

79167

SECTION 16123
BUILDING WIRE AND CABLE

PART 1 GENERAL

This section includes building wire and cable with insulation rated 600 volts and less.

1.1 SECTION INCLUDES

- A. Building wire and cable.
- B. Nonmetallic-sheathed cable.
- C. Underground feeder and branch circuit cable.
- D. Service entrance cable.
- E. Armored cable.
- F. Metal clad cable.
- G. Wiring connectors and connections.

1.2 RELATED SECTIONS

- A. Section 16111 - Conduit.
- B. Section 16130 - Boxes.
- C. Section 16195 - Identification.

1.3 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide for each cable assembly type.
- C. Test Reports: Indicate procedures and values obtained.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.

- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.6 FIELD SAMPLES

- A. Provide under provisions of Section 01400.

1.7 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Conductor sizes are based on copper.
- C. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions. Include wire and cable lengths within 10 feet of length shown.
- D. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.8 COORDINATION

- A. Coordinate Work under provisions of Section 01039.
- B. Determine required separation between cable and other work.
- C. Determine cable routing to avoid interference with other work.

PART 2 PRODUCTS

2.1 MANUFACTURERS - BUILDING WIRE AND CABLE

- A. Pirelli Cable Corp.
- B. Cablec/Anaconda
- C. Okonite.
- D. Substitutions: Under provisions of Section 01600.

2.2 BUILDING WIRE AND CABLE

- A. Sizes up to #6 AWG
 1. Description: Single conductor insulated wire or multiconductor tray cable as indicated.
 2. Conductor: Copper.
 3. Insulation Voltage Rating: 600 volts, 90°C.
 4. Insulation: ANSI/NFPA 70, Type THHN/THWN.

- B. Sizes #6 AWG and larger
1. Description: Single conductor stranded cable with a composite insulation of EPR/Hypalon.
 2. Conductor: Copper
 3. Insulation Voltage Rating: 600 volts, 90°C.
 4. ANSI/NFPA 70, Type RHH/RHW/USE/VW-1.
 5. To be constructed per CEA Specification #568-516 and pass the IEEE 383 Flame Test.

2.3 WIRING CONNECTORS

- A. Split Bolt Connectors:
1. Burndy, Model Servit.
 2. Ideal.
 3. T & B.
 4. Substitutions: Under provisions of Section 01600.
- B. Solderless Pressure Connectors:
1. Burndy, Model Hydent.
 2. T & B.
 3. Ideal.
 4. Substitutions: Under provisions of Section 01600.
- C. Spring Wire Connectors:
1. T & B.
 2. Burndy.
 3. Ideal.
 4. Substitutions: Under provisions of Section 01600.
- D. Compression Connectors:
1. T & B.
 2. Burndy.
 3. Ideal.
 4. Substitutions: Under provisions of Section 01600.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that mechanical work likely to damage wire and cable has been completed.

3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.

3.3 WIRING METHODS

- A. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.

- B. **Exposed Interior Locations:** Use only building wire, Type THHN/THWN insulation, in raceway, or tray rated cable, in cable tray where indicated. EPR/Hypalon shall be used for wire larger than #6 AWG.
- C. **Exterior Locations:** Use only EPR/Hypalon cable, Type RHH/RHW/USE/VW-1 in raceway.
- D. **Underground Installations:** Use only EPR/Hypalon cable, Type RHH/RHW/USE/VW-1 in raceway.
- E. Use wiring methods indicated on Drawings.

3.4 INSTALLATION

- A. Install products in accordance with manufacturers instructions.
- B. Use solid conductor for feeders and branch circuits 10 AWG and smaller.
- C. Use stranded conductors for control circuits.
- D. Use conductor not smaller than 12 AWG for power and lighting circuits.
- E. Use conductor not smaller than 14 AWG for control circuits.
- F. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.
- G. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.
- H. Pull all conductors into raceway at same time.
- I. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- J. Protect exposed cable from damage.
- K. Support cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure. Do not rest cable on ceiling panels.
- L. Use suitable cable fittings and connectors.
- M. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- N. Clean conductor surfaces before installing lugs and connectors.
- O. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- P. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
- Q. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

- R. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

3.5 INTERFACE WITH OTHER PRODUCTS

- A. Identify wire and cable under provisions of Section 16195.
- B. Identify each conductor with its circuit number or other designation indicated on Drawings.

3.6 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 16995.
- B. Inspect wire and cable for physical damage and proper connection.
- C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
- D. Verify continuity of each branch circuit conductor.

SECTION 16130

BOXES

PART 1 GENERAL

This section includes wall and ceiling outlet boxes, floor boxes, pull and junction boxes.

1.1 SECTION INCLUDES

- A. Wall and ceiling outlet boxes.
- B. Floor boxes.
- C. Pull and junction boxes.

1.2 RELATED SECTIONS

- A. Section 16141 - Wiring Devices: Mounting heights of wiring device outlets.
- B. Section 16160 - Cabinets and Enclosures.
- C. Section 16180 - Equipment Wiring Systems.
- D. Section 16721 - Fire Alarm System: Mounting height of fire alarm outlets.

1.3 REFERENCES

- A. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- B. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- C. ANSI/NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.
- D. ANSI/NFPA 70 - National Electrical Code.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.4 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700.
- B. Accurately record actual locations and mounting heights of outlet, pull, and junction boxes.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.6 PROJECT CONDITIONS

- A. Verify field measurements are as shown on Drawings.
- B. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose. Include installation within 10 feet of location shown. Final location to be as directed by construction representative.

PART 2 PRODUCTS

2.1 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
 - 2. Concrete Ceiling Boxes: Concrete type.
- B. Nonmetallic Outlet Boxes: ANSI/NEMA OS 2.
- C. Cast Boxes: NEMA FB 1, Type FD, cast ferrous alloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.

2.2 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Surface-Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface-mounted junction box.
 - 1. Material: Cast aluminum.
 - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- C. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting.
 - 1. Material: Cast aluminum.
 - 2. Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.
 - 3. Cover Legend: As required.
- A. Fiberglass Handholes: Die-molded fiberglass handholes.
 - 1. Cable Entrance: Pre-cut 6 x 6 inch cable entrance at center bottom of each side.
 - 2. Cover: Fiberglass weatherproof cover with nonskid finish.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- B. Install electrical boxes to maintain headroom and to present neat mechanical appearance.
- C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- D. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- E. Install boxes to preserve fire resistance rating of partitions and other elements.
- F. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.
- G. Use flush mounting outlet boxes in finished areas.
- H. Do not install flush mounting boxes back-to-back in walls; provide minimum 6 inch separation. Provide minimum 24 inches separation in acoustic rated walls.
- I. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- J. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- K. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- L. Use adjustable steel channel fasteners for hung ceiling outlet box.
- M. Do not fasten boxes to ceiling support wires.
- N. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.
- O. Use gang box where more than one device is mounted together. Do not use sectional box.
- P. Use gang box with plaster ring for single device outlets.
- Q. Use cast outlet box in exterior locations and wet locations.
- R. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.
- S. Set floor boxes level.
- T. Large Pull Boxes: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.
 - 1. Interior Dry Locations: Use hinged enclosure under provisions of Section 16160.
 - 2. Other Locations: Use surface-mounted cast metal box.

3.2 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate installation of outlet box for equipment furnished under Division 15.
- B. Coordinate locations and sizes of required access doors with Section 08305.
- C. Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes.
- D. Position outlet boxes to locate luminaires as shown on plans.

3.3 ADJUSTING

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closure in unused box opening.

SECTION 16141

WIRING DEVICES

PART 1 GENERAL

This section includes wiring devices such as receptacles, wall switches and unit dimmers.

1.1 SECTION INCLUDES

- A. Wall switches.
- B. Receptacles.
- C. Device plates and decorative box covers.

1.2 RELATED SECTIONS

- A. Section 01630: Boxes.

1.3 REFERENCES

- A. NEMA WD 1 - General Purpose Wiring Devices
- B. NEMA WD 6 - Wiring Device Configurations

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.1 WALL SWITCHES

- A. Double Pole Switch:
 - 1. 15 amp, 120/227 VOLT.
 - 2. Devices installed outdoors shall have a weatherproof cover.

2.2 RECEPTACLES

- A. Single Convenience Receptacle:
 - 1. 15 AMP, 2 pole, 3 wire
 - 2. 125 volt
 - 3. Weatherproof receptacle plate (except in office areas).
- B. Duplex Convenience Receptacle:
 - 1. 20 AMP, 2 pole, 3 wire.
 - 2. 125 Volt.
 - 3. Weatherproof receptacle plate (except in office areas).

2.3 WALL PLATES

- A. Decorative Cover Plate: Smooth stainless steel for service and control rooms.
- B. Weatherproof Cover Plate: Cast metal or zinc coated sheet steel with rounded or bevelled edges.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify outlet boxes are installed at proper height.
- B. Verify wall openings are neatly cut and will be completely covered by wall plates.
- C. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean debris from outlet boxes.

3.3 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install devices plumb and level.
- C. Install switches with OFF position down.
- D. Do not share neutral conductor on load side of dimmers.
- E. Install receptacles with grounding pole on bottom.
- F. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
- G. Connect wiring devices by wrapping conductor around screw terminal.

- H. Use jumbo size plates for outlets installed in masonry walls.
- I. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- J. Install weatherproof receptacles horizontally.

3.4 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity as described in Section 16995.

3.5 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

SECTION 16160

CABINETS AND ENCLOSURES - INDOOR

PART 1 GENERAL

This section includes metal cabinets and enclosures used for enclosing terminal blocks and electrical devices. Hinged cover enclosures specified in this section may also be used as large pullboxes.

1.1 SECTION INCLUDES

- A. Hinged cover enclosures.
- B. Cabinets.
- C. Terminal blocks.
- D. Accessories.

1.2 RELATED SECTIONS

- A. Section 16190 - Supporting Devices.

1.3 REFERENCES

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems.
- C. ANSI/NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide manufacturer's standard data for enclosures and cabinets.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.6 EXTRA MATERIALS

- A. Furnish under provisions of Section 01700.
- B. Provide two extra sets of each cabinet key at completion of work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Hoffman.
- B. Spring City
- C. Square D.
- D. Substitutions: Under provisions of Section 01600.

2.2 HINGED COVER ENCLOSURES

- A. Construction: NEMA 250, Type 4 steel enclosure.
- B. Covers: Continuous hinge, held closed by flush latch operable by screwdriver. Provide hasp and staple for padlock.
- C. Provide interior metal panel for mounting terminal blocks and electrical components; finish with white enamel.
- D. Enclosure Finish: Manufacturer's standard enamel.

2.3 CABINETS

- A. Boxes: Galvanized steel.
- B. Box Size: As indicated on project drawings.
- C. Fronts: Steel, surface type with concealed trim clamps, concealed hinge, and flush lock. Finish with vendors standard finish.
- D. Knockouts: As indicated on drawings.
- E. Provide metal barriers to separate compartments containing control wiring operating at less than 50 volts from power wiring.
- F. Provide accessory feet for free-standing equipment.

2.4 TERMINAL BLOCKS

- A. **Manufacturers:**
 - 1. Allen Bradley.
 - 2. Phoenix.
 - 3. Weid Muller.
 - 4. Substitutions: Under provisions of Section 01600.
- B. Terminal Blocks: ANSI/NEMA ICS 4.
- C. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.
- D. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts.
- E. Provide ground bus terminal block, with each connector bonded to enclosure.

2.5 ACCESSORIES

- A. **Plastic Raceway:**
 - 1. Panduit.
 - 2. Hoffman.
 - 3. Taylor.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify conditions under provisions of Section 01039.
- B. Verify that surfaces are ready to receive Work.

3.2 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions and per project drawings.
- B. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner.
- C. Install cabinet fronts plumb.

SECTION 16161

CABINETS AND ENCLOSURES - OUTDOOR PAD MOUNTED

PART 1 GENERAL

This section includes metal cabinets and enclosures used for enclosing terminal blocks and electrical devices in an outdoor environment.

1.1 SECTION INCLUDES

- A. Single door outdoor enclosures
- B. Terminal blocks.
- C. Accessories.

1.2 RELATED SECTIONS

- A. Section 03300 - Cast-in-place concrete

1.3 REFERENCES

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems.
- C. ANSI/NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide manufacturer's standard data for enclosures and cabinets.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.6 EXTRA MATERIALS

- A. Furnish under provisions of Section 01700.
- B. Provide two extra sets of each cabinet key at completion of work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Hennessy or Equal
- B. Substitutions: Under provisions of Section 01600.

2.2 OUTDOOR

- A. Hennessy or Equal

2.3 SINGLE DOOR OUTDOOR ENCLOSURES

- A. Construction: NEMA 250, Type 4 aluminum.
- B. Door 1 continuous hinge, held closed by 2-point draw roller latch with operating handle. Provide provisions for padlocking handle in closed position. Door opening shall be double flanged on all (4) sides. Door restraint shall be provided. Door gasket shall satisfy UL508 Table 21:1 requirements.
- C. Provide interior metal panel for mounting terminal blocks and electrical components; finish with white enamel.
- D. Enclosure Finish: Manufacturer's standard enamel.
- E. Provide metal barriers to separate compartments containing control wiring operating at less than 50 volts from power wiring.
- F. Provide reinforced base plate for mounting to PAD.

2.4 TERMINAL BLOCKS

- A. Manufacturers:
 - 1. Allen Bradley.
 - 2. Phoenix.
 - 3. Weid Muller.
 - 4. Substitutions: Under provisions of Section 01600.
- B. Terminal Blocks: ANSI/NEMA ICS 4.
- C. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.
- D. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts.
- E. Provide ground bus terminal block, with each connector bonded to enclosure.

2.5 ACCESSORIES

- A. Plastic Raceway:
 - 1. Panduit.
 - 2. Hoffman.
 - 3. Taylor.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify conditions under provisions of Section 01039.
- B. Verify that surfaces are ready to receive Work.

3.2 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions and per project drawings.
- B. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner.
- C. Install cabinet fronts plumb.

SECTION 16170
GROUNDING AND BONDING

PART 1 GENERAL

This section includes basic materials and methods for grounding and bonding electrical systems, building structure and finishes, and pipings systems.

1.1 SECTION INCLUDES

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.

1.2 RELATED SECTIONS

- A. Section 02781 - Site Grounding
- B. Section 03200 - Concrete Reinforcement.
- C. Section 03300 - Cast-In-Place Concrete.

1.3 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

1.4 GROUNDING ELECTRODE SYSTEM

- A. Metal underground water pipe.
- B. Metal frame of the building.
- C. Concrete-encased electrode.
- D. Ground ring specified in Section 02781.
- E. Metal underground gas piping system.
- F. Rod electrode.
- G. Plate electrode.
- H. Active electrode.

1.5 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 5 ohms.

1.6 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide data for grounding electrodes and connections.
- C. Test Reports: Indicate overall resistance to ground. Per requirements in 16995.
- D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

1.7 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700.
- B. Accurately record actual locations of grounding electrodes.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this Section.

1.9 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.1 ROD ELECTRODE

- A. Manufacturers:
 - 1. Weaver
 - 2. T & B
 - 3. Blackburn
 - 4. Substitutions: Under provisions of Section 01600.
- B. Material: Copper-clad steel.
- C. Diameter: 3/4 inch.
- D. Length: 10 feet.

2.2 ACTIVE ELECTRODES

- A. Active electrodes are not to be used.

2.3 MECHANICAL CONNECTORS

A. Manufacturers:

1. Burndy
2. T & B
3. Substitutions: Under provisions of Section 01600.

B. Material: Bronze.

2.4 EXOTHERMIC CONNECTIONS

A. Manufacturers:

1. Cadweld or equal.
2. Substitutions: Under provisions of Section 01600.

2.5 WIRE

A. Material: Stranded copper.

B. Foundation Electrodes: 2/0 AWG.

C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
- C. Provide grounding well pipe with cover at rod locations where indicated. Install well pipe top flush with finished grade.
- D. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing. Bond steel together.
- E. Provide bonding to meet Regulatory Requirements.
- F. Bond together metal siding not attached to grounded structure; bond to ground.
- G. Bond together reinforcing steel and metal accessories in structures.

- H. Bond together each metallic raceway, pipe, duct and other metal object entering. Use two (2) AWG bare copper conductor.
- I. Provide isolated grounding conductor where indicated.
- J. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- K. Use exothermic connectons only in non-hazardous areas. Areas to be grounded shall be checked with a portabled combustion analyzer prior to start of work.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Interface with site grounding system installed under Section 02781.

3.4 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Test per Section 16995.

SECTION 16180
EQUIPMENT WIRING SYSTEMS

PART 1 GENERAL

This section includes wiring connections to utilization and control equipment specified under other sections.

1.1 WORK INCLUDED

- A. Electrical connections to equipment specified under other sections.

1.2 RELATED WORK

- A. Section 16111 - Conduit
B. Section 16120 - Wire and Cable
C. Section 16130 - Boxes

1.3 REFERENCES

- A. FS W-C-596 - Electrical Power Connector, Plug, Receptor, and Cable Outlet.
B. NEMA WD 1 - General Purpose Wiring Devices.
C. NEMA WD 5 - Specific-Purpose Wiring Devices.

PART 2 PRODUCTS

2.1 CORDS AND CAPS

- A. Straight-blade Attachment Plug: NEMA WD 1. FS W-C-596.
B. Locking-blade Attachment Plug - NEMA WD 5.
C. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.
D. Cord Construction: Oil-resistant thermoset insulated Type SOOW multiconductor flexible cord with identified equipment grounding conductor, suitable for extra hard usage in damp locations.
E. Cord Size: Suitable for connected load of equipment and rating of branch circuit overcurrent protection.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 PREPARATION

- A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.3 INSTALLATION

- A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.
- B. Make conduit connections to equipment using liquid-tight flexible conduit. Provide external grounding jumper where required.
- C. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.
- D. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.
- E. Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as indicated. Connect with conduit and wiring as indicated.
- F. Bond together reinforcing steel and metal accessories in structures.
- G. Bond together each metallic raceway, pipe, duct and other metal object entering. Use 2 AWG bare copper conductor.
- H. Provide isolated grounding conductor where indicated.
- I. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- J. Use exothermic connections only in non-hazardous areas. Areas to be grounded shall be checked with a portabled combustion analyzer prior to start of work.

3.4 INTERFACE WITH OTHER PRODUCTS

- A. Interface with site grounding system installed under Section 02781.

3.5 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Test per Section 16995.

SECTION 16190
SUPPORTING DEVICES

PART 1 GENERAL

This section includes straps, clamps, steel channel, and fastening hardware for supporting electrical work.

The Contractor shall cut, fabricate, and weld all steel brackets, hangers, platforms, and supports required for the installation of this work. Typical details shown on the Plans are not to be construed as working or shop drawings. They merely indicate methods, sizes and types of steel. The Contractor shall determine actual dimensions and quantities as the work progresses.

1.1 WORK INCLUDED

- A. Conduit and equipment supports.
- B. Fastening hardware.

1.2 QUALITY ASSURANCE

- A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 PRODUCTS

2.1 MATERIAL

- A. Support Channel: Galvanized or painted steel.
- B. Hardware: Corrosion resistant.
- C. Outdoor Installation: Hot-dipped galvanized steel.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure as needed.
- B. Use toggle bolts or hollow wall fasteners in hollow masonry, and walls, expansion anchors or preset inserts in solid masonry walls, self-drilling anchors or expansion anchor on concrete surfaces; and sheet metal screws in sheet metal studs.
- C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
- D. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- E. In wet locations, install free-standing electrical equipment on concrete pads.

- F. Install surface-mounted cabinets and panel boards with minimum of four anchors.
- G. Obtain permission from Architect/Engineer before using powder-actuated anchors.
- H. Obtain permission from Architect/Engineer before drilling or cutting structural members.
- I. In wet and damp locations, use steel channel supports to stand cabinets and panel boards one (1) inch (25 mm) off wall.

SECTION 16195
ELECTRICAL IDENTIFICATION

PART 1 GENERAL

This section includes field-installed nameplates, labeling and identification methods for electrical equipment, components, and wiring.

1.1 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.

1.2 RELATED SECTIONS

- A. Section 09900 - Painting.

1.3 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide catalog data for nameplates, labels, and markers.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.6 EXTRA MATERIALS

- A. Furnish under provisions of Section 01700.

PART 2 PRODUCTS

2.1 NAMEPLATES AND LABELS

- A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.

Unless indicated otherwise on project drawings.

B. Locations:

1. Motor control centers.
2. Field push button station, control stations, and pilot devices.
3. Field instruments.
4. Transformers.
5. Power, lighting and instrument panel boards.
6. Relay cabinets and programmable controllers.

C. Letter Size:

1. Use 3/16 inch letters.

D. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use only for identification of individual wall switches and receptacles.

2.2 WIRE MARKERS

A. Manufacturers:

1. T & B or computer generated self-laminating.
2. Substitutions: Under provisions of Section 01600.

B. Description: self-laminating type wire markers.

C. Locations: Each conductor at panel board gutters, pull boxes, outlet and junction boxes, and each load connection.

D. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings.

2.3 CONDUIT MARKERS

A. Manufacturers:

1. Brady
2. T & B
3. Seton
4. Substitutions: Under provisions of Section 01600.

B. Description:

C. Location: Furnish markers for each conduit longer than 6 feet.

D. Spacing: 20 feet on center.

E. Color:

1. 480 Volt System: Black on orange.

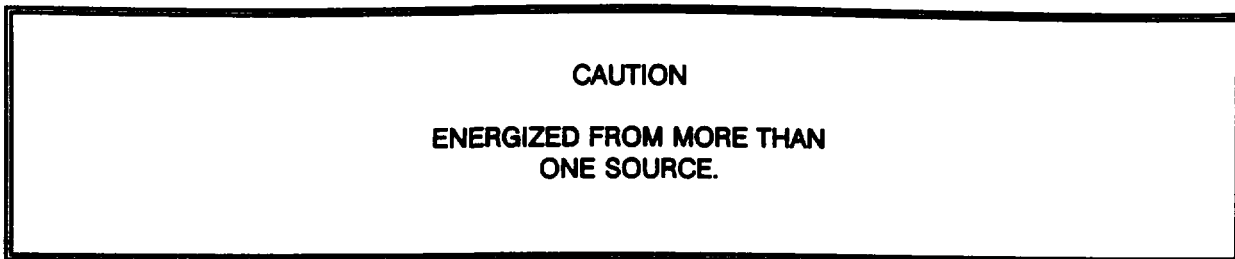
2. 208 Volt System: Black on orange.
3. Fire Alarm System: Red.
4. Telephone System: Black on orange.
5. Control System: Blue on white.

F. Legend:

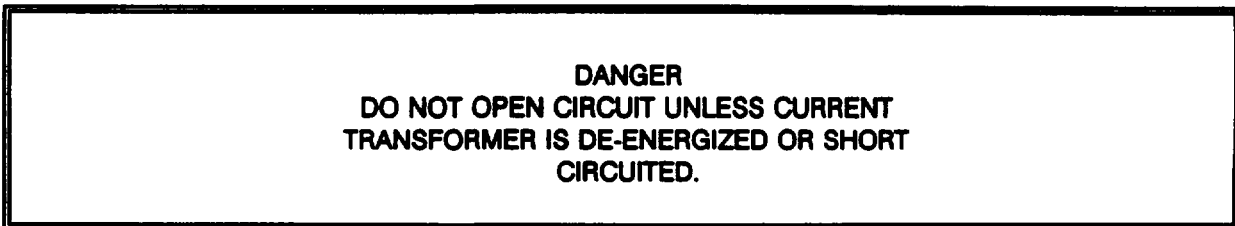
1. 480 Volt System: 480 Volt
2. 208 Volt System: 208 Volt
3. Fire Alarm System: Fire
4. Telephone System: Telephone
5. Control System: Controls

2.4 ELECTRICAL AND INSTRUMENT ENCLOSURE NAMEPLATES

Electrical and instrument enclosures and panels containing more than one external voltage source in addition to the name and number of the enclosure and panel shall be furnished and installed with the following red lamacoid (plastic) engraved nameplate, letters shall be white and not less than 1/2 inch high.



In addition to the labeling described herein, provide and locate adjacent to each current transformer red lamacoid (plastic) engraved nameplate, with white letters not less than 1/2 inch high that reads as follows:



In addition to the labeling described herein, disconnect switches and outlets connected to standby power shall be provided with a yellow lamacoid (plastic) engraved nameplate with black letters not less than 3/8 inch high that reads as follows:



MAIN SUPPLY
MCC...
SOURCE

ALTERNATE SUPPLY
MCC...
SOURCE

Disconnect switches of vital equipment such as UPS MAIN and ALTERNATE power sources shall be furnished and installed with the following red lamacoid (plastic) engraved nameplate. Letters shall be white and not less than 1/2 inch high.

DO
NOT
OPEN

In the event that a UPS unit has more than one panel board, identify the UPS circuit breaker that feeds the panel boards. Similarly, the panel board must identify the circuit breaker which controls its power.

Lamacoid nameplates shall be installed directly on or adjacent to the front of the equipment being identified, and be secured by a method that does not alter the strength or environmental integrity of the equipment. Self-tapping screws shall be of the blunt point type.

To indicate rotation, apply black on orange factory printed arrows manufactured by Brady Industries, Catalog #93262, on drive end of motors.

Covers of pull boxes and junction boxes containing single and/or three phase conductors over 120 volts shall be conspicuously labeled to indicate source (sources) and load (loads) of the circuits within the box. Labels shall be made by using 3/4 inch wide orange 3M Company Scotch or Dymo labeling tool and tape. If boxes contain conductors over 600 volts, a separate and distinct, minimum 2 inch letters, "High Voltage" sign shall be secured to the box cover.

When two or more switchgear compartments are secured together in a line, the rear covers shall be labeled with the same information that is shown on the front of the compartments. Labels shall be made by using 3/4 inch wide orange 3M Company Scotch or Dymo labeling tool and tape.

Contractor shall apply Dymo type labels within starter enclosures that indicate the thermal element size, catalog number and date installed. In addition, he shall provide customer with an 8-1/2 inch x 11 inch tabulation sheet that indicates the same information prior to start-up schedule. The tabulation sheet shall also show the horsepower, and motor function.

2.5 UNDERGROUND CABLE MARKING

A. Manufacturers:

1. Seton
2. T & B
3. Stranco
4. Substitutions: Under provisions of Section 01600.

- B. Description: 4 inch wide minimum plastic tape, colored red with suitable warning legend describing buried electrical lines.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive-backed nameplates and labels.

3.2 APPLICATION

- A. Install nameplate and label parallel to equipment lines.
- B. Secure nameplate to equipment front using screws, rivets, or adhesive.
- C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.
- D. Identify conduit with conduit markers.
- E. Identify each conduit longer than 6 feet.
- F. Place identification 20 feet on center.
- G. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches below finished grade.

SECTION 16421

UTILITY SERVICE ENTRANCE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Arrangement with Utility Company for permanent electric service, including payment of Utility Company charges for service.
- B. Overhead or Underground Vault service entrance. Refer to Single-Line Diagram.
- C. Metering equipment.

1.2 RELATED SECTIONS

- A. Section 02222 - Excavating.
- B. Section 02223 - Backfilling.
- C. Section 02225 - Trenching.
- D. Section 03300 - Cast-in-Place Concrete: Transformer pads.
- E. Section 16111 - Conduit.
- F. Section 16170 - Grounding and Bonding.

1.3 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

1.4 SYSTEM DESCRIPTION

- A. Utility Company: Indiana-Michigan Electric, (219) 293-0661.
- B. System Characteristics: Refer to single line for voltage, and amperage.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Submit Utility Company prepared drawings.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with Utility Company written requirements.
- B. Maintain two (2) copies of each document on site.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.8 PRE-INSTALLATION CONFERENCE

- A. Convene one (1) week prior to commencing work of this Section, under provisions of Section 01039.

1.9 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on Utility Company drawings.

PART 2 PRODUCTS

2.1 UTILITY METERS

- A. Meters will be furnished by Utility Company.

2.2 UTILITY METER BASE

- A. Manufacturers:
 - 1. Superior Anchor.
 - 2. Durham.
 - 3. Milbank.
 - 4. Substitutions: Under provisions of Section 01600.

2.3 METERING TRANSFORMER CABINET

- A. Manufacturers:
 - 1. Superior Anchor.
 - 2. Durham.
 - 3. Milbank.
 - 4. Substitutions: Under provisions of Section 01600.
- B. Include provisions for padlocking and sealing.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify conditions under provisions of Section 01039.
- B. Verify that service equipment is ready to be connected and energized.

3.2 PREPARATION

- A. **Make arrangements with Utility Company to obtain permanent electric service to the Project.**
- B. **Coordinate location of Utility Company's facilities to ensure proper access is available.**

3.3 INSTALLATION

- A. **Overhead.**
 - 1. **Install service rack and weatherhead at height as required by Utility Company. Utility Company will connect service drop to service entrance conductors. Provide drip loop in service conductors.**
- B. **Underground.**
 - 1. **Install service entrance conduits in concrete envelope from property line Utility Company's manhole, Utility Company's terminal pole, Utility Company's pad-mounted transformer to building service entrance equipment. Utility Company will connect service lateral conductors to service entrance conductors. Connect service lateral conductors to service entrance conductors.**
 - 2. **Provide cast-in-place concrete pad for Utility Company transformer, under the provisions of Section 03300.**

SECTION 16441
ENCLOSED SWITCHES

PART 1 GENERAL

This section includes enclosed safety switches for use as feeder and branch circuit switching, and disconnect switches for motors and equipment.

1.1 SECTION INCLUDES

- A. Fusible switches.
- B. Nonfusible switches.
- C. Fuses.

1.2 REFERENCES

- A. NEMA Type HD - Disconnect switches.
- B. NEMA KS 1 - Enclosed switches
- C. NFPA 70 - National Electrical Code.
- D. UL 198C - High-Interrupting Capacity Fuses; Current Limiting Type.
- E. UL 198E - Class R Fuses

1.3 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide switch ratings and enclosure dimensions.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with NECA Standard of Installation.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.

1.6 EXTRA MATERIALS

- A. Furnish under provisions of Section 01700.
- B. Provide two sets of each size and type fuse installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Square D
- B. Allen Bradley
- C. General Electric
- D. Substitutions: Under provisions of Section 01600.

2.2 ENCLOSED SWITCHES

- A. Fusible Switch Assemblies: NEMA KS 1, Type HD load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate Class R fuses.
- B. Nonfusible Switch Assemblies: NEMA KS 1, Type HD load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- C. Enclosures: NEMA KS 1.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 4.

2.3 FUSES

- A. Manufacturers:
 - 1. Bussman Model: Low-Peak
 - 2. Substitutions: Under provisions of Section 01600.
- B. Description: Dual element, current limiting, time delay, one-time fuse, 600 volt, UL 198E, Class RK 1.
- C. Interrupting Rating: 200,000 rms amperes.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install disconnect switches where indicated.
- B. Install fuses in fusible disconnect switches.
- C. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.
- D. Provide labels per 16195.

SECTION 16461

DRY TYPE TRANSFORMERS

PART 1 GENERAL

This section includes enclosed dry type transformers rated 600 volts and less, sizes 0.25 kVA through 500 kVA.

1.1 SECTION INCLUDES

- A. Dry type two winding transformers.
- B. Dry type isolation transformers.
- C. Transformer Distribution Center.

1.2 RELATED SECTIONS

- A. Section 16111 - Conduit: Flexible conduit connections.
- B. Section 16170 - Grounding and Bonding.
- C. Section 16190 - Supporting Devices.

1.3 REFERENCES

- A. NEMA ST 1 - Specialty Transformers
- B. NEMA ST 20 - Dry Type Transformers for General Applications.
- C. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide outline and support point dimensions of enclosures and accessories, unit weight, voltage, KVA, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.
- C. Test Reports: Indicate loss data, efficiency at 25, 50, 75 and 100 percent rated load, and sound level.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.
- E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with NECA Standard of Installation.
- B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. **Manufacturer:** Company specializing in manufacturing Products specified in this Section with minimum three years documented experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store, protect, and handle products to site under provisions of Section 01600.
- B. Deliver transformers individually wrapped for protection and mounted on shipping skids.
- C. Accept transformers on site. Inspect for damage.
- D. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- E. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 TWO-WINDING TRANSFORMERS

- A. **Manufacturers:**
 - 1. GE
 - 2. Square D
 - 3. **Substitutions:** Under provisions of Section 01600.
- B. **Description:** NEMA ST 20, factory-assembled, air cooled dry type transformers, ratings as indicated.
- C. **Insulation system and average winding temperature rise for rated KVA as follows:**
 - 1. 1-15 KVA: Class 185 with 80 degrees C rise.
 - 2. 16-500 KVA: Class 220 with 115 degrees C rise.
- D. **Case temperature:** Do not exceed 35 degrees C rise above ambient at warmest point.

- E. **Winding Taps:**
 - 1. **Transformers Less than 15 KVA:** Two 5 percent below rated voltage, full capacity taps on primary winding.
 - 2. **Transformers 15 KVA and Larger:** NEMA ST 20.
- F. **Sound Levels:** NEMA ST 20.
- G. **Basic Impulse Level:** 10 KV for transformers less than 300 KVA, 30 KV for transformers 300 KVA and larger.
- H. **Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.**
- I. **Mounting:** Suitable for wall or floor mounting, except transformers larger than 75 KVA, suitable for floor mounting.
- J. **Coil Conductors:** Continuous windings with terminations brazed or welded.
- K. **Enclosure:** NEMA ST 20; Type 1 ventilated. Provide lifting eyes or brackets.
- L. **Isolate core and coil from enclosure using vibration-absorbing mounts.**
- M. **Nameplate:** Include transformer connection data and overload capacity based on rated allowable temperature rise.

PART 3 EXECUTION

3.1 EXAMINATION

- A. **Verify condition under provisions of Section 01039.**
- B. **Verify that surfaces are suitable for installing transformer supports.**

3.2 PREPARATION

- A. **Provide concrete pad under provisions of Section 03300, where indicated on drawings.**

3.3 INSTALLATION

- A. **Install Products in accordance with manufacturer's instructions.**
- B. **Set transformer plumb and level.**
- C. **Use flexible conduit, under the provisions of Section 16111, 2 ft (0.6 M) minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.**
- D. **Mount transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure.**
- E. **Provide seismic restraints.**

F. Provide grounding and bonding in accordance with Section 16170.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Sections 01400 and 016995.

B. Check for damage and tight connections prior to energizing transformer.

C. Measure primary and secondary voltages and make appropriate tap adjustments.

SECTION 16470

PANELBOARDS

PART 1 GENERAL

This section includes circuit breaker and fused switch type distribution panelboards, including those with motor controller branches; circuit breaker type lighting and appliance branch circuit panelboards; and circuit breaker load centers.

1.1 SECTION INCLUDES

- A. Distribution panelboards.
- B. Branch circuit panelboards.
- C. Load centers.

1.2 RELATED WORK

- A. Section 16190 - Supporting Devices.
- B. Section 16195 - Electrical Identification: Engraved nameplates.

1.3 REFERENCES

- A. NECA (National Electrical Contractors Association) "Standard of Installation."
- B. NEMA AB 1 - Molded Case Circuit Breakers.
- C. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.
- D. NEMA KS 1 - Enclosed Switches.
- E. NEMA PB 1 - Panelboards.
- F. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- G. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700.
- B. Record actual locations of Products; indicate actual branch circuit arrangement.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01700.
- B. Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.7 QUALITY ASSURANCE

- A. Perform Work in accordance with NECA Standard of Installation.
- B. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

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

1.9 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and acceptable to authority having jurisdiction as suitable for purpose specified and indicated.

1.10 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on drawings or instructed by manufacturer.

1.11 MAINTENANCE MATERIALS

- A. Provide maintenance materials under provisions of Section 01700.
- B. Provide two of each panelboard key at completion of job.
- C. Provide two fuse pullers at completion of job if fusible panelboards are installed.

1.12 EXTRA MATERIALS

- A. Furnish under provisions of Section 01700.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Square D
- B. General Electric
- C. Substitutions: Under provisions of Section 01600.

2.2 DISTRIBUTION PANELBOARDS

- A. Panelboards: NEMA PB 1, fusible switch type.
- B. Service Conditions:
 - 1. Temperature: 60 degrees F (17 degrees C).
- C. Panelboard Bus: Copper ratings as indicated. Provide copper ground bus in each panelboard.
- D. Minimum integrated short circuit rating: 10,000 amperes rms symmetrical for 240 volt panelboards; 14,000 amperes rms symmetrical for 480 volt panelboards, or as indicated.
- E. Fusible Switch Assemblies: NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate Class R fuses.
- F. Molded Case Circuit Breakers: NEMA AB 1. Provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
- G. Molded Case Circuit Breakers with Current Limiters: NEMA AB 1. Provide circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole.
- H. Current Limiting Molded Case Circuit Breakers: NEMA AB 1. Provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.
- I. Provide circuit breaker accessory trip units and auxiliary switches as indicated.
- J. Enclosure: NEMA PB 1, Type 1 or as indicated on project drawings.
- K. Cabinet Front: Surface type. Finish in manufacturer's standard gray enamel.

2.3 BRANCH CIRCUIT PANELBOARDS

- A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB1, circuit breaker type.
- B. Panelboard Bus: Aluminum, ratings as indicated. Provide copper ground bus in each panelboard; provide insulated ground bus where scheduled.

- C. Minimum integrated short circuit rating: 10,000 amperes rms symmetrical for 240 volt panelboards; 14,000 amperes rms symmetrical for 480 volt panelboards, or as indicated.
- D. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers.
- E. Current Limiting Molded Case Circuit Breakers: NEMA AB 1. Provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.
- F. Enclosure: NEMA PB 1, Type 1 or as indicated on project drawings.
- G. Cabinet box: 6 inches (153 mm) deep; width: 20 inches (508 mm) for 240 volt and less panelboards, 20 inches (508 mm) for 480 volt panelboards.
- H. Cabinet Front: Surface cabinet front with concealed trim clamps, concealed hinge, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

2.4 LOAD CENTERS

- A. Load Centers: Circuit breaker load center, with bus ratings as indicated.
- B. Minimum integrated short circuit rating: 10,000 amperes rms symmetrical.
- C. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where indicated. Do not use tandem circuit breakers.
- D. Enclosure: General Purpose or as indicated on project drawings.
- E. Box: Surface type with door, and lock on door. Finish in manufacturer's standard gray enamel.

2.5 FUSES

- A. Manufacturers:
 1. Bussman "Low-Peak"
 2. Substitutions: Under provisions of Section 01600.
- B. Fuses 600 Amperes and Less: Dual element, current limiting, UL Class as indicated. Type RK-1.
- C. Fuses 601 Amperes and Larger: Current limiting, time delay one time fuse, 600 volt, UL Class L
- D. Interrupting Rating: 200,000 rms amperes.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install panelboards in accordance with NEMA PB 1.1.
- B. Install panelboards plumb. Provide supports in accordance with Section 16190.
- C. Height: 6 ft (2 M) to top of panelboard; install panelboards taller than 6 ft (2 M) with bottom no more than 4 inches (10 cm) above floor.
- D. Provide filler plates for unused spaces in panelboards.
- E. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- F. Provide engraved plastic nameplates under the provisions of Section 16195.

3.2 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Sections 01400 and 16995.
- B. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.
- C. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

SECTION 16482
MOTOR CONTROL CENTER

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Motor control centers.

1.2 RELATED SECTIONS

- A. Section 03300 - Concrete: Housekeeping pads.
- B. Section 16195 - Electrical Identification: Engraved nameplates.

1.3 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. UL 198C - High-Interrupting Capacity Fuses; Current Limiting Type.
- C. UL 198E - Class R Fuses.
- D. NEMA AB 1 - Molded Case Circuit Breakers.
- E. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.
- F. NEMA ICS 2.3 - Instructions for the Handling, Installation, Operation, and Maintenance of Motor Control Centers.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Include front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, [neutral,] and ground; electrical characteristics including voltage, frame size and trip ratings, withstand ratings, and time/current curves of all equipment and components.
- C. Test Reports: Indicate field test and inspection procedures and test results.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01700.
- B. Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with NEMA ICS 2.3.
- B. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

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

1.8 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600.
- B. Deliver in 60 inch (1.2 m) maximum width shipping splits, individually wrapped for protection, and mounted on shipping skids.
- C. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy carvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle in accordance with NEMA ICS 2.3. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to motor control center components, enclosure, and finish.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Conform to NEMA ICS 2 service conditions during and after installation of motor control centers.

1.11 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

1.12 EXTRA MATERIALS

- A. Furnish under provisions of Section 01700.
- B. Provide two sets of each size and type fuse installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Allen Bradley.
- B. Square D
- C. General Electric
- D. Substitutions: Under provisions of Section 01600.

2.2 MOTOR CONTROL CENTER

- A. Motor Control Centers: NEMA ICS 2, Class I, Type B.
- B. Main Overcurrent Protection: Fusible switch.
- C. Feeder Tap Units: Fusible switches.
- D. Voltage Rating: 480 volts, three phase, three wire, 60 Hertz.
- E. Horizontal Bus: Aluminum with a continuous current rating of 600 amperes. Include copper ground bus entire length of control center.
- F. Vertical Bus: Copper. Aluminum.
- G. Integrated Equipment Short Circuit Rating: 65,000 amperes rms symmetrical at 480 volts.
- H. Configuration: Units front mounting only, accessible from the front only.
- I. Enclosure: NEMA ICS 6, Type 1.
- J. Finish: Manufacturer's standard gray enamel.

2.3 AUTOMATIC CONTROLLERS

- A. Magnetic Motor Controllers: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower.
- B. Reversing Controllers: Include electrical interlock and integral time delay transition between FORWARD and REVERSE rotation.
- C. Two Speed Controllers: Include integral time delay transition between FAST and SLOW speeds.

- D. Coil operating voltage: 120 volts, 60 Hertz.
- E. Overload Relay: NEMA ICS; Ambient compensated.

2.4 PRODUCT OPTIONS AND FEATURES

- A. Auxiliary Contacts: NEMA ICS 2, 2 each normally open field convertible contacts in addition to seal-in contact.
- B. Cover Mounted Pilot Devices: NEMA ICS 2, heavy duty type.
- C. Pilot Device Contacts: NEMA ICS 2, Form Z, rated A150.
- D. Relays: NEMA ICS 2.
- E. Control Power Transformers: 120 volt secondary, 135 VA minimum in each starter. Provide fused primary and secondary, and bond unfused leg of secondary to enclosure.

2.5 DISCONNECTS

- A. Combination Controllers: Combine motor controllers with fusible switch disconnect in common enclosure. Provide means for locking disconnect handle, and means for defeating cover interlock.
- B. Fusible Switch Assemblies: NEMA KS 1, enclosed knife switch with externally operable handle. Fuse clips: Designed to accommodate Class R fuses.

2.6 FUSES

- A. Manufacturers:
 - 1. Bussman or equal.
 - 2. Substituted permitted under provisions of Section 01600.
- B. Description: Dual element, current limiting, fuse, 600 volt, UL 198E, Class RK 5.
- C. Interrupting Rating: 200,000 rms amperes.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify conditions under the provisions of Section 01039.
- B. Verify that surface is suitable for motor control center installation.

3.2 INSTALLATION

- A. Install motor control centers in accordance with manufacturer's instructions.
- B. Tighten accessible bus connections and mechanical fasteners after placing motor control center.

- C. Install fuses in fusible switches.
- D. Select and install heater elements in motor starters to match installed motor characteristics.
- E. Provide engraved plastic nameplates and heater labels under the provisions of Section 16195.
- F. Motor Data: Provide neatly typed label inside each motor starter door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

3.3 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01400 and 16995.
- B. Inspect and test motor control center and each controller to NEMA ICS 2.

SECTION 16483

VARIABLE FREQUENCY CONTROLLERS

PART 1 GENERAL

This section includes three phase variable frequency motor controllers of the pulse width modulated design.

1.1 SECTION INCLUDES

- A. Variable frequency controller.

1.2 RELATED SECTIONS

- A. Section 16195 - Electrical Identification: Engraved nameplates.

1.3 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. NEMA ICS 3.1 - Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- D. IEEE 519-1992 - IEEE recommended practices and requirements for harmonic control in electrical power systems.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Include front and side views of enclosures with overall dimensions and weights shown; conduit entrance locations and requirements; and nameplate legends.
- C. Product Data: Provide catalog sheets, programming and hardware manuals (6 copies) showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.
- D. Test Reports: Indicate field test and inspection procedures and test results.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.
- F. Manufacturer's Field Reports: Submit under provisions of Section 01400.
- G. Manufacturer's Field Reports: Indicate start-up inspection findings.

1.5 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01700.
- B. Operation Data: Include instructions for starting and operating controllers, and describe operating limits that may result in hazardous or unsafe conditions.
- C. Maintenance Data: Include routine preventive maintenance schedule.

1.6 QUALIFICATIONS

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

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600.
- B. Accept controllers on site in original packing. Inspect for damage.
- C. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to components, enclosure, and finish.
- E. Follow manufacturer's instructions for electromagnetic discharge (ESD) to prevent damage to electronics.

1.9 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

1.10 MAINTENANCE SERVICE

- A. Furnish service and maintenance of controller for one year from Date of Substantial Completion.

1.11 EXTRA MATERIALS

- A. Furnish under provisions of Section 01700.

- B. Provide two of each air filter.
- C. Provide three of each fuse size and type.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Allen Bradley Model 1336.
- B. Substitutions: Under provisions of Section 01600.

2.2 DESCRIPTION

- A. Provide enclosed variable frequency controllers suitable for operating the indicated loads. Conform to requirements of NEMA ICS 3.1.

2.3 RATINGS

- A. Rated Input Voltage: 480 volts, three phase, 60 Hertz.
- B. Motor Nameplate Voltage: 460 volts, three phase, 60 Hertz.
- C. Displacement Power Factor: Between 1.0 and 0.95, lagging, over entire range of operating speed and load.
- D. Operating Ambient: 0 degrees C to 40 degrees C.
- E. Minimum Efficiency at Full Load: 90 percent.
- F. Harmonic currents and powerline distribution must meet IEEE-519-1992 levels without the use of filters.

2.4 DESIGN

- A. Employ microprocessor based inverter logic isolated from power circuits.
- B. Employ pulse width modulated inverter system.

2.5 PRODUCT OPTIONS AND FEATURES

- A. Display: Provide integral digital display to indicate output voltage, output frequency, and output current.
- B. Status Indicators: Separate indicators for overcurrent, overvoltage, ground fault, overtemperature, and input power ON.
- C. Volts Per Hertz Adjustment: Plus or minus 10 percent.
- D. Current Capability: 50 - 150 percent of rated output current for one minute.
- E. Acceleration Rate Adjustment: 1 - 600 seconds.

- F. Deceleration Rate Adjustment: 1 - 600 seconds.
- G. Provide HAND-OFF-AUTOMATIC selector switch and manual speed control.
- H. Input Signal: 4 - 20 mA DC.
- I. Safety Interlocks: Provide terminals for remote contact to inhibit starting under both manual and automatic mode.
- J. Control Interlocks: Provide terminals for remote contact to allow starting in automatic mode.

2.6 FABRICATION

- A. Wiring Terminations: Match conductor materials and sizes indicated on Project Drawings.
- B. Enclosure: NEMA Type 12 (1P54) or NEMA Type 4 (1P56).
- C. Finish: Manufacturer's standard.

2.7 SOURCE QUALITY CONTROL

- A. Inspect and production-test each product specified in this section.-

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify conditions under provisions of Section 01039.
- B. Verify that surface is suitable for controller installation.

3.2 INSTALLATION

- A. Install controller where indicated, in accordance with manufacturer's written instructions and NEMA ICS 3.1.
- B. Refer to manufacturer's requirements for wiring and conduit and spacing of conduits.
- C. Tighten accessible connections and mechanical fasteners after placing controller.
- D. Install fuses in fusible switches. Fuse types shall be Bussman JJS.
- E. Provide engraved plastic nameplates under the provisions of Section 16195.
- F. Provide neatly typed label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating and programmed parameters.

3.3 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01400.
- B. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

3.4 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems under provisions of Section 01400.

3.5 ADJUSTING

- A. Adjust work under provisions of Section 01700.
- B. Make final adjustments to installed drive to assure proper operation of fan system. Obtain performance requirements from installer of driven loads.

3.6 CLEANING

- A. Touch up scratched or marred surfaces to match original finish.

3.7 DEMONSTRATION

- A. Provide systems demonstration under provisions of Section 01650.
- B. Demonstrate operation of controllers in automatic and manual modes.

SECTION 16510
INTERIOR LUMINAIRES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Interior luminaires and accessories.
- B. Exit signs.
- C. Ballasts.
- D. Lamps.
- E. Luminaire accessories.

1.2 RELATED SECTIONS

- A. Section 16130 - Boxes.

1.3 REFERENCES

- A. ANSI C78.379 - Electric Lamps - Incandescent and High- Intensity Discharge Reflector Lamps - Classification of Beam Patterns.
- B. ANSI C82.1 - Ballasts for Fluorescent Lamps - Specifications.
- C. ANSI C82.4 - Ballasts for High-Intensity Discharge and Low Pressure Sodium Lamps (Multiple Supply Type).
- D. ANSI/NFPA 70 - National Electrical Code.
- E. ANSI/NFPA 101 - Life Safety Code.
- F. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- C. Product Data: Provide dimensions, ratings, and performance data.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.
- E. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700.
- B. Accurately record actual locations of each luminaire.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01700.
- B. Maintenance Data: Include replacement parts list.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.8 EXTRA MATERIALS

- A. Furnish under provisions of Section 01700.
- B. Provide two of each plastic lens.
- C. Provide one replacement lamp for each lamp installed.
- D. Provide two of each ballast type.

PART 2 PRODUCTS

2.1 LUMINAIRES

- A. Furnish products as specified on Drawings.
- B. Substitutions: Under provisions of Section 01600.
- C. Install ballasts, lamps, and specified accessories at factory.

2.2 EXIT SIGNS

- A. Manufacturers:
 - 1. Dual-Lite.
 - 2. Hubbell.
 - 3. Crouse-Hinds (Class I, Div. 2)
 - 4. Substitutions: Under provisions of Section 01600.
- B. Description: Exit sign fixture suitable for use as emergency lighting unit.

- C. Housing: Sheet steel.
- D. Face: Translucent plastic face with red letters on white background.
- E. Directional Arrows: Universal type for field adjustment.
- F. Mounting: Universal, for field selection.
- G. Battery: 12 volt, lead acid type, with 1.5 hour capacity.
- H. Battery Charger: Dual-rate type, with sufficient capacity to recharge discharged battery to full charge within twelve hours.
- I. Lamps: Manufacturers standard.
- J. Input Voltage: 120 volts.

2.3 BALLASTS

- A. Fluorescent Ballast:
 - 1. Magnatek
 - 2. Advance
 - 3. Universal
 - 4. Substitutions: Under provisions of Section 01600.
 - 5. Description: ANSI C82.1, high power factor type electromagnetic ballast.
 - 6. Provide ballast with high efficiency low harmonics, 10% THD or less, suitable for lamps specified.
 - 7. Voltage: 120 volts.
 - 8. Source Quality Control: Certify ballast design and construction by Certified Ballast Manufacturers, Inc.
- B. High Intensity Discharge (HID) Ballast:
 - 1. Magnatek
 - 2. Advance
 - 3. Universal
 - 4. Substitutions: Under provisions of Section 01600.
 - 5. Description: ANSI C82.4, high pressure sodium lamp ballast.
 - 6. Provide ballast suitable for lamp specified.
 - 7. Voltage: 120 volts.

