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June 19, 2020

ADDENDUM NUMBER 1 ON INVITATION TO BID ITB21KO-101

TITLE: SW Campus Transportation Improvements

This addendum shall be considered part of the Contract Documents for the above-mentioned project as though it had been issued at the same time and incorporated integrally therewith. Where provisions of the following supplementary data differ from those of the original Contract documents, this addendum shall govern and take precedence. Bidders are hereby notified that they shall acknowledge receipt of the addendum.

This addendum consists of:

- Answers to Contractor Questions and RFIs.
- Consultant's Addendum #1 dated June 17, 2020.
- Revised/Added List of Specifications.
- Floor Plans for Mehrhof Hall.
- Revised drawings as listed in Consultant's Addendum #1. Revised drawings are available for download by clicking the "Addendum 1 Drawings Dropbox" line on the Schedule of Bids webpage.
- Correction to Table of Contents (TOC-1), Technical Specifications, IV. This line should read:

  IV. ATTACHMENT A – Conformed Construction Documents – 279 Pages

- Reminder: Bids are due no later than July 1, 2020 at 1:30PM. See Section 00100 – INSTRUCTION TO BIDDERS, Item 1.4, for instructions.
- Bid opening that will be held remotely by Zoom. For those that wish to attend, please email procurement@ufl.edu for log-in details.

Karen Olitsky
Procurement Agent III

PLEASE ACKNOWLEDGE RECEIPT OF THIS ADDENDUM 1 AND RETURN WITH YOUR BID. FAILURE TO ACKNOWLEDGE THIS ADDENDUM COULD CONSTITUTE REJECTION OF YOUR BID.

_____
VENDOR NAME

_____
VENDOR ADDRESS

_____
SIGNATURE

Contractor Questions/RFIs
ITB21KO-101 – SW Campus Transportation Improvements

Q1. What is the Engineer's estimate for construction cost?

A1. The Engineer's estimate is $6,583,000.

Q2. Can the deadline for questions be extended?

A2. The deadline will not be extended.

Q3. Section 00100, 1.4B, of the ITB states that an electronic copy (Flash Drive or CD/DVD) shall be submitted with the sealed bid. Can this requirement be deleted? If not, can we submit the electronic copy within 24 hours after the bid? If it can be done post-bid, can we submit via email?

A3. Electronic copy on flash drive or CD/DVD is to be submitted with your bid. Emailed bids will not be accepted.

Q4. Reference Section 00430 of the ITB. 1.2A states that a subcontractor list must be submitted. Can the subcontractor list be submitted post-bid? Perhaps within 10 days of bidding? If not, can the references portion of this requirement be submitted post-bid?

A4. Section 00430 is to be complied with as written. All documentation is to be submitted with your bid.

Q5. Reference Spec Section 00811, 1.1. Please confirm that the entire project must comply with Buy American Act Compliance.

A5. This is not a Federally Funded project. Delete Section 00811 entirely.

Q6. Reference Spec Section 00811, 1.2. Please confirm that the entire project must comply with Davis-Bacon Wages.

A6. This is not a Federally Funded project. Delete Section 00811 entirely.

Q7. Spec section 00811 – Federally Funded Projects, section 1.2, states "A current wage determination will be issued, if required, during bidding". Please provide this wage determination.

A7. This is not a Federally Funded project. Delete Section 00811 entirely.

Q8. What are the Liquidated Damages per a day on this project?

A8. The Liquidated Damages will be tiered with the initial 5 days at $1,000 per day and all days after at $10,000 per day.

Q9. What is the contract time and estimated start date?

A9. See Section 1310.

Q10. Has acquisition time been figured in for signalization on Archer Road?

A10. Yes.

Q11. Are there any quantities on this project?

A11. There are no estimated quantities available.

Q12. If you do not have a General Contractors license, but are FDOT prequalified, would you be able to bid this project?

A12. A licensed Contractor is required to be the Prime bidder. A FDOT pre-qualified contractor is required for work within the FDOT R/W.

Q13. Please clarify if the costs for permitting the project are by owner or to be included with the bid?

A13. The regulatory permitting costs are by the Owner.

Q14. Will night work be allowed?

A14. Yes, with sufficient advance coordination and appropriate MOT plan.

Q15. Will portions of Ballpark Way be allowed to be closed entirely for construction?

A15. The proposed section of Ballpark Way will not be open until construction is complete. The existing portion of Ballpark Way will be allowed to be closed for short periods of time with sufficient advance coordination and an approved MOT plan.

Q16. Division 5 - Please provide a specification for the guardrail shown on C10.1.

A16. Specifications for the guardrail have been added to the project specifications under Section 32 19 99 Aluminum and Stainless-Steel Pipe and Tube Railings. See Revised/Added List of Specifications included in this Addendum.

Q17. Division 10 - Please provide a specification for the architectural signage shown on L4.3.

A17. Signage consists of pin set, powder coated metal cut letters. Further details to be coordinated during the shop drawing process.

Q18. Division 32 - Please provide a specification for the pavers shown on L4.0.

A18. A brick paving specification has been added. See Revised/Added List of Specifications included in this Addendum.

Q19. Reference Detail 1 on L4.1. Is that sand being shown for the setting bed under the pavers? Will the new foundation dowel into the existing foundation/wall?

A19. The new installation should match the existing conditions and utilize the installation method of the existing pavers in this area.

Q20. Can we be given access to Mehrhof Hall so we can take photos of the existing conditions or be given drawings of the building for reference?

A20. Floor plans for Mehrhof Hall are included in this Addendum.

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June 17, 2020

ADDENDUM #1

PROJECT:

UF-642 – SW Campus Transportation Improvements

DESCRIPTION:

Revisions were made to the construction plans as a result of comments provided during the permitting process FDOT and revisions requested by the owner.

DRAWING RELATED CHANGES:

1. Sheet C0.0 – Revised Sheet Index.

2. Sheet R-0 – Updated End Project Station and updated Drawing Index.

3. Sheet R-1 – Updated utility contact information. Added Project Coordination Note 4 regarding contacting RTS. Updated FDOT General Note 3 for common Bermuda sod. Added City of Gainesville General Notes.

4. Sheet R2.1 – Updated slopes in sod areas. Updated median along SW 23rd Terrace to concrete instead of sod. Increased structural course and friction course on SW 23rd Terrace to 1 ½" each. Increased structural course and friction course on Old Archer Road to 1 ½" each. Removed slopes noted on existing lanes to remain on SR 24/Archer Road. Updated proposed turn lane widths on SR 24/Archer Road to 11'.

5. Sheet R2.2 – Newly added sheet

6. Sheet R-3 – Updated trees to be removed. Added limits of construction. Updated sawcut on SR 24 near STA 33. Added note for contractor to provide field measurements for existing communications vault near station 13+50.

7. Sheet R-4.1 – Updated note for installation of bus stop boarding and alighting area near STA 11. Updated merge area near STA 13. Updated to not show existing drainage structures to be removed. Designated curb ramp type for path near STA 16. Updated note for relocation of memorial signs near STA 17. Updated median along SW 23rd Terrace to concrete instead of sod. Added radius information for SR 24 median noses. Added note to regrade area of demolished driveway near STA 38 and STA 13. Added drainage pipe to legend. Added note to see intersection plan for elevations. Added note for curb ramps not in FDOT ROW to meet City of Gainesville Standards. Updated profile information. Added note to adjust vault ring and cover near STA 13+50. Added note to see sections for grading in the area of the demolished SW 23rd Terrace.

8. Sheet R-4.2 – Updated sawcut area near STA 33. Added radius information for SR 24 median noses. Updated SR 24 alignment information. Added note to see intersection plan for elevations.

9. Sheet R-5 - Updated inlet type to type 4 for structures 4 and 5.

10. Sheet R-6 - Added match existing note where proposed sidewalk/path meets existing sidewalk/path. Updated spot grades/elevations per profile. Added notes for contractor.

11. Sheet R-7.1 – Updated cross sections to show ROW to ROW. Sheet shows STA 10+00 through STA 11+75. Added/updated elevations and grades.

12. Sheet R-7.2 - Updated cross sections to show ROW to ROW. Sheet shows STA 12+00 through STA 13+75 (previously on Sheet R-7.1). Added/updated elevations and grades.

13. Sheet R-7.3 - Updated cross sections to show ROW to ROW. Sheet shows STA 14+00 through STA 15+75 (previously on Sheet R-7.2). Added/updated elevations and grades.

14. Sheet R-7.4 – Updated cross sections to show ROW to ROW. Sheet shows STA 16+00 through STA 17+00 (previously on Sheet R-7.2). Added/updated elevations and grades.

15. Sheet R-7.5 – Updated sheet number per items above (previously Sheet R-7.3). Added/updated elevations and grades.

16. Sheet R-8.1 - Updated notes to include synthetic hay bales instead of straw.

17. Sheet R-8.2 – Added note to Figure 4.

18. Sheet R-9.1- Updated notes to include comments from City of Gainesville and FDOT. Added FDOT Notes.

19. Sheet R-9.2 - Updated notes to include comments from City of Gainesville and FDOT.

20. Sheet S-1 - Updated note 5 per FDOT and City requirements. Added note stating the tabulation of quantities is for information only. Updated tabulation of quantities per updates to Sheet S-2.

21. Sheet S-2 - Updated longitudinal crosswalk markings to preformed thermoplastic. Updated R10-15 sign at STA 15+98 to include stop sign. Updated crosswalks at Old Archer Road to special emphasis. Added delineators to median near STA 16. Updated marking skip type through intersection. Updated sign type at STA

38+85. Added memorial sign relocation note. Added dimensions for all crosswalks. Updated per changes to Sheet R-4.1.

22. Sheet S-3 - Specified letter series.

23. Sheet T-1.1 - Updated General Note 15 for first four (4) feet instead of first two (2) feet. Added City of Gainesville note 8.

24. Sheet T-1.2 - Updated note 7 to include coordination with City on bracket type/position. Updated tabulation of quantities per updates to Sheet T-1.3.

25. Sheet T-1.3 - Updated Sign D to electronic blank out sign R3-1. Removed Sign F. Updated Sign C per updates to Sheet T-1.6. Added removal of existing video detection equipment. Added replacement of existing fiber optic pull box. Added additional pull boxes for pedestals. Updated pole location/elevation callouts per changes to Sheets 4.2 and 7.5.

26. Sheet T-1.4 – Updated controller timings table. Added overlap movements for 4R and 8R in Phases 1 and 2 of signal operation plan. Updated span tabulation table per sign changes on Sheet T-1.3. Added Note 5 for blank out sign.

27. Sheet T-1.5 - Updated pole location/elevation per changes to Sheets 4.2 and 7.5. Updated pole height and depth for Pole C.

28. Sheet T-1.6 - Specified letter series. Updated layout of Sign C.

29. Sheet T-1.7 - Removed extraneous text from table.

30. Sheet T-1.8 – Reissued sheet.

31. Sheet T-2.1 - Updated General Note 14 for first four (4) feet instead of first two (2) feet. Added City of Gainesville note 3.

32. Sheet T-2.2 – Updated tabulation of quantities per updates to Sheet T-2.3.

33. Sheet T-1.3 – Updated to include new loops for westbound lanes. Updated to show existing loops to remain for northbound, southbound and eastbound lanes. Added new detectors for new westbound right-turn lane and westbound bike lane.

34. Sheet ED 1.2 – Clarified demolition in the area of the Baseball Stadium.

35. Sheet ED 1.3 - Clarified demolition in the area of Orchard Rd.

36. Sheet E 1.1 - Updated references to Detail number.

37. Sheet E1.2 - Updated references to Detail number.

38. Sheet E1.3 - Updated references to Detail number and added 6-way ductbank to connect manholes.

39. Sheet E1.4 - Updated references to Detail number and updated OFCI Switchgear information.

40. Sheet E1.5 – Updated references to Detail number.

41. Sheet E1.6 – Updated references to Detail number, added 2-way ductbank for connection to greenhouses, and added Alternate 1 regarding underground work.

