CHAPTER/REGIONAL TECHNOLOGY AWARD - SHORT FORM

1. Category - Check one and indicate New, Existing, or Existing Building Commissioning (EBCx)

☒ Commercial Buildings	☒ New	☐ Existing or	☐ EBCx
Institutional Buildings:				
☐ Educational Facilities	☐ New	☐ Existing or	☐ EBCx
☐ Other Institutional	☐ New	☐ Existing or	☐ EBCx
☐ Health Care Facilities	☐ New	☐ Existing or	☐ EBCx
☐ Industrial Facilities or Processes	☐ New	☐ Existing or	☐ EBCx
☐ Public Assembly	☐ New	☐ Existing or	☐ EBCx
☐ Residential (Single and Multi-Family)			

2. Name of building or project: Las Vegas Convention Center West Hall

City/State: Las Vegas, Nevada

3. Project Description: New exhibition halls, meeting centers, food court, full service kitchen, and new central utility plant.

Project Study/Design Period: 03/2018 (Begin date (mm/yyyy)) to 05/2019 (End date (mm/yyyy))

Percent Occupancy at time of submission: 100%

4. Entrant (ASHRAE member with significant role in project):

a. Name: Sun-Yuan (Last) Suzan (First) Xu (Middle)

Membership Number: 5226640

Chapter: Illinois

Region: 6

b. Address (including country): 233 S. wacker Drive Suite 5300

Chicago (City) IL (State) 60091 (Zip) USA (Country)

c. Telephone: (O) 312-853-9401 d. Email: ssunyuan@esdglobal.com

e. Member's Role in Project: Lead Mechanical Engineer

f. Member's Signature:

5. Engineer of Record: Mehdi Jalayerian, PE, LEED AP

By affixing my signature above, I certify that the information contained in this application is accurate to the best of my knowledge. In addition, I certify that I have discussed this entry with the owner and have received permission from the owner to submit this project to the ASHRAE Technology Awards Competition.

Introduction

The recently completed 1.4 million square foot West Hall addition makes the Las Vegas Convention Center the second largest in the country. The Convention Center facility includes 601,960 square feet of exhibition space, 150,141 square feet of meeting rooms, and a 1000 customer capacity foodservice area with food courts, pantry, and kitchen. The West Hall is located at 300 Convention Center Drive in Las Vegas, Nevada. The facility connects to the existing Convention Center North Hall via a glass bridge across Paradise Road.

Systems Overview

The mechanical central plant contains four 1750-ton centrifugal chillers with variable frequency drives (VFD). Both the chilled water and heating hot water system are configured as variable primary and variable secondary systems. Four crossflow cooling towers are mounted on the roof of the exhibition hall area. Chillers and all pumps are furnished with VFDs.

Variable volume single-zone air handling units (AHU) utilizing fan arrays are designed for the exhibition halls and the main lobby. Variable volume medium pressure AHUs with variable air volume (VAV) terminal units are designed for the meeting room blocks, concourse areas, food hall, and back of house office areas.

Smoke management systems include atrium exhaust, exhibition hall exhaust, stair pressurization, pressurized egress corridor, and elevator hoistway pressurization.

Energy Efficiency

ESD completed an energy performance model utilizing Integrated Environmental Solutions Virtual Environment (IES VE Pro-2017). With the Photovoltaic panel installation, the project will realize a 29% saving compared with the energy cost baseline. These opportunities and savings include:

- Unique architectural elements including a “Ribbon Roof” generates external south facing shading devices for the south lobby and meeting room block.
- The chilled water plant supplies 38ºF with a return at 56ºF, with 3,000 feet of piping distribution, at reduced flow, the pump motor savings greatly outweighs the chiller operating cost penalty.
- 18 AHUs supply air at low discharge temperatures of 45 ºF and 50 ºF reduced airflow by 537,500 CFM. The associated fan operation energy has been realized.
- In addition to the air side economizer, a water side economizer is included as part of the design via a plate and frame heat exchanger to provide for all the 24/7 secondary cooling needs.
- Addressable, networked, centralized lighting controls, vacancy and occupancy sensors, dimming systems including daylight dimming systems were included to achieve optimum energy savings.

