FOR REFERENCE
NOT TO BE TAKEN
FROM THIS ROOM

DESIGN CRITERIA
FOR
LIGHTING AND CONTROLS MODIFICATIONS

OSW, CTF, COS BUILDINGS

DEPARTMENT OF ENERGY

MOUND PLANT

MIAMISBURG, OHIO

AUGUST, 1991

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EG&G MOUND APPLIED TECHNOLOGIES

P.O. BOX 3000

MIAMISBURG, OHIO 45343-3000

513-865-4020

operated for the UNITED STATES DEPARTMENT OF ENERGY

Contract No. DE-AC04-88-DP43495

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MASTER

PROJECT QUALITY ASSURANCE REVIEW

Title: Lighting & Control Modifications

AES: unassigned

Location: OSW, CTF, COS

Sponsor: L.Kapka

CC: unassigned

Engineer: C.Logan

HP No: 4915

QA Meeting Date: 8/26/91

PROJECT DESCRIPTION/SCOPE:

DESCRIPTION/SCOPE:

This project will retrofit the lighting systems in three (3) buildings. The buildings are Central Operational Support (COS), Component Test Facility (CTF) and Operational Support West (OSW). This project consists of the installation of occupancy sensors in private offices, break areas and laboratories, automatic control lighting, (occupied/unoccupied) with the existing DDC system, removing selected light fixtures, replacing incandescent lighting and reprogramming some of the software controlling the operation of the air handling units in the aforementioned buildings.

TASK RISK REVIEW, MAJOR CONCERNS, & JUSTIFICATION FOR LEVEL ASSIGNMENT:

A. QUALITY LEVEL The overall project, in general, has been assigned a Level 3 consequence of failure based on the risk associated with the majority of the work. Should the asbestos survey indicate the presence of asbestos a Level 2 consequence of failure will be supported and a Quality Assurance Plan will be prepared for the asbestos related activities.

B. REVIEW BREAKDOWN

	<u>Conse- quence</u>	<u>Prob- ability</u>
1. Personnel health/safety & environment:	1	1
2. Property/monetary loss:	1	1
3. Production loss:	1	1
4. Facilities/utilities failure:	1	1
5. Security:	1	1
6. Public relations:	1	1
7. Regulatory/legal compliance:	1	1
8. Technological data loss:	1	1
9. Customer (external/internal) needs:	1	1

Ratings per MD-10165

Consequence ▶ 1 = minor, 5 = catastrophic

Probability ▶ 1 = unlikely, 5 = highly likely

DISCLAIMER

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C. BREAKDOWN NARRATIVE

1. No significant risk anticipated.
2. No significant risk anticipated.
3. No significant risk anticipated.
4. No significant risk anticipated.
5. No significant risk anticipated.
6. No significant risk anticipated.
7. No significant risk anticipated.
8. No significant risk anticipated.
9. No significant risk anticipated.

OTHER CONSIDERATIONS/SPECIAL PLANS:

ANTICIPATED QA
PROGRAM
REQUIREMENT

LEVEL 1 ☐

LEVEL 2 ☐

LEVEL 3 ☒

APPROVALS	DATES
Sponsor: <i>Laraine Atgala</i>	8/26/91
Proj. Eng.: <i>Cedric A. Logan</i>	8/26/91
Supervisor: <i>Laraine Atgala</i>	8/26/91
LP&EC: <i>701512</i>	8/26/91
QA Engineer: <i>[Signature]</i>	8/26/91

Design Criteria Package Approval Sheet

Date: August 5, 1991

Project: Lighting and Control Modifications; OSW, CTF, COS Buildings

This Design Criteria package has been written and prepared in agreement with the Construction Project Data Sheet and the Conceptual Design for this project and in accordance with applicable DOE Regulations. It is therefore reviewed and approved for final design by the following:

Reviewed By	Approved By
Maintenance Support Supervisor <i>Stephen D. Poling</i>	Sponsor <i>Terrence Atgasta</i>
Quality Assurance Representative <i>Ch. Meyer</i>	DAO Project Manager
LP&EC Representative <i>John B.</i>	Mound Project Manager <i>David Balsinger</i>
Engineering Inspector	Mound Program Manager
Security	Mound Construction Manager <i>Gedryc A. Logan</i>

Prepared by: Gedryc A. Logan

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Appendix B - Proposed Schedule

SECTION I. PURPOSE AND PHYSICAL DESCRIPTION

A. PURPOSE

1. The purpose of this project is to reduce the overall building energy consumption in OSW, COS, and CTF buildings, through the modifications of their lighting systems and the re-programming of their air handling units' mode of operation.

B. PHYSICAL DESCRIPTION

1. This Design Criteria is intended to be a general guide for the A/E. Hereafter, all references to EG&G Mound Applied Technology shall be EG&G. Refer to the attached study titled "Energy Management Analysis", as a conceptual design of the project.
2. It remains the responsibility of the Architect-Engineer to analyze and develop alternate proposals or suggestions to arrive at the most functional and economical solution.
3. This project provides for the retrofit of the lighting systems in three buildings. The buildings are: Central Operational Support (COS), Component Test Facility (CTF) and Operational Support West (OSW). Together, these three buildings total 157,000 ft². Included is the installation of occupancy sensors in private offices, break areas and laboratories, automatic control of lighting (occupied/unoccupied) with the existing direct digital control (DDC) system, removing selected light fixtures and replacing incandescent lighting.

In addition, the main air handling units in each building will be re-programmed. This re-programming will allow the discharge air temperature to be reset based on the zone with the greatest cooling requirement.

C. EXECUTION

1. The project phasing must maintain building activities as continuously as possible. Therefore specifications and drawings shall indicate the exact sequence and timing of demolition and new equipment installation and start-up.
2. The A/E shall have the following responsibilities:
 - a. Complete design of demolition.
 - b. Complete design of installation.
 - c. Complete specifications for equipment and ratings.
 - d. OSHA compliance.

SECTION II. ARCHITECT-ENGINEER REQUIREMENT

A. GENERAL

1. The A/E will provide the complete Title I and Title II design and construction services as specified in the following sections, for the Lighting and Control Modifications Project, including all support utilities, civil, mechanical, and electrical systems for a complete and usable installation. The A/E will utilize state-of-the-art concepts and design to obtain the overall objective at the lowest cost consistent with a high quality facility. The narrative and drawings included herein are intended to be guidelines for the design effort and should not be construed to limit the A/E from proposing more cost-effective alternatives. It remains the responsibility of the A/E to develop and economically justify final functional solutions within the prescribed budget and space allocations.
2. Specifications shall follow the CSI format using Mound Master Specifications as a guide.
3. All drawings shall be standard "D" size and conform to the Mound standard format. The desired format is Initial Graphic Exchange Specification (IGES). However, master drawings may be made using an AutoCad drawing file on 5-1/4 inch floppy disks supplied by the A/E. The data shall be grouped in a logical manner with BLOCKS, CELLS, LEVELS, and LAYERS used to represent such items as a desk, HVAC equipment, and TOPO information.
4. The A/E will be responsible for updating the master AutoCad drawings to their "As Built" condition upon completion of Title III work. Final construction drawing disks will become the property of the Government upon completion of construction.
5. The A/E shall, during design, field verify existing building site, utility conditions and any critical field conditions.
6. The A/E shall furnish the appropriate plans, specifications, sections, isometrics, profiles, details, and engineering diagrams, schedules, notes and legends to accurately convey all pertinent information to the construction contractor. Use the scale and arrangement selected by Mound and approved by Mound.
7. The A/E will provide an experienced Project Manager capable of effectively coordinating a multi-disciplined engineering team. His communication and administrative skills should be substantiated by prior successful experience in a similar role.
8. The A/E, upon final design review and approval, will prepare a lump sum bid package with bound drawings and specifications in the specified quantity listed at the end of this Section, for bidding by Mound.
9. The A/E shall investigate and employ the most efficient methods of engineering and drafting possible (i.e. overlays, computer aided drafting, photo drafting, etc.)