42. Sheet E1.7 – Updated manhole locations.

43. Sheet E1.8 – Added Sheet Keynote 4 regarding Archer Road crossing.

44. Sheet E4.1- Added a note to Detail 1 regarding irrigation controllers, updated Detail 2 Concrete Pole Base Detail, and updated Fixture Schedule descriptions.

45. Sheet E5.1 – Updated duct bank details for structural requirements. Updated manhole detail based on Owner preferences.

46. Sheet E6.1 - New Sheet. For reference only to clarify source of circuit(s) affecting project.

47. Sheet E6.2 - New Sheet. Clarifies scope of work regarding active feeders and distribution.

48. Sheet L2.5 – Additional trees removed south of the proposed SW 23rd Terrace. Additional trees removed at eastern end of western Old Archer Road. Additional tree barricade proposed along existing trees to remain east of SW 23rd Terrace.

49. Sheet L2.7 – Expanded note 4 to add FDOT requirements for within the Archer Road right of way. Added note 10 regarding tree removal requirements.

50. Sheet L2.8 – Moved tree barricade detail to this sheet and added note 1. Revised tree mitigation charts per new tree removals. Separated mitigation required within FDOT right of way from the rest of the mitigation as required within UF-owned properties, including the right of ways of SW 23rd Terrace and Old Archer Road.

51. Sheet L3.5 – Added and shifted proposed trees along eastern perimeter of SW 23rd Terrace to add replacement trees for additional mitigation requirements per additional tree removals. Moved proposed street trees and those near the eastern gateway walls per relocated light locations. Changed sod type to Bermuda in FDOT right of way areas, typical. Added areas of clear sight/sight triangles as per FDOT request Median of SW 23rd Terrace converted from sod to concrete. Nosing of eastern Archer Road median converted to concrete.

52. Sheet L3.6 - Shifted proposed trees along Ballpark Way to respond to revised light locations.

53. Sheet L3.7 - Revised plant counts due to tree adds and slight changes in a few beds at the Archer Road gateway plantings.

54. Sheet L3.8 - Revised mitigation per revised tree impact removals and proposed replacement tree counts.

55. Sheet L4.1 - Added notes to clarify paver requirements.

56. Sheet L5.5 - Moved a few irrigation heads due to plant moves at gateway. Showing new trees in SW 23rd Terrace area. Clarifying to cut and cap existing irrigation in medians of Archer Rd.

57. Sheet L5.6 - Moved several irrigation heads due to tree moves due to light relocations

58. Sheet L5.7 - Reformatted irrigation schedule to allow for addition of notes. Added Note 15 in 'Irrigation Notes'.

SPECIFICATIONS RELATED CHANGES:

1. Section 03 3000 – New section pertaining to concrete for electrical construction.

2. Section 26 0513 - Section updated for clarifications regarding active feeder work. Deletions are struck-through. Additions are underlined.

3. Section 26 0543 – Section updated for clarifications and Owner preferences. Deletions are struck-through. Additions are underlined.

4. Section 32 14 16 – Brick Unit Paving

5. Section 32 19 99 – Aluminum and Stainless Steel Pipe and Tube Railings

ISSUED BY ENGINEER:

A. J. "Jay" Brown, Jr., PE
President, JBrown Professional Group Inc.
Enclosure

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UF-642 – SW Campus Transportation Improvements

Addendum #1

Revised/Added List of Specifications

Specification Section	Specification Title
Division 26	**Electrical**
03 3000	Cast-In-Place Concrete for Utilities
26 05 13	Medium-Voltage Cables
26 05 43	Underground Ducts and Structures
Division 32	**Exterior Improvements**
32 14 16	Brick Unit Paving
32 19 99	Aluminum and Stainless Steel Pipe and Tube Railings

SECTION 03 3000

CAST-IN-PLACE CONCRETE FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
   1. Equipment pads.
   2. Equipment foundations.
   3. Duct banks.
   4. Light pole bases.
   5. Sidewalk replacement.

B. Related Sections: Section 16112 – Excavation and Backfill: Excavation and backfilling for equipment pads, foundations, duct banks, light pole bases, and sidewalks.

1.2 SUBMITTALS

A. General: In addition to the following, comply with submittal requirements in ACI 301.

B. Product Data: For each type of product indicated.

C. Design Mixtures: For each concrete mixture.

D. Field quality-control test and inspection reports.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. Source Limitations: Obtain each type of cement of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

C. Comply with ACI 301, "Specification for Structural Concrete," including the following sections, unless modified by requirements in the Contract Documents:
   1. "General Requirements."
   2. "Formwork and Formwork Accessories."
   3. "Reinforcement and Reinforcement Supports."
   4. "Concrete Mixtures."
   5. "Handling, Placing, and Constructing."

D. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
   1. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Edge Forms for Equipment Pads/Foundations and Sidewalks: Form-facing panels, boards, or metal that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.
   2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for light pole bases: Treated cardboard or metal that will provide continuous, true, and smooth concrete surfaces.
   1. Cardboard tubes, metal, or other approved materials.

D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
   1. Portland Cement: ASTM C 150, Type I/II, gray.
      a. Fly Ash: ASTM C 618, Class F for use in duct bank concrete only.

B. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.
   1. Maximum Coarse-Aggregate Size: 1 inch nominal.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   2. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, Class C, or polyethylene sheet, ASTM D 4397, not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.7 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

2.8 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
   1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
   1. Fly Ash for Duct banks: 25 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing admixture in concrete for equipment pads/foundations and sidewalks, as required, for placement and workability.
   2. Use plasticizing admixture in concrete for duct banks and light pole bases, as required, for placement and workability.
   3. Slump Limit for Equipment Pads/Foundations and Sidewalks: 4 inches.
   4. Duct Bank: 8 inches for concrete with verified slump of 2 to 3-1/2-inches before plasticizing admixture, plus or minus 1 inch.
   5. Light Pole Bases: 8 inches for concrete with verified slump of 2 to 3-1/2-inches before plasticizing admixture, plus or minus 1 inch.

2.9 CONCRETE MIXTURES FOR UTILITIES

A. Duct Bank: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: 3000 psi at 28 days.
   2. Maximum Water-Cementitious Materials Ratio: 0.50.
   3. Slump Limit: 4 inches, plus or minus 1 inch.
   4. Air Content: 2 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

B. Equipment Pads/Foundations and Sidewalks: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: 4000 psi at 28 days.
   2. Minimum Cementitious Materials Content: 520 lb/cu. yd.
   3. Slump Limit: 4 inches, plus or minus 1 inch.
   4. Air Content: Do not allow air content of sidewalks and equipment pads to exceed 3.5 percent.

C. Light Pole Bases: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: 4000 psi at 28 days.
   2. Minimum Cementitious Materials Content: 520 lb/cu. yd.
   3. Air Content: Do not allow air content of light pole bases to exceed 3.5 percent.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 SELECTIVE SITE DEMOLITION

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove sidewalk, and other elements as indicated.
   1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing sidewalk to remain before removing existing sidewalk. Saw-cut faces vertically.

3.2 EXCAVATION AND COMPACTION FOR DUCT BANK ENCASEMENT, EQUIPMENT PADS/FOUNDATIONS AND SIDEWALKS

A. Excavate surfaces under duct bank encasements, walks and equipment pads to indicated lines, cross sections, elevations, and subgrades.

B. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under duct bank encasements, walkways and equipment pads, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.

3.3 EXCAVATION AND COMPACTION FOR LIGHT POLE BASES

A. Bore holes for light pole bases using tractor mounted auger or other approved equipment.

B. Compact all loose soil left in bottom of bore hole to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.4 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
   1. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   1. Install keyways, reglets, recesses, and the like, for easy removal.
   2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

H. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

I. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.5 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.6 REMOVING AND REUSING FORMS

A. General: Formwork for parts of the Work that do not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.7 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
   1. Lap joints 6 inches and seal with manufacturer's recommended tape.
   2. Place under equipment pads/foundations and sidewalks to prevent soil from suctioning off water from concrete.

3.8 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.9 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.

3.10 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of

weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for duct bank encasements, equipment pads/foundations and sidewalks in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope sidewalks and equipment pads uniformly to drain.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.11 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces of duct bank.

3.12 FINISHING EQUIPMENT PADS/FOUNDATIONS AND SIDEWALKS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish and fine broom finish.

C. Trowel and Fine-Broom Finish for Sidewalks: Apply a first trowel finish to surfaces of sidewalks and equipment pads. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to direction of travel or as directed. Edge with 1-1/2-inch wide edger. Joint with a 3-inch steel jointer.

D. Broom Finish: Apply a broom finish to exterior concrete equipment pads, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

3.13 FINISHING EXPOSED SURFACES OF LIGHT POLE BASES

A. Rubbed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities. Wet surface and rub with carborundum stone or other approved method to achieve a smooth sand-textured finish.

3.14 MISCELLANEOUS CONCRETE ITEMS

A. Equipment Pads and Foundations: Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

B. Light Pole Bases: Set anchor bolts for light poles at correct elevations, complying with diagrams or templates from manufacturer furnishing light poles.

3.15 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

1. Light pole bases: Apply according to manufacturer's written instructions after placing, screeding, and floating and troweling top of light pole base concrete.

C. Formed Surfaces: Cure formed concrete surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces.

E. Cure concrete according to ACI 308.1, by the following method:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

3.16 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Repairing Unformed Surfaces: Test unformed surfaces, such as sidewalks and equipment pads, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

C. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.17 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

B. Inspections:

1. Steel reinforcement placement.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.

C. Tests: Perform according to ACI 301.

1. Testing Frequency: One composite sample shall be obtained for each day's pour of each concrete mix exceeding 5 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

3.18 REPAIRS AND DISPOSAL

A. Remove and replace concrete that does not comply with requirements in this Section.

B. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 26 0516

MEDIUM-VOLTAGE CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Medium voltage cable.
   2. Cable splices.
   3. Cable terminations.
   4. Insulated caps.
   5. Bushing inserts.
   6. Hot line voltage indicators.
   7. Fireproofing tape.

B. Related sections:
   1. Section 16075 – Electrical Identification.

1.2 REFERENCES

A. AEIC CS8 – Specification for Extruded Dielectric Shielded Power Cables Rated 5 Through 46 KV (2000).

B. ANSI/ICEA S-97-682 – Utility Shielded Power Cables Rated 5-46 kV (2000).

C. ANSI/IEEE 386 – Separable Insulated Connector Systems for Power Distribution Systems Above 600 V (1995, Rev. 2001).

D. ANSI/IEEE 400 – IEEE Guide for Making High-Direct-Voltage Tests on Power Cable Systems in the Field (1991).

E. ANSI/IEEE 495 – IEEE Guide for Testing Faulted Circuit Indicators (1986).

F. ANSI/IEEE C2 – National Electrical Safety Code (~~2007~~2017).

G. ANSI/IEEE C37.40 – Standard Service Conditions and Definitions for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories (2003).

H. ANSI/IEEE C37.41 – Standard Design Tests for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories (2000).

I. ANSI/IEEE C37.47 – Standard Specifications for Distribution Fuse Disconnecting Switches, Fuse Supports, and Current-Limiting Fuses (2001).

J. ANSI/NECA/MACSCB 600 – Recommended Practice for Installing and Maintaining Medium-Voltage Cable (2003).

K. ANSI/NFPA 70 – National Electrical Code (~~2005~~2014).

L. ANSI/UL 467 – Grounding and Bonding Equipment (1993, Bulletins 1994 and 1996, Revision 1996).

M. ANSI/UL 1072 - Medium Voltage Power Cables (1995, Rev. 2000).

N. ICEA S-93-639 - 5-46 kV Shielded Power Cable for Use in the Transmission And Distribution of Electric Energy (2000).

O. IEEE 48 – Test Procedures and Requirements for High- Voltage Alternating-Current Cable Terminations 2.5 KV Through 765 KV (1996).

P. IEEE 404 – Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2500 to 500000 V (2000).

Q. NEMA WC 74 - 5-46 kV Shielded Power Cable for Use in the Transmission And Distribution of Electric Energy (2000).

R. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association, 1999).

