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ATTACHMENT 6.
2007-443

Säzän
Group
Inc.

KING COUNTY

Data Center Design Criteria

Due Date:

February 16, 2007

Prepared For:

King County
Facilities Management Division
Seattle, WA

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INDEX

GENERAL PROVISIONS

1.0 SCOPE

1.1 General Requirements

A. The following is a summary of the Scope of Work for design and construction of the architectural, mechanical, electrical, and communications cabling of the new consolidated King County Data Center.

B. The Building Owner is responsible for the design process, including the Owner's Design Architect and Contractor. All lines of communication shall be directed through King County's project manager David Millar, Facilities Management (tel 206/296-0239).

1.2 Purpose

A. This document is intended for use by designers who need a comprehensive understanding of the architectural, mechanical, and electrical features of the data center design including the facility planning, the cabling system, and the network design.

B. The design criteria and standards contained within are the minimums acceptable for efficiency, economy, durability, maintainability, and reliability of the mechanical HVAC, and electrical power supply and distribution systems.

C. Clarifications of baseline design criteria, standards, policy, and guidance should be obtained through the normal communications channels established between the owner and contractor.

1.3 Design-Build Process

A. The Design team is strongly encouraged to recommend cost saving material, equipment, and/or design alternatives.

B. Provide all labor, materials, equipment, tools, plant, and reproduction services necessary for the development and delivery of complete design and construction for architectural, HVAC, plumbing, fire protection, power, lighting and alarm systems as described hereinafter.

C. Provide the necessary resources to complete the work expeditiously and within requirements of published project schedule.

D. Provide all items and work required to implement a fully functional data center. This includes all incidentals, equipment, appliances, services, scaffolding, supports, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide complete systems.

E. Provide all services necessary for startup, commission, and check out each item and system to provide fully operable systems.

2.0 DELIVERABLES AND DESIGN QUALIFICATIONS

A. Complete engineering plans, specifications, and calculations for the project shall be prepared and submitted to the Owner along with estimates of probable construction costs.

B. These documents shall be prepared, signed, and sealed by Professional Engineers, Architects, and Registered Communications Distribution Designers (RCDDs) licensed to practice in the State of Washington, and who are regularly engaged in the design of similar facilities and systems.

3.0 REVIEWING AUTHORITY AND DESIGN APPROVALS

3.1 General

A. Comply with all applicable governmental regulations. Comply with all Federal, State, City, and other applicable codes and ordinances.

B. If any conflict arises between the Specifications or codes and ordinances, immediately notify the Owner.

3.2 King County

A. King County will have the final decision with respect to system concepts, visual coordination, and acceptance of proposed products.

B. Design elements related to the telecommunications physical infrastructure are subject to review and approval by King County OIRM.

C. See submittal requirements hereinafter.

3.3 Local Authorities

A. Submit engineering plans, specifications, and calculations to local authorities for review in accordance with reviewing agencies instructions.

B. Obtain and pay for all permits and pay all fees required by authorities having jurisdiction for work. Pay all royalties or fees required in connection with the use of patented devices and systems.

C. Arrange for and schedule all tests required by authorities having jurisdiction and public or private utilities.

D. During construction do not deviate from approved drawings and specifications nor install any work that may be in conflict with codes and ordinances.

3.4 Owners Representative

A. Owner will retain Säzän Group, Inc. to act on the Owner's behalf as advisors on technical matters of interest to the Owner. Their involvement in this project shall, in no way, alleviate the statutory and professional requirements and obligations of the design and construction team as the Professional Engineer of Record. The review of designs or installations shall, in no way, reduce or diminish the obligation, responsibility or liability of the design and construction team or their professional consultants.

4.0 REFERENCES

A. The publications listed below form a part of this document to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR CONDITIONING ENGINEERS (ASHRAE)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASTM INTERNATIONAL (ASTM)

ASTM B 1	(2001) Hard-Drawn Copper Wire
ASTM B 8	(2004) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM D 709	(2001) Laminated Thermosetting Materials

ELECTRONIC INDUSTRIES ALLIANCE (EIA)

ANSI/TIA-942	(2005) Telecommunications Infrastructure Standard for Data Centers
EIA TIA-455-21-A	(1988) FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices
TIA/EIA-492AAAA-A	(1998) 62.5-um Core Diameter/125-um Cladding Diameter Class 1a Graded-Index Multimode Optical Fibers (ANSI/TIA/EIA-492AAAA-A)
TIA/EIA-492CAAA	(1998; R 2002) Class IVA Dispersion-Unshifted Single-Mode Optical Fibers
TIA/EIA-526-14A	(1998) OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant (ANSI/TIA/EIA-526-14A)
TIA/EIA-526-7	(1998) OFSTP-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant (ANSI/TIA/EIA-526-7)
TIA/EIA-568-B.1	(2001; Addendum 2001) Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements (ANSI/TIA/EIA-568-B.1)
TIA/EIA-568-B.2	(2001) Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Cabling Components (ANSI/TIA/EIA-568-B.2)
TIA/EIA-568-B.3	(2000; Addendum 2002) Optical Fiber Cabling Components Standard (ANSI/TIA/EIA-568-B.3)
TIA/EIA-569-A	(1998; Addenda 2000, 2001) Commercial Building Standards for Telecommunications Pathways and Spaces (ANSI/TIA/EIA-569-A)
TIA/EIA-598-B	(2001) Optical Fiber Cable Color Coding
TIA/EIA-604-10A	(2002) FOCIS 10 Fiber Optic Connector Intermateability Standard - Type LC
TIA/EIA-604-2	(1997; R 2002) FOCIS 2 Fiber Optic Connector Intermateability Standard

TIA/EIA-604-3A	(2000) FOCIS 3 Fiber Optic Connector Intermateability Standard - Standard Type SC
TIA/EIA-606-A	(2002) Administration Standard for the Telecommunications Infrastructure (ANSI/TIA/EIA-606)
EIA-310-D	(1992) Racks, Panels, and Associated Equipment
TIA J-STD-607-A	(2002) Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C12.7	(1993; R 1999) Requirements for Watt-hour Meter Sockets
IEEE Std 81	(1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1) Normal Measurements
IEEE Std 100	(2000) The Authoritative Dictionary of IEEE Standards Terms
IEEE Std 1100	(IEEE Emerald Book) IEEE Recommended Practice for Powering and Grounding Electrical Equipment

INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

NETA ATS	(2003) Acceptance Testing Specifications

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA S-83-596	(2001) Fiber Optic Premises Distribution Cable

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2003) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA C12.1	(2001) Code for Electricity Metering
NEMA C80.1	(1994) Rigid Steel Conduit - Zinc Coated (GRC)
NEMA C80.3	(1994) Electrical Metallic Tubing - Zinc Coated (EMT)
NEMA FU 1	(2002) Low Voltage Cartridge Fuses
NEMA KS 1	(2001) Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
NEMA MG 1	(2003; R 2004) Motors and Generators
NEMA ST 20	(1992; R 1997) Dry-Type Transformers for General Applications

NEMA WC 63.1	(2000) Twisted Pair Premise Voice and Data Communications Cables
NEMA WC 66	(2001) Category 5e and Category 6 100 Ohm Shielded and Unshielded Twisted Pairs
NEMA WD 1	(1999) General Color Requirements for Wiring Devices
NEMA WD 6	(2002) Wiring Devices - Dimensional Requirements
NEMA Z535.4	(2002) Product Safety Signs and Labels

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2005) National Electrical Code
NFPA 70E	(2004) Electrical Safety in the Workplace

SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION, INC. (SMACNA), SEISMIC HAZARD LEVEL AA

SEATTLE, CITY OF, REQUIREMENTS

STATE OF WASHINGTON BUILDING CODES

US FEDERAL COMMUNICATIONS COMMISSION (FCC)

FCC Part 68	Connection of Terminal Equipment to the Telephone Network (47 CFR 68)

UNDERWRITERS LABORATORIES (UL)

UL 1	(2005) Flexible Metal Conduit
UL 1010	(1995; Rev thru Mar 1999) Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations
UL 1063	(1998; Rev thru Jun 2001) Machine-Tools Wires and Cables
UL 1242	(2000; Rev thru May 2003) Electrical Intermediate Metal Conduit
UL 1449	(1996; Rev thru Jul 2002) Transient Voltage Surge Suppressors
UL 1561	(1999; Rev thru Feb 2004) Dry-Type General Purpose Transformers
UL 248-1	(2000) Low-Voltage Fuses - Part 1: General Requirements
UL 248-2	(2000) Low-Voltage Fuses - Part 2: Class C Fuses
UL 248-4	(2000) Low-Voltage Fuses - Part 4: Class CC Fuses

UL 248-5	(2000) Low-Voltage Fuses - Part 5: Class G Fuses
UL 248-8	(2000) Low-Voltage Fuses - Part 8: Class J Fuses
UL 248-9	(2000) Low-Voltage Fuses - Part 9: Class K Fuses
UL 248-10	(2000) Low-Voltage Fuses - Part 10: Class L Fuses
UL 248-12	(2000) Low-Voltage Fuses - Part 12: Class R Fuses
UL 248-15	(2000) Low-Voltage Fuses - Part 15: Class T Fuses
UL 20	(2000; Rev thru Jun 2002) General-Use Snap Switches
UL 2043	(1996; R 2001, Jul. 2001) Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
UL 360	(2003) Liquid-Tight Flexible Steel Conduits
UL 44	(2005) Thermoset-Insulated Wires and Cables
UL 467	(2004) Grounding and Bonding Equipment
UL 486A-486B	(2003; Rev thru Apr 2004) Wire Connectors
UL 486C	(2004) Splicing Wire Connectors
UL 489	(2002; Rev thru May 2003) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 498	(2001; Rev thru Oct 2002) Attachment Plugs and Receptacles
UL 5	(2004) Surface Metal Raceways and Fittings
UL 50	(1995; Rev thru Sep 2003) Enclosures for Electrical Equipment
UL 506	(2000; Rev thru Feb 2004) Specialty Transformers
UL 510	(2005) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
UL 512	(1993; Rev thru Mar 1999) Fuseholders
UL 514A	(2004) Metallic Outlet Boxes
UL 514B	(2004) Conduit, Tubing and Cable Fittings
UL 6	(2000; Rev thru May 2003) Rigid Metal Conduit
UL 67	(1993; Rev thru Nov 2003) Panelboards

UL 797	(2004) Electrical Metallic Tubing
UL 817	(2001; Rev thru Jan 2004) Cord Sets and Power-Supply Cords
UL 83	(2003; Rev thru Mar 2004) Thermoplastic-Insulated Wires and Cables
UL 869A	(1998) Reference Standard for Service Equipment
UL 870	(1995; Rev thru Jul 2003) Wireways, Auxiliary Gutters, and Associated Fittings
UL 943	(2006) Ground-Fault Circuit-Interrupters
UL 1286	(1999; Rev thru Oct 2002) Office Furnishings
UL 1666	(2000; Rev thru Jul 2002) Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
UL 1863	(2004) Communication Circuit Accessories
UL 444	(2002; Rev thru Aug 2002) Communications Cables
UL 467	(2004) Grounding and Bonding Equipment
UL 50	(1995; Rev thru Sep 2003) Enclosures for Electrical Equipment
UL 910	(1998) Test for Flame-Propagation and Smoke-Density Values for Electrical and Optical-Fiber Cables Used in Spaces Transporting Environmental Air
UL 969	(1995; Rev thru Nov 2001) Marking and Labeling Systems

WASHINGTON STATE ENERGY CODE WITH SEATTLE AMENDMENTS

5.0 DEFINITION OF TERMS, ACRONYMS AND ABBREVIATIONS

5.1 General

A. Unless otherwise specified or indicated, electrical and electronics terms used in this specification shall be as defined in TIA/EIA-568-B.1, TIA/EIA-568-B.2, TIA/EIA-568-B.3, TIA/EIA-569-A, TIA/EIA-606-A and IEEE Std 100 and herein.

5.2 Definitions

A. **ADA**: Americans with Disabilities Act

B. **BICSI**: Building Industry Consulting Service International is a professional telecommunications association.

C. **County Enterprise Network**: The network commonly used to conduct county business that provides transport of data within and between county facilities and other agencies of county government. This definition also refers to the network used to transport data

between the county, other government agencies and the Internet. It does not refer to networks built for the sole purpose of meeting special operations needs of county business units which include, but are not limited to, process control and supervisory control networks. Nor does it refer to the King County Institutional Network (I-Net) which is required to meet contractual obligations with I-Net customers and the local cable utility.

D. **Cross Zone Detection**: Cross Zone Detection is part of the National Fire Code. In the case of cross-zone detection, single detector activation shall cause an alarm signal to be generated; second detector activation shall generate a pre-discharge signal and start the pre-discharge condition. No single detector sets off the entire fire suppression system.

E. **Entrance Facility (EF)**: An entrance to the building for both private and public network service cables including the entrance point at the building for telecommunications equipment that serves the occupants of a building. Equipment housed therein is considered distinct from a telecommunications room because of the nature of its complexity.

F. **Horizontal Cross-connect (HC)**: An intermediate distribution point used to connect horizontal cable and cabling subsystems or equipment.

G. **HVAC**: Heating, Ventilation and Air-Conditioning

H. **Main Cross-connect (MC)**: A distribution point in which the building backbone cables terminate and at which connections to the wide-area network may be made.

I. **Open Cable**: Cabling that is not run in a raceway as defined by NFPA 70. This refers to cabling that is "open" to the space in which the cable has been installed and is therefore exposed to the environmental conditions of that space.

J. **Open Office**: A floor space division provided by furniture, moveable partitions, or other means instead of by building walls

K. **Pathway**: A physical infrastructure utilized for the placement and routing of telecommunications cable.

L. **TBB:** Telecommunications Bonding Backbone

M. **TGB:** Telecommunications Grounding Bus-bar

N. **TMGB:** Telecommunications Main Grounding Bus-bar

O. **Telecommunications Room (TR):** An enclosed space for housing telecommunications equipment, cable, terminations, and cross-connects. The room is the recognized cross-connect between the backbone cable and the horizontal cabling.

P. **Work Stations**: Defined as any place a person may work. This includes reception areas, conference rooms, lunch rooms, day rooms, copier rooms, printer rooms, etc.

6.0 DESIGN CRITERIA

A. The Subcontractors shall accept direction through the Contractor with respect to performance of their contractual obligations. Subcontractor shall have a designated project representative and a back-up representative, either or both of whom shall attend all meetings, whether regularly scheduled or not.

B. Subcontractor shall meet with members of local regulatory authorities, utility companies and municipal service boards to coordinate their requirements with the project design and installation.

C. King County reserves the right to review and comment on the design documents. Their reviews shall be in the form of comments which shall be considered either as interpretations of the design or clarification of the intent of the scope of work. Respond to these review comments with written acceptance or rejection of each comment. King County or its technical representatives will not accept responsibility for the technical design of the project, which remains the responsibility of the design and construction team.

D. Design team is required to carry, as Architect and Engineers of Record, professional liability insurance (errors and omissions), of sufficient policy value and acceptable deductible, to cover their acts as Architect and Engineer of Record for this project. Furnish evidence of professional liability insurance coverage to the Owner for review and acceptance. Minimum policy coverage shall be $2,000,000.

7.0 SUBMITTALS

7.1 General

A. Submit all design drawings, calculations, and shop drawings to the Owner for review and comment.

B. King County shall be the sole judge of a submittal's completeness. Incorporate all required information into the submittal as directed.

C. Documents shall be reviewed and stamped by Engineer of Record prior to submittal. By virtue of reviewing and commenting on such calculations and shop drawings, King County and its Representatives do not accept any responsibility for the accuracy or appropriateness of the calculations, since that responsibility rests solely with the Design and Construction Team.

7.2 Submittal Requirements

A. For Schematic and Design Development phases, submit as indicated below by discipline in accordance with the following:

1. Schematic Phase: As a minimum, a single line layout for at a scale not less than 1:100 (1/8 inch). Submit a complete double line layout of areas of critical importance, at a scale of 1:50 (1/4 inch) including equipment.

2. Design Development: Submit minimum 1:100 (1/8 inch) scale floor plans, new and renovated, incorporating all of the revisions required by comments from schematics.