10. The A/E shall provide in his proposal an estimated "cost of construction" of all elements of the project. This estimate shall include a detailed materials list and detailed manpower costs.

B. TITLE I - 40% TO 50% COMPLETE

1. Field work shall be complete to include conduit, cable tray, and wireway run investigations, location of existing conduit and equipment, location of new equipment, and breaker sizing and ratings.

Temporary electrical supply needs shall be addressed.

2. Preliminary drawings shall be complete. These may be in sketch form, but must be sufficient to convey the concepts to be carried forward into definitive design drawings.
3. Specifications shall be in outline form with all sections covered which are applicable to the completed document.
4. Design calculations shall be completed and in a form to permit detailed review by Mound. Structural calculations shall include 100% complete gravity lateral and stability analysis with dimensions of all members and components.
5. Alternatives specifically required and those suggested by the A/E and economic analysis supporting the alternatives should be completed and submitted for approval.
6. Electrical one line diagrams portraying the sizing of the electrical system will be complete.
7. Based on the submitted economic analysis, a master equipment list will be submitted with the detailed data and calculations supporting the equipment sizing.
9. Specification of equipment and materials of construction shall be complete in a form to provide a preliminary estimate of construction costs.
10. Revised detailed construction cost estimates shall be submitted. The estimates shall include separate estimated costs for any construction alternates included in the bid documents but not part of the base bid.
11. Prepare a Design Summary Report following guidelines in the Mound Project Management Manual #804 and DOE Order #6430, latest version.

C. TITLE II - 100% COMPLETE

1. Contract documents for the project shall be complete and ready for signatures. Only minor corrections shall be required after this review.
2. All corrections to drawings, specifications, calculations to be accomplished after Title I and subsequent intermediate reviews shall be complete.

3. The A/E shall provide a detailed Logic Bar Chart schedule for project construction and identify the critical path. The schedule shall include purchase and delivery activities and durations for all major equipment and building components.
4. Revised, detailed construction, materials, and manpower cost estimates shall be submitted. These estimates shall become the basis for the Government estimate to be used at bid opening. The estimates shall include separate estimated costs for any construction alternates included in the bid documents but not part of the base bid.
5. The A/E shall assist the Government in solicitation of bids and provide all specifications, drawings, and any amendments.
6. During the construction bidding, the A/E Project Manager shall accept and reply to all contractor inquiries relating to clarification and interpretation of the plans and specifications. These questions and answers will be formally documented and those which identify significant change or clarification will form the basis of a formal contract addendum prior to actual contract award. The A/E Project Manager shall participate in all pre-bid meetings and publish minutes of those meetings.

D. TITLE III - CONSTRUCTION SERVICES

Not a part of this project.

E. SCHEDULES AND REPORTS

1. The A/E will provide Mound with design schedules in bar chart form. Backup for these schedules shall include a preliminary list of required drawings and estimated engineering and drafting hours for each drawing.
2. Title I services shall commence at award of the contract. Four weeks for review by DOE and Mound shall be allowed.
3. Title II services shall commence upon approval of Title I design. Include four weeks for review by DOE and Mound.
4. Allow a minimum schedule for advance notice and CBD announcement:

10 days to place ad
 15 days for advance notice
30 days for bids to be due
 55 days minimum allowance total

F. MEETINGS AND DESIGN REVIEWS

1. Title I Design:

- a. Design Progress Reviews: Bi-weekly progress reviews during Title I will be held with the Mound Construction Manager. The purpose of this meeting is to review design progress in accordance with the approved schedule and to resolve issues that require team management decisions beyond the normal one-on-one telephone communications.

