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May 4, 1999

VIA OVERNIGHT DELIVERY

K. David Waddell, Executive Director
Tennessee Regulatory Authority
460 James Robertson Parkway
Nashville, Tennessee 37219

Re: In the Matter of the Petition of Hyperion Communications of Tennessee, L.P. for a Certificate of Convenience and Necessity to Provide Facilities-Based and Resold Local Exchange and Resold Interexchange Telecommunications Services Throughout the State of Tennessee - **Responses to Third Set of Data Requests**; Docket No. 98-00732 (filed October 19, 1999)

Dear Mr. Waddell:

Enclosed for filing on behalf of Hyperion Communications of Tennessee, L.P. ("HCT") are an original and thirteen (13) copies of HCT's Responses to the Authority's Third Set of Data Requests. HCT respectfully submits this information to assist and expedite the Authority's examination of the application in this matter and remains willing to provide any information that would be useful to the Authority's examination of HCT's application.[1]

By way of background, since HCT filed its application on October 19, 1998, it has responded to several Staff inquiries. On November 6, 1998, HCT filed a letter of non-opposition to the intervention of the TDS Companies. Moreover, HCT did not request a termination of any small or rural LEC exemption the TDS companies may have claimed. On December 17, 1998, HCT, in response to a data request dated December 9, 1998, provided the requested information to the Authority. On January 12, 1999, HCT filed information regarding its proposed procedures for responding to requests from the Authority and its Staff in response to another set of data requests dated January 5, 1999 concerning AVR, L.P. d/b/a Hyperion of Tennessee, L.P.'s ("AVR") compliance with certain Authority directives. Also pursuant to Staff request, on January 12, 1998 HCT presented Pre-Filed Testimony regarding its certification qualifications and formally filed its Notice of Filing and application service list (dated October 15, 1998). Finally, on February 4, 1999, HCT filed a letter clarifying the ownership of various Hyperion

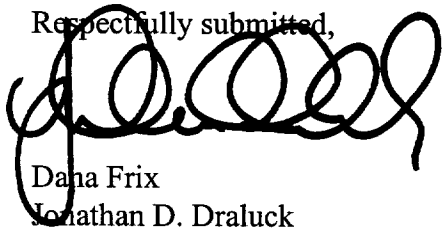
[1] Where indicated, HCT respectfully requests proprietary treatment for certain confidential information.

Telecommunications, Inc. ("HTI") subsidiaries and affiliates, and subsequently discussed with TVA Staff HTI's plans for streamlining affiliate operations in Tennessee.

As explained in previous correspondence, at this time, HCT only requests the same authority granted to its affiliate, AVR, and that which has been routinely granted to other competitive local exchange companies. HCT respectfully submits that its numerous responses and filings in this matter demonstrate its commitment to providing service in Tennessee. For these reasons, HCT respectfully requests that its application be placed on the next possible Authority agenda. Immediate grant of its application will enable HCT to rapidly bring the benefits of competition to more Tennessee consumers.

Please date stamp the enclosed extra copy of this filing and return it in the self-addressed, postage prepaid envelope provided. Should any questions arise concerning this filing, please do not hesitate to contact us or Ron Del Sesto at (202) 945-6923.

Respectfully submitted,



Dana Frix
Jonathan D. Draluck

Counsel for Hyperion Communications
of Tennessee, L.P.

Enclosure

cc: Mr. Paul Greene
Ms. Darlene Standley
Mr. Joe Werner
Mr. Darrell Whitis
Mr. David Hood

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Hyperion Communications of Tennessee, L.P. - Responses to Third Set of Data Requests

1. **The Company's application states that it plans to provide local exchange and interexchange telecommunications services through the use of its own facilities and through resale. Please provide the following information on the proposed facilities:**

   (a) Provide a listing of cities where the network facilities will be located in Tennessee.

   (b) Provide details of how the network facilities will be deployed.

   (c) Provide the type of equipment that HCT is proposing to deploy (i.e. DMS-100, 5ESS, etc.)

   (d) Provide the cost of the network facilities that HCT will deploy to furnish service in Tennessee.

   (e) Provide a narrative explaining how HCT will fund the deployment of its facilities in Tennessee.

   Response:

a. HCT's affiliate, AVR, L.P. d/b/a Hyperion of Tennessee, L.P. is already one of the leading Competitive Local Exchange Carriers ("CLECs") in Tennessee with respect to the deployment of facilities in Tennessee. HCT intends to continue to invest in facilities in Tennessee, expanding its facilities into all other areas within the state not currently serviced by its affiliate. Specifically, HCT plans to deploy its network facilities in the following Tennessee cities: Memphis, Nashville, Knoxville, Chattanooga, Kingsport and Johnson City.

b. Upon certification, HCT will immediately begin providing services on a resold basis and will commence the deployment of its own facilities network soon thereafter. HCT will install fiber optic rings with Lucent 5ESS or equivalent switches and related electronics. HCT will employ a regional switching architecture to serve its Tennessee customers. The fiber optic ring will connect with the major Incumbent Local Exchange Carrier's ("ILEC") central offices. HCT plans to deploy state-of-the-art transmission and multiplexor equipment in each of the ILEC central offices in which it is located. A copy of HCT's capital construction plan is attached hereto as Exhibit 1.

c. HCT will install fiber optic rings with Lucent 5ESS or equivalent switches and related electronics.

d. The costs to HCT of providing service in Tennessee are attached hereto as Exhibit 2. HCT maintains that this exhibit demonstrates its commitment to becoming a true facilities-based telecommunications alternative in Tennessee.

e. As described in HCT's Application, HCT has more than adequate access to necessary capital to deploy the proposed telecommunications facilities. As a start-up company, HCT will rely on the substantial financial resources of its parent company, Hyperion Telecommunications, Inc.("HTI"), to provide the initial capital investment for the necessary facilities and to fund any operating losses during the start-up phase of operations. HTI has financed HCT's initial operations and, in accordance with its pre-approved budget, will continue to provide financial support to HCT so long as HCT requires additional capital and resources to complete its networks and construct facilities. As detailed in the financial statements attached to HCT's initial application, HTI had $836,342,000 in total company assets for the period ending March 31, 1998. The financial statements attached demonstrate that HCT has access to the necessary capital to provide its proposed services in Tennessee. In addition, HTI is pleased to report that it recently completed an additional $300 million financing arrangement.

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2. Provide details of HCT's Year 2000 compliance plans.

Response:

The Year 2000 challenge is one of the most significant projects ever faced by data-sensitive companies today. Recognizing the potential impact to our products and services, HCT has been assessing the change of the century impact for more than five months, ensuring that existing and newly developed products and services operate without interruption to our customers both before and after the turn of the century.

The potential implications surrounding the Year 2000 challenge have assured full support and funding from HCT's Senior Management Team and the company 's Board of Directors. Resources and equipment are in place to ensure a complete and successful execution of our Year 2000 project plan.

Although the Year 2000 certification will require a monumental effort, HCT, because of its short existence, is not burdened with legacy systems, millions of lines of custom code, or hundreds of outside suppliers. In fact, almost all of our entire "back office" system is comprised of standard, off-the-shelf application products. Our software vendors have already supplied Year 2000 "ready" versions of software for internal testing purposes. In that light, HCT does not anticipate any major issues in achieving our Year 2000 project goals.

HCT defines a product or service as Year 2000 "compliant" as a product or service that will not fail to perform in accordance with its guaranteed performance specifications or as otherwise warranted, in any manner that is material and adverse to the customer, because of the following date changes: September 9, 1999, January 1, 2000, and February 29, 2000; provided that the customer uses the product or services with other product and services which are also Year 2000 compliant.

HCT is taking a phased approach to addressing Year 2000 issues; our goal is to have all transport equipment, applications, and operating systems Year 2000 compliant in sufficient time to allow for comprehensive testing before the data change occurs. Specifically, our goal is to be Year 2000 compliant by June 30, 1999.

The following are key aspects of our Year 2000 plans:

Phase I: Project Initiation entails taking inventory of all equipment and applications.

Phase II: Project Definition development of specific project plans (and assessment of supplier project plans) to address and prioritize Year 2000 solutions using the (refer to phase I) inventory lists. In many cases, this will involve working directly with our equipment vendors, as our compliance is to a great extent, dependent on our third-party vendors.

Phase III: Project Execution implementation and evaluation of the above specific project plans, providing updates as necessary. Ensuring our third-party vendors are meeting and/or exceeding

expected Year 2000 testing milestones, as well as ensuring industry standard Year 2000 testing suites are being followed.

Phase IV: Project Monitoring and Closure begins once all above milestones have been reached, and testing and customer acceptance has been completed.

Currently, HCT has completed Phase I of the project and is currently in the Project Definition stage as applicable to internal applications and third-party equipment vendors. During Phase I of the project, HCT prioritized inventory into three divisions, as defined below: Transport Equipment defined as any equipment that can be customer service effecting. "Back Office" Equipment defined as the computer systems and networking equipment used for service order, provisioning, monitoring, maintenance, billing, and other internal functions. Facilities Equipment defined as HVAC, security systems, fire suppression systems, and other facilities-related equipment. HCT will rely on our suppliers for Year 2000 certification for transport and facilities equipment. In that light, HCT has requested from each of these suppliers their respective Year 2000 test plans and results, as well as formal certifications for all applicable equipment. All "back office" computer systems, software applications, and networks will be internally tested.

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3. (a) Provide HCT's intraLATA toll dialing parity plan for customers in Tennessee.

(b) Indicate if the plan complies with the March 23, 1998 FCC Order in Docket No. 96-98.

(c) Indicate the procedures or steps HCT will use to inform customers of their choices for providers in intraLATA long distance services.

Response:

a. A copy of HCT's intraLATA toll dialing parity plan is attached hereto as Exhibit 3. HCT filed this plan with the Authority on April 22, 1999 in accordance with the FCC's Order in Docket No. 96-98.

b. This plan complies with all of the requirements contained in the March 23, 1998 FCC Order.

c. HCT will provide its customers with a bill insert to notify its customers of their choices for providers of intraLATA long distance services. Furthermore, HCT will require that all PIC change orders be requested directly from the customer or via the account executive in the form of a signed LOA or other method prescribed by the FCC and the Authority. PIC change requests from any other source will not be recognized by HCT. These policies comply with the Authority's regulations concerning slamming and are consistent with the FCC's telemarketing and PIC change rules applicable to the long distance industry.

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4. **The Company provided the Staff with a description of the merger plans between Hyperion of Tennessee, L.P. and Hyperion Telecommunications of Tennessee in a letter dated December 17, 1998. Have there been any more mergers that have taken place in Tennessee since then? If so, please provide a brief narrative.**

Response:

No other mergers regarding HCT entities have taken place in Tennessee. Please note, however, as we previously discussed with staff, that HT-Tennessee, a 95% owner of AVR, L.P. d/b/a Hyperion of Tennessee, L.P. ("Hyperion-Tennessee"), has acquired the remaining 5% minority interests previously held among Intermedia Partners, SE and Robin Media Group.

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Hyperion Communications of Tennessee, L.P. - Responses to Third Set of Data Requests

5. **The Balance Sheet for Hyperion Telecommunications, Inc., HCT's parent company, shows "Other Current Assets" of $4,434,000 for the fiscal year ended March 31, 1998. Indicate how much of this amount is for Accounts Receivable related to reciprocal compensation from Internet Service Providers.**

Response:

[This Response is filed under seal due to its proprietary and confidential nature]

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Hyperion Communications of Tennessee, L.P. - Responses to Third Set of Data Requests

6. **The Income Statement for Hyperion Telecommunications, Inc.'s HCT's parent company, shows "Revenues" of $13, 510, 000 for the fiscal year ended March 31, 1998. Indicate how much of this amount is related to revenues earned for services provided to Internet Service Providers.**

Response:

[This Response is filed under seal due to its proprietary and confidential nature]

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Hyperion Communications of Tennessee, L.P. - Responses to Third Set of Data Requests

7. Provide a three year projected balance sheet, income statement, and statement of cash flows for Hyperion Telecommunications, Inc. and for Hyperion Communications of Tennessee, L.P.

Response:

Attached hereto as Exhibit 4 is a three year balance sheet, income statement and statement of cash flows for Hyperion Telecommunications, Inc. and Hyperion Communications of Tennessee, L.P.

These exhibits clearly demonstrate that HCT is financially qualified to provide the services for which it currently seeks authorization. In particular, HCT has access to the financing and capital necessary to conduct its telecommunications operations as specified in its Application. As stated in its Application, HCT, as a newly formed company, will rely upon the substantial financial resources of its parent, HTI, to provide the initial capital investment and to fund operating costs. Moreover, HTI has financed the initial capital investment in HCT and will fund any operating losses during the initial start-up period. In addition, through a recent public offering, Wall Street investors boosted HTI's total asset valuation an additional $300 million dollars. Further, HTI estimates that its current expansion plans will increase HTI's nationwide addressable market potential to more than $40 billion in revenue. With the resources of HTI, HCT possesses the sound financial support necessary to effectively procure, install and operate the facilities and services requested as specified in its Application.

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Hyperion Communications of Tennessee, L.P. - Responses to Third Set of Data Requests

8. Provide a three year capital budget for Hyperion Telecommunications, Inc. and for Hyperion Communications of Tennessee, L.P.

Response:

Attached hereto as Exhibit 5 is a three year capital budget for Hyperion Telecommunications, Inc. and Hyperion Communications of Tennessee, L.P.

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9. Will potential customers have to purchase any customer premise equipment (CPE) which would be unique to HCT's network? Would the customer be able to use the CPE if they switch to another carrier?

Response:

HCT does not plan to require its customers to purchase any customer premise equipment.

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Hyperion Communications of Tennessee, L.P. - Responses to Third Set of Data Requests

TABLE OF EXHIBITS

EXHIBIT 1 - CAPITAL CONSTRUCTION PLAN

EXHIBIT 2 - SERVICE COSTS

EXHIBIT 3 - INTRALATA TOLL DIALING PARITY PLAN

EXHIBIT 4 - FINANCIAL INFORMATION

EXHIBIT 5 - CAPITAL BUDGET

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Hyperion Communications of Tennessee, L.P. - Responses to Third Set of Data Requests

EXHIBIT 1

Capital Construction Plan

Initial_____

Hyperion Telecommunications

Outside Plant Fiber Optics
Construction Specifications

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Part 2	Arial Construction Specifications	Page 3
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Part 4	Construction Materials Specifications	Page 10
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Part 1
Compliance Requirements

A. The plant constructed for Hyperion Communications Fiber Optic Network shall meet the specifications and criteria hereinafter set forth. In addition, the following supplemental referenced specifications shall be observed:

1. Occupational Safety and Health Code (latest edition)
2. Applicable power and telephone pole attachment agreements
3. Applicable city, county and state ordinances
4. National Electric Safety Code (latest edition)
5. National Electric Code (latest edition)
6. Applicable government agencies governing safety and health of the work force.
7. Manufacturers' specifications
8. Scope of Work

A. Municipal, county, state or federal regulations may alter construction specifications in some areas. If construction specifications are altered from these standards, an additional attachment will illustrate revisions.

B. All changes/revisions of the construction specifications made by the contractor must be requested in writing and approved by the Hyperion (hereafter called Owner) OSP Manager or representative thereof.

C. The Owner reserves the right to change/revise the construction specifications to adapt to local conditions. In such case, the contractor shall be notified in writing.

Part 2
Aerial Construction Specifications

A. Anchoring and Guying

1. General Procedures

a. Anchors and guy wires shall be installed and tensioned prior to sagging strand.

b. All guy wires shall be properly tensioned. The tensioning of CLEC guy wires is not to exceed that of any existing guys.

c. Care should be exercised in anchoring to prevent the raking of poles that could cause damage to the poles or to peripheral equipment.

d. All installations of anchors shall be coordinated with the Department of Public Works and all utility companies to insure that no damage will be incurred to buried services.

e. All guy wires shall maintain proper clearances to insure safe passage of vehicles and persons.

f. The splicing of down guys is not permitted.

g. All down guys shall be bonded to the strand.

h. False dead-end strand attachments with down guys shall be used where great differences on pulling tensions are required to maintain proper clearances and to prevent raking of non-guyed poles.

i. If anchor rods are distorted or damaged during the anchoring procedure, they must be replaced.

j. Auxiliary attachments can be installed where applicable.

2. Installation Procedures

a. Consult the aerial construction sketches for reference.

b. One quarter inch (1/4") or five-sixteenth inch (5/16") extra high strength strand shall be used at all anchoring locations, to match support system messenger.

c. Strand shall be continuous to the anchor where possible. Where continuous strand is not required to the anchor rod, a continuity bond shall be used to tie the guy wire to the support strand.

d. All anchors shall be placed in the ground making certain that at all times the anchor rod is in line with the proposed guy attachment. No bends will be allowed in the anchor.

e. The eye of the anchor rod shall not extend more than twelve inches above ground level.

f. Guy tails at anchor level shall be trimmed close to the pre-form guy grip and shall not extend more than two inches (2") beyond the grip loop.

g. Guy guards shall be installed on all down guy wires.

h. Span guys (pole to pole) shall be used in locations where it is not feasible to install an anchor or a false dead-end.

i. Sidewalk guys shall be used in all locations where a clearance of eight feet (8') is not available over sidewalks or lateral room is not available using normal guy wire installation techniques.

j. Temporary guys shall be installed at the end of any strand run that is proposed for extension by the owner before sagging in strand, with permission of the utility companies.

k. Pole to pole guys shall terminate at an anchor unless otherwise authorized in writing by the Construction Manager.

l. Side guys are required on all poles where the tangential pull is greater than ten degrees.

A. Installation of Strand

1.) General Procedures

a. All precautions shall be taken while pulling strand in order to:

- Prevent damage to other utility equipment and wires.
- Prevent damage to public and private properties
- Prevent strand from contacting utility lines.
- Maintain clearances across roads and driveways.

Strand shall not be pulled with a vehicle unless an appropriate tension release device is employed and approved by the Owner.

1.) Set-Up Procedures

(a.) Strand brakes (pole mount) shall be used at all road crossings and commercial drives.

(b.) The "B" roller or travelling ground is the approved method of grounding and shall be used at all times when pulling strand.

(c.) Proper set-up distance shall be maintained (twice the height of attachment).

(d.) Brakes shall be used on all trailers to maintain appropriate pulling tension.

(d.) Adequate safety cones and signs shall be used at all work locations consistent with local and state guidelines and good recommended safety practices.

3.) Pole Attachment

(a.) Consult the aerial construction sketches for installation.

(b.) All pole piercing holes will be eleven-sixteenth inches (11/16") with no less than four inches (4") vertically between holes in any direction.

(c.) Unless local regulations require differently, the strand shall be attached toThe same side of the pole to which the power neutral is attached and shall be at a minimum of forty inches (40") below the neutral. Where there is telephone cable only, the strand shall be attached to the same side as the telephone cable and shall be a minimum of twelve inches (12") above that cable.

(d.) At no time shall there be more than one and one half inches (1-1/2") or less than two (2) full threads of bolt extending beyond the outside of the square nut after the suspension clamp has been securely fastened.

(e.) The lip of the suspension clamp shall always be below the through bolt. Clamps should be mounted as per the manufacturer's specifications. Depending on the type used, the lip will be either facing the pole or facing away from the pole.

(f.) Curved suspension clamps shall be used where the tangential pull is from ten to thirty five degrees and attached on the front side of the pole.

(g.) Where tangential pull is greater than thirty five degrees, the pole shall be framed as a double dead-end pole. Down-guys will be placed at all locations that the pole owner has down-guys.

(h.) Curved suspension clamps shall always be placed on the threaded end of through bolts. Dead-end attachments may be attached to opposite end of through bolts.

(i.) Tangential pulls at strand cross-overs shall not be done.

(j.) False dead-end strand attachments shall be used in all locations accompanied with guying where great differences in pulling tensions are required to maintain proper clearances and prevent raking of non-guyed poles or placement of a dead-end anchor is not possible on the final pole.

(k.) All strand splices shall be of the two or three piece performed variety and shall be placed no more than eighteen inches (18") from the edge of the three-bolt suspension clamp.

(l.) All suspension clamps on either side of all road crossings must be tightened before strand crews leave the run.

(m.) Where slight differences of pulling tension are required between pole spans, suspension clamps shall be tightened after strand is sagged in.

(n.) Initial strand placement must always be slightly tighter than the final plant to allow for the installed cable weight to stretch the final plant into proper sag. Final sagging shall be accomplished when the cable is lashed.

A. Bonding and Grounding

1.) General Procedures

(a.) The fiber-optic plant shall be grounded in a manner as required by local ordinances, permits and grounding architecture established by the Owner.

(b.) The strand and equipment shall be bonded to all existing vertical grounds (power, phone, CATV) when possible.

(c.) The strand shall be bonded to the telephone company in a manner as specified by the telephone company but not to exceed every fifth pole.

(d.) At sites of existing buried facilities, the contractor shall request proper locates prior to driving the ground rods.

1.) Installation Procedures

(a.) The strand shall be bonded to a vertical ground (existing or installed) at the first, last and every tenth pole, plus or minus one pole.

(b.) All strand and guy wires attached to the same pole shall be bonded together with K-2 weaver clamps. Tails from bonding wires must point toward the pole.

(c.) In the absence of the power company vertical ground, grounding shall be accomplished by:

(1.) Driving a 5/8" x 8' ground rod to a depth of four inches (4") below ground level as specified in Part C, 2, f.

(2.) Attaching a soft #6 AWG drawn copper wire from the ground rod clamp to the strand with the K-1 weaver clamp.

(3.) Installing protective moulding over the bottom eight feet (8') of the ground wire in all locations where accessible to the public. The unprotected ground wire must be attached to the pole surface every twenty four inches (24") with copper staples.

