BSC

Design Calculation or Analysis Cover Sheet

Complete only applicable items.

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2. Page 1

3. System	4. Document Identifier
Surface Nuclear Confinement HVAC System	060-M8C-VCT0-00400-000-00D

5. Title

CRCF 1 Heating and Cooling Load Calculation (Tertiary Non ITS)

6. Group

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8. Notes/Comments

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Attachments	Total Number of Pages
Attachments 1 through 11 (See Section 5 List of Attachments)	37

RECORD OF REVISIONS

9. No.	10. Reason For Revision	11. Total # of Pgs.	12. Last Pg. #	13. Originator (Print/Sign/Date)	14. Checker (Print/Sign/Date)	15. EGS (Print/Sign/Date)	16. Approved/Accepted (Print/Sign/Date)
00A	Initial Issue	235	235	Elpidio S. Castroverde	Francisco I. Banea	Tracy Johnson	Hadi Jalali
00B	Incorporates trend ENG-FY07-085 by removing Rooms 1001A, 1047A & 1049A. Add exhaust from Decon Room. Rebalance airflows and revised cooling/heating loads for AHU-F and AHU-H. Add exhaust to HVAC Rooms.	234	234	Elpidio S. Castroverde	Fred Favis	Tracy Johnson	Hadi Jalali
00C	Revised airflow rates in Table H-1 to satisfy CR # 11047. Revised cfm of EXH-B & EXH-E in Table 7A.	234	234	Elpidio S. Castroverde	Fred Favis	Tracy Johnson	Hadi Jalali
00D	Revised airflow rates in alignment and SAR reconciliation with the latest G.A. drawings including additional and updated room heat loads.	225	225	Monico C. Pingul, Jr. 12-18-07	Elpidio S. Castroverde 12/18/07	Tracy Johnson GREG N. GOULD FOR 12/18/07	For Hadi Jalali O.T. Asuncion 12/18/07

DISCLAIMER

The calculations contained in this document were developed by Bechtel SAIC Company, LLC (BSC) and are intended solely for the use of BSC in its work for the Yucca Mountain Project.

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TABLES

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ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
ACH	air changes per hour
AHU	air handling unit
ANSI	American National Standard Institute
ASD	Adjustable Speed Drive
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BSC	Bechtel SAIC Company, LLC
Btu/h	British thermal unit per hour
CLF	cooling load factor
CLTD	cooling load temperature difference (or differential)
CRCF 1	Canister Receipt and Closure Facility 1
DIRS	Document Input Reference System
DOE	U.S. Department of Energy
HVAC	heating, ventilating, and air conditioning
ITS	important to safety
PDC	Project Design Criteria
WP	Waste Package
WBGT	wet bulb globe temperature

1. PURPOSE

The purpose of this calculation is to determine the following quantities for heating, ventilating, and air conditioning (HVAC) subsystems serving the non-ITS tertiary confinement areas of the Canister Receipt and Closure Facility 1 (CRCF 1):

- Room-by-room cooling and heating loads
- Room airflow rates
- Subsystem airflow rates
- Required outdoor air rates
- Total cooling load per subsystem
- Total heating load per subsystem

The heating and cooling load calculation for the non-confinement (non-ITS) areas of the CRCF 1 will be determined in a separate calculation 060-M8C-VNI0-00100-000. The ITS tertiary confinement areas cooling and heating load will be determined in calculation 060-M8C-VCT0-00700-000.

Revision D of this calculation relates the HVAC subsystems (i.e. AHU-A, EXH-A) to HVAC equipment numbers consistent with References 2.2.25 through 2.2.37 and Reference 2.2.47. All HVAC equipment numbers are prefixed by "060-VCT0" unless otherwise noted.

2. REFERENCES

2.1 PROCEDURES/DIRECTIVES

2.1.1 EG-PRO-3DP-G04B-00037, Rev. 10, *Calculations and Analyses*. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20071018.0001.

2.2 DESIGN INPUTS

2.2.1 BSC (Bechtel SAIC Company) 2007. *Project Design Criteria Document*. 000-3DR-MGR0-00100-000-007. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20071016.0005; ENG20071108.0001.

2.2.2 ANSI/ASHRAE 62.1-2004. 2004 *Ventilation for Acceptable Indoor Air Quality*. Atlanta, Georgia: American Society of Heating, Refrigerating and Air-Conditioning Engineers. TIC: 256875. ISSN: 1041-2336.

2.2.3 Rudoy, W. and Cuba, J. F. 1979. *Cooling and Heating Load Calculation Manual*. ASHRAE GRP 158. New York, New York: American Society of Heating, Refrigerating, and Air Conditioning Engineers. TIC: 256896.

2.2.4 ASHRAE (American Society of Heating, Refrigerating & Air-Conditioning Engineers) 2005. *2005 ASHRAE® Handbook, Fundamentals.* Inch-Pound Edition. Atlanta, Georgia: American Society of Heating, Refrigerating and Air Conditioning Engineers. TIC: 257499. ISBN: 1-931862-70-2.

2.2.5 ASHRAE 2001. *2001 ASHRAE Handbook, Fundamentals.* Inch-Pound Edition. Atlanta, Georgia: American Society of Heating, Refrigerating and Air-Conditioning Engineers. TIC: 249910. ISBN: 1-883413-87-7.

2.2.6 ANSI/ASHRAE/IESNA Standard 90.1-2004. 2004 *Energy Standard for Buildings Except Low-Rise Residential Buildings*. I-P Edition. Atlanta, Georgia: American Society of Heating, Refrigerating and Air-Conditioning Engineers. TIC: 257067. ISSN: 1041-2336.

2.2.7 ASHRAE 2004. *2004 ASHRAE® Handbook, Heating, Ventilating, and Air-Conditioning Systems and Equipment.* Inch-Pound Edition. Atlanta, Georgia: American Society of Heating, Refrigerating and Air-Conditioning Engineers. TIC: 256641. ISBN:1-931862-47-8.

2.2.8 ASHRAE 2007. *2007 ASHRAE® Handbook, Heating, Ventilating, and Air-Conditioning Applications.* Inch-Pound Edition. Atlanta, Georgia: American Society of Heating, Refrigerating and Air-Conditioning Engineers. ISBN: 987-1-933742-14-4

2.2.9 NOT USED

2.2.10 BSC 2007. *Basis of Design for the TAD Canister-Based Repository Design Concept*. 000-3DR-MGR0-00300-000-001. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20071002.0042; ENG.20071026.003; ENG.20071108.0002; ENG.20071109.0001; ENG.20071120.0023; ENG.20071126.0049.

2.2.11 White, W.N.; Pahwa, A.; and Cruz, C. 2004. "Heat Loss from Electrical and Control Equipment in Industrial Plants: Part II-Results and Comparisons. "*ASHRAE Transactions, [ASHRAE Annual Meeting Technical Program, Nashville, Tennessee, June 27-30, 2004]. NA-04-9-2b,* 852-870. [Atlanta, Georgia]: American Society of Heating, Refrigerating and Air-Conditioning Engineers. TIC: 257590.

2.2.12 BSC 2007. *CRCF 1 Ventilation Confinement Zoning Analysis*. 060-M1A-VC00-00100-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070710.0001.

2.2.13 BSC 2007. *Canister Receipt and Closure Facility 1 General Arrangement Legend and General Notes.* 060-P10-CR00-00101-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20071212.0002.

2.2.14 BSC 2007. *Canister Receipt and Closure Facility 1 General Arrangement Ground Floor Plan*. 060-P10-CR00-00102-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20071212.0003.

2.2.15 BSC 2007. *Canister Receipt and Closure Facility 1 General Arrangement Second Floor Plan*. 060-P10-CR00-00103-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20071212.0004.

2.2.16 BSC 2007. *Canister Receipt and Closure Facility 1 General Arrangement Third Floor Plan*. 060-P10-CR00-00104-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20071212.0005.

2.2.17 BSC 2007. *Canister Receipt and Closure Facility 1 General Arrangement Roof Plan*. 060-P10-CR00-00105-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20071212.00006.

2.2.18 BSC 2007. *CRCF 1 Building Confinement Areas Air Leakage Calculation*. 060-M8C-VCT0-00100-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20071218.0004.

2.2.19 ANSI/ASHRAE Standard 55 -2004. 2004. *Thermal Environmental Conditions for Human Occupancy*. Atlanta, Georgia: American Society of Heating, Refrigerating and Air-Conditioning Engineers. TIC: 257066. ISSN: 1041-2336.

2.2.20 BSC 2007. *YM WPCS Equipment Power and Utility Gas Requirements.* 005128Q-0190-001-001. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070416.0001.

2.2.21 BSC 2007. *Canister Receipt and Closure Facility 1 General Arrangement Sections A and B.* 060-P10-CR00-00106-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20071212.0007.

2.2.22 BSC 2007. *Canister Receipt and Closure Facility 1 General Arrangement Sections C and D*. 060-P10-CR00-00107-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20071212.0008.

2.2.23 BSC 2007. *Canister Receipt and Closure Facility 1 General Arrangement Sections E and F*. 060-P10-CR00-00108-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20071212.0009.

2.2.24 BSC 2007. *Discipline Design Guide and Standards For Surface Facilities HVAC Systems*. 000-3DG-GEHV-00100-000-00A. ACC: ENG20070514.0007.

2.2.25 BSC 2007. *CRCF 1 Confinement 2nd Floor North HVAC Supply System Ventilation & Instrumentation Diagram.* 060-M80-VCT0-00202-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070904.0019.

2.2.26 BSC 2007. *CRCF 1 Confinement Canister Transfer Room HVAC Supply System Ventilation & Instrumentation Diagram.* 060-M80-VCT0-00201-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070904.0018.

2.2.27 BSC 2007. *CRCF 1 Confinement Cask Prep Room HVAC Supply System Ventilation & Instrumentation Diagram.* 060-M80-VCT0-00105-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070829.0021.

2.2.28 BSC 2007. *CRCF 1 Confinement 2nd Floor South HVAC Supply System Ventilation & Instrumentation Diagram.* 060-M80-VCT0-00205-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070904.0022.

2.2.29 BSC 2007. *CRCF 1 Confinement Ground Flr North Areas HVAC Supply System Ventilation & Instrumentation Diagram.* 060-M80-VCT0-00107-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070910.0009.

2.2.30 BSC 2007. *CRCF 1 Confinement Ground Flr South Areas HVAC Supply System Ventilation & Instrumentation Diagram.* 060-M80-VCT0-00111-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070910.0012.

2.2.31 BSC 2007. *CRCF 1 Confinement WP Loadout Room HVAC Supply System Ventilation & Instrumentation Diagram.* 060-M80-VCT0-00101-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070829.0017.

2.2.32 BSC 2007. *CRCF 1 ITS Confinement Areas HEPA Exhaust System – Train A Ventilation & Instrumentation Diagram.* 060-M80-VCT0-00103-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20071204.00005.

2.2.33 BSC 2007. *CRCF 1 ITS Confinement Areas HEPA Exhaust System – Train B Ventilation & Instrumentation Diagram.* 060-M80-VCT0-00104-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20071204.0006.

2.2.34 BSC 2007. *CRCF 1 Confinement Non-ITS Battery Room Exhaust System Ventilation & Instrumentation Diagram.* 060-M80-VCT0-00110-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070910.0011.

2.2.35 BSC 2007. *CRCF 1 Confinement Ground Floor Non-ITS HEPA Exhaust System Ventilation & Instrumentation Diagram.* 060-M80-VCT0-00113-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070910.0014.

2.2.36 BSC 2007. *CRCF 1 Confinement LLW & Misc. Areas Non-ITS HEPA Exhaust System Ventilation & Instrumentation Diagram.* 060-M80-VCT0-00303-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070904.0027.

2.2.37 BSC 2007. *CRCF 1 Confinement Non-ITS HEPA Exhaust System – 2nd Floor Ventilation & Instrumentation Diagram.* 060-M80-VCT0-00207-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070904.0024.

2.2.38 BSC 2007. *CRCF 1 Confinement ITS Battery Room Exhaust System – Train A Ventilation & Instrumentation Diagram.* 060-M80-VCT0-00402-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20071119.0024.

2.2.39 BSC 2007. *CRCF 1 Confinement ITS Battery Room Exhaust System – Train B Ventilation & Instrumentation Diagram.* 060-M80-VCT0-00404-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20071119.0026.

2.2.40 BSC 2007. *CRCF 1 Hot Water System Piping & Instrument. Diagram.* 060-M60-PSH0-00101-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070917.0012.

2.2.41 BSC 2007. *CRCF 1 Chilled Water System Piping & Instrument. Diagram.* 060-M60-PSC0-00101-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070918.0005.

2.2.42 BSC 2007. *CRCF Cask Cavity Gas Sampling System Piping & Instrument Diagram.* 060-M60-MRE0-00101-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070328.0008.

2.2.43 BSC 2007. *CRCF Liquid Low-Level Waste Sampling and Sump Piping & Instrument Diagram.* 060-M60-MWL0-00111-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20070330.0012.

2.2.44 Ingersoll Rand 2007. *Nirvana Cycling Refrigerated Dryer: Models NVC4000A and NVC4000W*. Revision 3, July 20, 2007. Davidson, North Carolina: Ingersoll Rand. TIC: 259809.

2.2.45 NOT USED

2.2.46 ANSI/ASHRAE 15-2001. 2001. *Safety Standard for Refrigeration Systems.* Atlanta, Georgia: American Society of Heating, Refrigerating and Air-Conditioning Engineers. TIC: 254098. ISSN 1041-2336.

2.2.47 BSC 2007. *CRCF 1 Confinement LLW & Misc. Areas HVAC Supply System. Ventilation & Instrumentation Diagram.* 060-M80 VCT0-00301-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.200700904.0025.

2.3 DESIGN CONSTRAINTS

None

2.4 DESIGN OUTPUTS

2.4.1 *CRCF 1 Equipment Sizing and Selection Calculation (Tertiary Non ITS).* 060-M8C-VCT0-00200-000.

2.4.2 *CRCF 1 Chilled Water System Sizing.* 060-M6C-PSC0-00100-000

2.4.3 *CRCF 1 Hot Water System Sizing.* 060-M6C-PSH0-00100-000

2.4.4 *CRCF 1 Composite Vent Flow Diagram Tertiary Confinement ITS Exhaust & Non-ITS HVAC Supply Systems*. 060-M50-VCT0-00101-000.

2.4.5 *CRCF 1 Composite Vent Flow Diagram Tertiary Confinement Non-ITS HVAC Systems*. 060-M50-VCT0-00201-000.

2.4.6 *CRCF 1 Composite Vent Flow Diagram Tertiary Confinement Non-ITS HVAC System Supply & Exhaust*. 060-M50-VCT0-00301-000.

2.4.7 *CRCF 1 Pressure Drop Calculation (Tertiary Non ITS).* 060-MC8-VCT0-00300-000.

3. ASSUMPTIONS

3.1 ASSUMPTIONS REQUIRING VERIFICATION

3.1.1 General Arrangement Drawings

It is assumed that the room name designations, dimensions, and constructions are as shown in the Canister Receipt and Closure Facility #1 (CRCF1) General Arrangement Drawings (References 2.2.13 through 2.2.17 and 2.2.21 through 2.2.23).

Rationale–The CRCF 1 General Arrangement drawings are presently in the preliminary design stage; hence, they are a preliminary source of information for determining the individual room thermal cooling and heating loads, for the HVAC systems. When the General Arrangement drawings are issued for construction the room designations, room dimensions, wall and roof construction, and material information will be verified.

3.1.2 Lighting

The lighting type in rooms 1200 Support Areas (Assumption 3.1.22), 1007A Battery Room (Normal Power), 2007A, 2007B, and in all first, second and third floor corridors excepting Rooms 1045, 2045, and 3045 Corridors is assumed to be fluorescent, with two lamps per fixture, a lighting density of 2 W/sq. ft., and a ballast factor of 1.2. The Canister Staging Rooms are assumed to have no lighting. The lighting for all of the remaining spaces is assumed to be High Bay, Incandescent-type, with a lighting density of 2 W/sq. ft.

Rationale–The lighting fixture types have not been specified at this stage in the design. A lighting density of 2 W/sq. ft. is a conservative estimate based, on the range of lighting densities allowed by the ANSI/ASHRAE/IESNA Standard 90.1-2004, *Energy Standard for Buildings Except Low-Rise Residential Buildings* (Reference 2.2.6, Tables 9.5.1 and 9.6.1). The assumption of two fluorescent lamps per fixture according to the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3, Table 4.1, p. 4.1) indicates an average ballast factor of 1.2 for use in the lighting portion of the load calculation for Room 1200 Support Areas (Assumption 3.1.22), 1007A Battery Room (Normal Power), 2007A, 2007B, and in all first, second and third floor corridors excepting Rooms 1045, 2045 and 3045 Corridors only, and High Bay type for the remaining areas. The canister staging areas, currently, are inaccessible; therefore, lighting load is ignored. The types of fixtures and lighting density will be verified with actual design lighting densities as the design progresses to completion.

3.1.3 Factor of Safety

It is assumed that the 1.2 factor of safety added to each room's cooling load is adequate to include heat gains in the supply ductwork and to include any uncertainties in equipment heat gain.

Rationale–Various heat gain quantities are not firmed-up at this time. Adding a factor of safety for any not verified cooling loads is common engineering practice. The factor of safety will be checked and adjusted as the design progresses to completion.

3.1.4 Equipment Heat Gain List

It is assumed that the equipment heat gain estimates used in Appendix E represent the best available information at this stage of the design.

Rationale–The design of the CRCF 1 is still in a preliminary stage, and accurate configurations and sizes of heat producing equipment are not known. However, a combination of preliminary input from interdepartmental disciplines yields conservative estimates for the Canister Receipt and Closure Facility 1 room heat gains. As the design progresses, Appendix E will be updated.

3.1.5 Air Temperature Leaving the Cooling Coil

It is assumed that the air temperature leaving the cooling coil is 51°F dry bulb and 46.36°F wet bulb.

Rationale–The actual air temperature leaving the cooling coil can only be determined upon selection of a cooling coil. In this calculation a leaving dry bulb temperature of 51°F is assumed, because a normal cooling coil design has a 6 to 9°F approach. A typical entering chilled water temperature is 42°F (Discipline Design Guide and Standards For Surface Facilities HVAC Systems 000-3DG-GEHV-00100-000-00A), the 51°F dry bulb leaving air temperature then meets the approach criteria. Per Assumption 3.1.12, the humidity ratio of the indoor air is assumed to be approximately 0.00646 lb moisture/lb of dry air. With this humidity ratio the cooling coil process is expected to be a sensible only process. Consequently, the leaving air humidity ratio will equal 0.00646 lb moisture/lb of dry air and this equates to a wet bulb temperature of 46.36°F.

3.1.6 Supply Fan Heat Gain

The bounding maximum temperature rise of the supply air as it passes through the supply fan and motor is 6°F for all subsystems.

Rationale–From *2004 ASHRAE HVAC Systems and Equipment* (Reference 2.2.7, Chapter 18, p. 18.6) for low pressure rises, the following equation is used to calculate the temperature rise across a fan:

$$\Delta T = \frac{\Delta P \cdot C_p}{\rho \cdot c_p \cdot J \cdot \eta} \qquad \text{(Eq. 1)}$$

where

ΔT = temperature rise across fan, °F
ΔP = pressure rise across fan, in. w.g.
C_p = conversion factor = 5.193 lbf/ft^2 in. w.g.
ρ = density of air, lbm/ft^3
c_p = specific heat = 0.24 Btu/lbm °F
J = mechanical equivalent of heat = 778.2 ft lbf/Btu
η = efficiency (combined efficiencies of motor and fan).

A pressure rise across the fan of 10 in. w.g. is a reasonably total pressure drop for the CRCF1 HVAC systems, especially the units containing HEPA filters. The density of the return air at the temperature entering the supply fans, 90°F (highest room and expected return air temperature), is approximately 0.063 lbm/ft^3. A conservative efficiency for a centrifugal fan is 0.84. A reasonable motor efficiency for motors in the range of 30 hp to 60 hp is 0.89 (Reference 2.2.4, Table 3A p. 30.7). These values give a temperature rise of 5.903°F. Rounding up to ΔT = 6°F gives a conservative estimate for the temperature rise across the supply fan and motor. This result derives from a subsystem with the worst pressure rise across fan. For other subsystems with lower pressure rise across fan, it will be re-evaluated in the detailed design.

3.1.7 Air Dryer Package Heat Rejection and Refrigerant Charge

It is assumed that the heat rejection from Nirvana Cycling Refrigerated Dryer Package, Model NVC4000A to be 241,193 Btu/h and the refrigerant charge to be 22 lb (Reference 2.2.44).

Rationale–The design of the refrigerated dryer located in Room 1028 is in the preliminary stage. The information is representative of similar packages throughout the compressor industry. As the design progresses to the detailed design phase, heat rejection from this equipment and the refrigerant charge will be verified and updated appropriately.

3.1.8 Room Ventilation Confinement Zoning

It is assumed that the ventilation confinement zoning classifications established in *CRCF 1 Ventilation Confinement Zoning Calculation* (Reference 2.2.12) are suitable for use and are the best available information at this time of the design.

Rationale–The *CRCF 1 Ventilation Confinement Zoning Calculation* (Reference 2.2.12) is a committed calculation and determines the ventilation confinement zoning for the rooms in the CRCF 1. When this calculation is confirmed, the ventilation confinement zoning will be verified.

3.1.9 Room Infiltration Rates

It is assumed that the infiltration rates presented in *CRCF 1 Building Air Leakage/Ventilation Calculation* (Section 7.2 of Reference 2.2.18) are suitable for use and are the best available information at this time of the design.

Table 1. Not Used

Rationale–This cooling and heating load calculation uses building layout that has been updated. The same building layouts were used in the *CRCF 1 Building Confinement Areas Air Leakage Calculation* (Reference 2.2.18). The infiltration rates presented in Table J of this calculation were taken from the Reference 2.2.18 and will be verified during final and detailed design of the facility.

3.1.10 U-Values for Metal Building

It is assumed that the U-Values for the metal building roofs and walls are as follows:

$$U_{ROOF} = 0.065 \text{ Btu/h-ft}^2\text{-°F and } U_{WALL} = 0.113 \text{ Btu/h-ft}^2\text{-°F}$$

Rationale–The design of the building envelope associated with this calculation is in the preliminary stage. These values are the best available information at this time, which are consistent with Table 5.5-5 and Figure B-1 of ASHRAE Standard 90.1-2004, *Energy Standard for Buildings Except Low-Rise Residential Buildings* (Reference 2.2.6). As the design progresses to the detailed design phase, the U-values will be verified and updated appropriately.

3.1.11 Air inleakage to Cask Preparation Room (Room 1026), WP Loadout Room (Room 1014) and Site Transporter Vestibule (Room 1027)

It is assumed that the air inleakage to the Cask Preparation Room (Room 1026) from Transportation Cask Vestibule (Room 1036) and Vestibule Annex (Room 1036A) will be the total inleakage from Rooms 1036 and 1036A as calculated in the *CRCF 1 Building Confinement Areas Air Leakage Calculation* (Reference 2.2.18), less the inleakage through the south wall and door of Room 1036.

Rationale–In Rooms 1036 and 1036A, inleakage were added due to the TAD operation that the doors between Rooms 1036 and 1036A and Rooms 1036 and 1026 will be open when the TAD canisters are being brought in. During this mode of operation, Rooms 1036 and 1036A is considered as one area. Therefore the inleakage through the south wall and door of Room 1036 is subtracted from the calculated inleakage for Room 1036. Following the preceding statement, from Section 7.2, of Reference 2.2.18, the total inleakage rate for Room 1036 will be (860 cfm – 596 cfm = 264 cfm) plus 2,360 cfm for Room 1036A = 2,624 cfm. The following conservative and bounding estimated air inleakage rate of 3,040 cfm will be used.

In addition, the calculated inleakage from Section 7.2, Reference 2.2.18 for Site Transporter Vestibule (Room 1027) is 1,760 cfm and WP Loadout Vestibule (Room 1014) is 6,220 cfm. For conservatism and bounding purposes, 3,690 cfm will be used for Room 1027 and 6,280 cfm will be used for Room 1014.

The assumed air inleakage values above will be verified during final and detailed design of the facility.

3.1.12 Humidity Ratio of Indoor Air

It is assumed that the humidity ratio of all air inside the facility for summer design will equal the humidity ratio of the design outdoor air condition 102°F dry bulb/65°F wet bulb which equals approximately 0.00646 lb moisture/lb of dry air.

Rationale–This is a reasonable assumption because the expected latent loads in the CRCF1 are very small compared to the amount of sensible loads expected. Due to infiltration and ventilation air entering the building on a continual basis and an expectation that all cooling coil

process will be sensible cooling only, the indoor air should reach, for design purposes, a steady state humidity level equal to the design outdoor conditions.

3.1.13 Large Exterior Metal Doors

It is assumed that the large exterior metal doors (roll-up, telescoping, etc.) have a U-Value of 1.15 Btu/h-ft^2-°F and the doors are 10 feet tall in Rooms 1002, 1047A, and 1049A.

Rationale–The width dimensions of the doors were derived from the CRCF 1 Layouts and Sections (Assumption 3.1.1). The heights of the doors in Rooms 1002, 1047A, and 1049A are not called out on the layouts. They have been estimated for this calculation. The large exterior metal doors have not been specified to date. The U-Value of 1.15 Btu/h-ft^2-F is taken from the Annunciated Steel Door entry in Table 6, p. 31.11 of 2005 *ASHRAE Fundamentals* (Reference 2.2.4). The number is the most conservative in the Table for Sectional Overhead Doors. The U-Value of the large exterior metal doors will be verified in detailed design.

3.1.14 Corridor Tunnel Construction

It is assumed that all corridors on the first, second and third level inside the concrete portion of the structure are of tunnel construction with a top of ceiling height of 15 feet except Corridors 1045, 2045, and 3045.

Rationale–The CRCF 1 General Arrangement Drawings (Assumption 3.1.1) show some of the corridors with a tunnel construction, but not all corridors are visible in the building sections. The current Plant Design computer model shows tunnel construction for the first and second level corridors. Because the Plant Design computer model cannot be referenced, the construction of the corridors must be assumed. The height of the top of the tunnel ceiling will be verified when the General Arrangement Drawings are issued for construction.

3.1.15 Temperature of External Stairwells and Fire Water Riser Valve Rooms

It is assumed that the internal temperatures of all externally located stairwells and all Fire Water Riser Valve Rooms are equal to the outdoor ambient temperature.

Rationale–The external stairwells and fire water riser valve rooms are not conditioned spaces at this point in the design of the CRCF 1. Their internal temperatures will, most likely, rise and fall with the outdoor temperature. Consequently, the load calculations for spaces adjacent to the exterior stairwells and fire water riser valve rooms can treat the walls as North facing exterior walls. The temperature will match the outdoor air temperature without too much additional solar gain because North-facing walls get very little solar heat gain. This assumption will be verified during the detailed design phase of the CRCF 1.

3.1.16 Miscellaneous Equipment Heat Load in Rooms 1026 and 2004

It is assumed that there are miscellaneous equipment heat load and future additional load shown in Appendix E that are not known at this time in Rooms 1026 and 2004.

Rationale–In the revision of this calculation from the previous version, it is not necessary to remove conservative equipment load at this time. Instead, the extra heat gain is categorized as a miscellaneous load. As the design progresses to the detailed design phase, it will be verified and updated.

3.1.17 Occupancy Numbers

It is assumed that the number of people in the occupied areas of the CRCF 1 Tertiary Non-ITS areas is as indicated in Table 2.

Table 2. Occupancy Numbers

Room No.	Room Name	No. of People
1200	Support Area (Assumption 3.1.22)	9
1015	WP Loadout Room	4
1026	Cask Preparation Room	10
1028	Utility Room	0
2003	Closure Support Room (North)	1
2004	Canister Transfer Room	2
2007	WP Closure Room	2
2007A	Closure Equipment Room	1
2007B	Closure Equipment Room	1
2011	Closure Support Room (South)	1
	Total	31

Rationale–The number of people is estimated based on conversations with the Operations group. The preliminary numbers have been confirmed in an e-mail shown in Attachment 10. In the previous version of this calculation, four people were assigned to Room 1028. From Reference 2.2.13, Room 1028 was renamed from Maintenance Room to Utility Room normally unoccupied, therefore number of people assigned was removed. These occupancy numbers will be verified as the design progresses.

3.1.18 Air Handling Unit and Fan Coil Unit Fan Configurations

It is assumed that all air handling units will be configured with a blow-thru fan configuration and the fan coil unit with a draw-thru configuration.

Rationale–The blow-thru configuration is assumed in order to keep the air flow values at a reasonable rate by lowering the supply air temperature to the room to a value equal to the leaving coil temperature. Fan coil units are more commonly configured in a draw-thru configuration in the HVAC industry.

3.1.19 Indoor Design Temperature for Corridors and Elevator Lobbies

It is assumed that a summer indoor design temperature of 82°F and a winter indoor design temperature of 65°F are suitable for use in corridors and elevator lobbies.

Rationale–Summer indoor design temperature of 82°F and winter indoor design temperature of 65°F are used for corridors because occupants are just passing through these areas. The corridors are not normally occupied for long periods of time.

3.1.20 Equipment Heat Gain in 1044A Elevator Mechanical Room

It is assumed that the equipment heat gain in Room 1044A Elevator Mechanical Room is equal to 1000 Watts.

Rationale–The equipment in Room 1044A has not yet been specified. A heat gain of 1000 W is assigned to this room as a placeholder for future equipment. During detailed design, the actual equipment heat gain will be verified.

3.1.21 Outdoor Ventilation Air

It is assumed that the *ASHRAE Standard 62.1* (Reference 2.2.2) outdoor air requirements are going to be adequately handled with infiltration air and air-handling unit (AHU) make-up air to offset exhaust air requirements.

Rationale–The fundamental design principle for the tertiary confinement area of CRCF 1 is the use of infiltration and engineered openings to cascade air throughout the building in order to maintain negative pressures between tertiary confinement areas and non-confinement areas. Because the design is in a very early stage, the number of people expected to occupy the building are relatively low (Assumption 3.1.17), and infiltration and exhaust make-up is the fundamental design principle for maintaining confinement it is reasonable to assume that the amount of outside air entering the spaces through infiltration and make-up will exceed the amount required by *ASHRAE Standard 62.1* (Reference 2.2.2). During detailed design, the subsystems that serve areas containing people can be analyzed in more depth.

3.1.22 Support Area

It is assumed that Rooms 1211 through 1213 and 1215 through 1222 can be modeled as one large space (room) for this load calculation with little effect on the overall results of this calculation. Moreover, the support area (formerly Room 1004) will be designated as Room 1200 for this calculation.

Rationale–The functions of Rooms 1211 through 1213 and 1215 through 1222 are not specifically defined at this point in the design. Grouping the rooms together as one Support Area allows a simplified approach to calculating the loads and airflows for the overall space without impacting overall calculation results. As the individual rooms are better defined in detailed design, the individual room loads will be calculated.

3.1.23 Tertiary Confinement Rooms Not Ventilated

It is assume that the following Tertiary Confinement rooms are not ventilated. Personnel Elevator 1044, Liquid LLW Sump P001, Personnel Elevator Machine Rooms R001 and R038, Freight Elevator Machine Rooms R002, R003, R041, and R048A, Utility Chase 1006, 2006L and 2006M, Freight Elevator 1047 and 1049, Stairs 1038, 1041, 2038, 2041, 3038, and 3041.

Rationale–The above mentioned Tertiary Confinement (C2) are not ventilated at this time, but as the design progresses it will be re-evaluated including room pressure and will be incorporated in the detailed design.

3.1.24 Electrical Bus Losses 5 Vertical Stack in Room 1007

It is assumed that the electrical bus losses in Room 1007 to 0.4 kW for 5 vertical stack.

Rationale-In the revision of this calculation from the previous version, the electrical bus heat losses were included however not indicated in Attachment 2. It is not necessary to remove this heat loss for conservatism. As the design progresses to the detailed phase, it will be verified and updated.

3.2 ASSUMPTIONS NOT REQUIRING VERIFICATION

3.2.1 Hours of Operation

It is assumed that the CRCF 1 will operate 7 days a week, 24 hours a day.

Rationale–It is expected that 7 day a week, 24 hours a day operation will be necessary to meet throughput requirements. But whether it is necessary or not, an assumption of continuous operation will provide the most conservative, bounding results for this calculation.

3.2.2 Not Used

3.2.3 Wall and Roof Color

A dark colored surface is assumed in determining the cooling load from sunlit walls and flat roofs, in order to provide an upper bounding solar radiation absorption component to the cooling load temperature differences generated.

Rationale–The assumption of a dark colored surface for the roof and walls in this calculation allows the use of a CLTD correction factor of 1.0; that maximizes the adjusted CLTD values. Because the color of the walls and roofs are not known at this time, assuming a dark color results in the most conservative upper bounding CLTD values.

3.2.4 F-factor for Slab on Grade

The F-factor for calculating heating loads from slab-on-grade floors is F=0.73.

Rationale–This value is the maximum value allowed by Table 5.5-5 of the *Energy Standard for Buildings Except Low-Rise Residential Buildings* (Reference 2.2.6). Using the maximum value allowed for calculating heating loads provides an adequate margin of safety factor.

3.2.5 Lighting Load to Space

For the calculation of cooling loads, it is assumed that 100% of the lighting load is transmitted to the space.

Rationale–Assuming 100% of the lighting load is transmitted to the space provides a maximum, upper bounding, heat gain contribution to the space from lighting for conservatism and safety factor.

3.2.6 Cooling Load Factor for Lighting

The lighting Cooling Load Factor (CLF) for every hour of the load calculation is equal to 1.0.

Rationale–Per Assumption 3.2.1 the CRCF 1 is assumed to operate 7 days a week, 24 hours a day. Section 4.1 of the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3) states that a CLF value of 1.0 should be used when lights are on more than 16 hours a day.

3.2.7 Cooling Load Factor for People

The person (CLF) for every hour of the load calculation is equal to 1.0.

Rationale–Per Assumption 3.2.1, the CRCF 1 is assumed to operate 7 days a week, 24 hours a day. It is noted, from Table 4.6 of the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3) that the sensible heat cooling load factors for people would approach a value of 1.0 for people in the space for 24 hours per day, since a CLF of 0.97 is listed in the table for people in the space for a total of 18 hours.

3.2.8 Cooling Load Factor for Equipment

The equipment (CLF) for every hour of the load calculation is equal to 1.0.

Rationale–Per Assumption 3.2.1, the CRCF 1 is assumed to operate 7 days a week, 24 hours a day. It is noted, from Table 4.11 of the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3) that the cooling load factors for equipment (unhooded appliances, motors, etc as shown in the Table) would approach a value of 1.0 for equipment operating for 24 hours per day, since the CLF of 0.98 is listed in the table for equipment operating 18 hours.

4. METHODOLOGY

4.1 QUALITY ASSURANCE

This calculation was prepared in accordance with procedure EG-PRO-3DP-G04B-00037, *Calculations and Analyses* (Reference 2.1.1). The Tertiary Non-ITS portion of the Surface Nuclear Confinement HVAC system discussed in this calculation is classified Non-ITS in the *Basis of Design for the TAD Canister-Based Repository Design Concept* (Reference 2.2.10, Section 19.1.2) because during operation of HVAC systems do not mitigate the consequences of a radioactive release. Therefore, the approved version of this calculation is designated QA:N/A.

4.2 USE OF SOFTWARE

No software was used in this calculation.

4.3 METHODOLOGY

The calculation methodology outlined below is accomplished through the use of hand calculations.

1. Gather room information using the preliminary Canister Receipt and Closure Facility 1 General Arrangements (Assumption 3.1.1), and develop a Room Load Information Sheet for each room. Additionally, determine U-values for any roofs, walls, partitions, ceilings, and floors. See Appendix A for Room Load Information Sheets and U-Values for this calculation.

2. Calculate room-by-room cooling loads using the CLTD/CLF method and heating loads using the temperature difference method presented in the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3). Heating loads from slab-on-grade floors are calculated using the simplified slab perimeter method given by Equations 39 and 40 of *2005 ASHRAE Fundamentals* (Reference 2.2.4, Chapter 29). See Section 6.1.3.

3. Calculate the room airflow rates required to satisfy each room's cooling load using the room-by-room cooling loads. See Section 6.2.1.

4. Calculate each subsystem's airflow rate by summing all the peak space airflow rates belonging to each subsystem. This is a conservative approach since the rooms' peak cooling loads do not occur at the same time. See Section 6.2.2.

5. Calculate the minimum required outdoor air rate using ANSI/ASHRAE 62.1-2004, *Ventilation for Acceptable Indoor Air Quality* (Reference 2.2.2, Section 6.2). See Section 6.2.3.

6. Calculate the room-by-room exhausts airflow rates based on the subsystem requirements. See Section 6.2.3 and Tables H-1 and H-2 in Appendix H.

7. Calculate the cooling and heating ventilation loads from the required outdoor air rates determined above. See Section 6.3.

8. Calculate the cooling (coil) load for each subsystem by determining the cooling coil entering conditions, the mixed air conditions based on the psychometric equations in Appendix D, and using cooling coil leaving conditions from Assumption 3.1.5. The mixed air is the mixture of the return air and the outside air. See Section 6.3.

9. Calculate the heating (coil) loads for each subsystem. See Section 6.3.

5. LIST OF ATTACHMENTS

		Number of Pages
Attachment 1:	E-mail Regarding Waste Cask Heat Gain Information	2
Attachment 2:	E-mail Regarding CRCF 1 Electrical Equipment Heat Gain Information	8
Attachment 3:	E-mail Regarding Environmental, Safety & Health Equipment Heat Gain Information	6
Attachment 4:	E-mail Regarding Waste Package Closure Equipment Room & Control Room Design Temperature	3
Attachment 5:	Not Used	1
Attachment 6:	E-mail Regarding Mechanical Handling Group Equipment Heat Gain Information	4
Attachment 7:	Not Used	1
Attachment 8:	E-mails Regarding Instrumentation and Controls Equipment Heat Gain Information	4
Attachment 9:	E-mail Regarding Operations Equipment Heat Gain Information	2
Attachment 10:	E-mail Regarding Occupancy Numbers in CRCF 1 Building.	3
Attachment 11:	E-mail Regarding Mechanical Handling Equipment Heat Gain Diversity Factor	3

6. BODY OF CALCULATION

6.1 ROOM-BY-ROOM COOLING AND HEATING LOADS

6.1.1 Outdoor Design Conditions

This calculation uses the meteorological conditions at Mercury, Nevada for the cooling and heating load calculations as directed in Section 4.9.2.3.1 of the *Project Design Criteria Document* (Reference 2.2.1). The following data is taken from Tables 1A and 1B of Chapter 27 of *2001 ASHRAE Fundamentals Handbook* (Reference 2.2.5):

- Site: Mercury, Nevada
- North latitude: 36.62°
- West longitude: 116.02°
- Elevation: 3,310 ft
- Heating Dry Bulb Temperature, 99.6% value: 24°F
- Cooling Dry Bulb/Mean Coincident Wet Bulb Temperatures, 0.4% value: 102°F/65°F
- Daily Temperature Range: 25.9°F

The 0.4% annual percentile design value for cooling and the 99.6% design value for heating are used for confinement and sensitive areas as directed by the *Project Design Criteria Document* (Reference 2.2.1).

6.1.2 Indoor Design Conditions

This calculation uses the summer and winter indoor design temperatures presented in Table 3 as a guide for assigning individual room design temperatures. As for humidity, the normally occupied areas the maximum dew point shall be 62.2°F. There are no established lower humidity limits for thermal comfort (*ASHRAE Standard 55-2004, Section 5.2.2* (Reference 2.2.19). Currently, no project requirements exist dictating the need for minimal humidity levels for special processes or equipment needs.

For winter design conditions, there is the possibility for the humidity levels to reach low percentage levels and humidification may be desirable in occupied areas to reduce skin and eye dryness and in some areas to reduce static electricity generation. But it will not be addressed at this time since the spaces, processes, and equipment for this facility have not yet been designed in detail.

The indoor design temperature guide was not used in this calculation but the temperature shown in this table is in line or closer to the design temperature guide.

Table 3. Indoor Design Temperatures

Rooms/Areas	Summer/Winter
Normally Unoccupied Areas (with Occasional Short Term occupancy): (e.g. Exit / Entrance Vestibules, Electrical & Mechanical Equipment Rooms, WP Closure, Gas Bottle Storage Room, Gas Sampling Room)	90°F (summer)/65°F (winter) See Note 4
Cask Unloading Room, Canister Staging Room, WP Positioning Room	100°F (summer)/65°F (winter) See Note 2
Maintenance Room, Prep Area, WP Load-out area, Canister Transfer Area	79°F (summer)/65°F (winter) See Notes 4 and 5
Corridors and Elevator Lobbies	82°F (summer)/65°F (winter) Assumption 3.1.19
Battery Room	77°F (summer)/77°F (winter) See Note 3
WP Control Room, WP Closure support Room, Closure Equipment Room, Support Areas	78°F maximum (summer)/70°F (winter) See Note 1

NOTES:

1. A 78°F room design temperature maximum is confirmed in an e-mail from the Mechanical Handling Group (See Attachment 4). A value of 78°F is used in the listed rooms except the support areas for energy conservation purposes. For the Support Areas, a 76°F dry bulb (summer) temperature is used for extra conservatism and comfort. The winter design temperature meets a typical energy conservation temperature of 68°F with some conservatism.
2. These rooms are normally unoccupied and are similar to the Mechanical Equipment Room in Table 1, Chapter 25 of 2007 ASHRAE Applications (Reference 2.2.8) which recommends a maximum room temperature of the "Design Outdoor Temperature + 10°F = (112°F). Electrical equipment (such as a CCTV) within the room cannot sustain a room temperature higher than 104°F therefore 100°F was used as a design room temperature for conservatism.
3. From Table 1, Chapter 25 of 2007 ASHRAE Applications (Reference 2.2.8).
4. Refer to Section 3.2 of Discipline Design Guide and Standards For Surface Facilities HVAC Systems (Reference 2.2.24)
5. A summer indoor design temperature of 79°F is used, in Rooms 1015 and 1026 because the air from those rooms is used as cascaded air to cool adjacent areas. Rooms 1028 and 2004 can have long-term personnel occupancy so 79°F is used rather than the warmer temperature.

6.1.3 Room-by-Room Cooling Load Calculation

As stated in Section 4.3, the cooling loads are calculated using the CLTD/CLF method presented in the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3). For each room the cooling load is calculated considering the cooling load contribution of the following load components: roofs, walls, partitions, lighting, people, equipment, and infiltration. The cooling load contributions from the floors (slab-on-grade) are ignored. The equations used to calculate the various components of the cooling load are given in Appendix C. The specific values used in these equations are given in the Room Load Information Sheets presented in Appendix A. An explanation regarding the sources of the information contained in the Room Load Information Sheets is given at the beginning of Appendix A. U-values for roofs, walls, and partition types are calculated and presented at the end of Appendix A.

The unadjusted ASHRAE values of CLTD are presented in Appendix B. The unadjusted roof CLTD values correspond to a Type-12 (6-in. h.w. concrete with 1 in. or 2 in. insulation) roof and Type 1 (steel with 1 in. or 2 in. insulation) per Table 3.8 in the *Cooling and Heating Load*

Calculation Manual (Reference 2.2.3). Per note 4 of Table 3.8 of Reference 2.2.3, an effective CLTD of 29 is used for the Type-12 roof for each solar time because the CRCF 1 concrete roof has an R-value of approximately 35 (hr ft^2 °F)/Btu greater than the Type-12 roof selected. Also, per note 4 of Table 3.8 of Reference 2.2.3, the CLTD values of a Type 2 roof are used for calculating the cooling load from the metal room because of a higher calculated resistance of the roof. The unadjusted CLTD values for the wall Types B and G (Reference 2.2.3, Table 3.10) are given in Appendix B. These wall types are determined from Table 3.9 of the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3) by determining the best comparison of the CRCF 1 walls with the types given in the table. Because the R-value of the CRCF thick concrete wall is not significantly greater than the Type B wall chosen, a CLTD correction per note 4 of Table 3.10 in Reference 2.2.3 is not required.

The unadjusted CLTD values in Appendix B need to be corrected for latitude-month, color, indoor design temperature, and outdoor design temperature before being used in the cooling load equations. See Appendix B for the equations used to correct the unadjusted roof and wall CLTD values. The Latitude and Month corrections for the roofs and walls are given in Table B-2. For the correction of the Roof CLTD and the Wall CLTD, the K-factor is equal to 1.0 based on Assumption 3.2.3. For the correction of the Roof CLTD, the f-factor is taken at 1.0 for conservatism. The monthly outdoor design temperatures used in this calculation are shown in Table B-3. The summer design conditions of 102°F dry bulb/65°F wet bulb are assigned to June, July, August, and September for a more conservative cooling load result. Table F-1 and Table F-2 present the room-by-room roof and wall load calculations, respectively, for the peak month and hour of each room. The roof and wall totals for each room are summarized in Table 4.

The CLF values are also provided in Appendix B, Table B-1. The CLF values for lighting, people, and equipment are all equal to 1.0 based on Assumptions 3.2.6, 3.2.7, and 3.2.8 respectively.

Partition loads are handled in a simplified and conservative manner in this calculation. Partition loads due to wall partitions are considered only when there is a heat gain into the room or space. The negative load value is not considered for the spaces on the side of the partition that experience a heat loss. This method was chosen in this preliminary/committed calculation to make the hand calculations simpler yet conservative by not having to track down every heat gain or loss from the multiple partitions and temperature differences that could be experienced by any single room. The amount of conservatism is seen by totaling the Partition Load column in Table 4. If all partition gains and losses were accounted for, then this total would be equal to zero.

Infiltration sensible load is calculated by using Equation D-14 using infiltration cfm from *CRCF 1 Building Confinement Areas Air Leakage Calculation* (Reference 2.2.18) and Assumption 3.1.9 with air temperature from outdoor design condition and room design temperature. The infiltration load is calculated in Appendix J, Table J-1. The results are summarized in Table 4.

Latent load using equation D-15 is equal to zero because the humidity ratio is constant for outside air and inside air conditions.

For corridors 2006A – 2006K at second floor, total infiltration air were divided to each individual corridor through percentage by area as presented in Table J-1.

Heat loss for cascade air from lower room temperature to higher room temperature were neglected for conservatism. Heat gain for cascade air applies only for Rooms 1007A and 1015. Heat gain is also calculated by using Equation D-14 as presented in Table J-1.

In order to determine the peak cooling load for each room, the maximum value of the sum of the roof, wall, partition, lights, people, equipment, and infiltration heat gains for all months and hourly times is determined. See Example A1.1 in the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3) for an example on how to determine the room peak cooling load. The peak month and hour for each room served by the CRCF1 HVAC systems is given in Table 4.