This will be the forum for major design issue discussion and solution. Formal minutes will be published with clear delineation of unresolved issues, the individual(s) responsible for resolution, and target date for resolution. The A/E Project Manager will provide a formal status briefing for the team.

- b. Additional informal reviews will be held as required by the project status.
- c. Title I Design Review Meeting: Upon completion of Title I review, changes will be made during Title II design. A minimum of four weeks will be required for both Title I and Title II review by Mound. In addition to the comment review, the Project Manager shall present a revised Title II design schedule for approval by Mound.

2. Title II Design:

- a. Design Progress Reviews: Bi-weekly progress reviews during Title II will be held with the Mound Construction Manager. The purpose of this meeting is to perform a comprehensive review of project status including schedule and cost. Major unresolved issues will be discussed. Formal minutes will be published by the A/E with clear delineation of unresolved issues, the individual(s) responsible for resolution and the target date for resolution.
- b. Additional informal reviews will be held as required by the project status.
- c. Final Design Review Meeting: Upon completion of Mound reviews of Title II design a final meeting will be held to review all design plans, specifications, and construction documents. Four weeks will be required to permit timely review and assembly of discipline comments prior to the meeting. At this point, the A/E will have a bid package completely assembled.

3. Design Changes:

Design changes may be proposed by the A/E or directed by Mound at any time during the design. These changes shall be fully discussed to determine their impact. All deviations from the design criteria or "Title I Design Summary" must be approved by the EG&G Construction Manager. A sequentially numbered Change Order Log will be kept by the A/E to show a description of change, date, cost, and schedule impact.

4. Issue Lists:

The A/E shall issue and continually update a list that indicates outstanding issues to be resolved, by whom, and the target date for resolution (both original and current). This list shall be a main force of discussion at the bi-weekly design progress meetings and shall be maintained during the life of both Title I and Title II design phases of the project. It will be updated continuously as new issues arise and others are resolved. A separate list will be maintained by the construction Manager during the Title III phase.

5. Document Issue Requirements:

Specifications, estimates, drawings, and time schedules shall be prepared in such form and furnished in such quantity as directed by Mound. Minimum requirements are:

	<u>Title I</u>	<u>Title II</u>	<u>Bidding Doc.</u>	<u>Comp.</u> <u>Proj.</u>
Specifications	20	20	40	-
Drawings	20	20	40	-
Origs.	-	-	-	AutoCad*
Design Summary Report (Cost Estimates, Schedules, Design Considerations, and Calculations)	10	10	10	-

NOTE: Copies of drawings shall be provided for design progress reviews and informal reviews as required.

* In "As Built" condition.

** Provide on 5-1/4 inch floppy disk in ASCII or Multimate format compatible to IBM PC.

SECTION III. REFERENCE DOCUMENTS

The following reference documents are listed as a guide to be used in designing the project. If a conflict exists between statements in this design criteria and the referenced documents, or between any of the referenced documents, then the more restrictive requirement shall apply to the design of the project. Unless specifically noted otherwise, the edition of the following documents in effect on date of the design contract shall apply to the design of this project.

A. Department of Energy

- o Environmental Protection, Safety, and Health Protection Program for DOE Operations, DOE Order 5480.1B, Chapter I, VII, & IX.
- o General Design Criteria Manual (GDCM), DOE Order 6430.1A
- o General Design Criteria for Energy Conservation and Use of Renewable Energy Sources in DOE Facilities, DOE N 6430.2
- o DOE Handbook for Preparation of Specifications for Construction Contracts (This is issued as part of Mound 808 Manual).
- o Project Management System, DOE Order 4700.1 and AL 4700.1.
- o DOE Quality Assurance Plan, DOE Order 5700.6B.
- o Work Breakdown Structure Guide, DOE/MA-0295, 2/6/87

B. Mound

- o Mound Project Management, Systems Manual 804.
- o General Requirements for A/E Work - Mound Systems Manual 808, Volume I & II
- o Master Construction Specifications
- o Mound Engineering Department Standards.
- o Mound Technical Manual, MD-10241, Engineering Department Non-Weapons Quality Programs
- o Guide for Presentation of Structural Design Information, April 17, 1990.
- o Guide for Calculations of Design Wind Pressures, May 15, 1986, (as edited for Mound use). Supplement with use of ANSI A58.1-1982.