7.3 Disciplines

A. Plumbing

1. Narrative

a. Existing plumbing systems to be used and necessary modifications

b. New plumbing systems

c. New or modified water treatment

2. Floor Plans/Drawings
    a. Room names
    b. Identify
        1) Existing plumbing fixtures
        2) New plumbing fixtures
        3) Existing equipment
        4) New equipment
        5) Plumbing piping
    c. Size of pipe
    d. Equipment schedule
    e. Fire & smoke partitions
    f. Demolition plans
    g. Riser diagrams
    h. Legend, notes, and details
3. Location and size of sprinkler riser, standpipes, and fire pumps (see fire protection)
4. Location of emergency eyewash and shower equipment
5. Calculations (equipment & piping)
6. List of Required Contract Specifications
7. Contract Specifications

B. Sanitary
1. Narratives:
    a. Existing sanitary systems: underground water, sanitary sewers, storm sewers, and fuel gas with sources, disposal methods, storage pressures, condition, etc.
    b. New sanitary systems
    c. Provide water analysis & expected yield if well required
    d. Circulation study to assess emergency vehicle access
2. Utility Plans/Drawings showing existing and new sanitary systems:
    a. Size of pipes
    b. Invert elevations of sewers
    c. Locate/size
        1) Pumps

2) Storage facilities
3) Treatment equipment
4) Fire hydrants
5) Sectional and post indicator valves
6) Backflow preventer

d. Profiles of sanitary & storm sewers
e. Demolition Plans
f. Legend, notes, and details

3. Point of connection to sprinkler system
4. Calculations
5. List of specifications
6. Contract Specifications

C. HVAC:

1. Description of HVAC systems
2. Equipment for each functional space
3. Location/sizes:
   a. Mechanical equipment room
   b. Principal vertical shafts
4. Block layout of equipment
5. Louvers:
   a. Outside air
   b. Exhaust air
   c. Relief air
6. Engineering calculations[3]
7. Selection of HVAC equipment
8. Catalog cuts of equipment
9. Room by room heating and cooling loads
10. Zone by zone heating & cooling loads
11. Building block heating & cooling loads

12. Psychometric chart for air handling unit
13. Coil entering and leaving conditions
14. Fan motor heat gains
15. Consumption of humidification loads
16. Sound/acoustic analysis
17. Room-by-room air balance charts[4]
18. Chilled water plant:[5]
    a. Quantity and type of chillers
    b. Capacity in tons of refrigeration
    c. Electrical equipment
19. Heating system:
    a. Total heating load
    b. Domestic hot water load
    c. Humidification load
    d. Equipment steam demand
    e. Zoning of heating system
20. HVAC floor plan: [6]
    a. Main supply, return and exhaust ductwork
21. HVAC
    a. Volume dampers
    b. Fire and smoke partitions
    c. Fire and smoke dampers
    d. Smoke detectors
    e. Automatic control dampers
    f. Air quantities for each room
    g. Air inlets/outlets
    h. Rises and drops in ductwork
    i. Expansion loops
    j. Anchors
    k. Valves

l. Drip assemblies
m. Balancing fittings

22. Interconnection of HVAC equipment with fire protection equipment (see fire protection)
23. Plan/section of mechanical equipment rooms
24. Schematic flow and riser diagrams[7]
25. Schematic control diagrams[8]
26. HVAC demolition drawings
27. Phasing plan
28. Equipment schedule
29. Seismic bracing
30. Symbols and abbreviation
31. Selection of:
    a. Pumps
    b. Fans
32. Sizing and selection of
    a. Expansion tanks
    b. Heat exchangers
33. Sound analysis
34. Complete selection data
35. Outside chilled water and condenser water distribution[9]
36. Standard detail drawings
37. Automatic temperature control drawings[10]
38. HVAC specifications

Submittal Footnotes:

[1] Provide specific design recommendations and full back-up data. Include the heating and cooling capacities of each functional area and the block cooling and heating loads for each new and/or existing building.

[2] The locations of these louvers must not allow short circuiting of air from emergency generator exhaust or truck waiting and loading dock areas into air intake etc. Consider factors affecting

louver location such as visibility, historical considerations, wind direction, nuisance and health hazard odors (from emergency generator or truck exhausts).

[3] Include room-by-room, peak zone-by-zone, and building block heating and cooling loads. Provide a tabulation of steam consumption based on data from all sources. Show correlation between each HVAC zone boundary and architectural floor area correlation between the architectural room numbers and abbreviated/coded room numbers used with computer input data sheets.

[4] Show supply, return, exhaust, make-up, and transfer quantities with intended pressure relationships, i.e. positive, negative, or zero with respect to adjoining spaces.

[5] Provide pertinent data on accessories such as pumps and cooling tower etc. Show the extent of the outside chilled water and condenser water piping. Clearly show how the piping will be laid in tunnels, trenches, or by direct burial.

[6] Show ceiling clearances, at locations where ducts cross each other, by providing 1:50 (1/4 inch) scale local sections. Show all ductwork, and piping 150 mm (6 inch) and larger in double line. Show separate floor plans for air distribution and piping unless waived by THE OWNER. Show clearances required for access and maintenance with coil and tube pull.

[7] Show typical air handling systems and all hydronic systems with existing capacities and new estimated loads. Verify actual operating conditions and capacities of HVAC systems prior to design.

[8] Show control devices, such as, thermostats, humidistats, flow control valves, dampers, freezestats, operating and high limit sensors for all air systems and fluids, smoke dampers, duct detectors etc. Provide a written description of the sequence of operation on the floor plans. Detail the scope of work involved with the Central Engineering Center (ECC) and address if enough spare capacity is available or a new ECC is required. Show a point schedule for analog/digital input/output to be included in ECC.

[9] Show pipe sizes and insulation with plans, profile, sections, details, and all accessories, such as, anchors, expansion loops/joints, valves, manholes, capped and flanged connections, interface between the new and existing work (if any). Clearly indicate interferences (if any) with the existing utilities and/or landscape elements on outside piping layout drawings. Show rerouting any utilities, cuttings of roads, pavements, trees, etc., and the extent of new and demolition work. Outside utility drawings shall be based on the study of the latest site drawings, discussions with engineering personnel, and actual site inspection of the existing utility.

[10] Show all duct detectors, control valves/dampers static pressure sensors, differential pressure control assemblies, etc., whose actual physical location is critical for the intended sequence of operation on floor plans.

D. Fire Protection

1. Narrative: [1]

   a. Fire and smoke separation
   b. Fire sprinkler/standpipe system
   c. Water supply available/max. demand
   d. Water flow testing results

2. Fire alarm systems [2]
    a. Existing to be modernized
    b. Base loop system for interface of new construction
    c. Size of air handling units
    d. Exit paths from each zone
    e. Distances to stairs
    f. Occupancy of each area
    g. Exit calculations for each floor
    h. Smoke control features
3. Floor Plans/Drawings: [3]
    a. Sprinkler zones
    b. Fire alarm zones
    c. Smoke zones
    d. Building water supply
    e. Interior sprinkler supply lines
    f. Standpipes
    g. Fire extinguisher cabinets
    h. Fireproofing of structural members
    i. Sprinkler/standpipe riser supply piping
    j. Termination of sprinkler main and inspector test drains
    k. Sprinkler alarm valves
    l. Waterflow and tamper switches
    m. Sprinkler system fire department connections
    n. Sprinkler design hazards per NFPA 13
    o. Exit signs and emergency lighting
    p. Occupied areas not protected by automatic sprinklers
4. Calculations
    a. Estimated capacities for proposed air handling units in cubic meters (cubic feet) per minute
5. Location of
    a. Fire alarm system
    b. Annunciator panels
    c. Pull stations

d. Flow switches
e. Audio-visual devices
f. Smoke detectors
g. Duct smoke detectors
h. Smoke dampers
i. Fire dampers
j. Fire alarm risers [4]
k. Exit signs
l. Emergency lighting
m. Fire sprinklers
n. Standpipes
o. Fire hydrants
p. Fire pumps
q. Post indicator valves
r. Sectional valves
s. Fire extinguisher cabinets
t. Electromagnetic door hold open devices
u. Wall sections indicating fire resistive ratings
v. Door and window schedule with fire rating or fire rated glazing
w. Zoning of each fire alarm initiating device

6. Details:
   a. Fire pump system (capacity and pressure)
   b. Elevation and isometric view of fire pump
   c. Stairwell sign
   d. Annunciator panel
   e. Interconnection of fire alarm system with:
   f. Smoke dampers
   g. Air handlers
   h. Elevator controls
   i. Kitchen fire extinguishing and fire pump system
   j. HVAC system with smoke duct detectors
7. Single line riser diagram for fire alarm system
8. Height/configuration of storage racks and shelving

9. Specifications

10. Corresponding data for FM200 System

Fire Protection Submittal Footnotes:

[1] Indicate NFPA 220 and UBC fire resistive rating of the building, NFPA 101 occupancy type, and fire protection code analysis to access compliance with NFPA 101.

[2] Determine type, features, age, reliability, compliance with present day codes, capacity, zoning, supervision, control panel and power supplies, initiating devices and circuits, and auxiliary functions for existing fire alarm system. Indicate manufacturer, model number, voltage, and wiring style of existing alarm systems and devices. Provide recommendations for the proposed fire alarm work.

[3] At submission, include room names, room numbers, door locations and swings, smoke and fire rated partitions, sprinkler/standpipe risers to floor plans. Add location of all valves (post indicator, sectional) and backflow preventer if provided.

[4] Show new equipment and/or the necessary changes involved if modification to the existing system is required. Include any recommendations where certain requirements of the design criteria might be waived in order to allow the existing equipment to be reused.

E. Electrical

1. Design Narrative

2. Location and size of:

   a. Electrical equipment

   b. Electrical closets

   c. Telephone closets

3. Drawings:

   a. Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation.

   b. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

   c. Submit drawings for:

      1) Communications systems

      2) Proposed electrical system[4]

4. List of drawing symbols

5. List of specialty areas

6. Method of short-circuit calculations
7. Method of voltage drop and demand calculations
8. Load calculations for normal and emergency use

F. Product Data
1. Panelboards
2. Transformers
3. Cable trays
4. Wireways
5. Receptacles
6. Circuit breakers
7. Switches
8. Transformers
9. Enclosed circuit breakers
10. Motor controllers
11. Manual motor starters
12. Combination motor controllers
13. Telecommunications Grounding Busbar
14. Surge protective devices

7.4 Equipment

A. Equipment (on architectural drawing)
B. Activation Equipment List (Excel format)
C. Specifications

7.5 Specifications

A. Submit for all technical disciplines the original CSI Master Specification section drafts marked-up with pencil showing the editing for the project. Clearly identify modifications, deletions and insertions. Assure the specification drafts have been edited and tailored in their application to represent accurate coordination between disciplines.

B. Type specifications in final format and content including any desk copy changes made at the previous review. Submit a complete set of the typed specifications for review. Include one set of full size final drawings of all disciplines, fully coordinated.

C. Return all draft specifications reviewed to aid the final bid document review. These draft specifications will later be returned.

8.0 CONSTRUCTION DOCUMENTS PHASE

8.1 Construction Document Submittals:

A. Submit fully dimensioned, complete, and coordinated 1:100 (1/8 inch) scale floor plans, incorporating all revisions required by comments from previous phases. Submit legend, notes, and details at a scale not less than 1:100 (1/8 inch).

B. Construction documents shall consist of coordinated drawings and specifications signed and sealed by a Professional Engineer registered in the State of Washington ready for permit submission to the authorities having jurisdiction; containing, as a minimum, the following:

8.2 Mechanical

A. Include the following for each submittal:

1. Heating, cooling and ventilation calculations for server rooms, office space, NOC, mainframe, printers, telecommunication room, lobbies, sprinkler room, MDF, IDF rooms, etc.

2. Equipment schedules defining performance characteristics of all items of equipment. Rotating equipment, such as fans and pumps, shall include efficiencies, brake horsepower and motor sizes.

3. Riser diagrams for plumbing systems showing all locations and areas served.

4. HVAC, plumbing, and fire protection plans, 1/8" scale. Systems distribution and equipment location shall be shown for each floor. Ductwork over 18" shall be shown double line. Number drawings to easily correlate to architectural numbering system; coordinate with architectural drawing list. Plans shall show coordination with all other construction trades.

5. Miscellaneous details and large-scale plans and sections necessary to show coordination in congested areas.

6. Site plans showing extent of contract, work and point of interface with site utilities work.

7. Complete specifications defining a scope of work, equipment items, materials, and means and methods of installation. All drawings and specifications shall be prepared in the format designated by the Contractor.

8. Equipment submittals for all mechanical equipment intended for use on the project (e.g. CRACs, fans, pumps, heaters, etc.) with manufacturer's installation instructions and proposed operating conditions (e.g. fan curves).

9. Documentation suitable for building department approval demonstrating envelope compliance with Washington State Energy Code (with Seattle Energy Code) may be prepared by an Energy Code Compliance Consultant. Obtain a copy of this document from the Architect.

8.3 Electrical

A. Submittals shall include performance and characteristic curves.

B. Submit coordination data for overcurrent protective devices.

C. Submit testing procedures for:

1. 600-volt wiring test
2. Grounding system test
3. Transformer tests
4. Ground-fault tests

D. Submit Manufacturers Shop Drawings for:

1. Panelboards
2. Transformers
3. Cable trays
4. Wireways

E. Submit Manufacturers Product Data for:

1. Receptacles
2. Circuit breakers
3. Switches
4. Transformers
5. Enclosed circuit breakers
6. Motor controllers
7. Manual motor starters
8. Combination motor controllers

9. Telecommunications Grounding Busbar

10. Surge protective devices

9.0 COORDINATION

A. Transmit to other trades, via the Contractor, all information required for work to be provided under this Section in ample time for installation.

B. Wherever work interconnects with work of other trades, coordinate with these trades to insure that all trades have the necessary information to properly install all connections and equipment.

C. Provide required supports and hangers for major items of piping and equipment, so that loading will not exceed allowable loadings of structure. Submit equipment weights and loadings, including method of attachment, to the Contractor for review.

D. Coordinate and schedule work with all trades and the construction sequence. Install and coordinate the mechanical work in cooperation with other trades installing interrelated work. Before installation, take proper provisions to avoid interferences in a manner reviewed by the Contractor. All changes required in the work of the Subcontractor, caused by their neglect to do so, shall be made by them at their own expense.

E. Required anchor bolts, sleeves, inserts and supports shall be furnished by the Subcontractor as necessary for equipment provided by Subcontractor. Such anchor bolts, sleeves, inserts and supports shall be installed, except as otherwise agreed to, by the trade furnishing and installing them. Location of anchor bolts, sleeves, inserts and supports shall be coordinated by the Subcontractor requiring them to insure that they are properly installed. Any expense resulting from the improper location of anchor bolts, sleeves, inserts and supports shall be paid for by the Subcontractor with the responsibility for directing their proper locations.

F. Adjust location of pipes, equipment, ducts, etc. to accommodate the work and to prevent interferences, both anticipated and encountered. Determine the exact route and location of each pipe and duct prior to fabrication. Right of Way: Lines which pitch shall have the right of way over those which do not pitch. For example, plumbing drains normally have right of way. Lines whose elevations cannot be changed shall have right of way over lines whose elevations can be changed. Make offsets, bends and changes in direction of pipes and ducts as required to maintain proper head room and pitch of sloping lines whether or not indicated on the Drawings.

G. Install all mechanical work to permit removal (without damage to other parts) of compressors, filters, fan shafts and wheels, belt guards, sheaves and drives and all other parts requiring periodic replacement or maintenance. Provide manufacturer's recommended clearances around equipment for service and proper operation.

H. Provide access panels in equipment, ducts, etc., as required for inspection of equipment and for proper maintenance.

10.0 MATERIAL REQUIREMENTS

A. If products and materials for specific items or systems are specified, use those specified as representative of quality desired. If products and materials are not specified, use first-class high quality products and materials subject to review and acceptance by the Architect and Owner.

B. All products and materials shall be new, clean, free of defects and free of damage and corrosion.

C. Ship and store all products and materials in a manner which will protect them from damage, weather and entry of debris. If items are damaged in the opinion of the Architect, Owner's Representatives, or Contractor do not install, but take immediate steps to obtain replacement or repair.

11.0 INSTALLATION

A. The Subcontractor shall prepare shop-drawing submittals in accordance with submittal schedule. These submittals shall be reviewed and stamped by the Engineer of Record. Shop drawings shall show compliance with the Construction documents, coordination with all construction disciplines, accuracy of technical and dimensional data, and of the proposed manufacturer.

B. Attend regularly scheduled construction coordination meetings and other meetings, as requested by Contractor. Members of the Subcontractor's staff, who have direct knowledge of the mechanical design, shall accompany their respective installation counterparts at these meetings.

C. The Engineer of Record shall perform periodic site observations, on an average of twice per month basis, and prepare a status of installation report including deficiencies with respect to the contract documents. These site observations shall be performed in the presence of the Architect and/or the Owner's representatives, at their discretion.

D. Provide a written description of all observed field coordination problems, along with proposed resolutions, to the Contractor for distribution.

E. The Architect and the owner may perform additional periodic observations, which may generate deficiency comments. Respond to these published deficiency lists within a one-week period.

F. The Engineer of Record shall perform final punch list inspections and submit to the Contractor.

G. Perform all system tests required by regulatory or code agencies in the presence of the appropriate local authorities, the contractor and the Owner.

12.0 OWNER ACCEPTANCE REQUIREMENTS

A. Identify equipment with permanent nameplates that agree with subcontractor furnished as-built drawings.

B. After completion of work and prior to final acceptance, thoroughly clean all parts of the work, remove all debris and surplus equipment and leave installation in perfect condition, ready for use.

C. Operational and Maintenance Manuals.

1. Maintenance manuals shall be provided to the Owner (minimum of three (3) copies) in three-ring binders, labeled and tabbed, consisting of the following as minimum requirements.

   a. Manufacturer's literature on all items of equipment.

   b. Operating and maintenance instructions.

c. Sequence of operation, wiring, and control diagrams.

D. Commissioning: Commission all mechanical and electrical systems at the presence of King County's representative. Provide detailed commissioning plan prior to start of TAB and commissioning work for review and approval by King County. Provide 2 week notice in advance of all commissioning and testing activities.

