AWARD SET

COLORADO
DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISIONS
South Bore Tunnel Lighting

The 1991 Standard Specifications for Road and Bridge Construction controls construction of this project. The following special provisions supplement or modify the Standard Specifications and Supplemental Specifications and take precedence over the Standard Specifications, Supplemental Specifications, and plans. When specifications or special provisions contain both English units and SI units, the English units apply and are the specification requirement.

Required provision on Federal - Aid Contract – Form FHWA-1273.

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COLORADO
DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISIONS
South Bore Tunnel Lighting

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DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISIONS

STANDARD SPECIAL PROVISIONS
South Bore Tunnel Lighting

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NOTICE TO BIDDERS

The proposal guaranty shall be a certified check, cashier's check, or bid bond in the amount of 5 percent of the Contractor's total bid.

Pursuant to subsections 102.04 and 102.05, it is recommended that bidders on this project review the work site and plan details with an authorized Department representative. Prospective bidders shall contact one of the following listed authorized Department representatives at least 12 hours in advance of the time they wish to go over the project.

Construction Engineer -	Brian Pinkerton Office Phone: 303-757-9651
Resident Engineer -	Wes Goff, P.E. Post Office Box 399 Dumont, CO 80436 Office Phone: 303-512-5750 Fax: 303-512-5775 Mobile Phone: 303-478-8041 Residence: 303-670-3654
Project Engineer -	Inessa N. Zisman, P.E. Post Office Box 399 Dumont, CO 80436 Office Phone: 303-512-5750 Fax: 303-512-5775 Mobil Phone: 303-884-8827 Residence: 303-216-1247

The above referenced individuals are the only representatives of the Department with authority to provide any information, clarification, or interpretation regarding the plans, specifications, and any other contract documents or requirements.

COMMENCEMENT AND COMPLETION OF WORK

The Contractor shall commence work under the Contract on or before the 20th day following the date of award unless such time for beginning the work is changed by the Chief Engineer in the "Notice to Proceed."

The Contractor shall complete all work within 240 working days in accordance with the "Notice to Proceed."

Salient features to be shown on the Contractor's Progress Schedule are:

1. Mobilization
2. Surveying
3. Power Distribution
   - Shop Drawings
   - Panel Boards
   - Transformers
   - Transformer Switches/Interrupter Switches
   - Circuit Breakers
   - Storage Batteries
   - Conduit (69,650LF)/Pull Box Installation
   - Wiring
4. Lighting
   - Shop Drawings (Lighting and Lighting Control System)
   - Manufacturing
   - Shop Drawings (HID Mounting Support System Installation)
   - HID Mounting Support System Installation
   - Fluorescent Fixture Installation
   - Removal of Lighting
   - Wireway
   - Tunnel Lighting Control System Installation
5. VMS/ITS
   - Shop Drawings
   - Manufacturing
   - Installation (VMS/LUS/Sign Controller)
   - Cabinet (Recessed/Surface Mounted Installation)
   - Fiber/Innerduct Installation
   - ITS Terminations
   - VMS/LUS Software Shop Drawings
   - VMS/LUS Software Development
   - VMS/LUS Integration and Testing

COMMENCEMENT AND COMPLETION OF WORK
(2)

Section 108 of the Standard and Supplemental Specifications is hereby revised for this project as follows:

Subsection 108.03 shall include the following:

The Contractor's progress schedule shall be a Critical Path Method Schedule.

Subsection 108.06 shall include the following:

Time will not be charged during the months of December, January, February, March, and April. This time is defined as free time and work may continue if conditions permit.

CONTRACT GOAL (COMBINED)

The Department has determined that underutilized Disadvantaged Business Enterprises (DBEs) will participate by contracting for a part of the work of this Contract. The contract goal for participation in this Contract by certified DBEs who have been determined to be underutilized has been established as follows:

African American, Native American, or Asian DBE	0%

The percentage will be calculated from proposals received for this project according to the following formula:

$$\text{Percentage} = 100 \times \frac{\text{*Dollar amount of work to be contracted to underutilized DBEs}}{\text{Total dollar amount of the original Contract}}$$

* Based on DBE contract unit prices rather than prime contract unit prices.

DESCRIPTION OF PROJECT

The project is located on I-70 beginning 215.3 milepost east of the Eisenhower Tunnel extending through the North and South Tunnels to a point 213.6 milepost west, approximately 55 miles west of Denver Colorado.

The project consists of the rehabilitation of the South Tunnel as noted below. It consists of the following:

1. Removal and disposal of existing VMS signs, LUS Signs (Performed by CDOT Personnel).
2. Removal and disposal of all Fluorescent Tunnel Lighting.
3. Removal and disposal of existing Electrical Distributions systems associated with the existing Fluorescent Lighting being removed.
4. Supply, Install, and Electrify new VMS and LUS Signage with Control System.
5. Supply, Install, and Electrify new Fluorescent Tunnel Lighting System.
6. Supply, Install, and Electrify new Traffic Management Control System.
7. Supply, Install, and Electrify new Tunnel Lighting (Fluorescent & HID) Control System.
8. Supply and Install new Electrical Distribution System for Fluorescent and HID Tunnel Lighting System.
9. Supply and Install new HID Mounting System and Electrify receptacles (HID Light Fixture not in Contract).
10. Replace Battery Systems in both Ventilation Buildings.

The Department anticipates no delay toward completion of the project due to the restrictions imposed herein.

REVISION OF SECTION 105
COOPERATION WITH CONTRACTORS

Section 105 of the Standard Specifications is hereby revised for this project and includes the following:

Subsection **105.07** shall be revised as follows:

105.07 The Contractor is hereby advised the other CDOT construction projects will be working concurrently within the project limits. All costs associated with the forgoing requirements shall be included in the original contract unit prices.

REVISION OF SECTION 202
REMOVAL OF STRUCTURES AND OBSTRUCTIONS

Section 202 of the Standard Specifications is hereby revised for this project to include the following:

Subsection **202.01** shall be revised as follows:

Replace the first paragraph, which begins with the phrase "This work consists of the removal and disposal..." with the following sentences:

The work shall include but not be limited to the following demolition items:

(a) This work consists of the removal and disposal of existing fluorescent tunnel luminaires, lamps, ballasts, mounting brackets, and variable message / lane use signs and portions of the raceway system and electrical conductors that supply power to them. The extent of the removal of conduit and conductors shall be minimized and shall retain the raceways in a suitable condition for future use. See Contract Drawings for the extent of removal.

(b) A panelboard shall be removed and disposed of from each of the south tunnel Crosscut Electrical Rooms. Inherent in this work are important construction phasing considerations related to maintaining a level of illumination in the tunnel at all times. Included in this element of work is the removal of segments of conduit and the conductors that supply power to the existing lighting system in the tunnel.

(c) A set of 480 volt transformer feeder conductors and the associated 300 kVA transformer that it supplies shall be removed from the West Ventilation Building.

(d) Two 480 volt feeder conduits and conductors associated with the existing "peak shaving" system shall be removed from each of the two Ventilation Buildings.

(e) Two sets of 2.4 kV feeder conductors associated with the 225 kVA that shall be partially removed and disposed of from each of the south tunnel Crosscut Electrical Rooms.

Subsection **202.02** shall be revised as follows:

Replace the first paragraph, which begins with the phrase "The Contractor shall raze, remove and dispose..." with the following sentences:

The demolition shall include but not be limited to the following:

(a) Obtain the approval of the Engineer prior to disconnecting or de-energizing any existing feeder or circuit. The removal and disposal of the existing fluorescent tunnel luminaires shall necessitate the removal of that portion of the raceway system and electrical conductors that supply power to them shall be removed. The wiring for these circuits shall be removed from the circuit breakers that protect them and the wiring shall be taped and neatly coiled in the bottom of the panelboard. The wiring in these conduits at the luminaire end shall be removed to the nearest junction or pull box. Twelve (12) inches of surplus conductors shall be coiled in the box, with the ends taped. The conduit ends shall be cut-off, threaded and a coupling installed complete with plug, as near as possible to the tunnel wall.

REVISION OF SECTION 202
REMOVAL OF STRUCTURES AND OBSTRUCTIONS

(b) The removal and disposal of the panelboard from each of the Crosscut Electrical Rooms shall necessitate the removal of segments of conduit and conductors that supply the existing lighting system in the tunnel. The conduits and conductors involved in this element of work shall be removed back to the nearest pull box, normally located above the entrance to the Crosscut passageway. Twelve (12) inches of surplus conductors shall be coiled in the box, with the ends taped. One possible sequence of construction for this element of work is noted on the plans.

(c) The removal and disposal of the 480 volt transformer feeder conductors and the associated 300 kVA transformer from the West Ventilation Building shall be staged in coordination with the Engineer such that any period of power loss to the north tunnel lighting is minimized. The replacement feeder shall be installed prior to this removal, to the extent possible.

(d) The two 480 volt feeder conduits and conductors associated with the existing "peak shaving" system shall not be removed from either of the two Ventilation Buildings until approval is obtained from the Engineer.

(f) Neither the two sets of 2.4 kV feeder conduits and conductors supplying the 225 kVA transformers nor the transformer themselves shall be removed without first obtaining the approval of the Engineer. The conductors at the Ventilation Building end shall be removed from the motor control centers back to the nearest pull box. Three (3) feet of surplus conductors shall be coiled in the box, with the ends taped. One possible sequence of construction for the removal and replacement of the existing transformers is noted on the plans.

Subsection **202.11** shall be revised as follows:

Replace the first sentences of the first paragraph, which begins with the phrase "When the Contract provides payment for removal ..." with the following sentences:

When the Contract provides payment for the removal of electrical equipment, conduit, wiring and luminaires complete with associated items on a lump sum basis, this payment will include the removal, hauling and disposal of all abandoned or non-used electrical items which in any way hinders or obstructs the installation of the new electrical equipment or luminaires indicated on the plans. Included in the term "associated items" are all equipment required to perform the complete demolition of the electrical items as required for the tunnel facility. This payment will also include the relocation or rearrangement of all electrical items that are presently in use or energized which in any way hinders or obstructs the installation of the new electrical equipment or luminaires indicated on the plans.

CONSTRUCTION REQUIREMENTS

Removal and disposal of the existing tunnel lighting system shall be as follows:

(a) Remove bracket extension and dispose of conduit connections as required.

REVISION OF SECTION 202
REMOVAL OF STRUCTURES AND OBSTRUCTIONS

(b) Remove luminaire, lamp(s), and ballast(s) associated with the Fluorescent Tunnel Lighting System. Refer to Section for disposal requirements.

(c) Leave welded bracket in place. Verify integrity of bracket(s). Contractor to notify Engineer of any brackets that have failed or defective.

(d) Existing wall panel to remain.

BASIS OF PAYMENT

202.12 Payment. The completed and accepted work for the removal of structures and obstructions including all electrical items indicated on the plans or specified herein will be paid for at the lump sum price for the pay item listed below as Removal of Existing Lighting System.

The completed and accepted work for the removal of structures and obstructions including all fluorescent tunnel luminaires as indicated on the plans or specified herein will be paid for at the lump sum price for the pay item listed below as Removal of Luminaires.

Payment will be made under:

Pay Item	Pay Unit
Removal of Existing Lighting System	Lump Sum
Removal of Luminaire	Each

REVISION OF SECTION 250

ENVIRONMENTAL, HEALTH & SAFETY MANAGEMENT

Section 250 of the Standard Specifications is hereby revised for this project and includes the following:

Subsection **250.09** shall include the following:

All work associated with Environmental Health Safety & Hazardous Material issues will be included in the pay item "ENVIRONMENTAL, HEALTH & SAFETY MANAGEMENT" and paid for as a LUMP SUM.

REVISION OF SECTION 613
LIGHTING

Section **613** of the Standard Specifications is hereby revised for this project as follows:

Subsection **613.01** shall be replaced by the following:

(a) The work includes, but is not limited to, furnishing, delivering, storing, installing, wiring, testing and placing into operation, the following equipment:

1. Two (2) dry-type step-up transformers, one rated 150 kVA and the other 300 kVA. Six (6) dry-type step-down transformers rated 150 kVA and six (6) associated oil fuse cutout switches. This work item includes all related feeder conductors, conduit and related items.
2. Two (2) 1000 ampere automatic transfer switches.
3. Fourteen (14) tunnel lighting panelboards and two (2) distribution panelboards.
4. A tunnel lighting system, including associated terminal boxes, junction boxes, wiring, etc.
5. A tunnel variable message sign system, associated terminal boxes, junction boxes, mini-load center, wiring, etc.
6. A medium voltage controller cubicle addition to one of the existing 2400 volt motor control centers in each of the two Ventilation Buildings.

(b) The Contractor shall maintain a continuous two rows of lamps in operation until the replacement lighting system for the opposite row is completed, tested, inspected, and accepted by the Engineer. During construction, the existing luminaires shall remain in operation during both daytime and night-time hours. Portions of the existing lighting system may be temporarily removed in areas where night-time construction work is being performed, however the remainder of the existing tunnel lighting system must be kept in operation. Remove exposed portions of the existing tunnel luminaire circuits from the tunnel once permanent luminaires have been installed and energized. Obtain the prior approval of the Engineer before disconnecting or deenergizing any existing electrical feeder.

(c) The Drawing indicate the general arrangement of circuits, locations of devices, equipment, conduits, and other work. It is intended that the Plans and Special Provisions describe the work in its entirety, notwithstanding the fact that every item necessarily involved may not be specifically mentioned.

(d) The arrangement, position and connection of wires, conduits and apparatus shown in the Drawings are diagrammatic but shall be followed as closely as possible. The Contractor shall coordinate the location of equipment, fixtures, devices, outlets, conduit, etc., to avoid interferences and to best fit with the details of job conditions.

(e) Any portion of the work which should reasonably and obviously be necessary for the complete, safe and satisfactory operation of the installation, but is not expressly described or specified, shall be provided and installed as a part of the contract and the Contractor shall not be entitled to any extra payment.

REVISION OF SECTION 613
LIGHTING

Subsection **613.03** shall include the following:

(a) Handle all equipment carefully to prevent internal component damage, breakage, denting or scoring of the finish. Do not install damaged equipment.

(b) Store equipment in a clean, dry space. Protect equipment from dirt, fumes, water, construction debris, and physical damage.

(c) Provide auxiliary heaters, or store in a heated space, for any equipment that would be damaged by moisture condensation, such as electronic components, contacts, etc.

(d) Installer must examine the areas and conditions under which electrical equipment is to be installed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer and the Engineer.

Subsection **613.07** shall include the following:

Scope of Work: The work shall include furnishing, handling, storing and installing all conduit, conduit fittings, conduit bodies, fireproofing, trenching, concrete coverage over conduit in exhaust duct, wireways, boxes having no dimension greater than 12 inches and mounting hardware in accordance with the Standard Specifications, the Plans and these Special Provisions.

Conduit Sizing, Arrangement and Support

(a) Where a conduit size is not shown, size conduit for conductor type installed or for Type THW conductors, whichever is larger. Conduit size shall be 3/4-inch minimum unless noted otherwise.

(b) Arrange conduit to maintain headroom and present a neat appearance.

(c) Route exposed conduit parallel and perpendicular to walls and adjacent piping.

(d) Maintain minimum 6-inch clearance between conduit and piping.

(e) Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using conduit straps or bolted split stamped hangers.

(f) Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit clamps. Provide space for 25 percent additional conduit (minimum 12-inch greater than required).

(g) Fasten conduit with approved steel clamps before conductors are pulled. Do not use spring steel clips for conduit clamps. Remove all wire used for temporary conduit support during construction.

(h) Support conduit at a maximum of 7-feet on center. Provide steel channel supports to standoff conduits from the mounting surface.

REVISION OF SECTION 613

LIGHTING

Wireways:

(a) Wireways shall be furnished and installed where indicated on the Drawings.

(b) Wireways indicated for installation in the Ventilation Buildings shall be NEMA Type 1, without knockouts. Knockouts shall be field installed only where required for conduit entry. Wireways indicated for installation in damp locations or inside the ventilation air ducts shall be NEMA Type 12 oiltight lay-in wireway.

(c) Covers shall be hinged to the wireway. Covers for NEMA 1 wireways shall have keyhole slots to accept captive screws that are capable of securely locking the cover in place. Covers for oiltight wireways shall be held closed with pull down latches and be supplied with neoprene gaskets. Furnish wireways complete with all fittings, end plates and supports as required.

(d) Finish of wireway shall be ANSI-49 gray epoxy enamel applied over a corrosion resistant phosphate primer coat. The epoxy paint and application process shall be UL 870 listed for outdoor use.

CONSTRUCTION METHODS

(a) Use malleable iron hubs for fastening conduit to NEMA 4, NEMA 4X, and NEMA 12 boxes, and for fastening conduit to sheet metal boxes inside the tunnel.

(b) Install no more than the equivalent of three 90-degree bends between boxes. Adequately sized boxes shall be installed to meet this requirement whether specifically shown or not in the Plans.

(c) Use conduit bodies to make sharp changes in direction, as around beams.

(d) Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 1-1/2 inch size.

(e) Avoid moisture traps where possible; where unavoidable, provide conduit body with drain fitting at conduit low point.

(f) Conduit offsets shall be properly made and installed where required. Where two or more conduit offsets or bends are installed in parallel, they shall be symmetrically formed and arranged.

(g) Wipe plastic conduit clean and dry before joining. Apply full even coat of primer and cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum. Any additional installation procedures recommended by conduit manufacturer shall be followed.

(h) Conduit shall be supported on each side of conduit bends or fitting and not more than 2 feet away from any junction box, pull box, panelboard, switch or control cabinet.

(i) Conduit shall not be fastened to other conduits or pipes for support.

REVISION OF SECTION 613
LIGHTING

(j) Conduit shall not cross equipment access hatch, but shall be routed to avoid such openings in wall or ceiling construction.

(k) Conduits and conduit boxes shall be of such sizes and numbers and shall be so installed that the required number of conductors may be drawn in without injury or excessive strain. The Contractor will be permitted to increase the size of conduits and number of boxes, if he so desires, to facilitate a speedier and less complicated installation, however, such changes shall be at his expense.

(l) Where fasteners are required in concrete floors, walls or ceilings of the Ventilation Buildings, use ½-inch diameter stud-type expansion anchors unless noted otherwise. Anchor material shall be stainless steel in accordance with ANSI 304. The minimum allowable anchor working load for existing concrete strength f'c = 3000, shall be certified in writing as follows:

Tension = 1730 lbs., Shear = 2220 lbs.

The corresponding ultimate anchor capacity shall be certified in writing as follows:

Tension = 6500 lbs., Shear = 8340 lbs.

These values are based on a minimum 3-1/2 inch embedment into existing concrete.

The stud bolts, nuts, washers, and couplers shall be supplied by the following manufacturer or an approved equal:

HILTI Corporation

Only one type (manufacturer) of anchor shall be used.

The bolts shall be installed by drilling holes into existing concrete in accordance with manufacturer recommendations. The Contractor shall exercise care in locating and drilling the holes so as to avoid damage to existing reinforcing steel bars and concrete.

In addition to the above requirements, the Contractor shall follow the installation procedures recommended by the manufacturer, including, but not limited to, the size and depth of hole for the required bolt size, the type of drilling tools preferred, and surface preparation.

(m) Where fasteners are required in concrete floors, walls or ceilings of the tunnel liner or outdoors, epoxy resin (adhesive) anchors shall be used unless noted otherwise.

The minimum allowable anchor working load for existing concrete strength f'c = 3000, shall be certified in writing as follows:

Tension = 6800 lbs., Shear = 5000 lbs.

The corresponding ultimate anchor capacity shall be certified in writing as follows:

Tension = 22,000 lbs., Shear = 18,000 lbs.

These values are based on a minimum 6-inch embedment into existing concrete.

The Type 304 stainless steel bolts, nuts, washers, and the epoxy resin shall be supplied by one of the following manufacturer or an approved equal:

HILTI Corporation

REVISION OF SECTION 613
LIGHTING

Only one type of anchor shall be used.

The bolts shall be installed by first drilling holes into existing concrete and effectively cleaning any loose material from the drilled holes. Epoxy resin shall then be utilized for anchoring bolts in the required positions. The Contractor shall exercise care in locating and drilling the holes so as to avoid damage to existing reinforcing steel bars and concrete.

The Contractor shall follow the installation procedures recommended by the manufacturer, including, but not limited to, the size and depth of hole for the required bolt size, the type of drilling tools preferred, surface preparation, and epoxy resin mixing instructions.

The Contractor shall proof-test the required number of anchors as indicated on the Drawings (minimum 5% of installed anchors; minimum two for each type). The testing shall be performed using a portable hydraulic unit specifically designed for such tests and which provides a scaled indication of the force of tension to which the anchor is being subjected. A gauge or chart recorder would provide an acceptable indication for this test.

(n) Wooden plugs inserted in concrete or masonry are not acceptable as a base for conduit fastenings, nor shall conduit or pipe straps be welded to steel structures.

(o) Conduit terminations in NEMA 1 enclosures, except those in cast fittings or items that have a threaded hub, shall be made with two locknuts and a bushing. No running threads will be permitted. The ends of all conduits at NEMA 1 enclosures shall include insulated grounding bushings that are to be interconnected and bonded to the box, panel, tray or cabinet at which they terminate by #8 (minimum) copper wire.

(p) Conduit terminations in NEMA 4/4x and NEMA 12 enclosures, except those made in cast boxes or boxes that have threaded hubs, shall be made using malleable iron hubs, 'Bullet' hub by Thomas & Betts or approved equal.

(q) Openings in floors, walls, or ceilings required for the installation of the conduit shall be sealed and patched to match the existing area after the installation is complete.

(r) Compression seals shall be used wherever a conduit passes through an exterior wall, or ceiling sleeve to preclude the entrance of water or moisture through the seal. The seals shall be the modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the conduit and sleeve. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide a watertight seal between the conduit and sleeve, thus reducing chances of cathodic corrosion between these two members. The compression seals shall be as manufactured by the Thunderline Corporation, O-Z/GEDNEY, or approved equal.

(s) Conduit passing through or routed in the exhaust ventilation duct shall have a fireproofing compound applied where the conduit enters and exits the duct. The fireproofing caulk or sealant shall provide a three-hour rating to block fire, fumes, smoke

or water. The fireproofing material shall be intumescence, rapidly expanding to 5 to 10 times the original volume when exposed to temperatures exceeding 250 degrees Fahrenheit. A minimum 2-inch layer of concrete shall be installed to completely encase conduits routed through the exhaust duct.

(t) Rigid metallic conduits installed inside or on the exterior of the Ventilation Buildings shall have expansion fittings installed at every expansion joint. A specific example is the expansion joints located approximately midway (north-to-south) in the Electrical Rooms of the Ventilation Buildings. Conduits routed in the supply ventilation duct shall have an expansion fitting installed in conduit runs between pull boxes, where the distance between pull boxes exceeds 100 feet. The expansion fittings shall provide for 4-inch conduit movement, 2-inches in either direction. A 14-inch bonding jumper, designed for use in conjunction with the expansion fitting shall be installed around every expansion fitting

(u) All conduits shall be identified at each end with Brady B361 (or approved equal) marker. The conduit identifying number shall be as shown in the plans. Numbers shall be a minimum of ½-inch in height.

Conduit Schedules of Installation:

(a) Conduits routed within the tunnel or Ventilation Buildings and on the exterior of the Ventilation Buildings or on the face of the portal shall be Type R Rigid Steel Conduits. Conduits routed on the tunnel wall or ceiling shall be primed and painted white. Conduits routed on the face of the portal or Ventilation Buildings shall be primed and painted to match the color of the portal face or building.

(b) Conduits installed underground shall be Schedule 80 polyvinylchloride (PVC). Underground PVC conduits shall transition to rigid steel conduit prior to vertical bends using a rigid steel conduit elbow below grade.

(c) Connections to equipment subject to vibration, calibration, periodic removal or where specifically indicated or noted on the plans shall be made with between 18 and 24-inches of liquidtight flexible metal conduit, Type F.

Subsection **613.08** shall include the following:

(a) Examination - Wiring:

1. Verify that raceways are ready to receive wire or cable prior to installation.
2. Conductors shall be examined for damage and damaged wire shall not be installed.

(b) Installation - Conductor Handling:

1. All conductors shall be handled carefully during installation to avoid damage of any kind and shall be unreeled or uncoiled slowly in order to prevent damage to the insulation.
2. Repeated bending shall be avoided in unreeling, uncoiling and pulling in, and the conductor shall be unreeled or uncoiled as straight as possible. Bends necessary

during handling and installing shall be in accordance with industry standards for the wire sizes involved.

3. When cable lengths are cut from cable reels, all exposed cable ends must be resealed with plastic weatherproof end caps, or suitably taped to prevent the entrance of moisture into the cables. Loose cable ends on the reels must be securely refastened to the reel flange and shall not be allowed to lay on the ground.

(c) Installation - Conductor Pulling:

1. Extreme care shall be exercised when pulling wire into conduit. The cable reel or coil shall be set up so that the conductor may be trained into the conduit as directly as possible, with a minimum number of changes of direction or amount of bending.
2. Conductors may be pulled by means of a wire grip of the endless woven basket type or by attaching the pulling device directly to the conductor. An approved inert lubricant may be used to facilitate the pulling of conductors. Pulling tension shall not exceed the manufacturer's recommendations. If a pulling eye is attached to the conductor, the end of the conductor so attached shall be removed prior to terminating.

(d) Installation - Terminations:

1. Except for terminations at wiring devices, relays, terminal blocks, etc., all conductors shall be terminated with compression-type lugs, bolted to an equipment terminal.

(e) Installation – Splices

1. Splices shall be made only when absolutely necessary and shall be made only in pull boxes as approved by the Engineer. Splices shall be made only by qualified electricians and shall be made with splice kits of appropriate size and voltage class.

(f) Installation - Grounding Conductors:

1. Grounding conductors shall be run in conduit with all power circuits and shall be connected to a grounding bushing at both ends of the conduit.

(g) Installation - Conductor routed Across Expansion Joints:

1. A minimum of eight inches excess length of conductors and/or cables shall be coiled up in the terminal box or pull box nearest each expansion joint.

(h) Installation - Conductor Identification:

1. Color coding for the roadway lighting conductors and miscellaneous power circuit conductors shall be permanent, solid color as follows:

Phase	120/240V	277/480V
A	Black	Brown
B	Red	Orange
C	--	Yellow
Neutral	White	White (with stripe)*
Ground	Green	Green

* - 277 volt neutral conductor shall have an identifiable colored stripe (not green) running along the insulation.

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Color coding of electrical conductors No. 6 AWG and smaller by the use of colored phase tape or field painting is not acceptable on this project.

(i) Testing - Cable and Wire:

1. Install all cables and conductors to the point of connection to the load, final device or circuit. Perform an insulation resistance (Megger) test on all new cables and conductors per Special Provision **Section 613.09, Testing.**

Subsection **613.09** shall include the following:

(a) Provide all instrumentation and labor required to conduct all tests recommended by the manufacturer, required by codes or laws, required by the Standard Specifications and required by these Special Provisions.

(b) Voltage: When the installation is complete and the system is in operation, check the voltage on the secondary side of each new transformer supplying power to project loads. Adjust the transformer taps as required to bring the voltage to within nominal and 2-1/2% below nominal under loaded conditions. Record voltage amplitude and balance between phases for loaded (daytime with Steps 1 through 4 'on') and unloaded (night-time) conditions and submit in writing to the Engineer.

(c) Install all cables and conductors to the point of connection to the load, final device or circuit. Perform an insulation resistance (Megger) test on all new 600 volt cables and conductors with respect to ground and adjacent cables, at 1000 VDC. Minimum megger test value shall be as follows on circuits with total single conduction length of:

- 2000 feet and over – at least 6 Meg-ohms
- Less than 2000 feet – at least 8 Meg-ohms

(d) For each panelboard, record the amperes reading on each phase and the neutral, under fully loaded conditions and submit to the Engineer.

(e) Perform all tests in the presence of Department personnel or his authorized Engineer. All test results shall be documented and submitted to the Engineer for approval.

Subsection **613.10** shall be revised as follows:

Replace the first two sentences of paragraph five (5), which begins with the phrase "Conduit on structures..." with the following sentence:

Conduit on structures or underground shall include couplings, conduit fittings, conduit bodies smaller than 2-inch, 90 degree sweep ells, supports with anchoring, pull wire, weatherheads, adaptors, and conduits. Conduit will be measured by the linear feet in place and shall include all core drilling, saw cutting, excavation, backfill, jacking and drilling pits. Conduit bodies sized 2-inch and larger shall be measured on a per unit basis. Conduit bodies in sizes smaller than 2-inch shall not be measured separately, but shall be incidental to the conduit that connects to it. Liquidtight flexible metal conduit sized 1-1/4-inch and larger shall be measured on a per foot

basis. Liquidtight flexible metal conduit in sizes smaller than 1-1/4-inches shall be measured on a per foot basis as the same size of electrical conduit.

Wireways shall not be measured separately, but shall be incidental to the conduits that connect to it.

Delete the first sentence of paragraph eight (8), which begins with the sentence "The Contractor may elect to use direct burial cable in conduit..."

Add the following sentence to the end of paragraph eight (8):

Terminations and any associated components and incidentals and the installation thereof shall be included in this Bid Item. Included in the term "incidentals" are all pulling compounds and equipment required to perform the complete installation and testing for the tunnel wiring system.

Subsection **613.11** shall be revised as follows:

Replace (**Pay Item**) "__" Electrical Conduit" and (**Pay Unit**) "Linear Foot" with the following:

Pay Item	**Pay Unit**
3-½ Inch Electrical Conduit	Linear Foot
3 Inch Electrical Conduit	Linear Foot
3 Inch Electrical Conduit (Plastic)	Linear Foot
2-½ Inch Electrical Conduit	Linear Foot
2-½ Inch Electrical Conduit (Liquidtight Flexible Metal)	Linear Foot
2 Inch Electrical Conduit	Linear Foot
2 Inch Electrical Conduit (Liquidtight Flexible Metal)	Linear Foot
2 Inch Electrical Conduit (Plastic)	Linear Foot
1-½ Inch Electrical Conduit	Linear Foot
1-¼ Inch Electrical Conduit	Linear Foot
1-¼ Inch Electrical Conduit (Liquidtight Flexible Metal)	Linear Foot
1 Inch Electrical Conduit	Linear Foot
¾ Inch Electrical Conduit	Linear Foot
2 Inch Electrical Body (Type LB)	Each
2 Inch Electrical Conduit body (Type TEE)	Each

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Section 613 of the Standard Specifications is hereby revised for this project and includes the following:

DESCRIPTION

613.1201 General. This work consists of furnishing, installing, wiring, and testing, tunnel lighting systems complete with luminaires, lamps, mounting brackets, wireways, and all other equipment and materials required to make the lighting system complete and operable as specified herein, and as shown on the Contract Drawings. General requirements include those specified in Section 613.00 of the Standard Specifications; "Lighting" and as specified herein.

613.1202 Applicable Publications. The publications listed below form a part of these Specifications to the extent referenced. The publications are referenced in the text by basic designation only. Materials and workmanship shall be in accordance with the following Standards and Codes to the extent specified herein. Unless otherwise indicated the issuance, or date of applicable Codes and Standards at the time the Request for Proposal is issued shall govern.

(a) American National Standards Institute (ANSI) Publications:

1.	C2	-	National Electrical Safety Code
2.	C37.98	-	Seismic Testing of Relays
3.	C78.1	-	Fluorescent Lamp, Rapid Start, Electrical Characteristics
4.	C82.1	-	Fluorescent Lamp Ballasts

(b) Illuminating Engineering Society of North America (IESNA) Publication:

1.	HB-93	-	IESNA Lighting Handbook - 8th Edition
2.	RP-22-96	-	Practice for Tunnel Lighting
3.	LM-63-95 Data	-	Standard file format for Electronic Transfer of Photometric
4.	LM-41-85	-	Photometric Testing of Indoor Fluorescent Luminaires
5.	LM-10-96	-	Photometric Testing of Outdoor Fluorescent Luminaires
6.	RP-16-96	-	Nomenclature and Definition

(c) National Fire Protection Association (NFPA) Publication:

1.	70	-	National Electrical Code, 1996
2.	502	-	Life Safety Code in Tunnels, 1998

(d) Underwriter's Laboratories Inc. (UL) Publications:

1.	467	-	Grounding and Bonding Equipment
2.	542	-	Fluorescent Lamps, Lampholders

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3.	935	-	Fluorescent-Lamp Ballasts
4.	1570	-	Fluorescent Lighting Fixtures

613.1203 Submittals. Submittals shall consist of Manufacturer's Data, Shop Drawings, Samples and Test Data. All submitted data, shop drawings, and reports shall employ the terminology, classifications, and methods prescribed by the IESNA Lighting Handbook, as applicable, for the lighting systems specified.

(a) Proof of the Manufacturer's experience record shall be submitted according to Subsection 613.1207, before any review of the Manufacturer's data by the Engineer will occur.

(b) Manufacturer's data shall be submitted for the following: luminaires, including housing, lensframe, lamps and ballasts; luminaire mounting assembly (support channels, cross supports, hardware); lamp sockets and lampholders, terminal blocks, fuses and fuseholders, grounding lug, pin and socket (quick-disconnect) connectors; wireways (Types F1, F2, F3, HID Feed and Non-Feed) and wireway housing, covers and mounting assemblies; independent testing laboratory photometric data; waterspray test results (tunnel fixtures only); experience record certifications; and paint adhesion tests.

(c) Shop Drawings shall be submitted for the following:

Each type of luminaire, including complete fabrication and assembly drawings, bill of materials, mounting brackets, including fabrication, bills of materials and assembly drawings for tunnel lighting luminaires, wireways including complete fabrication and assembly drawings, bills of materials (Types F1, F2, F3); and wireways (Types F1, F2, F3, HID, Feed and Non-Feed Types).Included with the shop drawings, submit a sample luminaire of each style, mounting and lamp arrangement specified and a sample wireway of each style and mounting arrangement. Reports indicating that all required tests specified have been successfully completed shall accompany each pre-production sample at the time it is submitted. The sample, if acceptable, will be retained until completion of the work to confirm quality conformance to the prescribed requirements herein. Provide the luminaire sample with lamp capable of operation at 120 volts with six-foot cord and plug. Provide access for factory inspection, for two representatives of the Department, during initial production runs of the tunnel lighting luminaires and wireways at no cost to Department. Finishes and colors for the samples shall be identified as to alloy pretreatment and color. Do not begin processing of production materials until Engineer's written acceptance of samples has been obtained.

613.1204 Testing Procedure. The Engineer reserves the right to order such tests as it deems necessary to ensure compliance with these specifications and to reject those luminaires failing such tests, or those luminaires with improper or inadequate light distribution or construction quality. The Engineer shall be the sole judge as to acceptability. The Engineer shall randomly select one luminaire and wireway of each type from the project's production lot at either the

manufacturer's plant or job site; this choice shall be of sole discretion of the Engineer. The Contractor shall then deliver the luminaire(s) to a recognized independent testing laboratory that is acceptable to the Engineer.

The certified results of these tests shall be forwarded directly to the Engineer. If one or more in each group fail to meet the criteria of the Engineer, the Contractor shall deliver two additional luminaires for testing. Additional groups of two luminaires shall be delivered until one group fully passes all tests. No rejected luminaires may be used on this Project. All testing shall be at the sole expense of the Contractor.

(a) **Photometric Test.** The luminaires shall be tested at an independent testing laboratory for compliance with illumination, efficiency, and uniformity ratios of illumination depicted on the design documents.

Photometric data shall be accompanied with a diskette that includes the in IESNA format. An independent testing laboratory must have completed all photometric tests in accordance to LM-10-96, Photometric Testing of Outdoor Fluorescent Luminaires, within the past five years. The photometric report must include candela distribution tabulation; candela distribution curves for the 0, 45, and 90 degree lateral angles, coefficient of utilization table, and brightness data in 10-degree increments above 45 degrees vertical to 90 degrees.

(b) **Paint Adhesion Test.** Paint tests shall be conducted by an independent laboratory and submitted to the Engineer. The Manufacturer shall submit a single 12-inch by 24 inch by .032 inch thick panel of 5050 aluminum to the independent testing laboratory for the tests. The Vendor shall use the same preparation treatment, the same polyester powder paint, and the same method of application as the housing shall receive. Testing shall be as follows:

1. A 2.0 mil thick coating of polyester powder paint shall withstand a 160 inch-pound impact measured with a standard Gardner Impact Tester.

2. The flexibility of polyester powder paint shall withstand a 180 degree bend over a ¼ inch mandrel diameter without loss of adhesion or cracking.

3. Polyester powder paint shall not exhibit any blistering or loss of adhesion when exposed for 500 hours of 100 percent humidity at 100 degrees F or after a 24 hour period of immersion in 100 degree F tap water.

(c) **Water Spray Test.** Water spray tests shall be conducted on ten luminaires selected at random by the Engineer. The tests shall be witnessed by the Engineer. The results shall be stated in writing (pass or fail) and shall be submitted to the Engineer.

The luminaire shall be completely operable. The luminaire assembly shall be mounted to an adjustable mounting surface with the longitudinal side of the fixture facing the spray nozzles. (For the fluorescent type luminaires, two luminaires and wireways shall be

affixed using standard flexible joint detail connected and mounted as shown in the Contract Drawings. For the HID type wireways, two wireways shall be affixed using the standard flexible joint detail connected and mounted as shown in the Contract Drawings.)

The Manufacturer has the option to make the nozzle positions adjustable or to have the luminaire assembly adjustable. The range of the nozzle adjustment shall be such that all exposed surfaces of the luminaire assembly when mounted in the tunnel shall be able to be in direct contact of the spray.

The spray apparatus shall consist of four spraying nozzles, spaced 30 inches apart attached to a 2 inch pipe, each providing 12 gallons per minute at 100 pounds per square inch at the nozzle, in a 90 degree cone. A water pressure gauge shall be installed at the first spray nozzle.

The test procedure shall be as follows:

1. With the joint of the two luminaires/wireways positioned between the center two nozzles at a distance of 18 inches, rotate the assembly so that the spray is directly aimed at the bottom of the assembly.
2. Energize the luminaire for a minimum of 30 minutes. Then turn on the water. After 15 minutes of applying water, turn off the fixture, leaving the water spray on for 15 more minutes. The luminaire or wireway shall not show any evidence of leakage under the test conditions specified. There shall not be any experience of any latch releasing during the procedure.
3. Rotate assembly 75 degrees so that the water spray is applied to the front of the assembly and repeat step 2.
4. Rotate assembly 150 degrees in the opposite direction to apply the water spray to the back side of the assembly. Repeat step 2.
5. The Engineer reserves the right to adjust the assembly to one final position. Repeat Step 2.
6. Repeat test until all ten luminaires and wireways have been tested or unless the Engineer warrants that all ten do not need to be tested.

613.1205 Warranty. The Manufacturer shall provide written confirmation of willingness to comply with the following product warranty:

(a) The Manufacturer warrants that the design, material and workmanship incorporated in each luminaire shall be of the highest grade and consistent with established, and generally accepted, standards for roadway tunnel lighting applications.

(b) The Manufacturer agrees that this warranty (non-prorated) for the products procured for this Project shall commence upon the acceptance of the installed and operating tunnel

lighting system, whether a defect is patent or latent, and shall continue for a period of five (5) years (non-prorated) after acceptance by the Department.

(c) Any claims against the warranty shall be valid regardless of whether the defect in the lighting and/or wireway is due to materials, workmanship or installation. The warranty shall include all labor and material costs for furnishing and installing any replacement, or providing any repairs to materials, equipment and/or devices. The Manufacturer shall reserve the right to make any repairs or corrections at their own cost.

(d) Any claims against the warranty will be valid regardless of who performs the installation. The Manufacturer will be allowed to inspect after the time the repair has been made, at no cost to the District with the Engineer present, the installation of the product in order for the final issuance of the warranty specified.

613.1206 Handling and Delivery. Ship luminaires, wireways, and accessories securely packaged and labeled for safe handling in shipment and to avoid damage or distortion. Store luminaires, wireways, and accessories in secure and dry facility and in original packaging in a manner to prevent soiling, physical damage, wetting or corrosion prior to installation. Provide for storage inspection by Engineer after luminaires, wireways, and accessories has been delivered. This inspection shall be at no additional cost to the Department. All cartons shall be clearly marked with the proper identification of Manufacturer, Catalogue Number, Luminaire or Wireway Type designation and proper storage/handling instructions.

613.1207 Manufacturer's Experience Record. Submissions from Manufacturers other than those listed below will be reviewed providing the Contractor shall submit proof to the Engineer that the manufacturer of the proposed tunnel roadway luminaires has been manufacturing similar fixtures to those specified herein, for use in a vehicular tunnel environment, for a minimum of five years and has a proven satisfactory performance record. Certification will be required of the five year manufacturing history and of a satisfactory performance record. Tunnel Luminaire submittals will not be reviewed until the Manufacturers Experience Record has been approved. The Engineer shall be the sole judge as to acceptability. Acceptable Manufacturers; Thomas-Schreder, NuArt Lighting, Mark Lighting.

MATERIALS

613.1208 General Requirements. All materials, equipment, and devices shall, as a minimum, meet the requirements of UL where UL standards are established for those items, and the requirements of NFPA 70. All equipment and materials provided shall be new. All assembled luminaires shall bear the Underwriters' UL1570 Wet Location Label appropriate to location applied on the Contract Drawings. Locations of luminaires are shown diagrammatically on the Contract Drawings. Contractor shall verify exact locations in the field and shall notify the Engineer about field conditions at variance with plans before commencing installation. Inclusive of the submittals listed above, the manufacturer shall provide verification of the UL Listing as Underwriters Laboratories listing sheet (e.g.: Listing Sheet provided to the manufacturer upon

acceptance.)

Reflector cones, baffles, louvers, aperture plates, and decorative elements of fixtures shall be packed by the manufacturer separate from the housing of the fixture at no cost to the Department. Blemished, damaged, or unsatisfactory fixtures shall be replaced in a satisfactory manner at no cost to the Department.

(a) Reflector material shall be prefinished aluminum, minimum thickness 0.032 inch, architectural type 1 with class M1, ANODIC coating providing 83 percent reflectivity.

(b) All luminaires and wireways shall be painted inside and outside. Painted finishes of fixtures and accessories shall be applied such that the entire assembly is rendered completely corrosion resistant for the service intended.

(c) Where aluminum parts come in contact with bronze or stainless steel parts, apply to both surfaces a coating of acceptable corrosion protection material.

(d) Components, fasteners, hangers, and mounting brackets shall be Type 316L stainless steel.

(e) Fixtures shall be free of light leaks and shall be designed to provide the appropriate heat dissipation for lamps and ballasts to operate per the component manufacturer's recommended conditions.

(f) Lampholders and lamp sockets shall hold lamps securely with seismic 1 rating.

(g) Wiring channels and socket mountings shall be rigid and accurately made.

(h) Luminaires shall be furnished complete, of the type specified herein, and shall conform to fixture dimensions shown on the Contract Drawings.

(i) Acrylic Diffusers shall be a minimum of 0.125 thick and made of 100% clear virgin type "DR" acrylic. The overall thickness shall be a minimum of 0.156 inches with the physical properties listed below:

(j)

Property	Test Method	Value
Refractive Index	ASTM D-542	1.49
Light Transmission	ASTM D-1003 Total white light	92%
Haze		<2%

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Property	Test Method	Value
Rockwell Hardness	ASTM D-785 M Scale	97
Tensile Strength	ASTM D-638 (0.1 in./in/min.) Initial. Strain rate, max. psi	10,200 psi
Flexural Strength	ASTM D-790 Span-depth ratio 16 (0.1 in./min.) max. psi	15,000 psi
Flexural Modulus		450,000 psi
Impact Strength	ASTM D-256 ID milled notch Falling Dart (6" X 6" X 1/8", 3 lb. Dart, ¼" radius)	0.23 ft.lb./in. of notch 1 ft.lb.
Deflection	ASTM D-648	216°F
Deflection Temp. Under Load, Annealed		3.6°F/min., 264 psi
Continuous Service Temp. Range		185-215°F (dependent on part "molded-in" stresses)

(j) Gasketing to be extruded Neoprene-SBR of the following physical properties. All shapes used to completely cover flange to which gasket is affixed. Adhesive where required, to complete seal and be as for gasket per manufacturers recommendation.

Property / Test Method	
ASTM D-1056-68	SCE-41
ASTM D-1056-78	RE-41 E1
ASTM D-1056-85	2C1.B2

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Property / Test Method	
Compression Deflection (psi)	2 – 5
Shore "00" Durometer (Approx. Average)	20 – 55*
Water Absorption by Weight (Max.) ASTM D-1056-85	5%
Density (p.c.f.) Average	15 – 35
Temperature Range (°F)	Low (Flex without Cracking) @ -20^{O}
High Continuous	150^{O}
High Intermittent	200^{O}
Compression Set (Average) ASTM D-1056 ½" compressed 22 hrs. @ 70 °F - 24 Hrs. recovery	50% 15% 25%

***Depending on size and cross section.**

613.1208 Finishes. Unless otherwise stated the luminaire housing, wireway, and lens door assemblies, shall be finished with an electrostaticaly applied, thermally cured, triglycidyl isocyanurate polyester powder paint. Finish shall be applied to all part surfaces after fabrication to a minimum 2.0-mil total dry thickness, and applied over an anodized conversion coat base. Powder coat shall be applied and baked on prior to anodic seal coat, to guarantee maximum adherence. Commence no finishing operations until fabrication and forming operations have been completed.

613.1209 Aluminum Finishes. All aluminum components are to be anodized prior to the final finishing process as stated in Subsection 613.1208, Finishes. Each component shall be given a pre-anodic treatment followed by an architectural Class 1; anodic coating as described by the Aluminum Association.

613.1210 Luminaire and Electrical Components. All components shall consist of the highest grade of materials commercially available. Manufacturer shall be responsible for all compatibility testing between components.

(a) Lampholders/Lampsockets shall be the class and style recommended by the lamp manufacturer for the specific lamp required by each fixture. Rigidly and securely fastened to the mounting surface with the necessary provisions to prevent lampholder

from turning and front removable without dismantling any part of the fixture. Located in the Luminaires to place each lamp, of size specified, in the proper position with relation to fixture design specified. Clearly marked to indicate manufacturer lamp type and voltage and appropriate listings.

Fluorescent lamp holders: White urea, spring loaded with silver-plated contacts of the pedestal or butt-on type, in accordance with the applicable requirements of UL-542. Shall be rated for 660 watts, 600 volts.

(b) Ballasts shall conform to UL 935, ANSI C82.1, and shall be labeled as Certified Ballast Manufacturers (CBM) certified by Electrical Testing Laboratories (ETL). Ballasts shall be high power factor electromagnetic type and shall be designed to operate at 277 volts plus or minus ten percent, 60 Hertz unless otherwise noted. Fixture and ballast shall be designed and constructed to limit the ballast case temperature to 90 degrees Celsius when installed in an ambient temperature of 40 degrees Celsius. All ballasts must be similar to MagneTek Lighting Products ballasts' and conform to the operating requirements of the submitted lamps.

1. Slimline 210 mA, eight foot lamp ballasts shall be Class P with a "B" sound rating and a minimum starting and operating temperature of zero degrees Fahrenheit.

2. Instant start, high output, 800 mA lamp ballasts shall be Class P with a "D" sound rating and a minimum starting and operating temperature of minus 20 degrees Fahrenheit.

(c) Fixture Wires shall be stranded tinned-copper construction, not smaller than No. 16 AWG. Insulation for conductors is to be silicone rubber type SF-2 and 200 degrees Celsius rated. Conductor size, temperature rating, voltage rating and manufacture clearly marked on the insulation of each conductor. Use wires between lampholders and associated operating and starting equipment of the same ampacity rating as leads from the ballast. Wiring within the fixtures shall conform to the requirements of NEC and UL. Unless otherwise specified, the housing of each ballasted lighting fixture shall be provided with a separate, factory-installed grounding device. The grounding device shall be used for connecting a separate, green, grounding conductor to the fixture housing. Wireways and wiring channels shall have rounded edges or bushed holes wherever conductors pass through. Insulated bushings shall be installed at points of entrance and exit of wiring.

(d) Terminal blocks shall be molded, one-piece construction, with a four circuit, 30 AMP, 600 volt capacity. Connections shall be made with copper spades held in place with #10-32 washer head binding screws. A non-conducting barrier strip shall be between each adjacent row of terminal positions. Terminal block shall be attached to slot in ballast tray by No. 10 screws as per manufacturer recommendations. Terminal block shall accommodate wires sized No. 18 to No. 10 inclusive. Terminal blocks shall conform to NEMA and UL standards.

(e) Quick connect/Quick disconnect connectors shall be supplied with the ballast and exactly mated to wireway cap. Connectors shall be made from Nylon 6/6 94V-O with Brass and Phosphor bronze sockets. Pins shall be solid and made of Brass and Phosphor bronze. Connectors shall have capacity for 3 connections of not smaller than no. 16 AWG. Minimum operating characteristics to allow 600 VA @ 15 amps maximum with an operating temperature of -55° to 105°C. Performance test for vibration shall require no discontinuities greater than 10 microseconds and 5.0 milliohms maximum termination resistance, dry circuit. Contact shall be retained at a minimum axial force of 15 pounds. Plug and caps shall be visually inspected for defects that would increase mating force beyond 3 pounds and decrease pull-out force below 7 pounds with locking latches disengaged. Connectors to conform to UL and NEMA standards.

613.1211 Fixture Hardware. Hardware shall consist of the highest grade of commercially available. Manufacturer shall be responsible for all compatibility testing between components. Latch and release mechanism, hinges, pins and other retaining parts of fixtures: screws, grounding lug, bolts or other assembly and mounting parts shall be manufactured of Type 316L stainless steel. All springs shall be heavy-duty stainless steel. All retaining hardware shall be self-retaining and be rated for a minimum of a 400 pound load capacity. Form gaskets, sealant and adhesives subjected to high temperature from silicone rubber. Provide other gaskets of neoprene, as specified herein or as indicated. Provide bolts, nuts, washers, screws, nails, rivets and other fastenings necessary for proper installation or assembly of work. When exposed to the atmosphere, provide fasteners made of 18-8 stainless steel. Fasteners within the housing shall be made of zinc plated, bright iridite, steel or electrogalvanized gray. All nuts shall have captive externally footed lockwashers.

613.1212 Welds. Locate welds in assemblies to be anodized to conceal visible discoloration in the heat-affected zone. Where welded metal will be exposed after anodizing, select filler alloys to closely match composition of base material. Comply with parent metal manufacturer's recommendations for such filler alloys.

613.1213 Fluorescent Lamps. Fluorescent lamps shall conform to all applicable standards. Provide each lighting fixture with the number, type, and wattage of lamps required by the Contract Drawings. Provide lamps of standard manufacture, readily available, and of the highest efficiency and life consistent with other requirements of the illumination system. Lamps shall be eight foot in nominal length with a maximum tube diameter equaling one inch, which provide a correlated color temperature (CCT) of between 4000 and 4100 Kelvin (K). Each lamp shall also provide the following characteristics:

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Length / Diameter (Feet/Inches)	Lamp	Phosphor Type	Minimum CRI	Lamp Watts	Initial Lumens
8 / 1	F96T8/841 (210mA) Slimline, Instant Start	4000K	80	75	5,900
8 /1	F96T8HO/741 (800mA) High Output, Rapid Start	4000K	80	86	8,200

Contractor shall supply complete manufacturer's data on lamps prior to procurement. Bi-Pin lamps are not acceptable. All lamps shall be provided by one manufacturer and similar to Osram Sylvania.

613.1214 Fluorescent Luminaire Components. The fluorescent tunnel lighting luminaires to be provided, shall be UL wet label listed and manufactured in accordance with the following specifications, and shall contain a completely wired and removable ballast tray and optical assembly containing the photometric distribution as indicated the Contract Drawings. The luminaire shall bear the "UL 1570 Listed SUITABLE FOR WET LOCATIONS" label. Construction shall conform to UL595 – Marine Duty Salt Water Applications and be IP65 rated. The luminaire shall have a NEMA lamp identification decal and consist of the following elements:

(a) The luminaire body shall be one piece of extruded aluminum alloy type 6063T5 with a minimum wall thickness of 0.144-inch and two end caps. Minimum 0.125-inch thick (356 alloy) die-cast aluminum end caps shall enclose the two ends of the main body extrusion, which shall be seam welded in place to produce a watertight enclosure with a .625 alignment flange. The maximum luminaire dimensions shall be as shown on the Contract Drawings.

(b) Provisions shall be made within the extrusion for a removable hinged ballast tray that provides for mounting of the ballasts, reflector, and terminal blocks without piercing the housing. Ballast tray design shall be capable of supporting the ballast tray assembly when hanging at 90 degrees from the horizontal position. Ballast tray shall be designed such that it is interchangeable with previously installed luminaires on the project and provides alignment slots enabling electrical components to have various mounting locations.

(c) The reflector shall be formed from one-piece specular anodized aluminum sheets, and shall be formed to provide the required distribution characteristic shown on the Contract

Drawings. The entire length of the reflector shall have bends and side flanges for strength, safety and efficiency. The reflector design shall permit the reflector to be readily removable without the use of tools. The reflector shall be mounted to the removable ballast tray. The tray shall be self-hinging and retained by means of quarter turn, positive detach type fasteners capable of supporting the entire weight of the ballast tray, ballasts, and reflector. The ballast tray shall be a minimum .125 inch thick extruded aluminum with a full length integral male hinge design that enables the tray to be removed only when positioned at 45 degrees down from the horizontal position.

(d) The housing body shall include the mating female retaining profile hinge receiver. The hinged cover assembly shall have extruded aluminum side rails of alloy 6063T5 and die-cast (356 alloy) aluminum end caps framing an extruded high impact 100 percent clear virgin DR-acrylic plastic lens, 0.125-inch minimum wall thickness, smooth on the outside, and pyramidal prismatic pattern on the inside. The end caps and the lens side rails shall be secured using 4 stainless steel screws. The door shall be a minimum of 0.9-inch wide where it seats against the fixture housing with a knifing vertical member of at least 0.1-inches high. The upper gasketed ledge shall be a minimum of 0.56-inch wide.

The minimum door frame thickness shall be 0.144-inch. The cover assembly shall seat against a continuous extruded Neoprene-SBR, closed cell sponge, "D" shaped extrusion permanently cemented to the housing and that by design will permit hinging from either side, and adjustment to provide a tight seal. The hinged cover assembly shall meet the minimum water spray test as described herein. For luminaires that are to be wall mounted, provide a hinge support clip to ensure against separation of the hinged cover assembly from the luminaire.

(e) A gasket sealing surface of a minimum of 0.9 inches wide shall be provided where the lens frame seals against the fixture body. Fixture housings shall have a seamless or fused, one-piece extruded Neoprene-SBR closed cell sponge gasket permanently cemented to the bottom flange providing a watertight seal to the wireway.

(f) The door assembly shall provide a minimum of four stainless steel latches for each side of an 8-foot long assembly. The latch assemblies shall be able to carry the weight of the total doorframe assembly. The release action of the latch shall be such that when released, the latch snaps to an open position allowing for the door to open naturally. Refer to the Contract Drawings for size shape and operation of the latch assembly.

(g) An extruded, watertight wireway integral to the luminaire shall be provided for each fluorescent tunnel lighting luminaire. The wireway shall run the full length of the fixture to carry the branch circuit wires. The top flange of the wireway shall be designed to accept the mounting bracket and carry the weight of a completely assembled luminaire. Connections between wireway sections will be made through a Neoprene-SBR gasket and an extruded aluminum conduit sleeve that allows for slight curvature in the luminaire row. The gasket will seat against the cast end caps of the wireway. Wireway housing

shall have an integral continuous clevis on each side, accommodating slide grip hanger brackets to facilitate installation and provide a secure mounting. UL labeling shall be required for complete fixture including wireway.

(h) Fixture mounting brackets for the fluorescent tunnel lighting luminaire shall be by means of custom designed rigid mounting plates. The mounting plates shall be manufactured using a one-piece Type 316L stainless steel plate and formed as designated in the Contract Drawings.

(i) Supplemental mounting plates for the fluorescent tunnel lighting luminaire shall be by means of custom designed rigid mounting plates. The mounting plates shall be manufactured using a one-piece Type 316L stainless steel plate and formed as designated in the Contract Drawings.

(j) Fixtures shall have fixture-type-identifying labels permanently attached to the interior. Labels shall include lamp-type to aid maintenance personnel in lamp replacement. Fixtures connected to standby circuits shall have a permanent red label affixed below the ballast tray with the words "STANDBY CIRCUIT #___"

(k) Lampholders shall be supported in a die-formed aluminum socket support plate and shall be accurately spaced for either slimline or high output rapid start lamps.

(l) Each luminaire shall have a primary lead terminal block to accept leads from the incoming line. Ballast supply wiring shall terminate at this terminal block.

(m) Each luminaire shall be equipped with a fuse holder and dual element time delay fuse for each ballast. Fuse shall conform to the requirements of the ballast and lamp manufacturers. Fuses shall be panel mounted and accessible with removal of reflector. Fixtures shall be equipped with internal wiring in place and an additional two-foot length of the required conductor size with a quick-connect connectors on one end, number as required by circuit(s). Additional connectors shall be supplied above ballast tray for its removal with final connection made to the outgoing supply side of the terminal block.

613.1215 HID Wireway Components.

(a) All HID wireways shall be interchangeable in their components. The difference between the types is as indicated, namely; Non-Feed type wireway connects to luminaires on one side only, Feed type connects to luminaires on one side of the wireway, and contains a power feed connector on each opposite end as shown on the Contract Drawings.

(b) Wireways shall require only one tool for normal maintenance functions.

(c) Wiring channels and plug mountings shall be rigid and accurately made.

(d) Wireways shall be furnished complete, of the type specified herein, and shall conform to dimensions shown on the Contract Drawings.

(e) The wireways to be provided shall be UL wet label listed and manufactured in

accordance with the following specifications, and shall consist of the following elements:

1. Housing: An extruded, watertight wireway enclosure shall be provided for each luminaire. The wireway shall run the full length of the luminaire to carry the branch circuit wires. The top flange of the wireway shall be designed to accept the mounting bracket and carry the weight of a completely assembled wireway.

   Connections between wireway sections shall be made through a gasketed connector, secured by means of stainless steel hardware, that allows for slight curvature in the luminaire row primarily due to the longitudinal profile grade of the tunnels. The gasket shall seat against the cast end caps of the wireway and the wireway sleeve. An additional gasket assembly shall be added to be sure that wireways seal completely end to end. Wireway end caps shall be provided at the end of the rows of wireways or break points as noted on the Contract Drawings.

2. Wireway covers shall be made of a single piece of extruded aluminum with a minimum thickness of 0.144 inch and cover the entire length of the wireway. A Neoprene-SBR gasket shall be included in between the bottom of the wireway and the wireway cover to allow the wireway to be completely sealed.

3. A wireway continuation sleeve shall be included for each end of the wireway and for both the normal and the standby sides of the wireway. It shall be made of extruded aluminum to provide protection for the wiring at the wireway connections. Sleeve shall provide a minimum of 5 square inches in area inside of the sleeve.

4. The wireway shall be factory pre-wired with a 3-conductor #12, 3-contact, 600 volt, 10 amp straight female receptacle with a molded thermoplastic construction. Each receptacle shall be furnished with one threaded molded thermoplastic cap to insure against water intrusion prior to connecting the HID luminaries. The cap shall include a neoprene gasket. The connected receptacle with cap shall meet the requirements of NEMA 4-4X, 6, and 6P plus IP 65, 67, and 68, and shall withstand hose-down pressures of up to 1,000 psi.

5. Wireways shall be securely mounted to the ceiling by means of attaching to surface mounted lighting fixture support channels using lighting fixture support hardware (misc.) as specified in Revision of Section 613, Supporting Devices.

613.1216 Luminaire and Wireway Samples. The manufacturer shall provide a random sample of post-production run of each luminaire and wireway type as deemed necessary by the Engineer. The sample shall be sent to an independent lab designated by the Engineer. The sample shall be tested for water tightness, noise omittance, lumen output and overall adherence to quality standards set forth in these specifications. Random selection and testing to be overseen by the independent testing laboratory and the Engineer.

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REVISION OF SECTION 613
TUNNEL LIGHTING

613.1217 Luminaire Types. The following fixture types shall be manufactured as described above in the configurations detailed below:

Type "F1" Shall contain a wireway and light fixture that contains a pair of 210 ma (F96T8/841) 96" T-8 slimline, instant start fluorescent lamp with 4000K color coating, with one lamp ballast, and wired for operation at 277 volts plus or minus ten percent, 60 Hertz.

Type "F2" Shall contain a wireway and light fixture that contains a pair of 800 ma (F96T8HO/841) 96" T-8 high output and a single 210 ma (F96T8/841K) 96" T-8 slimline, instant start fluorescent full wattage lamps with ANSI RE 841 Tri Phosphor coating, with one lamp ballast, and wired for operation at 277 volts plus or minus ten percent, 60 Hertz.

Type "F3" Shall contain a wireway and light fixture that contains two 210 ma (F96T8/841) 96" T-8 slimline and a single 800mA (F96T8HO/841), instant start high output, fluorescent full wattage lamps with ANSI RE 841 Tri Phosphor coating, with one lamp ballast, and wired for operation at 277 volts plus or minus ten percent, 60 Hertz.

613.1218 Wireway Types. The following wireway types shall be manufactured as described above in the configurations detailed below:

"Non-Feed" Type The complete wireway shall be designed to allow for four metal halide luminaires to be mounted to one side of the wireway (total 4 luminaires), spaced 2'-6" on center, using the receptacle described above.

"Feed" Type The complete wireway shall be as the "Non-Feed Type" above and shall allow for two electrical power feed location, 2" RGS conduit fitting out of the side wall at each opposite end of the wireway as shown on the Contract Drawings.

CONSTRUCTION REQUIREMENTS

613.1219 Performance Requirements. Perform all Work in accordance with the requirements of NFPA 70 and authorities having jurisdiction. Verify that other construction work is complete to the extent that Luminaires may be installed. Install Luminaires of the type required in the locations shown and make all final electrical connections. Provide accessories as required for ceiling construction type installed even though these accessories may not be specifically indicated on the drawings. Fixture catalog numbers do not necessarily denote specific mounting accessories for type of ceiling in which a fixture may be installed. Provide appropriate support for each lighting fixture. Fixtures and support elements shall not be mounted on or in contact with ducts or pipes.

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REVISION OF SECTION 613
TUNNEL LIGHTING

613.1220 Installation. Install rows of fixtures accurately on straight lines unless otherwise indicated on Contract Drawings. Install all necessary hangers, channels, bars, supports, and rods required to align Luminaires. Coordinate with mechanical work. Fixture Alignment: Provide labor and materials for final aiming of all fixtures to the Engineer's satisfaction. Aiming shall take place immediately before the Work is accepted by the Engineer.

613.1221 Cleaning. Follow the cleaning procedures recommended by the fixture manufacturer. Clean the bottoms, trim, reflecting surfaces, and lenses of luminaires during installation, so as to render them free of any foreign material, substance, or film on the fixture.

613.1222 Lamping. Ascertain and make sure that lamps installed are exactly as specified for each fixture type. Install in each lighting fixture the required lamps as soon as fixture is properly installed and wired. Provide ten percent additional lamps of each type and wattage in addition to those replaced due to failure. Replace without cost to the Department burned out or inoperative lamps, which fail prior to Final Acceptance of the Work.

613.1223 Temporary Luminaires. Remove temporary luminaires, lamps and/or associated wiring, conduit and boxes after the permanent system is fully operational.

613.1224 Grounding. Ground non-current carrying parts of Luminaires and associated equipment as specified in Revision of Section 613, Bonding and Grounding. Where the copper grounding conductor is connected to a metal other than copper, provide specifically treated or lined connectors suitable for this purpose to mitigate corrosion between the facing surfaces of dissimilar metals.

613.1225 Warranty Replacement. Replace faulty ballasts at no additional costs to the Department. The fixtures shall not be installed until after wall tiling and ceiling erection and cleaning in the vicinity have been completed. Deviation from location and mounting height shall be a maximum of ½-inch, noncumulative, in any unit or continuous run of fixtures. All damage to tunnel ceiling and tiled walls shall be repaired prior to Final Acceptance. All repairs shall be performed as directed by the Engineer.

613.1226 Operation Tests and Inspections. The following tests and inspections shall occur, and be completed satisfactorily before Contractor turns lighting system over to the Department.

(a) Operating Tests: Upon completion of the installation, conduct an operating test to demonstrate that the lighting systems and associated equipment operates in accordance with the requirements of this Section.

(b) Insulation Resistance Tests: Perform test as specified below:

1. Inspect cables for physical damage and proper connection in accordance with accepted shop drawings.

   Test cable connections for proper torque in accordance with Manufacturer's recommended values.

2. After wiring installation is completed and connected ready for operation, but prior to placing in service and before any branch circuit breakers are energized, perform the following:

   A. Continuity tests to insure proper cable connections.

   B. Insulation resistance tests between conductors and between each conductor and ground.

   Use an instrument capable of making measurements at an applied potential of 1,000 volts. Take readings after the voltage has been applied for a minimum of one (1) minute.

   Each length or cicuit wire or cable shall have an insulation resistance in megaohms (1000 feet at temperature of 60 degrees F (15.6 degrees C)) of not less than the value of R. R is calculated by the following formula:

   $$R = \frac{K \log_{10} D}{d} \text{ (as per ICEA)}$$

(c) Ground Resistance Tests: Perform test as specified below:

1. Each ground-resistance measurements of each rod shall be taken, before any wire is connected, and test results recorded. Perform all measurements in normally dry weather, not less than 48 hours after rainfall. Grounding connection and grounding measurements shall be inspected by the Engineer.

2. The Contractor shall provide measurement of resistance to earth from all grounded non-current carrying metallic parts of electrical equipment and pull boxes (enclosures) to a reference ground, auxiliary (mode) electrode, or ground electrode. It is the responsibility of the Contractor to construct an auxiliary electrode or reference ground where ground electrode is not practical. The Contractor shall also provide measurement of resistance to earth of each ground electrode and ground bus located in pull boxes, manholes, electrical rooms, utility rooms and in locations installed by the contractor. All measured results shall be recorded and tabulated.

3. Recorded results shall be tabulated to forma test report. The test report shall include, but not be limited to the following:

   A. Identification of each component tested.

   B. Location of each component tested.

   C. Time of each test.

   D. Impedance values shall not exceed 10Ω.

E. Soil condition and resistivity at the time the test (for ground rod measurements) was performed.

4. Test Methods shall be performed as follows:

A. Perform "fall-of-potential" type test per IEEE Standard No. 81 on the grounding electrode system.

B. Perform the "two-point" type test per IEEE No. 81 on the grounding electrode system.

C. Perform the ratio method type test on the grounding electrode system.

METHOD OF MEASUREMENT

613.1227 Measurement. Tunnel lighting luminaires, fluorescent luminaire wireways (included in Types F1, F2, F3), HID wireways ("Wireway"), lamps, and mounting components and incidentals described herein and the installation thereof shall be measured as each. Included in the term "incidental" are all nuts, bolts, anchors, grouts, and equipment required to perform the complete installation and testing for the tunnel lighting luminaires and mounting equipment.

BASIS OF PAYMENT

613.1228 Payment. The accepted systems will be paid for at the contract lump sum price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

Description	Units
Luminaire Fluorescent (Type F1 Tunnel)	EACH
Luminaire Fluorescent (Type F2 Tunnel)	EACH
Luminaire Fluorescent (Type F3 Tunnel)	EACH
HID Fixture Mounting Support System	LS
Wireway	LF

REVISION OF SECTION 613
TUNNEL LIGHTING CONTROL SYSTEM

Section 613 of the Standard Specifications is hereby revised for this project and includes the following:

DESCRIPTION

613.1301 General. This work consists of furnishing, installing and testing, tunnel lighting control systems and all other equipment and materials required to make the tunnel lighting control system complete and workable as specified herein, and as shown on the Contract Drawings. Unless otherwise accepted by the Engineer the Tunnel Lighting Control System shall be supplied by one source. General requirements include those specified in Section 613.00; "Lighting" and as specified herein.

613.1302 Submittals. Submittals shall consist of Manufacturer's Data, Shop Drawings, Samples and Test Data. All submitted data, shop drawings, and reports shall employ the terminology, classifications, and methods prescribed by the IESNA Lighting Handbook, as applicable, for the lighting systems specified.

(a) Proof of the Manufacturer's experience record shall be submitted according to Subsection 613.1303, before any review of the Manufacturer's data will occur.

(b) Manufacturer's data shall be submitted for the following: photocontroller/light level control system, and lighting contactors.

(c) Shop Drawings shall be submitted for the following:

1. Luminance meter
2. Drift Parameters for Photocells
3. Mounting Brackets
4. Lighting Contactors
5. Cabinet and Component Assembly Details
6. Wiring Diagrams
7. Bill of Materials
8. Installation Diagrams

(d) With the shop drawings, submit a sample of the lighting controller and operator panel accompanied with a sample software package. The sample, if acceptable, will be retained until completion of the work to confirm quality conformance to the prescribed requirements herein.

(e) The Contractor shall provide written certification of their agreement to comply with the product handling and delivery procedures according to Subsection 613.1304.

(f) Independent testing laboratory results demonstrating the tolerance values for the complete system, including longevity projections shall be submitted prior to shop drawing acceptance.

(g) The Engineer shall be provided with complete operations and maintenance instruction manuals and engineering services for initial set up of control system and training of operators.

REVISION OF SECTION 613
TUNNEL LIGHTING CONTROL SYSTEM

613.1303 Manufacturer's Experience Record. Submissions from Manufacturers other than those listed below will be reviewed providing the Contractor shall submit proof to the Engineer that the lighting control system (complete) proposed for use in the tunnel installation has been in continuous service in a similar tunnel environment and has proven to be satisfactory to its owner for a minimum period of five years. Acceptable Manufacturers; PLC Multipoint, Thomas-Schreder, Meyer.

613.1304 Handling and Delivery. Ship luminance meters, contactors, and accessories securely packaged and labeled for safe handling in shipment to avoid damage or distortion. Store luminance meters, contactors, and accessories in secure and dry facility and in original packaging in a manner to prevent soiling, physical damage, wetting or corrosion prior to installation. Provide for storage inspection by Engineer after luminance meters, contactors, and accessories has been delivered. This inspection is at no additional cost to the Department. All cartons must be clearly marked with the proper identification of Manufacturer, Catalogue Number and proper storage/handling instructions.

MATERIALS

613.1305 Tunnel Lighting Controller. The tunnel lighting controller shall receive a linear analog light level signal from the luminance meter and provide for six controlled output levels that can be configured through an operator interface terminal. Equipment shall be installed per Manufacturer's instructions. The Engineer shall submit calibration methods and procedures for review. Check all connections to contactor(s) and control coil, install fuses and replace enclosure cover. The tunnel lighting controller shall include the following:

(a) The 19" rack mounted lighting controller/receiving unit shall be capable of field adjusting the five light level operating points from 2 to 10,000 cd/m^2 in steps of 2 cd/m^2.

(b) Time delays for turn off/on for each level shall be selectable in 1-minute steps from 2 to 30 minutes. Each level shall have separate off and on setpoints that form a deadband. A hold on timer shall provide a minimum operating time for the control output, regardless of any changes in the illumination level. The hold on timer shall be adjustable from 0 to 240 minutes.

(c) The lighting parameters shall be pre-programmed and stored in non-volatile memory. The parameters to be stored shall include: power-on memory in active RAM, battery backed memory, and EPROM - for the original commissioning settings.

(d) The output switching relays shall be rated a minimum of 2 AMPS at 250 Volts, AC. Input voltage shall be 120 volts, AC.

(e) All controllers shall be marked as to load capacity or rating. A terminal board with five stations for output and input voltage shall be provided and marked lighting Level 1 through Level 5 as a minimum.

(f) Transient Voltage Surge Suppressor (TVSS) protection shall be provided at the voltage inputs of the luminance meter and controller. Circuit breakers shall isolate control circuits from the luminance meter. In the event of a power outage, selected standby lighting circuits will be switched on and normal automatic control overridden. Upon resumption of normal power after an outage, the control unit shall gradually restore each light level output separated by a time delay.

(g) The controller shall connect to the North Tunnel Lighting Control Systems (Future) using IEEE 802.3 protocol Thin Ethernet (10Base2). The controller shall communicate with local building contactor cabinets using serial rack communication. The controller shall communicate to remote lighting contactor cabinets using Ethernet fiber optic communications.

613.1306 Luminance Meter. The luminance meter shall contain an eye-corrected silicon cell to measure the luminance in a 20-degree conical field, from 2 to 10,000 cd/m^2 with a resolution of 2 cd/m^2. The components for the Luminance meter shall include the following:

(a) The housing for the luminance meter is to be extruded anodized aluminum with cast aluminum end caps. The housing shall be IP 55 rated per CEI publication 529 and NEMA 4X. The lens shall be tempered glass.

(b) The mounting bracket shall be a painted steel bracket arm, which shall allow for the aiming of the luminance meter in at least two angles of rotation.

(c) The sensor transmitter shall be capable of providing a luminance measurement 500 feet without signal loss.

(d) The luminance meter housing shall be equipped with a line voltage resistance heater element and temperature sensor to prevent snow and ice from obscuring the sensor lens.

(e) Color shall match as closely as possible, to the supporting structure. All exterior hardware shall be stainless steel. Access door shall be fastened by means of a continuous hinge, with a one piece, compressible neoprene gasket.

613.1307 Operator Interface Terminal. An LED display on the control unit shall be provided to display the various parameters to be controlled and shall connect to the controller via serial communications. All configurations can be accomplished through a two-line front panel display. The interface can operate in running, test, or setup modes. Changes can be made only with a password. All configured values shall be saved in battery backed memory capable of holding values unpowered for up to two years and up to ten years in normal use. The system shall provide means for a level lockout for emergency power resumption. Surge protection shall be provided at the voltage inputs of the luminance meter and controller. Circuit breakers shall isolate control circuits from the luminance meters.

613.1308 Lighting Contactors. Lighting contactors shall conform to applicable standards. Lighting contactor(s) shall be rated at 600 volts, 60 Hertz, 3-phase, 4-wire, 30 amperes, or as shown on the Contract Drawings. The number of poles shall be as shown on the Contract

REVISION OF SECTION 613
TUNNEL LIGHTING CONTROL SYSTEM

Drawings. The contactor(s) coil shall operate at 120-volt ac. The contactor(s) shall be electrically operated, electrically held and shall have silver alloy double-break contacts and coil clearing contacts, and shall require no arcing contacts. Provide contactor(s) with hand-off-automatic selector switch mounted in cabinet door. Each contactor shall have two auxiliary contacts, one each for local indication and remote status. Selector switch shall illuminate when energized with LED back-lighted face. Arrange ¾" switches as indicated on the Contract Drawings. Square D, class 9001, Type K_J or equal.

613.1309 Lighting Contactor Control Cabinets. The tunnel lighting control contactor cabinet assembly shall include the following:

(a) Cabinets and covers, shall be NEMA 12, fabricated from No. 14 United States Standard gauge steel. Floor mounted enclosures shall be provided with mounting stands. Reference Contract Drawings for actual size requirements including lighting contactors and auxilary devices as specified herein.

(b) Each cabinet seam shall be continuously welded. Box flanges shall be turned inward. All welds shall be made smooth and uniform. Excess welding material shall be ground smooth. Cabinets shall conform to UL 50 "Standard for cabinets and Boxes".

(c) Cabinets and covers shall be galvanized after fabrication, and shall have an epoxy painted finish.

(d) Box covers shall be secured to boxes by captive stainless steel screws. The screws shall thread into sealed wells in the box. Box covers shall be provided with a continuous 1/8-inch thick neoprene gasket continuous around the cover perimeter. Boxes shall be provided with mounting feet.

(e) A color reproduction of the "Lighting Level Control Diagram – I-70 Eastbound", as shown on the South tunnel lighting control diagram drawing of the VB Electrical Subset, shall be mounted to the front of the control cabinet under a ¼" clear virgin acrylic sheet with weatherstrip edges and secured by (8) 3/16" stainless steel pan head machine screws with washers and nuts.

(f) A connection to the control system shall be made available to plug-in a laptop computer for maintenance purposes.

(g) Front panel operators shall include the tunnel controller LCD display, and illuminated three position switches for each lighting contactor. The operator assemblies shall be rated NEMA 12. Switch contacts shall be rated for 10A at 600V. Switch lever shall be translucent red. Pilot light shall be LED with 120VAC-transformer base. Legend and adhesive nameplates shall be white background with black lettering with text as shown per contract drawings.

(h) Control Power Transformer (CPT), 480-120 Volt, fused, of adequate volt-ampere (VA) capacity to handle the 120-Volt power requirement of each cabinet assembly.

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TUNNEL LIGHTING CONTROL SYSTEM

613.1310 Network Communications. Network communication shall be IEEE 802.3 Ethernet supporting TCP/IP. Fiber Optic communication shall be via 1300nm wavelength multi mode fiber optic cable. Communication redundancy shall be achieved by using two channel fiber optic communication modules with automatic channel switching in the event of communication failure. The fiber optic cable shall have six strands is 62.5 micron core and 125 micron cladding. Connections shall be made using ST style fiber optic cable connectors.

(a) South tunnel locations shall have fiber optic communication modules: West Ventilation Building, West Cross Cut Passage, Center Cross Cut Passage, East Cross Cut Passage, East Ventilation Building and Operations Center.
(b) Communication between the SCADA PC and the lighting controllers shall use Ethernet protocol over fiber optic network.

Thin Ethernet shall use RG58 coaxial cable, connecting to Network interface modules and optical communication modules with BNC connectors. Terminating plugs and connector adapters shall also be provided.

(a) Communication between South and future North lighting controllers and contactors within the same building or passage shall be Thin Ethernet 802.3.

Communication between lighting controllers and local contactor cabinets shall be serial multiple twisted pair cabling.

613.1311 Supervisory Control And Data Acquisition. The operation center shall have a PC based SCADA system. The SCADA system shall communicate with the lighting control system to read the status of the luminance sensor, controller, and lighting contactors. The SCADA system shall provide remote scheduling and override capability. The SCADA software shall be a graphical user interface of sufficient capacity to include future information North tunnel system requirements.

613.1312 SCADA PC Requirements. The SCADA PC requires the hardware provided in Revision of Section 614, VMS/LUS Management System, Subsection 614.1707. Contractor responsible for coordinating all compatibility issues with respect to the two systems.

613.1313 SCADA System Functions. The SCADA menu shall be mouse driven with the following major functions.

(a) Password Screen to enter User ID and password

(b) Overview Screen showing graphically the system's current status using color coded symbols, icons and figures, including:
    i. Luminance meter sensor values.
    ii. Lighting controller mode of operation (Run, Test, Program)
    iii. Lighting controller output status (Manual On, Manual Off, Auto)
    iv. Lighting output level and feedback from lighting contactors.
    v. Alarm summary window showing latest alarms
    vi. Pop up menu symbols to allow for complete level override.

(c) Alarm Handler/Event log screen using color-coded text messages with a date/time stamp, status, priority, description, tag name and value. Alarms shall be latched and logged to disk in a daily alarm file. Alarms shall be displayed on the SCADA monitor for a day. Alarms can be retrieved from the SCADA PC's hard disk drive. The Alarm Handler/Event log shall show a minimum of the following

i. Alarm summary, segregated by priority.
ii. Event log, showing output status and contactor feedback.
iii. Alarm history showing by date and time stamp, an event sequence
iv. Alarm state with unacknowledged, acknowledged and return to normal separately colored messages.

(d) Trend Graph screen showing instantaneous values of the luminance meter sensor, along with controller output response. Each controller output level shall be color-coded. The trend graph shall have a minimum resolution of 1 minute. The time-base of the trend graph shall be selectable. A separate trend graph shall be provided for low temperature control.

(e) Equipment Status screen shows the front panel view of each lighting contactor cabinet. Remote override of individual lighting contactors shall be accomplished when the local panels Hand/Off/Auto selector switch position is in the AUTO position. Indicator light symbols shall show the status of lighting contactors.

(f) Report Screen allowing the operator to select between pre-configured reports that are event based (alarm reports), time based (period and accumulated runtime hours) and operator based (operator log). Each operator interface screen shall also be capable of printing to the system printer.

(g) Scheduler program for automatic control output changes and report schedules.

613.1314 Software Maintenance. The lighting control system and SCADA system software shall be maintained from the SCADA PC. Master program databases and development editors shall be provided, as well as runtime executable programs. Password protection of the source code shall be maintained for the duration of the warranty period. The contractor shall provide a non-PBX data grade analog telephone line. The SCADA PC shall have a modem and dial up remote control software to support and maintain software.

613.1315 Dynamic Data Exchange. Dynamic Data Exchange shall serve system data from the tunnel SCADA system to other applications supporting DDE to provide luminance meter readings for the Variable Message Display system.

613.1316 Fiber Optic Cable. A fiber optic cable (6 strand) shall be used to connect the control system components. Three FO strands shall run 10,500 feet and return in the same cable on a 10,500-foot run. Fiber optic cable shall provide a multimode using 1300nm wavelength with a bandwidth of 500 MHz-km and attenuation of 1.5 dB/km. Cable shall be double jacketed with high tensile strength and a life expectancy of twenty years. Cable shall be oil, chemical, moisture, abrasion, and UV sunlight resistant.

SEE PROB #61 +59 PRINTS

REVISION OF SECTION 613
TUNNEL LIGHTING CONTROL SYSTEM

613.1317 Temperature Sensor. Under extreme cold weather conditions when the ambient temperature is five degrees Fahrenheit, the temperature sensor located in the luminaires indicated will signal the controller to turn on all T8 lamps. These lamps will remain energized, overriding their preset control until the temperature sensor mounted at the portal of the tunnels, outside of any lighting fixture enclosure, signals that the temperature has risen above minus 0.4degrees Fahrenheit, and has remained so for two hours. The temperature sensors shall contain the following:

(a) Each temperature probe shall utilize a miniature non-isolated, two-wire temperature transmitter, which shall have an output range of 4 to 20mA dc.

(b) One set of temperature probes shall be located within the fluorescent fixture housing in the ballast compartment of the luminaire. They shall be RTD-850, a stainless steel housing with ¼" hex head and #8-32 NC-2A threaded body. Sensor shall be encapsulated with Teflon insulated leads. These probes shall be integral to the control system, and shall signal the control system to turn on all T8 lamps when the internal temperature reaches 5^0 to 14^0 Fahrenheit range. These lamps shall stay energized when the internal temperature is within this range or below, overriding the preset luminance levels for the T8 lamps.

(c) The second set of temperature probes shall be mounted at the portal of the entrance to the tunnels. They shall be positioned in a junction box. Upon sensing when the temperature remains above 14^0 Fahrenheit for more than two hours, these T8 lamps shall reset to the preset luminance levels.

613.1318 Spares: The contractor shall provide spare parts to include the following

(a) 5 x 3 pole 30A lighting contactors with 120VAC coils and auxilary contacts.
(b) 1 x each other type electrically held contactor
(c) 10 x LED lamps of each color and type
(d) 10 x fuse of each rating and size
(e) 1 each type lighting controller module
(f) 1 fiber optic communication module
(g) 1 operator display

613.1319 Warranty. The system shall be warranted for a period of 5 years after commissioning. During this period, owner maintenance personnel and contractor will be assisted by the control system manufacturer to diagnose and remedy system problems via telephone modem and dial up remote control. The manufacturer will replace spare parts that are used to effect repairs during the warranty period.

613.1320 Commissioning. The Engineer shall review complete system test procedures for lighting control hardware, fiber optic and wire communication. Lighting controller sequence software and SCADA operator interface design test forms shall be approved before commissioning. SCADA database and representative operator screens and reports shall be approved.

Automatic script procedures shall be utilized to test lighting control hardware and software elements, log system response and generate commissioning reports.

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REVISION OF SECTION 613

TUNNEL LIGHTING CONTROL SYSTEM

METHOD OF MEASUREMENT

613.1321 Measurement. Tunnel lighting controller including meters, cabinet, lighting contactors, fiber optic cable, all control cables/wires, incidentals, installation and testing, thereof shall be measured as a single lump sum. Included in the term "incidental" are all nuts, bolts, anchors, and equipment required to perform the complete installation and testing for the tunnel lighting controller.

BASIS OF PAYMENT

613.1322 Payment. The accepted systems will be paid for at the contract lump sum price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

Description	Units
Tunnel Lighting Control System	LS

REVISION OF SECTION 613
SUPPORTING DEVICES

Section 613 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

613.1401 This work consists of furnishing and installing supports for fastening conduit and equipment to the tunnel or building structure. Anchors and fasteners are also included in this Section.

MATERIALS

613.1402 Supporting materials shall be as follows:

(a) Conduit Clamps: Two-hole, cadmium plated or galvanized heavy gauge steel, or galvanized malleable iron.

(b) Hanger Rod: Galvanized Steel or electro-galvanized and zinc chromate coated steel, 3/8-inch minimum.

(c) Channels, Fittings, Hangers, Clamps, and Accessories: Unless otherwise indicated, all surface mounted supporting channels and associated fittings, clamps and accessories shall be stainless steel, AISI Type 316L. Channels shall be constructed of 12-gauge minimum, 1-5/8-inch deep by 1-5/8-inch wide minimum. Hangers shall be steel which is hot-dip galvanized after fabrication. All hardware installed inside the tunnel shall be stainless steel Type 316L. Approved manufacturers: Midland Ross, Unistrut, or approved equal.

(d) Single Runs: Stainless steel or galvanized conduit straps. Straps installed inside the tunnel shall be stainless steel

(e) Hardware: Nuts, bolts, and washers shall be Type 316L stainless steel.

CONSTRUCTION REQUIREMENTS

613.1403 Supporting devices shall be installed as follows:

(a) Provide anchors with sufficient strength to support four times the load imposed by the combined conduit and conductor weight. Anchors shall be seismic rated for Zone 3 requirements.

(b) Hollow Masonry: Toggle bolt type expansion anchors.

(c) Solid Masonry: Expansion anchors or preset inserts.

(d) Metal Surfaces: Machine screws, bolts, or welded studs.

(e) Wood Surfaces: Wood screws.

(f) Concrete Surfaces: Concrete expansion, Red Head, or approved equal. Power driven (powder actuated) studs shall not be used.

METHOD OF MEASUREMENT

613.1404 Measurement. Conduit clamps, hanger rods, channels, associated accessories and hardware described herein and the installation thereof shall not be measured separately, but shall be incidental to the equipment that they support.

REVISION OF SECTION 613
MEDIUM VOLTAGE CABLE

Section 613 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

613.1501 This work consists of furnishing and installing medium voltage cable in the tunnel and Ventilation Buildings as indicated on the Contract Drawings. Medium voltage cable terminations and splices are also included in this Section.

MATERIALS

613.1502 Medium voltage cable materials shall be as follows:

(a) Cable Description: Single copper conductor ethylene propylene rubber (EPR) insulated, shielded, Type MV-90 power cable, 5kV insulation, with 133 percent insulation level for 90 degrees C normal operation, 130 degrees C for emergency overload conditions and 250 degrees C for short circuit conditions. Suitable for installation indoors or outdoors, aerial, in rack, trough or cable trays, or direct burial.

1. Conductor: Uncoated annealed copper per ASTM B3, Class B stranding per ASTM B8.
2. Insulation:
   - A. Conductor Shielding: Extruded semi-conducting compound in accordance with AEIC CS6.
   - B. EPR 115 mils minimum 133 percent insulation level.
3. Shielding:
   - A. Over the insulation shall be applied an extruded conducting thermosetting insulation shield. It shall be in intimate contact with the outer surface of the insulation and shall be free stripping, leaving no conducting particles or other residue on the insulation surface. This layer shall be legibly identified as being conducting. The thickness of this layer shall be in accordance with Table C3 of AEIC CS6. The insulation shield shall meet the resistivity requirements of Paragraph C.5 of AEIC CS6.
   - B. An uncoated copper tape shall be helically applied over the extruded insulation shield with a minimum lap of 12.5 percent. The copper tape shall meet the requirements of Part 4 of ICEA.
4. Outer Jacket: Continuous extruded PVC vulcanized jacket shall be applied. Jacket per ICEA S068-516 and UL 1072.
5. Phase Identification: A colored (1/C black, 1/C red, and 1/C blue) tape shall be applied longitudinally under the copper shielding tape to provide phase identification.

(b) Labeling: The cable outer jacket shall be labeled with cable physical characteristics at 2-foot intervals. The labeling shall contain the following data as a minimum: Manufacturer's name and cable type, voltage rating, conductor size and approved testing laboratory label.

(c) Heat Shrink Stress Relief Cable Termination: Description: IEEE 48; Class 1, 5kV, heat-shrinkable, indoor, cable termination in kit form with stress cone, shield ground connection, and accessories required for proper application on solid dielectric, shielded, single copper conductor cable. Provide with solderless ground connector and ground braids of adequate length to reach the enclosure ground busses without splices.

(d) Cable Splices: Cable splices shall be made using heat-shrinkable 600 amp, 5kV in-line permanent splice kits for solid dielectric, shielded, single copper conductor cable. The kits shall be complete with all materials including the connectors necessary to make up three single phase, copper conductor, and shielded cable splices.

CONSTRUCTION REQUIREMENTS

613.1503 The Medium voltage cable conduits shall be prepared and the cables installed as follows:

(a) Examination: Verify that conduit and duct is ready to receive cable.

(b) Preparation: Use swab to clean conduits and ducts before pulling cables.

(c) Installation: The following procedures shall be adhered to during cable installation.

1. Install cable and accessories in accordance with manufacturer's instructions.
2. Avoid abrasion and other damage to cables during installation.
3. Use suitable lubricants and pulling equipment.
4. Do not exceed cable pulling tensions and bending radius.
5. Ground cable shield at each termination and splice.

(d) Field Quality Control: Monitor the quality of the cable installation as follows.

1. Inspect exposed cable sections for physical damage.
2. Inspect cable for proper connections as shown on Drawings.
3. Inspect shield grounding, cable supports, and terminations for proper installation.
4. Perform medium voltage cable testing.

(e) Protection: Protect installed cables from entrance of moisture.

METHOD OF MEASUREMENT

613.1504 Measurement. The medium voltage cable, complete with terminations and any associated components and incidentals described herein and the installation thereof shall not be measured separately. Included in the term "incidentals" are all pulling compounds and equipment required to perform the complete installation and testing for the tunnel medium voltage cable system.

REVISION OF SECTION 613
MEDIUM VOLTAGE CABLE

BASIS OF PAYMENT

613.1505 Payment. The completed and accepted work for the medium voltage cable wiring system shall not be paid for separately, but will be incidental to the pay item 613 "Wiring", lump sum.

REVISION OF SECTION 613

BOXES

Section 613 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

613.1601 This work consists of furnishing and installing outlet boxes and pull and junction boxes in the tunnel and Ventilation Buildings with no dimension greater than 12-inches. Exterior boxes located above grade that have no dimension greater than 12-inches are also included in this Section.

MATERIALS

613.1602 Boxes shall be fabricated of the specified materials and constructed as follows:

(a) Indoor Boxes Description: Indoor, surface mounted boxes shall be pressed steel with zinc coating. Fabricate large junction and pull boxes from sheet steel with zinc coating or baked enamel finish, except for boxes installed in the exhaust air duct that shall be stainless steel.

(b) Large Enclosures: Sheet Metal Boxes Larger Than 12 Inches In Any Dimension: Hinged enclosure in accordance with REVISION OF SECTION 613 titled PULL BOXES.

(c) Outlet Boxes shall be constructed as follows:

1. Indoor Outlet Boxes: Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.

   A. Luminaire and Equipment Supporting Boxes: 4-inch octagon. Rated for weight of equipment supported; include ½-inch male fixture studs where required.

   B. Switch or Receptacle Boxes: 4-inch square, minimum.

2. Outdoor Cast Outlet Boxes: NEMA FB 1, Type FD, aluminum and cast feralloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.

(d) Pull and Junction Boxes: Sheet Metal Boxes located in dry indoor locations and the supply air duct shall be galvanized steel meeting requirements of NEMA OS 1. Boxes located in exhaust air duct shall be Type 316L stainless steel.

(e) Tunnel and Exterior Boxes shall be constructed as follows:

1. Labeled for damp or wet locations.

2. Above Grade: NEMA 250; Type 4 or Type 4X, stainless steel.

   A. Cast Boxes: Malleable iron or corrosion resistant alloy, metal complete with conduit hubs, compatible with raceway to which it is connected, and mounting lugs.

   B. Sheet Metal Boxes: Heavy-gage galvanized steel with baked epoxy enamel finish or stainless steel Type 316L in exterior areas. Boxes located in the tunnel shall be Type 4X, constructed of Type 316L stainless steel. Hinged covers shall be supplied for all boxes and mounting feet where indicated on the Drawings.

REVISION OF SECTION 613

BOXES

CONSTRUCTION REQUIREMENTS

613.1603 The boxes of the types specified above shall be installed as follows:

(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, in unfinished areas and as indicated on the plans.

(d) Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel.

(e) Install boxes to preserve fire resistance rating of partitions and other fire rated elements, using approved materials and methods.

(f) Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

(g) Use flush mounted 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) Install flush mounting box without damaging wall insulation or reducing its effectiveness.

(k) Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

(l) Use gang box where more than one device is mounted together. Do not use sectional box.

(m) Use cast outlet box in exterior locations exposed to the weather and wet locations.

(n) Provide blank covers or plates over boxes that do not contain devices or are not hidden by equipment.

(o) Boxes in Concrete or Paved Areas: Set in place on a minimum 3-inch sand bed with cover plates flush to, and matching the slope. Locate so that water will drain away from the box.

(p) Boxes In Unpaved Areas: Set in place on a minimum 3-inch sand bed with cover plates ½-inch above, and matching the slope. Locate so that water will drain away from the box. Boxes indicated to be installed below grade shall be listed for service and installed with covering material consisting of gravel, light aggregate, or noncohesive granulated soil. Location of these underground boxes shall be effectively identified, as directed by Engineer, and shall be accessible for excavation.

(q) Coordinate Box Locations as Follows:

1. Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of boxes and outlets in offices and work areas before roughing in.

REVISION OF SECTION 613

BOXES

2. Locate outlet boxes to allow access, otherwise provide access doors.

3. Coordinate the work of this Section with the work of other sections and trades to avoid conflicts between the work of this Section with the work of other trades. Check and verify door swings and locations of built-in cabinets, plumbing, heating, and ventilating equipment

4. Provide outlet boxes of sizes and at locations necessary to serve equipment furnished under this or other divisions of the specifications, or by others, and provide final connections thereto. Outlet box required if equipment is furnished with pigtail for external connection, does not have space to accommodate branch circuit wiring or requires wire with insulation rating different from the branch circuit wiring. Review equipment Shop Drawings for required outlet locations.

5. Where more than one outlet is shown or indicated to be at the same elevation or one above the other, align them exactly on center lines horizontally or vertically. Relocate outlets that are not so installed (including lighting, receptacle, power, signal, and temperature control outlets) at no additional expense.

6. Install sheet metal outlet boxes and NEMA 1 pull and junction boxes in indoor locations that are heated and dry.

7. Install cast metal outlet boxes and NEMA 4 pull and junction boxes in outdoor locations and in the ventilation air ducts. Install NEMA 4X stainless steel hinged boxes in the tunnel and indoor locations that are wet. Install NEMA 3R pull and junction boxes only where specifically called out in the Drawings.

8. Adjust box locations or mounting as follows:

    A. Adjust flush-mounted outlets to make front flush with finished wall material.

    B. Install knockout closure in unused box opening.

METHOD OF MEASUREMENT

613.1604 Measurement. Boxes with no dimension greater than 12-inches, complete with any associated components described herein and the installation thereof shall not be measured separately, but shall be incidental to the conduit that connects to it. Included in the term "associated components" are all equipment required to perform the complete installation of the boxes required for the tunnel facility.

REVISION OF SECTION 613
PULL BOXES

Section 613 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

613.1701 This work consists of furnishing and installing cabinets and enclosures used as pull boxes in the tunnel and Ventilation Buildings as indicated on the Contract Drawings. Terminal blocks and accessories are also included in this Section. Handholes and exterior boxes that are located at grade or below grade are also included in this Section.

MATERIALS

613.1702 Cabinets and enclosures used as pullboxes shall be fabricated of the specified materials and constructed as follows:

(a) Hinged Cover Enclosures: NEMA 250; Type 1 or Type 4 steel or as otherwise indicated on the Drawings.

1. Manufacturers: Hoffman, Rittal or approved equal.
2. Finish: Manufacturer's standard enamel finish.
3. Covers: Continuous hinge, held closed by flush latch (NEMA 1) or stainless steel clamps (NEMA 4) operable by screwdriver.
4. Panel For Mounting Terminal Blocks or Electrical Components: 14-gage steel, white enamel finish.

(b) Cabinets: Galvanized steel.

1. Manufacturers: Hoffman, Rittal or approved equal.
2. Box Size: As shown on Drawings.
3. Fronts: Steel, surface type with concealed trim clamps, concealed hinge, and flush lock. Finish with gray baked enamel.
4. Provide metal barriers to separate compartments containing control wiring operating at less than 50 volts from power wiring.
5. Provide accessory feet for free-standing equipment.

(c) Terminal blocks shall be constructed as follows:

1. Terminal Blocks: NEMA ICS 4; UL-listed. Marathon, Square D or Buchanan.
   A. Power Terminals: Unit construction type, with closed-back type, with tubular pressure screw connectors, rated 600 volts, Marathon, Square D or Buchanan.
   B. Signal and Control Terminals: Marathon 1612, Square D or Buchanan.
2. Outdoor Cast Outlet Boxes: NEMA FB 1, Type FD, aluminum and cast feralloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.

(d) Fabricate cabinets and enclosures as follows:

1. Shop assemble enclosures and cabinets housing terminal blocks or electrical components in accordance with NEMA ICS 6.
2. Provide knockouts on enclosures where noted or required.

REVISION OF SECTION 613
PULL BOXES

3. Provide protective pocket inside front cover with schematic diagram, connection diagram, and layout drawing of control wiring and components within enclosure.

(e) Exterior Boxes located at grade or below grade shall be constructed as follows:

1. Labeled for wet locations.
2. Below Grade, Exposed to Earth: Pull boxes (handholes) shall be constructed of precast concrete with size, configuration, cover, grates, and reinforcing as required for the particular installation. Minimum size shall be 2' x 3' x 3'D with cast iron frame and cover having a H-20 traffic rating.
3. At Grade Not Exposed to Earth: NEMA 250 Type 4, outside flanged, recessed cover for flush mounting, cast malleable iron or corrosion resistant alloy, complete with conduit hubs, compatible with raceway to which it is connected.

CONSTRUCTION REQUIREMENTS

613.1703 The cabinets, enclosures and handholes used as pull boxes of the types specified above shall be installed as follows:

(a) Install products in accordance with manufacturer's instructions.

(b) Install cabinets and enclosures plumb; fasten securely to metal support channels that are anchored to the wall with support points at each corner, minimum.

(c) Provide accessory feet for free-standing equipment enclosures.

(d) Install cabinet fronts and trim plumb.

(e) Pull boxes installed in the ventilation air ducts or Crosscut Passageways/Electrical Rooms shall be NEMA Type 4 hinged boxes. Install NEMA 4X stainless steel hinged boxes in the tunnel and indoor locations that are wet.

(f) Pull boxes (handholes) installed below grade and exposed to earth shall be installed with the top located approximately one foot below finished grade and covered by gravel or light aggregate. The box shall be readily accessible for excavation, with no paving installed above it. The location of the box shall be effectively identified by placing a 1' x 1' x ¼" thick steel plate above the box, 4 inches below finished grade.

METHOD OF MEASUREMENT

613.1704 Measurement. Pull boxes, associated accessories and hardware described herein and the installation thereof shall be measured on a per unit basis.

BASIS OF PAYMENT

613.1705 Payment. The completed and accepted work for pull boxes will be paid for at the per unit price for the pay items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Pull box (42" x 30" x 6") Deep	Each

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PULL BOXES

Pull box (24" x 20" x 12") Deep	Each
Pull box (16" x 24" x 12") Deep	Each
Pull box (24" x 36" x 36") Deep	Each

REVISION OF SECTION 613
BONDING AND GROUNDING

Section 613 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

613.1801 This work consists of furnishing and installing bonding and grounding in the tunnel, ventilation ducts and Ventilation Buildings as indicated on the Contract Drawings. Grounding electrodes and grounding conductors are included in this Section.

MATERIALS

613.1802 Bonding and grounding components shall be fabricated of the specified materials and constructed as follows:

(a) Rod Electrodes: Rods shall be constructed of copper-clad steel.

1. Manufacturers: Cadweld, American Electric-Blackburn, Carolina Galvanizing Corporation or approved equal.
2. Diameter: 3/4 inch.
3. Length: 10 feet.

(b) Mechanical Connectors: All copper alloy compression type.

1. Manufacturers: Thomas & Betts Series 54000, American Electric-Blackburn, Carolina Galvanizing Corporation or approved equal.
2. Connection of grounding conductor to grounding conductor.
3. Provide exothermic weld connections where indicated.

(c) Exothermic connections shall meet the following requirements:

1. Manufacturers: Cadweld, ERICO Products, Inc. or approved equal.
2. Provide exothermic connection in which powdered metals are dumped into a graphite crucible mounted over the components to be connected and then ignited by a spark. The resulting molten metal slag flows over the conductors and welds them together.

   A. Use in lieu of mechanical compression connectors, where indicated.

   B. Connection of grounding conductor to ground rods.

(d) Grounding Conductors: Stranded, insulated, copper as indicated on the Drawings.

(e) Grounding Connectors: All copper alloy ground connectors, specification grade. Use OZ Gedney "G" Series, Thomas & Betts, American Electric-Blackburn or approved equal for ground wire connection to pipes, and building steel.

CONSTRUCTION REQUIREMENTS

613.1803 The bonding and grounding of the types specified above shall be installed as follows:

(a) Install products in accordance with manufacturer's instructions.

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BONDING AND GROUNDING

(b) Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve a maximum of 5 ohms resistance to ground.

(c) Provide bonding to meet Regulatory Requirements and as specified herein.

(d) Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

METHOD OF MEASUREMENT

613.1804 Measurement. Rod electrodes, grounding connectors, grounding conductors and associated components described herein and the installation thereof shall not be measured separately. Included in the term "associated components" are all equipment required to perform the complete installation of bonding and grounding required for the tunnel facility.

BASIS OF PAYMENT

613.1805 Payment. The completed and accepted work for bonding and grounding shall not be paid for separately, but will be incidental to the pay item 613 "Wiring", lump sum.

REVISION OF SECTION 613
ELECTRICAL IDENTIFICATION

1. All junction boxes installed in accessible ceiling spaces and exposed in unfinished areas shall be color-coded using spray paint on the box and cover.
2. Junction box color-coding shall exactly match Raceway color-coding.
3. Indicate on J-box cover the panelboard number and homerun circuit(s) in lettering 1/8-inch in height. Use contrasting color, i.e., indelible marker.

(g) Warning Signs: Provide warning signs where there is hazardous exposure or danger associated with access to or operation of electrical facilities. Provide text of sufficient clarity and lettering of sufficient size to convey adequate information at each location; mount permanently in an appropriate and effective location.

(h) Operational Signs: Where needed for proper and adequate information on operation and maintenance of electrical systems, provide tags of plasticized card stock, either pre-printed or hand printed to convey the message.

METHOD OF MEASUREMENT

613.1904 Measurement. Nameplates, labels, wire and cable markers and associated components described herein and the installation thereof shall not be measured separately, but shall be incidental to the equipment that they identify.

REVISION OF SECTION 613

MEDIUM VOLTAGE LOAD INTERRUPTER SWITCH

Section 613 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

613.2001 This work consists of furnishing and installing three complete indoor metal enclosed load interrupter switch assemblies, each consisting of a dead front, free-standing, structure housing a load interrupter switch complete with fuses of the number, rating and type noted on the Drawings or specified herein. Two adjoining 5kV-class switches shall be installed in the West Ventilation Building Main Electrical Room. One 5kV-class switch shall be installed in the East Ventilation Building Main Electrical Room. The plans indicate the switch locations. Each switch / switch grouping shall be close-coupled to a dry- type transformer, as specified in the REVISION OF SECTION 613 titled POWER TRANSFORMER.

MATERIALS

613.2002 Medium voltage load interrupter switch construction and materials shall be as follows:

(a) Description: The switch will consist of an integrated assembly of switch, bus and fuses that are coordinated electrically and mechanically for medium voltage circuit protection. All buses within the switch enclosure shall be copper. The switch shall be a 3-pole fused load interrupter switch rated 5 kV and be suitable for use on a grounded system rated 2,400V, 3-phase, 3-wire, 60 Hz.

(b) Switch Usage: The switches shall be suitable for usual service conditions as defined in ANSI C37 and for Seismic Zone 1 as defined by the UBC.

(c) Switch Ratings: The continuous current ratings shall be 600 amperes. The momentary short circuit rating shall be 40,000 amperes (Asymmetrical). The fault close short circuit rating shall be 40,000 amperes (Asymmetrical). The fuses shall be Type E, rated 100 amperes when supplying two 150 kVA transformers and 50 amperes when supplying a single 150 kVA transformer, 5.5 kV.

1. The main busses shall be rated for a minimum of 600 amperes continuous.
2. Basic Impulse Level (BIL) shall be 60 kV.

(d) Switch Enclosure: The switch assemblies shall consist of a single free standing, full height (90" nominal), NEMA 1 enclosure arranged to be cable connected to an adjacent dry type transformer.

1. Ventilation: Louvers equipped with standard filters shall be located to provide proper ventilation, but exclude dirt, dust, and other foreign objects. Filters shall be replaceable from the outside of the enclosure.
2. Barriers: Metal side sheets shall provide grounded barriers between the adjacent structures and tract resistant porcelain or glass polyester barriers shall provide isolation between phases and between outer phases and the housing. A grounded metal safety barrier shall be designed to prevent inadvertent contact with any live part.
3. Enclosure door: A full height door with a gasketed viewing window shall permit an operator to view the position of all three switch blades through the closed door. The door shall have a minimum of two rotary latch type handles, concealed hinges

and be padlockable. Interlocks shall be provided to prevent the enclosure door from being opened when the switch is in the closed position and to prevent closure of the switch when the door is open. Provide a viewing window for fuse indicator inspection.

(e) Ground Bus: The grounding bus shall be copper and shall be solidly connected to the enclosure of the switch.

1. Bus shall be provided with NEMA 2-hole terminal pads for terminating No. 4/0 – 500 kcmil copper cable.

2. Provide A.B. Chance spherical grounding studs (C600-2102) grounding connection on the line side of the switch phase buses and the ground bus. This will be used for visibly grounding the busses for maintenance work. Provide with insulated boot that can be removed with an insulated hotstick.

(f) Load Interrupter Switches: The switches shall be a 3-pole, fusible, load interrupter switches with a quick-make, quick-break operating mechanism.

1. Switch closing shall be operated by a stored energy mechanism that has a constant speed of opening and closing, independent of the operators action. The operating handle shall be non-removable.

2. The switch shall have the following features:

A. Arc interruption contacts and blades shall be silver-tungsten coated. A de-ionizing gas-generating arc chute shall quickly extinguish any arcing during switching operations. The switch shall be designed such that no arcing takes place at the main switch blades.

B. Auxiliary switch contacts shall be provided. Not less than two (2) N.O. and two (2) N.C. contacts shall be provided.

(g) Wiring and Accessories: Switch will be completely wired at the factory, ready for installation and connection by Contractor.

1. Terminal blocks and jumper cables will be properly identified for assembly.

2. Miscellaneous accessory equipment such as mounting brackets and wiring ducts shall be installed where needed within the enclosure.

3. Sufficient terminal blocks, fuse blocks, fuses and lugs will be furnished for proper connection to external wiring. Terminal bocks will be provided for all wiring leaving the panels and will have marking strips to accommodate Owner's identification system as well as the manufacturer's. At least 20 percent spare terminals shall be provided.

A. Each conductor will be identified at both ends with permanently attached, machine embossed, black identification number on white plastic, heat-shrink type label.

B. Unused terminals on relays and auxiliary contacts will be brought to conveniently located terminal blocks.

(h) Nameplates: Nameplates shall be furnished and installed for devices, including those internally mounted.

REVISION OF SECTION 613
MEDIUM VOLTAGE LOAD INTERRUPTER SWITCH

1. Nameplates will be screw retained, white lettering on black background.
2. Letters shall be approximately ¾ inch high, mounted on the upper portion of the front enclosure panel.
3. Inscriptions will be machine engraved in upper case letters and will be centered on the nameplates.
4. Identify the West Ventilation Building load interrupter switches that supply power to the West and Center Crosscut Electrical Rooms with the nameplates indicating:

South Tunnel	**South Tunnel**
Lighting System	**Lighting System**
Disconnect Switch	**Disconnect Switch**
SW-WVSDW	**SW-WVSDC**

5. Identify the East Ventilation Building load interrupter switch that supplies power to the East Crosscut Electrical Room with a nameplates indicating:

South Tunnel
Lighting System
Disconnect Switch
SW-EVSDE

(i) Painting: Painting of the switch exterior will be in accordance with the manufacturer's standard application procedures.

1. Color will be ANSI No. 61 light gray to match the same shade as the transformers. Interior sheet metal of the switch shall be painted gloss white.
2. All surfaces shall be thoroughly cleaned and phosphated prior to painting.

(j) The switch shall be marked with a sign at all the access points that a hazard exists using the words:

WARNING 2,400 VOLTS
LOCK-OUT ALL SOURCES, TEST AND
GROUND-OUT BEFORE WORKING INSIDE

(k) Relays: All protective relays shall be draw-out, semi-flush, switchboard type with built-in test facilities and rectangular dust proof cases with black matte finish. Protective relays shall be provided with operation indicators for each element and holding coil. Any necessary external loading resistors required for correct functioning of the operation indicators shall be furnished with the relays.

1. Feeder ground fault relay shall be equivalent to a ABB Type GKC/FT, device 50G. The relay shall have a pickup range of 5-60 amperes and be designed to operate at 125 volts DC.
2. The ground fault relay shall be installed in a compartment shielded from the 5 kV components.

REVISION OF SECTION 613

MEDIUM VOLTAGE LOAD INTERRUPTER SWITCH

CONSTRUCTION REQUIREMENTS

613.2003 The Medium voltage load interrupter switches shall be assembled and tested as follows:

(a) The switch will be completely assembled and wired, and all accessories installed and adjusted in the manufacturer's facility. The switch will be subjected to the following tests in accordance with the latest applicable requirements of ANSI C37.20. No equipment will be shipped until testing is complete. The following tests are required:

1. All of the manufacturer's standard production tests.
2. All routine tests as specified in ANSI C37.20.
3. Dielectric tests in accordance with ANSI 37.20.

(b) All control devices and wiring will conform to the requirements of NEMA publications ICS-2 and HP-1.

(c) Testing: The manufacturer will furnish the Engineer with five (5) certified copies of the test reports which define the tests performed and the results of the tests. These reports will be attested to by the manufacturer's Test Engineer.

1. All tests will be in accordance with the latest applicable standards as recommended by ANSI, NEMA and IEEE.
2. After assembly, test the switch for operation under simulated service conditions to assure the accuracy of the wiring and functioning of the equipment.
3. The Owner will reserve the right to witness tests on the assembled switch. Notification of at least thirty (30) calendar days prior to the start of testing must be given so travel arrangements may be made.

(d) Examine existing conditions as follows:

1. Verify that surfaces are ready to receive work.
2. Verify field measurements are as shown on the drawings.
3. Verify that required utilities are available, in proper location, and ready for use.
4. Beginning of installation means contractor accepts conditions.

(e) Preparation: Provide 4-inch high concrete pad 2 inches wider and longer than switch / transformer combination, under the provisions of Section 03300. Provide embedded galvanized channel for leveling and welding down the equipment. Locate the channel to suit the structural bases of the load interrupter switch and the transformer.

(f) Installation: The following procedures shall be followed during switch installation.

1. Install switch (and adjacent transformer) on a 4-inch high concrete housekeeping with fronts aligned. Weld clip angles to leveling channels to anchor or secure the switch.
2. Install switch in accordance with manufacturer instructions.
3. Provide connections to the building grounding system as shown on the drawings.

(g) Field Quality Control: Field inspection and testing will be performed per NEMA 210.

REVISION OF SECTION 613
MEDIUM VOLTAGE LOAD INTERRUPTER SWITCH

METHOD OF MEASUREMENT

613.2004 Measurement. The medium voltage load interrupter switches, complete with fuses and any associated components and incidentals described herein and the installation thereof shall be measured on a per unit basis. Included in the term "incidental" is all equipment required to perform the complete installation and testing of the tunnel medium voltage load interrupter switches.

BASIS OF PAYMENT

613.2005 Payment. The completed and accepted work for the medium voltage load interrupter switches will be paid for at the per unit price for the pay item listed below that appears in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Medium Voltage Load Interrupter Switch	Each

REVISION OF SECTION 613
POWER TRANSFORMER

Section 613 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

613.2101 This work consists of furnishing and installing two complete dry-type, three-phase, two winding, step-up power transformers with a delta connected 480 volt primary and wye connected 2400 volt secondary. One transformer shall be installed in the Main Electrical Room of each Ventilation Building. Each of these two transformers shall be close-coupled to a load interrupter switch, as specified in the REVISION OF SECTION 613 titled MEDIUM VOLTAGE LOAD INTERRUPTER SWITCH. This work also includes the furnishing and installing of six complete dry-type, three-phase, two winding, step-down power transformers with a delta connected 2400 volt primary and wye connected 480 volt secondary. Two transformers and replacement exhaust fans to provide additional cooling capability shall be installed in each of the three Crosscut Electrical Rooms. Maximum dimensions of the six Crosscut Electrical Room transformers are as indicated on the plans.

MATERIALS

613.2102 Dry type transformer construction and materials shall be as follows:

(a) General Requirements and Ratings: Design and build the transformer in accordance with the latest issues of NEMA ST 20 (Dry-Type Transformers for General Application) and UL 1561 (Dry-Type General Purpose and Power Transformers). Each shall be ventilated, two winding, dry type, self cooled rated as follows:

1. Capacity: At the following continuous loading the indicated maximum temperature rises shall not be exceeded: 150 degrees C AA, where the rating applies for operation in a 30 degrees C average ambient temperature in any 24 hour period and a 40 degrees C maximum ambient temperature.
   - A. One 300 kVA rated unit sized to match the height of the adjacent load interrupter switch (unit substation style) for the West Ventilation Building
   - B. One 150 kVA rated unit sized to match the height of the adjacent load interrupter switch (unit substation style) for the East Ventilation Building
   - C. Two 150 kVA rated units for the West Crosscut Electrical Room
   - D. Two 150 kVA rating units for the Center Crosscut Electrical Room
   - E. Two 150 kVA rating units for the East Crosscut Electrical Room
2. Frequency: 60 Hz.
3. Impedance: NEMA Standard.
4. Sound Level: Self-Cooled Rating: NEMA Standard.
5. Altitude: All ratings applicable at 11,000 feet above sea level.
6. Phasing: X1 Lags H1 by 30 degrees.
7. Voltage: Two units with 480 volt Delta connected primary and 2,400 volt Wye connected secondary windings. Six units with 2400 volt Delta connected primary and 480 volt Wye connected secondary windings.
8. BIL: Primary 60 kV; Secondary 10 kV.

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9. Listing by a qualified testing laboratory acceptable to the authority having jurisdiction is required.

(b) Windings: Copper. Silver-plated at primary and secondary termination points.

(c) Taps: All transformers rated 150 kVA and higher shall be provided with 4 full capacity taps to accept primary voltages at nominal, -5, -2.5, +2.5, and +5 percent of nominal while maintaining 480V secondary voltage. Tap changing shall be accomplished by means of an internal tap changing terminal board, or primary winding mounted lugs with a short section of non shielded copper cable. Tap terminals shall be rigidly braced such that full rated torque can be applied to terminal bolts without damaging the tap terminals.

(d) Insulation: Insulation system for transformers rated 150 kVA and higher shall be Class H 220 degrees C, UL component recognized. Primary and secondary coils shall be twice vacuum pressure impregnated with polyester 220 degrees C resin. Prior to impregnation, coils shall be subjected to vacuum drying treatment. Mini-load center transformers shall have the primary and secondary coils sand-epoxy encapsulated, designed for full load operation at a maximum temperature rise of 115 degrees Celsius (C) above a 40 degree C ambient.

(e) Core Steel: The transformer cores shall be constructed of grain oriented M6 or better 29 gage low loss non-aging silicon steel laminations. Miter type punching of laminations is required. Magnetic flux densities shall be well below the knee of the saturation curve for all ratings of the unit.

(f) Bracing: The entire assembly shall be adequately braced to tolerate full through fault short circuit conditions with negligible mechanical distortion when faults are terminated by upstream devices to the left of the ANSI transformer damage curve. Provide sway bracing on core/coil assembly of transformers rated 150 kVA and higher.

(g) Enclosure: Ventilated NEMA 1 Indoor for transformers rated 150 kVA and higher, suitable for installation in environments accessible to authorized personnel only and arranged to be cable connected to an adjacent medium voltage load interrupter switch. Access shall be from the front only. Front panel shall be hinged, and shall be secured at the opposite edge by captive bolts. The bolts shall engage welded nuts in the transformer case structure, not cage nuts, pressed nuts, or tapped holes in sheet metal. The size of the hinged panels for the unit substation style units (close-coupled to the load interrupter switches) shall not exceed 24 inches in width.

1. The enclosure for transformers rated 150 kVA and higher shall be 12 gauge steel minimum, with the exterior and interior cleaned, phosphated and primed, with a final coating of 1 mil thick ANSI 61 light gray acrylic enamel. The base of the enclosure shall be furnished with ground pads located on the primary and secondary termination ends of the transformer, to match up with grounding provisions in the medium voltage switch. Ground pads shall be connected together via a 1½ inch by ¼ inch minimum size transformer ground bus. The base shall have jacking pads and shall be constructed of heavy steel members to permit skidding or rolling in any direction, without distortion of the case. Both the transformer core/coil assembly individually, and the complete enclosed assembly shall be suitable for lifting via an overhead means. The core shall be insulated from the core clamping steel by Class H insulation, and shall be grounded at one point, by means of a flexible copper strap, rated to carry line to ground secondary

current for a duration adequate to allow the selected size of primary circuit breaker to trip, in the event of a secondary voltage winding to core short circuit.

2. Termination and connection provisions for transformers rated 150 kVA and higher shall be as follows:

   A. Transformer shall have adequate space for termination of the 600 volt cables indicated on the Drawings and the medium voltage cable consisting of one (1) 5 kV cable per phase (EPR, Cu, Tape Shield), including adequate allowance for cable bending limitations. Each medium voltage termination pad shall be equipped with one 2-hole-5 kV lug.

   B. Contractor shall crimp lugs using T&B 15-ton tool (calibrated within 90 days prior to use) and appropriate rounding dies supplied from the manufacturer of the termination lugs.

   C. Contractor shall crimp lugs to cable via two step crimp, outlined in lug crimping instructions, followed by careful light filing of crimp edges.

   D. Cable braces shall be provided for all cables, and shall be designed to maintain 5-inch minimum clearance from insulated busses or bare terminations to 5 kV cable jackets when conduits enter the designated areas (top or bottom) shown on the drawings.

(h) Mounting: Floor mounting for transformers rated 150 kVA and higher. The unit substation style assemblies shall be mounted on raised concrete housekeeping pads.

(i) Accessories and features shall be as follows:

1. Diagrammatic stainless steel engraved nameplate. Engravings shall be filled with black enamel. Nameplate shall indicate all applicable ratings at all temperature rises referenced in 2.1 A.1., impedance, voltages, weights, conductor material (copper), phasing layout, frequency, and allowable ambient temperature.

2. The core and core assembly of transformers rated 150 kVA and higher shall be isolated from the enclosure by vibration absorbing pads.

3. All hardware used shall be grade 5 minimum hardness. All hardware shall be plated. All bolted current carrying connections shall utilize either Belleville washers or helical spring cut washers with brass safety cups.

4. No plastic wire ties shall be used inside the transformer.

(j) Exhaust Fans: Furnish a replacement exhaust fan in each of the three Crosscut Electrical Rooms. The fans shall be rated ¼ horsepower and designed to operate at 120 volts. The fans shall have an air volume rating of 3,000 cubic feet per minute or greater. The fans shall be furnished complete with a wire safety guard. Furnish a line voltage thermostat set to initiate fan operation at a room temperature exceeding 80 degrees Fahrenheit.

(k) Tests: All transformers rated 150 kVA and higher shall be subjected to the following tests per ANSI standards. Provide certified test reports for Engineer review prior to shipment of the transformers. Owner reserves the right to witness all tests:

1. Resistance of all windings.

2. Ratio tests at all tap connections.

3. Polarity and phase relation tests at the nominal tap position.

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4. No load loss and excitation current at rated voltage at the nominal tap position.
5. Impedance and load loss at rated current at the nominal tap.
6. Applied Potential test.
7. Induced Potential test.
8. ANSI impulse test, consisting of one reduced wave, two chopped waves, and one full wave tests with test data and tracings.
9. Provide test reports for prototype units for short circuit and temperature rise tests.

(l) Source Quality Control: Provide production testing of each unit in accordance with NEMA ST20.

(m) Acceptable manufacturers shall be as follows:

1. ABB
2. Square D
3. Siemens, I-T-E

CONSTRUCTION REQUIREMENTS

613.2103 The dry-type power transformers shall be assembled, tested and installed as follows:

(a) Examination: Verify physical condition prior to installation and that surfaces are suitable for installing transformer supports.

(b) Preparation: Provide concrete pad for transformer under provisions of Section 601.

(c) Installation shall meet the following requirements:

1. Install Products in accordance with manufacturer's instructions. Maintain adequate spacing around unit for ventilation.
2. Set transformer plumb and level.
3. Make conduit connections to enclosure as indicated on the Plans.
4. Mount transformer on vibration isolating pads suitable for isolating the transformer noise from the building structure.
5. Provide seismic restraints as required.
6. Provide grounding and bonding in accordance with the REVISION OF SECTION 613 titled BONDING AND GROUNDING.

(d) Exhaust Fans Installation: Remove the existing fractional horsepower exhaust fan and install the new exhaust fans in their place in each of the three Crosscut Electrical Rooms. Increase the size or modify the existing opening in the masonry wall as required to accommodate the new fans. Install the line voltage thermostat inside the Electrical Room adjacent to the door and wire it to interrupt the 120 volt supply to the exhaust fan. Provide a new 15 ampere circuit breaker in the existing 120/208 volt panelboard that presently supplies the existing exhaust fan. Install new #12 AWG circuit conductors (including ground) in ¾" conduit between the panelboard and the thermostat/exhaust fan.

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(e) Field Quality Control: Field inspection and testing will be performed in the presence of the Engineer.

1. Check for damage and tight connections prior to energizing transformer.
2. Measure primary and secondary voltages and make appropriate tap adjustments.

METHOD OF MEASUREMENT

613.2104 Measurement. The dry-type power transformers and Electrical Room exhaust fans, complete with any associated components and incidentals described herein and the installation thereof shall be measured on a per unit basis. Included in the term "incidental" is all equipment required to perform the complete installation and testing of the tunnel dry-type power transformers and exhaust fans.

BASIS OF PAYMENT

613.2105 Payment. The completed and accepted work for the dry-type power transformers and exhaust fans will be paid for at the per unit price for the pay items listed below that appears in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Power Transformer (300 kVA, 480-2400V, 3-Phase)	Each
Power Transformer (150 kVA, 480-2400V, 3-Phase)	Each
Power Transformer (150 kVA 2400-480/277V, 3-Phase)	Each
Exhaust Fan	Each

REVISION OF SECTION 613

PANELBOARD

Section 613 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

613.2201 This work consists of furnishing and installing panelboards in the Main Electrical Room of the West and East Ventilation Buildings and the three Crosscut Electrical Rooms for the South Tunnel. Also included in this work is the furnishing and installing of mini-load centers complete with dry-type, single-phase, two winding, step-down transformers with a 480 volt primary and 240/120 volt secondary.

MATERIALS

613.2202 Panelboard construction and materials shall be as follows:

(a) General: NEMA PB 1; circuit breaker type. Listed according to UL 67 for wire terminations based on 75 degrees C wire ampacities as shown in the National Electrical Code Article 300.

1. Arrange branch circuits using double row construction.
2. Enclosure: NEMA PB 1; Type 1.
3. Cabinet size shall be 20 inches wide, minimum.
4. Provide cabinet front with continuous hinged door-in-door construction. Provide inner hinged door with flush type cylinder lock. Outer door shall be held in place with captive screws.
5. Factory standard enamel paint over a rust-inhibiting phosphatized coating.

(b) Bussing: Provide panelboards with copper bus, ratings as scheduled on the panel schedules.

1. Support bus bars and branch taps independently and throughout their full length.
2. Phase bussing to be full height without reduction in size.
3. Neutral Bus: Full size, isolated from the enclosure, and have a suitable lug for each branch circuit neutral conductor.

(c) Short Circuit Rating: Minimum short circuit rating regardless of short circuit rating shown on the panel schedules shall be 65,000 Amperes rms. symmetrical for 480Y/277 Volt panelboards located in the Ventilation Buildings. Series rating of devices is acceptable. Minimum short circuit rating of panelboards located in the Crosscut Electrical Rooms shall be 42,000 amperes rms. symmetrical for 480Y/277 Volt panelboards. Circuit breakers of the same rating and number of poles shall be identical for all panelboards.

(d) Completely factory assemble all panel interiors. They shall be so designed that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors so that circuits may be changed without machining, drilling, or tapping.

(e) Panelboard enclosures shall be constructed as follows:

1. Provide sheet steel enclosures, NEMA PB 1; Type 1, code gage, minimum 16 gage thickness, without knockouts. Provide doors with flush lock and key, all

panelboard enclosures keyed alike, with concealed hinges and door swing as indicated; equipped with interior circuit-directory frame, card and clear plastic covering.

2. Panelboards shall have tight closing doors without play, when latched. Where two cabinets are located adjacent to each other as a single panelboard, provide a single trim for the two cabinets.

3. Provide factory prime and finish coat for cabinets of all panelboards. Finish coat color shall be ANSI 64, light gray.

(f) Circuit Breakers: Provide thermal magnetic type circuit breakers of bolt-in, single unit construction per NEMA AB 1 and UL 489. Provide multi-pole circuit breakers with trip elements in each pole with common trip bar. Provide frame size 225 amp and larger with adjustable magnetic instantaneous trip. All values are minimum at rated voltage. Provide solid state short delay trip for all breakers 400A and above, adjustable for pickup and delay. Provide interchangeable trip unit type breakers for all ratings over 150A, 480V.

1. Install ground fault interrupter type circuit breakers where required by code, or as indicated by drawings or specifications.

2. Provide all circuit breakers with provisions for locking off individual branch circuits and mains with a padlock.

(g) Mini-Load Centers: 5 kVA rated mini-load centers for supplying 120 volt power to the VMS/LUS control cabinets.

1. Mini-load centers shall be furnished with 480 volt, single-phase primary and 240/120 volt secondary windings.

2. The mini-load center transformers shall be provided with 2 full capacity taps to accept primary voltages at nominal, -5 and -10 percent of nominal while maintaining 240V secondary voltage.

3. The enclosure for the mini-load center shall be weather-resistant, designed for both indoor and outdoor use. The mini-load center assemblies shall be designed for wall mounting.

4. The mini-load centers shall be supplied complete with an enclosed 20 ampere, 2-pole primary main circuit breaker and a 30 ampere, 2-pole secondary main circuit breaker. A panel section of the mini-load center shall provide six (6) single-pole, bolt-on, circuit breakers, rated 20 amperes. The minimum short circuit rating shall be 10,000 Amperes rms

(h) Acceptable manufacturers shall be as follows:

1. General Electric

2. Square D

3. Cutler-Hammer

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PANELBOARD

CONSTRUCTION REQUIREMENTS

613.2203 The panelboards shall be assembled, tested and installed as follows:

(a) Examination: Verify physical condition prior to installation and that surfaces are suitable for installing panelboard-mounting struts.

(b) Preparation: Provide a minimum of two horizontal steel struts having approximate 1.5-inch square dimensions for mounting panelboards.

(c) Installation: Install in accordance with the manufacturer's instructions, and in conformance with NEMA PB 1.1.

1. Anchor enclosures firmly to wall mounted struts, ensuring that they are permanently and mechanically secured. Support panel cabinets independently to the struts, with no weight bearing on conduits. Provide all corrosion resistant mounting hardware.
2. Height: 6 feet 6 inches to top, or as indicated on Drawings. Install plumb.
3. Provide filler plates or spare circuit breakers for unused spaces in panelboards as indicated on the panel schedules.

(d) Provide panelboard identification as follows:

1. Provide manufacturers type designation in addition to NEC required labeling inside the panelboard door.
2. Provide a front mounted nameplate identifying the panel as shown on Drawings, and listing voltage, phase and wire circuitry.
3. Post panel schedules with all changes clearly marked in red at completion of the project. Provide updated panel schedules in Microsoft EXCEL format, reflecting FINAL AS-BUILT conditions. The contractor will be furnished with AS-BID panel schedules in Microsoft EXCEL format.

(e) Field Quality Control shall include the following procedures and tests:

1. Protect panelboards and cabinets during construction to prevent damage and entry of dirt, paint, etc.
2. Provide the necessary test equipment and personnel to conduct tests on the completed panelboard installation. Electrical tests to be witnessed by the Engineer or his designated representative.
3. Electrical Test and Inspection: Test installed panelboards and wiring for short circuits and ground faults before energizing.
4. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

(f) Balancing Electrical Loads: Exercise care in connecting the various electrical loads to panelboards in order to arrive at a reasonable balance between loads on each phase at each panelboard. If circuit connections or loads differ significantly from that indicated on the Contract Drawings, make tests and adjust loads at each panelboard to result in a reasonably balanced load condition satisfactory to the Engineer.

REVISION OF SECTION 613
PANELBOARD

METHOD OF MEASUREMENT

613.2204 Measurement. The panelboards and mini-load centers, complete with circuit breakers and any associated components and incidentals described herein and the installation thereof shall be measured on a per unit basis. Included in the term "incidental" is all equipment required to perform the complete installation and testing of the tunnel panelboards

BASIS OF PAYMENT

613.2205 Payment. The completed and accepted work for the panelboards and mini-load centers will be paid for at the per unit price for the pay item listed below that appears in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Panelboard (1000A, 277/480V, 3-Phase)	Each
Panelboard (225A, 277/480V, 3-Phase)	Each
Panelboard (5 kVA Mini Load Center)	Each

REVISION OF SECTION 613
CIRCUIT BREAKER

Section 613 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

613.2301 This work consists of furnishing and installing circuit breakers in existing 480 volt motor control centers. Also included in this work is the retrofitting of two circuit breakers in the existing 480 volt switchgear, one located in the Main Electrical Rooms of each Ventilation Building.

MATERIALS

613.2302 Circuit breaker construction and materials shall be as follows:

(a) General: NEMA PB 1; circuit breaker type. Listed according to UL 67 for wire terminations based on 75 degrees C wire ampacities as shown in the National Electrical Code Article 300.

(b) Short Circuit Rating: Minimum short circuit rating regardless of short circuit rating shown on the panel schedules shall be 65,000 Amperes rms. symmetrical for 480Y/277 Volt enclosed circuit breakers located in the Ventilation Buildings.

(c) Molded Case Circuit Breakers: NEMA AB 1 and UL 489; bolt-on type thermal magnetic trip circuit breakers with common trip handle for all poles.

(d) Completely factory assemble all enclosed circuit breakers.

(e) Circuit breaker enclosures shall be constructed as follows:

1. Provide sheet steel enclosures which conform to UL 50, code gage, minimum 16 gage thickness, without knockouts.
2. Padlocking provisions shall be provided to allow locking the circuit breaker in the "OFF" position.
3. Provide factory prime and electrodeposited enamel finish coat for enclosures of all circuit breakers. Finish coat color shall be ANSI 64, light gray.

(f) Circuit Breakers: Provide thermal magnetic type circuit breakers of single unit construction per UL 489. Provide multi-pole circuit breakers with trip elements in each pole with common trip bar. Provide frame size 225 amp and larger with adjustable magnetic instantaneous trip. All values are minimum at rated voltage. Provide solid state short delay trip for all breakers 400A and above, adjustable for pickup and delay. Provide interchangeable trip unit type breakers for all ratings over 150A, 480V. Install ground fault interrupter type circuit breakers where required by code, or as indicated by drawings or specifications.

(h) Retrofit of Existing Low Voltage Air Circuit Breakers:

1. Furnish and install new General Electric (GE) MVT-Plus retrofit kits one spare GE Type AK air circuit breaker in the existing 480 volt switchgear that is indicated for use in supplying power to the new automatic transfer switch in the Main Electrical Room of each Ventilation Building
2. The GE MVT-Plus retrofit kits shall include new trip devices with Long, Short, Instantaneous and Ground (LSIG) trip functions, new current transformers and electrical wiring harness.

REVISION OF SECTION 613
CIRCUIT BREAKER

(i) Acceptable manufacturers shall be as follows:

1. General Electric only to match existing equipment.

CONSTRUCTION REQUIREMENTS

613.2303 The circuit breakers shall be assembled, tested and installed as follows:

(a) Examination: Verify physical condition prior to installation and that compartments are suitable for installing circuit breakers.

(b) Safety: Perform Lock Out/Tag Out procedures in the presence of the Engineer and in compliance with established tunnel maintenance policy. Do not disconnect power from any energized circuit breaker without first obtaining written permission from the Engineer.

(c) Preparation: Provide any support rails or channels necessary for securing circuit breakers in compartments.

(d) Installation: Install in accordance with the manufacturer's instructions and in conformance with NEMA PB 1.1.

1. Motor Control Center Circuit Breaker: Install circuit breaker in motor control center compartment, ensuring that each breaker is permanently and mechanically secured.

   A. Modify or replace hinged door assembly of motor control center or switchgear compartment to accommodate breaker operating handle and any indication devices.

   B. Provide any necessary modifications to circuit breaker for motor control center to permit it to mate with vertical electrical bus stab connections.

   C. Provide all corrosion resistant mounting hardware.

2. 480 Volt Switchgear Air Circuit Breaker Retrofit: Install new General Electric (GE) MVT-Plus retrofit kits on GE Type AK air circuit breakers.

   A. Remove old electro-mechanical trip devices, current transformers and electrical wiring harness.

   B. Clean all components of existing circuit breaker and inspect for physical damage.

   C. Install new retrofit kits in accordance with manufacturer's instructions.

   D. Check tightness of all hardware and wiring connections.

   E. Check cell fit and element alignment upon installation into switchgear cubicle.

   F. Perform mechanical operational tests in accordance with manufacturer's instructions.

(e) Provide circuit breaker identification as follows:

1. Provide manufacturers type designation in addition to NEC required labeling.

2. Provide a front mounted nameplate identifying the circuit breaker as shown on Drawings, and listing voltage, phase and wire circuitry.

(f) Field Quality Control shall include the following procedures and tests:

1. Protect circuit breakers and associated devices during construction to prevent damage and entry of dirt, paint, etc.

2. Provide the necessary test equipment and personnel to conduct tests on the completed circuit breaker installation. Electrical tests to be witnessed by the Engineer or his designated representative.

3. Electrical Test and Inspection: Test installed circuit breakers and wiring for short circuits and ground faults before energizing.

4. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

5. Testing of 480 Volt Switchgear Air Circuit Breaker: Perform the following tests upon completion of the circuit breaker retrofit installation. Provide a tabulation of all test results and comparisons to manufacturer's established values where applicable.