1.3 SUBMITTALS

A. Section 01340 – Submittal Procedures.

B. Product Data: Provide for cable, terminations, splices, and accessories.

C. Installer's Certifications: Provide certification from a trade school, labor union, journeyman training program, military training school, factory training program, or other formal training program that the installer has received formal training in medium voltage cable splicing and terminating.

D. Installer's Experience: Provide documentation that the installer of medium voltage cable joints/terminations has a minimum of three years experience in splicing and terminating the type and rating of cables specified. Provide a list of five (5) minimum successfully completed medium voltage cabling projects for reference. All project references shall have been in satisfactory operation for a period of not less than one (1) year.

E. Manufacturer's Test Reports: Indicate procedures and results for factory testing and inspection performed in accordance with referenced standards. Tests shall include, but not be limited to:
   1. AC, DC high voltage withstand test
   2. Insulation resistance
   3. Partial discharge (corona level)
   4. Dielectric loss
   5. U-bend discharge
   6. Uniformity of insulation thickness and cable dimensions
   7. Heat shock
   8. Heat distortion
   9. Void and contamination determination

10. Shielding stripping
11. Tensile strength of insulation
12. Elongation at rupture
13. Cold bend test
14. Abrasion resistance
15. Cut through resistance

F. Manufacturer's Instructions: Indicate application conditions and limitations of use. Include instructions for storage, handling, protection, examination, preparation, and installation of Product. Installation manual shall include, but not be limited to, the following information:
   1. Maximum allowable pulling tension (in pounds and Newtons).
   2. Minimum allowable bending radius.
   3. Recommended pulling compounds to be used.
   4. Splicing and termination instructions, include diagrams, dimensions and material lists.
   5. Weight per 1,000 ft.
   6. Standard "packaging" of reels (i.e., lengths, lagging, banding, etc.).
   7. Reactance and AC resistance (ohms to neutral) of each size and voltage class of cable, both in magnetic and non-magnetic duct, based on 3-1/C cables or 1-3/C cable in one duct.
   8. Recommended DC high potential test voltage and corresponding leakage current for field testing after cable installation.

1.4 SUBMITTALS FOR CLOSEOUT

A. Section 01720 – Project Record Documents.

B. Field Acceptance Test Reports: Medium voltage cabling system field acceptance testing performed by an independent certified testing agency.

C. Project Record Documents: Record actual sizes and locations of cables.

1.5 OPERATION AND MAINTENANCE DATA

A. Section 01730 – Operation and Maintenance Data.

B. Maintenance Data: Include instructions for testing and cleaning cable and accessories.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ANSI/NECA/MACSCB 600.
   1. Maintain at least one copy of referenced document at the job site.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten years documented experience.

B. Manufacturer's Testing Facility: Member of International Electrical Testing Association and specializing in testing products specified in this section with minimum ten years documented experience.

C. Installer of Cable Joints/Terminations: Certification from a trade school, labor union, journeyman training program, military training school, factory training program, or other formal training program that the installer has received formal training in medium voltage cable splicing and terminating.

D. Installer of Cable Joints/Terminations: Minimum of three years documented experience in splicing and terminating the type and rating of cables specified and with a minimum of five (5) successfully completed medium voltage cabling projects for reference. All project references shall have been in satisfactory operation for a period of not less than one (1) year.

1.8 REGULATORY REQUIREMENTS

A. Installer of the Work under this Section: State of Florida Certified or Registered Electrical Contractor including Utility Line Electrical Contractor Specialty (Code ET 068) in accordance with Rule 61G6, Florida Administrative Code.

1. Exception: Where the work is performed by the forces of a public utility company (regulated by Florida Public Service Commission) and the work is incidental to their business (Chapter 489.503, Florida Statutes).

B. Conform to ANSI/IEEE C2 and ANSI/NFPA 70.

1.9 FIELD SAMPLES

A. Provide under provisions of Section 01340 – Submittal Procedures.

B. Provide one field sample, two feet long, of each cable type installed under the project.

1.10 DELIVERY, STORAGE AND HANDLING

A. Accept cable and accessories on site in manufacturer's packaging. Inspect for damage.

B. Store and protect in accordance with manufacturer's instructions.

C. Protect cable ends from entrance of moisture.

1.11 PROJECT CONDITIONS

A. Comply with all applicable University of Florida safety/security procedures and policies.

B. Verify that field measurements are as indicated.

C. Verify routing and termination locations of cables prior to rough-in.

D. Cable routing is shown in approximate locations unless dimensioned. Route as required to complete wiring system.

1.12 SEQUENCING AND SCHEDULING

A. Utility Outages: Refer to Section 01016 – Utility Outages.

B. Coordinate with University of Florida to schedule any power outages required to perform the work. Provide two (2) weeks advance notice of any proposed minor power outage. Provide thirty (30) days advance notice of any proposed major power outage.

C. Sequence work to meet Owner's occupancy requirements.

1.13 GUARANTY AND WARRANTY

A. Contractor Guaranty: Guarantee for one year after Date of Substantial Completion all equipment, materials, and workmanship to be free from defects. Provide replacement parts for components found defective at no extra cost to the Owner.

B. Manufacturer's Warranty: The manufacturer shall provide a standard one-year written warranty against defects in materials and workmanship for all Products specified in this section. The warranty period shall begin on the Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MEDIUM VOLTAGE CONCENTRIC NEUTRAL CABLE

A. Manufacturers:

1. The Okonite Company.
2. Prysmian Power Cables and Systems (formerly Pirelli).
3. General Cable.
4. The Kerite Company.
5. Southwire Company.

B. Description: Jacketed primary underground distribution cable conforming to ANSI/ICEA S-94-649 and AEIC CS8.

C. Voltage Rating: 15 kV with application on a 12.47Y/7.2 kV, 3 phase, 4 wire, multigrounded system.

D. Central Conductor: Compact Class B stranded annealed uncoated copper.

1. Conductor size as indicated:

a. 500 kCMIL with 37 strands.

E. Conductor Shielding: Extruded semiconducting thermosetting compound compatible with the insulation and conductor. The outer surface of the conductor shield shall be cylindrical and shall be firmly bonded to the overlying insulation. The conductor shield shall fit tightly to, but strip readily from the conductor.

F. Insulation: 133% insulation level, homogeneous ethylene-propylene-rubber, 220 mils nominal thickness. Suitable for use in wet or dry locations and not exceeding 105 degrees C at normal conductor temperatures or 140 degrees C under emergency conditions.

G. Insulation Shielding: Single layer of black, thermosetting, semi-conducting, cross-linked polyethylene compound applied directly over the insulation.

1. The insulation shielding shall not require heat for removal.
2. The insulation shield, insulation, and the conductor shield shall all be applied in the same extrusion operation using a single pass method.

H. Concentric Neutral: Annealed, solid bare, uncoated copper wires conforming to ASTM B3.

1. Concentric neutral wires: Helically applied with uniform spacing over the semi-conducting layer with a lay of not less than 6 or more than 10 times the diameter over the concentric wire.
2. Cable intended for three phase applications shall have neutral equal to one-third the circular mil area of the central conductor (one-third neutral):
   a. For 500 kCMIL central conductor, provide twenty six (26) #12 AWG concentric neutral wires.

I. Jacket: Black, insulating, sunlight resistant, linear low-density polyethylene (LLDPE) extruded to fill spaces between neutral wires.
1. The jacket shall be free stripping and shall maintain contact with the insulation shield. The interface between the insulation shield and the insulating jacket shall be tightly fitting but free stripping.

J. Identification: Permanent surface ink or indent printing indicating manufacturer, NESC lightning bolt symbol, conductor size and material, insulation type and nominal thickness, voltage rating, insulation level, year of manufacture, UL designations, and sequential footage markings.

2.1 15 KV MEDIUM VOLTAGE TAPE SHIELDED CABLE

A. Manufacturer:
1. The Okonite Company.
2. Prysmian Power Cables and Systems (formerly Pirelli).
3. General Cable.
4. The Kerite Company.
5. Southwire Company.

B. Description: Ozone-resistant ethylene-propylene-rubber (EPR) insulated cable conforming to AEIC CS 8, ANSI/ICEA S-97-682, ICEA S-93-639, NEMA WC 74, ANSI/NFPA 70, and ANSI/UL 1072 Type MV-105.

C. Voltage Rating: 15 kV with 3-wire application from a 12.47 kV, 3 phase, 3 wire, single-point solidly grounded system.

D. Conductor: Compact Class B stranded annealed uncoated copper.
1. Conductor size as indicated:

E. Conductor Shielding: Extruded semi-conducting thermosetting compound compatible with, and firmly bonded to, the cable insulation.

F. Insulation: 133% insulation level, homogeneous ethylene-propylene-rubber, 220 mils nominal thickness. Suitable for use in wet or dry locations and not exceeding 105 degrees C at normal conductor temperatures or 140 degrees C under emergency conditions.

G. Shielding: Extruded semi-conducting thermosetting insulation shield covered by a helically applied 5 mil uncoated copper shielding tape with a minimum lap of 12.5%.

H. Jacket: PVC, flame-retardant and sunlight-resistant.

I. Identification: Permanent surface ink or indent printing indicating manufacturer, NESC lightning bolt symbol, conductor size and material, insulation type and nominal thickness, voltage rating, insulation level, year of manufacture, UL designations, and sequential footage markings.

2.2 15 KV CONCENTRIC NEUTRAL CABLE SPLICES (JOINTS) – IN-LINE TYPE (EPR TO EPR CABLE)

A. Manufacturer:

1. Tyco Electronics/Raychem – HVS-1510S-J Series, 15 kV Class, Splice for 1/C Jacketed Concentric Neutral Power Cables.

B. Selection and Ordering: Splice kits must be sized to the cable insulation diameter and conductor size/type. Verify proper splice kit selection (part number) using cable manufacturer's catalog data.

C. Specifications:

1. Power cable splices for jacketed URD (concentric neutral) cable shall be factory-engineered kits that rebuild the primary cable insulation, shielding and grounding systems, and outer jacket equivalent to that of the original cable.
2. When assembled on cable, the splice shall be capable of passing the electrical test requirements of IEEE-404 and the water immersion tests of ANSI C119.1-1986. Splices shall be of a uniform-cross-section, heat-shrinkable polymeric construction utilizing an impedance-layer stress control tube and high-dielectric-strength insulating layers.
3. The outer insulating layer shall be bonded to a conducting layer for shielding. The splice shall be rejacketed with a heat-shrinkable adhesive-lined sleeve to provide a waterproof seal.
4. The splice shall accommodate a range of cable sizes and be completely independent of cable manufacturer's tolerances. Splices shall be capable of being properly installed on out-of-round cable per relevant ICEA and AEIC standards. Kits shall accommodate a range of commercially available connectors. Splices for armored cables shall provide a means of reinstating the armor over the span of the installed splices.
5. Wye splices shall include a sealant profile to seal the area between the branch and the main cable.
6. The splice manufacturer shall provide a test report demonstrating compliance with the above requirements.
7. Splices shall be furnished in kit form including dual layer tube, stress relief material, discharge control compound, sealant, aluminum deflector, spring clamp, wraparound sleeve, metal channel and clip, and installation instructions.

D. Ratings:

1. 15 kV voltage class.
2. 110 kV BIL impulse withstand.
3. 35 kV AC 1-minute withstand.
4. 35 kV AC 6-hour withstand.
5. 70 kV DC 15-minute withstand.
6. Partial Discharge Voltage (DEV) <3 pc at 13 kV.
7. Load Cycling – 30 at 130 deg. C.

E. Compression Connectors:

1. Provide UL Listed compression connectors for cable splices.
2. Connectors on 15 kv service shall be designed and approved for use with conductor material and shall provide uniform compression over entire contact surface

~~2.2~~2.3 15 KV TAPE SHIELDED CABLE SPLICES (JOINTS) – IN-LINE TYPE (EPR TO EPR CABLE)

A. Manufacturer:

1. Tyco Electronics/Raychem – HVS-1520S Series, 15 kV Class, Splice for Extruded Dielectric (Poly/EPR) Power Cables with Metallic Tape Shield, Wire Shield, UniShield, or Lead Sheath.

