration.

C. Circuit breakers shall have “On,” “Off,” and “Tripped” indication and shall be pad-lockable with 3 padlocks in “On” and “Off” position.
   1. Breakers rated over 70 amperes shall be rated 100% and have adjustable electronic trip units.
   2. Breakers shall be capable of adding alarm, lockout, shunt trip, and under-voltage as options.

2.18 LOCAL SEPARATE DISCONNECT SWITCHES

A. Three-pole, nonfusible, heavy-duty, rated 600-volt with continuous current rating as shown on Drawings and as required by load.
1. Type: Either molded-case or blade.
2. Switches shall use high-conductivity copper for current carrying parts.

B. Switches shall be positive, quick-make, and quick-break mechanisms.
1. Switch assembly plus operating handle shall be integral part of enclosure base.
2. Each switch shall have handle whose position is easily recognizable and which can be locked in “On” and “Off” position with 3 padlocks. “On” and “Off” positions shall be clearly marked.

C. Switches shall be UL-listed and horsepower rated. Where applicable, switches shall have defeatable door interlocks that prevent door from being opened while operating handle is in “On” position.

2.19 AUXILIARY POWER TRANSFORMERS

A. Provide separately mounted transformers as shown on Drawings.
B. Windings shall be copper.
C. Transformers shall be self-air-cooled, dry-type, capable of wall- or floor-mounting, and enclosed for wiring connection by conduit. In areas where dust and dirt may be normally present, use encapsulated-type transformers.
D. NEMA enclosure type protection shall be as specified herein.
E. Provide at least 2 full KVA capacity voltage taps above and 2 full KVA capacity taps below nominal rating. Each tap shall be 2.5% step.
F. Transformer shall be capable of at least 150°C rise above rated site maximum ambient without degrading transformer life.
G. Transformers shall be capable of continuous operation at rated kVA with normal life expectancy as defined in ANSI C57.
H. Sound level shall not exceed NEMA maximum lowest sound level.
I. Enclosure shall be sheet steel with corrosion-resistant finish and manufacturer’s standard color.

2.20 PLATES AND COVERS

A. Provide finish plates and covers of appropriate type and size for wiring and control devices, signal, and communication outlets.
B. Mark each plate and cover to show circuit and panel designation. Unless indicated to be engraved plate, use self-sticking, clear membrane, UV-resistant labels with typed black letters. Handwritten labels not allowed.
C. Coordinate color with adjacent surfaces.
D. Raised cover galvanized steel plates shall be acceptable for use on surface-mounted outlet boxes in unfinished areas where weatherproof plates are not required.
E. For weatherproof installations, cover plates shall be gasketed and rated for NEMA Type 4 installation.
F. Device plate mounting hardware shall be countersunk and finished to match plate.
2.21 WIRING DEVICES

A. Where more than one flush device is indicated in same location, mount devices in gangs under common plate.

B. Switches for control of ac lighting panel load circuits, single-pole, 3-way, and 4-way, shall be premium, heavy-duty specification-grade, and meet FS W-S-896E. Switches shall be rated for use at 120 or 277 volts and 20 amperes minimum.

C. Device color, if not shown on Drawings, shall be coordinated to match adjacent finishes.

D. Wall switches requiring pilot light indication shall have red LED pilot light when toggled “On.”

E. Pulse control of lighting contactors shall be 20 amperes, 120/277 volts, momentary, double-throw, and center "Off."

F. Standard convenience outlets: Premium, heavy-duty, specification-grade, duplex, 3-wire, grounding, 20-ampere, 125-volt for 120-volt circuits, and rated 250-volts for 240 or 208-volt circuits.

G. Ground fault circuit interrupter (GFI) receptacles: Duplex, 20-ampere, and 125 volts, feed-through type.

H. Isolated ground (IG) outlets: Duplex, 3-wire, with isolated grounding terminal, 20-ampere, and 125 volts. Outlets shall be orange in color, unless specified otherwise.

2.22 PANELBOARDS

A. Dead-front, circuit breaker type, rated for voltage, phase, with main lugs or main breaker as indicated on panel schedules.

B. Enclosure shall be NEMA-rated for installation location and capable of flush or surface mounting.

C. Enclosure cover and access door shall be hinged with breaker operating handles accessible through latchable and lockable door.

D. Typed panel directory located inside door shall have panel and circuits function clearly identified. Handwritten panel schedules not allowed.

E. Provide main and neutral buses insulated from cabinet with separate ground bus. Bus material shall be copper. Ground bus shall be similar to neutral bus in size and number of conductor terminating positions.
   1. Bond ground bus to panelboard enclosure by copper ground strap or copper conductor of appropriate size. Bond neutral bus to ground bus in accordance with requirements of NEC.
   2. Grounding bus connection to enclosure by removable screws not allowed.
   3. Bus shall be capable of terminating clamp type lugs for neutral cable in each supply conduit, and connections for neutral cable in each load circuit.
   4. Neutral bus shall be fully rated, unless specified otherwise.
   5. Isolated ground panelboards: As specified above, except isolated ground bus shall be bonded, by insulated ground conductor, back to source of separately derived system. Do not bond isolated ground bus to panelboard enclosure unless this is first point of grounding for separately derived system.

2.23 CIRCUIT BREAKERS

B. Branch circuit breakers used for lighting circuits shall be switch duty rated, “SWD.”

C. Breakers having multiple poles shall be manufactured as common trip type.

D. Interrupting rating shall be not less than interrupting rating of panelboards, and not series rated to achieve required short circuit interrupting rating.

E. Provide handle clips for 10%, or minimum of 2 whichever is greater, for breakers to prevent casual operation. If no breakers are indicated for installation, then provide on breakers labeled as spare.

F. Breakers, and provisions for future breakers, shall be provided in quantities, poles, and ampere ratings shown on Drawings.

G. Molded-case circuit breakers used in ac and dc panelboards and ac load centers shall be bolt-on type, G-frame size.

2.24 FINISHES

A. Manufacturer’s standard coating systems shall be factory-applied. Coating systems shall provide resistance to corrosion caused by weather and industrial environments.
   1. Surfaces inaccessible after factory or field assembly shall be protected for life of equipment.
   2. Painted surfaces shall be filled to provide smooth, uniform base for painting.
   3. Surfaces requiring field welds shall not be coated within 3” (75 mm) of field weld.

B. Coating material and application techniques shall conform to regulations of air quality management agency having jurisdiction.

C. Exterior surfaces of control and electrical equipment, including panels, cabinets, switchgear, transformers, and motors shall be manufacturer’s standard colors unless specified otherwise.

D. Apply high-temperature coating systems to uninsulated equipment operating at temperatures at or above 200°F (93°C).

2.25 RUST-INHIBITOR COMPOUNDS

A. Uncoated machined and ferrous surfaces subject to corrosion shall be protected with rust-inhibitor compounds.

B. Rust-inhibitor compounds used to protect surfaces of equipment and piping exposed to feedwater or steam shall be completely water-soluble.

C. Surfaces to be field welded shall be coated with consumable rust-inhibitor compounds that will not affect quality of weld.

D. External gasket surfaces, flange faces, couplings, rotating equipment shafts and bearings shall be thoroughly cleaned and coated with rust-inhibitor compounds.

2.26 GALVANIZING

A. Galvanized structural steel members and steel assemblies shall be pickled after fabrication. Remove scale, rust, grease, and other impurities, then hot-dip galvanized in accordance with ASTM.

B. If galvanized member is to be bolted, structural bolts shall be galvanized in accordance with ASTM.
2.27 IDENTIFICATION AND TAGGING

A. Conduits inside manholes, hand holes, building entrance pull boxes, and junction boxes shall be provided with 19-gage (1 mm) stainless steel identification tags, with 1/2" (13 mm) stamped letters and numbers.
   1. Attach conduit identification tags with stainless steel banding. Tag position shall be readily visible for inspection.
   2. Tags shall provide, as minimum:
      a. Circuit origination and destination.
      b. Voltage.
      c. Number of conductors in accordance with phase.
      d. Number of phase conductors.

B. Cables passing through or terminating in manholes, hand holes, and pull boxes shall have 19-gage (1 mm) stainless steel identification tags with stamped lettering that provides circuit identification information.
   1. Provide physical layout of manholes, hand holes and pull boxes labeling conductors and conduits.

C. Provide power, control, and instrumentation cables with permanent type identification markers with typed cable numbers and from/to information at each point of termination. Cable numbers and from/to information will be provided for circuits not associated with low-voltage panelboards.
   1. Position cable markers to be readily visible for inspection.
   2. Cable numbers shall match those as shown on Drawings.
   3. Provide wire tags at each termination point for each conductor. Tags shall be permanent, wrap around, heat-shrinkable type with typewritten information.

D. Color-code power conductors with electrical tape or provide with colored jacket.
   1. Source voltage of 208Y/120 volts:
      a. Phase A: Black.
      b. Phase B: Red.
      c. Phase C: Blue.
   2. Source voltage of 120/240 volts:
      a. Phase A: Black.
      b. Phase B: Red.
   3. Source voltage of 480Y/277 volts:
      b. Phase B: Orange.
      c. Phase C: Yellow.
      d. Neutral: Gray.
   4. Source voltage of 240/120-volt delta: High-leg systems shall not be used without Engineer approval.
   5. Service entrance and equipment ground conductors shall be bare copper or green insulated conductor. Equipment bonding conductors shall be bare copper.
   6. Isolated ground conductors shall be insulated; green in color with integral yellow stripe. No substitutions.

2.28 EQUIPMENT NAMEPLATES

A. Laminated white-over-black plastic such that face is white with black letters, with 1/8" (3 mm) engraved letters securely fastened with minimum of 2 self-tapping, stainless steel screws.

B. Motor starters, either separately mounted or contained in motor control centers, shall have nameplates identifying related equipment. Where separate control and indicating lights are used, starters shall have engraved or etched legends ("start", "stop", etc.) as shown on Drawings.
C. Provide control stations with nameplates identifying related equipment. Control and indicating lights shall have engraved or etched legends as shown on Drawings.

D. Circuit breakers within main switchboards and distribution switchboards shall be provided with nameplates identifying related equipment being served.

E. Fused and nonfused switches shall have 2 front cover-mounted nameplates.
   1. Nameplate containing permanent record indicating switch type, manufacturer's name, catalog number, and appropriate rating for equipment served.
   2. Provide additional nameplate to identify associated equipment.

F. Panelboards shall have front cover-mounted nameplates identifying panelboard, matching information shown on Drawings and associated panel schedule. Nameplate shall have at least 4 lines of text consisting of:
   1. Line 1: Panel equipment identification number.
   3. Line 3: Appropriate description from which power is derived, (i.e. fed from HP1 through XFMR-LP1).
   4. Line 4: Location of power source, (i.e. PP-1, NW wing).

G. Lighting and auxiliary power transformers shall have front cover-mounted nameplates identifying transformer, matching information shown on Drawings. Nameplate shall have at least 2 lines of text that consist of:
   1. Line 1: Transformer equipment identification number.
   2. Line 2: Location of derived power source (i.e. fed from MDB, Elec Rm Basement).

H. Nameplates shall meet requirements of NFPA 70E

2.29 HARDWARE

A. Provide hardware including, but not limited to, anchor bolts, nuts, washers, expansion anchors, wire nuts needed for installation.

B. Hardware smaller than 3/4" (19 mm) shall match NEMA standard size bolt holes on motors and electrical equipment.

2.30 LOGIC SYSTEMS FACTORY TESTING

A. Prior to shipment, test electrical equipment containing solid-state logic systems in accordance with manufacturer's standard tests for minimum of 120 hours under power.
   1. Components tested shall include electronic devices; power supplies, input-output devices, operator interface devices, and interconnecting cables provided with system.
   2. System shall be tested as complete assembly. Testing of individual components or modules not allowed as system tests.

B. System test shall include:
   1. Means of confirming logic or mathematical design response of system by simulating changes in system input.
   2. Test shall repeatedly cycle system through operations system will be expected to perform in service with loads on various components equivalent to those which will be experienced in actual service.
   3. Adjustment of power source voltages to high and low limits. Verify correct operation of system at both high and low power source voltage limits.

C. System shall be tested and verified capable of providing surge withstand capability in accordance with requirements of ANSI C37.90.1.
D. Perform tests with solid-state logic system exposed to ambient temperature appropriate to service for which associated electrical equipment is designed.

PART 3 EXECUTION

3.01 EXAMINATION OF SITE

A. Contractor shall be responsible for familiarity with Project Site conditions. Equipment furnished and installed shall be capable of withstanding most severe conditions that will be encountered.

3.02 PROTECTION OF WORK

A. Protect installed Work and provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

B. Damage occurring to building or equipment during installation shall be repaired or replaced to conditions existing prior to damage at no additional cost or delay to project or Owner.

3.03 INSTALLATION

A. Install equipment and materials in accordance with manufacturer's recommendations and Drawings.

B. Details for equipment and systems installed in accordance with industry standard techniques will not be furnished.

C. Installation details furnished on Drawings shall be followed unless found to be unsafe, inappropriate for equipment specified, or unachievable due to site conditions.

D. Install equipment indicated on Drawings as furnished by others, unless noted as installed by others, including but not limited to:
   1. Medium-voltage switchgear.
   2. Medium-voltage bus duct.
   3. Secondary unit substations.

E. Except as otherwise specified or indicated on Drawings, equipment shall be installed plumb, square, and level.

F. Sheet metal junction boxes, equipment enclosures, sheet metal raceways, and similar items mounted on earth-bearing walls shall be separated from wall not less than 1/4" (6 mm) by corrosion-resistant spacers.

G. Substations, switchgear, motor control centers, and similar equipment located outdoors shall be permanently sealed at base. Openings into equipment shall be screened or sealed as to prevent entrance of birds, rodents, and insects the size of wasps and mud daubers.
   1. Sealing material at base shall be concrete grout.
   2. Small cracks and openings shall be sealed from inside with silicone sealant.
   3. Large openings shall use galvanized screen mesh.

3.04 TRIP SETTING COORDINATION

A. Motor overload protection shall be selected and set by Contractor based on final motor nameplate information. Size motor circuit protectors to coordinate with motor starting characteristics and overload protection. Submit summary of settings to Owner, list:
   1. Equipment project identification number.
   2. Nameplate information.
   3. Overload device trip range.
   4. Overload device setting.
5. Trip device rating.
6. Trip device setting if different from rated value.

B. Set trip devices and verify devices are operating within manufacturer’s tolerances. Make changes to settings not complying with requirements furnished by Engineer. Device settings will be furnished for following equipment:
   1. Medium-voltage system.
   2. Low-voltage switchgear.
   3. Secondary unit substations.

3.05 CABLE

A. Prior to installation of each cable or cable group into assigned raceway, verify that raceway has been correctly sized.
   1. Where raceway is not indicated in circuit schedule or on Drawings, size in accordance with requirements of NEC.
   2. If raceway size indicated on Contract Documents is inadequate, notify Engineer.

B. Replace cables pulled into wrong raceway or cut too short to rack and train.

C. Do not reinstall cables installed in wrong raceway and removed. Discard cables unless inspected and accepted by Owner’s Representative in writing.

D. Carefully lay or pull circuits in cable tray so neither cables nor tray is damaged.

E. Protect cables from dirt, water, oil, damaging chemicals, and from physical injury prior to, and during installation.

F. Cables shall be cut sufficiently long to conform to contour of trays, with particular attention paid to vertical inside bends.

G. Remove excessive slack so cables lie parallel to sides of trays.

H. Multiple single-conductor power cables No. 1/0 AWG (50 mm²) or larger installed in cable tray that constitute single power circuit shall be grouped together in triplexed or quadriplexed arrangement. Maintain cable spacing to be 2.15 x O.D. of largest conductor in group or adjacent group.

I. Multiconductor power cables No. 4/0 AWG (120 mm²) or larger installed in cable tray shall be installed in single layer with maintained spacing of not less than 1 cable diameter of largest cable.

J. Fasten cables to cable tray with rated nylon ties to hold cables in place.

K. Perform fishing and pulling with flexible round metal tape, CO₂ propelled polyethylene cord, nylon rope, or manila rope.

L. Cable damage caused by improper pulling tension and excessive sidewall pressures shall be considered for any cable pulls that require use of mechanized cable pulling machine, whether installed underground or overhead.
   1. NEC requirements shall be used as guideline. Calculations shall be performed for duct bank runs over 300’ (90 m), and for installations in conduit over 100’ (30 m).
   2. Monitor pulling tension during installation of cable. Tension shall not exceed maximum recommended by cable manufacturer.
   3. To avoid damage from excessive sidewall pressure at bends, pulling tension shall not exceed cable manufacturer’s recommendation.
   4. Pulling mechanisms, manual or power type, shall have rated capacity in tons legibly marked on mechanism.
5. During installation, observer shall constantly watch dynamometer and record maximum tension achieved during pull.
   a. If excessive strain develops, stop pulling operation at once. Determine difficulty and correct.
   b. Provide records of dynamometer readings to Engineer.
   c. Inform Owner prior to cable pulls.
6. Do not use woven wire cable grips. Use only pulling eyes for pulling cables.
7. As soon as cable is pulled into place, remove pulling eyes and reseal cable.

M. Insert reliable nonfreezing type of swivel or swivel connection between pulling rope and eye to prevent twisting under strain.

N. Only use lubricants as recommended by cable manufacturer. Water-based lubricants not allowed.

O. Outside of each cable reel shall be carefully inspected. Remove protruding nails, fastenings, or other objects that might damage cable.
   1. Perform visual inspection for flaws, breaks, or abrasions in cable sheath as cable leaves reel.
      Pulling speed shall be slow enough to permit inspection.
   2. Damage to sheath or finish of cable shall be sufficient cause for rejecting cable.
   3. Cable damaged during installation shall be replaced at no expense to Owner.

P. Permanent radius of each bend after cable installation shall be in accordance with manufacturer's recommendations.

Q. Cable supports and securing devices shall have bearing surfaces located parallel to surfaces of cable sheath. Install to provide adequate support without deformation of cable jackets or insulation.

R. Provide adequate cable end lengths. Properly install in junction boxes and manholes to avoid longitudinal strains and distorting pressures on cable at conduit bushings and duct end bells.

S. Final inspection shall be made after cables are in place. Where supports, bushings, and end bells deform cable jacket, provide additional supports.

T. Splices, joints, and connections shall be made only in accessible junction boxes in accordance with methods specified and instructions of cable manufacturer. Splices not allowed unless shown on Drawings.

U. Rough-in wiring terminated in junction boxes shall have at least 8” (200 mm) of free conductor coiled in box for connection to equipment and receptacles.

V. Circuit information for circuits originating from panelboards is indicated on panel schedules. Other circuits are identified on circuit schedule.
   1. Do not combine receptacle loads with lighting loads.
   2. Circuits fed from panelboards shall not be combined with circuits from circuit schedule.

W. Panelboard circuits are indicated as individual runs. Circuits may be combined into common conduits in accordance with rules of NEC. Perform work associated with combining of circuits at no additional cost to Owner.

3.06 WIRING DEVICES, BOXES, AND FITTINGS

A. Install galvanized or cadmium plated, threaded, malleable iron boxes and fittings in:
   1. Embedded in concrete walls, ceiling, and floors.
   2. Outdoor exposed faces of masonry walls.
   3. Locations where weatherproof cover is required by code or this specification.

B. Install galvanized or cadmium plated sheet steel boxes in:
   1. Indoor exposed faces of masonry walls.
2. Interior partition walls.
3. Joist supported ceilings.

C. Rigid PVC device boxes shall be installed in exposed nonmetallic conduit systems.

D. Telephone and communication conduit systems shall have separate junction boxes and pull fittings.

E. Install fire system wiring in dedicated conduit system.

F. Finish openings so standard sized cover plates can be used. Oversized plates not allowed.

G. Mount wall switches 3'-6" (1050 mm) above finished floor or grade unless specified otherwise. After circuits are energized, test wall switches for proper operation.

H. Outlets:
   1. Standard mounting height: 18" (450 mm) above finished floor, unless specified otherwise.
   2. Outlets outdoors, garages, basements, shops, storerooms, and other rooms where equipment may be hosed down: 4'-0" (1200 mm) above finished floor or grade.
   3. Surface-mount welding receptacles 4'-0" (1200 mm) above finished floor or grade.
   4. After circuits are energized, test each receptacle for correct polarity.
   5. Test GFCI receptacles for proper operation.
   6. Mount wall thermostats 5'-6" (1650 mm) above finished floor unless noted otherwise. Thermostats mounted shall be suitably insulated from wall temperatures.

I. Communication outlets shall be 18" (450 mm) above finished floor unless required otherwise. Outlets outdoors, garages, basements, shops, storerooms, and rooms where equipment may be hosed down shall be 4'-0" (1200 mm) above floor.

J. Clock outlets shall be located 7'-0" (2.13 m) above finished floor or grade.

3.07 GROUNDING AND BONDING

A. Electrical system and equipment grounding shall be installed in accordance with NEC and shall conform to following, where applicable:
   1. Ground conductors shall be bare or green-insulated in accordance with NEC.
   2. Cable shall be soft-drawn copper or copper bar, sized in accordance with drawings and NEC, but not smaller than No. 12 AWG.
   3. Ground cable splices and joints inaccessible upon completion of construction shall meet requirements of IEEE 837 and shall be exothermic weld or compression system type.
   4. Ground cable through exterior building walls not in conduit shall enter within 3' (1 m) below finished grade and shall be provided with water stop. Installation of water stop shall include filling space between strands with solder and soldering 12" (300 mm) copper disc over cable.
   5. Ground cable near base of structure shall be in undisturbed earth and as far from structure as excavation permits, but not closer than 6" (150 mm).
   6. Copper ground conductor in addition to conduit connection shall ground each piece of electrical equipment.
   7. Copper or high-conductivity copper alloy ground lugs or clamps shall make ground connections to equipment and ground buses. Connections to enclosures not provided with ground buses or ground terminals shall be made by clamp-type lugs added under permanent assembly bolts or under new bolts drilled and added through enclosures other than explosionproof, or by grounding locknuts or bushings. Ground cable connections to anchor bolts; against gaskets, paint, or varnish; or on bolts holding removable access covers not permitted.
   8. Bond grounding system to water piping by connection to first flange inside building from main that will form good ground connection. Make connection with copper bar or strap by drilling and tapping flange and providing bolted connection.
   9. Ground conductors on equipment shall be formed to contour of equipment and firmly supported.
   10. Ground rods not described elsewhere shall be minimum 5/8" (16 mm) diameter by 10' (3.0 m) long, with copper jacket bonded to steel core.
11. Make connections to ground grid where shown on Drawings.
12. Verify connections by performing continuity checks.

