

Mechanical Tech Report 1

ASHRAE Standard 62.1 and Standard 90.1 Evaluation

M Resort Spa and Casino
Henderson, Nevada

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1.0 Executive Summary

Part I of this report focuses on The M Resort's compliance with Section 5 of ASHRAE Standard 62.1. This standard outlines general requirements for the design of a mechanical system. Part II uses the Ventilation Rate Procedure described in Section 6 of ASHRAE Standard 62.1.2007 to determine the outdoor air required for each space in the building. Part III explores The M Resort in terms of ASHRAE Standard 90.1.2007, which deals with the energy efficiency of buildings.

The building is comprised of two main areas the first is a low-rise portion that includes the casino, restaurants, kitchens, entertainment, bars, ballroom, spa and health club, meeting rooms and other various accommodations. These areas are served by air handling units and make up air units located on the low rise roof that are supplied with hot and chilled water from the central utility plant.

The guest tower is the other portion of the building, which includes standard guest suites as well as larger suites and a restaurant that is located on the top floor of the tower. The guest rooms are served by vertical fan coil units that are supplied with outdoor air from integrated wall mullions. They are supplied with chilled water and each have electric heat. A more detailed description of these different systems can be found in Section 3.0.

Twenty five of the twenty eight air handling units comply with the ASHRAE Standard. The other systems all met the outside air with some having significantly larger quantities of outside air supplied. One of the discrepancies found to exist in all of the varying outside air quantities was the differing codes used. The International Mechanical Code 2006 was used for the design of The M Resort, which upon review lists stricter requirements for the spaces listed. The space classification also varied between the codes.

The ASHRAE Standard 90.1.2007 analysis of this building has not led to any significant conclusions about the energy efficiency of the building as a whole. The compliance of the various systems that were examined under the prescriptive requirements of the standard had mixed results. A further analysis of the various systems as a whole is necessary to attain a more detailed conclusion concerning the energy efficiency of the building. A summary of this information is available in Sections 7.0, 8.0, and 9.0.

Part I

ASHRAE Standard 62.1
Section 5 Analysis

2.0 ASHRAE Standard 62.1.2007 Section 5 Compliance

ASHRAE Standard 62.1 Section 5 outlines requirements and guidelines for the design of a mechanical system. The M Resort is comprised of a variety of different spaces with each having various design parameters, however, many of the provisions outlined in Section 5 are either inherent to this system or do not apply. Below the key points of Section 5 have been outlined.

5.1 Natural Ventilation

This building uses mechanical rather than natural ventilation.

5.3 Exhaust Duct Location

All exhaust ducts carrying contaminants such as smoke, toilet exhaust, and kitchen exhaust, are all negatively pressurized throughout the spaces which they pass. These systems have been designed to minimize their exposure to critical spaces, utilizing the most direct and convenient path. They have also been located sufficient distances away from intakes and other critical equipment to minimize reentry.

5.5 Air Stream surfaces

According to building specifications, all surfaces in the ducts and mechanical equipment have been determined to resist mold growth and erosion in accordance with acceptable testing methods.

5.6 Outdoor Air Intakes

The design documents have shown that all outdoor air intakes have been located at distances that meet or exceed the specified guidelines. Their openings are protected from the elements as well as unwanted intruders.

5.11 Drain Pans

Upon review of the various documents, it has been determined that all drain pans are in compliance with Section 5.11.

5.14 Access for Inspection, Cleaning, and Maintenance

Access to each piece of equipment has been provided within regards to the specific needs of the unit. The Central Plant includes the chillers, boilers, cooling towers, and other necessary equipment, all being readily accessible. The bulk of the air handling units serving the low rise portion have been located on the low rise roof with roof access available. All other equipment located in the ceiling is accessible through the ceiling tiles or access panels. The vertical units in the guest rooms are all fitted with access panels.

5.15 Building Envelope

The building envelope has been specified to prohibit the penetration of liquid water into the building. All piping, ductwork and other surfaces have been properly insulated to prevent the formation of condensation where it is undesired.

Part II

ASHRAE Standard 62.1
Section 6 Analysis

3.0 Building Mechanical System Summary

The M Resort consists of two main types of areas. There is a low rise portion that consists of the spa and health club, meeting rooms, ballrooms, two restaurants, a buffet, kitchens, entertainment lounges, casinos, and other various office and back of the house spaces. The other segment of the resort encompasses a high rise guest tower with a restaurant on the top floor. The low rise section is served by twenty eight Air Handling Units (AHU) located on the roof of the low rise building as well as the roof of the guest tower. The guest tower is conditioned using two pipe chilled water vertical fan coil units (FCU) with electric heat. For this report a full analysis of the low rise portion of the building will be conducted since the majority of the critical spaces are located in this area. With the guest tower being so repetitive between the floors, a brief analysis of typical spaces has been included; however a full analysis was determined to be unnecessary.

The following is a breakdown of the air handling units listing information taken from the design document schedules, a condensed summary can be found below in Table 1.

AHU-B-1: Located in the low rise service platform. This indoor, ceiling hung unit serves the Wine bar and respective kitchen. The unit is balanced to a supply airflow of 11,000 CFM, and it is a 100% outdoor air unit. This unit has an economizer, humidifier, filters, chilled water cold, hot water coil and a supply fan with a VFD.

AHU-1-1: Located on the roof of the chiller room, this unit serves the chiller room. The unit is balanced to a supply airflow of 23,000 CFM with a minimum of 4,300CFM of outside air. This unit is constant volume with an economizer and is supplied with chilled water from the central plant.

AHU 1-2: Located on the low rise roof. This unit serves the Spa and Fitness center. It is balanced to a supply airflow of 21,000 CFM with a minimum of 7,041 CFM of outside air. It includes intake and relief louvers, economizer section, filters, chilled water cold, hot water coil, and a mixing box. The supply and relief fans will have variable frequency drives. The supply fan will be used for positive pressurization. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 1-3: Located on the low rise roof. This unit serves the promenade. It is balanced to a supply airflow of 38,000 CFM with a minimum of 18,523 CFM of outside air. This unit is comprised of the same sections as AHU 1-2. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 1-4: Located on the low rise roof. This unit serves meeting rooms. It is balanced to a supply airflow of 29,000 CFM with a minimum of 19,733 CFM of outside air. This unit is comprised of the same sections as AHU 1-2. The supply fan will be used for positive pressurization.

AHU 1-5: Located on the low rise roof. This unit serves the back of house offices. It is balanced to a supply airflow of 15,000 CFM with a minimum of 4,508 CFM of outside air. It includes intake and relief louvers, economizer section, filters, chilled water coil, hot water coil, and a mixing box. The supply and relief fans will have variable frequency drives.

AHU 1-6: Located on the low rise roof. This unit serves the Main Kitchen, Bakery and Employee Dining Room Kitchen. It is balanced to a supply airflow of 37,000 CFM with a minimum of 22,293 CFM of outside air. This unit is comprised of the same sections as AHU 1-5.

AHU 1-7: Located on the low rise roof. This unit serves the promenade. It is balanced to a supply airflow of 19,000 CFM with a minimum of 3,555 CFM of outside air. This unit is comprised of the same sections as AHU 1-5. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 1-8: Located on the low rise roof. This unit serves the ballroom. It is balanced to a supply airflow of 63,000 CFM with a minimum of 31,846 CFM of outside air. This unit is comprised of the same sections as AHU 1-5. The supply fan will be used for positive pressurization. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 1-9: Located on the low rise roof. This unit serves the warehouse and facilities offices. It is balanced to a supply airflow of 11,000 CFM with a minimum of 723 CFM of outside air. This unit is comprised of the same sections as AHU 1-5.

AHU 1-10: Located on the low rise roof. This unit serves back of house offices. It is balanced to a supply airflow of 24,000 CFM with a minimum of 8,729 CFM of outside air. This unit is comprised of the same sections as AHU 1-5.

AHU 1-11: Located on the low rise roof. This unit serves the promenade. It is balanced to a supply airflow of 15,000 CFM with a minimum of 3,225 CFM of outside air. This unit is comprised of the same sections as AHU 1-5. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 2-1: Located on the low rise roof. This unit serves the Steak/Seafood Restaurant and kitchen. It is balanced to a supply airflow of 25,500 CFM with a minimum of 11,537 CFM of outside air. This unit is comprised of the same sections as AHU 1-5. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 2-3: Located on the low rise roof. This unit serves the Italian Restaurant Bar and respective Kitchen. It is balanced to a supply airflow of 15,500 CFM with a minimum of 8,172 CFM of outside air. This unit is comprised of the same sections as AHU 1-5.

AHU 2-4: Located on the low rise roof. This unit serves the Entertainment and High Limit Salon. It is balanced to a supply airflow of 27,000 CFM with a minimum of 17,658 CFM of outside air. This unit is comprised of the same sections as AHU 1-5. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 2-5: Located on the low rise roof. This unit serves the Casino Floor (SW). It is balanced to a supply airflow of 50,000 CFM and it is 100% Outdoor air. This unit is comprised of the same sections as AHU 1-5. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 2-6: Located on the low rise roof. This unit serves the Casino Floor (SE). It is balanced to a supply airflow of 55,000 CFM and it is 100% outside air. This unit is comprised of the same sections as AHU 1-5. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 2-7: Located on the low rise roof. This unit serves the Casino Floor (NW). It is balanced to a supply airflow of 62,000 CFM and it is 100% outside air. This unit is comprised of the same sections as AHU 1-5. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 2-8: Located on the low rise roof. This unit serves the Casino Floor (N). It is balanced to a supply airflow of 62,000 CFM and it is 100% outside air. This unit is comprised of the same sections as AHU 1-5. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 2-9: Located on the low rise roof. This unit serves the Café and Grille. It is balanced to a supply airflow of 13,000 CFM with a minimum of 7,442 CFM of outside air. This unit is comprised of the same sections as AHU 1-5. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 2-10: Located on the low rise roof. This unit serves the Casino Floor (NE). It is balanced to a supply airflow of 62,000 CFM and it is 100% outside air. This unit is comprised of the same sections as AHU 1-5. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 2-11: Located on the low rise roof. This unit serves the Buffet. It is balanced to a supply airflow of 38,000 CFM with a minimum of 16,688 CFM of outside air. This unit is comprised of the same sections as AHU 1-5. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 2-12: Located on the low rise roof. This unit serves the food court. It is balanced to a supply airflow of 16,000 CFM with a minimum of 6,370 CFM of outside air. This unit is

comprised of the same sections as AHU 1-5. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 2-13: Located on the low rise roof. This unit serves the Sports Book and Poker room. It is balanced to a supply airflow of 29,500 CFM and it is 100% outside air. This unit is comprised of the same sections as AHU 1-5. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 3-1: Located in the low rise service platform. This indoor unit serves the Executive and Corporate Offices, Registration and Lobby. It is balanced to a supply airflow of 42,000 CFM with a minimum of 14,707 CFM of outside air. This unit is comprised of the same sections as AHU 1-5. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 3-2: Located in the low rise service platform. This indoor unit serves the Public Circulation, Lobby and Patissire. It is balanced to a supply airflow of 36,000 CFM with a minimum of 13,700 CFM of outside air. This unit is comprised of the same sections as AHU 1-5. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU 3-3: Located on the low rise roof. This unit serves the Offices, Money Cage, and Room Service Kitchen. It is balanced to a supply airflow of 24,000 CFM with a minimum of 7,300 CFM of outside air. This unit is comprised of the same sections as AHU 1-5. The relief fan will be used for smoke exhaust and is rated up to 200°F

AHU T1: Located on the low rise roof. This unit serves the Tower Restaurant and associated Kitchen. It is balanced to a supply airflow of 16,000 CFM with a minimum of 8,600 CFM of outside air. This unit is comprised of the same sections as AHU 1-5. The relief fan will be used for smoke exhaust and is rated up to 200°F

Table 1: AHU Scheduled Data			
Equipment	Area Served	Scheduled Supply CFM	Scheduled Min OA CFM
AHU B-1	Wine Bar/ Kitchen	11,000	11,000
AHU 1-1	Chiller Room	23,000	4,300
AHU 1-2	Spa/Fitness Center	21,000	7,050
AHU 1-3	Promenade	38,000	18,525
AHU 1-4	Meeting Rooms	29,000	19,735
AHU 1-5	Back of House Offices	15,000	4,510
AHU 1-6	Main Kitchen Bakery EDR Kitchen	37,000	22,300
AHU 1-7	Promenade	19,000	3,560
AHU 1-8	Ballroom	63,000	31,850
AHU 1-9	Warehouse Facilities Offices	11,000	725
AHU 1-10	Back of House Offices	24,000	8,730

AHU 1-11	Promenade	15,000	3,225
AHU 2-1	Steak/Seafood Restaurant and Kitchen	25,500	11,540
AHU 2-3	Italian Restaurant and Kitchen	15,500	8,170
AHU 2-4	Entertainment and High Limit Salon	27,000	17,660
AHU 2-5	Casino Floor SW	50,000	50,000
AHU 2-6	Casino Floor SE	55,000	55,000
AHU 2-7	Casino Floor NW	62,000	62,000
AHU 2-8	Casino Floor N	62,000	62,000
AHU 2-9	Café and Grille	13,000	7,445
AHU 2-10	Casino Floor NE	62,000	62,000
AHU 2-11	Buffet	38,000	16,690
AHU 2-12	Food Court	16,000	6,370
AHU 2-13	Sports Book and Poker Room	29,500	29,500
AHU 3-1	Executive and Corporate Offices Registration and Lobby	42,000	14,710
AHU 3-2	Public Circulation, Lobby and Patisserie	36,000	13,700
AHU 3-3	Offices, Money Cage, and Room Service	24,000	7,300
AHU T1	Tower Restaurant/Kitchen	16,000	8,600
	Totals	879,500	568,195

Low Rise Make up Air Units: There are fifteen (15) MAUs serving the various kitchen and food prep areas throughout the low rise portion of the building. They are all 100% outside air units which are only supplying the air that was exhausted through the hoods. Therefore it is acceptable to not fully analyze these units.

Guest Tower Fan Coil Units: The fan coil units (FCU) in the guest rooms are two pipe vertical stacked fan coil units. The FCUs will consist of master slave configurations as well as single units. They will be pre piped from the factory with chilled water being distributed from the central plant through connecting risers. The FCUs will be the non-ducted concealed type to be located in drywall enclosures at the outside walls of the guest rooms. Outside air will be ducted through integrated wall mullions directly fed to the inlet plenum of the FCU where it mixes with return air. The room is kept at a negative pressure by utilizing constant volume exhaust fans sized to match the outdoor air requirements of the space which exceeds the exhaust requirement of the bathrooms. This allows the correct amount of outdoor air to enter the space through the mullion. The short analysis in Table 2 below shows that the outdoor air requirements of the guest

rooms are less than the 70 cfm that are supplied to the space. It is therefore acceptable to not fully analyze these zones in this report.

Table 2: Guest Room Analysis						
Room Size	Area ft ²	Number of people	Rp	Ra	Voz=Vot	Amount of OA Supplied
King	429	2	5	0.06	36	70
Double	377	2	5	0.06	33	70

Guest Tower Make up Air Units: There are five (5) MAUs in the guest tower, two serving the end guest suites, two serving the corridors, and one serving the kitchen of the restaurant on the top floor. These are all 100% outdoor air units as well. The kitchen unit is making up the exiting air flow from the exhaust fans, therefore it is acceptable to not fully analyze this unit. The MAUs for the guest rooms are sized based on the values from Table 2. Table 3 illustrates an analysis of a typical corridor, the amount of outdoor air required is less than the 995 cfm supplied to the spaces.

Table 3: Guest Tower Corridor					
Room	Number of people	Rp	Ra	Voz=Vot	Amount of OA Supplied
Corridor	0	0	0.06	495	995

4.0 Assumptions

ASHRAE Standard 62.1.2007 describes two different methods for calculating the minimum ventilation air needed. These two methods are Ventilation Rate Procedure (VRP) and the Indoor Air Quality Procedure. The Ventilation Rate Procedure has been utilized throughout this report as the accepted method due to its simplicity in regards to the Indoor Air Quality Procedure.