(4.) The ground rod clamp shall be treated with Penetrox "E", an oxidize inhibiting compound, before being buried.

(a.) Materials used for bonding and grounding:

(1.) Number 6 AWG solid soft drawn wire

(2.) Copper or copper clad staples

(3.) Plastic moulding – 2" x 4"

(4.) Ground rods 5/8" x 8' copper clad steel

(5.) Bronze ground rod clamps, using a non-galvanic locking bolt

(6.) All bonding clamps shall be of non-galvanic material or have bi-metal spacers to prevent corrosion when bonding two dissimilar metals.

Part 3
Buried Plant Construction Specifications

A. General Procedures

1.) All buried plant construction shall meet National Electrical Safety Code minimum depth requirements, as well as those specified by city, county and/or state codes and Owner.

2.) All buried plant construction shall be in accordance with local permit requirements and stay within easements.

3.) The Owner will acquire all street opening and easement permits prior to the commencement of work in these areas.

4.) Any cable or conduit not meeting the minimum depth specifications must be approved in writing by the Owner prior to back-filling of trench.

A. Pre-Planning

1.) Prior to commencement of construction in any buried plant area, the following shall be done:

(a.) Pre-survey the site and plan the route. The cable route should be selected for the best trenching conditions, minimum obstructions and straightest line possible.

(b.) Where there are existing buried facilities, including sprinkler systems, within the area to be trenched, the Contractor shall request locates of such facilities by the respective persons, companies or utilities.

(c.) Consult all parties involved to resolve any errors or inconsistencies between the design, actual layout and existing locates.

(d.) When opening a trench or boring pit, arrange the work schedule such that no open trenches are left overnight. If, for some reason, a trench has to be left open, make sure that it is well marked and barricaded, and notify Owner's representative. All bore pits are to be covered and barricaded.

A. Construction Techniques

1.) Sod and Plant Removal

(a.) All sod along the buried cable route shall be properly removed by sod cutting machines or shovels and rolled up to protect it against moisture loss. It is to be stored out of the way, preferably in a cool area, until restoration. Occasional wetting may be required.

(b.) Extreme care shall be used in removing plants or fixtures along the buried cable route to prevent them from being damaged.

1.) Direct Bury

(a.) Either trenching or plowing is an acceptable method to "direct bury" conduit, depending on local conditions.

(b.) Trench width shall be the absolute minimum necessary to accommodate re-compaction.

(c.) Duct shall be routed beneath fixed obstacles located at or above the required depth in the trench or plow line.

1.) Conduit

(a.) Unless otherwise specified by the Owner, cables shall be buried in conduit at the following locations:

- Road Crossings
- Driveway Crossings
- Joint Trenches
- Fiber Runs

(b.) All conduits shall be buried at a minimum depth of thirty-six inches (36") measuring from the top of the conduit to the surface level, unless otherwise required by local codes or permits or specified by the Owner.

(c.) Conduit shall be galvanized steel pipe, rigid PVC conduit (schedule 40) or rolled flexible cable conduit (SDR11), as specified by Owner.

(d.) Vertical conduit ends shall extend twelve inches (12") above ground level. Ends shall be smoothed out and capped until cable is to be installed. After the cable is pulled, all conduit ends (both horizontal and vertical) shall be sealed with materials approved by Owner.

(e.) If conduits must cross, a pad (of dirt) shall be installed between them to prevent breakage.

1.) Bore

(a.) All road bores are to be bored at a minimum depth of thirty-six inches (36") and meet or exceed National Electrical Safety Code, city, county or state minimum depth requirements.

(b.) Bore pits should be a minimum of six feet (6') from pavement.

(a.) Missiles, water or air jetting is not an acceptable method of boring.

1.) Surface Cuts

(a.) All concrete and asphalt cuts and patches shall be done in accordance with National Electrical Safety Code minimum depth requirements as well as those specified by Owner, the city, county or state offices.

(b.) Concrete, asphalt and other non-salvageable materials shall be removed from the job site.

A. Backfill and Re-compaction

1.) Backfill and re-compaction of trench line shall occur immediately upon completion of cable or conduit installation for a given run.

2.) Back-filling shall be done in lifts of approximately twelve inches (12"). Each lift shall be thoroughly compacted before the next lift is laid.

3.) Burial tape is to be placed twelve inches (12") above cable or conduit in all open trenches.

4.) In rocky soil, a three inch (3") layer of clean fill shall be laid in and the entire lift compacted. Great care shall be taken to insure that cable is not damaged during this process.

A. Restoration

1.) All sod, plants and fixtures disturbed by buried plant construction shall be restored to its original condition and to the satisfaction of the Owner, landowner or any other party responsible for the condition of the property.

2.) Items damaged or destroyed shall be repaired and made functional or replaced completely.

A. Setting Enclosures

1.) All vaults will be located after notification of the appropriate property owner(s).

2.) The proper size of vault shall be determined according to the closure, number of cables and storage needs.

3.) All vaults shall be placed within the right-of-way or easement, no closer than eighteen inches (18") from side and rear property line intersections and, if possible, clustered with existing facilities of phone and power without obstructing their accessibility.

4.) All vaults shall be installed parallel to the street if possible.

5.) All vaults shall be installed to grade per manufacturer's specifications. All vaults shall be lined in bottom with pea gravel or other non-compressible drainage fill at a depth of six inches (6").

Part 4
Construction Materials Specifications Provided by Owner

A. General

1.) All forged steel and iron hardware used shall be hot dipped galvanized.

2.) All copper clad hardware used shall not have less than 15 mils thickness of copper coating and shall not have extensive electroplating pits.

3.) All wood products used shall be pressure treated to not less than 10 pounds of preservative per cubic foot of wood.

4.) All other hardware materials not specified above (paragraph 1, 2 & 3) shall be corrosive protected to the environment and have a life expectancy of at least twenty (20) years.

5.) Owner may change Construction Materials Specification as may be deemed necessary by Owner.

A. Support Hardware

1.) Anchors and Guy Wires

(a.) Anchors shall be six inches (6") screw type, galvanized, with a five foot (5') rod or eight way expanding anchors with a six foot (6') galvanized rod or as required by the local utility companies.

(b.) Guy wire shall be the same as the supporting strand when the guy has a lead over height ratio of one half (1/2) or better.

(c.) Guys shall be attached to standard pole line hardware and anchor rods using pre-form dead ends.

1.) Bonding and Grounding

(a.) Ground rods shall be five-eighths inch by eight feet (5/8" x 8') copper clad steel rods.

(b.) Ground wire shall be #6 AWG solid soft drawn bare copper wire.

(c.) Ground wire staples shall be copper or copper clad.

(d.) Ground rod clamps shall be bronze, using a non-galvanic locking bolt.

(e.) All bonding clamps shall be of non-galvanic materials or have special bi-metal spacers used in connectors to prevent corrosion when bonding two dissimilar metals.

(f.) Ground wire moulding shall be of plastic material.

1.) Bolts

(a.) All machine and thimble eye bolts shall be five-eighths inch (5/8") size, 12,400 pounds minimum tensile strength with cone ends.

(b.) All suspension clamps shall be of the three bolt, flat back variety.

1.) Lashing Wire

(a.) Lashing wire shall be 0.045 inch alloy 302 or 316 stainless steel, unless otherwise specified by the Owner.

1.) Strand

(a.) All strand shall be one-quarter inch (1/4") seven (7) strand extra high strength class A galvanized for normal cable runs, unless otherwise specified by Owner.

(b.) Five-sixteenths inch (5/16") shall be used for all highway, railroad or major waterway crossings, unless otherwise specified by Owner.

1.) Cable support straps shall be stainless steel.

Part 5
Aerial Fiber Optic Construction Specifications

A. Reel Handling and Inspection

1.) Inspect fiber cable reels for flange protrusions, irregularities or structural damage that could be a hazard to the fiber cable sheath.

2.) Inspect the fiber cable for any external damage prior to loading on a cable trailer.

3.) Load cable trailers with care to protect the fiber cable from any damage. A lifting device is recommended.

4.) Be sure that fiber cable is properly secured on the trailer for transporting to the field.

A. Installation – Back Pull Method or Stationary Reel Method

1.) Protect the work area by placing warning signs, flags or other warning devices at appropriate points to alert drivers and pedestrians.

2.) Remove all cable support straps during the back pull of fiber cable to eliminate any possible damage to the fiber cable jacket.

3.) The use of a tension release device or break-away swivel rated for the manufacturers specifications will be required at all times.

4.) The fiber cable on the reel trailer will require a man (reel spinner) to spin the reel to eliminate any tension during the installation of the fiber cable.

5.) Radio communication between both ends of the operation will be required to protect the fiber optic cable during installation.

6.) The storage of excess fiber cable (slack points) will utilize the figure eight method. The fiber loops shall be supported by a fiber optic strand storage unit, not coiled at pole attachment.

7.) During the lash back of fiber cables, as-built fiber cable footage will be recorded at each pole location and the slack point storage of excess fiber cable will be identified.

A. Installation – Drive-off Method or Moving Reel Method

1.) Protect the work area by placing warning signs, flags or other warning devices at appropriate points to alert drivers and pedestrians.

2.) The fiber cable on the reel trailer will require a man (reel spinner) to spin the reel to eliminate any tension during the installation of the fiber cable.

3.) Radio communication between the aerial lift basket and the truck will be required to protect the fiber optic cable during installation.

1.) The pulling lines for the fiber cable lasher are attached to the cable trailer or truck body. DO NOT ATTACH TO THE BOOM OR BASKET.

2.) The storage of excess fiber cable and the recording as-built fiber cable footage are the same as the Back Pull method.

Part 6
Buried Fiber Optic Construction Specifications

A. Installation – Buried Fiber Cable

1.) Protect the work area by placing warning signs, flags or other warning devices at appropriate points to alert drivers and pedestrians.

1.) Installation of fiber cable will be monitored with an approved monitoring device (dynamometer) at all times during installation.

2.) The same type of conduit shall be installed continuously from the buried plant up to the utility pole. When flexible conduit (cable-con) is used, conduit shall extend onto the strand to within four inches (4") of the cable lashing clamp. At locations where fiber cable only is lashed to strand, flexible conduit will extend onto the strand three feet (3'). Stainless steel straps will affix the conduit to the strand a minimum of every six inches (6") and within two inches (2") of the conduit end. All fiber optic cables and conduits will be covered by a galvanized steel guard from six inches (6") below ground level to within twenty four inches (24") of the strand attachment position. Multiple galvanized steel guards will be covered by an appropriately sized PVC guard, as specified by Owner. Spare conduits will extend four feet (4') above ground level and be covered by one section of galvanized steel guard. All conduit ends will be sealed with split rubber cap, cable-con type cap or foam sealant.

3.) Vault locations and slack storage device installation instructions will be provided by Owner at time of installation.

4.) The fiber cable on the reel trailer will require a man (reel spinner) to spin the reel to eliminate any tension during the installation of the fiber cable.

5.) Radio communication between both ends of the operation will be required to protect the fiber optic cable during installation.

1.) During the installation of the fiber cable, all as-built fiber cable footage will be recorded at riser locations, pull boxes and slack storage locations.

2.) Fiber cable markers will be installed along the trench to identify the cable route.

3.) Burial tape shall be placed twelve inches (12") and twenty-four inches (24") above fiber cable or conduit.

A. Figure Eight Method

1.) Protect the work area by placing warning signs, flags or other warning devices at appropriate points to alert drivers and pedestrians

2.) Pull the fiber cable from the cable reel and place the fiber cable on the ground in a figure eight (8) pattern. Place safety cones in a manner to keep the figure eight (8) in an orderly manner. The bigger the figure eight (8), the easier the installation.

1.) During the installation of fiber optic cable from the figure eight (8), the fiber cable will be handed off by an individual to eliminate the possibility of kinking the fiber cable.

2.) Radio communication between both ends of the operation will be required to protect the fiber optic cable during installation.

A. Fiber cable security shall be maintained at all times. Should fiber cable need to be left outside overnight, a security guard will be required.

Hyperion COMMUNICATIONS

CENTRAL OFFICE SPECIFICATIONS FOR COMBINED SWITCH AND TRANSMISSION FACILITY

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UPGRADE SWITCH SITE DESIGN CRITERIA
FOR
HYPERION TELECOMMUNICATIONS

EQUIPMENT ROOM TYPICAL REQUIREMENTS:

	Typical	SQUARE	
SPACE	SIZE	FOOTAGE	COMMENTS
GENERATOR	1-1.2 MW Typical		OUTSIDE/ROOF/BASEMENT 3 PHASE 480 V TYPICAL SIZE AS REQUIRED, VERIFY WITH HYPERION
SWITCH AREA AND EQUIPMENT AREA	60' X 30'	1800	PREFER 1000 SQ. FT. FOR SWITCH AREA AND 800 SQ. FT. FOR EQUIPMENT AREA. FIRE SUPPRESSION REQUIRED SEE SPECIFICATIONS. ZONE 1
STORAGE ROOM/LOADING ENTRANCE	16' X 25'	400	FIRE SUPPRESSION OPTIONAL SEE SPECIFICATIONS
TECH. AND ADMIN. AREA	12' X 12'	144	VIEW WINDOW TO SWITCH AREA 3' HIGH X 8'-0" WIDE , 36" A.F.F.
BATTERY ROOM	14' X 25'	350	FIRE SUPPRESSION REQUIRED. SEE SPECIFICATIONS. ZONE 2 A CABLE PASS THROUGH WINDOW SHALL BE INSTALLED FOR CABLE FEEDS TO THE EQUIPMENT. SEE DRAWING ATTACHED.

LIGHTING & MISC. REQUIREMENTS

	ELECTRICAL	PHONE	
SPACE	OUTLETS	DATA	LIGHTING
EQUIPMENT AREA	AS SPECIFIED ON FLOOR PLAN	As required	8' 0" DOUBLE TUBE FLUORESCENT STRIP FIXTURES SUSPENDED FROM CEILING BY CHAIN 8'-9" A.F.F. 3 WAY SWITCHED W/ TUBE PROTECTORS
STORAGE ROOM LOADING ENTRANCE	(4) DUPLEX OUTLETS		8' DOUBLE TUBE FLUORESCENT STRIP FIXTURES SUSPENDED FROM CEILING BY CHAIN AT 8'-9" A.F.F. AND 3 WAY SWITCHED W/ TUBE PROTECTORS
TECH./MCC AREA	(3) DUPLEX OUTLETS	(2) PHONE (2) DATA	(2) 2 BULB 4' FLUORESCENT LAY-IN FIXTURES 1 SWITCH
BATTERY ROOM	(2) DUPLEX OUTLETS		8' 0" DOUBLE TUBE FLUOR. STRIP FIXTURES SUSPENDED FROM CEILING BY CHAIN 8'-9" A.F.F. 2 WAY SWITCHED IF REQUIRED W/ TUBE PROTECTORS

SWITCH / TRANSMISSION CENTRAL OFFICE

REQUIREMENTS

Floor Loading:	80-150 lbs. per sq. ft.
Battery Plants:	5792 lbs., 2.3' X 3.7' footprint and 17,376 lbs., 2.3' X 10.8' footprint
Flooding:	Not to be located in a 100 year Flood Hazard Area.
Access:	24 Hours-a-day, 365 days a year
Notes:	**No outside windows to Equipment or Power Rooms.** **No sprinklers or water pipes (will install FM 200 fire system)** **Walls sealed up to underside of the Deck** **11' Clear to Ceiling (9'- 6" special approval required from Hyperion)** **400 amp 3 phase sub panel or as required** **Prefer remaining structure to have sprinkler system.**
Generator:	Diesel preferred, Natural Gas only in special circumstances, **175 kW 3 Phase 208V** Typical. Other voltages and sizes as required by Electrical Engineer Need Outside, Roof or Vented Basement Location
Contract:	**Need Cost Breakdown of space Build-out Before Lease Signing.** Unrestricted access from the street to our equipment space to install fiber optic cable and conduit.

GENERAL REQUIREMENTS:

1. Access permitted 24 hours a day, 365 days a year.

2. Not to be located in flood hazard area or 100 year flood plane. Need 500 year if available.

3. No outside windows to switch/equipment rooms preferred.

4. No sprinklers or water pipes in Switch/Equipment Area or Storage area. Piping that cannot be avoided must be wrapped and sealed to prevent water from spraying or leaking into the Switch/Equipment area. Hyperion must be made aware of any and all water sources on floors above the Hyperion switch/equipment space.

5. All partitions at Switch/Equipment Area to be 3 5/8" metal studs 16" O.C. screwed, not crimped, with 5/8" fire rated sheet rock and full height (deck to underside of deck construction). All drywall shall be taped and sealed to maintain fire protection system.

6. Preferred ceiling heights and wall space to be a clear 11'-0" A.F.F. (absolute min. 9'-6") No pipes, conduits, or fire suppression hardware is allowed to unnecessarily protrude into this space.

7. Ceiling to be exposed in Switch/Equipment Area and Battery Room with a maximum height of 14 ft. All heights above the 14-ft. maximum will have a white lay-in Gypsum board ceiling. Tiles are to be secured with clips. Exception: If structure has sprayed fire insulation, then a lay-in acoustical ceiling will be required. The flat black painting is eliminated for this ceiling type.

8. It is required that mechanical equipment be concealed in ceiling plenum for office area.

9. Interior door to Switch/Equipment Area from Office Area to be steel solid core 60-minute with 12" x 12" view window (centerline 60" A.F.F.). Fire rated frame.

10. Doors from Switch/Equipment Area to be 36" wide and swing out, unless noted otherwise, with both a seal gasket and door sweep.

11. Doors to Switch/Equipment Area to have cipher type changeable code locks with **key bypass**, rubber seal, sweep, and hydraulic door closures to insure FM 200 seal integrity.

12. Furnish and install (3) surface mounted fire extinguishers.
    (1) Ea. 10 lb. ABC
    (2) Ea. 10 lb. CO2

13. Windows from tech. and Office Area to Switch/Equipment Area to be 3'0" h x 8'0" w, 36" A.F.F., unless noted otherwise on the plans and 1 hr. fire rated wire glass.

14. Finishes for Equipment, technical and Office area:

Walls: primer and two- (2) coats semi-gloss washable acrylic enamel.
Off White, submit for approval.

NOTE:

Equipment Room: 7'-9" A.F.F. to be sprayed flat black (includes mechanical, electrical and structural surfaces). Finish must be smooth and consistent in color. Exception: If a Gypsum board ceiling has been installed do not paint black.

Base: 4" cove rubber base. Roppe Vinyl "Steel Blue" No. 577.

Flooring: Vinyl composition tile
Armstrong 12" x 12" x 1/8" Premium Excelon Stonetex®
#52122 Pebble Gray

Provide 1 unopened box of tile upon completion of construction to be used as spare.

15. Structural floor loading:

General floor loading shall be designed for 80 lbs. to 150 lbs. per square foot.
Exception: floor load at Battery shall be designed for battery chargers and battery packs. See plan for weights. Verify structural design floor load & modify as required.

16. All abandoned electrical, phone, data, mechanical equipment, conduit, j-boxes and ductwork shall be removed and all penetrations sealed. Space is to be free and clear of existing unused construction materials.

17. All penetrations, sleeves and raceways, shall be sealed as per dry fire protection system specifications for testing and operation.

18. Engineer must verify generator size (typical 175 kW). Diesel preferred (natural gas in special circumstances) with a minimum 72-hr fuel supply.

19. All lighting shall be 8'0" fluorescent 2-tube fixtures, suspended by separate chains and mounted 9' 0" A.F.F.. Provide 2-ft. separation between fixtures. All lighting in the switch area shall have tube protectors over the bulbs.

20. The Equipment Room is not to be located within 100 yards of any power source greater than 19.2 kV unless appropriate tests are taken to insure the equipment will not be adversely affected. A safe distance must be maintained from any source capable of generating a high Electromagnetic Field (EMF).

21. Install two (2) 4" EMT conduits mounted as high as possible in the equipment room, and protruding 12" into equipment space at opposite ends of the equipment room (4 total conduits) to a designated location to be determined by the Project Manager.

22. If the Central Office is located in an area that experiences seismic activity, tropical storms or tornadoes, has the building owner taken any precautions to prevent structural damage should an event occur.

23. No external HVAC supplies or returns are to pass through the Equipment space.

24. Floors are to be level in Equipment areas.

25. Access to the roof area above the Equipment room shall be restricted at all times.

26. Transformers used to step up or down voltages shall be placed in electrical rooms and **NOT in the Equipment room**.

27. **HVAC evaporators shall be placed so as not to reduce floor space**.

MECHANICAL CRITERIA OVERVIEW
FOR
HYPERION TELECOMMUNICATIONS

1. CAPACITY:

A. The Switch/Equipment Area HVAC system shall have the capacity to handle the present and future heat load requirements and maintain a 72° F/ 45% Relative Humidity in the space for 24 hours a day 365 days a year. A 100% separate redundant HVAC system shall be provided. The humidity shall increase no higher than 50%

B. The Office Area temperature shall be maintained at 72° F in the winter and 75° F @ 45% Relative Humidity in the summer. Standard deviation.

2. EQUIPMENT/ SYSTEMS:

A. The Switch/Equipment Area HVAC system shall be a stand-alone system and shall be Liebert or approved equal. The systems shall have an automatic switch over to cycle units approximately every 24 hrs.

B. The office HVAC equipment, if not supplied by the existing building system, shall be equal to Trane, York, Carrier, McQuay, or an approved equal.

C. HVAC equipment shall be located outside the Switch/Equipment Room if at all possible. The second choice is the equipment storage room. The last choice is in the Switch/Equipment Room with all water piping wrapped to prevent water from spraying into the room in the event of a pipe rupture.

D. No water piping will be allowed into or through the equipment room with the exception as noted in item "C" which is not to be routed over or near the electronic equipment.