3.08 FIRE PROOFING AND FIRE RATINGS

A. Maintain fire-resistant integrity during construction.

B. Penetrations through fire-resistant structures shall be sealed with fire-resistant material compatible with construction penetration.

C. Where required by codes, local building officials, or fire marshal, furnish UL fire sealing systems and install in accordance with manufacturer’s recommendations.

3.09 STARTUP AND TESTING

A. Clean equipment interiors and exteriors prior to start-up and testing.

B. Unless specified otherwise, tests performed shall be standard tests listed by ANSI/IEEE for intended equipment.

C. Equipment shall be checked and placed in service ready for operation.

D. Circuits shall be electrically tested after installation. Test power and motor circuits prior to final connection to equipment. Splices shall be complete prior to testing.
   1. Provide equipment and labor required for testing.
   2. Circuit failing to test satisfactorily shall be replaced or repaired, and retested at no additional cost to Owner.
   3. Check power and motor circuits, dc power, and control circuits for:
      a. Correct terminations.
      b. Continuity.
      c. Unintentional shorts and grounds.
   4. Check power conductors for correct phasing.
   5. Motor circuits shall be checked for proper rotation and motors "bumped" to verify correct machine rotation.
   6. Control, instrumentation, and thermocouple wire shall be checked for correct termination, continuity, freedom from shorts or grounds, and identification.
   7. Current transformer wiring shall be loop checked by injecting current at one end of loop and checking with clip-on ammeter at each field termination point to assure continuity and phase identification.
   8. Voltage transformer wiring shall be tested by applying voltage at one point and checking with voltmeter phase rotation meter and phase angle meter at each field termination point to assure continuity, identification and phase shift.

3.10 DEMONSTRATION

A. Final start-up and check out shall be completed prior to Owner acceptance of project.

B. Electrical installation shall be complete in every detail and capable of normal operation in presence of Owner or Owner’s Representative to verify its readiness.

END OF SECTION

1) R.L. Boudreaux
2) G.H. Ogg
PART 1  GENERAL

1.01  SECTION INCLUDES

A. Grounding system requirements providing protection of equipment and personnel.

1.02  WORK BY OTHERS

A. Receiving, unloading, and storage.

B. Final placement and assembly.

1.03  INFORMATIONAL SUBMITTALS

A. Submit with Bid:
   1. Description of ground system components to be used.
   2. Product data sheets for components.

B. Product Data:
   1. Final product data sheets for each type of component.
   2. Accessories list.
   3. Ratings and nameplate information.
   4. Special installation tools list.

C. Quality assurance data:
   1. Certified shop test reports.
   2. Certified field installation data and reports.
   3. Manufacturer’s installation information.

1.04  MAINTENANCE MATERIALS

A. Provide complete set of special tools as necessary for installation for each piece of equipment. Tools and their intended use shall be identified in assembly instructions.

1.05  QUALITY ASSURANCE

A. Manufacturer qualifications:
   1. Grounding assembly manufacturer shall be manufacturer of major components of ground system.
   2. Manufacturer shall be ISO certified.
   3. When requested by Engineer, provide acceptable list of similar equipment installations complying with this Specification.

B. Regulatory requirements:
   1. Design, manufacture, and test ground system and accessories in accordance with applicable requirements of NFPA 70, IEEE STD 80, IEEE STD 81, IEEE STD 142 IEEE STD 837, and applicable state and local codes and regulations.
   2. Standards of foreign organizations shall not be used without written approval from Engineer.

1.06  DELIVERY, STORAGE, AND HANDLING

A. Prepare detailed packing lists and shipping notification for all items shipped.

B. During delivery and storage, handle equipment to prevent damage.
C. Store equipment in clean, dry place. Protect from weather, dirt, water, construction debris, and physical damage in accordance with manufacturer’s instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. FCI-Burndy.
B. Erico.
C. Galvan Industries
D. Southern Grounding Products
E. Harger Lightning & Grounding
F. Thompson Lightning Protection, Inc.

2.02 SYSTEM DESCRIPTION
A. Grounding system includes, but is not limited to, rods, cable, connectors and miscellaneous hardware and materials.
B. Owner will provide outline, arrangement, and detail drawings for grounding system.

2.03 MATERIALS
A. Grounding materials shall be new and undamaged.
B. Ground rods: Copper-clad steel not less than 3/4” (19 mm) in diameter and 10’ (3 m) in length. Ground rods shall be UL listed with not less than 10 mils of Copper cladding and stamped near top of rod to show manufacturer, diameter, and length with one end pointed to facilitate driving. Ground rod size shall be as shown on Drawings. If ground rod is longer than 10’ (3 m), use sectional, threaded ground rods.
C. Bare ground cable: Soft drawn copper in accordance with ASTM B3, Class A or B stranding, not less than No. 4/0 AWG (120 mm²) in accordance with ASTM B8. Ground conductor size shall be as shown on Drawings.
D. Insulated ground conductors shall have green colored insulation.
E. Ground conductors shall be bare or have green colored insulation or marked with green colored tape or adhesive labels at each end and at every point where conductor is accessible.
F. Connections shall be made using an exothermic welded process or compression system.
   1. Exothermic molds and weld metal shall be selected for connection and be made in strict accordance with manufacturer’s instructions.
   2. Where compression type connections are used, provide tools and proper dies as recommended by manufacturer.
   3. Where flush ground plates are to be embedded in concrete, ground cable shall be exothermally welded to plate and plate firmly secured to concrete forms.
G. Above-grade connections shall be provided as shown on Drawings.
H. Above-grade clamps and other hardware used with grounding system shall be bronze or copper alloy.
I. Above ground bolts, washers, and nuts shall be silicon bronze alloy or approved type of cadmium-plated steel.

J. Connections to ground rods and ground cables to be buried in earth or concrete shall be suitable for direct burial and shall be identified for such use.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify Site conditions are acceptable for installation.

B. Verify grounding system components are in good condition and undamaged.

3.02 INSTALLATION

A. Install at locations shown on Drawings and in accordance with manufacturer’s recommendations.

B. Coordinate interface installation with existing grounding systems.

C. Connect electrical equipment to ground grid with ground conductor. Electrical equipment shall be designated as metallic structures including equipment mounted thereon, instrument transformers, surge arrestors, overhead shield wires, transformers, breakers, voltage regulators, enclosures, switchgear, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits, operate continuously at ground potential, and provide low impedance path for possible ground fault currents.

D. Install separate, green-insulated equipment grounding conductor in conduit with related phase and neutral conductor.

E. Above-grade connections to permanent and removable equipment shall be exothermic-weld, bolted, or compression-connection type.

F. Connections to exposed structural steel within buildings or plants shall be exothermic-welded type, unless noted otherwise. Connections to structural steel within substations shall be bolted type. Connections to galvanized steel shall be by bolting.

G. Above-grade conductors:
   1. Install exposed conductors inconspicuously in vertical or horizontal positions on supporting structures.
   2. When located on irregular supporting surfaces or equipment, conductors shall run parallel to or normal to dominant surfaces.
   3. Conductors routed over concrete, steel, or equipment surfaces shall be kept in close contact with surfaces by using fasteners located at intervals not to exceed 3’ (1 m).

H. Conduits extending into equipment shall be grounded through grounding bushings in enclosure where terminated. Grounding bushings shall be wired together and connected internally to enclosure ground lug or ground bus with bare copper conductors.

I. Conduits connected to metal enclosures shall be grounded to enclosure by either grounding bushing or double locknuts, with one conduit locknut on each side of enclosure, to provide continuous ground path back to source voltage. Provide grounding bushing for knockout holes in metal enclosures that are oversized, elongated, or deformed.

J. Install bare grounding conductor for entire length of power cable tray and where indicated on Drawings. Connect grounding conductor to each tray section and bond tray grounding system to station ground grid at each end. Cable tray shall additionally be continuous and rated for carrying fault
current in accordance with NEC. Trays shall be bonded either by direct connection to or by bonded conduit or jumper conductor to panels, switchgear, and equipment tray cable serves. Conduit takeoffs from tray shall use UL-approved grounding clamps.

K. Bare conductor, used for the building or facility lightning protection system, shall be connected to the below grade grounding system.

L. Install ground conductor below grade near building perimeters, foundations, and equipment skids as indicated on Drawings. Repair or replace damaged ground system conductors.

M. Exothermic welds shall encompass 100% of cable end being welded and shall resist moderate hammer blows.

N. Connect building and pipe support columns to grid with No. 4/0 AWG (120 mm²) cable. Equipment skid frames, switchgear and motor control center ground bars, dry-type transformer cases, and other required solid grounds shall be connected to site grid by “stingers” extended from grid. Where indicated on Drawings, stingers shall be same diameter as ground cable. Provide 5’ (1.5 m) of coiled cable above grade for equipment connection.

O. Extend plant ground grid system to utility substation ground grid or adjacent grounding systems where indicated. Care shall be taken when exposing and connecting to existing grounding systems to maintain continuity and backfill correctly.

P. Excavate for grid conductor to depths of 18” (50 mm) minimum or as indicated on Drawings. Use special care for excavation near existing foundations and utilities. Excavate by hand in such areas. After installation of grid conductor, backfill with material from excavation, excluding large stones and organic material. Backfill around conductor completely, thoroughly tamping to provide good contact between earth and ground conductor.

Q. Install ground rods in firm soil. Drive top of rod to depth of 18” below grade as a minimum to match conductor depth, unless otherwise shown on Drawings. Use driving studs or other suitable means to prevent damage to threaded ends of sectional rods.

R. Maximum resistance-to-ground of single driven ground rod shall not exceed 25 ohms. Maximum resistance-to-ground of ground grid system shall not exceed 2 ohms. If measured resistance exceeds above values, add rods and bond together to achieve desired resistance. Measurements shall be made and data recorded in presence of Owner’s Representative. Test shall be documented and report turned over to owner.

S. Install ground conductor near top and on each side of concrete encased duct bank. Connect duct bank ground conductor to plant grounding system. Install duct bank ground conductors through manhole walls to provide grounding for metallic noncurrent-carrying cable supports, metallic sheaths of cable, and enclosures. Metallic conduits within duct bank shall be provided with grounding bushings within manholes. Connect grounding bushings to grid conductor with minimum No. 8 AWG (10 mm²) conductor.

T. Install ground conductor in cable trenches along with power conductors or other raceway as detailed on the drawings.

3.03 FIELD QUALITY CONTROL

A. Ground grid resistance measurements and data recording shall be made by using fall-of-potential method in accordance with IEEE 81 with results no great then 5 ohms.

B. Tests shall be made with approved ground resistance tester in accordance with instrument manufacturer’s instructions.
   1. Make measurements made in presence of Owner’s Representative and record data.
2. Volt-ohmeter not acceptable.
3. Tests shall be performed by personnel knowledgeable in ground system testing.

3.04 MAINTENANCE

A. Grounding system shall not require maintenance after final installation, testing, and acceptance.

END OF SECTION

1) R.L. Boudreaux
2) G.H. Ogg
PART 1    GENERAL

1.01 SECTION INCLUDES
   A. Medium-voltage cable and related splices, terminations, and accessories for cables rated at or above 2001 volts and at or below 35 kV.

1.02 WORK BY OTHERS
   A. Receiving, unloading and storing of cable.
   B. Installation and termination of cable.
   C. Quality assurance data:
      1. Certified manufacturer test reports in accordance with AEIC and ICEA.
      2. Cable test data report in accordance with AEIC and ICEA for each lot and type of cable.
      3. Pulling tension and side wall pressure calculations if requested by Engineer.
      4. Submit documented installer experience if requested by Engineer.

1.03 INFORMATIONAL SUBMITTALS
   A. Submit with Bid for each cable type supplied:
      1. Completed Data Sheets.
      2. Cable damage curves.
      3. List of recommended cable pulling lubricants.

1.04 ACTION SUBMITTALS
   A. Shop Drawings:
      1. Completed and updated Data Sheets.
      2. Detailed drawings and manufacturer information for accessories.

1.05 CLOSEOUT SUBMITTALS
   A. Operation and maintenance manuals. Provide at a minimum:
      1. General description and technical data.
      2. List accessories supplied, listing manufacturer, model number and operating ranges.
      3. Receiving, storage, installation, and testing instructions.
      4. Complete documentation of inspections and tests performed, including logs, curves, and certificates.

1.06 QUALITY ASSURANCE
   A. Installer qualifications: Installer shall have minimum of 10 years documented experience as an installer of medium-voltage electrical systems, medium-voltage cable, and medium-voltage terminations and splices.
   B. Manufacturer’s qualifications:
      1. Manufacturer of cable and any accessories shall be ISO certified.
      2. Manufacturer shall have produced similar equipment for a minimum period of 5 years.
      3. When requested by Engineer, provide acceptable list of similar equipment installations complying with requirements of this Section.
   C. Regulatory requirements:
      1. Cables and accessories shall be in accordance with applicable standards
         a. Armored and unarmored shielded power cable ICEA S-93-639 and NEMA WC74.
b. IEEE 383, ASTM B3 and B8, UL 1072.
d. AIEC CS6.
e. IEEE 48 and IEEE 386.

2. Standards of foreign organizations shall not be used without written approval from Engineer.

D. Cable shall not have had more than 1 year elapse from date of manufacture to date of delivery to job site.

E. Testing services: Employ and pay for services of qualified independent testing agency to perform field quality control testing. Test equipment shall be calibrated within 3 months prior to cable test date. Certified test reports shall be furnished to Owner. Interpretation of test results with regards to compliance to this specification shall accompany test reports.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Coordinate transportation with requirements of pertinent authorities.

B. Cover and protect cable and accessories from damage during shipment.

C. Dispose of nonreturnable reels. Return recyclable reels to cable manufacturer.

D. Ensure reel lengths accommodate continuous pull lengths required. Splicing not allowed unless specifically shown on Drawings.

E. Cable ends on cable reels shall be available for testing. Cable ends, whether exposed or concealed, shall be sealed with heat shrinkable caps. Cap sizes shall be as recommended by cap manufacturer for cable OD and insulation. Caps shall contain sufficient adhesive so shrinkage of cap during application result in formation of positive water seal capable of withstanding complete immersion or totally exposed storage over a period of several months without permitting entrance of moisture.

F. Prepare detailed packing lists and shipping notification for items shipped.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Okonite.

B. Prysmian Power and Cable Systems

2.02 SYSTEM DESCRIPTION

A. Components may include, but are not limited to:
   1. Tape.
   2. Break out boots.
   3. Lugs and termination kits.
   4. Strain relief devices.
   5. Splices.

B. Asbestos in any form is prohibited from cable, including fillers and binding tapes even if encapsulated or if asbestos fibers are impregnated with binder material.

2.03 POWER CABLE

A. Single-conductor and multi-conductor, unarmored:
1. Conductor material: In accordance with Data Sheet.
2. Stranding: Class B.
3. Cable sizes and types: In accordance with Data Sheet.
4. Insulation levels and voltage classes: in accordance with Data Sheet.
5. Temperature: 105°C continuous; 140°C emergency; and 250°C short circuit.
6. Conductor insulation: in accordance with Data Sheets. If specified on Data Sheets, provide ethylene propylene rubber (EPR) with minimum dielectric strength of 3.2 and minimum impulse strength of 1,500 V/mil. The ethylene content of the elastomer used in the insulation shall not exceed 72% by weight nor shall the insulation compound contain any polyethylene. Insulation compound shall be manufactured in house.
8. Metallic shield: In accordance with Data Sheet.
10. Cable assemblies shall be tested and shall pass ICEA 70,000 Btu/hr and 210,000 Btu/hr vertical tray flame tests.

2.04 CABLE MARKING

A. Surface print each length of conductor or cable at least every 3’ (1 m) with:
   1. Voltage rating.
   2. Conductor size.
   3. Conductor quantity.
   4. Conductor material.
   5. Insulation type.
   6. Manufacturer’s identification.
   7. Running length of cable.

B. Permanently attach metal tags to both sides of each cable reel displaying:
   1. Manufacturer.
   2. Date of manufacture.
   3. Job order number.
   4. Unique reel identification number.
   5. Purchaser’s name.
   6. Voltage rating.
   7. Conductor size.
   8. Conductor quantity.
   10. As shipped weight of cable and reel.

2.05 SPLICING

A. Splices not allowed unless specifically shown on Drawings.

B. Manufacturer’s:
   1. Canusa
   2. Raychem

C. Use compression-type, 2-hole lugs with corrosion-resistant bolting material or compression barrel connectors.

D. Shield shall be appropriately connected at splice to provide continuous shield for complete cable installation.

2.06 TERMINATIONS

A. Design terminations for shielded cables and include shield ground strap. Only Class 1 terminations acceptable.
B. Termination kits: 3M “Cold Shrink” silicon rubber; compression-type connectors and lugs. Field-verify lug type and arrangement with equipment configurations.

2.07 UNDERGROUND WARNING TAPE

A. Use: Underground installation including direct-buried cable, direct-buried conduit and concrete-encased duct banks.

B. Type and size: Permanent, vinyl; not less than 6" wide x 4 mils thick (150 mm wide x 0.102 mm thick).

C. Compounded for permanent direct-burial service.

D. Copper Head Industry, Snake Pit Tracer wire and box, #12 AWG.

E. Printed legend shall indicate type of underground line.

2.08 SOURCE QUALITY CONTROL

A. Factory-test cables in accordance with AEIC CS6.

B. Submit certificate of compliance and manufacturer’s test reports showing results of tests required by AEIC CS6. Reports shall include reel numbers for tests performed on each length of completed cable.

C. Include manufacturer’s flame test data in test reports. Prototype data is acceptable instead of flame testing, as long as conductor size, insulating and jacketing materials, and insulation and jacket thickness are same as worst-case flame test configuration being provided.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer’s recommendations, IEEE 576 and Section 26 05 00.

B. Perform pulling tension and side wall pressure calculations for each pull. If requested by Engineer, submit data verifying compliance with manufacturer’s recommendations.

C. Support cables in accordance with requirements of NEC.

D. Install direct-buried cables in minimum 3" (80 mm) thick bed of clean sand. Separate multiple sets of 3-phase cables by minimum of 4" (105 mm).

E. Place underground warning tape 6" to 12" (150 mm to 300 mm) above electrical lines.

F. Install underground cables with minimum earth cover to final grade in accordance with NEC requirements.

G. Cable installed underground in cable vaults, manholes, and hand holes shall have arc-proof taping installed for additional protection. Clean cable sheath and apply half-lap layer of tape. Secure with electrical tape in accordance with manufacturer’s instructions.

H. Unarmored cable installed in cable tray shall transition out of cable tray by use of conduit or wireway, or as allowed by the NEC. Armored cable may transition out of cable tray without use of conduit or wireway as long as it is supported by approved methods. Cable glands shall be used where conduit or wireway is not provided.
I. Cable in cable tray:
1. Portions of cable located in trays shall be arc proofed with a minimum of one half-lapped layer of Scotch Fire retardants Electric Arc Proofing Tape 77.
2. Install single conductor cables in triplexed or quadriplexed configuration. Maintain free air space minimum 2.15 x cable OD of largest conductor in group and adjacent conductor configurations or cable. Refer to corresponding sections of NEC for acceptable ampacity tables.
3. Install multiconductor cables with maintained spacing of not less than 1 x O.D. of largest cable, between cables.

J. Terminations and shields.
1. Install terminations at ends of conductors with standard kits. Comply with kit manufacturer’s written instructions and with classes of terminations indicated.
2. Provide break out boots for multiconductor cables.
3. Connect shield ground strap to cable shield after cable passes through ground sensors. Route ground shield strap back through ground sensor to cancel effect of circulating currents.
4. Connect shields to ground on both ends of cable. Connection of shield to a shield ground strap shall be with solder and mechanical clamp.

K. Provide cable tagging including phase indication and cable number identification in accordance with Section 26 05 00.

L. In manholes, handholes, pull boxes, junction boxes, and cable vaults, train cable through walls by longest route from entry and exit. Support cables at intervals adequate to prevent sag.

M. Install cable accessories in accordance with manufacturer’s recommendations and as shown on Drawings.

N. Use heat shrinkable caps for storing unused cable.

3.02 FIELD QUALITY CONTROL

A. Cable insulation test: Conductors with insulation rated 5,000 volts and above shall be given high-voltage dc insulation test (Hi-Pot).
1. Ampacity of direct current testing equipment shall be at least 2,500 microamperes.
2. Final test voltages and duration of test shall be in accordance with cable manufacturer’s recommendations.
3. Test procedures shall conform to IEEE STD 400.
4. Competent personnel specializing in electrical cable testing shall perform tests.
5. Perform test on completed cable installation. Perform test done after installation of termination kits and splice kits. Cable shall be isolated from equipment.