A summary of the cooling load calculations is given in Table 4 for both sensible and latent loads. For conservatism, a 20% factor of safety has been added to the room peak sensible and latent loads to account for duct heat gain (Assumption 3.1.3) and to account for any unknowns at this stage of the design. The rooms are presented in numerical order per expected service by subsystem.

Table 4. Cooling Load Summary

			SENSIBLE COOLING, Btu/h											LATENT COOLING, Btu/h				
Room No. Note 1	**Room Name** Note 1	**Room Peak Mo/hr** Note 2	**Roof** Note 3	**Walls** Note 4	**Partitions** Note 5	**People** Note 6	**Lights** Note 7	**Equip-ment** Note 8	**Cascade** Note 9	**Infil-tration** Note 9	**Room Peak Sensible** Note 10	**Factor of Safety** Note 11	**Room Total Peak Sensible** Note 12	**People** Note 6	**Equip-ment** Note 8	**Room Peak Latent** Note 13	**Factor of Safety** Note 11	**Room Total Peak Latent** Note 14
Rooms served by AHU-A (AHU-00001 & 2) - Second Floor North Areas																		
2001	HVAC Room	6/16	3,337	8,371	0	0	31,877	10,700	0	6,642	60,928	1.2	73,113	0	0	0	1.2	0
2002	Instrument and Electrical Shop	6/16	3,293	2,458	0	0	14,335	0	0	821	20,907	1.2	25,088	0	0	0	1.2	0
2003	Closure Support Room (North)	6/16	3,114	`	24,492	250	16,451	101,782	0	857	146,947	1.2	176,336	200	0	200	1.2	240
2003A	Personnel Access Room (North)	All	0	0	1,414	0	1,393	0	0	0	2,806	1.2	3,367	0	0	0	1.2	0
2005	HVAC Room	6/20	4,287	14,488	0	0	38,499	17,355	0	4,714	79,343	1.2	95,211	0	0	0	1.2	0
2006A	Corridor	6/16	732	13,709	4,315	0	10,649	0	0	1,428	30,833	1.2	37,000	0	0	0	1.2	0
2006B	Corridor	6/15	0	0	4,800	0	6,553	0	0	1,250	12,603	1.2	15,123	0	0	0	1.2	0
2006J	Corridor	6/15	1,097	0	6,480	0	9,338	0	0	1,428	18,343	1.2	22,012	0	0	0	1.2	0
2006K	Corridor	6/15	0	0	5,382	0	4,751	0	0	1,250	11,382	1.2	13,659	0	0	0	1.2	0
2007A	Closure Equipment (North)	6/15	0	0	4,419	250	2,457	18,950	0	0	26,077	1.2	31,292	200	0	200	1.2	240
2045	Corridor	6/15	0	4,510	0	0	1,843	0	0	2,500	8,853	1.2	10,623	0	0	0	1.2	0
2045A	Storage Room	6/10	0	3,020	0	0	683	0	0	4,285	7,988	1.2	9,586	0	0	0	1.2	0
2046	Elevator Lobby	9/15	0	1,160	0	0	683	0	0	3,214	5,056	1.2	6,067	0	0	0	1.2	0
2048	Elevator Lobby	6/16	0	6,082	0	0	3,208	0	0	14,285	23,575	1.2	28,290	0	0	0	1.2	0
3001	Corridor	6/16	1,540	36,838	0	0	13,106	0	0	21,784	73,268	1.2	87,922	0	0	0	1.2	0
3045	Corridor	6/16	1,335	5,610	0	0	1,843	0	0	1,786	10,574	1.2	12,688	0	0	0	1.2	0
3045A	Storage Room	6/15	494	2,416	0	0	683	0	0	3,571	7,164	1.2	8,597	0	0	0	1.2	0
3046	Lobby	9/15	438	1,304	0	0	683	0	0	2,857	5,282	1.2	6,338	0	0	0	1.2	0
3048	Elevator Lobby	6/15	2,323	6,388	0	0	3,208	0	0	12,142	24,061	1.2	28,874	0	0	0	1.2	0
AHU-A (AHU-00001 & 2), TOTAL =			**21,990**	**106,354**	**51,302**	**500**	**162,240**	**148,787**	**0**	**84,816**	**575,990**		**691,188**	**400**	**0**	**400**		**480**
Room served by AHU-B (AHU-00003 & 4) - Second Floor Transfer Room 2004																		
2004	Canister Transfer Room	6/22	23,159	115,876	104,733	500	149,762	265,510	0	23,409	682,950	1.2	819,540	400	0	400	1.2	480
AHU-B (AHU-00003 & 4), TOTAL =			**23,159**	**115,876**	**104,733**	**500**	**149,762**	**265,510**	**0**	**23,409**	**682,950**		**819,540**	**400**	**0**	**400**		**480**
Room served by AHU-C (AHU-00005 & 6) - Ground Floor Cask Preparation Room 1026																		
1026	Cask Preparation Room	9/16	6,476	22,528	39,851	2,500	56,315	362,482	0	0	490,152	1.2	588,182	2,000	0	2,000	1.2	2,400
AHU-C (AHU-00005 & 6), TOTAL =			**6,476**	**22,528**	**39,851**	**2,500**	**56,315**	**362,482**	**0**	**0**	**490,152**		**588,182**	**2,000**	**0**	**2,000**		**2,400**
Rooms served by AHU-D (AHU-00007 & 8) - Second Floor, South Areas																		
2006D	Corridors	6/15	1,097	0	0	0	9,338	0	0	1,428	11,863	1.2	14,236	0	0	0	1.2	0
2006E	Corridor	6/15	0	0	4,568	0	5,734	0	0	1,428	11,730	1.2	14,077	0	0	0	1.2	0
2006F	Corridor	9/15	0	349	3,864	0	4,259	0	0	1,250	9,722	1.2	11,667	0	0	0	1.2	0
2006G	Corridor	9/22	526	21,117	4,315	0	10,649	0	0	1,428	38,035	1.2	45,642	0	0	0	1.2	0
2006H	Corridor	6/15	0	0	3,974	0	4,751	0	0	1,250	9,975	1.2	11,970	0	0	0	1.2	0
2007B	Closure Equipment (South)	6/15	0	0	4,419	250	2,457	18,950	0	0	26,077	1.2	31,292	200	0	200	1.2	240
2008	HVAC Room	6/21	3,337	15,051	0	0	31,877	25,717	0	6,642	82,625	1.2	99,150	0	0	0	1.2	0
2010	Maintenance and Operations Storage Room	6/22	3,293	3,163	0	0	14,335	0	0	821	21,612	1.2	25,934	0	0	0	1.2	0
2011	Closure Support Room (South)	6/17	3,114	1,381	24,492	250	16,451	101,782	0	857	148,327	1.2	177,993	200	0	200	1.2	240
2011A	Personnel Access Room (South)	All	0	0	1,414	0	1,393	0	0	857	3,663	1.2	4,396	0	0	0	1.2	0
2012	HVAC Room	9/22	3,016	20,819	0	0	37,270	28,347	0	3,214	92,666	1.2	111,199	0	0	0	1.2	0

			SENSIBLE COOLING, Btu/h											LATENT COOLING, Btu/h				
Room No. Note 1	**Room Name** Note 1	**Room Peak Mo/hr** Note 2	**Roof** Note 3	**Walls** Note 4	**Partitions** Note 5	**People** Note 6	**Lights** Note 7	**Equip-ment** Note 8	**Cascade** Note 9	**Infil-tration** Note 9	**Room Peak Sensible** Note 10	**Factor of Safety** Note 11	**Room Total Peak Sensible** Note 12	**People** Note 6	**Equip-ment** Note 8	**Room Peak Latent** Note 13	**Factor of Safety** Note 11	**Room Total Peak Latent** Note 14
2050	Elevator Lobby	6/16	0	5,942	0	0	3,208	0	0	12,499	21,649	1.2	25,979	0	0	0	1.2	0
3002	Corridor	6/15	770	10,988	0	0	6,553	0	0	11,428	29,739	1.2	35,687	0	0	0	1.2	0
3050	Elevator Lobby	6/16	2,323	8,833	0	0	3,208	0	0	11,428	25,792	1.2	30,951	0	0	0	1.2	0
AHU-D (AHU-00007 & 8), TOTAL =			**17,476**	**87,642**	**47,047**	**500**	**151,483**	**174,796**	**0**	**54,532**	**533,477**		**640,172**	**400**	**0**	**400**		**480**
Rooms served by AHU-E (AHU-00009 & 10) - Ground Floor North Areas																		
1005A	Corridor	6/15	0	900	14,556	0	10,812	0	0	0	26,268	1.2	31,521	0	0	0	1.2	0
1005B	Corridor	All	0	0	5,304	0	4,259	102	0	0	9,665	1.2	11,599	0	0	0	1.2	0
1005C	Corridor	All	0	0	1,800	0	5,980	102	0	0	7,882	1.2	9,458	0	0	0	1.2	0
1005D	Corridor	All	0	0	29,570	0	10,894	0	0	0	40,465	1.2	48,558	0	0	0	1.2	0
1005E	Corridor	All	0	0	15,523	0	11,140	0	0	0	26,663	1.2	31,996	0	0	0	1.2	0
1007	Electrical Room (Normal Power)	6/16	0	8,728	0	0	28,942	207,664	0	5,785	251,119	1.2	301,343	0	0	0	1.2	0
1007A	Battery Room (Normal Power)	All	0	0	7,332	0	3,276	0	1,179	0	11,788	1.2	14,145	0	0	0	1.2	0
1009	HVAC Room	All	0	0	0	0	3,413	4,261	0	0	7,674	1.2	9,209	0	0	0	1.2	0
1010	HVAC Room	6/20	0	1,121	0	0	10,444	4,686	0	0	16,250	1.2	19,500	0	0	0	1.2	0
1011	HVAC Room	6/20	0	2,954	1,440	0	23,754	60,726	0	0	88,875	1.2	106,650	0	0	0	1.2	0
1012	Maintenance Room(North CTM)	6/20	0	764	960	0	10,649	0	0	0	12,373	1.2	14,847	0	0	0	1.2	0
1016	Unassigned	All	0	0	4,140	0	3,003	0	0	0	7,143	1.2	8,572	0	0	0	1.2	0
1200	Support Area	All	0	0	28,557	2,250	28,342	21,601	0	0	80,749	1.2	96,899	1,800	0	1,800	1.2	2,160
AHU-E (AHU-00009 & 10), TOTAL =			**0**	**14,466**	**109,183**	**2,250**	**154,909**	**299,142**	**1,179**	**5,785**	586,914		**704,297**	**1,800**	**0**	**1,800**		**2,160**
Rooms served by AHU-F (AHU-00011 & 12) - Ground Floor South Areas																		
1005F	Corridor	All	0	0	29,570	0	10,894	0	0	0	40,465	1.2	48,558	0	0	0	1.2	0
1005G	Corridor	All	0	0	4,908	0	4,178	102	0	0	9,188	1.2	11,025	0	0	0	1.2	0
1005H	Corridor	All	0	0	7,195	0	6,094	102	0	0	13,391	1.2	16,070	0	0	0	1.2	0
1005J	Corridor	9/15	0	7,559	14,066	0	14,089	0	0	20,713	56,427	1.2	67,713	0	0	0	1.2	0
1017	Canister Staging Area #1	All	0	0	0	0	0	85,325	0	0	85,325	1.2	102,390	0	0	0	1.2	0
1020	Unassigned	All	0	0	4,140	0	3,003	0	0	0	7,143	1.2	8,572	0	0	0	1.2	0
1021	Canister Staging Area #2	All	0	0	0	0	0	30,717	0	0	30,717	1.2	36,860	0	0	0	1.2	0
1022	Canister Staging Area #3	All	0	0	0	0	0	85,325	0	0	85,325	1.2	102,390	0	0	0	1.2	0
1025	Canister Staging Area #4	All	0	0	0	0	0	20,478	0	0	20,478	1.2	24,574	0	0	0	1.2	0
1030	HVAC Room	All	0		0	0	3,413	4,261	0	0	7,674	1.2	9,209	0	0	0	1.2	0
1031	HVAC Room	6/22	0	723	0	0	10,444	4,686	0	0	15,852	1.2	19,023	0	0	0	1.2	0
1032	HVAC Room	9/22	0	4,492	1,440	0	23,754	60,726	0	857	91,269	1.2	109,523	0	0	0	1.2	0
1033	Maintenance Room	9/22	0	2,495	960	0	10,649	0	0	429	14,532	1.2	17,439	0	0	0	1.2	0
1034	Gas Sampling Room	All	0		0	0	3,618	171	0	0	3,789	1.2	4,547	0	0	0	1.2	0
1035	HVAC Room	9/22	0	4,419	0	0	14,335	8,140	0	1,286	28,179	1.2	33,815	0	0	0	1.2	0
1050	Elevator Lobby	6/17	0	5,072	5,376	0	3,208	0	0	30,712	44,369	1.2	53,242	0	0	0	1.2	0
AHU-F (AHU-00011 & 12), TOTAL =			**0**	**24,759**	**67,656**	**0**	**107,679**	**300,033**	**0**	**53,997**	**554,124**		**664,948**	**0**	**0**	**0**		**0**
Room served by AHU-G (AHU-00013 & 14) - Ground Floor Loadout Area 1015																		
1015	WP Loadout Room	6/23	8,719	17,405	45,639	1,000	63,482	267,792	7,963	0	412,000	1.2	494,400	800	0	800	1.2	960
AHU-G (AHU-00013 & 14), TOTAL =			**8,719**	**17,405**	**45,639**	**1,000**	**63,482**	**267,792**	**7,963**	**0**	**412,000**		**494,400**	**800**	**0**	**800**		**960**
Rooms served by AHU-H (AHU-00015 & 16) - Ground Floor LLW Areas																		

			SENSIBLE COOLING, Btu/h											LATENT COOLING, Btu/h				
Room No. Note 1	**Room Name** Note 1	**Room Peak Mo/hr** Note 2	**Roof** Note 3	**Walls** Note 4	**Partitions** Note 5	**People** Note 6	**Lights** Note 7	**Equip-ment** Note 8	**Cascade** Note 9	**Infil-tration** Note 9	**Room Peak Sensible** Note 10	**Factor of Safety** Note 11	**Room Total Peak Sensible** Note 12	**People** Note 6	**Equip-ment** Note 8	**Room Peak Latent** Note 13	**Factor of Safety** Note 11	**Room Total Peak Latent** Note 14
1001	LLW Staging Room	6/15	11,279	2,221	0	0	17,406	135	0	14,142	45,183	1.2	54,219	0	0	0	1.2	0
1002	North Maintenance Vestibule	6/15	3,671	5,601	0	0	5,666	102	0	7,500	22,539	1.2	27,046	0	0	0	1.2	0
1004	HVAC Room (LLW Areas HEPA Exhaust)	6/16	5,971	8,318	0	0	9,215	12,059	0	19,713	55,276	1.2	66,331	0	0	0	1.2	0
1044A	Elevator Mechanical Room	6/9	0	1,292	0	0	751	3,413	0	0	5,455	1.2	6,546	0	0	0	1.2	0
1045	Corridor	6/15	0	4,085	691	0	1,843	2,491	0	12,856	21,967	1.2	26,360	0	0	0	1.2	0
1046	Elevator Lobby	All	0	0	0	0	614	0	0	0	614	1.2	737	0	0	0	1.2	0
1048	Elevator Lobby	6/16	0	2,980	6,679	0	3,208	102	0	28,570	41,538	1.2	49,846	0	0	0	1.2	0
AHU-H (AHU-00015 & 16), TOTAL =			**20,921**	**24,495**	**7,370**	**0**	**38,703**	**18,302**	**0**	**82,780**	**192,572**		**231,087**	**0**	**0**	**0**		**0**
Room served by FCU-E (FCU-00005 & 6)																		
1028	Utility Room	6/20	0	12,463	0	0	31,673	208,432	0	5,785	258,353	1.2	310,024	0	0	0	1.2	0
FCU-E (FCU-00005 & 6), TOTAL =			**0**	**12,463**	**0**	**0**	**31,673**	**208,432**	**0**	**5,785**	**258,353**		**310,024**	**0**	**0**	**0**		**0**
Rooms served by Cascade Air																		
1018	WP Positioning Room (North)	All	0	0	0	0	16,041	85,325	0	0	101,366	1.2	121,639	0	0	0	1.2	0
1019	WP Positioning Room (South)	All	0	0	0	0	16,041	85,325	0	0	101,366	1.2	121,639	0	0	0	1.2	0
1023	Cask Unloading Room (North)	All	0	0	0	0	6,143	85,325	0	0	91,468	1.2	109,762	0	0	0	1.2	0
1024	Cask Unloading Room (South)	All	0	0	0	0	6,143	85,325	0	0	91,468	1.2	109,762	0	0	0	1.2	0
2007	Waste Package Closure Room	6/15	2,501	0	8,990	500	23,891	63,387	0	643	99,912	1.2	119,894	400	0	400	1.2	480
OVERALL TOTALS (Note 15)=			**101,242**	**425,989**	**481,771**	**7,750**	**984,506**	**2,449,964**	**9,142**	**311,748**	**4,772,112**		**5,726,535**	**6,200**	**0**	**6,200**		**7,440**

Notes:1. Obtained from Room Load Information Sheets in Appendix A.
2. Determined using the Cooling and Heating load calculation methodology on a room-by-room basis. Month and hour can be hand checked by calculating loads differing from the months and hours shown. The term "All" is used when external loads are either not present or are constant and the entire room load is constant for all peak months and hours.
3. From Appendix F, Table F-1.
4. From Appendix F, Table F-2.
5. From partition and ceiling data contained in the Room Load Information Sheets in Appendix A. See the Room Load Information Sheets for additional remarks about partition and ceiling loads per room.
6. From People information and data in Room Load Information Sheets in Appendix A and Equation C-7 and C-8 in Appendix C.
7. Lighting loads are calculated using Equation C-6 in Table C-1 of Appendix C and specific values from Room Load Information Sheets in Appendix A. A unit conversion of 3.413 Btu/h/Watt was used.
8. Equipment loads are calculated using Equations C-9, C-10, and C-11 in Table C-1 of Appendix C and data from the Room Load Information Sheets in Appendix A. See the Room Load Information Sheets for any additional remarks about loads per room.
9. From Table J-1 in Appendix J.
10. Summation of Roof, Walls, Partitions, People, Lights, Equipment, Cascade, and Infiltration sensible loads.
11. See Assumption 3.1.3.
12. Total of Room Peak Sensible multiplied by factor of safety.
13. Sum of People, Cascade, Infiltration and Equipment latent loads.
14. Total of Room Peak Latent multiplied by factor of safety.
15. Totals are given for informational purposes in order to get an indication of the overall loads in CRCF 1. They are not necessarily meant to indicate the cooling load for any single HVAC subsystem.

6.1.4 Room-by-Room Heating Load Calculation

The room-by-room heating loads are calculated using the equations presented in Appendix C. As stated in Section 4.3 the heating loads are calculated using the method presented in the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3). Heating load due to conduction through the floors is calculated using the perimeter heat loss factor equation. Room information is taken from the Room Load Information Sheets presented in Appendix A.

Partition loads are handled in a simplified and conservative manner in this calculation. Partition loads due to wall partitions and ceiling partitions are considered only when there is a heat loss from the room or space. Heat gain is not considered for the spaces on the side of the partition that may experience it. This method was chosen in this calculation to make the hand calculations simpler yet conservative by not having to track down every heat gain or loss from the multiple partitions and temperature differences that could be experienced by any single room. The amount of conservatism is seen in the total of the Partition Load column in Table 5. If all partition and ceiling gains and losses were accounted for, then this total would be equal to zero.

A summary of the components of the heating load and the Total Room Heat Load for each space is presented in Table 5. For conservatism, a 20% factor of safety has been added to the room heat loads to account for any unknowns at this stage of the design.

Table 5. Heating Load Summary

Room No. Note 1	Room Name Note 1	HEATING LOAD, Btu/h							
		Roof Note 2	Wall Note 2	Partition Note 2	Floor Note 3	Infil-tration Note 4	Room Heat Load Note 5	Factor of Safety Note 6	Room Total Heat Load Note 7
Rooms served by AHU-A (AHU-00001 & 2)									
2001	HVAC Room	5,936	42,169	0	0	26,538	74,643	1.2	89,571
2002	Instrument and Electrical Shop	3,966	4,294	0	0	1,712	9,971	1.2	11,965
2003	Closure Support Room (North)	4,265	3,379	18,037	0	2,004	27,685	1.2	33,222
2003A	Personnel Access Room (North)	0	0	1,189	0	0	1,189	1.2	1,427
2005	HVAC Room	7,626	40,698	0	0	18,834	67,158	1.2	80,590
2006A	Corridor	966	29,450	0	0	3,424	33,841	1.2	40,609
2006B	Corridor	0	0	0	0	2,996	2,996	1.2	3,596
2006J	Corridor	1,449	0	0	0	3,424	4,873	1.2	5,848
2006K	Corridor	0	0	0	0	2,996	2,996	1.2	3,596
2007A	Closure Equipment (North)	0	0	0	0	0	0	1.2	0
2045	Corridor	0	6,968	0	0	5,993	12,961	1.2	15,553
2045A	Storage Room	0	2,965	0	0	10,273	13,238	1.2	15,886
2046	Elevator Lobby	0	1,334	0	0	7,705	9,039	1.2	10,847
2048	Elevator Lobby	0	4,744	0	0	34,243	38,987	1.2	46,785
3001	Corridor	2,034	51,353	0	0	52,221	105,607	1.2	126,729
3045	Corridor	720	7,839	0	0	4,280	12,839	1.2	15,407
3045A	Storage Room	267	3,336	0	0	8,561	12,163	1.2	14,596
3046	Lobby	267	1,501	0	0	6,849	8,616	1.2	10,339
3048	Elevator Lobby	1,253	8,006	0	0	29,107	38,365	1.2	46,038
	AHU-A (AHU-00001 & 2)							**Total=**	**572,602**
Room served by AHU-B (AHU-00003 & 4)									
2004	Canister Transfer Room	27,886	171,560	0	0	48,797	248,243	1.2	297,891
	AHU-B (AHU-00003 & 4)							**Total=**	**297,891**
Room served by AHU-C (AHU-00005 & 6)									
1026	Cask Preparation Room	10,486	31,173	0	0	0	41,659	1.2	49,991
	AHU-C (AHU-00005 & 6)							**Total=**	**49,991**
Rooms served by AHU-D (AHU-00007 & 8)									
2006D	Corridors	1,449	0	0	0	3,424	4,873	1.2	5,848
2006E	Corridor	0	0	0	0	3,424	3,424	1.2	4,109
2006F	Corridor	0	812	0	0	2,996	3,808	1.2	4,570
2006G	Corridor	966	31,299	0	0	3,424	35,690	1.2	42,828
2006H	Corridor	0	0	0	0	2,996	2,996	1.2	3,596
2007B	Closure Equipment (South)	0	0	0	0	0	0	1.2	0
2008	HVAC Room	5,936	42,169	0	0	26,538	74,643	1.2	89,571

		HEATING LOAD, Btu/h							
Room No. Note 1	**Room Name** Note 1	**Roof** Note 2	**Wall** Note 2	**Partition** Note 2	**Floor** Note 3	**Infil-tration** Note 4	**Room Heat Load** Note 5	**Factor of Safety** Note 6	**Room Total Heat Load** Note 7
2010	Maintenance and Operations Storage Room	3,966	4,294	0	0	1,712	9,971	1.2	11,965
2011	Personnel Access Room (South)	4,265	0	18,037	0	2,004	24,306	1.2	29,167
2011A	HVAC Room	0	0	1,189	0	0	1,189	1.2	1,427
2012	HVAC Room	8,635	43,007	0	0	12,841	64,484	1.2	77,380
2050	Elevator Lobby	0	4,744	0	0	29,963	34,707	1.2	41,648
3002	Corridor	1,017	22,355	0	0	27,395	50,767	1.2	60,920
3050	Elevator Lobby	1,253	8,006	0	0	27,395	36,653	1.2	43,984
	AHU-D (AHU-00007 & 8)							**Total=**	**417,013**
Rooms served by AHU-E (AHU-00009 & 10)									
1005A	Corridor	0	1,894	0	419	0	2,313	1.2	2,776
1005B	Corridor	0	0	0	0	0	0	1.2	0
1005C	Corridor	0	0	0	0	0	0	1.2	0
1005D	Corridor	0	0	0	0	0	0	1.2	0
1005E	Corridor	0	0	0	0	0	0	1.2	0
1007	Electrical Room (Normal Power)	0	44,739	0	2,993	23,114	70,846	1.2	85,016
1007A	Battery Room (Normal Power)	0	0	6,768	0	0	6,768	1.2	8,122
1009	HVAC Room	0	0	0	0	0	0	1.2	0
1010	HVAC Room	0	0	0	0	0	0	1.2	0
1011	HVAC Room	0	8,371	0	0	0	8,371	1.2	10,045
1012	Maintenance Room(North CTM)	0	2,165	0	0	0	2,165	1.2	2,598
1016	Unassigned	0	0	0	0	0	0	1.2	0
1200	Support Area	0	0	10,199	0	0	10,199	1.2	12,239
	AHU-E (AHU-00009 & 10)							**Total=**	**120,794**
Rooms served by AHU-F (AHU-00011 & 12)									
1005F	Corridor	0	0	0	0	0	0	1.2	0
1005G	Corridor	0	0	0	0	0	0	1.2	0
1005H	Corridor	0	0	0	0	0	0	1.2	0
1005J	Corridor	0	20,566	0	4,609	49,653	74,827	1.2	89,793
1017	Canister Staging Area #1	0	0	0	0	0	0	1.2	0
1020	Unassigned	0	0	0	0	0	0	1.2	0
1021	Canister Staging Area #2	0	0	0	0	0	0	1.2	0
1022	Canister Staging Area #3	0	0	0	0	0	0	1.2	0
1025	Canister Staging Area #4	0	0	0	0	0	0	1.2	0
1030	HVAC Room	0	0	0	0	0	0	1.2	0
1031	HVAC Room	0	3,680	0	0	0	3,680	1.2	4,416
1032	HVAC Room	0	7,793	0	0	0	7,793	1.2	9,352
1033	Maintenance Room	0	4,330	0	0	0	4,330	1.2	5,196

		HEATING LOAD, Btu/h							
Room No. Note 1	**Room Name** Note 1	**Roof** Note 2	**Wall** Note 2	**Partition** Note 2	**Floor** Note 3	**Infil-tration** Note 4	**Room Heat Load** Note 5	**Factor of Safety** Note 6	**Room Total Heat Load** Note 7
1034	Gas Sampling Room	0	0	0	0	0	0	1.2	0
1035	HVAC Room	0	7,667	0	0	0	7,667	1.2	9,200
1050	Elevator Lobby	0	5,041	0	509	73,623	79,172	1.2	95,007
	AHU-F (AHU-00011 & 12)							**Total=**	**212,964**
Room served by AHU-G (AHU-00013 & 14)									
1015	WP Loadout Room	10,498	25,978	0	0	0	36,476	1.2	43,771
	AHU-G (AHU-00013 & 14)							**Total=**	**43,771**
Rooms served by AHU-H (AHU-00015 & 16)									
1001	LLW Staging Room	6,796	4,448	0	898	56,501	68,643	1.2	82,371
1002	North Maintenance Vestibule	2,212	12,109	0	509	29,963	44,793	1.2	53,751
1004	HVAC Room (LLW Areas HEPA Exhaust	3,598	11,119	0	2,245	78,759	95,721	1.2	114,865
1044A	Elevator Mechanical Room	0	1,631	0	329	0	1,960	1.2	2,352
1045	Corridor	0	1,186	0	239	30,819	32,244	1.2	38,693
1046	Elevator Lobby	0	0	0	0	0	0	1.2	0
1048	Elevator Lobby	0	3,781	0	509	68,486	72,776	1.2	87,331
	AHU-H (AHU-00015 & 16)							**Total=**	**379,364**
Room Served by FCU-E (FCU-00005 & 6)									
1028	Utility Room	0	42,169	0	2,993	23,114	68,276	1.2	81,931
	FCU-E (FCU-00005 & 6)							**Total=**	**81,931**
Rooms served by Cascade Air									
1018	WP Positioning Room (North)	0	0	0	0	0	0	1.2	0
1019	WP Positioning Room (South)	0	0	0	0	0	0	1.2	0

		HEATING LOAD, Btu/h							
Room No. Note 1	**Room Name** Note 1	**Roof** Note 2	**Wall** Note 2	**Partition** Note 2	**Floor** Note 3	**Infil-tration** Note 4	**Room Heat Load** Note 5	**Factor of Safety** Note 6	**Room Total Heat Load** Note 7
1023	Cask Unloading Room (North)	0	0	0	0	0	0	1.2	0
1024	Cask Unloading Room (South)	0	0	0	0	0	0	1.2	0
2007	Waste Package Closure Room	4,449	0	0	0	2,568	7,017	1.2	8,420
	Totals (Note 8)	**122,154**	**776,120**	**55,419**	**16,252**	**848,960**	**1,818,906**	**--**	**2,182,687**

NOTES:

1. From information and data contained in Room Load Information Sheets in Appendix A. See the Room Load Information Sheets for any additional remarks about loads per room.
2. From Equation C-12 in Appendix C and specific values from Room Load Information Sheets in Appendix A.
3. From Equation C-13 and C-14 in Appendix C and data from Room Load Information Sheets in Appendix A.
4. From Equation C-11A in Appendix C and data from Room Load Information Sheets in Appendix A.
5. Sum of Roof, Wall, Partition, Floor, and Infiltration loads.
6. Factor of safety to account for unknowns.
7. Total of Room Heat Load multiplied by factor of safety.
8. Totals are given for informational purposes in order to get an indication of the overall loads in CRCF 1. They are not necessarily meant to indicate the heating load for any single HVAC subsystem.

6.2 SUBSYSTEM AIRFLOW RATES

6.2.1 Space Airflow Rates

To calculate the airflow rates required by each room the Total Sensible Heat Equation (Equation D-14, Appendix D) is rearranged to solve for CFM.

$$CFM = \frac{Q_s}{60 \cdot d \cdot (0.24 + 0.444W) \cdot (T_L - T_E)} \quad \text{(Eq. 2)}$$

where

CFM = airflow rate, cu. ft./min
Q_s = sensible heat gain, Btu/h
d = density of incoming air, lb/cu. ft. @ T_E
W = humidity ratio, lb water vapor/lb dry air
T_L = dry bulb temperature of leaving air, °F
T_E = dry bulb temperature of entering air, °F
60 = minutes per hour
0.24 = specific heat of dry air, Btu/lb °F
0.444 = specific heat of water vapor, Btu/lb °F.

For each room, the sensible heat gain, Q_s, is taken from the Total Room Peak Sensible value presented in Table 4. The density of air at 3,310 feet elevation can be calculated using the psychrometric equations presented in Appendix D. For rooms served directly by air-handling units the entering air to the room is equal to the leaving coil temperature because the air-handling units are assumed to be configured with a blow-thru fan arrangement (Assumption 3.1.18). The room entering air temperature, T_E, is assumed at 51°F dry bulb and a corresponding wet bulb temperature shown in Appendix I based on the leaving cooling coil conditions (Assumption 3.1.5). The density of the entering air is equal to 0.068 lb/cu. ft. The humidity ratio of the incoming air is determined at the same conditions in lb water vapor/lb dry air shown in Appendix I. The quantity 0.444W equals 0.0029 and is treated as negligible. The leaving air temperature for each room is taken as the room design temperature for each particular room as indicated in the Room Load Information Sheets in Appendix A.

There is no direct supply air into the WP Positioning Rooms (Rooms 1018 and 1019), Cask Unloading Rooms (Rooms 1023 and 1024), and the WP Closure Room (Room 2007).

Air from Loadout Area (Room 1015) at 79°F with density of 0.065 lb/cu. ft. is cascaded into Rooms 1018 and 1019. This cascaded air will maintain the ambient temperatures in these rooms at 100°F. The cascaded air is then exhausted thru HEPA filter plenums with an exhaust fan.

For Rooms 1023 and 1024, air from Cask Preparation Room (Room 1026) at 79°F with density of 0.065 lb/cu. ft. is cascaded into these rooms. This cascaded air will maintain the ambient temperatures in these rooms at 100°F. The cascaded air is then exhausted thru HEPA filter plenums with an exhaust fan.

For Room 2007, air from WP Closure Support areas (Rooms 2003 and 2011) at 78°F with density of 0.065 lb/cu. ft. is cascaded into the room. This cascaded air will maintain the ambient temperature in this room at 90°F. The cascaded air is then recirculated back to the corresponding AHUs. For infiltration/cascade air cooling load calculation see Appendix J, Table J-1.

The values used in calculating the airflow rates and the results of the calculation are given in Table 6. Adjusted room sensible loads based on the rounded airflow rates are presented in Table 6. They represent the sensible cooling load capability of the airflow values selected for use in each room.

Table 6. Space Airflow Rates

Room No. Note 1	Room Name Note 1	Room Total Peak Sensible Btu/h Note 2	Density of Entering Air, ρ lb/ft^3 Note 3	Constant 60 x ρ x 0.24 Note 4	T_L °F Note 5	T_E °F Note 6	Required Airflow cfm Note 7	Use Airflow cfm Note 8	Adjusted Room Sensible Load Btu/h Note 9	Remarks
Rooms served by AHU-A (AHU-00001 & 2) - Second Floor North Areas										
2001	HVAC Room	73,113	0.068	0.9792	90	51	1,915	1,920	73,322	
2002	Instrument and Electrical Shop	25,088	0.068	0.9792	79	51	915	1,200	32,901	920 cfm is required for 79F. However, use 1,200 cfm to allow for future equipment load
2003	Closure Support Room (North)	176,336	0.068	0.9792	78	51	6,670	6,670	176,344	
2003A	Personnel Access Room (North)	3,367	0.068	0.9792	78	51	127	130	3,437	
2005	HVAC Room	95,211	0.068	0.9792	90	51	2,493	2,500	95,472	
2006A	Corridor	37,000	0.068	0.9792	82	51	1,219	1,220	37,033	
2006B	Corridor	15,123	0.068	0.9792	82	51	498	500	15,178	
2006J	Corridor	22,012	0.068	0.9792	82	51	725	730	22,159	
2006K	Corridor	13,659	0.068	0.9792	82	51	450	450	13,660	
2007A	Closure Equipment (North)	31,292	0.068	0.9792	78	51	1,184	1,190	31,462	
2045	Corridor	10,623	0.068	0.9792	82	51	350	350	10,624	
2045A	Storage Room	9,586	0.068	0.9792	82	51	316	320	9,714	
2046	Elevator Lobby	6,067	0.068	0.9792	82	51	200	200	6,071	
2048	Elevator Lobby	28,290	0.068	0.9792	82	51	932	940	28,534	
3001	Corridor	87,922	0.068	0.9792	82	51	2,896	2,900	88,030	
3045	Corridor	12,688	0.068	0.9792	82	51	418	420	12,749	
3045A	Storage Room	8,597	0.068	0.9792	82	51	283	290	8,803	
3046	Lobby	6,338	0.068	0.9792	82	51	209	210	6,375	
3048	Elevator Lobby	28,874	0.068	0.9792	82	51	951	960	29,141	
AHU-A (AHU-00001 & 2), TOTAL =		**691,188**						**23,100**		
Room served by AHU- B (AHU-00003 & 4) - Second Floor Transfer Room 2004										
2004	Canister Transfer Room	819,540	0.068	0.9792	79	51	29,891	29,900	819,786	
AHU-B (AHU-00003 & 4), TOTAL =		**819,540**						**29,900**		
Room served by AHU-C (AHU-00005 & 6) - Ground Floor Cask Preparation Room 1026										
1026	Cask Preparation Room	588,182	0.068	0.9792	79	51	21,453	21,460	588,382	
1005A	Corridor	N/A	N/A	N/A	N/A	N/A	820	820	N/A	Make up to exhaust air in HVAC Rooms at Ground Floor
AHU- C (AHU-00005 & 6), TOTAL =		**588,182**						**22,280**		
Rooms served by AHU-D (AHU-00007 & 8) - Second Floor South Areas										
2006D	Corridors	14,236	0.068	0.9792	82	51	469	470	14,267	
2006E	Corridor	14,077	0.068	0.9792	82	51	464	470	14,267	
2006F	Corridor	11,667	0.068	0.9792	82	51	384	390	11,839	
2006G	Corridor	45,642	0.068	0.9792	82	51	1,504	1,510	45,836	
2006H	Corridor	11,970	0.068	0.9792	82	51	394	400	12,142	
2007B	Closure Equipment (South)	31,292	0.068	0.9792	78	51	1,184	1,190	31,462	
2008	HVAC Room	99,150	0.068	0.9792	90	51	2,596	2,600	99,291	

Room No. Note 1	Room Name Note 1	Room Total Peak Sensible Btu/h Note 2	Density of Entering Air, ρ lb/ft³ Note 3	Constant 60 x ρ x 0.24 Note 4	T_L °F Note 5	T_E °F Note 6	Required Airflow cfm Note 7	Use Airflow cfm Note 8	Adjusted Room Sensible Load Btu/h Note 9	Remarks
2010	Maintenance and Operations Storage Room	25,934	0.068	0.9792	79	51	946	1,900	52,093	950 cfm is required for 79F. However, use 1,900 cfm to allow for future equipment load
2011	Closure Support Room (South)	177,993	0.068	0.9792	78	51	6,732	6,740	178,195	
2011A	Personnel Access Room (South)	4,396	0.068	0.9792	78	51	166	170	4,495	
2012	HVAC Room	111,199	0.068	0.9792	90	51	2,912	2,920	111,511	
2050	Elevator Lobby	25,979	0.068	0.9792	82	51	856	860	26,105	
3002	Corridor	35,687	0.068	0.9792	82	51	1,176	1,180	35,819	
3050	Elevator Lobby	30,951	0.068	0.9792	82	51	1,020	1,020	30,962	
AHU- D (AHU-00007 & 8), TOTAL =		**640,172**						**21,820**		
Rooms served by AHU-E (AHU-00009 & 10) - Ground Floor North Areas										
1005A	Corridor	31,521	0.068	0.9792	82	51	1,038	1,040	31,569	
1005B	Corridor	11,599	0.068	0.9792	82	51	382	390	11,839	
1005C	Corridor	9,458	0.068	0.9792	82	51	312	320	9,714	
1005D	Corridor	48,558	0.068	0.9792	82	51	1,600	1,600	48,568	
1005E	Corridor	31,996	0.068	0.9792	82	51	1,054	1,060	32,177	
1007	Electrical Room (Normal Power)	301,343	0.068	0.9792	90	51	7,891	7,900	301,692	
1007A	Battery Room (Normal Power)	14,145	0.068	0.9792	77	51	556	560	14,257	
1009	HVAC Room	9,209	0.068	0.9792	90	51	241	250	9,547	
1010	HVAC Room	19,500	0.068	0.9792	90	51	511	520	19,858	
1011	HVAC Room	106,650	0.068	0.9792	90	51	2,793	2,800	106,929	
1012	Maintenance Room(North CTM)	14,847	0.068	0.9792	90	51	389	390	14,894	
1016	Unassigned	8,572	0.068	0.9792	90	51	224	230	8,783	
1200	Support Area	96,899	0.068	0.9792	76	51	3,958	3,960	96,941	
AHU-E (AHU-00009 &10), TOTAL =		**704,297**						**21,020**		
Rooms served by AHU-F (AHU-00011 & 12) - Ground Floor South Areas										
1005F	Corridor	48,558	0.068	0.9792	82	51	1,600	1,600	48,568	
1005G	Corridor	11,025	0.068	0.9792	82	51	363	370	11,231	
1005H	Corridor	16,070	0.068	0.9792	82	51	529	530	16,088	
1005J	Corridor	67,713	0.068	0.9792	82	51	2,231	2,240	67,996	
1017	Canister Staging Area #1	102,390	0.068	0.9792	100	51	2,134	2,140	102,679	
1020	Unassigned	8,572	0.068	0.9792	90	51	224	230	8,783	
1021	Canister Staging Area #2	36,860	0.068	0.9792	100	51	768	770	36,945	
1022	Canister Staging Area #3	102,390	0.068	0.9792	100	51	2,134	2,140	102,679	
1025	Canister Staging Area #4	24,574	0.068	0.9792	100	51	512	520	24,950	
1030	HVAC Room	9,209	0.068	0.9792	90	51	241	250	9,547	
1031	HVAC Room	19,023	0.068	0.9792	90	51	498	500	19,094	
1032	HVAC Room	109,523	0.068	0.9792	90	51	2,868	2,870	109,602	
1033	Maintenance Room	17,439	0.068	0.9792	90	51	457	460	17,567	
1034	Gas Sampling Room	4,547	0.068	0.9792	90	51	119	120	4,583	
1035	HVAC Room	33,815	0.068	0.9792	90	51	885	890	33,988	
1050	Elevator Lobby	53,242	0.068	0.9792	82	51	1,754	1,760	53,425	

Room No. Note 1	Room Name Note 1	Room Total Peak Sensible Btu/h Note 2	Density of Entering Air, ρ lb/ft³ Note 3	Constant 60 x ρ x 0.24 Note 4	T_L °F Note 5	T_E °F Note 6	Required Airflow cfm Note 7	Use Airflow cfm Note 8	Adjusted Room Sensible Load Btu/h Note 9	Remarks
AHU-F (AHU-00011 & 12), TOTAL =		**664,948**						**17,390**		
Room served by AHU-G (AHU-00013 & 14) - Ground Floor Loadout Area										
1015	WP Loadout Room	494,400	0.068	0.9792	79	51	18,032	18,040	494,614	
AHU-G (AHU-00013 & 14), TOTAL =		**494,400**						**18,040**		
Rooms served by AHU-H (AHU-00015 & 16) - Ground Floor LLW Area										
1001	LLW Staging Room	54,219	0.068	0.9792	90	51	1,420	1,420	54,228	
1002	North Maintenance Vestibule	27,046	0.068	0.9792	90	51	708	710	27,114	
1004	HVAC Room (LLW Areas HEPA Exhaust)	66,331	0.068	0.9792	90	51	1,737	1,740	66,449	
1044A	Elevator Mechanical Room	6,546	0.068	0.9792	90	51	171	180	6,874	
1045	Corridor	26,360	0.068	0.9792	82	51	868	870	26,409	
1046	Elevator Lobby	737	0.068	0.9792	82	51	24	50	1,518	
1048	Elevator Lobby	49,846	0.068	0.9792	82	51	1,642	1,650	50,086	
AHU-H (AHU-00015 & 16), TOTAL =		**231,087**						**6,620**		
Room served by FCU-E (FCU-00005 & 6)										
1028	Utility Room	310,024	0.068	0.9792	90	57	9,594	9,600	310,211	
FCU-E (FCU-00005 & 6), TOTAL =		**310,024**						**9,600**		
Rooms served by Cascade Air										
1023	Cask Unloading Room (North)	109,762	0.065	0.9360	100	79	5,584	6,820	134,054	There is no direct supply air into this room, only ducted exhaust. Air is cascaded into this room from Cask Preparation Room (Rm. 1026), Cask Transfer Room (Rm. 2004) and Corridor (Rm. 1005A). See Appendix H.
1024	Cask Unloading Room (South)	109,762	0.065	0.9360	100	79	5,584	6,820	134,054	There is no direct supply air into this room, only ducted exhaust. Air is cascaded into this room from Cask Preparation Room (Rm. 1026), Cask Transfer Room (Rm. 2004) and Corridor (Rm. 1005J). See Appendix H.
1018	WP Positioning Room (North)	121,639	0.065	0.9360	100	79	6,188	7,150	140,540	There is no direct supply air into this room, only ducted exhaust. Air is cascaded into this room from Loadout Area (Rm. 1015)
1019	WP Positioning Room (South)	121,639	0.065	0.9360	100	79	6,188	7,150	140,540	There is no direct supply air into this room, only ducted exhaust. Air is cascaded into this room from Loadout Area (Rm. 1015)

Room No. Note 1	Room Name Note 1	Room Total Peak Sensible Btu/h Note 2	Density of Entering Air, ρ lb/ft^3 Note 3	Constant 60 x ρ x 0.24 Note 4	T_L °F Note 5	T_E °F Note 6	Required Airflow cfm Note 7	Use Airflow cfm Note 8	Adjusted Room Sensible Load Btu/h Note 9	Remarks
2007	Waste Package Closure Room	119,894	0.065	0.9360	90	78	10,674	10,680	119,958	There is no direct supply air into this room. Air is cascaded into this room from WP Closure Support Rooms (Rm. 2003/2011) and Closure Equipment Rooms (Rm. 2003A/2011A).

NOTES:

1. From Room Load Information Sheets in Appendix A.
2. From Table 4. Cooling Load Summary.
3. Density of supply air 3,310 ft altitude.
4. Constant based on Density of Air at 3,310 ft. altitude. Refer to Equation 3 in Section 6.2.1. For cascaded air, constant = 60 x 0.24 x 0.065 (density of room air at 79F, from Appendix I).
5. Temperature of Return Air leaving the room (dry bulb) - Same as the design room temperature (dry bulb) from Room Load Information Sheets in Appendix A.
6. Temperature of Supply Air entering room from leaving coil temperature for rooms served by air-handling unit and from adjacent room temperature of rooms with cascaded air.
7. From Equation 2.
8. Airflow rates rounded to next 10 cfm.
9. Adjusted room sensible load using rounded airflow rates.

6.2.2 Subsystem Airflow Rate

The total airflow rate for each air handling unit (AHU) and fan coil unit (FCU) in this calculation is determined by summing the room airflow rates in Table 6 for all the rooms intended to be served by a subsystem. The total airflow rates calculated in Table 6 for each expected subsystem are shown in Table 7.

Table 7. Subsystem Airflow Rates

Subsystem No.	Area Served	Total Airflow Rate (cfm)
AHU-A (AHU-00001 & 2)	Second and Third Floor North Areas	23,100
AHU-B (AHU-00003 & 4)	Second Floor Transfer Room 2004	29,900
AHU-C (AHU-00005 & 6)	Ground Floor Cask Prep Room 1026	22,280
AHU-D (AHU-00007 & 8)	Second Floor South Areas	21,820
AHU-E (AHU-00009 & 10)	Ground Floor North Areas	21,020
AHU-F (AHU-00011 & 12)	Ground Floor South Areas	17,390
AHU-G (AHU-00013 & 14)	Ground Floor Loadout Area 1015	18,040
AHU-H (AHU-00015 & 16)	Ground Floor LLW Areas	6,620
FCU-E (FCU-00005 & 6)	Utility Room 1028	9,600

6.2.3 Required Outdoor Air Ventilation and Exhaust Airflow Rate

The required outdoor air ventilation rate is calculated after analyzing the system exhaust rates, and the minimum required outdoor air rates. It is assumed in Assumption 3.1.21 that the *ASHRAE Standard 62.1-2004* (Reference 2.2.2) required outdoor airflow rates are satisfied with the amount of infiltration and exhaust make-up coming into the rooms and zones of the building.

