PRE-DESIGN REPORT
NMR FOR THE CENTER FOR DRUG DESIGN
May 13, 2003

University of Minnesota
Academic Health Center
Minneapolis Campus
#144-02-1590
14th Floor, Phillips Wangensteen Building
PRE-DESIGN REPORT

NMR For The CENTER FOR DRUG DESIGN

7th FLOOR, PHILLIPS WANGENSTEEN BUILDING
516 Delaware Street SE, Minneapolis, MN

May 13, 2003

UNIVERSITY OF MINNESOTA
ACADEMIC HEALTH CENTER
#144-03-1590
MINNEAPOLIS CAMPUS
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3.0 STATEMENT OF NEED

Historical Background

The University of Minnesota has previously established The Center for Drug Design. It was approved by the Senior Vice President and the Council of Deans of the Academic Health Center on January 8, 2002. Dr. Robert Vince has been appointed as the first Director of the Center.

The University already has several Centers, but to date this Center is unique in its own right in the sense that it is wholly funded by the Zilagen royalties. The recent advances in structure-based drug design require an integrated team of specialists with expertise in medicinal chemistry, pharmacology and molecular biology. The Center will provide the leadership to accomplish this objective.

The Center is envisioned as a multi-disciplinary initiative of the Academic Health Center (AHC), including members of the Medicinal Chemistry faculty, and additional faculty members and research personnel from pharmacology, microbiology biomedical engineering, laboratory medicine and pathology, chemistry, radiology, the Cancer Center and others whose research focus is consistent with the goals of the Center.

Mission and Objectives:

The mission of the Center is to provide a forum for the development of focused interdisciplinary research programs in the general area of drug design leading to the discovery and development of new therapeutic agents. The Center is envisioned to serve as an academic environment and research focal point for scientists and students having interests related to drug design within the Academic Health Center and the Twin Cities Campus.

Program functions and relationship to Strategic plan:

The primary function of this proposal is to foster and support basic research through novel techniques such as nuclear magnetic resonance and mass spectroscopy etc., in order to identify drug targets. Also, these are the essential and fundamental instrumentation of any basic research in drug development. Currently, as the Center is brand new, such instrumentation is not present. In addition, sophisticated instrumentation such as nuclear magnetic resonance (NMR) spectroscopy would attract top researchers in the country to join the Center.

Approximately 4,000 sqf of space was allotted for The Center For Drug Design on 7th floor Phillips Wangensteen Building and, except for the space allotted for the installation of an Nuclear Magnetic Resonance, is now completely renovated and available for immediate occupancy.
3.0 STATEMENT OF NEED (continued)

Planning and decision process:

Late in 2002, Dr. Robert Vince presented the needs of the Center to the Senior Vice President and Council of Deans of the Academic Health Center. The space was allotted in Phillips Wangensteen Building Room 7-218 for a 600MHz NMR. Currently, this room in the Phillips Wangensteen Building is undergoing extensive evaluation for its suitability for installing the instrument. The presence of this instrument is vital to the long term success of the Center.

Expected outcome:

Achieving the planned goal of obtaining and locating the NMR instrument will have several direct and indirect beneficial results. It allows the Center for Drug Design to have its identity and becomes an attractive laboratory facility to new faculty. It will be highly useful to at least 18 researchers in the Center for Drug Design, along with other departments who are associated with the Center. Its location would be central to Medicinal Chemistry, Cancer Center and College of Pharmacy faculty.

Nuclear Magnetic Resonance equipment provides spectral analysis of organic molecules developed by the researcher in the lab. This is the critical step in the formation of new drugs.
4.0 PROGRAM ANALYSIS

Personnel and Research Activities

Prof. Robert Vince is principal investigator. His research addresses HIV, Herpes Simplex Virus and other viral diseases.

Prof. Ramaiah Muthyala is principal investigator. His research involves antibacterial and neurodegenerative diseases.

18 full time professionals at all levels will be investigating other areas such as the Central Nervous System and Cancer.

Functional Requirements:

A single space which supports the technical requirements of nuclear magnetic resonance equipment and can function closely to The Center for Drug Design.

Special Equipment:

600 MHz NMR spectrometer with cryoprobe.

Preliminary Architectural Program:

The existing Room 7-218 of Phillips Wangensteen Building is to be remodeled for the NMR room. Work would consist of enlarging the door to 5'-0", removing the carpet and adding new VCT, blocking up the existing window areas and reinstalling the ceiling for more floor to ceiling space. The existing mechanical and electrical systems would be modified to support the specialized equipment. No specialized structural reinforcement is required. The project area consists of the complete room and minimal parts of the adjacent corridor for a total of 496 gross sq. ft.

Previous and on-going testing will next be submitted to the selected equipment vendor for confirmation of conformance with equipment vibration thresholds. If the selected room (7-218) does not meet equipment specifications, the Academic Health Facilities office will determine an alternate location.

Mechanical Program:

Don Fairbanks, Don Heckman and Matt Stringfellow from Michaud Cooley Erickson Consulting Engineers completed a walk through of the proposed 7th floor NMR remodeling area in Phillips Wangensteen Building on Friday April 25, 2003 at 9:00 AM. Mike Kane from the University of Minnesota Facilities Management zone office accompanied them on the site visit.
4.0 PROGRAM ANALYSIS (continued)

During the NMR walk through, getting core shaft space adjacent to the NMR room for ductwork up to the 10th floor roof area as well as installing UPS equipment inside the core shaft adjacent to the NMR room on the 6th floor was discussed. The core of the adjacent shaft was looked at and found to be acceptable for both the ductwork and the UPS equipment as the shaft currently has a significant amount of unused space. This observation and conclusion was verified with Mike Kane.