Indoor Air Quality

The building has large outdoor air requirements with reasonable energy consumption. The building was designed with airflow measuring stations at the outdoor air inlet, supply, and return for every air handling unit. Multiple CO2 sensors were installed at every high-density area, exhibition hall, the meeting center, and food hall.

The selection of building materials was carefully considered with low emissions of VOS.

Innovation

The building location in the Mohave Desert requires a cooling dominant system. The low-temperature air distribution design applied to a low-pressure single zone system results in a creative new approach. Specifically, the round diffuser throw pattern and distance were carefully analyzed based on the 45-foot installation height and the 45ºF supply discharge air temperature finalized in the design. This establishes the chilled water operation temperature range going forward. The AHU chilled water pressure independent control valve, fan array VFD, and AHUs distribution setting ensure the superior comfort performance for each exhibition hall. This air distribution approach provides for the dynamic and flexible load conditions with reduced CFM when needed to meet demand.

Based on the building occupancy and density, both atrium and exhibition halls require smoke exhaust. With a 116-foot-tall atrium, there is a total of 1,130,000 CFM for both atrium and exhibition halls required during the smoke mode. No mechanical makeup air is included under the current life safety system design. All makeup air will be provided during a smoke mode via powered exit doors or overhead doors. With the limited applications with the increased number of overhead doors using emergency power, compensating makeup air is delivered more effectively to occupancy egress routes. This method significantly reduced the points of failures which is a critical feature for a life safety system.

Utilizing our extensive experience in convention center design, the “floor port” concept has been incorporated into this project, utilizing various types of floor utility ports within the exhibition halls, the south lobby, and meeting centers. Modular heavy-duty floor ports in the exhibition halls are designed to overcome vehicle load to provide multiple electrical service voltages and plumbing drain service connections utilized by exhibitors during the convention. The same concept of modular design applies to natural gas, 100 PSI compressed air, and domestic water services for exhibitors to provide during the convention. These utility modules include different voltages for power distributed along with an overhead catwalk system.

Cost Effectiveness

As previously indicated, the low temperature chilled water approach results in a one-third GPM savings benefit, or approximately 4,700 GPM of pumping energy. The main chilled water header size was reduced to 20”. This leads to substantial cost savings not only in material, but also for pump sizing, pump drive/VFD, and electrical feeder sizes.

The same results in savings are reflected in the use of low temperature air on the buildings air handling systems. Again, the overall reduction of 537,500 CFM versus a conventional air system, creates savings on sheet metal weight, AHU quantities, fan drive/VFDs, electrical feeders and wiring, associated control valves and dampers, and mechanical room sizes thereby providing substantial savings to the project

The energy stored in chilled water extensive piping network can be utilized as the thermal mass to support off-hours secondary cooling up to 12 hours. This design approach reduces the need for emergency power backup to the main chiller, main pumps, and cooling tower. EM power is provided only to critical 24/7 cooling units, associated inline pumps, and backup exhaust fans. This concept allowed for the compacted emergency power generator and associated distribution system.

With the AHJ’s approval, a 5 PSI natural gas distribution piping is delivered from the west incoming service location and distributed internally to each exhibition hall for exhibitor use. Operating at the higher pressure, a savings in pipe sizing was realized of approximately 1500 ft of welded schedule 40 carbon steel piping. Utilizing 4160V medium voltage fed from the west entrance to substations located along the exhibition halls., approximately 1500 feet of feeder size was markedly reduced in lieu of a conventional larger 460V busway distribution thereby providing a savings to the project. Chillers were designed to operate at 4160V with VFD’s to provide energy savings for the project.