For rooms with recirculated supply air, the exhaust is determined by the quantity of infiltration air coming into the room. For rooms that have no infiltration air, there will typically be no exhaust from that room, unless there is air cascaded from adjacent corridor into that room. For rooms where air recirculation is not permitted, exhaust air is determined by the sum of supply air and infiltration air. If there is no infiltration air in a room, the exhaust cfm is equal to supply cfm. Room by room supply air comes from Table 6 and infiltration air comes from *CRCF 1 Building Confinement Areas Air Leakage Calculation* (Reference 2.2.18) and Assumption 3.1.9. These values are presented in Table H-1.

There is no direct supply air for Rooms 1018, 1019, 1023, and 1024. Exhaust air for Rooms 1018 and 1019 are coming from Rooms 1015, 2007 and corridors 1005A and 1005J. Exhaust air for Rooms 1023 and 1024 is coming from Rooms 1026, 2004 and corridors 1005A and 1005J as indicated in Table H-1 Exhaust Airflow Rate. Exhaust cfm quantity for Rooms 1018, 1019, 1023, and 1024 are the total of cascade air from rooms indicated above.

All corridors have higher pressure compared to their adjacent rooms. A portion of direct supply air to corridors is cascaded to adjacent rooms to be returned back to Air Handling Unit. All

infiltration air to corridors are also cascaded to adjacent rooms to be exhausted to atmosphere as indicated in Table H-1 Exhaust Airflow Rate

Exhaust for Battery Room 1007A is based on Chapter 25 of *2007 ASHRAE Applications* (Reference 2.2.8) where it states that "the recommended hydrogen concentration in the battery room is 2% or less of room volume. When no battery design information is available, a general ventilation requirement exhaust rate of 2 to 4 air changes per hour (ACH) may be adequate for preventing the hydrogen concentration in the battery room from reaching the explosive limits". However, from p. 26.8 of ASHRAE HVAC Applications – 2003 the minimum number of air changes per hour is five.

For conservatism of this calculation 5 ACH will be used to calculate for the ventilation air requirement for the battery room to prevent the hydrogen concentration in battery room from reaching explosive limit. The battery room ventilation required for hydrogen concentration dilution will be:

$$Q_{VENT} = \frac{Volume \times ACH}{60} \qquad \text{(Eq. 4)}$$

where

Q_{VENT} = required ventilation airflow rate, cfm

$Volume$ = 5,600 ft^3 (volume of the battery room,=Area x height from Appendix A)

ACH = 5 air changes per hour required to prevent the hydrogen concentration in the battery room from reaching the explosive limits.

60 = conversion for 60 minutes per hour

$$Q_{VENT} = \frac{5{,}600 \times 5}{60}$$

$$Q_{VENT} = 467 \text{ cfm}$$

The ventilation airflow to the battery room is exhausted to outdoors, this is consistent with sound and practical engineering practice that (1) exhausting the ventilation air will avoid accumulation of combustible hydrogen gas in the space and (2) maintaining the room at negative pressure will prevent the escape/migration of combustible gas into the adjacent rooms.

As indicated in Table 6, the airflow rate required to maintain the Battery Room at the indoor design temperature of 77°F is 560 cfm. The total exhaust airflow rate from the Battery Room is 560 cfm + 100 cfm (cascading air into the room from adjoining electrical equipment room) = 660 cfm. This value is greater than the required exhaust of 467 cfm.

Summary of exhaust airflow rates in Table 7A are shown below.

Table 7A. Summary of Exhaust Airflow Rates

Exhaust Fan Tag No.	Area Served	Exhaust Airflow (cfm)
EXH-A (EXH-00001 & 2)	Battery Room	660
EXH-B (EXH-00003 & 4)	2nd and 3rd Floors	7,980
EXH-C (EXH-00009 & 10)	ITS-Areas 1st Floor	35,010
EXH-D (EXH-00011 & 12)	1st Floor North	7,845
EXH-E (EXH-00013 & 14)	1st Floor South	2,700

The total infiltration air is obtained by adding individual room by room infiltration air as presented in Appendix J. The total infiltration air in this calculation is 20,780 cfm.

The ventilation air for 100% recirculation subsystems AHU-A, AHU-B, AHU-D, AHU-E is zero.

The ventilation air for subsystem AHU-C serving Cask Preparation Room 1026 is determined by the amount of air to be exhausted in Rooms 1023 and 1024. Exhaust cfm for Rooms 1023 and 1024 is determined by the amount of cascade air from Room 1026 at 79°F to maintain room temperature of 100°F as explained in Section 6.2.1 and presented in Table H-1. 6150 cfm (6,000 cfm from Room 1026, 100 cfm from Room 2004 and 50 from corridor) cascaded to each for Rooms 1023 and 1024. 6,730 cfm infiltration air brought directly from outside through adjoining rooms (3690 cfm at Room 1027 and 3,040 cfm at Room 1036 and 1036A) to Room 1026. The total air from Room 1026 only to be cascaded to Rooms 1023 and 1024 is 12,000 cfm. The difference between 12000 cfm minus 6730 is 5270 cfm. Additionally another 820 cfm is needed at Ground Floor to make up the exhaust for HVAC Rooms therefore, adding 5,270 plus 820 equals 6,090 cfm and that is the ventilation air used for AHU-C. The ventilation air for each subsystem is shown in Appendix I.

The ventilation air for Subsystem AHU-F is determined by the total air supply (5,570 cfm) to Rooms 1017, 1021, 1022, and 1025, which are exhausted 100% directly to atmosphere plus 270 cfm (the net flow among exhaust, supply and infiltration) to Rooms 1020, 1030 through 1035 and 1050 which is also exhausted to atmosphere. The sum of 5,570 and 270 equals 5,840 cfm and is the ventilation air used for AHU-F as shown in Appendix I.

The ventilation air for subsystem AHU-G serving Loadout Area Room 1015 is determined by the amount of air to be exhausted in Rooms 1018 and 1019. Exhaust cfm for Rooms 1018 and 1019 is determined by the amount of cascade air from Room 1015 at 79°F to maintain room temperature of 100°F as explained in Section 6.2.1 and presented in Table H-1. 7,150 cfm (7,000 cfm from Room 1015, 100 cfm from Room 2004 and 50 from corridor) each for Rooms 1018 and 1019. 6,280 cfm infiltration air brought directly from outside through air intake louver to Room 1015. The total air from Room 1015 only to be cascaded to Rooms 1018 and 1019 is

14000 cfm. The difference between 14,000 cfm minus 6,280 cfm is 7,720 which equals the ventilation air used for AHU-G.

The outside ventilation air is calculated by taking th supply air total for AHU-H from Table 6 and subtracting the return airflow from the rooms served by AHU-H as given in Table H-1. The return air comes Room 1002 (1,010 cfm), Room 1044A (180 cfm), Room 1045 (870 cfm), Room 1046 (50 cfm), and Room 1048 (2,350 cfm). The return air total equals 4,460 cfm. The ventilation air is the supply air of 6,620 cfm – 4,460 cfm = 2,160 cfm for AHU-H.

6.3 TOTAL COOLING AND HEATING LOADS

6.3.1 Total Cooling Load

The total cooling load is the load required by the chilled water coil. In this calculation, it is determined by calculating the load required to cool the return/mixed air down to the leaving coil conditions. The conditions of the return air are required to determine the cooling load. This is accomplished by tracking the conditions of the air as it leaves the cooling coil and makes its way back to the air handling unit. The dry bulb temperature of the air leaving the cooling coil is assumed to be 51°F (Assumption 3.1.5). The properties of the air leaving the coil are presented in Appendix I.

Thermodynamic properties of moist air for each system were determined using psychrometric equations presented in Appendix D. The process of cooling the air from entering the coil to leaving coil conditions (supply air) is constant sensible cooling load process, where dew point temperature and humidity ratio are constant as shown in Appendix I.

For each subsystem as the return/mixed air passes through the supply fan, it gains 6°F of sensible heat per Assumption 3.1.6. The properties of moist air for each subsystem are presented in Appendix I.

Subsystems AHU-A, AHU-B, AHU-D, and AHU-E are 100% recirculation systems. Subsystems AHU-C, AHU-F, AHU-G, and AHU-H are partial recirculating systems. The total cooling load for each subsystem is determined by using equation D-16 and the values taken from Table 7 and Appendix I. The summary of subsystem cooling loads is shown in Table 8.

Table 8. Subsystem Total Cooling Loads

System No.	Airflow Rate cfm Note 1	Air Density Note 2	60 min/hr Note 3	h_1 Note 4	h_2 Note 5	Total Cooling Load Note 6
AHU-A (AHU-00001 & 2)	23,100	0.063	60	29.04	19.24	858,095
AHU-B (AHU-00003 & 4)	29,900	0.064	60	27.50	19.24	946,340
AHU-C (AHU-00005 & 6)	22,280	0.063	60	28.99	19.24	822,994
AHU-D (AHU-00007 & 8)	21,820	0.063	60	29.08	19.24	813,431
AHU-E (AHU-00009 & 10)	21,020	0.063	60	29.10	19.24	784,645
AHU-F (AHU-00011 & 12)	17,390	0.063	60	29.98	19.24	702,840
AHU-G (AHU-00013 & 14)	18,040	0.063	60	29.84	19.24	720,066
AHU-H (AHU-00015 & 16)	6,620	0.063	60	30.36	19.24	276,188
FCU-E (FCU-00005 & 6)	9,600	0.064	60	28.71	19.24	349,358

NOTES:

1. Subsystem airflow, from Table 6
2. Density of air entering the coil in pounds per cubic feet from Appendix I.
3. Minutes per hour conversion
4. Enthalpy of air 1 in Btu/h from Appendix I
5. Enthalpy of air 2 leaving the coil in Btu/lb from Appendix I.
6. Total cooling load for each subsystem

6.3.2 Total Heating Load

The subsystem heating load (total of room by room) plus the ventilation air load is the total heating load required by the hot water coil. For the 100% recirculation subsystems, the ventilation air load is zero. For the subsystem with outside air, ventilation load is determined by using equation D-14 and ventilation air cfm shown in Appendix I and based on winter outdoor and indoor air design conditions of 24°F and 65°F respectively. The density of outside air at 24°F dry bulb and 3,310 feet elevation is approximately 0.075 lbs/cu.ft. The summary of the subsystem total heating load is shown in Table 9.

6.3.3 Ventilation/Exhaust Requirement (for Room 1028)

From Assumption 3.1.7, refrigerated dryer is located in Room 1028. From Section 8.11.5 of Reference 2.2.46, the mechanical ventilation required to exhaust an accumulation of refrigerant due to leaks or rapture of the system shall be capable of removing air from the machinery room in not less than the following quantity:

$$Q = 100 \times (G)^{(0.5)}$$

where

Q = the airflow in cfm

G = the mass of refrigerant in pounds in the largest system, any part of which is located in the machinery room.

= 22 pounds (Assumption 3.1.7)

$Q = 100 \times (22)^{(0.5)}$
= 469 cfm, Use 540 cfm

Table 9. Subsystem Total Heating Loads

System No.	Outside air cfm Note 1	Air Density Note 2	60 min/hr Note 3	T_1 Note 4	T_2 Note 5	Ventilation Load Btu/h Note 6	Room Heating Load Btu/h Note 7	Total Heating Load Btu/h Note 8
AHU-A (AHU-00001 & 2)	0	-	60	65	24	0	572,602	572,602
AHU-B (AHU-00003 & 4)	0	-	60	65	24	0	297,891	297,891
AHU-C (AHU-00005 & 6)	6,090	0.075	60	65	24	1,123,605	49,991	1,173,596
AHU-D (AHU-00007 & 8)	0	-	60	65	24	0	417,013	417,013
AHU-E (AHU-00009 & 10)	0	-	60	65	24	0	120,794	120,794
AHU-F (AHU-00011 & 12)	5,840	0.075	60	65	24	1,077,480	212,964	1,290,444
AHU-G (AHU-00013 & 14)	7,720	0.075	60	65	24	1,424,340	43,771	1,468,111
AHU-H (AHU-00015 & 16)	2,160	0.075	60	65	24	398,520	379,364	777,884
FCU-E (FCU-00005 & 6)	0	-	60	65	24	0	81,931	81,931

NOTES:

1. From Appendix I.
2. Density of air entering the coil in pounds per cubic feet
3. Minutes per hour conversion
4. Winter room design condition.
5. Winter outside air design condition.
6. Ventilation Load
7. Total Room Heating Load for each subsystem from Table 5.
8. Total Heating Load is the sum of Room Load Heating Load and Ventilation Load.

7. RESULTS AND CONCLUSIONS

The room by room cooling and heating loads were calculated in Sections 6.1.3 and 6.1.4. The results are shown in Table 4 and Table 5, respectively, and not repeated here.

The room-by-room and subsystem airflow rates were calculated in Section 6.2.2. The results with all the room-by-room airflow rates are shown in Table 7. The subsystem airflow rates are summarized in Table 10.

The required outdoor air rates were calculated in Section 6.2.3. The infiltration air rates are shown in Appendix J and the ventilation air rates for each subsystem are shown in Appendix I.

The total cooling and heating loads for each subsystem were calculated in Section 6.3. The results are summarized in Table 10, below.

Table 10. Summary of Airflow Rates, Cooling Loads, and Heating Loads

Subsystem	**Supply Airflow Rate cfm** Note 1	**Outdoor Air Rate cfm** Note 5	**Total Sensible Cooling Load Btu/h** Note 2	**Total Latent Cooling Load Btu/h** Note 2	**Grand Total Cooling Load Btu/h** Note 3	**Total Heating Load Btu/h** Note 4
AHU-A (AHU-00001 & 2)	23,100	0	691,188	480	858,095	572,602
AHU-B (AHU-00003 & 4)	29,900	0	819,540	480	946,340	297,891
AHU-C (AHU-00005 & 6)	22,280	6,090	588,182	2,400	822,994	1,173,596
AHU-D (AHU-00007 & 8)	21,820	0	640,172	480	813,431	417,013
AHU-E (AHU-00009 & 10)	21,020	0	704,297	2,160	784,645	120,794
AHU-F (AHU-00011 & 12)	17,390	5,840	664,948	0	702,840	1,290,444
AHU-G (AHU-00013 & 14)	18,040	7,720	494,400	960	720,066	1,468,111
AHU-H (AHU-00015 & 16)	6,620	2,160	231,087	0	276,188	777,884
FCU-E (FCU-00005 & 6)	9,600	0	310,024	0	349,203	81,931
Grand Totals:					**6,273,801**	**2,176,322**
1 ton = 12,000 Btu/h					**= 523 tons**	

NOTES:

1. From Table 7
2. From Table 4
3. From Table 8
4. From Table 9
5. From Table I-1
6. From Table J-1

All results are calculated using the best information available at the present stage of the design. The results of this calculation are reasonable for inputs. As the design progresses, all internal and external heat gains/losses will be re-evaluated.

APPENDIX A: ROOM LOAD INFORMATION SHEETS AND U-VALUE CALCULATIONS

The following room load information sheets were assembled using a variety of references:

Room Number and Name: From General Arrangement Drawings (Assumption 3.1.1).

Room Area: Floor area take-off from the General Arrangement Drawings (Assumption 3.1.1) rounded to nearest 10 square feet.

Room Height: From General Arrangement Drawings (Assumption 3.1.1) Room height taken to top of floor above or top of roof.

Room Design Temperature (Summer/Winter): Assigned using the information presented in Section 6.1.2.

Room Design Relative Humidity (Summer/Winter): No requirement, not controlled.

Ventilation Confinement Classification: Assumption 3.1.8.

Roof U-Value: See the end of this appendix for U-Value calculations.

Roof Area: Taken to be equal to room area. Note that for corridors with a 15 ft ceiling height, and an interstitial space or chase with a roof above the ceiling, the roof area for the interstitial space or chase is added to the roof area for the corridor in order to account for that external load.

Roof Color: Roof color is not known at the time of this calculation. Conservatively, a dark roof color is assumed in this calculation (Assumption 3.2.3).

Wall Height: From General Arrangement Drawings (Assumption 3.1.1) or as noted. All wall heights are taken to the roof top-of-concrete for conservatism or floor-above top of concrete or as noted.

Wall Width: From General Arrangement Drawings (Assumption 3.1.1) or as noted.

Wall Orientation: Relative to the true north arrow on the General Arrangement Drawings (Assumption 3.1.1).

Wall U-Value: See the end of this appendix for U-Value calculations.

Wall Area: Product of Wall Height and Wall Width or as noted. Also, for conservatism, the areas of any vents, grilles, and pipes, and small exterior doors are included in the wall area. Note that for corridors with a 15 ft ceiling height, external exposure, and an interstitial space or chase above the ceiling, the wall area for the interstitial space or chase is added to the wall area for the corridor in order to account for that external load.

Wall Group: Wall group type is determined by comparing the wall types from the General Arrangement Drawings (Assumption 3.1.1) with the wall types presented in the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3).

Wall Color: Wall color is not known at the time of this calculation. Conservatively, a dark wall color is assumed in this calculation (Assumption 3.2.3).

Floor F-Value: Taken conservatively as F = 0.73 (Assumption 3.2.4).

Floor Perimeter: Taken from the General Arrangement Drawings (Assumption 3.1.1).

Partition U-Value: See the end of this appendix for U-Value calculations. When a room has multiple partitions, the highest U-Value is used to calculate the room partition load. Exceptions are as noted on the individual Room Load Information Sheet.

Partition Area: Partition lengths and heights taken from the General Arrangement Drawings (Assumption 3.1.1). All partition heights are taken to the roof top-of-concrete for conservatism. When a room has multiple types of partitions, the sum of the areas of all the types of partitions is used in conjunction with the highest partition U-Value as described above and largest temperature difference as described below. Exceptions are as noted on any individual Room Load Information Sheet.

Partition Temperature Difference: Taken as the temperature difference between the design room temperatures of the spaces on each side of the partition. For rooms with multiple partitions, the largest partition temperature difference is used to calculate the room partition load except as noted on any individual Room Load Information Sheets.

Ceiling U-Value, Area, and Temperature Difference: See the end of this appendix for U-Value calculations. When a room has multiple ceiling partitions, the highest U-Value is used to calculate the room ceiling partition load.

Ceiling Area: Ceiling area is taken from the General Arrangement Drawings (Assumption 3.1.1). No ceilings exist in the CRCF 1 except for some corridors. (See Assumption 3.1.14).

Ceiling Partition Temperature Difference: Taken as the temperature difference between the design room temperatures of the spaces on each side of the ceiling partition. For rooms with multiple ceiling partitions, the largest partition temperature difference is used to calculate the room partition load.

Light Type: The types of light fixtures are not known at this time. A two lamp fluorescent fixture is assumed and a ballast factor of 1.2 is used in Rooms 1200 (Assumption 3.1.22), 1007A, 2007A, 2007B and all corridors (except Corridors 1045, 2045 and 3045). The canister staging areas are assumed to have no lighting. The lighting for all of the remaining spaces is assumed to be High Bay, Incandescent-type. See Assumption 3.1.2.

Light Total Wattage: The light total wattage is not known at this time. A lighting density of 2 W/sq. ft. is assumed with 100% of all lighting load going to the space (Assumption 3.2.5). The Room Area value is used to determine Lights Total Wattage for a room even in instances where

the area of the ceiling may be greater due to the presence of tunnel-type corridors and battery rooms with ceilings that do not go up to structure. Light total wattage is equal to the room area x lighting density x ballast factor.

Light Ballast Factor: From Assumption 3.1.2 for Fluorescent lighting and Table 4.1 of the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3)

People Activity Type: Activity type is assigned by comparison of the type of space with the representative rates at which heat and moisture are given off by human beings in different states of activity as presented in *ASHRAE Fundamentals* (Reference 2.2.4, p. 30.4).

Number of People: Source indicated on Room Load Information Sheets of this appendix.

People Q Sensible: Sensible heat gain is from *ASHRAE Fundamentals* (Reference 2.2.4, p. 30.4).

People Q Latent: Latent heat gain is from *ASHRAE Fundamentals* (Reference 2.2.4, p. 30.4).

Equipment: Equipment heat gain, sensible and latent, comes from the sources noted in the Remarks column next to the heat gain listing.

Infiltration: Infiltration rates come from the sources noted in the Remarks column next to the listed infiltration rate.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1001 LLW Staging Room

						Remarks
Room Area (sf)	2,550	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.065	2,550			Roof 2, metal
Wall	32	30	NE	0.113	960	G		Wall 2, metal.
Wall								
Door								
Floor					F=0.73			Perimeter = 30 Feet

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2		Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat gain through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	5,100	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
135	0	From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks
1,320	See Assumption 3.1.9

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1002 North Maintenance Vestibule

						Remarks
Room Area (sf)	830	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.065	830			Roof 2, metal
Wall	-	-	NE	0.113	444	G		Wall 2, metal. See Note 1
Wall	32	36	N	0.113	1,152	G		Assumption 3.1.15. Wall 2, metal
Wall								
Door	10	10	NE	1.15	100	G		Metal, roll-up, See Note 1
Floor					F=0.73			Perimeter = 17 Feet

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2		Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	1,660	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
102		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks
700	See Assumption 3.1.9

Notes/Remarks

1. The overall wall height and width including the large exterior metal door is 32 ft. x 17 ft. for a total area of 544 sq. ft. The area of the wall, is 544 sq. ft. minus 100 sq. ft.(door area) which equals 444 sq. ft.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1004 HVAC Room (LLW Areas HEPA Exhaust)

						Remarks
Room Area (sf)	1,350	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary (Note 1)

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.065	1,350			Roof 2, metal
Wall	32	35	NE	0.113	1,120	G		Wall 2, metal
Wall	32	40	NW	0.113	1,280	G		Wall 2 metal
Wall								
Wall								
Floor					F=0.73			Perimeter = 75 Feet

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2		Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat gain through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	2,700	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks
	0			

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
12,059		From Equipment Heat Gain List (Assumption 3.1.4).

Infiltration

Airflow cfm	Remarks
1,840	See Assumption 3.1.9

Notes/Remarks

1. See Assumption 3.1.7.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1005A Corridor

						Remarks
Room Area (sf)	1,320	Rm. Height (ft)	15	See Note 1.		
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall	15	14	NE	0.22	210	B		Wall 1, Concrete
Wall								
Wall								
Door								
Floor					F=0.73			Perimeter = 14 Feet

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	6,065	8	Note 2.
Partition (winter)				No heat loss through partition.
Ceiling				

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	3,168	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
0	

Notes/Remarks

1. See Assumption 3.1.14 for assumed height of corridor ceiling/tunnel construction.

2. Partition Area=(170' x 15')+(170' x 7') = 3740 sq. ft. at U=0.30 and (155' x 15') = 2325 sq. ft. at U=0.2. Total = 6,065 sq. ft. using largest U-Value of 0.30.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1005B Corridor

						Remarks
Room Area (sf)	520	Rm. Height (ft)	15	See Note 1.		
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Door								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	2,210	8	Note 2.
Partition (winter)				No heat loss through partition.
Ceiling				

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	1,248	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
102		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. See Assumption 3.1.14 for assumed height of corridor ceiling/tunnel construction.
2. Partition Area=(65' x 15')+(65 x 7') = 1,430 sq. ft. at U=0.30 and (52' x 15') = 780 sq. ft. at U=0.2. Total = 2,210 sq. ft. using largest U-Value of 0.30.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1005C Corridor

						Remarks
Room Area (sf)	730	Rm. Height (ft)	15	See Note 1.		
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Door								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	750	8	Note 2.
Partition (winter)				No heat loss through partition.
Ceiling				

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	1,752	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
102		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. See Assumption 3.1.14 for assumed height of corridor ceiling/tunnel construction.
2. Partition Area=(50' x 15') = 750 sq. ft. at U=0.30. Heat gain is coming from Room 1012 and 1045. Largest adjacent room temperature is 90 F.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1005D Corridor

						Remarks
Room Area (sf)	1,330	Rm. Height (ft)	15	See Note 1		
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Door								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	5,476	18	Notes 2 and 3.
Partition (winter)				No heat loss through partition.
Ceiling				

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	3,192	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. See Assumption 3.1.14 for assumed height of corridor ceiling/tunnel construction.

2. Partition Area=(158' x 15')+(147' x 8') + (10' x 13') = 3,676 sq. ft. at U=0.30 and (32' x 15')+(88'x15') = 1,800 sq. ft. at U=0.2. Total = 5,476 sq. ft. using largest U-Value of 0.30.

3. Partition (summer) Temperature Difference is taken from the highest room design temperature of surrounding areas and floor above. The highest adjacent temperature is 100 F from Rooms 1017 and 1022.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1005E Corridor

						Remarks
Room Area (sf)	1,360	Rm. Height (ft)	15			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Door								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.2	4,312	18	See Note 1 and Note 2.
Partition (winter)				No heat loss through partition.
Ceiling				

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	3,264	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. Partition Area=(98' x 15')+(98' x 15')+(98 x 14) = 4,312 sq. ft. at U=0.20. Partition area of 1006 Utility Chase above is included in partition area for conservatism.

2. Partition (summer) Temperature Difference is taken from the highest room design temperature of surrounding areas and floor above. The highest adjacent temperature is 100 F. No internal temperature of 1006 Utility Chase will be determined in this calculation, so temperature will be taken at 100F.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1005F Corridor

						Remarks
Room Area (sf)	1,330	Rm. Height (ft)	15	See Note 1		
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	5,476	18	Notes 2 and 3.
Partition (winter)				No heat loss through partition.
Ceiling				

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	3,192	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. See Assumption 3.1.14 for assumed height of corridor ceiling/tunnel construction.

2. Partition Area=(158' x 15')+(147' x 8') + (10' x 13') = 3,676 sq. ft. at U=0.30 and (32' x 15')+(88'x15') = 1,800 sq. ft. at U=0.2. Total = 5,476 sq. ft. using largest U-Value of 0.30.

3. Partition (summer) Temperature Difference is taken from the highest room design temperature of surrounding areas and floor above. The highest adjacent temperature is 100 F from Rooms 1021 and 1025.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1005G Corridor

						Remarks
Room Area (sf)	510	Rm. Height (ft)	15	See Note 1.		
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Door								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	2,045	8	See Notes 2 and 3.
Partition (winter)				
Ceiling				

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	1,224	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
102		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. See Assumption 3.1.14 for assumed height of corridor ceiling/tunnel construction.

2. Partition Area=(55' x 15')+(55' x 8') = 1,265 sq. ft. at U=0.30 and (52' x 15') = 780 sq. ft. at U=0.2. Total = 2,045 sq. ft. using largest U-Value of 0.30.

3. Partition (summer) Temperature Difference is taken from the highest room design temperature of surrounding areas and floor above. The highest adjacent temperature is 90 F.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1005H Corridor

						Remarks
Room Area (sf)	740	Rm. Height (ft)	15	See Note 1		
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	2,998	8	See Notes 2 and 3.
Partition (winter)				
Ceiling				

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	1,786	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
102		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. See Assumption 3.1.14 for assumed height of corridor ceiling/tunnel construction.

2. Partition Area=(78' x 15')+(25' x 15') + (57' x 8') + (13'x10')+(24'x8')= 2,323 sq. ft. at U=0.30 and (45' x 15') = 675 sq. ft. at U=0.2. Total = 2,998 sq. ft. using largest U-Value of 0.30.

3. Partition (summer) Temperature Difference is taken from the highest room design temperature of surrounding areas and floor above. The highest adjacent temperature is 90 F.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1005J Corridor

						Remarks
Room Area (sf)	1,720	Rm. Height (ft)	15	See Note 1.		
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall	15	120	SW	0.22	1,800	B		Wall 1, Concrete
Wall	15	32	N	0.22	480	B		See Assumption 3.1.15. Wall 1, Concrete
Wall								
Door								
Floor					F=0.73			Perimeter = 154 Feet

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	5,861	8	See Notes 2 and 3.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	4,128	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
1,160	See Assumption 3.1.9

Notes/Remarks

1. See Assumption 3.1.14 for assumed height of corridor ceiling/tunnel construction.
2. Partition Area=(210' x 15')+(217' x 8') = 4,886 sq. ft. at U=0.30 and (65' x 15') = 975 sq. ft. at U=0.2. Total = 5,861 sq. ft. using largest U-Value of 0.30.
3. Partition (summer) Temperature Difference is taken from the highest room design temperature of surrounding areas and floor above. The highest adjacent temperature is 90 F.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1007 Electrical Room (Normal Power)

						Remarks
Room Area (sf)	4,240	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall	32	75	NE	0.22	2,400	B		Wall 1, Concrete
Wall	32	25	NW	0.22	800	B		Wall 1, Concrete
Wall	32	55	N	0.22	1760	B		See Assumption 3.1.15. Wall 1, Concrete
Wall								
Floor					F=0.73			Perimeter = 100 Feet

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partitions.
Partition (winter)				No heat loss through partitions.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	8,480	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
207,664		From Equipment Heat Gain List (Assumption 3.1.4).

Infiltration

Airflow cfm	Remarks
540	See Assumption 3.1.9

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1007A Battery Room (Normal Power)

						Remarks
Room Area (sf)	400	Rm. Height (ft)	14			
Indoor Design Conditions		Summer DB, °F	77	Relative Humidity	Not Controlled	
		Winter DB, °F	77	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.30	1,880	13	See Notes 1 and 2.
Partition (winter)	0.30	1,880	12	
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	960	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. Partition Area=(44' x 14')+(9' x 14') + (44'x9')= 1,138 sq. ft. at U=0.30 and (44' x 14') + (9' x 14') = 742 sq. ft. at U=0.2. Total = 1,950 sq. ft. using largest U-Value of 0.30.

2. Partition (summer) Temperature Difference is taken from the highest room design temperature of surrounding areas and floor above. The highest adjacent temperature is 90 F.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1009 HVAC Room

						Remarks
Room Area (sf)	500	Rm. Height (ft)	21			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	1,000	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks
				Room is normally unoccupied.

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
4,261		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1010 HVAC Room

						Remarks
Room Area (sf)	1,530	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall	16	22	NE	0.22	352	B		See Note 1. Wall 1, Concrete
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	3,060	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks
				Room is normally unoccupied.

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
4,686		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. This room has a NE facing wall above Corridor 1005A and above the roof of Room 1001.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1011 HVAC Room

						Remarks
Room Area (sf)	3,480	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall	16	58	NE	0.22	928	B		See Note 1. Wall 1, Concrete
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.20	720	10	See Note 2.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	6,960	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
60,726		From Equipment Heat Gain List (Assumption 3.1.4).

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. This room has a NE facing wall above Corridor 1005A and above the roof of Room 1001.

2. This room has a partition heat gain from Room 1017 through the partition above the Corridor 1005D tunnel construction. Partition Area = 16' x 45 ' = 720 sq. ft.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1012 Maintenance Room (North CTM)

						Remarks
Room Area (sf)	1,560	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall	16	15	NE	0.22	240	B		See Note 1. Wall 1, Concrete
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.2	480	10	No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	3,120	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks
				Room is normally unoccupied

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. This room has a NE facing wall above Corridor 1005A and above the roof of Room 1002.

2. This room has a partition heat gain from Room 1022 through the partition above the Corridor 1005D tunnel construction. Partition Area = 16’ x 30 ‘ = 480 sq. ft.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1015 WP Loadout Room

						Remarks
Room Area (sf)	9,300	Rm. Height (ft)	57			
Indoor Design Conditions		Summer DB, °F	79	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	8,260			See Note 1. Roof 1, concrete
Wall	30	96	NW	0.22	2,880	B		Wall 1, Concrete
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	13,830	11	See Note 2.
Partition (winter)				No heat loss through partitions.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	18,600	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks
Standing, Light work, Walking	4	250	200	See Assumption 3.1.17

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
267,792		From Equipment Heat Gain List (Assumption 3.1.4).

Infiltration

Airflow cfm	Remarks
0	.

Notes/Remarks

1. Roof area is less than floor area. See Building Section A from Assumption 3.1.1.

2. Approximate partition areas: Northeast Partition=3800 sq. ft., Southwest Partition=2430 sq. ft., Southeastern Partition=7600 sq. ft. For simplicity, all partitions taken at U=0.3 Btu/h ft^2 F. Adjacent room temperatures are 82F, 90F, and 100F. Because the partition area for adjacent spaces at 100F is small compared to the partition areas for adjacent spaces at 90F, the 90F adjacent room temperature is used for entire partition temperature difference. This prevents an overly conservative cooling load.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1016 Unassigned

						Remarks
Room Area (sf)	440	Rm. Height (ft)	30			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.30	1380	10	See Note 1.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	880	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. Partition load comes from Rooms 1017 and 1018 at 100 F.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1017 Canister Staging Area #1

						Remarks
Room Area (sf)	440	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	100	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
85,325		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1018 WP Positioning Room (North)

						Remarks
Room Area (sf)	2,350	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	100	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	4,700	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
85,325		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1019 WP Positioning Room (South)

						Remarks
Room Area (sf)	2,350	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	100	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	4,700	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
85,325		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1020 Unassigned

						Remarks
Room Area (sf)	440	Rm. Height (ft)	30			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.30	1,380	10	See Note 1.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	880	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. Partition load comes from Rooms 1017 and 1018 at 100 F.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1021 Canister Staging Area #2

						Remarks
Room Area (sf)	440	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	100	Relative Humidity	Not controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
30,717		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1022 Canister Staging Area #3

						Remarks
Room Area (sf)	310	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	100	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
85,325		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1023 Cask Unloading Room (North)

						Remarks
Room Area (sf)	900	Rm. Height (ft)	30			
Indoor Design Conditions		Summer DB, °F	100	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	1,800	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
85,325		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1024 Cask Unloading Room (South)

						Remarks
Room Area (sf)	900	Rm. Height (ft)	30			
Indoor Design Conditions		Summer DB, °F	100	Relative Humidity	Not controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	1,800	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
85,325		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1025 Canister Staging Area #4

						Remarks
Room Area (sf)	310	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	100	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
20,478		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1026 Cask Preparation Room

						Remarks
Room Area (sf)	8,250	Rm. Height (ft)	72			
Indoor Design Conditions		Summer DB, °F	79	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	8,250			Roof 1, Concrete
Wall	36	96	SE	0.22	3,456	B		Wall 1, Concrete
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	12,076	11	See Note 1.
Partition (winter)				No heat loss through partitions
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	16,500	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks
Standing, Light work, Walking	10	250	200	See Assumption 3.1.17

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
362,482		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks
0	

Notes/Remarks

1. Approximate partition areas: From Room 1034=1120 sq. ft. at 90F, From Room 1005H=256 sq. ft. at 82F, From Room 2006E=1275 sq. ft. at 82 F, From Room 2012=1445 sq. ft. at 90F, From Rooms 1022, 1023, 1024, and 1025=2850 sq. ft. at 100F, and From Room 2006D=5130 at 82F. For simplicity, all partitions taken at U=0.3 Btu/h ft^2 F. Because the partition area for adjacent spaces at 100F is small compared to the partition areas for adjacent spaces at lower temperatures, an approximate average of 90F adjacent room temperature is used for entire partition temperature difference. This prevents an overly conservative cooling load.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1028 Utility Room

						Remarks
Room Area (sf)	4,640	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall	32	25	NW	0.22	800	B		Wall 1, Concrete
Wall	32	60	SW	0.22	1,920	B		Wall 1, Concrete
Wall	15	13	SW	0.22	195	B		From Corridor tunnel. Wall 1, Concrete
Wall	32	55	N	0.22	1,760	B		See Assumption 3.1.15 Wall 1, Concrete
Floor					F=0.73			Perimeter = 100 Feet

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.31	6,550	11	See Note 1.
Partition (winter)				
Ceiling				

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	9,280	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks
Standing, Light work, Walking	4	250	200	See Assumption 3.1.17

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
208,432		From Equipment Heat Gain List (Assumption 3.1.4).

Infiltration

Airflow cfm	Remarks
540	See Assumption 3.1.9

Notes/Remarks

1. Partition Areas: From Room 1029 Concrete partition=55 ft L x 32 ft H =1,760 ft^2 at U=0.20. From Room 1029 through corridor tunnel=10 ft L x 15 ft H = 150 ft^2 at 0.30. From 2nd Floor Slab Area=4,640 ft^2 at U=0.31. Total Partition Area=6,550 ft^2 (partition and 2nd Floor Slab). The larger U-Value of 0.31 is used for conservatism.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1030 HVAC Room

						Remarks
Room Area (sf)	500	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	1000	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
4,261		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1031 HVAC Room

						Remarks
Room Area (sf)	1,530	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall	17	24	N	0.22	408	B		See Note 1. Wall 1, Concrete
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	3,060	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
4,686		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. This room has a wall above Corridor 1005J adjacent to Stairwell 1041. The wall is treated as facing north per Assumption 3.1.15.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1032 HVAC Room

						Remarks
Room Area (sf)	3,480	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall	16	54	SW	0.22	864	B		See Note 1. Wall 1, Concrete
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.2	720	10	See Note 2.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	6,960	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
60,726		From Equipment Heat Gain List (Assumption 3.1.4).

Infiltration

Airflow cfm	Remarks
80	

Notes/Remarks

1. This room has a NE facing wall above Corridor 1005J.

2. This room has a partition heat gain from Room 1021 through the partition above the Corridor 1005F tunnel construction. Partition Area = 16’ x 45’ = 720 sq. ft.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1033 Maintenance Room (South CTM)

						Remarks
Room Area (sf)	1,560	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall	16	30	SW	0.22	480	B		See Note 1. Wall 1, Concrete
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.2	480	10	See Note 2.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	3,120	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
40	

Notes/Remarks

1. This room has a SW facing wall above Corridor 1005J and above the roof of Room 1037.

2. This room has a partition heat gain from Room 1025 through the partition above the Corridor 1005F tunnel construction. Partition Area = 16’ x 30’ = 480 sq. ft.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1034 Gas Sampling Room

						Remarks
Room Area (sf)	530	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	1,060	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
171		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks
40	

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1035 HVAC Room

						Remarks
Room Area (sf)	2,100	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall	17	50	SW	0.22	850	B		See Note 1. Wall 1, Concrete
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2		4,200	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks
	0	0	0	Room is normally unoccupied

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
8,140		From Equipment Heat Gain List (Assumption 3.1.4).

Infiltration

Airflow cfm	Remarks
120	

Notes/Remarks

This room has a SW facing wall above Corridor 1005J.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1044A Elevator Mechanical Room

						Remarks
Room Area (sf)	110	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall	32	11	NE	0.113	352	G		Wall 2, metal
Wall								
Wall								
Wall								
Floor					F=0.73			Perimeter = 11 Feet

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	220	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
3413		See Assumption 3.1.20.

Infiltration

Airflow cfm	Remarks

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1045 Corridor

						Remarks
Room Area (sf)	270	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall	32	8	NE	0.113	256	G		Wall 2, metal
Wall	32	36	N	0.113	1,152	G		Assumption 3.1.15. Wall 2, metal
Wall								
Wall								
Floor					F=0.73			Perimeter = 8 Feet

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	288	8	
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	540	Assumption 3.1.2

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
2,491		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks
720	See Assumption 3.1.9

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1046 Elevator Lobby

						Remarks
Room Area (sf)	90	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	180	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1048 Elevator Lobby

						Remarks
Room Area (sf)	470	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall	32	17	NW	0.113	544	G		Wall 2, metal
Wall								
Wall								
Wall								
Floor					F=0.73			Perimeter = 17 Feet

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	544	8	See Note 1.
Partition (summer)	0.3	896	20	See Note 2.
Partition (winter				No heat loss through partition.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	940	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
102		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks
1,600	See Assumption 3.1.9

Notes/Remarks

1. Partition Area = 17’ x 32’ = 544 ft^2.
2 Partition Area = 28’ x 32’ = 896 ft^2

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1050 Elevator Lobby

						Remarks
Room Area (sf)	470	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall	32	17	NW	0.113	544	G		Wall 2, metal
Wall	32	17	N	0.113	544	G		Assumption 3.1.15. Wall 2, metal
Wall								
Wall								
Floor					F=0.73			Perimeter = 17 Feet

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	896	20	See Note 1.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	940	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
1,720	See Assumption 3.1.9

Notes/Remarks

1. Partition Area = 28’ x 32’ = 896 ft^2

ROOM LOAD INFORMATION SHEET

Room Number and Name: 1200 Support Area (Assumption 3.1.22)

						Remarks
Room Area (sf)	3,460	Rm. Height (ft)	30	See Note 3.		
Indoor Design Conditions		Summer DB, °F	76	Relative Humidity	Not Controlled	
		Winter DB, °F	70	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.31	6,580	14	Note 1 and Note 2.
Partition (winter)	0.31	6,580	5	Note 1
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	8,304	See Note 3.

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks
Office Workers	9	250	200	See Assumption 3.1.17

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
21,601		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. Partition Area=104 ft L x 30 ft H =3,120 ft^2 at U=0.30. 2nd Floor Slab Area=3,460 ft^2 at U=0.31. Total Partition Area=6,580 ft^2 (partition and 2nd Floor Slab). The larger U-Value of 0.31 is used for conservatism.
2. Partition (summer) Temperature Difference is taken from the highest room design temperature of surrounding areas and floor above. The highest adjacent temperature is 90 F.
3. The support areas have a ceiling. But the buffering effect of a ceiling is ignored in the loads with all partition loads going to room for conservatism. Fluorescent lighting is used in this area.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2001 HVAC Room

						Remarks
Room Area (sf)	4,670	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	4,670			Roof 1, concrete
Wall	32	60	NE	0.22	1,920	B		Wall 1, concrete
Wall	15	13	NE	0.22	195	B		From tunnel corridor. Wall 1, concrete
Wall	32	50	NW	0.22	1,600	B		Wall 1, concrete
Wall	32	30	N	0.22	960	B		See Assumption 3.1.15. Wall 1, concrete
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	9,340	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
10,700		From Equipment Heat Gain List (Assumption 3.1.4).

Infiltration

Airflow cfm	Remarks
620	See Assumption 3.1.9

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2002 Instrument and Electrical Shop

						Remarks
Room Area (sf)	2,100	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	79	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	3,120			See Note 1. Roof 1, concrete
Wall	17	28	NE	0.22	476	B		See Note 2. Wall 1, concrete.
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	4,200	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
40	See Assumption 3.1.9

Notes/Remarks

1. Roof area is larger than Room Area because of Corridor 2006A and 2006K tunnel construction (Assumption 3.1.14).
2. This room has a NE facing wall above Corridor 2006A.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2003 Closure Support Room (North)

						Remarks
Room Area (sf)	2,410	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	78	Relative Humidity	Not Controlled	
		Winter DB, °F	72	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	2,886			Roof 1, concrete. Note 1
Wall	32	23	NE	0.22	736	B		See Note 2. Wall 1, concrete
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.31	6,696	12	See Note 3.
Partition (winter)	0.31	8,424	7	See Note 4.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	4,820	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks
Standing, Light work, Walking	1	250	200	See Assumption 3.1.17

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
101,782		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks
40	See Assumption 3.1.9

ROOM LOAD INFORMATION SHEET
Room Number and Name: 2003 Closure Support Room (North)
Notes/Remarks 1.The roof area is greater than the floor area because the roof extends above 2003A. 2. This room has a NE facing wall above Corridor 2006A. 3. Summer Partition Areas: From Corridor 2006K = 70' x 15' = 1050 ft^2 at 82 F and U = 0.20, From Room 2002 = 70' x 17'= 1190 ft^2 at 90 F and U = 0.2, From 2006A = (23' x 15') + (37' x 8') = 641 ft^2 at 82 F and U = 0.3, From Room 2007 and 2007A = 37' x 32' = 1,184 ft^2 at 90 F and U = 0.2, From Rooms 1009 and 1010 = 2,410 ft^2 (floor area) at 90 F and U = 0.31. From Room 2048 = 17' x 13' = 221 ft^2 at 82 F and U = 0.2. Total Partition = 6,696 ft^2 using largest Temperature of 90 F and largest U = .31. The 1 F partition temperature difference from Room 2004 is ignored. 4. Winter Partition Areas: Use total from Note 3 plus partition load from Room 2004 = 54' x 32' = 1,728 ft^2. Total = 6,696 ft^2 + 1,728 ft^2 = 8,424 ft^2.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2003A Personnel Access Room (North)

						Remarks
Room Area (sf)	170	Rm. Height (ft)	12			
Indoor Design Conditions		Summer DB, °F	78	Relative Humidity	Not Controlled	
		Winter DB, °F	72	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.31	380	12	See Note 1.
Partition (winter)	0.31	548	7	See Note 2.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	408	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. Summer Partition Areas: From 2006A = (14' x 15") = 210 ft^2 at 82 F and U = 0.30, From Room 1010 = 170 ft^2 (room area) at 90 F and U = 0.31, The 1 F partition temperature difference from Room 2004 is ignored. Total = 380 ft^2 at 90 F and U = 0.31.

2. Winter Partition Areas: Use total from Note 2 plus partition load from Room 2004 = 14' x 12' = 168 ft^2. Total = 380 ft^2 + 168 ft^2 = 548 ft^2.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2004 Canister Transfer Room

						Remarks
Room Area (sf)	21,940	Rm. Height (ft)	68			
Indoor Design Conditions		Summer DB, °F	79	Relative Humidity	Not controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	21,940			Roof 1, concrete
Wall	28	93	SE	0.22	2,604	B		Wall 1, concrete
Wall	36	236	NW	0.22	8,496	B		Wall 1, concrete
Wall	36	150	SE	0.22	5,400	B		Wall 1, concrete
Wall	36	70	SW	0.22	2,520	B		Wall 1, concrete
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	38,790	9	See Note 1.
Partition (winter)				
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	43,880	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks
Standing, Light work, Walking	2	250	200	See Assumption 3.1.17

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
265,510		From Equipment Heat Gain List (Assumption 3.1.4).

Infiltration

Airflow cfm	Remarks
1,140	See Assumption 3.1.9

Notes/Remarks

1. Partition Area: From Floor Use entire room floor area, 21,240 ft^2 at average temperature of 92.5 F and U=0.31. From Corridors 2006A, 3001, 2006G, and 3002 = (190' x 67") – (70' – 36') = 10,210 ft^2 at 82 F and U = 0.30. From 2006B, 2006D, and 2006F = 236' x 15' = 3,540 ft^2 at 82F and U=0.30. From 2006D and 2006M = 95' x 40' = 3,800 ft^2 at 82 F and U = 0.30. Total Area = 38,790 ft^2 at average temperature of 87.4 F, use 88 F at U=0.3.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2005 HVAC Room

						Remarks
Room Area (sf)	5,640	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	6,000			Roof 1, concrete
Wall	32	50	SE	0.22	1,600	B		Wall 1, concrete
Wall	32	75	NE	0.22	2,400	B		Wall 1, concrete
Wall	32	16	N	0.22	512	B		Assumption 3.1.15. Wall 1, Concrete 1
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	11,280	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
17,355		From Equipment Heat Gain Lost (Assumption 3.1.4).