2.4 LAMPS

- A. Incandescent Lamp Manufacturers:
 - 1. Sylvania
 - 2. General Electric
 - 3. Substitutions: Under provisions of Section 01600.
- B. Fluorescent Lamp Manufacturers: Provide energy savings, coated shatterproof lamps.
 - 1. Shat-R-Shield or equal
 - 2. Substitutions: Under provisions of Section 01600.

- C. High Intensity Discharge (HID) Lamp Manufacturers:
 - 1. Sylvania
 - 2. General Electric
 - 3. Substitutions: Under provisions of Section 01600.
- D. Provide lamp type specified for luminaire.
- E. Reflector Lamp Beam Patterns: ANSI C78.379.

2.5 ACCESSORIES

- A. Photoelectric Control:
 - 1. Fisher Price or equal Model N9900 Series
 - 2. Substitutions: Under provisions of Section 01600.
 - 3. Description: Locking type photoelectric control. Rated 100-300 volts, maximum 1000 watts (1800 VA) ballast.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrate and supporting grids for luminaires.
- B. Examine each luminaire to determine suitability for lamps specified.

3.2 INSTALLATION

- A. Install in accordance with manufacturers instructions.
- B. Install suspended luminaires using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- C. Support luminaires larger than 2 x 4 foot (600 x 1 200 mm) size independent of ceiling framing.
- D. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
- E. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prohibit movement.
- F. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure
- G. Install recessed luminaires to permit removal from below.
- H. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- I. Install clips to secure recessed grid-supported luminaires in place.
- J. Install wall mounted luminaires, emergency lighting units and exit signs at height as indicated on Drawings.

- K. Install accessories furnished with each luminaire.
- L. Connect luminaires, emergency lighting units and exit signs to branch circuit outlets provided under Section 16130.
- M. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- N. Bond products and metal accessories to branch circuit equipment grounding conductor.
- O. Install specified lamps in each luminaire, emergency lighting unit and exit sign.

3.3 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.4 ADJUSTING

- A. Adjust Work under provisions of Section 01700.
- B. Aim and adjust luminaires as directed.
- C. Adjust exit sign directional arrows as indicated.
- D. Relamp luminaires that have failed lamps at Substantial Completion.

3.5 CLEANING

- A. Clean Work under provisions of Section 01700.
- B. Clean electrical parts to remove conductive and deleterious materials.
- C. Remove dirt and debris from enclosure.
- D. Clean photometric control surfaces as recommended by manufacturer.
- E. Clean finishes and touch up damage.

3.6 DEMONSTRATION

- A. Provide systems demonstration under provisions of Section 01650.
- B. Provide minimum of two hours demonstration of luminaire operation.

SECTION 16535
EMERGENCY LIGHTING

PART 1 GENERAL

1.1 Description of Work

Furnish and install battery powered emergency lighting units as specified or shown on the project drawings.

1.2 Related Work

- A. Section 16500 - Lighting

1.3 Submittals

- A. Submit data to owner for approval.

1.4 Standards

- A. NEC
- B. UL
- C. OSHA

PART 2 PRODUCTS

2.1 Battery Operated Units

- A. All equipment shall have the UL label.
- B. Unless otherwise specified, emergency lighting shall be self-contained, 12 volt, battery operated with lead-acid batteries and battery charger for use on 120 volt, 60 cycle service with a nominal operating capacity of 1-1/2 hours per NEC 700-12a.
- C. Units shall be suitable for the environment and hazardous classification.
- D. Equipment shall be packaged units without remotely located lights unless otherwise specified.

PART 3 EXECUTION

Emergency lighting units shall be connected to a 120 volt lighting circuit ahead of any light switch.

The connection shall be wired in conduit suitable for the area classification.

3.1 Battery-Operated Units

Battery operated emergency lighting units as described in NEC Article 700-12f shall be connected ahead of any local lighting switches and to the same branch circuit feeding normal lighting in the area. The exception indicated at the end of NEC Article 700-12f shall not be permitted. Battery units shall be directly connected to the branch circuit.

For a calculated 5 percent voltage drop, and the total load to be concentrated at the end of the circuit, the maximum wiring distance, and the conductor size from 6-volt and 12-volt battery-operated emergency lighting units to remote heads shall be as follows:

6-Volt Direct Current

<u>Lamp Total Watts</u>	<u>No. 12 AWG</u>	<u>No. 10 AWG</u>	<u>No. 8 AWG</u>
25	25 feet	39 feet	62 feet
50	12 feet	20 feet	31 feet
75	8 feet	13 feet	21 feet
100	6 feet	10 feet	16 feet

12 Volt Direct Current

<u>Lamp Total Watts</u>	<u>No. 12 AWG</u>	<u>No. 10 AWG</u>	<u>No. 8 AWG</u>
25	101 feet	161 feet	255 feet
50	50 feet	80 feet	127 feet
75	34 feet	54 feet	85 feet
100	25 feet	40 feet	63 feet

SECTION 16721
FIRE ALARM SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fire alarm control panels.
- B. Manual fire alarm stations.
- C. Automatic smoke and heat detectors.
- D. Fire alarm signaling appliances.
- E. Auxiliary fire alarm equipment.

1.2 RELATED SECTIONS

- A. Section 08360 - Sectional Overhead Doors.
- B. Section 15910 - Ductwork Accessories: Smoke dampers.
- C. Section 16123 - Building Wire and Cable.

1.3 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. NFPA 72 - Installation, Maintenance, and Use of Protective Signaling Systems.
- C. NFPA 72E - Automatic Fire Detectors.
- D. NFPA 72G - Notification Appliances for Protective Signaling Systems.
- E. NFPA 72H - Guide for Test Procedures for Protective Signaling Systems.
- F. NFPA 101 - Life Safety Code.

1.4 SYSTEM DESCRIPTION

- A. Fire Alarm System: NFPA 72, manual and automatic local fire alarm system

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Provide annunciator layout and system wiring diagram showing each device and wiring connection required.
- C. Product Data: Provide electrical characteristics and connection requirements.

- D. **Test Reports:** Indicate satisfactory completion of required tests and inspections.
 - E. **Manufacturer's Installation Instructions:** Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of products.
- 1.6 **PROJECT RECORD DOCUMENTS**
- A. Submit under provisions of Section 01700.
 - B. Record actual locations of initiating devices, signaling appliances, and end-of-line devices.
- 1.7 **OPERATION AND MAINTENANCE DATA**
- A. Submit under provisions of Section 01700.
 - B. **Operation Data:** Operating instructions.
 - C. **Maintenance Data:** Maintenance and repair procedures.
- 1.8 **QUALIFICATIONS**
- A. **Manufacturer:** Company specializing in manufacturing the products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of Project.
 - B. **Installer:** Company specializing in installing the products specified in this section with minimum three years documented experience, and certified as fire alarm installer.
- 1.9 **REGULATORY REQUIREMENTS**
- A. Conform to requirements of NFPA 70 and NFPA 101.
 - B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.
- 1.10 **MAINTENANCE SERVICE**
- A. Furnish service and maintenance of fire alarm system for one year from Date of Substantial Completion.
- 1.11 **EXTRA MATERIALS**
- A. Furnish under provisions of Section 01700.
 - B. Provide ten manual station break-glass rods.
 - C. Provide six keys of each type.
 - D. Provide three of each type of automatic smoke detector without base.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Simplex
- B. Substitutions: Under provisions of Section 01600.

2.2 FIRE ALARM AND SMOKE DETECTION CONTROL PANEL

- A. Control Panel: Modular construction with surface wall-mounted enclosure.
- B. Power supply: Adequate to serve control panel modules and alarm signaling devices. Include battery-operated emergency power supply with capacity for operating system in standby mode for 24 hours followed by alarm mode for 10 minutes.
- C. System Supervision: Component or power supply failure places system in trouble mode.
- D. Initiating Device Circuits: Supervised zone module with alarm and trouble indication; occurrence of single ground or open condition places circuit in trouble mode but does not disable that circuit from initiating an alarm.
- E. Indicating Appliance Circuits: Supervised march time signal module, sufficient for signal devices connected to system; occurrence of single ground or open condition places circuit in trouble mode but does not disable that circuit from signaling an alarm.
- F. Municipal Trip Circuit: Output connections for future use municipal master fire alarm box. Include municipal trip DISCONNECT switch.
- G. Auxiliary Relays: Provide sufficient SPDT auxiliary relay contacts for each detection zone to provide accessory functions specified.
- H. Provide TROUBLE ACKNOWLEDGE, DRILL, and ALARM SILENCE switch.
- I. Trouble Sequence of Operation: System or circuit trouble places system in trouble mode, which causes the following system operations:
 - 1. Visual and audible trouble alarm indicated by zone at fire alarm control panel.
 - 2. Visual and audible trouble alarm indicated at remote annunciator panel.
 - 3. Trouble signal transmitted to municipal connection.
 - 4. Manual acknowledge function at fire alarm control panel silences audible trouble alarm; visual alarm is displayed until initiating failure or circuit trouble is cleared.
- J. Alarm Sequence of Operation: Actuation of initiating device places circuit in alarm mode, which causes the following system operations:
 - 1. Sound and display local fire alarm signaling devices with march time signal.
 - 2. Transmit non-coded signal to municipal connection.

3. Indicate location of alarm zone on fire alarm control panel.
 4. Transmit signal to building mechanical systems to initiate shutdown of fans and damper operation.
- K. Alarm Reset: System remains in alarm mode until manually reset with key-accessible reset function; system resets only if initiating circuits are out of alarm mode.
- L. Lamp Test: Manual lamp test function causes alarm indication at each zone at fire alarm control panel.
- M. Drill Sequence of Operation: Manual drill function causes alarm mode operation as described above.

2.3 INITIATING DEVICES

- A. Manual Station: Surface mounted, non-coded type, single action manual station with break-glass rod. Provide manufacturer's standard backbox.
- B. Spot Heat Detector: Combination rate-of-rise and fixed temperature, rated 135 degrees F (57 degrees C).
- C. Ceiling Mounted Smoke Detector: NFPA 72E, ionization type or photoelectric type with [adjustable sensitivity, plug-in base, auxiliary relay contact, integral thermal element rated 135 degrees F (57 degrees C), and visual indication of detector actuation, suitable for mounting on 4 inch (102 mm) outlet box. Provide two-wire detector with common.
- D. Duct Mounted Smoke Detector: NFPA 72E, photoelectric type with auxiliary SPDT relay contact, key-operated NORMAL-RESET-TEST switch, duct sampling tubes extending width of duct, and visual indication of detector actuation, in duct-mounted housing. Provide two-wire detector with common power supply and signal circuits.

2.4 SIGNALING APPLIANCES

- A. Alarm Lights: NFPA 72G, strobe lamp and flasher with red lettered "FIRE" on white lens.
- B. Alarm Horn: NFPA 72G, surface type fire alarm horn. Sound Rating: 87 dB at 10 feet (3M).

2.5 AUXILIARY DEVICES

- A. None

2.6 FIRE ALARM WIRE AND CABLE

- A. Fire Alarm Power Branch Circuits: Building wire as specified in Section 16123.

- B. Initiating Device and Indicating Appliance Circuits: Power limited fire-protective signaling cable, copper conductor, 300 volts insulation rated 105 degrees C. Power limited fire-protective signaling cable classified for fire and smoke characteristics, copper conductor, 300 volts insulation rated 105 degrees C, suitable for use in air handling ducts, hollow spaces used as ducts, and plenums.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install manual station with operating handle 4 feet 6 inches (1.4 M) above floor. Install audible and visual signal devices 7 feet 6 inches (2.3 M) above floor.
- C. Use 16 AWG minimum size conductors for fire alarm detection and signal circuit conductors. Install wiring in conduit.
- D. Mount end-of-line device in control panel.
- E. Mount outlet box for electric door holder to withstand 80 pounds (36.4 kg) pulling force.
- F. Automatic Detector Installation: Conform to NFPA 72E.

3.2 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01400.
- B. Test in accordance with NFPA 72H and local fire department requirements.

3.3 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems under provisions of Section 01400.
- B. Include services of certified technician to supervise installation, adjustments, final connections, and system testing.

3.4 FIRE ALARM WIRE AND CABLE COLOR CODE

- A. Provide fire alarm circuit conductors with insulation color coded as follows, or using colored tape at each conductor termination and in each junction box.
- B. Power Branch Circuit Conductors: Black, red, white.
- C. Initiating Device Circuit: Black, red.
- D. Detector Power Supply: Violet, brown.
- E. Signal Device Circuit: Blue (positive), white (negative).

3.5 DEMONSTRATION

- A. Provide systems demonstration under provisions of Section 01650.
- B. Demonstrate normal and abnormal modes of operation, and required responses to each.

SECTION 16741

TELEPHONE SERVICE, PATHWAYS, AND WIRING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Telephone service entrance raceway.
- B. Equipment and terminal backboards.
- C. Telephone cabinets.
- D. Premises wiring and outlets.

1.2 RELATED SECTIONS

- A. Section 16111 - Conduit.
- B. Section 16114 - Cable Tray.
- C. Section 16141 - Wiring Devices: Telephone outlet jacks.

1.3 REFERENCES

- A. EIA/TIA-568 - Commercial Building Wiring Standard.
- B. EIA/TIA-569 - Commercial Building Standard for Telecommunication Pathways and Spaces.
- C. NFPA 70 - National Electrical Code.

1.4 SYSTEM DESCRIPTION

- A. Telephone Service Entrance Pathway: Rigid steel conduit from point of telephone utility connection at property line to building service termination.
- B. Backbone Pathway: Conform to EIA/TIA 569 using conduit as indicated.
- C. Horizontal Pathway: Conform to EIA/TIA 569, using raceway and cabinets as indicated.
- D. Premises Wiring: By telephone utility.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700.
- B. Record actual locations and sizes of pathways and outlets.

1.6 QUALITY ASSURANCE

- A. Telephone Utility: CONRAIL telecommunication's coordinator.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install wire and cable in accordance with manufacturer's instructions and in accordance with EIA/TIA 568.**
- B. Finish paint termination backboards with durable white enamel under the provisions of Section 09900 prior to installation of telephone equipment if backboard has not been painted.**
- C. Support raceways, backboards, and cabinets under the provisions of Section 16190.**
- D. Install termination cabinets plumb, and attach securely to building wall at each corner.**
- E. Install polyethylene pulling string in each empty telephone conduit over ten feet in length or containing a bend.**
- F. Mark all backboards and cabinets with the legend "TELEPHONE" under the provisions of Section 16195.**

SECTION 16864

ELECTRIC SPACE HEATING UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Electric unit heaters.
- B. Electric cabinet heaters.
- C. Electric baseboard heaters.
- D. Thermostats and accessories.

1.2 REFERENCES

- A. NEMA DC 3 - Low Voltage Room Thermostats.
- B. NEMA DC 15 - Line Voltage Room Thermostats.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product data: Provide unit size, finish, and performance data.
- C. Submit manufacturer's Installation Instructions.

1.4 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01700 and 01730.
- B. Operation Data: Include instructions for safe operating procedures.
- C. Maintenance Data: Include instructions for replacement parts and troubleshooting diagnostics.
- D. Include recommended cleaning methods, cleaning materials, and waxes for interior parts and exterior finishes.

1.5 FIELD MEASUREMENTS

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

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Chromalox

- B. Wellman
- C. Berko
- D. Substitutions: Under provisions of Section 01600.

2.2 ELECTRIC HORIZONTAL DISCHARGE UNIT HEATERS

- A. Description: Electric unit heater for suspended mounting, with fan forced air distribution over electric resistance heating coils and horizontal discharge.
- B. Input Voltage: 480 volts, 60 Hz, three phase.
- C. Output Rating: As shown on project drawings.
- D. Heating Element: Enclosed copper tube, aluminum finned element of coiled nickel-chrome resistance wire centered in tubes and embedded in refractory material.
- E. Input Fuses: Provide integral fuses for units rated more than 48 amperes full load.
- F. Provide line voltage disconnect switch for each input circuit.
- G. Fabrication: Fabricate cabinet of heavy welded steel.
- H. Provide hinged and latched panel for electrical connection and control compartment.
- I. Provide internal shroud around heating elements to assure uniform air flow and delivery temperature across heater face.
- J. Provide suitable fan blade protection using wire guard.
- K. Cabinet Finish: Vendor standard
- L. Contactor: Provide contactor control for unit.
- M. Thermostat: Provide integral low voltage thermostat to control contactor.
- N. Provide low voltage control transformer.
- O. Operating Stages: As required by size.
- P. Provide terminal blocks for power and control wiring connections.
- Q. Louver: Provide discharge louver with individually adjustable blades.

2.3 ELECTRIC DOWNFLOW DISCHARGE UNIT HEATERS

- A. Description: Electric unit heater for suspended mounting, with fan forced air distribution over electric resistance heating coils and vertical discharge.
- B. Input Voltage: 480 volts, 60 Hz, three phase.

- C. Output Rating: As shown on project drawings.
- D. Heating Element: Enclosed copper tube, aluminum finned element of coiled nickel-chrome resistance wire centered in tubes and embedded in refractory material.
- E. Input Fuses: Provide integral fuses for units rated more than 48 amperes full load.
- F. Provide line voltage disconnect switch for each input circuit.
- G. Fabrication: Fabricate cabinet of heavy welded steel.
- H. Provide hinged and latched panel for electrical connection and control compartment.
- I. Cabinet Finish: Vendor standard
- J. Contactor: Provide contactor control for unit.
- K. Thermostat: Provide integral low voltage thermostat to control contactor.
- L. Provide low voltage control transformer.
- M. Operating Stages: As required by size.
- N. Provide terminal blocks for power and control wiring connections.
- O. Diffuser: Louver type, adjustable from 0 degrees to 45 degrees.

2.4 ACCESSORIES

- A. Room Thermostat: NEMA DC 15; heating only double line break line voltage thermostat with control point reset, thermometer, and fan selector switch.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Verify that required utilities are available, in proper location, and ready for use.
- C. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Locate each unit in position indicated.
- C. Install unit with sufficient clearance from adjacent construction, piping, ductwork, and other obstructions to allow access for service and maintenance.

D. Support unit heaters from structure using construction details shown on Drawings.

3.3 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01400.

B. Verify operation of each electric heating unit by measuring input voltage and current simultaneously for period of ten minutes of continuous operation.

3.4 DEMONSTRATION

A. Provide systems demonstration under provisions of Section 01650.

B. Demonstrate location of circuit breakers and switches serving electric heating branch circuits, and location and setting procedures for thermostats and other heating controls.

SECTION 16902

ELECTRIC CONTROLS AND RELAYS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pushbutton and selector switches.
- B. Control stations.
- C. Relays.
- D. Time delay relays.
- E. Control power transformers.
- F. Control panels.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Section 15970 - Controls: Installation of pressure, temperature, and flow switches in piping, ductwork, and mechanical equipment.

1.3 RELATED SECTIONS

- A. Section 16160 - Cabinets: Cabinets and terminal blocks.

1.4 REFERENCES

- A. NEMA ICS 1 - General Standards for Industrial Control Systems.
- B. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers and Assemblies.
- C. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
- D. NEMA ST 1 - Standard for Specialty Transformers (Except General Purpose Type).

1.5 SUBMITTALS

- A. Submit shop drawings under provisions of Section 01300.
- B. Submit shop drawings to NEMA ICS 1 indicating control panel layouts, wiring connections and diagrams, dimensions, support points.
- C. Submit product data under provisions of Section 01300.
- D. Submit product data for each component specified.
- E. Submit manufacturer's installation instructions under provisions of Section 01300.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit record documents under provisions of Section 01700.
- B. Accurately record actual locations of control equipment. Revise diagrams included in Drawings to reflect actual control device connections.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit operation data under provisions of Section 01700.
- B. Include instructions for adjusting and resetting time delay relays, timers, and counters.
- C. Submit maintenance data under provisions of Section 01700.
- D. Include recommended preventive maintenance procedures and materials.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

PART 2 PRODUCTS

Refer to attached Project Drawings for product lists.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install devices and equipment in accordance with manufacturer's instructions.
- B. Install individual relays and time delay relays in enclosures.
- C. Install cabinets under the provisions of Section 16160.
- D. Make electrical wiring interconnections as shown on Drawings.

SECTION 16995

EQUIPMENT TESTING AND PERSONNEL TRAINING

PART 1 GENERAL

This section includes testing and personnel training that must be performed before substantial completion.

1.1 Related Sections

- A. Section 16170 - Grounding and Bonding

1.2 Project Record Documents

- A. Test Reports - Submit four copies of the following test reports for approval.
 - 1. Ground Continuity Tests
 - 2. Heat Tracing Tests
 - 3. Motor Tests

1.2.1 Testing Included:

- A. Test continuity between each main secondary feeder switchboard ground and its termination point.
- B. Test ground continuity between each unit of electrical apparatus on each main secondary feeder to the ultimate distribution point, excluding branch circuit conductors.
- C. Test earth resistance of grounding grids. The building, substation, and computer grounding system shall not exceed those values specified in Section 16170.
- D. Test continuity of all motors and all feeders using megger.
- E. Electrical continuity tests shall be performed after control and signal cables and conductors have been pulled in place and terminated.

PART 2 PRODUCTS

- A. Provide all instruments required for meggering and ground resistance testing as listed below:

<u>Task</u>	<u>Equipment Type/Manufacturer</u>
Voltage Measurement	Voltmeter/Weston Multimeter/Triplett Multimeter/Simpson Model 460
Voltage Sensing	Wiggy/Ideal Model 61-007 Wiggy/Knopp Model K-60 Non-Contact/Pasar "Tic Tracer"

Resistance Measurement	Multimeter/Simpson Model 260 or 460 Multimeter/Fluke Model 77 Multimeter/Triplett Earth Tester/Biddle No. 2502041 & No. 250220 Ducter/Biddle Bulletin No. 24
Current Measurement	Clamp on/Amprobe Models RS Multimeter/Fluke Model 77 Ammeter/Weston
Motor Rotation	Rotation Tester/Greenlee Model 5774
Circuit Tester	Daniel Woodhead Company No. 1750.

- B. Owner will provide equipment and personnel to test the high-voltage cable and transformers, induction disk relays, and low voltage circuit breakers.

PART 3 EXECUTION

- A. When the installation of all apparatus and wiring is complete, test all electrical conductors to insure continuity freedom from grounds and insulation resistance values in accordance with the requirements of the NEC and local inspection authorities.
- B. Set and adjust all overload devices to suit the load conditions and tests made to determine actual loads.
- C. All motors shall be meggered before placing in operation. All motors and driven equipment shall be tested for correct direction of rotation prior to turning equipment over to Owner.
- D. All motor control centers, bus ducts, feeder cables and branch circuits rated below 600 volts shall be megger tested between phase conductors and between phase conductors and ground, using a 1000 volt megger. Test shall be made upon completion of all connections and splices and insertion of all overcurrent devices. Tests shall indicate freedom from short circuits and grounds.
- E. Make all tests in the presence of the Owner's representative. Owner to be notified five (5) days prior to test.

3.1 Personnel Training and Equipment Testing.

- A. Contractor's personnel shall be trained by Owner Engineering personnel in the proper energization.
- B. Owner's personnel shall test the high-voltage cable, cable terminators and transformers prior to energization.
- C. Owner's personnel shall set and test the low voltage switchgear and circuit breaker static trip devices.
- D. The contractor shall provide personnel to accompany Owner's personnel for the above item.

- E. The contractor is to coordinate the above activities with Owner's resident Construction Engineer.

3.2 Initial Testing

Upon receipt of all motors, motor control centers, and transformers at the construction site, they shall be meggered. Provide one copy of this test report to the Owner's resident engineer.

3.3 Megger Testing (600 Volts and Below)

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

- A. Electrical power conductors and equipment 2,500 volts and below shall be megger tested in accordance with standard industrial practice or as stated in vendor manuals or installation instructions, and as specified herein.
- B. Whether hand or motor-driven generator is used, the megger test shall be applied for a minimum of 1 minute and held until the reading reaches a constant value for 15 seconds.
- C. **NOTE:** As the potential of the megger is high enough to be dangerous, all ungrounded terminals of the equipment being tested shall be guarded from accidental personnel contact. After completion of the test, ungrounded terminals shall be grounded for at least 5 seconds before anyone touches them, and cable shall remain grounded for not less than 30 seconds to allow the adsorbed charge to drain off. Leaving the megger connected to the conductor for the above duration will allow the potential to drain off through the meter connections.
- D. Items shall be megger tested:

1. 600 Volts ac Power Feeders

Megger Test

- Set megger to the 1000 volt range.
- Ground conductors not under test.
- Connect megger between conductor under test and ground.
- Momentarily ground the opposite end of the conductor under test to verify continuity.
- Test conductor insulation resistance.
- Repeat Steps 2 through 5 for each conductor.

Acceptable Value - 100 megs minimum.

2. AC Motors Rated Above 300 Volts

-- Megger Test

- Set megger to the 1000 volt range.
- Disconnect motor from supply conductors.
- Test phase-to-phase continuity.
- Test phase-to-ground (motor frame) insulation resistance.

Acceptable value - 50 megs minimum

3. AC Motors Rated Below 300 Volts

Megger Test

- Set megger to the 500 volt range.
- Disconnect motor from supply conductors.
- Test phase-to-phase continuity.
- Test phase-to-ground (motor frame) insulation resistance.

Acceptable Value - 20 meg minimum

4. AC Starters and Switches - 600 Volts and Under

Megger Test

- Set megger to the 500 volt range.
- Disconnect line and load leads.
- Close switch, Block starter closed.
- Ground phases not under test.
- Test each phase to enclosure.

Acceptable Value - 3 megs minimum.

5. Dry type Transformers

-- Megger Test

- Set megger voltage range as follows:

Normal Voltage	Megger Voltage
----------------	----------------

<u>Voltage</u>	<u>Range</u>
----------------	--------------

0-300	500
-------	-----

300-600	1000
---------	------

- Ground windings not under test.
- Test ungrounded windings.

Acceptable Value - 100 megs minimum (both windings)

6. Motor Control Centers

Megger Test

- Set megger to the 1000 volt range.
- Disconnect feeder cables (open switches and breakers)
- Ground busses not under test.
- Test between ungrounded bus and motor control center enclosure.
- Test each bus.

Acceptable Value - 10 megs minimum.

7. Switchgear - 600 Volts

Megger Test

- Remove LV breakers
- Remove control circuit fuses.
- Disconnect or remove fuses in PT primaries.
- Disconnect bus feeders.
- Clean bus supports.
- Ground busses not under test.
- Set megger to the 2500 volt range.
- Test each bus.

Acceptable Value - 10 megs minimum

8. **Lightning and Surge Arrestors**

Megger Test

- Disconnect ungrounded leads.
- Clean with General Electric 1500 Thinner.
- Set megger to the 2500 volt range.
- Test each arrestor.

Acceptable Value - 1 meg minimum
(Normal readings are 10 megs or higher)

9. **Grounding Electrode System**

Use Ground Megger

- Measurements shall be made by the three-point method in accordance with Du Pont Engineering Standard E13.1P titled, "measuring Ground Resistance".
- Test records shall include the soil conditions at the time measurements are taken. Measurements shall not be taken less than 48 hours after rainfall.
- When space and ground covering will not permit driving test rods, a ground of known low resistance value may be used as a reference ground.

Acceptable Value

- **Lightning Protection**

Hazardous Areas - 5 ohms maximum

Nonhazardous Areas - 5 ohms maximum

- **Substation Fences - 5 ohms maximum**
- **Property and Security Fences - 5 ohm maximum**

10. **Generators Rated 480 Volts**

-- **Megger Test**

- Disconnect load leads.
- Lift "B" phase ground lead if grounded at the generator.
- Set megger to the 1000 volt range.
- Test phase-to-phase continuity.
- Test phase-to-ground (generator frame) insulation resistance.

Acceptable Value - 50 megs minimum

3.4 **High Potential/Power Factor Testing (Over 600 Volts)**

- A. High potential (HI-Pot) and/or power factor (cable) testing of conductors and equipment over 600 volts will be performed by others.

3.5 **Heat Tracing Testing**

Contractor shall visually inspect the installation to insure that the tracer, components and thermostats are properly installed. The following items shall be inspected.

1. Verify that the tracer is mounted on the lower quadrant of the pipe and attached at proper intervals and flat against the surface to be heated.
2. Verify that the proper amount of tracer has been provided at each valve, flange, pipe support, etc. and is free from physical damage.
3. Verify that the electrical connections are installed correctly with the proper insulating barriers between the conductive polymer and the connection box.

B. **Insulation Resistance**

1. Electrically testing the insulation resistance between each bus wire and ground with a 2500 volt DC megger at the following points;
 - a. Upon receipt of heat tracing material.
 - b. Prior to installation of pipe insulation.

- c. Upon completion of installation of pipe insulation.
2. Readings are to be recorded and submitted as a test report.

Acceptance Criteria: 20 megs min.

Note: A drop in insulation below the minimum will indicate damage and potential problems, along the circuit. Contractor shall determine the cause and repair or replace the damaged components.

3.6 Protective Relaying and Circuit Breakers.

Testing of circuit breakers and coordination setting of protective relays shall be performed by others.

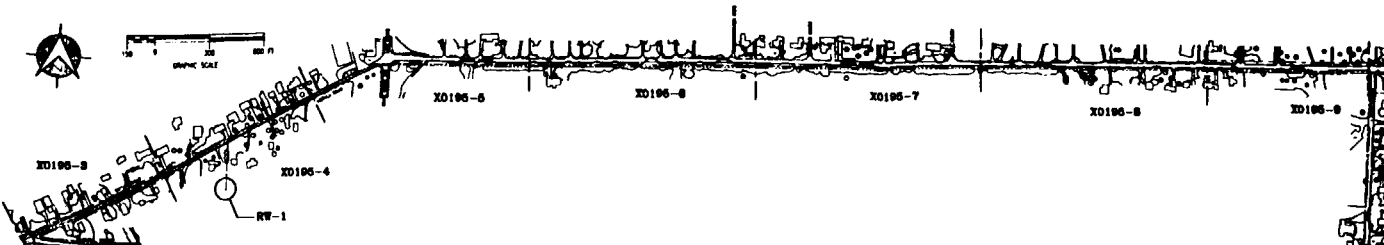
3.7 Other Checks and Tests

- A. Perform the following on all motors prior to start-up:
 1. Check shaft for freedom of rotation.
 2. Obtain proper certification that all driven equipment coupled to motors and all motors have been properly lubricated and in running condition before tests are made.
 3. Conduct and record a motor rotation test using a Greenlee Model 5774 rotation meter (this may require mechanical disengagement) and assure rotation indication label is applied properly; if not, relabel. The meter shall be used for testing on the DC voltage side of the tester. Line voltage tests will not be permitted. Verify that the required rotation of the driven equipment agrees with the motor rotation.
- B. Perform the following on all motors during or immediately after start-up:
 1. Check motor for smooth operation (vibration)
 2. Take a current reading using a clamp-on ammeter. (no-load readings and loaded readings on ac motors only).
- C. Check no-load and full-load voltage at each transformer.
- D. Check resistance between process and utility piping, heating and ventilating ducts and

pneumatic conveying tubes, and building steel in electrical Class 1 or 2, Division 1 or 2 hazardous area. With an approved multimeter, resistance shall not exceed 100 ohms.

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

- E.** Check single-phase, three-wire, 120 volt ac, polarized receptacles for correctness of polarity by testing with Daniel Woodhead Company No. 1750, series circuit tester.

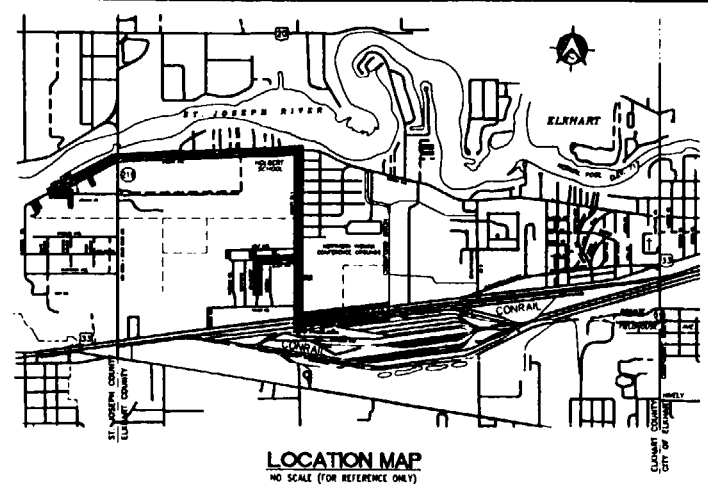


DRAWING INDEX

X-0105-3	LEHMAN STREET FORCEMAIN
X-0105-4	VESTULA ROAD FORCEMAIN
X-0105-5	VESTULA ROAD AND BIRMAN AVENUE FORCEMAIN
X-0105-6	BIRMAN AVENUE FORCEMAIN
X-0105-7	BIRMAN AVENUE FORCEMAIN
X-0105-8	BIRMAN AVENUE FORCEMAIN
X-0105-9	BIRMAN AVENUE FORCEMAIN
X-1005-10	COUNTY ROAD 1 FORCEMAIN
X-0105-11	COUNTY ROAD 1 FORCEMAIN
X-0105-12	COUNTY ROAD 1 FORCEMAIN
X-1005-13	COUNTY ROAD 1 FORCEMAIN
X-0105-14	COUNTY ROAD 1 FORCEMAIN
X-0105-15	CONRAIL YARD FORCEMAIN & DISCHARGE FORCEMAIN
X-0105-16	CONRAIL YARD FORCEMAIN & DISCHARGE FORCEMAIN
X-0105-17	CONRAIL YARD FORCEMAIN & DISCHARGE FORCEMAIN
X-0105-18	BLAKE AVENUE FORCEMAIN
X-0105-19	BELFLOWER FORCEMAIN
X-0105-20	STARRHART FORCEMAIN DETAILS
X-0105-21	FUTURE DEVELOPMENT & WELL RESTRICTION GUIDANCE MAP
Z-000	PSI LEGEND
X-001	PROCESS FLOW DIAGRAM
T-0100	PUMPS AND METROLOGIZATION DRAWING
B-0101	TREATMENT BUILDING/BUILDING FLOOR PLAN
B-0101-A	TREATMENT BUILDING/BUILDING SECTION/ELEVATIONS
B-0101-B	TREATMENT BUILDING/BUILDING ELEVATIONS
B-0101-C	TREATMENT BUILDING/BUILDING ROOF PLAN
C-0101	TREATMENT BUILDING/FOUNDATION PLAN & DETAIL
C-0102	TREATMENT BUILDING/BUILDING SITE PLAN
C-0103	TREATMENT BUILDING/SECTION AND DETAILS
C-0104	RECOVERY WELL VAULT/SECTION AND DETAILS
P-0101	TREATMENT BUILDING/EQUIPMENT AND PUMPS PLAN
A-0102	TREATMENT BUILDING/PUMPS SECTION AND DETAILS
A-0102-3	RECOVERY WELL 3 - SITE PLAN AND DETAILS
A-0102-4	RECOVERY WELL 4 - SITE PLAN AND DETAILS
A-0102-5	RECOVERY WELL 5 - SITE PLAN AND DETAILS
A-0102-6	RECOVERY WELL 6 - SITE PLAN AND DETAILS
A-0102-7	RECOVERY WELL 7 - SITE PLAN AND DETAILS
A-0102-8	RECOVERY WELL 8 - SITE PLAN AND DETAILS
A-0102-9	RECOVERY WELL 9 - SITE PLAN AND DETAILS
A-0102-10	RECOVERY WELL 10 - SITE PLAN AND DETAILS
A-0102-11	RECOVERY WELL 11 - SITE PLAN AND DETAILS
A-0102-12	RECOVERY WELL 12 - SITE PLAN AND DETAILS
A-0102-13	RECOVERY WELL 13 - SITE PLAN AND DETAILS
A-0102-14	RECOVERY WELL 14 - SITE PLAN AND DETAILS
A-0102-15	RECOVERY WELL 15 - SITE PLAN AND DETAILS
C-000	ELECTRICAL LEGEND
C-001	RECOVERY WELLS 1 THROUGH 5 - SINGLE LINE DIAGRAM
L-002	TREATMENT BUILDING - SINGLE LINE DIAGRAM
L-003	TREATMENT BUILDING - POWER & GROUNDING PLAN
L-004	TREATMENT BUILDING - LIGHTING PLAN
E-010	RECOVERY WELL 1 - SCHEMATIC SHEET 1
E-011	RECOVERY WELL 1 - SCHEMATIC SHEET 2
E-012	RECOVERY WELL 2 - SCHEMATIC SHEET 1
E-013	RECOVERY WELL 2 - SCHEMATIC SHEET 2
E-014	RECOVERY WELL 3 - SCHEMATIC SHEET 1
E-015	RECOVERY WELL 3 - SCHEMATIC SHEET 2
E-016	RECOVERY WELL 4 - SCHEMATIC SHEET 1
E-017	RECOVERY WELL 4 - SCHEMATIC SHEET 2
E-018	RECOVERY WELL 5 - SCHEMATIC SHEET 1
E-019	RECOVERY WELL 5 - SCHEMATIC SHEET 2
E-020	TREATMENT BUILDING - SCHEMATIC SHEET 1
E-021	TREATMENT BUILDING - SCHEMATIC SHEET 2
E-022	TREATMENT BUILDING - SCHEMATIC SHEET 3
E-023	TREATMENT BUILDING - SCHEMATIC SHEET 4
E-024	TREATMENT BUILDING - SCHEMATIC SHEET 5
E-025	TREATMENT BUILDING - SCHEMATIC SHEET 6
E-026	TREATMENT BUILDING - SCHEMATIC SHEET 7
E-027	TREATMENT BUILDING - SCHEMATIC SHEET 8
E-028	TREATMENT BUILDING - SCHEMATIC SHEET 9
E-029	TREATMENT BUILDING - SCHEMATIC SHEET 10
E-030	TREATMENT BUILDING - SCHEMATIC SHEET 11
E-031	TREATMENT BUILDING - SCHEMATIC SHEET 12
E-032	TREATMENT BUILDING - SCHEMATIC SHEET 13
E-033	TREATMENT BUILDING - SCHEMATIC SHEET 14
E-034	TREATMENT BUILDING - SCHEMATIC SHEET 15
E-035	TREATMENT BUILDING - SCHEMATIC SHEET 16
E-036	TREATMENT BUILDING - SCHEMATIC SHEET 17
E-037	TREATMENT BUILDING - SCHEMATIC SHEET 18
E-038	TREATMENT BUILDING - SCHEMATIC SHEET 19
E-039	TREATMENT BUILDING - SCHEMATIC SHEET 20
E-040	TREATMENT BUILDING - SCHEMATIC SHEET 21
E-041	TREATMENT BUILDING - SCHEMATIC SHEET 22
E-042	TREATMENT BUILDING - SCHEMATIC SHEET 23
E-043	TREATMENT BUILDING - SCHEMATIC SHEET 24
E-044	TREATMENT BUILDING - SCHEMATIC SHEET 25
E-045	TREATMENT BUILDING - SCHEMATIC SHEET 26
E-046	TREATMENT BUILDING - SCHEMATIC SHEET 27
E-047	TREATMENT BUILDING - SCHEMATIC SHEET 28
E-048	TREATMENT BUILDING - SCHEMATIC SHEET 29
E-049	TREATMENT BUILDING - SCHEMATIC SHEET 30
E-050	TREATMENT BUILDING - SCHEMATIC SHEET 31
E-051	TREATMENT BUILDING - SCHEMATIC SHEET 32
E-052	TREATMENT BUILDING - SCHEMATIC SHEET 33
E-053	TREATMENT BUILDING - SCHEMATIC SHEET 34
E-054	TREATMENT BUILDING - SCHEMATIC SHEET 35
E-055	TREATMENT BUILDING - SCHEMATIC SHEET 36
E-056	TREATMENT BUILDING - SCHEMATIC SHEET 37
E-057	TREATMENT BUILDING - SCHEMATIC SHEET 38
E-058	TREATMENT BUILDING - SCHEMATIC SHEET 39
E-059	TREATMENT BUILDING - SCHEMATIC SHEET 40
E-060	TREATMENT BUILDING - SCHEMATIC SHEET 41
E-061	TREATMENT BUILDING - SCHEMATIC SHEET 42
E-062	TREATMENT BUILDING - SCHEMATIC SHEET 43
E-063	TREATMENT BUILDING - SCHEMATIC SHEET 44
E-064	TREATMENT BUILDING - SCHEMATIC SHEET 45
E-065	TREATMENT BUILDING - SCHEMATIC SHEET 46
E-066	TREATMENT BUILDING - SCHEMATIC SHEET 47
E-067	TREATMENT BUILDING - SCHEMATIC SHEET 48
E-068	TREATMENT BUILDING - SCHEMATIC SHEET 49
E-069	TREATMENT BUILDING - SCHEMATIC SHEET 50
E-070	TREATMENT BUILDING - SCHEMATIC SHEET 51
E-071	TREATMENT BUILDING - SCHEMATIC SHEET 52
E-072	TREATMENT BUILDING - SCHEMATIC SHEET 53
E-073	TREATMENT BUILDING - SCHEMATIC SHEET 54
E-074	TREATMENT BUILDING - SCHEMATIC SHEET 55
E-075	TREATMENT BUILDING - SCHEMATIC SHEET 56
E-076	TREATMENT BUILDING - SCHEMATIC SHEET 57
E-077	TREATMENT BUILDING - SCHEMATIC SHEET 58
E-078	TREATMENT BUILDING - SCHEMATIC SHEET 59
E-079	TREATMENT BUILDING - SCHEMATIC SHEET 60
E-080	TREATMENT BUILDING - SCHEMATIC SHEET 61
E-081	TREATMENT BUILDING - SCHEMATIC SHEET 62
E-082	TREATMENT BUILDING - SCHEMATIC SHEET 63
E-083	TREATMENT BUILDING - SCHEMATIC SHEET 64
E-084	TREATMENT BUILDING - SCHEMATIC SHEET 65
E-085	TREATMENT BUILDING - SCHEMATIC SHEET 66
E-086	TREATMENT BUILDING - SCHEMATIC SHEET 67
E-087	TREATMENT BUILDING - SCHEMATIC SHEET 68
E-088	TREATMENT BUILDING - SCHEMATIC SHEET 69
E-089	TREATMENT BUILDING - SCHEMATIC SHEET 70
E-090	TREATMENT BUILDING - SCHEMATIC SHEET 71
E-091	TREATMENT BUILDING - SCHEMATIC SHEET 72
E-092	TREATMENT BUILDING - SCHEMATIC SHEET 73
E-093	TREATMENT BUILDING - SCHEMATIC SHEET 74
E-094	TREATMENT BUILDING - SCHEMATIC SHEET 75
E-095	TREATMENT BUILDING - SCHEMATIC SHEET 76
E-096	TREATMENT BUILDING - SCHEMATIC SHEET 77
E-097	TREATMENT BUILDING - SCHEMATIC SHEET 78
E-098	TREATMENT BUILDING - SCHEMATIC SHEET 79
E-099	TREATMENT BUILDING - SCHEMATIC SHEET 80
E-100	TREATMENT BUILDING - SCHEMATIC SHEET 81
E-101	TREATMENT BUILDING - SCHEMATIC SHEET 82

GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAIL ELKHART RAIL YARD

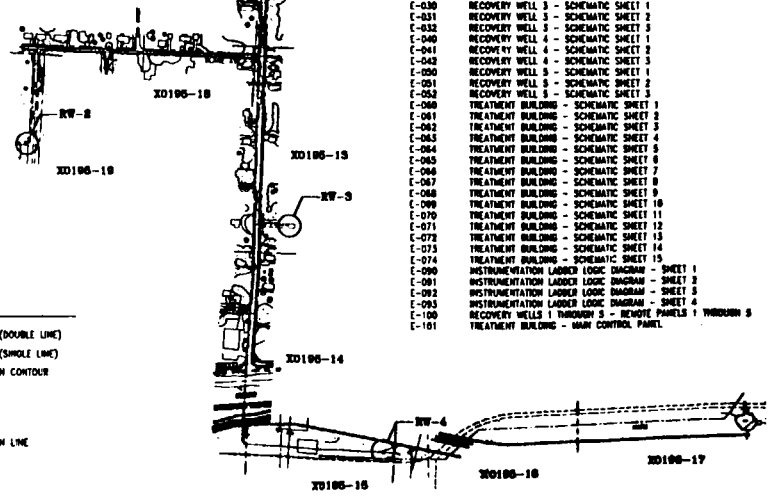
- ### UTILITIES
- ELECTRIC**
BIRMAN AND BIRMAN ELECTRIC CO.
210 S. SECOND STREET
ELKHART, INDIANA 46516
1-293-0661
- GAS**
NIPSCO
100 N. MAIN STREET
ELKHART, INDIANA 46516
1-294-3691
- TELEPHONE**
GENERAL TELEPHONE CO.
129 S. SECOND STREET
ELKHART, INDIANA 46516
1-293-3571
- SEWER**
CITY OF ELKHART
229 S. SECOND STREET
ELKHART, INDIANA 46516
1-294-5471
- CABLE TELEVISION**
ISH-HERRING CABLEVISION, INC.
813 W. EDISON ROAD
MISHAWAKA, INDIANA 46545
1-874-2793
- UTILITY LOCATE**
"NOIY MULEY"
1-800-382-5544



LOCATION MAP
NO SCALE (FOR REFERENCE ONLY)

MAP LEGEND (EXISTING) (FOR USE WITH X-0105-2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21)

- | | | | | |
|--|---|--|---|---|
| <ul style="list-style-type: none"> — CURB/VERT — TREE BASE → FLOW ARROW ○ SIGN ★ TRAFFIC LIGHT ● C.B. ● MANHOLE ● MILET — GUT ◇ LIGHT POLE ▽ TRAFFIC SIGN ▽ ADVERTISEMENT SIGN □ SQUARE CATCH BASIN | <ul style="list-style-type: none"> ▽ FIRE HYDRANT — FENCE — GUARD RAIL ○ POLE ◇ BORING ◇ R.R. GATE ○ VERTICAL CONTROL ○ FLAG POLE △ SWAMP △ HORIZONTAL CONTROL △ ANTENNA △ POST △ SPOT ELEVATION | <ul style="list-style-type: none"> △ PHONE BOOTH ○ BUSH ○ PEDESTAL ○ GRAVEL PIT ○ BASKETBALL GOAL ○ PARKING METER ○ MAILBOX ○ DEPRESSION TICK ○ WATER LEVEL ○ WATER LABEL △ HORIZONTAL & VERTICAL CONTROL | <ul style="list-style-type: none"> □ TELEPHONE VAULT □ ELECTRIC VAULT ○ WATER VALVE BOX ○ GAS VALVE BOX ○ WATER MANHOLE — TREE LINE ○ TREE | <ul style="list-style-type: none"> — RAILROAD (DOUBLE LINE) — RAILROAD (SINGLE LINE) — DEPRESSION CONTOUR — FENCE LINE — GUARDRAIL — WATERLINE — CULTIVATION LINE — GAS LINE — TELE LINE |
|--|---|--|---|---|



REFERENCE DRAWINGS	NO.	DATE	REVISIONS	BY	APP.	NO.	DATE	REVISIONS	BY	APP.	NO.	DATE	REVISIONS	BY	APP.	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE	

CLIENT: CONSOLIDATED RAIL CORPORATION
ADDRESS: 201 MARKET STREET
PHILADELPHIA, PA.