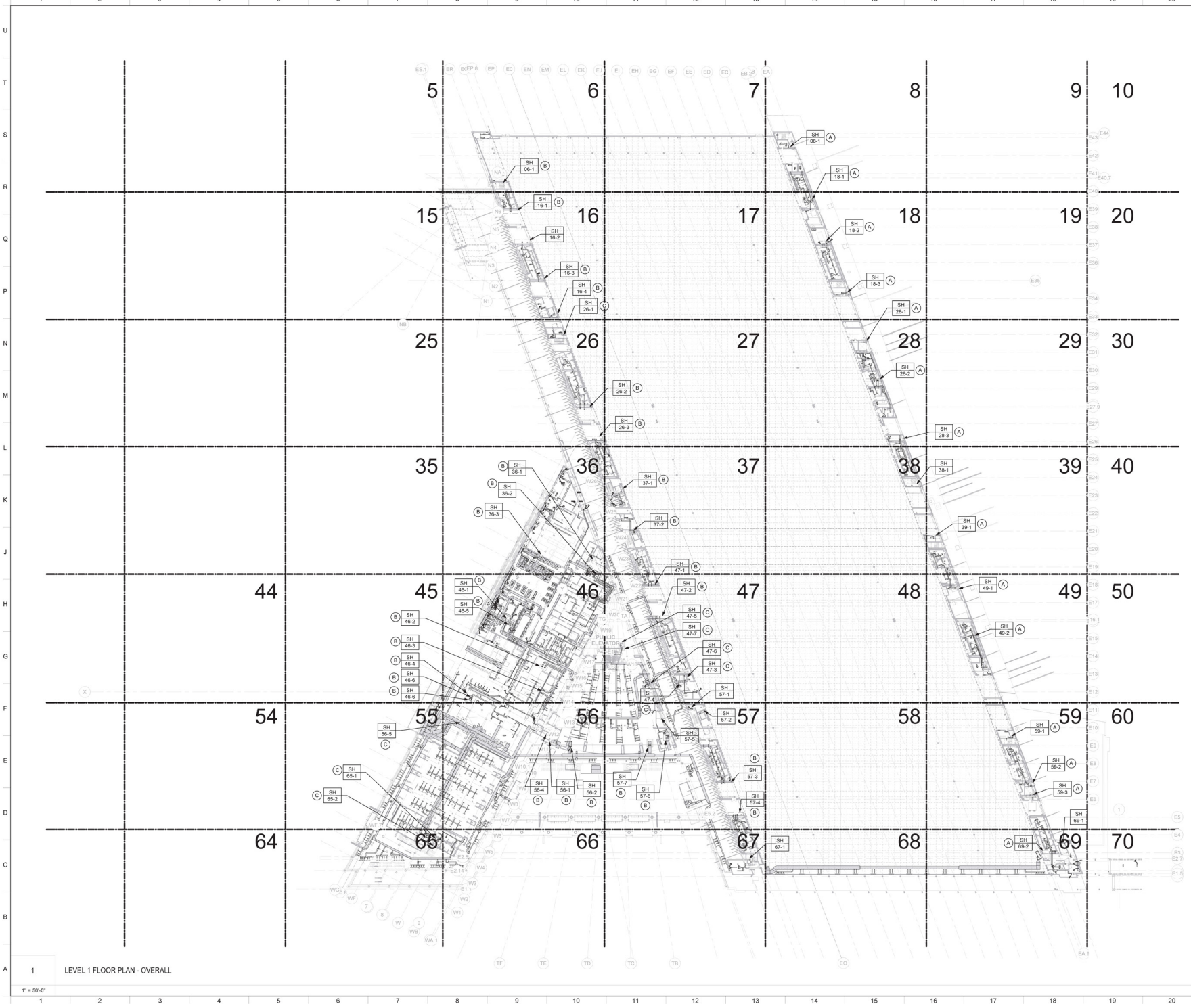
Operation and Maintenance

With the construction of the new Convention Center addition, the operators now have another central plant to maintain. Variable primary and variable secondary chilled water distribution allows for a stable and robust operation. The chillers and associated primary pumps operate more independently against the secondary distribution loop.