B. Selection and Ordering: Splice kits must be sized to the cable insulation diameter and conductor size/type. Verify proper splice kit selection (part number) using cable manufacturer's catalog data.

C. Description: Meet requirements of IEEE 404 (electrical requirements) and ANSI/IEEE 386 (water immersion tests). Splices shall be of a uniform cross-section, heat-shrinkable polymeric construction utilizing an impedance layer stress control tube and high dielectric strength insulating layers. The outer insulating layer shall be bonded to a conducting layer for shielding. The splice shall be rejacketed with a heat-shrinkable adhesive-line sleeve to provide a waterproof seal.

1. Splices shall be furnished in kit form including stress control tube, insulating tube, dual wall tube, rejacketing tube, copper braid, roll springs, ground connectors, copper tape, copper mesh, stress relief material, sealant, and installation instructions.

D. Ratings:

1. 15 kV voltage class.
2. 110 kV BIL impulse withstand.
3. 50 kV AC 1-minute withstand.
4. 35 kV AC 6-hour withstand.
5. 75 kV DC 15-minute withstand.
6. Partial Discharge Voltage (DEV) <3 pc at 13 kV.
7. Load Cycling – 21 days at 130 deg. C.

E. Compression Connectors:

1. Provide UL Listed compression connectors for cable splices.
2. Connectors on 15 kV service shall be designed and approved for use with conductor material and shall provide uniform compression over entire contact surface.

F. Accessories:

1. Raychem HVS-EG external grounding kit.

~~2.3~~2.4 15 KV CABLE TERMINATION ELBOWS AT SWITCHGEAR - 600 AMP DEADBREAK

A. Manufacturers:

1. Thomas & Betts/Elastimold K656LR Series.
2. Cooper Power Systems BT625T Series.
3. Hubbell Power Systems 9U60AA Series.

B. Selection and Ordering: Elbows must be sized to the cable insulation diameter and conductor size/type. Verify proper elbow selection (part number) using cable manufacturer's catalog data.

C. Description: ANSI/IEEE 386, 600 amp deadbreak separable insulated connector with test point, 15 kV class, made of molded EPDM rubber, fully shielded and submersible. Elbow

connectors shall be furnished in kit form including T-body with test point, insulating plug, cap, compression connector, threaded stud, cable tape shield adapter, silicone lubricant, special wrench (if required), and instruction sheet.

D. Ratings:
   1. 15 or 15/25 kV voltage class.
   2. 600 amps continuous.
   3. 14.4 kV max phase-to-phase.
   4. 8.3 kV max phase-to-ground.
   5. 95 kV BIL impulse withstand.
   6. 34 kV AC one minute withstand.
   7. 53 kV DC 15-minute withstand.
   8. 11 kV AC minimum corona voltage level.

E. Accessories:
   1. Provide a premolded tape shield adapter with grounding lead for each elbow connector. This adapter shall allow for the cable shield to be bonded to the equipment grounding facilities and seal the outer jacket stripback from contamination or moisture ingress.

~~2.4~~2.5 INSULATED CAPS AT 15 KV SWITCHGEAR - 600 AMP DEADBREAK

A. Manufacturers:
   1. Thomas & Betts/Elastimold K656DR.
   2. Cooper Power Systems DPC625.
   3. Hubbell Power Systems 9U60ACAP.

B. Description: ANSI/IEEE 386, 600 amp deadbreak separable insulated connector component for installation on 600 amp apparatus bushing, 15 kV class, made of molded EPDM rubber, fully shielded and submersible. Insulated caps shall be designed for use as temporary or permanent covers for the bushing interfaces of energized circuits. To avoid low-energy discharge from the outer conductive shield, the braided lead shall be grounded. Insulated caps shall be furnished in kit form including cap, silicone lubricant, and instruction sheet.

C. Ratings:
   1. 15 or 15/25 kV voltage class.
   2. 600 amps continuous.
   3. 14.4 kV max phase-to-phase.
   4. 8.3 kV max phase-to-ground.
   5. 95 kV BIL impulse withstand.
   6. 34 kV AC one minute withstand.
   7. 53 kV DC 15-minute withstand.
   8. 11 kV AC minimum corona voltage level.

~~2.5~~2.6 15 KV BUSHING INSERTS - 200 AMP LOADBREAK

A. Manufacturers:

1. Thomas & Betts/Elastimold 1601A4.
2. Cooper Power Systems LBI215.
3. Hubbell Power Systems 9U02AAB001.

B. Description: ANSI/IEEE 386, 200 amp loadbreak separable insulated connector component for interface between 200 amp bushing well and 200 amp loadbreak elbow, 15 kV class, made of molded EPDM rubber, fully shielded and submersible. Bushing inserts shall be furnished in kit form including insert, silicone lubricant, and instruction sheet. Include optional torque tool so that insert can be installed into the bushing well without accidental breakage of the bushing well stud.

C. Ratings:
1. 15 kV voltage class.
2. 200 amps continuous and loadbreak.
3. 14.4 kV max phase-to-phase.
4. 8.3 kV max phase-to-ground.
5. 95 kV BIL impulse withstand.
6. 34 kV AC one minute withstand.
7. 53 kV DC 15-minute withstand.
8. 11 kV AC minimum corona voltage level.

~~2.6~~2.7 CABLE TERMINATION ELBOWS - 200 AMP LOADBREAK

A. Manufacturers:
1. Thomas & Betts/Elastimold 165LR Series.
2. Cooper Power Systems LE215 Series.
3. Hubbell Power Systems 9U01ABD Series.

B. Selection and Ordering: Elbows must be sized to the cable insulation diameter and conductor size/type. Verify proper elbow selection (part number) using cable manufacturer's catalog data.

C. Description: ANSI/IEEE 386, 200 amp loadbreak separable insulated connector without test point, 15 kV class, made of molded EPDM rubber, fully shielded and submersible. Elbow connectors shall be furnished in kit form including molded elbow, bi-metal compression connector, probe, silicone lubricant, probe installation tool, and instruction sheet.

D. Ratings:
1. 15 kV voltage class.
2. 200 amps continuous and loadbreak.
3. 14.4 kV max phase-to-phase.
4. 8.3 kV max phase-to-ground.
5. 95 kV BIL impulse withstand.
6. 34 kV AC one minute withstand.
7. 53 kV DC 15-minute withstand.
8. 11 kV AC minimum corona voltage level.

E. Accessories:

1. Provide a premolded tape shield adapter with grounding lead for each elbow connector. This adapter shall allow for the cable shield to be bonded to the equipment grounding facilities and seal the outer jacket stripback from contamination or moisture ingress.

~~2.7~~2.8 ELBOW ARRESTERS - 200 AMP LOADBREAK

A. Manufacturers:

1. Thomas & Betts/Elastimold 167ESA Series.
2. Cooper Power Systems M.O.V.E. Series.
3. Hubbell Power Systems PDE Series.

B. Description: ANSI/IEEE C62.11 and ANSI/IEEE 386; 200 amp loadbreak separable insulated connector with integral metal oxide varistor (MOV) surge arrester, 15 kV class, housing made of molded EPDM rubber, fully shielded, submersible, and deadfront. Assembly shall be complete and ready for installation including molded elbow with pulling eye and drain wire tab, probe, metal oxide varistor, brass or stainless steel end cap, #4 AWG flexible copper ground lead, and instruction sheet.

C. Ratings:

1. 15 kV voltage class, 200 amp loadbreak design.
2. 15 kV duty cycle voltage rating.
3. 12.7 kV maximum continuous operating voltage (MCOV).
4. Duty cycle test: 22 current surges of 5 kA crest at 8 x 20 microseconds duration.
5. High current, short duration discharge: 2 current surges of 40 kA crest at 4 x 10 microseconds duration.
6. Low current, long duration discharge: 20 current surges of 75 A crest at 2000 microseconds duration.

2.9 15 KV CABLE TERMINATIONS AT OUTDOOR FACILITIES

A. Manufacturer:

1. Tyco Electronics/Raychem – HVT-150-J Series, Outdoor, 15 kV Class, High Voltage Termination for Jacketed Concentric Neutral URD Cable.

B. Selection and Ordering: Termination kits must be sized to the cable insulation diameter and conductor size/type. Verify proper splice kit selection (part number) using cable manufacturer's catalog data.

C. Specifications: Cable termination kits shall be factory engineered for the application and shall meet or exceed all rating requirements of IEEE-48 for Class I terminations and the test sequence prescribed by IEEE-404, including 130°C load cycling and 130°C impulse withstand.

1. Terminations shall be furnished in kit form including non-tracking tube, stress control tube, mastic strips, ground clamp and spring, ground braid, copper-backed tape, shim tube, and installation instructions.

D. Ratings:

1. 15 kV voltage class.
2. 110 kV BIL impulse withstand.

3. 50 kV AC 1-minute withstand.
4. 35 kV AC 6-hour withstand.
5. 45 kV wet withstand, 10 seconds.
6. 75 kV DC 15-minute withstand.
7. Partial Discharge Voltage (DEV) <3 pc at 15.6 kV.
8. Load Cycling – 30 days, 130 deg. C.

E. Provide UL listed copper compression lugs for cable terminations.

~~2.8~~2.10 HOT LINE VOLTAGE INDICATORS

~~A.~~K. Manufacturer:

1. Cooper Power Systems S.T.A.R. FCI Line Model STHL.

~~B.~~L. Description: ANSI/IEEE 495 compliant hot line voltage indicator.

1. Installs on test point of 200A loadbreak or 600A deadbreak elbows (all manufacturers – 15, 25, and 35 kV Class).
2. Hotstick applied.
3. LED voltage indication behind polycarbonate window.
4. Power requirements: 2.4 kV line to ground minimum.
5. Operating range: 2.4 kV to 19.9 kV line to ground.
6. Fault withstand capability: 25 kA per ANSI/IEEE 495.
7. Temperature range: -40 deg. C to +85 deg. C.
8. Materials: EPDM rubber, corrosion resistant and submersible per ANSI/IEEE 495.

~~2.9~~2.11 FIREPROOFING TAPE

A. 3M Company, Scotch Brand #77.
   1. Binder wrap with glass cloth tape, Scotch Brand #27.

~~2.10~~2.12 SOURCE QUALITY CONTROL

A. Provide factory tests for medium voltage cable in accordance with ANSI/ICEA S-97-682 and AEIC CS8.

B. Provide factory tests for separable insulated connector products in accordance with ANSI/IEEE 386.

C. Provide factory tests for splice (joint) and termination products in accordance with IEEE 48, IEEE 404, and ANSI/IEEE 386.

PART 3 - EXECUTION

3.1 CABLE SLICE, TERMINATION, AND ACCESSORY SCHEDULE

A. Provide medium voltage cable splices, terminations, separable connector components, and accessories at equipment as follows:

EQUIPMENT	TYPE OF SPLICE/TERMINATION/ACCESSORY
Manholes	15 kV In-line Splices
Switchgear	15 kV Termination Elbows, 600 Amp Deadbreak Hot Line Voltage Indicators (on elbows) 15 kV Insulated Caps (on spare bushings)
Pad-mounted Transformers	15 kV Termination Elbows, 200 Amp Loadbreak 15 kV Busing Inserts 15 kV Elbow Arresters Hot Line Voltage Indicators (on elbows)

3.2 EXAMINATION

A. Verify existing conditions prior to beginning work.

B. Verify that conduit, ducts, and manholes are ready to receive cable.

3.3 PREPARATION

A. Use swab to clean conduits and ducts before pulling cables.

3.4 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions.

B. Avoid abrasion and other damage to cables during installation.

C. Use suitable lubricants and pulling equipment.

D. Do not exceed cable pulling tension specified by manufacturer. Maintain bending radius specified by manufacturer and regulatory requirements.