PROJECT:
GROUNDWATER EXTRACTION & TREATMENT SYSTEM
FOR
CONRAIL ELKHART RAIL YARD

GROUNDWATER TECHNOLOGY, INC.
4800 W. 130TH STREET
MARIETTA, GA 30067

PROJECT NO. 04000-0100

DATE: 04/04/00

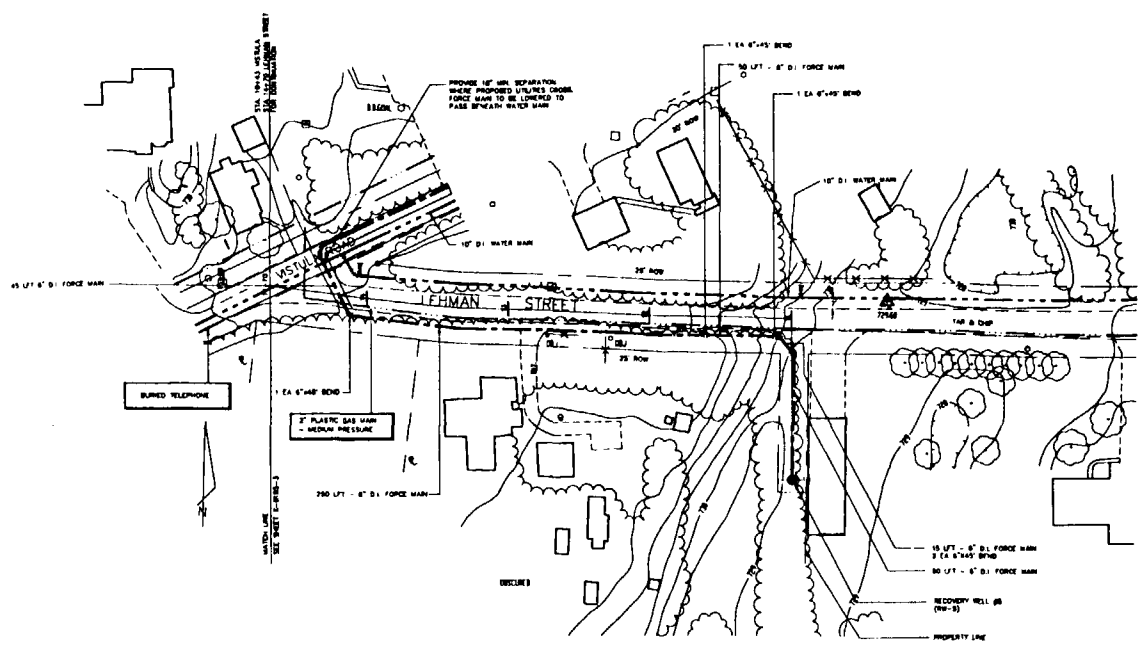
SCALE: AS NOTED

PROJECT NO. 04000-0100

DRAWING NO. 0001

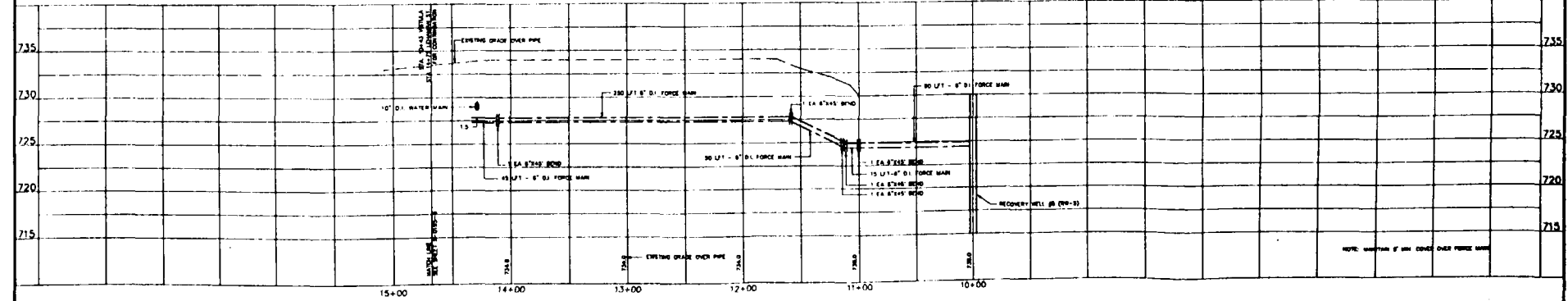
REVISION 0

ITEM	UNIT	QUANTITY
1" FORCE MAIN	LF	250
2" FORCE MAIN	LF	25
3" FORCE MAIN	LF	10
4" FORCE MAIN	LF	5
6" FORCE MAIN	LF	2
8" FORCE MAIN	LF	1
12" FORCE MAIN	LF	1
18" FORCE MAIN	LF	1
24" FORCE MAIN	LF	1
30" FORCE MAIN	LF	1
36" FORCE MAIN	LF	1
42" FORCE MAIN	LF	1
48" FORCE MAIN	LF	1
54" FORCE MAIN	LF	1
60" FORCE MAIN	LF	1
66" FORCE MAIN	LF	1
72" FORCE MAIN	LF	1
78" FORCE MAIN	LF	1
84" FORCE MAIN	LF	1
90" FORCE MAIN	LF	1
96" FORCE MAIN	LF	1
102" FORCE MAIN	LF	1
108" FORCE MAIN	LF	1
114" FORCE MAIN	LF	1
120" FORCE MAIN	LF	1
126" FORCE MAIN	LF	1
132" FORCE MAIN	LF	1
138" FORCE MAIN	LF	1
144" FORCE MAIN	LF	1
150" FORCE MAIN	LF	1
156" FORCE MAIN	LF	1
162" FORCE MAIN	LF	1
168" FORCE MAIN	LF	1
174" FORCE MAIN	LF	1
180" FORCE MAIN	LF	1
186" FORCE MAIN	LF	1
192" FORCE MAIN	LF	1
198" FORCE MAIN	LF	1
204" FORCE MAIN	LF	1
210" FORCE MAIN	LF	1
216" FORCE MAIN	LF	1
222" FORCE MAIN	LF	1
228" FORCE MAIN	LF	1
234" FORCE MAIN	LF	1
240" FORCE MAIN	LF	1
246" FORCE MAIN	LF	1
252" FORCE MAIN	LF	1
258" FORCE MAIN	LF	1
264" FORCE MAIN	LF	1
270" FORCE MAIN	LF	1
276" FORCE MAIN	LF	1
282" FORCE MAIN	LF	1
288" FORCE MAIN	LF	1
294" FORCE MAIN	LF	1
300" FORCE MAIN	LF	1
306" FORCE MAIN	LF	1
312" FORCE MAIN	LF	1
318" FORCE MAIN	LF	1
324" FORCE MAIN	LF	1
330" FORCE MAIN	LF	1
336" FORCE MAIN	LF	1
342" FORCE MAIN	LF	1
348" FORCE MAIN	LF	1
354" FORCE MAIN	LF	1
360" FORCE MAIN	LF	1
366" FORCE MAIN	LF	1
372" FORCE MAIN	LF	1
378" FORCE MAIN	LF	1
384" FORCE MAIN	LF	1
390" FORCE MAIN	LF	1
396" FORCE MAIN	LF	1
402" FORCE MAIN	LF	1
408" FORCE MAIN	LF	1
414" FORCE MAIN	LF	1
420" FORCE MAIN	LF	1
426" FORCE MAIN	LF	1
432" FORCE MAIN	LF	1
438" FORCE MAIN	LF	1
444" FORCE MAIN	LF	1
450" FORCE MAIN	LF	1
456" FORCE MAIN	LF	1
462" FORCE MAIN	LF	1
468" FORCE MAIN	LF	1
474" FORCE MAIN	LF	1
480" FORCE MAIN	LF	1
486" FORCE MAIN	LF	1
492" FORCE MAIN	LF	1
498" FORCE MAIN	LF	1
504" FORCE MAIN	LF	1
510" FORCE MAIN	LF	1
516" FORCE MAIN	LF	1
522" FORCE MAIN	LF	1
528" FORCE MAIN	LF	1
534" FORCE MAIN	LF	1
540" FORCE MAIN	LF	1
546" FORCE MAIN	LF	1
552" FORCE MAIN	LF	1
558" FORCE MAIN	LF	1
564" FORCE MAIN	LF	1
570" FORCE MAIN	LF	1
576" FORCE MAIN	LF	1
582" FORCE MAIN	LF	1
588" FORCE MAIN	LF	1
594" FORCE MAIN	LF	1
600" FORCE MAIN	LF	1
606" FORCE MAIN	LF	1
612" FORCE MAIN	LF	1
618" FORCE MAIN	LF	1
624" FORCE MAIN	LF	1
630" FORCE MAIN	LF	1
636" FORCE MAIN	LF	1
642" FORCE MAIN	LF	1
648" FORCE MAIN	LF	1
654" FORCE MAIN	LF	1
660" FORCE MAIN	LF	1
666" FORCE MAIN	LF	1
672" FORCE MAIN	LF	1
678" FORCE MAIN	LF	1
684" FORCE MAIN	LF	1
690" FORCE MAIN	LF	1
696" FORCE MAIN	LF	1
702" FORCE MAIN	LF	1
708" FORCE MAIN	LF	1
714" FORCE MAIN	LF	1
720" FORCE MAIN	LF	1
726" FORCE MAIN	LF	1
732" FORCE MAIN	LF	1
738" FORCE MAIN	LF	1
744" FORCE MAIN	LF	1
750" FORCE MAIN	LF	1
756" FORCE MAIN	LF	1
762" FORCE MAIN	LF	1
768" FORCE MAIN	LF	1
774" FORCE MAIN	LF	1
780" FORCE MAIN	LF	1
786" FORCE MAIN	LF	1
792" FORCE MAIN	LF	1
798" FORCE MAIN	LF	1
804" FORCE MAIN	LF	1
810" FORCE MAIN	LF	1
816" FORCE MAIN	LF	1
822" FORCE MAIN	LF	1
828" FORCE MAIN	LF	1
834" FORCE MAIN	LF	1
840" FORCE MAIN	LF	1
846" FORCE MAIN	LF	1
852" FORCE MAIN	LF	1
858" FORCE MAIN	LF	1
864" FORCE MAIN	LF	1
870" FORCE MAIN	LF	1
876" FORCE MAIN	LF	1
882" FORCE MAIN	LF	1
888" FORCE MAIN	LF	1
894" FORCE MAIN	LF	1
900" FORCE MAIN	LF	1
906" FORCE MAIN	LF	1
912" FORCE MAIN	LF	1
918" FORCE MAIN	LF	1
924" FORCE MAIN	LF	1
930" FORCE MAIN	LF	1
936" FORCE MAIN	LF	1
942" FORCE MAIN	LF	1
948" FORCE MAIN	LF	1
954" FORCE MAIN	LF	1
960" FORCE MAIN	LF	1
966" FORCE MAIN	LF	1
972" FORCE MAIN	LF	1
978" FORCE MAIN	LF	1
984" FORCE MAIN	LF	1
990" FORCE MAIN	LF	1
996" FORCE MAIN	LF	1
1002" FORCE MAIN	LF	1
1008" FORCE MAIN	LF	1
1014" FORCE MAIN	LF	1
1020" FORCE MAIN	LF	1
1026" FORCE MAIN	LF	1
1032" FORCE MAIN	LF	1
1038" FORCE MAIN	LF	1
1044" FORCE MAIN	LF	1
1050" FORCE MAIN	LF	1
1056" FORCE MAIN	LF	1
1062" FORCE MAIN	LF	1
1068" FORCE MAIN	LF	1
1074" FORCE MAIN	LF	1
1080" FORCE MAIN	LF	1
1086" FORCE MAIN	LF	1
1092" FORCE MAIN	LF	1
1098" FORCE MAIN	LF	1
1104" FORCE MAIN	LF	1
1110" FORCE MAIN	LF	1
1116" FORCE MAIN	LF	1
1122" FORCE MAIN	LF	1
1128" FORCE MAIN	LF	1
1134" FORCE MAIN	LF	1
1140" FORCE MAIN	LF	1
1146" FORCE MAIN	LF	1
1152" FORCE MAIN	LF	1
1158" FORCE MAIN	LF	1
1164" FORCE MAIN	LF	1
1170" FORCE MAIN	LF	1
1176" FORCE MAIN	LF	1
1182" FORCE MAIN	LF	1
1188" FORCE MAIN	LF	1
1194" FORCE MAIN	LF	1
1200" FORCE MAIN	LF	1
1206" FORCE MAIN	LF	1
1212" FORCE MAIN	LF	1
1218" FORCE MAIN	LF	1
1224" FORCE MAIN	LF	1
1230" FORCE MAIN	LF	1
1236" FORCE MAIN	LF	1
1242" FORCE MAIN	LF	1
1248" FORCE MAIN	LF	1
1254" FORCE MAIN	LF	1
1260" FORCE MAIN	LF	1
1266" FORCE MAIN	LF	1
1272" FORCE MAIN	LF	1
1278" FORCE MAIN	LF	1
1284" FORCE MAIN	LF	1
1290" FORCE MAIN	LF	1
1296" FORCE MAIN	LF	1
1302" FORCE MAIN	LF	1
1308" FORCE MAIN	LF	1
1314" FORCE MAIN	LF	1
1320" FORCE MAIN	LF	1
1326" FORCE MAIN	LF	1
1332" FORCE MAIN	LF	1
1338" FORCE MAIN	LF	1
1344" FORCE MAIN	LF	1
1350" FORCE MAIN	LF	1
1356" FORCE MAIN	LF	1
1362" FORCE MAIN	LF	1
1368" FORCE MAIN	LF	1
1374" FORCE MAIN	LF	1
1380" FORCE MAIN	LF	1
1386" FORCE MAIN	LF	1
1392" FORCE MAIN	LF	1
1398" FORCE MAIN	LF	1
1404" FORCE MAIN	LF	1
1410" FORCE MAIN	LF	1
1416" FORCE MAIN	LF	1
1422" FORCE MAIN	LF	1
1428" FORCE MAIN	LF	1
1434" FORCE MAIN	LF	1
1440" FORCE MAIN	LF	1



PLAN - LEHMAN STREET - STA 10+43 TO STA 14+75
SCALE 1" = 40'

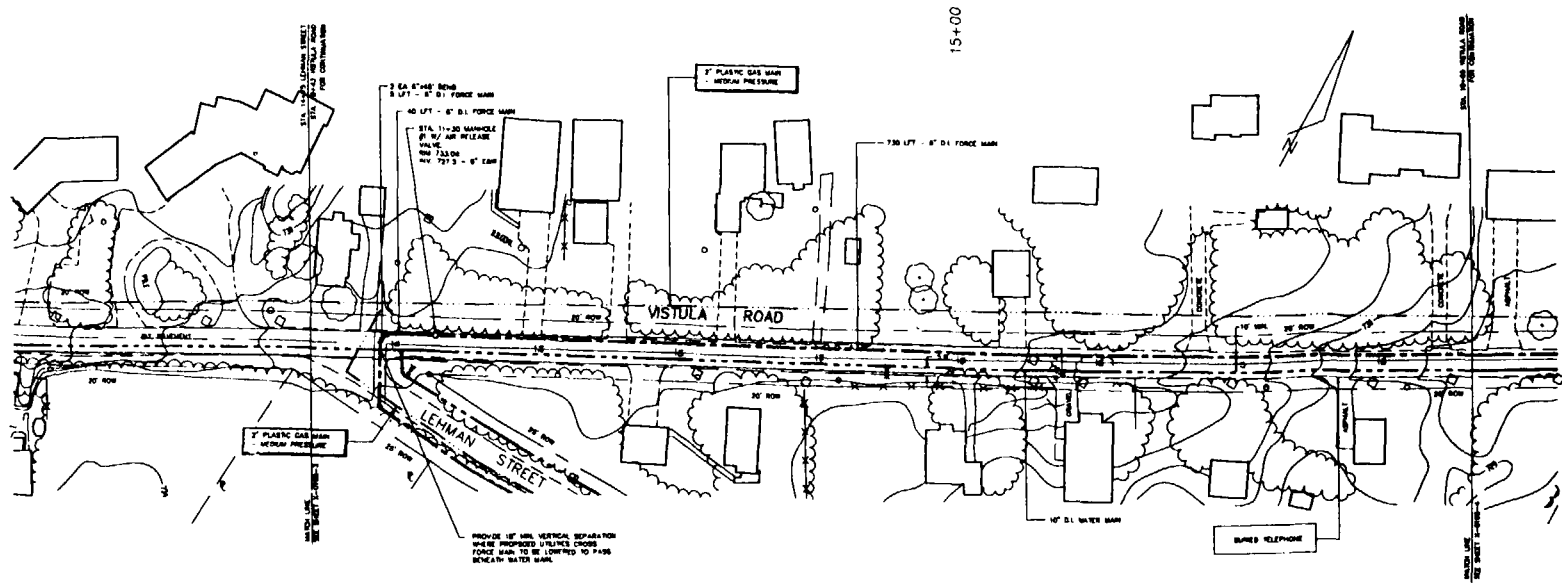
- ROAD & STREET RESTORATION (TYPE A)
- ROAD & STREET RESTORATION (TYPE B)





PROFILE - LEHMAN STREET - STA 10+43 TO STA 14+75
SCALE 1" = 40' H, 1" = 5' V

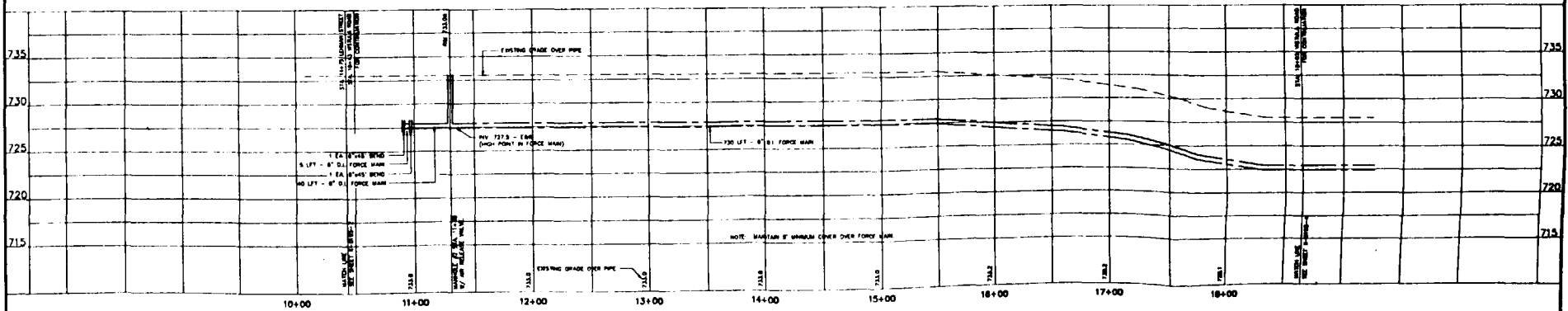
WIGHTMAN PETRIE INC. 2340 CASSOPOLIS STREET ELKHART, INDIANA PHONE (317) 284-4587 FAX (317) 284-1384	NO.	DATE	REVISIONS	BY	APP.	REFERENCE DRAWINGS	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE	CLIENT: CONSOLIDATED RAIL CORPORATION ADDRESS: 2001 MARKET STREET PHILADELPHIA, PA.	GROUNDWATER TECHNOLOGY, INC. 2001 MARKET STREET PHILADELPHIA, PA. 19103-2000	
	0	4/1/78	ISSUED FOR FINAL DESIGN SUBMITTAL	JAT	REL		APPROVAL		DESIGN				TITLE: SITE PLAN/PROFILE LEHMAN STREET STA 10+00 TO STA 14+75
							CONSTRUCTION		ENGINEER	EAR			5/1/78

ITEM	UNIT	QUANTITY
1. FORCE MAIN	LINE	725
2. 18" DI. STREET RESTORATION	SQ. YD.	210



PLAN - VISTULA ROAD STA. 10+43 TO STA. 18+65
SCALE 1" = 40'

-  ROAD & STREET RESTORATION (TYPE A)
-  ROAD & STREET RESTORATION (TYPE B)



PROFILE - VISTULA ROAD STA. 10+43 TO STA. 18+65
SCALE 1" = 40' H, 1" = 5' V

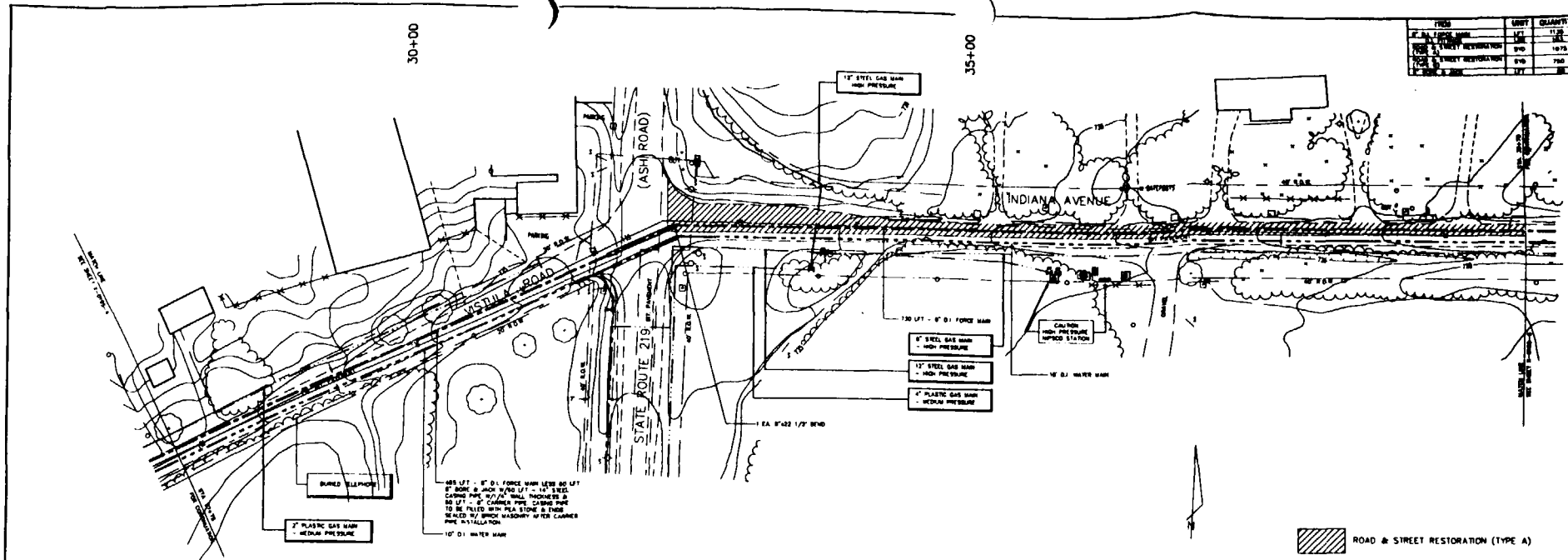
WIGHTMAN PETRIE INC.
2340 CASSOPOLIS STREET ELKHART, INDIANA
PHONE: (219) 264-1367 FAX: (219) 266-1361

NO.	DATE	REVISIONS	BY	APP.	REFERENCE DRAWINGS	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE
3	11/17/84	REVISED FOR FINAL DESIGN SUBMITTAL	JAT	R.E.L.		APPROVAL		DRAWN	
						APPROVAL		CHECKED	
						CONSTRUCTION		ENGINEER	EAR
								APPROVAL	11/17/84
								APPROVAL	

CLIENT: CONSOLIDATED RAIL CORPORATION
ADDRESS: 2001 MARKET STREET
PHILADELPHIA, PA.
PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM
FOR
CONRAIL ELKHART RAIL YARD

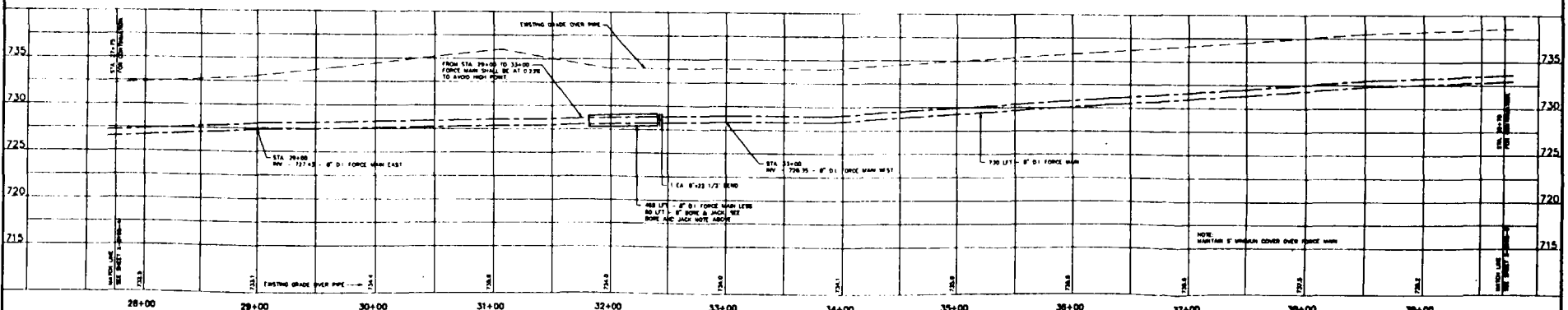
GROUNDWATER TECHNOLOGY, INC.
400 WESTBORO & CENTER STS.
WESTBORO, MA, 01581 (508) 853-2000
PROJECT: SITE PLAN/PROFILE
VISTULA ROAD FORCE MAIN
STA 10+00 TO STA 18+65
SERIES: 84-0000-01-03
DRAWING NO.: 18-000-3

ITEM	UNIT	QUANTITY
2" PL. FORCE MAIN	LF	1725
4" PL. FORCE MAIN	LF	360
6" PL. FORCE MAIN	LF	1875
8" PL. FORCE MAIN	LF	750
10" PL. FORCE MAIN	LF	75



PLAN - VISTULA RD & INDIANA AVENUE - STA. 27+75 TO 39+70

ROAD & STREET RESTORATION (TYPE A)
 ROAD & STREET RESTORATION (TYPE B)



PROFILE - VISTULA RD & INDIANA AVENUE - STA. 27+75 TO STA. 39+70

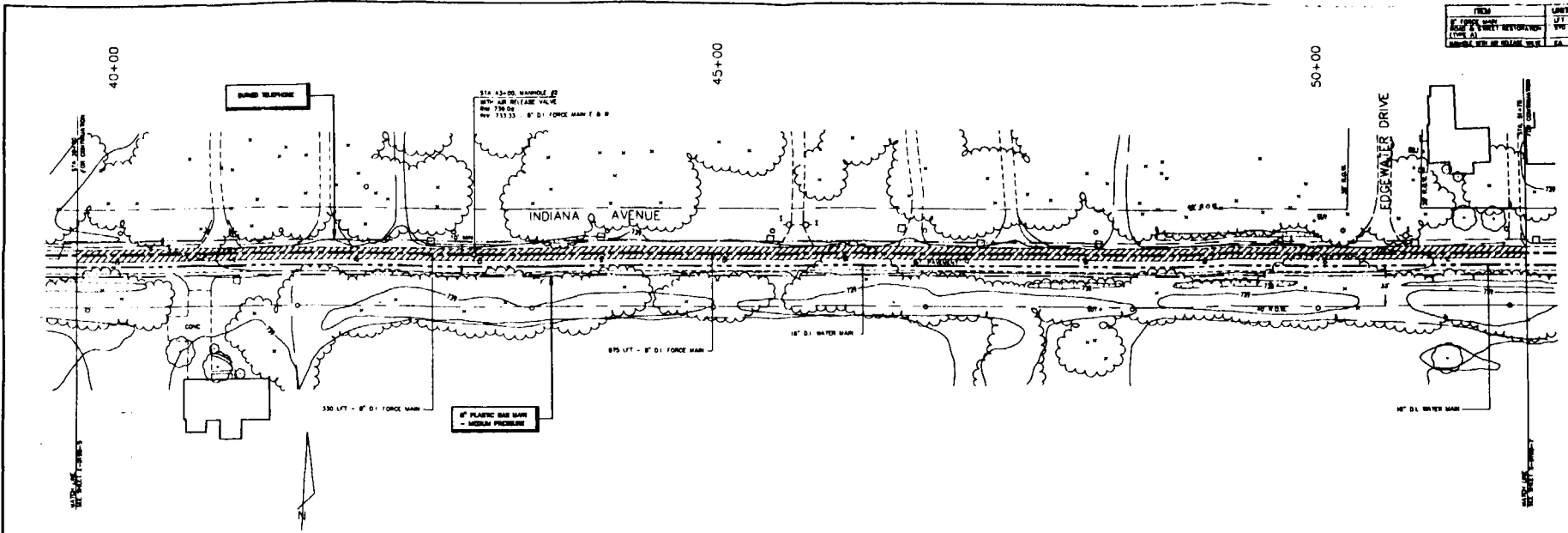
WIGHTMAN PETRIE INC.
 2340 CASSOPOLIS STREET
 ELKHART, INDIANA
 PHONE (317) 264-2567

NO.	DATE	REVISIONS	BY	APP.	REFERENCE DRAWINGS	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE
1	1/17/94	ISSUED FOR FINAL DESIGN SUBMITTAL	JPM	EPK		APPROVAL		DRAWN	
						APPROVAL		CHECKED	
						CONSTRUCTION		ENGINEER	EAH
								APPROVAL	4/17/94
								APPROVAL	
								APPROVAL	

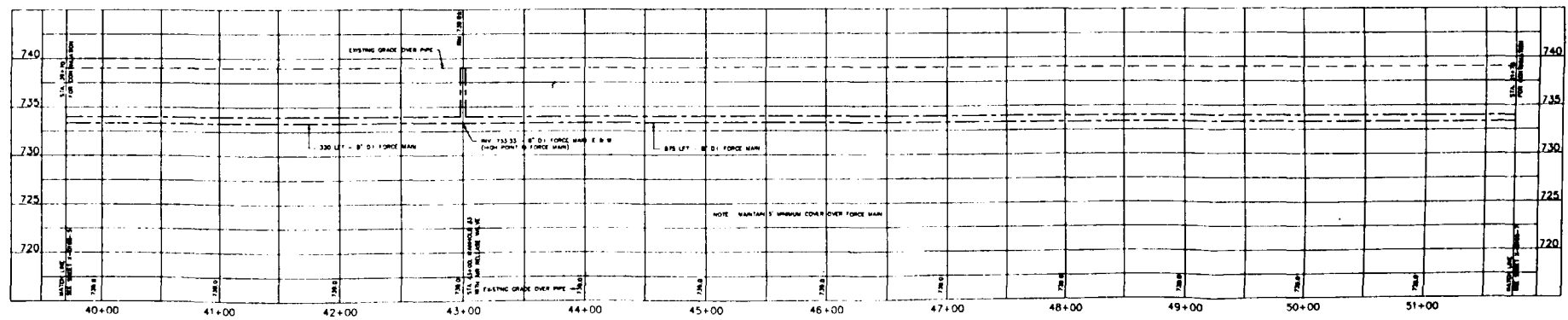
CLIENT: CONSOLIDATED RAIL CORPORATION
 ADDRESS: 2001 MARKET STREET
 PHILADELPHIA, PA.
 PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAIL ELKHART RAIL YARD

GROUNDWATER TECHNOLOGY, INC.
 200 WASHINGTON & BROAD STS.
 CHICAGO, ILL. 60604-0400
 TITLE: SITE PLAN/PROFILE VISTULA RD & INDIANA AVENUE
 SCALE: PROJECT: AS SHOWN
 DRAWING NO.: 04000-0120
 DRAWING SET: 2-0120-6
 REVISION: 0

ITEM	UNIT	QUANTITY
1.000	SQ. FT.	1500
2.000	LINEAL FT.	1000
3.000	EA.	1



PLAN - INDIANA AVENUE - STA 39+70 TO STA 51+75
SCALE 1" = 40'



PROFILE - INDIANA AVENUE - STA 39+70 TO STA 51+75
SCALE 1" = 40' H, 1" = 8' V

WIGHTMAN PETRIE INC.
2340 CASSOPOLIS STREET
PHONE (219) 254-0287
ELKHART, INDIANA
FAX (219) 266-1381

NO.	DATE	REVISIONS	BY	APP.
0	5/7/04	ISSUED FOR FINAL DESIGN SUBMITTAL	JJT	R.E.L.

REFERENCE DRAWINGS	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE
	APPROVAL		DRAWN	
	APPROVAL		CHECKED	
	CONSTRUCTION		ENGINEER	EAW 4/1/04
			APPROVAL	
			APPROVAL	

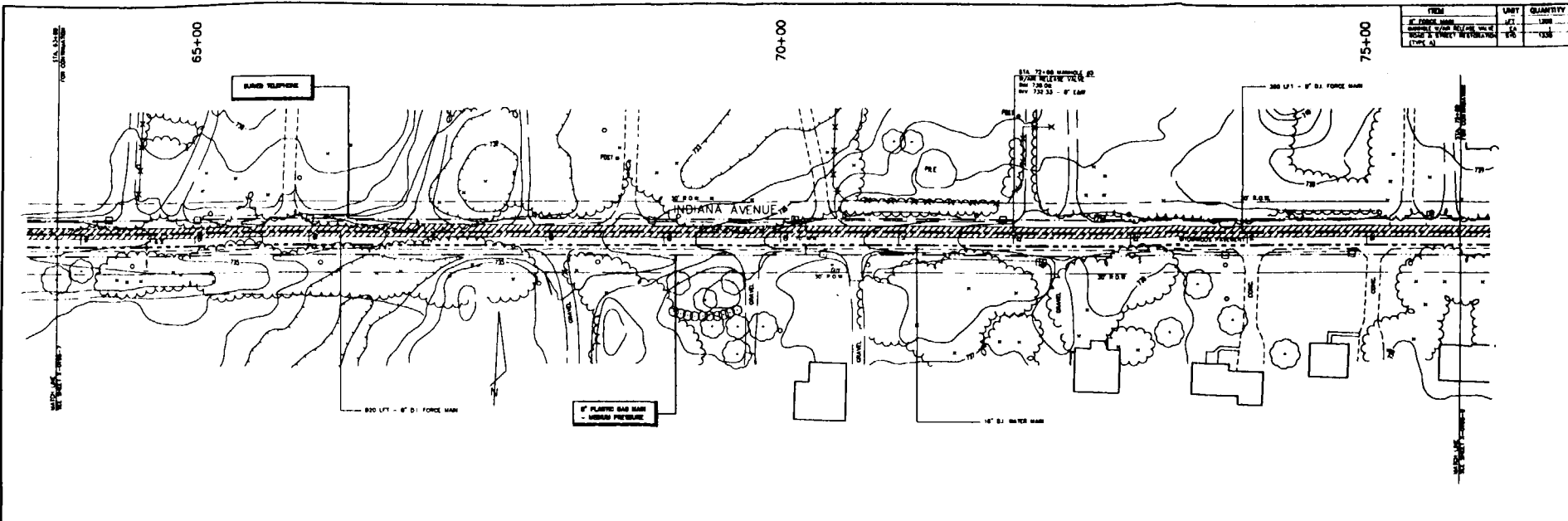
CLIENT	ADDRESS
CONSOLIDATED RAIL CORPORATION	3001 MARKET STREET PHILADELPHIA, PA.

PROJECT:
**GROUNDWATER EXTRACTION & TREATMENT SYSTEM
FOR
CONRAIL ELKHART RAIL YARD**

TITLE:	SCALE:	PROJECT NO.:	DRAWING NO.:	REVISION:
SITE PLAN/PROFILE INDIANA AVENUE FORCEMAIN		04002-0120	E-0108-B	0

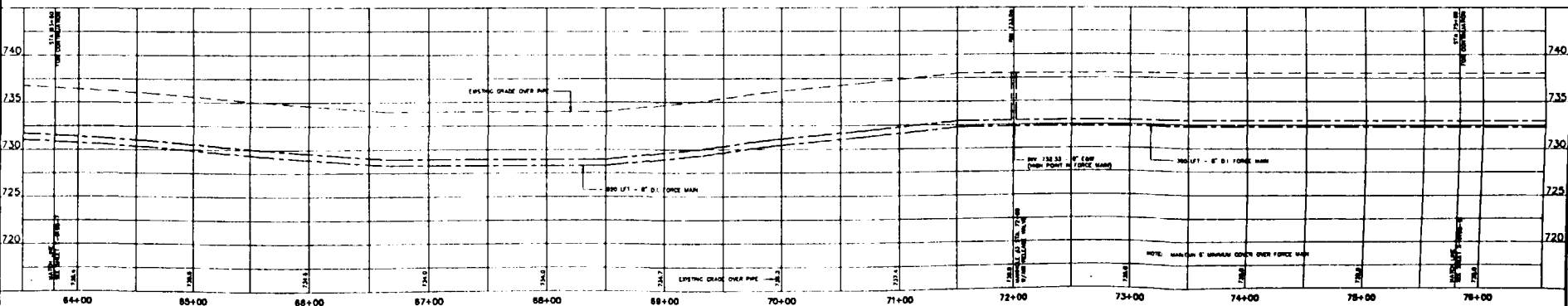


ITEM	UNIT	QUANTITY
1" FORCE MAIN	LINE	1335
4" FORCE MAIN	LINE	1335
36" DI. 15' SPAN	LINE	1335
36" DI. 15' SPAN	LINE	1335



PLAN - INDIANA AVENUE - STA. 63+80 TO STA. 75+80

ROAD & STREET RESTORATION (TYPE A)



PROFILE - INDIANA AVENUE - STA. 63+80 TO STA. 75+80

WIGHTMAN PETRIE INC.
 2340 CASSOPOLIS STREET
 PHONE (314) 264-0387

NO.	DATE	REVISIONS	BY	APP.
0	4/1/78	ISSUED FOR FINAL DESIGN SUBMITTAL	JAT	REL

REFERENCE DRAWINGS

PRINT RECORD	DATE	ENGINEER'S RECORD	DATE
APPROVAL		DRAWN	
APPROVAL		CHECKED	
CONSTRUCTION		ENGINEER	JAR
		APPROVAL	4/1/78
		APPROVAL	
		APPROVAL	

CLIENT: CONSOLIDATED RAIL CORPORATION
 ADDRESS: 2001 MARKET STREET
 PHILADELPHIA, PA.

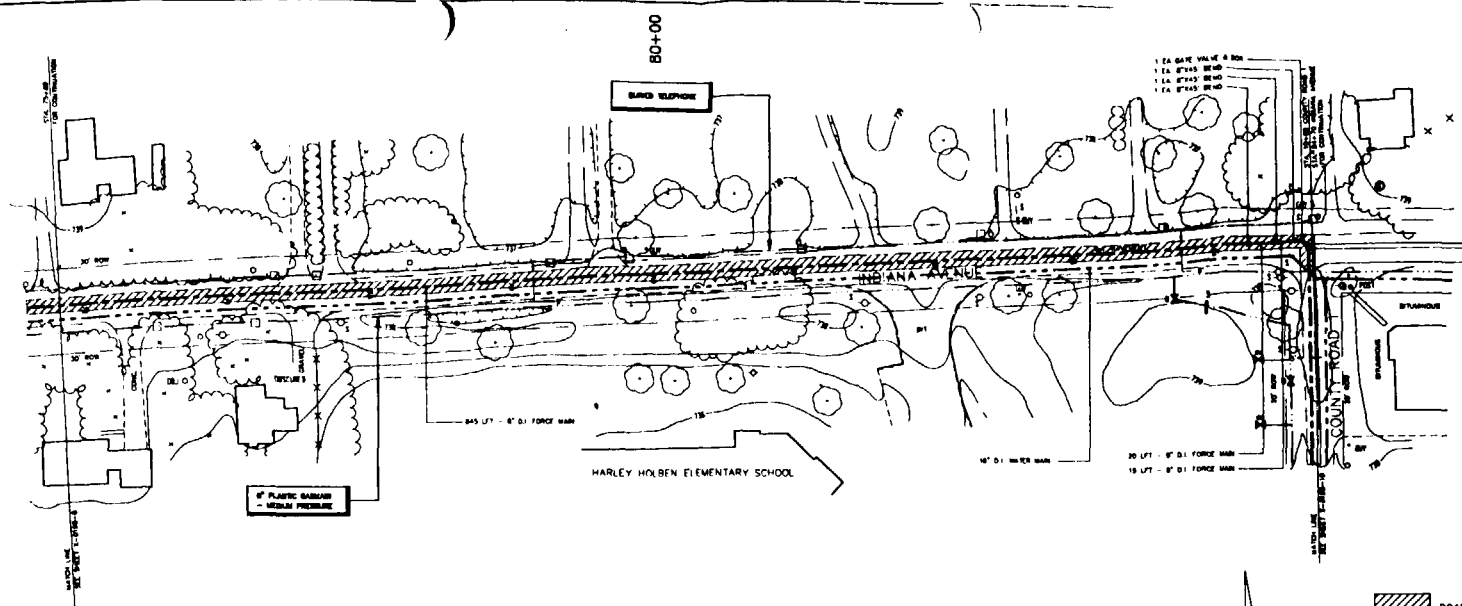
PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONVAL ELKHART RAIL YARD

GROUNDWATER TECHNOLOGY, INC.
 800 WASHINGTON STREET
 PHILADELPHIA, PA. 19107 (215) 261-0100

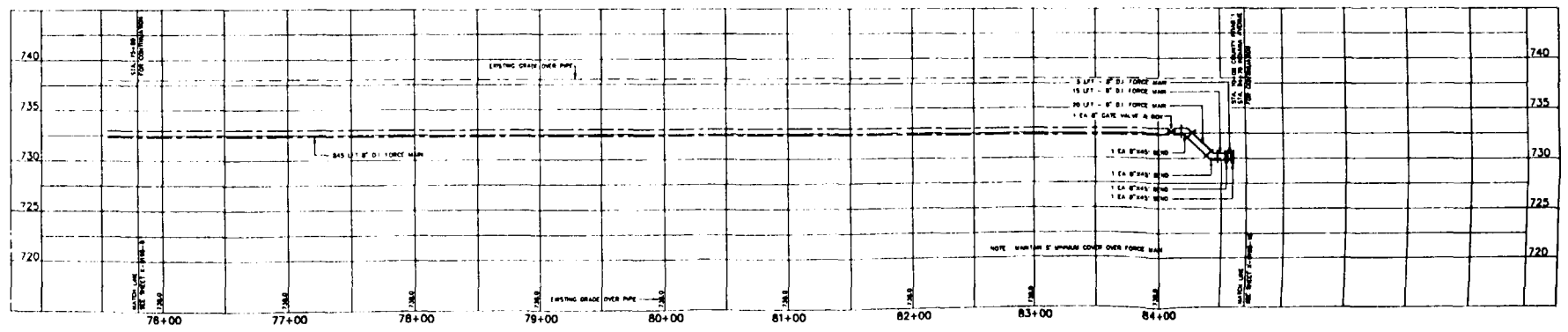
TITLE: SITE PLAN/PROFILE INDIANA AVENUE FORCE MAIN

SCALE: AS SHOWN PROJECT NO: 64000-0120 DRAWING NO: 2-0100-0 REVIEW: 0

ITEM	QTY	UNIT	AMOUNT
1. 12" DIA. FORCE MAIN	121	LF	121
2. 12" DIA. FORCE MAIN	121	LF	121
3. 12" DIA. FORCE MAIN	121	LF	121
4. 12" DIA. FORCE MAIN	121	LF	121
5. 12" DIA. FORCE MAIN	121	LF	121
6. 12" DIA. FORCE MAIN	121	LF	121
7. 12" DIA. FORCE MAIN	121	LF	121
8. 12" DIA. FORCE MAIN	121	LF	121
9. 12" DIA. FORCE MAIN	121	LF	121
10. 12" DIA. FORCE MAIN	121	LF	121
11. 12" DIA. FORCE MAIN	121	LF	121
12. 12" DIA. FORCE MAIN	121	LF	121
13. 12" DIA. FORCE MAIN	121	LF	121
14. 12" DIA. FORCE MAIN	121	LF	121
15. 12" DIA. FORCE MAIN	121	LF	121
16. 12" DIA. FORCE MAIN	121	LF	121
17. 12" DIA. FORCE MAIN	121	LF	121
18. 12" DIA. FORCE MAIN	121	LF	121
19. 12" DIA. FORCE MAIN	121	LF	121
20. 12" DIA. FORCE MAIN	121	LF	121
21. 12" DIA. FORCE MAIN	121	LF	121
22. 12" DIA. FORCE MAIN	121	LF	121
23. 12" DIA. FORCE MAIN	121	LF	121
24. 12" DIA. FORCE MAIN	121	LF	121
25. 12" DIA. FORCE MAIN	121	LF	121
26. 12" DIA. FORCE MAIN	121	LF	121
27. 12" DIA. FORCE MAIN	121	LF	121
28. 12" DIA. FORCE MAIN	121	LF	121
29. 12" DIA. FORCE MAIN	121	LF	121
30. 12" DIA. FORCE MAIN	121	LF	121
31. 12" DIA. FORCE MAIN	121	LF	121
32. 12" DIA. FORCE MAIN	121	LF	121
33. 12" DIA. FORCE MAIN	121	LF	121
34. 12" DIA. FORCE MAIN	121	LF	121
35. 12" DIA. FORCE MAIN	121	LF	121
36. 12" DIA. FORCE MAIN	121	LF	121
37. 12" DIA. FORCE MAIN	121	LF	121
38. 12" DIA. FORCE MAIN	121	LF	121
39. 12" DIA. FORCE MAIN	121	LF	121
40. 12" DIA. FORCE MAIN	121	LF	121
41. 12" DIA. FORCE MAIN	121	LF	121
42. 12" DIA. FORCE MAIN	121	LF	121
43. 12" DIA. FORCE MAIN	121	LF	121
44. 12" DIA. FORCE MAIN	121	LF	121
45. 12" DIA. FORCE MAIN	121	LF	121
46. 12" DIA. FORCE MAIN	121	LF	121
47. 12" DIA. FORCE MAIN	121	LF	121
48. 12" DIA. FORCE MAIN	121	LF	121
49. 12" DIA. FORCE MAIN	121	LF	121
50. 12" DIA. FORCE MAIN	121	LF	121
51. 12" DIA. FORCE MAIN	121	LF	121
52. 12" DIA. FORCE MAIN	121	LF	121
53. 12" DIA. FORCE MAIN	121	LF	121
54. 12" DIA. FORCE MAIN	121	LF	121
55. 12" DIA. FORCE MAIN	121	LF	121
56. 12" DIA. FORCE MAIN	121	LF	121
57. 12" DIA. FORCE MAIN	121	LF	121
58. 12" DIA. FORCE MAIN	121	LF	121
59. 12" DIA. FORCE MAIN	121	LF	121
60. 12" DIA. FORCE MAIN	121	LF	121
61. 12" DIA. FORCE MAIN	121	LF	121
62. 12" DIA. FORCE MAIN	121	LF	121
63. 12" DIA. FORCE MAIN	121	LF	121
64. 12" DIA. FORCE MAIN	121	LF	121
65. 12" DIA. FORCE MAIN	121	LF	121
66. 12" DIA. FORCE MAIN	121	LF	121
67. 12" DIA. FORCE MAIN	121	LF	121
68. 12" DIA. FORCE MAIN	121	LF	121
69. 12" DIA. FORCE MAIN	121	LF	121
70. 12" DIA. FORCE MAIN	121	LF	121
71. 12" DIA. FORCE MAIN	121	LF	121
72. 12" DIA. FORCE MAIN	121	LF	121
73. 12" DIA. FORCE MAIN	121	LF	121
74. 12" DIA. FORCE MAIN	121	LF	121
75. 12" DIA. FORCE MAIN	121	LF	121
76. 12" DIA. FORCE MAIN	121	LF	121
77. 12" DIA. FORCE MAIN	121	LF	121
78. 12" DIA. FORCE MAIN	121	LF	121
79. 12" DIA. FORCE MAIN	121	LF	121
80. 12" DIA. FORCE MAIN	121	LF	121
81. 12" DIA. FORCE MAIN	121	LF	121
82. 12" DIA. FORCE MAIN	121	LF	121
83. 12" DIA. FORCE MAIN	121	LF	121
84. 12" DIA. FORCE MAIN	121	LF	121
85. 12" DIA. FORCE MAIN	121	LF	121
86. 12" DIA. FORCE MAIN	121	LF	121
87. 12" DIA. FORCE MAIN	121	LF	121
88. 12" DIA. FORCE MAIN	121	LF	121
89. 12" DIA. FORCE MAIN	121	LF	121
90. 12" DIA. FORCE MAIN	121	LF	121
91. 12" DIA. FORCE MAIN	121	LF	121
92. 12" DIA. FORCE MAIN	121	LF	121
93. 12" DIA. FORCE MAIN	121	LF	121
94. 12" DIA. FORCE MAIN	121	LF	121
95. 12" DIA. FORCE MAIN	121	LF	121
96. 12" DIA. FORCE MAIN	121	LF	121
97. 12" DIA. FORCE MAIN	121	LF	121
98. 12" DIA. FORCE MAIN	121	LF	121
99. 12" DIA. FORCE MAIN	121	LF	121
100. 12" DIA. FORCE MAIN	121	LF	121



PLAN - INDIANA AVENUE - STA. 75+80 TO STA. 84+70
SCALE 1" = 40'



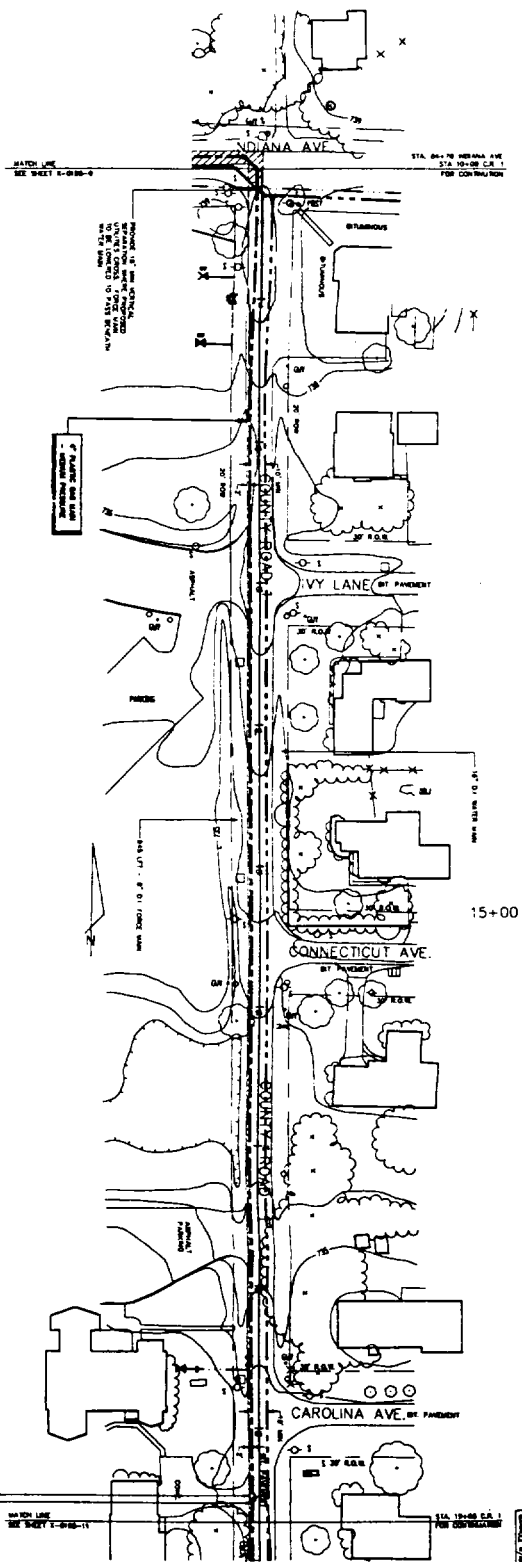
PROFILE - INDIANA AVENUE - STA. 75+80 TO STA. 84+70
SCALE 1" = 40' H. 1" = 5' V.