WORK INCLUDED
A. The information that is provided in this written “Scope of the Mechanical Systems” is intended for information only as an aid in understanding the project. The scope is not all encompassing. This scope represents a Pre-Design Phase understanding of the mechanical work required.
B. The mechanical work shall consist of furnishing all labor and materials necessary for the complete installation of new plumbing, medical gas, fire protection, heating, ventilating, air conditioning, hydronic systems, and automatic temperature control systems for remodeling of the NMR room located on the 7th floor of the Phillips-Wangensteen Building on the University of Minnesota, Minneapolis Campus.
   I. The total area of the remodel is approximately 380 square feet.
C. All equipment and material to be furnished and installed on this project shall be in accordance with the requirements of the authority having jurisdiction and shall be suitable for its intended use on this project.
D. All systems and equipment shall be complete in every respect and all items of materials, equipment and labor shall be furnished and installed for a fully operational system.
E. The Contractor shall coordinate his work with the work of the other trades so as to resolve conflicts without impeding job progress. Provide notice of any concrete work, gratings, louvers, etc. required by this Division that is not indicated on the Structural, Architectural, or Mechanical/Electrical Drawings.
F. This scope of work is to be used for budget pricing. The estimators shall make themselves familiar with the project and assure all systems are budgeted to completion. Sufficient contingency shall be included to assure adequate funding of final project.
G. All warranties shall be for 12 months after occupancy of building.

RELATED SECTIONS
H. The Contractors shall examine the Architectural, Structural, and Electrical Drawings and other Division, and sections of the specifications in order to determine the extent of work required to be completed under this Division. Failure to examine all the Contract Documents for this project will not relieve the Contractors of the responsibility to perform all the work required for a complete, fully operational and satisfactory installation.
4.0 PROGRAM ANALYSIS (continued)

CODES AND STANDARDS
I. All mechanical work shall be performed in compliance with the following codes and standards:
   1. 2000 International Building Code with Minnesota Amendments
   2. 1998 Minnesota Plumbing Code with Minnesota Amendments
   3. 2000 International Fire Code with Minnesota Amendments
   4. 1991 Uniform Mechanical Code with Minnesota Amendments
   7. State Administrative Rules, Chapter 1340 (Accessibility)
   8. Minnesota Rules 4640 and 4645
   9. American with Disabilities Act
   10. Municipal Water and Sewer Regulations
   11. Occupational Safety and Health Administration Regulations

PART 2 - PRODUCTS
YEAR 2000 COMPLIANCE (Y2K)
A. All control components shall be Y2K compliant. System manufacturer shall provide certification that all components are Y2K compliant.

ROOM CEILING HEIGHT
B. The new NMR equipment requires a high ceiling clearance. Therefore, all mechanical systems and equipment will be routed around perimeter soffits/ceiling space to preserve maximum ceiling height in the center of the NMR room.

PLUMBING SYSTEMS
C. Remove existing 1-1/2" plumbing vent line in ceiling space above NMR room. Re-route 1-1/2" vent line to be up tight to structure of floor above. New vent line shall be made from non-ferrous materials (non-magnetic).
D. Provide new domestic cold water makeup line and drain/flush line to new self contained humidifier.
E. Provide new lab compressed air supply line to NMR room from building core area on same floor.

FIRE PROTECTION SYSTEMS
G. Remove existing sprinkler heads and existing sprinkler branch piping from NMR room.
H. Provide new branch sprinkler piping and new sprinkler heads for NMR room.
   1. All fire protection materials penetrating or within the NMR room are to be copper or nonferrous materials. Any connections made between the copper and steel piping must use a dielectric union outside of the NMR room.
4.0 PROGRAM ANALYSIS (continued)

HUMIDIFICATION SYSTEM

I. Provide an electric, self-contained, surface wall mounted humidifier to serve NMR room for use with normal tap water. Humidifier shall contain stainless steel evaporating chamber and cover and be provided complete with dispersion tubes, controls, and finished cabinet.
   1. Acceptable manufacturers: Dri-Steam, Pure Humidifier.

J. Wall mount humidifier in lab room located across hall from NMR room. Provide humidifier steam supply pipe to dispersion tubes mounted in new supply duct serving NMR room.

K. Dispersion tubes shall be selected for a vapor absorption trail no longer than 18”. Mount dispersion tubes in supply duct to NMR room downstream from reheat coil. Provide a stainless steel duct section with sloped drain pan and drain line for humidifier dispersion tubes.

L. Control humidifier from humidity sensor located in exhaust air duct from NMR room. Provide air flow switch in supply air duct to NMR room to shut down humidifier if no air flow is present.