- o Existing Mound Drawings, as listed in various discipline sections. (Note: It is standard for Mound drawings to have north pointed down or to the right. For projects involving building additions or renovations the A/E shall insure that the drawings match the orientation and scale of the existing building's drawings.)
- o Mound Safety and Hygiene Manual
- o Mound Site Development Plan
- o Mound Building Floor Plans, Issue March 1989
- o "Mound Design Standard for Pipe Supports", Mound, November 25, 1986.
- o "Pipe Stanchion Standard Configurations", Mound, November 1, 1987.

C. National Codes, Standards, and Guides

- o Ohio Basic Building Code (OBBC), including the;
 - OBBC Mechanical Code
 - OBBC Plumbing Code
 - OBBC Pressure Piping Code, including ANSI B31.1
- o State of Ohio, Department of Transportation (ODOT) Construction and Material Specifications, Standard Construction Drawings, and Location and Design Manual.
- o National Fire Protection Association (NFPA)
 - Standard 13, "Sprinkler Systems"
 - Standard 70, "National Electric Code"
 - Standard 101, "Life Safety Code"
 - All other applicable NFPA Standards.
- o Uniform Building Code, 1988 edition.
- o Uniform Federal Accessibility Standards in 41 CFR 101-19.6.
- o Underwriter's Laboratory Fire Resistance Directory with supplements.
- o Underwriter's Laboratory Building Materials Directory with supplements.
- o Illuminating Engineering Society Lighting Handbook.

D. OSHA

- o Occupational Safety and Health Standards of the Occupational Safety and Health Administration, Department of Labor, Federal Register, Title 29, Chapter XVII, Part 1926 during construction, and Part 1910 for design and operation.

SECTION IV CIVIL

Not applicable to this project.

SECTION V. ARCHITECTURAL

Not applicable to this project.

SECTION VI. STRUCTURAL

Not applicable to this project.

SECTION VII - MECHANICAL

A. GENERAL

The following information is provided as a guide in establishing the Mechanical HVAC, piping and utility requirements for this project and should not be construed to limit the Architect-Engineer from proposing more cost effective alternatives. This information is subject to review and change during the design process.

1. CODES, STANDARDS AND REFERENCES

- a. National Standard Plumbing Code
- b. Ohio Building Code
- c. ASHRAE Manuals
- d. SMACNA Manuals
- e. AMCA Standards
- f. Industrial Ventilation Manuals
- g. AABC Standards Manuals
- h. National Fire Protection Association

2. DRAWINGS AND SKETCHES

Sketches and drawings in Appendix A provide a guideline to the Architect-Engineer in designing the facilities.

Note: The information shown on the above sketches and drawings represents the most recent information available at this time. This does not relieve the A-E from the responsibility of verifying the accuracy of the above material.

B. DESIGN

1. Provide a Design Summary Documentation in a well indexed report format with all assumptions and references stated. Report shall include design calculations, basis of design equipment information (e.g. catalog material, charts, tables, performance curves, etc.).
2. Provide for construction materials consistent with good design practice and in accordance with DOE and Federal Standards and other pertinent codes. Particular attention shall be directed to DOE Order 6430.1.
4. Direct the Construction Contractor to provide:
 - Detailed project submittals for all equipment and materials which are to be used in construction. Submittals shall include shop drawings (ductwork, equipment, piping, etc.), certifications, catalog material, performance curves, schedules, diagrams, installation instructions and all additional information required for a thorough review by Mound and A-E engineering personnel.