WIGHTMAN PETRIE INC.
2340 CASSOPOLIS STREET
PHONE (219) 264-4367
ELKHART, INDIANA
FAX (219) 264-1361

NO.	DATE	REVISIONS	BY	APP.	REFERENCE DRAWINGS	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE
1	11/17/98	REVISED FOR FINAL DESIGN SUBMITTAL	JLH	PFL		APPROVAL		DRAWN	
						CONSTRUCTION		CHECKED	
						APPROVAL		ENGINEER	TAB 11/17/98
						APPROVAL		APPROVAL	
						APPROVAL		APPROVAL	

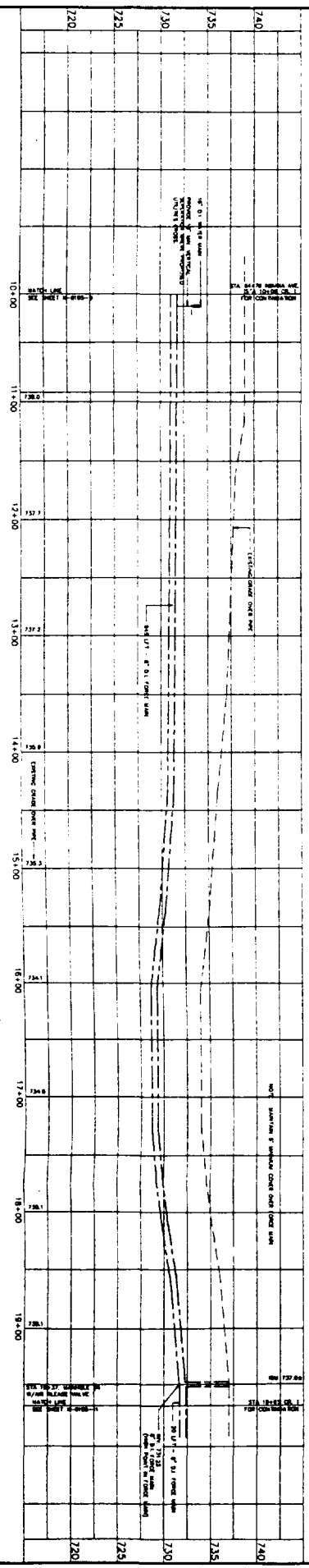
CLIENT: CONSOLIDATED RAIL CORPORATION
ADDRESS: 200 MARKET STREET
PHILADELPHIA, PA.
PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAL ELKHART RAIL YARD

GROUNDWATER TECHNOLOGY, INC.
200 W. WASHINGTON ST. SUITE 100
ELKHART, INDIANA 46516-1000
TYPE: SITE PLAN/PROFILE
INDIANA AVENUE FORCE MAIN
SHEET: 04022-01-20
DATE: 11/17/98
DRAWN BY: TAB
CHECKED BY: PFL
APPROVED BY: PFL



 ROAD & STREET RESTORATION (TYPE A)
 ROAD & STREET RESTORATION (TYPE B)

PLAN - COUNTY ROAD 1 STA. 10+00 TO STA. 19+65



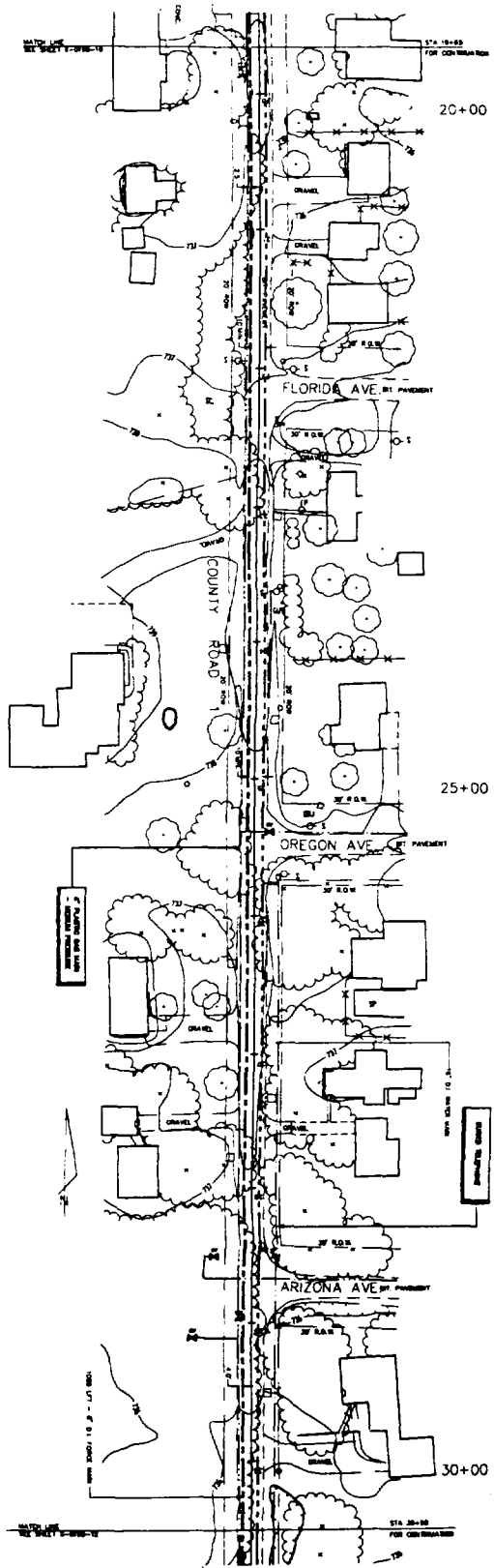
PROFILE - COUNTY ROAD 1 STA. 10+00 TO STA. 19+65

NO.	DATE	REVISIONS	BY	DATE	REVISIONS	DATE	REVISIONS	DATE	REVISIONS	DATE	REVISIONS	DATE	REVISIONS	DATE	REVISIONS
1	10/2/98	ISSUED FOR FINAL REVIEW SUBMITTAL	JLT	11/11/98											

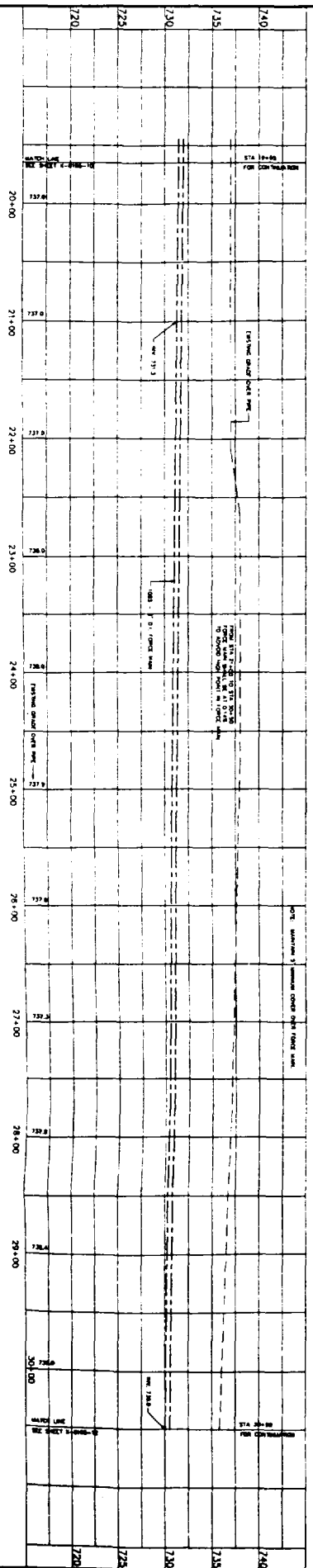
CLIENT: CONSOLIDATED PINE CORPORATION ADDRESS: 2801 WILSON STREET WILSONVILLE, IN 46093	PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONNARD ELKHART PINE YARD	TITLE: SITE PLAN/PROFILE COUNTY ROAD 1 FORCEMAIN	SHEET: PROJECT NO. 00000-0119 DRAWING NO. 10-119-10
---	---	--	---

WIGHTMAN PETRIE, INC.
 ENGINEERS
 3340 CANTON STREET
 ELKHART, IN 46516
 PHONE (765) 241-0000 FAX (765) 241-0000

ITEM	UNIT	QUANTITY
1. TOTAL AREA	SQ. FT.	100,000
2. TOTAL PERIMETER	FEET	1,000
3. TOTAL VOLUME	CU. YD.	10,000
4. TOTAL WEIGHT	TONS	100,000
5. TOTAL LENGTH	FEET	1,000



PLAN - COUNTY ROAD 1 - STA 19+65 TO STA 30+50

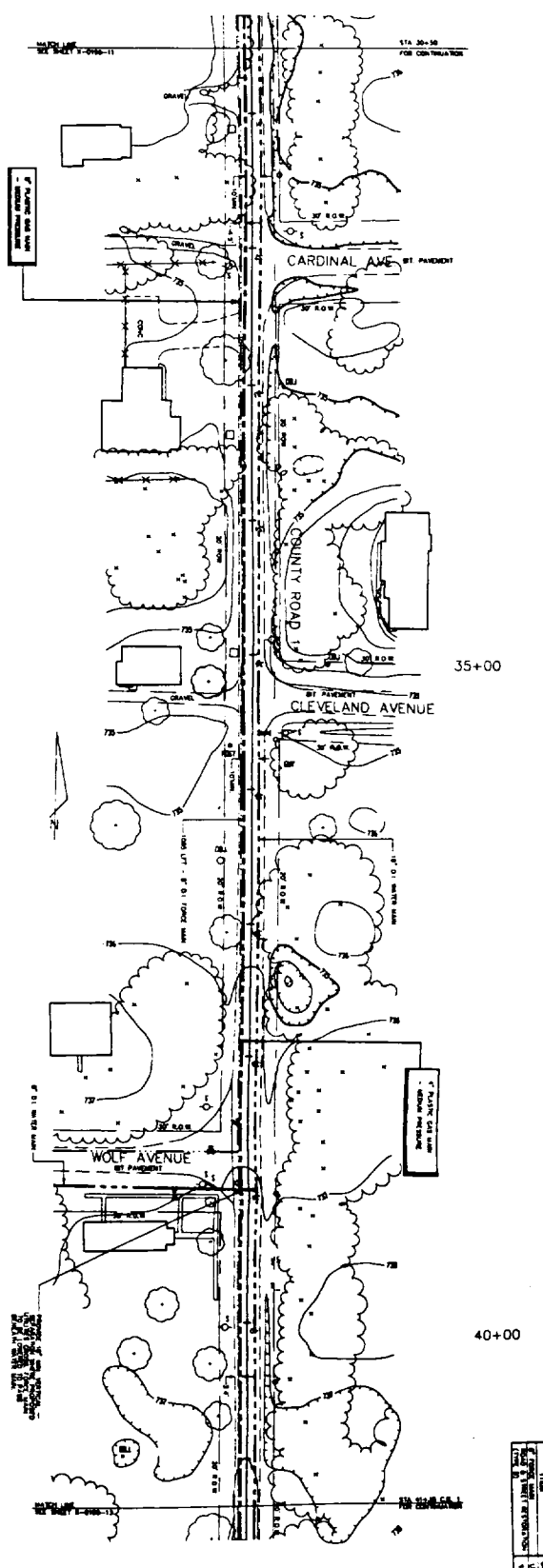


PROFILE - COUNTY ROAD 1 - STA 19+65 TO STA 30+50

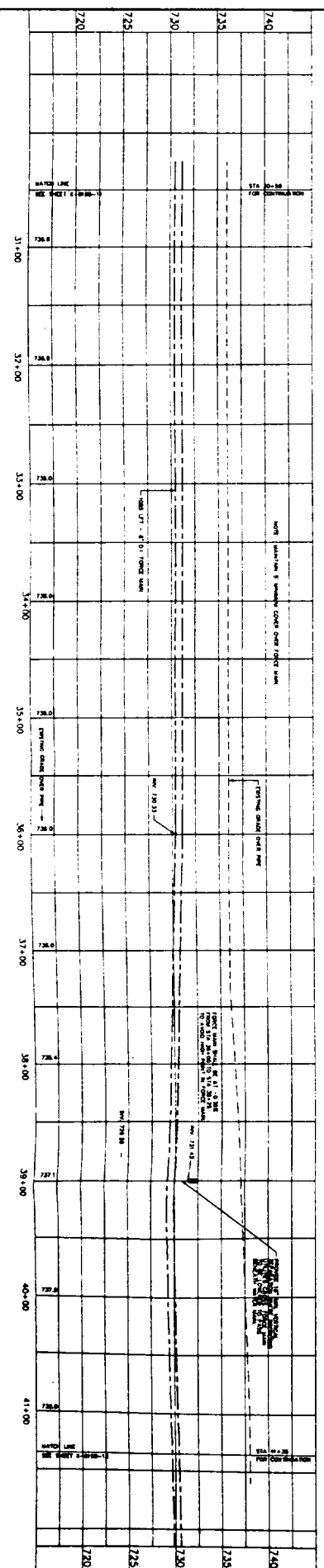
NO	DATE	REVISIONS	BY	DATE	REVISIONS	DATE	REVISIONS	DATE	REVISIONS
1	1/2/74	ISSUED FOR FINAL DESIGN SUBMITTAL	J.P.	1/2/74	APPROVAL	1/2/74	APPROVAL	1/2/74	APPROVAL
2	1/2/74	ISSUED FOR FINAL DESIGN SUBMITTAL	J.P.	1/2/74	APPROVAL	1/2/74	APPROVAL	1/2/74	APPROVAL
3	1/2/74	ISSUED FOR FINAL DESIGN SUBMITTAL	J.P.	1/2/74	APPROVAL	1/2/74	APPROVAL	1/2/74	APPROVAL

WIGHTMAN PETRIE, INC. 2340 CASSIDORIS STREET ELKHART, INDIANA 46517	PROJECT: COUNCILMAN'S DETENTION & TREATMENT STATION FOR COUNCIL ELEVATOR HALL WARD	FIELD: COUNTY ROAD 1 STA 19+65 TO STA 30+50
---	---	---

DATE	BY	QUANTITY
1/2/74	J.P.	1000
1/2/74	J.P.	1000
1/2/74	J.P.	1000



PLAN - COUNTY ROAD 1 - STA 30+50 TO STA 41+35
SCALE 1" = 40'

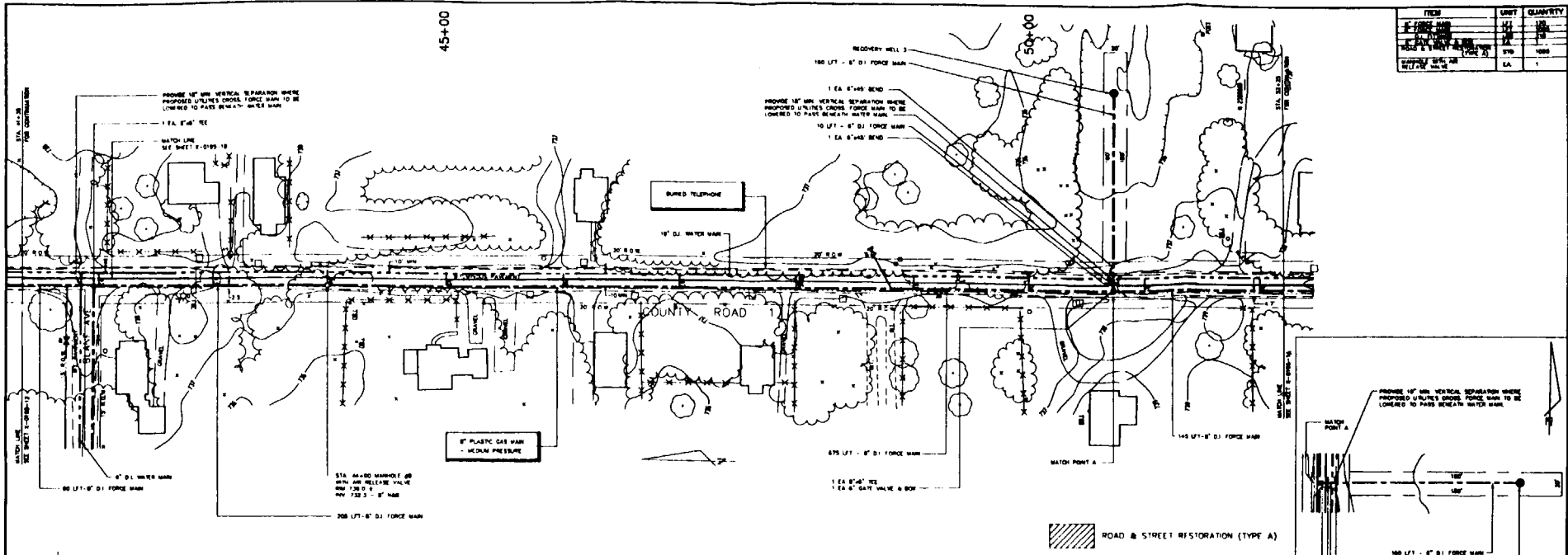


PROFILE - COUNTY ROAD 1 - STA 30+50 TO STA 41+35
SCALE 1" = 40'

NO. DATE		REVISIONS	BY	DATE	REFERENCE DRAWINGS	DATE	APPROVAL	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE
1		REVISED FOR FINAL SUBMITTAL													

CLIENT: CONSOLIDATED NATL. CORPORATION ADDRESS: 200 MARKET STREET CONNOR EXHAUST PAIL YARD	PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM FROM CONNOR EXHAUST PAIL YARD	DATE: 12/11/13	SCALE: 1" = 40'
--	---	--------------------------	---------------------------

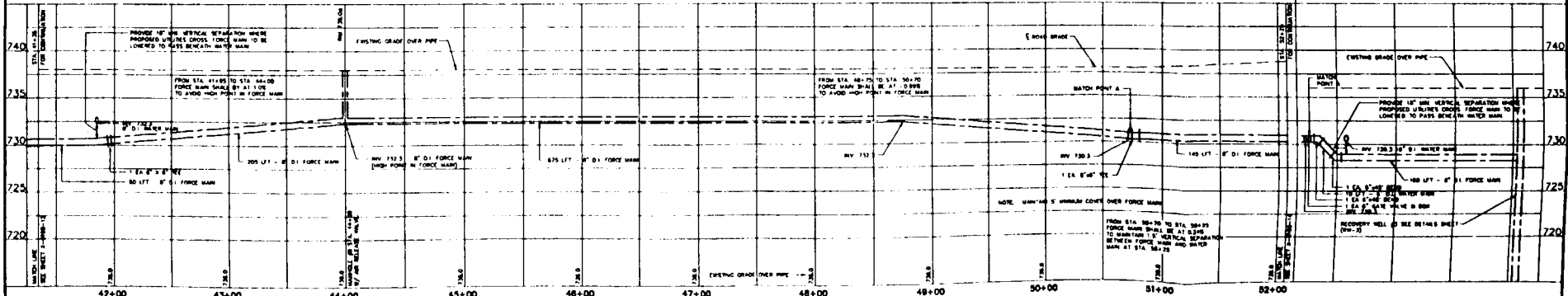
DESIGNER: MCHTMAN PETRE INC. 2340 CASSOPOLIS STREET ELKHART, INDIANA 46517 PHONE (317) 544-5600	CLIENT: CONSOLIDATED NATL. CORPORATION ADDRESS: 200 MARKET STREET CONNOR EXHAUST PAIL YARD
--	--



ITEM	UNIT	QUANTITY
1\"/>		

PLAN - COUNTY ROAD 1 - STA. 41+35 TO STA. 52+25

SCALE 1" = 40'

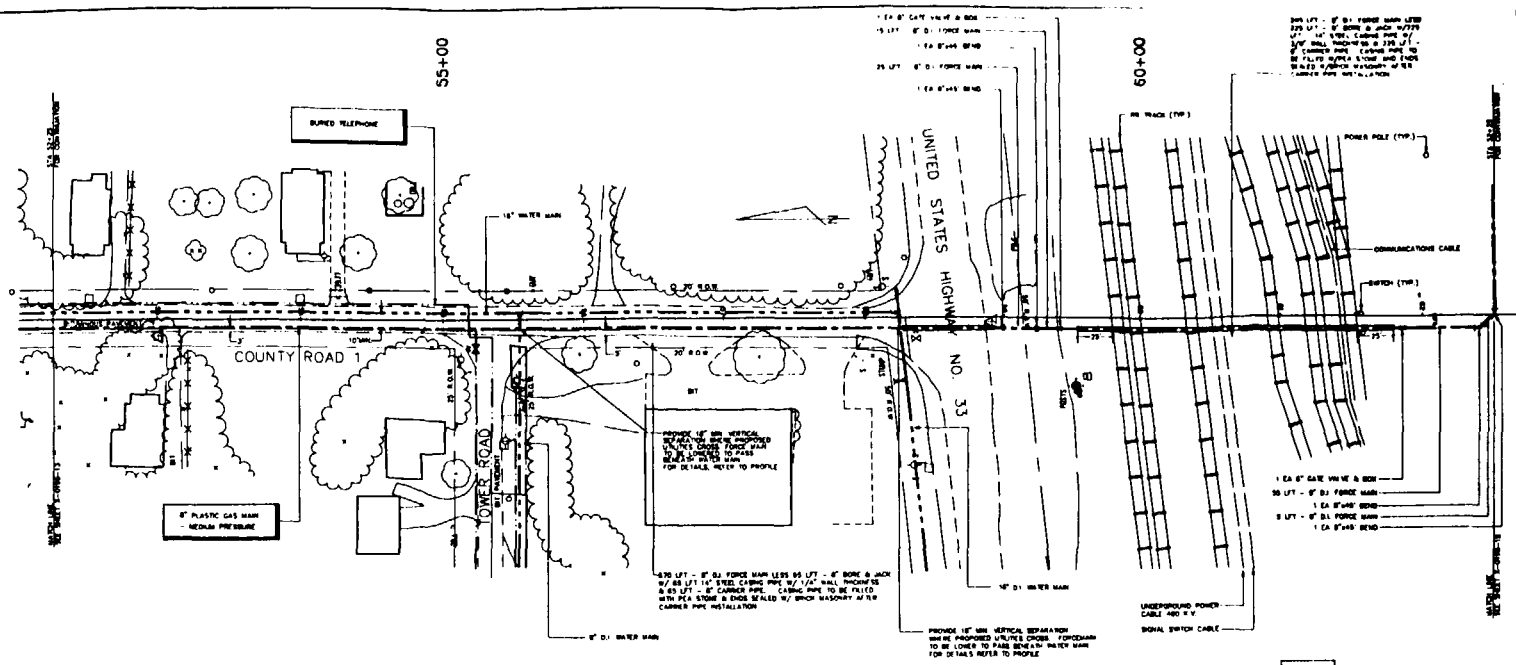


PLAN - COUNTY ROAD 1 - STA. 41+35 TO STA. 52+25

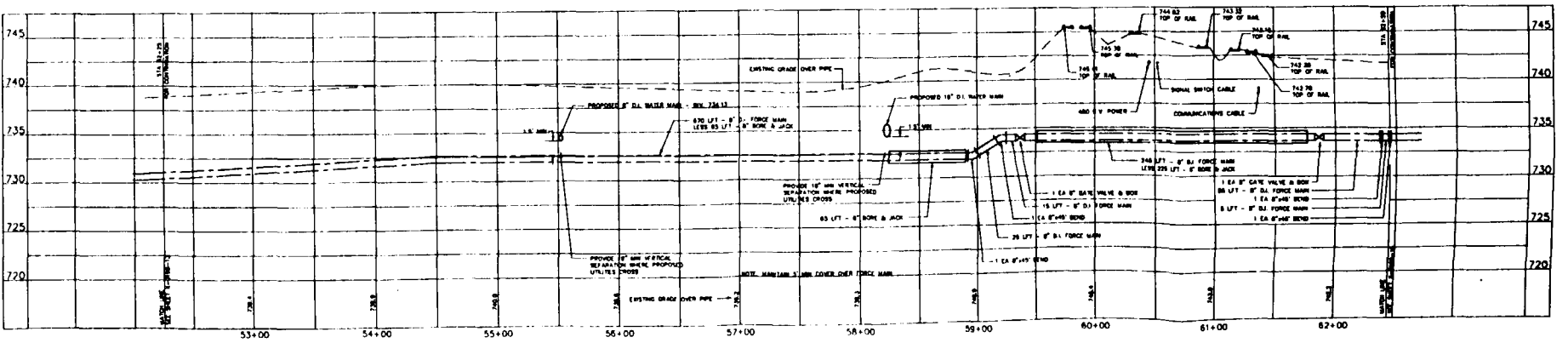
SCALE 1" = 40', 1" = 5'

WIGHTMAN PETRIE INC. 2340 CASSIOPUS STREET ELKHART, INDIANA PHONE: (317) 264-1587 FAX: (317) 264-1381	NO. DATE REVISIONS BY APP.	REFERENCE DRAWINGS	PRINT RECORD DATE ENGINEER'S APPROVAL DATE	CLIENT: CONSOLIDATED RAIL CORPORATION ADDRESS: 3001 MARKET STREET PHILADELPHIA, PA. PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAIL ELKHART RAIL YARD	GROUNDWATER TECHNOLOGY, INC. 800 HARRISON ST. ELKHART, IN PHONE: (317) 264-1587
	0 11/28 PERM FOR FINAL DESIGN SUBMITTAL JJJ PTA	APPROVAL DRAWN CHECKED ENGINEER APPROVAL APPROVAL APPROVAL	APPROVAL APPROVAL APPROVAL APPROVAL APPROVAL APPROVAL	APPROVAL APPROVAL APPROVAL APPROVAL APPROVAL APPROVAL	TITLE: SITE PLAN/PROFILE COUNTRY ROAD 1 FORCEMAIN SCALE: AS SHOWN PROJECT NO: 04088-0120 DRAWING NO: S-0188-13 NETWORK: 0

DATE	BY	REVISIONS
11/14/84	W.P.	REVISED FOR FINAL DESIGN SUBMITTAL



PLAN - COUNTY ROAD 1 - STA 52+75 TO STA 62+50



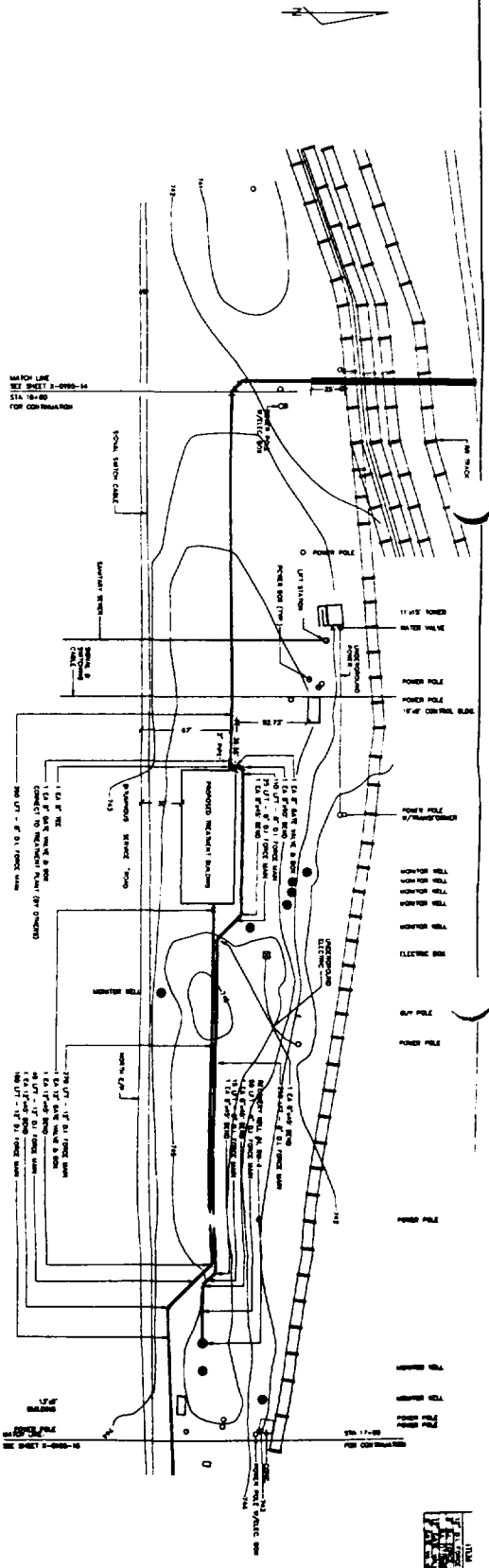
PROFILE - COUNTY ROAD 1 - STA 52+75 TO STA 62+50

WIGHTMAN PETRIE, INC.
 2340 CASSOPOLIS STREET ELKHART, INDIANA 46516
 PHONE (219) 264-4387 FAX (219) 266-1361

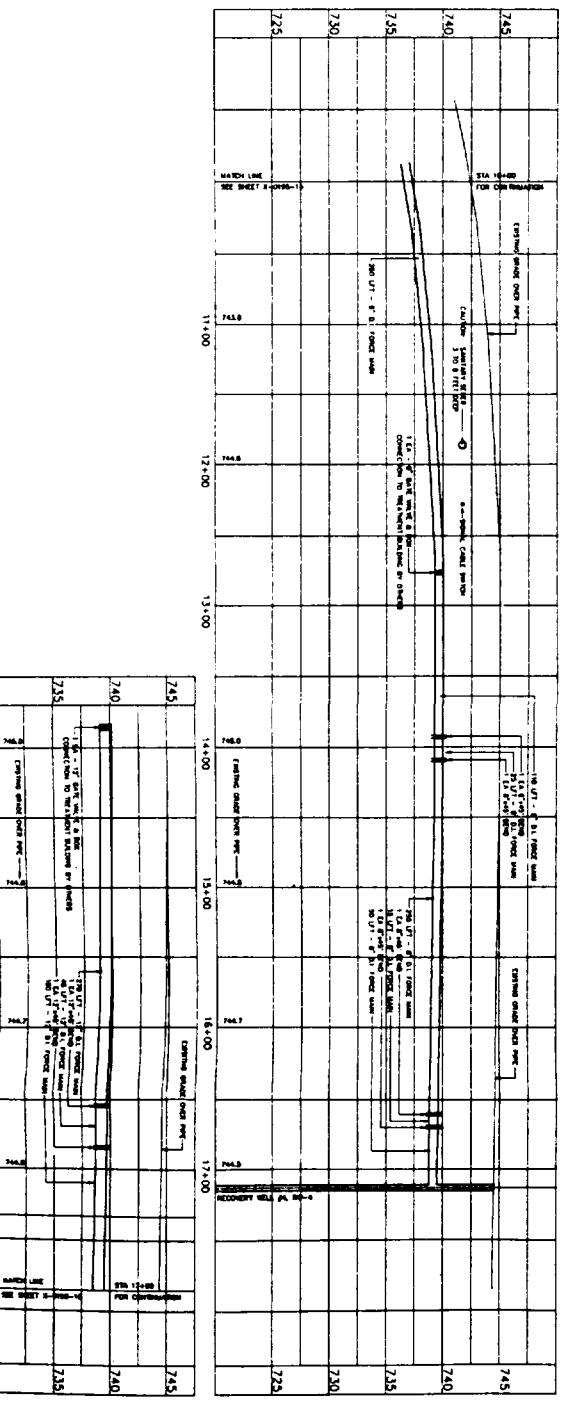
NO.	DATE	REVISIONS	BY	APP.	REFERENCE DRAWINGS	PRINT RECORD	DATE	ENGINEER'S PREPARED	DATE
1	11/14/84	REVISED FOR FINAL DESIGN SUBMITTAL	W.P.	R.L.L.		APPROVAL			
						CONSTRUCTION			

CLIENT: CONSOLIDATED RAIL CORPORATION
 ADDRESS: 2001 MARKET STREET PHILADELPHIA, PA.
 PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAL ELKHART RAIL YARD

GROUNDWATER TECHNOLOGY, INC. 2001 MARKET STREET PHILADELPHIA, PA. 19103-0400			
SITE PLAN/PROFILE COUNTRY ROAD 1 FORCEMAIN			
TITLE	DRAWN	CHECKED	DATE
NO. SHEETS	PROJECT NO.	DRAWING NO.	REVISION
16	04880-0120	0-0108-16	0



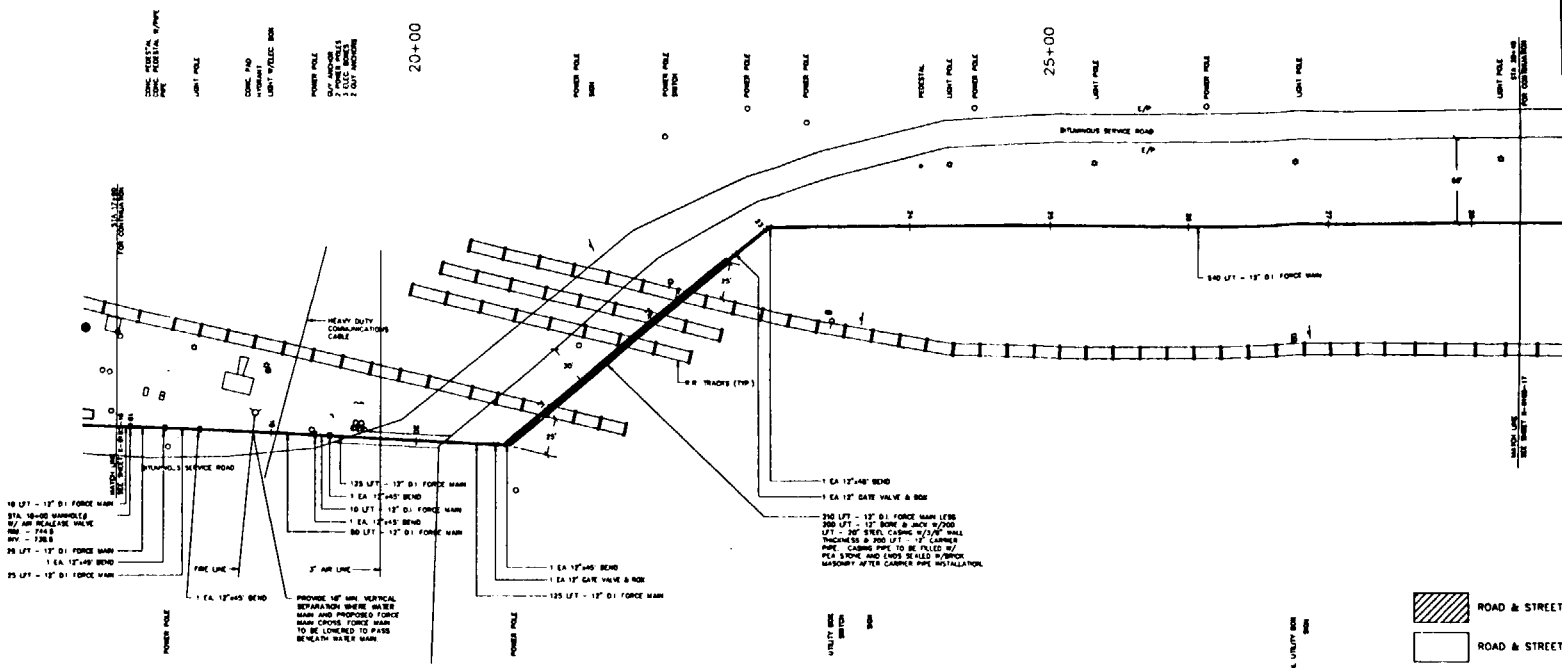
PLAN - CONRAIL YARD FORCE MAIN & DISCHARGE FORCE MAIN - STA 10+00 TO STA 17+90



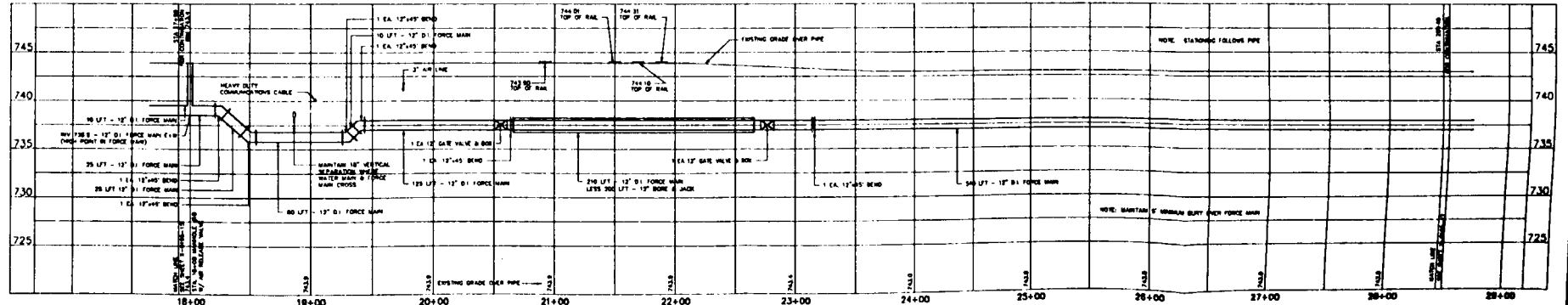
PROFILE - CONRAIL YARD FORCE MAIN & DISCHARGE FORCE MAIN - STA 10+00 TO STA 17+90

MICHIGAN PETRE, INC. 3340 CASSOPOLIS STREET DURHAM, INDIANA 46128 PHONE (317) 241-2887		CONRAIL YARD FORCE MAIN & DISCHARGE FORCE MAIN STA 10+00 TO STA 17+90		
NO.	DATE	DESCRIPTION	BY	APPROVED
1	5/7/78	PROPOSED PLAN
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

ITEM	UNIT	QUANTITY
12" DI. FORCE MAIN	LF	888
12" DI. FORCE MAIN	FT	135
12" DI. FORCE MAIN	EA	88
12" DI. FORCE MAIN	EA	1



PLAN - CONRAIL YARD DISCHARGE FORCE MAIN - STA. 17+90 TO STA. 28+45



PROFILE - CONRAIL YARD DISCHARGE FORCE MAIN - STA. 17+90 TO STA. 28+45

WICHTMAN PETRIE, INC.
 2340 CASSOPOLIS STREET
 PHONE: (318) 364-4887

ELKHART, INDIANA
 FAX: (318) 298-1381

NO.	DATE	REVISIONS	BY	APP.	REFERENCE DRAWINGS	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE
1	4/1/94	REVISED FOR FINAL DESIGN SUBMITTAL	JAT	DEL		APPROVAL		CHECKED	
						APPROVAL		ENGINEER	4/1/94
						CONSTRUCTION		APPROVAL	
								APPROVAL	

CLIENT: **CONSOLIDATED RAIL CORPORATION**
 ADDRESS: 3001 MARKET STREET
 PHILADELPHIA, PA.

PROJECT: **GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAIL ELKHART RAIL YARD**

GROUNDWATER TECHNOLOGY, INC.
 200 W. 10TH STREET
 PHILADELPHIA, PA. 19107

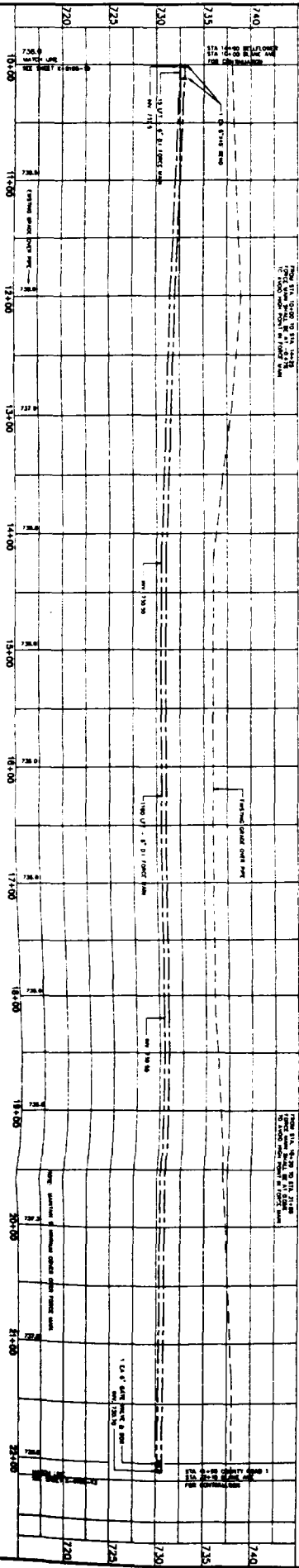
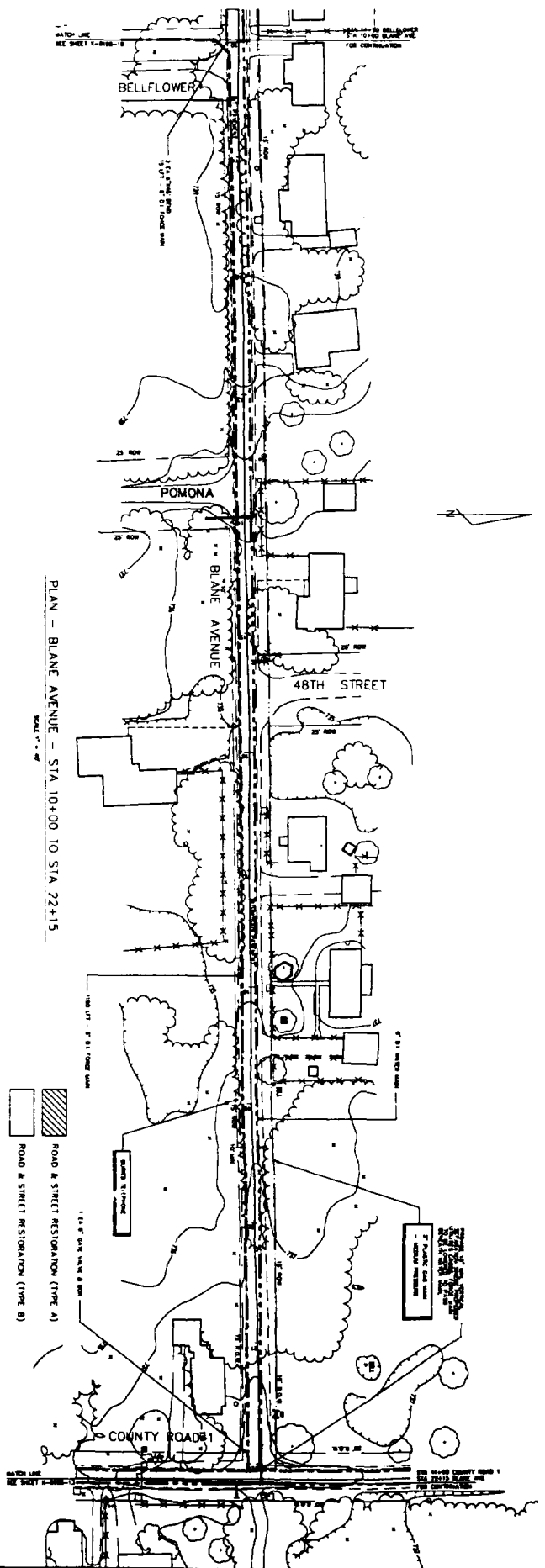
PROJECT: **SITE PLAN/PROFILE CONRAIL YARD DISCHARGE FORCE MAIN**

SCALE: AS SHOWN
 PREPARED BY: JAT
 CHECKED BY: JAT
 DATE: 4-1-94

10+00

15+00

20+00

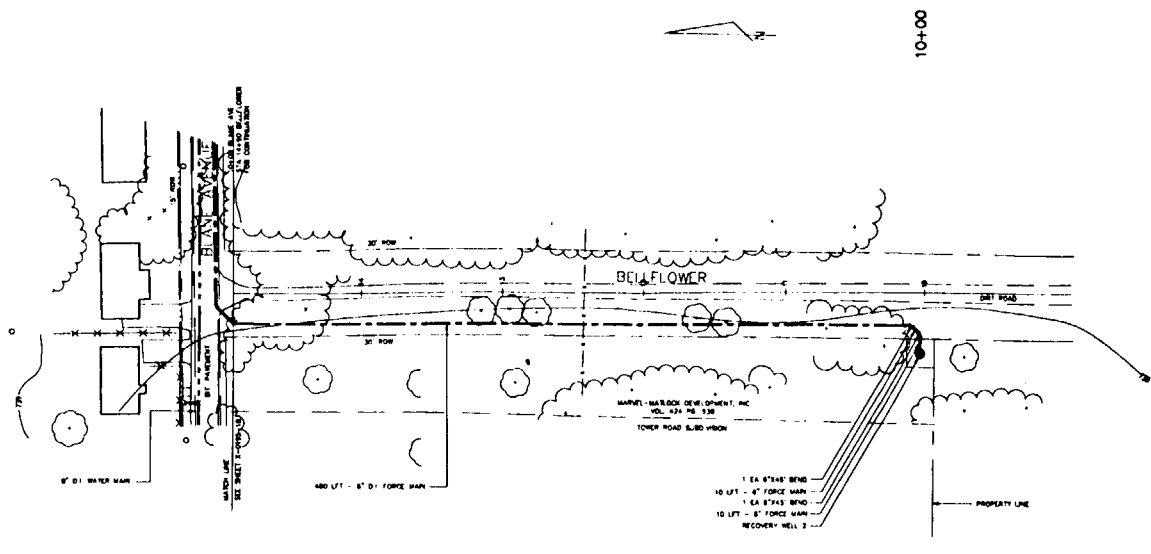


WIGHTMAN PETRIE, INC. 2340 CASSOPOLIS STREET ELKHART, INDIANA PHONE (765) 384-3300		DATE: 9/27/04 DRAWN BY: [Signature] CHECKED BY: [Signature]		PROJECT: [Blank] SHEET NO.: [Blank]	
NO.	DATE	REVISIONS	BY	APP'D	REVISIONS
1	9/27/04	ISSUED FOR PERMITS	[Signature]	[Signature]	
2	10/15/04	REVISED PER COMMENTS	[Signature]	[Signature]	
3	11/11/04	REVISED PER COMMENTS	[Signature]	[Signature]	
4	12/15/04	REVISED PER COMMENTS	[Signature]	[Signature]	
5	1/15/05	REVISED PER COMMENTS	[Signature]	[Signature]	
6	2/15/05	REVISED PER COMMENTS	[Signature]	[Signature]	
7	3/15/05	REVISED PER COMMENTS	[Signature]	[Signature]	
8	4/15/05	REVISED PER COMMENTS	[Signature]	[Signature]	
9	5/15/05	REVISED PER COMMENTS	[Signature]	[Signature]	
10	6/15/05	REVISED PER COMMENTS	[Signature]	[Signature]	
11	7/15/05	REVISED PER COMMENTS	[Signature]	[Signature]	
12	8/15/05	REVISED PER COMMENTS	[Signature]	[Signature]	
13	9/15/05	REVISED PER COMMENTS	[Signature]	[Signature]	
14	10/15/05	REVISED PER COMMENTS	[Signature]	[Signature]	
15	11/15/05	REVISED PER COMMENTS	[Signature]	[Signature]	
16	12/15/05	REVISED PER COMMENTS	[Signature]	[Signature]	
17	1/15/06	REVISED PER COMMENTS	[Signature]	[Signature]	
18	2/15/06	REVISED PER COMMENTS	[Signature]	[Signature]	
19	3/15/06	REVISED PER COMMENTS	[Signature]	[Signature]	
20	4/15/06	REVISED PER COMMENTS	[Signature]	[Signature]	
21	5/15/06	REVISED PER COMMENTS	[Signature]	[Signature]	
22	6/15/06	REVISED PER COMMENTS	[Signature]	[Signature]	
23	7/15/06	REVISED PER COMMENTS	[Signature]	[Signature]	
24	8/15/06	REVISED PER COMMENTS	[Signature]	[Signature]	
25	9/15/06	REVISED PER COMMENTS	[Signature]	[Signature]	
26	10/15/06	REVISED PER COMMENTS	[Signature]	[Signature]	
27	11/15/06	REVISED PER COMMENTS	[Signature]	[Signature]	
28	12/15/06	REVISED PER COMMENTS	[Signature]	[Signature]	
29	1/15/07	REVISED PER COMMENTS	[Signature]	[Signature]	
30	2/15/07	REVISED PER COMMENTS	[Signature]	[Signature]	
31	3/15/07	REVISED PER COMMENTS	[Signature]	[Signature]	
32	4/15/07	REVISED PER COMMENTS	[Signature]	[Signature]	
33	5/15/07	REVISED PER COMMENTS	[Signature]	[Signature]	
34	6/15/07	REVISED PER COMMENTS	[Signature]	[Signature]	
35	7/15/07	REVISED PER COMMENTS	[Signature]	[Signature]	
36	8/15/07	REVISED PER COMMENTS	[Signature]	[Signature]	
37	9/15/07	REVISED PER COMMENTS	[Signature]	[Signature]	
38	10/15/07	REVISED PER COMMENTS	[Signature]	[Signature]	
39	11/15/07	REVISED PER COMMENTS	[Signature]	[Signature]	
40	12/15/07	REVISED PER COMMENTS	[Signature]	[Signature]	
41	1/15/08	REVISED PER COMMENTS	[Signature]	[Signature]	
42	2/15/08	REVISED PER COMMENTS	[Signature]	[Signature]	
43	3/15/08	REVISED PER COMMENTS	[Signature]	[Signature]	
44	4/15/08	REVISED PER COMMENTS	[Signature]	[Signature]	
45	5/15/08	REVISED PER COMMENTS	[Signature]	[Signature]	
46	6/15/08	REVISED PER COMMENTS	[Signature]	[Signature]	
47	7/15/08	REVISED PER COMMENTS	[Signature]	[Signature]	
48	8/15/08	REVISED PER COMMENTS	[Signature]	[Signature]	
49	9/15/08	REVISED PER COMMENTS	[Signature]	[Signature]	
50	10/15/08	REVISED PER COMMENTS	[Signature]	[Signature]	
51	11/15/08	REVISED PER COMMENTS	[Signature]	[Signature]	
52	12/15/08	REVISED PER COMMENTS	[Signature]	[Signature]	
53	1/15/09	REVISED PER COMMENTS	[Signature]	[Signature]	
54	2/15/09	REVISED PER COMMENTS	[Signature]	[Signature]	
55	3/15/09	REVISED PER COMMENTS	[Signature]	[Signature]	
56	4/15/09	REVISED PER COMMENTS	[Signature]	[Signature]	
57	5/15/09	REVISED PER COMMENTS	[Signature]	[Signature]	
58	6/15/09	REVISED PER COMMENTS	[Signature]	[Signature]	
59	7/15/09	REVISED PER COMMENTS	[Signature]	[Signature]	
60	8/15/09	REVISED PER COMMENTS	[Signature]	[Signature]	
61	9/15/09	REVISED PER COMMENTS	[Signature]	[Signature]	
62	10/15/09	REVISED PER COMMENTS	[Signature]	[Signature]	
63	11/15/09	REVISED PER COMMENTS	[Signature]	[Signature]	
64	12/15/09	REVISED PER COMMENTS	[Signature]	[Signature]	
65	1/15/10	REVISED PER COMMENTS	[Signature]	[Signature]	
66	2/15/10	REVISED PER COMMENTS	[Signature]	[Signature]	
67	3/15/10	REVISED PER COMMENTS	[Signature]	[Signature]	
68	4/15/10	REVISED PER COMMENTS	[Signature]	[Signature]	
69	5/15/10	REVISED PER COMMENTS	[Signature]	[Signature]	
70	6/15/10	REVISED PER COMMENTS	[Signature]	[Signature]	
71	7/15/10	REVISED PER COMMENTS	[Signature]	[Signature]	
72	8/15/10	REVISED PER COMMENTS	[Signature]	[Signature]	
73	9/15/10	REVISED PER COMMENTS	[Signature]	[Signature]	
74	10/15/10	REVISED PER COMMENTS	[Signature]	[Signature]	
75	11/15/10	REVISED PER COMMENTS	[Signature]	[Signature]	
76	12/15/10	REVISED PER COMMENTS	[Signature]	[Signature]	
77	1/15/11	REVISED PER COMMENTS	[Signature]	[Signature]	
78	2/15/11	REVISED PER COMMENTS	[Signature]	[Signature]	
79	3/15/11	REVISED PER COMMENTS	[Signature]	[Signature]	
80	4/15/11	REVISED PER COMMENTS	[Signature]	[Signature]	
81	5/15/11	REVISED PER COMMENTS	[Signature]	[Signature]	
82	6/15/11	REVISED PER COMMENTS	[Signature]	[Signature]	
83	7/15/11	REVISED PER COMMENTS	[Signature]	[Signature]	
84	8/15/11	REVISED PER COMMENTS	[Signature]	[Signature]	
85	9/15/11	REVISED PER COMMENTS	[Signature]	[Signature]	
86	10/15/11	REVISED PER COMMENTS	[Signature]	[Signature]	
87	11/15/11	REVISED PER COMMENTS	[Signature]	[Signature]	
88	12/15/11	REVISED PER COMMENTS	[Signature]	[Signature]	
89	1/15/12	REVISED PER COMMENTS	[Signature]	[Signature]	
90	2/15/12	REVISED PER COMMENTS	[Signature]	[Signature]	
91	3/15/12	REVISED PER COMMENTS	[Signature]	[Signature]	
92	4/15/12	REVISED PER COMMENTS	[Signature]	[Signature]	
93	5/15/12	REVISED PER COMMENTS	[Signature]	[Signature]	
94	6/15/12	REVISED PER COMMENTS	[Signature]	[Signature]	
95	7/15/12	REVISED PER COMMENTS	[Signature]	[Signature]	
96	8/15/12	REVISED PER COMMENTS	[Signature]	[Signature]	
97	9/15/12	REVISED PER COMMENTS	[Signature]	[Signature]	
98	10/15/12	REVISED PER COMMENTS	[Signature]	[Signature]	
99	11/15/12	REVISED PER COMMENTS	[Signature]	[Signature]	
100	12/15/12	REVISED PER COMMENTS	[Signature]	[Signature]	

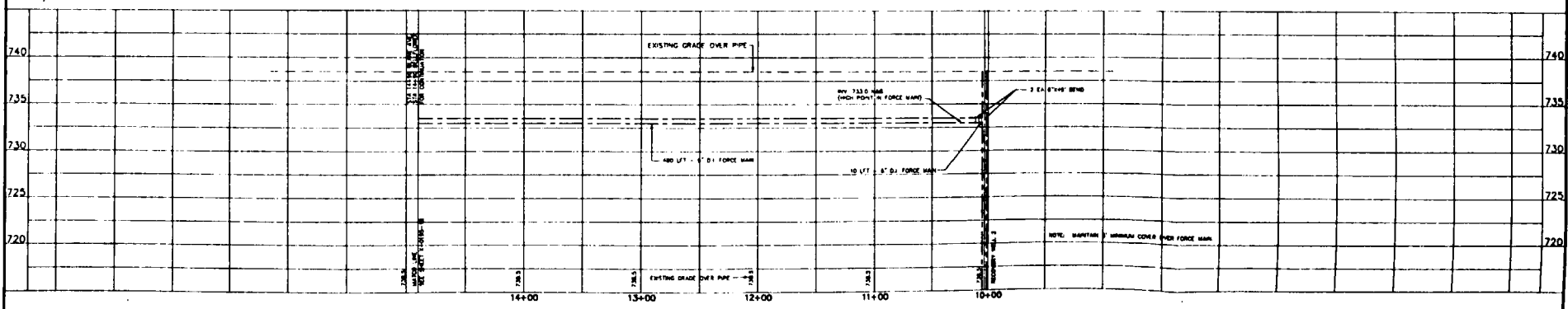
CIVIL ENGINEERING CORPORATION
 PROJECT: [Blank]
 CONTRACT NO.: [Blank]
 SHEET NO.: [Blank]

SITE PLAN/PROFILE
 BLANE AVENUE

ITEM	UNIT	QUANTITY
8" D.I. FORCE MAIN	L.F.	566
2" D.I. FITTINGS	PCS	208



PLAN - BELLFLOWER - STA 10+00 TO STA 14+90
SCALE 1" = 40'



PROFILE - BELLFLOWER - STA 10+00 TO STA 14+90
SCALE 1" = 40' H., 1" = 5' V.