M. Humidifier shall be sized to maintain 40% relative humidity at a 74°F room temperature.

HEATING, VENTILATION, AND AIR CONDITIONING SYSTEMS

N. Remove existing ferrous ductwork from NMR room:
   1. Remove existing 10 x 8 branch supply duct back to main outside NMR room and cap duct.
      a. Remove existing branch supply duct hot water reheat coil. Remove existing supply and return hot water heating piping back to pipe mains and cap.
   2. Remove existing 12 x 8 return duct crossing NMR room back to duct riser main located in vertical core shaft #28 adjacent to NMR room.
   3. Remove existing 26 x 8 return duct crossing NMR room back to duct riser main located in vertical core shaft #28 adjacent to NMR room.
   4. Remove existing 12 x 8 lab hood exhaust duct crossing NMR room back to duct riser main located in vertical core shaft #28 adjacent to NMR room.
   5. Remove existing 8 x 6 lab hood exhaust duct crossing NMR room back to duct riser main located in vertical core shaft #28 adjacent to NMR room.
   6. Remove existing 18 x 18 lab hood exhaust duct crossing NMR room back to duct riser main located in vertical core shaft #28 adjacent to NMR room.
   7. Remove existing 8 x 6 lab hood exhaust duct crossing NMR room back to duct riser main located in vertical core shaft #28 adjacent to NMR room.
   8. Remove existing 8 x 6 lab hood exhaust duct crossing NMR room back to duct riser main located in vertical core shaft #28 adjacent to NMR room.

O. Remove existing supply and return grilles from NMR room.

P. Provide new non-ferrous, aluminum ductwork to replace removed ducts:
   1. Re-install 12 x 8 return duct crossing NMR room back to duct riser main located in vertical core shaft #28 adjacent to NMR room. Route duct along west wall of NMR room.
4.0 PROGRAM ANALYSIS (continued)

2. Re-install 26 x 8 return duct crossing NMR room back to duct riser main located in vertical core shaft #28 adjacent to NMR room. Route duct along north wall of NMR room.

3. Re-install 12 x 8 lab hood exhaust duct crossing NMR room back to duct riser main located in vertical core shaft #28 adjacent to NMR room. Route duct along north wall of NMR room.

4. Re-install 8 x 6 lab hood exhaust duct crossing NMR room back to duct riser main located in vertical core shaft #28 adjacent to NMR room. Route duct along north wall of NMR room.

5. Re-install 18 x 18 lab hood exhaust duct crossing NMR room back to duct riser main located in vertical core shaft #28 adjacent to NMR room. Route duct along north wall of NMR room.

6. Re-install 8 x 6 lab hood exhaust duct crossing NMR room back to duct riser main located in vertical core shaft #28 adjacent to NMR room. Route duct along north wall of NMR room.

7. Re-install 8 x 6 lab hood exhaust duct crossing NMR room back to duct riser main located in vertical core shaft #28 adjacent to NMR room. Route duct along north wall of NMR room.

Q. Provide new all electric, direct expansion (D/X) rooftop air handling unit to serve NMR room. Locate rooftop unit on 10th floor roof.

1. New rooftop unit shall be 100% outside air makeup unit with the following characteristics:
   a. 800 CFM of 100% outside air for supply air
   b. 3 Tons cooling capacity
   c. 68 MBH electric heating capacity

2. The new rooftop unit will have the following features:
   a. Centrifugal supply fan
   b. Centrifugal power exhaust fan
   c. D/X cooling coil, compressor, condenser coil/condenser fans with hot gas bypass capacity control
   d. Electric heating coil with SCR control
   e. Hot gas reheat coil with modulating control
   f. Desiccant heat wheel for heat recovery with full modulating economizer with bypass
   g. Insulated double wall cabinet construction with solid interior liner and stainless steel drain pan
   h. Microprocessor controls

3. New rooftop unit shall be equal to Aaon Model No. RK-03-3-E0-1B2:ZG00G0F00MCX
   a. Unit dimensions: 12 Ft. long, 6.5 Ft. wide, 3 Ft. tall (not including roof curb height)
   b. Provide tall roof curb for horizontal duct connections through side of roof curb.
4.0 PROGRAM ANALYSIS  (continued)

R. Provide new supply ductwork with hot water reheat coil to serve NMR room from new rooftop air handling unit. Start new branch supply duct from rooftop air handling unit and run across roof to Vertical Shaft Core #28 (which is located adjacent to NMR room). Run supply duct down Vertical Core Shaft #28 to reach NMR room. Route supply duct across NMR room to corridor. Locate duct mounted reheat coil and humidifier dispersion tubes in supply duct in corridor. Then route supply duct back into NMR room to supply room. Route new supply duct along west wall of NMR room to connect to supply diffusers.

1. Provide new hot water heating supply and return branch piping to serve new reheat coil. Connect to existing pipe mains located in core area of floor.
2. Provide perforated, square, supply diffusers at perimeter of NMR room.
3. Size supply duct system to deliver 800 CFM to NMR room.

S. Provide exhaust grilles at perimeter of NMR room along east wall at ceiling level and at floor level. Provide motorized dampers to isolate upper and lower exhaust grilles so that either exhaust air flow from NMR room is through upper exhaust grilles only or through lower exhaust grilles only.

1. Normal operation shall have motorized dampers closed to ceiling exhaust grilles and open to floor exhaust grilles.
2. Size exhaust duct system to exhaust 800 CFM from NMR room.

T. Route exhaust ductwork from the NMR room up through Vertical Shaft Core #28 to 10th floor roof. Prior to exiting the shaft, split the exhaust duct into two ducts (of the same size as the originating exhaust duct) and provide a motorized damper in each of the split exhaust ducts. After the split, both ducts shall exit the shaft onto the 10th floor roof.

1. One of the split exhaust ducts shall connect to the new rooftop air handling unit.
2. The other split exhaust duct shall connect to a new roof mounted exhaust fan.
   a. Provide new, constant volume, exhaust fan to serve NMR room. Provide weatherproof, utility set, SWSL, exhaust fan with up-blast discharge on 10th floor roof adjacent to vertical shaft core #28.