- Provide an instructional and operational period at the completion of construction period as required to educate and prove systems operation to maintenance and engineering personnel in all aspects of systems installations.
 - Operation/maintenance manuals and instructions, recommended spare parts listing and schematic drawings of systems and subsystems.
5. Design drawings shall clearly indicate all appropriate plans, section views, system isometrics, details, flow diagrams (steam, brine, water systems, air, etc.), control systems schematics, equipment schedules, notes, legends, etc. as required to provide a complete and detailed system designs. The above requirements shall be indicated on the Title I submittal and revised for Title II.
 6. All legend symbols used as part of design shall be listed in the ASHRAE Handbook of Fundamentals.
 7. Major equipment items to be used as basis of design shall be approved by Mound personnel prior to design start.
 8. The specific space utilization schedule for each task shall be provided to A-E at design start indicating occupied/ unoccupied schedule for people, lighting, process equipment, HVAC equipment, etc.

C. UTILITIES

Not applicable to this project.

D. PIPING AND PLUMBING

Not applicable to this project.

E. NOISE AND VIBRATION

Not applicable to this project.

F. INSULATION

Not applicable to this project.

G. IDENTIFICATION AND LABELING

Not applicable to this project.

H. HEATING, VENTILATING AND AIR CONDITIONING

Not applicable to this project.

I. CONTROL AND INSTRUMENTATION

1. All mechanical equipment is to be tied into the central Mound Direct Digital Control system (based around the Andover AC-256).

2. Design shall include a complete sequence of operation, schematic and point listing of all mechanical control systems on the design drawings.
3. Design shall include a revision of the sequence of operation for the air handling units in each of the buildings. The following control features shall be incorporated in the existing sequence of operation.
 - CTF Bldg.
 1. Scheduling of minimum outside air with time of day and based on supply fan CFM.
 2. Reset of discharge air temperature base on the zone with the greatest call for cooling and dehumidification.
 - COS Bldg.
 1. Reset discharge air temperature based on the zone with the greatest call for cooling.
 - OSW Bldg.
 1. Reset discharge air temperature based on the zone with the greatest call for cooling.

J. ENERGY CONSERVATION

Not applicable to this project.

SECTION VIII ELECTRICAL

The following information is provided as a guide in establishing the electrical requirements associated with this project and should not be construed to limit the Architect-Engineer and Mound Engineering from proposing more cost effective alternates. This information is subject to review and change during the design process.

A. GENERAL REQUIREMENTS

Provide the electrical design for this project in accordance with the General Design Criteria, DOE Manual Appendix 6430.1A utilizing Mound Master Specifications and specific criteria included herein.

B. CODES AND STANDARDS

1. All electrical work shall be in accordance with the requirements of the National Electrical Code (NEC), ANSI/NFPA-70, and other applicable references as included in Section III.
2. All electrical equipment and materials furnished and installed shall bear the Underwriters' Laboratories Label of Approval for the particular service fitted.
3. The design of installation of raceways and equipment shall be as required by local seismic requirements and UCRL 15910.

C. IDENTIFICATION

1. Installation for permanent identification of electrical equipment and systems shall be specified per the following Mound standard:
 - a. Panels at 480 and 240 V, 3 phase: PP
 - b. Panels at 208/120 V, 3 phase and 240/120 V, 1 phase: LP
 - c. Room number shall follow the above designations.
 - d. Multiple panels in a single room shall be labeled as above with the added suffix A,B, or C... starting with the second panel.
 - e. A panel in a corridor shall be assigned the number of the room on the other side of the wall from the panel.
 - f. Special cases shall add a designated prefix to the PP and LP identification:
 - E - Emergency Power
(cover shall be painted yellow)
 - U - Uninterruptible Power Source
 - C - Conditioned Power
 - D - Direct Current

g. The format shall be: - - - - -
1 2 2 3 3 3 4

1-Prefix for special case (E, U, C, D)

2-PP or LP

3-Room Number (24, 106)

4-Additional Panels (A, B, C...)