Some of the spaces in The M Resort do not directly correlate to the space designations in ASHRAE Standard 62.1.2007 Table 6-1. Whenever this situation occurred, assumptions and approximations were made to attain the most applicable equivalent. The treatment rooms have been listed as health club space because of the similarity of the activity level in the spaces. Restrooms and janitor closets were exempt from the calculations since no outdoor air was supplied to those spaces. Originally the ballroom was assumed to be considered a Disco/Dance floor; however upon further calculation it was determined that this was not the correct space. The numbers given in ASHRAE Table 6-1 describe a dance floor with a high activity level; the ballroom will not only be used as a ballroom at times but also an assembly space. Therefore it was determined to be a multipurpose assembly space. A summary of these approximations can be seen in Table 4.

Table 4	
M Resort Space	Equivalent ASHRAE Space
Spa/Fitness Center	Health Club/ Aerobics Room
Promenade	Corridor
Meeting Room	Office
Kitchen	Cafeteria
Ballroom	Multipurpose Assembly
Treatment Room	Office
Locker Rooms	Special - 0.5 cfm/ft ²

Another assumption is that variable occupancy will not be considered for this report. Being a resort in the gaming industry it can be assumed that the spaces will be constantly occupied. The casino and other amenities offered on the low rise level are open to the public so there will also be non hotel patrons in the areas as well.

5.0 Calculated Outdoor Airflows

In Section 3.0 the actual ventilation outdoor air flow rates have been determined from the design documents, this value must then be compared to a calculated flow rate. The outdoor air flow rates for the low-rise portion of the building complex have been determined using the Ventilation Rate Procedure found in ASHRAE Standard 62.1.2007. A step by step guide to using this method can be found in Appendix A of this report. Each AHU has been broken down by zone and the space characteristics and calculations have been listed in Appendix B.

The following tables (Table 5-Table 32) summarize the results from the Ventilation Rate Procedure calculation for each of the twenty eight air handling units. A more detailed breakdown of each air handler can be found in Appendix B. This Appendix also includes space characteristics and other necessary variables and results from the calculations described in Appendix A.

AHU B-1

Table 5			
<u>Results for AHU B-1</u>			
Max Zp	0.50		
Ev	0.6		
ΣVot	3527	CFM	
Vot-Minimum OA intake for AHU 1-4	5878	CFM	
Percent OA Intake	53	%	

The minimum amount of outdoor air (OA) required for the zones served by AHU B-1 is 5878 cfm and the minimum OA intake scheduled for AHU B-1 (Table 1) is 11,000 cfm. Therefore,

AHU B-1 complies with ASHRAE Standard 62.1.2007.

AHU 1-1

Table 6			
<u>Results for AHU 1-1</u>			
Max Zp	0.02		
Ev	1.0		
ΣVot	440	CFM	
Vot-Minimum OA intake for AHU 1-4	440	CFM	
Percent OA Intake	2	%	

The minimum amount of outdoor air (OA) required for the zones served by AHU 1-1 is 440 cfm and the minimum OA intake scheduled for AHU 1-1 (Table 1) is 4,300 cfm. Therefore,

AHU 1-1 complies with ASHRAE Standard 62.1.2007.

AHU 1-2

Table 7			
Results for AHU 1-2			
Max Zp		0.64	
Ev		0.45	
ΣVot		5545	CFM
Vot-Minimum OA intake for AHU 1-4		12323	CFM
Percent OA Intake		59	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 1-2 is 12,323 cfm and the minimum OA intake scheduled for AHU 1-2 (Table 1) is 7,050 cfm. Therefore,

AHU 1-2 does NOT comply with ASHRAE Standard 62.1.2007.

AHU 1-3

Table 8			
Results for AHU 1-3			
Max Zp		0.59	
Ev		0.45	
ΣVot		7505	CFM
Vot-Minimum OA intake for AHU 1-4		16678	CFM
Percent OA Intake		44	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 1-3 is 16,678 cfm and the minimum OA intake scheduled for AHU 1-3 (Table 1) is 18,525 cfm. Therefore,

AHU 1-3 complies with ASHRAE Standard 62.1.2007.

AHU 1-4

Table 9			
Results for AHU 1-4			
Max Zp		0.60	
Ev		0.8	
ΣVot		5760	CFM
Vot-Minimum OA intake for AHU 1-4		7199	CFM
Percent OA Intake		25	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 1-4 is 7,199 cfm and the minimum OA intake scheduled for AHU 1-4 (Table 1) is 19,735 cfm. Therefore,

AHU 1-4 complies with ASHRAE Standard 62.1.2007.

AHU 1-5

Table 10			
Results for AHU 1-5			
Max Zp		0.47	
Ev		0.9	
ΣVot		2397	CFM
Vot-Minimum OA intake for AHU 1-4		2664	CFM
Percent OA Intake		18	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 1-5 is 2,664 cfm and the minimum OA intake scheduled for AHU 1-5 (Table 1) is 4,510 cfm. Therefore,

AHU 1-5 complies with ASHRAE Standard 62.1.2007.

AHU 1-6

Table 11			
Results for AHU 1-6			
Max Zp		0.52	
Ev		0.6	
ΣVot		10497	CFM
Vot-Minimum OA intake for AHU 1-4		17496	CFM
Percent OA Intake		47	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 1-6 is 17,496 cfm and the minimum OA intake scheduled for AHU 1-6 (Table 1) is 22,300 cfm. Therefore,

AHU 1-6 complies with ASHRAE Standard 62.1.2007.

AHU 1-7

Table 12			
Results for AHU 1-7			
Max Zp		0.30	
Ev		0.8	
ΣVot		1617	CFM
Vot-Minimum OA intake for AHU 1-4		2022	CFM
Percent OA Intake		11	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 1-7 is 2,022 cfm and the minimum OA intake scheduled for AHU 1-7 (Table 1) is 3,560 cfm. Therefore,

AHU 1-7 complies with ASHRAE Standard 62.1.2007.

AHU 1-8

Table 13			
Results for AHU 1-8			
Max Zp		0.44	
Ev		0.70	
ΣVot		11016	CFM
Vot-Minimum OA intake for AHU 1-4		15737	CFM
Percent OA Intake		25	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 1-8 is 15,737 cfm and the minimum OA intake scheduled for AHU 1-8 (Table 1) is 31,850 cfm. Therefore,

AHU 1-8 complies with ASHRAE Standard 62.1.2007.

AHU 1-9

Table 14			
Results for AHU 1-9			
Max Zp		0.47	
Ev		0.9	
ΣVot		849	CFM
Vot-Minimum OA intake for AHU 1-4		944	CFM
Percent OA Intake		9	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 1-9 is 944 cfm and the minimum OA intake scheduled for AHU 1-9 (Table 1) is 725 cfm. Therefore,

AHU 1-9 does NOT comply with ASHRAE Standard 62.1.2007.

AHU 1-10

Table 15			
Results for AHU 1-10			
Max Zp		0.60	
Ev		0.54	
ΣVot		4198	CFM
Vot-Minimum OA intake for AHU 1-4		7717	CFM
Percent OA Intake		32	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 1-10 is 7,717 cfm and the minimum OA intake scheduled for AHU 1-10 (Table 1) is 8,730 cfm. Therefore,

AHU 1-10 complies with ASHRAE Standard 62.1.2007.

AHU 1-11

Table 16			
Results for AHU 1-11			
Max Zp		0.15	
Ev		1.0	
ΣVot		1506	CFM
Vot-Minimum OA intake for AHU 1-4		1506	CFM
Percent OA Intake		10	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 1-11 is 1,506 cfm and the minimum OA intake scheduled for AHU 1-11 (Table 1) is 3,225 cfm. Therefore,

AHU 1-11 complies with ASHRAE Standard 62.1.2007.

AHU 2-1

Table 17			
Results for AHU 2-1			
Max Zp		0.49	
Ev		0.6	
ΣVot		6724	CFM
Vot-Minimum OA intake for AHU 1-4		11207	CFM
Percent OA Intake		44	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 2-1 is 11,207 cfm and the minimum OA intake scheduled for AHU 2-1 (Table 1) is 11,540 cfm. Therefore,

AHU 2-1 complies with ASHRAE Standard 62.1.2007.

AHU 2-3

Table 18			
Results for AHU 2-3			
Max Zp		0.59	
Ev		0.52	
ΣVot		2442	CFM
Vot-Minimum OA intake for AHU 1-4		4711	CFM
Percent OA Intake		30	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 2-3 is 4,711 cfm and the minimum OA intake scheduled for AHU 2-3 (Table 1) is 8,170 cfm. Therefore,

AHU 2-3 complies with ASHRAE Standard 62.1.2007.

AHU 2-4

Table 19			
Results for AHU 2-4			
Max Zp	0.31		
Ev	0.8		
ΣVot	2916	CFM	
Vot-Minimum OA intake for AHU 1-4	3645	CFM	
Percent OA Intake	13	%	

The minimum amount of outdoor air (OA) required for the zones served by AHU 2-4 is 3,645 cfm and the minimum OA intake scheduled for AHU 2-4 (Table 1) is 17,660 cfm. Therefore,

AHU 2-4 complies with ASHRAE Standard 62.1.2007.

AHU 2-5

Table 20			
Results for AHU 2-5			
Max Zp	0.29		
Ev	0.8		
ΣVot	14322	CFM	
Vot-Minimum OA intake for AHU 1-4	17903	CFM	
Percent OA Intake	36	%	

The minimum amount of outdoor air (OA) required for the zones served by AHU 2-5 is 17,903 cfm and the minimum OA intake scheduled for AHU 2-5 (Table 1) is 46,200 cfm. Therefore,

AHU 2-5 complies with ASHRAE Standard 62.1.2007.

AHU 2-6

Table 21			
Results for AHU 2-6			
Max Zp	0.29		
Ev	0.8		
ΣVot	15206	CFM	
Vot-Minimum OA intake for AHU 1-4	19007	CFM	
Percent OA Intake	35	%	

The minimum amount of outdoor air (OA) required for the zones served by AHU 2-6 is 19,007 cfm and the minimum OA intake scheduled for AHU 2-6 (Table 1) is 49,050 cfm. Therefore,

AHU 2-6 complies with ASHRAE Standard 62.1.2007.

AHU 2-7

Table 22			
Results for AHU 2-7			
Max Zp		0.34	
Ev		0.8	
ΣVot		19273	CFM
Vot-Minimum OA intake for AHU 1-4		24092	CFM
Percent OA Intake		39	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 2-7 is 24,092 cfm and the minimum OA intake scheduled for AHU 2-7 (Table 1) is 60,700 cfm. Therefore,

AHU 2-7 complies with ASHRAE Standard 62.1.2007.

AHU 2-8

Table 23			
Results for AHU 2-8			
Max Zp		0.31	
Ev		0.8	
ΣVot		18289	CFM
Vot-Minimum OA intake for AHU 1-4		22862	CFM
Percent OA Intake		37	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 2-8 is 22,862 cfm and the minimum OA intake scheduled for AHU 2-8 (Table 1) is 58,760 cfm. Therefore,

AHU 2-8 complies with ASHRAE Standard 62.1.2007.

AHU 2-9

Table 24			
Results for AHU 2-9			
Max Zp		0.41	
Ev		0.7	
ΣVot		3276	CFM
Vot-Minimum OA intake for AHU 1-4		4680	CFM
Percent OA Intake		36	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 2-9 is 4,680 cfm and the minimum OA intake scheduled for AHU 2-9 (Table 1) is 7,445 cfm. Therefore,

AHU 2-9 complies with ASHRAE Standard 62.1.2007.

AHU 2-10

Table 25			
Results for AHU 2-10			
Max Zp	0.31		
Ev	0.8		
ΣVot	18972	CFM	
Vot-Minimum OA intake for AHU 1-4	23715	CFM	
Percent OA Intake	38	%	

The minimum amount of outdoor air (OA) required for the zones served by AHU 2-10 is 23,715 cfm and the minimum OA intake scheduled for AHU 2-10 (Table 1) is 61,200 cfm. Therefore,

AHU 2-10 complies with ASHRAE Standard 62.1.2007.

AHU 2-11

Table 26			
Results for AHU 2-11			
Max Zp	0.35		
Ev	0.8		
ΣVot	10758	CFM	
Vot-Minimum OA intake for AHU 1-4	13448	CFM	
Percent OA Intake	35	%	

The minimum amount of outdoor air (OA) required for the zones served by AHU 2-11 is 13,448 cfm and the minimum OA intake scheduled for AHU 2-11 (Table 1) is 16,690 cfm. Therefore,

AHU 2-11 complies with ASHRAE Standard 62.1.2007.

AHU 2-12

Table 27			
Results for AHU 2-12			
Max Zp	0.59		
Ev	0.47		
ΣVot	2233	CFM	
Vot-Minimum OA intake for AHU 1-4	4702	CFM	
Percent OA Intake	29	%	

The minimum amount of outdoor air (OA) required for the zones served by AHU 2-12 is 4,702 cfm and the minimum OA intake scheduled for AHU 2-12 (Table 1) is 6,370 cfm. Therefore,

AHU 2-12 complies with ASHRAE Standard 62.1.2007.

AHU 2-13

Table 28			
Results for AHU 2-13			
Max Zp		0.42	
Ev		0.7	
ΣVot		7785	CFM
Vot-Minimum OA intake for AHU 1-4		11121	CFM
Percent OA Intake		38	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 2-13 is 11,121 cfm and the minimum OA intake scheduled for AHU 2-13 (Table 1) is 18,775 cfm. Therefore,

AHU 2-13 complies with ASHRAE Standard 62.1.2007.

AHU 3-1

Table 29			
Results for AHU 3-1			
Max Zp		0.59	
Ev		0.59	
ΣVot		5883	CFM
Vot-Minimum OA intake for AHU 1-4		10040	CFM
Percent OA Intake		24	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 3-1 is 10,040 cfm and the minimum OA intake scheduled for AHU 3-1 (Table 1) is 14,710 cfm. Therefore,

AHU 3-1 complies with ASHRAE Standard 62.1.2007.

AHU 3-2

Table 30			
Results for AHU 3-2			
Max Zp		0.59	
Ev		0.46	
ΣVot		5831	CFM
Vot-Minimum OA intake for AHU 1-4		12736	CFM
Percent OA Intake		35	%

The minimum amount of outdoor air (OA) required for the zones served by AHU 3-2 is 12,736 cfm and the minimum OA intake scheduled for AHU 3-2 (Table 1) is 13,700 cfm. Therefore,

AHU 3-2 complies with ASHRAE Standard 62.1.2007.

AHU 3-3

Table 31			
Results for AHU 3-3			
Max Zp		0.60	
Ev		0.5	
ΣVot		4196	CFM
Vot-Minimum OA intake for AHU 1-4		8260	CFM
Percent OA Intake	34		%

The minimum amount of outdoor air (OA) required for the zones served by AHU 3-3 is 8,260 cfm and the minimum OA intake scheduled for AHU 3-3 (Table 1) is 7,300 cfm. Therefore,

AHU 3-2 does NOT comply with ASHRAE Standard 62.1.2007.

AHU T1

Table 32			
Results for AHU T1			
Max Zp		0.49	
Ev		0.6	
ΣVot		4642	CFM
Vot-Minimum OA intake for AHU 1-4		7736	CFM
Percent OA Intake	48		%

The minimum amount of outdoor air (OA) required for the zones served by AHU T1 is 7,736 cfm and the minimum OA intake scheduled for AHU T1 (Table 1) is 8,600 cfm. Therefore,

AHU 3-2 complies with ASHRAE Standard 62.1.2007.

A summary of the AHU compliance with ASHRAE 62.1 has been provided in Table 33.