U. All ductwork, diffusers, equipment and materials installed within the NMR room must be nonferrous, aluminum.

V. All rooftop supply and exhaust ductwork shall be double wall construction with insulation between walls and solid interior liner.

TEMPERATURE CONTROL SYSTEMS

W. The temperature control system will consist of a fully networked direct digital control (DDC) system tied into the existing University of Minnesota BSAC network controls.

X. Provide DDC control and monitoring of new humidifier, new rooftop air handling unit, and new rooftop exhaust fan.

Y. The new rooftop air handling unit will run continuously.
4.0 PROGRAM ANALYSIS (continued)

Z. Under normal operating conditions, the new rooftop air handling unit power exhaust fan will run and the new rooftop exhaust fan will be shutdown.

AA. Provide oxygen monitoring sensor control system for NMR room. Provide both manual and automatic control for oxygen monitoring system. When oxygen monitoring sensor system goes into alarm, the exhaust duct motorized dampers in the NMR room will modulate to draw all exhaust air from the NMR room through the exhaust grilles located near the ceiling. The exhaust duct motorized dampers located in Vertical Shaft Core #28 will modulate closed to the new rooftop air handling and open to the new rooftop exhaust fan. The new rooftop air handling unit power exhaust fan will shutdown. The new rooftop exhaust fan will run.

BB. Typical NMR room control:
   1. Thermostat will modulate reheat coil control valve.
   2. Exhaust duct humidity sensor will modulate humidifier capacity.

PART 3 EXECUTION
TESTING, ADJUSTING AND BALANCING

A. The mechanical contractor shall obtain the services of an independent and certified Testing and Balancing (TAB) Agency for the testing and balancing of all air and hydronic systems. The agency shall be a fully Certified Member of the Associated Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB). The Mechanical Contractor shall not use his own forces for this work even if they meet the criteria herein before stated.
   1. Names of Testing and Balancing Agency shall be submitted to the Engineer for approval within 15 days after receipt of construction contract.

B. Perform testing and balancing in complete accordance with AABC Standards for Field Measurement and Instrumentation Form No. 81266 Volume One, as published by the Associated Air Balance Council, or equivalent NEBB Form. Perform testing and balancing on all air and hydronic systems.
   1. Instruments used for testing and balancing of air and hydronic systems must have been calibrated within a period of six months prior to balancing. All final test analysis reports shall include a letter of certification listing instrumentation used and last date of calibration.

COMMISSIONING

C. The mechanical contractor and all subcontractors shall include labor and materials to perform complete systems commissioning after completion of construction, prior to occupancy.
   1. Mechanical systems commissioning shall consist of performing operational testing of all systems and equipment in all modes of operation. The operational testing activities shall be extensive to positively prove that all systems and equipment are installed according to the construction documents and that all set points, controls, and operational sequences are properly adjusted and fully functional.
4.0 PROGRAM ANALYSIS (continued)

2. Contractors shall prepare detailed commissioning test reports for individual systems and for individual pieces of equipment within each system documenting all setpoints, modes of satisfactory operation, and corrective action taken to revise any unsatisfactory system performance.

Electrical Program:

WORK INCLUDED

D. The information that is provided in this written “Scope of the Electrical Systems” is intended for information only as an aid in understanding the project. The scope is not all encompassing. This scope represents a Pre-Design Phase understanding of the electrical work required.

E. The electrical work shall consist of furnishing all labor and materials necessary for the complete installation of lighting, power, voice/data provisions and fire alarm systems for the NMR Room located on the 7th floor of the Phillips-Wangensteen Building on the University of Minnesota, Minneapolis Campus.

F. The project includes remodeling construction for the NMR equipment and support spaces. The total area of the remodel is approximately 280 square feet.

G. All equipment and material to be furnished and installed on this project shall be in accordance with the requirements of the authority having jurisdiction and shall be suitable for its intended use on this project.

H. All systems and equipment shall be complete in every respect and all items of materials, equipment and labor shall be furnished and installed for a fully operational system.

I. The Contractor shall coordinate his work with the work of the other trades so as to resolve conflicts without impeding job progress. Provide notice of any concrete work, cutting, patching, etc. required by this Division that is not indicated on the Structural, Architectural, or Mechanical/Electrical Drawings.

J. This scope of work is to be used for budget pricing. The estimators shall make themselves familiar with the project and assure all systems are budgeted to completion. Sufficient contingency shall be included to assure adequate funding of final project.

K. All warranties shall be for 12 months after occupancy of building.

3.2 RELATED SECTIONS

A. The Contractors shall examine the Architectural, Structural, and Mechanical Drawings and other Divisions, and sections of the specifications in order to determine the extent of work required to be completed under this Division. Failure to examine all the Contract Documents for this project will not relieve the Contractors of the responsibility to perform all the work required for a complete, fully operational and satisfactory installation.
4.0 PROGRAM ANALYSIS (continued)

3.3 CODES AND STANDARDS
   A. All electrical work shall be performed in compliance with the following codes and standards:
      5. 1999 Minnesota Energy Code with Minnesota Amendments
      6. 1996 State Administrative Rules, Chapter 1340 (Accessibility)
      7. Minnesota Rules 4640 and 4645
      8. American with Disabilities Act
      9. Municipal Water and Sewer Regulations
      10. Occupational Safety and Health Administration Regulations

PART 4 - PRODUCTS
   (NOT APPLICABLE)