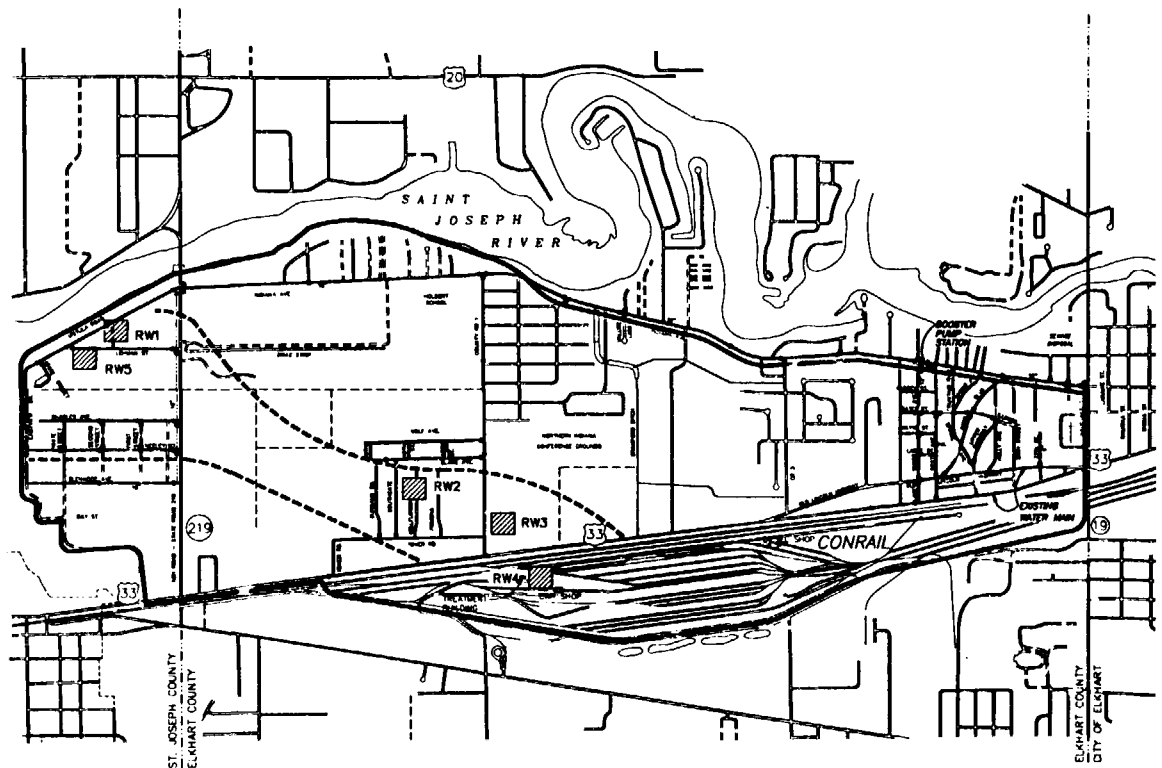
WIGHTMAN PETRIE INC.
2340 CASSOPOLIS STREET ELKHART, INDIANA
PHONE: (317) 264-4387 FAX: (317) 266-1361

NO	DATE	REVISIONS	BY	APP	REFERENCE DRAWINGS	PRINT RECORD	DATE	ENGINEER'S INITIAL	DATE
0	1/7/04	PREPARED FOR FINAL DESIGN SUBMITTAL	JAT	R CL		APPROVAL		DRAWN	
						CONSTRUCTION		CHECKED	1/8 4/04
								ENGINEER	
								APPROVAL	
								APPROVAL	





CLIENT: CONSOLIDATED RAIL CORPORATION
ADDRESS: 2001 MARKET STREET PHILADELPHIA, PA.
PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAL ELKHART RAIL YARD

GROUNDWATER TECHNOLOGY, INC.
128 HICKORY STREET PHILADELPHIA, PA. 19106-3642
TITLE: SITE PLAN/PROFILE BELLFLOWER FORCEMAN
SCALE: AS SHOWN PROJECT NO: 04000-0100 DRAWING NO: E-0100-10 REVISION: 0

FIGURE 2-7



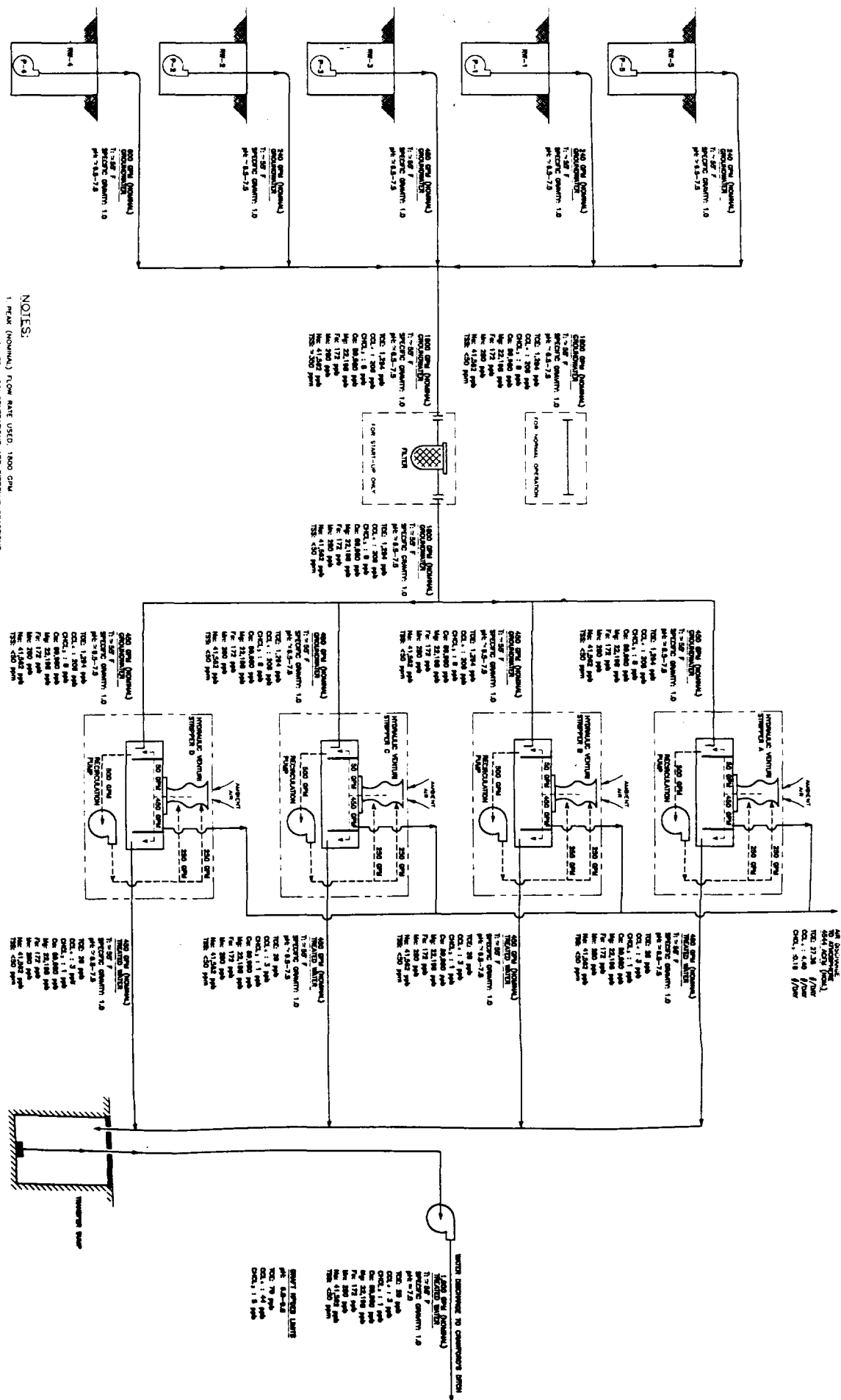
LEGEND

-  - RECOVERY WELL LOCATION AND SECURITY AREA
-  - BOUNDARY FOR POTENTIAL BUFFER ZONE CONSIDERATION FOR DEVELOPMENT & WELL USE RESTRICTIONS.
-  - OBSERVED EXTENT OF TCE & CCL4 ZONE OF CONTAMINATION NORTHWEST OF RAILYARD.
-  - 8" WATER MAIN (UNLESS OTHERWISE NOTED)



REFERENCE DRAWINGS		NO.	DATE	REVISIONS	BY	APP.	NO.	DATE	REVISIONS	BY	APP.	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE
							1	4/1/84	FILED FOR FINAL DESIGN SUBMITTAL					DRAWN	9/28/84
														CHECKED	9/28/84
														ENGINEER	10/1/84
														APPROVAL	10/1/84
														APPROVAL	10/1/84

CLIENT: CONSOLIDATED RAIL CORPORATION ADDRESS: 300 MARKET STREET PHILADELPHIA, PA.	GROUNDWATER TECHNOLOGY, INC. 200 W. 10TH STREET PHILADELPHIA, PA. 19107
PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAIL ELMHART RAIL YARD	TITLE: FUTURE DEVELOPMENT & WELL RESTRICTION GUIDANCE MAP
SCALE: 1"=1,000'	PROJECT NO: 04950-0100
DRAWING NO: 21-0100-01	DATE: 10/1/84



NOTES:
1. PEAK (NOMINAL) FLOW RATE USED: 1800 GPM
2. NOMINAL METAL CONCENTRATIONS ARE DISSOLVE FRACTIONS

REVISED DIMENSIONS		REVISIONS		BY DATE		DATE		DATE		DATE		DATE		DATE	
NO.	DATE	BY	DATE	NO.	DATE	BY	DATE	NO.	DATE	BY	DATE	NO.	DATE	BY	DATE
1	1/11/71	J.L.	1/11/71	1	1/11/71	J.L.	1/11/71	1	1/11/71	J.L.	1/11/71	1	1/11/71	J.L.	1/11/71

DATE	APPROVAL	DATE	APPROVAL	DATE	APPROVAL	DATE	APPROVAL

DATE	APPROVAL	DATE	APPROVAL	DATE	APPROVAL	DATE	APPROVAL

CLIENT:	PROJECT:	DATE:	BY:	DATE:	BY:	DATE:	BY:
CONSOLIDATED P.M. CORPORATION	GROUNDWATER EXTRACTION & TREATMENT SYSTEM	1/11/71	J.L.	1/11/71	J.L.	1/11/71	J.L.

PROJECT:	DATE:	BY:	DATE:	BY:	DATE:	BY:	DATE:
GROUNDWATER EXTRACTION & TREATMENT SYSTEM	1/11/71	J.L.	1/11/71	J.L.	1/11/71	J.L.	1/11/71

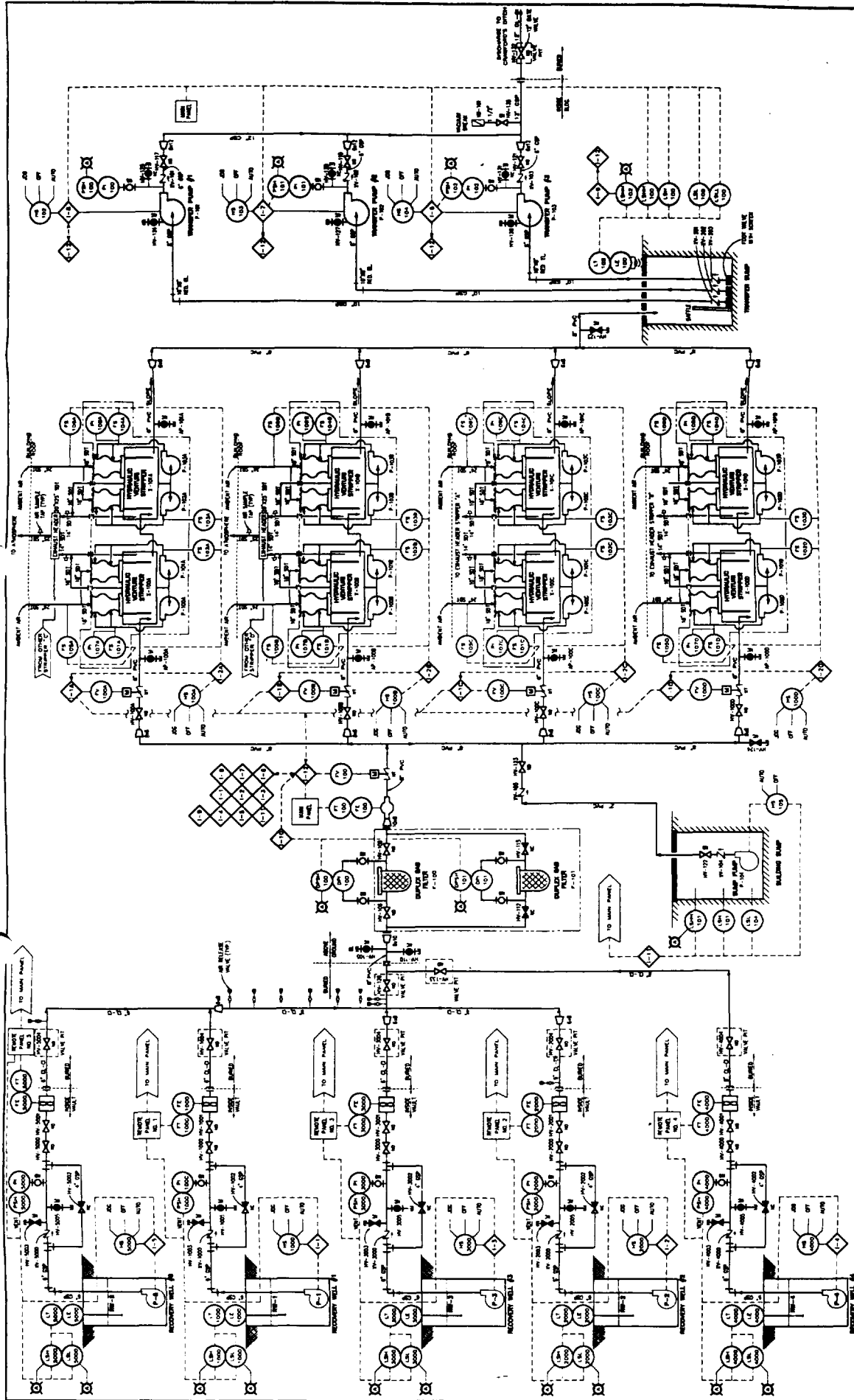
ENVIRONMENTAL TECHNOLOGY, INC.

3000 MARKET STREET
SAN FRANCISCO, CALIF. 94109

TEL: 415-774-4000
FAX: 415-774-4001

PROJECT NO. 91-08
SHEET NO. 1-01

PROCESS FLOW DIAGRAM



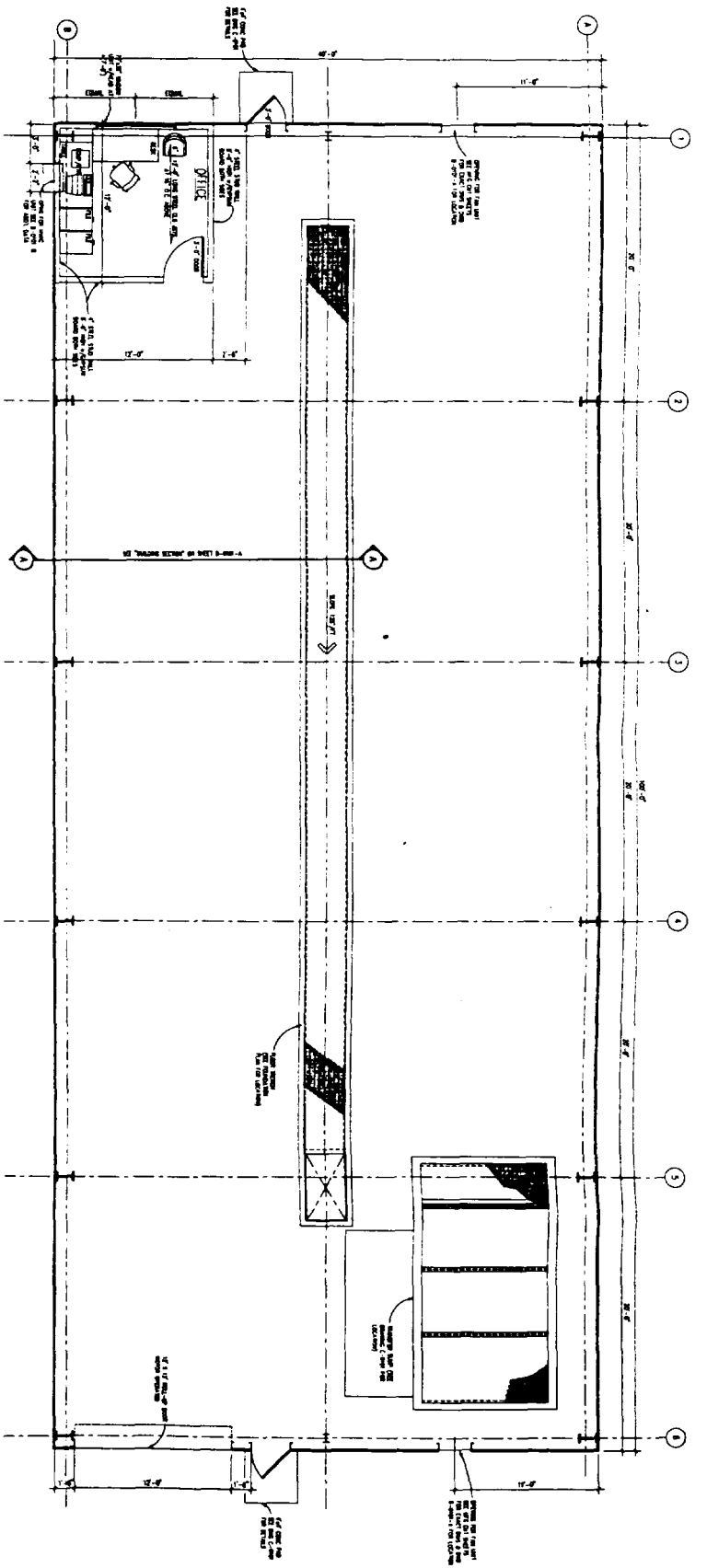
CORPORATE TECHNOLOGY, INC.
 ADDRESS AND PHONE NUMBER: 1000 W. 15th St., Suite 100, Lincoln, NE 68502
 TEL: (402) 441-1111 FAX: (402) 441-1112

PIPING & INSTRUMENTATION DIAGRAM

GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CORNELL UNIVERSITY AND YARD

NO.	DATE	REVISIONS	BY (LAD)	CHECKED (LAD)	DATE	COMPLETION RECORD

DRAWING NO. 1000-0110
 SHEET NO. 1 OF 10
 DATE: 12/1/88



FLOOR PLAN

GENERAL NOTES:

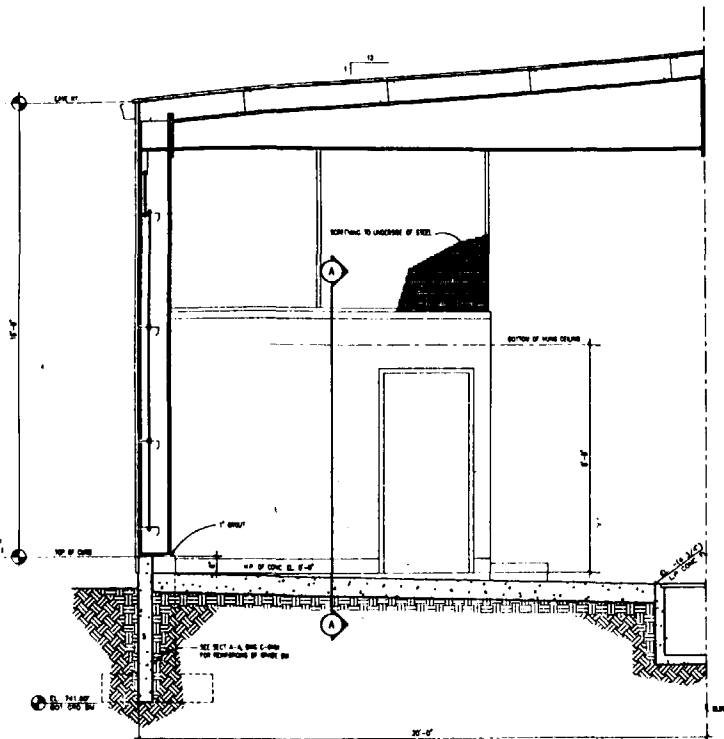
1. GENERAL NOTES TO BE OBSERVED FOR ALL WORK AND MATERIALS TO BE USED IN CONNECTION WITH THIS PROJECT.
2. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE SPECIFICATIONS AND DRAWINGS FOR THIS PROJECT.
3. ALL MATERIALS SHALL BE OF THE BEST QUALITY AVAILABLE AND SHALL BE SUBJECT TO INSPECTION AND APPROVAL BY THE ARCHITECT.
4. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE LOCAL AND STATE CODES AND REGULATIONS.
5. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE NATIONAL BUILDING CODE AND ALL OTHER APPLICABLE CODES AND REGULATIONS.
6. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE BEST PRACTICES OF THE TRADE.
7. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE ARCHITECT'S INTENT AND THE BEST INTERESTS OF THE PROJECT.
8. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE ARCHITECT'S SCHEDULE AND BUDGET.
9. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE ARCHITECT'S DESIGN AND CONCEPTS.
10. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE ARCHITECT'S SPECIFICATIONS AND DRAWINGS.

NO.	DATE	BY	FOR	DESCRIPTION
1	1/1/78	J.H.	CONTRACTOR	CONSTRUCTION OF TREATMENT BUILDING
2	2/1/78	J.H.	ARCHITECT	REVISIONS TO FLOOR PLAN
3	3/1/78	J.H.	CONTRACTOR	CONSTRUCTION OF TREATMENT BUILDING
4	4/1/78	J.H.	ARCHITECT	REVISIONS TO FLOOR PLAN
5	5/1/78	J.H.	CONTRACTOR	CONSTRUCTION OF TREATMENT BUILDING
6	6/1/78	J.H.	ARCHITECT	REVISIONS TO FLOOR PLAN
7	7/1/78	J.H.	CONTRACTOR	CONSTRUCTION OF TREATMENT BUILDING
8	8/1/78	J.H.	ARCHITECT	REVISIONS TO FLOOR PLAN
9	9/1/78	J.H.	CONTRACTOR	CONSTRUCTION OF TREATMENT BUILDING
10	10/1/78	J.H.	ARCHITECT	REVISIONS TO FLOOR PLAN
11	11/1/78	J.H.	CONTRACTOR	CONSTRUCTION OF TREATMENT BUILDING
12	12/1/78	J.H.	ARCHITECT	REVISIONS TO FLOOR PLAN

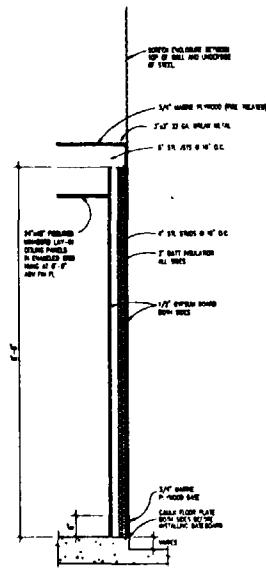
OWNER: CONSOLIDATED REAL CORPORATION
 PROJECT: INDUSTRIAL
 CONTRACTOR: CONSUMERS EXTRACTION & TREATMENT SYSTEMS
 ARCHITECT: GENERAL CONTRACTORS, INC.

DATE: 1/1/78
 DRAWN BY: J.H.
 CHECKED BY: J.H.
 APPROVED BY: J.H.

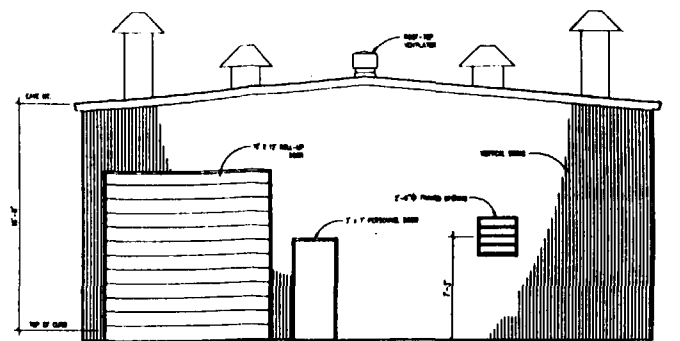
TREATMENT BUILDING FLOOR PLAN



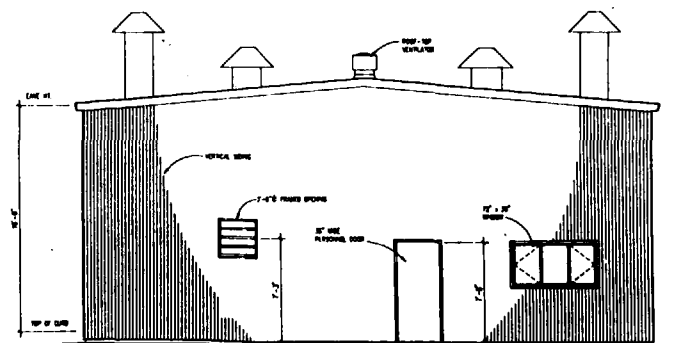
BUILDING SECTION
SCALE 1/8" = 1'-0"



INT PARTITION SECTION "A-A"
SCALE 3/8" = 1'-0"



EAST END ELEVATION
SCALE 1/8" = 1'-0"



WEST END ELEVATION
SCALE 1/8" = 1'-0"



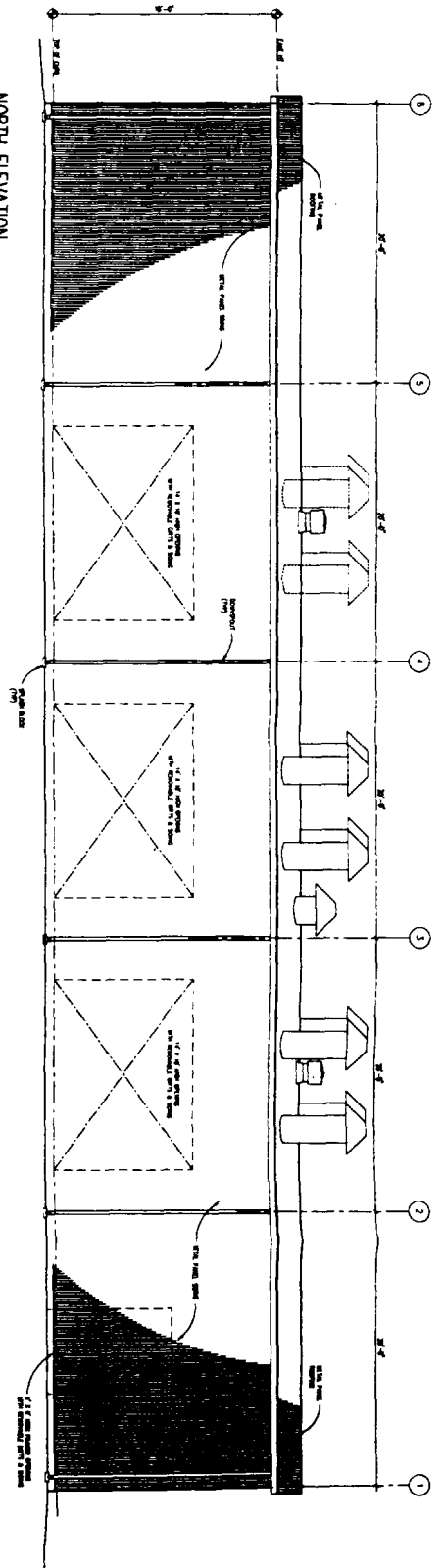
PROJECT - 24 APR 84 -

REFERENCE DRAWINGS	NO	DATE	REVISIONS	BY	APP	NO	DATE	REVISIONS	BY	APP	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE

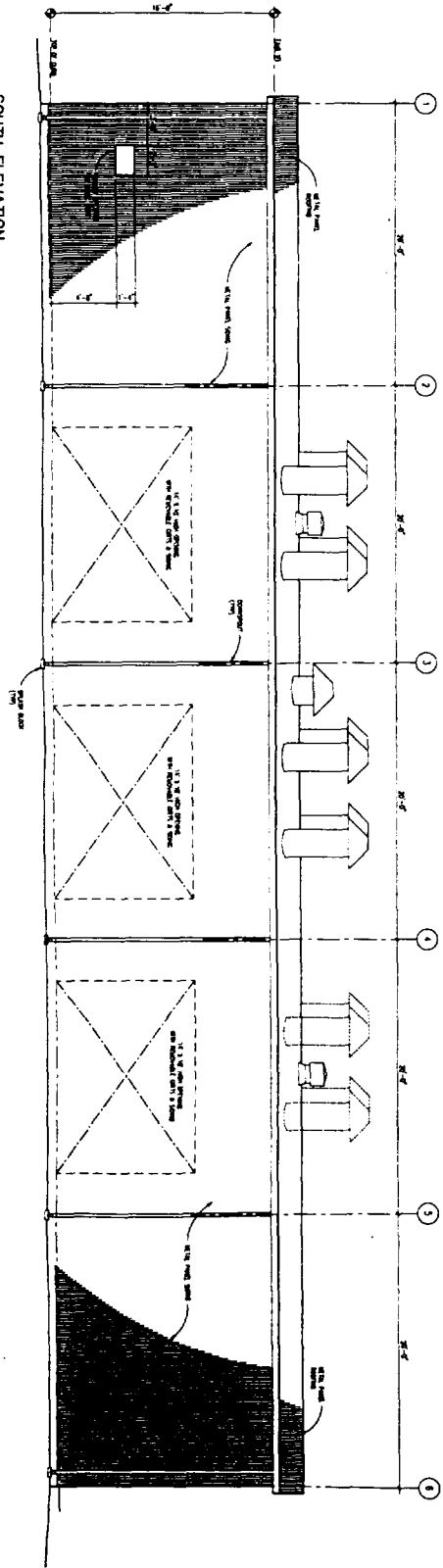
CLIENT: CONSOLIDATED RAIL CORPORATION
 ADDRESS: 3001 MARKET STREET
 PHILADELPHIA, PA.
 PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM
 FOR CONRAL ELIZABETH RAIL YARD

GROUNDWATER TECHNOLOGY, INC.
 100 WASHINGTON & MARKET STS.
 PHILADELPHIA, PA. 19107
 TITLE: TREATMENT BUILDING SECTION & ELEVATIONS
 SERIAL NO. 04000-0100 DRAWING NO. 0-0101-A

NORTH ELEVATION



SOUTH ELEVATION



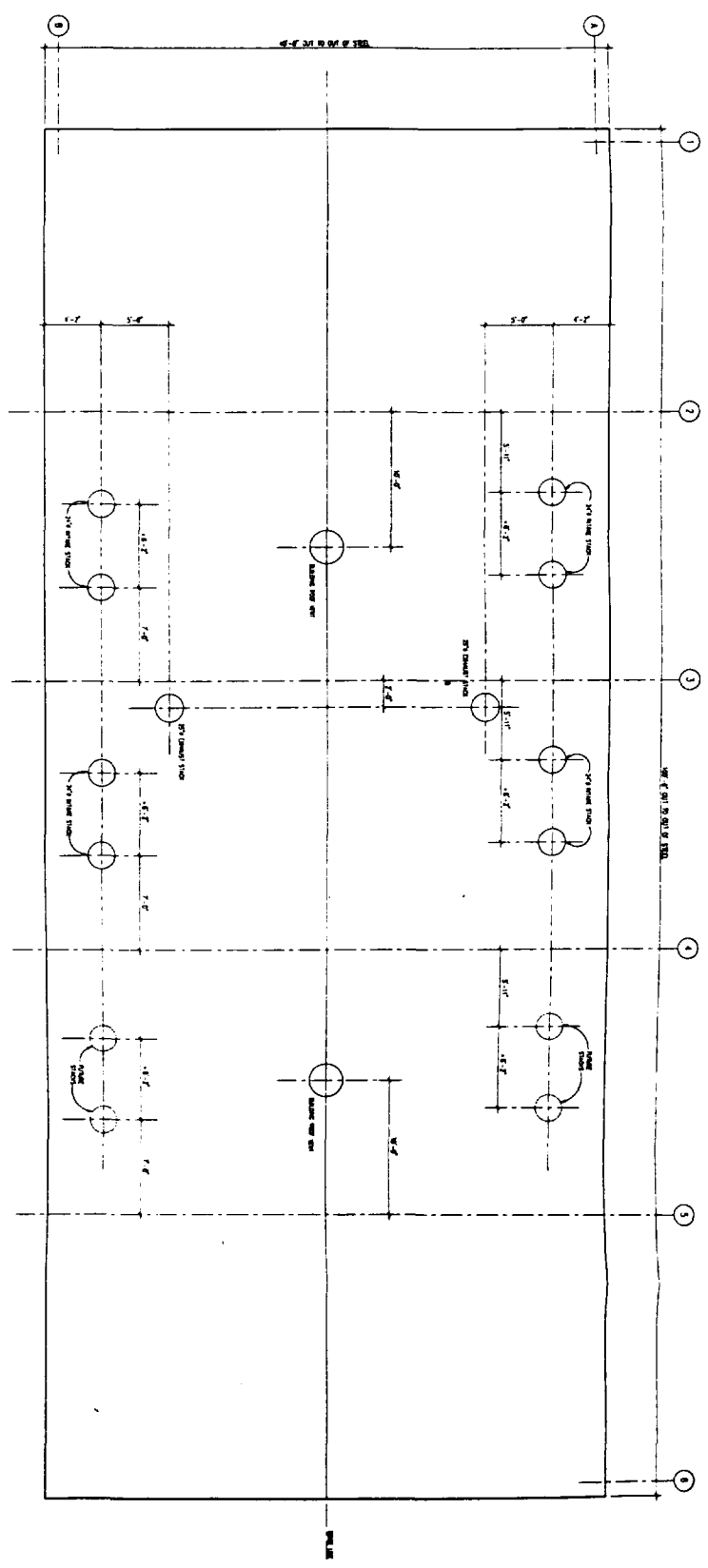
NO.	DATE	REVISIONS	BY	DATE	NO.	DATE	REVISIONS	BY	DATE	NO.	DATE	REVISIONS	BY	DATE	NO.	DATE	REVISIONS	BY	DATE	
1					1					1					1					
2					2					2					2					
3					3					3					3					
4					4					4					4					
5					5					5					5					
6					6					6					6					
7					7					7					7					
8					8					8					8					

CLIENT: CONSOLIDATED PAUL CORPORATION
 ADDRESS: 10000 W. 10th Ave., Denver, CO 80231
 PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAD ELKHART PAUL YARD

DATE: 1/2/11
 PROJECT NO: 10000-10
 DRAWING NO: 10000-10-10

GROUNDWATER TECHNOLOGIST, INC.
 10000 W. 10th Ave., Suite 1000
 Denver, CO 80231
 (303) 751-1000



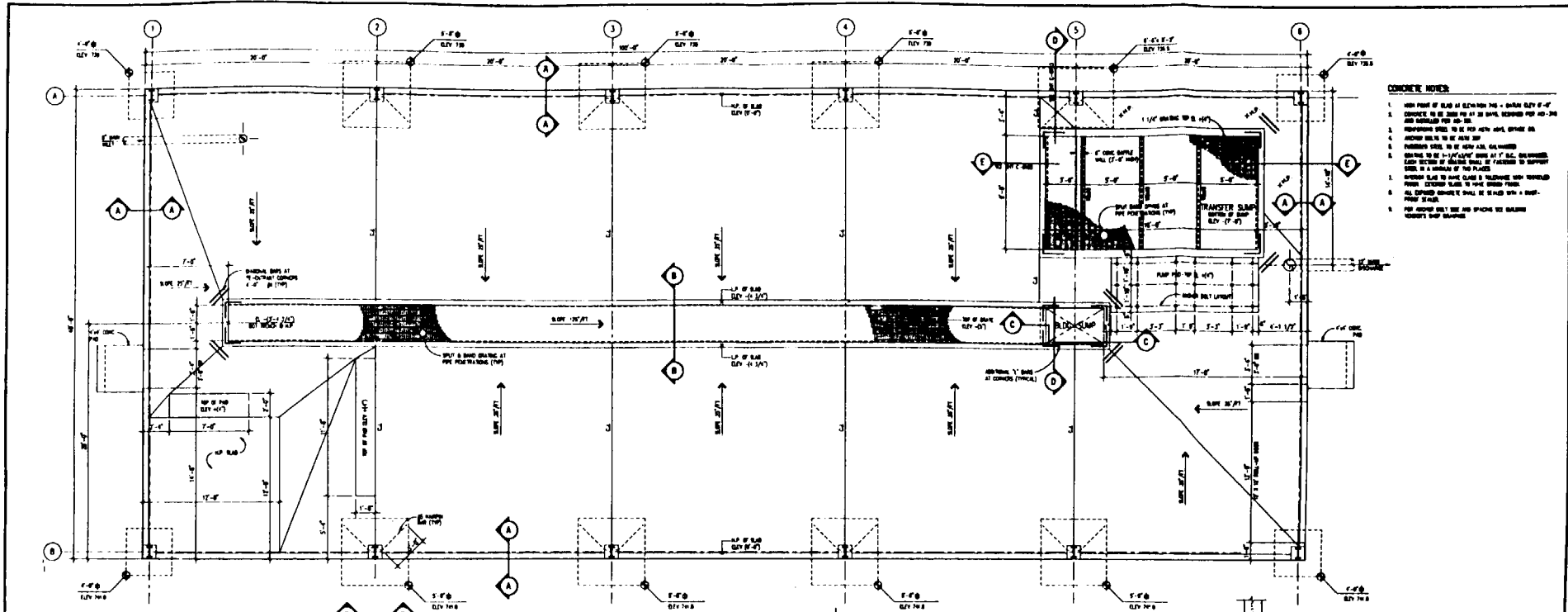



ROOF PLAN
 1/2" = 1'-0"

- NOTES**
1. SEE ALL NOTES ON DRAWINGS FOR ALL NOTES.
 2. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CITY OF CHICAGO ORDINANCES AND THE IBC.
 3. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CITY OF CHICAGO ORDINANCES AND THE IBC.
 4. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CITY OF CHICAGO ORDINANCES AND THE IBC.

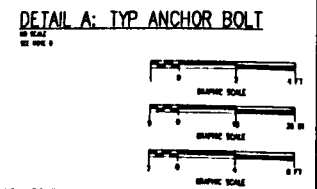
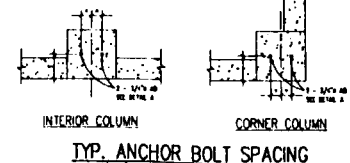
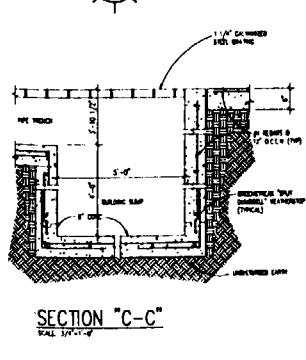
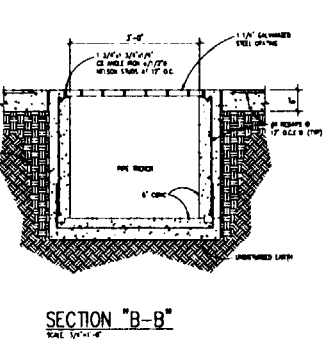
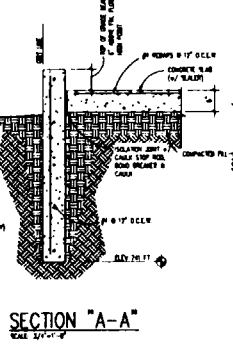
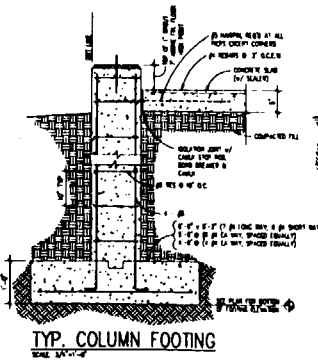
NO.	DATE	DESCRIPTION	BY	DATE	NO.	DATE	DESCRIPTION	BY	DATE	NO.	DATE	DESCRIPTION	BY	DATE	NO.	DATE	DESCRIPTION	BY	DATE	NO.	DATE	DESCRIPTION	BY	DATE
1	1/1/00	ISSUED FOR PERMITS	JLH	1/1/00	1	1/1/00	ISSUED FOR PERMITS	JLH	1/1/00	1	1/1/00	ISSUED FOR PERMITS	JLH	1/1/00	1	1/1/00	ISSUED FOR PERMITS	JLH	1/1/00	1	1/1/00	ISSUED FOR PERMITS	JLH	1/1/00
2	1/1/00	ISSUED FOR PERMITS	JLH	1/1/00	2	1/1/00	ISSUED FOR PERMITS	JLH	1/1/00	2	1/1/00	ISSUED FOR PERMITS	JLH	1/1/00	2	1/1/00	ISSUED FOR PERMITS	JLH	1/1/00	2	1/1/00	ISSUED FOR PERMITS	JLH	1/1/00
3	1/1/00	ISSUED FOR PERMITS	JLH	1/1/00	3	1/1/00	ISSUED FOR PERMITS	JLH	1/1/00	3	1/1/00	ISSUED FOR PERMITS	JLH	1/1/00	3	1/1/00	ISSUED FOR PERMITS	JLH	1/1/00	3	1/1/00	ISSUED FOR PERMITS	JLH	1/1/00

CONSULTANTS
 PROJECT: **GROUNDWATER EXTRACTION & TREATMENT SYSTEM**
 FOR **CONVAL FLUORIDE MIL WBD**
 PREPARED BY: **CONSULTANTS**
 PROJECT NO: **100-110**
 SHEET NO: **100-110-1**
 DATE: **1/1/00**

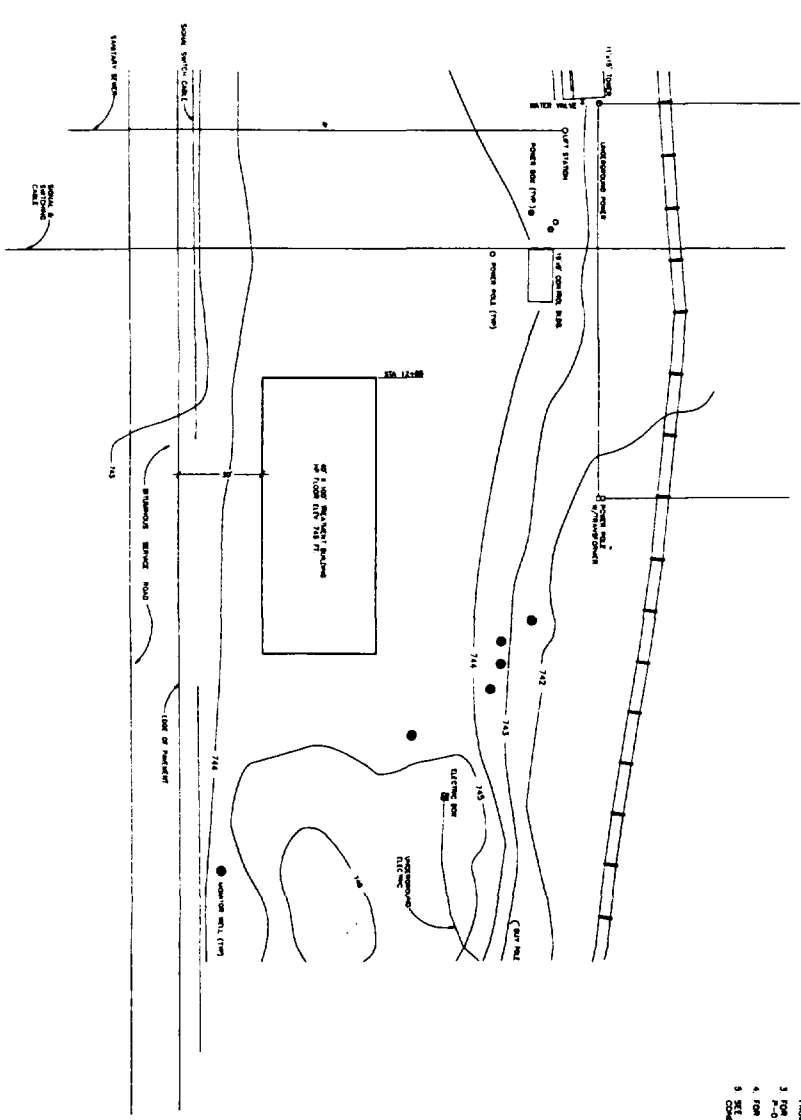
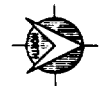


- CONCRETE NOTES**
1. LOW POINT OF SLAB AT ELEVATION 70.0 - DIMEN. ELEV. 6'-0"
 2. CONCRETE TO BE 3000 PSI AT 28 DAYS, ACCORDING PER ACI 308 AND REVISIONS PER 401-20.
 3. REINFORCING STEEL TO BE #4 @ 18" ON CENTER, UNLESS NOTED OTHERWISE.
 4. ANCHOR BOLTS TO BE 1/2" DIA. GALVANIZED.
 5. REINFORCING STEEL TO BE #4 @ 18" ON CENTER, UNLESS NOTED OTHERWISE.
 6. ANCHOR BOLTS TO BE 1/2" DIA. GALVANIZED.
 7. ANCHOR BOLTS TO BE 1/2" DIA. GALVANIZED.
 8. ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED.
 9. ALL DIMENSIONS SHALL BE CHECKED WITH A 30'-0" TAPING.
 10. FOR RECORD ONLY SEE SHOP DRAWINGS FOR REINFORCING STEEL SCHEDULE.

FOUNDATION AND SLAB PLAN
 SCALE 1/8" = 1'-0"
 HIGH ELEV. OF FIN. 7'-0"



NO.	DATE	REVISIONS	BY	APP	NO.	DATE	REVISIONS	BY	APP	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE	CLIENT	PROJECT	TYPE	SCALE	PROJECT NO.	DRAWING NO.	REVISION
														CONSOLIDATED RAIL CORPORATION	GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAL ELKHART RAIL YARD	TREATMENT BUILDING FOUNDATION PLAN & DETAILS		04002-0120	C-0101	



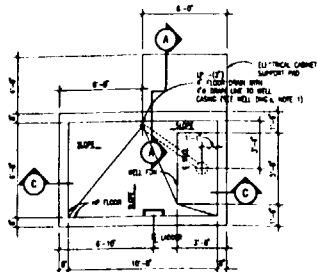
SITE PLAN
SCALE: 1" = 50'

- NOTES:
1. FINAL DESIGN AND/OR INSTALLATION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. ALL DIMENSIONS SHOWN SHALL BE PLACED OVER ALL DIMENSIONS SHOWN IN THIS DRAWING.
 2. SEE ELECTRICAL DRAWING FOR ALL ELECTRICAL SYMBOLS AND CONNECTIONS.
 3. FOR DIMENSIONAL INFORMATION AND NOTES, SEE DRAWING C-011.
 4. FOR MATERIAL SPECIFICATIONS, SEE DRAWING C-011.
 5. SEE ELECTRICAL DRAWING FOR ALL ELECTRICAL SYMBOLS AND CONNECTIONS.

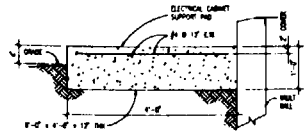
NO.	DATE	BY	REVISIONS
1	1/1/74	JLL	ISSUED FOR PERMITS
2	1/1/74	JLL	REVISED FOR PERMITS
3	1/1/74	JLL	REVISED FOR PERMITS
4	1/1/74	JLL	REVISED FOR PERMITS
5	1/1/74	JLL	REVISED FOR PERMITS
6	1/1/74	JLL	REVISED FOR PERMITS
7	1/1/74	JLL	REVISED FOR PERMITS
8	1/1/74	JLL	REVISED FOR PERMITS
9	1/1/74	JLL	REVISED FOR PERMITS
10	1/1/74	JLL	REVISED FOR PERMITS
11	1/1/74	JLL	REVISED FOR PERMITS
12	1/1/74	JLL	REVISED FOR PERMITS
13	1/1/74	JLL	REVISED FOR PERMITS
14	1/1/74	JLL	REVISED FOR PERMITS
15	1/1/74	JLL	REVISED FOR PERMITS
16	1/1/74	JLL	REVISED FOR PERMITS
17	1/1/74	JLL	REVISED FOR PERMITS
18	1/1/74	JLL	REVISED FOR PERMITS
19	1/1/74	JLL	REVISED FOR PERMITS
20	1/1/74	JLL	REVISED FOR PERMITS
21	1/1/74	JLL	REVISED FOR PERMITS
22	1/1/74	JLL	REVISED FOR PERMITS
23	1/1/74	JLL	REVISED FOR PERMITS
24	1/1/74	JLL	REVISED FOR PERMITS
25	1/1/74	JLL	REVISED FOR PERMITS
26	1/1/74	JLL	REVISED FOR PERMITS
27	1/1/74	JLL	REVISED FOR PERMITS
28	1/1/74	JLL	REVISED FOR PERMITS
29	1/1/74	JLL	REVISED FOR PERMITS
30	1/1/74	JLL	REVISED FOR PERMITS

CLIENT: CONSOLIDATED WALK CORPORATION
 ADDRESS: 1000 W. 10TH STREET
 PROJECT: ORGANOMETER EXTRACTOR & SPINDLER SYSTEM
 CONSULT: EDWARD BELL, WASH.