A. Measure and record circuit breaker contact resistance. Assure that measurements are within manufacturer's specified values.

B. Test the following functions by primary current injection and record measured values:

1) Measure minimum long-time pickup.

2) Measure long-time delay at three (3) times long-time pickup current.

3) Measure short-time pickup.

4) Measure instantaneous pickup.

5) Measure ground fault pickup.

6) Measure ground fault delay at one and one half (1-1/2) times ground fault pickup.

C. Check trip unit reset operation.

D. Perform insulation resistance test phase-to-phase, phase-to-ground and across open contacts.

METHOD OF MEASUREMENT

613.2304 Measurement. The circuit breakers and retrofitted existing circuit breakers, complete with any associated components and incidentals described herein and the installation thereof shall be measured on a per unit basis. Included in the term "incidental" is all equipment required to perform the complete installation and testing of the circuit breakers for the tunnel facility.

REVISION OF SECTION 613
CIRCUIT BREAKER

BASIS OF PAYMENT

613.2305 Payment. The completed and accepted work for new and retrofitted circuit breakers will be paid for at the per unit price for the pay item listed below that appears in the bid schedule.

Payment will be made under:

Pay Item	**Pay Unit**
Circuit Breaker (400A, 3-Pole)	Each
Circuit Breaker (225A, 3-Pole)	Each
Circuit Breaker (Retrofit 1200A, 3-Pole)	Each

REVISION OF SECTION 613
AUTOMATIC TRANSFER SWITCH

Section 613 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

613.2401 This work consists of furnishing and installing two (2) automatic transfer switches. One (1) transfer switch shall be installed in the Main Electrical Room of each Ventilation Building.

MATERIALS

613.2402 Automatic transfer switch construction and materials shall be as follows:

(a) Description: NEMA ICS 2 & UL 1008.

(b) Configuration: 4 Pole, 480Y/277V, 3 phase, 4 wire with ampacity as shown on the drawings. Provide a double throw switch with electrically operated and mechanically held contacts.

1. Transfer time - 10 cycles or less.
2. Neutral with fully rated neutral transfer contacts.
3. Mechanically interlock normal and emergency switch positions such that a neutral position is not possible.
4. Mount in NEMA 1 enclosure.
5. Equip with in-phase monitor.

(c) Switch operational features shall be as follows:

1. Provide 3 -phase control of three phase power sources.
2. Monitor each phase for loss. Pickup adjustable from 85% to 100%, drop out adjustable from 75% to 95%, both in increments of 1%.
3. Provide adjustable settings as follows:
   A. Time delay to override momentary normal source interruptions to delay all transfer switch functions: 0 to 6 seconds.
   B. Transfer to emergency time delay: 0 to 5 minutes.
   C. Retransfer to normal time delay to allow normal source to stabilize: 0 to 30 minutes.
   D. Unloaded running time delay for alternate source shutdown: 0 to 60 minutes.
4. Provide DPDT contacts from control module that will change state on loss of commercial power. Provide "Push to Test" button to simulate power failure.
5. Provide auxiliary contacts (one set of each) to mimic ATS status.

(d) Ratings: NEMA ICS 2; as follows:

1. Voltage: 480Y/277 volts, three-phase, four-wire, 60 Hz.
2. Switched poles: Four.
3. Load inrush rating: Combination load.

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AUTOMATIC TRANSFER SWITCH

4. Continuous rating: As shown on the Drawings (100% rated)
5. Interrupting capacity: 125% of continuous rating.
6. Withstand current rating: 65,000 rms symmetrical amperes.

(e) Additional ratings of automatic transfer switch shall be as follows:

1. The current rating shall be a 24-hour continuous rating when the switch is enclosed in an unventilated enclosure, and shall conform to NEMA temperature rise standards.
2. The current rating shall be based on all classes of loads, i.e., resistive, tungsten, ballast and inductive loads.
3. The thermal capacity of the main contacts shall not be less than 20 times the continuous duty rating for a minimum of 3 electrical cycles as established by certified test data.
4. Temperature rise test shall be in accordance with UL 1008 except that it shall be conducted at the conclusion of the overload and endurance tests.
5. The switch shall be rated to withstand a dielectric test at 1960 volts minimum at the conclusion of the withstand and closing tests.

(f) Acceptable manufacturers shall be as follows:

1. ASCO
2. Zenith
3. Russelectric

(g) Product options and features shall be as follows:

1. Indicating Lights: Mount in cover of enclosure to indicate NORMAL SOURCE AVILABLE ALTERNATE SOURCE AVAILABLE, SWITCH POSITION.
2. Test Switch: Mount in cover of enclosure to simulate failure of normal source.
3. Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate to normal source.
4. Transfer Switch Auxiliary Contacts: 2 normally open; 2 normally closed.
5. Normal Source Monitor: Monitor each line of normal source voltage and frequency; initiate transfer when voltage drops below 85 percent or frequency varies more than 3 percent from rated nominal value.
6. Alternate Source Monitor: Monitor alternate source voltage and frequency; inhibit transfer when voltage is below 85 percent or frequency varies more than 3 percent from rated nominal value.
7. In-Phase Monitor: Inhibit transfer until source and load are within 5 electrical degrees.
8. Switched Neutral: Fully rated.

(h) Switch enclosure shall be as follows:

1. Enclosure: ICS 6, Type 2.

2. Finish: Manufacturer's standard gray enamel.

CONSTRUCTION REQUIREMENTS

613.2403 The automatic transfer switch shall be assembled, tested and installed as follows:

(a) Examination: Verify physical condition prior to installation and that surfaces are suitable for installing transfer switch mounting struts.

(b) Preparation: Provide a minimum of two horizontal steel struts having approximate 1.5-inch square dimensions for securing back of switch enclosure.

(c) Installation: Install in accordance with the manufacturer's instructions, and in conformance with NEMA ICS2-447.

1. Anchor enclosures firmly to wall mounted struts, ensuring that they are permanently and mechanically secured. Provide all corrosion resistant mounting hardware.

2. Height: 6 feet 6 inches to top, or as indicated on Drawings. Install plumb.

(d) Provide transfer switch identification as follows:

1. Provide manufacturers type designation in addition to NEC required labeling inside the transfer switch door.

2. Provide a front mounted nameplate identifying the transfer switch as shown on Drawings, and listing voltage, phase and wire circuitry.

(e) Field Quality Control shall include the following procedures and tests:

1. Protect transfer switch and enclosure during construction to prevent damage and entry of dirt, paint, etc.

2. Provide the necessary test equipment and personnel to conduct tests on the completed transfer switch installation. Electrical tests to be witnessed by the Engineer or his designated representative.

3. Electrical Test and Inspection: Test installed transfer switches and wiring for short circuits and ground faults before energizing.

4. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for switches.

METHOD OF MEASUREMENT

613.2404 Measurement. Automatic transfer switches, complete with any associated components and incidentals described herein and the installation thereof shall be measured on a per unit basis. Included in the term "incidental" is all equipment required to perform the complete installation and testing of the automatic transfer switches.

REVISION OF SECTION 613
AUTOMATIC TRANSFER SWITCH

BASIS OF PAYMENT

613.2405 Payment. The completed and accepted work for the transfer switches will be paid for at the per unit price for the pay item listed below that appears in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Automatic Transfer Switch	Each

REVISION OF SECTION 613
2.4 KV MOTOR CONTROL CENTER CUBICLE

Section 613 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

613.2501 This work consists of furnishing two (2) 2.4 kV Motor Control Center Cubicles and mating these units to the existing medium voltage motor control centers. One (1) cubicle assembly shall be installed in the Main Electrical Room of each Ventilation Building.

MATERIALS

613.2502 2.4 kV Motor Control Center Cubicle construction and materials shall be as follows:

(a) Each new cubicle assembly shall consist of the following:

1. A General Electric (GE) Limitamp medium voltage motor control center with draw-out style compartment. The cubicle assembly shall be constructed as a two-high compartment design.
2. The top compartment shall consist of a 400 ampere GE Limitamp Control, across-the-line, full voltage, non-reversing controller. The controller shall be furnished complete with a medium voltage contactor, fusing and electronic overload relaying designed to prevent single-phasing on a 2400 volt system. Protection shall also be provided to trip the contactor upon the occurrence of a single blown fuse. All unit configuration, all electrical and mechanical ratings, controls and metering shall be provided to match that of the existing controllers in the motor control center line-up.
3. The lower compartment shall consist of a factory prepared space complete with vertical power bus, complete interlocking and isolating mechanisms, operating handle and high-voltage door. It shall not include electrical components.

(b) A three-phase bus extension and all required mating accessories shall be provided to interconnect the new cubicle and the existing motor control center. The cubicle bus rating and bracing shall match that of the existing motor control center.

(c) The cubicle enclosure shall match the vertical dimension of the adjacent units. Provide an gray enamel finish on the new enclosure to match the adjoining units. Provide a mechanical lifting mechanism to permit lower the controller from the enclosure and lifting the unit back into place.

REVISION OF SECTION 613
2.4 KV MOTOR CONTROL CENTER CUBICLE

CONSTRUCTION REQUIREMENTS

613.2503 The 2.4 kV Motor Control Center Cubicle shall be assembled and tested as follows:

(a) The medium voltage controller shall be completely assembled and wired, and all accessories installed and adjusted in the manufacturer's facility. After assembly, the complete cubicle/controller will be tested for operation under simulated service conditions to assure the accuracy of the wiring and functioning of the equipment. The controller will be subjected to the following tests in accordance with the latest applicable requirements of UL 347 and NEMA ICS 3, Part 2, for E2 controllers. No equipment will be shipped until testing is complete. The following tests are required:

1. All of the manufacturer's standard production tests.
2. All routine tests as specified in applicable ANSI standards..

(b) All control devices and wiring will conform to the requirements of NEMA publications ICS-2 and HP-1.

(c) Testing: The manufacturer will furnish the Engineer with five (5) certified copies of the test reports which define the tests performed and the results of the tests. These reports will be attested to by the manufacturer's Test Engineer.

1. All tests will be in accordance with the latest applicable standards as recommended by ANSI, NEMA and IEEE.
2. After assembly, test the switch for operation under simulated service conditions to assure the accuracy of the wiring and functioning of the equipment.
3. The Engineer will reserve the right to witness tests on the assembled switch. Notification of at least thirty (30) calendar days prior to the start of testing must be given so travel arrangements may be made.

(d) Examine existing conditions as follows:

1. Verify that surfaces are ready to receive work.
2. Verify field measurements are as shown on the drawings.
3. Verify that required utilities are available, in proper location, and ready for use.
4. Beginning of installation means contractor accepts conditions.

(e) Preparation: Match existing mounting method utilized on adjacent cubicles.

(f) Installation: The following procedures shall be followed during cubicle installation.

1. Install cubicle in accordance with manufacturer instructions.
2. Provide connections to the building grounding system through the adjacent motor control center cubicles.

(g) Field Quality Control: Field inspection and testing will be performed per NEMA 210.

REVISION OF SECTION 613
2.4 KV MOTOR CONTROL CENTER CUBICLE

METHOD OF MEASUREMENT

613.2504 Measurement. The medium voltage motor control center cubicle/assembly, complete with fuses and any associated components and incidentals described herein and the installation thereof shall be measured on a per unit basis. Included in the term "incidental" is all equipment required to perform the complete installation and testing of the tunnel medium voltage motor control center cubicle/assembly.

BASIS OF PAYMENT

613.2505 Payment. The completed and accepted work for the medium voltage motor control center cubicle/controller will be paid for at the per unit price for the pay item listed below that appears in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
2.4 KV Motor Control Center Cubicle	Each

REVISION OF SECTION 613
STORAGE BATTERY SYSTEMS

Section 613 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

613.2601 This work consists of furnishing installing and testing two complete storage battery systems including four chargers (two per system), racks, cables, protective devices, monitoring, communications interface and other materials required for a complete and operational Storage Battery Systems as specified herein and as shown on the contract drawings. The work shall also include the installation of a temporary storage battery system, the removal and disposal of the existing Storage Battery Plants as specified herein.

MATERIALS

613.2602 The storage battery systems shall include be constructed as described below or include the following features:

(a) Equipment and materials shall be new, of heavy duty industrial construction, listed and labeled to the latest requirements of the applicable Underwriters Laboratories standards, labeled by a nationally recognized testing agency and manufactured in accordance with current revisions of the following standards:

- DC circuit breakers
- UL standard

Equipment shall also satisfy the applicable sections of current revisions of the following standards:

- IEEE 446
- ANSI N45.2
- National Electrical Code (NFPA 70)
- NEMA PE-1
- Quality System Standard ISO 9001
- OSHA
- MIL-I-45208A
- MIL-Q-9858

(b) Battery Plant: The battery shall be lead-selenium, flooded-cell type, with a 25-year design life under full float operation.

(c) The battery shall be provided with a pro rata cycle life duty warranty based on the following discharges

1. 30% depth of discharge: 3500 Cycles
2. 50% depth of discharge: 1850 Cycles
3. 80% of depth of discharge: 1100 Cycles
4. 100% depth of discharge: 800 Cycles
5. 25-year warranty: 10 years unconditional warranty plus 15 years pro-rated warranty.

REVISION OF SECTION 613
STORAGE BATTERY SYSTEMS

(d) At the time of delivery, and after proper initial charging, the battery shall be capable of providing full specified capacity without the need for extended float time or additional discharge and recharge cycles based on the following parameters:

1. Back-up Time: 30 minutes
2. Load: 50kW, at 120/240V dc. split loads
3. Maximum Specific Gravity: 1.240 @77°F
4. Racks shall be (3) tier each certified for seismic zone 1
5. Battery strings: 116 cells in each Ventilation Building
6. Ampere-Hour: 425AH, 8-hour rate at 1.75-volt per cell

(e) Positive Plate: Tubular plate with selenium alloy.

(f) Negative Plate: Flat plate with low antimony grids.

(g) Casing: Styrene-acrylonitrile (SAN), high impact resistant.

(h) Post: Leakproof with copper insert.

(i) Intercells: Solid copper, bolt-on type, insulated.

(j) Vent caps: Flame arresting safety plugs.

(k) Float Voltage: 2.33 volts/cell.

(l) Temperature range: 30°F to 130°F (68°F optimum).

(m) Minimum discharge current at 1.75 volts/cell.

1. 290 amperes for 30 minutes
2. 213 amperes for 1 hour
3. 108 amperes for 3 hours

(n) Packaging: The battery system shall be delivered on skids suitable for handling by forklift or pallet jack. Packing of the battery jars must allow lifting straps to be inserted beneath the jar without moving, lifting or tilting the jar. Packaging shall assure the plates are oriented perpendicular to the normal direction of travel during transportation.

(o) Manufacturing Controls: Each cell shall be clearly identified as to cell type, voltage and capacity as well as manufacturing control group for future Quality Assurance traceability. All cells in the battery string shall be factory tested to verify 100% system capacity. The equipment shall be designed and manufactured under a Quality Assurance Program which is controlled and documented by written policies, procedures or instruction, and which shall be carried out throughout the performance of the work. The Quality Assurance Program shall conform to the requirements applicable to commercial/industrial power conversion equipment.

(p) Battery Disconnect Breaker: Battery plant shall have a property rated UL listed circuit breaker (600 VDC) to isolate it from the battery. The breaker shall be in a separate NEMA 1 enclosure. When the battery reaches the minimum discharge voltage level or when signaled by other control functions, the circuit breaker shall automatically open.

REVISION OF SECTION 613
STORAGE BATTERY SYSTEMS

Battery Charger/Rectifiers. The Battery charger/rectifiers for the Storage Battery System shall be fully automatic, temperature compensated. sized and rated to match the power requirement of the battery plant. Each unit shall include the following features:

(a) Battery status indicator

(b) Communications interface

(c) Battery cycle monitor

(d) Self-testing/self-diagnostic with visual readout

(e) Security control

(f) Protective devices (AC and DC)

(g) Free-standing, NEMA 12 enclosure

(h) Remote temperature sensor

Status Indicator. A battery status indicator at the unit shall display DC alarm conditions, shutdown voltages, the present battery voltage, and battery time remaining during discharge. A graphical representation of the battery voltage during the discharge shall be displayed. The graphical representation shall remain in the monitoring system memory until the next discharge occurs and shall be available for review of the battery performance.

Battery Cycle Monitor. The charger/rectifiers shall have a Battery Cycle Monitor (BCM) built into system firmware to document the cycle service of the battery. It shall collect and retain information on the last 132 events that involved discharging the battery. Each battery discharge cycle is to be put into one of four categories, depending on the duration of the event:

- 0-30 Seconds Discharge
- 31-90 Seconds Discharge
- 91-240 Seconds Discharge
- Over 240 Seconds Discharge

The BCM shall collect and retain this information for each discharge cycle:

- System time and date
- Event Number
- Duration of cycle (seconds)
- Lowest DC Bus Voltage
- Highest DC Bus Current
- KW carried by the batteries at the start of cycle, and
- Battery Environment Ambient Temperature

In addition, the BCM shall retain summary information on the total number of events, the cumulative ampere-hours and the total discharge time since a given date.

The BCM shall be capable of storing information for up to 132 discharge cycle events in its data buffer. When the buffer approaches its capacity, a warning message shall be broadcast via terminal and modem communication channels and a complete listing of all

records (in order of occurrence) shall be sent to the terminal port. Once the buffer is filled, new data will replace the old on a First In, First Out basis as new cycles occur.

The system operator shall be able to select either the BCM Summary screen or one of four screens showing detailed information on any one of the four categories of discharge (0-30 seconds, 31-90 seconds, 91-240 seconds and over 240 seconds).

The Summary screen will ordinarily show Total Number of Discharge Cycles, Accumulated Battery Time, Accumulated Battery Amp Hours (AH), Accumulated Battery Kilowatt Hours (KWH) and the current temperature at the spot where the Battery Temperature Sensor has been positioned. During a battery discharge event, the screen shall change to show information about the current discharge cycle. The screen shall display Active Cycle Time in place of Accumulated Battery Time and substitutes Active Battery AH and Active Battery KWH for their accumulated counterparts.

The system shall allow this information to be collected remotely, through the communications board and modem, by a remote terminal or a personal computer equipped with a modem and communications program.

Maintenance Accessories. Accessories shall be supplied with each battery system to facilitate installation and maintenance of the battery cells. Accessories shall include the following:

(a) Portable digital hydrometer with analog output for specific gravity, temperature, and cell voltage to data logger

(b) Data logger designed to be used in conjunction with digital hydrometer complete with PC software for downloading data

(c) Holster for digital hydrometer with extended run-time battery charger and case.

(d) Lifting strap and spreader block

(e) Portable digital battery resistance tester for high-capacity batteries.

Racks: Racks shall be certified for compliance with the latest edition of the Uniform Building Code, Standard 27-11. Racks shall have welded steel support frames and support rail construction designed to prevent long-term warpage, resulting in stresses on the cells and interconnections. The support rail shall be metallic-zinc finished steel covered with a rigid extruded PVC cover meeting UL94V0 flame spread criteria. All metallic rack components which directly contact the battery shall be insulated with removable covers to provide at least 6,500 volt dielectric strength. Rack parts not supplied with a metallic-zinc finish shall be covered with a chemical coating to protect the material from battery acid.

Battery Safety Accessories: The following rack accessories shall be included to meet the spill containment requirements of the latest edition of the UBC.

(a) Rack anchors shall be designed for an adequate factor of safety, when mounted to a concrete floor with a strength rating of 3000 PSI. A suitable number of concrete bits, depth gauge, and acid resistant sealant shall be supplied for the installation.

(b) Spill containment barrier with a four inch sill. The barrier shall provide a minimum interior dimension at least 1.75 inches greater than the overall rack dimensions.

(c) Battery electrolyte absorption shall be provided by use of neutralization mats to

completely fill the spill containment barrier. A minimum of 10% extra mats shall be provided to state.

(d) Spill cleanup and disposal kit shall be provided to facilitate cleanup after a spill. The kit shall include 20 gallon container, 10 pounds of electrolyte neutralizer, pH test strips, acid resistant gloves, sponge, and complete instructions for proper disposal of used material.

(e) Aisle matting of an acid resistant and insulating material. The mat shall be of sufficient length to be greater than the length of the barrier and a minimum of 32.5 inches wide. A beveled edge shall be supplied on all sides.

CONSTRUCTION REQUIREMENTS

613.2603 The storage battery systems shall be assembled and tested as follows:

Temporary Storage Battery: Temporary storage battery power shall be provided prior to removals of the existing storage battery system and during installation of the new storage battery system.

(a) Temporary storage battery shall provide the following output parameters:

1. Back-up time: 30 minutes
2. 200 AH at 8-hour rate or 140 amperes for 30 minutes
3. Output voltage: 120/240 vdc (split bus panelboards).

Removal and disposal of existing battery plant: The existing Battery Plant consisting of 364 nickel-cadnium cells within each battery room, including battery charger and racks shall be disconnected, removed and disposed of from the site in accordance with government regulations and requirements.

Inspection and Testing. The following inspections and test procedures shall be performed by factory trained field service personnel prior to start-up.

(a) Visual inspection

1. Inspect equipment for signs of damage.
2. Verify installation per drawings and these specifications.
3. Inspect cabinets for foreign objects.
4. Verify that the existing neutral and ground conductors are properly sized and configured.
5. Inspect electrolyte level in cells (flooded cells only).
6. Inspect all cell cases.
7. Inspect each cell for proper polarity.
8. Verify all printed circuit boards on charger/rectifiers are configured properly.

(b) Mechanical Inspection

1. Check all control wiring connections for tightness.
2. Check all power wiring connections for tightness.
3. Check all terminal screws, nuts and/or spade lugs for tightness.

REVISION OF SECTION 613
STORAGE BATTERY SYSTEMS

(c) Electrical Inspection

1. Check all fuses for continuity.
2. Confirm input voltage and phase sequence is correct.
3. Verify control transformer connections are correct for voltages being used.
4. Assure correct connection and voltage of the battery strings(s).

(d) Unit Start-up

1. Energize power supply.
2. Perform control/logic checks and adjust to meet specification.
3. Verify DC float and equalize voltage levels.
4. Verify DC voltage clamp and overvoltage shutdown levels.
5. Verify battery discharge, low battery warning and low battery shutdown levels.
6. Verify fuse monitor alarms and system shutdown.
7. Verify proper recharge.
8. Submit certified tests results to the Engineer.

METHOD OF MEASUREMENT

613.2604 Measurement. Storage Battery System including charger/rectifier, associated components and incidentals described herein and the installation thereof shall be measured as a single lump sum. Included in the term "incidental" are all wiring and equipment required to perform the complete installation and testing for the Storage Battery Systems, removal and disposal of existing battery system, and furnishing and installing tempoary storage battery systems until the new battery systems are operational.

BASIS OF PAYMENT

613.2605 Payment. The completed and accepted work for the Storage Battery System will be paid for at the contract lump sum price for the pay item below that appears in the bid schedule.

Payment will be made under:

Pay Item	**Pay Unit**
Storage Battery Systems	Lump Sum

TRAFFIC CONTROL PLAN - GENERAL

All traffic control required for this project shall be preformed by CDOT personnel in accordance with the requirements of Section 630 of the Standard Specifications and as further stipulated by the specific requirements established for the work at the tunnel.

The roadway surface shall be free of all debris and will be inspected by the tunnel maintenance person to determine that it is free of all safety hazards prior to being reopened to traffic. As required, the contractor shall machine-sweep the roadway prior to opening the roadway to traffic.

The traffic control in the Eisenhower/Johnson Memorial Tunnel shall conform to the following restrictions:

(a) The Tunnel shall have (2) lanes of traffic in each direction at all times with the following exceptions unless otherwise approved by the Engineer. The contractor shall notify the Engineer 24 hours in advance of the required closure.

(b) Unless otherwise approved by the Engineer, the Contractor's Working hours within the tunnel when any lane closure is required will be limited to the following:

Sunday	10:00 p.m.-	Monday	6:00 a.m.
Monday	8:00 p.m.-	Tuesday	6:00 a.m.
Tuesday	8:00 p.m.-	Wednesday	6:00 a.m.
Wednesday	8:00 p.m.-	Thursday	6:00 a.m.
Thursday	8:00 p.m.-	Friday	6:00 a.m.
Friday	10:00 p.m.-	Saturday	6:00 a.m.
Saturday	10:00 p.m.-	Sunday	6:00 a.m.

Depending on the actual traffic conditions encountered, hours may be adjusted by the Engineer. On holiday weekends, beginning on Friday prior to and ending on the day after the holiday, the hours may be adjusted by the Engineer.

Lane Closure shall be limited to one lane throughout the length of the tunnel. Two 15-minute Tunnel closures per hour will be permitted. Contractor may propose an alternate method for the approval of the Engineer.

The CDOT reserves the right to direct the Contractor to leave the tunnel at any time due to emergencies or unforeseen circumstance, as they may occur. The Engineer shall have the full authority to make this determination and direct the Contractor accordingly.

SPECIAL CONSTRUCTION REQUIREMENTS

It is the responsibility of the Contractor to ensure that the appropriate special requirements are adhered to:

(a) The Contractor shall take appropriate action to protect against asbestos contamination and worker exposure when penetrating the control room and electrical room ceiling (Fan Room Floor) in the West and East buildings. The ceilings of these rooms have approximately ½ inch sprayed-on asbestos covered by approximately one inch of foil-backed fiberglass insulation.

(b) It will be the Contractor's responsibility to locate existing utility lines within the tunnel. The existing utility lines are as shown on the drawings. The Contractor can obtain any additional information regarding utility lines at the project site from the Eisenhower Tunnel Maintenance Section tel. (303)-512-5733, Rick Steele. All affected utility lines protection will be responsibility of the Contractor and shall not be paid for separately.

(c) No storage will be allowed within the tunnel facilities. Two staging areas will be available to the Contractor as directed by the Engineer:

1. West staging area (30'x180') at the West Portal in the South Parking Lot (upper).
2. East staging area (59'x280') in the North Parking Lot.

The staging areas shall be defined with eight-foot high chain link fence to be provided by the Contractor. Cost for fence shall not be a separate pay item, but included in the work. Locking gates shall be provided for access. Temporary lighting shall be provided and guaranteed by the Contractor. Staging areas shall be cleaned and fencing shall be removed for the winter shutdown.

(d) All work requiring an electrical outage shall be performed during specific outage periods as identified by the Engineer.

All complete outages shall be scheduled with the Engineer and shall only be performed during the hours 10 PM to 6 AM each day Sunday night through Friday morning.

CDOT personnel will operate and disable all switchgear, motor controls, and power switching equipment as necessary for the work. At no time will the Contractor operate any of the above equipment himself.

(e) The Contractor shall keep one set of plans, reviewed shop drawings and working drawings available on the project site at all times. This set shall be defined as the "construction drawings." The Contractor shall note on these construction drawings all changes and deviations from the work shown on the plans, shop drawings and working drawings. The construction drawings shall be kept current as the work progresses and notations shall be made within seven days of the change or deviation.

The first sheet or page of each set of construction drawings shall be stamped "As Constructed" and signed by the Contractor.

Upon completion of the work and prior to final payment, the construction drawings shall be submitted to the Engineer.

SPECIAL CONSTRUCTION REQUIREMENTS

(f) For tasks that involve pulling cables through the ducts, special care should be used to minimum the generation of airborne dust and the number of workers in the duct.

(g) Note that each task of the project will need to be assessed individually, as required by OSHA, to evaluate all potential safety hazards. If a potential hazard is anticipated, initially the most conservative approach should be taken, until task specific testing can be conducted to verify the actual hazard level.

The dust on top of the ceiling slab may contain small amounts of lead within acceptable limits. However, the Contractor shall take adequate precautions if the construction activity will result in dust particles to become airborne.

The precautions may include the following personal protection equipment (PPE), as a minimum, full-face respirator or half-face respirator with goggles, disposable coveralls (with hood and booties), gloves, and hearing protection, as required. Note, paper dust

masks do not provide adequate inhalation protection for the fine dust. Typically, the half-face respirator with goggles is more comfortable and cooler for workers to wear over a long work period. Regular safety glasses do not provide adequate eye protection in dusty and windy work areas, thus, goggles are recommended. The workers should be required to wash their hands and face when they leave the work area at breaks, lunch, and at the end of the task or work day to prevent ingestion or inhalation of the dust. Initially, as a minimum, additional task specific air sampling in the worker's breathing zone will be needed to verify and document the safety requirements (work methods, PPE, etc.) are adequate to protect the workers health for the specific task or work being performed.

(h) The planned tunnel upgrade will require numerous holes to be drilled up through the tunnel ceiling into the ducts. The concrete ceiling is approximately 6 inches thick. It is expected that a significant amount of concrete dust to be generated during "dry" drilling making it necessary for the drilling operator(s) to wear the appropriate PPE. Also, it should be anticipated that drilling into exhaust ducts could allow the thick surface dust in the duct to escape through the hole immediately after drilling. Work may need to be suspended for a few minutes to allow the dust to vented out of the worker's breathing zone (head and shoulder region). We do not anticipate that the drilling will generate significant additional airborne dust within the ducts.

(i) Tunnel lighting shall be maintained with a minimum of two rows of lamps in a fixture operating on one side of the tunnel at all times.

UTILITIES

The following utilities are within the limits of this project but are not expected to be involved.

Electrical (Power) - CDOT

The work described in these plans and specifications may require coordination between the Contractor and the utility companies in accordance with subsection 105.06 in conducting their respective operations as necessary.

The work listed below shall be performed by the Contractor in accordance with the plans and specifications, and as directed by the Engineer. The Contractor shall keep the utility company(s) advised of any work being done to their facility, so that the utility company(s) can coordinate their inspections for final acceptance of the work with the Engineer.

FOR:

Richard Steele
Colorado Department of Transportation
Region 1
Eisenhower Tunnel
P.O. Box 397
Idaho springs, CO 80452
(303)512-5733

GENERAL:

The Contractor shall comply with Article 1.5 of Title 9, CRS ("Excavation Requirements") when excavation or grading is planned in the area of underground utility facilities. The Contractor shall notify all affected utilities at least two (2) business days prior to commencing such operations. Contact the Utility Notification Center of Colorado (UNCC) to have locations of UNCC registered lines marked by member companies. Calls originating within the Denver metro area use phone no. 534-6700; calls originating outside the Denver area use 1-800-922-1987. All other underground facilities shall be located by contacting the respective company. Utility service laterals shall also be located prior to beginning excavating or grading.

The location of utility facilities as shown on the plan and profile sheets, and herein described, were obtained from the best available information.

All costs incidental to the foregoing requirements will not be paid for separately but shall be included in the work.

REVISION OF SECTION 105
DISPUTES AND CLAIMS FOR CONTRACT ADJUSTMENTS

Section 105 of the Standard Specifications is hereby revised for this project as follows:

Delete Subsection 105.17 and replace with the following:

105.17 Disputes and Claims for Contract Adjustments. When the Project Engineer is a Consultant Project Engineer, actions decisions, and determinations specified herein as made by the Project Engineer may be made by the Resident Engineer.

(a) Disputes include, but are not limited to, any disagreement resulting from a change, a delay, a change order, another written order, or an oral order from the Project Engineer, including any direction, instruction, interpretation, or determination by the Project Engineer. When a dispute occurs, the Contractor shall pursue resolution through the process set forth in this subsection. The Contractor shall:

1. Provide a written notice of protest to the Project Engineer before doing the work;

2. Supplement the written protest within 15 calendar days with a written statement providing the following:
   (1) The date of the protested order;
   (2) The nature of the order and circumstances which caused the protest;
   (3) The contract provisions supporting the protest;
   (4) The estimated dollar cost, if any, of the protested work and documentation supporting the estimate; and
   (5) An analysis of the progress schedule showing the schedule change or disruption if the Contractor is asserting a schedule change or disruption; and

3. Supplement the information provided in 2. above as necessary during the time the dispute continues.

Throughout protested work, the Contractor shall keep complete records of extra costs and time incurred. The Contractor shall permit the Project Engineer access to these and all other records needed for evaluating the protest as determined by the Project Engineer.

The Project Engineer will evaluate all protests. If the Project Engineer determines that a protest is valid, the Project Engineer will adjust payment for work or time by an equitable adjustment in accordance with subsection 108.06, 109.04, or 109.10. If the Project Engineer fails to provide satisfactory resolution, the Contractor may pursue the more formalized method for submitting a claim, as outlined below.

(b) All claims filed by the Contractor based upon: (1) work or materials not clearly defined in the Contract, (2) extra work not ordered by the Engineer in accordance with subsection 104.03, (3) extensions of time made pursuant to subsection 108.06, or (4) any other cause, resulting in requests for additional compensation or time, shall be governed by this subsection.

The Contractor and the Department agree that the dispute resolution process set forth in this subsection shall be exhausted in its entirety prior to initiation of litigation.

Failure to comply with the requirements set forth in this subsection shall bar the Contractor from any further administrative, equitable, or legal remedy.

(c) Upon discovery of any facts which formulate the basis of a potential claim, or upon unsatisfactory resolution of a dispute, the Contractor shall give written notice to the Project Engineer to enable the Department to obtain its independent evidence of these facts.

Within seven calendar days after the discovery of the facts giving rise to a claim, or after unsatisfactory resolution of a dispute, the Contractor shall notify the Project Engineer in writing of the intent to file a claim as described in subsection 105.17(b), unless written notice of protest was given in accordance with subsection 105.17(a). The Contractor's formal notification of intent to file a claim shall describe the contractual and legal basis of the claim and factual evidence supporting the claim.

If notice of protest or notice of intent to file claim are not properly given by the Contractor according to these specifications, the Contractor shall not be entitled to any additional compensation or extension of time for any cause related to the claim, including any act or failure to act by the Engineer. Any such claim based upon any cause will be considered invalid and will be denied by the Project Engineer on the basis that proper notifications, as required herein, were not given. The Contractor's prior and formal notifications of intent to file a claim and subsequent Department acknowledgment of those notifications shall not be construed as proving or substantiating the validity of the Contractor's claim as related to the contractual basis of the claim, factual information related to the claim, or cost, or amount of time extension related to the claim.

(d) When the Contractor provides written notification of intent to file a claim pursuant to subsection 105.17(c), the claim will be reviewed by the Project Engineer who will render a written decision to the Contractor to either affirm the claim as valid or deny the claim, in whole or in part, in accordance with the following procedure:

1. Within 60 days after project acceptance, the Contractor shall submit to the Project Engineer a complete claim package which represents the final position the Contractor wishes to have considered by the Department. The submitted claim package shall include all documents supporting such claim, regardless of whether such documents have been provided previously to the Department. All claims filed by the Contractor shall be in writing and in sufficient detail to enable the Engineer to ascertain the basis and amount of claim. As a minimum, the following information must accompany each claim submitted:

   A. A claim certification containing the following language:

   CONTRACTOR'S CLAIM CERTIFICATION

   Under penalty of law for perjury or falsification, the undersigned, _____(name), _____(title), of _____(company), hereby certifies that the claim of $_____ for extra compensation and ____ Days additional time, made herein for work on this contract is a true statement of the actual costs and time incurred, and is fully documented herein and supported under the contract between the parties.

   Dated _____ /s/_____
   Subscribed and sworn before me this _____ day of _____ .

   _____
   NOTARY PUBLIC
   My Commission Expires:

   B. A detailed factual statement of the claim for additional compensation, time, or both, providing all necessary dates, locations, and items of work affected by the claim.

   C. The date on which facts were discovered which gave rise to the claim.

   D. The name, title, and activity of all known CDOT, Consultant, and other individuals who may be knowledgeable about facts giving rise to such claim.

   E. The name, title, and activity of all known Contractor, subcontractor, supplier and other individuals who may be knowledgeable about facts giving rise to such claim.

   F. The specific provisions of the Contract which support the claim and a statement of the reasons why such provisions support the claim.

G. If the claim relates to a decision of the Engineer which the Contract leaves to the Engineer's discretion, the Contractor shall set out in detail all facts supporting its position relating to the decision of the Engineer.

H. The identification of any documents and the substance of any oral communications that support the claim.

I. Copies of all known documents that support the claim.

J. If an extension of contract time is sought, the documents required by subsection 108.06(d).

K. If additional compensation is sought, the exact amount sought and a breakdown of that amount into the following categories:
   (1) Labor costs;
   (2) The actual cost of materials;
   (3) Equipment costs calculated in accordance with subsection 109.04(c) for Contractor owned equipment and based on invoice costs for rented equipment.
   (4) Jobsite overhead costs;
   (5) Documentation and costs for additional bond, insurance and tax;
   (6) Subcontractor's claims (the same level of detail as specified herein is required for all subcontractor's claims);
   (7) An additional 10 percent may be added to the total of items (1), (2), (3), (4), (5), and (6) as compensation for items for which no specific allowance is provided, which includes profit and home office overhead.

The time period within which the Contractor is to provide such written documentation may be extended by the Project Engineer if requested by the Contractor and if the Project Engineer determines an extension would enhance the claim record and improve the potential for resolution of the claim. If the Contractor fails to provide such written documentation within 60 days after project acceptance, or within an extended time period authorized by the Project Engineer, the Project Engineer will base the decision upon the information previously submitted in the Contractor's notification of intent to file a claim and pertinent specification and contract documents. Requests of time extension to submit documentation shall be submitted in writing prior to final acceptance of the project. The Engineer's approval or disapproval of the extension will be given to the Contractor in writing prior to final acceptance.

The Contractor shall keep full and complete records of the costs and additional time incurred for each claim. All Contractor's records and the records of all subcontractors on the Contract shall be open to inspection or audit by representatives of the Department during the life of the Contract and for a period of not less than three years after the date of final payment. The Contractor, subcontractors, and lower tier subcontractors shall provide adequate facilities, acceptable to the Engineer, for the audit during normal business hours. The Contractor shall permit the Engineer or Department auditor to examine and copy those records and all other records required by the Engineer to determine the facts or contentions involved in the claim. The audit may be performed for any claim, and is mandatory for all claims with amounts greater than $250,000.

2. The Project Engineer: (1) will review the information in the Contractor's written notification of intent to file a claim, (2) will review all written documents as submitted by the Contractor in support of the claim, and (3) may consider any other information available in rendering a decision. The Project Engineer will assemble and maintain a claim record comprised of all written documents submitted by the Contractor in support of the claim and all other written documents considered by the Project Engineer in reaching a decision. All documentation the Contractor wants considered shall be made available to the Project Engineer and will be made a part of the claim record during the review of the claim. Once the claim record has been assembled by the Project Engineer, the submission of

additional information, other than clarification and data supporting previously submitted documentation, at any subsequent levels of review by anyone, will not be permitted. The Project

Engineer will provide a copy of the complete claim record along with the written decision to the Contractor describing the contractual basis and factual information considered by the Project Engineer in reaching a decision.

3. The Project Engineer will render a written decision to the Contractor within 60 days from the receipt of the Contractor's submission of all written documentation supporting the claim. If more than one claim has been filed by the Contractor on the Project, the Project Engineer will have the right to consolidate all related claims and issue one decision on all such claims provided that consolidation of claims does not extend the time period within which the Project Engineer is to render a decision. Consolidation of unrelated claims will not be made. If the Project Engineer fails to render a written decision to the Contractor within the specified 60 day time period, or within any extended time period as agreed to by both, the Contractor must either: (1) accept this as a denial of the claim, or (2) appeal the claim to the Region Transportation Director, in the same manner as if the Project Engineer had denied the Contractor's claim, according to subsection 105.17(e).

(e) If the Contractor disagrees with the written decision of the Project Engineer, the Contractor must either: (1) accept the Project Engineer's decision as final, (2) file a one-time written appeal to the Project Engineer with the submission of additional information, or (3) file a written appeal to the Region Transportation Director based upon all information previously submitted and made a part of the claim record. The Contractor's written appeal shall be made within 60 days from the receipt of the Project Engineer's written decision. The Contractor hereby agrees that if a written appeal is not properly filed within this specified 60 day time period, the claim shall be settled in the same manner as if the Contractor had accepted the Project Engineer's written decision as final. Failure by the Contractor to properly file a written appeal, according to these specifications, shall bar the Contractor from any further administrative equitable or legal remedy for said claim under the Contract.

(f) When the Contractor properly files a written appeal to the Project Engineer pursuant to subsection 105.17(e), the Project Engineer will review all new submissions made by the Contractor and render a decision to the Contractor pursuant to subsection 105.17(d). When a written appeal to the Region Transportation Director is properly filed by the Contractor pursuant to subsection 105.17(e), the Project Engineer will provide the complete claim record, as defined by subsection 105.17(d), to the Region Transportation Director. The claim will be reviewed by the Region Transportation Director who will render a written decision to the Contractor to either affirm, overrule, or modify the Project Engineer's decision, in whole or in part, in accordance with the following procedure:

1. For the purpose of this subsection, Region Transportation Director shall be understood to mean the Region Transportation Director or the Region Transportation Director's designated representative.

2. The Region Transportation Director will maintain the claim record during the review of the claim. The Contractor's written appeal to the Region Transportation Director will be made a part of the claim record. Either the Contractor or the Department may request an oral hearing of the claim before the Region Transportation Director. When an oral hearing is requested by either party, both the Project Engineer and the Contractor's representative shall be present and the hearing shall be conducted at a time which is convenient to all parties. The Region Transportation Director will consider all written documents in the claim record and all oral presentations in support of that record made by the Contractor and the Project Engineer. The Region Transportation Director will not consider any written documents or oral arguments, which have not previously been made a part of the claim record, other than clarification and data supporting previously submitted documentation.

3. The Region Transportation Director will render a written decision to the Contractor within 60 days from the receipt of the Contractor's written appeal, unless both parties agree to an extension of time. If the Region Transportation Director fails to render a written decision to the Contractor within the specified 60 day time period, or within any extended time period as agreed by both parties, the Contractor must either: (1) accept this as a denial of the claim, or (2) appeal the claim to the Chief Engineer, in the same manner as if the Region Transportation Director had denied the Contractor's claim, according to subsection 105.17(g).

(g) If the Contractor disagrees with the written decision of the Region Transportation Director, the Contractor must either: (1) accept the Region Transportation Director's decision as final, or (2) file a written appeal to the Chief Engineer within 60 days from the receipt of the Region Transportation Director's written decision. The Contractor hereby agrees that if a written appeal is not properly filed within this specified 60 day time period, the claim shall be settled in the same manner as if the Contractor had agreed with and accepted the Region Transportation Director's written decision as final. Failure by the Contractor to properly file a written appeal according to these specifications shall bar the Contractor from any further administrative, equitable, or legal remedy for said claim under the Contract.

(h) When the Contractor properly files a written appeal to the Chief Engineer pursuant to subsection 105.17(g), the complete claim record as maintained by the Region Transportation Director will be provided to the Chief Engineer. The Chief Engineer will review said claim and will render a written decision to the Contractor to either affirm, overrule, or modify the Region Transportation Director's decision, in whole or in part, in accordance with the following procedure:

1. The Contractor's written appeal to the Chief Engineer will be made a part of the claim record. Either the Contractor or the Chief Engineer may request that arbitration be commenced to review the claim and provide a recommendation to the Chief Engineer. Arbitration will not be convened when the value of the claim is less than $20,000. Arbitration shall be in accordance with subsection 105.17(i).

2. When arbitration is not requested by either the Contractor or the Chief Engineer, the Chief Engineer will render a decision within 60 days after reviewing the information contained in the claim record. The Chief Engineer will not consider any written documents or oral arguments, which have not previously been made available to the Region Transportation Director and properly made a part of the claim record, other than clarification and data supporting previously submitted documentation.

3. When arbitration is requested by either the Contractor or the Chief Engineer, it shall be convened pursuant to subsection 105.17(i). The Chief Engineer will consider the entire administrative claim record, including the arbitrator's written recommendation. The Chief Engineer will not consider any written documents or oral arguments which have not been made available to arbitration and made a part of the claim record. The Chief Engineer will not be bound by the recommendation of the arbitration.

(i) When requested by either the Contractor or the Chief Engineer, pursuant to subsection 105.17(h), arbitration shall consist of independent arbitrators who shall consider the claim in accordance with the following procedures:

1. The Chief Engineer shall contact an independent arbitration organization such as the American Arbitration Association (AAA) which shall appoint arbitrators according to their internal procedures. Arbitrators shall not be employed by, affiliated with, or have consultive or business connection with the claimant Contractor. Arbitrators shall not have assisted either in the evaluation, preparation, or presentation of the claim case either for the Contractor or the Department or have rendered an opinion on the merits of the claim for either party, and shall not do so during the proceedings of arbitration.

   The costs and reasonable expenses of arbitration shall be directly paid by the Department. The Department will subtract one-half of the cost of the arbitration from the Contractor's final payment.

2. Once established, the arbitrators shall serve until the final recommendation is made to the Chief Engineer. The entire claim record will be made available to the arbitrators by the Chief Engineer.

   The independent arbitrators shall administer the process pursuant to the CDOT modified version of AAA's Construction Industry Arbitration Rules, established for its construction claims, except to the extent that such rules conflict with the specifications, in which case the specifications shall control. A

copy of the modified AAA rules is attached. Unless both parties agree otherwise one arbitrator shall be used for claims less than $250,000 and three arbitrators shall be used for claims $250,000 and greater. The arbitrators shall consider the facts of the claim and preside over an informal hearing on the claim. The hearing will be transcribed by a court recorder. Any person who has been licensed to practice law in any of the 50 states may not participate in the claimant Contractor's, or CDOT's, oral claim presentation, question or cross examine witnesses or object to the presentation of any testimony at the arbitration. Either party may have an attorney present at the arbitration hearing to provide advice during the proceedings. Unless both parties agree otherwise all hearings shall be held in Denver.

The arbitrators shall consider all written information available in the claim record and all oral presentations in support of that record by the Contractor and the Department. The arbitrators shall not consider any written documents or oral arguments which have not previously been made a part of the claim record, other than clarification and data supporting previously submitted documentation. The arbitrators shall not consider an increase in the amount of the claim, or any new claims.

3. After complete review of the facts associated with the claim, the arbitrators shall render a written explanation of it's recommendation, based upon it's findings of fact, to the Chief Engineer who will retain authority over disposition of the claim. When three arbitrators are used, and only two arbitrators agree then the recommendation of the two arbitrators and the recommendation of the third arbitrator shall be given to the Chief Engineer. The arbitrator's recommendation shall include: (1) a summary of the issues and factual evidence presented by the Contractor and the Department concerning the claim, (2) recommendations concerning the validity of the claim, (3) recommendations concerning the value of the claim as to cost and time impacts if the claim is determined to be valid, (4) the contractual and factual bases supporting the recommendations made, (5) detailed and supportable calculations which support any recommendation made. The arbitrators shall act only in an advisory capacity to the Chief Engineer, with no direct authority for resolution of the claim. Recommendations which are not supported by either the plans, the specifications or other portions of the Contract will not be considered by the Chief Engineer. The arbitrators shall not consider Contractor's claims for legal or consultant preparation fees or anticipated profit. Recommendations concerning the value of the claim as to cost and time impacts will not be considered by the Chief Engineer if not supported by the required documents from subsection 105.17(d).

4. Upon receipt of the recommendation of the arbitration, the Chief Engineer will render a final decision within 60 days pursuant to subsection 105.17(h).

The decision of the Chief Engineer, or the Chief Engineer's designee, shall constitute the final offer by the Department. The conclusions and recommendations of the arbitration panel and the Chief Engineer shall not be admissible in any court of law. Any offer made by the Contractor or the Department at any stage of the claims process as set forth in this subsection shall be deemed an offer of settlement pursuant Colorado Rule of Civil Procedure 408 and therefore inadmissible in any litigation.

REVISION OF SECTION 105
DISPUTES AND CLAIMS FOR CONTRACT ADJUSTMENTS
CONSTRUCTION INDUSTRY ARBITRATION RULES of the AMERICAN ARBITRATION ASSOCIATION

AS MODIFIED FOR USE WITH CDOT SPECIFICATION SUBSECTION 105.17
April 27, 1997

Regular Track

R-1 Agreement of Parties

The parties shall have been deemed to have made these rules a part of their arbitration agreement whenever they have provided for arbitration by the American Arbitration Association (hereinafter AAA) or under its Construction Industry Arbitration Rules. These rules and any amendment of them shall apply in the form obtaining at the time the demand for arbitration or submission agreement is received by the AAA.

R-2 Name of Tribunal

Any tribunal constituted by the parties for the settlement of their dispute under these rules shall be called the Construction Industry Arbitration Tribunal.

R-3 Administrator and Delegation of Duties

When parties agree to arbitrate under these rules, or when they provide for arbitration by the AAA and an arbitration is initiated under these rules, they thereby authorize the AAA to administer the Arbitration. The authority and duties of the AAA are prescribed in the agreement of the parties and in these rules, and may be carried out through such of the AAA's representatives as it may direct.

R-4 National Roster of Neutrals

In cooperation with the National Construction Dispute Resolution Committee, the AAA shall establish and maintain a National Roster of Construction Neutrals and shall appoint arbitrators as provided in these rules.

R-5 Regional Offices

The AAA may, in its discretion, assign the administration of an arbitration to any of its regional offices.

R-6 Initiation under an Arbitration Provision in a Contract

Arbitration under an arbitration provision in a contract shall be initiated in the following manner:

The initiating party (hereinafter claimant) shall, within the time period specified in the contract(s), give written notice to the other party (hereinafter respondent) of its intention to arbitrate (demand), which notice shall contain a statement setting forth the nature of the dispute, the amount involved, if any, the remedy sought, and the hearing locale requested.

R-9 Preliminary Matters

Administrative Conference
At the request of any party or at the discretion of the AAA, an administrative conference with the AAA and the parties and/or their representatives will be scheduled in appropriate cases to expedite the arbitration proceedings.

Preliminary Hearing
At the request of any party or at the discretion of the arbitrator or the AAA, a preliminary hearing with the parties and/or their representatives and the arbitrator may be scheduled by the arbitrator to specify the issues to be resolved, to stipulate to uncontested facts, to establish a schedule for hearings, and to consider any other matters that will expedite the arbitration proceedings.

With the consent of the parties, the AAA at any stage of the proceeding may arrange a mediation conference under the Construction Industry Mediation Rules. The mediation shall proceed in advance of the arbitration unless the parties agree otherwise. The mediator shall not be an arbitrator appointed to the case, unless otherwise agreed by the parties. Where the parties to a pending arbitration agree to mediate under AAA's rules, no additional administrative fee is required to initiate the mediation.

R-10 Exchange of Information

Consistent with the expedited nature of arbitration, the arbitrator may direct (I) the production of documents and other information, and (ii) the identification of any witnesses to be called. At least two business days prior to the hearing, the parties shall exchange copies of all exhibits they intend to submit at the hearing. The arbitrator is authorized to resolve any disputes concerning the exchange of information.

R-12 Qualification of an Arbitrator

Any arbitrator appointed pursuant to Section R-13, or selected by mutual choice of the parties or their appointees, shall be subject to disqualification for the reasons specified in Section R-19. If the parties specifically so agree in writing the arbitrator shall not be subject to disqualification for those reasons.

The term "arbitrator" in these rules refers to the arbitration Roster of Neutrals, whether composed of one or more arbitrators and whether the arbitrators are neutral or party appointed.

R-13 Appointment from Roster

If the parties have not appointed an arbitrator and have not provided any other method of appointment, the arbitrator shall be appointed in the following manner: immediately after the filing of the submission, the AAA shall send simultaneously to each party to the dispute an identical list of names of persons chosen from the Roster of Neutrals.

Each party to the dispute shall have ten days from the transmittal date in which to strike names objected to, number the remaining names in order of preference, and return the list to the AAA. In a single-arbitrator case, each party may strike three names on a peremptory basis. In a multi-arbitrator case, each party may strike five names on a peremptory basis. If a party does not return the list within the time specified, all persons named therein shall be deemed acceptable. From among the persons who have been approved on both lists, and in accordance with the designated order of mutual preference, the AAA shall invite the acceptance of an arbitrator to serve. If the parties fail to agree on any of the persons named, or if acceptable arbitrators are unable to act, or if for any other reason the appointment cannot be made from the submitted lists, the AAA shall have the power to make the appointment from among other members of the Roster of Neutrals without the submission of additional lists.

R-18 Notice to Arbitrator of Appointment

Notice of the appointment of the arbitrator, whether appointed mutually by the parties, or by the AAA, shall be sent to the arbitrator by the AAA, together with a copy of these rules, and the signed acceptance of the arbitrator shall be filed with the AAA prior to the opening of the first hearing.

R-19 Disclosure and Challenge Procedure

Any person appointed as arbitrator shall disclose to the AAA any circumstance likely to affect impartiality, including any bias or any financial or personal interest in the result of the arbitration or any past or present relationship with the parties or their representatives. Upon receipt of such information from the arbitrator or another source, the AAA shall communicate the information to the parties and, if it deems it appropriate to do so, to the arbitrator and others. Upon objection of a party to the continued service of an arbitrator, the AAA shall determine whether the arbitrator should be disqualified and shall inform the parties of its decision, which shall be conclusive.

R-20 Vacancies

If for any reason an arbitrator is unable to perform the duties of the office, the AAA may, on proof satisfactory to it, declare the office vacant. Vacancies shall be filled in accordance with the applicable provisions of these rules.

In the event of a vacancy in a panel of arbitrators after the hearings have commenced, the remaining arbitrator or arbitrators may continue with the hearing, unless the parties agree otherwise.

R-21 Date, Time, and Place of Hearing

The arbitrator shall set the date, time, and place for each hearing. The AAA shall send a notice of hearing to the parties at least ten days in advance of the hearing date, unless otherwise agreed by the parties.

R-24 Interpreters

Any party wishing an interpreter shall make all arrangements directly with the interpreter and shall assume the costs of the service

R-25 Attendance at Hearings

The arbitrator shall maintain the privacy of the hearings unless the law provides to the contrary. Any person having a direct interest in the arbitration is entitled to attend hearings. The arbitrator shall otherwise have the power to require the exclusion of any witness, other than a party or other essential person, during the testimony of any other witness. It shall be discretionary with the arbitrator to determine the propriety of the attendance of any other person.

R-26 Postponements

The arbitrator for good cause shown may postpone any hearing upon the request of a party or upon the agreements of all parties, or upon the arbitrator's own initiative.

R-27 Oaths

Before proceeding with the first hearing, each arbitrator may take an oath of office and, if required by law, shall do so. The arbitrator may require witnesses to testify under oath administered by any duly qualified person and, if it is required by law or requested by any party, shall do so.

R-28 Majority Decision

All decisions of the arbitrators must be by a majority. The recommendation must be made by a majority unless the concurrence of all is expressly required by the arbitration agreement or by law.

R-29 Order of Proceedings and Communications with Arbitrator

A hearing shall be opened by the filing of the oath of the arbitrator.

The Claimant shall first present evidence to support its claim. The Respondent party shall then present evidence supporting its defense. Witnesses shall submit to questions or other examination. The arbitrator has the discretion to vary this procedure and shall afford a full and equal opportunity to all parties to be heard. Exhibits, when offered by either party, may be received in evidence by the arbitrator.

The arbitrator shall control the proceedings with a view to expediting the resolution of the dispute. In order to expedite the proceedings the arbitrator may control the order of proof, bifurcate proceedings, exclude cumulative or irrelevant testimony or evidence, and direct the parties to focus the presentation of evidence on decisive issues. The arbitrator shall entertain motions, including motions that dispose of all or part of a claim, or that may expedite the proceedings.

There shall be no direct communication between the parties and an arbitrator other than at the hearing, unless the parties and the arbitrator agree otherwise. Any other oral or written communication from the parties to the arbitrator shall be directed to the AAA for transmittal to the arbitrator.

R-30 Arbitration in the Absence of a Party or Representative

Unless the law provides to the contrary, the arbitration may proceed in the absence of any party or representative who, after due notice, fails to be present or fails to obtain a postponement. A recommendation shall not be made solely on the default of a party. The arbitrator shall require the party who is present to submit such evidence as the arbitrator may require for the making of a recommendation.

R-31 Evidence and Claim Record

CDOT will provide one copy of the claim record for each arbitrator and one copy for the AAA administrative staff.

The parties may offer such evidence as is relevant and material to the dispute and shall produce such evidence as the arbitrator may deem necessary to an understanding of the dispute and recommendation.

The arbitrator shall be the judge of the relevance and materiality of the evidence offered, and conformity to legal rules of evidence shall no. be necessary. The arbitrator may request offers of proof, and may reject evidence deemed by the arbitrator to be cumulative, unreliable, unnecessary, or of slight value compared to the time and expense involved. All evidence shall be taken in the presence of all of the arbitrators and all of the parties, except where:

1) any of the parties is absent, in default, or has waived the right to be present, or

2) the parties and the arbitrators agree otherwise

R-32 Evidence by Affidavit

The arbitrator may receive and consider the evidence of witnesses by affidavit, but shall give it only such weight as the arbitrator deems it is entitled to after consideration of any objection made to its admission.

R-33 Inspection or Investigation

An arbitrator finding it necessary to make an inspection or investigation in connection with the arbitration shall advise the parties by notice transmitted at the hearing or through the AAA of the date and time. Any party who so desires may be present at such an inspection or investigation.

R-35 Closing of a Hearing

When satisfied that the presentation of the parties is complete, the arbitrator shall declare the hearing closed.

R-37 Waiver of Oral Hearing

The parties may provide, by written agreement, for the waiver of oral hearings. If the parties agree to waive oral hearings after the appointment of the arbitrator, the consent of the arbitrator must be obtained.

R-38 Waiver of Rules

Any party who proceeds with the arbitration after knowledge that any provision or requirement of these rules has not been complied with and who fails to state an objection in writing shall be deemed to have waived the right to object.

R-39 Extensions of Time

The parties may modify any period of time by mutual agreement. The AAA or the arbitrator may, for good cause, extend any period of time established by these rules, except the time for making the recommendation. The AAA shall notify the parties of any extension.

R-41 Time of Recommendation

The recommendation shall be made promptly by the arbitrator and, unless otherwise agreed by the parties or specified by law, no later than 30 days from the date of closing the hearing, or, if oral hearings have been waived, from the date of the AAA's transmittal of the final statements and proofs to the arbitrator.

R-42 Form of Recommendation

The recommendation shall be in writing and shall be signed by a majority of the arbitrators. The arbitrators shall provide a concise, written breakdown and explanation of the recommendation. If the arbitrators do not agree, the dissenting arbitrator shall also submit a written recommendation.

R-44 Modification of Recommendation

Within twenty (20) days after the transmittal of a recommendation, any party, upon notice to the other parties, may request the arbitrator to correct any clerical, typographical, technical or computational errors in the recommendation. The arbitrator is not empowered to re-determine the merits of any claim already decided.

The other parties shall be given ten (10) days to respond to the request. The arbitrator shall dispose of the request within twenty (20) days after transmittal by the AAA to the arbitrator of the request and any response thereto.

If applicable law provides a different procedural time frame, that procedure shall be followed.

R-46 Delivery of Recommendation to Parties

Parties shall accept as legal delivery of the recommendation the placing of the recommendation or a true copy thereof in the mail addressed to a party or its representative at the last known address, personal service of the recommendation, or filing of the recommendation in any other manner that is permitted by law.

R-47 Release of Documents for Judicial Proceedings

The AAA shall, upon written request of a party, furnish to the party, at its expense, certified copies of any papers in the AAA's possession that may be required in judicial proceedings related to the arbitration.

R-48 Applications to Court and Exclusion of Liability

(a) No judicial proceeding by a party relating to the subject matter of the arbitration shall be deemed a waiver of the party's right to arbitrate.

(b) Neither the AAA nor any arbitrator in a proceeding under these rules is a necessary party in judicial proceedings relating to the arbitration.

(c) Neither the AAA nor any arbitrator shall be liable to any party for any act or omission in connection with any arbitration conducted under these rules.

R-49 Administrative Fees

As a not-for-profit organization, the AAA shall prescribe filing and other administrative fees and service charges to compensate it for the cost of providing administrative services. The fees in effect when the fee or charge is incurred shall be applicable.

R-50 Expenses

The expenses of witnesses for either side shall be paid by the party producing such witnesses. All other expenses of the arbitration, including required travel and other expenses of the arbitrator, AAA representatives, and any witness and the cost of any proof produced at the direct request of the arbitrator, shall be borne equally by the parties, unless they agree otherwise.

R-51 Neutral Arbitrator's Compensation

Arbitrators shall charge a rate consistent with the arbitrator's stated rate of compensation, beginning with the first day of hearing.

If there is a disagreement concerning the terms of compensation, an appropriate rate will be established with the arbitrator by the Association and confirmed to the parties.

Any arrangement for the compensation of a arbitrator shall be made through the AAA and not directly between the parties and the arbitrator.

R-52 Deposits

The AAA may require the parties to deposit in advance of any hearings such sums of money as it deems necessary to cover the expense of the arbitration, including the arbitrator's fee, if any, and shall render an accounting to the parties and return any unexpected balance at the conclusion of the case.

R-53 Interpretation and Application of Rules

The arbitrator shall interpret and apply these rules insofar as they relate to the arbitrator's powers and duties. When there is more than one arbitrator and a difference arises among them concerning the meaning or application of these rules, it shall be decided by a majority vote. If that is not possible, either an arbitrator or a party may refer the question to the AAA for final decision. All other rules shall be interpreted and applied by AAA.

Administrative Fee Schedule

The administrative fees of the AAA are based on the amount of the claim. Arbitrator compensation is not included in this schedule.

Filing Fee

A nonrefundable filing fee is payable in full when a claim is filed. The fee will be paid by CDOT and one half will be charged to the contractor by them. The filing fee rate schedule is as follows:

Amount of Claim	Filing Fee	Hearing Fee	Postponement Fee
$20,000 to $50,000	$750	$150	$150
Above $50,000 to $100,000	$1,250	$150	$150
Above $100,000 to $250,000	$2,000	$150	$150
Above $250,000 to $500,000	$3,500	$250	$250
Above $500,000 to $1,000,000	$5,000	$250	$250
Above $1,000,000 to $5,000,000	$7,000	$250	$250

As indicated above, when no amount can be stated at the time of filing, the minimum filing fee is $2,000, subject to change when the claim is disclosed.

For any case having three or more arbitrator's, the minimum filing fee is $2,000, the hearing fee is $250 per party, and postponement fee is $250.

The administrative fee for claims in excess of $5,000,000 will be negotiated.

When a claim is not for a monetary amount, an appropriate filing fee will be determined by the AAA.

Postponement/Cancellation Fees

The postponement fees indicated above are payable by the party causing a postponement or cancellation of any schedule hearing.

Hearing Room Rental

The Hearing Fees described above do not cover the rental of hearing rooms, which are available on a rental basis. Check with the administrator for availability and rates.

July 21, 1999

REVISION OF SECTION 105
VIOLATION OF WORKING TIME LIMITATION

Section 105 of the Standard Specifications is hereby revised for this project as follows:

Subsection 105.03 shall include the following:

If there is a violation of the working time limitations for traffic control as set forth in the special provisions, a written notice to stop work will be imposed on the Contractor at the start of the next working day. Work shall not resume until the Contractor assures the Engineer, in writing, that there will not be a reoccurrence of the working time violation. If more violations take place, the Engineer will notify the Contractor in writing that there will be a price reduction charge for each incident in accordance with this specification. This incident price reduction charge will be deducted from any money due the Contractor. This price reduction will not be considered a penalty but will be a price reduction for failure to perform traffic control in compliance with the Contract.

An incident is any violation up to 30 minutes in duration. Each 30 minutes or increment thereof will be considered as an incident. A price reduction will be assessed for each successive or cumulative 30 minute period in violation of the working time limitations, as determined by the Engineer. The price reduction for each incident will increase at a progressive rate starting with $150 for the second incident and increasing to $1200 for the fifth and subsequent incidents in accordance with the following schedule. A 15 minute grace period will be allowed at the beginning of the second incident on the project before the price reduction is applied. This 15 minute grace period applies only to the second incident.

The number of incident charges will be accumulative throughout the duration of the Contract.

PRICE REDUCTION SCHEDULE

INCIDENT	INCIDENT RATE	TOTAL PRICE REDUCTION
1st	Notice to Stop Work	---
2nd	$150	$150
3rd	300	450
4th	600	1,050
5th	1,200	2,250
6th	1,200	3,450
Etc.	1,200	4,650
	Etc.	Etc.

July 21, 1999

REVISION OF SECTION 108
PROJECT SCHEDULE

Section 108 of the Standard Specifications is hereby revised for this project as follows:

In subsection 108.03, third paragraph, delete the first sentence and replace with the following:

The Bar Chart or Initial Schedule shall be submitted at least 10 working days prior to the start of the work.

In subsection 108.03(c), after the fourth paragraph, delete items (1), (2), and (3) and replace with the following:

(1) Initial Schedule. The Initial Schedule shall include all necessary detail for procurement, construction and submittal activities required during the first 90 days of contract time. In addition, the Initial Schedule shall include a very basic group of activities that describes the time period after the 90th day of contract time and through the completion of the project. Only salient features and other significant activities will be required for the period after the first 90 days of contract time. This submittal shall include a Time Scaled Logic Diagram.

(2) Project Schedule. The Project Schedule submittal shall consist of a Time Scaled Logic Diagram and Schedule Report. It shall be prepared in full and submitted to the Engineer within 45 calendar days after the Engineer's acceptance of the Initial Schedule. The Engineer's review of the Project Schedule will not exceed 7 calendar days. Revisions required as a result of the Engineer's review shall be submitted within 7 calendar days. Work shall not continue beyond 90 calendar days after the Engineer's acceptance of the Initial Schedule until the Project Schedule is accepted in writing, unless otherwise approved by the Engineer.

The Project Schedule shall cover the time from the Date of Notice to Proceed to the predicted completion date.

The Schedule Report shall tabulate for each activity the activity ID, description, duration, earliest start and finish date, latest start and finish date, total float time, and responsibility.

(3) Schedule Updates. The Contractor shall update the Initial Schedule or the Project Schedule monthly to reflect actual construction progress of all work activities on the project. Updates shall show the previous month's progress and a projection for all remaining work activities on the project.

Schedules shall be updated as of the cutoff date for the monthly progress pay estimate and submitted to the Engineer before the payment of the progress pay estimate is approved.

Each of the diagrams, charts, and reports shall comply with the requirements for the Project Schedule above, except that they shall also include the actual completion dates and percentages of completion for the appropriate activities.

A Job Progress Narrative Report shall be submitted with all updates. It shall detail the description of job progress, problem areas, current and anticipated delaying factors and their anticipated effects, impacts to job milestones or project completion, any corrective action proposed or taken, and any minor revisions to the Schedule.

July 21, 1999

REVISION OF SECTION 109
MEASUREMENT OF QUANTITIES

Section 109 of the Standard specifications is hereby revised for this project as follows:

In subsection 109.01, following paragraph 15, add the following:

The Engineer will randomly verify the accuracy of the certified weigher on every project where the weights are manually entered on the scale ticket. This verification will consist of at least one comparison check on the project. Additional verification checks may be required as determined by the Engineer. The Engineer will randomly select a loaded truck after the truck has been issued a scale ticket by the certified weigher. The loaded truck will then be reweighed, in the presence of the Engineer, on the same scale and the weight compared with the weight on the scale ticket. Reweighed loads shall be within the tolerance of 100 (kg 200 pounds) plus or minus.

The Engineer will also verify the accuracy of computerized scales. Computerized scales are scales that automatically print weights on the scale ticket. This verification will consist of at least one comparison check when the project requires more than 2500 metric tons (2500 tons) of material to be weighed. This comparison check shall be made by reweighing a loaded vehicle. The Contractor shall either provide a second certified scale or select a second certified scale in the vicinity to be used for the comparison check. Comparison checks shall be performed using the following procedures:

(1) Hopper Scale. A loaded truck will be randomly selected by the Engineer. The loaded truck shall be weighed on a certified platform scale to record the gross weight. The truck shall be unloaded and weighed again on the same scale to record the tare weight. The tare weight shall be subtracted from the gross weight and compared against the net weight recorded on the scale ticket.

(2) Platform Scales. A loaded truck will be randomly selected by the Engineer. The loaded truck shall be reweighed on a second certified scale and the gross weight shall be compared against the gross weight on the first scale ticket.

Should a comparison check reveal a weight difference of more than one percent, a second comparison check shall be performed immediately. If the weight differences of both comparison checks exceed the one percent limit, the Contractor shall immediately stop weighing and the scale shall be recertified and resealed at the Contractor's expense. The necessary adjustments as indicated by the recertification will be made to all scale tickets issued since the last certification or on the entire project, whichever occurred later, unless the Contractor demonstrates to the satisfaction of the Engineer that the defect in the scale was present for a lesser period of time.

If it is necessary to recertify a scale, and more than 2500 metric tons (2500 tons) of material remain to be weighed, another scale comparison check shall be made.

All comparison checks shall be made at the Contractor's expense.

AFFIRMATIVE ACTION REQUIREMENTS
EQUAL EMPLOYMENT OPPORTUNITY

A. AFFIRMATIVE ACTION REQUIREMENTS

Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246)

1. The Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area are as follows:

Goals and Timetable for Minority Utilization

Timetable - Until Further Notice			
Economic Area	**Standard Metropolitan Statistical Area (SMSA)**	**Counties Involved**	**Goal**
157 (Denver)	2080 Denver-Boulder	Adams, Arapahoe, Boulder, Denver, Douglas, Gilpin, Jefferson.....	13.8%
	2670 Fort Collins	Larimer.....	6.9%
	3060 Greeley	Weld.....	13.1%
	Non SMSA Counties	Cheyenne, Clear Creek, Elbert, Grand, Kit Carson, Logan, Morgan, Park, Phillips, Sedgwick, Summit, Washington & Yuma.....	12.8%
158 (Colo. Spgs. - Pueblo)	1720 Colorado Springs	El Paso, Teller.....	10.9%
	6560 Pueblo	Pueblo.....	27.5%
	Non SMSA Counties	Alamosa, Baca, Bent, Chaffee, Conejos, Costilla, Crowley, Custer, Fremont, Huerfano, Kiowa, Lake, Las Animas, Lincoln, Mineral, Otero, Prowers, Rio Grande, Saguache.....	19.0%
159 (Grand Junction)	Non SMSA	Archuleta, Delta, Dolores, Eagle, Garfield, Gunnison, Hinsdale, La Plata, Mesa, Moffat, Montezuma, Montrose, Ouray, Pitkin, Rio Blanco, Routt, San Juan, San Miguel	10.2%
156 (Cheyenne - Casper WY)	Non SMSA	Jackson County, Colorado.....	7.5%
GOALS AND TIMETABLES FOR FEMALE UTILIZATION			
Until Further Notice.....			6.9% -- Statewide

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These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and non-federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts meet the goals established for the geographical area where the contract resulting form this solicitation is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Par 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.

4. As used in this specification, and in the contract resulting from this solicitation, the "covered area" is the county or counties shown on the Invitation for Bids and on the plans. In cases where the work is in two or more counties covered by differing percentage goals, the highest percentage will govern.

AFFIRMATIVE ACTION REQUIREMENTS
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B. STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS

Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246)

1. As used in these Specifications:

   a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;

   b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;

   c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.

   d. "Minority" includes;

      (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
      (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
      (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
      (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractor toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered Construction contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any office of Federal Contract Compliance Programs Office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

AFFIRMATIVE ACTION REQUIREMENTS
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5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following;

   a. Ensure and maintain a working environment free of harassment, intimidation , and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

   b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its union have employment opportunities available, and maintain a record of the organization's responses.

   c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source of community organization and of what action was taken with respect to each individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.

   d. Provide immediate written notification to the Director when the union with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when he Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

   e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

   f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc., by specific review of the policy with all management personnel and with all minority and female employees at least once a year, and by posting the Contractor's EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

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g. Review, at least annually, the Contractor's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with onsite supervisory personnel such as Superintendents, General Foreman, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's workforce.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc. such opportunities.

m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and Contractor's activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligation.

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8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union contractor-community, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goal and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even thought the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13 The Contractor in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form, however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

AFFIRMATIVE ACTION REQUIREMENTS
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C. SPECIFIC EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES.

1. *General.*

   a. Equal employment opportunity requirements not to discriminate and to take affirmative action to assure equal employment opportunity as required by Executive Order 11246 and Executive Order 11375 are set forth in Required Contract. Provisions (Form FHWA 1273 or 1316, as appropriate) and these Special Provisions which are imposed pursuant to Section 140 of Title 23, U.S.C., as established by Section 22 of the Federal-Aid highway Act of 1968. The requirements set forth in these Special Provisions shall constitute the specific affirmative action requirements for project activities under this contract and supplement the equal employment opportunity requirements set forth in the Required Contract provisions.

   b. The Contractor will work with the State highway agencies and the Federal Government in carrying out equal employment opportunity obligations and in their review of his/her activities under the contract.

   c. The Contractor and all his/her subcontractors holding subcontracts not including material suppliers, of $10,000 or more, will comply with the following minimum specific requirement activities of equal employment opportunity: (The equal employment opportunity requirements of Executive Order 11246, as set forth in Volume 6, Chapter 4, Section 1, Subsection 1 of the Federal-Aid Highway Program Manual, are applicable to material suppliers as well as contractors and subcontractors.) The Contractor will include these requirements in every subcontract of $10,000 or more with such modification of language as is necessary to make them binding on the subcontractor.

2. *Equal Employment Opportunity Policy.* The Contractor will accept as his operating policy the following statement which is designed to further the provision of equal employment opportunity to all persons without regard to their race, color, religion, sex, or national origin, and to promote the full realization of equal employment opportunity through a positive continuing program;

   It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, or national origin. Such action shall include; employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, preapprenticeship, and/or on-the-job training.

3. *Equal Employment Opportunity Officer.* The Contractor will designate and make known to the State highway agency contracting officers and equal employment opportunity officer (herein after referred to as the EEO Officer) who will have the responsibility for an must be capable of effectively administering and promoting an active contractor program of equal employment opportunity and who must be assigned adequate authority and responsibility to do so.

4. *Dissemination of Policy.*

   a. All members of the Contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the Contractor's equal employment opportunity policy and contractual responsibilities to provide equal employment opportunity in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum;

      (1) Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the Contractor's equal employment opportunity policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer or other knowledgeable company official.

(2) All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer or other knowledgeable company official, covering all major aspects of the Contractor's equal employment opportunity obligations within thirty days following their reporting for duty with the Contractor.

(3) All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer or appropriate company official in the Contractor's procedures for locating and hiring minority group employees.

b. In order to make the Contractor's equal employment opportunity policy known to all employees, prospective employees and potential sources of employees, i.e., schools, employment agencies, labor unions (where appropriate), college placement officers, etc., the Contractor will take the following actions:

(1) Notices and posters setting forth the Contractor's equal employment opportunity policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

(2) The Contractor's equal employment opportunity policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

5. *Recruitment.*

a. When advertising for employees, the Contractor will include in all advertisements for employees the notation; "An Equal Opportunity Employer." All such advertisements will be published in newspapers or other publications having a large circulation among minority groups in the area from which the project work force would normally be derived.

b. The Contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants, including, but not limited to, State employment agencies, schools, colleges and minority group organizations. To meet this requirement, the Contractor will, through his EEO Officer, identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to the Contractor for employment consideration.

In the event the Contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the Contractor's compliance with equal employment opportunity contract provisions. (The U.S. Department of Labor has held that where implementation of such agreements have the effect of discriminating against minorities or women, or obligates the Contractor to do the same, such implementation violates Executive Order 11246, as amended.)

c. The Contractor will encourage his present employees to refer minority group applicants for employment by posting appropriate notices or bulletins in areas accessible to all such employees. In addition, information and procedures with regard to referring minority group applicants will be discussed with employees.

6. *Personnel Actions.* Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, or national origin. The following procedures shall be followed;

a. The Contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The Contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The Contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the Contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The Contract will promptly investigate all complaints of alleged discrimination made to the Contractor in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the Contractor will inform every complainant of all of his avenues of appeal.

7. *Training and Promotion.*

a. The Contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.

b. Consistent with the Contractor's work force requirements and as permissible under Federal and State regulations, the Contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

c. The Contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The Contractor will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.

8. *Unions.* If the Contractor relies in whole or in part upon unions as a source of employees, the Contractor will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women with the unions, and to effect referrals by such unions of minority and female employees. Actions by the Contractor either directly or thorough a contractor's association acting as agent will include the procedures set forth below:

a. The Contractor will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.

b. The Contractor will use best efforts to incorporate an equal employment opportunity clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, or national origin.

c. The Contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the Contractor, the Contractor shall so certify to the State highway department and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the Contractor with a reasonable flow of minority and women referrals within he time limit set forth in the collective bargaining agreement, the Contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion , sex or national origin; making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The U.S. Department of Labor has held that it shall be no excuse that the union with which the Contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) In the event the union referral practice prevents the Contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such Contractor shall immediately notify the State highway agency.

9. *Subcontracting.*

a. The Contractor will use his best efforts to solicit bids from and to utilize minority group subcontractors or subcontractors with meaningful minority group and female representation among their employees. Contractors shall obtain lists of minority-owned construction firms from State highway agency personnel.

b. The Contractor will use his best efforts to ensure subcontractor compliance with their equal employment opportunity obligations.

10. *Records and Reports.*

a. The Contractor will keep such records as are necessary to determine compliance with the Contractor's equal employment opportunity obligations. The records kept by the Contractor will be designed to indicate:

(1) The number of minority and nonminority group members and women employed in each work classification on the project.

(2) The Progress and efforts being made in cooperation with unions to increase employment opportunities for minorities and women (applicable only to contractors who rely in whole or in part on unions as a source of their work force).

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees, and

(4) The progress and efforts being made in securing the services of minority group subcontractors or subcontractors with meaningful minority and female representation among their employees.

b. All such records must be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the State highway agency and the Federal Highway Administration.

c. The Contractors will submit an annual report to the State highway agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form PR 1391.

DISADVANTAGED BUSINESS ENTERPRISE DEFINITIONS AND REQUIREMENTS

(a) Definitions and Procedures

For this project, the following terms are defined:

1. Disadvantaged Business Enterprise (DBE). A small business concern that is certified as being:

   A. At least 51 percent owned by one or more socially and economically disadvantaged individuals or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more socially and economically disadvantaged individuals; and

   B. Whose management and daily business operations are controlled by one or more of the socially and economically disadvantaged individuals who own it.

   C. "Socially and Economically Disadvantaged individuals" means those individuals who are citizens or lawfully admitted permanent residents of the United States and who are:

      (1) Minorities or individuals found by the Small Business Administration pursuant to Section 8(a) of the Small Business Act to be disadvantaged.
      (2) Individuals found by the Office of Certification at the Department of Regulatory Agencies to be socially and economically disadvantaged.

2. DBE Joint Venture. An association of two or more businesses formed to carry out a single business enterprise for profit for which purposes they combine their property, capital, efforts, skills and knowledge. DBE joint ventures must be certified as a joint venture.

   A. For those projects set-aside for bidding by DBEs only; all of the partners in a joint venture must be DBEs and certification of the joint venture will not be required.

   B. For all projects other than the set-aside projects discussed in A. above; one of the partners in a joint venture must be a DBE. The DBE percentage of the joint venture will be determined at the time of certification.

3. Underutilized DBE. A firm which meets the definition of DBE above and is eligible to meet the contract goal as defined in the project special provision titled "Contract Goal."

4. Contract Goal. The goal for underutilized DBE participation that the Department determines should appropriately be met by the successful bidder. Contract goal will be the percentage stated in the invitation for bids and in the project special provisions. Successful bidders that are awarded a Contract based on good faith efforts shall make good faith efforts through the period of time that work on the project is in process, to provide for additional underutilized DBE participation toward meeting the goal.

5. Good Faith Efforts. To demonstrate good faith efforts to meet the Contract goal, prior to award of Contract, the apparent low bidder shall document the good faith efforts to the Department, by submitting a fully executed CDOT Form No. 718 no later than 4:00 p.m. on the day after the date of bid opening to the Business Programs Office in the Center for Equal Opportunity. CDOT Form NO. 718 may be submitted by FAX, at Fax number (303)757-9019, with an original copy to follow. A copy of CDOT Form No. 718 is incorporated into this specification. The Contractor shall report all efforts made including but not limited to the efforts listed on CDOT Form No. 718.

   The good faith efforts documentation submitted by the apparent low bidder will be analyzed and confirmed by one of the Equal Employment Opportunity Representatives (EEO Reps) in the Business Programs Office in the Center for Equal Opportunity, who will contact the apparent low bidder and discuss any apparent deficiencies in the good faith efforts.

The Contractor will be allowed 7 calendar days after date of contact and discussion to submit to the EEO Rep any additional efforts to meet the DBE contract goal and correct any deficiencies.

The EEO Rep will present the analysis of the Contractor's good faith efforts to the Good Faith Efforts (GFE) Review Committee. A second, impartial EEO Rep will be a voting member of the GFE Review Committee to bring an objective viewpoint to the committee.

The GFE Review Committee will make a recommendation to the Chief Engineer.

The Chief Engineer will review the good faith efforts documentation and the recommendation of the GFE Review Committee and determine whether the required efforts are sufficient for award.

There will be no administrative appeal of the Chief Engineer's decision.

If award of the Contract is made based on the Contractor's good faith efforts, the goal will not be waived. The Contractor will be expected to continue to make good faith efforts as described below throughout the duration of the Contract.

To demonstrate Good Faith Efforts to meet the Contract goal throughout the performance of the Contract, the Contractor shall document to the Department the steps taken including, but not limited to the following:

A. Seek out and consider underutilized DBEs as potential subcontractors.
   (1) Contact two or more DBEs for each category of work that is being subcontracted.
   (2) Affirmatively solicit their interest, capability, and price quotations.
   (3) Provide equal time for all prospective subcontractors to prepare their proposals.
   (4) Provide at least as much time to DBEs in assisting them to prepare their bids for subcontract work as to non DBE subcontractors.
   (5) Award subcontracts to DBEs where DBE quotations are reasonably competitive with other quotations received.

B. Maintain documentation of underutilized DBEs contacted and their responses.
   (1) Maintain a list of DBEs contacted as prospective subcontractors.
   (2) Maintain thorough documentation of criteria used to select each subcontractor.
   (3) Where a DBE expressed an interest in a subcontract and made a quotation, and where the work was not awarded to a DBE, furnish a detailed letter explaining the reasons.

(b) Certification as a DBE by the Department

1. Any contractor may apply to the Department of Regulatory Agencies (DORA) for status as a DBE. Application shall be made on forms provided by the DORA for certification of DBEs. Application need not be made in connection with a particular bid. Only work contracted to underutilized DBE contractors or subcontracted to underutilized DBEs and independently performed by underutilized DBEs shall be considered toward contract goals as established elsewhere in these specifications.

2. It shall be the Contractor's responsibility to submit applications so that the DORA has sufficient time to render decisions. The DORA will review applications in a timely manner but is not committed to render decisions about a firm's DBE status within any given period of time.

3. The Department will prepare, publish or make available from time to time a list of DBE contractors, vendors and suppliers for the purpose of providing a reference source to assist any bidder in identifying DBEs and underutilized DBEs. Bidders will be solely responsible for verifying the Certification of DBEs they intend to use prior to submitting a proposal. The Business Programs Office in the Center for Equal Opportunity will maintain a current list of eligible DBEs and underutilized DBEs.

4. Bidders shall exercise their own judgments in selecting any subcontractor to perform any portion of the work.

5. Permission for a DBE/non-DBE joint venture to bid on a specific project may be obtained form the Department based on information provided by the proposed joint venture on CDOT Form No. 893, "Information For Determining Joint Venture Eligibility". Joint applications should be submitted well in advance of bid openings.

(c) Bidding Requirements

1. All bidders shall submit with their proposals a fully executed CDOT Form No. 714 including a list of the names of their DBE subcontractors to meet the contract goal. The apparent low bidder shall submit a fully executed CDOT Form No. 715 for each underutilized DBE used to meet the contract goal (sample attached) no later than 4:00 p.m. on the day after the date of bid opening to the Business Programs Office in the Center for Equal Opportunity. In addition, the apparent low bidder shall submit a fully executed CDOT Form No. 1629 identifying use of all DBEs to meet the Department's overall 10% annual DBE goal. CDOT Form No. 715 & 1629 may be submitted by FAX, at Fax number (303)757-9019, with an original copy to follow.

2. The award of Contract, if awarded, will be made to the lowest responsible bidder that will meet or exceed the contract goal or, if the goal will not be met, is able to demonstrate that good faith efforts were made to meet the goal. Good faith efforts are explained in (a)4 of this special provision.

3. The use of the DBE firms named on CDOT Form No. 714 or on a CDOT Form No. 715, for the items of work described, is a condition of award. The replacement of a named DBE firm will be allowed only as provided for in (e) of this special provision. Failure to comply will constitute grounds for default and termination of the Contract.

4. Contractor's DBE Obligation. The prime Contractor bidding on construction projects advertised by the Department agrees to ensure that Disadvantaged Business Enterprises (DBEs), as defined in this special provision, have the maximum opportunity to participate in the performance of contracts or subcontracts financed in whole or in part with Federal or State funds. The prime Contractor shall not discriminate on the basis of race, color, national origin, or sex in the bidding process or the performance of contracts.

   To ensure that DBEs are offered maximum opportunity to participate in the performance of contracts, it is the responsibility of the prime Contractor to offer and to provide assistance to DBEs related to the DBE performance of the subcontract. However, the DBE must independently perform a commercially useful function on the project.

(d) Counting DBE Participation Toward Goals

1, Once a firm has been certified as a DBE the total dollar amount of the contract awarded to the firm shall be counted toward the contract goal as explained below, and as modified for the project in the project special provisions titled "Contract Goal."

2. The actual dollar total of a proposed subcontract, supply or service contract with any DBE firm shall be reported to the Department using CDOT Form No. 713. A CDOT Form No. 713 for subcontracts is to be submitted with the CDOT Form No. 205 and receipt will be a condition of approval. A CDOT Form No. 713 for a supply or service contract is to be submitted once a contract has been fully executed so the Department will be able to report the DBE participation in a timely manner. The eligibility of a proposed DBE subcontractor will be finally established based on the firm's status at the time of CDOT Form No. 205 approval. The eligibility of a DBE supplier or service firm will be finally established as of the date the CDOT Form No. 713 is received by the Department. If a firm becomes certified as a DBE during performance under a fully executed contract with CDOT but prior to the DBE performing any work, then 100% of the work performed by the firm under that contract may be claimed as eligible work. No work performed by a DBE firm can be counted toward DBE participation prior to CDOT approval on CDOT Form No. 205.

3. The Contractor may count toward its contract goal the percentage of the total dollar amount of a contract with a Department certified joint venture that equals the percentage of the ownership and control of the underutilized DBE partner in a joint venture.

4. A. The Contractor may count toward its contract goal only that percentage of expenditures to underutilized DBEs which independently perform a commercially useful function in the work of a contract. A DBE is considered to be performing a commercially useful function by actually performing, managing, and supervising the work involved. To determine whether a DBE is performing a commercially useful function, the Department will evaluate the amount of work subcontracted, work performed solely by the DBE, industry practices, and other relevant factors.

B. A DBE may enter into subcontracts consistent with normal industry practices. If a DBE contractor subcontracts over 51% of the work of the Contract the DBE shall be presumed not to be performing a commercially useful function. The DBE may present evidence to rebut this presumption to the Department.

5. The Contractor may count toward its contract goal the percentage of expenditures for materials and supplies obtained from underutilized DBE suppliers (regular dealers) and manufacturers, provided that the DBEs assume the actual and contractual responsibility for and actually provide the materials and supplies.

A. The Contractor may count 100 percent of its expenditures to an underutilized DBE manufacturer. A DBE manufacturer is a certified firm that operates or maintains a factory or establishment that produces on the premises the materials or supplies obtained by the Contractor.

B. The Contractor may count 60 percent of its expenditures to underutilized DBE suppliers that are not manufacturers, provided that the DBE supplier performs a commercially useful function in the supply process. A supplier is a certified firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials or supplies required for the performance of the Contract are bought, kept in stock, and regularly sold to the public in the usual course of business. To be a supplier the firm must engage in, as its principal business and in its own name, the purchase and sale of the products in question. A supplier in such bulk items as steel, cement, gravel, stone, and petroleum products need not keep such products in stock, if it owns or operates distribution equipment. Brokers and packagers shall not be regarded as manufacturers or suppliers within the meaning of this section.

C. The Contractor may count toward its DBE goal the following expenditures to underutilized DBE firms that are not manufacturers or suppliers:

(1) The fees or commissions charged for providing a bona fide service, such as professional, technical, consultant or managerial services and assistance in the procurement of essential personnel, facilities, equipment, materials or supplies required for performance of the Contract, provided that the fee or commission is determined by the Department to be reasonable and not excessive as compared with fees customarily allowed for similar services.

(2) The fees charged for delivery of materials and supplies required to a job site (but not the cost of the materials and supplies themselves) when the hauler, trucker, or delivery service is not also the manufacturer of or a supplier of the materials and supplies, provided that the fee is determined by the Department to be reasonable and not excessive as compared with fees customarily allowed for similar services.

(3) The fees or commissions charged for providing any bonds or insurance specifically required for the performance of the Contract, provided that the fee or commission is determined by the Department to be reasonable and not excessive as compared with fees customarily allowed for similar services.

6. To determine the goals achieved under this Contract the DBE participation as described in (d) of this special provision shall be divided by the original prime Contract amount and multiplied by 100 to determine the percentage of performance. The Contractor shall maintain records of payment that show amounts paid to all DBEs. Upon completion of the project, the Contractor shall submit a CDOT Form No. 17 listing all DBEs that participated in this Contract, the subcontract tier number of each, and the dollar amount paid to each. This dollar amount shall include payments made by non DBE subcontractors to DBE subcontractors. The Contractor shall certify the amount paid which may be audited by the Department. When there is no participation by DBEs, the Contractor shall submit a CDOT Form NO. 17 that indicates no participation and gives reasons why there was no participation.

(e) Replacement of underutilized DBE Subcontractors used to meet the contract goal

Based upon a showing of good cause the Contractor may request that a DBE named on CDOT Form No. 714 or on a CDOT Form No. 715 be replaced with another underutilized DBE pursuant to the terms and conditions of this special provision. Replacements will be allowed only with prior written approval of the Department.

1. If a replacement is to be requested prior to the time that the named DBE has begun to effectively prosecute the work under a fully executed subcontract, the Contractor shall furnish to the Department the following:

   A. Written permission of the named DBE. Written permission may be waived only if such permission cannot be obtained for reasons beyond the control of the Contractor.

   B. A full written disclosure of the circumstances making it impossible for the Contractor to comply with the condition of award.

   C. Documentation of the Contractor's assistance to the DBE named on CDOT Form No. 714 or on CDOT Form No. 715.

   D. Copies of any pertinent correspondence and documented verbal communications between the Contractor and the named DBE.

   E. Documentation of the Good Faith Efforts in finding a replacement DBE subcontractor and the results of the efforts. It is within the control of the Contractor to locate, prior to award, DBEs that offer reasonable prices and that could reasonably be expected to perform the work. For this reason, increased cost shall not, by itself, be considered sufficient reason for not providing an in-kind replacement.

   In the event that the Contractor is able to both document the need and to offer a replacement DBE who can perform the work at a reasonable cost, the Department will approve the replacement at no additional cost to the Department.

2. In the event a DBE subcontractor begins to prosecute the work and is unable to satisfactorily complete performance of the work, the Contractor shall furnish to the Department the following:

   A. Documentation that the subject DBE subcontractor did not perform in a satisfactory manner.

   B. Documentation of the Contractor's assistance to the DBE subcontractor prior to finding the DBE subcontractor in default.

   C. A copy of the certified letter finding the DBE to be in default or a letter from the DBE stating that it cannot complete the work and it is turning the work back to the Contractor.

   D. Copy of the contract between the Contractor and the DBE subcontractor, plus any modifications thereto.

E. Documentation of the Good Faith Efforts in finding a replacement DBE subcontractor and the results of the efforts.

In the event the Contractor is able to locate a replacement underutilized DBE who can perform work at a reasonable cost to the Contractor, and also demonstrates to the satisfaction of the CDOT that prior to bid it had reason to believe that the named DBE firm was responsible and not expected to default, the Department may modify or renegotiate the Contract to compensate the Contractor for any reasonable extra costs, because of a higher price in the proposal of the replacement DBE subcontractor than that of the original DBE subcontractor who failed to perform.

Provided, however, that the Department will not be obligated to participate in any increased cost to the Contractor if the DBE that fails to perform has a recent history of performance failure(s) or default that was either known, or should have been known, to the Contractor prior to award.

3. If the Contractor is unable to locate an underutilized DBE replacement that is both interested in and capable of performing the work at a reasonable cost, the Department may waive the requirement that the work be performed by a DBE and the Contractor shall provide for the satisfactory completion of the work at no additional cost to the Department.

(f) Sanctions

It is the obligation of the Contractor to provide DBE firms with the maximum opportunity to participate in the performance of the work.

It is the responsibility of DBE firms to perform their work in a responsible manner fully consistent with the intent of the DBE program, and in substantial compliance with the terms and conditions of these DBE definitions and requirements.

DBE firms which fail to perform a commercially useful function as described in subsection (d)4 of these DBE definitions and requirements or operate in a manner which is not consistent with the intent of the DBE program may be subject to revocation of certification.

A finding by the Department that the Contractor has failed to comply with the terms and conditions of these DBE definitions and requirements shall constitute sufficient grounds for default and termination of the Contract in accordance with subsection 108.08 of the specifications.

Attachments:
CDOT Form No. 715
CDOT Form No. 1629
CDOT Form No. 718

COLORADO DEPARTMENT OF TRANSPORTATION

CERTIFICATE OF PROPOSED UNDERUTILIZED DBE PARTICIPATION

Project #	
Location	
Project code (SA#)	Sheet of

Contractor:
1. An officer of the contractor(s) must complete this form.
2. Include only DBE firms which meet the underutilized criteria in the contract goal specification for this project.
3. Submit a separate CDOT Form #715 for each proposed DBE.
4. Retain a photocopy for your records.

5. Send original to:
Colorado Department of Transportation
Business Programs Office
4201 E. Arkansas Ave.
Denver, Colorado 80222
FAX: (303) 757-9019

DBE Subcontractor Information

DBE Subcontractor name	❑ African American ❑ Asian or Native American	Certification #	Expiration date
Items of work subcontracted			

A) What is the total dollar value of this proposed subcontract that is applicable toward contract goals? (NOTE: dollar values are to be actual subcontractor dollars and not prime contract prices)	A>
B) What is the total dollar value of proposed subcontracts that are applicable toward contract goals from prior sheets?	B>
C) What is the accumulative value of proposed subcontracts that are applicable towards contract goals?	C>
D) What is the orginal contract bid total?	D>
E¹) What is the accumulative percent of contract bid total subcontracted to African American DBEs?	E¹>
E²) What is the accumulative percent of contract bid total subcontracted to Asian or Native American DBEs?	E²>
F) What is the accumulative percent of contract bid total subcontracted to all underutilized DBEs?	F>

A + B = C (C ÷ D) x 100 = F

Contractor certification

I certify that:
- my company has met the contracted DBE goals or has attached a completed CDOT Form #718, DBE Good Faith Effort Documentation.
- my company has accepted a proposal from the DBE subcontractor named above.
- my company has notified the proposed DBE subcontractor of the contracted DBE commitment.
- my company's use of the proposed DBE subcontractor for the items of work listed above is a condition of the contract award.
- my company will invite the proposed DBE subcontractor to attend the preconstruction conference.
- my company will not use a substitute DBE subcontractor for the proposed DBE subcontractor's failure to perform under a fully executed subcontract, unless my company complies with the definitions and requirements section of the DBE Special Provisions.
- I understand that failure to comply with the information shown on this form will be considered grounds for contract termination.

I declare under penalty of perjury in the second degree, and any other applicable state or federal laws, that the statements made on this document are true and complete to the best of my knowledge.

Prime contractor name	Date
Officer signature and title	

COLORADO DEPARTMENT OF TRANSPORTATION

ANTICIPATED DBE PARTICIPATION SUMMARY

Project #	
Location	
Project code (SA#)	

Instructions: Complete CDOT Form #1269 only one time per project. Include all UDBEs intended for use to meet the UDBE contract goal (listed on CDOT Form #715). Then list all other DBEs intended for use on this project who can be counted towards the Department's overall 10% annual DBE goal.

DBE Subcontractor	Certification #	Total dollar amount of proposed subcontract (Actual Subcontractor dollars, not Prime Contractor dollars)
Total DBE subcontract dollars (for CDOT recording purposes)		$

Contractor name	Date

COLORADO DEPARTMENT OF TRANSPORTATION

UNDERUTILIZED DBE GOOD FAITH EFFORT DOCUMENTATION

Project

Location

Date

The Contractor who is the apparent low bidder on a CDOT construction project and has failed to meet the Underutilized DBE (UDBE) contract goals shall use this form to document good faith efforts made to date by said Contractor to attempt to meet these goals. FAILURE TO FULLY COMPLETE THIS FORM MAY RESULT IN REJECTION OF THE BID.

Each portion of this form is to be addressed in the space provided, or on supplemental sheets. Attach supporting documentation as required. This completed form and required attachments are to be submitted to the Business Programs Office in the Center for Equal Opportunity prior to 4:00 p.m. on the day after the day bids are opened. This form may be submitted by FAX (303 -757-9019) with an original copy to follow. An extension may be granted by the DBE Liaison. Solely at its discretion, CDOT may request additional information and accept additional UDBE participation at any time and prior to the final decision concerning Good Faith Efforts.

I. List sufficient bid items (including portions of bid items) identified as subcontract work to be performed by UDBEs to achieve the established UDBE participation goal. Indicate the total percentage of work identified for UDBE participation. The total percentage of subcontract items identified for UDBE participation must equal or exceed the percentage goal established by CDOT.

II. For each subcontract item identified, contact by mail, FAX and/or telephone a minimum of two currently CDOT-certified UDBEs whose work and function codes match the type of work being solicited. For projects in areas of the state where there are more than two UDBEs capable of performing identified subcontract items, contact at least two thirds of those UDBEs. If soliciting by telephone, provide a telephone log of calls, including topic of discussion, date, time, name of person contacted, and the response received. If soliciting by mail, provide copies of letters to UDBEs and their responses. Letters and FAXes must specifically identify the project, the items to be subcontracted, and the bid date. Letters and FAXes must provide an address and phone number where specific quantities or details will be available to bidders. The Contractor shall provide sufficient time to allow the UDBEs to participate effectively in the bidding process. Submit a detailed explanation addressing failure to provide any of the above.

III. List all UDBE and non-UDBE bidders, bid dollar amounts for each bid item, and the name of the successful bidder. Describe how bid items were broken down to increase opportunities for specific UDBE bidders. If the UDBE bids were rejected, give reasons for each case. Cost alone may not be adequate justification for failure to use a UDBE bid. If the work is to be counted as a potential UDBE subcontract item, the Contractor cannot elect to perform that work itself when a UDBE bid is competitive or only UDBE bids are received. When a non-UDBE bid is significantly lower than a UDBE bid, the Contractor may choose to perform the item itself. Whether a bid is "competitive" or "significantly lower" will be determined by CDOT. Provide a detailed explanation for failure to provide any of the above.

IV. The efforts required herein are not exhaustive or exclusive. Other factors or types of efforts may be relevant in appropriate cases. In determining whether Good Faith Efforts have been made, the quantity and intensity of the efforts made as well as kinds of efforts made may be considered. List any additional efforts to increase UDBE contract participation, such as requesting subcontractors to assist with providing UDBE participation. Note the results of such efforts.

THE CONTRACTOR UNDERSTANDS THAT DEMONSTRATION OF GOOD FAITH EFFORTS IN ACHIEVING THE UDBE GOALS ESTABLISHED BY CDOT IS REQUIRED THROUGHOUT THE PERFORMANCE OF THE CONTRACT.

Company	Signature	
	Title	Phone
		FAX

EMERGING SMALL BUSINESS PROGRAM

DESCRIPTION

This standard special provision describes the Emerging Small Business (ESB) Program that is included in the Contract. The program is further described by the ESB Program Rules. This program is administered by the ESB Program Manager of the Colorado Department of Transportation (CDOT), Business Programs Office. Anyone who has questions about the Program should contact the ESB Program Manager at (303) 757-9162 or 1-800-925-3427. Mail should be directed to the ESB Program Manager at the Colorado Department of Transportation, 4201 East Arkansas Avenue, Room 287, Denver CO 80222.

GENERAL REQUIREMENTS - CONSTRUCTION CONTRACT OBLIGATIONS

(a) Definition and Eligibility. An Emerging Small Business (ESB) is a business which the Colorado Department of Transportation has determined meets the eligibility criteria and requirements of the ESB Rules, as follows:

1. **Eligibility Requirements.** The business must submit to CDOT, in its application, proof of either:

   A. Completion, by a principal of the business, of a minimum of 6 hours of class or seminar instruction within the last two years on subjects applicable to a small business, including topics such as planning, marketing, and finance; or

   B. Completion, by a principal of the business, of the U. S. Small Business Administration "Structuring Your Business Workshop" training course, or of any similar course that has been previously identified by the ESB Program Manager as equivalent thereto and that is available from a local source.

   There is no minimum time the business must have been in operation before applying for ESB status.

   The business must have all necessary licenses, permits and registrations to do business in the State of Colorado.

   The business must be an independent business.

   A construction business must not have exceeded a total adjusted gross income of $3,000,000 for the past two calendar years or an average of $1,500,000 per year. A consultant business must not have exceeded a total adjusted gross income of $1,200,000 for the past two calendar years or an average of $600,000 per year.

   The business must commit in writing to complete a Business Development Plan during each year of ESB eligibility.

   Each business in the ESB Program shall file an application with CDOT to renew its eligibility annually. The maximum term of the eligibility of a business in the ESB Program is a period of six years from the date CDOT initially determines that the business is eligible.

2. **Determination of Eligibility as ESB by CDOT.** Any contractor may apply to the ESB Program Manager for status as an ESB. Application need not be made in connection with a particular bid.

   It shall be the business' responsibility to submit applications so that the ESB Program Manager has sufficient time to render decisions. The ESB Program Manager will review applications in a timely manner but is not committed to render decisions about a business' ESB status within any given period of time. Applications can be obtained by contacting the ESB Program Manager.

   The ESB Program Manager will maintain and make available a Directory of eligible ESB contractors and consultants. Bidders will be solely responsible for verifying the eligibility of ESBs they intend to use prior to submitting a proposal. Verification can be made by calling the ESB Program Manager.

(b) **Reimbursement Payments.** Only one of the following two types of reimbursement payments may be made to the Contractor per ESB subcontractor.

1. **First-Time Reimbursement Payment.** The ESB Program Manager will authorize reimbursement payment to the Contractor if a retained ESB has never before had a subcontract on a CDOT project. Payment is earned only one time per project, regardless of how many ESBs are retained as subcontractors on the project. Payment will be 10 percent of the dollar value of work performed by the ESB subcontractor on the project. Payment shall not exceed a maximum amount of $5,000.

   CDOT Form No. 977 (copy attached) describes the terms and conditions for receiving this payment. This form must be submitted with CDOT Form No. 205 to the Project Engineer.

   CDOT Form No. 980 (copy attached) evaluating the ESB firm's performance shall be submitted monthly to the Project Engineer. Request for payment may be submitted when the subcontractor has completed work on the project and payment will be based on the final subcontract amounts. Request for payment shall be submitted with CDOT Form No. 981 (copy attached) directly to the ESB Program Manager.

2. **Hourly Reimbursement Payment.** The Department will provide hourly reimbursement to the Contractor if it retains one or more ESBs as subcontractors on the project. Payment is based upon the number of hours spent by the Contractor providing work-related services to the ESBs on the project, multiplied by the rate of pay listed below Payment for each ESB assisted shall not exceed 10% of the ESB's subcontract, and the total shall not exceed $7,500 per project. The Contractor must document the number of hours of work-related services provided to the ESB and provide a monthly CDOT Form 980 and a signed invoice to the Project Engineer for inclusion with the monthly pay estimate. The Contractor shall also complete and submit CDOT Form No. 978 (copy attached) which documents the specific assistance that was provided to the ESB subcontractor. The following wages will be paid per hour:

   - Project Superintendent $20.70
   - Foreman $14.40
   - General office help $10.00
   - Estimator or Project Scheduler $17.40

   Loading and fringe benefits are included in these rates.

(c) **Assistance with Retainage.** CDOT will waive retainage from the Contractor on up to the first $50,000 of the project, if the Contractor uses ESB subcontractors to perform project work and the Contractor agrees in writing to waive its retainage requirements for the ESB subcontractors on the first $50,000 of the subcontractor work for which the ESB has provided payment and performance bonds.

(d) **Assistance with Bonding.**

1. Where the ESB is the Prime Contractor, CDOT will pay a certain percentage of the cost of the bond obtained by the ESB Prime Contractor as specified in the ESB's Business Development Plan negotiated with ESB Program Manager. The total amount paid to any specific ESB for this purpose on all CDOT projects shall not exceed $5,000 per calendar year.

2. If an ESB subcontractor is able to obtain bonding required by the Contractor, CDOT will pay a certain percentage of the cost of the bond obtained by the ESB subcontractor, as defined in the ESB's Business Development Plan negotiated with ESB Program Manager, provided that the total amount paid to any specific ESB for this purpose on all CDOT projects shall not exceed $5,000 per calendar year. The ESB subcontractor must submit to the ESB Administrator proof that bonding was required and proof that the bond has been paid.

3. If an ESB subcontractor is unable to obtain bonding required by the Contractor and if the Contractor agrees to waive its bonding requirements for the ESB subcontractor, CDOT will provide assistance to the ESB subcontractor by reimbursing the prime contractor up to 5 percent of the ESB's subcontractor award to a maximum of $5,000 for costs incurred which result from the ESB subcontractor's failure to perform.

(e) Prompt Payment. The Contractor shall pay the subcontractor within seven calendar days of receipt of the payment from CDOT as required by CRS 24-91-103(2).

Attachments:
CDOT Form Nos. 977, 978, 980, 981

COLORADO DEPARTMENT OF TRANSPORTATION

EMERGING SMALL BUSINESS CONTRACTOR REIMBURSEMENT AGREEMENT

(First time payment)

Project code #	Project #	Subcontract start date	Subcontract finish date

Contractor	ESB subcontractor	ESB expiration date

Project Engineer name & phone #	Location

In order to encourage ESB participation on projects, the Colorado Department of Transportation agrees to provide a reimbursement payment to the Contractor for retaining a first time ESB. The reimbursement payment will be 10% of the dollar value of the work subcontracted to and completed by the ESB, not to exceed $5,000. This form must be submitted with a copy of CDOT Form #205 to the Project Engineer. CDOT Form #980 must be submitted monthly to the Project Engineer. The Project Engineer will forward these forms to the ESB Program Manager for approval. When the subcontractor has completed work on the project the Contractor must submit a billing requesting payment and CDOT Form #981 to the ESB Program Manager and payment will be based on the final amount paid to the subcontractor. Fill in the amount below:

_____ x 10% = _____.
committed subcontract amount — reimbursement amount

In exchange, the Contractor agrees to:

- retain the "first time" ESB subcontractor named above who has never had a subcontract on a CDOT project.
- provide work-related services to the ESB in the performance of the work. The work related services may include, but are not limited to :
  - instructions in scheduling
  - accounting, billing, purchasing, payroll and project superintendence
  - specific services the Contractor agrees to provide are:

_____

_____

_____

_____

- submit a written evaluation of the ESB's performance using CDOT Form #980 monthly to the Project Engineer. Project Engineer will forward all forms to the ESB Program Manager for approval.
- submit a completed CDOT Form #981 with a billing requesting payment to the ESB Program Manager when the subcontractor has completed work on the project.

Both parties agree and understand this reimbursement payment may be earned only one time per project regardless of how many ESBs are retained as subconsultants or subcontractors on the project. This reimbursement payment may not be used in conjunction with any other reimbursement payment for this ESB on this project. The reimbursement payment shall not exceed $5,000.

CDOT may terminate this agreement any time the Contractor does not comply with the terms and conditions listed in this agreement.

Contractor representative signature and title	Date

CDOT ESB representative approval	Date

Original-Business Programs > Central Files
cc Project Engineer
Contractor
ESB

CDOT Form #977 6/98

EMERGING SMALL BUSINESS PROGRAM

COLORADO DEPARTMENT OF TRANSPORTATION

EMERGING SMALL BUSINESS CONTRACTOR REIMBURSEMENT AGREEMEN

(Hourly payment)

Project code #	Project #	Subcontract start date	Subcontract finish date
Contractor			
Project Engineer name & phone #		Location	

CDOT and the Contractor agree:

- This reimbursement will be based upon the number of hours the Contractor provides work related services to the ESB(s), multiplied by rate of pay per hour, according to the project specification.
- The reimbursement amount will not exceed $7,500 per project regardless of the number of ESBs the Contractor provides work-related services to on the project.
- The Contractor will submit the following to the Project Engineer: CDOT Form #980, this agreement, and a signed monthly invoice that provides information as shown in the sample invoice format below, for each ESB. The Project Engineer will forward these forms to the ESB Program Manager for approval. Once approved, the ESB Program Manager will forward approved copies to the Project Engineer who will enter the reimbursement payment on the next progress estimate.

SAMPLE INVOICE FORMAT

(A x B = C) Classification & name of worker providing training	Begining date	Ending date	A hours spent	B rate per hour	C total amount due	*Describe type of assistance provided	ESB(s) provided with assistance
			GRAND TOTAL AMOUNT DUE:				

- The Contractor will provide the following statement on the invoice:
  I declare under penalty of perjury in the second degree and any other applicable state or federal laws that the statements made on this document are true and complete to the best of my knowledge.

Contractor signature | Date

- This reimbursement may not be used in conjunction with any other reimbursement payment for this ESB on this project.
- * The Contractor may provide any or all of the following work-related services to the ESB:
  a. assistance in scope
  b. control of work
  c. materials supply and control
  d. prosecution and progress of the work
  e. contract specifications
  f. documentation requirements
  g. getting appropriate permits, licenses and insurance
  h. payroll checking
  i. final project records
  j. other (describe)_____

- List the ESB subcontractors used in this project who qualify the Contractor for this payment.

name	address

CDOT may terminate this agreement any time the Contractor does not comply with the terms and conditions listed in this agreement.

Contractor representative signature and title	Date
CDOT ESB representative approval	Date

Original - Business Programs > Central Files
cc Project Engineer
Contractor
ESB

COLORADO DEPARTMENT OF TRANSPORTATION

CONTRACTOR PERFORMANCE EVALUATION OF AN EMERGING SMALL BUSINESS

Project code#	Project #	Subcontract start date	Subcontract finish date
Contractor	ESB subcontractor		ESB expiration date
Project Engineer name & phone #	Location		

Prior to payment, a Contractor must provide CDOT with a written evaluation of the ESB's performance of the subcontract work.

We are interested in your opinion of the ESB's job performance. This is your chance to "fill us in." Please complete this evaluation, and submit it monthly to the Project Engineer.

1. Please rate the ESB in each of the following work-related areas:

Category	Excellent	Above avg.	Average	Below avg.	Poor
Performance of work	☐	☐	☐	☐	☐
Reputation	☐	☐	☐	☐	☐
Ability to survive in business	☐	☐	☐	☐	☐
Competitive performance	☐	☐	☐	☐	☐
Reliability	☐	☐	☐	☐	☐
Financial stability	☐	☐	☐	☐	☐
Ability to perform independently according to specifications	☐	☐	☐	☐	☐
Judgement	☐	☐	☐	☐	☐

2. Give your opinion regarding the ESB's knowledge, experience and resources used to participate in the contract process.

3. If the ESB is rated below average or poor in any category, what specific measures do you recommend to improve the ESB's performance? Please explain.

Contractor representative signature and title	Date

Original - Business Programs > Central Files
cc Project Engineer
Contractor
ESB

CDOT Form #980 6/98

COLORADO DEPARTMENT OF TRANSPORTATION

CONTRACTOR CERTIFICATION OF ACTUAL PAYMENT TO A FIRST TIME EMERGING SMALL BUSINESS

Project code#	Project #	Subcontract start date	Subcontract finish date
Project Engineer name & phone #		Location	

CONTRACTOR (You are required to complete this form when the ESB subcontractor has completed work on the project.)

- List the ESB subcontractor and the amount you have paid or will pay the business for work performed and materials used on the project.
- Return this form to the Project Engineer with CDOT Form #980 and a billing requesting reimbursement payment.
- Retain supporting documentation for a minimum of seven years from the project acceptance date.

ESB name	Amount paid

x10%

TOTAL ELIGIBLE REIMBURSEMENT AMOUNT: =

(**NOTE:** If the Total Eligible Reimbursement Amount is greater than $5,000, Contractor will be reimbursed $5,000 per Chapter 4 Section II (3) (a) in the ESB Rules.)

I declare under penalty of perjury in the second degree, and any other applicable state or federal laws, that the statements made in this document are true and complete to the best of my knowledge.

Contractor name	Date
Authorized Contractor representative signature and title	Date

I certify this Contractor has met the contract requirements and is eligible for payment.

Authorized CDOT representative signature and title	Date

Original- Business Programs> Central Files
cc Project Engineer
Accounting
Contractor
ESB

July 21, 1999

MATERIALS AND LABOR USED, Form FHWA-47

This project is on the National Highway System. Form FHWA-47 shall be submitted to the Engineer for each Federal-Aid Project on the National Highway System involving construction performed under contract awarded by competitive bidding, except for the following cases:

(1) Projects for which the total final construction costs for roadway are less than $1,000,000.
(2) Projects consisting primarily of the installation of protective devices at railroad grade crossings.
(3) Projects consisting primarily of highway beautification.

The report will include data for all subcontractors, which may be combined by the prime Contractor into one report.

Forms are available from the Resident Engineer. Preparation instructions on the back of the form should be followed.

Decision No. CO990001 dated March 12, 199 supersedes Decision No. CO980001 dated February 13, 1998	Modifications	ID
	Mod 1, 4-16-99, Pages 1, 3	1
	Mod 2, 5-21-99, Pages 2, 3	2
	Mod 3, 6-04-99, Pages 1, 3	3
	Mod 4, 7-02-99, Page 3	4
	Mod 5, 8-20-99, Pages 1,2,3	5
	Mod 6, 9-03-99, Pages 1, 3	6
	Mod 7, 10-08-99, Page 2	7
	Mod 8, 11-19-99, Page 1	8

Code	Classification	Basic Hourly Rate	Fringe Benefits	Last Mod
101	CARPENTERS	$17.87	$ 4.20	
151	MILLWRIGHTS	22.02	5.84	8
	ELECTRICIANS:			
	Area 1:			
211	Electrical work $200,000 or less	18.31	5.74+ 3%	3
212	Electrical work over $200,000	21.21	5.74+ 3%	3
	Area 2:			
221	Electricians	23.56	5.91+ 3%	5
				5
	Area 3:			
231	Electricians	21.35	6.89+ 3%	3
	Area 4:			
241	Electricians	19.75	4.74+4%	8
	LINE CONSTRUCTION:			
271	Cable Splicers	24.67	2.00+ 15.25%	6
272	Lineman, Gas Fitter, Welder	25.15	2.00+ 15.25%	6
273	Line Equipment Operator, Line Truck Crew	19.64	2.00+ 15.25%	6
274	Groundman	12.94	2.00+ 15.25%	6
281	TRAFFIC SIGNAL INSTALLER	18.56	2.00 + 10.6%	
282	EQUIPMENT OPERATOR	17.48	2.00 + 10.6%	
283	GROUNDMAN	11.52	2.00 + 10.6%	

Code	Classification	Basic Hourly Rate	Fringe Benefits	Last Mod
	POWER EQUIPMENT OPERATORS: (Tunnels Above and Below Ground, Shafts, and Raises)			
301	Group 1	19.17	4.62	7
302	Group 2	19.52	4.62	7
303	Group 3	19.62	4.62	7
304	Group 4	19.87	4.62	7
305	Group 5	20.02	4.62	7
306	Group 6	20.42	4.62	7
307	Group 7	20.02	4.62	7
	POWER EQUIPMENT OPERATORS: (Any equipment listed below being used in tunnel work, below or above ground, shall be paid not less than $2.00 per hour above the listed wage rates.)			
331	Group 1	17.02	4.62	7
332	Group 2	17.37	4.62	7
333	Group 3	17.72	4.62	7
334	Group 4	17.87	4.62	7
335	Group 5	18.02	4.62	7
336	Group 6	18.17	4.62	7
337	Group 7	18.93	4.62	7
	IRONWORKERS:			
401	Structural, Ornamental, & Reinforcing	18.75	6.76	5
	LABORERS			
501	Group 1	13.95	3.28	2
502	Group 2	14.00	3.28	2
503	Group 3	14.50	3.28	2
504	Group 4	10.65	3.28	2
	LABORERS: (TUNNEL)			
511	Group 1	13.95	3.28	2
512	Group 2	14.85	3.28	2
513	Group 3	14.95	3.28	2
514	Group 4	16.05	3.28	2
515	Group 5	16.00	3.28	2

Code	Classification	Basic Hourly Rate	Fringe Benefits	Last Mod
	LABORERS: (SHAFTS, RAISES, MISSILE SILOS AND ALL UNDERGROUND WORK OTHER THAN TUNNELS)			
531	Group 1	14.95	3.28	2
532	Group 2	15.10	3.28	2
533	Group 3	15.20	3.28	2
534	Group 4	15.45	3.28	2
535	Group 5	15.55	3.28	2
536	Group 6	16.15	3.28	2
551	LABORERS: Removal or encapsulation of Asbestos Material (including removal of asbestos from mechanical systems that are going to be scraped) and work involving the removal, handling or dealing with toxic or hazardous waste.	17.35	3.28	2
	WATER, SEWAGE AND GAS LINES:			
571	Janitors, Yardmen, Traffic Directors	10.65	3.28	2
572	Laborers	13.25	3.28	2
573	Pipelayer (one per crew)	13.75	3.28	2
	PAINTERS			
611	Brush	$17.62	$3.50	
612	Spray	18.22	$3.50	
613	Swing Stage	18.27	$3.50	
701	CEMENT MASONS	19.20	3.52	2
711	HAZARDOUS AND TOXIC WASTE CONSTRUCTION SPECIALIST	21.20	3.52	6
721	CONCRETE SPECIALIST: Including finishing; grouting, patching, and curbing.	22.20	3.52	2
	PLUMBERS:			
801	Denver County	24.12	4.84	4
802	Montezuma County	18.20	7.10	3
	PIPEFITTERS:			
831	Denver County	24.12	4.84	5

Code	Classification	Basic Hourly Rate		Fringe	Last Mod
		Area 1	Area 2	Benefits	
	TRUCK DRIVERS (All work other than underground and tunnel):				
901	Group 1	$13.86	$14.36	$5.04	
902	Group 2	14.00	14.50	$5.04	
903	Group 3	14.15	14.65	$5.04	
904	Group 4	14.49	14.99	$5.04	
905	Group 5	14.83	15.33	$5.04	
906	Group 6	15.11	15.61	$5.04	
907	Group 7	15.40	15.90	$5.04	
908	Group 8	15.67	16.17	$5.04	
909	Group 9	15.96	16.46	$5.04	
910	Group 10	14.35	14.85	$5.04	
911	Group 11	14.28	14.78	$5.04	
912	Group 12	14.22	14.72	$5.04	
913	Group 13	14.63	15.13	$5.04	
914	Group 14	14.71	15.21	$5.04	
915	Group 15	15.06	15.56	$5.04	
916	Group 16	14.42	14.92	$5.04	
917	Group 17	15.26	15.76	$5.04	
918	Group 18	15.54	16.04	$5.04	
	TRUCK DRIVERS (Tunnel and Underground)				
941	Group 1	14.01	14.51	$5.04	
942	Group 2	14.15	14.65	$5.04	
943	Group 3	14.30	14.80	$5.04	
944	Group 4	14.64	15.14	$5.04	
945	Group 5	14.98	15.48	$5.04	
946	Group 6	15.26	15.76	$5.04	
947	Group 7	15.55	16.05	$5.04	
948	Group 8	15.82	16.32	$5.04	
949	Group 9	16.11	16.61	$5.04	
950	Group 10	14.50	15.00	$5.04	
951	Group 11	14.43	14.93	$5.04	
952	Group 12	14.37	14.87	$5.04	
953	Group 13	14.78	15.28	$5.04	
954	Group 14	14.86	15.36	$5.04	
955	Group 15	15.21	15.71	$5.04	
956	Group 16	14.57	15.07	$5.04	
957	Group 17	15.41	15.91	$5.04	
958	Group 18	15.69	16.19	$5.04	

WELDERS - receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses [29 CFR 5.5(a)(1)(v)].

ELECTRICAINS:

Area 1: Alamosa, Archuleta, Baca, Bent, Chaffee, Conejos, Costilla, Crowley, Custer, Fremont, Huerfano, Kiowa, Las Animas, Mineral, Otero, Prowers, Pueblo, Rio Grande, and Saguache Counties.

Area 2: Adams, Arapahoe, Boulder, Clear Creek, Denver, Douglas, Eagle, Gilpin, Grand, Jackson, Jefferson, Lake, Larimer, Logan, Morgan, Phillips, Sedgwick, Summit, Washington, Weld, and Yuma Counties.

Area 3: Cheyenne, Elbert, El Paso, Kit Carson, Lincoln, Park, and Teller Counties.

Area 4: Delta, Dolores, Garfield, Gunnison, Hinsdale, La Plata, Mesa, Moffat, Montezuma, Montrose, Ouray, Pitkin, Rio Blanco, Routt, San Juan, and San Miguel Counties.

POWER EQUIPMENT OPERATORS CLASSIFICATIONS: (Tunnels Above and Below Ground, Shafts, and Raises)

Group 1: Brakeman.

Group 2: Motorman.

Group 3: Compressor.

Group 4: Air Tractors; Grout Machine; Gunnite Machine; Jumbo Form.

Group 5: Concrete Placement Pumps, Mucking Machines and Front End Loaders, underground, Slusher; Mine Hoist Operator; Mechanic.

Group 6: Mole.

Group 7: Mechanic - Welder.

POWER EQUIPMENT OPERATORS CLASSIFICATIONS:

Group 1: Air Compressor; Oiler; Brakeman; Drill Operator - smaller than Williams MF and similar; Tender to Heavy Duty Mechanic and/or Welder; Operators of 5 or more light plants, Welding Machines, Generators, single unit conveyor; Pumps; Vacuum Well Point System; Tractor, under 70 HP with or without attachments, Compressors, 360 C.F.M. or less.

Group 2: Conveyor, handling building materials; Ditch Witch and similar Trenching Machine; Fireman or Tank Heater, road; Forklift; Haulage Motor Man; Pugmill; Portable Screening Plant with or without a spray bar; Screening Plants, with classifier; Self-propelled Roller, rubber-tires under 5 tons, Grade Checker.

Group 3: Asphalt Screed; Asphalt Plant; Backfiller, Bituminous Spreader or Laydown Machine; Cableway Signalman; Caisson Drill; Williams MF, similar or larger; C.M.I. and similar; Concrete Batching Plants; Concrete Finish Machine; Concrete Gang Saw on concrete paving; Concrete Mixer, less than 1 yd.; Concrete Placement Pumps, under 8 inches; Distributors, Bituminous Surfaces; Drill, Diamond or Core; Drill Rigs, Rotary, Churn, or Cable Tool; Elevating Graders, Equipment Lubricating and service Engineer; Engineer Fireman; Grout Machine; Gunnite Machine; Hoist, 1 drum; Hydraulic Backhoes, wheel mounted under 3/4 yd.; Loader, Barber Green, etc.; Loader up to and including 6 cu. yds.; Motor Grader/Blade, rough; Road Stabilization Machine; Rollers, self-propelled, all types over 5 tons; Sandblasting Machine; single unit portable crusher, with or without washer; Tie Tamper, wheel mounted; Tractor, 70 HP and over with or without attachments; Trenching Machine Operator; Winch on truck.

Group 4: Cable operated Crane, track mounted; Cable operated power Shovels, Draglines, Clamshells and Backhoes, 5 cu. yds. and under; Concrete Mixer over 1 cu. yd.; Concrete Paver 34E or similar; Concrete Placement Pumps, 8 in. and over; Crane, 50 tons and under; Hoist, two drums; Hydraulic Backhoe, 3/4 yd. and over; Loader, over 6 cu. yds.; Machine Doctor; Mechanic; Mixer Mobile; Motor Grader/blade, finish; Multiple unit portable Crusher, with or without washer; Piledriver; Scrapers, single bowl under 40 cu. yds.; Self-propelled Hydraulic Crane; Tractor with sideboom; Truck mounted Hydraulic Crane; Roto-Mill and similar, welder.

Group 5: Cable operated power Shovels, Draglines, Clamshells and Backhoes over 5 cu. yds.; Crane 51 to 90 tons carrier mounted; Electric rail type Tower Crane; Hoist, 3 drum or more; Quad Nine and similar push unit; Scrapers single bowl including pups 40 cu. yds. and tandem bowls and over; Mechanic-Welder (heavy-duty).

Group 6: Cableway; Crane (91 to 140 tons); Climbing Tower Crane; Crawler or truck mounted Tower Crane; Derrick, Wheel Excavator, Tower Crane, rail type; Belt or elevating loader.

Group 7: Cranes (140 tons and over).

LABORERS CLASSIFICATIONS:

Group 1: Minimum labor, including caissons to 8'; carrying reinforcing rods; dowel bars; fence erectors; fire watchers on power plants and oil refineries; gabion basket and reno mattresses; signaling, metal mesh; nursery man (including seeding; mulching and planting trees); pipe plants and yards; shrubs and flowers; stake chaser; tie bars and chairs in concrete paving; waterproofing concrete.

Group 2: Air, gas, hydraulic tools and electrical tool operators; barco hammers; cutting torches; drill; diamond and core drills; electric hammers; jackhammers; hydraulic jacks; tampers; air tampers; boring machines; air hydraulic boring machines; automatic concrete power curbing machines; concrete processing material; form-setters; highways, streets, and airports runways; operators of concrete saws on pavement (other than gangsaws); power operated concrete buggies; hot asphalt labor; asphalt curb machines; paving breakers; transverse concrete conveyor operator; cofferdams; boxtenders; caissons 8' to 12'; caisson over 12'; jackhammer operators in caissons over 12'; labor applicable to pipe coating or wrapping; pipe wrappers, plant and yard; relining pipe; hydroliner (a plastic may be used to waterproof); pipelayer on underground bores; sewer, water, gas, oil and telephone conduit; enamalers on pipe, inside and out, mechanical grouters; monitors; jeep holiday detector men; pump operators, rakers; vibrators; hydro-broom, mixer man; gunnite nozzelmen; shotcrete operator; timbermen, timber and chain saws; sand blaster; licensed powdermen; powdermen and blaster; siphons; signalmen; grade checker.

Group 3: Plug and galleys in dams; scalers and work on or off bridges 40' above the ground performed by laborers working from a Bos'n chair, swinging stage, life belt, or block and tackle as a safety requirement.

Group 4: Traffic directors.

TUNNEL LABORERS CLASSIFICATIONS:

Group 1: Outside Laborer above ground.

Group 2: Minimum Tunnel Laborer, Dry Houseman.

Group 3: Cable or Hose Tenders, Chuck Tenders, Concrete Laborers, Dumpmen, Whirley Pump Operators.

Group 4: Tenders on Shotcrete, Gunniting and Sand Blasting; Tenders, Core and Diamond Drills; Pot Tenders.

Group 5: Collapsible Form Movers and Setters, Miners, Machine Men and Bit Grinders, Nippers, Powdermen and Blasters, Reinforcing Steel Setters, Timbermen (steel or wood tunnel support, including the placement of sheeting when required) and all cutting and welding that is incidental to the Miner's work; Tunnel Liner Plate Setters; Vibrator Men, internal and external; Unloading, stopping and starting of Moran Agitator Cars; Diamond and Core Drill Operators; Shotcrete Operator; Gunnite Nozzlemen, Sand Blaster, Pump Concrete Placement Men.

LABORERS CLASSIFICATIONS:(Shafts, Raises, Missile Silos and All Underground Work Other Than Tunnels)

Group 1: Laborers, Topmen, Bottommen and Cagers.

Group 2: Chucktenders, Concrete Laborers, Whirley Pump Operators.

Group 3: Tenders in Shotcrete Gunniting and Sand Blasting; Tenders on Core and Diamond Drills; Pot Tenders.

Group 4: Diamond and Core Drill Operators; Gunnite Nozzlemen; Shotcrete Operators; Sandblasters and Pump Concrete Placement Men.

Group 5: Any employee performing work underground from a Bos'n Chair, Swinging Stage, Life Belt or Block and Tackle as a safety requirement.

Group 6: Collapsible Form Movers and Setters, Miners, Machine Men and Bit Grinders, Nippers, Powdermen and Blasters, Reinforcing Steel Setters, Timbermen (steel or wood tunnel support, including the placement of sheeting when required) and all cutting and welding that is incidental to the Miner's work; Liner Plate Setters; Internal and External Vibrator men.

TRUCK DRIVERS - AREA DEFINITIONS

AREA 1: Alamosa, Archuleta, Bent, Boulder, Chaffee, Clear Creek, Conejos, Costilla, Crowley, Custer, Delta, Denver, Douglas, El Paso, Fremont, Garfield, Gilpin, Huerfano, Jefferson, La Plata, Larimer, Logan, Mesa, Montezuma, Morgan, Otero, Phillips, Prowers, Pueblo, Rio Grande, Sedgwick, Teller, and Weld Counties; that portion of Adams, Arapahoe, Elbert, and Las Animas Counties lying west of the Township line between R59W and R60W of the 7th Guide Meridian West; that portion of Eagle County lying west of the Township line between R80W and R81W of the 10th Guide Meridian West; that portion of Montrose County lying northerly of the north line of Ouray County and said north line extended west to the Township line between R11W and R12W, said Township line of the New Mexico Principle Meridian; and that portion of Washington County lying north of the 40 00' 00" latitude base line.

AREA 2: Baca, Cheyenne, Dolores, Grand, Gunnison, Hinsdale, Jackson, Kiowa, Kit Carson, Lake, Lincoln, Mineral, Moffat, Ouray, Park, Pitkin, Rio Blanco, Routt, Saguache, San Juan, San Miguel, Summit, and Yuma Counties: that portion of Adams, Arapahoe, Elbert, and Las Animas Counties lying east of the Township line between R59W and R60W of the 7th Guide Metidian West; that portion of Eagle County lying east of the Township line between R80W and R81W of the 9th Guide Meridian West; that portion of Montrose County except that portion lying northerly of the north line of Ouray and said north line extended west to the Township line between R11W and R12W, said point being east of said Township line of the New Mexico Principle Meridian; and that portion of Washington County lying south of the 40 00' 00" latitude base line.

TRUCK DRIVERS CLASSIFICATIONS

Group 1: Pickup; Scalemen, Checkers, Spotters, and Dumpmen.

Group 2: Dump Truck Drivers to and including 6 cubic yards; Liquid and Bulk Tankers - single axle; Sweeper Truck; Flat Rack - single axle; Warehouseman - Washers - Greasemen - Servicemen - Ambulance Driver.

Group 3: Dump truck drivers over 6 cubic yards to and including 14 cubic yards; flat rack - tandem axle; liquid and bulk tankers - tandem axle.

Group 4: Dump truck drivers over 14 cubic yards, to and including 29 cubic yards; High boy - low boy - floats - semi; cab operated distributor truck driver - semi; liquid and bulk tankers - semi or combination; liquid and bulk tankers - Euclid - electric or similar; Truck driver dumptor type, youngbuggy, jumbo, and similar type equipment.

Group 5: Dump truck drivers over 29 cubic yards to and including 39 cubic yards.

Group 6: Dump truck drivers over 39 cubic yards to and including 54 cubic yards.

Group 7: Dump truck drivers over 54 cubic yards to and including 79 cubic yards.

Group 8: Dump truck drivers over 79 cubic yards to and including 104 cubic yards.

Group 9: Dump truck drivers over 104 cubic yards.

Group 10: Distributor truck driver; cement mixer, agitator truck to and including 10 cubic yards.

Group 11: Fork lift driver; Truck Drivers - Fuel Truck - Grease Truck - combination Fuel and Grease.

Group 12: Straddle drive - lumber carrier.

Group 13: Truck driver snow plow.

Group 14: Cement mixer - agitator truck over 10 cubic yards to and including 15 cubic yards.

Group 15: Cement mixer - agitator truck over 15 cubic yards.

Group 16: Multi-purpose truck - specialty and hoisting.

Group 17: Mechanic.

Group 18: Heavy duty diesel mechanics, body men - welders or combination men.

WAGE DETERMINATION APPEALS PROCESS

1. Has there been an initial decision in the matter? This can be:
   - an existing published wage determination
   - a survey underlying a wage determination
   - a Wage and Hour Division letter setting forth a position on a wage determination matter
   - a conformance (additional classification and rate) ruling

   On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2. And 3. should be followed.

   With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of construction wage Determinations. Write to:

   Branch of Construction Wage Determinations
   Wage and Hour Division
   U.S. Department of Labor
   200 Constitution Avenue, N.W.
   Washington, D.C. 20210

2. If the answer to the question in 1. is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

   Wage and Hour Administrator
   U.S. Department of Labor
   200 Constitution Avenue, N.W.
   Washington, D.C. 20210

   The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3. If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

   Administrative Review Board
   U.S. Department of Labor
   200 Constitution Avenue, N.W.
   Washington, D.C. 20210

4. All Decisions of the Administrative review board are final.

ON THE JOB TRAINING

This training special provision supplements subparagraph 6 of paragraph B and supersedes subparagraph 7b of paragraph C of the Special Provision entitled "Affirmative Action Requirements, Equal Employment Opportunity" and is an implementation of 23 U.S.C. 140 (a). As part of the Contractor's Equal Employment Opportunity Affirmative Action Program, training shall be provided as follows:

(a) General Requirements

1. The Contractor shall provide on the job training aimed at developing full journey workers in the type of trade or classification involved.

2. Training and upgrading of minorities and women toward journey worker status is a primary objective of this training special provision. Accordingly, the Contractor shall make every reasonable effort to enroll minority trainees and women (e.g., by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent that such persons are available within a reasonable area of recruitment. The Contractor shall be responsible for demonstrating the steps that were taken in pursuance thereof, prior to a determination as to whether the Contractor is in compliance with this training special provision. This training commitment shall not be used to discriminate against any applicant for training whether a member of a protected class or not.

3. An employee shall not be employed as a trainee in any classification in which the employee has successfully completed a training course leading to journey worker status or in which the employee has been employed as a journey worker. The Contractor shall satisfy this requirement by including appropriate questions (i.e. Have you ever worked as a journeyman in the highway construction industry?) in the employee application or by other suitable means. Regardless of the method used, the Contractor's records shall document the findings in each case.

4. The minimum length and type of training for each classification shall be as established in the training program selected by the Contractor and approved by the Department and the Colorado Division of the Federal Highway Administration (FHWA), or the U. S Department of Labor, Bureau of Apprenticeship and Training (DOL). The Department and the FHWA will approve a program if it is reasonably calculated to meet the Equal Employment obligations of the Contractor and to qualify the average trainee for journey worker status in the classification concerned by the end of the training period. Apprenticeship and training programs will be accepted if registered with the U.S. Dept. of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau. To obtain FHWA approval, the Contractor's training program must be reviewed by the CDOT Staff Construction and Materials Branch OJT Program Manager and approved by the Colorado Division of the Federal Highway Administration. The Contractor shall allow up to 30 days for FHWA review. The proposed training program shall be submitted by the Contractor to:

   OJT Program Manager
   Staff Construction and Materials Branch, Rm. 287
   4201 East Arkansas Avenue
   Denver, CO 80222

   Approved training programs shall provide the trainee with a minimum of 2000 hours of training. A minimum of 80 hours of classroom training will be required in all approved programs. Credit for prior classroom or other training may be allowed if such training is relevant to the trainees' current training program requirements.