E. All returns located in the Office area will be routed via ductwork unless the conditions are acceptable to the local codes for use of a return plenum.

F. All ductwork shall be externally wrapped where condensation on ductwork may occur.

G. The Switch/Equipment HVAC system shall have low ambient operation capabilities.

H. If required by the local building code, an evacuation exhaust system shall be provided for the FM-200 fire suppression system in the Switch/Equipment room. Requirements shall be coordinated with the fire protection contractor.

I. Under certain conditions it will be required to have the HVAC systems electrically metered individually when the office area is connected to common building systems.

J. Filters shall be 2" pleated medium in the Equipment Room. No Exceptions

K. Evaporators placed above the ceilings in the office area shall have overflow drain pans installed with a drain line routed to a conspicuous location chosen by the owner.

L. All systems must have low voltage shutdown for interaction with the fire alarm systems and be equipped to provide dry contacts for alarming in the event of system or humidifier failure.

M. All exterior equipment shall be protected from damage via bollards, etc. if located on the ground.

N. All duct work to be constructed of galvanized sheet metal as specified in Section 15890 and 15910.

REQUIREMENTS FOR HYPERION SWITCHING OFFICE

DIVISION 15: HVAC SYSTEMS

Section 15065: Refrigeration Piping System.....3 Sheets
Section 15785: Computer Room Air Conditioning Unit.....3 Sheets
Section 15890: Sheetmetal Ductwork - Low Pressure.....5 Sheets
Section 15910: Sheetmetal Accessories.....6 Sheets

SECTION 15065

REFRIGERATION PIPING SYSTEM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Piping, valves and fittings for refrigerant piping systems shown on drawings.

1.02 SAFETY CODE

A. Comply with the requirements of ANSI 89.1, Code for Refrigerant Systems.

1.03 SUBMITTALS

A. Submit for review manufacturer's product data for refrigerant piping system components.

PART 2 PRODUCTS

MATERIALS

A. Piping: Type "L" ARC hard copper, ASTM 888

B. Fittings: Wrought copper.

C. Solder: Silver solder, or phase-copper solder having a melting point of 1125 degrees F or higher.

D. Service Valves: Henry valves or equal. Provide packed type receiver, purge, and gauge valves with valve stem seal & cap parts.

1. Valves up to 5/8" OD: Henry Figure 516 or equal, diaphragm type.
2. Valves larger than 5/8" OD: Henry Figure 203 or equal.

E. Solenoid Valves: Sporlan Co., or equal, suitable for the type of refrigerant used, and of a type permitting manual lifting of stem for emergency operation. Size valves for pressure drop of 3-pound drop with R-22 refrigerant, at design flow.

F. Refrigerant Filter Dehydrator and Moisture Indicator

1. Dehydrator: Sporlon Co. Catch-All, or equal, with replaceable core, type of size recommended by manufacturer for maximum design tonnage.
2. Moisture Indicator: Sporlan Co. See-All, type SA-125, or equal.

G. Pipe Supports:

1. Pipes subject to vibration: Isolation type brackets.

2. Pipes not subject to vibration: Grinnel No. CT-95 or equal.
3. Riser clamps: Grinnel CT-121 or equal.

H. Escutcheons: To be Chrome plated sized to pipe.

PART 3 EXECUTION

3.01 INSTALLATION

A. Make solder joints with carbon dioxide or nitrogen passing through joints being soldered. Insure a clean, tight system. Pull a clean rag through each piece of tubing after cutting or reaming.

B. Install pipes and a hanger in accordance with hanger manufacturer's printed instructions.

3.02 LEAK TESTING

A. Test for leaks by use of carbon dioxide or nitrogen and a liquid soapsuds solution. Correct leaks found and retest.

B. Evacuate system to 20" vacuum and charge with refrigerant until a pressure of 15 psig is reached. Then test for leaks suing a Halide leak detector. Correct leaks found and retest.

C. Pressurize system, with carbon dioxide or nitrogen, to 300 psig on the high side, and 200 psig on the low side, and test for leaks. Correct leaks found and retest.

3.03 SYSTEM DEHYDRATION

A. Dehydrate system by the "Double Dehydration" method.

B. Use a suitable vacuum pump. Evacuate system to a vacuum of 0.2" Hg absolute and operate pump for eight hours when that pressure is reached.

C. After eight hours, admit dry nitrogen directly to the system, and then evacuate system to a vacuum of 0.2" Hg absolute and operate pump for four hours.

3.04 CHARGING SYSTEM

A. When system dehydration is complete and all leaks corrected, charge system with refrigerant.

3.05 SAFETY CODE

A. System shall be in accordance with ANSI B9.1 Code Refrigeration Systems.

END OF SECTION

SECTION 15785

EQUIPMENT ROOM AIR CONDITIONING UNIT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Comply with the provisions of Section 15010.

B. Provide components and controls for cooling, humidification, dehumidification, and high efficiency air cleaning capacities and sizes scheduled and in locations as shown on drawings and as specified herein.

1.02 SYSTEM DESCRIPTION

A. The system shall be a glycol, direct expansion, or type as scheduled.

1.03 RELATED WORK

A. Section 15065: Refrigeration Piping System

1.04 QUALITY ASSURANCE

A. Provide unit consisting of UL listed components, factory tested to conform to ASHRAE and ARI standards.

1.05 SUBMITTALS

A. Submit product data for review.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Liebert or approved equal.

2.02 EQUIPMENT REQUIREMENTS

A. Indoor unit: Factory wired and piped, containing the following items:

1. Frame and decorative insulated and sound proofed side panels constructed of welded structurally formed steel, with corners braced and coated with rust resisting paint.
2. Decorative outer front side and rear removable panels constructed of steel and painted in a standard textured finish, insulated and sound proofed.
3. Center front return air panel constructed of aluminum with a non-glare anodized finish.

...front of the unit or...

5. Filter section consisting of a set of prefilters and high efficiency filters with an N.B.S. rating of not less than 906 efficiency using ASHRAE 52-76.
6. Filter clog switch which senses and indicates dirty filters at a pilot light on the panel.
7. Fan section, which contains a D.W.D.I. forward curve centrifugal fan. Drive motor mounted on an adjustable base and connected with an adjustable "U" belt drive.
8. Cooling coil drain pan section constructed of stainless steel.
9. Cooling coil not less than five rows deep constructed of copper tubes and aluminum fins.
10. Electrical starter-relay panel in the units, completely prewired and prefused, with starters, contactors, relays, and terminal strips furnished, mounted, and wired.
11. Twenty-four volt control transformer for controls.
12. Automatic thermostats, humidistats, relays, switches, pilot lights, and name tags with a system on-off switch on the indicating light panel strip.
13. "SERVICE" alarm arrangement in the control system to indicate compressor overload, refrigerant high pressure conditions, fan motor overload, air failure, and room-hi-temperature conditions. This "SERVICE" alarm system shall contain a service pilot light and audible alarm bell with silencing switch, hot gas, or as scheduled, located on the leaving side of the cooling coil.
14. Refrigerant safety circuit with a separate high and low pressure cutout with a manual reset on the high side.
15. Built-in humidifier for space humidification by means of a controlled electric heater water vapor system using city water at a 1/4 inch size valved connection.
16. Refrigerant receiver, with service valves and relief valves, and a pump down capacity sufficient for the piping system shown.
17. Modulating capacity control (hot gas bypass) in the refrigerant circuit to maintain design conditions at reduced loads of down to 25%. Include a solenoid valve and adjustable modulating valve prepiped and prewired to evaporator coil.

B. Outdoor unit (condenser): Factory wired and piped to contain the following items:

1. Coils with aluminum fins and apertures.
2. Fan motors: Weatherproofed.
3. Fans: Direct drive and made of noncorrosive material.
4. Winter operation, head pressure control valve designed to operate continually at down to -10 degrees F. Ambient

PART 3 EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturers instructions, per locations shown on drawings, including any modifications.

B. Install electrical connections per Division 16.

C. Coordinate installation of temperature controls.

D. Charge system and place in operational condition.

3.02 START-UP AND TEST

A. Start-up unit, test for proper operation and capacity, check for proper control operation.

B. Demonstrate performance of unit to the Hyperion maintenance personnel.

C. Instruct maintenance personnel in use and operation of equipment. Provide maintenance and operations manuals and parts list.

END OF SECTION

SECTION 15890

SHEETMETAL DUCTWORK - LOW PRESSURE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Low pressure ductwork: Systems operating up to 2.00" w.g. total-static pressure and velocities up to 2000 f.p.m.. including low pressure supply, return, exhaust.

B. Provide an installed duct system which will supply the air quantities indicated by the plans and have the lowest possible friction and leakage loss. System static pressure loss for each system shall not exceed that which is indicated in the A.C. unit schedule as external static pressure or in the fan schedule as static pressure and shall include the losses of all accessories. Friction losses shall be minimized by reducing the number of offsets and elbows. Maintain access to accessories requiring maintenance, service, and inspection. Radius elbows are preferred for turns to minimize friction, noise, and vibrations and, especially for sections having large volume, higher velocities, or turbulence.

C. Provide and/or construct materials, ductwork, joints, transformations, splitters, dampers, and access doors as specified herein for the low pressure sheet metal ductwork as shown on drawings.

1.02 QUALITY CONTROL AND REGULATORY STANDARDS

A. SMACNA Manual: Sheet Metal Tradesman shall have access on the construction site to "HVAC Duct Construction Standards, Metal and Flexible, First Edition, 1985". The Manual is referred to in specifications for required construction methods and details. Comply with applicable provisions of the SMACNA Manual and more stringent requirements of this specification.

B. Quality control involves not only the general performance requirements for air ducts, but also quality workmanship which includes layout preplanning so that offsets, rises, falls. elbows, fittings, etc., are minimized or eliminated. General performance requirements for ducts include:

1. Dimensional stability (shape deformation and strength).
2. Containment of the air being conveyed (leakage control). (See Part 3 of this specification for leakage testing.)
3. Vibration (fatigue and appearance).
4. Noise (generation, transmission, or attenuation).
5. Exposure (to damage, weather, temperature extremes, flexure cycles, wind, corrosive, atmospheres, biological contamination, flow interruption or reversal,

underground or other encasement conditions, combustion, or other in-service conditions).

6. Support (alignment and position retention).
7. Thermal conductivity (heat gain or loss and condensation control).

C. Provide galvanized duct materials, which meet applicable requirements of local and state codes, whichever is the most stringent.

D. Support ductwork in accordance with applicable requirements of local and state codes and details on plans.

E. Emboss fittings with material gauge, manufacturer, and type material.

F. Install ductwork to comply with the roof ceiling assembly, shown on Architectural Drawings, in accordance with the UL Fire Resistance Index Catalog.

G. Sealers, liners, pre-insulated jackets and flexible ducts shall comply with a flame spread rating of 25 or less and a smoke developed rating of not over 50.

1.03 SUBMITTALS AND SHOP DRAWINGS

A. Submit material/product data to Architect for approval only when it deviates (no exceptions).

1.04 RELATED WORK

A . Section 15910 : Sheetmetal Accessories

PART 2 PRODUCTS

2.01 MATERIAL

A. Sheet metal angles, bar slips, hangers, and straps: To be Galvanized steel.

B. Screws: To be Cadmium plated.

C. Joint Sealers: To be Mineral impregnated woven fiber tape and plastic type activator/adhesive manufactured by Hardcast, Inc.

D. Flex duct and flexible connections shall be provided as required by Section 15910.

2.02 FABRICATION

A. Provide rectangular or round duct as indicated on drawings; of prime quality steel sheets, thickness as required by the following schedule of gauges and reinforcement or local and state standards, whichever is more stringent. When fabricating low pressure ductwork, large duct size governs the duct and complete joint.

Max. Duct	Duct	Slip	Bar	Bar Slip

Dimension Inches	Gauge	Gauge	Slip Gauge	Reinforcement
up thru 18	**24**	**24**	**--**	**-**
19 - 30	**24**	**24**	**I**	**No**
31 - 42	**22**	**22**	**1**	**No**
43 - 54	**22**	**22**	**1-1/2**	**1-3/8 x 1/8 Black Iron**

B. Duct dimensions shown on drawings indicate inside clear dimensions. Make allowances for duct requiring internal sound lining, or insulation to provide "inside clear" (IC) dimensions.

C. Check drawings for additional bracing requirements to prevent sagging and drumming, and/or vibration.

D. Provide transverse joints of "S" and drive construction at least every eight feet on duct whose larger side is less than 18". Provide joint sealant as required under Part 3.

E. Provide reinforcing for transverse joints, or equivalent supplemental angel reinforcing on 5 foot centers on duct whose larger side is greater than 18". At the Contractor's option, ductmate or equal joint system may be substituted for "S" and drive construction.

F. Longitudinal seams shall be Pittsburg Lock or grooved seams closed tightly and evenly. Button punch snap lock longitudinal seam construction shall not be allowed. Provide joint sealant as required under Part 3.

H. Cross break ductwork over 10" dimension, either side.

I. Do not exceed 1" in 7" of slope for increase-in-area transitions.

J. Do not exceed 1" in 4" of slope for decrease-in-area transitions, 1" in 7" is preferable.

K. Do not exceed 45 degrees on the entering or leaving side for angle of transitions at connections to equipment without the use of approved vanes.

L. Fabricate ells using one of the following specifications: The fabrication methods are listed in order of preference.

1. Unvaned, long radius elbow with the throat radius equal to 3/4 of the width of the duct and with a full heel radius.
2. Six inch throat radius with full radius, single thickness vanes and full heel radius. maximum unsupported length of vanes shall be 36t'. Securely fasten vanes to runners. Secure vanes in stable position. Construct vane edges to project tangents parallel to duct sides.
3. Square elbows with airfoil, double thickness turning vanes.
   a. Turning vanes:

(1) True airfoil design; smoothly-rounded entry nose with extended trailing edge. Generated sound power level shall not exceed 54 decibels in band 4 at 2000 fpm in a 24" x 24" duct.

(2) Acceptable manufacturers: Aero/Dyne Co.; High Efficiency Profile; and HEP. Contact Aero/Dyne Co. at 1215 High Street, Suite 103, Auburn, CA 95603. (Telephone # 800-522-2423)

(3) Fabricate assemblies with Aero/Dyne Co. side rails; install vanes on design centers of 2.4 inches across the full diagonal dimension of the elbow.

(4) Submit manufacturer's product data for review. Proposed substitutions shall include independent performance test data for pressure loss and generated sound power levels.

4. Use radius elbows wherever possible. Use square elbows only when available space prevents the use of radius elbows.

M. Make branch connections and T's in one of the following manners:

1. Converging radius elbow.

2. Radius tap-in.

3. Square take off with suitable vanes.

N. Space duct joints to avoid cutting them for branch takeoffs and outlet collars.

PART 3 EXECUTION

3.01 INSTALLATION, APPLICATION, ERECTION

A. Support ductwork with suitable sheared strips of galvanized metals of 1 inch by 1/8 inch galvanized steel band from hangers placed on each side of the duct.

B. Attach hangers to the ductwork using sheet metal screws.

C. Secure hangers to concrete structure with approved anchor shields and to steel structure by means of 'C-clamps'.

D. Space hangers approximately eight feet on centers along the duct except as noted below.

E. For ducts 60 inches and larger and heavy sections, such as welded duct and sound absorbers, space hangers at four foot intervals on center.

F. Do not locate obstructions within ducts.

G. Do not exceed 45 degrees for easement transition angle.

H. Seal transverse joints and longitudinal joints with approved sealer in accordance with manufacturer's directions.

I. Insulation: Where drawings and specifications require ducts to be insulated, make provisions for neat insulation finish around damper operating quadrants, splitter adjusting clamps, access doors, and similar operating devices. Metal collar

equivalent in depth to insulation thickness and of suitable size to which insulation may be finished used for this purpose shall be attached to the duct. Linings in air ducts shall meet the Erosion Test Method described in UL Publication No. 181.

J. Counterflashing: Counterflash ductwork penetrating roof.

K. Pitot Ports: Locate pitot ports for measuring airflow in each main supply duct at the downstream end of the straightest run of the main and before the first branch take-off. Form pitot ports by drilling 7/16" holes in the duct, lined up perpendicular to airflow on maximum 8" centers and at least three per duct, evenly spaced. Plug holes with plastic plugs when completed. Provide access to holes for future rebalancing.

3.02 CLEANING

A. Clean mechanical system thoroughly to assure all foreign matter, and dirt is removed, replacing all filters with new, prior to turning space over to HYPERION.

3.03 TESTING

A. Low pressure shall not require a pressure test. Audible observe duct for any leaks and seal same.

END OF SECTION

SECTION 15910

SHEETMETAL ACCESSORIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Air distribution registers, grilles, and diffusers.

B. Fire dampers

C. Smoke dampers.

D. Access doors.

E. Outside air louvers and louvered penthouses.

F. Flexible Duct.

1.02 RELATED WORK

A. Section 15890: Sheetmetal Ductwork - Low Pressure

B. Section 15896: Special Ductwork

1.03 QUALITY CONTROL

A. Air diffusers, grilles, and registers: Ratings certified by Air Diffusion Council.

B. Fire dampers: Comply with requirements of UL 555, NFPA 90A and NFPA 9OB.

C. Smoke dampers: Comply with requirements of UL 555S.

1.04 SUBMITTALS

A. Submit manufacturer's product data for review.

PART 2 PRODUCTS

2.01 REGISTERS, GRILLES AND DIFFUSERS

A. Acceptable Manufacturers: Titus, Metalaire, Krueger, Carnes, Anemostat.

B. Sidewall Supply registers: Titus, Model 300-RL with OBD, plaster frame Extruded aluminum, removable core, opposed blade damper with baked-on, off-white enamel finish.

C. Sidewall Return and Exhaust Registers: Titus, Model eto RL OBD, plaster frame. Extruded aluminum, removable core, with baked-on, off white enamel finish.

D. Return Air Filter Grilles: Titus, Model 23-RF, hinged access with 1" filter rack.

E. Louvered face ceiling diffusers

1. Square louvered faced ceiling diffuser for surface or lay-in mounting. Titus, Model TMS frame 1, baked-on, off-white enamel finish. Provide flush mounted frame and hardware.
2. Ceiling diffusers may be suitable for lay-in tile installation by mounting it in a factory fabricated, 24" x 24" panel, only if diffuser face is a minimum of 15" x 15". Provide Frame style 3.
3. Do not use directional diffusers. For diffusers noted on drawings as three-way or two-way blow, provide four-way diffusers with sides blanked off with sheet metal plates installed in the diffuser.
4. Provide ceiling diffusers complete with opposed blade volume dampers where diffuser is installed in inaccessible ceilings. Do not furnish volume damper for diffusers installed in accessible ceilings or exposed diffusers.

F. Ceiling Exhaust and Return Registers: Titus Model 50-F, 1/2" egg-crate aluminum with baked-on, off-white enamel finish.
1. Provide register complete with opposed blade volume dampers where installed in inaccessible ceilings.

2.02 FIRE AND SMOKE DAMPERS

A. Acceptable manufacturers:
1. Ruskin.
2. Air Balance

B. Damper fire ratings: See drawings for fire ratings of walls and floors in which dampers are installed. Coordinate damper fire rating with wall and floor rating. Dampers with asbestos paper or coating are unacceptable.

C. Fusible link: Provide fusible links which will melt at 165 degrees causing damper to close and lock in closed position.

D. Provide type "C" multi-leaf fire dampers with spring closing for horizontal mounting and weighted-gravity closing for vertical mounting. Construct dampers of steel with rust resistant finish.

E. Smoke dampers:
1. Low pressure duct: Ruskin SD-35.
2. Medium pressure duct: Ruskin SD-60.
3. Operators: Electric.
4. Install and mount qualified operator at time of fabrication by damper manufacturer. Furnish damper and operator by a single entity meeting applicable UL 555S qualifications for both damper and operator.

F. Combination Fire and Smoke Dampers: .
1. Low pressure ductwork: Ruskin Model FSD-36.
2. Medium pressure ductwork: Ruskin Model FSD-60.
3. Operators: Electric.

4. Install and mount qualified operator at time of fabrication by damper manufacturer. Furnish damper and operator by a single entity meeting applicable UL 555S qualifications for both damper and operator.

G. Sleeves:

1. Unless otherwise required by the authority having jurisdiction, sleeves for fire dampers and fire and smoke combination dampers shall be the rigid type of construction recommended in Schedule 2 of SMACNA Publication for "Fire Damper and Heat Stop Guide for Air Handling Systems". Use 16 gauge for ducts 24" or less in diameter or either rectangular dimension an d14 for ducts over 24". Provide minimum 18" long sleeves. Coordinate required length with wall thicknesses.
2. Conform to the requirements of UL 555S. Test damper and operator as a unit to comply with UL 555S.
3. Install 1-1/2" x I-1/2" x 1/8" angle bar on four sides of sleeves and both sides of wall.
4. Fasten angles to sleeve only.
5. Do not fasten angles to the wall.

H. Obstruction of ducts by dampers:

1. Supply ducts: Zero percent allowed.
2. Return and Exhaust Duct: Zero percent allowed.

2.03 CEILING FIRE DAMPERS

A. Acceptable Manufacturers:

1. Ruskin
2. Air Balance
3. Prefco.

B. Provide UL listed ceiling fire dampers at ceiling diffusers, grilles, and registers in accordance with UL Fire Resistive Index.

2.04 ACCESS DOORS

A. Acceptable manufacturers:

1. Ruskin, Model ADH22
2. Venco CAD-10

B. Provide insulated doors in ductwork for access to service equipment such as automatic dampers, fire dampers, smoke dampers, filters (each side), duct mounted smoke detectors and elsewhere as noted on drawings.