2. Nameplates shall be made of sandwich type plastic with white letters on a black background. Letter size shall be 1/8" for control devices, push buttons, etc., and 1/4" for distribution panels, control panels, etc., unless otherwise directed. Nameplates shall be mounted on the outside surfaces of all equipment within easy sight of all personnel.
3. Wire markers shall be on waterproof cloth tape of high adhesion and tensile strength. Brady used as basis of design.

D. DISCONNECTS (MOTOR AND CONTROL)

Not applicable to this project.

E. CONDUIT

1. General

Conduit systems may consist of rigid galvanized steel, IMC, EMT (electrical metallic tubing), or a combination of the three as required by applicable codes and standards. EMT shall not be used outdoors, in wet locations, in below-floor crawl spaces, or below 5 feet AFF. Type EB PVC, encased in reinforced concrete shall be used in all duct banks. All conduit shall be concealed where feasible.

F. WIRES AND CABLES

1. Conductors and Cables, 600V or less

- a. Single conductor power and control wire shall be uncoated, class B or compressed stranded soft copper. Insulations shall be permitted as shown in paragraph 1605-2.2.1 of DOE Order 6430.1A. Insulated conductor shall conform to Underwriters' Laboratories Specification UL44.
- b. Power conductors shall be 12 AWG copper or larger.
- c. Control conductors shall be 14 AWG copper.
- d. Specify type THW or THWN insulation for all wire sizes. Other types may be used if in compliance with the provisions of DOE Order 6430.1A, Section 1605-2.2.1.

2. Not applicable to this project.

	480/277 & Greater	240 and lower
A	BROWN	BLACK
B	ORANGE	RED
C	YELLOW	BLUE
NEUTRAL	WHITE	WHITE
GROUND	GREEN	GREEN

4. Phase rotation on 12,470 volt systems shall be ABC.

5. Connectors and Devices:

- a. Conductors larger than #10 AWG shall be joined by compression type connectors. Terminal connections shall be made using solderless pressure lugs, except when factory installed set screw connections are supplied.
- b. Conductors #10 AWG and smaller may be joined with electrical spring connectors with vinyl tape or insulated wire nuts.
- c. Cable ties shall be nylon self-locking type suitable for the environment in which they are installed.

G. PANELBOARDS

Not applicable to this project.

H. WIREWAYS

1. Indoor type wireway shall be restricted to indoor use only.
2. Finish sheet metal parts shall be of 12 gage steel construction, flangeless design, with removable hinged cover. Wireway shall be without knockouts.

I. MOTORS

Not applicable to this project.

J. MOTOR CONTROLS

Not applicable to this project.

K. ELECTRICAL TIE-INS

1. General:

- a. This section outlines contractor responsibility and procedure for energizing equipment for the first time and for tie-in into existing electrical lines or equipment for additions or expansions to Mound facilities.

- b. Ratings - Mound's distribution voltage is 12,470 volts; utilization voltage is 480 volts.
- c. Unless otherwise stated, the Contractor is responsible for all labor and materials for making electrical tie-ins. Whenever possible, all equipment and circuits shall be de-energized before work is started and personnel shall be protected by clearance procedures and grounding. When it is necessary to work on energized equipment or circuits, rubber gloves and other protective equipment or hotline tools rated and tested for the voltage(s) involved shall be used. The contractor shall obtain approval, in advance, from the contracting officer to work on energized equipment or circuits.
- d. Phase Rotation and Polarity:

480 volt - Mound has no polarity or phase rotation standard for 480 volts (or lower voltage)

12,470 volt - Mound has a fixed polarity and rotation standard for its distribution voltage. The Contractor shall, through the Mound Construction Manager, contact Mound Electrical Engineering Group for instructions on all terminations and tests for polarity.
- e. There shall be no splices made in any 15 KV rated cables.