13.0 RECORD DOCUMENTS

A. Deviations: Subcontractor to maintain record drawings of changes to mechanical systems, including locations, sizes, or arrangement. Record drawings to be used by the subcontractor to produce As-Built Drawings.

B. Location of Concealed Work: Locate accurately to scale and dimension from column lines, concealed piping and ductwork.

C. At end of construction furnish owner with an "as-built" set of reproducibles and electronic disk based on AutoCAD 2006 software.

14.0 WARRANTY

A. Submit a single guarantee stating that all portions of the work are in accordance with Contract requirements. Guarantee all work against faulty and improper material and workmanship for a period of one (1) year from date identified in invitation to bid. Within 24 hours after notification, correct any deficiencies that occur during the guarantee period at no additional cost to the Owner, all to the satisfaction of the Owner. Obtain similar guarantees from subcontractors, manufacturers, suppliers and sub trade-specialists.

B. Be responsible for leaks in pipes during Guarantee Period. Repair such leaks, at no cost to Owner, within 24 hours of notice by the Owner. Repair leaks which occur prior to the completion of this Subcontract at once. Be responsible for any damage caused by such leaks and repair thereof and reimburse Owner for expenses incurred. The subcontractor shall indemnify the owner, the Architect and Contractor against loss liability, damage or expense, including reasonable attorney's fees, in connection with any claim resulting from such leaks, which may be asserted by any other third party. Owner reserves the right to contract with others for remedy of guarantee deficiencies and invoice Sub-contractor for such work.

C. Fire stop and seal wall and floor penetrations and penetrations with materials that provide the same fire rating as the floor or wall. Provide fire dampers or combination fire/smoke dampers, as required.

D. The Subcontractor shall provide adequate means for and shall fully protect finish parts of the materials and equipment against damage from whatever cause during the progress of the work until final acceptance. Materials and equipment shall be covered in such a manner that no finished surfaces will be damaged or marred, and all moving parts shall be kept perfectly clean and dry.

E. At conclusion of each day's work, clean up and stockpile on site all rubbish, debris and trash accumulated during the day because of work of this Section. Sidewalks and street adjoining the property shall be kept broom clean and free of debris, rubbish, trash, and obstructions of any kind caused by work of this section, which will affect the conditions of streets, walks, utilities and property.

END OF GENERAL

ARCHITECTURAL GENERAL

1.0 SCOPE

A. The following information describes general architectural tenant improvements for the relocation and consolidation of a Data Center for King County. The project scope includes data equipment areas, technical support spaces, staff and administrative areas and storage. Space requirements and adjacencies apply generally to all sites under consideration for design and construction of the Center. For purposes of illustration, space sizes and adjacencies are illustrated with the drawing titled "Test Fit, Fisher Plaza, 4th Floor", dated February 15, 2007.

B. Codes and References:

1. International Building Code or Seattle Building Code as determined by project location and jurisdiction, 2003/2006 edition as applicable at date of submittal.
2. Accessible and Useable Buildings and Facilities ANSI Standard A117.1, 2003 edition.
3. Construction requirements as defined by the Telecommunications Industry Association (TIA) Standard for Data Centers. King County has identified this project as a Tier 3 center.

C. Submittals: During design and contract document preparation provide King County project representative with the following information:

1. Technical specifications and material color and finish samples for interior material selections in both General Office and Computer Center construction levels.
2. Design calculations and structural analysis of existing floor and ceiling construction indicating that existing structural systems are capable of supporting required equipment and supply storage loads in Equipment Areas, UPS, Storage Areas and as required by the specific site under consideration. Load information will be provided to the Design Team by King County. Analysis will consider vertical and lateral loads.
3. Provide details of the Architectural and Structural elements required for TIA Tier 3 construction identified as applicable by King County, including:
    a. Equipment Room/Main Frame Floor Loading: Minimum distributed floor loading capacity recommended by TIA-942 Tier 3: 250 lb/sf.
    b. Hanging capacity: 50 lb/sf
    c. Humidity Control: Vapor barriers to be installed the perimeter walls and ceiling of equipment areas to support equipment humidification limits, as identified in Final Design.
    d. Security Walls: Full height construction as defined, floor to underside of structural deck. Where HVAC or other building systems requirements dictate, provide permeable construction above finish ceiling.
    e. Other specific requirements are identified elsewhere in this document.

2.0 GENERAL PROGRAM SPACE REQUIREMENT MATRIX

A.	Function/Activity	Size (sf) Test Fit Model	Primary Adjacency	Secondary Adjacency	Construction Requirements	Security Partitions
1.	Equipment Room/ Main Frame	6,383	Command Center	Equipment Room	Computer Ctr	yes
2.	Printers	640	Command Center	Paper Storage		no
3.	Paper and Supply Storage	560	Command Center	Public Corridor		At demising walls
4.	Tape Storage	350	Command Center	Main Frame		At demising walls
5.	MDF Room	350	Equipment Room	N/A		At demising walls
6.	UPS System	295	Equipment Room	N/A		At demising walls
7.	Storage and Staging	600	Equipment Room	Public Corridor		yes
8.	Command Center	648	Equipment Room	Printers / Main frame		no
9.	Network Operations Center	included above	n/a	N/A		no
10.	Access Control	342	Public Corridor		general office	At demising walls
	Administrative spaces	2,328				
11.	Production Support	included above	General Admin.			N/A
12.	Production Engineering	included above	General Admin.			N/A
13.	Production Control	included above	Separate (quiet)	Command Center		N/A
14.	Managers	included above	General Admin.	Break Room		N/A
15.	Call Center (Help Desk/Service Desk)	included above	Separate (noise)			N/A
16.	Incident Response Team	250	Managers			N/A
17.	Break Room	240	General Access			N/A
18.	Storage/Office Supplies	338	General Access			N/A
19.	Staff Lockers	42	General Access			N/A

3.0 CONSTRUCTION REQUIREMENTS

A. Computer Center: Materials, systems, finishes and details required by King County and TIA Standards for construction of an environment appropriate for continued safe maintenance of data center systems and support equipment. Dust and humidity control, control of static electricity, security, noise and light reflectance are of primary importance.

B. General Office: Materials, systems, finishes and details generally acceptable for a commercial office environment. Normally acceptable levels of noise control, light reflectance, performance and durability are expected and may permit use of the site's standard materials and finishes, as acceptable to King County.

4.0 ADJACENCIES

A. Primary: Requiring immediate adjacency

1. Entry to Equipment Room- must gain access through Command Center with observation by Data Center staff at all times.
2. Public Corridor System to Access Control.
3. Equipment Room (principal server area) to Command Center. Provide access and full vision of servers and equipment from Command Center.
4. Network Operations Center and Command Center are combined.
5. Main Frame to Command Center. Provide access and full vision of equipment from Command Center.
6. Printers to Command Center and Equipment Areas. Provide direct access. Printers must be separated from dust sensitive Equipment Areas by dust-proof partitions that do not preclude full vision of printers from Command Center.
7. MDF Room to Equipment Area.
8. Paper Storage to Printer Area.

B. Secondary: Requiring convenient access, but not immediate adjacency

1. Tape Storage to Command Center. Command Center staff routinely access and run tapes from this library.
2. UPS to Equipment Areas. Minimize power runs. Equipment Storage and Staging. Convenient, secure access to Equipment Areas is valuable.
3. Offices and Administrative Areas to Command Center. Convenient communication and access to and from Command Center without leaving secure perimeter.

5.0 PRINCIPAL SPACE REQUIREMENTS

A. Command Center

1. Staffing: (3) operators per shift with 3 shifts that overlap by 2 hours requires (6) workstations, located for observation of equipment and printer areas.

   (9) total operators will work in the Center, all shifts
   (1) supervisor workstation will be shared by (3) supervisors over the (3) shifts.

2. Responsibilities: Mainframe operations

   Tape management
   Printer operation
   Call center for after hours help desk and NOC calls

3. Furnishings and equipment: (6) shared console spaces for operators
   (1) shared systems workstation for supervisor
   (12) individual lockers located in common locker area.

4. Adjacencies: Access control to equipment areas.

   Direct connection to equipment areas (servers and main frames), printers.
   Convenient access to tape storage.
   Convenient to Production Control Staff.
   Combined with NOC.

5. Environment: Acoustical treatment to control noise level in space when several operators and staff are working together.

   Construction required to minimize noise penetration from adjacent spaces.
   Lighting to minimize glare on monitors.
   Construction Level: Computer center

6. Narrative: There are 9 Data Center operators and 3 shift supervisors that work 3 shifts per day, 24x7x365; typically there are 3 staff per shift on weekdays, and 2 per shift weekends. Operators do not have their own cubicles but sit in the Command Center and have lockers for personal belongings. They perform mainframe operations, tape management and attend the high speed printers for report printing and distribution. They also are the call center for after-hours Help Desk and NOC calls for 300+ sites. Shifts overlap by up to 2 hours, so staff from both shifts are in the Command Center at that time. Systems technical support staff are often in the Command Center while troubleshooting or training operators on new procedures. One cubicle is required for supervisor workspace, for working on timesheets and other tasks.

B. Network Operations Center (NOC)

1. Staffing: (2) operators, day shift only
2. Responsibilities: Receive telephone and e-mail calls from system users and satellite locations.
3. Furnishings and equipment: (2) shared console spaces for operators
   Multiple screens and displays require black out background. The operators share up to (6) computer terminals requiring appropriate console space.
   (2) individual lockers located in common locker area.
4. Adjacencies: Combined with Control Center for ease of communication.
5. Environment: Acoustical control to reduce noise level in space and minimize noise penetration from adjacent spaces.
   Lighting that minimizes glare on monitors, focusing light on work consoles to allow clear viewing of larger, shared screens.
   Construction Level: Computer center
6. Narrative: There are currently 2 NOC staff; the NOC is currently staffed who provide after hours Help Desk and NOC (KCWAN and I-Net) call support during daytime hours. Calls are forwarded to the Command Center Operators after hours.

C. Access Control

1. Staffing: (1) staff person daytime only
2. Responsibilities: Control entry to data center for visitors, staff and some deliveries. Message center and administrative support for data center staff. Waiting area for visitors.
3. Furnishings equipment: (1) 10' x 12' reception desk/workstation. Custom casework and or systems furnishings as appropriate to final design.
   (3 or 4) chairs for waiting area.
   (1) individual lockers located in common locker area.
4. Adjacencies: Directly inside main entry doors to Data Center. Control point to administrative areas.
5. Environment: Normal office lighting and acoustical environment.
   Construction Level: General Office.
6. Narrative: During normal office hours all visitors are visually identified and electronically admitted to the Center from this desk.

D. Production Support Services

1. Staffing: (6) staff, day shift only

2. Responsibilities: Support change and configuration management, documentation, drawings procedures, websites, that support production networks, systems and applications.

3. Furnishings and equipment: (6) ORIM standard workstations, 7' x 8'
(6) individual lockers located in common locker area.

4. Adjacencies: Part of the shared office/administration area, convenient to Production Control and Production Engineering.

5. Environment: Normal office lighting and acoustical environment. Construction level: General office.

E. Data Center Management

1. Staffing: (3) staff, day shift only

2. Responsibilities: Overall management oversight of OIRM activities: Operations Manager

Production Support Services Manager
Help Desk/NOC Manager

3. Furnishings and equipment: (3) ORIM standard management workstations, 10' x12' include informal conferencing surface
(1) each 30" high x 42" lateral file, locking.
(2) each side chairs
(3) total individual lockers located in common locker area.

4. Adjacencies: Locate managers together, acoustically separated from other administrative area staff members in open office environment.

5. Environment: Normal office lighting and acoustical environment.

6. Construction level: General office.

F. Production Engineering

1. Staffing: (1) staff, day shift only + (up to 8) 'hoteling' workstations

2. Responsibilities: Full time data center facility engineer supports the data center. In addition, up to (8) 'hoteling' cubicles are required for OIRM and other agencies' IT support staff and

vendors that need to troubleshoot, install or work on systems and network equipment in the data center.

3. Furnishings and equipment: (1) ORIM standard workstations, 7' x 8'
(8) carrel style workstations, 5' x 5'
(1) 30" high x 42" lateral file, locking.
(1) individual locker located in common locker area.

4. Adjacencies: Part of the shared office/administration area, convenient to Production Control and other Administrative staff.

5. Environment: Normal office lighting and acoustical environment.
Construction level: General office.

G. Production Control

1. Staffing: (3) staff, day shift only

2. Responsibilities: Main frame Staging, scheduling, security and report management.
Interaction with the Command Center operators on mainframe operations.

3. Furnishings and equipment: (3) ORIM standard workstations, 7' x 8'
(1) 30" high x 42" lateral files, locking, to store mainframe security records, microfiche and report processing.
(3) individual lockers located in common locker area.

4. Adjacencies: Part of the shared office/administration area, convenient to Control Center.

5. Environment: This group works as a team and requires a quiet environment separated to extent possible from other office activities. Normal office lighting and acoustical environment.

6. Construction level: General office.

H. Call Center (Help Desk/Service Desk)

1. Staffing: (4) staff, day shift only

2. Responsibilities: Mainframe staging, scheduling, security and report management. Interaction with the Command Center operators on mainframe operations.

3. Furnishings and equipment: (6) station call center workstations, 5' x 5' each
(4) individual lockers located in common locker area.

4. Adjacencies: Part of the shared office/administration area, but acoustically isolated within open office environment to facilitate phone conversations and minimize cross-talk between help desk staff.

5. Environment: Acoustical absorption required to reduce sound transfer to adjacent areas.

6. Construction level: General office.

I. Paper and Supply Storage

1. Capacity: Provide storage for (10) 36" x 48" pallets weighing 2,000lbs each (166 lb/sf).

2. Furnishings and equipment: (6 to 10) steel shelving units

3. Note: Provide 3/4 in x 4 ft fire treated plywood wainscot, all walls.

6.0 FINISH SCHEDULE

A.	FUNCTION/ACTIVITY	FLOOR/FINISH	CEILING	WALL TYPE
1.	Equipment Room/Main Frame	Access floor 1 / vinyl	SAC 1	1 hour / secure / vapor barrier
2.	Printers	Access floor 1 / vinyl	SAC 2	1 hour / STC 35
3.	Paper and Supply Storage	Access floor 2 / vinyl	SAC 2	Bldg. standard
4.	Tape Storage	Access floor 1 / vinyl	SAC 1	1 hour / secure / vapor barrier
5.	MDF Room	Access floor 1 / vinyl	SAC 1	1 hour / secure / vapor barrier
6.	UPS System	Access floor 1 / vinyl	SAC 1	1 hour / secure
7.	Storage and Staging	Access floor 1 / rubber	SAC 2	1 hour / secure
8.	Command Center	Access floor 1 / vinyl	SAC 1	1 hour / STC 35
9.	Network Operations Center	Access floor 1 / vinyl	SAC 1	1 hour / STC 35
10.	Access Control	Access floor 2 / carp tile	SAC 2	Bldg. standard
11.	Production Support Services	Access floor 2 / carp tile	SAC 2	Bldg. standard
12.	Production Engineering	Access floor 2 / carp tile	SAC 2	Bldg. standard
13.	Production Control	Access floor 2 / carp tile	SAC 2	Bldg. standard
14.	Managers	Access floor 2 / carp tile	SAC 2	Bldg. standard
15.	Call Center (Help Desk / Service Desk)	Access floor 2 / carp tile	SAC 2	Bldg. standard

A.	FUNCTION/ACTIVITY	FLOOR/FINISH	CEILING	WALL TYPE
16.	Incident Response Team Room	Access floor 2 / carp tile	SAC 2	Bldg. standard / STC 35
17.	Break Room	Access floor 2 / rubber	SAC 2	Bldg. standard / STC 35
18.	Storage / Office Supplies	Access floor 2 / carp tile	SAC 2	Bldg. standard
19.	Staff Lockers	Access floor 2 / carp tile	SAC 2	Bldg. standard

7.0 GENERAL MATERIALS AND CONSTRUCTION:

A. Materials in Computer Center Areas: As defined by TIA Tier 3 guidelines and as follows:

1. Interior Partitions: Building Standard 1 hour light gauge metal framing with GWB each side. Install vapor barrier under GWB at interior space.
2. Security Partitions with vapor barrier:
3. In all Tenant areas bordering building common and service spaces or other tenant areas partitions will extend full height to underside of floor structure above, and tightly fitted around structural members, ductwork and other penetrations.

   Where HVAC systems or other considerations preclude full height partitions, provide 1-1/2" square mesh .225" wire cloth closure, attached with tek screws at 6" centers to track and underside of ceiling structure.
4. Partition Components:
   a. Framing: 3-5/8 inch deep, or as required to meet design requirements; ASTM C 645 with manufacturer's standard corrosion-resistant zinc coating.
   b. Deflection Track: 2-inch deep flanges at connections to structural deck and as required by building shell construction.
5. Sheet Blocking: 0.027 inch thick steel sheet.
6. Security board: 5/8" Fire resistant plywood fastened to framing under GWB at equipment room perimeters.
7. Gypsum Wallboard: ASTM C36. 5/8 inch Type X, tapered edges.
8. Finish: Level 4; satin and semi-gloss paint finishes.
9. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations.
10. Sound Attenuation Blankets: ASTM C 665, Type I, glass, slag wool, or rock wool. 3 inch thick between studs, and 48 inch wide, 3 inch thick continuous loose-lay batt centered over partitions and ceiling tile at perimeter of space.
11. Access Flooring 1: At areas where floor loading and movement of materials require, replace the existing raised access flooring with new Tier 3 compliant system.