E. Ground cable tape shield at each termination and splice. Grounding equipment shall conform to UL 467.

F. Cables in manholes: The length of any cable in manhole shall be not less than half the circumference of the interior of the manhole. This dimension shall be determined for a contiguous, unspliced length of cable, from the point where the cable enters the manhole to the point where it exits the manhole. If the newly installed cable is to be connected to an existing cable within the manhole, the newly installed cable shall have a length of not less than one half circumference of the manhole from the point where the cable enters or exits the manhole, to the point of connection to the existing cable. The existing cable shall not be required to be one half manhole circumference if that amount of length does not exist. However, the existing cable shall not be shortened without written permission from the Systems Department Assistant Director.

G. Arrange cable in manholes to avoid interference with duct entrances.

H. Apply colored electrical tape near ends of cables as required to identify and maintain proper phasing and phase rotation of circuits.

I. Apply fireproofing tape to each cable, individually by phase, overlapped with a half turn and installed into the duct a distance of one inch or more. Fireproofing tape shall be binder wrapped with glass cloth tape.

J. Attach cables in manhole to existing insulators and cable racks using nylon cable ties.

K. Attach cables in switchgear vault to new insulators and cable racks using nylon cable ties.

L. Provide cable tags on cables as specified in Section 16075 - Electrical Identification.

3.5 FIELD QUALITY CONTROL – PHASING VERIFICATION

A. Ensure proper phasing and phase rotation for all busses and circuits.

B. Phasing verification shall be witnessed by PPD Systems Department prior to energizing any equipment. Notify the Owner at least 72 hours in advance for this purpose.

3.6 FIELD QUALITY CONTROL - MEDIUM VOLTAGE CABLE FIELD ACCEPTANCE TESTING BY INDEPENDENT, CERTIFIED TESTING AGENCY

A. Contractor shall engage the services of an independent, certified testing agency, acceptable to the Owner, to perform medium voltage cable testing. Testing firm shall furnish certified test reports to the Owner upon completion of field acceptance testing. A general description of the work to be performed by the independent testing firm is given in Subparagraphs B through E below:

B. Perform medium voltage cable tests after installation of cable, joints (splices), and terminations are complete and before connecting to equipment.

C. Perform applicable inspections and tests in accordance with NETA ATS.

D. Visual and mechanical inspection
   1. Inspect exposed cable sections for physical damage.
   2. Inspect cable for proper connections as indicated.
   3. Inspect shield grounding, cable supports, and terminations for proper installation.
   4. Verify that cable bends are not less than ICEA or manufacturer's minimum allowable bending radii.
   5. Inspect for proper phase identification and arrangement.

E. DC high-potential electrical testing of medium voltage cables - perform in accordance with ANSI/IEEE 400, ICEA and cable manufacturer's recommendations. Adhere to precautions and limits specified in the referenced standards. Current sensing circuits in test equipment shall measure only the leakage current associated with the cable under test, and shall not include internal leakage current of the test equipment. The tests shall be conducted in the following general format:
   1. Record temperature and relative humidity. Do not perform tests unless weather is clear and relative humidity is below 70 percent.
   2. Test each conductor individually with other conductors grounded. Shields shall be grounded.

3. Terminations shall be properly corona suppressed by guard ring, field reduction sphere, or other suitable method.
4. Perform insulation resistance and continuity test prior to hi-pot test.
5. Ensure that the maximum test voltage does not exceed the limits for terminators specified in IEEE 48 or manufacturer's specifications.
6. Apply the DC high-potential test in at least five equal increments until maximum test voltage is reached. No increment shall exceed the voltage rating of the cable. Record a DC leakage current at each step after a constant stabilization time consistent with system charging current decay. One hundred percent voltage shall be reached in a maximum of 60 seconds.
7. Raise the test conductor to the specified maximum test voltage and hold for fifteen (15) minutes. Readings of leakage current shall be recorded at 30 seconds, at one minute, and at one-minute intervals thereafter. Provide a graphic plot of readings with leakage current (Y-axis) versus test voltage (X-axis) at each increment.
8. Reduce the conductor test potential to zero and measure residual voltage at discreet intervals.
9. Apply grounds for a time period adequate to drain all insulation stored charge. Grounds shall be applied for at least 10 minutes.
10. When new cables are spliced into existing cables, the DC high-potential test shall be performed on the new cable prior to splicing. After test results are approved for the new cable and the splice is completed, an insulation-resistance test and a shield continuity test shall be performed on the length of new and existing cable including the splice. After a satisfactory insulation-resistance test, a DC high-potential test shall be performed on the completed cable system utilizing a test voltage 75 percent of the new cable tested value.
11. The DC test voltage for cable shall be as directed by referenced standards or cable manufacturer's recommendations.

3.7 PROTECTION

A. Protect installed cables from entrance of moisture.

END OF SECTION

SECTION 26 0543

UNDERGROUND DUCTS AND STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
1. PVC conduit.
2. Duct spacers and bore spacers.
3. Detectable underground warning tape.
4. Precast concrete manholes.
5. ~~Manhole and vault access hatches.~~
6. ~~Precast concrete switchgear cabling pit.~~
7. ~~Precast concrete pullboxes.~~
8.5. Manhole and vault hardware.
9.6. Underground handhole boxes.

B. Related Sections:
1. Division 02 – Sitework.
2. Division 03 – Cast-In-Place Concrete for Utilities.

1.2 REFERENCES

A. 29 CFR 1910 – Occupational Safety and Health Standards (OSHA).

B. 29 CFR 1926 – Safety and Health Regulations for Construction (OSHA).

C. AASHTO HB-17-G – Standard Specifications for Highway Bridges (2002).

D. ACI 318 – Building Code Requirements for Structural Concrete (2005).

E. ANSI/IEEE C2 – National Electrical Safety Code (~~2007~~2017).

F. ANSI/NECA 1 – Standard for Good Workmanship in Electrical Contracting (2006).

G. ANSI/NECA/NEMA 605 – Recommended Practice for Installing Underground Nonmetallic Utility Duct (2005).

H. ANSI/NFPA 70 – National Electrical Code (~~2008~~2014).

I. ANSI/SCTE 77 – Specification for Underground Enclosure Integrity (2010).

J. ASTM A36 – Standard Specification for Carbon Structural Steel (2004).

K. ASTM A48 – Standard Specification for Gray Iron Castings (2003).

L. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products (2002).

M. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware (2004).

N. ASTM A185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete (2002).

O. ASTM A416 – Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete (2002).

P. ASTM C443 – Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (2005).

Q. ASTM C478 – Standard Specification for Precast Reinforced Concrete Manhole Sections (2003a).

R. ASTM A615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement (2004b).

S. ASTM C857 – Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures (1995, Rev. 2001).

T. ASTM C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete (2002).

U. ASTM C891 – Standard Practice for Installation of Underground Precast Concrete Utility Structures (1990, Rev. 2003).

V. Chapter 553.60-64, Florida Statutes – Trench Safety Act.

W. Chapter 556, Florida Statutes – Underground Facility Damage Prevention and Safety Act.

X. NEMA TC 2 – Electrical Polyvinyl Chloride (PVC) Tubing and Conduit (1998).

Y. NEMA TC 3 – PVC Fittings for Use with Rigid PVC Conduit and Tubing (1999).

Z. NEMA Bulletin TCB 2 – Guidelines for the Selection and Installation of Underground Nonmetallic Duct (2000).

AA. UL 651 – Schedule 40 and 80 Rigid PVC Conduit (1995).

BB. UL 514B – Fittings for Cable and Conduit (1997).

1.3 SUBMITTALS

A. Submit under provisions of Section 01340 – Submittal Procedures and Section 26000 – General Electrical Requirements.

B. Product Data: Provide for conduit, underground warning tape, ground rods, precast concrete manholes and vaults, and manhole/vault hardware.

C. Shop Drawings: Provide for precast concrete manholes/vaults and access hatches. Design submittals for these items shall be signed and sealed by a licensed engineer in the State of Florida.

D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ANSI/NECA 1, ANSI/NECA/NEMA 605, NEMA TCB 2, and ASTM C891.
   1. Maintain at least one copy of referenced documents at the job site.

1.5 QUALIFICATIONS

A. Designer Qualifications: Professional engineer registered and licensed in the State of Florida to design underground utility structures including manholes, precast cabling pits, and access hatches.

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01720 – Project Record Documents.

B. Accurately record actual location and routing of ductbanks.

C. Accurately record actual location of precast concrete manholes and vaults.

1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/IEEE C2 and ANSI/NFPA 70.

B. Conform to requirements of 29 CFR 1926.

C. Comply with Florida Trench Safety Act.

D. Comply with Florida Underground Facility Damage Prevention and Safety Act.

E. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Accept conduit on site. Inspect for damage.

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

C. Coordinate delivery of precast concrete manhole and vault components to jobsite with manufacturer. Handling of materials shall be done in accordance with ASTM C891 and manufacturer's recommendations. Components shall be handled and stored on jobsite using methods that will prevent damage.

1.9 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of ductbank prior to excavation for rough-in.

C. Ductbank routing is shown on Drawings in approximate locations unless dimensions are indicated. Route as required to complete duct system.

PART 2 - PRODUCTS

2.1 PVC CONDUIT

A. Description: NEMA TC 2 and UL 651; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3 and UL 651.

C. Elbows and Sweeps: Provide 36 inches minimum bend radius.

2.2 DUCT SPACERS AND BORE SPACERS

A. Ductbanks shall be encased in concrete with at least three inches of concrete cover on all sides. A horizontal and vertical separation between the ducts of 3 inches shall be maintained by installing one-piece, high impact polystyrene duct spacers as manufactured by Underground Devices, Inc., or equal. Spacers shall be interlocked horizontally only. Along the length of the duct run spacers shall be staggered at least 6 inches vertically and shall be placed at an interval of 4 spacers per 20 feet.

B. Bore spacers for conduit-in-casing applications: as indicated.
   1. Manufacturer: Underground Devices, Inc., or equal.

2.3 UNDERGROUND WARNING TAPE

A. Detectable Underground Warning Tape: Metalized plastic tape, 6 inches wide.
   1. 5.5 mils, triple layer lamination of full width aluminum foil core encased between polyester and/or polyethylene sheeting.
   2. Temperature withstand capability: -94 deg F to +200 deg F.
   3. Subsurface graphics permanently protected from soil acids and alkalis.
   4. Color in accordance with APWA Uniform Color Code:
      a. Electric utilities – Red in color with warning legend: "CAUTION BURIED ELECTRIC LINE BELOW".
      b. Communications utilities – Orange in color with warning legend: "CAUTION BURIED COMMUNICATIONS LINE BELOW".

2.4 PRECAST CONCRETE MANHOLES

A. Manufacturers:
   1. ~~Southern~~ Lindsay Pre-Cast, Inc., Alachua, Florida.
   2. Oldcastle Precast (Brooks Products), Medley, Florida.

B. Standards:
   1. Concrete: ACI 318 including all referenced standards and specifications.
   2. Loading: ASTM C857 and AASHTO HB-17-G.

C. Materials:
   1. Concrete: 5,500 PSI at 28 days.
   2. Reinforcement:
      a. Bars: ASTM A615, Grade 60.
      b. Welded Wire Fabric: ASTM A185.

D. Design Loads:
   1. Dead load:
      a. Concrete: 150 pounds per cubic foot.
      b. Earth Cover: 120 pounds per cubic foot.
      c. Steel: 490 pounds per cubic foot.
      d. Aluminum: 175 pounds per cubic foot.
      e. Macadam: 140 pounds per cubic foot.
   2. Lateral Earth Pressure on walls:
      a. Equivalent Fluid pressure above water table: 39.6 PSF per foot of depth.
      b. Equivalent Fluid pressure below water table: 81.4 PSF per foot of depth.
      c. Surcharge on walls: 2 feet of earth cover.
   3. Live Loads – comply with all of the following criteria:
      a. ASTM C857 A-16 and AASHTO HS20-44 wheel loads.
      b. ASTM C857 A-12 (AASHTO HS15-44) wheel loads with live load spacing of 32 inches rather than the 4 feet shown in ASTM C857 Figure 1.
   4. Impact:
      a. ASTM C857, A-16, A-12; live load increase depending on depth of structure.

E. Manholes and vaults shall be precast, reinforced concrete sections (top, base, and where required, extension section) with knockouts for main conduit entrances and subsidiary duct entrances. Concrete inserts shall be set in interior surfaces of walls of each section to provide for cable rack mounting.