Table 33: ASHRAE Compliance					
Equipment	Area Served	Scheduled Min OA CFM	Calculated OA CFM	ASHRAE 62.1.2007 compliant	Difference
AHU B-1	Wine Bar/ Kitchen	11,000	5,878	YES	5,122
AHU 1-1	Chiller Room	4,300	440	YES	3,860
AHU 1-2	Spa/Fitness Center	7,050	12,323	NO	-5,273
AHU 1-3	Promenade	18,525	16,678	YES	1,847
AHU 1-4	Meeting Rooms	19,735	7,199	YES	12,536
AHU 1-5	Back of House Offices	4,510	2,664	YES	1,846
AHU 1-6	Main Kitchen Bakery EDR Kitchen	22,300	17,496	YES	4,804
AHU 1-7	Promenade	3,560	2,022	YES	1,538
AHU 1-8	Ballroom	31,850	15,737	YES	16,113
AHU 1-9	Warehouse Facilities Offices	725	944	NO	-219

AHU 1-10	Back of House Offices	8,730	7,717	YES	1,013
AHU 1-11	Promenade	3,225	1,506	YES	1,719
AHU 2-1	Steak/Seafood Restaurant and Kitchen	11,540	11,207	YES	333
AHU 2-3	Italian Restaurant and Kitchen	8,170	4,711	YES	3,459
AHU 2-4	Entertainment and High Limit Salon	17,660	3,645	YES	14,015
AHU 2-5	Casino Floor SW	50,000	17,903	YES	32,097
AHU 2-6	Casino Floor SE	55,000	19,007	YES	35,993
AHU 2-7	Casino Floor NW	62,000	24,092	YES	37,908
AHU 2-8	Casino Floor N	62,000	22,862	YES	39,138
AHU 2-9	Café and Grille	7,445	4,680	YES	2,765
AHU 2-10	Casino Floor NE	62,000	23,715	YES	38,285
AHU 2-11	Buffet	16,690	13,440	YES	3,250
AHU 2-12	Food Court	6,370	4,702	YES	1,668
AHU 2-13	Sports Book and Poker Room	29,500	11,121	YES	18,379
AHU 3-1	Executive and Corporate Offices Registration and Lobby	14,710	10,040	YES	4,670
AHU 3-2	Public Circulation, Lobby and Patisserie	13,700	12,736	YES	964
AHU 3-3	Offices, Money Cage, and Room Service	7,300	8,260	NO	-960
AHU T1	Tower Restaurant/Kitchen	8,600	7,736	YES	864
	Totals	568,195	290,461		

The minimum amount of outdoor air (OA) required for the low rise portion of The M Resort is 290,461 cfm (Table 33) and the minimum OA intake scheduled for the low rise portion of The M Resort is 568,195 cfm (Table 33). Therefore,

The low rise portion of The M Resort complies with ASHRAE Standard 62.1.2007.

6.0 Identified Problems, Opportunities, and Discussion

Code analysis may explain many of the discrepancies between the calculated outside air and the scheduled outside air. For this report ASHRAE Standard 62.1.2007 was used to calculate the ventilation air, however the International Mechanical Code (IMC) 2006 was used as the basis for the design of the building.

Three main discrepancies have been identified within the system, a brief summary of these discrepancies can be found in Table 33. AHU 1-2, AHU 1-9, and AHU 3-3 each do not meet the calculated values determined by the Ventilation Rate Procedure found in ASHRAE Standard 62.1.2007.

AHU 1-2 The outdoor air calculated differs by 5273 cfm. This could most notably be explained by the classification of the spaces. With the information from the project and the information from ASHRAE, the most intuitive classification was given, however this may not be inline with the content used by the design team. Also, the design engineers may have had more knowledge of the use of the spaces and could have used diversity factors. A more detailed analysis and breakdown of the space uses is needed.

AHU 1-9 and AHU 3-3 These both have minor differences that can be attributed to the differences in the classification of the spaces.

General Note: Most of the differences in the spaces are on the conservative side, meaning more OA is supplied than is necessary according to ASHRAE Standard 62.1.2007. Calculations have also been conducted for those AHUs which are 100% OA units. This was done to verify that the correct amount was being supplied; however the difference in the amount of OA required is in large part found in the casino area. Smoking will be permitted in the casino and more OA is required in this instance, however ASHRAE Standard 62.1.2007 does not account for this in the classification of that occupancy. Further analysis of the standards applied to smoke ventilation must be conducted.

Part III

ASHRAE Standard 90.1.2007

7.0 Building Envelope Analysis

Section 5 of ASHRAE Standard 90.1.2007 provides requirements for the building envelope. One of the first steps in the process is determining the space conditioning category. The M Resort is a mixed use space throughout the entire campus, therefore the space can be classified as non residential conditioned. According to Figure B-1 of ASHRAE 90.1.2007, the climate zone for this building is 3B.

With these classifications known Table 5.5.5 of ASHRAE Standard 90.1.2007 can be used to determine the compliance of both the opaque elements and the fenestration of the building. These results can be seen in Tables 34-37.

Table 34: Opaque Elements Compliance				
Low Rise Portion				
Element	Description	Design R-Value	Min R-Value	Compliance
Roof	Insulation Above Deck	25.0	20.0	YES
Above Grade Walls	Mass	11.0	7.6	YES
SOG Floor	Unheated	NR	NR	YES

Table 35: Opaque Elements Compliance				
Guest Tower Portion				
Element	Description	Design R-Value	Min R-Value	Compliance
Roof	Insulation Above Deck	19.0	20.0	NO
Above Grade Walls	Mass	11.0	7.6	YES
SOG Floor	Unheated	NR	NR	YES

Table 36: Fenestration Compliance				
Low Rise Portion				
% vertical Glazing	Description	Design U-Value	Max U-Value	Compliance
42%	Metal Framing (all others)	0.29	0.65	YES

Table 37: Fenestration Compliance				
Guest Tower Portion				
% vertical Glazing	Description	Design U-Value	Max U-Value	Compliance
95%	Metal Framing (all others)	0.29	0.6	NO

8.0 HVAC System Compliance

Economizers

Section 6.5.1 of ASHRAE 90.1.2007 states that cooling systems with a fan must meet the specification listed in Table 6.5.1. According to this table, all systems that have an output of 65,000 BTU/hour or greater must have an economizer. All of the systems in The M Resort, meeting these requirements have economizers incorporated.

Fan Power Limitation

Section 6.5.3.1 of ASHRAE 90.1.2007 lists guidelines for fan power limitations. Table 6.5.3.1.1A of ASHRAE, describes the calculation method for these limitations. The compliance summary for fans in The M Resort can be seen in Table 38. The exhaust fans have not been included in this analysis due to their small size (<2hp).

Table 38: Fan Power Compliance				
AHU Data				
Equipment	Supply CFM	Allowable Nameplate hp	Design Nameplate hp	Compliance
AHU B-1	11,000	12.1	15	NO
AHU 1-1	23,000	25.3	25	Yes
AHU 1-2	21,000	23.1	30	NO
AHU 1-3	38,000	41.8	60	NO
AHU 1-4	29,000	31.9	40	NO
AHU 1-5	15,000	16.5	25	NO
AHU 1-6	37,000	40.7	50	NO
AHU 1-7	19,000	20.9	30	NO
AHU 1-8	63,000	69.3	100	NO
AHU 1-9	11,000	12.1	15	NO
AHU 1-10	24,000	26.4	40	NO
AHU 1-11	15,000	16.5	25	NO
AHU 2-1	25,500	28.05	30	NO
AHU 2-3	15,500	17.05	20	NO
AHU 2-4	27,000	29.7	40	NO
AHU 2-5	50,000	55	75	NO
AHU 2-6	55,000	60.5	75	NO
AHU 2-7	62,000	68.2	75	NO
AHU 2-8	62,000	68.2	75	NO
AHU 2-9	13,000	14.3	15	NO
AHU 2-10	62,000	68.2	75	NO
AHU 2-11	38,000	41.8	50	NO
AHU 2-12	16,000	17.6	20	NO
AHU 2-13	29,500	32.45	40	NO
AHU 3-1	42,000	46.2	50	NO
AHU 3-2	36,000	39.6	40	NO
AHU 3-3	24,000	26.4	40	NO

AHU T1	16,000	17.6	20	NO
MAU-1	7,000	7.7	7.5	Yes
MAU-2	12,500	13.75	15	NO
MAU-3	10,400	11.44	10	Yes
MAU-4	6,250	6.875	7.5	NO
MAU-5	6,900	7.59	7.5	Yes
MAU-6	7,200	7.92	7.5	Yes
MAU-7	3,550	3.905	5	NO
MAU-8	2,840	3.124	3	Yes
MAU-9	8,550	9.405	1	Yes
MAU-10	7,800	8.58	7.5	Yes
MAU-11	4,250	4.675	5	NO
MAU-12	15,000	16.5	15	Yes
MAU-13	6,200	6.82	7.5	NO
MAU-14	3,350	3.685	5	NO
MAU-15	4,700	5.17	5	Yes
MAU T1	1,140	1.254	0.75	Yes
MAU T2	1,540	1.694	1	Yes
MAU T3	5,665	6.2315	5	Yes
MAU T4	5,280	5.808	5	Yes
MAU T5	7,200	7.92	5	Yes

Kitchen Exhaust Hood

Section 6.5.7.1 of ASHRAE 90.1.2007 requires that all kitchen exhaust hoods larger than 5,000 cfm be provided with makeup air sized for at least 50% of the exhaust air volume. All of the sixteen make up air units supply enough air to the respected spaces to comply with this requirement.

Chillers and Boilers

An evaluation of the building’s chillers and boilers was documented and has been provided in Tables 39-40. The NPLV rating of the chillers were given in the schedules, however this number does not seem to correlate to the NPLV minimum rating. Further investigation with the design team is needed to validate this information. However, according to the COP alone it is compliant. Table 40 lists both hot water boilers as well as steam boilers.

Table 39: HVAC Compliance							
Chiller Efficiency							
Mark	Power input (kW)	Cooling (kW)	COP	COP _{min}	NPLV	NPLV _{min}	Compliance
CH-1	796.4	4572.1	5.74	5.45	0.369	5.73	No
CH-2	796.4	4572.1	5.74	5.45	0.369	5.73	No
CH-3	796.4	4572.1	5.74	5.45	0.369	5.73	No

Table 40: HVAC Compliance					
Boiler Efficiency					
Mark	Input MBH	Output MBH	% Eff.	% Min.	Compliance
HWB-1	16,800	13,390	79.7	80	NO
HWB-2	16,800	13,390	79.7	80	NO
HWB-3	16,800	13,390	79.7	80	NO
SB-1	3,360	2,678	79.7	80	NO
SB-2	3,360	2,678	79.7	80	NO

Motor Compliance

Section 10 of ASHRAE Standard 90.1.2007 provides requirements for minimum motor efficiency based on speed and horsepower. The results of this analysis have been included in Table 41. As shown, none of the motors comply with this standard; however this may also be a result of the design code used for this building.

Table 41: Pump Efficiency					
Motor	HP	BHP	% Eff	% min	Compliance
CHWP-1	125	99.29	78.94	94.5	NO
CHWP-2	125	99.29	78.94	94.5	NO
CHWP-3	125	99.29	78.94	94.5	NO
CHWP-4	125	99.29	78.94	94.5	NO
CWP-1	75	66.61	87	93.6	NO
CWP-2	75	66.61	87	93.6	NO
CWP-3	75	66.61	87	93.6	NO
CWP-4	75	66.61	87	93.6	NO
PHWP-1	10	8.01	71	89.5	NO
PHWP-2	10	8.01	71	89.5	NO
PHWP-3	10	8.01	71	89.5	NO
PHWP-4	10	8.01	71	89.5	NO
SHWP-1	40	27.02	71.4	93	NO
SHWP-2	40	27.02	71.4	93	NO
SHWP-3	40	27.02	71.4	93	NO
SHWP-4	40	27.02	71.4	93	NO
SCHWP-1	2	1.29	58.6	84	NO
SCHWP-2	1.5	0.72	49.4	84	NO
SCHWP-3	1	0.65	3	82.5	NO
SCHWP-4	1	0.65	31	82.5	NO
SCHWP-5	1	0.61	24.9	82.5	NO
SCHWP-6	1	0.58	17.4	82.5	NO
SCHWP-8	5	2.43	62.5	87.5	NO
SCHWP-9	1.5	0.54	23.25	84	NO
HRP-1	3	2.08	62.8	86.5	NO
HRP-2	3	2.35	63	86.5	NO
HRP-3	3	1.82	73	86.5	NO

HRP-4	3	1.82	73	86.5	NO
HRP-5	3	1.82	73	86.5	NO

9.0 Lighting Compliance

For this report the Space by Space method described in ASHRAE Standard 90.1.2007 has been applied to the lighting system for The M Resort. Each space has been listed and compared to an equivalent Max Lighting Power Density. The results of this analysis can be seen in Table 42.

Table 42: Lighting Power Density			
Location	Power Density (w/ft ²)	Max Power Density (w/ft ²)	Compliance
Ballroom	6	2.3	NO
Beverage Distribution	1.5	1.4	NO
Business Center	1.5	1.1	NO
Casino	3	1.7	NO
Coffee Shop	1.5	1.7	Yes
Control Room	2	0.5	NO
Corridor Low Rise	1.5	0.5	NO
Corridor Tower	1.5	0.5	NO
Data Room	1.5	0.5	NO
Dining	2	1.3	NO
Electrical Room	1.5	1.5	Yes
Elevator Vestibule	1.5	1.1	NO
Elev. Mach. Room	1.5	1.5	Yes
Employee Lounge	1.5	1.2	NO
Entertainment Lounge	3	1.2	NO
Fitness	1.5	0.9	NO
Hotel Room	1.5	1.1	NO
Housekeeping	1.5	0.8	NO
Janitor Closet	1.5	0.8	NO
Kitchen Bakery	1.5	1.2	NO
Locker Room	1.5	0.6	NO
Mechanical Room	1.5	1.5	Yes
Meeting Room	3	1.1	NO
Money Cage	1.5	1.1	NO
Office-Executive	1.5	1.1	NO
Office Staff	1.5	1.1	NO
Pantry	1.5	0.5	NO
Poker Room	3	1.1	NO
Pre-Function	2	1.1	NO
Race/Sports Bet A/v Room	1.5	0.5	NO
Race/Sports Bet	1.5	1.1	NO
Receiving Dock	1.5	0.9	NO
Reception Lobby	4	1.1	NO
Restroom	2.5	0.9	NO
Retail	2	1.7	NO
Salon	3	1.1	NO

Security Control Room	1.5	0.5	NO
Spa Treatment Room	1.5	1.1	NO
Spa Waiting Area	2	1.1	NO
Storage Rooms	1.5	0.8	NO
Telephone Rooms	1.5	0.5	NO
Trash Room	1.5	1.5	Yes
Warehouse	1.5	0.8	Yes

Most of the spaces in The M Resort do not comply with the lighting section of ASHRAE Standard 90.1.2007. Upon further investigation with the lighting designer it was determined that the International Energy Efficiency Code 2006 was followed for this building. This code lists higher allowable Lighting Power Densities than ASHRAE Standard 90.1.2007 which would explain the non compliance shown in Table 42.

10.0 References:

1. ASHRAE Standard 62.1.2007.
2. ASHRAE Standard 90.1.2007.
3. Southland Industries, Mechanical Drawings and Specifications.
4. Mike Hallenbeck and Jessica Lucas, Thesis Consultants, Southland Industries.
5. JBA Consulting Engineers, Electrical Drawings and Specifications.
6. Marnell Architecture, Drawings and Specifications.
7. The Pennsylvania State University Architectural Engineering Program, Thesis Advisor, Dr. William P. Bahnfleth
8. Past Thesis Technical Reports, e-Studio Archives, 2006-2008

Appendix A

Ventilation Rate Procedure:

The following procedure was utilized in this report in order to apply the Ventilation Rate Procedure from ASHRAE Standard 62.1.2007 to The M Resort.

Assumptions

- Each system has been broken down into multiple zones, which then add together to attain the total occupancy as well as the total area of each complete system
- The Occupancy value (P_z) was determined from Architectural furniture plans.
- Architectural floor plans also provided the floor area (A_z) for each space.