5. Training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, time-keepers, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted when significant and meaningful training is provided and it is approved by the FHWA Division office. There will be no reimbursement for offsite training.

6. The Contractor shall pay the training program wage rates and the correct fringe benefits to each registered trainee employed on the contract work and currently enrolled in an approved program. The minimum trainee wage shall be the full laborer wage (group 2, outside labor, above ground) on all Davis-Bacon projects.

7. All apprentices or trainees for which the Contractor expects to receive reimbursement must first be registered on the project by submitting a completed CDOT Form 838. This form must then be reviewed and approved by the CDOT Region Equal Employment Opportunity (EEO) Representative before reimbursement will be made. Requests for registration shall be submitted in writing to the Engineer and will be granted when the following information is provided and approved:

   A. A completed CDOT Form No. 838 for each trainee or apprentice
   B. Evidence of the certification of the applicable trainee program.
   C. Evidence of the registration of the trainee into the approved trainee program
   D. A copy of the current applicable approved training program.

8. Within the first 100 hours of training time completed, the Contractor shall provide each trainee with a review of the training program, pay scale, pension and retirement benefits, health and disability benefits, promotional opportunities, company policies and complaint procedure. The Contractor shall also furnish the trainee a copy of the training program.

9. On a monthly basis, the Contractor shall provide to the Engineer a completed On The Job Training Progress Report (CDOT Form No. 832) for each trainee on the project. The Contractor will be reimbursed for each approved apprentice or trainee required by the Department and documented on CDOT Form 832, but not more than the OJT Force Account budget unless approved by the Engineer. Upon completion of training, transfer to another project, termination of the trainee or notification of final acceptance of the project, the Contractor shall submit to the Engineer a completed CDOT Form No. 832.

10. All forms referred to are available in the Staff Construction Office of the Department of Transportation or through the CDOT Region Equal Employment Opportunity (EEO) Representative.

11. The Engineer will provide reimbursement to the Contractor. Payment is based on the number of hours of on-the-job training the Contractor provides to the trainee under this Contract and the applicable reimbursement rate. Submission of the CDOT Form No. 832 will document the training hours provided during the month, and will be considered a request for payment. Where applicable, the Contractor shall note and explain discrepancies between the hours documented on CDOT Form 832 and the corresponding certified payrolls. To receive payment the CDOT Form Numbers 838 and 832 must be completed in full and the Contractor must be in compliance with all requirements of this specification.

(b) Standard Training Program

If the Contractor is not participating in the Department's On-the-Job Training Pilot Program, the training shall be provided according to the following.

1. The required number of trainees to be employed on the project shall be as shown in the Contract. The required number of trainees or apprentices employed under the Contract shall be registered with the Department using CDOT Form No 838.

2. Subcontractor trainees who are approved by the Department may be used by the Contractor to satisfy the requirements of this special provision.

3. At least ten working days prior to the first progress payment to be made after work has begun, the Contractor shall submit to the Engineer documentation showing DOL or FHWA approval of the Contractor's training program, a plan that identifies each proposed trainee and the construction phase for training each of the proposed trainees, including the duration, for this specific project.

   Progress payments may be withheld until this plan is submitted and approved and may be withheld if the approved plan is not followed.

4. A trainee shall begin work on the project as soon as possible utilizing the skill involved and remain on the project as long as meaningful training opportunities exist. It is not required that all trainees be employed on the project for the entire length of the Contract.

5. The Contractor will be reimbursed 80 cents per hour for each approved apprentice or trainee required by the Department.

6. In order to receive reimbursement, the Contractor shall provide the number of trainees and total training hours specified below for the training category assigned to the project. The training category will be determined by the contract dollar amount. The category guidelines are as follows:

Category	Contract dollar value	Minimum total training hours to be provided on the project	Minimum number of trainees required	Maximum number of trainees allowed	Maximum reimbursement allowed
A	Up to 1 million	0	0	N/A	0
B	>1 - 2 million	160	1	3	$200
C	>2 - 4 million	320	1	3	$300
D	>4 - 6 million	640	1	3	$600
E	>6 - 8 million	800	2	4	$700
F	>8 - 12 million	960	4	5	$800
G	>12 - 16 million	1120	5	6	$1,000
H	>16 - 20 million	1280	6	6	$1,100
I	For each increment of $5 million, over $20 million	640	1	1	$600

7. The Contractor shall have fulfilled its responsibilities under this training special provision if it has provided acceptable training to the number of trainees specified in the Contract in accordance with this special provision.

(c) Colorado Program - formerly the OJT Pilot Program.

If the Contractor has a current approved Colorado Program proposal, the training shall be provided according to the following:

1. The Contractor shall comply with the requirements of the Department's OJT Pilot Program procedures defined in the Pilot Program Manual.

ON THE JOB TRAINING

2. Each trainee enrolled in the Colorado Program will receive a minimum of 1200 hours per year of on-the-job training. Up to 200 hour of offsite classroom training can be included in the 1200 hours minimum.

3. At least ten working days prior to the first progress payment to be made after work has begun, the Contractor shall submit to the Engineer documentation showing DOL or FHWA approval of the Contractor's training program and proof of good standing in the Colorado Program.

4. The Contractor will be reimbursed $4.80 per hour for each approved trainee who is working on the Contract, but not more than the OJT Colorado Program Force Account budget unless approved by the Engineer. The Department will not reimburse for classroom training under the Colorado Program.

5. The Contractor will be considered in compliance with the requirements of the Colorado Program when the Contractor demonstrates to the Department that it has met the requirements of the Colorado Program special provision and the approved Colorado Program Training Plan.

6. The Contractor shall comply with the affirmative action requirements in the approved training program and in the Colorado Program proposal.

7. Contractors having an approved Training Plan for the calendar year in which they are engaging in construction may use this option. Contractors who do not have a current Colorado Program Training Plan must comply with the requirements of Part (b) of this special provision.

8. The minimum required number of trainees to be employed by the Contractor shall be as shown in the Contractor's CDOT approved Colorado Program training plan.

9. The Contractor shall have fulfilled its responsibilities under this training special provision if it has maintained good standing in the Colorado Program during the life of the Contract.

REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

Attached is Form FHWA 1273 titled *Required Contract Provisions Federal-Aid Construction Contracts.* As described in Section I. General, the provisions of Form FHWA 1273 apply to all work performed under the Contract and are to be included in all subcontracts.

RQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

FHWA-1273 Electronic version – March 10, 1994

REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

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ATTACHMENTS

A. Employment Preference for Appalachian Contracts (included in Appalachian contracts only)

I. GENERAL

1. These contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

2. Except as otherwise provided for in each section, the contractor shall insert in each subcontract all of the stipulations contained in these Required Contract Provisions, and further require their inclusion in any lower tier subcontract or purchase order that may in turn be made. The Required Contract Provisions shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these Required Contract Provisions.

3. A breach of any of the stipulations contained in these Required Contract Provisions shall be sufficient grounds for termination of the contract.

4. A breach of the following clauses of the Required Contract Provisions may also be grounds for debarment as provided in 29 CFR 5.12:

Section I, paragraph 2;
Section IV, paragraphs 1, 2, 3, 4, and 7;
Section V, paragraphs 1 and 2a through 2g.

5. Disputes arising out of the labor standards provisions of Section IV (except paragraph 5) and Section V of these Required Contract Provisions shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor (DOL) as set forth in 29 CFR 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the DOL, or the contractor's employees or their representatives.

6. **Selection of Labor:** During the performance of this contract, the contractor shall not:

a. discriminate against labor from any other State, possession, or territory of the United States (except for employment preference for Appalachian contracts, when applicable, as specified in Attachment A), or

b. employ convict labor for any purpose within the limits of the project unless it is labor performed by convicts who are on parole, supervised release, or probation.

II. NONDISCRIMINATION

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $10,000 or more.)

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630 and 41 CFR 60) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The Equal Opportunity Construction Contract Specifications set forth under 41 CFR 60-4.3 and the provisions of the American Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the State highway agency (SHA) and the Federal Government in carrying out EEO obligations and in their review of his/her activities under the contract.

b. The contractor will accept as his operating policy the following statement:

> "It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, preapprenticeship, and/or on-the-job training."

2. **EEO Officer:** The contractor will designate and make known to the SHA contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active contractor program of EEO and who must be assigned adequate authority and responsibility to do so.

3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of

employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minority group employees.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minority groups in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the contractor's compliance with EEO contract provisions. (The DOL has held that where implementation of such agreements have the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Executive Order 11246, as amended.)

c. The contractor will encourage his present employees to refer minority group applicants for employment. Information and procedures with regard to referring minority group applicants will be discussed with employees.

5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of his avenues of appeal.

6. **Training and Promotion:**

a. The contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.

7. **Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women within the unions, and to effect referrals by such unions of minority and female employees. Actions by the contractor either directly or through a contractor's association acting as agent will include the procedures set forth below:

a. The contractor will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.

b. The contractor will use best efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the SHA and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of minority and women referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The DOL has held that it shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the SHA.

8. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment.

a. The contractor shall notify all potential subcontractors and suppliers of his/her EEO obligations under this contract.

b. Disadvantaged business enterprises (DBE), as defined in 49 CFR 23, shall have equal opportunity to compete for and perform subcontracts which the contractor enters into pursuant to this contract. The contractor will use his best efforts to solicit bids from and to utilize DBE subcontractors or subcontractors with meaningful minority group and female representation among their employees. Contractors shall obtain lists of DBE construction firms from SHA personnel.

c. The contractor will use his best efforts to ensure subcontractor compliance with their EEO obligations.

9. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the SHA and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women;

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees; and

(4) The progress and efforts being made in securing the services of DBE subcontractors or subcontractors with meaningful minority and female representation among their employees.

b. The contractors will submit an annual report to the SHA each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data.

III. NONSEGREGATED FACILITIES

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $10,000 or more.)

a. By submission of this bid, the execution of this contract or subcontract, or the consummation of this material supply agreement or purchase order, as appropriate, the bidder, Federal-aid construction contractor, subcontractor, material supplier, or vendor, as appropriate, certifies that the firm does not maintain or provide for its employees any segregated facilities at any of its establishments, and that the firm does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The firm agrees that a breach of this certification is a violation of the EEO provisions of this contract. The firm further certifies that no employee will be denied access to adequate facilities on the basis of sex or disability.

b. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, timeclocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are, in fact, segregated on the basis of race, color, religion, national origin, age or disability, because of habit, local custom, or otherwise. The only exception will be for the disabled when the demands for accessibility override (e.g. disabled parking).

c. The contractor agrees that it has obtained or will obtain identical certification from proposed subcontractors or material suppliers prior to award of subcontracts or consummation of material supply agreements of $10,000 or more and that it will retain such certifications in its files.

IV. PAYMENT OF PREDETERMINED MINIMUM WAGE

(Applicable to all Federal-aid construction contracts exceeding $2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural minor collectors, which are exempt.)

1. General:

a. All mechanics and laborers employed or working upon the site of the work will be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account [except such payroll deductions as are permitted by regulations (29 CFR 3) issued by the Secretary of Labor under the Copeland Act (40 U.S.C. 276c)] the full amounts of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment. The payment shall be computed at wage rates not less than those contained in the wage determination of the Secretary of Labor (hereinafter "the wage determination") which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor or its subcontractors and such laborers and mechanics. The wage determination (including any additional classifications and wage rates conformed under paragraph 2 of this Section IV

and the DOL poster (WH-1321) or Form FHWA-1495) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. For the purpose of this Section, contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act (40 U.S.C. 276a) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section IV, paragraph 3b, hereof. Also, for the purpose of this Section, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in paragraphs 4 and 5 of this Section IV.

b. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.

c. All rulings and interpretations of the Davis-Bacon Act and related acts contained in 29 CFR 1, 3, and 5 are herein incorporated by reference in this contract.

2. **Classification:**

a. The SHA contracting officer shall require that any class of laborers or mechanics employed under the contract, which is not listed in the wage determination, shall be classified in conformance with the wage determination.

b. The contracting officer shall approve an additional classification, wage rate and fringe benefits only when the following criteria have been met:

(1) the work to be performed by the additional classification requested is not performed by a classification in the wage determination;

(2) the additional classification is utilized in the area by the construction industry;

(3) the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and

(4) with respect to helpers, when such a classification prevails in the area in which the work is performed.

c. If the contractor or subcontractors, as appropriate, the laborers and mechanics (if known) to be employed in the additional classification or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the DOL, Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, D.C. 20210. The Wage and Hour Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

d. In the event the contractor or subcontractors, as appropriate, the laborers or mechanics to be employed in the additional classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. Said Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary

e. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 2c or 2d of this Section IV shall be paid to all workers performing work in the additional classification from the first day on which work is performed in the classification.

3. **Payment of Fringe Benefits:**

a. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor or subcontractors, as appropriate, shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly case equivalent thereof.

b. If the contractor or subcontractor, as appropriate, does not make payments to a trustee or other third person, he/she may consider as a part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

4. **Apprentices and Trainees (Programs of the U.S. DOL) and Helpers:**

a. Apprentices:

(1) Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the DOL, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or if a person is employed in his/her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.

(2) The allowable ratio of apprentices to journeyman-level employees on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate listed in the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work

actually performed. Where a contractor or subcontractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman-level hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

(3) Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator for the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

(4) In the event the Bureau of Apprenticeship and Training, or a State apprenticeship agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor or subcontractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the comparable work performed by regular employees until an acceptable program is approved.

b. Trainees:

(1) Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the DOL, Employment and Training Administration.

(2) The ratio of trainees to journeyman-level employees on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

(3) Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman-level wage rate on the wage determination which provides for less than full fringe benefits for apprentices, in which case such trainees shall receive the same fringe benefits as apprentices.

(4) In the event the Employment and Training Administration withdraws approval of a training program, the contractor or subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Helpers:

Helpers will be permitted to work on a project if the helper classification is specified and defined on the applicable wage determination or is approved pursuant to the conformance procedure set forth in Section IV.2. Any worker listed on a payroll at a helper wage rate, who is not a helper under a approved definition, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed.

5. **Apprentices and Trainees (Programs of the U.S. DOT):**

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

6. **Withholding:**

The SHA shall upon its own action or upon written request of an authorized representative of the DOL withhold, or cause to be withheld, from the contractor or subcontractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements which is held by the same prime contractor, as much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the SHA contracting officer may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

7. **Overtime Requirements:**

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen, or guards (including apprentices, trainees, and helpers described in paragraphs 4 and 5 above) shall require or permit any laborer, mechanic, watchman, or guard in any workweek in which he/she is employed on such work, to work in excess of 40 hours in such workweek unless such laborer, mechanic, watchman, or guard receives compensation at a rate not less than one-and-one-half times his/her basic rate of pay for all hours worked in excess of 40 hours in such workweek.

8. **Violation:**

Liability for Unpaid Wages; Liquidated Damages: In the event of any violation of the clause set forth in paragraph 7 above, the contractor and any subcontractor responsible thereof shall be liable to the affected employee for his/her unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic,

watchman, or guard employed in violation of the clause set forth in paragraph 7, in the sum of $10 for each calendar day on which such employee was required or permitted to work in excess of the standard work week of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 7.

9. **Withholding for Unpaid Wages and Liquidated Damages:**

The SHA shall upon its own action or upon written request of any authorized representative of the DOL withhold, or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 8 above.

V. STATEMENTS AND PAYROLLS

(Applicable to all Federal-aid construction contracts exceeding $2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural collectors, which are exempt.)

1. **Compliance with Copeland Regulations (29 CFR 3):**

The contractor shall comply with the Copeland Regulations of the Secretary of Labor which are herein incorporated by reference.

2. **Payrolls and Payroll Records:**

a. Payrolls and basic records relating thereto shall be maintained by the contractor and each subcontractor during the course of the work and preserved for a period of 3 years from the date of completion of the contract for all laborers, mechanics, apprentices, trainees, watchmen, helpers, and guards working at the site of the work.

b. The payroll records shall contain the name, social security number, and address of each such employee; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalent thereof the types described in Section 1(b)(2)(B) of the Davis Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. In addition, for Appalachian contracts, the payroll records shall contain a notation indicating whether the employee does, or does not, normally reside in the labor area as defined in Attachment A, paragraph 1. Whenever the Secretary of Labor, pursuant to Section IV, paragraph 3b, has found that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis Bacon Act, the contractor and each subcontractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, that the plan or program has been communicated in writing to the laborers or mechanics affected, and show the cost anticipated or the actual cost incurred in providing benefits. Contractors or subcontractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprentices and trainees, and ratios and wage rates prescribed in the applicable programs.

c. Each contractor and subcontractor shall furnish, each week in which any contract work is performed, to the SHA resident engineer a payroll of wages paid each of its employees (including apprentices, trainees, and helpers, described in Section IV, paragraphs 4 and 5, and watchmen and guards engaged on work during the preceding weekly payroll period). The payroll submitted shall set out accurately and completely all of the information required to be maintained under paragraph 2b of this Section V. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal stock number 029-005-0014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

d. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his/her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) that the payroll for the payroll period contains the information required to be maintained under paragraph 2b of this Section V and that such information is correct and complete;

(2) that such laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR 3;

(3) that each laborer or mechanic has been paid not less that the applicable wage rate and fringe benefits or cash equivalent for the classification of worked performed, as specified in the applicable wage determination incorporated into the contract.

e. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 2d of this Section V.

f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 231.

g. The contractor or subcontractor shall make the records required under paragraph 2b of this Section V available for inspection, copying, or transcription by authorized representatives of the SHA, the FHWA, or the DOL, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the SHA, the FHWA, the DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

VI. RECORD OF MATERIALS, SUPPLIES, AND LABOR

1. On all Federal-aid contracts on the National Highway System, except those which provide solely for the installation of protective devices at railroad grade crossings, those which are constructed on a force account or direct labor basis, highway beautification contracts, and contracts for which the total final construction cost for roadway and bridge is less than $1,000,000 (23 CFR 635) the contractor shall:

a. Become familiar with the list of specific materials and supplies contained in Form FHWA-47, "Statement of Materials and Labor Used by Contractor of Highway Construction Involving Federal Funds," prior to the commencement of work under this contract.

b. Maintain a record of the total cost of all materials and supplies purchased for and incorporated in the work, and also of the quantities of those specific materials and supplies listed on Form FHWA-47, and in the units shown on Form FHWA-47.

c. Furnish, upon the completion of the contract, to the SHA resident engineer on Form FHWA-47 together with the data required in paragraph 1b relative to materials and supplies, a final labor summary of all contract work indicating the total hours worked and the total amount earned.

2. At the prime contractor's option, either a single report covering all contract work or separate reports for the contractor and for each subcontract shall be submitted.

VII. SUBLETTING OR ASSIGNING THE CONTRACT

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the State. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635).

a. "Its own organization" shall be construed to include only workers employed and paid directly by the prime contractor and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph 1 of Section VII is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the SHA contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the SHA contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the SHA has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

VIII. SAFETY: ACCIDENT PREVENTION

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the SHA contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

IX. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, the following notice shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

NOTICE TO ALL PERSONNEL ENGAGED ON FEDERAL-AID HIGHWAY PROJECTS

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed,

or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 21, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined not more that $10,000 or imprisoned not more than 5 years or both."

X. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $100,000 or more.)

By submission of this bid or the execution of this contract, or subcontract, as appropriate, the bidder, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub.L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Pub.L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.

2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.

3. That the firm shall promptly notify the SHA of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.

4. That the firm agrees to include or cause to be included the requirements of paragraph 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

XI. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

1. Instructions for Certification - Primary Covered Transactions:

(Applicable to all Federal-aid contracts - 49 CFR 29)

a. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.

d. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is submitted for assistance in obtaining a copy of those regulations.

f. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded From Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration.

I. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph f of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Primary Covered Transactions

1. The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

b. Have not within a 3-year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 1b of this certification; and

d. Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

2. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

2. Instructions for Certification - Lower Tier Covered Transactions:

(Applicable to all subcontracts, purchase orders and other lower tier transactions of $25,000 or more - 49 CFR 29)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

I. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Covered Transactions:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XII. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

(Applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000 - 49 CFR 20)

REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

3. The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

SPECIAL NOTICE TO CONTRACTORS

The Contractor shall follow the procedures listed below to ensure the proper inspection, sampling, testing and certification of materials and products incorporated into all construction projects.

1. PROVIDE NOTIFICATION OF MATERIALS SOURCES AND SUPPLIERS.

In accordance with subsection 106.01 of the specifications:

The Contractor shall submit a list of material sources and suppliers to the Project Engineer with a copy to the Central Materials Laboratory, Inspection Engineer, at 4340 East Louisiana Avenue, Denver, Colorado 80222. The list shall be submitted at least two weeks prior to fabrication for items to be preinspected or two weeks before delivery for other materials or products. The list shall Include company name and address, item to be supplied, and contact person where material can be inspected.

2. DESIGN/BUILD PROJECTS – FORM #250 – MATERIALS DOCUMENTATION RECORD.

Two weeks before construction commences, the Contractor shall furnish the Engineer a list of pay items that will be used to construct the project in accordance with the pay items in the Standard Specifications and an approximate quantity for each pay item. The Contractor shall immediately notify the Engineer, in writing, if the pay items or quantities are revised during the project.

3. COMPLY WITH BUY AMERICAN REQUIREMENTS.

In accordance with subsection 106.08 of the specifications:

A. All manufacturing processes, including the application of a coating, for all steel products and all iron products permanently incorporated in the work shall have occurred in the United States of America.

B. The Contractor shall furnish a certification with every steel product and every iron product.

C. Upon completion of the project, the Contractor shall certify in writing of compliance with this requirement.

4. CDOT SAMPLING AND TESTING REQUIREMENTS:

A. Preinspected

The following items are preinspected by the Central Laboratory of the Colorado Department of Transportation. Inspection arrangements should be made by calling (303) 757-9227 a minimum of 10 days prior to the beginning of fabrication. Failure to give notification may result in delays to the project and/or rejection of materials or products.

Bearing Devices (Type 2 thru 5)
Bridge Expansion Device
Fasteners (Bolts) (Shop)
Hot Poured Joint and Crack Sealant
Precast Prestressed Units - Concrete
Precast Concrete Deck Panels
Prestressing Elements (Shop)
Structural Steel (Bridge Girders)

B. Certified Test Reports

In accordance with subsections 101.82 and 106.11 of the specifications, the following items will be accepted on the basis of certified test reports. Two copies of the certified test reports shall be furnished to the Project Engineer at the time of material delivery. Failure to comply may result in delays to the project and/or rejection of the materials.

Anchor Bolts (all items which include anchor bolts)
Breakaway Sign Structures
Bridge Rail (Type 10)
Delineators (Reflectors only)
Epoxy Pavement Marking
Fasteners (Bolts) (Field)
Gabions and Slope Mattress
Geotextiles
Glass Beads
Hydrated Lime (Chemical test only) (After Pre-Approval)
Mast Arms
MSE Wall (Facing Elements)
Paint (Structure)
Pavement Marking Paint
Pipe Railing
Preformed Bridge Compression Joint Seals and Waterstop
Preformed Plastic Pavement Marking Materials
Preformed Thermoplastic Pavement Marking Materials
Permanent Steel Bridge Deck Forms

Premolded Elastomeric Expansion Device
Prestressing Elements (Field)
Raised Pavement Markers
Recessed Pavement Markers
Reinforcement Elements (Item 504)
Sound Barrier Fence
Steel Sign Structures
Structural Steel Bridge Paint (Inorganic Zinc Rich, Polyurethane System)
Structural Steel Galvanized
Structural Steel, Misc.
Thermoplastic Pavement Marking (Preformed and Hot Applied)
Top Soil
Water(ing) (All items which include water)

C. Certification of Compliance

In accordance with subsections 101.81 and 106.10 of the specifications, the following items will be accepted on the basis of a certificate of compliance. Two copies of the certificate of compliance shall be furnished to the Project Engineer at the time of material delivery. Failure to comply may result in delays to the project and/or rejection of the materials.

Bridge Bearing Device, Type 1, 3/4" (20mm) or less [E]
Bridge Compression Joint Seal
Bridge Rail
Chemical Dust Palliative
Concrete Paver Stones
Delineator - Flexible
Epoxy Coating for Reinforcing Steel (Epoxy Powder) [A]
Flumes (any type)
Guard Rail Posts - Metal [A]
Guard Rail Posts - Timber Blocks and Posts [A]
Guard Rail - Type 4 - Precast
Guard Rail W-Beam [A]
Headgates
High Mast Light Standard
Inlets, Grates and Frames (Prefab)
Interior Insulation
Luminaires (Inclusive)
Manholes, Rings and Covers (Prefab)
Metal Light Standards
Meter Vaults
Pipe - Clay, Copper, Cast Iron
Plastic Pipe - Culverts
Plastic Underdrain Pipe and Perforated Drain
Pipe - Cement Asbestos
Pipe - Reinforced Concrete [D]
Pipe - Corrugated Metal [D]
Pipe - Non-reinforced Concrete [D]
Pipe - Welded Steel
Precast Concrete Items
Precast Concrete Box Culverts
Preformed Filler (Expansion Joint Material)
Rubber Gaskets (for Concrete Pipe)
Seed, and Wood Cellulose Mulch
Sign Panels
Silt Fence
Sprinkler System and Water Control Devices
Steel Sign Posts
Sign Bridge Structures and Anchor Bolts[A]
Structural Concrete Coating (Acrylic)
Structural Glazed Tile and Ceramic Tile
Structural Plate (Structures) [A]
Treated Timber
Wood Fence (Sound Barrier)
Water Control Devices
Waterstops

D. Preapproved

The following items must be preapproved before use on construction projects. Preapproval will be in accordance with the product evaluation process as defined by Procedural Directive 3.1. After preapproval, the products will be accepted on Construction projects as defined by CDOT specifications, plans and standards .

Admixtures for Concrete
Cement
Cementitious Grouts
Class 5 Finish (Coating-cementitious)
Concrete Curing Compounds
Curing Materials (Structural Concrete) [C]
Concrete Repair Materials [C]
Fly Ash
Epoxy
Epoxy Grout
Hydrated Lime (Plant Approval Required) (All Types)
Preformed Joint Sealers
Reinforced Pile Tips
Silane and Siloxane Sealers
Silicone Joint Sealers
Structural Concrete Coatings (Acrylic) [B]

E. Other materials or products.

All other materials or products not mentioned above must be fabricated in accordance with and meet the requirements of the applicable Colorado Department of Transportation specifications, plans, and standards.

5. REJECTION/PAYMENT.

All items shall contain identification or physical markings to permit direct correlation between the material or product and preinspection/ pretesting reports, certified test reports, or certificates of compliance. Items that are delivered without proper preinspection/ pretesting, certified test reports or certificates of compliance or do not contain identification or physical markings will be rejected and shall not be paid for.

Notes:

A A Mill Test Report shall be included.

B A Certificate of Compliance shall be furnished with the material.

C A Certified Test Report shall be furnished with the material or product.

D The product or material must be accompanied by the appropriate CDOT form, # 249 or # 251

E A Certified Test Report(s) on components must accompany the material or product.

OVERSIGHT / NHS	
FHWA OVERSIGHT?	☐NO ☒YES
NATIONAL HIGHWAY SYSTEM?	☐NO ☒YES

DEPARTMENT OF TRANSPORTATION
STATE OF COLORADO

HIGHWAY CONSTRUCTION BID PLANS OF PROPOSED

FEDERAL AID PROJECT NO. IM-0703-264

STATE HIGHWAY NO. 70

SUMMIT AND CLEAR CREEK COUNTIES

CONSTRUCTION PROJECT CODE NO. 12982

RELATED PROJECTS:
P.E. UNDER PROJECT:
PROJECT NUMBER IM-0703-242
PROJECT CODE 12117
R.O.W. PROJECTS:
R.O.W. PROJECT DESCRIPTION

SOUTH BORE TUNNEL LIGHTING

TABULATION OF LENGTH & DESIGN DATA

STATION	LINEAR FEET	
	ROADWAY FEET	MAJOR STRUCTURE
WEST END OF CONTRACT APPROACH ROAD (I-70 EASTBOUND)	2640	NONE
EISENHOWER/JOHNSON MEMORIAL TUNNEL SOUTH TUNNEL (JOHNSON/I-70 EASTBOUND) STRUCTURE NO. F-13-X NORTH TUNNEL (EISENHOWER/I-70 WESTBOUND) STRUCTURE NO. F-12-Y	8960	EJMT-SOUTH TUNNEL & VENTILATION BUILDINGS
EAST END OF CONTRACT APPROACH ROAD (I-70 EASTBOUND)	2640	NONE
TOTAL	14240	

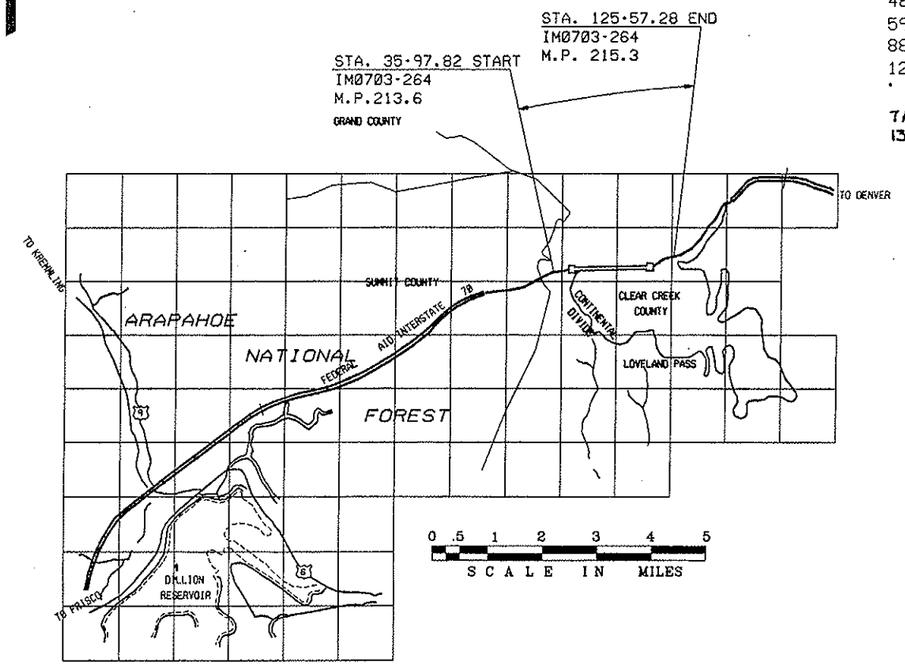
SUMMARY OF PROJECT LENGTH	FEET	MILES
ROADWAY (NET LENGTH) MAJOR STRUCTURE	8960	1.70
PROJECT GROSS LENGTH	14240	2.70
DESIGN DATA MINIMUM RADIUS OF CURVE(EXISTING) MAXIMUM GRADE (EXISTING) MINIMUM S.S.D HORIZONTAL(EXISTING) MINIMUM S.S.D VERTICAL (EXISTING) MAXIMUM DESIGN SPEED 1997-1998 TRAFFIC VOLUME	 3°30' 2.23% 350' 490' *65 MPH 25,787 ADT (EASTBOUND)	

* - POSTED SPEED LIMIT - 50 MPH.

N

SUMMIT AND CLEAR CREEK COUNTIES

SCALES OF ORIGINAL DRAWINGS ON PLANS AS SHOWN



SHEET NO.	INDEX OF SHEETS
1	TITLE SHEET
2	STANDARD PLANS LIST
3 TO 4	TYPICAL SECTIONS
5 TO 7	SUMMARY OF QUANTITIES
8	GENERAL PLAN AND BASELINES
9	LEGEND TO ELECTRICAL SYMBOLS
10 TO 28	TUNNEL ELECTRICAL DEMOLITION
29 TO 47	SOUTH TUNNEL LIGHTING PLANS
48 TO 58	TUNNEL LIGHTING DETAILS
59 TO 87	SOUTH TUNNEL POWER PLANS
88 TO 124	VENTILATION BUILDING ELECTRICAL
125 TO 157	TUNNEL TRAFFIC MANAGEMENT SYSTEMS (VMS, LUS & ITS)
7A	SUMMARY OF QUANTITIES
138A	VMS SIGN SUPPORT SECTION AND DETAILS

As Constructed

Sverdrup
260 MADISON AVENUE
NEW YORK, NEW YORK
212-481-9460

Design File Name: $DGNSSPEC$
Plot File Name: $PLOTFILE$
Date of Plot: $$$$DATE$$$$

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LAST MODIFICATION DATE: 01/04/2000	INITIALS: DJB	R-2
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DRAWING FILE NAME: GETS01.DWG		R-1
ACAD VER. R14 SCALE:AS NOTED	UNITS:English	R-1

INDEX OF REVISIONS		
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01/06/2000	94,95,96,118,121 & 124	
12/20/99	SHTS. 5,18,59,68,69,77,86,87	DJB
12/20/99	88,118,120,123,124,137,139,141	

COLORADO DEPARTMENT OF TRANSPORTATION
DOT DEPARTMENT OF TRANSPORTATION
P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W.G.

AS CONSTRUCTED	
NO REVISIONS:	
REVISED:	
VOID:	

CONTRACT INFORMATION	
CONTRACTOR	
RESIDENT ENGINEER:	WES GOFF
PROJECT ENGINEER:	NESSA N. ZISMAN
PROJECT STARTED -	ACCEPTED -
COMMENTS: -	

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 1

NOTE	PLAN NUMBER	M STANDARD TITLE	PAGE NUMBER
	M-100-1	STANDARD SYMBOLS	1
USE REVISED STANDARD	~~M-107-1~~	TEMPORARY EROSION CONTROL	2
	M-203-1	APPROACH ROADS	3
	M-203-2	DITCH TYPES	4
	M-203-10	SUPERELEVATION CROWNED HIGHWAYS	5
	M-203-11	SUPERELEVATION DIVIDED HIGHWAYS SHOULDER PIVOT	6
	M-203-12	SUPERELEVATION STREETS	7
	M-203-13	SUPERELEVATION DIVIDED HIGHWAYS CENTER PIVOT	8
USE PROJECT DETAILS D206-1A & -1B	~~M-206-1~~	EXCAVATION AND BACKFILL FOR STRUCTURES (3 SHEETS)	
	M-206-2	EXCAVATION AND BACKFILL FOR BRIDGES	12
	M-210-1	MAILBOX SUPPORTS (2 SHEETS)	13
	M-214-1	PLANTING DETAILS	15
USE REVISED M-412-1	~~M-412-1~~	CONCRETE PAVEMENT JOINTS	16
USE REVISED M-412-1	~~M-412-2~~	CURBED CONCRETE PAVEMENT JOINTS	17
	M-504-1	STEEL CRIBBING	18
	M-506-1	GABIONS AND SLOPE MATTRESS	19
	M-510-1	STRUCTURAL PLATE CULVERT PIPE H-20 LOADING	20
USE REVISED STANDARD	~~M-601-1~~	SINGLE CONCRETE BOX CULVERT (2 SHEETS)	21
USE REVISED STANDARD	~~M-601-2~~	DOUBLE CONCRETE BOX CULVERT (2 SHEETS)	23
USE REVISED STANDARD	~~M-601-3~~	TRIPLE CONCRETE BOX CULVERT (2 SHEETS)	25
USE REVISED STANDARD	~~M-601-10~~	HEADWALL FOR PIPE CULVERTS	27
	M-601-11	TYPE 'S' SADDLE HEADWALL FOR PIPE CULVERTS	28
	M-601-12	HEADWALLS AND CULVERT OUTLET PAVING	29
USE REVISED STANDARD	~~M-601-20~~	WINGWALLS FOR PIPE OR BOX CULVERTS	30
	M-603-1	METAL AND PLASTIC CULVERT PIPE (2 SHEETS)	31
	M-603-2	REINFORCED CONCRETE PIPE	33
	M-603-3	PRECAST CONCRETE BOX CULVERT	34
	M-603-10	CONCRETE AND METAL END SECTIONS (2 SHEETS)	35
	M-604-10	INLET, TYPE C	37
	M-604-11	INLET, TYPE D	38
	M-604-12	CURB INLET, TYPE R (2 SHEETS)	39
	M-604-13	CONCRETE INLET, TYPE 13	41
	M-604-20	MANHOLES (3 SHEETS)	42
	M-605-1	SUBSURFACE DRAINS	45
USE REVISED STANDARD	~~M-606-1~~	GUARDRAIL, TYPE 3, W-BEAM (12 SHEETS)	46
USE REVISED M-606-12 AND NEW M-606-13	~~M-606-12~~	GUARDRAIL, TYPE 4, CONCRETE BARRIER (6 SHEETS)	58

NOTE	PLAN NUMBER	M STANDARD TITLE	PAGE NUMBER
	M-607-1	WIRE FENCES AND GATES (2 SHEETS)	64
	M-607-2	CHAIN LINK FENCE (3 SHEETS)	66
	M-607-3	BARRIER FENCE	69
USE REVISED STANDARD	~~M-607-4~~	DEER FENCE AND GATE (2 SHEETS)	70
	M-607-10	PICKET SNOW FENCE	72
	M-608-1	CURB RAMPS	73
USE PROJECT DETAILS D609-1 & D609-2	~~M-609-1~~	CURBS AND GUTTERS	74
	M-611-1	CATTLE GUARD (2 SHEETS)	75
	M-613-1	CONVENTIONAL HIGHWAY LIGHTING (3 SHEETS)	77
	M-613-2	HIGH MAST LIGHTING (2 SHEETS)	80
USE REVISED STANDARD	~~M-614-1~~	RUMBLE STRIPS	82
	M-615-1	EMBANKMENT PROTECTOR, TYPE 3	83
	M-615-2	EMBANKMENT PROTECTOR, TYPE 5	84
	M-616-1	INVERTED SIPHON (ALSO USE APPLICABLE M-603)	85
	M-620-1	FIELD LABORATORY, CLASS 1	86
	M-620-2	FIELD LABORATORY, CLASS 2	87
	M-620-11	FIELD OFFICE, CLASS 1	88
	M-620-12	FIELD OFFICE, CLASS 2	89
USE REVISED STANDARD	~~M-629-1~~	SURVEY MONUMENTS (2 SHEETS)	90

PLAN NUMBER	S STANDARD TITLE	PAGE NUMBER
S-612-1	VARIABLE SPEED LIMIT SIGN	XX
S-612-2	TYPICAL DELINEATOR INSTALLATIONS (5 SHEETS)	93
S-614-1	TYPICAL GROUND SIGN PLACEMENT	98
S-614-2	CLASS I GROUND SIGN INSTALLATIONS	99
S-614-3	CLASS II GROUND SIGN INSTALLATIONS	100
S-614-4	CLASS III SIGNS, SHEET ALUMINUM PANELS (3 SHEETS)	101
S-614-5	BREAK-AWAY SIGN SUPPORT DETAILS FOR GROUND SIGNS (2 SHEETS)	104
S-614-6	CONCRETE FOOTINGS AND SIGN ISLANDS FOR CLASS III SIGNS (2 SHEETS)	106
S-614-10	TYPICAL MARKER ASSEMBLY INSTALLATIONS	108
S-614-11	MILEPOST SIGN AND INSTALLATION	109
S-614-12	STRUCTURE NUMBER INSTALLATION (BRIDGE INFORMATION SHEET)	110
S-614-14	FLASHING BEACON AND SIGN INSTALLATION (2 SHEETS)	111
S-614-20	TYPICAL POLE MOUNT SIGN INSTALLATION	113
S-614-21	CONCRETE BARRIER SIGN POST INSTALLATIONS	114
S-614-22	TYPICAL MULTI-SIGN INSTALLATIONS	115
S-614-40	TYPICAL TRAFFIC SIGNAL INSTALLATION (3 SHEETS)	116
S-627-1	TYPICAL PAVEMENT MARKINGS (4 SHEETS)	119
S-630-1	TRAFFIC CONTROLS FOR HIGHWAY CONSTRUCTION (9 SHEETS)	123
S-630-2	BARRICADES, DRUMS, CONCRETE BARRIERS (TEMP) & VERTICAL PANELS	132
S-630-3	FLASHING BEACON (PORTABLE) DETAILS	133
S-630-4	STANDARD CANTILEVER OF OVERHEAD VMS SUPPORT AND FOUNDATION	

NOTES:

1. USE M & S STANDARDS DATED NOVEMBER 1992.
2. THE M & S STANDARD PLANS LISTED ABOVE HAVE BEEN SUPPLEMENTED AND MODIFIED BY NEW AND REVISED STANDARD PLANS. THOSE NEW AND REVISED STANDARD PLANS SPECIFICALLY APPLICABLE TO THIS PROJRCT ARE LISTED ON THE TITLE SHEET. PROJECT SPECIFIC REVISIONS AND SUPPLEMENTS TO THESE PLAN ARE ALSO INCLUDED IN THIS PLAN SET.
3. ALL OF THE M & S STANDARD PLANS, AS SUPPLEMENTED AND REVISED, APPLY TO THIS PROJECT WHEN USED BY A DESIGNATED PAY ITEM.

Design File Name: DGNSPEC
Plot File Name: $PLOTFILE$
Date of Plot: $$$DATE$$$

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CREATION DATE: 02/26/99	INITIALS: CDOT
LAST MODIFICATION DATE: 11/05/99	INITIALS: CDOT
FULL PATH: 014102\700CADD\710STDS\	
DRAWING FILE NAME: GESP01.PLT	
ACAD VER. R14 SCALE: NONE	UNITS: ENGLISH

SHEET REVISIONS

COLORADO DEPARTMENT OF TRANSPORTATION

DOT DEPARTMENT OF TRANSPORTATION

P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775

REGION 1 MOUNTAIN RESIDENCY W.G.

AS CONSTRUCTED
NO REVISIONS:
REVISED:
VOID:

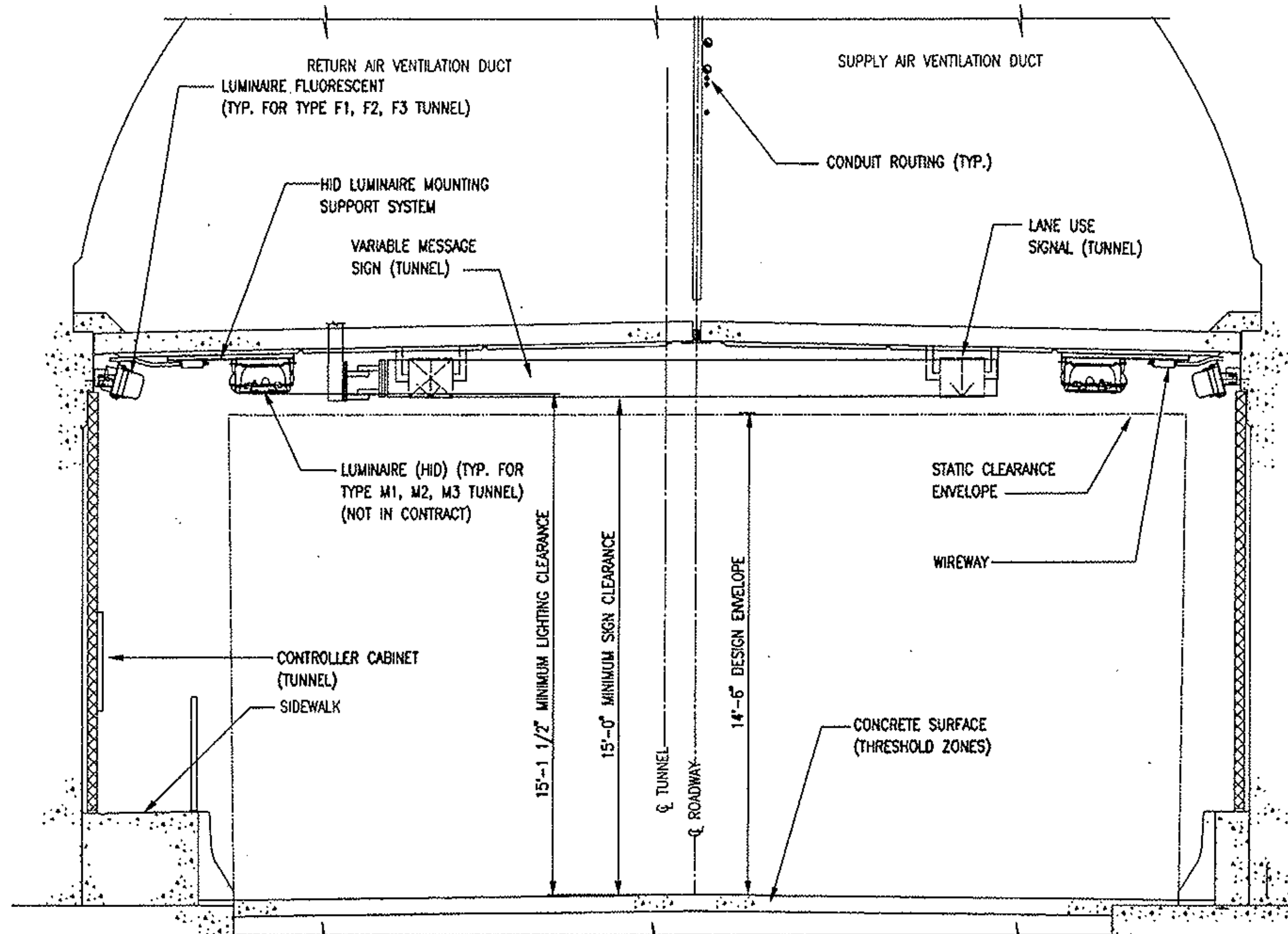
STANDARD PLANS LIST

DESIGNER: C.D.O.T. STRUCTURE NUMBERS
DETAILER: D. J. BURROUGHS
SHEET SUBSET: GENERAL SUBSET SHEETS: 1 OF 1

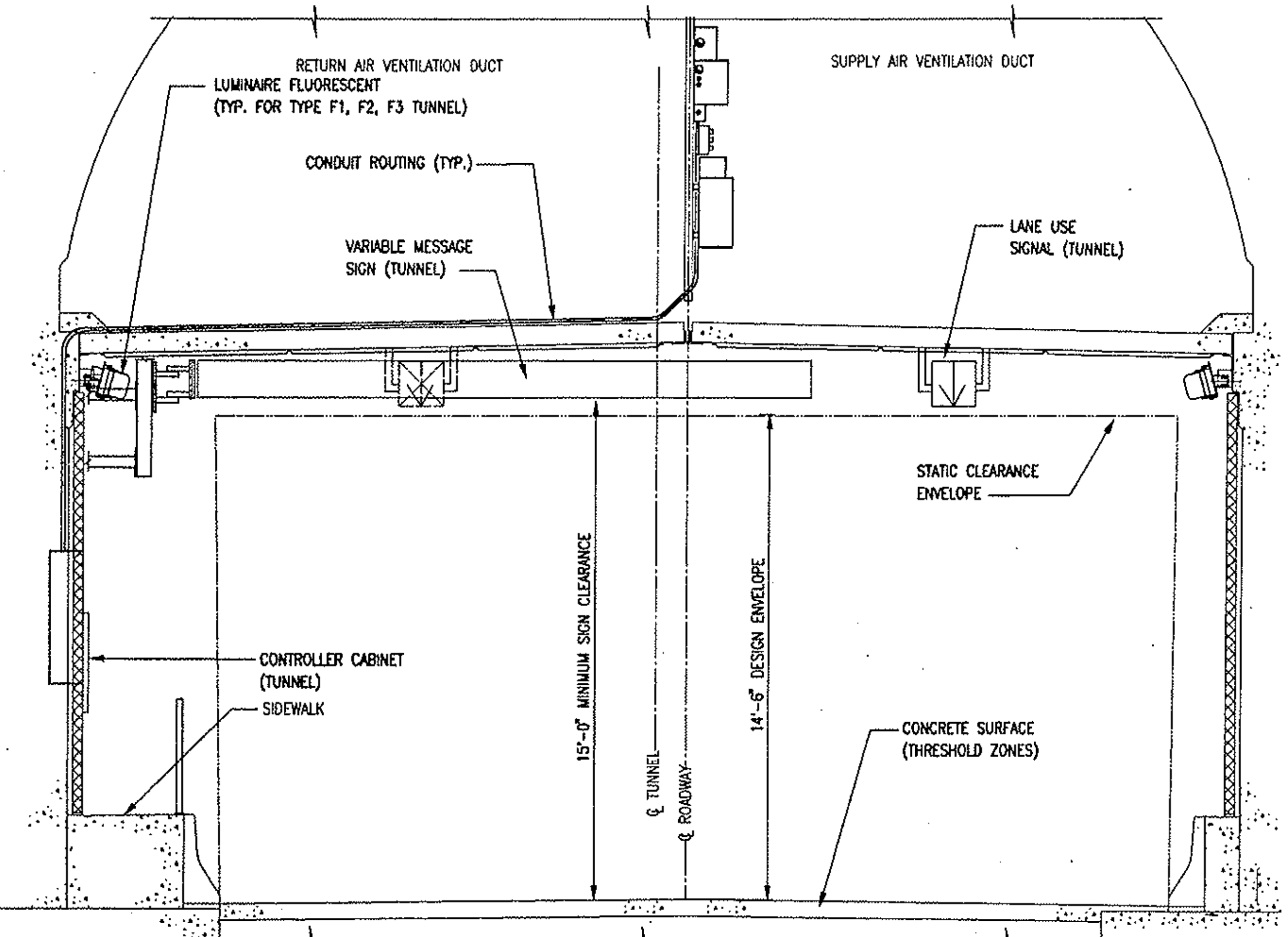
PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 2

NOTE:

A. ALL VERTICAL DIMENSIONS ARE TAKEN FROM THE HIGHPOINT OF THE ROADWAY.



TYPICAL SECTION LOOKING EAST (1)
AT VMS #1



TYPICAL SECTION LOOKING EAST (2)
AT VMS #2 THROUGH #11

0 3 6 12 FEET
3/8 "= 1'-0"

Design File Name: p:\014102\cathyplot\genty01.plt
Plot File Name: P:\PLOT\PAPER\genty01.prf
Date of Plot: 7/31/2000 (using STANDARD.TBL)

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Last Modification Date:	11/05/99	Initials:	DJB
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Drawing File Name:	genty01.dwg		
Acad Ver. R14	Scale: 3/8" = 1'-0"	Units:	ENGLISH

Sheet Revisions

Colorado Department of Transportation
P.O. BOX 399
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Region 1 Mountain Residency W.W.G.

As Constructed
No Revisions: 01/10/03
Revised:
Void:

TYPICAL SECTIONS
Designer: J. KROLL
Detailer: D. BURROUGHS
Structure Numbers
Sheet Subset: GENERAL
Subset Sheets: 1 of 2

Project No./Code
IM 0703-264
12982
Sheet Number 3

NOTES:

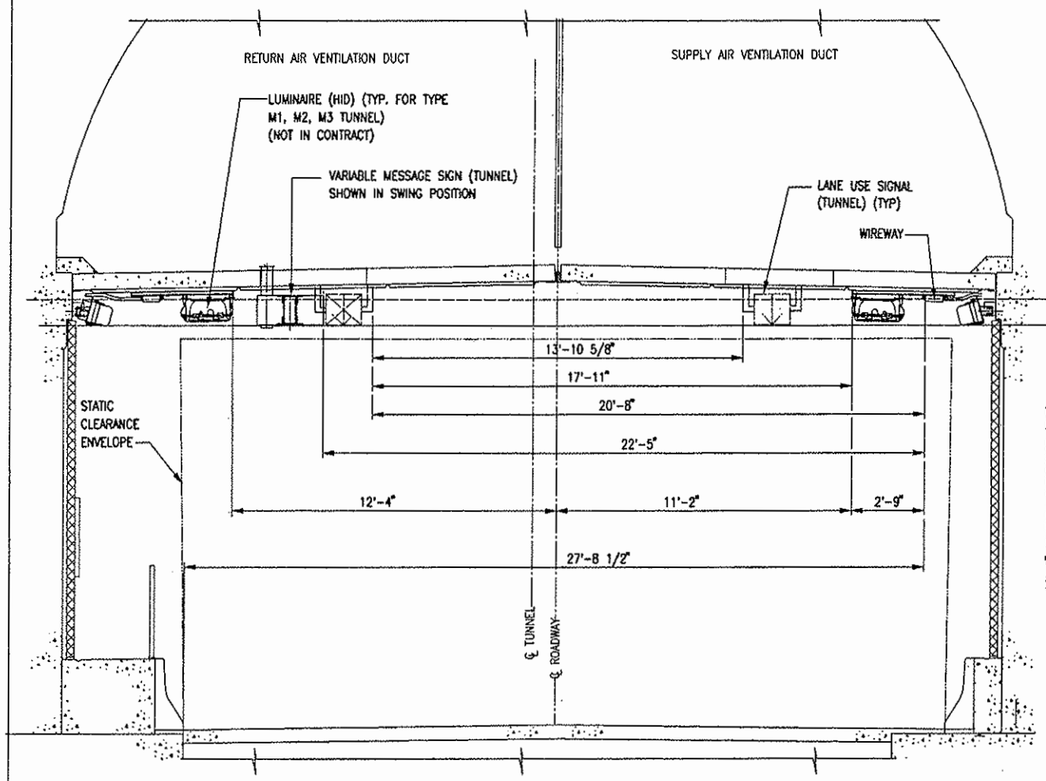
A. ALL CLEARANCES ARE BASED ON PHYSICAL DESIGN DIMENSIONS AS INDICATED ON DESIGN DRAWINGS. ACTUAL DIMENSIONS MAY VARY.

B. ALL VERTICAL DIMENSIONS ARE TAKEN FROM THE HIGHPOINT OF THE ROADWAY.

C. LANE USE SIGNALS AND LUMINAIRES (HID) ARE REMOVABLE WHEN REQUIRED.

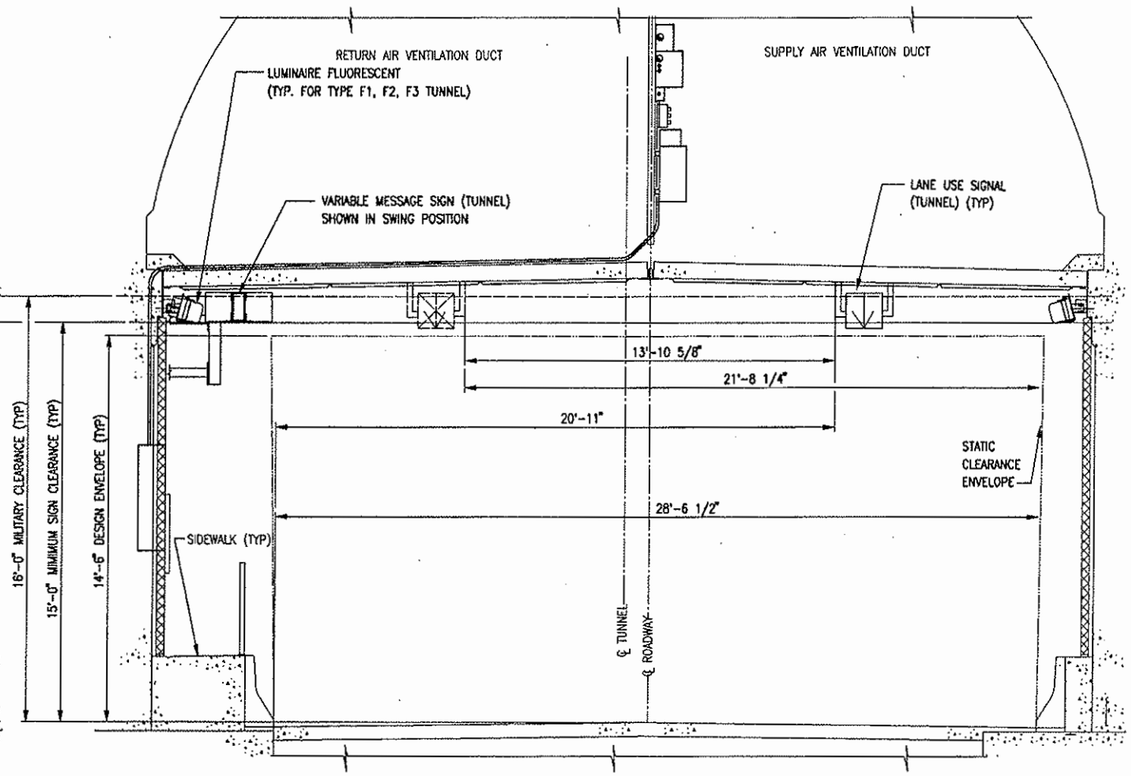
LEGEND:

- = 14'-6" DESIGN ENVELOPE
- = 15'-0" MIN. SIGN CLEARANCE
- = 16'-0" MILITARY CLEARANCE



TYPICAL SECTION LOOKING EAST — 1

AT VMS #1



TYPICAL SECTION LOOKING EAST — 2

AT VMS #2 THROUGH #11

0 3 6 12 FEET

3/8 "= 1'-0"

Design File Name: p:\014102\cathyplot\genty02.plt
Plot File Name: F:\PLOT\PAPER\genty02.prf
Date of Plot: 7/31/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	10/23/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:	014102\700cadd\710stds\		
Drawing File Name:	genty02.dwg		
Acad Ver. R14	Scale: 3/8" = 1'-0"	Units:	ENGLISH

Sheet Revisions		

Colorado Department of Transportation

CDOT DEPARTMENT OF TRANSPORTATION

P.O. BOX 399
DUMONT, CO. 80436
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Region 1 Mountain Residency W.W.G.

As Constructed	
No Revisions: 01/10/02	
Revised:	
Void:	

TYPICAL SECTION CLEARANCES

Designer:	J. KROLL	Structure Numbers	
Detailer:	D. BURROUGHS		
Sheet Subset:	GENERAL	Subset Sheets:	2 of 2

Project No./Code	
IM 0703-264	
12982	
Sheet Number	4

INDEX BOOK	INDEX PAGE	INDEX SHEET	CONTRACT ITEM NO.	CONTRACT ITEM	UNIT	ROADWAY PLAN	ROADWAY AS CONST.		PROJECT TOTALS PLAN	PROJECT TOTALS AS CONST.
			202-00725	Removal of Existing Lighting System	L S	1			1	1
			202-00750	Removal of Luminaire	EACH	2,200			~~2,200~~	1,992
			250-00010	Environmental Health and Safety Management	L S	1			1	1
			613-00075	3/4 inch Electrical Conduit	LF	8,510 (R-1)		(R-1)	~~8,510~~	10,759
			613-00100	1 inch Electrical Conduit	LF	800			~~800~~	4,132
			613-00125	1-1/4 Inch Electrical Conduit	LF	11,670 (R-1)		(R-1)	~~11,670~~	16,747
			613-00150	1-1/2 Inch Electrical Conduit	LF	9,960 (R-1)		(R-1)	~~9,960~~	9,893
			613-00200	2 Inch Electrical Conduit	LF	480			~~480~~	828
			613-00250	2-1/2 Inch Electrical Conduit	LF	5,172 (R-1)		(R-1)	~~5,172~~	4,677
			613-00300	3 Inch Electrical Conduit	LF	22,950 (R-1)		(R-1)	22,950	22,878
			613-00350	3-1/2 Inch Electrical Conduit	LF	1,360 (R-1)		(R-1)	1,360	1,150
			613-01200	2 Inch Electrical Conduit (Plastic)	LF	1,390			1,390	1,100
			613-01300	3 Inch Electrical Conduit (Plastic)	LF	2,380			2,380	2,760
			613-04125	1-1/4 Inch Electrical Conduit (Liquidtight Flexible Metal)	LF	380			380	66
			~~613-04200~~	~~2 Inch Electrical Conduit (Liquidtight Flexible Metal) Deleted by IOS~~	LF	130			130	0
			613-04250	2-1/2 Inch Electrical Conduit (Liquidtight Flexible Metal)	LF	40			40	14
			613-05500	Wireway	LF	1,753			1,753	1,680
			613-07026	Pull Box (16"x24"x12") Deep	EACH	42 (R-1)		(R-1)	42	39
			613-07033	Pull Box (24"x20"x12") Deep	EACH	6 (R-1)		(R-1)	6	6
			613-07044	Pull Box (42"x30"x6") Deep	EACH	59 (R-1)		(R-1)	59	56
			613-07180	Pull Box (24"x36"x36") Deep	EACH	8			8	8
			613-07200	2 Inch Electrical Body (Type LB)	EACH	4 (R-1)		(R-1)	4	2
			613-07210	2 Inch Electrical Conduit Body (Type TEE)	EACH	140			140	84
			613-10000	Wiring	L S	1			1	1.161
			613-12100	Luminaire Fluorescent (Type F1 Tunnel)	EACH	1,808			1,808	1,813
			613-12200	Luminaire Fluorescent (Type F2 Tunnel)	EACH	73			73	73
			613-12300	Luminaire Fluorescent (Type F3 Tunnel)	EACH	277			277	277
			613-15750	HID Luminaire Mounting Support System	L S	1			1	1
			613-50325	Tunnel Lighting Control System	L S	1			1	1
			613-50357	Power Transformer (150KVA,480-2400V,3 Phase)	EACH	1			1	1
			613-50359	Power Transformer (150KVA,2400-480V,3 Phase)	EACH	6			6	6

Design File Name: P:\DI4102\cathyplot\gano02.plt
Plot File Name: P:\PLOTS\PAPER\gano02.prf
Date of Plot: 1/30/2000 (using STANDARD.TBL)

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Last Modification Date: 16-Dec-1999	Initials:
Full Path: D:\12117	
Drawing File Name: 12982_SHEET5	
Acad Ver. R14 W Scale:	Units:

Sheet Revisions		
(R-1)	12/20/99	UPDATE QUANTITIES

Colorado Department of Transportation
DOT DEPARTMENT OF TRANSPORTATION
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Region 1 Mountain Residency W.W.G.

As Constructed	
No Revisions:	
Revised: 01/10/02	
Void:	

SUMMARY OF QUANTITIES

Designer:	J. WEAVER	Structure Numbers	
Detailer:	C. BAISLY		
Sheet Subset:	GENERAL	Subset Sheets:	1 OF 3

Project No./Code
IM 0703-264
12982
Sheet Number 5

INDEX			CONTRACT ITEM NO.	CONTRACT ITEM	UNIT	ROADWAY		PROJECT TOTALS	
BOOK	PAGE	SHEET				PLAN	AS CONST.	PLAN	AS CONST.
			613-50362	POWER TRANSFORMER (300KVA,480-2400V,3 PHASE)	EACH	1		1	1
			613-80022	CIRCUIT BREAKER (225A, 3 POLE)	EACH	1		1	1
			613-80044	CIRCUIT BREAKER (400A, 3 POLE)	EACH	1		1	1
			613-80120	CIRCUIT BREAKER (RETROFIT 1200A, 3 POLE)	EACH	2		2	2
			613-80200	2.4KV MOTOR CONTROL CENTER CUBICLE	EACH	2		2	2
			613-80250	AUTOMATIC TRANSFER SWITCH	EACH	2		2	2
			613-80270	MEDIUM VOLTAGE LOAD INTERRUPTER SWITCH	EACH	3		3	3
			613-80290	STORAGE BATTERY SYSTEM	L S	1		1	1
			613-80400	EXHAUST FAN	EACH	3		3	3
			613-81022	PANELBOARD (225A, 277/480V, 3 PHASE)	EACH	14		14	14
			613-81100	PANELBOARD (1000A, 277/480V, 3 PHASE)	EACH	2		2	2
			613-81500	PANELBOARD (5KVA MINI LOAD CENTER)	EACH	13		13	13
			614-10140	VARIABLE MESSAGE SIGN LED (DOUBLE FACED)	EACH	5		5	11
			614-10145	DELETED BY 105 ~~VARIABLE MESSAGE SIGN LED (SINGLE FACED)~~	EACH	1		1	0
			614-10240	LANE USE CONTROL SIGNAL LED (DOUBLE FACED)	EACH	14		14	44
			614-10245	~~LANE USE CONTROL SIGNAL LED (SINGLE FACED)~~ DELETED BY 105	EACH	2		2	0
			614-10300	VMS/LUS MANAGEMENT SOFTWARE	L S	1		1	1
			614-10320	SYSTEM INTERGRATION AND TESTING	L S	1		1	2.467
			614-10350	VMS MOUNTING SUPPORT AND WIRING (DOUBLE FACE	EACH	11		11	11
			614-10360	LUS MOUNTING SUPPORT AND WIRING (DOUBLE FACE	EACH	44		44	44
			614-10370	VMS & LUS MOUNTING SUPPORT AND WIRING (SINGLE FACED)	EACH	2		2	2
			614-72830	COMMUNICATIONS CABINET	EACH	2		2	2
			614-72856	RECESSED CONTROL CABINET	EACH	11		11	11
			614-72857	SURFACE MOUNTED CONTROL CABINET	EACH	2		2	2
			614-86245	CONTROLLER (TYPE 170E)	EACH	8		8	13
			614-87006	FIBER OPTIC TERMINATION PANEL - 6 FIBER	EACH	13		13	13
			614-87015	BUFFER TUBER FAN OUT KIT	EACH	34		34	34
			614-87020	OPTICAL TRANSCEIVER	EACH	17		17	17
			614-87025	OPTICAL TRANSCEIVER CHASSIS	EACH	1		1	1
			614-87040	CABLE INNERDUCT (1 INCH)	LF	29,750		29,750	29,750
			614-87144	FIBER OPTIC TERMINATION PANEL-144 FIBER	EACH	2		2	2
			614-87318	MASTER COMPUTER AND SOFTWARE	L S	1		1	1

Design File Name: DGN$SPEC$
Plot File Name: $PLOTFILE$
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION	
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LAST MODIFICATION DATE:	INITIALS:
FULL PATH: \12117	
DRAWING FILE NAME: 12982_SHEET6	
ACAD VER. R14 W	

SHEET REVISIONS

COLORADO DEPARTMENT OF TRANSPORTATION

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DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775

REGION 1 MOUNTAIN RESIDENCY W.W.G.

AS CONSTRUCTED
NO REVISIONS:
REVISED: 01/10/03
VOID:

SUMMARY OF QUANTITIES

DESIGNER: J. WEAVER
DETAILER: C. BAISL
STRUCTURE NUMBERS
SHEET SUBSET: GENERAL
SUBSET SHEETS: 2 OF 3

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 6

Contract Item No.	Contract Item	Unit	Roadway Plan	Roadway As Const.	Project Totals Plan	Project Totals As Const.
614-87407	FIBER OPTIC CABLE (MULTI MODE) (6 STRANDS)	LF	21,000		21,000	21,000
614-87413	FIBER OPTIC CABLE (MULTI MODE) (12 STRANDS)	LF	9,300		9,300	9,300
626-00000	MOBILIZATION	L S	1		1	1
	FORCE ACCOUNT **********					
700-70010	F/A MINOR CONTRACT REVISIONS	F A	1		1	
700-70020	~~F/A ON-THE-JOB TRAINEE~~ Deleted By 105	EACH	1		1	0
700-70022	~~F/A OJT PILOT~~ Deleted By 105	F A	1		1	0
700-70028	~~F/A ESB PROGRAM~~ Deleted By 105	F A	1		1	0
900-00007	Added Item (Each)/HID Fixture (Type M1)	EACH				482
900-00007	Added Item (Each)/HID Fixture (Type M2)	EACH				64
900-00007	Added Item (Each)/HID Fixture (Type M3)	EACH				38
700-70002	~~F/A Anticipated CMO Additional VMS Panels and Lighting~~ Deleted By 105	F/A				
900-00006	~~Assess Liquidated Damages~~ Deleted By 105	Dol.				0
900-00012	Added Item (Foot)/3 inch Electrical Conduit (Liquidtight Flexible Metal)	L.Foot				12
900-00007	Added Item (Each)/2 inch Mogul L.B. Conduit	Each				2
900-00007	Added Item (Each)/3 inch BUB Conduit	Each				9
900-00014	Added Item (Lump Sum)/Engineering Services	L.S.				1
900-00005	Added Item (Day)/Standby Time	Day				7
900-00014	Added Item (Lump Sum)/Battery Rack	L.S.				1
900-00007	Added Item (Each)/Photometer Poles	Each				2
900-00006	~~Added Item (Dollar)/Subcontractor Lien - US Communications Survey On~~ Deleted By 105	Dol.				0
900-00012	Added Item (Foot)/1½ inch Electrical Conduit (Liquidtight Flexible Metal)	L.F.				292
900-00014	Added Item (Lump Sum)/Circuit Breaker (Retrofit 1200A, 3 Pole) (Additional Work)	L.S.				1
900-00014	Added Item (Lump Sum)/2.4Kv Switch Modification	L.S.				1
900-00014	Added Item (Lump Sum)/Fiber Optic Breakout Kit	L.S.				1
900-00014	Added Item (Lump Sum)/Lighting Control Changes	L.S.				1
900-00007	Added Item (Each)/Unistrut Splice Plates	Each				750
900-00014	Added Item (Lump Sum)/"A" Bracket Change from Hinge to Tangle	L.S.				1
900-00007	Added Item (Each)/Additional Wall Mounting Plates	Each				153
900-00014	Added Item (Lump Sum)/Repair of Existing Wall Mounting Plates	L.S.				1
900-00014	Added Item (Lump Sum)/Partnering	L.S.				1
900-00014	Added Item (Lump Sum)/Additional Work for Mounting Recessed Control Cabinet	L.S.				1
900-00007	Added Item (Each)/Removal of Existing HID Light	Each				289 ~~289~~ AM
900-00014	Added Item (Lump Sum)/Modify Wireway	L.S.				1
900-00014	Added Item (Lump Sum)/Upgrade Master Computer	L.S.				1

COMPUTER FILE INFORMATION
CREATION DATE: 02-NOV-1999 INITIALS:
LAST MODIFICATION DATE: INITIALS:
FULL PATH: \12117
DRAWING FILE NAME: 12982_SHEET7
ACAD VER. R14 W

SHEET REVISIONS

COLORADO DEPARTMENT OF TRANSPORTATION

P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W.G.

AS CONSTRUCTED
NO REVISIONS:
REVISED: 01/10/03
VOID:

SUMMARY OF QUANTITIES
DESIGNER: J. WEAVER
DETAILER: C. BAISL
SHEET SUBSET: GENERAL
STRUCTURE NUMBERS
SUBSET SHEETS: 3 OF 3

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 7

INDEX			CONTRACT ITEM NO.	CONTRACT ITEM	UNIT	ROADWAY		PROJECT TOTALS	
BOOK	PAGE	SHEET				PLAN	AS CONST.	PLAN	AS CONST.
			900-00014	ADDED ITEM (LUMP SUM)/HID INTEGRATION AND TESTING	L.S.		1		1
			900-00014	ADDED ITEM (LUMP SUM)/ EXPANSION CONDUITS FOR THE FLUORESCENT WIREWAYS	L.S.		1		1
			900-00014	ADDED ITEM (LUMP SUM)/REMOVE AND REPLACE VMS SIGN #2	L.S.		1		1
			900-00014	ADDED ITEM (LUMP SUM)/LUMINAIRE MOUNTING BRACKETS	L.S.		1		1
			900-00014	ADDED ITEM (LUMP SUM)/MODIFY POSTAL SIGN SUPPORT	L.S.		1		1
			900-00014	ADDED ITEM (LUMP SUM)/MODIFY VMS STORS	L.S.		1		1
			900-00014	ADDED ITEM (LUMP SUM)/MODIFY VMS SUPPORTS	L.S.		1		1
			900-00014	ADDED ITEM (LUMP SUM)/170 E CONTROLLER PRICE INCREASE	L.S.		1		1
			900-00007	ADDED ITEM (EACH)/LANE USAGE SIGN (18 INCH) (SINGLE FACED)	EACH		4		4
			900-00007	ADDED ITEM (EACH)/BLACK OUT SIGN (18 INCH)	EACH		2		2
			900-00007	ADDED ITEM (EACH)/BLACK OUT SIGN (18 INCH) (SUPPLY ONLY)	EACH		1		1
			900-00014	ADDED ITEM (LUMP SUM)/ POSTAL BOS HARDWARE, SOFTWARE AND FIRMWARE MODIFICATIONS	L.S.		1		1
			900-00014	ADDED ITEM (LUMP SUM)/TRANSFORMERS AND 5KV SWITCH MODIFICATIONS	L.S.		1		1

Computer File Information		Sheet Revisions			
Creation Date: _____ Initials:					
Last Modification Date: _____ Initials: ____					
Full Path: _____					
Drawing File Name: ____					
Acad Ver. 2000					

Colorado Department of Transportation
CDOT DEPARTMENT OF TRANSPORTATION
P.O. BOX 399
DUMONT CO 80436
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Region 1 MOUNTAIN RESIDENCY W.W.G.

As Constructed	SUMMARY OF APPROXIMATE QUANTITIES		Project No./Code
No Revisions:	Designer:	Structure Numbers	IM 0703-264
Revised:	Detailer:		12982
Void:	Sheet Subset:	Subset Sheets:	Sheet Number: 7A

PI CURVE COORDINATES AND CURVE DATA

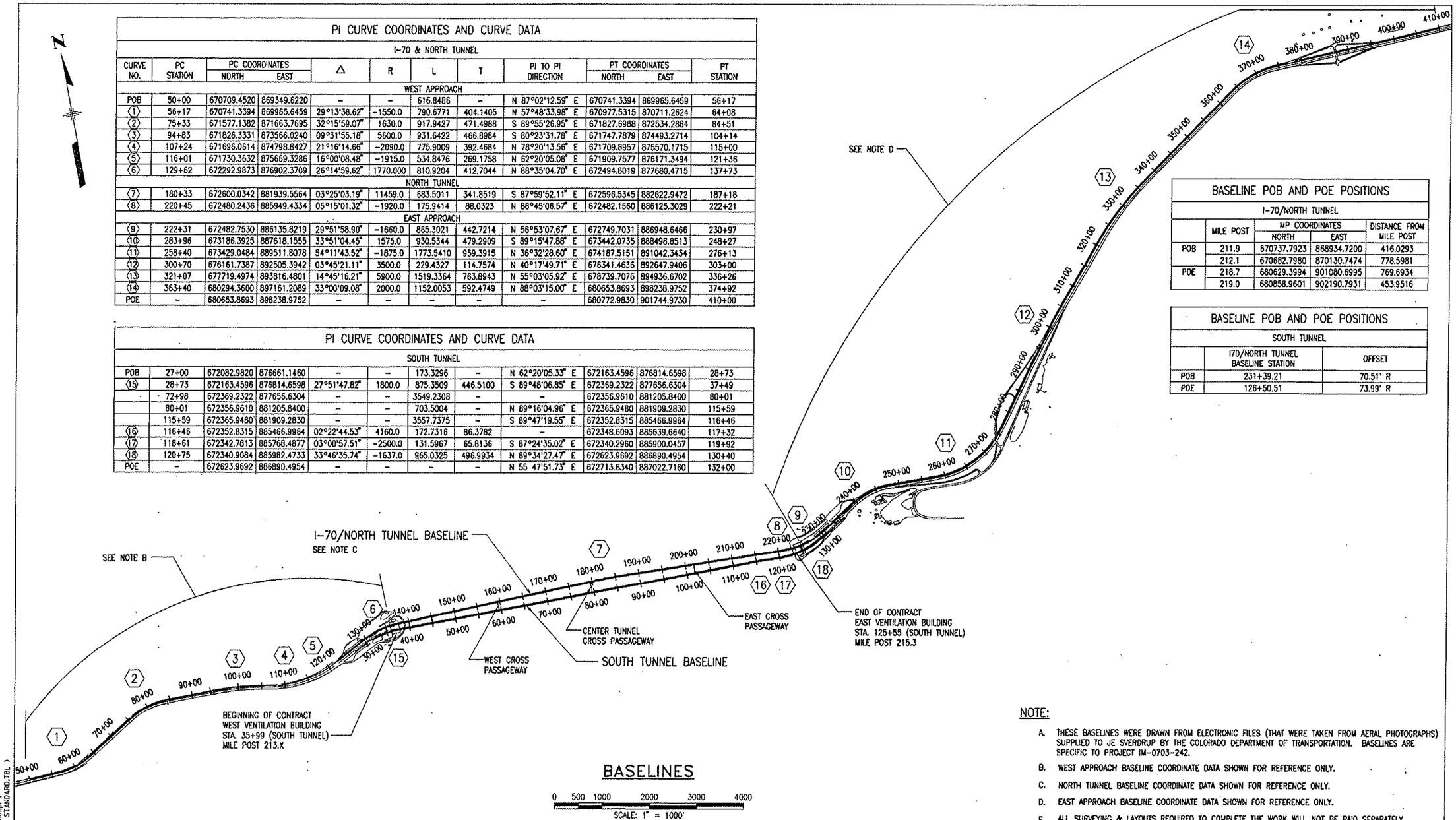
I-70 & NORTH TUNNEL

CURVE NO.	PC STATION	PC COORDINATES NORTH	PC COORDINATES EAST	Δ	R	L	T	PI TO PI DIRECTION	PT COORDINATES NORTH	PT COORDINATES EAST	PT STATION
					WEST APPROACH						
POB	50+00	670709.4520	869349.6220	-	-	616.8486	-	N 87°02'12.59" E	670741.3394	869965.6459	56+17
(1)	56+17	670741.3394	869965.6459	29°13'38.62"	-1550.0	790.6771	404.1405	N 57°48'33.98" E	670977.5315	870711.2624	64+08
(2)	75+33	671577.1382	871663.7695	32°15'59.07"	1630.0	917.9427	471.4988	S 89°55'26.95" E	671827.6988	872534.2884	84+51
(3)	94+83	671826.3331	873566.0240	09°31'55.18"	5600.0	931.6422	466.8984	S 80°23'31.78" E	671747.7879	874493.2714	104+14
(4)	107+24	671696.0614	874798.8427	21°16'14.66"	-2090.0	775.9009	392.4684	N 78°20'13.56" E	671709.8957	875570.1715	115+00
(5)	116+01	671730.3632	875669.3286	16°00'08.48"	-1915.0	534.8476	269.1758	N 62°20'05.08" E	671909.7577	876171.3494	121+36
(6)	129+62	672292.9873	876902.3709	26°14'59.62"	1770.000	810.9204	412.7044	N 88°35'04.70" E	672494.8019	877680.4715	137+73
					NORTH TUNNEL						
(7)	180+33	672600.0342	881939.5564	03°25'03.19"	11459.0	683.5011	341.8519	S 87°59'52.11" E	672596.5345	882622.9472	187+16
(8)	220+45	672480.2436	885949.4334	05°15'01.32"	-1920.0	175.9414	88.0323	N 86°45'06.57" E	672482.1560	886125.3029	222+21
					EAST APPROACH						
(9)	222+31	672482.7530	886135.8219	29°51'58.90"	-1660.0	865.3021	442.7214	N 56°53'07.67" E	672749.7031	886948.6466	230+97
(10)	283+96	673186.3925	887618.1555	33°51'04.45"	1575.0	930.5344	479.2909	S 89°15'47.88" E	673442.0735	888498.8513	248+27
(11)	258+40	673429.0484	889511.8078	54°11'43.52"	-1875.0	1773.5410	959.3915	N 36°32'28.60" E	674187.5151	891042.3434	276+13
(12)	300+70	676161.7387	892505.3942	03°45'21.11"	3500.0	229.4327	114.7574	N 40°17'49.71" E	676341.4636	892647.9406	303+00
(13)	321+07	677719.4974	893816.4801	14°45'16.21"	5800.0	1519.3364	763.8943	N 55°03'05.92" E	678739.7076	894936.6702	336+26
(14)	363+40	680294.3600	897161.2089	33°00'09.08"	2000.0	1152.0053	592.4749	N 88°03'15.00" E	680653.8693	898238.9752	374+92
POE	-	680653.8693	898238.9752	-	-	-	-	-	680772.9830	901744.9730	410+00

PI CURVE COORDINATES AND CURVE DATA

SOUTH TUNNEL

POB	27+00	672082.9820	876661.1460	-	-	173.3296	-	N 62°20'05.33" E	672163.4596	876814.6598	28+73
(15)	28+73	672163.4596	876814.6598	27°51'47.82"	1800.0	875.3509	446.5100	S 89°48'06.85" E	672369.2322	877656.6304	37+49
	72+98	672369.2322	877656.6304	-	-	3549.2308	-	-	672356.9610	881205.8400	80+01
	80+01	672356.9610	881205.8400	-	-	703.5004	-	N 89°16'04.96" E	672365.9480	881909.2830	115+59
	115+59	672365.9480	881909.2830	-	-	3557.7375	-	S 89°47'19.55" E	672352.8315	885466.9964	116+46
(16)	116+46	672352.8315	885466.9964	02°22'44.53"	4160.0	172.7316	86.3782	-	672348.6093	885639.6640	117+32
(17)	118+61	672342.7813	885768.4877	03°00'57.51"	-2500.0	131.5967	65.8136	S 87°24'35.02" E	672340.2960	885900.0457	119+92
(18)	120+75	672340.9084	885982.4733	33°46'35.74"	-1637.0	965.0325	496.9934	N 89°34'27.47" E	672623.9692	886890.4954	130+40
POE	-	672623.9692	886890.4954	-	-	-	-	N 55 47'51.73" E	672713.8340	887022.7160	132+00



BASELINE POB AND POE POSITIONS

I-70/NORTH TUNNEL

	MILE POST	MP COORDINATES NORTH	MP COORDINATES EAST	DISTANCE FROM MILE POST
POB	211.9	670737.7923	868934.7200	416.0293
	212.1	670682.7980	870130.7474	778.5981
POE	218.7	680629.3994	901080.6995	769.6934
	219.0	680858.9601	902190.7931	453.9516

BASELINE POB AND POE POSITIONS

SOUTH TUNNEL

	I70/NORTH TUNNEL BASELINE STATION	OFFSET
POB	231+39.21	70.51' R
POE	126+50.51	73.99' R

NOTE:

A. THESE BASELINES WERE DRAWN FROM ELECTRONIC FILES (THAT WERE TAKEN FROM AERAL PHOTOGRAPHS) SUPPLIED TO JE SVERDRUP BY THE COLORADO DEPARTMENT OF TRANSPORTATION. BASELINES ARE SPECIFIC TO PROJECT IM-0703-242.

B. WEST APPROACH BASELINE COORDINATE DATA SHOWN FOR REFERENCE ONLY.

C. NORTH TUNNEL BASELINE COORDINATE DATA SHOWN FOR REFERENCE ONLY.

D. EAST APPROACH BASELINE COORDINATE DATA SHOWN FOR REFERENCE ONLY.

E. ALL SURVEYING & LAYOUTS REQUIRED TO COMPLETE THE WORK WILL NOT BE PAID SEPARATELY, BUT WILL BE INCIDENTAL TO THE WORK..

Design File Name: p:\014102\catmyplot\gepl01.plt
Plot File Name: P:\PLOT\PAPER\gepl01.prf
Date of Plot: 1/31/2000 (using STANDARD.TBL)

Computer File Information			
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Last Modification Date: 11/05/99	Initials:	DJB	
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Drawing File Name:		gepl01.plt	
Acad Ver. R14	Scale: As Shown	Units: ENGLISH	

Sheet Revisions		

Colorado Department of Transportation
DOT DEPARTMENT OF TRANSPORTATION
P.O. BOX 399
DUMONT, CO. 80436
Phone: 303-512-5750 FAX: 303-512-5775
Region 1 Mountain Residency W.W.G.

As Constructed	
No Revisions: 01/10/03	
Revised:	
Void:	

GENERAL PLAN AND BASELINES

Designer: L F KEEGAN		Structure Numbers	
Detailer: C W BAISLY			
Sheet Subset: GENERAL	Subset Sheets: 1 OF 1		

Project No./Code	
IM 0703-264	
12982	
Sheet Number	8

CONDUIT, WIRE AND PLAN SYMBOLS

- EXPOSED CONDUIT
- CONDUIT CONCEALED, EMBEDDED OR BELOW GRADE
- CONDUIT TURNING TOWARDS VIEWER
- CONDUIT TURNING AWAY FROM VIEWER
- CONDUIT CHANGE IN ELEVATION
- 1 — CONSTRUCTION NOTES
- WATERTIGHT FLEXIBLE METAL CONDUIT
- P500 — CONDUIT CONTAINING CIRCUITS. (SEE CIRCUIT SCHEDULES FOR CONDUIT WIRE TYPE, SIZE, NUMBER AND CIRCUIT DESCRIPTION
- J — JUNCTION BOX
- JB-P500 — JUNCTION OR PULL BOX (DIMENSION ON PLAN)
- GROUND CONDUCTOR CONNECTION, BOLTED
- PE — PHOTOELECTRIC CONTROL SENSOR
- GFI — DUPLEX RECEPTACLE GFI- GROUND FAULT INTERRUPTER
- LIGHTING FIXTURE (HID)
- LIGHTING FIXTURE (FLUORESCENT)
- BREAK IN WIREWAY(S) TO ACCOMODATE VMS SIGN
- LANE USE SIGN LOCATION
- VARIABLE MESSAGE SIGN LOCATION
- EXISTING VARIABLE MESSAGE SIGN LOCATION
- INDICATES DEMOLITION ITEM(S)

DIAGRAM SYMBOLS

- 201 / 225 / 200 — MOLDED CASE AIR CIRCUIT BREAKER, THERMAL MAGNETIC TYPE, FRAME SIZE AS INDICATED (225), TRIP SETTING AS INDICATED (200), 3 POLE, 480 VOLT EXCEPT WHERE OTHERWISE INDICATED. "201" BREAKER DESIGNATION NUMBER.
- ELECTRICALLY OPERATED DRAWOUT, 480 VOLT POWER AIR CIRCUIT BREAKER. DUAL MAGNETIC TRIP UNDER VOLTAGE TRIP AS INDICATED.
- 120V-480V / CPT — FUSE AND CONTROL POWER TRANSFORMER
- CT / 600/5 — CURRENT TRANSFORMER (CT) RATING AS INDICATED
- (25) — MOTOR - HORSEPOWER AS INDICATED (25)
- DISCONNECT SWITCH (UNFUSED)
- (ETM) — ELASPED TIME METER - RESET TYPE
- (27) — UNDERVOLTAGE RELAY
- (46) — PHASE - BALANCE CURRENT RELAY
- (49) — THERMAL OVERLOAD RELAY
- (52C) — CIRCUIT BREAKER CLOSING COIL
- (52T) — CIRCUIT BREAKER TRIP COIL
- (50/GS) — INSTANTANEOUS OVERCURRENT GROUND RELAY
- (V) — VOLTMETER
- [VS] — VOLTMETER SWITCH
- [AS] — AMMETER SWITCH

- DRAWOUT DEVICE AS SPECIFIED
- LOCAL AND/OR REMOTE CONTROLS & INTERLOCKS (SEE ELEMENTARY DIAGRAMS)
- 600/100 — DUAL SPEED MOTOR (AS INDICATED) 600 HORSEPOWER (HIGHER SPEED) 100 HORSEPOWER (LOWER SPEED)
- 100E — FUSED LOAD AIR INTERRUPTER SWITCH WITH "E" RATED FUSES
- CL, CL, H, I1, I2, L — MULTI-SPEED, DRAWOUT TYPE, FAN MOTOR STARTER/CONTROLLER. H- HIGH SPEED, I1- INTERMEDIATE SPEED 1, I2- INTERMEDIATE SPEED 2, L- LOW SPEED, CL- CURRENT LIMITING (FUSE)
- 75 — POWER FACTOR CORRECTION CAPACITOR KVAR RATING AS INDICATED
- DRY-TYPE TRANSFORMER, DELTA PRIMARY-DELTA SECONDARY WINDINGS
- DRY-TYPE TRANSFORMER, DELTA PRIMARY-WYE SECONDARY WINDINGS
- 225 / AS / ST — MOLDED CASE CIRCUIT BREAKER- TRIP RATING AS INDICATED, 3 POLE UNLESS OTHERWISE INDICATED. ST INDICATES SHUNT TRIP. AS INDICATES AUXILARY ALARM SWITCH.
- 6 — LIGHTING OR POWER PANELBOARD NO. AS INDICATED
- H / L — CONTACTOR (MOTOR STARTER) COIL, LETTER DENOTES SPEED
- 50 A — OIL FUSE CUTOUT WITH FUSE LINE(S) AS INDICATED
- NORMALLY OPEN CONTACT
- NORMANALLY CLOSED CONTACT
- 52A — AUXILIARY CONTACT-OPEN WHEN BREAKER IS OPEN (NORMALLY OPEN)
- 52B — AUXILIARY CONTACT-CLOSED WHEN BREAKER IS OPEN (NORMALLY CLOSE)
- CS — CONTROL SWITCH (CLOSING)
- CS — CONTROL SWITCH (TRIPPING)
- E — ELECTRICAL INTERLOCK
- K — KEY INTERLOCK (KIRK-KEY)
- CONTROL SWITCH WITH KEY INTERLOCK SWITCH

ABBREVIATIONS

A	AMP
AWG	AMREICAN WIRE GAGE
BKR, CB, OR C/B	CIRCUIT BREAKER
BLDG	BUILDING
C	CONDUIT
CC	CROSSCUT
CKT	CIRCUIT
CPT	CONTROL POWER TRANSFORMER
CT	CURRENT TRANSFORMER
CU	COPPER
E	EVEN (NUMBER)
ELEC	ELECTRICAL
EM	EMERGENCY
EXIST.	EXISTING
GND	GROUND
GS	GROUND SENSOR
HID	HIGH INTENSITY DISCHARGE (LUMINAIRE)
HT	HEAT TRACE
INCL	INCLUDING
INT	INTERIOR ZONE
KV	KILOVOLT
LTG	LIGHTING
LUS	LANE USE SIGN
MB	MESSAGE BOARD
MV	MEDIUM VOLTAGE (2.4 KV TO 5.0 KV)
NO.	NORTH
O	ODD (NUMBER)
RI	CALLOUT FOR CONCRETE ROAD SURFACE
SO.	SOUTH
SS	STAINLESS STEEL
ST	SHUNT TRIP
STA	STATION
TH	THRESHOLD ZONE
THRESH	THRESHOLD
TR1	TRANSITION ZONE 1
TR2	TRANSITION ZONE 2
TR3	TRANSITION ZONE 3
TYP.	TYPICAL
V	VOLT
VENT	VENTILATION (BUILDING)
VMS	VARIABLE MESSAGE SIGN

Design File Name: DGNSPEC*
Plot File Name: $PLOTFILE*
Date of Plot: $$$$DATE$$$$

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LAST MODIFICATION DATE:	11/05/99	INITIALS:	DMO
FULL PATH:	14102\700CADD\710STDS		
DRAWING FILE NAME:		lgnd01.dwg	
ACAD VER. R14	SCALE: NTS	UNITS:	ENGLISH

SHEET REVISIONS			

COLORADO DEPARTMENT OF TRANSPORTATION
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REGION 1 MOUNTAIN RESIDENCY W.G.

AS CONSTRUCTED
NO REVISIONS: 01/10/03
REVISED:
VOID:

LEGEND TO ELECTRICAL SYMBOLS

DESIGNER: J. MILLS
DETAILER: S. DZUIBA
STRUCTURE NUMBERS
SHEET SUBSET: GENERAL
SUBSET SHEETS: 1 OF 1

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 9

SOUTH TUNNEL ELECTRICAL DEMOLITION NOTES:

1. THE MAIN OBJECTIVE SHALL BE TO MAINTAIN A FULLY FUNCTIONAL TUNNEL DURING CONSTRUCTION. ALL SOUTH LIGHTING, VMS, LUS OR ELECTRICAL DISTRIBUTION, DEMOLITION OR MOBILIZATION THAT REQUIRES LANE CLOSURE SHALL BE PERFORMED DURING OFF-PEAK TRAFFIC PERIODS AND COORDINATED WITH THE ENGINEER. SEE CONTRACT DOCUMENTS AND SPECIAL PROVISIONS TO THE SPECIFICATIONS FOR OTHER RESTRICTIONS.

2. PRIOR TO RE-OPENING OF A LANE TO TRAFFIC, INSURE EQUIPMENT, DEVICES AND ANCHORAGE ARE SECURE AND MEET CLEARANCE REQUIREMENTS. CLEAN-UP SHALL BE PERFORMED CONTINUOUSLY AND SHALL REMOVE AND PROPERLY DISPOSE OF ALL DEBRIS ON A DAILY BASIS.

3. DRAWINGS REPRESENT DIAGRAMMATIC LOCATIONS AND APPROXIMATE QUANTITIES. THE CONTRACTOR SHALL VERIFY THE LOCATION OF EXISTING UTILITIES AND SHALL EXERCISE SUITABLE CARE TO AVOID DISRUPTION OR DAMAGE OF UTILITIES OR EQUIPMENT TO REMAIN IN SERVICE. REPAIR DAMAGE ACCORDING TO THE PROVISIONS.

4. REFER TO ELECTRICAL DRAWINGS TO COORDINATE SUITABLE PHASING OF DEMOLITION AND NEW CONSTRUCTION. IMMEDIATELY NOTIFY THE ENGINEER IF CONCEALED UTILITIES, CONDUIT OR CONDITIONS ARE DISCOVERED THAT WILL INHIBIT NEW CONSTRUCTION INDICATED ON THE CONTRACT DOCUMENTS. CONTRACTOR TO PROPOSE RESOLUTIONS FOR APPROVAL BY THE ENGINEER.

5. MAINTAIN EMERGENCY CIRCUITING UNTIL RAPID CHANGE-OVER TO NEW EMERGENCY CIRCUITING OCCURS. ALL TEMPORARY WIRING SHALL COMPLY WITH THE NATIONAL ELECTRICAL CODE AND BE PRE-APPROVED BY THE ENGINEER. RE-LABEL ALL CIRCUIT BREAKERS WITH REVISED LOAD DESCRIPTIONS WHERE CONNECTED LOAD CHANGES HAVE OCCURED.

6. REUSE EXISTING PULLBOXES, CONDUIT OR PENETRATIONS WHERE SUITABLE, SUCH AS WHERE THE ELECTRICAL ROOM CONDUIT INTERFACES WITH THE TUNNEL. ANY ANTICIPATED REUSE OF EXISTING ITEMS SHALL FIRST BE APPROVED IN WRITING BY THE ENGINEER.

7. WHERE EQUIPMENT OR DEVICE IS INDICATED AS REMOVED, REMOVE EXISTING EXPOSED CONDUIT IN ITS ENTIRETY TO WHERE IT IS EMBEDDED OR CONCEALED. RETAIN 18' OF SURPLUS CONDUCTOR LENGTH, TAPE ENDS AND PERMANENTLY MARK TO IDENTIFY SOURCE. INSTALL NEW JUNCTION BOX AND INSERT SURPLUS CONDUCTOR LENGTH INTO BOX. PLUG ALL HOLES AND ADD BLANK COVERPLATE. INSIDE OF TUNNELS, PROVIDE HIGH DENSITY POLYETHYLENE GASKETS TO WITHSTAND HIGH PRESSURE WASHDOWN. AT SUPPLY END, DISCONNECT CONDUCTOR AND MAKE SAFE. ABANDON IN THE SAME MANNER WITH PERMANENT MARKING TO INDICATE DESTINATION, SUCH AS 'TUNNEL SO. WALL, STA 60+00'.

8. WHERE CONDUIT IS PERMANENTLY REMOVED ON BOTH SIDES OF A PENETRATION, SEAL HOLE WITH 2-HOUR RATED FIRESTOP. PATCH HOLES IN TUNNEL GLAZED CERAMIC WALLS AND ENAMELED CEILING PANELS PER TUNNEL MAINTENANCE PROCEDURES, TO MATCH EXISTING FINISH.

9. SAWCUT AND CAREFULLY REMOVE THE MINIMUM AMOUNT OF TUNNEL GLAZED CERAMIC WALL AS REQUIRED TO INSTALL (RECESS) THE VMS/LUS SIGN CONTROLLER CABINETS AND ASSOCIATED CONDUIT. STORE SALVAGABLE GLAZED UNITS FOR FUTURE REUSE AND/OR PATCHING.

10. ASBESTOS ABATEMENT PROCEDURES SHALL BE UTILIZED IN THE VENTILATION BUILDING FIRST FLOOR AREA & CONTROL ROOM CEILINGS. TEST OTHER AREAS THAT MAY BE SUSPECT AND PROVIDE A WRITTEN REPORT OF FINDINGS TO THE ENGINEER AND SHALL BE HANDLED IN ACCORDANCE TO SECTION 250 OF THE SPECIFICATIONS.

11. LOW LEVEL LEAD CONTAMINATION MAY BE PRESENT IN VENTILATION DUCTS AND SHALL BE HANDLED IN ACCORDANCE WITH SECTION 250 OF THE SPECIFICATIONS.

12. PROVIDE TEMPORARY CONNECTION BETWEEN ADJACENT FLUORESCENT LIMINAIRES AT VMS LOCATIONS AS REQUIRED. INSTALL LIQUIDTIGHT FLEXIBLE CONDUIT AND MATCH SIZE AND TYPE OF CIRCUIT CONDUCTORS.

SOUTH TUNNEL LIGHTING DEMOLITION NOTES

13. REMOVE ALL SOUTH TUNNEL LIGHTING IN ITS ENTIRETY.

14. FOR SOUTH TUNNEL LIGHTING DEMOLITION DETAIL, SEE SHEET 5.

15. CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER DISPOSAL OF LUMINAIRES AND LAMPS. LAMPS TO BE REMOVED FROM ALL LUMINAIRES AND SENT TO LICENSED RECEIVER. BALLASTS TO BE SEALED INTO 55 GALLON DRUMS, AND DISPOSED OF BY LICENSED ABATEMENT TRANSPORTER AS PER SPECIFICATIONS.

QUANTITIES - SOUTH TUNNEL ELECTRICAL DEMOLITION

ITEM NUMBER	DESCRIPTION	UNIT	ROADWAY	
			PLAN	AS CONST.
202	REMOVAL OF LUMINAIRE	EACH	2200	1,992
202	REMOVAL OF EXISTING LIGHTING SYSTEM	LS	1	1
250	ENVIRONMENTAL HEALTH AND SAFETY MANAGEMENT	LS	1	1

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Plot File Name: $PLOTFILE=
Date of Plot: $$$$DATE$$$$

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FULL PATH:	14102\700CADD\703ELECT\		
DRAWING FILE NAME:	gesno01.dwg		
ACAD VER. R14	SCALE: NTS	UNITS:	

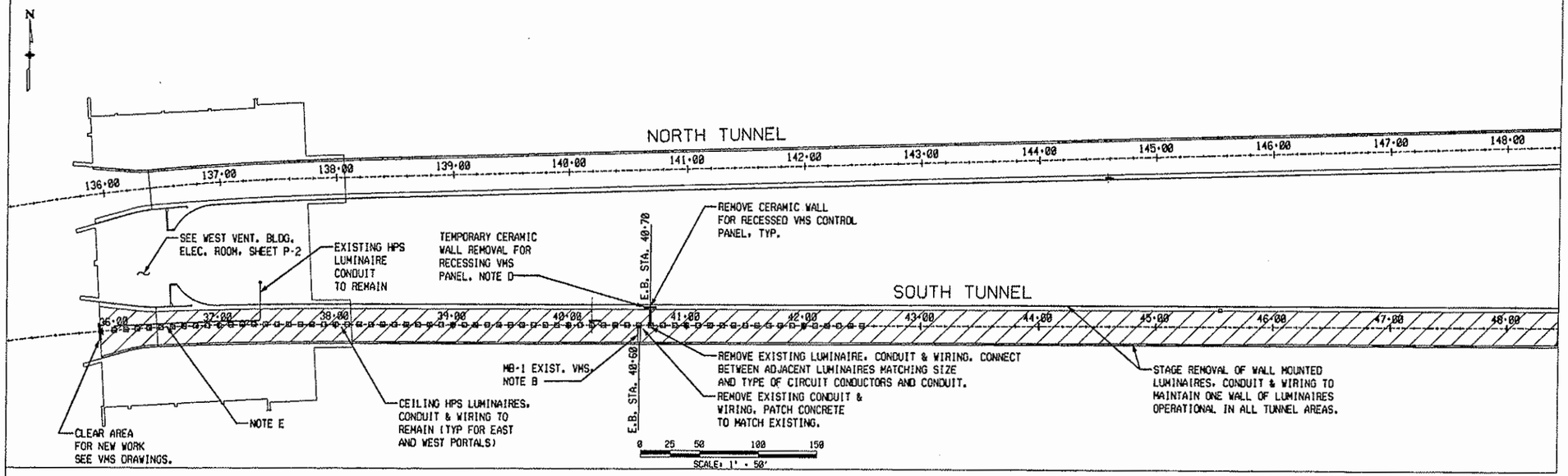
SHEET REVISIONS		

COLORADO DEPARTMENT OF TRANSPORTATION
DOT
P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W. W. G.

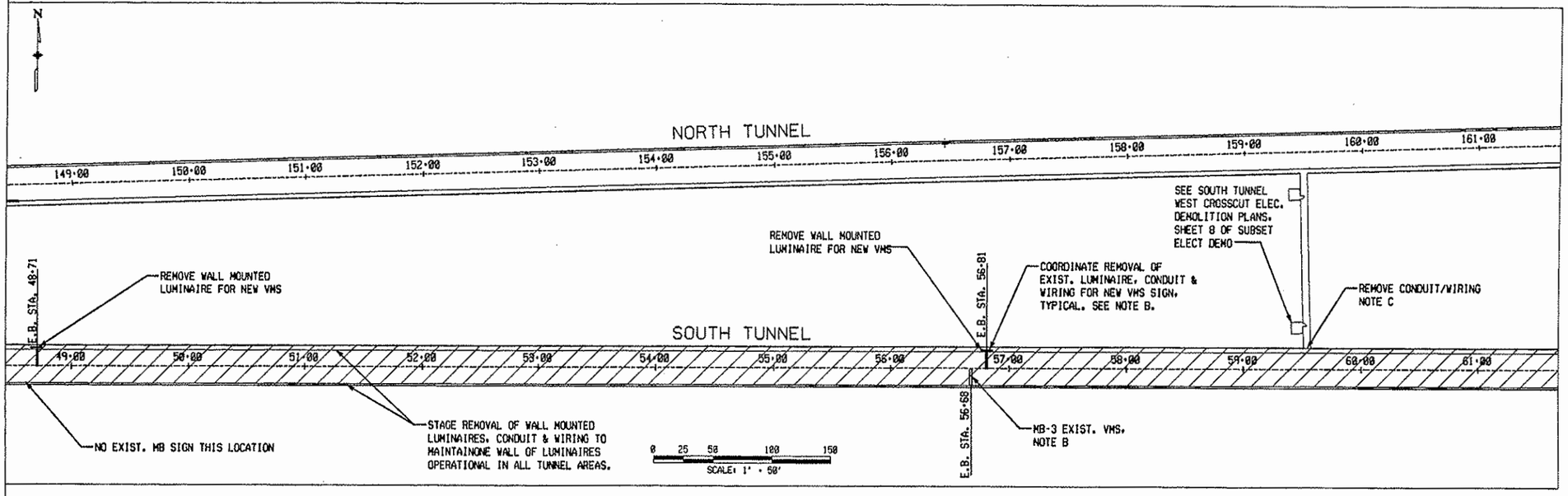
AS CONSTRUCTED	
19	
NO REVISIONS:	
REVISED:	
VOID:	

TUNNEL ELECTRICAL DEMO NOTES & QUANTITIES			
DESIGNER: J. MILL	STRUCTURE NUMBERS		PROJECT NO./CODE
DETAILER: S. DZUIBA			IM 0703-264
SHEET SUBSET: ELECT DEMO	SUBSET SHEETS:	1 OF 19	12982
			SHEET NUMBER 10

014102\710STDS\BORDERIN.DGN



PLAN 1



PLAN 2

NOTES:

A. SEE GENERAL DEMOLITION NOTES. SHEET 1 OF SUBSET ELECT DEMO.

B. REFER TO VMS DRAWINGS FOR REMOVALS AND ASSOCIATED WORK..

C. SPACE FOR CONDUIT ROUTING FROM TUNNEL INTO CROSSCUT PASSAGE-WAY IS LIMITED. CONTRACTOR SHALL COORDINATE PHASING SUITABLE TO MAINTAIN THE TUNNEL OPERATION PROVIDE TEMPORARY WIRING AS REQUIRED.

D. STRUCTURAL WALL IS APPROXIMATELY 12" BEHIND THE SURFACE OF THE GLAZED CERAMIC TUNNEL WALL. CONTRACTOR SHALL VERIFY IN FIELD. SEE VMS DRAWINGS.

E. CONTRACTOR TO PROVIDE PLANKING IN AREA OF SUSPENDED CEILINGS @ TUNNEL PORTAL AREAS.

Design File Name: DGNSPEC=
Plot File Name: $PLOTFILE=
Date of Plot: $$$$DATE$$$$

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LAST MODIFICATION DATE: 11/05/99	INITIALS: SFD
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ACAD VER. R14 SCALE: 1"=50'-0"	UNITS:

SHEET REVISIONS			

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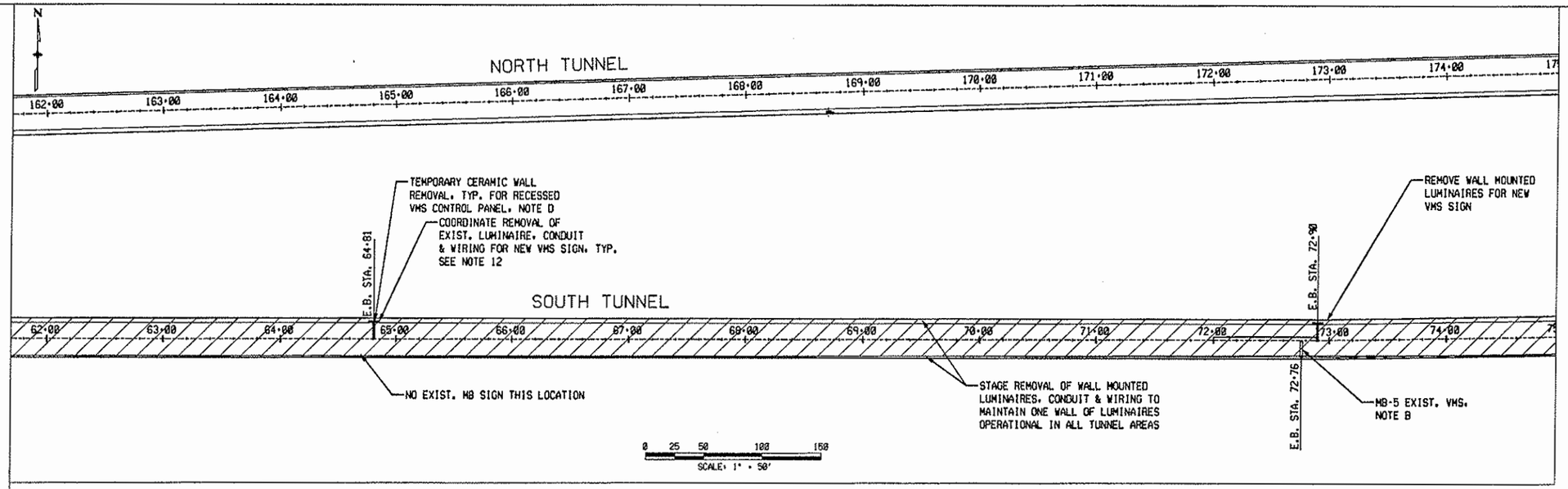
W. W. G.

AS CONSTRUCTED
NO REVISIONS: 01/10/03
REVISED:
VOID:

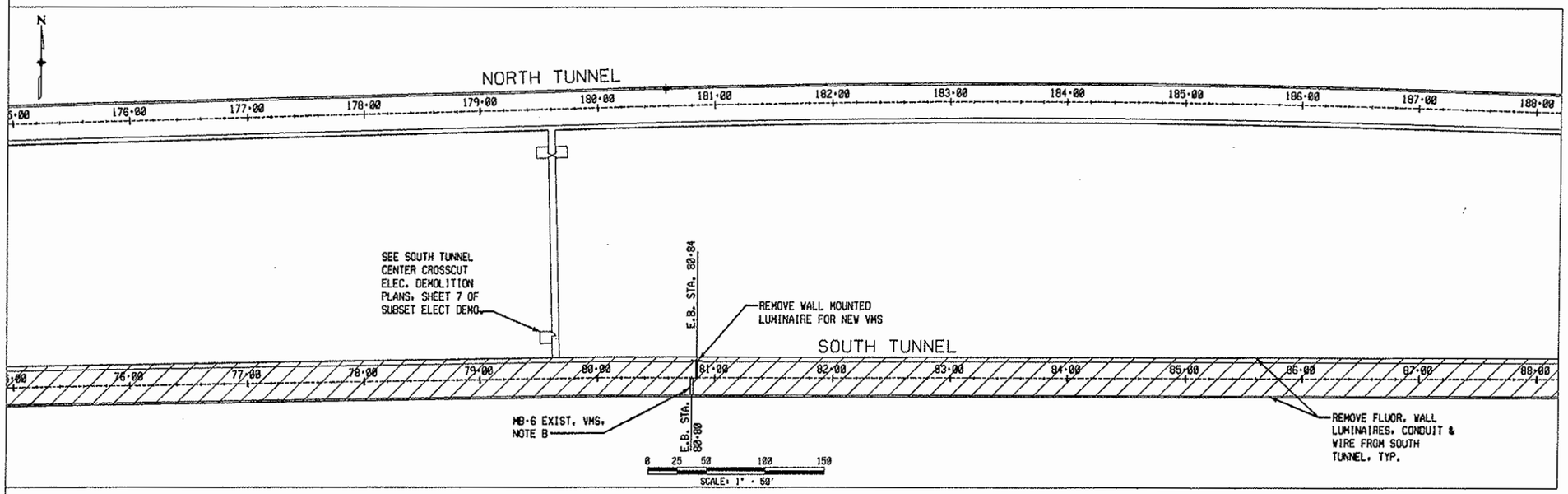
TUNNEL ELECTRICAL DEMO PLAN - SHEET 1 OF 4

DESIGNER: A. HARLICK	STRUCTURE NUMBERS		
DETAILER: S. DZUIBA			
SHEET SUBSET: ELECT DEMO	SUBSET SHEETS: 2 OF 19		

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 11



PLAN 1



PLAN 2

NOTES:

A. SEE GENERAL DEMOLITION NOTES, SHEET 7 OF SUBSET ELEC DEMO.

B. REFER TO VMS DRAWING FOR REMOVALS AND ASSOCIATED WORK.

C. SPACE FOR CONDUIT ROUTING FROM TUNNEL INTO CROSSCUT PASSAGEWAY IS LIMITED. CONTRACTOR SHALL COORDINATE PHASING REQUIRED TO MAINTAIN TUNNEL OPERATION. PROVIDE TEMPORARY WIRING AS REQUIRED.

D. STRUCTURAL WALL IS APPROXIMATELY 12" BEHIND THE SURFACE OF THE GLAZED CERAMIC TUNNEL WALL. CONTRACTOR SHALL VERIFY IN THE FIELD. SEE VMS DRAWINGS.

Design File Name: DGN\$SPEC\$
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SHEET REVISIONS		

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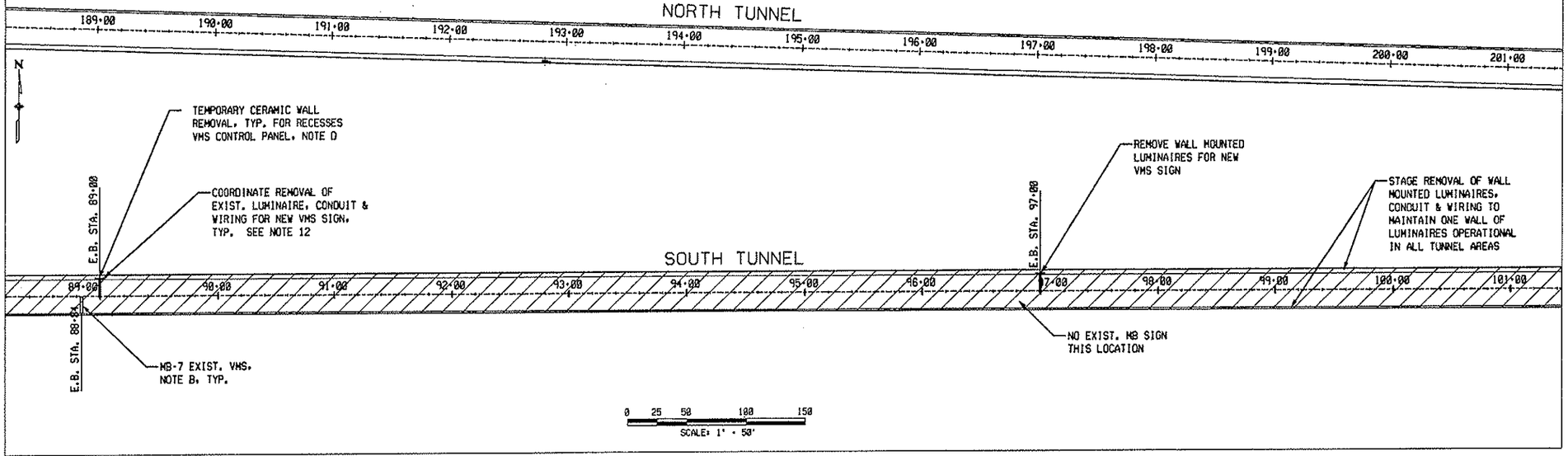
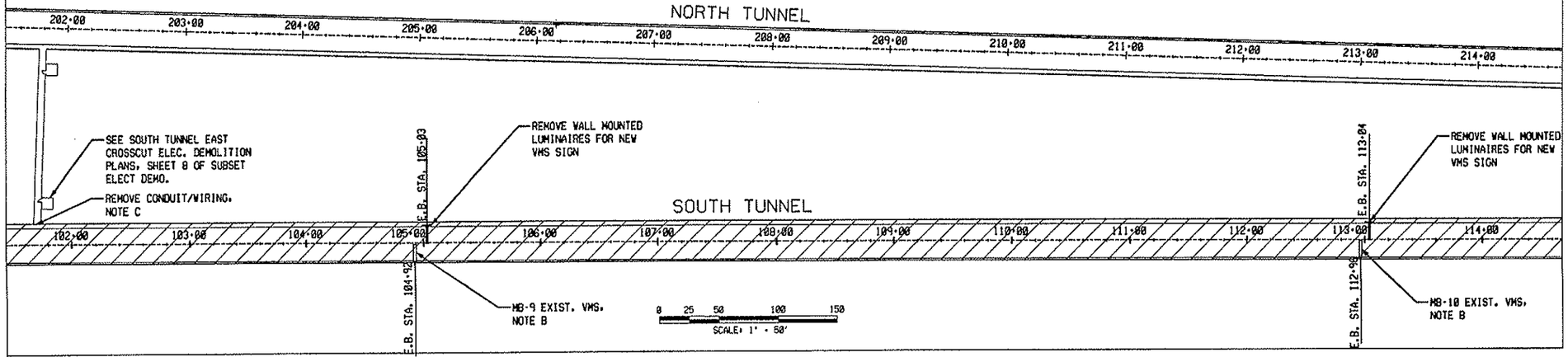
AS CONSTRUCTION	
NO REVISIONS: 01/10/03	
REVISED:	
VOID:	

TUNNEL ELECTRICAL DEMO PLAN - SHEET 2 OF 4		
DESIGNER: A. HARLICK	STRUCTURE NUMBERS	
DETAILER: S. DZUIBA		
SHEET SUBSET: ELECT DEMO	SUBSET SHEETS: 3 OF 19	

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 12



PLAN 1



PLAN 2

NOTES:

A. SEE GENERAL DEMOLITION NOTES, SHEET 7 OF SUBSET ELEC DEMO.

B. REFER TO VMS DRAWING FOR REMOVALS AND ASSOCIATED WORK.

C. SPACE FOR CONDUIT ROUTING FROM TUNNEL INTO CROSSCUT PASSAGEWAY IS LIMITED. CONTRACTOR SHALL COORDINATE PHASING REQUIRED TO MAINTAIN TUNNEL OPERATION. PROVIDE TEMPORARY WIRING AS REQUIRED.

D. STRUCTURAL WALL IS APPROXIMATELY 12" BEHIND THE SURFACE OF THE GLAZED CERAMIC TUNNEL WALL. CONTRACTOR SHALL VERIFY IN THE FIELD. SEE VMS DRAWINGS.

Design File Name: DGNSPEC
Plot File Name: $PLOTFILE
Date of Plot: $$$$DATE$$$$

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LAST MODIFICATION DATE:	11/05/99	INITIALS: DMO
FULL PATH:	14102\700CADD\703ELECT\	
DRAWING FILE NAME:	rme103.dwg	
ACAD VER. R14	SCALE: 1"=50'-0"	UNITS:

SHEET REVISIONS			

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NO REVISIONS: 01/10/03	
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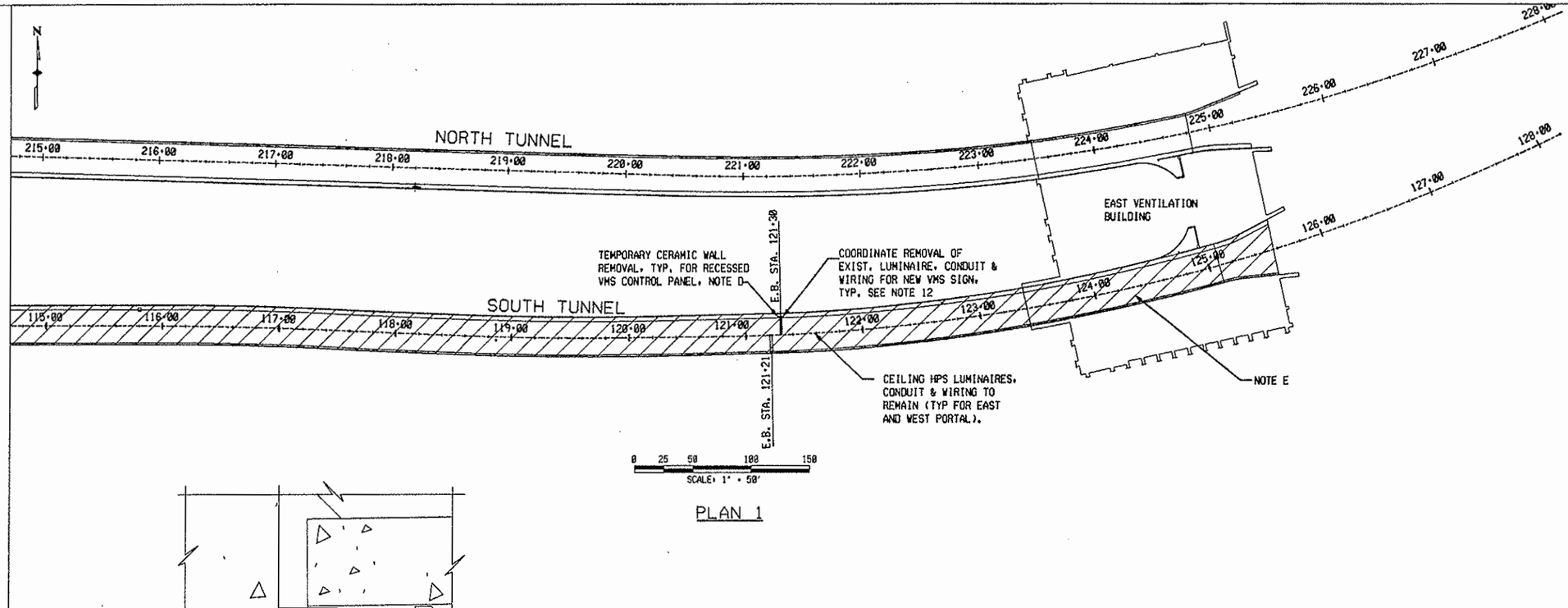
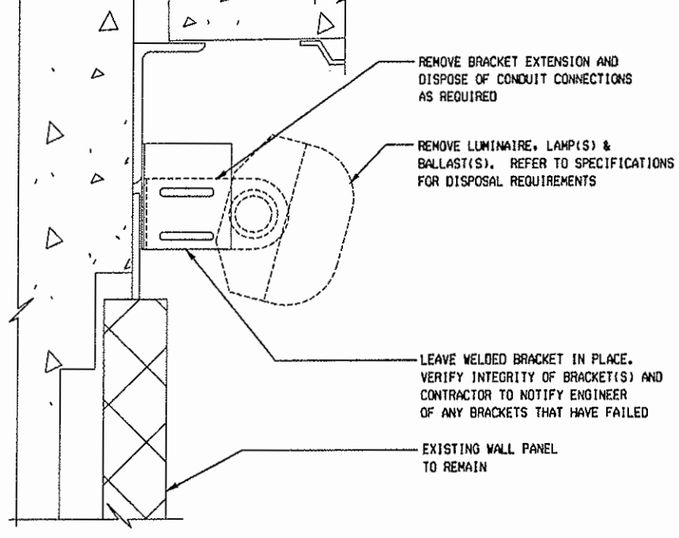
TUNNEL ELECTRICAL DEMO PLAN - SHEET 3 OF 4		
DESIGNER: A. HARLICK	STRUCTURE NUMBERS	
DETAILER: S. DZUIBA		
SHEET SUBSET: ELECT DEMO	SUBSET SHEETS: 4 OF 19	

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 13



PLAN 1



SOUTH TUNNEL WALL
TYPICAL DETAIL (NOT TO SCALE)

NOTES:

A. SEE GENERAL DEMOLITION NOTES, SHEET 7 OF SUBSET ELEC DEMO.

B. REFER TO VMS DRAWING FOR REMOVALS AND ASSOCIATED WORK.

C. SPACE FOR CONDUIT ROUTING FROM TUNNEL INTO CROSSCUT PASSAGEWAY IS LIMITED. CONTRACTOR SHALL COORDINATE PHASING REQUIRED TO MAINTAIN TUNNEL OPERATION. PROVIDE TEMPORARY WIRING AS REQUIRED.

D. STRUCTURAL WALL IS APPROXIMATELY 12" BEHIND THE SURFACE OF THE GLAZED CERAMIC TUNNEL WALL. CONTRACTOR SHALL VERIFY IN THE FIELD. SEE VMS DRAWINGS.

E. CONTRACTOR TO PROVIDE PLANKING IN AREA OF SUSPENDED CEILINGS AT TUNNEL PORTAL AREAS.

Design File Name: DGNSPEC
Plot File Name: $PLOTFILE$
Date of Plot: $$$$DATE$$$$

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ACAD VER. R14 SCALE: "=50'-0"	UNITS:

SHEET REVISIONS		

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AS CONSTRUCTED	
NO REVISIONS: 01/10/03	
REVISED:	
VOID:	

TUNNEL ELECTRICAL DEMO PLAN - SHEET 4 OF 4

DESIGNER: A. HARLICK	STRUCTURE NUMBERS		PROJECT NO./CODE: IM 0703-264
DETAILER: S. OZUIBA			12982
SHEET SUBSET: ELECT DEMO	SUBSET SHEETS: 5 OF 19		SHEET NUMBER 14

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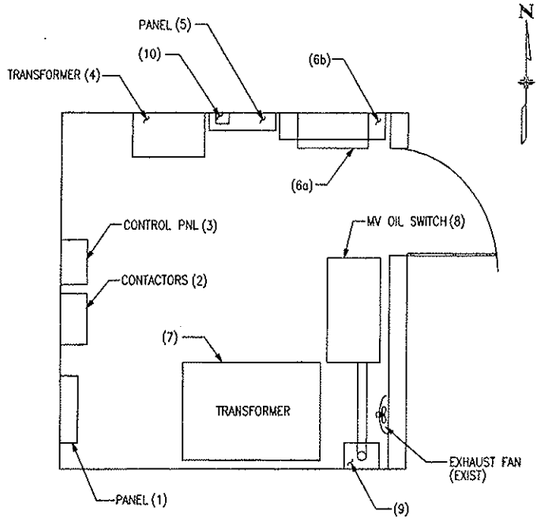
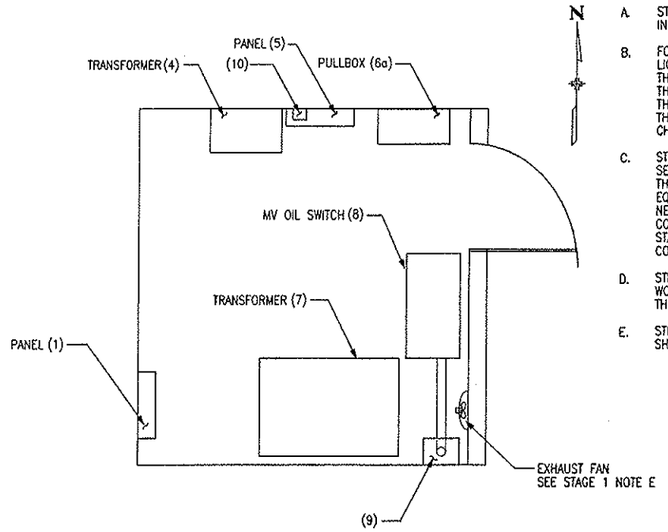
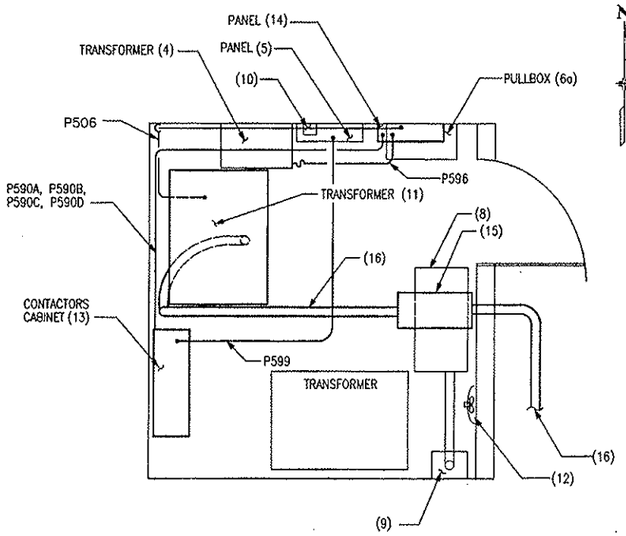


EXISTING PLAN



INTERIM PLAN – STAGE 1

(SEE STAGE 1 CONSTRUCTION NOTES)



INTERIM PLAN – STAGE 2

(SEE STAGE 2 CONSTRUCTION NOTES)

EXISTING PLAN LEGEND

(1) 480 / 277 V PANELBOARD – 22"W x 65"H x 6"D
(2) LIGHTING AND HEATING CONTACTOR PANEL
(3) LIGHTING CONTROL PANEL – 15"W x 20"H x 9"D
(4) 15 KVA, 480 V – 208Y / 120 V TRANSFORMER
(5) 208 / 120 V LITS PANEL – 22"W x 40"H x 6"D
(6a) PULLBOX (TOP) FOR LV CABLES – 24"W x 12"H x 12"D
(6b) PULLBOX (BOTTOM) – 36"W x 36"H x 9"D
(7) 225 KVA, 2400 V – 480Y / 277 V TRANSFORMER
(8) MV OIL FUSE CUTOUT SWITCH – 35"W x 38"H x 18"D
(9) MV CABLE PULLBOX – 12"W x 12"H x 9"D
(10) CONTACTOR – 4"W x 6"H x 4"D

INTERIM PLAN LEGEND – STAGE 1/STAGE 2

(1) 480 / 277 V PANELBOARD – 22"W x 65"H x 6"D
(2) REMOVED – LIGHTING AND HEATING CONTACTOR PANEL
(3) REMOVED – LIGHTING CONTROL PANEL
(4) 15 KVA, 480 V – 208Y / 120 V TRANSFORMER
(5) 208 / 120 V LITS PANELBOARD – 22"W x 40"H x 6"D
(6a) PULLBOX (TOP) FOR LV CABLES – 24"W x 12"H x 12"D
(6b) REMOVED – PULLBOX (BOTTOM) – 36"W x 36"H x 9"D
(7) 225 KVA, 2400 V – 480Y / 277 V TRANSFORMER
(8) MV FUSED OIL CUTOUT SWITCH – 35"W x 38"H x 18"D
(9) MV CABLE PULLBOX – 12"W x 12"H x 9"D
(10) CONTACTOR – 4"W x 6"H x 4"D
(11) NEW 150 KVA, 2400 V – 480Y / 277 V TRANSFORMER TX-SWN-1 48"W x 58"H x 32"D
(12) NEW EXHAUST FAN
(13) NEW CONTACTOR CABINET CSW-1-36"W x 72"H x 12"D
(14) NEW 480 / 277 V PANEL – 22"W x 50"H x 6"D
(15) NEW MV CABLE PULLBOX – 24"W x 20"H x 12"D
(16) NEW PRIMARY FEEDER P500 FROM WEST VENT BUILDING TO TRANSFORMER (11)

STAGE 1 CONSTRUCTION NOTES

A. STEP 1 OF THE FIRST STAGE OF CONSTRUCTION FOR THE WEST CROSSCUT ELECTRICAL ROOM INVOLVES THE CONSECUTIVE TEMPORARY DEENERGIZING OF INDIVIDUAL TUNNEL LIGHTING CIRCUITS USING THE THREE-POLE CIRCUIT BREAKERS IN THE PANELBOARDS SERVING THESE LIGHTING LOADS.

B. FOLLOWING THE DEENERGIZATION OF AN INDIVIDUAL THREE-PHASE LIGHTING CIRCUIT, STEP 2 REQUIRES THAT THE LINE AND LOAD CIRCUIT CONNECTIONS TO THE LIGHTING CONTACTOR CONTROLLING THAT CIRCUIT BE REMOVED AND EXTENDED TO A TEMPORARY WIREWAY. THE WIREWAY SHALL EXTEND OVER AND BETWEEN THE PANELBOARD AND CONTACTOR PANEL AND BE MOUNTED AT A HEIGHT ABOVE THE HORIZONTAL RUNS OF LIGHTING CIRCUIT CONDUITS THAT ARE ROUTED TO THE CONTACTOR PANEL. IN LOCATING THE WIREWAY, AVOID INTERFERENCE WITH ANY NEW EQUIPMENT THAT IS TO BE INSTALLED IN THE ELECTRICAL ROOM. THE EXTENDED CIRCUIT CONDUCTORS FROM THE CONTACTOR PANEL SHALL BE TEMPORARILY SPLICED IN THE WIREWAY TO NEW CIRCUIT CONDUCTORS FROM THE PANELBOARD. THE ONLY CONTROL FOR EACH REROUTED LIGHTING CIRCUIT WOULD BE THE THREE-POLE CIRCUIT BREAKER IN THE PANELBOARD. ONCE THE CHANGES FOR ONE LIGHTING CIRCUIT HAVE BEEN COMPLETED, THE REROUTING OF THE NEXT CIRCUIT CAN PROCEED.

C. STEP 3 REQUIRES THE TEMPORARY DEENERGIZATION OF THE THREE-PHASE HEAT TRACE CIRCUIT USING THE THREE-POLE CIRCUIT BREAKER IN THE PANELBOARD SERVING THIS HEATING LOAD. DISCONNECT THE LINE AND LOAD CIRCUIT CONNECTIONS TO THE HEATING CONTACTOR CONTROLLING THE CIRCUIT AND RELOCATE THE HEATING CONTACTOR TO AN ENCLOSURE MOUNTED ADJACENT TO THE WIREWAY. THE ENCLOSURE SHALL BE LOCATED TO AVOID INTERFERENCE WITH NEW EQUIPMENT INDICATED TO BE INSTALLED IN THE ELECTRICAL ROOM. EXTEND THE HEATING CIRCUIT TO THE RELOCATED HEATING CONTACTOR AND MAKE THE NECESSARY LINE AND LOAD CIRCUIT CONNECTIONS. EXTEND THE THERMOSTATIC CONTROL CIRCUIT TO THE HEATING CONTACTOR AND MAKE THE NECESSARY CONTROL CIRCUIT CONNECTIONS TO OPERATE IT AUTOMATICALLY FROM THE REMOTE THERMOSTAT. THE CONTRACTOR MAY REQUEST PERMISSION FROM THE STATE ENGINEER TO OMIT THE TEMPORARY RECONNECTION OF THE THERMOSTATICALLY CONTROLLED CIRCUIT FOR THE CONSTRUCTION WORK THAT IS TO BE COMPLETED DURING SUMMER MONTHS.

D. STEP 4 REQUIRES THAT THE LIGHTING AND HEATING CONTACTOR PANEL AND THE LIGHTING CONTROL PANEL BE REMOVED FROM THE ELECTRICAL ROOM. THIS WORK CAN PROCEED ONCE ALL LIGHTING AND HEATING CIRCUITS HAVE BEEN EXTENDED AND REROUTED THROUGH THE NEW WIREWAY AND/OR CONTACTOR. THE SAME SHALL BE FULLY OPERATIONAL AS DESCRIBED ABOVE.

E. STEP 5 REQUIRES THAT THE EXISTING EXHAUST FAN BE REMOVED AND THE WALL OPENING ENLARGED TO ACCOMODATE A NEW 1/4 HP EXHAUST FAN. THE UNIT SHALL HAVE AN AIR VOLUME RATING OF 3,000 CUBIC FEET PER MINUTE OR GREATER. INSTALL UNIT AND MAKE OPERATIONAL PRIOR TO PROCEEDING TO STAGE 2.

STAGE 2 CONSTRUCTION NOTES

A. STEP 1 OF THE SECOND STAGE OF CONSTRUCTION FOR THE CENTER CROSSCUT ELECTRICAL ROOM INVOLVES INSTALLING THE 2400 V – 480Y / 277 VOLT TRANSFORMER, THE NEW MEDIUM VOLTAGE CABLE PULLBOX AND THE TRANSFORMER MEDIUM VOLTAGE FEEDER WHICH ORIGINATES FROM THE VENTILATION BUILDING.

B. FOLLOWING THE INSTALLATION OF THE NEW TRANSFORMER AND PRIMARY FEEDER, STEP 2 REQUIRES THAT THE LOWER OF THE TWO CABINETS IMMEDIATELY ADJACENT TO THE DOOR OF THE ELECTRICAL ROOM BE REMOVED AND A NEW 480 / 277 VOLT PANELBOARD BE PROVIDED IN ITS PLACE. PRIOR TO THE REMOVAL OF THE CABINET, THE CONTRACTOR SHALL COORDINATE WITH THE STATE ENGINEER REGARDING THE REROUTING OF THE EXISTING CABLES THAT ARE ROUTED THROUGH THIS CABINET. NEXT, THE SECONDARY FEEDER BETWEEN THE TRANSFORMER AND PANELBOARD SHALL BE INSTALLED IN THE ELECTRICAL ROOM.

C. PROVIDE TEMPORARY CONNECTIONS BETWEEN THE EXISTING TUNNEL LIGHTING CIRCUITS AND THE NEW 480Y/277 VOLT PANELBOARD. DISCONNECT AND TEMPORARILY RECONNECT INDIVIDUAL CIRCUITS FROM THE EXISTING PANEL TO THE NEW PANEL, ONE CIRCUIT AT A TIME. REROUTE ALL OTHER 480 AND 277 VOLT CIRCUITS TO THE NEW PANELBOARD ONE CIRCUIT AT A TIME . REMOVE THE EXISTING 480/277V PANEL AND FEEDER SUPPLIED FROM THE EXISTING 225 KVA TRANSFORMER.