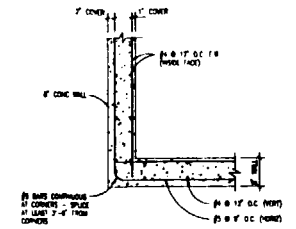
DATE: 1/1/74
 PROJECT: TREATMENT BUILDING
 SHEET: 1 OF 1
 DRAWN BY: JLL
 CHECKED BY: JLL
 SCALE: 1" = 50'



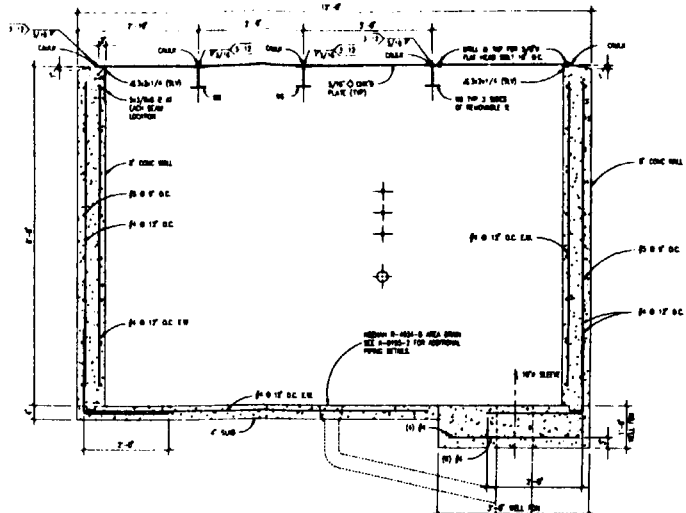
WELL VAULT DRAINAGE PLAN
SCALE 1/2"=1'-0"



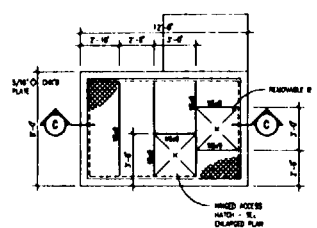
SECTION "A-A"
SCALE 1/2"=1'-0"



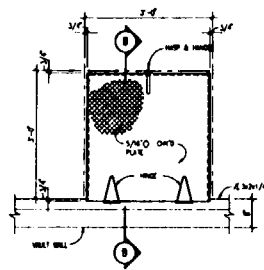
PLAN: SECTION AT CORNER OF WALL
SCALE 1/2"=1'-0"



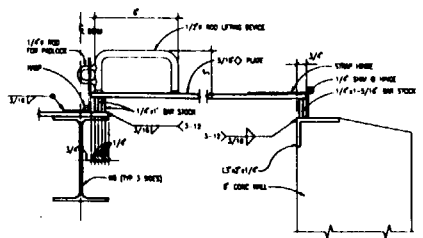
SECTION "C-C"
SCALE 1/2"=1'-0"



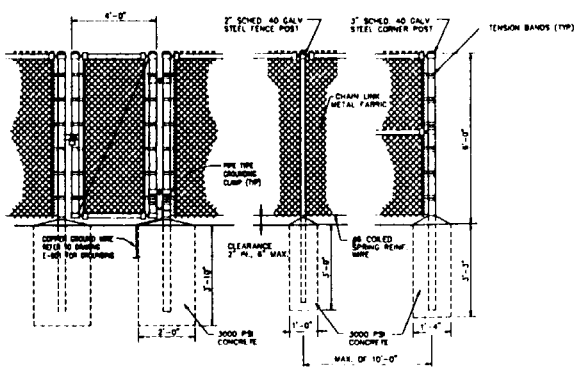
WELL VAULT FRAMING PLAN
SCALE 1/2"=1'-0"



ACCESS HATCH COVER PLAN
SCALE 1/2"=1'-0"

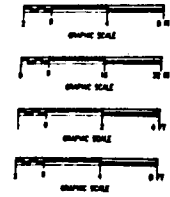


SECTION "B-B"
SCALE 1/2"=1'-0"



GATE & FENCE DETAIL
SCALE 1/2"=1'-0"

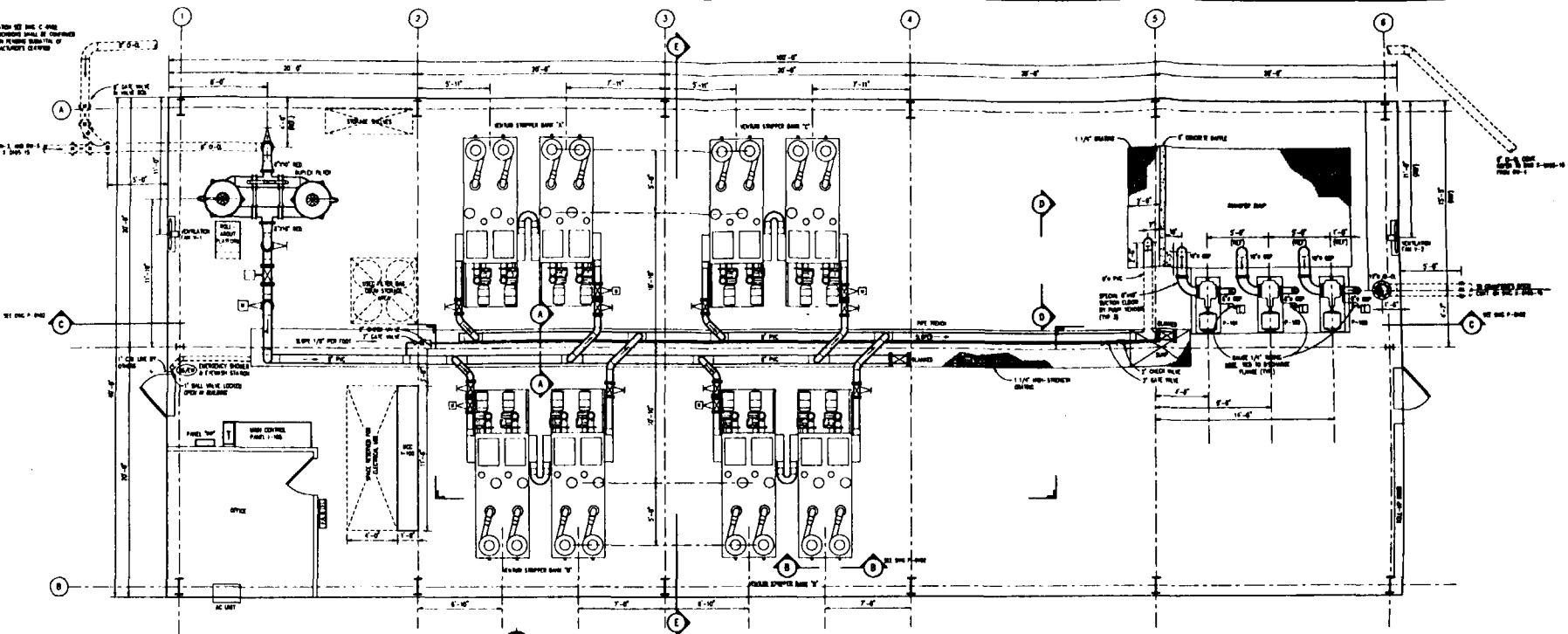
- NOTES
1. SEE WELLS DRAWING FOR SIZE OF THE (A) RECOVERY WELLS. WELLS ARE TO BE INSTALLED IN ACCORDANCE WITH THE FOLLOWING: (A) - 24" DIA. x 30' DEEP; (B) - 24" DIA. x 40' DEEP; (C) - 24" DIA. x 50' DEEP.
 2. SEE SECTIONS DRAWING (C-C) FOR REINFORCED CONCRETE AND DIMENSIONS.
 3. SEE DRAWING C-2001 FOR CONCRETE GENERAL NOTES.
 4. FINISH EXTERIOR OF WELLS WITH 1" DIA. x 12' HIGH AND 12" DIA. WELLS SHALL BE FINISHED WITH 1" DIA. x 12' HIGH.



REFERENCE DRAWINGS	NO.	DATE	REVISIONS	BY	APP.	NO.	DATE	REVISIONS	BY	APP.	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE	CLIENT	CONSOLIDATED RAIL CORPORATION	ADDRESS	3001 MARKET STREET PHILADELPHIA, PA.	GROUNDWATER TECHNOLOGY, INC.	200 UNIVERSITY CITY CENTER PHILADELPHIA, PA. 19104		
											APPROVAL		ENGINEER		PROJECT	GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAIL ELIZABETH RAIL YARD			FILE:	RECOVERY WELL VAULT SECTIONS & DETAILS		
											APPROVAL		APPROVAL		SCALE	AS SHOWN	PRIORITY	0000-0100	DRAWING NO.	C-004	REVISED	0

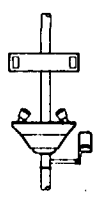
NOTES:
 1. THE MACHINE LEGATION SEE SHEET C-100
 2. ALL EQUIPMENT AND/OR SHALL BE PROVIDED
 FROM MANUFACTURER'S DRAWINGS OF
 EQUIPMENT MANUFACTURER'S DRAWINGS

F-10-01-001
 FROM SHEET C-100, PART 1-100, SHEET C-100
 CONTACT THE SHEET C-100, PART 1-100

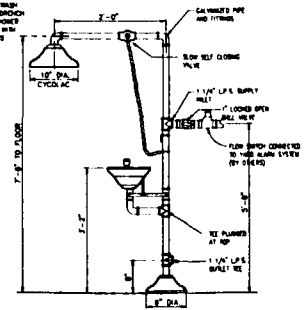


WATER SAVER FAUCET CO. MODEL SS-800

SAFETY SHOWER AND EYE WASH
 COMBINATION WITH PRET STANDING SHOWER
 SHOWER, 1" BLOW-BLEED CLOSING SHOWER
 VALVE, HAND OPERATED 1/2" WASH WITH
 200 PSI STREAM HEAD AND STAINLESS
 STEEL BOWL, FLOOR FLANGE AND
 INTERGRATE BASKET

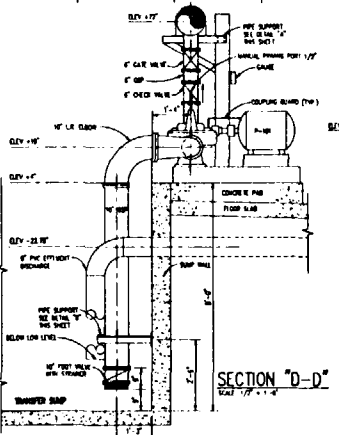


EYEWASH
 1/4" SCALE



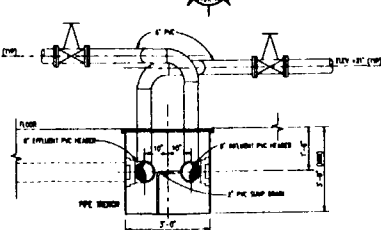
FLOOR-MTD SAFETY SHOWER
 1/4" SCALE

DETAIL: SAFETY SHOWER & EYEWASH

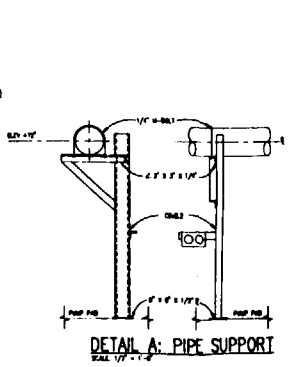


SECTION "D-D"
 1/4" SCALE

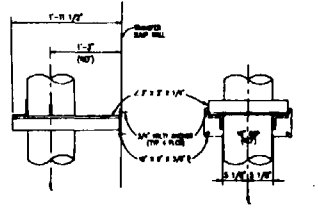
FLOOR PLAN
 SCALE 1/8" = 1'-0"



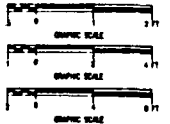
SECTION "A-A"
 1/4" SCALE



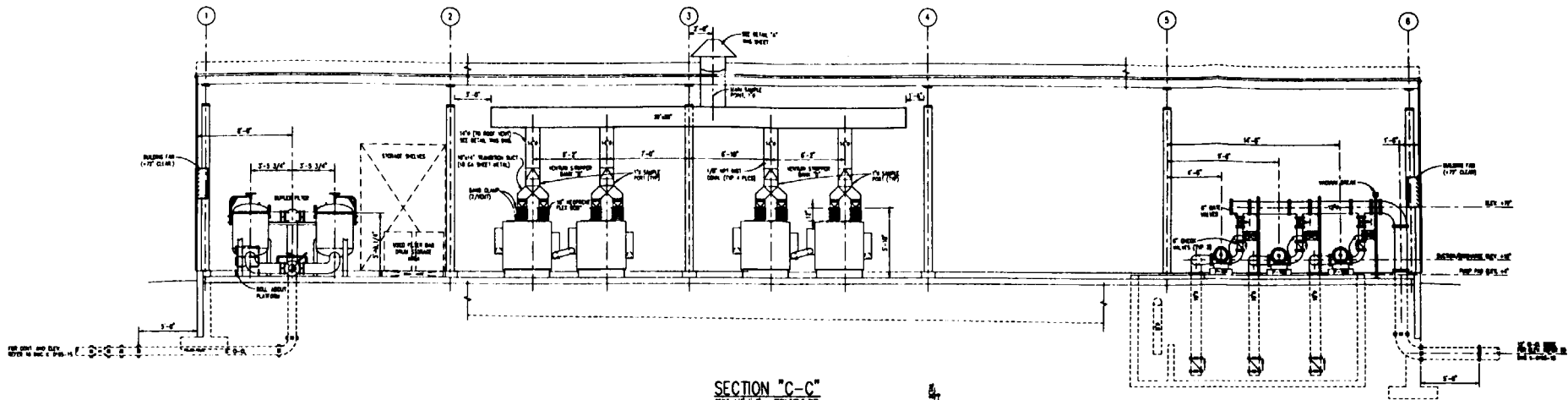
DETAIL A: PIPE SUPPORT
 1/4" SCALE



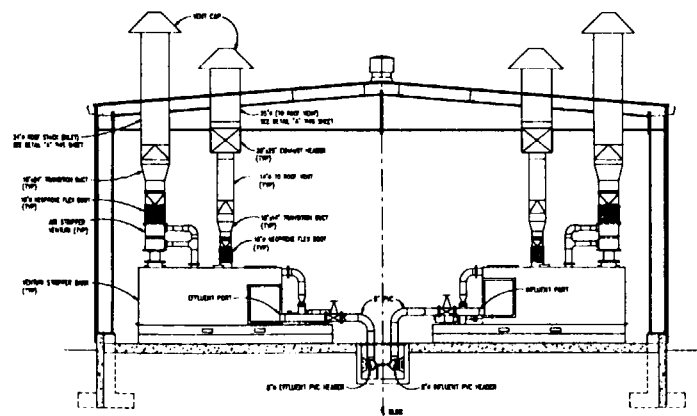
DETAIL B: PIPE SUPPORT
 1/4" SCALE



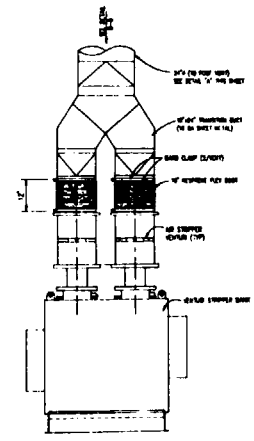
REFERENCE DRAWINGS	NO	DATE	REVISIONS	BY	APP	NO	DATE	REVISIONS	BY	APP	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE	CLIENT	ADDRESS	TITLE	SCALE	PROJECT NO.	DRAWING NO.	REVISION
															CONSOLIDATED RAIL CORPORATION	2001 MARKET STREET PHILADELPHIA, PA.	TREATMENT BUILDING EQUIPMENT AND PIPING PLAN	AS SHOWN	04028-0120	P-0101	0



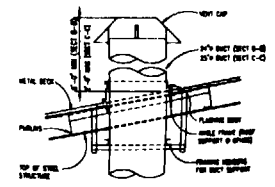
SECTION "C-C"
SCALE: 1/4" = 1'-0" FROM SHEET 7-200



SECTION "E-E"
SCALE: 1/4" = 1'-0" FROM SHEET 7-200



SECTION "B-B"
SCALE: 1/2" = 1'-0" FROM SHEET 7-200



DETAIL "A"
SCALE: 1/2" = 1'-0"

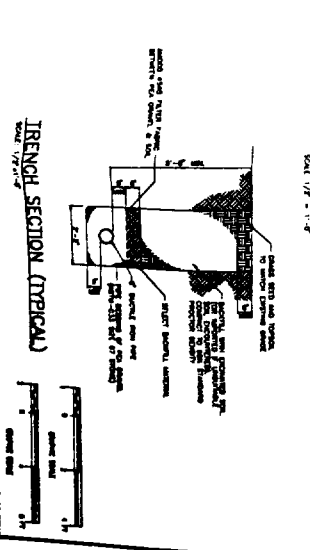
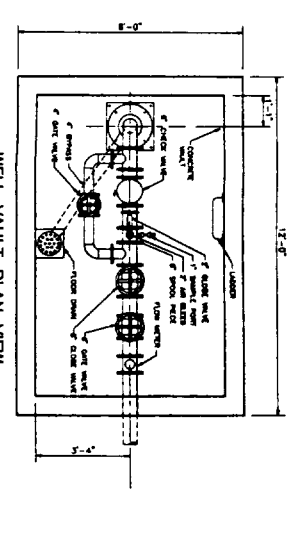
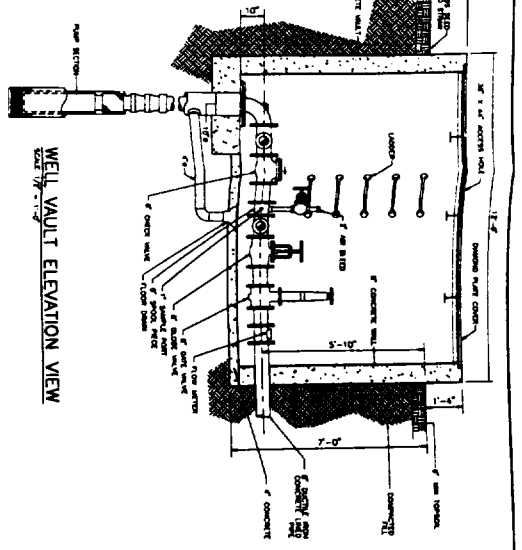
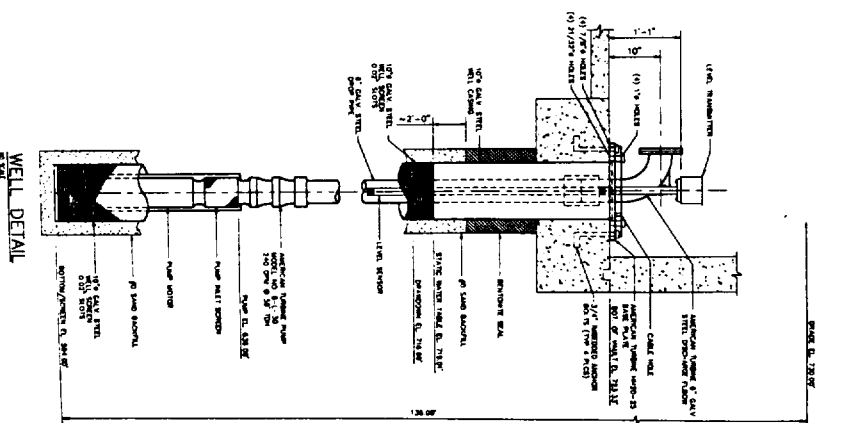
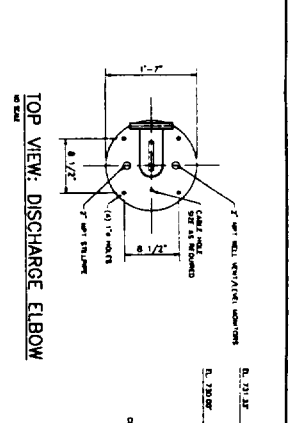
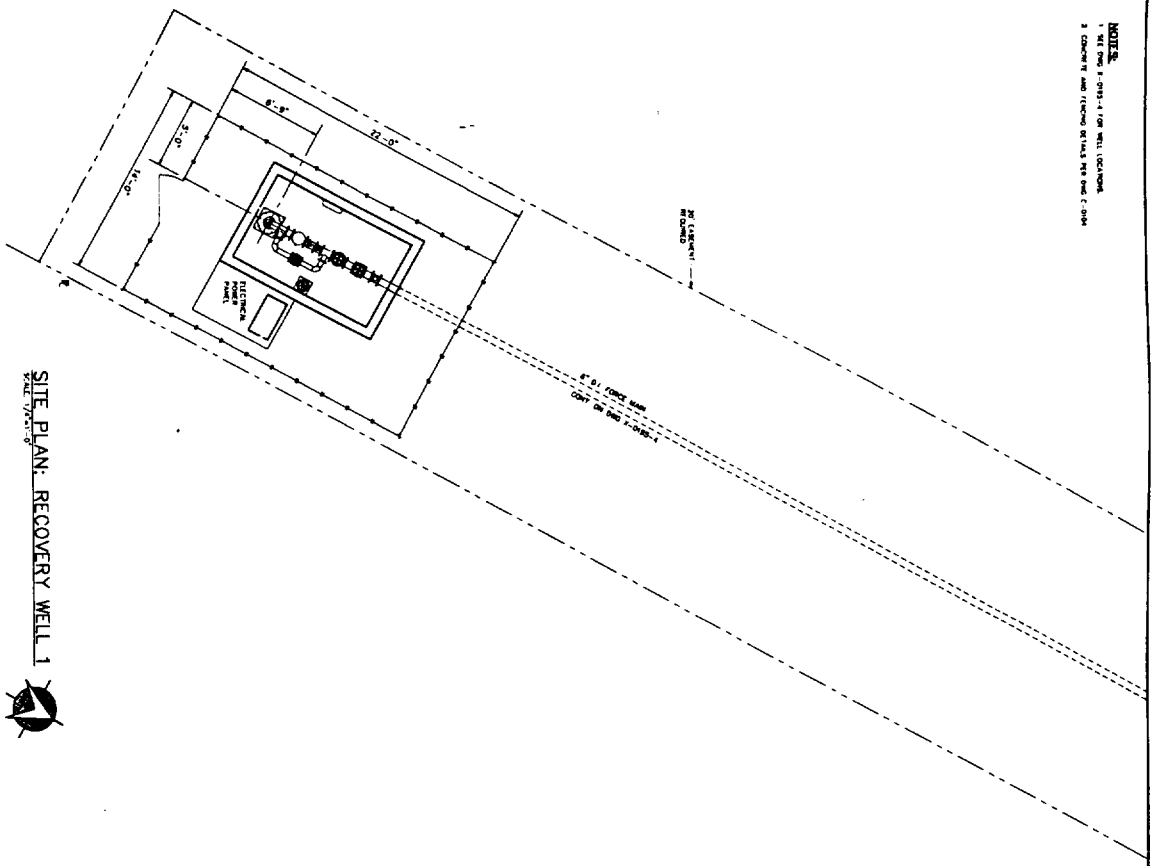
1. ALL DIMENSIONS UNLESS OTHERWISE NOTED ARE TO FACE UNLESS OTHERWISE NOTED.
2. FINISHES ARE TO BE AS SHOWN ON SHEET 7-200.
3. REFER TO SHEET 7-200 FOR ALL NOTES.



7/20/99 - 28 APR 04

REFERENCE DRAWINGS	NO	DATE	REVISIONS	BY	APP	NO	DATE	REVISIONS	BY	APP	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE	CLIENT	CONSOLIDATED RAIL CORPORATION 2001 MARKET STREET PHILADELPHIA, PA	PROJECT	GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAIL ELKHART RAIL YARD	FILED	GROUNDWATER TECHNOLOGY, INC. 400 WASHINGTON & MARKET STS PHILADELPHIA, PA 19106-3000
						8	4/1/04	ISSUED FOR FINAL DESIGN SUBMITTAL	JET	PEL	APPROVAL		DRAWN	3	6/0	4/1/04				
											APPROVAL		CHECKED	2	2	4/1/04				
											CONSTRUCTION		ENGINEER	1	1	4/1/04				
													APPROVAL							
													APPROVAL							
													APPROVAL							

NOTES:
 1. SEE DRAWING 101-1 FOR WELL LOCATION.
 2. CHECK FOR AND REMOVE ALL S&W BEFORE CONSTRUCTION.



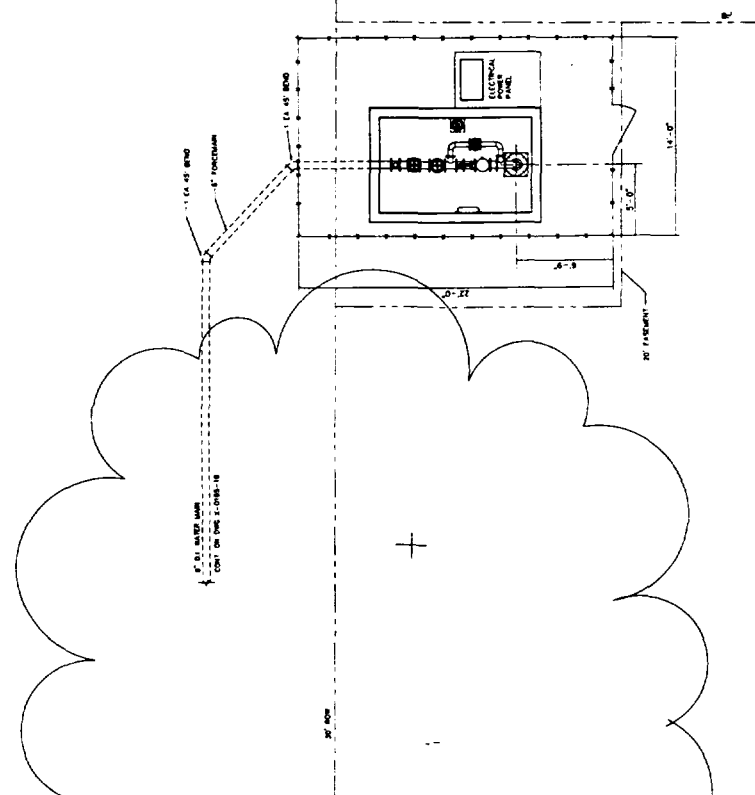
NO.	DATE	BY	CHKD	REVISIONS
1	1/11/11	JLH	WJM	ISSUE FOR PERMITS
2	1/11/11	JLH	WJM	ISSUE FOR CONSTRUCTION
3	1/11/11	JLH	WJM	ISSUE FOR CONSTRUCTION
4	1/11/11	JLH	WJM	ISSUE FOR CONSTRUCTION
5	1/11/11	JLH	WJM	ISSUE FOR CONSTRUCTION
6	1/11/11	JLH	WJM	ISSUE FOR CONSTRUCTION
7	1/11/11	JLH	WJM	ISSUE FOR CONSTRUCTION
8	1/11/11	JLH	WJM	ISSUE FOR CONSTRUCTION
9	1/11/11	JLH	WJM	ISSUE FOR CONSTRUCTION
10	1/11/11	JLH	WJM	ISSUE FOR CONSTRUCTION

DATE	PROJECT	CONTRACT NO.	CONTRACT DESCRIPTION
1/11/11	RECOVERY WELL 1 - SITE PLAN & DETAILS		

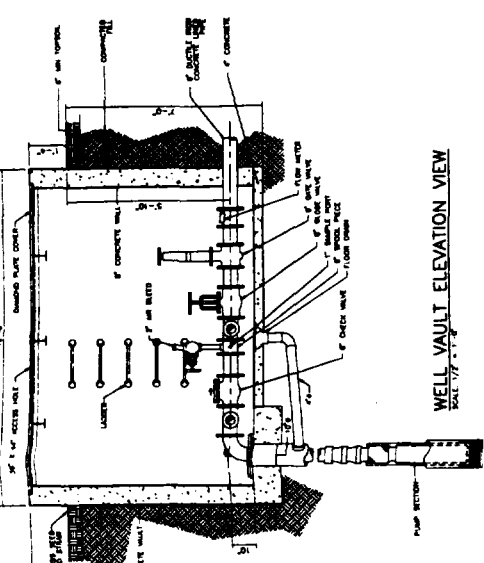
DATE	PROJECT	CONTRACT NO.	CONTRACT DESCRIPTION
1/11/11	RECOVERY WELL 1 - SITE PLAN & DETAILS		

NOTES:
 1. SEE SHEET 17-1 FOR WELL LOCATION.
 2. CONCRETE AND FINISHING DETAILS PER SHEET C-204.

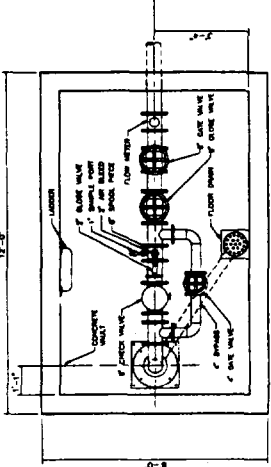
BELFLOWER RD



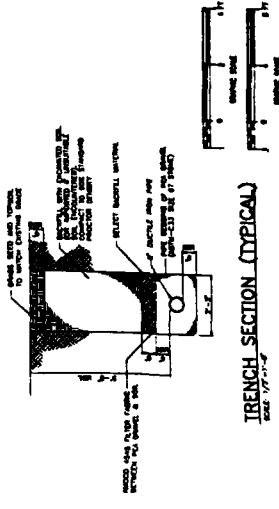
SITE PLAN: RECOVERY WELL 2
 SCALE 1/8\"/>



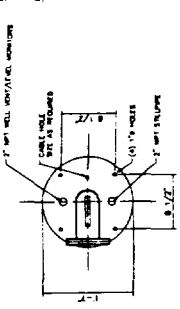
WELL VAULT ELEVATION VIEW
 SCALE 1/8\"/>



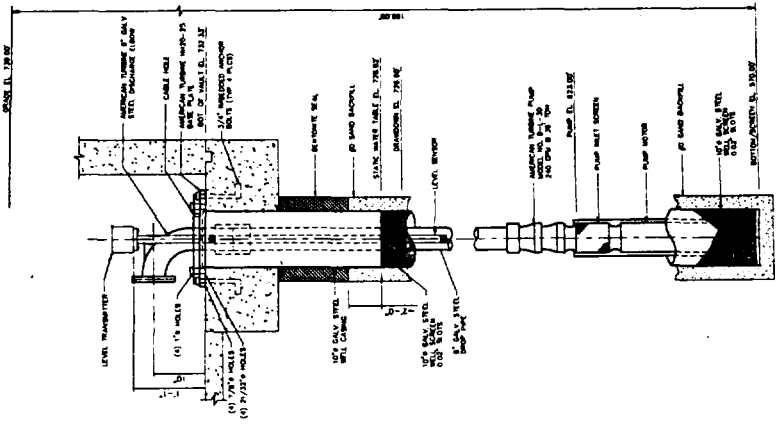
WELL VAULT PLAN VIEW
 SCALE 1/8\"/>



TRENCH SECTION (TYPICAL)
 SCALE 1/8\"/>



TOP VIEW: DISCHARGE ELBOW
 SCALE 1/8\"/>



WELL DETAIL
 SCALE 1/8\"/>

NO.	DATE	BY	CHKD	NO.	DATE	BY	CHKD	NO.	DATE	BY	CHKD	NO.	DATE	BY	CHKD	NO.	DATE	BY	CHKD
1	11/17/16	JAT	JAT	1	11/17/16	JAT	JAT	1	11/17/16	JAT	JAT	1	11/17/16	JAT	JAT	1	11/17/16	JAT	JAT
2	11/17/16	JAT	JAT	2	11/17/16	JAT	JAT	2	11/17/16	JAT	JAT	2	11/17/16	JAT	JAT	2	11/17/16	JAT	JAT
3	11/17/16	JAT	JAT	3	11/17/16	JAT	JAT	3	11/17/16	JAT	JAT	3	11/17/16	JAT	JAT	3	11/17/16	JAT	JAT
4	11/17/16	JAT	JAT	4	11/17/16	JAT	JAT	4	11/17/16	JAT	JAT	4	11/17/16	JAT	JAT	4	11/17/16	JAT	JAT
5	11/17/16	JAT	JAT	5	11/17/16	JAT	JAT	5	11/17/16	JAT	JAT	5	11/17/16	JAT	JAT	5	11/17/16	JAT	JAT
6	11/17/16	JAT	JAT	6	11/17/16	JAT	JAT	6	11/17/16	JAT	JAT	6	11/17/16	JAT	JAT	6	11/17/16	JAT	JAT
7	11/17/16	JAT	JAT	7	11/17/16	JAT	JAT	7	11/17/16	JAT	JAT	7	11/17/16	JAT	JAT	7	11/17/16	JAT	JAT
8	11/17/16	JAT	JAT	8	11/17/16	JAT	JAT	8	11/17/16	JAT	JAT	8	11/17/16	JAT	JAT	8	11/17/16	JAT	JAT
9	11/17/16	JAT	JAT	9	11/17/16	JAT	JAT	9	11/17/16	JAT	JAT	9	11/17/16	JAT	JAT	9	11/17/16	JAT	JAT
10	11/17/16	JAT	JAT	10	11/17/16	JAT	JAT	10	11/17/16	JAT	JAT	10	11/17/16	JAT	JAT	10	11/17/16	JAT	JAT

CLIENT: CONCRETE WATER TREATMENT CORPORATION
 ADDRESS: 2001 MARKET STREET
 PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM
 FOR CONNA ELKHART AND WAB

PROJECT: RECOVERY WELL 2 - SITE PLAN & DETAILS

DATE: 11/17/16

SCALE: 1/8\"/>

PROJECT NO: 16-000-10

DATE: 11/17/16

SCALE: 1/8\"/>

PROJECT NO: 16-000-10

DATE: 11/17/16

SCALE: 1/8\"/>

PROJECT NO: 16-000-10

DATE: 11/17/16

SCALE: 1/8\"/>

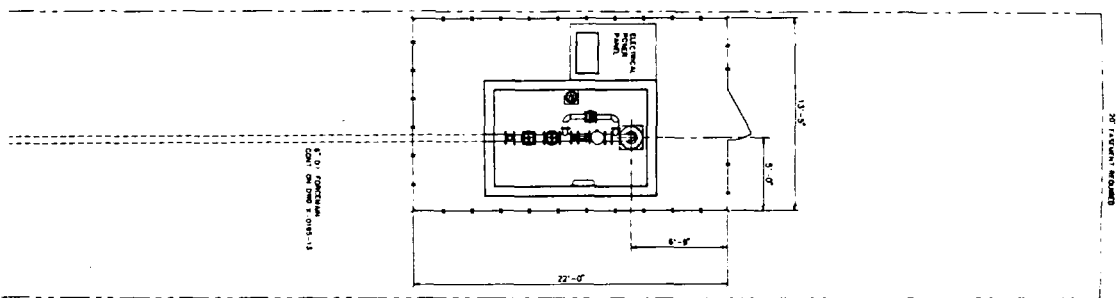
PROJECT NO: 16-000-10

DATE: 11/17/16

SCALE: 1/8\"/>

PROJECT NO: 16-000-10

NOTES:
 1. SEE DWG. 3 FOR WELL LOCATION
 2. CONCRETE AND STEEL SHALL BE PER DWG. C-2004

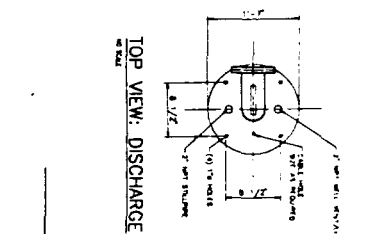


SITE PLAN: RECOVERY WELL 3
 SCALE: 1/8" = 1'-0"

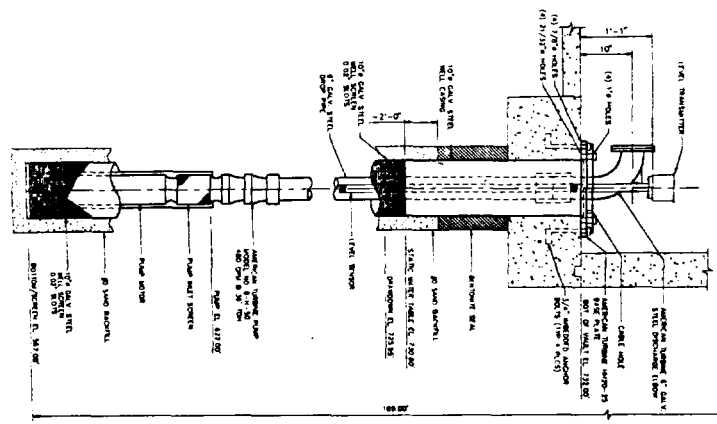


NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011
DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE
BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY
DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION
NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011	NO. 2011
DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE
BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY	BY
DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION	DESCRIPTION

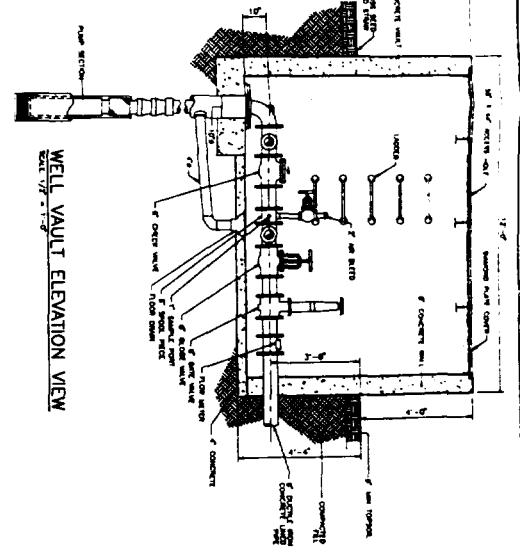
TOP VIEW: DISCHARGE ELBOW
 SCALE: 1/8" = 1'-0"



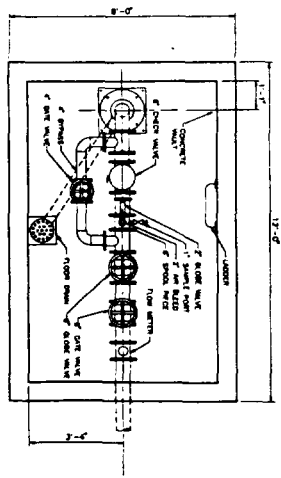
WELL DETAIL
 SCALE: 1/8" = 1'-0"



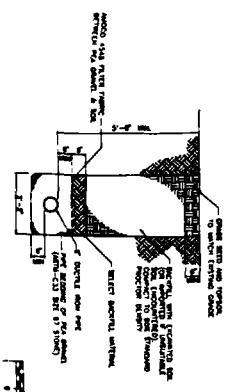
WELL VAULT ELEVATION VIEW
 SCALE: 1/8" = 1'-0"



WELL VAULT PLAN VIEW
 SCALE: 1/8" = 1'-0"



TRENCH SECTION (TYPICAL)
 SCALE: 1/8" = 1'-0"



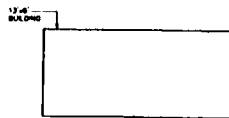
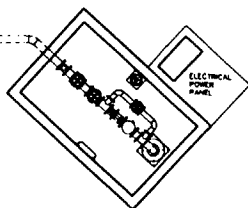
CONSOLIDATED REAL CORPORATION
 200 MARKET STREET
 SAN FRANCISCO, CA 94102
 (415) 774-1100
GROUNDWATER EXTRACTION & TREATMENT SYSTEM
 CONICAL ELBOW AND VALVE

CONSOLIDATED TECHNOLOGY INC.
 200 MARKET STREET
 SAN FRANCISCO, CA 94102
 (415) 774-1100
RECOVERY WELL 3 - SITE PLAN & DETAILS
 SHEET NO. 2011-01

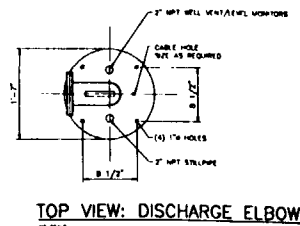
NOTES:

1. SEE DWG. 2-0195-15 FOR WELL LOCATIONS
2. CONCRETE AND FENCING DETAILS PER DWG. C-0104

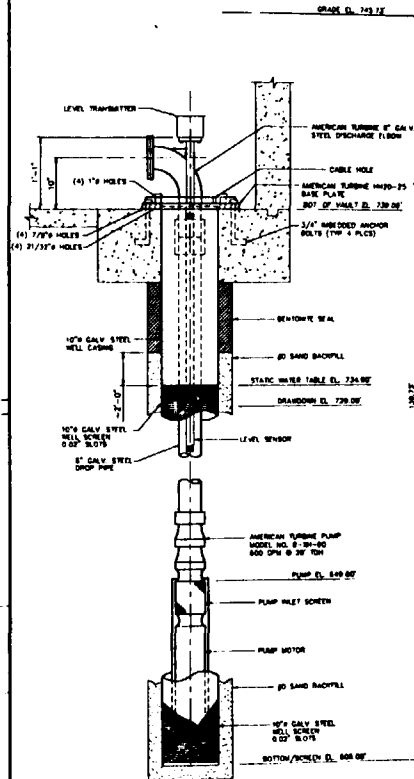
6" D.I. FORCE MAIN
CONT. ON DWG. 2-0195-15



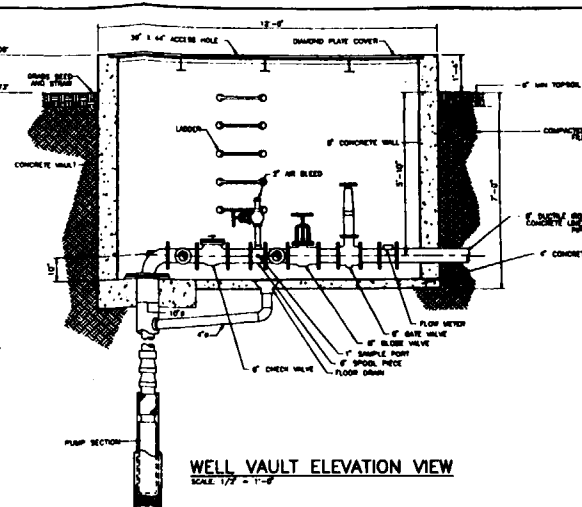
SITE PLAN: RECOVERY WELL 4
SCALE: 1/8" = 1'-0"



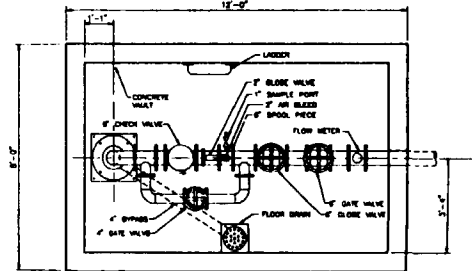
TOP VIEW: DISCHARGE ELBOW
NO SCALE



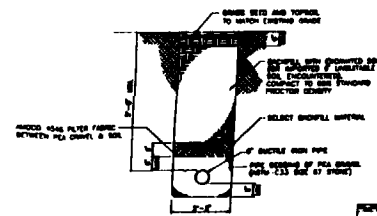
WELL DETAIL
NO SCALE



WELL VAULT ELEVATION VIEW
SCALE: 1/2" = 1'-0"



WELL VAULT PLAN VIEW
SCALE: 1/2" = 1'-0"



TRENCH SECTION (TYPICAL)
SCALE: 1/2" = 1'-0"

REFERENCE DRAWINGS	NO.	DATE	REVISIONS	BY	APP'D	NO.	DATE	REVISIONS	BY	APP'D	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE
						0	4/7/74	BASED FOR FINAL DESIGN SUBMITAL	JLT	REI	APPROVAL		DRAWN	B. GIB
											CONSTRUCTION		CHECKED	JLT
													APPROVAL	1/1/74
													APPROVAL	1/1/74
													APPROVAL	

CLIENT: CONSOLIDATED RAIL CORPORATION
 ADDRESS: 2001 MARKET STREET, PHILADELPHIA, PA.
 PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAIL ELKHART RAIL YARD

GROUNDWATER TECHNOLOGY, INC.
 400 BROADWAY & GREENWAY
 PHILADELPHIA, PA. 19106-3000
FILED: RECOVERY WELL 4 - SITE PLAN & DETAILS
 SCALE: AS SHOWN PROJECT NO.: 04000-0130 DRAWING NO.: 2-0195-15

ONE - LINE DIAGRAM SYMBOLS

- CIRCUIT AND EQUIPMENT INSTALLED BY THIS CONTRACT
- - - EQUIPMENT ENCLOSURE
- - - CONTROL OR INTERLOCK CIRCUIT
CONNECTION
MOLDED CASE CIRCUIT BREAKER
FUSE
FUSED DISCONNECT SWITCH
FULL VOLTAGE, NON-REVERSING (FVNR) MAGNETIC MOTOR STARTER W/OVERLOADS
MANUAL MOTOR STARTER W/OVERLOADS
AMMETER SWITCH
VOLTMEETER SWITCH
AMMETER
VOLTMETER
FUSED POTENTIAL TRANSFORMERS
CURRENT TRANSFORMER
POWER TRANSFORMER
LIGHTNING OR SURGE ARRESTER
GROUND CONNECTION
KW-HOUR METER SOCKET, METER FURNISHED BY UTILITY.
MOTOR - NUMBER INDICATES HP

PLAN SYMBOLS

- NEW CONSTRUCTION
EXISTING CONSTRUCTION
EXISTING CONSTRUCTION TO BE REMOVED
CONDUIT EXPOSED
CONDUIT CONCEALED IN FLOOR OR UNDERGROUND
FLEXIBLE CONDUIT (LIQUID TIGHT)
GROUND CABLE
WELDED GROUND CONNECTION
GROUND ROD
HOMERUN, ARROWHEADS INDICATE NUMBER OF CIRCUITS
CONDUIT TURNING UP
CONDUIT TURNING DOWN
CONDUIT WITH BUSHING
FLUORESCENT LUMINAIRE TYPE L-1
INCANDESCENT OR H.I.D. LUMINAIRE TYPE L-1
EMERGENCY LIGHTING UNIT
EMERGENCY FLUORESCENT LIGHTING FIXTURE
DUPLEX RECEPTACLE WP-WEATHERPROOF GFI-GROUND FAULT CIRCUIT INTERRUPTER
RECEPTACLE-208V-3 PHASE
THERMOSTAT
S SINGLE POLE SWITCH
S2 THREE-WAY SWITCH
S4 FOUR-WAY SWITCH
RECEPTACLE-CLASS 1, DIVISION 1, GROUPS C, D
RECEPTACLE-CLASS 1, DIVISION 2, GROUPS C, D
POWER PANEL-480V, 3P
LIGHTING PANEL-120/240V, 1P OR 208/120, 3P
DISCONNECT (SAFETY) SWITCH
MANUAL MOTOR STARTER
MAGNETIC MOTOR STARTER
COMBINATION MAGNETIC MOTOR STARTER
MOTOR (NUMBER INDICATES HP)
JUNCTION BOX
EXIT LIGHT
FIRE ALARM PANEL
FIRE ALARM HORN / STROBE LIGHT
FIRE PULL BOX
PHOTO-ELECTRIC SMOKE DETECTOR
HEAT DETECTOR

SCHEMATIC DIAGRAM SYMBOLS

- □ TERMINAL
CONDUCTOR CONNECTION
NO CONNECTION
CONTACT NORMALLY OPEN (NO)
CONTACT NORMALLY CLOSE (NC)
SWITCH
SELECTOR SWITCH
PUSHBUTTON-NORMALLY OPEN MOMENTARY
PUSHBUTTON-NORMALLY CLOSED MOMENTARY
PRESSURE OR VACUUM SWITCH-CLOSES WITH INCREASING PRESSURE OR DECREASING VACUUM
PRESSURE OR VACUUM SWITCH-OPENS WITH INCREASING PRESSURE OR DECREASING VACUUM
FLOW SWITCH-CLOSES WITH INCREASING FLOW
E-STOP PUSHBUTTON-MAINTAINED
LIMIT SWITCH NC
LIMIT SWITCH NC-HELD OPEN
NO TIME DELAY CONTACT, TIME DELAY CLOSING AFTER ENERGIZATION
NC TIME DELAY CONTACT, TIME DELAY OPENING AFTER ENERGIZATION
NO TIME DELAY CONTACT, TIME DELAY OPENING AFTER DE-ENERGIZATION
NC TIME DELAY CONTACT, TIME DELAY CLOSING AFTER DE-ENERGIZATION
MOTOR STARTER COIL
RELAY COIL
INDICATING LIGHT-COLOR INDICATED
SOLENOID VALVE COIL
THERMAL OVERLOAD RELAY CONTACT
FLOW SWITCH-OPENS WITH INCREASING FLOW
LIQUID LEVEL SWITCH-CLOSES ON RISING LEVEL
LIQUID LEVEL SWITCH-OPENS ON RISING LEVEL
TEMPERATURE SWITCH-CLOSES ON RISING TEMPERATURES
TEMPERATURE SWITCH-OPENS ON RISING TEMPERATURES
LIMIT SWITCH NO
LIMIT SWITCH NO-HELD CLOSED
CONTROL POWER TRANSFORMER (CPT)
GROUND
HORN
BELL

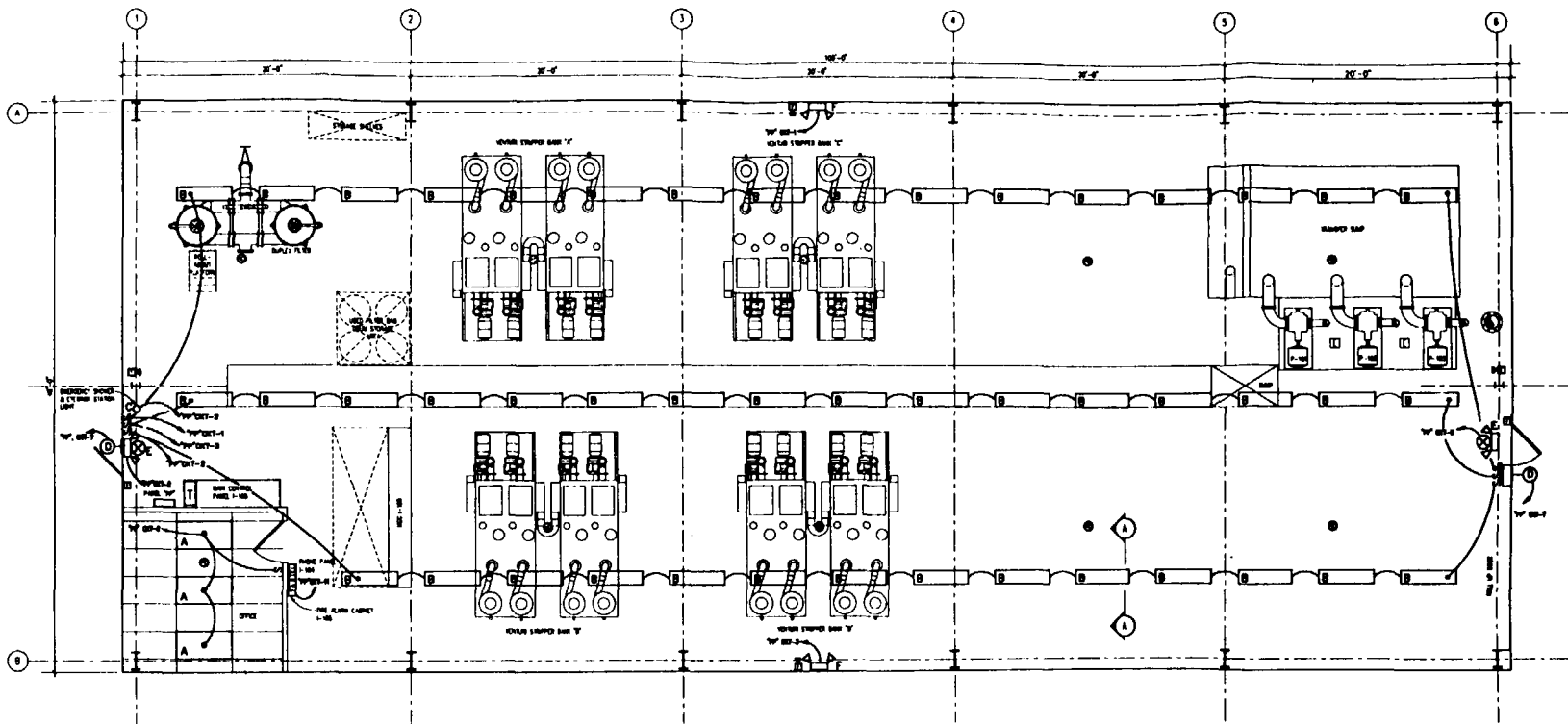
GENERAL ABBREVIATIONS

- A, AUTO AUTOMATIC
ACK ACKNOWLEDGE
AFF ABOVE FINISH FLOOR
AFB ABOVE FINISH GRADE
BC BARE COPPER
C CONDUIT
CB CIRCUIT BREAKER
CL CLOSE
CPT CONTROL POWER TRANSFORMER
CR CONTROL RELAY
CS CONTROL SWITCH
CT CURRENT TRANSFORMER
DWB DRAWING
ETM ELAPSED TIME METER
FU FUSE
FWD FORWARD
GND GROUND
H HAND
H HIGH
HS HIGH SPEED
IL INDICATING LIGHT
INST INSTANTANEOUS
L LOW
LOC LOCAL
LS LOW SPEED
MAN MANUAL
MC NORMALLY CLOSED
MO NORMALLY OPEN
O OFF
OL THERMAL OVERLOAD RELAY
OP OPEN
PB PUSHBUTTON
PLC PROGRAMMABLE LOGIC CONTROLLER
REMOTE
REV REVERSE
SOL SOLENOID (OTHER THAN VALVE)
SP SPARE
SW SELECTOR SWITCH
SV SOLENOID VALVE
T, T-STAT THERMOSTAT
TDM TIME DELAY AFTER ENERGIZATION
TDDP TIME DELAY AFTER DE-ENERGIZATION
TRM TIME DELAY RELAY
TEMP TEMPERATURE
TMR TIMER
WP WEATHERPROOF
WTR TRANSFORMER
XP EXPLOSIONPROOF-CLASS 1, DIVISION 1, GROUPS C, D

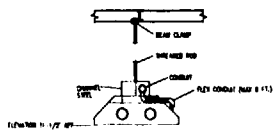
NOTE: THIS DRAWING AND ANY ATTACHMENTS ("DRAWINGS") HAVE BEEN PRODUCED FOR THE SOLE USE OF THE RECIPIENT AND MUST NOT BE USED, REUSED, REPRODUCED, MODIFIED OR COPIED ("USE") IN ANY MANNER WITHOUT PRIOR WRITTEN APPROVAL OF GROUNDWATER TECHNOLOGY, INC. THIS DRAWING MAY CONTAIN CONFIDENTIAL AND PROPRIETARY INFORMATION OF GROUNDWATER TECHNOLOGY, INC. ANY UNAUTHORIZED USE OF THIS DRAWING IS STRICTLY PROHIBITED.