Step 1: Calculate the floor areas (A_z) and zone occupancy (P_z).

Step 2: Calculate the Breathing Zone Outdoor airflow, V_{bz} , for each zone:

$$V_{bz} = R_p * P_z + R_a * A_z \text{ (ASHRAE Equation 6-1)}$$

A_z = Zone floor area or the net occupiable floor area (ft^2).

P_z = Zone population or the largest number of people expected to occupy the zone during normal use. When the number was unknown, it was estimated using the Occupancy Density found in ASHRAE Table 62.1

R_p = Outdoor airflow rate required per person determined from ASHRAE Table 6-1

R_a = Outdoor airflow rate required per unit area as determined from ASHRAE Table 6-1.

Step 3: The Zone Air distribution Effectiveness (E_z) is found using ASHRAE Table 6-2. The M Resort, is supplied by either warm or cool air from the ceiling, therefore $E_z = 1.0$ for all cases.

Step 4: Calculate the Zone Outdoor Airflow (V_{oz}):

$$V_{oz} = V_{bz} / E_z \text{ (ASHRAE Equation 6-2)}$$

The next task involves calculating V_{ot} , however this depends on the system being analyzed. For 100% outdoor air systems $V_{ot} = \sum V_{oz}$ for all of the zones, and for single zone systems $V_{ot} = V_{oz}$. None of the Air Handling units being analyzed in this report fit into either category. For the AHUs being examined here, which are multi-zone recirculating systems, V_{ot} is calculated using Section 6.2.5.1 through Section 6.2.5.4 in ASHRAE Standard 62.1.2007.

Step 5: Calculate the Primary Outdoor Air Fraction (Z_p)

$$Z_p = V_{oz} / V_{pz} \text{ (ASHRAE Equation 6-5)}$$

V_{pz} = primary airflow to the zone, including OA and recirculated air

Step 6: Determine E_v after finding the maximum value of Z_p .

If the maximum value of Z_p is less than or equal to 0.55, ASHRAE Table 6-3 can be used to attain E_v . If the efficiency is greater than 0.55 then the procedure outlined in ASHRAE Standard 62.1.2007 – Appendix A should be followed. Then continue on to Step 7.

Step A: Calculate Diversity Factor (D):

$$D = P_s / (\sum_{\text{all zones}} P_z)$$

P_s = System population

The diversity factor is the ratio of the system population to the sum of the zone populations.

Step B: Calculate Uncorrected Outdoor Air Intake (V_{ou}):

$$V_{ou} = D * \sum R_p * P_z + \sum R_a * A_z \text{ (ASHRAE Equation 6-6)}$$

Step C: Calculate System Primary Airflow (V_{ps}):

$$V_{ps} = \sum V_{pz}$$

Step D: Calculate average Outdoor Air Fraction (X_s):

$$X_s = V_{ou} / V_{ps}$$

Step E: Calculate the discharge Outdoor Air Fraction (Z_d):

$$Z_d = V_{oz} / V_{dz}$$

Step F: Single Supply Systems:

$$E_{vz} = 1 + X_s - Z_d \text{ (A-1)}$$

Step G: System Ventilation Efficiency (E_v):

$$E_v = \text{minimum } (E_{vz}) \text{ (A-3)}$$

After determining the system ventilation efficiency, continue to Step 7 and follow the rest of the procedure where necessary.

Step 7: Determine the Occupant Diversity (D).

$$D = P_s / (\sum_{\text{all zones}} P_z)$$

P_s = System population

In order to attain the most conservative results a diversity of 1.0 was used.

Step 8: Calculate the Uncorrected outdoor air intake (V_{ou}):

$$V_{ou} = D * \sum_{\text{all zones}} (R_p * P_z) + \sum_{\text{all zones}} (R_a * A_{pz}) \text{ (ASHRAE Equation 6-6)}$$

Step 9: Calculate the outdoor air intake (V_{ot}):

$$V_{ot} = V_{ou} / E_v$$

AHU B-1															
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6-1	ft2	# people	cfm/person	cfm/ft2									
B-102 Z1	Service Corridor	Corridor	3400	0	0	0.06	1.0	0	204.0	204.0	204	819	0.25		
B-102 Z2	Service Corridor	Corridor	515	0	0	0.06	1.0	0	30.9	30.9	30.9	124	0.25		
B-110 Z1	Wine Cellar Bar	Bar	1500	150	7.5	0.18	1.0	1,125	270.0	1,395	1395	4,500	0.31		
B-110 Z2	Wine Cellar Bar	Bar	1500	150	7.5	0.18	1.0	1,125	270.0	1,395	1395	4,500	0.31		
B-110 Z3	Wine Cellar Bar	Kitchen	350	7	7.5	0.18	1.0	52.5	63.0	115.5	115.5	318	0.36		
B-115	Office	Office	56	0	5	0.06	1.0	0	3.4	3.4	3.36	55	0.06		
B-117	Dishwashing	Kitchen	220	4	7.5	0.18	1.0	30	39.6	69.6	69.6	218	0.32		
B-118	Storage	Kitchen	186	4	7.5	0.18	1.0	30	33.5	63.5	63.48	184	0.35		
B-121	BOH	Kitchen	1180	5	7.5	0.18	1.0	37.5	212.4	249.9	249.9	502	0.50	Max Zp	0.6

AHU 1-1															
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6-1	ft2	# people	cfm/person	cfm/ft2									
S-151	Chiller Room	Electrical Room	7340	0	0	0.06	1.0	0	440.4	440.4	440.4	23,000	0.02	Max Zp	1.0

AHU 1-2															
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6-1	ft2	# people	cfm/person	cfm/ft2									
S-207	Spa Storage	Storage	315	0	0	0.06	1.0	0	18.9	18.9	18.9	254	0.07		
S-208	Corridor	Corridor	153	0	20	0.06	1.0	0	9.2	9.2	9.18	130	0.07		
S-209	Treatment Room 1	Health Club/Aerobics	125	2	20	0.06	1.0	40	7.5	47.5	47.5	203	0.23		
S-210	Treatment Room 2	Health Club/Aerobics	125	2	20	0.06	1.0	40	7.5	47.5	47.5	203	0.23		
S-211	Treatment Room 3	Health Club/Aerobics	125	2	20	0.06	1.0	40	7.5	47.5	47.5	203	0.23		
S-212	Seating Area	Office	125	7	5	0.06	1.0	35	7.5	42.5	42.5	800	0.05		
S-213	Treatment Room 4	Health Club/Aerobics	125	2	20	0.06	1.0	40	7.5	47.5	47.5	203	0.23		
S-214	Treatment Room 5	Health Club/Aerobics	125	2	20	0.06	1.0	40	7.5	47.5	47.5	203	0.23		
S-215	Treatment Room 6	Health Club/Aerobics	125	2	20	0.06	1.0	40	7.5	47.5	47.5	203	0.23		
S-216	Treatment Room 7	Health Club/Aerobics	125	2	20	0.06	1.0	40	7.5	47.5	47.5	203	0.23		

S-218	Pantry	Storage	80	2	0	0.12	1.0	0	9.6	9.6	9.6	52	0.18		
S-221	Corridor	Corridor	992	0	0	0.06	1.0	0	59.5	59.5	59.52	869	0.07		
S-222	Service Station	Office	168	3	5	0.06	1.0	15	10.1	25.1	25.08	125	0.20		
S-223	Spa Manager	Office	132	1	5	0.06	1.0	5	7.9	12.9	12.92	73	0.18		
S-224	Fitness Manager	Office	165	1	5	0.06	1.0	5	9.9	14.9	14.9	105	0.14		
S-225	Couples Treatment Room 17	Health Club/Aerobics	176	3	20	0.06	1.0	60	10.6	70.6	70.56	110	0.64	Max Zp	0.45
S-226	Treatment Room 16	Health Club/Aerobics	125	2	20	0.06	1.0	40	7.5	47.5	47.5	75	0.63		
S-227	Treatment Room 15	Health Club/Aerobics	125	2	20	0.06	1.0	40	7.5	47.5	47.5	75	0.63		
S-228	Foyer	Corridor	360	0	0	0.06	1.0	0	21.6	21.6	21.6	87	0.25		
S-229	Treatment Room 14	Health Club/Aerobics	125	2	20	0.06	1.0	40	7.5	47.5	47.5	75	0.63		
S-230	Treatment Room 13	Health Club/Aerobics	125	2	20	0.06	1.0	40	7.5	47.5	47.5	75	0.63		
S-231	Treatment Room 12	Health Club/Aerobics	125	2	20	0.06	1.0	40	7.5	47.5	47.5	75	0.63		
S-232	Treatment Room 11	Health Club/Aerobics	125	2	20	0.06	1.0	40	7.5	47.5	47.5	75	0.63		
S-233	Wet Treatment Room 10	Health Club/Aerobics	130	2	20	0.06	1.0	40	7.8	47.8	47.8	122	0.39		
S-234	Wet Treatment Room 9	Health Club/Aerobics	100	2	20	0.06	1.0	40	6.0	46.0	46	111	0.41		
S-238	Wet Area	Office	635	19	5	0.06	1.0	95	38.1	133.1	133.1	594	0.22		
S-239	Wet Area	Office	635	19	5	0.06	1.0	95	38.1	133.1	133.1	594	0.22		
S-243	Salon BOH	Office	600	6	5	0.06	1.0	30	36.0	66.0	66	300	0.22		
S-244	Fitness Z1 - Perimeter	Health Club/Aerobics	750	8	20	0.06	1.0	160	45.0	205.0	205	1,613	0.13		
S-244	Fitness Z2 - Interior	Health Club/Aerobics	1085	11	20	0.06	1.0	220	65.1	285.1	285.1	1,092	0.26		
S-246	Men Locker	Special	545	27	0	0.5	1.0	0	272.5	272.5	272.5	452	0.60		
S-247	Mens Spa Lounge	Waiting	784	47	7.5	0.06	1.0	352.5	47.0	399.5	399.54	1,021	0.39		
S-248	Womens Spa Lounge	Waiting	784	47	7.5	0.06	1.0	352.5	47.0	399.5	399.54	1,021	0.39		
S-250	Womens Locker	Special	570	29	0	0.5	1.0	0	285.0	285.0	285	473	0.60		
S-251	Spa Entry	Corridor	667	0	0	0.06	1.0	0	40.0	40.0	40.02	1,286	0.03		
S-252	Salon	Beauty and Nail Salon	2550	64	20	0.12	1.0	1280	306.0	1586.0	1586	2,772	0.57		
S-254	Dressing	Health Club/Aerobics	37	0	20	0.06	1.0	0	2.2	2.2	2.22	19	0.12		
S-255	Salon Manager	Office	97	1	5	0.06	1.0	5	5.8	10.8	10.82	61	0.18		
S-257	Storage	Storage	103	0	0	0.12	1.0	0	12.4	12.4	12.36	47	0.26		
S-258	Spa Lobby	Corridor	1100	73	7.5	0.06	1.0	547.5	66.0	613.5	613.5	1,691	0.36		
S-259	Call Center	Office	203	1	5	0.06	1.0	5	12.2	17.2	17.18	129	0.13		
S-261	Pantry	Storage	66	1	0	0.12	1.0	0	7.9	7.9	7.92	43	0.18		
S-262	Corridor	Corridor	334	0	0	0.06	1.0	0	20.0	20.0	20.04	230	0.09		
S-264	Elevator Lobby	Corridor	98	0	0	0.06	1.0	0	5.9	5.9	5.88	30	0.20		
S-499	Barber Station	Barber shop	144	4	7.5	0.06	1.0	30	8.6	38.6	38.64	157	0.25		
S-518	Pantry	Storage	66	1	0	0.12	1.0	0	7.9	7.9	7.92	43	0.18		
S-519	Pantry	Storage	66	1	0	0.12	1.0	0	7.9	7.9	7.92	43	0.18		

AHU-1-3															
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6-1	ft2	# people	cfm/person	cfm/ft2									
B004	Service Corridor	Corridor	4000	0	0	0.06	1.0	0	240.0	240.0	240	819	0.29		
S-101 Z12	Promenade	Lobby	2430	162	5	0.06	1.0	810	145.8	955.8	955.8	4,091	0.23		
S-101 Z13	Promenade	Lobby	2620	175	5	0.06	1.0	875	157.2	1032.2	1032.2	4,192	0.25		
S-101 Z14	Promenade	Lobby	2790	186	5	0.06	1.0	930	167.4	1097.4	1097.4	4,192	0.26		
S-266	Seating	Office	388	26	5	0.06	1.0	130	23.3	153.3	153.28	955	0.16		
S-267	Office	Office	145	1	5	0.06	1.0	5	8.7	13.7	13.7	209	0.07		
S-268	Office	Office	96	1	5	0.06	1.0	5	5.8	10.8	10.76	61	0.18		
S-269	BOH	Office	186	2	5	0.06	1.0	10	11.2	21.2	21.16	93	0.23		
S-271	Registration	Office	600	4	5	0.06	1.0	20	36.0	56.0	56	417	0.13		
S-272 Z1	Spa Promenade	Lobby	2015	134	5	0.06	1.0	670	120.9	790.9	790.9	3,341	0.24		
S-272 Z2	Spa Promenade	Lobby	2575	172	5	0.06	1.0	860	154.5	1014.5	1014.5	4,222	0.24		
S-272 Z3	Spa Promenade	Lobby	650	43	5	0.06	1.0	215	39.0	254.0	254	2,191	0.12		
S-272 Z4	Spa Promenade	Lobby	1550	103	5	0.06	1.0	515	93.0	608.0	608	2,564	0.24		
S-272 Z5	Spa Promenade (otb)	Lobby	1700	113	5	0.06	1.0	565	102.0	667.0	667	4,378	0.15		
S-441	Kitchen Storage	Storage	284	0	0	0.12	1.0	0	34.1	34.1	34.08	73	0.47		
S-442	Lobby	Lobby	375	25	5	0.06	1.0	125	22.5	147.5	147.5	496	0.30		
S-443	Elevator Vestibule	Corridor	192	13	0	0.06	1.0	0	11.5	11.5	11.52	254	0.05		
S-444	Boardroom	Office	432	22	5	0.06	1.0	110	25.9	135.9	135.92	613	0.22		
S-445	Pantry	Storage	172	0	0	0.12	1.0	0	20.6	20.6	20.64	35	0.59	Max Zp	0.45
S-450	Lost and Found	Storage	214	1	0	0.12	1.0	0	25.7	25.7	25.68	136	0.19		
S-451	Training and Briefing Room	Office	265	13	5	0.06	1.0	65	15.9	80.9	80.9	376	0.22		
S-452	Security Director	Office	134	1	5	0.06	1.0	5	8.0	13.0	13.04	85	0.15		
S-453	Lieutenants	Office	170	1	5	0.06	1.0	5	10.2	15.2	15.2	108	0.14		
S-512	Security Administration	Office	235	2	5	0.06	1.0	10	14.1	24.1	24.1	149	0.16		
	Smoothie Bar	Bar	245	5	7.5	0.18	1.0	37.5	44.1	81.6	81.6	381	0.21		

AHU 1-4															
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6-1	ft2	# people	cfm/person	cfm/ft2									
S-172	Meeting Room	Office	1225	61	5	0.06	1.0	305	73.5	378.5	378.5	1,737	0.22		
S-173	Partition Storage	Office	70	0	5	0.06	1.0	0	4.2	4.2	4.2	14	0.30		