    New Access Floor System to consist of modular and removable cementitious filled welded steel panels supported on all four edges by structural steel members which bolt onto adjustable height pedestal assemblies forming a modular grid pattern. Existing

support structure is acceptable for reuse if required specifications are met.

a. Floor Height: 18 inches, match existing raised flooring system.

b. Pedestals: Axial Load: 5000 lb. axial load without permanent deformation.

c. Overturning Moment: 1000 in-lbs.

d. Stringers: Concentrated Load: 450 lbs./sq. in. placed in the mid-span stringer center

e. Floor Panels: Concentrated Load: 1000 lbs./sq. in. at any location on the panel with a maximum top surface deflection of 0.100 inches.

f. Uniform Load: 250 lbs./sq. ft.

g. Ultimate Load: Minimum concentrated load of 3000 lbs. applied onto a one square inch area at any location on the panel without failure.

h. Impact Load: 150 lbs. dropped from a height of 36 inches onto a one square inch area

i. Flammability: Class A in accordance with ASTM-E84-1998.

j. Combustibility: Noncombustible per ASTM E 136.

k. Finish: 1/8 inch Static Dissapative Vinyl

l. Anti-Static Protection: 1,000,000 ohms (1.0 x 106) to 20,000 megaohms (2.0 x 1010 ohms), per NFPA 99 Chapter 3; and in conformance with IEC 61000-4-2.

12. Resilient Static Control Flooring: Rubber Tile, Noraplan duo el, Article 270

Type:	ESD control, electrically conductive
Finish:	Smooth surface
Size:	24 inches by 24 inches, 2.5 mm (0.10 inches)
Conductivity Warranty:	5 year wear; 10 year conductivity.

13. Resilient Base: 6-inch resilient base at all walls.

14. Suspended Ceiling Systems (SAC 1):

a. Tile: Armstrong Clean Room Mylar type 1716, or approved square edge tile, 24 in. x 24 in. x 15/16 in. thick; color: White; NRC .55; Light reflectance 79%; Class A Flame spread.

b. Ceiling Suspension System: Prelude XL exposed tee. Seismically brace per IBC/SBC requirements.

15. Access Control and Security Systems: Provide hardware and construction to accommodate access and security control at all doors leading to Tenant areas from building common areas. Systems will include card access and/or biometric readers and other equipment as identified by King County.

Security Doors: Solid Core wood or metal doors with Hollow Metal frames, grouted solid. Non-removable pin hinges where door swings out into public space. Install 180 degree security viewers on all such doors.

B. Materials in General Office Areas:

1. Interior Partitions:

2. Provide building standard GWB partitions consistent with the Tenant's use of space as identified by King County. Fire ratings as required by life safety and other building requirements.

3. Partition Components:

   a. Framing: 3-5/8 inch deep, or as required to meet design requirements; ASTM C 645 with manufacturer's standard corrosion-resistant zinc coating.

   b. Deflection Track: 2-inch deep flanges at connections to structural deck and as required by building shell construction.

   c. Sheet Blocking: 0.027 inch thick steel sheet.

   d. Gypsum Wallboard: ASTM C36. 5/8 inch Type X, tapered edges.

   e. Finish: Level 4; satin and semi-gloss paint finishes.

   f. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations.

   g. Sound Attenuation Blankets: ASTM C 665, Type I, glass, slag wool, or rock wool. 3 inch thick between studs, and 48 inch wide, 3 inch thick continuous loose-lay batt centered over partitions and ceiling tile at perimeter of space.

4. Access Flooring Type 2: If available, utilize existing building system. Where no access floor is installed provide code compliant ramps and stairs to raised access floor areas.

5. Carpet Tile: For installation over access flooring Lees, Shaw or approved commercial carpet tile equal or exceeding the following specifications:

Construction:	Tufted loop pile
Gauge:	1/8"
Stitches per inch:	8.3
Finished Pile Thickness:	.145"
Dye:	yarn dyed
Face weight:	26 oz/yd
Size:	24"x24"
Static performance:	Text Method NFPA 99 RTG 1.5 x 10(5) Ohms minimum, 2.0 x 10(10) Ohms maximum
Adhesive:	Conductive releasable type
Flammability:	DOC-FF-1-70 Pill Test
Radiant Panel Test:	NFPA 1

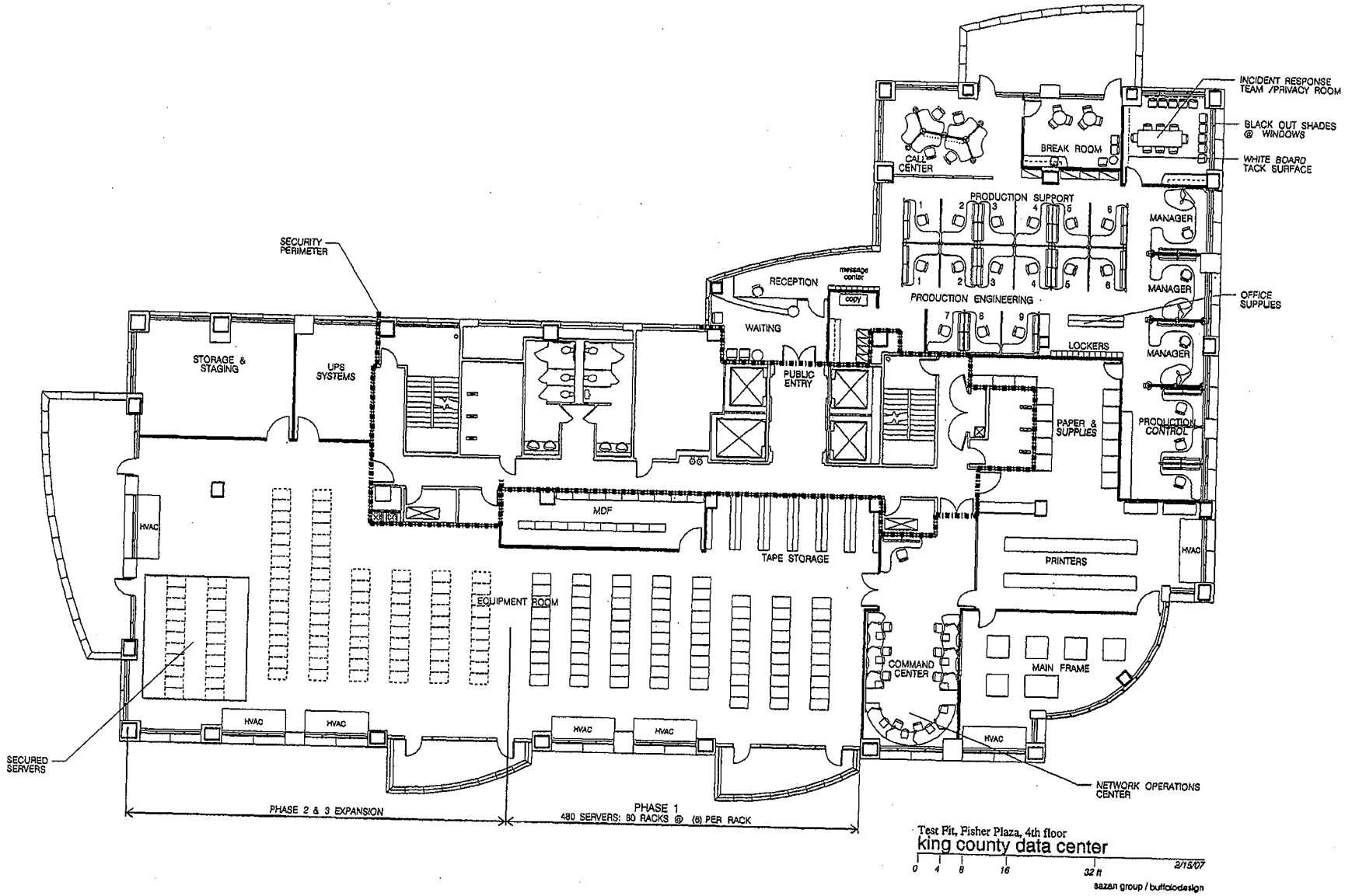
6. Resilient Static Control Flooring: Rubber Tile, Noraplan duo el, Article 270

Type:	ESD control, electrically conductive
Finish:	smooth surface
Size:	24 inches by 24 inches, 2.5 mm (0.10 inches)
Conductivity Warranty:	5 year wear; 10 year conductivity.

7. Resilient Base: 6-inch resilient base at all walls.

8. Suspended Ceiling Systems (SAC 2):
   a. Tile: Armstrong Ultima type 1914, or approved beveled tegular tile, 24 in. x 48 in. x 15/16 in. thick, color: White; NRC .70; Light reflectance 90%; Class A Flame spread
   b. Ceiling Suspension System: Prelude XL exposed tee. Seismically brace per IBC/SBC requirements.

END OF ARCHITECTURAL



Test Fit, Fisher Plaza, 4th floor

king county data center

0 4 8 16 32 ft

2/15/07

sazan group / buffalodesign

MECHANICAL GENERAL

1.0 SCOPE

A. The mechanical work will include:

1. Utilities (extend building systems).
2. Heating, Ventilation, and Air Conditioning (HVAC).
3. Plumbing.
4. Fire protection (sprinklers and FM200).

B. Alternative Bids:

1. M-1 CRAC Unit Manufacturer: Provide alternative price for Data Air CRAC units instead of Liebert. See Paragraph 18.1
2. M-2 FM 200: Provide alternative price for adding FM200 to pre-action system. See Paragraph 20.

2.0 STANDARDS AND CODES

A. Applicable industry codes, standards, or publications referenced hereinafter apply to equipment, materials, and construction covered herein. See General Provisions Section for list of references.

B. Work will be installed in conformity with the following codes:

1. Washington State Energy Code (2006) - – with Seattle Amendments.
2. Washington State Ventilation and Indoor Air Quality Code.
3. Uniform Plumbing Code (2003) – with Seattle Amendments.
4. International Building Code (2003) – with Seattle Amendments.

C. Temperature Standards for Design:

1. Outdoor Standards:
   a. Winter: 24 degrees F (Seattle, WA).
   b. Summer: 88 degrees F dry bulb, and 68 degrees F wet bulb (0.1% Seattle, Washington)
   c. See program matrix attached.

3.0 UTILITIES

3.1 Plumbing

A. Connect plumbing services to existing building services – cold water, fire sprinklers, hot water, waste, vent, and roof drainage.

4.0 QUALITY ASSURANCE

4.1 Substitutions

A. Whenever any material or equipment is specified by patent or proprietary name or by the name of the manufacturer, such specification establishes the standard of quality in that particular field of manufacture.

B. When approved substitute equipment or material necessitates revisions to the plans or involves other trades, include drawings and details showing all such changes, and coordinate and assume any liability from the affected trades.

C. Acceptance: The acceptance of a manufacturer's name or product by the A/E does not relieve the Contractor of the responsibility for providing materials and equipment which comply in all details with the requirements of the contract documents.

4.2 Tests And Demonstration

A. Demonstrate that all equipment operates as indicated as specified, and in accordance with the manufacturer's recommendations. Perform tests in the presence of the A/E. Provide all instruments and personnel required to conduct the tests.

B. Perform testing and balancing (TAB) by subcontractor independent of Mechanical and General Contractor and approved by Engineer. Neudorfer is pre-approved.

C. Assist Owner's commissioning agent (Säzän Group) during design and construction.

4.3 Qualifications

A. Use sufficient journeyman and competent supervisors in the execution of the work to ensure proper and adequate installation throughout. In the acceptance of installed work, no allowance will be made for lack of skill on the part of the workmen.

5.0 WORK OF OTHER TRADES

5.1 Coordination

A. Plan and execute work including, but not limited to, piping and ductwork, in cooperation with all other trades particularly Electrical, Acoustical Ceilings and drywall. Make every reasonable effort to provide all concerned with timely notice of work affecting other trades to prevent conflicts or interference as to space requirements, dimensions, openings, block-outs, sleeves, or other matters which will cause delays or necessitate work-around methods. Failure to coordinate work will be considered sufficient cause for work to be altered at Contractor's expense, as directed by Owner's Construction Manager.

6.0 GENERAL REQUIREMENTS

A. Related Work: Comply with the provisions of all other divisions, parts or sections of the specifications wherever applicable.

7.0 DETAIL DRAWINGS BY CONTRACTOR

A. Wherever the work is of sufficient complexity to warrant additional detailing, prepare additional detail drawings to scale 1/4 inch = 1 foot, prepared on tracing paper the same size as contract drawings; with these layouts, coordinate work with the work of other trades. All such detailing work shall be clearly identified on the drawings as to the area to which it applies. As a minimum provide detail drawings for Level 4.

B. Submit these drawings to the Owner's Construction Manager for approval. At completion, however, include a set of such drawings with each set of as-built drawings for Owner's record purposes.

8.0 SUBMITTALS

8.1 General

A. Submit, at one time, all equipment and materials for acceptance prior to installation. Partial submittals will not be accepted.

B. Bind submittals in a hanging, view, 3-post binder. Binder shall be Wilson-Jones WLJ36549W or WLJ36544W, no substitution.

C. Reference all items by paragraph number. Fold drawings to 8-1/2-inch size and bind as above or place in pocket of folder. Provide transmittal letter with index of all items submitted, including catalog numbers or drawing numbers if appropriate.

D. List of Manufacturers: Submit within 30 days after award of contract a Bill of Materials containing items to be used on this project, listing manufacturer's name and catalog numbers (where applicable) and referenced to the applicable specification paragraph.

E. Provide shop drawings, descriptive bulletins, data sheets, diagrams, catalog cuts or other additional information as required for the items specified hereinafter in other sections.

F. Acceptance: The acceptance of a manufacturer's name or product by the Engineer does not relieve the Contractor of the responsibility for providing materials and equipment that comply in all details with the requirements of these requirements.

G. When changes and an additional review are required, the changes shall be highlighted with yellow marker. Only the material so marked will be reviewed.

H. Shop Drawings

1. Sleeve Installation
2. Ceiling Hanger Installation
3. Bolt Setting Information
4. Seismic Restraints
5. Provide a complete set of vendor shop drawings of major mechanical equipment items including, but not limited to: pumps, air handling units, fans, etc. These shall be used for coordination of seismic restraints; refer to paragraph "Equipment, Piping and Ductwork Seismic Restraints."

I. Product Data

1. Motors
2. Variable Speed Drives
3. Motor Control Equipment
4. Beam Attachments
5. Ceiling Hangers
6. Vibration Isolation Mountings
7. Pipe Markers

J. Electrical: See paragraph below.

9.0 ELECTRICAL WORK

A. Review electrical requirements in the General and Electrical sections shown in more than one place of the Contract Documents. After making this review, notify the Owner's Construction Manager of any conflicts. Equipment shall not be ordered or electrical installation started until the conflicts are resolved. The Contractor shall make this review immediately after the Notice to Proceed is issued and before the construction schedule is affected by the time required to make any required changes.

B. Refer to Electrical Section for motor starters and motor circuit protective devices for equipment included in Division 15 unless the starters are supplied (manufactured) as an integral part of the equipment or as specified otherwise.

C. The Electrical Contractor is responsible for providing power outlet boxes for each piece of equipment, installing electrical devices and connecting them to the equipment.

10.0 OPERATING AND MAINTENANCE INSTRUCTIONS AND MANUALS

A. Prepare three copies of an operating and maintenance manual for all equipment provided under Division 15 in accordance with Division 1 and the following paragraphs.

B. Information Contained:

1. Manuals shall include control diagrams and maintenance information and parts lists furnished by the manufacturer for the equipment. Clearly identify options provided for each piece of equipment.
2. Data in manuals shall be neat, clean copies. An index shall be provided with all contents listed in an orderly presentation, similar to the arrangement of the specifications. Indicate date of guarantee.
3. Include filter maintenance, oiling instructions, methods of operation, seasonal requirements, manufacturer's data and warranty forms. Provide address and 24-hour phone number of firm responsible under warranty.

C. Bind submittals in a hanging, view, 3-post binder. Binder shall be Wilson-Jones WLJ36549W or WLJ36544W, no substitution.

D. Approval: Prior to binding the final copies submit a single loose copy to the Engineer for approval, no later than 60 days before the scheduled completion date.

11.0 AS-BUILT (RECORD) DRAWINGS

A. Furnish as-built (record) drawings to the A/E.

1. Conform to requirements of General Section.

2. Post all addenda and other changes.

3. Drawing shall be same size as the Contract Documents. Mark in new work in red, existing work in green, and deletions in silver.