D. STEP 3 REQUIRES THAT THE NEW CONTACTOR CABINET BE INSTALLED AT THE LOCATION INDICATED ON THE PLAN. PROVIDE A 120 VOLT POWER CIRCUIT FROM THE EXISTING 208 / 120 VOLT PANELBOARD LOCATED IN THE CROSSCUT ELECTRICAL ROOM TO THE NEW CONTACTOR CABINET. PROVIDE REQUIRED CONTROL / SIGNAL CIRCUITS TO THE NEW CONTACTOR CABINET FROM THE NEAREST CROSSCUT ELECTRICAL ROOM(S) AND / OR VENTILATION BUILDING. PROVIDE FOUR NEW THREE-PHASE LIGHTING CIRCUITS FROM THE PANELBOARD TO THEIR ASSOCIATED CONTACTORS IN THE CONTACTOR CABINET. A MAXIMUM OF TWO THREE-PHASE CIRCUITS SHALL BE INSTALLED IN ANY ONE CONDUIT. MAKE ALL CONDUCTOR TERMINATIONS TO THE CIRCUIT BREAKERS, LIGHTING CONTACTORS, NEUTRAL AND GROUND BUS OF THE SAME.

E. STEP 4 REQUIRES THAT THE FOUR EXISTING THREE-PHASE LIGHTING CIRCUITS THAT SERVE ONE SIDE OF THE TUNNEL BE DEENERGIZED AND THE CIRCUIT CONDUCTORS REMOVED BETWEEN THE PANEL AND THE NEAREST TUNNEL LIGHTING CIRCUIT PULLBOX. TAPE THE ENDS OF THE ABANDONED CIRCUIT CONDUCTORS IN THE PULLBOX, LEAVING A MINIMUM OF THREE FEET EXTRA LENGTH OF EACH CONDUCTOR COILED IN THE PULLBOX. REMOVE THE CONDUIT FOR THESE CIRCUITS BETWEEN THE PANEL AND THE PULLBOX LOCATED ABOVE THE ENTRANCE TO THE CROSSCUT PASSAGE. THIS SEQUENCE OF WORK FACILITATES THE INSTALLATION OF A SEGMENT OF THE CONTINUOUS TUNNEL INTERIOR FLUORESCENT LIGHTING AND THE CONDUITS AND WIRING WHICH WILL BE USED TO SUPPLY POWER.

F. STEP 5 REMOVE THE EXISTING LUMINAIRES THAT WERE DE-ENERGIZED IN STEP 4. CONTRACTOR SHALL DISPOSE OF LUMINAIRES AND LAMPS. PROVIDE CERTIFICATION TO STATE THAT DISPOSAL METHOD UTILIZED FOR LUMINAIRES AND LAMPS MEETS ALL STATE AND FEDERAL REGULATIONS.

G. STEP 6 REQUIRES THAT THE NEW FLUORESCENT LUMINAIRES ON ONE SIDE OF THE TUNNEL BE INSTALLED. AFTER INSTALLATION, THE NEW LIGHTING CIRCUITS SHALL BE TERMINATED ON THE LOAD SIDE OF THEIR RESPECTIVE LIGHTING CONTACTORS IN THE CONTACTOR CABINET.

H. STEP 7 REQUIRES THAT THE THREE-PHASE CIRCUIT CONDUCTORS FOR THE HEAT TRACE CIRCUIT BE INSTALLED BETWEEN THE CONTACTOR CABINET AND THE NEW 480 / 277 VOLT PANELBOARD. DEENERGIZE THE EXISTING THREE-PHASE HEAT TRACE CIRCUIT THAT SERVES THE ADJACENT SECTIONS OF THE TUNNEL AT THE EXISTING 480 VOLT PANEL AND EXTEND THE CIRCUIT TO THE NEW CONTACTOR CABINET. PROVIDE JUNCTION BOX(ES) FOR THE SPLICED CIRCUIT CONDUCTORS OR WIRING.

I. STEP 8 REQUIRES THAT ALL OTHER 480 AND 277 VOLT LOADS, EXCLUDING THE FOUR REMAINING TUNNEL LIGHTING CIRCUITS, BE PERMANENTLY TRANSFERRED TO THE NEW 480 / 277 VOLT PANELBOARD. THESE CIRCUITS INCLUDE THE FEEDER TO THE 480 – 208Y / 120 VOLT TRANSFORMER (WHICH SUPPLIES THE EXISTING 208 VOLT PANEL), MESSAGE BOARD CIRCUIT(S) AND TELEVISION CAMERA CIRCUIT(S). DEENERGIZE THE EXISTING CIRCUITS AT THE EXISTING 480 VOLT PANEL AND EXTEND THE CIRCUITS TO THE NEW 480 / 277 VOLT PANELBOARD. PROVIDE JUNCTION BOXE(S) TO ENCLOSE ANY SPLICED CIRCUIT CONDUCTORS OR WIRING.

J. STEP 9 REQUIRES THAT THE CONDUCTORS FOR THE FOUR REMAINING THREE-PHASE LIGHTING CIRCUITS THAT SERVE THE OPPOSITE SIDE OF THE TUNNEL SHALL BE REMOVED BETWEEN THE NEW PANELBOARD AND THE NEAREST TUNNEL LIGHTING CIRCUIT PULLBOX. TAPE THE ENDS OF THE ABANDONED CIRCUIT CONDUCTORS IN THE PULLBOX, LEAVING A MINIMUM OF THREE FEET EXTRA LENGTH OF EACH CONDUCTOR COILED IN THE PULLBOX. REMOVE THE CONDUIT FOR THESE CIRCUITS BETWEEN THE NEW PANEL AND THE PULLBOX LOCATED ABOVE THE ENTRANCE TO THE CROSSCUT PASSAGE. THE EXISTING 480 VOLT PANEL SHALL THEN BE REMOVED. THIS SEQUENCE OF WORK FACILITATES THE REMOVAL AND REPLACEMENT OF THE EXISTING 2400 V – 480Y / 277 VOLT TRANSFORMER. IT ALSO FACILITATES THE REMOVAL OF THE EXISTING MEDIUM VOLTAGE CABLE PULLBOX AND OIL CUTOUT SWITCH. THE INSTALLATION OF THE REMAINING SEGMENT OF THE CONTINUOUS TUNNEL INTERIOR FLUORESCENT LIGHTING AND THE ASSOCIATED LIGHTING CIRCUITS SUPPLIED FROM THIS ELECTRICAL ROOM CAN NOW PROCEED.

0 1 2 4 6
SCALE: 1/2" = 1'-0"

NOTE:
THE INTENT OF STAGING IS TO MAINTAIN A FULLY FUNCTIONAL TUNNEL DURING CONSTRUCTION. ONE ROW OF TUNNEL LIGHTING IN EACH BORE SHALL REMAIN OPERATIONAL AT ALL TIMES UNLESS SPECIFICALLY PERMITTED OTHERWISE BY THE ENGINEER.

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Plot File Name: F:\PLOT\PAPER\102epl05.prf
Date of Plot: 7/3/2000 (using STANDARD.TBL)

Computer File Information			
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Last Modification Date:	11/05/99	Initials:	SFD
Full Path:	14102\700CADD\703ELECT\		
Drawing File Name:	102epl05.dwg		
Acad Ver. R14	Scale: 1/2" = 1'-0"	Units:	

Sheet Revisions		

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As Constructed				
No Revisions: 01/10/03	ELEC DEMO – SO. TUNNEL WEST CROSSCUT ELEC RM			Project No./Code
Revised:				IM 0703-264
Void:	Designer: J. MILLS	Structure Numbers		12982
	Detailer: S. DZUIBA			
	Sheet Subset: ELECT DEMO	Subset Sheets:	6 of 19	Sheet Number 15

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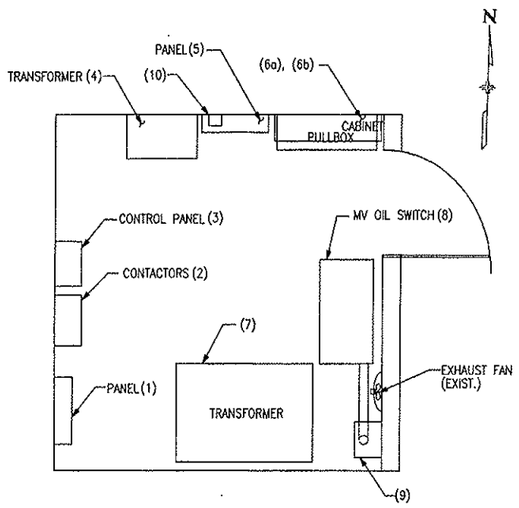
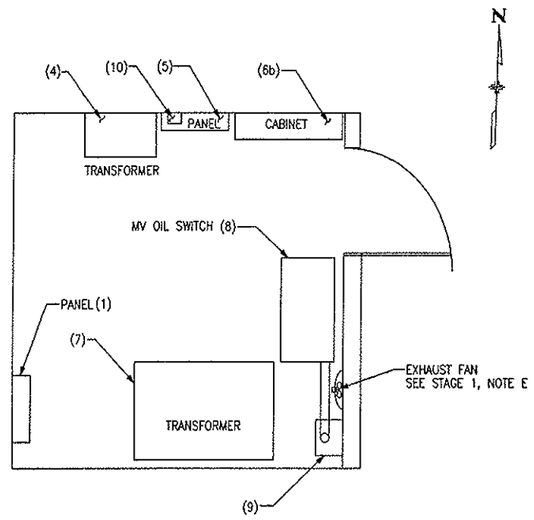


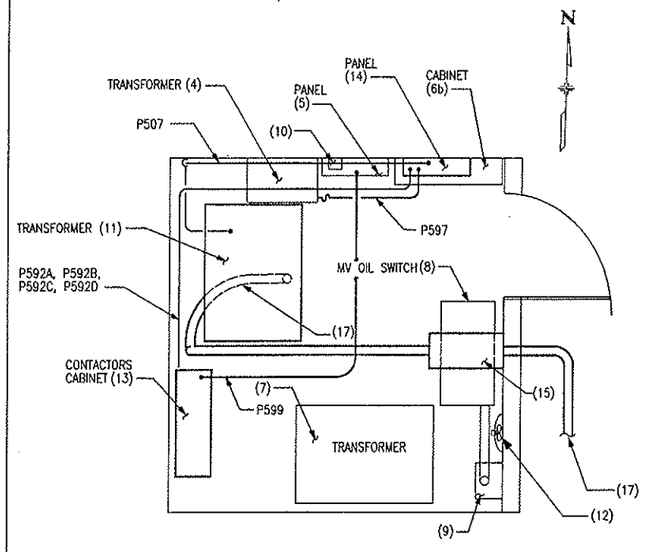
EXISTING PLAN

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



INTERIM PLAN – STAGE 1

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



INTERIM PLAN – STAGE 2

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

0 1 2 4 6

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

EXISTING PLAN LEGEND

(1) 277 / 480 V PANELBOARD – 22"W x 65"H x 6"D
(2) LIGHTING AND HEATING CONTACTOR PANELBOARD– 17"W x 32"H x 9"D
(3) LIGHTING CONTROL PANEL – 15"W x 20"H x 9"D
(4) 15 KVA, 480 V – 208Y / 120 V TRANSFORMER – 23"W x 27"H x 15"D
(5) 120 / 208 V LITS PANELBOARD – 22"W x 40"H x 6"D
(6a) PULLBOX (TOP) FOR LV CABLES – 24"W x 12"H x 12"D
(6b) PULLBOX (BOTTOM) – 36"W x 36"H x 9"D
(7) 225 KVA, 2400 V – 480Y / 277 V TRANSFORMER – 46"W x 55"H x 32"D
(8) MV FUSED OIL CUTOUT SWITCH – 35"W x 38"H x 18"D
(9) MV CABLE PULLBOX – 12"W x 12"H x 9"D
(10) CONTACTOR – 4"W x 6"H x 4"D

INTERIM PLAN LEGEND – STAGE 1 / STAGE 2

(1) 480 / 277 V PANELBOARD – 22"W x 65"H x 6"D
(2) REMOVED – LIGHTING AND HEATING CONTACTOR PANEL
(3) REMOVED – LIGHTING CONTROL PANEL
(4) 15 KVA, 480 V – 208Y / 120 V TRANSFORMER – 23"W x 27"H x 15"D
(5) 208 / 120 V LITS PANELBOARD – 22"W x 40"H x 6"D
(6a) REMOVED – PULLBOX (TOP) FOR LV CABLES
(6b) CABINET (BOTTOM) – 36"W x 36"H x 9"D
(7) 225 KVA, 2400 V – 480Y / 277 V TRANSFORMER – 46"W x 55"H x 32"D
(8) MV FUSED OIL CUTOUT SWITCH – 35"W x 38"H x 18"D
(9) MV CABLE PULLBOX – 12"W x 12"H x 9"D
(10) CONTACTOR – 4"W x 6"H x 4"D
(11) NEW 150 KVA, 2400 V – 480Y / 277 V TRANSFORMER TX-SCN-1 – 48"W x 58"H x 32"D
(12) NEW EXHAUST FAN
(13) NEW CONTACTOR CABINET
(14) NEW 480 / 277 V PANELBOARD – 22"W x 50"H x 6"D
(15) NEW MV CABLE PULLBOX – 24"W x 20"H x 12"D
(17) NEW PRIMARY FEEDER P501 FROM WEST VENT BUILDING TO TRANSFORMER (11).

NOTE:
THE INTENT OF STAGING IS TO MAINTAIN A FULLY FUNCTIONAL TUNNEL DURING CONSTRUCTION. ONE ROW OF TUNNEL LIGHTING IN EACH BORE SHALL REMAIN OPERATIONAL AT ALL TIMES UNLESS SPECIFICALLY PERMITTED OTHERWISE BY STATE.

STAGE 1 CONSTRUCTION NOTES

A. STEP 1 OF THE FIRST STAGE OF CONSTRUCTION FOR THE CENTER CROSSCUT ELECTRICAL ROOM INVOLVES THE CONSECUTIVE TEMPORARY DEENERGIZING OF INDIVIDUAL TUNNEL LIGHTING CIRCUITS USING THE THREE–POLE CIRCUIT BREAKERS IN THE PANELBOARDS SERVING THESE LIGHTING LOADS.

B. FOLLOWING THE DEENERGIZATION OF AN INDIVIDUAL THREE–PHASE LIGHTING CIRCUIT, STEP 2 REQUIRES THAT THE LINE AND LOAD CIRCUIT CONNECTIONS TO THE LIGHTING CONTACTOR CONTROLLING THAT CIRCUIT BE REMOVED AND EXTENDED TO A TEMPORARY WIREWAY. THE WIREWAY SHALL EXTEND OVER AND BETWEEN THE PANELBOARD AND CONTACTOR PANEL AND BE MOUNTED AT A HEIGHT ABOVE THE HORIZONTAL RUNS OF LIGHTING CIRCUIT CONDUITS THAT ARE ROUTED TO THE CONTACTOR PANEL. IN LOCATING THE WIREWAY, AVOID INTERFERENCE WITH ANY NEW EQUIPMENT THAT IS TO BE INSTALLED IN THE ELECTRICAL ROOM. THE EXTENDED CIRCUIT CONDUCTORS FROM THE CONTACTOR PANEL SHALL BE TEMPORARILY SPLICED IN THE WIREWAY TO NEW CIRCUIT CONDUCTORS FROM THE PANELBOARD. THE ONLY CONTROL FOR EACH REROUTED LIGHTING CIRCUIT WOULD BE THE THREE–POLE CIRCUIT BREAKER IN THE PANELBOARD. ONCE THE CHANGES FOR ONE LIGHTING CIRCUIT HAVE BEEN COMPLETED, THE REROUTING OF THE NEXT CIRCUIT CAN PROCEED.

C. STEP 3 REQUIRES THE TEMPORARY DEENERGIZATION OF THE THREE–PHASE HEAT TRACE CIRCUIT USING THE THREE–POLE CIRCUIT BREAKER IN THE PANELBOARD SERVING THIS HEATING LOAD. DISCONNECT THE LINE AND LOAD CIRCUIT CONNECTIONS TO THE HEATING CONTACTOR CONTROLLING THE CIRCUIT AND RELOCATE THE HEATING CONTACTOR TO AN ENCLOSURE MOUNTED ADJACENT TO THE WIREWAY. THE ENCLOSURE SHALL BE LOCATED TO AVOID INTERFERENCE WITH NEW EQUIPMENT INDICATED TO BE INSTALLED IN THE ELECTRICAL ROOM. EXTEND THE HEATING CIRCUIT TO THE RELOCATED HEATING CONTACTOR AND MAKE THE NECESSARY LINE AND LOAD CIRCUIT CONNECTIONS. EXTEND THE THERMOSTATIC CONTROL CIRCUIT TO THE HEATING CONTACTOR AND MAKE THE NECESSARY CONTROL CIRCUIT CONNECTIONS TO OPERATE IT AUTOMATICALLY FROM THE REMOTE THERMOSTAT. THE CONTRACTOR MAY REQUEST PERMISSION FROM THE STATE ENGINEER TO OMIT THE TEMPORARY RECONNECTION OF THE THERMOSTATICALLY CONTROLLED CIRCUIT FOR THE CONSTRUCTION WORK THAT IS TO BE COMPLETED DURING SUMMER MONTHS.

D. STEP 4 REQUIRES THAT THE LIGHTING AND HEATING CONTACTOR PANEL AND THE LIGHTING CONTROL PANEL BE REMOVED FROM THE ELECTRICAL ROOM. THIS WORK CAN PROCEED ONCE ALL LIGHTING AND HEATING CIRCUITS HAVE BEEN EXTENDED AND REROUTED THROUGH THE NEW WIREWAY AND/OR CONTACTOR. THE SAME SHALL BE FULLY OPERATIONAL AS DESCRIBED ABOVE.

E. STEP 5 REQUIRES THAT THE EXISTING EXHAUST FAN BE REMOVED AND THE WALL OPENING ENLARGED TO ACCOMODATE A NEW 1/4 HP EXHAUST FAN. THE UNIT SHALL HAVE AN AIR VOLUME RATING OF 3,000 CUBIC FEET PER MINUTE OR GREATER. INSTALL UNIT AND MAKE OPERATIONAL PRIOR TO PROCEEDING TO STAGE 2.

STAGE 2 CONSTRUCTION NOTES

A. STEP 1 OF THE SECOND STAGE OF CONSTRUCTION FOR THE CENTER CROSSCUT ELECTRICAL ROOM INVOLVES INSTALLING THE 2400 V – 480Y / 277 VOLT TRANSFORMER, THE NEW MEDIUM VOLTAGE CABLE PULLBOX AND THE TRANSFORMER MEDIUM VOLTAGE FEEDER WHICH ORIGINATES FROM THE VENTILATION BUILDING.

B. FOLLOWING THE INSTALLATION OF THE NEW TRANSFORMER AND PRIMARY FEEDER, STEP 2 REQUIRES THAT THE LOWER OF THE TWO CABINETS IMMEDIATELY ADJACENT TO THE DOOR OF THE ELECTRICAL ROOM BE REMOVED AND A NEW 480 / 277 VOLT PANELBOARD BE PROVIDED IN ITS PLACE. PRIOR TO THE REMOVAL OF THE CABINET, THE CONTRACTOR SHALL COORDINATE WITH THE STATE ENGINEER REGARDING THE REROUTING OF THE EXISTING CABLES THAT ARE ROUTED THROUGH THIS CABINET. NEXT, THE SECONDARY FEEDER BETWEEN THE TRANSFORMER AND PANELBOARD SHALL BE INSTALLED IN THE ELECTRICAL ROOM.

C. PROVIDE TEMPORARY CONNECTIONS BETWEEN THE EXISTING TUNNEL LIGHTING CIRCUITS AND THE NEW 480Y/277 VOLT PANELBOARD. DISCONNECT AND TEMPORARILY RECONNECT INDIVIDUAL CIRCUITS FROM THE EXISTING PANEL TO THE NEW PANEL, ONE CIRCUIT AT A TIME. REROUTE ALL OTHER 480 AND 277 VOLT CIRCUITS TO THE NEW PANELBOARD ONE CIRCUIT AT A TIME . REMOVE THE EXISTING 480/277V PANEL AND FEEDER SUPPLIED FROM THE EXISTING 225 KVA TRANSFORMER.

D. STEP 3 REQUIRES THAT THE NEW CONTACTOR CABINET BE INSTALLED AT THE LOCATION INDICATED ON THE PLAN. PROVIDE A 120 VOLT POWER CIRCUIT FROM THE EXISTING 208 / 120 VOLT PANELBOARD LOCATED IN THE CROSSCUT ELECTRICAL ROOM TO THE NEW CONTACTOR CABINET. PROVIDE REQUIRED CONTROL / SIGNAL CIRCUITS TO THE NEW CONTACTOR CABINET FROM THE NEAREST CROSSCUT ELECTRICAL ROOM(S) AND / OR VENTILATION BUILDING. PROVIDE FOUR NEW THREE–PHASE LIGHTING CIRCUITS FROM THE PANELBOARD TO THEIR ASSOCIATED CONTACTORS IN THE CONTACTOR CABINET. A MAXIMUM OF TWO THREE–PHASE CIRCUITS SHALL BE INSTALLED IN ANY ONE CONDUIT. MAKE ALL CONDUCTOR TERMINATIONS TO THE CIRCUIT BREAKERS, LIGHTING CONTACTORS, NEUTRAL AND GROUND BUS OF THE SAME.

E. STEP 4 REQUIRES THAT THE FOUR EXISTING THREE–PHASE LIGHTING CIRCUITS THAT SERVE ONE SIDE OF THE TUNNEL BE DEENERGIZED AND THE CIRCUIT CONDUCTORS REMOVED BETWEEN THE PANEL AND THE NEAREST TUNNEL LIGHTING CIRCUIT PULLBOX. TAPE THE ENDS OF THE ABANDONED CIRCUIT CONDUCTORS IN THE PULLBOX, LEAVING A MINIMUM OF THREE FEET EXTRA LENGTH OF EACH CONDUCTOR COILED IN THE PULLBOX. REMOVE THE CONDUIT FOR THESE CIRCUITS BETWEEN THE PANEL AND THE PULLBOX LOCATED ABOVE THE ENTRANCE TO THE CROSSCUT PASSAGE. THIS SEQUENCE OF WORK FACILITATES THE INSTALLATION OF A SEGMENT OF THE CONTINUOUS TUNNEL INTERIOR FLUORESCENT LIGHTING AND THE CONDUITS AND WIRING WHICH WILL BE USED TO SUPPLY POWER.

F. STEP 5 REMOVE THE EXISTING LUMINAIRES THAT WERE DE–ENERGIZED IN STEP 4. CONTRACTOR SHALL DISPOSE OF LUMINAIRES AND LAMPS. PROVIDE CERTIFICATION TO STATE THAT DISPOSAL METHOD UTILIZED FOR LUMINAIRES AND LAMPS MEETS ALL STATE AND FEDERAL REGULATIONS.

G. STEP 6 REQUIRES THAT THE NEW FLUORESCENT LUMINAIRES ON ONE SIDE OF THE TUNNEL BE INSTALLED. AFTER INSTALLATION, THE NEW LIGHTING CIRCUITS SHALL BE TERMINATED ON THE LOAD SIDE OF THEIR RESPECTIVE LIGHTING CONTACTORS IN THE CONTACTOR CABINET.

H. STEP 7 REQUIRES THAT THE THREE–PHASE CIRCUIT CONDUCTORS FOR THE HEAT TRACE CIRCUIT BE INSTALLED BETWEEN THE CONTACTOR CABINET AND THE NEW 480 / 277 VOLT PANELBOARD. DEENERGIZE THE EXISTING THREE–PHASE HEAT TRACE CIRCUIT THAT SERVES THE ADJACENT SECTIONS OF THE TUNNEL AT THE EXISTING 480 VOLT PANEL AND EXTEND THE CIRCUIT TO THE NEW CONTACTOR CABINET. PROVIDE JUNCTION BOX(ES) FOR THE SPLICED CIRCUIT CONDUCTORS OR WIRING.

I. STEP 8 REQUIRES THAT ALL OTHER 480 AND 277 VOLT LOADS, EXCLUDING THE FOUR REMAINING TUNNEL LIGHTING CIRCUITS, BE PERMANENTLY TRANSFERRED TO THE NEW 480 / 277 VOLT PANELBOARD. THESE CIRCUITS INCLUDE THE FEEDER TO THE 480 – 208Y / 120 VOLT TRANSFORMER (WHICH SUPPLIES THE EXISTING 208 VOLT PANEL), MESSAGE BOARD CIRCUIT(S) AND TELEVISION CAMERA CIRCUIT(S). DEENERGIZE THE EXISTING CIRCUITS AT THE EXISTING 480 VOLT PANEL AND EXTEND THE CIRCUITS TO THE NEW 480 / 277 VOLT PANELBOARD. PROVIDE JUNCTION BOXE(S) TO ENCLOSE ANY SPLICED CIRCUIT CONDUCTORS OR WIRING.

J. STEP 9 REQUIRES THAT THE CONDUCTORS FOR THE FOUR REMAINING THREE–PHASE LIGHTING CIRCUITS THAT SERVE THE OPPOSITE SIDE OF THE TUNNEL SHALL BE REMOVED BETWEEN THE NEW PANELBOARD AND THE NEAREST TUNNEL LIGHTING CIRCUIT PULLBOX. TAPE THE ENDS OF THE ABANDONED CIRCUIT CONDUCTORS IN THE PULLBOX, LEAVING A MINIMUM OF THREE FEET EXTRA LENGTH OF EACH CONDUCTOR COILED IN THE PULLBOX. REMOVE THE CONDUIT FOR THESE CIRCUITS BETWEEN THE NEW PANEL AND THE PULLBOX LOCATED ABOVE THE ENTRANCE TO THE CROSSCUT PASSAGE. THE EXISTING 480 VOLT PANEL SHALL THEN BE REMOVED. THIS SEQUENCE OF WORK FACILITATES THE REMOVAL AND REPLACEMENT OF THE EXISTING 2400 V – 480Y / 277 VOLT TRANSFORMER. IT ALSO FACILITATES THE REMOVAL OF THE EXISTING MEDIUM VOLTAGE CABLE PULLBOX AND OIL CUTOUT SWITCH. THE INSTALLATION OF THE REMAINING SEGMENT OF THE CONTINUOUS TUNNEL INTERIOR FLUORESCENT LIGHTING AND THE ASSOCIATED LIGHTING CIRCUITS SUPPLIED FROM THIS ELECTRICAL ROOM CAN NOW PROCEED.

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Date of Plot: 7/31/2000 (using STANDARD.TBL)

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Last Modification Date:	11/05/99.	Initials: SFD
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Drawing File Name:	102ep106.dwg	
Acad Ver. R14	Scale: 1/2" = 1'-0"	Units:

Sheet Revisions			

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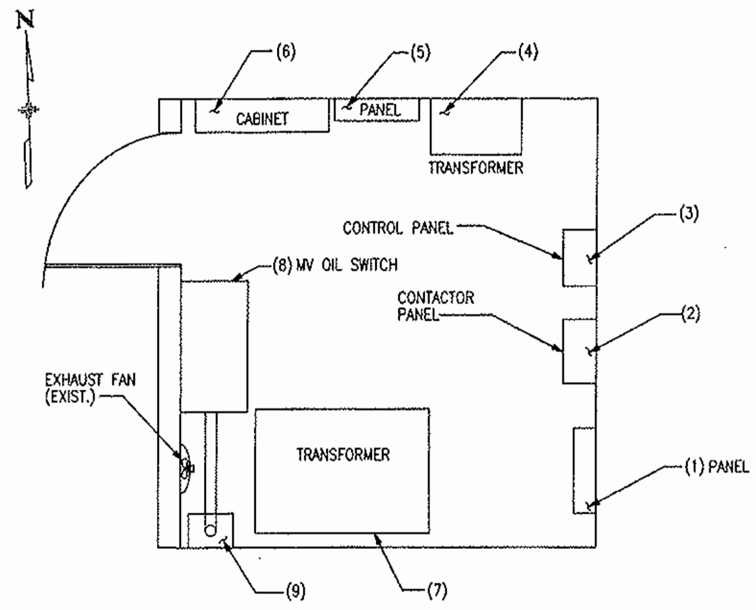
As Constructed
No Revisions: 01/10/03
Revised:
Void:

ELEC DEMO – SO. TUNNEL CENTER CROSSCUT ELEC RM

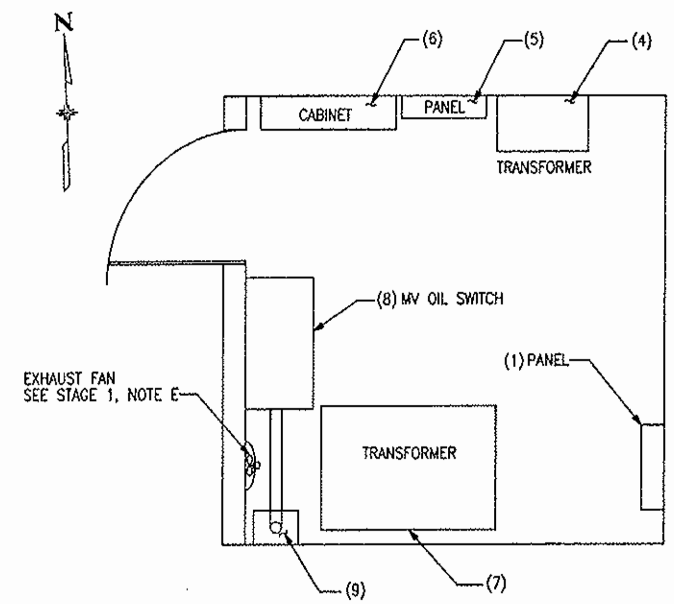
Designer:	J. MILLS	Structure Numbers	
Detailer:	S. DZUIBA		
Sheet Subset:	ELECT DEMO	Subset Sheets:	7 of 19

Project No./Code	
IM 0703-264	
12982	
Sheet Number	16



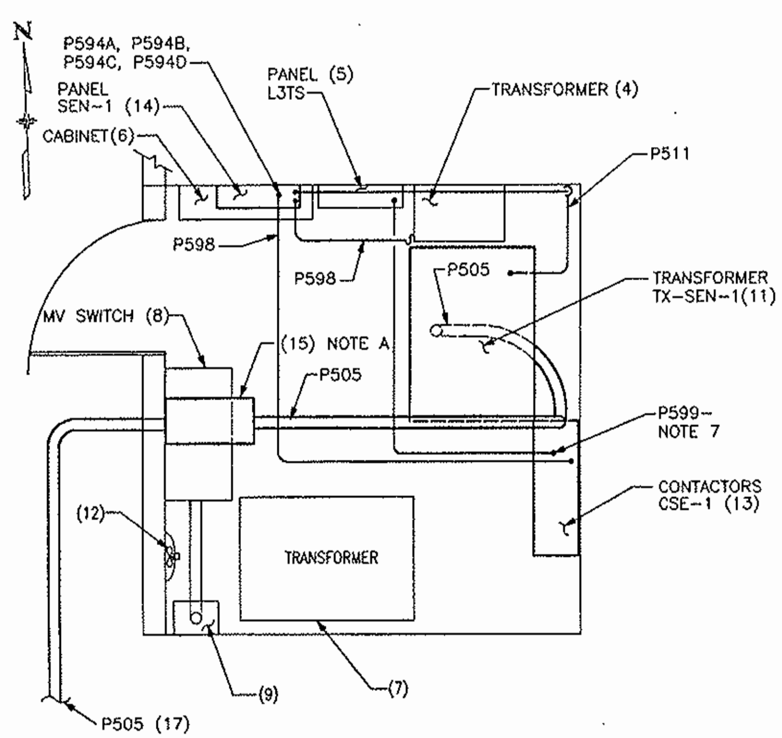
EXISTING PLAN

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



INTERIM PLAN – STAGE 1

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



INTERIM PLAN – STAGE 2

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

EXISTING PLAN LEGEND

(1) 480 / 277 V PANELBOARD
(2) LIGHTING AND HEATING CONTACTOR PANEL
(3) LIGHTING CONTROL PANEL
(4) 15 KVA, 480 V – 208Y / 120 V TRANSFORMER
(5) 208 / 120 V L1TS PANELBOARD
(6) TWO CABINETS (ONE BENEATH THE CABINET SHOWN)
(7) 225 KVA, 2400V – 480Y / 277V TRANSFORMER
(8) MV FUSED OIL CUTOUT SWITCH
(9) MV CABLE PULLBOX

INTERIM PLANS LEGEND – STAGE 1 / STAGE 2

(1) 480 / 277 V PANELBOARD
(2) REMOVED – LIGHTING AND HEATING CONTACTOR PANEL
(3) REMOVED – LIGHTING CONTROL PANEL
(4) 15 KVA, 480 V – 208Y / 120 V TRANSFORMER
(5) 208 / 120 V L1TS PANELBOARD
(6) CABINET
(7) 225 KVA, 2400 V – 480Y / 277 V TRANSFORMER
(8) MV FUSED OIL CUTOUT SWITCH
(9) MV CABLE PULLBOX
(11) NEW 150 KVA, 2400 V – 480Y / 277 V TRANSFORMER TX-SEN-1 – 48"W x 58"H x 32"D
(12) NEW EXHAUST FAN
(13) NEW CONTACTOR CABINET – 36"W x 72"H x 12"D
(14) NEW 480 / 277 V PANEL
(15) NEW MV CABLE PULLBOX – 24"W x 20"H x 12"D
(17) NEW PRIMARY FEEDER P505 FROM EAST VENT BUILDING TO TRANSFORMER (11)

NOTE:
THE INTENT OF STAGING IS TO MAINTAIN A FULLY FUNCTIONAL TUNNEL DURING CONSTRUCTION. ONE ROW OF TUNNEL LIGHTING IN EACH BORE SHALL REMAIN OPERATIONAL AT ALL TIMES UNLESS SPECIFICALLY PERMITTED OTHERWISE BY THE ENGINEER.

STAGE 1 CONSTRUCTION NOTES

A. STEP 1 OF THE FIRST STAGE OF CONSTRUCTION FOR THE EAST CROSSCUT ELECTRICAL ROOM INVOLVES THE CONSECUTIVE TEMPORARY DEENERGIZING OF INDIVIDUAL TUNNEL LIGHTING CIRCUITS USING THE THREE-POLE CIRCUIT BREAKERS IN THE PANELBOARDS SERVING THESE LIGHTING LOADS.

B. FOLLOWING THE DEENERGIZATION OF AN INDIVIDUAL THREE-PHASE LIGHTING CIRCUIT, STEP 2 REQUIRES THAT THE LINE AND LOAD CIRCUIT CONNECTIONS TO THE LIGHTING CONTACTOR CONTROLLING THAT CIRCUIT BE REMOVED AND EXTENDED TO A TEMPORARY WIREWAY. THE WIREWAY SHALL EXTEND OVER AND BETWEEN THE PANELBOARD AND CONTACTOR PANEL AND BE MOUNTED AT A HEIGHT ABOVE THE HORIZONTAL RUNS OF LIGHTING CIRCUIT CONDUITS THAT ARE ROUTED TO THE CONTACTOR PANEL. IN LOCATING THE WIREWAY, AVOID INTERFERENCE WITH ANY NEW EQUIPMENT THAT IS TO BE INSTALLED IN THE ELECTRICAL ROOM. THE EXTENDED CIRCUIT CONDUCTORS FROM THE CONTACTOR PANEL SHALL BE TEMPORARILY SPLICED IN THE WIREWAY TO NEW CIRCUIT CONDUCTORS FROM THE PANELBOARD. THE ONLY CONTROL FOR EACH REROUTED LIGHTING CIRCUIT WOULD BE THE THREE-POLE CIRCUIT BREAKER IN THE PANELBOARD. ONCE THE CHANGES FOR ONE LIGHTING CIRCUIT HAVE BEEN COMPLETED, THE REROUTING OF THE NEXT CIRCUIT CAN PROCEED.

C. STEP 3 REQUIRES THE TEMPORARY DEENERGIZATION OF THE THREE-PHASE HEAT TRACE CIRCUIT USING THE THREE-POLE CIRCUIT BREAKER IN THE PANELBOARD SERVING THIS HEATING LOAD. DISCONNECT THE LINE AND LOAD CIRCUIT CONNECTIONS TO THE HEATING CONTACTOR CONTROLLING THE CIRCUIT AND RELOCATE THE HEATING CONTACTOR TO AN ENCLOSURE MOUNTED ADJACENT TO THE WIREWAY. THE ENCLOSURE SHALL BE LOCATED TO AVOID INTERFERENCE WITH NEW EQUIPMENT INDICATED TO BE INSTALLED IN THE ELECTRICAL ROOM. EXTEND THE HEATING CIRCUIT TO THE RELOCATED HEATING CONTACTOR AND MAKE THE NECESSARY LINE AND LOAD CIRCUIT CONNECTIONS. EXTEND THE THERMOSTATIC CONTROL CIRCUIT TO THE HEATING CONTACTOR AND MAKE THE NECESSARY CONTROL CIRCUIT CONNECTIONS TO OPERATE IT AUTOMATICALLY FROM THE REMOTE THERMOSTAT. THE CONTRACTOR MAY REQUEST PERMISSION FROM THE STATE ENGINEER TO OMIT THE TEMPORARY RECONNECTION OF THE THERMOSTATICALLY CONTROLLED CIRCUIT FOR THE CONSTRUCTION WORK THAT IS TO BE COMPLETED DURING SUMMER MONTHS.

D. STEP 4 REQUIRES THAT THE LIGHTING AND HEATING CONTACTOR PANEL AND THE LIGHTING CONTROL PANEL BE REMOVED FROM THE ELECTRICAL ROOM. THIS WORK CAN PROCEED ONCE ALL LIGHTING AND HEATING CIRCUITS HAVE BEEN EXTENDED AND REROUTED THROUGH THE NEW WIREWAY AND/OR CONTACTOR. THE SAME SHALL BE FULLY OPERATIONAL AS DESCRIBED ABOVE.

E. STEP 5 REQUIRES THAT THE EXISTING EXHAUST FAN BE REMOVED AND THE WALL OPENING ENLARGED TO ACCOMODATE A NEW 1/4 HP EXHAUST FAN. THE UNIT SHALL HAVE AN AIR VOLUME RATING OF 3,000 CUBIC FEET PER MINUTE OR GREATER. INSTALL UNIT AND MAKE OPERATIONAL PRIOR TO PROCEEDING TO STAGE 2.

STAGE 2 CONSTRUCTION NOTES

A. STEP 1 OF THE SECOND STAGE OF CONSTRUCTION FOR THE CENTER CROSSCUT ELECTRICAL ROOM INVOLVES INSTALLING THE 2400 V – 480Y / 277 VOLT TRANSFORMER, THE NEW MEDIUM VOLTAGE CABLE PULLBOX AND THE TRANSFORMER MEDIUM VOLTAGE FEEDER WHICH ORIGINATES FROM THE VENTILATION BUILDING.

B. FOLLOWING THE INSTALLATION OF THE NEW TRANSFORMER AND PRIMARY FEEDER, STEP 2 REQUIRES THAT THE LOWER OF THE TWO CABINETS IMMEDIATELY ADJACENT TO THE DOOR OF THE ELECTRICAL ROOM BE REMOVED AND A NEW 480 / 277 VOLT PANELBOARD BE PROVIDED IN ITS PLACE. PRIOR TO THE REMOVAL OF THE CABINET, THE CONTRACTOR SHALL COORDINATE WITH THE STATE ENGINEER REGARDING THE REROUTING OF THE EXISTING CABLES THAT ARE ROUTED THROUGH THIS CABINET. NEXT, THE SECONDARY FEEDER BETWEEN THE TRANSFORMER AND PANELBOARD SHALL BE INSTALLED IN THE ELECTRICAL ROOM.

C. PROVIDE TEMPORARY CONNECTIONS BETWEEN THE EXISTING TUNNEL LIGHTING CIRCUITS AND THE NEW 480Y/277 VOLT PANELBOARD. DISCONNECT AND TEMPORARILY RECONNECT INDIVIDUAL CIRCUITS FROM THE EXISTING PANEL TO THE NEW PANEL, ONE CIRCUIT AT A TIME. REROUTE ALL OTHER 480 AND 277 VOLT CIRCUITS TO THE NEW PANELBOARD ONE CIRCUIT AT A TIME . REMOVE THE EXISTING 480/277V PANEL AND FEEDER SUPPLIED FROM THE EXISTING 225 KVA TRANSFORMER.

D. STEP 3 REQUIRES THAT THE NEW CONTACTOR CABINET BE INSTALLED AT THE LOCATION INDICATED ON THE PLAN. PROVIDE A 120 VOLT POWER CIRCUIT FROM THE EXISTING 208 / 120 VOLT PANELBOARD LOCATED IN THE CROSSCUT ELECTRICAL ROOM TO THE NEW CONTACTOR CABINET. PROVIDE REQUIRED CONTROL / SIGNAL CIRCUITS TO THE NEW CONTACTOR CABINET FROM THE NEAREST CROSSCUT ELECTRICAL ROOM(S) AND / OR VENTILATION BUILDING. PROVIDE FOUR NEW THREE-PHASE LIGHTING CIRCUITS FROM THE PANELBOARD TO THEIR ASSOCIATED CONTACTORS IN THE CONTACTOR CABINET. A MAXIMUM OF TWO THREE-PHASE CIRCUITS SHALL BE INSTALLED IN ANY ONE CONDUIT. MAKE ALL CONDUCTOR TERMINATIONS TO THE CIRCUIT BREAKERS, LIGHTING CONTACTORS, NEUTRAL AND GROUND BUS OF THE SAME.

E. STEP 4 REQUIRES THAT THE FOUR EXISTING THREE-PHASE LIGHTING CIRCUITS THAT SERVE ONE SIDE OF THE TUNNEL BE DEENERGIZED AND THE CIRCUIT CONDUCTORS REMOVED BETWEEN THE PANEL AND THE NEAREST TUNNEL LIGHTING CIRCUIT PULLBOX. TAPE THE ENDS OF THE ABANDONED CIRCUIT CONDUCTORS IN THE PULLBOX, LEAVING A MINIMUM OF THREE FEET EXTRA LENGTH OF EACH CONDUCTOR COILED IN THE PULLBOX. REMOVE THE CONDUIT FOR THESE CIRCUITS BETWEEN THE PANEL AND THE PULLBOX LOCATED ABOVE THE ENTRANCE TO THE CROSSCUT PASSAGE. THIS SEQUENCE OF WORK FACILITATES THE INSTALLATION OF A SEGMENT OF THE CONTINUOUS TUNNEL INTERIOR FLUORESCENT LIGHTING AND THE CONDUITS AND WIRING WHICH WILL BE USED TO SUPPLY POWER.

F. STEP 5 REMOVE THE EXISTING LUMINAIRES THAT WERE DE-ENERGIZED IN STEP 4. CONTRACTOR SHALL DISPOSE OF LUMINAIRES AND LAMPS. PROVIDE CERTIFICATION TO STATE THAT DISPOSAL METHOD UTILIZED FOR LUMINAIRES AND LAMPS MEETS ALL STATE AND FEDERAL REGULATIONS.

G. STEP 6 REQUIRES THAT THE NEW FLUORESCENT LUMINAIRES ON ONE SIDE OF THE TUNNEL BE INSTALLED. AFTER INSTALLATION, THE NEW LIGHTING CIRCUITS SHALL BE TERMINATED ON THE LOAD SIDE OF THEIR RESPECTIVE LIGHTING CONTACTORS IN THE CONTACTOR CABINET.

H. STEP 7 REQUIRES THAT THE THREE-PHASE CIRCUIT CONDUCTORS FOR THE HEAT TRACE CIRCUIT BE INSTALLED BETWEEN THE CONTACTOR CABINET AND THE NEW 480 / 277 VOLT PANELBOARD. DEENERGIZE THE EXISTING THREE-PHASE HEAT TRACE CIRCUIT THAT SERVES THE ADJACENT SECTIONS OF THE TUNNEL AT THE EXISTING 480 VOLT PANEL AND EXTEND THE CIRCUIT TO THE NEW CONTACTOR CABINET. PROVIDE JUNCTION BOX(ES) FOR THE SPLICED CIRCUIT CONDUCTORS OR WIRING.

I. STEP 8 REQUIRES THAT ALL OTHER 480 AND 277 VOLT LOADS, EXCLUDING THE FOUR REMAINING TUNNEL LIGHTING CIRCUITS, BE PERMANENTLY TRANSFERRED TO THE NEW 480 / 277 VOLT PANELBOARD. THESE CIRCUITS INCLUDE THE FEEDER TO THE 480 – 208Y / 120 VOLT TRANSFORMER (WHICH SUPPLIES THE EXISTING 208 VOLT PANEL), MESSAGE BOARD CIRCUIT(S) AND TELEVISION CAMERA CIRCUIT(S). DEENERGIZE THE EXISTING CIRCUITS AT THE EXISTING 480 VOLT PANEL AND EXTEND THE CIRCUITS TO THE NEW 480 / 277 VOLT PANELBOARD. PROVIDE JUNCTION BOXE(S) TO ENCLOSE ANY SPLICED CIRCUIT CONDUCTORS OR WIRING.

J. STEP 9 REQUIRES THAT THE CONDUCTORS FOR THE FOUR REMAINING THREE-PHASE LIGHTING CIRCUITS THAT SERVE THE OPPOSITE SIDE OF THE TUNNEL SHALL BE REMOVED BETWEEN THE NEW PANELBOARD AND THE NEAREST TUNNEL LIGHTING CIRCUIT PULLBOX. TAPE THE ENDS OF THE ABANDONED CIRCUIT CONDUCTORS IN THE PULLBOX, LEAVING A MINIMUM OF THREE FEET EXTRA LENGTH OF EACH CONDUCTOR COILED IN THE PULLBOX. REMOVE THE CONDUIT FOR THESE CIRCUITS BETWEEN THE NEW PANEL AND THE PULLBOX LOCATED ABOVE THE ENTRANCE TO THE CROSSCUT PASSAGE, THE EXISTING 480 VOLT PANEL SHALL THEN BE REMOVED. THIS SEQUENCE OF WORK FACILITATES THE REMOVAL AND REPLACEMENT OF THE EXISTING 2400 V – 480Y / 277 VOLT TRANSFORMER. IT ALSO FACILITATES THE REMOVAL OF THE EXISTING MEDIUM VOLTAGE CABLE PULLBOX AND OIL CUTOUT SWITCH. THE INSTALLATION OF THE REMAINING SEGMENT OF THE CONTINUOUS TUNNEL INTERIOR FLUORESCENT LIGHTING AND THE ASSOCIATED LIGHTING CIRCUITS SUPPLIED FROM THIS ELECTRICAL ROOM CAN NOW PROCEED.

Design File Name: p:\014102\cadd\plot\102ep107.dgn
Plot File Name: P:\PLOT\PAPER\102ep107.prf
Date of Plot: 7/31/2000 (using STANDARD.TBL)

Computer File Information			
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Last Modification Date:	11/05/99	Initials:	SFD
Full Path:	14102\700CADD\703ELECT\		
Drawing File Name:	102ep107.dwg		
Acad Ver. R14	Scale: 1/2" = 1'-0"	Units:	

Sheet Revisions

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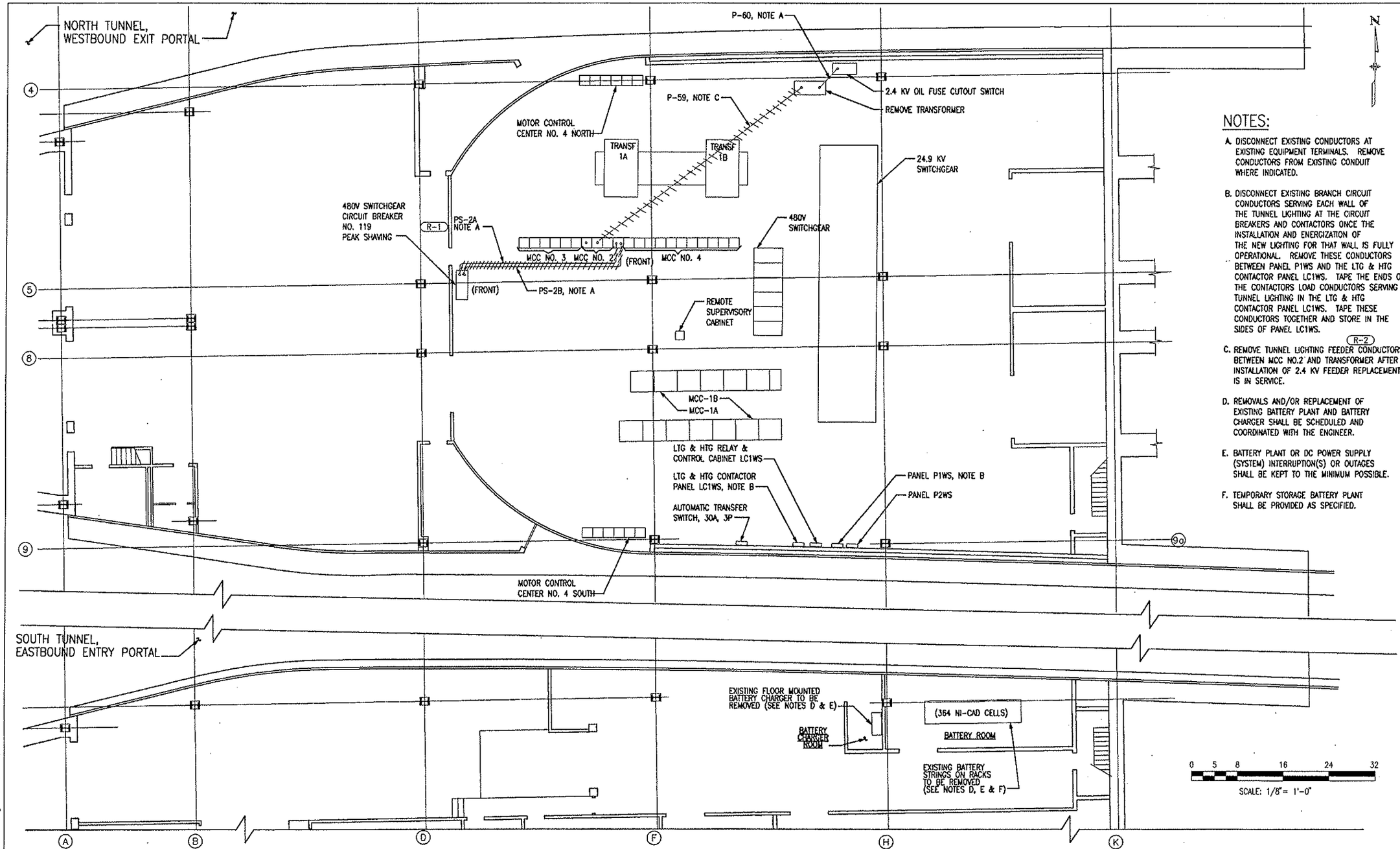
Phone: 303-512-5750 FAX: 303-512-5775
Region 1 Mountain Residency W.W.G.

As Constructed
No Revisions: 01/10/03
Revised:
Void:

ELEC DEMO – SO. TUNNEL
EAST CROSSCUT ELEC RM

Designer: J. MILLS
Detailer: S. DZUIBA
Structure Numbers
Sheet Subset: ELECT DEMO Subset Sheets: 8 of 19

Project No./Code
IM 0703-264
12982
Sheet Number 17



NOTES:

A. DISCONNECT EXISTING CONDUCTORS AT EXISTING EQUIPMENT TERMINALS. REMOVE CONDUCTORS FROM EXISTING CONDUIT WHERE INDICATED.

B. DISCONNECT EXISTING BRANCH CIRCUIT CONDUCTORS SERVING EACH WALL OF THE TUNNEL LIGHTING AT THE CIRCUIT BREAKERS AND CONTACTORS ONCE THE INSTALLATION AND ENERGIZATION OF THE NEW LIGHTING FOR THAT WALL IS FULLY OPERATIONAL. REMOVE THESE CONDUCTORS BETWEEN PANEL P1WS AND THE LTG & HTG CONTACTOR PANEL LC1WS. TAPE THE ENDS OF THE CONTACTORS LOAD CONDUCTORS SERVING TUNNEL LIGHTING IN THE LTG & HTG CONTACTOR PANEL LC1WS. TAPE THESE CONDUCTORS TOGETHER AND STORE IN THE SIDES OF PANEL LC1WS.

C. (R-2) REMOVE TUNNEL LIGHTING FEEDER CONDUCTORS BETWEEN MCC NO.2 AND TRANSFORMER AFTER INSTALLATION OF 2.4 KV FEEDER REPLACEMENT IS IN SERVICE.

D. REMOVALS AND/OR REPLACEMENT OF EXISTING BATTERY PLANT AND BATTERY CHARGER SHALL BE SCHEDULED AND COORDINATED WITH THE ENGINEER.

E. BATTERY PLANT OR DC POWER SUPPLY (SYSTEM) INTERRUPTION(S) OR OUTAGES SHALL BE KEPT TO THE MINIMUM POSSIBLE.

F. TEMPORARY STORAGE BATTERY PLANT SHALL BE PROVIDED AS SPECIFIED.

Design File Name: p:\04102\cathyplot\rmple05w.dgn
Plot File Name: P:\PLOT\PAPER\rmple05w.prt
Date of Plot: 7/31/2000 (using STANDARD.TBL)

Computer File Information	
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Last Modification Date:	01/04/2000 Initials: SFD
Full Path:	14102\700CADD\703ELECT\
Drawing File Name:	rmple05w.dwg
Acad Ver. R14	Scale: 1/8" = 1'-0" Units:

Sheet Revisions			
(R-2)	01/06/2000	REVISED NOTE C.	DJB
(R-1)	12/20/99	REVISED NOTE CALLOUT	JHM

Colorado Department of Transportation
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Region 1 Mountain Residency W.W.G.

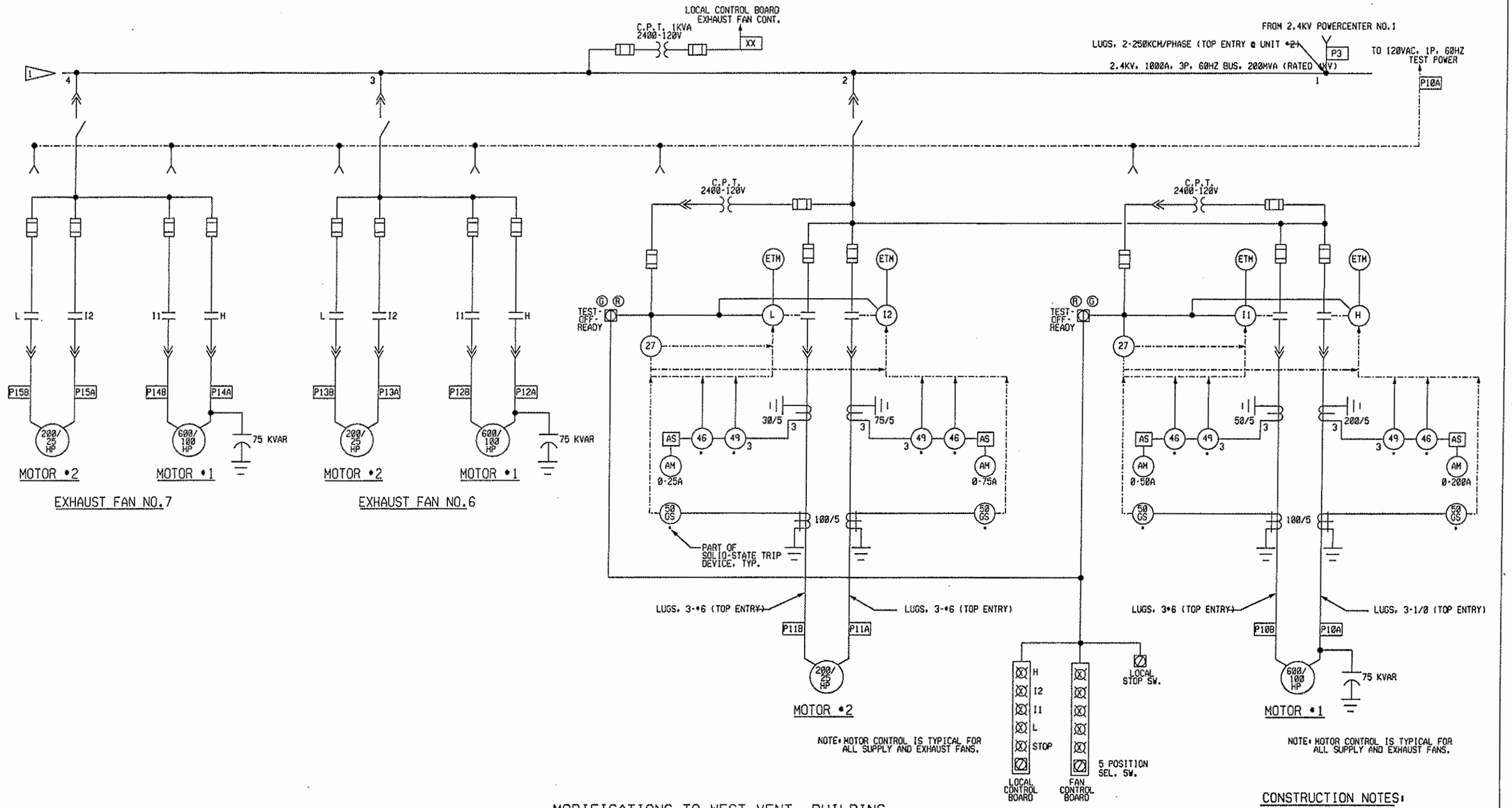
As Constructed
No Revisions: 01/10/03
Revised:
Void:

ELECTRICAL DEMOLITION WEST VENT BUILDING PLAN

Designer: J. MILLS
Detailer: S. DZUIBA
Sheet Subset: ELECT DEMO
Structure Numbers:
Subset Sheets: 9 of 19

Project No./Code
IM 0703-264
12982
Sheet Number 18

014102\710STDS\BORDERIN.DGN



MODIFICATIONS TO WEST VENT. BUILDING
2.4KV MOTOR CONTROL CENTER NO. 1A
(RATED 4KV)

CONSTRUCTION NOTES:

1. PROVIDE NECESSARY BUS AND ENCLOSURE MODIFICATIONS TO FACILITATE THE ADDITION OF A NEW MOTOR CONTROL CENTER CUBICLE.

Design File Name: DGNSSPEC=
Plot File Name: $PLOTFILE=
Date of Plot: $$$$DATE$$$$

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LAST MODIFICATION DATE:	11/05/99	INITIALS:	SFD
FULL PATH:	14102\700CADD\703ELECT\		
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ACAD VER. R14	SCALE: NONE	UNITS:	

SHEET REVISIONS		

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REGION 1 MOUNTAIN RESIDENCY W. W. G.

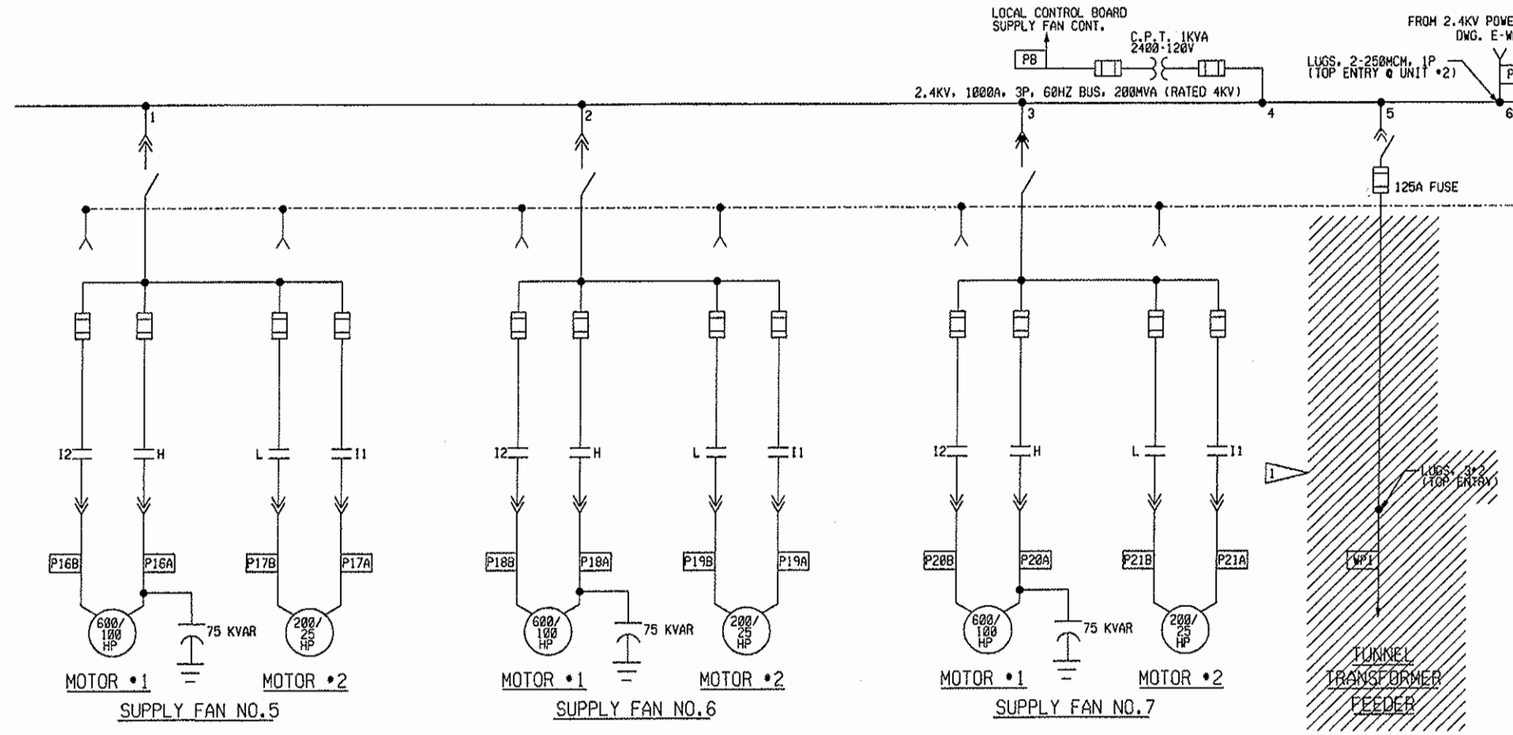
AS CONSTRUCTED	
NO REVISIONS: 01/10/03	
REVISED:	
VOID:	

ELECTRICAL DEMOLITION
WEST 2.4KV MCC NO. 1A

DESIGNER:	J. MILLS	STRUCTURE NUMBERS	
DETAILER:	S. DZUIBA		
SHEET SUBSET:	ELECT DEMO	SUBSET SHEETS:	10 OF 19

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 19

Ø14102\710STDS\BORDERIN.DGN



CONSTRUCTION NOTES:

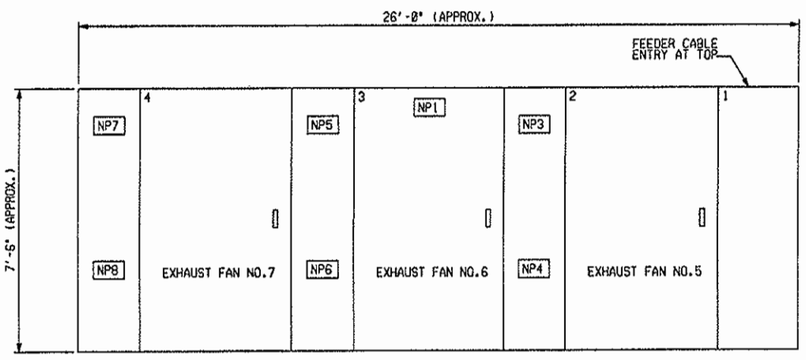
1. REMOVE TUNNEL LIGHTING FEEDER ONLY AFTER NEW REPLACEMENTS ARE INSTALLED AND OPERATIONAL FOR SAME TUNNEL AREA AND LIGHTING TYPE.

LEGEND:

- (ETM) ELASPED TIME METER - RESET TYPE
- (27) UNDERVOLTAGE RELAY
- (46) PHASE - BALANCE CURRENT RELAY (FOR SINGLE PHASING PROTECTION)
- (49) THERMAL OVERLOAD RELAY
- (AS)–(AM) AMMETER SWITCH AND AMMETER
- (50 GS) INSTANT OVERCURRENT GROUND FAULT RELAY
- ELECTRICAL INTERLOCK
- MULTI-SPEED DRAWOUT TYPE CURRENT LIMITING STARTER
- 600/100HP, 1800/900 RPM, HIGH (H)/ INTERMEDIATE #1 (I1) SPEED
- 200/25 HP, 1200/600 RPM, INTERMEDIATE #2 (I2)/ LOW (L) SPEED
- POWER FACTOR CORRECTION CAPACITORS

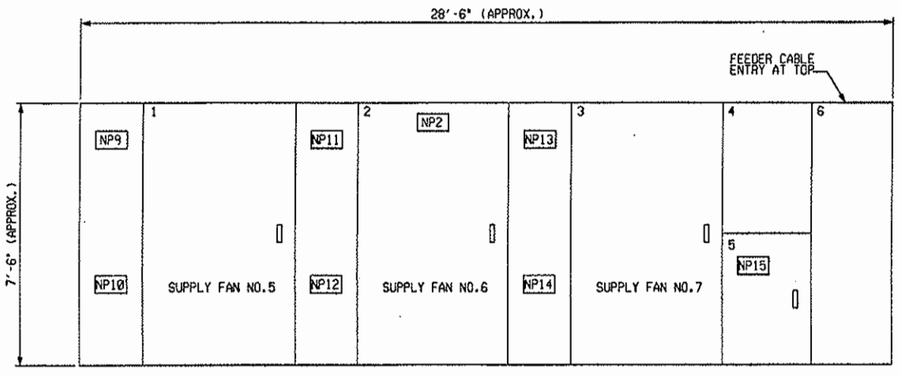
MODIFICATIONS TO WEST VENT. BUILDING 2.4KV MOTOR CONTROL CENTER NO. 1B

(RATED 4KV)



2.4KV MOTOR CONTROL CENTER NO. 1A - FRONT VIEW

N.T.S.



2.4KV MOTOR CONTROL CENTER NO. 1B - FRONT VIEW

N.T.S.

NAMEPLATE SCHEDULE

NP NO.	ENGRAVING
1	2.4KV M.C.C. NO.1A SOUTH TUNNEL
2	2.4KV M.C.C. NO.1B SOUTH TUNNEL
3	EXHAUST FAN EF-5 MOTOR NO.1
4	EXHAUST FAN EF-5 MOTOR NO.2
5	EXHAUST FAN EF-6 MOTOR NO.1
6	EXHAUST FAN EF-6 MOTOR NO.2
7	EXHAUST FAN EF-7 MOTOR NO.1
8	EXHAUST FAN EF-7 MOTOR NO.2
9	SUPPLY FAN SF-5 MOTOR NO.1
10	SUPPLY FAN SF-5 MOTOR NO.2
11	SUPPLY FAN SF-6 MOTOR NO.1
12	SUPPLY FAN SF-6 MOTOR NO.2
13	SUPPLY FAN SF-7 MOTOR NO.1
14	SUPPLY FAN SF-7 MOTOR NO.2
15	TUNNEL TRANSFORMER FEEDER

Design File Name: DGNSPEC•
Plot File Name: $PLOTFILE•
Date of Plot: $$$$DATE$$$$

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CREATION DATE:	04/22/99	INITIALS:	SFD
LAST MODIFICATION DATE:	11/05/99	INITIALS:	SFD
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ACAD VER. R14	SCALE: NONE	UNITS:	

SHEET REVISIONS		

COLORADO DEPARTMENT OF TRANSPORTATION

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REGION 1 MOUNTAIN RESIDENCY W. W. G.

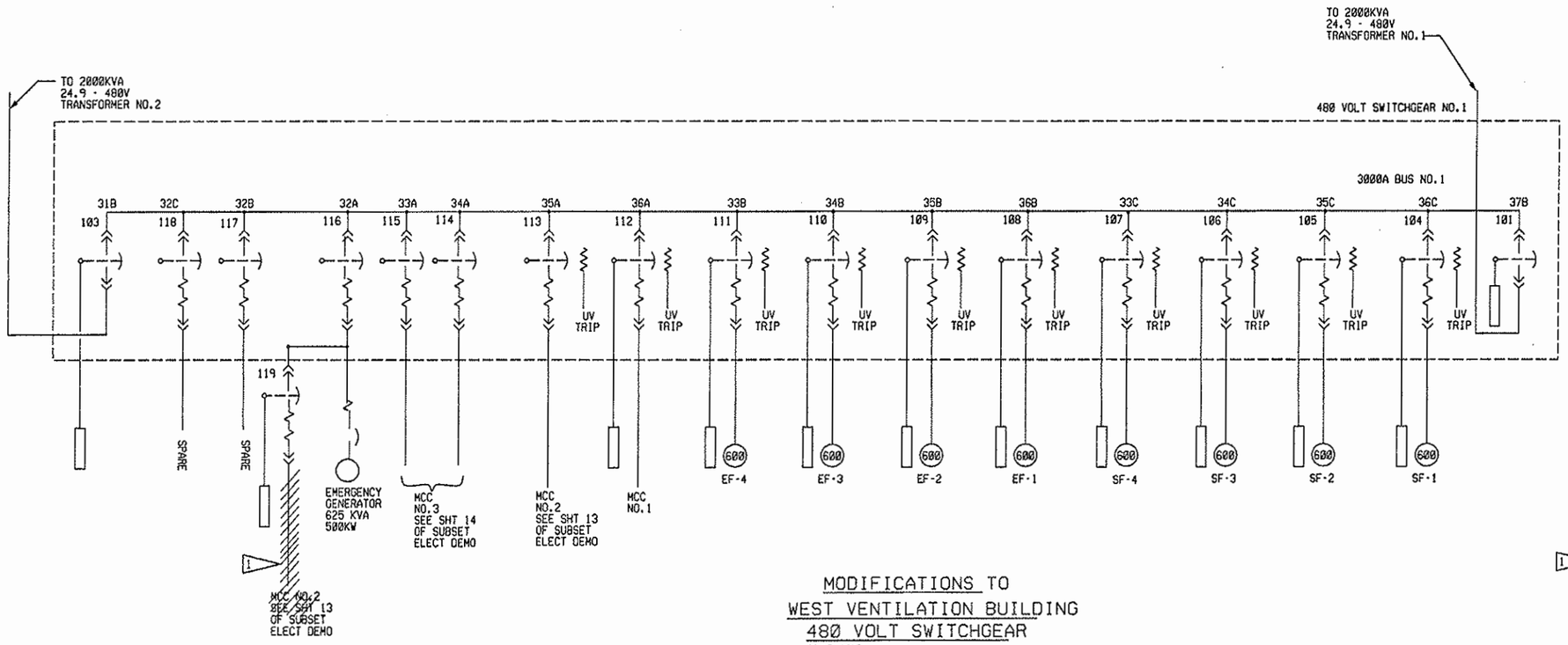
AS CONSTRUCTED	
NO REVISIONS: 01/10/03	
REVISED:	
VOID:	

ELECTRICAL DEMOLITION
WEST 2.4KV MCC NO.1B

DESIGNER:	J. MILLS	STRUCTURE NUMBERS	
DETAILER:	S. DZUIBA		
SHEET SUBSET:	ELECT DEMO	SUBSET SHEETS:	11 OF 19

PROJECT NO./CODE	
IM 0703-264	
12982	
SHEET NUMBER	20

Ø14102\710STDS\BORDERIN.DGN



MODIFICATIONS TO
WEST VENTILATION BUILDING
480 VOLT SWITCHGEAR

SCALE: NONE

CONSTRUCTION NOTES:

1. DISCONNECT EXISTING CONDUCTORS AT EXISTING EQUIPMENT TERMINALS. REMOVE CONDUCTORS FROM EXISTING CONDUIT.

WEST VENTILATION BUILDING - 480V SWITCHGEAR

31	32	33	34	35	36	37
A	A	A	A	A	A	A
B	B	B	B	B	B	B
C	C	C	C	C	C	C

480 VOLT SWITCHGEAR ELEVATION

SCALE: NONE

Design File Name: DGNSPEC
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ACAD VER. R14	SCALE: NONE UNITS:

SHEET REVISIONS		

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REGION 1 MOUNTAIN RESIDENCY W. W. G.

AS CONSTRUCTED	
NO REVISIONS: 01/10/03	
REVISED:	
VOID:	

ELECTRICAL DEMOLITION
WEST 480V SWITCHGEAR

DESIGNER:	J. MILLS	STRUCTURE NUMBERS	
DETAILER:	S. DZUIBA		
SHEET SUBSET:	ELECT DEMO	SUBSET SHEETS:	12 OF 19

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 21

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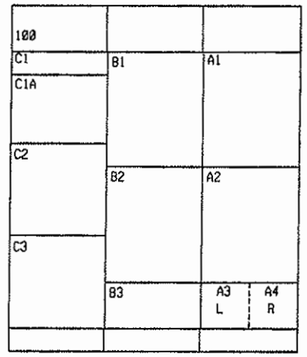
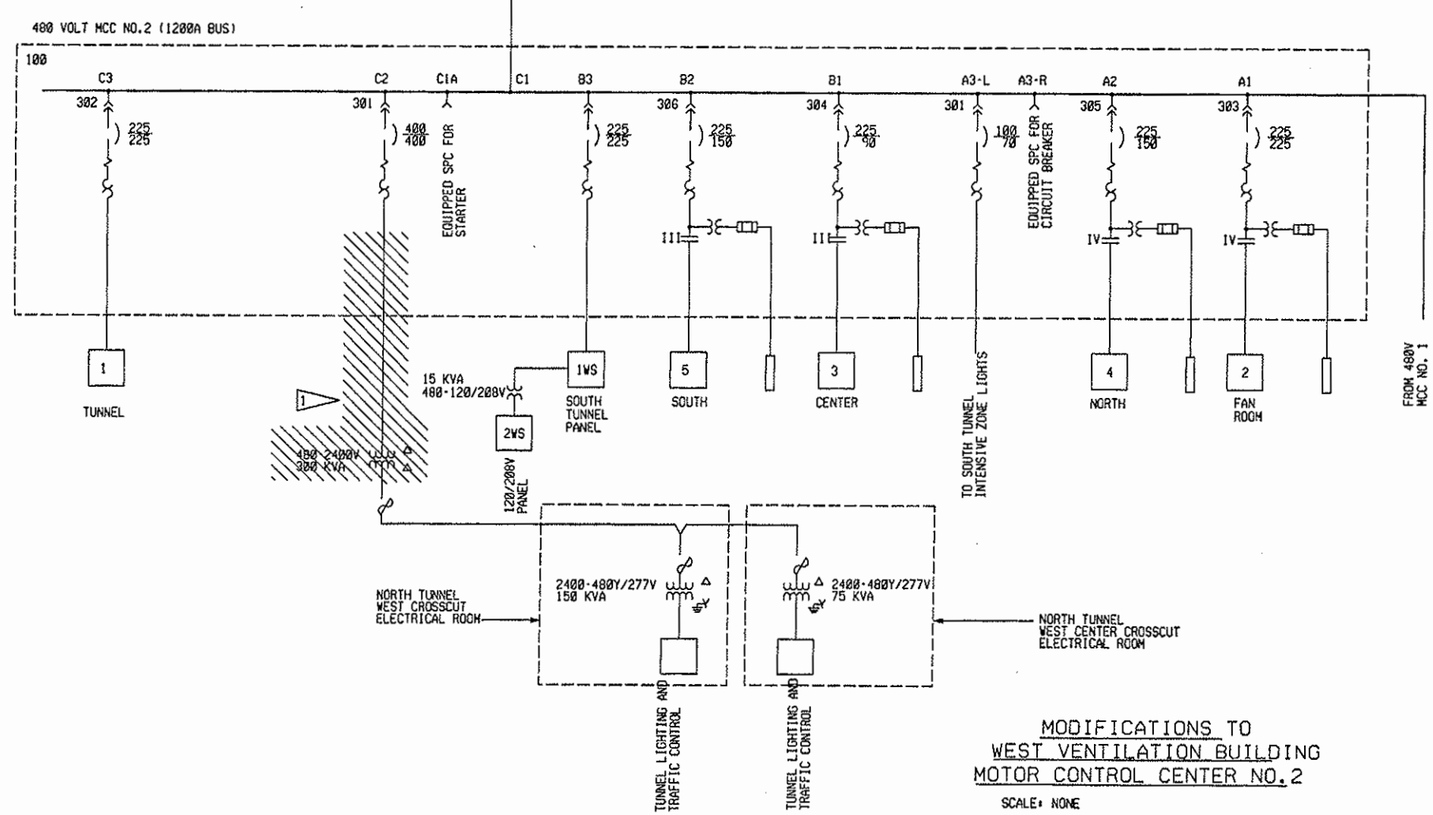
WEST VENTILATION BUILDING (MCC) NO. 2



MCC NO.2 ELEVATION
SCALE: NONE

CONSTRUCTION NOTES:

1. REMOVE TUNNEL LIGHTING FEEDER BETWEEN MCC NO.2 AND TRANSFORMER ONLY AFTER NEW REPLACEMENT 2.4 KV FEEDER IS INSTALLED AND OPERATIONAL.



MODIFICATIONS TO
WEST VENTILATION BUILDING
MOTOR CONTROL CENTER NO.2
SCALE: NONE

NAMEPLATE SCHEDULE

REF	FIRST LINE	SECOND LINE	THIRD LINE
100	480 VOLT	MCC NO. 2	SOUTH
A1	FAN ROOM	POWER DIST.	PANEL NO. 2
A2	NORTH BLDG.	POWER DIST.	PANEL NO. 4
A3-L	SOUTH TUNNEL	INTENSIVE	ZONE LIGHTS
A3-R	EQUIPD. SPC.	FOR CIRCUIT	BREAKER
B1	CENTER BLDG.	POWER DIST.	PANEL NO. 3
B2	SOUTH BLDG.	POWER DIST.	PANEL NO. 5
B3	PANEL	1WS	SOUTH TUNNEL
C1	INCOMING	FEEDER	BUS
C1A	EQUIPD. SPC.	FOR STARTER	SIZE 3
C2	300KVA	TRANSFORMER	PRIMARY
C3	TUNNEL SUPPLY	POWER DIST.	PANEL NO. 1

Design File Name: DGNSSPEC•
Ref File Name: $FLOTALE•
Date of Plot: $$$$DATE$$$$

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DRAWING FILE NAME:	102esd22.dwg
ACAD VER. R14 SCALE: NONE	UNITS:

SHEET REVISIONS

COLORADO DEPARTMENT OF TRANSPORTATION
DOT DEPARTMENT OF TRANSPORTATION
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DUMONT, CO. 80436
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REGION 1 MOUNTAIN RESIDENCY W. W. G.

AS CONSTRUCTED
NO REVISIONS: 01/10/03
REVISED:
VOID:

ELECTRICAL DEMOLITION WEST MCC NO.2

DESIGNER: J. MILLS
DETAILER: S. DZUIBA
STRUCTURE NUMBERS
SHEET SUBSET: ELECT DEMO
SUBSET SHEETS: 13 OF 19

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 22

014102\710STDS\BORDERIN.DGN

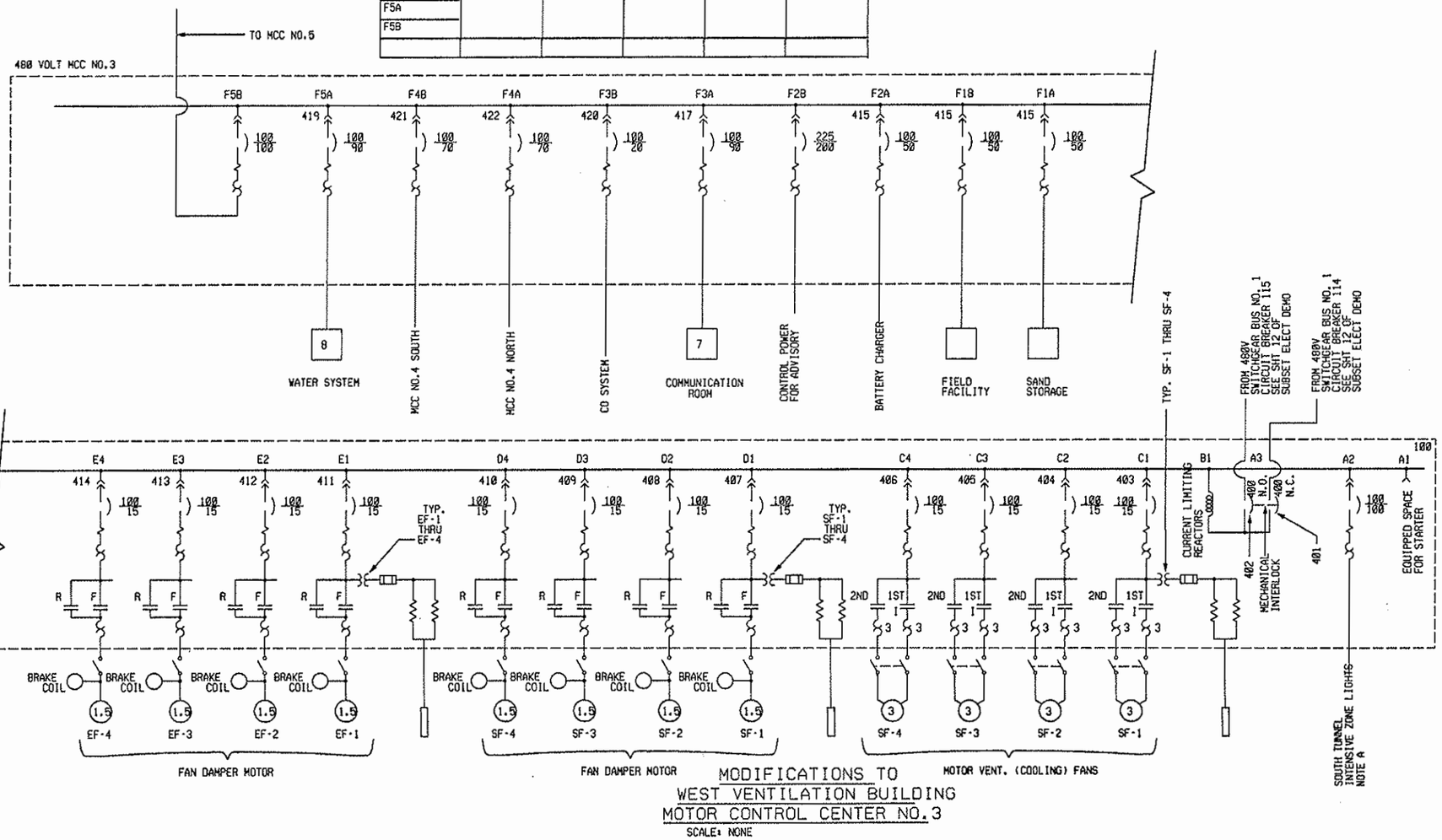
WEST VENTILATION BUILDING (MCC) NO. 3

100					
F1A	E1	D1	C1	B1	A1
F1B					
F2A	E2	D2	C2		A2
F2B					A3
F3A	E3	D3	C3		
F3B					
F4A					
F4B	E4	D4	C4		
F5A					
F5B					

NOTES:

A. MAINTAIN UNINTERRUPTED SERVICE TO THE SOUTH TUNNEL INTENSIVE ZONE HID LIGHTS DURING CONSTRUCTION.

MCC NO.3 ELEVATION
SCALE: NONE



NAMEPLATE SCHEDULE

REF	FIRST LINE	SECOND LINE	THIRD LINE
100	480 VOLT	MCC NO. 3	SOUTH
A1	EQUIPD. SPC.	FOR STARTER	SIZE 3
A2	INTENSIVE	ZONE	LIGHTS
A3	INCOMING	FEEDER NO. 1	FEEDER NO.2
B1	CURRENT LIMITING	REACTOR	
C1	VENT FAN	FOR	SF-1
C2	VENT FAN	FOR	SF-2
C3	VENT FAN	FOR	SF-3
C4	VENT FAN	FOR	SF-4
D1	DAMPER	FOR	SF-1
D2	DAMPER	FOR	SF-2
D3	DAMPER	FOR	SF-3
D4	DAMPER	FOR	SF-4
E1	DAMPER	FOR	EF-1
E2	DAMPER	FOR	EF-2
E3	DAMPER	FOR	EF-3
E4	DAMPER	FOR	EF-4
F1A	SAND	STORAGE	
F1B	FIELD	FACILITY	
F2A	BATTERY	CHARGER	
F2B	CONTROL	POWER FOR,	SUPERVISORY
F3A	STATE	COMMUNICATION	
F3B	CO SYSTEM		
F4A	MOTOR CONTRL	CENTER NO. 4	NORTH
F4B	MOTOR CONTRL	CENTER NO. 4	SOUTH
F5A	WATER SYSTM	POWER DIST.	PANEL NO.8
F5B	MOTOR CONTRL	CENTER NO. 5	

MODIFICATIONS TO
WEST VENTILATION BUILDING
MOTOR CONTROL CENTER NO.3
SCALE: NONE

Design File Name: DGNSSPEC>
Plot File Name: $PLOTFILE$
Date of Plot: $$$$DATE$$$$

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LAST MODIFICATION DATE: 11/05/99	INITIALS: SFD
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ACAD VER. R14 SCALE: NONE	UNITS:

SHEET REVISIONS		

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AS CONSTRUCTED	
NO REVISIONS: 01/10/03	
REVISED:	
VOID:	

ELECTRICAL DEMOLITION
WEST MCC NO. 3

DESIGNER:	J. MILL	STRUCTURE NUMBERS	
DETAILER:	S. DZUIBA		
SHEET SUBSET: ELECT DEMO	SUBSET SHEETS: 14 OF 19		

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 23

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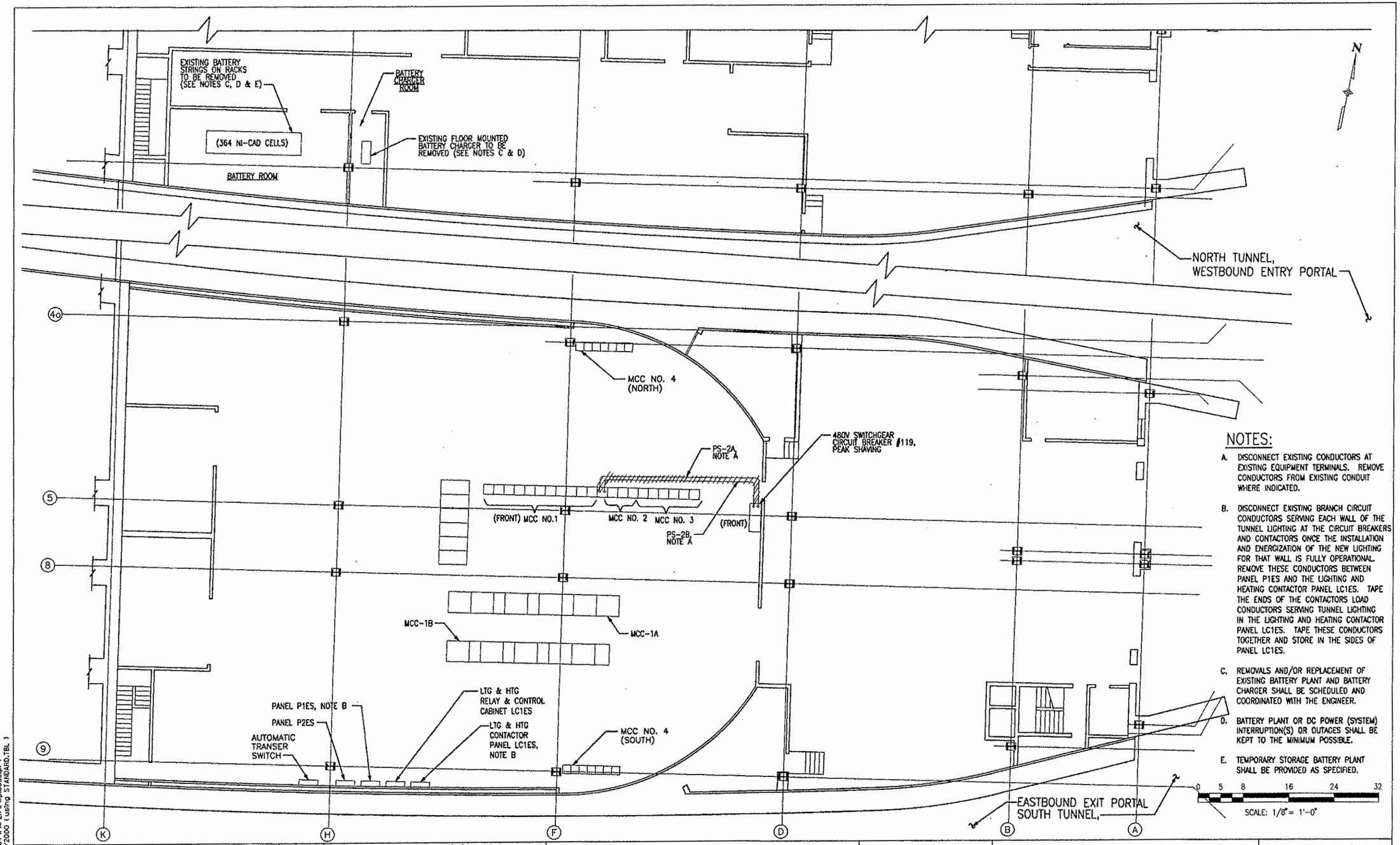

NOTES:

A. DISCONNECT EXISTING CONDUCTORS AT EXISTING EQUIPMENT TERMINALS. REMOVE CONDUCTORS FROM EXISTING CONDUIT WHERE INDICATED.

B. DISCONNECT EXISTING BRANCH CIRCUIT CONDUCTORS SERVING EACH WALL OF THE TUNNEL LIGHTING AT THE CIRCUIT BREAKERS AND CONTACTORS ONCE THE INSTALLATION AND ENERGIZATION OF THE NEW LIGHTING FOR THAT WALL IS FULLY OPERATIONAL. REMOVE THESE CONDUCTORS BETWEEN PANEL P1ES AND THE LIGHTING AND HEATING CONTACTOR PANEL LC1ES. TAPE THE ENDS OF THE CONTACTORS LOAD CONDUCTORS SERVING TUNNEL LIGHTING IN THE LIGHTING AND HEATING CONTACTOR PANEL LC1ES. TAPE THESE CONDUCTORS TOGETHER AND STORE IN THE SIDES OF PANEL LC1ES.

C. REMOVALS AND/OR REPLACEMENT OF EXISTING BATTERY PLANT AND BATTERY CHARGER SHALL BE SCHEDULED AND COORDINATED WITH THE ENGINEER.

D. BATTERY PLANT OR DC POWER (SYSTEM) INTERRUPTION(S) OR OUTAGES SHALL BE KEPT TO THE MINIMUM POSSIBLE.

E. TEMPORARY STORAGE BATTERY PLANT SHALL BE PROVIDED AS SPECIFIED.

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Plot File Name: P:\PLOT\PAPER\rmple05e.prt
Date of Plot: 7/31/2000 (using STANDARD.TBL)

Computer File Information			
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Last Modification Date:	11/05/99	Initials:	DMO
Full Path:	14102\700CADD\703ELECT\		
Drawing File Name:	rmple05e.dwg		
Acad Ver. R14	Scale: 1/8"=1'-0"	Units:	

Sheet Revisions		

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DUMONT, CO. 80436
Phone: 303-512-5750 FAX: 303-512-5775
Region 1 Mountain Residency W.W.G.

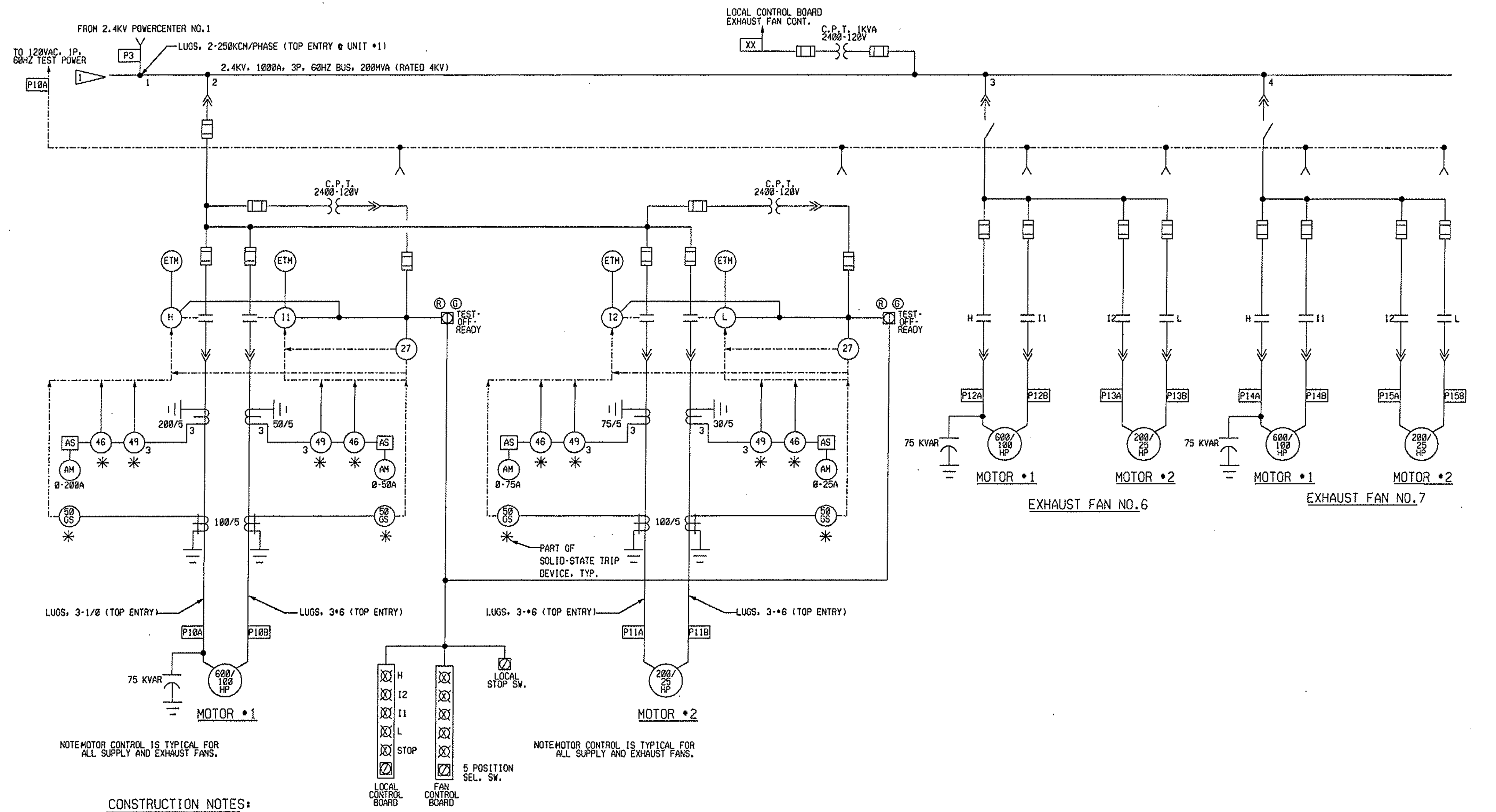
As Constructed
No Revisions: 01/10/03
Revised:
Void:

ELECTRICAL DEMOLITION
EAST VENT BUILDING PLAN

Designer:	J. MILLS	Structure Numbers	
Detailer:	S. DZUIBA		
Sheet Subset:	ELECT DEMO	Subset Sheets:	15 of 19

Project No./Code
IM 0703-264
12982
Sheet Number 24

014102\710STDS\BORDERIN.DGN



NOTE: MOTOR CONTROL IS TYPICAL FOR ALL SUPPLY AND EXHAUST FANS.

NOTE: MOTOR CONTROL IS TYPICAL FOR ALL SUPPLY AND EXHAUST FANS.

CONSTRUCTION NOTES:

1. PROVIDE NECESSARY BUS AND ENCLOSURE MODIFICATIONS TO FACILITATE THE ADDITION OF A NEW MOTOR CONTROL CENTER CUBICLE.

MODIFICATIONS TO EAST VENT. BUILDING 2.4KV MOTOR CONTROL CENTER NO. 1A

(RATED 4KV)

COMPUTER FILE INFORMATION	
CREATION DATE: 04/23/99	INITIALS: SFD
LAST MODIFICATION DATE: 11/05/99	INITIALS: SFD
FULL PATH: 14102\700CADD\703ELECT\	
DRAWING FILE NAME: rmel07E.dwg	
ACAD VER. R14 SCALE: None	UNITS:

SHEET REVISIONS

COLORADO DEPARTMENT OF TRANSPORTATION

P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775

REGION 1 MOUNTAIN RESIDENCY W.W.G.

AS CONSTRUCTED
NO REVISIONS: 01/10/03
REVISED:
VOID:

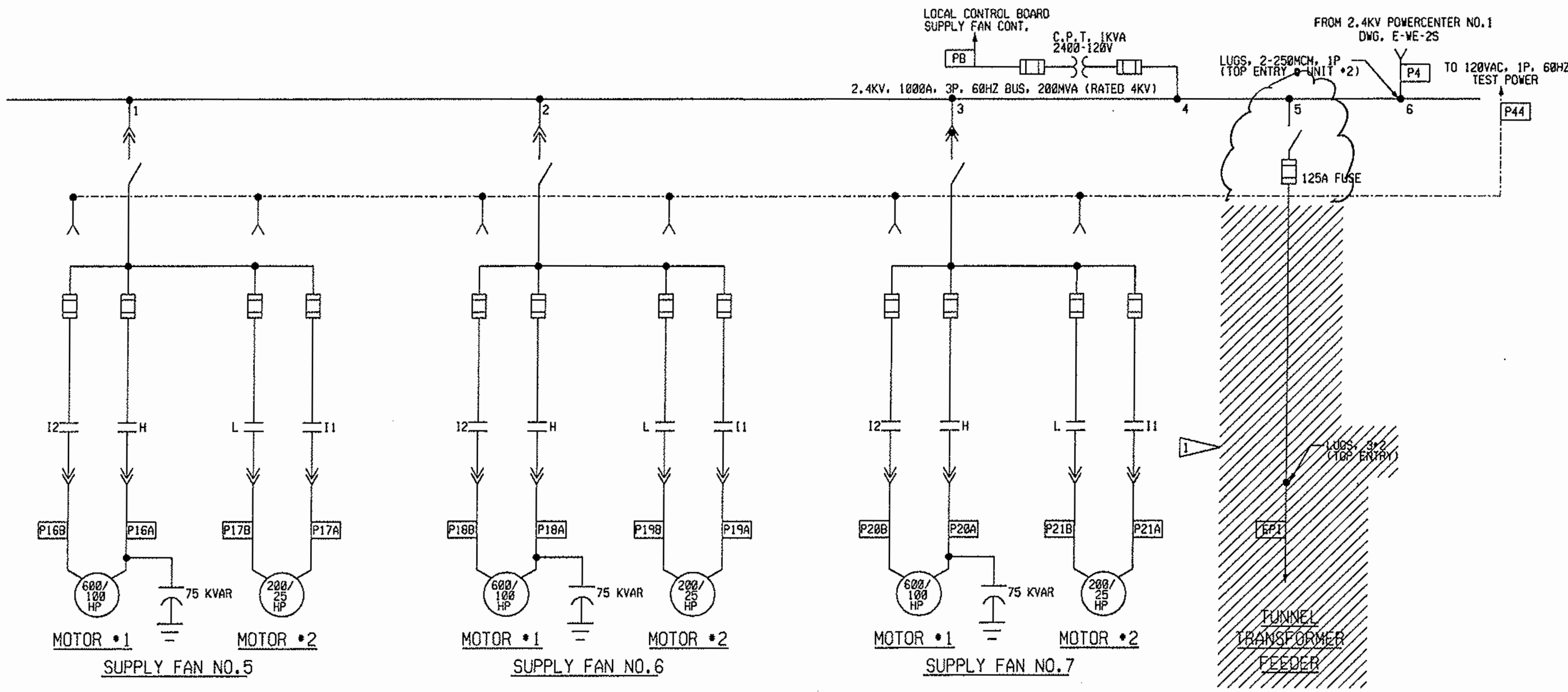
ELECTRICAL DEMOLITION
EAST 2.4 KV MCC NO. 1A

DESIGNER: J. MILL
DETAILER: S. DZUIBA
STRUCTURE NUMBERS
SHEET SUBSET: ELECT DEMO
SUBSET SHEETS: 16 OF 19

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 25

Design File Name: DGN$SPEC$
Plot File Name: $PLOTFILE$
Date of Plot: $$$$DATE$$$$

014102\710STDS\BORDERIN.DGN



MODIFICATIONS TO EAST VENT. BUILDING

2.4KV MOTOR CONTROL CENTER NO. 1B

(RATED 4KV)

CONSTRUCTION NOTES:

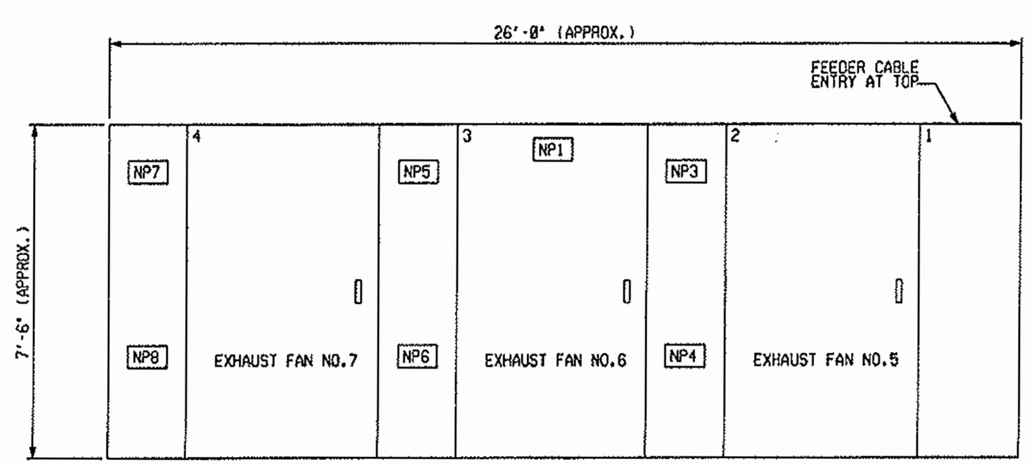
1. REMOVE TUNNEL LIGHTING FEEDER ONLY AFTER NEW REPLACEMENTS ARE INSTALLED AND OPERATIONAL FOR SAME TUNNEL AREA AND LIGHTING TYPE.

LEGEND:

- (ETM) ELASPED TIME METER - RESET TYPE
- (27) UNDERVOLTAGE RELAY
- (46) PHASE - BALANCE CURRENT RELAY (FOR SINGLE PHASING PROTECTION)
- (49) THERMAL OVERLOAD RELAY
- AS-(AM) AMMETER SWITCH AND AMMETER
- (SO/GS) INSTANT OVERCURRENT GROUND FAULT RELAY
- ELECTRICAL INTERLOCK
- MULTI-SPEED DRAWOUT TYPE CURRENT LIMITING STARTER 600/100HP, 1800/900 RPM, HIGH (H)/ INTERMEDIATE #1 (I1) SPEED 200/25 HP, 1200/600 RPM, INTERMEDIATE #2 (I2)/ LOW (L) SPEED
- POWER FACTOR CORRECTION CAPACITORS

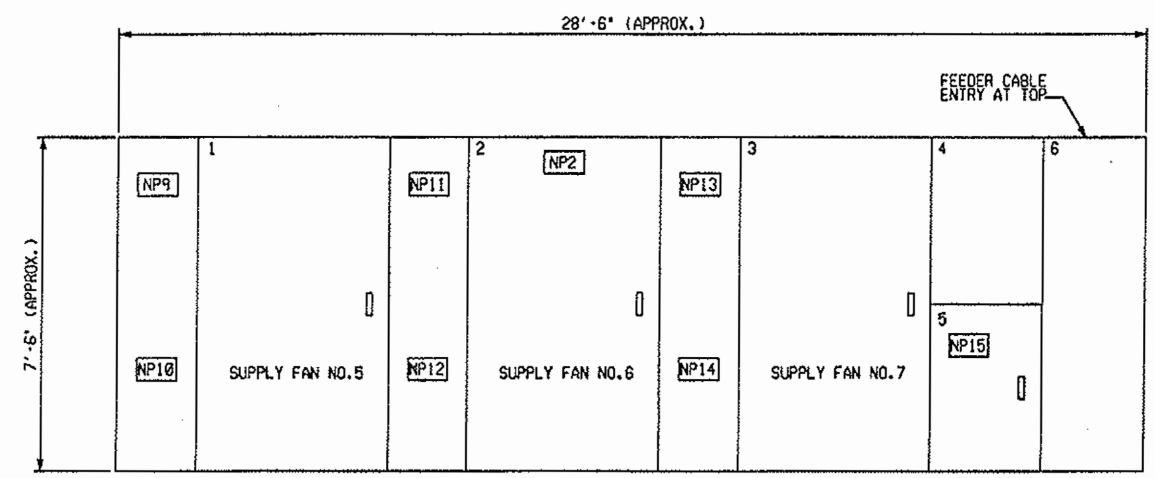
NAMEPLATE SCHEDULE

NP NO.	ENGRAVING
1	2.4KV M.C.C. NO.1A SOUTH TUNNEL
2	2.4KV M.C.C. NO.1B SOUTH TUNNEL
3	EXHAUST FAN EF-5 MOTOR NO.1
4	EXHAUST FAN EF-5 MOTOR NO.2
5	EXHAUST FAN EF-6 MOTOR NO.1
6	EXHAUST FAN EF-6 MOTOR NO.2
7	EXHAUST FAN EF-7 MOTOR NO.1
8	EXHAUST FAN EF-7 MOTOR NO.2
9	SUPPLY FAN SF-5 MOTOR NO.1
10	SUPPLY FAN SF-5 MOTOR NO.2
11	SUPPLY FAN SF-6 MOTOR NO.1
12	SUPPLY FAN SF-6 MOTOR NO.2
13	SUPPLY FAN SF-7 MOTOR NO.1
14	SUPPLY FAN SF-7 MOTOR NO.2
15	TUNNEL TRANSFORMER FEEDER



2.4KV MOTOR CONTROL CENTER NO. 1A - FRONT VIEW

N.T.S.



2.4KV MOTOR CONTROL CENTER NO. 1B - FRONT VIEW

N.T.S.

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LAST MODIFICATION DATE: 11/05/99	INITIALS: SFD
FULL PATH: 14102\700CADD\703ELECT\	
DRAWING FILE NAME: rme108e.dwg	
ACAD VER. R14 SCALE: None	UNITS:

SHEET REVISIONS

COLORADO DEPARTMENT OF TRANSPORTATION

P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775

REGION 1 MOUNTAIN RESIDENCY, W.G.

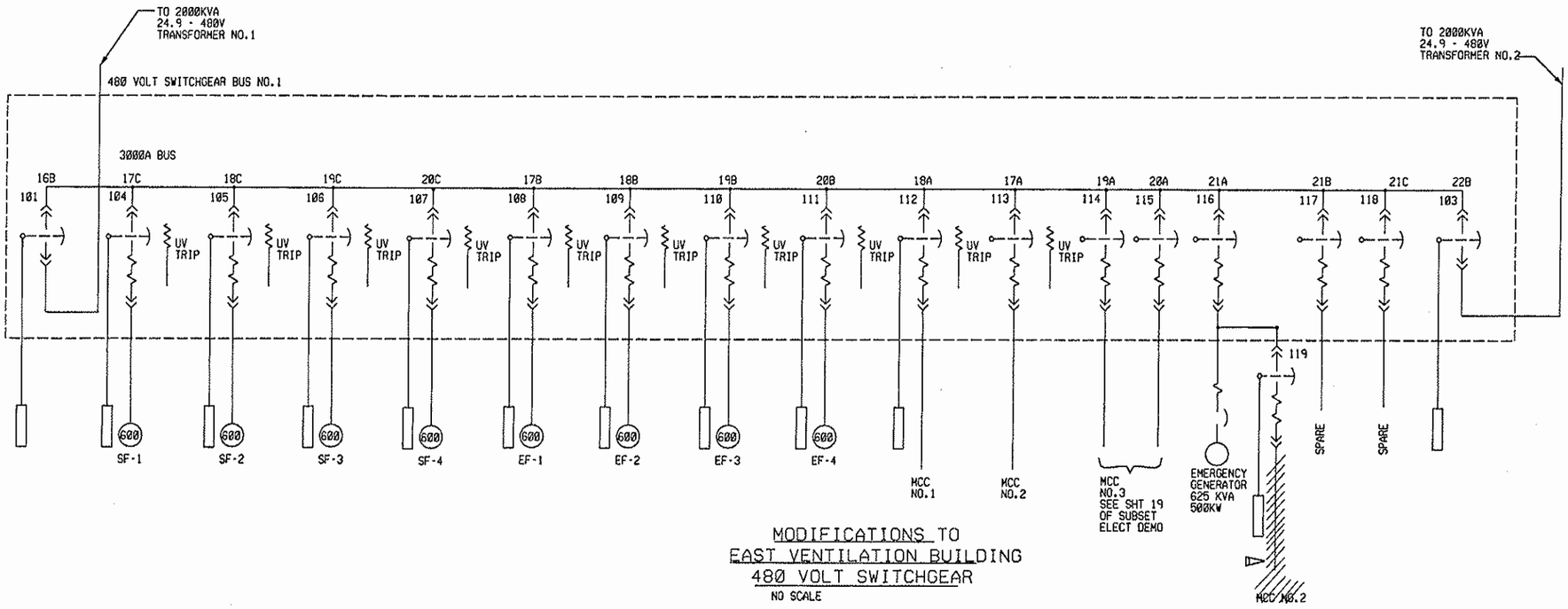
AS CONSTRUCTED
NO REVISIONS: 01/10/03
REVISED:
VOID:

ELECTRICAL DEMOLITION
EAST 2.4KV MCC NO.1B

DESIGNER: J. MILLS
DETAILER: S. DZUIBA
SHEET SUBSET: ELECT DEMO
STRUCTURE NUMBERS
SUBSET SHEETS: 17 OF 19

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 26

014102\710STDS\BORDERIN.DGN



MODIFICATIONS TO
EAST VENTILATION BUILDING
480 VOLT SWITCHGEAR
NO SCALE

CONSTRUCTION NOTES:

1. DISCONNECT EXISTING CONDUCTORS AT EXISTING EQUIPMENT TERMINALS. REMOVE CONDUCTORS FROM EXISTING CONDUIT.

EAST VENTILATION BUILDING - 480V SWITCHGEAR

16	17	18	19	20	21	22
A	A	A	A	A	A	A
B	B	B	B	B	B	B
C	C	C	C	C	C	C

480 VOLT SWITCHGEAR ELEVATION
NO SCALE

Design File Name: DGN:$SPEC=
Plot File Name: $PLOTFILE=
Date of Plot: $$$$DATE$$$$

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CREATION DATE:	04/26/99	INITIALS: SFD
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FULL PATH:	14102\700CADD\703ELECT\	
DRAWING FILE NAME:	102ESD13.DWG	
ACAD VER. R14	SCALE: NONE	UNITS:

SHEET REVISIONS		

COLORADO DEPARTMENT OF TRANSPORTATION
DOT
DEPARTMENT OF TRANSPORTATION
P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W. W.G.

AS CONSTRUCTED	
NO REVISIONS: 01/10/03	
REVISED:	
VOID:	

ELECTRICAL DEMOLITION
EAST 480V SWITCHGEAR

DESIGNER:	J. MILL	STRUCTURE NUMBERS	
DETAILER:	S. DZUIBA		
SHEET SUBSET:	ELECT DEMO	SUBSET SHEETS:	18 OF 19

PROJECT NO./CODE	
IM 0703-264	
12982	
SHEET NUMBER	27

014102\710STDS\BORDERIN.DGN

EAST VENTILATION BUILDING (MCC) NO. 3

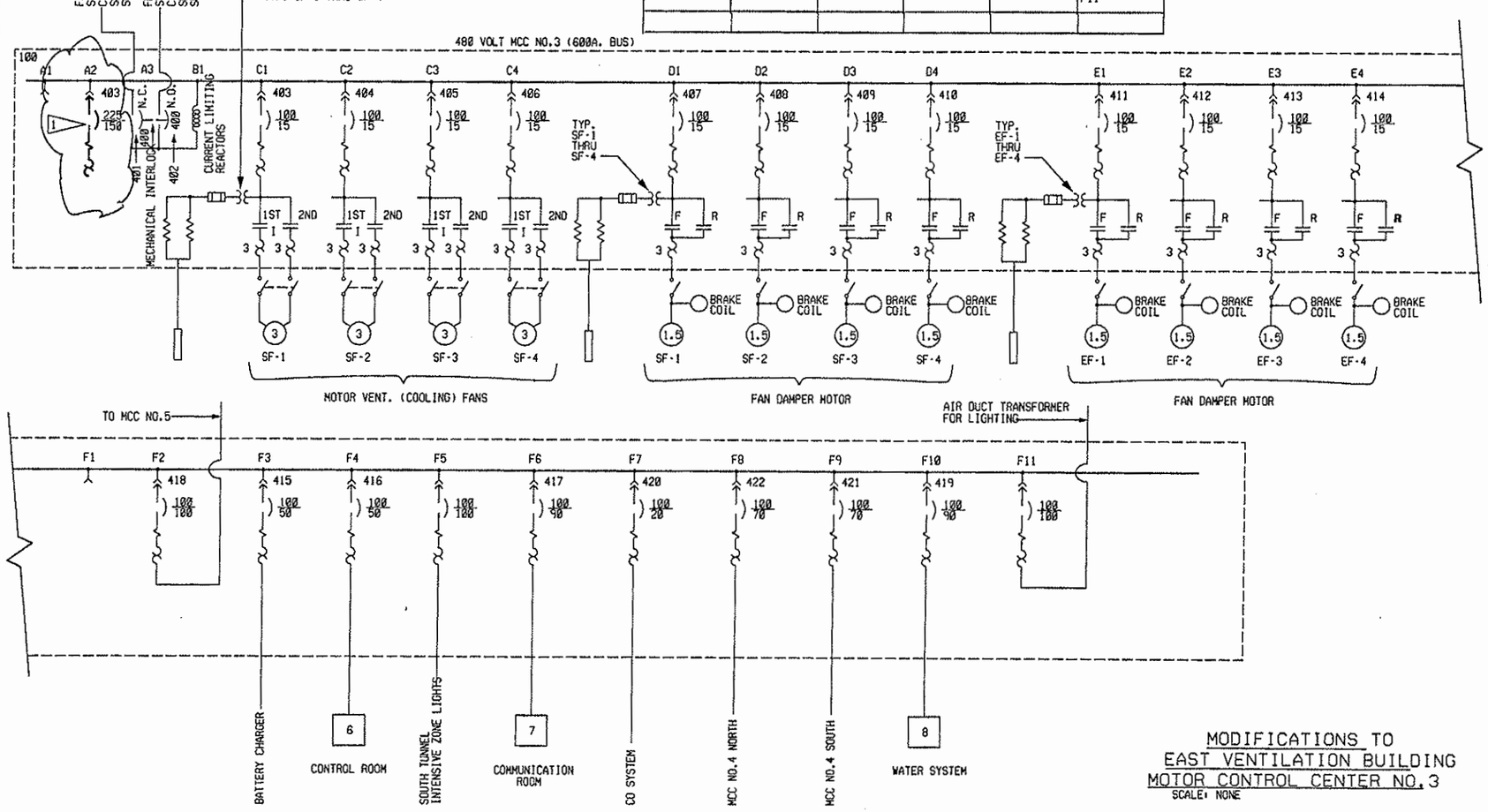
100					
A1	B1	C1	D1	E1	F1
					F2
A2		C2	D2	E2	F3
					F4
A3					F5
		C3	D3	E3	F6
					F7
					F8
		C4	D4	E4	F9
					F10
					F11

CONSTRUCTION NOTES:

1. INSTALL NEW CIRCUIT BREAKER WITH NAMEPLATE ON FRONT DOOR AS INDICATED IN NAMEPLATE SCHEDULE.

MCC NO.3 ELEVATION

SCALE: NONE



MODIFICATIONS TO EAST VENTILATION BUILDING MOTOR CONTROL CENTER NO.3

SCALE: NONE

2

NAMEPLATE SCHEDULE			
REF	FIRST LINE	SECOND LINE	THIRD LINE
100	480 VOLT	MCC NO. 3	NORTH
A1	EQUIPD. SPC.	FOR STARTER	SIZE 3
A2	TUNNEL LTG.	PANEL EVS-204	
A3	INCOMING	FEEDER NO.1	FEEDER NO.2
B1	CURRENT LIMITING	REACTOR	
C1	VENT FAN	FOR	SF-1
C2	VENT FAN	FOR	SF-2
C3	VENT FAN	FOR	SF-3
C4	VENT FAN	FOR	SF-4
D1	DAMPER	FOR	SF-1
D2	DAMPER	FOR	SF-2
D3	DAMPER	FOR	SF-3
D4	DAMPER	FOR	SF-4
E1	DAMPER	FOR	EF-1
E2	DAMPER	FOR	EF-2
E3	DAMPER	FOR	EF-3
E4	DAMPER	FOR	EF-4
F1	EQUIPD. SPC.	FOR STARTER	SIZE 2
F2	MOTOR	CONTROL CENTER NO. 5	
F3	BATTERY	CHARGER	
F4	CONTROL RM.	POWER DIST.	PANEL NO.6
F5	SO. TUNNEL	INTENSIVE	ZONE LIGHTS
F6	STATE	COMMUNICATION	ROOM
F7	CO SYSTEM		
F8	MOTOR CONTRL	CENTER NO. 4	NORTH
F9	MOTOR CONTRL	CENTER NO. 4	SOUTH
F10	WATER SYSTM	POWER DIST.	PANEL NO.8
F11	AIR DUCT	TRANSFORMER	FOR LIGHTING

Design File Name: DGN=SPEC=
Plot File Name: $PLOTFILE=
Date of Plot: $$$$DATE$$$$

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LAST MODIFICATION DATE: 11/05/99	INITIALS: DMO
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ACAD VER. R14 SCALE: NONE	UNITS:

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COLORADO DEPARTMENT OF TRANSPORTATION
DOT DEPARTMENT OF TRANSPORTATION
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DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W.W.G.

AS CONSTRUCTED	
NO REVISIONS: 11/10/99	
REVISED:	
VOID:	

ELECTRICAL DEMOLITION EAST MCC NO.3

DESIGNER:	J. MILL	STRUCTURE NUMBERS	
DETAILER:	S. DZUIBA		
SHEET SUBSET: ELECT DEMO		SUBSET SHEETS:	19 OF 19

PROJECT NO./CODE	
IM 0703-264	
12982	
SHEET NUMBER	28

Ø14102\710STDS\BORDERIN.DGN

TUNNEL LIGHTING NOTES

1. UNLESS OTHERWISE NOTED, ALL LUMINAIRES SHALL BE MOUNTED IN ACCORDANCE TO THE TYPICAL MOUNTING DETAILS SHOWN ON SUBSET 'TLD' TUNNEL LIGHTING DETAILS SHEETS.
2. PLAN DRAWINGS ARE SCHEMATIC FOR LUMINAIRE LOCATION AND INFORMATION ONLY. REFER TO TUNNEL LIGHTING DETAILS FOR ACTUAL PLACEMENT ON WALLS AND CEILINGS.
3. UNDER THIS CONTRACT, NO LIGHTING WORK IS TO BE COMPLETED IN THIS AREA.
4. AT VMS LOCATIONS WITHIN THE TUNNEL, THE ROW OF FLUORESCENT TUNNEL LUMINAIRES (INCLUDING WIREWAYS) END APPROXIMATELY 3'-0" IN FRONT OF THE C OF SIGN, AND RESUMES APPROXIMATELY 3'-0" AFTER C OF THE SIGN. SEE SUBSET 'TLD' TUNNEL LIGHTING DETAILS, SHEET 2 FOR CLARIFICATION.
5. AT BREAKS IN THE ROW OF LUMINAIRES FLUORESCENT, WHERE WIREWAY IS NOT CONTINUOUS, CONDUIT ENTRANCES INTO REAR OF WIREWAY SHALL BE PROVIDED AT BOTH STARTING AND STOPPING POINTS OF TUNNEL LIGHTING RUN. USE 2" RIGID CONDUIT, SECURED TO WALL PANELS (WHERE FEASIBLE), TO CONTINUE CIRCUIT RUNS ACROSS INTERRUPTION POINTS. SEE ELECTRICAL SECTIONS & DETAILS FOR INTERCONNECT REQUIREMENTS.
6. CONTRACTOR SHALL COORDINATE TUNNEL LIGHTING WIREWAY POWER FEED LOCATIONS AS INDICATED ON THE TUNNEL POWER PLANS. REFER TO SUBSET 'TUN POWER' FOR LOCATIONS.
7. SEE SUBSET 'TLD' TUNNEL LIGHTING DETAILS DRAWING SHEETS FOR SPECIFIC MOUNTING REQUIREMENTS OF EACH SYSTEM COMPONENT.
8. FOR TABULATION OF TUNNEL MOUNTING CONDITIONS, REFER TO SUBSET 'TLD' TUNNEL LIGHTING DETAILS, SHEET 1.
9. PROVIDE ONE EXTRA SUPPLIMENTAL MOUNTING PLATE WITH A LUMINAIRE MOUNTING BRACKET AT THE END OF EACH RUN OF FLUORESCENT LUMINAIRES (TYPES F1, F2 AND F3 TUNNEL).
10. PROVIDE A CAST ALUMINUM CAP AT THE END OF EACH RUN OF FLUORESCENT LUMINAIRES AND WIREWAYS TO ENSURE AGAINST WATER INTRUSION. CONTRACTOR SHALL COORDINATE ACTUAL NUMBER REQUIRED.
11. LUMINAIRES (HID) MOUNTED TO LESS THAN 8'-0" ON CENTER SHALL BE MOUNTED IN CONJUCTION TO A CONTINUOUS WIREWAY. WHEN TRANSITIONING FROM 5'-0" ON CENTER SPACING TO 8'-0" ON CENTER SPACING, BEGIN 8'-0" ON CENTER SPACING FROM THE NEXT JOINT BETWEEN CEILING SLABS. PROVIDE A MINIMUM OF 5'-0" (MAXIMUM OF 8'-0") BETWEEN MOUNTING METHODS. SEE SUBSET 'TLD' TUNNEL LIGHTING DETAILS SHEET 3.
12. THE LOCATIONS SHOWN ON SOUTH TUNNEL LIGHTING PLANS AND DETAILS, DEPICTING BEGINNING AND ENDING OF MOUNTING CONDITIONS FOR THE TUNNEL LUMINAIRES ARE APPORXIMATE. CONTRACTOR TO VERIFY EXACT LOCATION, LAYOUT, MOUNTING CHANNEL, AND ANCHOR POINTS ACCORDINGLY.
13. THE NOTATIONS FOR R1 (CONCRETE) PAVEMENT ARE FOR FUTURE REFERENCE.
14. ALL QUANTITIES SHOWN ON THE SHEETS NOTED BETWEEN STATIONS ARE APPROXIMATE. DUE TO THE FLEXIBLE NATURE OF THE TUNNEL LIGHTING SYSTEM DESIGN, LUMINAIRES MAY SHIFT TO ADJACENT CALLOUT AREAS. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING ALL CHANGES WHICH ARE REQUIRED.
15. ACCESS HATCH SHOWN FOR REFERENCE. LUMINAIRES SHOULD BE COORDINATED SO AS NOT TO BE AFFECTED. ROUTE ALL CONDUIT AROUND HATCH IF REQUIRED.

LUMINAIRE LOCATION TABULATION - SOUTH TUNNEL

		LUMINAIRE LOCATION		QUANTITIES (UNIT EACH)						
		FROM	TO	F1	F2	F3	M1	M2	M3	HID WIREWAY
NORTH WALL	TH	36+04	40+33			52	(170)			44
		40+33	41+82			18	(30)			15
	TR1	41+82	42+39			7		(11)		6
		42+39	43+39			12		(11)		
		43+39	43+87			6		(3)		
	TR2	43+87	45+95		25				(13)	
	TR3	45+95	48+01	25						
		48+01	48+66	8						
	INT	48+66	48+74	VMS BREAK (SEE NOTES 4 & 5)						
		48+74	56+76	97						
		56+76	56+85	VMS BREAK (SEE NOTES 4 & 5)						
		56+85	59+56	33						
		59+56	64+77	63						
		64+77	64+86	VMS BREAK (SEE NOTES 4 & 5)						
		64+86	72+85	97						
		72+85	72+94	VMS BREAK (SEE NOTES 4 & 5)						
		72+94	79+64	81						
		79+64	80+78	14						
		80+78	80+87	VMS BREAK (SEE NOTES 4 & 5)						
		80+87	88+95	98						
		88+95	89+06	VMS BREAK (SEE NOTES 4 & 5)						
		89+06	96+88	95						
		96+88	96+97	VMS BREAK (SEE NOTES 4 & 5)						
		96+97	101+68	57						
		101+68	104+98	40						
		104+98	105+07	VMS BREAK (SEE NOTES 4 & 5)						
		105+07	112+98	96						
		112+98	113+07	VMS BREAK (SEE NOTES 4 & 5)						
		113+07	119+94	83						
	TR3	119+94	120+93	12						
	TR2	120+93	121+24		4					
		121+24	121+33	VMS BREAK (SEE NOTES 4 & 5)						
	TR1	121+33	121+94		7					
		121+94	122+86			11			(6)	
	TH	122+86	123+35			6		(7)		
		123+35	125+51			27	(41)			23
SOUTH WALL	TH	36+04	40+33			52	(170)			44
		40+33	41+82			18	(30)			15
	TR1	41+82	42+39			7		(11)		6
		42+39	43+39			12		(11)		
		43+39	43+87			6		(3)		
	TR2	43+87	45+95		25				(13)	
	TR3	45+95	48+01	25						
	INT	48+01	59+55	140						
		59+55	79+69	244						
		79+69	101+72	267						
		101+72	119+95	221						
	TR3	119+95	120+94	12						
	TR2	120+94	121+92		12					
	TR1	121+92	122+82			11			(6)	
	TH	122+82	123+38			7		(7)		
		123+38	125+52			27	(41)			23
TOTALS				1808	73	277	(460)	(62)	(37)	176

WEST CROSSCUT
CENTER CROSSCUT
EAST CROSSCUT

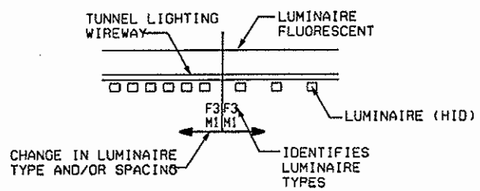
WEST CROSSCUT
CENTRAL CROSSCUT
EAST CROSSCUT

QUANTITIES - SOUTH TUNNEL LIGHTING

ITEM NUMBER	DESCRIPTION	UNIT	ROADWAY	
			PLAN	AS CONST.
	CONSTRUCTION			
613	LUMINAIRE FLUORESCENT (TYPE F1 TUNNEL)	EA	1808	1813
613	LUMINAIRE FLUORESCENT (TYPE F2 TUNNEL)	EA	73	73
613	LUMINAIRE FLUORESCENT (TYPE F3 TUNNEL)	EA	277	277
613	WIREWAY	LF	1753	1680
613	HID LUMINAIRE MOUNTING SUPPORT SYSTEM	LS	1	1
~~613~~	~~LUMINAIRE (HIGH INTENSITY DISCHARGE) (TYPE M1 TUNNEL)~~	~~EA~~	(482)	~~482~~
~~613~~	~~LUMINAIRE (HIGH INTENSITY DISCHARGE) (TYPE M2 TUNNEL)~~	~~EA~~	(64)	~~64~~
~~613~~	~~LUMINAIRE (HIGH INTENSITY DISCHARGE) (TYPE M3 TUNNEL)~~	~~EA~~	(38)	~~38~~

NOTES:
1. QUANTITIES IN PERENTHESIS (XXX) ARE FOR INFORMATION ONLY, NOT PART OF BID.
2. THE CROSSED OUT BOXES ARE TO BE ADDED TO THE CONTRACT IF THE FUNDS BECOME AVAILABLE.

LEGEND



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Plot File Name: $PLOTFILE$
Date or Plot: $$$$DATE$$$$

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LAST MODIFICATION DATE:	11/05/99	INITIALS: DJB
FULL PATH:	14102\700CADD\703ELEC\	
DRAWING FILE NAME:	LTTX03.DWG	
ACAD VER. R14	SCALE: NTS	UNITS: English

SHEET REVISIONS

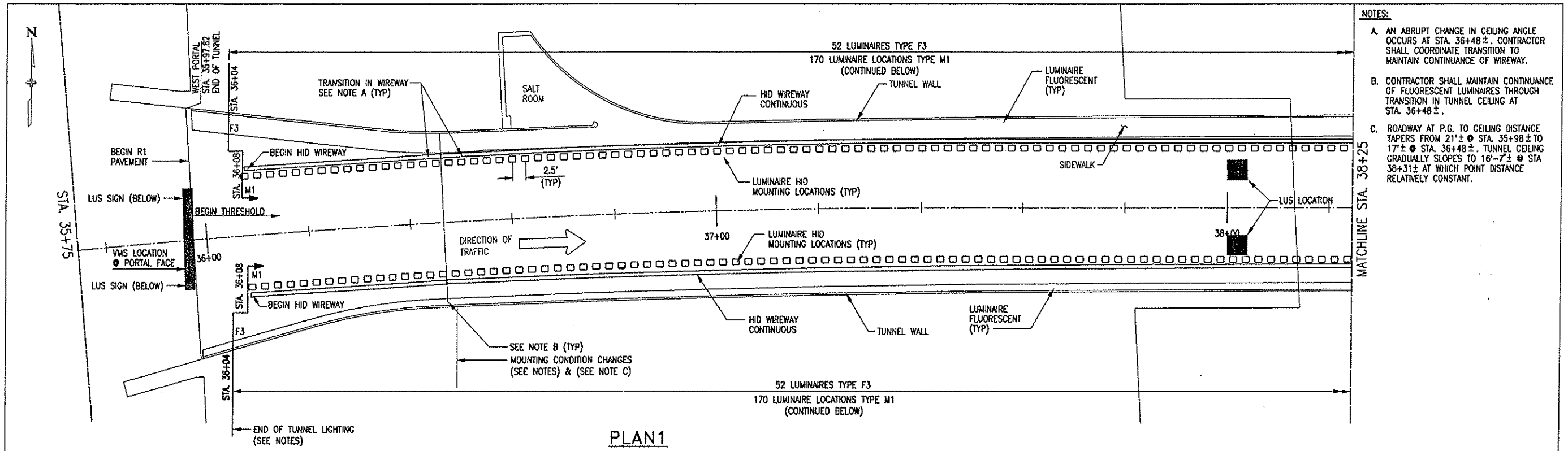
COLORADO DEPARTMENT OF TRANSPORTATION
P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W. W. G.

AS CONSTRUCTED
NO REVISIONS: 01/10/03
REVISED:
VOID:

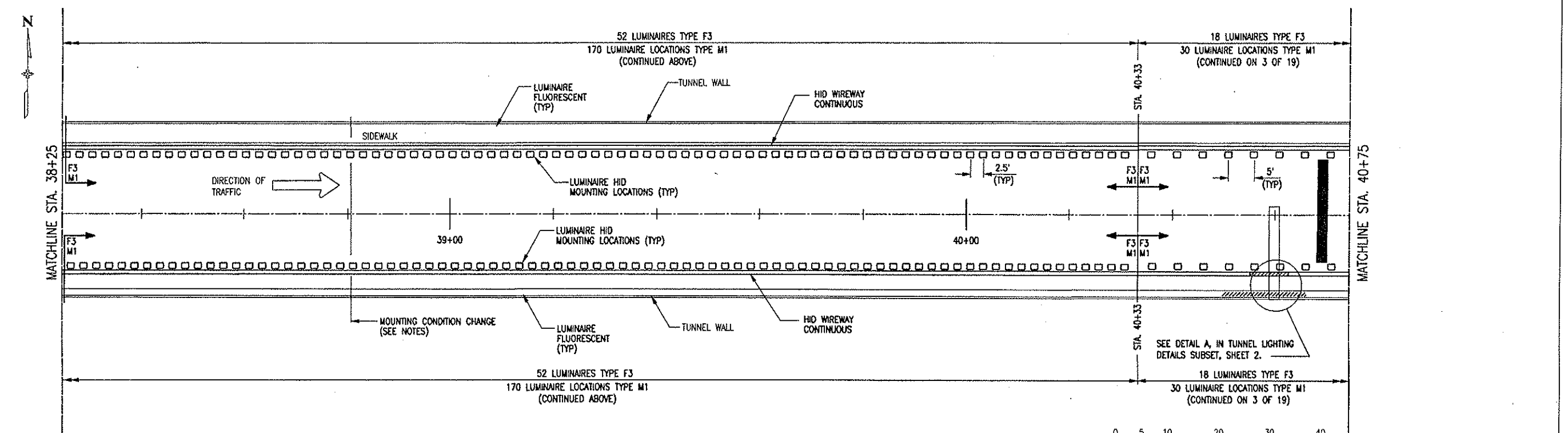
SOUTH TUNNEL LIGHTING NOTES

DESIGNER: J. WEAVER
DETAILER: D. BURROUGHS
SHEET SUBSET: S.T. LTG. SUBSET SHEETS: 1 OF 19
STRUCTURE NUMBERS:

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 29



PLAN1



PLAN2

Design File Name: p:\04102\cathyplot\ltpl01s.plt
Plot File Name: P:\PLOT\PAPER\ltpl01s.prt
Date of Plot: 7/31/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	2/26/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:			14102\700cadd\703elec\
Drawing File Name:			ltpl01s.dwg
Acad Ver. R14	Scale: 1" = 10'-0"	Units:	ENGLISH

Sheet Revisions		

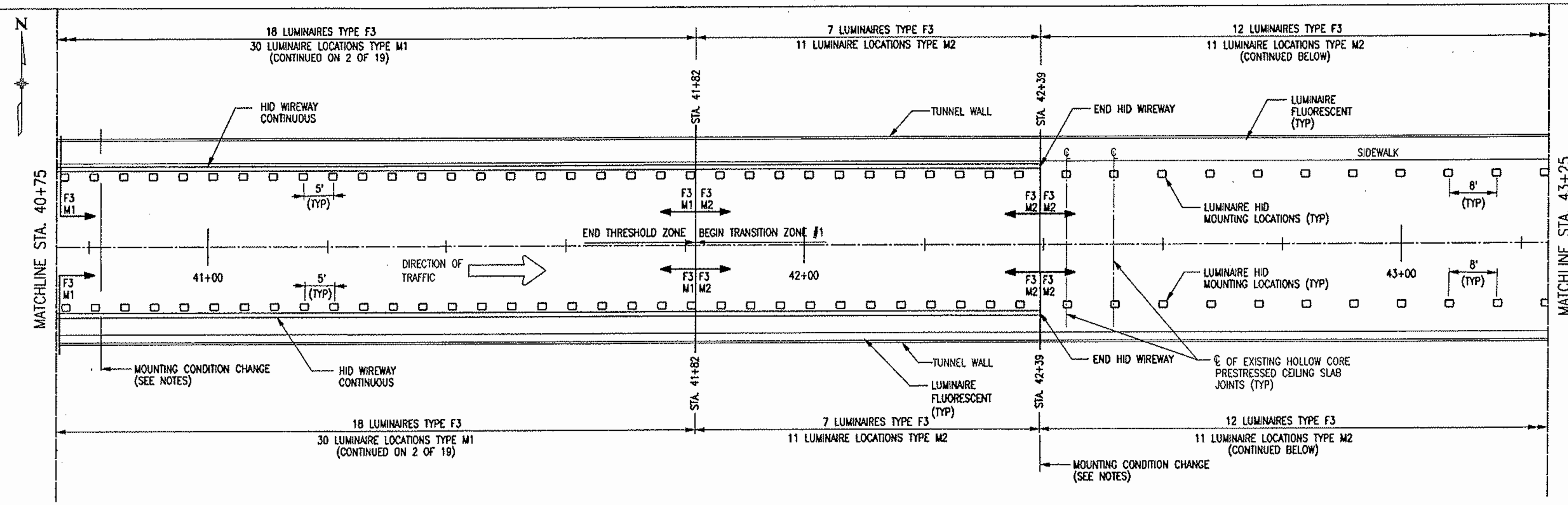
Colorado Department of Transportation
DOT
P.O. BOX 399
DUMONT, CO. 80436
Phone: 303-512-5750 FAX: 303-512-5775
Region 1 Mountain Residency W.W.G.