2. Power

Electrical characteristics for this project shall be 120v, single phase.

3. Grounding

Not applicable to this project.

4. Lightning Protection

Not applicable to this project.

L. INTERIOR

1. Distribution

- a. Distribution of power, lights, fire alarm, telephone, and miscellaneous signals shall be in metallic conduit. EMT is suitable for all raceway, except rigid conduit shall be utilized where it emerges from concrete or where the conduit may receive physical abuse. EMT shall not be used outdoors or in wet locations.

- a. Provide illumination levels in accordance with IES for the various tasks and activities. In general, provide 50 footcandles at work stations, 30 footcandles in work areas, and 10 footcandles in non-work areas. Utilize the highest efficiency light sources (usually fluorescent with high efficiency ballasts, high pressure sodium, and metal halide). At computer work stations, consider fixtures with parabolic diffusers to reduce glare.
- b. Provide lighting control and switching for each building as follows:
 - CTF - Install occupancy sensors in private offices and the lunchroom for control of lighting.
 - COS - Install occupancy sensors in laboratories and private offices for control of lighting.
 - OSW - Install occupancy sensors for the control of light fixtures in private offices.

M. FIRE ALARM SYSTEMS

Not applicable for this project.

N. TELEPHONE/HVAC

Not applicable for this project.

O. EXTERIOR

Not applicable for this project.

P. DEMOLITION

Not applicable for this project.

Q. TESTING

1. Specify that the contractor is responsible for all testing, removal for testing, reinstallation, and deficiency correction.
2. Tests to be performed include:
 - Insulation resistance tests
 - Outlet hot, neutral, and ground tests
 - Operational demonstrations including control schemes and interlocks

Not applicable to this project.

- A. The A/E will be required to implement a quality assurance program commensurate with the types of construction. All pertinent design data and specifications will be reviewed for compliance to the criteria by the Mound project team members, as well as the A/E. The A/E will - in preparing design specifications - include a subsection in each specification section entitled: Quality Assurance, and will list all applicable codes and quality requirements including testing and reporting of quality by the contractor. The QA plan will contain the necessary elements and controls to assure compliance with the Design Criteria, internal coordination of features and dimensions, internal checking and cross-checking between drawings and specifications, and tracking to assure incorporation of review comments from Title I and Title II reviews.
- B. During construction, submittals will be directed through the Mound Inspector to the A/E for review to determine compliance with the specifications. The inspection functions will include working jointly with the Mound Construction Manager through the project team. The project team includes Safety, Loss Prevention, and Environmental Control and other specialists who will review drawings, specifications and critical submittals to insure compliance with quality requirements.
- C. Areas of the project that require special attention will be reevaluated jointly during Title I design. The extent of application of general and special quality activities will be consistent with the engineering practices, systems, materials or components to assure needed reliability.
- D. The A/E shall, in conjunction with the Contractor, maintain a set of "as-built" records which define:
- Location of any lines, utilities and services which do not correspond with those shown in the reference materials.
 - Location with elevations, of any lines, utilities and services moved to a new position from the original location.

(The locations shall be determined with the assistance of a licensed surveyor).

These records shall, at the conclusion of the project, be transferred to a set of "as-built" drawings which will be turned over to the buyer as a permanent record.

- A. Security escorts will be used with any uncleared personnel employed in the construction of these facilities when work is within any security island, but outside of temporary construction fencing. Work in these areas will be subject to scheduling in order to assure adequate escort service by Mound Security personnel. Security escorts are also required while working in any penthouse or on any roof.
- B. Parking will not be permitted within the construction site. A contractor parking lot is located with access off Benner Road from which the contractor will be required to ferry personnel to the job site.

APPENDIX A

PROPOSED SCHEDULE

LIGHTING AND CONTROLS MODIFICATIONS

(OSW,CTF & COS BLDGs)

SCHEDULE