Infiltration

Airflow cfm	Remarks
440	See Assumption 3.1.9

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2006A Corridor

						Remarks
Room Area (sf)	1,300	Rm. Height (ft)	See Note 1			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	760			See Note 1. Roof 1, concrete
Wall	32	80	NE	0.22	2,560	B		Wall 1, concrete
Wall	15	32	N	0.22	480	B		Assumption 3.1.15. Wall 1, concrete
Wall	15	15	NE	0.22	225	B		Wall 1, concrete
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.31	1,740	8	See Note 1.
Partition (winter)				
Ceiling				

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	3,120	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
80	See Assumption 3.1.9

Notes/Remarks

1. Room height varies. This corridor is of tunnel construction in Rooms 2002 and 2003 with a height of 15 feet. Otherwise, it has a full height of 32 feet. The roof area of the portion with a roof is 760 sq. ft. Fluorescent lighting is used.

2. Partition Area: From floor below = 160’ x 8’ = 1,280 sq. ft. at 90 F and U=0.31, From Room 2002 = (20’ x 15’) + (20” x 8’) = 460 sq. ft. at 90F and U=0.3. Total = 1,740 at 90 F and U=0.31.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2006B Corridor

						Remarks
Room Area (sf)	800	Rm. Height (ft)	15			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	2,000	8	See Note 1.
Partition (winter)				
Ceiling				

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	1,920	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
70	See Assumption 3.1.9

Notes/Remarks

1. Partition Area = (80’ x 15’) + (80’ x 10’) = 2,000 sq. ft.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2006D Corridor and 2006M Utility Chase

						Remarks
Room Area (sf)	1,140	Rm. Height (ft)	40			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	1,140			Roof 1, concrete
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	2,736	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
80	See Assumption 3.1.9

Notes/Remarks

For simplicity and conservatism, load calculation for Corridor 2006D is based on a full height wall including Utility Chase 2006M.
Fluorescent lighting is used in this corridor.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2006E Corridor

						Remarks
Room Area (sf)	700	Rm. Height (ft)	15			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.31	1,842	8	See Note 1.
Partition (winter)				
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	1,680	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
80	See Assumption 3.1.9

Notes/Remarks

1. Partition Area = Through tunnel partition (78’ x 15”) + (84’ x 8’) = 1,842 sq. ft. at 90 F and U = 0.30, From Room 1034 (33’ x 8”) = 264 sq. ft. at 90F and U=0.31 Total = 1,842 sq. ft. at 90F and U=0.31.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2006F Corridor

						Remarks
Room Area (sf)	420	Rm. Height (ft)	15			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall	15	6	SW	0.22	90	B		Wall 1, concrete
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	1,610	8	See Note 1.
Partition (winter)				
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	1,008	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
70	See Assumption 3.1.9

Notes/Remarks

1. Partition Area = Through tunnel partition (70’ x 15”) + (70’ x 8’) = 1,610 sq. ft. at 90 F and U = 0.30,

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2006G Corridor

						Remarks
Room Area (sf)	1,300	Rm. Height (ft)	See Note 1.			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	760			Roof 1, concrete
Wall	32	85	SW	0.22	2,720	B		Wall 1, concrete
Wall	15	35	N	0.22	525	B		Assumption 3.1.15. Wall 1, concrete
Wall	15	15	NW	o.22	225	B		Wall 1, concrete
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.31	1,740	8	See Note 2
Partition (winter)				
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	3,120	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
80	See Assumption 3.1.9

Notes/Remarks

1. Room height varies. This corridor is of tunnel construction in Rooms 2010 and 2011 with a height of 15 feet. Otherwise, it has a full height of 32 feet. The roof area of the portion with a roof is 760 sq. ft. Fluorescent lighting is used.

2. Partition Area: From floor below = 160’ x 8’ = 1,280 sq. ft. at 90 F and U=0.31, From Room 2010 = (20’ x 15’) + (20” x 8’) = 460 sq. ft. at 90F and U=0.3. Total = 1,740 at 90 F and U=0.31.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2006H Corridor

						Remarks
Room Area (sf)	580	Rm. Height (ft)	15			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	1,656	8	See Note 1.
Partition (winter)				
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	1,392	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
70	See Assumption 3.1.9

Notes/Remarks

1. Partition Area = (72' x 15') + (72' x 8') = 1,656 sq. ft. at 90F and U=0.3.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2006J Corridor and 2006L Utility Chase

						Remarks
Room Area (sf)	1,140	Rm. Height (ft)	40			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	1,140			Roof 1, concrete
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.3	2,700	8	
Partition (winter)				
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	2,736	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
80	See Assumption 3.1.9

Notes/Remarks

1. Partition Area = 90' x 30'H = 2,700 ft^2 at 90 F and U=0.3.

For simplicity and conservatism, load calculation for Corridor 2006J is based on a full height wall including Utility Chase 2006L.

Fluorescent lighting is used in this corridor.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2006K Corridor

						Remarks
Room Area (sf)	580	Rm. Height (ft)	15			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.31	2,170	8	See Note 1.
Partition (winter)				
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	1,392	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
70	See Assumption 3.1.9

Notes/Remarks

1. Partition Area: From Room 2002 = (70' x 15') + (70' x 8') = 1,610 ft^2 at 90 F and U = 0.3. From 1008 = 70' x 8' = 560 ft^2 at 90 F and U = 0.31. Total Area = 2,170 ft^2 at 90 F and U = 0.31.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2007 Waste Package Closure Room

						Remarks
Room Area (ft)	2,900	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	3,500			Roof 1, concrete (Note 1)
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.31	2,900	10	Heat gain through floor slab
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	7,000	Using roof area.

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks
Standing, Light work, Walking	2	250	200	

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
63,387		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks
60	See Assumption 3.1.9

Notes/Remarks

1. Roof areas includes area above Rooms 2007A and 2007B.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2007A Closure Equipment Room

						Remarks
Room Area (ft)	300	Rm. Height (ft)	12			
Indoor Design Conditions		Summer DB, °F	78	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.31	1,188	12	See Note 1.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	720	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks
Standing, Light work, Walking	1	250	200	

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
18,950		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks
	See Assumption 3.1.9

Notes/Remarks

1. Partition Area: From 2007 = 37' x 24' = 888 ft^2 at 90 F and U = 0.3. From 1016 = 300 ft^2 at 90 F and U = 0.31. Total Area = 1,188 ft^2 at 90 F and U = 0.31.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2007B Closure Equipment Room

						Remarks
Room Area (ft)	300	Rm. Height (ft)	12			
Indoor Design Conditions		Summer DB, °F	78	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.31	1,188	12	See Note 1.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	720	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks
Standing, Light work, Walking	1	250	200	

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
18,950		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. Partition Area: From 2007 = 37' x 24' = 888 ft^2 at 90 F and U = 0.3. From 1020 = 300 ft^2 at 90 F and U = 0.31. Total Area = 1,188 ft^2 at 90 F and U = 0.31.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2008 HVAC Room

						Remarks
Room Area (sf)	4,670	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	4,670			Roof 1, concrete
Wall	32	60	SW	0.22	1,920	B		Wall 1, concrete
Wall	15	13	SW	0.22	195	B		From tunnel corridor. Wall 1, concrete
Wall	32	50	NW	0.22	1,600	B		Wall, concrete
Wall	32	30	N	0.22	960	B		See Assumption 3.1.15. Wall 1 concrete
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	9,340	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
25,717		From Equipment Heat Gain List (Assumption 3.1.4).

Infiltration

Airflow cfm	Remarks
620	See Assumption 3.1.9

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2010 Maintenance and Operations Storage Room

						Remarks
Room Area (sf)	2,100	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	79	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	3,120			See Note 1. Roof 1, concrete
Wall	17	28	SW	0.22	476	B		See Note 2. Wall 1, concrete
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	4,200	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
40	See Assumption 3.1.9 and Note 3 below.

Notes/Remarks

1. Roof area is larger than Room Area because of Corridor 2006G and 2006H tunnel construction (Assumption 3.1.14).
2. This room has a SW facing wall above Corridor 2006A.
3. Room 2009 & 2010 are adjacent to each other. Room 2009 was deleted and became one new big room (Rm. 2010) The 40 cfm infiltration air is the sum of previous 2009 & 2010 rooms as shown in CRCF 1 Building Confinement Areas Air Leakage Calculation 060-M8C-VCT0-00100-000-00A..

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2011 Closure Support Room (South)

						Remarks
Room Area (sf)	2,410	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	78	Relative Humidity	Not Controlled	
		Winter DB, °F	72	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	2,866			Roof 1, concrete
Wall	17	23	N	0.22	391	B		See Assumption 3.1.15. Wall 1 concrete
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.31	6,696	12	Use bigger U-value
Partition (winter)	0.31	8,312	7	
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	4,820	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks
Standing, Light work, Walking	1	250	200	See Assumption 3.1.17

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
101,782		From Equipment Heat Gain List (Assumption 3.1.4)

Infiltration

Airflow cfm	Remarks
40	See Assumption 3.1.9

Notes/Remarks

1. Not used.

2. Summer Partition Areas: From Corridor 2006H = 70' x 15' = 1050 ft^2 at 82 F and U = 0.20, From Room 2010 = 70' x 17'= 1190 ft^2 at 90 F and U = 0.2, From 2006G = (23' x 15') + (37' x 8') = 641 ft^2 at 82 F and U = 0.3, From Room 2007 and 2007B = 37' x 32' = 1,184 ft^2 at 90 F and U = 0.2, From Rooms 1030 and 1031 = 2,410 ft^2 (floor area) at 90 F and U = 0.31. From Room 2050 = 17' x 13' = 221 at 82 F and U = 0.2. Total Partition = 6,696 ft^2 using largest Temperature of 90 F and largest U = .31. The 1 F partition temperature difference from Room 2004 is ignored.

3. Winter Partition Areas: Use total from Note 2 plus partition load from Room 2004 = 54' x 32' = 1,728 ft^2. Total = 6,696 ft^2 + 1,728 ft^2 = 8,424 ft^2.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2011A Personnel Access Room (South)

						Remarks
Room Area (sf)	170	Rm. Height (ft)	12			
Indoor Design Conditions		Summer DB, °F	78	Relative Humidity	Not Controlled	
		Winter DB, °F	72	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								
Wall								
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)	0.31	380	12	See Note 1.
Partition (winter)	0.31	548	7	See Note 2.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	408	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks

Notes/Remarks

1. Summer Partition Areas: From 2006G = (14' x 15") = 210 ft^2 at 82 F and U = 0.30, From Room 1031 = 170 ft^2 (floor area) at 90 F and U = 0.31, The 1 F partition temperature difference from Room 2004 is ignored. Total = 380 ft^2 at 90 F and U = 0.31.

2. Winter Partition Areas: Use total from Note 2 plus partition load from Room 2004 = 14' x 12' = 168 ft^2. Total = 380 ft^2 + 168 ft^2 = 548 ft^2.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2012 HVAC Room

						Remarks
Room Area (sf)	5,460	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	90	Relative Humidity	Not controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	6,794			See Note 1. Roof 1, concrete
Wall	32	50	SE	0.22	1,600	B		Wall 1, concrete
Wall	32	76	SW	0.22	2,432	B		Wall 1, concrete
Wall	32	23	N	0.22	736	B		Assumption 3.1.15 Wall 1, concrete
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	10,920	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks
28,347		From Equipment Heat Gain List (Assumption 3.1.4).

Infiltration

Airflow cfm	Remarks
300	See Assumption 3.1.9

Notes/Remarks

1. Roof area is larger than Room Area because of Corridors 2006E and 2006F tunnel construction (Assumption 3.1.14).

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2045 Corridor

						Remarks
Room Area (sf)	270	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								Roof 2, metal
Wall	32	6	NE	0.113	192	G		Wall 2, metal
Wall	32	8	SE	0.113	256	G		Wall 2, metal
Wall	32	33	N	0.113	1,056	G		Assumption 3.1.15. Wall 2, metal
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	540	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
140	See Assumption 3.1.9

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2045A Storage Room

						Remarks
Room Area (sf)	100	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								Roof 2, metal
Wall	32	11	NE	0.113	352	G		Wall 2, metal
Wall	32	9	SE	0.113	288	G		Wall 2, metal
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	200	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
240	

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2046 Elevator Lobby

						Remarks
Room Area (sf)	100	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								Roof 2, metal
Wall	32	9	SE	0.113	288	G		Wall 2, metal
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	200	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
180	See Assumption 3.1.9

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2048 Elevator Lobby

						Remarks
Room Area (sf)	470	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								Roof 2, metal
Wall	32	16	NW	0.113	512	G		Wall 2, metal
Wall	32	16	SE	0.113	512	G		Wall 2, metal
Wall	32	16	NE	0.113	512	G		Wall 2, metal
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	940	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
800	See Assumption 3.1.9

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 2050 Elevator Lobby

						Remarks
Room Area (sf)	470	Rm. Height (ft)	32			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof								Roof 2, metal
Wall	32	16	NW	0.113	512	G		Wall 2, metal
Wall	32	16	SE	0.113	512	G		Wall 2, metal
Wall	32	16	N	0.113	512	G		Assumption 3.1.15. Wall 2, metal
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	940	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
700	See Assumption 3.1.9

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 3001 Corridor

						Remarks
Room Area (sf)	1,600	Rm. Height (ft)	36			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	1,600			Roof 1, concrete
Wall	36	102	NE	0.22	3,672	B		Wall 1, concrete
Wall	36	11	SE	0.113	396	G		Wall 2, metal
Wall	36	62	SW	0.113	2,232	G		Wall 2, metal
Wall	36	11	NW	0.113	396	G		Wall 2, metal
Wall	36	13	N	0.22	468	B		See Assumption 3.1.15. Wall 1 concrete
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	3,840	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
1,220	See Assumption 3.1.9

Notes/Remarks

1. The chase on the Northwest end of the corridor is included in the area for conservatism.

ROOM LOAD INFORMATION SHEET

Room Number and Name: 3002 Corridor

						Remarks
Room Area (sf)	800	Rm. Height (ft)	36			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.031	800			Roof 1, concrete
Wall	36	15	SW	0.22	540	B		Wall 1, concrete
Wall	36	12	NW	0.113	432	G		Wall 2, metal
Wall	36	22	N	0.22	792	B		See Assumption 3.1.15. Wall 1 concrete
Wall	36	50	NE	0.113	1,800	G		Wall 2, metal
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.
Floor				

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
Fluorescent	2	1.2	1,920	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
640	See Assumption 3.1.9

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 3045 Corridor

						Remarks
Room Area (sf)	270	Rm. Height (ft)	36			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.065	270			Roof 2, metal
Wall	36	6	NE	0.113	216	G		Wall 2, metal
Wall	36	8	NW	0.113	288	G		Wall 2, metal
Wall	36	33	N	0.113	1,188	G		See Assumption 3.1.15. Wall 2 metal
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.
Floor				

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	540	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
100	See Assumption 3.1.9

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 3045A Storage Room

						Remarks
Room Area (sf)	100	Rm. Height (ft)	36			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.065	100			Roof 2, metal
Wall	36	11	NE	0.113	396	G		Wall 2, metal
Wall	36	9	SE	0.113	324	G		Wall 2, metal
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	200	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
200	See Assumption 3.1.9

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 3046 Elevator Lobby

						Remarks
Room Area (sf)	100	Rm. Height (ft)	36			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.065	100			Roof 2, metal
Wall	36	9	SE	0.113	324	G		Wall 2, metal
Wall								
Wall								
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	200	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
160	See Assumption 3.1.9

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 3048 Elevator Lobby

						Remarks
Room Area (sf)	470	Rm. Height (ft)	36			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.065	470			Roof 2, metal
Wall	36	16	NW	0.113	576	G		Wall 2, metal
Wall	36	16	SE	0.113	576	G		Wall 2, metal
Wall	36	16	NE	0.113	576	G		Wall 2, metal
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	940	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
680	See Assumption 3.1.9

Notes/Remarks

ROOM LOAD INFORMATION SHEET

Room Number and Name: 3050 Elevator Lobby

						Remarks
Room Area (sf)	470	Clg Height (ft)	36			
Indoor Design Conditions		Summer DB, °F	82	Relative Humidity	Not Controlled	
		Winter DB, °F	65	Ventilation Confinement Classification		Tertiary

External Conduction

Item	Height ft	Width ft	Orien-tation	U Btu/h-ft^2 F	Area ft^2	Wall Group	Color	Remarks
Roof				0.065	470			Roof 2, metal
Wall	36	16	NW	0.113	576	G		Wall 2, metal
Wall	36	16	SW	0.113	576	G		Wall 2, metal
Wall	36	16	N	0.113	576	G		Assumption 3.1.15. Wall 2, metal
Wall								
Floor								

Internal Conduction

Item	U Btu/h-ft^2 F	Area ft^2	ΔT F	Remarks
Partition (summer)				No heat gain through partition.
Partition (winter)				No heat loss through partition.
Ceiling				.

Lights

Type	W/sq. ft.	Ballast Factor	Total Watts	Remarks
High Bay	2	-	940	

People

Activity Type	No. of People	Q Sensible Btu/h Ea.	Q Latent Btu/h Ea.	Remarks

Equipment Heat Gain

Q Sensible Btu/h	Q Latent Btu/h	Remarks

Infiltration

Airflow cfm	Remarks
640	See Assumption 3.1.9

Notes/Remarks

CALCULATION OF U-VALUES

Roof Assembly U-Value

The elements of construction come from the Preliminary General Arrangement Drawings (Assumption 3.1.1). Values of resistance come from *ASHRAE Fundamentals* (Reference 2.2.4, Chapter 25). Where a range of resistance is given, the average resistance value is used in this calculation. The concrete density of 150 pounds per cubic foot comes from Section 4.2.11.6.6 of the *Project Design Criteria Document* (Reference 2.2.1). Roof deck thickness comes from Assumption 3.1.1.

Table A-1. Roof No. 1: 1'-6" Thick Concrete, with R-30 Insulation

Element	Reference	Resistance, R ft^2-°F-h/Btu
Moving Air, Any Position. at 7.5 mph wind - Summer	ASHRAE Fundamentals 2005, Table 1, p25.2	0.25
R-30 Insulation	Reference 2.2.1 Section 4.2.12.4.11	30.00
Concrete 18" thick at density of 150 lb/ft^3	ASHRAE Fundamentals 2005, Table 4, p25.8	1.35
Still Air, Horizontal-Downward Flow	ASHRAE Fundamentals 2005, Table 1, p25.2	0.92
	Total Resistance, R_T =	32.44
	U-Factor = 1/R_T, Btu/h-ft^2-°F	**0.031**

Table A-2. Roof No. 2: Metal Roofing

Element	Reference	Resistance, R ft^2-°F-h/Btu
See Assumption 3.1.10		
	U-Factor = Btu/h-ft^2-°F	**0.065**

Wall Assembly U-Value

The elements of construction come from the Preliminary General Arrangement Drawings (Assumption 3.1.1). Values of resistance come from *ASHRAE Fundamentals* (Reference 2.2.4, Chapter 25) and *ASHRAE Std. 90.1-2004* (Reference 2.2.6, Table A9.2B). The concrete density of 150 pounds per cubic foot comes from Section 4.2.11.6.6 of the *Project Design Criteria Document* (Reference 2.2.1).

Table A-3. Wall No. 1: 4'-0" Thick Concrete, no insulation

Element	Reference	Resistance, R ft^2-°F-h/Btu
Moving Air, Any Position. at 7.5 mph wind Summer	ASHRAE Fundamentals 2005, Table 1, p25.2	0.25
Concrete 48" thick at density of 150 lb/ft^3 (Reference 2.2.1, Section 4.2.11.6.6)	ASHRAE Fundamentals 2005, Table 4, p25.8	3.60
Still Air, Horizontal Flow	ASHRAE Fundamentals 2005, Table 1, p25.2	0.68
	Total Resistance, R_T =	4.45
	U-Value = 1/R_T, Btu/h-ft^2-°F	**0.22**

Table A-4. Wall No. 2: Metal Wall

Element	Reference	Resistance, R ft^2-°F-h/Btu
See Assumption 3.1.10		
	U-Value = Btu/h-ft^2-°F	**0.113**

Partition U-Values

The elements of construction come from the Preliminary General Arrangement Drawings (Assumption 3.1.1). Values of resistance come from *ASHRAE Fundamentals* (Reference 2.2.4, Chapter 25) and *ASHRAE Std. 90.1-2004* (Reference 2.2.6, Table A9.2B). The concrete density of 150 pounds per cubic foot comes from Section 4.2.11.6.6 of the *Project Design Criteria Document* (Reference 2.2.1).

Table A-5. Partition No. 1: 4'- 0" Thick Concrete, no Insulation

Element	Reference	Resistance, R ft^2-°F-h/Btu
Still Air, Horizontal Flow	ASHRAE Fundamentals 2005, Table 1, p25.2	0.68
Concrete 48" thick at density of 150 lb/ft^3	ASHRAE Fundamentals 2005, Table 4, p25.8	3.60
Still Air, Horizontal Flow	ASHRAE Fundamentals 2005, Table 1, p25.2	0.68
	Total Resistance, R_T =	4.96
	U-Value = 1/R_T, Btu/h-ft^2-°F	**0.20**

Table A-6. Partition No. 2: Gypsum Board, One-Hour Fire Rated

Element	Reference	Resistance, R ft^2-°F-h/Btu
Still Air, Horizontal Flow	ASHRAE Fundamentals 2005, Table 1, p25.2	0.68
5/8" gypsum board	ASHRAE Fundamentals 2005, Table 4, p25.5	0.56
4" metal stud, 24" O.C. with air space. No insulation.	ASHRAE 90.1 - 2004, Table A9.2B, Effective resistance. (Reference 2.1.13)	0.91
5/8" gypsum board	ASHRAE Fundamentals 2005, Table 4, p25.5	0.56
Still Air, Horizontal Flow	ASHRAE Fundamentals 2005, Table 1, p25.2	0.68
	Total Resistance, R_T =	3.39
	U-Value = $1/R_T$, Btu/h-ft^2-°F	**0.30**

Table A-7. Partition No. 3: 2'- 0" Thick Concrete, no insulation

Element	Reference	Resistance, R ft^2-°F-h/Btu
Still Air, Horizontal Flow	ASHRAE Fundamentals 2005, Table 1, p25.2	0.68
Concrete 24” thick at density of 150 lb/ft^3	ASHRAE Fundamentals 2005, Table 4, p25.8	1.80
Still Air, Horizontal Flow	ASHRAE Fundamentals 2005, Table 1, p25.2	0.68
	Total Resistance, R_T =	3.16
	U-Value = $1/R_T$, Btu/h-ft^2-°F	**0.32**

Table A-8. Concrete Floor (2nd Floor): 1'- 6" Thick

Element	Reference	Resistance, R ft^2-°F-h/Btu
Still Air, Downward Flow	ASHRAE Fundamentals 2005, Table 1, p25.2	0.92
Concrete 18” thick at density of 150 lb/ft^3	ASHRAE Fundamentals 2005, Table 4, p25.8	1.35
Still Air, Upward Flow	ASHRAE Fundamentals 2005, Table 1, p25.2	0.92
	Total Resistance, R_T =	3.19
	U-Value = $1/R_T$, Btu/h-ft^2-°F	**0.31**

Exterior Roll-up Door U-Value

Table A-9. Door: Metal Roll-up

Element	Reference	Resistance, R ft^2-°F-h/Btu
See Assumption 3.1.13		
	U-Value = Btu/h-ft^2-°F	**1.15**

Floor F-Factor

For calculating the heat loss during winter for slab-on-grade construction, the floor F-Factor is 0.73 according to *Energy Standard for Buildings Except Low-Rise Residential Buildings* (Reference 2.2.6, Table 5.5-5 and Appendix B) based on climate zone and building envelope requirements.

APPENDIX B: ASHRAE TABLE VALUES FOR CLTD AND CORRECTION TABLES FOR LATITUDE AND MONTH

Table B-1 presents the unadjusted Cooling Load Temperature Difference (CLTD) values used in this calculation. The unadjusted roof CLTD values come from Table 3.8 of the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3). The unadjusted wall CLTD values come from Table 3.10 of the same reference. The Cooling Load Factors for Lights, People, and Equipment are based on the similar tables in Chapter 4 of the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3). All Cooling Load Factors are equal to 1.0 based on Assumptions 3.2.6, 3.2.7, and 3.2.8. See Section 6.1.3 of this calculation for determination of roof and wall types and additional information on correcting the unadjusted values for latitude-month, color, indoor design temperature, and outdoor design temperature.

Table B-2 presents the CLTD correction for latitude and month related to the design latitude for this building as given in Section 6.1.1. The CLTD correction values were interpolated from the 32 degree and 40 degree North latitude values given in Table 3.12 of the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3). Table B-3 presents the outdoor design temperatures for each month of the year. The summer outdoor design temperature of 102°F dry bulb and 65°F wet bulb are assigned for the four months June, July, August, and September for conservatism. All *K* factors below for roof and wall color at taken at a value of 1.0 per Assumption 3.2.3. The *f* factor for the roof CLTD correction is taken at a value of 1.0 for conservatism.

For flat roofs, the following formula (Reference 2.2.3, Table 3.8, and Note 2) is used to correct the roof CLTD values:

$$CLTD_{roof,corr} = \left[\left(CLTD + LM\right) \times K + \left(78°\text{F} - T_r\right) + \left(T_o - 85°\text{F}\right)\right] \times f \qquad \text{(Eq. B-1)}$$

where

$CLTD$ = from Table B-1.

LM = Latitude-month correction from Table B-2 for a horizontal surface.

K = Color adjustment factor equal to 1.0 for a dark colored or light in an industrial area and equal to 0.5 if permanently light-colored in a rural area.

T_r = Indoor design room temperature, °F.

T_o = Average outside temperature on design day, °F. T_o = 102°F - (25.9/2) = 89.05°F for a 102°F outdoor design temperature.

f = factor for attic fan and/or ducts above ceiling taken at a value equal to 1.0 for no attic fan or ducts and a value equal to 0.75 for positive ventilation.

For sunlit walls, the following formula (Reference 2.2.3, Table 3.10, and Note 2) is used to correct the wall CLTD values:

$$CLTD_{wall,corr} = (CLTD + LM) \times K + (78°\text{F} - T_r) + (T_o - 85°\text{F}) \qquad \text{(Eq. B-2)}$$

where

$CLTD$ = from Table B-1.

LM = Latitude-month correction from Table B-2.

K = Color adjustment factor equal to 1.0 for a dark colored or light in an industrial area, equal to 0.83 if permanently medium-colored in a rural area, and equal to 0.65 if permanently light-colored in a rural area.

T_r = Indoor design room temperature, °F.

T_o = Average outside temperature on design day, °F. T_o = 102°F - (25.9/2) = 89.05°F for a 102°F outdoor design temperature, T_o = 100°F - (25.9/2) = 87.05°F for a 100°F outdoor design temperature

Table B-1. Unadjusted CLTD Values and CLF Values (°F)

ASHRAE TABLE VALUES FOR CLTD																								
hour	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Roof 1 (Type 12) (Note 1 & 7)	31	28	25	22	20	17	15	14	14	16	18	22	26	31	36	40	43	45	45	44	42	40	37	34
Roof 2 (Type 1) (Note 1 & 8)	6	3	0	-1	-3	-3	-2	4	14	27	39	52	62	70	74	74	70	62	51	38	28	20	14	9
Group B Wall -N (Note 2)	15	14	14	13	12	11	11	10	9	9	9	8	9	9	9	10	11	12	13	14	14	15	15	15
-NE (Note 2)	19	18	17	16	15	14	13	12	12	13	14	15	16	17	18	19	19	20	20	21	21	21	20	20
-E (Note 2)	23	22	21	20	18	17	16	15	15	15	17	19	21	22	24	25	26	26	27	27	26	26	25	24
-SE (Note 2)	23	22	21	20	18	17	16	15	14	14	15	16	18	20	21	23	24	25	26	26	26	26	25	24
-S (Note 2)	21	20	19	18	17	15	14	13	12	11	11	11	11	12	14	15	17	19	20	21	22	22	22	21
-SW (Note 2)	27	26	25	24	22	21	19	18	16	15	14	14	13	13	14	15	17	20	22	25	27	28	28	28
-W (Note 2)	29	28	27	26	24	23	21	19	18	17	16	15	14	14	14	15	17	19	22	25	27	29	29	30
-NW (Note 2)	23	22	21	20	19	18	17	15	14	13	12	12	12	11	12	12	13	15	17	19	21	22	23	23
Group G Wall -N (Note 2)	3	2	1	0	-1	2	7	8	9	12	15	18	21	23	24	24	25	26	22	15	11	9	7	5
-NE (Note 2)	3	2	1	0	-1	9	27	36	39	35	30	26	26	27	27	26	25	22	18	14	11	9	7	5
-E (Note 2)	4	2	1	0	-1	11	31	47	54	55	50	40	33	31	30	29	27	24	19	15	12	10	8	6
-SE (Note 2)	4	2	1	0	-1	5	18	32	42	49	51	48	42	36	32	30	27	24	19	15	12	10	8	6
-S (Note 2)	4	2	1	0	-1	0	1	5	12	22	31	39	45	46	43	37	31	25	20	15	12	10	8	5
-SW (Note 2)	5	4	3	1	0	0	2	5	8	12	16	26	38	50	59	63	61	52	37	24	17	13	10	8
-W (Note 2)	6	5	3	2	1	1	2	5	8	11	15	19	27	41	56	67	72	67	48	29	20	15	11	8
-NW (Note 2)	5	3	2	1	0	0	2	5	8	11	15	18	21	27	37	47	55	55	41	25	17	13	10	7
Glass (Note 3)	1	0	-1	-2	-2	-2	-2	0	2	4	7	9	12	13	14	14	13	12	10	8	6	4	3	2
ASHRAE TABLE VALUES FOR CLF																								
Lights (Note 4)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
People (Note 5)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Equipment hooded (N/A)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Equip. non-hooded (Note 6)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

NOTES:
1. From Table 3.8 in Reference 2.2.3.
2. From Table 3.10 in Reference 2.2.3.
3. From Table 3.23 in Reference 2.2.3.
4. From Assumption 3.2.6.
5. From Assumption 3.2.7.
6. From Assumption 3.2.8
7. The unadjusted values listing here are for Type 12 roof. But because the CRCF 1 insulated concrete roof has a much higher resistance (See U-Value Calculation in Attachment 2) compared to the Type12 roof listed in Table 3.8 of the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3), Note 4 of Table 3.8 is used to determine that an effective CLTD of 29°F should be used in the Cooling Load Calculation.
8. The roof type selected in this calculation for the sheet metal roof is Type 1. The unadjusted CLTD values in this table are from Type 2 roof because the requirements from Note 4 of Table 3.8 in the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3) were used. Because the CRCF 1 metal roof has a higher value by over R-7 and less than R-14 (See U-Value Calculation in Attachment 2) the CLTD data was analyzed and the Type 2 CLTD data Was chosen as the best set of values to use in this calculation.

Table B-2. CLTD Correction For Latitude and Month Applied to Walls and Roofs (°F)

North Latitude	Month	N	NNE NNW	NE NW	ENE WNW	E W	ESE WSW	SE SW	SSE SSW	S	HOR
36.62	Dec	-5.58	-7.58	-10.00	-12.16	-9.16	-6.16	0.85	7.85	10.85	-19.31
	Jan/Nov	-5.00	-7.00	-9.58	-11.58	-8.58	-5.16	1.42	8.42	11.42	-17.31
	Feb/Oct	-4.58	-6.58	-7.58	-8.58	-5.16	-2.58	3.42	8.00	11.58	-12.31
	Mar/Sep	-3.58	-4.58	-4.58	-5.16	-2.58	-1.00	3.58	6.16	8.73	-6.73
	Apr/Aug	-2.00	-2.58	-1.58	-2.00	0.00	-0.42	1.16	2.16	2.73	-2.16
	May/Jul	0.42	0.42	0.42	0.00	0.00	-0.42	-0.42	-1.27	-0.69	1.00
	Jun	1.00	1.42	1.42	0.42	0.58	-0.85	-0.85	-2.27	-2.27	2.00

NOTE:

1. All values from interpolation of Table 3.12 in Reference 2.2.3.

Table B-3. Monthly Outdoor Design Temperatures

	Outside Design Temperature	
Month	db F	wb F
JAN	24	20
JUN	102	65
JUL	102	65
AUG	102	65
SEP	102	65
DEC	24	20

NOTE:

The summer outdoor design temperature of 102°F dry bulb and 65°F wet bulb are assigned for the four months June, July, August, and September for conservatism.

APPENDIX C: COOLING/HEATING LOAD EQUATIONS

Table C-1 contains the equations used by the CLTD/CLF cooling load calculation method discussed in the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3). The table references given after the definition of the equation variable in Table C-1 are specific to the *Cooling and Heating Calculation Manual*. In many instances, newer sources and other sources have been used. See the main body of the calculation for those sources.

Table C-1. Cooling Load Equations

Load Source	Cooling Load Equation	Equation No.	Reference, Tables, Description [From *ASHRAE GRP 158, Cooling and Heating Load Manual* (Reference 2.2.3)]
Roof	q = U x A x CLTD	Equation C-1	U = Design Heat transmission Coefficients, Btu/(hr ft^2 °F) - Tables 3.1 - 3.5; A3.1 and A3.2, A = Areas Calculated from Building Plans, ft^2 CLTD = Cooling Load Temperature Difference at Base Condition for Roofs, °F - Table 3.8 and Notes Note 2 - Correction for color of Exterior surface Note 2 - Correction for Outside Dry Bulb Temperature and Daily Range - Table 3.13 Note 2 - Correction for Inside Dry Bulb Temperature - Table 3.13 Note 2 - Application of Latitude and Month - Table 3.12 Note 4 – For a more conservative roof load result, corrections for additional insulation are not used.
Walls	q = U x A x CLTD	Equation C-2	U = Design Heat transmission Coefficients, Btu/(hr ft^2 °F) - Tables 3.1 - 3.4; A3.1 and A3.2 A = Areas Calculated from Building Plans, ft^2 CLTD = Cooling Load Temperature Difference at Base Condition for Wall Group, °F - Table 3.9, 3.10 + Notes Note 2 - Correction for color of Exterior surface Note 2 - Correction for Outside Dry Bulb Temperature and Daily Range - Table 3.13 Note 2 - Correction for Inside Dry Bulb Temperature - Table 3.13 Note 2 - Application of Latitude and Month - Table 3.12

Load Source	Cooling Load Equation	Equation No.	Reference, Tables, Description [From *ASHRAE GRP 158, Cooling and Heating Load Manual* (Reference 2.2.3)]
Glass Conduction	q = U x A x CLTD	Equation C-3	U = Overall Heat Transmission Coefficient for type of Glass and Interior Shading, if used, Btu/(hr ft^2 °F) - Tables 3.14 - 3.16 & A3.4 A = Glass Areas Calculated from Building Plans, ft^2 CLTD = Cooling Load Temp. Difference for Conduction Load through Glass , °F - Table 3.23 Correction for Outside Dry Bulb Temperature and Daily Range - Table 3.13 Correction for Inside Dry Bulb Temperature - Table 3.13
Glass Solar	q = A x SC x SHGF x CLF	Equation C-4	A = Glass Area Calculated from Building Plans, ft^2 SC = Shading coefficients for combined type of Glass and type of shading - Table 3.17 - 3.22 SHGF = Solar Heat Gain Factor for specific orientation of surface, Btu/(hr ft^2) Latitude and Month - Table 3.25 for no external shading Externally shaded - Location less than 24 deg Latitude - Table 3.26 Location at or more than 24 deg Latitude - Table 3.25-N orient. CLF = Cooling Load Factor With no interior shading - Table 3.27 With interior shading - Table 3.28 For glass areas shaded externally, use north orientation with either Table 3.27 or 3.28.
Partitions, Ceilings, Floors	q = U x A x TD	Equation C-5	U = Design Heat transmission Coefficients, Btu/(hr ft^2 °F) - Tables 3.1 - 3.5 & A3.1 A = Areas Calculated from Building Plans, ft^2 TD = Design Temperature Difference between rooms, °F
Internal Lights	q = Input x CLF	Equation C-6	Input = Input rating from electrical Plans or Lighting Fixture data, Btu/h - Table 4.1 Coefficient "a" and "b" for type of fixture - Tables 4.2 & 4.3 CLF = Cooling Load Factor based on total hours of operation and time - Table 4.4 Note 1: Correction for Schedule of Operation of Lights and Cooling System, CLF=1when cooling system is operated only when lights are on or when lights are on 24 hrs/day.
People Sensible	q = No. x Sens. HG x CLF	Equation C-7	No. = Number of People in space, from survey or Table 5.3 Sens. HG = Sensible Heat Gains from Occupants, Btu/h - Table 4.5 CLF = Cooling Load Factor - based on duration of occupancy and time of entry - Table 4.6

Load Source	Cooling Load Equation	Equation No.	Reference, Tables, Description [From *ASHRAE GRP 158, Cooling and Heating Load Manual* (Reference 2.2.3)]
People Latent	q = No. x Latent HG	Equation C-8	No. = Number of People in space, from survey or Table 5.3 Latent HG = Latent Heat Gain from Occupants, Btu/h - Table 4.5
Equipment/ Appliances Sensible	q = Heat Gain x CLF	Equation C-9	Heat Gain = Recommended rate of heat gain - sensible heat, Btu/h - Tables 4.8 & 4.9 CLF = Cooling Load Factor For use with hood - Table 4.10 For use without hood - Table 4.11
Equipment/ Appliances Latent	q = Heat Gain	Equation C-10	Heat Gain = Recommended rate of heat gain, Btu/h Latent heat without hood - Tables 4.8 & 4.9 Set Equal to zero when hood is used over appliances.
Power	q = Heat Gain x CLF	Equation C-11	Heat Gain = Manufacturer's Data or Tables 4.12 & 4.13, Btu/h CLF = Cooling Load Factor - Table 4.11 or CLF = 1.0 if cooling system is not operated continuously
Ventilation and Infiltration Air	q = 60 x 0.24 x density x CFM x TD	Equation C-11A	TD = Temperature Difference between inside design db and ambient temperature, °F CFM = Ventilation and Infiltration Air, actual cfm 0.24 = specific heat of dry air, Btu/lb-°F 60 = minutes per hour density = density of air, actual air

Table C-2 contains the equations used by the *Cooling and Heating Load Calculation Manual* (Reference 2.2.3) to calculate heating load for roofs, walls, glass, and floors over exterior space. The table references given after the definition of the equation variable in Table C-1 are specific to the *Cooling and Heating Calculation Manual*. In many instances, newer sources and other sources have been used. See the main body of the calculation for those sources. The equation for calculating the heating load from slab-on-grade floors is from *ASHRAE Fundamentals* (Reference 2.2.4, Chapter 29).

Table C-2. Heating Load Equations

Heating Load	Heating Load Equation	Equation No.	Reference, Tables, Description
Roofs, Walls, Partitions, Glass	q = U x A x TD	Equation C-12	[From *ASHRAE GRP 158, Cooling and Heating Load Manual* (Reference 2.2.3)] U = Design Heat transmission Coefficients, Btu/(hr ft^2 °F) - Tables 3.1 - 3.5; A3.1 and A3.2, A = Areas Calculated from Building Plans, ft^2 TD = Temperature Difference between inside design db and design outside db – Table 2.1
Floors over exterior space	q = U x A x TD	Equation C-13	[From *ASHRAE GRP 158, Cooling and Heating Load Manual* (Reference 2.2.3)] U = Design Heat transmission Coefficients, Btu/(hr ft^2 °F) - Tables 3.1 - 3.5; A3.1 and A3.2, A = Areas Calculated from Building Plans, ft^2 TD = Temperature Difference between inside design db and design outside db – Table 2.1
Slab-on-grade floors	q = F_p x P x TD	Equation C-14	From ASHRAE Fundamentals (Reference 2.2.4, Chapter 29, Equations 39 and 40) F_p = Heat loss coefficient per foot of perimeter, Btu/(hr ft^2 °F) P = Perimeter (exposed edge) of slab, ft. TD = Temperature Difference between inside design db and ambient temperature, °F

APPENDIX D: PSYCHROMETRIC CALCULATION EQUATIONS

The following methods and equations are used to numerically calculate the various thermodynamic properties of moist air. These equations are derived from Chapter 6 of the *2005 ASHRAE Handbook, Fundamentals* (Reference 2.2.4). These equations are used throughout the calculation whenever individual air properties, mixed air properties, sensible heat gain, latent heat gain, and total heat gain need to be calculated.

1. Barometric Pressure, *P* - [Equation 3, p. 6.1]

$$P = K \cdot \left[1 - 6.8754 \times 10^{-6} Z\right]^{5.2559} \quad \text{(Eq. D-1)}$$

where

P = barometric pressure (in. w.g.; in. Hg; or psia)
Z = elevation above sea level (ft)
K = a constant (407.1894 in. w.g./atm, 29.921 in. Hg/atm., or 14.696 psia/atm.)

2. Water Vapor Saturation Pressure, *Pws* (for Temperature < 32°F) [Equation 5, p. 6.2]

$$\ln P_{ws} = C1/R + C2 + C3 \cdot R + C4 \cdot R^2 + C5 \cdot R^3 + C6 \cdot R^4 + C7 \cdot \ln R \quad \text{(Eq. D-2)}$$

or

$$P_{ws} = e^{\ln Pws}$$

where

P_{ws} = saturation pressure, psia (at the dry bulb or wet bulb temperature)
R = absolute Temp, °R = (T + 459.67)
T = dry or wet bulb temperature, °F
$C1$ = -1.0214165E+04
$C2$ = -4.8932428E+00
$C3$ = -5.3765794E-03
$C4$ = 1.9202377E-07
$C5$ = 3.5575832E-10
$C6$ = -9.0344688E-14
$C7$ = 4.1635019E+00

3. Water Vapor Saturation Pressure, *Pws* (for Temperature = or > 32°F) [Equation 6, p. 6.2]

$$\ln P_{ws} = C8/R + C9 + C10 \cdot R + C11 \cdot R^2 + C12 \cdot R^3 + C13 \cdot \ln R \qquad \text{(Eq. D-3)}$$

or

$$Pws = e^{\ln Pws}$$

where

P_{ws} = saturation pressure, psia (at the dry bulb or wet bulb temperature)
R = absolute Temp, °R = (T + 459.67)
T = dry or wet bulb temperature, °F
$C8$ = -1.0440397E+04
$C9$ = -1.1294650E+01
$C10$ = -2.7022355E-02
$C11$ = 1.2890360E-05
$C12$ = -2.4780681E-09
$C13$ = 6.5459673E+00

4. Humidity Ratio or Moisture Content, W [Equation 35, p. 6.13]

$$W = \frac{(1093 - 0.556T_{wb}) \cdot Ws - 0.24 \cdot (T_{db} - T_{wb})}{1093 + 0.444T_{db} - T_{wb}} \qquad \text{(Eq. D-4)}$$

where

W = humidity Ratio or Moisture content, lb water/lb dry air
Ws = 0.62198 · [(P_{ws}/($P - P_{ws}$)]
Pws = saturation pressure (for T_{db}), psia (from Equation D-2 or Equation D-3 above)
P = barometric pressure, psia (from Equation B-1 above)
T_{db} = dry bulb temperature, °F
T_{wb} = wet bulb temperature, °F

5. Water Vapor Partial Pressure, Pw [Equation 38, p. 6.13]

$$P_W = (P \cdot W)/(0.62198 + W) \qquad \text{(Eq. D-5)}$$

where

P_W = water vapor partial pressure, psia
P = barometric pressure, psia (from Equation D-1 above)
W = humidity ratio, lb water/lb dry air (from Equation D-4 above)

6. Relative Humidity [Equation 24, p. 6.12]

$$RH = (P_w / P_{ws}) \cdot 100 \qquad \text{(Eq. D-6)}$$

where

RH = relative humidity, percent
P_w = water vapor partial pressure, psia (from Equation D-5 above)
P_{ws} = saturation pressure (for T_{db}), psia (from Equation D-2 or Equation D-3 above)

7. Specific Volume [Equation 28, p. 6.12]

$$v = [0.3704 \cdot (T_{db} + 459.67) \cdot (1 + 1.6078 \cdot W) / P] \qquad \text{(Eq. D-7)}$$

where

v = specific volume, cu. ft./lb dry air
T_{db} = dry bulb temperature, °F
W = humidity ratio, lb water/lb dry air (from Equation D-4 above)
P = total pressure, psia (from Equation B-1 above)

8. Density of moist air mixture, d [Equation 11, p. 6.2]

$$d = (1/v) \cdot (1 + W) \qquad \text{(Eq. D-8)}$$

where

d = density, lb/cu. ft.
v = specific volume, cu. ft./lb dry air (from Equation D-7 above)
W = humidity ratio, lb water/lb dry air (from Equation D-4 above)

9. Enthalpy, h [Equation 32, p. 6.13]

$$h = (0.24 \cdot T_{db}) + [W \cdot (1061 + (0.444 \cdot T_{db})] \qquad \text{(Eq. D-9)}$$

where

h = enthalpy, Btu/lb dry air
T_{db} = dry bulb temperature, °F
W = humidity ratio, lb water/lb dry air (from Equation D-4 above)

10. Dew Point, Td (for Temperature < 32°F) [Equation 40, p. 6.13]

$$T_d = 90.12 + [26.142 \cdot Ln(P_w)] + [0.8927 \cdot (Ln(P_w))^2] \quad \text{(Eq. D-10)}$$

where

T_d = dew point temperature, °F
Ln = natural logarithm
P_w = water vapor partial pressure, psia (from Equation D-5 above)

11. Dew Point, Td (for Temperature = or > 32°F) [Equation 39, p. 6.13]

$$T_d = 100.45 + [33.193 \cdot Ln(P_w)] + [2.319 \cdot (Ln(P_w))^2] + [0.17074 \cdot (Ln(P_w))^3] + [1.2063 \cdot (P_w)^{0.1984}] \quad \text{(Eq. D-11)}$$

where

T_d = dew point temperature, °F
Ln = natural logarithm
P_w = water vapor partial pressure, psia (from Equation D-5 above)

12. Mass of dry air, Mass

$$M = CFM / v \quad \text{(Eq. D-12)}$$

where

M = mass of air, lb/min
Airflow cfm = airflow rate, cu. ft./min
v = specific volume, cu. ft./lb dry air (from Equation D-7 above)

13. Mixed Air Psychrometric (Adiabatic Mixing) [Equation 46, p. 6.17]

$$\text{MProp} = [(\text{Prop1} \cdot \text{Mass1}) + (\text{Prop2} \cdot \text{Mass2})] / [\text{Mass1} + \text{Mass2}] \quad \text{(Eq. D-13)}$$

where

Mprop = property of mixed air, enthalpy (h) or humidity ratio (W)
Prop1 = property of air stream #1, enthalpy (h) or humidity ratio (W)
Mass1 = mass of dry air stream #1, lb/min (from Equation D-12 above)
Prop2 = property of air stream #2, enthalpy (h) or humidity ratio (W)
Mass2 = mass of air stream #2, lb/min (from Equation D-12 above)

NOTE: It should be noted that only the enthalpy and the humidity ratio follows the above equation. Knowing two properties (h and W), the rest of the other psychrometric properties are determined using the equations found in Items 1 to 12. Also, wet bulb temperature calculation using the humidity ratio equation above will require trial and error because the saturated water pressure (P_{ws}) based on wet bulb temperature is required in the humidity ratio calculation. For initial value of the wet bulb temperature, the value determined from the mixed air equation above may be used, and then adjusted accordingly until the values converge.