12.0 INSTRUCTION FOR OWNER'S PERSONNEL

A. Following the installation of all mechanical equipment and prior to acceptance of the mechanical work, conduct demonstrations and instruction periods for Owner's representatives to point out the location of servicing points and required points of maintenance. Provide a qualified foreman or superintendent from the trade involved as an instructor. For Control Systems, the Engineer who performs testing and adjustment shall be responsible for instruction on the temperature control system. Their qualifications shall be submitted before conducting the instruction, if requested by the Owner's Construction Manager.

B. Each instruction period shall include a preliminary discussion and a presentation of information in the maintenance manuals, with appropriate references to drawings; tours of the building areas, with explanations of maintenance requirements, access methods, servicing and maintenance procedures, equipment cleaning procedures, temperature control settings and adjustment locations.

C. Advise the Owner's Construction Manager two weeks prior to conducting instructions and demonstrations. Make final arrangements after receiving approval from the Owner's Construction Manager.

13.0 COMPLETION OF WORK

A. When requesting final inspection, give 10 days' notice. Submit written certification that the work has been fully completed in strict accordance with plans and specifications.

B. At final inspections the contractor shall provide completed TAB report, commission report, O and M manuals, as-built drawings and signal permits.

C. All of the work described herein shall be performed prior to installation of server racks and telecommunication cabling.

14.0 MATERIALS AND WORKMANSHIP GUARANTY

A. Submit written guaranty that all materials and workmanship that prove defective within one year after date of acceptance will be replaced. Comply with the requirements of Division 1.

15.0 INSPECTION

A. Submit written certification of inspection from the governing building authority stating that all work has been inspected, accepted, and approved as complying with existing governing ordinances and codes. A completed permit shall satisfy this requirement.

16.0 MOTORS

A. Design and Construction: Unless otherwise specified, provide electric motors and enclosures conforming to the applicable definitions and requirements of NEMA MG1 "Motors and Generators."

B. Manufacturers: General Electric, Baldor, Reliance, Marathon, U.S. Motors, or approved; one HP and larger shall be high efficiency equivalent to Goulds "E" plus, Marathon Series "E," G.E. "Energy Saver," or Baldor "Super E."

C. Type and Construction

1. Electrical phase and voltages specified here are a general standard. Refer to Electrical Section. Motors one-third HP and smaller shall be single-phase capacitor type. One-half HP and Larger shall be three-phase, single-speed induction type.

2. Service Factor shall not be less than 1.1.

3. Motor Frames: Open drip-proof construction; for motors exposed to the weather - totally enclosed.

4. Motors used with variable speed drives shall be approved for use with the variable speed drive model and manufacturer used. Marathon, General Electric, Baldor, Reliance, U.S. Motors, Lincoln, or approved.

17.0 VIBRATION ISOLATION MOUNTINGS

A. Provide vibration isolation mountings for equipment, (piping and ductwork) as indicated. All metal exterior vibration equipment exposed to the weather shall be neoprene coated or hot dip galvanized.

B. Manufacturer: Mason, Dynasonics, Vibron, Kinetics, Amber/Booth, Vibrex, Vibro-Acoustics, Korfund, or approved.

C. Anchor Bolts: Provide galvanized bolts for each isolator; two minimum for each unit.

D. Computations: Following selection of equipment mounted on isolation mountings, the manufacturer shall prepare computations with vibration isolation mountings selections and showing how vibration isolation efficiency will be produced; submit for review prior to ordering materials.

E. Provide spring isolation of the stable housed type, with built-in horizontal and vertical snubbers consisting of neoprene or rubber inserts. Provide a 1/4-inch thick pad of waffle type neoprene between the mount and the bearing surface. Provide restrained spring mounts and height saving brackets for floor-mounted equipment.

F. Isolator Types:

1. Type 1. Two layers of 3/4" thick neoprene pad consisting of 2" square waffle modules separated horizontally by a 16 gauge galvanized shim. Load distribution plates shall be used as required. Pads shall be Type Super "W" as manufactured by Mason Industries, Inc.

2. Type 2. Bridge-bearing neoprene mountings shall have a minimum static deflection of 0.2" and all directional seismic capability. The mount shall consist of a ductile iron casting containing two separated and opposing molded neoprene elements. The

elements shall prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation. The shock absorbing neoprene materials shall be compounded to bridge-bearing specifications. Mountings shall have an Anchorage Pre-approval "R" Number from OSHPD in the State of California verifying the maximum certified horizontal and vertical load ratings.

3. Type 5. Spring isolators shall be free standing and laterally stable without any housing, and complete with a molded neoprene cup or 1/4" neoprene acoustical friction pad between the baseplate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflection, compressed spring height and solid spring height.

4. Type 16. All directional seismic snubbers shall consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene. Bushing shall be replaceable and a minimum of 1/4" thick. Rated loadings shall not exceed 1000 psi. A minimum air gap of 1/8" shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces. Snubber end caps shall be removable to allow inspection of internal clearances. Neoprene bushings shall be rotated to insure no short circuits exist before systems are activated.

18.0 HVAC

18.1 Raised Floor Cooling

A. Provide cooling in the raised floor area with CRAC (Computer Room Air Conditioning) Units. The initial construction will include a minimum of six (6) CRAC units (5 for load and one for standby) 35-ton chilled water down-flow units, Liebert (total 165 tons, and one 35-ton unit as standby, N+1 redundancy; total 210 tons). Cooling shall be based on a minimum of 1,050 kW of internal load plus building heat gain to outside and adjacent spaces. Submit calculations to substantiate selections. Provide alternative bid (M-1) for manufacturer other than Liebert (Data Aire is pre-approved).

B. Provide each new CRAC with identical features. The components of the new CRACs will include, in order of airflow:

1. Outside air louver with birdscreen (located on outside wall).

2. Mixed air plenum (mixing outside air and return air as directed by control system, see below).

3. Filter (35% efficient) – Farr 30/30.

4. Chilled water cooling coil with modulating two-way valve.

5. Supply fan (multi-scroll fan on common shaft).

6. Air deflecting vanes under the floor.

7. Floor stand to support the CRAC independent of the raised floor and bracing to the structure for seismic support (SHL-AA).

8. Smoke detector (connect to building fire alarm).

9. Floor grilles arranged for hot and cold aisles.

C. Provide chilled water distribution piping from the main building risers to the new CRAC locations. Provide three risers (minimum of three) to independently supply chilled water from the building mechanical room. New piping shall be piped under the floor.

D. Chilled water system shall be independent of other cooling systems in the building. Provide steel (schedule 40, grooved joint or threaded) or type K copper piping. Insulate with 2-inch closed cell (Armaflex or approved). Provide building chilled water distribution so that complete building cooling load can be met with one chiller, one chilled water pump, one cooling tower, or one condenser water pump off-line (in repair; i.e. N+1 redundancy).

E. Exhaust: When the CRACs are operating on outside air (economizer), the room air will be relieved by pressure sensitive exhaust fans. Provide the exhaust fans with speed drives and sound attenuators. Install exhausts 20 feet away from outside air intake.

F. Controls:

1. Provide separate temperature controls for Command Center NOC (Network Operations Center), printer room, and mainframe area.

2. See Room Control paragraph below.

G. Maintenance: Arrange layout to allow service and adjustment of components.

H. Scalability: Arrange layout for future addition of additional CRAC units (indicate at least two additional units).

18.2 **Non-Raised Floor Cooling**

A. Office Area System: Provide an independent office area air conditioning system (independent of the CRACs). Provide a chilled water air handling unit (AHU) for air distribution to the offices through overhead or under floor distribution. The components of the new AHU will include, in order of airflow:

1. Outside air louver with bird-screen (located on outside wall).

2. Mixed air plenum (mixing outside air and return air as directed by control system, see below).

3. Filter.

4. Chilled water cooling coil with modulating two-way valve.

5. Supply fan (plug fan) with speed drive (VFD, variable frequency drive – See Electrical Section).

6. Sound attenuator.

7. Floor stand to support the CRAC independent of the raised floor.

8. Smoke detector.
9. Air terminal units – series fan powered.
10. Return fan with speed drive (VFD – See Electrical Section).
11. Sound attenuator
12. Recirculation damper
13. Exhaust damper
14. Exhaust louver with bird screen

B. Office Air Distribution: Provide variable air volume (VAV) air distribution with fan-powered VAV units with supplemental electric heat. Air will be delivered with ceiling diffusers or floor grilles. Provide separate zones of air distribution on building corners (15'x15' maximum) and 15-foot wide perimeter zones (maximum 500 SF per zone).

C. Provide exhaust in toilet rooms, break area, print room, and locker rooms.

18.3 **Room Control - DDC**

A. Provide a DDC temperature control system for the CRACs and AHU-1. The system may be the building Direct Digital Control (DDC) system. Provide linkage so County Facilities engineers can monitor the system at the King County Administration Building (or in a location designated by them) and the Owner's network engineer can monitor and adjust set-points at the engineer's desk or remote from the building.

B. Provide room temperature sensors in various locations in the raised floor area to control the operation (On-Off) of the CRACs and the temperature control.

C. Provide room temperature sensors in separate zones in the office areas. Each zone will have an electric coil to temper the air supply to the room.

D. Points of control shall include the following:

1. CRAC (each):

a. CRAC start/stop
b. CRAC operating
c. Mixed air temperature.
d. Filter pressure, alarm if too high.
e. Chilled water supply temperature.
f. Supply air temperature.
g. Smoke detector.
h. Return air temperature.
i. Return air humidity (%RH).

j. Supply air humidity (%RH).

k. Room temperature sensor.

2. AHU:

a. AHU start/stop (monitor).

b. AHU operating.

c. VFD speed, power.

d. Outside air temperature.

e. Mixed air temperature

f. Filter pressure, alarm if too high.

g. Chilled water supply temperature.

h. Supply air temperature.

i. Supply air pressure (control to 1.0 inches, alarm at 2.5 inches).

j. Smoke detector (as above).

k. Each VAV box, monitor CFM, discharge temperature, room temperature

l. Return air humidity (% RH)

3. Automatic Reset: Provide automatic reset of temperature and humidity setpoints to optimize operation. For example, if it takes less energy to operate the facility with return air instead of outside air, adjust operation accordingly.

4. Security system: Monitor trouble and fire alarms.

5. Fire alarm system: Monitor trouble and fire alarms.

6. Miscellaneous:

a. Under-floor moisture (monitor each zone).

b. Coordinate with the data center fire suppression system (FM200).

c. Provide maintenance scheduling and monitoring.

d. Indicate ability to provide open protocols.

18.4 **HVAC - General**

A. Provide sheet-metal supply and exhaust air routed to and from various spaces. Duct-board will not be allowed. Insulate new supply ductwork from main AHU to VAV terminal units and from terminal units to diffusers.

B. Flexible ducts are allowed to supply diffusers and return/exhaust grilles, no longer than 8 feet in length and not to replace fittings. Provide full radius bends where possible. Connections at hard ductwork shall be double tye-wrapped.

C. Provide a volume damper for each supply diffuser and ducted return/exhaust grille. Locate as far from the opening as possible.

D. Provide fire/smoke dampers at all fire-rated penetrations. Coordinate fire-ratings with the Architect to verify separation code compliance.

E. Provide a leak detection system arranged for one zone per CRAC.

F. Noise, vibration, and seismic control will be maintained to noise levels below NC-40 or as noted above.

G. All HVAC systems for the data center shall be supported for Seismic Hazard Level AA (SHL-AA) as called for in SMACNA Seismic Design Manual. Bracing shall include lateral support of CRACs, chilled water pipes, server racks, etc. Seismic support to structure shall not interfere with vibration isolation (provide neoprene snubbers or approved). Instead of SHL-AA, provide lateral support conforming to IBC 2003 for critical equipment and occupancies.

H. Test all air systems for capacity (air balance). See above.

I. Test all mechanical systems and controls for proper function (commissioning) prior to moving of the electronic servers into the data center. As part of the commissioning, the CRACs and control system shall be tested with heaters sufficient to match the capacity including load banks as necessary to test both the CRACs and power system. See above.

19.0 PLUMBING

A. Provide fixtures and services to suit the architectural layout.

B. Extend building hot water system to new fixtures. Provide tempering control (mixing 140 F and 50 F water) to 120 degrees F as necessary to comply with code.

C. Provide new circulation pump(s) to continuously circulate the hot water within the systems. Extend circulation to ensure that fixtures are not more than 10' from recirculated hot water.

D. Existing plumbing will remain. Provide new floor drains near the CRACs as necessary for gravity condensate drainage.

E. Plumbing piping will include:

1. Standard weight no-hub cast iron for waste and vent.

2. Type L copper for domestic hot and cold water. Provide new backflow valves at the cold water service and at the cold and hot water services to the Laboratory.

3. Insulate domestic hot water and circulating hot water with 1-inch thick glass fiber with high density, white vapor barrier jackets.

4. Insulate domestic cold water with 0.5-inch thick glass fiber with high-density, white vapor barrier jackets.

5. Insulate all rain-leaders in data center space.

6. Insulate traps under sinks and lavatories where subject to patients or staff getting burned. Provide ½-inch thick insulation with high-density plastic jacket, pre-manufactured for this type of installation. Comply with ADA requirements.

20.0 FIRE PROTECTION

A. Modify existing wet pipe sprinkler system to serve the revised architectural and room configuration in the non-raised floor area.

B. Modify the existing wet pipe sprinkler system for a pre-action system to serve the revised room configuration in the entire raised floor area. Coordinate the interlock with the fire alarm system (VESDA system) to prevent false discharge.

C. Sprinkler system shall comply with NFPA 13, Light Hazard Classification as approved by the Seattle Fire Department.

D. The sprinkler heads will be standard response, semi-recessed type and will be located in the center of the ceiling tiles.

E. Piping will be schedule 40, black steel.

F. Alternate Bid M-2: Provide an alternative bid for a gaseous (FM 200, FE227, or Inergen) fire suppression system (in addition to the pre-action system).

1. The system shall be provided with gaseous agent, charged, tested, and integrated with cross-zoned smoke detection (addressable) system.

2. Provide room integrity test.

3. Installing Contractor: Fire Chief Equipment or approved.

4. Connect corss-zoned detection system with buiding fire alarm system.

5. Provide control panel with at least three audible circuits (24V DC), three audible silence switches, alarm and trouble contacts, diagnostic LED for troubleshooting, solid-state time delay (0-60 seconds), abort options, batteries, microprocessor, release output switch, detection and cross-zone detection capability, and parallel, wired-agent release module with electrical initiators.

6. Manual release switch.

7. Abort station.

8. Audible and visual alarms.

9. System inspection, checkout and acceptance testing.

10. Close-out requirements including a room integrity test, detector test, equipment, interlock test, Owner training, O&M manuals, record drawings, and acceptance testing.

END OF MECHANICAL

Säzän Group, Inc.
720 Olive Way, Suite 1525
Seattle, Washington 98101

Data Center Relocation - Space Program

Date: 01/16/07

	Space	Occ., # of people	Area, SF	Ceiling Height, ft	Raised Floor	Temp, Degree F	Relative Humidity, %	Noice Level, NC	Fire Protection	Remarks
A	Raised Floor - Server Room and Tape Storage	10	12,499	10 ft	Y	66+/-2	45+/-10	45	FM-200	Area includes CRACs, PDUs, expansion space, circulation space, tape storage
B	Main Frame	2	700	10 ft	Y	66+/-2	45 +/-10	45	FM-200	
C	UPS Room	2	500	8.5 ft	Y	72+/-2	25 - 55	45	FM-200	
D	MDF Room	2	120	10 ft	Y	66+/-2	45+/-10	45	FM-200	
E	IDF Room #1	2	120	10 ft	Y	66+/-2	45+/-10	45	FM-200	
F	IDF Room #2	2	120	10 ft	Y	66+/-2	45+/-10	45	FM-200	
G	Command (Network Operations Center)	6	1000	8.5 ft	Y	72	40+/-10	35	Pre-action	Separately switched lighting
H	Printer Room	4	500	8.5 ft	N	72	40+/-10	50	Pre-action	Dust filters
I	Paper storage room	2	600	8.5 ft	N	72	30+/-10	45	Pre-action	
J	Office and Locker Room	25	3500	8.5 ft	N	72	30+/-15	40	Pre-action	
K	Break room	4	600	8.5 ft	N	72	30+/-15	35	Pre-action	

Notes

1. Ceiling Heights indicated are clear height above finished floor, excludes height of raised floor and return air plenum above the ceeling
2. For adjacency requirements, see space diagram
3. All areas with FM-200 to also be provided with Preaction Sprinklers and a VESDA system
4. **Area Square Footages are preliminary, net useable.**
5. UPS = Uninterruptible Power Supply
6. MDF = Main Distribution Frame
7. IDF = Intermediate Distribution Frame

ELECTRICAL - GENERAL

1.0 SCOPE

A. The purpose of this document is to provide requirements and guidelines for the design and installation of a Data Center electrical distribution system. It is intended for use by designers who need a comprehensive understanding of the data center design including the facility planning and associated cabling and network system designs.

B. The design criteria and standards contained within are the minimums acceptable for efficiency, economy, durability, maintainability, and reliability of electrical power supply and distribution systems.

C. Clarifications of baseline design criteria, standards, policy, and guidance should be obtained through the normal communications channels established between the owner and contractor.

2.0 STANDARDS AND CODES

A. Applicable industry codes, standards, or publications referenced hereinafter apply to equipment, materials, and construction covered herein. See General Provisions Section for list of references.