C. Size access doors as follows:

1. Duct sizes under 12": Door sized sufficient to service equipment or replace fusible link.

2. Duct sizes 12" to 20": 12"x12" door
3. Duct sizes 20" to 36": 18"x18" door
4. Duct sizes 36" and above: 24"x24" door

D. Apparatus casing access doors: Prehung door frame assemblies, size 22" x 58" Ruskin ADW2.

E. Use double panel construction, two sheets of at least 24 gauge galvanized steel with 1" thick insulation between panels.

F. Mount doors in a rigid frame of at least 22 gauge formed galvanized steel or aluminum.

G. Use angle iron bracing as required to make the door frame a rigid assembly.

H. Provide latches that permit easy removal of access door while maintaining positive closing and minimum leakage.

I. Provide sponge rubber gaskets for all doors.

J. In accordance with NFPA 90A, identify each access door with 1/2" high stenciled letters as "Fire Damper" or "Smoke Dampers, in Red.

2.05 LOUVERS AND LOUVERED PENTHOUSES

A. Verify size, location, and placement of louvers prior to fabrication; coordinate field measurements and shop drawings

B. Preassemble louvers in sections as large as practical.

C. Exterior louvers and screens: Dowco Corporation, Model DBE-04 or DBE-06 (to match wall thickness), Penn Airstream, Model M44 or M63 (to match wall thickness Ruskin Model ELF-375D or ELF-6375D, Airolite, Construction Specialties, or Louvers and Dampers, Inc.)

D. Material: Extruded aluminum with 12 gauge, .081" thick aluminum blades and frame and welded construction.

E. Blade angle: Minimum 35 degrees from horizontal.

F. Use blades minimum 4" or 6" deep, blades to match wall thickness, with drain gutter on each blade and downspouts in jams and mullions.

G. Set blades on 3" or 4½" centers.

H. Provide internally braced corners with caulking slots.

I. Provide slidable interlocked mullions with a provision for expansion and contraction.

J. Design structural supports to carry a wind load of not less than 20 pounds per square foot.

K. Provide bird screen, 1/2" square mesh of 16 gauge, .051", expanded flattened aluminum. Screens shall be on the interior side of louver and shall be in a removable frame.

L. Provide formed metal sills of the same gauge and material as the louver, sized to lap under the louver sill and over the outside edge of the wall.

M. Louver finish: As selected by Architect from submitted color samples from: Duranotic finish. Mill finish for painting. Clear anodized finish.

N. Provide louvers with the AMCA Certified Ratings Seal for Air Performance and Water Penetration.

O. Size louvers per drawings.

P. Select intake louvers at or below the "Point of Zero Water Penetration".

Q. Do not exceed 0.2" of water pressure drop across louvers.

2.06 FLEXIBLE DUCT

A. Acceptable manufacturer:

1. Flexmaster U.S.A., Model No. Type 3 insulated.
2. Wiremold Type WCK.
3. Omniair 1200.
4. Thermaflex.
5. H.K. Porter.

B. Install UL listed flexible duct connectors made of 28 ounce, heavy glass fabric double coated with neoprene between duct and fan discharge.

C. Characteristics of flexible duct to air terminals:

1. Approved as UL Class 1 air duct.
2. Flame spread less than 25, smoke developed rating less than 50.
3. Insulated with 1/2" thick fiberglass insulation. 4. Do not exceed four feet in length.

D. Seal off the insulation jacket at its ends and at joints with mastic, hardcast, or similar material. Replace any flex if jacket is punctured.

E. Complete insulation coverage up to the boxes.

F. Do not route flexible duct through corridor walls, fire or smoke partitions.

G. No bends shall be made in flexible duct with the center line radius less than one and one-half duct diameter and only one bend may occur per four foot length of duct material.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install sheet metal accessories in locations shown on drawings.

B. Install accessories in accordance with manufacturer's published recommendations as well as applicable sections of SMACNA manual and other standards set forth in Part 1.

C. Provide all screws, bolts, nuts, inserts, and material required for attaching sheet metal to duct, walls, floors, and ceilings.

D. Where diffusers, grilles, and registers are not provided with volume dampers, install spin-in fitting with balancing damper in duct runout.

3.02 TESTING

A. Check work for satisfactory installation and performance.

B. Insure that adequate access exists for fire and smoke dampers and that damper operator motors are not hindered in operation by proximity to walls or other objects.

C. Check duct connections at access doors for air leakage or condensation. Make correct connections as needed.

END OF SECTION

HYPERION ELECTRICAL OUTLINE SPECIFICATIONS

1. Electrical systems shall be in complete and working order.

2. CODES, PERMITS, AND FEES:
   Obtain all permits, pay all fees, and secure all inspections requisite for lawful execution of this work. Complete all work necessary to pass required tests by agencies have authority over this work.

3. Electrical work shall include power, interlock, and control wiring. Control components furnished under other divisions of these specifications shall be installed under this division. Wire and connect controls, complete and in working order, in accordance with approved wiring diagrams submitted under other divisions.

4. Electrical work shall be installed in accordance with the drawings and specifications, with the latest edition of the National Electrical Code, with state and local electrical and building codes and ordinances, and with special codes having jurisdiction over specific portions within the complete installation. In the event of conflict between drawings, specifications, and such codes, a ruling shall be requested of the Architect.

5. Equipment shall be UL listed. Installation shall conform to UL Standards, where applicable. Equipment shall be installed in accordance with manufacturer's recommendation. Where conflicts occur between contract documents and these recommendations, a ruling shall be requested of the Architect.

6. Contractor shall visit the site before submitting a bid to acquaint himself with existing conditions.

7. Protect work and materials from damage. Cap conduit during installation. Avoid damage to materials and equipment in place. Satisfactorily repair or remove and replace damaged work with new materials.

8. Failure to route conduit without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit, and fixtures shall fit into available spaces and shall not be introduced at such times and manner as to cause damage to structure. Equipment requiring servicing shall be readily accessible.

9. Perform testing in presence of Engineer and authorities having jurisdiction. Do not cover concealed work until testing is completed and installation has been approved. Furnish instruments, devices, and equipment necessary to perform tests. Remedy defects discovered during tests.

10. Equipment shall be turned over to the Owner in lubricated condition. Instruction on further lubrication shall be included in the operating manuals.

11. At termination of work under this division, furnish Owner with three complete bound sets of operating instructions pertaining to equipment furnished under this division.

12. Make electrical connections to mechanical equipment and controls. Determine requirements from drawings, specifications, and shop drawings.

13. Maintain one set of blueline electrical prints on the site, marked in RED to show as-built conditions and installations. **Prepare sepia copies of these prints at job completion.**

14. Provide NEMA HD safety switches and disconnects by Square D, ITE, GE, or Westinghouse.

15. Provide junction boxes as shown on drawings and otherwise where required, sized according to number of conductors in box or type of service to be provided. Minimum junction-box size 4 11/16 inches square and 2 1/8 inches deep unless otherwise noted.

16. Provide screwed on covers for junction boxes.

17. Use minimum 16 gauge steel for pull boxes, paint with prime coat, and provide with a screw cover. Size pull boxes according to intended use.

18. Pull and junction boxes for emergency circuits shall be spot painted so they will be readily identified as a component of an emergency circuit. Use this color code:

Emergency Power System	Yellow
Fire Alarm System	Red

19. Install feeder wiring in conduit. Comply with National Electrical Code and local authorities having jurisdiction, including grounding and supporting arrangement.

20. WIRING:

Wire and cable shall be type THHN or THW, 600V by Anaconda, General Electric, Triangle, Rome, or Southwire. All wiring shall be in conduit.

a. Wiring shall be minimum #12 AWG.
b. #12 and #10 AWG conductors shall be solid with THWN or THHN insulation.
c. #8 AWG and larger, stranded THW, THWN, or THHN.
d. Color code connectors as follows:

Phase A - Black
Phase B - Red
Phase C - Blue
Neutral - White
Ground - Green

21. GROUNDING:

Provide all cables with green ACEG ground conductors. Ground electrical system in accordance with Article 250, National Electrical Code and local authorities having jurisdiction. Do not use flexible metal conduit and fittings as a grounding means. Pull a green wire in or around each piece of flexible conduit and screw to conduit system with lugs at both ends.

GENERAL GROUNDING NOTES

a) All new ground cable, unless otherwise specified, shall be stranded, copper-type, fire retardant cable which meets the Institute of Electrical and Electronic Engineers, Inc (IEEE) IEEE-383 full scale fire test and **limited 28% (percent) oxygen index** except for the exterior ring ground system.

b) All bus bars shall be copper; **aluminum is not permitted**.

c) Two-hole crimp lugs shall be used; **mechanical-type not acceptable**. Use only for stranded wire, not solid wire.

d) Crimp connectors shall be used; **mechanical-type not acceptable**. Wire to Wire

e) All contact surfaces (lugs or connectors) shall be thoroughly cleaned and coated with an anti-oxidant compound.

f) H or C tap connections shall be the crimp-type with the cable always turned toward the ground source using long sweeping bends with at least a 1-0 foot or large bending radius. **Very important.**

g) Metallic conduits, sleeves and raceways shall not be used to run ground cables. **Do not** completely encircle the ground conductor run in PVC with metallic support brackets.

h) Use two crimp connectors when splicing a solid-to-stranded conductor, but exothermic welds are preferred.

i) Use solid conductors outside the building and for the interior to exterior ground ties. Use only PVC conduit and non encircling support brackets for extension of the ground conductor into the building or site. No. 2 bare solid annealed copper wire. Do not use straight "tee" type welds. Use the sweeping bend type.

j) Use exothermic welds where ever possible when terminating or splicing solid conductors. Exothermic welds cannot be used on thin sheet metal. Use Exothermic two-hole lugs attached to the thin sheet metal.

k) Ground conductors shall be equipped with "FAR-END TERMINATION" tags.

l) Maintain ground continuity at all times during transition work, additions, and removals of equipment to ensure equipment and personnel protection.

m) All ground conductors shall be run exposed and supported by brackets attached to the cable racks stringer, and unistrut unless otherwise specified.

n) Small ground conductors (No. O and smaller) can be tied to the side of the cable rack stringer; however, this is for short runs only. Ground conductors No. 00 and larger must be run on brackets spaced 1'-0" to 1'-6" apart.

o) All ground bars must be insulated from the walls with 2-1/2 inch space minimum to prevent flash-over.

p) A ground system must have more than one ground source, such as water pipes, building steel, ring grounds, ground fields, fire system water lines. Gas lines are never allowed per the National Electrical Code (NEC) 250. Lightning protection requires two paths to ground.

q) All AC circuits must have an ACEG conductor run with their phase and neutral conductors per NEC 250-95.

Please refer to the attached copy of a typical qroundinq of the Main AC Distribution Panel & Power Room AC Panel.

22. LIGHTING FIXTURES:

    All fixtures shall be new as specified, or approved equal. Furnish lamps for all fixtures. Fluorescent lamps shall be reduced wattage, energy saving, equal to G.E. Wattmiser cool white. If refitting, every attempt shall be made to utilize existing lighting fixtures as appropriate.

23. RACEWAYS:

    Provide complete conduit system with associated couplings, connectors, and fittings.

24. Use EMT where drawings call for conduit to be concealed in walls, or installed above suspended ceilings. Use IMC where drawings call for conduit to be installed for feeders, installed exposed below 6 feet, or installed in wet locations.

25. Use flexible metal conduit at the termination of light fixtures or of equipment subject to mechanical vibration. Flexible metal conduit shall be electrically continuous from outlet or conduit end to utilization equipment. Length shall not exceed 6 feet exposed or 3 feet concealed in walls. A copper ground wire shall be installed as a jumper around flexible conduit. The jumper may be installed inside or outside of conduit to assure continuity of ground.

26. Use PVC conduit for outside underground branch circuits, for electrical service, and for telephone service. Use IMC or GRC ELLS when turning up above ground or through concrete slab. PVC conduit shall be Carlon, Schedule 40 and spares shall be capped.

27. Provide pull box every 100 feet of conduit run and where excessive number of bends necessitates a box for ease of wire installation.

28. Run exposed conduit plumb and level.

29. Use proper sized tools for bending. Do not heat conduit. Dents and flat spots will be rejected. Cut and thread conduit so ends will butt in couplings. Make threads no longer than necessary and ream pipe free of burrs.

30. Support conduit vertically and horizontally by straps or hangers.
Do not exceed these intervals:

    1/2 inch and 3/4 inch - 5 feet
    1 inch through 1 1/2 inches - 7 feet
    2 inches and larger - 9 feet.
    Leave one #10 pull wire in empty conduits.

31. Use expansion fittings, properly bonded to assure ground continuity across expansion joints in floors and ceilings. Use double lock nuts and bushings on panel feeders at panel enclosures. Use short pieces, approximately two feet of flexible conduits, to connect motors and other devices subject to motion and vibration.

32. Connectors and couplings for electrical metallic tubing shall be double locknut type, compression fittings.

33. IMC and EMT conduit shall be hot dipped, galvanized or electrogalvanized steel by Allied, General Electric, Republic, Triangle, or Wheatland.

34. OUTLET BOXES:
Outlet boxes shall be National, Appleton, General Electric, or Raco.

35. Provide wiring devices, fixtures, and special outlets with an outlet box. Use galvanized steel for concealed boxes. Use cast iron conduit fittings similar to "Condulets" and "Unilets" with threaded hubs for exposed boxes.

36. WIRING DEVICES:
Acceptable manufacturers shall be Hubbell, Leviton, Pass & Seymour, Bryant, or General Electric. Part numbers listed are Leviton.

    Single Pole Switch - 15A, 120/277 VAC: Leviton 1201-I
    Duplex Receptacle - 15A, 125 VAC: Leviton 5252-I
    Ground Fault Interrupting Receptacle - 15A, 125 VAC: Leviton 6599LI
    Isolated Ground Single 30A/125V Locking Receptacle - Leviton 70530-F1G
    Isolated Ground Single Duplex Receptacle 125V, 20A - Leviton 5362-IG

37. DEVICE PLATES:

Provide device plates on switches, receptacles, telephone outlets, and miscellaneous devices from a manufacturer equal to Leviton plates.

38. PANELBOARDS:

Lighting panelboards for 120/208 volts, 1-phase, with circuit breakers rated 10,000 AIC, or equal by Square D, G.E., or Westinghouse. Panelboards shall be provided with copper bussing and copper lugs. Equipment Room and Power Room panels shall be surface mounted. Where panelboards are flush mounted, provide 3 3/4" empty conduits stubbed up above ceiling for future use. **Other phases and voltages require Hyperions approval and shall be faxed to their office.**

ELECTRICAL CRITERIA OVERVIEW
FOR
HYPERION TELECOMMUNICATIONS

1. ELECTRICAL:

A. Equipment Room LIGHTING

1. Lighting to be provided via chain suspended on connected fluorescent fixtures separated 2 ft., mounted 9 ft. A.F.F. and centered on equipment room aisles. Foot-candle levels are to be based on IES standards. Typical will be 5-8 aisles of 3-4 each, 8 ft. 2 bulb fixtures.

2. Power for the lighting to be supplied via flexible conduit to allow raising fixtures.

3. Lights for each aisle must be on a separate switch and must be set up for control at each entry door. **All exposed tubes will have tube guards installed.**

4. One set of lights in the most used equipment aisle are to be non-switched and on a separate circuit (Project Manager will determine).

5. Office lighting and switching to be building standard per approved drawings.

B. WALL OUTLET BOXES.

1. All wall outlet boxes will be surface mounted.

2. All boxes must be accessible after construction.

3. Support securely from building construction and not from raceway.

4. Seal all unused openings.

C. ELECTRICAL OUTLETS

1. All electrical conduit and junction boxes feeding into the transmission and switch equipment are to be **fully isolated from the building as per 22 TED-1 attached**. Office area duplex outlets mounted at standard N.E.C. code building height.

2. All outlet circuits are to be 20 amp with no more than five (5) duplex outlets per circuit.

3. At a location to be determined by the engineer in charge, additional outlets may be installed with a separate circuit for a workbench area.

4. At locations to be shown on plans, provide fully isolated conduit and junction boxes for AC circuits feeding pull down power cords. **Refer to typical diagram 22TED-1 for details.** Leave a **MAXIMUM** of 3 ft. of wire at the grounding junction box for final

connection to the **Main Ground Buss**. These must be coordinated with the equipment and cable rack plan and will consist of at least two locations over each front equipment aisle. These cords must be rated at least 15 amps and provide 3 to 4 plugs. **Grainger Part # 1A136 or equivalent. These circuits are not to be confused with the orange duplex outlets.**

5. Provide a 2 fully isolated quad outlet boxes, as above, 20 amp circuit field mounted 6" A.F.F. for **DECNES Rack**. Location to be designated by Hyperion Project Manager.

D. BREAKER PANEL

1. Breaker panel size will be determined by calculations based on a five (5) year load plan. Typical needs are 400 amps for the Switch Central Office and 100 amps for offices. If house panels are available they are acceptable for office power only. Power for the Switch area must be fed from normal and emergency power by way of an automatic transfer switch. Architect to properly size.

E. LIGHTNING PROTECTION

1. All AC power entries are to be both lightning and surge protected as specified in Item #2 TVSS.
2. The protection system shall be terminated to the Master Station Ground.

F. EMERGENCY LIGHTING

1. Emergency lighting is to be provided according to code by using a two bulb self contained style fixture with test button and charge indicator light in the Switch/Equipment room. They shall meet all requirements of governing codes for emergency egress lighting.

G. BATTERY PLANT RECTIFIERS

1. Field install as required for switch, 208-480volt (1) single and/or (3) three phase circuits to a junction box sized accordingly, located at the overhead deck above the charger b nbay as noted on the drawings. Leave additional flexable conduit and slack to floor plus an additional 2 ft.. Typical will be 6 each, 30 amp single phase circuits and, 8 each 50 amp three (3) phase circuits, (4 of which are for future expansion with no slack to floor) backed up by the emergency generator. The final circuit count and capacity will be determined by the Hyperion Engineer. Other voltages and phases may be specified by Hyperion.

H. Switch Inverter Power

1. Provide a 120v 50 amp isolated circuit from a protected panel to the MOO frame of the switch. This location will be provided by the Hyperion Project Manager.

2. TRANSIENT VOLTAGE AND SURGE PROTECTION (TVSS):

A. STANDARDS

1. National Fire Protection Association (NFPA 20, 70, 75 and 78)
2. Underwriters Laboratories (UL 1449, UL 1283)

B. UL LISTING:

1. Complete system to be UL listed under UL 1449. Attach rating label to TVSS.

C. NOMINAL SYSTEM OPERATING VOLTAGE:

1. Building dependent. Units are to be sized in accordance with the buildings AC voltage.

D. MAXIMUM CONTINUOUS OPERATING VOLTAGE (MCOV):

1. Greater than 110% of Nominal System Operating voltage.

E. SURGE CURRENT CAPACITY:

Based on an 8 x 20 microsecond wave form, capacity shall be as follows:

1. 25k Amps per Phase for line to neutral.
2. 25k Amps per Phase for line to ground and for neutral to ground.

F. UL 1449 RATINGS:

Performance based on IEEE C62.41 Category B impulse wave forms of:

1. 6,000 V 1.2 x 50 microseconds
2. 3,000 Amp 8 x 20 microseconds

G. CLAMPING VOLTAGE CATEGORY C:

Tested per ANSI/IEEE C 62.45 (1987) and C62.41 Category C impulse waveform of:

1. 10,000 V 1.2 x 50 microseconds
2. 10,000 Amp 8 x 20 microseconds

H. Response Time: **0.5 nanoseconds**

I. Noise Attenuation: **40 db**

J. Short Circuit Capability: **Minimum 300,000 interrupting capability (A/C)**

K. TVSS MONITORING CAPABILITY

1. Individual suppressor module status indicating lights.

2. System status indicating lights on front cover.
3. Built-in remote monitoring capabilities through Form C contacts.

L. Each suppressor module shall be field replaceable.

M. BUSS BAR CONNECTIONS

1. Suppression module connections shall be through low inductance plated buss bars. Stranded wire is not acceptable.

2. Surge suppression modules and terminal lugs for external connections shall use bolted connections to the plated buss bar. Lugs shall be sized for #1/0 cable.

N. TRANSIENT PROTECTOR

1. Provide documentation of UL 1449 listing and clamping voltage ratings.

O. Provide a 5 yr. warranty.

P. TESTING

1. "Hi-Pot" tests for two times the rated voltage plus 1,000 volts per UL.
2. Surge tests per IEEE C62.41 Category B.
3. UL ground leakage test.

Q. ENCLOSURE

Heavy Duty NEMA 12 dust and drip tight enclosure with no ventilation openings.

R. Approve Vendors

1. Transtector Systems (800) 882-9110

3. GENERATOR STANDBY POWER

A. ENGINE/GENERATOR PLANT

1. Description
   a. Housed, Diesel (natural gas in special circumstances) fueled engine driven generator plant arranged for automatic transfer upon failure or voltage dip of normal building power.

   b. System to consist of a **175 KW minimum** continuous standby generator at unity power factor with automatic transfer to emergency by means of a transfer switch(s).

   c. Fuel supply to be diesel (natural gas in special circumstances, provide proper size primary regulator to match engine requirements. The regulator shall reduce the pressure to the proper level for generator operation).

d. Weather protective enclosure with mounted critical muffler to include a tail pipe and rain cap.

2. Generator Installation
   a. Secure to concrete pad. Pad specifications per manufacturer.
   b. Install in strict conformance with manufacturer's printed instructions.
   c. Factory trained personnel to start and test generator.

B. AUTOMATIC TRANSFER SYSTEM

1. The transfer system is to be a fully automatic design with manual override and transfer ability. **Built-in exercise timer (with load) required.**

2. Unit shall function to close engine starting contact after normal voltage. If any phase has dropped to 74% for 3 seconds or longer, and transfer load from normal source to emergency source after generator output voltage and frequency have come up to rated values, then to automatically reconnect load to normal source upon its restoration. Switch shall be provided with a time delay to start, time delay to transfer, time delay to retransfer to normal power. Fail to start relay and three (3) undervoltage sensing relays.