B. If equipment or system fails to function properly, make necessary corrections, including replacement, at no cost to Owner, and after such corrections are completed, demonstrate to Engineer that equipment or system functions properly.
**DATA SHEETS**

**MEDIUM-VOLTAGE CABLE**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>UNITS</th>
<th>SPEC DATA</th>
<th>VENDOR DATA</th>
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<td>By Manufacturer</td>
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END OF SECTION

1) R.L. Boudreaux
2) G.H. Ogg
PART 1    GENERAL

1.01 SECTION INCLUDES

A. Below-grade conduit, boxes, and associated accessories for support, securing, and protection of electrical wiring.

1.02 INFORMATIONAL SUBMITTALS

A. Product Data:
1. List of proposed materials identifying manufacturer and type to be furnished.
2. Manufacturer's catalog sheets, marked as necessary to indicate specific type, model or catalog number for equipment to be furnished for project.

B. Quality assurance data:
1. Component and accessories data sheets.
2. Installation information.

C. Such other similar information as Engineer may request.

1.03 ACTION SUBMITTALS

A. Shop Drawings: Manhole dimensional layouts.

1.04 QUALITY ASSURANCE

A. Manufacturer’s qualifications:
1. Manufacturer shall be manufacturer of major components within assembly and shall be ISO certified.
2. Manufacturer shall have produced similar equipment for a minimum period of 5 years.

B. Regulatory requirements
1. Equipment shall be designed and manufactured in accordance with applicable requirements of following; NFPA 70; ANSI C80.1, C80.3, C80.4, C80.5; UL 1, UL 6, UL 360, UL 651, UL 797, UL 870, UL 1242; and NEMA TC2, TC3, TC6, TC9, and RN1.
2. Standards of foreign organizations shall not be used without written approval from Engineer.

PART 2    PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Raceway systems and accessories include, but shall not be limited to:
1. Concrete encased ducts.
2. Elbows, fittings, and accessories.
3. Hardware for support, securing, and protection.
5. Trenching and backfilling.

2.02 RIGID METAL CONDUIT, STEEL (RGS)

A. Material: Mild steel tube with continuous welded seam in accordance with ANSI C80.1, and UL 6.

B. Exterior and Interior protective coating: Metallic zinc applied by hot-dip galvanizing or electro-galvanizing. Apply final coat of transparent zinc chromate to exterior. Exterior and interior coatings applied to conduit shall afford sufficient flexibility to permit field bending without cracking or flaking.
C. Conduits shall be available in standard trade sizes, 3/4" (21 mm) minimum.

D. Thread pitch shall conform to ANSI/ASME B1.20.1. Taper shall be 3/4"/ft (62.5 mm/m).

E. Each length of conduit shall have UL listing label.

F. In areas designated as corrosive, conduit shall meet NFPA 70.

G. Couplings, unions, and fittings: Threaded-type, galvanized steel.

H. Conduit bodies: Threaded-type, cast metal or malleable iron type with zinc or cadmium coating. Covers shall have solid gaskets and captive screw fasteners.

I. Running thread not acceptable.

2.03 RIGID NONMETALLIC UNDERGROUND CONDUIT (EB)

A. Material: PVC, plastic schedule 40, designed for concrete encased applications. Comply with NEMA TC-6 and TC-8, and ASTM F512 for utility duct, and ETL-listed.

B. No special cutting or tapering devices required.

C. Joints shall be made with solvent-type cement.

D. Provide duct end bells for termination into manholes.

E. Fittings, elbows, and accessories, shall be manufactured by conduit manufacturer, and be of same material.

F. Prohibited for interior use. Allowed in concrete slabs and walls.

2.04 PULLBOXES AND JUNCTION BOXES

A. Hazardous areas: UL-approved for area classification.

B. Where required for elbows, fittings, and accessories to be furnished by same manufacturer as conduit, boxes shall also be furnished by conduit manufacturer or by supplier approved by manufacturer.

2.05 MANHOLES

A. Hardware:
   1. Support cables on walls by means of heavy-duty, nonmetallic cable racks.
   2. Cable rack shall consist of stanchion attached to manhole wall in accordance with manhole manufacturer’s recommendations with adjustable arms that lock into stanchion.
   3. Cable rack arm lengths shall be appropriate for manhole size and cable being installed. Install at least (2) spare arms at each stanchion.
   4. Provide holes or slots in arms for cable wire ties.
   5. Cable rack capabilities shall exceed load capacity requirements of cable installed.

B. Insulators not required.
PART 3  EXECUTION

3.01 INSTALLATION - GENERAL

A. Coordinate timing of installation and locations of raceway with other trades. Do not block access or impede construction.

B. Locations of raceway indicated on Drawings are approximate. Coordinate actual locations in field to avoid conflicts with other equipment.

C. Areas designated for, but not limited to; access, maintenance, hatchway, equipment removal, and expansion shall be kept clear of field-routed raceway.

D. Use expansion fittings where necessary. When expansion or deflection will be greater than 6” (152 mm) or greater than fitting is designed to accommodate, provide junction boxes solidly mounted on each side of expansion joint and connect with flexible, liquidtight conduit, or adjust conduit sections to limit expansion to less than 6” (152 mm).

E. Support raceway independently from equipment, and temporary or movable structures.

F. At minimum, identify raceways at both ends with raceway numbers provided by Engineer. Markers shall be adhesive, UV-resistance type with 1” (25 mm) high lettering.

3.02 USES AND LIMITATIONS

A. Refer to NEC for guidelines regarding use, and limitation of each type of conduit. Follow NEC except as specified otherwise herein, or as shown on Drawings.

B. RGS: Do not use underground except as stub-ups and apply corrosion protection. Do not mix aluminum fittings with steel conduit and vice versa.

C. PVC and EB: Use Schedule 80 PVC conduit encased in concrete for installation under heavy traffic areas.

3.03 RIGID CONDUIT

A. Conduits not shown on Drawings shall be sized in accordance with NEC. Minimum size: 3/4” (19 mm).

B. Conceal conduit in finished areas.

C. Drainage: Avoid water pockets in conduit runs; provide suitable fittings at low spots in exposed conduit where pockets cannot be avoided. Weep holes not permitted in conduit.

D. Conduit ends:
   1. Cap spare conduits with fittings designed for intended use.
   2. Conduit terminating in panels or enclosures where exposed to entrance of foreign material shall be plugged with commercial duct-sealing compound around conductors.
   3. Cap conduit ends during construction to prevent entrance of foreign material.

E. Where practicable, provide 3” (75 mm) stubbed up conduit for conduit entering into bottom of freestanding equipment. Coordinate locations with equipment. Terminate with grounding bushings.

F. Clean and swab inside of conduit by mechanical means to remove foreign materials and moisture before wires or cables are installed. Cleaning method shall not damage interior surface of conduit.
G. Bushings: Provide at termination of conduit not terminated in hubs and couplings. Insulating bushings with 150°C rated insulating inserts in metal housings shall be provided on conduit 1-1/4" (31 mm) and larger. Insulating bushings shall be grounding type. Standard bushings shall be galvanized.

H. Apply coat of zinc chromate to zinc-coated conduits where protective coating is damaged.

I. Couplings and unions:
   1. Threaded conduit couplings shall join metal conduit with conduit ends butted. Where standard threaded couplings cannot physically be used, join metal conduit using conduit unions or split couplings.
   2. Use ground-seat type, watertight unions where union may be submerged.

J. Bends: Run of conduit shall not contain more than equivalent of three 90° bends, including offsets. Use only manufacturer-approved conduit bending equipment. Do not use deformed or crushed conduits.

K. Threads: Cut ends of conduit with saw; do not use wheel cutter. Conduit end shall have same number of threads as present from factory. Apply coat of zinc chromate to steel conduit threads and apply anti-seize compound containing powdered zinc or lubricating graphite to aluminum conduit threads.

L. Use expansion joints as required such that no more than 6" (152 mm) allowance for expansion or contraction of conduit occurs. Steel fittings shall provide grounding continuity.

3.04 CONDUIT SUPPORTS

A. Supports of structural steel or manufactured framing members shall be fabricated from lightweight channel approved by manufacturer for intended use, provide required rods, anchors, inserts, clamps, spacers, shims, bolts and accessories.

B. Clamps: Galvanized malleable iron 1-hole straps, beam clamps, or other device with necessary bolts and expansion shields.

C. Adjustable hangers: Use to support horizontal runs only. Use trapeze-type supports for parallel runs of conduit. Install U-bolts at end of each run and at each elbow. Install conduit clamps every third intermediate hanger for each conduit. Hanger rods shall be 3/8" (10 mm) minimum diameter threaded galvanized steel rods.

D. Conduits supports mounted on concrete surfaces: Fasten with self-drilling tubular expansion shell anchors with externally split expansion shells, single cone expanders, and annular break-off grooved chucking cones.

3.05 PENETRATIONS

A. Provide required penetrations in floors and walls. Penetrations shall be kept to minimum, as small as possible, and installed in neat manner. Restoration of surrounding surfaces damaged during installation of penetrations shall be included as part of this work.

B. Seal penetrations in floors and enclosures. Provide fire stops for electrical raceway penetrations. Maintain original fire rating that existed prior to commencement of work. Do not install fire seal for wire openings until interconnecting wiring of equipment is proven to operate properly.

C. Sleeves:
   1. Provide for passage of conduits through walls, floors, or partitions. Set sleeves in masonry during construction; set sleeves through concrete before placement begins.
   2. Material: Rigid conduit or pipe securely fastened in position.
3. Cut sleeve flush with floor where conduit enters equipment enclosure otherwise extend sleeve 3” (75 mm) above floor.
4. Sleeves through exterior building walls: Install conduit in center of sleeve. Pack interior and exterior annular space around conduit with plastic backer rod sized to fit annular space in compression as recommended by backing manufacturer. Seal interior and exterior of joint with acrylic polymer sealant.
5. Sleeves through waterproof construction shall be flanged type.

D. Penetrations required after footings, walls, or floors are constructed shall be provided and grouted or sealed. Openings shall be core-drilled, do not jackhammer.

E. Patch and finish openings made in existing walls and floors to match original material in composition and appearance.

3.06 CONDUIT INSTALLED UNDERGROUND

A. Concrete encased underground duct may be Type EB, unless noted otherwise. Verify by calculation that hydraulic force on bottom duct does not exceed theoretical collapse pressure of duct. Use thicker wall duct as required, unless a sequential pour technique is used.
   1. Standard conduit size 5” in all ducts unless shown otherwise on drawings.
   2. Provide (1) empty 2” communication conduit in all ductbanks.

B. Elbow that stubs up at end of a conduit run shall be RGS conduit and shall be bonded to grounding system. Provide required fittings and accessories for connection of RGS conduit to nonmetallic conduit.

C. Install duct runs and manholes at elevations consistent with project requirements. Top of duct banks shall be below frost line or at 36” (915 mm) below finished grade elevation, whichever is deeper, unless indicated otherwise. Provide extension rings on manholes as required to bring opening flush with finished surface.

D. Utilize duct spacers, both vertically and horizontally, to support runs of concrete encased ducts. Install duct spacers 8’ (2.4 m) maximum on center, unless specified otherwise. Brace duct runs during concrete placement to prevent floating. Concrete blocks and wood spacers or braces in concrete encasement are not acceptable, and iron ties or straps shall not be used around single ducts, but may be used around whole duct run. Wire duct tie downs are prohibited. Nylon tie downs shall be used to hold down ducts to spacer.

E. Crown duct runs between manholes at midpoint of run to allow drainage back into manholes. Slope shall be minimum of 1/32” per foot (0.8 mm per meter) of slope. Duct runs from stub-ups back to manholes shall maintain same slope. Provide end bell fittings at terminations of conduits into manholes.

F. Install ground cable and connect to ground system on both ends of duct bank. Place ground cable in concrete, and above direct buried conduits.

G. Concrete work:
   1. Duct bank concrete shall be poured without forming, provided trench walls do not cave; otherwise, use forms. Make trench no wider than necessary to provide nominal size concrete thickness.
   2. Tie down conduits to prevent floating during concrete pouring.
   3. Remove foreign substances from conduits before pouring concrete.
   4. Use splashboard to divert flow of concrete away from trench sides, and avoid dislodging soil and stones. Prevent loose excavated material from falling into trench during concrete pouring.
   5. Pour each section of duct bank complete in one operation; if this is not feasible, provide construction joint using rigid steel conduit 5’ (1.5 m) on each side of joint.
   6. Begin concrete pouring at 1 end of duct bank, working toward other end, to allow free end to move. Do not pour concrete from each end toward center.
   7. Do not use mechanical vibrators.
8. Provide red coloring in concrete.
9. Use reinforcing rods in concrete encasement for all ductbanks. A rebar 4-bar cage shall be used.

H. Adjust duct footage at each tie-in to account for expansion and contraction due to variations in temperature anticipated during installation. Backfill terminated duct runs from tie-in point toward other end. If trench must be left open, do not terminate run. Consult with manufacturer for coefficient of thermal expansion properties.

I. Use expansion joints as required such that no more than 6” (150 mm) allowance for expansion or contraction of conduit occurs.

J. After construction of duct bank is complete, pull mandrel through each duct. Mandrel shall be 1/4” (6 mm) smaller in diameter than duct. If obstruction is encountered, or if there is evidence of water pocket, that section of duct bank shall be located, removed, and rebuilt with no schedule delay and additional cost to Owner.

K. Underground utility marking tape for below grade raceway systems:
   1. Provide solid aluminum foil core tapes for protection, location, and identification of underground utility installations.
   2. Meet or exceed industry standards for APWA color code.
   3. Resist degradation from acids and alkalis found in soil.
   4. Contain environmentally safe lead-free pigments and organic lead-free ink identifying type of utility line it protects.
   5. Provide width of tape appropriate for detection of conduit at required depth of installation.
      a. Use 3” wide, yellow, polyethylene film tape for buried cable marker.
      b. Bury 1'-0" above high voltage conduit.
      c. Required wording “Danger – High Voltage Cable” or similar.

L. Support wireways and boxes independently of conduits by means of bolts, screws, rod hangers, and other suitable means.

3.07 MANHOLES

A. Install in accordance with manufacturer’s instructions.

B. Remove material as required for proper alignment and elevation of work. Backfill and grade area to match final grade elevations. Backfill material shall be clean and free of stones.

C. Provide extension rings as required to meet final finished elevations.

END OF SECTION

1) R.L. Boudreaux
2) G.H. Ogg
PART 1   GENERAL

1.01 SECTION INCLUDES

A. Above grade conduit, wireway, boxes, and associated accessories for support, securing, and protection of electrical wiring.

1.02 INFORMATIONAL SUBMITTALS

A. Product Data:
   1. List of proposed materials identifying manufacturer and type to be furnished.
   2. Manufacturer’s catalog sheets, marked as necessary to indicate specific type, model or catalog number for equipment to be furnished for project.

B. Quality assurance data:
   1. Component and accessories data sheets.
   2. Installation information.

C. Such other similar information as Engineer may request.

1.03 QUALITY ASSURANCE

A. Manufacturer’s qualifications:
   1. Manufacturer shall be manufacturer of major components within assembly and shall be ISO certified.
   2. Manufacturer shall have produced similar equipment for a minimum period of 5 years.

B. Regulatory requirements
   1. Equipment shall be designed and manufactured in accordance with applicable requirements of following: NFPA 70; ANSI C80.1, C80.3, C80.4, C80.5; UL 1, UL 6, UL 360, UL 651, UL 797, UL 870, UL 1242; and NEMA TC2, TC3, TC6, TC9, and RN1.
   2. Standards of foreign organizations shall not be used without written approval from Engineer.

PART 2   PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Raceway systems and accessories shall include, but not be limited to:
   1. Exposed and concealed conduit.
   2. Elbows, fittings, and accessories.
   3. Hardware for support, securing, and protection.
   4. Wireways.

2.02 RIGID METAL CONDUIT, STEEL (RGS)

A. Material: Mild steel tube with continuous welded seam in accordance with ANSI C80.1, and UL 6.

B. Exterior and Interior protective coating: Metallic zinc applied by hot-dip galvanizing or electro-galvanizing. Apply final coat of transparent zinc chromate to exterior. Exterior and interior coatings applied to conduit shall afford sufficient flexibility to permit field bending without cracking or flaking.

C. Thread pitch shall conform to ANSI/ASME B1.20.1. Taper shall be 3/4”/ft (62.5 mm/m).

D. Each length of conduit shall have UL listing label.

E. Couplings, unions, and fittings: Threaded-type, galvanized steel.
F. Conduit bodies: Threaded or threadless type, cast metal or malleable iron type with zinc or cadmium coating. Covers shall have solid gaskets and captive screw fasteners.

G. Running thread not acceptable.

2.03 ELECTRICAL METALLIC TUBING (EMT)

A. Material: Hot-dipped galvanized, high-grade steel with continuously welded seam.

B. External protective coating: Metallic zinc applied by hot-dip galvanizing or electro-galvanizing. Coating shall not flake or crack when conduit is bent.

C. Internal coating: Baked enamel or similar compound resulting in smooth surface.

D. Fittings: Rust-resistant steel compression type. Connectors shall have insulated insert in throat. Die-cast aluminum material, and indent or set screw type, are not acceptable.
   1. All steel set screw fittings may be sued for interior locations.

E. Conduit bodies: Malleable iron for use with compression type fittings. Set screw type not acceptable.

2.04 FLEXIBLE METAL CONDUIT (FMC)

A. Material: Galvanized mild steel.

B. Construction: One continuous length of steel strip of uniform weight and thickness and shaped in interlocking convolutions; fabrication shall result in smooth interior and exterior surfaces, reduced or full wall.

C. Fittings: All steel, compression type fittings.

2.05 PULLBOXES AND JUNCTION BOXES

A. General use areas, protected or indoor: Galvanized sheet steel with a metal thickness meeting UL 50. Provide removable covers attached with round head silicon bronze machine screws.

B. Process or wet locations, indoor or outdoor: Galvanized cast iron box and cover with neoprene gasket attached with stainless steel hardware using raintight hubs.

C. Hazardous areas: UL-approved for area classification.

D. Where required for elbows, fittings, and accessories to be furnished by same manufacturer as conduit, boxes shall also be furnished by conduit manufacturer or by supplier approved by manufacturer.

2.06 WIREWAY

A. Metal gage thickness shall conform to NEC.

B. NEMA 1: Minimum 16-gage steel with baked enamel finish, hinged or removable covers with captive stainless steel screws.

C. NEMA 3R: Minimum 16-gage galvanized steel with baked enamel finish, gasketed drip-shield cover, with stainless steel screws, weatherproof.

D. NEMA 4X: Minimum 14-gage Type 304 stainless steel with neoprene gasket, hinged cover, stainless steel external screw clamps, and external mounting tabs.
E. NEMA 12: Minimum 16-gage steel with baked enamel finish with gasketed, hinged cover with stainless steel screws, dust-tight.

F. Screws shall be guarded to prevent damage to wire installation.

G. Provide fittings, supports, end plates, and accessories as required.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Coordinate timing of installation and locations of raceway with other trades. Do not block access or impede construction.

B. Locations of above grade raceway indicated on Drawings are approximate. Coordinate actual locations in field to avoid conflicts with other equipment.

C. Areas designated for, but not limited to; access, maintenance, hatchway, tube removal, and expansion shall be kept clear of field-routed raceway.

D. Exposed raceway runs shall be installed parallel or perpendicular to dominant surfaces with right-angle turns made with symmetrical bends or fittings.

E. Install exposed raceway minimum of 6” (150 mm) from outside surface of insulation and lagging on hot water pipes, steam pipes, and other heat sources. Install minimum of 12” (300 mm) from uninsulated heat sources. Avoid long runs parallel to heat sources.

F. Use expansion fittings where necessary. When expansion or deflection will be greater than 6” (152 mm) or greater than fitting is designed to accommodate, provide junction boxes solidly mounted on each side of expansion joint and connect with flexible, liquidtight conduit, or adjust conduit sections to limit expansion to less than 6” (152 mm).

G. Support raceway independently from equipment, and temporary or movable structures.

H. At minimum, identify raceways at both ends with raceway numbers provided by Engineer. Markers shall be adhesive, UV-resistance type with 1” (25 mm) high lettering.

3.02 USES AND LIMITATIONS

A. Refer to NEC for guidelines regarding use, and limitation of each type of conduit. Follow NEC except as specified otherwise herein, or as shown on Drawings.

B. EMT: Use for concealed wiring in finished areas associated with lighting and small power circuits rated 600 volts or less. Do not use outdoors in concrete, or in damp or wet locations. Acceptable for use in nonhazardous, indoor, unfinished areas for lighting and communication, and specialty wiring.

3.03 RIGID CONDUIT

A. Conduits not shown on Drawings shall be sized in accordance with NEC. Minimum size 1/2” (13mm).

B. Conceal conduit in finished areas.

C. Drainage: Avoid water pockets in conduit runs; provide suitable fittings at low spots in exposed conduit where pockets cannot be avoided. Weep holes not permitted in conduit.

D. Conduit ends:
   1. Cap spare conduits with fittings designed for intended use.
2. Conduit terminating in panels or enclosures where exposed to entrance of foreign material shall be plugged with commercial duct-sealing compound around conductors.
3. Cap conduit ends during construction to prevent entrance of foreign material.

E. Where practicable, provide 3” (75 mm) stubbed up conduit for conduit entering into bottom of freestanding equipment. Coordinate locations with equipment. Terminate with grounding bushings.

F. Clean and swab inside of conduit by mechanical means to remove foreign materials and moisture before wires or cables are installed. Cleaning method shall not damage interior surface of conduit.

G. Bushings: Provide at termination of conduit not terminated in hubs and couplings. Insulating bushings with 150°C rated insulating inserts in metal housings shall be provided on conduit 1-1/4” (31 mm) and larger. Insulating bushings shall be grounding type. Standard bushings shall be galvanized.

H. Apply coat of zinc chromate to zinc-coated conduits where protective coating is damaged.

I. Couplings and unions:
   1. Threaded conduit couplings shall join metal conduit with conduit ends butted. Where standard threaded couplings cannot physically be used, join metal conduit using conduit unions or split couplings.
   2. Use ground-seat type, watertight unions where union may be submerged.
   3. Install coupling nut in upper-most union to prevent entrance of water into union when used in vertical or inclined conduit runs.