As Constructed
No Revisions: 01/10/03
Revised:
Void:

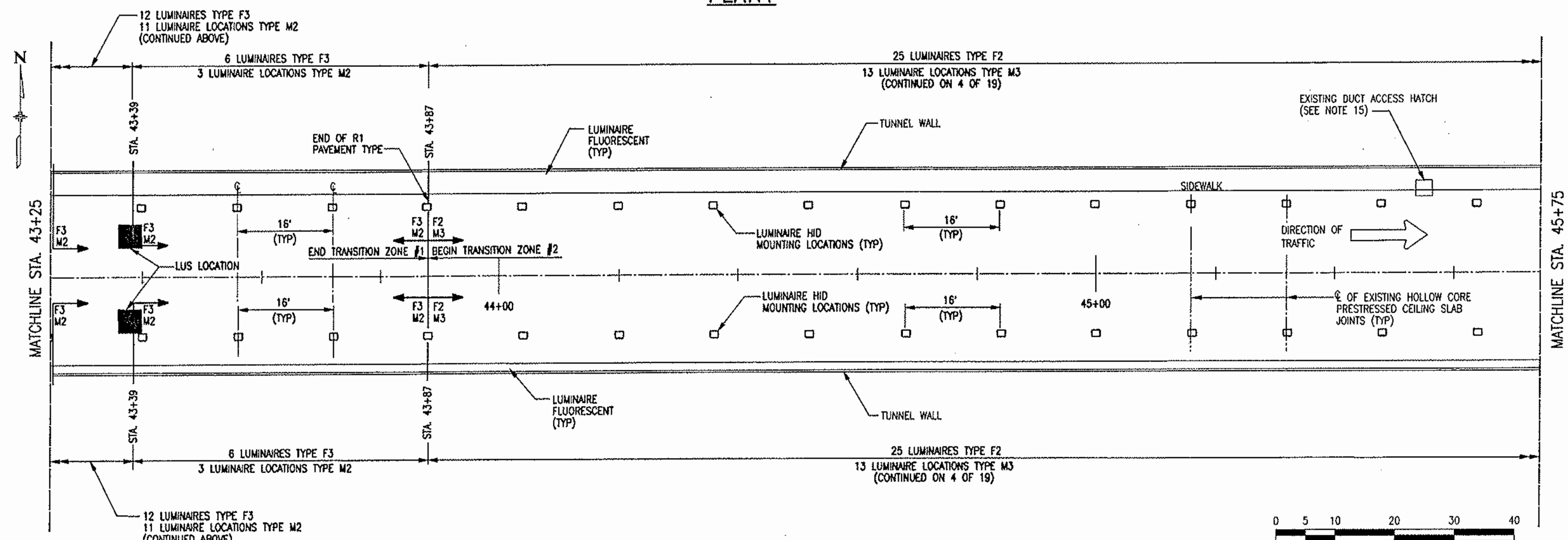
SOUTH TUNNEL LIGHTING PLANS

Designer: J.T. Weaver
Detailer: D. J. Burroughs
Sheet Subset: S.T. LTG.
Structure Numbers:
Subset Sheets: 2 OF 19

Project No./Code
IM 0703-264
12982
Sheet Number 30



PLAN1



PLAN2

Design File Name: p:\014102\cadd\typlot\ltpl02s.plt
Plot File Name: P:\PLOT\PAPER\ltpl02s.prf
Date of Plot: 7/31/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	2/26/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:	14102\700cadd\703elec\		
Drawing File Name:	ltpl02s.dwg		
Acad Ver. R14	Scale: 1" = 10'-0"	Units:	ENGLISH

Sheet Revisions

Colorado Department of Transportation

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Region 1 Mountain Residency W.W.G.

As Constructed

No Revisions: 01/10/03

Revised:

Void:

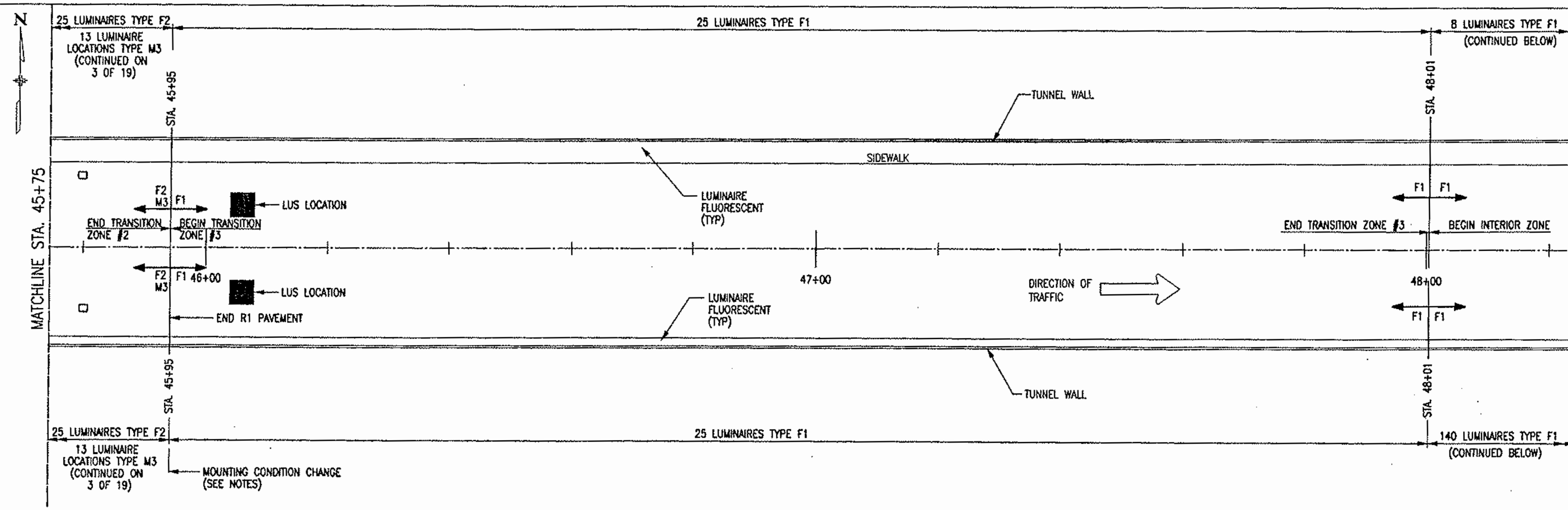
SOUTH TUNNEL LIGHTING PLANS

Designer: J.T. Weaver
Detailer: D. J. Burroughs
Structure Numbers
Sheet Subset: S.T. LTG.
Subset Sheets: 3 OF 19

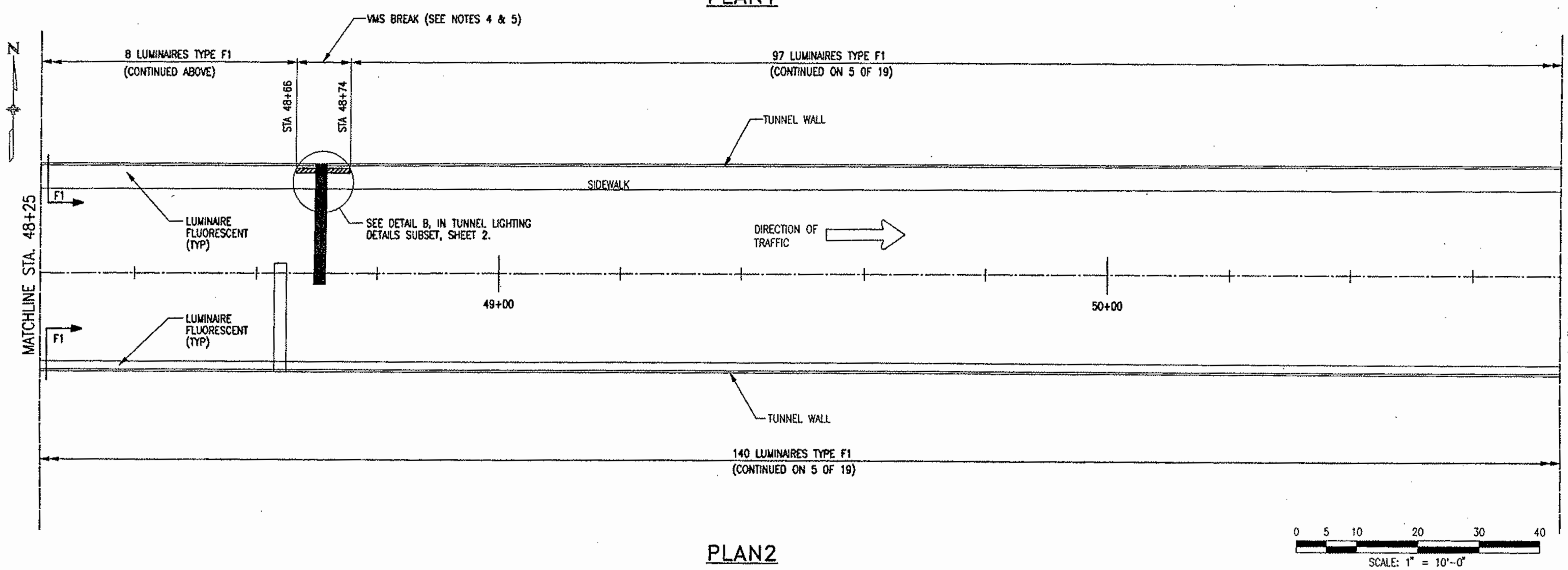
Project No./Code
IM 0703-264
12982

Sheet Number 31

014102\710STDS\BORDERIN.DGN



PLAN1



PLAN2

Design File Name: p:\014102\cathyplot\ltpl03s.plt
Plot File Name: P:\PLOT\PAPER\ltpl03s.prf
Date of Plot: 7/31/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	2/26/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:	14102\700cadd\703elec\		
Drawing File Name:	ltpl03s.dwg		
Acad Ver. R14	Scale: 1" = 10'-0"	Units:	ENGLISH

Sheet Revisions

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Region 1 Mountain Residency W.W.G.

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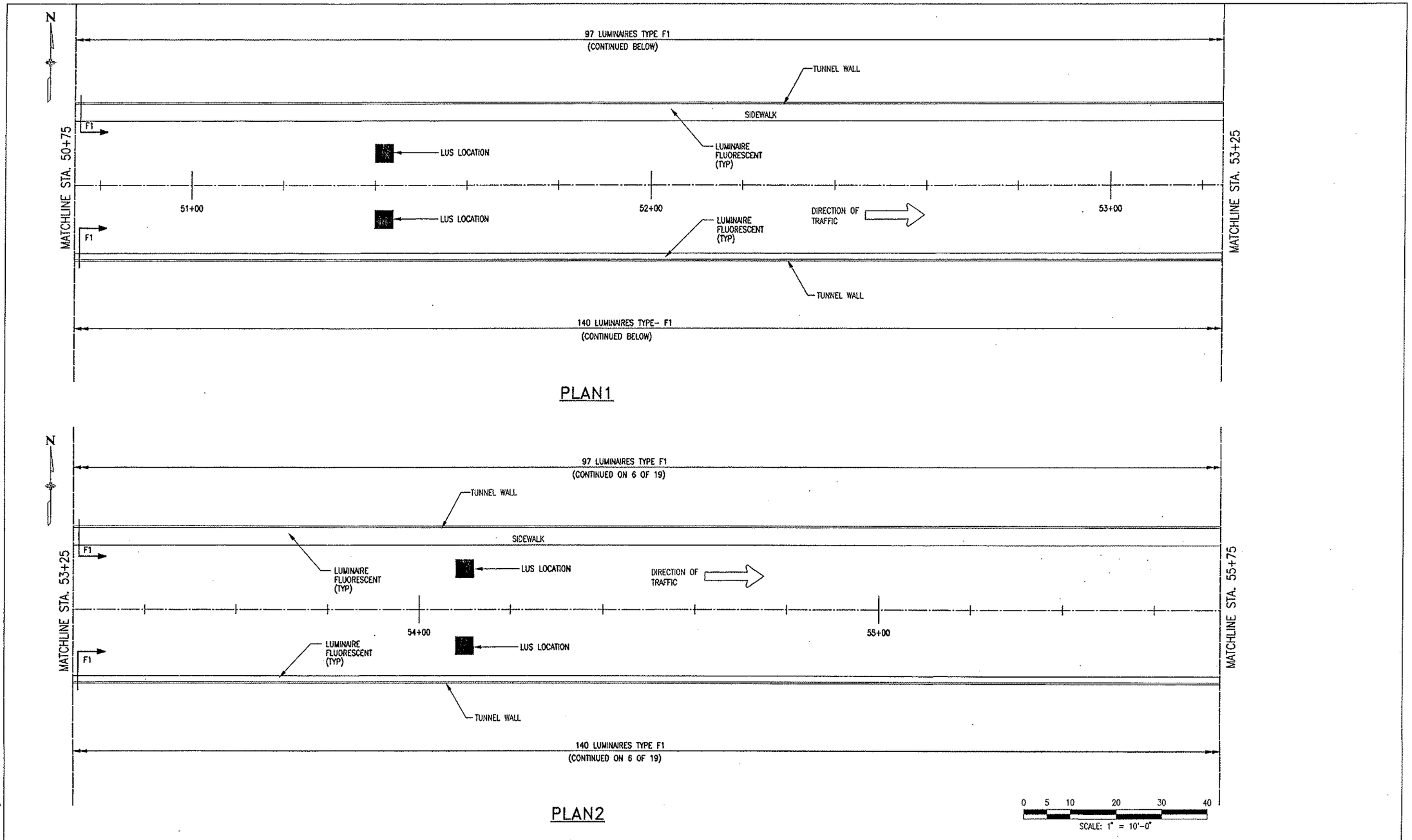
No Revisions: 01/10/03
Revised:
Void:

SOUTH TUNNEL LIGHTING PLANS

Designer: J.T. Weaver	Structure Numbers
Detailer: D. J. Burroughs	
Sheet Subset: S.T. LTG.	Subset Sheets: 4 OF 19

Project No./Code
IM 0703-264
12982
Sheet Number 32



PLAN1

PLAN2

0 5 10 20 30 40
SCALE: 1" = 10'-0"

Design File Name: p:\04102\cattyplot\ltpl04s.plt
Plot File Name: P:\PLOT\PAPER\ltpl04s.prf
Date of Plot: 7/30/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	2/26/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:			14102\700cadd\703elec\
Drawing File Name:			ltpl04s.dwg
Acad Ver. R14	Scale: 1" = 10'-0"	Units:	ENGLISH

Sheet Revisions		

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No Revisions: 01/10/03	
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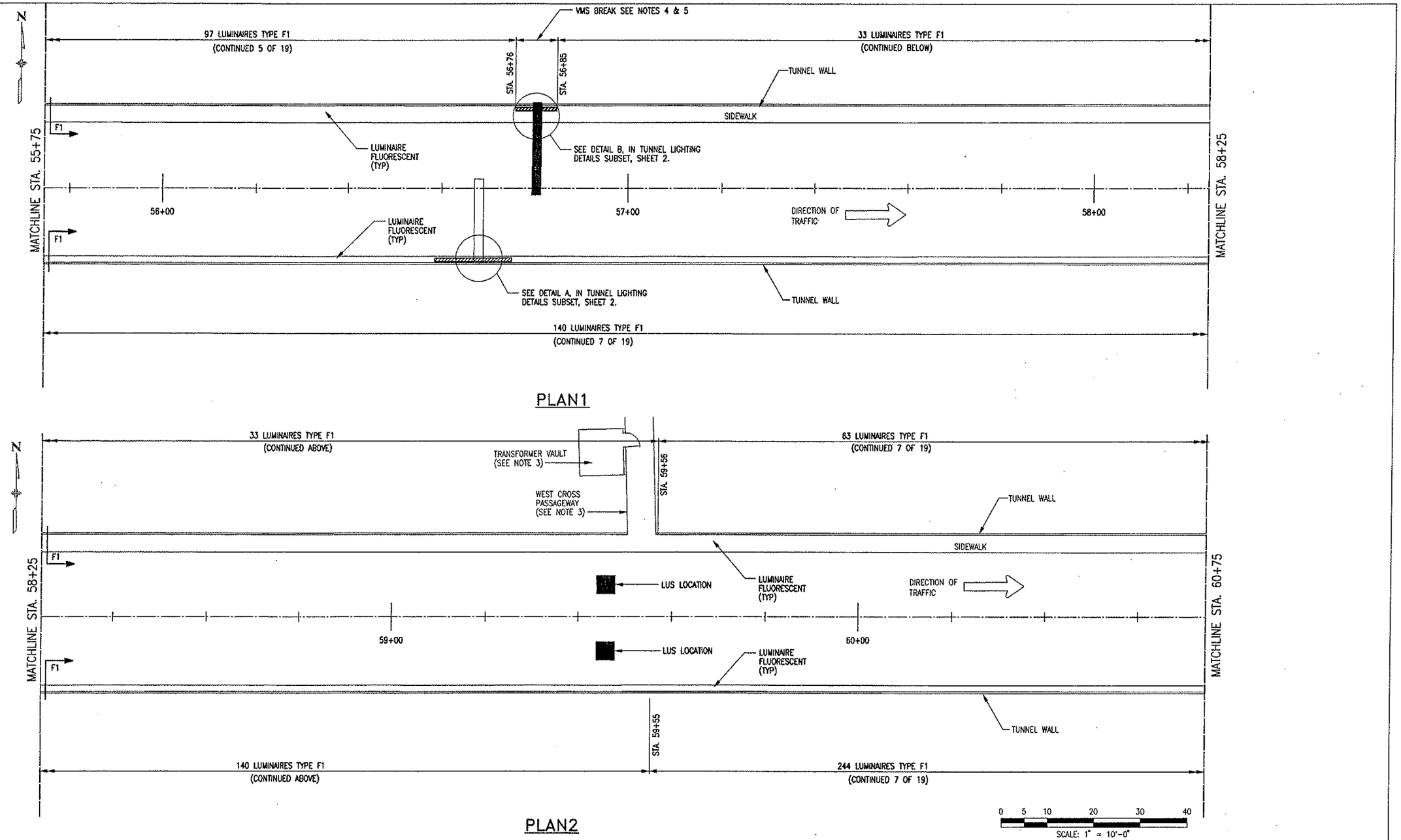
SOUTH TUNNEL LIGHTING PLANS

Designer: J.T. Weaver		Structure Numbers	
Detailer: D. J. Burroughs			
Sheet Subset: S.T. LTG.	Subset Sheets: 5 OF 19		

Project No./Code	
IM 0703-264	
12982	
Sheet Number	33



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Date of Plot: 12/30/2000 (using STANDARD.TBL)

Computer File Information			
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Last Modification Date:	11/05/99	Initials:	DJB
Full Path:	14102\700cadd\703elec\		
Drawing File Name:	ltpl05s.dwg		
Acad Ver. R14	Scale: 1" = 10'-0"	Units:	ENGLISH

Sheet Revisions		

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No Revisions: 01/10/03	
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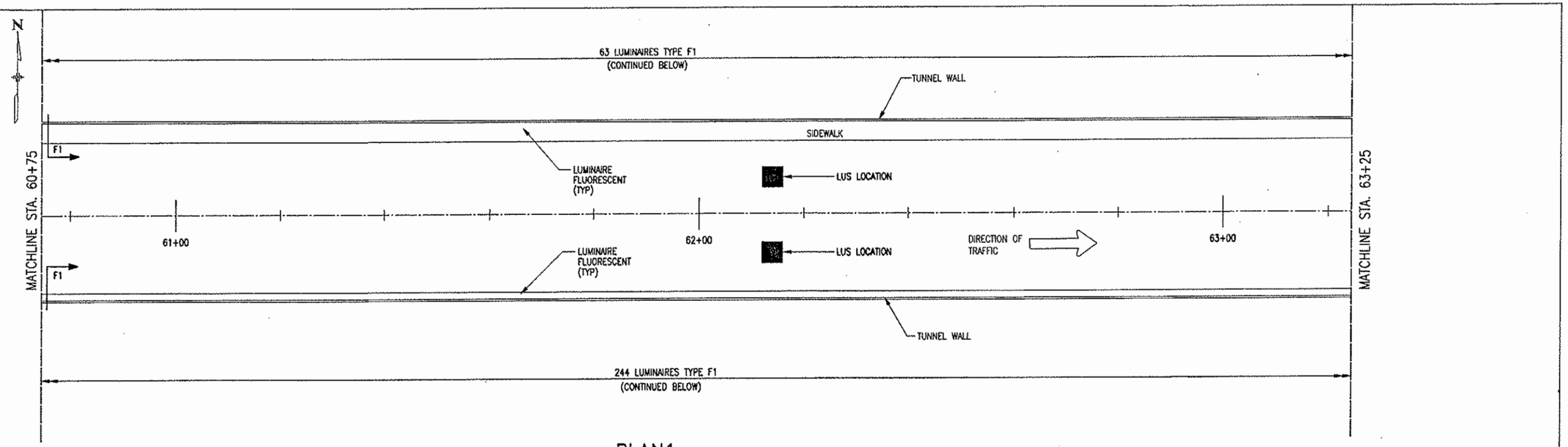
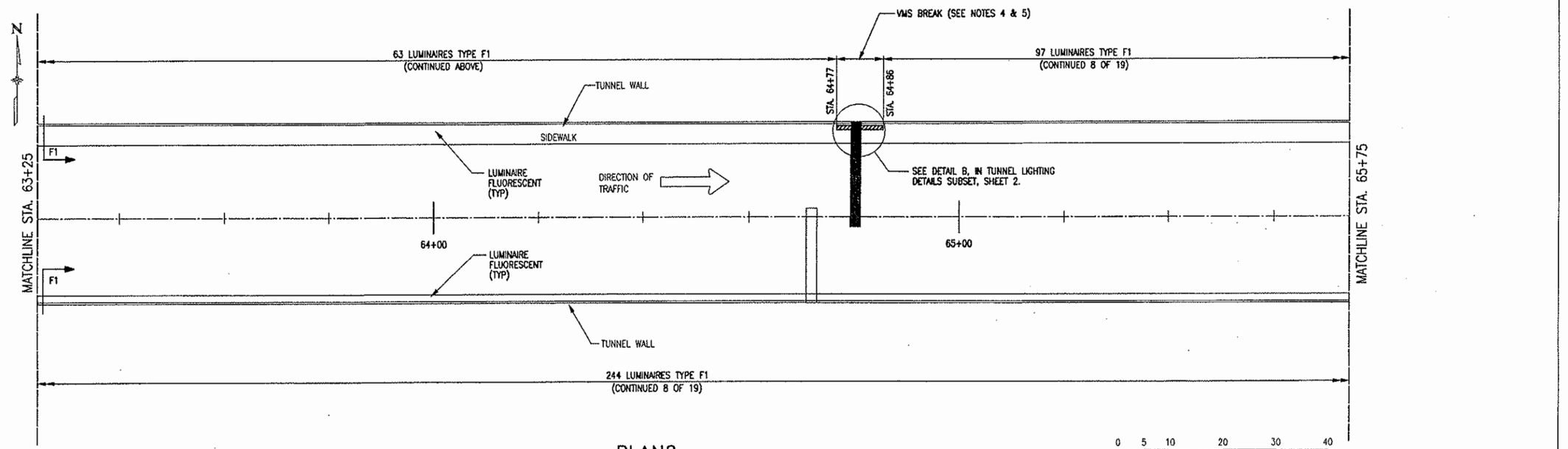
SOUTH TUNNEL LIGHTING PLANS

Designer: J.T. Weaver		Structure Numbers	
Detailer: D. J. Burroughs			
Sheet Subset: S.T. LTG.	Subset Sheets: 6 OF 19		

Project No./Code
IM 0703-264
12982
Sheet Number 34



PLAN1



PLAN2

0 5 10 20 30 40
SCALE: 1" = 10'-0"

Design File Name: p:\04102\cadthyplot\ltpl06s.plt
Plot File Name: P:\PLOTS_PAPER\ltpl06s.prf
Date of Plot: 1/31/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	2/26/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:	14102\700cadd\703elec\		
Drawing File Name:	ltpl06s.dwg		
Acad Ver. R14	Scale: 1" = 10'-0"	Units:	ENGLISH

Sheet Revisions		

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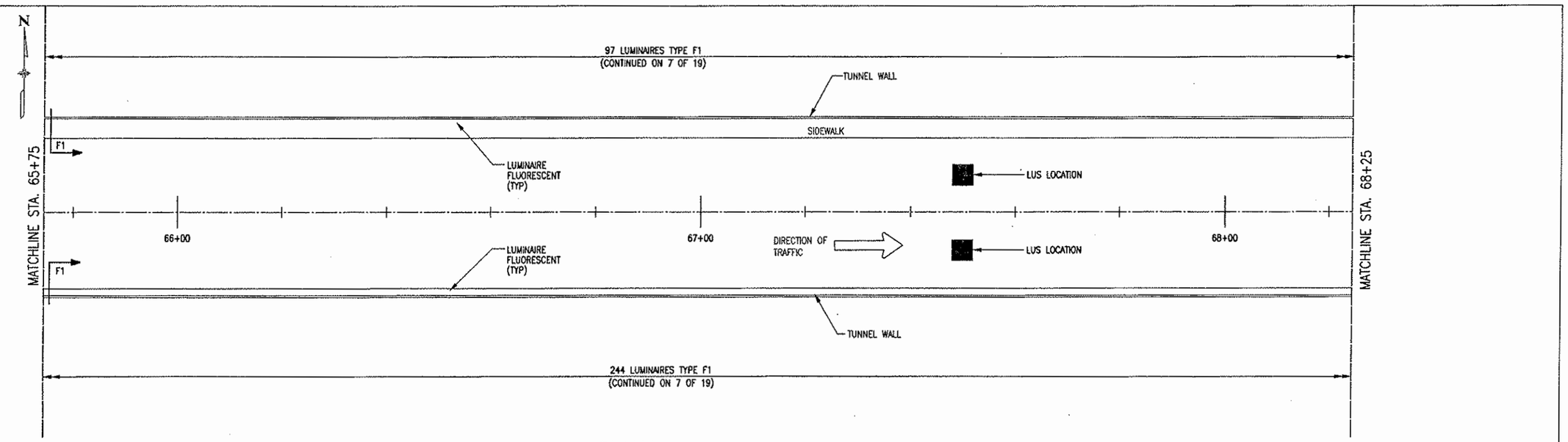
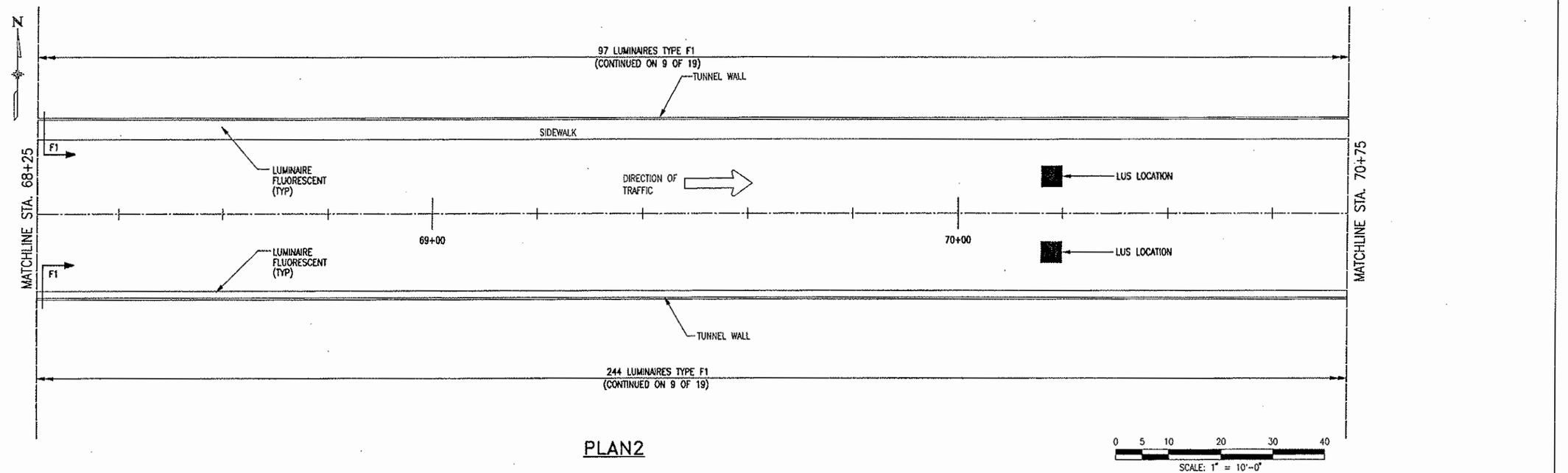
No Revisions: 01/10/03	SOUTH TUNNEL LIGHTING PLANS		Project No./Code
Revised:	Designer: J.T. Weaver	Structure Numbers	IM 0703-264
Void:	Detailer: D. J. Burroughs		12982
	Sheet Subset: S.T. LTG.	Subset Sheets: 7 OF 19	Sheet Number 35



PLAN1



PLAN2

0 5 10 20 30 40
SCALE: 1" = 10'-0"

Design File Name: p:\04402\cathyplot\ltpl07s.plt
Plot File Name: P:\PLOT\PAPER\ltpl07s.prf
Date of Plot: 7/31/2000 (using STANDARD.TBL)

Computer File Information	
Creation Date: 2/26/99	Initials: DJB
Last Modification Date: 11/05/99	Initials: DJB
Full Path:	14102\700cadd\703elec\
Drawing File Name:	ltpl07s.dwg
Acad Ver. R14	Scale: 1" = 10'-0" Units: ENGLISH

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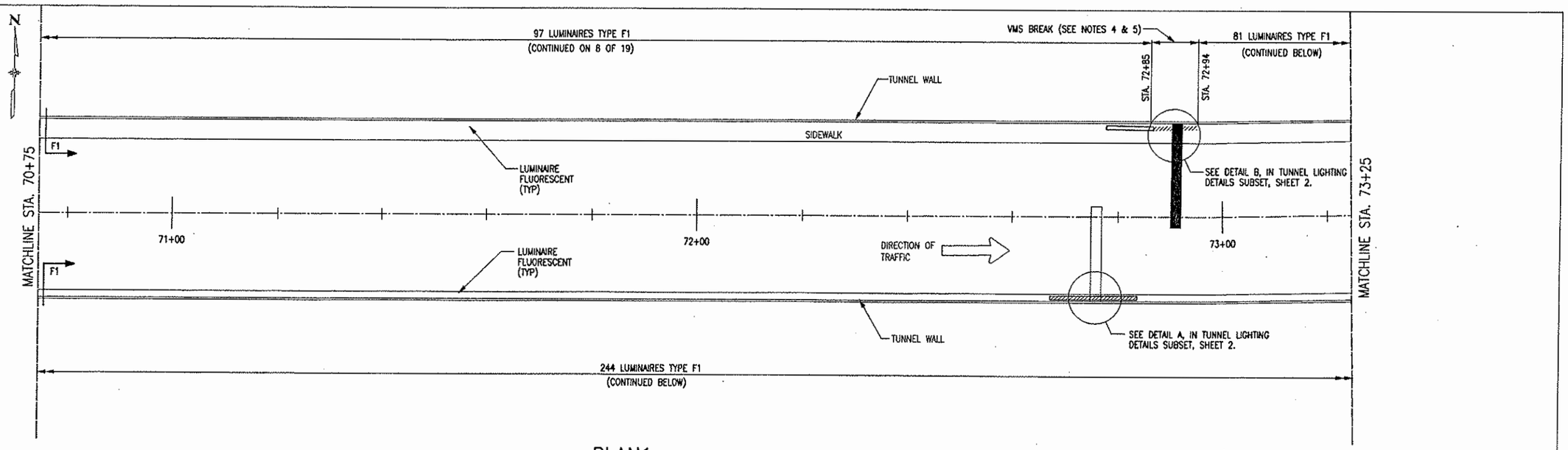
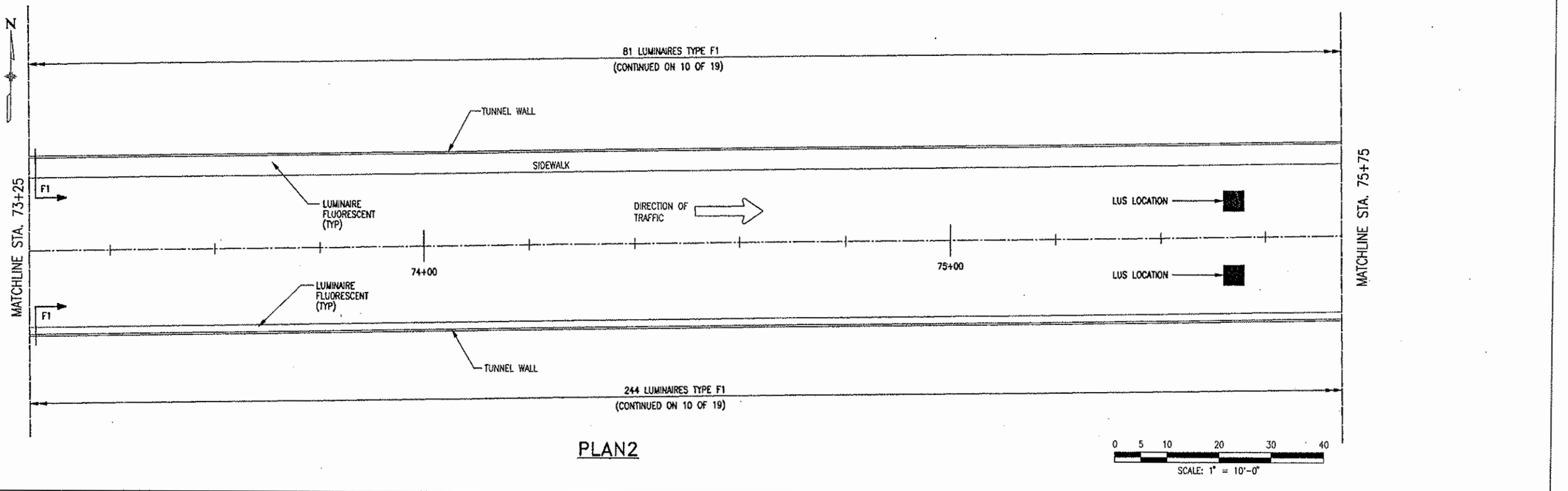
SOUTH TUNNEL LIGHTING PLANS

Designer: J.T. Weaver		Structure Numbers	
Detailer: D. J. Burroughs			
Sheet Subset: S.T. LTG.	Subset Sheets: 8 OF 19		

Project No./Code
IM 0703-264
12982
Sheet Number 36



PLAN1



PLAN2

0 5 10 20 30 40
SCALE: 1" = 10'-0"

Design File Name: p:\01402\cathyplot\itpl08s.plt
Plot File Name: P:\PLOT\PAPER\itpl08s.prf
Date of Plot: 7/31/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	2/26/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:			14102\700cadd\703elec\
Drawing File Name:			itpl08s.dwg
Acad Ver. R14	Scale: 1" = 10'-0"	Units:	ENGLISH

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SOUTH TUNNEL LIGHTING PLANS

Designer: J.T. Weaver
Detailer: D. J. Burroughs
Sheet Subset: S.T. LTG.
Structure Numbers:
Subset Sheets: 9 OF 19

Project No./Code
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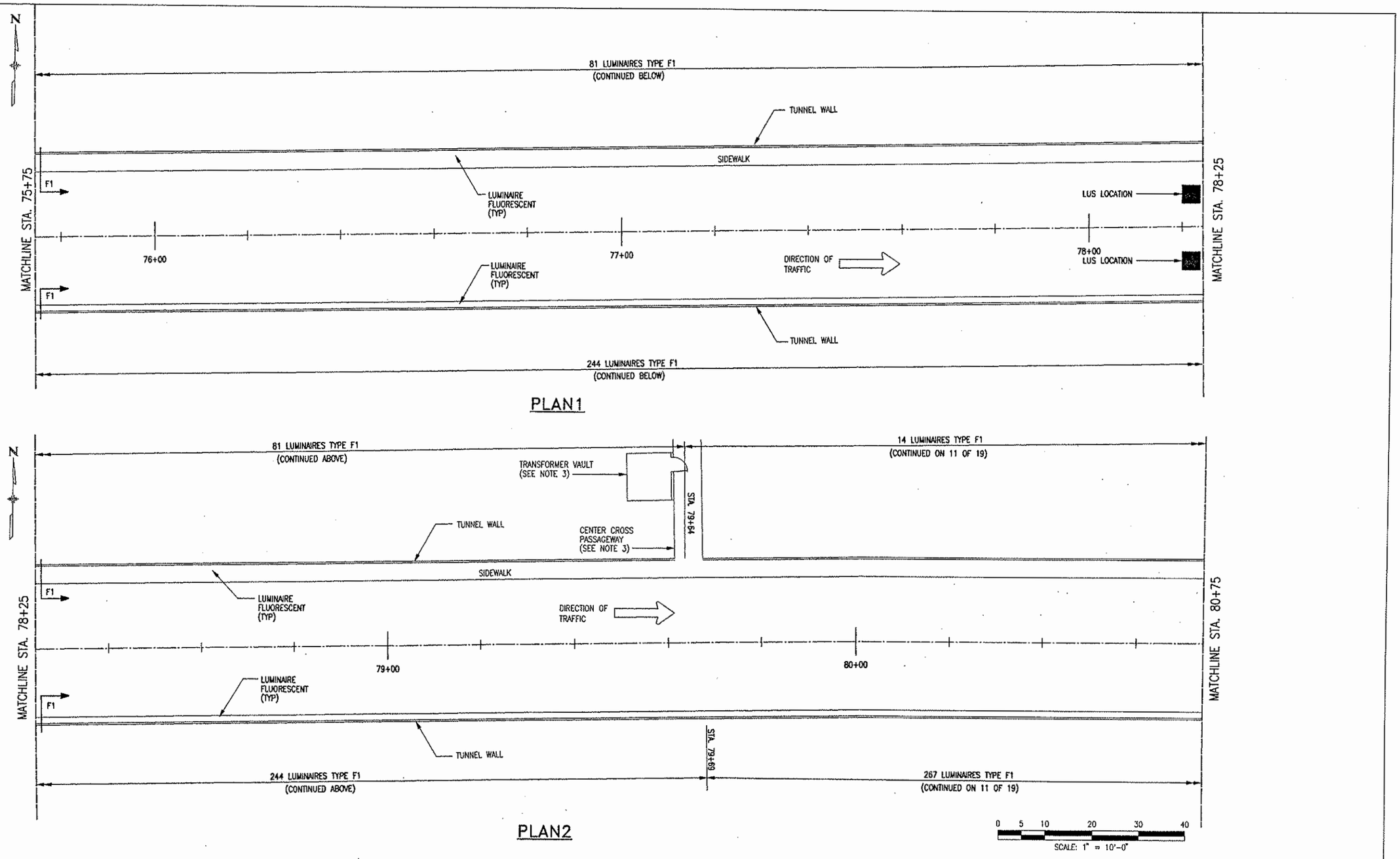
12982
Sheet Number 37



PLAN1

PLAN2

Design File Name: p:\04402\cathyplot\ltpl09s.plt
Plot File Name: P:\PLOT\PAPER\ltpl09s.prt
Date of Plot: 1/31/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	2/26/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:			14102\700cadd\703elec\
Drawing File Name:			ltpl09s.dwg
Acad Ver. R14	Scale: 1" = 10'-0"	Units:	ENGLISH

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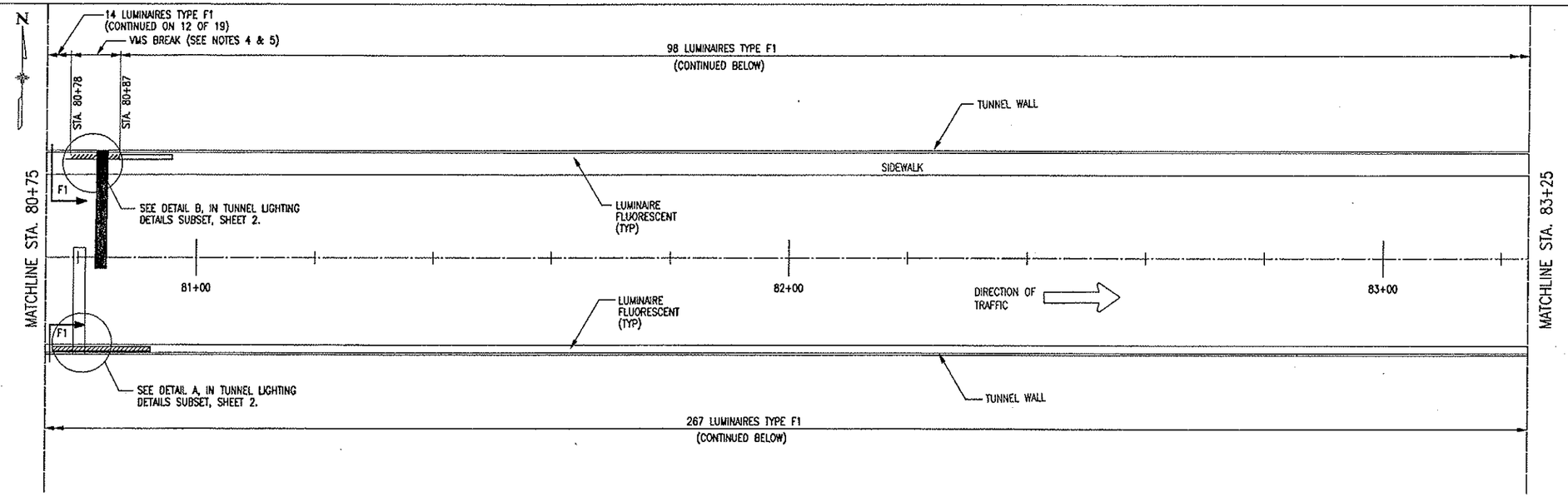
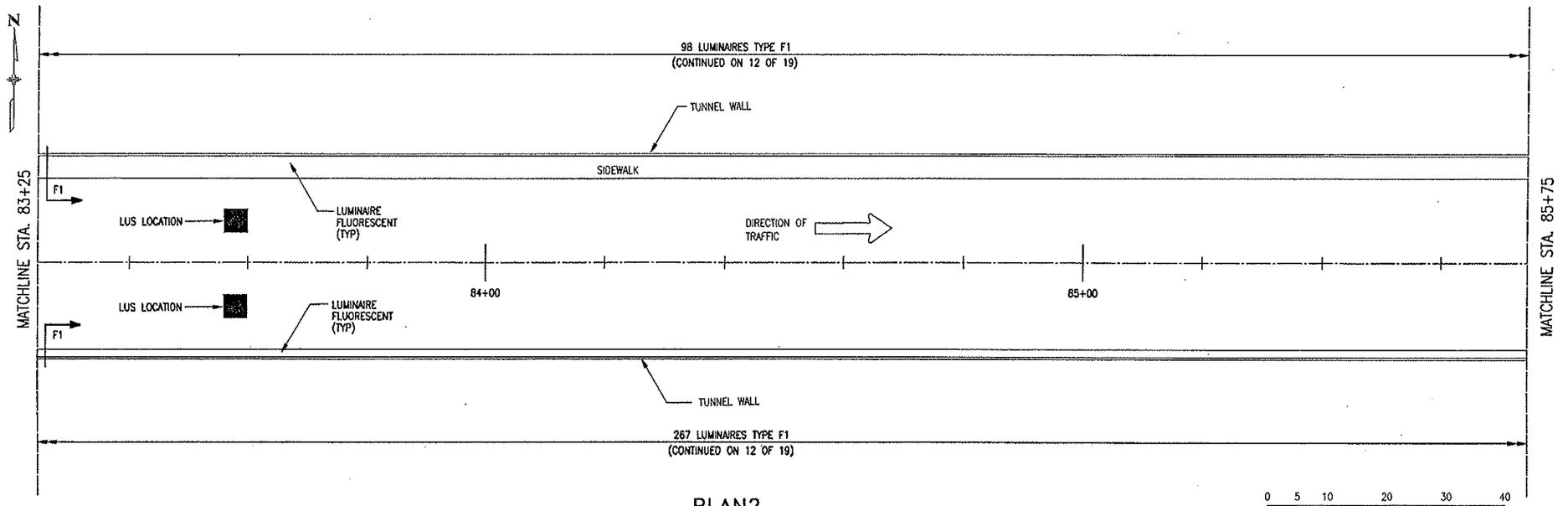
As Constructed	SOUTH TUNNEL LIGHTING PLANS		Project No./Code
No Revisions: 01/10/03			IM 0703-264
Revised:	Designer: J.T. Weaver	Structure Numbers	12982
Void:	Detailer: D. J. Burroughs		Sheet Number 38
	Sheet Subset: S.T. LTG.	Subset Sheets: 10 OF 19	



PLAN1



PLAN2

0 5 10 20 30 40
SCALE: 1" = 10'-0"

Design File Name: p:\04102\cathyplot\ltpl10s.plt
Plot File Name: P:\PLOT\PAPER\ltpl10s.prf
Date of Plot: 7/31/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	2/26/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:			14102\700cadd\703elec\
Drawing File Name:			ltpl10s.dwg
Acad Ver. R14	Scale: 1" = 10'-0"	Units:	ENGLISH

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No Revisions: 01/10/03	
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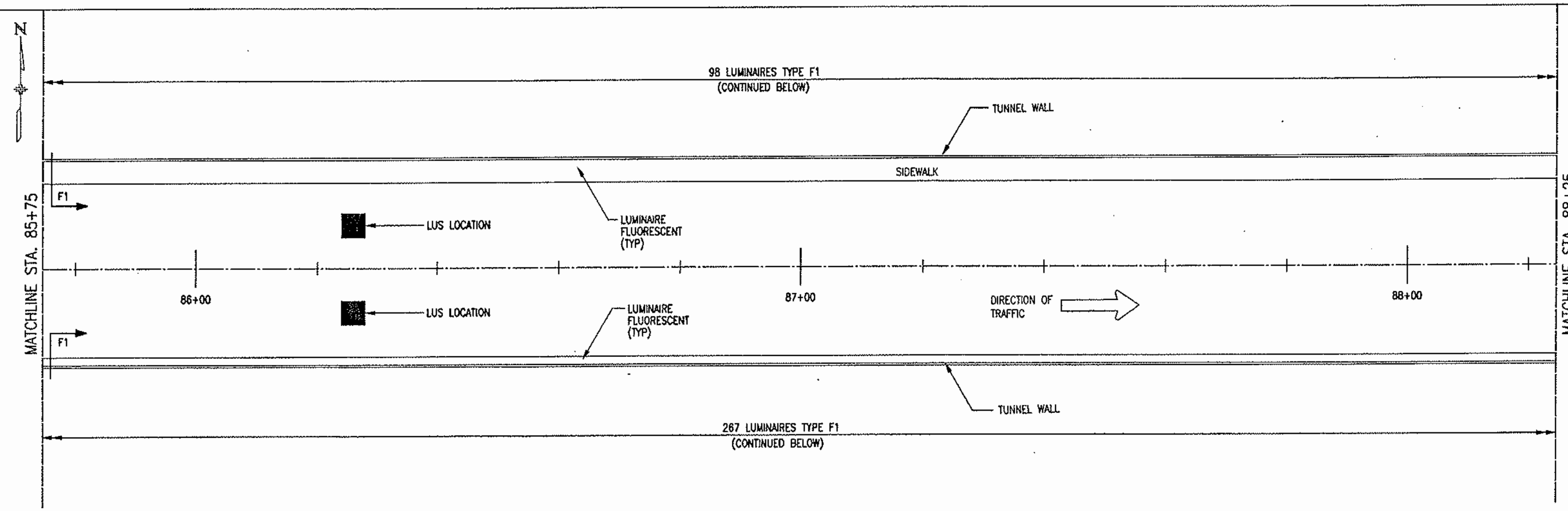
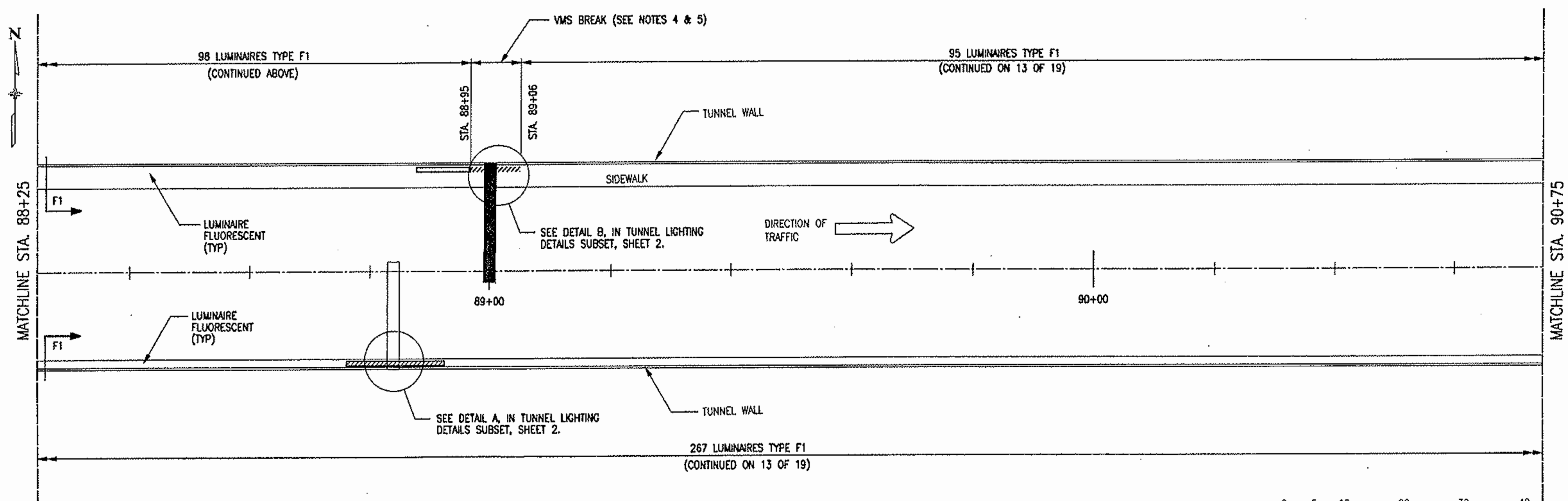
SOUTH TUNNEL LIGHTING PLANS

Designer: J.T. Weaver		Structure Numbers	
Detailer: D. J. Burroughs			
Sheet Subset: S.T. LTG.	Subset Sheets: 11 OF 19		

Project No./Code	
IM 0703-264	
12982	
Sheet Number	39



PLAN1



PLAN2

0 5 10 20 30 40
SCALE: 1" = 10'-0"

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Date of Plot: 7/31/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	2/26/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:	14102\700cadd\703elec\		
Drawing File Name:	ltpl11s.dwg		
Acad Ver. R14	Scale: 1" = 10'-0"	Units:	ENGLISH

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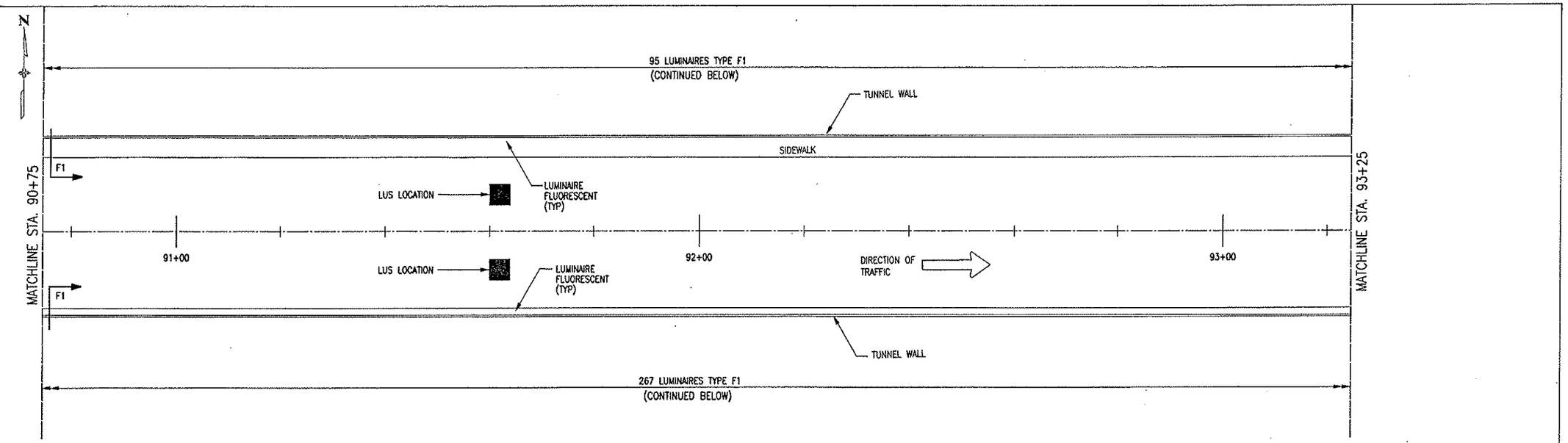
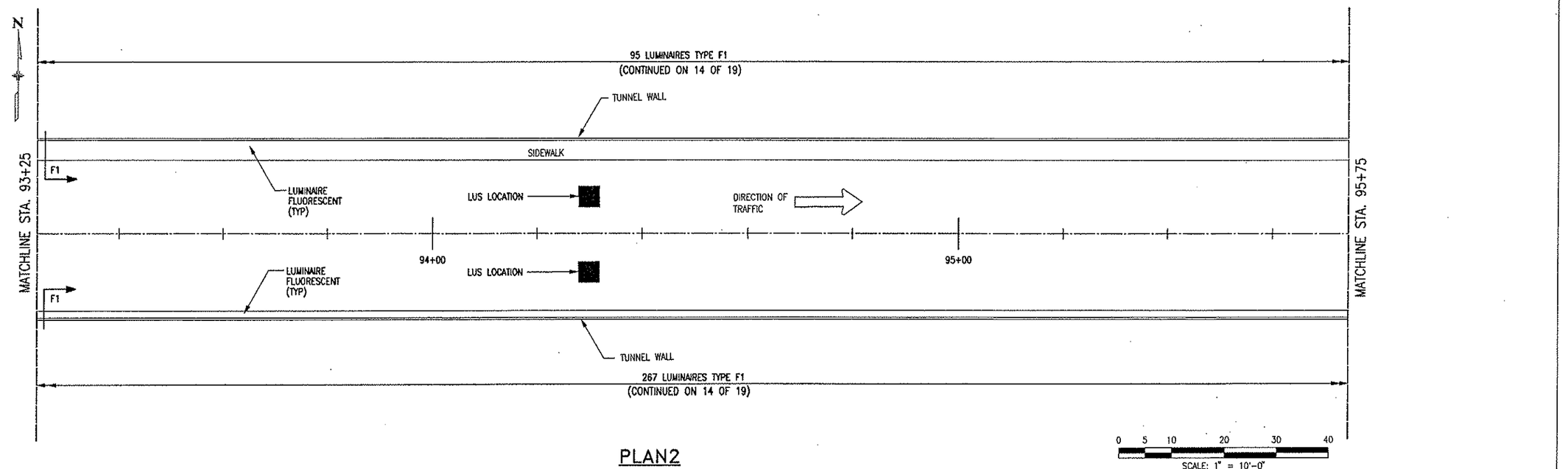
SOUTH TUNNEL LIGHTING PLANS

Designer: J.T. Weaver	Structure Numbers		
Detailer: D. J. Burroughs			
Sheet Subset: S.T. LTG.	Subset Sheets: 12 OF 19		

Project No./Code
IM 0703-264
12982
Sheet Number 40



PLAN1



PLAN2

Design File Name: p:\04102\cothyplot\tpl12s.plt
Plot File Name: P:\PLOT\PAPER\tpl12s.prf
Date of Plot: 7/31/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	2/26/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:			14102\700cadd\703elec\
Drawing File Name:			tpl12s.dwg
Acad Ver.	R14	Scale: 1" = 10'-0"	Units: ENGLISH

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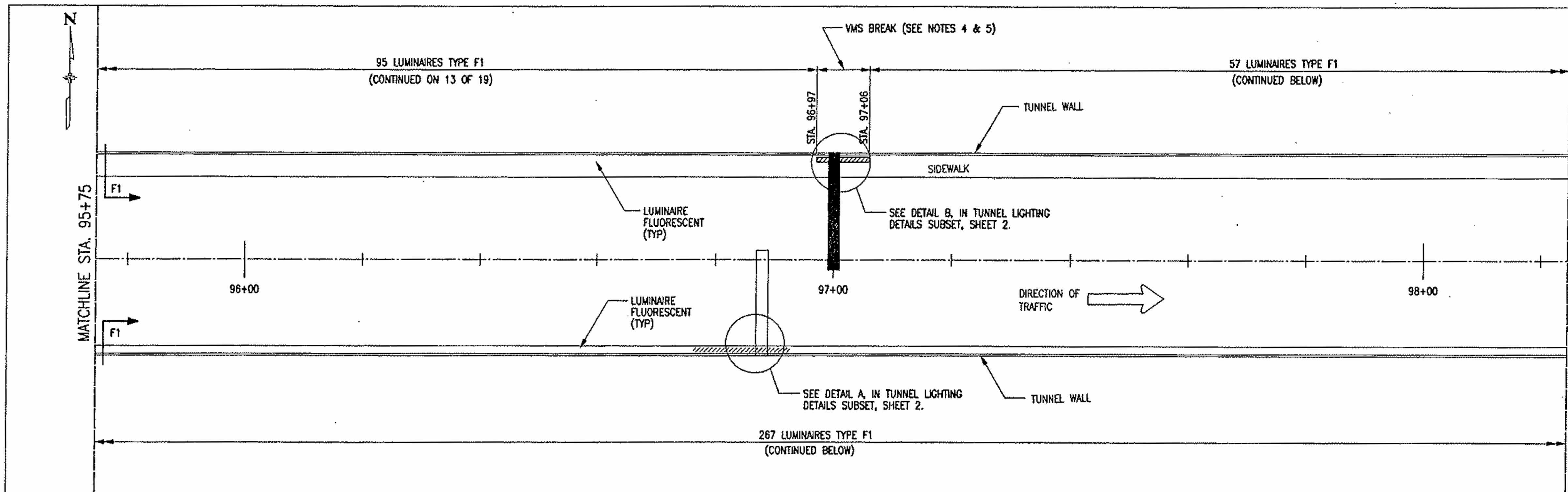
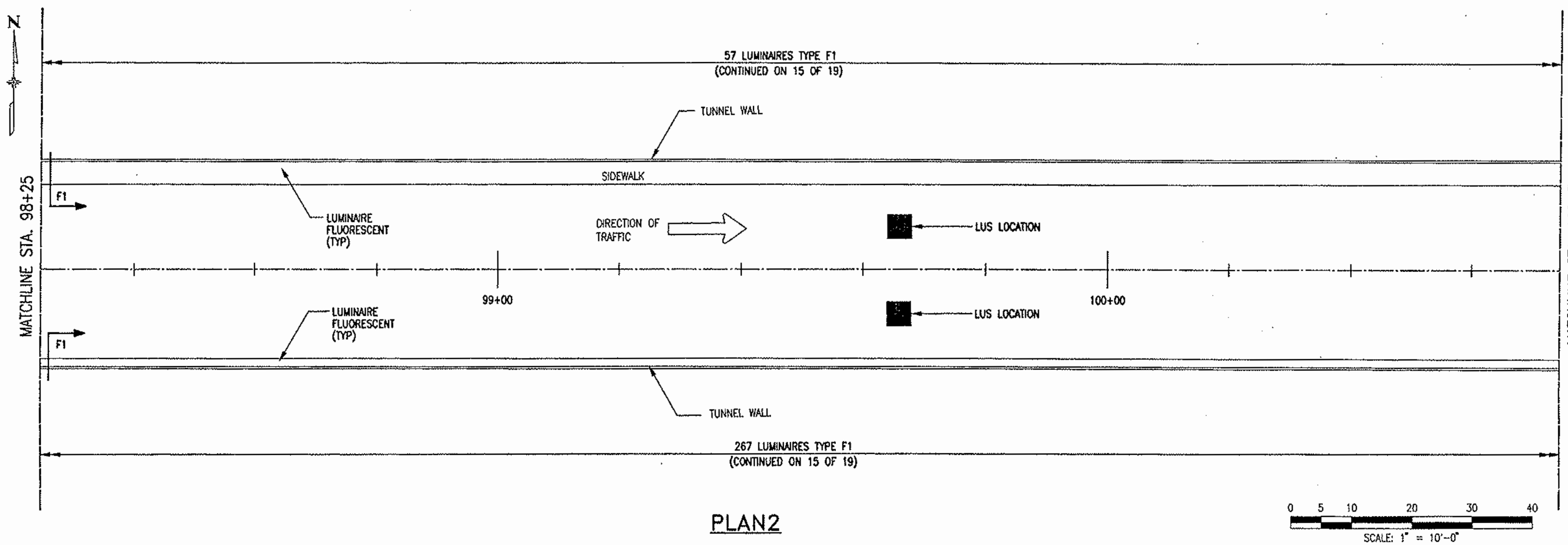
SOUTH TUNNEL LIGHTING PLANS

Designer: J.T. Weaver		Structure Numbers	
Detailer: D. J. Burroughs			
Sheet Subset: S.T. LTG.	Subset Sheets: 13 OF 19		

Project No./Code	
IM 0703-264	
12982	
Sheet Number	41



PLAN1



PLAN2

Design File Name: p:\014102\cathyplot\ltpl13s.plt
Plot File Name: P:\PLOT\PAPER\ltpl13s.prf
Date of Plot: 8/1/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	2/26/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:	14102\700cadd\703elec\		
Drawing File Name:	ltpl13s.dwg		
Acad Ver. R14	Scale: 1" = 10'-0"	Units:	ENGLISH

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As Constructed
No Revisions: 01/10/03
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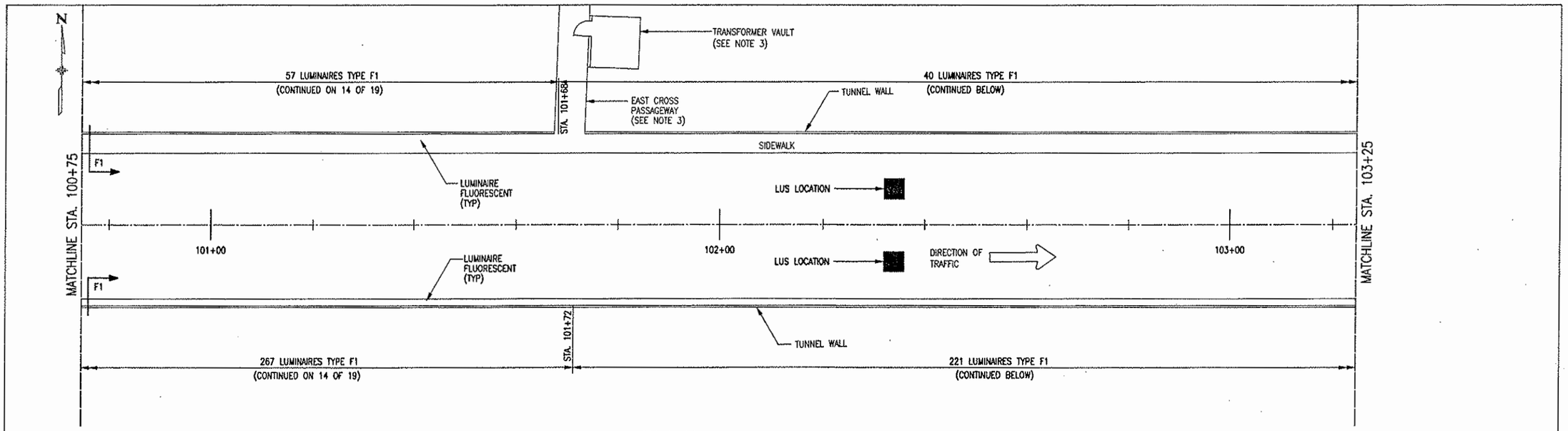
Void:

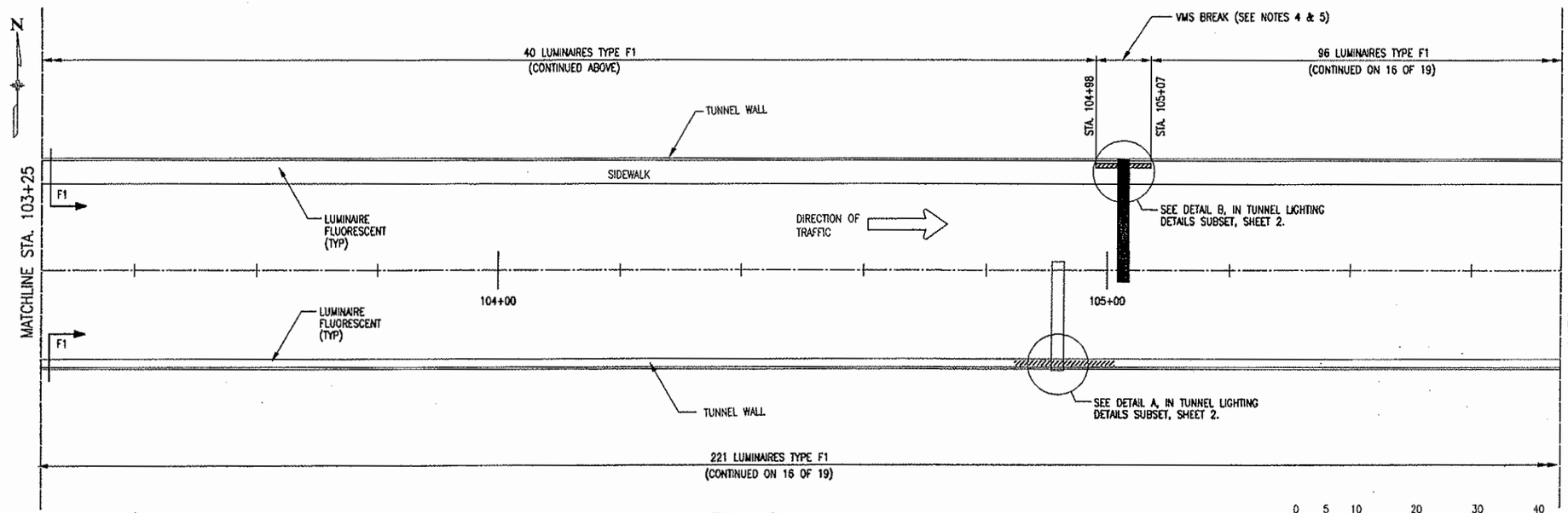
SOUTH TUNNEL LIGHTING PLANS

Designer: J.T. Weaver
Detailer: D. J. Burroughs
Sheet Subset: S.T. LTG.
Structure Numbers
Subset Sheets: 14 OF 19

Project No./Code
IM 0703-264
12982
Sheet Number 42



PLAN1



PLAN2

Design File Name: p:\04102\cathyplot\itpli4s.plt
Plot File Name: P:\PLOT\PAPER\itpli4s.prf
Date of Plot: 8/1/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	2/26/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:	14102\700cadd\703elec\		
Drawing File Name:	itpli4s.dwg		
Acad Ver. R14	Scale: 1" = 10'-0"	Units:	ENGLISH

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No Revisions: 01/10/03	
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Void:	

SOUTH TUNNEL LIGHTING PLANS

Designer: J.T. Weaver		Structure Numbers	
Detailer: D. J. Burroughs			
Sheet Subset: S.T. LTG.	Subset Sheets: 15 OF 19		

Project No./Code	
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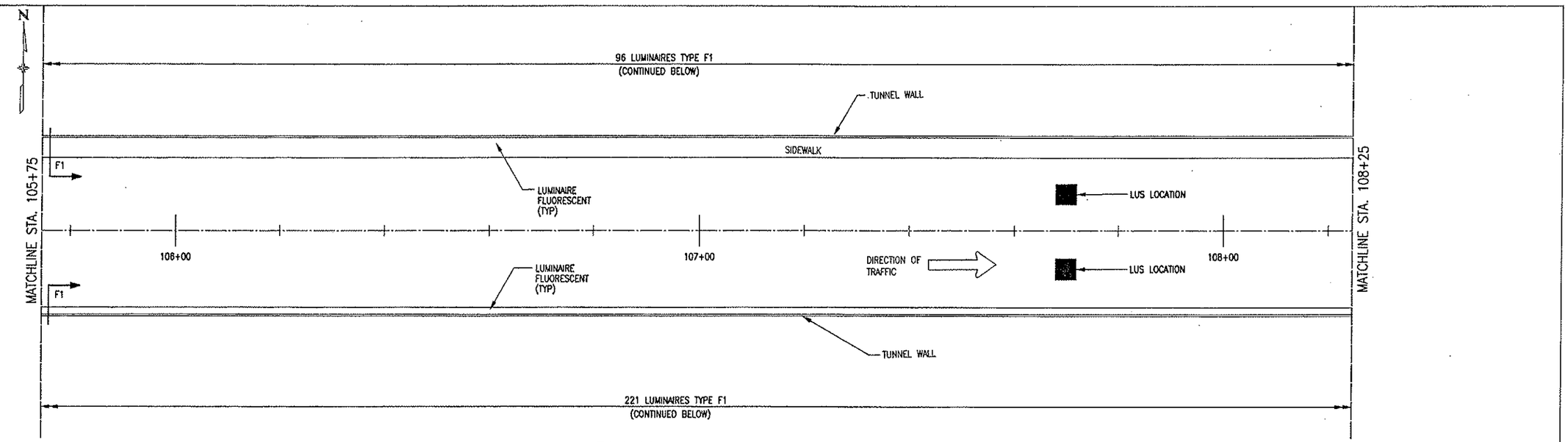
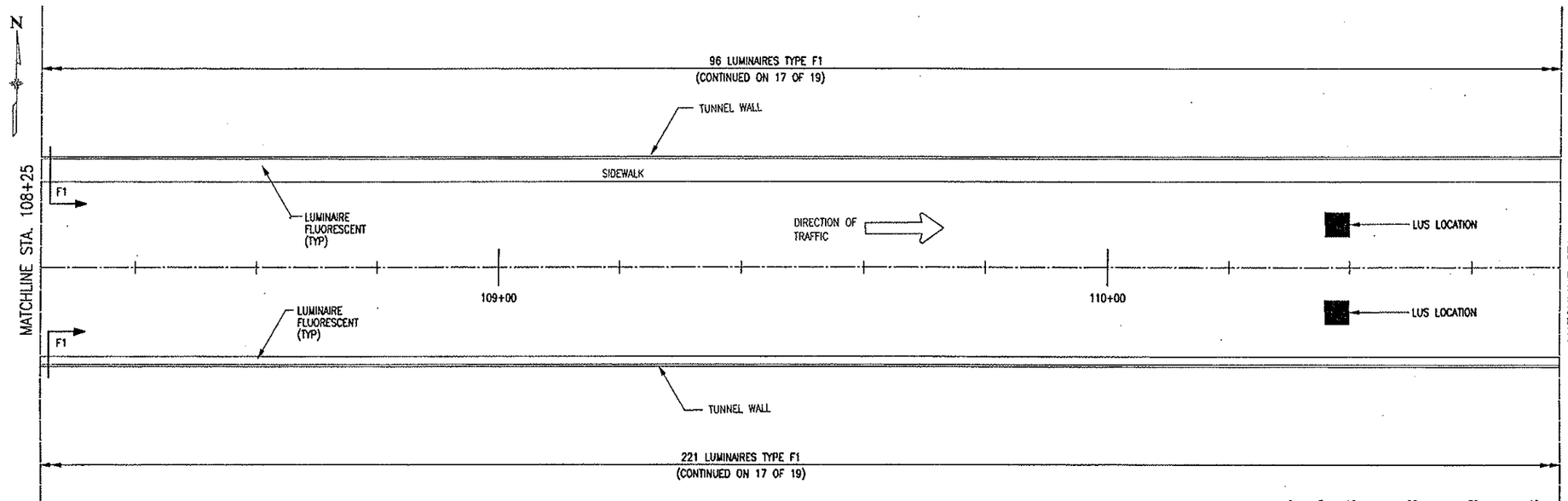
12982	
Sheet Number	43



PLAN1



PLAN2

0 5 10 20 30 40
SCALE: 1" = 10'-0"

Design File Name: p:\04402\cadhyplot\ltpl15s.plt
Plot File Name: F:\PLOT\PAPER\ltpl15s.prf
Date of Plot: 8/1/2000 (using STANDARD.TBL)

Computer File Information	
Creation Date: 2/26/99	Initials: DJB
Last Modification Date: 11/05/99	Initials: DJB
Full Path:	14102\700cadd\703elec\
Drawing File Name:	ltpl15s.dwg
Acad Ver. R14	Scale: 1" = 10'-0" Units: ENGLISH

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Region 1 Mountain Residency W.W.G.

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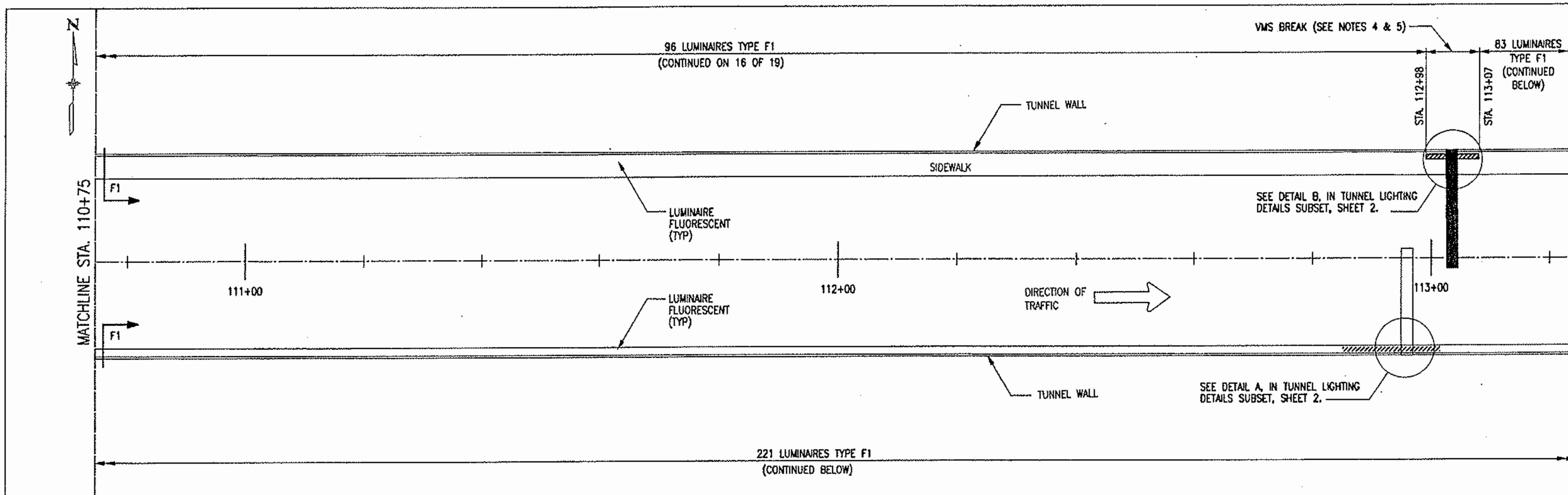
No Revisions: 01/10/03	
Revised:	
Void:	

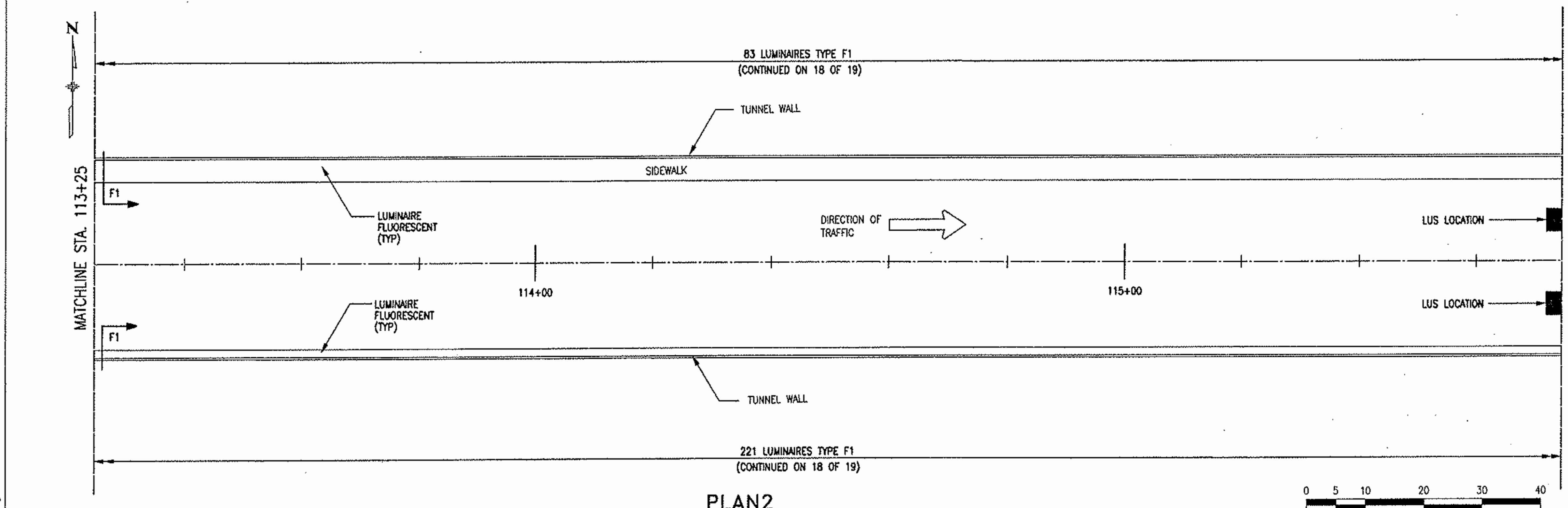
SOUTH TUNNEL LIGHTING PLANS

Designer: J.T. Weaver		Structure Numbers	
Detailer: D. J. Burroughs			
Sheet Subset: S.T. LTG.	Subset Sheets: 16 OF 19		

Project No./Code	
IM 0703-264	
12982	
Sheet Number	44



PLAN1



PLAN2

Design File Name: p:\04102\cathyplot\ltpl16s.plt
Plot File Name: P:\PLOT\PAPER\ltpl16s.prf
Date of Plot: 8/1/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	2/26/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:	14102\700cadd\703elec\		
Drawing File Name:	ltpl16s.dwg		
Acad Ver. R14	Scale: 1" = 10'-0"	Units:	ENGLISH

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No Revisions: 01/10/03

Revised:

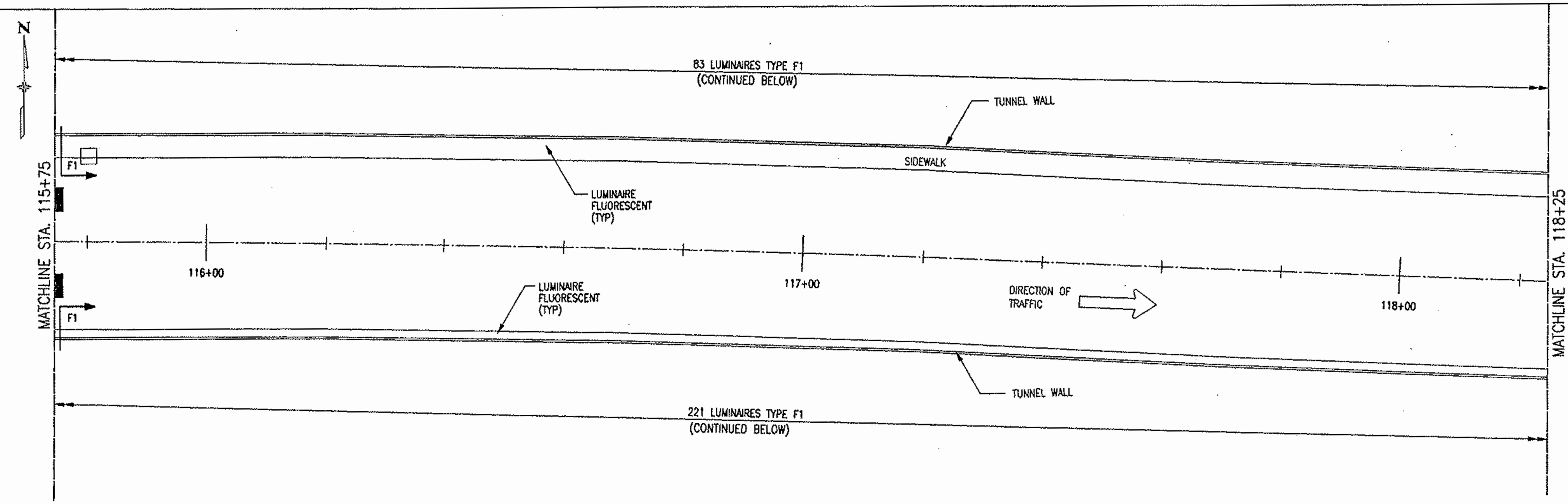
Void:

SOUTH TUNNEL LIGHTING PLANS

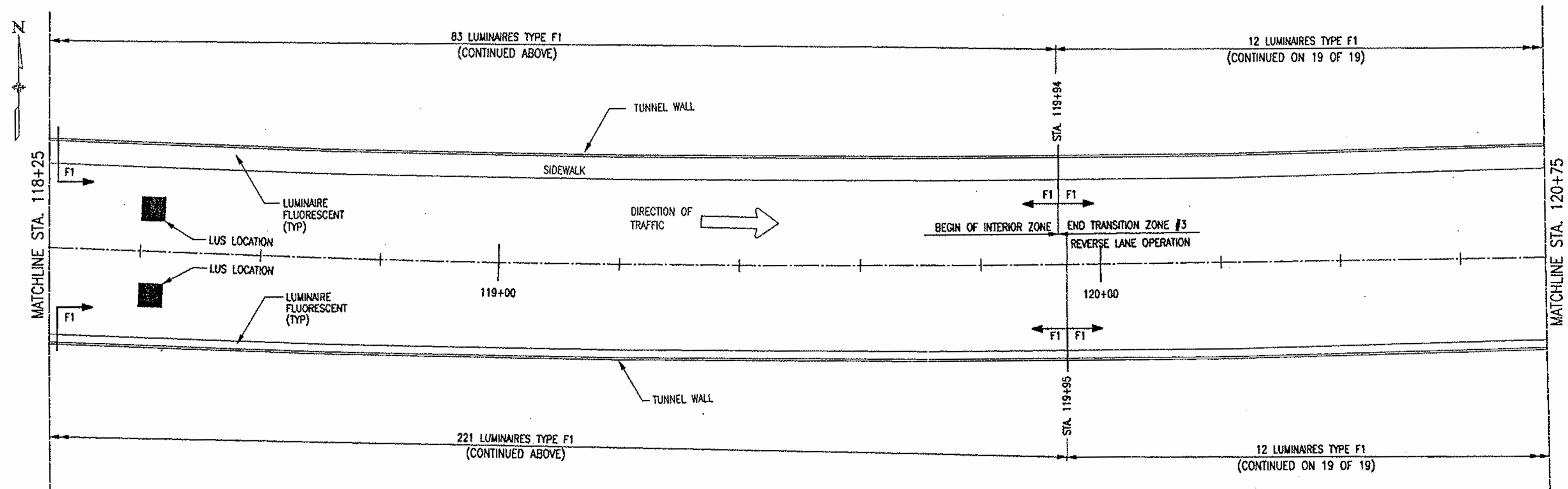
Designer: J.T. Weaver
Detailer: D. J. Burroughs
Structure Numbers
Sheet Subset: S.T. LTG.
Subset Sheets: 17 OF 19

Project No./Code
IM 0703-264
12982

Sheet Number 45



PLAN1



PLAN2

0 5 10 20 30 40
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Date of Plot: 8/1/2000 (using STANDARD.TBL)

Computer File Information		
Creation Date: 2/26/99	Initials:	DJB
Last Modification Date: 11/05/99	Initials:	DJB
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Sheet Revisions

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Region 1 Mountain Residency W.W.G.

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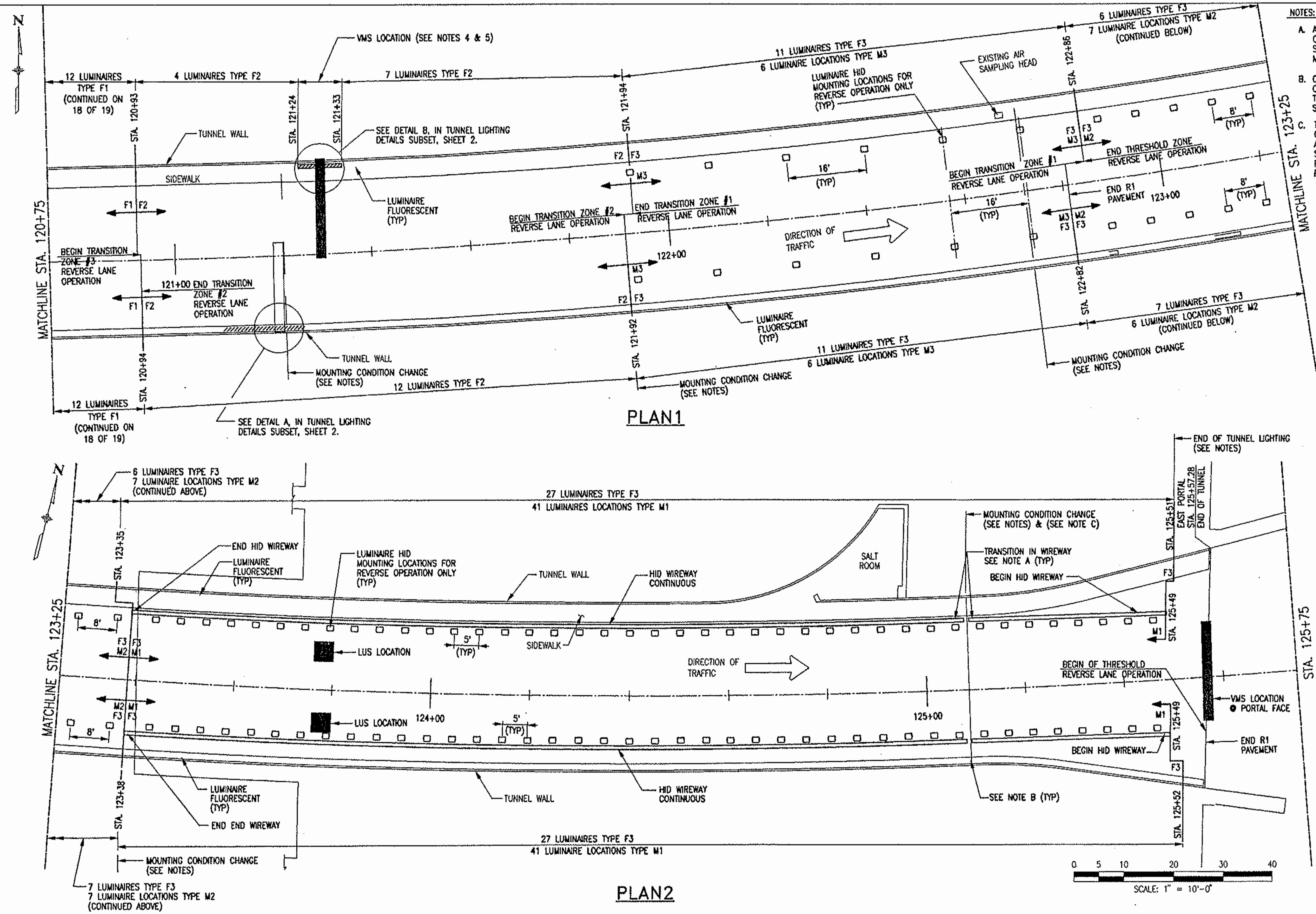
No Revisions: 01/10/03
Revised:
Void:

SOUTH TUNNEL LIGHTING PLANS

Designer: J.T. Weaver
Detailer: D. J. Burroughs
Structure Numbers
Sheet Subset: S.T. LTG.
Subset Sheets: 18 OF 19

Project No./Code
IM 0703-264
12982
Sheet Number 46



NOTES:

A. AN ABRUPT CHANGE IN CEILING ANGLE OCCURS AT STA. 125+08 ±. CONTRACTOR SHALL COORDINATE TRANSITION TO MAINTAIN CONTINUANCE OF WIREWAY.

B. CONTRACTOR SHALL MAINTAIN CONTINUANCE OF FLUORESCENT LUMINAIRES THROUGH TRANSITION IN TUNNEL CEILING AT STA. 125+08 ±.

C. THE TUNNEL CEILING IS RELATIVELY CONSTANT AT 16'-7"± TO STA.120+21± AND GRADUALLY RISES TO 17'-8"± @ STA.125+08± AT WHICH POINT THE ROADWAY AT P.G. TO CEILING DISTANCE RISES TO 22'-8"± @ STA.125+57±.

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Date of Plot: 8/1/2000 (using STANDARD.TBL)

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Acad Ver. R14	Scale: 1" = 10'-0"	Units: ENGLISH

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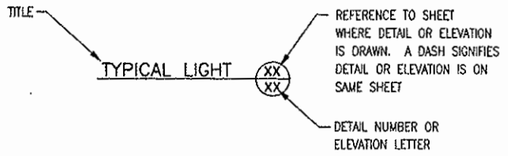
No Revisions: 01/10/03
Revised:
Void:

SOUTH TUNNEL LIGHTING PLANS

Designer: J.T. Weaver
Detailer: D. J. Burroughs
Structure Numbers
Sheet Subset: S.T. LTG.
Subset Sheets: 19 OF 19

Project No./Code
IM 0703-264
12982
Sheet Number 47



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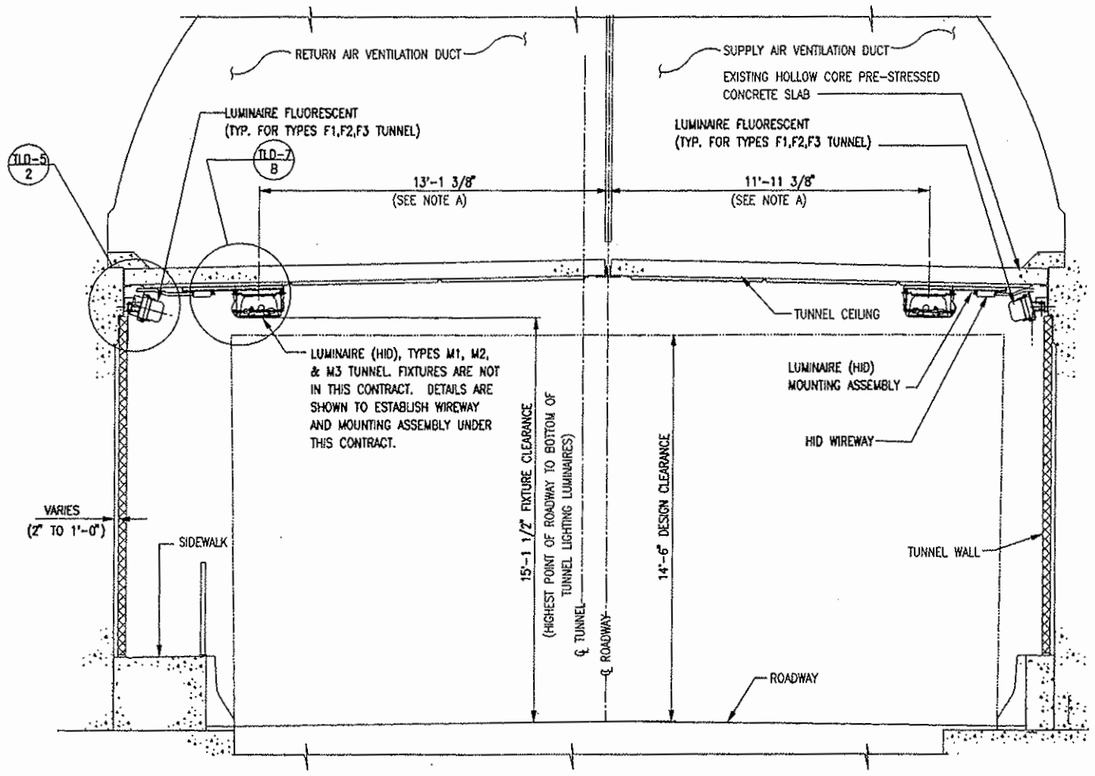

TYPICAL SECTION LOOKING EAST

SOUTH TUNNEL (WITH TRAFFIC)
STA. 35+97.90 TO STA. 38+81.43
STA. 122+73.18 TO STA. 125+57.28

NOTES:
A. SEE DETAILS TLD-7 (B & D) FOR STARTING DIMENSION TO POSITION TRANSVERSE LUMINAIRE MOUNTING SUPPORT CHANNEL

LUMINAIRE FLUORESCENT TUNNEL MOUNTING TABULATION

	STATION FROM	STATION TO	DESCRIPTION	MOUNTING CONDITION FLUORESCENT DETAIL	SUPPLEMENTAL MOUNTING PLATE TYPE A	SUPPLEMENTAL MOUNTING PLATE TYPE B	QUANTITY OF LUMINAIRE FLUORESCENT MOUNTING BRACKET (BY TYPE/HAND) 1R	1L	2R	2L	3R	3L
NORTH WALL	35+97.82	36+04	NO LUMINAIRES	N/A			N/A	N/A	N/A	N/A	N/A	N/A
	36+04	38+81	PORTAL / THRESHOLD ZONE	TLD-6 (1)	31		46	46				
	38+81	40+82	THRESHOLD ZONE	TLD-5 (2)		23			34	34		
	40+82	121+22	THRESHOLD, TRANSITIONS #1,#2 & #3, INTERIOR AND REVERSE LANE OPERATION TRANSITION ZONE #3	TLD-5 (1)		894					1340	1341
	121+22	122+73	REVERSE LANE OPERATION TRANSITION ZONE #2 & #1	TLD-5 (2)		17			26	25		
	122+73	125+50	REVERSE LANE OPERATION TRANSITION ZONE #1 & THRESHOLD	TLD-6 (1)	31		46	46				
	125+50	125+57.28	NO LUMINAIRES	N/A			N/A	N/A	N/A	N/A	N/A	N/A
SOUTH WALL	35+97.82	36+04	NO LUMINAIRES	N/A			N/A	N/A	N/A	N/A	N/A	N/A
	36+04	38+81	PORTAL / THRESHOLD ZONE	TLD-6 (1)	31		46	46				
	38+81	40+82	THRESHOLD ZONE	TLD-5 (2)		23			34	34		
	40+82	121+22	THRESHOLD, TRANSITIONS #1,#2 & #3, INTERIOR AND REVERSE LANE OPERATION TRANSITION ZONE #3	TLD-5 (1)		894					1341	1341
	121+22	122+73	REVERSE LANE OPERATION TRANSITION ZONE #2 & #1	TLD-5 (2)		17			25	26		
	122+73	125+51	REVERSE LANE OPERATION TRANSITION ZONE #1 & THRESHOLD	TLD-6 (1)	31		46	47				
	125+51	125+57.28	NO LUMINAIRES	N/A			N/A	N/A	N/A	N/A	N/A	N/A
				TOTAL BRACKETS	124	1868	184	185	119	119	2681	2682

FOR INFORMATION ONLY. ITEMS SHOWN ABOVE ARE TO BE INCLUDED.

LUMINAIRE (HID) TUNNEL MOUNTING TABULATION – (HID) MOUNTING SYSTEM

	STATION FROM	STATION TO	DESCRIPTION	MOUNTING CONDITION H.I.D. PARTIAL PLAN	MOUNTING CONDITION H.I.D. ELEV. / SECT.	LUMINAIRE (HID) MOUNTING SUPPORT CHANNEL ATTRIBUTES LONGITUDINAL LENGTH (FT)	TRANSVERSE LENGTH (FT)	HANGING POINTS (EA)	CONNECTION POINTS (EA)
NORTH WALL	35+97.82	36+08	NO LUMINAIRE (HID)	N/A	N/A	N/A	N/A	N/A	N/A
	36+08	38+81	H.I.D. & WIREWAY	TLD-3	TLD-7 (A&B)	556	512	205	137
	38+81	40+82	CEILING CHANGE @ 38+81	TLD-4	TLD-7 (A&B)	402	377	151	101
	40+82	42+39	END WIREWAY @ 42+39	TLD-4	TLD-7 (A&B)	314	294	118	79
	42+39	45+95	END H.I.D. @ 45+95	TLD-4	TLD-7 (C&D)	N/A	76	57	N/A
	45+95	121+94	NO LUMINAIRE (HID)	N/A	N/A	N/A	N/A	N/A	N/A
	121+94	122+73	START H.I.D. @ 121+94	TLD-4	TLD-7 (C&D)	N/A	13	10	N/A
	122+73	123+38	CEILING CHANGE @ 122+73	TLD-3	TLD-7 (C&D)	N/A	22	16	N/A
	123+38	125+49	START WIREWAY @ 123+25	TLD-3	TLD-7 (A&B)	427	396	158	106
	125+49	125+57.28	NO LUMINAIRE (HID)	N/A	N/A	N/A	N/A	N/A	N/A
SOUTH WALL	35+97.82	36+08	NO LUMINAIRE (HID)	N/A	N/A	N/A	N/A	N/A	N/A
	36+08	38+81	H.I.D. & WIREWAY	TLD-3 (1)	TLD-6 (A&B)	556	512	205	137
	38+81	40+82	CEILING CHANGE @ 38+81	TLD-3 (2)	TLD-6 (A&B)	402	377	151	101
	40+82	42+39	END WIREWAY @ 42+39	TLD-3 (2)	TLD-6 (A&B)	314	294	118	79
	42+39	45+95	END H.I.D. @ 45+95	TLD-3 (2)	TLD-6 (C&D)	N/A	76	57	N/A
	45+95	121+92	NO LUMINAIRE (HID)	N/A	N/A	N/A	N/A	N/A	N/A
	121+92	122+73	START H.I.D. @ 121+94	TLD-3 (2)	TLD-6 (C&D)	N/A	13	10	N/A
	122+73	123+38	CEILING CHANGE @ 122+73	TLD-3 (1)	TLD-6 (C&D)	N/A	22	16	N/A
	123+38	125+49	START WIREWAY @ 123+25	TLD-3 (1)	TLD-6 (A&B)	427	396	158	106
	125+49	125+57.28	NO LUMINAIRE (HID)	N/A	N/A	N/A	N/A	N/A	N/A
					TOTALS	3398	3380	1430	842

ALL STATIONS SHOWN ARE APPROXIMATE. MOUNTING POINTS ARE LOCATED BETWEEN EXISTING SUSPENDED CEILING PAN JOINTS AND AT THE EXISTING HOLLOW CORE PRE-STRESSED CONCRETE SLAB JOINTS.

0 3 6 12 FEET
3/8 "= 1'-0"

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Plot File Name: P:\PLOT\PAPER\ttyr03.plt
Date of Plot: 8/1/2000 (using STANDARD.TBL)

Computer File Information			
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Sheet Revisions		

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No Revisions: 01/10/03
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TUNNEL LIGHTING DETAILS

Designer: J. WEAVER
Detailer: D. BURROUGHS
Sheet Subset: TLD
Structure Numbers:
Subset Sheets: 1 of 11

Project No./Code
IM 0703-264
12982
Sheet Number 48

Sverdrup
A Jacobs Company

Me norandum

DATI : 12/17/01

TO: Larry McKenzie

FRO I: DJ Burroughs

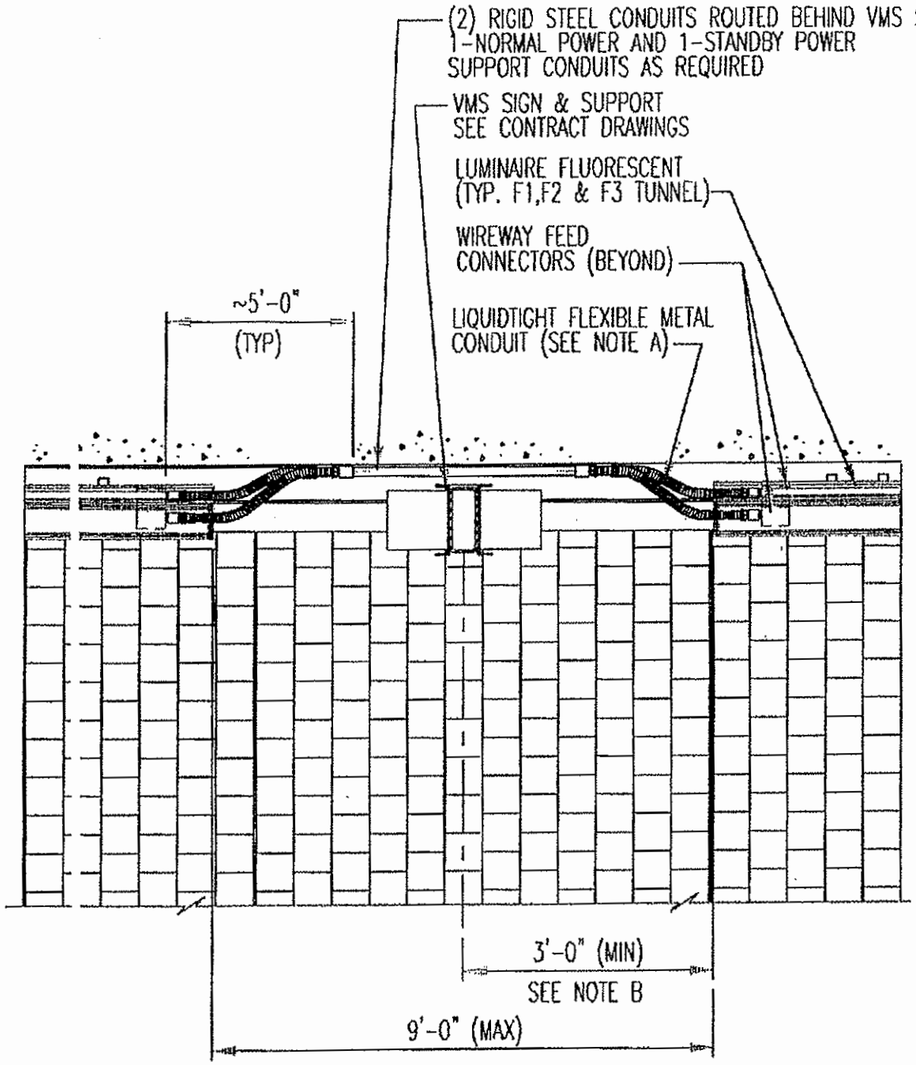
SUBJ CT: Eisenhower/Johnson Field Design Modifications

Larry,

Please see the attachments labeled SK01-121101 and SK02-121101 these detail are in response to the contractors request for information and your e-mail dated 12/12 01 to provide a means to account for thermal contraction at attachments to wire way f ed connectors at breaks in the continuous luminaire runs for the South Tunnel Lighti ıg project both North and South walls.

Pleas notify us if you require any further assistance.

DJ Bu toughs
Lightin ; Design
JE- Sv rdrup - Boston, MA
Phone: 517.742.8060.4378
Fax: 6 7.742.8830



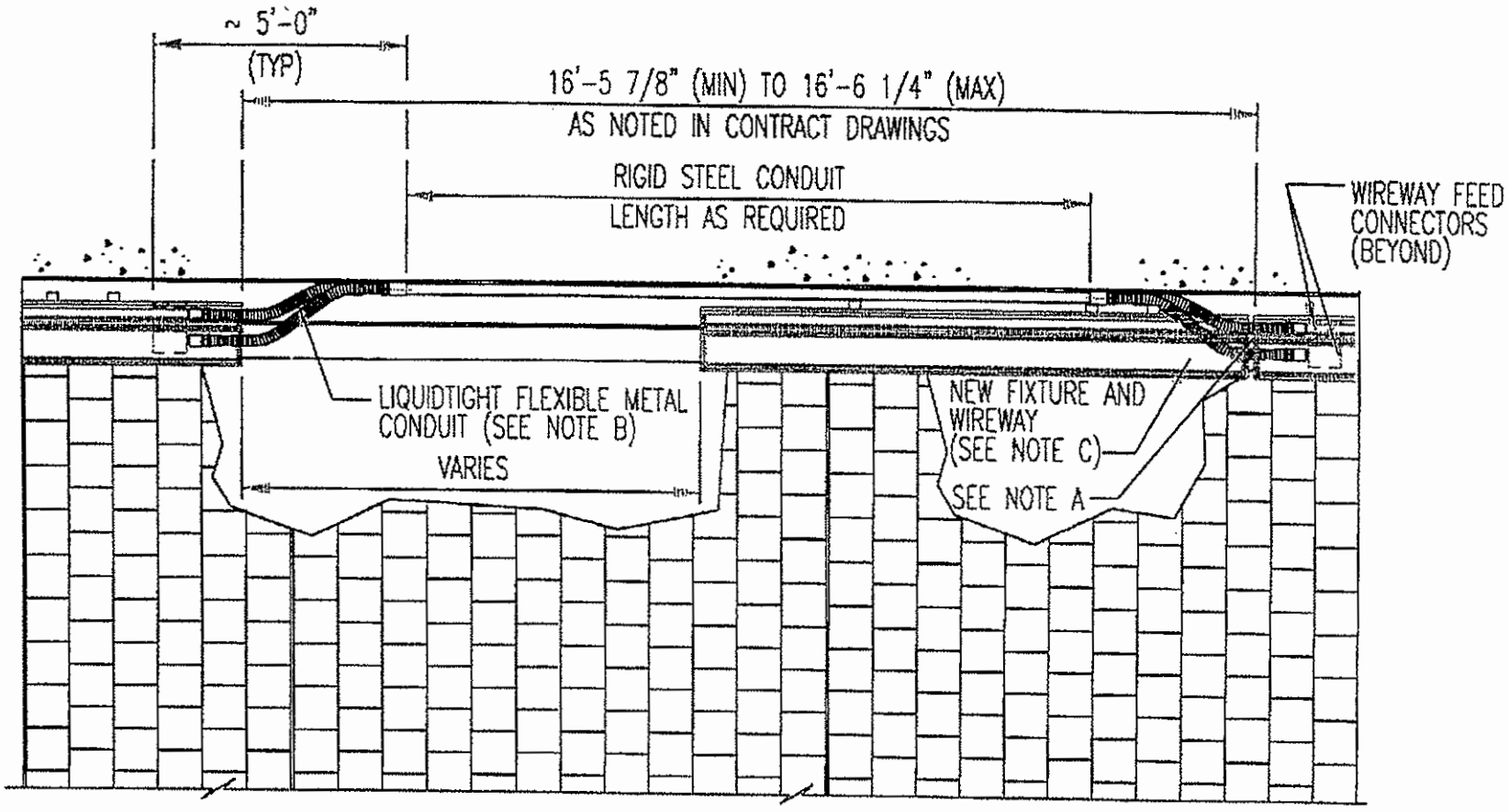
LUMINAIRE(S) FEED ACROSS VMS SUPPORT

N.T.S.

NOTES:

A. TERMINATE RIGID STEEL CONDUIT TO ALLOW FOR ADEQUATE BENDING RADIUS OF LIQUIDTIGHT FLEXIBLE METAL CONDUIT. (REFER TO CONTRACT DRAWINGS FOR CONDUIT SIZE)

B. DISTANCE OF PRECEDING LUMINAIRE TO VMS SIGN IN DIRECTION OF TRAFFIC.



LUMINAIRE INSTALLATION AFTER VMS REMOVAL

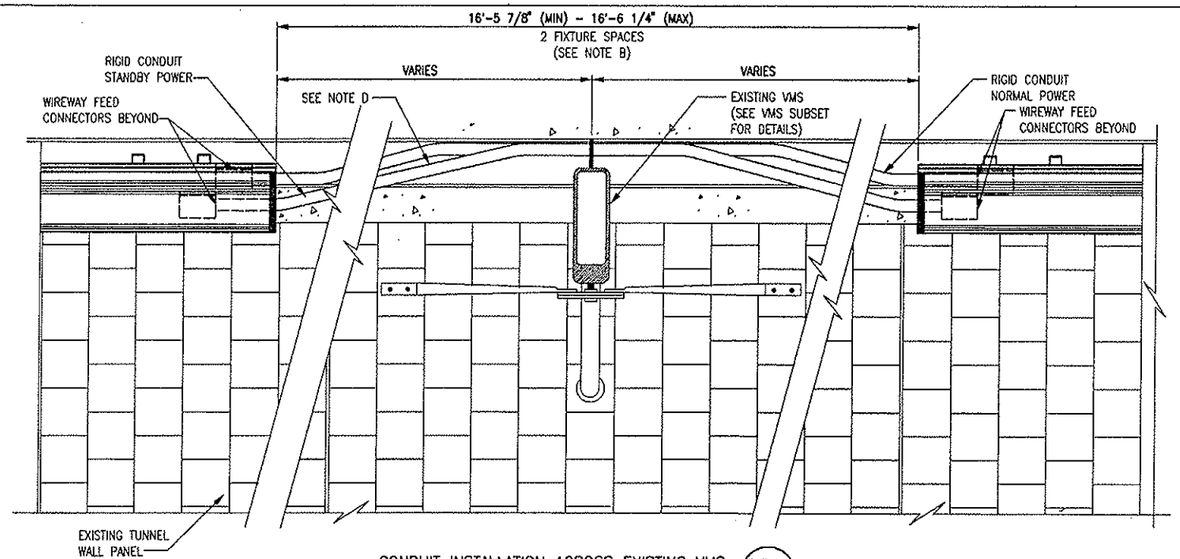
N.T.S.

NOTES:

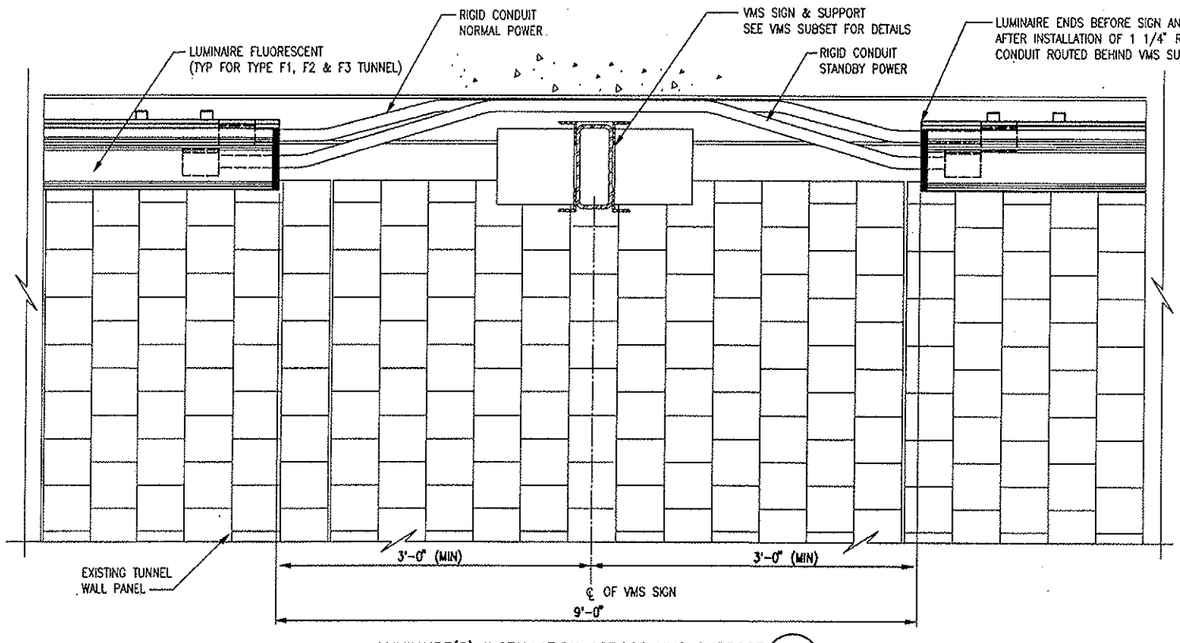
A. DISCONNECT WIREWAY END CAP AND CONNECT NEW WIREWAY AS SHOWN IN CONTRACT DRAWINGS. BACK FEED CONDUCTORS AS REQUIRED TO ENERGIZE LUMINAIRE.

B. TERMINATE RIGID STEEL CONDUIT TO ALLOW FOR ADEQUATE BENDING RADIUS OF LIQUIDTIGHT FLEXIBLE METAL CONDUIT. (REFER TO CONTRACT DRAWINGS FOR CONDUIT SIZE.)

C. SUPPORT AND CONNECT WIREWAY AS DETAILED IN CONTRACT DRAWINGS SEAL END OF WIREWAY AT BREAK WITH WIREWAY END CAP AS NOTED IN SPECIFICATIONS.



CONDUIT INSTALLATION ACROSS EXISTING VMS (TLD-2 A)



LUMINAIRE(S) INSTALLATION ACROSS VMS SUPPORT (TLD-2 B)

NOTES

A. NOT USED

B. PROVISION SHALL BE MADE TO ALLOW FOR INSTALLATION OF 2-FLUORESCENT TUNNEL LUMINAIRES AFTER EXISTING VMS SIGN IS REMOVED. CONTRACTOR RESPONSIBLE FOR MAINTAINING THE NOTED DIMENSION IN ORDER TO INSTALL LUMINAIRES AT A LATER DATE.

C. PROVIDE CONDUIT SUPPORT ON EITHER SIDE OF MOGUL TYPE "T" (CONDUIT BODY) FITTINGS. FOR FITTINGS SPACED GREATER THAN 10'-0" ON CENTER, PROVIDE AN ADDITIONAL CONDUIT SUPPORT CENTERED BETWEEN FITTINGS.

D. DURING CONSTRUCTION, INSTALLATION ON AND/OR STAGING OF WORK, THE HID FIXTURE WIREWAY MAY BE INTERRUPTED AS INDICATED ON THE CONTRACT DRAWINGS. PROVIDE CONDUIT(S) BETWEEN WIREWAY FEED, ROUTED AS SHOWN.

E. FOR ACTUAL VMS SIGNS REFERENCE VMS SUBSET SHEETS.

0 1 2 5 FEET
1"= 1'-0"

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No Revisions:
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TUNNEL LIGHTING DETAILS

Designer: J. WEAVER
Detailer: D. BURROUGHS
Sheet Subset: TLD
Structure Numbers:
Subset Sheets: 2 of 11

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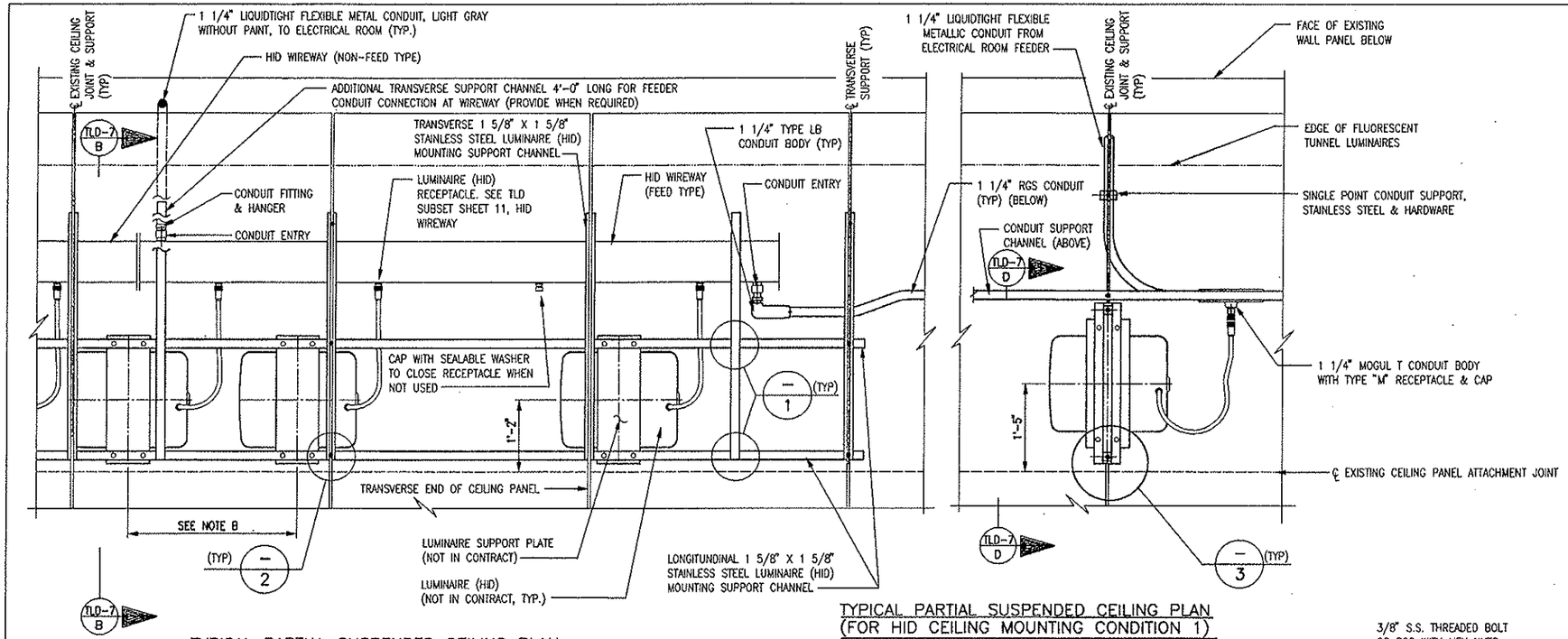
IM 0703-264
12982
Sheet Number 49



TYPICAL PARTIAL SUSPENDED CEILING PLAN
(FOR HID RACK MOUNTING CONDITION 1)

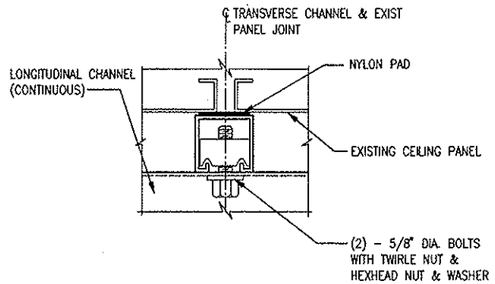
TYPICAL PARTIAL SUSPENDED CEILING PLAN
(FOR HID CEILING MOUNTING CONDITION 1)

NOTES:

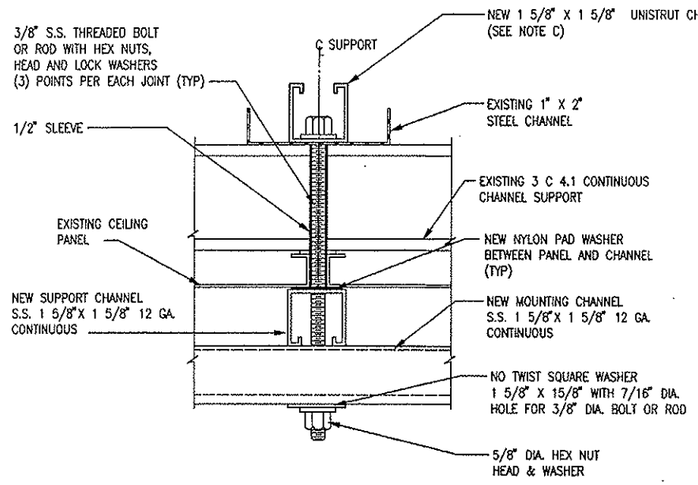
A. POWER FEEDERS ARE SHOWN TO ILLUSTRATE APPROXIMATE LOCATION AND METHOD TO FEED LUMINAIRES (HID) – FOR LOCATIONS REFER TO TUNNEL POWER SHEETS.

B. FOR LUMINAIRE (HID) SPACING DIMENSIONS REFER TO SOUTH TUNNEL LIGHTING PLANS, SHEETS 2, 3 AND 19

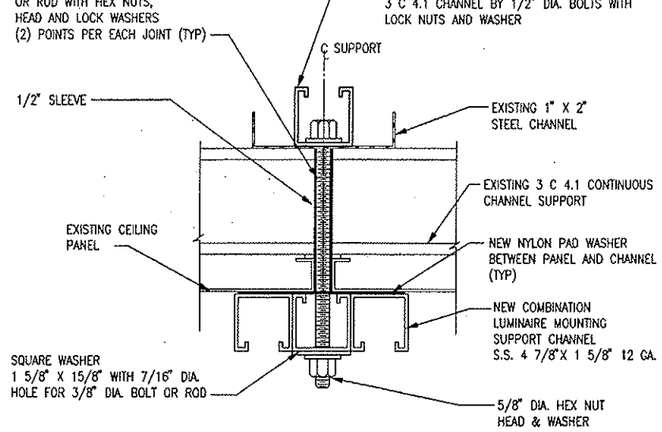
C. NEW 1 5/8" X 1 5/8" UNISTRUT CHANNEL SUPPORTED ON LONGITUDINAL 3 C 4.1 CHANNEL BY 1/2" DIA. BOLTS WITH LOCK NUTS AND WASHER. PROVIDE LENGTH REQUIRED TO SPAN FROM EDGE OF CEILING TO FIRST LONGITUDINAL CHANNEL. WHEN SPAN IS GREATER THAN 6'-0" PROVIDE ADDITIONAL SUPPORTING ROD SECURED TO CEILING BY MEANS OF AN EMBEDDED EPOXY ANCHOR.



CHANNEL CONNECTION
(MOUNTING CONDITION 1 & 2) 1



HANGING POINT DETAIL
(MOUNTING CONDITION 1) 2



HANGING POINT DETAIL
(MOUNTING CONDITION 1) 3

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TUNNEL LIGHTING DETAILS

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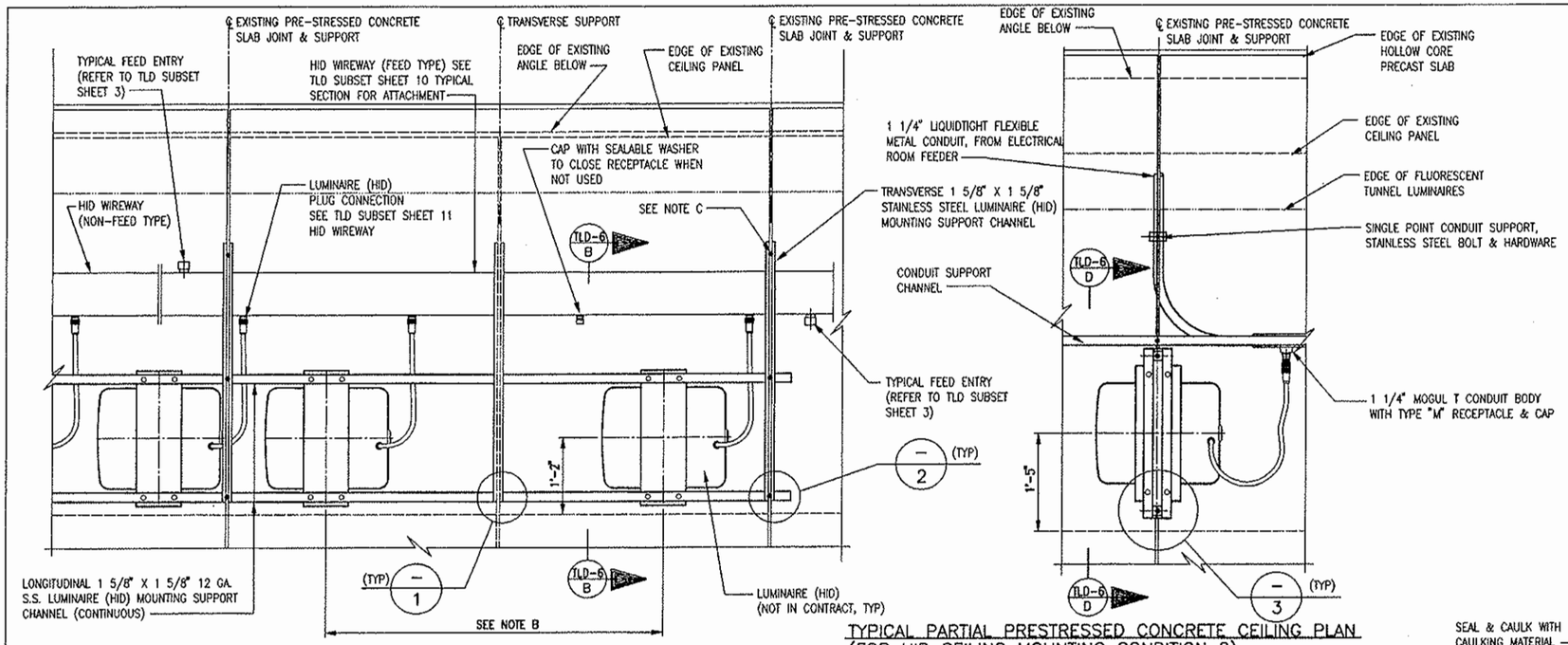
Detailer:	D. BURROUGHS		
Sheet Subset:	TLD	Subset Sheets:	3 of 11

Project No./Code	
IM 0703-264	
12982	
Sheet Number	50



TYPICAL PARTIAL PRESTRESSED CONCRETE CEILING PLAN
(FOR HID RACK MOUNTING CONDITION 2)

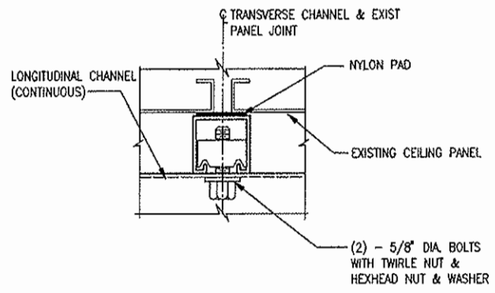
TYPICAL PARTIAL PRESTRESSED CONCRETE CEILING PLAN
(FOR HID CEILING MOUNTING CONDITION 2)

NOTES:

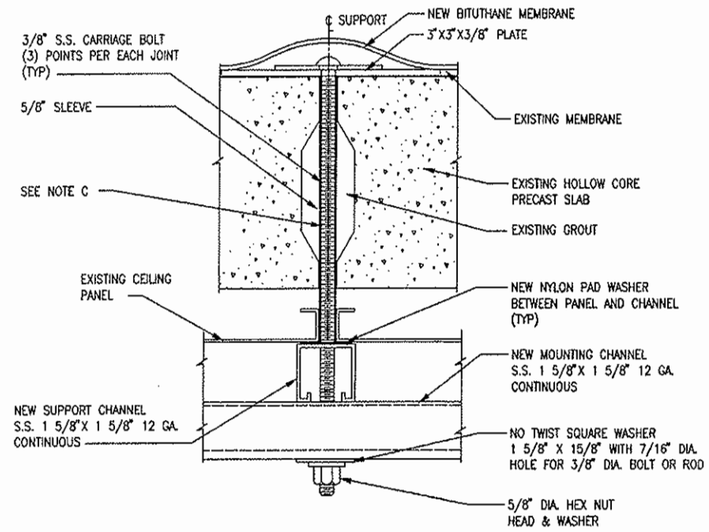
A. POWER FEEDERS ARE SHOWN TO ILLUSTRATE APPROXIMATE LOCATION AND METHOD TO FEED LUMINAIRE (HID) – FOR LOCATIONS REFER TO TUNNEL POWER SHEETS.

B. FOR LIMINAIRE (HID) SPACING DIMENSIONS REFER TO SOUTH TUNNEL LIGHTING PLANS, SHEETS 2, 3 AND 19

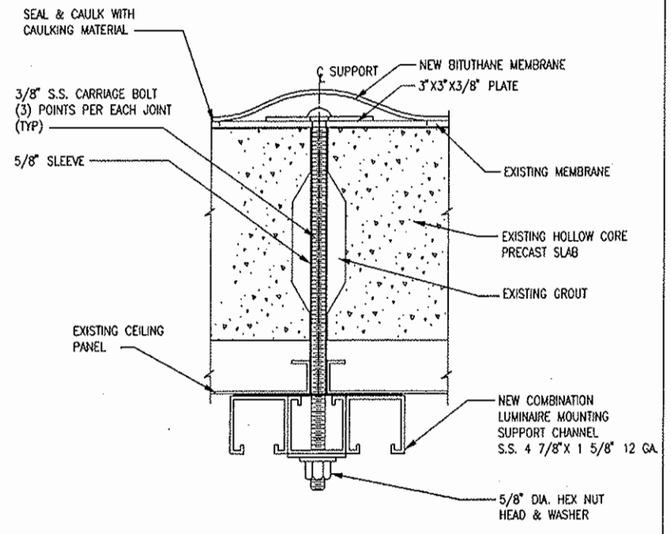
C. WHEN EXISTING CONDITION PROHIBITS USE OF CARRIAGE BOLT ANCHOR METHOD, A THREADED ROD SHALL BE SUBSTITUTED AND SHALL BE SECURED TO THE CEILING BY MEANS OF AN EMBEDDED EPOXY ANCHOR.



CHANNEL CONNECTION
(MOUNTING CONDITION 1 & 2) 1



HANGING POINT DETAIL
(MOUNTING CONDITION 2) 2



HANGING POINT DETAIL
(MOUNTING CONDITION 2) 3

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TUNNEL LIGHTING DETAILS

Designer:	J.W. / D.B.	Structure Numbers	
Detailer:	D. BURROUGHS		
Sheet Subset:	TLD	Subset Sheets:	4 of 11

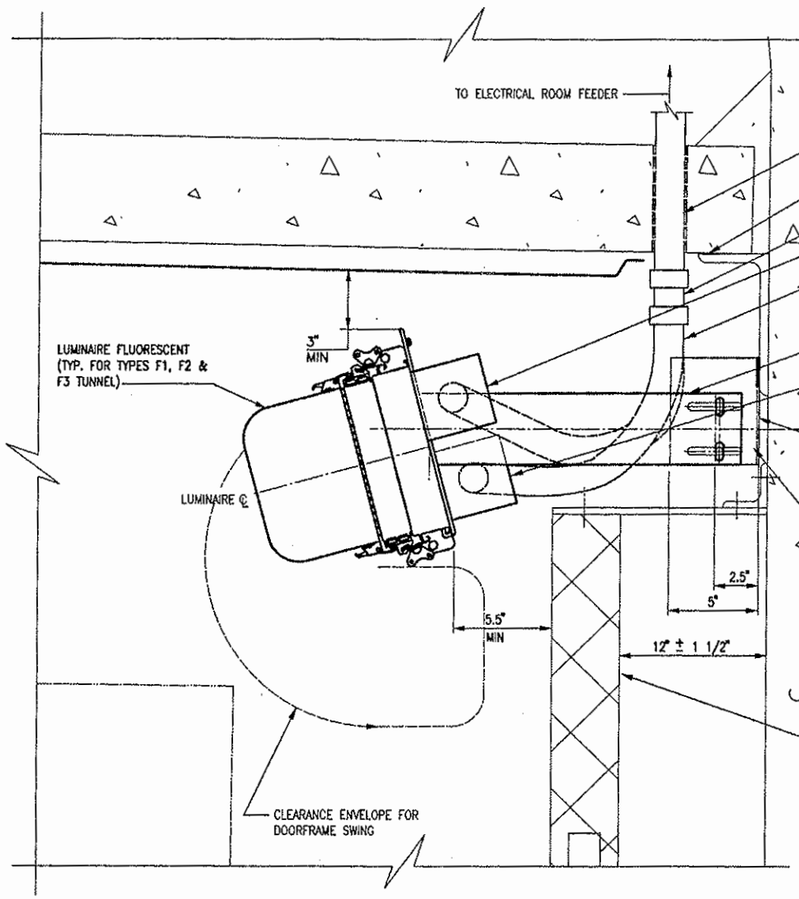
Project No./Code	
IM 0703-264	
12982	
Sheet Number	51

014102\710STDS\BORDERIN.DGN

NOTES:

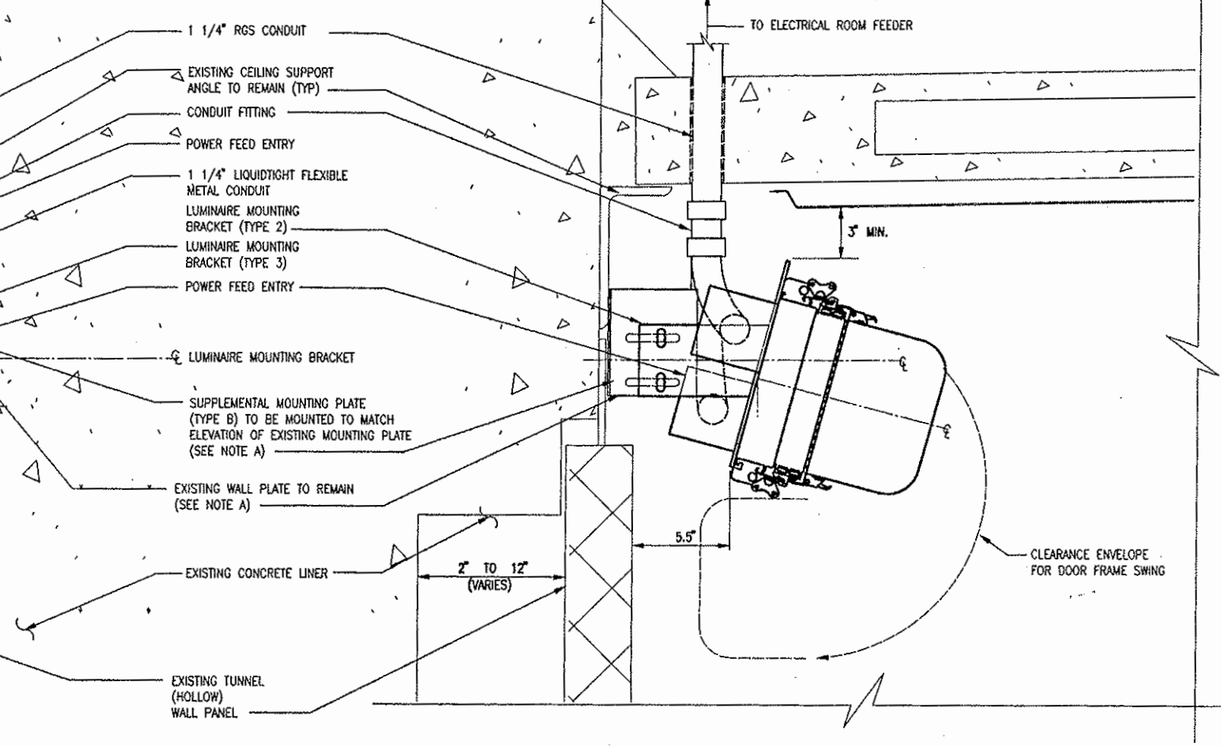
A. PROVIDE A NEW SUPPLEMENTAL MOUNTING PLATE CENTERED BETWEEN THE EXISTING MOUTING PLATES. ALSO INCLUDE ONE LUMINAIRE MOUNTING BRACKET (RIGHT HANDED OR LEFT HANDED AS REQUIRED).