3. Rating:
   Voltage to match building power system, rated ampere, withstanding and closing rating.

4. Time delay setting for transfer to be an adjustable unit (0-20 min.).

5. Accessories:
   a. Engine starting contact, exerciser clock, test switch with start-stop-auto positions, battery float charger, battery charger ammeter, water temperature gauge, run time meter, volt meter, frequency meter, phase selector switch, 2 N.O./N.C. auxiliary contacts for alarming.

6. Manufacturer: Onan, Kohler, and Caterpillar.

C. AUTOMATIC TRANSFER SWITCH INSTALLATION

1. Mount on wall per manufacturers printed instructions.

2. Provide all wiring among prime mover, generator, transfer switch, engine starting control and charging equipment in accordance with manufacturers instructions.

3. Insure ACEG ground bar has been grounded to cabinet.

D. ANNUNCIATION

Generator system to provide form "C" alarm contacts for Generator Running, Generator Fail and Over Crank Conditions and have conduit and pull string installed from equipment room for connection by others. Remote annunciator is

required and shall be surface mounted in the Switch/Equipment Room next to the Fire Panel or as appropriate.

E. TESTING

Generator will be tested at start-up with a vendor supplied load bank of at least 100% of generators rated capacity. A 100% load test will be required for not less than one (1) hour. Hyperion personnel must view the test and be given maintenance and operating instruction.

F. LOAD SHED NECESSITY

If the Central Office is with Sales/Marketing, these facilities, (Sales & Marketing), must be automatically load shed during generator operation if they are served by the same distribution panel as the Central Office.

4. Office Principle Ground Point (OPGP)

The buildings principal metallic cold water pipe system is preferred, and if used, an additional 5/8" x 8' copper clad ground rod shall be installed in accordance with NEC Section 250-81(a) or in Section 250-83. If this is not available then an approved driven ground rod system shall be utilized. The grounding conductor shall be sized according to Section 250-94.

A second ground shall be made utilizing the building steel or other approved location.

A. Grounding Electrode Connection

The vertical equalizer and master station ground shall be connected to the buildings primary grounding electrode by exothermic welding, listed lugs, listed pressure connectors, listed clamps, or other as listed in the NEC Article 250-115(a), (b), (c), (d). No connection by solder shall be approved or used. Not more than one conductor shall be attached to the grounding electrode by a single clamp or fitting unless the fitting is listed for multiple conductors.

B. Vertical Equalizer

A. In locations were the Central Office is located in a single story building, with or without a basement, the vertical equalizer from the Main Ground Bus (MGB) to the Office Principle Ground Point (OPGP) shall be a # 0000 AWG conductor.

B. In locations were the Central Office is located in a multi story building, with or without a basement, the vertical equalizer from the Main Ground Bus (MGB) to the Office Principle Ground Point (OPGP) shall be a 750 MCM conductor.

C. Vertical risers shall be run and mounted on columns or walls in the interior of the building at least 6 feet from outer walls and columns. They are not permitted on outer walls or columns if possible.

C. Main Ground Bus (MGB) and Office Principle Ground Point (OPGP)

1. The Main Ground Bus shall not be permitted on outer walls or columns. For small buildings with no interior walls or columns, consideration shall be given to constructing false columns or other similar structures in the interior of the building to support the Main Ground Bus. The ideal location for the placement of the Main Ground Bus is as near as is reasonably achievable to the main power distribution frames, so as to provide as direct a path to earth for discharge of energy that is intercepted by the protectors. The MGB shall be mounted on insulators 8 ft. A.F.F., to insure it is insulated from the buildings integrated ground plane. Any ironwork supporting the MGB must be bonded to the MGB with a minimum #6 AWG stranded copper wire. The Electrical Contractor will not install the MGB bar.
2. All connections to the MGB will utilize only two-hole crimp (compression) connectors and will be torqued in accordance with the manufacturer specifications. All conductors shall be coated with an appropriate anti-oxidant compound before crimp connections are made. All unplated connectors, braided straps, and bus bars will be brought to a bright finish and coated with an anti-oxidant compound before they are made.
3. At the Main Ground Bar (MGB) location, securely install a 2" X 12" #1 grade knot free spruce board 4 ft. in length and painted black in color at 9 ft. to center of board above finished floor.
4. **All lighting fixtures, FM 200 discharge piping, building structural steel or any other metallic object located within (6) six feet of the switching frames, shall be bonded using #6 AWG stranded copper and connected to the main ground plane. This work to be completed by switch/transmission contractor.**
5. All grounding conductors from building steel and the outside ground connection shall be routed to the OPGP ground bar location. This bar is to be located near the primary AC feed panel, to provide as direct a path to earth for discharge of energy as possible. Grounding conductors from the exterior ground ring shall be #2 solid tinned copper. Crimped connectors are not permitted on solid copper wire. Only two hole connectors are permitted.

D. CONTROLS

1. Provide 3 stages of start-up for HVAC units to reduce the start-up current on the generator.

2. Provide power and connection of the fire suppressor system and controls in conjunction with the sprinkler contractor if so involved.

3. Power switch to exhaust system, if required by local building code, must be provided near exit door. Check with Hyperion personnel for operation procedures.

5. FIRE ALARM SYSTEM

A. Provide a fire alarm system in accordance with all local codes. Include an automatic dial feature on control panel to notify an off site monitoring station.

B. Provide system with all necessary control and monitor interfaces with HVAC systems and fire suppression system.

FIRE PROTECTION, DETECTION

& FM-200 SUPPRESSION SYSTEM

A. SCOPE:

This specification outlines the requirements for a cross-zoned detection and total flooding FM-200 fire suppression system and **if required** by the Authority Having Jurisdiction (**AHJ**) a Double Interlock Dry, High Temp Preaction Sprinkler System. In some locations the **AHJ** may require a connected reserve system for the FM-200 System. The work described in the specification consists of all labor, materials, equipment, and services necessary and required to complete and test these systems **an shall include an evacuation exhaust system** that shall be provided for the FM-200 fire suppression system in the Equipment Room. Requirements and installation shall be coordinated with the Electrical & HVAC contractor. **Fenwal is used for reference purposes only and other manufacturers may be utilized provided they meet all specifications.**

B. STANDARDS:

The system shall be designed, installed, and tested in accordance with the latest editions or statutes listed below and shall conform to all state and local codes:

1. NFPA standards 2001, 70, 72, and 72E
2. Factory Mutual Approval Guide
3. UL Listings
4. State & Local Fire Marshal approvals
5. NFPA #13

C. REQUIREMENTS:

This installation shall be made in accordance with the drawings, specifications, and applicable standards. Should a conflict occur between the drawings and specifications, the specifications shall prevail.

D. EXCLUSION:

The work listed below shall be provided under other sections of the specifications.

1. 120 VAC power to the FM-200 panel (Division 16)
2. Interlock conduit and wiring to A/C equipment, dampers, and shunt-trip breakers (Electrical Division)

E. GENERAL:

1. Hyperion shall approve manufacturer of equipment.

2. The systems and equipment shall be supplied and installed by a licensed contractor.

3. Qualifications of installer/contractor:

   a) At least 10 working days prior to bid date, any contractor wishing to bid on this project shall obtain written approval from the specifying engineer/architect together with a set of approved prints and specifications. Failure to comply with this requirement will nullify the bidder's proposal.

   b) The system shall be installed by an experienced firm regularly engaged in the installation of automatic sprinkler and FM-200 fire extinguishing systems in strict accordance with NFPA standards.

   c) The contractor's firm must have a minimum ten (10) years' experience in design, installation, and testing of automatic sprinkler and FM-200 or related fire suppression systems. A list of systems of similar nature and scope shall be provided at the time of proposal.

   d) The contractor shall show proof of the following prior to time of bidding:

      1) The installing Contractor shall be a UL listed FM-200 charging station. The installing Contractor shall provide certification of his capability to recharge the largest FM-200 system within 12 hours after discharge. Certification shall include information as to amount of contractor's bulk storage available.

      2) The installation Contractor shall be an authorized stocking distributor of the manufacturer for the equipment included in the system so that immediate replacement parts can be made from inventory. He shall show proof of available telephone communications on a twenty-four hour, seven-days-a-week basis; his service personnel shall be available for emergency service at all times.

4. Existing Automatic Sprinklers:

   a) If the Switch area is protected with a wet automatic sprinkler system the contractor will obtain approval from the **AHJ** to remove the sprinklers from all areas prior to the installation of the FM-200 system.

   b) If the **AHJ** requires an automatic sprinkler system for the Switch area the contractor will furnish a Dry High Temp. preaction system as described in the specifications.

5. Permits:
   a) Pay for and obtain all permits, inspections, and licenses and furnish copies to the owner.

6. Sleeves:
   a) Sleeves shall be one size larger than pipe passing through, sealed air tight on both ends.
   b) Sleeves in partitions to be 16 GA sheet metal or schedule 10 steel pipe.

7. Hangers:
   a) Support all piping from structural steel, masonry or steel beams at not more than 8' 0" on center. Provide steel members to span between structural steel members. provide trapeze hangers when passing under obstructions. Do Not use threaded pipe, metal straps, chains, or wires as hangers

8. Insurance Requirements:
   a) The FM-200 systems contractor shall show evidence that he carries a minimum **$2,000,000.00** liability and completed operations insurance policy.

   b) These limits shall supersede limits required in the general conditions of the specifications.

F. SUBMITTALS

1. The following shall be submitted for approval prior to the start of installation:

   a) Shop drawings and component details for all systems:

      1) Manufacturer's certificates of acceptance of the qualifications of the installing contractor to install, test, maintain, and recharge the manufacturer's equipment.

      2) Shop drawing shall indicate locations, installation details, and operation details of all equipment associated with the FM-200 & Pre-Action system. Floor plans showing equipment locations, piping, conduit runs, and other details, as required, be provided. Floor plans shall be drawn to a scale of not less than 1/8" = 1'0". Elevations, cross section, and other details shall be drawn to a larger scale as required.

      3) Sequences of operation, electrical schematics, and connection diagrams shall be provided too completely describe the operation of the FM-200 and Preaction system controls.

4) The contractor shall illustrate the agent distribution system, provide calculations to demonstrate the volumetric concentrations.

5) The contractor shall provide detailed hydraulic calculations for the Preaction System (if installed).

G. SYSTEM DESCRIPTION AND OPERATION

1. The system shall be total flooding FM-200 extinguishing system designed to provide a uniform concentration of 7% minimum of FM-200 for Zone # 1 the Equipment area and zone # 2 the Battery room

   a) The amount of FM-200 to be provided shall be the amount required to obtain the minimum uniform concentration of ten (10) minutes. The contractor shall take into consideration such factors as non closable openings (if any), run-down time of fans, time required for dampers to close (and requirements for any additional dampers), and any other feature of the facility that could affect concentration.

2. The FM 200 system shall be actuated by a combination of ionization and photoelectric smoke detectors. If a Preaction system is installed this detection will serve to actuate the Preaction solenoid. Automatic operation in each separate protected area shall be as follows:

   a) Actuation of one (1) detector in either loop shall:

      1) Illuminate the respective zone (circuit) lamp on the control unit.

      2) Energize a pre-alarm audible and visual signal associated with that area in which the detector was operated.

      3) Actuate door closer/holders on access doors to the protected area if applicable.

      4) Transmit a signal to the building's fire alarm system if applicable.

   b) Actuation of a second detector in the same area, but on the second detection loop, shall:

1) Illuminate the respective zone circuit lamp on the control unit.

2) Energize an evacuation audible and visual signal associated with the area in which the detector was operated.

3) Start time-delay sequence.

4) Shut down A/C equipment and/or close dampers.

5) Actuate Preaction System solenoid valves if applicable.

c) Discharge of the FM-200 shall occur at the end of time-delay period.

3. The system shall be capable of being actuated by manual discharge switches located at each fire exit. Operation of manual switch shall duplicate the cross-zones sequence description above, except that time-delay shall be bypassed. The manual discharge station shall be of the electrical actuation type and be supervised at the control panel. Local, manual, mechanical release shall be installed on each pilot cylinder. Systems that do not allow for this type of releasing shall not be permitted.

H. MATERIALS AND EQUIPMENT

1. General Requirements: Materials and equipment shall be standard products of the manufacturer's latest design and suitable to perform the functions intended. When one or more pieces of equipment must perform the same functions, they shall be duplicates produced by one manufacturer. The name of the manufacturer and the serial numbers shall appear on all major components. Locks for all cabinets shall be keyed alike. All components of the Preaction system if installed shall be UL listed, FM approved and conform to NFPA #13.

2. All devices and equipment shall be UL listed and/or FM approved.

3. All devices, equipment and components shall be products of the same manufacturer.

4. The FM-200 control panel will perform the functions necessary to operate the detection and the FM-200 Suppression System. The control unit shall be approved by Underwriters' Laboratories, Inc., and/or Factory Mutual as FM-200 system control units. This control unit shall be located as shown on plans.

   a) The control unit shall be housed in a wall mounted, sheet metal enclosure suitable for protecting electrical circuits. It shall be a NEMA Type 1 metal cabinet with hinged, locked doors.

   b) The control unit shall operate on 120 volts AC, 50/60 Hz. Power consumption shall be 10 watts steady state with a peak requirement of 200 watts.

c) In the event of a loss of rectified power, visual and audible trouble signs shall be activated.

d) The control unit shall contain a self-contained, 24 volts DC emergency power supply. The units shall have built-in, rechargeable standby batteries to provide a minimum 24-hour emergency power. A trouble signal will be initiated if battery leads are disconnected or the battery is in an abnormally low state of charge.

5. Manual pull stations shall be of the dual-action type, which will require that an outer door be lifted to expose the actuation door. The concealed release switch shall be double action DPDT. The front shall be marked with the legend "FM-200 RELEASE." Push type manual pull stations shall not be permitted.

   a) Manual actuation shall bypass the delay and abort functions and shall cause all alarm and shutdown devices to operate the same as if the system had operated automatically.

6. The detectors shall be spaced, located, etc., in accordance with the manufacturer's specifications and within the guidelines of NFPA standard 72E.

   a) The Ionization products-of-combustion smoke detectors shall be FENWAL CPD-7051 or **equal in quality, performance, and features.**

   b) The Photoelectric smoke detector shall be FENWAL PSD-7155, **or equal in quality, performance, and features.**

7. Alarm signals shall be operated from the control unit.

   a) The alarm bells shall be FENWAL P/N 29-116623-014, 294938 **or equal in quality, performance, and features, as specified herein.**

   b) The alarm horns shall be FENWAL P/N 29-117265-001, 219926 **or equal in quality, performance, and features as specified herein.**

   c) Visual alarm unit shall be vertical strobe unit mounted on the alarm horn or on an independent bracket and are to be placed at each entry door and inside the equipment room.

8. All wiring shall be furnished and installed by the contractor.

   a) All wiring shall be installed in electrical metallic tubing (EMT) or conduit.

   b) All system components shall be securely fastened to their support independent of the wiring. Runs of conduit and wiring shall be straight, neatly arranged, properly supported, and parallel and perpendicular to walls and partitions.

   c) The sizes of the conductors shall be those specified by the manufacturer. Color code shall be used where specified. All wires shall be tagged at all junction points and shall be free from grounds or crosses between conductors. Final connections between

equipment and the system wiring shall be made under direct supervision of a factory trained representative.

d) All wiring shall be installed to conform to the requirements of the National Electrical Code, Article 725 for class 1 Signal Systems, except as otherwise permitted for limited energy circuits, as described in NFPA 72E. All wiring shall also meet State and local codes.

e) The complete electrical installation of the system and all components shall be grounded in accordance with the National Electrical Code.

9. Pre-Action Systems

Unless required by local building codes no pre-action dry sprinkler system is to be installed in the Equipment, Storage Room, or Battery Room.

10. Abort Stations shall be of the "Dead Man" type and located next to each manual station. The abort stations shall be supervised and shall indicate a trouble condition at the FM-200 control unit if depressed. "Locking" or "keyed" abort stations shall not be permitted.

I. FM-200 STORAGE AND DISTRIBUTION

1. Each protected area shall have its own separate supply of FM-200. The system shall be of "central storage" design.

a) Each supply shall be located within the hazard area or as near to it as possible so that a minimum of distribution piping is used.

b) The FM-200 shall be stored in floor mounted cylindrical containers. Containers should be super-pressurized with dry nitrogen to 360 PSIG at 70 degrees F. Containers shall be of high-strength alloy steel construction that complies with the Department of Transportation regulation for refillable actuated by solenoid operation only. Parallel wired initiators shall not be permitted.

1) Each agent storage container shall also have a pressure gauge and pressure switch to facilitate visual and electrical supervision of the container pressure. The pressure switch shall be isolated from the container assembly by check valves such that it may be replaced without having to remove the agent from the container.

2) Each container shall have a pressure relief device that automatically operates when internal pressure exceeds 805 psig.

3) It shall be possible to determine the agent liquid level within each container without removing the storage container from its mounting bracket, disconnecting the distribution piping, or shutting down the FM-200 system.

c) Each agent storage container shall be securely mounted to a rigid surface. The bracket anchors and mounting surface shall withstand a thrust at 1000 lbs. for 5 seconds.

2. Discharge nozzles shall distribute the FM-200 throughout the protected area.

   a) The nozzles shall be designed and sized per manufacturer requirements to provide proper distribution and weight of the agent. Ceiling penetrations shall be finished with chrome plated escutcheons. All nozzles shall be brass.

3. All distribution piping shall be in accordance with the latest requirements listed in NFPA Standard 2001.

   a) All pipe length must be reamed, blown clear, and swabbed with suitable solvents to remove burrs, mill varnish, and cutting oil before assembly.

   b) For threaded fittings, Teflon tape only shall be used and applied to male pipe threads only.

J. SYSTEM INSPECTION AND CHECKOUT

1. After the installation is complete, the system shall be inspected by factory trained personnel in accordance with the manufacturer's recommended procedures.

2. All wiring shall be tested for proper connection, continuity, and resistance to ground.

3. The complete system shall be functionally tested in the presence of the Owners, and all functions, including system and equipment interlocks, must be operational at least ten (10) days prior to the final acceptance test.

   a) Each detector shall be tested in accordance with the manufacturers recommended procedures. The system and equipment interlocks, such as door releases, audible and visual alarms, and equipment shut-downs shall function at that time.

   b) Each circuit shall be tested for trouble by inducing a trouble condition to the system.

K. TRAINING REQUIREMENTS

1. Prior to final acceptance, the contractor shall provide operation training to each shift of the Owner's personnel. Each training session shall include emergency procedures, abort functions, system control panel operation, trouble procedures, and safety requirements. Each session shall include a complete demonstration of the system. Dates and times of the training period shall be coordinated through the Owner not less than two weeks prior to session.

L. OPERATION AND MAINTENANCE

1. Prior to final acceptance, the contractor shall provide complete operation and maintenance instruction manuals (three copies for each system) to the owner. All aspects of system operation and maintenance shall be detailed, including electrical schematics of all circuits, a written description of the system design, drawing illustrating control logic and equipment used in the system. Checklists and procedures for emergency situations, troubleshooting techniques, and maintenance operations shall be included.

M. AS-BUILT DRAWINGS

1. Upon completion of each system, the contractor shall provide four copies of as-built drawings showing actual installation details, all equipment locations (manual stations, abort switches, alarms, detectors, control panels, etc.) shall be shown, as well as exact conduit and piping routing details and agent storage positions. All facilities modifications, including door and damper installations, and modifications to insure required soak times, shall be illustrated. One Sepia copy of reproducible engineering drawings will be provided reflecting all As Built details.

N. ACCEPTANCE TESTS

1. At the time "As-Built" drawings and maintenance/operation manuals are submitted, the contractor shall submit a "Test Plan" which shall describe how the system will be tested. This "Test Plan" shall include a step-by-step description of all tests and shall indicate type and location of test apparatus to be employed. The tests shall demonstrate that the operating and installation requirements of this specification have been met. All tests shall be conducted in the presence of the owner and shall not be conducted until the "Test Plan" is approved.

2. Tests shall demonstrate the entire control system functions as intended. All circuits shall be tested: Automatic actuation, manual actuation, equipment shut-down, alarm devices, Pre-Action System actuation and storage container pressure. In addition, supervision of each circuit shall be tested.

3. A room pressurization test shall be conducted in each room to determine the presence of openings which could effect the FM-200 system concentration levels. This test will be conducted using Infiltec Corp. Door-Fan system, or equivalent, with integrated computer program. All testing shall be in accordance with NFPA 2001.

4. If the room-pressurization test indicates that there are openings which could result in leakage of the extinguishing agent, the FM-200 contractor will direct the general contractor to properly seal the space and will inspect the work. THE FM-200 CONTRACTOR WILL BE RESPONSIBLE FOR THE SUCCESS OF THE TEST. If the first room pressurization test is not successful in accordance with these specifications, the contractor shall determine and correct the cause of failure and shall conduct a second or subsequent room pressurization test at no additional cost to the owner.

5. Upon acceptance by owners, the complete system shall be placed in operation within a nominal twenty-four (24) hour period. The contractor shall provide written certification that all containers are filled as required.

O. FM-200 SYSTEM INSPECTIONS

1. The contractor shall provide two (2) inspections of each system under this contract during the one-year warranty period. The first inspection shall be at the six month interval after system acceptance, and the second at the 12 month interval. Inspections shall include determination of agent container weight and pressure and that the system is in proper working order.

2. Inspection shall also include a complete checkout of the control and alarm system. Documents certifying satisfactory system conditions shall be submitted to the Owner's technical representative upon completion of each inspection. All inspections shall be done in accordance with NFPA 2001.