B. The minimum requirements of the latest edition of International Building Code (IBC), NFPA 70, and National Electrical Code (NEC) shall apply unless more stringent requirements are specified and/or dictated.

2.2 **Definitions**

A. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE Std 100.

3.0 DATA CENTER AUXILIARY SYSTEMS

A. Provide complete design and installation of all required data center auxiliary and monitoring systems. Required systems include but are not limited to:

1. Fire Protective Systems
2. Fire Detection and Alarm system
3. Access Control System
4. Intrusion Detection System
5. Video Surveillance Systems
6. Underfloor Water-leak Detection Alarm

B. Refer to the Mechanical section for any of the above systems being provided under that section, or requiring electrical connections and/or control interface to systems provide under this section.

4.0 LIGHTING DESIGN

4.1 General

A. Coordinate placement of lighting with equipment layouts so that lighting fixtures are placed in aisles between cabinets and racks instead of directly over equipment rows or above cable trays.

B. Service and Access: Locate lighting fixtures to enable reasonable access for service and relamping.

C. Lighting fixtures shall not be powered from the same electrical distribution panel as the computing equipment in the Data Center/Server Room.

D. Circuiting: Provide separate circuits and switching for fixtures located in the Command Center/NOC, Data Center/Server Room, MDF, Main Frame, and Printer Room.

E. Fluorescent Lamps: Provide tri-phosphor 2700K to 3500K color temperature; 4 ft. maximum length for ease of storage.

F. Emergency lighting and signs shall be properly placed per authority having jurisdiction (AHJ) such that an absence of primary lighting will not hamper emergency exit.

4.2 Lighting Levels

A. Data Center/Server Room, MDF, Main Frame, and Printer Room: Lighting shall be a minimum of 50 footcandles in the horizontal plane and 20 footcandles in the vertical plane, measured three feet above the finished floor in the middle of all aisles between cabinets.

B. Other areas of the data center: Design lighting systems to provide minimum foot candle levels in compliance with IES recommended practices.

4.3 Lighting Controls

A. Offices: Locally switched, Adjustable occupancy sensors

B. Data Center/Server Room: Continuously on; locally switched, multi-zone

C. Corridors: switched daily, local switch; continuously on, panelboard switch

D. Command Center/NOC: dimmer controlled, dimmer switch; continuously on, panelboard switch; switched daily, local switch.

5.0 ELECTRICAL SYSTEMS

5.1 General

A. Review the architectural drawings and system requirements described herein to determine the power supply configurations required to achieve the necessary degree of reliability, durability, maintainability, efficiency, and economy.

1. The electrical System design shall provide a system that consistently and reliably provides power to the facility.

2. Electrical systems and electrical equipment shall be designed for the design life of the facility: 15 years

3. The design of electrical systems shall incorporate features which provide access space for maintenance in accordance with NFPA 70 and means to replace equipment and field installed wiring without significant demolition and reconstruction of the facility.

B. The electrical distribution system shall be designed to facilitate power monitoring of feeders and branch circuits within the Data Center/Server Room.

5.2 Electrical Distribution

A. Electrical distribution systems shall meet the requirements for a Tier-3 Fault Tolerant classification as defined by The Uptime Institute, Inc. for a concurrently maintainable site infrastructure:

1. System Component Redundancy: N+1
2. Distribution Paths: (1) Normal and (1) Alternate

B. Power Distribution

1. General Distribution: 277/480 Volt and 120/208 Volt sub-distribution panels for lighting, receptacles, appliances circuits, and mechanical equipment.
2. Data Center Distribution: UPS-backed PDU; Tier-3 compliant

5.3 Load Calculations And Load Density Allowances

A. Branch circuit, feeder, and service load calculations shall be based on NPFA 70 Article 220 as amended by WAC 296-46B for all areas of the data center. Loads calculations shall include:

1. Lighting
2. General purpose receptacles
3. HVAC motors and compressors
4. Electric heat
5. All miscellaneous electrical loads associated with the data center.

B. In addition to the loads calculated above, an allowance of 150 W/sq. ft. shall be included for computing loads in the following rooms or areas:

1. Data Center/Server Room
2. Main Frame
3. Command Center/NOC
4. MDF

C. Allow a growth factor of 25% above the total demand load calculated in A and B above.

5.4 Switchboards and Panels

A. Main Switchboard: Provide circuit breakers with single main disconnect switch and GFI protection in accordance with NFPA 70.

B. Sub-distribution Panelboards: Bolt-in circuit breaker type.

C. Provide separate panels for power and lighting.

D. Locate panelboards where practicable to limit length of branch circuits to 100 feet or less.

E. Locate panel boards in secured rooms out of sight of public view, on same floor as load served.

5.5 Materials and Equipment

A. Materials, equipment, and devices shall, as a minimum, meet requirements of UL, where UL standards are established for those items, and requirements of NFPA 70.

5.6 Conduit and Fittings

A. Intermediate Metal Conduit (IMC): UL 1242, zinc-coated steel only.

B. Electrical, Zinc-Coated Steel Metallic Tubing (EMT): UL 797, NEMA C80.3.

C. Flexible Metal Conduit: UL 1.

D. Liquid-Tight Flexible Metal Conduit, Steel: UL 360.

E. Fittings for Metal Conduit, EMT, and Flexible Metal Conduit: UL 514B. Ferrous fittings shall be cadmium- or zinc-coated in accordance with UL 514B.

F. Fittings for IMC: Threaded-type.

G. Fittings for EMT: Steel compression type.

5.7 Surface Metal Raceway

A. UL 5, two-piece painted steel, totally enclosed snap-cover type.

B. Snap-in device mounting plates for installation of grounding-type twist-loc receptacles for equipment cabinet connections. Receptacles shall be spaced minimum one over every cabinet. Redundant raceways/outlets required.

5.8 Cable Trays

A. Cable Tray construction shall comply with NEMA VE 1.

B. Cable trays shall form part of the telecommunications cable pathway system, and shall be Ladder-Type, nominal 4 inch depth, with maximum rung spacing of 6 inches. Cable tray widths shall be as determined by the designer to suit cabling applications.

C. Cable trays shall be provided as complete systems that include:

1. Splice plates
2. End plates
3. Dropouts
4. and miscellaneous assembly and support hardware.

D. Edges, fittings, and hardware shall be finished free from burrs and sharp edges. Fittings shall have not less than load-carrying ability of straight tray sections and shall have manufacturer's minimum standard radius.

E. Overhead cable tray side rails shall be used for mounting Surface Metal Raceways above equipment cabinets to facilitate power wiring and connections.

F. Cable trays located under access floors shall be the ventilated type to allow airflow. See ANSI/TIA-569-B for further cable tray design considerations.

G. Under-floor cable tray routing shall be coordinated with other under floor systems during the planning stages of the building. Refer to NEMA VE 2-2001 for recommendations regarding installation of cable trays.

H. Metallic cable trays shall be bonded to the data center grounding infrastructure.

5.9 Open Telecommunications Cable Support

A. Open Top Cable Supports: UL 2043. Open top cable supports shall be galvanized or zinc-coated steel.

B. Closed Ring Cable Supports: UL 2043. Closed ring cable supports shall be galvanized or zinc-coated steel.

5.10 Telecommunications Pathways

A. See paragraph 10.0, Security Systems, for requirements affecting telecommunications pathway installations.

B. Design telecommunications cable-supporting structures (pathways), including: outlet boxes, conduits with pull wires, wireways, cable trays, open cable supports, and other accessories for telecommunications pathways in accordance with EIA TIA/EIA-569-A.

1. Horizontal Pathway: Telecommunications pathways from the work area to the telecommunications room shall be designed to comply with cabling length limitations in accordance with EIA TIA/EIA-568-B.1. Conduits, wireways, and cable trays shall be sized in accordance with EIA TIA/EIA-569-A.

2. Backbone Pathway: Telecommunication pathways from the telecommunications entrance facility to telecommunications equipment rooms (backbone cabling) shall be installed in accordance with EIA TIA/EIA-569-A. Conduits, wireways, and cable trays shall be sized in accordance with EIA TIA/EIA-569-A.

C. Each IDF shall have a single, complete path to the MDF.

D. Backboards: See Telecommunications Section.

5.11 Outlet Boxes and Covers

A. Outlet boxes shall comply with UL 514A, cadmium- or zinc-coated ferrous metal; UL 514C nonmetallic.

B. Outlet Boxes for Telecommunications

1. Standard type 4 inches square by 2 1/8 inches deep for single gang outlets.

2. Standard type 4 11/16 inches square by 2 1/8 inches deep for outlets utilizing optical fiber cabling.

3. Outlet boxes for wall-mounted telecommunications outlets shall be 4 by 2 1/8 by 2 1/8 inches deep. Depth of boxes shall be large enough to allow manufacturers' recommended conductor bend radii.

4. Outlet boxes for optical fiber telecommunication outlets shall include a minimum 3/8 inch deep single or two gang plaster ring and designed using a minimum 1 inch conduit system.

5.12 Wires and Cables

A. Wires and cables shall meet applicable requirements of NFPA 70 and UL for type of insulation, jacket, and conductor specified or indicated.

B. Wires and cables manufactured more than 12 months prior to date of delivery to site shall not be used.

C. Conductors:

1. Conductors No. 8 AWG and larger shall be stranded.
2. Conductors No. 10 AWG and smaller shall be solid, except that conductors for remote control, alarm, and signal circuits, classes 1, 2, and 3, shall be stranded unless indicated otherwise.
3. All conductors shall be copper.

D. Minimum Conductor Sizes:

1. Minimum size for branch circuits shall be No. 12 AWG
2. Class 1 remote-control and signal circuits, No. 14 AWG
3. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG
4. Class 3 low-energy, remote-control, alarm and signal circuits, No. 22 AWG.

E. Color Coding: For service, feeder, branch, control, and signaling circuit conductors: Color shall be green for grounding conductors and white for neutrals; except where neutrals of more than one system are designed in same raceway or box, other neutrals shall be white with a different colored (not green) stripe for each. Color of ungrounded conductors in different voltage systems shall be as follows:

1. 208/120 Volt, Three-Phase
   a. Phase A - Black
   b. Phase B - Red
   c. Phase C - Blue
2. 480/277 Volt, Three-Phase
   a. Phase A - Brown
   b. Phase B - Orange
   c. Phase C - Yellow

F. Wire and Cable Insulation Type: As selected by Designer.

5.13 Switches

A. Toggle Switches: NEMA WD 1, UL 20, totally enclosed with bodies of thermoplastic or thermoset plastic and mounting strap with grounding screw. Wiring terminals shall be screw-type, side-wired. Contacts shall be silver-cadmium and contact arm shall be one-piece copper alloy. Switches shall be rated quiet-type ac only, 120/277 volts, with current rating and number of poles required.

B. Switch with Red Pilot Handle: NEMA WD 1, pilot light integral to the switch's handle. The pilot light shall be red and shall illuminate whenever the switch is closed. The pilot lighted

switch shall be rated 20 amps and 120 volts or 277 volts. Provide the circuit's neutral conductor to each switch with a pilot light.

C. Breakers Used as Switches: For 120- and 277-Volt fluorescent fixtures, mark breakers "SWD" in accordance with UL 489.

D. Disconnect Switches: NEMA KS 1.

1. Heavy-duty type for switches rated higher 240 volts, and for double-throw switches.
2. Fused switches shall utilize Class R fuseholders and fuses.
3. Switches serving as motor-disconnect means shall be horsepower rated.
4. Switches enclosure ratings shall be per NEMA ICS 6.

5.14 Receptacles (NEMA WD 6)

A. UL 498, hard use, heavy-duty, grounding-type, screw-type side-wired wiring terminals; triple-wipe power contacts and double or triple-wipe ground contacts; thermoplastic face and body supported on a metal mounting strap.

B. General use: Maximum of five per 20A, 120V circuit.

C. Tech offices, staging, and operations rooms: Maximum of two per 20A, 120V circuit, located on each wall with one on each side of a door.

D. Corridors: Maximum of three per 20A, 120V circuit located at 25 ft. intervals.

E. Administration Areas: Maximum of four per 20A, 120V circuit located at desks and work areas for electronic equipment, lamps, and convenience.

F. Mechanical Areas: Maximum of five per 20A 120V circuit located within 25 ft. of all mechanical equipment.

G. Data Center Equipment Cabinet Connections: Redundant 30 Amp, 120/208V 3-phase dedicated circuit, receptacles located overhead in surface metal raceway mounted on cable tray.

5.15 Branch Circuits and Equipment Connections

A. Branch circuits serving data center equipment cabinets and racks shall be from panelboards that are fed separately from any large electrical loads, such as HVAC equipment. Branch circuits shall be terminated in surface metal raceways mounted on cable trays above the racks as follows:

1. Equipment Cabinet Outlets: dedicated 30 Amp, 120/208V 3-phase circuit (L18-30R) with ground installed in surface metal raceway above cabinets. Redundant outlets required.
2. Equipment Rack Outlets: there shall be a minimum of two (2) 20 amp, 120 VAC circuits, with (2) duplex receptacles (5-20R) provided for each 19" equipment rack.
3. MDF/IDF Rack Outlets: in addition to the rack outlets above, provide a 30 Amp, 120V dedicated circuit (L5-30R) with ground installed above each rack located in the MDF/IDF.
4. Backboard outlets: 20 Amp, 120V dedicated circuit with two (2) 20 Amp duplex receptacles (5-20R) shall be installed at each backboard. Outlets shall be located where practicable at each end of the backboard; maintain separation of twelve inches (12") from telecommunications cables or terminations.

B. The above circuits shall be served from the UPS backup source and labeled as such.

C. Provide branch circuits from the UPS backup source for 1 receptacle per work station and 2 receptacles per office

5.16 Panelboards

A. Panelboards shall comply with UL 67 and UL 50. Panelboards for use as service disconnecting means shall also conform to UL 869A.

B. Panelboards shall be bolt-in circuit breaker type.

C. Enclosure: door-in-door type with a combined catch and lock.

D. Panelboard Buses: Main buses copper, isolated neutral bus, separate equipment grounding bus per UL 67; second "isolated" ground bus for data center panels.

E. Panelboard for Non-Linear Loads: UL listed, UL heat rise tested for use on non-linear loads; neutral assembly rated at 200 percent of the phase bus current rating. Nameplates for panelboard rated for use on non-linear loads shall be marked "SUITABLE FOR NON-LINEAR LOADS."

F. Circuit Breakers: UL 489, bolt-in, thermal magnetic-type having a minimum short-circuit current rating equal to the short-circuit current rating of the panelboard.

G. Circuit breakers for HVAC equipment having motors shall be marked for use with HACR type and UL listed as HACR type.

5.17 Transformers

A. NEMA ST 20, general purpose, dry-type, self-cooled, ventilated, 220 degrees C insulation system for transformers 15 kVA and greater, and shall have 180 degrees C insulation for transformers rated 10 kVA and less, with temperature rise not exceeding 80 degrees C under full-rated load in maximum ambient of 40 degrees C. Transformer of 80 degrees C temperature rise shall be capable of carrying continuously 130 percent of nameplate kVA without exceeding insulation rating.

B. Transformers with Non-Linear Loads: Analysis of the connected loads shall be made to determine the harmonic contents and the appropriate K-Factor rating.

1. Transformer insulation shall be a UL recognized 220 degrees C system. Neither the primary nor the secondary temperature shall exceed 220 degrees C at any point in the coils while carrying their full rating of non-sinusoidal load. Transformers are to be UL listed and labeled for its K-Factor rating in accordance with UL 1561.

2. Transformers evaluated by the UL K-Factor evaluation shall be listed for 80 degrees C average temperature rise only. K-Factor rated transformers shall have an impedance range of 3 percent to 5 percent, and shall have a minimum reactance of 2 percent to prevent excessive neutral current when supplying loads with large amounts of third harmonic.

5.18 Underfloor Wiring

A. The accessible underfloor areas will be used for routing feeders and backbone cabling. Conduit penetrations into the accessible underfloor area shall be sealed. Branch circuits and horizontal cabling shall be run overhead.

B. Floor stanchion grounding and bonding requirements: See Telecommunications Grounding and Bonding herein.

C. Water-leak Detection (By Mechanical): Leak detection sensors shall be installed along chilled water piping paths in the underfloor area.

6.0 ELECTRICAL CONNECTIONS FOR MECHANICAL EQUIPMENT

6.1 Extent of Electrical Connections

A. This section includes final electrical connection of all equipment having electrical requirements.

B. Make final connections for all owner furnished equipment including switches, receptacles, etc.

C. See Mechanical Section for temperature control wiring requirements.

D. Connection to equipment specified in the Mechanical Section shall be as follows:

1. For motorized only equipment with built-in controllers (package equipment): connect power complete and provide an external disconnect at the unit.
2. For motorized only equipment with external controller (non-packaged equipment): furnish the external controller and disconnect switch; install the controller, and make all power connections to the equipment.
3. For electric duct heaters with built in controllers (package type equipment): connect power complete and provide an external disconnect switch at the unit.
4. For electric duct heaters with remote controllers (non-package type equipment): connect power complete to the remote controller and provide an external disconnect switch at the remote controller. Provide all power wiring between the remote controller and the heaters.
5. For combination motorized and electric heating packaged units specified with built in controllers and specified "single point connected": connect power complete and provide an external disconnect switch.