B. POWER FEEDERS ARE SHOWN TO ILLUSTRATE APPROXIMATE LOCATION AND METHOD TO FEED FLUORESCENT TUNNEL LUMINAIRES. FOR LOCATIONS REFER TO TUNNEL POWER SHEETS.



MOUNTING CONDITION
TYPICAL INTERIOR ZONE — TLD-5 / 1

SOUTH BORE – NORTH WALL & SOUTH WALL
STA. 40+82 TO STA. 121+22



MOUNTING CONDITION
TUNNEL TRANSITION — TLD-4 / 2

SOUTH BORE – NORTH WALL & SOUTH WALL
STA. 38+81 TO STA. 40+82
STA. 121+22 TO STA. 122+73

0 ½ 1 1½ FEET
3"= 1'-0"

Design File Names: p:\04102\cathyplot\tld14.plt
Plot File Names: P:\PLOT\PAPER\tld14.prt
Date of Plot: 8/1/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	06/26/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:	14102\700CADD\703elec\		
Drawing File Name:			tldt14.dwg
Acad Ver. R14	Scale: 3" = 1'-0"	Units:	English

Sheet Revisions		

Colorado Department of Transportation
DOT
P.O. BOX 399
DUMONT, CO. 80436
Phone: 303-512-5750 FAX: 303-512-5775
Region 1 Mountain Residency W.W.G.

As Constructed
No Revisions: 01/10/03
Revised:
Void:

TUNNEL LIGHTING DETAILS

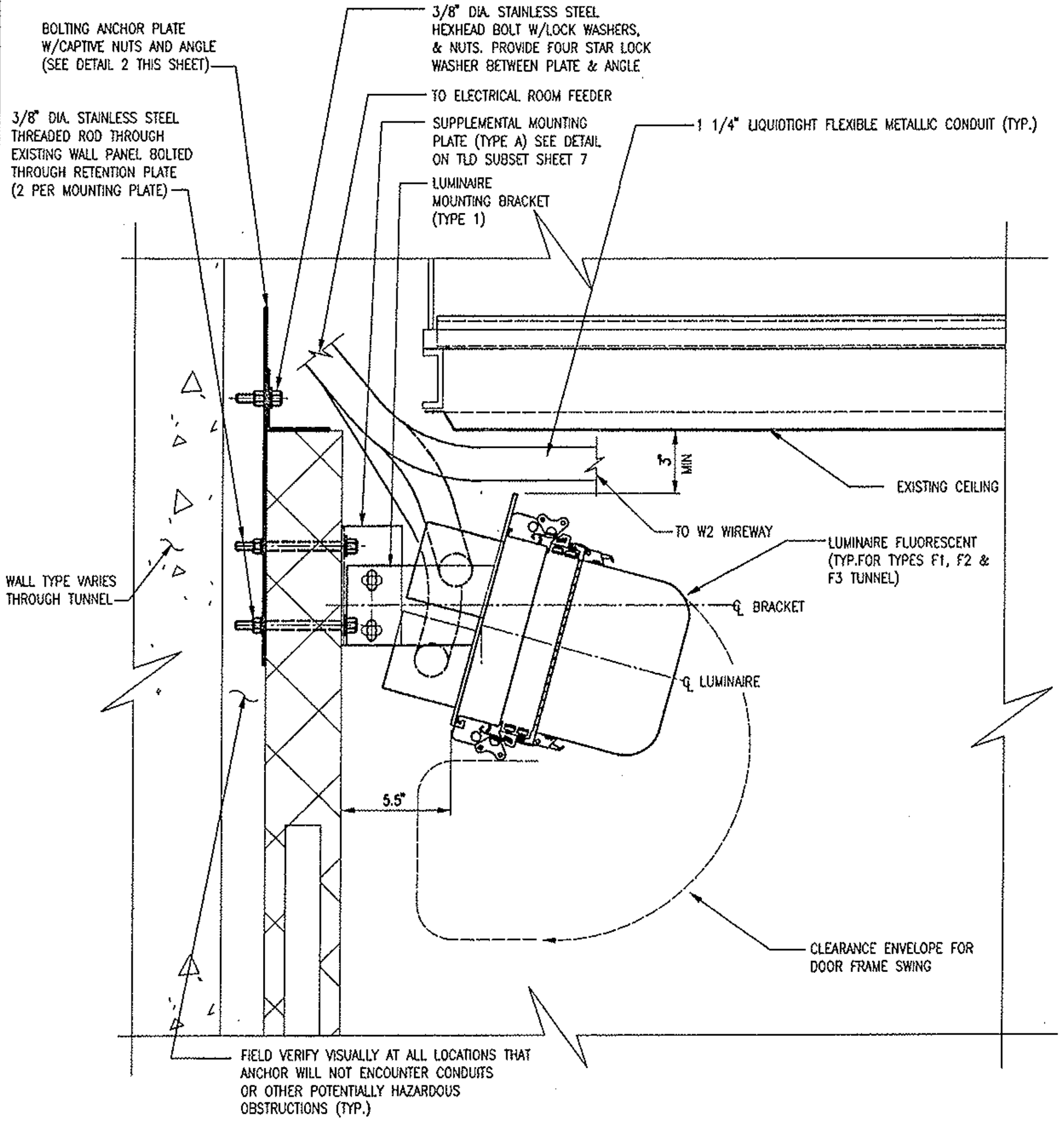
Designer:	J.W. / D.B.	Structure Numbers	
Detailer:	D. BURROUGHS		
Sheet Subset:	TLD	Subset Sheets:	5 of 11

Project No./Code: IM 0703-264
12982
Sheet Number 52

NOTES:

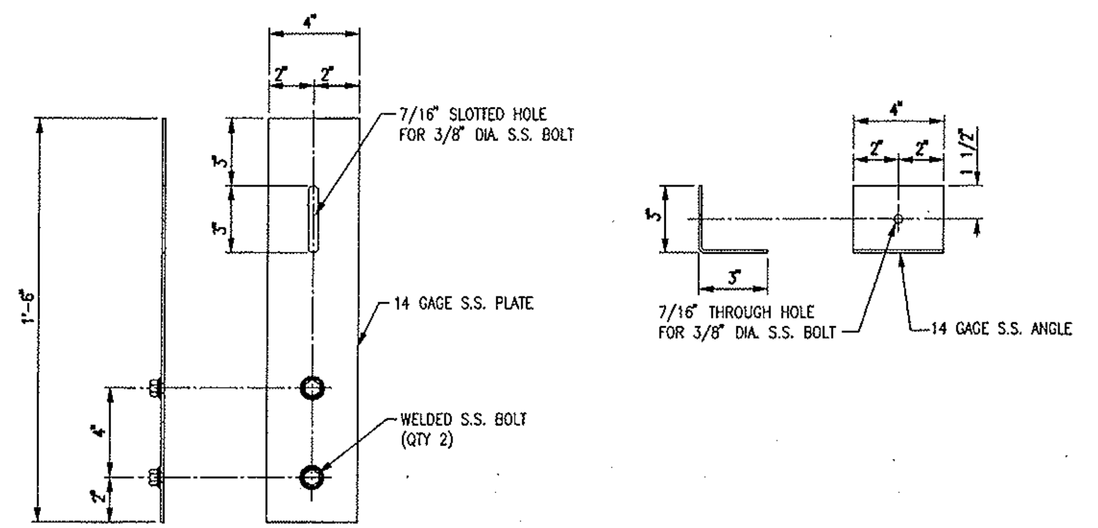
A. POWER FEEDERS ARE SHOWN TO ILLUSTRATE APPROXIMATE LOCATION AND METHOD TO FEED FLUORESCENT TUNNEL LUMINAIRES. FOR LOCATIONS REFER TO TUNNEL POWER SHEETS.

B. PROVIDE BOLT ANCHOR PLATE TO SECURE NEW SUPPLEMENTAL MOUNTING PLATES AS REQUIRED.



MOUNTING CONDITION
TUNNEL PORTAL TRANSITION (TLD-6 / 1)

SOUTH BORE – NORTH WALL & SOUTH WALL
STA. 36+04 TO STA. 38+81
STA. 122+73 TO STA 125+51



BOLT ANCHOR PLATE NTS (TLD-6 / 2)
SEE NOTE B.

0 ½ 1 1½ FEET
3"= 1'-0"

Design File Name: p:\014102\cathyplot\ltdt16.plt
Plot File Name: P:\PLOT\PAPER\ltdt16.prf
Date of Plot: 8/1/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	02/26/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:	14102\700CADD\703elec\		
Drawing File Name:	ltdt16.dwg		
Acad Ver. R14	Scale: 3" = 1'- 0"	Units: English	

Sheet Revisions

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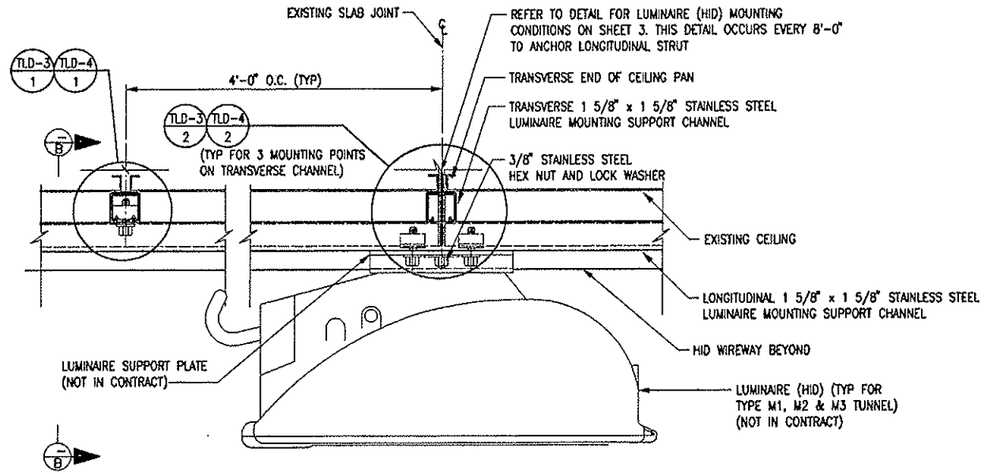
Phone: 303-512-5750 FAX: 303-512-5775
Region 1 Mountain Residency W.W.G.

As Constructed
No Revisions: 01/10/03
Revised:
Void:

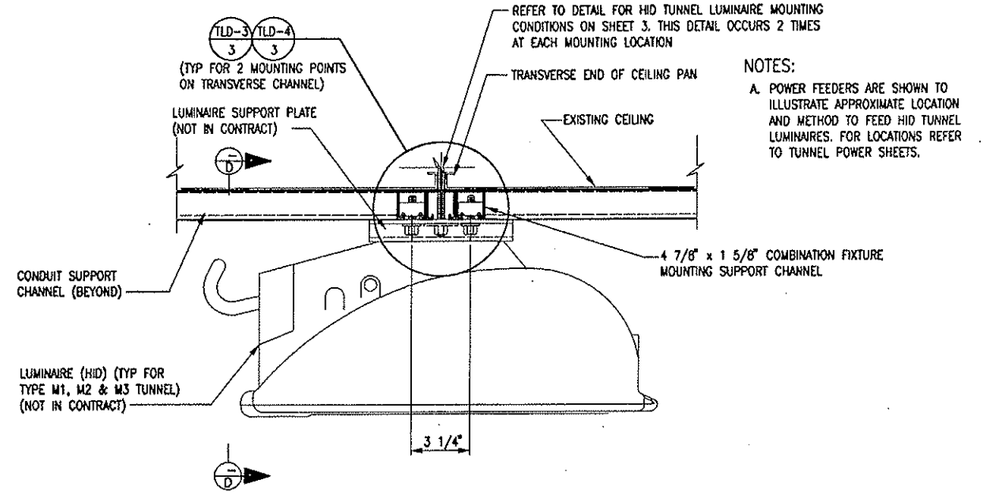
TUNNEL LIGHTING DETAILS

Designer:	J.W. / D.B.	Structure Numbers	
Detailer:	D. BURROUGHS		
Sheet Subset:	TLD	Subset Sheets:	6 of 11

Project No./Code
IM 0703-264
12982
Sheet Number 53



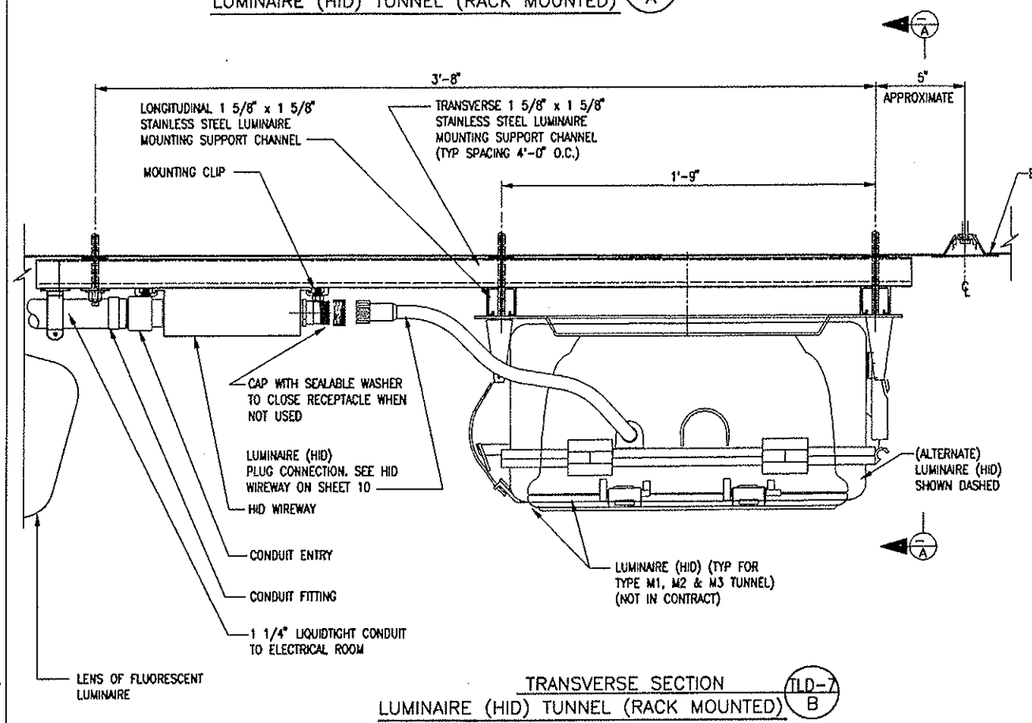
LONGITUDINAL SECTION
LUMINAIRE (HID) TUNNEL (RACK MOUNTED) TLD-7 A



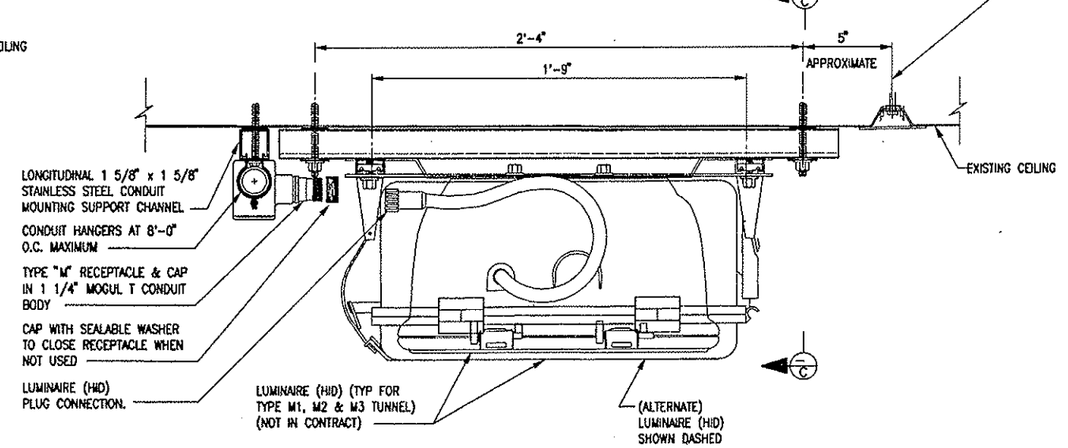
NOTES:

A. POWER FEEDERS ARE SHOWN TO ILLUSTRATE APPROXIMATE LOCATION AND METHOD TO FEED HID TUNNEL LUMINAIRES. FOR LOCATIONS REFER TO TUNNEL POWER SHEETS.

LONGITUDINAL SECTION
LUMINAIRE (HID) TUNNEL (CEILING MOUNTED) TLD-7 C



TRANSVERSE SECTION
LUMINAIRE (HID) TUNNEL (RACK MOUNTED) TLD-7 B



TRANSVERSE SECTION
LUMINAIRE (HID) TUNNEL (CEILING MOUNTED) TLD-7 D

0 ½ 1 1½ FEET
3"= 1'-0"

Design File Name: p:\04102\cathyplot\tldt17.plt
Plot File Name: P:\PLOT\PAPER\tldt17.prf
Date of Plot: 8/1/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	02/26/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:	14102\700CADD\703elec\		
Drawing File Name:	tldt17.dwg		
Acad Ver. R14	Scale: 3" = 1'- 0"	Units:	English

Sheet Revisions		

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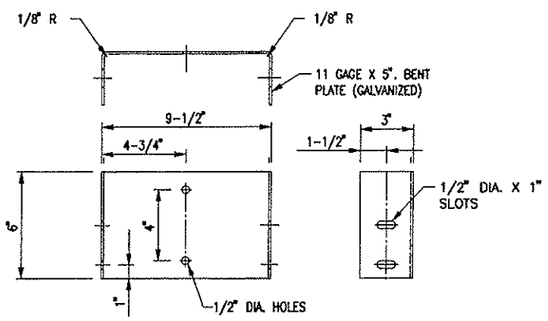
Phone: 303-512-5750 FAX: 303-512-5775
Region 1 Mountain Residency W.W.G.

As Constructed
No Revisions: 01/10/03
Revised:
Void:

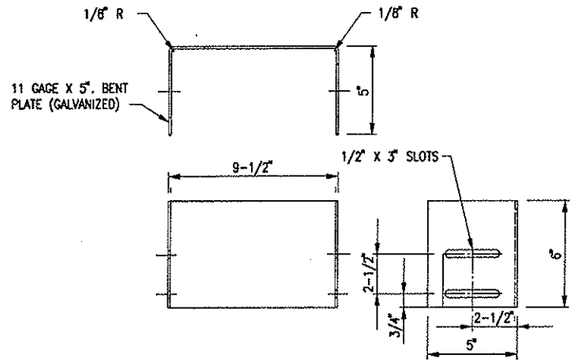
TUNNEL LIGHTING DETAILS

Designer: J.W. / D.B.
Detailer: D. BURROUGHS
Sheet Subset: TLD
Structure Numbers:
Subset Sheets: 7 of 11

Project No./Code
IM 0703-264
12982
Sheet Number 54



SUPPLEMENTAL MOUNTING PLATE TYPE A



SUPPLEMENTAL MOUNTING PLATE TYPE B

NOTES:

A. BRACKET SHALL BE MODIFIED AS REQUIRED TO ACCOMMODATE FLUORESCENT TUNNEL LUMINAIRE.

B. COORDINATE BRACKET BEND WITH LUMINAIRE TO CREATE AN INTERLOCK.

C. THE DESIGN INTENT IS TO HAVE BRACKET FORMED USING A SINGLE PIECE OF METAL PLATE. A CONTINUOUS WELD ON BOTH SIDES CAN BE SUBSTITUTED BY VENDOR AS APPROVED.

D. PROVIDE A RIGHT AND LEFT LUMINAIRE MOUNTING BRACKET AT ALL EXISTING MOUNTING PLATES.

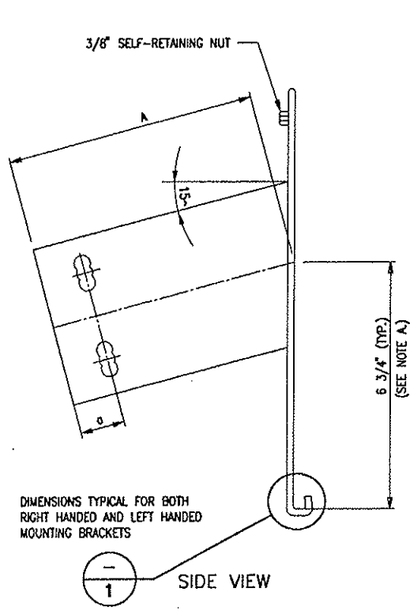
E. PROVIDE A NEW SUPPLEMENTAL MOUNTING PLATE CENTERED BETWEEN THE EXISTING MOUTING PLATES. PROVIDE ONE LUMINAIRE MOUNTING BRACKET (RIGHT HANDED OR LEFT HANDED AS REQUIRED).

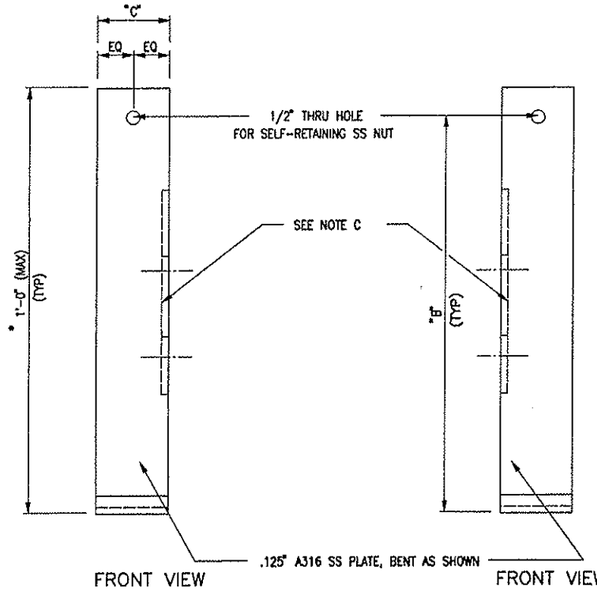
LUMINAIRE MOUNTING BRACKET SCHEDULE

DESCRIPTION	DIMENSION							
	A	o	B	C	D	E	F	G
FOR BRACKET TYPE 1	7"	1 1/4"	••	2"	••	••	••	1/8"
FOR BRACKET TYPE 2	7 7/8"	1 1/4"	••	2"	••	••	••	1/8"
FOR BRACKET TYPE 3	1'-5 3/4"	1 1/2"	••	2"	••	••	••	1/8"

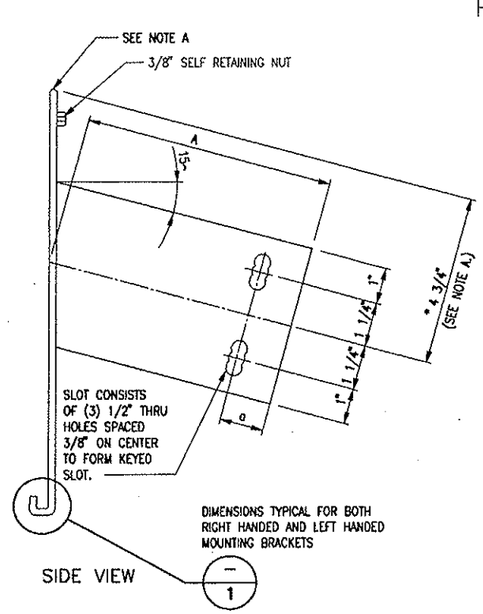
• DIMENSION IS APPROXIMATE DEPENDING WIDTH OF LUMINAIRE.

•• DIMENSION SHALL BE SUPPLIED BY CONTRACTOR ON SHOP DRAWING FOR APPROVAL.

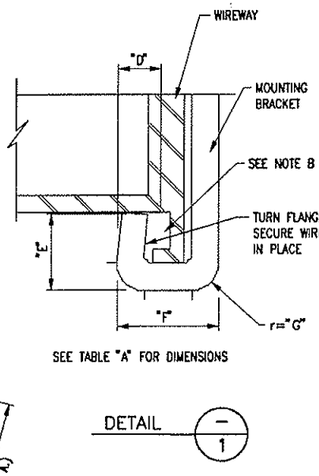




LUMINAIRE MOUNTING BRACKET LEFT HANDED



LUMINAIRE MOUNTING BRACKET RIGHT HANDED



SEE TABLE "A" FOR DIMENSIONS

DETAIL 1

Design File Name: p:\04102\carthyplot\ltdt02.plt
Plot File Name: P:\PLOT\PAPER\ltdt02.prf
Date of Plot: 8/2/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	02/26/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:	14102\700CADD\703elec\		
Drawing File Name:	ltdt02.dwg		
Acad Ver. R14	Scale: N.T.S.	Units:	English

Sheet Revisions		

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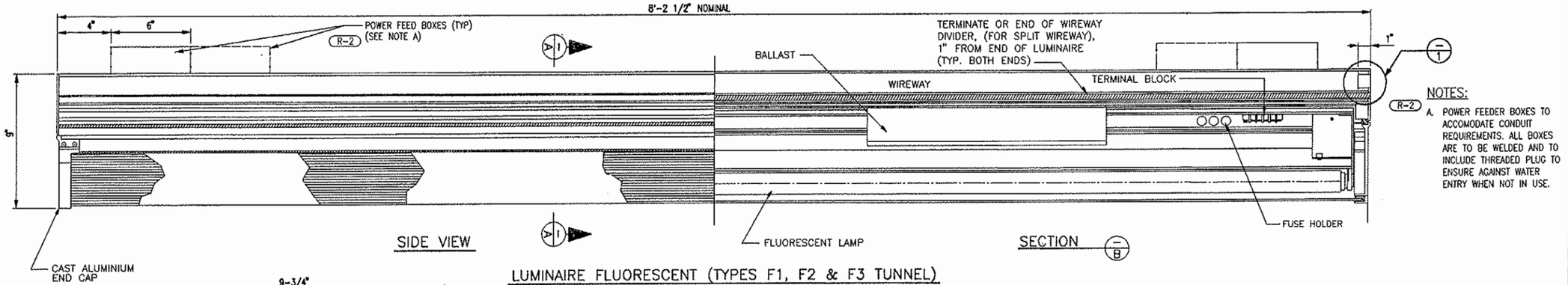
DUMONT, CO. 80436
Phone: 303-512-5750 FAX: 303-512-5775
Region 1 Mountain Residency W.W.G.

As Constructed
No Revisions: 1/10/03
Revised:
Void:

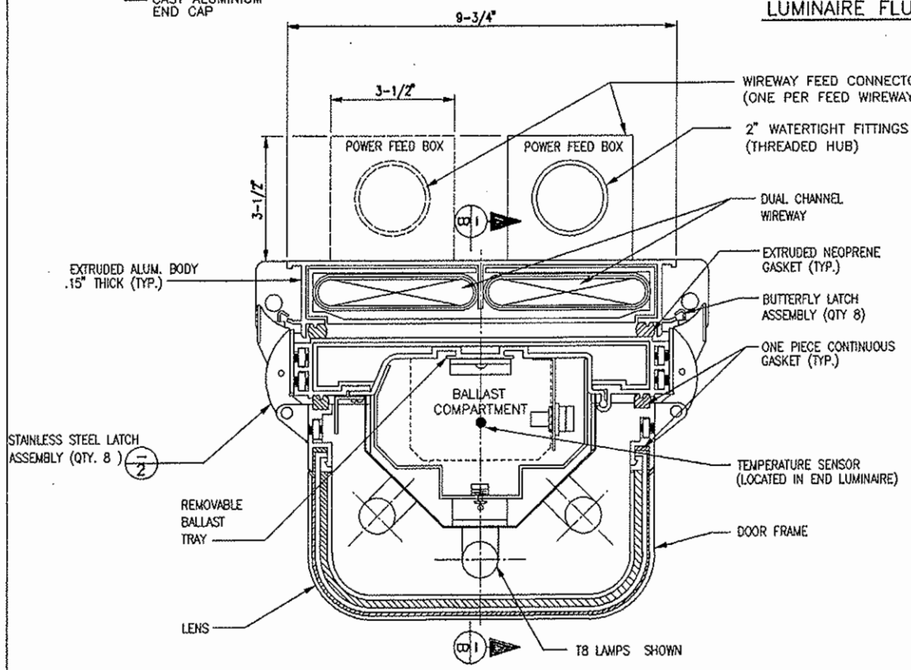
TUNNEL LIGHTING DETAILS

Designer:	J.W. / D.B.	Structure Numbers	
Detailer:	D. BURROUGHS		
Sheet Subset:	TLD	Subset Sheets:	8 of 11

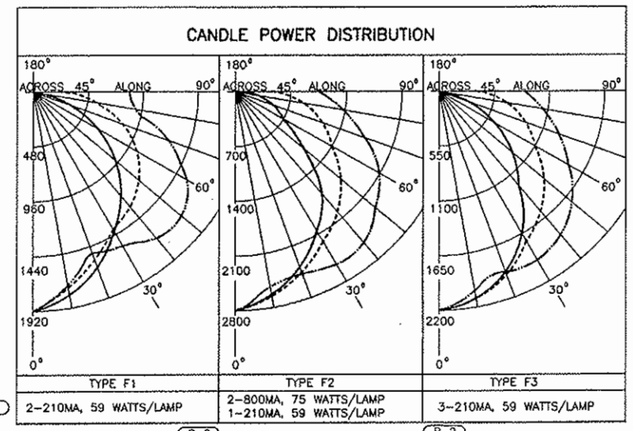
Project No./Code	
IM 0703-264	
12982	
Sheet Number	55



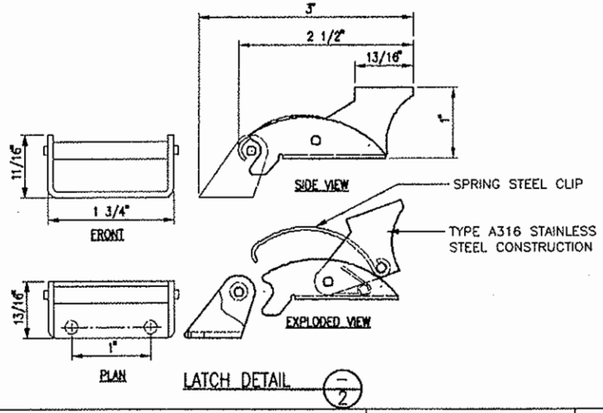
LUMINAIRE FLUORESCENT (TYPES F1, F2 & F3 TUNNEL)



LUMINAIRE FLUORESCENT (TYPES F1,F2 & F3 TUNNEL) — A

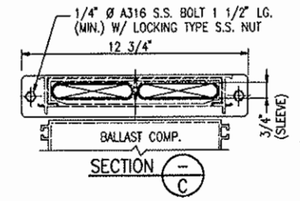


PHOTOMETRIC DATA

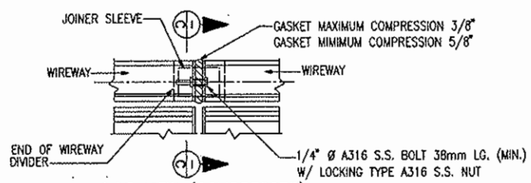


LATCH DETAIL — 2

PHOTOMETRIC KEY
- ACROSS
- ALONG
- 45°



SIDE VIEW (UNCOMPRESSED)



SIDE VIEW (COMPRESSED)

JOINER SLEEVE FOR WIREWAY — 1

Design File Name: p:\04102\cathyplot\ltdt05.plt
Plot File Name: P:\PLOT\PAPER\ltdt05.prf
Date of Plot: 8/1/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	02/26/99	Initials:	DJB
Last Modification Date:	01/04/2000	Initials:	DJB
Full Path:	14102\700CADD\703elec\		
Drawing File Name:	ltdt05.dwg		
Acad Ver. R14	Scale: NTS	Units: English	

Sheet Revisions			
R-2	01/06/2000	NOTE A & EDIT PHOTOMETRIC DATA	DJB

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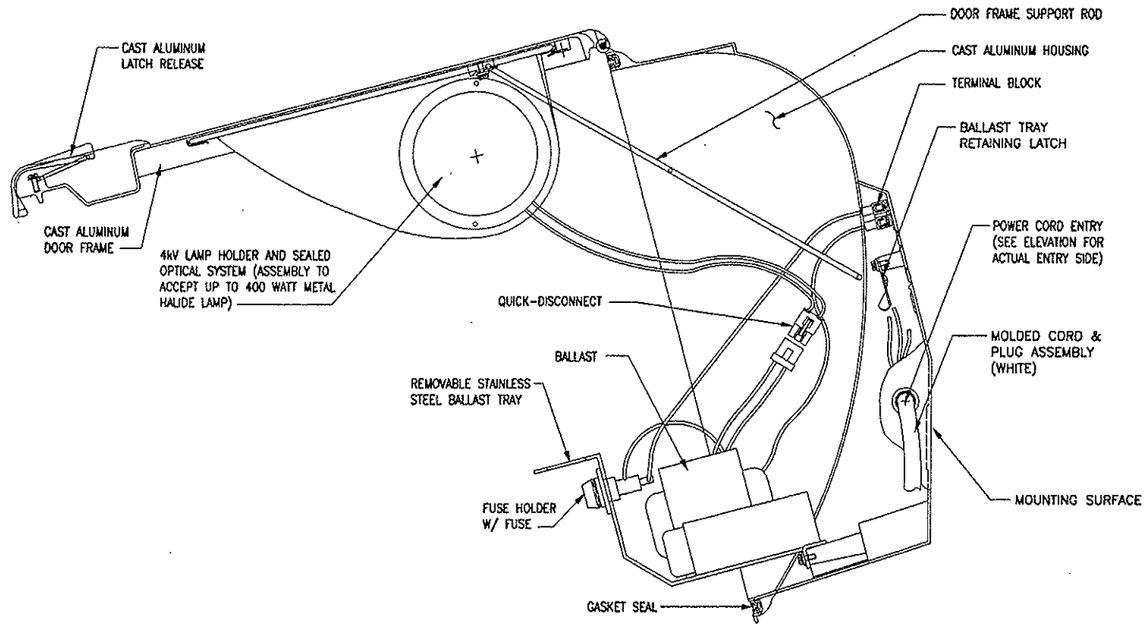
Region 1 Mountain Residency W.W.G.

As Constructed
No Revisions: 1/10/03
Revised:
Void:

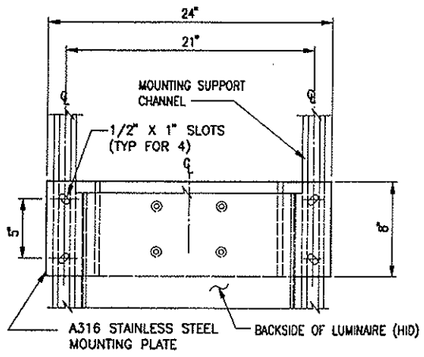
TUNNEL LIGHTING DETAILS

Designer: J. WEAVER
Detailer: D. BURROUGHS
Sheet Subset: TLD
Structure Numbers:
Subset Sheets: 9 of 11

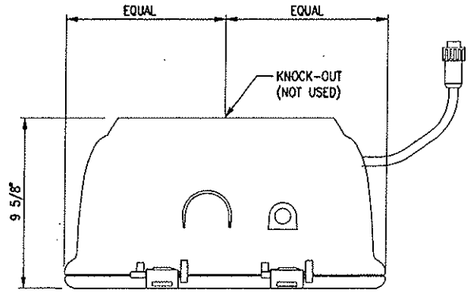
Project No./Code: IM 0703-264
12982
Sheet Number 56



LUMINAIRE (HID) (TYPES M1, M2 & M3 TUNNEL) (A)



LUMINAIRE (HID) MOUNTING PLATE DEAIL

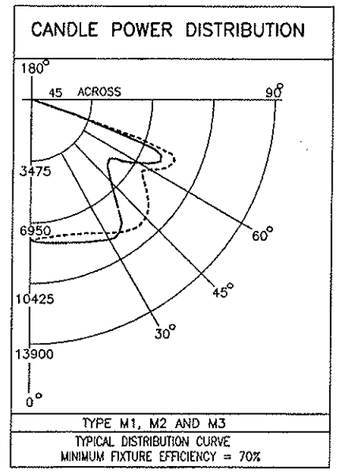


TOP VIEW

PHOTOMETRIC KEY

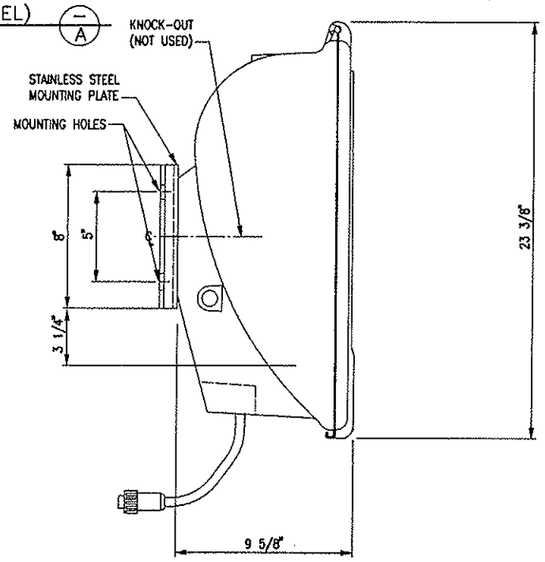
——— ACROSS

- - - - - - - - 45°

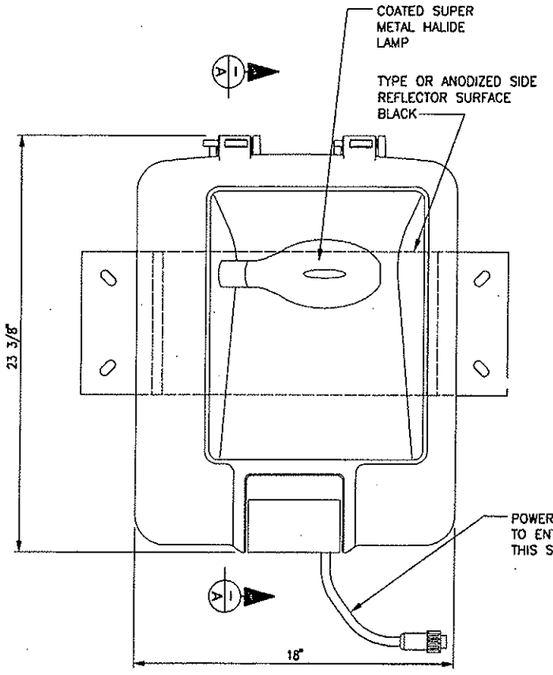


(R-2)

PHOTOMETRIC DATA



LEFT SIDE VIEW



FRONT VIEW

NOTE: THIS DRAWING IS PROVIDED FOR INFORMATION ONLY. LUMINAIRE (HID) (TYPES M1, M2, & M3 TUNNEL) ARE NOT IN THIS CONTRACT.

Design File Name: p:\01402\cathyplot\tldt06.plt
Plot File Name: P:\PLOT\PAPER\tldt06.prt
Date of Plot: 8/2/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	2/26/99	Initials:	DJB
Last Modification Date:	01/04/2000	Initials:	DJB
Full Path:	014102\700cadd\703elec\		
Drawing File Name:		tldt06.dwg	
Acad Ver. R14	Scale: NTS	Units:	ENGLISH

Sheet Revisions		
(R-2)	01/06/2000	EDIT PHOTOMETRIC DATA — DJB

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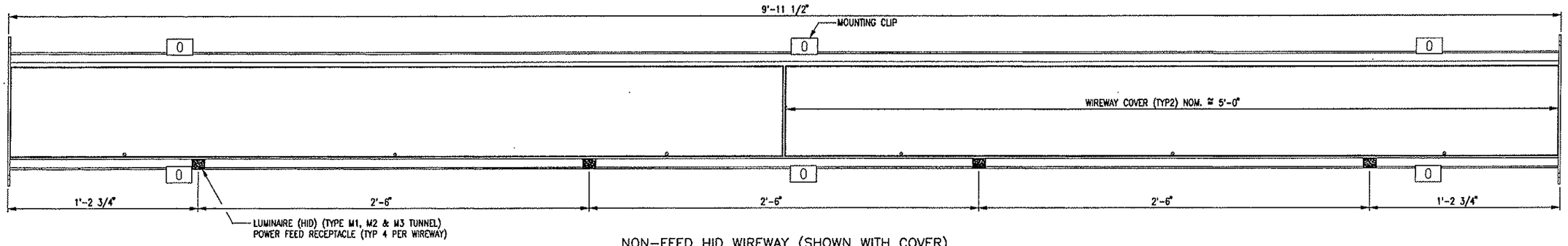
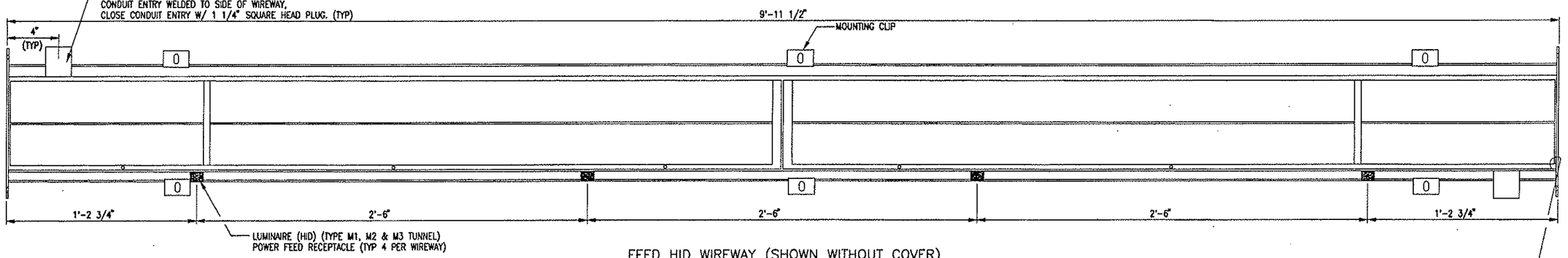
Phone: 303-512-5750 FAX: 303-512-5775
Region 1 Mountain Residency W.W.G.

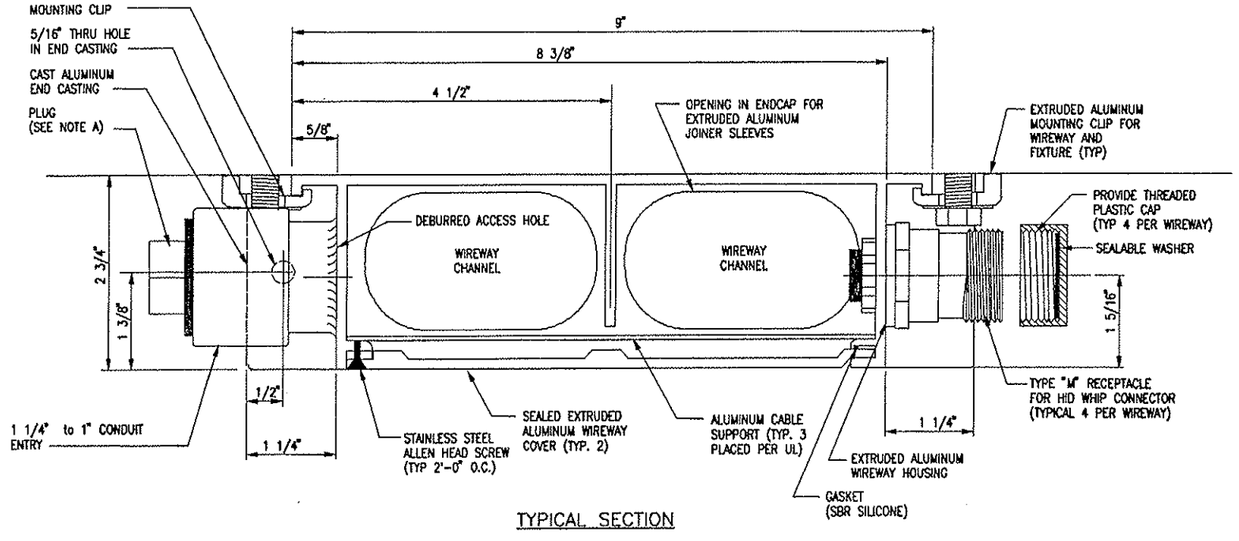
As Constructed	TUNNEL LIGHTING DETAILS		Project No./Code
No Revisions: 01/01/03			IM 0703-264
Revised:	Designer: J. WEAVER	Structure Numbers	12982
Void:	Detailer: D. BURROUGHS		
	Sheet Subset: TLD	Subset Sheets: 10 of 11	Sheet Number 57



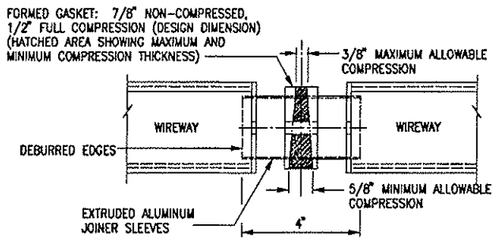
NON-FEED HID WIREWAY (SHOWN WITH COVER)



FEED HID WIREWAY (SHOWN WITHOUT COVER)



TYPICAL SECTION



SIDE VIEW

NOTE:

A. CONTRACTOR TO PROVIDE A PLUG TO CLOSE CONDUIT ENTRY WHEN NOT USED.

Design File Name: p:\0fi02\cathyplot\ttdt12.plt
Plot File Name: P:\PLOT\PAPER\ttdt12.prf
Date of Plot: 8/2/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	04/21/99	Initials:	DJB
Last Modification Date:	11/05/99	Initials:	DJB
Full Path:	014102\700cadd\703elec\		
Drawing File Name:	ttdt12.dwg		
Acad Ver. R14	Scale: NTS	Units: English	

Sheet Revisions		

Colorado Department of Transportation
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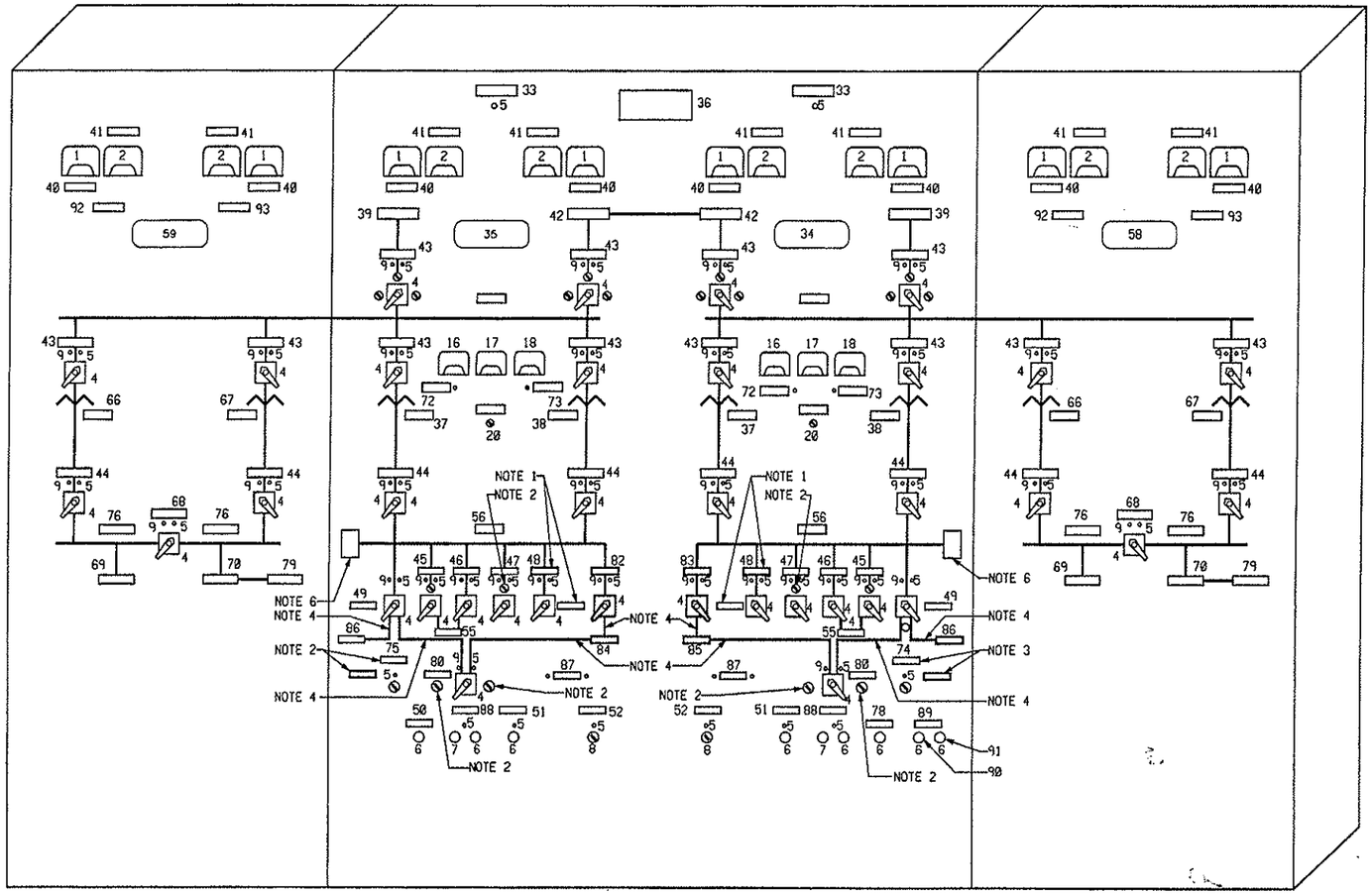
DUMONT, CO. 80436
Phone: 303-512-5750 FAX: 303-512-5775
Region 1 Mountain Residency W.W.G.

As Constructed
No Revisions: 01/10/03
Revised:
Void:

TUNNEL LIGHTING DETAILS

Designer: J. WEAVER		Structure Numbers	
Detailer: D. BURROUGHS			
Sheet Subset: TLD	Subset Sheets: 11 of 11		

Project No./Code
IM 0703-264
12982
Sheet Number 58



EQUIPMENT LIST

1. AMMETER TYPE 171-141-LSV3 0-3000 AMP.
2. VOLTMETER TYPE 171-031-SJSJ AC 0-600 VOLTS.
3. SWITCH TYPE SB1, 2 STAGE WITH KIRK KEYLOCK, 55-185285P3, ON-OFF.
4. SWITCH TYPE SB1, 2 STAGE 55-185285P6, ON-OFF.
5. INDICATING LIGHTS, TYPE ET 16, RED, 125 V.D.C.
6. CR2940UA202B PUSH BUTTON.
7. CR2940UA202C PUSH BUTTON.
8. CR2940UB202A SELECTOR SWITCH.
9. INDICATING LIGHT, TYPE ET-16 GREEN 125 V.D.C.
10. 0-5 MILLIAMMETER, TYPE 171-FXFX WITH 0-3000 AMP SCALE.
11. 0-5 MILLIAMMETER, TYPE 171-FXFX WITH 0-600 VOLT SCALE.
12. TERMINAL BOARD, (NOT SHOWN) CR151B26.
13. TRANSFORMER #1.
14. TRANSFORMER #2.
15. SWITCH, TYPE SB1, WITH KIRK KEYLOCK, 55-188285P4.
16. AMMETER.
17. FREQUENCY METER.
18. VOLTMETER.
19. APPROACH LOW OIL PRESSURE LIGHT.
20. GOVERNOR CONTROL.
21. APPROACH HIGH WATER TEMPERATURE.
22. AMMETER, AC 0-800AMP.
23. VOLTMETER, AC 0-3000 VOLT.
24. 0-5 MILLIAMMETER WITH 0-800 AMP SCALE.
25. 0-5 MILLIAMMETER WITH 0-3000 VOLT SCALE.
26. 0-5 MILLIAMMETER WITH 0-1000 AMP SCALE.
27. 0-5 MILLIAMMETER WITH 55-65 HERTZ SCALE.
28. 0-5 MILLIAMMETER WITH 0-600 VAC SCALE.
29. INDICATING LIGHT, RED 125 V.D.C.
30. PUSHBUTTON RESET.
31. SELECTOR SWITCH, SPRING RETURN TO CENTER FROM LEFT & RIGHT POSITIONS, FAST-OFF-SLOW.
32. SELECTOR SWITCH, START-STOP.

NAMEPLATE SCHEDULE

	FIRST LINE	SECOND LINE	THIRD LINE	DETAIL
	33. POWER	ON		2
	34. EAST	BUILDING		1
	35. WEST	BUILDING		1
	36. POWER	CONTROL	BOARD	3
	37. TRANSFORMER	NO. 2	SECONDARY	2
	38. TRANSFORMER	NO. 1	SECONDARY	2
	39. PUBLIC SERVICE	INCOMING	LINE	2
	40. AMMETER			2
	41. VOLTMETER			2
	42. 24.9 K.V.	EMERGENCY	TIE	2
	43. LOAD	BREAK	SWITCH	2
	44. AIR	CIRCUIT	BREAKER	2
	45. MCC #1	FEEDER	BREAKER	2
	46. MCC #2	FEEDER	BREAKER	2
	47. MCC #3	FEEDER	BREAKER A	2
	48. MCC #3	FEEDER	BREAKER B	2
	49. EMERGENCY	GENERATOR	BREAKER	2
	50. TUNNEL & BUILDING	NORMAL LIGHTS	RESET	2
	51. BUILDING	POWER PANELS	RESET	2
	52. SEDIMENTATION	TANKS	VENT. FAN	2
	53. TUNNEL & BUILDING	NORMAL LIGHTS	RESET	2
	54. EMERGENCY	GENERATOR	CONTROL	2
	55. 460 VOLT	TIE BREAKER		2
	56. 460 VOLT	BUS		2
	57. 24.9 K.V.	BUS		2
	58. EAST	BUILDING	SOUTH TUNNEL	1
	59. WEST	BUILDING	NORTH TUNNEL	1
	60. TRANSFORMER	NO. 1A	SECONDARY	2
	61. TRANSFORMER	NO. 1B	SECONDARY	2
	62. AMMETER			2
	63. VOLTMETER			2
	64. LOAD	BREAK	SWITCH	2
	65. AIR	CIRCUIT	BREAKER	2
	66. TRANSFORMER	NO. 1A		2
	67. TRANSFORMER	NO. 1B		2
	68. 2400 VOLT	TIE	BREAKER	2
	69. MCC1A	EXHAUST		2
	70. MCC1B	SUPPLY		2
	71. EMERGENCY	GENERATOR	BREAKER	2
	72. APPROACHING	LOW OIL	PRESS	2
	73. APPROACHING	HIGH WATER	TEMP	2
	74. EMERGENCY	GENERATOR	GOVERNOR CONTROL	2
	75. EMERGENCY	GENERATOR	CONTROL	2
	76. 2400 VOLT	BUS		2
	77. WEST VENT BUILDING	EMERGENCY GENERATOR		2
	78. NORTH TUNNEL	BLDG. & LIGHTS	NORMAL RESET	2
	79. SOUTH TUNNEL	LIGHTS		2
	80. EAST	PEAK SHAVING		3
	81. WEST	PEAK SHAVING		3
	82. AUTOMATIC	TRANSFER	SWITCH	2
	83. AUTOMATIC	TRANSFER	SWITCH	2
NOTE 5	84. TRANSFER	SWITCH	ATS-WV	4
	85. TRANSFER	SWITCH	ATS-EV	2
	86. EMERGENCY	GENERATOR		2
	87. EAST D.C.	UNDERVOLTAGE		2
	88. TUNNEL & BLDG.	D.C. LIGHTS	CONTROL ON	2
	89. NORTH TUNNEL	BROWNOUT	ENGAGE ONE ONLY	2
	90. SOUTH (PUSHBUTTON)			
	91. NORTH (PUSHBUTTON)			
	92. EXHAUST			
	93. SUPPLY			

NOTES

1. REMOVE NAMEPLATE FOR 'MCC 3B FEEDER BREAKER' AND RELOCATE ABOVE ASSOCIATED TYPE SB1 CONTROL SWITCH.
2. REMOVE THE KIRKKEY INTERLOCK SWITCHES INDICATED. INSTALL NEW CONTROL WIRING TO BYPASS THE PREVIOUS INTERLOCK FUNCTION OF THESE SWITCHES WHILE MAINTAINING ALL OTHER CONTROL FUNCTIONALITY. FURNISH AND INSTALL BLANKING PLATES IN PLACE OF REMOVED SWITCHES. PAINT PLUGS TO MATCH POWER CONTROL BOARD FINISH USING EPOXY ENAMEL PAINT.
3. REMOVE NAMEPLATE FOR 'EMERGENCY GENERATOR CONTROL' AND RELOCATE TO THE RIGHT SIDE OF THE ASSOCIATED RED INDICATING LIGHT.
4. ADD NEW MIMIC BUS LINE-WORK TO GRAPHIC FOR POWER CONTROL BOARD USING 3/8"W X 1/16"D GREEN LAMINATED PLASTIC TO MATCH EXISTING.
5. ADD NEW NAMEPLATES 82 THROUGH 86 PER NAMEPLATE SCHEDULE.
6. NAMEPLATE FOR '600 HP FAN MOTOR FEEDER BREAKERS'.

EXISTING POWER CONTROL BOARD AND MIMIC BUS
N.T.S.

Design File Name: DGNSPEC
Plot File Name: #PLOTFILE#
Date of Plot: #$$DATE$$$$

COMPUTER FILE INFORMATION			
CREATION DATE:	04/19/99	INITIALS:	SFD
LAST MODIFICATION DATE:	11/05/99	INITIALS:	DMO
FULL PATH:	14102\700CADD\703ELECT\		
DRAWING FILE NAME:	epdt05.dwg		
ACAD VER. R14	SCALE: None	UNITS:	

SHEET REVISIONS		

COLORADO DEPARTMENT OF TRANSPORTATION
DOT DEPARTMENT OF TRANSPORTATION
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REGION 1 MOUNTAIN RESIDENCY W. W. G.

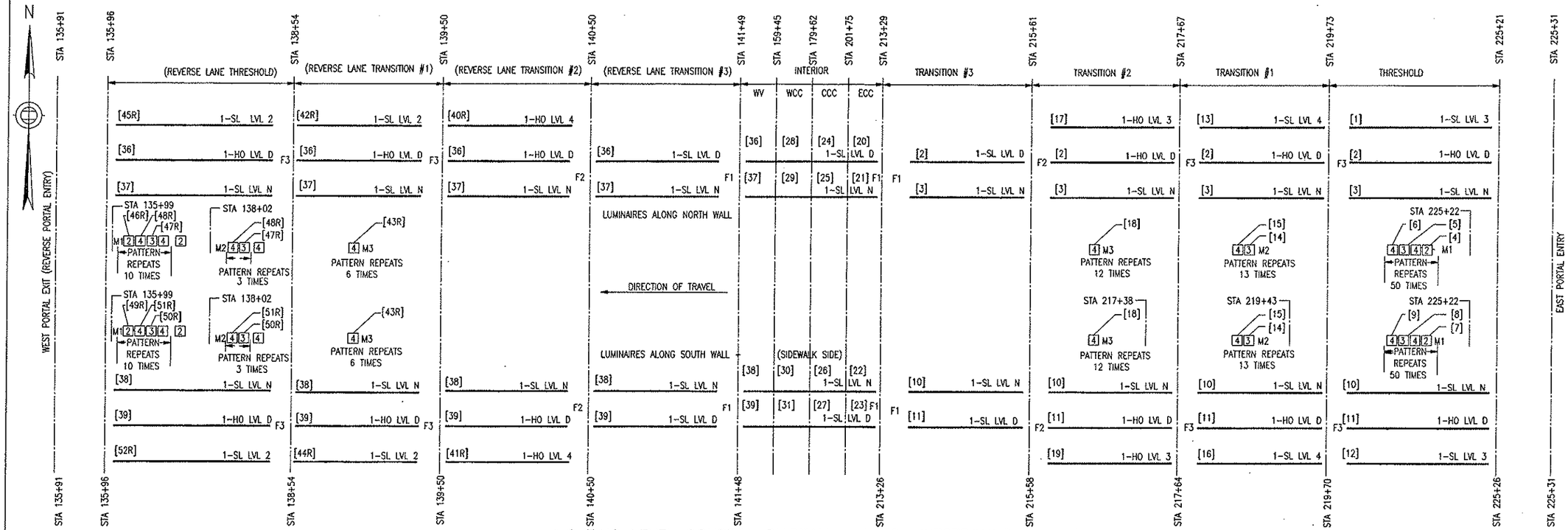
AS CONSTRUCTED
NO REVISIONS: 01/10/03
REVISED:
VOID:

POWER CONTROL BOARD LAYOUT AND DETAILS

DESIGNER: A. HARLICK
DETAILER: S. DZUIBA
STRUCTURE NUMBERS:
SHEET SUBSET: VB ELECT
SUBSET SHEETS: 18 OF 37

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 105

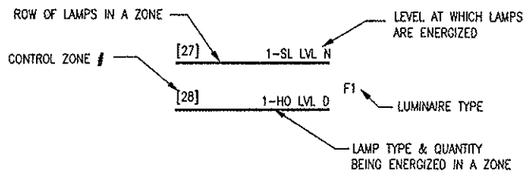
014102\710STDS\BORDERIN.DGN



LIGHTING LEVEL CONTROL DIAGRAM – I-70 WESTBOUND

SENSOR SETTINGS (cd/m²) (I-70 E BD)			
LEVEL	ON INCREASING DAYLIGHT	OFF DECREASING DAYLIGHT	%
4	4000	3800	100
3	800	700	40
2	200	180	22
D	50	35	5
NIGHT	0 TO 50		4

LEGEND



TUNNEL LIGHTING SWITCHING TABLE

CONTROL ZONE / NOTE	LEVEL 4	LEVEL 3	LEVEL 2	LEVEL D	LEVEL N
1	ON	ON	OFF	OFF	OFF
2/A	ON	ON	ON	ON	OFF
3/A	ON	ON	ON	ON	ON
4	ON	ON	ON	OFF	OFF
5	ON	ON	OFF	OFF	OFF
6	ON	OFF	OFF	OFF	OFF
7	ON	ON	ON	OFF	OFF
8	ON	ON	OFF	OFF	OFF
9	ON	OFF	OFF	OFF	OFF
10/A	ON	ON	ON	ON	ON
11/A	ON	ON	ON	ON	OFF
12	ON	ON	OFF	OFF	OFF
13	ON	OFF	OFF	OFF	OFF
14	ON	ON	OFF	OFF	OFF
15	ON	OFF	OFF	OFF	OFF
16	ON	OFF	OFF	OFF	OFF
17	ON	ON	OFF	OFF	OFF
18	ON	OFF	OFF	OFF	OFF
19	ON	ON	OFF	OFF	OFF
20/A	ON	ON	ON	ON	OFF
21/A	ON	ON	ON	ON	ON
22/A	ON	ON	ON	ON	ON
23/A	ON	ON	ON	ON	OFF
24/A	ON	ON	ON	ON	OFF
25/A	ON	ON	ON	ON	ON
26/A	ON	ON	ON	ON	ON
27/A	ON	ON	ON	ON	OFF
28/A	ON	ON	ON	ON	OFF
29/A	ON	ON	ON	ON	ON
30/A	ON	ON	ON	ON	ON
31/A	ON	ON	ON	ON	OFF
32/E	–	–	–	–	–
33/E	–	–	–	–	–
34/E	–	–	–	–	–
35/E	–	–	–	–	–
36/A	ON	ON	ON	ON	OFF
37/A	ON	ON	ON	ON	ON
38/A	ON	ON	ON	ON	ON
39/A	ON	ON	ON	ON	OFF
40/C	ON	OFF	OFF	OFF	OFF
41/C	ON	OFF	OFF	OFF	OFF
42/C	ON	ON	ON	OFF	OFF
43/C	ON	OFF	OFF	OFF	OFF
44/C	ON	ON	ON	OFF	OFF
45/C	ON	ON	ON	OFF	OFF
46/C	ON	ON	ON	OFF	OFF
47/C	ON	ON	OFF	OFF	OFF
48/C	ON	OFF	OFF	OFF	OFF
49/C	ON	ON	ON	OFF	OFF
50/C	ON	ON	OFF	OFF	OFF
51/C	ON	OFF	OFF	OFF	OFF
52/C	ON	ON	ON	OFF	OFF

A. CONTROL ZONES WITH AN "A" DESIGNATION WILL BE ALTERNATELY ENERGIZED AT NIGHT.
B. ALL LUMINAIRES WITH THE SAME SWITCH LEVEL DESIGNATION AS SHOWN ON THE DRAWING ARE ENERGIZED TOGETHER AS A PART OF A SINGLE ZONE.
C. CONTROL ZONES WITH AN "C" DESIGNATION ARE ENERGIZED DURING REVERSE LANE OPERATION ONLY.
D. INTERIOR ZONE POWER IS SERVED FROM 4 SEPARATE ELECRICAL ROOM LOCATIONS.
E. CONTROL ZONES WITH AN "E" DESIGNATION ARE NOT USED.

NOTE: DETAIL SHOWN FOR INFORMATION ONLY

Design File Name: p:\01402\cathyplot\ltsd01.plt
Plot File Name: P:\PLOT\PAPER\ltsd01.prf
Date of Plot: 8/2/2000 (Using STANDARD.TBL)

Computer File Information			
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Last Modification Date:	11/05/99	Initials:	DJB
Full Path:	14102\700CADD\703elec\		
Drawing File Name:	ltsd01.dwg		
Acad Ver. R14	Scale: NTS	Units: English	

Sheet Revisions		

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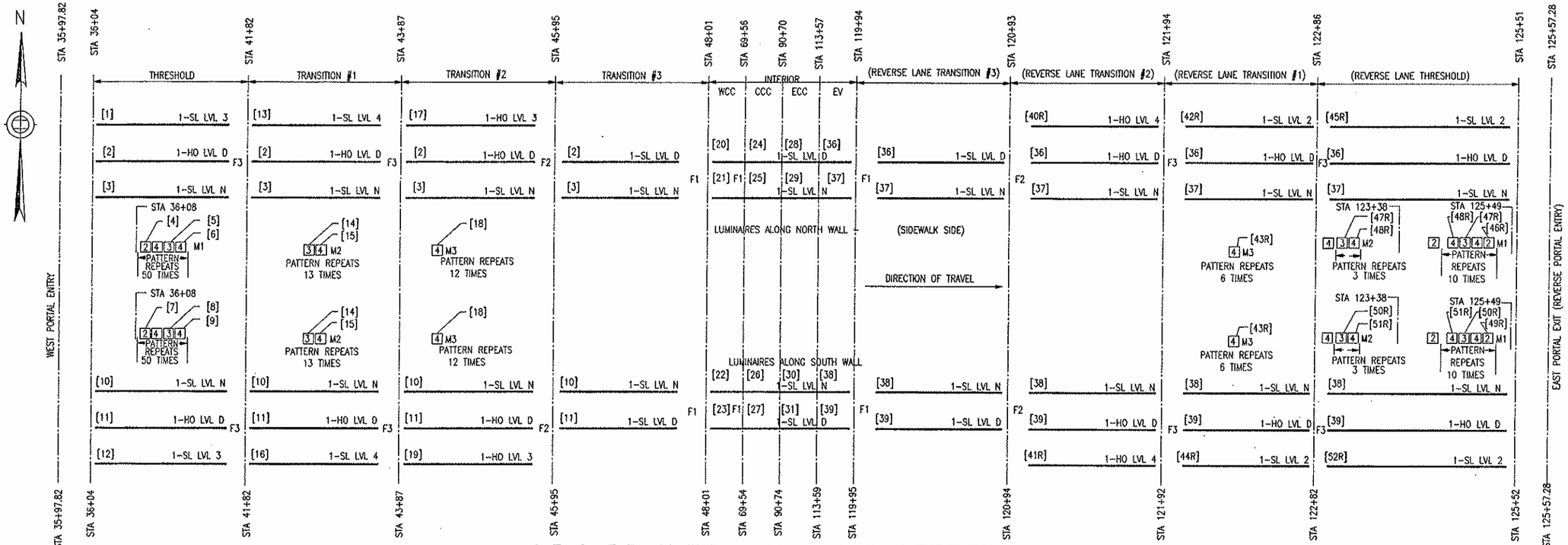
Region 1 Mountain Residency W.W.G.

As Constructed	
No Revisions: 01/10/03	
Revised:	
Void:	

NORTH TUNNEL LIGHTING CONTROL DIAGRAM

Designer:	J. WEAVER	Structure Numbers	
Detailer:	D. BURROUGHS		
Sheet Subset:	V8 ELECT	Subset Sheets:	19 of 37

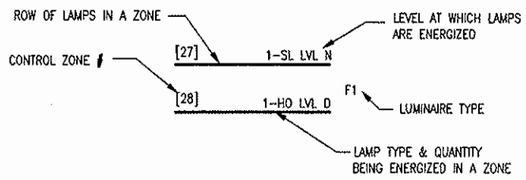
Project No./Code	
IM 0703-264	
12982	
Sheet Number	106



LIGHTING LEVEL CONTROL DIAGRAM — I-70 EASTBOUND

SENSOR SETTINGS (cd/m^2) (I-70 E BD)			
LEVEL	ON INCREASING DAYLIGHT	OFF DECREASING DAYLIGHT	%
4	4000	3800	100
3	800	700	40
2	200	180	22
D	50	35	5
NIGHT	0 TO 50		4

LEGEND



TUNNEL LIGHTING SWITCHING TABLE

CONTROL ZONE / NOTE	LEVEL 4	LEVEL 3	LEVEL 2	LEVEL D	LEVEL N
1	ON	ON	OFF	OFF	OFF
2/A	ON	ON	ON	ON	OFF
3/A	ON	ON	ON	ON	ON
4	ON	ON	ON	OFF	OFF
5	ON	ON	OFF	OFF	OFF
6	ON	OFF	OFF	OFF	OFF
7	ON	ON	ON	OFF	OFF
8	ON	ON	OFF	OFF	OFF
9	ON	OFF	OFF	OFF	OFF
10/A	ON	ON	ON	ON	ON
11/A	ON	ON	ON	ON	OFF
12	ON	ON	OFF	OFF	OFF
13	ON	OFF	OFF	OFF	OFF
14	ON	ON	OFF	OFF	OFF
15	ON	OFF	OFF	OFF	OFF
16	ON	OFF	OFF	OFF	OFF
17	ON	ON	OFF	OFF	OFF
18	ON	OFF	OFF	OFF	OFF
19	ON	ON	OFF	OFF	OFF
20/A	ON	ON	ON	ON	OFF
21/A	ON	ON	ON	ON	ON
22/A	ON	ON	ON	ON	ON
23/A	ON	ON	ON	ON	OFF
24/A	ON	ON	ON	ON	OFF
25/A	ON	ON	ON	ON	ON
26/A	ON	ON	ON	ON	ON
27/A	ON	ON	ON	ON	OFF
28/A	ON	ON	ON	ON	OFF
29/A	ON	ON	ON	ON	ON
30/A	ON	ON	ON	ON	ON
31/A	ON	ON	ON	ON	OFF
32/E	--	--	--	--	--
33/E	--	--	--	--	--
34/E	--	--	--	--	--
35/E	--	--	--	--	--
36/A	ON	ON	ON	ON	OFF
37/A	ON	ON	ON	ON	ON
38/A	ON	ON	ON	ON	ON
39/A	ON	ON	ON	ON	OFF
40/C	ON	OFF	OFF	OFF	OFF
41/C	ON	OFF	OFF	OFF	OFF
42/C	ON	ON	ON	OFF	OFF
43/C	ON	OFF	OFF	OFF	OFF
44/C	ON	ON	ON	OFF	OFF
45/C	ON	ON	ON	OFF	OFF
46/C	ON	ON	ON	OFF	OFF
47/C	ON	ON	OFF	OFF	OFF
48/C	ON	OFF	OFF	OFF	OFF
49/C	ON	ON	ON	OFF	OFF
50/C	ON	ON	OFF	OFF	OFF
51/C	ON	OFF	OFF	OFF	OFF
52/C	ON	ON	ON	OFF	OFF

A. CONTROL ZONES WITH AN "A" DESIGNATION WILL BE ALTERNATELY ENERGIZED AT NIGHT.
B. ALL LUMINAIRES WITH THE SAME SWITCH LEVEL DESIGNATION AS SHOWN ON THE DRAWING ARE ENERGIZED TOGETHER AS A PART OF A SINGLE ZONE.
C. CONTROL ZONES WITH AN "R" DESIGNATION ARE ENERGIZED DURING REVERSE LANE OPERATION ONLY.
D. INTERIOR ZONE POWER IS SERVED FROM 4 SEPARATE ELECRICAL ROOM LOCATIONS.
E. CONTROL ZONES WITH AN "E" DESIGNATION ARE NOT USED.

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Plot File Name: P:\PLOT\PAPER\itsd02.prf
Date of Plot: 8/2/2000 (using STANDARD.TBL)

Computer File Information			
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Last Modification Date:	11/05/99	Initials:	DJB
Full Path:	14102\700CADD\703elec\		
Drawing File Name:	itsd02.dwg		
Acad Ver. R14	Scale: NTS	Units: English	

Sheet Revisions		

Colorado Department of Transportation
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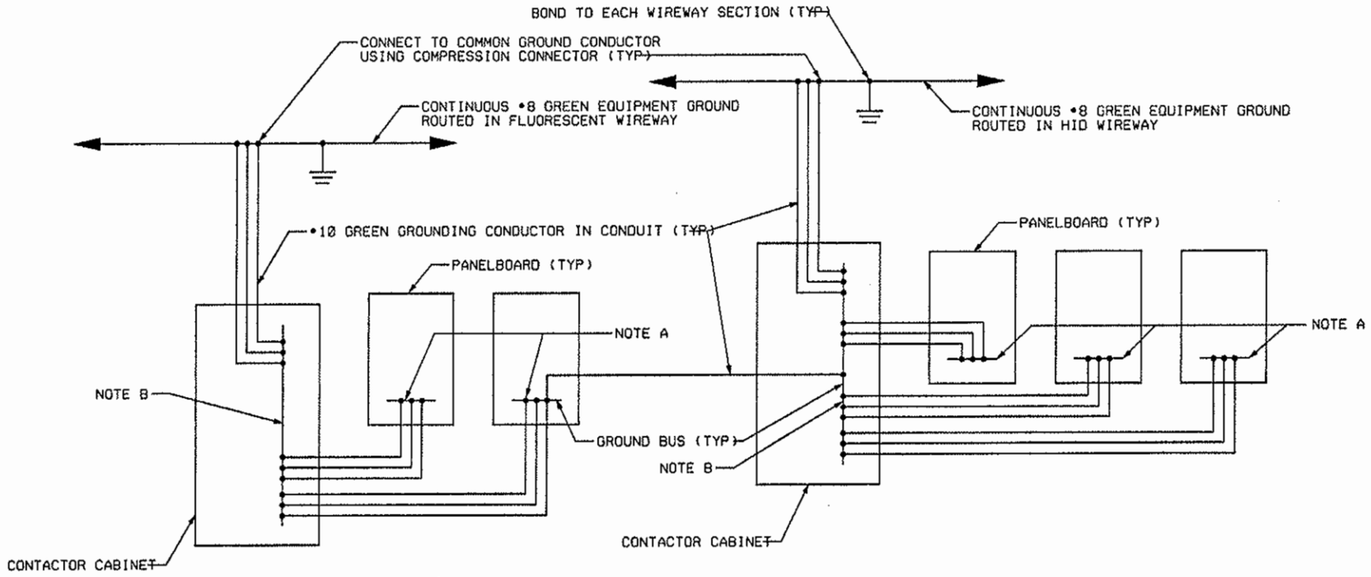
Region 1 Mountain Residency W.W.G.

As Constructed	
No Revisions: 01/10/03	
Revised:	
Void:	

SOUTH TUNNEL LIGHTING CONTROL DIAGRAM

Designer:	J. WEAVER	Structure Numbers	
Detailer:	D. BURROUGHS		
Sheet Subset:	VB ELECT	Subset Sheets:	20 of 37

Project No./Code	
IM 0703-264	
12982	
Sheet Number	107



SOUTH TUNNEL LIGHTING GROUNDING SYSTEM DIAGRAM

NOTES:

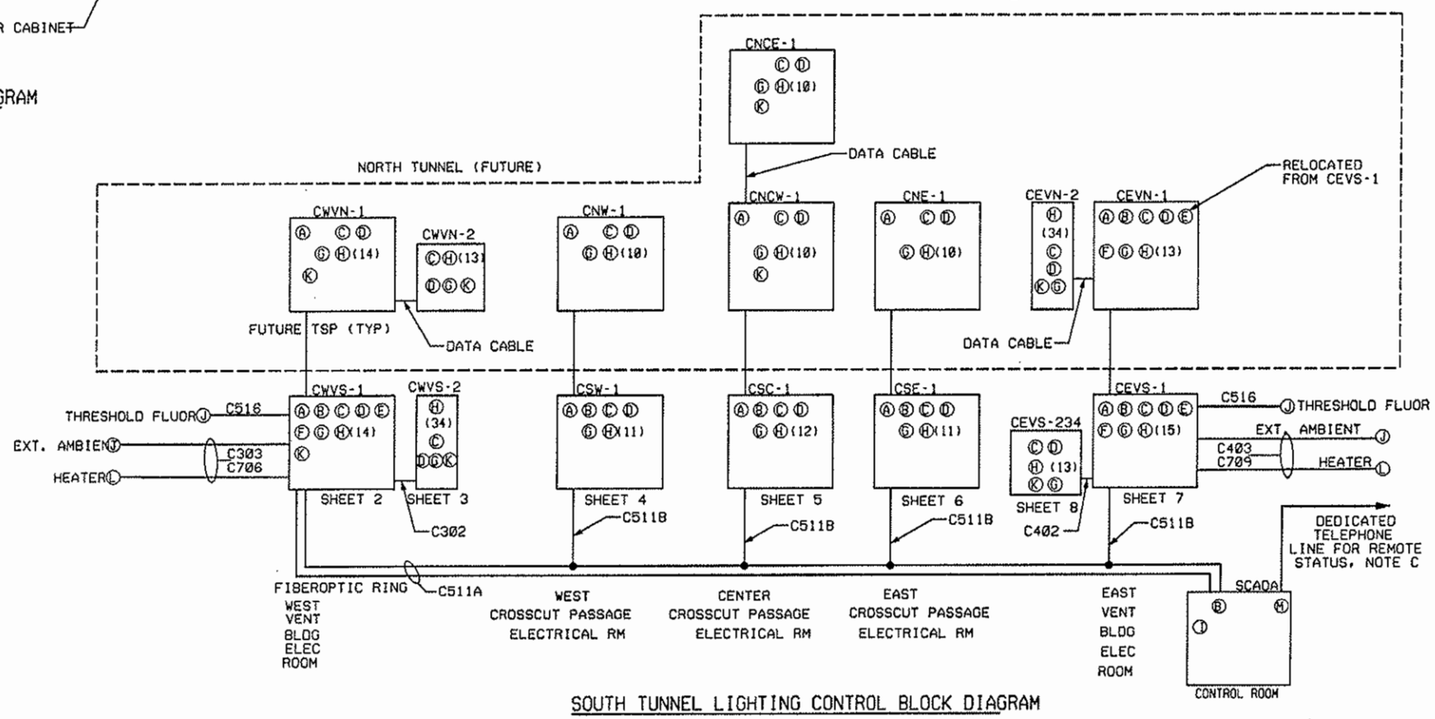
A. NEUTRAL BUS (EACH PANELBOARD) SHALL NOT BE BONDED TO THE GROUND BUS OF THE PANELBOARD. CONNECTION SHALL BE MADE ONLY AT THE SOURCE. FOR A SEPERATELY DERIVED SYSTEM ('STEP DOWN' TRANSFORMER) IT SHALL BE BONDED WITH THE TRANSFORMER NEUTRAL GROUNDING PAD OR LUG.

B. GROUNDING FOR ELECTRONIC, DATA LOGGING, TRANSMITTERS/RECEIVERS AND OTHER ELECTRONIC DEVICES SHALL BE SEPERATE FROM THE ELECTRICAL (A/C) SYSTEM GROUND. BONDING OF THESE SYSTEMS 'GROUND' SHALL BE MADE AT THE SOURCE ONLY.

C. INSTALL A DEDICATED TELEPHONE LINE TO THE NEAREST TELEPHONE BACKBOARD. THE CIRCUIT SHALL CONSIST OF TWO PAIRS #22 AWG (MINIMUM) PVC INSULATED AND IN AN OVERALL PVC JACKET ROUTED IN 3/4 INCH CONDUIT.

LEGEND

- Ⓐ - SERIAL COMM.
- Ⓑ - F.O. COMM.
- Ⓒ - HOA SELECTOR SWITCHES
- Ⓓ - PILOT LIGHT (LED HOA)
- Ⓔ - OPERATOR TERMINAL
- Ⓕ - ANALOG I/O
- Ⓖ - DIGITAL I/O
- Ⓗ - LIGHTING CONTACTORS (QTY)
- Ⓘ - PC WORKSTATION (BY ITS)
- Ⓙ - TEMPERATURE SENSOR
- Ⓚ - RACK COMMUNICATION MODULE
- Ⓛ - LUMINANCE SENSOR
- Ⓜ - MODEM



SOUTH TUNNEL LIGHTING CONTROL BLOCK DIAGRAM

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Plot File Name: $PLOTFILE*
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION		
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LAST MODIFICATION DATE: 11/05/99	INITIALS: SFO	
FULL PATH: 14102\700CADD\703ELECT\		
DRAWING FILE NAME: ltdt24.dwg		
ACAD VER. R14 SCALE: NONE	UNITS:	

SHEET REVISIONS			

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REGION 1 MOUNTAIN RESIDENCY W. W. G.

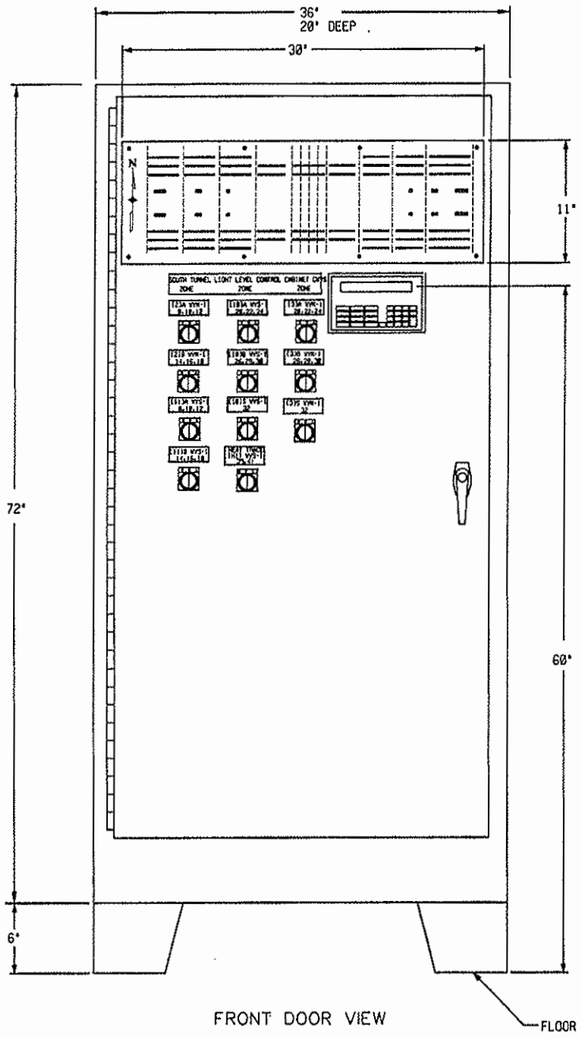
AS CONSTRUCTED	
NO REVISIONS: 01/10/03	
REVISED:	
VOID:	

SOUTH TUNNEL LIGHTING CONTROL DETAILS SHEET

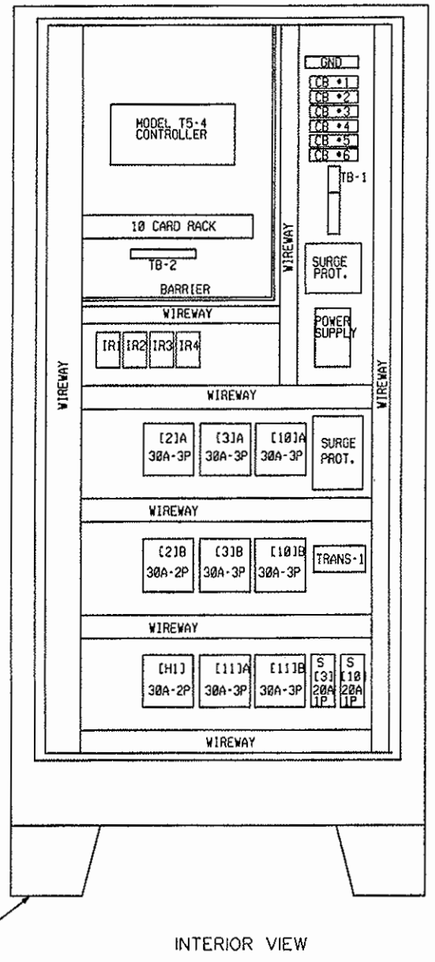
DESIGNER: A. HARLICK	STRUCTURE NUMBERS		
DETAILER: S. OZUIBA			
SHEET SUBSET: V8 ELECT	SUBSET SHEETS: 21 OF 37		

PROJECT NO./CODE
1 IM 0703-264
12982
SHEET NUMBER 108

014102\710STDS\BORDERIN.DGN



FRONT DOOR VIEW

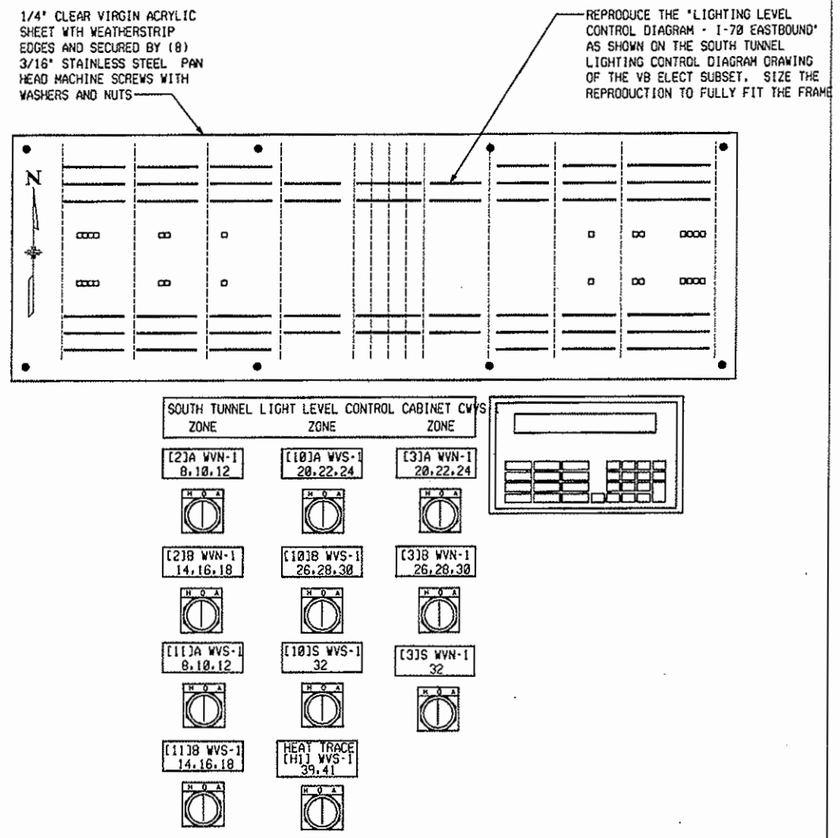


INTERIOR VIEW

FLOOR STAND

LIGHTING CONTROL AND CONTACTOR CABINET CWVS-1

PANEL ASSEMBLY IN WEST VENT. BLDG.



ENLARGED VIEW OF

FRONT DOOR SWITCHES FOR CABINET CWVS-1

Design File Name: DGNSPEC
Plot File Name: $PLOTFILE$
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION			
CREATION DATE:	04/19/99	INITIALS: SFD	
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FULL PATH:	14102\700CADD\703ELECT\		
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SHEET REVISIONS		

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DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W. W. G.

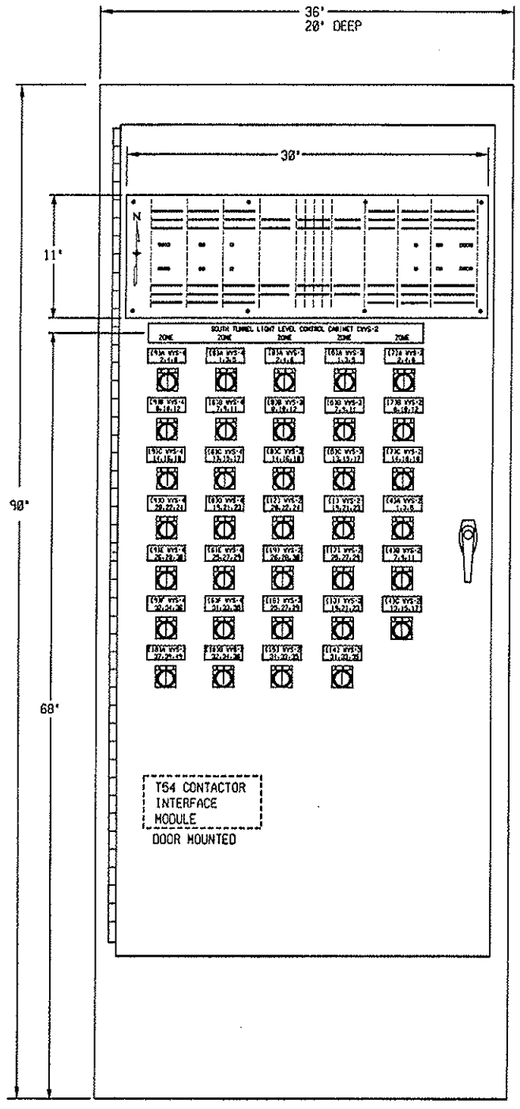
AS CONSTRUCTED	
NO REVISIONS: 01/10/03	
REVISED:	
VOID:	

SOUTH TUNNEL LIGHTING CONTROL DETAILS SHEET 2

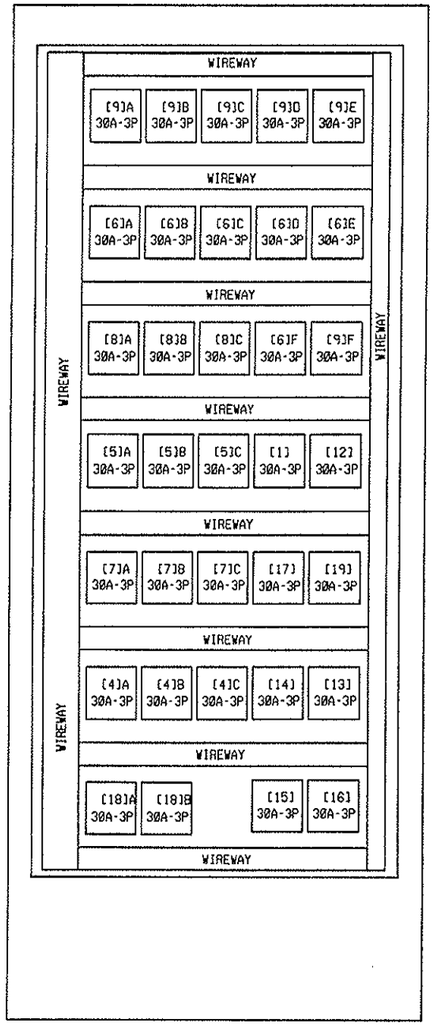
DESIGNER:	A. HARLICK	STRUCTURE NUMBERS	
DETAILER:	S. DZUIBA		
SHEET SUBSET:	V8 ELECT	SUBSET SHEETS:	22 OF 37

PROJECT NO./CODE	
IM 0703-264	
12982	
SHEET NUMBER	109

014102\710STDS\BORDERIN.DGN

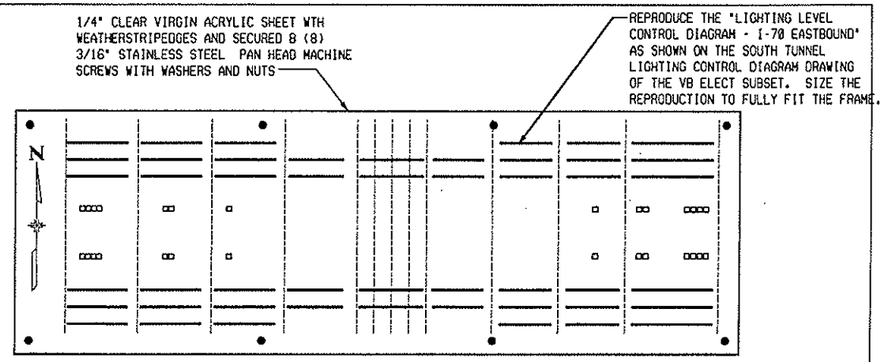


FRONT DOOR VIEW



INTERIOR VIEW

LIGHTING CONTROL AND CONTACTOR CABINET CWVS-2
PANEL ASSEMBLY IN WEST VENT. BLDG.



ENLARGED VIEW OF
FRONT DOOR SWITCHES FOR CABINET CWVS-2

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Plot File Name: $PLOTFILE
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION			
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SHEET REVISIONS		

COLORADO DEPARTMENT OF TRANSPORTATION
DOT
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P.O. BOX 399
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PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W. W. G.

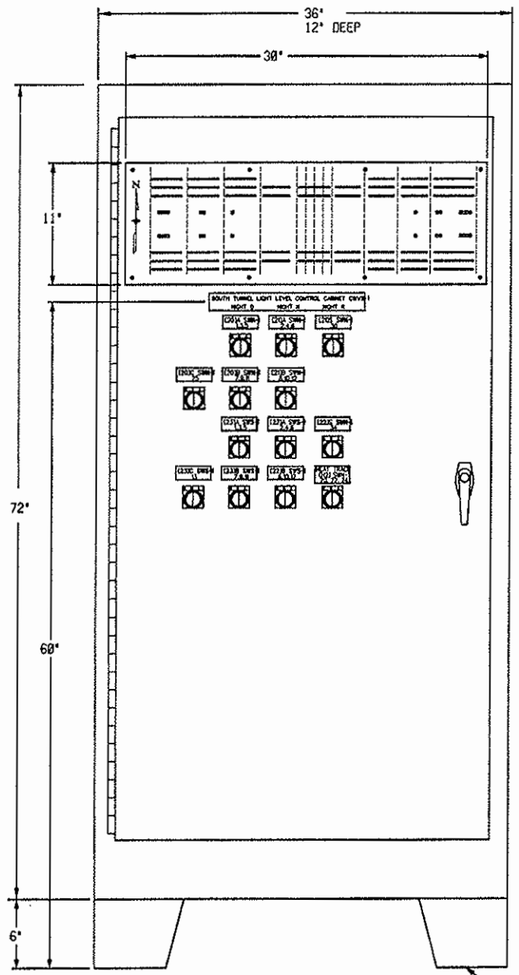
AS CONSTRUCTED	
NO REVISIONS: 01/10/03	
REVISED:	
VOID:	

SOUTH TUNNEL LIGHTING CONTROL DETAILS SHEET 3

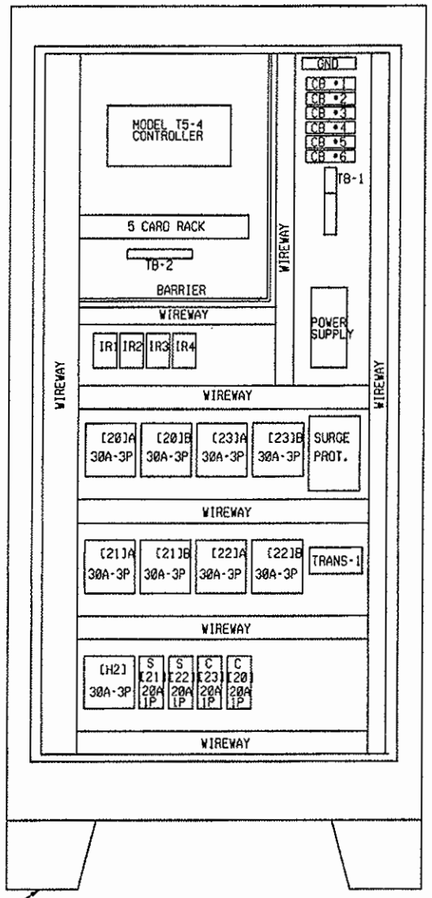
DESIGNER:	A. HARLICK	STRUCTURE NUMBERS	
DETAILER:	S. DZUIBA		
SHEET SUBSET:	VB ELEC	SUBSET SHEETS:	23 OF 37

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 110

014102\710STDS\BORDERIN.DGN



FRONT DOOR VIEW



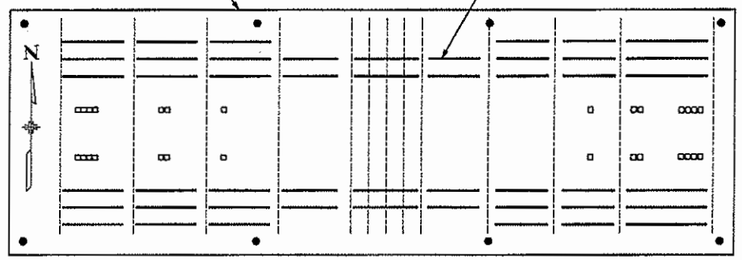
INTERIOR VIEW

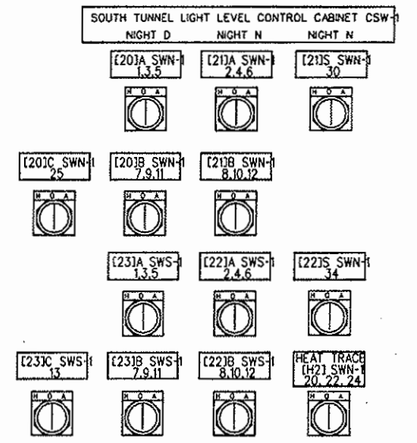
FLOOR STAND

LIGHTING CONTROL AND CONTACTOR CABINET CSW-1
PANEL ASSEMBLY IN SOUTH WEST CROSSCUT ROOM

1/4" CLEAR VIRGIN ACRYLIC SHEET WTH WEATHERSTRIP EDGES AND SECURED BY (8) 3/16" STAINLESS STEEL PAN HEAD MACHINE SCREWS WITH WASHERS AND NUTS

REPRODUCE THE "LIGHTING LEVEL CONTROL DIAGRAM - I-70 EASTBOUND" AS SHOWN ON THE SOUTH TUNNEL LIGHTING CONTROL DIAGRAM DRAWING OF THE VB ELECT SUBSET. SIZE THE REPRODUCTION TO FULLY FIT THE FRAME





ENLARGED VIEW OF
FRONT DOOR SWITCHES FOR CABINET CSW-1

Design File Name: DGNSPEC\
Plot File Name: $PLOTFILE\
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION			
CREATION DATE:	04/19/99	INITIALS:	SFD
LAST MODIFICATION DATE:	11/05/99	INITIALS:	DMO
FULL PATH:	14102\700CADD\703ELECT\		
DRAWING FILE NAME:			1td126.dwg
ACAD VER. R14	SCALE: NONE	UNITS:	xx

SHEET REVISIONS		

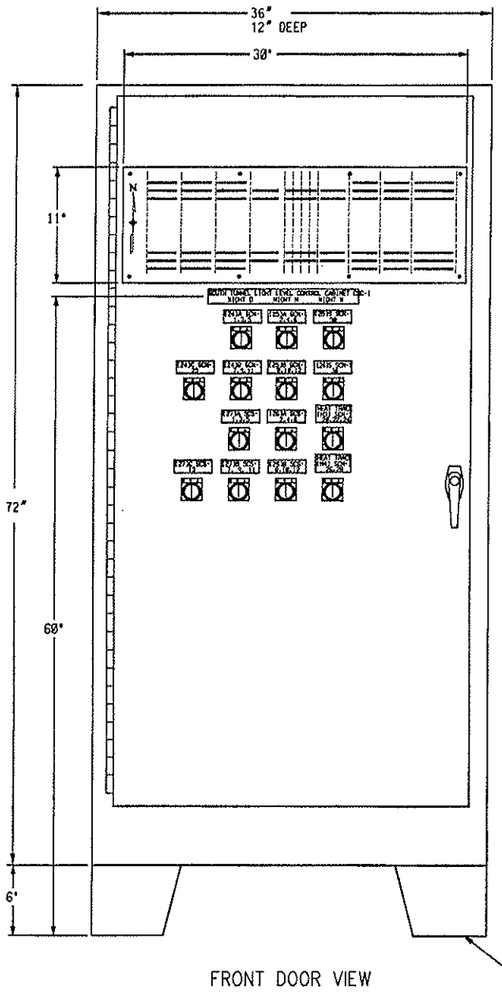
COLORADO DEPARTMENT OF TRANSPORTATION
DOT DEPARTMENT OF TRANSPORTATION
P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W. W. G.

AS CONSTRUCTED	
NO REVISIONS:	01/10/03
REVISED:	
VOID:	

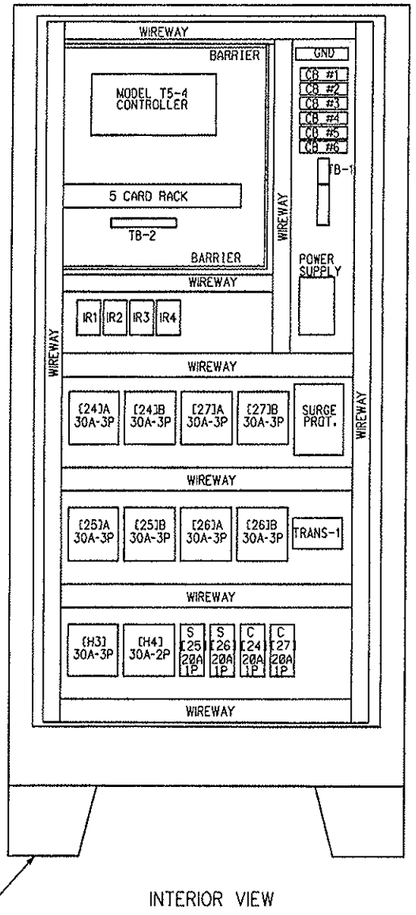
SOUTH TUNNEL LIGHTING CONTROL DETAILS SHEET 4			
DESIGNER: A. HARLICK	STRUCTURE NUMBERS		
DETAILER: S. DZUIBA			
SHEET SUBSET: VB ELECT	SUBSET SHEETS:	24 OF 37	

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 111

Ø14102\710STDS\BORDERIN.DGN



FRONT DOOR VIEW

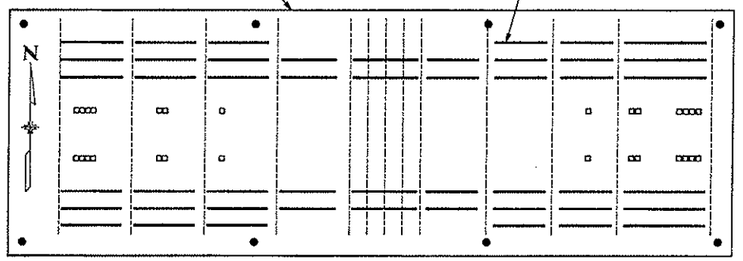


INTERIOR VIEW

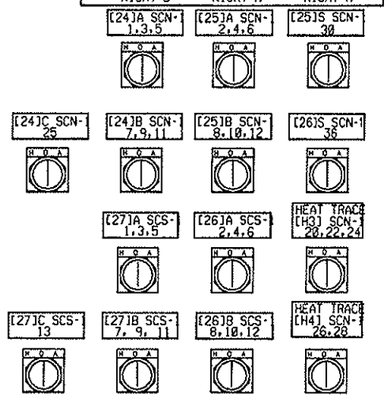
FLOOR STAND

1/4" CLEAR VIRGIN ACRYLIC SHEET WTH WEATHERSTRIP EDGES AND SECURED BY (8) 3/16" STAINLESS STEEL PAN HEAD MACHINE SCREWS WITH WASHERS AND NUTS

REPRODUCE THE "LIGHTING LEVEL CONTROL DIAGRAM - I-70 EASTBOUND" AS SHOWN ON THE SOUTH TUNNEL LIGHTING CONTROL DIAGRAM DRAWING OF THE VB ELECT SUBSET. SIZE THE REPRODUCTION TO FULLY FIT THE FRAME.



SOUTH TUNNEL LIGHT LEVEL CONTROL CABINET CSC-1



ENLARGED VIEW OF
FRONT DOOR SWITCHES FOR CABINET CSC-1

LIGHTING CONTROL AND CONTACTOR CABINET CSC-1
PANEL ASSEMBLY IN SOUTH CENTER CROSSCUT ROOM

Design File Name: DGN$SPEC$
Plot File Name: $PLOTFILE$
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION			
CREATION DATE:	04/19/99	INITIALS: SFD	
LAST MODIFICATION DATE:	11/05/99	INITIALS: DMO	
FULL PATH:	14102\700CADD\703ELECT\		
DRAWING FILE NAME:		!tdt23c.dwg	
ACAD VER. R14	SCALE: NONE	UNITS:	

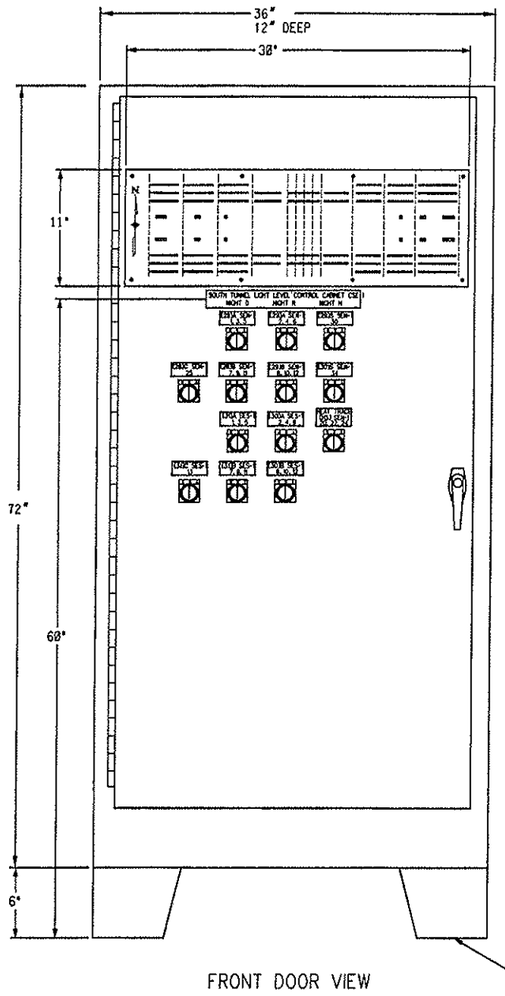
SHEET REVISIONS			

COLORADO DEPARTMENT OF TRANSPORTATION
REGION 1 MOUNTAIN RESIDENCY W. W. G.
P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775

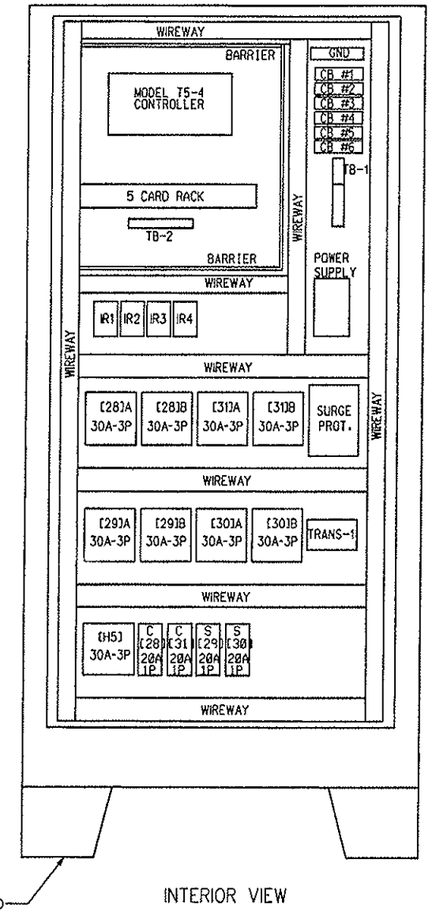
AS CONSTRUCTED	
NO REVISIONS: 01/01/03	
REVISED:	
VOID:	

SOUTH TUNNEL LIGHTING CONTROL DETAILS SHEET 5			PROJECT NO./CODE
DESIGNER: A. HARLICK	STRUCTURE NUMBERS		IM 0703-264
DETAILER: S. DZUIBA			12982
SHEET SUBSET: VB ELECT	SUBSET SHEETS: 25 OF 37		SHEET NUMBER 112

Ø14102\710STDS\BORDERIN.DGN



FRONT DOOR VIEW

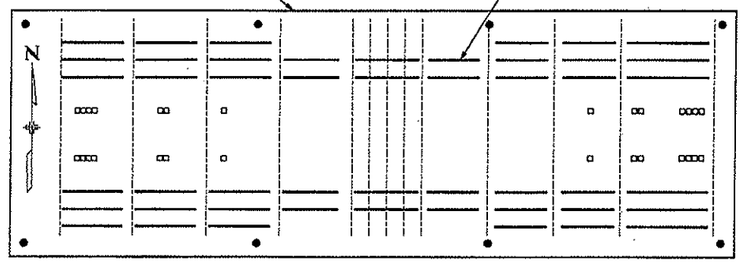


INTERIOR VIEW

FLOOR STAND

1/4" CLEAR VIRGIN ACRYLIC SHEET WTH WEATHERSTRIP EDGES AND SECURED BY (8) 3/16" STAINLESS STEEL PAN HEAD MACHINE SCREWS WITH WASHERS AND NUTS

REPRODUCE THE 'LIGHTING LEVEL CONTROL DIAGRAM - I-70 EASTBOUND' AS SHOWN ON THE SOUTH TUNNEL LIGHTING CONTROL DIAGRAM DRAWING OF THE VB ELECT SUBSET. SIZE THE REPRODUCTION TO FULLY FIT THE FRAME



ENLARGED VIEW OF

FRONT DOOR SWITCHES FOR CABINET CSE-1

LIGHTING CONTROL AND CONTACTOR CABINET CSE-1
PANEL ASSEMBLY IN SOUTH EAST CROSSCUT ROOM

Design File Name: DGNSPEC•
Plot File Name: $PLOTFILE•
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION			
CREATION DATE:	04/19/99	INITIALS:	SFD
LAST MODIFICATION DATE:	11/05/99	INITIALS:	DMO
FULL PATH:	14102\700CADD\703ELECT\		
DRAWING FILE NAME:		ltdt25e.dwg	
ACAD VER. R14	SCALE: NONE	UNITS:	xx

SHEET REVISIONS		

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DEPARTMENT OF TRANSPORTATION
P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W. W. G.

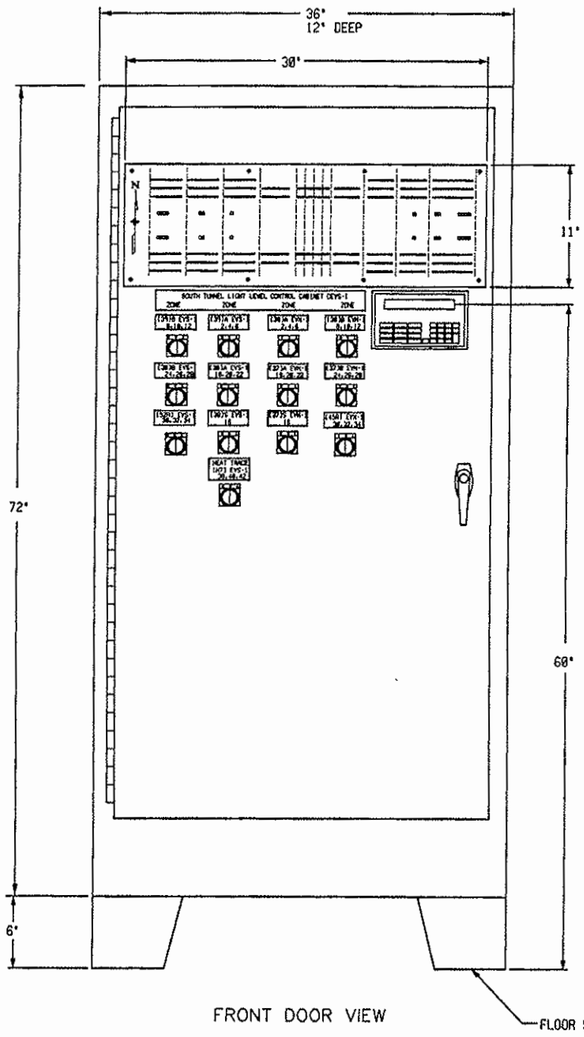
AS CONSTRUCTED
NO REVISIONS: 01/10/03
REVISED:
VOID:

SOUTH TUNNEL LIGHTING CONTROL DETAILS SHEET 6

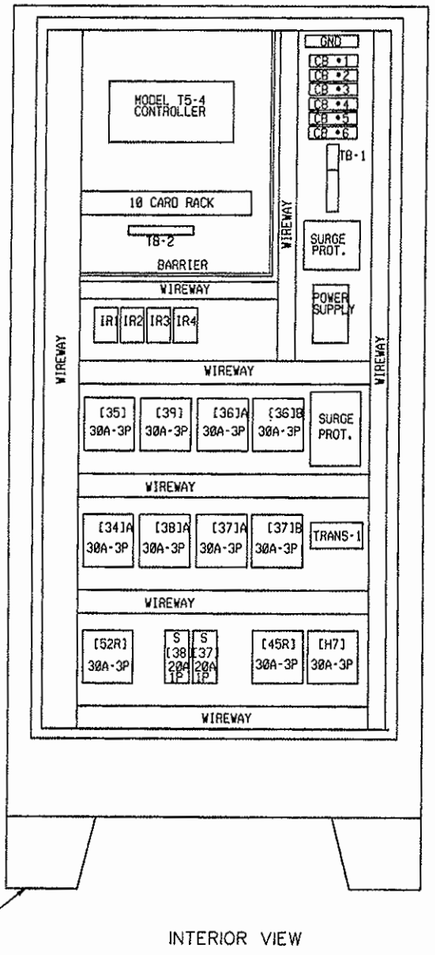
DESIGNER:	A. HARLICK	STRUCTURE NUMBERS	
DETAILER:	S. DZUIBA		
SHEET SUBSET:	V8 ELECT	SUBSET SHEETS:	26 OF 37

PROJECT NO./CODE	
IM 0703-264	
12982	
SHEET NUMBER	113

014102\710STDS\BORDERIN.DGN



FRONT DOOR VIEW

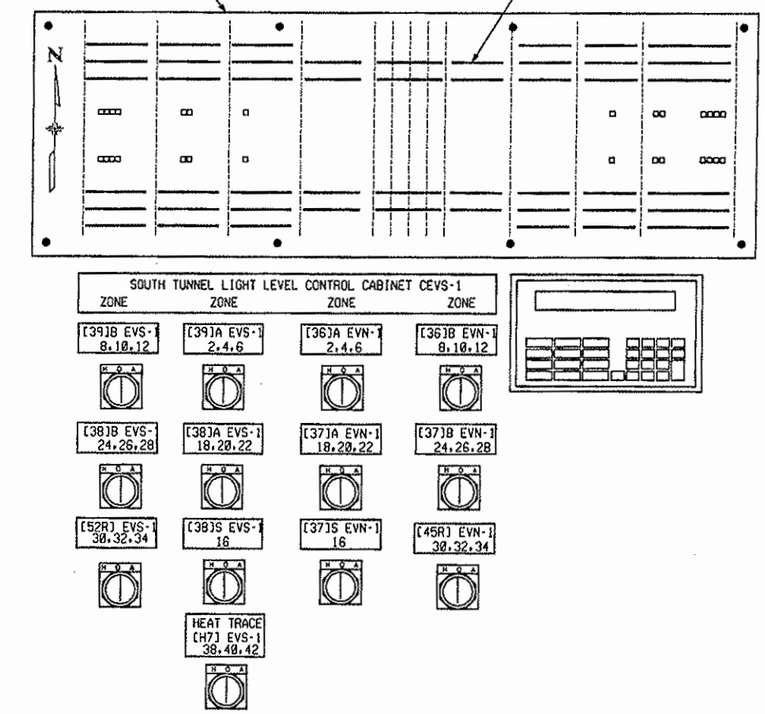


FLOOR STAND

INTERIOR VIEW

1/4" CLEAR VIRGIN ACRYLIC SHEET WTH WEATHERSTRIP EDGES AND SECURED BY (8) 3/16" STAINLESS STEEL PAN HEAD MACHINE SCREWS WITH WASHERS AND NUTS

REPRODUCE THE "LIGHTING LEVEL CONTROL DIAGRAM - I-70 EASTBOUND" AS SHOWN ON THE SOUTH TUNNEL LIGHTING CONTROL DIAGRAM DRAWING OF THE VB ELECT SUBSET. SIZE THE REPRODUCTION TO FULLY FIT THE FRAME



ENLARGED VIEW OF
FRONT DOOR SWITCHES FOR CABINET CEVS-1

LIGHTING CONTROL AND CONTACTOR CABINET CEVS-1
PANEL ASSEMBLY IN WEST VENT. BLDG.

Design File Name: DGNSPEC
Plot File Name: $PLOTFILE
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION			
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LAST MODIFICATION DATE:	11/05/99	INITIALS:	OMO
FULL PATH:	14102\700CADD\703ELECT\		
DRAWING FILE NAME:			td721e.dwg
ACAD VER. R14	SCALE: NONE	UNITS:	xx

SHEET REVISIONS			

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DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W. W. G.

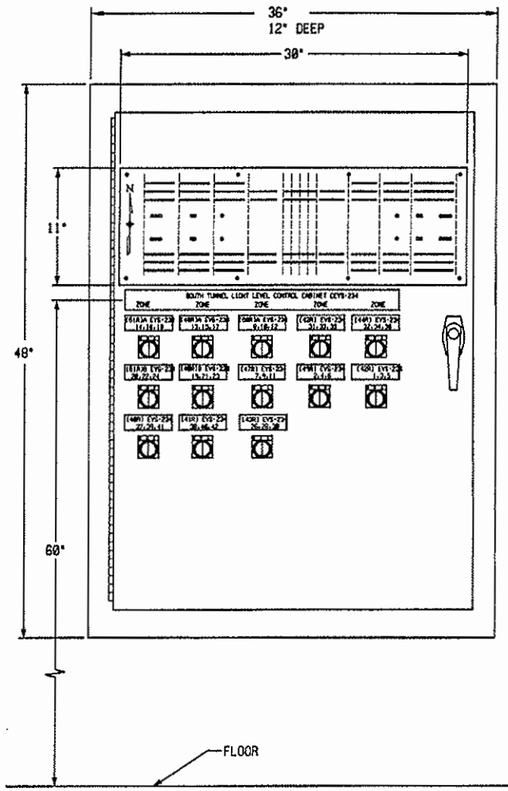
AS CONSTRUCTED
NO REVISIONS: 01/10/03
REVISED:
VOID:

SOUTH TUNNEL LIGHTING CONTROL DETAILS SHEET

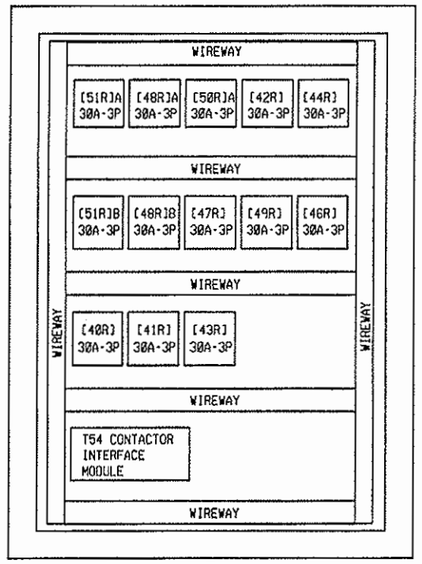
DESIGNER: A. HARLICK
DETAILER: S. DZUIBA
STRUCTURE NUMBERS
SHEET SUBSET: VB ELECT
SUBSET SHEETS: 27 OF 37

PROJECT NO./CODE
7 IM 0703-264
12982
SHEET NUMBER 114

014102\710STDS\BORDERIN.DGN

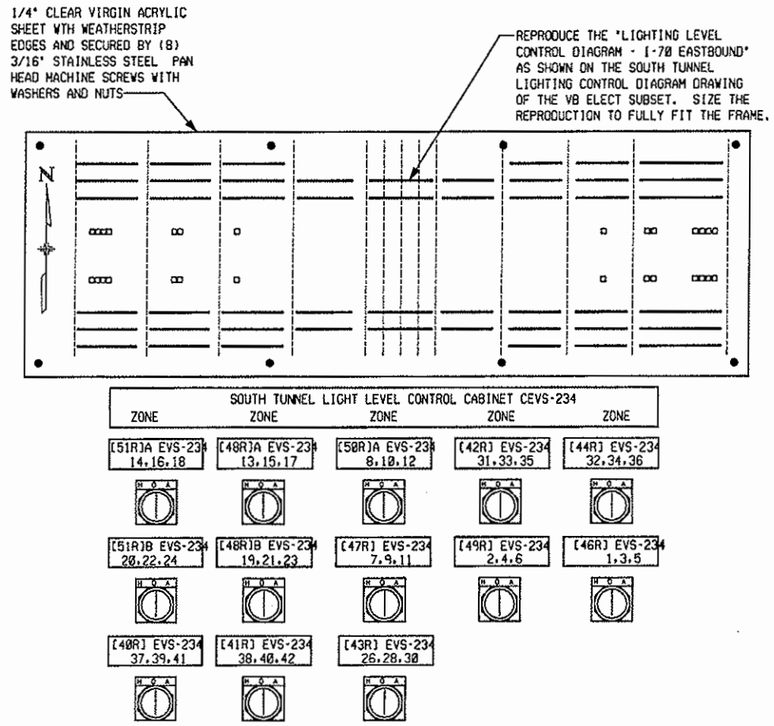


FRONT DOOR VIEW



INTERIOR VIEW

LIGHTING CONTROL AND CONTACTOR CABINET CEVS-234
WALL PANEL ASSEMBLY IN EAST VENT BUILDING



ENLARGED VIEW OF
FRONT DOOR SWITCHES FOR CABINET CEVS-234

Design File Name: DGN\$SPEC\$
Plot File Name: \$PLOTFILE\$
Date of Plot: \$\$\$\$DATE\$\$\$\$

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ACAD VER. R14	SCALE: NONE UNITS:

SHEET REVISIONS		

COLORADO DEPARTMENT OF TRANSPORTATION
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DUMONT, CO. 80436
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REGION 1 MOUNTAIN RESIDENCY W. W. G.

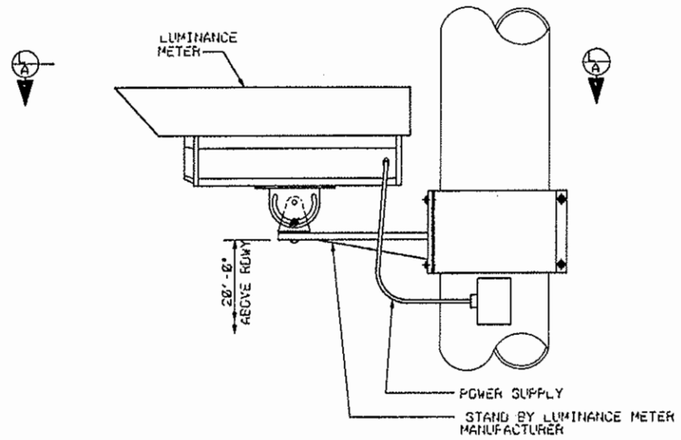
AS CONSTRUCTED
NO REVISIONS: 01/10/03
REVISED:
VOID:

SOURH TUNNEL LIGHTING CONTROL DETAILS SHEET 8

DESIGNER: A. HARLICK
DETAILER: S. DZUIBA
STRUCTURE NUMBERS
SHEET SUBSET: V8 ELECT SUBSET SHEETS: 28 OF 37

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 115

014102\710STDS\BORDERIN.DGN

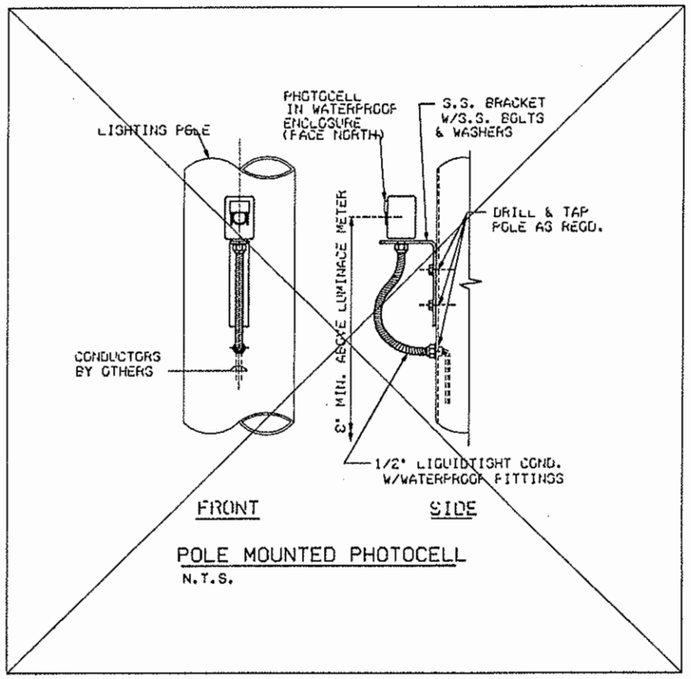


DETAIL

ELEVATION OF POLE MOUNTED LUMINANCE METER

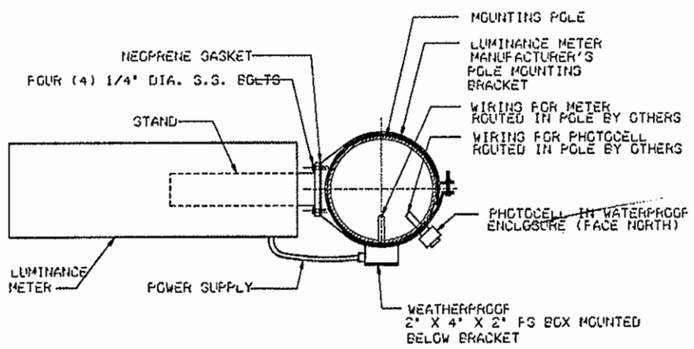
N.T.S.

NOTE:
MOUNT TO POLE @ ROOF OF TRAFFIC CONTROL BOOTH.
SEE PLAN DWGS FOR ACTUAL LOCATION.



POLE MOUNTED PHOTOCELL

N.T.S.



PLAN OF POLE MOUNTED LUMINANCE METER (A)

N.T.S.

Design File Name: DGNSPEC
Plot File Name: #PLOTFILE#
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION		
CREATION DATE: 2/26/99	INITIALS: DJB	
LAST MODIFICATION DATE: 11/05/99	INITIALS: DJB	
FULL PATH:	014102\700CADD\703ELEC	
DRAWING FILE NAME:	LTDT09.DWG	
ACAD VER. R14 SCALE:	UNITS: ENGLISH	

SHEET REVISIONS		

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P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY

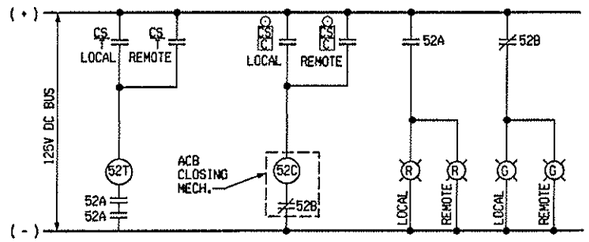
W. W. G.

AS CONSTRUCTED	
NO REVISIONS:	1/10/03
REVISED:	
VOID:	

TUNNEL LIGHTING CONTROLLER DETAILS

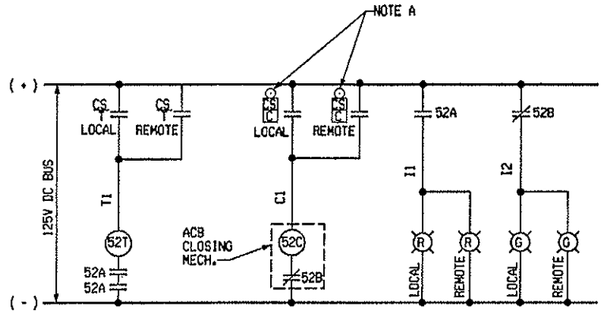
DESIGNER:	J. T. WEAVER	STRUCTURE NUMBERS	
DETAILER:	D. J. BURROUGHS		
SHEET SUBSET:	V8 ELECT	SUBSET SHEETS: 29 OF 37	

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 116



AUTOMATIC TRANSFER SWITCH
460V CIRCUIT BREAKER •118 CONTROL

TYPICAL FOR BREAKER •118 IN WEST (SERVING ATS-WV) AND EAST (SERVING ATS-EV) VENTILATION BUILDING ELECTRICAL ROOMS.



STANDBY POWER (MODIFIED PEAK SHAVING)
460V CIRCUIT BREAKER •119 CONTROL (EAST)

⊙ KEY INTERLOCK SWITCHES

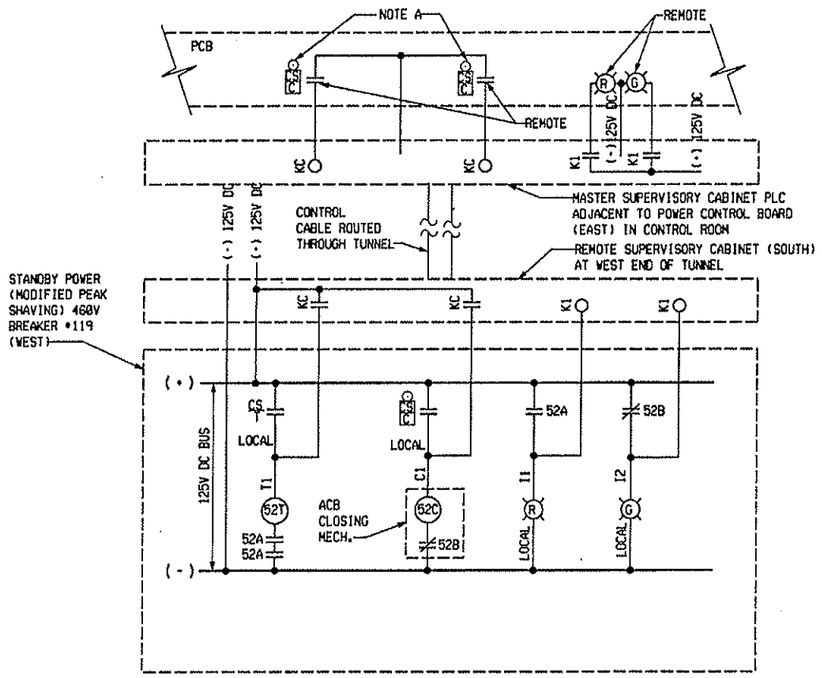
NOTES:

A. REMOVE KIRK-KEY INTERLOCK SWITCHES ASSOCIATED WITH THE CONTROL OF CIRCUIT BREAKER •119 ON THE POWER CONTROL BOARD IN THE CONTROL ROOM AND ON CIRCUIT BREAKER •119 ITSELF. INSTALL NEW CONTROL WIRING TO BYPASS THE PREVIOUS INTERLOCK FUNCTION OF THESE SWITCHES WHILE MAINTAINING ALL OTHER CONTROL FUNCTIONALITY.

B. MAKE MODIFICATIONS TO EACH GENERATOR CONTROL BOARD WIRING AS REQUIRED TO INTERFACE NEW AUTOMATIC TRANSFER SWITCH START AND SHUTDOWN CONTACTS FOR THE TWO GENERATORS. MAINTAIN ALL OTHER GENERATOR CONTROL FUNCTIONALITY.

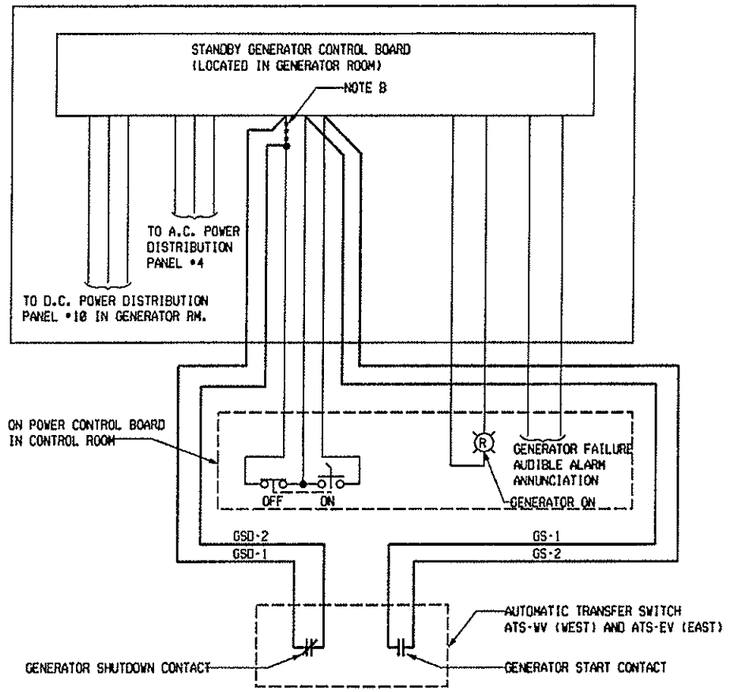
C. DEVICE LOCATION INDICATED AS FOLLOWS:

LOCAL	ON MCC OR ON THE BOARD CONTAINING THE EQUIPMENT
PCB	POWER CONTROL BOARD IN CONTROL ROOM
REMOTE	ON "POWER CONTROL BOARD" IN CONTROL ROOM



STANDBY POWER (MODIFIED PEAK SHAVING)
460V CIRCUIT BREAKER •119 CONTROL (WEST)

⊙ KEY INTERLOCK SWITCHES



STANDBY GENERATOR AC/DC POWER CONTROL AND INDICATION

Design File Name: DGNSSPEC•
Plot File Name: $PLOTFILE•
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION			
CREATION DATE:	04/19/99	INITIALS:	SFD
LAST MODIFICATION DATE:	11/05/99	INITIALS:	SFD
FULL PATH:	14102\700CADD\703ELECT\		
DRAWING FILE NAME:	102esd33.dwg		
ACAD VER. R14	SCALE: NONE	UNITS:	

SHEET REVISIONS		

COLORADO DEPARTMENT OF TRANSPORTATION
DOT
P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W. W. G.