P. WARRANTY

1. All FM-200 and Preaction system components furnished under this contract shall be guaranteed against defective design, materials, and workmanship for the full warranty time which is standard with the manufacturer, but in no case less than one year from the date of system acceptance.

2. The FM-200 contractor shall warrant refill of the system should there be any accidental discharge of the system during the warranty period contingent on the following:

   a) System shall be under service contract by the installing contractor during the entire warranty period.

   b) Tampering of the system or servicing by any others shall void this warranty.

   c) Discharge will not have been caused by operator negligence, sabotage, or release of contaminating media into the detection system.

Typical Central Office Power Load Requirements

Item	Kw each	Average Quantity	Switch & Transmission KW	Transmission Only KW	BTU/hr Each
HVAC Switch Load		10 ton	15-25 Ton	5 ton	
HVAC Transmission Load		5 ton	25-35.88 kw	13 kw	
Duplex Receptacle	.5	15	7.5	7.5	
Lighting typical	.3	18	6	6	
400 amp 480v to –48v Rectifier	14.4	8	115.2 if used	0	7500
200 amp 208v - 48v Rectifier	7.9	8	63.2 if used	0	4100
50 amp 208v - 48v Rectifier	3.12	6	18.72	18.72	1540
Exhaust Fan 208v FM200	.5	1	.5	.5	
		Total KW	120.9-183.8	45.72	

1. The above Kw power loads are based on full build-out of the rectifiers.

2. **The HVAC of 15 and 25 tons includes the space cooling requirements.**

3. Total heat loads for the 400 amp rectifiers if used would be 60,000 BTU/hr based on 8 total rectifiers. Install with 4-1.25in Liquidtight drops to floor plus 2 ft.

4. Total heat loads for the 200 amp rectifiers if used would be 32,800 BTU/hr based on 8 total rectifiers. Install with 4-1.25in Liquidtight drops to floor plus 2 ft.

5. Total heat load for the 50 amp rectifiers would be 9,240 BTU/hr based on 6 total rectifiers. Install with 6-1/2in Liquidtight drops to floor plus 2 ft.

Above figures for the HVAC, lighting, duplex outlets, and fan are averages and must be adjusted to reflect the actual size and quantities used.

Battery Rectifier Specifications:

400 Amp Rectifiers	**200 Amp Rectifiers**	**50 Amp Rectifiers**
480V nominal @ 30amp ea.	208-220V @ 38amp ea.	208-220V @ 16.5amp ea.
60hz 3 phase	60hz 3 phase	60hz 1 phase
50A breaker	50A breaker	30A breaker
3,#6AWG & 1,#8AWG	3,#6AWG & 1,#10AWG	3,#10AWG
weight ea. 1330 lbs.	weight ea. 725 lbs.	weight ea. 25 lbs.
Conduit knockout 1.75 in	Conduit knockout 1.75 in	Conduit knockout 1@1.1/8 / 3@7/8 in
Liguidtight size 1.25 in X 4	Liguidtight size 1.25 in X 4	Liguidtight size 1/2 in X 6

Input wire count includes "green wire" ground. Use KS-5482, KS-20747, KS-20785, or equivalent 75 ° C commercial wire.
Other voltages are available for the rectifiers and will affect the current loads and wire sizes.

SYMBOL SCHEDULE

COMBINATION HORN / STROBE BY EQUIPMENT MANUFACTURER

STROBE LIGHT BY EQUIPMENT MANUFACTURER

ABORT SWITCH BY EQUIPMENT MANUFACTURER

MANUAL SWITCH BY EQUIPMENT MANUFACTURER

IONIZATION DETECTOR BY EQUIPMENT MANUFACTURER

PHOTO DETECTOR BY EQUIPMENT MANUFACTURER

ALARM BELL BY EQUIPMENT MANUFACTURER

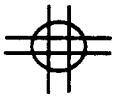
HALON CYLINDER BY EQUIPMENT MANUFACTURER

FIRE ALARM CONTROL PANEL BY EQUIPMENT MANUFACTURER

EMERGENCY LIGHTING

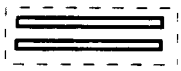
DUPLEX CONVENIENCE RECEPTACLE - 20A-125 VOLT

CEILING MOUNTED RETRACTABLE DROP CORD GRAINGER # 1A136 or EQUIVALENT.

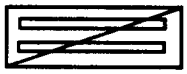


DOUBLE DUPLEX RECEPTACLE - 20A-125 VOLT

EXIT FIXTURE WITH ARROW



FLUORESCENT FIXTURE 8 FT 2 BULB - RECESSED, SURFACE, OR PENDANT MOUNTED



FLUORESCENT FIXTURE 8 FT 2 BULB - RECESSED, SURFACE, OR PENDANT MOUNTED, NORMAL AND EMERGENCY

SINGLE POLE SWITCH - 20A-120/277 VOLT

THREE WAY SWITCH - 20A-120/277 VOLT

General Office Area

PAINT: SHERWIN WILLIAMS LIMOGE CREAM #1340 LRV 75%
CARPET: BENTLY WALLSLEY LOOP, PENDLE HILL #WL30-6212
TILE: ARMSTRONG IMPERIAL, COPPER NUANCEAT #51923
WALLPAPER: WYNDSTONE L1041 TYPE II 20oz CLASS A, MALIBU SAND #L1041
BASE: MERCER .080 STANDARD VINYL BASE COLOR 218

Carpet and wall paper to be ordered through:
Linda Beck at Eleni Interiors (716) 373-9401.

Equipment/Battery Rooms

PAINT: SHERWIN WILLIAMS SEMI-GLOSS ACRYLIC ENAMEL OFF WHITE
TILE: 12" X 12" X 18" ARMSTRONG EXCELON (SPECKLED GRAY)
TRIM PAINT: TO MATCH COVE BASE
BASE: ROPPE VINYL "STEEL BLUE" NO. 577

ROOM	WALLS	FLOORS	BASE	REMARKS
Reception Area	Paint	Carpet	Vinyl	
Equipment Room	Paint	VCT	Vinyl	See Note Below
General Storage	Paint	VCT	Vinyl	
Sales	Paint	Carpet	Vinyl	
Travel	Paint	Carpet	Vinyl	
Managers	Paint	Carpet	Vinyl	
Conference	Paint	Carpet	Vinyl	
Equipment Storage	Paint	VCT	Vinyl	See Note Below
Technicians Office / MCC Room	Paint	Carpet	Vinyl	
Halls	Paint	Carpet	Vinyl	

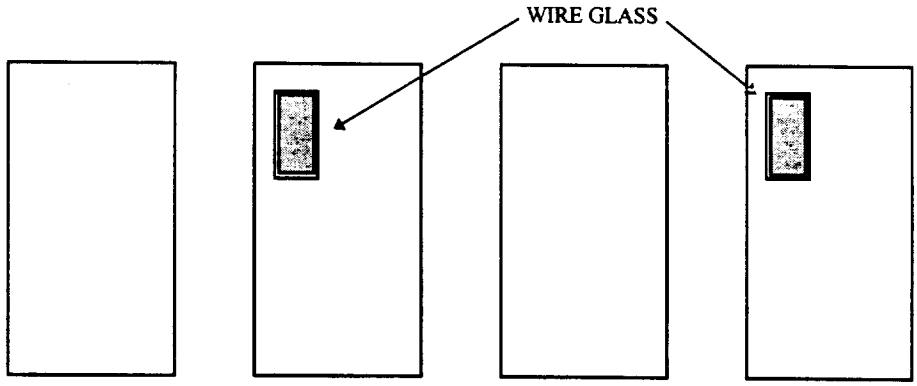
NOTES:

WALLS: 5/8" G.W.B. OVER 3 5/8" METAL STUDS PRIMED & PAINTED W/ (2) COATS OF PAINT AS SPECIFIED ABOVE. WALLS IN EQUIPMENT ROOM & EQUIPMENT STORAGE ROOM @ 7'-9" AFF AND UP ARE TO BE SPRAY PAINTED FLAT BLACK (INCLUDING MECHANICAL, ELECTRICAL, & STRUCTURAL SURFACES) WITH A MINIMUM OF (2) COATS OF PAINT.

VCT: LOCAL OPERATIONS PERSONNEL TO BE SUPPLIED WITH AT LEAST (1) ONE UNOPENED BOX OF SPARE TILES EACH UPON PROJECT COMPLETION.

FINISH SCHEDULE

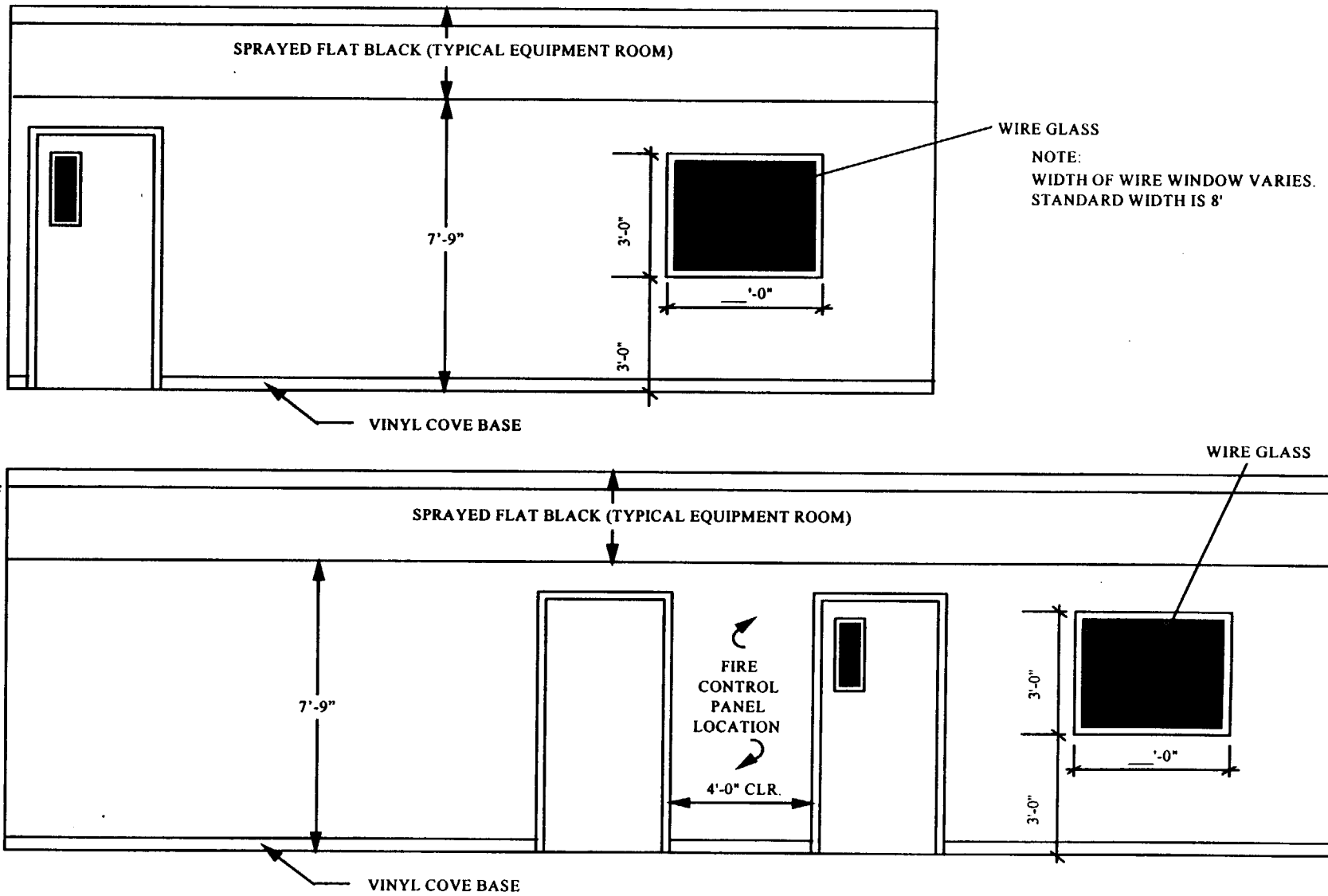
DOOR SCHEDULE



NO	SIZE	TYPE	FRAME	LATCH SET	LOCK SET	REMARKS
1&6	3'-0" x 7'-0" x 1 ¾ "	HOLLOW METAL	METAL		●	PAINT
2	3'-0" x 7'-0" x 1 ¾ "	WOOD - SOLID	WOOD	●		STAIN
3	3'-0" x 7'-0" x 1 ¾ "	WOOD - SOLID	WOOD		●	STAIN
4	3'-0" x 7'-0" x 1 ¾ "	WOOD - SOLID	METAL		✳	STAIN DR. PAINT FRAME
5	3'-0" x 7'-0" x 1 ¾ "	FIRE RATED	METAL		✳	PAINT DOOR & FRAME

NOTES: ✳ DENOTES CIPHER SIMPLEX CODE LOCKS W/ KEY
HYDRAULIC
TYPE 4,5 & 6 DOORS TO BE EQUIPPED W/ SEAL GASKET & FLOOR SWEEP.

ALL DOORS TO BE RATED MINIMUM CLASS 2 FIRE
METAL DOORS & JAMS TO BE PAINTED MEDIUM GRAY W/ OIL BASED SEMI-ENAMEL.


SPRAYED FLAT BLACK (TYPICAL EQUIPMENT ROOM)
7'-9"
3'-0"
'-0"
3'-0"
WIRE GLASS
NOTE:
WIDTH OF WIRE WINDOW VARIES.
STANDARD WIDTH IS 8'
VINYL COVE BASE
WIRE GLASS
SPRAYED FLAT BLACK (TYPICAL EQUIPMENT ROOM)
9'-6" MINIMUM
7'-9"
FIRE
CONTROL
PANEL
LOCATION
4'-0" CLR.
3'-0"
'-0"
3'-0"
VINYL COVE BASE

HYPRSWCH

SYMBOLS (FIRE SUPPRESSION SYSTEM ONLY)

S — COMBINATION HORN / STROBE BY EQUIPMENT MANUFACTURER

S — STROBE LIGHT BY EQUIPMENT MANUFACTURER

A — ABORT SWITCH BY EQUIPMENT MANUFACTURER

M — MANUAL SWITCH BY EQUIPMENT MANUFACTURER

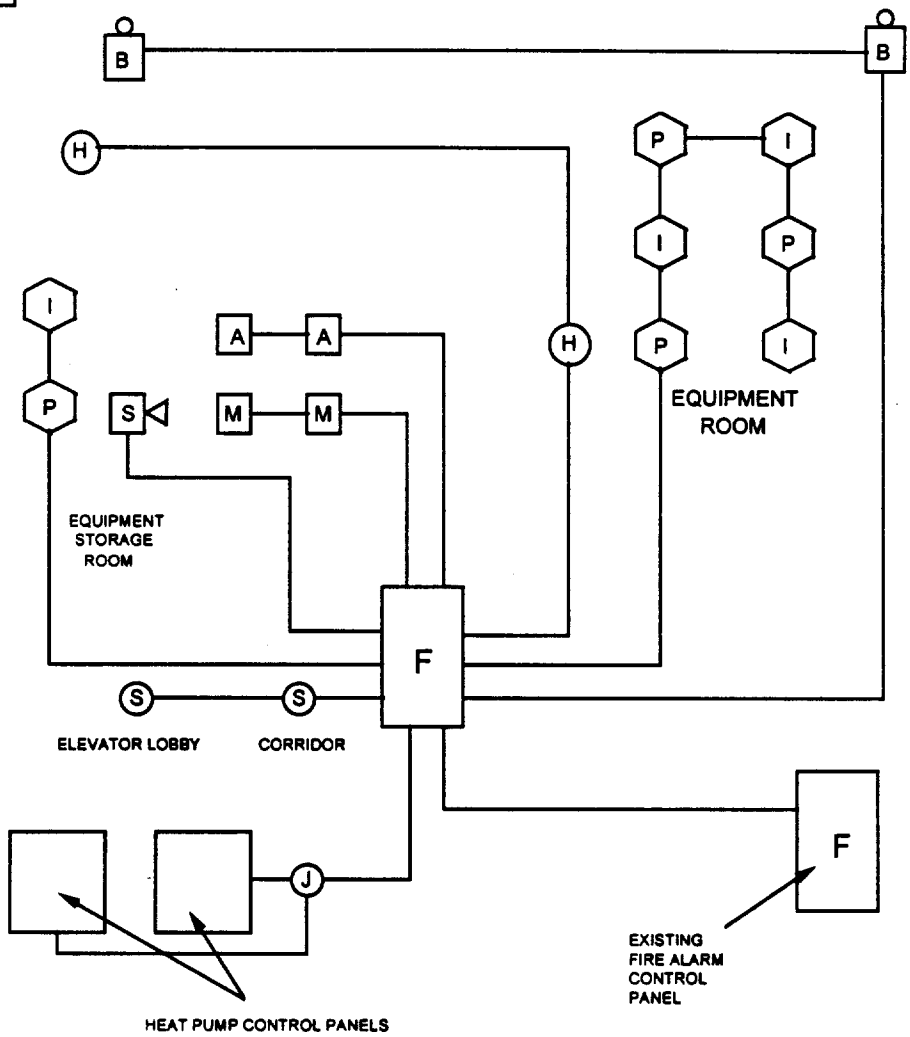
I — IONIZATION DETECTOR BY EQUIPMENT MANUFACTURER

P — PHOTO DETECTOR BY EQUIPMENT MANUFACTURER

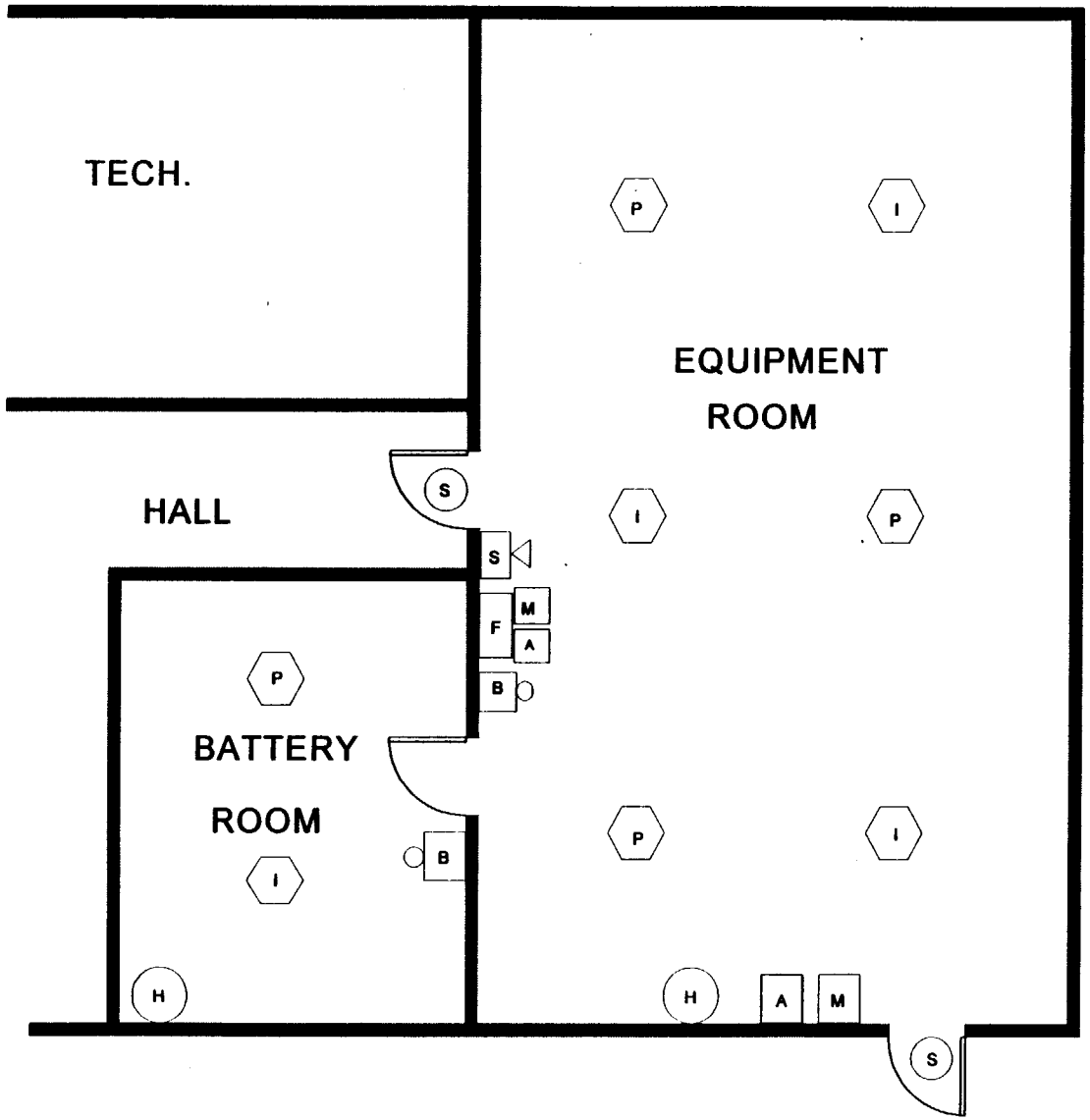
B — ALARM BELL BY EQUIPMENT MANUFACTURER