100000 - 1 SHEET

Table with columns: REFERENCE DRAWINGS, NO, DATE, REVISIONS, BY, APP, NO, DATE, REVISIONS, BY, APP, PRINT RECORD, DATE, ENGINEER'S RECORD, DATE, CLIENT, ADDRESS, PROJECT, GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAIL ELKHART RAIL YARD, FILE, ELECTRICAL LEGEND, SCALE, PROJECT NO, DRAWING NO, REVISION.

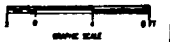


ELECTRICAL PLAN: LIGHTING
SCALE 1/8" = 1'-0"



SECTION A-A
1/8"

FIXTURE SCHEDULE					
A	2" x 4" LAT. W/ PROTECTOR	4 - LAMP	120V	200	HUBBELL - #244 EL
B	INDUSTRIAL RECYCLING	2 - LAMP	120V	100	METALUX - DM-240-LE3-U
C	FLUSH LIGHT	1 - LAMP	120V	100	GRUZE MINDS - V042750 W/BLUE LENS
D	HPS - WALLPACK	1 - LAMP	120V	400	HUBBELL - MACHILITER MMW-0400S-2FS
E	EXIT LIGHT / EMERGENCY LIGHTS	---	120V	60	DUAL LIGHT EMWHR-80
F	EMERGENCY LIGHT	2 - HEAD	120V	100	DUAL LIGHT M467-12V



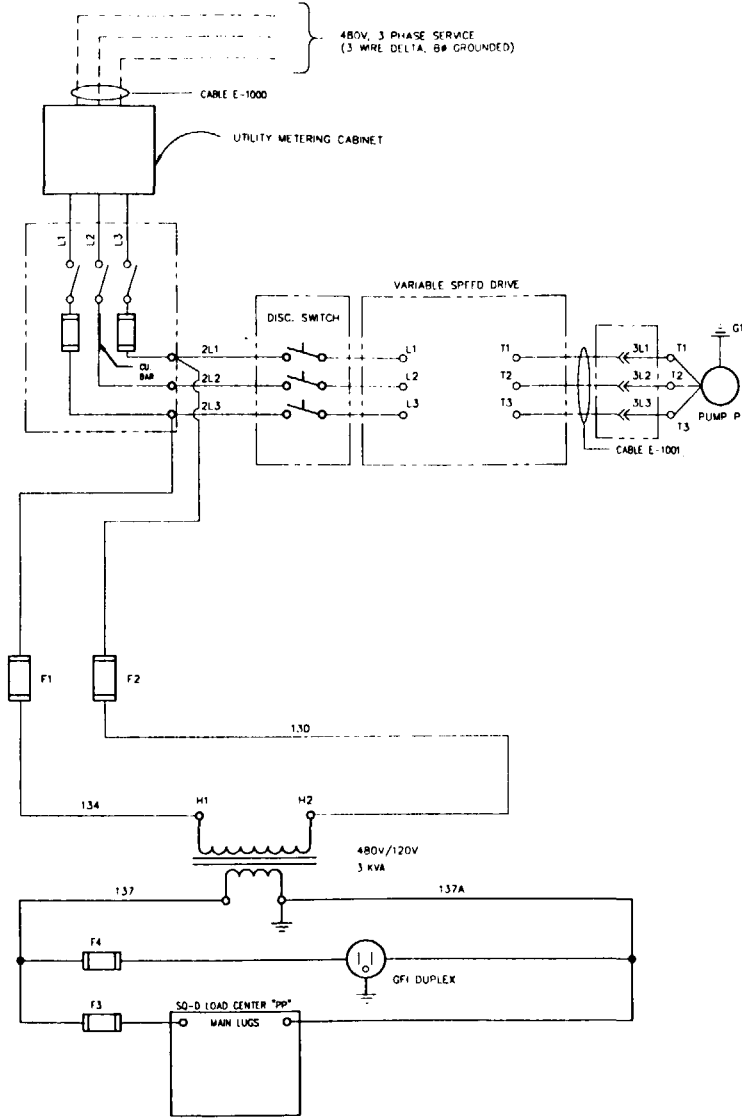
REVISED - 20 APR 84 -

REFERENCE DRAWINGS	NO.	DATE	REVISIONS	BY	APP.	NO.	DATE	REVISIONS	BY	APP.	NO.	DATE	REVISIONS	BY	APP.	NO.	DATE	REVISIONS	BY	APP.	
SHOLE LUM. DRAWING - 1980						0	4/1/84	REVISED FOR FINAL DESIGN SUBMITAL	JLT	ELL											

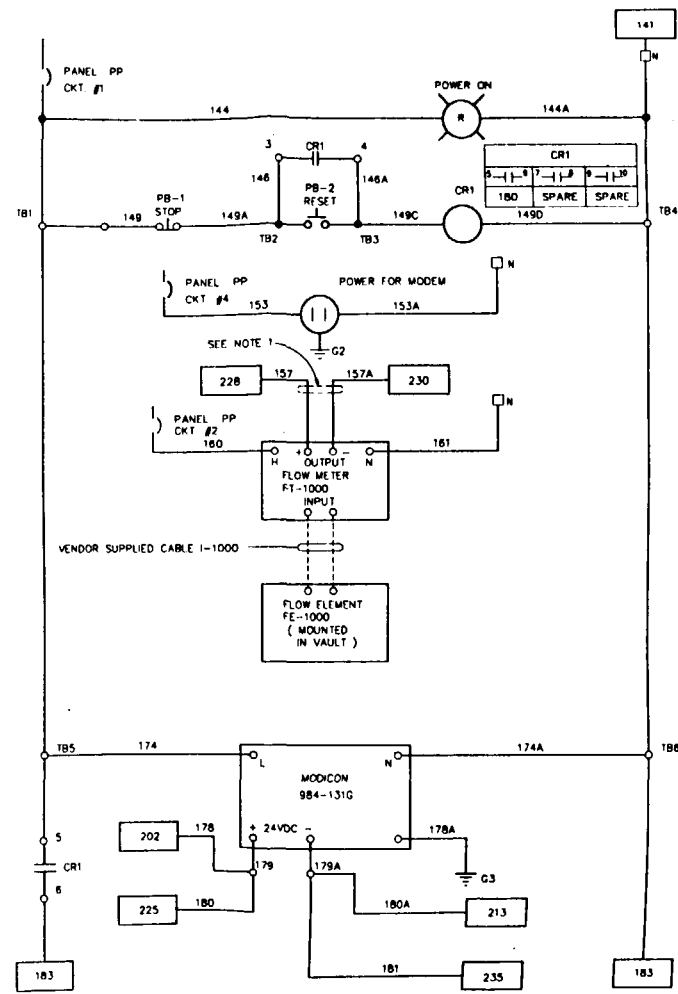
CLIENT: CONSOLIDATED RAIL CORPORATION
 ADDRESS: 2001 MARKET STREET
 PHILADELPHIA, PA.
 PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM
 FOR CONRAL ELIZABETH RAIL YARD

GROUNDWATER TECHNOLOGY, INC.
 600 ROXBOROUGH & GREENWOOD PIKE
 PHILADELPHIA, PA. 19106
 TITLE: TREATMENT BUILDING ELECTRICAL - LIGHTING PLAN
 SCALE: 1/8" = 1'-0"
 PROJECT NO.: 04000-0120
 DRAWING NO.: E-200

101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141



142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182



NOTE:
1. USE SHIELDED CABLE. Belden #1030A OR EQUAL.
CUT AND TAPE SHIELDS AT FIELD END.

PROBOD - 01 APR 84

REFERENCE DRAWINGS	NO	DATE	REVISIONS	BY	APP	NO	DATE	REVISIONS	BY	APP	NO	DATE	ENGINEER'S RECORD	DATE	CLIENT	ADDRESS	CONTRACT NO.	DATE	SCALE	PROJECT NO.	DRAWING NO.	REVISION	
PANEL DRAWING I-100						8	4/1/84	PREP FOR FINAL DESIGN & INSTALL	JST	REL					CONSOLIDATED RAIL CORPORATION	2001 MARKET STREET							
F & B I-008																							

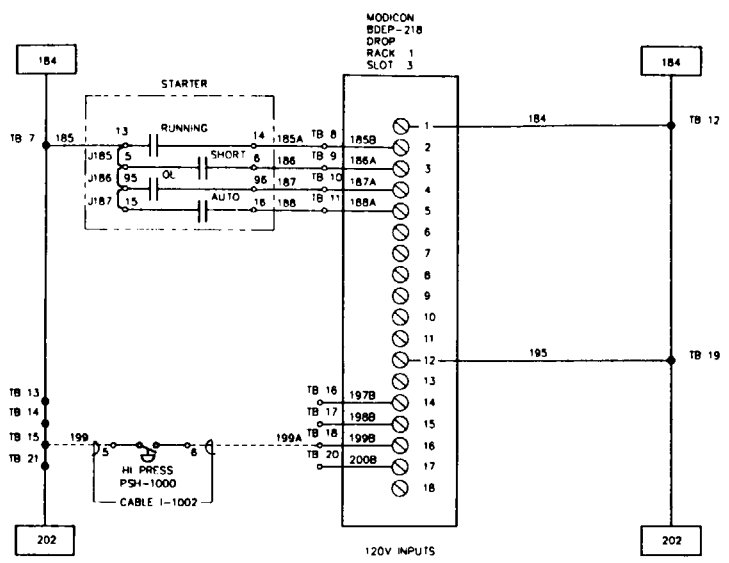
GROUNDWATER TECHNOLOGY, INC.
 200 MARKET STREET
 PHILADELPHIA, PA 19106
 (215) 562-0200

PROJECT:
GROUNDWATER EXTRACTION & TREATMENT SYSTEM
 FOR
CONRAD ELPHART RAIL YARD

WFL:
RECOVERY WELL RW-1
SCHEMATIC SHEET 1

SCALE: NONE
 PROJECT NO: 04002-0130
 DRAWING NO: C-010
 REVISION: 0

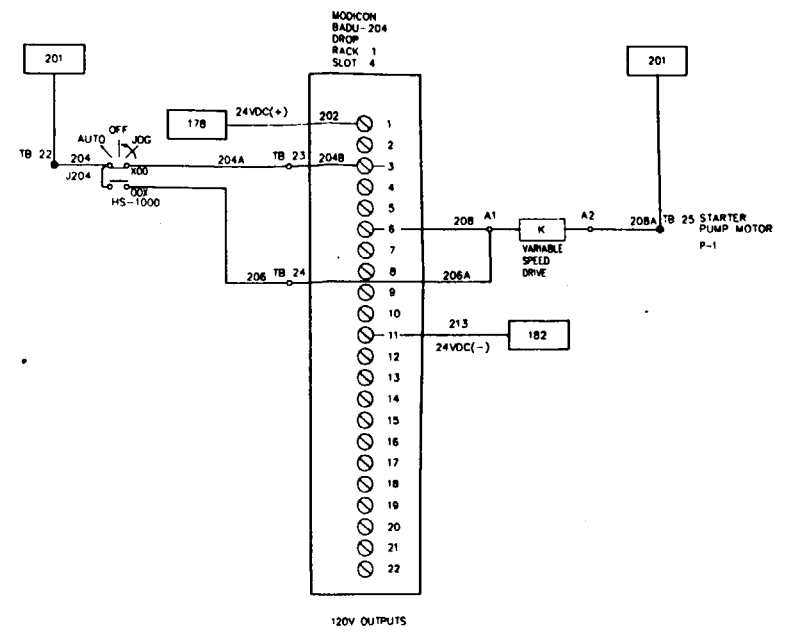
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201



MODICON
BDEP-218
DROP
RACK 1
SLOT 3

120V INPUTS

202
203
204
206
207
208
209
210
211
212
213
214
215
218
217
218
219
220
221
222
223
224



MODICON
BADD-204
DROP
RACK 1
SLOT 4

120V OUTPUTS

PT8000 - 8 APR 84 -

REFERENCE DRAWINGS	NO	DATE	REVISIONS	BY	APP	NO	DATE	REVISIONS	BY	APP	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE	
PANEL DRAWING I-100						8	4/7/84	FIXED FOR PANEL REVISION SUBMITAL	221	REL	APPROVAL		DRAWN	B-DOB	4/7/84
P. D. B. 1-1000											APPROVAL		CHECKED	JAB	4/7/84
											CONSTRUCTION		ENGINEER	EAR	4/7/84
													APPROVAL		
													APPROVAL		

CLIENT: CONSOLIDATED RAIL CORPORATION
ADDRESS: 300 MARKET STREET
PHILADELPHIA, PA.

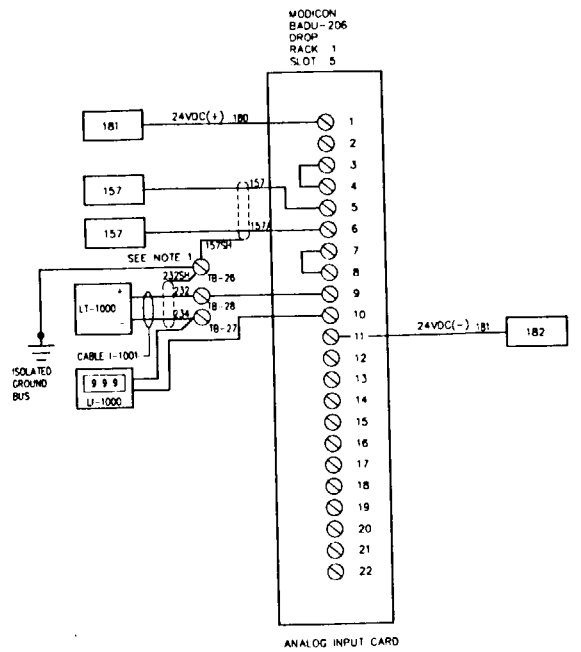
PROJECT:
GROUNDWATER EXTRACTION & TREATMENT SYSTEM
FOR
CONRAIL ELIZABETH RAIL YARD

GROUNDWATER TECHNOLOGY, INC.
100 UNIVERSITY CITY CENTER BUILDING
PHILADELPHIA, PA. 19104
(215) 598-0000

PROJECT: RECOVERY WELL RW-1
SCHEMATIC SHEET 2

SCALE: NONE
PROJECT NO: 840001-01-20
DRAWING NO: E-001
REVISION: 0

- 225
- 226
- 227
- 228
- 229
- 230
- 231
- 232
- 233
- 234
- 235
- 236
- 237
- 238
- 239
- 240
- 241
- 242
- 243
- 244
- 245
- 246



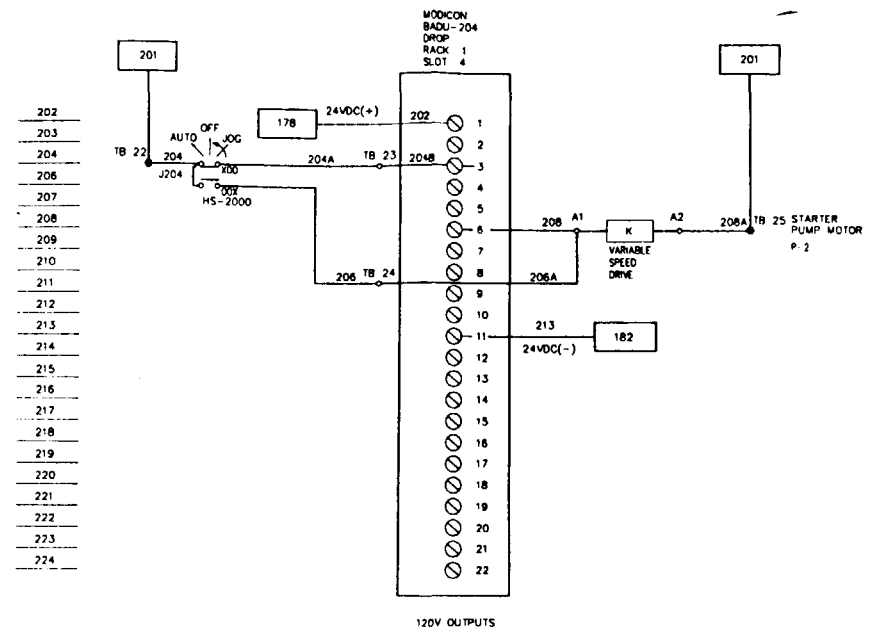
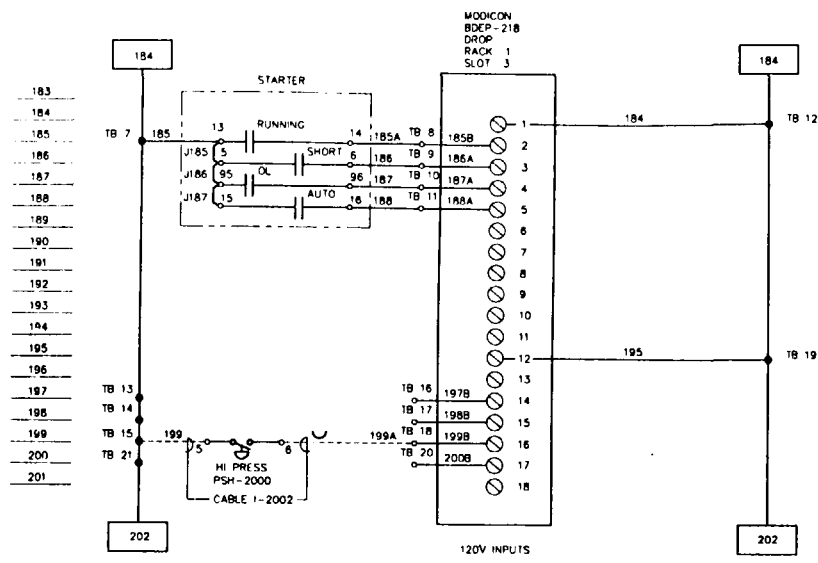
CABLE SCHEDULE						
CABLE NUMBER	CABLE SPEC.	FROM	WA	TO		
E-1000	3/4" P-1/C P2 GRD	UTILITY DROP	1" C	REMOTE PANEL		I-1000
E-1001	3/4" P-1/C P2 GRD	REMOTE PANEL	1-1000	3/4" C	PUMP	P-1
I-1000	VENDOR CABLE	FLOW ELEMENT	FE-1000	3/4" C	FLOW TRANSMITTER	FT-1000
I-1001	3/4" P-1/C P2 GRD	REMOTE PANEL	1-1000	3/4" C	LEVEL TRANSMITTER	LT-1000
I-1002	3/4" P-1/C P2 GRD	REMOTE PANEL	1-1000	3/4" C	PRESSURE SWITCH	PSH-1000

NOTE:
1. USE SHIELDED CABLE, REIDEN #1030A OR EQUAL CUT AND TAPE SHIELDS AT TRANSMITTER END.

REFERENCE DRAWINGS		NO	DATE	REVISIONS	BY	APP	NO	DATE	REVISIONS	BY	APP	NO	DATE	REVISIONS	DATE	ENGINEER'S RECORD	DATE	CLIENT	ADDRESS	PROJECT	SCALE	PROJECT NO.	DRAWING NO.	REVISION
PANEL DRAWING 1-100																		CONSOLIDATED RAIL CORPORATION	2001 MARKET STREET PHILADELPHIA, PA.	GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAIL ELKHART RAIL YARD	SCALE NONE	PROJECT NO. 04000-0100	DRAWING NO. E-012	REVISION 0

GROUNDWATER TECHNOLOGY, INC.
400 MILLIKEN & COMPANY ROAD
CHESHAM, PA 19022

PROJECT: RECOVERY WELL RW-1
SCHEMATIC SHEET 3



PROVIDED - 6/18/84 -

REFERENCE DRAWINGS		NO.	DATE	REVISIONS	BY	APP.	NO.	DATE	REVISIONS	BY	APP.	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE	CLIENT	PROJECT	PRZ.	SERIAL	PROJECT NO.	DRAWING TAG	REVISION	
PANEL DRAWING	1-100						0	1/1/84	ISSUED FOR TANK BENCH INSTALLATION			APPROVAL		DRAWN	8/10/84	CONSOLIDATED RAIL CORPORATION	GROUNDWATER EXTRACTION & TREATMENT SYSTEM	RECOVERY WELL RW-2		0-000-01-00	E-001	0	
P. & B.	2-000											CONSTRUCTION		CHECKED	1/1/84								
												APPROVAL		ENGINEER	1/1/84								
														APPROVAL									
														APPROVAL									

GROUNDWATER TECHNOLOGY, INC.
 1000 MARKET STREET
 PHILADELPHIA, PA. 19107
 (215) 590-0400

PROJECT
 GROUNDWATER EXTRACTION & TREATMENT SYSTEM
 FOR
 CONRAIL ELKHART RAIL YARD

PRZ.
 RECOVERY WELL RW-2
 SCHEMATIC SHEET 2

SERIAL PROJECT NO. 0-000-01-00 DRAWING TAG E-001 REVISION 0

480V, 3 PHASE SERVICE
(3 WIRE DELTA, B6 GROUND)

101

102

103

104

105

106

107

108

109

110

111

112

113

114

115

116

117

118

119

120

121

122

123

124

125

126

127

128

129

130

131

132

133

134

135

136

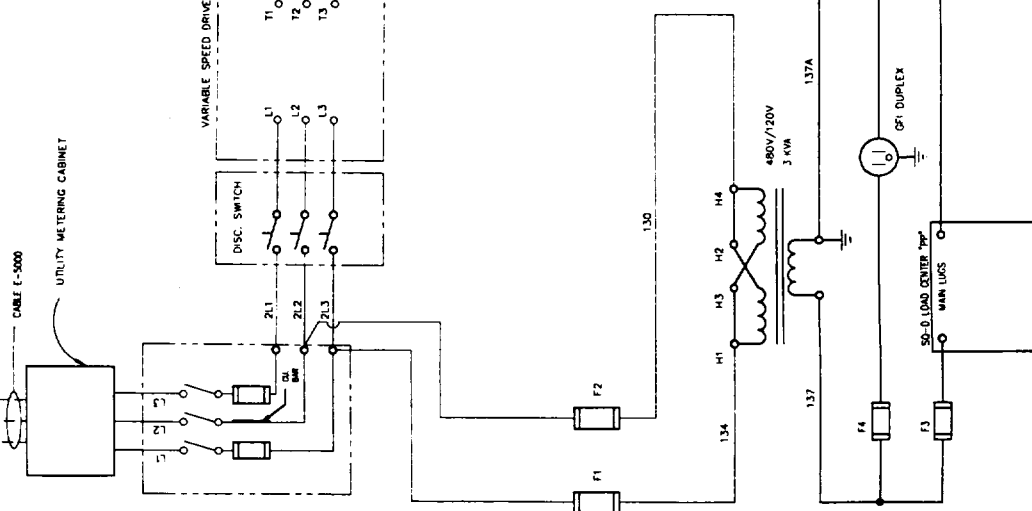
137

138

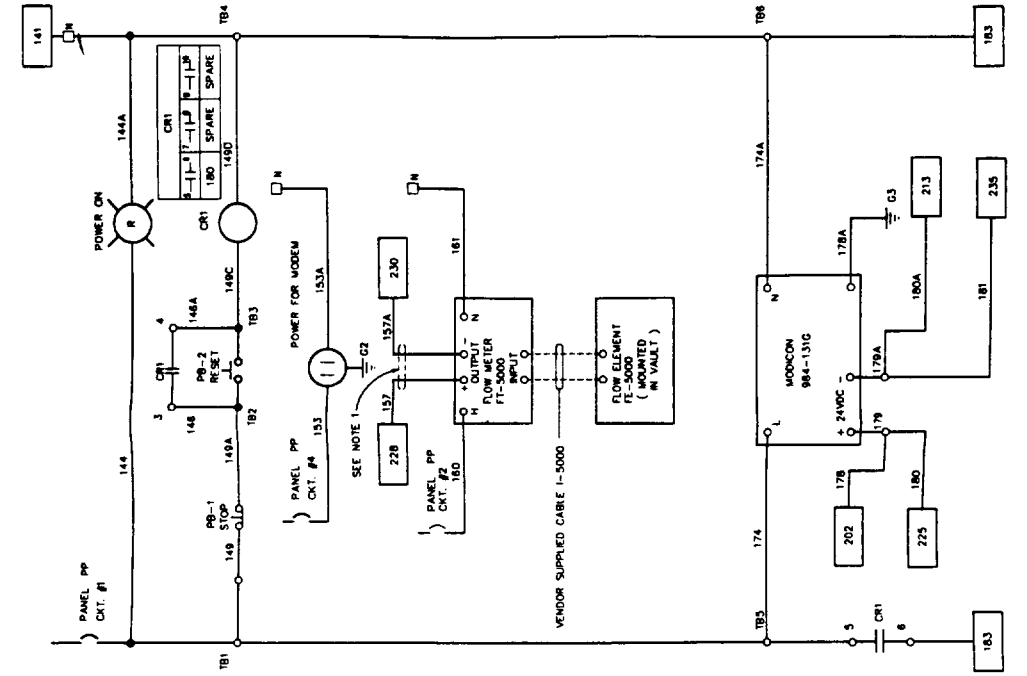
139

140

141



- 142
- 143
- 144
- 145
- 146
- 147
- 148
- 149
- 150
- 151
- 152
- 153
- 154
- 155
- 156
- 157
- 158
- 159
- 160
- 161
- 162
- 163
- 164
- 165
- 166
- 167
- 168
- 169
- 170
- 171
- 172
- 173
- 174
- 175
- 176
- 177
- 178
- 179
- 180
- 181
- 182



NOTE:
1. USE SHIELDED CABLE, BELDEN BDDMA OR EQUAL.
CUT AND TAPE SHIELDS AT FIELD END.

NO.	DATE	REVISIONS	BY	APP'D	DATE	REVISIONS	BY	APP'D	DATE	BY	APP'D	DATE	REVISIONS	BY	APP'D	DATE	REVISIONS	BY	APP'D	DATE	
1	11/18	AS BUILT	AS BUILT		11/18																
2	11/18	AS BUILT	AS BUILT		11/18																
3	11/18	AS BUILT	AS BUILT		11/18																
4	11/18	AS BUILT	AS BUILT		11/18																
5	11/18	AS BUILT	AS BUILT		11/18																
6	11/18	AS BUILT	AS BUILT		11/18																
7	11/18	AS BUILT	AS BUILT		11/18																
8	11/18	AS BUILT	AS BUILT		11/18																
9	11/18	AS BUILT	AS BUILT		11/18																
10	11/18	AS BUILT	AS BUILT		11/18																
11	11/18	AS BUILT	AS BUILT		11/18																
12	11/18	AS BUILT	AS BUILT		11/18																
13	11/18	AS BUILT	AS BUILT		11/18																
14	11/18	AS BUILT	AS BUILT		11/18																
15	11/18	AS BUILT	AS BUILT		11/18																
16	11/18	AS BUILT	AS BUILT		11/18																
17	11/18	AS BUILT	AS BUILT		11/18																
18	11/18	AS BUILT	AS BUILT		11/18																
19	11/18	AS BUILT	AS BUILT		11/18																
20	11/18	AS BUILT	AS BUILT		11/18																
21	11/18	AS BUILT	AS BUILT		11/18																
22	11/18	AS BUILT	AS BUILT		11/18																
23	11/18	AS BUILT	AS BUILT		11/18																
24	11/18	AS BUILT	AS BUILT		11/18																
25	11/18	AS BUILT	AS BUILT		11/18																
26	11/18	AS BUILT	AS BUILT		11/18																
27	11/18	AS BUILT	AS BUILT		11/18																
28	11/18	AS BUILT	AS BUILT		11/18																
29	11/18	AS BUILT	AS BUILT		11/18																
30	11/18	AS BUILT	AS BUILT		11/18																
31	11/18	AS BUILT	AS BUILT		11/18																
32	11/18	AS BUILT	AS BUILT		11/18																
33	11/18	AS BUILT	AS BUILT		11/18																
34	11/18	AS BUILT	AS BUILT		11/18																
35	11/18	AS BUILT	AS BUILT		11/18																
36	11/18	AS BUILT	AS BUILT		11/18																
37	11/18	AS BUILT	AS BUILT		11/18																
38	11/18	AS BUILT	AS BUILT		11/18																
39	11/18	AS BUILT	AS BUILT		11/18																
40	11/18	AS BUILT	AS BUILT		11/18																
41	11/18	AS BUILT	AS BUILT		11/18																
42	11/18	AS BUILT	AS BUILT		11/18																
43	11/18	AS BUILT	AS BUILT		11/18																
44	11/18	AS BUILT	AS BUILT		11/18																
45	11/18	AS BUILT	AS BUILT		11/18																
46	11/18	AS BUILT	AS BUILT		11/18																
47	11/18	AS BUILT	AS BUILT		11/18																
48	11/18	AS BUILT	AS BUILT		11/18																
49	11/18	AS BUILT	AS BUILT		11/18																
50	11/18	AS BUILT	AS BUILT		11/18																

CLIENT: CONSOLIDATED RAIL CORPORATION
ADDRESS: 100 MARKET STREET
PHILADELPHIA, PA 19102
PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAD EIGHTH RAIL YARD
DRAWN BY: [REDACTED]
CHECKED BY: [REDACTED]
DATE: 11/18/18

REVISIONS: [REDACTED]
DATE: 11/18/18
BY: [REDACTED]
APP'D: [REDACTED]

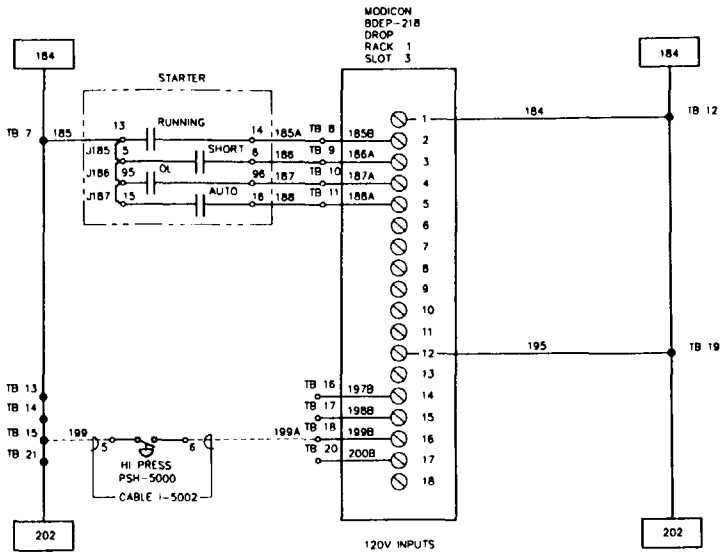
REVISIONS: [REDACTED]
DATE: 11/18/18
BY: [REDACTED]
APP'D: [REDACTED]

REVISIONS: [REDACTED]
DATE: 11/18/18
BY: [REDACTED]
APP'D: [REDACTED]

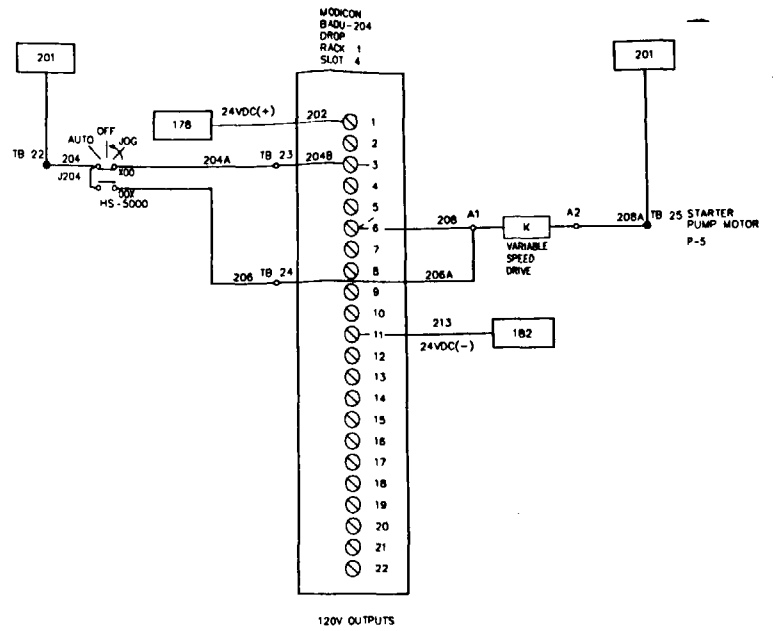
REVISIONS: [REDACTED]
DATE: 11/18/18
BY: [REDACTED]
APP'D: [REDACTED]

REVISIONS: [REDACTED]
DATE: 11/18/18
BY: [REDACTED]
APP'D: [REDACTED]

183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201



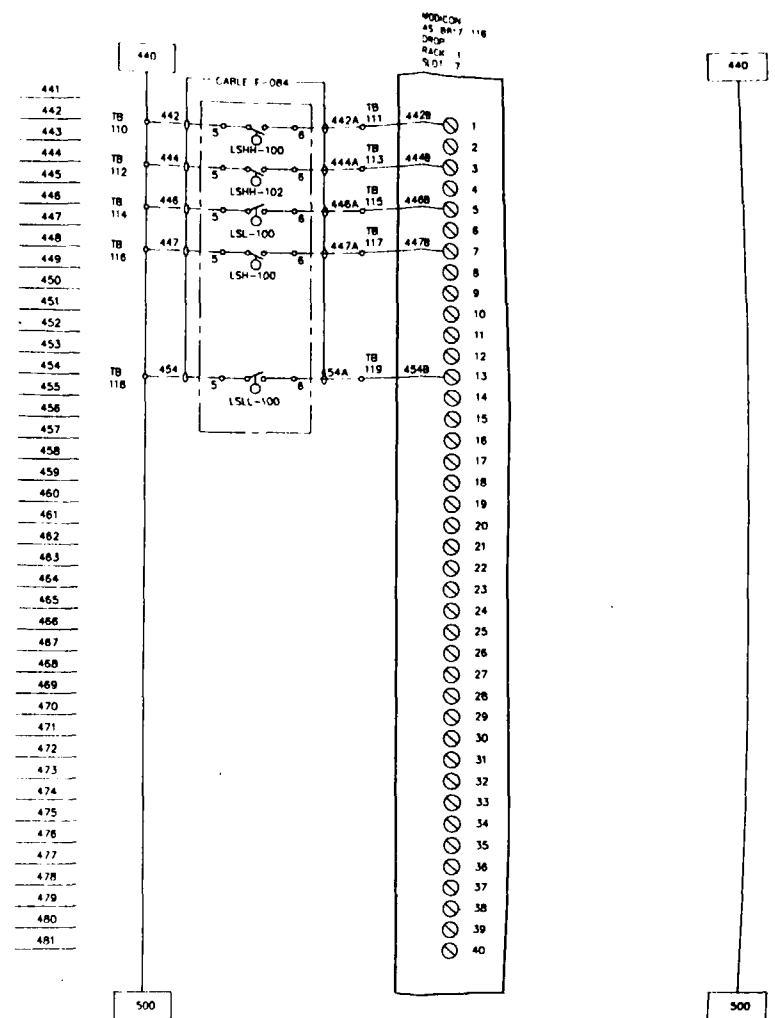
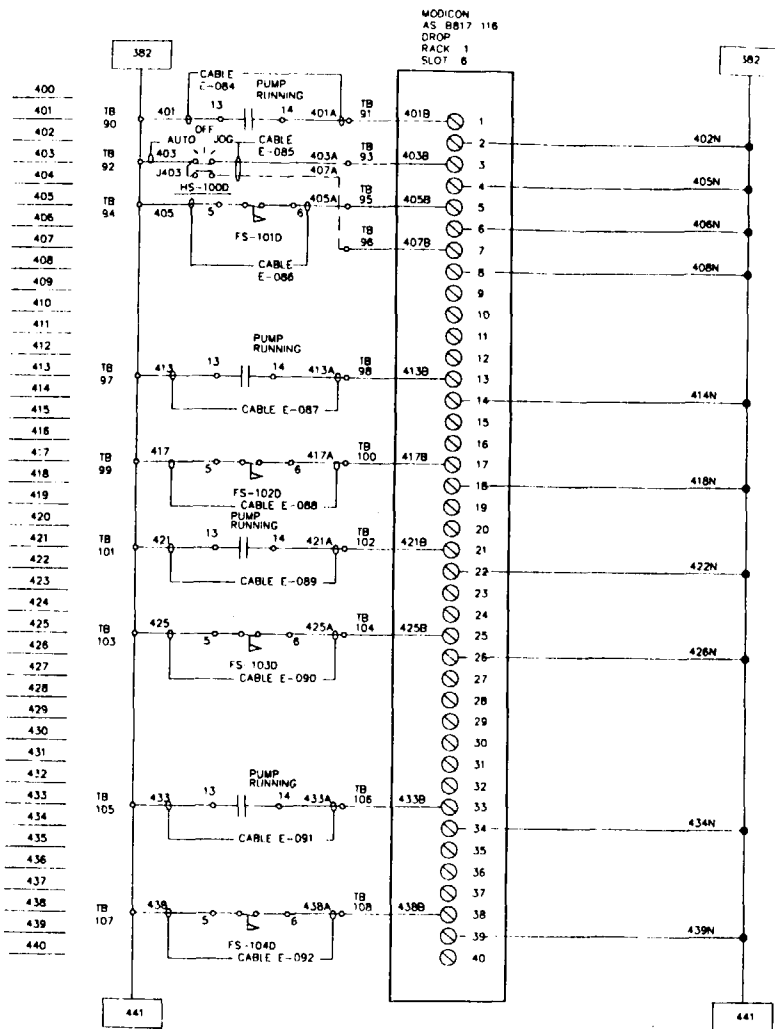
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224



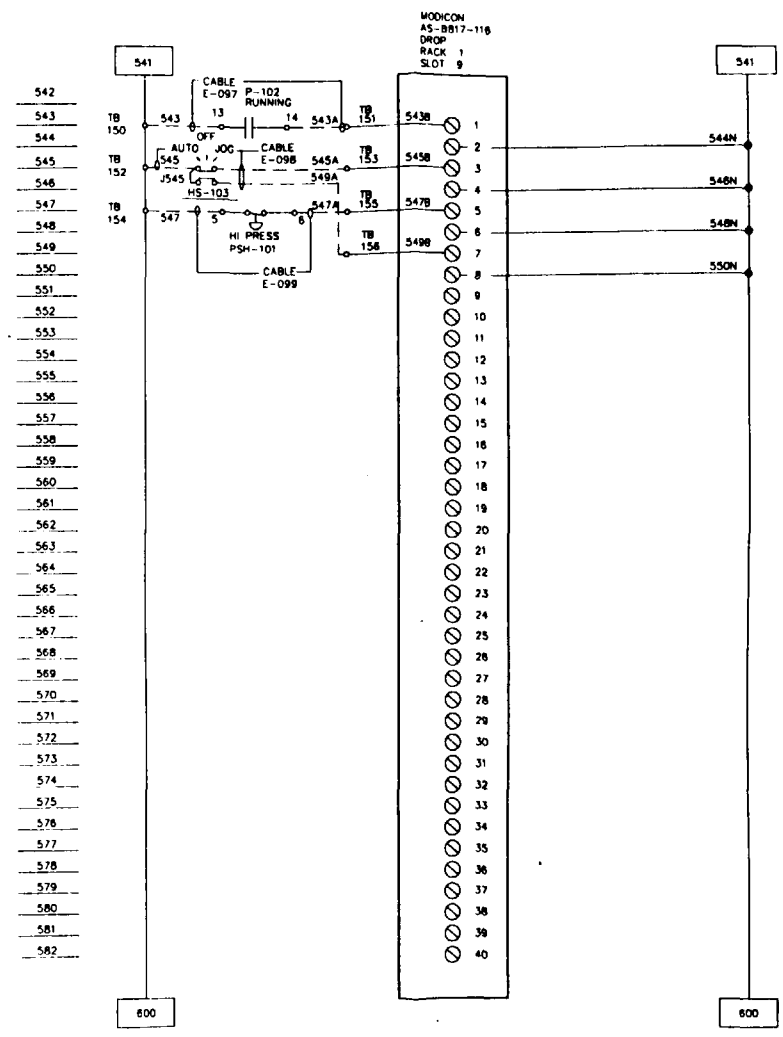
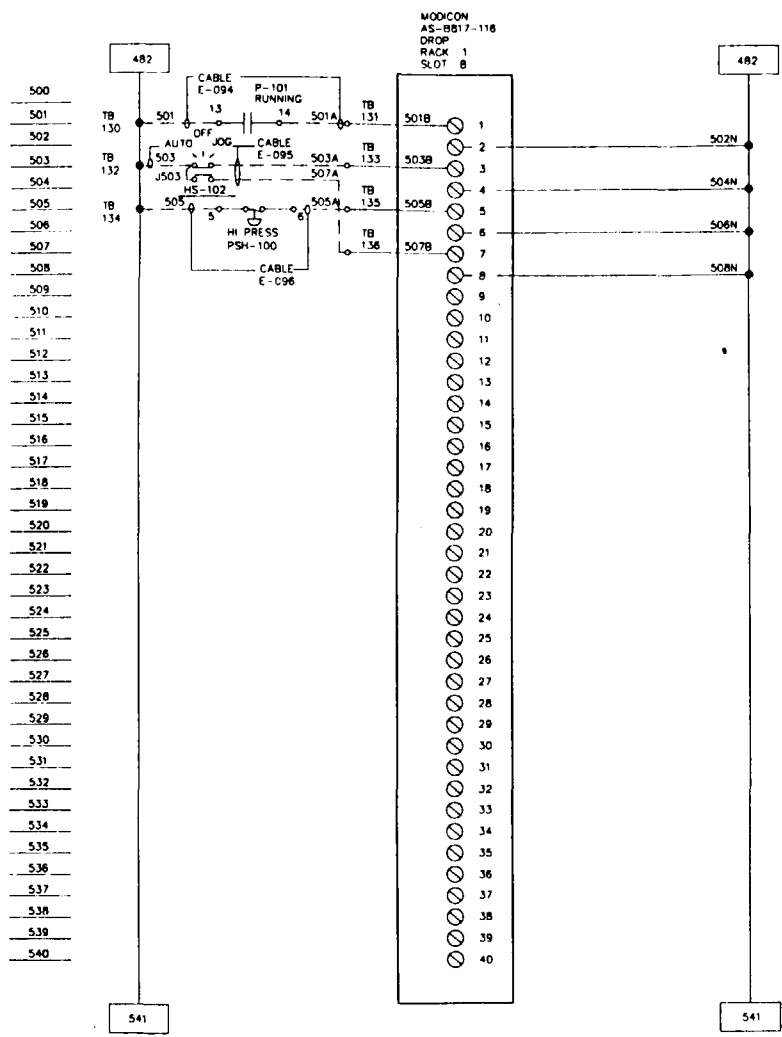
FINISHED - BY HP 24 -

REFERENCE DRAWINGS	NO	DATE	REVISIONS	BY	APP	NO	DATE	REVISIONS	BY	APP	PRINT IN CHARGE	DATE	ENGINEER'S RECORD	DATE
PANEL DRAWING (1-10)													DRAWN	
P & S													CHECKED	
													ENGINEER	
													APPROVAL	
													APPROVAL	

CLIENT CONSOLIDATED RAIL CORPORATION ADDRESS 200 MARKET STREET PHILADELPHIA, PA.	PROJECT GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAIL ELKHART RAIL YARD	FILED RECOVERY WELL RW-5 SCHEMATIC SHEET 2
SCALE	PANELSHEET NO. 04000-0100	DRAWING NO. E-001



REFERENCE DRAWINGS		REVISIONS		BY APP		REVISIONS		BY APP		PRINT RECORD		DATE		ENGINEER'S RECORD		DATE		CLIENT		GROUNDWATER TECHNOLOGY, INC.		
																			200 MARKET STREET PHILADELPHIA, PA.		800-520-5200	
																			PROJECT:		TREATMENT BUILDING	
																			FOR		SCHEMATIC SHEET 4	
																			CONRAIL ELKHART RAIL YARD		SCALE	PROJECT NO.
																					DRAWING NO.	REVISED
																					04880-0100	1-003



REFERENCE DRAWINGS	NO.	DATE	REVISIONS	BY	APP.	NO.	DATE	REVISIONS	BY	APP.	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE
						8	1/1/78	REVIS FOR FINAL DESIGN SUBMITTAL	AST	REL	APPROVAL		DRAWN	9/26
											APPROVAL		CHK'D	1/28
											CONSTRUCTION		ENGINEER	1/28
													APPROVAL	1/28
													APPROVAL	1/28

CLIENT: CONSOLIDATED RAIL CORPORATION
 ADDRESS: 300 MARKET STREET
 PHILADELPHIA, PA.

PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM
 FOR CONRAIL ELKHART RAIL YARD

GROUNDWATER TECHNOLOGY, INC.
 600 YORKERS & SHIPLEY AVE.
 GAITHERSBURG, MD 20878

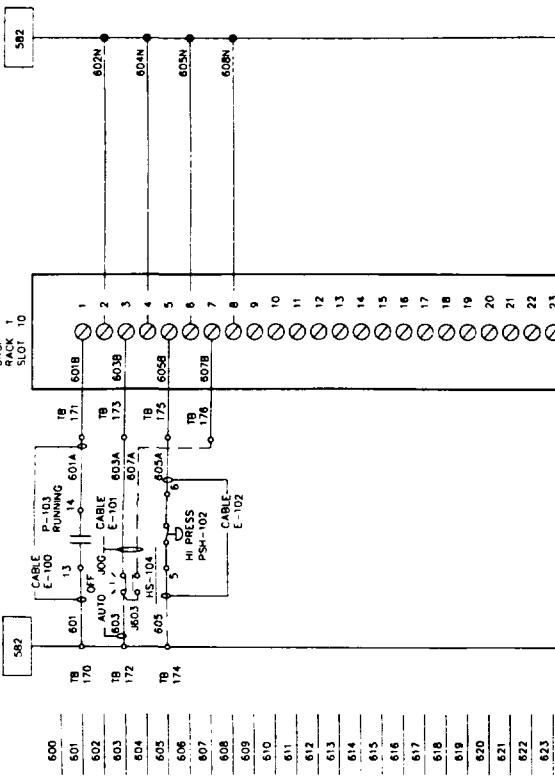
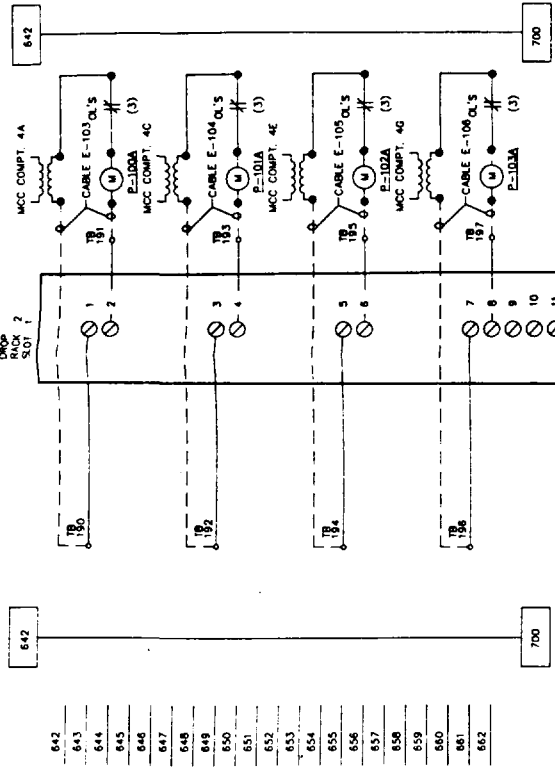
FILE: TREATMENT BUILDING SCHEMATIC SHEET 5

SCALE: NONE PROJECT NO: 04028-0128 DRAWING NO: E-094

MOXCON
AS-B014-108
DNDP
RACK 2
SLOT 1

MOXCON
AS-B014-108
DNDP
RACK 2
SLOT 2

MOXCON
AS-B017-116
RACK 1
SLOT 10



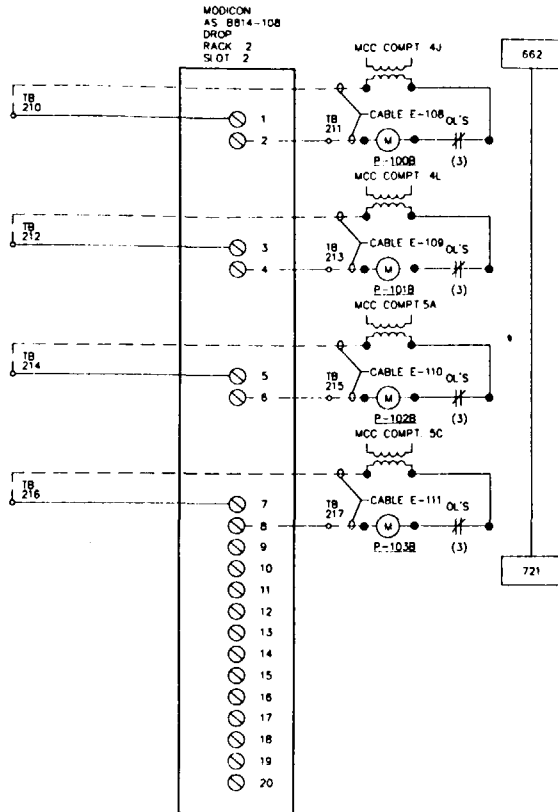
- 642
- 643
- 644
- 645
- 646
- 647
- 648
- 649
- 650
- 651
- 652
- 653
- 654
- 655
- 656
- 657
- 658
- 659
- 660
- 661
- 662

- 600
- 601
- 602
- 603
- 604
- 605
- 606
- 607
- 608
- 609
- 610
- 611
- 612
- 613
- 614
- 615
- 616
- 617
- 618
- 619
- 620
- 621
- 622
- 623
- 624
- 625
- 626
- 627
- 628
- 629
- 630
- 631
- 632
- 633
- 634
- 635
- 636
- 637
- 638
- 639
- 640

REFERENCE DRAWINGS		REVISIONS		BY DATE		APPROVAL		DATE		PROJECT		SHEET	
CLIENT: CONSOLIDATED RAIL CORPORATION ADDRESS: PROJECTIONS, PA		PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CORRAL ELPHANT RAIL YARD		DATE: 1-18-11		APPROVAL: [Signature]		DATE: 1-18-11		PROJECT: TREATMENT BUILDING SCHEMATIC SHEET 6		SHEET: 6-000	
PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CORRAL ELPHANT RAIL YARD		DATE: 1-18-11		APPROVAL: [Signature]		DATE: 1-18-11		PROJECT: TREATMENT BUILDING SCHEMATIC SHEET 6		SHEET: 6-000		PROJECT: TREATMENT BUILDING SCHEMATIC SHEET 6	

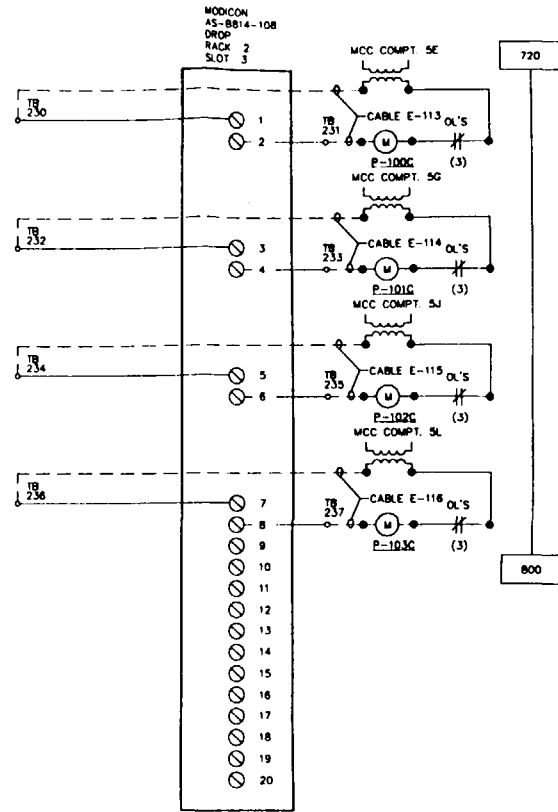
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720

662
721



721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741

720
800



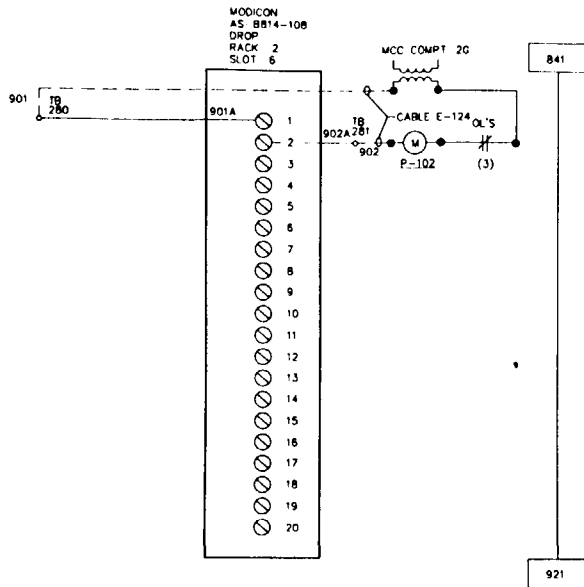
REFERENCE DRAWINGS	NO	DATE	REVISIONS	BY	APP	NO	DATE	REVISIONS	BY	APP	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE	CLIENT	CONSOLIDATED RAIL CORPORATION	ADDRESS	2001 MARKET STREET PHILADELPHIA, PA.	PROJECT	GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAIL EUGHART RAIL YARD	SCALE	PROJECT NO.	DRAWING NO.	REVISION	
						8	4/7/04	ISSUED FOR FINAL DESIGN SUBMITTAL	EL	REL	APPROVAL		DRAWN	8.00	4/7/04										
											CONSTRUCTION		CHECKED	1.00	4/7/04										
													ENGINEER	1.00	4/7/04										
													APPROVAL												
													APPROVAL												

WOODCON TECHNOLOGY, INC.
100 WOODMAN STREET
PHILADELPHIA, PA. 19106

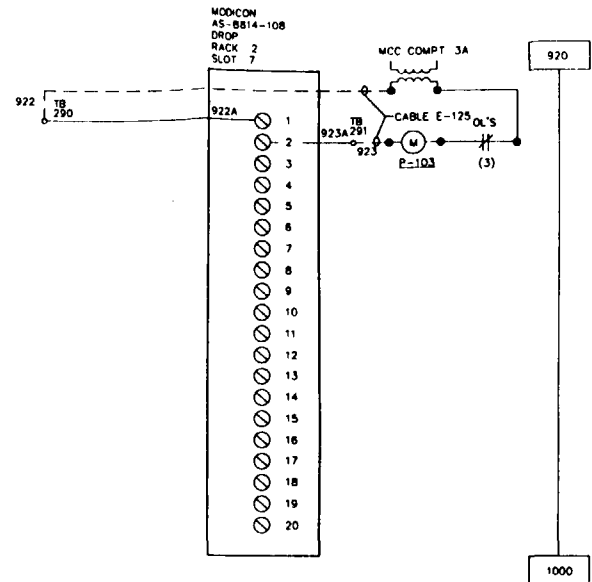
FILE: TREATMENT BUILDING SCHEMATIC SHEET 7

SCALE: AS SHOWN PROJECT NO: 04000-01-00 DRAWING NO: 4-000 REVISION: 0

900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920



921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941



REFERENCE DRAWINGS	NO.	DATE	REVISIONS	BY	APP.	NO.	DATE	REVISIONS	BY	APP.	PERMIT RECORD	DATE	ENGINEER'S RECORD	DATE	CLIENT	CONSOLIDATED RAIL CORPORATION	ADDRESS	2001 MARKET STREET PHILADELPHIA, PA.	PROJECT	GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAIL ELKHART RAIL YARD	SCALE	PROJECT NO.	04000-0100	DRAWING NO.	E-008	DATE	08-00-00	
						6	11/78	ISSUED FOR FINAL DESIGN SUBMITAL	JT	ELL	APPROVAL		DRAWN	8/90	11/78													
											CONSTRUCTION		CHECKED	1/88	11/78													
													NUMBER	1/87	11/78													
													APPROVAL															
													APPROVAL															

GROUNDWATER TECHNOLOGY, INC.
300 RIVERSIDE 1 SUITE 400
PHILADELPHIA, PA. 19106
DATE 08-00-00

P.L.C. TREATMENT BUILDING
SCHEMATIC SHEET 9

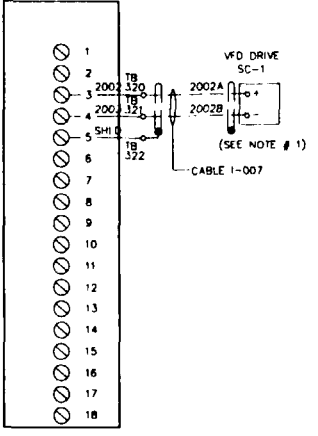
SCALE NONE PROJECT NO. 04000-0100 DRAWING NO. E-008

- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2018
- 2017
- 2018

1055

2019

MODICON
AS-BB73-001
DROP
RACK 2
SLOT 10



1055

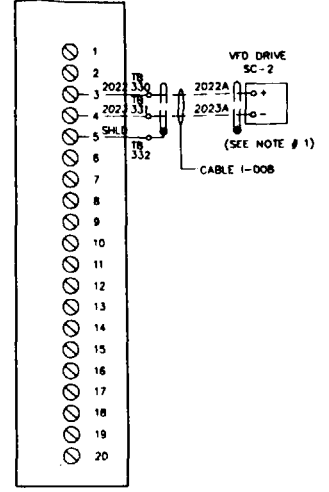
2019

- 2019
- 2020
- 2021
- 2022
- 2023
- 2024
- 2025
- 2026
- 2027
- 2028
- 2029
- 2030
- 2031
- 2032
- 2033
- 2034
- 2035
- 2036
- 2037
- 2038
- 2039

2018

3000

MODICON
AS-BB73-001
DROP
RACK 3
SLOT 1



2018

3000

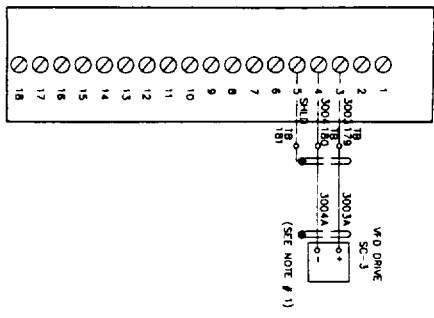
REFERENCE DRAWINGS	NO	DATE	REVISIONS	BY	APP	NO	DATE	REVISIONS	BY	APP	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE
								CHECK FOR FINAL DESIGN SUBMITAL			APPROVAL		DRAWN	3/18
											CONSTRUCTION		CHECKED	3/18
													ENGINEER	3/18
													APPROVAL	
													APPROVAL	

CLIENT: CONSOLIDATED RAIL CORPORATION
ADDRESS: 201 MARKET STREET PHILADELPHIA, PA.
PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAL ELKHART RAIL YARD

GROUNDWATER TECHNOLOGY, INC.
2000 MARKET STREET PHILADELPHIA, PA. 19103
PROJECT: TREATMENT BUILDING SCHEMATIC SHEET 11
SCALE: PROJECT NO: 04000-0100 DRAWING NO: 0-010

- 3000
- 3001
- 3002
- 3003
- 3004
- 3005
- 3006
- 3007
- 3008
- 3009
- 3010
- 3011
- 3012
- 3013
- 3014
- 3015
- 3016
- 3017
- 3018

2019



2018

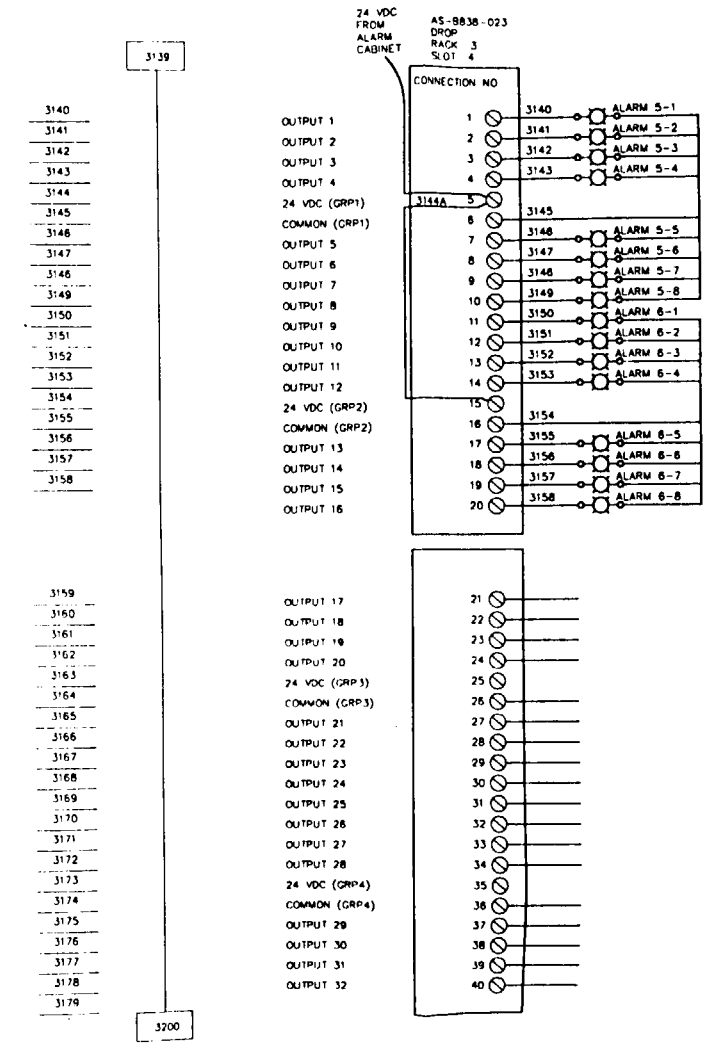
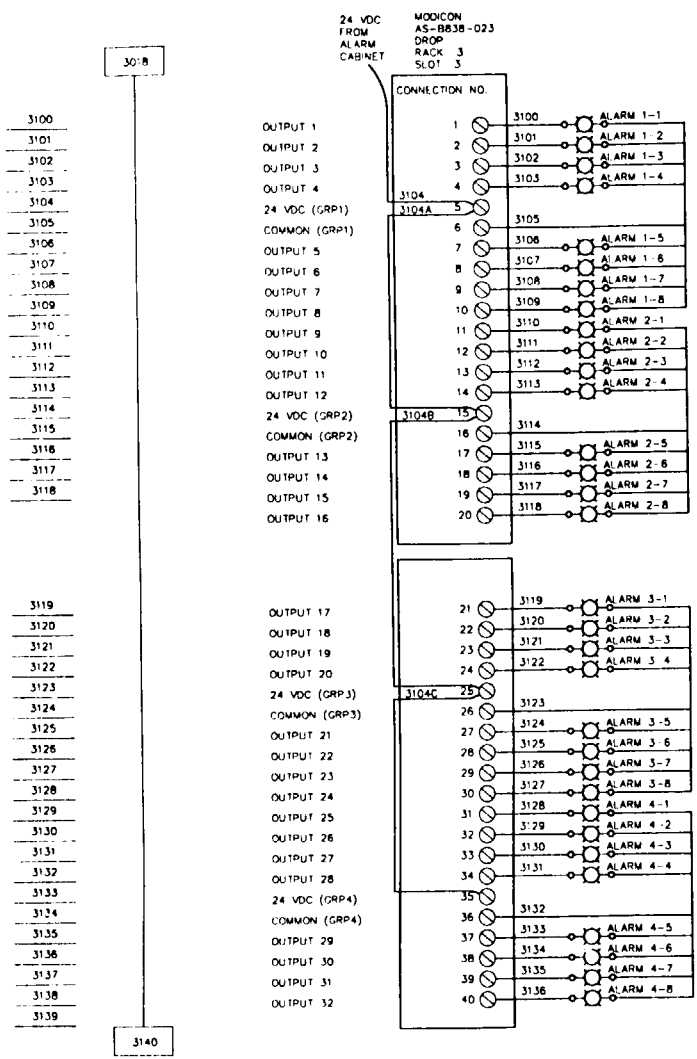
NOTE:
 1. THE SHOWN CASE SHALL BE USED
 2. THE SHOWN CASE SHALL BE USED
 3. THE SHOWN CASE SHALL BE USED

NO	DATE	BY	REVISIONS	NO	DATE	BY	REVISIONS	NO	DATE	BY	REVISIONS	NO	DATE	BY	REVISIONS	NO	DATE	BY	REVISIONS

DATE	CONTRACTOR NAME	PROJECT	DESCRIPTION	DATE	BY	REVISIONS

NO	DATE	BY	REVISIONS

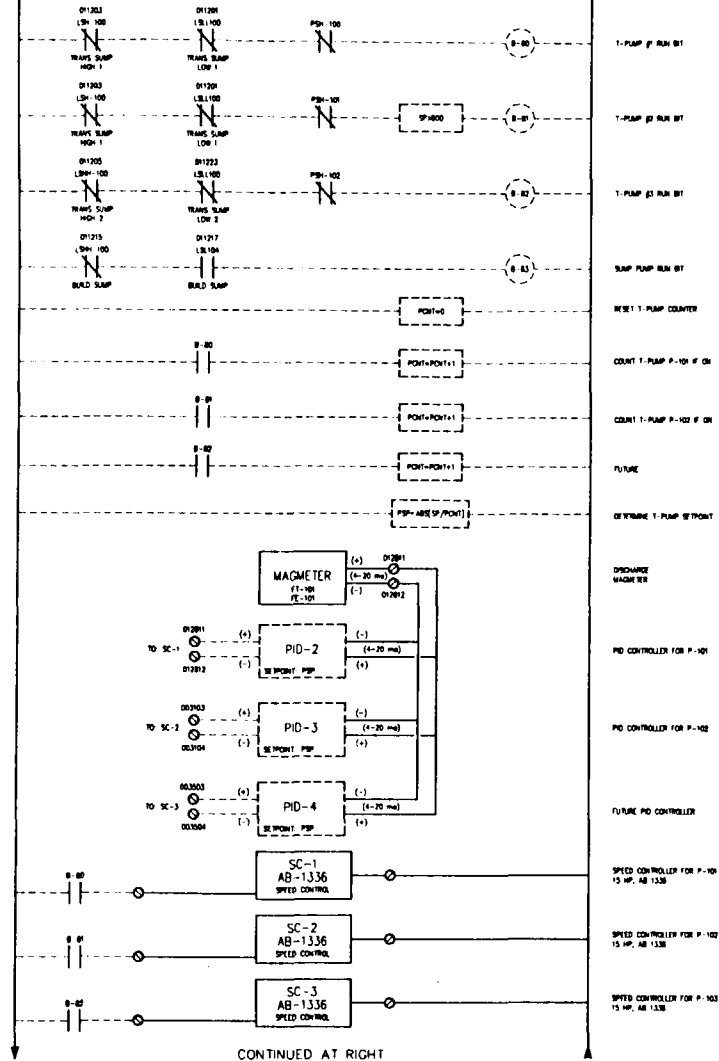
RECOVERY COMPOUND ENVELOPE
 SCHEDULE SHEET 12



REFERENCE DRAWINGS		REVISIONS		BY APP		NO DATE		REVISIONS		BY APP		DATE		ENGINEER'S RECORD		DATE		CLIENT		PROJECT		DRAWING FILE		REVISION	
NO	DATE	NO	DATE	NO	DATE	NO	DATE	NO	DATE	NO	DATE	NO	DATE	NO	DATE	NO	DATE	NO	DATE	NO	DATE	NO	DATE	NO	DATE

CLIENT: CONSOLIDATED RAIL CORPORATION
 ADDRESS: 3001 MARKET STREET PHILADELPHIA, PA.
 PROJECT: GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAIL ELIZABETH RAIL YARD
 DRAWING FILE: C-072
 REVISION: 0

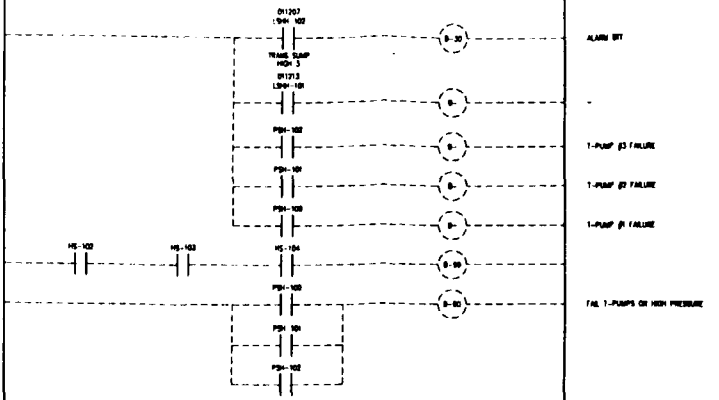
CONTINUED FROM SHEET 3



1-PUMP #1 RUN BT
 1-PUMP #2 RUN BT
 1-PUMP #3 RUN BT
 SUMP PUMP RUN BT
 RESET 1-PUMP COUNTER
 COUNT 1-PUMP P-101 # OF ON
 COUNT 1-PUMP P-102 # OF ON
 FUTURE
 DETERMINE 1-PUMP SETPOINT
 DISCHARGE MACHETER
 PID CONTROLLER FOR P-101
 PID CONTROLLER FOR P-102
 FUTURE PID CONTROLLER
 SPEED CONTROLLER FOR P-101
 SPEED CONTROLLER FOR P-102
 SPEED CONTROLLER FOR P-103

CONTINUED AT RIGHT

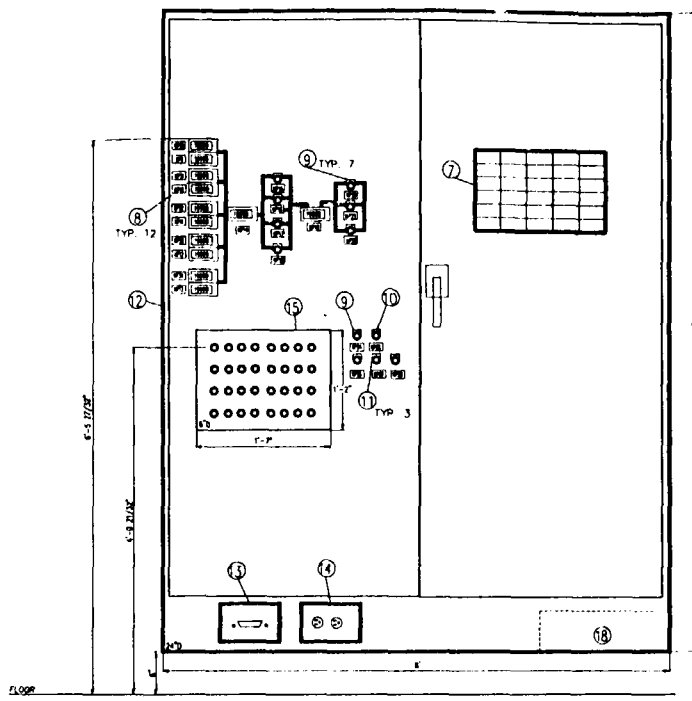
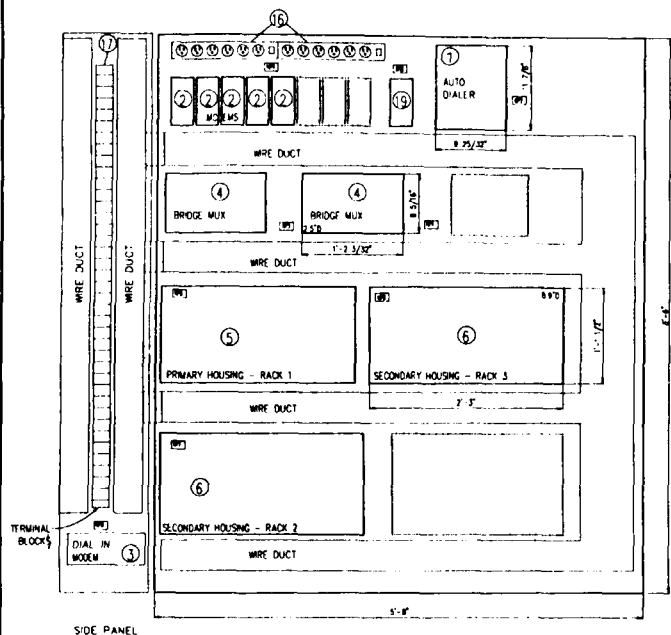
CONTINUED FROM LEFT



ALARM BT
 1-PUMP #3 FAILURE
 1-PUMP #2 FAILURE
 1-PUMP #1 FAILURE
 FAIL 1-PUMPS OF HIGH PRESSURE

NOTES:
 1. ——— DENOTES CONTROL WIRE
 2. - - - - - DENOTES PLC LOGIC (INTERMEDIATE)
 3. ● DENOTES NORMAL LAMP DESIGNATOR

NO.	DATE	REVISIONS	BY	APP.	NO.	DATE	REVISIONS	BY	APP.	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE	CLIENT ADDRESS	PROJECT	TITLE	SCALE	PRIORITY	REVISION	DATE	BY	APP.	
														CONSOLIDATED RAIL CORPORATION 3001 MARKET STREET PHILADELPHIA, PA.	GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAL ELKHART RAIL YARD	INSTRUMENTATION LADDER LOGIC SHEET 4							



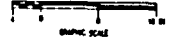
BILL OF MATERIALS

#	QUAN	MANUFACTURER	MODEL #	REMARKS
1	1	BAIRD	START MFC	
2	3	BAIRD	LR-38	
3	1	BAIRD	ACCU-144	
4	2	MOORE	MC-100	NOTED BY ENGINEERS
5	1	MOORE	MC-100	FOR I/O CABLE
			MC-100	
			MC-100	
6	2	MOORE	MC-100	NOTED BY ENGINEERS
			MC-100	FOR I/O CABLE
			MC-100	
			MC-100	
7	1		PANEL ALARM	
8	6	ACORN	ACORN	
9	1		1000-10	
10	1	ALLEN BRADLEY	1000-10	
11	3	ALLEN BRADLEY	1000-10	
12	1	HOTTENHAM	4072490	PANEL AMP/PT
13	1	MOORE	MC-100	
14	1	MOORE	MC-100	
15	1	MOORE	MC-100	
			MC-100	
16	1	ALLEN BRADLEY	1000-10	
17	200	ALLEN BRADLEY	1000-10	
18	1	MC-100	AC/DC	100 OH FLOOR
19	1	SEALER	1000-10	RELAY

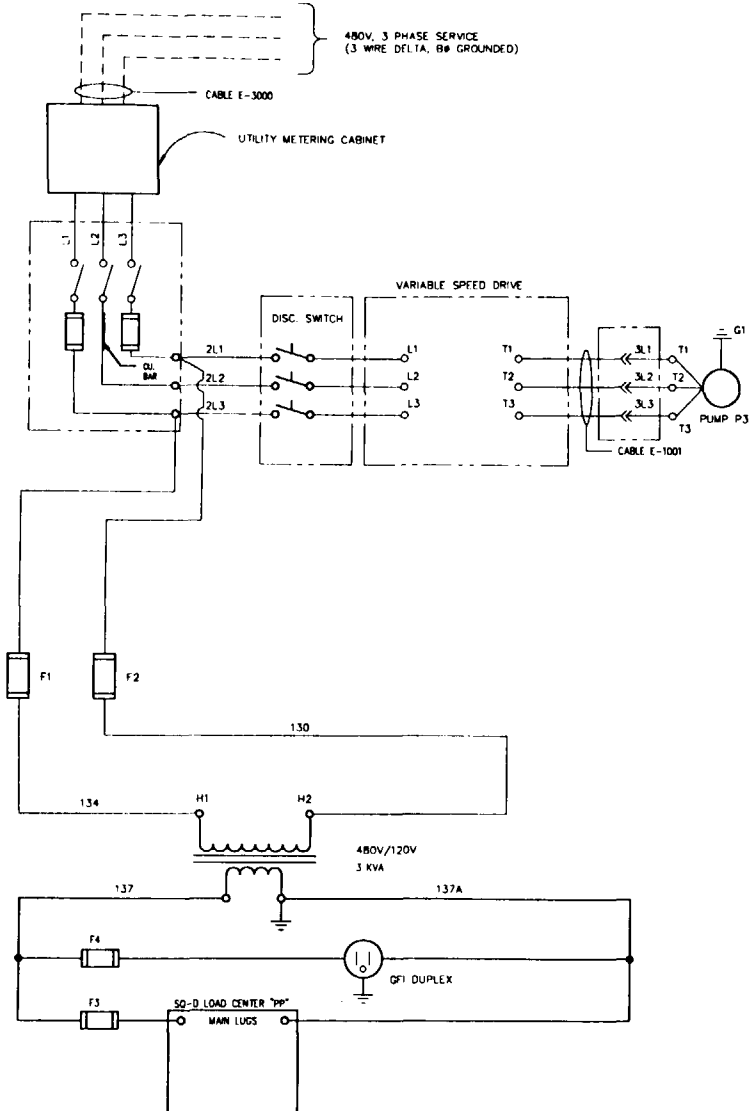
NAME PLATES

NAME PLATE #	LINE 1	LINE 2	LINE 3
NP-1	RECOVERY WELL	RECOVERY	MOORE
NP-2	ALARM	AUTO-DIALER	
NP-3	RECOVERY WELL	RECOVERY	MOORE
NP-4	RECOVERY WELL	RECOVERY	MOORE
NP-5	FLE	RACK 1	
NP-6	FLE	RACK 2	
NP-7	FLE	RACK 3	
NP-8	FLE	FLOOR	
NP-9	NO-1	FLOOR	SPN
NP-10	NO-2	FLOOR	SPN
NP-11	NO-3	FLOOR	SPN
NP-12	NO-4	FLOOR	SPN
NP-13	NO-5	FLOOR	SPN
NP-14	NO-6	FLOOR	SPN
NP-15	STRIPPER '1'	3-1000/1000	REPAIRING
NP-16	STRIPPER '2'	3-1000/1000	REPAIRING
NP-17	STRIPPER '3'	3-1000/1000	REPAIRING
NP-18	STRIPPER '4'	3-1000/1000	REPAIRING
NP-19	STRIPPER '5'	3-1000/1000	REPAIRING
NP-20	STRIPPER PUMP	P-100	REPAIRING
NP-21	STRIPPER PUMP	P-100	REPAIRING
NP-22	STRIPPER PUMP	P-100	REPAIRING
NP-23	STRIPPER PUMP	P-100	REPAIRING
NP-24	SWA PANEL	POWER	ON-OFF
NP-25	ALARM	ALARM	REPAIRING
NP-26	ALARM	ALARM	REPAIRING
NP-27	ALARM	ALARM	REPAIRING
NP-28	ALARM	ALARM	REPAIRING
NP-29	CONTROL PANEL	RELAY	
NP-30	NO-1	WELL LEVEL	0
NP-31	NO-2	WELL LEVEL	0
NP-32	NO-3	WELL LEVEL	0
NP-33	NO-4	WELL LEVEL	0
NP-34	NO-5	WELL LEVEL	0

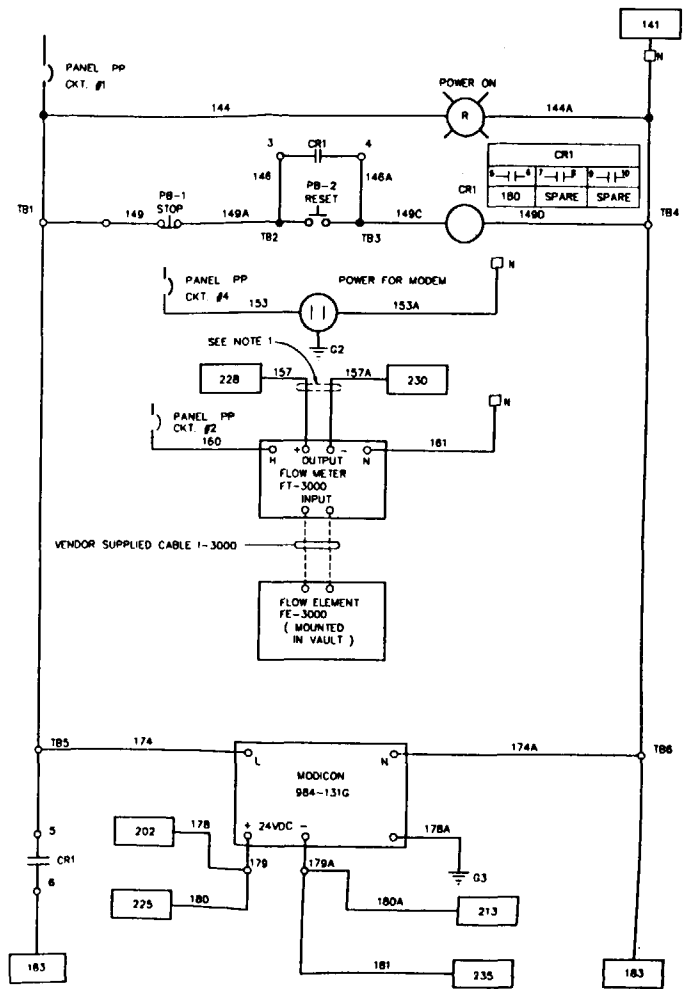
NO	DATE	REVISIONS	BY	APP	NO	DATE	REVISIONS	BY	APP	NO	DATE	REVISIONS	BY	APP	NO	DATE	REVISIONS	BY	APP	CLIENT	PROJECT	SCALE	PROJECT NO.	DRAWING NO.	REVISION	
					0	10/74	PREP FOR FINAL REVISION														CONSOLIDATED RAIL CORPORATION	GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAL ELKHART RAILYARD	AS SHOWN	04012-0128	E-101	REVISION 0



101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141



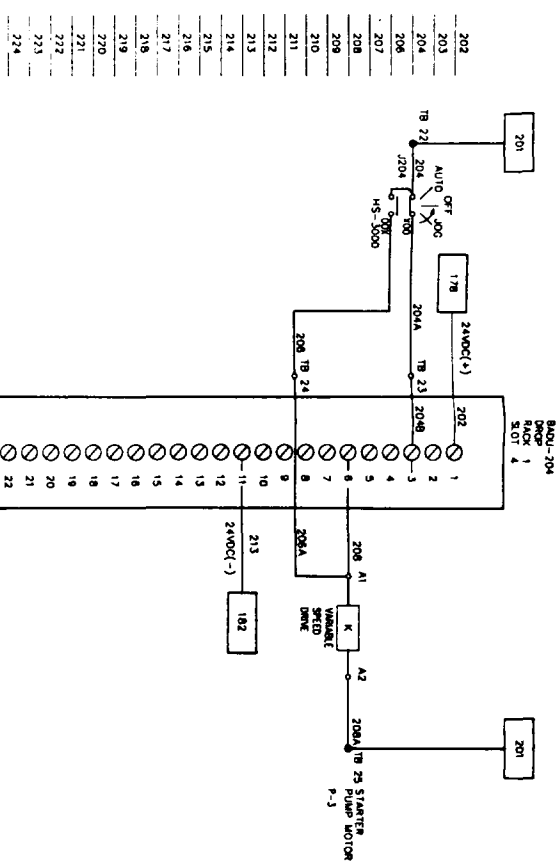
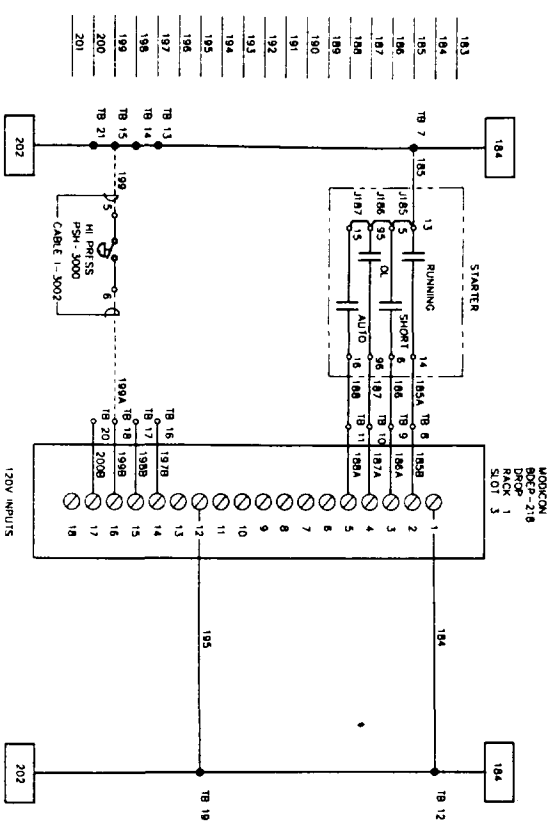
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182



NOTE:
1. USE SHIELDED CABLE, WELDED BUSHING OR EQUAL. CUT AND TAPE SHIELDS AT FIELD END.

REVISED	NO.	DATE	BY	APP.	NO.	DATE	BY	APP.	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE
					0	11/78			APPROVAL		DRAWN	8-108
									APPROVAL		CHECKED	1-8
									CONSTRUCTION		ENGINEER	1-8
											APPROVAL	
											APPROVAL	

CLIENT CONSOLIDATED RAIL CORPORATION ADDRESS 2001 MARKET STREET PHILADELPHIA, PA.	PROJECT GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAIL ELKHART RAIL YARD	GROUNDWATER TECHNOLOGY, INC. 1400 WASHINGTON & GARDNER STS. PHILADELPHIA, PA. 19102 215-382-0200
FILE RECOVERY WELL RW-3 SCHEMATIC SHEET 1	SCALE AS SHOWN	PROJECT NO. 98400-020
DRAWING NO. E-020	REVISION 0	



NO.	DATE	BY	CHKD	DATE	REVISIONS	BY	CHKD	DATE	REVISIONS	BY	CHKD	DATE	REVISIONS
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													

PROJECT: CONSOLIDATED RAIL CORPORATION
ADDRESS: 3000 W. 10th St., Oklahoma City, Oklahoma 73106

PROJECT: RECOVERY WELLS R/W-3
SCHEMATIC SHEET 2

CONTRACT NO. 1-10
DATE 1-10-80

REVISIONS

DATE 1-10-80

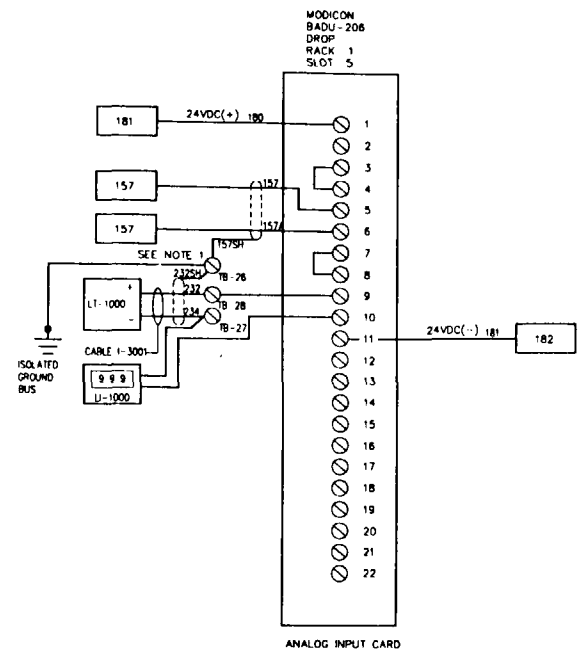
BY [Signature]

CHKD [Signature]

DATE 1-10-80

BY [Signature]

225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246



CABLE SCHEDULE					
CABLE NUMBER	CABLE SPEC.	FROM	WA	TO	
E-3000	3/4" B-1/C PD GRD	UTILITY DROP	1" C	REMOTE PANEL	I-3000
E-3001	3/4" PD-1/C PD GRD	REMOTE PANEL	I-3000	3/4" C	PUMP P-3
I-3000	VENDOR CABLE	FLOW ELEMENT	FE-3000	3/4" C	FLOW TRANSMITTER FT-3000
I-3001	2/C PD TW SH PR	REMOTE PANEL	I-3000	3/4" C	LEVEL TRANSMITTER LT-3000
I-3002	2/C PD-1/C PD GRD	REMOTE PANEL	I-3000	3/4" C	PRESSURE SWITCH PSH-3000

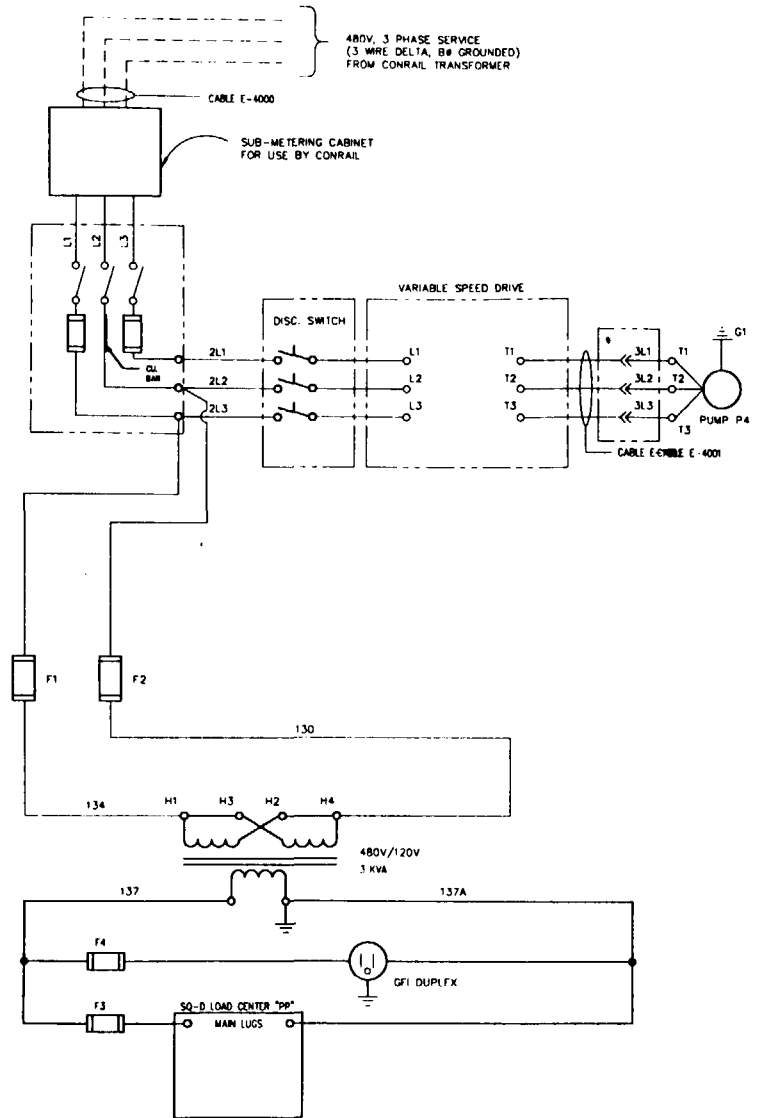
NOTE:
1. USE SHIELDED CABLE, BELDEN #1030A OR EQUAL
CUT AND TAPE SHIELDS AT TRANSMITTER END.

11/20/83 - 01 APR 84 -

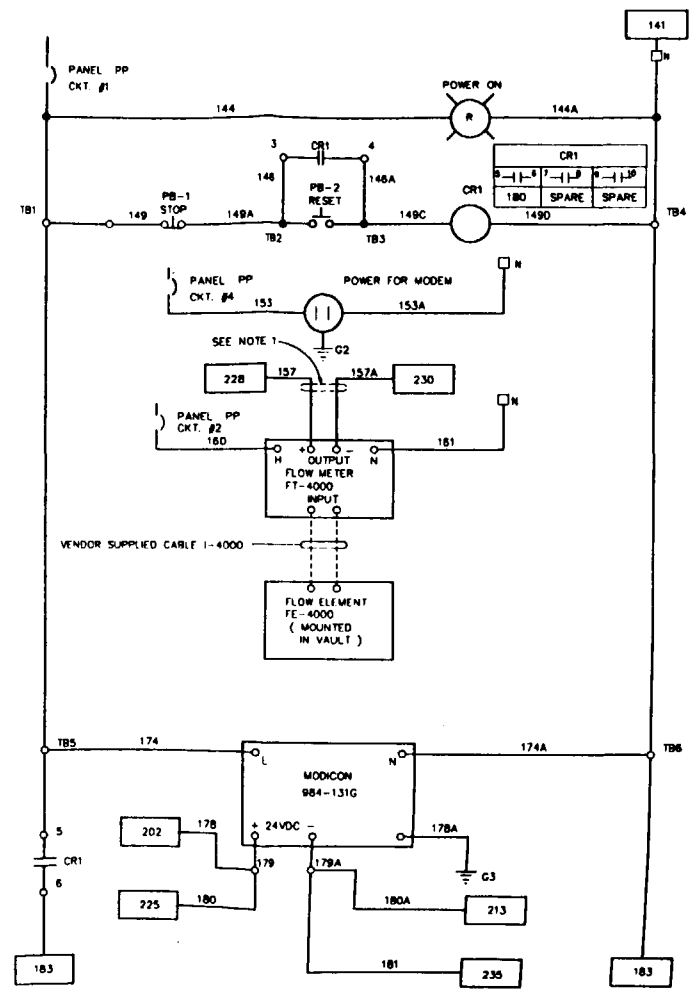
REFERENCE DRAWINGS	NO	DATE	REVISIONS	BY	APP	NO	DATE	REVISIONS	BY	APP	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE	CLIENT	ADDRESS	PROJECT	SCALE	PROJECT NO	DRAWING NO	REVISION	
PANEL DRAWING E-100						0	4/1/84	ISSUED FOR FINAL DESIGN SUBMITTAL	JTB	JTB	APPROVAL		DRAWN	0 1/84	CONSOLIDATED RAIL CORPORATION 3001 MARKET STREET PHILADELPHIA, PA.		GROUNDWATER EXTRACTION & TREATMENT SYSTEM FOR CONRAIL ELKHART RAIL YARD	1"=10'	04-000-01-00	E-000		
P & B E-080											CONSTRUCTION		CHECKED	JAR								
													ENGINEER	JAR								
													APPROVAL									
													APPROVAL									
													APPROVAL									

GROUNDWATER TECHNOLOGY, INC.
208 WASHINGTON & MARKET STS
PHILADELPHIA, PA. 19106
PROJECT: RECOVERY WELL RW-3
SCHEMATIC SHEET 3

101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141



142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182



PSBMD - 1 APR 81

NO.	DATE	REVISIONS	BY	APP.	NO.	DATE	REVISIONS	BY	APP.	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE
1	4/1/81	ISSUED FOR FINAL SUBMITTAL	JLT	REL.	1	4/1/81	APPROVAL			APPROVAL		B-ØØ	4/1/81
2					2		APPROVAL			CONSTRUCTION		JAE	4/1/81
												EAB	4/1/81

CLIENT: CONSOLIDATED RAIL CORPORATION
ADDRESS: 2001 MARKET STREET
PHILADELPHIA, PA.

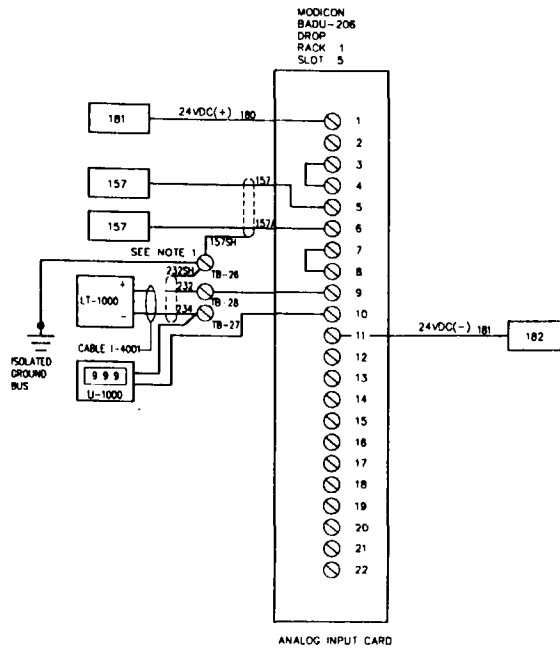
PROJECT:
GROUNDWATER EXTRACTION & TREATMENT SYSTEM
FOR
CONRAIL ELIZABETH RAIL YARD

GROUNDWATER TECHNOLOGY, INC.
200 MARKET STREET
PHILADELPHIA, PA. 19106

PROJECT:
RECOVERY WELL RW-4
SCHEMATIC SHEET 1

SCALE: AS SHOWN
PROJECT NO: G-ØØØ-ØØØ
DRAWING NO: 6-ØØØ
DATE: 4/1/81

225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246



NOTE:
1. USE SHIELDED CABLE, BELDEN #1030A OR EQUAL.
CUT AND TAPE SHIELDS AT TRANSMITTER END.

CABLE NUMBER	CABLE SPEC.	CABLE SCHEDULE			
		FROM	MA	TO	
E-4000	3/4" B-1/2" RD GRD	LITRITY DROP	1" C	REMOTE PANEL	I-4000
E-4001	3/4" B-1/2" RD GRD	REMOTE PANEL	I-4000	3/4" C	PUMP P-2
I-4000	VENDOR CABLE	FLOW ELEMENT	FE-4000	3/4" C	FLOW TRANSMITTER FT-4000
I-4001	2/C#18 TW SH PR	REMOTE PANEL	I-4000	3/4" C	LEVEL TRANSMITTER LT-4000
I-4002	2/C#12-1/C#12 GRD	REMOTE PANEL	I-4000	3/4" C	PRESSURE SWITCH PSH-4000

PRINTED - 8 APR 84

REFERENCE DRAWINGS	NO	DATE	REVISIONS	BY	APP	NO	DATE	REVISIONS	BY	APP	PRINT RECORD	DATE	ENGINEER'S RECORD	DATE	CLIENT	PROJECT	SCALE	PROJECT NO.	DRAWING NO.	REVISION	
PANEL BRANING C-100						0	4/1/84	ISSUED FOR FINAL DESIGN SUBMITAL	JST	JEL	APPROVAL		DRAWN	B-LAB	4/7/84	CONSOLIDATED RAIL CORPORATION ADDRESS: 2001 MARKET STREET PHILADELPHIA, PA.					
P & B 3-000											CONSTRUCTION		CHECKED	JAB	4/7/84						
													ENGINEER	EAR	4/7/84						
													APPROVAL								
													APPROVAL								
													APPROVAL								
													APPROVAL								

		GROUNDWATER TECHNOLOGY, INC. <small>1000 MARKET STREET PHILADELPHIA, PA. 19107</small>	
RECOVERY WELL RW-4 SCHEMATIC SHEET 3			
SCALE	PROJECT NO.	DRAWING NO.	REVISION
	84-000-000	0-000	0