F. Lift loops shall be ASTM A416 steel strand. Lifting loops made from deformed bars shall not be allowed.

1. Lifting inserts, holes, and devices shall comply with OSHA Standard 1926.704. Lift holes and inserts shall be sized for precision fit with lift devices and shall not penetrate through structure wall. Lifting devices shall be provided by precast manufacturer. Lifters shall be located on top, not sides, of manhole.

G. Joints shall be sealed internally between tongue and groove and additionally around external perimeter of the joint.

1. Joint sealer: Evergrip 990 or equal.

H. Exterior of manholes below grade shall be coated with bituminous waterproofing mastic.

I. Manhole rings and covers shall be AASHTO HS20-44 traffic rated as manufactured by U.S. Foundry & Manufacturing Corp.

~~H.~~1. Electrical manhole: USF 695 ring and CP-TA covers or equal, of metal casting conforming to ASTM A48, Class 35B, gray iron, 42 inches minimum outer diameter for personnel access. Include the logo “ELECTRIC” permanently cast or engraved in the label area of the lid.

~~2.5 MANHOLE AND SWITCHGEAR VAULT ACCESS HATCHES~~

~~A. Manufacturers:~~

~~1. Inwesco, Inc.~~

~~2. U.S.F. Fabrication, Inc.~~

~~3. Syracuse Castings Corporation.~~

~~B. Heavy duty Gray Iron circular access cover. Size as detailed on the drawings.~~

~~C. Access cover to include engraved or welded identification: “ELECTRIC”.~~

~~1. Additionally, electrical manholes shall include engraved or welded identification of manhole number.~~

~~D. Access cover ring frame shall be structurally attached to the manhole top slab in a manner approved by a Florida licensed structural engineer.~~

~~1. Live Loads – comply with all of the following criteria:~~

~~a. ASTM C857 A-16 and AASHTO HS20-44 wheel loads.~~

~~b. ASTM C857 A-12 (AASHTO HS15-44) wheel loads with live load spacing of 32 inches rather than the 4 feet shown in ASTM C857 Figure 1.~~

~~2. Impact:~~

~~a. ASTM C857, A-16, A-12; live load increase depending on depth of structure.~~

~~2.6 PRECAST CONCRETE SWITCHGEAR CABLING PIT~~

~~A. Manufacturers:~~

~~1. Southern Pre-Cast, Inc., Alachua, Florida.~~

~~2. Oldcastle Precast (Brooks Products), Medley, Florida.~~

~~B. Standards:~~

~~1. Concrete: ACI 318 including all referenced standards and specifications.~~

~~2. Loading: ASTM C857.~~

C. Materials:

1. Concrete: 5,500 PSI at 28 days.
2. Reinforcement:
   a. Bars: ASTM A615, Grade 60.
   b. Welded Wire Fabric: ASTM A185.

D. Design Loads:

1. Dead load:
   a. Concrete: 150 pounds per cubic foot.
   b. Earth Cover: 120 pounds per cubic foot.
2. Lateral Earth Pressure on walls:
   a. Equivalent Fluid pressure above water table: 39.6 PSF per foot of depth.
   b. Equivalent Fluid pressure below water table: 81.4 PSF per foot of depth.
   c. Surcharge on walls: 2 feet of earth cover.

E. Pit shall be precast, reinforced concrete sections (top, base, and where required, extension section) with knockouts for main conduit entrances and subsidiary duct entrances. Concrete inserts shall be set in interior surfaces of walls of each section to provide for cable rack mounting.

F. Lift loops shall be ASTM A416 steel strand. Lifting loops made from deformed bars shall not be allowed.

1. Lifting inserts, holes, and devices shall comply with OSHA Standard 1926.704. Lift holes and inserts shall be sized for precision fit with lift devices and shall not penetrate through structure wall. Lifting devices shall be provided by precast manufacturer. Lifters shall be located on top, not sides, of structure.

G. Joints shall be sealed internally between tongue and groove and additionally around external perimeter of the joint.

1. Joint sealer: Evergrip 990 or equal.

2.7 PRECAST CONCRETE PULBOXES

A. Manufacturers:

1. Oldcastle Precast (Brooks Products), Medley, Florida.
2. Southern Pre-Cast, Inc., Alachua, Florida.

B. Handholes shall be precast, reinforced concrete sections (top, base, and where required, extension section) with knock-outs or duct terminators for main conduit entrances and subsidiary duct entrances. Concrete inserts shall be set in interior surfaces of walls of each section to provide for cable rack mounting. Base section shall be equipped with pulling-in irons located opposite each main cable entrance. Provide 1-1/2" diameter hole in floor for ground rod installation. Provide 12" diameter sump in floor for drainage.

C. Handhole rings and covers shall be as manufactured by U.S. Foundry & Manufacturing Corp., or equal, of metal casting conforming to ASTM A48, Class 30B, gray iron. Cover shall include the logo "ELECTRIC" or "TELECOM" in the casting as applicable.

D. Concrete shall conform to ASTM C478 and as follows:

1. Compressive Strength: 5,000 PSI minimum at 28 days.
2. Air Content: 4% minimum.
3. Cementitious Materials: Minimum of 564 lbs/cu yd.
4. Course Aggregates: ASTM C33. Sound, Crushed, Angular Granitic Stone only. Smooth or rounded stone shall not be used.
5. Fine Aggregates: ASTM C33. Free from organic impurities.

6. Chemical Admixtures: ASTM C494. Calcium chloride or admixtures containing calcium chloride shall not be used.

7. Air Entraining Admixtures: ASTM C260.

E. Reinforcing steel shall be ASTM A615 grade 60 deformed bar.

F. Lift loops shall be ASTM A416 steel strand. Lifting loops made from deformed bars shall not be allowed.

G. Flexible Joint Sealants shall be butyl rubber based conforming to Federal Specification SS-S-210A, AASHTO-198, Type B-Butyl Rubber and maximum of 1% volatile matter and suitable for application temperatures between 10 and 100°F.

H. Epoxy gels shall be 2-component, solvent-free, moisture-insensitive, high modulus, high strength, structural epoxy paste adhesive meeting ASTM C-881, Type I and II, Grade 3, Class B and C, epoxy resin adhesive.

I. Precast components shall be designed and manufactured as described in this paragraph and in the following paragraphs for specific components:

1. Lifting inserts, holes, and devices shall comply with OSHA Standard 1926.704. Lift holes and inserts shall be sized for precision fit with lift devices and shall not penetrate through structure wall. Lifting devices shall be provided by precast manufacturer.

J. Joints shall be sealed internally between tongue and groove and additionally around external perimeter of the joint as follows:

1. External seals shall consist of polyethylene backed flat butyl rubber sheet no less than 1/16" thick and 6" wide applied to outside perimeter of joint.

2. Internal seals shall consist of plastic or paper-backed butyl rubber rope no less than 14 ft long and having cross-sectional area no less than annular space times height of joint.

3. At option of Contractor, internal seals on round joints may consist of O-ring gasket conforming to ASTM C443, installed according to precast manufacturer's recommendation.

K. Precast base sections, shall be cast monolithically without construction joints or with approved galvanized or PVC waterstop cast in the cold joint between base slab and walls.

L. Wall and inside slab finish resulting from casting against forms standard for industry shall be acceptable. Form ties through the wall are not allowed. Exterior slab surfaces below grade shall have float finish. Small surface holes, normal color variations, normal form joint marks, and minor depressions, chips and spalls will be tolerated. Dimensional tolerances shall be as set forth in appropriate references.

M. Conduit openings shall not extend into corners of structures, but may extend across joint with Engineer's approval.

N. Knockout panel dimensions shall be as required by structural design at their maximum burial depth using design loads specified herein.

O.J. Components shall be designed in accordance with ACI 318, ASTM C857, and AASHTO HS20-44 loading.

2.82.5 MANHOLE AND VAULT HARDWARE

A. Acceptable manufacturers:

1. Hubbell Power Systems/Chance.

2. Joslyn Manufacturing.

2. MacLean Power Systems.

3. Inwesco, Inc.

B. General: Steel products shall be manufactured from ASTM A36 steel and hot-dip galvanized to ASTM A123 and A153.

C. Cable Pulling Irons: 7/8" diameter hot-dipped galvanized steel bar with exposed triangular shaped opening. Locate opposite each duct entry. Provide watertight seal.

~~D. Cable Rack Inserts: Minimum load rating of 800 pounds. Locate at 16" on center.~~

~~E.~~D. Cable Rack Supports: 1/2" x 1" hot dip galvanized steel support to stand cable rack off wall where required to avoid obstructions or escape water seepage. Two supports required per cable rack.

~~F.~~E. Cable Racks: 3/16" x 9/16" x 1-1/2" hot rolled, heavy duty, hot-dipped galvanized channel with mounting slots for attaching hooks spaced at 1-1/2" intervals. ~~Provide lengths to meet detail requirements on drawings.~~ Provide lengths to vertically span inside wall of structure less 6" at the top and 6" at the bottom. Coordinate placement with locations of cable rack inserts.

~~G.~~F. Cable Rack Hooks: 3/16" x 1-1/8" x 1-1/2" hot rolled, heavy duty, hot-dipped galvanized channel with rounded bearing surface and upturned ends to prevent insulators from slipping off . Hooks shall be approximately ~~7-1/2~~ 14 inches long. Include lock clips for hooks.

~~H.~~G. Cable Rack Insulators for Cable Support: High glazed, wet process porcelain, white in color.

~~I.~~H. Spares: Equip each cable rack with one spare hook and insulator for future use.

~~2.9~~2.6 UNDERGROUND HANDHOLE BOXES FOR ~~BURIED GROUND LOOP ACCESS~~LIGHTING

A. Manufacturer:
   1. Hubbell Power Systems; Quazite or CDR Style.

B. Buried ~~ground loop access~~ in-grade junction boxes: ANSI/SCTE 77, Tier 5; precast polymer-concrete underground handhole box, dimensions 14" wide x ~~25~~14" long x 18" deep.

C. Cover shall include:
   1. Engraved/stamped logo to read, ~~"ELECTRIC" or "GROUND LOOP"~~ "LIGHTING" as applicable.
   2. Engraved/stamped identification with tier rating.
   3. Stainless steel captive hex head bolts.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify location of all existing underground utility lines in accordance with applicable law.

B. Verify that excavation, base material installation, and compaction is completed.

3.2 PREPARATION

A. Prepare excavation in accordance with manhole manufacturer's instructions.

3.3 DUCTBANK INSTALLATION

A. Install underground nonmetallic ductbank in accordance with NEMA Bulletin TCB 2.

B. Install duct to locate top of ductbank minimum of 30 inches below grade.

C. Install duct with minimum slope of 4 inches per 100 feet. Slope duct away from building entrances. Slope to drain toward manholes and/or manholes.

D. When ductbank system crosses a sewer system, domestic water, or chilled water main, it shall be supported on each side so as not to transfer any direct load to the piping.

E. Provide conduit end bells at pads and manholes.

F. Cut duct square using saw or pipe cutter; de-burr cut ends.

G. Insert duct to shoulder of fittings; fasten securely.

H. Join nonmetallic duct using adhesive as recommended by manufacturer.

I. Wipe nonmetallic duct dry and clean before joining. Apply full even coat of adhesive to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

J. Internal finish of the duct shall be free of sharp edges, bumps, or butts which could damage electric wiring or cables.

K. Install no more than equivalent of three 90-degree bends between pull points.

L. Radius of elbows and sweeps shall meet minimum bending radius requirements for medium voltage cables.

M. Provide suitable fittings to accommodate expansion and deflection where required.

N. Stagger duct joints vertically in concrete encasement 6 inches minimum.

O. Use suitable separators and chairs installed not greater than 4 feet on centers.

P. Band ducts together before placing concrete.

Q. Securely anchor duct to prevent movement during concrete placement.

R. Provide complete encasement of underground ductbanks using 3,000 psi concrete. Provide minimum 3 inch cover at bottom, top, and sides of ductbank.