H — HALON CYLINDER BY EQUIPMENT MANUFACTURER

F — FIRE ALARM CONTROL PANEL BY EQUIPMENT MANUFACTURER



TYPICAL FIRE SUPPRESSION RISER DIAGRAM
HYPRSWCH

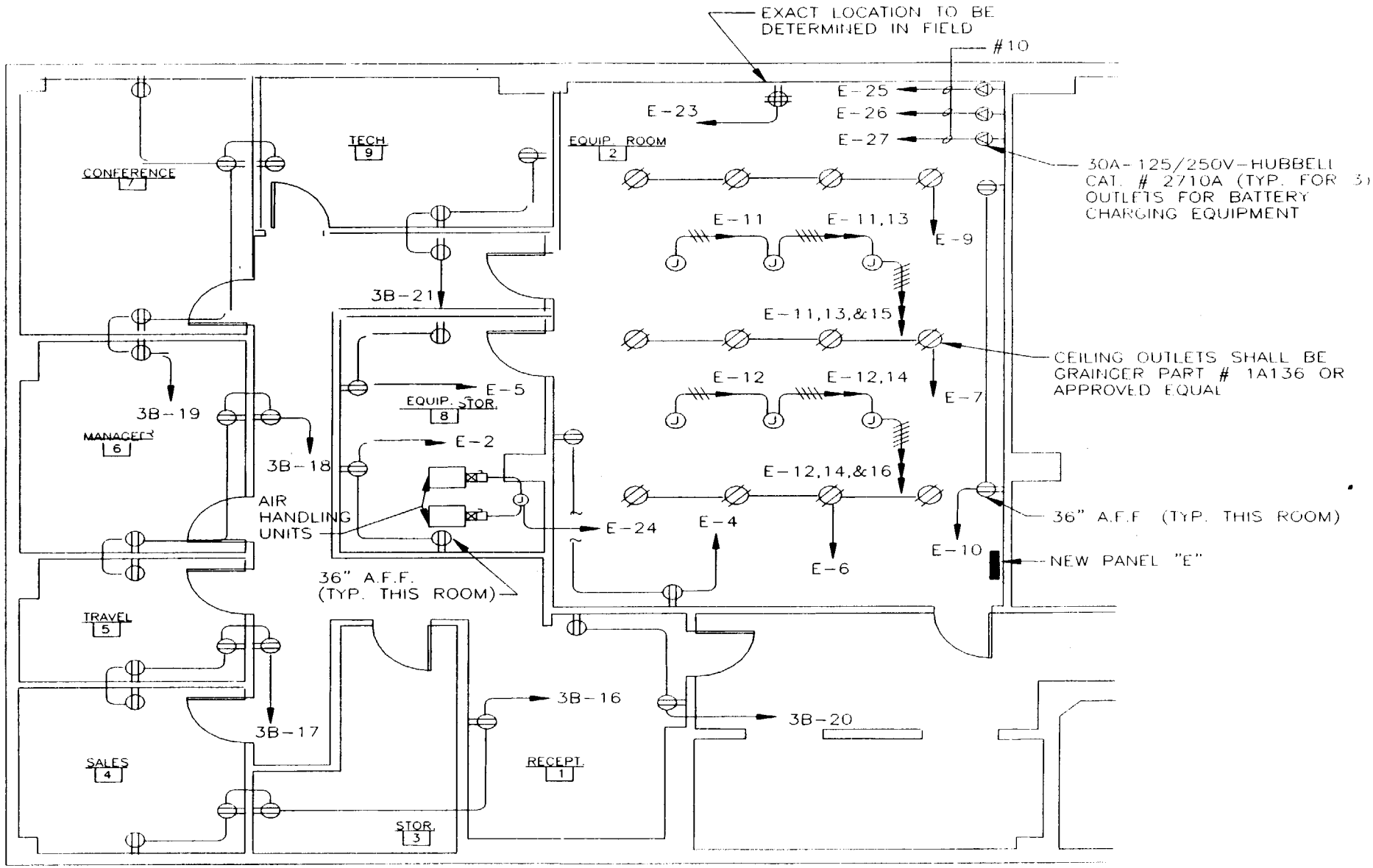


LEGEND

- S — COMBINATION HORN / STROBE BY EQUIPMENT MANUFACTURER
- S — STROBE LIGHT BY EQUIPMENT MANUFACTURER
- A — ABORT SWITCH BY EQUIPMENT MANUFACTURER
- M — MANUAL SWITCH BY EQUIPMENT MANUFACTURER
- I — IONIZATION DETECTOR BY EQUIPMENT MANUFACTURER
- P — PHOTO DETECTOR BY EQUIPMENT MANUFACTURER
- B — ALARM BELL BY EQUIPMENT MANUFACTURER
- H — HALON CYLINDER BY EQUIPMENT MANUFACTURER
- F — FIRE ALARM CONTROL PANEL BY EQUIPMENT MANUFACTURER

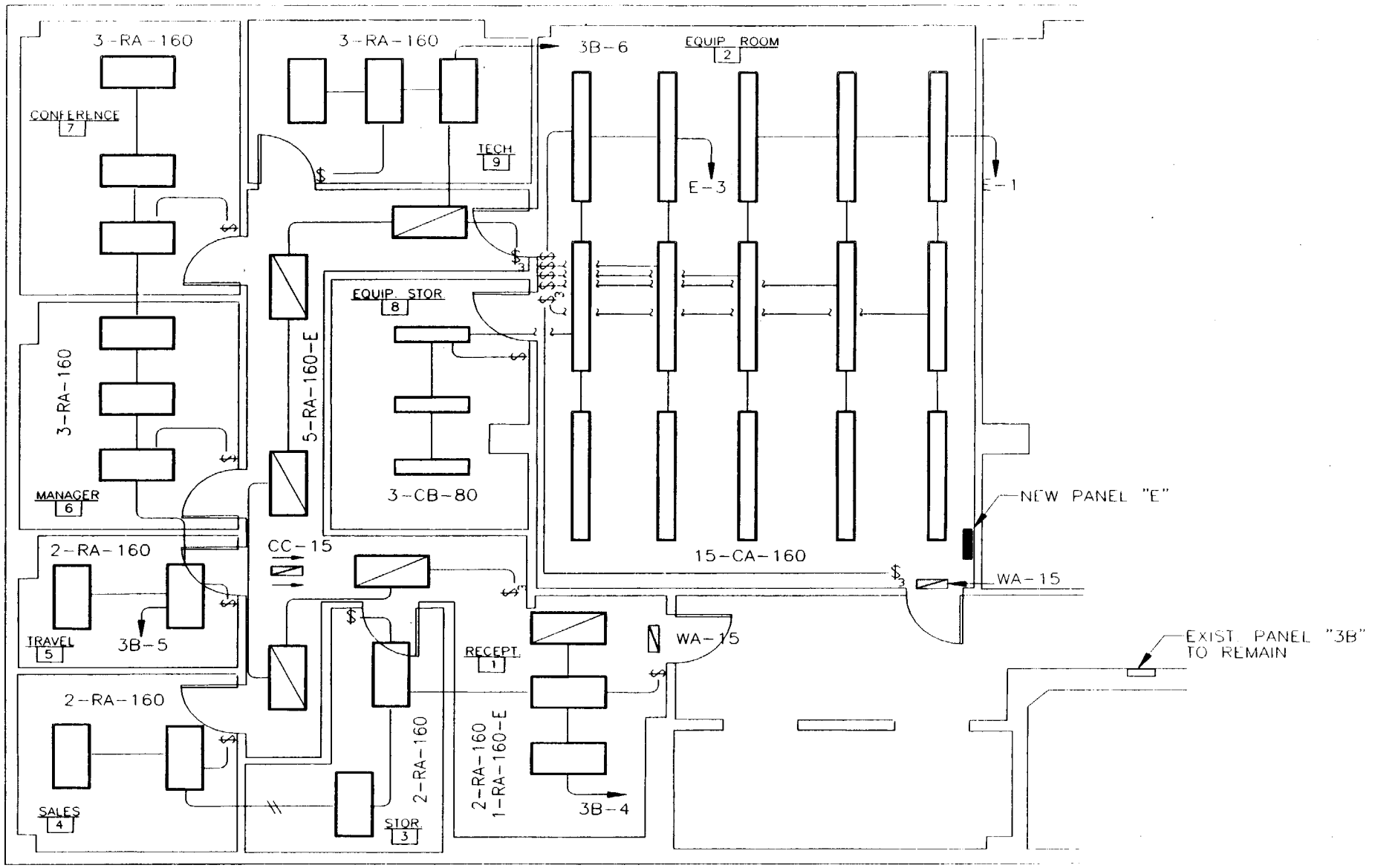
TYPICAL FIRE SUPPRESSION PLAN FM200 SYSTEM

HYPRSWCH



TYPICAL POWER FLOOR PLAN

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

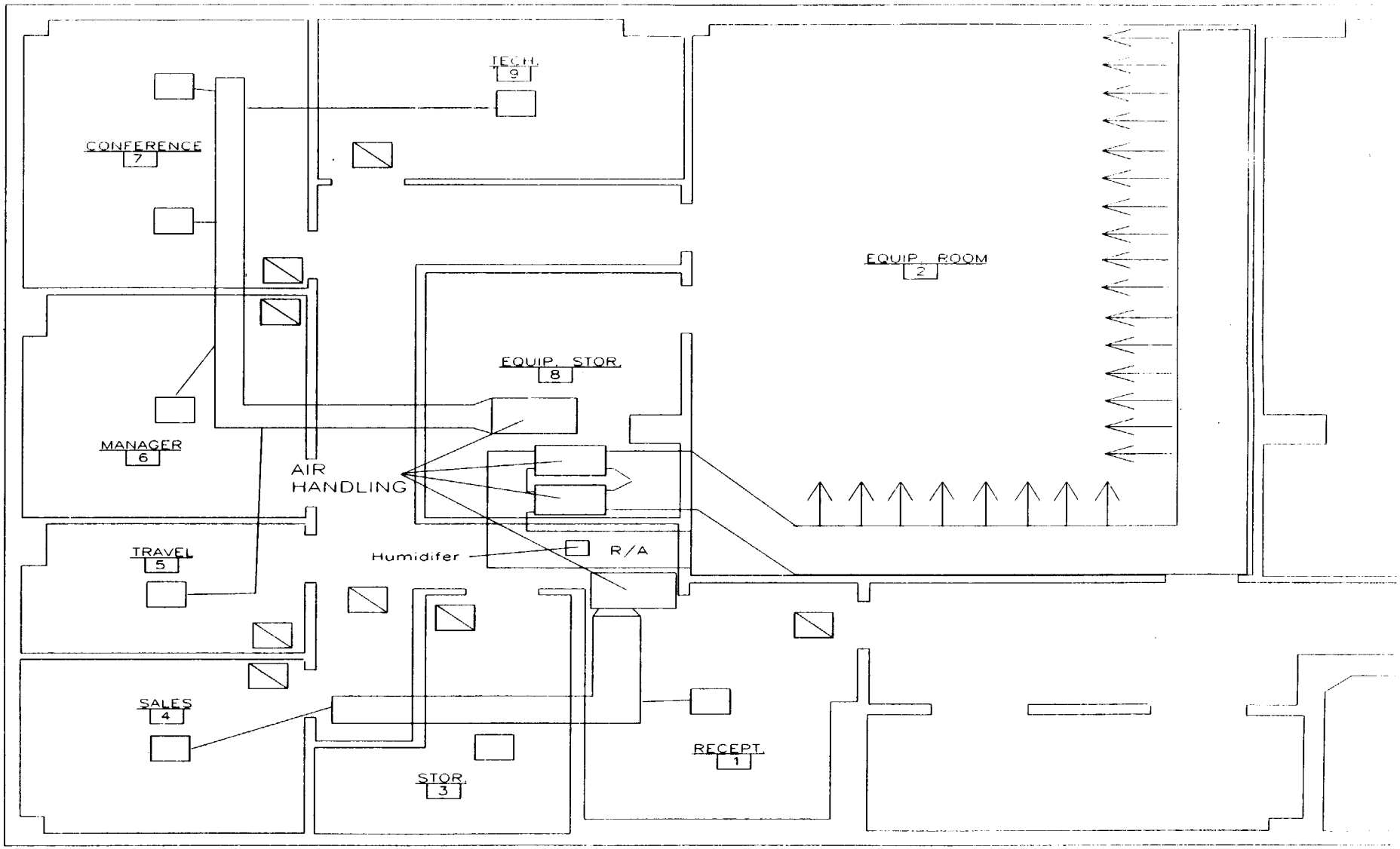


NOTE: CONNECT ALL EXIT SIGNS TO CIRCUIT E-3.

TYPICAL LIGHTING FLOOR PLAN

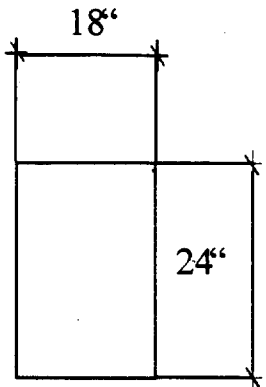
SCALE : 1/8" = 1'-0"

HYPRSWCH



TYPICAL HVAC SYSTEM LAYOUT

HYPRSWCH

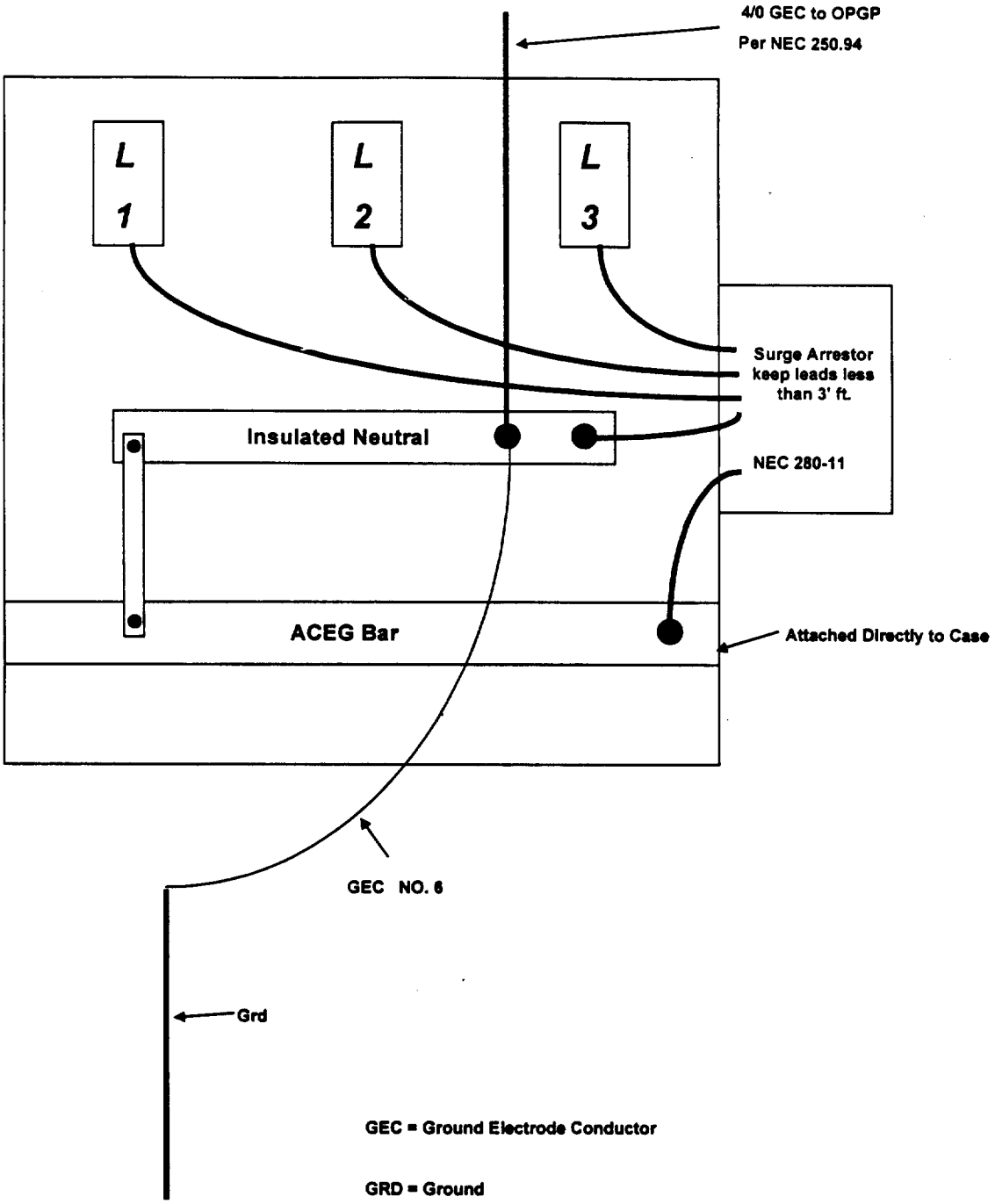


If two Rack windows are required at the Power Room, they shall be placed with 54 inches of separation from each other. This will allow the installation of the 48 inch ground bar between them.