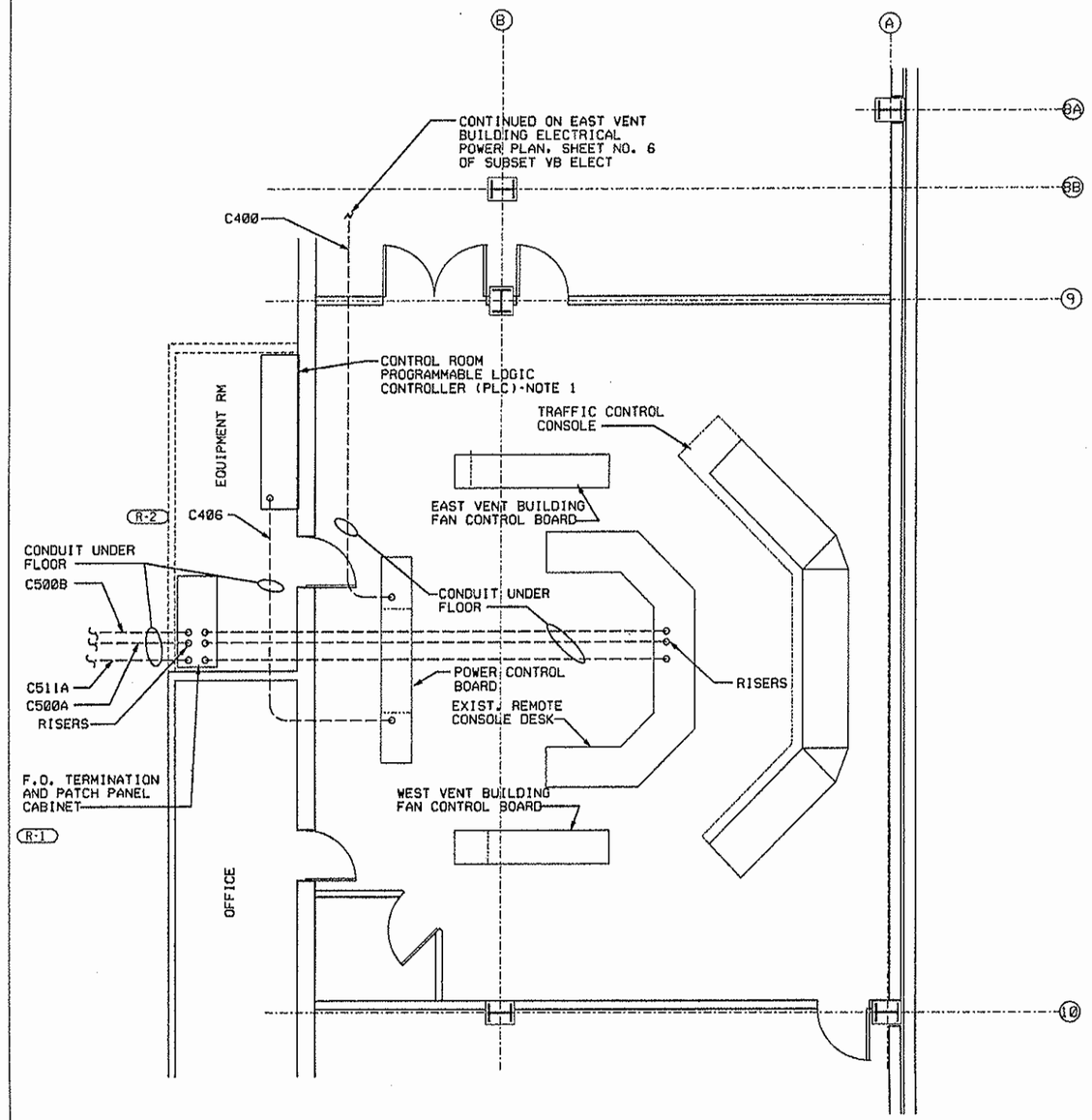
AS CONSTRUCTED	
NO REVISIONS: 01/10/03	
REVISED:	
VOID:	

MISCELLANEOUS CONTROL AND ELEMENTARY DIAGRAMS

DESIGNER:	A. HARLICK	STRUCTURE NUMBERS	
DETAILER:	S. OZUIBA		
SHEET SUBSET:	VB ELECT	SUBSET SHEETS:	30 OF 37

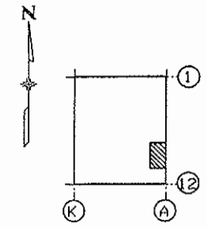
PROJECT NO./CODE	
IM 0703-264	
12982	
SHEET NUMBER	117

014102\710STDS\BORDERIN.DGN



EAST VENT BUILDING
CONTROL ROOM PLAN

SCALE: 1/4" = 1'-0"



KEY PLAN

NOTE:

1. PLC IN CONTROL ROOM COMMUNICATES WITH WEST VENT. BUILDING PLC WHICH IS LOCATED IN THE ELECTRICAL ROOM REMOTE SUPERVISORY CABINET

Design File Name: DGNSPEC
Plot File Name: $PLOTFILE
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION	
CREATION DATE: 04/26/99	INITIALS: SFD
LAST MODIFICATION DATE: 01/04/2000	INITIALS: SFD
FULL PATH: 14102\700CADD\703ELECT\	
DRAWING FILE NAME: 102ep126.dwg	
ACAD VER. R14 SCALE: 1/4"=1'-0"	UNITS:

	SHEET REVISIONS		
R-2	01/06/2000	REVISE CONDUIT NUMBER	JHM
R-1	12/20/99	SHOW PANEL, ADD C511A	JHM

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DOT DEPARTMENT OF TRANSPORTATION
P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W. W. G.

AS CONSTRUCTED	
NO REVISIONS: 1/10/03	
REVISED:	
VOID:	

EAST VENTILATION BUILDING
CONTROL ROOM PLAN

DESIGNER:	A. HARLICK	STRUCTURE NUMBERS	
DETAILER:	S. OZUIBA		
SHEET SUBSET:	VB ELECT	SUBSET SHEETS:	31 OF 37

PROJECT NO./CODE	
IM 0703-264	
12982	
SHEET NUMBER	118

014102\710STDS\BORDERIN.DGN

PANEL SWN-1 CIRCUIT SCHEDULE

SERVICE VOLTAGE 480Y/277 — BUS RATING 225A — LOCATION SO. TUNNEL, WEST CC
MOUNTING SURFACE — BUS CONNECTION 3P 4W — DRAWING No.

LUMINAIRE NUMBERS UPPER LAMPS	VOLTAMPS A	B	C	BREAKER POLE	AMP	CKT No	BUS CONNECTION	CKT No	BREAKER AMP	POLE	VOLTAMPS A	B	C	LUMINAIRE NUMBERS LOWER LAMPS
2,9,16,23,30,...247 [20]A	2775					1		2			2775			2,9,16,23,30,...247 [21]A
4,11,18,25,32,...249 [20]A		2775		3	20	3		4	20	3		2775		4,11,18,25,32,...249 [21]A
6,13,20,27,34,...251 [20]A			2775			5		6					2775	6,13,20,27,34,...251 [21]A
3,10,17,24,31,...248 [20]B	2775					7		8			2775			3,10,17,24,31,...248 [21]B
5,12,19,26,33,...250 [20]B		2700		3	20	9		10	20	3		2700		5,12,19,26,33,...250 [21]B
7,14,21,28,35,...245 [20]B			2700			11		12					2700	7,14,21,28,35,...245 [21]B
WATER MAIN	7645					13		14			9972			LIGHTING TRANSFORMER
PIPE HEATING		5096		3	40	15		16	50	3		9972		IN WEST CROSSCUT
FEEDER			7645			17		18					9972	ELECTRICAL ROOM
VMS AND LUS SIGNS	5664					19		20	30	1	2400			DRAINAGE PIPE HT TRACING
"		5664		3	30	21		22	30	1		4800		DRAINAGE PIPE HT TRACING
"			5664			23		24	30	1			4800	DRAINAGE PIPE HT TRACING
1,8,15,22,39,...246 [20]C	2850			1	20	25		26	20	1	0			SPARE
~~SPARE~~ JB-S1 CONTROL POWER		0		1	20	27		28	20	1		0		SPARE
~~SPARE~~ CB-S2 CONTROL POWER			0	1	20	29		30	20	1			2850	1,8,15,22,39...246 [21]S
CSW-1 CONTROL POWER	0					31		32	20	1	0			SPARE
~~SPARE~~ CSW-1 CONTROL POWER		0		3	20	33		34	20	1		2775		4,11,18,25,32..249 [22]S
			0			35		36	20	1			0	SPARE
	0					37		38			0			
SPARE		0		3	20	39		40	20	3		0		SPARE
			0			41		42					0	
TOTALS	21709	16235	18784				S/N				17922	23022	23097	

BUS A	39631	MAIN BREAKER	225 AMPS.	LINE AMPS	145.3
BUS B	39257	LOCATION (TOP)	TOP	PHASING	3 @ 480
BUS C	41881	FEEDER SIZE	4#4/0, 1#6G, 2-1/2"C	kVA DEMAND	120.8
TOTAL LOAD	120769	SOURCE	XMFR. SWN-1	DATE	6-28-99

PANEL SCN-1 CIRCUIT SCHEDULE

SERVICE VOLTAGE 480Y/277 — BUS RATING 225A — LOCATION SO. TUNNEL, CENTER CC
MOUNTING SURFACE — BUS CONNECTION 3P 4W — DRAWING No.

LUMINAIRE NUMBERS UPPER LAMPS	VOLTAMPS A	B	C	BREAKER POLE	AMP	CKT No	BUS CONNECTION	CKT No	BREAKER AMP	POLE	VOLTAMPS A	B	C	LUMINAIRE NUMBERS LOWER LAMPS
2,9,16,23,30,...254 [24]A	2700					1		2			2700			2,9,16,23,30,...254 [25]A
4,11,18,25,32,...256 [24]A		2700		3	20	3		4	20	3		2700		4,11,18,25,32,...256 [25]A
6,13,20,27,34,...251 [24]A			2700			5		6					2700	6,13,20,27,34,...251 [25]A
3,10,17,24,31,...255 [24]B	2700					7		8			2700			3,10,17,24,31,...255 [25]B
5,12,19,26,33,...250 [24]B		2700		3	20	9		10	20	3		2700		5,12,19,26,33,...250 [25]B
7,14,21,28,35,...252 [24]B			2700			11		12					2700	7,14,21,28,35,...252 [25]B
WATER MAIN	7645					13		14			9972			LIGHTING TRANSFORMER
PIPE HEATING		7645		3	40	15		16	50	3		9972		IN CENTER CROSSCUT
FEEDER			7645			17		18					9972	ELECTRICAL ROOM
VMS AND LUS SIGNS	5664					19		20	30	1	4800			DRAINAGE PIPE HT TRACING
"		5664		3	30	21		22	30	1		4800		DRAINAGE PIPE HT TRACING
"			5664			23		24	30	1			4800	DRAINAGE PIPE HT TRACING
1,8,15,22,39,...253 [24]C	2775			1	20	25		26	30	1	2400			DRAINAGE PIPE HT TRACING
~~SPARE~~ JB-PS51 CONTROL POWER		0		1	20	27		28	30	1		4800		DRAINAGE PIPE HT TRACING
~~SPARE~~ JB-PS71 CONTROL POWER			0	1	20	29		30	20	1			2775	1,8,15,22,39...253 [25]S
CSC-1 CONTROL POWER	0					31		32	20	1	0			SPARE
~~SPARE~~ CSC-1 CONTROL POWER		0		3	20	33		34	30	1		0		SPARE
			0			35		36	20	1			2775	5,12,19,26,33..250 [26]S
	0					37		38			0			
SPARE		0		3	20	39		40	3	20		0		SPARE
			0			41		42					0	
TOTALS	21484	18709	18709				S/N				22572	24972	25722	

BUS A	44056	MAIN BREAKER	225 AMPS.	LINE AMPS	159.0
BUS B	43681	LOCATION (TOP)	TOP	PHASING	3 @ 480
BUS C	44431	FEEDER SIZE	4#4/0, 1#6G, 2-1/2"C	kVA DEMAND	132.2
TOTAL LOAD	132168	SOURCE	XMFR. SCN-1	DATE	6-28-99

PANEL SWS-1 CIRCUIT SCHEDULE

SERVICE VOLTAGE 480Y/277 — BUS RATING 225A — LOCATION SO. TUNNEL, WEST CC
MOUNTING SURFACE — BUS CONNECTION 3P 4W — DRAWING No.

LUMINAIRE NUMBERS UPPER LAMPS	VOLTAMPS A	B	C	BREAKER POLE	AMP	CKT No	BUS CONNECTION	CKT No	BREAKER AMP	POLE	VOLTAMPS A	B	C	LUMINAIRE NUMBERS LOWER LAMPS
5,12,19,26,33,...250 [23]A	2775					1		2			2775			5,12,19,26,33,...250 [22]A
7,14,21,28,35,...245 [23]A		2775		3	20	3		4	20	3		2775		7,14,21,28,35,...245 [22]A
2,9,16,23,30,...247 [23]A			2850			5		6					2850	2,9,16,23,30,...247 [22]A
6,13,20,27,34,...251 [23]B	2775					7		8			2775			6,13,20,27,34,...251 [22]B
1,8,15,22,39,...246 [23]B		2850		3	20	9		10	20	3		2850		1,8,15,22,39,...246 [22]B
3,10,17,24,31,...248 [23]B			2775			11		12					2775	3,10,17,24,31,...248 [22]B
4,11,18,25,...249 [23]C	2775			1	20	13		14			0			
SPARE		0		1	20	15		16	20	3		0		SPARE
SPARE			0	1	20	17		18					0	
~~SPARE~~ 480 VOLT POWER OUTLET	0					19		20			0			
~~SPARE~~ "		0			40	21		22	20	3		0		SPARE
~~SPARE~~ "			0			23		24					0	
TOTALS	8325	5625	5625				S/N				5550	5625	5625	

BUS A	13875	MAIN BREAKER	150 AMPS.	LINE AMPS	43.8
BUS B	11250	LOCATION (TOP)	TOP	PHASING	3 @ 480
BUS C	11250	FEEDER SIZE	4#1/0, 1#6G, 1-1/2"C	kVA DEMAND	36.4
TOTAL LOAD	36375	SOURCE	XMFR. SWS-1	DATE	6-28-99

PANEL SCS-1 CIRCUIT SCHEDULE

SERVICE VOLTAGE 480Y/277 — BUS RATING 225A — LOCATION SO. TUNNEL, CENTER CC
MOUNTING SURFACE — BUS CONNECTION 3P 4W — DRAWING No.

LUMINAIRE NUMBERS UPPER LAMPS	VOLTAMPS A	B	C	BREAKER POLE	AMP	CKT No	BUS CONNECTION	CKT No	BREAKER AMP	POLE	VOLTAMPS A	B	C	LUMINAIRE NUMBERS LOWER LAMPS
6,13,20,27,34,...251 [27]A	2775					1		2			2775			6,13,20,27,34,...251 [26]A
1,8,15,22,39,...253 [27]A		2775		3	20	3		4	20	3		2775		1,8,15,22,39,...253 [26]A
3,10,17,24,31,...255 [27]A			2775			5		6					2775	3,10,17,24,31,...255 [26]A
7,14,21,28,35,...252 [27]B	2700					7		8			2700			7,14,21,28,35,...252 [26]B
2,9,16,23,30,...254 [27]B		2775		3	20	9		10	20	3		2775		2,9,16,23,30,...254 [26]B
4,11,18,25,32,...256 [27]B			2775			11		12					2775	4,11,18,25,32,...256 [26]B
5,12,19,26,33,...250 [27]C	2775			1	20	13		14	30		0			480V POWER OUTLET
SPARE		0		1	20	15		16	~~20~~ 30	3		0		~~SPARE~~ "
SPARE			0	1	20	17		18					0	"
	0					19		20	30		0			OLD VMS SIGNS
SPARE		0		3	20	21		22	~~20~~ 30	3		0		~~SPARE~~ "
			0			23		24					0	"
TOTALS	8250	5550	5550				S/N				5400	5475	5550	

BUS A	13650	MAIN BREAKER	150 AMPS.	LINE AMPS	43.0
BUS B	11025	LOCATION (TOP)	TOP	PHASING	3 @ 480
BUS C	11100	FEEDER SIZE	4#1/0, 1#6G, 1-1/2"C	kVA DEMAND	35.8
TOTAL LOAD	35775	SOURCE	XMFR. SCS-1	DATE	6-28-99

Design File Name: p:\04102\cathyplot\02eps01.dgn
Plot File Name: P:\PLOT\PAPER\02eps01.prf
Date of Plot: 8/2/2000 (using STANDARD.TBL)

Computer File Information			
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Acad Ver. R14	Scale: None	Units:	

Sheet Revisions		

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As Constructed
No Revisions:
Revised: 01/19/03
Void:

ELECTRICAL PANEL SCHEDULES - SHEET 1

Designer: J. MILLS — Structure Numbers:
Detailer: S. DZUIBA
Sheet Subset: VB ELECT — Subset Sheets: 32 of 37

Project No./Code
IM 0703-264
12982
Sheet Number 119

PANEL SEN-1 CIRCUIT SCHEDULE

SERVICE VOLTAGE 480Y/277 — BUS RATING 225A — LOCATION SO. TUNNEL, EAST CC
MOUNTING SURFACE — BUS CONNECTION 3P 4W — DRAWING No.

LUMINAIRE NUMBERS UPPER LAMPS	VOLTAMPS A	B	C	BREAKER POLE	AMP	CKT No	BUS CONNECTION	CKT No	BREAKER AMP	POLE	VOLTAMPS A	B	C	LUMINAIRE NUMBERS LOWER LAMPS
5,12,19,26,33,...271 [28]A	2925					1		2			2925			5,12,19,26,33,...271[29]A
7,14,21,28,35,...273 [28]A		2850		3	20	3		4	20	3		2850		7,14,21,28,35,...273 [29]A
2,9,16,23,30,...275 [28]A			2925			5		6					2925	2,9,16,23,30,3...275 [29]A
6,13,20,27,34,...272 [28]B	2925					7		8			2925			6,13,20,27,34,...272 [29]B
1,8,15,22,39,...274 [28]B		2925		3	20	9		10	20	3		2925		1,8,15,22,39,...274 [29]B
3,10,17,24,31,...276 [28]B			3000			11		12					3000	3,10,17,24,31,...276 [29]B
WATER MAIN	10194					13		14			9972			208Y/ 120V TRANSFORMER
PIPE HEATING		7645		3	50	15		16	50	3		9972		IN EAST CROSSCUT
FEEDER			7645			17		18					9972	ELECTRICAL ROOM
VMS AND LUS SIGNS	5464					19		20	30	1	4800			DRAINAGE PIPE HT TRACING
•		5464		3	30	21		22	30	1		4800		DRAINAGE PIPE HT TRACING
•			5464			23		24	30	1			4800	DRAINAGE PIPE HT TRACING
4,11,18,25,32,...277 [28]C	3000			1	20	25		26	30	1	0			SPARE
~~SPARE~~ JB 564 CONTROL POWER		0		1	20	27		28	30	1		0		SPARE
~~SPARE~~ JB 564 CONTROL POWER			0	1	20	29		30	20	1			3000	4,11,18,25,32,...277 [29]S
CSE-1 CONTROL POWER	0					31		32	20	1	0			SPARE
~~SPARE~~ CSE-1 CONTROL POWER		0		3	20	33		34	20	1		3000		1,8,15,22,39,...274 [30] S
			0			35		36	20	1			0	SPARE
SPACE	0					37		38			0			SPACE
SPACE		0				39		40				0		SPACE
SPACE			0			41		42					0	SPACE
TOTALS	24508	18884	19034				S/N				20622	23547	23697	

BUS A	45130	MAIN BREAKER	225 AMPS.
BUS B	42431	LOCATION (TOP)	TOP
BUS C	42731	FEEDER SIZE	4#4/0, 1#6G. 2-1/2"C
TOTAL LOAD	130292	SOURCE	XMFR. SEN-1
LINE AMPS	156.7		
PHASING	3 Ø 480		
kVA DEMAND	130.3		
DATE	6-28-99		

PANEL EVN-1 CIRCUIT SCHEDULE

SERVICE VOLTAGE 480Y/277 — BUS RATING 225A — LOCATION EAST VENTILATION BLDG.
MOUNTING SURFACE — BUS CONNECTION 3P 4W — DRAWING No.

LOAD DESCRIPTION	VOLTAMPS A	B	C	BREAKER POLE	AMP	CKT No	BUS CONNECTION	CKT No	BREAKER AMP	POLE	VOLTAMPS A	B	C	LOAD DESCRIPTION
	0					1		2			2050			TH-INT MID LAMP, [36]A
SPARE		0		3	20	3		4	20	3		2050		TH-INT MID LAMP, [36]A
			0			5		6					2050	TH-INT MID LAMP, [36]A
	0					7		8			2050			TH-INT MID LAMP, [36]B
SPARE		0		3	20	9		10	20	3		2050		TH-INT MID LAMP, [36]B
			0			11		12					2050	TH-INT MID LAMP, [36]B
	0					13		14	20	1	0			SPARE
SPARE		0		3	20	15		16	20	1		1575		TH-INT LOW LAMP, [37]S
			0			17		18					1575	TH-INT LOW LAMP, [37]A
	0					19		20	20	3	1575			TH-INT LOW LAMP, [37]A
SPARE		0		3	20	21		22				1575		TH-INT LOW LAMP, [37]A
			0			23		24					1575	TH-INT LOW LAMP, [37]B
	0					25		26	20	3	1575			TH-INT LOW LAMP, [37]B
SPARE		0		3	20	27		28				1575		TH-INT LOW LAMP, [37]B
			0			29		30					750	TH UPPER LAMP, [45R]
	0					31		32	20	3	825			TH UPPER LAMP, [45R]
SPARE		0		3	20	33		34				825		TH UPPER LAMP, [45R]
			0			35		36					0	SPACE
	0					37		38			0			SPACE
SPARE		0		3	20	39		40				0		SPACE
			0			41		42					0	SPACE
TOTALS	0	0	0				S/N				8075	9650	8000	

BUS A	8075	MAIN BREAKER	150 AMPS.
BUS B	9650	LOCATION (TOP)	BOTTOM
BUS C	8000	FEEDER SIZE	4#1/0, 1#6G. 1-1/2"C
TOTAL LOAD	25725	SOURCE	XMFR. SWS-1
LINE AMPS	31.0		
PHASING	3 Ø 480		
kVA DEMAND	25.8		
DATE	11-4-99		

PANEL EVS-1 CIRCUIT SCHEDULE

SERVICE VOLTAGE 480Y/277 — BUS RATING 225A — LOCATION EAST VENTILATION BLDG.
MOUNTING SURFACE — BUS CONNECTION 3P 4W — DRAWING No.

LOAD DESCRIPTION	VOLTAMPS A	B	C	BREAKER POLE	AMP	CKT No	BUS CONNECTION	CKT No	BREAKER AMP	POLE	VOLTAMPS A	B	C	LOAD DESCRIPTION
	0					1		2			2050			TH-INT MID LAMP, [39]A
SPARE		0		3	20	3		4	20	3		2050		TH-INT MID LAMP, [39]A
			0			5		6					2050	TH-INT MID LAMP, [39]A
	0					7		8			2050			TH-INT MID LAMPS, [39]B
SPARE		0		3	20	9		10	20	3		2050		TH-INT MID LAMPS, [39]B
			0			11		12					2050	TH-INT MID LAMPS, [39]B
	0					13		14	20	1	0			SPARE (R-1)
SPARE		0		3	20	15		16	20	1		1575		TH-INT LOW LAMP, [38]S
			0			17		18					1575	TH-INT LOW LAMP, [38]A
	0					19		20	20	3	1575			TH-INT LOW LAMP, [38]A
SPARE		0		3	20	21		22				1575		TH-INT LOW LAMP, [38]A
			0			23		24					1575	TH-INT LOW LAMP, [38]B
	0					25		26	20	3	1575			TH-INT LOW LAMP, [38]B
SPARE		0		3	20	27		28				1575		TH-INT LOW LAMP, [38]B
			0			29		30					750	TH-INT UPPER LAMP, [52R
	0					31		32	20	3	825			TH-INT UPPER LAMP, [52R
SPARE		0		3	20	33		34				825		TH-INT UPPER LAMP, [52R
			0			35		36	20	1			0	SPACE
VMS AND LUS SIGNS	4398					37		38	30	1	2400			DRAINAGE PIPE HT TRACING
FOR SOUTH		4398		3	30	39		40	30	1		4800		DRAINAGE PIPE HT TRACING
TUNNEL			4398			41		42	30	1			5600	DRAINAGE PIPE HT TRACING
TOTALS	4398	4398	4398				S/N				10475	14450	13600	

BUS A	14873	MAIN BREAKER	150 AMPS.
BUS B	18848	LOCATION (TOP)	BOTTOM
BUS C	17998	FEEDER SIZE	4#1/0, 1#6G. 1-1/2"C
TOTAL LOAD	51719	SOURCE	XFMR SWS-1
LINE AMPS	62.2		
PHASING	3 Ø 480		
kVA DEMAND	51.7		
DATE	11-4-99		

Design File Name: p:\DI402\cathyplot\102eps02.dgn
Plot File Name: P:\PLOT\PAPER\102eps02.prf
Date of Plot: 8/2/2000 (using STANDARD.TBL)

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(R-1)	12/20/99	REVISE DESCRIPTION	JHM

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As Constructed
No Revisions:
Revised: 01/10/03
Void:

ELECTRICAL PANEL SCHEDULES - SHEET 2

Designer: J. MILLS — Structure Numbers:
Detailer: S. DZUIBA
Sheet Subset: VB ELECT — Subset Sheets: 33 of 37

Project No./Code: IM 0703-264
12982
Sheet Number 120

PANEL WVS-1 CIRCUIT SCHEDULE

SERVICE VOLTAGE 480Y/277 — BUS RATING 225A — LOCATION WEST VENTILATION BLDG.
MOUNTING SURFACE — BUS CONNECTION 3P 4W — DRAWING No.

SPARES FOR FUTURE CONTRACT	VOLTAMPS A	VOLTAMPS B	VOLTAMPS C	BREAKER POLE	BREAKER AMP	CKT No	BUS CONNECTION	CKT No	BREAKER AMP	BREAKER POLE	VOLTAMPS A	VOLTAMPS B	VOLTAMPS C	FLUORESCENT SOUTH TUNNEL
~~SPARE~~ CWVS-1 CONTROL POWER						1		2			0			
~~SPARE~~ CWVS-1 CONTROL POWER				3	20	3		4	20	3		0		SPARE
SPARE						5		6					0	
						7		8			2375			TH-TR3 MID LAMP, [11] A
SPARE				3	20	9		10	20	3		2300		TH-TR3 MID LAMP, [11] A
						11		12					2300	TH-TR3 MID LAMP, [11] A
						13		14			2300			TH-TR3 MID LAMP, [11] B
SPARE				3	20	15		16	20	3		2300		TH-TR3 MID LAMP, [11] B
						17		18					2300	TH-TR3 MID LAMP, [11] B
						19		20			1575			TH-TR3 LOW LAMP, [10] A
SPARE				3	20	21		22	20	3		1575		TH-TR3 LOW LAMP, [10] A
						23		24					1500	TH-TR3 LOW LAMP, [10] A
						25		26			1575			TH-TR3 LOW LAMP, [10] B
SPARE				3	20	27		28	20	3		1575		TH-TR3 LOW LAMP, [10] B
						29		30					1500	TH-TR3 LOW LAMP, [10] B
						31		32	20	1	1500			TH-TR3 LOW LAMP, [10] S
SPARE				3	30	33		34	20	1		0		SPARE
						35		36	20	1			0	SPARE
SPARE				1	20	37		38			3565			VMS AND LUS SIGNS
DRAINAGE PIPE HT TRACING		4800		2	30	39		40	30	3		3565		FOR SOUTH
DRAINAGE PIPE HT TRACING			4800			41		42					3565	TUNNEL
TOTALS	0	4800	4800				S/N				12690	11315	11165	

BUS A 12890 — MAIN BREAKER 150 AMPS. — LINE AMPS 48.3
BUS B 16115 — LOCATION (TOP) BOTTOM — PHASING 3 Ø 480
BUS C 15915 — FEEDER SIZE 4#1/0, 1#6G, 1-1/2"C — kVA CONN. 40.2
TOTAL LOAD 40170 — SOURCE ATS-WV — DATE 10-25-99

PANEL WVS-4 CIRCUIT SCHEDULE

SERVICE VOLTAGE 480Y/277 — BUS RATING 225A — LOCATION WEST VENTILATION BLDG.
MOUNTING SURFACE — BUS CONNECTION 3P 4W — DRAWING No.

LOAD DESCRIPTION	VOLTAMPS A	VOLTAMPS B	VOLTAMPS C	BREAKER POLE	BREAKER AMP	CKT No	BUS CONNECTION	CKT No	BREAKER AMP	BREAKER POLE	VOLTAMPS A	VOLTAMPS B	VOLTAMPS C	LOAD DESCRIPTION
TH N MH LAMPS, [6] A	2880					1		2			2880			TH S MH LAMPS, [9] A
TH N MH LAMPS, [6] A		2880		3	20	3		4	20	3		2880		TH S MH LAMPS, [9] A
TH N MH LAMPS, [6] A			2400			5		6					2400	TH S MH LAMPS, [9] B
TH N MH LAMPS, [6] B	2880					7		8			2880			TH S MH LAMPS, [9] B
TH N MH LAMPS, [6] B		2880		3	20	9		10	20	3		2880		TH S MH LAMPS, [9] B
TH N MH LAMPS, [6] B			2400			11		12					2400	TH S MH LAMPS, [9] B
TH N MH LAMPS, [6] C	2880					13		14			2880			TH S MH LAMPS, [9] C
TH N MH LAMPS, [6] C		2880		3	20	15		16	20	3		2880		TH S MH LAMPS, [9] C
TH N MH LAMPS, [6] C			2400			17		18					2400	TH S MH LAMPS, [9] C
TH N MH LAMPS, [6] D	2880					19		20			2880			TH S MH LAMPS, [9] D
TH N MH LAMPS, [6] D		2880		3	20	21		22	20	3		2400		TH S MH LAMPS, [9] D
TH N MH LAMPS, [6] D			2400			23		24					2400	TH S MH LAMPS, [9] D
TH N MH LAMPS, [6] E	2880					25		26			2880			TH S MH LAMPS, [9] E
TH N MH LAMPS, [6] E		2400		3	20	27		28	20	3		2400		TH S MH LAMPS, [9] E
TH N MH LAMPS, [6] E			2400			29		30					2400	TH S MH LAMPS, [9] E
TH N MH LAMPS, [6] F	2880					31		32			2880			TH S MH LAMPS, [9] F
TH N MH LAMPS, [6] F		2400		3	20	33		34	20	3		2400		TH S MH LAMPS, [9] F
TH N MH LAMPS, [6] F			2400			35		36					2400	TH S MH LAMPS, [9] F
SPARE	0					37		38	20	1	0			SPARE
SPARE		0		3	20	39		40	20	1		0		SPARE
SPARE			0			41		42	20	1			0	SPARE
TOTALS	17280	16320	14400				S/N				17280	15840	14400	

BUS A 34560 — MAIN BREAKER 225 AMPS. — LINE AMPS 114.9
BUS B 32160 — LOCATION (TOP) TOP — PHASING 3 Ø 480
BUS C 28800 — FEEDER SIZE 4#4/0, 1#4G, 2-1/2"C — kVA CONN. 95.5
TOTAL LOAD 95520 — SOURCE XFMR. SEN-1 — DATE 10-24-99

PANEL WVS-2 CIRCUIT SCHEDULE

SERVICE VOLTAGE 480Y/277 — BUS RATING 225A — LOCATION WEST VENTILATION BLDG.
MOUNTING SURFACE — BUS CONNECTION 3P 4W — DRAWING No.

LOAD DESCRIPTION	VOLTAMPS A	VOLTAMPS B	VOLTAMPS C	BREAKER POLE	BREAKER AMP	CKT No	BUS CONNECTION	CKT No	BREAKER AMP	BREAKER POLE	VOLTAMPS A	VOLTAMPS B	VOLTAMPS C	LOAD DESCRIPTION
TH N MH LAMPS, [4] A	2880					1		2			2880			TH S MH LAMPS, [7] A
TH N MH LAMPS, [4] A		2880		3	20	3		4	20	3		2880		TH S MH LAMPS, [7] A
TH N MH LAMPS, [4] A			2400			5		6					2400	TH S MH LAMPS, [7] A
TH N MH LAMPS, [4] B	2880					7		8			2880			TH S MH LAMPS, [7] B
TH N MH LAMPS, [4] B		2880		3	20	9		10	20	3		2880		TH S MH LAMPS, [7] B
TH N MH LAMPS, [4] B			2400			11		12					2400	TH S MH LAMPS, [7] B
TH N MH LAMPS, [4] C	2880					13		14			2880			TH S MH LAMPS, [7] C
TH N MH LAMPS, [4] C		2400		3	20	15		16	20	3		2400		TH S MH LAMPS, [7] C
TH N MH LAMPS, [4] C			2400			17		18					2400	TH S MH LAMPS, [7] C
TH N FL UP LAMP [1]	1800					19		20			1800			TH S FL UP LAMP [12]
TH N FL UP LAMP [1]		1725		3	20	21		22	20	3		1725		TH S FL UP LAMP [12]
TH N FL UP LAMP [1]			1725			23		24					1725	TH S FL UP LAMP [12]
TR2 N FL UP LAMP [17]	900					25		26			900			TR2 S FL UP LAMP [19]
TR2 N FL UP LAMP [17]		800		3	20	27		28	20	3		800		TR2 S FL UP LAMP [19]
TR2 N FL UP LAMP [17]			800			29		30					800	TR2 S FL UP LAMP [19]
TR1 MH LAMPS, [15]	2440					31		32			640			TR2 S MH LAMPS, [18] B
TR1 MH LAMPS, [15]		2745	(R-2)	3	20	33		34	20	3		640		TR2 S MH LAMPS, [18] B
TR1 MH LAMPS, [15]			2745			35		36					640	TR2 S MH LAMPS, [18] B
TR2 N MH LAMPS, [18] A	640					37		38			0			CWVS-2 CONTROL POWER
TR2 N MH LAMPS, [18] A		640	(R-2)	3	20	39		40	20	3		0		~~SPARE~~ CWVS-2 CONTROL POWER
TR2 N MH LAMPS, [18] A			640			41		42					0	
TOTALS	14420	14070	13110				S/N				11980	11325	10365	

BUS A 26400 — MAIN BREAKER 225 AMPS. — LINE AMPS 90.5
BUS B 25395 — LOCATION (TOP) TOP — PHASING 3 Ø 480
BUS C 23475 — FEEDER SIZE 4#4/0, 1#4G, 2-1/2"C — kVA CONN. 75.3
TOTAL LOAD 75270 — SOURCE XMFR. SEN-1 — DATE 10-24-99

Design File Name: p:\04102\cathyplot\102eps03.dgn
Plot File Name: P:\PLOT\PAPER\102eps03.pr-t
Date of Plot: 8/2/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	04/26/99	Initials:	SFD
Last Modification Date:	01/03/2000	Initials:	SFD
Full Path:	14102\700CADD\703ELECT\		
Drawing File Name:	102eps03.dwg		
Acad Ver. R14	Scale: None	Units:	

Sheet Revisions			
(R-2)	01/06/2000	REVISED WVS-2 BREAKERS	JHM

Colorado Department of Transportation
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DUMONT, CO. 80436
Phone: 303-512-5750 FAX: 303-512-5775
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As Constructed
No Revisions:
Revised: 01/20/03
Void:

ELECTRICAL PANEL SCHEDULES – SHEET 3

Designer: J. MILLS — Structure Numbers:
Detailer: S. DZUIBA
Sheet Subset: VB ELECT — Subset Sheets: 34 of 37

Project No./Code
IM 0703-264
12982
Sheet Number 121

PANEL WVN-1 CIRCUIT SCHEDULE

SERVICE VOLTAGE 480Y/277 — BUS RATING 225A — LOCATION WEST VENTILATION BLDG.
MOUNTING SURFACE — BUS CONNECTION 3 P 4 W — DRAWING NO.

SPARES FOR FUTURE CONTRACT	VOLTAMPS A	B	C	BREAKER POLE	AMP	CKT NO	BUS CONNECTION	CKT NO	BREAKER AMP	POLE	VOLTAMPS A	B	C	FLUORESCENT SOUTH TUNNEL
SPARE	0					1		2			0			
SPARE		0		3	20	3		4	20	3		0		SPARE
SPARE			0			5		6					0	
SPARE	0					7		8			2375			TH-TR3 MID LAMP, [2] A
SPARE		0		3	20	9		10	20	3		2300		TH-TR3 MID LAMP, [2] A
SPARE			0			11		12					2300	TH-TR3 MID LAMP, [2] A
SPARE	0					13		14			2300			TH-TR3 MID LAMP, [2] B
SPARE		0		3	20	15		16	20	3		2300		TH-TR3 MID LAMP, [2] B
SPARE			0			17		18					2300	TH-TR3 MID LAMP, [2] B
SPARE	0					19		20			1575			TH-TR3 LOW LAMP, [3] A
SPARE		0		3	20	21		22	20	3		1575		TH-TR3 LOW LAMP, [3] A
SPARE			0			23		24					1500	TH-TR3 LOW LAMP, [3] A
SPARE	0					25		26			1575			TH-TR3 LOW LAMP, [3] B
SPARE		0		3	20	27		28	20	3		1575		TH-TR3 LOW LAMP, [3] B
SPARE			0			29		30					1500	TH-TR3 LOW LAMP, [3] B
SPARE	0			2	20	31		32	20	1	1500			TH-TR3 LOW LAMP, [3] B
SPARE		0				33		34	20	1		0		SPARE
SPARE			0	2	20	35		36	20	1			0	SPARE
SPARE	0					37		38			0			
SPARE		0		2	20	39		40	20	3		0		SPARE
SPARE			0			41		42					0	
TOTALS	0	0	0				S/N				9325	7750	7675	

BUS A 9325 — MAIN BREAKER 150 AMPS. — LINE AMPS 29.8
BUS B 7750 — LOCATION (TOP) BOTTOM — PHASING 3 @ 480
BUS C 7675 — FEEDER SIZE 4*1/0, 1*6G, 1 1/2"C — KVA DEMAND 24.8
TOTAL LOAD 24750 — SOURCE ATS-WV — DATE 10-11-99

PANEL EVS-234 CIRCUIT SCHEDULE

SERVICE VOLTAGE 480Y/277 — BUS RATING 225A — LOCATION EAST VENTILATION BLDG.
MOUNTING SURFACE — BUS CONNECTION 3 P 4 W — DRAWING NO.

LOAD DESCRIPTION	VOLTAMPS A	B	C	BREAKER POLE	AMP	CKT NO	BUS CONNECTION	CKT NO	BREAKER AMP	POLE	VOLTAMPS A	B	C	LOAD DESCRIPTION
TH N. MH LAMPS [46R]	1920					1		2				1920		TH S. MH LAMPS [49R]
TH N. MH LAMPS [46R]		1920		3	20	3		4	20	3			1920	TH S. MH LAMPS [49R]
TH N. MH LAMPS [46R]			1440			5		6					1440	TH S. MH LAMPS [49R]
TH N. MH LAMPS [47R]	2225					7		8			2225			TH S. MH LAMPS [50R]
TH N. MH LAMPS [47R]		1745		3	20	9		10	20	3		1745		TH S. MH LAMPS [50R]
TH N. MH LAMPS [47R]			1745			11		12					1745	TH S. MH LAMPS [50R]
TH N. MH LAMPS [48R]A	1745					13		14		1	1745			TH S. MH LAMPS [51R]A
TH N. MH LAMPS [48R]A		1745		3	20	15		16	20	3		1745		TH S. MH LAMPS [51R]A
TH N. MH LAMPS [48R]A			1920			17		18		1			1920	TH S. MH LAMPS [51R]A
TH N. MH LAMPS [48R]B	1745					19		20				1745		TH S. MH LAMPS [51R]B
TH N. MH LAMPS [48R]B		1745		3	20	21		22	20	3		1745		TH S. MH LAMPS [51R]B
TH N. MH LAMPS [48R]B			1920			23		24					1920	TH S. MH LAMPS [51R]B
DEVS-234 CONTROL POWER	0					25		26			640			TR1 MH LAMPS [43R]
~~SPARE~~ DEVS-234 CONTROL POWER		0		3	20	27		28	20	3		640		TR1 MH LAMPS [43R]
			0			29		30					640	TR1 MH LAMPS [43R]
TR1 N. MH LAMPS [42R]	300					31		32			300			TR1 S. MH LAMPS [44R]
TR1 N. MH LAMPS [42R]		300		3	20	33		34	20	3		300		TR1 S. MH LAMPS [44R]
TR1 N. MH LAMPS [42R]			225			35		36					225	TR1 S. MH LAMPS [44R]
TR1 N. MH LAMPS [40R]	400					37		38			400			TR2 S. MH LAMPS [41R]
TR1 N. MH LAMPS [40R]		300		3	20	39		40	20	3		400		TR2 S. MH LAMPS [41R]
TR1 N. MH LAMPS [40R]			400			41		42					400	TR2 S. MH LAMPS [41R]
TOTALS	8335	7845	7650				S/N				8975	8585	8290	

BUS A 17310 — MAIN BREAKER 225 AMPS. — LINE AMPS 59.8
BUS B 16430 — LOCATION (TOP) TOP — PHASING 3 @ 480
BUS C 15940 — FEEDER SIZE 4*4/0, 1*4G, 2 1/2"C — KVA DEMAND 49.7
TOTAL LOAD 49680 — SOURCE XFMR. SEN-1 — DATE 10-27-99

PANEL SES-1 CIRCUIT SCHEDULE

SERVICE VOLTAGE 480Y/277 — BUS RATING 225A — LOCATION SO. TUNNEL, EAST CC
MOUNTING SURFACE — BUS CONNECTION 3 P 4 W — DRAWING NO.

LUMINAIRE NUMBERS UPPER LAMPS	VOLTAMPS A	B	C	BREAKER POLE	AMP	CKT NO	BUS CONNECTION	CKT NO	BREAKER AMP	POLE	VOLTAMPS A	B	C	LUMINAIRE NUMBERS LOWER LAMPS
2,9,16,23,30,..J2363 A	3000					1		2				3000		2,9,16,23,30,..J2365 A
4,11,18,25,32,..J2367 A		3000		3	20	3		4	20	3			3000	4,11,18,25,32,..J2367 A
6,13,20,27,34,..J2372 A			2925			5		6					2925	6,13,20,27,34,..J2372 A
3,10,17,24,31,..J2376 B	3000					7		8				3000		3,10,17,24,31,..J2376 B
5,12,19,26,33,..J2371 B		2925		3	20	9		10	20	3			2925	5,12,19,26,33,..J2371 B
7,14,21,28,35,..J2373 B			2925			11		12					2925	7,14,21,28,35,..J2373 B
1,8,15,22,39,..J2240 C	3000			1	20	13		14				0		
SPARE		0		1	20	15		16	20	3		0		SPARE
SPARE			0	1	20	17		18					0	
SPARE	0					19		20	30		0			480 VOLT POWER OUTLETS
SPACE		0				21		22	~~20~~	3		0		~~SPARE~~ 0
SPARE			0			23		24					0	"
~~SPACE~~ OCD VMS SIGNS	0					25		26			0			SPACE
~~SPACE~~ "		0			30	27		28				0		SPACE
~~SPACE~~ "			0			29		30					0	SPACE
TOTALS	9000	5925	5850				S/N				6000	5925	5850	

BUS A 15000 — MAIN BREAKER 150 AMPS. — LINE AMPS 46.4
BUS B 11850 — LOCATION (TOP) TOP — PHASING 3 @ 480
BUS C 11700 — FEEDER SIZE 4*1/0, 1*6G, 1-1/2"C — KVA DEMAND 38.6
TOTAL LOAD 38550 — SOURCE XFMR. SES-1 — DATE 6-29-99

PANEL WVS-3 CIRCUIT SCHEDULE

SERVICE VOLTAGE 480Y/277 — BUS RATING 225A — LOCATION WEST VENTILATION BLDG.
MOUNTING SURFACE — BUS CONNECTION 3 P 4 W — DRAWING NO.

LOAD DESCRIPTION	VOLTAMPS A	B	C	BREAKER POLE	AMP	CKT NO	BUS CONNECTION	CKT NO	BREAKER AMP	POLE	VOLTAMPS A	B	C	LOAD DESCRIPTION
TH N MH LAMPS, [5] A	2880					1		2			2880			TH S MH LAMPS, [8] A
TH N MH LAMPS, [5] A		2880		3	20	3		4	20	3		2880		TH S MH LAMPS, [8] A
TH N MH LAMPS, [5] A			2400			5		6					2400	TH S MH LAMPS, [8] A
TH N MH LAMPS, [5] B	2880					7		8			2880			TH S MH LAMPS, [8] B
TH N MH LAMPS, [5] B		2880		3	20	9		10	20	3		2880		TH S MH LAMPS, [8] B
TH N MH LAMPS, [5] B			2400			11		12					2400	TH S MH LAMPS, [8] B
TH N MH LAMPS, [5] C	2880					13		14			2880			TH S MH LAMPS, [8] C
TH N MH LAMPS, [5] C		2400		3	20	15		16	20	3		2400		TH S MH LAMPS, [8] C
TH N MH LAMPS, [5] C			2400			17		18					2400	TH S MH LAMPS, [8] C
TR1 N FL UP LAMP [13]	675					19		20			2440			TR1 MH LAMPS, [14]
TR1 N FL UP LAMP [13]		600		3	20	21		22	20	3		2745		TR1 MH LAMPS, [14]
TR1 N FL UP LAMP [13]			600			23		24					2745	TR1 MH LAMPS, [14]
TR1 S FL UP LAMP [16]	675					25		26			0			SPARE
TR1 S FL UP LAMP [16]		600		3	20	27		28	20	3		0		SPARE
TR1 S FL UP LAMP [16]			600			29		30					0	SPARE
TOTALS	9990	9360	8400				S/N				11080	8985	9945	

BUS A 21070 — MAIN BREAKER 150 AMPS. — LINE AMPS 71.8
BUS B 20265 — LOCATION (TOP) TOP — PHASING 3 @ 480
BUS C 18345 — FEEDER SIZE 4*1/0, 1*6G, 2"C — KVA CONN. 59.7
TOTAL LOAD 59680 — SOURCE XMFR. SEN-1 — DATE 10-23-99

Design File Name: DGNSPEC+
Plot File Name: $PLOTFILE+
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION

CREATION DATE:	04/26/99	INITIALS: SFD
LAST MODIFICATION DATE:	11/05/99	INITIALS: SFD
FULL PATH:	14102\700CADD\703ELECT\	
DRAWING FILE NAME:	102eps04.dwg	
ACAD VER. R14	SCALE: None	UNITS:

SHEET REVISIONS

COLORADO DEPARTMENT OF TRANSPORTATION
DOT DEPARTMENT OF TRANSPORTATION
P.O. BOX 399
DUMONT, CO. 80436
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REGION 1 MOUNTAIN RESIDENCY W.W.G.

AS CONSTRUCTION
NO REVISIONS:
REVISED: 01/10/03
VOID:

ELECTRICAL PANEL SCHEDULES - SHEET 4

DESIGNER: J. MILL
DETAILER: S. DZUBA
STRUCTURE NUMBERS
SHEET SUBSET: VB ELECT SUBSET SHEETS: 35 OF 37

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 122

014102\710STDS\BORDERIN.DGN

CONDUIT NO.	CONDUIT SIZE (IN) & KIND	WIRE OR CABLE QTY.	WIRE OR CABLE SIZE & TYPE (AWG-KCMIL)	ROUTING FROM	ROUTING TO	FUNCTION
P 300A	3-1/2 RGS	4	500 1/C-600V	480V SWITCHGEAR, CIRCUIT BREAKER 118	AUTOMATIC TRANSFER SWITCH ATS-WV	TUNNEL FLUOR. LIGHTING
		1	1/0 1/C-600V			GROUND
P 300B	3-1/2 RGS	4	500 1/C-600V	480V SWITCHGEAR, CIRCUIT BREAKER 118	AUTOMATIC TRANSFER SWITCH ATS-WV	TUNNEL FLUOR. LIGHTING
		1	1/0 1/C-600V			GROUND
P 301A	3-1/2 RGS	4	500 1/C-600V	480V SWITCHGEAR CIRCUIT BREAKER 119	AUTOMATIC TRANSFER SWITCH ATS-WV	TUNNEL FLUOR. LIGHTING
		1	1/0 1/C-600V			GROUND
P 301B	3-1/2 RGS	4	500 1/C-600V	480V SWITCHGEAR CIRCUIT BREAKER 119	AUTOMATIC TRANSFER SWITCH ATS-WV	TUNNEL FLUOR. LIGHTING
		1	1/0 1/C-600V			GROUND
P 302	3-1/2 RGS	4	500 1/C-600V	480V MOTOR CONTROL CENTER NO.2	WIREWAY WVS FOR PANELS WVS-2,-3,-4	TUNNEL M.H. LIGHTING
		1	1/0 1/C-600V			GROUND
P 303	2-1/2 RGS	4	4/0 1/C-600V	WIREWAY WVS FOR PANELS WVS-2,-3,-4	PANEL WVS-2	FEEDER
		1	4 1/C-600V			GROUND
P 304	1-1/4 RGS	52	10 1/C-600V	LIGHTING CONTACTOR CABINET CWVS-2	480V PANELBOARD WVS-2	TUNNEL M.H. LTG
	(6 RGS)	1	10 1/C-600V			GROUND
P 305	1-1/2 RGS	4	1/0 1/C-600V	WIREWAY WVS FOR PANELS WVS-2,-3,-4	PANEL WVS-3	FEEDER
		1	6 1/C-600V			GROUND
P 306	1-1/4 RGS	36	10 1/C-600V	LIGHTING CONTACTOR CABINET CWVS-2	480V PANELBOARD WVS-3	TUNNEL M.H. LTG
	(6 RGS)	1	10 1/C-600V			GROUND
P 307	2-1/2 RGS	4	4/0 1/C-600V	WIREWAY WVS FOR PANELS WVS-2,-3,-4	PANEL WVS-4	FEEDER
		1	4 1/C-600V			GROUND
P 308	1-1/4 RGS	48	10 1/C-600V	LIGHTING CONTACTOR CABINET CWVS-2	480V PANELBOARD WVS-4	TUNNEL M.H. LTG
	(6 RGS)	1	10 1/C-600V			GROUND
P 309A	3-1/2 RGS	4	500 1/C-600V	AUTOMATIC TRANSFER SWITCH ATS-WV	DISTRIBUTION PANEL DP-WV	TUNNEL FLUOR. LIGHTING
		1	1/0 1/C-600V			GROUND
P 309B	3-1/2 RGS	4	500 1/C-600V	AUTOMATIC TRANSFER SWITCH ATS-WV	DISTRIBUTION PANEL DP-WV	TUNNEL FLUOR. LIGHTING
		1	1/0 1/C-600V			GROUND
P 310A	3-1/2 RGS	1/3	350 1/C-5KV 600V	DISTRIBUTION PANEL DP-WV	300 KVA TRANSFORMER T-WVSD	FEEDER FOR WEST CC
		1	1/0 1/C-600V			GROUND
P 310B	3-1/2 RGS	1/3	350 1/C-5KV 600V	DISTRIBUTION PANEL DP-WV	300 KVA TRANSFORMER T-WVSD	FEEDER FOR WEST CC
		1	1/0 1/C-600V			GROUND
P 311	1-1/2 RGS	4	1/0 1/C-600V	DISTRIBUTION PANEL DP-WV	480V PANELBOARD WVN-1	NORTH WALL FLUOR. LTG
		1	6 1/C-600V			GROUND
P 312	1-1/2 RGS	4	1/0 1/C-600V	DISTRIBUTION PANEL DP-WV	480V PANELBOARD WVS-1	SOUTH WALL FLUOR. LTG
	RGS	1	6 1/C-600V			GROUND
P 313	1-1/4 RGS	9	10 1/C-600V	480V PANELBOARD WVN-1/8-18 (EVEN)	CONTACTOR CABINET CWVS-1	TUNNEL FLUOR. LTG
P 314	1-1/4 RGS	11	10 1/C-600V	480V PANELBOARD WVN-1/20-30 (EVEN)	CONTACTOR CABINET CWVS-1	TUNNEL FLUOR. LTG
P 315	3/4 RGS	3	10 1/C-600V	480V PANELBOARD WVN-1/32	CONTACTOR CABINET CWVS-1	TUNNEL FL. STANDBY LTG
P 316	1-1/4 RGS	9	10 1/C-600V	480V PANELBOARD WVS-1/8-18 (EVEN)	CONTACTOR CABINET CWVS-1	TUNNEL FLUOR. LTG
P 317	1-1/4 RGS	11	10 1/C-600V	480V PANELBOARD WVS-1/20-30 (EVEN)	CONTACTOR CABINET CWVS-1	TUNNEL FLUOR. LTG
P 318	3/4 RGS	3	10 1/C-600V	480V PANELBOARD WVS-1/32	CONTACTOR CABINET CWVS-1	TUNNEL FL. STANDBY LTG
P 319	3/4 RGS	4	10 1/C-600V	480V PANELBOARD WVS-1/39,41	CONTACTOR CABINET CWVS-1	DRAINAGE PIPE HEAT
P 320	3/4 RGS	4	10 1/C-600V	J-BOX ABOVE PANEL WVS-1/38,40,42	VMS MINI-LOAD CENTER IN WEST VENT. ELEC.	PORTAL VMS SIGN POWER
P 321	3 RGS	3	2 1/C-5KV	2.4KV MOTOR CONTROL CENTER NO.1A	2.4KV OIL FUSE CUTOUT SWITCH	NORTH TUNNEL LTG. FEEDER
		1	4 1/C-600V			GROUND
P 322						

CONDUIT NO.	CONDUIT SIZE (IN) & KIND	WIRE OR CABLE QTY.	WIRE OR CABLE SIZE & TYPE (AWG-KCMIL)	ROUTING FROM	ROUTING TO	FUNCTION
		1	8 1/C-600V	PANEL WVN-1	BUILDING INTERFACE TO W. APPROACH/EB UG	GROUND CONDUCTOR
P 323	2 RGS	9	2 1/C-600V	PANEL WVN-1/35,37,39,41	BUILDING INTERFACE TO W. APPROACH/EB UG	ROADWAY LIGHTING
		1	8 1/C-600V	PANEL WVN-1	BUILDING INTERFACE TO W. APPROACH/EB UG	GROUND CONDUCTOR
P 324						
P 325	3/4 RGS	2	10 1/C-600V	480V SWITCHGEAR, WEST VENT. BLDG.	AUTOMATIC TRANSFER SWITCH ATS-WV	125VDC CONTROL POWER
P 326	3/4 RGS	2	10 1/C-600V	AUTOMATIC TRANSFER SWITCH ATS-WV	DISTRIBUTION PANEL DP-WV	125VDC CONTROL POWER
P 327						
P 328						
P 329						
P 330						
P 331						
P 332						
P 333						
P 334						
P 335						
P 336						
P 337						
P 338						
P 339						
P 340						
P 341						
P 342						
P 343						
P 344						
P 345						
C 300	1-1/4 RGS	7	10 1/C-600V	480V SWITCHGEAR COMPT. 118	REMOTE SUPERVISORY CABINET (PLC)	BREAKER 118 CONTROL & EAST V.B. POWER CONTROL BOARD
C 301	1 RGS	7	10 1/C-600V	AUTOMATIC TRANSFER SWITCH ATS-WV	STANDBY GENERATOR CONTROL BOARD	GENERATOR START SIGNAL
C 302	3/4 RGS	1	LTG CABLE	CONTACTOR CABINET CWVS-1	CONTACTOR CABINET CWVS-2	CONTROL COMMUNICATION
C 303	2 RGS	1	4/C.18 150V/80C	CABINET CWVS-1 LUMINANCE CONTROL (R-1)	BUILDING INTERFACE TO W. APPROACH/EB UG	LUMINANCE CONTROL
		1	3/C.18 150V/80C	CABINET CWVS-1 TEMP. CONTROL (R-1)	BUILDING INTERFACE TO W. APPROACH/EB UG	HEATER CIRCUIT
C 304						
C 305						
C 306						
C 307						
C 308						
C 309						
C 310						

Design File Name: DGNSPEC+
Plot File Name: $PLOTFILE+
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION			
CREATION DATE:	05/13/99	INITIALS:	SFD
LAST MODIFICATION DATE:	12/15/99	INITIALS:	SL
FULL PATH:	14102\700CADD\703ELECT\		
DRAWING FILE NAME:	102ecs01.dwg		
ACAD VER. R14	SCALE: None	UNITS:	

SHEET REVISIONS		
12/20/99	REVISE CAB. LABEL	JHM

COLORADO DEPARTMENT OF TRANSPORTATION
DOT DEPARTMENT OF TRANSPORTATION
P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W. W. G.

AS CONSTRUCTED
NO REVISIONS:
REVISED: 01/10/03
VOID:

ELECT CIRCUIT SCHEDULES
SHEET 1

DESIGNER: J. MILLS
DETAILER: S. OZUIBA
STRUCTURE NUMBERS
SHEET SUBSET: V8 ELECT
SUBSET SHEETS: 36 OF 37

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 123

014102\710STDS\BORDERIN.DGN

CONDUIT NO.	CONDUIT SIZE (IN) & KIND	WIRE OR CABLE QTY.	WIRE OR CABLE SIZE & TYPE (AWG-KCMIL)	ROUTING FROM	ROUTING TO	FUNCTION
P 400A	3-1/2 RGS	4	500 1/C-600V	480V SWITCHGEAR, CIRCUIT BREAKER 118	AUTOMATIC TRANSFER SWITCH ATS-EV	TUNNEL FLUOR. LIGHTING
		1	1/0 1/C-600V			GROUND
P 400B	3-1/2 RGS	4	500 1/C-600V	480V SWITCHGEAR, CIRCUIT BREAKER 118	AUTOMATIC TRANSFER SWITCH ATS-EV	TUNNEL FLUOR. LIGHTING
		1	1/0 1/C-600V			GROUND
P 401A	3-1/2 RGS	4	500 1/C-600V	480V SWITCHGEAR CIRCUIT BREAKER 119	AUTOMATIC TRANSFER SWITCH ATS-EV	TUNNEL FLUOR. LIGHTING
		1	1/0 1/C-600V			GROUND
P 401B	3-1/2 RGS	4	500 1/C-600V	480V SWITCHGEAR CIRCUIT BREAKER 119	AUTOMATIC TRANSFER SWITCH ATS-EV	TUNNEL FLUOR. LIGHTING
		1	1/0 1/C-600V			GROUND
P 402	2 RGS	4	1/0 1/C-600V	480V MOTOR CONTROL CENTER NO.3	480V PANELBOARD EVS-234	TUNNEL M.H. LIGHTING
		1	6 1/C-600V			GROUND
P 403	1 RGS	9	10 1/C-600V	480V PANELBOARD EVS-234/1-11(ODD)	CONTACTOR CABINET CEVS-234	NO. ROW MH
P 404	1 RGS	9	10 1/C-600V	480V PANELBOARD EVS-234/13-23(ODD)	CONTACTOR CABINET CEVS-234	NO. ROW MH
P 405	1 RGS	9	10 1/C-600V	480V PANELBOARD EVS-234/2-12(EVEN)	CONTACTOR CABINET CEVS-234	SO. ROW MH
P 406	1 RGS	9	10 1/C-600V	480V PANELBOARD EVS-234/14-24(EVEN)	CONTACTOR CABINET CEVS-234	SO. ROW MH
P 407	1 RGS	5	10 1/C-600V	480V PANELBOARD EVS-1/38, 40, 42	CONTACTOR CABINET CEVS-1	DRAINAGE PIPE HEAT TRACE
P 408A	3-1/2 RGS	4	500 1/C-600V	AUTOMATIC TRANSFER SWITCH ATS-EV	DISTRIBUTION PANEL DP-EV	TUNNEL FLUOR. LIGHTING
		1	1/0 1/C-600V			GROUND
P 408B	3-1/2 RGS	4	500 1/C-600V	AUTOMATIC TRANSFER SWITCH ATS-EV	DISTRIBUTION PANEL DP-EV	TUNNEL FLUOR. LIGHTING
		1	1/0 1/C-600V			GROUND
P 409	2-1/2 RGS	3	4/0 1/C-600V	DISTRIBUTION PANEL DP-EV	150 KVA TRANSFORMER T-EVSD	FEEDER FOR EAST CC
		1	4 1/C-600V			GROUND
P 410	2 RGS	4	1/0 1/C-600V	DISTRIBUTION PANEL DP-EV	480V PANELBOARD EVN-1	NORTH WALL FLUOR. LTG
		1	6 1/C-600V			GROUND
P 411	2 RGS	4	1/0 1/C-600V	DISTRIBUTION PANEL DP-EV	480V PANELBOARD EVS-1	SOUTH WALL FLUOR. LTG
		1	6 1/C-600V			GROUND
P 412	1 RGS	9	10 1/C-600V	480V PANELBOARD EVN-1/2-12(EVEN)	CONTACTOR CABINET CEVS-1	TUNNEL FLUOR. LTG
P 413	1 RGS	11	10 1/C-600V	480V PANELBOARD EVN-1/16-28(EVEN)	CONTACTOR CABINET CEVS-1	TUNNEL FLUOR. LTG
P 414	1 RGS	5	10 1/C-600V	480V PANELBOARD EVN-1/30, 32, 34	CONTACTOR CABINET CEVS-1	TUNNEL FLUOR. LTG
P 415	1 RGS	9	10 1/C-600V	480V PANELBOARD EVS-1/2-12(EVEN)	CONTACTOR CABINET CEVS-1	TUNNEL FLUOR. LTG
P 416	1 RGS	11	10 1/C-600V	480V PANELBOARD EVS-1/16-28(EVEN)	CONTACTOR CABINET CEVS-1	TUNNEL FLUOR. LTG
P 417	1 RGS	5	10 1/C-600V	480V PANELBOARD EVS-1/30, 32, 34	CONTACTOR CABINET CEVS-1	TUNNEL FLUOR. LTG
P 418	3/4 RGS	5	10 1/C-600V	480V PANELBOARD EVS-1/38, 40, 42	CONTACTOR CABINET CEVS-1 37,39,41	DRAINAGE PIPE HEAT TRACE
P 419	3/4 RGS	4	10 1/C-600V	PANEL EVS-1/38,40,42 37,39,41	J-BOX ABOVE PANEL EVS-1 (CIRCUITS 38,40,42)	PORTAL VMS SIGN POWER
P 420	3/4 RGS	4	10 1/C-600V	J-BOX ABOVE PANEL EVS-1 (CIRCUITS 38,40,42)	VMS MINI-LOAD CENTER IN EAST VENT. ELEC.	PORTAL VMS SIGN POWER
P 421						
P 422	3/4 RGS	2	10 1/C-600V	480V SWITCHGEAR, EAST VENT. BLDG.	AUTOMATIC TRANSFER SWITCH ATS-EV	125VDC CONTROL POWER
P 423	3/4 RGS	2	10 1/C-600V	AUTOMATIC TRANSFER SWITCH ATS-EV	DISTRIBUTION PANEL DP-EV	125VDC CONTROL POWER
P 424	1-1/4 RGS	9	10 1/C-600V	480V PANELBOARD EVS-234/31-41(ODD)	CONTACTOR CABINET CEVS-234	NO. ROW MH
P 425	1-1/4 RGS	13	10 1/C-600V	480V PANELBOARD EVS-234/26-42(EVEN)	CONTACTOR CABINET CEVS-234	SO. ROW MH
P 426						
P 427						
P 428						
P 429						
P 430						
P 431						

DELETE — NOT USED

CONDUIT NO.	CONDUIT SIZE (IN) & KIND	WIRE OR CABLE QTY.	WIRE OR CABLE SIZE & TYPE (AWG-KCMIL)	ROUTING FROM	ROUTING TO	FUNCTION
P 700	3 PVC	1		WEST VENT BLDG PORTAL	HANDHOLE 'HH-P2' EB, STA 32+50	(R-1) FUTURE VMS/LTG
P 701	3 PVC	1		WEST VENT BLDG PORTAL	HANDHOLE 'HH-P2' EB, STA 32+50	(R-1) FUTURE VMS/LTG
P 702	3 PVC	1		EAST VENT BLDG PORTAL	HANDHOLE 'HH-P2' WB, STA 229+40	(R-1) FUTURE VMS/LTG
P 703	3 PVC	1		EAST VENT BLDG PORTAL	HANDHOLE 'HH-P2' WB, STA 229+40	(R-1) FUTURE VMS/LTG
P 704						
P 705						
P 706						
P 707						
P 708						
C 400	1-1/4 RGS	7	12 1/C-600V	480V SWITCHGEAR COMPT. 118 (R-2)	CONTROL RM POWER CONTROL BOARD	BREAKER 118 CONTROL AT POWER CONTROL BOARD
C 401	1 RGS	7	12 1/C-600V	AUTOMATIC TRANSFER SWITCH ATS-EV	STANDBY GENERATOR CONTROL BOARD	GENERATOR START SIGNAL
C 402	3/4 RGS	1	LTG CABLE	CONTACTOR CABINET CEVS-1	CONTACTOR CABINET CEVS-234	CONTROL COMMUNICATION
C 403	2 RGS PVC	1	4/C.10 150V/80C	CABINET CEVS-1 LUMINANCE CONTROL (R-1)	BUILDING INTERFACE TO E. APPROACH /WB UG	LUMINANCE CONTROL
		1	3/C.10 150V/80C	CABINET CEVS-1 TEMPERATURE CONTROL (R-1)	BUILDING INTERFACE TO E. APPROACH /WB UG	HEATER CONTROL
C 404						
C 405						
C 406	1-1/4 RGS	7	12 1/C-600V	EAST VENT BLDG CONTROL RM PLC (R-2)	CONTROL RM POWER CONTROL BOARD	BREAKER 118 CONTROL AT POWER CONTROL BOARD
C 600						
C 601	3 RGS			VMS/LUS COMM. PULLBOX JB-C501	VENT BUILDING ELECTRICAL ROOM	VMS/LUS CONTROL LOOP
C 602	1-1/2 RGS			VMS/LUS COMM. PULLBOX JB-C501	VENT BUILDING ELECTRICAL ROOM	VMS CONTROL
C 603						
C 604						
C 605	(R-1)					
C 606	(R-1)					
C 700	3 PVC	1		WEST VENT BLDG PORTAL	HANDHOLE 'HH-C2' EB, STA 32+50	SPARE COMM. CONDUIT
C 701						
C 702	3 PVC	1	(R-1)	EAST VENT BLDG PORTAL	HANDHOLE 'HH-C2' WB, STA 229+50	SPARE COMM. CONDUIT
C 703						
C 704						
C 705						
C 706	2 PVC	1	4/C.18 150V/80C	BUILDING INTERFACE (FROM CAB. CWVS-1)	W. APPROACH LUMINANCE METER	LUMINANCE CONTROL
		1	3/C.18 150V/80C	BUILDING INTERFACE (FROM CAB. CWVS-1)	W. APPROACH LUMINANCE METER HEATER	HEATER CIRCUIT
C 707	(R-1)					
C 708	(R-1)					
C 709	2 PVC	1	4/C.18 150V/80C	BUILDING INTERFACE (FROM CAB. CEVS-1)	E. APPROACH LUMINANCE METER	LUMINANCE CONTROL
		1	3/C.18 150V/80C	BUILDING INTERFACE (FROM CAB. CEVS-1)	E. APPROACH LUMINANCE METER HEATER	HEATER CIRCUIT
C 710	(R-1)					
C 711	(R-1)					
C 712	(R-1)					
C 713	(R-1)					

Design File Name: DGNSPEC
Plot File Name: $PLOTFILE$
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION	
CREATION DATE:	05/13/99 INITIALS: SFD
LAST MODIFICATION DATE:	01/04/2000 INITIALS: SFD
FULL PATH:	14102\700CADD\703ELECT\
DRAWING FILE NAME:	102ecs02.dwg
ACAD VER. R14	SCALE: None UNITS:

SHEET REVISIONS		
01/06/2000	REVISE CIRCUIT C406	JHM
12/28/99	REMOVE FUTURE C.	JHM

COLORADO DEPARTMENT OF TRANSPORTATION

P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775

REGION 1 MOUNTAIN RESIDENCY W. W. G.

AS CONSTRUCTED	
NO REVISIONS:	
REVISED: 01/00/03	
VOID:	

ELECT CIRCUIT SCHEDULES SHEET 2

DESIGNER:	J. MILLS	STRUCTURE NUMBERS	
DETAILER:	S. DZUIBA		
SHEET SUBSET:	VB ELECT	SUBSET SHEETS:	37 OF 37

PROJECT NO./CODE	
IM 0703-264	
12982	
SHEET NUMBER	124

014102\710STDS\BORDERIN.DGN

VMS NOTES

1. UNLESS OTHERWISE NOTED, ALL VMS AND LUS ARE TO BE MOUNTED IN ACCORDANCE TO THE TYPICAL MOUNTING DETAILS SHOWN ON VMS AND LUS SIGN SUPPORT DETAILS, SHEETS 12 TO 17.
2. PROPOSED SIGN LOCATIONS ARE APPROXIMATE. FINAL LOCATION SHALL BE FIELD SURVEY ADJUSTED AS PER FIELD CONDITION AND COORDINATED WITH THE TUNNEL LIGHTING FIXTURES AND APPROVED BY THE ENGINEER PRIOR TO DEVELOPING OF SHOP DRAWING.
3. ALL SIGN INSTALLATIONS THAT REQUIRE A LANE CLOSURE SHALL BE PERFORMED DURING THE WORKING HOURS SPECIFIED IN SECTION 630 OF THE CONSTRUCTION ZONE TRAFFIC CONTROL PLAN SPECIFICATIONS.
4. ALL EXISTING TRAFFIC SIGNS AND SIGNAL EQUIPMENT BEING REMOVED AND STACKED REMAIN THE PROPERTY OF CDOT AS DIRECTED BY CDOT.
5. EXISTING TUNNEL VMS AND LUS SHALL BE MAINTAINED IN OPERATIONAL CONDITION AT ALL TIMES DURING THE INSTALLATION OF THE PROPOSED VMS AND LUS. EXISTING VMS WILL BE REMOVED BY CDOT AFTER THE INSTALLATION OF THE PROPOSED VMS ARE COMPLETED, TESTED AND IN OPERATIONAL CONDITION.
6. FOR PROPOSED TYPICAL TUNNEL VMS AND LUS CROSS SECTION, SEE SHEETS 8 AND 9.
7. FOR SIGN SUPPORT LOCATIONS, SIGNS CONTROLLERS AND CONTROL CABINETS TO BE INSTALLED IN THIS CONTRACT, SEE TABULATION OF SIGNS SHEET 2.
8. FOR VARIABLE MESSAGE SIGNS, THE MAXIMUM SIGN (CONTRACTOR DESIGNED) MOUNTING BRACKET SPACING ONTO THE FRAMING SUPPORT SYSTEM SHALL BE 2'-6" CENTER TO CENTER.
9. FOR CONTROL CABINET MOUNTING DETAIL, SEE SHEETS 18 & 19.
10. EXISTING VMS SIGNS (MB-2, MB-4 & MB-8), LOCATED IN THE SOUTH TUNNEL, HAVE BEEN REMOVED AND RELOCATED TO THE NORTH TUNNEL BY CDOT.
11. FOR VMS/LUS MANAGEMENT SYSTEM, SEE SHEETS 20 TO 33.
12. FOR ADDITIONAL LEGEND AND ABBREVIATION, SEE SHEETS 12 AND 20 THRU 33.

LEGEND

- VMS • VARIABLE MESSAGE SIGN
- LUS • LANE USE SIGNAL
- TSCS • TRAFFIC SIGNAL CONTROL SYSTEM
- C-X • CONTROLLER
- CAB • CABINET
- BOS • BLANKOUT SIGN
- VMS-PXX • PORTAL VMS IDENTIFIER
- LUS-XX • LANE USE SIGNAL (LUS) IDENTIFIER
- LUS-PXX • PORTAL LUS IDENTIFIER
- MB-XX • EXISTING MESSAGE BOARD IDENTIFIER
- ▬ • TUNNEL VMS
- ═ • EXISTING TUNNEL VMS
- ■ • LUS
- □ • EXISTING LUS
- HP • HIGH POINT
- PGL • PAVING GRADE LEVEL
- PEP • PORCELAIN ENAMEL PANEL
- CONST. • CONSTRUCTION LEVEL
- LF • LINER FEET
- EA • EACH
- LS • LUMP SUM
- STA. • STATION

QUANTITIES - SOUTH TUNNEL VMS

ITEM NUMBER	DESCRIPTION	UNIT	ROADWAY PLAN	ROADWAY AS CONST.
	CONSTRUCTION			
614	VARIABLE MESSAGE SIGN LED (DOUBLE FACED)	EA	5	5
614	~~VARIABLE MESSAGE SIGN LED (DOUBLE FACED)~~	~~EA~~	(6)	6
614	VARIABLE MESSAGE SIGN LED (SINGLE FACED)	EA	1	0
614	~~VARIABLE MESSAGE SIGN LED (SINGLE FACED)~~	~~EA~~	(1)	0
614	LANE-USE CONTROL SIGNAL LED (SINGLE FACED)	EA	2	0
614	~~LANE-USE CONTROL SIGNAL LED (SINGLE FACED)~~	~~EA~~	(2)	0
614	LANE-USE CONTROL SIGNAL LED (DOUBLE FACED)	EA	14	14
614	~~LANE-USE CONTROL SIGNAL LED (DOUBLE FACED)~~	~~EA~~	(30)	30
614	CONTROLLER (TYPE 170E)	EA	8	8
614	~~CONTROLLER (TYPE 170E)~~	~~EA~~	(5)	5
614	RECESSED CONTROL CABINET	EA	11	11
614	SURFACE MOUNTED CONTROL CABINET	EA	2	2
614	LUS MOUNTING SUPPORT AND WIRING (DOUBLE FACED)	EA	44	44
614	VMS MOUNTING SUPPORT AND WIRING (DOUBLE FACED)	EA	11	11
614	VMS & LUS MOUNTING SUPPORT AND WIRING (SINGLE FACED)	EA	2	2
614	COMMUNICATIONS CABINET	EA	2	2
614	CABLE INNERDUCT (1 INCH)	LF	29,750	29,750
614	OPTICAL TRANSCEIVER CHASSIS	EA	1	1
614	OPTICAL TRANSCEIVER	EA	17	17
614	BUFFER TUBE FAN OUT KITS	EA	34	34
614	FIBER OPTIC CABLE (MULTI MODE) (6 STRANDS)	LF	21,000	21,000
614	FIBER OPTIC CABLE (MULTI MODE) (12 STRANDS)	LF	9,300	9,300
614	FIBER OPTIC TERMINATION PANEL-6 FIBER	EA	13	13
614	FIBER OPTIC TERMINATION PANEL-144 FIBER	EA	2	2
614	MASTER COMPUTER AND SOFTWARE	LS	1	1
614	VMS/LUS MANAGEMENT SOFTWARE	LS	1	
614	SYSTEM INTEGRATION AND TESTING	LS	1	

NOTES:
1. QUANTITIES IN PERENTHESIS (XXX) ARE FOR INFORMATION ONLY, NOT PART OF BID.
2. THE CROSSED OUT BOXES ARE TO BE ADDED TO THE CONTRACT IF THE FUNDS BECOME AVAILABLE.
3. VMS SYSTEMS FOR THE NORTH BORE WILL BE ADDED TO THE PROJECT IF THE FUNDS BECOME AVAILABLE.

Design File Name: DGNSPEC•
Plot File Name: $PLOTFILE•
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION		
CREATION DATE: 04/16/99	INITIALS: KS	
LAST MODIFICATION DATE: 05/05/99	INITIALS: LN	
FULL PATH: 14102\700CADD\713TRA\		
DRAWING FILE NAME: TTX01.DWG		
ACAD VER. R14 SCALE: NTS	UNITS: English	

SHEET REVISIONS		

COLORADO DEPARTMENT OF TRANSPORTATION
DOT DEPARTMENT OF TRANSPORTATION
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DUMONT, CO. 80436
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REGION 1 MOUNTAIN RESIDENCY W. W.G.

AS CONSTRUCTED
NO REVISIONS:
REVISED: 01/10/03
VOID:

VMS
GENERAL NOTES

DESIGNER: K HO | STRUCTURE NUMBERS:
DETAILER: E. MCCHESNEY
SHEET SUBSET: VMS | SUBSET SHEETS: 1 OF 33

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 125

SIGN SCHEDULE

LOCATION	LUS	VMS	MOUNTING & WIRING (BETWEEN SIGN & CONTROLLER)	VMS CONTROLLER 170E	CONTROL CABINET	FIBEROPTIC TERMINATION PANEL	FIBEROPTIC TRANSCEIVER	FO PRIMARY RING OUT SECONDARY RING IN		FO PRIMARY RING IN, SECONDARY RING OUT	
								CABLE	FIBERS	CABLE	FIBERS
*STA. 35+97	LUS-P1A, P1B	VMS-P1	INCLUDED IN CONTRACT	C-1*	CAB-1*	INCLUDED IN CONTRACT	INCLUDED IN CONTRACT	3	1,2	5	1,2
STA. 38+02	LUS-1A, 1B (NIC)	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 40+70	—	VMS-1 (NIC)	INCLUDED IN CONTRACT	C-2 (NIC)	CAB-2	INCLUDED IN CONTRACT	INCLUDED IN CONTRACT	4	1,2	5	5,6
STA. 43+38	LUS-2A, 2B	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 46+06	LUS-3A, 3B (NIC)	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 48+71	—	VMS-2	INCLUDED IN CONTRACT	C-3	CAB-3	INCLUDED IN CONTRACT	INCLUDED IN CONTRACT	3	3,4	5	3,4
STA. 51+42	LUS-4A, 4B	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 54+10	LUS-5A, 5B (NIC)	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 56+81	—	VMS-3 (NIC)	INCLUDED IN CONTRACT	C-4 (NIC)	CAB-4	INCLUDED IN CONTRACT	INCLUDED IN CONTRACT	4	3,4	5	7,8
STA. 59+46	LUS-6A, 6B (NIC)	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 62+14	LUS-7A, 7B (NIC)	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 64+81	—	VMS-4	INCLUDED IN CONTRACT	C-5	CAB-5	INCLUDED IN CONTRACT	INCLUDED IN CONTRACT	3	1,2	5	1,2
STA. 67+50	LUS-8A, 8B	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 70+18	LUS-9A, 9B (NIC)	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 72+90	—	VMS-5 (NIC)	INCLUDED IN CONTRACT	C-6 (NIC)	CAB-6	INCLUDED IN CONTRACT	INCLUDED IN CONTRACT	4	1,2	5	5,6
STA. 75+54	LUS-10A, 10B (NIC)	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 78+22	LUS-11A, 11B (NIC)	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 80+84	—	VMS-6	INCLUDED IN CONTRACT	C-7	CAB-7	INCLUDED IN CONTRACT	INCLUDED IN CONTRACT	3	3,4	5	3,4
STA. 83+58	LUS-12A, 12B	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 86+26	LUS-13A, 13B (NIC)	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 89+00	—	VMS-7 (NIC)	INCLUDED IN CONTRACT	C-8 (NIC)	CAB-8	INCLUDED IN CONTRACT	INCLUDED IN CONTRACT	4	3,4	5	7,8
STA. 91+62	LUS-14A, 14B (NIC)	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 94+30	LUS-15A, 15B (NIC)	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 97+00	—	VMS-8	INCLUDED IN CONTRACT	C-9	CAB-9	INCLUDED IN CONTRACT	INCLUDED IN CONTRACT	3	1,2	5	1,2
STA. 99+66	LUS-16A, 16B	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 102+34	LUS-17A, 17B (NIC)	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 105+03	—	VMS-9 (NIC)	INCLUDED IN CONTRACT	C-10 (NIC)	CAB-10	INCLUDED IN CONTRACT	INCLUDED IN CONTRACT	4	1,2	5	5,6
STA. 107+70	LUS-18A, 18B (NIC)	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 110+38	LUS-19A, 19B (NIC)	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 113+04	—	VMS-10	INCLUDED IN CONTRACT	C-11	CAB-11	INCLUDED IN CONTRACT	INCLUDED IN CONTRACT	3	3,4	5	3,4
STA. 115+74	LUS-20A, 20B	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 118+42	LUS-21A, 21B (NIC)	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 121+30	—	VMS-11 (NIC)	INCLUDED IN CONTRACT	C-12	CAB-12	INCLUDED IN CONTRACT	INCLUDED IN CONTRACT	4	3,4	5	7,8
STA. 123+78	LUS-22A, 22B	—	INCLUDED IN CONTRACT	—	—	—	—	—	—	—	—
STA. 125+57	LUS-P2A, P2B (NIC)	VMS-P2 (NIC)	INCLUDED IN CONTRACT	C-13 (NIC)	CAB-13	INCLUDED IN CONTRACT	INCLUDED IN CONTRACT	3	1,2	5	1,2

NIC = NOT IN CONTRACT

* TO BE INSTALLED IN THE WEST PORTAL ELECTRIC ROOM

Design File Name: DGNSPEC=
Plot File Name: $PLOTFILE=
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION		
CREATION DATE: 4/16/99	INITIALS:	N
LAST MODIFICATION DATE: 6/05/99	INITIALS:	GS
FULL PATH: 014102\700CADD\713TRA\		
DRAWING FILE NAME: SGDT13.DWG		
ACAD VER. R14 SCALE: NTS	UNITS:	ENGLISH

SHEET REVISIONS		

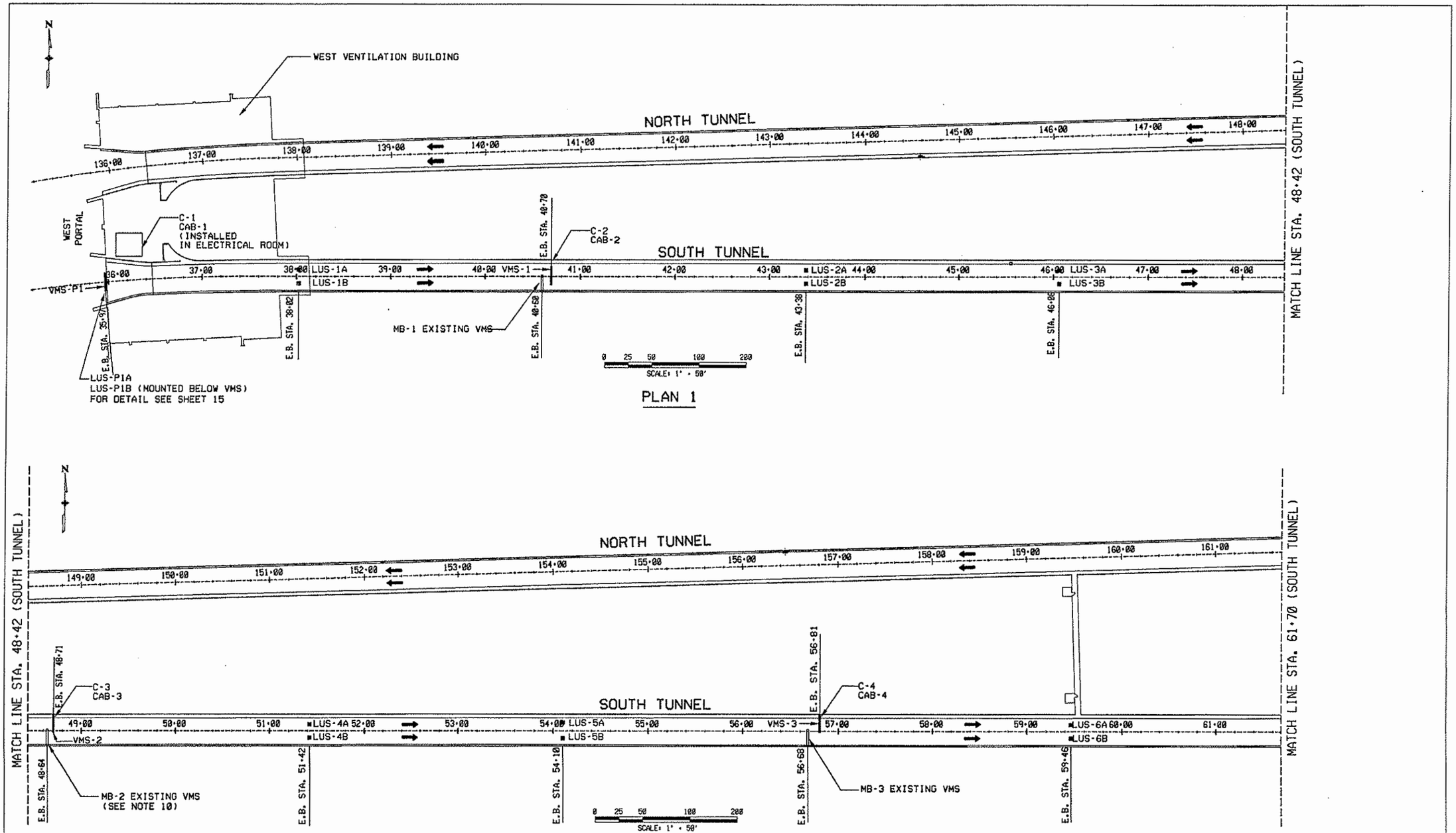
COLORADO DEPARTMENT OF TRANSPORTATION
DOT
P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W. W. G.

AS CONSTRUCTED
NO REVISIONS: 01/10/03
REVISED:
VOID:

TABULATION OF SIGNS

DESIGNER: K. HO
DETAILER: K. J. SINGH
SHEET SUBSET: VMS
STRUCTURE NUMBERS
SUBSET SHEETS: 2 OF 33

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 126



PLAN 2

Design File Name: DGNSPEC\
Plot File Name: $PLOTFILE$
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION		
CREATION DATE: 4/16/99		INITIALS: LN
LAST MODIFICATION DATE: 5/05/99		INITIALS: TR
FULL PATH:	014102\700CADD\713TRA\	
DRAWING FILE NAME: SGPL01.DWG		
ACAD VER. R14	SCALE: 1" = 50'-0"	UNITS: ENGLISH

SHEET REVISIONS		

COLORADO DEPARTMENT OF TRANSPORTATION

DOT DEPARTMENT OF TRANSPORTATION

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DUMONT, CO. 80436
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REGION 1 MOUNTAIN RESIDENCY W. W. G.

AS CONSTRUCTED

NO REVISIONS: 01/10/03

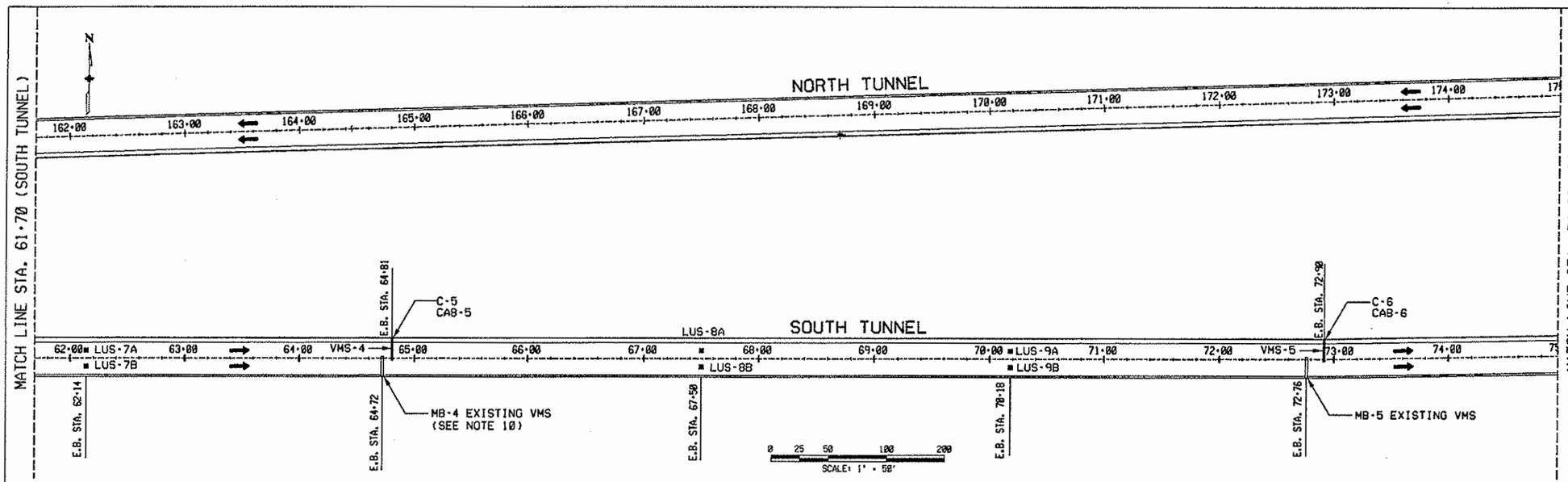
REVISED:

VOID:

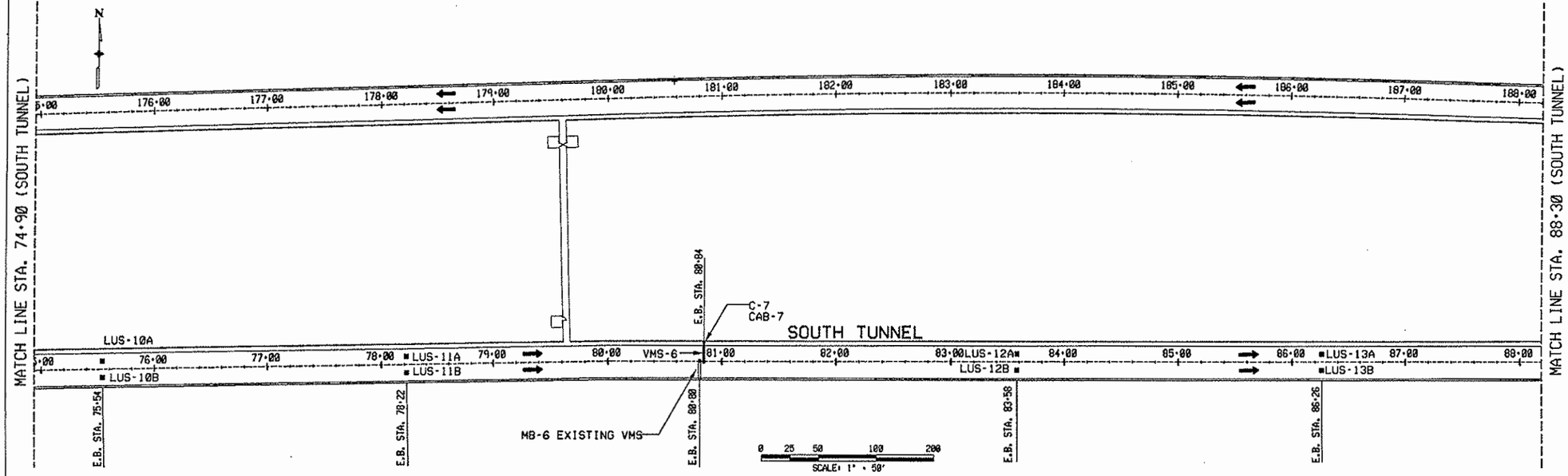
SOUTH TUNNEL VMS & LUS PLAN

DESIGNER: K. HO
DETAILER: E. MCCHESNEY
SHEET SUBSET: VMS
STRUCTURE NUMBERS:
SUBSET SHEETS: 3 OF 33

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 127



PLAN 1



PLAN 2

Design File Name: DGNSPEC=
Plot File Name: $PLOTFILE=
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION		
CREATION DATE: 4/16/99	INITIALS:	
LAST MODIFICATION DATE: 5/05/99	INITIALS:	
FULL PATH: 014102\700CADD\713TRA\		
DRAWING FILE NAME: SGPL02.DWG		
ACAD VER. R14 SCALE: 1" = 50'-0" UNITS: ENGLISH		

SHEET REVISIONS		

COLORADO DEPARTMENT OF TRANSPORTATION
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P.O. BOX 399
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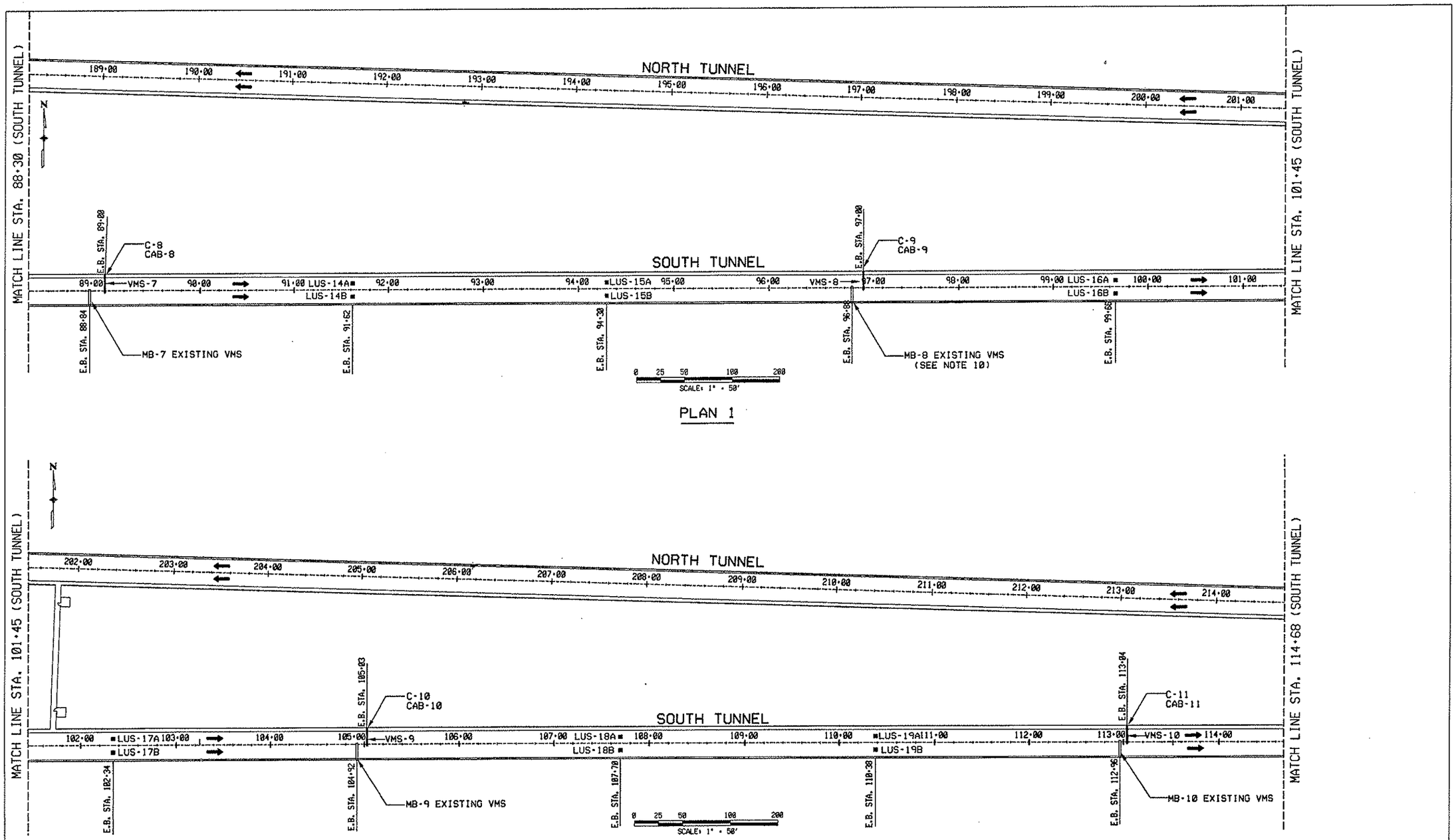
REGION 1 MOUNTAIN RESIDENCY W. W. G.

AS CONSTRUCTED	
NO REVISIONS: 01/10/03	
REVISED:	
VOID:	

SOUTH TUNNEL VMS & LUS PLAN			
DESIGNER: K. HO	STRUCTURE NUMBERS		PROJECT NO./CODE
DETAILER: E. MCCHESNEY			IM 0703-264
SHEET SUBSET: VMS	SUBSET SHEETS: 4 OF 33		12982
		SHEET NUMBER	128



Design File Name: DGN$SPEC$
Plot File Name: $PLOTFILE$
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION		
CREATION DATE: 4/16/99		INITIALS: N
LAST MODIFICATION DATE: 05/99		INITIALS: R
FULL PATH: 014102\700CAOD\713TRA\		
DRAWING FILE NAME: SGPL03.DWG		
ACAD VER. R14	SCALE: 1" = 50'-0"	UNITS: ENGLISH

SHEET REVISIONS		

COLORADO DEPARTMENT OF TRANSPORTATION
CDOT DEPARTMENT OF TRANSPORTATION
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DUMONT, CO. 80436
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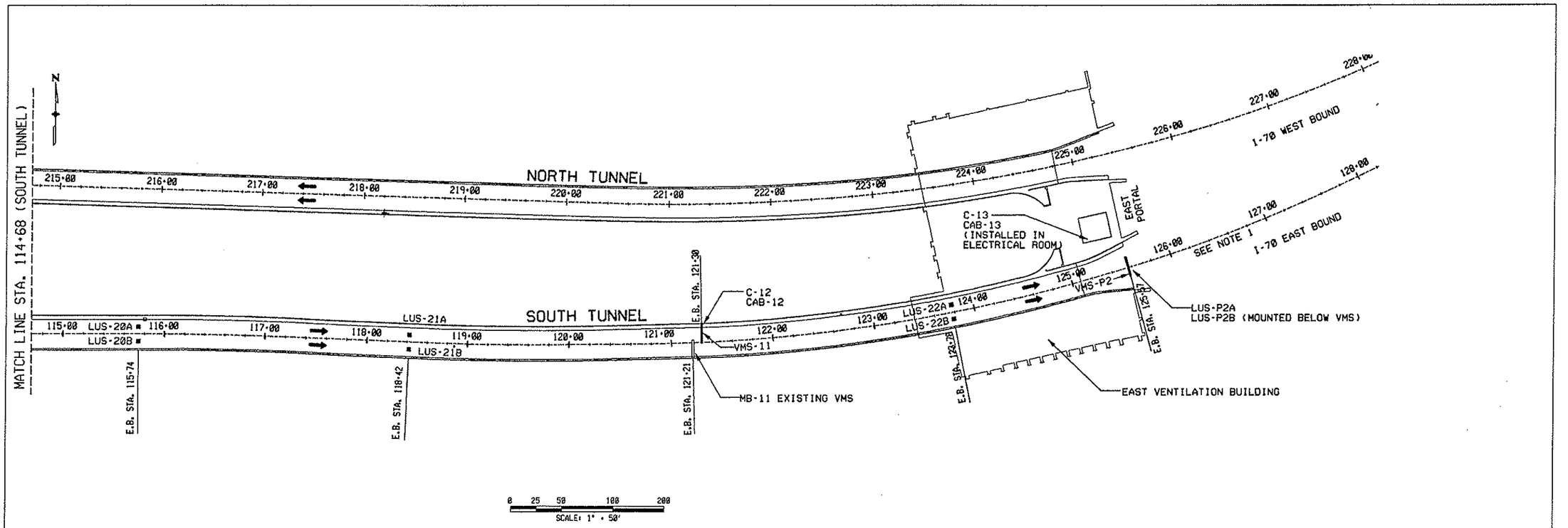
REGION 1 MOUNTAIN RESIDENCY W. W. G.

AS CONSTRUCTED	
NO REVISIONS: 01/10/03	
REVISED:	
VOID:	

SOUTH TUNNEL VMS & LUS PLAN

DESIGNER: K. HO		STRUCTURE NUMBERS	
DETAILER: E. MCCHESNEY			
SHEET SUBSET: VMS	SUBSET SHEETS: 5 OF 33		SHEET NUMBER 129

PROJECT NO./CODE
IM 0703-264
12982



PLAN 1

Design File Name: DGNSSPEC
Plot File Name: $PLOTFILE$
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION			
CREATION DATE: 4/16/99	INITIALS:	KLN	
LAST MODIFICATION DATE: 05/05/99	INITIALS:	STR	
FULL PATH: 014102\700CADD\713TRA\			
DRAWING FILE NAME: SGPL04.DWG			
ACAD VER. R14 SCALE:1" = 50'-0"	UNITS:	ENGLISH	

SHEET REVISIONS		

COLORADO DEPARTMENT OF TRANSPORTATION
DOT DEPARTMENT OF TRANSPORTATION
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DUMONT, CO. 80436
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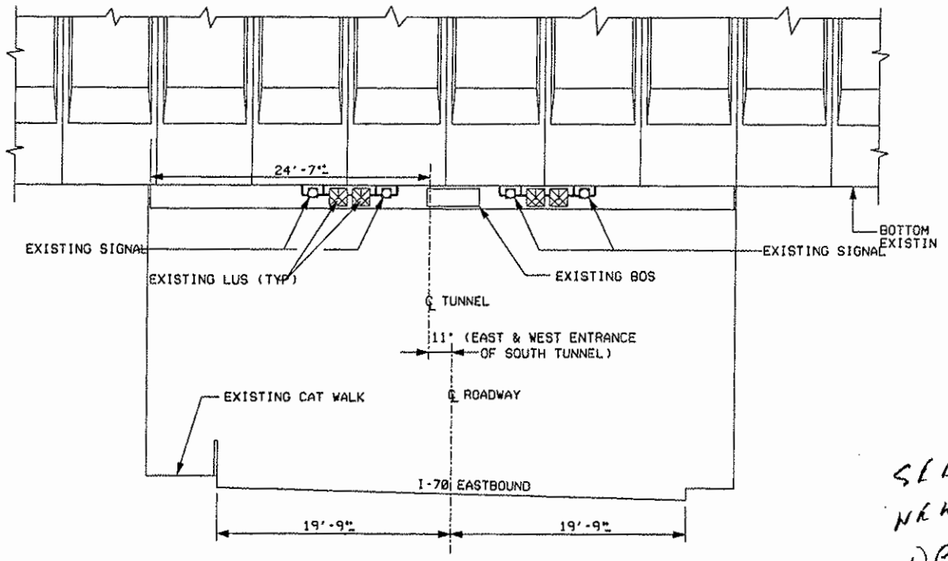
REGION 1 MOUNTAIN RESIDENCY W. W.G.

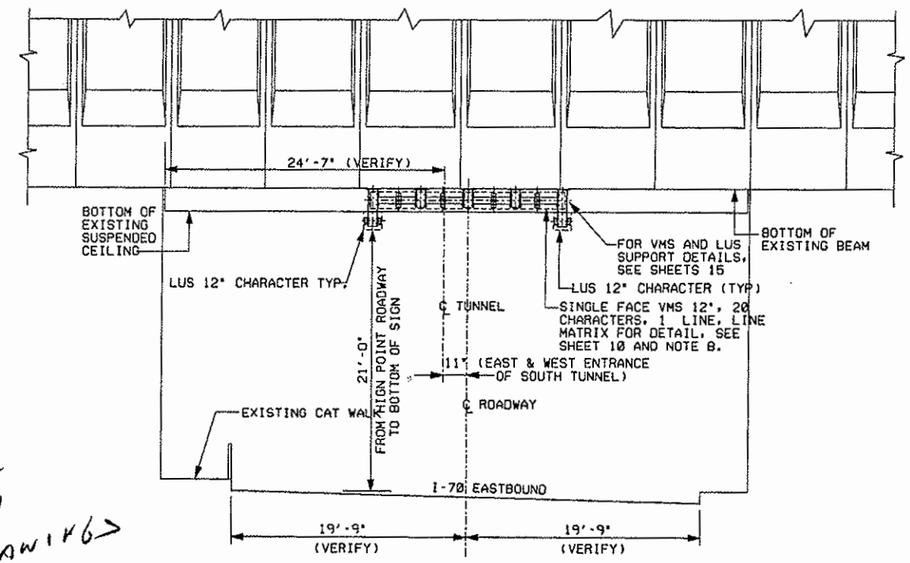
AS CONSTRUCTED	
NO REVISIONS: 01/10/03	
REVISED:	
VOID:	

SOUTH TUNNEL VMS & LUS PLAN		
DESIGNER: K. HO	STRUCTURE NUMBERS	
DETAILER: E. MCCHESNEY		
SHEET SUBSET: VMS	SUBSET SHEETS: 6 OF 33	

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 130



ELEVATION-SOUTH TUNNEL
EXISTING WEST PORTAL FACE BOS, LUS AND SIGNAL FACE-LOOKING EAST
SCALE: NTS



ELEVATION-SOUTH TUNNEL
WEST PORTAL FACE VMS AND LUS-LOOKING EAST
EAST PORTAL FACE VMS AND LUS (SUPPORT SYSTEM SIMILAR)
SCALE: NTS

NOTES:

A. EXISTING WEST PORTAL FACE BOS, LUS AND SIGNAL FACES INCLUDED MOUNTING & WIRING TO BE REMOVED BY CONTRACTOR AND BECOME PROPERTY OF CDOT.

B. WEST PORTAL INCLUDE VMS, LUS MOUNTING AND SUPPORT SYSTEM. EAST PORTAL INCLUDE SUPPORT SYSTEM ONLY.

Design File Name: DGNSPEC
Plot File Name: $PLOTFILE$
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION			SHEET REVISIONS		
CREATION DATE: 4/16/99		INITIALS: LN			
LAST MODIFICATION DATE: 04/06/99		INITIALS: JS			
FULL PATH: 014102\700CADD\713TRA\					
DRAWING FILE NAME: SCDT11.DWG					
ACAD VER. R14	SCALE: NTS	UNITS: ENGLISH			

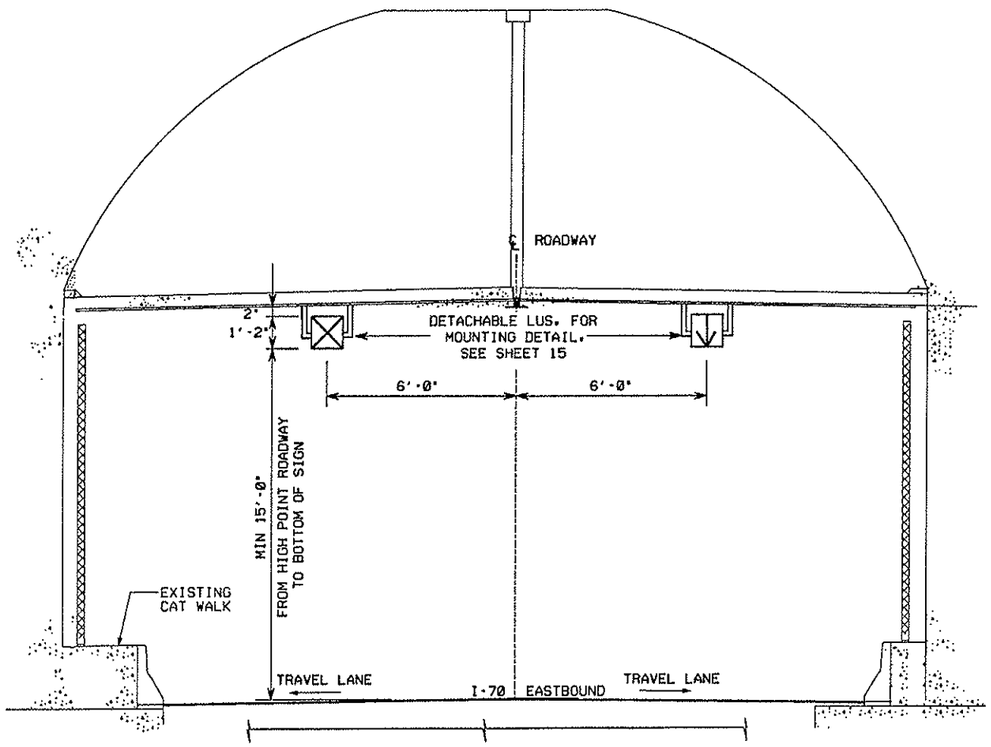
COLORADO DEPARTMENT OF TRANSPORTATION
DEPARTMENT OF TRANSPORTATION
P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W.G.

AS CONSTRUCTED
NO REVISIONS:
REVISED:
VOID:

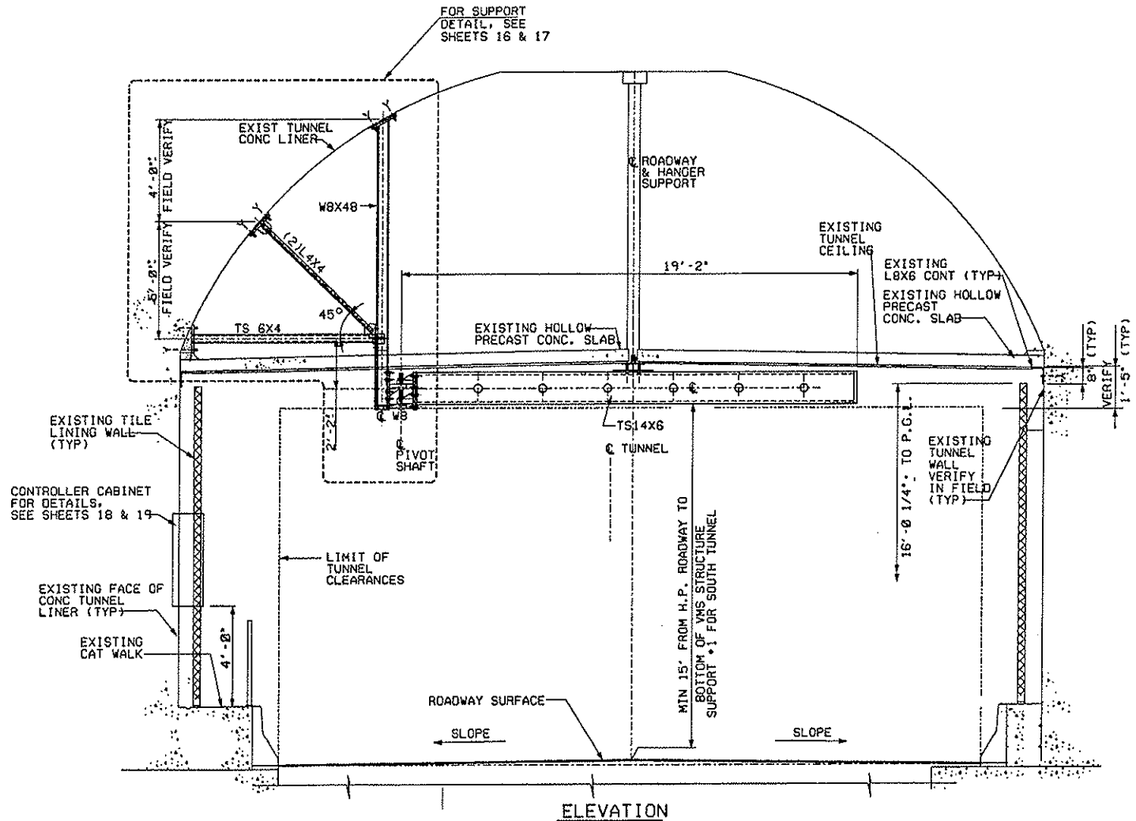
ELEVATION
PORTAL FACE VMS & LUS

DESIGNER: K. HO
DETAILER: K. J. SINGH
STRUCTURE NUMBERS
SHEET SUBSET: VMS
SUBSET SHEETS: 7 OF 33

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 131



SOUTH TUNNEL
TYPICAL TUNNEL LUS (DOUBLE FACE) SIGN ELEVATION
LOOKING EAST
SCALE: NTS



ELEVATION
SOUTH TUNNEL
TUNNEL DOUBLE FACE VMS SIGN SUPPORT #1
LOOKING EAST
SCALE: NTS

NOTE:

A. FOR VMS MESSAGE BOARD TO BE INSTALLED IN THIS CONTRACT, SEE SHEET 2.

Design File Name: DGNSPEC
Plot File Name: $PLOTFILE$
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION		
CREATION DATE: 4/20/99		INITIALS: BR
LAST MODIFICATION DATE: 05/05/99		INITIALS: SS
FULL PATH: 014102\700CADD\713TRA\		
DRAWING FILE NAME: SGDT12.DWG		
ACAD VER. R14	SCALE: NTS	UNITS: ENGLISH

SHEET REVISIONS		

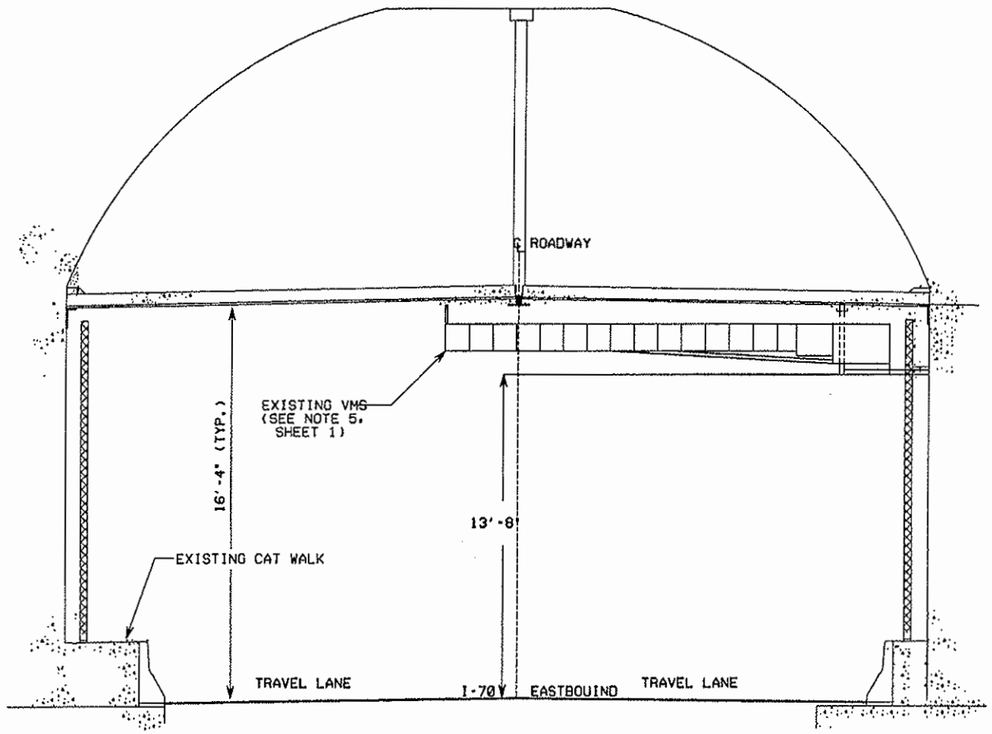
COLORADO DEPARTMENT OF TRANSPORTATION
DOT DEPARTMENT OF TRANSPORTATION
P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W. W. G.

AS CONSTRUCTED	
NO REVISIONS: 1/10/03	
REVISED:	
VOID:	

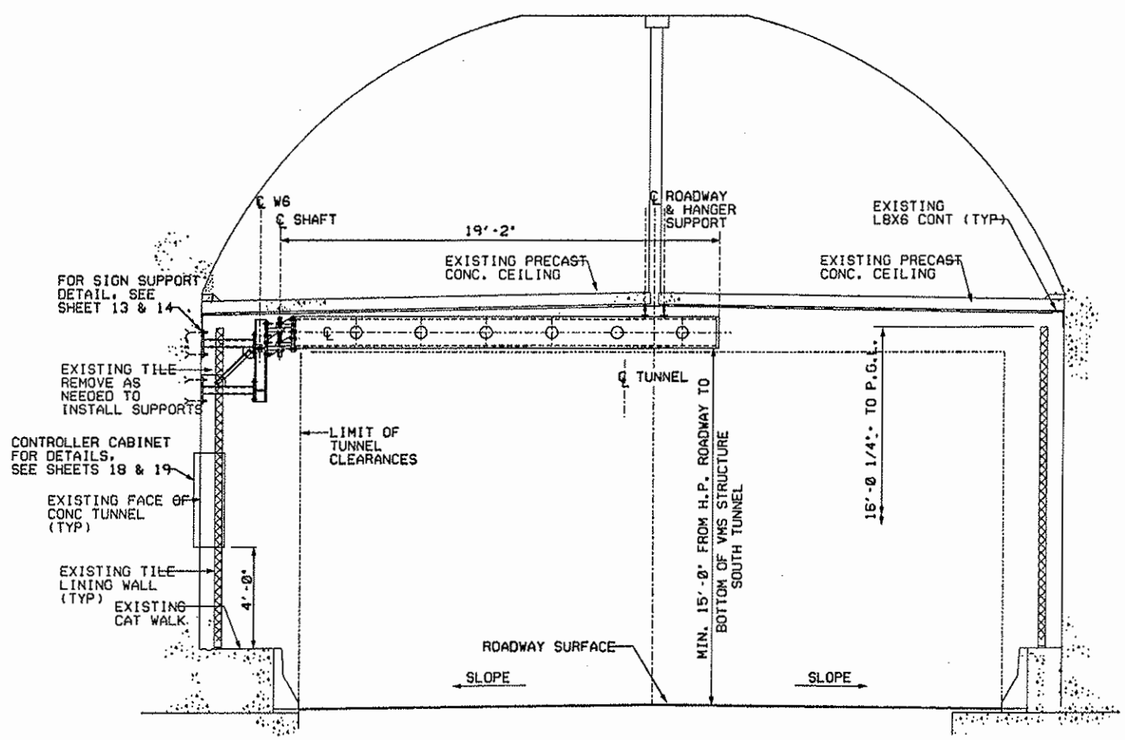
TUNNEL LUS/VMS ELEVATION

DESIGNER: K. HO	STRUCTURE NUMBERS	
DETAILER: K. J. SINGH		
SHEET SUBSET: VMS	SUBSET SHEETS: 8 OF 33	

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 132



SOUTH TUNNEL
EXISTING VMS (SINGLE FACE) SIGN ELEVATION
LOOKING EAST
SCALE: NTS



SOUTH TUNNEL
VMS DOUBLE FACE SIGN ELEVATION
LOOKING EAST
SCALE: NTS

NOTES:

A. FOR VMS MESSAGE BOARD TO BE INSTALLED IN THIS CONTRACT, SEE SHEET 2.

Design File Name: DGNSSPEC
Plot File Name: $PLOTFILE
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION		
CREATION DATE: 4/20/99		INITIALS:
LAST MODIFICATION DATE: 04/26/99		INITIALS: ER
FULL PATH: 014102\700CADD\713TRA\		
DRAWING FILE NAME: SGDT03.DWG		
ACAD VER. R14	SCALE: NTS	UNITS: ENGLISH

SHEET REVISIONS		

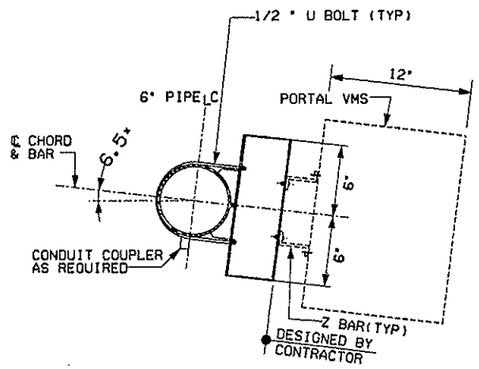
COLORADO DEPARTMENT OF TRANSPORTATION
DOT
DEPARTMENT OF TRANSPORTATION
P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W. W. G.

AS CONSTRUCTED
NO REVISIONS: 1/10/03
REVISED:
VOID:

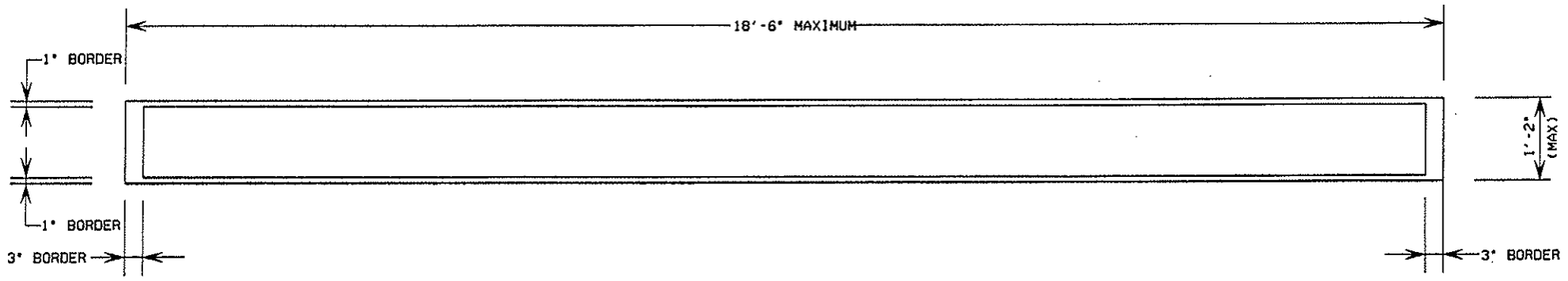
TUNNEL VMS ELEVATION

DESIGNER: K. HO		STRUCTURE NUMBERS	
DETAILER: E. MCCHESNEY			
SHEET SUBSET: VMS	SUBSET SHEETS: 9 OF 33		SHEET NUMBER 133

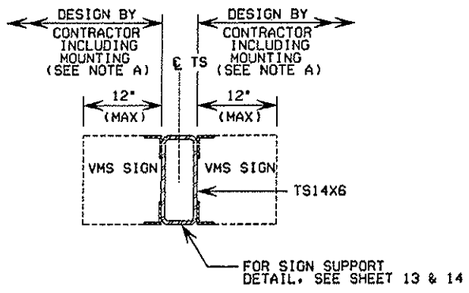
PROJECT NO./CODE
IM 0703-264
12982



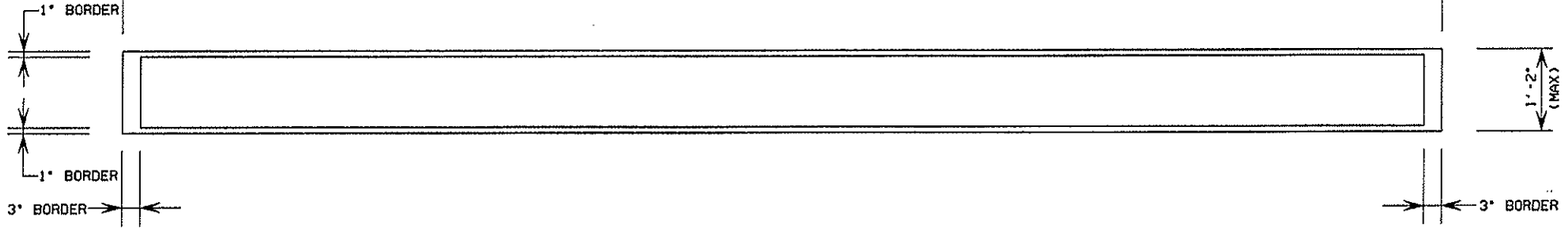
SIDE VIEW
SCALE: NTS



FRONT VIEW ELEVATION
PORTAL FACE VMS - 12", 20 CHARACTERS, 1 LINE, LINE MATRIX
(SINGLE FACE)
SCALE: NTS



SIDE VIEW
SCALE: NTS



FRONT VIEW ELEVATION
TUNNEL VMS - 12", 20 CHARACTERS, 1 LINE, LINE MATRIX
(DOUBLE FACE)
SCALE: NTS

NOTES:

A. CONTRACTOR IS RESPONSIBLE FOR DESIGN, FABRICATE AND INSTALL VMS SIGN BOARD AS PER CONTRACT DOCUMENTS.

B. FOR LOCATION OF VMS MESSAGE BOARD TO BE INSTALLED IN THIS CONTRACT, SEE SIGN TABULATION SHEET 2.

Design File Name: DGN$SPEC$
Plot File Name: $PLOTFILE$
Date of Plot: $$$$DATE$$$$

COMPUTER FILE INFORMATION		
CREATION DATE: 4/20/99		INITIALS: G
LAST MODIFICATION DATE: 11/05/99		INITIALS: N
FULL PATH: Ø14102\700CADD\713TRA\		
DRAWING FILE NAME: SGDT09.DWG		
ACAD VER. R14	SCALE: NTS	UNITS: ENGLISH

SHEET REVISIONS		

COLORADO DEPARTMENT OF TRANSPORTATION

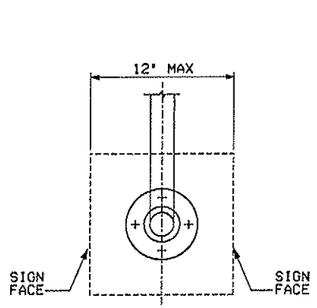
CDOT DEPARTMENT OF TRANSPORTATION
P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775
REGION 1 MOUNTAIN RESIDENCY W.W.G.

AS CONSTRUCTED	
NO REVISIONS: 01/10/03	
REVISED:	
VOID:	

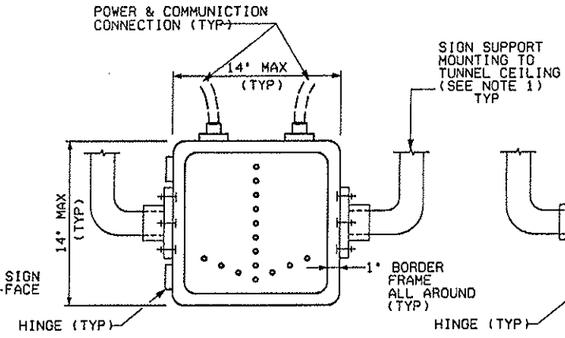
VMS SIGN
FACE LAYOUT DETAILS

DESIGNER:	STRUCTURE NUMBERS:	
DETAILER:		
SHEET SUBSET: VMS	SUBSET SHEETS: 10 OF 33	

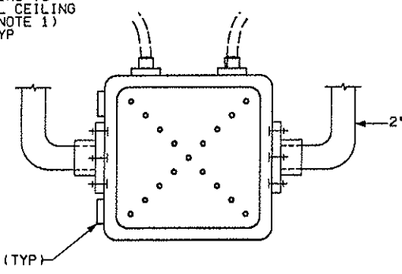
PROJECT NO./CODE
IM Ø703-264
12982
SHEET NUMBER 134



SIDE VIEW



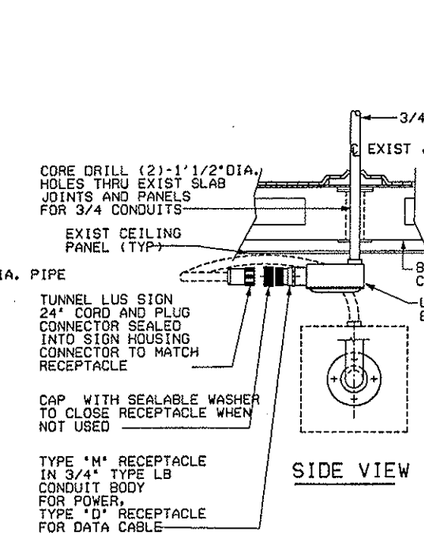
GREEN DISPLAY COLOR
FRONT VIEW



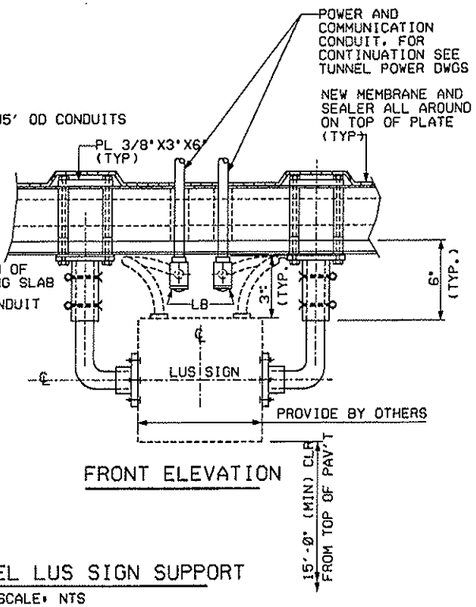
RED DISPLAY COLOR
FRONT VIEW

TYP. TUNNEL LANE USE SIGNAL (LUS)
12' CHARACTER (DOUBLE FACE)

SCALE: NTS



SIDE VIEW

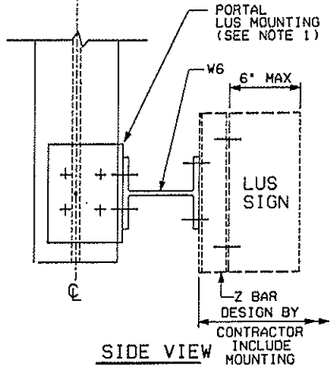


FRONT ELEVATION

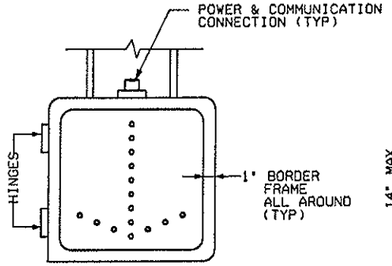
TYPICAL TUNNEL LUS SIGN SUPPORT

SCALE: NTS

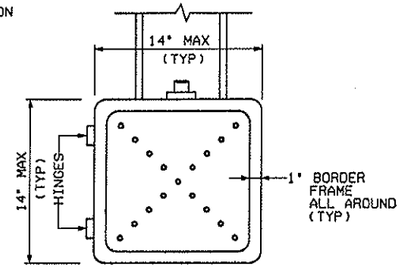
℄ POST



SIDE VIEW



GREEN DISPLAY COLOR
FRONT VIEW



RED DISPLAY COLOR
FRONT VIEW

TYP. PORTAL FACE LANE USE SIGNAL (LUS)
12'CHARACTER (SINGLE FACE)

SCALE: NTS

NOTES:

A. CONTRACTOR IS RESPONSIBLE TO DESIGN, FABRICATE AND INSTALL AS PER CONTRACT DOCUMENTS.

B. FOR LUS LOCATIONS TO BE INSTALLED IN THIS CONTRACT, SEE SIGN TABULATION SHEET 2.

Design File Name: DGNSPEC=
Plot File Name: $PLOTFILE=
Date of Plot: $$$DATE=$$$

COMPUTER FILE INFORMATION		
CREATION DATE: 4/21/99		INITIALS: JR
LAST MODIFICATION DATE: 5/5/99		INITIALS: JS
FULL PATH: 014102\700CADD\713TRA\		
DRAWING FILE NAME: SGDT22.DWG		
ACAD VER. R14	SCALE: NTS	UNITS: ENGLISH

SHEET REVISIONS		

COLORADO DEPARTMENT OF TRANSPORTATION

P.O. BOX 399
DUMONT, CO. 80436
PHONE: 303-512-5750 FAX: 303-512-5775

REGION 1 MOUNTAIN RESIDENCY W. W. G.

AS CONSTRUCTED

NO REVISIONS: 01/10/03	
REVISED:	
VOID:	

LUS SIGN FACE LAYOUT & POWER CONNECTION DETAILS

DESIGNER: K. HO		STRUCTURE NUMBERS	
DETAILER: E. MCCHESNEY			
SHEET SUBSET: MS	SUBSET SHEETS: 11 OF 33		

PROJECT NO./CODE
IM 0703-264
12982
SHEET NUMBER 135

STRUCTURAL NOTES

SPECIFICATIONS AND CODES

SPECIFICATIONS:

STRUCTURAL DESIGN: AASHTO "STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS," 1985 AS REVISED BY INTERIM SPECIFICATIONS–BRIDGES 1986–1989, 1991, 1993 AND 1994.

CONSTRUCTION: COLORADO DOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION 1991 AS REVISED BY SUPPLEMENTAL SPECIFICATIONS 1996, THE PROJECT CONSTRUCTION DRAWINGS, SPECIFICATIONS AND SPECIAL PROVISIONS.

WELDING:

1. AWS D1.1–94 STRUCTURAL WELDING CODE.
2. ALL AREAS TO BE WELDED SHALL BE GROUND TO BRIGHT METAL. NO BUTT WELD SPLICES WILL BE PERMITTED.

STRUCTURAL DESIGN CRITERIA

1. THE DESIGN OF SIGN AND EQUIPMENT SUPPORTS ARE IN ACCORDANCE WITH THE WORKING STRESS METHOD.

2. DESIGN LOADS:

   A. WIND LOADS:

   60 MPH DESIGN BASIC WIND SPEED (TUNNEL INSIDE)
   80 MPH DESIGN BASIC WIND SPEED (TUNNEL PORTAL)

   B. DEAD LOADS:

   IN ADDITION TO THE SELF–WEIGHT OF THE STRUCTURAL SUPPORT, THE FOLLOWING MAJOR DEAD LOAD HAS BEEN INCLUDED

DOUBLE FACED VMS SIGN AND HARDWARE (TUNNEL)	1,600 LBS
SINGLE FACED VMS SIGN AND HARDWARE (PORTAL)	900 LBS
DOUBLE FACED LUS SIGN AND HARDWARE (TUNNEL)	50 LBS

   C. EARTHQUAKE:

   SEISMIC PERFORMANCE CATEGORY A REQUIREMENTS U.S.A. ACCORDING FOR BRIDGES – AASTHO STANDARD SPECIFICATIONS FOR BRIDGES–1996.

3. DESIGN STRENGTHS:

   MATERIAL DESIGN STRENGTHS SHALL CONFORM TO THE FOLLOWING REQUIREMENTS:

   A. STRUCTURAL STEEL:

PIPE (ROUND):	ASTM A 53, EXTRA STRONG, WELDED AND SEAMLESS STEEL PIPE
TUBE:	ASTM A 847
BARS, PLATES AND SHAPES:	AASHTO M270, ASTM DESIGNATION A 36
ANCHOR ROD:	ASTM A 193, GRADE B7. STEEL.
PIN OR SHAFT:	ASTM A 193, GRADE B7. STEEL.
HIGH STRENGTH STEEL BOLTS, NUTS AND WASHERS:	ASTM A 325 SC SHALL CONFORM TO THE PROVISIONS OF COLORADO DOT SPECIFICATION SECTION 509.28.

   B. ALL TUBE AND PIPE MEMBER SHALL BE HOT–DIP GALVANIZED AS PER ASTM A 123.

   C. STRUCTURAL STEEL, NUTS, BOLTS AND WASHERS FOR SIGN STRUCTURES SHALL BE GALVANIZED AFTER FABRICATION AS PER ASTM A 123 OR ASTM A 153 AS APPROPRIATE, AND SHALL NOT BE PAINTED.

4. CLEARANCES: ALL SIGNS, EQUIPMENT AND SUPPORT STRUCTURES SHALL BE INSTALLED TO PROVIDE A MINIMUM VERTICAL CLEARANCE FROM THE ROADWAY AS SHOWN ON THE CONTRACT PLANS AND ELEVATIONS.

5. ALL MATERIAL, FABRICATIONS, AND ATTACHMENT OF FIXED ALUMINUM SHALL CONFORM TO CURRENT EDITION OF AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR CDOT HIGHWAY SIGNS, LUMINAIRE AND TRAFFIC SIGNALS, UNLESS OTHERWISE SHOWN ON THESE CONTRACT DOCUMENTS.

6. FOR PAY ITEMS, QUANTITIES, AND GENERAL NOTES SEE VMS SUBSET SHEET 1.

7. CAULKING AND SEALER MATERIAL FOR TILE WALLS AND P.E.P. CEILING SHALL BE POLYURETHANE, ELASTOMERIC, NON–SAG SEALANT, CONFORM TO ASTM C 920, TYPE M, GRADE NS, CLASS 25, USE NT OR APPROVED EQUAL.

8. ALL GROUT SHALL BE EPOXY NON–SHRINK, NON–METALLIC GROUT UNLESS OTHERWISE NOTED.

9. ALL MEMBRANES SHALL CONSIST OF RUBBERIZED ASPHALT BONDED TO POLYETHYLENE SHEETING. SHEET MEMBRANE WILL BE SEALED WITH FILLET AND FLASHING MASTIC AROUND ENTIRE PERIMETER OF NEW SHEET.