PART 5 EXECUTION

5.1 GENERAL: The work includes, but is not limited to the following systems, equipment and services:
   A. Demolition will consist of:
      1. Relocating/rerouting of electrical equipment to accommodate the NMR Room.
      2. Removing miscellaneous circuits and feeders to accommodate wall changes, mechanical equipment changes, etc.
   B. Temporary Services
      1. Temporary power for construction will be derived from existing building electrical system.
      2. Provide temporary light and power for use of all trades, including distribution to loads such as tools, welders, etc.
      3. Energy costs will be paid for by the Owner.
   C. Electrical Service
      1. The electrical service for the remodeled area is existing. Branch panels are in place within core 32.
      2. Re-use existing circuits for remodeled areas.
   D. Emergency Power
      1. Utilize existing life safety circuits for egress lighting and exit signs.
   E. UPS Power
      1. Provide a 50 kw UPS with 10 min battery back-up. Unit shall be furnished with maintenance by-pass.
      2. Provide 2" - 4# 1/0 from UPS located on 6th level of core 28 to bus duct in core 32. Provide a 200A bus plug fused at 150 amps.
      3. Provide 208V, 3 phase, 4 wire panel fed from UPS. See attached sketch for location and branch circuit requirements.
4.0 PROGRAM ANALYSIS (continued)

F. Lighting

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<th>Area</th>
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<tr>
<td>NMR Room</td>
<td>40-50 FC</td>
<td>2 x 4 Fluorescent w/ Parabolic Louver</td>
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</table>

1. Lamps and Ballasts: Provide <20% THD electronic ballasts and 3,000°F color temperature, 70-75 CRI, tri-phosphor lamps for all linear fluorescent fixtures. Use T8 lamps in fluorescent fixtures. The 4' T8 lamp shall produce a minimum of 2,800 lumens.

G. Convenience Power

1. See attached sketch for required receptacles and circuits.
2. Face plates for all receptacles shall be stainless steel. Face plates for UPS receptacles shall be engraved with "UPS" and filled with orange paint.

H. Mechanical Equipment Power

1. Provide power connections to mechanical equipment. See Division 15 scope.
   a. Exhaust fan located on 10th floor roof.
   b. Electric humidifier.

I. Grounding

1. All convenience power circuits shall have an individual ground wire back to panel or overcurrent device.
2. Provide a ground conductor within all feeder conduits.
3. Provide ground conductors within all motor feeder conduits.

J. Voice/Data

1. Voice/Data provisions including wall phones shall consist of a J-box and a 1" conduit stubbed to existing cable tray system. Provide bushing and bond conduit to cable tray.
2. Cable and devices shall be installed by Owners IS Vendor.

K. Fire Alarm

1. Modify the existing fire alarm system to service the NMR Room. Provide for:
   a. Duct smoke detectors with remote indicators along with interface to combination dampers and air handling equipment.
   b. Emergency page speakers shall be relocated and reconnected to accommodate wall changes.
   c. An alarm condition will be initiated by automatic detectors, sprinkler watermark switches and by manual stations.
   d. The fire alarm system will monitor the wires of all detection zones and report a trouble condition if any wire is disconnected.
   e. The fire alarm system control panel will be provided with integral battery backup for 90 minutes minimum and also will be powered from an emergency power panelboard.
   f. Indicating devise consisting of horn/strobe shall be installed in the NMR Room.
4.0 PROGRAM ANALYSIS (continued)

L. Access Control Systems
   1. Provide card access on NMR Room door.
   2. The system shall consist of a Central Controller, Card Readers, Door
      Position Switches, Wire and Cable, etc.
   3. The system shall be connected to the existing University of Minnesota
      Access Management System.
   4. The system shall be of solid-state design employing state-of-the-art digital
      technology.
   5. The system shall employ serial, digital communication from its card readers
      via a single twisted pair.
   6. All system components shall operate on 120 VAC, 60 Hertz or from power
      supplies operating on 120 VAC, 60 Hertz.
   7. The electric door hardware and power supplies for the electric locks shall
      be provided by the hardware contractor.

M. Paging/Sound Systems
   1. None required.

N. MATV/CATV
   1. None required.
5.0 FINANCIAL ANALYSIS

Not Applicable.
6.0 SITE ANALYSIS: MAJOR REMODELING

This project exists wholly within the Phillips-Wangensteen Building and, as a result, there are no site issues.
7.0 ENVIRONMENTAL/CODE/HAZARDOUS MATERIAL ANALYSIS

Code improvements for the project will consist of the following:

1. Existing partitions at Corridors do not all go to deck for proper separation and will be corrected.
2. Structure fireproofing will need to be replaced when disturbed by new construction.

Comprehensive assessment by the Department of Environmental Health and Safety is the next step in the project.

A detailed survey would then be undertaken to confirm hazardous conditions and requirements. Funds are allocated in non-construction costs for removal of hazardous materials. Abatement and removal would be accomplished before construction is initiated.

The new NMR for The Center For Drug Design will not require any modifications to the existing security system.
8.0 COST ANALYSIS

A schematic construction estimate was prepared and is detailed on the following pages. The estimate was based upon the attached Skaaden-Helmes Architects plans. The estimated construction budget for the project is:

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<th>Description</th>
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# Construction Estimate Budget Summary

**University of Minnesota - May 2003 - MN - Minneapolis**

- **Project:** PWB 7th Floor NMR for CDD
- **Project No.:** 144-02-1590
- **Phase:** Predesign
- **Prepared By:** David Gurtason/Craig Skaaden
- **Skaaden-Helmes Architects**
- **Building Sq. Size:** 496 estimated
- **Bid Date:** 08/15/2003
- **No. of floors:** 1
- **No. of Buildings:** 1
- **Project Use:** NMR Equipment
- **Project Type:** I-A

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**0000B Project Notes**

- A Scope includes General, Mechanical and Electrical Construction. Structural work not included.
- B Refer to written summary for Mechanical work.
- C Refer to written summary for Electrical work.
- D Estimate/Bidding Contingency of 5% included.
- E UPS Power to serve Equipment
- F Totals for Construction only. Estimate based on Square Foot cost unless noted otherwise.