TYPICAL BATTERY ROOM WINDOW ELEVATION

Main Distribution Bay

Grounding



GEC = Ground Electrode Conductor

GRD = Ground

L1-L3 = Phase

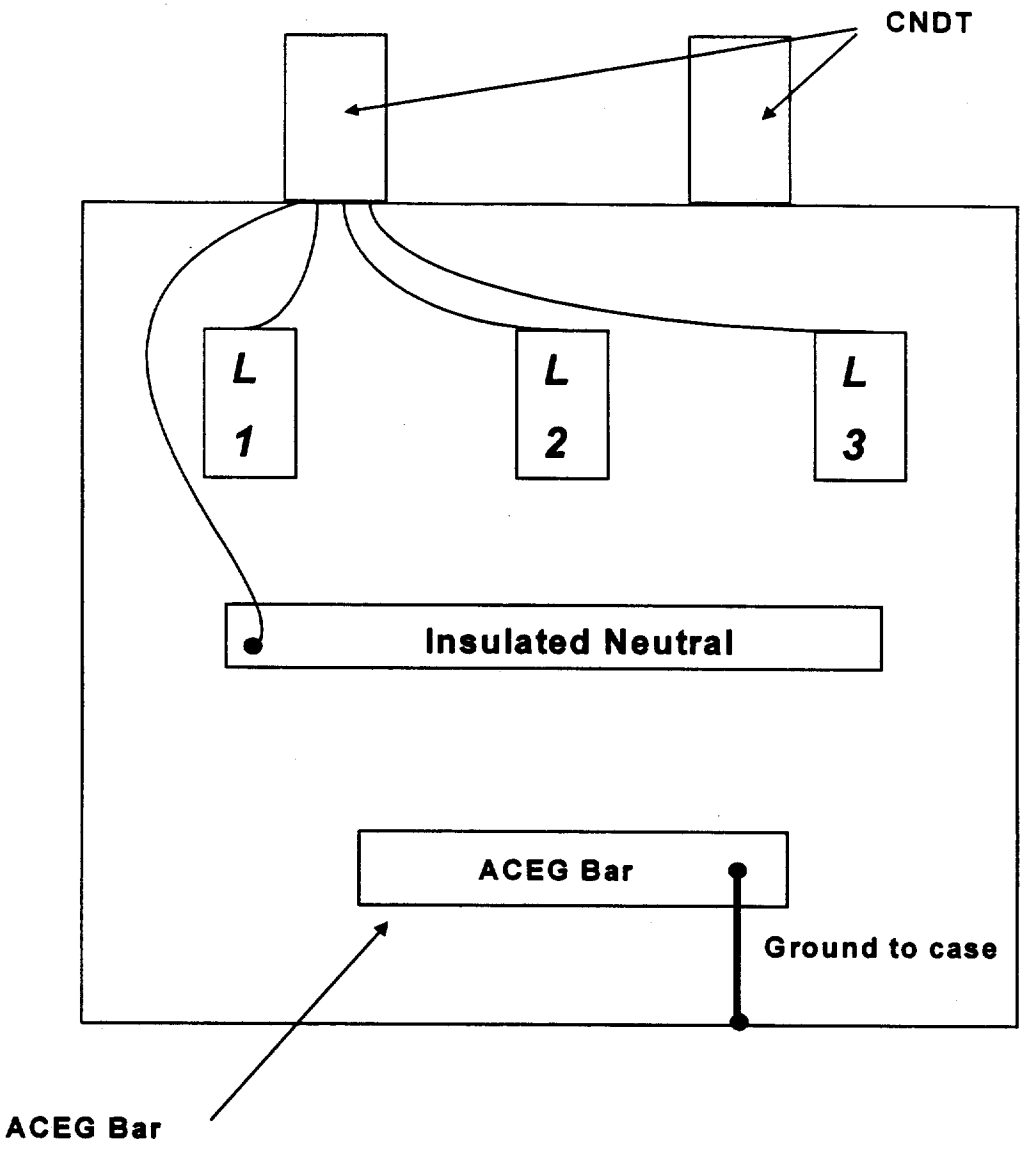
ACEG = AC Equipment Ground

4/0 = No. 0000 AWG Conductor

OPGP = Office Principle Ground Point

Generator Transfer

Panel Grounding

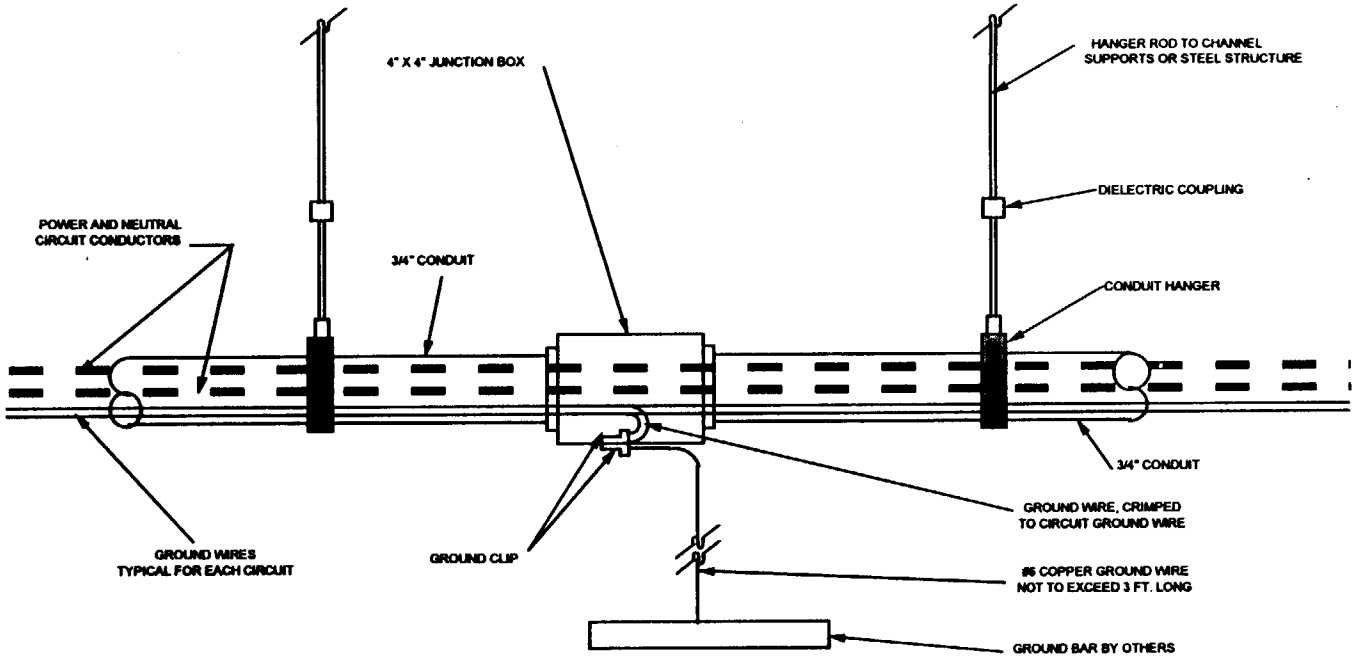


L1-L3 = Phase

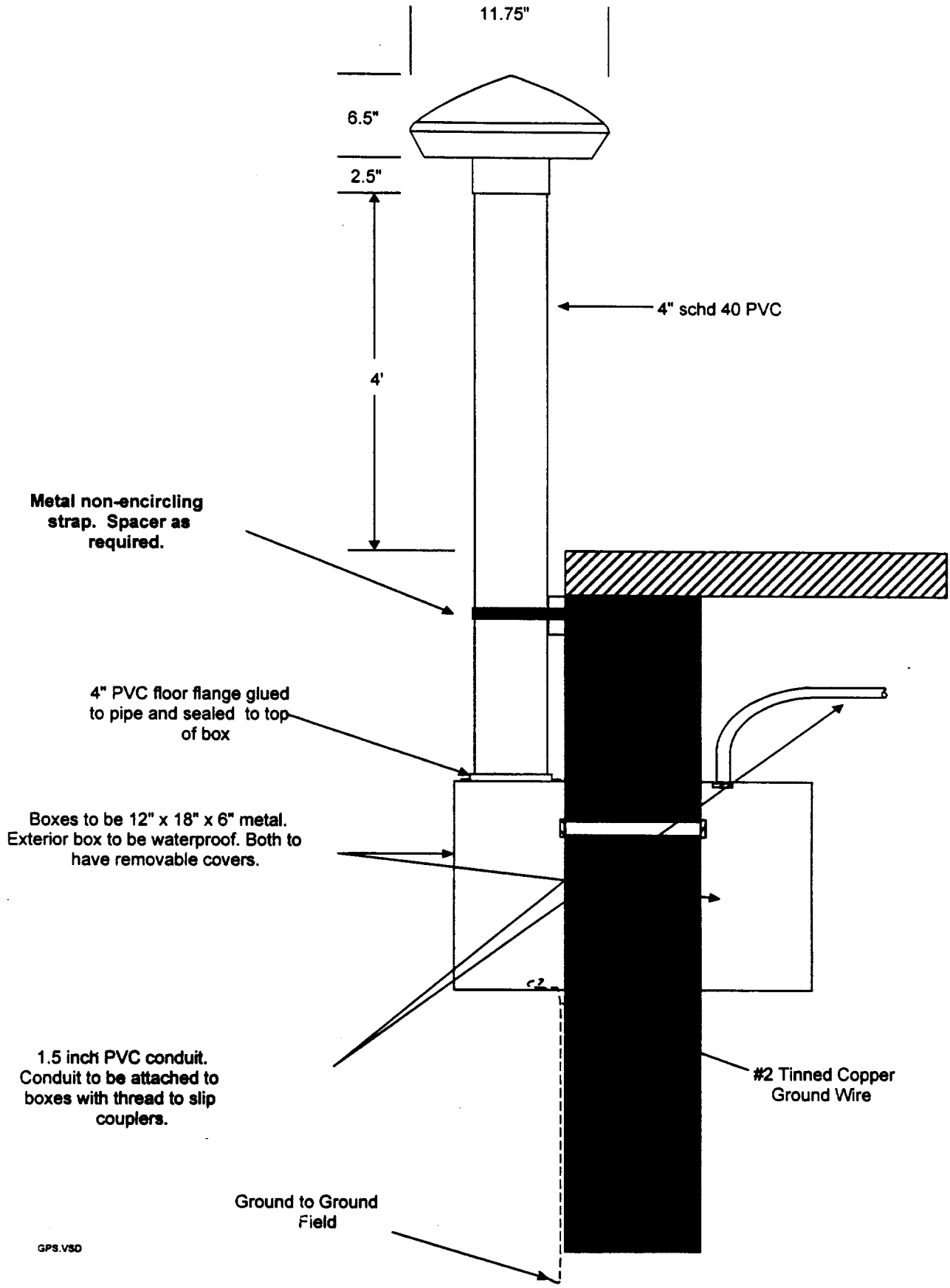
ACEG = AC Equipment Ground

INS = Insulated

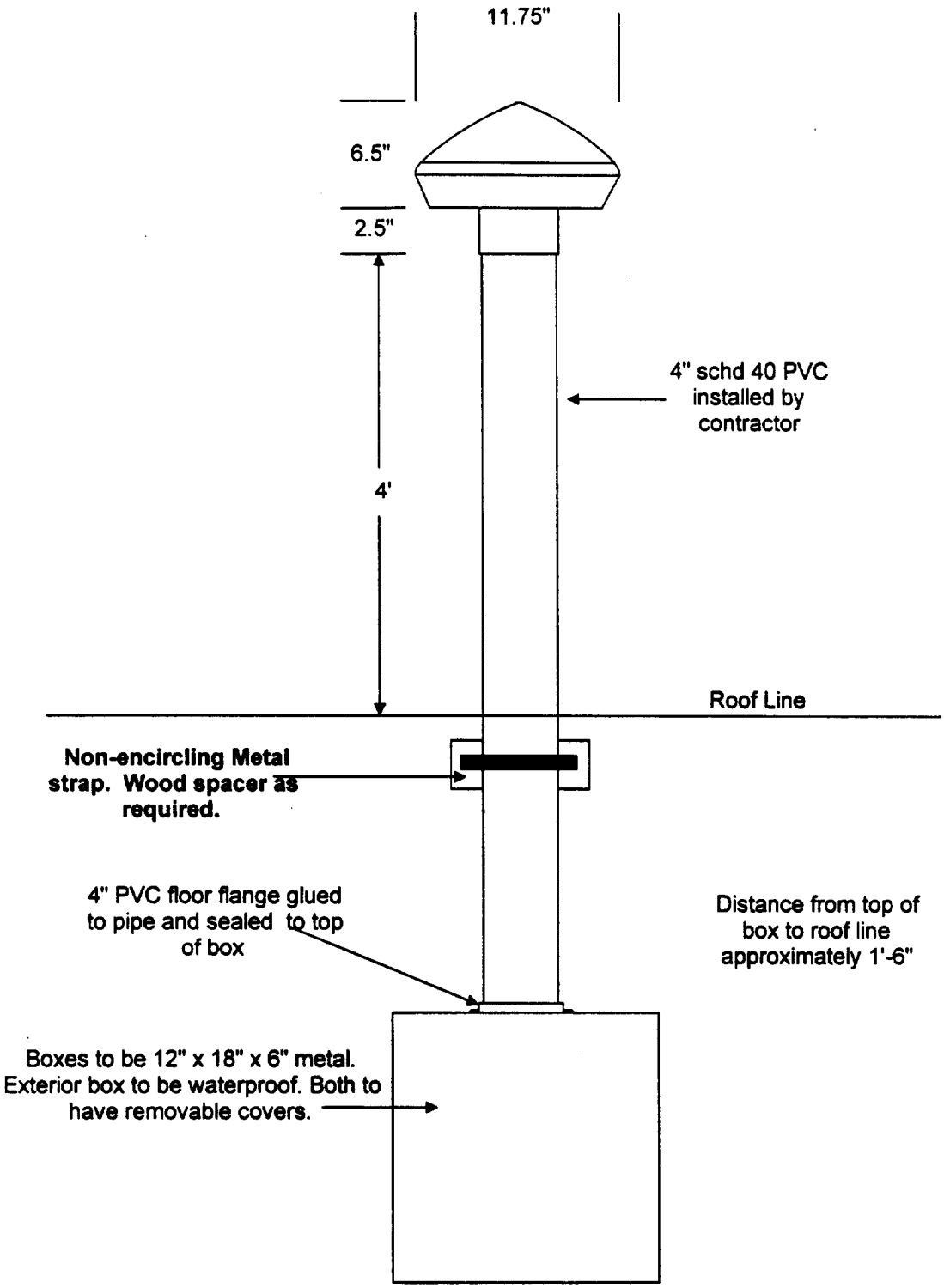
CNDT = Conduit



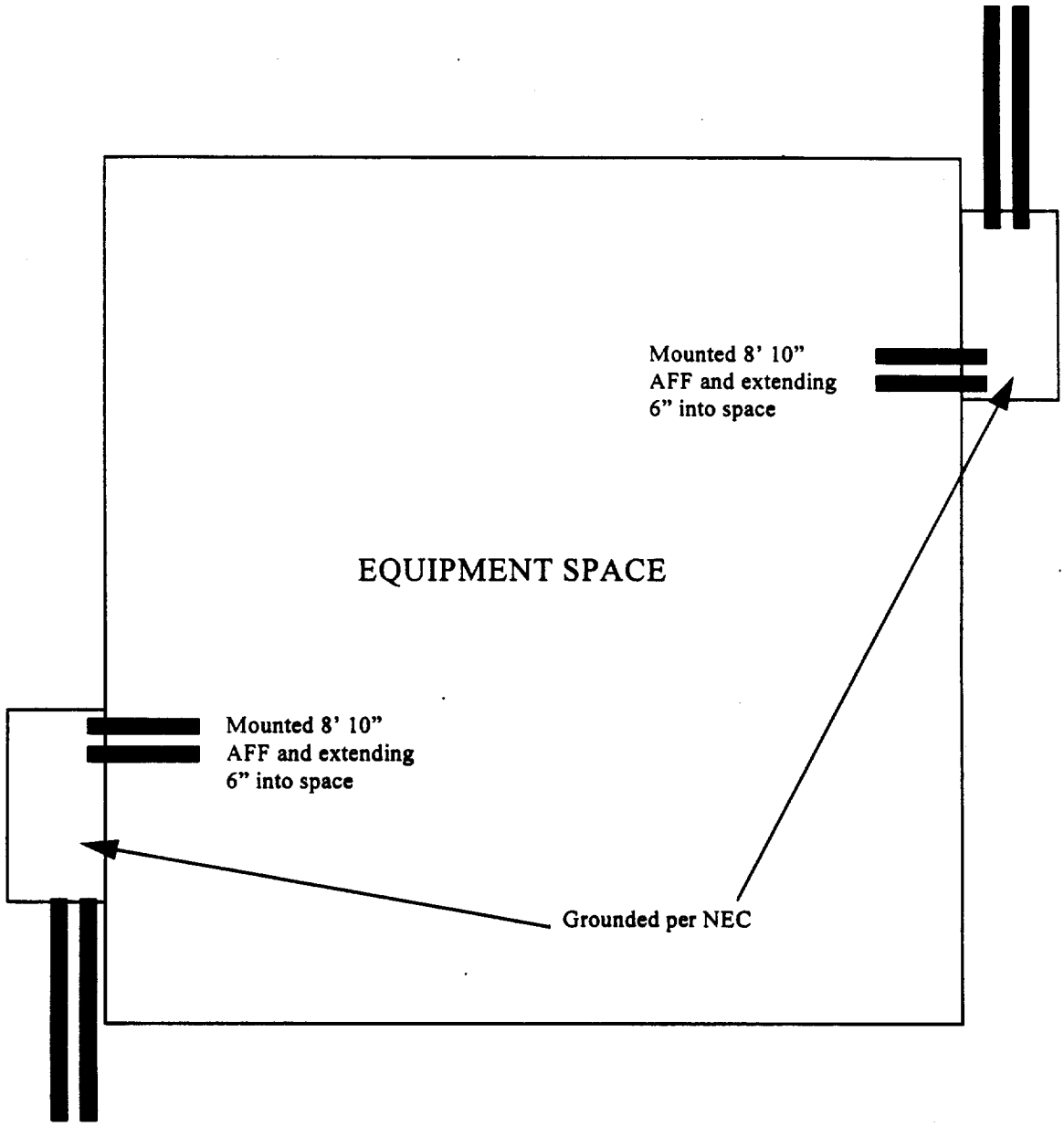
22 / TED-1	DETAIL - AC POWER TO GROUND WINDOW


11.75"
6.5"
2.5"
4' schd 40 PVC
4'
Metal non-encircling strap. Spacer as required.
4" PVC floor flange glued to pipe and sealed to top of box
Boxes to be 12" x 18" x 6" metal. Exterior box to be waterproof. Both to have removable covers.
1.5 inch PVC conduit. Conduit to be attached to boxes with thread to slip couplers.
#2 Tinned Copper Ground Wire
Ground to Ground Field
GPS.VSD

HYPRSWCH


11.75"
6.5"
2.5"
4' schd 40 PVC installed by contractor
4'
Roof Line
Non-encircling Metal strap. Wood spacer as required.
4" PVC floor flange glued to pipe and sealed to top of box
Distance from top of box to roof line approximately 1'-6"
Boxes to be 12" x 18" x 6" metal. Exterior box to be waterproof. Both to have removable covers.

GPS1.VSD



Exact location of conduit to be determined by Landlord and Project Manager

DOCKET NO. 98-00732

Hyperion Communications of Tennessee, L.P. - Responses to Third Set of Data Requests

EXHIBIT 2

Service Costs

[This Exhibit is filed under seal due to its proprietary and confidential nature]

DOCKET NO. 98-00732

Hyperion Communications of Tennessee, L.P. - Responses to Third Set of Data Requests

EXHIBIT 3

IntraLATA Toll Dialing Parity Plan

HYPERION TELECOMMUNICATIONS, INC.

INTRALATA TOLL DIALING PARITY PLAN

INTRODUCTION

Hyperion Telecommunications, Inc. ("Hyperion") has implemented the following processes which are designed to give end user customers the opportunity to designate a carrier for their intraLATA toll call traffic in those market areas where Hyperion is a facilities-based local exchange service provider. IntraLATA toll calls will automatically be directed to the designated carrier without the customer having to dial an access code.

POLICIES

Hyperion will deploy two-PIC (Primary Interexchange Carrier) technology in its switches enabling customers to pre-subscribe to either the same or two different carrier for their intraLATA and interLATA service.

Appropriate tariffs will be revised and filed in accordance with this plan.

Hyperion will offer customers the ability to access all participating carriers by dialing the appropriate access code (10XXX/101XXXX).

All eligible Hyperion end user telephone line numbers will be pre-subscribed and have a PIC associated with them.

CARRIER INFORMATION

Interexchange carriers will have the option of offering intraLATA service only or intraLATA and interLATA service.

Interexchange carriers will have the option of participating in all market areas or in a specific market area.

Interexchange carriers will be required to return a completed Non-Disclosure Agreement and Participation Agreement(s).

Hyperion will not participate in billing disputes for intraLATA service between an alternative competing interexchange carrier and its customers.

Hyperion representatives will not initiate or accept three-way calls from an alternative interexchange carriers in order to discuss pre-subscription.

Carriers wishing to participate will be requested to submit Access Service Requests/Translation Questionnaires to the Access Tandem owner and to Hyperion.

CALL ELIGIBILITY/TOLL DIALING PLAN

All local service customers of Hyperion will have calls routed according to the following plan:

If a Hyperion Customer Dials:	The Call is Handled By/Routed To:
911	PSAP on originating line number
411/555-1212	Hyperion's Directory Assistance Operator
0-	Hyperion's Operator
0 + intraexchange number	IntraLATA Toll Provider
1 + 7 or 10 digits	IntraLATA Toll Provider
0 + 7 or 10 digits interexchange number	InterLATA Toll Provider
10XXX or 101XXXX + 0-	XXX/XXXX Carrier
10XXX or 101XXXX + 0 + 7 or 10 digits	XXX/XXXX Carrier
10XXX or 101XXXX + 7 or 10 digits	XXX/XXXX Carrier

If a Hyperion customer originates a call to an alternative interexchange carrier's Operator by dialing 00-, the call will be routed to the PIC on that customer's line. If the customer originates a call to an alternative interexchange carrier's Operator by dialing an access code (e.g., 10XXX/101XXXX + 0-), the call will be routed to the XXX/XXXX carrier. In both cases, the carrier's switch is responsible for routing this call to the alternative interexchange carrier's Operator or to an announcement.

NETWORK INFORMATION

All originating intraLATA traffic will initially be routed via the incumbent Local Exchange Carrier (LEC) Access Tandem(s). Following conversion, direct trunks between the Hyperion switch and the interexchange carrier location(s) may be provided when warranted by traffic volume.

Interexchange carriers must have Feature Group D trunks in place (or ordered) between their point of presence and the incumbent LEC Access Tandem(s).

Hyperion will route all originating intraLATA traffic to the designated carrier and will only block traffic at the request of the end user customer and/or in compliance with regulatory requirements. Requests from carriers to block traffic or to remove customers from their network will not be honored. Calls that cannot be completed to a carrier will be routed to an announcement.

CUSTOMER CONTACT INFORMATION

Hyperion customer contact representatives will process customer initiated PIC selections to Hyperion or to an alternative intraLATA carrier. Carriers will have the option of allowing the Hyperion representative to process PIC requests on their behalf.

Hyperion will not ballot or allocate its customer base. At the time of conversion, all customers will be "PIC'd" to Hyperion unless another carrier is chosen by the particular customer.

Hyperion customer contact representatives will respond to customer inquiries about intraLATA carriers in a competitively neutral fashion. If a customer requests information on alternative carriers other than Hyperion, a list of participating carriers will be read to that customer in random order by Hyperion representatives.

If the intraLATA toll carrier selected by the customer permits Hyperion to process orders on its behalf, Hyperion will accept the PIC change request. If the customer selects an intraLATA toll carrier that does not allow Hyperion to process PIC changes on its behalf, Hyperion will provide the customer with the carrier's toll-free number (if provided by the carrier).

Hyperion representatives will not discuss alternative carrier rates or services and will not provide customers with Carrier Identification Codes or access code dialing instructions.

PRE-SUBSCRIPTION INFORMATION

A $5.00 PIC change charge will be incurred and billed to a Hyperion customer for each eligible line where a PIC change is made. Hyperion will offer its customers a 90-day grace period following the implementation of this plan during which the customers may change intraLATA carriers without incurring a PIC change charge. Customers can make multiple PIC changes during these 90 days at no charge. After the 90-day period, Hyperion will assess the $5.00 PIC change charge for each PIC change made. Hyperion will offer interexchange carriers the option of having the PIC charge billed to the carrier or directly to the customer.

New line customers, including customers adding lines, will have the opportunity to select a participating carrier, or they will be assigned a NO PIC designation. If a customer cannot decide upon an intraLATA carrier at the time of order, Hyperion may extend a 30-day period following placement of the customer's service order for the customer to select an intraLATA carrier without charge. Such a customer will be assigned a NO PIC designation in the interim. After this 30-day period, Hyperion will assess the $5.00 PIC change charge as described above. Customers assigned a NO PIC designation as set forth in this paragraph will be required to dial an access code to reach an intraLATA carrier's network.

If a Hyperion customer denies requesting a change in intraLATA toll providers as submitted by an intraLATA carrier, and the intraLATA carrier is unable to produce a Letter of Agency signed by the customer or some other form of verification that is permitted by law, the intraLATA carrier will be

assessed a $30.00 charge for the unauthorized PIC change and the PIC will be changed as per the customer's request. This penalty is in addition to any other penalties authorized by law.

Alternative interexchange carriers may submit PIC changes to Hyperion via a fax/paper interface.

Hyperion will process intraLATA PIC selections in the same manner and under the same intervals of time as interLATA PIC changes.

Carriers will be required to submit PIC changes using the Customer Account Record Exchange (CARE) format via paper medium. Hyperion will provide carriers with PIC order confirmation and reject information using the CARE format. Specific details regarding CARE will be provided to participating carriers.

For customers who change their local service provider from the incumbent LEC to Hyperion and retain their incumbent LEC telephone number(s), Hyperion, as part of the CARE PIC process, will provide the selected intraLATA carrier with both the retained (incumbent LEC) telephone number and the Hyperion telephone number.

Dated: April 21, 1999

DOCKET NO. 98-00732

Hyperion Communications of Tennessee, L.P. - Responses to Third Set of Data Requests

EXHIBIT 4

Financial Information

[This Exhibit is filed under seal due to its proprietary and confidential nature]

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EXHIBIT 5

Capital Budget

[This Exhibit is filed under seal due to its proprietary and confidential nature]