Local atmospheric conditions drive the condenser water treatment system with three layers of filtration: the spray pump package to rinse the cold-water basin, the basket strainer, and the centrifugal hydro cyclone air and dirt separator which remove the particulate from the water distribution piping. These three processes help to prolong the life of chillers and reduce the maintenance required for the condenser systems.

Environmental Impact

R-1233zd is the refrigerant utilized on the four centrifugal chillers. Low-flow water fixtures are utilized in this project. Cooling tower makeup water is also metered and interfaced with BAS.



1 LEVEL 1 FLOOR PLAN - OVERALL

1" = 50'-0"

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KEYNOTE LEGEND

KEYNOTES:

A. SHAFT TOP ENCLOSED WITH THE SAME FIRE RATED AS THE SHAFT WALL ON 2.5 LEVEL.
B. SHAFT IS EXTENDED TO CEILING CAVITY. BOTTOM ENCLOSURE HAS THE SAME FIRE RATED AS THE SHAFT WALL.
C. SHAFT TOP ENCLOSED WITH THE SAME FIRE RATED AS THE SHAFT WALL BELOW ROOF. SHAFT IS EXTENDED TO CEILING CAVITY. BOTTOM ENCLOSURE HAS THE SAME FIRE RATED AS THE SHAFT WALL

KEY PLAN

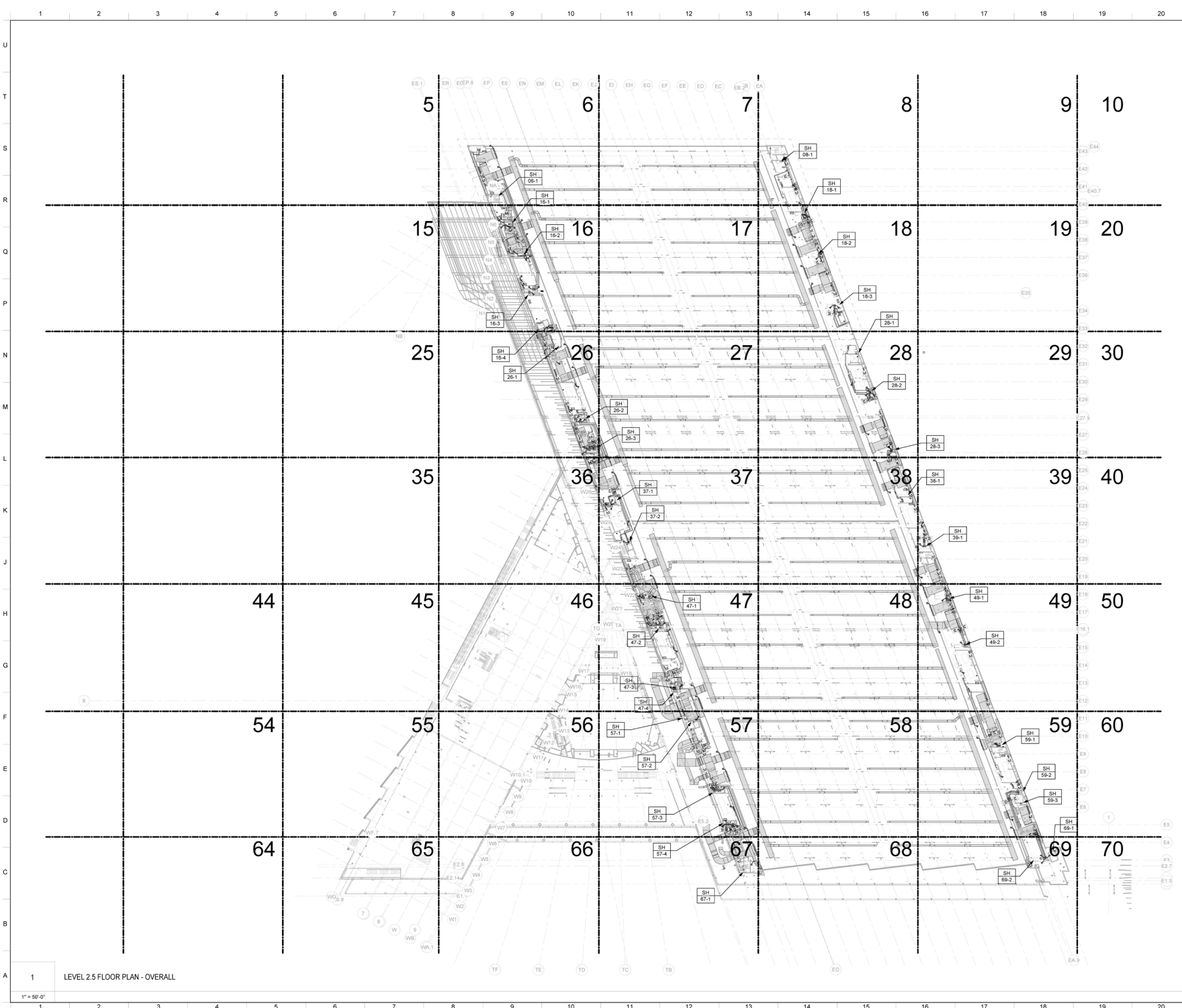
NO.	REVISIONS/ SUBMISSIONS	DATE
8	Delta 43 - Construction Document Revisions	SEP 11, 2019
7	CONSTRUCTION DOCUMENTS	MAY 14, 2019
6	Construction Documents Progress Set 3	APR 18, 2019
5	Construction Documents Progress Set 2	FEB 8, 2019
4	Building Permit	NOV 29, 2018
3	Construction Documents Progress Set 1	NOV 28, 2018
2	Design Development	SEP 17, 2018
1	Design Development Progress Set 1 - GMP	JULY 17, 2018