J. Bends: Run of conduit shall not contain more than equivalent of three 90° bends, including offsets at outlets or fittings. Use only manufacturer-approved conduit bending equipment. Do not use deformed or crushed conduits.

K. Threads: Cut ends of conduit with saw; do not use wheel cutter. Conduit end shall have same number of threads as present from factory. Apply coat of zinc chromate to steel conduit threads and apply anti-seize compound containing powdered zinc or lubricating graphite to aluminum conduit threads.

L. Use expansion joints as required such that no more than 6” (152 mm) allowance for expansion or contraction of conduit occurs. Steel fittings shall provide ground continuity.

3.04 FLEXIBLE CONDUIT

A. Connect equipment that moves due to vibration, normal operation of mechanism, or thermal expansion, in relation to supported conduit using flexible conduit. Install junction boxes as required. Provide green ground wire.

B. Flexible metal conduit 1-1/2” (38 mm) and larger shall be installed with external lugs and external grounding conductor.

3.05 SPECIAL FITTINGS

A. Fittings installed outdoors or in damp locations shall be weathertight. Outdoor fittings shall be of heavy-duty construction.

3.06 CONDUIT SUPPORTS

A. Supports of structural steel or manufactured framing members shall be fabricated from lightweight channel approved by manufacturer for intended use, provide required rods, anchors, inserts, clamps, spacers, shims, bolts and accessories.
B. Clamps: Galvanized malleable iron 1-hole straps, beam clamps, or other device with necessary bolts and expansion shields.

C. Adjustable hangers: Use to support horizontal runs only. Use trapeze-type supports for parallel runs of conduit. Install U-bolts at end of each run and at each elbow. Install conduit clamps every third intermediate hanger for each conduit. Hanger rods shall be 3/8” (10 mm) minimum diameter threaded galvanized steel rods. Perforated pipe strap or wire hangers are not permitted.

D. Conduits supports mounted on concrete surfaces: Fasten with self-drilling tubular expansion shell anchors with externally split expansion shells, single cone expanders, and annular break-off grooved chucking cones.

3.07 PENETRATIONS

A. Provide required penetrations in floors, walls, or roofs. Penetrations shall be kept to minimum, as small as possible, and installed in neat manner. Restoration of surrounding surfaces damaged during installation of penetrations shall be included as part of this work.

B. Seal penetrations in walls, floors, ceilings, and enclosures. Provide fire stops for electrical raceway penetrations. Maintain original fire rating that existed prior to commencement of work. Do not install fire seal for wire openings until interconnecting wiring of equipment is proven to operate properly.

C. Sleeves:
   1. Provide for passage of conduits through walls, floors, or partitions. Set sleeves in masonry during construction; set sleeves through concrete before placement begins.
   2. Material: Rigid conduit or pipe securely fastened in position.
   3. Cut sleeve flush with floor where conduit enters equipment enclosure otherwise extend sleeve 3” (75 mm) above floor.
   4. Sleeves through exterior building walls: Install conduit in center of sleeve. Pack interior and exterior annular space around conduit with plastic backer rod sized to fit annular space in compression as recommended by backing manufacturer. Seal interior and exterior of joint with acrylic polymer sealant.
   5. Sleeves through waterproof construction shall be flanged type.

D. Penetrations required after walls, floors, or ceilings are constructed shall be provided and grouted or sealed. Openings shall be core-drilled, do not jackhammer.

E. Patch and finish openings made in existing walls and floors to match original material in composition and appearance.

F. Cut or punch penetrations in wall panels. External penetration shall be flashed and caulked to provide weather tight seal.

G. Limit penetrations in roofs to applications where required for connection to specific piece of equipment. When required, flash and apply seal material after installation of conduit to provide weathertight bond and seal. Materials shall be compatible with roofing system.

3.08 WIREWAY AND BOXES

A. Installed in accordance with manufacturer's recommendations.

B. Connections shall be made such that they maintain NEMA rating of enclosure and system.

C. Locations and quantities shown on Drawings are approximate. Make adjustments as required to eliminate field interferences or to meet requirements of NEC. Provide Engineer with information regarding new locations.
D. To access interior, locate to permit full removal of covers, or such that doors can be opened more than 100°. Mount at height as indicated, or as required by NEC, whichever is more restrictive.

E. Support wireways and boxes independently of conduits by means of bolts, screws, rod hangers, and other suitable means.

END OF SECTION

1) R.L. Boudreaux
2) G.H. Ogg
PART 1  GENERAL

1.01  SECTION INCLUDES

A. Cable tray system including, but is not limited to, tray sections, fittings, covers, connection hardware, end plates, supports, and necessary hardware.

1.02  INFORMATIONAL SUBMITTALS

A. Product Data:
   1. List of proposed material identifying manufacturer and type to be for complete job.
   2. Manufacturer’s catalog sheets, marked as necessary to indicate specific type, model or catalog number for equipment to be furnished.
   3. Component and accessories data sheets.

B. Quality assurance data: Manufacturer’s installation information.

C. Such other similar information as Engineer may request.

1.03  QUALITY ASSURANCE

A. Manufacturer’s qualifications:
   1. Manufacturer shall be manufacturer of major components within assembly and shall be ISO certified.
   2. Manufacturer shall have produced similar equipment for a minimum period of 5 years.

B. Regulatory requirements
   1. Equipment shall be designed and manufactured in accordance with applicable requirements of following; NFPA 70; ANSI C80.1, C80.3, C80.4, C80.5; UL 1, UL 6, UL 360, UL 651, UL 797, UL 870, UL 1242; and NEMA TC2, TC3, TC6, TC9, and RN1.
   2. Standards of foreign organizations shall not be used without written approval from Engineer.

PART 2  PRODUCTS

2.01  SYSTEM DESCRIPTION

A. Cable tray system shall be capable of supporting low-voltage control cables and instrumentation cables, low-voltage power cable rated 600 volts and below and medium-voltage power cable rated 601 volts to 26 kV.

2.02  CABLE TRAY AND FITTINGS

A. Provide complete and coordinated cable tray system of size, type and arrangement as shown on Drawings.

B. Construction:
   1. Material: Roll-form structural steel in accordance with ASTM A570 or ASTM A611; hot-dip galvanized after fabrication in accordance with ASTM A123.
   2. Trough-type with ventilated bottom and solid longitudinal side rails.

C. Cable tray widths: Manufacturer’s standard 9” (230 mm), 12”(300 mm), 18” (460 mm), 24” (600 mm), 30” (750 mm), and 36” (900 mm) as indicated on drawings.

D. Tray and fittings depth: 4” (100 mm) minimum loading depth.
E. Minimum internal bending radius: 12” (300 mm). Adjust radius to meet bending radius requirements of cable.

F. Rungs shall have flat top surface with rounded edges to prevent cable damage.

G. Installation indoors: Provide for minimum working load classification of 75 lb/lin ft (112 kg/lin m), 12’ (3.5 m) support span, 1.5 safety factor., with supports a maximum of 12'-0” (3.5 m) spacing.

H. Installation outdoors: Provide for minimum working load classification of 75 lb/lin ft(112 kg/lin m), 20' (6 m) support span, 1.5 safety factor, with supports a maximum of 20'-0” (6 m) spacing.

I. In addition to above working loads, tray and supports shall be capable of withstanding 200 lb concentrated static load applied at mid-span between supports without damage.

J. Ladder tray shall have minimum 9” (225 mm) rung spacing with side rail flanges on outside of tray.
   1. Aluminum tray and fittings shall be suitable as equipment-grounding conductor meeting requirements of NEC for minimum 1,000-ampere rating, and minimum 0.60 sq in (39 mm²) metallic cross section.
   2. Steel tray and fittings shall be suitable as equipment-grounding conductor meeting requirements of NEC for 400-ampere rating, and minimum 0.40 sq in (26 mm²) metallic cross section.
   3. Aluminum and steel trays shall have rungs welded to side rails.
   4. Install fiberglass cable tray and fittings in corrosive areas. Fiberglass tray installed outdoors shall be UV sunlight-resistant by use of additive to material during manufacturing, and surface-applied protective veil. Repair scratches with veil material prior to completion of work. Furnish minimum of 2 cans of spare touch-up veil material for maintenance personnel.
   5. Install solid bottom tray and fittings where shown on Drawings.

K. Finish:
   1. Hot-dip galvanized or zinc-coated after welding and fabrication for steel.

2.03 HARDWARE

A. Connecting hardware for aluminum and steel tray, fittings, and accessories shall be zinc-plated and shall maintain solid electrical connection for grounding path.

B. Fiberglass tray shall use Type 316 stainless steel bolts, nuts, and washers.

2.04 SPLICE PLATES

A. Splice plates for connecting tray sections to each other and to fittings shall match cable tray systems. Furnish in pairs.

B. Provide expansion plates for horizontal or vertical straight run tray lengths exceeding 60 lin ft (18 lin m) for aluminum tray and 120 lin ft (36 lin m) for steel tray. Expansion plates shall allow minimum of 1” (25 mm) expansion.

C. If required, provide adjustable hinged connector plates for minor horizontal or vertical offsets.

D. Prior to assembly, coat contact surfaces of aluminum connections to be coated with antioxidant compound.

E. Expansion connectors and hinged adjustable connectors shall have bonding jumpers minimum No. 1/0 AWG copper or prefabricated aluminum or copper braid.

2.05 TRAY COVERS

A. Fully ventilated, solid flanged covers matching tray material for protection of cables.
B. **Material:**
1. Aluminum covers: Flanged type with 1/2" (13 mm) side flanges, minimum 0.040" (1 mm) thick, sized to fit tray width and fittings styles; aluminum joint strips between cover sections.
2. Steel covers: Minimum 20-gage (0.9 mm) steel, pregalvanized with 1/2" (13 mm) side flanges, sized to fit tray width and fitting styles; galvanized steel joint strips between cover sections.

C. Peak exterior tray covers minimum 1/2" (13 mm) rise for water shedding.

### 2.06 TRAY COVER CLAMPS

A. Provide hold-down clamps for covers installed indoors. Provide standoffs for bolting covers to tray outdoors.

B. **Material:** Aluminum, galvanized steel with zinc-plated hardware, or fiberglass to match tray material.

C. Clamps at expansion joints shall be guide-type to allow slide movement of tray at support.

D. Provide cover clips and standoffs in quantities as recommended by manufacturer.

### 2.07 CONDUIT-TO-TRAY CLAMPS

A. Clamps designed for conduit takeoffs from cable tray shall be UL-listed as acceptable grounding means.

B. Conduits not directly attached to trays that receive cables from tray shall have grounding bushings with stranded copper-bonding jumper from bushing to tray.

### 2.08 BOX CONNECTORS

A. Aluminum, galvanized steel, or fiberglass, as required, size for tray loading depth.

### 2.09 TRAY SUPPORTS

A. Provide tray supports in accordance with manufacturer’s recommendations unless indicated otherwise. Strictest requirement shall apply.

B. Trapeze support rods: 1/2" (13 mm) all-thread; 13 threads per inch, zinc-plated with minimum working load of 1,130 lb (512 kg) and safety factor of 5.

C. Preformed channel:
   1. Minimum 12-gage (2.5 mm) carbon steel with pregalvanized zinc coating.
   2. Nominal dimensions: 1.625" x 1.625" (41 mm x 41 mm) with 9/16" x 7/8" (14 mm x 22 mm) slots on 2" (50 mm) centers.

D. Preformed channel nuts, connector bolts, locknuts, nuts, and washers shall be zinc-plated.

E. Hanger rod beam clamps:
   1. Unfinished iron or zinc-plated steel designed to clamp onto beam flanges up to 1" (25 mm) thick with case-hardened 5/8" x 11" (16 mm x 28 cm) steel set screw.
   2. Clamp shall have 1/2" (13 mm) x 13-tapped hole for 1/2" (13 mm) rod.
   3. Safe working load of clamp shall be minimum 900 lb (408 kg).

F. Trapeze support beams:
   1. Preformed channel, minimum 12-gage (2.5 mm) carbon steel with pregalvanized zinc coating.
   2. Dimensions: 3-1/4" deep x 1.625" wide (80 mm deep x 41.3 mm wide) with 9/16" x 7/8" (14 mm x 22 mm) slots on 2" (50 mm) centers.
PART 3  EXECUTION

3.01  INSTALLATION

A. Install tray level and with sections properly aligned.
B. Do not permit workers to stand, walk, sit, or lay in tray.
C. Where tray galvanizing is drilled out, cut, or damaged during installation, coat damaged portion with rust-inhibitor and paint with one coat of zinc-enriched paint.
D. Edges, fittings, and hardware shall be finished free from burrs and sharp edges.
E. Trays installed outdoors shall be installed with cable tray covers on top tray for UV protection.
F. Trays installed indoors under walkways or platforms shall be installed with cable tray covers on top tray.
G. Tray covers shall be ventilated and shall be secured in accordance with manufacturer’s recommendations.

3.02  ROUTING

A. General routing of cable tray is shown on Drawings without reference to detailed dimensions. Elevations and penetrations are also shown as approximate. Proposed deviations of general routing shall be pre-approved by Owner.
B. Establish reference dimensions and coordinate routing, placement of supports, and hanger rods with other project activities and contractors to avoid piping, steel, and equipment interferences.

3.03  SUPPORTS

A. Contractor shall be responsible for complete layout and location of supports.
B. Provide supports for cable tray in accordance with manufacturer’s recommendations and at maximum spacing of 12’ (3.5 m) indoors and 20’ (6 m) outdoors.
C. Maintain mechanically strong and rigid installation suitable for supporting wire carried and capable of maintaining electrical continuity.
D. Provide supplementary support steel as necessary to hang and support tray system.

3.04  DIRECTIONAL CHANGES AND SPACING

A. Change horizontal or vertical directions by stacking and bolting tray together at flange.
B. Provide bonding jumpers at directional changes to maintain grounding integrity.
C. Provide fittings as necessary.
D. Installation shall allow sufficient space around cable tray to permit easy installation of conductors and installation or removal of cover.

3.05  PENETRATIONS

A. Provide cable tray penetrations through floors, walls, ceilings, and roofs where necessary to meet project requirements.
B. Seal tray penetrations with fire-sealing material after cable and wires have been installed and tested. Fire sealant shall be approved for intended use and rated equal to or greater than rating of penetrated structure.

3.06 CIRCUIT SEGREGATION

A. Route medium-voltage circuits in dedicated tray.
B. Route low-voltage motor and power feeder circuits in dedicated tray.
C. Route low-voltage control circuits and dc circuits in control tray.
D. Route instrumentation circuits in dedicated tray or combined with other circuits by use of divider as where so indicated.

3.07 GROUNDING AND BONDING

A. Ground cable tray system in accordance with NEC requirements, Drawings, and specifications.
B. Tray system shall be electrically continuous.
C. Tray-to-tray connections shall be bolted-type, meeting electrical continuity requirements of NEMA VE1.
D. Provide copper bonding jumper at discontinuities in tray system.
E. Ground each end of tray to building ground grid or to equipment with copper bonding jumper.
F. Ground long runs of tray every 100’ (30 m) with copper bonding jumper.
G. For fiberglass trays and trays used for low-voltage and medium-voltage power cables, run separate ground length of tray. Separate ground shall be minimum 1/0AWG bare copper cable bonded to every tray section and to ground every 100’ and to equipment at both ends.

3.08 EXPANSION JOINTS

A. Install expansion slice plate where cable tray spans building joints or 2 structures.
B. Cable tray straight run: Install expansion splice plates every 120’ (36 m) for steel tray and 60’ (18 m) for aluminum tray in areas with maximum 100°F (38°C) differential.
C. Anchor cable tray at support closest to midpoint between expansion splice plates. Install expansion guides at supports between anchor and expansion splice plates.

3.09 BOX CONNECTORS

A. Install at locations where trays connect to equipment enclosures.

END OF SECTION

1) R.L. Boudreaux
2) G.H. Ogg
PART 1    GENERAL

1.01 SECTION INCLUDES

A. Medium-voltage metal-clad switchgear and accessories, rated 27 kV and below.

1.02 WORK BY OTHERS

A. Switchgear foundations and supports.

B. Receiving, unloading, and storage.

C. Final placement, leveling, and assembly.

D. External power, control, and grounding terminations.

1.03 INFORMATIONAL SUBMITTALS

A. Submit with Bid:
   1. Completed Data Sheets.
   2. Preliminary outline drawings of switchgear including, but not limited to:
      a. Dimensions of complete line-up. Dimensions shall include estimated values as well as all
         worst case values for the design of the PDC Building to house the switchgear.
      b. Maximum achievable shipping split sections with dimensions.
      c. Weight of complete line-up.
      d. Weight of each shipping section.
   3. List of proposed equipment including model numbers, description of breakers, current
      transformers, voltage transformers, fuses, relays, control switches, and other devices.
   4. Information as defined in ANSI C37.12.
   5. List of special equipment required for operation and maintenance of switchgear.
   6. List of recommended “start-up” and “running” spare parts with current (good for one year) prices.
   7. List of items requiring field assembly.
   8. Recommended long term and short-term storage requirements, and procedures.
  10. Geographical location of switchgear and breaker manufacturing facilities.
  11. Manufacturing schedule.
  12. Nearest geographical location of field service personnel.
  13. For arc-resistant switchgear, copies of type tests to meet IEEE C37.20.7.

B. Product Data:
   1. Complete instruction manuals and software for protective relays, metering equipment,
      instrumentation.

C. Quality assurance data:
   1. Certified shop test reports.
   2. Proposed test schedules.

1.04 ACTION SUBMITTALS

A. Shop Drawings:
   1. Complete and accurate Data Sheets.
   2. Certified outline and general arrangement drawing including front view, dimensions, floor plan,
      weight (shipping and installed), anchor locations, lifting points, center of gravity, enclosure
      construction, layout of accessories and shipping sections.
   3. For arc-resistant switchgear, provide certified drawings showing arc chute routing and associated
      ductwork.
   4. Certified drawings of cable termination compartments showing preferred locations for conduit
      entry/exit locations and indicating space available for cable terminations.
5. Nameplate drawing.
6. Nameplate schedule prior to fabricating nameplates.
7. Mimic diagram prior to fabrication
8. Support details.
10. Elementary 3-line diagrams for switchgear, showing voltage transformer and current transformer primary and secondary circuits. Terminal block terminations, device terminal numbers, and internal diagrams shall be shown in detail. Typical drawings are not acceptable.
11. Breaker and relay schematic control diagrams. Provide specific schematic diagram for each breaker. Typical drawings are not acceptable.
12. Complete wiring diagrams showing connections of component devices and equipment.

B. Product Data:
2. Interface coordination details.
3. Information to be furnished as defined in ANSI C37.12.

C. Quality assurance data:
1. Inspection and factory testing schedule.
2. Current transformer saturation, excitation and ratio correction factor curves.
3. Certified copies of factory final test reports.

1.05 CLOSEOUT SUBMITTALS

A. Operation and maintenance manuals. Provide at a minimum:
1. General description and technical data, including actual weights and dimensions.
2. List of instruments and accessories supplied, listing manufacturer, model number, operating ranges, and equipment tag numbers.
3. Receiving, storage, installation, handling, and testing instructions.
4. Operating and maintenance procedures.
5. Complete set of reviewed drawings that require no further action.
6. Data Sheets modified to include field installation conditions.
7. Complete documentation of inspections and tests performed, including logs, curves, and certificates. Documentation shall note any replacement of equipment or components that failed during testing.
8. Recommended spare parts list, including circuit breakers.
9. Bill of Materials including nameplate information and shop order numbers for each item of equipment furnished.
10. Material Safety Data Sheets.
11. Instruction manuals including detailed erection sequence and procedures.

1.06 MAINTENANCE MATERIALS

A. Provide complete set of special tools required for installation of equipment.

B. Tools and their intended use shall be detailed in manufacturer’s assembly instructions.

1.07 QUALITY ASSURANCE

A. Qualifications: Manufacturer shall have produced similar equipment for minimum period of 10 years.

B. Regulatory requirements:
2. For arc-resistant switchgear, standard ANSI/IEEE C37.20.7 applies in addition to above.
3. Equipment manufactured and tested to other standards shall not be used without written approval from Engineer.
1.08 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with manufacturers’ recommendations.
B. Coordinate transportation with requirements of pertinent authorities.
C. Ship switchgear for installation as completely assembled. Where switchgear is installed in separate building ship enclosure complete with switchgear and components installed inside for ease of installation in field.
D. Prepare detailed packing lists and shipping notification.
E. Cover equipment and accessories and protected from damage during shipment. Materials used for shipping shall be acceptable for protecting equipment when manufacturer’s recommended storage procedures are maintained.
F. Power circuit breakers shall be shipped and packaged separately from switchgear structure.

1.09 TEMPORARY POWER

A. Space heaters shall be connected to temporary source of power; capable of being monitored.
B. Maintain temporary power until switchgear is installed and normal power source is permanently energized.

1.10 WARRANTY

A. Manufacturers standard warranty from the date of delivery on all parts, equipment, labor and material associated with the switchgear provided under this Contract. Warranty shall be a minimum of one year.
B. Submit separate prices for extending warranty to 2 and 5 years respectively.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB.
B. Eaton Cutler-Hammer.
C. General Electric.
D. Siemens.
E. Pedersen Power Products.
F. Powell Electric.

2.02 SYSTEM DESCRIPTION

A. Switchgear shall be a complete, coordinated factory assembly ready for installation, connection, and designed for operation at site ambient temperatures and elevations. Switchgear shall include instruments and equipment as specified herein and detailed on Data Sheets and drawings.
B. Attached Data Sheets specify major components and accessories to be provided. Data Sheets do not provide complete parts list or Bill of Materials for scope of work.
C. When one-line drawings are furnished with specifications, drawings are preliminary and intended as an aid in understanding scope of equipment to be provided, unless specifically noted otherwise.