**0000C Project Comments**

2. Based on Drawings dated 04/18/03
## Estimate of Probable Cost

### Prepared By:
David Gustafson/MCE
Skaden-Helmes Architects
401 North 3rd Street, Suite 100
Minneapolis, MN 55401
612.339.9260 Fax:612.339.5052

### Prepared For:
Don Archibeque-Owner Representative
UsF M Facilities Management-Zone 3
B117 Moos Tower; 515 Delaware St SE
Minneapolis, MN 55455
612.624.8972 Fax:612.625.5164

**Building Sq. Size:** 496
**Bid Date:** 08/15/2003
**No. of floors:** 1
**No. of buildings:** 1
**Project Height:** 14
**1st Floor Height:** 16

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9.0 PROJECT SCHEDULE

The following have been identified as key dates for the project.

- May, 2003: Regents Review (Information)
- June, 2003: Regents Approval
- June, 2003: Equipment Selection and Testing
- August 1, 2003: Project Initiation
- October, 2003: Design Complete
- November, 2003: Construction Start
- February, 2004: End Construction

Please also refer to the following Project Construction Schedule.
10.0 DIAGRAMS/CONCEPT PLANS

Please refer to the following four pages for the location of The Center For Drug Design Nuclear Magnetic Resonance equipment, proposed demolition plan, schematic floor plan and electrical plans.
NEW CONSTRUCTION PLAN

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

PWB 7TH FLOOR NMR FOR CENTER FOR DRUG DESIGN 144-03-1590 4-18-03 SD
PROJECT PROJ. NO. DATE BY

NOTES:

1. REMOVE EXISTING FRAME, DOOR & HARDWARE OPEN WALL FOR NEW DOORS, FRAME AND HARDWARE: 3'-0" ACTIVE LEAF; 2'-0" INACTIVE

2. REMOVE CARPET & BASE. PROVIDE NEW VCT FLOORING AND VINYL BASE.

3. BLOCK UP WINDOW AREAS W/ NEW INSULATED SHAFT-WALL CONSTRUCTION PER DETAIL 1/2

4. REMOVE EXISTING CEILING SYSTEM AND INSTALL NEW AT 10'-9" HEIGHT

COMM. NO. 02027

DRAWING 1 OF 2
NEW SUSPENDED ACOUSTIC CEILING AT 10'-9" AFF

2-1/2" X 20 GA. METAL STUDS AT 1'-4" O.C. MAX. UP TO DECK PROVIDE DIAGONAL BRACING AT 4'-0" O.C. MAX.

5/8" TYPE 'X' GYPSUM BOARD TO 4" ABOVE CEILING. CONTINUE GYPSUM BOARD & STUDS ACROSS FACE OF SERVICE CORE WALL AT SOFFIT LINE.

EXISTING METAL SOFFIT

5/8" TYPE 'X' GYPSUM BOARD ON 2 1/2"C-H STUDS AT 2'-0"O.C. PRE-PAINTED AT WINDOW SIDE

1" RIGID INSULATION BOARD, FOIL FACED BOTH SIDES

1" GYPSUM LINER PANELS, PRE-PAINTED AT WINDOW SIDE

EXISTING RADIATOR CABINET

EXISTING AIR FLOW

EXISTING WINDOW

CUT OPENINGS IN SOFFIT (TO BE DETERMINED) TO VENT INTO CEILING PLENUM TO BE EXHAUSTED

STEEL J-RUNNER TOP & BOTTOM PRE-PAINTED AT WINDOW SIDE

EXISTING AIR FLOW

EXISTING AIR FLOW

TAPED-IN METAL EDGE ALL EDGES

TAPED-IN METAL EDGE & CORNER

DETAILS AT NEW INSULATED SHAFT WALL

SCALE: 3"=1'-0"

PWB 7TH FLOOR NMR FOR

CENTER FOR DRUG DESIGN 144-03-1590 4-18-03 SD

PROJECT PROJ. NO. DATE BY

NOTES:

SKANDON-HELME ARCHITECTS INC.

Suite 100
401 North 3rd Street
Minneapolis, MN 55401
612/339-9260 FAX: 612/339-9052

COMM. NO. 02027

DRAWING 2 OF 2
TYPE B1: 2'X4' PARABOLIC FIXTURE, (3) F32 T8 LAMPS, 277V T8 ELECTRONIC BALLAST, 3" DEEP MINIMUM LOW IRIDESCENCE LOUVER, 18 CELL, LITHONIA PM3 SERIES (OR EQUAL).

NMR ROOM LIGHTING PLAN

1/8" = 1'-0"
2" - 4 #6 TO CORE 32. PROVIDE BUS PLUG FUSED AT 150 AMPS.
KEY NOTES

1 PROVIDE A NEMA 14–30R, 120V, 1PH, 30 AMP IG DEDICATED RECEPTACLE FOR NMR EQUIPMENT. VERIFY EXACT RECEPTACLE CONFIGURATION WITH SYSTEM SUPPLIER PRIOR TO INSTALLATION. PROVIDE A 30A/1P CIRCUIT BREAKER, WITH 3/4" C. 2#10, 1#10 GND AND 1#10 NEUTRAL.