S. Provide steel reinforcing bars where indicated.

T. Provide 3/16" diameter nylon cord in each spare duct.

U. Swab duct. Use suitable caps to protect installed duct against entrance of dirt and moisture.

V. Interface installation of underground warning tape with backfilling. Install tape 18 to 30 inches above conduit or ductbank but no less than 6 inches below finished grade.

3.4 PRECAST MANHOLE INSTALLATION

A. Excavate to required depth and remove materials that are unstable or unsuitable for good foundation. Prepare level, compacted foundation extending 6" beyond base.

B. Install and seal precast sections in accordance with ASTM C891 and manufacturer's instructions.

C. Set base plumb and level.

D. Thoroughly clean bells and spigots to remove dirt and other foreign materials that may prevent sealing. Unroll butyl sealant rope directly against spigot or keyway. Leave protective wrapper attached until sealant is entirely unrolled. Do not stretch. Overlap from side to side - not top to bottom.

E. When recommended by manufacturer, fill void between horizontal joint surfaces with sand cement grout around the outside perimeter.

F. After joining sections, apply butyl sealant sheet around outside perimeter of joint.

G. Lift holes leaving less than 2" of wall thickness shall be plugged from outside using sand cement mortar then covered with butyl rubber sheet. Lift holes penetrating wall shall be additionally sealed with epoxy gel on interior.

H. Set frames or tops to required elevation sealing joints with butyl sealant rope and sheet.

I. Install driven grounds rod through open bottom of manhole. Leave 6 inches of ground rod exposed above floor. Provide closed ground loop conductor around interior of manhole located 12 to 24 inches above floor and securely attached to walls. Exothermically weld to ground rod. Bond all splices, cable racks, and non-current carrying metal equipment in manhole to ground loop.

J. Attach cable racks to inserts after manhole installation is complete.

~~3.5 PRECAST CONCRETE CABLING PIT INSTALLATION~~

~~A. Excavate to required depth and remove materials that are unstable or unsuitable for good foundation. Prepare level, compacted foundation extending 6" beyond base.~~

~~B. Install and seal precast sections in accordance with manufacturer's instructions.~~

~~C. Set base plumb and level.~~

~~D. Thoroughly clean bells and spigots to remove dirt and other foreign materials that may prevent sealing. Unroll butyl sealant rope directly against spigot or keyway. Leave protective wrapper attached until sealant is entirely unrolled. Do not stretch. Overlap from side to side - not top to bottom.~~

~~E. When recommended by manufacturer, fill void between horizontal joint surfaces with sand cement grout around the outside perimeter.~~

~~F. After joining sections, apply butyl sealant sheet around outside perimeter of joint.~~

~~G. Lift holes leaving less than 2" of wall thickness shall be plugged from outside using sand cement mortar then covered with butyl rubber sheet. Lift holes penetrating wall shall be additionally sealed with epoxy gel on interior.~~

~~H. Set frames or tops to required elevation sealing joints with butyl sealant rope and sheet.~~

~~I. Install driven grounds rod through open bottom of structure. Leave 6 inches of ground rod exposed above floor. Provide closed ground loop conductor around interior of cabling pit located 12 to 24 inches above floor and securely attached to walls. Exothermically weld to ground rod. Bond all splices, cable racks, and non-current carrying metal equipment in cabling pit to ground loop.~~

~~J.~~K. ~~Attach cable racks to inserts after cabling pit installation is complete~~

~~3.6~~3.5 DUCTBANK CONNECTIONS TO MANHOLES

A. For duct connections to new manholes and vaults, use thin wall knockouts pre-cast into manhole walls.

~~3.7 DUCTBANK CONNECTIONS TO CABLING PIT~~

~~A. For duct connections to new vault, use thin wall knockouts or openings pre-cast into structure walls.~~

~~3.8~~3.6 DUCTBANK CONNECTIONS TO EXISTING MANHOLES

A. For duct connections to existing manhole, provide core drills through manhole walls.

B. Provide drilled holes in manhole walls and insert rebar dowels to tie ductbank reinforcing to manhole. Secure dowels using adhesive or grout as recommended by manhole manufacturer.

C. Complete concrete pour for ductbank, providing 3” minimum cover over all ducts and rebar dowels.

~~3.9~~3.7 FIELD QUALITY CONTROL

A. Notify Architect/Engineer 24 hrs in advance of ductbank concrete pour.

END OF SECTION

SECTION 32 19 99

ALUMINUM AND STAINLESS STEEL PIPE AND TUBE RAILINGS

PART 1- GENERAL

1.1 SUMMARY

A) This section includes both standard handrails as shown in the contract drawings.
B) These include aluminum and stainless steel pipe railing, aluminum and stainless steel picket railing

1.2 REFERENCES

A) ASTM B209- Standard Specification for aluminum sheet and plate
B) ASTM B210- Standard Specification for aluminum drawn seamless tube
C) ASTM B221- Standard Specification for aluminum extruded bars, rods, tubes and channel
D) ASTM B429- Standard Specification for aluminum structural pipe and tube
E) ASTM A167- Standard Specification for stainless and heat resisting chromium nickel steel plate, sheet and strip
F) ASTM A269- Standard Specification for seamless and welded austenitic stainless steel tubing
G) ASTM A276- Standard Specification for stainless and heat resisting bars and shapes
H) ASTM A312- Standard Specification for seamless and welded austenitic stainless steel pipe
I) AWS D1.1- Structural Welding Code Steel; 2008
J) AWS D1.2- Structural Welding Code Aluminum; 2003
K) AWS D1.6- Structural Welding Code Stainless Steel; 2007
L) AWS B2.1-84- Welding procedure and performance calculations
M) ASTM E894- Standard Test Methods for anchorage of permanent metal railing systems and rails for buildings
N) ASTM E935- Standard Test Methods for performance of permanent metal railing systems and rails for buildings
O) ASTM E985- Specifications for permanent metal railing systems and rails for buildings
P) NOMMA- Metal finishes manual
Q) AA DAF-45- Aluminum Association designation system for aluminum finishes
R) AA SAA-46- Aluminum Association standards for anodized architectural aluminum

1.3 PERFORMANCE REQUIREMENTS

A) Handrail shall be designed to withstand without permanent deflection the following loads:
    a) Top Rail-
        (1) Concentrated load of 200 lb/ft applied at any point and any direction.
        (2) Uniform load of 50 lb/ft applied horizontally and concurrently with uniform load of 100 lb/ft applied vertically downward.
        (3) Concentrated and uniform loads above need not be assumed to act concurrently.

b) Hand Rails other than top rail-
   (1) Concentrated load of 200 lb/ft applied at any point and any direction.
   (2) Uniform load of 50 lb/ft applied in any direction.
   (3) Concentrated and uniform loads above need not be assumed to act concurrently
c) Infill areas-
   (1) Concentrated horizontal load 50 lb/ft applied to 1 sq. ft. at any point is system, including intermediate rails, panels, pickets, cables or other elements making up infill area. Loads need not be assumed to act concurrently with loads on top rails in determining stress on infill.

1.4 SUBMITTALS

A) Shop drawings which specify material sizes, shapes, plans, sections, install details and finishes per requirements.
B) One year manufacturer's warranty for materials and installation at project completion.
C) Forward warranty on finish; when applicable; to owner at project completion.

1.5 QUALITY ASSURANCE

A) Obtain railing through one source from a single manufacturer.
B) Check dimensions of other construction by accurate field measurements before fabrication to insure proper rail fit up. Incorporate final dimensions into field use shop drawings. Coordinate fabrication lead times with construction progress to avoid delaying the work.
C) Shop assembled mechanical joints shall fit to within 1/16".
D) Expansion joints shall fit within 1/8" to allow for thermal expansion within the handrail.
E) Railing posts shall be plumb to within 1/8" over 3'-0'.
F) Qualify welders and procedures per AWS standard qualification procedures.

1.6 DELIVERY, STORAGE AND HANDLING

A) Materials to be delivered to job site crated and packaged to prevent damage.
B) Store material on site in manufacturers unopened packaging until ready to install.
C) Store material in a clean dry location avoiding exposure to uncured concrete, masonry or acidic cleaning agents.

PART 2 –PRODUCTS

2.0 MATERIALS

A) Provide metal free from pitting, seam marks, roller marks, grinding marks and stains at areas exposed to view on completed rail units.

a) Aluminum
   (1) Extruded pipe: ASTM B 221 alloy 6063-T6.
   (2) Extruded tube: ASTM B 221 alloy 6063-T6.
   (3) Extruded bar, plate and sheet: ASZTM B 221 alloy 6061-T6/T52.
   (4) Castings: ASTM B 26 Almag 35.
b) Stainless Steel
   (1) Pipe and tubing: ASTM A 269 Type 304 or Type 316.
   (2) Bar: ASTM A 276 Type 304 or Type 316.
   (3) Fittings: ASTM A 276/ A 479 Type 304 or Type 316.

2.1 FINISHES

A) Aluminum
   a) AA 204 or AA 215 R1 Clear satin anodize.
   b) 180 grit centerless ground.
   c) Kynar 500 High-performance organic coating.
   d) Powder coating with pre-treatment and average 3 mil film thickness per AAMA 2604 in standard color and gloss.

B) Stainless Steel
   a) #4 (180 grit) centerless ground.
   b) #4 (180 grit) directional.
   c) #6 (320 grit) centerless ground.
   d) #6 (320 grit) directional.
   e) #7 mirror polish with visible grain.
   f) #8 mirror polish.

2.3 FABRICATION

A) Fabricate handrails and guardrails in accordance to approved shop drawing and field dimensions using mitered and welded joints with bends where indicated on shop drawings.
B) Shop fabricate in greatest possible lengths to eliminate field splicing, but not to exceed 20’-0” in length.
C) Form bends to uniform radius, free of distortion, twists, cracks and grain separation.
D) Top rails shall be continuous over posts for strength with splices for expansion located within 6 to 12 inches of post.
E) Splices and expansion joints shall utilize internal splice connectors with set screws to allow for rail expansion over ambient temperature change.
F) Weld all shop assembled connections continuous without undercut and or distortion of rail materials.
G) Grind and or dress exposed welds smooth and flush to corner or fillet without weakening rail connection.
H) Remove all burrs and sharp edges from exposed ends of final rail assemblies.
I) Lightly sand and blend with fine grit paper all light scratches prior to rail finishing.
J) Provide drainage and weep holes within rail assemblies to prevent entrapment of water within rail assemblies. Note that caution should be used when pressure washing rails assemblies to prevent water entry to non- vented areas under pressure.
K) Provide post inserts where required due to loading within long post spans.

PART 3- EXECUTION

3.1 EXAMINATION

A) Verify that field conditions are acceptable and ready to receive work.

3.2 INSTALLATION

A) Install in accordance with shop drawings utilizing established working points.
B) Set railings within sleeves, use anchor bolts or core drill for mounting holes. Maintain slab edge distances and rail locations per shop drawings.
C) Assemble rails fitting splices together to form tight hairline joints while allowing for thermal expansion as required.
D) Make all adjustments to alignment for satisfactory rail appearance and to plumb posts prior to final tightening of fasteners or pouring of holes.
E) Set railings within sleeves or cored holes using a high quality anchoring grout such as Quickrete. Slope grout 1/8” up on posts for drainage.
F) Locate wall brackets per shop drawings and set anchors within concrete or into blocking within sheetrock walls. Use wall rails to insure proper location and plumb at ends.
G) Install wall rail onto brackets using fasteners supplied per the drawings.
H) After installation is complete clean product using non-abrasive mild soap and water. Do not utilize any cleaners containing any type of acid.
I) Use touch up paint and touch up kit to repair any areas damaged during installation.

END OF SECTION

SECTION 32 14 16

BRICK UNIT PAVING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Includes installation of brick pavers in a pedestrian condition.

1.02 QUALITY ASSURANCE

A. Adhere to applicable as TM standards.

B. Construction shall be by a contractor and crew with at least one year of experience in placing brick pavers on projects of similar scale and scope.