D. If arrangement has been furnished, and detailed engineering design by manufacturer requires rearrangement, coordinate new arrangement with Engineer prior to Bid or drawing submittal.

E. If arrangement changes after award of Contract, submit drawings reflecting actual scope of work and configuration.

F. Switchgear shall be of the same manufacturer as the circuit breakers utilized within the switchgear.

2.03 ENCLOSURE

A. Switchgear assembly shall consist of individual free-standing vertical sections to form a rigid, metal-clad switchgear assembly.

B. Vertical sections shall have metal side sheets of minimum 12-gage steel.

C. Solid removable metal barriers shall isolate major primary sections.

D. Provide safety shutter between bus compartment and breaker cubicle, which will close automatically when circuit breaker is disconnected from bus and removed from connected position.

E. Metal work shall be free from burrs and sharp edges.

F. Expandability:
   1. Switchgear shall be capable of future expansion as specified on Data Sheet without modification to existing switchgear structural members or bus work.
   2. Documentation shall provide adequate information for design of future extensions.

G. Operating height for unit disconnects and other operable controls shall not be more than 6’-6” (2 m) above finished floor.

H. Switchgear enclosure rating shall be as specified on Data Sheets.

I. Gaskets shall be provided to seal doors, and filters shall be provided on all louvers to impede entrance of dust, and falling dirt. Filters shall be easily removable for maintenance.

J. Cable Entrances:
   1. Depth of finished equipment shall be sufficient to allow for entrance, bending, and termination of cables.
   2. Provide minimum clearance between terminal pads and cable entrance, as shown on Data Sheets for either top or bottom entrance.

K. Provide minimum distance of 36” (0.9 m) for termination of cables between cable termination point and window-type current transformer, or cable termination point and cable entrance location if window-type current transformers are not used.

2.04 DOORS

A. Switchgear doors shall open a minimum of 110° to allow for breaker removal with door mounted relays.

B. Doorstops and brackets with detents shall hold doors in fully open position.

C. Front doors shall not open so far as to allow damage to devices mounted on adjacent doors.

D. Front and rear doors shall be made from 12-gauge heavy-duty formed steel with hand-operated triple door latches, and triple-hinges with provisions for padlocking.
1. Front doors for switchgear with 2-high construction shall have separate doors for each compartment.
2. Rear doors of vertical sections for single-high and 2-high construction shall have single, full-height removable door.

2.05 CUBICLE SPACE HEATERS

A. Each cubicle of switchgear shall be furnished with space heater to prevent condensation of moisture.
B. Locate heater in interior of cubicle.
C. Thermally insulate from metal enclosure so no painted surface will be damaged or discolored.
D. Space heaters shall maintain compartment internal temperature at no less then 5° above dew point connected through an adjustable humidistat, factory set.
E. Wire individual heaters to accessible common terminal blocks for connection to single external power source.
F. Refer to Data Sheets for heater rating and power supply information.
G. Protect heater circuits with miniature circuit breaker.
H. When control power transformers are required by Data Sheets:
   1. Size transformer to accommodate cubicle space heater power requirements.
   2. External power source not required.

2.06 AUXILIARY COMPARTMENTS

A. Control and instrumentation compartment shall serve as location for meters, relays, terminal blocks, controls, communication devices, and miscellaneous devices that serve, or are connected to devices that serve, overall switchgear functions and not associated directly with operation of an individual breaker.
B. Bus voltage and current transformer mounted devices shall be wired to terminal blocks located in compartment. Overall switchgear-indicating instruments shall be mounted on door of compartment.
C. Provide wiring required to termination points for outgoing supervisory connections.
D. Spare auxiliary contacts, meter outputs, multifunction relay outputs and inputs, and spare control switch contacts shall be connected to terminal points to facilitate external connection.

2.07 CIRCUIT BREAKER COMPARTMENTS

A. Each compartment shall have screw-type racking mechanism capable of manual operation by field-engaged crank. Each breaker shall have 3 defined stop positions in enclosure: “Connected,” “Test,” and “Withdrawn.”
   1. Racking mechanism shall have mechanical interlocks to prevent insertion, or withdrawal, of circuit breaker with contacts closed.
   2. Provide interlocks to prevent breaker from closing between connected and test positions.
   3. If breaker contacts are closed, contacts shall be opened automatically and stored energy mechanism discharged prior to either inserting or removing breaker from connected position.
   4. Provisions shall be made for padlocking breaker in withdrawn position.
   5. Provisions shall be made to allow breaker-racking operation with compartment door closed.
   6. Each cubicle door shall be capable of being fully closed with breaker in withdrawn position.
   7. Breaker frame shall maintain ground connection in any position.
B. Secondary control circuit contacts shall be stationary mounted within breaker compartment to mate with control circuit contacts on circuit breaker. Contacts shall remain engaged when breaker is racked into test position.

C. Provide remote racking device(s) if specified on Data Sheets.

2.08 CIRCUIT BREAKERS

A. Circuit breakers shall be vacuum interrupting horizontal draw-out type capable of being withdrawn. Ratings shall be as specified on Data Sheets. Breakers shall not be forced cooled in order to achieve maximum rating. Comply with latest version of ANSI C37.04 and C37.06. MVA rated breakers not acceptable.

B. Operating mechanism:
   1. Operating voltage shall be in accordance with Data Sheets.
   2. Mechanically and electrically trip free.
   3. Mechanical operations counter: Visible at front of breaker assembly.
   4. Mechanism shall be capable of manual charging by use of handle.

C. Mechanical indicator shall show breaker position and condition of stored-energy mechanism.

D. Each breaker shall contain 3 vacuum interrupters, separately mounted in self-contained and self-aligning unit, which can easily be removed. Breaker shall be hermetically sealed in high-vacuum and be maintenance free.
   1. Mount unit on either glass polyester or epoxy supports.
   2. Provide contact wear gap indicator for each vacuum interrupter requiring no tools to indicate available contact life. Indicator shall be easily visible.

E. Contacts:
   1. Contact surfaces shall be silver-to-silver, designed and fabricated to be self-aligning and to resist burning and deterioration.
   2. Breaker main contacts shall not touch or arc across into faulted circuit when breaker close signal is received while trip signal is being applied.
   3. Closing speed of moving contacts shall be independent of both control voltage and operator.
   4. Contacts shall have low current chopping characteristics.
   5. Primary disconnect contacts shall be "fingers" that engage cubicle stationary contacts when breaker is moved into operating position.
   6. Secondary control circuit contacts on breaker shall engage stationary control circuit contacts when breaker is moved into connected position.

F. Breaker units of same type and ampere capacity shall be wired alike and shall be mechanically and electrically interchangeable.

G. Grounding:
   1. Provide breaker frame grounding facility for grounding in connected and test positions.
   2. Power circuit breaker ground connection shall be capable of carrying short-circuit rating of circuit breaker for minimum of 2 seconds and also be capable of withstanding peak current value or 2.7 times rated short circuit current of circuit breaker.

H. Provisions on breaker shall be made for operating mechanism-operated auxiliary switch contacts (MOC) (Device 52) and stationary truck-operated cell switch contacts (TOC) (Device 33).

I. Testing:
   1. Provide testing station to permit checking of breaker controls and operation with breakers high-voltage side de-energized and isolated from switchgear bus.
   2. Testing shall be done in fully withdrawn position. Control station shall be wall-mounted.

2.09 AUXILIARY CONTACTS
A. Each breaker shall be furnished with circuit breaker auxiliary contacts, MOCs, and TOCs as required to provide interlocking or control of auxiliary devices. In addition, provide spare contacts in quantities as specified on Data Sheets.
   1. Wire contacts to terminal blocks for ease of maintenance and access to external connection.
   2. Furnish no less than 2 Type “a” and 2 Type “b” spare electrically separate auxiliary contacts mounted on breaker for remote interlocking service.

B. Auxiliary contacts shall be electrically separate. Each contact shall have 20-ampere minimum continuous current rating.

C. MOC contacts shall be activated by circuit breaker mechanism when circuit breaker is in “connected” position only. A minimum of 4 Type “a” and 4 Type “b” spare MOC contacts shall be provided.

D. TOC contacts shall be activated by circuit breaker mechanism when circuit breaker is in “connected,” “test,” or “disconnected” position. A minimum of 4 Type “a” and 5 Type “b” spare TOC contacts shall be provided.

2.10 BREAKER CONTROL

A. Location:
   1. When specified on Data Sheet, a separate breaker control cubicle section shall be provided with all breaker control switches for that switchgear lineup; otherwise, provide breaker control switch on breaker cubicle.
   2. For arc-resistant switchgear, breaker control switches shall be mounted on instrument compartment associated with that breaker cubicle.

B. Breaker control switches:
   1. Provide each breaker with local control switch and breaker truck position switches arranged to provide following control of breaker operation.

   | Breaker Position | Remote | Local |
   |==================|--------|-------|
   |                  | Close  | Trip  |
   | Connected        | Yes    | Yes   |
   | Test             | Yes    | Yes   |

   2. Each circuit breaker local control switch shall have trip-close escutcheon, center normal position, and spring return to normal from close and trip. Furnish with red and green indication lights as shown on Data Sheet. Circuit breaker control switches shall have pistol-grip handles.
   3. Manufacturer: Electroswitch Series 24 or equal with indication as shown on Data Sheet.

C. Trip and close circuits:
   1. Provide terminal pairs wired in trip and close circuits of each breaker for Owner furnished trip and close contacts.
   2. Terminals shall be grouped adjacent to each other.
   3. Unless specified otherwise, quantities shall be:
      a. Trip circuit: 2 pairs.
      b. Close circuit: 2 pairs.

2.11 CONTROL POWER

A. Furnish internal switchgear wiring to distribute single source of control power to each switchgear unit.

B. Control power voltage shall be as specified on Data Sheets.

C. For ac control power:
   1. When required by Data Sheets, provide control power transformer integral to switchgear line-up capable of providing required power.
   2. Provide each breaker with capacitive trip device that stores a minimum of two breaker operations in event of loss of ac control power.
3. Each breaker shall be furnished with 1- or 2-pole, as required, DIN rail-mounted, miniature circuit breakers (MCB) as control power disconnecting and protective device.
4. Provide one for closing circuit and one for tripping circuit.
5. MCBs shall have contacts wired to I/O blocks for common external alarm indication of tripped MCB.

D. For dc control power:
1. Each breaker shall be furnished with 1- or 2-pole, as required, DIN rail-mounted, miniature circuit breakers (MCB) as control power disconnecting and protective device.
2. Provide one set for closing circuit and one set for tripping circuit.
3. MCBs shall have contacts wired to I/O blocks for common external alarm indication of tripped MCB.

E. Power source for closing circuit shall be derived from load side of tripping circuit, such that open trip circuit will render closing circuit inoperative.

F. Provide loss of voltage relay for breaker closing control voltage.
1. Form C contact shall be wired to terminal blocks.
2. Contact shall be used for remote indication.

G. If required on Data Sheet provide self-contained dc control power system within line-up:
1. Provide with voltage as indicated on Data Sheets.
2. Batteries:
   a. Use sealed-type, maintenance-free, lead-acid, gel cell type batteries.
   b. Batteries furnished with minimum 10-year, pro-rated warranty.
3. Battery charger: Size to fully recharge batteries within 8 hours with batteries fully discharged, while simultaneously providing rated power for dc loads.
4. Provide separate, full-height switchgear section for dc control power system.
5. Dc distribution panel with required number of dc rated breakers.
6. Provide required interface between breaker circuitry and relaying for compatibility with dc voltage supply.
7. Provide ventilation or air conditioning for batteries in accordance with code requirements and to meet battery manufacturer's recommendations.
8. Alarms:
   a. Provide Form C contact for remote indication common alarm.
   b. Common alarm shall, at a minimum, include charger malfunction, overload on battery, low-battery voltage, and loss of dc power output.

2.12 MAIN BUS
A. Switchgear main bus shall be copper bar, designed to continuously carry current as specified on Data Sheets without exceeding temperature rise requirements

B. Bus shall meet requirements of latest version of ANSI C37.04, C37.06, and C37.09.

C. Install with rigid, nontracking, fire-resistant, and nonhygroscopic insulating supports capable of withstanding mechanical forces imposed by short-circuit currents greater than or equal to momentary current rating of switchgear.

D. To prevent destructive mechanical strains in bus supports and connections throughout full ambient temperature range as stated on Data Sheets, furnish expansion joints where necessary.

E. Current-carrying connections shall be flat bar and completed by bolting together.

F. Joints shall have silver-to-silver contact surfaces with minimum contact resistance.

G. Design instrument transformer connections to permit removal and replacement of transformers without damage to connections.
H. Insulation:
1. Except at bolted terminations and connection points, coat bus with fluidized bed epoxy-type insulating material molded around and bonded to bus.
2. Voltage rating of insulation shall be greater than or equal to highest voltage rating of switchgear.
3. Bolted joints, expansion joints, external bus connections, terminals for external power cable connectors, and instrument transformer connections shall be insulated with removable boots.
4. Design removable boots to overlap permanent bus or cable insulation minimum of 1” upon each conductor in connection insulated by boot.
5. Furnish materials required to complete field connections, insulation of switchgear bus, and terminals.

I. Orientation of bus when viewed from front of switchgear shall be A-B-C top-to-bottom, front-to-back, and left-to-right.

J. Provide molded epoxy inserts for bus passing through barriers.

2.13 GROUND BUS

A. Provide uninsulated copper ground bus with momentary rating at least equal to momentary rating of Switchgear.

B. Connect switchgear equipment grounds to ground bus.

C. Location of ground bus shall be as indicated on Data Sheets.

D. Provide 2 ground cable connectors for attachment of stranded copper cable to each end of ground bus for external connection to grounding system in copper cable size as specified on Data Sheet.

E. Each switchgear unit containing terminals for connection of metal-enclosed bus duct shall have provision for connecting bus duct ground bus to switchgear ground bus.

2.14 FACTORY WIRING

A. Low-voltage control and instrument wiring shall be installed and tested at factory.

B. Provide manufactured wiring harnesses to complete interconnection of switchgear groups in field for wiring across shipping splits.

C. Contractor shall furnish and install, at own expense, missing wires or termination points, wiring not matching interconnection diagrams, or other deficiencies.

D. Cable shall be selected for electrical and environmental conditions of installation, and suitable for unusual service conditions where encountered.
   1. Proper temperature application cable shall be used throughout, but shall not be less than 90ºC rated.
   2. Conductors routed over hinges shall utilize extra flexible stranding.
   3. Cable insulation shall be rated for maximum service voltage utilized, but not less than 600 volts.
   4. Splices not acceptable.

E. Panel, control cabinet, switchboard, motor control center, and switchgear wiring shall use flame-retardant, cross-linked polyethylene (XLP) or flame-retardant ethylene-propylene rubber (EPR) insulation that meet or exceed requirements of UL 44 for Types SIS, and XHHW.
   1. Minimum size: No. 14 AWG
   2. Conductors: Annealed bare copper Class B stranding passing IEEE 1202 and UL VW-1 flame test.

F. Instrumentation wire shall use twisted shielded pairs/triads having flame-retardant, cross-linked polyethylene (XLPE) insulation, and chlorinated polyethylene (CPE) jacket.
   1. Minimum size: No. 16 AWG
2. Conductor type: Annealed copper Class B stranding.
3. Provide each pair/triad with shield.
4. Shielding shall consist of aluminum-polyester tape and a flexible strand tin-coated No.18 AWG copper drain wire.
5. Drain wire for each instrument cable shall be insulated with spaghetti sleeve. Terminate one end of shield wire on grounded terminal.
6. Cables shall pass IEEE 1202 and ICEA 70,000 Btu/hr vertical tray flame test. Each conductor shall pass UL VW-1 flame test.

G. Terminations:
   a. Construct connectors of copper and tin-plate.
   b. Interior surface of connector wire barrel shall be serrated; exterior surface of connector wire barrel shall be furnished with crimp guides.
2. Use noninsulated terminal connectors for conductors terminated on devices equipped with individual fitted covers, such as, but not limited to, control switches and lockout relays.
3. Provide connections requiring disconnect plug and receptacle type devices with factory-terminated conductors on each plug and receptacle.
   a. Plugs and receptacles shall be factory wired into junction boxes containing terminal blocks for external connections.
   b. Conductors on disconnect portion of plug-receptacle assemblies shall be in common jacket.
4. Temporary wiring installed in factory for equipment testing shall be removed prior to shipment of equipment.
5. Current transformers shall terminate on shorting type terminal blocks and shall be shipped with shorting jumpers installed.
6. Terminal Blocks: General Electric EB-25, or equal.
7. Spare auxiliary contacts, meter outputs, multifunction relay outputs and inputs, and spare control switch contacts shall be connected to terminal points to facilitate external connection.

H. Identification and labeling.
1. Provide preprinted conductor identification sleeve on each end of each internal conductor.
2. Mark each sleeve with opposite end destination identification.
3. Conductor identification sleeves shall be UV-resistant, self-adhesive type or PVC, not less than 1/2" long.
4. Conductor identification shall be computer printed on sleeve with nonsmudging, permanent black ink. Hand written identification is not acceptable.
5. Each terminal block, terminal, conductor, relay, breaker, fuse block, and other auxiliary devices shall be permanently labeled to coincide with identification indicated on manufacturer’s drawings.

2.15 CONTROL AND INSTRUMENT WIRING

A. Low-voltage control and instrument wiring shall be installed and tested at factory.

B. Provide manufactured wiring harnesses to complete interconnection of switchgear groups in field for wiring across shipping splits. Contractor shall furnish and install, at own expense, missing wires or termination points, wiring not matching interconnection diagrams, or other deficiencies.

C. Identify each internal interconnecting wire at both ends with sleeve-type wire markers. Label markers with “from” and “to” information.

2.16 CURRENT TRANSFORMERS (CT)

A. CTs shall be in accordance with requirements of ANSI C57.13.

B. CT mechanical and thermal limits shall withstand without damage momentary and short time ratings of circuit breakers with which used.

C. CTs shall be multi-ratio type, unless specified otherwise.
D. Wire secondary leads out to shorting terminal blocks including leads from spare CTs and unused multiratio CT leads.

E. Ground in accordance with C57.13.3.

F. CT secondary circuits identified for metering or relaying devices not located in switchgear shall be grounded in switchgear using easily removable secondary ground straps.

G. Manufacturer’s drawings shall specifically state ground straps that should be removed if circuit will be grounded remotely.

H. Unless indicated otherwise, CT polarity markings shall be toward circuit breaker.

I. Separate CTs shall provide metering and protection functions, unless specified otherwise.

### 2.17 VOLTAGE TRANSFORMERS (VT)

A. VTs shall be in accordance with requirements of ANSI C57.13.

B. Each set shall be draw-out type and removable with 4-stage cell interlock switch.

C. Where physical size restrictions do not allow VTs to be mounted as draw-out assembly, VTs may be stationary mounted with primary fuses mounted as draw-out unit.

D. Provide appropriate interlocks in accordance with ANSI standards for operator safety.
   1. Provide continuously maintained ground for transformer primary windings and fuses that is clearly visible when assembly is moved to “withdrawn” position.
   2. Disconnect and ground secondary circuit in “draw-out” position.

E. Protect each transformer primary and secondary.
   1. Primary circuit:
      a. Current-limiting fuses mounted on draw-out type removable carriage unit designed to isolate and ground potential circuits when unit is in fully withdrawn position.
      b. Fuses shall meet requirements of NEMA SG2.
      c. Three spare fuses for each transformer shall be provided.
   2. Secondary circuit:
      a. Relays and meters shall be kept on separate circuits, unless specified otherwise.
      b. Each secondary circuit shall be protected by use of separate DIN rail-mounted miniature circuit breaker (MCB).
      c. Each MCB shall be furnished with dry contact that changes state when breaker is tripped.
      d. Contacts shall be wired to terminal blocks for use as alarm signal.
      e. Wire contacts in parallel at terminal blocks to allow single external connection for common alarm condition.

F. Ground in accordance with C57.13.3.

G. Voltage transformers shall have accuracy rating as indicated on Data Sheets.

### 2.18 LOCKOUT RELAYS

A. Mount lockout relays on breaker or breaker auxiliary compartment door.

B. Wire to trip breaker and simultaneously block closing of breaker.

C. Rated operating trip voltage shall be capable of allowing coil operation at 75% of rated voltage.

D. Furnish with required number of contacts to perform functions and with additional spare contacts for customer use in quantities as indicated on Data Sheets.
E. Wire normal and spare contacts to terminal blocks.

F. Provide all used and spare contacts with test switches wired in series to facilitate relay testing.

G. Provide with local tripped indication and pistol-grip handle.

H. Lockout relays shall be manually reset.

I. Manufacturer: Electroswitch Series 24 LOR with lighted target nameplate, or equal.

2.19 PROTECTIVE RELAYS

A. Relays shall be solid-state microprocessor-type; flush panel mounted self-contained units; operable from designated control power source.

B. Relay functions, type and manufacturer shall be in accordance with Data Sheet.
   1. All primary (main, tie, and feeder breaker) relays shall be manufactured by Schweitzer Engineering Laboratories (SEL) as shown on the one-line diagram.
   2. All back-up main breaker relays shall be manufactured by a manufacturer other than SEL that still meets the specifications.

C. All SEL relays shall be capable of modbus communication. Interconnect all SEL relays utilizing modbus to provide communication back to Distributed Control system. One main breaker relay, associated feeder breaker relays, and one tie breaker relay shall be interconnected to one communication cable. Second main breaker relay and associated feeder breaker relays shall be interconnected to a second communication cable.

D. Programming of relay shall be from face of unit without requiring additional equipment. Programming of relay shall also be possible from lap top computer.

E. Provide all software required for relay settings, communications, and oscillography as a Corporate perpetual license.

F. Operation, troubleshooting, and trip indication information shall be displayed on unit face.

G. Relays shall have built-in self-test functions with Form C relay failure alarm contact for remote indication. Separate Form C trip alarm contact shall also be furnished for remote trip indication.