LAS VEGAS CONVENTION CENTER
PHASE TWO EXPANSION
CONVENTION CENTER DISTRICT LAS VEGAS, NEVADA

Drawing
LEVEL 1 - OVERALL FLOOR PLAN

Seal | Project No. 53005 | Date 07/17/2018 | Scale 1" = 50'-0" | Drawing **MD.0110**

VOLUME 4.1



1 LEVEL 2.5 FLOOR PLAN - OVERALL

1" = 50'-0"

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Scales as stated hereon are valid on the original drawing, the dimensions of which are 36x48 inches. These scales noted hereon are hereby changed by the ratio of the overall sheet dimensions of the print to the corresponding dimensions of the original drawing.

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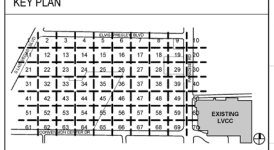
KEYNOTE LEGEND

GENERAL NOTES:

1. OUTSIDE AIR AND EXHAUST AIR DUCTWORK WITHIN THE 2.5 LEVEL MECHANICAL ROOMS HAVE BEEN REDUCED IN SIZE TO REFLECT OWNER ACCEPTED VALUE ENGINEERING CONCEPT OF INCREASED DUCT VELOCITIES AND REMOVAL OF "PLENUM BOXES". FURTHER REDUCTION OF OA/EXH DUCT MAINS WOULD FIRST REQUIRE CONTRACTOR TO REVIEW SUPPLY AND RETURN FANS PRESSURE CAPABILITIES TO AFFORD FURTHER INCREASE IN DUCTWORK VELOCITIES AND PRESSURE DROP

KEY PLAN



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LAS VEGAS CONVENTION CENTER
PHASE TWO EXPANSION
CONVENTION CENTER DISTRICT LAS VEGAS, NEVADA

Drawing
LEVEL 2.5 - OVERALL FLOOR PLAN

Seal | Project No. 53005 | Date 07/17/2018 | Scale 1" = 50'-0" | Drawing **MD.0125**

VOLUME 4.1