14. Total Sensible Heat and Air flow Equation [Equation 43, p. 6.16]

From Equation D-16,

$$Q = (CFM \cdot d) \cdot 60 \cdot (h_L - h_E);$$

Substituting the value of enthalpy, h from Equation D-9 equation (with $W_E = W_L$):

$$Q_s = CFM \cdot 60 \cdot d_E \cdot (0.24 + 0.444W) \cdot (T_L - T_E) \qquad \text{(Eq. D-14)}$$

where

Qs	= sensible heat gain, Btu/h
Airflow cfm	= airflow rate, cu. ft./min
d_E	= density of incoming air, lb/cu. ft. @ T_E
W	= humidity ratio, lb water vapor/lb dry air
T_L	= dry bulb temperature of leaving air, °F
T_E	= dry bulb temperature of entering air, °F
60	= minutes per hour
0.24	= specific heat of dry air, Btu/lb °F
0.444	= specific heat of water vapor, Btu/lb °F

The value of $0.444W$ being very small is disregarded.

15. Latent Heat and Air flow Equation [Equation 43, p. 6.16]

From Equation B-16,

$$Q = (CFM \cdot d) \cdot 60 \cdot (h_L - h_E);$$

Substituting the value of enthalpy, h from Equation D-9 equation (with $T_E = T_L$):

$$Q_L = CFM \cdot 60 \cdot d_E \cdot (1061 + 0.444T_E) \cdot (W_L - W_E) \qquad \text{(Eq. D-15)}$$

where

Q_L	= latent heat gain, Btu/h
d_E	= density of incoming air, lb/cu. ft. @ T_E

T_E = dry bulb temperature of entering air, °F
W_L = humidity ratio of leaving air, lb water vapor/lb dry air
W_E = humidity ratio of entering air, lb water vapor/lb dry air
60 = minutes per hour
1061 = energy content of water vapor at 50% RH and 75°F, Btu/lb °F
0.444 = specific heat of water vapor, Btu/lb °F

16. Grand Total Heat and Air flow Equation [Equation 45, p. 6.16]

$$Q_T = CFM \cdot d_E \cdot 60 \cdot (h_L - h_E) - [(W_L - W_E) \cdot h_{WL}] \quad \text{(Eq. D-16)}$$

where

Q_T = Grand Total heat gain, Btu/h
Airflow cfm = airflow rate in cu. ft/min
d_E = density of incoming air, lb/cu. ft.
60 = minutes per hour
h_L = enthalpy of leaving air, Btu/lb dry air (from Equation D-9 above)
h_E = enthalpy of entering air, Btu/lb dry air (from Equation D-9 above)
W_L = humidity ratio of leaving air, lb water vapor/lb dry air
W_E = humidity ratio of entering air, lb water vapor/lb dry air
h_{WL} = enthalpy of condensed water leaving, Btu/lb water.

NOTE: The value of $[(W_L - W_S) \cdot h_{WL}]$ is negligible and is ignored.

APPENDIX E: ROOM EQUIPMENT HEAT GAIN LIST

The Room Equipment Heat Gain List was originally assembled by asking each group/discipline to provide a list of equipment. They specified equipment room-by-room with their corresponding heat load and approximate number of hours or usage within a 24-hour period. After some follow-up conversations with each group/discipline, a Room Equipment Heat Gain List was assembled. E-mails were sent to each group/discipline to confirm the data of each piece of equipment they originally specified. Confirmation responses from each group/discipline are contained in Attachments 1 through 7.

Note that between the time that the information was confirmed and the Room Equipment Heat Gain List shown in Table E-1 was created, a couple of room numbers changed on the CRCF General Arrangement Drawings (Assumption 3.1.1). The original "2003A Closure Equipment Room (North)" became "2007A Closure Equipment Room (North)" and the original "2011A Closure Equipment Room (South)" became "2007B Closure Equipment Room (South)." The original "1004 Support Area" became Rooms 1211 through 1213 and 1215 through 1222. In this calculation they are referred to, collectively, as "1200 Support Area" (Assumption 3.1.22). The original "1003A HVAC Room" became "1004 HVAC Room." Consequently, Table E-1 lists the newer room numbers and the Attachments list the older room numbers and names. For instance, the equipment shown in Attachment 5 belonging in rooms 2003A and 2011A currently is expected to reside in Rooms 2007A and 2007B, respectively.

Table E-1. Equipment Heat Gain List

Room No.	Room Name	Heat Source Note 1	Qty. Note 2	Use Factor Note 3	Load Factor Note 4	Heat Load, Each Note 5	Units Note 6	Motor Location Note 7	Equip Load Btu/h Note 8	Continuous Operation Note 9	Intermittent Operation Note 10	Simultaneous Operation (Intermittent) Note 11	Equip Load by Process Btu/h Note 12	Process Note 13	Equip Load USED, per Rm Btu/h Note 14	Originating Group/ Discipline	Remarks
1001	LLW Staging Room	CRCF MP LLW LIQUID COLL. SAMPLE PUMP	1	0.10	1.00	0.5	HP	C	850		X		85		0	Process	Pump motor HP taken from Reference 2.2.43. Engineering judgment of 2-minutes per start, 1-hr. per day total.
1001	LLW Staging Room	CRCF MP LLW SOLID COLL. SUMP PUMP	1	0.10	1.00	2.0	HP	C	1,350			X	135		135	Process	Pump motor HP taken from Reference 2.2.43. Engineering judgment of 2-minutes per start, 1-hr. per day total. Does not operate simultaneously with the other pump.
														Total Equipment Room Load =	**135**		
1002	North Maintenance Vestibule	RAACS STATIONS	1	1.00	1.00	30.0	Watts		102	X			102		102	ES&H	See Attachment 3 e-mail text for equipment and table for similar load.
														Total Equipment Room Load =	**102**		
1004	HVAC Room (LLW Supply)	EXH. FAN MOTOR	1	1.00	1.00	30.0	HP	C	9,440	X			9,440		9,440	HVAC	(EXH-00011) Motor HP rating taken from Reference 2.2.36.
1004	HVAC Room (LLW Supply)	EXH. FAN MOTOR - ASD	1	1.00	1.00	30.0	HP	C	2,619	X			2,619		2,619	HVAC	(EXH-00011) Motor HP rating taken from Reference 2.2.36. See Note 15.
1004	HVAC Room (LLW Supply)	EXH. FAN MOTOR	1	1.00	1.00	30.0	HP	C	9,440		X		0		0	HVAC	(EXH-00012) Motor HP rating taken from Reference 2.2.36.
1004	HVAC Room (LLW Supply)	EXH. FAN MOTOR - ASD	1	1.00	1.00	30.0	HP	C	2,619		X		0		0	HVAC	(EXH-00012) Motor HP rating taken from Reference 2.2.36. See Note 15.
														Total Equipment Room Load =	**12,059**		
1005B	Corridor	RAACS STATIONS	1	1.00	1.00	30.0	Watts	N/A	102	X			102		102	ES&H	See Attachment 3, e-mail text
1005B	Corridor	FRISKER	1	1.00	1.00	0.0		N/A	0	X			0		0	ES&H	No heat load.
														Total Equipment Room Load =	**102**		
1005C	Corridor	RAACS STATIONS	1	1.00	1.00	30.0	Watts	N/A	102	X			102		102	ES&H	See Attachment 3, e-mail text
1005C	Corridor	FRISKER	1	1.00	1.00	0.0		N/A	0	X			0		0	ES&H	No heat load.
														Total Equipment Room Load =	**102**		
1005G	Corridor	RAACS STATIONS	1	1.00	1.00	30.0	Watts	N/A	102	X			102		102	ES&H	See Attachment 3, e-mail text
1005G	Corridor	FRISKER	1	1.00	1.00	0.0		N/A	0	X			0		0	ES&H	No heat load.
														Total Equipment Room Load =	**102**		
1005H	Corridor	RAACS STATIONS	1	1.00	1.00	30.0	Watts	N/A	102	X			102		102	ES&H	See Attachment 3, e-mail text
1005H	Corridor	FRISKER	1	1.00	1.00	0.0		N/A	0	X			0		0	ES&H	No heat load.
														Total Equipment Room Load =	**102**		
1007	Electrical Room (Normal Power)	480V LOAD CENTER	1	1.00	1.00	11.16	kW	N/A	38,089	X			38,089		38,089	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	480V LOAD CENTER	1	1.00	1.00	11.16	kW	N/A	38,089	X			38,089		38,089	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	480V MCC 1A	1	1.00	1.00	0.631	kW	N/A	2,154	X			2,154		2,154	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	480V MCC 1B	1	1.00	1.00	0.631	kW	N/A	2,154	X			2,154		2,154	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	480V MCC 1C	1	1.00	1.00	0.631	kW	N/A	2,154	X			2,154		2,154	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	480V MCC 1D	1	1.00	1.00	0.631	kW	N/A	2,154	X			2,154		2,154	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	DIST XFMR 480-208/120 V	1	1.00	1.00	2.695	kW	N/A	9,198	X			9,198		9,198	Electrical	See Attachment 2.

Room No.	Room Name	Heat Source Note 1	Qty. Note 2	Use Factor Note 3	Load Factor Note 4	Heat Load, Each Note 5	Units Note 6	Motor Location Note 7	Equip Load Btu/h Note 8	Continuous Operation Note 9	Intermittent Operation Note 10	Simultaneous Operation (Intermittent) Note 11	Equip Load by Process Btu/h Note 12	Process Note 13	Equip Load USED, per Rm Btu/h Note 14	Originating Group/ Discipline	Remarks
1007	Electrical Room (Normal Power)	120V PANEL-DP-01A	1	1.00	1.00	0.5	kW	N/A	1,707	X			1,707		1,707	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	DISTRIBUTION PANEL 01A	1	1.00	1.00	0.5	kW	N/A	1,707	X			1,707		1,707	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	DCMIS PANEL 01A #1	1	1.00	1.00	0.4	kW	N/A	1,365	X			1,365		1,365	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	DCMIS PANEL 01A #1	1	1.00	1.00	0.4	kW	N/A	1,365	X			1,365		1,365	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	PLC PANELS 01A #1	1	1.00	1.00	0.34	kW	N/A	1,160	X			1,160		1,160	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	PLC PANELS 01A #2	1	1.00	1.00	0.34	kW	N/A	1,160	X			1,160		1,160	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	UPS 480-208/120 (RATED 40 KVA)	1	1.00	1.00	6.556	kW	N/A	22,376	X			22,376		22,376	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	MAINTENANCE BYPASS XFMR (40 KVA)	1	1.00	1.00	0.5	kW	N/A	1,707	X			1,707		1,707	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	LIGHTING PANEL LP-01	1	1.00	1.00	0.5	kW	N/A	1,707	X			1,707		1,707	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	LIGHTING PANEL LP-01	1	1.00	1.00	0.5	kW	N/A	1,707	X			1,707		1,707	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	UPS 01A #2	1	1.00	1.00	0.5	kW	N/A	1,707	X			1,707		1,707	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	UPS 01A #1	1	1.00	1.00	17.0	kW	N/A	58,021	X			58,021		58,021	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	MAINTENANCE BYPASS XFMR (160 KVA)	1	1.00	1.00	1.09	kW	N/A	3,720	X			3,720		3,720	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	CABLE TRAY 36", 350'	1	1.00	1.00	3.78	kW	N/A	12,901	X			12,901		12,901	Electrical	See Attachment 2.
1007	Electrical Room (Normal Power)	BUS LOSSES 5 VERT. STACK	1	1.00	1.00	0.4	kW	N/A	1,365	X			1,365		1,365	Electrical	Engineering judgment, to account for BUS losses (Assumption 3.1.24)
														Total Equipment Room Load =	**207,664**		
1009	HVAC Room	EXH. FAN MOTOR	1	1.00	1.00	5.0	HP	C	2,790	X			2,790		2,790	HVAC	(EXH-00005) Motor HP rating taken from Reference 2.2.38.
1009	HVAC Room	EXH. FAN MOTOR - ASD	1	1.00	1.00	5.0	HP	C	1,471	X			1,471		1,471	HVAC	(EXH-00005) Motor HP rating taken from Reference 2.2.38. See Note 15.
1009	HVAC Room	EXH. FAN MOTOR	1	1.00	1.00	5.0	HP	C	2,790		X		0		0	HVAC	(EXH-00006) Motor HP rating taken from Reference 2.2.38.
1009	HVAC Room	EXH. FAN MOTOR - ASD	1	1.00	1.00	5.0	HP	C	1,471		X		0		0	HVAC	(EXH-00006) Motor HP rating taken from Reference 2.2.38. See Note 15.
														Total Equipment Room Load =	**4,261**		
1010	HVAC Room	AHU RATED MOTOR - ASD	1	1.00	1.00	75.0	HP	A	4,686		X		0		0	HVAC	(AHU-00009 Motor HP rating taken from Reference 2.2.29. See Note 15
1010	HVAC Room	AHU RATED MOTOR - ASD	1	1.00	1.00	75.0	HP	A	4,686	X			4,686		4,686	HVAC	(AHU-00010) Motor HP rating taken from Reference 2.2.29. See Note 15
														Total Equipment Room Load =	**4,686**		
1011	HVAC Room	EXH. FAN MOTOR	1	1.00	1.00	200.0	HP	C	50,300	X			50,300		50,300	HVAC	(EXH-00009) Motor HP rating taken from Reference 2.2.32.
1011	HVAC Room	EXH. FAN MOTOR - ASD	1	1.00	1.00	200.0	HP	C	10,426	X			10,426		10,426	HVAC	(EXH-00009) Motor HP rating taken from Reference 2.2.32. See Note 15.
														Total Equipment Room Load =	**60,726**		

Room No.	Room Name	Heat Source Note 1	Qty. Note 2	Use Factor Note 3	Load Factor Note 4	Heat Load, Each Note 5	Units Note 6	Motor Location Note 7	Equip Load Btu/h Note 8	Continuous Operation Note 9	Intermittent Operation Note 10	Simultaneous Operation (Intermittent) Note 11	Equip Load by Process Btu/h Note 12	Process Note 13	Equip Load USED, per Rm Btu/h Note 14	Originating Group/ Discipline	Remarks
1015	WP Loadout Room	TAD (TRAIN A)	1	1.00	1.00	25.0	kW	N/A	85,325			X	85,325		85,325	Waste Package	See Attachment 1.
1015	WP Loadout Room	TAD (TRAIN B)	1	1.00	1.00	25.0	kW	N/A	85,325			X	85,325		85,325	Waste Package	See Attachment 1.
1015	WP Loadout Room	WP TRANSFER TROLLEY A	2	0.10	0.85	75.0	HP	A	212,000			X	36,040		9,010	Mechanical Handling	See Attachment 6. 25 % diversity factor, see Note 16.
1015	WP Loadout Room	WP TRANSFER TROLLEY B	2	0.10	0.85	75.0	HP	A	212,000		X		0		0	Mechanical Handling	See Attachment 6. 25 % diversity factor, see Note 16.
1015	WP Loadout Room	CRCF LOADOUT PLATFORM 1	1	0.10	1.00	2.0	HP	A	6,440			X	644		161	Mechanical Handling	See Attachment 6. 25 % diversity factor, see Note 16.
1015	WP Loadout Room	CRCF LOADOUT PLATFORM 2	1	0.10	1.00	2.0	HP	A	6,440		X		644		161	Mechanical Handling	See Attachment 6. 25 % diversity factor, see Note 16.
1015	WP Loadout Room	CRCF LOADOUT PLATFORM 3	1	0.10	1.00	2.0	HP	A	6,440		X		644		161	Mechanical Handling	See Attachment 6. 25 % diversity factor, see Note 16.
1015	WP Loadout Room	WP TRANSFER CARRIAGE DOCKING STATION	1	0.10	1.00	40.0	HP	A	11,440			X	1,144		286	Mechanical Handling	See Attachment 6. 25 % diversity factor, see Note 16.
1015	WP Loadout Room	WP TRANSFER CARRIAGE DOCKING STATION	1	0.10	1.00	40.0	HP	A	11,440		X		0		0	Mechanical Handling	See Attachment 6. 25 % diversity factor, see Note 16.
1015	WP Loadout Room	WP POSITIONING ROOM-NORTH SHIELD DOOR 1	1	0.10	1.00	15.0	HP	A	44,400			X	4,440		1,110	Mechanical Handling	See Attachment 6. 25 % diversity factor, see Note 16.
1015	WP Loadout Room	WP POSITIONING ROOM-SOUTH SHIELD DOOR 2	1	0.10	1.00	15.0	HP	A	44,400		X		0		0	Mechanical Handling	See Attachment 6. 25 % diversity factor, see Note 16.
1015	WP Loadout Room	WP HANDLING CRANE	1	0.10	0.85	60.0	HP	A	172,000			X	14,620		3,655	Mechanical Handling	See Attachment 6. 25 % diversity factor, see Note 16.
1015	WP Loadout Room	WP HANDLING CRANE MOTOR - ASD	1	0.10	0.85	60.0	HP	A	3,997			X	340		85	Mechanical Handling	See Attachment 6. 25 % diversity factor, see Note 16.
1015	WP Loadout Room	AHU RATED MOTOR - ASD	1	1.00	1.00	50.0	HP	A	3,538		X				0	HVAC	(AHU-00013) Motor HP rating taken from Reference 2.2.31. See Note 15
1015	WP Loadout Room	AHU RATED MOTOR - ASD	1	1.00	1.00	50.0	HP	A	3,538			X	3,538		3,538	HVAC	(AHU-00014) Motor HP rating taken from Reference 2.2.31. See Note 15
1015	WP Loadout Room	MISC. LOAD	--	--	--	--	--	--	78,975	X			78,975		78,975		See Note 17.
														Total Equipment Room Load =	**267,792**		
1017	Canister Staging Area #1	TAD (TRAIN A)	1	1.00	1.00	25.0	kW	N/A	85,325			X	85,325		85,325	Waste Package	See Attachment 1.
														Total Equipment Room Load =	**85,325**		
1018	WP Positioning Room (North)	TAD (TRAIN A)	1	1.00	1.00	25.0	kW	N/A	85,325			X	85,325		85,325	Waste Package	See Attachment 1.
1018	WP Positioning Room (North)	CLOSURE AREA SHIELD DOOR	1	1.00	1.00	15.0	HP	A	44,400		X		0		0	Mechanical Handling	See Attachment 6. Room numbers at reference e-mail are not in numerical order
1018	WP Positioning Room (North)	WP TRANSFER TROLLEY A	2	1.00	0.85	75.0	HP	A	360,400		X		0		0	Mechanical Handling	See Attachment 6. Room numbers at reference e-mail are not in numerical order
														Total Equipment Room Load =	**85,325**		
1019	WP Positioning Room (South)	TAD (TRAIN A)	1	1.00	1.00	25.0	kW	N/A	85,325			X	85,325		85,325	Waste Package	See Attachment 1.
1019	WP Positioning Room (South)	CLOSURE AREA SHIELD DOOR	1	1.00	1.00	15.0	HP	A	44,400		X		0		0	Mechanical Handling	See Attachment 6. Room numbers at reference e-mail are not in numerical order
1019	WP Positioning Room (South)	WP TRANSFER TROLLEY B	2	1.00	0.85	75.0	HP	A	360,400		X		0		0	Mechanical Handling	See Attachment 6. Room numbers at reference e-mail are not in numerical order

Room No.	Room Name	Heat Source Note 1	Qty. Note 2	Use Factor Note 3	Load Factor Note 4	Heat Load, Each Note 5	Units Note 6	Motor Location Note 7	Equip Load Btu/h Note 8	Continuous Operation Note 9	Intermittent Operation Note 10	Simultaneous Operation (Intermittent) Note 11	Equip Load by Process Btu/h Note 12	Process Note 13	Equip Load USED, per Rm Btu/h Note 14	Originating Group/ Discipline	Remarks
													Total Equipment Room Load =		**85,325**		
1021	Canister Staging Area #2	DOE CANISTERS	6	1.00	1.00	1.5	kW	N/A	30,717			X	30,717		30,717	Waste Package	See Attachment 1.
													Total Equipment Room Load =		**30,717**		
1022	Canister Staging Area #3	TAD (TRAIN A)	1	1.00	1.00	25.0	kW	N/A	85,325			X	85,325		85,325	Waste Package	See Attachment 1.
													Total Equipment Room Load =		**85,325**		
1023	Cask Unloading Room (North)	TAD (TRAIN A)	1	1.00	1.00	25.0	kW	N/A	85,325			X	85,325		85,325	Waste Package	See Attachment 1.
1023	Cask Unloading Room (North)	CASK TRANSFER TROLLEY A	1	1.00	1.00	0.0		N/A	0			X	0		0	Mechanical Handling	Uses air operated motor, No heat load.
													Total Equipment Room Load =		**85,325**		
1024	Cask Unloading Room (South)	TAD (TRAIN A)	1	1.00	1.00	25.0	kW	N/A	85,325			X	85,325		85,325	Waste Package	See Attachment 1.
1024	Cask Unloading Room (South)	CASK TRANSFER TROLLEY B	1	1.00	1.00	0.0		N/A	0			X	0		0	Mechanical Handling	Uses air operated motor, No heat load.
													Total Equipment Room Load =		**85,325**		
1025	Canister Staging Area #4	DOE CANISTERS	4	1.00	1.00	1.5	kW	N/A	20,478			X	20,478		20,478	Waste Package	See Attachment 1.
													Total Equipment Room Load =		**20,478**		
1026	Cask Preparation Area	CASK HANDLING CRANE	1	0.45	0.90	100.0	HP	A	283,000			X	114,615		28,654	Mechanical Handling	See Attachment 6. 90 HP is listed in the attachment. By engineering judgement and for conservatism, 100 HP is used in this calculation with a load factor of 90%. 25% diversity factor, see Note 16.
1026	Cask Preparation Area	CASK HANDLING CRANE MOTOR - ASD	1	0.45	1.00	100.0	HP	--	5,834			X	2,625		656	Mechanical Handling	See Note 15. 25% diversity factor, see Note 16.
1026	Cask Preparation Area	MOBILE ACCESS PLATFORM	2	0.45	1.00	10.0	HP	A	29,900			X	26,910		6,728	Mechanical Handling	See Attachment 6. 25% diversity factor, see Note 16.
1026	Cask Preparation Area	CASK PREPARATION PLATFORM	4	0.45	1.00	20.0	HP	A	58,500			X	105,300		26,325	Mechanical Handling	See Attachment 6. 25% diversity factor, see Note 16.
1026	Cask Preparation Area	CASK UNLOADING ROOM-NORTH SHIELD DOOR 1	1	0.10	1.00	15.0	HP	A	44,400			X	4,440		1,110	Mechanical Handling	See Attachment 6. 25% diversity factor, see Note 16.
1026	Cask Preparation Area	CASK UNLOADING ROOM-NORTH SHIELD DOOR 2	1	0.10	1.00	15.0	HP	A	44,400			X	4,440		1,110	Mechanical Handling	See Attachment 6. 25% diversity factor, see Note 16.
1026	Cask Preparation Area	TRANSPORTATION CASK WITH TAD ON RAIL CAR	1	1.00	1.00	25.0	KW	N/A	85,325			X	85,325		85,325	Waste Package	See Attachment 1
1026	Cask Preparation Area	STC OR OA WITH TAD (TRAIN A)	1	1.00	1.00	25.0	KW	N/A	85,325			X	85,325		85,325	Waste Package	See Attachment 1
1026	Cask Preparation Area	STC OR OA WITH TAD (TRAIN B)	1	1.00	1.00	25.0	KW	N/A	85,325			X	85,325		85,325	Waste Package	See Attachment 1
1026	Cask Preparation Area	MISC LOAD							41,925				41,925		41,925		See Note 17.
													Total Equipment Room Load =		**362,483**		For room total mechanical handling load, see Note 16.
1028	Utility Room	CRCF ME DESSICANT DRYER	1	1.00	1.00	0.0	kW	N/A	0				0		0	Process	No heat load.
1028	Utility Room	CRCF ME REFRIGERATED DRYER	1	0.50	1.00	0.0	kW	N/A	241,193				120,596		120,596	Process	See Assumption 3.1.7. Engineering judgement, Used 50% USE FACTOR
1028	Utility Room	CRCF ME CHILLED WATER PUMP #1	1	1.00	1.00	100.0	HP	C	28,300	X			28,300		28,300	Process	(PSC0-P-00001A) Motor HP rating taken from Reference

Room No.	Room Name	Heat Source Note 1	Qty. Note 2	Use Factor Note 3	Load Factor Note 4	Heat Load, Each Note 5	Units Note 6	Motor Location Note 7	Equip Load Btu/h Note 8	Continuous Operation Note 9	Intermittent Operation Note 10	Simultaneous Operation (Intermittent) Note 11	Equip Load by Process Btu/h Note 12	Process Note 13	Equip Load USED, per Rm Btu/h Note 14	Originating Group/ Discipline	Remarks
																	2.2.41.
1028	Utility Room	CRCF ME CHILLED WATER PUMP #1 - ASD	1	1.00	1.00	100.0	HP		5,834	X			5,834		5,834	Process	(PSC0-P-00001A) Motor HP rating taken from Reference 2.2.41. See Note 15.
1028	Utility Room	CRCF ME CHILLED WATER PUMP #2	1	1.00	1.00	100.0	HP	C	28,300		X		0		0	Process	(PSC0-P-00001B) Motor HP rating taken from Reference 2.2.41.
1028	Utility Room	CRCF ME CHILLED WATER PUMP #2 - ASD	1	1.00	1.00	100.0	HP	N/A	5,834		X		0		0	Process	(PSC0-P-00001B) Motor HP rating taken from Reference 2.2.41. See Note 15.
1028	Utility Room	CRCF ME HOT WATER PUMP #1	1	1.00	1.00	25.0	HP	C	8,680	X			8,680		8,680	Process	(PSH0-P-00001A) Motor HP rating taken from Reference 2.2.40.
1028	Utility Room	CRCF ME HOT WATER PUMP #1 - ASD	1	1.00	1.00	25.0	HP	N/A	2,390	X			2,390		2,390	Process	(PSH0-P-00001A) Motor HP rating taken from Reference 2.2.40. See Note 15.
1028	Utility Room	CRCF ME HOT WATER PUMP #2	1	1.00	1.00	25.0	HP	C	8,680		X		0		0	Process	(PSH0-P-00001B) Motor HP rating taken from Reference 2.2.40.
1028	Utility Room	CRCF ME HOT WATER PUMP #2 - ASD	1	1.00	1.00	25.0	HP	N/A	2,390		X		0		0	Process	(PSH0-P-00001B) Motor HP rating taken from Reference 2.2.40. See Note 15.
1028	Utility Room	FCU MOTOR - ASD	1	1.00	1.00	25.0	HP	N/A	2,390		X		0		0	HVAC	FCU motor assume to 25 HP. See Note 15.
1028	Utility Room	FCU MOTOR - ASD	1	1.00	1.00	25.0	HP	N/A	2,390	X			2,390		2,390	HVAC	FCU motor assume to 25 HP. See Note 15.
1028	Utility Room	480V LOAD CENTER	1	1.00	1.00	11.16	kW	N/A	38,089	X			38,089		38,089	Electrical	See Attachment 2.
1028	Utility Room	MCC	1	1.00	1.00	0.631	kW	N/A	2,154	X			2,154		2,154	Electrical	See Attachment 2.
														Total Equipment Room Load =	**208,432**		
1030	HVAC Room	EXH. FAN MOTOR	1	1.00	1.00	5.0	HP	C	2,790	X			2,790		2,790	HVAC	(EXH-00007) Motor HP rating taken from Reference 2.2.39.
1030	HVAC Room	EXH. FAN MOTOR - ASD	1	1.00	1.00	5.0	HP	C	1,471	X			1,471		1,471	HVAC	(EXH-00007) Motor HP rating taken from Reference 2.2.39. See Note 15.
1030	HVAC Room	EXH. FAN MOTOR	1	1.00	1.00	5.0	HP	C	2,790		X		0		0	HVAC	(EXH-00008) Motor HP rating taken from Reference 2.2.39.
1030	HVAC Room	EXH. FAN MOTOR - ASD	1	1.00	1.00	5.0	HP	C	1,471		X		0		0	HVAC	(EXH-00008) Motor HP rating taken from Reference 2.2.39. See Note 15.
														Total Equipment Room Load =	**4,261**		
1031	HVAC Room	AHU RATED MOTOR - ASD	1	1.00	1.00	75.0	HP	A	4,686		X				0	HVAC	(AHU-00011) Motor HP rating taken from Reference 2.2.30. See Note 15
1031	HVAC Room	AHU RATED MOTOR - ASD	1	1.00	1.00	75.0	HP	A	4,686			X	4,686		4,686	HVAC	(AHU-00012) Motor HP rating taken from Reference 2.2.30. See Note 15
												Total Equipment Room Load =			**4,686**		
1032	HVAC Room	EXH. FAN MOTOR	1	1.00	1.00	200.0	HP	C	50,300	X			50,300		50,300	HVAC	(EXH-00010) Motor HP rating taken from Reference 2.2.33.
1032	HVAC Room	EXH. FAN MOTOR - ASD	1	1.00	1.00	200.0	HP	C	10,426	X			10,426		10,426	HVAC	(EXH-00010) Motor HP rating taken from Reference 2.2.33. See Note 15.
														Total Equipment Room Load =	**60,726**		
1034	Gas Sampling Room	CRCF MP CASK CAV GAS SAMPLING VAC PUMP	1	0.05	1.00	1.0	kW	N/A	3,413		X		0		0	Process	Engineering judgment, usage of 15-minutes once a day.

Room No.	Room Name	Heat Source Note 1	Qty. Note 2	Use Factor Note 3	Load Factor Note 4	Heat Load, Each Note 5	Units Note 6	Motor Location Note 7	Equip Load Btu/h Note 8	Continuous Operation Note 9	Intermittent Operation Note 10	Simultaneous Operation (Intermittent) Note 11	Equip Load by Process Btu/h Note 12	Process Note 13	Equip Load USED, per Rm Btu/h Note 14	Originating Group/ Discipline	Remarks
1034	Gas Sampling Room	CRCF MP CASK CAV GAS SAMPLING AIR COOLING UNIT	1	0.05	1.00	1.0	kW	N/A	3,413			X	171		171	Process	(MRE0-VACR 00001) Motor HP rating taken from Reference 2.2.42. Engineering judgment, usage of 15-minutes once a day.
														Total Equipment Room Load =	**171**		
1035	HVAC Room	EXH. FAN MOTOR	1	1.00	1.00	15.0	HP	C	6,210	X			6,210		6,210	HVAC	(EXH-00013) Motor HP rating taken from Reference 2.2.35.
1035	HVAC Room	EXH. FAN MOTOR - ASD	1	1.00	1.00	15.0	HP	C	1,930	X			1,930		1,930	HVAC	(EXH-00013) Motor HP rating taken from Reference 2.2.35. See Note 15.
1035	HVAC Room	EXH. FAN MOTOR	1	1.00	1.00	15.0	HP	C	6,210		X		0		0	HVAC	(EXH-00014) Motor HP rating taken from Reference 2.2.35.
1035	HVAC Room	EXH. FAN MOTOR - ASD	1	1.00	1.00	15.0	HP	C	1,930		X		0		0	HVAC	(EXH-00014) Motor HP rating taken from Reference 2.2.35. See Note 15.
														Total Equipment Room Load =	**8,140**		
1044A	Elevator Mechanical Room	Elevator Equipment	1	1.00	1.00	1000.0	Watts	N/A	3,413	X			3,413		3,413		See Assumption 3.1.20
														Total Equipment Room Load =	**3,413**		
1045	Corridor	TEST PORTAL MONITOR/CALIBRATOR	1	1.00	1.00	700.0	Watts	N/A	2,389	X			2,389		2,389	ES&H	See Attachment 3, e-mail text
1045	Corridor	RAACS STATIONS	1	1.00	1.00	30.0	Watts	N/A	102	X			102		102	ES&H	See Attachment 3, e-mail text
														Total Equipment Room Load =	**2,491**		
1048	Elevator Lobby	RAACS STATIONS	1	1.00	1.00	30.0	Watts	N/A	102	X			102		102	ES&H	See Attachment 3, e-mail text
														Total Equipment Room Load =	**102**		
1200	Support Area	DISPLAY BOARD	1	1.00	1.00	30.0	Watts	N/A	102	X			102		102	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	TEST PORTAL MONITOR/CALIBRATOR	1	1.00	1.00	700.0	Watts	N/A	2,389	X			2,389		2,389	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	SMALL EQUIPMENT MONITOR	1	1.00	1.00	30.0	Watts	N/A	102	X			102		102	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	FRISKER	1	1.00	1.00	0.0		N/A	0	X			0		0	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	COMPUTER TERMINAL WALL DISPLAY	1	1.00	1.00	30.0	Watts	N/A	102	X			102		102	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	DISPLAY BOARD	1	1.00	1.00	30.0	Watts	N/A	102	X			102		102	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	DISPLAY BOARD	1	1.00	1.00	30.0	Watts	N/A	102	X			102		102	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	ELECTRONIC DOSIMETER CALIBRATOR	1	1.00	1.00	0.9	Watts	N/A	3	X			3		3	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.

Room No.	Room Name	Heat Source Note 1	Qty. Note 2	Use Factor Note 3	Load Factor Note 4	Heat Load, Each Note 5	Units Note 6	Motor Location Note 7	Equip Load Btu/h Note 8	Continuous Operation Note 9	Intermittent Operation Note 10	Simultaneous Operation (Intermittent) Note 11	Equip Load by Process Btu/h Note 12	Process Note 13	Equip Load USED, per Rm Btu/h Note 14	Originating Group/ Discipline	Remarks
1200	Support Area	BARCODE SCAN STATION	1	1.00	1.00	0.0		N/A	0	X			0		0	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	NEUTRON SOURCE CHECK STATION	1	1.00	1.00	0.0		N/A	0	X			0		0	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	BATTERY CHARGING STATION	1	1.00	1.00	0.0		N/A	0	X			0		0	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	PROPORTIONAL COUNTER	1	1.00	1.00	575.0	Watts	N/A	1,962	X			1,962		1,962	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	GAMMA SPECTOMETER	2	1.00	1.00	1200.0	Watts	N/A	8,191	X			8,191		8,191	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	ALPHA SPECTOMETER	1	1.00	1.00	3.0	Watts	N/A	10	X			10		10	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	LIQUID SCINTILATION COUNTER	1	1.00	1.00	1230.0	Watts	N/A	4,198	X			4,198		4,198	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	SWIPE COUNTER	2	1.00	1.00	575.0	Watts	N/A	3,925	X			3,925		3,925	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	FRISKER STATION	2	1.00	1.00	0.0		N/A	0	X			0		0	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	SAMPLE PREPARATION HOOD	1	1.00	1.00	0.0		N/A	0	X			0		0	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	BAR CODE SCANNER	1	1.00	1.00	0.0		N/A	0	X			0		0	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
1200	Support Area	RAACS STATIONS	4	1.00	1.00	30.0	Watts	N/A	410	X			410		410	ES&H	See Attachment 3. Note that Room 1200 Support Area was formally known as Room 1004 in Attachment 3.
														Total Equipment Room Load =	**21,601**		
2001	HVAC Room	480V MCC 1E	1	1.00	1.00	0.631	kW	N/A	2,154	X			2,154		2,154	Electrical	See Attachment 2.
2001	HVAC Room	480V MCC 1E	1	1.00	1.00	0.631	kW	N/A	2,154	X			2,154		2,154	Electrical	See Attachment 2.
2001	HVAC Room	LIGHTING PANEL LP-01	1	1.00	1.00	0.5	kW	N/A	1,707	X			1,707		1,707	Electrical	See Attachment 2.
2001	HVAC Room	AHU RATED MOTOR - ASD	1	1.00	1.00	75.0	HP	A	4,686		X				0	HVAC	(AHU-00001) Motor HP rating taken from Reference 2.2.25. See Note 15
2001	HVAC Room	AHU RATED MOTOR - ASD	1	1.00	1.00	75.0	HP	A	4,686			X	4,686		4,686	HVAC	(AHU-00002) Motor HP rating taken from Reference 2.2.25. See Note 15

Room No.	Room Name	Heat Source Note 1	Qty. Note 2	Use Factor Note 3	Load Factor Note 4	Heat Load, Each Note 5	Units Note 6	Motor Location Note 7	Equip Load Btu/h Note 8	Continuous Operation Note 9	Intermittent Operation Note 10	Simultaneous Operation (Intermittent) Note 11	Equip Load by Process Btu/h Note 12	Process Note 13	Equip Load USED, per Rm Btu/h Note 14	Originating Group/ Discipline	Remarks
													Total Equipment Room Load =		**10,700**		
2003	Closure Support Room (North)	WIS ARC WELDING ROBOT A (ROBOT CONTROLLER A)	1	1.00	1.00	13.3	kW	N/A	45,393	X			45,393	RACK	45,393	WP Closure	See Page 7 of Reference 2.2.20.
2003	Closure Support Room (North)	WIS ARC WELDING ROBOT B (ROBOT CONTROLLER B)	1	1.00	1.00	13.3	kW	N/A	45,393	X			45,393	RACK	45,393	WP Closure	See Page 8 of Reference 2.2.20.
2003	Closure Support Room (North)	WIS MAINT./TESTING NDE EQUIPT. RACK (UT ELECTRNICS-FOCUS LT)	1	1.00	1.00	135.0	Watts	N/A	461	X			461	RACK	461	WP Closure	See Page 11 of Reference 2.2.20.
2003	Closure Support Room (North)	WIS MAINT./TESTING NDE EQUIPT. RACK (ET ELECTRONICS-QUICK SCAN)	1	1.00	1.00	165.0	Watts	N/A	563	X			563	RACK	563	WP Closure	See Page 11 of Reference 2.2.20.
2003	Closure Support Room (North)	WIS MAINT./TESTING NDE EQUIPT. RACK (UT ACQUISITION COMPUTER)	1	1.00	1.00	200.0	Watts	N/A	683	X			683	RACK	683	WP Closure	See Page 11 of Reference 2.2.20.
2003	Closure Support Room (North)	WIS MAINT./TESTING NDE EQUIPT. RACK (ET ACQUISITION COMPUTER)	1	1.00	1.00	200.0	Watts	N/A	683	X			683	RACK	683	WP Closure	See Page 11 of Reference 2.2.20.
2003	Closure Support Room (North)	WIS MAINT./TESTING NDE EQUIPT. RACK (NDE TOOL TRAY HARDWARE CONTROLS)	1	1.00	1.00	12.0	Watts	N/A	41	X			41	RACK	41	WP Closure	See Page 12 of Reference 2.2.20.
2003	Closure Support Room (North)	WIS MAINT./TESTING NDE EQUIPT. RACK (NDE TOOL TRAY HARDWARE CONTROLS)	1	1.00	1.00	720.0	Watts	N/A	2,457	X			2,457	RACK	2,457	WP Closure	See Page 12 of Reference 2.2.20.
2003	Closure Support Room (North)	WIS MAINT./TESTING CONTROLS EQUIPT. RACK (REAL TIME COMPUTER)	1	1.00	1.00	720.0	Watts	N/A	2,457	X			2,457	RACK	2,457	WP Closure	See Page 12 of Reference 2.2.20.
2003	Closure Support Room (North)	WIS MAINT./TESTING CONTROLS EQUIPT. RACK (MOTOR DRIVE BOX)	1	1.00	1.00	72.0	Watts	N/A	246	X			246	RACK	246	WP Closure	See Page 12 of Reference 2.2.20.
2003	Closure Support Room (North)	WIS MAINT./TESTING CONTROLS EQUIPT. RACK (EE CAMERA CCUs)	1	1.00	1.00	12.0	Watts	N/A	41	X			41	RACK	41	WP Closure	See Page 12 of Reference 2.2.20.
2003	Closure Support Room (North)	WIS MAINT./TESTING, SCAM TRACKER/VT CONTROLS	1	1.00	1.00	162.0	Watts	N/A	553	X			553	RACK	553	WP Closure	See Page 12 of Reference 2.2.20.
2003	Closure Support Room (North)	WIS WELDING POWER SUPPLY - A	1	1.00	1.00	412.0	Watts	N/A	1,406			X	1,406	WELDING	1,406	WP Closure	See Page 15 of Reference 2.2.20.
2003	Closure Support Room (North)	WIS WELDING POWER SUPPLY - B	1	1.00	1.00	412.0	Watts	N/A	1,406			X	1,406	WELDING	1,406	WP Closure	See Page 15 of Reference 2.2.20.
2003	Closure Support Room (North)	WIS WELDING POWER SUPPLY - MAINT./TESTING	1	1.00	1.00	412.0	Watts	N/A	1,406		X		0	MAINT	0	WP Closure	See Page 15 of Reference 2.2.20.
2003	Closure Support Room (North)	MAINTENANCE SYSTEM (TRANSFER CART & RAILS)	1	1.00	1.00	120.0	Watts	N/A	410		X		0	MAINT	0	WP Closure	See Page 16 of Reference 2.2.20.

Room No.	Room Name	Heat Source Note 1	Qty. Note 2	Use Factor Note 3	Load Factor Note 4	Heat Load, Each Note 5	Units Note 6	Motor Location Note 7	Equip Load Btu/h Note 8	Continuous Operation Note 9	Intermittent Operation Note 10	Simultaneous Operation (Intermittent) Note 11	Equip Load by Process Btu/h Note 12	Process Note 13	Equip Load USED, per Rm Btu/h Note 14	Originating Group/ Discipline	Remarks
2003	Closure Support Room (North)	UTILITIES CONTROL SYSTEM - SUPPORT RM. UTILITIES CONTROL	1	1.00	1.00	0.0		N/A	0		X		0		0	WP Closure	See Page 19 of Reference 2.2.20.
2003	Closure Support Room (North)	OPERATION WORK STATION SYSTEM-SUPPORT ROOM OPERATOR WORKSTATIONS	3	1.00	1.00	30.0	Watts	N/A	307		X		0	MAINT	0	WP Closure	See Page 18 of Reference 2.2.20.
														Total Equipment Room Load =	**101,782**		
2004	Canister Transfer Room	CANISTER TRANSFER MACHINE	1	0.10	1.00	60.0	HP	A	172,000			X	17,200		4,300	Mechanical Handling	See Attachment 6. 25% diversity factor, see Note 16.
2004	Canister Transfer Room	CANISTER TRANSFER MACHINE	1	0.10	1.00	60.0	HP	A	172,000		X		0		0	Mechanical Handling	See Attachment 6. 25% diversity factor, see Note 16.
2004	Canister Transfer Room	CTM MAINTENANCE CRANE	1	0.10	0.85	40.0	HP	A	114,000			X	9,690		2,423	Mechanical Handling	See Attachment 6. 25% diversity factor, see Note 16.
2004	Canister Transfer Room	CTM MAINTENANCE CRANE MOTOR - ASD	1	0.10	0.85	40.0	HP	A	3,078			X	262		65	Mechanical Handling	See Note 15. 25% diversity factor, see Note 16.
2004	Canister Transfer Room	CAST PORT SLIDE GATE	2	0.10	1.00	0.5	HP	A	2,120		X		0		0	Mechanical Handling	See Attachment 6. 25% diversity factor, see Note 16.
2004	Canister Transfer Room	CAST PORT SLIDE GATE	2	0.10	1.00	0.5	HP	A	2,120		X		0		0	Mechanical Handling	See Attachment 6. 25% diversity factor, see Note 16.
2004	Canister Transfer Room	DOE CANISTER SLIDE GATE	5	0.10	1.00	3.0	HP	A	9,430		X		0		0	Mechanical Handling	See Attachment 6. 25% diversity factor, see Note 16.
2004	Canister Transfer Room	TAD SLIDE GATE	1	0.10	1.00	3.0	HP	A	9,430		X		943		236	Mechanical Handling	See Attachment 6. 25% diversity factor, see Note 16. Gates in the room, only one gate operate at any time. Engineering judgement and for conservatism, gate with 3 HP motor will be used.
2004	Canister Transfer Room	TAD SLIDE GATE	1	0.10	1.00	3.0	HP	A	9,430		X		0		0	Mechanical Handling	See Attachment 6. 25% diversity factor, see Note 16.
2004	Canister Transfer Room	WP PORT SLIDE GATE	2	0.10	1.00	0.5	HP	A	2,120		X		0		0	Mechanical Handling	See Attachment 6. 25% diversity factor, see Note 16.
2004	Canister Transfer Room	WP PORT SLIDE GATE	2	0.10	1.00	0.5	HP	A	2,120		X		0		0	Mechanical Handling	See Attachment 6. 25% diversity factor, see Note 16.
2004	HVAC Room	AHU RATED MOTOR - ASD	1	1.00	1.00	75.0	HP	A	4,686		X		0		0	HVAC	(AHU-00003) Motor HP rating taken from Reference 2.2.26. See Note 15
2004	HVAC Room	AHU RATED MOTOR - ASD	1	1.00	1.00	75.0	HP	A	4,686			X	4,686		4,686	HVAC	(AHU-00004) Motor HP rating taken from Reference 2.2.26. See Note 15
2004	HVAC Room	MISC. LOAD	--	--	--	--	--	--	253,800	X			253,800		253,800		See Note 17.
														Total Equipment Room Load =	**265,510**		
2005	HVAC Room	480V MCC 1G	1	1.00	1.00	0.631	kW	N/A	2,154	X			2,154		2,154	Electrical	See Attachment 2.
2005	HVAC Room	480V MCC 1G	1	1.00	1.00	0.631	kW	N/A	2,154	X			2,154		2,154	Electrical	See Attachment 2.
2005	HVAC Room	DIST XFMR 480-208/120 V	1	1.00	1.00	1.45	kW	N/A	4,949	X			4,949		4,949	Electrical	See Attachment 2.
2005	HVAC Room	LIGHTING PANEL 480/277 V	1	1.00	1.00	0.50	kW	N/A	1,707	X			1,707		1,707	Electrical	See Attachment 2.
2005	HVAC Room	DIST PANEL 208/120 V	1	1.00	1.00	0.50	kW	N/A	1,707	X			1,707		1,707	Electrical	See Attachment 2.
2005	HVAC Room	AHU RATED MOTOR - ASD	1	1.00	1.00	75.0	HP	A	4,686		X		0		0	HVAC	(AHU-00005) Motor HP rating taken from Reference 2.2.27. See Note 15
2005	HVAC Room	AHU RATED MOTOR - ASD	1	1.00	1.00	75.0	HP	A	4,686			X	4,686		4,686	HVAC	(AHU-00006) Motor HP rating taken from Reference 2.2.27. See Note 15

Room No.	Room Name	Heat Source Note 1	Qty. Note 2	Use Factor Note 3	Load Factor Note 4	Heat Load, Each Note 5	Units Note 6	Motor Location Note 7	Equip Load Btu/h Note 8	Continuous Operation Note 9	Intermittent Operation Note 10	Simultaneous Operation (Intermittent) Note 11	Equip Load by Process Btu/h Note 12	Process Note 13	Equip Load USED, per Rm Btu/h Note 14	Originating Group/ Discipline	Remarks
													Total Equipment Room Load =		**17,355**		
2007	Waste Package Closure Room	WP PORT SLIDE GATE	1	1.00	1.00	1.0	HP	A	3,390		X		0		0	WP Closure	See Page 7 of Reference 2.2.20.
2007	Waste Package Closure Room	WIS BEARING (MOTOR)	2	1.00	1.00	1.4	kW	N/A	9,556	X			9,556	WELDING	9,556	WP Closure	See Page 7 of Reference 2.2.20.
2007	Waste Package Closure Room	WIS ARC WELDING ROBOT A (CAMERA A COOLING)	2	1.00	1.00	18.0	Watts	N/A	123	X			123		123	WP Closure	See Page 7 of Reference 2.2.20.
2007	Waste Package Closure Room	WIS ARC WELDING ROBOT A (CAMERA B COOLING)	2	1.00	1.00	18.0	Watts	N/A	123	X			123		123	WP Closure	See Page 7 of Reference 2.2.20.
2007	Waste Package Closure Room	DRESSING END EFFECTOR A (GRINDING MOTOR A)	2	1.00	1.00	565.0	Watts	N/A	3,857		X		0	GRIND	0	WP Closure	See Page 13 of Reference 2.2.20.
2007	Waste Package Closure Room	DRESSING END EFFECTOR B (GRINDING MOTOR B)	2	1.00	1.00	560.0	Watts	N/A	3,823		X		0	GRIND	0	WP Closure	See Page 13 of Reference 2.2.20.
2007	Waste Package Closure Room	ET END EFFECTOR A (ET REPAIR PROBE A)	2	1.00	1.00	11.0	Watts	N/A	75		X		0	REPAIR	0	WP Closure	See Page 13 of Reference 2.2.20.
2007	Waste Package Closure Room	ET END EFFECTOR A (ET MULTIPLEXER A)	2	1.00	1.00	33.0	Watts	N/A	225			X	225	NDE	225	WP Closure	See Page 13 of Reference 2.2.20.
2007	Waste Package Closure Room	ET END EFFECTOR B (ET REPAIR PROBE B)	2	1.00	1.00	11.0	Watts	N/A	75		X		0	REPAIR	0	WP Closure	See Page 13 of Reference 2.2.20.
2007	Waste Package Closure Room	ET END EFFECTOR B (ET MULTIPLEXER B)	2	1.00	1.00	33.0	Watts	N/A	225			X	225	NDE	225	WP Closure	See Page 13 of Reference 2.2.20.
2007	Waste Package Closure Room	UT/ET END EFFECTOR A (ET OUTLET LIST PROBE A)	2	1.00	1.00	11.0	Watts	N/A	75		X		0	NDE	0	WP Closure	See Page 13 of Reference 2.2.20.
2007	Waste Package Closure Room	UT/ET END EFFECTOR A (UT PROBES A)	2	1.00	1.00	15.0	Watts	N/A	102		X		0	NDE	0	WP Closure	See Page 13 of Reference 2.2.20.
2007	Waste Package Closure Room	UT/ET END EFFECTOR B (ET OUTLET LIST PROBE B)	2	1.00	1.00	11.0	Watts	N/A	75		X		0	NDE	0	WP Closure	See Page 13 of Reference 2.2.20.
2007	Waste Package Closure Room	UT/ET END EFFECTOR B (UT PROBES B)	2	1.00	1.00	15.0	Watts	N/A	102		X		0	NDE	0	WP Closure	See Page 13 of Reference 2.2.20.
2007	Waste Package Closure Room	WELDING END EFFECTOR A (TIG TORCH A)	2	1.00	1.00	3705.0	Watts	N/A	25,290			X	25,290	WELDING	25,290	WP Closure	See Page 14 of Reference 2.2.20.
2007	Waste Package Closure Room	WELDING END EFFECTOR A (OSCILLATION & AVC MOTORS)	2	1.00	1.00	100.0	Watts	N/A	683			X	683	WELDING	683	WP Closure	See Page 14 of Reference 2.2.20.
2007	Waste Package Closure Room	WELDING END EFFECTOR B (TIG TORCH B)	2	1.00	1.00	3705.0	Watts	N/A	25,290			X	25,290	WELDING	25,290	WP Closure	See Page 14 of Reference 2.2.20.
2007	Waste Package Closure Room	WELDING END EFFECTOR B (OSCILLATION & AVC MOTORS)	2	1.00	1.00	100.0	Watts	N/A	683			X	683	WELDING	683	WP Closure	See Page 14 of Reference 2.2.20.
2007	Waste Package Closure Room	LEAK DETECTOR SYSTEM TOOLS (HELIUM LEAK DETECTOR)	2	1.00	1.00	800.0	Watts	N/A	5,461		X		0	INERTG	0	WP Closure	See Page 15 of Reference 2.2.20.
2007	Waste Package Closure Room	EVACUATION & BACKFILL SYSTEM (PURGE PORT TOOL)	2	1.00	1.00	100.0	Watts	N/A	683		X		0	INERTG	0	WP Closure	See Page 15 of Reference 2.2.20.
2007	Waste Package Closure Room	EVACUATION & BACKFILL SYSTEM (VACUUM PUMP SKID)	2	1.00	1.00	300.0	Watts	N/A	2,048		X		0	INERTG	0	WP Closure	See Page 16 of Reference 2.2.20.

Room No.	Room Name	Heat Source Note 1	Qty. Note 2	Use Factor Note 3	Load Factor Note 4	Heat Load, Each Note 5	Units Note 6	Motor Location Note 7	Equip Load Btu/h Note 8	Continuous Operation Note 9	Intermittent Operation Note 10	Simultaneous Operation (Intermittent) Note 11	Equip Load by Process Btu/h Note 12	Process Note 13	Equip Load USED, per Rm Btu/h Note 14	Originating Group/ Discipline	Remarks
2007	Waste Package Closure Room	REMOTE HANDLING SYSTEM	2	1.00	1.00	8.0	kW	N/A	54,608			X	54,608	RHS	54,608	WP Closure	See Page 16 of Reference 2.2.20.
2007	Waste Package Closure Room	MISC. HANDLING TOOLS & SUPPORT EQUIP. (CLEAN-UP TOOL)	2	1.00	1.00	0.2	kW	N/A	1,638		X		0		0	WP Closure	See Page 17 of Reference 2.2.20.
2007	Waste Package Closure Room	SAFETY SYSTEM (WELD SHIELDS CURTAINS & INTERLOCKS	2	1.00	1.00	240.0	Watts	N/A	1,638			X	1,638	WELDING	1,638	WP Closure	See Page 19 of Reference 2.2.20.
2007	Waste Package Closure Room	WELD STRESS MITIGATION SYSTEM (EQUIPMENT SKID)	2	1.00	1.00	3.0	kW	N/A	20,478			X	20,478	BURNISH	20,478	WP Closure	See Page 20 of Reference 2.2.20.
2007	Waste Package Closure Room	WELD STRESS MITIGATION SYSTEM (DEPLOYMENT MECHANISM)	2	1.00	1.00	2.0	kW	N/A	13,652			X	13,652	BURNISH	13,652	WP Closure	See Page 21 of Reference 2.2.20.
2007	Waste Package Closure Room	WP CLOSURE ROOM CRANE	1	0.10	1.00	40.0	HP	A	114,000			X	11,400	MAINT	11,400	Mechanical Handling	See Attachment 6. 35 HP is listed in the attachment. By engineering judgement and for conservatism 40 HP motor is used in this calcualtion with a load factor of 90%.
2007	Waste Package Closure Room	WP CLOSURE ROOM CRANE MOTOR - ASD	1	0.10	1.00	40.0	HP	A	3,078			X	308	MAINT	308	Mechanical Handling	See Attachment 6. 35 HP is listed in the attachment. By engineering judgement and for conservatism 40 HP motor is used in this calcualtion with a load factor of 90%. For room mechanical handling load, see Note 16.
															63,141	WP Closure	Welding loads of 63,141 Btu/h is the load used for this room because it is the worst load compared to grinding, maintenance, inerting, burnishing & RHS. See Attachment 5.
													Total Equipment Room Load =		**63,387**		Welding load plus the ASD heat gain from the motor of the crane.
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL NDE EQUIP. RACK A (UT ELECTRONICS-FOCUS LT A)	1	1.00	1.00	135.0	Watts	N/A	461	X			461	RACK	461	WP Closure	See Page 8 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL NDE EQUIP. RACK A (ET ELECTRONICS-QUICK SCAN A)	1	1.00	1.00	165.0	Watts	N/A	563	X			563	RACK	563	WP Closure	See Page 8 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL NDE EQUIP. RACK A (UT ACQUISITION COMP. A)	1	1.00	1.00	200.0	Watts	N/A	683	X			683	RACK	683	WP Closure	See Page 8 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL NDE EQUIP. RACK A (ET ACQUISITION COMP. A)	1	1.00	1.00	200.0	Watts	N/A	683	X			683	RACK	683	WP Closure	See Page 9 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL NDE EQUIP. RACK A (NDE TOOL TRAY HARDWARE CONTROLS A)	1	1.00	1.00	12.0	Watts	N/A	41	X			41	RACK	41	WP Closure	See Page 9 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL NDE EQUIP. RACK A (NDE	1	1.00	1.00	720.0	Watts	N/A	2,457	X			2,457	RACK	2,457	WP Closure	See Page 9 of Reference 2.2.20.

Room No.	Room Name	Heat Source Note 1	Qty. Note 2	Use Factor Note 3	Load Factor Note 4	Heat Load, Each Note 5	Units Note 6	Motor Location Note 7	Equip Load Btu/h Note 8	Continuous Operation Note 9	Intermittent Operation Note 10	Simultaneous Operation (Intermittent) Note 11	Equip Load by Process Btu/h Note 12	Process Note 13	Equip Load USED, per Rm Btu/h Note 14	Originating Group/ Discipline	Remarks
		TOOL TRAY HARDWARE CONTROLS A)															
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL NDE EQUIP. RACK B (UT ELECTRONICS-FOCUS LT B)	1	1.00	1.00	135.0	Watts	N/A	461	X			461	RACK	461	WP Closure	See Page 9 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL NDE EQUIP. RACK B (ET ELECTRONICS-QUICK SCAN B)	1	1.00	1.00	165.0	Watts	N/A	563	X			563	RACK	563	WP Closure	See Page 9 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL NDE EQUIP. RACK B (UT ACQUISITION COMP. B)	1	1.00	1.00	200.0	Watts	N/A	683	X			683	RACK	683	WP Closure	See Page 9 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL NDE EQUIP. RACK B (ET ACQUISITION COMP. B)	1	1.00	1.00	200.0	Watts	N/A	683	X			683	RACK	683	WP Closure	See Page 10 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL NDE EQUIP. RACK B (NDE TOOL TRAY HARDWARE CONTROLS B)	1	1.00	1.00	12.0	Watts	N/A	41	X			41	RACK	41	WP Closure	See Page 10 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL NDE EQUIP. RACK B (NDE TOOL TRAY HARDWARE CONTROLS B)	1	1.00	1.00	720.0	Watts	N/A	2,457	X			2,457	RACK	2,457	WP Closure	See Page 10 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL CONTROLS EQUIP. RACK A (REAL TIME COMPUTER A)	1	1.00	1.00	720.0	Watts	N/A	2,457	X			2,457	RACK	2,457	WP Closure	See Page 10 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL CONTROLS EQUIP. RACK A (MOTOR DRIVE A)	1	1.00	1.00	72.0	Watts	N/A	246	X			246	RACK	246	WP Closure	See Page 10 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL CONTROLS EQUIP. RACK A (EE CAMERA CCUs A)	1	1.00	1.00	12.0	Watts	N/A	41	X			41	RACK	41	WP Closure	See Page 10 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL CONTROLS EQUIP. RACK B (REAL TIME COMPUTER B)	1	1.00	1.00	720.0	Watts	N/A	2,457	X			2,457	RACK	2,457	WP Closure	See Page 10 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL CONTROLS EQUIP. RACK B (MOTOR DRIVE B)	1	1.00	1.00	72.0	Watts	N/A	246	X			246	RACK	246	WP Closure	See Page 10 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	WIS CLOSURE CELL CONTROLS EQUIP. RACK B (EE CAMERA CCUs B)	1	1.00	1.00	12.0	Watts	N/A	41	X			41	RACK	41	WP Closure	See Page 10 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	SCAM TRACKER/VT CONTROLS A	1	1.00	1.00	162.0	Watts	N/A	553	X			553	RACK	553	WP Closure	See Page 10 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	SCAM TRACKER/VT CONTROLS B	1	1.00	1.00	162.0	Watts	N/A	553	X			553	RACK	553	WP Closure	See Page 11 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	SAFETY SYSTEM I/O POWER-24VDC/20A POWER SUPPLY	1	1.00	1.00	72.0	Watts	N/A	246			X	246	WELDING	246	WP Closure	See Page 19 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	SAFETY SYSTEM - WELD SHIELD CURTAINS & INTERLOCKS	1	1.00	1.00	240.0	Watts	N/A	819			X	819	WELDING	819	WP Closure	See Page 19 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	UTILITIES CONTROL SYSTEM - CLOSURE CELL UTILITIES CONTROL	1	1.00	1.00	95.0	Watts	N/A	324		X		0		0	WP Closure	See Page 19 of Reference 2.2.20.

Room No.	Room Name	Heat Source Note 1	Qty. Note 2	Use Factor Note 3	Load Factor Note 4	Heat Load, Each Note 5	Units Note 6	Motor Location Note 7	Equip Load Btu/h Note 8	Continuous Operation Note 9	Intermittent Operation Note 10	Simultaneous Operation (Intermittent) Note 11	Equip Load by Process Btu/h Note 12	Process Note 13	Equip Load USED, per Rm Btu/h Note 14	Originating Group/ Discipline	Remarks
2007A	Closure Equipment Room (North)	IMCER - CLOSURE CELL	1	1.00	1.00	0.0		N/A	0				0	RACK	0	WP Closure	See Page 20 of Reference 2.2.20.
2007A	Closure Equipment Room (North)	CLOSURE SUPPORT ROOM CRANE - NORTH	1	0.10	1.00	20.0	HP	N/A	58,500			X	5,850		1,463	Mechanical Handling	See Attachment 6. 25% diversity factor, see Note 16.
2007A	Closure Equipment Room (North)	CLOSURE SUPPORT ROOM CRANE - NORTH - ASD	1	0.10	1.00	20.0	HP	N/A	2,160			X	216		54	Mechanical Handling	See Note 15. See Attachment 6. 25% diversity factor, see Note 16.
														Total Equipment Room Load =	**18,950**		
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL NDE EQUIP. RACK A (UT ELECTRONICS-FOCUS LT A)	1	1.00	1.00	135.0	Watts	N/A	461	X			461	RACK	461	WP Closure	See Page 8 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL NDE EQUIP. RACK A (ET ELECTRONICS-QUICK SCAN A)	1	1.00	1.00	165.0	Watts	N/A	563	X			563	RACK	563	WP Closure	See Page 8 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL NDE EQUIP. RACK A (UT ACQUISITION COMP. A)	1	1.00	1.00	200.0	Watts	N/A	683	X			683	RACK	683	WP Closure	See Page 8 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL NDE EQUIP. RACK A (ET ACQUISITION COMP. A)	1	1.00	1.00	200.0	Watts	N/A	683	X			683	RACK	683	WP Closure	See Page 9 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL NDE EQUIP. RACK A (NDE TOOL TRAY HARDWARE CONTROLS A)	1	1.00	1.00	12.0	Watts	N/A	41	X			41	RACK	41	WP Closure	See Page 9 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL NDE EQUIP. RACK A (NDE TOOL TRAY HARDWARE CONTROLS A)	1	1.00	1.00	720.0	Watts	N/A	2,457	X			2,457	RACK	2,457	WP Closure	See Page 9 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL NDE EQUIP. RACK B (UT ELECTRONICS-FOCUS LT B)	1	1.00	1.00	135.0	Watts	N/A	461	X			461	RACK	461	WP Closure	See Page 9 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL NDE EQUIP. RACK B (ET ELECTRONICS-QUICK SCAN B)	1	1.00	1.00	165.0	Watts	N/A	563	X			563	RACK	563	WP Closure	See Page 9 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL NDE EQUIP. RACK B (UT ACQUISITION COMP. B)	1	1.00	1.00	200.0	Watts	N/A	683	X			683	RACK	683	WP Closure	See Page 9 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL NDE EQUIP. RACK B (ET ACQUISITION COMP. B)	1	1.00	1.00	200.0	Watts	N/A	683	X			683	RACK	683	WP Closure	See Page 9 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL NDE EQUIP. RACK B (NDE TOOL TRAY HARDWARE CONTROLS B)	1	1.00	1.00	12.0	Watts	N/A	41	X			41	RACK	41	WP Closure	See Page 10 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL NDE EQUIP. RACK B (NDE TOOL TRAY HARDWARE CONTROLS B)	1	1.00	1.00	720.0	Watts	N/A	2,457	X			2,457	RACK	2,457	WP Closure	See Page 10 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL CONTROLS EQUIP. RACK A (REAL TIME COMPUTER A)	1	1.00	1.00	720.0	Watts	N/A	2,457	X			2,457	RACK	2,457	WP Closure	See Page 10 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL CONTROLS EQUIP. RACK A (MOTOR DRIVE A)	1	1.00	1.00	72.0	Watts	N/A	246	X			246	RACK	246	WP Closure	See Page 10 of Reference 2.2.20.

Room No.	Room Name	Heat Source Note 1	Qty. Note 2	Use Factor Note 3	Load Factor Note 4	Heat Load, Each Note 5	Units Note 6	Motor Location Note 7	Equip Load Btu/h Note 8	Continuous Operation Note 9	Intermittent Operation Note 10	Simultaneous Operation (Intermittent) Note 11	Equip Load by Process Btu/h Note 12	Process Note 13	Equip Load USED, per Rm Btu/h Note 14	Originating Group/ Discipline	Remarks
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL CONTROLS EQUIP. RACK A (EE CAMERA CCUs A)	1	1.00	1.00	12.0	Watts	N/A	41	X			41	RACK	41	WP Closure	See Page 10 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL CONTROLS EQUIP. RACK B (REAL TIME COMPUTER B)	1	1.00	1.00	720.0	Watts	N/A	2,457	X			2,457	RACK	2,457	WP Closure	See Page 10 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL CONTROLS EQUIP. RACK B (MOTOR DRIVE B)	1	1.00	1.00	72.0	Watts	N/A	246	X			246	RACK	246	WP Closure	See Page 10 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	WIS CLOSURE CELL CONTROLS EQUIP. RACK B (EE CAMERA CCUs B)	1	1.00	1.00	12.0	Watts	N/A	41	X			41	RACK	41	WP Closure	See Page 10 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	SCAM TRACKER/VT CONTROLS A	1	1.00	1.00	162.0	Watts	N/A	553	X			553	RACK	553	WP Closure	See Page 10 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	SCAM TRACKER/VT CONTROLS B	1	1.00	1.00	162.0	Watts	N/A	553	X			553	RACK	553	WP Closure	See Page 11 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	SAFETY SYSTEM I/O POWER-24VDC/20A POWER SUPPLY	1	1.00	1.00	72.0	Watts	N/A	246			X	246	WELDING	246	WP Closure	See Page 19 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	SAFETY SYSTEM - WELD SHIELD CURTAINS & INTERLOCKS	1	1.00	1.00	240.0	Watts	N/A	819			X	819	WELDING	819	WP Closure	See Page 19 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	UTILITIES CONTROL SYSTEM - CLOSURE CELL UTILITIES CONTROL	1	1.00	1.00	95.0	Watts	N/A	324		X		0		0	WP Closure	See Page 19 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	IMCER - CLOSURE CELL	1	1.00	1.00	0.0		N/A	0				0	RACK	0	WP Closure	See Page 7 of Reference 2.2.20.
2007B	Closure Equipment Room (South)	CLOSURE SUPPORT ROOM CRANE - SOUTH	1	0.10	1.00	20.0	HP	N/A	58,500			X	5,850		1,463	Mechanical Handling	See Attachment 6. 25% diversity factor, see Note 16.
2007B	Closure Equipment Room (South)	CLOSURE SUPPORT ROOM CRANE - SOUTH - ASD	1	0.10	1.00	20.0	HP	N/A	2,160			X	216		54	Mechanical Handling	See Note 15. See Attachment 6. 25% diversity factor, see Note 16.
														Total Equipment Room Load =	**18,950**		
2008	HVAC Room	480V MCC	1	1.00	1.00	0.631	kW	N/A	2,154	X			2,154		2,154	Electrical	See Attachment 2.
2008	HVAC Room	480V MCC	1	1.00	1.00	0.631	kW	N/A	2,154	X			2,154		2,154	Electrical	See Attachment 2.
2008	HVAC Room	DIST XFMR 480-208/120V	1	1.00	1.00	1.45	kW	N/A	4,949	X			4,949		4,949	Electrical	See Attachment 2.
2008	HVAC Room	DIST XFMR 208/120V	1	1.00	1.00	0.50	kW	N/A	1,707	X			1,707		1,707	Electrical	See Attachment 2.
2008	HVAC Room	DIST XFMR 480-208/120V	1	1.00	1.00	1.45	kW	N/A	4,949	X			4,949		4,949	Electrical	See Attachment 2.
2008	HVAC Room	DIST XFMR 208/120V	1	1.00	1.00	0.50	kW	N/A	1,707	X			1,707		1,707	Electrical	See Attachment 2.
2008	HVAC Room	LIGHTING PANEL, LP-01F #1	1	1.00	1.00	0.5	kW	N/A	1,707	X			1,707		1,707	Electrical	See Attachment 2.
2008	HVAC Room	LIGHTING PANEL, LP-01F #2	1	1.00	1.00	0.5	kW	N/A	1,707	X			1,707		1,707	Electrical	See Attachment 2.
2008	HVAC Room	AHU RATED MOTOR - ASD	1	1.00	1.00	75.0	HP	A	4,686		X		0		0	HVAC	(AHU-00007) Motor HP rating taken from Reference 2.2.28. See Note 15
2008	HVAC Room	AHU RATED MOTOR - ASD	1	1.00	1.00	75.0	HP	A	4,686			X	4,686		4,686	HVAC	(AHU-00008) Motor HP rating taken from Reference 2.2.28. See Note 15
														Total Equipment Room Load =	**25,717**		
2011	Closure Support Room (South)	WIS ARC WELDING ROBOT A (ROBOT CONTROLLER A)	1	1.00	1.00	13.3	kW	N/A	45,393	X			45,393	RACK	45,393	WP Closure	See Page 7 of Reference 2.2.20.

Room No.	Room Name	Heat Source Note 1	Qty. Note 2	Use Factor Note 3	Load Factor Note 4	Heat Load, Each Note 5	Units Note 6	Motor Location Note 7	Equip Load Btu/h Note 8	Continuous Operation Note 9	Intermittent Operation Note 10	Simultaneous Operation (Intermittent) Note 11	Equip Load by Process Btu/h Note 12	Process Note 13	Equip Load USED, per Rm Btu/h Note 14	Originating Group/ Discipline	Remarks
2011	Closure Support Room (South)	WIS ARC WELDING ROBOT B (ROBOT CONTROLLER B)	1	1.00	1.00	13.3	kW	N/A	45,393	X			45,393	RACK	45,393	WP Closure	See Page 8 of Reference 2.2.20.
2011	Closure Support Room (South)	WIS MAINT./TESTING NDE EQUIPT. RACK (UT ELECTRNICS-FOCUS LT)	1	1.00	1.00	135.0	Watts	N/A	461	X			461	RACK	461	WP Closure	See Page 11 of Reference 2.2.20.
2011	Closure Support Room (South)	WIS MAINT./TESTING NDE EQUIPT. RACK (ET ELECTRONICS-QUICK SCAN)	1	1.00	1.00	165.0	Watts	N/A	563	X			563	RACK	563	WP Closure	See Page 11 of Reference 2.2.20.
2011	Closure Support Room (South)	WIS MAINT./TESTING NDE EQUIPT. RACK (UT ACQUISITION COMPUTER)	1	1.00	1.00	200.0	Watts	N/A	683	X			683	RACK	683	WP Closure	See Page 11 of Reference 2.2.20.
2011	Closure Support Room (South)	WIS MAINT./TESTING NDE EQUIPT. RACK (ET ACQUISITION COMPUTER)	1	1.00	1.00	200.0	Watts	N/A	683	X			683	RACK	683	WP Closure	See Page 11 of Reference 2.2.20.
2011	Closure Support Room (South)	WIS MAINT./TESTING NDE EQUIPT. RACK (NDE TOOL TRAY HARDWARE CONTROLS)	1	1.00	1.00	12.0	Watts	N/A	41	X			41	RACK	41	WP Closure	See Page 12 of Reference 2.2.20.
2011	Closure Support Room (South)	WIS MAINT./TESTING NDE EQUIPT. RACK (NDE TOOL TRAY HARDWARE CONTROLS)	1	1.00	1.00	720.0	Watts	N/A	2,457	X			2,457	RACK	2,457	WP Closure	See Page 12 of Reference 2.2.20.
2011	Closure Support Room (South)	WIS MAINT./TESTING CONTROLS EQUIPT. RACK (REAL TIME COMPUTER)	1	1.00	1.00	720.0	Watts	N/A	2,457	X			2,457	RACK	2,457	WP Closure	See Page 12 of Reference 2.2.20.
2011	Closure Support Room (South)	WIS MAINT./TESTING CONTROLS EQUIPT. RACK (MOTOR DRIVE BOX)	1	1.00	1.00	72.0	Watts	N/A	246	X			246	RACK	246	WP Closure	See Page 12 of Reference 2.2.20.
2011	Closure Support Room (South)	WIS MAINT./TESTING CONTROLS EQUIPT. RACK (EE CAMERA CCUs)	1	1.00	1.00	12.0	Watts	N/A	41	X			41	RACK	41	WP Closure	See Page 12 of Reference 2.2.20.
2011	Closure Support Room (South)	WIS MAINT./TESTING, SCAM TRACKER/VT CONTROLS	1	1.00	1.00	162.0	Watts	N/A	553	X			553	RACK	553	WP Closure	See Page 12 of Reference 2.2.20.
2011	Closure Support Room (South)	WIS WELDING POWER SUPPLY - A	1	1.00	1.00	412.0	Watts	N/A	1,406			X	1,406	WELDING	1,406	WP Closure	See Page 15 of Reference 2.2.20.
2011	Closure Support Room (South)	WIS WELDING POWER SUPPLY - B	1	1.00	1.00	412.0	Watts	N/A	1,406			X	1,406	WELDING	1,406	WP Closure	See Page 15 of Reference 2.2.20.
2011	Closure Support Room (South)	WIS WELDING POWER SUPPLY - MAINT./TESTING	1	1.00	1.00	412.0	Watts	N/A	1,406		X		0	MAINT	0	WP Closure	See Page 15 of Reference 2.2.20.
2011	Closure Support Room (South)	MAINTENANCE SYSTEM (TRANSFER CART & RAILS)	1	1.00	1.00	120.0	Watts	N/A	410		X		0	MAINT	0	WP Closure	See Page 16 of Reference 2.2.20.
2011	Closure Support Room (South)	UTILITIES CONTROL SYSTEM - SUPPORT RM. UTILITIES CONTROL	1	1.00	1.00	0.0		N/A	0		X		0		0	WP Closure	See Page 19 of Reference 2.2.20.
2011	Closure Support Room (South)	OPERATION WORK STATION SYSTEM-SUPPORT ROOM OPERATOR WORKSTATIONS	3	1.00	1.00	30.0	Watts	N/A	307		X		0	MAINT	0	WP Closure	101,782 obtain by adding (rack & welding) under Process column.

Room No.	Room Name	Heat Source Note 1	Qty. Note 2	Use Factor Note 3	Load Factor Note 4	Heat Load, Each Note 5	Units Note 6	Motor Location Note 7	Equip Load Btu/h Note 8	Continuous Operation Note 9	Intermittent Operation Note 10	Simultaneous Operation (Intermittent) Note 11	Equip Load by Process Btu/h Note 12	Process Note 13	Equip Load USED, per Rm Btu/h Note 14	Originating Group/ Discipline	Remarks
													Total Equipment Room Load =		**101,782**		
2012	HVAC Room	480V MCC	1	1.00	1.00	0.631	kW	N/A	2,154	X			2,154		2,154	Electrical	See Attachment 2.
2012	HVAC Room	480V MCC	1	1.00	1.00	0.631	kW	N/A	2,154	X			2,154		2,154	Electrical	See Attachment 2.
2012	HVAC Room	DISTR XFMR 480-208/120V	1	1.00	1.00	1.45	kW	N/A	4,949	X			4,949		4,949	Electrical	See Attachment 2.
2012	HVAC Room	DISTR PANEL 208/120V	1	1.00	1.00	0.5	kW	N/A	1,707	X			1,707		1,707	Electrical	See Attachment 2.
2012	HVAC Room	LIGHTING PANEL, LP-01H	1	1.00	1.00	0.5	kW	N/A	1,707	X			1,707		1,707	Electrical	See Attachment 2.
2012	HVAC Room	EXH. FAN MOTOR	1	1.00	1.00	40.0	HP	C	12,600	X			12,600		12,600	HVAC	(EXH-00003) Motor HP rating taken from Reference 2.2.37.
2012	HVAC Room	EXH. FAN MOTOR - ASD	1	1.00	1.00	40.0	HP	C	3,078	X			3,078		3,078	HVAC	(EXH-00003) Motor HP rating taken from Reference 2.2.37. See Note 15.
2012	HVAC Room	EXH. FAN MOTOR	1	1.00	1.00	40.0	HP	C	12,600		X		0		0	HVAC	(EXH-00004) Motor HP rating taken from Reference 2.2.37.
2012	HVAC Room	EXH. FAN MOTOR - ASD	1	1.00	1.00	40.0	HP	C	3,078		X		0		0	HVAC	(EXH-00004) Motor HP rating taken from Reference 2.2.37. See Note 15.
													Total Equipment Room Load =		**28,347**		

NOTES:

1. Description of equipment giving heat to the room.
2. Quantity of equipment in the room.
3. "Use Factor" means the approximate usage of equipment based on a 24 hour period.
4. "Load Factor" applies to equipment driven by electric motor such as Cranes, Trolleys and Site Transporter. The electric motor horsepower selection is based on the maximum capacity that the equipment can handle. In reality, these pieces of equipment are not lifting or pulling the maximum load all the time during a 24 hour period, therefore 85% load factor is a very conservative assumption.
5. Heat load that each equipment gives up into a room. Refer to next column for units (Watts, kW or HP)
6. The conversion factor used to convert Watts to Btu/h is 3.413 and kW to Btu/h is 3413. For HP conversion, refer to Note 7.
7. Refer to Table 4.12 of ASHRAE Cooling and Heating Load Calculation Manual (Reference 2.2.4) for location of motor and driven equipment with respect to conditioned space or airstream (A - motor in, driven equipment in, B - motor out, driven equipment in, C - motor in, driven equipment out) and equivalent Btu/h rating for listed motor HP.
8. Equipment heat load in Btu/hr
9. "Continuous Operation" means equipment is operating all the time 24 hour a day, heat load is constant.
10. "Intermittent Operation" means equipment is operating ON and OFF during a 24 hour period. The time of operation is not simultaneous with other equipment in a room which is also operating intermittently.
11. "Simultaneous Operation" means the equipment is also operating ON and OFF, but it operates at the same time with other equipment which is also operating intermittently.
12. Heat load by an individual piece of equipment based on the type of operation (continuous, intermittent or simultaneous).
13. Most of the equipment listed in this table operates intermittently. There are certain types of work when an appropriate piece of equipment is used to handle that particular job. The process that utilizes the most equipment working simultaneously represents the highest heat load. That figure is used as the room equipment heat load.
14. The total equipment heat load per room obtained by adding all the equipment heat load in a room under the column "Equipment Load by Process".
15. The heat gain value from an ASD of an electric motor rated horsepower at 460 V is calculated using Equation 34, Page 868 of Reference 2.2.11, where the heat gain is equal to [(Motor Rated HP x 13.45435) + 363.7949] in watts.
16. A 25% diversity factor is applied to the mechanical handling equipment (e.g. crane motors) heat gain per Attachment 11. (Example: Equip Load by Process = Use Factor x Load Factor x Equipment Load x 0.25)
17. Miscellaneous equipment are future additional load that are not known at this time, see Assumption 3.1.16.

APPENDIX F: CALCULATED ROOF AND WALL COOLING LOADS

Tables F-1 and F-2 present the room-by-room roof and wall cooling load calculations, respectively, for the peak month and hour of each room.

Table F-1. Room-by-Room Calculated Roof Cooling Loads

Room No. Note 1	Room Name Note 1	Room Peak Mo/hr Note 2	Design Room Temp. °F Note 1	Roof Area ft^2 Note 1	Roof Type	U-value of Roof Btu/h ft2 °F Note 1	Unadjusted Roof CLTD °F Note 4	CLTD Correction for Latitude And Month °F Note 5	K Color Correction Factor Note 6	CLTD Indoor Temperature Adjustment °F Note 7	CLTD Outdoor Temperature Adjustment °F Note 8	f-factor Note 9	Adjusted Roof CLTD °F Note 10	Calculated Roof Load Btu/h Note 11
1001	LLW Staging Room	6/15	90	2,550	Type 1	0.065	74	2	1	-12	4.05	1	68.05	11,279
1001A	HVAC Room	6/16	90	1,520	Type 1	0.065	74	2	1	-12	4.05	1	68.05	6,723
1002	North Maintenance Vestibule	6/15	90	830	Type 1	0.065	74	2	1	-12	4.05	1	68.05	3,671
1004	HVAC Room (LLW Areas HEPA Exhaust)	6/16	90	1,350	Type 1	0.065	74	2	1	-12	4.05	1	68.05	5,971
1005A	Corridor	6/15	82	0		-	-	-	-	-	-	-	-	0
1005B	Corridor	All	82	0		-	-	-	-	-	-	-	-	0
1005C	Corridor	All	82	0		-	-	-	-	-	-	-	-	0
1005D	Corridor	All	82	0		-	-	-	-	-	-	-	-	0
1005E	Corridor	All	82	0		-	-	-	-	-	-	-	-	0
1005F	Corridor	All	82	0		-	-	-	-	-	-	-	-	0
1005G	Corridor	All	82	0		-	-	-	-	-	-	-	-	0
1005H	Corridor	All	82	0		-	-	-	-	-	-	-	-	0
1005J	Corridor	9/15	82	0		-	-	-	-	-	-	-	-	0
1007	Electrical Room (Normal Power)	6/16	90	0		-	-	-	-	-	-	-	-	0
1007A	Battery Room (Normal Power)	All	77	0		-	-	-	-	-	-	-	-	0
1009	HVAC Room	All	90	0		-	-	-	-	-	-	-	-	0
1010	HVAC Room	6/20	90	0		-	-	-	-	-	-	-	-	0
1011	HVAC Room	6/20	90	0		-	-	-	-	-	-	-	-	0
1012	Maintenance Room(North CTM)	6/20	90	0		-	-	-	-	-	-	-	-	0
1015	WP Loadout Room	6/23	79	8,260	Type 12	0.031	29	2	1	-1	4.05	1	34.05	8,719
1016	Unassigned	All	90	0		-	-	-	-	-	-	-	-	0
1017	Canister Staging Area #1	All	100	0		-	-	-	-	-	-	-	-	0
1018	WP Positioning Room (North)	All	100	0		-	-	-	-	-	-	-	-	0
1019	WP Positioning Room (South)	All	100	0		-	-	-	-	-	-	-	-	0
1020	Unassigned	All	90	0		-	-	-	-	-	-	-	-	0
1021	Canister Staging Area #2	All	100	0		-	-	-	-	-	-	-	-	0
1022	Canister Staging Area #3	All	100	0		-	-	-	-	-	-	-	-	0
1023	Cask Unloading Room (North)	All	100	0		-	-	-	-	-	-	-	-	0
1024	Cask Unloading Room (South)	All	100	0		-	-	-	-	-	-	-	-	0
1025	Canister Staging Area #4	All	100	0		-	-	-	-	-	-	-	-	0
1026	Cask Preparation Room	9/16	79	8,250	Type 12	0.031	29	-6.73	1	-1	4.05	1	25.32	6,476
1028	Utility Room	6/20	90	0		-	-	-	-	-	-	-	-	0
1030	HVAC Room	All	90	0		-	-	-	-	-	-	-	-	0
1031	HVAC Room	6/22	90	0		-	-	-	-	-	-	-	-	0
1032	HVAC Room	9/22	90	0		-	-	-	-	-	-	-	-	0
1033	Maintenance Room	9/22	90	0		-	-	-	-	-	-	-	-	0
1034	Gas Sampling Room	All	90	0		-	-	-	-	-	-	-	-	0
1035	HVAC Room	9/22	90	0		-	-	-	-	-	-	-	-	0

Room No. Note 1	Room Name Note 1	Room Peak Mo/hr Note 2	Design Room Temp. °F Note 1	Roof Area ft^2 Note 1	Roof Type	U-value of Roof Btu/h ft2 °F Note 1	Unadjusted Roof CLTD °F Note 4	CLTD Correction for Latitude And Month °F Note 5	K Color Correction Factor Note 6	CLTD Indoor Temperature Adjustment °F Note 7	CLTD Outdoor Temperature Adjustment °F Note 8	f-factor Note 9	Adjusted Roof CLTD °F Note 10	Calculated Roof Load Btu/h Note 11
1044A	Elevator Mechanical Room	6/9	90	0		-	-	-	-	-	-	-	-	0
1045	Corridor	6/15	82	0		-	-	-	-	-	-	-	-	0
1046	Elevator Lobby	All	82	0		-	-	-	-	-	-	-	-	0
1047A	Vestibule	6/15	82	770	Type 1	0.065	74	2	1	-4	4.05	1	76.05	3,806
1048	Elevator Lobby	6/16	82	0		-	-	-	-	-	-	-	-	0
1049A	Vestibule	9/16	82	770	Type 1	0.065	74	-6.73	1	-4	4.05	1	67.32	3,369
1050	Elevator Lobby	6/17	82	0		-	-	-	-	-	-	-	-	0
1200	Support Area	All	76	0		-	-	-	-	-	-	-	-	0
2001	HVAC Room	6/16	90	4,670	Type 12	0.031	29	2	1	-12	4.05	1	23.05	3,337
2002	Instrument and Electrical Shop	6/16	79	3,120	Type 12	0.031	29	2	1	-1	4.05	1	34.05	3,293
2003	Closure Support Room (North)	6/16	78	2,590	Type 12	0.031	29	2	1	0	4.05	1	35.05	2,814
2003A	Personnel Access Room (North)	All	78	0		-	-	-	-	-	-	-	-	0
2004	Canister Transfer Room	6/22	79	21,940	Type 12	0.031	29	2	1	-1	4.05	1	34.05	23,159
2005	HVAC Room	6/20	90	6,000	Type 12	0.031	29	2	1	-12	4.05	1	23.05	4,287
2006A	Corridor	6/16	82	760	Type 12	0.031	29	2	1	-4	4.05	1	31.05	732
2006B	Corridor	6/15	82	0		-	-	-	-	-	-	-	-	0
2006D	Corridors	6/15	82	1,140	Type 12	0.031	29	2	1	-4	4.05	1	31.05	1,097
2006E	Corridor	6/15	82	0		-	-	-	-	-	-	-	-	0
2006F	Corridor	9/15	82	0		-	-	-	-	-	-	-	-	0
2006G	Corridor	9/22	82	760	Type 12	0.031	29	-6.73	1	-4	4.05	1	22.32	526
2006H	Corridor	6/15	82	0		0	-	-	-	-	-	-	-	0
2006J	Corridor	6/15	82	1,140	Type 12	0.031	29	2	1	-4	4.05	1	31.05	1,097
2006K	Corridor	6/15	82	0		-	-	-	-	-	-	-	-	0
2007	Waste Package Closure Room	6/15	90	3,500	Type 12	0.031	29	2	1	-12	4.05	1	23.05	2,501
2007A	Closure Equipment (North)	6/15	78	0		-	-	-	-	-	-	-	-	0
2007B	Closure Equipment (South)	6/15	78	0		-	-	-	-	-	-	-	-	0
2008	HVAC Room	6/21	90	4,670	Type 12	0.031	29	2	1	-12	4.05	1	23.05	3,337
2010	Maintenance and Operations Storage Room	6/22	79	3,120	Type 12	0.031	29	2	1	-1	4.05	1	34.05	3,293
2011	Closure Support Room (South)	6/17	78	2,590	Type 12	0.031	29	2	1	0	4.05	1	35.05	2,814
2011A	Personnel Access Room (South)	All	78	0	-	-	-	-	-	-	-	-	-	0
2012	HVAC Room	9/22	90	6,794	Type 12	0.031	29	-6.73	1	-12	4.05	1	14.32	3,016
2045	Corridor	6/15	82	0		-	-	-	-	-	-	-	-	0
2045A	Storage Room	6/10	82	0		-	-	-	-	-	-	-	-	0
2046	Elevator Lobby	9/15	82	0		-	-	-	-	-	-	-	-	0
2048	Elevator Lobby	6/16	82	0		-	-	-	-	-	-	-	-	0
2050	Elevator Lobby	6/16	82	0		-	-	-	-	-	-	-	-	0
3001	Corridor	6/16	82	1,600	Type 12	0.031	29	2	1	-4	4.05	1	31.05	1,540
3002	Corridor	6/15	82	800	Type 12	0.031	29	2	1	-4	4.05	1	31.05	770
3045	Corridor	6/16	82	270	Type 1	0.065	74	2	1	-4	4.05	1	76.05	1,335
3045A	Storage Room	6/15	82	100	Type 1	0.065	74	2	1	-4	4.05	1	76.05	494

Room No. Note 1	Room Name Note 1	Room Peak Mo/hr Note 2	Design Room Temp. °F Note 1	Roof Area ft^2 Note 1	Roof Type	U-value of Roof Btu/h ft2 °F Note 1	Unadjusted Roof CLTD °F Note 4	CLTD Correction for Latitude And Month °F Note 5	K Color Correction Factor Note 6	CLTD Indoor Temperature Adjustment °F Note 7	CLTD Outdoor Temperature Adjustment °F Note 8	f-factor Note 9	Adjusted Roof CLTD °F Note 10	Calculated Roof Load Btu/h Note 11
3046	Lobby	9/15	82	100	Type 1	0.065	74	-6.73	1	-4	4.05	1	67.32	438
3048	Elevator Lobby	6/15	82	470	Type 1	0.065	74	2	1	-4	4.05	1	76.05	2,323
3050	Elevator Lobby	6/16	82	470	Type 1	0.065	74	2	1	-4	4.05	1	76.05	2,323

NOTES:

1. From information and data contained in Room Load Information Sheets in Appendix A. See the Room Load Information Sheets for additional remarks about loads per room.
2. Determined using the Cooling and Heating load calculation methodology on a room-by-room basis. "All" means load is constant (room has no exterior exposure).
3. Not Used.
4. From Appendix B, Table B-1.
5. From Appendix B, Table B-2.
6. See Assumption 3.2.3.
7. From Appendix B, Equation B-1. The values equals 78 F minus the design room temperature.
8. From Appendix B, Equation B-1. The value equals the average outside temperature on design day minus 85 F.
9. From Appendix B text and Equation B-1.
10. Using Equation B-1 with information from previous columns.
11. Product of "Roof Area," "U-Value of Roof," and "Adjusted Roof CLTD.

Table F-2. Room-by-Room Calculated Wall Cooling Loads

Room No. Note 1	Room Name Note 1	Room Peak Mo/hr Note 2	Design Room Temp. °F Note 1	Wall Orientation Note 1	Wall Area ft^2 Note 1	Wall Group Note 1	U-value of Wall Btu/h ft2 °F Note 1	Unadjusted Wall CLTD °F Note 4	CLTD Correction for Latitude And Month °F Note 5	K Color Correction factor Note 6	CLTD Indoor Temperature Adjustment °F Note 7	CLTD Outdoor Temperature Adjustment °F Note 8	Adjusted Wall CLTD °F Note 9	Calculated Wall Load Btu/h Note 10	Total Wall Load Btu/h Note 11
1001	LLW Staging Room	6/15	90	NE	960	G		27	1.42	1	-12	4.05	20.47	2,221	2,221
1001A	HVAC Room	6/16	90	NE	1,216	G		26	1.42	1	-12	4.05	19.47	2,675	
			90	NW	1,280	G	0.113	47	1.42	1	-12	4.05	40.47	5,854	
			90	SE	960	G 0.113	0.113	30	-0.85	1	-12	4.05	21.2	2,300	
						0.113								Total	10,829
1002	North Maintenance Vestibule	6/15	90	NE	444	G	0.113	27	1.42	1	-12	4.05	20.47	1,027	
			90	N	1,152	G	0.113	24	1	1	-12	4.05	17.05	2,220	
			90	NE	100	G	1.15	27	1.42	1	-12	4.05	20.47	2,354	
														Total	5,601
1004	HVAC Room (LLW Areas HEPA Exhaust)	6/16	90	NE	1,120	G	0.113	26	1.42	1	-12	4.05	19.47	2,464	
			90	NW	1,280	G	0.113	47	1.42	1	-12	4.05	40.47	5,854	
														Total	8,318
1005A	Corridor	6/15	82	NE	210	B	0.22	18	1.42	1	-4	4.05	19.47	900	900
1005B	Corridor	All	82	-	-	-	-	-	-	-	-	-	-	-	
1005C	Corridor	All	82	-	-	-	-	-	-	-	-	-	-	-	
1005D	Corridor	All	82	-	-	-	-	-	-	-	-	-	-	-	
1005E	Corridor	All	82	-	-	-	-	-	-	-	-	-	-	-	
1005F	Corridor	All	82	-	-	-	-	-	-	-	-	-	-	-	
1005G	Corridor	All	82	-	-	-	-	-	-	-	-	-	-	-	
1005H	Corridor	All	82	-	-	-	-	-	-	-	-	-	-	-	
1005J	Corridor	9/15	82	SW	1,800	B	0.22	14	3.58	1	-4	4.05	17.63	6,981	
			82	N	480	B	0.22	9	-3.58	1	-4	4.05	5.47	578	
														Total	7,559
1007	Electrical Room (Normal Power)	6/16	90	NW	800	B	0.22	12	1.42	1	-12	4.05	5.47	963	
			90	NE	2,400	B	0.22	19	1.42	1	-12	4.05	12.47	6,584	
			90	N	1,760	B	0.22	10	1	1	-12	4.05	3.05	1,181	
														Total	8,728
1007A	Battery Room (Normal Power)	All	77	-	-	-	-	-	-	-	-	-	-	-	
1009	HVAC Room	All	90	-	-	-	-	-	-	-	-	-	-	-	
1010	HVAC Room	6/20	90	NE	352	B	0.22	21	1.42	1	-12	4.05	14.47	1,121	1,121
1011	HVAC Room	6/20	90	NE	928	B	0.22	21	1.42	1	-12	4.05	14.47	2,954	2,954
1012	Maintenance Room(North CTM)	6/20	90	NE	240	B	0.22	21	1.42	1	-12	4.05	14.47	764	764
1015	WP Loadout Room	6/23	79	NW	2,880	B	0.22	23	1.42	1	-1	4.05	27.47	17,405	17,405
1016	Unassigned	All	90	-	-	-	-	-	-	-	-	-	-	-	
1017	Canister Staging Area #1	All	100	-	-	-	-	-	-	-	-	-	-	-	
1018	WP Positioning Room (North)	All	100	-	-	-	-	-	-	-	-	-	-	-	
1019	WP Positioning Room (South)	All	100	-	-	-	-	-	-	-	-	-	-	-	
1020	Unassigned	All	90	-	-	-	-	-	-	-	-	-	-	-	
1021	Canister Staging Area #2	All	100	-	-	-	-	-	-	-	-	-	-	-	
1022	Canister Staging Area #3	All	100	-	-	-	-	-	-	-	-	-	-	-	
1023	Cask Unloading Room (North)	All	100	-	-	-	-	-	-	-	-	-	-	-	
1024	Cask Unloading Room (South)	All	100	-	-	-	-	-	-	-	-	-	-	-	
1025	Canister Staging Area #4	All	100	-	-	-	-	-	-	-	-	-	-	-	

Room No. Note 1	Room Name Note 1	Room Peak Mo/hr Note 2	Design Room Temp. °F Note 1	Wall Orientation Note 1	Wall Area ft^2 Note 1	Wall Group Note 1	U-value of Wall Btu/h ft2 °F Note 1	Unadjusted Wall CLTD °F Note 4	CLTD Correction for Latitude And Month °F Note 5	K Color Correction factor Note 6	CLTD Indoor Temperature Adjustment °F Note 7	CLTD Outdoor Temperature Adjustment °F Note 8	Adjusted Wall CLTD °F Note 9	Calculated Wall Load Btu/h Note 10	Total Wall Load Btu/h Note 11
1026	Cask Preparation Room	9/16	79	SE	3,456	B	0.22	23	3.58	1	-1	4.05	29.63	22,528	22,528
1028	Utility Room	6/20	90	NW	800	B	0.22	19	1.42	1	-12	4.05	12.47	2,195	
			90	SW	1,920	B	0.22	25	-0.85	1	-12	4.05	16.2	6,843	
			90	SW	195	B	0.22	25	-0.85	1	-12	4.05	16.2	695	
			90	N	1,760	B	0.22	14	1	1	-12	4.05	7.05	2,730	
														Total	12,463
1030	HVAC Room	All	90	-	-	-	-	-	-	-	-	-	-	-	
1031	HVAC Room	6/22	90	N	408	B	0.22	15	1	1	-12	4.05	8.05	723	723
1032	HVAC Room	9/22	90	SW	864	B	0.22	28	3.58	1	-12	4.05	23.63	4,492	4,492
1033	Maintenance Room	9/22	90	SW	480	B	0.22	28	3.58	1	-12	4.05	23.63	2,495	2,495
1034	Gas Sampling Room	All	90	-	-	-	-	-	-	-	-	-	-	-	
1035	HVAC Room	9/22	90	SW	850	B	0.22	28	3.58	1	-12	4.05	23.63	4,419	4,419
1044A	Elevator Mechanical Room	6/9	90	NE	352	G	0.113	39	1.42	1	-12	4.05	32.47	1,292	1,292
1045	Corridor	6/15	82	NE	256	G	0.113	27	1.42	1	-4	4.05	28.47	824	
			82	N	1,152	G	0.113	24	1	1	-4	4.05	25.05	3,261	
														Total	4,085
1046	Elevator Lobby	All	82	-	0	-	-	-	-	-	-	-	-	-	
1047A	Vestibule	6/15	82	NW	1,088	G	0.113	37	1.42	1	-4	4.05	38.47	4,730	
			82	NE	860	G	0.113	27	1.42	1	-4	4.05	28.47	2,767	
			82	SE	544	G	0.113	32	-0.85	1	-4	4.05	31.2	1,918	
			82	NE	100	G	1.15	27	1.42	1	-4	4.05	28.47	3,274	
														Total	12,689
1048	Elevator Lobby	6/16	82	NW	544	G		47	1.42	1	-4	4.05	48.47	2,980	2,980
1049A	Vestibule	9/16	82	NW	1,088	G	0.113	47	-4.58	1	-4	4.05	42.47	5,221	
			82	SW	860	G	0.113	63	3.58	1	-4	4.05	66.63	6,475	
			82	SE	544	G 0.113	0.113	30	3.58	1	-4	4.05	33.63	2,067	
			82	SW	100	G	1.15	63	3.58	1	-4	4.05	66.63	7,662	
														Total	21,425
1050	Elevator Lobby	6/17	82	NW	544	G		55	1.42	1	-4	4.05	56.47	3,471	
			82	N	544	G	0.113	25	1	1	-4	4.05	26.05	1,601	
														Total	5,072
1200	Support Area	All	76	-	-	- 0.113	-	-	-	-	-	-	-	-	
2001	HVAC Room	6/16	90	NE	1,920	B	0.22	19	1.42	1	-12	4.05	12.47	5,267	
			90	NE	195	B	0.22	19	1.42	1	-12	4.05	12.47	535	
			90	NW	1,600	B	0.22	12	1.42	1	-12	4.05	5.47	1,925	
			90	N	960	B	0.22	10	1.0	1	-12	4.05	3.05	644	
														Total	8,371
2002	Instrument and Electrical Shop	6/16	79	NE	476	B	0.22	19	1.42	1	-1	4.05	23.47	2,458	2,458
2003	Closure Support Room (North)	6/16	78	NE	736	B	0.22	19	1.42	1	0	4.05	24.47	3,962	3,962
2003A	Personnel Access Room (North)	All	78	-	-	-	-	-	-	-	-	-	-	-	
2004	Canister Transfer Room	6/22	79	SE	2,604	B	0.22	26	-0.85	1	-1	4.05	28.2	16,155	
			79	NW	8,496	B	0.22	22	1.42	1	-1	4.05	26.47	49,476	
			79	SE	5,400	B	0.22	26	-0.85	1	-1	4.05	28.2	33,502	
			79	SW	2,520	B	0.22	28	-0.85	1	-1	4.05	30.2	16,743	
														Total	115,876

Room No. Note 1	Room Name Note 1	Room Peak Mo/hr Note 2	Design Room Temp. °F Note 1	Wall Orientation Note 1	Wall Area ft^2 Note 1	Wall Group Note 1	U-value of Wall Btu/h ft2 °F Note 1	Unadjusted Wall CLTD °F Note 4	CLTD Correction for Latitude And Month °F Note 5	K Color Correction factor Note 6	CLTD Indoor Temperature Adjustment °F Note 7	CLTD Outdoor Temperature Adjustment °F Note 8	Adjusted Wall CLTD °F Note 9	Calculated Wall Load Btu/h Note 10	Total Wall Load Btu/h Note 11
2005	HVAC Room	6/20	90	SE	1,600	B	0.22	26	-0.85	1	-12	4.05	17.2	6,054	
			90	NE	2,400	B	0.22	21	1.42	1	-12	4.05	14.47	7,640	
			90	N	512	B	0.22	14	1.0	1	-12	4.05	7.05	794	
														Total	14,488
2006A	Corridors	6/16	82	NE	2,560	B	0.22	19	1.42	1	-4	4.05	20.47	11,529	
			82	N	480	B	0.22	10	1.0	1	-4	4.05	11.05	1,167	
			82	NE	225	B	0.22	19	1.42	1	-4	4.05	20.47	1,013	
														Total	13,709
2006B	Corridor	6/15	82	-	-	-	-	-	-	-	-	-	-	-	
2006D	Corridor	6/15	82	-	-	-	-	-	-	-	-	-	-	-	
2006E	Corridor	6/15	82	-	-	-	-	-	-	-	-	-	-	-	
2006F	Corridor	9/15	82	SW	90	B	0.22	14	3.58	1	-4	4.05	17.63	349	349
2006G	Corridor	9/22	82	SW	2,720	B	0.22	28	3.58	1	-4	4.05	31.63	18,927	
			82	N	525	B	0.22	15	-3.58	1	-4	4.05	11.47	1,325	
			82	NW	225	B	0.22	22	-4.58	1	-4	4.05	17.47	865	
														Total	21,117
2006H	Corridor	6/15	82	-	-	-	-	-	-	-	-	-	-	-	
2006J	Corridor	6/15	82	-	-	-	-	-	-	-	-	-	-	-	
2006K	Corridor	6/15	82	-	-	-	-	-	-	-	-	-	-	-	
2007	Waste Package Closure Room	6/15	90	-	-	-	-	-	-	-	-	-	-	-	
2007A	Closure Equipment (North)	6/15	78	-	-	-	-	-	-	-	-	-	-	-	
2007B	Closure Equipment (South)	6/15	78	-	-	-	-	-	-	-	-	-	-	-	
2008	HVAC Room	6/21	90	SW	1,920	B	0.22	27	-0.85	1	-12	4.05	18.2	7,688	
			90	SW	195	B	0.22	27	-0.85	1	-12	4.05	18.2	781	
			90	NW	1,600	B	0.22	21	1.42	1	-12	4.05	14.47	5,093	
			90	N	960	B	0.22	14	1.0	1	-12	4.05	7.05	1,489	
														Total	15,051
2010	Maintenance and Operations Storage Room	6/22	79	SW	476	B	0.22	28	-0.85	1	-1	4.05	30.2	3,163	3,163
2011	Closure Support Room (South)	6/17	78	N	391	B	0.22	11	1.0	-	0	4.05	16.05	1,381	1,381
2011A	Personnel Access Room (South)	All	78	-	-	-	-	-	-	-	-	-	-	-	
2012	HVAC Room	9/22	90	SE	1,600	B	0.22	26	3.58	1	-12	4.05	21.63	7,614	
			90	SW	2,432	B	0.22	28	3.58	1	-12	4.05	23.63	12,643	
			90	N	736	B	0.22	15	-3.58	1	-12	4.05	3.47	562	
														Total	20,819
2045	Corridor	6/15	82	NE	192	G	0.113	27	1.42	1	-4	4.05	28.47	618	
			82	SE	256	G	0.113	32	-0.85	1	-4	4.05	31.2	903	
			82	N	1,056	G	0.113	24	1.0	1	-4	4.05	25.05	2,989	
														Total	4,510
2045A	Storage Room	6/10	82	NE	352	G	0.113	35	1.42	1	-4	4.05	36.47	1,451	
			82	SE	288	G	0.113	49	-0.85	1	-4	4.05	48.2	1,569	
														Total	3,020
2046	Elevator Lobby	9/15	82	SE	288	G	0.113	32	3.58	1	-4	4.05	35.63	1,160	1,160
2048	Elevator Lobby	6/16	82	NW	512	G		47	1.42	1	-4	4.05	48.47	2,804	
			82	SE	512	G	0.113	30	-0.85	1	-4	4.05	29.2	1,689	

0.113

Room No. Note 1	Room Name Note 1	Room Peak Mo/hr Note 2	Design Room Temp. °F Note 1	Wall Orientation Note 1	Wall Area ft^2 Note 1	Wall Group Note 1	U-value of Wall Btu/h ft2 °F Note 1	Unadjusted Wall CLTD °F Note 4	CLTD Correction for Latitude And Month °F Note 5	K Color Correction factor Note 6	CLTD Indoor Temperature Adjustment °F Note 7	CLTD Outdoor Temperature Adjustment °F Note 8	Adjusted Wall CLTD °F Note 9	Calculated Wall Load Btu/h Note 10	Total Wall Load Btu/h Note 11
			82	NE	512	G	0.113	26	1.42	1	-4	4.05	27.47	1,589	
														Total	6,082
2050	Elevator Lobby	6/16	82	NW	512	G		47	1.42	1	-4	4.05	48.47	2,804	
			82	SE	512	G	0.113	30	-0.85	1	-4	4.05	29.2	1,689	
			82	N	512	G	0.113	24	1.0	1	-4	4.05	25.05	1,449	
						0.113								Total	5,942
3001	Corridor	6/16	82	NE	3,672	B	0.22	19	1.42	1	-4	4.05	20.47	16,536	
			82	SE	396	G	0.113	30	-0.85	1	-4	4.05	29.2	1,307	
			82	SW	2,232	G	0.113	63	-0.85	1	-4	4.05	62.2	15,688	
			82	NW	396	G	0.113	47	1.42	1	-4	4.05	48.47	2,169	
			82	N	468	B	0.22	10	1.0	1	-4	4.05	11.05	1,138	
														Total	36,838
3002	Corridor	6/15	82	SW	540	B	0.22	14	-0.85	1	-4	4.05	13.2	1,568	
			82	NW	432	G	0.113	37	1.42	1	-4	4.05	38.47	1,878	
			82	N	792	B	0.22	9	1.0	1	-4	4.05	10.05	1,751	
			82	NE	1,800	G	0.113	27	1.42	1	-4	4.05	28.47	5,791	
														Total	10,988
3045	Corridor	6/16	82	NE	216	G	0.113	26	1.42	1	-4	4.05	27.47	670	
			82	NW	288	G	0.113	47	1.42	1	-4	4.05	48.47	1,577	
			82	N	1,188	G	0.113	24	1.0	1	-4	4.05	25.05	3,363	
														Total	5,610
3045A	Storage Room	6/15	82	NE	396	G	0.113	27	1.42	1	-4	4.05	28.47	1,274	
			82	SE	324	G	0.113	32	-0.85	1	-4	4.05	31.2	1,142	
														Total	2,416
3046	Lobby	9/15	82	SE	324	G	0.113	32	3.58	1	-4	4.05	35.63	1,304	1,304
3048	Elevator Lobby	6/15	82	NW	576	G		37	1.42	1	-4	4.05	38.47	2,504	
			82	SE	576	G	0.113	32	-0.85	1	-4	4.05	31.2	2,031	
			82	NE	576	G	0.113	27	1.42	1	-4	4.05	28.47	1,853	
						0.113								Total	6,388
3050	Elevator Lobby	6/16	82	NW	576	G		47	1.42	1	-4	4.05	48.47	3,155	
			82	SW	576	G	0.113	63	-0.85	1	-4	4.05	62.2	4,048	
			82	N	576	G	0.113	24	1.0	1	-4	4.05	25.05	1,630	
						0.113								Total	8,833

NOTES:
1. From information and data contained in Room Load Information Sheets in Appendix A. See the Room Load Information Sheets for additional remarks about loads per room.
2. Determined using the Cooling and Heating load calculation methodology on a room-by-room basis.
3. Not Used.
4. From Appendix B, Table B-1.
5. From Appendix B, Table B-2.
6. See Assumption 3.2.3.
7. From Appendix B, Equation B-1. The values equals 78 F minus the design room temperature.
8. From Appendix B, Equation B-1. The value equals the average outside temperature on design day minus 85 F.
9. Using Equation B-1 with information from previous columns.
10. Product of "Wall Area," "U-Value of Wall," and "Adjusted Wall CLTD."
11. Sum of Calculated Wall Loads per room.

APPENDIX G: NOT USED

APPENDIX H: CALCULATION OF EXHAUST AIRFLOW RATE (ROOM BY ROOM)

Calculations of exhaust airflow rates on a room-by-room basis to support Section 6.2.3.

Table H-1. Exhaust Airflow Rate (Room by Room)

Room No. Note 1	Room Name Note 1	Supply Airflow (cfm) Note 2	Return Airflow (cfm) Note 3	Airflow Transfer-in (cfm) Note 4	Airflow Transfer-out (cfm) Note 5	Infiltration (cfm) Note 6	Exhaust (cfm) Note 7	Exhaust Fan Tag Number Note 8	Remarks
Rooms served by EXH-A (EXH-00001 & 2)									
1007A	Battery Room (Normal Power)	560	0	100	0	0	660	EXH-A	See Section 6.2.3.
						Total=	**660**	**EXH-A**	
Rooms served by EXH-B (EXH-00003 & 4)									
2001	HVAC Room	1,920	1,920	270	0	620	890	EXH-B	270 cfm in from Rm. 2006A
2002	Instrument and Electrical Shop	1,200	1,255	300	0	40	285	EXH-B	50 cfm in from Rm 2006K, 50 cfm in from Rm 2006J, 200 cfm in from Rm 2006A
2003	Closure Support Room (North)	6,670	1,915	50	4,755	40	90	EXH-B	4755 cfm transfer out to Rm 2007, 50 cfm in from Rm. 2006A
2004	Canister Transfer Room	29,900	29,900	400	1,540	1,140	0	EXH-B	150 cfm in from Rm 3001, 150 cfm in from Rm 3002, 100 cfm in from Rm 2006A. 770 cfm out to Room 1023, 770 cfm out to Room 1024
2005	HVAC Room	2,500	2,945	515	0	440	510	EXH-B	100 cfm in from 2006A, 50 cfm in from 2006B, 365 cfm in from 2006A (infiltration)
2008	HVAC Room	2,600	2,705	395	0	620	910	EXH-B	395 cfm in from Rm. 2006G
2010	Maintenance and Operations Storage Room	1,900	1,840	295	0	40	395	EXH-B	295 cfm in from 2006G
2011	Closure Support Room (South)	6,740	1,985	50	4,755	40	90	EXH-B	4755 cfm transfer out to Rm 2007, 50 cfm in from Rm. 2006A
2012	HVAC Room	2,920	2,920	370	0	300	670	EXH-B	370 cfm in from 2006G (670 cfm exhaust taken from enclosure between two HEPA filter plenum)
2045	Corridor	350	370	0	0	140	120	EXH-B	
2048	Elevator Lobby	940	815	0	0	800	925	EXH-B	
2050	Elevator Lobby	860	1,560	0	0	700	0	EXH-B	
3001	Corridor	2,900	2,990	0	150	1,220	980	EXH-B	150 cfm transter out to Rm. 2004
3002	Corridor	1,180	770	0	150	640	900	EXH-B	150 cfm transter out to Rm. 2004
3045	Corridor	420	300	0	0	100	220	EXH-B	
3045A	Storage Room	290	290	0	0	200	200	EXH-B	
3046	Lobby	210	190	0	0	160	180	EXH-B	
3048	Elevator Lobby	960	1,275	0	0	680	365	EXH-B	
3050	Elevator Lobby	1,020	1,410	0	0	640	250	EXH-B	
						Total =	**7,980**	**EXH-B**	
Rooms served by EXH-C (EXH-00009 & 10)									
1009	HVAC Room	250	0	50	0	0	300	EXH-C	50 cfm in from Rm. 1005A
1011	HVAC Room	2,800	2,800	450	0	0	450	EXH-C	450 cfm in from Rm 1005A
1017	Canister Staging Area #1	2,140	0	0	0	0	2,140	EXH-C	
1018	WP Positioning Room (North)	0	0	7,150	0	0	7,150	EXH-C	7,000 cfm transfer in from Rm 1015, 100 cfm in from Rm. 2007 and 50 cfm in from Rm. 1005A.
1019	WP Positioning Room (South)	0	0	7,150	0	0	7,150	EXH-C	7000 cfm transfer in from Rm 1015, 100 cfm in from Rm. 2007 and 50 cfm in from Rm. 1005J.
1021	Canister Staging Area #2	770	0	0	0	0	770	EXH-C	
1022	Canister Staging Area #3	2,140	0	0	0	0	2,140	EXH-C	
1023	Cask Unloading Room (North)	0	0	6,820	0	0	6,820	EXH-C	6,000 cfm transfer in from Rm 1026, 770 cfm in from Rm. 2004 and 50 cfm in from Rm. 1005A.

Room No. Note 1	Room Name Note 1	Supply Airflow (cfm) Note 2	Return Airflow (cfm) Note 3	Airflow Transfer-in (cfm) Note 4	Airflow Transfer-out (cfm) Note 5	Infiltration (cfm) Note 6	Exhaust (cfm) Note 7	Exhaust Fan Tag Number Note 8	Remarks
1024	Cask Unloading Room (South)	0	0	6,820	0	0	6,820	EXH-C	6,000 cfm transfer in from Rm 1026, 770 cfm in from Rm. 2004 and 50 cfm in from Rm. 1005J.
1025	Canister Staging Area #4	520	0	0	0	0	520	EXH-C	
1030	HVAC Room	250	0	50	0	0	300	EXH-C	25 cfm in from Rm 1005G, 25 cfm in from Rm 1005J
1032	HVAC Room	2,870	2,790	290	0	80	450	EXH-C	290 cfm in from Rm. 1005J
						Total =	**35,010**	**EXH-C**	
Rooms served by EXH-D (EXH-00011 & 12)									
1001	LLW Staging Room	1,420	0	1,040	0	1,320	3,780	EXH-D	650 cfm in from Rm 1002, 390 cfm in from rm 1002A
1002	North Maintenance Vestibule	710	1,010	250	650	700	0	EXH-D	650 cfm out to Rm 1001, 250 cfm in from Rm 1002A
1002A	Personnel Vestibule	0	0	0	640	640	0	EXH-D	250 cfm in from Rm 1002, 390 cfm in from Rm 1001
1004	HVAC Room (LLW Areas HEPA Exhaust)	1,740	0	100	0	1,840	3,680	EXH-D	100 cfm in from Rm 1003
1044A	Elevator Mechanical Room	180	180	0	0	0	0	EXH-D	
1045	Corridor	870	870	0	720	720	0	EXH-D	720 cfm out to Rm 1005A
1046	Elevator Lobby	50	50	0	0	0	0	EXH-D	
1048	Elevator Lobby	1,650	2350	0	900	1,600	0	EXH-D	900 cfm out to Rm 1005A
1200	Support Area	3,960	3,960	385	0	0	385	EXH-D	190 cfm in from Rm 1005A, 195 cfm in from Rm 1214. 385 cfm exhaust from Room 1212.
						Total =	**7,845**	**EXH-D**	
Rooms served by EXH-E (EXH-00013 & 14)									
1007	Electrical Room (Normal Power)	7,900	8,410	120	100	540	50	EXH-E	100 cfm transfer out to Battery Rm. 1007A, 120 cfm in from Rm 1005A
1010	HVAC Room	520	570	150	0	0	100	EXH-E	150 cfm in from Rm 1005A,
1012	Maintenance Room(North CTM)	390	440	100	0	0	50	EXH-E	100 cfm in from 1005A
1016	Unassigned	230	0	0	0	0	230	EXH-E	
1020	Unassigned	230	0	50	0	0	280	EXH-E	50 cfm in from Rm 1005F
1028	Utility Room	9,600	9,600	0	0	540	540	EXH-E	
1031	HVAC Room	500	550	300	0	0	250	EXH-E	100 cfm in from Rm 1005F, 200 cfm in from 1005J
1033	Maintenance Room	460	425	175	0	40	250	EXH-E	175 cfm in from Rm. 1005J
1034	Gas Sampling Room	120	0	175	0	40	335	EXH-E	50 cfm in from Rm 1005F, 50 cfm in from Rm 1005H, 75 cfm in from 1005J
1035	HVAC Room	890	860	225	0	120	375	EXH-E	225 cfm in from Rm. 1005J (150 cfm of total 375 cfm exhausted comes from enclosure between two HEPA filter plenum)
1050	Elevator Lobby	1,760	3,240	0	0	1,720	240	EXH-E	
1005A	Corridor	1,040	650	1,620	2,010	0	0	EXH-E	Total 2,010 cfm, transfer out to the following rooms through doors and to be exhausted to atmosphere: Rm. 1018=50 cfm, Rm. 1023=50 cfm, Rm. 1008=850 cfm, Rm 1007=120 cfm, Rm 1200=190 cfm. (720 cfm in from Rm 1045, 900 cfm in from Rm 1048, 820 cfm direct supply from AHU-C(AHU-00005 & 6), 150 cfm out to Rm 1010, 450 cfm out to Rm 1011, 100 cfm out to Rm 1012, 50 cfm out to Rm 1009..
						Total =	**2,700**	**EXH-E**	
1005B	Corridor	390	390	0	0	0	0		
1005C	Corridor	320	320	0	0	0	0		

Room No. Note 1	Room Name Note 1	Supply Airflow (cfm) Note 2	Return Airflow (cfm) Note 3	Airflow Transfer-in (cfm) Note 4	Airflow Transfer-out (cfm) Note 5	Infiltration (cfm) Note 6	Exhaust (cfm) Note 7	Exhaust Fan Tag Number Note 8	Remarks
1005D	Corridor	1,600	1,600	0	0	0	0		
1005E	Corridor	1,060	1,060	0	0	0	0		
1005F	Corridor	1,600	1,400	0	200	0	0		50 cfm out to Rm. 1034, 100 cfm to Rm. 1031, 50 cfm out to Rm 1020
1005G	Corridor	370	345	0	25	0	0		25 cfm to Rm. 1030
1005H	Corridor	530	480	0	50	0	0		50 cfm to Rm. 1034
1005J	Corridor	2,240	1,460	0	1,940	1,160	0		Total Infiltration of 1,160 cfm, transfer out to the following rooms through doors: Rm. 1029=850 cfm, Rm. 1030=25 cfm, Rm. 1031=200 cfm, Rm. 1032=190 cfm, Rm. 1035=125 cfm, Rm. 1034= 75 cfm, Rm. 1019=50 cfm, Rm. 1024=50 cfm Rm. 1033=75 cfm. (100 cfm return air to each Rm 1032, Rm 1033 & Rm 1035 = 300 cfm total)
1008	Electrical Room (ITS Train A)			850					850 out of 1240 cfm Transfer out from Corridor 1005A goes to Electrical Room 1008 to be exhausted outside. Room 1008 is not part of this calculation. It is shown for information only. It is included in Calculation No. 060-M8C-VCT0-00700-000-00Aa.
1015	WP Loadout Room	18,040	10,320	6,280	14,000	0	0		6,280 cfm infiltration coming directly from outside into Rm. 1014 (Assumption 3.1.11). From Rm. 1014, 6,280 cfm passes through Rm 1015 then transfer out to Rm. 1018 & Rm. 1019.
1016	Unassigned	230	230	0	0	0	0		
1020	Unassigned	230	230	0	0	0	0		
1026	Cask Preparation Room	21,460	16,190	6,730	12,000	0	0		6,730 cfm infiltration coming directly from outside into Rms. 1027 & 1036 (Reference 2.2.18). 6,730 cfm passes through Rm 1026 then transfer out to Rm. 1023 & Rm. 1024.
1029	Electrical Room (ITS Train B)			850		0			850 out of 1620 cfm Transfer Out from Corridor 1005J goes to Electrical Room 1029 to be exhausted outside. Room 1029 is not part of this calculation. It is shown for information only. It is included in Calculation No. 060-M8C-VCT0-00700-000-00Aa.
2003A	Personnel Access Room (North)	130	130	0	0	0	0		
2006A	Corridor	1,220	115	0	1,185	80	0		Corridors 2006A thru 2006K Total Infiltration of 680 cfm, transfer out to the following rooms through doors and to be exhausted to atmosphere: Rm. 2001=270 cfm, Rm. 2002=200 cfm, Rm. 2003=50 cfm, Rm. 2004=100 cfm, Rm. 2005=365 cfm, Rm. 2011= 50 cfm, Rm. 2007=50 cfm. (100 cfm return air transfer out to Rm. 2005)
2006B	Corridor	500	520	0	50	70	0		50 cfm to Rm. 2005
2006D	Corridors	470	550	0	0	80	0		
2006E	Corridor	470	550	0	0	80	0		
2006F	Corridor	390	460	0	0	70	0		
2006G	Corridor	1,510	530	0	1,060	80	0		395 cfm out to Rm. 2008, 295 cfm out to Rm 2010, 370 cfm out to Rm 2012
2006H	Corridor	400	470	0	0	70	0		
2006J	Corridor	730	760	0	50	80	0		50 cfm to Rm. 2002
2006K	Corridor	450	470	0	50	70	0		50 cfm to Rm. 2002
2007	Waste Package Closure Room	0	11,800	11,940	200	60	0		100 cfm exh. To Rm. 1018, 100 cfm exh. To Rm. 1019, 50 cfm in from Rm 2006A.
2007A	Closure Equipment (North)	1,190	0	0	1,190	0	0		1,190 cfm transfer out to Rm. 2007.
2007B	Closure Equipment (South)	1,190	0	0	1,190	0	0		1,190 cfm transfer out to Rm. 2007.

Room No. Note 1	**Room Name** Note 1	**Supply Airflow (cfm)** Note 2	**Return Airflow (cfm)** Note 3	**Airflow Transfer-in (cfm)** Note 4	**Airflow Transfer-out (cfm)** Note 5	**Infiltration (cfm)** Note 6	**Exhaust (cfm)** Note 7	**Exhaust Fan Tag Number** Note 8	**Remarks**
2011A	Personnel Access Room (South)	170	170	0	0	0	0		
2045A	Storage Room	320	560	0	0	240	0		
2046	Elevator Lobby	200	380	0	0	180	0		

Notes:
1. From Room Load Information Sheet in Appendix A
2. From Table 6 Space Airflow Rates
3. Room return airflow
4. Air cascaded into the room and the note under Remarks column explains the origin.
5. Air cascaded out of the room and note under Remarks column explains which room to go.
6. From CRCF 1 Confinement Areas Air Leakage Calculation 060-M8C-VCT0-00100-000-00A and Assumption 3.1.9.
7. Room exhaust airflow
8. Exhaust Fan Tag No. to identify the zoning.
9. Return air registers for corridors can be located in one location because they are open to each other.

APPENDIX I: CALCULATION OF THERMODYNAMIC PROPERTIES OF MOIST AIR

Table I-1. Thermodynamic Properties of Moist Air

Description	Air Flow cfm	Elevation ft.	Air Dry Bulb Temp. °F	Air Wet Bulb Temp. °F	Air Dew Point Temp. °F	Humidity Ratio W lb water/lb dry air	Specific Volume v cu. ft./lb dry air	Enthalpy h Btu/lb dry air	Density d lb/cu. ft.
AHU-A (AHU-00001 & 2) - 100% Recirculation									
Supply Air Leaving Coil	23,100	3,310	51.00	46.36	42.5	0.00646	14.68	19.24	0.068
Air Leaving Supply Fan/Entering the Coil	23,100	3,310	91.36	61.67	42.5	0.00646	15.84	29.04	0.063
Return Air	23,100	3,310	85.36	59.68	42.5	0.00646	15.67	27.59	0.064
AHU-B (AHU-00003 & 4) - 100% Recirculation									
Supply Air Leaving Coil	29,900	3,310	51.00	46.36	42.5	0.00646	14.68	19.24	0.068
Air Leaving Supply Fan/Entering the Coil	29,900	3,310	85.00	59.55	42.5	0.00646	15.66	27.50	0.064
Return Air	29,900	3,310	79.00	57.47	42.5	0.00646	15.49	26.04	0.065
AHU-C (AHU-00005 & 6)									
Supply Air Leaving Coil	22,280	3,310	51.00	46.36	42.5	0.00646	14.68	19.24	0.068
Air Leaving Supply Fan/Entering the Coil	22,280	3,310	91.10	61.59	42.5	0.00646	15.83	28.99	0.063
Return Air	16,190	3,310	79.00	57.46	42.5	0.00646	15.49	26.04	0.065
Mixed Air(Before Supply Fan)	22,280	3,310	85.10	59.59	42.5	0.00646	15.66	27.53	0.064
Outside Air	6,090	3,310	102.00	65.01	42.5	0.00646	16.15	31.63	0.062
AHU-D (AHU-00007 & 8) - 100% Recirculation									
Supply Air Leaving Coil	21,820	3,310	51.00	46.36	42.5	0.00646	14.68	19.24	0.068
Air Leaving Supply Fan/Entering the Coil	21,820	3,310	91.50	61.72	42.5	0.00646	15.84	29.08	0.063
Return Air	21,820	3,310	85.50	59.73	42.5	0.00646	15.67	27.63	0.064
AHU-E (AHU-00009 & 10) - 100% Recirculation									
Supply Air Leaving Coil	21,020	3,310	51.00	46.36	42.5	0.00646	14.68	19.24	0.068
Air Leaving Supply Fan/Entering the Coil	21,020	3,310	91.60	61.74	42.5	0.00646	15.85	29.10	0.063
Return Air	21,020	3,310	85.60	59.76	42.5	0.00646	15.68	27.65	0.064

Description	Air Flow cfm	Elevation ft.	Air Dry Bulb Temp. °F	Air Wet Bulb Temp. °F	Air Dew Point Temp. °F	Humidity Ratio W lb water/lb dry air	Specific Volume v cu. ft./lb dry air	Enthalpy h Btu/lb dry air	Density d lb/cu. ft.
AHU- F (AHU-00011 & 12)									
Supply Air Leaving Coil	17,390	3,310	51.00	46.36	42.5	0.00646	14.68	19.24	0.068
Air Leaving Supply Fan/Entering the Coil	17,390	3,310	95.24	62.91	42.5	0.00646	15.95	29.98	0.063
Return Air	11,550	3,310	83.71	58.86	42.5	0.00646	15.60	27.01	0.064
Mixed Air(Before Supply Fan)	17,390	3,310	89.24	60.97	42.5	0.00646	15.78	28.53	0.063
Outside Air	5,840	3,310	102.00	65.00	42.5	0.00646	16.15	31.63	0.062
AHU-G (AHU-00013 & 14)									
Supply Air Leaving Coil	18,040	3,310	51.00	46.36	42.5	0.00646	14.68	19.24	0.068
Air Leaving Supply Fan/Entering the Coil	18,040	3,310	94.80	62.72	42.5	0.00646	15.93	29.84	0.063
Return Air	10,320	3,310	79.00	57.46	42.5	0.00646	15.49	26.04	0.065
Mixed Air Ent. Coil	18,040	3,310	88.80	60.77	42.5	0.00646	15.76	28.38	0.063
Outside Air	7,720	3,310	102.00	65.01	42.5	0.00646	16.15	31.63	0.062
AHU- H (AHU-00015 & 16)									
Supply Air Leaving Coil	6,620	3,310	51.00	46.36	42.5	0.00646	14.68	19.24	0.068
Air Leaving Supply Fan/Entering the Coil	6,620	3,310	100.38	63.40	42.5	0.00646	16.00	30.36	0.063
Return Air	4,460	3,310	85.52	59.73	42.5	0.00646	15.67	27.63	0.064
Mixed Air(Before Supply Fan)	6,620	3,310	94.38	61.49	42.5	0.00646	15.82	28.91	0.063
Outside Air	2,160	3,310	102.00	65.01	42.5	0.00646	16.15	31.63	0.062
FCU- E (FCU-00005 & 6)									
Supply Air Leaving Coil	9,600	3,310	51.00	46.36	42.5	0.00646	14.68	19.24	0.068
Air Leaving Supply Fan	9,600	3,310	57.00	48.95	42.5	0.00646	14.85	20.70	0.063
Return Air	9,600	3,310	90.00	61.22	42.5	0.00646	15.80	28.71	0.064

NOTES:

1. Table above is summary of the calculated thermodynamic air properties of moist air using psychrometric equations presented in Appendix D.
2. Humidity Ratio, W in lb water/lb dry air = Humidity Ratio, W in grains/lb dry air divided by 7,000
3. Density, d in lb/cu.ft. = reciprocal of the specific volume, v in cu.ft./lb. dry air

APPENDIX J: INFILTRATION/CASCADE AIR COOLING LOAD CALCULATION (ROOM-BY-ROOM)

Infiltration/Cascade Table J-1 presents how the load was calculated using infiltration air (Assumption 3.1.9 and Reference 2.2.18), outside/inside design air temperatures and density of air using equation D-14.

Table J-1. Infiltration/Cascade Air Cooling Load

INPUT DATA									SENSIBLE LOAD	
Room No. Note 1	**Room Name** Note 1	**Outdoor Temp. F** Note 2	**Adjacent Room Temp. F** Note 3	**Design Room Temp. F** Note 1	**Cascaded Air cfm** Note 4	**Infiltration Air cfm** Note 5	**Constant 60 x 0.24 = 14.4**	**Density of Entering Air lb/ft^3** Note 6	**Cascaded Air Load Btu/h** Note 7	**Infiltration Air Load Btu/h** Note 7
1001	LLW Staging Room	102	---	90	---	1,320	14.4	0.062	0	14,142
1002	North Maintenance Vestibule	102	---	90	---	700	14.4	0.062	0	7,500
1002A	Personnel Vestibule	---	---	---	---	640	---	---	---	---
1004	HVAC Room	102	---	90	---	1,840	14.4	0.062	0	19,713
1005J	Corridor	102	90	82	---	1,160	14.4	0.062	0	20,713
1007	Electrical Room (Normal Power)	102	---	90	---	540	14.4	0.062	0	5,785
1007A	Battery Room (Normal Power)	102	90	77	100	0	14.4	0.063	1,179	0
1015	WP Loadout Room	102	79	79	6,280	0	14.4	0.065	0	0
1026	Cask Preparation Room	102	79	79	6,730	0	14.4	0.065	0	0
1028	Utility Room	102	---	90	---	540	14.4	0.062	0	5,785
1032	HVAC Room (ITS HEPA Exhaust Train B)	102	---	90	---	80	14.4	0.062	0	857
1033	Maintenance Room (South CTM)	102	---	90	---	40	14.4	0.062	0	429
1034	Gas Sampling Room	79	---	79	---	40	14.4	0.062	0	0
1035	HVAC Room (Non-ITS Room HEPA Exh)	102	---	90	---	120	14.4	0.062	0	1,286
1045	Corridor	102	---	82	---	720	14.4	0.062	0	12,856
1048	Elevator Lobby	102	---	82	---	1,600	14.4	0.062	0	28,570
1050	Elevator Lobby	102	---	82	---	1,720	14.4	0.062	0	30,712
2001	HVAC Room	102	---	90	---	620	14.4	0.062	0	6,642

INPUT DATA									SENSIBLE LOAD	
Room No. Note 1	**Room Name** Note 1	**Outdoor Temp. F** Note 2	**Adjacent Room Temp. F** Note 3	**Design Room Temp. F** Note 1	**Cascaded Air cfm** Note 4	**Infiltration Air cfm** Note 5	**Constant 60 x 0.24 = 14.4**	**Density of Entering Air lb/ft^3** Note 6	**Cascaded Air Load Btu/h** Note 7	**Infiltration Air Load Btu/h** Note 7
2002	Instrumental and Electrical Room	102	---	79	---	40	14.4	0.062	0	821
2003	Closure Support Room (North)	102	90	78	---	40	14.4	0.062	0	857
2004	Canister Transfer Room	102	90	79	---	1,140	14.4	0.062	0	23,409
2005	HVAC Room	102	---	90	---	440	14.4	0.062	0	4,714
2006A	Corridor	102	90	82	---	80	14.4	0.062	0	1,428
2006B	Corridor	102	90	82	---	70	14.4	0.062	0	1,250
2006D	Corridor	102	---	82	---	80	14.4	0.062	0	1,428
2006E	Corridor	102	90	82	---	80	14.4	0.062	0	1,428
2006F	Corridor	102	90	82	---	70	14.4	0.062	0	1,250
2006G	Corridor	102	90	82	---	80	14.4	0.062	0	1,428
2006H	Corridor	102	90	82	---	70	14.4	0.062	0	1,250
2006J	Corridor	102	90	82	---	80	14.4	0.062	0	1,428
2006K	Corridor	102	90	82	---	70	14.4	0.062	0	1,250
2007	Waste Package Closure Room	102	---	90	---	60	14.4	0.062	0	643
2008	HVAC Room	102	---	90	---	620	14.4	0.062	0	6,642
2010	Maintenance and Operations Storage Room	102	---	79	---	40	14.4	0.062	0	821
2011	Closure Support Room (South)	102	90	78	---	40	14.4	0.062	0	857
2012	HVAC Room	102	---	90	---	300	14.4	0.062	0	3,214
2045	Corridor	102	---	82	---	140	14.4	0.062	0	2,500
2045A	Storage Room	102	---	82	---	240	14.4	0.062	0	4,285
2046	Elevator Lobby	102	---	82	---	180	14.4	0.062	0	3,214
2048	Elevator Lobby	102	---	82	---	800	14.4	0.062	0	14,285
2050	Elevator Lobby	102	---	82	---	700	14.4	0.062	0	12,499

INPUT DATA									SENSIBLE LOAD	
Room No. Note 1	**Room Name** Note 1	**Outdoor Temp. F** Note 2	**Adjacent Room Temp. F** Note 3	**Design Room Temp. F** Note 1	**Cascaded Air cfm** Note 4	**Infiltration Air cfm** Note 5	**Constant 60 x 0.24 = 14.4**	**Density of Entering Air lb/ft^3** Note 6	**Cascaded Air Load Btu/h** Note 7	**Infiltration Air Load Btu/h** Note 7
3001	Corridor	102	---	82	---	1,220	14.4	0.062	0	21,784
3002	Corridor	102	---	82	---	640	14.4	0.062	0	11,428
3045	Corridor	102	---	82	---	100	14.4	0.062	0	1,786
3045A	Storage Room	102	---	82	---	200	14.4	0.062	0	3,571
3046	Lobby	102	---	82	---	160	14.4	0.062	0	2,857
3048	Elevator Lobby	102	---	82	---	680	14.4	0.062	0	12,142
3050	Elevator Lobby	102	---	82	---	640	14.4	0.062	0	11,428
					Total =	**20,780**			**1,179**	**310,891**

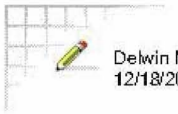
NOTES:

1. Obtained from Room Load Information Sheets in Attachment 2.
2. Outdoor dry bulb design temperature from Section 6.1.1.
3. Refer to Load Information Sheets in Appendix A for room temperature.
4. Applies to Room 1007A & Room 1015. For Room 1007A, 100 cfm cascade coming from Room 1007. For Room 1015, 6280 cfm coming from Room 1014 (WP Loadout Vestibule).
5. Room Infiltration cfm obtained from Assumption 3.1.9 & Reference 2.2.18.
6. Density of Air at 3310 ft. altitude and entering air temperature. See Appendix D for equations to determine density.
7. Calculated using Equation C-11A.

ATTACHMENT 1: EMAIL REGARDING WASTE CASK HEAT GAIN INFORMATION

(2 pages)

This e-mail is from Delwin Mecham of BSC Thermal Analysis dated 12/18/07, to Greg Gould of the BSC Mechanical HVAC Group. It confirms the use of Waste Cask heat load in the CRCF 1 as an assumption requiring verification.



Delwin Mecham
12/18/2007 07:19 AM

To: Greg Gould/YM/RWDOE@CRWMS
cc:
Subject: Re: Fw: HVAC Heat Load input

LSN: Not Relevant - Not Privileged
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

Based on the following, I suggest the surface design HVAC to the following heat loads:

TAD	25 kW each
DOE canisters	1.5 kW each
Naval canisters	11.8 kW each
Waste Packages	18 kW to 25 kW each

Total heat load per room will depend on number of items per room.

TAD 25 kW based on the range in the TAD draft specification , also Thermal Management Study Section 3.4. (DIRS 172739). There really is no limit, it is whatever the vendors design, but 30 kW should be bounding, 22 kW is more likely.

WP 18.0 kW based on pending TMRB decision (TMRB 2007-064), but better use 25 kW to meet potential changes in drift thermal requirements.

DOE canister 1500 watts REF: [DIRS 176668] "Request for Updated U.S. Department of Energy (DOE) Canister Thermal Output Limits in Support of Repository Design (EM-FMDP-06-006)." Memorandum from M.R. Arenaz (DOE) to W.J. Arthur, III (DOE/ORD), February 6, 2006, 0210065322, with enclosures. ACC: MOL.20060315.0141.

Naval canister 11.8 kW REF: Section 11 of [DIRS 165219] Naval Nuclear Propulsion Program Technical Baseline Compliance Document, Revision 1, October 2002. Letter from J.M. McKenzie (DOE) to J. Williams (DOE/OCRWM)

ATTACHMENT 2: E-MAIL REGARDING CRCF 1 ELECTRICAL EQUIPMENT HEAT GAIN INFORMATION

(8 pages)

This e-mail is from Arsenio Mendiola of BSC Electrical Group dated 11/14/07 to Tracy Johnson of BSC Mechanical Group and then forwarded to Greg Gould of BSC Mechanical HVAC Group confirming the use of heat load in the CRCF 1 Electrical Room (Normal Power).

There are seven files attached to the e-mail. One pertains to the normal power to the CRCF Heat Loads. The Heat Loss for RF (normal), RF ITS Train A, RF ITS Train B, Heat Loss for RF Room 2012, IHF Heat Loads and WHF Heat Loads are not applicable to this calculation, therefore are not attached.

Greg Gould
11/14/2007 11:38 AM

To: Monico Pingul/YM/RWDOE@CRWMS, Elpidio Castroverde/YM/RWDOE@CRWMS, Gin Cababa/YM/RWDOE@CRWMS, Fred Favis/YM/RWDOE@CRWMS, Orlando Santiago/YM/RWDOE@CRWMS, Jerry Herszman/YM/RWDOE@CRWMS, Hang Yang/YM/RWDOE@CRWMS, Oscar Rosales/YM/RWDOE@CRWMS, Ricardo Abraham/YM/RWDOE@CRWMS, Orlando Asuncion/YM/RWDOE@CRWMS, Francis Banea/YM/RWDOE@CRWMS
cc:
Subject: Fw: Heat Loss update

LSN: Not Relevant - Not Privileged
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

FYI.

---------- Forwarded by Greg Gould/YM/RWDOE on 11/14/2007 11:37 AM ----------

Arsenio Mendiola
11/14/2007 11:33 AM

To: Tracy Johnson/YM/RWDOE@CRWMS
cc: Debra Nevergold/YM/RWDOE@CRWMS, David Tooker/YM/RWDOE@CRWMS, Roshellia Goines/YM/RWDOE@CRWMS, Hadi Jalali/YM/RWDOE@CRWMS, Greg Gould/YM/RWDOE@CRWMS, Robert Slovic/YM/RWDOE@CRWMS, Muhammad N Islam/YM/RWDOE@CRWMS
Subject: Heat Loss update

LSN: Not Relevant - Not Privileged
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

Attached below are the estimated heat losses for nuclear facilities.

Regards,
Arsenio

---------- Forwarded by Arsenio Mendiola/YM/RWDOE on 11/14/2007 10:58 AM ----------

Muhammad N Islam
11/14/2007 10:08 AM

To: Arsenio Mendiola/YM/RWDOE@CRWMS
cc: Amando de la Cruz/YM/RWDOE@CRWMS
Subject: Heat Loads Updated

LSN: Not Relevant - Not Privileged
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

Incorporated your comments.

CRCF Heat Loads.xls Heat loss for RF (normal).xls Heat loss for RF ITS Train B.xls Heat loss for RF ITS TrainA.xls


Heat loss for RF ROOM 2012.xls
IHF Heat Loads.xls
WHF Heat Loads 1.xls

Attachment 2 – Print of Attached File Heat Loss for CRCF normal.xls

CRCF NORMAL ELECTRICAL ROOM (ROOM 1007)

	Component ID	Description	Heat Loss kW
	060-EEN0-LC-00001	LC BUS A / LC BUS B 480/277 V	11.16
	060-EEN0-LC-00002	LC BUS A / LC BUS B 480/277 V	11.16
	060-EEN0-MCC-00001	MCC 480/277 V	0.631
	060-EEN0-MCC-00002	MCC 480/277 V	0.631
	060-EEN0-MCC-00003	MCC 480/277 V	0.631
	060-EEN0-MCC-00004	MCC 480/277 V	0.631
	060-EEN0-XFMR-00051	DISTR XFMR 480-208/120 V	2.695
	060-EEN0-PL-00051	DISTR PANEL	0.5
	060-EUL0-PL-00001	LIGHTING PANEL 480/277 V	0.5
	060-EUL0-PL-00002	LIGHTING PANEL 480/277 V	0.5
	060-EEP0-UJX-00001	UPS 480-480/277 V (Rated 160 kVA)	17
	060-EEP0-PL-00001	UPS DISTR PANEL 480/277 V	0.5
	060-EEP0-XFMR-00001	BYPASS XFMR 480-480/277V (Rated 160 kVA)	1.09
	060-EEP0-UJX-00002	UPS 480-208/120 V (Rated 40 kVA)	6.556
	060-EEP0-PL-00002	UPS DISTR PANEL 208/120 V	0.5
	060-EEP0-XFMR-00002	BYPASS XFMR 480-208/120V (Rated 40 kVA)	0.5
	TBD	DCMIS PANEL	0.4
	TBD	DCMIS PANEL	0.4
	TBD	PLC	0.34
	TBD	PLC	0.34

Attachment 2 – Print of Attached File Heat Loss for CRCF normal.xls (Continued)

	TBD	Cable Tray 36", 350	3.78
			60.445
CRCF NORMAL BATTERY ROOM (ROOM 1007A)			
	Component ID	**Description**	**Heat Loss kW**
	TBD	NORMAL 125VDC BATTERY	0
			0
CRCF ITS TRAIN A ELECTRICAL ROOM (ROOM 1008)			
	Component ID	**Description**	**Heat Loss kW**
	060-EEE0-XFMR-00001	ITS XFMR – TRAIN A 13.8 kV-480 V (Rated 750kVA)	11.8
	060-EEE0-LC-00001	ITS LC – TRAIN A 480/277 V (3 Ckt Breaker Feeders)	2.645
	060-EEE0-MCC-00001	ITS MCC – TRAIN A 480/277 V	0.631
	060-EUL0-PL-00001-A	LTG PANEL 480/277 V	0.5
	060-EEE0-XFMR-00003	ITS DISTR XFMR – TRAIN A 480-208/120 V	1.45
	060-EEE0-PL-00003	ITS DISTR PANEL – TRAIN A 208/120 V	0.5
	060-EEU0-UJX-00001	ITS UPS – TRAIN A 480-208/120 V	6.556
	060-EEU0-PL-00001	ITS UPS DISTR PANEL – TRAIN A 208/120 V	0.5
	060-EEU0-XFMR-00001	ITS BYPASS XFMR – TRAIN A 480-208/120 V (Rated 40 kVA)	0.5
	TBD	DCMIS PANEL	0.4
	TBD	DCMIS PANEL	0.4
	TBD	PLC	0.34
	TBD	PLC	0.34

Attachment 2 – Print of Attached File Heat Loss for CRCF normal.xls (Continued)

	TBD	Cable Tray 36", 350	3.78
			30.342
CRCF ITS TRAIN A BATTERY ROOM (ROOM 1008A)			
	Component ID	**Description**	**Heat Loss kW**
	TBD	NORMAL 125VDC BATTERY	0
			0
CRCF ITS TRAIN B ELECTRICAL ROOM (ROOM 1029)			
	Component ID	**Description**	**Heat Loss kW**
	060-EEE0-XFMR-00002	ITS XFMR – TRAIN B 13.8 kV-480 V (Rated 750kVA)	11.8
	060-EEE0-LC-00002	ITS LC – TRAIN B 480/277 V (3 Ckt Brkr Feeders)	2.645
	060-EEE0-MCC-00002	ITS MCC – TRAIN B 480/277 V	0.631
	060-EUL0-PL-00001-B	LTG PANEL 480/277 V	0.5
	060-EEE0-XFMR-00004	ITS DISTR XFMR – TRAIN B 480-208/120 V	1.45
	060-EEE0-PL-00004	ITS DISTR PANEL – TRAIN B 208/120 V	0.5
	060-EEU0-UJX-00002	ITS UPS – TRAIN B 480-208/120 V	6.556
	060-EEU0-PL-00002	ITS UPS DISTR PANEL – TRAIN B 208/120 V	0.5
	060-EEU0-XFMR-00002	ITS BYPASS XFMR – TRAIN B 480-208/120 V (Rated 40 kVA)	0.5
	TBD	DCMIS PANEL	0.4
	TBD	DCMIS PANEL	0.4
	TBD	PLC	0.34
	TBD	PLC	0.34

Attachment 2 – Print of Attached File Heat Loss for CRCF normal.xls (Continued)

	TBD	Cable Tray 36", 350	3.78
			30.342
CRCF ITS TRAIN B BATTERY ROOM (ROOM 1029A)			
Component ID		**Description**	**Heat Loss kW**
	TBD	NORMAL 125VDC BATTERY	0
			0
CRCF MAINTENANCE ROOM (ROOM 1028)			
Component ID		**Description**	**Heat Loss kW**
	060-EEN0-LC-00003	LC BUS A / LC BUS B 480/277 V	11.16
	060-EEN0-MCC-00013	MCC 480/277 V	0.631
			11.791
CRCF HVAC ROOM (ROOM 2001)			
Component ID		**Description**	**Heat Loss kW**
	060-EEN0-MCC-00005	MCC 480/277 V	0.631
	060-EEN0-MCC-00006	MCC 480/277 V	0.631
	060-EUL0-PL-00003	LIGHTING PANEL 480/277 V	0.5
			1.762
CRCF HVAC ROOM (ROOM 2005)			
Component ID		**Description**	**Heat Loss kW**
	060-EEN0-MCC-00007	MCC 480/277 V	0.631
	060-EEN0-MCC-00008	MCC 480/277 V	0.631
	060-EEN0-XFMR-00053	DISTR XFMR 480-208/120 V	1.45
	060-EEN0-PL-00053	DISTR PANEL 208/120 V	0.5

Attachment 2 – Print of Attached File Heat Loss for CRCF normal.xls (Continued)

	060-EUL0-PL-00005	LIGHTING PANEL 480/277 V	0.5
			3.712
CRCF HVAC ROOM (ROOM 2008)			
Component ID		**Description**	**Heat Loss kW**
	060-EEN0-MCC-00009	MCC 480/277 V	0.631
	060-EEN0-MCC-00010	MCC 480/277 V	0.631
	060-EEN0-XFMR-00052	DISTR XFMR 480-208/120 V	1.45
	060-EEN0-PL-00052	DISTR PANEL 208/120 V	0.5
	060-EEN0-XFMR-00055	DISTR XFMR 480-208/120 V	1.45
	060-EEN0-PL-00055	DISTR PANEL 208/120 V	0.5
	060-EUL0-PL-00004	LIGHTING PANEL 480/277 V	0.5
	060-EUL0-PL-00006	LIGHTING PANEL 480/277 V	0.5
			6.162
CRCF HVAC ROOM (ROOM 2012)			
Component ID		**Description**	**Heat Loss kW**
	060-EEN0-MCC-00011	MCC 480/277 V	0.631
	060-EEN0-MCC-00012	MCC 480/277 V	0.631
	060-EEN0-XFMR-00054	DISTR XFMR 480-208/120 V	1.45
	060-EEN0-PL-00054	DISTR PANEL 208/120 V	0.5
	060-EUL0-PL-00007	LIGHTING PANEL 480/277 V	0.5
			3.712

ATTACHMENT 3: E-MAIL REGARDING ENVIRONMENTAL, SAFETY & HEALTH EQUIPMENT HEAT GAIN INFORMATION

(6 pages)

This e-mail is from Thomas Bastian of BSC Environmental, Safety And Health Group dated 3/23/07 to Elpidio Castroverde of BSC Mechanical HVAC Group confirming the use of heat load of various equipment listed as assumption requiring verification

NOTE: Room 1004 described in this attachment has been renumbered as Rooms 1211 through 1213 and 1215 through 1222. For the purpose of this calculation, these rooms is designated as Room 1200. (See Assumption 3.1.22)

Thomas Bastian 03/23/2007 10:51 AM

To: Elpidio Castroverde/YM/RWDOE@CRWMS
cc: Gregory Eadie/YM/RWDOE@CRWMS
Subject: Re: CRCF 1 Equipment Heat Load

LSN: Not Relevant - Not Privileged
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

Elpidio,

This Equipment Load only addresses RM#1004, the immediate corridor (#1045) at the North entrance, and RM#1013. For these areas, the list appears to be appropriate for the types and number of heat sources.

However, there is other radiological equipment that is expected to be located in other rooms in the facility. For example there will be RAACS stations for personnel access to all radiological areas such as: RMs 1039, 1040, 1041, 1042, 1043, 1048; freight elevators 1047A/1047 and 1049A/1049; equipment access doors (1027, 1014, 1036A) and maintenance vestibules (1002, 1036B, 1037); and all interior personnel access points leading into radiological areas (e.g., 1005G, 1005B, three corridor entrances to 1026). There will also be additional radiological monitoring at locations throughout the facility such as: Continuous Air Monitors (CAMs) to be located at various locations throughout the facility; Fixed continuous radiation area monitors to be located at various locations throughout the facility; Criticality monitors/alarms to be located at various locations throughout the facility; and Portal Contamination Monitors/Friskers at all personnel access points leading into radiological areas (e.g., 1005G, 1005B, three corridor entrances to 1026).

The heat load from the additional equipment listed above will be similar to those already identified.

Let me know if you have any questions, or need additional information.

Tom

Elpidio Castroverde

Elpidio Castroverde
03/20/2007 03:00 PM

To: Thomas Bastian/YM/RWDOE@CRWMS
cc: Greg Gould/YM/RWDOE@CRWMS, Monico Pingul/YM/RWDOE@CRWMS
Subject: CRCF 1 Equipment Heat Load

LSN: Not Relevant - Not Privileged
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

Dear Tom,

Attached please find the spreadsheet for CRCF 1 Heat Load List. These equipment listed room by room are based on our conversation about three months ago when we sat down together. Presently, we are basing our Load Calculations on this data. Please review this list and let us know if there are some changes or addition to it. We need a reference to our Load Calculations regarding these equipment so, please response via e-mail to make it official.

Thanks,
Elpidio

ES&H Equipment Load List CRCF1 (03-20-07).xls

Attachment 3 – Print of Attached File ES&H Equipment Load List CRCF1 (03-20-07).xls

APPENDIX A : ROOM EQUIPMENT LOAD GAIN LIST

	Room No.	Conf. Zoning C or NC	Not Used	Area	Room Name	Heat Source	Qty.	USE FACTOR	Load Factor	Heat Load, Each	Units	Motor Location Type	Equip Load Btu/h	Not Used	Continuous Operation	Intermittent Operation	Simultaneous Operation	Reference Document	Originating Group/ Discipline	Contact Person	Remark 1	Remark 2
3	1004	TERTIARY		SUPPORT	SUPPORT AREA	DISPLAY BOARD	1	1.00	1.00	30	WATTS		102		X				ES&H	TOM BASTIAN	ASSUME 1 PC IN ENERGY SAVE MODE AT 30 WATTS EACH, MONITOR AT 0 WATTS PER ASHRAE (2005) CH. 30, TABLE 8	
4	1004	TERTIARY		SUPPORT	SUPPORT AREA	TEST PORTAL MONITOR/CALIBRATOR	1	1.00	1.00	700	WATTS		2,389		X				ES&H	TOM BASTIAN	ASSUME 700 WATTS SUPPLY FOR WHOLE BODY GAMMA MONITOR	
5	1004	TERTIARY		SUPPORT	SUPPORT AREA	SMALL EQUIPMENT MONITOR	1	1.00	1.00	30	WATTS		102		X				ES&H	TOM BASTIAN	ASSUME 1 PC IN ENERGY SAVE MODE AT 30 WATTS EACH, MONITOR AT 0 WATTS PER ASHRAE (2005) CH. 30, TABLE 8	
6	1004	TERTIARY		SUPPORT	SUPPORT AREA	FRISKER	1	1.00	1.00	0			0		X				ES&H	TOM BASTIAN	ASSUME NO HEAT LOAD	
7	1004	TERTIARY		SUPPORT	SUPPORT AREA	COMPUTER TERMINAL WALL DISPLAY	1	1.00	1.00	30	WATTS		102		X				ES&H	TOM BASTIAN	ASSUME 1 PC IN ENERGY SAVE MODE AT 30 WATTS EACH, MONITOR AT 0 WATTS PER ASHRAE (2005) CH. 30, TABLE 8	
8	1004	TERTIARY		SUPPORT	SUPPORT AREA	DISPLAY BOARD	1	1.00	1.00	30	WATTS		102		X				ES&H	TOM BASTIAN	ASSUME 1 PC IN ENERGY SAVE MODE AT 30 WATTS EACH, MONITOR AT 0 WATTS PER ASHRAE (2005) CH. 30, TABLE 8	
9	1004	TERTIARY		SUPPORT	SUPPORT AREA	DISPLAY BOARD	1	1.00	1.00	30	WATTS		102		X				ES&H	TOM BASTIAN	ASSUME 1 PC IN ENERGY SAVE MODE AT 30 WATTS EACH, MONITOR AT 0 WATTS PER ASHRAE (2005) CH. 30, TABLE 8	
10	1004	TERTIARY		SUPPORT	SUPPORT AREA	ELECTRONIC DOSIMETER CALIBRATOR	1	1.00	1.00	1	WATTS		3		X				ES&H	TOM BASTIAN	ASSUME 0.9 WATTS POWER CONSUMPTION FOR GDS MODEL LDM220	
11	1004	TERTIARY		SUPPORT	SUPPORT AREA	BARCODE SCAN STATION	1	1.00	1.00	0			0		X				ES&H	TOM BASTIAN	ASSUME NO HEAT LOAD	
12	1004	TERTIARY		SUPPORT	SUPPORT AREA	NEUTRON SOURCE CHECK STATION	1	1.00	1.00	0			0		X				ES&H	TOM BASTIAN	ASSUME NO HEAT LOAD	
13	1004	TERTIARY		SUPPORT	SUPPORT AREA	BATTERY CHARGING STATION	1	1.00	1.00	0			0		X				ES&H	TOM BASTIAN	ASSUME NO HEAT LOAD	
14	1004	TERTIARY		SUPPORT	SUPPORT AREA	PROPORTIONAL COUNTER	1	1.00	1.00	575	WATTS		1,962		X				ES&H	TOM BASTIAN	ASSUME POWER REQUIREMENTS OF 575 WATTS FOR TENNELE LB4100, MULTI-DETECTOR COUNTING SYSTEM	
15	1004	TERTIARY		SUPPORT	SUPPORT AREA	GAMMA SPECTOMETER	2	1.00	1.00	1200	WATTS		8,191		X				ES&H	TOM BASTIAN	ASSUME POWER REQUIREMENTS OF 1200 WATTS FOR CANBERRA, GAM-AN1 GAMMA SPECTOMETER	
16	1004	TERTIARY		SUPPORT	SUPPORT AREA	ALPHA SPECTOMETER	1	1.00	1.00	3	WATTS		10		X				ES&H	TOM BASTIAN	ASSUME POWER REQUIREMENTS OF 3 WATTS FOR CANBERRA MODEL 7401 ALPHA SPECTOMETER	
17	1004	TERTIARY		SUPPORT	SUPPORT AREA	LIQUID SCINTILATION COUNTER	1	1.00	1.00	1230	WATTS		4,198		X				ES&H	TOM BASTIAN	ASSUME POWER REQUIREMENTS OF 1230 WATTS FOR BECKMAN COULTER, MODEL 6500 SCINTILATION COUNTING SYSTEM	
18	1004	TERTIARY		SUPPORT	SUPPORT AREA	SWIPE COUNTER	2	1.00	1.00	575	WATTS		3,925		X				ES&H	TOM BASTIAN	ASSUME POWER REQUIREMENTS OF 575 WATTS FOR TENNELE LB4100, MULTI-DETECTOR COUNTING SYSTEM	

INPUT FROM OTHER DISCIPLINES

1 of 2

4/9/2007

Attachment 3 – Print of Attached File ES&H Equipment Load List CRCF1 (03-20-07).xls (Continued)

APPENDIX A : ROOM EQUIPMENT LOAD GAIN LIST

19	1004	TERTIARY		SUPPORT	SUPPORT AREA	FRISKER STATION	2	1.00	1.00	0			0		X				ES&H	TOM BASTIAN	ASSUME NO HEAT LOAD	
20	1004	TERTIARY		SUPPORT	SUPPORT AREA	SAMPLE PREPARATION HOOD	1	1.00	1.00	0			0		X				ES&H	TOM BASTIAN	ASSUME NO HEAT LOAD	
21	1004	TERTIARY		SUPPORT	SUPPORT AREA	BAR CODE SCANNER	1	1.00	1.00	0			0		X				ES&H	TOM BASTIAN	ASSUME NO HEAT LOAD	
22	1004	TERTIARY		SUPPORT	SUPPORT AREA	RAACS STATIONS	4	1.00	1.00	30	WATTS		410		X				ES&H	TOM BASTIAN	ASSUME AS PC IN ENERGY SAVE MODE AT 30 WATTS EACH, MONITOR AT 0 WATTS PER ASHRAE (2005) CH. 30, TABLE 8	
91	1045	TERTIARY		SUPPORT	CORRIDOR	TEST PORTAL MONITOR/CALIBRATOR	1	1.00	1.00	700	WATTS		2,389		X				ES&H	TOM BASTIAN	ASSUME 700 WATTS SUPPLY FOR WHOLE BODY GAMMA MONITOR	
92	1045	TERTIARY		SUPPORT	CORRIDOR	RAACS STATIONS	1	1.00	1.00	30	WATTS		102		X				ES&H	TOM BASTIAN	ASSUME AS PC IN ENERGY SAVE MODE AT 30 WATTS EACH, MONITOR AT 0 WATTS PER ASHRAE (2005) CH. 30, TABLE 8	

INPUT FROM OTHER DISCIPLINES 2 of 2 4/9/2007

Attachment 3 – Print of Attached File ES&H Equipment Load List CRCF1 (03-20-07).xls (Continued)

A	Room No.	Conf. Zoning	Area	Room Name	Heat Source	Qty.	Use Factor	Load Factor	Heat Load	Units	Motor Location Type	Equip Load Btu/hr	Continuous Operation	Intermittent Operation	Simultaneous Operation	Reference Document	Originating Group/ Discipline	Contact Person	Remarks
7	1013	Non Confinement		OPERATIONS ROOM	DISPLAY BOARD	10			30	WATTS		1024	X				ES&H	TOM BASTIAN	ASSUME 1 PC IN ENERGY SAVE MODE AT 30 WATTS EACH, MONITOR AT 0 WATTS PER ASHRAE (2005) CH. 30, TABLE 8 (BASED ON NO. OF WORKSTATION ON PLAN)
19	1013A	Non Confinement		OFFICE	DISPLAY BOARD	1			30	WATTS		102	X				ES&H	TOM BASTIAN	ASSUME 1 PC IN ENERGY SAVE MODE AT 30 WATTS EACH, MONITOR AT 0 WATTS PER ASHRAE (2005) CH. 30, TABLE 8 (BASED ON NO. OF WORKSTATION ON PLAN)
3	1004A	Non Confinement		SUPPORT AREA	RAACS STATIONS	4			30	WATTS		102		X			ES&H	TOM BASTIAN	ASSUME AS PC IN ENERGY SAVE MODE AT 30 WATTS EACH, MONITOR AT 0 WATTS PER ASHRAE (2005) CH. 30, TABLE 8

1 of 1

ATTACHMENT 4: E-MAIL REGARDING WASTE PACKAGE CLOSURE EQUIPMENT ROOM & CONTROL ROOM DESIGN TEMPERATURE

(3 pages)

This e-mail is from Jim Canning of BCS Mechanical Handling Group dated 11/14/07 to Fred Favis of BSC Mechanical HVAC Group (then forwarded to Monico C. Pingul, Jr., BSC Mechanical HVAC Group) confirming the room design temperature listed as assumption requiring verification.

Fred Favis
11/14/2007 03:44 PM

To: Greg Gould/YM/RWDOE@CRWMS, Elpidio Castroverde/YM/RWDOE@CRWMS, Monico Pingul/YM/RWDOE@CRWMS
cc:
Subject: Fw: Waste Package Closure System - room temperatures

LSN: Not Relevant - Not Privileged
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

F Y I. CRCF is included in the attachment.

---------- Forwarded by Fred Favis/YM/RWDOE on 11/14/2007 03:43 PM ----------

James Canning
11/14/2007 02:07 PM

To: Fred Favis/YM/RWDOE@CRWMS
cc: Tracy Johnson/YM/RWDOE@CRWMS, Myra Beyer/YM/RWDOE@CRWMS
Subject: Waste Package Closure System - room temperatures

LSN: Not Relevant - Not Privileged
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

Fred
Please refer to the attached table for the room temperatures for the Waste Package Closure System. INL has agreed with the information in the table. Updates were made to the IHF closure support room.

If you decide to consider a potential move of the Remote Handling System control cabinet from the equipment room into the closure support room, then for the heat load refer to INL's Engineering Design File EDF-7850 "YM WPCS Equipment Power and Utility Gas Requirements". This INL document is in InfoWorks. The BSC Document Number is 005128Q-0190-001 and the path in InfoWorks is - bscympepc / ym epc / Design and Engineering / Supplier Documents / 005128Q (INL). On page 16 of 21 under Remote Handling System / Four Axes Robotic System, the total heat load of 8kW can be used for the control cabinet. It is a value for the entire system that actually would be split between the closure room and closure support room but separate values of individual components are not known - so it would be conservative to consider the total in each room.

Let me know if you have any questions..

Thanks
Jim Canning

Room Temperatures 11-14-07.xls

Attachment 4 – Print of Attached File Room Temperatures 11-14-06.xls

Waste Package Closure System				
Room Temperatures				
	11/14/2007 updates in red font			
	Description			**Indoor Design Temperature, °F**
1	WP Positioning Cell	CRCF and IHF: no sensitive electronic equipment	Not occupied	Not in WPCS scope
2	WP Closure Cell	CRCF: no sensitive electronic equipment	Normally not occupied when the WP is in the positioning cell; Infrequently occupied for maintenance purposes when the WP is moved out of the positioning cell.	90°F maximum
		IHF: no sensitive electronic equipment	Normally not occupied when the WP is in the positioning cell; Normally occupied for maintenance purposes when the WP is moved out of the positioning cell.	90°F maximum
3	Closure Support Room	CRCF: contains sensitive electronic equipment (overflow from closure equipment room)	Normally occupied	78°F maximum
		IHF: no sensitive electronic equipment. The Remote Handling System control cabinet may have to be moved from the equipment room into the closure support room due to a possible reduction in the open floor space in the equipment room. If temperature is a problem, then the control cabinet design could change to add an AC unit.	Normally not occupied	90°F maximum
4	Closure Equipment Room	CRCF and IHF: contains sensitive electronic equipment	Normally not occupied	78°F maximum
5	Control Room	CRCF: workstations located in Main Operations Room at east side of building.	Normally occupied	78°F maximum
		IHF: workstations located in Control Area at north side of building.	Normally occupied	78°F maximum

ATTACHMENT 5: NOT USED

ATTACHMENT 6: E-MAIL REGARDING MECHANICAL HANDLING GROUP EQUIPMENT HEAT GAIN INFORMATION

(4 pages)

This e-mail is from Bryan Elliott of BSC Mechanical Handling Group dated 11/14/07 to Greg Gould of BSC Mechanical HVAC Group (forwarded to Monico C. Pingul, Jr. of BSC Mechanical HAVC Group) confirming the use of heat load of various equipment listed as an assumption requiring verification.

There is one file attached to the e-mail with four worksheets. One worksheet pertains to the CRCF. There other worksheet pertains to the IHF, RF and WHF are not applicable to this calculation, therefore were not printed.

Greg Gould
11/15/2007 07:58 AM

To: Monico Pingul/YM/RWDOE@CRWMS, Elpidio Castroverde/YM/RWDOE@CRWMS, Gin Cababa/YM/RWDOE@CRWMS, Fred Favis/YM/RWDOE@CRWMS, Oscar Rosales/YM/RWDOE@CRWMS, Ricardo Abraham/YM/RWDOE@CRWMS, Orlando Santiago/YM/RWDOE@CRWMS, Jerry Herszman/YM/RWDOE@CRWMS, Hang Yang/YM/RWDOE@CRWMS, Orlando Asuncion/YM/RWDOE@CRWMS
cc: Tracy Johnson/YM/RWDOE
Subject: Fw: Mechanical Handling Equipment Loads

LSN: Not Relevant - Not Privileged
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

Gentlemen,

Bryan has taken a final look at the mechanical equipment loads and use factors. He has also addressed the incidental loads (See below). Please use the attached spreadsheet for your calculation. Please look at the information and elevate any problems you find.

Greg

---------- Forwarded by Greg Gould/YM/RWDOE on 11/15/2007 07:55 AM ----------

Bryan Elliott
11/14/2007 05:04 PM

To: Greg Gould/YM/RWDOE@CRWMS
cc: Daryl Lopez/YM/RWDOE@CRWMS, Maurice LaFountain/YM/RWDOE@CRWMS
Subject: Mechanical Handling Equipment Loads

LSN: Not Relevant - Not Privileged
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

Greg,

Attached is an Excel file providing the loads for the mechanical handling equipment.

The loads are based on the motor sizes shown on issued mechanical equipment envelope drawings. This table also provides the updated usage factors, based on the throughput studies.

After some investigation, incidental loads (power for controls) are insignificant, and are thus not included within the table.

Please let me know if you need anything further.

Bryan Elliott

MH Equipment Load List.xls

Attachment 6: Print of Attached File MECHANICAL HANDLING Equipment Load List CRCF1 (11/14/07).xls

Equipment Number	Room Number	Room Name	Description	Use Factor	Load Factor	Equipment Motors	Continuous operation	Intermittent operation	Simultaneous operation	Reference Drawing	Remark 1
060-CR00-DR-00001	1026	Cask Preparation Room	CASK UNLOADING ROOM-NORTH SHIELD DOOR 1 (TYPE 1)	0.10	1.00	15 HP		X		000-MJ0-H000-00701-000	
060-CR00-DR-00002	1026	Cask Preparation Room	CASK UNLOADING ROOM-SOUTH SHIELD DOOR 2 (TYPE 1)	0.10	1.00	15 HP		X		000-MJ0-H000-00701-000	
060-CR00-DR-00003	1015	WP Loadout Room	WP POSITIONING ROOM-NORTH SHIELD DOOR 1 (TYPE 4)	0.10	1.00	15		X		000-MJ0-H000-01001-000	
060-CR00-DR-00004	1015	WP Loadout Room	WP POSITIONING ROOM-SOUTH SHIELD DOOR 2 (TYPE 4)	0.10	1.00	15		X		000-MJ0-H000-01001-000	
060-CR00-DR-00005	1014	WP Loadout Vestibule	WP LOADOUT VESTIBULE ROOM SHIELD DOOR 1 (TYPE 4)	0.10	1.00	10		X		000-MJ0-H000-01001-000	
060-CR00-DR-00006	1014	WP Loadout Vestibule	WP LOADOUT VESTIBULE ROOM SHIELD DOOR 2 (TYPE 4)	0.10	1.00	10		X		000-MJ0-H000-01001-000	
060-CR00-DR-00010	1036	Transportation Cask Vestibule	CASK PREPARATION ROOM EQUIPMENT CONFINEMENT DOOR SOUTH	0.10	1.00	(2) 3 HP		X		060-MJ0-HMH0-00201-000	Both motors operate at the same time
060-CR00-DR-00011	1027	Site Transporter Vestibule	CASK PREPARATION ROOM EQUIPMENT CONFINEMENT DOOR EAST 1	0.10	1.00	2.5 HP, 5 HP		X		060-MJ0-HMH0-00301-000	Both motors operate at the same time
060-CR00-DR-00012	1027	Site Transporter Vestibule	CASK PREPARATION ROOM EQUIPMENT CONFINEMENT DOOR EAST 2	0.10	1.00	2.5 HP, 5 HP		X		060-MJ0-HMH0-00301-000	Both motors operate at the same time
060-HL00-75-00001	1015	WP Loadout Room	WP TRANSFER CARRIAGE DOCKING STATION	0.10	1.00	40 HP		X		000-MJ0-HL00-00201-000	
060-HL00-75-00002	1015	WP Loadout Room	WP TRANSFER CARRIAGE DOCKING STATION	0.10	1.00	40 HP		X		000-MJ0-HL00-00201-000	
060-HL00-PLAT-00001	1015	WP Loadout Room	CRCF LOADOUT PLATFORM 1	0.10	1.00	(1) 2HP		X	X	060-MJ0-HL00-00201-000	Equipment can operate simultaneously with CRCF Loadout Platform 2
060-HL00-PLAT-00002	1015	WP Loadout Room	CRCF LOADOUT PLATFORM 2	0.10	1.00	(2) 2HP		X	X	060-MJ0-HL00-00201-000	Only one motor operates at a time. Equipment can operate simultaneously with either platform 1 or 3.
060-HL00-PLAT-00003	1015	WP Loadout Room	CRCF LOADOUT PLATFORM 3	0.10	1.00	(1) 2HP		X	X	060-MJ0-HL00-00201-000	Equipment can operate simultaneously with CRCF Loadout Platform 2
060-HL00-TRLY-00001	1015	WP Loadout Room	WP TRANSFER TROLLEY	0.10	0.85	(2) 75 HP AND (2) 30 HP		X		000-MJ0-HL00-00101-000	Use (2) 75 HP motors for load
060-HL00-TRLY-00002	1015	WP Loadout Room	WP TRANSFER TROLLEY	0.10	0.85	(2) 75 HP AND (2) 30 HP		X		000-MJ0-HL00-00101-000	Use (2) 75 HP motors for load
060-HM00-CRN-00001	1026	Cask Preparation Room	CASK HANDLING CRANE	0.45	1.00	H 90HP,A 45HP, T 7.5HP & B 30HP		X		060-MJ0-HM00-00101-000	Only one motor operates at a time
060-HMC0-PLAT-00001	1026	Cask Preparation Room	MOBILE ACCESS PLATFORM	0.45	1.00	(4) 1HP, (4) 5HP, (2) 10HP		X	X	000-MJ0-HMC0-00301-000	Use (2) 10 HP motors for load. Equipment can operate at the same time as the Cask Handling Crane
060-HMH0-PLAT-00001	1026	Cask Preparation Room	CASK PREPARATION PLATFORM	0.45	1.00	(4) 20 HP		X	X	060-MJ0-HMH0-00101-000	All motors can operate at the same time. Equipment can operate simultaneously with the Cask Handling Crane
060-HMP0-CRN-00001	1015	WP Loadout Room	WP HANDLING CRANE	0.10	0.85	H 60HP, A 45HP, T 7.5HP, B 20HP		X		060-MJ0-HMP0-00101-000	Only one motor operates at a time
060-HTC0-CRN-00001	2004	Canister Transfer Room	CTM MAINTENANCE CRANE	0.10	0.85	H 35HP,T 2HP & B 7.5HP		X		060-MJ0-HTC0-00101-000	Only one motor operates at a time
060-HTC0-FHM-00001	2004	Canister Transfer Room	CANISTER TRANSFER MACHINE	0.10	1.00	45HP, 3HP,(2) 7.5HP,60HP, 5 HP		X		000-MJ0-HTC0-00201-000	Only one motor operates at a time
060-HTC0-FHM-00002	2004	Canister Transfer Room	CANISTER TRANSFER MACHINE	0.10	1.00	45HP, 3HP,(2) 7.5HP,60HP, 5 HP		X		000-MJ0-HTC0-00201-000	Only one motor operates at a time
060-HTC0-HTCH-00001	2004	Canister Transfer Room	CASK PORT SLIDE GATE	0.10	1.00	(2) .5 HP		X		000-MJ0-H000-00301-000	Both motors operate at the same time
060-HTC0-HTCH-00002	2004	Canister Transfer Room	CASK PORT SLIDE GATE	0.10	1.00	(2) .5 HP		X		000-MJ0-H000-00301-000	Both motors operate at the same time
060-HTC0-HTCH-00003	2004	Canister Transfer Room	WP PORT SLIDE GATE	0.10	1.00	(2) .5 HP		X		000-MJ0-H000-00301-000	Both motors operate at the same time

060-HTC0-HTCH-00004	2004	Canister Transfer Room	WP PORT SLIDE GATE	0.10	1.00	(2) .5 HP		X		000-MJ0-H000-00301-000	Both motors operate at the same time
060-HTC0-HTCH-00005	2004	Canister Transfer Room	DOE CANISTER SLIDE GATE	0.10	1.00	(1) 3HP		X		060-MJ0-H000-00301-000	
060-HTC0-HTCH-00006	2004	Canister Transfer Room	DOE CANISTER SLIDE GATE	0.10	1.00	(1) 3HP		X		060-MJ0-H000-00301-000	
060-HTC0-HTCH-00007	2004	Canister Transfer Room	DOE CANISTER SLIDE GATE	0.10	1.00	(1) 3HP		X		060-MJ0-H000-00301-000	
060-HTC0-HTCH-00008	2004	Canister Transfer Room	DOE CANISTER SLIDE GATE	0.10	1.00	(1) 3HP		X		060-MJ0-H000-00301-000	
060-HTC0-HTCH-00009	2004	Canister Transfer Room	DOE CANISTER SLIDE GATE	0.10	1.00	(1) 3HP		X		060-MJ0-H000-00301-000	
060-HTC0-HTCH-00010	2004	Canister Transfer Room	TAD SLIDE GATE	0.10	1.00	(1) 3HP		X		060-MJ0-H000-00201-000	
060-HTC0-HTCH-00011	2004	Canister Transfer Room	TAD SLIDE GATE	0.10	1.00	(1) 3HP		X		060-MJ0-H000-00201-000	
060-HW00-CRN-00001	2007	Waste Package Closure Room	WP CLOSURE ROOM CRANE	0.10	1.00	H 35HP,T 2HP & B 7.5HP		X		060-MJ0-HW00-00101-000	Only one motor operates at a time
060-HW00-CRN-00002	2007A	Closure Equipment Room (North)	CLOSURE SUPPORT ROOM CRANE NORTH	0.10	1.00	H 20HP,T 1HP, B 3HP		X		060-MJ0-HW00-00201-000	Only one motor operates at a time
060-HW00-CRN-00003	2007B	Closure Equipment Room (South)	CLOSURE SUPPORT ROOM CRANE SOUTH	0.10	1.00	H 20HP,T 1HP, B 3HP		X		060-MJ0-HW00-00201-000	Only one motor operates at a time

ATTACHMENT 7: NOT USED

ATTACHMENT 8: E-MAILS REGARDING INSTRUMENTATION AND CONTROLS EQUIPMENT HEAT GAIN INFORMATION

(4 pages)

This attachment contains two e-mails. E-mail No. 1 from Lino Salgado to Elpidio Castroverde dated 03/23/2007 confirms the information in the file attached to e-mail No. 2. E-mail No. 2 is from Elpidio Castroverde to Lino Salgado dated 03/20/2007 contains a file consisting of Instrumentation and Controls equipment and their associated room locations and heat gains.

Attachment 8: E-mail No 1

Lino Salgado
03/23/2007 08:18 AM

To: Elpidio Castroverde/YM/RWDOE@CRWMS
cc:
Subject: Re: CRCF 1 Equipment Heat Load List

LSN: Not Relevant
User Filed as: Not a Record

Elpidio,

The heat loads I have on file is consistent with your list.

Thanks,

Lino

Attachment 8: E-mail No 2

Elpidio Castroverde
03/20/2007 04:21 PM

To: Lino Salgado/YM/RWDOE@CRWMS
cc: Greg Gould/YM/RWDOE@CRWMS, Monico Pingul/YM/RWDOE@CRWMS
Subject: CRCF 1 Equipment Heat Load List

LSN: Not Relevant
User Filed as: Not a Record

Dear Lino,

Attached please find the spreadsheet for CRCF 1 Heat Load List. These equipment are based on the list you send to Surjit Singh sometimes about four months ago. Presently, we are basing our Load Calculations on this data. Please review this list and let us know if there are some changes or addition to it. We need a reference to our Load Calculations regarding these equipment so, please response via e-mail to make it official.

Thanks,
Elpidio

I & C Equipment Load List CRCF1 (03-20-07).xls

Attachment 8: Print of File I & C Equipment Load List CRCF1 (03-20-07).xls

APPENDIX A: ROOM EQUIPMENT LOAD GAIN LIST

	Room No.	Conf. Zoning C or NC	Not Used	Area	Room Name	Heat Source	Qty.	USE FACTOR	Load Factor	Heat Load, Each	Units	Motor Location Type	Equip Load Btu/h	Not Used	Continuous Operation	Intermittent Operation	Simultaneous Operation	Reference Document	Originating Group/ Discipline	Contact Person	Remark 1	Remark 2
41	1007	TERTIARY		ELECT	ELEC ROOM (NORMAL POWER)	DCMS Cabinets	2	1.00	1.00	1000	watts		6,826		X				I&C	Lino Salgado	Assumed 1000 watts each	
130	2009	TERTIARY		HVAC RM	HVAC ROOM (SUPPORT AREA SUPPLY)	DCMS Workstations	2	1.00	1.00	920	WATTS		6,280		X				I&C	Lino Salgado	1 control console consists of 1 computer and 4 screens. Power supply for computer is 200 w (Dell Model DHP) and 180 w (Dell model 1905 FP) for 1 screen. Total power supply is 920 watts. (INL has a total of 12 workstations, 6 for each closure cell)	
131	2005	TERTIARY		HVAC RM	HVAC ROOM (SUPPORT AREA SUPPLY)	CCTV Power supplies	2	1.00	1.00	960	WATTS		6,553		X			Source: SuperON Technology Co website (http://www.globalsources.com/gsol/I/CCTV-control/p/sm/1000532009.htm)	I&C	Lino Salgado		
132	2005	TERTIARY		HVAC RM	HVAC ROOM (SUPPORT AREA SUPPLY)	DCMS Network Cabinet	1	1.00	1.00	500	WATTS		1,707		X				I&C	Lino Salgado	Assumed 500 watts each. (INL has 4 Network cabinets)	
209	2005A	TERTIARY		COMM	COMMUNICATIONS ROOM	Comm Cabinets	5	1.00	1.00	750	WATTS		12,799		X				I&C	Lino Salgado	Assumed 750 watts each	

INPUT FROM OTHER DISCIPLINES 1 of 1 5/3/2007

ATTACHMENT 9: E-MAIL REGARDING OPERATIONS EQUIPMENT HEAT GAIN INFORMATION

(2 pages)

This attachment contains an e-mail from Clarence Smith to Elpidio Castroverde dated 05/04/2007 confirming the existence of a Welding Machine and its capacity for use in the CRCF.

Clarence Smith
05/04/2007 07:31 AM

To: Elpidio Castroverde/YM/RWDOE@CRWMS
cc: Greg Gould/YM/RWDOE@CRWMS, Clarence Smith/YM/RWDOE@CRWMS
Subject: Re: Electric Welding Machine Heat Load for CRCF 1 Building

LSN: Not Relevant - Not Privileged
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

Yes I am still planning to use the said equipment as listed below.
If there are any questions please call.
Thanks
Clarence

Elpidio Castroverde

Elpidio Castroverde
05/03/2007 05:36 PM

To: Clarence Smith/YM/RWDOE@CRWMS
cc: Greg Gould/YM/RWDOE@CRWMS
Subject: Electric Welding Machine Heat Load for CRCF 1 Building

LSN: Not Relevant - Not Privileged
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

Dear Clarence,

Sometimes about 3-months ago, you gave me a copy of catalog cuts for Electric Welding Machine by Miller Electric Mfg. Co., Gold Star Series 302/402 with a capacity of 13.8 KW. Please confirm via e-mail if the equipment capacity is still the same so I can attached this to my load calculation as assumption to be verified.

Thanks,

Elpidio

ATTACHMENT 10: E-MAIL REGARDING THE NUMBER OF OCCUPANCY IN CRCF 1 BUILDING.

(3 pages)

This attachment contains an e-mail from Clarence Smith to Elpidio Castroverde dated 05/08/2007 confirming the number of occupancy in the CRCF 1 building.

Clarence Smith
05/08/2007 11:01 AM

To: Elpidio Castroverde/YM/RWDOE@CRWMS
cc:
Subject: Re: CRCF 1 Occupancy Numbers

LSN: Not Relevant - Not Privileged
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

Elipidio I agree with the attached chart for the numbers of personnel as shown.

Thanks
Clarence

Elpidio Castroverde

Elpidio Castroverde
05/08/2007 10:05 AM

To: Clarence Smith/YM/RWDOE@CRWMS
cc: Greg Gould/YM/RWDOE@CRWMS
Subject: CRCF 1 Occupancy Numbers

LSN: Not Relevant - Not Privileged
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

Dear Clarence,

Attached please find a table showing occupancy numbers at CRCF 1 building per our conversation this morning. I will use this numbers in my load calculations as an assumption to be verified. Please review the numbers and response via e-mail so I can use as an attachment to calculation.

Thanks,
Elpidio

Scrap.shs

Room No.	Room Name	No. of People
1004	Support Area	9
1015	WP Loadout Room	4
1026	Cask Preparation Room	10
1028	Maintenance Room	4
2003	Closure Support Room (North)	1
2004	Canister Transfer Room	2
2007	Waste Package Closure Room	2
2007A	Closure Equipment Room	1
2007B	Closure Equipment Room	1
2011	Closure Support Room (South)	1
Total No. of People in the Building		35

ATTACHMENT 11: E-MAIL REGARDING MECHANICAL HANDLING EQUIPMENT HEAT GAIN DIVERSITY FACTOR

(3 pages)

This attachment contains an e-mail from Steve Ployhar of BSC Mechanical Handling Group, dated 11/17/07, to Greg Gould of BSC Mechanical HVAC Group (forwarded to Monico C. Pingul, Jr. of BSC Mechanical HVAC Group) stating that a factor of 4 reduction in heat load from operation of Mechanical Handling equipment motors, from what is assumed based on the throughput use factors, is justified and still conservative.

Greg Gould
11/17/2007 08:36 AM

To: Fred Favis/YM/RWDOE@CRWMS, Monico Pingul/YM/RWDOE@CRWMS, Elpidio Castroverde/YM/RWDOE@CRWMS, Ricardo Abraham/YM/RWDOE@CRWMS, Orlando Santiago/YM/RWDOE@CRWMS
cc: Gin Cababa/YM/RWDOE@CRWMS, Oscar Rosales/YM/RWDOE@CRWMS, Jerry Herszman/YM/RWDOE@CRWMS, Orlando Asuncion/YM/RWDOE@CRWMS, Tracy Johnson/YM/RWDOE, Hadi Jalali/YM/RWDOE@CRWMS, Debra Nevergold/YM/RWDOE@CRWMS, David Tooker/YM/RWDOE@CRWMS
Subject: Fw: MH Equipment Heat Loads

LSN: Not Relevant - Not Privileged
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

Please use where applicable in your calculations. Coordinate with Fred Favis as to a consistent approach.

Greg

---------- Forwarded by Greg Gould/YM/RWDOE on 11/17/2007 08:32 AM ----------

Steve Ployhar
11/17/2007 08:19 AM

To: Greg Gould/YM/RWDOE@CRWMS
cc: Bryan Elliott/YM/RWDOE@CRWMS, Tracy Johnson/YM/RWDOE@CRWMS
Subject: MH Equipment Heat Loads

LSN: Not Relevant - Not Privileged
User Filed as: Excl/AdminMgmt-14-4/QA:N/A

Greg,

I believe that a factor of 4 reduction in heat load from operation of MH equipment motors, from what is assumed based on throughput use factors, is justified and still conservative. See attachment.

Steve

MH Equipment Heat Loads for HVAC Load Calcs_17Nov07.doc

Mechanical Handling Equipment Heat Loads for Use in HVAC Load Calculations

HVAC engineers are assuming that mechanical handling equipment motors operate continuously based on the use factors defined in the YMP throughput analyses. This assumption is conservative. While the equipment may be "occupied," meaning it is dedicated to a task for those periods, it is not in continuous operation (producing heat) during all of that time. Two examples from WHF evaluated below.

Canister Transfer Machine

Use Factor (WHF) = 0.20

Time CTM in use each 24 hours: 288 minutes

On a busy day, the WHF CTM might handle the import of a DPC (from an AO to an STC) and the export of a loaded TAD (from an STC to an AO). This involves two canister lifts and 8 lid lifts (conservatively assume remove and replace at each end of the transfer). The total vertical travel of the CTM hoist for all these lifts (up and down) is on the order of 200 feet. At 5 feet per minute hoist speed, the hoist will be operating (producing heat) for 40 minutes.

Other, smaller CTM motors will be in use for horizontal travel from port to port and back and forth to the lid staging location. A total of 500 feet of travel is estimated. At 20 feet per minute this is another 25 minutes of motor operation.

Based on this conservative evaluation, the large CTM motors are producing heat only about 23% of the time that the CTM is occupied based on the use factor.

Site Transporter Vestibule Shield Door

Use Factor (WHF) = 0.10

Time Shield Door in use each 24 hours: 144 minutes

On a busy day it could be assumed that this shield door might be opened 4 times to allow a site transporter to enter or depart. This door has a travel of 20' – 6". Total travel distance is thus 164 feet. Assuming a slow travel speed of 5 fpm (actual speed not known) result in a motor operating time of 32.8 minutes.

Based on this conservative evaluation, the large shield door drive motor is producing heat only about 23% of the time that the shield door is occupied based on the use factor.

Conclusion:

These two examples produced a similar result by chance, but I believe these results are typical for cranes and other mechanical handling equipment. Where HVAC load calculations assume continuous motor heat generation based on the throughput study use factors, I believe these heat loads could be reduced by a factor of four and still be conservative.

Steve Ployhar/ November 17, 2007