H. Provide relays in draw-out type or connectorized type cases, whenever available.

I. Auxiliary relays shall be surface-mounted inside same switchgear cubicle in which it is used. Provide with following ratings:
   1. Relay: 300-volt minimum.
   2. Coil: 115-volt.
   3. Continuous duty.
   4. Number of poles as required or as indicated on drawings.

J. Contacts shall be universal or convertible type for connection as either normally open or normally closed, rated NEMA B150, minimum.

2.20 METERS

A. Meters shall be microprocessor-based, multifunction type.

B. Metering unit shall provide local indication and be capable of remote communication for all functions.

C. Meters mounted on front of switchgear shall be semi-flush, draw-out type with test facilities and rear-connecting terminals if draw-out type cases are not available, exception shall be noted in bid. Meter functions, type and manufacturer shall be in accordance with Data Sheet.
D. Provide meters with test switches on VT and CT circuits to isolate meter for testing of meters shall be from face of unit without requiring additional equipment.

E. Provide all software required for meter settings or setup, communications, and oscillography as a Corporate perpetual license.

F. Revenue quality meters shall have accuracy guaranteed by testing traceable to NBS. Revenue power meters shall meet requirements of ANSI C12.20.

2.21 INDICATING LIGHTS

A. Provide LED-colored indicating lights as manufactured by Data Display Products or equal. Clear LEDs with colored caps not acceptable.

B. Provide each breaker with at least following LEDs:
   1. Red LED: Illuminated when breaker is closed.
   2. Green LED: Illuminated when breaker is open.

C. Provide each lockout relay with following lights:
   1. LEDs may be optionally integrated into nameplate
   2. LED colors as specified on Data Sheets and wired as follows:
      a. Continuity light shall be illuminated to indicate LOR is ready to respond and coil continuity is intact. If coil fails, light shall go out and contact shall close to initiate alarm.
      b. Trip indicator light shall illuminate when LOR has tripped, and shall stay lit until relay is reset regardless of whether trip signal is maintained or not.

2.22 TEST SWITCHES

A. Provide test switches for all relay and meter VT, CT, and trip circuits.

B. Relay and meter switches shall be industrial grade, manually operated, knife-blade type, 10-pole with voltage and current elements with screw-on cover for personnel protection. Switches shall be ABB FT-1, or equal.

C. Identify each voltage and current switch by group and phase. Orientation shall be Phase A-B-C, left-to-right when looking at test switch from front. Extend voltage and current wiring for each relay and meter for incorporation into single test block.

D. Lockout relay test switches shall be 10 single-pole voltage elements wired in series with coils and normally open contacts of relays. Provide screw-on cover for protection when not in use.

E. Test switches shall be back-wired unless installed in location requiring front-wired type.

2.23 SURGE ARRESTERS

A. Provide station class, metal oxide surge arresters in quantities and ratings as indicated on Data Sheets.

B. Manufacturer: Ohio Brass Type “DynaVar,” or equal.

2.24 SWITCHGEAR ACCESSORY SET

A. Provide accessories for test, inspection, maintenance, and operation.

B. Minimum one hand-crank or racking handle per switchgear line-up for moving breakers into “Connected,” “Test,” or “Disconnected” position.

C. Minimum one remote operated racking device per switchgear line-up for moving breakers into “Connected,” “Test,” or “Disconnected” position.
1. Device shall be capable of operating the breaker from a minimum of 50'-0" distance.

D. Wall-mounted test cabinet for testing electrically operated breakers complete with connecting cables and secondary couplers. Provide quantity as specified on Data Sheets.

E. Tool for manually charging breaker closing spring and manually opening shutter.

F. Test jumper for electrically operating breaker while out of compartment.

G. One breaker maintenance closing device per switchgear line-up.

H. One test plug for draw-out relays per switchgear line-up.

I. Provide dolly for circuit breaker transport for switchgear as indicated on Data Sheets. Dolly shall be combination cart and lifting device capable of removing and inserting breakers in both single- and 2-high switchgear. Dolly shall be suitable for transporting vacuum contactors or switchgear circuit breakers; portable, floor-supported with roller base.

J. Provide grounding and test device for installation into breaker compartment during testing and maintenance.

2.25 NAMEPLATES

A. Laminated black letters on white background, with 1/8" (3 mm) engraved letters securely fastened with minimum of 2 self-tapping, stainless steel screws. Coordinate nameplate information with Engineer after award of Contract.

B. Provide nameplates to identify:
   1. Each externally visible device including, but not limited to, protective relays, lockout relays, meters, switches, instruments, and indicating lights shall have nameplate on outside of switchgear and on inside of switchgear.
   2. Each externally invisible device shall have nameplate identifying device.
   3. Each vertical section shall have nameplate located on front and rear of switchgear. Nameplates shall include equipment description and identification number of equipment being served.
   4. Each switchgear line-up shall have main nameplate located on front and rear of switchgear with switchgear name and identification number.

C. Caution nameplates: Yellow with black letters.

D. Warning nameplates: Red with white letters.

E. Provide nameplates for terminal blocks. Mark in accordance with manufacturer's instructions.

F. Each internal device or component shall have identification marking in accordance with manufacturer’s instructions.

G. Nameplates and placards including warning signs and safety placards shall meet NFPA 70E requirements.

2.26 BREAKER BUS TEST TERMINALS

A. If specified on Data Sheets, provide means for connecting test equipment directly to bus, located on load side of each breaker. Terminal shall be accessible without having to remove conductor insulation material.

B. Protect connection point with removable insulating boot material rated same voltage class as switchgear main bus.
C. Provide same connection point on ground bus so phase conductors may be grounded for protection of personnel during maintenance.

2.27 MIMIC DIAGRAMS

A. If specified on Data Sheets, provide mimic diagrams on front of each switchgear door that depicts interconnection of switchgear and associated equipment.

B. Mimic diagrams shall be acceptable to Engineer prior to fabrication.

2.28 SOURCE QUALITY CONTROL

A. Manufacturer shall submit proposed testing plan for complete switchgear and accessories for review and approval prior to performing testing.

B. Switchgear shall be electrically and mechanically assembled into single line-up, inspected, and tested as single unit with actual project breakers installed in switchgear at factory prior to shipment. Notify Owner at least 30 days prior to final testing so arrangements can be made for Owner and Engineer to witness tests.

C. Perform following tests on equipment specified in accordance with latest edition of ANSI standards.
   1. Manufacturer’s standard production inspections and testing on switchgear assemblies.
   2. Complete wiring check including function operation. Provide Engineer with certified copies of test data and reports.
   3. Polarity verification of phase-sensitive circuits including VT and CT circuitry.
   4. Test communications of devices including control devices, relays and meters.
   5. High-potential insulation check of main bus.
   6. Control wiring insulation check.

D. Test breakers in accordance with ANSI C37.09.

E. Arc-resistant design testing shall be performed in accordance with IEEE C37.20.7 using maximum short circuit current available for system or device rating as perspective current available at incoming bus terminals of test sample.

F. Relays shall have latest software installed and tested for functionality. Relays shall be programmed with protective function settings furnished by Engineer. Information needed from manufacturer by Engineer to set protection functions shall be furnished at least 4 weeks prior to factory testing of line-up.

G. Relay and meter communications settings shall be selected and set according to equipment furnished. Coordinate with Engineer. Communications shall be shown to be fully functional prior to shipment.

H. Test results shall indicate that equipment meets specified standards before shipment can be made.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify Site conditions are acceptable for switchgear installation.

3.02 INSTALLATION

A. Install in accordance with manufacturer’s requirements.

B. Provide housekeeping pad under switchgear unless indicated otherwise, minimum 4” (100 mm) high. Level pad to within manufacturer’s tolerances such that switchgear can be installed directly on top of
pad without additional leveling. Provide anchors and other hardware necessary. Anchor in place in accordance with manufacturer’s instructions. Refer to Drawings for leveling requirements.

C. Seal conduit, cable, and bus duct penetrations into switchgear with materials and methods designed for intended use maintaining NEMA rating of enclosure.

D. Provide connections to ground grid, using fittings designed and rated for intended use.

3.03 MANUFACTURER’S FIELD SERVICES

A. Provide manufacturer’s field service representative to perform wiring interconnections between shipping splits.

B. Relays shall be programmed using settings furnished by Engineer or Owner.

3.04 TRAINING

A. If specified on Data Sheet, provide authorized representative of switchgear manufacturer to train Owner’s maintenance personnel on procedures for startup and shutdown, troubleshooting, servicing, and preventive maintenance as follows:
   1. Duration: 2 days minimum.
   2. Review data in operating and maintenance manuals.
   3. Review normal maintenance and operating procedures.

B. Instruction shall be provided on site and include all training documents.
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY/UNITS</th>
<th>SPEC DATA</th>
<th>VENDOR DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switchgear Manufacturer</td>
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<td>By Manufacturer</td>
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<tr>
<td>Switchgear Catalog No.</td>
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**ENVIRONMENTAL CONDITIONS:**

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**CHARACTERISTICS:**

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**BUS BAR:**

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<tbody>
<tr>
<td>Phase and Ground Bus Material</td>
<td>Copper</td>
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<tr>
<td>Phase Connection Plating Material</td>
<td>Silver</td>
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<tr>
<td>Ground Bus Location</td>
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<td>Phase Bus Dimensions</td>
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<tr>
<td>Ground Bus Dimensions</td>
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<td>Ground cable lug size</td>
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**STRUCTURE:**

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<td>Arrangement</td>
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**DOORS:**
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<th>DESCRIPTION</th>
<th>QTY/UNITS</th>
<th>SPEC DATA</th>
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<tr>
<td>Lockable</td>
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**AUXILIARY COMPARTMENT:**

| Terminals Wired in Close Circuit For Owner Use | Pairs | 2 |
| Terminals Wired in Trip Circuit For Owner Use | Pairs | 2 |
| Control Power:                                 |       |   |
| Voltage                                       | Vac or Vdc | 240/120 Vdc |
| External Control Power Source                 | Y/N   | Y |
| Self Contained DC Control Power System        | Y/N   | Y |
| Control Power Transformer-                    | Y/N   | Y |
| Rating                                        | kVA   |               |
| Secondary Voltage                            | V     | 240/120 V     |

**MOTOR AND SPACE HEATER POWER**

| Voltage                                      | Vac | 120/240 Vac |
| External Heater Power Source                 | Y/N | N |
| Internal Heater Power Source                 | Y/N | Y |
| Estimated Motor Space Heater Load            | KW   |               |
| Rating                                        | kVA  | By Manufacturer |

**RELAYS**

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<tr>
<th>Manufacturer and Model Number</th>
<th>Quantity</th>
<th>Ref One-Line Diagram</th>
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<tbody>
<tr>
<td>Test Switches</td>
<td>Qty</td>
<td>Ref One-Line Diagram</td>
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<tr>
<td>Manufacturer/Model</td>
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<td>All current and voltage inputs as well as all trip outputs</td>
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**INDICATION METERS**

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<tr>
<td>Drawout</td>
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<td>Data Communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantity of Analog Outputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Switches</td>
<td>Qty</td>
<td></td>
</tr>
<tr>
<td>Manufacturer/Model</td>
<td>ABB FT-1</td>
<td></td>
</tr>
<tr>
<td>Application</td>
<td></td>
<td>All current and voltage inputs</td>
</tr>
</tbody>
</table>

**REVENUE OR BILLING METERS**

<table>
<thead>
<tr>
<th>Manufacturer and Model Number</th>
<th>Quantity</th>
<th>Revenue Metering Quality</th>
<th>Mounting</th>
<th>Drawout</th>
<th>Data Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Y/N</td>
<td>Semi-flush</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
### DATA SHEETS
**MV METAL-CLAD SWITCHGEAR**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY/UNITS</th>
<th>SPEC DATA</th>
<th>VENDOR DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity of Analog Outputs</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Switches</td>
<td>Qty</td>
<td></td>
<td></td>
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<tr>
<td>Manufacturer/Model</td>
<td>-</td>
<td>ABB FT-1</td>
<td></td>
</tr>
<tr>
<td>Application</td>
<td>-</td>
<td>All current and voltage inputs</td>
<td></td>
</tr>
</tbody>
</table>

#### VOLTAGE TRANSFORMERS:
- Manufacturer and Model Number: By Manufacturer
- Voltage Ratio: Ref One-Line Diagram
- Accuracy Rating: 0.3WXYZ, 1.2ZZ
- Bus VT Quantity: Ref One-Line Diagram
- Line VT Quantity: Ref One-Line Diagram

#### COMMUNICATIONS EQUIPMENT:
- Relay Communications Processor: By Manufacturer
- Metering Communications Multiplexer: By Manufacturer
- Control Processor: By Manufacturer
- Fiber Optic Transceivers: Y
- I/O Blocks: By Manufacturer
- Spare Terminal Blocks: Qty 25%

#### ACCESSORIES:
- Wall Mounted Test Cabinets: Qty 1
- Breaker Racking Crank: Qty 1
- Breaker Dolly: Qty 1
- Remote Racking Device: Y/N Y
- Length of Cord: ft 50

#### BREAKER CUBICLE:
- Model Number: By Manufacturer
- Continuous Current Rating: A Ref One-Line Diagram
- Voltage Range Factor, K: n/a K=1.0
- Short Circuit Interrupting Current: kA, sym Ref One-Line Diagram
- Closing and Latching Capability: kA, peak Ref One-Line Diagram
- Protection Relay: Model No. Ref One-Line Diagram
- Relay Test Switches: Qty Ref One-Line Diagram
- Lockout Relay: Qty Ref One-Line Diagram
- Continuity Light Color: --- Green
- Trip Indication: --- Amber
- Lockout Test Switches: Qty Ref One-Line Diagram
- Multifunction Meter: Model No. Ref One-Line Diagram
- Metering Test Switches: Qty Ref One-Line Diagram
- Current Transformers: Ref One-Line Diagram
- Bus Side: Qty Ref One-Line Diagram
- Ratio: Ref One-Line Diagram
- Accuracy: Ref One-Line Diagram
- Load Side: Qty Ref One-Line Diagram
- Ratio: Ref One-Line Diagram
- Accuracy: Ref One-Line Diagram
## DATA SHEETS

**MV METAL-CLAD SWITCHGEAR**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>QTY/UNITS</th>
<th>SPEC DATA</th>
<th>VENDOR DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED Indicating Lights (separately mounted)</td>
<td>Qty</td>
<td>1 set</td>
<td></td>
</tr>
<tr>
<td>Red Indicating Light (Breaker Closed)</td>
<td>Y/N</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Green Indicating Light (Breaker Opened)</td>
<td>Y/N</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Amber Indicating Light (Breaker Trip Coil Monitor)</td>
<td>Y/N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>E-MAX RAW Trip Coil Monitor</td>
<td>Y/N</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Spare MOC contacts</td>
<td>Qty</td>
<td>8 N.C and 8 N.O.</td>
<td></td>
</tr>
<tr>
<td>Spare TOC contacts</td>
<td>Qty</td>
<td>4 N.C and 4 N.O.</td>
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</tr>
<tr>
<td>Spare Lockout Relay contacts</td>
<td>Qty</td>
<td>10 N.C and 10 N.O.</td>
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<tr>
<td>Breaker Control Switch</td>
<td>Model No.</td>
<td>By Manufacturer</td>
<td></td>
</tr>
<tr>
<td>With Red LED (Breaker Closed)</td>
<td>Y/N</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>With Green LED (Breaker Opened)</td>
<td>Y/N</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>With Amber LED (Breaker Trip Coil Monitor)</td>
<td>Y/N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Cable or Bus Entry Location</td>
<td></td>
<td>Bottom</td>
<td></td>
</tr>
<tr>
<td>Surge Protection:</td>
<td>Y/N</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Surge Arresters</td>
<td>Qty/Type</td>
<td>Ref One-Line Diagram</td>
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</tr>
<tr>
<td>Surge Capacitors</td>
<td>Qty/Type</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Cable Lug Size/Qty Per Phase</td>
<td></td>
<td>Ref One-Line Diagram</td>
<td></td>
</tr>
<tr>
<td>Minimum Clearance Between Terminal Pads and Cable Entrance</td>
<td>in</td>
<td>33</td>
<td></td>
</tr>
</tbody>
</table>

[Owner's Instructions]

END OF SECTION

1) R.L. Boudreaux
2) G.H. Ogg
PART 1    GENERAL

1.01 SECTION INCLUDES

A. Furnish and install medium voltage, pad – mounted switch including all necessary components and specified accessories.

1.02 WORK BY OTHERS

A. Switch foundations and supports.

B. Receiving, unloading, and storage of switchgear.

C. Final placement, leveling, and field assembly.

D. Power, control, and grounding connections.

1.03 RELATED SECTIONS

A. Section 01 33 00 – Submittal Procedures.

B. Section 33 05 930 – Testing for Electrical Equipment.

C. Section 26 05 00 – Common work result for Electrical.

D. Section 26 05 05 – Common work results for Electrical Packaged Equipment.

1.04 SYSTEM DESCRIPTION

A. Integrated switchgear assembly consisting of metal enclosed compartments coordinated electrically and mechanically for medium-voltage circuit protection. Switch shall include, but not be limited to:
   1. Switch mechanism.
   2. Fuses.
   3. Phase and ground bus.
   4. Safety interlocks and position indicators.
   5. Auxiliary control devices.

B. Provide auxiliary equipment and services as indicated on Data Sheets.

1.05 SUBMITTALS

A. Submit with Bid:
   1. Complete Data Sheets.
   2. Product data sheets for each switch, component, and accessory.
   3. Preliminary outline drawing of switch lineups showing approximate dimensions and weight.
   4. Complete list of equipment proposed; including model numbers and technical descriptions for breakers, fuses, switches, etc.

B. Product Data:
   1. List of special equipment required for installation, operation, and maintenance of switch.
   2. List of recommended “start-up” and “running” spare parts and prices, as well as maintenance tools for each type of switch.
   3. List of items requiring field installation.
   4. Recommended long term and short term storage requirements and procedures.
C. Shop Drawings:
1. Complete and accurate Data Sheets.
2. Certified outline and general arrangement drawing including front view, dimensions, floor plan, weight (shipping and installed), anchor locations, lifting points, center of gravity, enclosure construction, layout of accessories and shipping sections.
3. Certified drawings of cable termination compartments showing preferred locations for conduit entry/exit and indicating space available for cable terminations.
4. Nameplate schedule prior to fabricating nameplates.
5. Provide specific 3-line diagrams for each switch. Typical drawings not acceptable.
6. Complete wiring diagrams showing connections of all component devices and equipment.
7. Interface coordination details.

D. Quality assurance data:
1. Certified production test reports.
2. Test reports for previous design, and documentation showing previous design ratings and configurations.

E. Operation and maintenance manuals. Provide at minimum:
1. General description and technical data, including actual weights and dimensions.
2. List of instruments and accessories supplied. List shall include manufacturer, model number, operating ranges, and equipment tag numbers.
3. Receiving, storage, installation, handling, and testing instructions.
4. Operating and maintenance procedures.
5. Complete set of reviewed shop drawings that require no further action.
6. Data Sheets updated to reflect field installation conditions.
7. Complete documentation of inspections and tests performed, including logs, curves, and certificates. Documentation shall note replacement of equipment or components that failed during testing.
8. Spare parts list.
9. Installation field reports.
10. Certified copies of final test reports.
11. Nameplate information and shop order numbers for each item of equipment furnished.

1.06 QUALITY ASSURANCE

A. Regulatory requirements:
1. Switch shall be designed manufactured, and tested in accordance with the latest version of all applicable requirements of including but not limited to:
   a. ANSI/IEEE C37.20.3, C37.20.4 C37.22, C37.57, C37.58, C37.71, C37.73, C57.12.28, NEMA SG5 and NEMA SG6.
2. All switch characteristics shall be UL Listed and/or Classified.
3. Standards of foreign organizations shall not be used without written approval from ENGINEER.

B. Manufacturer’s qualifications:
1. Manufacturer shall be manufacturer of major components.
2. Manufacturer shall be ISO certified.
3. Manufacturer shall have produced similar equipment for minimum of 5 years.
4. When requested by ENGINEER, provide acceptable list of similar equipment installations complying with requirements of this Section.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Switch shall be capable of operating and providing full power output in accordance with Data Sheet for installed location, including ambient temperature, altitude and seismic conditions.
1.08 WARRANTY
   A. Unless requested otherwise, provide manufacturer’s standard warranty. Warranty shall be no less than 1 year from the date of energization.

1.09 DELIVERY, STORAGE, AND HANDLING
   A. Coordinate transportation with requirements of pertinent authorities.
   B. Prepare detailed packing lists and shipping notification.
   C. Ship to job Site as completely assembled as practicable, accounting for shipping limitations and access to installation location. CONTRACTOR shall detail field assemblies, as required.
   D. Ship enclosure as complete as practicable with switch installed inside for ease of installation in field. If shipping split is required, connections between splits for enclosure circuits shall be clearly identified and junction boxes shall be provided for connection.
   E. Equipment and accessories shall be carefully covered and protected to prevent damage, denting or scoring during shipment.
   F. Store switch and components in clean, dry place. Protect from weather, dirt, water, construction debris, and physical damage in accordance with manufacturer’s instructions.

1.10 OWNER’S INSTRUCTIONS
   A. Provide authorized representative of switchgear manufacturer to train Owner’s maintenance personnel on procedures for startup and shutdown, troubleshooting, servicing, and preventive maintenance as follows:
      1. Review data in operating and maintenance manuals.
      2. Review normal maintenance and operating procedures.

1.11 MAINTENANCE
   A. Provide complete set of special tools as necessary for installation for each piece of equipment. Tools and intended use shall be identified in assembly instructions.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS
   A. Cooper Power Systems.