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S-174	Meeting Room	Office	1225	61	5	0.06	1.0	305	73.5	378.5	378.5	1,737	0.22		
S-175	Partition Storage	Storage	70	0	0	0.12	1.0	0	8.4	8.4	8.4	14	0.60		
S-176	Meeting Room	Office	1225	61	5	0.06	1.0	305	73.5	378.5	378.5	1,737	0.22		
S-273	Meeting Room	Office	1225	61	5	0.06	1.0	305	73.5	378.5	378.5	1,737	0.22		
S-274	Meeting Room	Office	1225	61	5	0.06	1.0	305	73.5	378.5	378.5	1,737	0.22		
S-275	Partition Storage	Storage	70	0	0	0.12	1.0	0	8.4	8.4	8.4	14	0.60	Max Zp	0.8
S-276	Partition Storage	Storage	70	0	0	0.12	1.0	0	8.4	8.4	8.4	14	0.60	Max Zp	0.8
S-277	Meeting Room	Office	1225	61	5	0.06	1.0	305	73.5	378.5	378.5	1,737	0.22		
S-278	Meeting Room	Office	1225	61	5	0.06	1.0	0	73.5	73.5	73.5	1,737	0.04		
S-280	Corridor	Corridor	2100	0	0	0.06	1.0	0	126.0	126.0	126	506	0.25		
S-281	Storage	Storage	197	0	0	0.12	1.0	0	23.6	23.6	23.64	40	0.59		
S-282	Corridor	Corridor	1122	0	0	0.06	1.0	0	67.3	67.3	67.32	270	0.25		
S-283	Meeting Room	Office	1225	61	5	0.06	1.0	305	73.5	378.5	378.5	1,737	0.22		
S-284	Partition Storage	Storage	70	0	0	0.12	1.0	0	8.4	8.4	8.4	14	0.60	Max Zp	0.8
S-285	Meeting Room	Office	1225	61	5	0.06	1.0	305	73.5	378.5	378.5	1,737	0.22		
S-286	Partition Storage	Storage	70	0	0	0.12	1.0	0	8.4	8.4	8.4	14	0.60	Max Zp	0.8
S-287	Meeting Room	Office	1225	61	5	0.06	1.0	0	73.5	73.5	73.5	1,737	0.04		
S-287	Partition Storage	Storage	70	0	0	0.12	1.0	0	8.4	8.4	8.4	14	0.60	Max Zp	0.8
S-288	Partition Storage	Storage	70	0	0	0.12	1.0	0	8.4	8.4	8.4	14	0.60	Max Zp	0.8
S-289	Partition Storage	Storage	70	0	0	0.12	1.0	0	8.4	8.4	8.4	14	0.60	Max Zp	0.8
S-290	Meeting Room	Office	1225	61	5	0.06	1.0	305	73.5	378.5	378.5	1,737	0.22		
S-291	Meeting Room	Office	1225	61	5	0.06	1.0	305	73.5	378.5	378.5	1,737	0.22		
S-292	Partition Storage	Storage	70	0	0	0.12	1.0	0	8.4	8.4	8.4	14	0.60	Max Zp	0.8
S-293	Partition Storage	Storage	70	0	0	0.12	1.0	0	8.4	8.4	8.4	14	0.60	Max Zp	0.8
S-294	Meeting Room	Office	1225	61	5	0.06	1.0	305	73.5	378.5	378.5	1,737	0.22		
S-295	Meeting Room	Office	1225	61	5	0.06	1.0	305	73.5	378.5	378.5	1,737	0.22		
S-296	Partition Storage	Storage	70	0	0	0.12	1.0	0	8.4	8.4	8.4	14	0.60	Max Zp	0.8
S-298	Meeting Room	Office	1225	61	5	0.06	1.0	305	73.5	378.5	378.5	1,737	0.22		
S-299	Meeting Room	Office	1225	61	5	0.06	1.0	305	73.5	378.5	378.5	1,737	0.22		

AHU 1-5															
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6-1	ft2	# people	cfm/person	cfm/ft2									
S-280	Corridor	Corridor	1600	0	0	0.06	1.0	0	96.0	96.0	96	482	0.20		
S-307	Convention Storage	Storage	1530	0	0	0.12	1.0	0	183.6	183.6	183.6	392	0.47	Max Zp	0.9
S-318	Accounting	Office	2090	15	5	0.06	1.0	75	125.4	200.4	200.4	1,324	0.15		
S-319	Office	Office	104	1	5	0.06	1.0	5	6.2	11.2	11.24	66	0.17		

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S-320	Project Manager	Office	104	1	5	0.06	1.0	5	6.2	11.2	11.24	66	0.17		
S-321	Payroll Manager	Office	108	1	5	0.06	1.0	5	6.5	11.5	11.48	68	0.17		
S-322	Acct Storage	Storage	1065	0	0	0.12	1.0	0	127.8	127.8	127.8	273	0.47	Max Zp	0.9
S-323	Compliance Manager	Office	115	1	5	0.06	1.0	0	6.9	6.9	6.9	73	0.09		
S-324	Controller	Office	113	1	5	0.06	1.0	0	6.8	6.8	6.78	72	0.09		
S-325	Controller	Office	113	1	5	0.06	1.0	5	6.8	11.8	11.78	72	0.16		
S-326	Risk Management	Office	118	1	5	0.06	1.0	5	7.1	12.1	12.08	75	0.16		
S-327	Conference Room	Conference	310	16	5	0.06	1.0	80	18.6	98.6	98.6	440	0.22		
S-328	Director Finance	Office	115	1	5	0.06	1.0	5	6.9	11.9	11.9	73	0.16		
S-329	VP Finance	Office	171	1	5	0.06	1.0	5	10.3	15.3	15.26	127	0.12		
S-330	Training	Conference	710	36	5	0.06	1.0	180	42.6	222.6	222.6	1,007	0.22		
S-331	Human Resources VP	Office	209	1	5	0.06	1.0	0	12.5	12.5	12.54	156	0.08		
S-332	Human Resources Director	Office	172	1	5	0.06	1.0	5	10.3	15.3	15.32	109	0.14		
S-333	Benefits Dirctor	Office	156	1	5	0.06	1.0	5	9.4	14.4	14.36	99	0.15		
S-334	Training Manager	Office	88	1	5	0.06	1.0	5	5.3	10.3	10.28	56	0.18		
S-335	VP M Visioning	Office	205	1	5	0.06	1.0	5	12.3	17.3	17.3	153	0.11		
S-336	Conference Room	Conference	224	11	5	0.06	1.0	55	13.4	68.4	68.44	318	0.22		
S-337	Media Manager	Office	110	1	5	0.06	1.0	5	6.6	11.6	11.6	70	0.17		
S-338	Creative Services Manager	Office	108	1	5	0.06	1.0	5	6.5	11.5	11.48	68	0.17		
S-339	PR Manager	Office	112	1	5	0.06	1.0	5	6.7	11.7	11.72	71	0.17		
S-340	Director Creative Services	Office	175	1	5	0.06	1.0	5	10.5	15.5	15.5	111	0.14		
S-341	Director Advertising	Office	126	1	5	0.06	1.0	5	7.6	12.6	12.56	80	0.16		
S-342	Multi Media Manager	Office	127	1	5	0.06	1.0	5	7.6	12.6	12.62	80	0.16		
S-343	Steak & Seafood Rest. Manager	Office	108	1	5	0.06	1.0	5	6.5	11.5	11.48	68	0.17		
S-344	Italian Rest. Manager	Office	104	1	5	0.06	1.0	5	6.2	11.2	11.24	66	0.17		
S-345	Café Manager	Office	102	1	5	0.06	1.0	5	6.1	11.1	11.12	65	0.17		
S-346	Food and Beverage	Office	922	6	5	0.06	1.0	30	55.3	85.3	85.32	584	0.15		
S-347	Conference Room	Conference	201	10	5	0.06	1.0	50	12.1	62.1	62.06	285	0.22		
S-348	VP of Food and Beverage	Office	157	1	5	0.06	1.0	5	9.4	14.4	14.42	117	0.12		
S-349	Director of Food Ops	Office	133	1	5	0.06	1.0	5	8.0	13.0	12.98	84	0.15		
S-353	Reception	Lobby	356	24	5	0.06	1.0	120	21.4	141.4	141.36	613	0.23		
S-355	Training	Conference	710	36	5	0.06	1.0	180	42.6	222.6	222.6	1,007	0.22		
S-356	Human Recourses	Office	853	6	5	0.06	1.0	30	51.2	81.2	81.18	540	0.15		
S-357	Employee Relations Manager	Office	99	1	5	0.06	1.0	5	5.9	10.9	10.94	63	0.17		
S-358	Counseler	Office	147	1	5	0.06	1.0	5	8.8	13.8	13.82	93	0.15		
S-359	Conference Room	Conference	157	8	5	0.06	1.0	40	9.4	49.4	49.42	223	0.22		
S-360	Corridor	Corridor	3160	0	0	0.06	1.0	0	189.6	189.6	189.6	2,775	0.07		
S-459	Marketing	Office	1970	14	5	0.06	1.0	70	118.2	188.2	188.2	1,248	0.15		
S-484	Tower Restaruant Manager	Office	106	1	5	0.06	1.0	5	6.4	11.4	11.36	67	0.17		
S-485	Director of Beverage Ops	Office	136	1	5	0.06	1.0	5	8.2	13.2	13.16	86	0.15		

S-506	Employee Manager	Office	86	1	5	0.06	1.0	5	5.2	10.2	10.16	54	0.19		
S-511	Mail Room	Office	174	1	5	0.06	1.0	5	10.4	15.4	15.44	110	0.14		

AHU 1-6															
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6-1	ft2	# people	cfm/person	cfm/ft2									
S-114	Corridor	Corridor	2428	0	0	0.06	1.0	0	145.7	145.7	145.68	731	0.20		
S-115	Storage	Storage	388	0	0	0.12	1.0	0	46.6	46.6	46.56	99	0.47		
S-117	Heated Plate Storage	Storage	198	0	0	0.12	1.0	0	23.7	23.7	23.712	40	0.59		
S-119	Pantry	Storage	320	6	0	0.12	1.0	0	38.4	38.4	38.4	208	0.18		
S-171	Green Room	Office	160	2	5	0.06	1.0	10	9.6	19.6	19.6	80	0.25		
S-177 Z1	Main Kitchen	Kitchen	2280	46	7.5	0.18	1.0	345	410.3	755.3	755.346	3,037	0.25		
S-177 Z2	Main Kitchen	Kitchen	2850	57	7.5	0.18	1.0	427.5	513.0	940.5	940.5	3,111	0.30		
S-177 Z3	Meat Butcher	Kitchen	1028	21	7.5	0.18	1.0	157.5	185.1	342.6	342.576	1,020	0.34		
S-177 Z4	Seafood	Kitchen	1323	26	7.5	0.18	1.0	195	238.2	433.2	433.194	1,312	0.33		
S-177 Z5	Prep Kitchen	Kitchen	1371	27	7.5	0.18	1.0	0	246.7	246.7	246.69	1,359	0.18		
S-178	Office	Office	246	2	5	0.06	1.0	0	14.7	14.7	14.748	156	0.09		
S-179	Office	Office	72	1	5	0.06	1.0	5	4.3	9.3	9.32	46	0.20		
S-180	Office	Office	77	1	5	0.06	1.0	5	4.6	9.6	9.632	49	0.20		
S-181	Office	Office	77	1	5	0.06	1.0	5	4.6	9.6	9.632	49	0.20		
S-182	Dry Storage	Storage	99	0	0	0.12	1.0	0	11.9	11.9	11.88	20	0.59		
S-183	Dry Storage	Storage	200	0	0	0.12	1.0	0	24.0	24.0	24	41	0.59		
S-184	Dry Storage	Storage	199	0	0	0.12	1.0	0	23.9	23.9	23.88	41	0.58		
S-185	Office	Office	102	1	5	0.06	1.0	0	6.1	6.1	6.12	65	0.09		
S-186	Ice Carve	Kitchen	138	1	7.5	0.18	1.0	7.5	24.8	32.3	32.34	69	0.47		
S-187	Pot & Pan Wash	Kitchen	1049	21	7.5	0.18	1.0	157.5	188.8	346.3	346.32	1,577	0.22		
S-189	Bakery	Kitchen	3300	66	7.5	0.18	1.0	495	594.0	1089.0	1089	2,618	0.42		
S-190	Utility Room	Storage	225	0	0	0.12	1.0	0	27.0	27.0	27	58	0.47		
S-191	Dry Storage	Storage	348	0	0	0.12	1.0	0	41.8	41.8	41.796	71	0.59		
S-192	Office	Office	96	1	5	0.06	1.0	5	5.8	10.8	10.76	61	0.18		
S-193	Office	Office	95	1	5	0.06	1.0	5	5.7	10.7	10.7	60	0.18		
S-194	Finishing Room	Kitchen	762	8	7.5	0.18	1.0	60	137.2	197.2	197.16	381	0.52	Max Zp	0.6
S-205	Ice Room	Kitchen	283	3	7.5	0.18	1.0	22.5	50.9	73.4	73.44	142	0.52	Max Zp	0.6
S-270	Dish Washing	Kitchen	990	20	7.5	0.18	1.0	150	178.2	328.2	328.2	982	0.33		
S-177 Z6	Corridor	Corridor	1760	0	0	0.06	1.0	0	105.6	105.6	105.6	424	0.25		
S-302	Corridor	Corridor	415	0	0	0.06	1.0	0	24.9	24.9	24.9	125	0.20		
S-303	Pantry	Storage	490	10	0	0.12	1.0	0	58.8	58.8	58.8	319	0.18		

S-304	Pantry	Storage	610	12	0	0.12	1.0	0	73.2	73.2	73.2	397	0.18		
S-305	Dry Storage	Storage	143	0	0	0.12	1.0	0	17.2	17.2	17.208	29	0.59		
S-310	Convention Storage	Storage	1126	0	0	0.12	1.0	0	135.1	135.1	135.12	288	0.47		
S-313	Office	Office	200	1	5	0.06	1.0	5	12.0	17.0	16.994	127	0.13		
S-314	Dry Storage	Storage	87	0	0	0.12	1.0	0	10.4	10.4	10.44	18	0.58		
S-315 Z1	EDR	Dining	3552	200	7.5	0.18	1.0	1500	639.4	2139.4	2139.36	5,089	0.42		
S-315 Z2	EDR Kitchen	Kitchen	1173	23	7.5	0.18	1.0	172.5	211.1	383.6	383.64	2,061	0.19		
S-315 Z3	Corridor	Corridor	520	0	0	0.06	1.0	0	31.2	31.2	31.2	125	0.25		
S-315 Z4	Serving	Kitchen	1563	31	7.5	0.18	1.0	232.5	281.3	513.8	513.84	1,550	0.33		
S-316	Smokers Room	Casino	880	62	7.5	0.18	1.0	465	158.4	623.4	623.4	3,720	0.17		
S-317	Corridor	Corridor	2800	0	0	0.06	1.0	0	168.0	168.0	168	675	0.25		
S-350	Dry Storage	Storage	192	0	0	0.12	1.0	0	23.0	23.0	22.98	39	0.59		
S-351	Shell	Office	217	2	5	0.06	1.0	10	13.0	23.0	23.02	120	0.19		
S-354	Dealer Lounge	Break Room	423	42	5	0.06	1.0	210	25.4	235.4	235.38	840	0.28		
S-489	Corridor	Corridor	3035	0	0	0.06	1.0	0	182.1	182.1	182.1	914	0.20		
S-496	Dish Washer	Kitchen	1425	29	7.5	0.18	1.0	217.5	256.5	474.0	474	1,413	0.34		

AHU 1-7																
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev	
		ASHRAE Std. 62.1 2007 Table 6-1	ft2	# people	cfm/person	cfm/ft2										
S-101 Z1	Promenade	Lobby	1427	43	5	0.06	1.0	215	85.6	300.6	300.62	3,168	0.09			
S-101 Z2	Promenade	Lobby	1000	30	5	0.06	1.0	150	60.0	210.0	210	3,077	0.07			
S-101 Z3	Promenade	Lobby	735	22	5	0.06	1.0	110	44.1	154.1	154.1	2,135	0.07			
S-101 Z4	Promenade	Lobby	870	26	5	0.06	1.0	130	52.2	182.2	182.2	1,171	0.16			
S-101 Z5	Promenade	Lobby	1410	42	5	0.06	1.0	210	84.6	294.6	294.6	1,955	0.15			
S-101 Z6	Promenade	Lobby	1525	46	5	0.06	1.0	230	91.5	321.5	321.5	3,134	0.10			
S-101 Z15N	Promenade	Lobby	210	6	5	0.06	1.0	30	12.6	42.6	42.6	2,365	0.02			
S-113	Bar	Bar/Cocktail Lounge	162	11	7.5	0.18	1.0	82.5	29.2	111.7	111.66	373	0.30	Max Zp	0.8	

AHU 1-8																
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev	
		ASHRAE Std. 62.1 2007 Table 6-1	ft2	# people	cfm/person	cfm/ft2										
S-102 Z1	Ballroom	Disco/Dance Floor	1035	125	5	0.06	1.0	625	62.1	687.1	687.1	3,430	0.20			
S-102 Z2	Ballroom	Disco/Dance Floor	1320	159	5	0.06	1.0	795	79.2	874.2	874.2	4,375	0.20			

S-102 Z3	Ballroom	Disco/Dance Floor	1320	159	5	0.06	1.0	795	79.2	874.2	874.2	4,375	0.20		
S-102 Z4	Ballroom	Disco/Dance Floor	1320	159	5	0.06	1.0	795	79.2	874.2	874.2	4,375	0.20		
S-102 Z5	Ballroom	Disco/Dance Floor	1273	153	5	0.06	1.0	765	76.4	841.4	841.38	4,219	0.20		
S-102 Z6	Ballroom	Disco/Dance Floor	923	111	5	0.06	1.0	555	55.4	610.4	610.38	3,059	0.20		
S-102 Z7	Ballroom	Disco/Dance Floor	923	111	5	0.06	1.0	555	55.4	610.4	610.38	3,059	0.20		
S-102 Z8	Ballroom	Disco/Dance Floor	1030	124	5	0.06	1.0	620	61.8	681.8	681.8	3,414	0.20		
S-102 Z9	Ballroom	Disco/Dance Floor	1030	124	5	0.06	1.0	620	61.8	681.8	681.8	3,414	0.20		
S-102 Z10	Ballroom	Disco/Dance Floor	1000	120	5	0.06	1.0	600	60.0	660.0	660	3,414	0.19		
S-102 Z11	Ballroom	Disco/Dance Floor	940	113	5	0.06	1.0	0	56.4	56.4	56.4	3,115	0.02		
S-102 Z12	Ballroom	Disco/Dance Floor	940	113	5	0.06	1.0	0	56.4	56.4	56.4	3,115	0.02		
S-102 Z13	Ballroom	Disco/Dance Floor	1050	127	5	0.06	1.0	635	63.0	698.0	698	3,480	0.20		
S-102 Z14	Ballroom	Disco/Dance Floor	1050	127	5	0.06	1.0	635	63.0	698.0	698	3,480	0.20		
S-102 Z15	Ballroom	Disco/Dance Floor	1017	123	5	0.06	1.0	615	61.0	676.0	676.02	3,371	0.20		
S-102 Z16	Ballroom	Disco/Dance Floor	1300	157	5	0.06	1.0	785	78.0	863.0	863	4,308	0.20		
S-103	Storage	Storage	186	0	0	0.12	1.0	0	22.3	22.3	22.32	113	0.20		
S-104	Partition Storage	Storage	118	0	0	0.12	1.0	0	14.2	14.2	14.16	69	0.21		
S-105	Partition Storage	Storage	162	0	0	0.12	1.0	0	19.4	19.4	19.44	86	0.23		
S-106	Partition Storage	Storage	85	0	0	0.12	1.0	0	10.2	10.2	10.2	58	0.18		
S-107	Storage	Storage	89	0	0	0.12	1.0	0	10.7	10.7	10.68	41	0.26		
S-108	Partition Storage	Storage	93	0	0	0.12	1.0	0	11.2	11.2	11.208	62	0.18		
S-109	Storage	Storage	66	0	0	0.12	1.0	0	7.9	7.9	7.92	41	0.19		
S-116	Partition Storage	Storage	159	0	0	0.12	1.0	0	19.1	19.1	19.08	48	0.40		
S-118	Storage	Storage	42	0	0	0.12	1.0	0	5.0	5.0	5.04	33	0.15		
S-120	Partition Storage	Storage	101	0	0	0.12	1.0	0	12.1	12.1	12.12	48	0.25		
S-122	Storage	Storage	122	0	0	0.12	1.0	0	14.6	14.6	14.592	35	0.42		
S-124	Storage	Storage	515	0	0	0.12	1.0	0	61.8	61.8	61.8	215	0.29		
S-127	Stage	Storage	730	0	0	0.12	1.0	0	87.6	87.6	87.6	1,495	0.06		
S-128	Pantry	Storage	838	17	0	0.12	1.0	0	100.6	100.6	100.56	545	0.18		
S-129	Green Room	Office	150	2	5	0.06	1.0	10	9.0	19.0	19	75	0.25		
S-131	Storage	Storage	1309	0	0	0.12	1.0	0	157.1	157.1	157.08	355	0.44	Max Zp	0.7

AHU 1-9															
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6-1	ft2	# people	cfm/person	cfm/ft2									
S-134 Z1	Corridor	Corridor	3395	0	0	0.06	1.0	0	203.7	203.7	203.7	1,933	0.11		
S-137	Purchase Office	Office	388	3	5	0.06	1.0	15	23.3	38.3	38.3	246	0.16		
S-138	Liquor Dispensing Room	Storage	413	0	0	0.12	1.0	0	49.5	49.5	49.5	211	0.23		

S-139	Soda Storage	Storage	164	0	0	0.12	1.0	0	19.7	19.7	19.7	42	0.47		
S-140	Office	Office	150	1	5	0.06	1.0	5	9.0	14.0	14.0	95	0.15		
S-141	Liquior Storage	Storage	240	0	0	0.12	1.0	0	28.8	28.8	28.8	61	0.47	Max Zp	0.9
S-142 Z1	Warehouse	Warehouse	3113	16	0	0.06	1.0	0	186.8	186.8	186.8	2,182	0.09		
S-142 Z2	Warehouse	Warehouse	3113	16	0	0.06	1.0	0	186.8	186.8	186.8	2,182	0.09		
S-143	Corridor	Corridor	1630	0	0	0.06	1.0	0	97.8	97.8	97.8	3,054	0.03		
S-507	Purchasing Director	Office	194	1	5	0.06	1.0	5	11.6	16.6	16.6	123	0.14		
S-508	Receiving Manager	Office	121	1	5	0.06	1.0	0	7.3	7.3	7.3	77	0.09		

AHU 1-10																
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev	
		ASHRAE Std. 62.1 2007 Table 6.1	ft2	# people	cfm/person	cfm/ft2										
S-134 Z2	Corridor	Corridor	2966	0	0	0.06	1.0	0	178.0	178.0	177.96	893	0.20			
S-195	Linen	Storage	1336	7	0	0.12	1.0	0	160.3	160.3	160.32	548	0.29			
S-196	Executive Steward	Office	142	1	5	0.06	1.0	5	8.5	13.5	13.52	90	0.15			
S-197	Banquet Steward	Office	116	1	5	0.06	1.0	5	7.0	12.0	11.96	73	0.16			
S-198	Banquet Manager	Office	115	1	5	0.06	1.0	5	6.9	11.9	11.9	73	0.16			
S-199	Director Office	Office	168	1	5	0.06	1.0	5	10.1	15.1	15.08	106	0.14			
S-200	Manager	Office	160	1	5	0.06	1.0	5	9.6	14.6	14.6	101	0.14			
S-201	Office	Office	440	3	5	0.06	1.0	15	26.4	41.4	41.4	279	0.15			
S-203	Elevator Lobby	Lobby	178	12	5	0.06	1.0	60	10.7	70.7	70.68	246	0.29			
S-201	Main Shop	Wood/Metal Shop	2765	14	10	0.18	1.0	140	497.7	637.7	637.7	2,765	0.23			
S-502	Flooring	Storage	526	3	0	0.12	1.0	0	63.1	63.1	63.12	526	0.12			
S-502	Paint	Storage	485	0	0	0.12	1.0	0	58.2	58.2	58.2	458	0.13			
S-363	Surveillance Office	Office	179	1	5	0.06	1.0	5	10.7	15.7	15.74	162	0.10			
S-366	Surveillance	Office	835	6	5	0.06	1.0	30	50.1	80.1	80.1	899	0.09			
S-367	Surveillance Technology	Office	260	2	5	0.06	1.0	10	15.6	25.6	25.6	222	0.12			
S-368	Storage	Storage	215	0	0	0.12	1.0	0	25.8	25.8	25.8	55	0.47			
S-370	Beer Pump	Storage	470	0	0	0.12	1.0	0	56.4	56.4	56.4	241	0.23			
S-371	Womens Lockers	Special	920	46	0	0.5	1.0	0	460.0	460.0	460	763	0.60	Max Zp	0.54	
S-374	Dressing Room	Office	90	1	5	0.06	1.0	5	5.4	10.4	10.4	45	0.23			
S-378	Men's Lockers	Special	1005	50	0	0.5	1.0	0	502.5	502.5	502.5	834	0.60	Max Zp	0.54	
S-379	Shell	Office	1240	12	5	0.06	1.0	60	74.4	134.4	134.4	1,240	0.11			
S-382	Information Technology Dept.	Office	1376	10	5	0.06	1.0	50	82.6	132.6	132.56	1,224	0.11			
S-383	VP of IT	Office	172	1	5	0.06	1.0	5	10.3	15.3	15.32	153	0.10			
S-384	Reporting Manager	Office	110	1	5	0.06	1.0	5	6.6	11.6	11.6	98	0.12			
S-385	Network Manager	Office	106	1	5	0.06	1.0	5	6.4	11.4	11.36	94	0.12			

S-386	IT Manager	Office	106	1	5	0.06	1.0	5	6.4	11.4	11.36	94	0.12		
S-388 Z1	IT Training	Office	380	19	5	0.06	1.0	95	22.8	117.8	117.8	661	0.18		
S-388 Z2	IT Training	Office	380	19	5	0.06	1.0	95	22.8	117.8	117.8	661	0.18		
S-389	IT Tech	Office	742	5	5	0.06	1.0	25	44.5	69.5	69.52	470	0.15		
S-390	Corridor	Corridor	1632	0	0	0.06	1.0	0	97.9	97.9	97.92	951	0.10		
S-391	Uniform Queue	Lobby	1006	67	5	0.06	1.0	335	60.4	395.4	395.36	1,895	0.21		
S-392	Uniform Manager	Office	173	1	5	0.06	1.0	5	10.4	15.4	15.38	110	0.14		
S-393	Fitting Room	Special	173	0	0.5	0.06	1.0	0	10.4	10.4	10.38	62	0.17		
S-394	Uniform Issue	Warehouse	2330	12	0	0.06	1.0	0	139.8	139.8	139.8	1,830	0.08		
S-395	Shell	Office	1550	16	5	0.06	1.0	80	93.0	173.0	173	1,180	0.15		
S-396	Corridor	Corridor	1290	0	0	0.06	1.0	0	77.4	77.4	77.4	388	0.20		
S-397	Corridor	Corridor	1264	0	0	0.06	1.0	0	75.8	75.8	75.84	1,044	0.07		
S-490	Storage	Storage	153	0	0	0.12	1.0	0	18.4	18.4	18.36	39	0.47		
S-503	Crib Office	Office	137	1	5	0.06	1.0	5	8.2	13.2	13.22	94	0.14		
S-504	Parts Crib	Warehouse	1074	5	0	0.06	1.0	0	64.4	64.4	64.44	440	0.15		
S-505	Steward Open Office	Office	453	3	5	0.06	1.0	15	27.2	42.2	42.18	287	0.15		

AHU 1-11																
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev	
		ASHRAE Std. 62.1 2007 Table 6.1	ft2	# people	cfm/person	cfm/ft2										
S-101 Z7	Promenade	Lobby	886	27	5	0.06	1.0	135	53.2	188.2	188.16	1,279	0.15	Max Zp	1.0	
S-101 Z8	Promenade	Lobby	1266	38	5	0.06	1.0	190	76.0	266.0	265.96	1,935	0.14			
S-101 Z9	Promenade	Lobby	1275	38	5	0.06	1.0	190	76.5	266.5	266.5	2,593	0.10			
S-101 Z10	Promenade	Lobby	915	27	5	0.06	1.0	135	54.9	189.9	189.9	2,254	0.08			
S-101 Z11	Promenade	Lobby	2625	79	5	0.06	1.0	395	157.5	552.5	552.5	4,436	0.12			
S-101 Z15S	Promenade	Lobby	210	6	5	0.06	1.0	30	12.6	42.6	42.6	2,365	0.02			

AHU 2-1																
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev	
		ASHRAE Std. 62.1 2007 Table 6.1	ft2	# people	cfm/person	cfm/ft2										
C-161	Service Station	Kitchen	186	4	7.5	0.18	1.0	30	33.5	63.5	63.48	184	0.35			
C-164	Private Dining	Dining	831	20	7.5	0.18	1.0	150	149.6	299.6	299.58	1,485	0.20			
C-165 Z1	Steak/Seafood Kitchen	Kitchen	885	18	7.5	0.18	1.0	135	159.3	294.3	294.3	702	0.42			
C-165 Z2	Steak/Seafood Kitchen	Kitchen	830	17	7.5	0.18	1.0	127.5	149.4	276.9	276.9	823	0.34			

C-165 Z3	Steak/Seafood Kitchen	Kitchen	1410	28	7.5	0.18	1.0	210	253.8	463.8	463.8	1,119	0.41		
C-166	Service Station	Kitchen	90	2	7.5	0.18	1.0	15	16.2	31.2	31.2	109	0.29		
C-167	Corridor	Corridor	170	0	7.5	0.18	1.0	0	30.6	30.6	30.6	62	0.49	Max Zp	0.6
C-168	Storage	Storage	75	0	0	0.12	1.0	0	9.0	9.0	9	15	0.60		
C-171 Z1	Steak/Seafood Restaurant	Dining	460	18	7.5	0.18	1.0	135	82.8	217.8	217.8	2,567	0.08		
C-171 Z2	Steak/Seafood Restaurant	Dining	3665	147	7.5	0.18	1.0	1102.5	659.7	1762.2	1762.2	4,902	0.36		
C-171 Z3	Steak/Seafood Restaurant	Dining	220	9	7.5	0.18	1.0	67.5	39.6	107.1	107.1	2,522	0.04		
C-171 Z4	Steak/Seafood Restaurant	Dining	2875	192	7.5	0.18	1.0	1440	517.5	1957.5	1957.5	5,514	0.36		
C-171 Z5	Steak/Seafood Restaurant	Dining	332	13	7.5	0.18	1.0	97.5	59.8	157.3	157.26	1,253	0.13		
C-172 Z1	Seafood Bar - Cooking	Kitchen	580	12	7.5	0.18	1.0	90	104.4	194.4	194.4	460	0.42		
C-172 Z2	Seafood Bar - Dining	Dining	1105	74	7.5	0.18	1.0	555	198.9	753.9	753.9	2,229	0.34		
C-173	Corridor	Corridor	923	0	0	0.06	1.0	0	55.4	55.4	55.38	1,132	0.05		
C-174	Service Station	Kitchen	120	2	7.5	0.18	1.0	15	21.6	36.6	36.6	144	0.25		
C-175	Corridor	Corridor	224	0	0	0.06	1.0	0	13.4	13.4	13.44	81	0.17		

AHU 2-3																
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev	
		ASHRAE Std. 62.1 2007 Table 6.1	ft2	# people	cfm/person	cfm/ft2										
C-134	Private Dining	Dining	585	16	7.5	0.18	1.0	120	105.3	225.3	225.3	1,438	0.16			
C-135	Service	Kitchen	125	3	7.5	0.18	1.0	22.5	22.5	45.0	45	124	0.36			
C-137	Corridor	Corridor	316	0	0	0.06	1.0	0	19.0	19.0	18.96	76	0.25			
C-187 Z1	Italian Restaurant	Dining	1300	56	7.5	0.18	1.0	420	234.0	654.0	654	4,038	0.16			
C-187 Z2	Italian Restaurant	Dining	2450	88	7.5	0.18	1.0	660	441.0	1101.0	1101	3,494	0.32			
C-188 Z1	Italian Kitchen	Kitchen	1210	24	7.5	0.18	1.0	180	217.8	397.8	397.8	960	0.41			
C-188 Z2	Italian Kitchen	Kitchen	640	13	7.5	0.18	1.0	97.5	115.2	212.7	212.7	730	0.29			
C-188 Z3	Italian Kitchen	Kitchen	680	14	7.5	0.18	1.0	105	122.4	227.4	227.4	674	0.34			
C-188 Z4	Italian Kitchen	Kitchen	158	0	7.5	0.18	1.0	0	28.4	28.4	28.44	81	0.35			
C-191	Dry Storage	Storage	186	0	0	0.12	1.0	0	22.3	22.3	22.32	38	0.59	Max Zp	0.52	
C-195	Italian Bar	Bar	1495	100	7.5	0.18	1.0	750	269.1	1019.1	1019.1	3,447	0.30			

AHU 2-4																
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev	
		ASHRAE Std. 62.1 2007 Table 6.1	ft2	# people	cfm/person	cfm/ft2										
C-113	Control Booth	Office	118	0	5	0.06	1.0	0	7.1	7.1	7.08	24	0.30			

C-116	Storage	Storage	704	7	0	0.12	1.0	0	84.5	84.5	84.48	545	0.16		
C-119 Z1	Entertainment Lounge	Casino	920	61	7.5	0.18	1.0	457.5	165.6	623.1	623.1	4,884	0.13		
C-119 Z2	Entertainment Lounge	Casino	911	61	7.5	0.18	1.0	457.5	164.0	621.5	621.48	2,735	0.23		
C-119 Z3	Entertainment Lounge	Casino	1153	77	7.5	0.18	1.0	577.5	207.5	785.0	785.04	2,937	0.27		
C-119 Z4	Entertainment Lounge	Casino	1165	78	7.5	0.18	1.0	585	209.7	794.7	794.7	2,964	0.27		
C-119 Z5	Stage	Stage	440	0	10	0.06	1.0	0	26.4	26.4	26.4	811	0.03		
C-119 Z6	Bar	Bar	1960	131	7.5	0.18	1.0	982.5	352.8	1335.3	1335.3	4,519	0.30		
C-197 Z1	High Limit Salon	Casino	761	76	7.5	0.18	1.0	570	137.0	707.0	706.98	3,478	0.20		
C-197 Z2	High Limit Salon	Casino	988	99	7.5	0.18	1.0	742.5	177.8	920.3	920.34	3,012	0.31	Max Zp	0.8

AHU 2-5

Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6.1	ft2	# people	cfm/person	cfm/ft2									
C-121 Z1	Casino		15400	1540	7.5	0.18	1.0	11550	2772.0	14322.0	14322	49,917	0.29	Max Zp	0.8

AHU 2-6

Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6.1	ft2	# people	cfm/person	cfm/ft2									
C-121 Z2	Casino	Gambling Casino	16350	1635	7.5	0.18	1.0	12262.5	2943.0	15205.5	15205.5	52,439	0.29	Max Zp	0.8

AHU 2-7

Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6.1	ft2	# people	cfm/person	cfm/ft2									
C-121 Z3	Casino	Casino	17400	1740	7.5	0.18	1.0	13050	3132.0	16182.0	16182	52,200	0.31		
C-200	Ice Room	Kitchen	440	9	7.5	0.18	1.0	67.5	79.2	146.7	146.7	436	0.34	Max Zp	0.8
C-201	Storage	Storage	66	0	0	0.06	1.0	0	4.0	4.0	3.96	14	0.28		
C-202	M Bar Seating	Bar	4105	274	7.5	0.18	1.0	2055	738.9	2793.9	2793.9	9,464	0.30		
C-312	M Bar	Kitchen	440	9	7.5	0.18	1.0	67.5	79.2	146.7	146.7	436	0.34	Max Zp	0.8

AHU 2-8															
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6.1	ft2	# people	cfm/person	cfm/ft2									
C-114	Stair 10	Lobby	1574	105	5	0.06	1.0	525	94.4	619.4	619.44	4,125	0.15		
C-121 Z5	Casino	Casino	19000	1900	7.5	0.18	1.0	14250	3420.0	17670.0	17670	57,000	0.31	Max Zp	0.8

AHU 2-9															
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6.1	ft2	# people	cfm/person	cfm/ft2									
C-109 Z1	Café/Grill Dining	Dining	1875	62	7.5	0.18	1.0	465	337.5	802.5	802.5	3,447	0.23		
C-109 Z2	Café/Grill Dining	Dining	1865	86	7.5	0.18	1.0	645	335.7	980.7	980.7	2,829	0.35		
C-109 Z3	Café/Grill Dining	Dining	1775	78	7.5	0.18	1.0	585	319.5	904.5	904.5	2,188	0.41	Max Zp	0.7
C-110	Service Bar	Kitchen	114	2	7.5	0.18	1.0	15	20.5	35.5	35.52	113	0.31		
C-111	Dry Storage	Storage	84	0	0	0.12	1.0	0	10.1	10.1	10.08	29	0.35		
C-112 Z1	Café/Grill Kitchen	Kitchen	1640	33	7.5	0.18	1.0	247.5	295.2	542.7	542.7	1,771	0.31		
C-112 Z2	Café/Grill Kitchen	Kitchen	1625	33	7.5	0.18	1.0	247.5	292.5	540.0	540	1,650	0.33		
C-124	Corridor	Corridor	740	0	0	0.06	1.0	0	44.4	44.4	44.4	334	0.13		

AHU 2-10															
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6.1	ft2	# people	cfm/person	cfm/ft2									
C-121 Z4	Casino	Casino	20400	2040	7.5	0.18	1.0	15300	3672.0	18972.0	18972	61,266	0.31	Max Zp	0.8

AHU 2-11															
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6.1	ft2	# people	cfm/person	cfm/ft2									
C-104 Z1	Corridor	Corridor	960	0	0	0.06	1.0	0	57.6	57.6	57.6	655	0.09		
C-104 Z2	Corridor	Corridor	2565	0	0	0.06	1.0	0	153.9	153.9	153.9	2,377	0.06		
C-105	Corridor	Corridor	196	0	0	0.06	1.0	0	11.8	11.8	11.76	308	0.04		

C-106	Dishwashing	Kitchen	1146	23	7.5	0.18	1.0	172.5	206.3	378.8	378.78	1,137	0.33		
C-130 Z1	Buffet Kitchen	Kitchen	2346	47	7.5	0.18	1.0	352.5	422.3	774.8	774.78	2,169	0.36		
C-130 Z2	Buffet Kitchen	Kitchen	1575	32	7.5	0.18	1.0	240	283.5	523.5	523.5	1,562	0.34		
C-130 Z3	Buffet Kitchen	Kitchen	2690	54	7.5	0.18	1.0	405	484.2	889.2	889.2	3,724	0.24		
C-133	Corridor	Corridor	210	0	0	0.06	1.0	0	12.6	12.6	12.6	322	0.04		
C-140	Office	Office	97	1	5	0.06	1.0	5	5.8	10.8	10.82	61	0.18		
C-141	Office	Office	112	1	5	0.06	1.0	5	6.7	11.7	11.72	71	0.17		
C-147 Z1	Buffet Dining	Dining	3390	146	7.5	0.18	1.0	1095	610.2	1705.2	1705.2	4,812	0.35	Max Zp	0.8
C-147 Z2	Buffet Dining	Dining	3563	126	7.5	0.18	1.0	945	641.3	1586.3	1586.34	4,682	0.34		
C-147 Z3	Buffet Dining	Dining	3010	84	7.5	0.18	1.0	630	541.8	1171.8	1171.8	3,534	0.33		
C-147 Z4	Buffet Dining	Dining	1890	54	7.5	0.18	1.0	405	340.2	745.2	745.2	2,240	0.33		
C-147 Z5	Buffet Dining	Dining	2010	82	7.5	0.18	1.0	615	361.8	976.8	976.8	2,854	0.34		
C-147 Z6	Buffet Dining	Dining	985	42	7.5	0.18	1.0	315	177.3	492.3	492.3	2,883	0.17		
C-148	Pastry Dessert	Kitchen	897	18	7.5	0.18	1.0	135	161.5	296.5	296.46	1,165	0.25		
C-152	Corridor	Corridor	235	0	0	0.06	1.0	0	14.1	14.1	14.1	293	0.05		
C-153	Service Station	Kitchen	408	8	7.5	0.18	1.0	60	73.4	133.4	133.44	463	0.29		
C-154	Studio	Dining	1395	52	7.5	0.18	1.0	390	251.1	641.1	641.1	3,100	0.21		
C-155	Service Station	Kitchen	435	9	7.5	0.18	1.0	67.5	78.3	145.8	145.8	431	0.34		
C-313	Storage	Storage	40	0	0	0.12	1.0	0	4.8	4.8	4.8	19	0.25		
C-343	Control Booth	Media Room	85	1	10	0.12	1.0	10	10.2	20.2	20.2	170	0.12		

AHU 2-12																
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev	
		ASHRAE Std. 62.1 2007 Table 6-1	ft2	# people	cfm/person	cfm/ft2										
C-149Z1	Pharmacy Zone 1	Sales	535	16	7.5	0.12	1.0	120	64.2	184.2	184.2	550	0.33			
C-143	Porter	Office	345	0	5	0.06	1.0	0	20.7	20.7	20.7	257	0.08			
C-144	Queue Lines	Lobby	3000	200	5	0.06	1.0	1000	180.0	1180.0	1180	5,170	0.23			
C-146	Office	Office	122	1	5	0.06	1.0	5	7.3	12.3	12.32	91	0.14			
C-149Z2	Pharmacy	Sales	1615	48	7.5	0.12	1.0	360	193.8	553.8	553.8	1,728	0.32			
C-156	Corridor	Corridor	1175	0	5	0.06	1.0	0	70.5	70.5	70.5	1,157	0.06			
C-157	Storage	Storage	205	0	0	0.12	1.0	0	24.6	24.6	24.6	178	0.14			
C-158	Players Club	Lobby	267	18	5	0.06	1.0	90	16.0	106.0	106.02	513	0.21			
C-321	Card / Dice Storage	Storage	255	0	0	0.12	1.0	0	30.6	30.6	30.6	52	0.59	Max Zp	0.47	
C-322	Work Area	Office	322	2	5	0.06	1.0	10	19.3	29.3	29.32	240	0.12			
C-323	Slot Shift Manager	Office	90	1	5	0.06	1.0	5	5.4	10.4	10.4	67	0.16			
C-324	Casino Shift Manager	Office	90	1	5	0.06	1.0	5	5.4	10.4	10.4	67	0.16			

AHU 2-13															
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6.1	ft2	# people	cfm/person	cfm/ft2									
C-203 Z1	Sports Beer Bar	Bar	565	11	7.5	0.18	1.0	82.5	101.7	184.2	184.2	560	0.33		
C-203 Z2	Sports Beer Bar	Bar	2380	159	7.5	0.18	1.0	1192.5	428.4	1620.9	1620.9	5,487	0.30		
C-204	Deli	Dining	1766	100	7.5	0.18	1.0	750	317.9	1067.9	1067.88	3,420	0.31		
C-205 Z1	Deli Kitchen	Kitchen	364	7	7.5	0.18	1.0	52.5	65.5	118.0	118.02	468	0.25		
C-205 Z2	Deli Kitchen	Kitchen	806	16	7.5	0.18	1.0	120	145.1	265.1	265.08	875	0.30		
C-206 Z1	Race and Sports Bet Lobby	Lobby	600	40	7.5	0.06	1.0	300	36.0	336.0	336	793	0.42	Max Zp	0.7
C-206 Z2	Race and Sports Bet Lobby	Lobby	600	40	7.5	0.06	1.0	300	36.0	336.0	336	793	0.42		
C-206 Z3	Race and Sports Bet	Casino	2330	75	7.5	0.18	1.0	562.5	419.4	981.9	981.9	4,097	0.24		
C-206 Z4	Race and Sports Bet	Casino	2330	75	7.5	0.18	1.0	562.5	419.4	981.9	981.9	4,097	0.24		
C-207	Poker Room	Casino	2330	117	7.5	0.18	1.0	877.5	419.4	1296.9	1296.9	3,510	0.37		
C-208	VIP Poker	Casino	790	40	7.5	0.18	1.0	300	142.2	442.2	442.2	1,200	0.37		
C-210	Race and Sports BOH Offices	Office	845	6	5	0.06	1.0	30	50.7	80.7	80.7	568	0.14		
C-211	Race and Sports Manager	Office	110	1	5	0.06	1.0	5	6.6	11.6	11.6	84	0.14		
C-212	Race and Sports Director	Office	134	1	5	0.06	1.0	5	8.0	13.0	13.04	99	0.13		
C-216	Corridor	Corridor	134	0	0	0.06	1.0	0	8.0	8.0	8.04	32	0.25		
C-220	Poker Room Office	Office	293	2	5	0.06	1.0	10	17.6	27.6	27.58	186	0.15		
C-221	Poker Manager	Office	133	1	5	0.06	1.0	5	8.0	13.0	12.98	105	0.12		

AHU 3-1															
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6.1	ft2	# people	cfm/person	cfm/ft2									
C-224	Ceo Reception	Reception	508	6	5	0.06	1.0	30	30.5	60.5	60.48	430	0.14		
C-229	Room Reservation Manager	Office	163	1	5	0.06	1.0	5	9.8	14.8	14.78	103	0.14		
C-233	Room Reservation Supervisor	Office	108	1	5	0.06	1.0	5	6.5	11.5	11.48	68	0.17		
C-237	Casino Cust Ser Manager	Office	128	1	5	0.06	1.0	5	7.7	12.7	12.68	81	0.16		
C-238	Casino Cust Service Call Center	Office	1247	9	5	0.06	1.0	45	74.8	119.8	119.82	790	0.15		
C-240	Restaurant Queue / Lobby	Lobby	294	20	5	0.06	1.0	100	17.6	117.6	117.64	507	0.23		
C-241	Baggage	Storage	1682	0	0	0.12	1.0	0	201.8	201.8	201.84	344	0.59	Max Zp	0.00
C-242	Hotel Director	Office	157	1	5	0.06	1.0	5	9.4	14.4	14.42	117	0.12		
C-243	Vice President	Office	157	1	5	0.06	1.0	5	9.4	14.4	14.42	117	0.12		
C-244	Admin	Office	275	2	5	0.06	1.0	10	16.5	26.5	26.5	174	0.15		