C. Mock-up:

1. Provide a mock-up for evaluation of surface preparation techniques and application workmanship. Refer to mock-up note in finish schedule regarding requirements.
2. Do not proceed with remaining work until mock-up is approved by the owner's representative.
3. Refinish mock-up area as required to produce acceptable work if mock-up is installed in place.

1.03 SUBMITTALS

A. Product data for all materials.

B. Full size samples of brick paving units including several typical bricks within the specified range to indicate color and shape selections.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Clay brick pavers: Match existing. Brick pavers shall be a grade pavers manufactured by a member of the brick industry association (BIA). Existing pavers may be reused with the Owner's Representative approval.

B. Bedding and joint sand: use clean, non-plastic, masonry sand that is natural or manufactured from crushed rock. Sand particles shall be sharp and angular and contain at least 30% of 1/8" particles. Bedding sand to conform to the grading requirements of ASTM C33. Joint sand to conform to the grading requirements of ASTM C144.

C. Sand joint stabilizer: sand joint stabilizer ‘Paver Kare Sand Joint Stabilizer’ by Prosoco or equal.

D. Concrete, if required for underlay slab: Standard grey concrete to 2800 PSI.

2.02 TESTING

A. Brick pavers shall meet the following requirements:

1. Minimum average compressive strength of 10,000 PSI.
2. The average cold water absorption shall not be greater than 6% with no individual unit testing greater than 7%. Absorption test results may not be achieved through the use of sealers or other products applied to the clay paver.
   a. Resistance to 50 freeze thaw cycles, when tested in accordance with ASTM C67.
   b. Dimensional tolerances should meet the PX standard. The dimensional tolerances around the mean values for length, width, and depth shall be 1/16”.
   c. The pavers should be solid units without core holes or other perforations.

PART 3 - EXECUTION

3.01 EXISTING CONDITIONS

A. Coordinate masonry with other trades. Install required conduit or sleeving prior to commencement of work.

3.02 INSTALLATION

A. Protect materials before, during, and after installation and protect the installed work and materials of all other trades.

B. Construction of the base:
   1. Compact subgrade to 95% standard Proctor density as per ASTM D698. Ensure subgrade is dry, uniform, and even to support pavers.

C. Laying of clay brick pavers:
   1. **Match installation method of existing brick paving in this area.**
   2. If the existing method is sand set: Spread setting sand evenly over the concrete base pad and screed to thickness as shown in detail. Do not spread bedding sand beyond the area to be covered by pavers on any given day. If sand is disturbed, rework and re-screen sand bed prior to laying pavers.
   3. Use string lines to hold all pattern lines true. Lay units plumb, level and true to line. Lay full pavers first. Lay pavers hand tight and maintain straight pattern lines in direction as indicated on drawings and/or finish schedule.
   4. Joints between pavers shall be between 1/16” and 1/8” wide maximum.
   5. Cut pavers at edge as needed. Cut with a masonry saw or paver splitter. Do not cut smaller than one third (1/3) of a full paver.

6. If the existing method is sand set: Vibrate pavers into the base course using a plate compactor capable of 3,000 to 5,000 pounds compaction force with the surface clean and joints open. After vibration, spread jointing sand over the paving stone surfaces, allow to dry, and vibrate into joints with vibrator. Do not vibrate within three feet of any unrestrained edge. All work to within three feet of the laying face must be left fully compacted with sand filled joints at the completion of each day. Sweep off excess sand when completed.
7. A maximum of ¼" vertical change shall be permitted between pavers or between paver areas and adjacent paving, drainage inlets, concrete collars or other utility improvements at grade.
8. Prior to applying joint sand stabilizer, clean the surface and ensure it is free from oil, dust from cutting and any loose material. The surface and joint sand shall also be dry for its full depth prior to commencing work. Treat the area and protect from rain or wetting. Apply per manufacturer's specifications. Do not allow traffic for 24 hours following application.

3.03 CLEANUP

A. Remove all waste materials and leave site clean and safe condition daily.

B. After completion of any repair work, clean all exposed surfaces with clean water and stuff brushes until all stains and dirt are removed. The use of commercial cleaning solutions must be in accordance with the manufacturers' recommendations and approved for use on clay pavers.

3.04 PROTECTION

A. Protect site furnishings from damage until Final Acceptance.

3.05 INSPECTION AND ACCEPTANCE

A. Remove and replace pavers which are loose, chipped, broken, stained, or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment to eliminate evidence of replacement and at no additional cost.

B. When paving is substantially complete, the Landscape Architect will, upon request, make a substantial completion inspection to determine acceptability and compliance with the Contract Documents. The Landscape Architect will produce a written punch list for the Contractor and Owner's Representative to identify items that shall be addressed prior to final acceptance.

C. Once items of the punch list are addressed, the Landscape Architect will conduct a final completion inspection. If necessary, the Landscape Architect will produce a final punch list for the Contractor and Owner's Representative to identify items to be addressed prior to final acceptance.

D. Final acceptance will not be issued until all punch list items have been completed and accepted by the Owner and all submittals have been made.

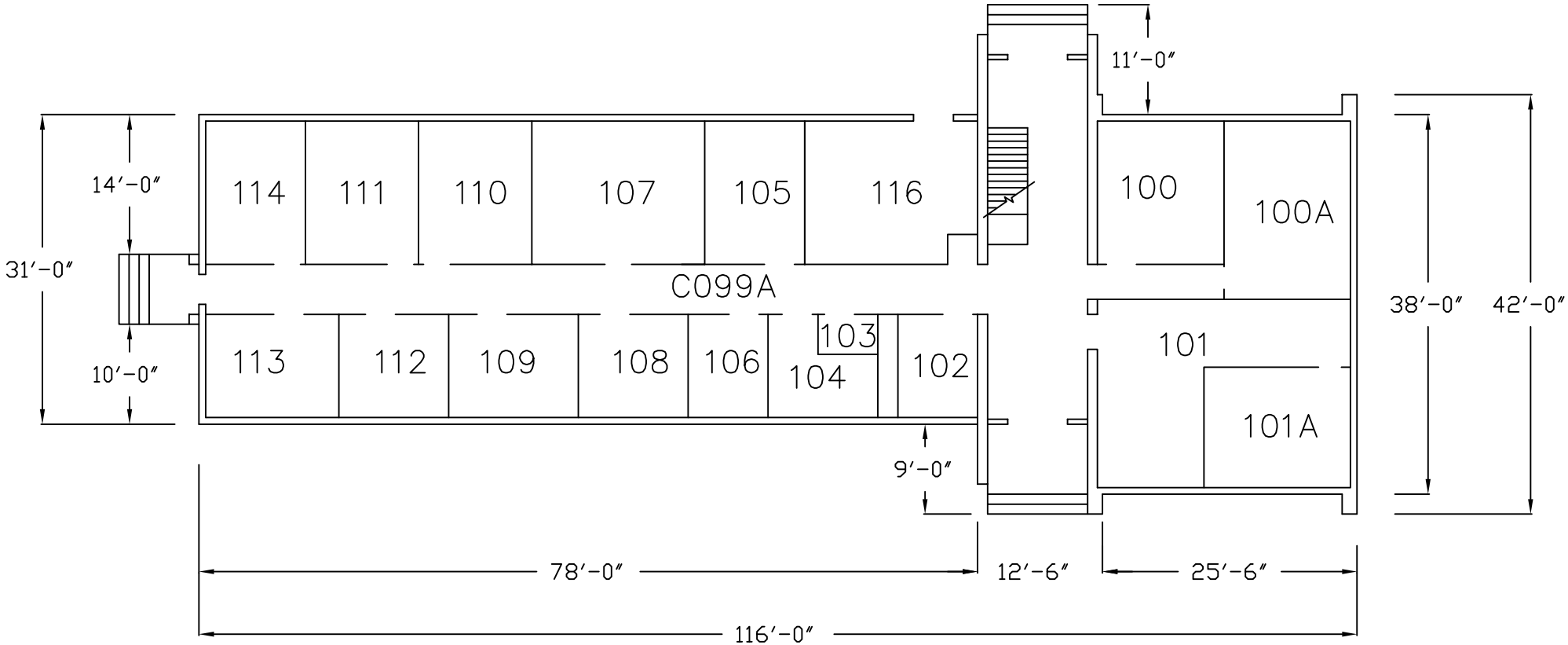
E. Work may be inspected for acceptance in portions as phases of installation are completed and as agreeable to the Landscape Architect, provided each portion of work offered for inspection is substantially complete.

F. Final acceptance will begin the required warranty period.

3.06 AURENTEE AND REPLACEMENTS

A. Warrant in writing pavers for a period of one (1) year from the date of acceptance.

END OF SECTION 32 14 16



FIRST FLOOR PLAN

BLDG. NAME: MEHROHF HALL	
DATE: 1958	REV. 3: 6/03
REV. 1: 12/91	REV. 4:
REV. 2: 3/03	REV. 5:

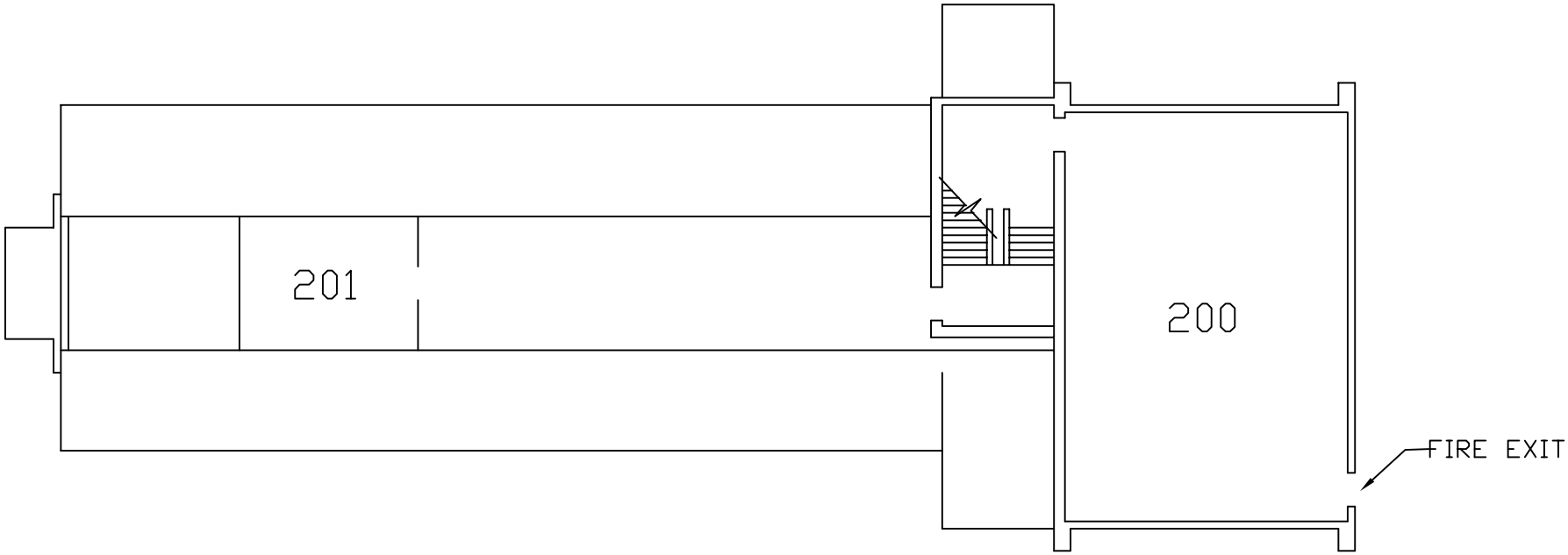
UNIVERSITY OF FLORIDA

BLDG. NUMBER: 559

LOCATION: 2B4

FILENAME: BB-0559-1

LAYERS:



0 10′ 30′

SCALE

SECOND FLOOR PLAN

BLDG. NAME: MEHROHF HALL	
DATE: 1958	REV. 3:
REV. 1: 12/91	REV. 4:
REV. 2: 3/03	REV. 5:

N

UNIVERSITY OF FLORIDA

BLDG. NUMBER: 559

LOCATION: 2B4

FILENAME: BB-0559-2

LAYERS: