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AABC Commissioning Group
AIA Provider Number 50111116

# Commissioning of the Mercedes-Benz Stadium: The Best or Nothing

Course Number: CXENERGY1936


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***John McFarland***
***WorkingBuildings***

April 17, 2019

Credit(s) earned on completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

This course is registered with AIA CES

# Course Description

**Commissioning of the Mercedes-Benz Stadium**
**Massive Project - Details Matter**

The Mercedes-Benz Stadium in Atlanta is essentially a small city, with a myriad of space uses, systems and equipment to support them all. This presentation demonstrates how commissioning activities were incorporated as early as possible into the construction schedule, reveals how Cx data was tracked to resolution, and highlights Cx activities for the stadium's remarkable 1.2 million gallon rainwater retention and re-use system.

# Learning Objectives

At the end of the this course, participants will be able to:

1. How to effectively deliver large and complex project management.
2. How to facilitate equipment maintenance during construction.
3. Understand lessons learned from commissioning a large water retention system.
4. How to orchestrate a global test on a scale such as the Mercedes Benz Stadium.


GOOOOOOOOAL!
ATLANTA UNITED
Mercedes-Benz Stadium


#RISEUP
#RISEUP
@Atlanta_Falcons RT if you're #ProudToBeAFanOf the Falcons! @TailgateTeam Keep
@Atlanta_Falcons alumni players! @Atlanta_Falcons RT if you're #ProudToBeAFanOf the Falcons!

# A City Inside A City

- 173 M cubic feet within the bowl area.
- 1.2 M CFM of conditioned air for arena via 12 100K CFM fan array AHUs @ 18 Fans ea.
- Plus additional 820K CFM via 52 AHUs serving the rest of the areas.
- ETFE (Ethylene tetrafluoroethylene) Clear/fritted building skin
- 8,400 Nominal Tons of cooling capacity
- 400+ pages BAS Sequence Document outlining the various systems and operational metrics.
- Both air-side and hydronic economization provisions/systems
- Computational Fluid Dynamic Models utilized to optimize heating and cooling as well as ensuring HVAC systems do not impact game play.
- Waterless urinals and rainwater harvesting utilization in CT make-up and irrigation.
- 32 separate Kitchens + 86 individual atmosphere monitored beverage areas

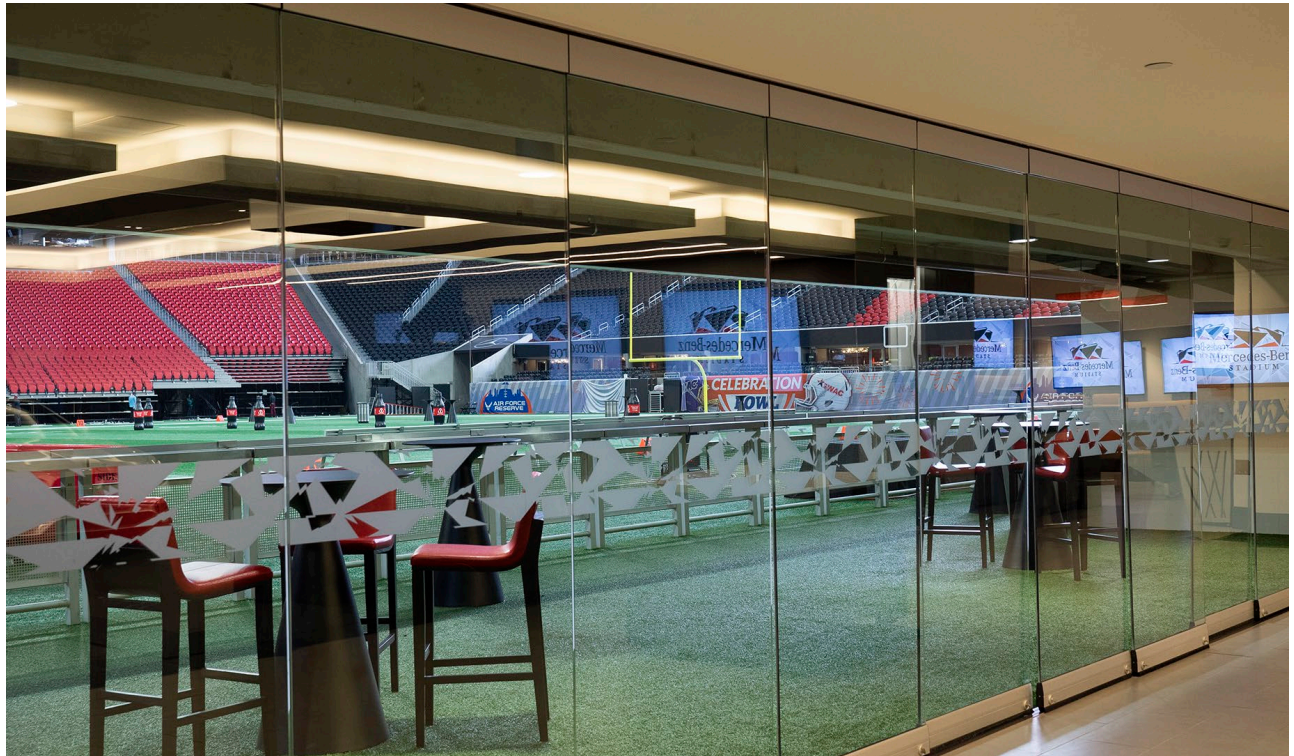

Mercedes-AMG


EXIT


EXIT
Mercedes-Benz
STADIUM


AMG


TRINCHERO
FAMILY OF WINES
Mercedes-Benz
STADIUM
Mercedes-Benz
STADIUM
Mercedes-Benz
STADIUM


CELEBRATION
NOW


TOURS


Mercedes-Benz STADIUM
ENTRY
Gameday's favorite light lager.
BUD LIGHT
BUD LIGHT


TOUCHDOWN!
BOOM
URBAN LICKS

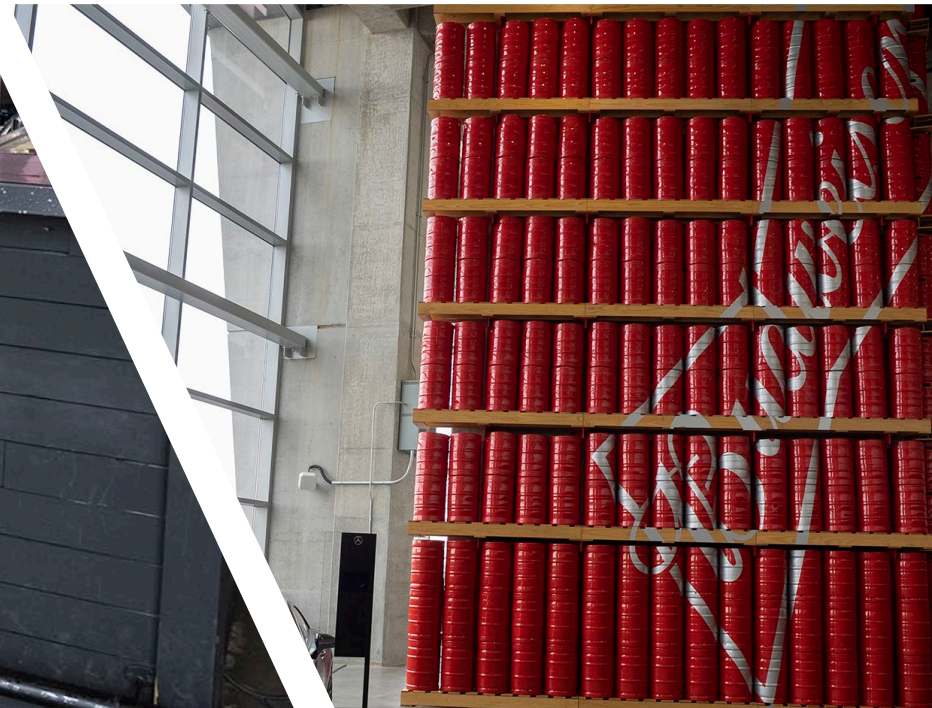

GULLWING
CLUB


BROTHERHOOD

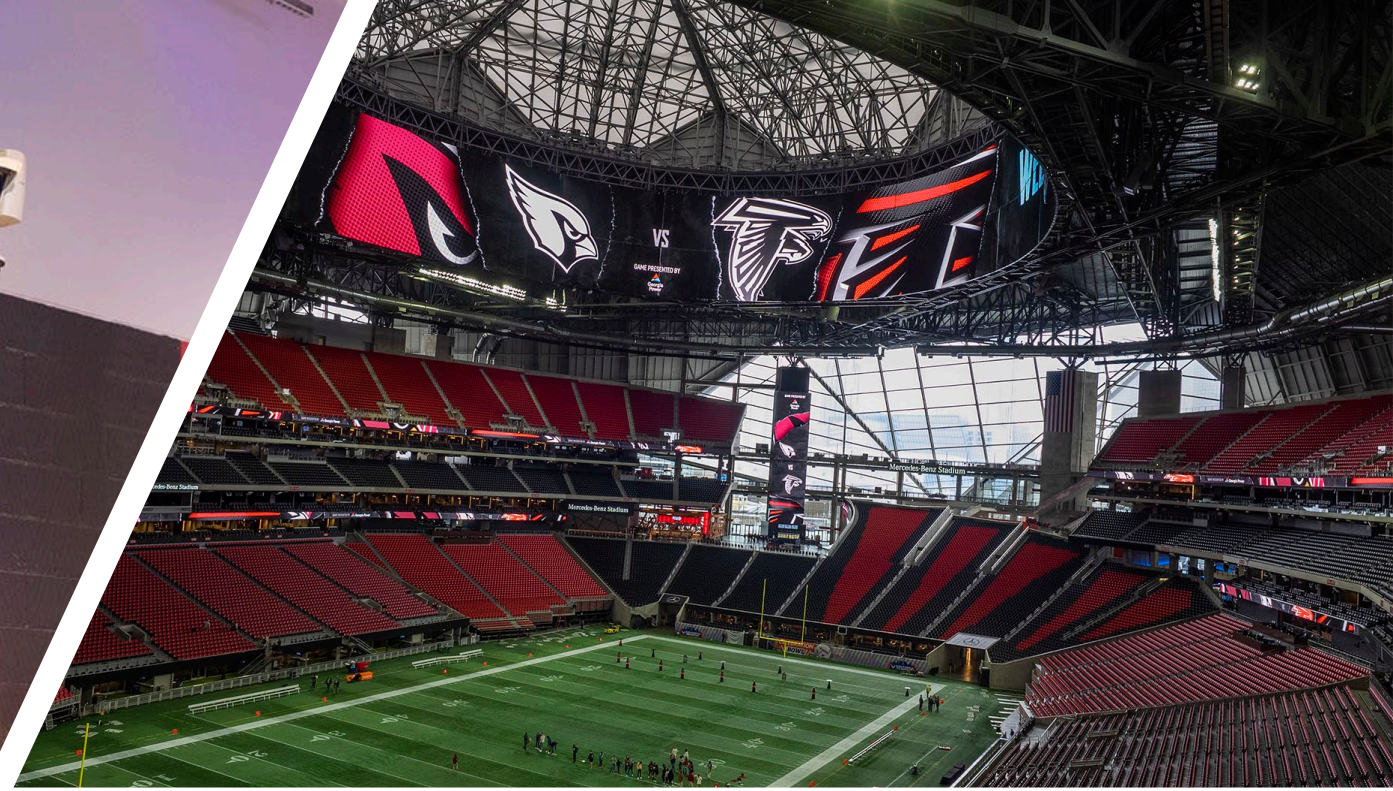

LANGFORD
GRACE
TAVECCHIO
GRAHAM
24
ATLANTA FALCONS
OUR
BROTHERHOO
IS AN UNWAVERING KIN


JACK DANIEL'S
Making Whiskey and Friends Since 1866
No 7
BRAND


EXIT




ATLANTA
UNITED FC
UNITE & CONQUER


VS
Mercedes-Benz Stadium


PILLARS OF CHARACTER
UNITY
EXCELLENCE
///WE EXCEED EXPECTATIONS.
COMMUNITY
///WE ARE STRONG FAR BEYOND THE PITCH.
DETERMINATION
EXIT

# Vision and Approach


- Each part of the city was handled differently
- A bunch of small projects
- Divide, Unite & Conquer
- United within the team, process and CxAlloy

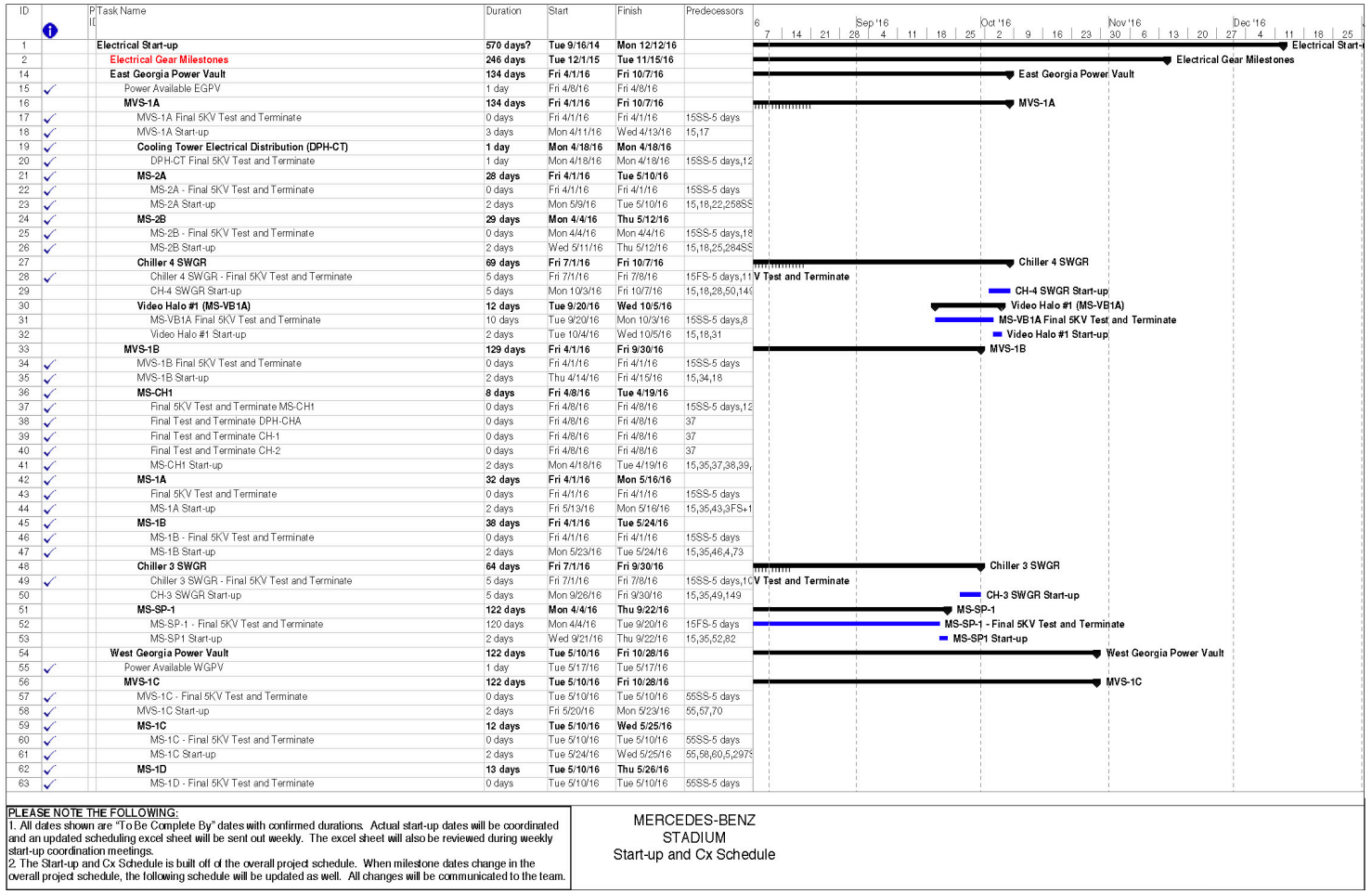
# Large Scale Approach

- Break the systems down into components:
  - Mechanical – Chilled Water, Heating Hot Water, Air
  - Plumbing – Natural Gas, Sanitary/Waste & Vent, Reclaimed Water
  - Electrical – Distribution, Branch, Normal and Stand-by

- Further break the systems down into functional areas:
  - Kitchen
  - Support
  - Office use
  - Locker
  - AV production
  - Data Center
  - Event Area

# Complex Project Management

- How were commissioning services incorporated into the construction schedule?
- Why put off till tomorrow that which you can do today?
- We DROVE the commissioning process into the construction schedule….like a linebacker.



| ID | Task Name | Duration | Start | Finish | Predecessors |
|---|---|---|---|---|---|
| 1 | **Electrical Start-up** | **570 days?** | **Tue 9/16/14** | **Mon 12/12/16** | |
| 2 | **Electrical Gear Milestones** | **246 days** | **Tue 12/1/15** | **Tue 11/15/16** | |
| 14 | **East Georgia Power Vault** | **134 days** | **Fri 4/1/16** | **Fri 10/7/16** | |
| 15 | Power Available EGPV | 1 day | Fri 4/8/16 | Fri 4/8/16 | |
| 16 | **MVS-1A** | **134 days** | **Fri 4/1/16** | **Fri 10/7/16** | |
| 17 | MVS-1A Final 5KV Test and Terminate | 0 days | Fri 4/1/16 | Fri 4/1/16 | 15SS-5 days |
| 18 | MVS-1A Start-up | 3 days | Mon 4/11/16 | Wed 4/13/16 | 15,17 |
| 19 | **Cooling Tower Electrical Distribution (DPH-CT)** | **1 day** | **Mon 4/18/16** | **Mon 4/18/16** | |
| 20 | DPH-CT Final 5KV Test and Terminate | 1 day | Mon 4/18/16 | Mon 4/18/16 | 15SS-5 days,12 |
| 21 | **MS-2A** | **28 days** | **Fri 4/1/16** | **Tue 5/10/16** | |
| 22 | MS-2A - Final 5KV Test and Terminate | 0 days | Fri 4/1/16 | Fri 4/1/16 | 15SS-5 days |
| 23 | MS-2A Start-up | 2 days | Mon 5/9/16 | Tue 5/10/16 | 15,18,22,258SS |
| 24 | **MS-2B** | **29 days** | **Mon 4/4/16** | **Thu 5/12/16** | |
| 25 | MS-2B - Final 5KV Test and Terminate | 0 days | Mon 4/4/16 | Mon 4/4/16 | 15SS-5 days,18 |
| 26 | MS-2B Start-up | 2 days | Wed 5/11/16 | Thu 5/12/16 | 15,18,25,284SS |
| 27 | **Chiller 4 SWGR** | **69 days** | **Fri 7/1/16** | **Fri 10/7/16** | |
| 28 | Chiller 4 SWGR - Final 5KV Test and Terminate | 5 days | Fri 7/1/16 | Fri 7/8/16 | 15FS-5 days,11 |
| 29 | CH-4 SWGR Start-up | 5 days | Mon 10/3/16 | Fri 10/7/16 | 15,18,28,50,149 |
| 30 | **Video Halo #1 (MS-VB1A)** | **12 days** | **Tue 9/20/16** | **Wed 10/5/16** | |
| 31 | MS-VB1A Final 5KV Test and Terminate | 10 days | Tue 9/20/16 | Mon 10/3/16 | 15SS-5 days,8 |
| 32 | Video Halo #1 Start-up | 2 days | Tue 10/4/16 | Wed 10/5/16 | 15,18,31 |
| 33 | **MVS-1B** | **129 days** | **Fri 4/1/16** | **Fri 9/30/16** | |
| 34 | MVS-1B Final 5KV Test and Terminate | 0 days | Fri 4/1/16 | Fri 4/1/16 | 15SS-5 days |
| 35 | MVS-1B Start-up | 2 days | Thu 4/14/16 | Fri 4/15/16 | 15,34,18 |
| 36 | **MS-CH1** | **8 days** | **Fri 4/8/16** | **Tue 4/19/16** | |
| 37 | Final 5KV Test and Terminate MS-CH1 | 0 days | Fri 4/8/16 | Fri 4/8/16 | 15SS-5 days,12 |
| 38 | Final Test and Terminate DPH-CHA | 0 days | Fri 4/8/16 | Fri 4/8/16 | 37 |
| 39 | Final Test and Terminate CH-1 | 0 days | Fri 4/8/16 | Fri 4/8/16 | 37 |
| 40 | Final Test and Terminate CH-2 | 0 days | Fri 4/8/16 | Fri 4/8/16 | 37 |
| 41 | MS-CH1 Start-up | 2 days | Mon 4/18/16 | Tue 4/19/16 | 15,35,37,38,39, |
| 42 | **MS-1A** | **32 days** | **Fri 4/1/16** | **Mon 5/16/16** | |
| 43 | Final 5KV Test and Terminate | 0 days | Fri 4/1/16 | Fri 4/1/16 | 15SS-5 days |
| 44 | MS-1A Start-up | 2 days | Fri 5/13/16 | Mon 5/16/16 | 15,35,43,3FS+1 |
| 45 | **MS-1B** | **38 days** | **Fri 4/1/16** | **Tue 5/24/16** | |
| 46 | MS-1B - Final 5KV Test and Terminate | 0 days | Fri 4/1/16 | Fri 4/1/16 | 15SS-5 days |
| 47 | MS-1B Start-up | 2 days | Mon 5/23/16 | Tue 5/24/16 | 15,35,46,4,73 |
| 48 | **Chiller 3 SWGR** | **64 days** | **Fri 7/1/16** | **Fri 9/30/16** | |
| 49 | Chiller 3 SWGR - Final 5KV Test and Terminate | 5 days | Fri 7/1/16 | Fri 7/8/16 | 15SS-5 days,10 |
| 50 | CH-3 SWGR Start-up | 5 days | Mon 9/26/16 | Fri 9/30/16 | 15,35,49,149 |
| 51 | **MS-SP-1** | **122 days** | **Mon 4/4/16** | **Thu 9/22/16** | |
| 52 | MS-SP-1 - Final 5KV Test and Terminate | 120 days | Mon 4/4/16 | Tue 9/20/16 | 15FS-5 days |
| 53 | MS-SP1 Start-up | 2 days | Wed 9/21/16 | Thu 9/22/16 | 15,35,52,82 |
| 54 | **West Georgia Power Vault** | **122 days** | **Tue 5/10/16** | **Fri 10/28/16** | |
| 55 | Power Available WGPV | 1 day | Tue 5/17/16 | Tue 5/17/16 | |
| 56 | **MVS-1C** | **122 days** | **Tue 5/10/16** | **Fri 10/28/16** | |
| 57 | MVS-1C - Final 5KV Test and Terminate | 0 days | Tue 5/10/16 | Tue 5/10/16 | 55SS-5 days |
| 58 | MVS-1C Start-up | 2 days | Fri 5/20/16 | Mon 5/23/16 | 55,57,70 |
| 59 | **MS-1C** | **12 days** | **Tue 5/10/16** | **Wed 5/25/16** | |
| 60 | MS-1C - Final 5KV Test and Terminate | 0 days | Tue 5/10/16 | Tue 5/10/16 | 55SS-5 days |
| 61 | MS-1C Start-up | 2 days | Tue 5/24/16 | Wed 5/25/16 | 55,58,60,5,297S |
| 62 | **MS-1D** | **13 days** | **Tue 5/10/16** | **Thu 5/26/16** | |
| 63 | MS-1D - Final 5KV Test and Terminate | 0 days | Tue 5/10/16 | Tue 5/10/16 | 55SS-5 days |



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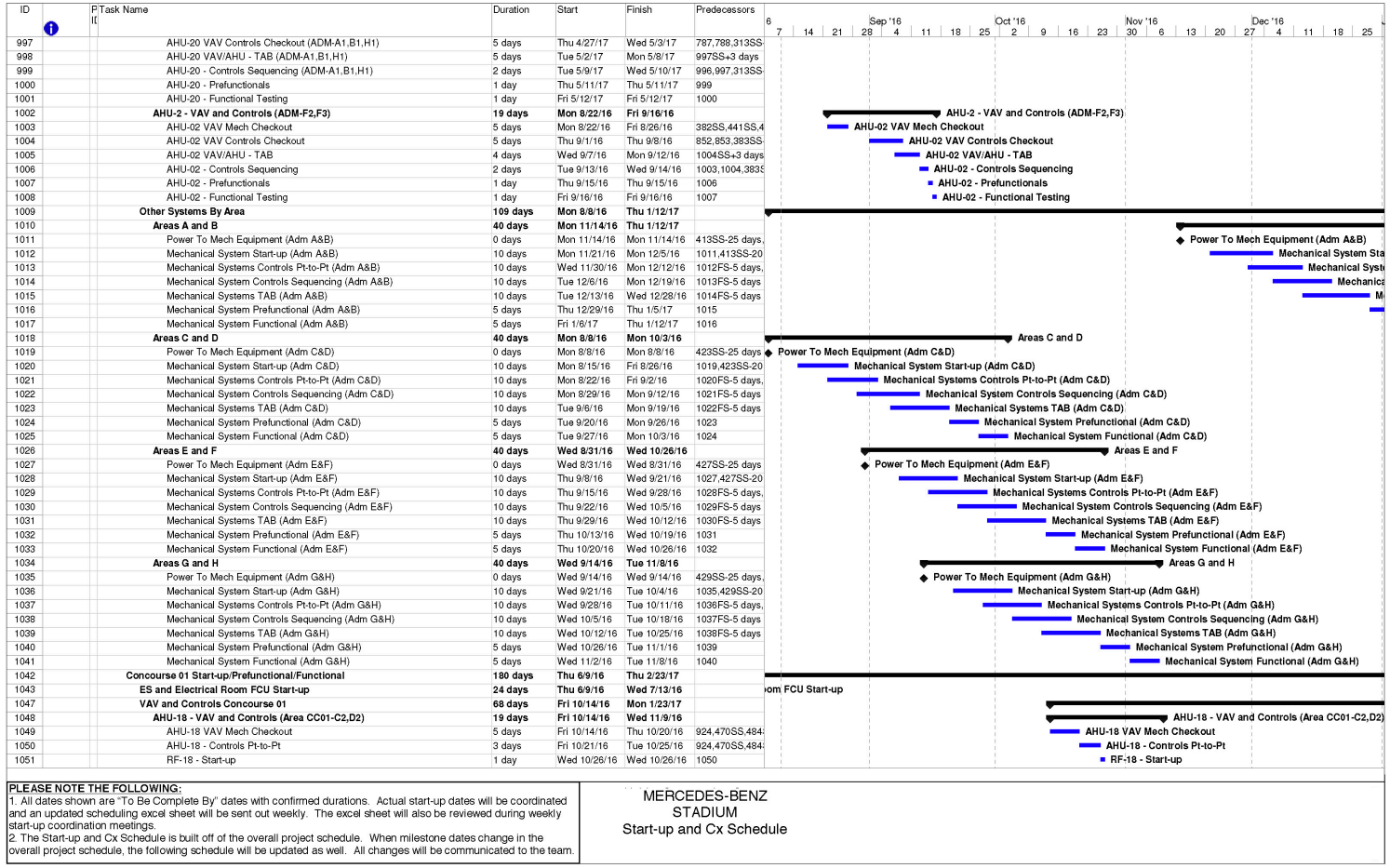
2. The Start-up and Cx Schedule is built off of the overall project schedule. When milestone dates change in the overall project schedule, the following schedule will be updated as well. All changes will be communicated to the team.

MERCEDES-BENZ
STADIUM
Start-up and Cx Schedule

# Complex Project Management

- We completed incremental portions of the testing ie. Safeties, Devices, Sequences, Graphics, Alarms
- DID not wait until “ready” we identified levels of ready and monitored directly in the field.
- Removed the constraints of testing.



| ID | Task Name | Duration | Start | Finish | Predecessors |
|---|---|---|---|---|---|
| 997 | AHU-20 VAV Controls Checkout (ADM-A1,B1,H1) | 5 days | Thu 4/27/17 | Wed 5/3/17 | 787,788,313SS |
| 998 | AHU-20 VAV/AHU - TAB (ADM-A1,B1,H1) | 5 days | Tue 5/2/17 | Mon 5/8/17 | 997SS+3 days |
| 999 | AHU-20 - Controls Sequencing (ADM-A1,B1,H1) | 2 days | Tue 5/9/17 | Wed 5/10/17 | 996,997,313SS |
| 1000 | AHU-20 - Prefunctionals | 1 day | Thu 5/11/17 | Thu 5/11/17 | 999 |
| 1001 | AHU-20 - Functional Testing | 1 day | Fri 5/12/17 | Fri 5/12/17 | 1000 |
| 1002 | **AHU-2 - VAV and Controls (ADM-F2,F3)** | **19 days** | **Mon 8/22/16** | **Fri 9/16/16** | |
| 1003 | AHU-02 VAV Mech Checkout | 5 days | Mon 8/22/16 | Fri 8/26/16 | 382SS,441SS,4 |
| 1004 | AHU-02 VAV Controls Checkout | 5 days | Thu 9/1/16 | Thu 9/8/16 | 852,853,383SS |
| 1005 | AHU-02 VAV/AHU - TAB | 4 days | Wed 9/7/16 | Mon 9/12/16 | 1004SS+3 days |
| 1006 | AHU-02 - Controls Sequencing | 2 days | Tue 9/13/16 | Wed 9/14/16 | 1003,1004,383S |
| 1007 | AHU-02 - Prefunctionals | 1 day | Thu 9/15/16 | Thu 9/15/16 | 1006 |
| 1008 | AHU-02 - Functional Testing | 1 day | Fri 9/16/16 | Fri 9/16/16 | 1007 |
| 1009 | **Other Systems By Area** | **109 days** | **Mon 8/8/16** | **Thu 1/12/17** | |
| 1010 | **Areas A and B** | **40 days** | **Mon 11/14/16** | **Thu 1/12/17** | |
| 1011 | Power To Mech Equipment (Adm A&B) | 0 days | Mon 11/14/16 | Mon 11/14/16 | 413SS-25 days |
| 1012 | Mechanical System Start-up (Adm A&B) | 10 days | Mon 11/21/16 | Mon 12/5/16 | 1011,413SS-20 |
| 1013 | Mechanical Systems Controls Pt-to-Pt (Adm A&B) | 10 days | Wed 11/30/16 | Mon 12/12/16 | 1012FS-5 days, |
| 1014 | Mechanical System Controls Sequencing (Adm A&B) | 10 days | Tue 12/6/16 | Mon 12/19/16 | 1013FS-5 days |
| 1015 | Mechanical Systems TAB (Adm A&B) | 10 days | Tue 12/13/16 | Wed 12/28/16 | 1014FS-5 days |
| 1016 | Mechanical System Prefunctional (Adm A&B) | 5 days | Thu 12/29/16 | Thu 1/5/17 | 1015 |
| 1017 | Mechanical System Functional (Adm A&B) | 5 days | Fri 1/6/17 | Thu 1/12/17 | 1016 |
| 1018 | **Areas C and D** | **40 days** | **Mon 8/8/16** | **Mon 10/3/16** | |
| 1019 | Power To Mech Equipment (Adm C&D) | 0 days | Mon 8/8/16 | Mon 8/8/16 | 423SS-25 days |
| 1020 | Mechanical System Start-up (Adm C&D) | 10 days | Mon 8/15/16 | Fri 8/26/16 | 1019,423SS-20 |
| 1021 | Mechanical Systems Controls Pt-to-Pt (Adm C&D) | 10 days | Mon 8/22/16 | Fri 9/2/16 | 1020FS-5 days, |
| 1022 | Mechanical System Controls Sequencing (Adm C&D) | 10 days | Mon 8/29/16 | Mon 9/12/16 | 1021FS-5 days |
| 1023 | Mechanical Systems TAB (Adm C&D) | 10 days | Tue 9/6/16 | Mon 9/19/16 | 1022FS-5 days |
| 1024 | Mechanical System Prefunctional (Adm C&D) | 5 days | Tue 9/20/16 | Mon 9/26/16 | 1023 |
| 1025 | Mechanical System Functional (Adm C&D) | 5 days | Tue 9/27/16 | Mon 10/3/16 | 1024 |
| 1026 | **Areas E and F** | **40 days** | **Wed 8/31/16** | **Wed 10/26/16** | |
| 1027 | Power To Mech Equipment (Adm E&F) | 0 days | Wed 8/31/16 | Wed 8/31/16 | 427SS-25 days |
| 1028 | Mechanical System Start-up (Adm E&F) | 10 days | Thu 9/8/16 | Wed 9/21/16 | 1027,427SS-20 |
| 1029 | Mechanical Systems Controls Pt-to-Pt (Adm E&F) | 10 days | Thu 9/15/16 | Wed 9/28/16 | 1028FS-5 days, |
| 1030 | Mechanical System Controls Sequencing (Adm E&F) | 10 days | Thu 9/22/16 | Wed 10/5/16 | 1029FS-5 days |
| 1031 | Mechanical Systems TAB (Adm E&F) | 10 days | Thu 9/29/16 | Wed 10/12/16 | 1030FS-5 days |
| 1032 | Mechanical System Prefunctional (Adm E&F) | 5 days | Thu 10/13/16 | Wed 10/19/16 | 1031 |
| 1033 | Mechanical System Functional (Adm E&F) | 5 days | Thu 10/20/16 | Wed 10/26/16 | 1032 |
| 1034 | **Areas G and H** | **40 days** | **Wed 9/14/16** | **Tue 11/8/16** | |
| 1035 | Power To Mech Equipment (Adm G&H) | 0 days | Wed 9/14/16 | Wed 9/14/16 | 429SS-25 days |
| 1036 | Mechanical System Start-up (Adm G&H) | 10 days | Wed 9/21/16 | Tue 10/4/16 | 1035,429SS-20 |
| 1037 | Mechanical Systems Controls Pt-to-Pt (Adm G&H) | 10 days | Wed 9/28/16 | Tue 10/11/16 | 1036FS-5 days, |
| 1038 | Mechanical System Controls Sequencing (Adm G&H) | 10 days | Wed 10/5/16 | Tue 10/18/16 | 1037FS-5 days |
| 1039 | Mechanical Systems TAB (Adm G&H) | 10 days | Wed 10/12/16 | Tue 10/25/16 | 1038FS-5 days |
| 1040 | Mechanical System Prefunctional (Adm G&H) | 5 days | Wed 10/26/16 | Tue 11/1/16 | 1039 |
| 1041 | Mechanical System Functional (Adm G&H) | 5 days | Wed 11/2/16 | Tue 11/8/16 | 1040 |
| 1042 | **Concourse 01 Start-up/Prefunctional/Functional** | **180 days** | **Thu 6/9/16** | **Thu 2/23/17** | |
| 1043 | **ES and Electrical Room FCU Start-up** | **24 days** | **Thu 6/9/16** | **Wed 7/13/16** | |
| 1047 | **VAV and Controls Concourse 01** | **68 days** | **Fri 10/14/16** | **Mon 1/23/17** | |
| 1048 | **AHU-18 - VAV and Controls (Area CC01-C2,D2)** | **19 days** | **Fri 10/14/16** | **Wed 11/9/16** | |
| 1049 | AHU-18 VAV Mech Checkout | 5 days | Fri 10/14/16 | Thu 10/20/16 | 924,470SS,484 |
| 1050 | AHU-18 - Controls Pt-to-Pt | 3 days | Fri 10/21/16 | Tue 10/25/16 | 924,470SS,484 |
| 1051 | RF-18 - Start-up | 1 day | Wed 10/26/16 | Wed 10/26/16 | 1050 |



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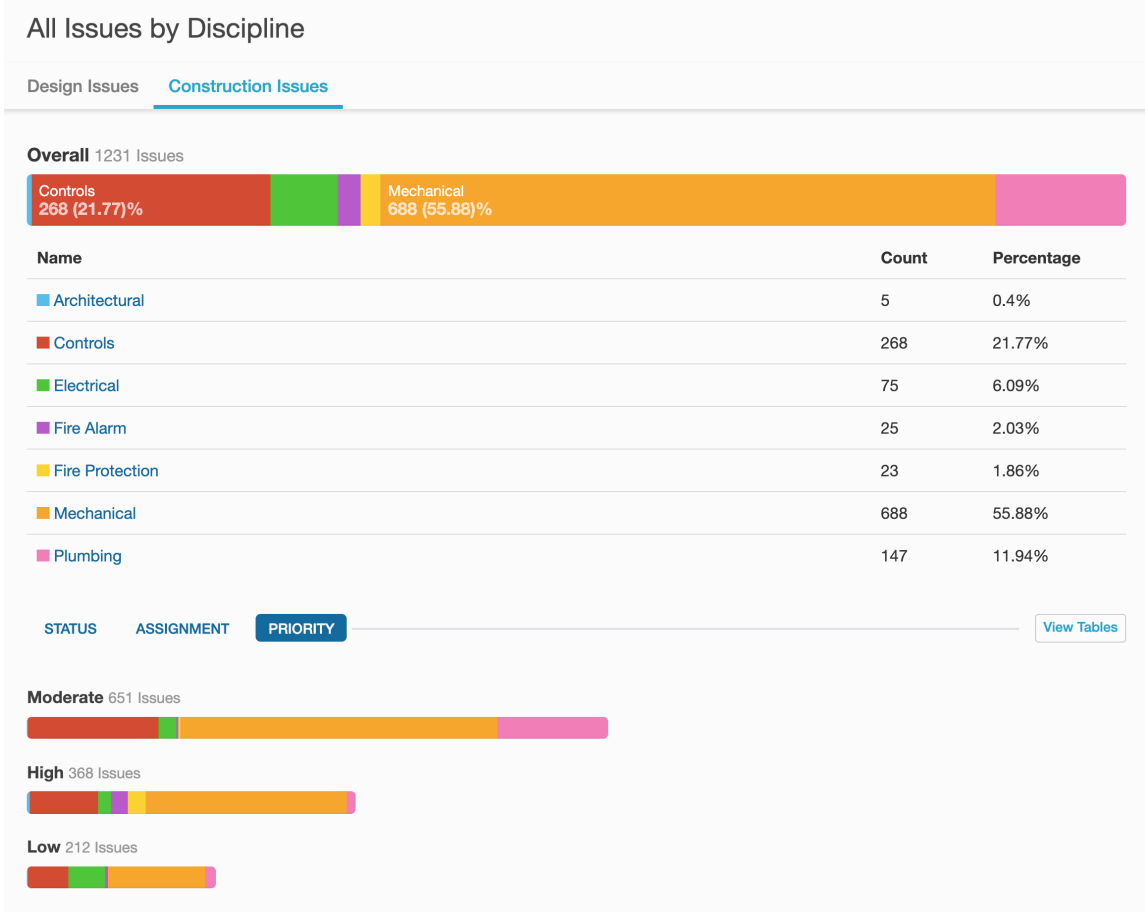
MERCEDES-BENZ
STADIUM
Start-up and Cx Schedule

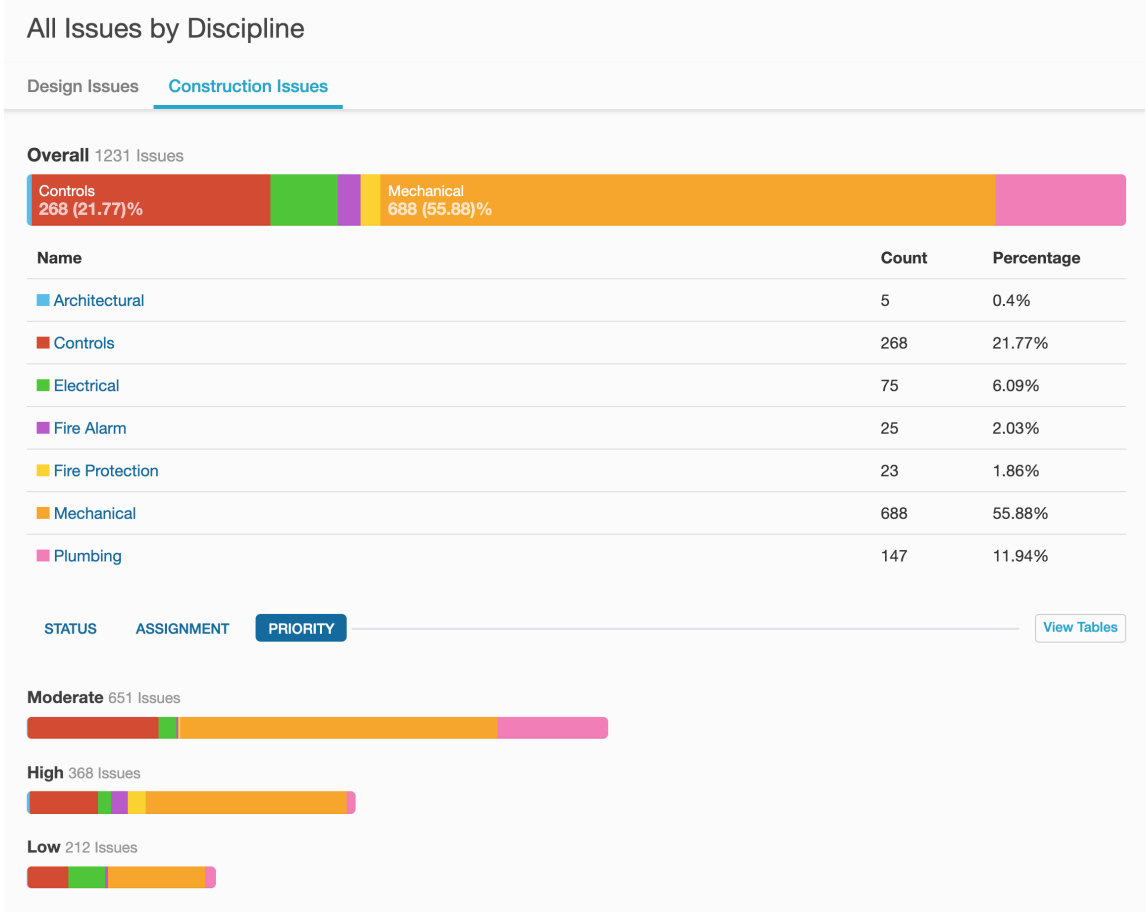
# Commissioning Highlights

- **Critical integrated testing** – 80+ individuals weeks in the planning phase. Identified multiple issues, but nothing critical failed due to previously Cx'd systems
- **MegaFlush Test** – 300+ individuals simulating full house (70,000+) event restroom break (AKA halftime) ~3,500 GPM @ 90 PSI.



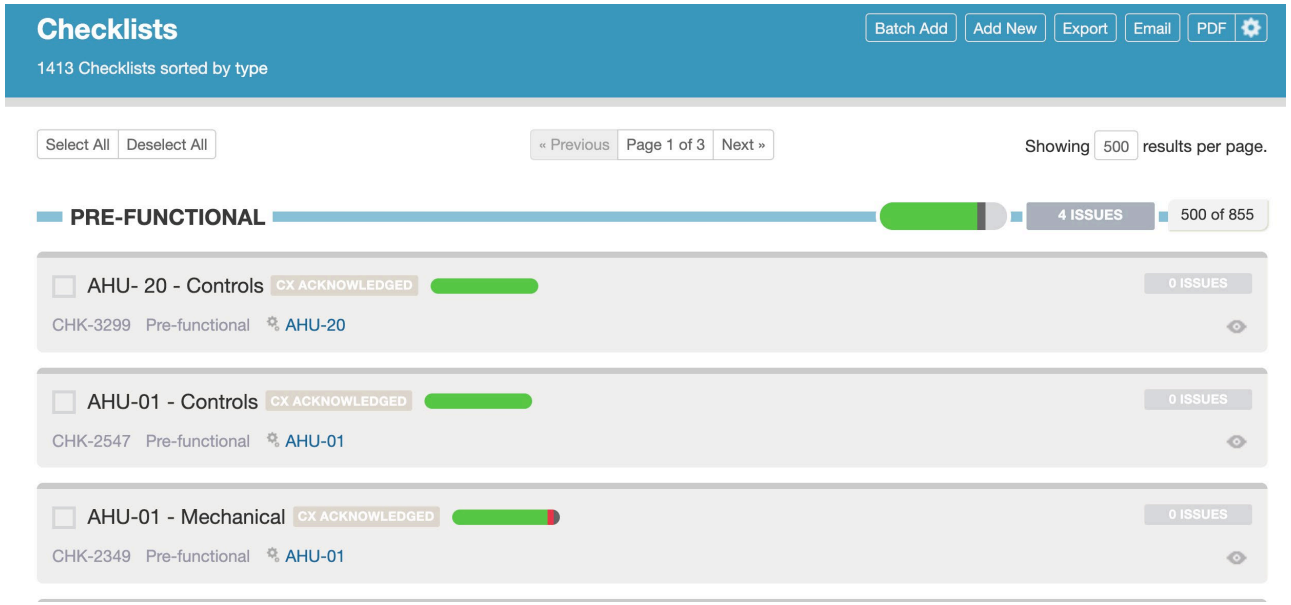
# Commissioning Highlights

- **Programmed building** “Modes” – Condensation mitigation due to ETFE, Pre-event, High occupancy event, Low Occupancy event, Post event (moisture removal), Occupied Non-Event
- **Implementation of energy conservation measures** – Time weighted average ventilation requirements: If event occupancy < 45,000 = Demand control ventilation, If event occupancy > 45,000 = Time weighted average and begin ventilation ~12 hours prior to event.

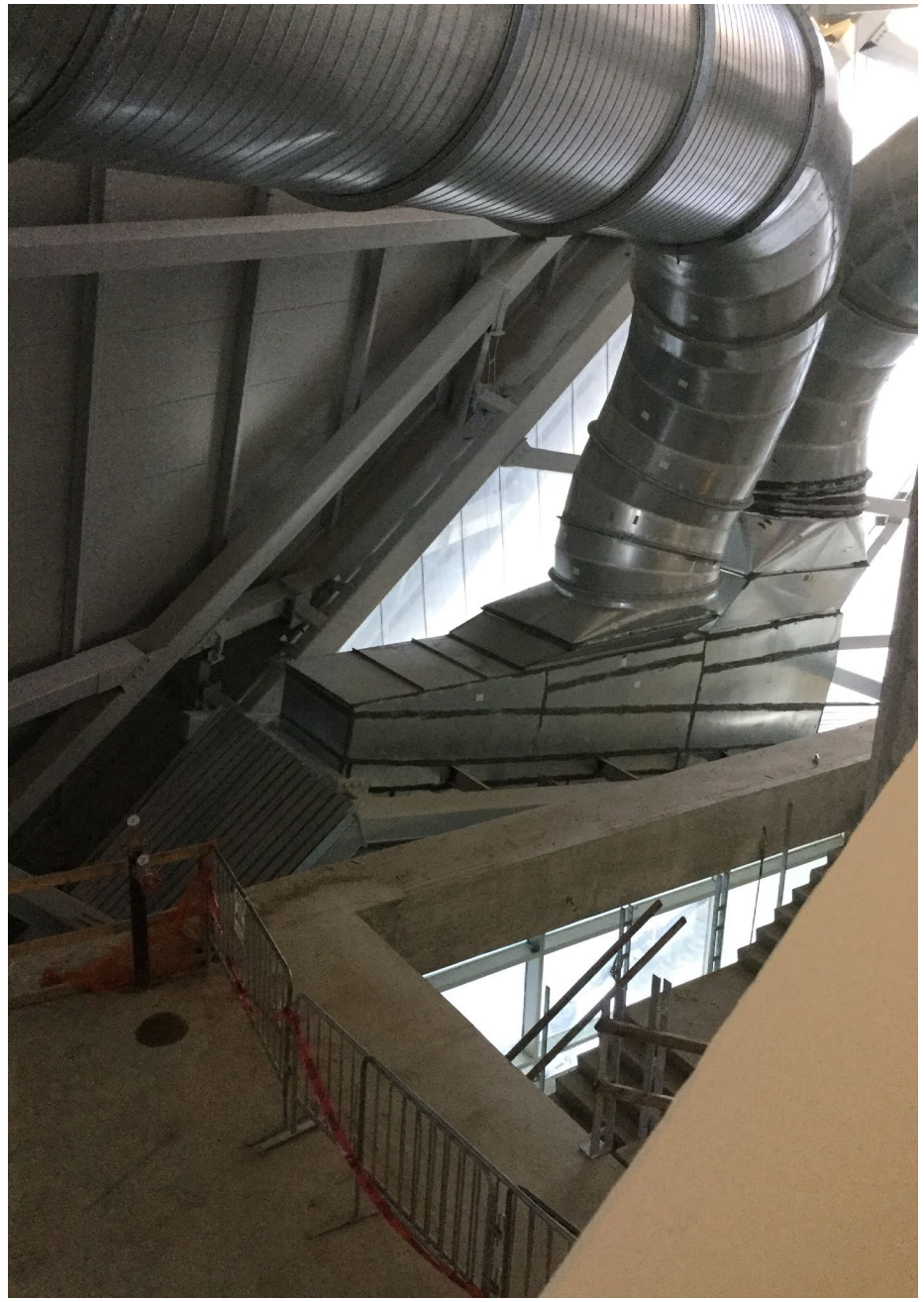


# Tracking

- System/ Construction Team specific Cx members with intra-disciplinary knowledge
- Managed multi trade, multi-disciplinary dissemination effortlessly. **Tied to payments**
- Proctored incrementally more frequent site meeting to discuss priority and completion of deficiencies found.
- Utilization of collaborative FM and Cx software – CxAlloy.
- Had to track PM due to project duration – FM
- Needed Facilities maintenance program output at end – FM

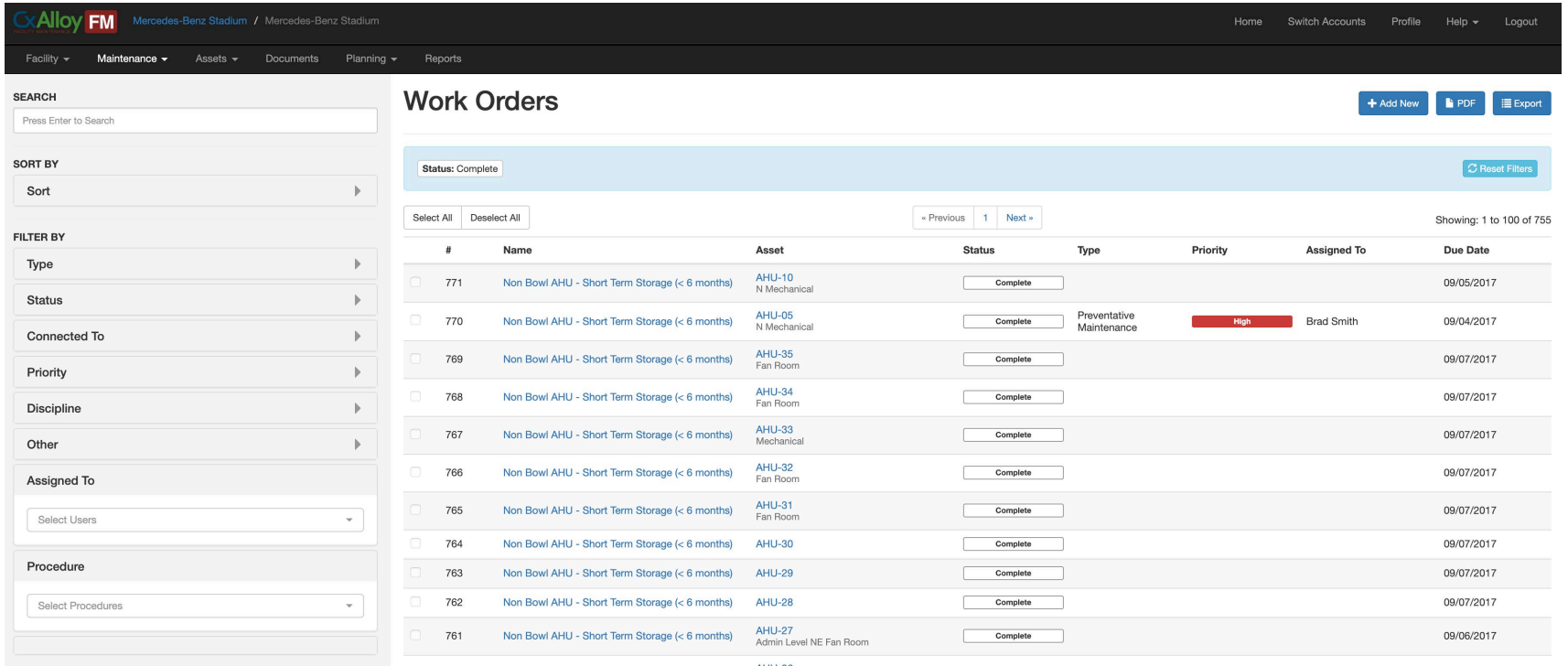



JLG LIFT
MAXIM



# Equipment Maintenance

- Due to project duration > 24 mos., equipment had to be maintained by construction forces. Tracked in CxAlloy FM
- Cx team recorded and populated FULL detailed equipment data for FM program via CxAlloy FM export.
- Given the size and specialty of many systems – WB generated many of the MOP's for the PM



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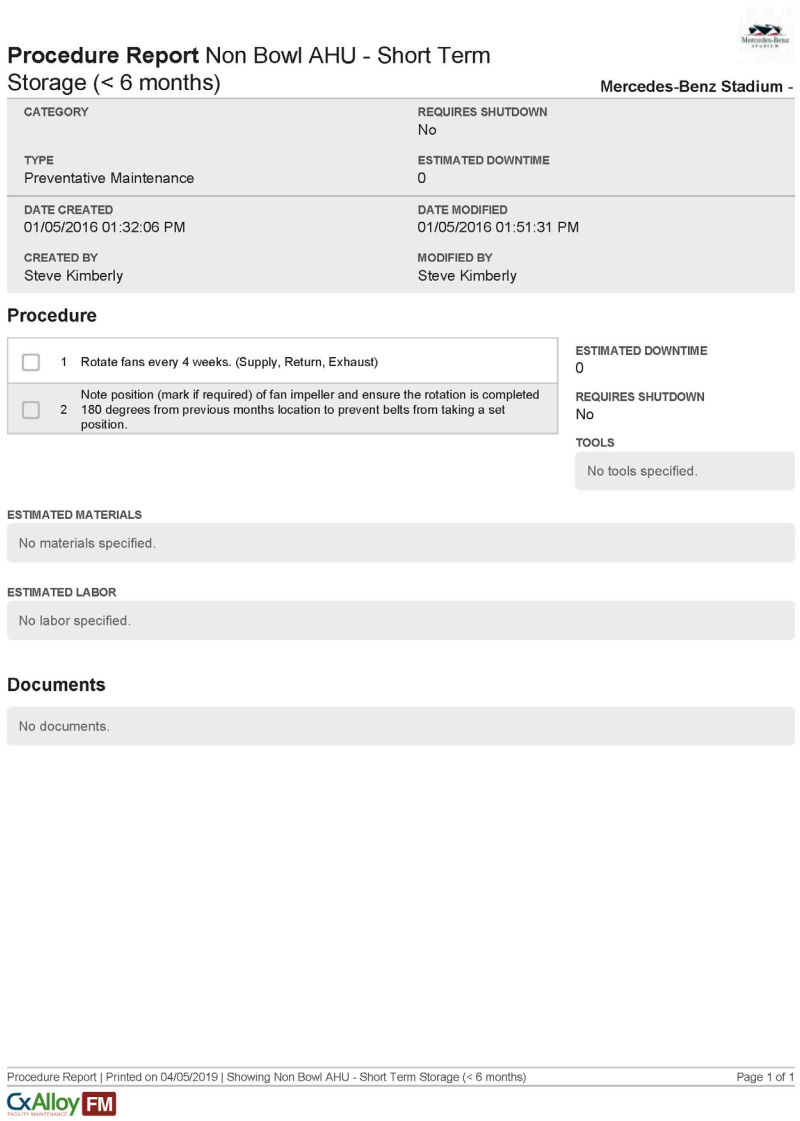

**Procedure Report** Non Bowl AHU - Short Term Storage (< 6 months)

Mercedes-Benz Stadium -

| | |
|---|---|
| CATEGORY | REQUIRES SHUTDOWN: No |
| TYPE: Preventative Maintenance | ESTIMATED DOWNTIME: 0 |
| DATE CREATED: 01/05/2016 01:32:06 PM | DATE MODIFIED: 01/05/2016 01:51:31 PM |
| CREATED BY: Steve Kimberly | MODIFIED BY: Steve Kimberly |

**Procedure**

| | |
|---|---|
| ☐ 1 Rotate fans every 4 weeks. (Supply, Return, Exhaust) | ESTIMATED DOWNTIME: 0 |
| ☐ 2 Note position (mark if required) of fan impeller and ensure the rotation is completed 180 degrees from previous months location to prevent belts from taking a set position. | REQUIRES SHUTDOWN: No |
| | TOOLS: No tools specified. |

ESTIMATED MATERIALS

No materials specified.

ESTIMATED LABOR

No labor specified.

**Documents**

No documents.

Procedure Report | Printed on 04/05/2019 | Showing Non Bowl AHU - Short Term Storage (< 6 months) Page 1 of 1

CxAlloy FM

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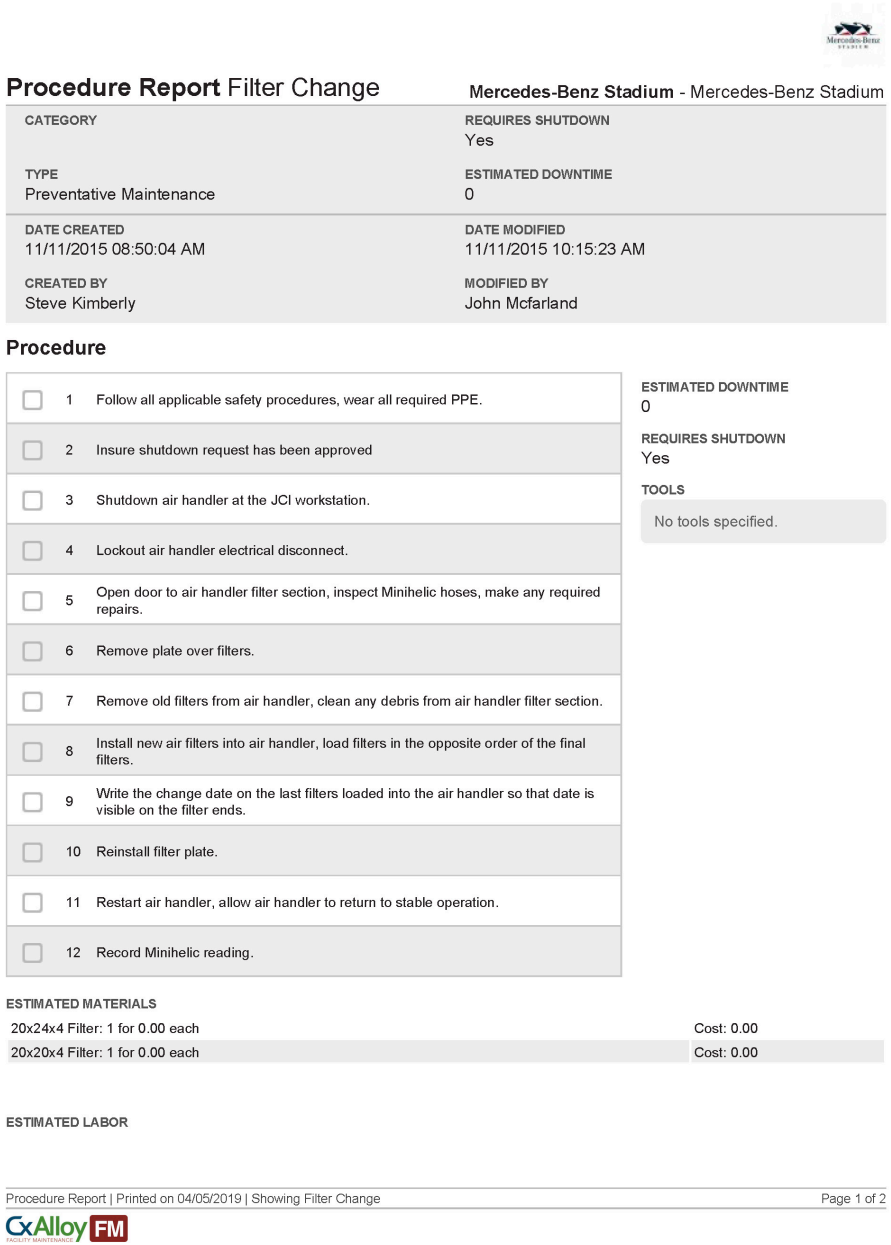
- Cx team recorded and populated FULL detailed equipment data for FM program via CxAlloy FM export.
- Given the size and specialty of many systems – WB generated many of the MOP's for the PM



**Procedure Report** Filter Change — **Mercedes-Benz Stadium** - Mercedes-Benz Stadium

| | |
|---|---|
| CATEGORY | REQUIRES SHUTDOWN: Yes |
| TYPE: Preventative Maintenance | ESTIMATED DOWNTIME: 0 |
| DATE CREATED: 11/11/2015 08:50:04 AM | DATE MODIFIED: 11/11/2015 10:15:23 AM |
| CREATED BY: Steve Kimberly | MODIFIED BY: John Mcfarland |

**Procedure**

| | | |
|---|---|---|
| ☐ | 1 | Follow all applicable safety procedures, wear all required PPE. |
| ☐ | 2 | Insure shutdown request has been approved |
| ☐ | 3 | Shutdown air handler at the JCI workstation. |
| ☐ | 4 | Lockout air handler electrical disconnect. |
| ☐ | 5 | Open door to air handler filter section, inspect Minihelic hoses, make any required repairs. |
| ☐ | 6 | Remove plate over filters. |
| ☐ | 7 | Remove old filters from air handler, clean any debris from air handler filter section. |
| ☐ | 8 | Install new air filters into air handler, load filters in the opposite order of the final filters. |
| ☐ | 9 | Write the change date on the last filters loaded into the air handler so that date is visible on the filter ends. |
| ☐ | 10 | Reinstall filter plate. |
| ☐ | 11 | Restart air handler, allow air handler to return to stable operation. |
| ☐ | 12 | Record Minihelic reading. |

ESTIMATED DOWNTIME: 0

REQUIRES SHUTDOWN: Yes

TOOLS: No tools specified.

ESTIMATED MATERIALS

| | |
|---|---|
| 20x24x4 Filter: 1 for 0.00 each | Cost: 0.00 |
| 20x20x4 Filter: 1 for 0.00 each | Cost: 0.00 |

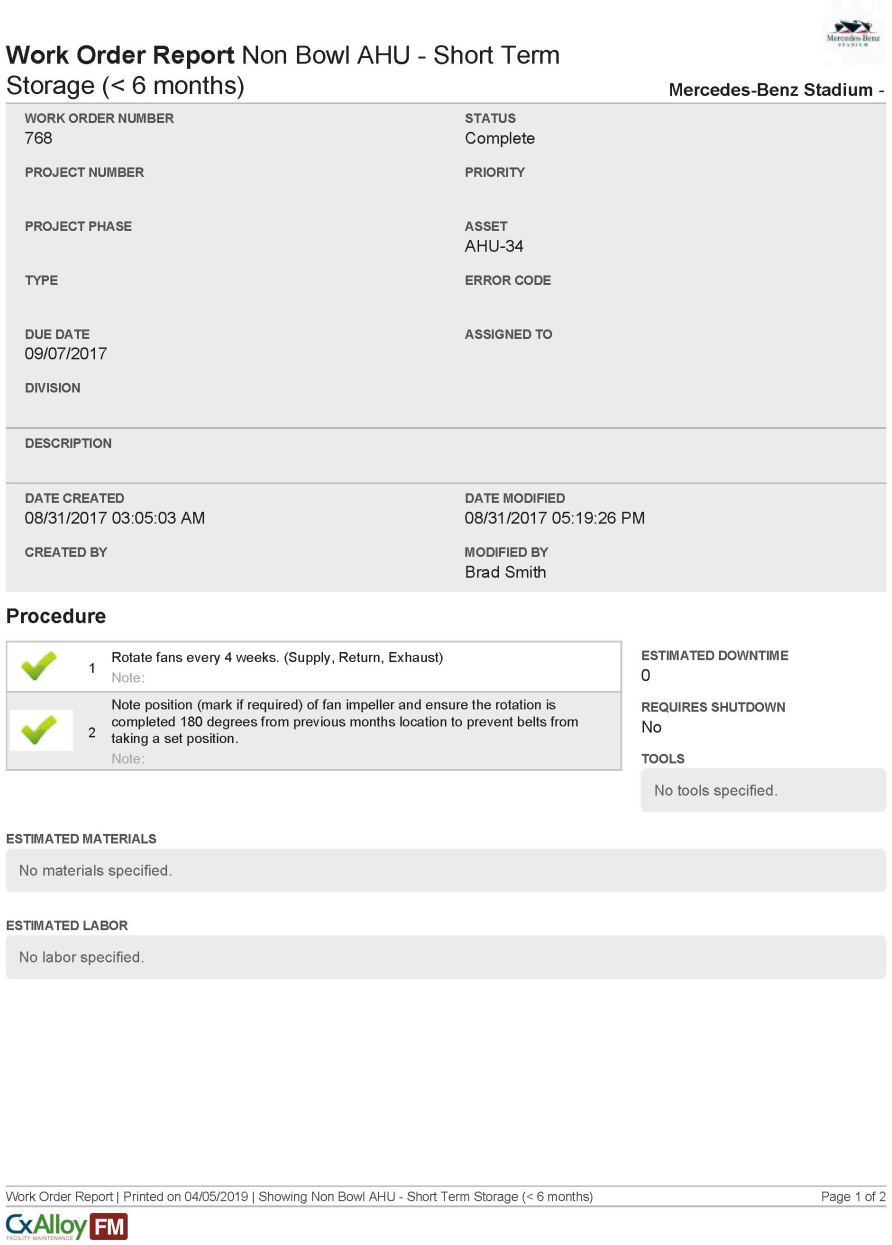
ESTIMATED LABOR

Procedure Report | Printed on 04/05/2019 | Showing Filter Change — Page 1 of 2

CxAlloy FM

# Equipment Maintenance

- Due to project duration > 24 mos., equipment had tc be maintained by construction forces. Tracked in CxAlloy FM
- Cx team recorded and populated FULL detailed equipment data for FM program via CxAlloy FM export.
- Given the size and specialty of many systems – WB generated many of the MOP's for the PM



**Work Order Report** Non Bowl AHU - Short Term Storage (< 6 months)

Mercedes-Benz Stadium -

| | |
|---|---|
| WORK ORDER NUMBER<br>768 | STATUS<br>Complete |
| PROJECT NUMBER | PRIORITY |
| PROJECT PHASE | ASSET<br>AHU-34 |
| TYPE | ERROR CODE |
| DUE DATE<br>09/07/2017 | ASSIGNED TO |
| DIVISION | |
| DESCRIPTION | |
| DATE CREATED<br>08/31/2017 03:05:03 AM | DATE MODIFIED<br>08/31/2017 05:19:26 PM |
| CREATED BY | MODIFIED BY<br>Brad Smith |

**Procedure**

| | | |
|---|---|---|
| ✓ | 1 | Rotate fans every 4 weeks. (Supply, Return, Exhaust)<br>Note: |
| ✓ | 2 | Note position (mark if required) of fan impeller and ensure the rotation is completed 180 degrees from previous months location to prevent belts from taking a set position.<br>Note: |

ESTIMATED DOWNTIME
0

REQUIRES SHUTDOWN
No

TOOLS
No tools specified.

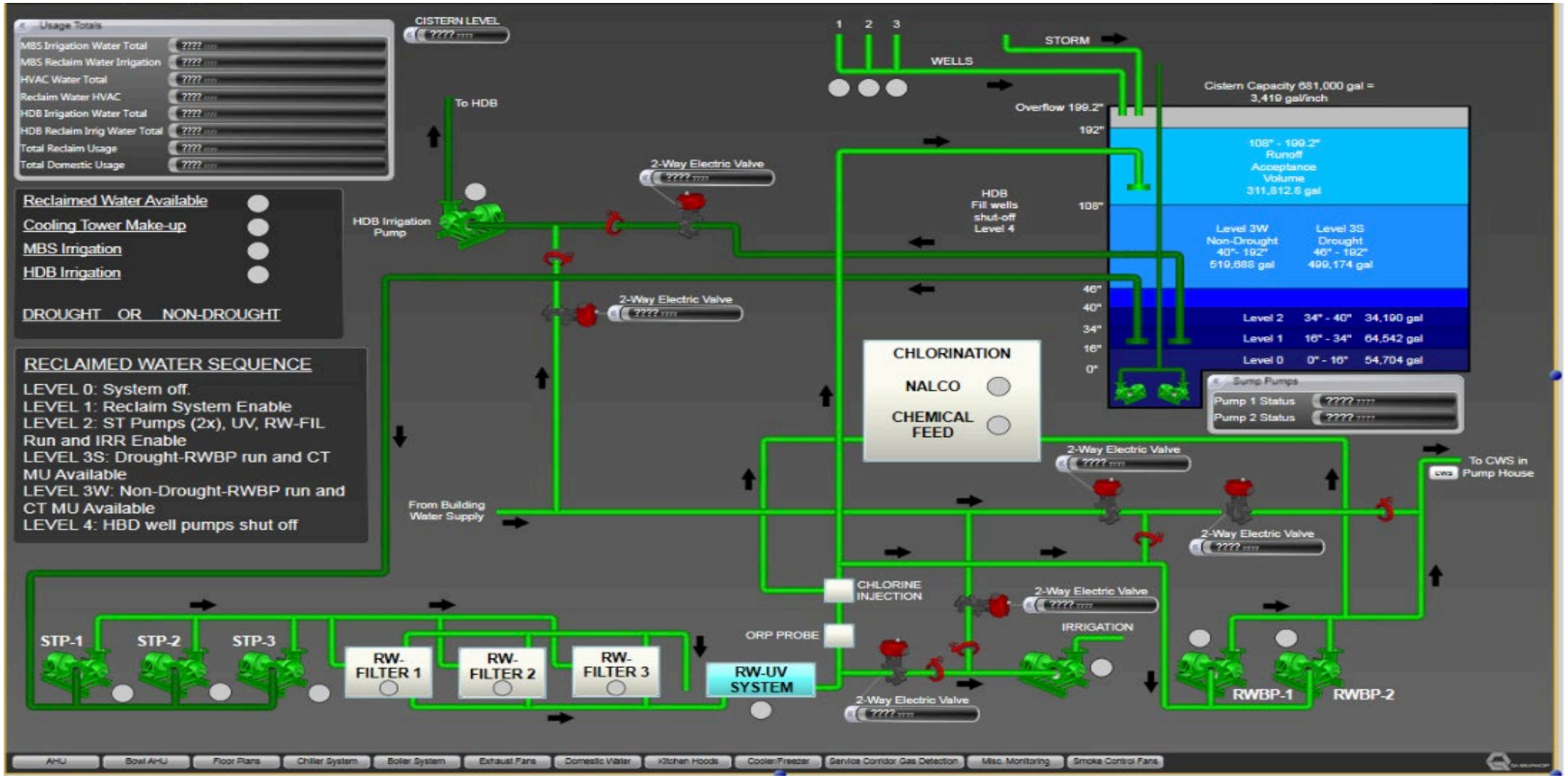
ESTIMATED MATERIALS
No materials specified.

ESTIMATED LABOR
No labor specified.

Work Order Report | Printed on 04/05/2019 | Showing Non Bowl AHU - Short Term Storage (< 6 months) Page 1 of 2

CxAlloy FM

# Large Water Retention Systems




KOHLER


ARMSTRONG
ST-3


Yardney
Yardney
WATER FILTRATION SYSTEMS



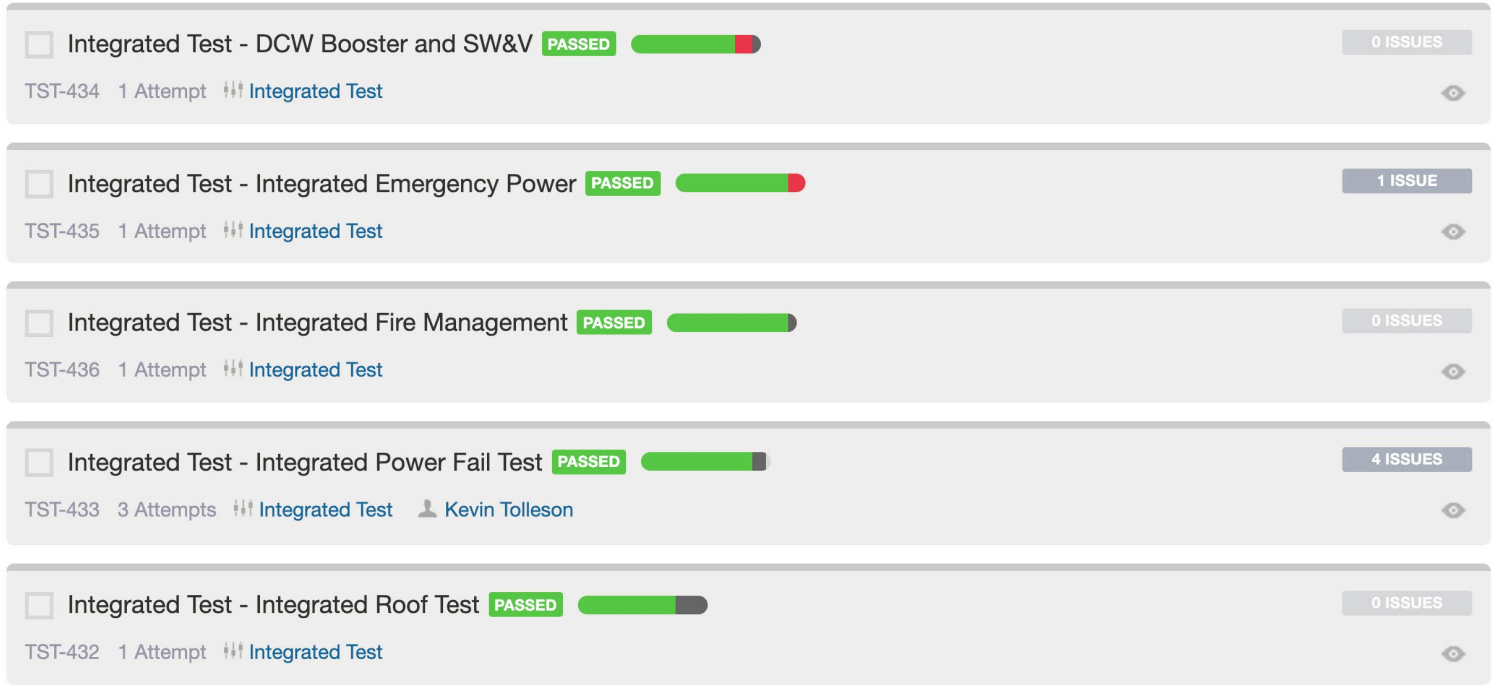
# Large Water Retention Systems

Challenges associated with massive rain harvesting:

- Size – Compact site footprint needed….Tucked under MLK Blvd
- Management of volume – State funds for portions of construction required insurance of vegetation, so most of the volume is dedicated to irrigation, then process.
- Who manages the water when volume is needed by many customers? Prioritization based on volume
- How do you keep a body of water at appropriate sanitization levels given the exposure to public and not impact vegetation?
    - Filtration, UV, Chlorine

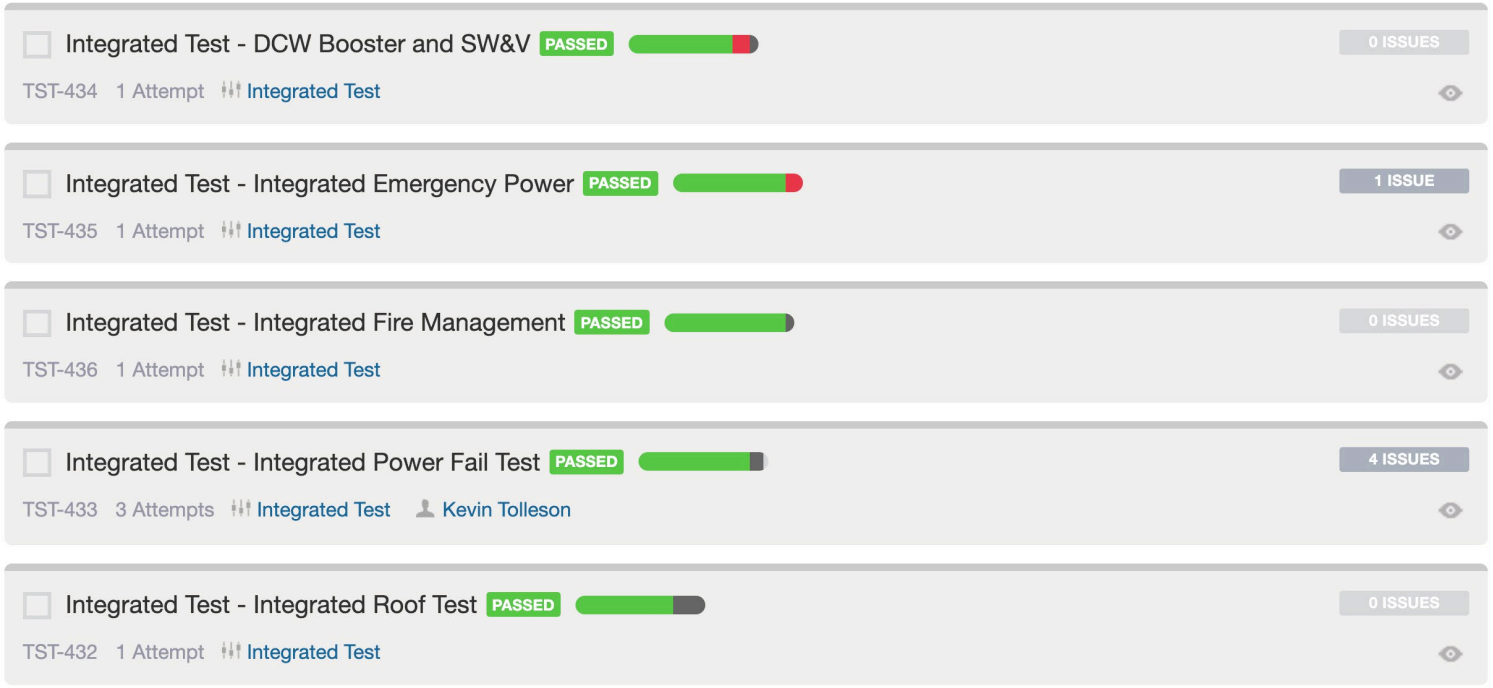
# Global Testing

- Joint venture teams require joint-venture testing plans
- Overall break-down into systems – Electrical (Power), Mechanical, AV, Food Service, FA, Smoke Control, Vertical Transportation….etc.
- Each team has scripted test stemming from power outage.

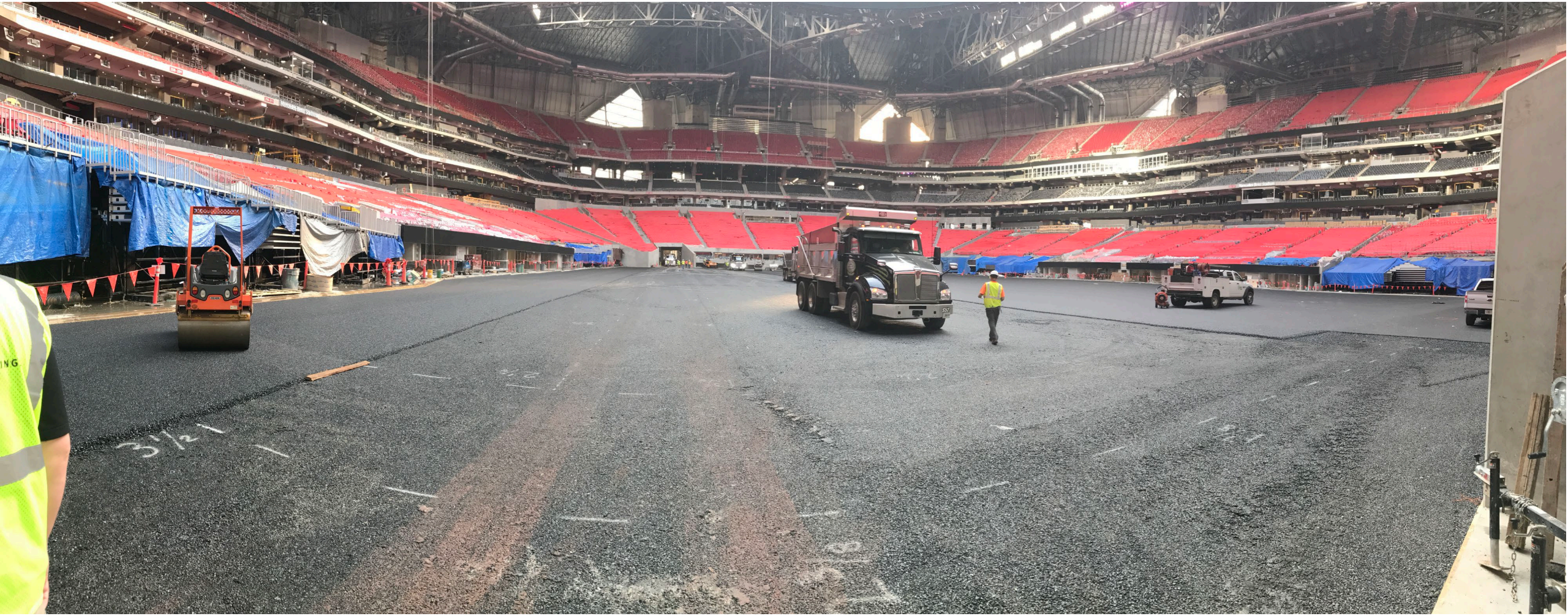


# Global Testing

- Equally as important as emergency/stand-by operation is RECOVERY
- Provided critical time allowances and resumption expectations with integrated testing.
- Emergency operation plans developed post Integrated testing outcomes.



# Multi-Discipline Coordination



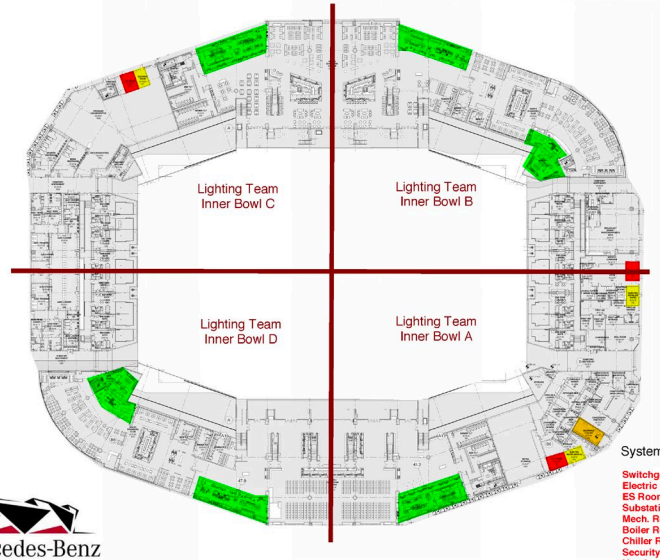
# Global Test – Day Of Meeting

Mercedes-Benz Stadium
Integrated Testing Schedule
07/14/17

A. 6:00pm – Team Arrives Pre-Test Huddle – D1 Trailer
    a. Run Through Testing Plan and Staffing
B. 6:30pm – Inspect All Equipment To Confirm In Normal Operating Mode
C. 8:00pm – Team Reconvenes By Security Room
    a. Support Staff Mobilizes To Equipment / System Locations
D. 9:00pm – First Outage – East and West Vault – 2 Hour Duration
    a. Emergency Power Sources – MOP (WB)
    b. Emergency Lighting – Light Meters?
        i. Pre-test (330p-530p 4 Days 30min per quad – ICU to provide sche)
        ii. Provide cert that lights operate per contract documents
    c. Exit Signs – Pre-Test
        i. Pre-test (330p-530p 4 Days 30min per quad – ICU to provide sche)
        ii. Provide cert that lights operate per contract documents
    d. Fire Management System – Verify e-Power Source and batteries
        i. Test with emergency lighting – Either at front end of each panel
    e. Ribbon Board – Message (e-power)
        i. Talk to Dak to Pre-Test
    f. Public Address System – Announcement (e-power)
        i. Talk to Baker to Pre-Test
    g. Smoke Control System
    h. Network and Security Systems (ES Room UPS Work)
    i. Retractable Roof Power Source – (How Do we Check)
        i. MS-RR – Open main and see PLC transfer
    j. ETFE Inflation System Power Source – (How Do we Check)
        i. Emergency Sports / House light tied to same circuit – Confirm that light stay on
    k. Mechanical Systems (ATS Power Test)
        i. Confirm when Nixon will be out here next week. Pre-test next
    l. Commissary Coolers and Freezers (Confirm e-power source and monitoring point)
    m. Dial Out Phone Security Room – Where is Phone – Phones come from Falcons….
E. 11:00am – Second Outage – East Vault Outage – 30 Minutes – Can do without Ga Pwr?

## Lower Bowl

**Support Scope In Space:**
Emergency Lights
Exit Lights

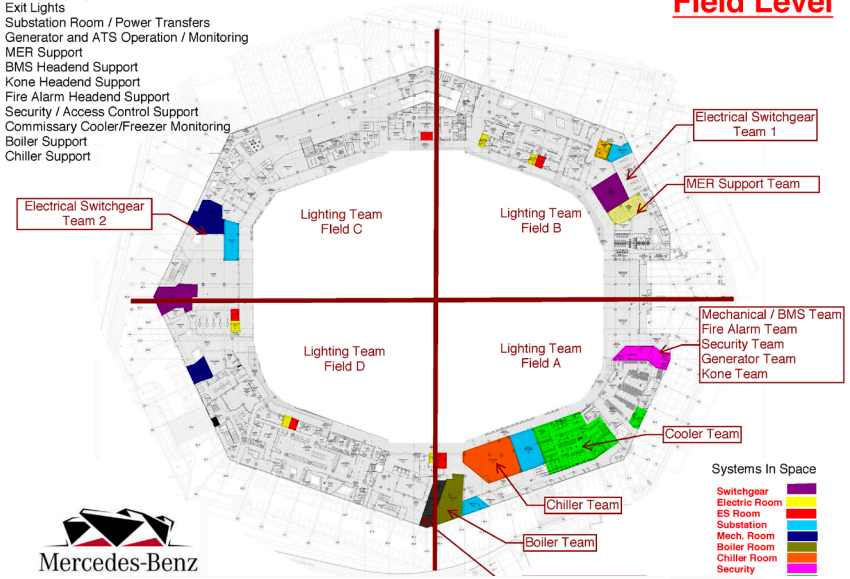



Systems In Space
Switchgear
Electric Room
ES Room
Substation
Mech. Room
Boiler Room
Chiller Room
Security
Hood

Mercedes-Benz STADIUM

## Field Level

**Support Scope In Space:**
Emergency Lights
Exit Lights
Substation Room / Power Transfers
Generator and ATS Operation / Monitoring
MER Support
BMS Headend Support
Kone Headend Support
Fire Alarm Headend Support
Security / Access Control Support
Commissary Cooler/Freezer Monitoring
Boiler Support
Chiller Support

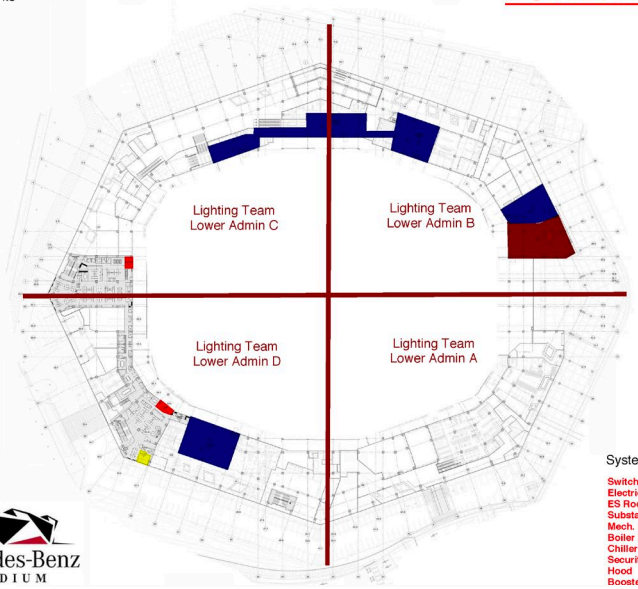



Systems In Space
Switchgear
Electric Room
ES Room
Substation
Mech. Room
Boiler Room
Chiller Room
Security

Mercedes-Benz STADIUM

## LOWER ADMIN

**Support Scope In Space:**
Emergency Lights
Exit Lights

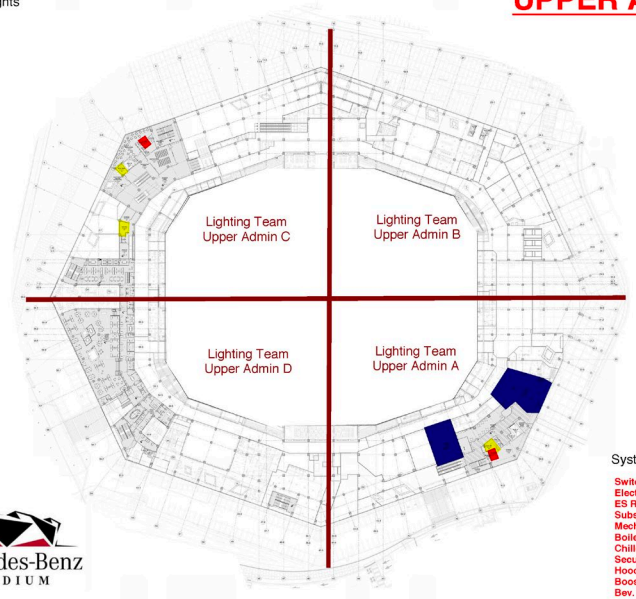



Systems In Space
Switchgear
Electric Room
ES Room
Substation
Mech. Room
Boiler Room
Chiller Room
Security
Hood
Booster Pump

Mercedes-Benz STADIUM

## UPPER ADMIN

**Support Scope In Space:**
Emergency Lights
Exit Lights

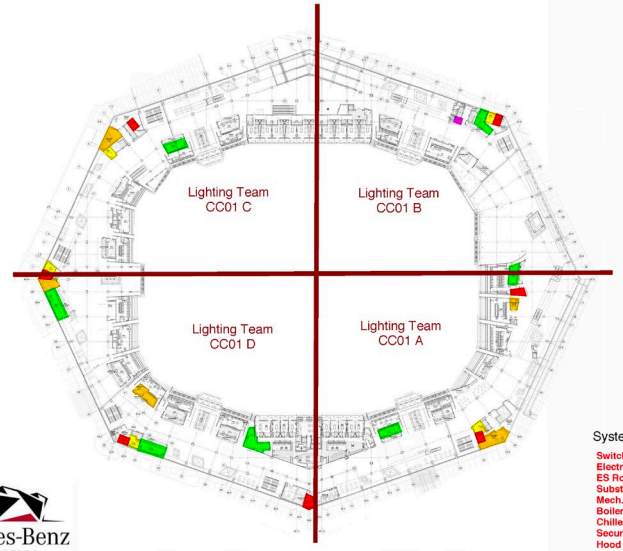



Systems In Space
Switchgear
Electric Room
ES Room
Substation
Mech. Room
Boiler Room
Chiller Room
Security
Hood
Booster Pump
Bev. Cooler

Mercedes-Benz STADIUM

## Concourse 1

**Support Scope In Space:**
Emergency Lights
Exit Lights

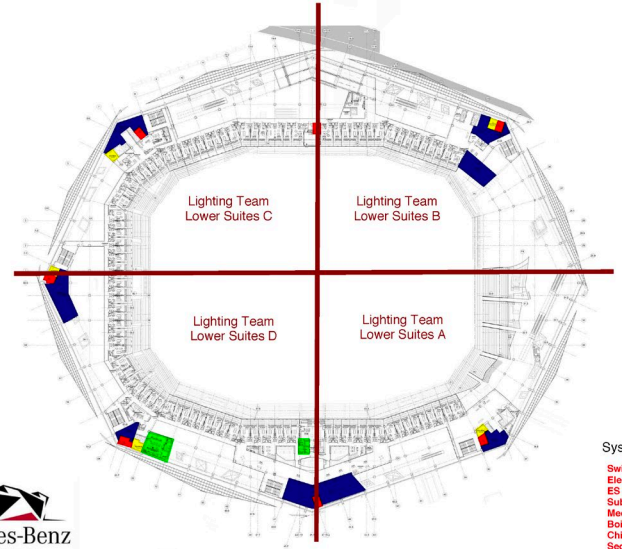



Systems In Space
Switchgear
Electric Room
ES Room
Substation
Mech. Room
Boiler Room
Chiller Room
Security
Hood
Booster Pump
Bev. Cooler

Mercedes-Benz STADIUM

## Lower Suite

**Support Scope In Space:**
Emergency Lights
Exit Lights



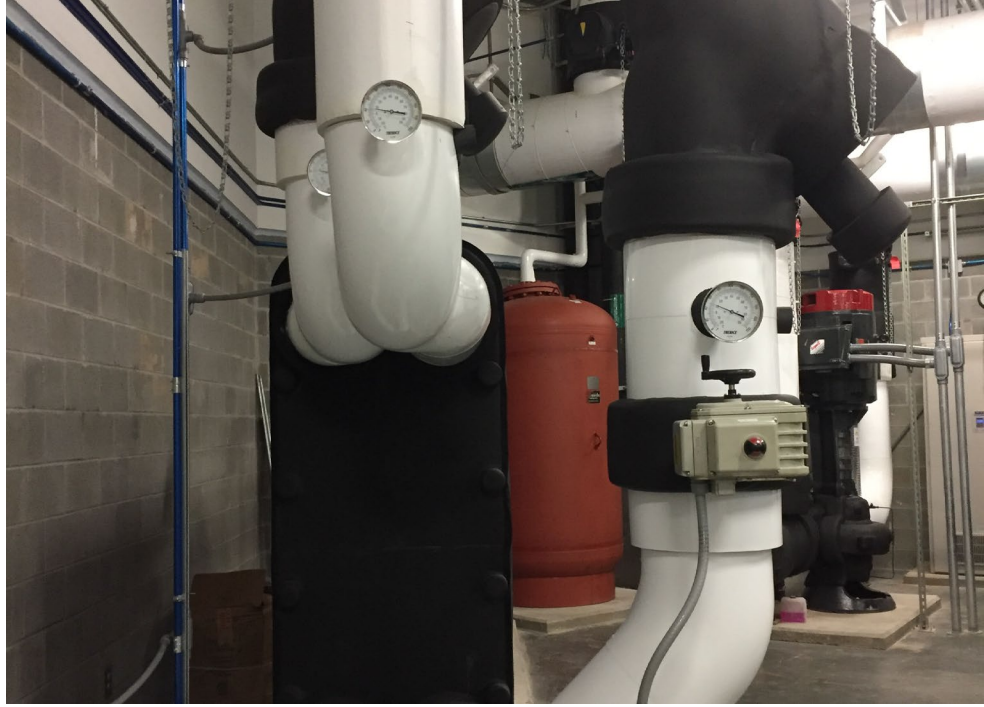

Systems In Space
Switchgear
Electric Room
ES Room
Substation
Mech. Room
Boiler Room
Chiller Room
Security
Hood
Booster Pump
Bev. Cooler

Mercedes-Benz STADIUM

# Global Testing


ANGER
POWER


CONDENSER WATER RETURN
CONDENSER WATER SUPPLY
CHILLED WATER SUPPLY
CHILLED WATER RETURN




GOOOOOOOOAL!
ATLANTA UNITED
Mercedes-Benz Stadium

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This concludes The American Institute of Architects Continuing Education Systems Course