6.2 Tier 3 Circuiting Requirements

A. Refer to the Mechanical Section for Data Center HVAC system design requirements.

B. The HVAC systems include multiple air conditioning units with a combined cooling capacity to maintain critical space temperature and relative humidity at design conditions with sufficient redundant units to withstand failure of one electrical service switchboard.

C. These air conditioning units are served by a chilled water system likewise sized to maintain design conditions with one electrical switchboard removed from service.

D. This level of redundancy shall be obtained by furnishing two sources of power to each air conditioning unit.

6.3 Computer Room Air Conditioning (CRAC) Units

A. Electrical supply to CRAC units shall be provided from separate panels to provide electrical redundancy. Power circuits shall be distributed among a number of power panelboards to minimize the effects of electrical system failures on the air conditioning system.

B. All Data Center/Server Room CRAC unit circuits shall be backed up by generator power.

C. CRAC unit temperature control systems shall be powered through redundant dedicated circuits from the UPS system.

6.4 Motor Starters and Motor Circuit Protective Devices

A. Furnish all motor controllers not furnished under the Mechanical Section. Install all motor controllers including all controllers not factory assembled into equipment furnished under the Mechanical Section.

1. Magnetic motor Starters: full voltage non-reversing with three overloads sized to suit nameplate amperes of motor served, motor "On" and "Off" pilot lights, "Hand-Off-Auto" switch and auxiliary contacts for interlocking.
2. Combination Motor Starter/Disconnect: fused switch type with all features of Paragraph 1 above. In addition, provide disconnect switch auxiliary contacts for disconnection of externally powered control circuits where applicable.
3. Variable Frequency Drives: Multi-purpose, variable torque, with voltage and current ratings to match the 3-phase motor characteristics.
4. Manual Starters: toggle switch type, lockable in the "Off" position, with overload relays, pilot light and enclosure as described below.
5. Enclosures: all motor controllers shall be contained in an enclosure suitable for the environment in which the controller is mounted.
6. Overload Devices: melting alloy or bimetallic type. One overload shall be provided for each phase. Provisions shall be made for resetting the overload devices from outside the starter enclosure. Provide ambient compensated overload devices only when the motor is at a constant temperature and the controller is subject to a separate, varying temperature.

7.0 TELECOMMUNICATIONS GROUNDING AND BONDING

7.1 General Requirements

A. Grounding systems shall comply with ANSI/TIA/EIA-J-STD-607-A Commercial Building Grounding and Bonding Requirements for Telecommunications.

B. Establish a common bonding network (CBN) and signal reference grid within the data center by bonding the electrically continuous access-floor system to the building grounding system as described in IEEE Standard 1100 for the bonding of telecommunications and computer equipment.

C. Coordinate with Access flooring specifications to ensure that the floor system has been designed to function as a data center grounding infrastructure.

D. Bonding Conductors

1. ASTM B 1, solid copper wire for sizes No. 8 AWG and smaller diameter; ASTM B 8, Class B, stranded copper wire for sizes No. 6 AWG and larger diameter.
2. Bonding conductors shall be installed for each PDU and panelboard, sized per NEC 250.122

3. Equipment Bonding Conductors:
   a. 6 AWG or larger bonding conductor to HVAC equipment
   b. 4 AWG or larger bonding conductor to each column in the Data Center/Server Room
   c. 6 AWG or larger bonding conductor to each cable ladder, cable tray, and cable wireway entering room
   d. 6 AWG or larger bonding conductor to each conduit, water pipe, and duct entering room
   e. 6 AWG or larger bonding conductor to every 6th access floor pedestal in each direction
   f. 6 AWG or larger bonding conductor to each computer or telecommunications cabinet, rack, or frame. Do not bond racks, cabinets, and frames serially.

E. Telecommunications Grounding and Bonding (TIA J-STD-607-A)
   1. A Telecommunication Bonding Backbone (TBB) is required between the telecommunications main grounding busbar (TMGB) and all telecommunications grounding busbars (TGBs). Size in accordance with the following:

TBB length linear feet	**TBB Size (AWG)**
Less than 13	6
14 - 20	4
21 - 26	3
27 - 33	2
34 - 41	1
42 - 52	1/0
53 - 66	2/0
Greater than 66	3/0

   2. TBB conductor type: insulated copper
   3. A Bonding Conductor for Telecommunications is required between the telecommunications main grounding busbar (TMGB) and the electrical service ground in accordance with TIA J-STD-607-A. The bonding conductor for telecommunications shall be sized the same as the TBB.
   4. Telecommunications Grounding Busbars: corrosion-resistant copper grounding busbar electrotin plated for reduced contact resistance.
      a. Provide a telecommunications main grounding busbar (TMGB) in the telecommunications entrance room(s) and a (TGB) in all other telecommunications equipment areas and enclosures. Refer to Telecommunications section, 4.2 Data Center Structure, for area descriptions
      b. Size the TMGB and the TGBs in accordance with the immediate application requirements and with consideration of future growth.
      c. Minimum dimensions: 0.25 in thick x 4 in wide for the TMGB and 2 in wide for TGBs with lengths as required; Listed by a nationally recognized testing laboratory.

8.0 STANDBY POWER FOR EMERGENCY POWER AND LIGHTING

8.1 Engine-Generator

A. Diesel engine driven generator set(s) with synchronization and automatic transfer switches to activate generator upon loss of primary electrical service.

B. Standby generator system shall provide power to the uninterruptible power supply system and mechanical equipment required to maintain data center mission critical operations.

C. On-site fuel storage tanks should be sized to provide a minimum of 24 hours of generator operation at the design loading condition.

8.2 Uninterruptible Power Supply (UPS)

A. Provide static UPS systems for ridethrough capability during a power outage until the generators start and come on-line.

B. The system shall be capable of automatic and manual internal bypass and be equipped with external means to bypass the system and avoid interruption of power in the event of system failure or maintenance.

C. Provide individual battery systems for a minimum of 5 minute capacity at full-rated UPS load.

D. Pushbutton Stations (EPO): UPS systems shall be tied to the EPO (Emergency Power Off) system so that the UPS systems do not continue to provide power if the EPO is activated.

E. Refer to IEEE Standard 1100 for additional information on UPS system design.

8.3 Battery for Standby Power

A. A combination of generator and battery standby systems may be used to address project requirements.

B. Provide battery systems in compliance with governing regulations.

8.4 Emergency Power

A. Provide standby power to the following systems required for code compliance, security, life safety, loss prevention, and data center operations:

1. Emergency lighting
2. Fire Alarm System
3. Communications System
4. Security System
5. UPS systems

8.5 Emergency Lighting

A. Provide emergency lighting for illumination of egress paths and exit markings in accordance with NFPA 101, Life Safety Code (LSC), and at data center operations and security as follows:

1. Exit signs
2. Egress paths
3. Exterior exit doors

4. Mechanical, electrical, and communications equipment rooms
5. Administrative Offices
6. Data Center/Server Room
7. Security Office

9.0 FIRE PROTECTIVE SYSTEMS

9.1 General

A. Fire detection systems shall be designed in accordance with the IBC, NFPA 75, and NFPA 72. Provide all required electrical connections between the data center fire protective systems describe hereafter and existing facility fire alarm system.

B. Provide electrical connections for mechanical smoke control methods requiring an electrical source.

C. Provide a Very Early Smoke Detection (VESDA) pre-action cross-zoned control system in the Data Center/Server Room. Provide required connections between the system control panel and automatic extinguishing systems provided under the mechanical section. See Mechanical Section, 22.0 Fire Protection.

D. All wall and floor penetrations shall be sealed with firestop materials that match the fire rating of the system penetrated.

E. Coordinate specific fire alarm type(s), fire protection, and central reporting requirements of the installations with the Fire Marshall/Chief.

9.2 System Devices for Fire Alarm

A. Area Smoke Detectors (Photo-Electric): Locate area smoke detectors in the following spaces:
   1. In Corridors spaced at no more than 42 ft apart, and elsewhere at a maximum area of 900 sq. ft. per detector
   2. In Mechanical, electrical, and communications equipment rooms
   3. At duct penetrations into Data Center/Server Room to operate fire/smoke dampers
   4. In the underfloor space of the Data Center/Server Room to interrupt air circulation

B. Duct Smoke Detectors (Photo-Electric):
   1. Provide in return ductwork of HVAC units and connect to fire alarm system
   2. Supply Ducts: Provide downstream of HVAC units over 2000cfm to shut-down unit upon sensing smoke. Detector annunciates at fire alarm panel but will not activate smoke control system

9.3 Automatic Detection Systems

A. An automatic detection system shall be installed in the following locations:
   1. At the ceiling level throughout the computer area.
   2. Below the raised floor of the computer area containing cables.

3. Above the suspended ceiling and below the raised floor in the computer room where these spaces are used to recirculate air to other parts of the building

B. Where interlock and shutdown devices are provided, the electrical power to the interlocks and shutdown devices shall be supervised by the fire alarm control panel.

C. The alarms and trouble signals of automatic detection or extinguishing systems shall be arranged to annunciate at a constantly attended locations.

9.4 **Annunciator Panels**

A. Either digital or matrix type indicating floor or zone of floor and type of device initiating alarm or trouble

B. Locate annunciator panels in Fire Command Center and Data Center/Server Room

C. Devices that Require Alarm Annunciation

1. Pull stations
2. Area smoke detectors
3. Water flow switches
4. Heat detectors
5. Sprinkler valve tamper switches (trouble)

10.0 SECURITY SYSTEMS

10.1 **Video Surveillance System**

A. Video Surveillance System: Video surveillance for data center, corridors, public entry, and other areas as directed by the Owner.

10.2 **Access Control**

A. Provide dual-technology Proximity/Biometric type card readers in selected locations to secure sensitive areas of the data center from public areas.

10.3 **Physical Security**

A. Telecommunications cabling associated with the data center shall not be routed through spaces accessible by the public or by other tenants of the building. Route cables enclosed in conduit or other secure pathways. Any maintenance access doors, pull boxes, or splice boxes shall be equipped with a lock.

B. Any maintenance holes on building property or under control of the data center owner shall be locked and monitored by the data center security system using a camera and remote alarm.

C. Entrance to utility tunnels used for telecommunications entrance rooms and other data center cabling shall be locked. If the tunnels are used by multiple tenants or cannot be locked, telecommunications cabling for data centers shall be in rigid conduit or other secure pathway.

END OF ELECTRICAL

TELECOMMUNICATIONS - GENERAL

1.0 SCOPE

A. The purpose of this document is to provide requirements and guidelines for the design and installation of a consolidated Data Center for King County.

B. This section is intended for use by designers who need a comprehensive understanding of the data center cabling system and network design.

2.0 STANDARDS AND CODES

A. Applicable industry codes, standards, or publications referenced hereinafter apply to equipment, materials, and construction covered herein. See General Provisions Section for list of references.

B. The minimum requirements of the latest edition of International Building Code (IBC), NFPA 70, National Electrical Code (NEC), and ANSI/TIA/EIA Communications Standards shall apply unless more stringent requirements are specified and/or dictated.

3.0 DATA CENTER DESIGN OVERVIEW

3.1 General

A. The data center telecommunications cabling and pathway system shall include permanently installed backbone and horizontal cabling, horizontal and backbone pathways, service entrance facilities, work area pathways, telecommunications outlet assemblies, conduit, raceway, and hardware for terminating and interconnecting cabling.

B. The horizontal system shall be wired in a star topology from the workstation outlets to the horizontal cross-connect or main cross-connect at the center of hub of the star.

C. The backbone cabling and pathway system includes intrabuilding interconnecting cabling, pathway, and terminal hardware. The intrabuilding backbone provides connectivity from the horizontal cross-connects to the main cross-connect. The backbone system shall be wired in a star topology with the MC at the center or hub of the star.

3.2 Tiering

A. The data center design shall meet the requirements for a Tier III classification as defined by The Uptime Institute, Inc. for a concurrently maintainable site infrastructure.

B. Tier III level capability allows for any planned site infrastructure activity without disrupting the computer hardware operation in any way. Planned activities include preventive and programmable maintenance, repair and replacement of components, addition or removal of capacity components, testing of components and systems, and more. Sufficient capacity and distribution must be available to simultaneously carry the load on one path while performing maintenance or testing on the other path.

3.3 Data Center Communications Systems

A. Required systems include but are not limited to:

1. Data Communications
2. Voice Communications
3. Dual-band transceiver with distributed antennas to facilitate cell phone/PCS communications indoors
4. Optical fiber interconnects
5. Wireless connectivity to KCPAN
6. Wireless connectivity to KCWAN

4.0 DATA CENTER SPACES

4.1 General

A. Data center spaces dedicated to the support of the telecommunications infrastructure includes:

1. The entrance room
2. Main distribution area (MDF)
3. Horizontal distribution area (IDF)
4. and equipment distribution area (EDA).

4.2 Data Center Structure

A. Entrance Room

1. The entrance room is the interface between the data center structured cabling system and inter-building cabling, both access provider and King County owned. This room includes the access provider demarcation hardware and access provider equipment. Multiple entrance rooms are desired to provide additional redundancy for access provider-provisioned circuits.
2. The entrance room locations are outside the data center area. The designer shall confirm exact location(s) of the entrance room(s) and include pathways between the entrance rooms and the data center.
3. The entrance room(s) interfaces with the computer room through the main distribution area.

B. Main Distribution Area (MDF)

1. This space is a room labeled "MDF." and is located inside the Data Center/Server Room. The main distribution area includes the main cross-connect (MDF), which is the central point of distribution for the data center structured cabling system.

2. The main distribution area serves horizontal distribution areas or equipment distribution areas within the data center and telecommunications rooms located outside the computer room space to support office spaces, Command Center/NOC, and other external support rooms.

C. Horizontal Distribution Area (IDF)

1. The horizontal distribution area is used to serve equipment areas when the HC is not located in the main distribution area. The horizontal distribution area includes the IDF, which is the distribution point for cabling to the equipment distribution areas.

2. The horizontal distribution areas are located inside the Data Center/Server Room. The horizontal distribution area includes LAN switches, SAN switches, and Keyboard/Video/Mouse (KVM) switches, etc. for the end equipment located in the equipment distribution areas.

3. Several horizontal distribution areas are required.

D. Equipment Distribution Area (EDA)

1. The equipment distribution area is the space allocated for equipment cabinets housing the computer systems and equipment. These areas shall not serve the purposes of an entrance room, main distribution area or horizontal distribution area.

2. There may be an optional interconnection point within the horizontal cabling, called a zone distribution area. This area is located between the horizontal distribution area and the equipment distribution area to allow frequent reconfiguration and flexibility.

5.0 DATA CENTER CABLING SYSTEMS

5.1 General

5.2 Horizontal Cabling

A. Topology:

1. The horizontal cabling shall be installed in a star topology. Each mechanical termination in the equipment distribution area shall be connected to a horizontal cross-connect in the horizontal distribution area or main cross-connect in the main distribution area via a horizontal cable.

2. Horizontal cabling shall contain no more than one consolidation point in the zone distribution area between the horizontal cross-connect in the horizontal distribution area and the mechanical termination in the equipment distribution area.

B. Horizontal Cabling Distances:

1. The horizontal cabling distance is the cable length from the mechanical termination of the media at the horizontal cross-connect in the horizontal distribution area or the main distribution area to the mechanical termination of the media in the equipment distribution area. The maximum horizontal distance shall be 90 m (295 ft), independent of media type.

2. The maximum channel distance including equipment cords shall be 100 m (328 ft).

3. Horizontal cable distances in the Data Center/Server Room shall be reduced to compensate for longer equipment cords in the data center distribution areas.

5.3 Backbone Cabling

A. The backbone cabling shall allow network reconfiguration and future growth without disturbance of the backbone cabling.

B. The backbone cabling shall support different connectivity requirements, including both the network and physical console connectivity such as local area networks, wide area networks, storage area networks, computer channels, and equipment console connections.

C. Topology:

1. The backbone cabling shall use the hierarchical star topology wherein each horizontal cross-connect in the horizontal distribution area is cabled directly to a main crossconnect in the main distribution area.

2. There shall be no more than one hierarchical level of crossconnect in the backbone cabling. From the horizontal cross-connect, no more than one crossconnect shall be passed through to reach another horizontal cross-connect.

6.0 CABLING PATHWAYS

6.1 General

A. Telecommunications pathways shall be designed in accordance with TIA/EIA-569-A, TIA-942, and as specified hereinafter.

B. Except where otherwise specified, data center cabling pathways shall adhere to the specifications of ANSI/TIA-569-B.

C. System furniture pathways shall be in accordance with UL 1286.

D. See electrical section paragraph "Telecommunications Pathway Design," for additional information.

6.2 Security for Data Center Cabling

See Electrical Section, 10.0 Security Systems.

6.3 Separation of Power and Telecommunications Cables

A. A separation of 12" between power and telecommunications cables shall be maintained to minimize longitudinal coupling between power cables and twisted-pair copper cables.