2 PROVIDE AN EMERGENCY POWER SHUTOFF PUSHBUTTON TO SHUTOFF POWER TO THE PANEL SERVING THE NMR. PUSHBUTTON SHALL BE A MUSHROOM TYPE, ALLEN BRADLEY FX604 WITH COVER. ROUTE A 1/2" C. 2#12 TO PANEL.

3 PROVIDE A DEDICATED 120V, 15A ISOLATED GROUND DUPLEX RECEPTACLE FOR NMR EQUIPMENT.

4 PROVIDE A NEMA 14–20R, 208V, 1PH, 20 AMP IG DEDICATED RECEPTACLE FOR NMR EQUIPMENT. VERIFY EXACT RECEPTACLE CONFIGURATION WITH SYSTEM SUPPLIER PRIOR TO INSTALLATION. PROVIDE A 20A/2P CIRCUIT BREAKER, WITH 3/4" C. 2#12, 1#12 GND AND 1#12 NEUTRAL.

5 PROVIDE 150A 120V/208V, 3PH, (42) CIRCUIT BREAKER ELECTRONIC GRADE PANELBOARD FOR NMR ROOM. PANEL SHALL HAVE A SHUNT TRIP MAIN CIRCUIT BREAKER.

6 PROVIDE A JUNCTION BOX AND 1" C. TO JUNCTION BOX AT CONTROL LOCATION. VERIFY EXACT REQUIREMENTS WITH SUPPLIER.

7 50 KW UPS WITH 10 MINUTE BATTERY CAPACITY. LOCATE ON 6TH LEVEL OF CORE 28.
11.0 DESIGN GUIDELINES

INFRASTRUCTURE IMPROVEMENTS:

Efficient utilization is partially obtained by refurbishing an existing space rather than building out a new space.

As a remodeled space, the NMR for The Center For Drug Design will have minimal impact upon the architectural character of the Phillips Wangensteen Building, nor impact the internal functioning of the building.

As a totally interior project, the Site Guidelines Impact Report is not required.

The architectural guidelines are met with the project being designed within the University of Minnesota Design and Construction Standards.
12.0 COMMUNITY NEIGHBORHOOD IMPACT ASSESSMENT

This project exists wholly within the Phillips-Wangensteen Building and, as a result, there are no community neighborhood issues.
13.0 GENDER EQUITY IMPACT ASSESSMENT: INTERCOLLEGIATE ATHLETIC PROJECTS:

As a laboratory project, Title IX issues are not affected.
14.0 APPENDIX:

Please refer to the following pages.
May 5, 2003

Mr. Craig Skaaden
Skaaden Helmes Architects, Inc.
401 North 3rd Street, Suite 100
Minneapolis, MN 55401

Re: Phillips Wangensteen Building NMR 144-03-1590
    BKBM Project Number 03234.00

Dear Craig:

As requested, we have completed an analysis of the referenced building to determine if it is feasible for the seventh floor structure to support a new NMR unit.

Our analysis was performed using the original building structural drawings prepared by the Architects Collaborative, Inc., and information on equipment weight, approximate size, and location as provided by you via email and telephone.

The existing floor system is composite steel deck with lightweight concrete on steel trusses and beams. The NMR is supported on three 18” x 18” legs and weighs a total of 2,600 pounds. Precise overall NMR dimensions were not available at this time. We assumed a 4-foot distance between any two legs.

Our analysis indicates that the existing floor system will likely support the NMR unit with no additional reinforcing. If the overall NMR dimensions are significantly smaller than assumed, some local reinforcing may be required. This analysis did not address potential vibration concerns for this unit.

The opinions contained in this report are based on information as noted above. No physical testing has been performed to verify the accuracy of this information. This report does not address any portion of the structure other than those areas mentioned. It does not provide any warranty, either expressed or implied, for any portion of the existing structure.

If you have any questions, please contact me.

Sincerely,

BKBM ENGINEERS

Jason A. Bolstad, P. E.

Direct Line: (763) 843-0442

F:\03234\Skaaden 05-05-03.doc
A REPORT ON VIBRATION MONITORING
FOR THE PROPOSED NMR EQUIPMENT
AT THE UNIVERSITY OF MINNESOTA
CENTER FOR DRUG DESIGN
MINNEAPOLIS, MINNESOTA

April 30, 2003

ESI Project 1347

Prepared for
The Center for Drug Design
7-125F Weaver-Densford Hall
308 Harvard Street S.E.
Minneapolis, Minnesota 55455-0343
Tel. (612) 624-7120
Fax (612) 625-2633

Prepared by

ESI ENGINEERING, INC.
Three Paramount Plaza
7831 Glenroy Road/Suite 340
Minneapolis, Minnesota 55439 USA
Contact: Bret Peterson
Tel: (952) 831-4646 Fax: (952) 831-6897
Internet: www.esi-engineering.com
1.0 SUMMARY

On, April 16, 2003, ESI completed vibration tests for the University of Minnesota Center for Drug Design, at their proposed NMR site on the 7th floor of the Phillips Wangensteen Building (PWB). The existing building has a structural concrete floor system and testing was completed to evaluate baseline vibration prior to the purchase and installation of the new NMR equipment.