C-245	Group Sales	Office	293	2	5	0.06	1.0	10	17.6	27.6	27.58	186	0.15		
C-246	Director Sales	Office	127	1	5	0.06	1.0	5	7.6	12.6	12.62	80	0.16		
C-247	Yeild Manager	Office	137	1	5	0.06	1.0	5	8.2	13.2	13.22	87	0.15		
C-248	VIP Check In	Office	455	3	5	0.06	1.0	15	27.3	42.3	42.3	673	0.06		
C-249	Regional Sales Manager	Office	87	1	5	0.06	1.0	5	5.2	10.2	10.22	55	0.19		
C-250	Registration Offices	Office	583	4	5	0.06	1.0	20	35.0	55.0	54.98	369	0.15		
C-251	Copy / Files	Office	134	1	5	0.06	1.0	5	8.0	13.0	13.04	85	0.15		
C-253	Registration Desk	Office	916	6	5	0.06	1.0	30	55.0	85.0	84.96	1,282	0.07		
C-255	Valet	Office	70	0	5	0.06	1.0	0	4.2	4.2	4.2	194	0.02		
C-183 Z2	Lobby Bar	Bar	410	45	7.5	0.18	1.0	337.5	73.8	411.3	411.3	3,024	0.14		
C-184 Z1	Public Circulation (otb)	Lobby	1358	91	5	0.06	1.0	455	81.5	536.5	536.48	4,121	0.13		
C-223 Z1	Public Circulation	Lobby	5600	373	5	0.06	1.0	1865	336.0	2201.0	2201	11,563	0.19		
C-254 Z1	Lobby	Lobby	1920	128	5	0.06	1.0	640	115.2	755.2	755.2	3,781	0.20		
C-329	National Sales Manager	Office	88	1	5	0.06	1.0	5	5.3	10.3	10.28	56	0.18		
S-398	Coporate Offices	Office	389	3	5	0.06	1.0	15	23.3	38.3	38.34	290	0.13		
S-399	Conference	Conference	190	10	5	0.06	1.0	50	11.4	61.4	61.4	269	0.23		
S-400	Storage	Storage	90	0	0	0.12	1.0	0	10.8	10.8	10.8	420	0.03		
S-404	Admin	Office	323	2	5	0.06	1.0	10	19.4	29.4	29.38	241	0.12		
S-405	Boardroom	Conference	343	17	5	0.06	1.0	85	20.6	105.6	105.58	486	0.22		
S-406	Pantry	Storage	120	0	0	0.12	1.0	0	14.4	14.4	14.4	25	0.58		
S-407	Work Room	Office	204	1	5	0.06	1.0	5	12.2	17.2	17.24	129	0.13		
S-408	CFO	Office	230	2	5	0.06	1.0	10	13.8	23.8	23.8	171	0.14		
S-409	Reception	Office	335	22	5	0.06	1.0	110	20.1	130.1	130.1	557	0.23		
S-410	General Consul	Office	236	2	5	0.06	1.0	10	14.2	24.2	24.16	176	0.14		
S-417	Elevator Lobby	Lobby	187	12	5	0.06	1.0	60	11.2	71.2	71.22	258	0.28		
S-418	Linen	Storage	354	0	0	0.12	1.0	0	42.5	42.5	42.48	72	0.59	Max Zp	0.59
S-419	Linen Storage	Storage	1160	0	0	0.12	1.0	0	139.2	139.2	139.2	297	0.47		
S-421	Housekeeping Manager	Office	122	1	5	0.06	1.0	5	7.3	12.3	12.32	77	0.16		
S-422	Business Center	Office	263	2	5	0.06	1.0	10	15.8	25.8	25.78	167	0.15		
S-423	Work Room	Office	1160	8	5	0.06	1.0	40	69.6	109.6	109.6	735	0.15		
S-425	Conv Services Manager	Office	200	1	5	0.06	1.0	5	12.0	17.0	17	127	0.13		
S-426	Cater Director	Office	150	1	5	0.06	1.0	5	9.0	14.0	14	95	0.15		
S-427	Cater Manager	Office	79	1	5	0.06	1.0	5	4.7	9.7	9.74	50	0.19		
S-428	Admin	Office	533	4	5	0.06	1.0	20	32.0	52.0	51.98	338	0.15		
S-429	Housekeeping Manager	Office	113	1	5	0.06	1.0	5	6.8	11.8	11.78	72	0.16		
S-430	Business Center Manager	Office	113	1	5	0.06	1.0	5	6.8	11.8	11.78	72	0.16		
S-431	Conference Room	Conference	420	21	5	0.06	1.0	105	25.2	130.2	130.2	596	0.22		
S-432	Cater Manager	Office	79	1	5	0.06	1.0	5	4.7	9.7	9.74	50	0.19		

AHU 3-2															
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6.1	ft2	# people	cfm/person	cfm/ft2									
C-183 Z1	Lobby Bar	Bar	1653	110	7.5	0.18	1.0	825	297.5	1122.5	1122.54	5,776	0.19		
C-183 Z5	Public Circulation - Bar	Kitchen	472	9	7.5	0.18	1.0	67.5	85.0	152.5	152.46	492	0.31		
C-223 Z2	Public Circulation	Lobby	2690	179	5	0.06	1.0	895	161.4	1056.4	1056.4	7,926	0.13		
C-254 Z2	Lobby	Lobby	3620	241	5	0.06	1.0	1205	217.2	1422.2	1422.2	6,871	0.21		
C-257	Storage	Storage	22	0	0	0.12	1.0	0	2.6	2.6	2.64	5	0.53		
C-258	Sundries	Sales	820	25	7.5	0.12	1.0	187.5	98.4	285.9	285.9	1,001	0.29		
C-259	Patisserie	Sales	2210	66	7.5	0.12	1.0	495	265.2	760.2	760.2	2,573	0.30		
C-260	Retail Promenade	Lobby	1720	115	5	0.06	1.0	575	103.2	678.2	678.2	2,273	0.30		
C-264	Elevator Lobby	Lobby	214	14	5	0.06	1.0	70	12.8	82.8	82.84	1,001	0.08		
C-265	Logo Apparel	Sales	193	6	7.5	0.12	1.0	45	23.2	68.2	68.16	186	0.37		
C-266	Storage	Storage	255	0	0	0.12	1.0	0	30.6	30.6	30.6	52	0.59	Max Zp	0.46
C-267	Elevator Lobby	Lobby	347	23	5	0.06	1.0	115	20.8	135.8	135.82	459	0.30		
C-328	Shoe Shine	Sales	85	3	7.5	0.12	1.0	22.5	10.2	32.7	32.7	82	0.40		

AHU 3-3															
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev
		ASHRAE Std. 62.1 2007 Table 6.1	ft2	# people	cfm/person	cfm/ft2									
C-268	2 Hr Passageway	Corridor	303	0	0	0.06	1.0	0	18.2	18.2	18.18	338	0.05		
C-269	Players Lounge	Casino	1000	50	7.5	0.18	1.0	375	180.0	555.0	555	1,000	0.56		
C-273	Storage	Storage	228	0	0	0.12	1.0	0	27.4	27.4	27.36	241	0.11		
C-272	Players Club	Office	294	6	5	0.06	1.0	30	17.6	47.6	47.64	120	0.40		
C-274	Director Player Dev.	Office	77	1	5	0.06	1.0	5	4.6	9.6	9.62	49	0.20		
C-275	Exec Host	Office	75	1	5	0.06	1.0	5	4.5	9.5	9.5	48	0.20		
C-276	Exec Host	Office	75	1	5	0.06	1.0	5	4.5	9.5	9.5	48	0.20		
C-277	Exec Host	Office	75	1	5	0.06	1.0	5	4.5	9.5	9.5	48	0.20		
C-278	Casino Marketing	Office	774	5	5	0.06	1.0	25	46.4	71.4	71.44	490	0.15		
C-280	Players Club Manager	Office	120	1	5	0.06	1.0	5	7.2	12.2	12.2	76	0.16		
C-281	Private Cage	Office	61	0	5	0.06	1.0	0	3.7	3.7	3.66	39	0.09		
C-282	Private Cage	Office	61	0	5	0.06	1.0	0	3.7	3.7	3.66	39	0.09		
C-283	Trap	Corridor	33	0	0	0.06	1.0	0	2.0	2.0	1.98	8	0.25		

Tom Chirdon
Mechanical Option

The M Resort Spa Casino
Henderson, Nevada

C-284	Vault	Storage	122	0	0	0.12	1.0	0	14.6	14.6	14.64	25	0.59		
C-285	Soft Count	Office	1205	24	5	0.06	1.0	120	72.3	192.3	192.3	1,164	0.17		
C-286	BOH Corridor	Corridor	1531	0	0	0.06	1.0	0	91.9	91.9	91.86	1,506	0.06		
C-287	Chip Storage	Storage	113	0	0	0.12	1.0	0	13.6	13.6	13.56	23	0.59		
C-288	Cage Manager	Office	83	1	5	0.06	1.0	5	5.0	10.0	9.98	53	0.19		
C-289	Director	Office	126	1	5	0.06	1.0	5	7.6	12.6	12.56	80	0.16		
C-290	Trap	Corridor	97	0	0	0.06	1.0	0	5.8	5.8	5.82	35	0.17		
C-291	Cashier Cage	Office	852	17	5	0.06	1.0	85	51.1	136.1	136.12	823	0.17		
C-292	Hall	Corridor	248	0	0	0.06	1.0	0	14.9	14.9	14.88	60	0.25		
C-293	Employee Vault	Office	65	0	5	0.06	1.0	0	3.9	3.9	3.9	41	0.10		
C-294	Employee Cage	Office	106	2	5	0.06	1.0	10	6.4	16.4	16.36	102	0.16		
C-295	Credit Coll Manager	Office	99	1	5	0.06	1.0	5	5.9	10.9	10.94	63	0.17		
C-296	Files	Office	111	0	5	0.06	1.0	0	6.7	6.7	6.66	23	0.29		
C-299	Trap	Corridor	30	0	0	0.06	1.0	0	1.8	1.8	1.8	10	0.18		
C-307	Jewelry	Sales	1100	33	7.5	0.12	1.0	247.5	132.0	379.5	379.5	1,232	0.31		
C-309	Office	Office	120	1	5	0.06	1.0	5	7.2	12.2	12.2	133	0.09		
C-325	Corridor	Corridor	435	0	0	0.06	1.0	0	26.1	26.1	26.1	342	0.08		
C-326	Corridor	Corridor	185	0	0	0.06	1.0	0	11.1	11.1	11.1	45	0.25		
S-413 Z2	Corridor	Corridor	6305	0	0	0.06	1.0	0	378.3	378.3	378.3	2,931	0.13		
S-446 Z1	Food Prep	Kitchen	1234	25	7.5	0.18	1.0	187.5	222.1	409.6	409.62	1,224	0.33		
S-446 Z2	Cook Line	Kitchen	622	12	7.5	0.18	1.0	90	112.0	202.0	201.96	1,427	0.14		
S-446 Z3	Rm Service Kitchen	Kitchen	737	15	7.5	0.18	1.0	112.5	132.7	245.2	245.16	731	0.34		
S-446 Z4	Dish Washing	Kitchen	250	5	7.5	0.18	1.0	37.5	45.0	82.5	82.5	248	0.33		
S-447	Dry Storage	Storage	69	0	0	0.12	1.0	0	8.3	8.3	8.28	14	0.59		
S-448	Office	Office	104	1	5	0.06	1.0	5	6.2	11.2	11.24	66	0.17		
S-449	Elevator Lobby	Lobby	226	15	5	0.06	1.0	75	13.6	88.6	88.56	299	0.30		
S-453	Linen	Storage	69	0	0	0.12	1.0	0	8.3	8.3	8.28	14	0.59		
S-454	Order Desk	Office	109	1	5	0.06	1.0	5	6.5	11.5	11.54	69	0.17		
S-455	Service Bar	Kitchen	147	3	7.5	0.18	1.0	22.5	26.5	49.0	48.96	221	0.22		
S-456	Corridor	Corridor	320	0	0	0.06	1.0	0	19.2	19.2	19.2	77	0.25		
S-458 Z1	Table Game & Slot Office	Office	1330	9	5	0.06	1.0	45	79.8	124.8	124.8	843	0.15		
S-458 Z2	Table Game & Slot Office	Office	1675	12	5	0.06	1.0	60	100.5	160.5	160.5	1,061	0.15		
S-460	Conference Room	Conference	430	22	5	0.06	1.0	110	25.8	135.8	135.8	610	0.22		
S-461	Storage	Storage	45	0	0	0.12	1.0	0	5.4	5.4	5.4	9	0.60	Max Zp	0.51
S-462	Pantry	Storage	115	0	0	0.12	1.0	0	13.8	13.8	13.8	24	0.58		
S-463	Executive Offices	Office	670	5	5	0.06	1.0	25	40.2	65.2	65.2	499	0.13		
S-464	General Manager	Office	235	2	5	0.06	1.0	10	14.1	24.1	24.1	175	0.14		
S-466	Corporate VP Operations	Office	240	2	5	0.06	1.0	10	14.4	24.4	24.4	179	0.14		
S-467	Office	Office	112	1	5	0.06	1.0	5	6.7	11.7	11.72	71	0.17		
S-468	Office	Office	110	1	5	0.06	1.0	5	6.6	11.6	11.6	70	0.17		

S-469	Casino VP Marketing	Office	222	2	5	0.06	1.0	10	13.3	23.3	23.32	141	0.17		
S-470	Database VP	Office	220	2	5	0.06	1.0	10	13.2	23.2	23.2	139	0.17		
S-471	Parts Storage	Storage	195	0	0	0.12	1.0	0	23.4	23.4	23.4	40	0.59		
S-472	Electrical Test Repair	Office	477	3	5	0.06	1.0	15	28.6	43.6	43.62	302	0.14		
S-473	Machinery Setup / Storage	Storage	220	2	0	0.12	1.0	0	26.4	26.4	26.4	139	0.19		
S-474	VP Casino Operation	Office	189	1	5	0.06	1.0	5	11.3	16.3	16.34	120	0.14		
S-475	Conference Room	Conference	366	18	5	0.06	1.0	90	22.0	112.0	111.96	519	0.22		
S-476	Director Slot Tech	Office	145	1	5	0.06	1.0	5	8.7	13.7	13.7	92	0.15		
S-477	Manager Slot Tech	Office	132	1	5	0.06	1.0	5	7.9	12.9	12.92	84	0.15		
S-479	Beverage Manager	Office	368	3	5	0.06	1.0	15	22.1	37.1	37.08	233	0.16		
S-480	File	Office	82	0	5	0.06	1.0	0	4.9	4.9	4.92	17	0.29		
S-481	Data Base Director	Office	158	1	5	0.06	1.0	5	9.5	14.5	14.48	100	0.14		
S-482	Special Events Manager	Office	153	1	5	0.06	1.0	5	9.2	14.2	14.18	97	0.15		

AHU T1																
Room Number	Room Name	Space Type	Az	Pz	Rp	Ra	Ez	Pz*Rp	Az*Ra	Vbz	Voz	Vpz	Zp	Max Zp	Ev	
		ASHRAE Std. 62.1 2007 Table 6.1	ft2	# people	cfm/person	cfm/ft2										
T15102	Elevator Lobby	Lobby	240	16	5	0.06	1.0	80	14.4	94.4	94.4	300	0.31			
T15103-Z1	Restaurant	Dining	550	28	7.5	0.18	1.0	210	99.0	309.0	309	1,932	0.16			
T15103-Z2	Restaurant	Dining	710	36	7.5	0.18	1.0	270	127.8	397.8	397.8	1,742	0.23			
T15103-Z3	Restaurant	Dining	272	14	7.5	0.18	1.0	105	49.0	154.0	153.96	600	0.26			
T15103-Z4	Restaurant	Dining	254	13	7.5	0.18	1.0	97.5	45.7	143.2	143.22	579	0.25			
T15103-Z5	Restaurant	Dining	514	26	7.5	0.18	1.0	195	92.5	287.5	287.52	581	0.49	Max Zp	0.6	
T15103-Z6	Restaurant	Kitchen	632	13	7.5	0.18	1.0	97.5	113.8	211.3	211.26	919	0.23			
T15103-Z7	Restaurant	Dining	604	30	7.5	0.18	1.0	225	108.7	333.7	333.72	1,497	0.22			
T15103-Z8	Restaurant	Dining	1350	68	7.5	0.18	1.0	510	243.0	753.0	753	1,526	0.49			
T15103-Z9	Restaurant	Dining	1900	95	7.5	0.18	1.0	712.5	342.0	1054.5	1054.5	2,147	0.49			
T15103-Z10	Restaurant	Corridor	604	2	0	0.06	1.0	0	36.2	36.2	36.24	181	0.20			
T15105	Dry Storage	Storage	197	0	0	0.12	1.0	0	23.6	23.6	23.64	101	0.23			
T15109	Kitchen	Kitchen	2560	51	7.5	0.18	1.0	382.5	460.8	843.3	843.3	1,783	0.47			
T15111	BOH Corridor	Corridor	1547	6	0	0.06	1.0	0	92.8	92.8	92.82	1,034	0.09			