B. Refer to NFPA 70, article 800 or applicable WAC code for additional installation requirements.

6.4 Telecommunications Entrance Pathways

A. Entrance pathway types and materials are described in the electrical section.

B. The designer shall confirm exact location(s) of the entrance room(s) and include pathways between the entrance rooms and the data center

6.5 Access Floor Systems

A. See architectural section for access floor specifications, installation, and performance requirements.

B. See electrical section paragraph "Telecommunications Grounding and Bonding," for access floor grounding and bonding requirements.

6.6 Overhead Cable Trays

A. Overhead cable trays shall be used to distribute network cabling as well as a support for power distribution to equipment cabinets within the Data Center/Server Room.

B. Coordinate cable tray routes with equipment cabinet layouts to facilitate power and communication cable distribution.

C. See electrical section paragraph "Cable Trays," for additional information.

7.0 DATA CENTER CABLING SYSTEM INFRASTRUCTURE

7.1 General

A. Cabling and interconnecting hardware and components for telecommunications systems shall be UL listed or third party independent testing laboratory certified, and shall comply with NFPA 70 and conform to the requirements specified herein.

B. UL or third party certified. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations, submit proof of such compliance.

C. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, a certificate from an independent testing organization, competent to perform testing, and approved by the Owner. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

D. A system of telecommunications cabling and pathway components complete with outlets, cables, connecting hardware and telecommunications cabinets/racks arranged in star topology.

7.2 Telecommunications Cabling

A. Cabling shall be UL listed for the application and shall comply with TIA/EIA-568-B.1, TIA/EIA-568-B.2, TIA/EIA-568-B.3, and NFPA 70. Labeling system for cabling shall be in accordance with TIA/EIA-606-A and UL 969.

B. Backbone Cabling

1. Backbone Copper:

a. Comply with ICEA S-90-661, TIA/EIA-568-B.1, TIA/EIA-568-B.2, NEMA WC 66 and UL 444

b. Copper backbone cable shall be solid conductor, 24 AWG, 100 ohm, 150-pair UTP (Unshielded twisted pair), formed into 25 pair binder groups covered with a white thermoplastic jacket. Confirm exact pair densities required during design phase.

c. Cable shall be imprinted with manufacturers name or identifier, flammability rating, gauge of conductor, transmission performance rating (category designation) at regular intervals not to exceed 2 feet.

d. Cable shall be communications general purpose (CM or CMG), communications plenum (CMP) or communications riser (CMR) rated cabling in accordance with NFPA 70. Type CMP and CMR may be substituted for type CM or CMG and type CMP may be substituted for type CMR in accordance with NFPA 70.

e. Color coding shall comply with industry standards for 25 pair cables.

2. Backbone Optical Fiber:

a. Comply with ICEA S-83-596, TIA/EIA-568-B.3, UL 1666 and NFPA 70. Cable outer jacket shall be imprinted at regular intervals not to exceed 40 inches with fiber count, fiber type and aggregate length.

b. Optical fiber cables shall be tight buffered and comply with the following:

1. TIA/EIA-492AAAA-A, multimode, 62.5/125-um diameter, 0.275 numerical aperture
2. TIA/EIA-492CAAA, single-mode, 8/125-um diameter, numerical aperture

c. Backbone cables shall be 24-strand unless other strand densities are indicated.

d. Cable shall be nonconductive optical fiber general purpose (OFN or OFNG), nonconductive optical fiber plenum cable (OFNP), and nonconductive optical fiber riser cable (OFNR) rated cable in accordance with NFPA 70 and UL 910.

e. Type OFNP or OFNR may be substituted for type OFN or OFNG and type OFNP may be substituted for type OFNR in accordance with NFPA 70.

C. Horizontal Cabling:

1. Horizontal Copper

a. Horizontal copper cable shall comply with TIA/EIA-568-B.2, UL 444, NEMA WC 66, ICEA S-90-661 UTP (unshielded twisted pair), 100 ohm.

b. Construct cables using four each individually twisted pair, 24 AWG conductors, Category 6, with a blue thermoplastic jacket.

c. Cable shall be imprinted with manufacturers name or identifier, flammability rating, gauge of conductor, transmission performance rating (category designation) at regular intervals not to exceed 2 feet.

d. Cables shall be communications general purpose (CM or CMG), communications plenum (CMP) or communications riser (CMR) rated in accordance with NFPA 70. Type CMP and CMR may be substituted for type CM or CMG and type CMP may be substituted for type CMR in accordance with NFPA 70.

e. Cable shall be nonconductive optical fiber general purpose (OFN or OFNG), nonconductive optical fiber plenum cable (OFNP), and nonconductive optical fiber riser cable (OFNR) rated cable in accordance with NFPA 70 and UL 910.

f. Type OFNP or OFNR may be substituted for type OFN or OFNG and type OFNP may be substituted for type OFNR in accordance with NFPA 70.

7.3 Cable And Equipment Color Codes

A. Cross-Connect Field Color Codes shall adhere to TIA/EIA-606-A color coding standards in accordance with the following:

Orange	Demarcation point
Green	Network connections
Purple	Common equipment, private branch exchange (PBX)
White	First-level backbone (e.g., MDF to an IDF)
Gray	Second-level backbone (e.g., EDA to an IDF)
Blue	Horizontal cable
Yellow	Miscellaneous (auxiliary, alarms, security)
Red	Reserved for future use (also, key telephone systems).

B. Cable Terminations

1. Include termination materials, hardware and equipment to terminate horizontal and backbone cabling in the telecommunications entrance facility and telecommunication equipment rooms.

2. Color coding of telecommunications interconnecting hardware shall be in accordance with TIA/EIA-606-A.

7.4 Equipment Racks

A. Equipment Racks: 19 inch floor mounted universal type. Equip rack with vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug and a surge protected power strip with 6 duplex 20 amp receptacles.

B. Vertical cabling Section, 6" wide: Racks shall have a Combination Cabling Section (CCS) (Chatsworth 30165) installed on the outside ends of two or more racks, or on each side of a single rack.

C. Vertical cabling Section, 12" wide: Master Cabling Sections (MCS) (Chatsworth 40097-X03) installed between each rack of a multi-rack installation.

D. Racks shall have a vertical Combination Cabling Section (CCS) (Chatsworth 30165) installed on the outside ends of two or more racks, or on each side of a single rack.

E. Racks shall be laid out in a way that allows future expansion and access to all sides with a minimum of forty-eight inches (48") of clear space in front and thirty-six inches (36") in the back.

F. There shall be a twelve inch (12") cable runway above the rack and extending to the backboard. This rack and cable runway shall be used for data networking equipment and patch cables.

G. Rack and associated equipment shall be equipped with seismic bracing. This bracing shall be installed in a way that does not interfere with accessibility or installation of equipment in the open frame rack.

H. All rack(s) and associated equipment shall be grounded and bonded to the TMGB or TGB.

I. Rack Equipment and Accessory List:

1. CHATSWORTH Universal Rack

   a. Size: 19"W x 7' H x 3" D
   b. Color: Clear
   c. RMU: 45
   d. Posts: 2 with two top angles
   e. UL Listed
   f. Part No: 48353-503

2. Mounting Screws

   a. Size: 12-24
   b. Zinc Plated
   c. Quantity: 50
   d. Combination Pan Head
   e. Pilot Point
   f. Part No: 40606-001

3. Rack base dust cover

   a. Size: 19" W
   b. Color: Clear
   c. Channel size: 3"
   d. Part No. 41050-519

4. Cable Management:

   a. Rack Top Mount Cable Trough
   b. Size: 6" W x 2.25" L
   c. Color: Clear
   d. Part No: 12382-519

5. MCS-EFX Master Cabling Section

   a. Size: 12" W x 7' H x 21.23" D
   b. Color: Black
   c. Extended Fingers
   d. Part No: 40097-703

6. CCS-EFX Combination Cabling Section

   a. Size: 12" W x 7' H x 14.94" D
   b. Color: Black
   c. Extended Fingers
   d. Part No: 40100-703

7. Large Horizontal Ring Panel

   a. Size: 19" W x 3.47" H x 6" D
   b. Color: Clear
   c. Part No: 11564-719

8. Accessories:

   a. Small Peripheral Shelf
   b. Size: 19"W x 3.44" H x 10" D
   c. Color: Clear
   d. Non-vented
   e. Single sided
   f. Part No: 10758-501

9. Heavy Duty Equipment Shelf

   a. Size: 19" W x 7.16" H x 20" D
   b. Color: Clear
   c. Non-vented
   d. Double-Sided
   e. Part No: 11164-519

10. Double-Sided Shelf

   a. Size: 19" W x 6.13" H x 21.75" D
   b. Color: Clear
   c. Non-vented
   d. Double-sided
   e. Part No: 40108-519

11. Concrete Floor Installation Kit

    a. Part No. 40604-003

12. Rack Seismic Gusset Kit

    a. Color: Black
    b. Part No. 11592-701

7.5 Equipment Cabinets

A. Cabinets (CPI TeraFrame Series): 24" wide freestanding modular type, equipped with Air dam, blanking panels and 208V 3-phase, 30A cabinet distribution unit (Server Technology C-48VDY-L2130).

1. Cabinet Enclosure:

    a. Size: 23.6" W x 83.5" H x 40.40" D
    b. Color: Black
    c. RMU: 45
    d. Square Punched Rails
    e. Perforated Metal Front Door
    f. Perforated Metal Rear Door
    g. Two Point Swing Handle Latch
    h. Server Top Panel
    i. 2 Solid Sides
    j. Part No: FF1K-112C-C12

2. Multi-Mount Hardware Kit:

    a. Size: 12-24
    b. Color: Black
    c. Quantity: 25
    d. Part No: 12639-001
    e. Air Dam Kit
    f. Size: 23.6" W x 45U H
    g. Color: Black
    h. Part No: 34521-C05

3. Cable Management:

    a. Large Horizontal Ring Panel
    b. Size: 19" W x 3.47" H x 6" D
    c. Color: Black
    d. Part No: 11564-719

4. Accessories:

    a. MegaFrame Fixed Shelf
    b. Size: 19" W x 3.5" H x 29" D
    c. Color: Black
    d. Single Sided

e. Non-Vented
f. Part No: 14070-719

5. Filler Panel (4U):

a. Size: 19" W x 6.97" H
b. Color: Black
c. Metal
d. Part No: 30026-704

6. Filler Panel (6U):

a. Size: 19" W x 10.47" H
b. Color: Black
c. Metal
d. Part No: 30026-006

7. Filler Panel (10U):

a. Size: 19" W x 17.47" H
b. Color: Black
c. Metal
d. Part No: 30026-010

8. Snap-in Filler Panel (1U):

a. Size: 19" W x 1.75" H
b. Color: Black
c. Plastic
d. Part No: 34537-000 (1 each)
e. Part No: 34537-001 (6 each)

9. Snap-in Filler Panel (2U):

a. Size: 19" W x 3.5" H
b. Color: Black
c. Plastic
d. Part No: 34538-000 (1 each)
e. Part No: 34538-001 (6 each)

10. Concrete Floor Installation Kit: Part No. 40604-003

7.6 Backboards

A. Backboards shall be fire rated, interior grade plywood 3/4 inch thick 4 by 8 feet. Backboards shall be installed on a minimum of two walls in the telecommunication spaces.

B. Cable guides of ring or bracket type shall be mounted on backboards for cable management.

7.7 Connector Blocks (Systimax VisiPatch 360 System)

A. Specify a complete system of connector blocks for copper twisted-pair backbone, voice, and auxiliary circuit terminations including but not limited to:

1. Wall or rack mounted VisiPatch units
2. Vertical and horizontal wire management throughout; wire management for the VisiPatch wall field shall be required and specified with backboard elevations.
3. VisiPatch units for horizontal cable terminations
4. VisiPatch units for copper backbone and PBX extension terminations
5. VisiPatch units for network interface cable terminations
6. and space for future VisiPatch units.

B. The VisiPatch units for the workstation terminations and the copper PBX extensions shall occupy the bottom two thirds (2/3) of the VisiPatch field, with the space left for future VisiPatch units at the top one third (1/3).

C. The top one third (1/3) of the VisiPatch field is to be used to terminate backbone and network interface Cables from the rack mounted network equipment.

D. Patch cables shall be VisiPatch type, and used to cross-connect the upper one third (1/3) to the lower two thirds (2/3).

E. Allow for the number of horizontal and backbone cables terminated on the block plus 25 percent spare.

7.8 Patch Panels (Category 6)

A. Comply with TIA/EIA-568-B.1 and TIA/EIA-568-B.2. Panels shall be third party verified and shall comply with EIA/TIA Category 6 requirements. Panel shall be constructed of aluminum and shall be cabinet, rack, and wall mountable and compatible with EIA-310-D 19 inch mounting. Panels shall accommodate 48 non-keyed, 8-pin modular ports, wired to T-568B wiring designation.

B. Patch panels shall terminate the data center cabling on Type 110 IDCs and shall utilize a printed circuit board interface. The rear of each panel shall have incoming cable strain-relief and routing guides. Panels shall have each port factory numbered and be equipped with laminated plastic nameplates above each port.

7.9 Fiber Optic Patch Panels

A. Compatible with EIA-310-D 19 inch equipment racks; constructed of steel or aluminum, and suitable for cabinet or rack mounting; equip with low-density TIA/EIA-604-10A type LC adapters with thermoplastic alignment sleeves for use with multimode or single-mode optical fibers.

B. The front of the panel shall have a key-lockable hinged door. The rear of each panel shall have a cable management tray a minimum of 8 inches deep with removable cover, incoming cable strain-relief and routing guides. Panels shall have each adapter factory numbered and be equipped with laminated plastic nameplates above each adapter.

C. Fiber optic panels shall be labeled in a consistent manner with descriptive and unique labels indicating "to" and "from" on each end. Individual fiber connectors shall be labeled with the same label on each end. Labeling scheme shall be approved by King County prior to use.

7.10 Optical Fiber and Copper Patch Cords for Patch Panels

A. Patch cords shall meet minimum performance requirements specified in TIA/EIA-568-B.1, TIA/EIA-568-B.2 and TIA/EIA-568-B.3.

B. Verify quantities, lengths, and jacket colors with the owner during the design phase.

7.11 Telecommunications Outlet/Connector Assemblies

A. Copper Cable Outlet/Connectors

1. Outlet/connectors shall comply with FCC Part 68, TIA/EIA-568-B.1, and TIA/EIA-568-B.2.

2. UTP outlet/connectors shall be UL 1863 listed, non-keyed, 8-pin modular jacks, constructed of high impact rated thermoplastic housing and shall be third party verified and shall comply with TIA/EIA-568-B.2 Category 6 requirements.

3. Outlet/connectors provided for UTP cabling shall meet or exceed the requirements for the cable provided.

4. Outlet/connectors shall be terminated using a Type 110 IDC PC board connector, color-coded for both T-568A and T-568B wiring designations.

5. Each outlet/connector shall be wired T-568B.

6. UTP outlet/connectors shall comply with TIA/EIA-568-B.2 for 200 mating cycles.

7. Each workstation outlet shall have a minimum of three (3) RJ-45 jacks on a four (4) jack faceplate. Category 6 cables shall be run to each jack in the faceplate.

8. The jacks shall be labeled as "A", "B" & "C", prefaced by the communications faceplate numbering scheme proposed for the building, in accordance with the King County Labeling Standard.

9. All RJ-45 jacks shall be "universal", allowing voice or data to be used in any combination.

10. Cable length shall not exceed ninety (90) meters of installed cable from the workstation jack to the IDF patch panel.

B. Optical Fiber Adapters

1. Optical fiber adapters shall be type LC in accordance with TIA/EIA-604-10A.

2. Comply with EIA TIA-455-21-A for 500 mating cycles.

C. Optical Fiber Connectors:

1. Comply with EIA TIA-455-21-A. Optical fiber connectors shall be type LC in accordance with TIA/EIA-604-10A with thermoplastic ferrule, compatible with 62.5/125 multimode, and 8/125 single-mode fiber.

2. Optical fiber connectors shall provide a maximum attenuation of 0.3 dB with less than a 0.2 dB change after 500 mating cycles.

D. Faceplates:

1. Telecommunications cover plates shall comply with UL 514C, and TIA/EIA-568-B.1, TIA/EIA-568-B.2, TIA/EIA-568-B.3; constructed of high impact thermoplastic material to match color of receptacle/switch cover plates.

2. Labeling shall be in accordance with the King County Labeling Standard.

7.12 Grounding and Bonding Products

A. Grounding shall be in accordance with UL 467, TIA J-STD-607-A, and NFPA 70. Components shall be identified as required by TIA/EIA-606-A.

B. See electrical section paragraph "Telecommunications Grounding and Bonding," for additional information.

7.13 Firestopping Material

A. Firestop all locations where cables penetrate fire rated surfaces. Materials and methods used shall be acceptable to the code authority having jurisdiction and shall maintain the fire integrity of the wall, floor, or ceiling surface penetrated

7.14 Tests, Inspections, And Verifications

A. Factory Reel Tests: Require documentation of the testing and verification actions taken by manufacturers to confirm compliance with TIA/EIA-568-B.1, TIA/EIA-568-B.3, and TIA/EIA-526-7 for single mode optical fiber, and TIA/EIA-526-14A for multimode optical fiber cables.

END OF SECTION