Low floor vibration is desired in all areas where sensitive equipment is used. However, the two possible vendors have not provided current vibration limits for the proposed equipment. The purpose of the study is to determine the severity of the vibration at the proposed site.

The monitoring was coordinated with Mr. Ramaiah Muthyala from the Center for Drug Design at the University of Minnesota. The monitoring equipment was setup to monitor steady state vibration and to capture typical traffic and any normal transient activity.

This report discusses results of the vibration monitoring as well as the permissible vibration levels for human sensitivity and industry standards. A summary of the test procedures and results are discussed along with a detailed summary plot of individual test for vibration.
2.0 VIBRATION MONITORING

Building vibration was measured with very sensitive seismic accelerometers and a two-channel spectrum analyzer. The equipment and settings used are described in the following paragraphs.

2.1 Test Equipment

Vibration monitoring equipment uses a transducer to sense motion. In this case the transducer was a very sensitive accelerometer. When the accelerometer is moved, it produces an electrical signal that is proportional to the acceleration of the transducer. The signal is amplified and then analyzed using a spectrum analyzer. This instrument shows the motion in terms of frequency and acceleration or displacement. The following instrumentation was used in this project:

1. **Accelerometers** — PCB Piezotronics, Inc., Model 393A03 seismic accelerometers. These accelerometers produce 1 volt/g over a frequency range of 0.5 to 2000 Hz.

2. **Amplifiers** — PCB signal conditioning amplifiers provide variable voltage amplification for each of the accelerometers.

3. **Spectrum Analyzer** — A Data Physics Corp. dual-channel, Fast Fourier Transform (FFT) spectrum analyzer was used to capture and analyze the vibration data.

4. **Personal Computer** — The data from the FFT spectrum analyzer is transferred directly to a PC that provides data analysis, output, and storage capabilities.

2.2 Equipment Settings

The spectrum analyzer was set up with 1600 lines of resolution over a frequency band of 0.0 Hz to 125 Hz. Stable averaging was used in conjunction with the Hanning window over the entire spectrum. The magnitude is displayed in velocity (in/sec rms) unless noted otherwise. The tests were typically 16 stable averages in length with 0% overlap. All measurements taken were narrow-band Fast Fourier Transforms (FFT's) taken over the frequency range of 0.0 Hz to 125 Hz with \( \Delta f = 0.078 \) Hz.
2.3 Permissible Vibration Levels

Part of vibration control is deciding how much motion is permissible for parts of a building based on human sensitivity as well as for floors supporting the sensitive equipment. Criteria and limits need to be established whenever there is concern over vibration in a building. Sensitive equipment such as NMR equipment, etc., will need floor areas that are restricted to low levels of vibration. The equipment vendor usually provides vibration criteria for sensitive equipment as part of their site guide.

2.4 Response to Vibration in Buildings

Researchers have established various criteria for vibration. Results of work on an international level led to development of a set of standards published by the International organization for Standardization. The standards ISO 2631/1, 2631/3 (References 1 and 2) and ISO 6897 (Reference 3) give and evaluation of human exposure to whole-body vibration.

The American Standards Institute (ANSI) in conjunction with the Acoustical Society of America have developed and published a similar set of standards, ANSI S3.29-1983 (Reference 4). Recommendations from the ISO standards are shown in Figure 2.4-1 for people occupying various building areas and/or doing various types of work. The five lower Vibration Criteria (VC) curves are not part of the ISO standards but are often used to categorize levels of vibration for various types of use. These curves are provided only as a means of comparing the measured data to a generic standard. These curves have no direct relationship to the requirements of the NMR equipment being considered.
Figure 2.4-1
ISO Vibration Criteria & Sensitive Equipment (VC) Extensions
2.5 Locations Monitored

Four locations were monitored as shown in Figure 2.5-1. The accelerometers were attached directly to floor in the vertical and horizontal directions at points PT1 through PT4. Accelerometers were attached with wax at all locations.

Figure 2.5-1
7th Floor PWB Locations Monitored
2.6 Steady State Vibration Measurements

A typical plot of the current steady state vibration at each location is shown in Figure 2.6-1 through Figure 2.6-4.

Figure 2.6-1
PT1 - Steady State Vibration
Figure 2.6-2
PT2 - Steady State Vibration
Figure 2.6-3
PT3 - Steady State Vibration
Figure 2.6-4
PT4 - Steady State Vibration
2.7 Transient Vibration Measurements

Transient events from footfall traffic in the hallway and from within the room were captured and is shown in Figure 2.7-1 and Figure 2.6-2. In Figure 2.6-1, a single event was captured from a person walking down the corridor and past the proposed lab area. Vibration levels at 20 Hz are nearly 1.8x higher than the steady state levels.

Figure 2.7-1
PT1 - Footfall (Hallway) Vibration
In Figure 2.6-2, a single event was captured from a person walking inside the proposed lab area. Vibration levels near 20 Hz are over 3x higher than the steady state levels.
3.0 Results of Vibration Testing

Vibration measurements were made at four points near the proposed location for the new NMR equipment on seventh floor of the Phillips Wangensteen Building at the University of Minnesota. The measurements were performed using very sensitive seismic accelerometers and a spectrum analyzer. Data was collected in the vertical and two horizontal directions.

Results of the testing are shown on the preceding pages in terms of velocity in inches/second (rms). Steady state and transient conditions are shown.

Since vibration criteria was not provided by the equipment vendors, the results are not compared to specific equipment criteria. The measured data should be reviewed by the equipment vendors for their evaluation and comment.