2.02 VACUUM INTERRUPTER SWITCHES
   A. Operation of switch shall require a push to close – pull to open mechanics.
   B. Mechanism shall be a quick make – and – break action, with a positive over toggle travel.
   C. Switch shall have the option of manual automatic control.
   D. All switch components shall be top mounted.
   E. Switch operating handle shall be fabricated from Stainless Steel and handle of Brass.
   F. Interrupter shall be housed within a glass – ceramic “bottle”
G. Interrupter contacts shall be constructed from a copper alloy to prevent contact welding.

H. A Stainless Steel vapor condensing shield shall be provided in the “bottle.”

I. A locking hasp shall be provided to padlock the operating handle in the open or closed switched position.

J. Mechanical Interlock shall be provided to prevent simultaneous closure of two switched ways.

K. Switch Options include:
   1. Single Phase
      a. 2-way.
      b. 3-way, one switched tap.
      c. 3-way, with solid tap.
      d. 3-way, all switched.
   2. Three Phase
      a. 2-way.
      b. 3-way, with solid tap.
      c. 3-way, all switched.
      d. 4-way, two solid taps.
      e. 4-way, three switches.
      f. 4-way, with tie switch.
      g. 4-way, all switched.

2.03 TANK

A. Tank shall be completely welded to provide hermetically sealed construction.

B. Tank shall be constructed of 304 Stainless Steel.

C. Tank shall be filled with inert non – corrosive, non – flammable sulfur hexafluoride (SF₆) insulating gas.

D. Tank shall be provided with lifting eyes and hold down installation tabs.

2.04 TERMINATION COMPARTMENTS

A. Termination compartments for switched shall have bushings, and terminations compartments for fuses shall have bushing wells to permit connection of elbow.

B. Terminations compartments for bushings rates 600 amperes continuous shall be of an adequate depth to accommodate two 600 ampere elbows mounted piggyback, encapsulated surge arresters or grounding elbows mounted on 600 ampere elbows having 200 ampere interfaces, or other similar accessory combinations without the need for an enclosure extension.

C. Termination compartments for bushing wells rated 200 amperes continuous shall be of adequate depth to accommodate 200 ampere elbows mounted on portable feed through or standoff insulators, or other similar accessory combinations without the need for an enclosure extension.

D. Termination compartments for a switch shall be provided with one parking stand for each bushing or bushing well. Stand shall be located immediately adjacent to the associated bushing or bushing well and shall accommodate standard feed through and standoff insulators, and other similar accessories.

2.05 BUSHINGS ANS BUSHING WELLS

A. Bushing and bushing wells shall be in accordance with ANSI C119.2.
B. Welded bushing wells shall be provided to terminate 200A circuit, and welded stud bushing shall be provided to terminate 600A circuits.

C. Bushings and bushing wells shall be of cycloaliphatic epoxy resin system with characteristics and restrictions as follows:
   1. Operating experience of at least 15 year under similar conditions.
   3. Adequate strength for short circuit stress established by test.
   4. Conformance with latest versions of the applicable ANSI standards.
   5. Homogeneity of the cycloaliphatic epoxy resin throughout each insulator to provide maximum resistance of power arcs.

2.06 BUS

A. Main bus shall be silver-plated copper bar, designed to continuously carry maximum current rating of equipment without exceeding temperature rise requirements at standard 40°C ambient temperature unless indicated higher on Data Sheets. Bolted connection joints shall be silver-plated.

B. Bus and interconnections shall consist of aluminum bar of 56% IACS conductivity.

C. When indicated, provide bus with fluidized bed epoxy-type insulating material molded around and bonded to bus, except at bolted terminations and connection points. Voltage rating of insulation shall be greater than or equal to highest voltage rating of switchgear.
   1. Bolted joints, expansion joints, external bus connections, and terminals for external power cable connectors, and instrument transformer connections shall be insulated with removable boots.
   2. Design removable boots to overlap permanent bus or cable insulation minimum of 1” (25 mm) upon each conductor in connection insulated by boot.

D. Furnish materials required to complete field connections, insulation of switchgear bus, and terminals.

E. Bolted bus joints, feeder cable terminations and incoming cable or incoming bus terminations shall be furnished with removable insulating boots.

F. Support main power bus using high-strength, high-creep epoxy-type supports providing minimum of 14” (355 mm) creep distance between phases and ground. Mechanically brace to withstand stresses resulting from current values equivalent to close and latch rating of largest circuit breaker in assembly.

G. Provide molded epoxy inserts whenever bus passes through barrier of any type on 15 kV and above applications.

H. Provide uninsulated, silver-plated copper ground bus with momentary rating at least equal to momentary rating of highest rated circuit breaker throughout entire length of switchgear. Connect switchgear equipment grounds to ground bus. Location of ground bus shall be as indicated on Data Sheets.

I. Steel structure for cubicles shall be electrically bonded to ground bus.

J. Provide NEMA 2-hole ground connection on each end of ground bus for connection of bare No. 4/0 AWG copper.

K. Neutral bus shall be provided only when shown on Drawings. Bus shall be insulated for 1,000 volts ac to ground. Current rating of neutral bus shall be 600 amperes.

2.07 ENCLOSURE

A. Switch enclosure shall be constructed to maximize strength, minimize weight, and inhibit corrosion.
B. Enclosure shall be constructed of 11-gauge hot-rolled, pickled and oil steel sheet, unless specified otherwise.

C. To guard against corrosion due to extremely harsh environmental conditions, the entire exterior of the enclosure shall be fabricated from 11-guage 304 Stainless Steel or a fiberglass – resin material.

D. All structural joints and butt joints shall be welded, and the external seams shall be ground flush and smooth. The gas-metal-arc welding process is to be used to eliminate alkaline residues and to minimize distortion and spatter.

E. To guard against unauthorized or inadvertent entry, enclosure shall not utilize any externally accessible hardware.

F. The base shall consist of continuous 90° flanges, turned inward and welded at the corners for bolting to a concrete pad.

G. The door opening shall have 90° flanges, turned outward, that shall provide strength and rigidity as well as a deep overlapping between doors and door openings to guard against water entry.

H. Polyurethane self – adhesive bumpers shall be placed on the left – hand door channel, and on the center door divider to prevent paint abrading.

I. Enclosure top side edges shall overlap with roof side edges to create a mechanical maze which shall allow ventilation to help keep the enclosure interior dry while discouraging tampering or insertion of foreign objects.

J. A heavy coat non-drip compound shall be applied to the inside surface of the roof to minimize the condensation of moisture.

K. Insulating interphase and end barriers of NEMA GPO3-grade fiberglass-reinforced-polyester shall be provided for each interrupter switch and each set of fuses where required to achieve BIL ratings. Additional insulating barriers of the same material shall be separate from the front compartments from the rear compartments (where applicable) and isolate the tie bus (where furnished).

L. Full length steel barriers shall separate adjoining termination compartments.

M. Lifting tabs shall be removable. Sockets for the lifting tabs bolts shall be blind tapped. A resilient material shall be placed between the lifting tabs and the enclosure to help prevent corrosion by protecting the finish against scratching by that tabs. To further prevent corrosion, this material shall be closed-cell to prevent moisture from being absorbed and held between the tabs and the enclosure in the event that lifting tabs are not removed.

N. The enclosure shall be provided with an instruction manual holder.

O. Operating height for unit disconnects and other operable controls shall be not more than 6'-6" (2 m) above finished floor.

P. Equipment shall be suitable for utility service.

Q. Feeder cable entrance:
   1. Depth of finished equipment shall be sufficient to allow for entrance, bending, and termination of power cables. Provide individual units for top or bottom entrance as specified. Provide minimum of 33" (825 mm) of clearance between terminal pads and cable entrance.
   2. Cable entrance to cubicles shall be in accordance with Data Sheet.
   3. Cables shall be separated from high- and low-voltage compartments by barriers.
   4. Provide cable termination kits for feeder cables and incoming cables. Kits shall be sized in accordance with cable sizes provided.
R. Enclosure and coating shall be in accordance with ANSI C57.12.28 including but not limited to:
   1. Salt Spray Test
   2. Crosshatch Adhesion Test.
   3. Humidity Test
   4. Impact Test.
   5. Oil Resistance Test.
   6. Ultraviolet Accelerated Weathering Test.

S. Enclosures shall be constructed in accordance with IEEE/ANSI C37.20.3 specifications for indoor applications.

2.08 DOORS
A. Doors shall be made from minimum 12-gage heavy-duty, formed steel.
B. Doors shall open minimum of 90° with doorstops that latch when doors are fully open.
C. Door edge flanges shall overlap with door opening flanges and shall be formed to create a mechanical maze that shall guard against water entry and discourage tampering or insertion of foreign objects, but shall allow ventilation to help keep the enclosure interior dry.
D. Doors shall have three extruded – aluminum hinges with stainless steel hinge pins, and interlocking extruded – aluminum hinge supports for the full length of the doors to provide strength, security, and corrosion resistance. Mounting hardware shall be stainless steel or zinc – nickel – steel, and shall not be externally accessible to guard against tampering.
E. In consideration of controlled access and tamper resistance, each set of doors shall be equipped with an automatic three-point latching mechanism.
   1. The latching mechanism shall be spring loaded, and shall latch atomically when the door is closed. All latch points shall latch at the same time to prevent partial latching.
   2. A hex-head socket wrench or tool shall be required to actuate to mechanism to unlatch the door and, in the same motion, recharge the spring for the next closing operation.
   3. The latching mechanism shall have provisions for padlocking that incorporate a means to protect the padlock shackle from tampering and that shall be coordinated with the latches such that:
      a. It shall not be possible to unlatch the mechanism until the padlock is removed, and
      b. It shall not be possible to insert the padlock until the mechanism is completely latched and closed.
F. Door providing access to solid – material power fuses shall have provisions to store spare fuses units or refill units.
G. Each door shall be provided with a zinc – nickel – plated steel door holder located above the door opening. The holder shall be hidden from view when the door is closed, and it shall not be possible for the holder to swing inside the enclosure.
H. To facilitate installation and maintenance of cables and bus in each vertical section, provide split removable top cover and pad-lockable hinged rear door held closed by bolts.
I. External doors and covers shall be gasketed.

2.09 FUSES
A. Provide fuses for fault protection, with continuous ratings as shown on Data Sheets.
B. Furnish 3 spares for each fused switch. Fuse and switch integrated momentary and fault close ratings specified shall have been verified by test and UL and CSA certified.
C. Solid Material Power Fuses

1. Fuses shall be disconnect style, solid – material power fuses, and shall utilize refill unit and holder or fuse unit and end fitting construction. The refill unit or fuse unit shall be readily replaceable.
2. Fusible elements shall be non – aging, and non - damageable so that it is unnecessary to replace unblown companion fuses on suspicion of damage following a fuse operation.
3. Fusible elements for refill units or fuse units rated 10 amperes or larger shall be helically coiled to avoid mechanical damage due to stresses from current surges.
4. Fusible elements, that carry continuous current, shall be supported in air to help prevent damage from current surges.
5. Each refill unit or fuse unit shall have a single fusible element to eliminate the possibility of unequal current sharing in parallel current paths.
6. Solid material power fuses shall have melting time current characteristics that are permanently accurate to within a maximum total tolerance of 10% in terms of current. Time current characteristics shall be available which permit coordination with protective relays, automatic circuit recloses, and other fuses.
7. Solid material power fuses shall be capable of detecting and interrupting all faults whether large, medium, or small under all realistic conditions of circuitry, with line to line or line to ground voltage across the fuse, and shall be capable of handling the full range of transient recovery voltage severity associated with these faults.
8. All arcing accompanying operation of solid material power fuses shall be contained within fuses, and all arc products and gases evolved shall be effectively contained within the exhaust control device during fuse operation.
9. Solid material power fuses shall be equipped with a blown fuse indicator that shall provide visible evidence of fuse operation while installed in the fuse mounting.

2.10 GROUND CONNECTED PADS

A. A ground connected pad shall be provided in each compartment of the pad-mounted gear.
B. The ground connection pad shall be constructed of 3/16” thick steel which shall be nickel plated and welded to the enclosure, and shall have a short circuit rating equal to that of the pad mounted gear.
C. Ground connection pads shall be coated with a uniform coating of an oxide inhibitor and sealant prior to shipment.
D. A 3/8” diameter copper rod connected to the ground connection pad shall be provided in each termination compartment for switches and each terminations compartment for bus. Rod shall extend full width of each compartment to allow grounding of cable concentric neutrals and accessories. Shall have short circuit rating equal to that of the pad – mounted gear.
E. Continuous copper ground bus shall be provided across the full width of each termination compartment for fuses. For each fuse mounting, there shall be a ground ring made of 3/8” diameter copper rod bolted to the ground bus. Ground rings and bus shall have short circuit rating equal to that of the pad – mounted gear.

2.11 AUTOMATIC TRANSFER CONTROL PACKAGE

A. Controller enclosure shall have NEMA rating equal to or greater to that of the switch enclosure.
B. To guard against unauthorized or inadvertent entry, enclosure shall not utilize any externally accessible hardware, and shall have the provision to be securely locked. The latching mechanism shall have provisions for padlocking that incorporate a means to protect the padlock shackle from tampering.
C. Controller shall have provisions to be mounted either directly to the switch or to a nearby wall or structure. Distance from controller to switch shall be minimized.
D. System shall consist of
E. Package shall include a manual override permitting local operation.

F. Controller batteries shall be equipped with a back up charger powered by a internal switch connection.

G. Switch actuator enclosure shall be constructed of 11 – gauge stainless steel material.

H. Manufacturer shall provide control cable for the connection of each actuator to the controller.

I. Accessories  
   1. Fault detectors, one on each phase.  
   2. NEMA 4 or NEMA 4X stainless steel enclosure.  
   3. SCADA interface board.  
   4. Dual AC power supply.  
   5. Distributed communication for two switches.

2.12 INSTRUMENT AND CONTROL POWER TRANSFORMERS

A. Current transformers (CT):  
   1. Fully rated for appropriate voltage class. CTs with 600-volt insulation levels may be used if installed with fully rated insulation barriers such as around primary disconnect bushing assemblies.  
   2. Unless specified otherwise, CT polarity markings shall be toward switch.  
   3. CTs shall have rated 5-ampere secondary current, unless otherwise specified.  
   4. Each CT shall be rated to withstand thermal and mechanical stresses imposed by short-circuit rating of applied circuit breaker.  
   5. CTs shall have continuous thermal current ratio of at least 1.2.

B. Potential transformers (PT):  
   1. Accuracy rating shall be comparable to metering equipment and burden capacity equal to twice initial load.  
   2. Mounting: Stationary. Primary fuses shall be in draw-out unit with appropriate interlocks for operator safety. Secondaries shall be protected with DIN rail mounted miniature circuit breakers.  
   3. VTs shall have 120-volt secondaries, unless otherwise specified.  
   4. Design to withstand basic impulse level of switchgear.

2.13 FACTORY WIRING

A. Cable shall be selected for electrical and environmental conditions of installation, and suitable for unusual service conditions where encountered.  
   1. Proper temperature application cable shall be used throughout, but shall not be less than 90ºC rated.  
   2. Conductors routed over hinges shall utilize extra flexible stranding.  
   3. Cable insulation shall be rated for maximum service voltage utilized, but not less than 600 volts.  
   4. Splices not acceptable.

B. Panel, control cabinet, switchboard, motor control center, and switchgear wiring shall use flame-retardant, cross-linked polyethylene (XLP) or flame-retardant ethylene-propylene rubber (EPR) insulation that meet or exceed requirements of UL 44 for Types SIS, and XHHW.  
   1. Minimum size: No. 14 AWG (1.5 mm²).  
   2. Conductors: Annealed bare copper Class B stranding passing IEEE 1202 and UL VW-1 flame test.

C. Instrumentation, thermocouple, and thermocouple extension wire shall use twisted shielded pairs/triads having flame-retardant, cross-linked polyethylene (XLPE) insulation, and chlorinated polyethylene (CPE) jacket.  
   1. Minimum size: No. 16 AWG (1.0 mm²).
2. Conductor type:
3. Provide each pair/triad with shield.
4. Shielding shall consist of aluminum-polyester tape and a flexible strand tin-coated No.18 AWG (0.75 mm²) copper drain wire.
5. Drain wire for each instrument cable shall be insulated with spaghetti sleeve. Terminate one end of shield wire on grounded terminal.
6. Cables shall pass IEEE 1202 and ICEA 70,000 Btu/hr vertical tray flame test. Each conductor shall pass UL VW-1 flame test.

D. Terminations:
   a. Construct connectors of copper and tin-plate.
   b. Interior surface of connector wire barrel shall be serrated; exterior surface of connector wire barrel shall be furnished with crimp guides.
2. Use non-insulated terminal connectors for conductors terminated on devices equipped with individual fitted covers, such as, but not limited to, control switches and lockout relays.
3. Provide connections requiring disconnect plug and receptacle type devices with factory-terminated conductors on each plug and receptacle.
   a. Plugs and receptacles shall be factory wired into junction boxes containing terminal blocks for external connections.
   b. Conductors on disconnect portion of plug-receptacle assemblies shall be in common jacket.
4. Temporary wiring installed in factory for equipment testing shall be removed prior to shipment of equipment.
5. Current transformers shall terminate on shorting type terminal blocks and shall be shipped with shorting jumpers installed.

E. Identification and labeling.
1. Provide conductor identification sleeve on each end of each internal conductor. Mark each sleeve with opposite end destination identification. Conductor identification sleeves shall be UV-resistant, self-adhesive type or PVC, not less than 1/2" long. Conductor identification shall be printed on sleeve with non-smudging, permanent black ink.
2. Each terminal block, terminal, conductor, relay, breaker, fuse block, and other auxiliary devices shall be permanently labeled to coincide with identification indicated on manufacturer’s drawings.

2.14 ARRESTERS
A. Live front designs shall have mounting nuts welded on tank wall for arrester mounting.
B. Dead front arresters shall not hinder dead front construction in cabinet and usable wherever a load-break elbow can be used.
C. Furnish distribution class surge arresters when specified.

2.15 IDENTIFICATION AND TAGGING
A. Laminated black-over-white plastic, with 1/8" (3 mm) engraved letters securely fastened with minimum of 2 self-tapping, stainless steel screws.
B. Nameplates to contain standard information in locations specified below:
   1. On the top of the Tank;
      a. Manufacturer’s name.
      b. Catalog number.
      c. Model number.
      d. Date of manufacture.
      e. Serial number.
      f. Additional information as specified in Data Sheet.
2. If Enclosure is utilized:
   a. On the exterior of set of doors indicating:
      1) Manufacturer’s name.
      2) Catalog number.
      3) Model number.
      4) Date of manufacture.
      5) Serial number.
      6) Additional information as specified in Data Sheet.
   b. On the interior of set of doors indicate:
      1) Manufacturer’s model number.
      2) Voltage ratings.
      3) Main bus continuous rating.
      4) Short circuit rating.
      5) Type of fuse and rating.
      6) Interrupter switch rating.
      7) Three line diagram showing interrupter switches, fuses with integral load interrupter, and bus.

C. Caution nameplates shall be yellow with black letters.

D. Warning nameplates shall be red with white letters.

E. Hazard Alerting Signs shall be affixed, at a minimum, to the following:
   1. Exterior of Tanks
   2. If enclosure is utilized:
      a. Exterior of ALL doors.
      b. Interior of each door. The text shall further indicate that operating personnel must know and obey the employer’s work rules, know the hazards involved, and use proper protective equipment and tools to work on this equipment.
      c. Interrupter switch compartments.
      d. Fuse compartments.

F. Terminal blocks shall be clearly marked in accordance with Shop Drawings.

G. Each internal device or component shall have identification marking in accordance with Shop Drawings.

H. Nameplates and placards including warning signs and safety placards shall meet NFPA 70E requirements.

2.16 FAULT INDICATOR

A. Provide (1) System Test Point Reset Faulted Circuit Indicator with low trip rating and standard indicator with auxiliary and small remote display.
   1. Standard indicator shall be mounted on load break elbows within the switch enclosure.
   2. Remove indicator shall be mounted on the switch enclosure, visible without opening the enclosure.

2.17 ACCESSORIES

A. Stainless Steel Nameplate

B. Enclosure

C. Ground Connected Pad

D. Fuse Units, and fuse handling unit as recommended by the fuse manufacturer.
E. Gas pressure gauge and fill valve.

F. Control modules.

G. Set of three grounding jumpers, each three feet in length, with storage bag.

H. Voltage tester with audiovisual signal capabilities, batteries, shotgun clamp – stick adapter, and storage case.

I. Shotgun clamp stick, 6'5½" or 8'5½" in length, with canvas storage bag.

J. Automatic Transfer Control Package

2.18 SOURCE QUALITY CONTROL

A. Manufacturer shall submit proposed testing plan for complete switch and accessories for review and approval prior to performing testing.

B. Switch shall be electrically and mechanically assembled into single line-up, inspected, and tested as single unit at factory prior to shipment.

C. Notify Owner at least 30 days prior to final testing so arrangements can be made for Owner to witness tests.

D. Perform following tests on equipment specified. Tests shall be in accordance with latest edition of ANSI and NEMA standards.
   1. Perform manufacturer’s standard production inspections and testing on switchgear assemblies.
   2. Wiring check including yellow-lined schematics, wiring diagrams and function operation.
   3. High-potential insulation check.
   4. Control wiring insulation check.

E. Wiring checks including schematics, wiring diagrams, and function operation.

F. Test results shall be tabulated, submitted, and approved by OWNER prior to shipment.

G. Provide Engineer with certified copies of test data and reports including associated drawings.

H. Defects and defective equipment revealed or noted during testing shall be corrected prior to shipment.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify site conditions are acceptable for switch installation.

3.02 INSTALLATION

A. Install in accordance with manufacturer’s requirements.

B. Provide 4" (100 mm) high housekeeping pad under switch unless indicated otherwise. Level pad such that switch can be installed directly on top of pad without additional leveling. Provide anchors and other hardware necessary. Follow manufacturer’s instructions for anchoring in place.