ABBREVIATIONS

ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS	GALV.	GALVANIZED	R	RADIUS
AWS	AMERICAN WELDING STANDARD	HEX	HEXAGON	REINF	REINFORCEMENT
&	AND	H.P.	HIGH POINT	RD.	ROAD
@	AT	HORIZ	HORIZONTAL	REQ'D	REQUIRED
B.C.	BOLT CIRCLE	LBS	POUNDS	SQ.	SQUARE
B.S.	BOTH SIDE	LS	LUMPSUM	S.S.	STAINLESS STEEL
CJP	COMPLETE JOINT PENETRATION	LG	LONG	STD	STANDARD
CL	CLEAR, CLEARANCE	LUS	LANE USAGE SIGNAL	STA	STATION
CONC.	CONCRETE	MAX	MAXIMUM	STIFF	STIFFNESS
CONT.	CONTINUOUS	MIN	MINIMUM	TS	TUBE STEEL
CY	CUBIC YARD	MANUF	MANUFACTURE	TYP	TYPICAL
℄	CENTERLINE	MAT'L	MATERIAL	THK	THICK
C/C	CENTER TO CENTER	NTS	NOT TO SCALE	VMS	VARIABLE MESSAGE SIGN
DEG	DEGREE	NO. or #	NUMBER	WA	WEDGE ANCHOR
DWG	DRAWING	PL or ℗	PLATE	XS	EXTRA STRONG
DIA	DIAMETER	PCF	POUNDS PER CUBIC FOOT		
EA	EACH	PSF	POUNDS PER SQUARE FOOT		
EXIST	EXISTING	PSI	POUNDS PER SQUARE INCH		
FT	FEET	PEP	PORCELAIN ENAMELED PANEL		
FDN	FOUNDATION	PGL	PAVING GRADE LEVEL		
		PAV'T	PAVEMENT		

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Sheet Revisions		

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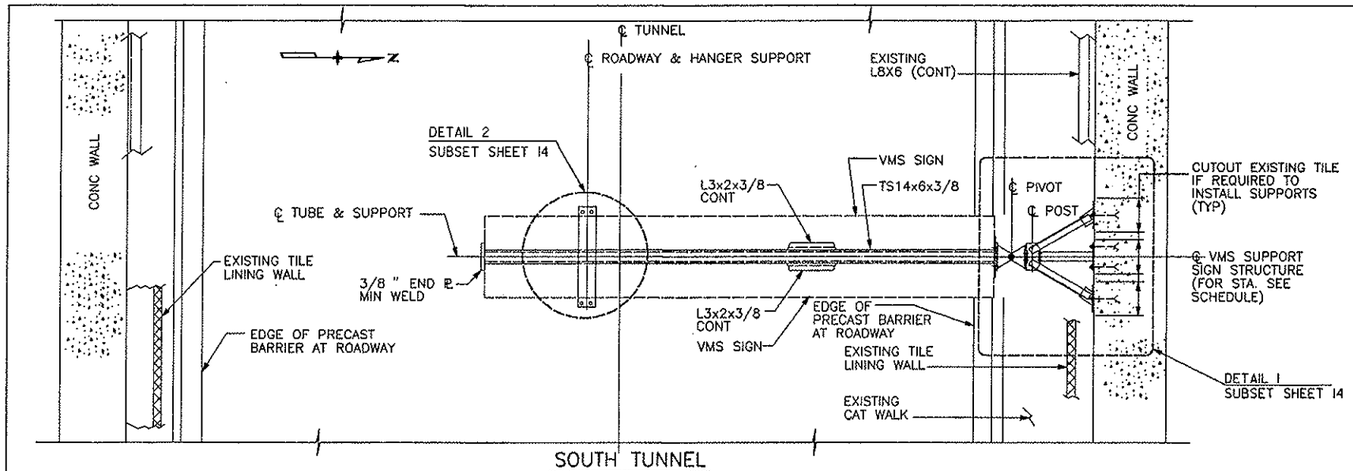
Region 1 Mountain Residency W.W.G.

As Constructed	
No Revisions: 01/10/03	
Revised:	
Void:	

VMS SIGN SUPPORT STRUCTURAL NOTES

Designer: NHP		Structure Numbers	
Detailer: RAM			
Sheet Subset: VMS	Subset Sheets: 12 OF 33		

Project No./Code
IM 0703–264
12982
Sheet Number 136

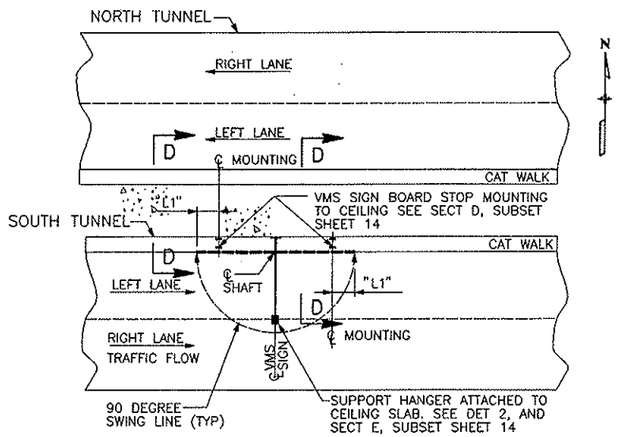


SOUTH TUNNEL

TYPICAL TUNNEL DOUBLE FACE VMS SIGN SUPPORT PLAN

(STRUCTURES 2 THRU 11)

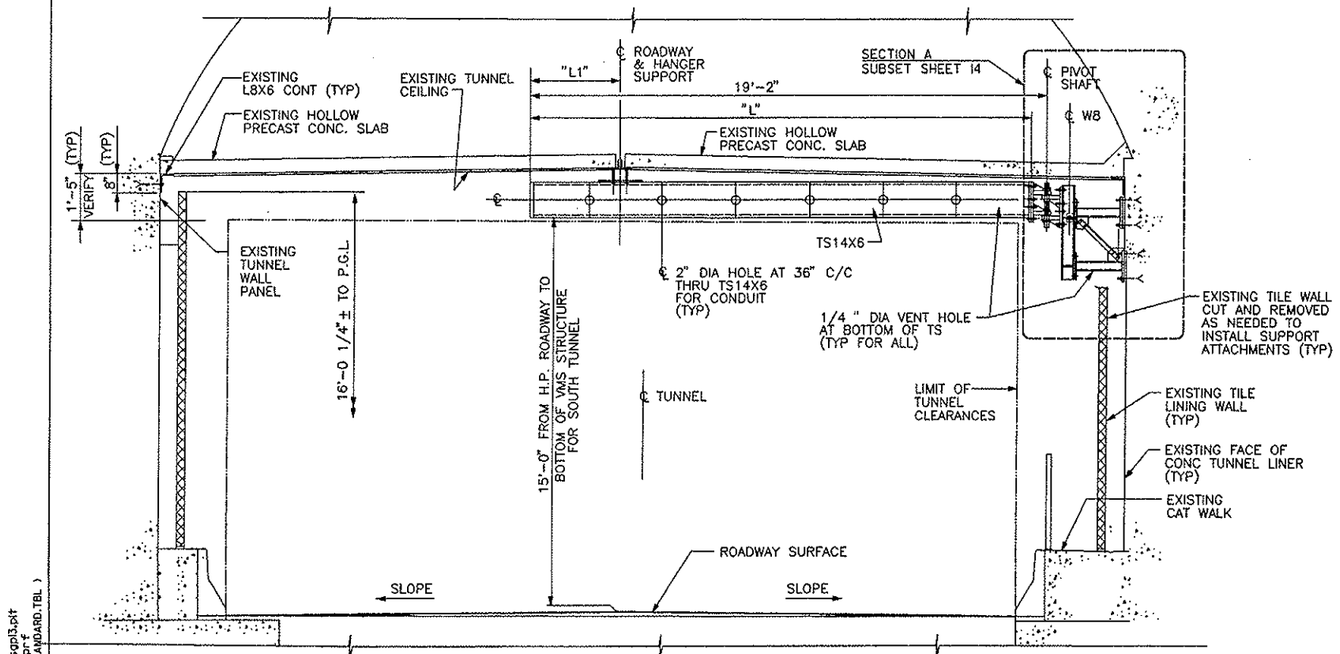
SCALE: 3/8"=1'-0"



VMS SIGN SUPPORT ORIENTATION PLAN

(STRUCTURES 2 THRU 11)

SCALE: NTS



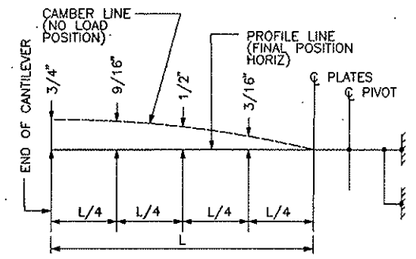
SOUTH TUNNEL – LOOKING WEST

TYPICAL TUNNEL DOUBLE FACE VMS SIGN SUPPORT ELEVATION

(STRUCTURES 2 THRU 11)

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

VMS SIGN SUPPORTS SCHEDULE (TUNNEL)	
SOUTH TUNNEL	
SIGN SUPPORT STRUCTURE NO.	LOCATION STATION
1	STA. 40 + 70
2	STA. 48 + 71
3	STA. 56 + 81
4	STA. 64 + 81
5	STA. 72 + 90
6	STA. 80 + 84
7	STA. 89 + 00
8	STA. 97 + 00
9	STA.105 + 03
10	STA.113 + 04
11	STA.121 + 30
EAST PORTAL	STA.125 + 57
WEST PORTAL	STA. 35 + 97



CAMBER DIAGRAM

TUBE SECTION

SCALE: NTS

NOTES:

A. FOR STRUCTURAL NOTES, SEE VMS SUBSET SHEET 12.

B. CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER FIT OF SIGN STRUCTURES AT ANCHORAGES. CONTRACTOR SHALL TAKE FIELD MEASUREMENTS TO VERIFY ANCHORAGE LOCATIONS, ELEVATIONS, CLEARANCES AND MEMBER SPANS PRIOR TO PREPARING SHOP DRAWINGS. STATION LOCATION SHOWN ON THIS SHEET ARE APPROXIMATE. CONTRACTOR SHALL ADJUST LOCATION PER FIELD CONDITION.

C. FOR VMS ELECTRONIC SIGN, SEE VMS SIGN ELEVATIONS SHEETS 2 THRU 10.

D. FOR VMS SUPPORT FRAMING DETAILS, SEE VMS SUBSET SHEET 14.

E. VMS SIGN MESSAGE BOARD ASSEMBLY NOT IN THIS CONTRACT AT SIGN SUPPORT STRUCTURE NO's. 1, 3, 5, 7, 9, 11, AND WEST PORTAL.

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Last Modification Date:	8/30/99	Initials:	RAM
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Drawing File Name:	SGP13.PLT		
Acad Ver. R14	Scale: AS NOTED	Units: ENGLISH	

Sheet Revisions		

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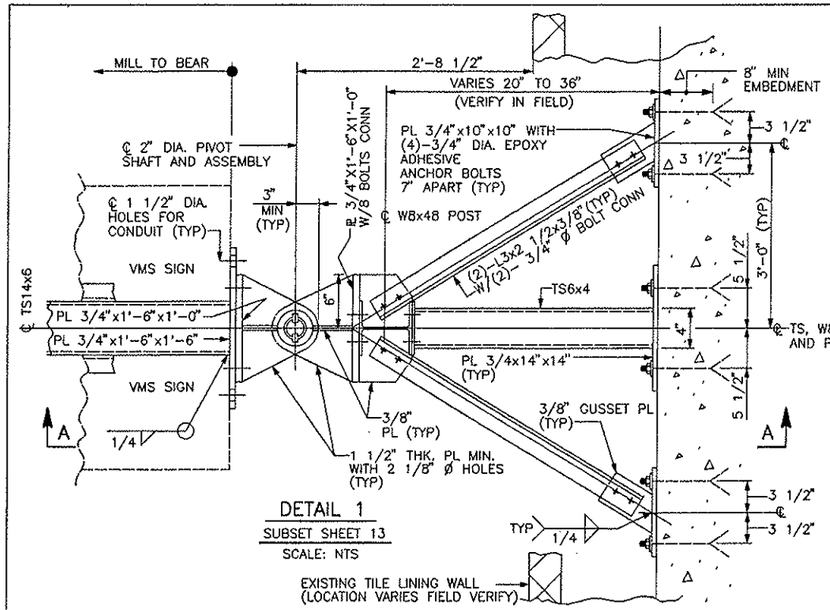
Region 1 Mountain Residency W.W.G.

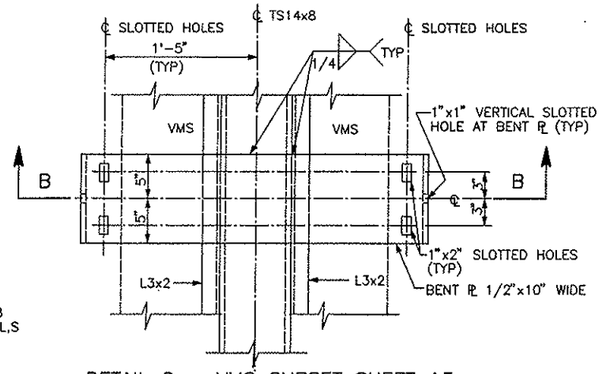
As Constructed	TUNNEL VMS SIGN SUPPORT PLAN AND ELEVATION		Project No./Code
No Revisions: 1/10/03			IM 0703-264
Revised:	Designer: NHP	Structure Numbers	12982
Void:	Detailer: MFE		
	Sheet Subset: VMS	Subset Sheets: 13 of 33	Sheet Number 137



DETAIL 1

SUBSET SHEET 13

SCALE: NTS



DETAIL 2 -- VMS SUBSET SHEET 13

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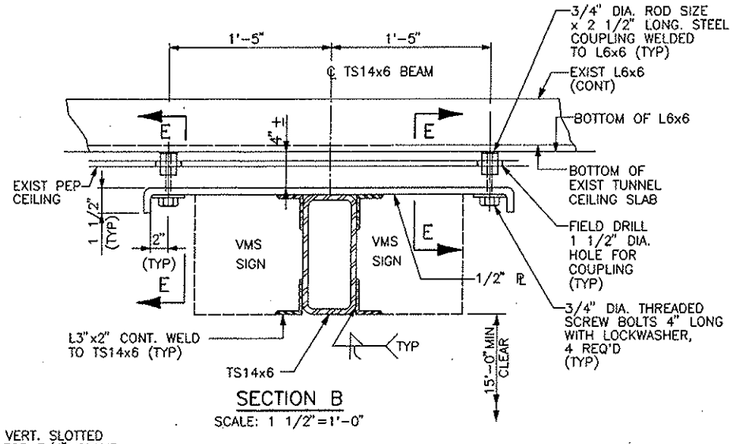
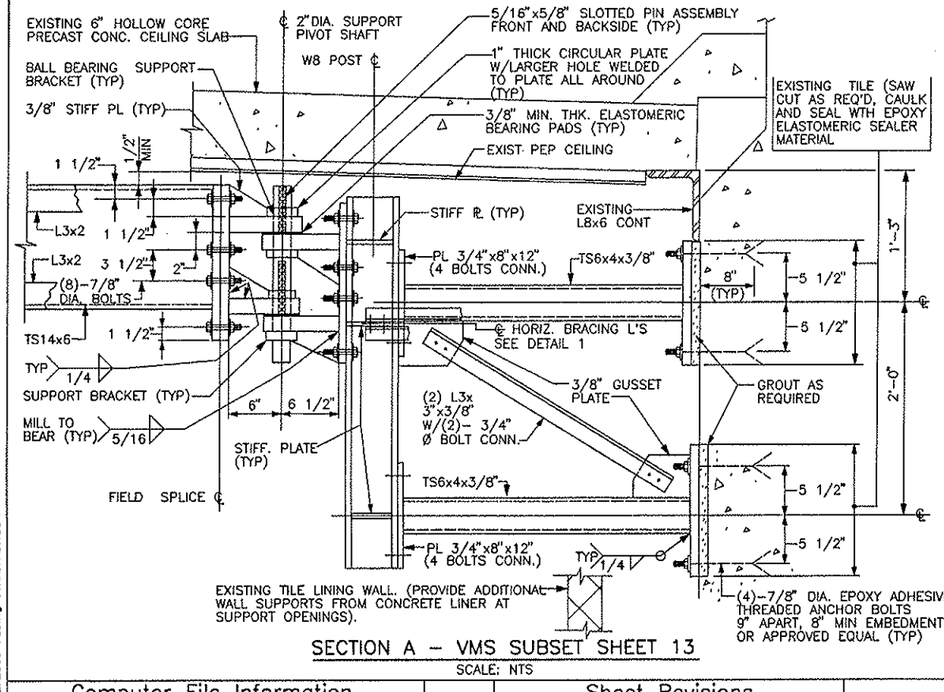


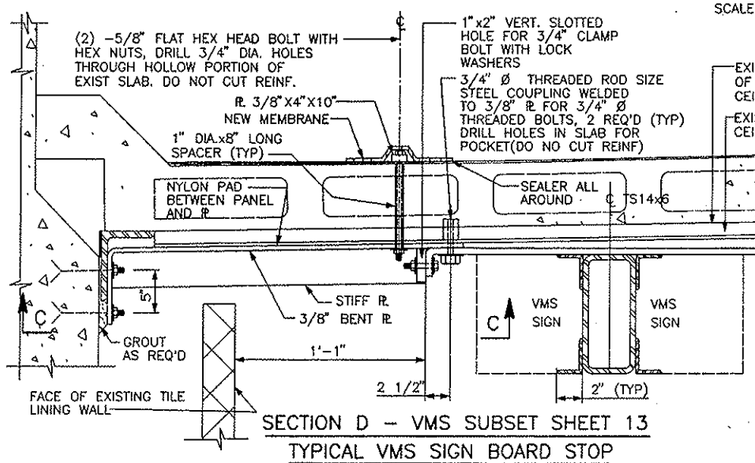
SECTION B

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



SECTION A -- VMS SUBSET SHEET 13

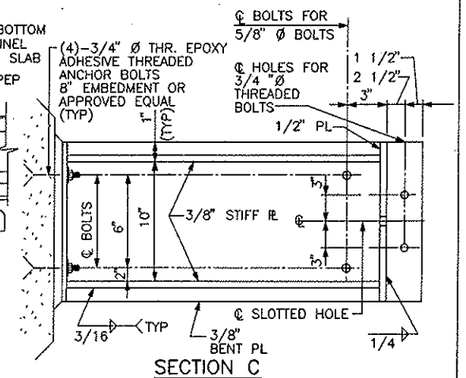
SCALE: NTS



SECTION D -- VMS SUBSET SHEET 13

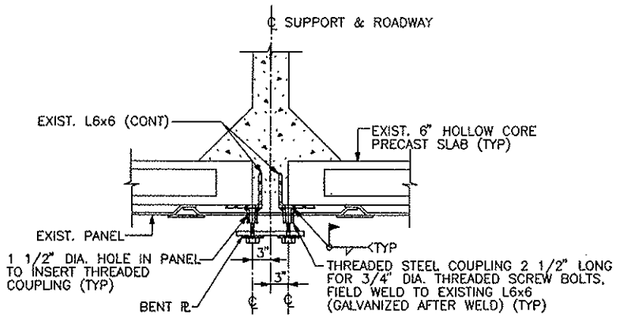
TYPICAL VMS SIGN BOARD STOP

SCALE: NTS



SECTION C

SCALE: NTS



SECTION E--CENTER CEILING HANGER SUPPORT

SCALE: NTS

NOTES:

A. VMS STEEL STRUCTURE, ATTACHMENT, CONNECTION, STEEL FRAMING, GROUT, CAULKING, SEALER, MEMBRANE, WIRING AND CUT PANEL, CONC. OR TILE ARE INCLUDED IN THE COST OF VMS MOUNTING SUPPORT PAY ITEMS.

B. FOR ALL ANCHORING SYSTEMS TO EXISTING CONCRETE OR PRECAST CONCRETE SLAB, USE HILTI HSE 2411 EPOXY ADHESIVE. HAS SUPER THREADED ROD WITH LOCK NUTS OR APPROVED EQUAL.

C. CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER AND EASY MANUAL SWING OPERATION OF BALL BEARING SUPPORT AND BRACKETS.

D. ALL CONNECTION BOLTS SHALL BE 7/8" Ø A 325 SC UNLESS NOTED OTHERWISE.

E. ELASTOMER PAD SHALL BE 100% VIRGIN CHLOROPRENE (NEOPRENE) 60+/- 5 DUROMETER (SHORE A). INTERNAL STEEL LAMINAE SHALL BE ASTM A570 GRADE 33.

F. NEW MEMBRANE SHALL BE MATCHED WITH EXISTING MEMBRANE TYPE AND THICKNESS.

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Drawing File Name:	SGP14.PLT		
Acad Ver. R14	Scale: AS NOTED	Units: ENGLISH	

Sheet Revisions		

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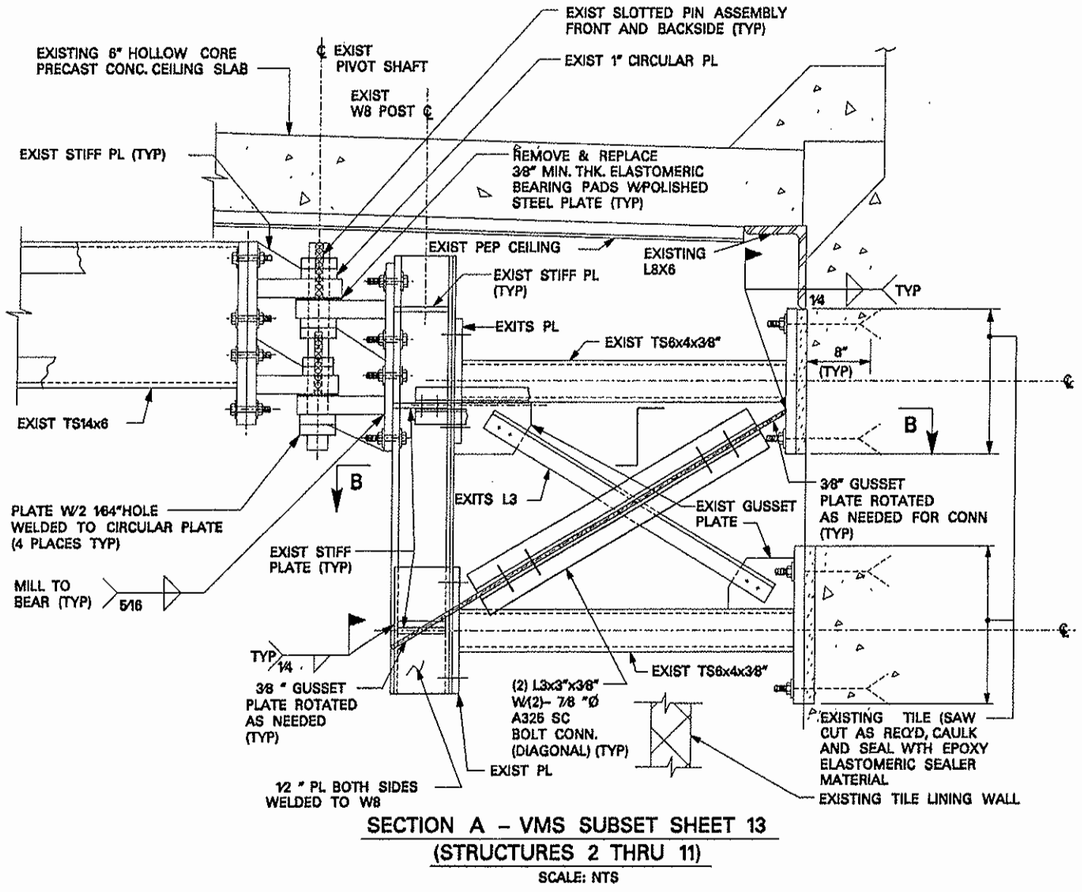
As Constructed	
No Revisions:	
Revised:	
Void: 1/10/03	

VMS SIGN SUPPORT SECTIONS AND DETAILS

Designer: NHP		Structure Numbers	
Detailer: RN			
Sheet Subset: VMS	Subset Sheets: 14 of 33		

Project No./Code	
IM 0703-264	
12982	
Sheet Number	138



SECTION A – VMS SUBSET SHEET 13 (STRUCTURES 2 THRU 11)

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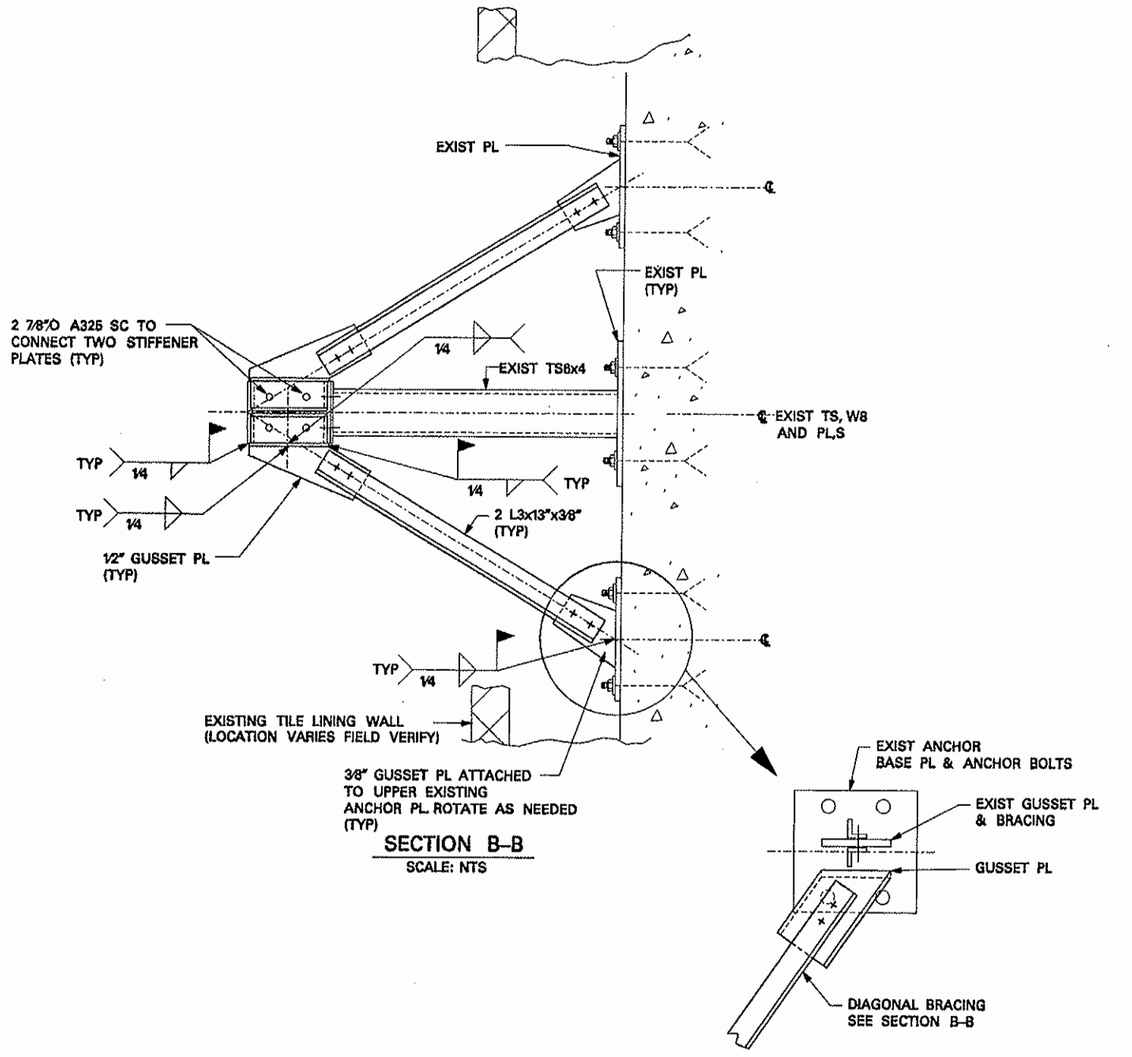

SECTION B–B

SCALE: NTS

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Date of Plot: $$$$DATE$$$$

Sheet Revisions		
07/03/02	ADDED BRACING & PLATES	NHP

R-1

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No Revisions:	
Revised:	
Void:	

VMS SIGN SUPPORT SECTIONS AND DETAILS

Designer:	NHP	Structure Numbers	
Detailer:	MFE		
Sheet Subset:	VMS	Subset Sheets:	14A of 33

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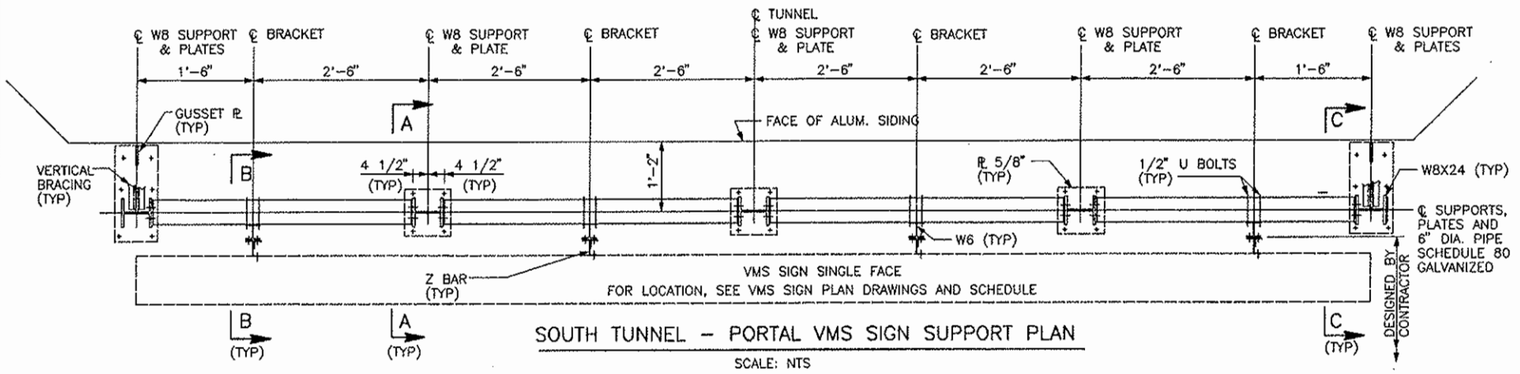
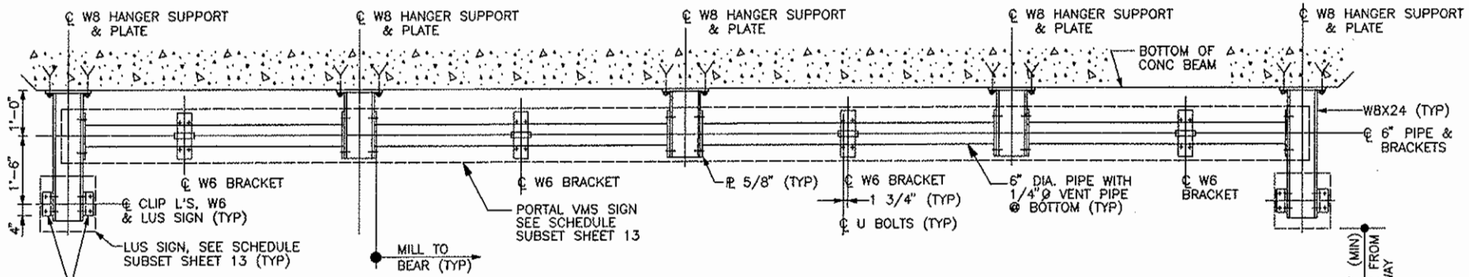
12117	
Sheet Number	138A



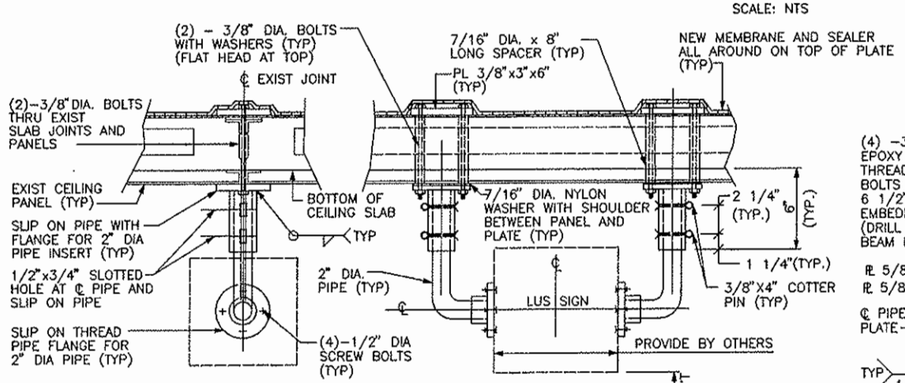
SOUTH TUNNEL – PORTAL VMS SIGN SUPPORT PLAN

SCALE: NTS



SOUTH TUNNEL– PORTAL VMS SIGN SUPPORT ELEVATION

SCALE: NTS



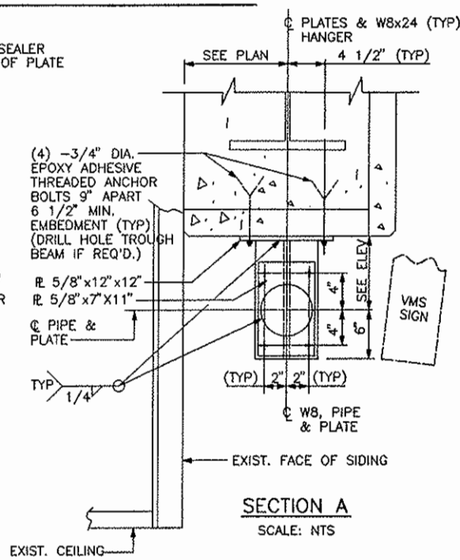
SIDE VIEW — FRONT ELEVATION

NOTE:
A TUNNEL LUS SIGN SUPPORT LOCATION, SEE TUNNEL VMS & LUS PLAN DRAWINGS SUBSET SHEETS 2 TO 11. CONTRACTOR SHALL ADJUST LOCATION AT EXISTING CEILING SLAB JOINT PER FIELD CONDITION.

B FOR LUS POWER AND COMMUNICATION CONDUIT CONNECTION DETAILS, SEE LUS SIGN FACE LAYOUT & POWER CONNECTION DETAILS SHEET 11

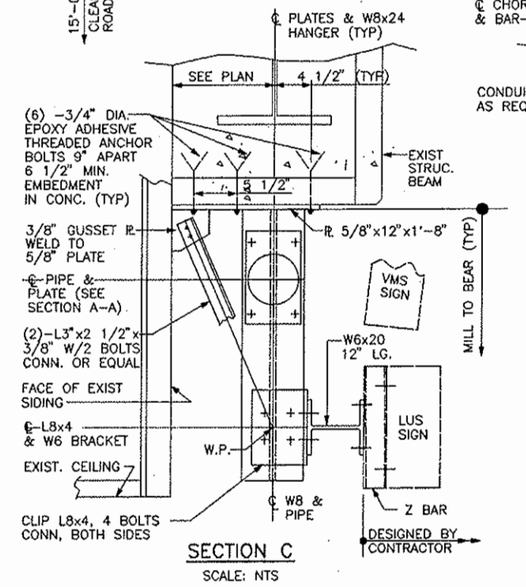
TYPICAL TUNNEL LUS SIGN SUPPORT (EXCEPT @ STA. 38 + 02)

SCALE: NTS



SECTION A

SCALE: NTS



SECTION C

SCALE: NTS

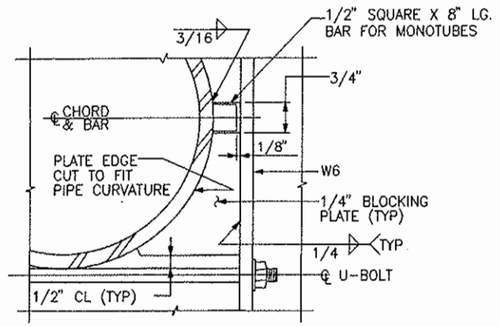
NOTES:

A. FOR STRUCTURAL NOTES, SEE VMS SUBSET SHEET 12.

B. TUNNEL LUS SIGN SUPPORT FRAME, ATTACHMENT, WIRING, NEW MEMBRANE, MOUNTING, CUTTING PANEL, AND CAULKING ARE INCLUDED IN COST OF TUNNEL LUS MOUNTING SUPPORT PAY ITEM.

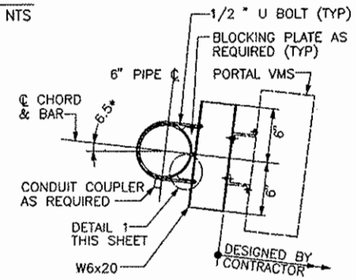
C. PORTAL FACE VMS SIGN SUPPORT FRAME, ATTACHMENT, WIRING AND BRACKETS ARE INCLUDED IN COST OF PORTAL FACE VMS MOUNTING SUPPORT PAY ITEM.

D. PORTAL FACE LUS SIGN MOUNTING BRACKETS, WIRING AND ATTACHMENTS ARE INCLUDED IN COST OF PORTAL LUS MOUNTING SUPPORT PAY ITEM.



DETAIL 1

SCALE: NTS



SECTION B

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Acad Ver. R14	Scale: AS NOTED	Units: ENGLISH	

Sheet Revisions		

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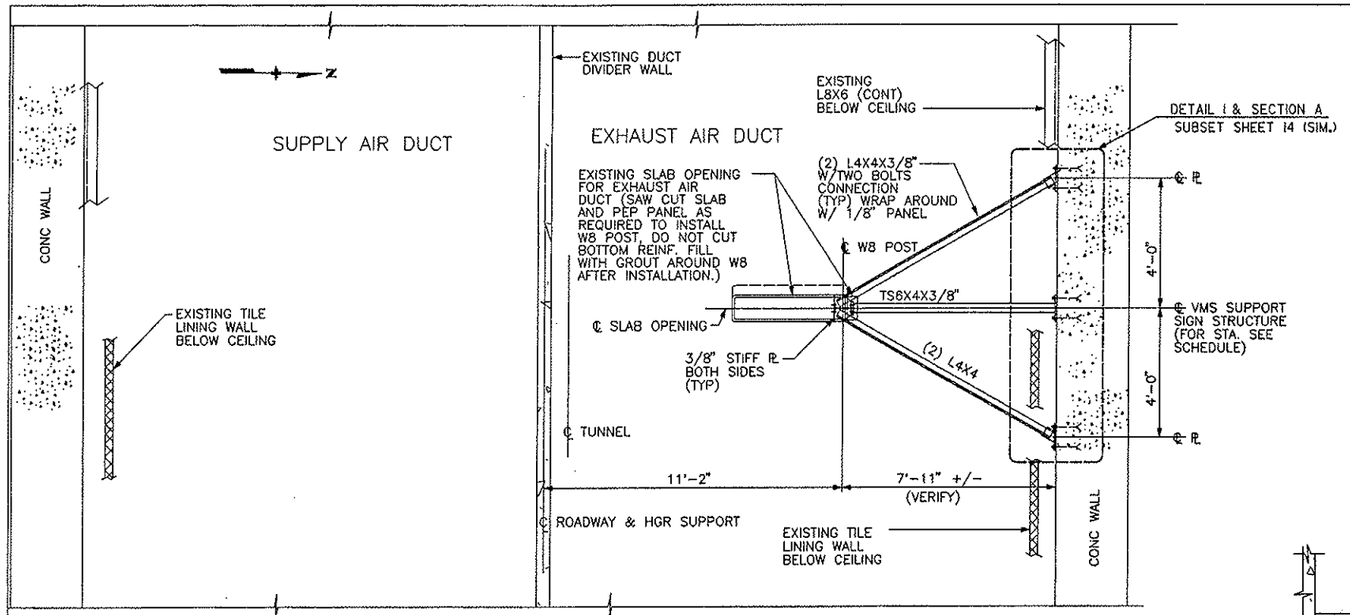
As Constructed
No Revisions: 01/10/03
Revised:
Void:

LUS & VMS SIGN SUPPORT MOUNTING BRACKET DETAILS

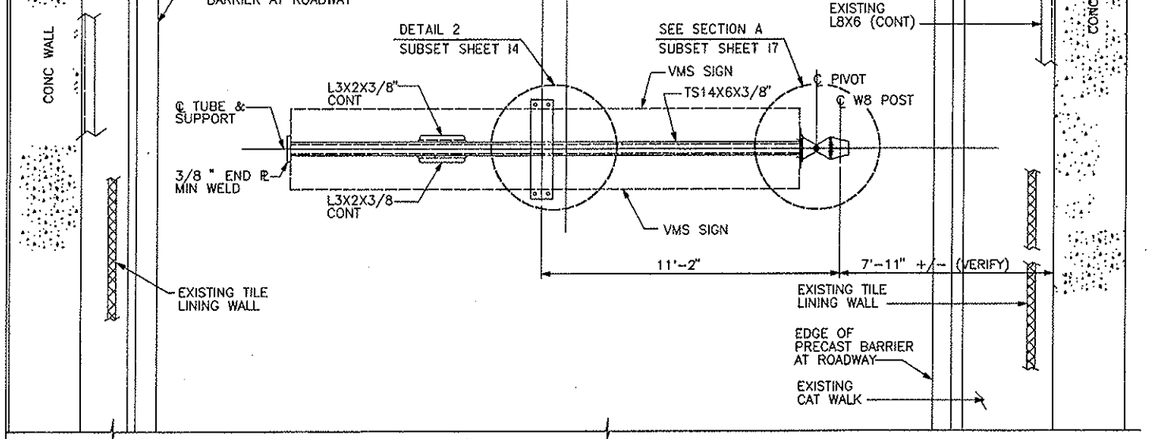
Designer: NHP
Detailer: RN
Sheet Subset: VMS
Structure Numbers:
Subset Sheets: 15 OF 33

Project No./Code
IM 0703-264
12982
Sheet Number 139



SOUTH TUNNEL
ABOVE CEILING PLAN
TUNNEL DOUBLE FACE VMS SIGN SUPPORT # 1

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



SOUTH TUNNEL
BELOW CEILING PLAN
TUNNEL DOUBLE FACE VMS SIGN SUPPORT # 1

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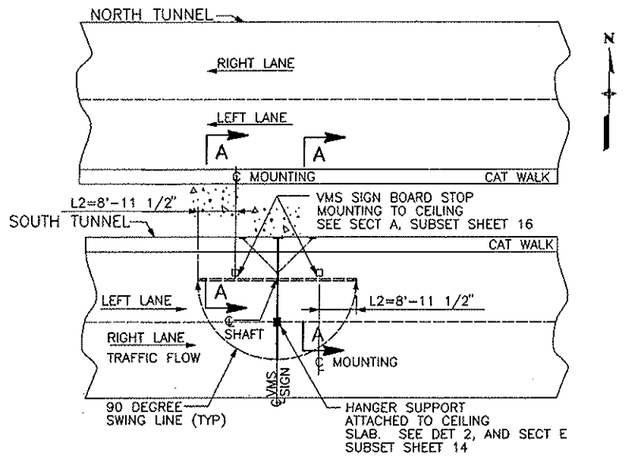
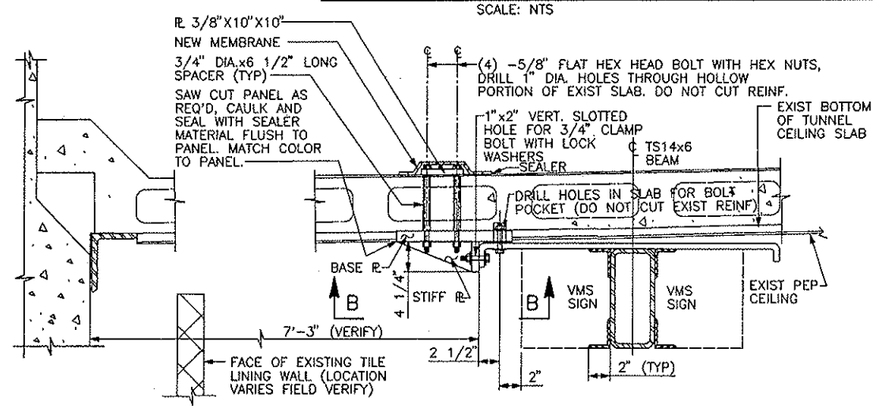


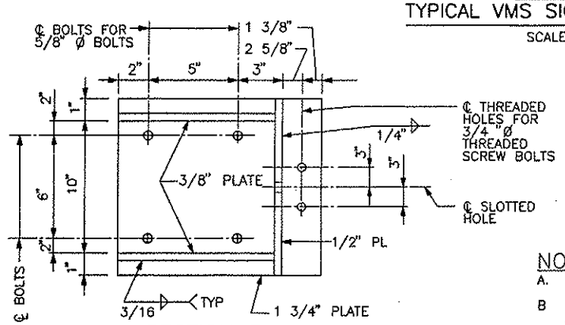
VMS SIGN SUPPORT ORIENTATION PLAN (SUPPORT #1)

SCALE: NTS



SECTION A
TYPICAL VMS SIGN BOARD STOP

SCALE: NTS



SECTION B

SCALE: NTS

NOTES:

A. FOR STRUCTURAL NOTES, SEE VMS SUBSET SHEET 12 & 13.

B FOR TUNNEL DOUBLE FACE VMS SIGN SUPPORT ELEVATION AND MOUNTING DETAILS SEE SUBSET SHEET 17.

Design File Name: p:\04402\cathyplot\sgpl6.plt
Plot File Name: P:\PLOT\PAPER\sgpl6.prf
Date of Plot: 8/2/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	04/9/99	Initials:	MFE
Last Modification Date:	8/30/99	Initials:	RAM
Full Path:	14102\700CADD\709STR\		
Drawing File Name:	SGP16.PLT		
Acad Ver.	R14	Scale: AS NOTED	Units: ENGLISH

Sheet Revisions		

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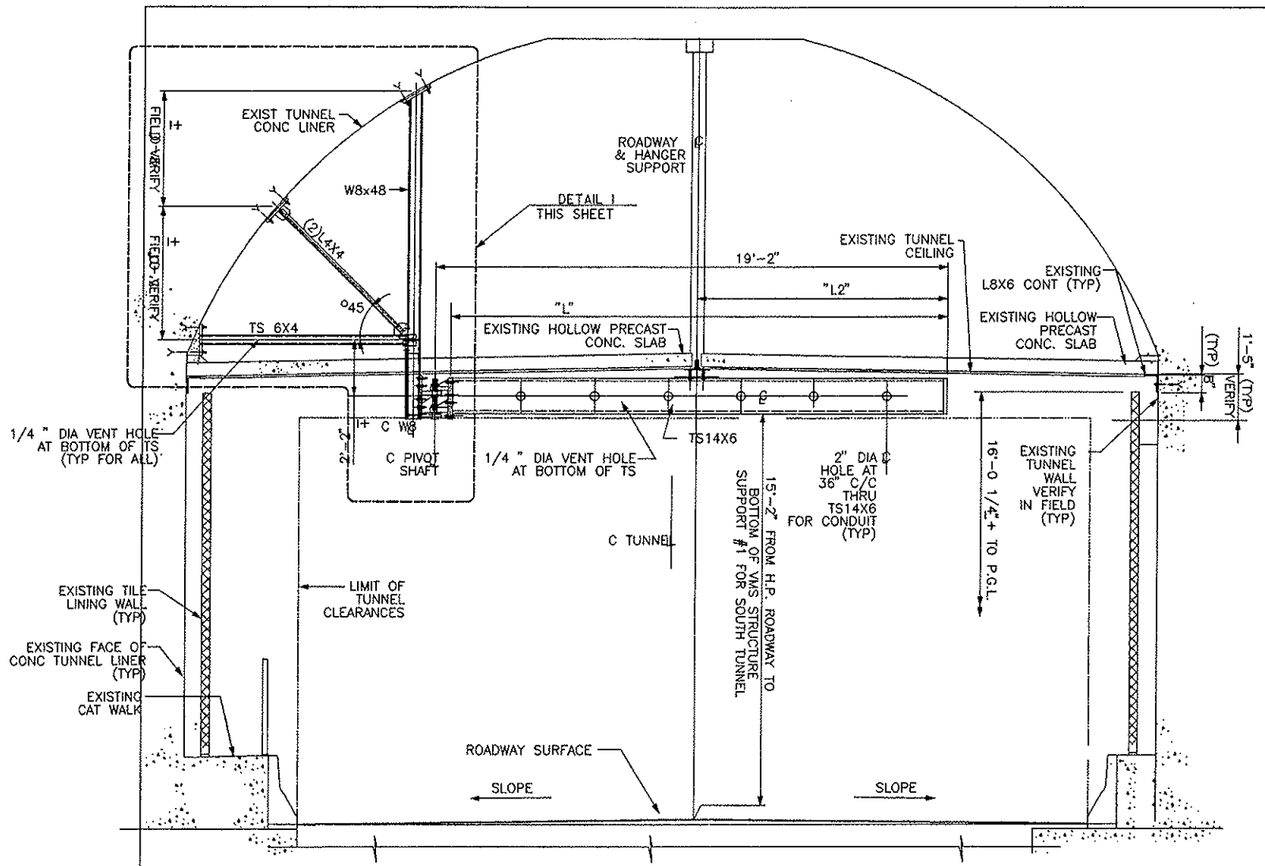
Region 1 Mountain Residency W.W.G.

As Constructed
No Revisions: 01/10/03
Revised:
Void:

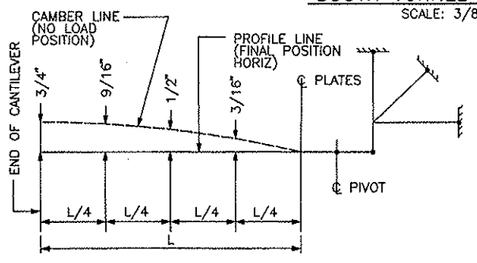
TUNNEL VMS SIGN SUPPORT PLANS AND SECTIONS

Designer: NHP
Detailer: MFE
Sheet Subset: VMS
Structure Numbers:
Subset Sheets: 16 OF 33

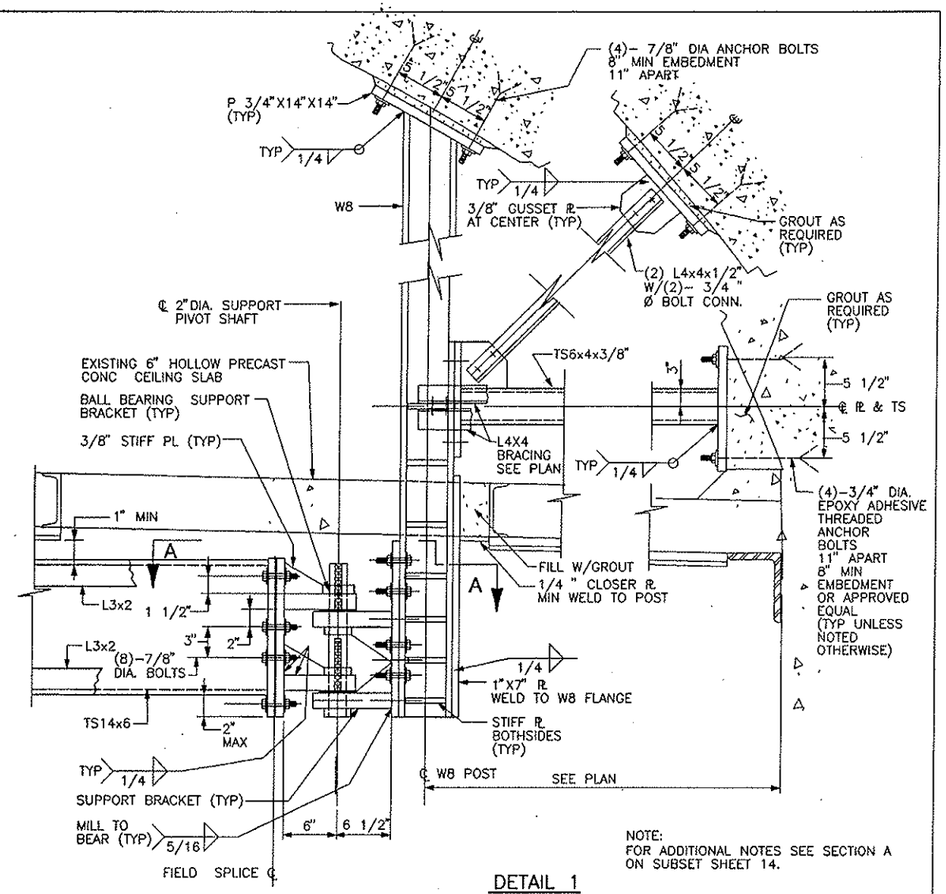
Project No./Code
IM 0703-264
12982
Sheet Number 140



ELEVATION
TUNNEL DOUBLE FACE VMS SIGN SUPPORT #1
SOUTH TUNNEL – LOOKING WEST
SCALE: 3/8"=1'-0"

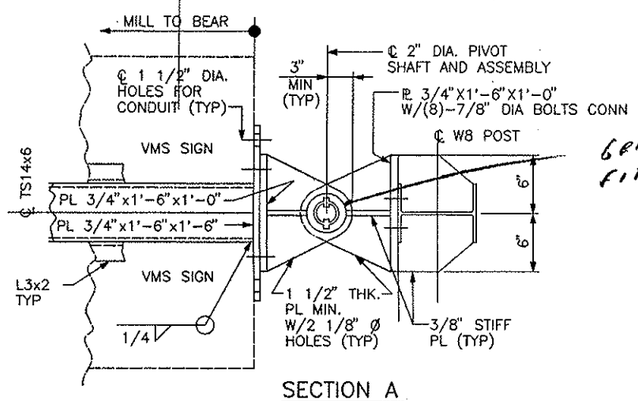


CAMBER DIAGRAM
TUBE SECTION
SCALE: NTS



DETAIL 1
SCALE: NTS

NOTE:
FOR ADDITIONAL NOTES SEE SECTION A ON SUBSET SHEET 14.



SECTION A
SCALE: NTS

NOTES:

A. FOR STRUCTURAL NOTES, SEE VMS SUBSET SHEET 12 & 13.
B. WORK THIS SHEET WITH SUBSET SHEET 16.

Design File Name: p:\0ih02\cathypiot\sgp17.plt
Plot File Name: P:\PLOT\PAPER\sgp17.prt
Date of Plot: 8/2/2000 (using STANDARD.TBL)

Computer File Information			
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Last Modification Date:	8/30/99	Initials:	RAM
Full Path:	14102\700CADD\713TRA\		
Drawing File Name:	SGP17.PLT		
Acad Ver. R14	Scale:AS NOTED	Units:	ENGLISH

Sheet Revisions		

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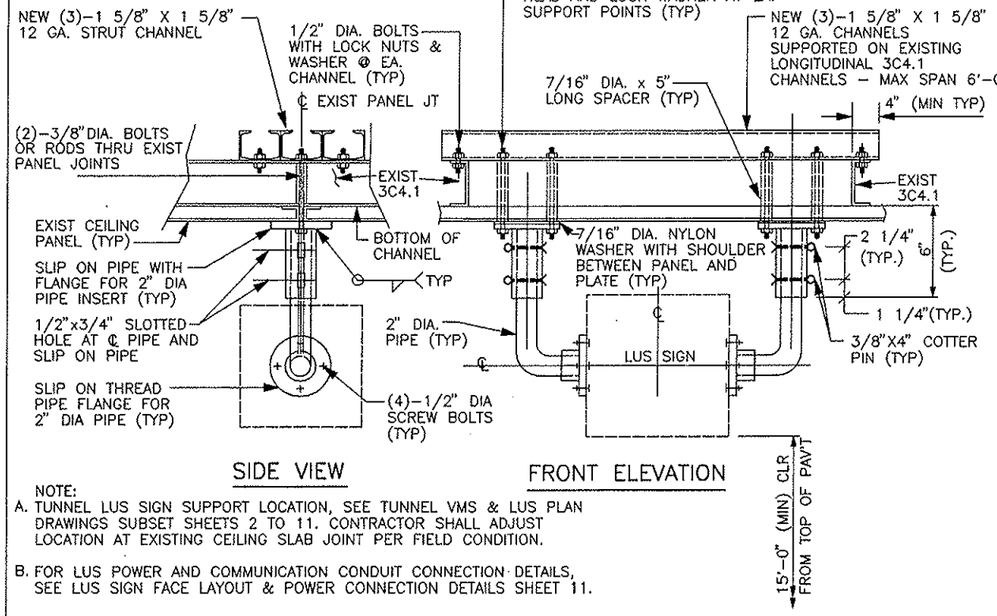
Void:	

TUNNEL VMS SIGN SUPPORT ELEVATION AND DETAILS			
Designer: NHP	Structure Numbers		Project No./Code
Detailer: MFE			IM 0703-264
Sheet Subset: VMS	Subset Sheets: 17 of 33		12982
		Sheet Number	141



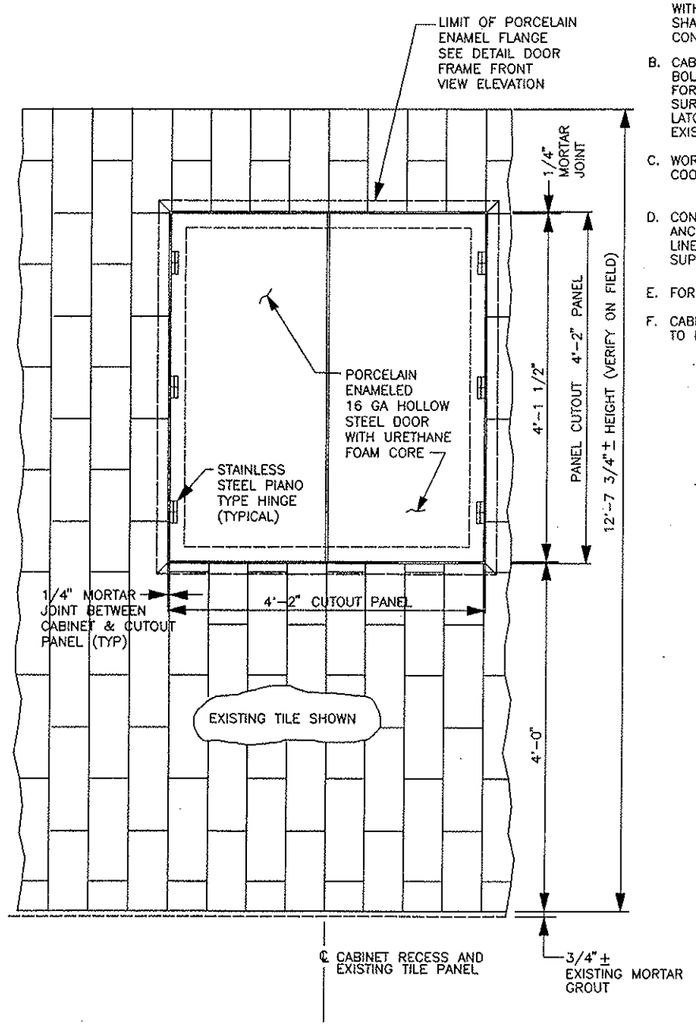
NOTE:

A. TUNNEL LUS SIGN SUPPORT LOCATION, SEE TUNNEL VMS & LUS PLAN DRAWINGS SUBSET SHEETS 2 TO 11. CONTRACTOR SHALL ADJUST LOCATION AT EXISTING CEILING SLAB JOINT PER FIELD CONDITION.

B. FOR LUS POWER AND COMMUNICATION CONDUIT CONNECTION DETAILS, SEE LUS SIGN FACE LAYOUT & POWER CONNECTION DETAILS SHEET 11.

TYPICAL TUNNEL LUS SIGN SUPPORT (AT STA. 38 + 02)

SCALE: NTS



ELEVATION SOUTH TUNNEL CUTOUT GLAZED WALL TILE FOR RECESS CONTROL CABINET NORTH WALL

SCALE: NTS

NOTES:

A. REMOVAL OF CONCRETE FOR BLOCKOUT TO BE IN ACCORDANCE WITH CDOT SPEC. SECTION 202. THE PERIMETER OF THE BLOCKOUT SHALL BE SAWED TO A MINIMUM OF 3 INCHES BEFORE REMOVING CONCRETE.

B. CABINET FOR VMS CONTROL CABINET SHALL BE OF WELDED AND BOLTED CONSTRUCTION AND GALVANIZED ON ALL SURFACES EXCEPT FOR DOORS AND FLANGES WHICH SHALL HAVE A PORCELAIN ENAMEL SURFACE FRONT AND BACK. PORCELAIN ENAMEL SURFACE, DOOR LATCH, DOOR HARDWARE, AND FINISH SHALL BE MATCHED WITH EXISTING UNLESS OTHERWISE NOTED.

C. WORK ASSOCIATED FOR THE CONTROLLER CABINET SHALL BE COORDINATED WITH SHEET # 19.

D. CONTRACTOR SHALL BE RESPONSIBLE TO DESIGN AND PROVIDE PROPER ANCHORING OF GLAZED TILE PANEL TO EXISTING CONCRETE TUNNEL LINER AFTER CUTOUT OF THE TILE PANEL. PROVIDE TEMPORARY SUPPORT TO GLAZED TILE PANEL AT THE TIME OF CUTOUT.

E. FOR CABINET LOCATION, SEE SHEET 2.

F. CABINET DEPTH ADJUSTABLE AND #12 SELF-TAPPING SCREWS TO BE INSTALLED AFTER CABINET DEPTH IS ADJUSTED IN FIELD.

Design File Name: p:\0ih102\cathyplot\sgp18.plt
Plot File Name: P:\PLOT\PAPER\sgp18.prf
Date of Plot: 8/2/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	04/9/99	Initials:	KLN
Last Modification Date:	11/05/99	Initials:	PTR
Full Path:	14102\700CADD\709STR\		
Drawing File Name:	SGP18.DWG		
Acad Ver. R14	Scale: AS NOTED	Units:	ENGLISH

Sheet Revisions		

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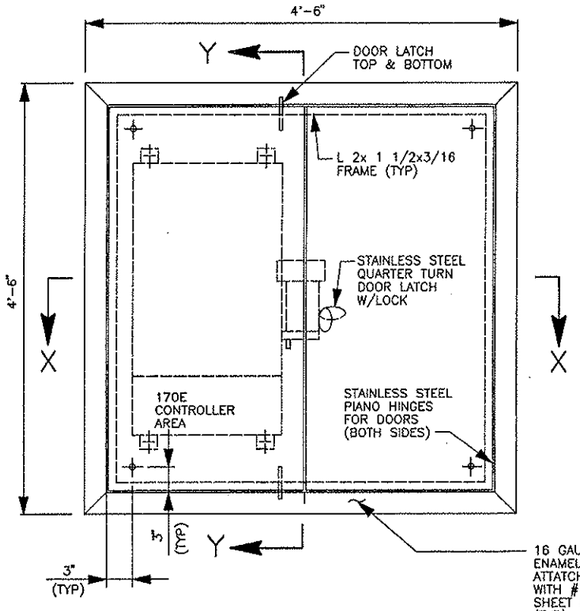
As Constructed
No Revisions: 1/10/03
Revised:
Void:

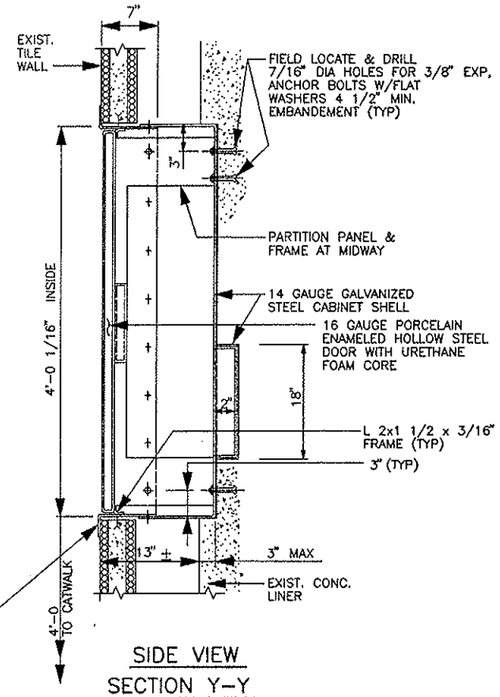
CONTROLLER CABINET

Designer: NHP
Detailer: RN
Sheet Subset: VMS
Structure Numbers:
Subset Sheets: 18 OF 33

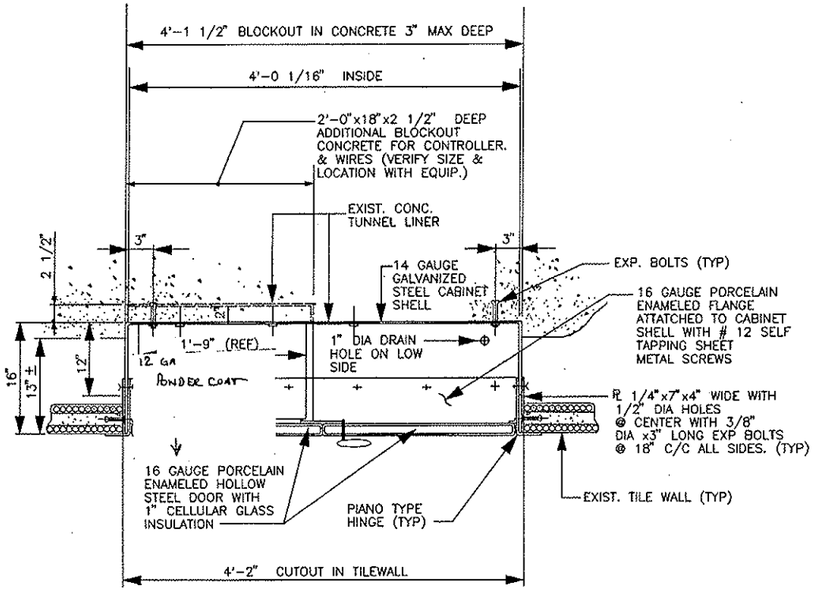
Project No./Code
IM 0703-264
12982
Sheet Number 142



FRONT VIEW
CONTROL CABINET
SCALE: NTS



SIDE VIEW
SECTION Y-Y
SCALE: NTS



SECTION X-X
SCALE: NTS

Design File Names: p:\01402\cathyplot\sgp19.plt
Plot File Names: P:\PLOT\PAPER\sgp19.prt
Date of Plot: 8/2/2000 (using STANDARD.TBL)

Computer File Information			
Creation Date:	04/9/99	Initials:	KLN
Last Modification Date:	11/05/99	Initials:	PTR
Full Path:	14102\700CADD\713TRA\		
Drawing File Name: SGP19.DWG			
Acad Ver. R14	Scale: AS NOTED	Units: ENGLISH	

Sheet Revisions		

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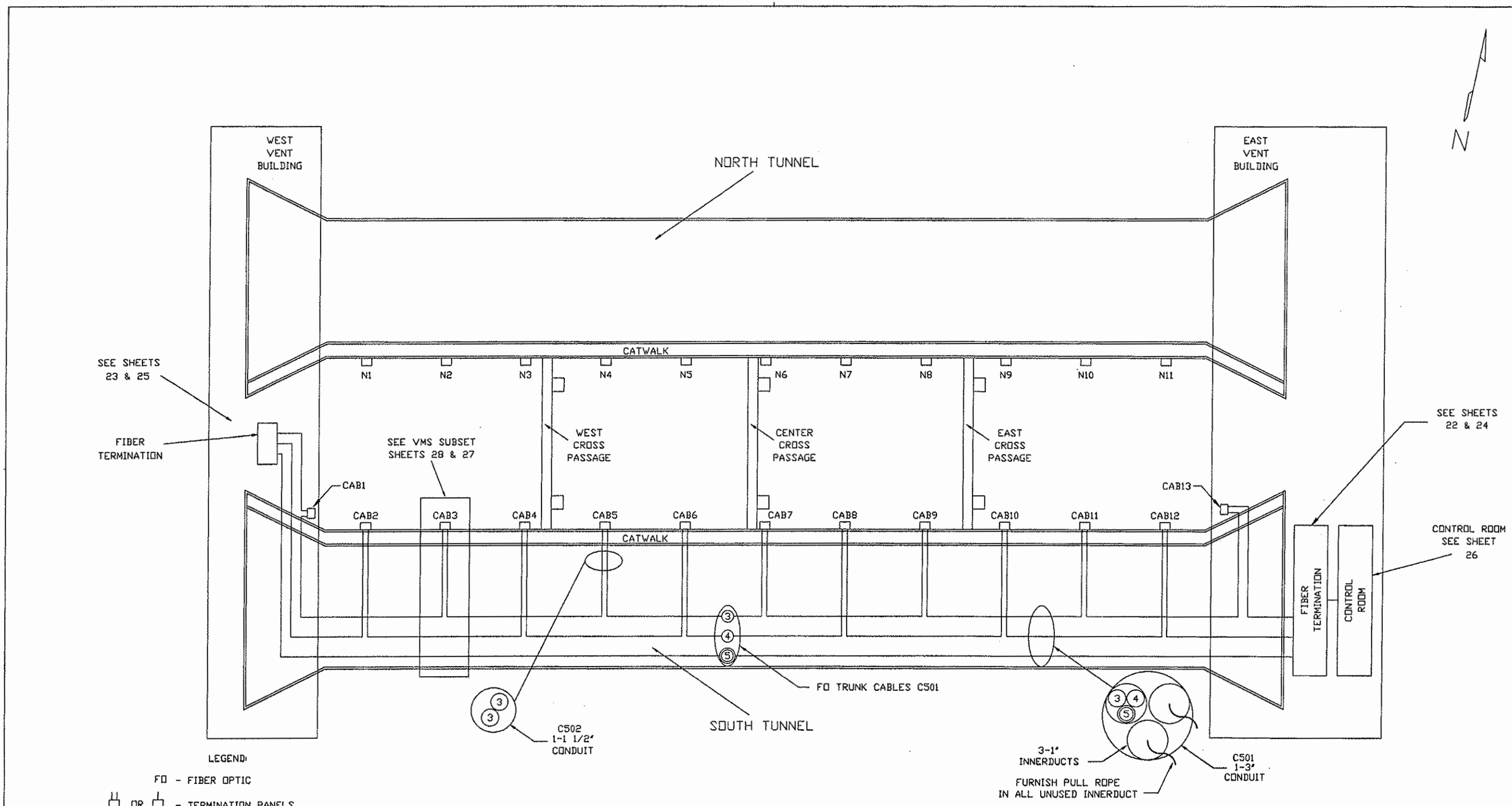
Revised:	
Void:	

CONTROLLER CABINET DETAILS			
Designer: NHP	Structure Numbers		
Detailer: RN			
Sheet Subset: VMS	Subset Sheets: 19 OF 33		

Project No./Code	
IM 0703-264	
12982	
Sheet Number	143



LEGEND:

FO - FIBER OPTIC

OR - TERMINATION PANELS

③ & ④ - 6-FIBER FO TRUNK CABLES

⑤ - 12-FIBER FO TRUNK CABLE

NP1-2, N1 TO N11 - FUTURE CONTROL CABINETS

Design File Name: VMS-20.DWG
Plot File Name:
Date of Plot: 10/15/99

Computer File Information			
Creation Date:	07/14/99	Initials:	PWM
Last Modification Date:	11/05/99	Initials:	PWM
Full Path:	014102\700CADD\713TRA		
Drawing File Name:	VMS-20.DWG		
Acad Ver. R14	Scale: NTS	Units:	ENGLISH

Sheet Revisions		

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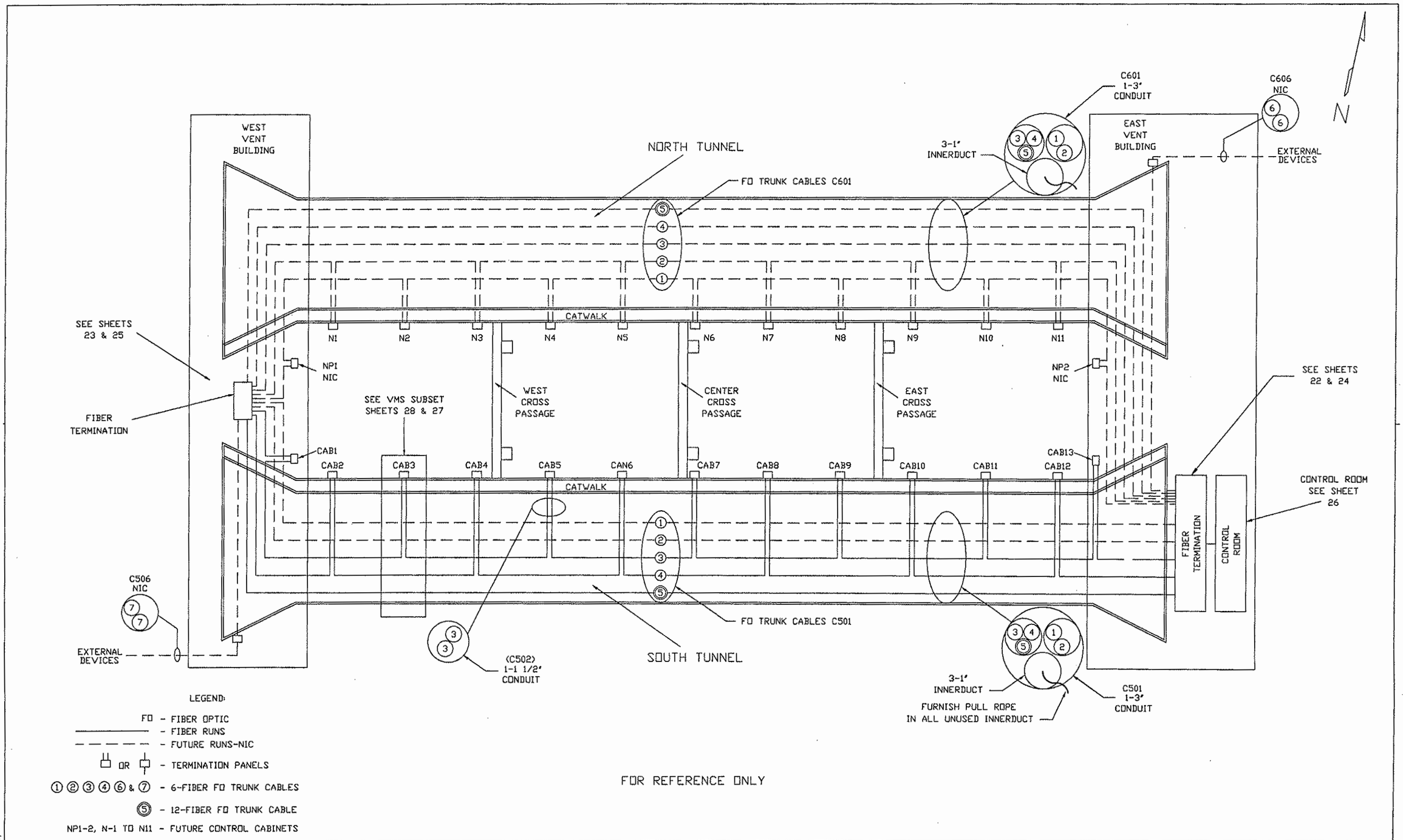
No Revisions: 01/10/03	
Revised:	
Void:	

VMS/LUS FIBER TRUNK PLAN

Designer: J. MANCINELLI		Structure Numbers	
Detailer: P. MEYDRECH			
Sheet Subset: VMS	Subset Sheets: 20 OF 33		

Project No./Code
IM 0703-264
12982
Sheet Number 144



LEGEND:

FO - FIBER OPTIC
——— - FIBER RUNS
– – – – – – - FUTURE RUNS-NIC
⊓ OR ⊓ - TERMINATION PANELS
① ② ③ ④ ⑥ & ⑦ - 6-FIBER FO TRUNK CABLES
⑤ - 12-FIBER FO TRUNK CABLE
NP1-2, N-1 TO N11 - FUTURE CONTROL CABINETS

FOR REFERENCE ONLY

Design File Name: VMS-21.DWG
Plot File Name: -
Date of Plot: 10/15/99

Computer File Information			
Creation Date:	07/14/99	Initials:	PWM
Last Modification Date:	11/05/99	Initials:	PWM
Full Path:	014102\700CADD\713TRA		
Drawing File Name:	VMS-21.DWG		
Acad Ver. R14	Scale: NTS	Units:	ENGLISH

Sheet Revisions		

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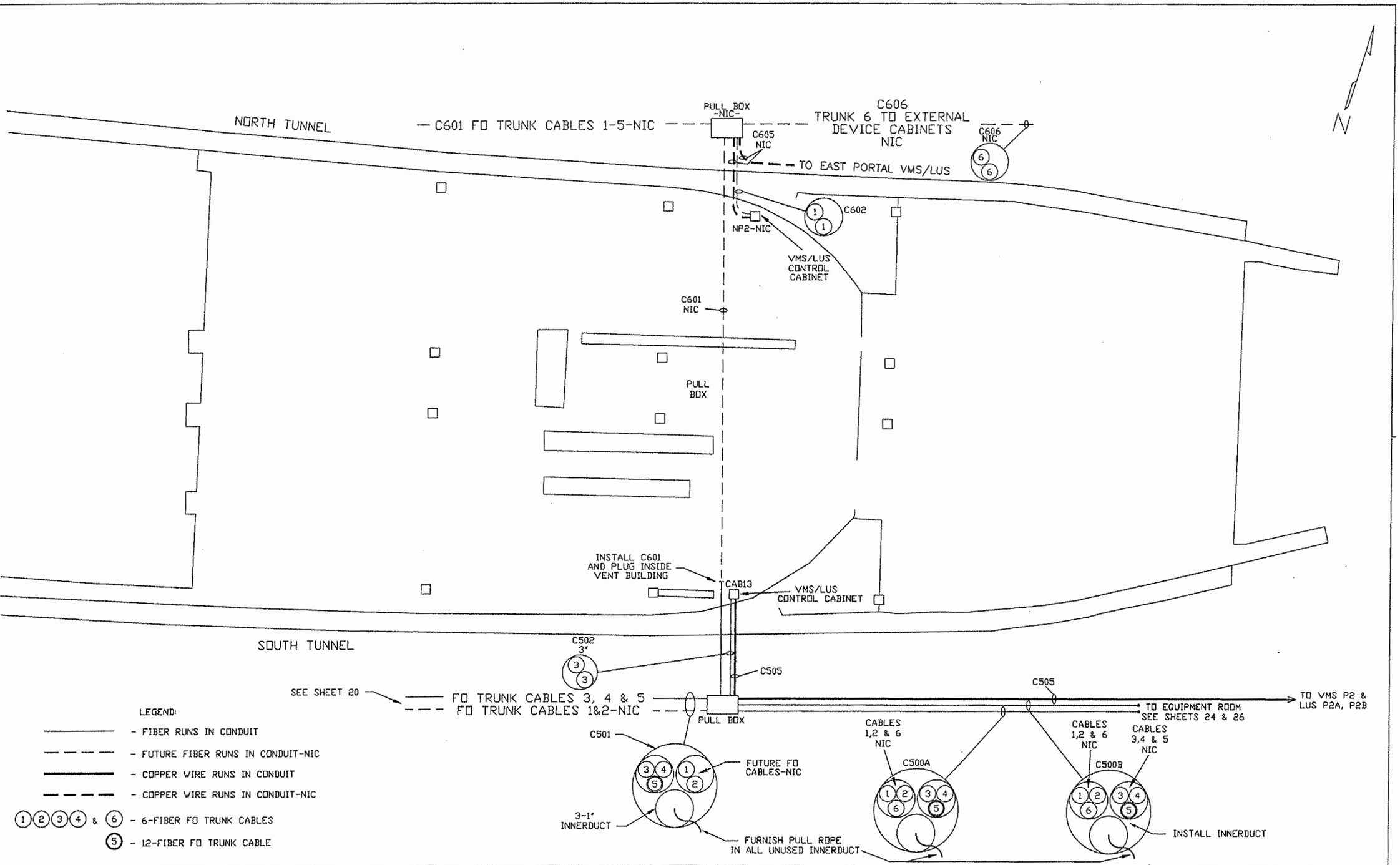
No Revisions: 01/10/03
Revised:
Void:

FUTURE VMS/LUS FIBER TRUNK PLAN

Designer: J. MANCINELLI
Detailer: P. MEYDRECH
Sheet Subset: VMS
Structure Numbers
Subset Sheets: 21 OF 33

Project No./Code
IM 0703-264
12982
Sheet Number 145



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Plot File Name:
Date of Plot: 10/22/99

Computer File Information			
Creation Date:	07/14/99	Initials:	PWM
Last Modification Date:	11/05/99	Initials:	PWM
Full Path:	014102\700CADD\713TRA		
Drawing File Name:	VMS-22.DWG		
Acad Ver. R14	Scale: NTS	Units:	ENGLISH

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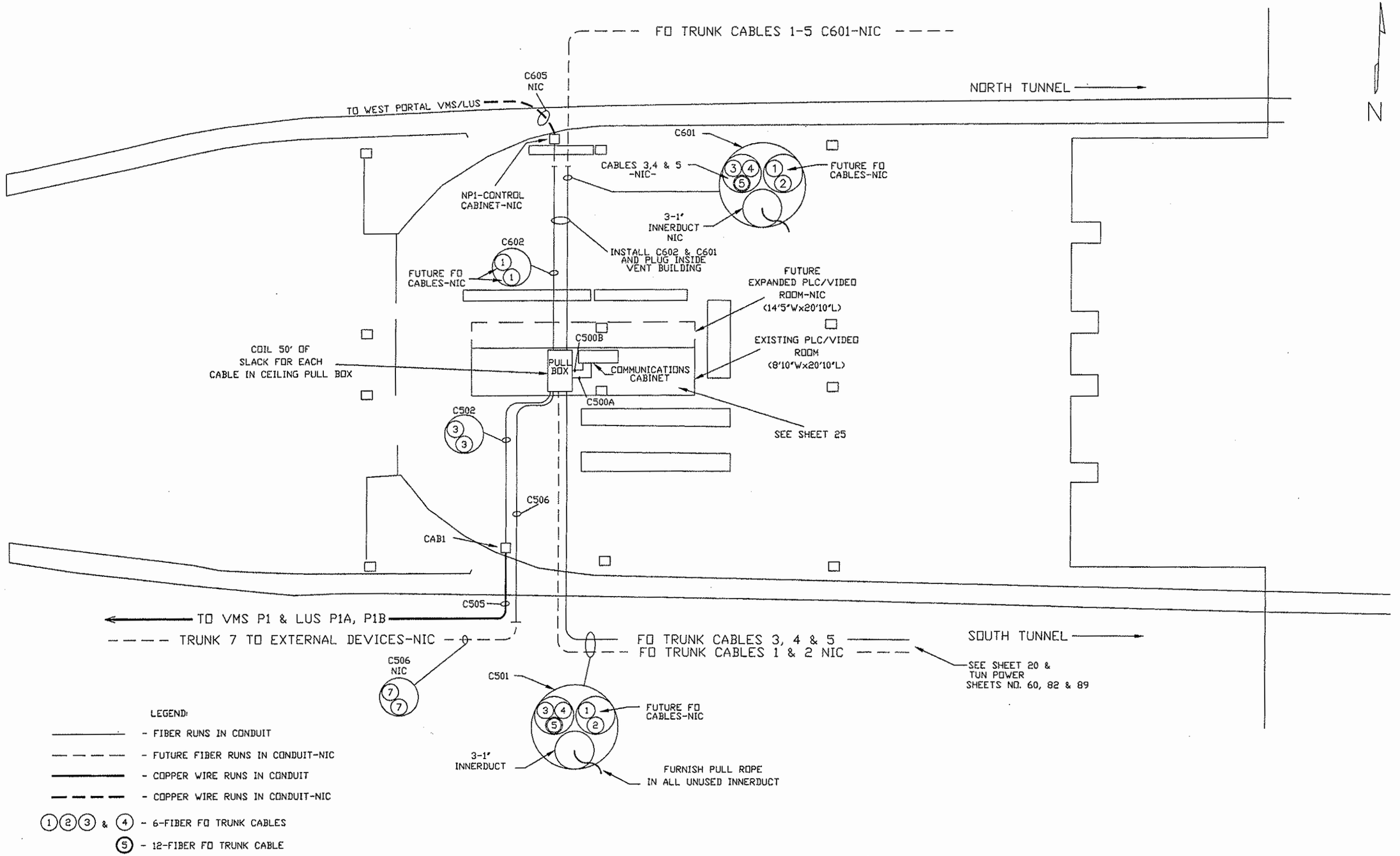
No Revisions: 01/10/03
Revised:
Void:

EAST VENT BUILDING VMS/LUS CABLE PLAN

Designer: J. MANCINELLI		Structure Numbers	
Detailer: P. MEYDRECH			
Sheet Subset: VMS	Subset Sheets: 22 OF 33		

Project No./Code
IM 0703-264
12982
Sheet Number 146



Design File Name: VMS-23.DWG
Post File Name:
Date of Plot: 10/22/99

Computer File Information			
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Last Modification Date:	11/05/99	Initials:	PWM
Full Path:	014102\700CADD\713TRA		
Drawing File Name:	VMS-23.DWG		
Acad Ver. R14	Scale: NTS	Units:	ENGLISH

Sheet Revisions		

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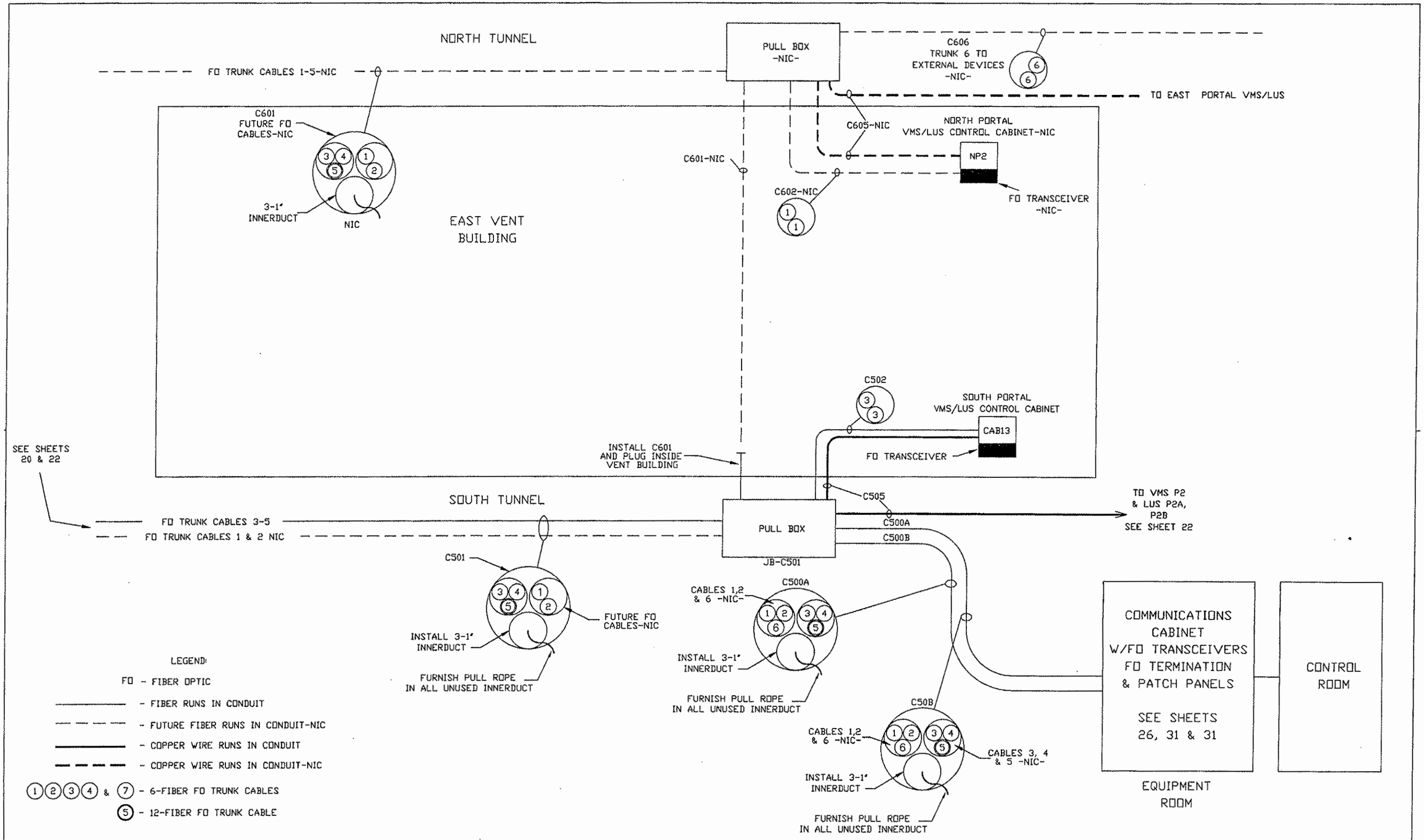
No Revisions: 01/10/03	
Revised:	
Void:	

WEST VENT BUILDING VMS/LUS CABLE RUNS

Designer: J. MANCINELLI		Structure Numbers	
Detailer: P. MEYDRECH			
Sheet Subset: VMS	Subset Sheets: 23 OF 33		

Project No./Code	
IM 0703-264	
12982	
Sheet Number	147



Design File Name: VMS-24.DWG
Plot File Name: -
Date of Plot: 10/22/99

Computer File Information			
Creation Date:	07/14/99	Initials:	PWM
Last Modification Date:	11/05/99	Initials:	PWM
Full Path:	014102\700CADD\713TRA		
Drawing File Name:	VMS-24.DWG		
Acad Ver. R14	Scale: NTS	Units:	ENGLISH

Sheet Revisions		

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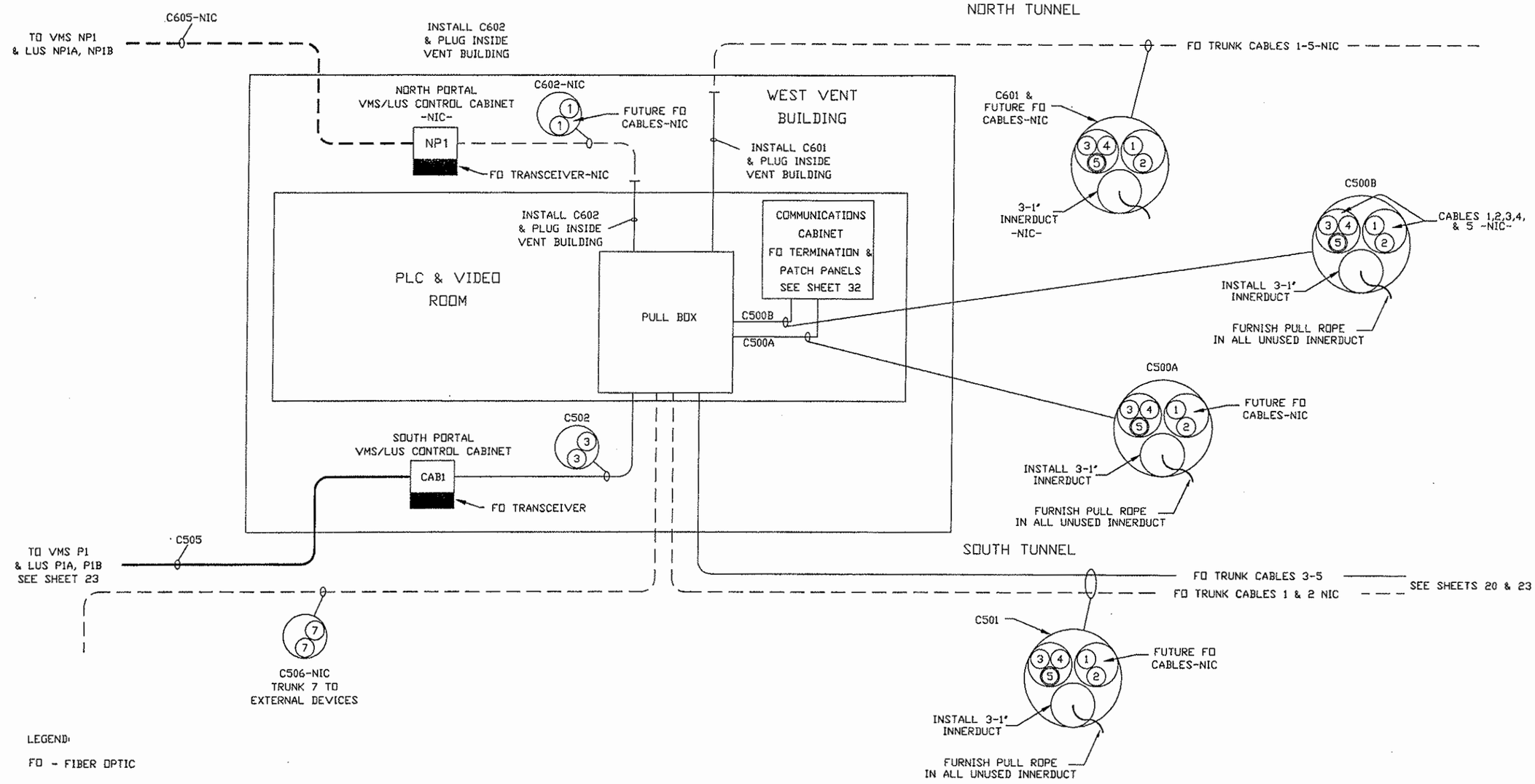
No Revisions: 01/10/03	
Revised:	
Void:	

EAST VENT BUILDING VMS/LUS CABLING DETAIL

Designer: J. MANCINELLI		Structure Numbers	
Detailer: P. MEYDRECH			
Sheet Subset: VMS	Subset Sheets: 24 OF 33		

Project No./Code
IM 0703-264
12982
Sheet Number 148



LEGEND:

FO - FIBER OPTIC

_____ - FIBER RUNS IN CONDUIT

— — — — - FUTURE FIBER RUNS IN CONDUIT-NIC

_____ - COPPER WIRE RUNS IN CONDUIT

— — — — - COPPER WIRE RUNS IN CONDUIT-NIC

(1)(2)(3)(4) & (7) - 6-FIBER FO TRUNK CABLES

(5) - 12-FIBER FO TRUNK CABLE

Design File Name: VMS-25.DWG
Plot File Name:
Date of Plot: 10/22/99

Computer File Information			
Creation Date:	07/14/99	Initials:	PWM
Last Modification Date:	11/05/99	Initials:	PWM
Full Path:	014102\700CADD\713TRA		
Drawing File Name:	VMS-25.DWG		
Acad Ver. R14	Scale: NTS	Units:	ENGLISH

Sheet Revisions		

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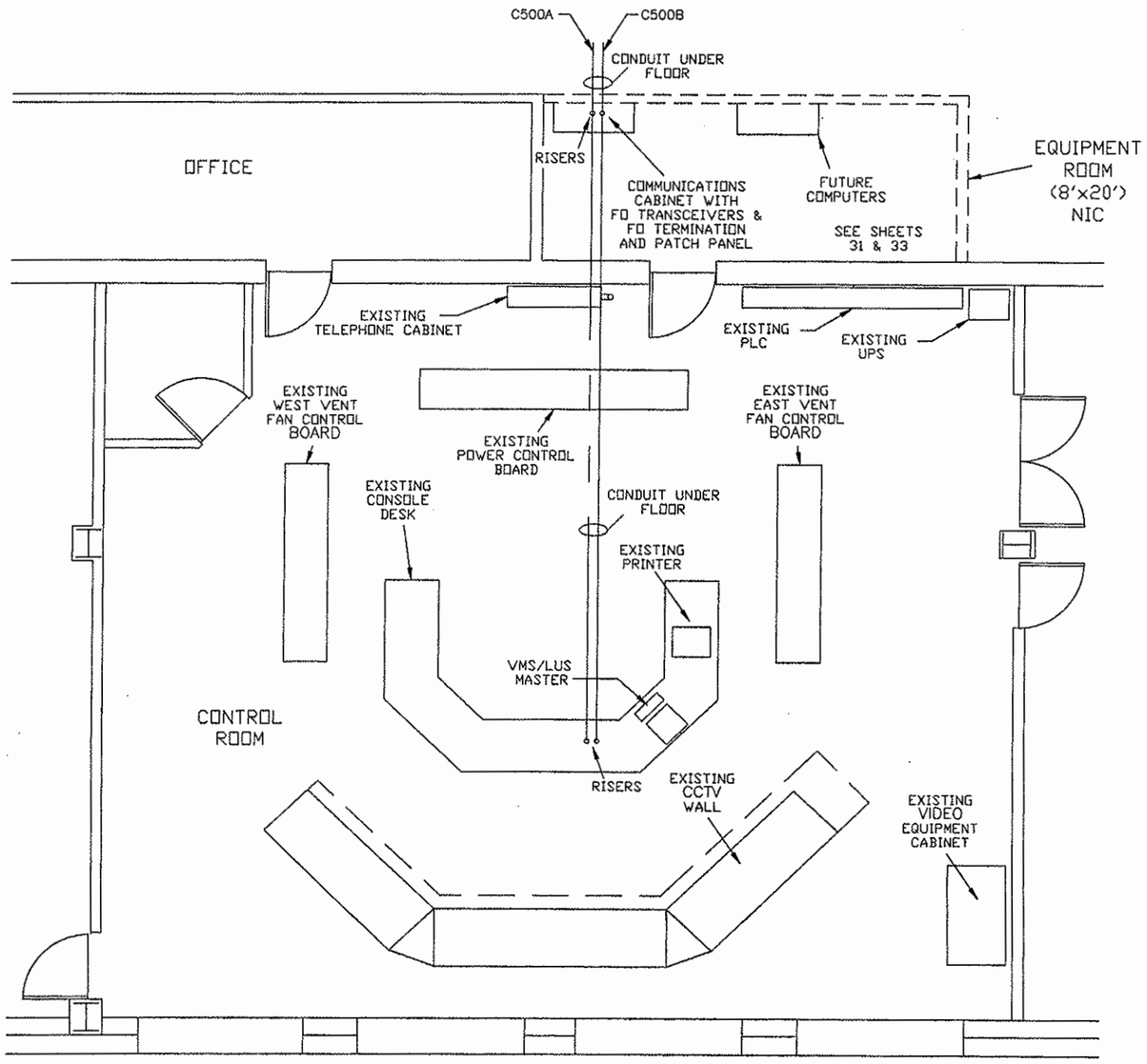
As Constructed
No Revisions: 01/10/03
Revised:
Void:

WEST VENT BUILDING VMS/LUS CABLING DETAILS

Designer: J. MANCINELLI
Detailer: P. MEYDRECH
Sheet Subset: VMS
Structure Numbers
Subset Sheets: 25 OF 33

Project No./Code	
IM 0703-264	
12982	
Sheet Number	149



SEE SHEETS 20, 22 & 24
SEE VB ELECT SHEET NO. 118

Design File Name: VMS-26.DWG
Plot File Name: -
Date of Plot: 10/18/99

Computer File Information			
Creation Date:	07/14/99	Initials:	PWM
Last Modification Date:	11/05/99	Initials:	PWM
Full Path:	014102\700CADD\713TRA		
Drawing File Name:	VMS-26.DWG		
Acad Ver. R14	Scale: NTS	Units:	ENGLISH

Sheet Revisions		

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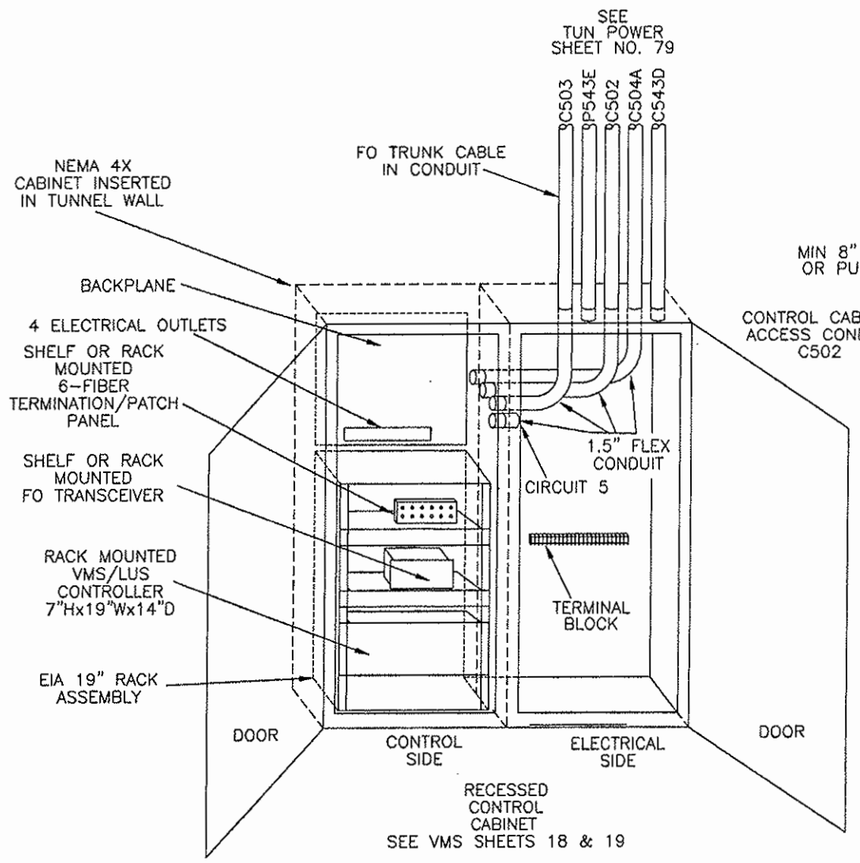
As Constructed	
No Revisions: 01/10/03	
Revised:	
Void:	

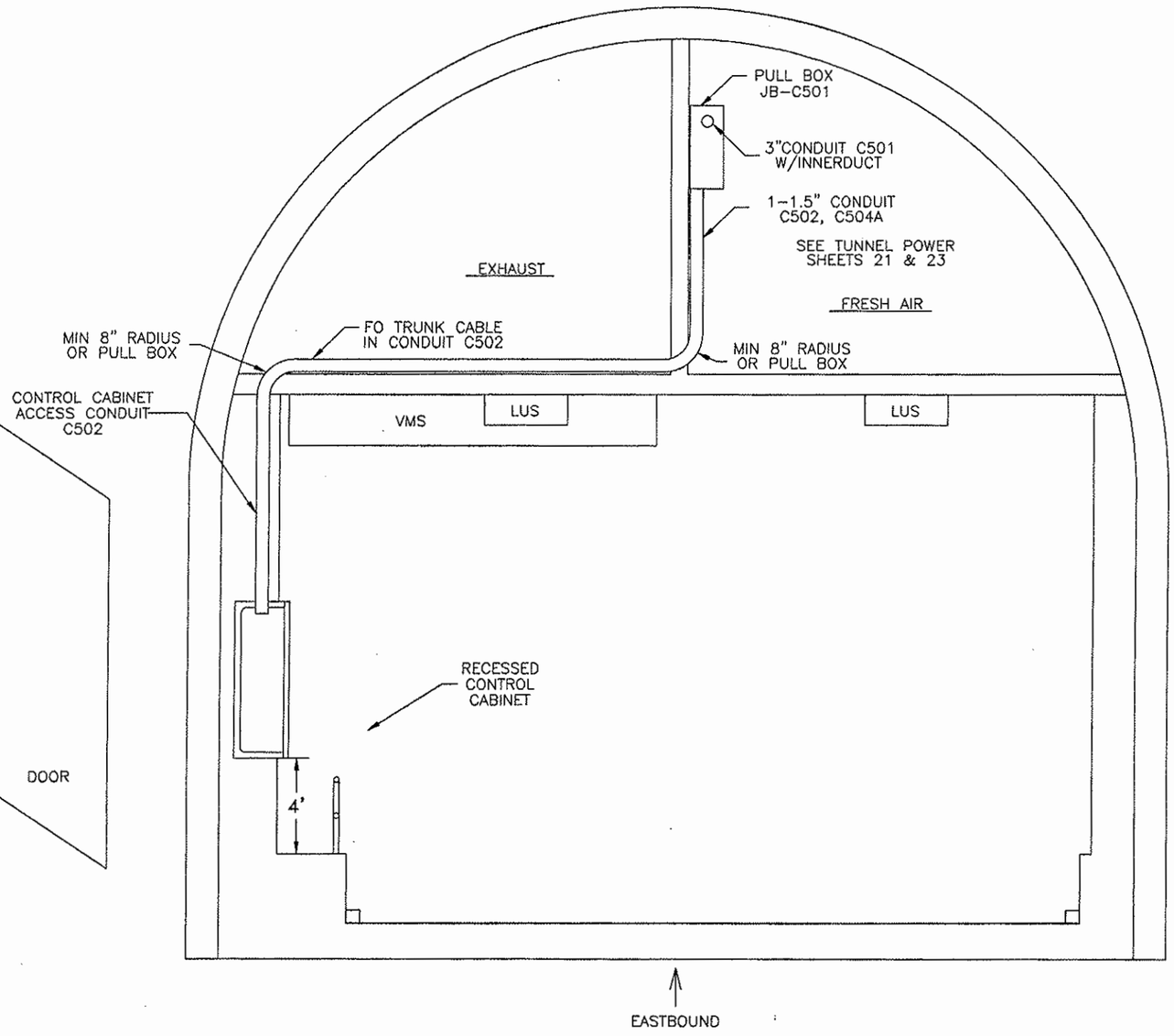
EAST VENT BUILDING CONTROL ROOM PLAN

Designer: J. MANCINELLI		Structure Numbers	
Detailer: P. MEYDRECH			
Sheet Subset: VMS	Subset Sheets: 26 OF 33		

Project No./Code
IM 0703-264
12982
Sheet Number 150



LEGEND:
FO - FIBER OPTIC



Design File Name: VMS-27.DWG
Plot File Name: .
Date of Plot: 10/25/99

Computer File Information			
Creation Date:	07/14/99	Initials:	PWM
Last Modification Date:	11/05/99	Initials:	PWM
Full Path:	014102\700CADD\713TRA		
Drawing File Name:	VMS-27.DWG		
Acad Ver. R14	Scale: NTS	Units:	ENGLISH

Sheet Revisions		

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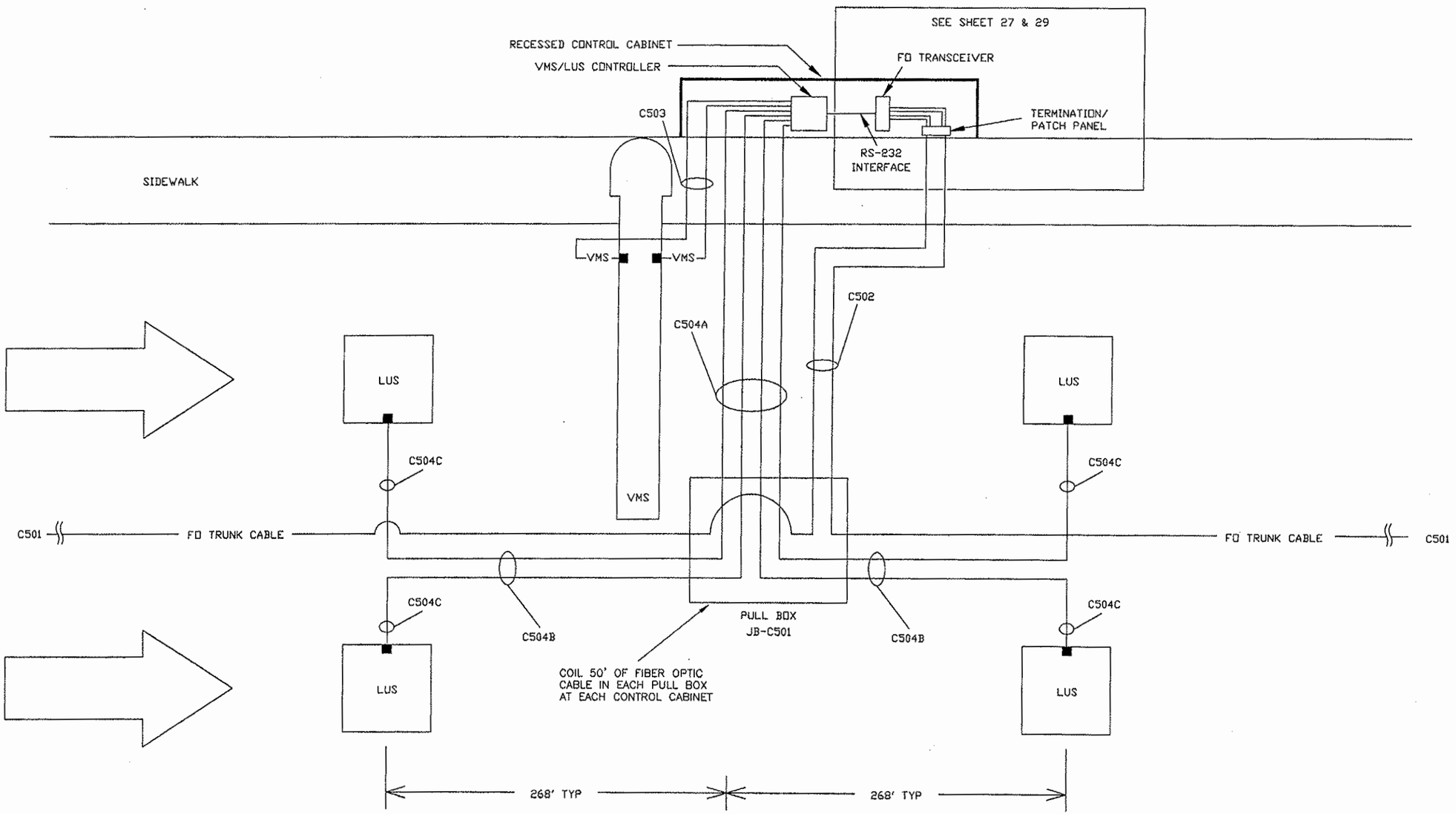
As Constructed			
No Revisions: 01/10/03			
Revised:			
Void:			

VMS/LUS CONTROL CABINET LAYOUT

Designer: J. MANCINELLI	Structure Numbers		
Detailer: P. MEYDRECH			
Sheet Subset: VMS	Subset Sheets: 27 OF 33		

Project No./Code	
IM 0703-264	
12982	
Sheet Number	151



TYPICAL TUNNEL VMS/LUS CONTROL CIRCUIT LAYOUT

SEE TUN POWER, SHEET NO. 79

LEGEND:

FO - FIBER OPTIC

■ - DEVICE INTERFACE

Design File Name: VMS-28.DWG
Plot File Name:
Date of Plot: 10/19/99

Computer File Information			
Creation Date:	07/14/99	Initials:	PWM
Last Modification Date:	11/05/99	Initials:	PWM
Full Path:	014102\700CADD\713TRA		
Drawing File Name:	VMS-28.DWG		
Acad Ver. R14	Scale: NTS	Units:	ENGLISH

Sheet Revisions		

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As Constructed
No Revisions: 01/10/03
Revised:
Void:

VMS/LUS CONTROL CIRCUIT		
Designer: J. MANCINELLI	Structure Numbers	
Detailer: P. MEYDRECH		
Sheet Subset: VMS	Subset Sheets: 28 OF 33	

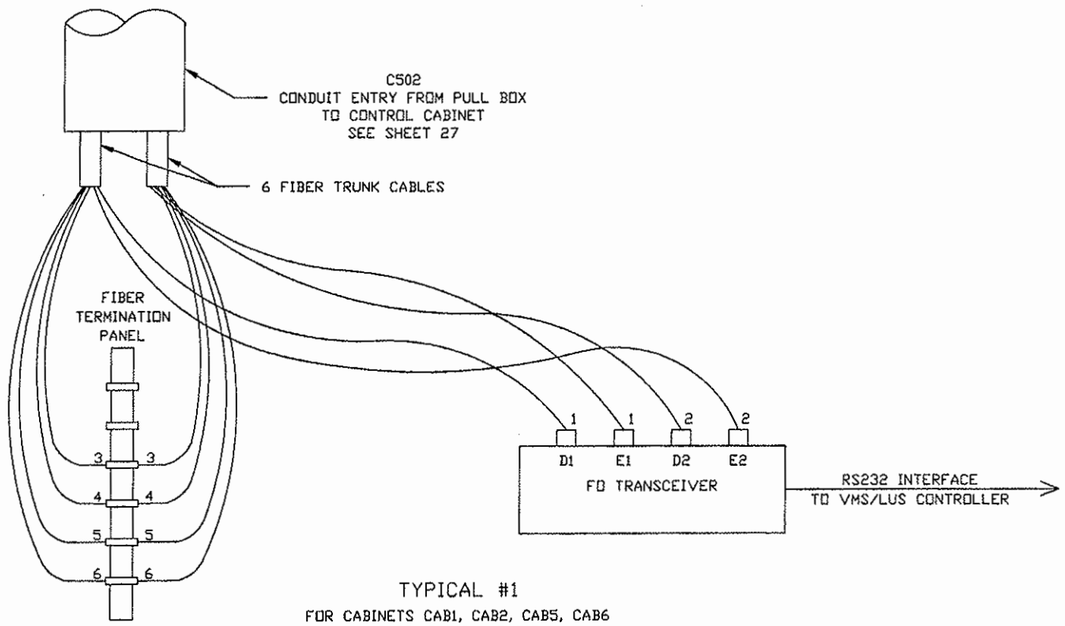
Project No./Code
IM 0703-264
12982
Sheet Number 152

NOTES:

A. INSTALL BUFFERS AND ST CONNECTORS ON ALL FIBERS PER MANUFACTURER'S INSTALLATION PROCEEDURE

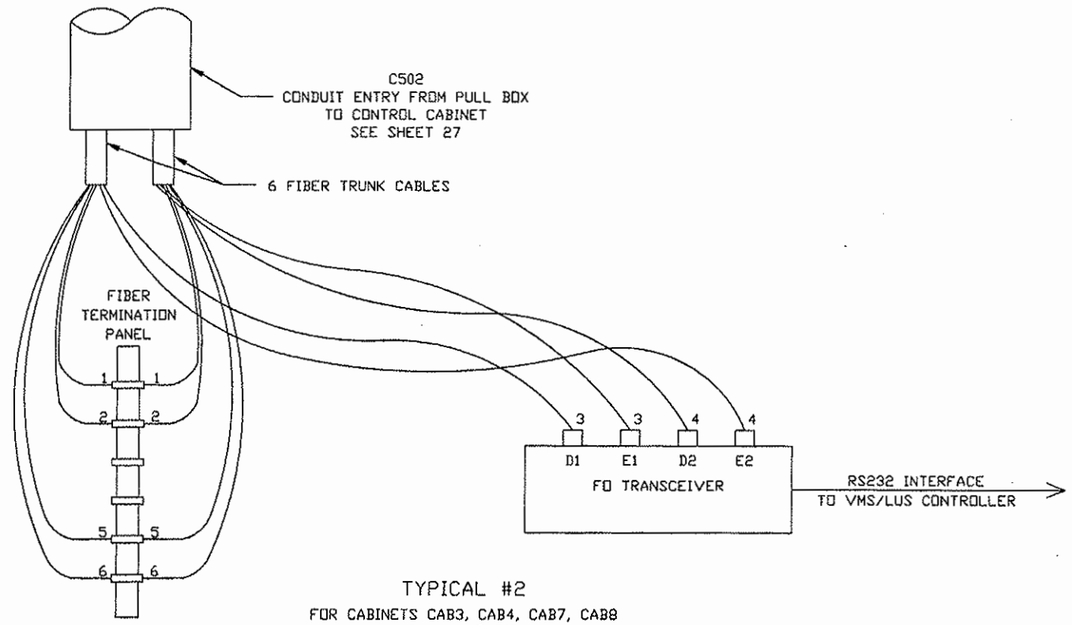
B. D1, D2 DENOTES OPTICAL DETECTOR

C. E1, E2 DENOTES LIGHT EMITTER



TYPICAL #1

FOR CABINETS CAB1, CAB2, CAB5, CAB6
CAB9, CAB10 & CAB13



TYPICAL #2

FOR CABINETS CAB3, CAB4, CAB7, CAB8
CAB11 & CAB12

LEGEND:

FO - FIBER OPTIC

SEE SHEET 28

Design File Name: VMS-29.DWG
Plot File Name:
Date of Plot: 10/19/99

Computer File Information			
Creation Date:	07/14/99	Initials:	PWM
Last Modification Date:	11/05/99	Initials:	PWM
Full Path:	014102\700CADD\713TRA		
Drawing File Name:	VMS-29.DWG		
Acad Ver. R14	Scale: NTS	Units:	ENGLISH

Sheet Revisions		

Colorado Department of Transportation
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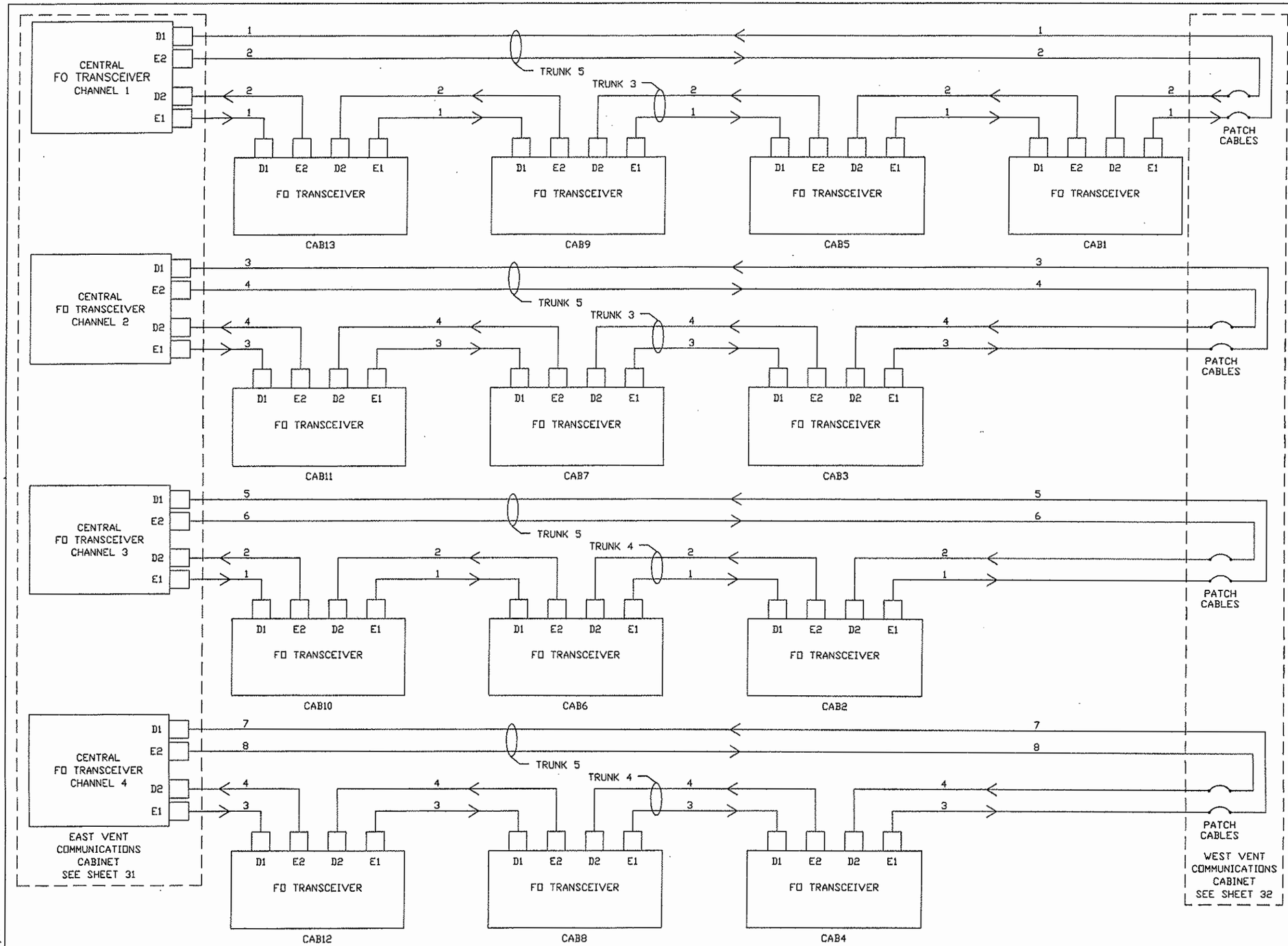
DUMONT, CO. 80436
Phone: 303-512-5750 FAX: 303-512-5775
Region 1 Mountain Residency W.W.G.

As Constructed	
No Revisions: 01/10/03	
Revised:	
Void:	

VMS/LUS FIBER TERMINATION DETAILS

Designer: D. EWAN		Structure Numbers	
Detailer: P. MEYDRECH			
Sheet Subset: VMS	Subset Sheets: 29 OF 33		

Project No./Code	
IM 0703-264	
12982	
Sheet Number	153



NOTES:

1. DIRECTIONAL ARROWS DENOTE SIGNAL FLOW
2. NUMBERS SHOWN CORRESPOND TO FIBER NUMBERS IN EACH CABLE
3. SEE SHEETS 31 & 32 FOR PATCH PANEL WIRING
4. ON ALL FO TRANSCIEVERS, D1 AND E1 DENOTE-RING 1 AND D2 AND E2 DENOTE-RING 2

LEGEND:

FO - FIBER OPTIC

Design File Name: VMS-30.DWG
Plot File Name:
Date of Plot: 10/19/99

Computer File Information			
Creation Date:	09/24/99	Initials:	PWM
Last Modification Date:	11/05/99	Initials:	PWM
Full Path:	014102\700CADD\713TRA		
Drawing File Name:	VMS-30.DWG		
Acad Ver. R14	Scale: NTS	Units:	ENGLISH

Sheet Revisions		

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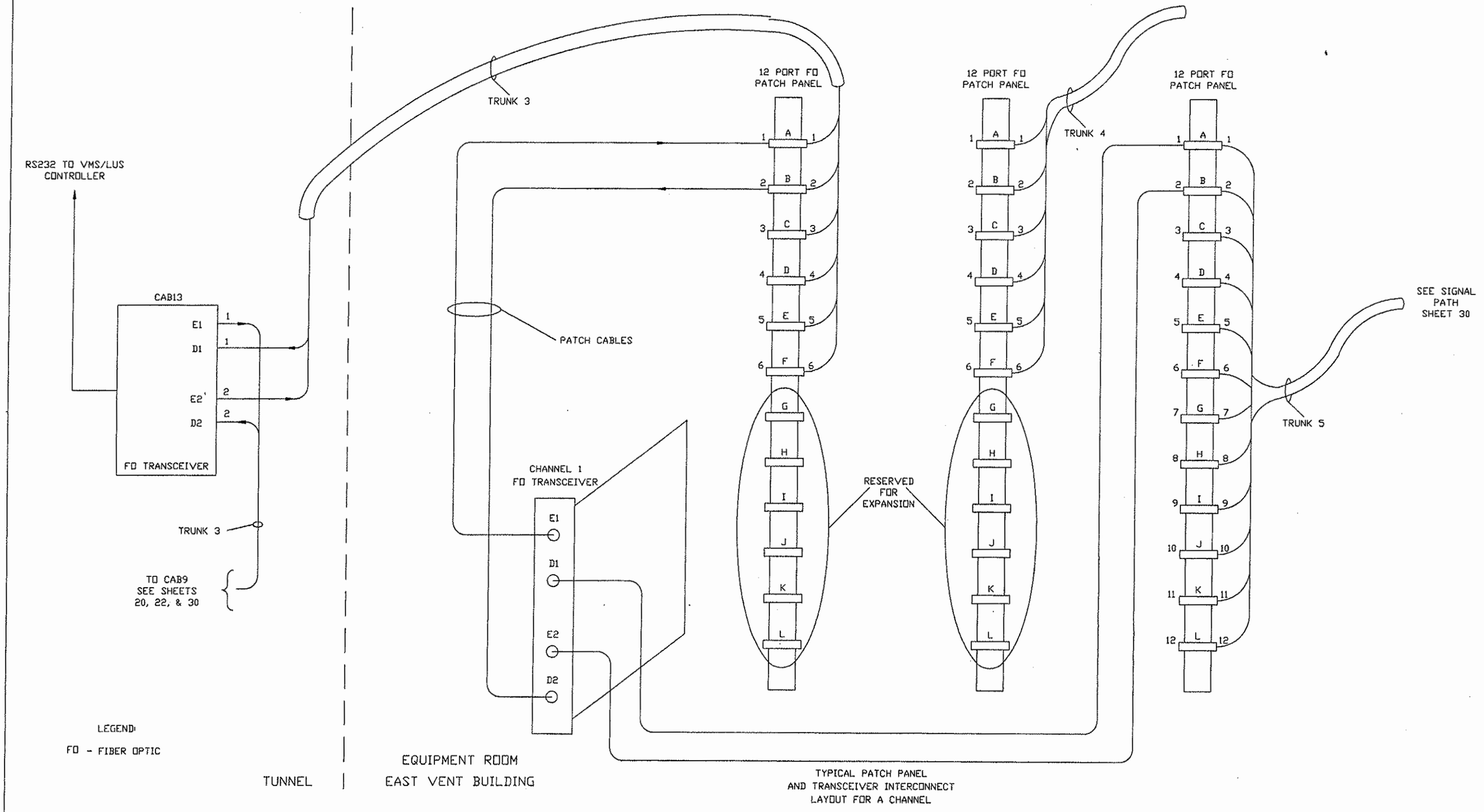
No Revisions: 01/10/03	
Revised:	
Void:	

TUNNEL FO INTERCONNECT DETAIL

Designer: D.EWAN		Structure Numbers	
Detailer: P. MEYDRECH			
Sheet Subset: VMS	Subset Sheets: 30 OF 33		

Project No./Code	
IM 0703-264	
12982	
Sheet Number	154



Design File Name: VMS-31.DWG
Plot File Name: -
Date of Plot: 10/19/99

Computer File Information			
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Last Modification Date:	11/05/99	Initials:	JLM
Full Path:	014102\700CADD\713TRA		
Drawing File Name:	VMS-31.DWG		
Acad Ver. R14	Scale: NTS	Units:	ENGLISH

Sheet Revisions		

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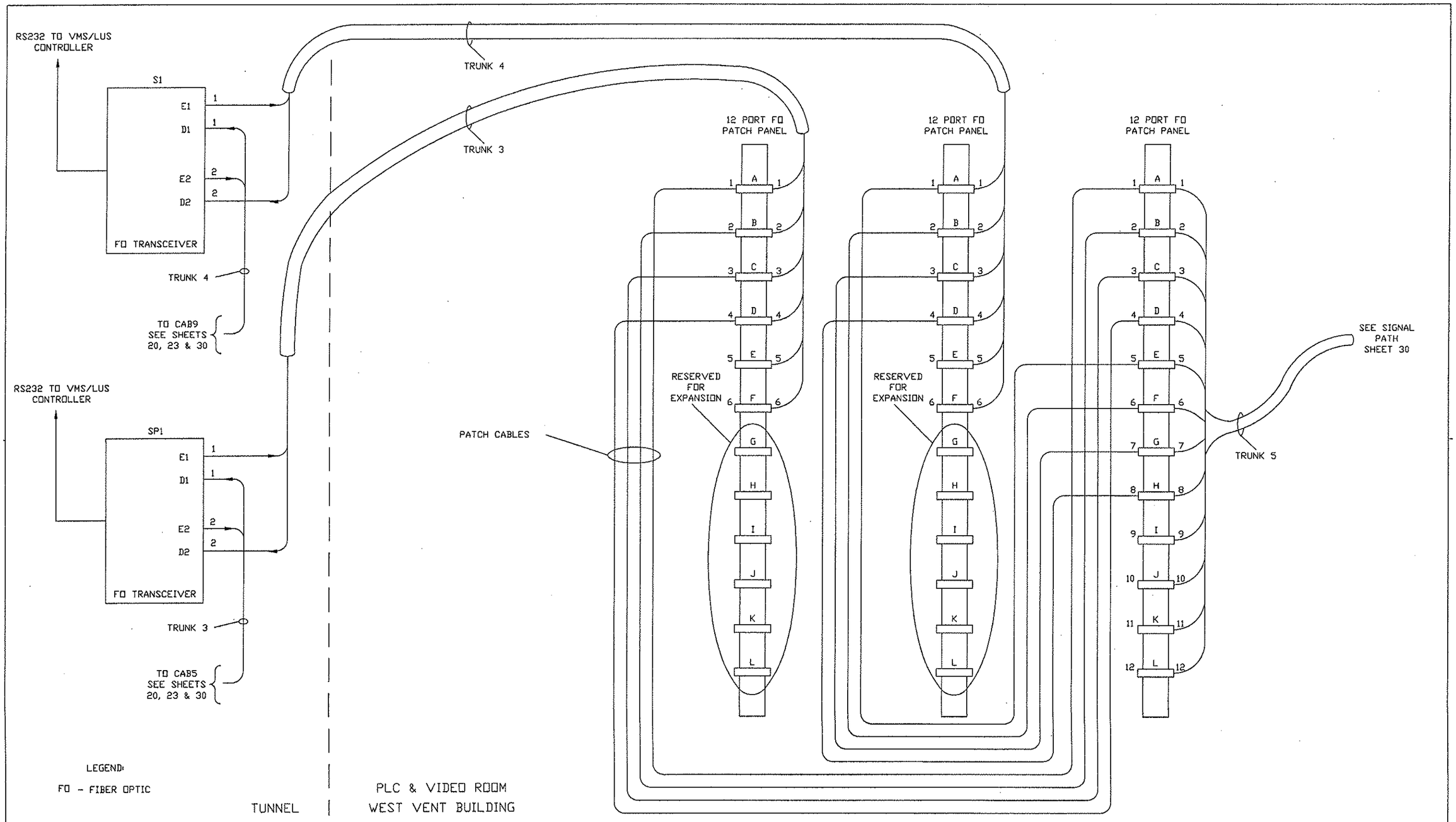
No Revisions: 01/10/03	
Revised:	
Void:	

PATCH PANEL AND FO TRANSCEIVER INTERCONNECT

Designer: D. EWAN		Structure Numbers	
Detailer: P. MEYDRECH			
Sheet Subset: VMS	Subset Sheets: 31 OF 33		

Project No./Code	
IM 0703-264	
12982	
Sheet Number	155



Design File Name: VMS-32.DWG
Plot File Name: -
Date of Plot: 10/19/99

Computer File Information			
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Last Modification Date:	11/05/99	Initials:	JLM
Full Path:	014102\700CADD\713TRA		
Drawing File Name:	VMS-32.DWG		
Acad Ver. R14	Scale: NTS	Units:	ENGLISH

Sheet Revisions		

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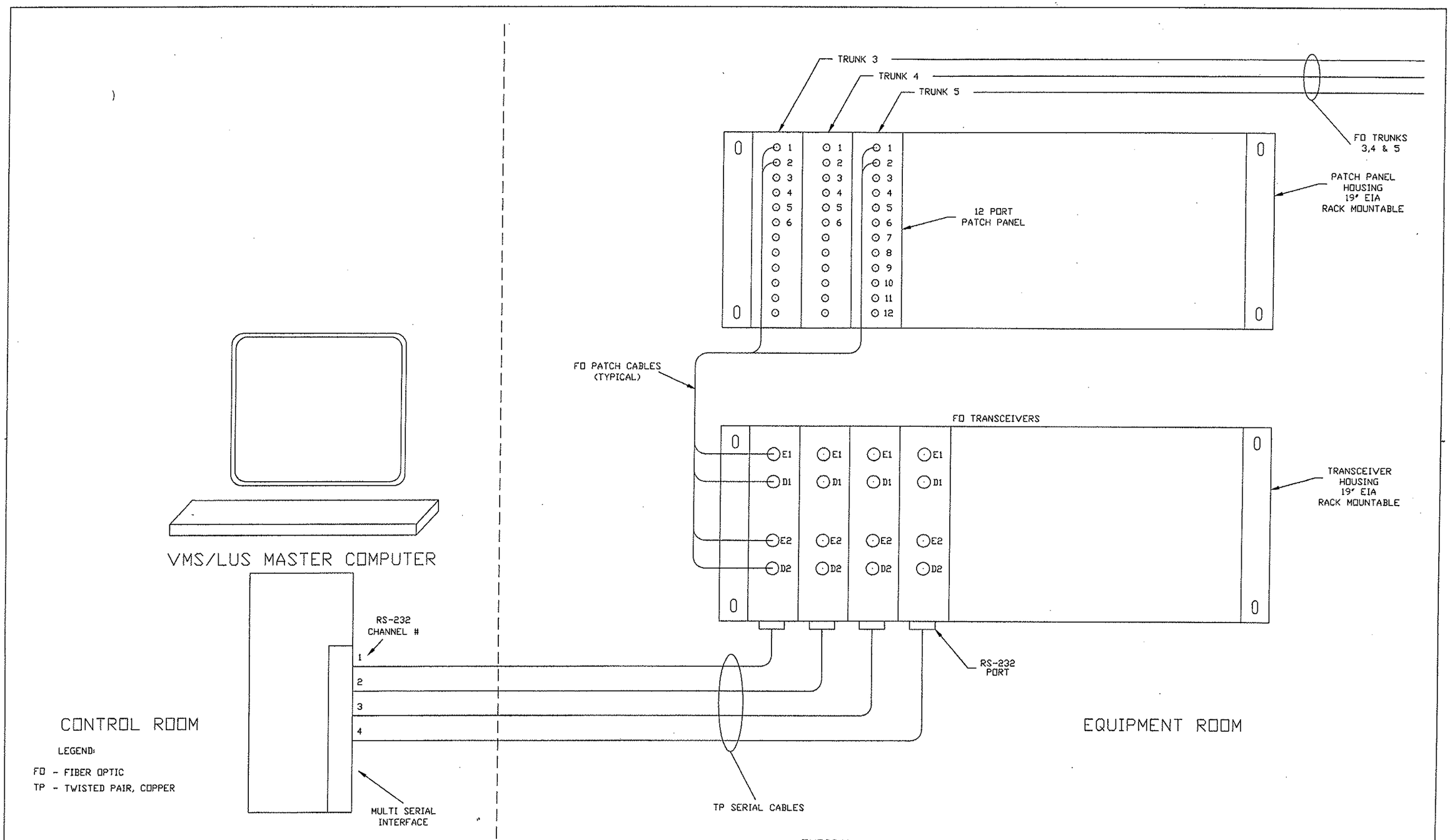
As Constructed
No Revisions: 01/10/03
Revised:
Void:

WEST VENT TERMINATION AND INTERCONNECT DETAIL

Designer: D. EWAN
Detailer: P. MEYDRECH
Sheet Subset: VMS
Structure Numbers:
Subset Sheets: 32 OF 33

Project No./Code
IM 0703-264
12982
Sheet Number 156



Design File Name: VMS-33.DWG
Post File Name:
Date of Plot: 10/19/99

Computer File Information			
Creation Date:	08/21/99	Initials:	DE
Last Modification Date:	11/05/99	Initials:	JLM
Full Path:	014102\700CADD\713TRA		
Drawing File Name:	VMS-33.DWG		
Acad Ver. R14	Scale: NTS	Units:	ENGLISH

Sheet Revisions

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No Revisions: 01/10/03
Revised:
Void:

CENTRAL FIBER TERMINATION AND TRANSCEIVER LAYOUT

Designer: D. EWAN
Detailer: P. MEYDRECH
Sheet Subset: VMS
Structure Numbers
Subset Sheets: 33 OF 33

Project No./Code
IM 0703-264
12982
Sheet Number 157