C. Seal penetrations with materials designed for intended use that will maintain NEMA rating of enclosure.

D. Make connections to ground grid using fittings designed and rated for intended use.
3.03 FIELD QUALITY CONTROL

A. Manufacturer’s Field Services
   1. Provide manufacturer’s field service representative to perform wiring interconnections between shipping splits.

3.04 VACUUM SWITCH

A. Tank shall be welded to provide a hermetically sealed enclosure.
B. Tank shall be provided with lifting eyes and hold down installation tabs.
C. Tank and operating shaft shall be constructed from 300 Stainless Steel.
D. Operating handle shall be constructed of brass.
E. Tank shall be filled with inert non-corrosive sulfur hexafluoride (SF$_6$) insulating gas.
F. Vacuum interrupter contacts shall be housed within a glass-ceramic enclosure, and be constructed from copper alloy to prevent contact welding.
G. Stainless steel bellows within the tank shall be attached to a movable external terminal that permits the contacts to be switched while maintaining a vacuum.
H. An external operating shaft shall be used for the switching function: push to close, pull to open.
I. A locking hasp shall be provided to the operating handle to be padlocked in the open or closed position.
J. Welded bushing wells shall be used for 200A circuit connections, and welded stud bushings for 600A circuit connections.
K. Nameplate and appropriate scheduling shall be affixed to the top of the tank.
L. Accessories
   1. Dial type Pressure Gauge.
   2. Dead Front Switch/Fuse combinations.
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>UNITS</th>
<th>SPEC DATA</th>
<th>VENDOR DATA</th>
</tr>
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**ENVIRONMENTAL CONDITIONS**

- Installation Location (Indoor or Outdoor) -
- Maximum Ambient Temperature °C
- Minimum Ambient Temperature °C
- Elevation Above Sea Level Installed Ft
- Corrosive Environment Y/N
- Corrosive Material Type -
- Seismic Zone -
- Snow Load (Per NESC C2 Section 250)
- Ice Load (Per NESC C2 Section 250)
- Wind Exposure (Per NESC C2 Section 250)

**STRUCTURAL CHARACTERISTICS**

- Stainless Steel Tank Y/N
- Manual Selector Switch Interlock Y/N

**ELECTRICAL CHARACTERISTICS**

- Rated Voltage Class, Maximum kV
- Rated Nominal, Three Phase System Voltage kV
- Number of Phases Qty
- Number of Wires Qty
- Frequency Hz
- Basic Impulse Level KVBL
- Main Bus Current Rating A
- Current, Short Circuit, Symmetrical kA
- Current, Momentary, Asymmetrical kA
- Current, Continuous A
- Load Splitting and Load Dropping Current A
- Fault Closing Duty Cycle, Two Time -
- RMS Asymmetrical kA
- RMS Symmetrical kA
- Peak kA
- Three Phase Symmetrical MVA MVA

**DESIGN CHARACTERISTICS**

- Live Front or Dead Front -
- Solid Material Power Fuses -
- Type -
- Maximum Amperes A
- Cable Termination Device at Switch Terminals -
- Bushing Rating -

**ACCESSORIES**

- General -
- Nameplate Fabrication Material -
- UL Listed Y/N
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<th>SPEC DATA</th>
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<td>Control Modules</td>
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<td>Set of Three Grounding Jumpers with Storage Bag</td>
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## MEDIUM-VOLTAGE VACUUM SWITCHES

**Job No. 23143.01**

### DATA SHEETS

<table>
<thead>
<tr>
<th>MEDIUM-VOLTAGE PAD – MOUNTED SWITCH</th>
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<th><strong>Equipment Name:</strong></th>
<th><strong>Tag No.:</strong></th>
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### SPECIAL REQUIREMENTS

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<tr>
<th>DESCRIPTION</th>
<th>UNITS</th>
<th>SPEC DATA</th>
<th>VENDOR DATA</th>
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</thead>
</table>

- **Additional Specifications to be Added to Nameplate:**

- **Miscellaneous Work Required:**

- **List of Part Requiring Field Assembly:**

- **List of Required Maintenance Tools to be Furnished with Equipment:**

- **Shipment and Installation**
  - **Method of Shipment:**
  - **Furnished By:**
  - **Installed By:**

END OF SECTION

---

1) R.L. Boudreaux
2) G.H. Ogg
PART 1    GENERAL

1.01 SECTION INCLUDES

A. Design, manufacture, and furnish one (1) complete environmentally controlled, Power Distribution Center (PDC) consisting of electrical power and control equipment and appurtenances as specified herein.

1.02 WORK BY OTHERS

A. Furnish and placing of building foundations and supports.
B. Receipt, unloading, placement and assembly.
C. AC Power, DC power and control connections external to PDC.
D. Communications and fire alarm connections external to PDC.
E. Ground connections external to PDC.
F. Above and Below grade raceways.

1.03 INFORMATIONAL SUBMITTALS

A. Submit with Bid:
   1. Completed Data Sheets.
   2. Submittal schedule and complete equipment delivery schedule.
   3. Preliminary general arrangement drawings showing location of equipment including equipment provided by others.
   4. Building base skid details.
   5. Provide details regarding shipping splits.
   6. Anchor details.
   7. Building elevations.
   8. Complete data and listing of items requiring field assembly, installation and special equipment required. Special tools and their intended use shall be identified in assembly drawings.
   10. Wiring that cannot be completed in factory shall be submitted as an exception with Bid.

B. Product Data.
   1. Component and accessories list.
   2. Ratings and nameplate information.
   3. Installation information.

1.04 ACTION SUBMITTALS

A. Shop Drawings:
   1. Master drawing list.
   2. Certified elevation and outline drawings with dimensions.
   3. Certified plan view drawings with dimensions and loading information.
   4. Interface coordination details.
   5. Wiring and termination drawings.
   6. Building plan view drawings that include general arrangement of all equipment.
   7. Building base skid details.
   8. Anchor details.
   10. Certified structural calculations.
12. Installation instructions.
13. 208/120V Electrical Panel schedule including loads in watts.

1.05 CLOSEOUT SUBMITTALS

A. Operation and maintenance manuals. Provide, at minimum:
   1. Table of Contents.
   2. Master drawing list.
   3. Master shop drawing index.
   4. General description and technical data.
   5. Receiving, storage, installation, and testing instructions.
   6. Operating and maintenance procedures.
   7. Complete set of final drawings.
   8. Complete documentation of inspections and tests performed, including any logs, curves, and certificates. Documentation shall note any replacement of equipment or components that failed during testing.
   9. Spare parts lists.
10. Installation field reports.
11. Data Sheets updated to reflect field installation conditions.

1.06 QUALITY ASSURANCE

A. All equipment and cables shall be conducted in accordance with the latest applicable standards on ANSI, UL, IEEE, NEMA, and the Insulated Cable Engineers Association (ICEA), unless otherwise stated herein.

B. Manufacturer qualifications:
   1. Manufacturer shall be ISO 9001 certified and shall have produced similar equipment for minimum period of five (5) years.
   2. When requested by Engineer, provide acceptable list of similar equipment installations complying with requirements of this specification.
   4. All installed equipment shall be functionally tested and in accordance with specifications.
   5. Certified production test reports indicating satisfactory completion of all inspection and test procedures shall be available upon request.
   7. Equipment shall be made available for Buyers inspection prior to shipment.

1.07 SHIPPING REQUIREMENTS

A. Notify Erection Contractor in advance of shipping.

B. Coordinate transportation requirements with all pertinent authorities. Obtain and pay for all required permits and licenses.

C. Shipping splits shall be minimized. Building, and components mounted thereon, shall be designed for, and anchored sufficiently for transporting.

D. Detailed packing lists and shipping notification shall be prepared for all items.

E. Equipment and accessories shall be clearly labeled, covered and protected from both physical and environmental damage.

F. During delivery and storage, handle equipment to prevent damage, denting or scoring.
G. Store equipment and components in clean, dry place. Protect from weather, dirt, water, construction debris and physical damage in accordance with manufacturer’s instructions.

H. A complete set of tools necessary for installation and maintenance shall be furnished for each piece of equipment supplies. These tools and their intended use shall be identified in the included assembly instructions.

I. Building shall be delivered to site within five (5) days of switchgear delivery.

J. Erection contractor will be responsible for unloading, storing, and setting of the building upon arrival at site.

1.08 WARRANTY

A. Supplier’s warranty shall be a minimum of 18 months commencing from date of commissioning or 24 months from date of delivery whichever comes first.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB

B. Eaton Cutler-Hammer

C. General Electric

D. Siemens

E. Pedersen Power Products

F. Powell Electric

2.02 DESIGN REQUIREMENTS

A. Design and construct PDC for outdoor use based on prevailing wind and seismic conditions, and in accordance with IBC or governing state and local guidelines, whichever are stricter. City of Boulder has adopted the 2006 IBC by reference except as modified by the City of Boulder Building Code.
   1. City of Boulder 3-second wind gust velocity: 110 mph
   2. City of Boulder roof snow load: 30 psf minimum

B. Equipment placement within PDC shall be as shown on general arrangement drawings. Contractor may provide alternate layouts with Bid if savings can be obtained, or shipping splits can be avoided. Alternate layout must be approved by Engineer due to site location physical constraints. Final layout drawings shall be provided by manufacturer.

C. Code-required clearances shall be manufacturer’s responsibility. Arrange equipment and doors such that any piece of equipment may be removed from PDC without necessitating removal of other equipment.

D. Foundation will consist of a perimeter concrete wall with embedded plates for PDC anchorage. Foundation will be designed by others based on manufacturer’s loading data. Provide the location and magnitude of applied forces to the foundation, under loading combinations defined in the International Building Code (IBC).
2.03 SKID/GROUNDING

A. Welded seamless construction using ASTM A36 structural steel or better. Size and arrange members for proper strength and ability to withstand stress and loads that result when lifting complete factory fabricated and equipped assembly. Deflection shall be L/240.

B. Provide two (2) stainless steel ground pads located at opposite corners of skid. Pads shall be easily accessible for connection to external grounding system by others when building has been placed in final location.

C. Provide bare No. 4/0 AWG copper ground ring that consists of loop located inside, near perimeter of building at ceiling height. Firmly attach to structural steel base assembly using Cadweld, or equal, connectors at grounding pads.

D. Provide with 8-10 mil thick bituminous mastic undercoating.

2.04 FLOOR

A. Floor shall be minimum of 0.25" ASTM A36 smooth steel plate welded to perimeter and longitudinal or transverse structural members of skid.

B. Floor loading shall not be less than 250 lb/sq. ft.

C. In general, cable shall enter from above ground cable tray unless noted otherwise. Where underground entrances are required and noted, provide floor cutouts for power and control cable entry or exit from installed equipment.
   1. Cutouts for equipment furnished by others shall be coordinated with equipment provider.
   2. Provide cutouts with 12-gauge galvanized, removable from above, cover plates.

D. Insulate floor with polyurethane spray foam insulation with rating as indicated on Data Sheets.

2.05 WALLS, ROOF, AND CEILING

A. Building walls, roof and ceiling shall be fabricated from G90 galvanized steel, minimum 18-gage thickness, rated to withstand loading requirements of jobsite conditions and equipment mounted to structure.

B. Exterior walls, exterior roof, and interior ceiling shall be self-framing, interlocking design, with maximum panel width of 16". Buildings of framed construction not acceptable.

C. Slope roof at 0.25" per linear foot and slope away from entrance and equipment access doors. Provide drainage gutters if runoff above access doors cannot be avoided.

D. Where bulkhead penetrations are required, cutouts shall be completely framed with 0.25" thick aluminum cover plates with neoprene gasket.
   1. Wall penetrations shall be made in walls prior to bending with appropriate machinery.
   2. No manual cutting of wall penetrations by use of jigsaw, plasma torch or other means allowed.

E. Fastening hardware shall be zinc-plated. Do not weld galvanized steel or use rivets as method of exterior fastening.

F. Provide exterior walls and roof with fiberglass batt-type insulation meeting R11 rating, minimum.

2.06 DOORS AND EQUIPMENT ACCESS

A. Doors shall be double-wall construction with threshold built into door frame. Each door shall have following:
1. Brushed aluminum panic hardware.
2. Built-in hold-open device and automatic closure device.
3. Cylinder lock and thumb latch.
4. Prime coated hinges.
5. Neoprene gasket.
6. Drip shields and water flashing.

B. Provide one 3'-0"W x 7'-0"H and one 6'-0"W x 7'-0"H door to meet the requirements of NFPA 70.

C. Where required, provide 14-gage galvanized steel, gasketed and hinged equipment rear exterior access doors. Access doors shall have 3-point latching system with rust-resistant pad lockable handles, drip shields and water flashing.

D. For doors used for equipment access, provide signage that reads: “DANGER, HIGH VOLTAGE, KEEP OUT.” Permanently attach with self-tapping stainless steel screws.

2.07 HVAC SYSTEM

A. Provide HVAC system appropriately sized taking into consideration ambient conditions of job site, dimensions of building, solar heat gain, and heat generated by equipment from within building when operating at 100% capacity.

B. HVAC system shall consist of one (1) unit sized at 100%, when system is operating at 100%. Building interior shall be maintained at ambient temperature between 60°F and 85°F. Provide system with electronic automatic changeover thermostat.

C. Building shall remain positively pressurized at 0.05 ” w.c.

D. Provide industrial grade filtration system for dust control.

2.08 BUILDING SYSTEMS

A. Provide electrical distribution equipment required for proper operation of interior and exterior building services. Operating voltages for distribution systems shall be as indicated on Data Sheets.

B. Provide either 2-lamp or 4-lamp, 48” industrial fluorescent fixtures with wire guards for protection of T8 lamps. Fixtures shall provide minimum of 50 foot-candles within any location of building.
   1. Control with 3-way wall switches located at each entry door.
   2. Provide minimum of 2 fixtures with 90 minute battery backup to provide illumination in event of power failure.

C. Exterior lighting shall consist of fully shielded 70-watt, metal halide fixture located above each building access door and one at exterior switchgear doors.
   1. Each fixture shall be controlled automatically by photocell mounted integrally within each fixture.
   2. Breaker used for lighting circuit shall be switch-duty rated.
   3. Fixtures shall not interfere with doors or movement of equipment.

D. Provide 120-volt AC, 20-ampere spec-grade duplex receptacles. At a minimum, provide one duplex receptacle at interior and exterior locations, near each access door. Exterior outlets shall be GFI-protected.

E. Cable tray systems shall be provided with structural steel channel supports embedded in ceiling. Unistrut fastened directly to ceiling for cable tray support not allowed. Supports shall be by means of “All-Thread” and Unistrut hangers.
F. All the interconnection wiring of equipment furnished by Others, for installation in PDC, shall be completed at the factory prior to shipment to the site as one package. Cables shall be clearly identified on shop drawings and marked for easy identification.

G. Provide fire detection system meeting requirements of NFPA 850. Provide heat and smoke detectors and hand held fire extinguishers.
   1. Extinguishers and placards shall be located inside PDC at each door.
   2. Heat and smoke detectors shall have alarm contacts wired into fire alarm control panel located near door.
   3. Fire alarm control panel shall have dry contacts for connection to remote alarm systems.
   4. Provide red warning beacon mounted on outside of PDC above roof level and over personnel door. Warning beacon shall become energized when heat or smoke is detected in PDC.

2.09 TESTING AND INSPECTION

A. Test and inspect building and electrical equipment and systems prior to shipment.
   1. Continuity checks of wiring.
   2. Equipment function tests.
   3. Electrical apparatus checks in accordance with specific equipment specifications.

B. Provide certified test reports.

C. Notify owner two (2) weeks prior to testing and provide access for witnessing.

2.10 IDENTIFICATION AND TAGGING

A. Nameplate lettering shall be black on white background. Securely attach nameplates with self-tapping stainless steel screws. Adhesive nameplates not allowed.

B. Equipment installed in building shall be tagged in accordance with associated drawings.
### DATA SHEETS
#### PACKAGED ELECTRICAL CENTER

<table>
<thead>
<tr>
<th>Description</th>
<th>Units</th>
<th>Specification Data</th>
<th>Vendor Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer</td>
<td>N/A</td>
<td>By Manufacturer</td>
<td></td>
</tr>
<tr>
<td>Location of Manufacturer</td>
<td>N/A</td>
<td>By Manufacturer</td>
<td></td>
</tr>
</tbody>
</table>

#### Site Information:

- **Maximum Ambient Temperature**: °C $\leq 40$
- **Minimum Ambient Temperature**: °C $\geq -30$
- **Site Altitude**: Ft $\leq 600$
- **High Humidity**: Y/N N
- **Corrosive**: Y/N N
- **Salt-Laden**: Y/N N
- **Seismic**: - None

#### Building General:

- **Number of shipping splits**: - None
- **Foundation (Piers or Wall)**: - Wall
- **Elevation of Building from Finished Grade**: in. $\leq 6$ (Estimate)
- **Floor material, thickness and insulation**: - By Manufacturer
- **Exterior wall material, thickness and insulation**: - By Manufacturer
- **Exterior roof material, thickness and insulation**: - By Manufacturer
- **Interior wall material and thickness**: - By Manufacturer
- **Exterior wall material and thickness**: - By Manufacturer
- **Number of access doors and dimensions**: - By Manufacturer
- **Number of equipment access doors and dimensions**: - By Manufacturer
- **Total building weight**: lb By Manufacturer
- **Weight of heaviest shipping section**: lb By Manufacturer

#### HVAC:

- **Manufacturer and model number**: - By Manufacturer
- **Number of units**: - 1
- **Rating of units**: - By Manufacturer

#### Building Systems:

- **Number of interior light fixtures**: - By Manufacturer
- **Number of exterior light fixtures**: - By Manufacturer
- **Number of receptacles**: - By Manufacturer
- **Fire Alarm System**: - By Manufacturer
- **Dimensions**: Inches By Manufacturer

#### Special Requirements:

END OF SECTION

1) R.L. Boudreaux
2) G.H. Ogg
PART 1   GENERAL

1.01 SECTION INCLUDES
A. Data raceway system including raceway, pullboxes, junction boxes, communications backboards, inter building optical fiber cable.

1.02 WORK BY OTHERS
A. None.

1.03 INFORMATIONAL SUBMITTALS
A. Product Data:
   1. Material list, including all devices, panels, and wire.
   2. Data cable system:
      a. Connectors.
      b. Data cable.
   3. Manufacturer’s data for computer system cable and connectors.
   4. Manufacturer’s data for optical fiber cable and connectors.

1.04 ACTION SUBMITTALS
A. Shop Drawings
   1. Assembly drawing showing arrangement and connections to equipment furnished.
   2. Coordinated system schematic and wiring diagrams of equipment furnished.

1.05 CLOSEOUT SUBMITTALS
A. Instruction manuals including:
   1. Nameplate information and shop order number for central control panels.
   2. List of recommended spare parts.

1.06 QUALITY ASSURANCE
A. Electronic equipment shall be UL listed. System components shall meet or exceed minimum standards of EIA. System installation shall conform to NEC and applicable local codes.

PART 2   PRODUCTS

2.01 DATA SYSTEMS
A. Raceway system:
   1. Raceway conduit as specified in Section 16050.
   2. Provide nylon cord in each conduit for future installation of wire.

B. Plywood backboard: ¾” A-C fire-resistant or non-combustible plywood backboard, void free, 8’ high, painted with two coats of light colored fire retardant paint.

2.02 INTER BUILDING OPTICAL FIBER CABLE
A. Cable:
   1. Singlemode 8.3/125, 6-strand dielectric: Systimax 5022-006A-WX BK (760004010)
   2. Multimode 62.5/125, 6-strand dielectric: Systimax 5022-006A-MXBK (700010721)
B. Distribution
1. Fiber Distribution Shelf: Modular design with jumper routing guides for vertical and horizontal runs and all associated shelves, panels, interconnection couplers and hardware necessary to terminate all fibers with room for 25% growth.
2. Wall Mount Distribution Units: Metal construction, lockable, capable of splicing and termination in same housing, all hardware necessary to terminate fiber (including cable attachment, connector panels, interconnect couplers, fan-out kits, etc.)

C. Raceway
1. Utilize existing inter-duct contained within existing underground duct bank for inter building routing of optical fiber cable.

D. Connectors
1. Multimode ST II connector 0.9/2.4/3.0 mm for 62.5/125: Systimax P2020C-Z-125
2. Singlemode ST II connector 0.9/2.4/3.0 mm: Systimax P2020C-Z-125
3. Other consumable and kits as required for field termination of fiber optic cable on connectors.

E. Fiber Splices
1. Splice Closure: 3M2178-LS fully equipped with cable addition kit 2181-LS, splice tray 2522 and all required accessories for a complete installation.
2. Provide all required hardware and kits for field fusion splicing in splice closures and for sealing and mounting the closures.
3. Perform fusion splices for singlemode fiber strands with splice loss < 0.2dB at 1310 nm.
4. Perform fusion splices for multimode fiber strands with splice loss < 0.3dB at 850 nm.

F. Terminations
1. Do not terminate, splice or cut off “Dead” cable strands. Neatly coil these un-terminated strands inside panels with the proper bend radius to protect them for future termination or splicing.

G. Testing
1. Perform termination of multimode fiber strands on ST II and SC connectors with loss < 0.5dB at 850 nm.
2. Perform termination of singlemode fiber strands on St II and Sc connectors with loss < 0.2dB at 1310 nm.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL
A. Install wireway, conduit, conductors, and related items in accordance with Section 16050.
B. Coordinate installation with requirements of Owner.
C. Install equipment in accordance with manufacturer's instructions and as shown on Drawings.

3.02 TESTING
A. Manufacturer's representative shall provide written certification to Owner that equipment has been properly installed and is operating satisfactorily.
B. Provide continuity test of data cables.
C. Correct deficiencies observed during test, at no cost to Owner, until equipment operates properly.

END OF SECTION